

ANNUAL REPORT 2020-21



Ministry of Electronics & Information Technology
GOVERNMENT OF INDIA



सत्यमेव जयते

Ministry of Electronics & Information Technology (MeitY)
Government of India

ANNUAL REPORT
2020–21



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Executive Summary

Technologies have the potential to transform the trajectories of nations. Digital India, a flagship program of MeitY has been implemented with a vision to transform India into a knowledge economy and digitally empowered society by realizing the full potential of fast paced technological advancement. Developing digital infrastructure and offering digital services that can bridge the digital divide and lead to inclusive growth and empowerment of every citizen is the essence of Digital India.

Focused effort towards developing the world's largest digital infrastructure to connect all the 2.50 lakh Gram Panchayats of India by optical fiber has now connected 1.51 lakh Gram Panchayats. Setting up 3.7 lakh Common Service Centres across India has not only encouraged digital entrepreneurship in rural areas but also improved access to digital services for common man. Digital services like eHospital, BHIM-UPI, online scholarships, DigiLocker, Umangapp, eCourts, Tele Law, eWay Bills etc. have improved ease of living for citizens. The Government eMarketplace (GeM) has not only made government procurement transparent but has also enabled small businesses and even Start-Ups to sell their products and services to government organisations.

Resurgence of electronic manufacturing has made India the manufacturing location for the second largest number of mobile phones in the world. These transformations speak volumes about the success of Digital India. We have made efforts to make India an electronics manufacturing hub. The domestic production of electronic items has increased substantially, from INR 1,90,366 Crores (USD 29 billion) in 2014-15 to INR 5,33,550 Crores (USD 75.7 billion) in 2019-20 at a Compounded Annual Growth Rate (CAGR) of 23%. India's share in global electronics manufacturing has grown from 1.3% in 2012 to 3.6% in 2019, as per industry estimates. 'Make in India'spirit has propelled electronics manufacturing, that is particularly visible in over 200 manufacturing units of mobile phones and accessories creating almost 6.3 lakh direct and indirect jobs. The production of mobile phones has gone up from about 6 crore mobile phones in 2014-15 to approximately 33 crore mobile phones in 2019-20. Promoting electronics manufacturing in India shall be a key element of Digital India in the coming years. Three new schemes namely PLI, SPECS and EMC 2.0 under National Policy on Electronics 2019 has been launched to further boost electronic manufacturing in the country, offset the disabilities faced by industries, develop a robust electronics manufacturing ecosystem, utilize the opportunities arising from disruption in global supply chains due to pandemic, and establish India as a global leader in electronics manufacturing.

Use of JanDhan-Aadhaar-Mobile (JAM) Trinity has transformed the delivery of benefits to the poor enabling direct transfer of entitlements to the beneficiary's bank account digitally. In the process, leakages to ghost beneficiaries have been plugged, leading to cumulative savings of Rs. 1.7 lakh crore by 2020. If on one hand world's largest digital literacy program PradhanMantri Grameen Digital SakshartaAbhiyan (PMG DISHA) is

working to boost digital inclusion by making 6 Crore rural adults digitally literate then on the other hand 233 BPO units set up under BPO Promotion Schemes are creating new job opportunities for young men and women. A total of 7300 crore online transactions on e-Gov applications in 2020 speaks volumes about the impact of Digital India in transforming India.

Building on the success of public digital platforms like Aadhaar, BHIM-UPI, GeM and GSTN, we have to catalyse sectoral public digital platforms in healthcare, education, land resources, agriculture, transportation, logistics and jobs, re-organising valuable data sets and accelerating economic growth in these sectors. The National Digital Health Mission is underway, building a nationwide digital platform in healthcare. The Government propose to develop more nationwide sectoral platforms by weaving together multiple existing and new projects with central support in key sectors of the economy. Such platforms will strengthen data governance, facilitate the use of new technologies such as AI, Blockchain, IOT and Geo-spatial technologies, and will significantly enhance the spectrum of services available online. As in case of Aadhaar, UPI and GeM, these platforms will create opportunities for Indian Startups and the industry to build globally competitive value-added services in these domains. MeitY has identified 21 potential National Public Digital Platforms in key sectors.

Emerging technologies like 5G, Internet of Things, Advanced Data Analytics, Artificial Intelligence, Cloud computing, Augmented and Virtual Reality, 3D printing, robotics and blockchain etc. will redefine the future of technology led transformation. Several Centres of Excellence have been setup to promote innovation in these areas. Efforts are also on to enable Indian IT professionals attain world class skills in these technologies through a Future Skills Programme. A National Programme on 'Artificial Intelligence' has been envisaged, which will be catalysed by the establishment of National Centre on Artificial Intelligence as a hub along with Centres of Excellence. The National Supercomputing Mission is progressively bringing the manufacturing and design of supercomputers into India. This will augment High Performance Computing within India to support the growing requirements of computing for nationwide data platforms and artificial intelligence.

The Annual Report 2020-21 of MeitY highlights the achievements of Digital India 2.0 with a vision to harness digital technology & foster innovation for inclusive, strong, secure and sustainable Digital Economy. MeitY has been able to actualize the slogan of "Minimum government and maximum governance" with 'low investment and high returns' through multiple platforms like Aadhaar, UPI, GeM, UMANG, GSTN etc. benefits of this generational change of India's digital journey to make India the global leader for digital products, platforms, services and goods. The report showcases India's position in the digital revolution as a country, generating future pathways, powered by technology that is affordable, developmental and sustainable. It is now incumbent upon all the stakeholders and participants of our Government and society to collectively work towards defining this 'tectonic shift' in our digital strategy to harness the opportunity to create economic value add of \$800 Billion by the year 2024 and \$1 Trillion by the year 2025 through right digital interventions.

Overview: Vision, Mission, Objectives, Structure and Functions of MeitY



1.1 Introduction

Ministry of Electronics and Information Technology (MeitY) is responsible for formulation, implementation and review of national policies in the field of Information Technology, Electronics and Internet (all matters other than licensing of Internet Service Provider).

1.2 Vision

e-Development of India as the engine for transition into a developed nation and an empowered society.

1.3 Mission

To promote e-Governance for empowering citizens, promoting the inclusive and sustainable growth of the Electronics, IT and ITeS industries, enhancing India's role in Internet Governance, adopting a multipronged approach that includes development of human resources, promoting R&D

and innovation, enhancing efficiency through digital services and ensuring a secure cyber space.

1.4 Objectives

- **e-Government:** Providing e-infrastructure for delivery of e-services
- **e-Industry:** Promotion of electronics hardware manufacturing and IT-ITeS industry
- **e-Innovation/R&D:** Implementation of R&D Framework - Enabling creation of Innovation/ R&D Infrastructure in emerging areas of ICT&E/Establishment of mechanism for R&D translation
- **e-Learning:** Providing support for development of e-Skills and Knowledge network
- **e-Security:** Securing India's cyber space
- **e-Inclusion:** Promoting the use of ICT for more inclusive growth

- **Internet Governance:** Enhancing India's role in Global Platforms of Internet Governance.

1.5 Functions of Ministry of Electronics and Information Technology (Electroniki Aur Soochana Praudyogiki Mantralaya)¹

1. Policy matters relating to Information Technology; Electronics; and Internet (all matters other than licensing of Internet Service Provider).
2. Promotion of internet, IT and IT enabled services.
- 2A. Promotion of Digital Transactions including Digital Payments.²
3. Assistance to other Departments in the promotion of E-Governance, E- Commerce, E- Medicine, E-Infrastructure, etc.
4. Promotion of Information Technology education and Information Technology-based education.
5. Matters relating to Cyber Laws, administration of the Information Technology Act, 2000 (21 of 2000) and other IT related laws.
6. Matters relating to promotion and manufacturing of Semiconductor Devices in the country excluding all matters relating to Semiconductor Complex Limited (SCL), Mohali.³

7. Interaction in IT related matters with international agencies and bodies e.g. Internet for Business Limited (IFB), Institute for Education in Information Society (IBI) and International Code Council–online (ICC).
8. Initiative on bridging the Digital Divide: Matters relating to Digital India Corporation (DIC)⁴.
9. Promotion of Standardisation, Testing and Quality in IT and standardisation of procedure for IT application and Tasks.
10. Electronics Export and Computer Software Promotion Council (ESC).
11. National Informatics Centre (NIC).
12. Initiatives for development of Hardware/ Software industry including knowledge–based enterprises, measures for promoting IT exports and competitiveness of the industry.
13. All matters relating to personnel under the control of the Ministry⁵.
14. Unique Identification Authority of India (UIDAI)⁶.

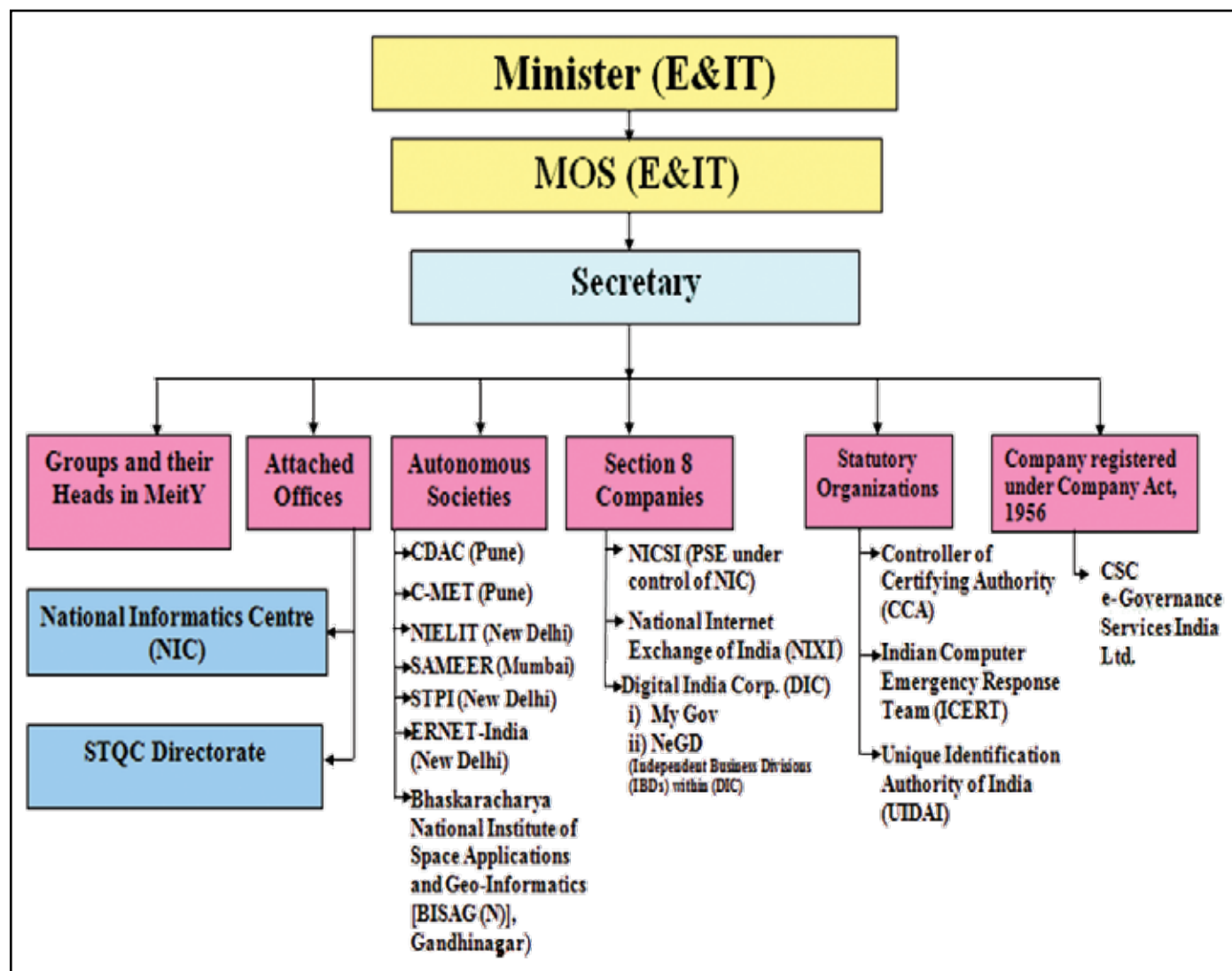
1.6 Organisation Structure:

The Secretariat of the Ministry of Electronics and Information Technology (MeitY) is headed by Secretary, who is assisted by SS and FA, and Group Coordinators and Heads of Organisations under the administrative charge of MeitY. The organisation chart is as follows:-

1 Modified vide Amendment series no. 243 dated 15.10.1999, 257 dated 21.12.2001, 300 dated 26.02.2012 and 327 dated 16.07.2016.
2 Inserted vide Amendment series no. 332 dated 13.02.2017.
3 Inserted vide Amendment series no.279 dated 01.03.2005 and further modified vide no.322 dated 17.03.2016.

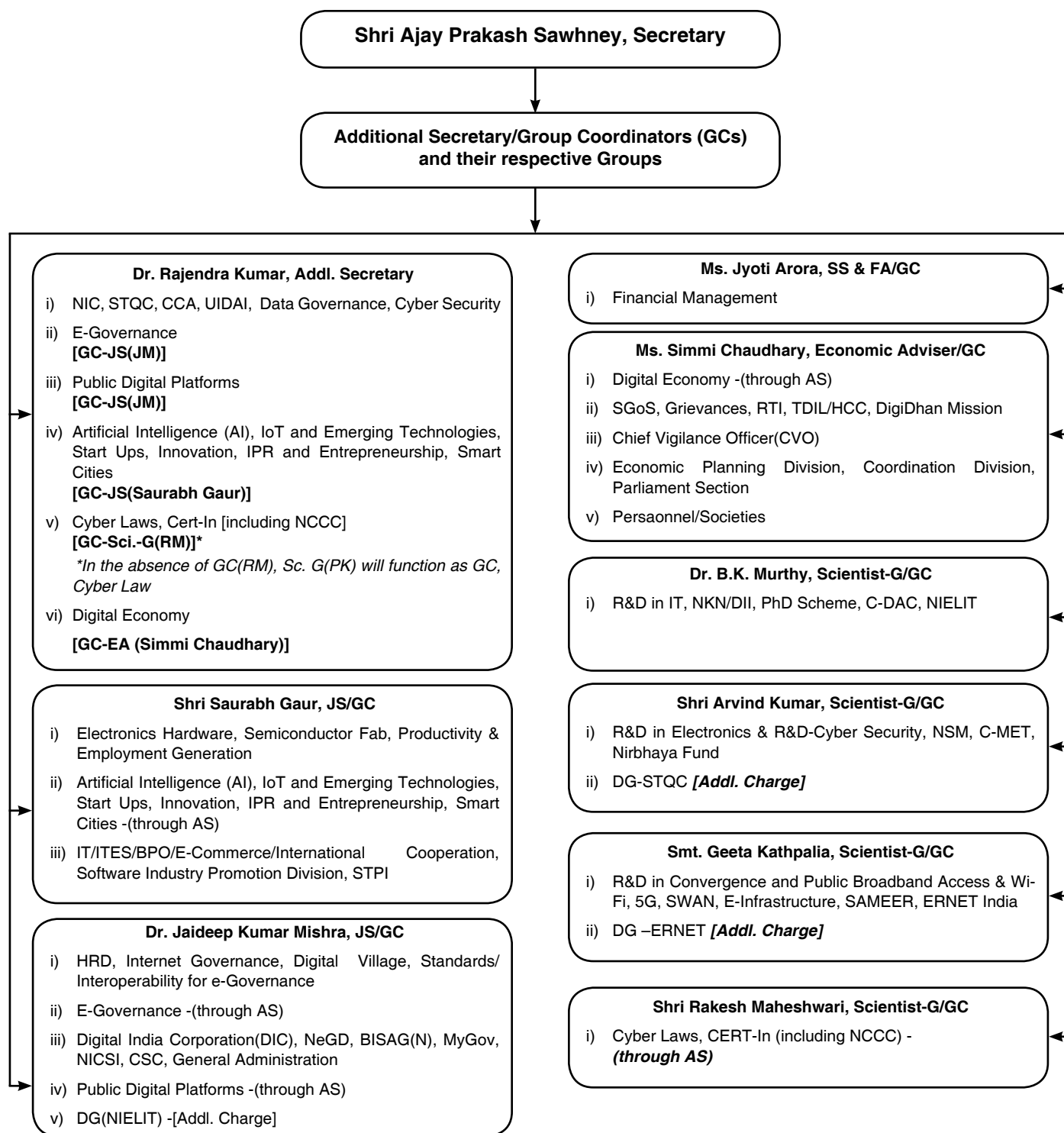
4 Modified vide Amendment series no. 345 dated 17.10.2018.
5 Modified vide Amendment series no. 281 dated 01.09.2005, Further modified vide amendment series no.327 dated 16.07.2016.
6 Inserted vide Amendment series no.318 dated 12.09.2015 (Earlier inserted under Planning Commission vide Amendment Series no.296 dated 22.02.2010, and in NITI Aayog vide series no.312)

MINISTRY OF ELECTRONICS AND INFORMATION TECHNOLOGY (MEITY) ORGANISATION STRUCTURE



In order to operationalise the objectives of MeitY, schemes are formulated and implemented, either directly or through its Responsibility Centres (Organisations/Institutions) under its jurisdiction. To make the technology robust and state-of-the-art, collaborations with the academia and the private/public sector is also sought. MeitY has two Attached Offices (viz., NIC, STQC), six Autonomous Societies

(viz., C-DAC, C-MET, NIELIT, SAMEER, STPI and ERNET India), three Section 8 companies [viz., NISCI, NIXI and Digital India Corporation (DIC)], three Statutory Organisations (viz., CCA, ICERT and UIDAI) and one Company registered under Companies Act. 1956 (viz., CSC e-Governance Services India Ltd.) under its charge to carry out the business allocated to the Ministry.



1.7. Client's/Citizens' Charter (CCC)

Details on CCC are available on MeitY's website, url: www.MeitY.gov.in/clients-citizens-charter (as a part of About MeitY).

Digital India: Power to Empower



Digital India is an umbrella programme to prepare India for a knowledge based transformation. It weaves together a large number of ideas and thoughts into a single comprehensive vision so that each of them is seen as part of a larger goal. The focus of Digital India programme is on being transformative to realize - IT (Indian Talent) + IT (Information Technology) = IT (India Tomorrow) and making technology central to enable change. This programme pulls together many existing schemes. The Digital India programme is designed to transform India into a knowledge-based economy and a digitally empowered society by ensuring digital services, digital access, bridging the digital divide, digital inclusion and digital empowerment. Such an objective is sought to be achieved with the power of technology that is affordable, developmental and inclusive.

Digital India architecture has transformed governance processes for delivery of services. Digital India weaves together a large number of ideas and thoughts into a single comprehensive vision to ensure that benefits of development reach each and every citizen of the country in equal measure along with the need for faster and timely service delivery. This vision is centred on three key areas, namely Infrastructure as Utility to Every Citizen, Governance & Services on Demand and Digital Empowerment of Citizens.

Vision of Digital India: The Digital India programme is centred on three key vision areas:

Vision Area 1: Digital Infrastructure as a Utility to Every Citizen includes:

- Availability of high speed internet as a core utility for delivery of services to citizens

- Providing cradle to grave digital identity that is unique, lifelong, online and authenticable to every citizen
- Mobile phone & bank account enabling citizen participation in digital & financial space
- Easy access to a Common Services Centre
- Shareable private space on a public cloud
- Safe and secure cyber-space.

Vision Area 2: Governance & Services on Demand includes:

- Seamlessly integrated services across Departments or jurisdictions
- Services availability in real time from online & mobile platforms
- All citizen entitlements to be available on the cloud
- Digitally transformed services for improving ease of doing business
- Making financial transactions electronic & cashless
- Leveraging GIS for decision support systems & development

Vision Area 3: Digital Empowerment of Citizens includes:

- Universal digital literacy
- Accessible digital resources universally
- All documents/certificates to be available on cloud
- Availability of digital resources/services in Indian languages
- Collaborative digital platforms for participative governance
- Portability of all entitlements through cloud

Pillars of Digital India

This transformational programme has been designed to build holistic capabilities across infrastructure, manufacturing, processes, skill sets

and delivery platforms which, in turn, will lead to the creation of a self-reliant, knowledge economy. The focus is on improving direct services to citizens, as well as making the country ready for ease of doing business. Accordingly, the initiatives under this programme aim is to build and sustain all associated layers required for a digital empowerment of the people and building a digital economy.

To ensure focus on each of these layers, following nine pillars of growth areas have been identified under the Digital India Programme:

- Broadband Highways
- Universal Access to Mobile Connectivity
- Public Internet Access Programme
- e-Governance – Reforming Government through Technology
- e-Kranti - Electronic Delivery of Services
- Information for all
- Electronics Manufacturing– Target NET ZERO imports
- IT for Jobs
- Early Harvest Programmes.

2.1 Digital Infrastructure as a Core Utility to Every Citizen

2.1.1 Digital Identity

2.1.1.1 Aadhaar: An efficient and targeted Service Delivery Platform

Unique Identification Authority of India (UIDAI) has been mandated to empower every resident of India with a unique identification number and provide a digital platform for authentication in an easy, electronic and cost-effective way.

The Aadhaar system is built on a sound strategy and a strong technology backbone and has now evolved into a vital digital identity infrastructure.

Key features of Aadhaar include:

- 12-digit random unique number for a resident obtained through the process of de-duplication involving biometrics.
- Number does not contain any intelligence.
- Scalable technology architecture
- Open source technologies

Aadhaar, being a unique digital ID, provides a powerful platform for authenticating a resident anytime and anywhere, in line with the vision of the UIDAI. The purpose of authentication is to enable residents to prove their identity and for service providers to confirm that the residents are 'who they say they are' in order to supply services and give access to benefits.

2.1.1.2 e-Pramaan: A National Authentication Service

e-Pramaan is a centralized standard based strong multi-factored authentication system with single sign on (SSO). e-Pramaan provides four factors for user authentication: Password (text, image), One Time Password (SMS, email, mobile app), Digital Certificate (Indian CAs), and Biometric (Finger Print, IRIS) in its production environment. Aadhaar APIs are used for biometric authentication.

Key Features

- Single Sign On (SAML 2.0 based)
- Support in Java, Dotnet, PHP
- Seamless upgrade to new technology
- Two way authentication

- Flexible authentication chaining
- Role based authorization
- Secured communication channel
- IP based fraud detection and management
- Integration with ID providers like Aadhaar, Driving Licence

Another major component of e-Pramaan is Aadhaar Ecosystem. C-DAC is Authentication Service Agency (ASA) – Authentication User Agency (AUA)/KYC User Agency (KUA) of UIDAI to provide Aadhaar services and is compliant with the latest notifications of UIDAI.

Major Outcome

- 270 Departments integrated with over 12.46 crore Transactions
- A standard was formulated

e-Pramaan – Products

e-Pramaan is also available as a solution and product along with service. Below are the details.

- One Time Password (OTP)
- e-Pramaan Complete Solution as an Instance
 - Customizable portal specific to State/Department
 - Independent State/Department's User directory
 - Autonomy of Infrastructure management by State/Department
 - Inclusion of State Identity Cards



2.1.1.3 Online e-Sign (e-Hastakshar):

e-Sign is a key digital platform for providing online digital signature service, which can be integrated with service delivery applications via an Application Programming Interface (API), to facilitate an e-Sign user to digitally sign a document. Using authentication of the Aadhaar holder through Aadhaar e-KYC service, online electronic signature service is facilitated. e-Sign service facilitates instant signing of documents online by citizens in a legally acceptable form. Using this, an Aadhaar holder can electronically sign a form/document anytime, anywhere, using device such as Personal Computer or Laptop or Mobile.

Notification of Electronic Signature or Electronic Authentication Technique and Procedure Rules, 2015, in which the technique known as 'e-authentication technique using Aadhaar e-KYC services' for the e-Sign Online Service was introduced, which allows everyone to have the ability to digitally sign electronic documents. Recently, CCA has released e-Sign 3.0 specifications based on Aadhaar offline eKYC wherein XML is enabling offline mode for obtaining eKYC. This requires one-time registration between e-Sign user and e-Sign service provider and supports two factor authentication while e-Signing.

Current Status

- 7 agencies namely, eMudhra Ltd., C-DAC, Safescrypt, Verasys, IdSign, NSDL e-Governance Infrastructure Ltd. and Capricorn have been empanelled to offer e-Sign Services.
- Total 14.00 crore e-Sign issued by all ESPs. Out of these, 2.04 crore e-Sign issued by C-DAC (i.e. under e-Hastakshara project).
- 7 workshops have been organized by C-DAC on e-Sign during the year 2020.
- Currently 55 agencies are leveraging e-Sign 2.1 Production service.

- The services are being leveraged by various applications such as National Informatics Centre (NIC), Digital Locker, Centre for e-Governance Karnataka Government, Directorate General of Human Resource Development (DGHR), Employee Provident Fund Organization, India Post Payments Bank, UTI Infrastructure Technology and Services Limited, Jammu & Kashmir UT, Department of Panchayati Raj & Rural Development of Andhra Pradesh Government, Uttar Pradesh Forest and Wildlife Department etc.

2.1.2 State Wide Area Network (SWAN)

State Wide Area Network (SWAN) is one of the core infrastructure components of the National e-Governance Plan (NeGP) of Government of India. Under the SWAN Scheme, it was proposed to establish State Wide Area Networks across the 35 States/UTs so that a common secure IT infrastructure is created to enable seamless delivery of Government to Government (G2G), Government to Citizen (G2C) and Government to Business (G2B) services.

SWAN envisaged as the Converged Backbone Network for data, voice and video communications throughout a State/UT and has catered to the information communication requirements of various Government Departments by extending connectivity up to the block level.

The Scheme for establishing State Wide Area Network (SWAN) across the country was approved to connect all State/UT Headquarters up to the Block level via District/sub-Divisional Headquarters, in a vertical hierarchical structure with a minimum bandwidth capacity of 10 Mbps per link. Each of the State/UT could enhance the bandwidth up to 34-100 Mbps between SHQ and DHQs and upto 8-10 Mbps between DHQs and BHQs depending upon the utilization.

Government approval for the SWAN Scheme in the country with an overall outlay of Rs.3,334 crore, (MeitY's Grant-In-Aid component being Rs.2005 crore and ACA components Rs.1329 crore) was to be expended in five years. To facilitate smooth and time bound implementation, policy guidelines were formulated, addressing various issues related to planning and implementation of the SWAN scheme, including roles and responsibilities of different agencies/Stakeholders.

Presently, SWANs have been made operational in 34 States/UTs. The States/UTs are utilising the core infrastructure of SWAN for providing the closed user Group (CUG) connectivity to various Government offices in the State/UTs. These offices access their applications through SWAN in secured environment hosted at State Data Centres (SDCs). The States have been utilising the core infrastructure of SWAN for connectivity and dedicated close user application access connectivity. SWAN has been integrated with NKN in 29 States/UTs at SHQ level and 540 at the District level to provide the high bandwidth.

Increasing digitisation amongst States has led to higher utilization of bandwidth. Presently, 30 States/UTs are utilizing around 70-72 % of bandwidth of the existing link capacity. To monitor the performance of SWANs, the Ministry has mandated positioning of Third Party Auditors (TPAs) in the States/UTs. As on date, 29 States have empanelled the TPAs for monitoring the performance of the SWANs in the respective States/UTs.

2.1.3 Vikaspedia (India Development Gateway)

Vikaspedia is a MeitY initiative for providing e-knowledge and using ICT-based applications for empowerment of poor (rural and urban). It seeks to maximise utility of ongoing Government programmes through provision of universally accessible digital information resources in Indian languages, created and shared collaboratively by various development stakeholders.

As part of the initiative, a multi-lingual, multi-sectoral online knowledge platform- www.vikaspedia.in has been developed. The portal is available in all 22 constitutionally recognized languages of the country, besides English. The portal provides information related to six key livelihood sectors - Agriculture, Health, Education, Social Welfare, Energy and e-Governance. Two additional areas of "Aspirational Districts" and a "Digital catalogue of Government schemes" have been made available in the portal.

During the year, utility of Vikaspedia as a knowledge platform for Aspirational Districts has been initiated in 50 Aspirational districts covering 15 states. 230 webinars have been organized on digital content access & sharing in Indian languages for about 25,000 first level services providers from across the country in various languages. An outreach campaign through Community Radio to promote Atmanirbhar and PM Garib Kalyan Yojana was also taken up in the Aspirational Districts and northern and north-eastern States of the country.



2.1.4 State Data Centre(SDC)

State Data Centre (SDC) is one of the three core infrastructure components under the NeGP. Under the SDC scheme, Data Centres to be established in all the States/UTs to consolidate services, applications and infrastructure in order to provide efficient electronic delivery of Government to Government (G2G), Government to Citizen (G2C) and Government to Business (G2B) services. These services can be rendered by the States through common service delivery platforms seamlessly supported by core connectivity infrastructure, such as, SWAN and CSCs as the front-end delivery outlets at the village level. Some of the key functionalities that can be provided through SDC are central repository for the State, secure data storage, online delivery of services, citizen information/services portal, State Intranet Portal, disaster recovery, remote management and service integration, etc., SDCs also provide better operational and management control with minimized overall cost of data management, IT resource management, deployment and other costs for States/UTs.

As of 31st December 2020, 29 SDCs have been declared operational including Tamil Nadu, Puducherry, West Bengal, Andhra Pradesh, Meghalaya, Goa, Karnataka, Manipur, Odisha, Sikkim, Haryana, Kerala, Maharashtra, Gujarat, Tripura, Rajasthan, Nagaland, Uttar Pradesh, Andaman and Nicobar Islands, Madhya Pradesh, Lakshadweep, Chhattisgarh, Jammu and Kashmir, Mizoram, Bihar, Himachal Pradesh, Jharkhand, Punjab and Uttarakhand.

Out of the 3 pending SDCs (yet to be operational) Assam has already started installation work .

Since the SDCs are expected to host critical Government applications/services including important citizen data, protection of the same is of prime importance. In this regard, the SDC scheme has provisioned for a Disaster Recovery (DR)

mechanism through storage-based replication as part of the SDC enhancement. 17 States are DR enabled till December, 2020.

MeitY is providing continuous support and guidance to the States/UTs in order to ensure smooth implementation of the project across the country. Policy guidelines, roles and responsibilities of different agencies/stakeholders, including various issues/concerns to be addressed while planning, implementation operations and maintenance of the Data Centres have been formulated. Guidelines are updated from time to time and are communicated to the States/UTs, leading to creation of consistent and State of art infrastructure.

Achievements

- In FY 2020-21, Assam SDC is under implementation and likely to become operational.
- State Data Centre Bihar would be completing 5 years of operations during the year 2020-21.

National Data Centre in North-East Region (NDC-NER):

The proposal for setting-up of “National Data Centre in North-East Region (NDC-NER)” at Guwahati, Assam will facilitate the ICT Infrastructure requirements for North-Eastern States. The ambitious project is in line with “Vision Document for Digital North-East by 2020”. The project will be implemented by NIC at a total outlay of Rs.348.66 crore over a period of five and a half years.

The NDC-NER is proposed with the following key features:

- In the present proposal, NDC-NER building cost is for ground plus 5 floors with facility creation for 200 racks (G+3) of DC and Cloud infrastructure (IT and Non-IT). 4th and 5th floor shall be built and reserved for future expansion.

- It would provide a robust, highly available & significantly scalable infrastructure with adequate redundancy to enable Government to render efficient delivery of citizen services.
- It will have Security Operation Centre (SOC), Network Operation Centre (NOC) and Centre of Excellence (CoE) for Application Security.
- It will act as Disaster Recovery site for various applications hosted in other data centres in the region.

2.1.5 GI Cloud (MeghRaj):

In order to realize the Digital India vision, and to harness the benefits of Cloud Computing, the Government of India has embarked upon an ambitious initiative – “GI Cloud”, which has been named as ‘MeghRaj. MeghRaj initiative is intended to deliver ICT services over cloud to all the Departments/Ministries at the Centre and States/UTs. The vision of this initiative is to accelerate delivery of e-Services in the country, while optimizing ICT spending of the Government. As per the MeghRaj policy, “Government Departments at the Centre and States have to first evaluate the option of using the GI Cloud for implementation of all new projects funded by the Government. Existing applications, services and projects be evaluated to assess, whether they should migrate to the GI Cloud”.

Some of the major benefits of GI Cloud are listed below:

- Driving cost efficiencies with increased utilization of IT Infrastructure resources through cloud.
- Enable conversion of CAPEX to OPEX paving the way for consumption based billing and faster procurement of IT Infrastructure services.
- Rapid development, deployment and re-use of ICT applications.

- On demand scalability of infrastructure to meet the long-term capacity requirements and elasticity, to cater to the peak load requirements.

The major components of MeghRaj include:

- Setting up of State and National Clouds
- Setting up of an e-Gov Appstore
- Empanelment of Cloud Service Providers
- Setting up of Cloud Management Office (Policies, Guidelines, templates, security norms, certification, etc.)
- Awareness workshops, training programmes and migration support for cloud adoption by Departments
- MeghRaj (GI-Cloud) service Directory
- Setting up of Clouds by other Government entities

Achievements

The first National Cloud implemented by NIC is already being used by more than 1,260 applications of Government Departments. NIC Cloud can be accessed using the following link: <https://cloud.gov.in/Initiatives> under Digital India Program hosted on National Cloud include:

- Digital India Portal
- Digital Locker
- Make-in-India
- Skill Development
- Smart Cities
- Online Registration System (e-Hospital)
- Aadhaar based Biometric Attendance of Government employees
- Jeevan Pramaan - service for pensioners
- MyGov - largest citizen engagement platform of the Government

The e-Gov Appstore under GI Cloud can be accessed using the link <http://apps.gov.in/>. MeitY has empaneled 12 Cloud Service Providers for a variety of Cloud deployment models (Public Cloud, Virtual Private Cloud, and Government Community Cloud) and Cloud Service offerings (IaaS, PaaS & SaaS). The empaneled CSPs are Microsoft Corporation (India) Private Limited, Tata Communications Limited, Bharat Sanchar Nigam Limited (BSNL), ESDS Software Solutions Private Limited, Net Magic IT Services Private Limited, Sify Technologies Limited, CtrlS Data Centre Limited, Cyfuture India Private Limited, Web Werks India Private Limited, Amazon Internet Services Pvt. Limited, Nxtra Data Limited and Reliance Corporate IT Park Ltd. The current status of the audit and the contact details of the empanelled CSPs can be accessed using the link <https://www.meity.gov.in/content/gi-cloud-meghraj>.

2.1.6 Service Delivery Gateway:

Government services should be seamlessly integrated across Departments or jurisdictions to provide easy and a single window access to all citizens. It will reduce the time and efforts involved in various approvals, clearances, etc., It would also ensure transparency to the system. In order to meet the objective of seamless integration across the Departments, architecture of the application should be designed in a way that interfaces with other systems, may be built whenever required.

e-Sangam: National Service Delivery Gateway (NSDG) is Service Oriented Architecture (SOA) based constellation of National and State e-Governance Service Delivery Gateways, with an objective to provide a standardized interfacing and seamless message exchange among various Government portals as front-end service access providers, back-end service providing Departments and domain gateways. e-Sangam enables seamless integration of department applications and provides a framework for single point delivery of e-Governance services delivered by heterogeneous Departments.

Achievements

- 88 Services of Kerala State successfully integrated with e-Sangam Production environment
- Common Application Form (CAF) for registration of Foreign Portfolio Investors (FPI) with Securities and Exchange Board of India (SEBI) made live with e-Sangam Production environment
- 26 Departments are accessing e-Sangam middleware with 639 services integrated and
- Average monthly transaction for the year 2020: 16.17 lakh.

2.1.7 National Knowledge Network (NKN)

NKN was approved in March 2010, for 10 years by Government of India with National Informatics Centre (NIC) is the implementing agency. NKN has been extended till 31st March 2021 and the approval for the next phase of NKN is underway.

National Knowledge Network (NKN) is an innovative cutting-edge secured & resilient network, which provides a centralized multi-gigabit high-speed digital connectivity backbone for research & education institutions and Government Organizations spread across India. NKN is the only network globally, that carries R&E, Internet and e-Governance traffic as three independent verticals under one umbrella.

Institutes connected under NKN belong to diverse categories (but not limited to) as depicted in the table below:

Major Categories				
IITs	IIMs	Medical	Central/ State University	Engineering
Agriculture Research	Armed Forces	Quality Testing Labs	State Wide Area Networks (SWAN)	State Data Centers (SDC)
Research Labs	CSIR National Labs	National Data Centres	C-DAC	Art & Design
DRDO	Space	DST	Security	ISRO & DAE

NKN has been empowering Digital India, as it is the primary backbone for all e-Governance initiatives in the country. NKN has been playing a vital role in enhancing digital capabilities and implementing the digital initiatives of the Government of India. NKN addressed the challenge of providing a strong, robust and secured network which enabled the Government to implement Government to Government (G2G) and Government to Citizen (G2C) services seamlessly and on time bound manner for implementing the Digital India Initiative.

NKN Growth and Current Status

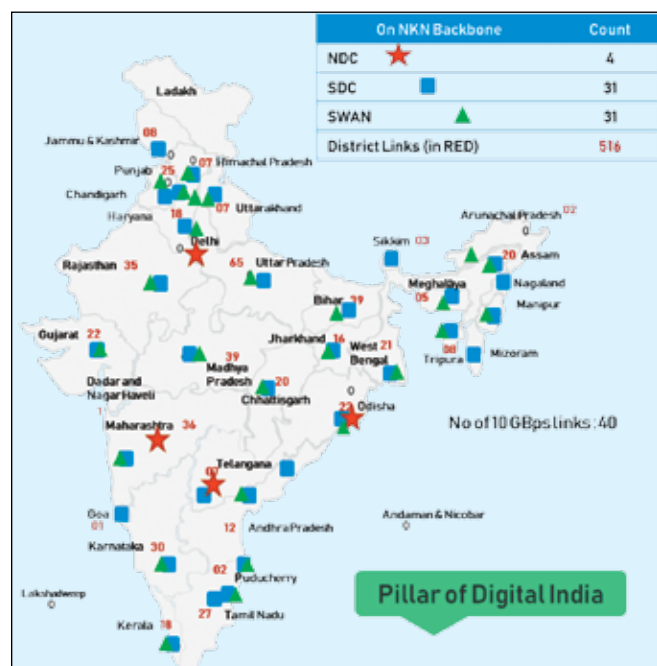
Since its inception NKN has been progressively growing its footprints at National and International frontiers to ensure that Indian Research and Education community excel in their endeavors and also get international and global collaboration with their peers across the globe.

NKN is the one of the largest networks of its kind in the world and is currently perceived as a leading research and education network (REN) globally.

NKN Status: National Reach

- Under NKN, more than 1743 links to institutions have been commissioned and made operational, comprising almost all the major IITs, Central Universities, State Universities, NITs, IIITs, IIMs, hospitals in tertiary care such as AIIMS, PGIs, State Government hospitals, national laboratories under DAE & DST, DRDO, MHRD, ICAR, ICMR and a host of other Government institutions/Departments.
- The outreach includes 516 district links covering 468 districts connected under NKN across the country
- NKN has 31 Points of Presence (PoPs) in various State Capitals (including 7 Super Core PoPs)
- The network strength of NKN comprises of high speed (10G) core backbone with

uniformly spread 94 core links across the country

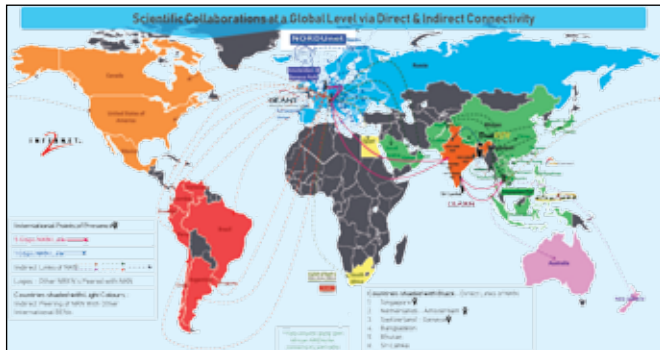


- In its progressive outreach, NKN has provided 10G bandwidth to 42 Edge links covering 34 Institutes.
- High Capacity SCPC VSAT Connectivity at Kavarati, Lakshadweep and Port Blair, Andaman & Nicobar Island

NKN Status: International Reach

- NKN has been significantly expanding its global reach by establishing **3 International PoPs** at Singapore, Amsterdam and Geneva (CERN).
- For increasing its Global outreach, NKN has peered with other National Research and Education Networks (NRENs) such as Asi@connect in Asia Pacific, CERN and GEANT in Europe, SingAREN in Singapore, Internet2 in USA, LEARN in Sri Lanka, BdREN in Bangladesh, DrukREN in Bhutan and NORDUnet for Nordic countries.
- NKN is under process for expanding links in SAARC and BIMSTEC Nations; As per the

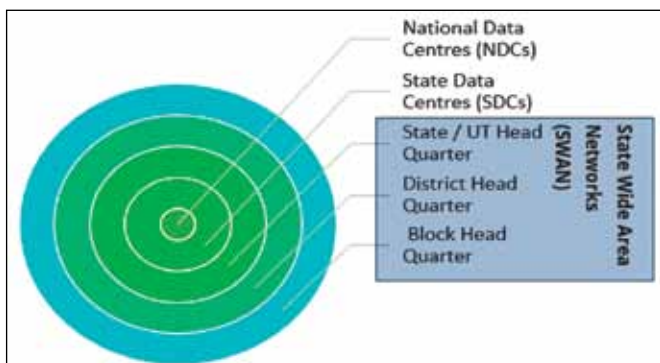
vision of Hon'ble Prime Minister of India, to bolster sub-regional collaboration among SAARC and BIMSTEC countries, NKN has already extended its connectivity to Sri Lanka (LEARN), Bhutan and Bangladesh. It is also in the process of extending its connectivity with the RENs of Nepal, Afghanistan and Maldives.



Achievements

Facilitating Digital India

NKN facilitates Digital India, as it is the backbone for all e-Governance initiatives in the country. In addition to educational Institutes, NKN connects 4 NDCs (National Data Centre), 31 SDCs (State Data Centre), 31 SWANs (State Wide Area Networks), Ministries, Departments and mission oriented agencies such as; S&T, DRDO, Earth Sciences, Space, ICAR, MHRD, amongst others.



Connecting Remote Locations

- **Connectivity in North east region:** NKN has ensured stable connectivity in the north-

eastern region by connecting major institutions and enabling Digital Inclusion in the region.

- **VSAT Connectivity in remote locations:** NKN has successfully established a High Capacity SCPC VSAT Connectivity at Kavarati, Lakshadweep and Port Blair, Andaman & Nicobar Island.
- **Connectivity in Jammu & Kashmir (J&K) and Laddakh:** NKN has extended connectivity to some of the major institute of J&K and Laddakh such as IIT Jammu, IIM Jammu, University of Jammu, Sher E Kashmir, Defence Institute of High Altitude Research (DIHAR) Leh etc.

Incessant Network

To ensure high accessibility, availability & sustainability, NKN has focused on dedicated high bandwidth with low latency and redundancy.

- In order to optimise bandwidth utilization, NKN has brought the content close to the users, via direct peering and caching with leading Content Providers such as; Google, Microsoft, Facebook and Akamai.



- The peering has been done via servers installed at the premises of NKN in order to ensure enhanced user experience. With the aid of NKN, Near Real Time Data availability is provided along with Service Continuity with High Uptime.
- NKN provides Direct Connectivity to Institutes/ Organizations by taking the best path via

minimum hops. Hence, due to this quality of services, connected Institutes have given NKN a rating of excellent on all quality of service parameters.

Secure Network

NKN's security eco-system is balanced, robust and provides a resilient backbone network for its user community that can recover quickly from breakdowns and other cyber-attacks.

- Vulnerability Assessment and safe guarding of the network is performed regularly via multiple tools e.g. DDOS Implementation etc.,
- NKN is ISO 27001, certified that ensures the right processes for the robustness of the network and applications.
- For time synchronisation, NKN has implemented Network Time Protocol (NTP) which is an Internet time synchronisation protocol, used to synchronise computer clocks to a time reference using the IP network/ internet.
- NKN currently provides multiple free of cost services to the Institutes like Single Sign On (SSO), DDOS, E-mail services (at a cost), DNS, LDAP etc.

Bolstering Knowledge Society

NKN has been a key backbone for Research, e-Governance, e-learning and collaboration usage in the fields of education, health, agriculture, science, space and weather, etc.,

- NKN playing vital role in resolving the pollution crisis. NKN comprising of IITs (Delhi, Kanpur, Chennai, Mumbai, Roorkee, Guwahati, Hyderabad and Tirupati) and other institutes (PGI Chandigarh and Bose Institute Kolkata) will support and act as a knowledge partner to the National Clean Air Program (NCAP) which aims to reduce air pollution by 20-30 per cent in the next five years.

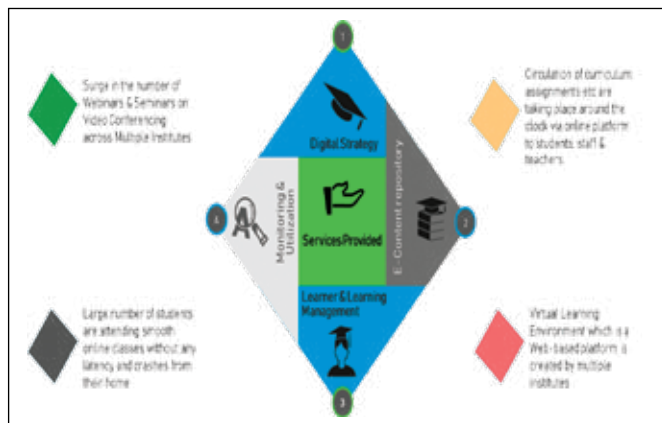
- NKN has implemented 66 Virtual Classroom as part of its e-Learning service. Educational institutes on NKN are connected through studio and web-based video conferencing services.
- By Connecting National Digital Library through NKN, the network made it possible to ensure that every institute of higher learning had access to NDL. It has on-boarded 35 lakh users so far.
- In the field of education NKN has been used as a backbone for pan India delivery of NPTEL videos, Knowledge Management Centre's (KMC at National Institutes of Design) database accessibility, Training 10 Thousand Teachers (T10KT).
- In the field of health NKN has helped Open Source Drug Discovery (OSDD), Collaborative Digital Diagnosis System, Cancer Grid, Knowledge and Healthcare Delivery Network in SGPGI and in Telemedicine.
- India's efforts in Space & Weather Research has been further enhanced by connecting to NKN. Some of the notable mentions are GARUDA, Indian Space Science Data Centre - Mission Mars, Chandryaan-2.
- In the area of weather forecasting, NKN has supported in establishing "EUMETSAT Terrestrial Broadcasting Reception" at ISRO for receiving EUMETSAT data on real time basis. It has helped in setting a secure network for receiving database from NOAA-NESDIS (USA), which helped immensely in accurate weather forecasting and analysis

Savings & Benefits due to NKN

- Savings due to NKN Network Topology
- Virtual Private Network: Savings due multiple CUGs of VPNs connection on network
- Innovative Techniques: Peering and Caching with TSPs & Leading Content Providers

- Savings via NKN negotiated rates with TSPs & based Bandwidth Usage of Institutes
- Unified Network: Aggregation of network leading to high cost effectiveness
- Resilient Network: Centralised resilience, Cyber Security capability & a cyber incident response team
- High Bandwidth: High Speed Dedicated Network to multiple Real Time synchronization projects
- 24*7 Security: 24*7 Dedicated Security Operations Centre (SOC), Network Operations Centre (NOC), Threat Monitoring Services Team

Role in COVID-19 pandemic: Institutes have fully utilized NKN Network in creating a virtual eLearning platform as a contemporary way of working:



NKN as a Backbone is Building Resilience in Higher Education:



Many Premier Institutes of the country (such as; CSIR-Lucknow, NIV-Pune, ICAR-Hyderabad, Army R&R Hospital-Delhi, STQC, C-DAC, DRDO etc.) have appreciated the efforts of NKN for providing uninterrupted services and support to its users at this pandemic lockdown in the country.

During this crisis, NKN continues to provide 24*7 uninterrupted services to National Data Centre (NDCs) which runs nation's critical applications like My Gov, Prime Ministers Official Website, Government Websites, e-Office, e-Hospital etc., The NIC Email services which is the one stop secured communication in the Government run on NKN Network has now gained more national importance.

On Global front, connectivity with Global NRENs has empowered indigenous institutions to transcend the physical national boundaries in pursuit of higher academics and research. NKN has ensured Service Continuity for all connected International NRENs, with no disruption of connectivity. NKN extends its connectivity to SAARC countries and provides Plethora of services with no disruption. Even during the crisis, multiple collaborations with Global Research & Development Network, continue to take place.

Way Ahead

The proposal for Next Phase of the Project that Digital India Info way (DII) which is continuation of NKN with significantly enhanced scope and scale is under consideration.

2.1.8 Mobile Seva Platform

MeitY has initiated a massive countrywide initiative on mobile governance, being implemented by C-DAC Mumbai, to provide Government services to the people through mobile phones and tablets. As a part of this initiative, the Framework for Mobile Governance was notified in February 2012.

Mobile Seva is an innovative initiative aimed at mainstreaming mobile governance in the country by enabling all Government Departments and agencies at the Centre, State and local levels to deliver services through mobiles through various channels such as SMS, IVRS, USSD and mobile apps. It is a centrally hosted cloud based mobile enablement platform which allows Departments to expeditiously start offering their services through mobile devices anywhere in India, without having to invest heavily in creating their separate mobile platforms.

Achievements:

- Mobile Seva now support TRAI's DLT platform. Departments are now getting registered through the same.
- e-sign service has been initiated for implementation
- Most popular apps like UMANG, AarogyaSetu, BHIM, Digilocker and many more are now available on Mobile Seva Appstore. COVID-19 related application namely nCov-Starak, MbPT Suraksha, 112++ India have been uploaded.
- Generic Applications like Feedback poll System, Complaint Management System, Secure Chat App and Smart Notification App has been developed under Mobile Seva. Geo-fence Attendance App has also been developed under Mobile Seva for monitoring "Work from Home".
- Over 3,750 accounts of Departments have been integrated with the platform and availing service with authenticity.
- 3,800 crore Push SMS sent till 31st December, 2020 by the Departments have been integrated with the platform.
- Total 958 m-apps have been developed and hosted on Mobile Seva Appstore for different platforms.

2.1.9 Geographic Information System (GIS):

The Geographic Information System (GIS) based Decision Support System (DSS) platform was established under the National Centre of Geo-Informatics (NCoG) which was approved on 31st December 2015 with outlay of Rs.98.28 crore.

NCoG is providing single source GIS platform for sharing, collaboration, location-based analytics and decision support system, catering to Central and State Government Departments across the country. It is developed by NeGD in collaboration with 'Bhaskaracharya Institute for Space Applications and Geo-Informatics (BISAG).

Some of the key features of NCoG based applications include

- Base map available at 1:5,000 scale
- Compatibility of multi-purpose geo-datasets
- Allows user to plot assets/features on their own
- Self-sustainable
- Cost effective
- Based on Open-Source (no software procured)

NCoG is also working on the following new projects:

- Social Benefits Management System – A web portal for loan management, disbursement and recovery. GIS support for monitoring of loan recovery – Design and Development phase.
- Industrial Performance Monitoring System– A web portal for Ministry of Statistics and Programme Implementation and 11 other Ministries to use this portal to report data of their industrial sector – Design phase.
- A dashboard to manage Technology and Innovation Support Centre to capture R&D Activities is also being created for Department of Industrial Policy and Promotion.

- Delhi Police – Design, development, amalgamation and maintenance of ‘Delhi Police. One Touch Away’ – a citizen centric app with 26 services provided by Delhi Police through the previous apps or Web applications.
- Ayushman Bharat, Ministry of Health and Family Welfare (MoH& FW): Infrastructure and disease level mapping of health facilities, including primary, secondary and tertiary care and identification of gaps therein to plan for new health and wellness centres establishment.
- Implementation of National Mission on Cultural Mapping (Ministry of Culture).

Key Achievements of NCoG:

- Total number of Applications: 560
- Total number of Web applications: 522
- Total number of Mobile applications: 38
- Number of Central Ministries/Departments/Agencies: 29
- Number of States/UTs: 19

2.1.10 Bhaskaracharya National Institute for Space Applications and Geo-informatics {BISAG (N)}:

The Union Cabinet chaired by the Honorable Prime Minister approved the “Elevation of (BISAG) to {BISAG(N)}” as an Autonomous Scientific Society under MeitY dated 19th February 2020 with an outlay of Rs.407 crore. Approval was published through Gazette notification on this subject matter, and same was published in the Gazette of India, Extraordinary (Part-I, Section-I) on 22nd April 2020 by MeitY.

BISAG (N) has been set up to undertake technology development & management, research & development, facilitate national & international cooperation, capacity building and

support technology transfer & entrepreneurship development in the area of geo-spatial technology. The objective of BISAG (N) is to infuse geo-spatial technologies and the grass roots level applications based on geo-spatial data into e-Governance at the Central and State level. BISAG (N) has three main domain areas: satellite communication, geo-informatics and geo-spatial technology.

2.1.11 Public Internet Access Programme (including Wi-Fi in Universities)

Wi-Fi Enabled Campus Network in Five Universities

MeitY has taken up the task of providing model Wi-Fi enabled campus networks at five universities, namely, University of Allahabad, University of Pune, Osmania University, Hyderabad, Utkal University, Bhubaneswar and North-Eastern Hill University (NEHU), Shillong. The budget outlay of the project is Rs.35.51 crore. ERNET India has deployed Wi-Fi in these five universities.

Wi-Fi connectivity is a high speed wireless access to Internet/Intranet resources on any-time any-where basis across the campus. Students/staff are being benefitted largely from it. They are accessing e-Books, journals from UGC-Infonet, e-journals, video lectures, online study material, digital repository, research and projects and collaborations and jobs and sharing their information and knowledge among users. It has improved performance and efficiency of the users. It has enhanced user participation where users from all parts of the world are collaborating and sharing information/data for research and development and education. It has provided freedom of work on the move, study/work continuity, easy access to the information, increase in productivity and reduction in day to day cost. At Osmania University, there are approx. 6500 Wi-Fi users, at Utkal University approx. 5300 Wi-Fi users have been created, at NEHU there are approx. 6000 Wi-Fi users, and at Pune University there are approx. 7200 Wi-Fi users.

The project duration is till March 2021. The model is replicable and can be replicated at other higher learning institutions/universities/hospitals across India. This would enable on campus students, faculty, teachers, visitors, guests to access the internet through Wi-Fi enabled devices retrieve and post information any time, from any place within the campus.

Setting-up VSAT connectivity for Internet/ Intranet in the North-Eastern part of the country

The objective of the project is to establish C-band VSAT connectivity at 60 institutions (Jawahar Navodaya Vidyalayas, Kendriya Vidyalayas, Krishi Vigyan Kendras) in remote areas of North-Eastern part of the country to provide Internet access. As part of the project, institutions which do not have any form of connectivity are connected. The project is implemented by ERNET India. The budget outlay of the project is Rs.19.98 crore.

This connectivity has played an important role in the development and progress of the schools and institutes; like in schools both teachers and students will use connectivity to access course material, prepare themselves for exams, preparing lectures, general knowledge and current affairs, competitions, employments, etc., This has helped in narrowing the gap between remote areas and other parts of the country. This has helped in removing the barriers to information dissemination and access to knowledge which will promote equitable and sustainable development of these remote areas.

VSAT has been installed and is operational at 60 sites. The links were made operational from March 2017, and operations & maintenance of the link was done for 3 years to provide connectivity for internet/ intranet access. The duration of the project was till 22nd February 2020. On MHRD's request, MeitY had considered supporting connectivity at 37 JNVs in the North-Eastern region for extended period of 1 year till 22nd Feb 2021 with additional funds of

Rs.3.76 crore. The revised outlay of the project is now Rs.22.94 crore.

Alternate technology using Optical Wireless Communication

Optical Wireless Access Network for Rural and Urban Communication

Through this project, a low cost and energy efficient broadband telecom access network shall be implemented, which will utilize the existing solar cells or photodiodes as data receivers. This project complements the investment made by Government of India in the renewable energy infrastructure where it can provide a possible solution for the last mile access to rural areas. The technology can also be used in solar-power grids, Internet of Things smart devices, defence and space mission payloads where reconfigurable information can be received over the same solar panel used for electrical energy harvesting.

The co-existence between Li-Fi and Wi-Fi shall be explored to achieve high system throughput and improved energy efficiency. Li-Fi can be used to provide high data rate to indoor users but coverage area of Li-Fi is limited. On the other hand, Wi-Fi has larger coverage but limited data rate. As Li-Fi and Wi-Fi operates on different frequencies, they do not cause interference to each other, therefore they can coexist, i.e., it is possible to have a heterogeneous Li-Fi/Wi-Fi network, which will possess the advantages of both Li-Fi and Wi-Fi. The heterogeneous Li-Fi/Wi-Fi network would provide higher data rate to static users (Li-Fi), free up Wi-Fi capacity for mobile user, and enhance security.

The budget outlay of the project is Rs.1.39 crore and is being implemented by IIIT Delhi and ERNET India. The expected outcomes of the project are last mile bidirectional access of 10 Mbps for rural areas and hybrid Li-Fi/Wi-Fi system with throughput more than standalone Li-Fi or Wi-Fi system and link aggregation experimentation.

The activities related to the project like study and modelling of the photoreceiver, indoor Li-Fi testbed to study deployment issues & AP selection algorithm for heterogeneous Li-Fi/Wi-Fi network: Problem formulation and simulation and validation of the proposed AP selection algorithms using simulation tools like NS3/MATLAB are being carried out.

In addition, new proposals like Strengthening of ICT Infrastructure in Himachal Pradesh University, Enabling Smart Elements in Villages by utilizing BharatNet, setting-up Wi-Fi enabled Campus Network at Patna University have been evolved and are in the process of initiation.

2.2 Governance and Services on Demand

2.2.1 e-District

- National Roll-out of e-District MMP: e-District is a Mission Mode Project (MMP) that aims at electronic delivery of identified high volume citizen centric services at the district or sub-district level. Ministry of Electronics and Information Technology (MeitY), Government of India (GoI) is the nodal Ministry for e-District MMP. This MMP is being implemented by State Governments/UT Administrations through their designated agencies. The MMP envisages leveraging and utilizing the four pillars of e-infrastructure, namely, State Data Centre (SDC), State Wide Area Network (SWAN), State Service Delivery Gateway (SSDG) and Common Services Centre (CSC).
- The objectives of the e-District project are to ensure end-to-end workflow, to ensure delivery of e-Services by undertaking Business Process Re-engineering (BPR) of services and providing easy, anywhere and anytime access to Government services. The project intends to achieve benefits/outcomes as mentioned below:

- Assured, reliable and efficient delivery of high-volume citizen services, electronically and with process reengineering at the district level in all the districts of the country.
- Service fulfillment for the citizens will be quicker.
- Citizens save time and money.
- Modernization of District Administration with training and capacity building at all levels.
- Transparency and Good Governance resulting in empowerment of citizens.

Coverage and Services under e-District MMP:

The e-District MMP covers 705 Districts across 28 States & 5 UTs. MeitY has identified 10 categories (5 mandatory + 5 State/UT Specific) of high volume citizen centric public services at District and Sub-District level will be taken up to be electronically delivered under this project. Following is the State/UT-wise status –

National Roll-out Status of e-District MMP	
1. Andaman & Nicobar Islands	(2/3)
2. Andhra Pradesh	(13/13)
3. Arunachal Pradesh	(26/26)
4. Assam	(33/33)
5. Bihar	(38/38)
6. Chandigarh	(1/1)
7. Chhattisgarh	(28/28)
8. Dadra & Nagar Haveli and Daman & Diu	(3/3)
9. Delhi	(11/11)
10. Goa	(2/2)
11. Gujarat	(33/33)
12. Haryana	(22/22)

13. Himachal Pradesh (12/12)
14. Jharkhand (24/24)
15. Karnataka (30/30)
16. Kerala (14/14)
17. Madhya Pradesh (52/52)
18. Maharashtra (36/36)
19. Manipur (16/16)
20. Meghalaya (11/11)
21. Mizoram (8/8)
22. Nagaland (11/11)
23. Odisha (30/30)
24. Puducherry (4/4)
25. Punjab (22/22)
26. Rajasthan (33/33)
27. Sikkim (4/4)
28. Tamil Nadu (36/37)
29. Telangana (31/31)
30. Tripura (8/8)
31. Uttar Pradesh (75/75)
32. Uttarakhand (13/13)
33. West Bengal (23/23)

Achievements:

- Empowered Committee has approved DPRs of all States/UTs (DPRs of Telangana and Andhra Pradesh are under revision).
- SPMU selected in 36 States/UTs.
- Formation of Districte-Governance Societies (DeGS) completed in all 36 States/UT (100% covered in 30 States/UTs and partially

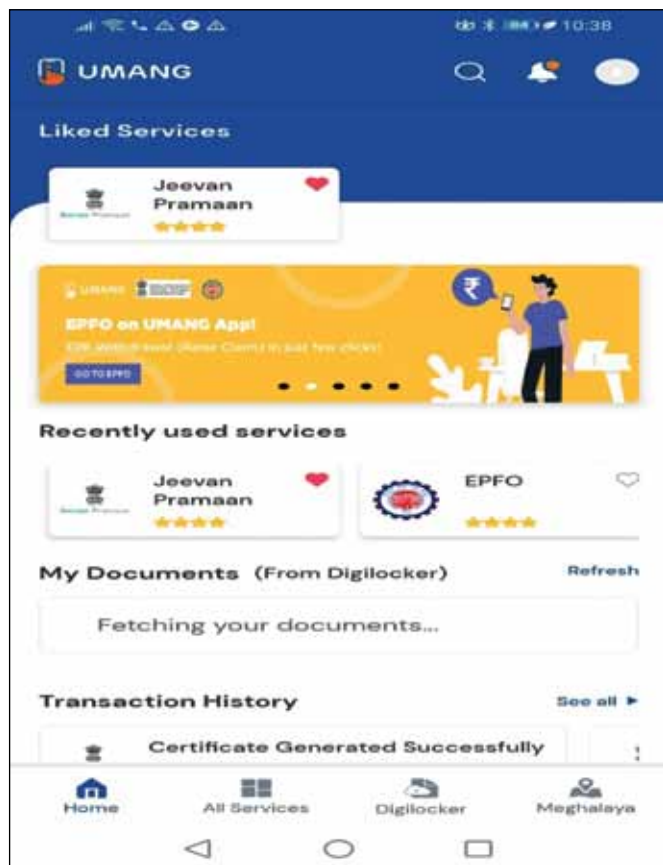
completed in 5 States/UTs; due to newly created Districts).

- Selection of e-District Managers (eDMs) completed in all 36 States/UTs (100% selected in 32 States/UTs, partially selected in 2 States/UTs, due to newly created districts and process initiated in 2 States/UTs, where the roll-out is in process).
- Erstwhile State of J&K has surrendered the funds and proposal from UT of J&K and Ladakh is yet to be received. Further, Andaman & Nicobar Islands and Lakshadweep have opted for NIC's ServicePlus platform for final roll-out of project.
- Issuance of following Guidelines/Advisories have been completed:
 - National Rollout Guidelines
 - e-District Manager Hiring Guidelines
 - Guidelines for Integrated Framework for the Delivery of e-services under National Roll-out of e-District MMP
 - Implementation Guideline for providing flexibility to States/UTs for the implementation of National Roll-out.
 - Guidelines for Horizontal Connectivity
 - Draft Agreement Template for States/ UT opting NIC as the Implementation Agency for e-District MMP
 - Report on "Business Process Re-engineering of High-volume Government to Citizen Services".
 - Advisory on Operational Expenses of e-District Manager
 - Advisory on Implementing Ration Card services under e-District MMP
 - Advisory on Implementing Birth and Death services under e-District MMP
 - Guidelines for using Hand-held devices for e-District Services

2.2.2 All Services through Online & Mobile

2.2.2.1 Unified Mobile Application for New-Age Governance (UMANG)

Unified Mobile Application for New-Age Governance (UMANG) has been developed as a single mobile platform to deliver major Government services. Hon'ble Prime Minister has dedicated UMANG to nation on 23rd November, 2017.



- UMANG has been developed as a single mobile platform to deliver major Government services with Core Platform integrated with DigiLocker, PayGov, Rapid Assessment System (RAS) etc.
- UMANG supports 12 Indian languages, in addition to English and has been hosted on cloud. UMANG aims to bring power to the fingertips of citizens.

- Till 31st December, 2020, UMANG has about 20209 services (974 – Central and State Government services; 19235– Bharat Bill Payment services BBPS) from 205 Departments of Central Government Departments and Government Departments of 27 States/UTs. Many more are continuously being on-boarded. About 2.55 crore users are registered with UMANG.
- Revamped UMANG Android app was launched with a new UI/UX providing more personalized and secure experience.
- MoU was signed between NeGD and CSC e-Governance Services India to facilitate delivery of UMANG app services through Common Service Centres (CSCs) in an assisted mode. Select services on UMANG app are now also available to citizens through the network of 3.75 lakh CSCs.
- In order to reach more and more residents of India, selected services of UMANG app are being made available on Feature Phones running on KaiOS Operating System (Jio phones). This will enable users, who do not have smartphones, to also avail services of integrated Departments on UMANG. 120 services of UMANG have been made live on KaiOS platform.
- Around 9.80 lakh Advance Claims (COVID -19) in EPFO were raised via UMANG Platform.
- 205 services of DBT (Direct Benefit Transfer) have been made live on UMANG during this period.
- PM Cares Service for collecting fund to fight against COVID was also made live on UMANG.

2.2.2.2 World Bank assisted “India: e-Delivery of Public Services” Project

Following approval of a Development Policy Loan amounting to USD 150 from the World Bank for

programme management and financial support for National e-Governance Plan (NeGP), MeitY has been utilizing this support as a focal point to convene all the associated Departments of the Central and State Governments around a concrete reform agenda for e-Governance in the country. MeitY is supporting critical policy and institutional actions of the Central/State/UT Governments that entail e-delivery of services leading to more robust implementation of NeGP, with significant social benefits for the population and positive impacts on the poor. As on 15.12.2020, a total of 42 projects have been approved.

Achievements: 30 projects covering various domains such as health, education, legislature, prison, election commission, capacity building have been successfully implemented under the scheme and other projects are at different stages of implementation.

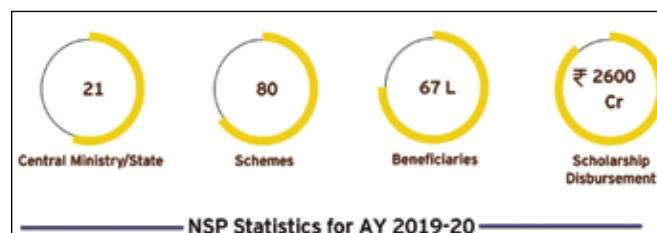
2.2.2.3 National Scholarships Portal:

National Scholarships Portal (NSP) is an end to end integrated unified portal for all scholarship schemes offered by Central Ministries/Departments and states. NSP offers hassle-free services to all stakeholders like online scholarship application submission, tracking by student's verification by institute and final disbursement of scholarships amount directly into a student's bank account. This new unified system creates brings transparency by avoiding duplication and ensures timely disbursement.

Objective of the project:



Impact



Stakeholder wise benefits



Major outcomes:

- In AY 2019-20, over Rs.2600 crore has been pushed to PFMS to approximately to 67.7 lakh beneficiaries to disburse scholarship directly into their bank account
- Commutatively, in last five Academic years (2015-16, 16-17, 17-18, 18-19, 19-20) approximately 6.11 crore applications have been received and approx. Rs.10,000 crore disbursed to over 3 crore student's beneficiaries.

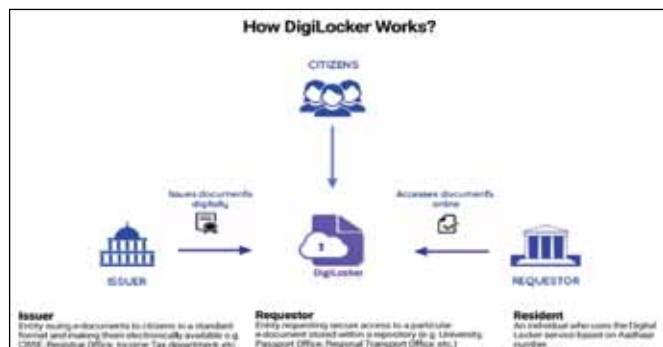
2.2.2.4 Digital Locker & other initiatives

Digital Locker

DigiLocker is a key initiative under Digital India, the Indian Government's flagship program aimed at transforming India into a digitally empowered society and knowledge economy. DigiLocker ties into Digital India's vision areas of providing citizens a secure document access platform on a public cloud.

Targeted at the idea of paperless governance, DigiLocker is a platform for issuance and verification

of documents & certificates in a digital way, thus eliminating the use of physical documents. DigiLocker has helped in bringing paradigm shift towards paperless governance i.e. it helped citizens and Departments to shift from paper based processes to paperless processes thereby helping to contribute to Hon'ble Prime Minister's vision of Digital India.



Achievements:

In the last 5 years, DigiLocker has striven to provide critical Identity, educational, transport, financial and municipal documents to the citizen in the form of a digital wallet. In this pursuit a critical mass of over 418 crore authentic documents have been made available to the citizen of the country. Current statistics as of 31st Dec 2020 are:



- DigiLocker like platforms can serve as boon during any catastrophic situations. A successful example was shown in case of Kerala Flood wherein IT department provided digital certificates to Kerala residents during floods.
- More than 37 crore educational documents are made available to students across the country.
- Foreign Universities verifying data via DigiLocker repository via eSanad (MEA system) of academic documents
- CBSE, CISCE, 22 State Education Boards and 6 UT Education Boards, Skill Development Agencies and Technical Education Councils are providing digital certificates through DigiLocker. In addition, 273 Universities are registered with DigiLocker for their academic records and documents.
- e-District services of 20 States, Land Records from 5 States and PDS services of 6 States are integrated with DigiLocker.
- Digital DL/RC is made available to the citizens and a notification was issued by Transport department for the acceptance of such documents by enforcement authorities.
- Identity documents through DigiLocker are now accepted at airports, railways and on roads by traffic police and enforcement agencies.
- Ministry of Education (Erstwhile Ministry of HRD) notified DigiLocker as sole National Academic Depository (NAD) for digital academic awards management on 18th March 2020.
- Ministry of Finance (Department of Revenue): Amendment in Prevention of Money-laundering (Maintenance of Records) Rules, 2005 to accept digital KYC document through G.S.R. 582(E) on 20th August 2019.

- In similar lines of Ministry of Finance, RBI and SEBI notified for the acceptance of DigiLocker issued documents as part of customer KYC in Jan 2020 and April 2020 respectively.



2.2.2.5 Enabling All Schools with Virtual Class Rooms

Smart Virtual Classroom (SVC) is a pre-scheduled, online, teacher-led pedagogical intervention where, unlike conventional classrooms, teachers are not present with learners physically but instead interact through public network in an online learning environment.

ERNET India “Smart Virtual Classroom” solution has established an ICT based virtual classroom facilities in 3204 Government owned/controlled schools plus 50 DIETs in seven pilot States - Himachal Pradesh, Gujarat, Rajasthan, Tripura, Haryana, Andhra Pradesh and Tamil Nadu. Project aimed to improve the ‘quality of education’ to students in remote/rural parts of the country. A Centralized control system was established in Delhi at ERNET’s data centre which hosted the Multipoint control unit(MCU), Streaming/Recording server and other associated components for multiparty audio/video interaction and offline access of classroom sessions round the clock for learning/collaboration between all the stakeholders.

The SVC project created technology enhanced classrooms to foster opportunities for teaching and learning by integrating learning technology, such as computers, electronic white boards, projectors, specialized software, interactive audio-video systems, etc., The operational training of SVC infrastructure was provided to the School and DIETs teachers under the project.

Details on the subject are available in Chapter 9 under “ERNET” (9.4)*

2.2.2.6 Open Government Data (OGD 2.0) Platform for National Data Sharing and Accessibility Policy (NDSAP)

The Open Government Data (OGD) Platform India (<https://data.gov.in>) has been developed by the National Informatics Centre (NIC) in compliance with the National Data Sharing and Accessibility Policy (NDSAP). The objective is to provide proactive access to Government owned shareable data along with its usage information in open/machine readable format, through a wide area of network across the country, in a periodically updated manner, within the framework of various related policies, rules, and acts of the Government. Developed using Open-Source Stack, the project is one of the initiatives under Pillar 6 (Information for All) of the Digital India initiative.

Similarly, Government Open Data License – India has been developed to give legal framework to the data consumers wishing to use and build on top of public data. License also gives assurance of what they legally can and can’t do with the data both commercially and non-commercially.

All users are provided a worldwide, royalty-free, non-exclusive license to use, adapt, publish (either in original, or in adapted and/or derivative forms), translate, display, add value, and create derivative works (including products and services), for all lawful commercial and non-commercial purposes.

Till 31st December 2020, the OGD India was having 4,68,527 dataset resources, 9,730 catalogs contributed by 175 Ministry/Departments (88 Central and 88 States), 2,215 Visualizations created, 70,906 Application Programming Interfaces (APIs) created, 354 Chief Data Officers (106 Central and 244 States). OGD India has been viewed 294.60 lakh times and 84.50 lakh datasets have been downloaded.

Achievements:

S. No	Items	01.04.2014 to 31.03.2018	As on 31.03.2018	As on 30.11.2020
1	Dataset Resources	1,57,425	1,64,481	4,68,527
2	Downloads	51,50,536	56,00,000	8,53,000
3	Views	1,42,60,000	1,54,60,000	2,94,600
4	Catalogs published	1373	4,247	9,730
5	Number of Ministries/ Departments	44	110	174 (87 Central +88 States)
6	CDO's Nominated	115	115	354
7	No. of Datasets APIs	3877	3877	70,906
8	No. of Visualizations	1037	1368	2,215

OGD also acts as a knowledge-sharing platform through online communities. It facilitates community participation for development of Apps, Information graphics, etc., by using the available datasets. Dedicated Community (<http://community.data.gov.in>) and event portals (<https://event.data.gov.in>) have also been developed to help in community engagement and event management. OGD team regularly conducts events like Data Hackathon, Challenges, and Workshops etc., for promotion, data utilization and public engagement.

The new phase OGD-2.0 has been initiated in May 2020 with an objective to “Expanding Indian Open Government Data Ecosystem” by targeted approach and focused engagement with stakeholders. The major thrust of OGD-2.0 project would be:

- Focusing on release of datasets through Open APIs.
- Focusing on datasets with respect to Global Open Data Index, Open Data Barometer, etc required for ranking of countries on Open Data.

Open Government Data Platform of India (data.gov.in) has been built and maintained as per the mandate given to MeitY in the NDSAP Policy. The OGD platform is completely based on Open Source Technologies, which has been developed to promote transparency and making Government datasets publicly available in useful machine-readable/open formats. In order to facilitate implementation of NDSAP Policy through OGD-2.0 platform, following activities were outlined to be carried out:

- Development, Deployment and Management of a Workflow Application for Data Publishing through Open APIs using an API Management Solution.
- Tech-Upgrade of the OGD Platform and Migrating to NIC Cloud.
- State Specific Open Data Perspectives Instances.
- Awareness and Training.
- Targeted and Focused Engagement with Stakeholders to tap the potential of Government Data.

2.2.2.7 Electronic Transaction Aggregation and Analysis Layer (eTaal-2.0)

A large number of e-Governance initiatives, including various Mission Mode Projects (MMPs) under e-Kranti, are being implemented in the country by the Central and State Governments and Organizations for ensuring efficient, affordable, transparent and convenient service delivery to citizens. Several of these initiatives have national importance and are included in the country's IT strategy. Some applications use internal performance measurement mechanisms defined through Service Levels and Key Performance Indicators (KPIs), but there is no standard metric to evaluate the impact of all initiatives. In view of the rapid growth in the number of services delivered

through electronic means in India, Ministry of Electronics and Information Technology (MeitY) and National Informatics Centre (NIC), the nodal ICT Organization, identified the number of end to-end electronic transactions as the best indicator for measuring the real-time performance of e-Governance services in terms of service delivery to citizens.

MeitY and NIC have developed eTaal (URL: <http://etaal.gov.in>) as an electronic dashboard for providing a real time aggregated view of e-Services being delivered across different States and levels of Government. eTaal provides an aggregated view of e-Transactions performed through e-Governance applications implemented including, but not limited to, the national level projects like Digital India initiatives and MMPs defined under the Pillar 5: e-Kranti – Electronic Delivery of Services of Digital India. eTaal automatically pulls the e-transaction count from the applications integrated with it using Web Services technology.

eTaal 2.0 has been launched recently. The portal has been expanded to provide deeper insights about the e-Services through visually appealing Business Intelligence (BI) reports and data analytics dashboards that provides meaningful insights in near to real time basis. To provide a quick view of e-Services being delivered across the country, an eService Directory has also been developed. User can search for any eService delivered by a given State/Ministry, under a given service category and a sub category. Citizen can also get the URL of the service delivery portal from eService Directory.

State portal is also created for each State which can be accessed by the user from home page. Ministry portal is also under development stage which will provide ministry specific analysis for e-Transaction.

Achievements

- 21,065.53 crore e-transactions have been recorded till 31st December, 2020.

- 3,935 e-Services have been integrated including Central Ministries/Departments including Mission Mode Projects (MMPs), Smart Cities and e-Services of 36 States/UTs till 31st December, 2020.

2.2.2.8 e-Hospital Project/Online Registration System (ORS)

As part of the Digital India initiative of Ministry of Electronics & Information Technology (MeitY), NIC has developed the e-Hospital, e-BloodBank and ORS applications. ORS is the patient interface of e-Hospital for citizens to book online appointment for the hospitals. ORS is a system to link hospitals across the country for online appointment and providing patient centric services like viewing lab reports, checking blood availability status etc.

The e-Hospital application is the Hospital Management Information System for internal workflows and processes of hospitals. ORS as well as e-Hospital applications are hosted at NIC's National Cloud MeghRaj. The e-Hospital system is a one-stop solution which helps in connecting patients, hospitals and doctors on a single digital platform.

Achievements

- 414 hospitals have been on-boarded one-Hospital, from which 268 hospitals are reporting live
- 17.39 crore transactions have been generated through e-Hospital since September 2015 and over 2.5 lakh transactions on daily basis.
- ORS has been adopted by 254 hospitals across the country
- 34.33 lakh appointments have been booked from ORS since July 2015
- ORS is now available as a part of UMANG app.

2.2.2.9 Rapid Assessment System (RAS)

National e-Governance Division (NeGD) under MeitY has developed a Rapid Assessment System (RAS) for continuous feedback on e-services delivered by Government of India and State Governments. This system has multiple channels for receiving feedback and it is backed by analytics. These analytics will help RAS Integrated Departments/Ministries for continuous system improvement and better governance. It offers trigger-based service integration with department's process workflow through APIs.

A citizen may provide feedback using RAS through various channels – Web Portal, Mobile App and SMS. RAS Portal allows department to quickly build feedback forms as per their requirement, publish them and make these feedback forms available to end users on Department defined triggers i.e., delivery of service etc., Departments have their own dashboard and have option to view reports. RAS offers Localized Feedback Forms, in 9 languages, i.e., Hindi, Gujarati, Bengali, Kannada, Malayalam, Marathi, Punjabi, Tamil and Telugu.

Physical Progress: Till 31st December 2020, the RAS application has been integrated with 2,090 e-services of 384 Departments in 28 States/UTs. Total 15.10 crore feedback requests have been sent. Major integrated e-Gov applications of States, include Caste certificate, Income certificate, Domicile certificate, Birth & Death certificates and Central Projects namely VAHAN, SAARTHI, DigiLocker, DAY-NULM, UMANG & Central Pension Accounting Office.

2.2.2.10 Jeevan Pramaan:

In a big relief to over a crore retired employee of Government and PSUs, with Jeevan Pramaan, a pensioner can now digitally provide proof of his existence to the authorities for continuity of pension every year instead of requiring to present himself physically or through a Life Certificate issued by

specified authorities. This facility has been widely acclaimed by the pensioners. The Aadhaar enabled biometric digital certification does away with the requirement of a pensioner having to submit a physical Life Certificate in the month of November every year, in order to ensure continuity of pension being credited in the account.

Till 31st December, 2020, over 441.27 lakh pensioners have already submitted digital life certificates since 2014.

2.2.2.11 PRAGATI- (Proactive Governance and Timely Implementation)

Hon'ble Prime Minister of India launched this ambitious multi-purpose and multi-modal platform PRAGATI on 25th March, 2015, as a part of Digital India Program, e-Governance, reforming Government through Technology.

The Prime Minister of India started directly monitoring the progress of PRAGATI schemes/projects using videoconferencing facility on every fourth Wednesday of the month. This is a Three Tier System; PMO, all Secretaries of GOI and Chief Secretary of all States. This project brings all the Secretaries to Government of India and the Chief Secretaries of the States on single platform, through which Prime Minister is able to discuss the issues with the concerned Central and State officials directly with full information and latest visuals of the ground level situation. This makes faster implementation of Central level schemes/projects, State level projects and resolution of grievances between State and Central level Departments.

This is the PM's unique initiative of resolving bottlenecks in project implementation, cutting delays, reviewing the progress of flagship Government initiatives and keeping tabs on handling and resolution of public grievances. PRAGATI is turning out to be quite a help for the Government as it tries to speed up development schemes.

Every project or issue taken up at PRAGATI meetings comes with a deadline, which Government agencies have to adhere to. NIC managed around 150 sites participants in interactive mode during each PRAGATI VC session.

PRAGATI Project rolled out on March 25, 2015 has pushed 257 projects (Central/State) involving investment of around Rs 12.05 lakh crore. 47 Programs/Schemes of 17 Ministries/Departments and 28 States/8 UTs have been reviewed. More than thirty PRAGATI sessions have been chaired by Hon'ble Prime Minister till November 2020.

2.2.2.12 Digitize India Platform (DIP)

Digitize India Platform (DIP) is an initiative of the Government of India under the Digital India Programme to provide digitization services for scanned document images or physical documents for any Organization. The aim is to digitize and make usable all the existing content in different formats and media, languages, digitizes and create data extracts for document management, IT applications and records management. This platform was launched in August, 2015 under Digital India.

Achievements:

Items	FY: 2015-16	FY: 2016-17	FY: 2017-18	FY: 2018-19 (as on 31.03.19)
Digital Contributors	21,000	2.09 lakh	5.09 lakh	5.20 lakh
Document Digitized	2.6 lakh	8.86 lakh	1.02 crore	1.08 crore
Snippets Digitized	24.3 lakh	2.10 crore	3.89 crore	3.94 crore

NOTE: Project has been closed on 31st March 2019 based on the PRSG recommendations.

2.2.2.13 e-Governance Standards and Guidelines

Standards form an important pillar in 'Digital India'. 'Standards in e-Governance' is a high priority

activity, which ensures sharing of information and seamless interoperability of data across e-Governance applications. MeitY had set-up an institutional mechanism under Digital India to evolve/adopt standards in e-Governance under the project titled 'e-Governance Standards and Guidelines'. Key objective of this project is to develop/adopt ICT standards/guidelines/frameworks for effective and efficient implementation of e-Governance projects.

Achievements

- In order to identify the areas wherein new standards/guidelines/frameworks are required to be developed for e-Governance projects, a brainstorming workshop was organized with participation from academia, R&D organizations and industry associations.
- Various new areas such as online learning and examination system, zero trust architecture, anonymization of data, video conferencing systems etc., have been identified for developing guidelines/frameworks and their development is in process. Constitution of Working Groups for developing the guidelines in the aforementioned areas is in progress.
- In addition, a Working Group (WG) has been constituted under the chairmanship of Shri J. Satyanarayana, Former Secretary, MeitY for formulating India Enterprise Architecture (IndEA) 2.0 along with its implementation guide. 2 meetings of WG have been held and three sub-groups on the broad themes namely (a) Architecture Development (b) Federated ID Ecosystem (c) Architecture Adoption have been constituted.

2.2.2.14 Implementation of National Data Highway (NDH)

MeitY in 2015 had notified the 'Policy on Open Application Programming Interfaces (APIs)'. The policy intended to promote efficient sharing of data among data owners and inter-and-intra

Governmental agencies to achieve the objective of interoperable systems in order to deliver services in an integrated manner. This project intends to facilitate implementation of this policy.

APIs are the building blocks of the digital transformation and it needs a world-class API infrastructure that delivers now and into the future. API can act as a gateway to e-Governance data and services by not only promoting software interoperability for e-Governance applications but at the same time provide secure and controlled access to data and services of e-Governance applications to stakeholders, including partners and citizens. An effective API Strategy will drive future direction for nationwide e-Governance data and services. It will empower digital transformation, opening avenues to new types of solutions, drive innovation, improve time-to-value, and open new possibilities for creative e-Governance models.

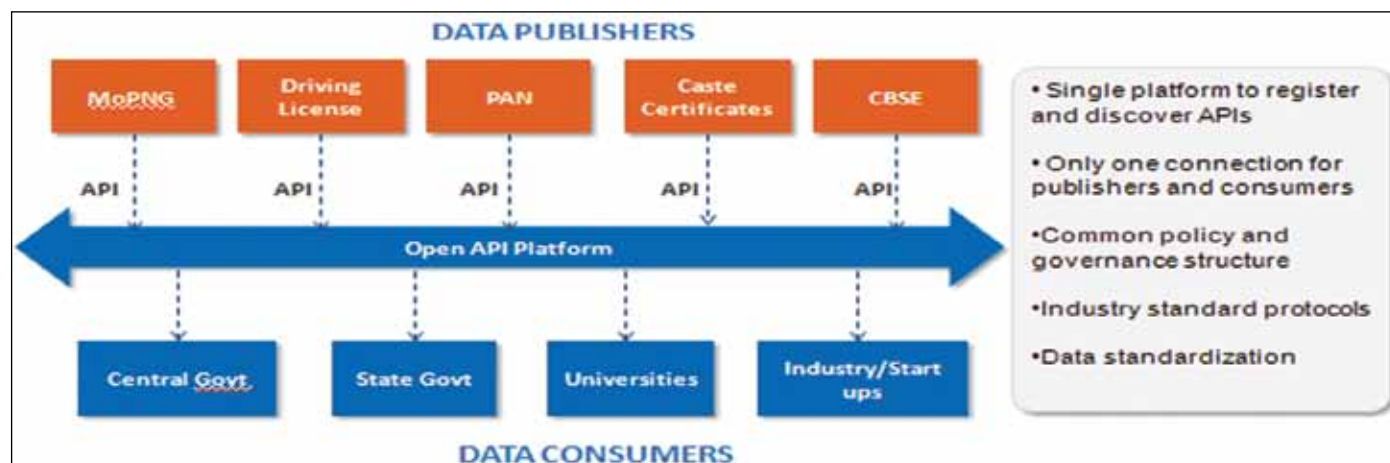
The platform would have following key objectives:

- Facilitate implementation of Open API Policy notified in July 2015;
- To build open and interoperable digital platform to enable seamless service delivery across Government silos;

- To enable quick and transparent software integration with other e-Governance applications and systems;
- To promote 'API first' approach, enabling an ecosystem of micro-services and related cost savings;
- To enable and promote safe and reliable sharing of information and data across various e-Governance applications and systems;
- Promote innovation through the availability of data from e-Governance applications and systems to the industry and public; and
- Provide guidance to Government organizations in developing, publishing and implementation using these APIs.

The above figure illustrates the Open API platform relentlessly managing the data Publishers and the data consumers. The platform aims to address following challenges in e-Governance applications:

- Lack of API availability;
- Proprietary standards and protocols;
- Absence of common data standards; and
- Lack of central governance, common policy, control, accounting and monitoring.



Current Status

- API Implementation Guidelines have been released. Directory and API Portal is ready.
- The portal has published around 600 APIs provided by many Central and State Government Departments viz. Driving License, Vehicle Registration, PAN, CBSE, e-District in NeGD's DigiLocker and e-Court, e-Hospital APIs to NIC etc., on NDH gateway.
- The platform is currently hosted at <https://ndh.digitallocker.gov.in> and a dedicated domain registration is in progress.
- The APIs are also being consumed by various applications of public and private entities including DigiLocker, eSanad, Delhi University, Haryana Higher Education for verification of data.
- The API Portal is currently being updated to support any REST API and to comply with industry standard OpenAPI 3.0 specification.

2.2.2.15 Development of a Machine Learning Based System to assist Medical Practitioners by Predicting Treatment, Advice and Diagnosis

The Project was envisaged to design and develop Machine Learning based system, which will suggest possible treatment, advice and diagnosis, based on patient demographics (age, gender, location), seasons, symptoms, examination, history of present illness, and past treatments. The system will involve web interfaces and mobile apps for collection of data in codified form and dashboard to monitor the collected data. The proposed algorithm is to be integrated with HMIS and deployed at one hospital. Open APIs will also be developed for the algorithms.

Achievements:

- Collected anonymized data of 5,24,472 patients from 3 hospitals.

- Identification of data collection fields (mandatory, optional, relevant for interpretation by ML algorithms) and finalization of data collection format
- Design of data collection interface
- Initiatives during COVID-19
 - Collected data for Flu patients
 - Open Source Dashboard for COVID-19 India
- Data analysis on data obtained from HMIS (refinement, statistics, normalization etc.)
- Dashboard for analysis of Investigation Requisitions, Diagnosis, Symptoms and Drugs
- REST API released for recommendation engine for Symptoms, Investigations, Drugs and Diagnosis
- Framework for health analytics engine
- Demonstration of the developed algorithm and use cases developed

2.2.3 Direct Benefit Transfer (DBT)

Fee Reimbursement to Scheduled Caste and Scheduled Tribe with financial support of MeitY under which free training is provided to SC/ST candidates at NIELIT Centres.

As per the directions received from NITI Aayog (erstwhile Planning Commission) to MeitY (then DeitY) Vide their communication No.D.O.No. M-13054/2/2005-BC dated 05.09.07, no fee should be charged from the SC and ST candidates for educational and skill development programmes by the Government and autonomous institutions and the expenditure for the Scheme should be accounted for from the SCSP and TSP fund of the respective Ministries/Departments.

Since 2007-08, NIELIT Centres are implementing the programme with financial support of MeitY.

Under this programme, NIELIT Centres do not charge fees from the SC or ST candidates for undergoing courses offered by NIELIT. Further, there is no exclusive batch/schedule of training under this scheme and the beneficiaries are trained as per general training schedule of the respective NIELIT Centre.

Status:

The programme has been notified under Section 7 of the Aadhaar Act 2016 vide Gazette Notification No. D.L.-33004/99 dated 10th August 2019. The courses offered under the programme are limited to NSQF aligned Non-Formal Courses/Formal Courses in association with universities and are conducted at NIELIT's own Centres. The Course Fee is reimbursed in accordance with the Gazette Notification as per the Schedule-I of Common Norms issued by Ministry of Skill Development and Entrepreneurship (MSDE) vide even Notification No.H-22011/2/2014-SDE-I dated 15.07.2015, dated 20.05.2016, dated 28.02.2017 & dated 31.12.2018 or the actual charges of NIELIT whichever is less.

The number of candidates trained in 2019-20 (till December 2020) and fee reimbursement claimed from MeitY is as under:

Duration	No. of SC Candidates trained	Fund claimed according to Common Norms (Rs. in crore)	No. of ST Candidates trained	Fund claimed according to Common Norms (Rs. in crore)	Total Trained	Total Fund received in (Rs.)
2019-20	2,457	2.92	17,912	14.53	20,369	17.45

Status of MIS Development for the programme:

In Management Information System (MIS) application, integration with Direct Benefit Transfer (DBT) portal is to be modified to incorporate Local Government Directory (LGD compliance). In this regard, mapping of data with LGD codes at database end has been done. The changes at application level are under process along with modifications in Application Programme Interface (API) for integration with DBT portal.

2.2.4 Technical & Other Support

2.2.4.1 e-Gov App Store

The e-Gov App Store (<https://apps.gov.in>), launched in May 2013, is a National level common repository of customizable and configurable applications, components and web services, that can be re-used by various Government agencies/ Departments at Centre and States, with the vision to accelerate delivery of e-services as envisaged under NeGP and optimizing the ICT spending of the Government. Core and common applications that have high demand and are replicable across the Central and State levels, are the potential applications to be included in e-Gov AppStore and they can be hosted on the National Cloud. The project enables re-use of already developed applications without incurring further cost and effort in development of those applications. Therefore, the Appstore facilitates the Government Departments with the following objectives:

- Speeding up the development and deployment of e-Gov applications.
- Easy replication of successful applications across States.
- Avoid duplication of effort and cost in development of similar applications.
- Ensure availability of certified applications following common standards at one place.

Achievements

- Currently 61 applications (51 Apps, 8 Components and 2 Web services) are uploaded on e-Gov App Store and 19 applications have been funded for productization under the outlay of the project
- Important guidelines on Application Development & Re-engineering have been prepared in consultation with various Government & Private agencies (CGG, C-DAC, NIC & industry experts) and published.

- State level awareness workshops have been organized in various States to educate the Application Owners on Cloud ready application development & deployment
- “Revamping of MMPs /Projects” i.e. Transport, PDS, Prisons, Scholarship etc., was undertaken.
- AppStore Portal has been upgraded to a new version with improved performance and upgraded framework, and increased functionality.

2.2.4.2 Development of Common Minimum Framework (CMF) for Government Websites:

- Websites of 95 Ministries/Departments/Apex bodies have been made accessible.
- Websites of 66 Ministries/Departments/Apex bodies migrated to the Content Management Framework (CMF).
- 26 Ministries/Departments/Apex bodies were guided and technically supported to make their websites accessible
- 7 more Ministries/Departments/Apex bodies have on-boarded to CMF to make their websites accessible
- Training provided to officials of 57 Ministries/Departments for Content Management of websites
- Training provided to officials of 55 Ministries/Departments for obtaining Website Quality Certification by STQC
- 17 Government offices/entities were provided with the CMF Core Framework for developing accessible websites
- Review and testing for websites’ quality and performance were carried out
- Provided comprehensive WQR to stakeholders of the Ministries/Departments/Apex bodies in order to achieve consistent compliance to W3C’s Web Content Accessibility Guidelines (WCAG 2.0), The Rights of Persons with

Disabilities Act 2016, Information Technology Act of India and Guidelines for Indian Government Websites (GIGW).

2.2.4.3 India Portal

India Portal, a Mission Mode Project in the integrated services category under the NeGP (National e-Governance Plan), that provides a ‘single-window access’ to information and services that are electronically delivered from all Government Departments, institutions and organisations. It has been a most popular source of information to a wide range of stakeholders - from citizens, to Government, to business and to Indian diaspora. It is a gateway of Indian Government websites at Centre, State and District levels. The portal is also integrated with MyGov and Data Portal to present the citizen engagement activities and open data across various sectors.

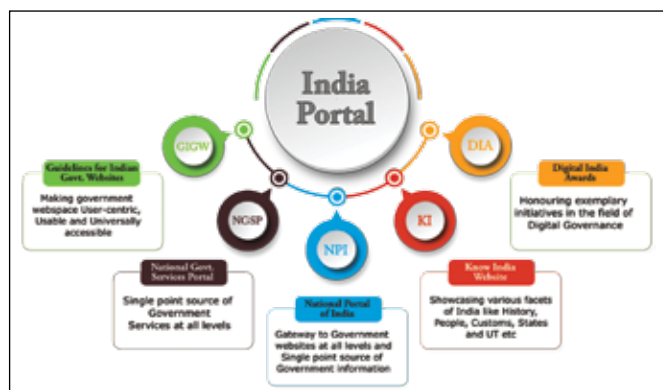
The India Portal has over 3.1 million visitors per month (7.9 million-page views) and 5.44 lakh registered users. Till date, India Portal has published ~21000 metadata. India Portal is also a platform for the promotion of various Government initiatives/events such as:

- Micro site for Republic Day showcasing the Republic Day celebrations, President’s speech to the nation and awardees of various awards that has been designed, developed and maintained at <https://knowindia.gov.in/republic-day-celebration/index.php>
- Micro site for Independence Day which is maintained at <https://knowindia.gov.in/independence-day-celebration/index.php>
- Spotlights covering important Government initiatives and events like Scheme of Fund for Regeneration of Traditional Industries (SFURTI), Union Budget 2020-21, Pradhan Mantri Jan Vikas Karyakram, Building Atmanirbhar Bharat & Overcoming COVID-19,

Helping MSMEs Grow & Reviving Economy, Educating Young Minds & Building a Stronger Nation, PM Street Vendor's AtmaNirbhar Nidhi (PM SVANidhi)

- Monthly newsletters that are sent to subscribers of India Portal to keep them updated about the latest content on the portal. The portal also has a Social Media presence through
 - Facebook page that is maintained at <https://www.facebook.com/NationalPortalIndia>
 - Twitter handle is maintained at <https://twitter.com/indiagovin>
- COVID-19 site to share information about inter-ministerial notifications thus serving as a single source of authentic information during the pandemic has been launched at <https://covid19.india.gov.in>

Other initiatives/activities under the aegis of India Portal are:



Guidelines for Indian Government websites (<https://web.guidelines.gov.in>)

GIGW were formulated under the India Portal project and have been helping achieve the objective of making the Indian Government websites Usable, User-Centric and Universally Accessible.

The first version of Guidelines for Indian Government Websites (GIGW) was released in

2009. Subsequently, with the change in technology and user needs, a new version of the guidelines was proposed and came into effect from February 2019. The new version features inclusion of the latest standards in web technologies and accessibility, and a new section with guidelines pertaining to Mobile Apps. GIGW has also been adopted by DARPG and included in the Central Secretariat Manual of Office Procedure (CSMOP).

National Government Services Portal (<https://servuces.india.gov.in>)

To facilitate the availability of online services that are provided by various Government entities from one platform, in a citizen-centric manner under categories like health and wellness, education and learning, money and taxes etc., the National Government Services Portal has been developed. The portal lists 9,963 services that can be searched by categories and has over 2 million visitors each month.

Digital India Awards (<https://digitalindiaawards.gov.in>)

Digital India Awards under the ambit of India Portal have been instituted to acknowledge the exemplary initiatives in digital governance. Government entities at the Centre, State, district and local levels and Indian missions abroad are eligible to participate in the awards. The awards are biennial, and the 6th edition of Digital India Awards is being organized in 2020 in a novel way, fully online from nominations to screening of entries to final awards ceremony. The previous five editions of the award were held in the years 2009, 2012, 2014, 2016 and 2018.

There are 7 categories this year, including 2 new categories for Innovation in Pandemic and Exemplary Product. Three Awards- Platinum Icon, Gold Icon and Silver Icon will be conferred in six categories. A Jury Choice award will also be conferred for excellence in design and implementation of National Public Digital Platform.



National Government Services Portal (<https://services.india.gov.in>)

Know India (<https://knowindia.gov.in>)

This website showcases India's profile, its unique and rich culture & heritage, National Identity Symbols, States/UTs/Districts etc., The microsites on republic day (<https://knowindia.gov.in/republic-day-celebration/index.php>) and independence day (<https://knowindia.gov.in/independence-day-celebration/index.php>) celebrations are a part of this website.

2.2.4.4 To set-up India Enterprise Architecture (IndEA) at NeGD

In order to facilitate better governance to citizens and enable whole-of-Government approach, policy integration and use of Big Data Analytics is required. These trends require breaking of sectoral barriers and silos and re-architecting the Government as a single enterprise. Keeping in view the above facts, MeitY formulated India Enterprise Architecture

(IndEA) Framework along with its Adoption Guide. The vision of IndEA is “to establish best-in-class architectural governance, processes and practices with optimal utilization of ICT infrastructure and applications to offer ONE Government experience to the citizens and businesses”.

Designing Enterprise Architecture for a large and complex organization typically takes months and years, requires big modelling upfront and involves creation of scores of artifacts, even before the first line of code is written. The Agile methodology, on the other hand, postpones any kind of modelling to the eleventh hour, insists on very little planning and documentation, and promises delivery of working software in weeks.

Accordingly, Agile IndEA framework was developed and released wherein IndEA Framework and Agile Practices were distilled and harmonized. Agile IndEA recommends referring to the IndEA Reference Models, where and when required for seeking more details - adopting the principle of Just-Enough-Architecture. Agile IndEA can be applied to both Greenfield Projects and Brownfield Projects.

MeitY through NeGD is providing technical support to Ministries/Departments to prepare sectoral blueprints coupled with implementation plans to achieve the above. The National Digital Health Blueprint is under implementation; the education and agriculture blueprints are nearing completion while blueprints for energy, logistics, social justice, ICJS etc., are on the anvil. The role of MeitY is to provide only technical support and concerned Ministry/State would be the owner of their respective platform.

Major objective of the project is to raise maturity of existing e-Services to Level IV i.e. Connected Services (ref. United Nations e-Service Maturity Model), simplify processes, enhance enterprise security, make use of latest technology, facilitate

information based decision making while driving efficiency, cost benefits, sharing and reuse.

For pilot implementation of IndEA, a project titled ‘To set-up India Enterprise Architecture (IndEA) Division at NeGD’ has been initiated in March, 2019 under which 2 Ministries/Departments (Education & Agriculture) and 2 States/UTs (Meghalaya & 1 more State) have been targeted.

Achievements

- Initially, the sectors namely Agriculture and Education along-with the State of Meghalaya were selected as pilot initiatives for preparation of architecture blueprint and segmented implementation as proof of concept. Later, the scope of the architecture blueprint preparation has been expanded to other sectors i.e. Power & Energy, Rural Development, Land Records, Urban Development, Logistics, Industry/MSME, Public Safety & Integrated Criminal Justice, Women & Child, Skills & Employment etc.
- The architecture blueprint is in advanced stages of implementation for the Ministry of Agriculture & Farmers Welfare and Department of School Education & Literacy, Ministry of Education.
- In Meghalaya, Vision document has been finalized. Detailed requirement specifications and Finance Solution Architecture are under finalization. Implementation of IndEA for Finance domain has been initiated in pension services. The final MeghEA blueprint is in draft stage.
- 16 workshops have been conducted in Ministries/States/UTs. A film on IndEA has been prepared to spread awareness about India Enterprise Architecture.
- The IndEA repository has been enriched with project documents, guidelines, e-learning material, architectural building blocks,

reference architectures, model domain architectures, standardised templates, cases studies, best practices, lessons learnt, tools and artefacts etc.,

- NeGD has empanelled EA experts and consulting Agencies to provide technical support to Ministries/States for implementation of IndEA.

2.2.4.5 Knowledge and Resource Centre for Accessibility in ICT

MeitY is implementing a project- Knowledge & Resource Centre for Accessibility in ICT (KAI) to develop accessibility standards and procurement guidelines for hardware & software through C-DAC, Pune. Various activities and the policy decisions taken for implementation of the RPwD act 2016, during FY 2019-20 by MeitY.

ERNET India is executing a project funded by the Department of Empowerment of Persons with Disabilities (DEPwD), MSJE (GOI) to develop 803 websites of State Government to make them accessible to Divyangjan as per standards Government of India Guidelines for websites (GIGW). As of now 649 websites have been made accessible.

Initiatives and projects under Digital India Programme of MeitY related to accessibility are as follows:

- MeitY is funding a project “Development of Common Minimum Framework (CMF)” for making 100 Government websites accessible. As of now, 95 websites have been made accessible. The project is being implemented by NIC.
- A platform “S3WaaS- Secure, Scalable and Sugamya Website as a Service” is a website development framework based on SaaS (Software as a Service) model hosted on the

National Cloud of NIC. S3WasS has been built with an objective to empower the district administration to generate, configure, deploy and manage secure, scalable and accessible website for publishing district specific information and services without much effort and technical knowhow.

- STQC Directorate has setup testing infrastructure for accessibility compliance as per guidelines of Guidelines for Indian Government Websites (GIGW).
- Knowledge & Resource Centre for Accessibility in ICT (KAI) –Project funded by MeitY to develop procurement guidelines for accessible hardware & software. The project is being implemented by C-DAC, Pune.

Budget Provision

- A project “Development of Common Minimum Framework for Government Websites” has been funded by MeitY with a total outlay of Rs.18.66 crore
- Another project named “Website Quality Evaluation (Phase-III)” has been funded by MeitY with a total outlay of Rs.4.18 crore
- Knowledge & Resource Centre for Accessibility in ICT (KAI) –Project funded by MeitY at total cost of Rs.2.94 crore for 2 years.

Allocation under various schemes for the benefit of the persons with disabilities, the amount released, and the amount utilized.

- For Project “Development of Common Minimum Framework for Government Websites” the amount released so far is Rs.15.82 crore for project “Website Quality Evaluation (Phase-III)”, Rs.2.04 crore and for Knowledge & Resource Centre for Accessibility in ICT (KAI) Rs.0.71 crore have been released.

2.2.4.6 Capacity Building Scheme 2.0

Capacity Building Scheme 2.0

The Digital India led transformation requires considerable enhancement of capacities within the Government at both the Central and the State levels to lead and manage various Digital Governance initiatives. In order to address the emerging and increasing need to build internal capacity in the Government to envision, conceptualise and implement digital transformation, Capacity Building (CB) scheme was launched in 2009. The scheme's Phase-II started in January, 2015 and is extended upto September, 2021.

Capacity Building scheme components broadly cover: (i) State e-Mission Teams (SeMTs): Professional and technical manpower support to the States/UTs; (ii) Various need-based training programmes and thematic workshops that range from short duration sensitization and awareness sessions to long duration in-depth, role-based trainings; (iii) Learning and Knowledge Management System (LMS & KMS): Technology enabled learning and knowledge management for anytime, anywhere learning and sharing; (iv) Content development and strengthening of training institutes, collaborations and partnerships: Covers content and faculty support to ATI & CTI and incorporates digital governance modules in the regular calendar, besides collaboration with premier institutes for conducting capacity building programmes.

With the recent focus on new emerging areas, enterprise architecture and Cyber Security, new programmes, such as Cyber Surakshit Bharat has been introduced and existing programme modules like CIO programme has been revamped and revised, accordingly. Various need-based training modules have been developed and standardised. Also, a resource pool has been identified and trained under Train the Trainer programme to scale up capacity

building efforts across the country. The details on capacity building components and programmes are also available at www.negd.gov.in.

Achievements (FY 2020-21 till 31.12.2020):

SeMT support to States/UTs: Current Strength is 170 in 36 States & UT out of approved strength of 229. Regular review meeting of SeMTs at P&CEO, NeGD level and Secretary, MeitY is being done to ensure their alignment with National Digital priorities and sharing of better practices for further replication at other States/UTs.

Training is an ongoing activity offered to various Central and State level officers, from time-to-time. Various Government officers from various Central and State Ministries/Departments and other organisations are trained in relevant training programmes. The programmes conducted are as follows:

The programme comprises domestic and international exposure components and has two variants - Leadership and Champions level. Some of the recently conducted CIO programmes were based on new emerging areas such as AI, Block Chain, Enterprise architecture, IoT, Cyber Security, DSS, Design & thinking etc., As of now,

- Programs for champions (3-4 weeks)-7 programmes with 156 participants
- Programs for Leaders/Policy level (1-2 weeks)- 7 programmes with 140 participants

SeMT Orientation Training for States/UTs – 5 Programmes, 138 Participants

The thematic workshops are conducted on e-Gov competency framework, Change Management, e-Gov standards and open source policy, GIS, Electronic Payments and receipt, emerging technologies like AI, Blockchain, Big Data and Data Analytics etc., As of now, 22 workshops have been conducted (1-2 days) with 3,471 participants.

- Train the trainer (TTT) programme aims to create and enlarge a pool of expert trainers whose expertise can be used by Central and States/UTs Governments for their e-Governance training programmes, as of now 13 programmes have been conducted with 189 participants.
- Empowered Central and Administrative Training Institutes (ATI-CTI) and academic training partners to take up need-based e-Gov Training programs all across regions and cadres, by innovative engagement model of training of trainers, providing expert faculty and content support. MOU signed with NPC, ChiPs Chhattisgarh and content/faculty support extended to 22 ATIs-CTIs for 117 e-Gov training modules/sessions (Indian Forest Officers (IFS): IGFNA-Deharadun, Indian Audit and Account Services (IAAS) with NIFM-Faridabad, CSS officers with ISTM-Delhi, State Administrative Officers with MGSIPA-Chandigarh etc.,). This innovative engagement model led to additional 3,118 Government officials trained with a little financial support of NeGD by extending Content & Faculty support to ATI-CTI since September 2016.
- To address the emerging training needs in Cyber Security, emerging Technologies and transition-exit management of IT initiative, trainings are designed to cater new functions like CISO and CTO with in Government. As of now, 14 programmes have been conducted with 535 participants. First 9 programmes were from CB-II funding and now it is directly funded by MeitY.
- NeGD has widened its partnership with international institutions like Asian Productivity Organization through National Productivity Council. NeGD is participating and facilitating NPC and APO in various Capacity building activities such as international research study, national and international workshops/training programs etc.,
 - A Post Graduate Program in Digital Governance and Management (PGP-DGM) leading to the award of Master of Business Administration (MBA) degree is launched by the Indian Institute of Management Visakhapatnam (IIMV), an institution of national importance, under the aegis of the National e-Governance Division (NeGD), Ministry of Electronics and Information Technology (MeitY), Government of India (GOI). The Program is of 18-month duration, spread over 4 terms of 4.5 months each. It is a blended-learning model with a judicious combination of traditional and virtual classroom modes using NeGD Learning Management System (LMS). The first batch of the Program (2019-21) has started from January 2020 with the inauguration of Secretary, MeitY. The First Semester of the Diploma will be completed by June 2020.
 - Learning Management System (LMS) (<https://lms.gov.in/>): A virtual learning platform for administration, documentation, tracking and reporting of training programmes, classroom and online events, e-learning programmes, and training content. The Learning Management System (LMS) (<https://lms.gov.in/>) launched in March 2017, is an application for administration, documentation, tracking and reporting of training programs, classroom and online events, e-learning programs, and training content along with blended capacity building feature. It

saves time and money and to foster continuous learning, technology is being used in such a way that learning and knowledge exchange becomes a normal engagement without external interventions. It is providing e-Learning as a service, enabling capacity building through e-learning and virtual training.

- The NeGD Learning Management System has been requested by 62+ Ministries/ Departments across India to facilitate their e-Learning purposes. 56+ Government Ministries/Departments have already been on-boarded on the NeGD LMS.
- The LMS Mobile application is developed for the android and iOS platforms.
- LMS have nearly 100 hours of e-Content on various topics like Digital India, e-Governance and Soft skills, UNDP sustainable development goals on NeGD Learning Management System (LMS) which can be accessed online through any internet browser or mobile app from Google Play/iOS app store.
- The draft brochure (Annexure-I) to provide online training is designed to offer the online diploma, certification on e-Governance, soft skills and sustainable development goals. The on-boarded training institutes can use these contents to award the online diploma, certifications on joint branding of MeitY/NeGD.
- The external certification program from the Harvard University/Simplilearn made available through LMS. Nearly 50 Principal/ Commissioners (IRS officers) are undergoing Harvard Manage Mentor Course using the NeGD LMS Instance allotted to NaCIN.
- LMS team Provided the public webinar and mass online training programs for the central line Ministries and State Government events to disseminate knowledge and create public awareness.

- NeGD LMS Team conducted 400+ webinars for various Ministries and Government Departments and initiatives like Goods and Services Tax Network (GSTN), Ministry of Tourism, Ministry of Culture, Department of Telecommunications (DoT); MeitY Start-up; Indian Railways; Department of Defence Production, Ministry of Defence; ISTM, NACIN, NAIR, Department of Revenue; Telangana Police, TERI GDHP 2018 (Ministry of Health) etc., LMS Team supports the MyGov Samvaad webinar series.
- For GST Ecosystem alone LMS team has conducted more than 200+ webinars with 26 lakh viewership in association with GSTN on various applications on GST portal in English, Hindi and various other regional languages. On 5th April 2019, NeGD was honoured with an award in recognition of the valuable contribution and support in the development of the Goods and Services Tax (GST) ecosystem.
- LMS Team conducted the Aero India 2019 and Def Expo 2020 webinar series and received appreciation from the Ministry of Defence for arranging the international webinars.
- During the current lockdown period as a special support to Ministries and Departments, the NeGD LMS Team supported meetings VC sessions as follows (status as on 31st April 2020):

Total No. of meeting/ session requests received	346
Total meetings Sessions already conducted	341
Total No. of hours of sessions conducted (approx.)	505 hours
No. of Departments/ Ministries/Organisation (approx.)	61

- LMS team also conducted 72 webinars with 37,259 live participants from 13th March to 5th May 2020 and approximately 50,000 views in Digital India Learning YouTube Channel.
- All the training conducted which are open for the public are available on the Digital India Learning YouTube Channel:
- (https://www.youtube.com/channel/UCbzIbBmMvtvH7d6Zo_ZEHDA), As on 12th May 2020, the Digital India Learning YouTube Channel has approx. 38,000 subscribers with 241 videos and 1.5 Million views.

Knowledge Management System (KMS) and Content Development & Management:

- A Knowledge Management System (KMS) (<https://kms.gov.in/>) for e-Governance has been created under Digital India and launched in August 2019. KMS enables stakeholders to effectively utilize the vast information available in Government organizations. It facilitates access, collaboration and sharing of information and knowledge on e-Governance issues and projects under Digital India. SeMT.
- Departments on-boarded on NeGD KMS portal are the Department of Administrative Reforms and Public Grievances (DARPG), MyGov, Meghalaya State Government, Telangana State Government, Kerala State Government, Bureau of Indian Standards, Income Tax Department & Punjab State Government and State e-Governance Mission Teams of all States. KM portal has been requested by three more new Departments/organisation like GSTN, Gujarat Institute of Disaster Management (GIDM) and Haryana Institute of Public Administration (HIPA) which are in the pipeline.

2.2.5 Common Services Centers

The Common Services Centers (CSCs) are internet enabled access points for delivery of various Digital Services (e-Services) to the citizens. The CSCs enable citizens to avail the Government and other services closer to their locality in a transparent and timely manner. The primary objective of the CSC is to provide e-Governance services within the reach of the citizen, by creating the physical service delivery ICT infrastructure. It helps in making a transparent service delivery mechanism and eliminating citizens' effort in visiting Government offices.

CSCs are run by Village Level Entrepreneurs (VLEs), who are co-opted into the ecosystem from the community they serve. To ensure sustainability of the CSC, the entrepreneurship capabilities of the VLEs are nurtured from time to time through entrepreneurship development programs and training workshops.

The CSCs aim to provide individual access to internet and access devices to citizens in rural India where the ICT intervention is very low, thereby, reducing/eliminating the digital divide. CSCs being well equipped ICT enabled centers, necessarily play a significant role in enabling universal access to plethora of e-Services for citizens and acting as cornerstone for the citizens' digital empowerment, hence creating a transparent governance ecosystem. Altogether, these CSCs are becoming a game changer by providing a common Information Technology (IT) platform for rural citizens.

Today, CSCs are more than service delivery points in rural India. They are positioned as change agents, promoting rural entrepreneurship and building rural capacities and livelihoods. They are enablers of community participation and collective action for engendering social change through a bottom-up approach with key focus on the rural citizens.

CSC-2.0 Project

The CSC Scheme was initially launched in September, 2006 under National e-Governance Plan (NeGP), with an aim to cover all 6 lakh census villages by one lakh CSCs, as per 1:6 ratio equitably spread across rural India.

Based on the assessment of the CSC Scheme, the Government of India has launched CSC 2.0 Project in December, 2015, under the pillar-3 of Digital India Programme, to expand the outreach of the CSCs to all Gram Panchayats (GPs) across the country and made the CSCs the integral part of the Digital India Programme. It has aimed to set up at least one CSC in every GP across the Country within duration of 4 years (by November, 2019), thereby envisaging establishment of at least 2.5 lakh CSCs covering all Gram Panchayats of the country over a period of four years.

The CSC 2.0 is envisaged as transaction based and service delivery-based model, delivering a large bouquet of e-services through a single delivery technological platform, which would increase the sustainability of the CSCs across the country. As on 31st December 2020, there are total 3,73,827 CSCs functional in PAN India, out of them 2,78,048 CSCs are functional at Gram Panchayat (GP) level.

CSC – Service Delivery platform

The number of services offered by CSCs has increased steadily over the years and the CSCs are offering more and more G2C services (Central and State Government services), UIDAI Services, Election Commission Services, Digital literacy and other educational services, services under Financial Inclusion (Banking, DigiPay, Insurance and Pension), Healthcare services, Skill Development, and other B2C services (IRCTC, Utility Bill Payment, E-Commerce, E-Recharge) through Digital Seva Portal.

Currently, 28 Central Government services are offered to the citizens through the CSC network using the centralized Digital Seva Portal. State G2C services, ranging from 10 to 400 in various States, are also being delivered through the CSCs in collaboration with various State Governments and their Departments. By partnering with Government and private service providers, CSC SPV is enabling the CSCs to deliver a wide range of services and thus ensuring the viability and sustainability of the CSCs.

A few of the important new initiatives as well as other services that are implemented and provided through the CSCs are:

- Ayushman Bharat Yojana
- Pradhan Mantri Shram Yogi Mann-dhan Pension Yojana (PM-SYM)
- 7th National Economic Census
- Jeevan Pramaan
- Udyam Parichay/Udyam Jyoti
- HIMCARE - Himachal Health Care Scheme
- Tele-Centre Entrepreneurship Course
- Printing of Ration Card in Himachal Pradesh
- E-Courts Service
- Sarathi Services

Other programmes of national Importance

Apart from the above noted initiatives, during the Financial Year, 2018-19, CSC E-Governance Services India Limited implemented the following Programmes/Projects of national importance:

- Pradhan Mantri Digital Saksharata Abhiyan (PMG DISHA)
- Wi-Fi Choupal
- Setting up of Sanitary Napkin Micro Manufacturing Units
- Digital Village

Services through CSCs under CSC ecosystem

A large bouquet of Services has been offered to the citizens through the CSCs under the following major categories of Services:

- State Government Services
- Central G2C Services
- Aadhaar Services
- Digital Literacy
- Other Educational Services
- Skill Development
- Services under Financial Inclusion
- Tours & Travels
- Utility Bill Payment
- Healthcare Services
- Other B2C Services

MyGov

Promotes active participation of Indian citizens in governance and development, creates a common platform to “crowd source governance ideas from citizens”.

Citizens can collaborate with Government right from the conceptualization of scheme, to its implementation and post implementation and participate in various activities such as discussions, tasks, quizzes, talks, surveys, polls, innovation challenges, Swachh Bharat activities, volunteering, events etc., through the site and associate micro sites.

As on November, 2020, more than 144.37 lakh citizens are registered on the Platform and participating in various collaborative activities with Government. The platform has 856 discussion themes, 992 tasks, 275 Poll/survey. Weekly newsletters are being sent to all registered users of MyGov. 8,81,635 submissions have been made in 992 Tasks. Received 45.79 lakh comments on 856 discussions.

e-Mail solution of Government of India: email policy of Government of India lays down the guidelines with respect to use of e-mail services of GOI and employees of those State/UT Governments that use the e- mail services of GOI. The Objective of this policy is to ensure secured access and usage of Government of India e-mail services by its users. Over 25 lakh Government employees email ids/users created. New version with more secured email services launched like two factor authentication, device mapping and Geofencing “KAVACH” etc., Now performing over 2 crore email transactions per day.

e-Sampark & e-Greeting: Development of e-Greetings Portal and Sampark Portal along with Sampark database of all elected representatives, Government officials and professionals across India in order to promote citizen engagement in e-Governance. Under the “Digital India” initiative of the Government of India 1402.11 crore emails sent and 2249 campaigns held under Sampark till December 2020. MeitY has also implemented an E-Greetings portal. The objective of the portal is to promote a contemporary and eco-friendly method of sending Greetings by Government officials and agencies to colleagues and friends. The portal allows users to select and send a greeting from several templates for an occasion. The Departments can also customize the greetings by adding taglines relating to their programmes of public interest. The first version of the portal was launched on 14th August 2014. There are 1,391 greetings cards available in more than 48 categories. Since launch 6,58,17,578 greetings have been sent till December 2020.

2.3 Digital India Initiatives by NIC

Technology has played a key lever in the rationalization of good governance by ensuring rapid execution of public policies across the length and breadth of the country while upholding the transparency, accountability and trust amongst

the citizens. NIC platforms and services are being offered in different domains like Agriculture, Education, Health and Family Welfare, Transport, Finance, Law and Justice, Social Welfare & Skill Development, Home Affairs, Food & Public Distribution etc., through multiple delivery points thereby providing rich benefits of enterprise mobility and accessibility.



Digitizing core sectors for sustainable national development

2.3.1 Digital Initiatives during COVID-19 times

COVID-19 pandemic imposed unprecedented challenge for the Government to ensure Government service delivery to the citizens. NIC solutions such as eOffice facilitated Government officials to work in the safety of home in the critical lockdown period. NICs Video Conferencing Services facilitated virtual meetings and interactions to help Government officials to deliberate amongst themselves and with officials from various States & UTs without meeting physically on a frequent basis in the difficult days of complete lockdown. Software solutions by NIC have supported the Government at Centre, State and district level to help in monitoring & management of different aspects of pandemic right from the dissemination of information, advisories, guidelines to ePass systems, quarantine management, surveillance apps, complaint management systems, travel history registration systems, hospital management, COVID-19 tests management, telemedicine, tele-education, helpline portals and dashboards.



2.3.1.1 AarogyaSetu

AarogyaSetu is a mobile application launched on 2-April-2020, to aid the COVID-19 efforts of the Government. The App works based on contact tracing method and helps the Government in identifying, monitoring and mitigating the spread of COVID-19 across the country. The App proactively reaches out and informs the users of the app regarding risks, best practices and relevant advisories pertaining to the containment of COVID-19.

Key features of AarogyaSetu include - automatic contact tracing using Bluetooth, self-assessment test based on ICMR guidelines, Open API features for organizations to check health status of their employees/customers, integration with e-Pass, nation-wide geo-location COVID-19 statistics, emergency COVID-19 helpline contacts, ICMR approved Labs with COVID-19 testing facilities, risk status of user, Recent Contacts feature to check the health status of recent bluetooth contacts, provision to share health status with any other AarogyaSetu user, QR code, support for over 12 languages and AarogyaSetu IVRS for citizens with feature phones and landlines.



2.3.1.2 Healthcare Initiatives during COVID-19 pandemic

NIC has also undertaken various technology initiatives in health sector during the unprecedented times caused by COVID-19 pandemic. Some of these are:

- Implementation of e-Hospital for dedicated COVID-19 hospitals via integration of ICMR ID with e-Hospital. Functionality includes registration, in-patient care management, bed management, comprehensive clinic care, transfer/discharge module and inventory management. This was implemented in Sardar Patel COVID-19 Care Centre and Hospital (SPCCCH), New Delhi and in Puducherry Hospitals.
- Enablement of e-Hospital application for capturing COVID-19 information in Non-COVID-19 hospitals, it includes travel history (Period and location), symptomatic (cough, fever, breathing problem etc.) or asymptomatic cases, co-morbidity conditions (Diabetic, Hypertension, Lung and Heart disease), contact tracing for COVID-19 patients.
- Development of real-time Reverse Transcription–Polymerase Chain Reaction (RT-PCR) and Rapid Antigen Test of India (RATI) application for sample collection and its integration with ICMR lab software.
- Technical support provided to ICMR and Centre for Health Informatics, MoHFW in development of application, management of infrastructure and integration of ICMR data with COVID-19 India Portal and with States.
- Integration of COVID-19 Test Reports in Hospitals where e-Hospital has been implemented.
- Development and implementation of Tele-Medicine Solution well integrated with e-Hospital.

Dashboard for e-Hospital implementation at Sardar Patel COVID-19 Care Centre and Hospital (SPCCCH)



2.3.1.3 ePass

ePass Systems were quickly developed using NIC's ServicePlus framework for generating passes for easy movement of vehicles during the lockdown. These solutions have also facilitated the movement of residents, stranded in other parts of the country amid lockdown. Many States have implemented NIC's ePass solutions within a short span of time.



2.3.1.4 COVID-19 Warriors

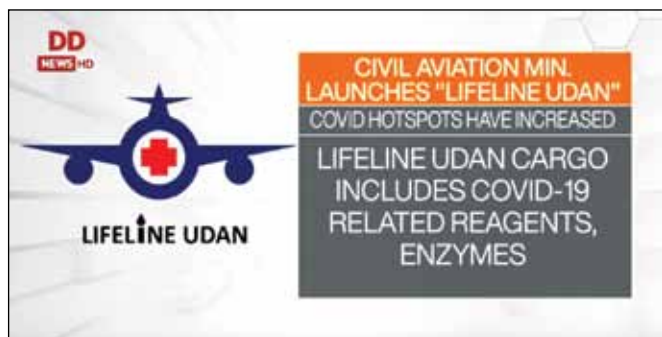
A portal named 'COVID-19 Warriors' was developed. It offers information about various resources available nationwide in the war against the COVID-19 contagion. This covers a detailed list

of hospitals, Nodal Officers by States and Districts, Associations, and Personnel.



2.3.1.5 Lifeline Udan

In order to ensure uninterrupted supply of essential goods, NIC has developed a website 'Lifeline Udan' for Ministry of Civil Aviation which has facilitated flights to operate amid the lockdown to transport essential medical cargo to remote parts of the country.



2.3.1.6 Vande Bharat Mission

NIC also played a significant role in helping MEA while operating Vande Bharat Mission for bringing back Indians stranded abroad due to COVID-19 Pandemic. A robust ICT platform was setup by NIC for collation and secured transmission of near real-time data through Indian Missions, social portals etc., to all stakeholders involved in the Mission. More than 18 lakh Indians have been evacuated across the world through thousands of flights and ships.



2.3.1.7 eOffice

eOffice is one of the key IT projects of NIC, aimed at improving internal efficiencies in an organization through electronic administration leading to informed and quicker decision making, which in turn results in better public service delivery. It is a complete digital work place solution for Government offices and is based on Central Secretariat Manual of eOffice Procedure (CSMeOP), formulated by the Department of Administrative Reforms and Public Grievances (DAR&PG). eOffice covers the entire gamut of office administration, which is amenable to replication across the Governments, at the Central, State and District levels. It is a web-based and cloud enabled product that brings together the independent functions and systems under a single framework.



The eOffice product is a suite of applications comprises File Management System (eFile), Knowledge Management System (KMS), Leave Management System (eLeave), Tour Management

System (eTour) and Smart Performance Appraisal Report Recording Online Window (SPARROW).

eOffice has played a key role in enabling, the concept of work from home in Government Offices, a rather alien and hitherto mode, generally seen in private companies. As we come to terms with physical distancing, major office work of processing of files is getting accomplished in eOffice, by working from home. eOffice has truly stood the test of the time and proved to be a game-changer and life-line in the crisis of COVID-19 pandemic. There has been an unprecedented growth in eOffice during pandemic period, as it has provided much needed business continuity during the lockdown.

	Files Created	Files Moved	Receipts Created	Receipts Moved
Office	3,59,925	93,73,595	33,57,822	53,03,908
Home	1,25,373	30,08,597	9,16,601	7,03,251
Total	4,85,298	1,23,82,192	42,74,423	60,07,159

Summary of Transactions in Central Government from 23rd March 2020 till 31st December, 2020.

Till December 2020, eOffice has been implemented in 622 organizations of Government of India.

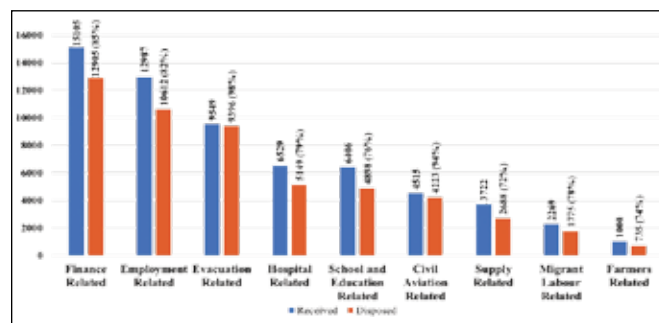
2.3.1.8 GIS Support

The key activities and support include the MOHFW website and dashboard, geo-coding and reverse geo-coding services in coordination with HERE maps for AarogyaSetu app, development of thematic map portal as per requirements of Ministry of Labour & Employment for capturing the Relief Camp-wise details of Unorganized Migrant Workers. MHA map compositions and GIS Visualizations for decision making regarding lockdown, dashboards for States. GIS Support to COVID-19 site which provides a platform for RT-PCR testing and monitoring has been provided. COVID-19 Testing

Lab Details ICMR application shows COVID-19 Test Labs Location in India along with lab details, URL: <https://covid.icmr.org.in/map/map.html>

2.3.1.9 Public Grievances

In wake of announcement of Nation-wide lockdown due to COVID-19 from 25th March 2020, Empowered Group of Officers-10 was constituted under the Disaster Management Act, 2005 on Public Grievances and Suggestions to ensure timely disposal on grievances received from citizens on COVID-19 related issues. A Monitoring Dashboard was developed and implemented where COVID-19 related grievances received in CPGRAMS with all Ministries/Departments and States/UTs are monitored on priority.



Grievances received and disposal under various main COVID-19 Sub-Categories

2.3.2 Agriculture

2.3.2.1 PM Kisan- Pradhan Mantri Kisan Samman Nidhi

Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) portal by NIC is an end-to-end technology solution for transfer of funds directly in to the accounts of farmers under the Direct Benefit Transfer Scheme PM-KISAN. This year the portal took giant strides by the disbursal of funds to the large number of farmers across India in a very short duration of time even in challenging times of COVID-19 lockdowns. Hon'ble Prime Minister of India Shri Narendra Modi transferred benefit

amounting to Rs.17,100 crore to 8.55 crore farmers in a single click of button on 9th August 2020. On 25th December 2020 at 12:00 noon, Hon'ble Prime Minister released the financial benefits amounting more than Rs.18,000 crore to more than 9 crore farmers' families through video conferencing.

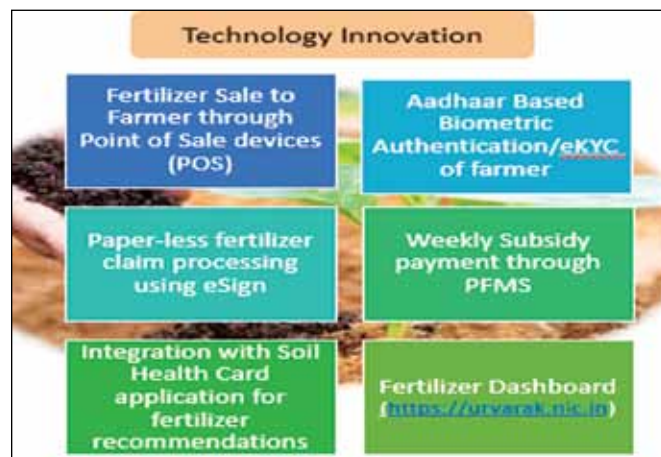


New features and functionalities are being added in the PM-KISAN portal, some of which are as introduction of farmer's corner, various corrections windows for States, Aadhaar authentication, Payment mode as Aadhaar based as well as Account based, Distributed Grievance Management, IVRS, Income Tax payee exclusion mechanism and Refund mechanism. Additional features also include temporary hold and revocation of beneficiaries for pending corrections, Re-processing of transaction failure records, change of payment mode, MIS reports and dashboards, Physical verification, external linkages through APIs with PFMS, States Portals, CSC portal, Prayas - PM Dashboard, DBT Bharat and DBT Agri portals, KisanSuvidha App and KrishiKalyanAbhiyaan (KKA)-III dashboard. Bulk processing is being done at the start of each quadrimester, so that benefits reach to maximum number of farmers in the minimum time period.

2.3.2.2 Integrated Fertilizer Management System (eUrvarak)

Integrated Fertilizer Management System (eUrvarak) is a technology solution for the scheme "Direct Benefit Transfer in Fertilizers" to ensure adequate and timely availability of fertilizers in the country. It aims to manage fertilizer subsidy disbursement by the Department of Fertilizers and covers all functionalities in entire supply chain for capturing transactional data starting from procurement of raw material, production of fertilizers, imports at different ports, movement from plant and ports by rail or road to district warehouses in accordance to the monthly supply plan, sales from district to wholesalers and from wholesalers to retailers. POS based application enabled with Aadhaar based biometric and contactless OTP based authentication is used to capture fertilizer sale from retailers to farmers. The system is used for generation and paper-less processing of subsidy claims of different fertilizers for their payment to fertilizer companies through Public Financial Management System (PFMS).

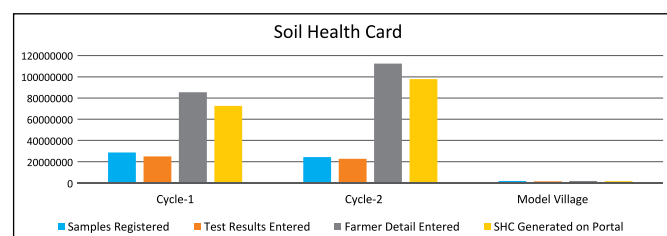
Home delivery of fertilizers to the farmers has been implemented as a pilot project in Andhra Pradesh where farmers after biometric authentication can place their orders through RBK (RythuBharosa Kendra) located in their villages and the fertilizers are then delivered at their door step.



Periodic SMS are sent to farmers through the system for the fertilizer stock availability at the retail outlet from where he last purchased the fertilizer. Farmer can also send SMS to get information about availability of fertilizer at any retail outlet.

2.3.2.3 Soil Health Card

Soil Health Card Scheme is a flagship program which has issued Soil Health Cards (SHC) to farmers for every 2 years. A SHC provides the farmer with the nutrient status of his land and gives recommendations on dosage of fertilizers, bio-fertilizers, organic fertilizers as well as soil amendments to maintain soil health in the long run. The Soil Health Card Portal is a web and smart phone-based application, designed and developed by NIC, MeitY. Soil Health Cards are generated in 22 different languages, 5 dialects and in local units for the benefit of farmers in uniform and standardized format across the country. During the year 2020, new interface has been added in the Soil Health Card portal for monitoring the progress of “Farmers Training and Demonstration” scheme - a unique approach that aims to demonstrate and popularize the improved technologies at the farmers’ fields for efficient and profitable management of resources and to provide a direct interface between subject matter specialists (including researchers) and farmers.



2.3.2.4 KisanRath: Facilitating Transportation of Agri-Produce

KisanRath is a mobile app developed by NIC to facilitate farmers/traders hire transporters for transporting Agri-produce, which is a critical activity

affecting the availability of fresh agri-produce in the markets and food wastage along the supply chain. KisanRath app ensures smooth supply linkages between farmers, warehouses, FPOs, APMC mandis, intra-State & inter-State buyers, and helps in reduction of food wastage by timely transport.



NIC rolled out the app within a challenging timeframe of 10 days and was launched by Hon'ble Minister of Agriculture & Farmers' Welfare, Shri Narendra Singh Tomar on 17th April 2020.

KisanRath enables the consignor (farmers, FPOs, traders) to post their transportation requirements (load request) online. The app then disseminates these load requests to the transport service providers as per various criteria (e.g. area of operation of transporter, type of vehicle, distance and weight etc.). The service providers can then revert with a quote against the posted load requests and can also contact the consignor for negotiation and finalising the deal. This app is available in 10 Indian languages.

For ease of user registration and posting of load requests, KisanRath is integrated with eNAM and Farms mobile app also.

Fruits and Vegetables module: Going one step further than mere facilitating transportation of agri-produce, a module to enable farmers/traders to sell/purchase fruits and vegetables online was also developed and has been launched for Assam on 06-Oct-2020 by Hon'ble CM of Assam.

Since its launch “KisanRath” has benefitted the farmers and traders by ensuring smooth and seamless supply linkages between farmers,

warehouses, FPOs, APMC mandis and intra-State & inter-State buyers.

Till December 2020, 4.5 lakh+ farmers, 91,000+ traders, 1911 FPOs, 26,000+ service providers, 7 major truck aggregators and 1 tractor trolley aggregator have been on-boarded, providing 10 lakh+ transport vehicles for hire (comprising trucks and tractor trolleys).

KisanRath has received 8,000+ post load requests and has facilitated transport of 22,000+ metric tonnes of agri-produce.

2.3.2.5 Digital Platform for Farm Mechanization and Technology

Government of India has launched the SMAM scheme to improve the farm input and farm power availability. NIC has created a Digital Platform for Farm Mechanization and Technology at <http://agrimachinery.nic.in>

Following digital solutions are presently being offered on this platform:

Agri Machinery DBT Portal (ICT Solution for automation of Farm Machinery Subsidy workflow and Implementation of DBT)

The Sub-Mission on Agricultural Mechanization (SMAM), a centrally-sponsored scheme for promotion of farm mechanisation, provides financial assistance to the Farmers, Entrepreneurs, Society/SHG/FPOs for purchasing single equipment and for the establishment of CHCs, Hi-Tech Hubs and Farm Machinery Banks.

8.6 lakh+ Farmers, Entrepreneurs, Society, SHG, FPO have registered, 3,734 manufacturers and 34,865 dealers are on-boarded. 5.24 lakh+ subsidy applications for purchase of single equipment processed and Rs.747 crore+ subsidy disbursed, and 8,540 applications for CHC projects processed and Rs.49 crore+ subsidy disbursed.

Centralized Farm Machinery Performance Testing Portal

The portal enables monitoring the testing process and activities of farm machinery by FMTTIs and covers end-to-end activities involved in the testing process from registration of manufacturer, submission of application and fees, sampling of equipment, testing and uploading of Final Test Reports (FTR).

The application was launched by Hon'ble Union Minister of Agriculture in September 2020.

At present, 141 applications have been applied by Manufacturers for testing purpose at various FMTTIs and testing of 3 machineries have been completed.

FARMS (Farm Machinery Solutions - Mobile app for connecting Farmers and CHCs Owners)

A multi-lingual mobile app has been developed with the following objectives:

- Rent out the Agricultural machinery by All Custom Hiring Service Providers.
- Facilitate farmers to book custom hiring services through the app by giving the requirement of their agricultural machinery
- Sale and Purchase of Second-Hand Farm Machinery and Equipment
- The mobile app has 65,000+ registered CHC Owners, 5.40 lakh+ registered farmers and 1.56 lakh+ implements available for hiring.

2.3.2.6 Kisan Suvidha – Integrated Mobile App for Farmers

Kisan Suvidha is a smart and integrated mobile app for farmers to access all relevant services and information at one place. It is an initiative by National Informatics Centre. The features include:

- One app for farmers to digitally access all agricultural schemes and services

- All services/information relevant to farmers are linked here as a common platform
- It intends to include various schemes and services of the Central and State Governments for Farmers
- It is interactive and informative with support for user queries and status of user requests
- 16 major services are integrated with KisanSuvidha as of now (PM-Kisan, Fertiliser, KisanRath, Crop Insurance, Agri Marketing & Procurement, Soil Fertility, Organic Farming, Seeds, Farm Machinery, Horticulture, PM-KMY, Trainings & Extension Services, Information of various Government Schemes, Directory Services, Advisory Services on Animal Husbandry) and more are in the process of integration.



2.3.3 Health & Family Welfare

2.3.3.1 e-Hospital

e-Hospital (Hospital Management Information System), e-BloodBank and ORS (Online Registration System) applications are available on cloud, through Software as a Service (SaaS) model. The e-Hospital applications are based on the global healthcare standards like HL7, SNOMED-CT, ICD10 and LOINC, and Meta Data and Data Standards published by the Ministry of Health & Family Welfare (MoHFW).

e-Hospital Modules implemented are Patient Registration (OPD & Casualty), Billing, Radiology Information System, Dietary, Store & Pharmacy,

E-Blood Bank, IPD (Admission, Discharge & Transfer), Lab Information System, Clinic, Laundry, OT Management, Online Registration System (ORS).

More than 419 hospitals are on-boarded with e-Hospital and 254 hospitals are on-boarded with ORS & e-Blood Bank.

2.3.3.2 Beneficiary Identification System (PM-JAY)

Beneficiary Identification System (BIS) is a process to search the beneficiary from entitled beneficiaries database, to get beneficiary's KYC (through Aadhaar or Non-Aadhaar) and his/her family verification (through API or document uploading) done through the system. The system works on the approach of maker and checker; therefore, the created records are approved by the designated approvers before printing and handing over eCard PM-JAY cards to verified beneficiaries. PMJAY e-Card is printed and handed over to the beneficiary to serve as a proof of verified beneficiary to get health insurance benefits under PM-JAY.

Aayushman Bharat-Pradhan Mantri Jan Arogya Yojna (AB PM-JAY) aims to target about 10.74 crore poor, deprived rural families and identified occupational category of urban workers' families as per the last Socio-Economic Caste Census (SECC) data and all active enrolled families under RSBY. It consists of approx. 50 crore target PMJAY beneficiaries to be identified through this system. The system has integrations with Aadhaar, DigiLocker, SMS, e-Mail, CSC and UTIITSL and APIs for data of more than 10 States (PDS, Samagra and State Health Insurance Beneficiaries, etc.). In addition to the above, this system has been customized to use for ESIC and CAPF schemes also. The benefits can be availed through empanelled hospitals for approved Medical Packages.

The BIS has been implemented in 31 States, 8.09 crore beneficiaries and 3.41 crore families identified; and 7.97 crore PM-JAY e-Cards have been issued.

2.3.3.3 Central Government Health Scheme (CGHS)

CGHS software has been developed to facilitate Central Government employees to avail better health services. CGHS Beneficiaries- 37.58 lakh Beneficiaries in numbers, Wellness Centres- 443 in number, Doctors, CGHS HQ, Additional Director Offices, Medical Supply Depot (MSD), Authorized Local Chemists (ALC), Preventive Health Checkup Labs etc., are major stakeholders of this system. Beneficiaries have been facilitated to login into the system to avail Online appointments booking, download and print CGHS card- 8.38 lakh CGHS in number till now, Check Claim Status, Plastic Card Print Status, update Mobile Number and e-Mail, view master data related to their family and check medical prescriptions. Doctors can prescribe medicines for disbursement by pharmacists. Complete transparency is maintained by triggering SMS updates for every medicine handed over to beneficiary. On transfer of Government Servant, online transfer of CGHS card to any of the CGHS cities for serving beneficiaries has been facilitated. 20+ lakh online appointments have been taken for specific doctors & for specific time slot.

2.3.3.4 Reproductive & Child Health (RCH)

Reproductive & Child Health (RCH) is an augmented version of Mother and Child Tracking System. RCH application tracks services provided to individual beneficiaries and facilitates service record capturing and monitoring at all levels (National, State, District, Block, PHC and Sub Centre level). Application facilitates capturing of all components of antenatal, postnatal and delivery services of Pregnant Women, complete immunization services to children and family planning services to eligible couples. RCH application has been integrated with PFMS system for making payments to Janani Suraksha Yojana (JSY) beneficiaries, with Rashtriya Baal Swasthya Karyakram (RBSK) for sharing beneficiaries and

with Mobile Academy, Kilkari etc., Apart from RCH web Portal, ANM Online (ANMOL) mobile application has also been made live in 9 States and training process is going on in 13 States. 20.81 crore eligible couples, 19.12 crore pregnant women, 16.41 crore children and 15.63 lakh health workers have been registered with RCH.

2.3.3.5 Direct Benefit Transfer - Health (DBT)

DBT Health portal enables States/UTs to report and enter their DBT related progress on monthly basis and having compiled consolidated report generated at Ministry level. DBT Health Portal has been integrated with DBT Bharat portal and total 9 schemes have been on-boarded and integrated with DBT Health Portal. These include Janani Suraksha Yojana, ASHA Incentives, Payment to Contractual Staff, Family Planning Compensation, Janani Shishu Suraksha Karyakram (JSSK), NIKSHAY – TB Patient Incentive for Nutritional Support, NIKSHAY – Tribal TB Patients, NIKSHAY – DOT Provider Honorarium, NIKSHAY – TB Notification Incentive for Private Sector. District level data collection has been facilitated for all schemes during 2020-21.

2.3.3.6 CollabDDS

Collaborative Digital Diagnosis System (CollabDDS) is image/DICOM viewer to visualize medical and dental images for diagnosis and treatment planning. Remote Health Centres can be connected to expert radiologists and doctors in Centres of Excellence, by suitable tools and channel for data transmission and diagnosis. eCollabDDS is a web-enabled tool for visualizing image/DICOM data. It provides an interface for Tele-Radiology services and is ready for integration with Telemedicine solution.

CollabDDS Online Radiological Services (CORS) provides a web interface among different health communities for resolution of radiological and dental problems. CORS has been successfully

implemented on National Medical College Network (NMCN). Currently, 79 hospitals are registered in CORS. It has also been successfully deployed and implemented for the State of Karnataka with 21 registered doctors. Efforts are also being made to make it AI-enabled.

An interface was developed in eCollabDDS in a week time to detect COVID-19 at an early stage with the use of Artificial Intelligence. The Chest X-Ray of a Patient is fed to the AI model which has been trained on COVID-19, other infections and normal images. This trained AI model predicts the probability of COVID-19 with a confidence score. eCollabDDS is used to upload an X-Ray image which will be sent to the AI model for prediction. This prediction will aid the Radiologist to reach to a diagnosis immediately.

2.3.4 Finance

2.3.4.1 Public Financial Management System (PFMS)

PFMS aims to develop integrated digital finance network of Central, State Governments and the agencies of State Governments. It plans to provide financial management platform for all plan schemes, a database of all recipient agencies, integration with core banking solution of banks handling plan funds, integration with State Treasuries and efficient and effective tracking of fund flow to the lowest level of implementation for plan scheme of the Government.

In order to avoid parking of funds in the bank accounts of Autonomous bodies and to implement just-in-time payment of grants to autonomous bodies by Government of India, Treasury Single Account (TSA) module has been implemented for 363 autonomous/sub-autonomous bodies (16 first level agencies and 347 below level agencies). This model successfully controls the out flow of the fund from Consolidated Fund of India, thus saving the Government money on borrowings and

strengthening the top management to plan the fund for other welfare schemes. 10 new external systems were integrated with PFMS this year.

PAHAL scheme has been on-boarded to PFMS for disbursement of subsidy whereby all the Oil marketing companies have been registered as agencies and their systems are being integrated with PFMS for validation of bank accounts/Aadhaar seeding verification and payment of subsidies.

During the COVID-19 lockdown period, 8.5 crore beneficiaries were paid the 6th installment of PM KISAN SammanNidhi through PFMS with a record of 3.89 crore transactions on a single day. The 15th Finance Commission was on-boarded to PFMS through “eGramSwaraj” portal (Priyasoft). Total of 1.5 lakh gram panchayats and 22,000 tribal local bodies, 2,500 block panchayats, 750 district panchayats are registered as agencies on PFMS portal.

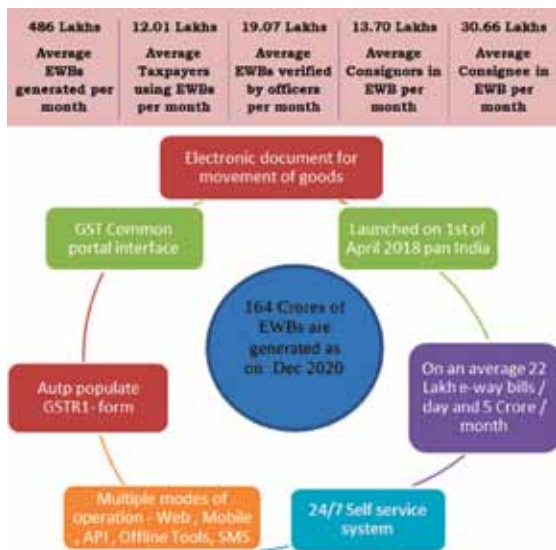
National Tax Revenue Portal (NTRP) aims to provide 24x7 year round electronic services to deposit the money into Government Account using internet based payment technologies to the users at the door step through the web-based portal.

2.3.4.2 e-Way Bill

e-Way Bill (EWB) mechanism is put in place to ensure that goods are transported in accordance with GST laws and tax is paid for the supply of goods. e-Way Bill is an electronic document which gives details regarding the movement of goods and needs to be carried by transporters for any consignment exceeding Rs.50,000. The application facilitates operations on e-Way Bill through multiple modes like Web, Mobile, SMS, API and Offline tool.

164 crore numbers of e-Way bills have been generated as on December 2020. E-way bill has been interfaced with Vaahan system to verify the vehicle numbers entered by the transporters. Non-filers of GST Returns are blocked from generating

e-Way bills and are unblocked when they file the Returns. This has improved the compliance by the tax payers and also the tax collection.



2.3.4.3 GST Prime

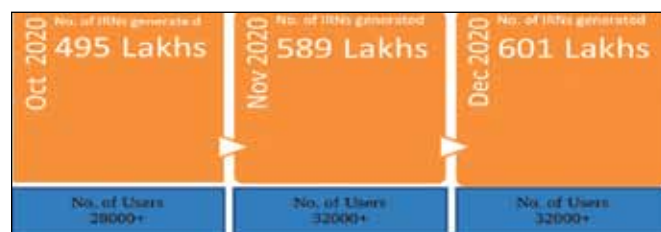
GST Prime is an analytical tool for the GST Departments to effectively monitor the compliance. Based on the data such as registrations, filing of various returns, e-Way Bill and payment, the application provides intelligence reports to the tax officers to trace the tax suppressions, evasion of taxes and ineligible claims for Input Tax Credits. The system analyses the past data (vertically) and other statements of the same period such as other types of returns filings, ITC claims and e-Way Bill (horizontal). Key risk factors are identified; the officers are provided with such tax payers who are likely to be carrying out fraudulent activities to evade taxes, based on these risk factors.



2.3.4.4 e-Invoicing System

GST e-Invoicing system is a system of reporting, the invoices being issued by the taxpayers to their customers, on the Government portal on near real time basis and obtaining a unique Invoice Reference Number (IRN). The e-invoicing system facilitates the tax payers to integrate their ERP systems with e-invoicing portal for exchange of information between machines using APIs. This system was launched on 1st October 2020 for taxpayers having turnover above Rs.500 crore. Tools for bulk IRN generation, mobile apps for verifying IRNs have also been provided in the e-Invoice portal.

e-Invoicing system is game changer in GST implementation. It has many advantages for businesses such as standardization, interoperability, auto-population of invoice details between various stakeholders- suppliers, recipient, transporters, Government and financial institutions.



This system is being extended in phased manner for the remaining tax payers by the Government. On 1st January 2021, the e-Invoicing system was extended to the tax payers with turnover above Rs.100 crore.

2.3.4.5 eAbgari



eAbgari project is end-to-end supply chain management system of Beverage Alcohol, Medicinal Alcohol, Industrial Alcohol & Life Saving Narcotic Drugs in State excise sector enabling better regulation so as to minimize the social and public health import while safeguarding the revenue collection from excisable articles. Presently, 62 e-Services are being rendered in workflow based manner for Grant & Renewal of Licenses, Packaged Liquor Brand Registration, Issuance of NOC/Permit/ Passes for Import/Export/Transport, Real-time management of Spirit/Packaged Liquor Inventory and Excise Revenue, e-Chemical Examination Laboratory and management of Excise Offender Cases, Enforcement Activity. All Distilleries, Manufactories, Distributors, Retail Shops and also Hospitals, Educational Institutes & Industrial Units connect eAbgari for Production/Procurement/Sell of alcohol. Seamlessly integrating wide array of ICT technologies – Web, Mobile Apps, SMS& Email based Notifications/Alerts, QR codes, HHT based Track & Trace, GPS mapping, Data Analytics - eAbgari has significantly reduced service-delivery time and has enhanced the Government's regulatory capabilities.

2.3.4.6 Indian Customs EDI Systems (ICES)

Indian Customs Electronic Data Interchange System (ICES), operational at 250 locations is a robust, resilient and time-tested application, striving towards time-bound implementation of Government policies for the benefit of exporters and importers, stakeholders, regulators and citizens at large.

ICES-Exports facilitates contactless & paperless customs with digital copies of the shipping bill for exporters, e-LEO copy of the shipping bill, e-gate pass for customs broker and exporter, e-docs utilities for custodian, transhipper, shipping line developed in SCMTR-TURANT Customs, bank account module for authorized dealer code, automation of GST Cess for clear accounting

heads, release of ROSL licence and disbursement of export incentive, e-mail/SMS information and a robust alert module.

ICES-Imports Turant Customs programme has brought in faceless assessment, self-registration of goods by importers, automated clearances of bills of entry and digitization of Customs documents. Faceless, Paperless Customs Offices facilitate transparency in assessment of BEs. Among the many beneficial features initiated, the major ones include - Digital Bills of Entry and QR Code generation, mobile app for QR Code reader and verification, e-OOC and e-Gate Pass modules, ICE DASH-Indian Customs EODB monitoring Dashboard, AEO Registration Module for World Customs Organisation, Bonded Manufacturing Scheme, Integration of Container Scanned Data, Direct Port Delivery (DPD) Registration Module, SMS Alerts for OOC, Faceless assessment, Queries to importers and Compliance Information Portal.

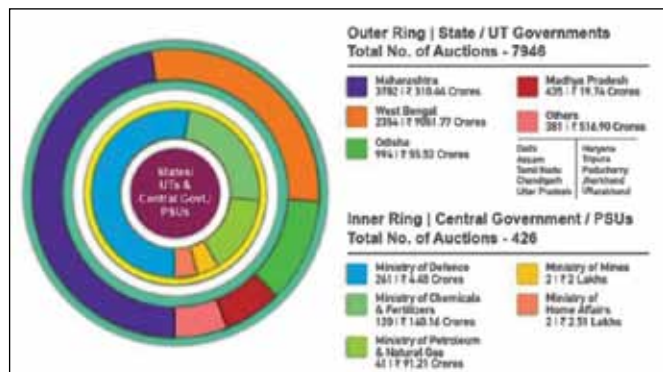
The ICES application is a major step towards achieving the goal of "Ease of Doing Business" envisaged by the Government.

2.3.4.7 eAuction India

eAuction India is a platform for Government Departments to conduct online auctions for sale and purchase. It removes all barriers of geography, presence, time, space, and a small target audience as in case of Physical auction. Propelled by a versatile, safe and secured engine developed by National Informatics Centre many Users have witnessed multi-fold increase in revenue over the years.

eAuction India platform has been recently enhanced with many enriching features like provisions to cater Limited or Specialised and Open Auction in which citizens in general can participate, In addition to conducting Commodity Auction as a Centralised

Auction the usual commodity auction. eAuction India has come as a boon to many organisations in conducting online auction during this pandemic times.



Achievement during COVID-19 Pandemic:

- eAuction India has come as a boon to many organisations in conducting online auction during this pandemic times.
- Daily Web Learning training sessions to Department Users & Bidders
- Online Training sessions conducted using Video Conference to various department users across country during COVID-19 pandemic.

2.3.5 Education

NIC provides digital solutions to the Government of India for running different programs to promote primary and higher education in the country. NIC also supported the Government for building more resilience in the education system by introducing education technology for overcoming the disruptions caused by COVID-19 pandemic.

2.3.5.1 Educational Registries

Unified District Information on School Education (UDISE) and All India Survey on Higher Education (AISHE) provide robust, real time and credible information collection mechanism for objective evaluation of the system, based on which specific interventions for improvement can be designed.

Several parameters such as teachers, student enrollment, examination results, education finance, infrastructure etc., are being captured.



The systems play crucial role in monitoring sustainable development pointers such as gross enrollment ratio, pupil teacher ratio, gender parity index etc., using Data Analytics.

2.3.5.2 Digital Learning and Management Platform

'PadhaiTunharDuar' is a comprehensive academic cycle management system which uses gamification and Data Analytics to provide personalized adaptive learning to each student in Chhatisgarh. It includes crowd sourced content, assignments and doubts, online classes, quizzes, virtual schools, subjective assessment by teachers, online attendance and offline support. Higher Education Digital Library Portal has been launched in Uttar Pradesh to provide quality study material for free in the form of e-books, lecture material, theses, reports, articles and journals.



Education Management platforms like Shala Darpan, Sanch Manyata, Banglar Shiksha have been implemented in Rajasthan, Madhya Pradesh, Maharashtra, West Bengal, Uttarakhand to build a digital symbiotic system of data capturing and usage. These platforms cover various modules including teachers' profile, transfers, inspections, enrolments, training & assessment, incentives, GIS, digital contents etc., Face Recognition based Attendance Monitoring System (FRBAS) 1.0 is an innovative solution which is a very useful tool in post COVID-19 scenario to capture attendance of trainees & trainers in a contactless & non-invasive manner.

2.3.5.3 Scheme & Program Management

Data regarding enrollment and meals is reflected on the National Portal on daily basis on Mid-day meal ARMS software. During the pandemic, application played an important role in ensuring continued nutrition to school going children through mid-day meals, doorstep delivery of ration kits and food security allowance. Software is used for storing location, school profile, teacher details, reason for non-serving, student/teacher attendance, alerts, monitoring tools, direct entry of meals data, graphical reports, interfacing with the mobile app, GIS reports etc., PadhnaLikhnaAbhiyan Mobile and web application have been developed to facilitate planning, monitoring, inspection and creation of learning centres to promote basic literacy.



Financial help is provided to meritorious students under Swami Vivekananda Merit-cum-Means Scholarship and KanyashreePrakalpa in West Bengal using NIC application. NIC's GyanSankalp Portal is implemented in Rajasthan to streamline and ease all types of CSR, philanthropic, and crowd-funding contributions.

2.3.6 eTransport

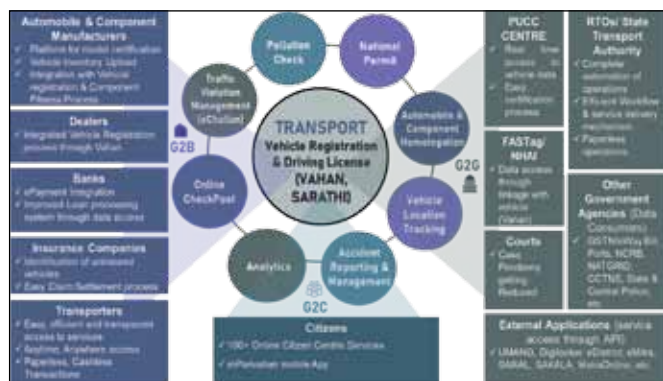
eTransport MMP is an umbrella platform for facilitation of various transport services in a user-friendly manner. It has transformed the service delivery mechanism for vehicle registration, driving license, enforcement, taxation, permit, fitness and related activities through multitude of applications. 100+ online services complement the solution by facilitating document upload, ePayment, online appointment etc., some of which are completely contactless.



2.3.6.1 Growth as a Public Digital Platform

The eTransport MMP has steadily evolved from primarily a medium for online RC and DL related services, to a comprehensive public digital platform. Multitude of upstream and downstream integrations with a large number of internal/external stakeholders, along with array of solution around the entire lifecycle of vehicle and license services, have propelled this growth, enhancing service delivery mechanism and user experience to a great extent, for citizens, business and Governments alike.

The integrated eco-system comprises Automobile and component manufacturers, Fitment Centres, Car dealers, PUC kiosks, Banks, Insurance Companies, Transporters, Private Fitness Centres, support agencies for Smart Card, HSRP, FasTag, Security agencies like Police, CCTNS/NCRB, NATGRID, along with eDistrict, CSC, UMANG, DigiLocker, etc., services, all connected to the common eTransport platform through API and other mechanisms.



The continuous data/service exchange, leading from these integrations, arms the project with large volume of data, which is then analysed to generate key insights for decision making/monitoring by the Authorities. Further, it allows preparedness required for adapting to upcoming trends and scenarios, and benchmarking with best practices.

2.3.6.2 mVahan

mVahan has been envisaged as a convenient mobile solution for managing various Vahan Services by Departmental Officers at the RTOs and other internal stake-holders like Dealers. The current version, available in Android platform, facilitates a number of processes including automation of Vehicle Inspection and Fitness, facilitation of document upload by Dealer/RTO during vehicle registration and other services like processing requests for Change of Address etc., Work is on to further expand the functionalities to cover full range of RTO operations.

Fitness Inspection using mVahan: Motor Vehicle Inspector (MVI) inspects vehicles by first capturing their current geo-location and time ensuring the presence of the vehicle within specified proximity at the recorded time. The MVI uploads time-stamped images taken as part of the inspection process, along with status of vehicle condition parameters like breaks, wipers, seat belts, front light, rear light etc., The details are then processed further for approval/rejection, as applicable.



The facility is currently implemented in all RTOs of Tamil Nadu and Uttarakhand. Roll out in 5 other States, Bihar, Gujarat, Maharashtra, Punjab and Uttar Pradesh is underway.

2.3.6.3 VLTS Command & Control Centre Solution

Vehicle Location Tracking & Emergency Alerts System (VLTEAS) has been conceived by MoRTH for implementation across the country. The complete system is based on AIS-140 specification as notified by the Ministry – defining the process for fitment of approved tracking devices in public service vehicles and setting-up of VLTS Command and Control Centre (C&CC) at State level.



SMS. The SMS provides link to view the violation details on portal and also allows citizen to pay the penalty online. Additionally, there is integration with Virtual Court, which enables online settlement of violations, from online court referral to closure. Such integrated system has been implemented in Delhi and a number of other Smart Cities.

2.3.7.1 Pradhan Mantri Adarsh Gram Yojana – PMAGY

Pradhan Mantri Adarsh Gram Yojana aims for integrated development of SC majority villages by providing the adequate infrastructure, requisite services to the identified beneficiaries and improvement in socio-economic indicators in the villages. Assessment of infrastructure requirement in the village and needs of households are identified under 50 socio-economic indicators covered in 10 domains. The application facilitates end-to-end digitization of village infrastructure and households survey to help generate village development plan (VDP) from the web application itself. It has a dynamic and analytical dashboard for all stakeholders including District, State, Ministry, convergence Ministry and PM Office. Survey data of more than 16 lakh households has been captured. It generates analytical reports of physical and financial progress, graphical representation of village score progress etc.



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2.3.7.2 Mahatma Gandhi National Rural Employment Guarantee Act

Mahatma Gandhi NREGA is one of the largest social schemes for the Ministry of Rural Development. This scheme is supported by NREG Asoft, the end-to-end workflow system that used in all the States, except Andhra Pradesh and Telangana, with the user base of 1.5 lakh users across 708 districts, 7,084 Blocks and 2,68,582 GPs. MGNREGA has 28.6 crore registered workers 14.25 crore active workers, total number of Job Cards issued 14.74 crore and total number of Active Job Cards at 9.16 crore

NREGAsoft on daily basis handles around 1 crore transactions and over the years multiple external applications have also been integrated in the MIS. Since April 2020, 296.89 crore person days have been generated for 9.92 crore individuals with an average of 43.55 days of employment provided per household. With MGNREGA's evolving and focus shifting to creation of sustainable assets in this year alone 62.46 lakh works have been completed and there are 128.25 lakh on going works.

2.3.7.3 Jal Jeevan Mission (JJM)

Jal Jeevan Mission aims for providing drinking water in adequate quantity of prescribed quality on regular and long-term basis at affordable service delivery charges through tap. Some key ICT initiatives in this domain are : a dedicated e-Governance solution for JJM keeping the focus on citizen-centric services, integration of JJM-IMIS with PFMS, IT support to the 100 days national program for providing Tap connection to each school/anganwadi/balwadi in all the villages, Rashtriya Jal Jeevan Kosh for public partnership in the mission, a comprehensive dashboard for FHTC to monitor the progress of provision of FHTC, separate dashboard for HAR

GHAR JAL for depicting 100% saturated villages, blocks, Districts & States, dashboard for depicting all the Arsenic and fluoride affected habitations across the nation.

2.3.7.4 Swachh Bharat Mission (Grameen)

The Swachh Bharat Mission (Grameen) was launched for eradicating the practice of open defecation across the country. The success of this mission was possible due to the effective utilisation of the ICT based technical solutions. This includes Robust MIS, Dashboard, Mobile app for capturing photographs of toilets with geo-coordinates and Swachh app for tracking real time progress of village/GP/Block/Districts and State by all the stockholders.

For Phase-II of SBMG ODF-Plus, information from the field is captured through SBM 2.0 mobile App with geotagging with the aim to have ODF Plus villages. MIS has been developed for displaying the information related to phase-II components in various query-based reports/dashboards etc which are being captured using integrated mobile app.

Key Mobile Applications are Mobile App SBM2.0 for capturing ground reality of all solid and liquid-based components/assets (community compost pit, community soak pits, Individual Soak & compost pit, WSP etc) and assets creating under Phase-II programme in the rural villages across the country, Mobile App mSBM which facilitates user to upload the photographs of beneficiaries receiving toilet facilities in their homes under this Mission, using a smartphone, Mobile App SwachhAppc to serve and empower the rural citizens of India, by facilitating single window access to sanitation related information at village level. The application serves as a monitoring tool that can be used in real time basis. Citizens can view the information of household toilets under SBM.

2.3.8 Consumer Affairs and Food & Public Distribution

2.3.8.1 Targeted Public Distribution System

The Public Distribution System (PDS) is an extensive food Security System established under the Ministry of Consumer Affairs, Food, and Public Distribution. The System is operated under the shared responsibility of the Central and the State Governments. The scheme envisages to provide efficient and transparent system and create an ecosystem for the delivery of beneficiary-centric and qualitative PDS services to more than 81 crore beneficiaries across the country on a digital platform. As part of the Digital India initiative, NIC has developed various applications for Digitization of beneficiary data (RCMS), Computerization of Supply Chain Management (FEAST), Setting up of Transparency portal and Grievance Redressal mechanisms (NFSA, ANNAVITRAN etc.).

2.3.8.2 One Nation One Ration Card

India has the largest Public Distribution network in the world. In order to address various challenges such as leakages and diversion of foodgrains and create a Smart Public Distribution System, IM-PDS scheme was launched having key components of National Portability, De-Duplication, creation of Central Repository and Data Analytics. NIC in close coordination with the Department of Food & Public Distribution (DFPD/Department) has created the Central Repository by collating Ration cards details from all States through web services and filtering the data as per defined policy to identify the eligible beneficiaries for National Portability. Further, a De-duplication process (Inter-State and Intra-state) was established to identify the duplicate RCs and flag them. “One Nation One Ration Card (ONORC)” scheme facilitates migrant NFSA beneficiaries to avail ration at any Fair-Price Shop in the country through biometric Aadhaar authentication. The scheme also provides the facility to avail cash benefits.

NIC being the technical partner supporting the Department with various schemes introduced under PDS, played a pivotal role in the effective implementation of the ONORC scheme by defining standards for uniform flow of data and creation of a National Portability platform such that any beneficiary can use the ration card number or Aadhaar number to lift monthly entitlement of foodgrains in any State/UT. The developed platform also facilitates to verify the balance entitlement of the beneficiary from the Home State to avoid duplicate lifting of foodgrains. The rollout of the scheme is executed in a phased manner. National portability is made operational in 28 States/UTs and intra-State Portability of Ration Card Holders is completed in 25 States/UTs.

2.3.8.3 CONFONET

The scheme of ‘Computerization and Computer Networking of Consumer Fora in the country, (CONFONET)’ aims to digitalize the functioning of the Consumer Fora at all the three tiers throughout the country to enable access of information and quicker disposal of cases established under the Consumer Protection Act, 1986 and now under the new Consumer protection Act, 2019. The project is extended as a sub-scheme of Consumer Protection Scheme for CONFONET for 2020-21.

Through the portal <https://confonet.nic.in>, consumers have easy access to accurate and dependable information regarding cause lists, judgments, case status and case history. Quick search facility using case number, complainant name, respondent name etc., and free text search for judgments is also available. The Online Case Monitoring system has been fully implemented & operational at NCDRC, all State Commissions and more than 600 Consumer Commissions including few clubbed DCCs. More than 21 lakh cases have been updated on Central Server. Various services for consumers/public like Case Status, Case History, Cause Lists, Judgments, Display Board,

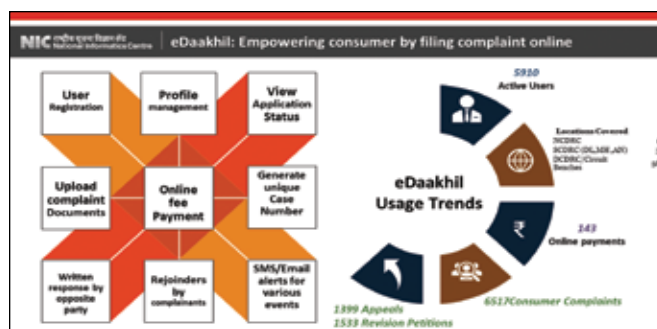
Pull SMS have been developed. Dashboards have been developed for administrators and public.



Confonet Mobile app has also been developed for Android as well as for IOS users. IVRS and CHATBOT facility have been introduced to know the Case Status. In this year, more than 50,000 users used CHATBOT to get the case status and other relevant information.

2.3.8.4 eDaakhil

As an initiative of the Department of Consumer Affairs, a web-based application software named “eDaakhil (<https://edaakhil.nic.in>)” has been developed by NIC. The e-Daakhil portal empowers the consumers (who has any grievance w.r.t any deficiency in services or quality of Goods) or their advocates to file the consumer complaints along with payment of requisite complaint fees online from anywhere for the redressal of their consumer complaint in respective Consumer Commission of 3-tier Quasi-Judicial setup established for redressal of consumer complaints. It also facilitates the consumer commissions to scrutinize the complaints online to accept, reject or forward the complaint to the concerned commission for further processing. Various events based SMS/Email alerts are also being sent to the user at the time of complaint filing and processing.



2.3.9 Law & Justice

2.3.9.1 e-Governance Support to Supreme Court

Supreme Court of India website i.e. <https://sci.gov.in> is hosted on NIC Cloud providing benefits of scalability and extensibility for managing inbound traffic. It is a comprehensive site incorporating all information which stakeholders would like to see, refer and use. Website has been integrated with content delivery network for faster access with unlimited concurrency handling for accessing famous Judgments like Ayodhya, Sabrimala, Rafael, CJI office under RTI Act etc., Judgments are made available in nine vernacular languages other than English (Hindi, Tamil, Telugu, Kannada, Bengali, Marathi, Punjabi, Gujrati, Malayalam). Litigants, Advocates and Registry officials' specific Mobile App has been developed which was inaugurated by the CJI in presence of Hon'ble President of India. The app was extremely useful during COVID-19 Pandemic period when Supreme Court conducted VC hearings for disposing litigations on regular basis. The app was very handy for Registry officials to perform their allocated work even when working from home.

2.3.9.2 National Tribunal

National Green Tribunal

NGT with the help of NIC has initiated NGT Online Portal to enrich public awareness on the clean and green environment by publishing various Government Initiatives/acts/notifications on the

portal and to facilitate IT based effective and paperless Grievance Redress System through digitization of various processes. The software has three modules viz. E-Filing, Case Information System and Document Management System. NGTOnline has been developed under the aegis of Ease of Doing Business, keeping in mind the concept of completely paperless courts for efficient G2C services and optimum use energy and natural resources. Digitalization of courts and digitization of the filing system has reduced consumption of paper for different purposes. Ver 2.0 of NGTOnline has been implemented in all benches offering a Complete paperless solution.

National Company Law Tribunal (NCLT)

National Company Law Tribunal (NCLT) with the help of NIC has launched Online Courts System in all sixteen NCLT benches across India for filing petitions/applications/documents and also to facilitate IT based effective paperless system with green governance coverage through digitization of various Registry and Court processes. It is a Mission Mode Project with strategic objectives of effectively delivering G2C and G2G services and to build a transparent, efficient, accessible judiciary system under the guidance of EoDB.

The system has led to ICT enablement of National Company Law Tribunal by automating majority of the judicial functions. Records are preserved in digitally encrypted format in Document Management System significantly reducing the required physical storage space. Process Re-engineering made the system single window solution available anytime anywhere basis and NCLT registry to control huge footfall of litigants/Advocates in court complexes. The aforesaid system is integrated with NeSL and BharatKosh for generating online record of defaults and online court fee payment respectively. The project has successfully laid the path for a digitally powered tribunal through innovation and in turn brought e-Governance initiatives to fruition.

2.3.9.3 eCourts

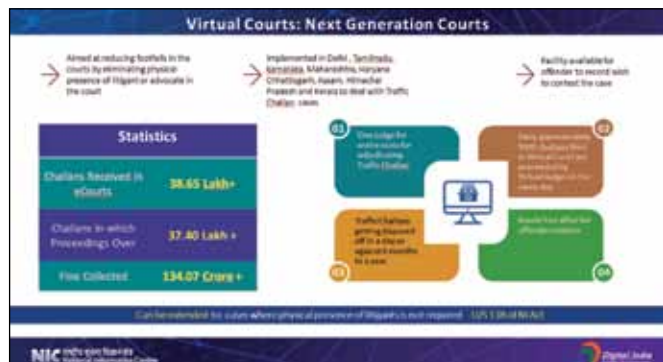
Case Information System (CIS) is an application designed and developed for Indian Judiciary. It is implemented in High Courts and District & Sub-ordinate courts of the country. Currently CIS version 3.1 is implemented in District & Sub-ordinate courts and CIS HC Version 1.0 is implemented in 24 High Courts in the country. Data from all these courts are replicated in real time to the NIC Data Centre at New Delhi.

National Judicial Data Grid <http://njdg.ecourts.gov.in> is a consolidated nationwide judicial data warehouse which was set up with real time updation. NJDG provides statistics of pending and disposed cases in the country. It works as a monitoring tool to identify and manage the pendency of cases. This information can be used by management authorities for policy making and decision support. Citizen-centric services like Case Status, Cause lists, Orders/Judgements, SMS etc., are provided using eCourts portal <http://ecourts.gov.in>, eCourts Services Mobile App (Available on both Android and iOS platforms) and JustIS App for Judicial Officers. Unique 16 Character Case Number Record (CNR) is created for each case. Automated SMS and eMails are triggered to Advocate/Litigants on case events. It is integrated with CSCs, UMANG, ICJS etc., eCourts portal is GIGW compliant and differently-abled friendly. Metadata and Data Standard (MDDS) are used for standardized information exchange within the application.

2.3.9.4 Virtual Courts

A novel concept of virtual courts has been introduced under the eCourts project. The concept is aimed at reducing footfalls in the courts by eliminating the physical presence of violator or advocate in the court. Virtual court can be managed by virtual judge whose jurisdiction can be extended to entire State and working hours may be 24x7. Neither

litigant need to visit the court nor judge will have to physically preside over the court thus saving precious judicial time.



Currently there are 9 Virtual courts functioning in India- Delhi (2 Courts), Haryana (Faridabad), Maharashtra (Pune), Madras, Karnataka (Bengaluru), Maharashtra (Nagpur), Kerala (Kochi) and Assam (Guwahati). They are all dealing with Traffic Challan cases only. The Virtual Court concept reduces the pendency of cases tremendously, considering the large number of traffic offences and offences under local and special laws. Number of judges required for adjudicating traffic challans across the State can be reduced virtually to single judge. eChallans to be submitted in the court are automatically filed to the virtual court for adjudication. Virtual Judge can access the Virtual Court application from anywhere, view the cases and adjudicate the cases online.

2.3.10 Home Affairs

2.3.10.1 Interoperable Criminal Justice System (ICJS)

ICJS is a National platform for Criminal Justice System. Primary stakeholders of ICJS are CCTNS (Police), Court, Prison, Prosecution, and Forensic. There are additional pillars added to it are NIA, CBI, RPF, NCB, ALIS, WCD, & Track Child etc., Its main objective is to offer 24x7 workflow based nationwide data availability to all ICJS Stakeholders by integrating all pillar applications-CCTNS, eCourts, ePrisons, eProsecution, eForensics, TrackChild, Arm License etc.,

It enables Interoperability by linking the primary ids of stakeholders and PAN India across domain search. This facility generates Mini/Comprehensive docket required by the users and Criminal Network established on common parameters among the prison inmates.

Offence wise need-based data to the courts and other investigation agencies are made available under ICJS National platform. Analytical dashboard predicts trends in crimes to control criminal activities. 360° Profiling of the persons involved in various pillars is done. Data Exchange is carried out through secure protocols.

It is an open platform where any new pillar can be added to enhance the criminal justice system working. It is further added with facility to compile the data as per the requirements of the Courts, Tribunals and Ministries for dispensing the immediate relief to the victims of sexual offences, SC/ST and motor accident cases.

The Crime Data spectrum available with ICJS:

Crime Data Spectrum	Units integrated PAN India
- FIRs : 5.14 Cr - Criminal Cases: 10.21 crore - Prison Inmates : 1.32 crore - Visitors : 2.15 crore - Prosecution : 50 Lakh - Forensic Exhibits : 8 Lakh - Arms Licenses : 11 Lakh - RPF FIRs : 42 K	- Police Stations : 15985 - Courts : 3205 Complexes - Prisons : 1217 - Prosecution 370 Districts - Forensic : 105 Labs - Arms Across the country - RPF : all Police Stations - CBI : 15 regional centres

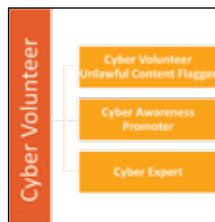
2.3.10.2 National Cyber Crime Reporting Portal

NIC has developed a 'Cyber Crime Volunteer Framework' under the 'National Cybercrime Reporting Portal' to enable citizen participation for supporting Government initiatives to tackle the menace of cybercrime. This framework also aims to bring together citizens having passion to serve the society in making the cyber space clean and safe. Any Indian citizen can associate themselves by registering in any of the three categories of 'Cyber Volunteer':

- Cyber Volunteer Unlawful Content Flagger- For helping in identifying online illegal/unlawful content like CP/RGR, Terrorism,

Radicalisation, anti-national activities, etc., and reporting to Government.

- **Cyber Awareness Promoter**– For helping in creating awareness about cybercrime among citizens including vulnerable groups like women, children and elderly, rural population, etc.
- **Cyber Expert** – For helping in dealing with specific domains of cybercrime forensics, network forensics, malware analysis, memory analysis, cryptography, etc.



Registrations under the above categories are processed by the State Nodal officer as per the law. The list of approved 'Cyber Awareness Promoter' and 'Cyber Expert' will be visible to the State Nodal officer on 'Cyber Volunteers', dashboard. State Nodal officer can directly contact these listed volunteers and utilize their services as per their expertise/skill set.

2.3.10.3 e-Prisons

ePrisons Suite is a cloud-based application software with easy to use graphical interface and embedded with a comprehensive security feature. This is single unified application for all the States of India where States need to configure State-specific parameters.

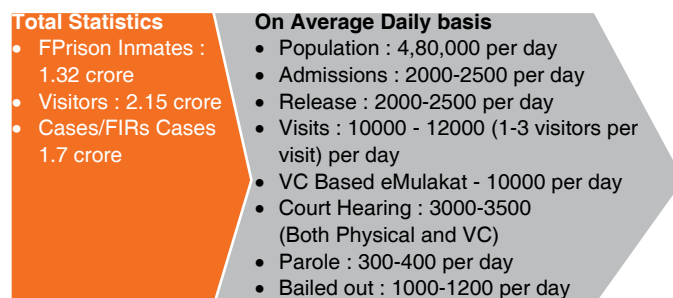
It has enhanced the administrative capabilities of the Prisons, country-wide digitization of the prison administration, monitoring various activities of the prison, improving the efficiency and productivity of the Prisons.

- New module for eMulakat was developed and rolled out across country to facilitate the visitors and the inmates. This facility was

successfully implemented and caters to more than 5,000 visitors every day.

- New module for High Courts/Sessions Courts was also developed which enables the courts to view list of inmates of their court lodged in various prisons and to deliver orders directly to the respective Prison online. Court can also ask for response from the prison online using the option and Prison authority can submit the response using ePrisons application.
- Online eCustody and eSurrender certificate system are also part of this system. Direct VC facility between court and Prison is also developed as part of Court module.

ePrisons data availability at the national platform:



2.3.10.4 e-Visa

e-Visa service has been extended to 171 countries at 28 Indian airports and 5 Sea Ports. Since the launch of the scheme (November'2014) approx. 96.54 lakh e-Visas have been issued till 30th December 2020. Further, Visa-on-Arrival service has been extended to the nationals of Japan, South Korea and UAE.

Scheme facilitates international business seekers, medical patients, and tourists to avail Visa on short notice. It is a Faceless, Cashless and Paperless service for foreigners which has decreased Visa application processing time. Electronic Travel Authorisation is conveyed to applicant via e-mail within 72 hours of online application.

2.3.11 Social Welfare & Skill Development

2.3.11.1 National Social Assistance Programme (NSAP)

NSAP-PPS (Pension Processing system) is a workflow-based e-Governance solution for identification, verification, approval, sanction of new applications and monthly pension processing system. NSAP-PPS is integrated with DBT Framework as PFMS, UIDAI and NPCI also integrated with PRAYAS Dashbaord, e-Taal, DARPAN DM Dashbaord, NDAP. It manages 3.34 crore of NSAP pensioners out of them 2.82 crore having Bank/Postal account. Through NSAP-PPS total 14 States process end-to-end transactions and pension to beneficiaries is given directly in their bank/postal accounts i.e. Direct Benefit Transfer (DBT). The detail of all beneficiaries at GP level under NSAP are displayed in 'Gram Samvad' (rural mobile app). Apart from Centrally sponsored NSAP Schemes of MoRD, NSAP-PPS Platform also supports State funded pension schemes.

2.3.11.2 NGO Grants in Aid Proposal and Tracking System (e-Anudaan)

E-Anudaan grants-msje.gov.in is the first work flow based, role based, NGO Application for online submission of application proposal, among Ministries/Departments. Seven schemes are being implemented in this web portal (with online sanctions in 2020-21 as on 31st December 2020) -Scheme of Grant in Aid to Voluntary Organizations working for Scheduled Castes (37.74 crore), Assistance to Voluntary Organizations working for OBCs, National Action Plan for Drug Demand Reduction- NAPDDR (76.94 crore), National Action Plan for Senior Citizens – NAPSrC (94.17 crore), Free Coaching Scheme for SC and OBC Students' (2.67 crore), Assistance to Disabled Persons for Purchase/Fitting of Aids and Appliances - ADIP

(6.13 crore), and Deendayal Disabled Rehabilitation Scheme (DDRS) to Promote Voluntary Action for Persons with Disabilities (50.57 crore)

The web-application facilitates Online proposal submission by NGOs/Institutes, tracking and processing by various BO users at Central Ministry where the process includes application verification, checklist filling, field inspections, scrutinizing, screening, recommendation, financial approval and GIA sanction. It also includes Tracking Application status, Integration of Data analytics enabled Dashboard, Integration with NGO Darpan portal for Registration of VOs at e-Anudaan, Integration with DBT Bharat Portal for DBT data of the schemes.

2.3.11.3 Tribal Caste Certificates and Pre/Post Matric scholarships

NIC has developed software systems in various states for issuing Caste Certificates to Scheduled Tribe citizen viz E-District system of UP, OSCAR System of West Bengal. Gujarat has integrated tribal registration portal namely <https://tribal.guj.nic.in>. Pre and Post Matric scholarships for Tribal students are being disbursed in several states using NIC developed scholarship systems.

2.3.12 Labour and Employment

2.3.12.1 Unified Shram Suvidha Platform (USSP)

USSP portal facilitates the Ministry of Labour & Employment and it's Labour Law Enforcement Agencies to monitor the implementation of labour laws in various establishments in central sphere. It facilitates the employer/establishment to common registration, filing monthly and annual returns under 8 Labour Laws along with online common Return under Mines Act. Unique Labour Identification Number (LIN) is allotted to each establishment registered under any labour law after de-duplication of data coming from various enforcement agencies. Nine State Governments are also on-boarding with

Shram Suvidha Portal. LIN Only Regime is being established within various agencies in labour sector.

The USSP Platform provided transparent Labour Inspection Scheme through computerized system on Risk based criteria and uploading the inspection reports within 48 hours by the Labour inspectors. USSP made easy Sharing of Inspection Reports, Annual Returns among various labour enforcement agencies.

2.3.12.2 Platform for Effective Enforcement for No Child Labour (PENCiL)

PENCiL connects the Ministry of Labour & Employment with 20 States, 284 Districts Project Societies with 3,000 Special Training Centres (STCs) for effective enforcement for “No Child Labour”. It sets baselines based on key performance indicators at the levels to monitor physical and financial progress report. The platform captures children identified and rehabilitated through STCs and skill development depending on age group and nature of industry from where the children have been rescued.

The portal facilitates reporting of child labour incidents followed by First Action Report (FAR) within 48 hours and subsequently Second Action Report (SAR) with 21 days, if required. Afterwards, Legal Action Report (LAR) is recorded if required. The portal has been enhanced to capture daily attendance along with group photograph of children attending the school.

2.3.12.3 SAMADHAN Portal

Software Application for Monitoring and Disposal, Handling of Apprehended/Existing Industrial Dispute (SAMADHAN) portal facilitates a trade union or management to raise an industrial dispute before Conciliation Officer (CO) of the area. CO for the purpose tries to settle the dispute amicably, without delay, by the way of counselling with the concerned parties. The settlement or FOC (Failure of Conciliation) report is sent to appropriate Government to take necessary action. The portal

is operational on PAN-India basis, more than 2,500 disputes are registered in the portal.

2.3.13 Power and Energy

National Power Portal (NPP) is a unified system for Indian Power Sector which facilitates online data capture at various frequencies (daily, monthly, annually). The data is provided by generation, transmission and distribution utilities in the country through various automated subsystems which validate and process the collected data and disseminates the same through various analysed reports, graphs, statistics at all India, region, State level for Central, State and private sector.

NPP provides a platform for monitoring of metering of around 42,000 urban distribution feeders, their power supply position and AT&C losses. Similarly, NPP facilitates Rural Electrification Corporation (REC) to monitor power supply position of around 1,08,000 feeders out of which around 30% feeders providing data through IoT devices. The All India Installed Capacity and Generation data is captured from around 511 stations and 1695 units. Transmission system under NPP gives the monthly update of growth of transmission lines and transformation capacity.

In addition to NPP dashboard, which is available in public domain, a GIS enabled Bharat map-based Power Analytics Platform (PAP) has also been developed to provide the useful insights for higher authorities for quick decision-making



National Power Portal designed by NIC has facilitated continuous monitoring of aggregate technical & commercial losses

2.3.14 Good Governance & Enforcement

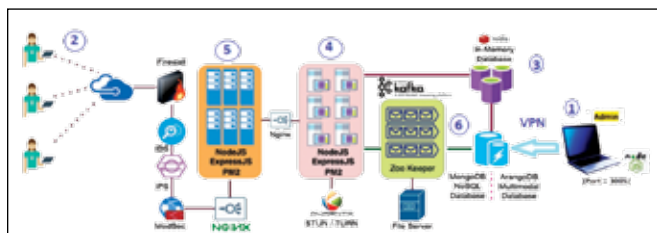
2.3.14.1 PRAYAS - Pursuing Excellence in Governance

Government of India has launched many Nationwide Programs and Scheme to improve the lives and social environment for the people of country in line with the United Nation Development Program (UNDP). With the passage of time, the number of Schemes and funding through the scheme have increased multi-fold which has created an urgent need to build a single platform to enable the Prime Minister's Office (PMO) view these schemes across critical Key Performance Indicators (KPIs). 'PRAYAS - Pursuing Excellence in Governance' (<https://prayas.nic.in>), a dashboard of dashboards provides an integrated & consistent view of the performance of Government Programs & Schemes, thereby encouraging a culture of data-driven Governance. It facilitates actionable insights and enable concerned Ministries & Departments to take appropriate measures at right time. Eventually, this would enable PMO to align Key Policy Makers and Executioners take adequate measures to improve the Scheme's progress vis-a-vis envisaged outcomes. PRAYAS also provides secure channel with MIS of respective schemes to provide real time data through Application Programming Interface (API). PRAYAS acts as a robust platform for quick on boarding of Government Schemes and can generate Score cards based on the performance. As of now, 83 schemes with 434 KPIs are enabled on PRAYAS.



2.3.14.2 P-Box/e-Parikhya: Online examination with AI and remote Proctoring

e-Parikhya is designed to take care of all challenges of online examination using the emerging AI/ ML technologies which matches the candidate's face with the registered photo. Remote proctoring module helps the proctor in vigilate the policy violations defined for each test from a remote location.



Salient features include Admin module to configure an exam with multiple and single choices randomized questions and options. Candidate can wait in the pre-exam lounge before the exam starts and do the required device calibrations, go through the instructions, see demo exam video, etc., There is provision for multi-factor biometric authentication using AI to verify the identity of students before starting exam. Each student has to provide a face ID, which is measured against the student's baseline biometric profile, stored on file. Question panel displays colour coded numbers for displaying questions which are attempted, not attempted and attempted but not synchronized to the server separately. Proctoring features face recognition, Multi-person detection, absence detection, eyeball tracking, and whispering detection. The product is highly scalable and has Chatbot support for candidates. It has network resilient occasionally disconnected architecture; exam can continue even if the network fails in between for some time.

2.3.14.3 DARPAN: Dashboard for Analytical Review of Projects Across Nation

"DARPAN- Dashboard for Analytical Review of

Projects Across Nation” is a configurable Multilingual product of NIC to transform complex Government data into compelling visuals. DARPAN provide seamless, authenticated and secure integration with user repository through APIs/Web Services for automatic updates of data on predefined frequency. The single window online solution can be accessed anytime anywhere on heterogeneous devices. DARPAN is a consolidated dashboard product for Central Ministries and Departments at Central and at State level for Hon'ble Governors, Chief Ministers, Chief Secretaries, Divisional Commissioners and DMs/DCs across Districts.



2.3.14.4 PARIVESH

‘PARIVESH’ is a Single-Window Integrated Environmental Management System, developed in pursuance of the spirit of ‘Digital India’ and capturing the essence of “minimum Government and maximum governance”. A workflow based application has been rolled-out for online submission, monitoring and management of proposals submitted by Project Proponents to the Ministry of Environment, Forest and Climate Change (MOEFCC), Government of India as well as to the State Level Environmental Impact Assessment Authorities (SEIAA) to seek various types of clearances (e.g. Environment, Forest, Wildlife and Coastal Regulation Zone Clearances) from Central, State and district-level authorities. It automates the entire process of submitting the application and tracking the status of such proposals at each stage of the processing.

2.3.14.5 NEVA (National e-Vidhan)

e-Vidhan Application 3.0 is a Generic Product suitable for a country-wide implementation aspect, enabled with provisions for inclusions of workflows and business rules for any Legislature and Municipal Corporation. It is a complete role-based workflow ICT solution facilitating paperless working of the House, House Committees and e-Constituency Management.

2.3.14.6 eCabinet

An innovative eCabinet (eMantrimandal) solution for automation of Cabinet meetings brings Cabinet meetings online, automates its workflow and facilitates paper-free virtual meetings. It offers secure value-added services such as online agenda points, build institutional memory, paper like experience of meeting in smart tablets and update progress & display in large screen to Secretaries in waiting lounge.

eCabinet is a Knowledge Repository of Cabinet Meetings & Decisions with four major components: eCabinet Portal provides Anytime, Anywhere Availability of Information for Cabinet Ministers, Secretaries & Departments, Gopan Portal provides restricted Access to Gopan department for Cabinet related Confidential matters, Meeting Day Management System is a solution to manage the Meeting on Meeting Day and provides restricted access to Gopan Officers, Waiting Lounge Management System system for Secretaries/ Officers.



The relevance of this initiative in COVID-19 pandemic situation is huge, as it reduces physical contacts and paper-based systems.

2.3.14.7 Public Service Commission

It is rolled out as a standard product with the objective to enable transparent and faster processing of requisitions of Departments for recruitment to various posts.

The system has interconnected components like Public portal for general public, PSC ADMIN portal for public service commission administration, MDM for master data management, OTR for one-time candidate registration, IDMS for integrated document management system, Helpdesk for Applicants etc., It is currently implemented in Himachal Pradesh Public Service Commission.



The system has successfully catered the needs of more than 45 Departments, more than 13.5 K registrations were made, 8 exams were conducted, and more than Rs 2 lakh was collected in fee.

2.3.14.8 Service Plus

ServicePlus (<http://serviceonline.gov.in>) is one of the applications developed as part of Panchayat Enterprise Suite (PES) under e-panchayat Mission Mode Project (MMP). Government Departments' benefit immensely from using this framework as it facilitates rapid rollout of any service by configuring the wizard-like interface. Its aims to make Government services accessible to the common

man at door step or by through common service delivery outlets. The framework allows configuration of beneficiary profile, submission modes, service charges, payment mechanisms, service delivery modes, application form, service output, notifications, process flow, digital signatures, QR codes and much more. ServicePlus considerably reduces the effort, time and cost for Government as well as citizens. Almost all the required functionalities are already bundled with ServicePlus and hence the department spends very little in terms of time, effort and cost to e-enable their services. Currently, it is being used by 9 Central Departments and 31 States for delivering over 1820+ services as on 31st December 2020. It is been using by different stakeholder, as solution for eDistrict, e-Services, EoDB and/or DBT services.

2.3.14.9 SAMPADA Suite-Enabling the Food Processing Sector in India

NIC's application suite named "SampadaSuite" (<https://sampada-mofpi.gov.in>) provides grants to various promoters desirous of setting-up different types of Food Processing Facilities. The different modules of the suite, based on different schemes of the Ministry provide an online system for submitting application for setting-up food processing facilities; their evaluation by the different Divisions and Project Management Agencies engaged by the Ministry, approval or rejection, monitoring of grant release instalments and final closure of a Project.



The detail workflow of the Ministry for these activities has been automated in the Sampada suite. The suite has helped the Ministry to simplify the process of grant allocation to promoters and manage the schemes more efficiently helping timely completion of projects. Currently, there are 9 modules in the suite.



2.3.14.10 ManavSampada- A tool for Human Resource Management

ManavSampada is a standard ICT solution for the Government sector, addressing maximum requirements of State Governments related to personnel management. It is also referred as the eHRMS or the electronic Human Resource Management for Government Departments to help them in taking right decisions at right time and for proper monitoring, manpower planning, recruitments, postings, promotion and transfer based on employee skill sets and State policies.

“ManavSampada” has significantly reduced the delays in service-related matters in Government Departments. It provides important statistical report like vacancy, staff strength, retiree detail and employee service detail etc., at each level which allows online solution in timely and effective manner. The Lower cost of maintenance, User convenience, Standardization of forms and procedures, Improvement in Carbon-Credit rating by reducing the usage of paper and Multi-channels delivery through mobile phones, web-application (eHRMS-Manav Sampada) and Android/iOS mobile Apps (eHRMS and eTransfer) are additional features of this application.

2.3.14.11 NGDRS (National Generic Document Registration System)

Digitization of the document registration system (governed by registration act 1908) has been taken under Digital India Land Records Modernization DILRMP Programme. Development of National Generic Document Registration System application addresses the diversity and variations in document registration across states and union territories because of languages, processes, formulae and formats. It fulfills the need of “ONE NATION ONE SOFTWARE”, which can cater to all the States and Union Territories’ requirements.

The software of National Generic Document Registration System (NGDRS) is configurable as per State-specific Property Registration Act. It works as complete user interface for Document Registration process. Application is specifically designed and developed to be used by citizens. The software empowers citizens to calculate property valuation & apply online for document submission and prior appointment can be taken. In addition, the Application is specifically designed and developed to meet the requirements of State Administration, District Administration, SROs, Document writers and applicants.

2.3.14.12 Aadhaar Authentication Services

NIC has signed agreement with UIDAI to setup Aadhaar Authentication Services i.e. AUA and ASA service for e-Governance projects.

Some of the important projects which are using NIC’s Aadhaar Authentication service are: Biometric Attendance System, PDS for various States, Scholarship, Jeevan Pramaan, Pradhan Mantri Awas Yojana (PMAY), National Urban Livelihood Mission etc., Type of Aadhaar Authentication services offered for applications are Demographic Authentication, Biometric Authentication, OTP Authentication and eKYC based on Biometric,

OTP. Average response time for authentication is around 1 second and 95% transactions are served within 1 second. Average number of transactions served by NIC platform are 1 crore and maximum transactions served through this platform in a day are about 2.5 crore. NIC is the highest transaction requestors for Aadhaar services of UIDAI.

2.3.14.13 JeevanPramaan

JeevanPramaan is a biometric enabled digital service for pensioners. The Pensioners of the Central Government, the State Governments or any other Government organisation can avail the benefit of this facility. One of the major requisites for the pensioners, post their retirement from service, is to provide life certificates to authorised pension disbursing agencies, such as, banks and post offices etc., following which, their pension is credited to their respective bank accounts. Digital Life Certificate (DLC) for Pensioners aims to streamline the process of getting this certificate and making it hassle free and much easier for the pensioners.

JeevanPramaan has provided relief to old-age persons by eliminating the need of physical visit to Pension Disbursing Agencies. It provides an opportunity for anytime, anywhere submission of Digital Life Certificate (DLC) by the pensioners. This has streamlined the pensioners' verification process at Pension Disbursing Agency. Cloud and Mobile enablement have enhanced the scalability and accessibility, and digitization has cut down unnecessary logistic hurdles.

2.3.14.14 Bhavishya

BHAVISHYA is an online Pension Sanction and Payment tracking system. It is a Web Responsive application which provides "End-to-End Solution" to the Pension Processing. It begins with online filling of pension forms by retiring employee till the issue

of "Electronic Pension Payment Order" (ePPO) and "Electronic Special Seal Authority" (eSSA), payment of retirement benefits and credit of first pension in the bank account. Bhavishya has been seamlessly integrated with following applications: Employee Information System (EIS), Public Financial Management System (PFMS), eAwas, Pension Authorisation Retrieval and Accounting System (PARAS) and DigiLocker.



The system provides for on-line tracking of pension sanction and payment process by the individual as well as the administrative authorities. The system captures pensioners personal and service-related details. The forms for processing of pension are submitted online. It keeps retiring employees informed of the progress of pension sanction process through SMS/E-Mail. The system obviates delays in payment of pension by ensuring complete transparency. Bhavishya has 96 Ministry/Department/Apex Bodies/UTs and 811 Attached/Subordinate offices are on-board.

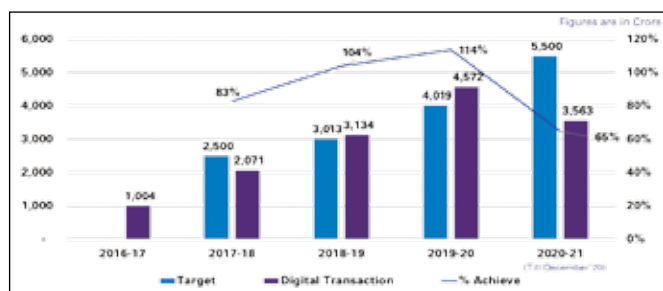
2.4 Digital Empowerment of Citizens

2.4.1 DigiDhan - Digital Payments

Promotion of digital payments ecosystem is an essential aspect of the Digital India programme and has the potential to transform the Indian economy by extending inclusive financial services.

Consequent upon the allocation of Business Rules vide the Cabinet Secretariat Notification No. 1/21/1/2017.Cab dated 15th February 2017, Ministry of Electronics & Information Technology was assigned the responsibility of “Promotion of Digital Transactions including Digital Payments”. In compliance with the Union Budget announcement of FY 2017-18, a dedicated DigiDhan Mission was set up at MeitY in June 2017.

The DigiDhan Mission has been the primary catalyst to promote the digital payment ecosystem in India. The digital payments transactions have steadily been increasing over the last few years with the total transaction volume having increased from Rs.1,004 crore in FY 2016-17 to Rs.4,572 crore in FY 2019-20. The DigiDhan Mission aims to achieve a target of 5,500 crore digital payment transactions in the current FY 2020-21.



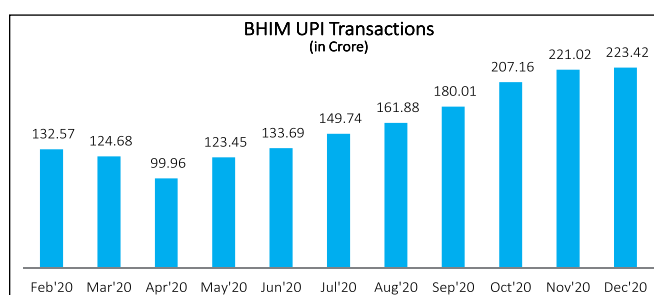
Note – RBI is yet to publish the digital payments data for Nov & Dec '20

Growth of Digital Payment Transactions

Over the past three years, digital payment transactions have registered tremendous growth in India. New payment modes - Bharat Interface for Money-Unified Payments Interface (BHIM UPI), Aadhaar enabled Payment System (AePS) and National Electronic Toll Collection (NETC) – have transformed digital payment ecosystem by increasing Person to Person (P2P) as well as Person-to-Merchant (P2M) payments. At the same time, existing payment modes such as Debit cards, Credit cards, Immediate Payment Service (IMPS) and Prepaid Payment Instruments (PPIs)

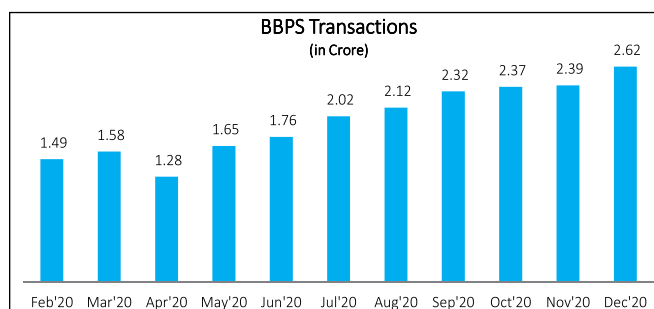
have registered substantial growth. BHIM UPI now accounts for more than 30% of digital payment transactions.

BHIM UPI: While digital payment transactions have increased steadily, certain payment products have witnessed tremendous growth during this period. BHIM UPI, which has emerged as the preferred payment mode, crossed 200 crore transactions in the month of October 2020 and registered 223.42 crore transactions in December 2020.



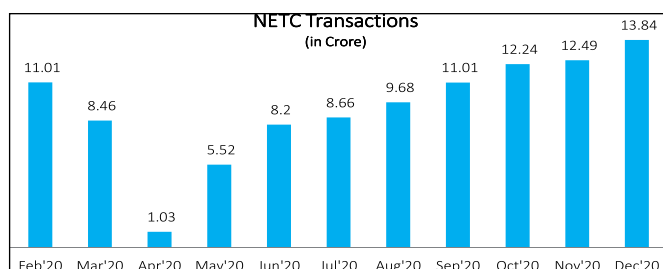
Source: NPCI

- **Bharat Bill Payment System (BBPS):** BBPS has been one of the standout digital payment solutions available to citizens. In October 2016, BBPS registered 11,000 transactions with a value of Rs.3.5 lakh. This has increased significantly to 2.62 crore transactions with a value of Rs.3,962.76 crore in December 2020.



Source: NPCI

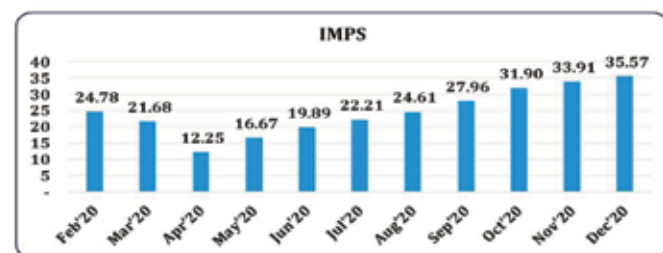
NETC: In December 2016, NETC was launched for electronic toll collection at toll plazas using FASTag and the number of electronic transactions at tollplazas is 13.84 crore with a value of Rs.2,303.79 crore, in December 2020.



Source: NPCI

Growth in transactions of Other Digital Payment Modes:

The growth in other payments modes such as Debit cards, Credit cards, Immediate Payment Service (IMPS) and Prepaid Payment Instruments (PPIs) is as below:

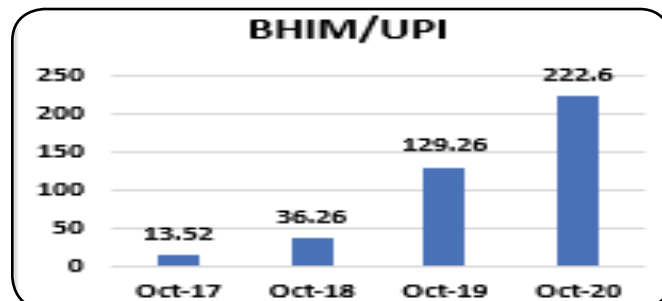
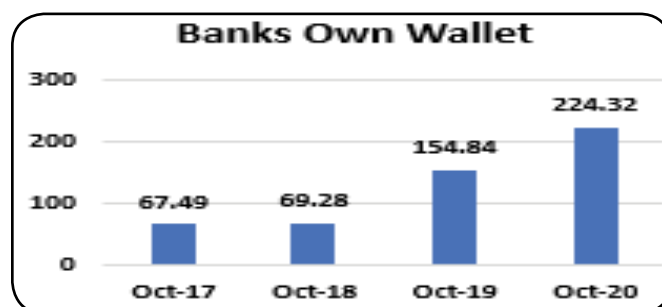
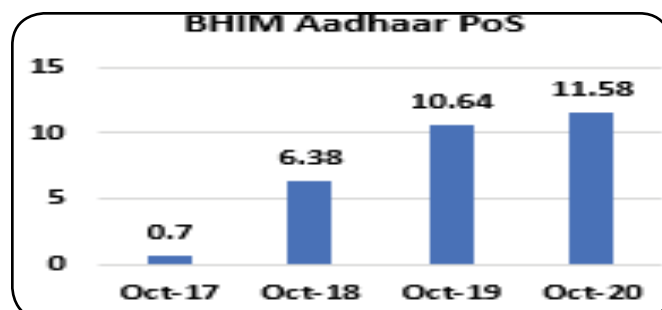
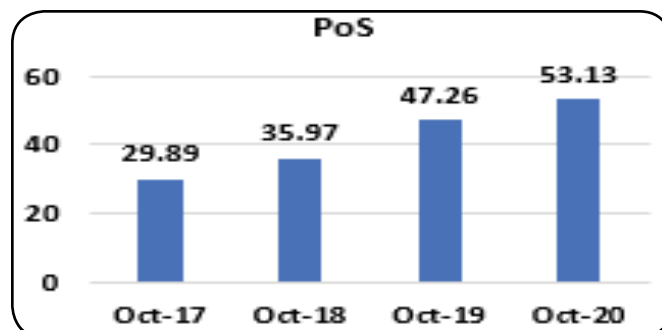


Growth in Volume of Digital Transactions (in crore)

Source: NPCI and RBI (as on 6th January 2021, RBI has not published the data for the months of Nov-Dec2020)

Growth of Digital Payment Acceptance Infrastructure:

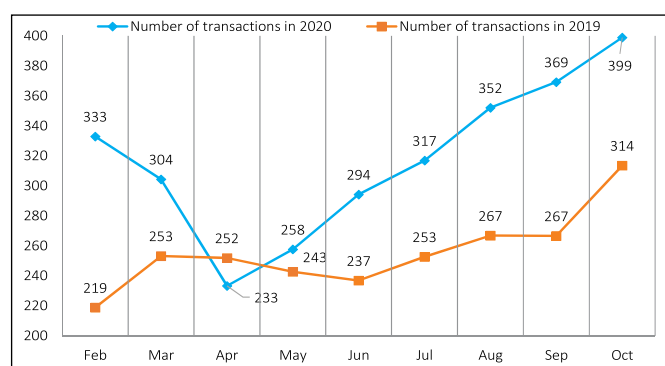
Digital Payment acceptance infrastructure has significantly increased due to coordinated efforts of Banks and other stakeholders. 544 lakh merchants were enabled to accept digital payments till October 2020, through various modes including BHIM UPI QR code, PoS, BHIM Aadhaar PoS and Banks own wallets, as indicated below:



Growth of Digital Payments Acceptance Infrastructure (in lakh)
[as per DFS Report]

Role of Digital Payments in COVID

The COVID-19 pandemic has given prominence to one more benefit of digital payments, its role in enabling healthcare. Equipped with contactless payment modes like UPI QR code and NFC enabled cards, digital payments are complimenting the “new normal” of social distancing. During the corona virus crisis, digital payments have been keeping the economy running and helping people reduce contact with virus.



Growth of Digital Payments during COVID in crore (Source: NPCI, RBI, Banks, PPIs) Debit cards, Credit Card, NEFT, PPI Data for Sep and Oct 2020 is provisional Modes considered: NACH, IMPS, BHIM UPI, NETC, Debit cards, Credit Card, NEFT, PPIs

Steps Taken for promotion of Digital Payments

- **Coordination with Banks:** To promote digital payments, public and private sector banks are allocated digital payment transaction targets annually. A concept of Scorecard, wherein Banks are being ranked based on their performance of various policy parameters, has been introduced by MeitY. This is one of the success stories as banks are trying to perform better than others, to achieve good position.
- In order to enhance the awareness level on digital payments modes, its benefits and its enablement processes, MeitY regularly participates in training workshops with various stakeholder agencies.

- Coordination with Ministries/Departments/ States for promotion of digital payments and enabling digital payment acceptance infrastructure at citizen touch points. Promotional campaigns have been undertaken by Smart Cities for promotion of digital payments in the Government offices.
- Weekly reporting on the progress of digital payments to Cabinet Secretariat, PMO and Hon'ble MEIT.
- The mission is also ensuring massive on-boarding of Billers on BBPS. With opening of new categories of Billers, this is one of the main focus areas of the Government. At the end of December 2020, number of billers on-boarded on BBPS ecosystem is 19,316.
- Enablement of NCMC ecosystem with aim to promote “One Nation One Card”.

MDR Reimbursement Schemes

To promote digital payment transactions in the country, MeitY was implementing the following Merchant Discount Rate (MDR) Reimbursement Schemes, wherein MDR claims of the acquiring banks were being reimbursed by the Government:

- MDR Reimbursement Scheme on transactions of value up to Rs.2,000 done through Debit cards/BHIM Unified Payments Interface (UPI)/ Aadhaar Pay
- MDR Reimbursement Scheme on Government receipts up to Rs.1 lakh for transactions made through Debit cards

MDR Reimbursement Schemes have ended on 31.12.2019, however, settlement against pending MDR claims is still being done by the Ministry. As on December 2020, payment of Rs.1,388.18 crore has been reimbursed to the acquiring banks under the scheme, including the amount of Rs.188.90 crore in the current FY 2020-21.

New Products and Services

- National Common Mobility Card (NCMC):** NCMC has been launched by the Government, to provide an easy, convenient and fast method of digital payment to the citizens for all routine low value transactions including public transport and retail. This will allow citizens to use a single interoperable digital payment mode across all metro, railway and bus services as well as retail outlets to fulfill the vision of 'One Nation One Card'. NCMC supports both online and offline transactions through dual interface (contact and contactless). Passengers are no longer required to stand in multiple queues to purchase tickets. Going ahead, the card will support more and more applications for increased convenience allowing citizens to use the same card for a variety of needs and free them from carrying separate cards for banking and transit requirements. More than 1.30 crore NCMC debit cards have been issued till December 2020. Marking the beginning of first open loop, non-exclusive project, Delhi Metro Rail Corporation launched National Common Mobility Card on the Airport Express Line on 28th December 2020. Now more than 1.30 crore NCMC cardholders (cards issued by different certified banks) can use their cards on the DMRC Airport Express Line and also use the same card to make all other payments.
- As part of ongoing efforts to promote various digital payment modes including BHIM, BHIM QR code, NCMC, BBPS, BHIM Aadhar and Rupay cards, communication has been sent to all Ministries and States encouraging the promotion of these modes. Furthermore, communication has been sent to all payment service providers/aggregators to ensure the adoption of BHIM UPI and Rupay cards.

States/UTs have been requested to enable all merchants and payment receipt counters to accept digital payments with UPI QR code and to undertake campaign for universal coverage of all merchants and payment receipt counters with UPI QR code, in coordination with UPI QR code solution providers.

Awareness and Publicity of Digital Payments

India has huge potential for digital payments. There is a need for customers/merchants to know about the availability of various modes of payment. Furthermore, it is vital to inform customers/merchants about the convenience along-with safety and security features built around these modes of payment to induce change in their behavior from using cash to digital modes of payment. As such, a promotion and awareness campaign has been initiated to encourage citizens to use digital payments. The envisaged promotional campaign comprises of traditional means of publicity as well as emergent means such as social media platforms.

Keeping in view the COVID-19 pandemic in the country, it becomes more important that people switch over to digital modes for undertaking their transactions from cash to obviate the possibilities of contraction of the contagion. In the month of November 2020 i.e. festive season, digital advertisements were released on Digital India and MeitY's social media pages on Facebook, Twitter, Instagram and LinkedIn promoting the use of BHIM UPI for transactions on the occasions of Diwali and Bhai Dooj.



Figure 1: Ad creatives promoting BHIM UPI over the festive period of Diwali and Bhai Dooj

In the month of December 2020, similar digital advertisements were released on Digital India's and MeitY's social media pages to promote BHIM UPI during Christmas and New Year. Furthermore, in December 2020, BHIM UPI achieved a new milestone with the value of transactions in a single month crossing the Rs.4 lakh crore mark. To highlight this significant landmark, a digital advertisement was released in the first week of January 2021, on Digital India and MeitY's social media pages.



Figure 2: Ad creatives promoting BHIM UPI during the occasions of Christmas and New Year



Figure 3: Ad creative highlighting the achievement of Rs.4 lakh crore worth of transactions in December 2020

Way Forward

The digital payment landscape in India is undergoing a massive transformation. Indian consumers have shown tremendous affinity to digital technology leading to rapid growth of digital payment infrastructure. The payment ecosystem comprises of banks, fintech companies and start-ups. Presently, major technology players, with large

user base, are using UPI platform for providing payment services. They are playing a vital role in the expansion of digital payments. Forward looking regulatory and Government policies, industry-led collaborative decision making and adoption of new technologies in digital payments have allowed India to shine on the world map.

Digital platforms like BHIM UPI, RuPay, One Nation One Card (NOC) and Aadhaar based payment systems continue to be lauded as innovations worldwide. The indigenous RuPay and BHIM UPI also aspire to expand their footprint in the international markets. The efforts are to enable countries where large number of Indian diaspora resides, popular tourist locations, high foreign inward remittances and trade. BHIM UPI acceptance is live in Singapore.

Digital payments in India are expected to grow over threefold by 2025 due to the growing Fintech ecosystem, COVID-led changes in consumer behavior and Government policies around financial inclusion.

There is need to accelerate the adoption of digital payments across the country. Strengthening the acceptance infrastructure especially in the North-East Region, J&K, Ladakh and Aspirational Districts will be focus areas of Government to unlock their digital potential. Fintech companies have played a key role in the growth of digital transactions by enabling transparent, secure, swift and cost-effective mechanisms benefitting the entire digital payment ecosystem. Promotion of the fintech sector would be another key focus area of the Government. Further, efforts will be made towards internationalization of our domestic products i.e. RuPay cards and BHIM UPI.

While the quest for a less-cash society continues, the endeavor is to also ensure increased efficiency, uninterrupted availability of safe, secure, accessible and affordable payment systems as also to serve

segments of the population which are hitherto untouched by the payment systems. The decade to follow will witness a revolutionary shift in the way Indian citizens use digital payment options and will also empower them with an e-payment experience that will be exceptionally safe, secure and truly world class.

2.4.2 e-Learning

E-Learning is an effective tool for quality and lifelong education to learners. E-Learning is the learning facilitated and supported by Information Communication Technologies (ICT). Advancements in ICT have made possible the availability of quality education on 24x7 basis to millions of people in a cost effective manner. The use of ICT in education has opened the doors for “anytime, anywhere” learning. Supplementing the formal way of education with e-learning tools/content and use of ICT in formal education is important to facilitate enhanced learning environment; especially when there is large gap in demand and supply of quality content and educators. The Ministry has been financially supporting R&D projects in this area at various academic educational institutes, R&D Labs etc for development of tools and technologies to promote e-learning.

The project “Rollout of Online Labs (OLabs) for schools” being implemented by C-DAC, Mumbai jointly with Amrita Vishwa Vidyapeetham, Kollam, Kerala, aims to create infrastructural and support framework for making OLabs (online labs for schools) accessible and usable by students and teachers across India and to train approximately 30,000 teachers across India in effective use of OLabs resources to enhance the teaching learning experience. Total duration of the project is 3 years with budget outlay of Rs.816.00 lakh. The project was further extended for 18 months.

As per the objectives of Olab project, Level 1 and 2 Support system under the project, has been setup and operationalized to address issues/queries of Olabs users, using e-mail, phone and queries on portal. Helpdesk is hosted at <http://support.olabs.co.in> and support number is also available from Monday to Friday from 8:00 AM to 5:00 PM. Under the project, so far 29,114 CBSE teachers (out of 30,000 teachers) from 8,376 CBSE schools across India and 2,217 Teachers from 616 State Board Schools have been trained. There are total 173 experiments available on the Olabs portal using interactive Simulators and Videos etc., These 173 lab experiments are covering various subjects viz. Physics -54, Chemistry -46, Biology -36, Maths -25, and English -12. The OLabs contents are available in four languages viz. English, Hindi, Marathi and Malayalam and available in the public domain as www.olabs.edu.in. For Olabs Offline, Olabs Live bootable DVD and Olabs Windows Installer is available and is updated periodically with the website dump.

2.4.2.1 Language Computing:

Natural Language Translation Mission

Pilot NLT Project

For learning strategies, MeitY initiated one year (23rd March, 2020 – 22nd March, 2021) NLT pilot project towards end of last Financial Year. The Implementing Agencies are IIT Madras, IIT Bombay, IIIT Hyderabad, C-DAC, Pune and IISc Bangalore. The goal of the pilot project was to switch from Rule base & Statistical Techniques to neural based technologies in the areas of Automatic Speech Recognition (ASR), Text-to-Speech (TTS), Machine Translation (MT) and Optical Character Recognition (OCR) are for few languages and domains along with datasets with the participation of start ups by holding challenge rounds. Also the possibilities for engaging the states towards

the long term mission goals are being explored to increase participation of states in building language technology ecosystem. The success has been achieved in making available NPTEL Video Lectures in Indian Languages through technology interventions. ASR systems thus developed are available as offline services. Web Pages have been created for uploading speech files. <<https://www.iitm.ac.in/speech/NPTEL/audio/>>. For TTS systems, users can upload srt files and synthesised files can be downloaded from this link.: <<https://www.iitm.ac.in/donlab/s2s/dev/srt-to-audio/>>

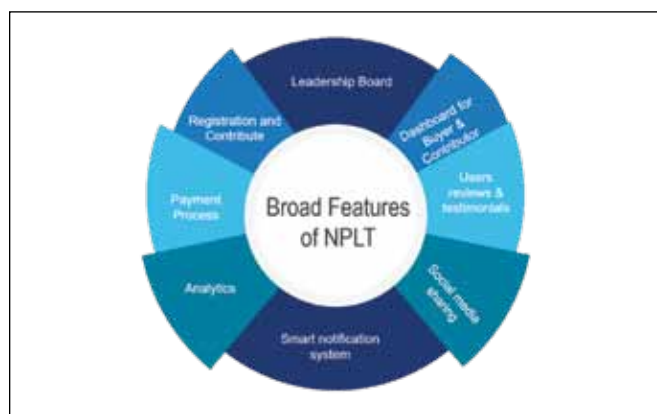
NLTM Mission

Due to COVID-19 challenges and learnings of pilot, MeitY has revisited the goals of the mission to focus on 'AatmaNirbhar Bharat' primarily. Now, NLTM aims at removing language barrier among all major Indian languages, particularly in the domains of science and engineering, education, healthcare, governance, law & justice, etc., through the collaboration with possible start-ups. Under the mission, it is envisaged to build machine translation systems which could be used to translate from one Indian language to another with minimal human involvement. It is also planned to create and nurture an ecosystem involving start-ups to develop and deploy innovative solutions in Indian languages. Further, language-specific Missions for each of the constitutionally recognized languages are to be initiated in partnership with the State Governments with an objective to increase the content in Indian languages on the Internet manifold. In this regard, a revised detailed project report has been prepared in consultation with the stakeholders and necessary action has been initiated for necessary approval.

National Platform for Language Technology

National Platform for language Technology (NPLT) has been developed to provide an e-marketplace for the stakeholders in language technology. The platform is planned to be opened to public as well as

private players. At present, it hosts a good number of linguistic resources developed under various projects sponsored by MeitY. The resources include parallel text corpora for major Indian languages for use in machine translation, speech corpora in several Indian language for automatic speech recognition and speech synthesis. It also hosts several other language tools such as WebOCR, IndoWordNet, HindiWordNet, glossary tool, etc., NPLT would also have a leadership board for language technology products and services. The platform has been developed by C-DAC under a project sponsored by MeitY. This platform shall be leveraged for outreach activities of the mission.



So far, these linguistic resources/tools were being given to Indian academic researchers only. It has now been decided to make it available to start-ups, IT companies and international academic researchers as well. This would be given free of cost to Indian start-ups and academic researchers whereas other companies would have to pay the price of the resource. There is an option to download a demo/trial version of any resource/tool to try out its features before buying it. The platform also provides a place to showcase tools and systems in language technology. One can also provide language technology-based services through the platform. For instance, one can host a Machine Translation System on the platform for users who can use it on payment basis.

Cloud based Localization Services for Government of India Websites in Indian Languages:

In one of the MeitY sponsored project, an advanced Localisation Projects Management Framework (LPMF) is being implemented which handles the end to end process i.e. right from the crawl, text extraction, conversion, job creation, profiling, job assignment, leveraging and deployment of the translated contents with the empanelment of the translators. Various Machine Translation systems are also integrated to aid the translator/post-editor in contributing to the translations. Along with this, INSCRIPT based keyboard is also provided to freshly type the translation or edit the suggestions coming from the Machine Translation System. Once the translation is submitted, it immediately gets reflected and appeared next time when the webpage is translated again. Using this, various portals can be translated dynamically/on the fly to Indian Languages.

In this project, it is envisaged that to make available the services of LPMF to any Government Departments for making their web portals into multiple languages at the cost of translation only or free if content shall be translating by the owner department. For this, the various components of LPMF are being hosted at NIC cloud so that these services may be available free for all Government Departments. The following are the few websites which have already been integrated LPMF: <http://localization.gov.in/>, <http://www.cca.gov.in/>, <https://cdac.in>, <https://farmer.gov.in/>, <https://greene.gov.in/etc>.

2.4.3 Initiatives on Accessibility

Government of India has launched Accessible India Campaign (Sugamya Bharat Abhiyan) as a nation-wide Campaign for achieving universal accessibility for Persons with Disabilities (PwDs). MeitY is one of the key stakeholders for execution of the scheme.

As part of Accessible India Campaign, a flagship programme of the Department of Empowerment of Persons with Disabilities (DEPwD), MeitY is making continuous efforts to make websites of respective Ministries/State Governments accessible and following up with Central Ministries and States for the same

National Policy on Universal Electronic Accessibility was formulated by the Ministry of Electronics and Information Technology (MeitY) and it was notified on 25th October 2013. The policy facilitates equal and unhindered access of Electronics and ICT's product and services by differently-abled persons.

Central Government Ministries/Departments Accessibility

- Main Informational Web Sites of Central Government Ministries/Departments were made GIGW compliant under CMF Project. The Web Sites are compliant to accessibility requirements as per GIGW by design.
- Central Ministries/Departments/Apex bodies with GIGW Compliant Web Sites (*By design*) = 95
- Web Sites for Central Ministries/Departments/Apex bodies in process : 8
- Ready to Go Live : 5 (Ministries/Departments to give go ahead for going live)
- Under content verification & Testing : 1

District Web Sites Accessibility : NIC developed S3WaaS (Secure, Scalable and Sugmaya Web Site as a Service) which meet the accessibility requirements as GIGW guidelines by design.

616 Websites of Districts are developed under S3WaaS.

State Government Web Sites Accessibility: ERNET India is executing a project funded by the Department of Empowerment of Persons with disabilities (DEPwD), MoSJE to make 745 State Government websites accessible as per the

standards of Government of India Guidelines for Websites (GIGW) and web content accessibility guidelines WCAG 2.0 (AA). Based on the inputs received from ERNET, till December 2020, 424 State Government websites were made accessible.

Knowledge & Resource Centre for Accessibility in ICT (KAI) Project: MeitY is implementing a project- Knowledge & Resource Centre for Accessibility in ICT (KAI) to develop accessibility standards and procurement guidelines for hardware.

2.5 Digital Platforms

The Digital India Programme weaves together a large number of ideas and thoughts into a single comprehensive vision to ensure that benefits of development reach each and every citizen of the country in equal measure along with faster and timely service delivery.

Till December 2020, over 200+ major projects and 3900+ services are running in digital space, resulting into the efficient delivery of services to citizens. Digital platforms such as UPI, Aadhaar, GeM, GSTN etc have realised increased efficiencies in the system and have become the testaments of 'low investment and high returns'.

Now, the aim is to consolidate large number of e-Gov projects, create more national platforms with Central support to provide personalized services to citizens across sectors, enable data driven governance and improve overall experience of citizens. There is a need felt to weave together large number of initiatives in digital space into a convergent and comprehensive enterprise. MeitY envision evolving, and building unifying digital platforms for key sectors that is interoperable, federated and secure by design for effective implementation and monitoring of programmes, policies and systems for the sectors. The underlying foundation of the platforms will rest upon adoption of open API, open standards, specifications and

policies for interoperability, data, digital credentials etc., The platforms will leverage new and emerging technology & innovations like AI/ML, AR/VR, NLTM etc as well as existing systems, solutions, applications tools and assets.

The platforms will be developed on the principles of cooperative federalism and enable a single source of truth with interoperable systems while working with the states and union territories to enhance good governance and administration. This will energize the ecosystem to bring in innovation, diversity, and contextualization with participation, collaboration, and contribution from all stakeholders including citizens while ensuring equitable access, choice, convenience, inclusion and reduce digital divide

The National Digital Platforms are taking shape in key sectors. National Digital Health Mission is being implemented in 6 UTs and will soon be scaled up across the country. Similarly, the exercise to design National Public Digital Platforms in Agriculture and Education is in advanced stage. Not only these platforms will provide a large range of services to citizens and other stakeholders, they will also harness the emerging technologies for the benefit of all, and provide huge opportunity to start ups, innovators and researchers to build new value-added services that can also be offered to all the citizens through the same platforms. By growing capacities in digital technologies and applying them across sectors, India can lead towards a trillion dollar economy by 2025.

2.6 Sectoral Group of Secretaries (SGoS) – Technology

With a vision of Technology Empowered “New India” a Sectoral Group of Secretaries (SGoS)-Technology was constituted which consists of 11 technological Departments/Ministries of India. Under this, MeitY envisions to create a Self-reliant, Strong, Secure and Sustainable Digital Economy by harnessing digital technology &

fostering innovation on the strategic pillars of Digital Services, Digital Inclusion, Digital Economy, Digital Infrastructure and Digital Confidence. MeitY's thrust would be on development of Public Digital Sectoral Platforms at national scale, creation next generation infrastructure, strengthen Manufacturing with Expand & Export strategy and develop India as a software product nation.

2.7 Working Group of Ministers (WGoM)

The Government has formed seven Working Groups of Ministers (WGoM) aiming to identify priority sectors to be focused in the wake of pandemic of COVID-19 for converting threats into an opportunity. The seven sectors and their concerned Sectoral Group of Secretaries (SGoS) are:

Sl. No.	Working Group on	Concerned SGoS
1	E-governance and E-education	SGoS-8 (Technology) SGoS-4 (Social)
2	Communications	SGoS-9 (Governance)
3	Export promotion	SGoS-7 (Commerce & Industry)
4	Manufacturing	SGoS-7 (Commerce & Industry)
5	Healthcare	SGoS-4 (Social)
6	Rural development	SGoS-1 (Rural & Agriculture)
7	Skill development and employment generation	SGoS-4 (Social)

The Conveners of the respective SGoS and other Members/Secretaries are responsible for the implementation of the recommendations suggested by the Group of Ministers (GoM). The reports on the recommendations of Working Groups of Ministers on all the seven identified sectors have been prepared by concerned Sectoral Group of Secretaries (SGoS). Weekly meetings of GoM have been holding since 2nd December, 2020 to review

the implementation progress of the suggested recommendations by the Group of Ministers.

MeitY is the member Ministry of SGoS-8 (Technology). There are 45 recommendations which have been identified where MeitY has to work in collaboration with other Ministries. All the recommendations have also been uploaded on e-Samiksha portal for monitoring the progress/status.

Make in India: **Electronics Manufacturing**



Electronics industry is the world's largest and fastest growing industry and is increasingly finding applications in all sectors of the economy. The Government attaches high priority to electronics hardware manufacturing as it is one of the important pillars of "Make in India" and "Digital India" Programme of Government of India.

The National Policy on Electronics 2019 (NPE 2019) which was notified on 25.02.2019 envisions positioning India as a global hub for Electronics System Design and Manufacturing (ESDM) by encouraging and driving capabilities in the country for developing core components, including chipsets, and creating an enabling environment for the industry to compete globally. The implementation of schemes and initiatives under the aegis of National Policy on Electronics 2019, is expected to generate employment for about 10 million (1 crore) persons (direct and indirect) at various levels and the demand for electronics hardware is expected to rise rapidly to about USD 400 billion by 2025.

Government has taken several initiatives to promote electronics manufacturing and as a result, electronics production has increased from Rs.1,90,366 crore (USD 29 billion) in 2014-15 to Rs.5,33,550 crore (USD 75.7 billion) in 2019-20 at a Compound Annual Growth Rate (CAGR) of 23%. The intent of the Government is to provide a level playing field for domestic manufacturers to enable them to compete with imports in the sector by rationalization of tariff structure, simplification of procedures, providing incentives and upgrading infrastructure.

3.1 Modified Special Incentive Package Scheme (MSIPS)

In order to promote large-scale manufacturing in the country to offset disability and attract investment in ESDM sector, Modified Special Incentive Package Scheme (MSIPS) was announced by the Government in July, 2012. The scheme has been amended twice - in August, 2015 and in

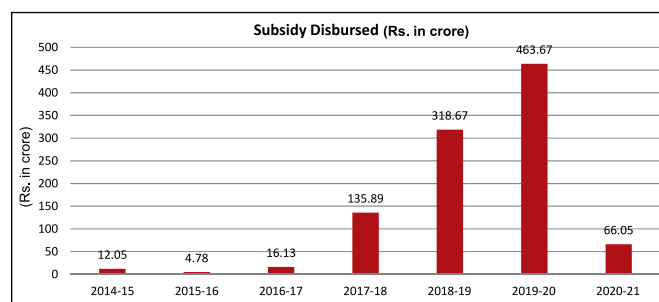
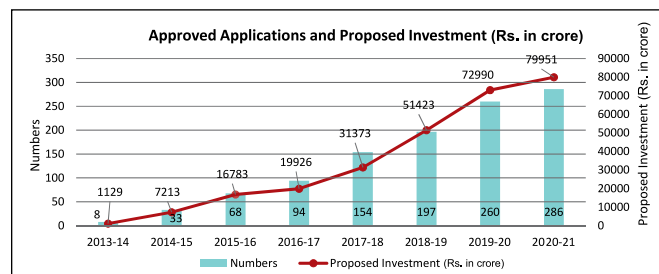
January, 2017. The scheme mainly provides CapEx subsidy of 20-25%. The policy provides for an Inter-Ministerial Appraisal Committee to evaluate investment applications. Based on the recommendation of Appraisal Committee, approval of Competent Authority is obtained. The Scheme has been closed on 31st December, 2018 to receive new applications. The salient features of the Scheme are:

- Provides Capital Subsidy - 20% for investments in Special Economic Zones (SEZs) and 25% in non-SEZs.
- Provides incentives for both new units and expansion units.
- Provides incentives for a period of 5 years from the date of approval of application.
- Provides incentives for 44 categories/verticals across the value chain (raw materials including assembly, testing, packaging and accessories, chips, components).
- Minimum investment threshold for each product category/vertical (from Rs.1 crore for manufacturing of accessories to Rs.5,000 crore for semiconductor wafer fabrication unit).
- Unit to be, in Industrial Area notified by Central/State Government

The status of M-SIPS applications as on 31st December, 2020 is as follows:

351 applications with proposed investment of Rs.1,02,681 crore are under consideration. Out of these, 286 applications with proposed investment of approximately Rs.79,951 crore have been approved, 11 applications with proposed investment of approximately Rs.3,116 crore have been recommended by the Appraisal Committee for approval and 54 applications with proposed investment of Rs.19,614 crore are under appraisal process. The incentives to the tune of Rs.1017.24

crore have been disbursed to the 80 applicants.



Out of 351 applicants, 211 applicants have started incurring investment and made investment of Rs.24,200 crore. 188 applicants have commenced commercial production and reported turnover of Rs.2,16,090 crore, out of which exports are of Rs.36,146 crore. These units have so far given employment opportunities (Direct & Indirect) to over 1,46,369 persons and paid revenue of about Rs.29,777 crore to the Government.

3.2 Electronics Manufacturing Clusters (EMC) Schemes

To create conducive and sustainable ecosystem for electronics manufacturing in the country, Government notified Electronics Manufacturing Clusters (EMC) Scheme in October, 2012. It also provides support for creation of world-class infrastructure along with common facilities and amenities for attracting investments in ESDM sector. The scheme was open for receiving applications for a period of five years from the date of its notification i.e. upto October, 2017. Further period of five years is available for disbursement of funds to the approved projects. The salient features of the scheme are:

- To create infrastructure base for electronics manufacturing in the country through development of Greenfield EMCs and Common Facility Centers (CFCs)
- Financial assistance upto 50% of the project cost subject to a ceiling of Rs.50 crore for every 100 acres of land provided as Grant for Greenfield EMC and 75% of the cost of infrastructure, subject to a ceiling of Rs.50 crore provided as Grant for Common Facility Centre.
- State Government incentives are over and above the Central financial assistance.
- Development of EMCs to provide ready infrastructure for industry engaged in electronics verticals and its entire value chain

to set up their manufacturing facilities in EMC.

Status of EMC till December, 2020 is as under:

Under the scheme, MeitY received 50 applications out of which 46 applications were for setting-up of Greenfield EMCs and 4 applications were for setting-up of Common Facility Centers (CFC) in Brownfield Clusters from 19 States across the country. Of these, nineteen (19) Greenfield EMCs and three (3) Common Facility Centers (CFCs) have been approved measuring an area of 3,464 acres with project cost of Rs.3,743 crore including Grant-in-aid of Rs.1,527 crore from Government of India. These EMCs are poised to attract an investment of Rs.52,000 crore and are expected to generate 6.30 lakh employment opportunities in the coming years. The details are as under:

List of Approved Greenfield EMCs

S.No.	State	Location/City
1	Andhra Pradesh	Village-Cherivi, Satyavedu Mandal, Chittoor District
2		Vikruthamala Village, Yerpedu Mandal, Chittoor District
3		Renigunta and Yerpedu Mandal, Chittoor District, Near Airport Tirupati
4	Assam	Bongora (Village), Chayani (Mouza), Palasbari (Revenue Circle), Kamrup (R) (District)
5	Chhattisgarh	Village-Tuta, Sector-22, Naya Raipur, Tehsil-Abhanpur, District- Raipur
6	Gujarat	Village-Tunda, Taluka- Mundra, District-Kutch
7	Goa	Village-Tuem , Taluka- Pernem, North Goa District
8	Jharkhand	Adityapur, Saraikela-Kharsawan District
9	Kerala	Kakkanad Village, Kanayannur Taluk, Ernakulam District
10	Madhya Pradesh	Badwai-Bhopal
11		Purva-Jabalpur
12	Odisha	Infovalley, Bhubaneswar Industrial Area, Khurda District
13	Rajasthan	SPL-1 Salarpur, Khushkhera, Bhiwadi
14		Karoli Industrial Area, Bhiwadi, Alwar District

S.No.	State	Location/City
15	Telangana	E-city, Fab City, Hyderabad
16		Maheshwaram, Ranga Reddy District
17	Uttar Pradesh	Plot No. -1, Block-C, Ecotech-VI Industrial Area, Greater Noida
18	West Bengal	Sector-IV & V, Falta Industrial Centre, P.S. Ramnagar, South 24 Parganas District
19		Naihati town, North 24 Parganas District

List of Approved Common Facility Centres (CFCs)

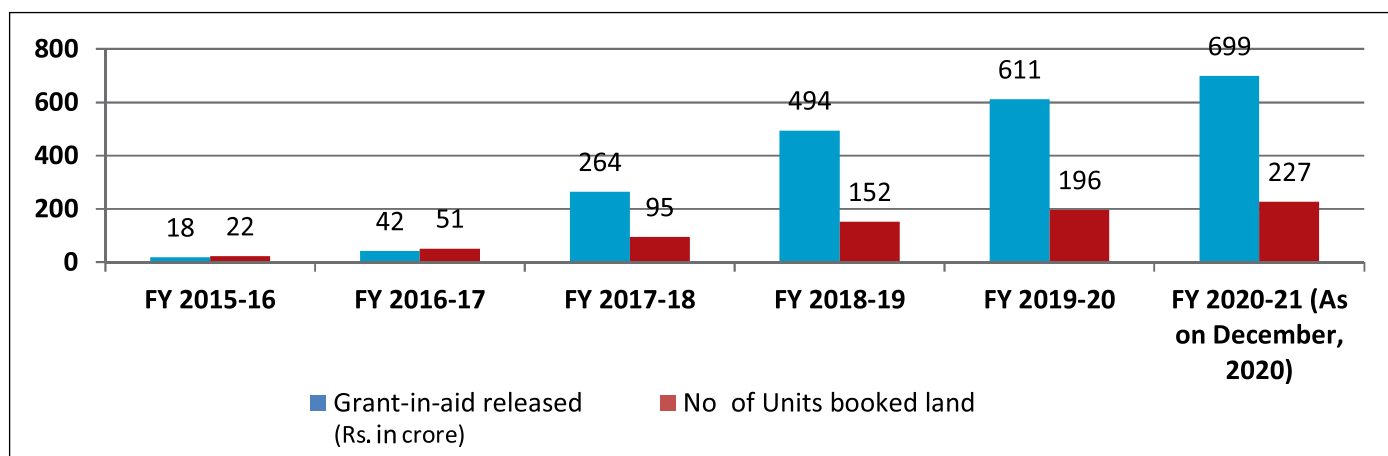
S.No.	State	Location/City
1	Karnataka	Plot No. 336/4 & 336/5, Hebbal Industrial Area, Mysore
2	Maharashtra	Plot No.-P 30, Shendra Five Star Industrial Area, Aurangabad District
3		Plot No. J/P-8, J 462 and J 462/P, Pimpri Industrial Area, Pune

Infrastructure development within these EMCs is underway. In the FY 2020-21 as on 31st December, 2020; Government Grant-in-aid amounting to Rs.87.58 crore has been released. With the said release, cumulative Grant-in-aid amounting to Rs.699.12 crore has been released to fillip the infrastructure development activities.

These EMCs are providing level playing field to electronics industry to start their production activities in the country. Electronics industries are showing their interest to set up their manufacturing operations in these clusters. Till December 2020,

227 companies have reserved about 963 acres of land for setting-up of their manufacturing facilities within these EMCs. Of these, 33 companies have commenced their commercial production with an investment of Rs.5,100 crore in various verticals of electronics segment and have provided employment opportunities to over 17,910 persons. Another 70 electronics manufacturing units have started construction activity and are at various stages of implementation.

Year-wise progress of the EMC scheme is depicted in the table below:



Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme

To provide avenues for expansion and strengthening of electronics manufacturing ecosystem in the country to make India an Electronics Manufacturing Hub; the Ministry of Electronics and Information Technology has notified the Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme on April 01, 2020 with the objective to address the disabilities, by providing support for creation of world class infrastructure along with common facilities and amenities, including Ready Built Factory (RBF) Sheds/Plug and Play facilities for attracting major global electronics manufacturers along with their supply chain to set up units in such clusters.

The scheme provides requisite financial assistance for creation of quality infrastructure along with industry specific facilities like Common Facility Centres, Ready Built Factory Sheds/Plug and Play facilities etc., to encourage investments in the Electronics System Design and Manufacturing (ESDM) sector. This will attract large scale electronics manufacturers to commence their production in the country and act as Anchor units to bring their suppliers in such clusters. It will also ensure greater integration with the global supply chains in electronics manufacturing sector. Salient features of EMC 2.0 Scheme are as follows:

- Scheme entails scope of large area development for electronics manufacturing activity to encompass major electronics players along with their supply chain.
- Provides financial assistance upto 50% of the project cost subject to ceiling of Rs.70 crore per 100 acres of land for setting-up of Electronics Manufacturing Cluster projects and 75% of the project cost subject to a ceiling of Rs.75 crore for Common Facility Centres.
- Minimum land area requirement is 200 acres, (100 acres in case of North-Eastern States, Hill States and UTs)

- Commitment from Anchor Units for having minimum 20% of saleable/leasable area with investment Commitment of Rs.300 crore (10% and Rs.150 crore in case of North-Eastern States, Hill States and UTs)
- Development of most required industry oriented Ready Built Factory (RBF) Sheds and Plug & Play facilities in at least 10% of the saleable/leasable land area.
- Open for new as well as expansion of existing EMCs/CFCs.
- State Government/its agencies, Central PSUs/ State PSUs, Industrial Corridor Development Corporations (ICDCs) or joint venture of such agencies with Anchor units or industrial park developers (existing SPVs in case of expansion of projects) are eligible to apply
- Scheme open for receipt of application for a period of three (3) years i.e. upto March, 2023 and further five (05) years for release of financial assistance to the approved projects.

Under the scheme, till December 2020, MeitY has received 2 applications for setting-up of EMC projects over an area of 1040 acres in States of Haryana and Andhra Pradesh.

3.3 Electronics Development Fund (EDF)

Electronics Design and Manufacturing is a sector which is characterized by high velocity of technological change. Intellectual Property is possibly the most critical determinant of success, not only for the companies of this sector but also to the countries and economies as a whole. Setting up of EDF was one of the important strategies which would enable creating an electronics industry ecosystem in the country. Creating a vibrant ecosystem of innovation, Research and Development (R&D) with active industry involvement is essential for a thriving electronics industry. It is with this objective that an Electronics Development Fund (EDF)

is set up as a “Fund of Funds” to participate in professionally managed “Daughter Funds” which in turn provides risk capital to companies developing new technologies in the area of Electronics, Nano-electronics and Information Technology (IT). This fund is expected to foster R&D and innovation in these technology sectors. EDF enables creation of an ecosystem for providing risk capital to industry to undertake market driven Research and Development in these technology areas. It will, in the process, enrich the Intellectual Property in the country and encourage more entrepreneurs towards product and technology development.

Canbank Venture Capital Funds Ltd. (CVCFL), a 100% subsidiary of Canara Bank, is the Investment Manager and MeitY is the anchor investor of EDF. EDF has drawn Rs.186.33 crore from its contributors, which includes Rs.180.33 crore from

MeitY. A total of around 9 Daughter Funds are expected to avail funding from EDF. The total targeted corpus of these 9 Daughter Funds is Rs.2,626.15 crore and the amount committed by EDF to these 9 Daughter Funds is Rs.409 crore. As on 31st December, 2020, EDF has invested Rs.164.24 crore in seven Daughter Funds, which in turn have made total investments of Rs.697.03 crore in 88 Ventures/Start-ups. Total Funds raised by the supported start-ups of the Daughter Funds of EDF are approximately Rs.6425 crore. Total employment in supported Start-ups was around 12,200. The number of IPs created/acquired by the supported start-ups is 216. The supported start-ups and companies are majorly working in IoT, Robotics, Drones, Autonomous Cars, Health-tech, Cyber Security, Artificial Intelligence/Machine Learning etc.

S. No.	Daughter Fund Name	Amount Invested by EDF (Rs. in crore)	Total Amount Invested by the Daughter Fund in Start-up/ Companies (Rs. in crore)	No. of Investee Start-ups/Companies of the Daughter Fund
1	Endiya Seed Co-Creation Fund	26.35	125.59	12
2	KARSEMVEN Fund	23.48	54.68	12
3	YourNest India VC Fund – II	28.05	82.63	10
4	PI Venture Fund – I	9.47	114.24	12
5	Unicorn India Ventures Fund – I	15.36	63.14	17
6	Aaruha Technology Fund – I	6.75	26.31	12
7	Ventureast Proactive Fund – II	54.78	230.44	13
	Total	164.24	697.03	88

3.4 Compulsory Safety Standards for Electronics

The “Electronics and Information Technology Goods (Requirements for Compulsory Registration) Order, 2012” was notified on 3rd October, 2012 under the Compulsory Registration Scheme notified by BIS under the ambit of the BIS Act, 1986 to ensure the safety of Indian consumers and to curb the

inflow of substandard electronic products. The Order necessitates creation of institutional mechanism for developing and mandating standards and certification for electronic products to strengthen Conformity Assessment infrastructure nationwide. As per the provisions of the Order, before manufacturing, import, sale, stock, etc., of the products notified under the schedule of the Order, the product needs to be registered with Bureau

of Indian Standards (BIS) based on testing of the notified product at BIS recognized laboratories as per the Indian Standards. The registration is granted to manufacturer for manufacturing a product at a particular location. As per the provisions of the scheme, BIS grants registration to the manufacturers and in order to check compliance of the Order, random surveillance is carried out by MeitY. At present, based on the consultation with the stakeholders, 63 products categories have been added to the schedule of the Order in a phased manner and the Order has already come into effect for 44 notified product categories.

The Compulsory Registration Scheme has resulted in high compliance of notified electronic goods with Indian safety standards and more than 25,000 registrations have been granted by BIS to manufacturing units covering approximately 1,25,000 products models/series.

Scheme for setting-up/up-gradation of Electronic Product Testing/Quality Control Laboratories

To strengthen the conformity assessment infrastructure, MeitY notified “Scheme for setting-up/up-gradation of Electronic Product Testing/Quality Control Laboratories” on 25th August, 2013. The objective of the scheme was to encourage setting-up testing facilities by Central/State/Academic Institutions which will be used for evaluating goods under the “Electronics and Information Technology Goods (Compulsory Registration Order) 2012”.

The Scheme was open upto 25th August, 2018. The Programme Review and Steering Group (PRSG) had approved 5 project proposals under the scheme for providing maximum GIA of Rs.1.5 crore. The following project proposals were approved:

- CEC, IIT Madras, Chennai for total GIA of Rs.140 lakh.
- CSIR, Central Institute of Mining and Research (CIMFR), Dhanbad for total GIA of Rs.142.75 lakh.
- MPSEDC, Bhopal for total GIA of Rs.127.50 lakh.

- NRTC, Parwanoo for total GIA of Rs.140.27 lakh.
- Institute for Design of Electrical Measuring Instruments (IDEMI), Mumbai for total GIA of Rs.150 lakh.

3.5 Growth of Electronics Manufacturing Sector

Indian electronics manufacturing industry has undergone major transformation in last few years with a host of initiatives and reforms undertaken taken by the Government of India. The domestic demand for electronics hardware is expected to rise rapidly to about Rs.29,304 crore by 2025. Government has taken several initiatives to promote electronics manufacturing and as a result, domestic electronics manufacturing is on high growth trajectory. Domestic production of electronic goods has increased from Rs.1,90,366 crore in 2014-15 to Rs.5,33,550 crore in 2019-20 at a Compound Annual Growth Rate (CAGR) of 23%. Availability of large domestic market, strong consumerism and availability of skilled talent at low cost have contributed to the growth.

Government attaches high priority to electronics hardware manufacturing and it is one of the important pillars of both “Make in India” and “Digital India” Programmes of Government of India. The Government’s “Make in India” Programme, launched in 2014, was designed to make India a Global design and manufacturing hub by increasing domestic manufacturing and reducing India’s dependence on the services sector, thereby imparting a healthy mix of contribution from all sectors to the Indian economy. Another flagship initiative, “Digital India”, too targets a substantial boost in the domestic manufacturing of electronics and reducing India’s dependence on imports. The intent of the Government is to provide a level playing field for domestic manufacturers, to enable them to compete with imports in the sector by rationalization of tariff structure, simplification of procedures, providing incentives and upgrading infrastructure.

To encourage electronics manufacturing in India, National Policy on Electronics 2019 (NPE 2019) was notified on 25.02.2019. The vision of NPE 2019 is to position India as a global hub for Electronics System Design and Manufacturing (ESDM).

As per the data available, the production, exports and imports of electronic goods for previous 6 years is as under:

(Values in crore)

Subject	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Production*	1,90,366	2,43,263	3,17,331	3,88,306	4,58,006	5,33,550
Imports**	2,29,615	2,68,105	2,87,559	3,40,901	4,01,450	3,85,081
Exports**	38,263	39,064	39,980	41,220	61,908	82,929

*Source: Based on figures shared by Electronics Industry Associations.

**Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S)

CAGR for production from FY14-15 to FY19-20: 23%

CAGR for Imports from FY14-15 to FY19-20: 11%

CAGR for Exports from FY14-15 to FY19-20: 17%

Electronics manufacturing sector has several verticals in terms of its main constituents. The production profile of the Electronics Sector, based on the information provided by various electronic associations, is as follows:

Production of Electronics – Sector Wise (Rs. in crore)						
Item/ Vertical	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21*
Consumer Electronics	55,765	64,742	73,524	77,000	81,000	70,000
Industrial Electronics	45,083	62,214	69,057	80,850	92,200	77,760
Computer Hardware	19,885	20,382	21,401	21,180	21,500	22,000
Mobile phones	54,000	90,000	1,32,000	1,70,000	2,14,000	2,20,000
Strategic Electronics	18,055	20,760	23,562	28,270	32,800	28,864
Electronic Components	45,383	52,099	59,132	67,706	75,800	64,430
Light Emitting Diode (LED) Products	5,092	7,134	9,630	13,000	16,250	14,430
Total	2,43,263	3,17,331	3,88,306	4,58,006	5,33,550	4,97,484

Notes: Data above is as provided by respective Electronic Industry Associations.

Source: 1-CEAMA; 2,5 & 6 - ELCINA; 3 - MAIT; 4 - ICEA; 7 - ELCOMA

*Estimated

Countries across the world are facing serious consequences and damages to the economies due to the COVID-19 pandemic. In its recent forecast, the World Trade Organisation (WTO) indicated a clear fall in world trade between 13 per cent and 32 per cent in 2020, perhaps the highest fall since the Great Depression of the 1930s. Although, India did well to save human lives but the effect of pandemic was felt in the Indian manufacturing sector. Electronics manufacturing sector was more severely affected due to the disruption in the global supply chain initially and subsequently due to lockdown imposed across the country.

In a post COVID-19 business environment, it is imminent for electronics industry to address challenges associated with geographically concentrated manufacturing and supply chain model. Global companies are looking to diversify their manufacturing locations to mitigate the risk. To utilize these opportunities and establish India as a global leader in electronics manufacturing, MeitY has introduced a number of measures including launching of the three flagship Schemes namely, Production Linked Incentive Scheme (PLI), Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECES) and Modified Electronics Manufacturing Clusters (EMC 2.0), which are aimed at “Atmanirbhar Bharat – A self-reliant India” under the aegis of National Policy on Electronics 2019 (NPE 2019):

- Production Linked Incentive Scheme (PLI) for Large Scale Electronics Manufacturing notified vide Gazette Notification No.CG-DL-E-01042020-218990 dated April 01, 2020 shall provide financial incentive to boost domestic electronics manufacturing and attract large investments. The Scheme shall extend an incentive of 4% to 6% to eligible companies on incremental sales (over base year i.e. 2019-20) of manufactured goods including mobile phones and specified electronic components for a period of five

(5) years subsequent to the base year. The scheme will promote large scale electronics manufacturing particularly in the mobile phone segment and contribute significantly to achieving a USD 1 Trillion digital economy and a USD 5 Trillion GDP by 2025.

PLI scheme has been a huge success in terms of the immense interest received from Global as well as Domestic Mobile manufacturing companies. Over the next 5 years, the Scheme is expected to lead to total production of about Rs.11.5 lakh crore. The scheme is also expected to boost exports significantly. Out of the total production, more than 60% is expected to be contributed by exports of the order of Rs.7 lakh crore. The Scheme will bring additional investment in electronics manufacturing to the tune of Rs.11,000 crore. PLI Scheme will also help in promotion of domestic champion companies by reviving Indian Brands and strengthening Indian EMS companies.

- Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECs) notified vide Gazette Notification No.CG-DL-E-01042020- 218992 dated April 01, 2020 shall provide financial incentive of 25% on capital expenditure for the identified list of electronic goods that comprise downstream value chain of electronic products, i.e., electronic components, semiconductor/display fabrication units, ATMP units, specialized sub-assemblies and capital goods for manufacture of aforesaid goods. The scheme will promote development of electronic components manufacturing ecosystem in the country, deepen the electronics value chain and is expected to bring new investments to the tune of Rs.20,000 crore.
- Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme notified vide Gazette

Notification No.CG-DL-E-01042020- 218991 dated April 01, 2020 shall provide support for creation of world class infrastructure along with common facilities and amenities, including Ready Built Factory (RBF) sheds/ Plug and Play facilities for attracting major global electronics manufacturers along with their supply chain to set up units in the country. The Scheme shall provide financial assistance for setting-up of both EMC projects and Common Facility Centres (CFCs) across the country.

The overall impact of these new schemes will be an increase in domestic value addition, creation of National/Domestic Champion Companies and incremental manufacturing of Rs.15 lakh crore and exports of Rs.10 lakh crore, along with employment to more than 10 lakh people in electronics manufacturing sector over next 5 years. There is expected to be further increase in domestic value addition upto 40% due to deepening of value chain and diversification and domestic integration of supply chains.

Consumer Electronics

Consumer electronics encompasses a wide category of electronic products which include televisions, cameras, digital cameras, calculators, DVDs, clocks, audio devices, headphones, and many other home products. As per Indian Brand Equity Foundation (IBEF), Indian appliance and consumer electronics market is expected to reach Rs.1.48 lakh crore (USD 21.18 billion) by 2025. Key drivers for this growth are growing awareness, easier access, changing lifestyle, higher disposable incomes and reduction in the per unit prices.

Television is an important device in the home consumer electronics and has been identified as one of the products for which India can become the global hub for manufacturing. The organized TV

market size was approximately 16.1 million units (valued at USD 3.1 billion) and is expected to grow at CAGR of around 8.5% till 2024-25, as per FICCI. Nearly 12.5 million TV sets were manufactured in India during 2019-20. Globally, the TV market size in 2019-20 was around 229 million units valued at USD 129 billion and is expected to grow at CAGR of 2% unit's wise and 7% value wise. Types of Televisions available today in the market cover a wide range of LCD/LED/QLED TVs which offer sharper, higher resolution pictures. With the decreasing trend in the prices of LCD/LED televisions, the penetration of these TVs is increasing significantly.

Some of the initiatives taken by the Government to promote domestic manufacturing include increasing the Basic Customs Duty (BCD) on several consumer electronic goods to encourage companies to substitute imported goods with domestically manufactured goods, permitting 100% FDI in the consumer electronics manufacturing sector via direct route and providing CapEx subsidy under the Modified Special Incentive Package Scheme (M-SIPS), etc., Due to these efforts, foreign companies were encouraged to set up manufacturing facilities in the area of consumer electronics without the need to establish a joint venture or some other form of partnership with a domestic entity. In distributing consumer electronic goods to their end users, however, a local partner is both legally and practically required.

Industrial Electronics

Industrial Electronics can be classified on the basis of segments viz Power Electronics, DC/AC converters, Material handling and Industrial Robots. The key application segments of the Industrial electronics industry are process control equipment, test and measuring equipment, power electronics equipment, automation and analytical instruments. These technologies are gaining ground as modernization, automation and robotics would play an important role in the modern industry. The

Industrial electronics sector is witnessing growth due to enhanced digitization and Robotics applications in Industry 4.0. Additionally, the impetus on Smart Cities and IoT will bring a whole new focus and demand for smart and automation electronics.

Increasing focus on the use of renewable power sources across the globe and growing adoption of power electronics in the manufacturing of electric vehicles are the major factors driving the growth of the power electronics market. Power electronics space in India is dominated by unorganized regional players, which is expected to grow at higher rate due to huge demand and low penetration. Inverters and UPS are also becoming household items driving the growth of this segment. Some of the Indian players have set up global tie-ups over the last few years and have brought in newer technologies into the Indian industry. Solar Photovoltaic and allied equipment is another segment which is likely to grow at a sustained high growth rate.

Industrial electronics is an empirical barometer of overall growth in the contribution of the manufacturing sector in the economy. The spurt in investments due to the "Make in India" Programme is bringing significant interest in engineering, electrical, automotive and electronics segments, which are the driving force behind the growth of Industrial Electronics sector. In future, M2M (machine-to-machine and machine-to-man) communication modules driven by Industry 4.0 activities will drive the growth of the Industrial electronics segment.

Information and Communication Technology (ICT) Hardware

The very first application of electronics was in the domain of communication and computing. With the emergence of the Integrated circuit, the world saw the advent of the digital computer era. With the advent of the microprocessor in the 1970's, the world saw an exponential growth of the Information and Communication Technology (ICT) industry.

The Digital Infrastructure of a nation and its Internet is an outcome of the evolution of ICT. Such is its strategic importance that countries across the world have declared it as an essential commodity.

ICT in the context of the hardware industry encompasses Computers, Storage, Datacom, Office Automation Hardware and Operating systems. It involves the design of the Semiconductors, the Design of products, the manufacturing of hardware and the development of their operating systems.

With its pool of technical manpower, its proven capability as a design center for most of the global hardware companies, the country is all ready to emerge as an end to end player and global leader in the ICT hardware design and manufacturing space. To achieve this, Government of India is putting in place the right economic policies to incentivize ICT manufacturing to compete with other Asian economies.

India has a huge opportunity (to the tune of USD 100 billion annually) arising from both Import substitution and Export led manufacturing in the space of ICT hardware. In addition, ICT hardware holds the promise of high value addition in India, with the manufacturing of the Components (i.e. sub-assemblies of ICT Products), Product design and Semiconductor design being done in the country.

Emerging domains like AI, ML and IoT are becoming the new driving forces behind the growth of ICT Hardware segment. These domains require the design of specialized Semiconductors, Sensors and Servers for which India has the capability. Another emerging domain in ICT hardware is the Large-Scale Data Centers. India with its technical prowess, cheap labour, large pool of manpower, English as the working language, has the opportunity to lead the world in all these domains.

Year 2020 has seen a rise in demand for ICT hardware arising out of work from home and the need to be connected remotely due to the COVID-19

pandemic. Individual consumers have bought computers and tablets, enterprises have invested in their data center infrastructure (to service the work from home, online B2B dealings) and the Telecom service providers have been upgrading their infrastructure to cater to the increased broadband demand.

The newly released National Education Policy 2020 will promote the use of ICT in education towards building India's next generation of skilled manpower and narrow the digital divide in the nation.

Mobile Phones

India has become the second largest mobile phone manufacturing nation globally in volume terms. India has also become the second largest smart phone market in the world and is also the fastest growing smart phone market in the world. Production of mobile phones has gone up from 6 crore units valued at Rs 19,000 crore in 2014-15 to 33 crore units valued Rs.2,14,000 crore in 2019-20 thus making the domestic manufacturing of mobile phones and their sub-assemblies/parts and components as one of the flagship sectors under the "Make in India" initiative of the Government. Most of the major brands (both foreign and Indian) have set up the manufacturing plants or have sub contracted their mobile handset manufacturing to Electronic Manufacturing Services (EMS) companies. For the first time ever in 2019-20, the domestic production of mobile phones was more than the domestic demand and the export of mobile phones contributed to about 25% of the total electronics export.

MeitY had introduced the Phased Manufacturing Programme (PMP) for cellular mobile handsets and related sub-assemblies/parts manufacturing with the objective of progressively increasing the domestic value addition for establishment of a robust cellular mobile handsets manufacturing eco-system. As a result of implementation of the

PMP, the mobile handset manufacturing has steadily moved from Semi Knocked Down (SKD) to Completely Knocked Down (CKD) level.

To attract large-scale investments, Government of India successfully launched its flagship Production Linked Incentive Scheme (PLI) on April 01, 2020 which would entail companies an incentive of 4% to 6% on incremental sales (over base year) involved in mobile phone manufacturing and manufacturing of specified electronic components, including Assembly, Testing, Marking and Packaging (ATMP) units. There is indeed a tremendous potential in mobile phones manufacturing eco-system for the nation in future in terms of employment generation, value addition, forex savings, ability to transform the socio-economic identity of citizens and contribution in uplifting the economy, etc.

The industry is shifting from import substitution to large-scale manufacturing and exports. With the PLI applications already in place, export worth Rs.7 lakh crore is expected over the next 5 years.

Strategic Electronics

The Strategic Electronics segment consists of Military Communication Systems, Radars and Sonars, Network Centric Systems, Electronic Warfare Systems, Weapon Systems, Satellite based Communication, Navigation and Surveillance systems, Navigational Aids, Underwater Electronic Systems, Infra-Red (IR) based Detection and Ranging System, Disaster Management System, Internal Security Systems, etc.

India has the second largest armed force in the world, and is considered the seventh largest Aerospace and Defence (A&D) market globally with a sizeable budget to cover the needs of the country's Army, Navy and Air Force. Large scale modernization of the defence forces and the drive to manufacture locally have become focus areas of the Government. Emerging technologies are going to reshape modern day warfare and will harness

the power of electronics to do so. This will make the Indian strategic electronics sector, mainly comprising Aerospace and Defence, a vibrant industry over the next decade. The defence sector in the country has been growing at a modest pace for the past few years, however, it is the strategic partnership model in defence production that will boost the Make in India programme to a great extent. The concept of import substitution is being gradually accepted by stakeholders.

The next decade is likely to see exponential growth in combat systems as well as non-platform based programmes, facilitating smart battalions. Therefore, there are opportunities for electronics manufacturing in India in both standalone systems (as part of platforms) as well as at a sub-system level. Key factors that will influence growth are:

- The modernization of weapon platforms
- The induction of state-of-art weapons by the armed forces
- The impact of indigenisation and the Make in India programme

Electronic Components

According to Global Industry Analyst Inc., the global market for electronic components is expected to reach USD 191.8 billion by 2022, of which the Asia Pacific region is going to capture a dominant share. Following this global trend, the Indian electronic components market is also poised to grow significantly. According to Electronic Industries Association of India (ELCINA), the demand for the Electronic Components increased from USD 11 billion in 2015-16 to USD 25.3 billion in 2019-20 (excluding the Imported PCB-Assemblies). Mobile Phones, Consumer Electronics and Industrial Electronics account for the major demand (about 82%) for electronic components in India. This is followed by the demand of electronic components in computer hardware, strategic electronics and lighting industry sector. Industries like Mobile

Phones, Industrial Electronics (due to the advent of EVs) and Strategic Electronics are expected to witness substantial growth in the near future.

Government of India launched the Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS), notified vide Gazette Notification No.CG-DL-E-01042020-218992 dated April 01, 2020 and this scheme provides financial incentive of 25% on capital expenditure for the identified list of electronic goods that comprises downstream value chain of electronic products, i.e., electronic components, semiconductor/display fabrication units, ATMP units, specialized sub-assemblies and capital goods for manufacture of aforesaid goods. Apart from SPECS, the other policies of Government of India which would boost the production of electronic components include rationalization of tariff structure, Phased Manufacturing Programme (PMP), and notification of electronics products under the Public Procurement (Preference to Make in India), Order 2017. Under the umbrella of “Make in India” programme, Basic Customs Duty (BCD) has been imposed increased on Printed Circuit Board (PCB) Assembly of Mobile handsets with the intension to strengthen the domestic EMS and components segment in India. Production Linked Incentive Scheme (PLI) for Large Scale Electronics Manufacturing is also supporting manufacturing of specified electronic components.

The Electronics Manufacturing Services (EMS) industry in India is growing rapidly and key global players as well as a number of domestic companies are operational in the country. A strong components manufacturing base is essential for a sustainable Electronics System Design and Manufacturing (ESDM) ecosystem in India. This segment needs very high efficiency of operations to stay profitable. Availability of components and an effective supply chain is vital for EMS companies for their growth.

Light Emitting Diodes (LEDs) Products

The lighting infrastructure in India is evolving rapidly through the replacement of conventional products and LED lighting is extensively used now in a wide variety of domestic and industrial products ranging from screens and walls to ceilings. LED lighting offers multiple benefits over other types of lighting systems including energy efficiency, cost-saving, longer life, lower heat emission, etc., Demand for the LED lighting market in India has been majorly driven by Government initiatives such as Unnat Jyoti by Affordable LEDs for All (UJALA) and Street Lighting National Programme (SLNP), Smart City project, housing for all, etc., Under the SLNP, Government aims to replace over 1.34 crore conventional street lights in India. Further, with the decline in average selling price of chips and components, the manufacturing cost of LEDs has declined significantly and has resulted in the growth of LED market. Opportunities for LEDs have emerged in sectors like automotive, communications, signalling, and entertainment.

Global LED lighting market was approximately USD 81 billion in 2019 and is expected to grow to approximately USD 127 billion by 2027 at CAGR of 13.4%. Asia Pacific region is expected to grow at CAGR of 14.6% in the same period. (Source - Report by Grand View Research, Inc). The Indian LED lighting market stood at USD 918.70 million in 2016 and is expected to reach USD 3.76 billion by 2022 with a projected CAGR of around 24% (Source- A report from TechSci Research, a global research-based consulting firm).

Indian LED lighting industry is assembling LED lighting products in India and is dependent on import of chips and electronic components which are not manufactured in India.

Automotive Electronics

Automotive Electronics are electrically operated systems integrated and mounted in several

vehicle applications such as body electronics, safety systems, and infotainment. The automotive market demand is experiencing trends related to advanced mobility solutions, powertrain and vehicle system electrification and advanced safety systems. Due to the increased implementation of these systems in vehicles, the penetration of automotive electronics has also increased, creating further demand for automotive electronics products across the globe. The digitization of automotive systems by including connected technologies, in-vehicle communication, and automated systems have created several opportunities for market growth. The growing integration and adoption of Automotive Electronics in modern vehicles to deliver enhanced safety and comfort to consumers is one of the major factors driving the growth of automotive electronics industry. Several features offered by Original Equipment Manufacturers (OEMs) including Automated Emergency Braking (AEB) system, airbag system, and lane departure warning, etc., have significantly reduced road accidents worldwide. Automotive electronics along with the presence of broad computing technologies and connected features are enhancing automobile capabilities. Alcohol ignition interlock, accident data recorder system, and emergency call system are some of the features which will further propel the growth.

According to Allied Market Research, the global Auto electronics market is estimated to reach USD 382 billion by 2026, growing at a CAGR of 7.3 per cent from 2019 to 2026. In 2019, the global automotive electronics market was about USD 228.34 billion. On the components front, the microcontrollers segment accounted for the largest share of the global automotive electronics market, contributing to more than one-fourth of the total market in 2019.

Automotive Mission Plan 2016-26 targets India to be among the top three in the world for engineering,

manufacturing and export of vehicles and auto components. The growing presence of global automobile Original Equipment Manufacturers (OEMs) in the Indian manufacturing landscape has significantly increased the localization of components in the country. India has become the preferred designing and manufacturing base for most global auto OEMs for local sourcing and exports.

The introduction of autonomous or driverless cars that offer a self-driven experience to the user along with the launch of cost-efficient electric vehicles with enhanced features is driving the growth of the market. Furthermore, a shift toward hybrid and luxury vehicles equipped with in-vehicle entertainment devices offering a more sophisticated and interactive user experience is further augmenting the demand for automotive electronics.

Medical Electronics

Designing, implementation and use of electronic components, devices and equipment for medical or healthcare purposes, comes under the field of medical electronics. Some of the important applications of medical electronics are in the field of research, examination, diagnosis, treatment, assistance and care, to name a few.

Indian medical devices market is among the top twenty in the world by market size, and fourth in Asia after Japan, China and South Korea. The Government has taken various regulatory steps to promote this sector and has created excellent opportunities for the domestic manufacturers, thereby reducing the dependence on imports. Medical devices industry in the country is dominated by multinationals that controls about 75-80 per cent of the Indian market. Further, more than 80 per cent of domestic manufacturers are in the small-scale sector and have a turnover of less than INR 10 crore. Also, more than 6,000 types of medical devices are

in use worldwide, but India manufactures just one-sixth of these Medical devices.

A Production Linked Incentive (PLI) Scheme for promoting domestic manufacturing of medical devices, including medical electronic devices and a Scheme for promotion of medical device parks have been notified by the Department of Pharmaceuticals on 28.05.2020.

Exports

India's electronics export for the year 2019-20 was 3.74% of India's total export, for the same period. As per DGCI&S data, export of electronic goods has increased from Rs.61,908 crore (USD 8.8 billion) in 2018-19 to Rs.82,929 crore (USD 11.7 billion) in 2019-20, exhibiting an Y-o-Y growth of 34% over previous year. However, the export of electronic goods for the year 2020-21 (April-October) is Rs.37,547 crore (USD 5 billion), exhibiting de-growth of 19% over last year, for the same period, due to the COVID-19 pandemic.

Government has taken several measures for the growth of the exports of electronics hardware sector. Special Economic Zones (SEZs) set up to enable hassle-free manufacturing and trading for export purposes and Electronics Hardware Technology Park (EHTP) units are the major contributors to exports.

Imports

As per DGCI&S data, import of electronic goods has decreased from Rs.4,01,450 crore (USD 57.4 billion) in 2018-19 to Rs.3,85,081 crore (USD 54.4 billion) in 2019-20, exhibiting an Y-o-Y decline of 4% over previous year. Import of electronic goods for the year 2020-21 (April-October) was Rs.2,13,017 crore (USD 28.6 billion), exhibiting a de-growth of 13 % over last year, for the same period.

It is also seen that growth rate of imports of finished goods have declined and that of electronic components have grown up indicating setting-up

of manufacturing units of electronic products in the country.

3.6 Public Procurement (Preference to Make in India) Order 2017

The Government has issued Public Procurement (Preference to Make in India) Order 2017 [PPP-MII Order 2017] vide the Department for Promotion of Industry and Internal Trade (DPIIT) Order No.P-45021/2/2017-B.E.-II dated 15.06.2017, as amended by Orders dated 28.05.2018, 29.05.2019, 04.06.2020, and 16.09.2020 to encourage 'Make in India' and promote manufacturing and production of goods and services in India with a view to enhancing income and employment.

In furtherance of the aforesaid Order, Ministry of Electronics and Information Technology (MeitY) vide Notification No. W-43/4/2019-IPHW-MeitY dated 07.09.2020 has notified the mechanism for calculating local content for 13 electronic products viz., (i) Desktop PCs, (ii) Thin Clients, (iii) Computer Monitors, (iv) Laptop PCs, (v) Tablet PCs, (vi) Dot Matrix Printers, (vii) Contact and Contactless Smart Cards, (viii) LED Products, (ix) Biometric Access Control/Authentication Devices, (x) Biometric Finger Print Sensors, (xi) Biometric Iris Sensors, (xii) Servers, and (xiii) Cellular Mobile Phones.

MeitY has also notified Cellular Mobile Phones under clause 3(a) of the PPP-MII Order which mandates public procurement of Cellular Mobile Phones from local suppliers only.

3.7 Development and Implementation of Indian Conditional Access System (iCAS)

Conditional Access System (CAS) is a system used to limit the access of TV signals to only authorized viewers and forms an integral part of Set Top Boxes (STBs). A major impediment in design and development of domestic STBs was identified as the CAS license. Therefore, the need as well as an opportunity was felt to develop

Indian CAS (iCAS) for boosting the development and manufacturing of STBs in the country. MeitY, through a novel PPP model, has funded a unique project for the development and implementation of Indian Conditional Access System (iCAS) for Set-Top Boxes (STBs). In November, 2014, M/s. ByDesign India Pvt. Ltd., Bangalore, was selected and awarded the task for development and implementation of iCAS, in association with Centre for Development of Advanced Computing (C-DAC), with technical specifications that are best in class.

The Development Stage of iCAS was successfully completed in November, 2015, within the specified time limit. The development of iCAS has enabled India to enter a niche market hitherto dominated by few big global companies. The iCAS is available to domestic STB manufacturers at a price of USD 0.5 per license for a period of three years, as against market price of USD 3-5 per license for other competing products. The implementation of iCAS in the cable networks is under implementation. The solution has been well received by Indian Operators at large. Over 18,00,000 STBs with iCAS have been deployed with more than 200 cable operators in the country. Doordarshan has also adopted iCAS for its Free Dish DTH Platform, thus giving thrust to 'Make-In-India' initiative. About 31,000 iCAS enabled DD free Dish STBs have been deployed.

3.8 National Policy on Electronics (NPE) 2019

The National Policy on Electronics 2019 (NPE 2019) has been formulated to reflect the new aspirations, requirements and realities of the electronics manufacturing sector in the country and the emerging international dynamics. The aim of NPE 2019 is as follows:

- NPE 2019 aims to increase domestic value addition and combining potential of both domestic demand and export with the aim to make India a global hub of electronics

manufacturing. The NPE 2019 is focused on promoting an eco-system of manufacturing (group of industries) which form supply chain of a product as against the emphasis of existing policy on promoting individual industries. The policy shall promote generation of Intellectual Property in India and deepening of the domestic research, development and designing capabilities.

- NPE 2019 also envisages intervention in emerging sectors of electronics like IoT, 5G equipment, Sensors, drones, additive manufacturing (3D printers), robotics, etc., and promoting their R&D and manufacturing. Among the sectors, Medical Electronics, Strategic Electronics, Auto & Power electronics have been especially identified as thrust areas for promoting manufacturing in India.
- The NPE 2019 has set a target of production of electronics goods worth USD 400 billion in India by 2025.
- Concept of trusted value chain in electronics has been introduced, which will help in addressing concerns related to cyber bugs and data thefts from our equipment. There is also focus on skilling, re-skilling and employment generation.
- To provide the supportive environment, NPE 2019 envisages extending the Phased Manufacturing Programme (PMP) to products other than mobile phones, maintain a progressive duty regime and incentivize industry to compensate for disabilities as compared to other manufacturing economies. The NPE-2019 will also enable India to take advantage of the global shifts in electronics manufacturing locations.
- NPE 2019 has ushered in a slew of new incentive schemes. Prominent among these are Production Linked Incentive (PLI) Scheme

for Large Scale Electronics Manufacturing, Scheme for Promotion of manufacturing of Electronic Components, Semiconductors (SPECS)–and Electronics Manufacturing Clusters (EMC 2.0) Scheme.

3.9 Centre of Excellence in Electronics and ICT Application

3.9.1 National Centre of Excellence for Large Area Flexible Electronics (NCFlexE)

The project for setting-up of National Centre of Excellence for Large Area Flexible Electronics (NCFlexE) at IIT-Kanpur was approved in November, 2014 with a project cost of Rs.132.99 crore, including Government Grant-in-aid of Rs.111.12 crore. The main objective of the NCFlexE centre is to establish a research programme to engage in leading edge research in large area of flexible electronics and build strategic academic collaborations to address requirements through joint technology developments, to realize home grown technologies for manufacturing. Overall objective of NCFlexE is to spur development of ecosystem for flexible electronics in the country. The Centre has been mandated to develop technology prototypes, in PPP mode through industry collaborations. The centre is also expected to incubate start-ups, commercialize products and executing technology transfer of innovative prototype models in collaboration with start-ups and other industries in the field of Flexible electronics over a period of 5 years. The duration of the project has been extended upto November, 2021.

3.9.2 National Centre of Excellence in Technology for Internal Security (NCETIS)

The project for setting-up of National Centre of Excellence in Technology for Internal Security (NCETIS) at IIT-Bombay has been approved on 28th May, 2015 to address the challenges of homeland security and to develop state-of-the-art

technologies which are vital for the national security agencies for providing rescue and relief operations with the indigenously developed technologies/products. The project is being setup at a cost of Rs.83.89 crore funded by Government of India. The project is envisaged to set up the required infrastructures and carrying out R&D activities for developing prototype model, commercialization and technology transfer of multiple products over a period of 5 years. The duration of the project has been extended upto March, 2021.

3.9.3 Next Generation AMOLED Displays, OLED Lighting and OPV Products

The project for setting-up of Next Generation AMOLED Displays, OLED Lighting and OPV Products at IIT-Madras was approved in July, 2018 at a cost of Rs.35.63 crore including Government Grant-in-aid of Rs.28.68 crore. The objective of the project is to collaborate with stakeholders to develop next-generation, state-of-the-art, high-volume and cost effective electronic components based on organic devices to address requirements through joint technology developments, to realize indigenous technologies for manufacturing. This project will develop prototypes of AMOLED displays for mobile products, OLED lighting panels, and lightweight OPV devices.

3.9.4 Centre of Excellence in Medical Electronics and Bio-Physics

National Centre of Excellence on Medical Electronics and Bio-Physics is being set up at the Andhra Pradesh MedTech Zone Limited (AMTZ), Visakhapatnam with a total outlay of Rs.32.02 crore over a period of three years. Out of the total outlay, Rs.18.67 crore will be funded by MeitY. The project is being implemented by the Kalam Institute of Health Technology (KIHT), AMTZ. The project has been conceptualized to strengthen the medical electronics devices manufacturing eco-system in the country with suitable innovations, import

substitution and value addition, etc., The Centre of Excellence (CoE) is envisaged to provide functional research support to design and prototyping for manufacturing, conduct R&D for manufacturing of electronics and integration of components to make functional critical parts (assembly/sub-assembly) for medical devices, carrying out Bio-Physics research such as Bio-Organs/Electro-organs, etc., and research and prototyping of key electro-potential based components, etc.

3.10 Investment Promotion to Attract Investment in the ESDM Sector

3.10.1 Coping up with the Challenges of COVID-19

The virus outbreak in China in early part of the year manifested itself as disruption in global supply chains of electronics that are dependent on China to a large extent. There was depletion of inventories of electronics manufacturers in India in the months of January and February led to shortfall in production.

As the severity of the pandemic increased in end of March, discussions were being held to explore sources of import of such components from other countries. Industry associations were advised to organize buyer-seller meets to explore such avenues.

MeitY was in constant touch with the ESDM industry and feedback was being taken to understand the impact of outbreak of COVID-19 pandemic on the electronics hardware sector in India and take appropriate measures to mitigate any adverse impact on the electronics hardware sector in India. It was understood that too much dependency on a single country for sourcing electronics goods is a cause for concern. Based on this understanding, short to medium-term and long-term actions to mitigate the impact of COVID-19 outbreak in China on electronics hardware sector in India were finalized. It was decided to take steps to broad base the sources of electronics hardware imports in India

while promoting indigenous production at the same time in order to reduce dependency on a single market/geographical region so that any sudden/ abrupt/unforeseen event does not cause any large-scale shortage of inventory in the Indian market.

In the medium and long-term perspective, companies were being encouraged to set up electronic components manufacturing in the country by offering them suitable incentives through schemes such as PLI, SPECS and EMC 2.0.

Nation-wide lockdown that was imposed on 23rd March, 2020 led to a halt in all production activities, including electronics manufacturing, with an exception of few companies which were manufacturing electronics components for essential medical equipment like ventilators.

During the period of lockdown, following measures were taken:

- Extensive interaction with the ESDM sector to check the status of their global supply chain and other operational issues. It was learnt from the interaction that the industry was of the opinion that IT Hardware should be added into the list of essential goods as during the lockdown this was the required medium through which people could work remotely across all sectors.
- A recommendation was made to the Ministry of Home Affairs (MHA) which was accepted. MHA issued Order No.40-3/2020-DM-I(A) dated 15th April, 2020, giving consolidated guidelines on the measures to be taken by Ministries/Departments of Government of India, State/UT Governments and State/UT authorities for containment of COVID-19 in the country. This included providing relaxation for activities pertaining to “Manufacturing of IT Hardware” in certain areas where the disease spread was under control. Based on such instructions, 20% to 30% of electronic

manufacturing operations could be resumed by taking approvals from respective State and local authorities.

- The Standard Operating Procedures (SOP) as per directions from MHA were developed by the Ministry in conjunction with industry bodies. These SOPs have been made to cover aspects like social and physical distancing norms, regulation of entry and exit of personnel, regular monitoring of health of employees, transport management, canteen operations, disinfection operations, awareness generation, etc., These measures are aimed at gradual and sequenced approach to restarting the operations and resuming economic activity, along with adoption of prevention and containment measures.

3.10.2 Promotion of the PLI, SPECS and EMC 2.0 Schemes

Three new schemes, namely, PLI, SPECS and EMC 2.0 were launched on the 1st April 2020 and aggressive promotional activities were started. Online meetings were organized with individual companies where presentations on the three schemes were made. Particular focus was given to the PLI scheme as the scheme was open only till the 31st July, 2020.

In addition to companies, online meetings and webinars with Indian embassies in other countries, foreign embassies in India, Industry associations viz, MAIT, IESA, ELCINA, ELCOMA, FICCI, CII etc., consulting companies, multinational banks, foreign industry associations in India viz., European Business and Technology Centre, etc., were conducted to promote the three schemes.

Individual meetings with over 100 companies at various levels including Secretary, Joint Secretary, Senior Director and other senior officials of MeitY were held towards this focused and strategic outreach initiative.

As a result of this outreach exercise, the PLI scheme got a tremendous response from the industry. After the PLI Scheme application period was over, focus was shifted to aggressive promotion of the SPECS Scheme. Companies manufacturing electronics components across all sectors viz., Automotive, Consumer Electronics, Medical Electronics, Strategic Electronics, etc., have been approached and informed about the Scheme.

3.10.3 State and National Level Webinars

Various outreach events were organised with participation of States for promotion of the Schemes and incentives being offered by the State Governments to companies who choose to start operations in the particular State.

The schemes of the MeitY (Central Government) are not linked to the incentives provided by the State Governments and the companies would be able to take benefit of both the Central and State Government incentives, simultaneously.

3.10.4 International Webinars

Outreach events were mostly planned in association with the Indian Cosulates/Embassies/ High Commissions in other countries. To promote the three schemes launched by MeitY, webinars were organised with the Indian Embassy in Japan, Indian Embassy in South Korea, Indian Embassy in the USA, India-Taipei Association in Taiwan, European Union, etc.

In addition, webinars were also conducted with partners like Citibank and HSBC for their ESDM clients across the globe.

3.10.5 Handholding and Facilitation for Investors to Attract Investment in ESDM Sector

The outreach event planned was very strategic and focused. A proper study of the ESDM market was done and the target companies were approached.

The key decision makers in these companies were identified and they were reached out through various sources. Meetings at multiple levels (Secretary, Joint Secretary, Senior Directors and other senior officials of MeitY) were conducted and the cooperation and intervention at levels from the Government of India was assured to them. Any issues which the company might be facing were dealt with agility and with a focus to solve the bottleneck in the shortest possible time. To name a few, issues with visa facilitation and approval of engineers travelling to India to commission a new

plant during the lockdown, registration of companies at a very short time to be eligible to apply for the PLI scheme, land issues involving the State industrial development bodies, etc., were dealt with.

3.10.6 Social Media Participation

To reach out to all ESDM stakeholders, all the events, webinars were widely promoted on twitter through the official handle (@Electronics_GoI) of the Industrial Promotion – Electronics Hardware Manufacturing (IPHW) Division of MeitY.

Make in India: **Software and Services**



With the Government's outlook on Digital Diplomacy, Digital Economy and launch of Digital India Programme, this Ministry has been synergized its efforts to expand IT/ITeS sector globally including diversification of to geographies, domain expertise, High Skill Work Forces to enhance business opportunities. Efforts have also been made to evolve strategic cooperation with potential foreign partners in emerging and frontier areas of Information and Communication Technology under bilateral and multilateral framework of cooperation. The Ministry regularly engages with various Governments including academic and industrial bodies for forging partnerships for mutual progress, also provide an opportunity for sharing of knowledge and experience. The International Cooperation Division has been involved in the following tasks:

- Aligning foreign collaboration activities in India's 'Digital India Program' and 'Make in India' initiatives of the Government of India.
- Strengthen India's position on multilateral forums for the different issues like e-Commerce, Digitalization, Digital Divide, Digital Government, Digital Infrastructure and Gender Divide etc.,
- Creating a conducive environment for international cooperation to help industries to cooperate with the industries of other countries.
- Fostering, encouraging and promoting research and development in the application of Information Technology related facilities.
- Coordinating technical and policy issues with international bodies/institutions like G20, UN & its associated organizations (UNESCO, UNCTAD, UNDP, ECOSOC, ESCAP etc.), ASEAN, SCO, BRICS, SAARC, WSIS, World Bank, WTO, ADB, World Economic Forum (WEF) etc., to safeguard India's interest.

- Initiating joint projects like IT institutes, software parks, programmes for joint R&D and facilitating IT Advisers etc.
- Showcasing India's ICT strength across the globe by organizing, sponsoring and participating in trade fairs, symposiums, exhibitions etc.

The International Cooperation Division of this Ministry has been pursuing the above objectives through Memorandum of Understandings (MoUs), Joint Working Groups (JWG) meetings, Multilateral deliberations/negotiations, Projects in other geographies/countries, participating in major International events to showcase India's strength and enhance business opportunity for Indian IT/ Software Industry. Also, issues faced w.r.t India's IT exports and mobility of Indian IT professionals have been handled at various bilateral and international forums from time to time.

4.1 BPM Industry Promotion

MeitY is working towards the vision of Digital Inclusion and to create new opportunities in the digital economy India BPO Promotion Scheme (IBPS) and North-East BPO Promotion Scheme (NEBPS) have been initiated in 2015 under IT for Jobs pillar of Digital India Programme. These schemes aim to incentivize setting-up of BPO/ITeS operations across the country, particularly in small towns/cities, to create employment opportunities and promote dispersal of the industry for balanced regional growth. A total of 48,300 seats under IBPS and 5,000 seats under NEBPS were planned. The duration of IBPS was up to 31.03.2019 while NEBPS was up to March 2020, however disbursement of financial support may continue beyond this period. Under IBPS, Seat distribution to States and UTs was based on population as per 2011 Census. The outlay of the Scheme is Rs.493 crore (IBPS) and Rs.50 crore (NEBPS).

Salient Features

- **Financial Support:** These schemes provide financial support up to Rs.1 lakh per seat in the form of Viability Gap Funding (VGF) towards Capital and Operational expenses for a period of 3 years.
- **Special Incentives:** These schemes also provide special incentive for promoting local entrepreneur, employment to women and physically challenged persons, setting-up operations at other than State capital, and providing employment beyond target.
- **Effective Implementation:** To ensure transparency and smooth implementation of these schemes processes, such as, bidding, reporting, monitoring and disbursement are made completely online and done through dedicated Web Portal www.ibps.stpi.in and www.nebps.stpi.in which are one stop web portal to know bidding details, status, news, alerts and other related information regarding India BPO Promotion Scheme (IBPS) and North-East BPO Promotion Scheme (NEBPS). These web portals also provide special login for bidders to submit progress report, raise disbursement requests related to financial support and special incentives etc.
- **Focus on Employment generation through IT/ITES:** The disbursement of financial support under these schemes is directly linked with the outcome i.e. employment generation.

Location of BPO/ITeS Units under IBPS and NEBPS

Some of the Operational Units are at:

Patna, Muzaffarpur, Raipur, Shimla, Sagar, Bhubaneswar, Cuttack, Jaleswar, Kottakuppam, Bhaderwah, Budgam, Jammu, Sopore, Srinagar, Aurangabad, Bhiwandi, Sangli, Wardha, Bareilly, Kanpur, Varanasi, Guwahati, Jorhat, Kohima,

Imphal, Madurai, Mayiladuthurai, Tiruchirappalli, Tiruppattur, Vellore, Karimnagar, Tirupati, Guntupalli, Rajamundry.

Impact

Dispersal of Industry: Growth of IT/ITES sector in India has traditionally remained confined to a few select urban clusters. BPO Promotion Schemes have facilitated in expanding the base of IT/ITeS industry and creation of employment opportunities beyond metros. Under IBPS and NEBPS, over 250 units have set up at more than 100 locations distributed across 28 States/UTs providing direct employment to over 39,000 persons.

Journey towards Digital India through Bridging the Digital Divide: The NEBPS and IBPS were launched in 2015 and 2016 respectively. As the location of BPO/ITeS operations is client driven, and the metro cities were excluded from these schemes, the industry response to these schemes was not very encouraging at the beginning but gained momentum over the period of time. The BPO/ITeS units in Tier-II/III cities are changing the digital profile of the nation by creating job opportunities in ITeS sector and developing the ecosystem for the dispersal of IT industry.

- **Empowerment and Inclusion of Marginalized Groups of the Society:** The schemes encourage employment to women and differently-abled persons. Under these schemes, special incentives have been provided to the units encouraging employment to women, and specially abled persons. Out of the total employment provided by BPO/ITeS units under these schemes, around one-third are women.
- **Jobs Opportunities near Home with the Ease of Living:** The BPO/ITeS units starting in Tier-II/III locations are providing job opportunities to the youth near their home which would reduce the migration to metros

and lower the attrition rate. The BPOs in small towns and cities are providing services in local languages, which would create employment opportunities for the local youth and services provided in local languages that results in better customer satisfaction.

North-East BPO Promotion Scheme (NEBPS)

Government had also launched North-East BPO Promotion Scheme (NEBPS), under Digital India Programme, to incentivize setting-up of 5,000 seats BPO/ITeS Operations in North-East Region (NER), create of employment opportunities for the youth and growth of IT/ITeS Industry. NEBPS provides similar financial support as IBPS with outlay of Rs.50 crore. Under NEBPS, 17 companies have been selected to set up 20 BPO/ITES units spread across the 6 States of NER, namely, Assam, Nagaland, Meghalaya, Manipur, Arunachal Pradesh and Tripura. Out of these, 12 units are operational providing initial employment to about 650 persons. Further details of the scheme are available at <https://nebps.stpi.in>.

4.2 National Policy on Software Products-2019

The National Policy on Software Products aims to develop India as the global software product hub, driven by innovation, improved commercialization, sustainable Intellectual Property (IP), promoting technology start-ups and specialized skill sets. Further, the Policy aims to align with other Government initiatives such as Start-up India, Make in India and Digital India, Skill India etc., so as to create Indian Software products Industry of USD ~70-80 billion 2025.

The followings programmes have been implemented/are under implementation under the National Policy on Software Products-2019:

National Software Product Mission (NSPM): The National Software Product Mission (NSPM) has been constituted to evolve and monitor schemes,

programmes and strategy for the implementation of National Policy on Software Products (NPSP 2019). Its 2nd meeting was held on July 08, 2020 through Video Conferencing.

Indian Software Product Registry (ISPR)

Indian Software Product Registry (ISPR) has been created to analyse numbers/statistics/database of Indian Software Product Companies (ISPC) and to bring all software products at one single platform. The key features of the ISPR are as below:

- The Indian Software product registry acts as a common pool of Indian Software Products thereby providing a trusted trade environment.
- Serving as a gateway to the Indian Software Product Company (ISPC) with exposures to millions of global players.
- Core Identity base for ISPC's to be a part of Government e-Marketplace (GeM)
- Facilitation of Indian Software Product Industry for providing fiscal incentives, if any, at a later stage.
- Database for the Indian Software Product Companies, products developed in India with any analytics around what kind of domains, sectors, geo-regions are currently serves.
- List Products Industry-wise, Technology-wise, intended audience (B2B, B2C, B2G), product stage etc.
- Updates on latest news/events

The ISPR (www.ispr.gov.in) has been launched on 21st October, 2019. As of now, more than 1,050 users, 214 software product companies and 289 software products have been successfully applied for registration on ISPR. Out of these, more than 167 Indian Software Product Companies having ownership over the software product(s) and more than 95 Indian Software Product have been displayed live on the portal after internal verification and declaration provided by the applicants.

Next Generation Incubation Scheme (NGIS)

Next Generation Incubation Scheme (NGIS) has been approved to support software product ecosystem and to address a significant portion of National Policy on Software Products (NPSP 2019). It is envisaged to create a vibrant software product ecosystem to complement the robust IT Industry for continued growth, new employment and enhance competitiveness.

Some salient features of NGIS scheme are as below:

- To identify start-ups working towards solutions/outstanding software products for futuristic problems/emerging ICT technology/societal problems
- To promote them through technical & financial support and provide them training on business solutions/mentoring support/plug-n-play facility/Security and Vulnerability Testing facility and a "Challenge/Internship Grant".
- Scheme has been launched at 12 locations i.e. Agartala, Bhillai, Bhopal, Bhubaneswar, Dehradun, Guwahati, Jaipur, Lucknow/Prayagraj, Mohali/Chandigarh, Patna & Vijaywada.

The scheme has a vision to drive the rise of India as a Software Product Nation so as to make India a global player in development, production and supply of Innovative, Efficient and Secure Software Products thus facilitating the growth across the entire spectrum of ICT sector.

The Scheme is proposed to be launched from 12 locations i.e. Agartala, Bhillai, Bhopal, Bhubaneswar, Dehradun, Guwahati, Jaipur, Lucknow & Prayagraj, Mohali/Chandigarh, Patna & Vijaywada. The Scheme has solution-oriented architecture and aims to handhold 300 Tech Start-ups in Tier-2/3 cities over a period of 3 years with the total budget outlay of Rs.95.03 crore.

The objective of Next Generation Incubation Scheme (NGIS) is to identify start-ups working towards solutions/outstanding software products for futuristic problems/emerging ICT technologies/ Societal problems and to promote identified start-ups through technical, financial and mentoring support under STPI's incubation facilities across pan-India and to provide vibrant software product ecosystem to complement the robust IT Industry for continued growth, new employment and to enhance competitiveness.

The 1st Start-up Challenge under the Next Generation Incubation Scheme (NGIS) has been launched through an online Idea Challenge contest "CHUNAUTI" (Challenge Hunt Under NGIS by Advancing Uninhibited Technology Innovation). CHUNAUTI has received overwhelming response in the form of 1820 complete applications. Pitches under CHUNAUTI have been completed and list of the selected shortlisted start-ups for final round will be shared shortly.

ICT Grand Challenge (ICTGC) under National Policy on Software Products

National Policy on Software Products has a provision to conduct at least 20 Grand Challenge so as to develop a variety of software products addressing socio-economic challenges. ICT Grand Challenge (ICTGC) Scheme has been launched to develop innovative software product by conducting four challenges round in the specified area.

The Ministry of Electronics & Information Technology (MeitY) in partnership with National Jal Jeevan Mission (NJJM), Department of Drinking Water and Sanitation, Ministry of Jal Shakti has announced to develop a 'Smart water supply measurement and monitoring system' via an ICT Grand Challenge.

The aim of this ICT Grand Challenge is to develop innovative, modular, and cost-effective solution called "Smart water supply measurement and

monitoring system" to be deployed at the village/ semi-rural/semi-urban levels. The system would collect and facilitate centralised monitoring of data. A battery back-up for controller may support the system for downtime and it is expected that the design should support 48 hours back-up and the sensors should also be battery powered with more than 3 years of battery life.

Upcoming ICTGC would be focusing on Work from home, agri-tech and edu-tech for masses etc.

Innovation Challenge for Development of Indian Video Conferencing Solution (Software Product)

A Programme of Innovation Challenge for Development of Video Conferencing solution has been launched to develop innovative Video Conferencing solution. The end product will be an Indian Software Product at par with International video and audio quality, should work in low and high network scenarios. The initiative is an attempt to promote Indian Software products as envisaged under the National Policy on Software Products.

The winner of the challenge who will be provided financial support of Rs.1 crore (One crore) with additional Rs.10 lakh towards O&M for next three years and will be adopted for Government use through a contract is:

Sr. No.	Name	City
1.	Techgentsia Software Technologies Private Limited (Vconsol)	Alappuzha

In addition, the Jury also selected the following three applicants as potential products and decided to sign a developmental contract to be supported by Rs.25 lakh each for further maturing their product within a period of three months. These three products will be further analyzed by a technical committee and subsequently MeitY will recommend to onboard all selected four products on GeM.

Sr. No.	Name	City
1.	Instrive Softlabs Pvt Ltd (HydraMeet)	Chennai
2.	PeopleLink Unified Communications Pvt Ltd (Insta VC)	Hyderabad
3.	Sarv Webs Pvt. Ltd. (Sarv Wave)	Jaipur

All the aforesaid VC products will also be provided support of STQC, CERT-In, C-DAC and NIC. It has also been recommended that all four products will be hosted on NIC cloud and NIC will facilitate for adoption of these products for Government use through GeM. All teams including winning team shall also be free to market the product globally.

The technical committee will also specify a matrix containing list of key features for Video Conferencing products and quality, functionality, performance, load, scalability and security benchmarks to onboard the Make in India VC products on GeM with MeitY endorsement that fulfil the specified VC requirements and qualified the threshold benchmark.

Installation of Vconsol on NIC Cloud has been completed (<https://bharatvc.nic.in/>) and Vconsol is working to sign the contracts and SLA with NIC/MeitY.

Model RFP Template for Software Products

For ensuring Ease of Doing Business and to provide an ecosystem for the Software Product companies to thrive, there is a need to standardize and harmonize the IT Software Product Procurement process through creation of Model RFP Template. Importantly, promoting the Product based mindset and developing a culture of creating world class Software Products that are 'Made in India' and ensuring self-reliance in the Software Product Domain.

Based on the comments of Central Ministries/ Departments and State Governments, Draft model RFP template for software product is under approval.

HS Codes for Software Products

The IT Software (products and services) is defined as one single HS code i.e. 8523 80 20 - Information Technology software. Under NPSP 2019, it is envisaged and proposed that a classification system for Indian Software products will be evolved through a model HSN code.

Due to non-availability of separate HSN code for software products, authentic/promising statistical data of industry is not available at present. The proper classification of Software Products and Software services will benefit in tracking of software industry (software product and software services separately). The tracking of software industry will generate data that will help in measuring import, export and size of software industry, which will further help in taking informed and supportive decision for the promotion & expansion of Indian software product industry.

Matter regarding formulation/notification of new HSN Codes has been taken up with the concerned Departments i.e. Department of Revenue and Department of Commerce and regular exchange of information is being done for fast tracking of the issue.

Software Product Development Fund (SPDF)

The National Policy on Software Products (NPSP) envisioned setting-up of dedicated Software Product Development Fund (SPDF) in the form of Fund of Funds (FoF). The objective of the SPDF is to support Venture Funds to provide risk capital so as to promote scaling up of market ready Software Products. The supported Daughter Funds will promote innovation, design & development of

software product within the country. Any Daughter Fund which is registered in India and abides with relevant rules and regulations including the Securities and Exchange Board of India (SEBI) regulations on Venture Funds will be eligible for support from the SPDF.

It is estimated that the Government investment of Rs.1,000 crore into the SPDF can have a 125x multiplier effect on the Indian Software Product Ecosystem, ensuring a higher return that's guarded against any concentration risk. Further, this ecosystem can help in creating at least 100 Indian software product companies with a combined enterprise valuation of at least Rs.50,000 crore and which shall create atleast 20,000 jobs. The detailed paper on SPDF in consultation with Working Group, Fund managers, Daughter Funds has been prepared and draft EFC document is being finalized.

Start-up Accelerator Programme of MeitY

Start-up Accelerator of MeitY for Product Innovation and Development and Growth (SAMRIDH) programme with support existing and upcoming Accelerators to select and accelerate potential IT based start-ups to scale for solving India's Problems creating positive social impact through relevant software products. The SAMRIDH programme will provide support to selected Accelerators for extending Accelerator Services as defined below to start-ups and even provide first round of funding of 1 crore. The programme will invite applications from existing and upcoming Accelerators to become partners with MeitY and provide start-ups accelerator programme of 6 months in a batches every year. The best of lot Accelerators should be selected by the Scheme Management Committee (SMC) based on Metrics. In each batch, max 25 start-ups will be selected across Accelerators for services and first round of funding support.

The proposal is under approval stage.

Research and Innovation Scheme for Software Products Development

A Research & Innovation Scheme for Software Products Development (RISE4Software Products) has been prepared which is aimed to boost Public - Private - Partnership (PPP) efforts in the country. The backbone of this Scheme is to create an enabling platform for the identified organizations to realize their potential in terms of product and process development and taking them to the market so as to contribute in Indian Economic growth. It will also facilitate research & innovation, risk taking by MSMEs, Start-ups and bringing together the private industry, public institutions and the Government under one roof to promote the research and innovation in the Indian Software Products Sector.

The proposal is under approval stage.

Accelerating Digital Adoption by MSMEs Using Indian Software Products

The Digital adoption in Indian SMEs is at an extremely low level and SMEs are now feeling the pinch of not being able to react to the present situation very well. On the other hand, there is significant number of Indian Software products available both in SaaS/PaaS and On-premises versions.

Therefore, a scheme to incentivise Indian Software Products buying by Indian MSMEs is proposed. This scheme will:

- Encourage digital adoption in Indian MSMEs to make them more efficient and competitive. This also stimulates the formalization of economy. The capability of MSMEs will get enhanced for competition in post COVID-19 world, and
- Expand domestic demand of Indian Software products and thereby help Indian Software product industry to become more competitive in global marketplace.

- Provide level playing field to Indian Software products against foreign players who can sell B2C products (Such as Online Video meetings, Email solutions etc.) without GST.

This will help in fulfilling mission objectives of National Policy on Software Products (NPSP2019), by boosting demand for Software products in domestic market.

The proposal is under approval stage.

4.3 MeitY-NASSCOM Start-up Women Entrepreneur Award for Software Products

Government of India has been assigning increasing importance to the development of women entrepreneurs in the country in recent years. MeitY-NASSCOM Start-up Women Entrepreneur Award for Software products is a remarkable mission to celebrate the entrepreneurial spirit of women in India. The aim and objective of the proposed award are as below:

- To recognize and cultivate the entrepreneurial spirit in women and inspire the next generation of women to lead the Indian digital era so as to serve as guiding role models.
- To encourage promising Entrepreneurs who not only contribute to the nation's economy but also to the social community.
- These entrepreneurs will serve to provide leadership and also as guiding examples for emerging and young or future entrepreneurs.

In 2019, seven Women entrepreneurs have been awarded by INR 2 lakh each in 6 categories by Hon'ble MEIT, Shri Ravi Shankar Prasad during MeitY Start-up Summit in New Delhi on October 21, 2019. For, MeitY-NASSCOM Start-up Women Entrepreneur Award for Software Products, we received a total of 210 completed applications with 510 nominations across categories and the winners are:

Winners			
1	Innovative Start-up of the Year	Ms Shobana Uthayashankar Innogle Technologies Private Limited	
2	Emerging Start-up of the Year	Ms. Krithika Radhakrishnan Cosine Labs Pvt. Ltd.	
3	Best Social Impact Start-up	Ms. Sanskriti Dawle Thinkerbell Labs Private Limited	
4	Start-up of the Year (Tehnology)	Ms. Kalaivani Chittaranjan K Nomics Techno Solutions Pvt. Ltd.	
5	Three Sector Start-ups (Water/ Healthcare/ Agritech)	Healthcare	Ms. Sneha Sahasrabuddhe Kovid BioAnalytics
		Agriculture	Ms. Rubal Chib Qzense Labs Pvt. Ltd.
		Water	No one found suitable
6	Start-up Leader of the Year	Ms. Mabel Chacko Open Financial Technologies Pvt. Ltd.	

4.4 Software Technology Parks Scheme

For the promotion of Software exports from the country, Software Technology Parks of India (STPI) was set up in 1991 as an Autonomous Society under the Ministry of Electronics and Information Technology. STPI acts as 'single-window' in providing services to the software exporters. STPI has set-up a total of 60 STPI operational centres/ Sub-centres across the country, out of which 52 centres are in Tier-II and Tier-III cities.

The STP Scheme allows software companies to set up operations in convenient and inexpensive locations and plan their investment and growth driven by business needs. There are many benefits under STP scheme like duty free import of capital

goods which are also IGST exempted, capital goods purchased from DTA are entitled for refund of GST, 100% FDI is permitted, Sales in the DTA is permissible, 100% depreciation on capital goods over a period of 5 years etc.

Rental Waiver to STPI Units: Considering this COVID-19 pandemic, which has caused severe disruption globally, IT/ITeS/ESDM Sector in the country, is facing unprecedented adversities in their business operations. To support and provide some relief to the industry in this crisis situation emerged due to COVID-19 pandemic, a rental waiver for 4 months (1st March, 2020 to 30th June, 2020) has been provided to the units in Software Technology Parks of India (STPI). This initiative has provided relief to nearly 200 IT/ITeS MSMEs, operating from 60 STPI centres. It will benefit about 3000 IT/ITeS employees of the beneficiary units. Also, the some other miscellaneous concern like 24 x 7 operations of IT companies, OSP licensing, movement of capital goods from custom bonded area to the other location during Work from Home etc., faced by the Indian IT industry has also been taken to the concerned Ministries to provide some relief in this covid-pandemic.

4.5 Domain Specific Centres of Excellence across the Country by STPI

To ensure India builds leadership in the emerging sectors of IoT, Block Chain, FinTech, Artificial Intelligence, Augmented & Virtual Reality, Medical Electronics, Health Informatics, Gaming & Animation, Machine Learning, Data Science & Analytics, Cyber Security, Chip Designing, ESDM etc., and to build nextwave of budding entrepreneurs, Honorable Minister of Electronics & IT announced setting-up of domain centric “Centers of Excellence” (CoEs) by STPI in collaborative manner across India. The CoEs aim at providing comprehensive structural & fundamental support including lab & incubation, training, mentoring, hand-holding, funding etc.,

through a joint collaborative effort of Government of India, State Govt, Industry, Academia, Domain & Technology experts etc. Accordingly, STPI is currently setting-up around 18 domain specific CoEs in collaboration with suitable partners.

VR/AR CoE at Bhubaneswar, Fin Tech CoE (“FinBlue”) at Chennai, IoT Open Lab CoE at Bengaluru, AI/Data Analytics/AVG/IoT CoE (“Neuron”) at Mohali and ACES CoE (“Motion”) at Pune have commenced activities and start-ups for incubation for these CoE’s have been selected after a formal “Call for Application” process & Open Challenge Program. Gaming/VFX/CV/AI CoE at Hyderabad, Block Chain CoE (Apiary) at Gurugram, Medi-Tech CoE at Lucknow and 3 CoE-SIZ in three North-East regions has been also launched and are in process of selection of start-ups for incubation. ESDM Incubation CoE at Bhubaneswar (“Electropreneur Park”) has been launched in December 2019. Smart AgriCoE at Patna-Motihari and 5 CoE-SIZs in each of the 8 North-Eastern capital cities are in last stages of approval process & stakeholder on-boarding.

Centre of Excellence (CoE) in Skills at NIELIT Aurangabad:

This CoE will utilize cutting edge technology with industry collaboration to transform the skilling ecosystem in the country and will improve learning outcomes and satisfy industry needs by skilling students for vocational training courses based on the job/vacancy/market needs of the Industries using technologies like AR/VR. Collaboration with Industry is a key element of the project wherein learning scenarios will be built to reflect the real time needs of the Industry. It will be managed by NIELIT, Aurangabad.

- The NICCS “NIELIT CII CoE in Skills” will institutionalize the successful approaches with technology and industry collaboration to transform the skilling ecosystem at scale.

Collaboration with Industry is a key element of the project wherein learning scenarios will be built to reflect the real time needs of the Industry.

- This CoE envisages enhancing the employability ratio of the skill development trainings upto 50% by implementing the latest technological advances in vocational training to demonstrate the potential of Electronics and Information Technology to effectively skill youth at scale.
- In the critical pandemic situation, and corresponding lockdown, there is an immediate need for the frontline healthcare work-force trained to deal with the COVID-19 patients and to provide some relief the healthcare professionals who are working day and night for protecting life of many.
- COVID Sathi is one such effort, wherein 100 Asha workers will be trained digitally using Augmented and Virtual Reality about COVID-19, its symptoms, diagnosis and treatment. They will also be trained in dealing psychologically with the COVID-19 patients, families and self. The role of healthcare workers in the COVID-19 Ward etc. First course on COVID Sathi: Capacity Building of ASHA Workers to cope with COVID-19 has been launched by Secretary, MeitY on 28th September, 2020 through Virtual mode.

4.6 Multilateral Cooperation:

In order to protect India's interest and promote India's Digitalization story on global platforms, MeitY actively participated in various multi-lateral meetings including G20, BRICS, Shanghai Cooperation Organization (SCO).

Under the G20 Saudi Arabia Presidency, the ministry negotiated various ICT issues in G20 Digital Economy Task Force (DETF) meetings

and presented India's position. Subsequently, a G20 Digital Ministers Meeting was convened on July 22, 2020 on virtual mode to discuss the fundamental importance of harnessing emerging technologies and data for the social inclusion while addressing the challenges of security, data privacy and protection. The Ministers agreed and adopted a Digital Economy Ministerial Declaration to work towards the enhanced cooperation in trustworthy Artificial Intelligence, Data Flows, Smart Cities and Mobility, Security and Measurement of Digital Economy among the G20 members. Hon'ble Minister, Electronics & Information Technology, Shri Ravi Shankar Prasad led the Indian delegation and share India's success story of Digitalization through Digital India to bridge the digital divide and bring digital inclusion. Shri Prasad also highlighted that India has set up a new benchmark in pursuit of empowerment and inclusion of every citizen of India with the adoption of smart applications of its digital eco-system. India also highlighted the critical role of data for the development and advocated for the sovereignty of personal data of the Indian citizens. He further emphasized that G20 nations should seriously ponder and reflect upon the emerging contours of data use and its impact on digital economy.



India joined the Global Partnership on Artificial Intelligence (GPAI or Gee-Pay) as a founding member on June 15, 2020 to support the

responsible and human-centric development and use of AI. With this, India joined the league of leading economies including USA, UK, EU, Australia, Canada, France, Germany, Italy, Japan, Mexico, New Zealand, Republic of Korea and Singapore to launch the GPAI. By joining GPAI as a founding member, India will actively participate in the global development of Artificial Intelligence, leveraging upon its experience around use of digital technologies for inclusive growth.



The Ministry also attended the GPAI Council Meeting during the GPAI Montreal Summit 2020 (Virtual) in December, 2020 and Shri Ajay Prakash Sawhney, Secretary, MeitY represented the country to share India's experiences and future plans towards the development of Artificial Intelligence across various sector of economy.

4.7 Cooperation through Bilateral Interaction:

Russia:

Under the framework of Russia-India Inter-Governmental Commission on trade-economic, scientific-technical and cultural cooperation, the 6th meeting of the Joint Working Group on Information and Communication Technologies (ICT) was held on January 22-24, 2020, in Moscow. The meeting was held under the chairmanship of Secretary, Ministry of Electronics and Information Technology of the Republic of India, Mr. Ajay Sawhney from the Indian side and Deputy Minister of Digital Development, Communications and Mass Media of the Russian Federation, Mr. Mikhail Mamonov from the Russian side. The Working Group on ICT included representatives from some of the top IT and Telecom companies from both sides.

On January 22, 2020 couple of field visits were organized by Indian Embassy in Moscow for deeper industry-to-industry collaboration. The JWG meeting was held in two back-to-back sessions i.e. B2B on January 23, 2020 and G2G on January 24, 2020. During the Joint Working Group meeting both sides discussed the ICT issues in detail, which includes Industry-to-Industry cooperation, Cooperation in the area of Digital Economy, cooperation in the area of Emerging technology etc.

Innovate and Design in India



5.1 Creation of Research Eco-System

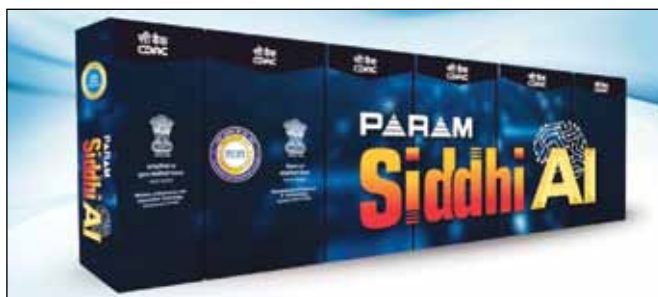
5.1.1 National Supercomputing Mission (NSM)

“National Supercomputing Mission (NSM): Building Capacity and Capability” was approved by the Cabinet Committee on Economic Affairs (CCEA) on April 9, 2015 and is being implemented jointly by MeitY and DST with IISc Bangalore and C-DAC as the executing agencies.

India's fastest Supercomputer - PARAM Siddhi 210 AI PetaFlop System

Today, “PARAM Siddhi – AI”, is the largest and fastest Supercomputer in India, ranked at No. 63 position in ‘TOP500 Supercomputer List – November, 2020’ declared at the Supercomputing Conference 2020 held virtually in the United States. PARAM Siddhi - AI of 210 AI Petaflops with 2.4 Million cores and 6.5 Petaflops Peak DP is based on the NVIDIA DGX SuperPOD reference architecture along with an

HPC-AI engine, developed indigenously, Software Frameworks, Cloud Platform by C-DAC. “PARAM Siddhi – AI, the State-of-the-Art large-scale HPC-AI scalable infrastructure will play a pivotal role in developing a vibrant ecosystem for research and innovation in science and engineering.



PARAM SIDDHI India's First and Fastest 210 AI Petaflop Scalable Supercomputer

This infrastructure will accelerate experiments and outcomes for India specific grand challenge problems in Health Care, Education, Energy, Cyber

Security, Space, Automotive and Agriculture. It will also catalyze partnerships with Academia, Industry, MSMEs and Start-ups.

Supercomputing Infrastructure

HPC systems have been installed which were developed under 'build approach' during Phase-II of NSM in line with the 'Atmanirbhar Bharat' vision of Government of India. During the year, one system of 1.3 PF (1.6 PF Peak) has been installed at IIT Kanpur and two systems of 650 TF (800TF Peak) each, have been installed at IIT Hyderabad and C-DAC Bangalore under Phase-II. Details of usage of other supercomputing systems established under NSM are as given below:

- PARAM ShivaY (800 TF) at IIT BHU has successfully executed 5,57,000 jobs until November, 2020
- PARAM Brahma (800 TF) at IISER Pune has successfully executed 5,66,496 jobs until November, 2020
- PARAM Shakti (1.6 PF) at IIT Kharagpur has successfully executed 1,21,392 jobs until November, 2020

In order to make India a supercomputing major, an MoU was signed between C-DAC and 9 host institutes under NSM on October 12, 2020 for the establishment of Supercomputing facilities under Phase-II of the mission. MoU was also signed with 4 host institutes for establishment of Nodal Centres, for training in HPC and AI. As per the MoU, C-DAC will be establishing Supercomputing Infrastructure with assembly and manufacturing of critical components in various premier institutions across India including IISc-Bangalore, IIT-Kanpur, IIT-Roorkee, IIT-Hyderabad, IIT-Guwahati, IIT-Mandi, IIT-Gandhinagar, NIT-Trichy, NABI Mohali. C-DAC in collaboration with IIT-Madras, IIT-Kharagpur, IIT-Goa and IIT-Palakkad shall be providing training in HPC and AI to fulfill the objectives of the NSM HR development activities.

PARAM AMBAR at ISRO-NARL

PARAM AMBAR Supercomputing facility is designed and installed at ISRO-National Atmospheric Research Laboratory (NARL) in Gadanki, Andhra Pradesh. It consists of 196 compute nodes and 8 GPU nodes with peak computing capacity of 1.658 PFs performance. The system is using system software stack developed by C-DAC. The system has been commissioned on November 20, 2020 by Dr. K. Sivan, Chairman of ISRO.

HPC System Software

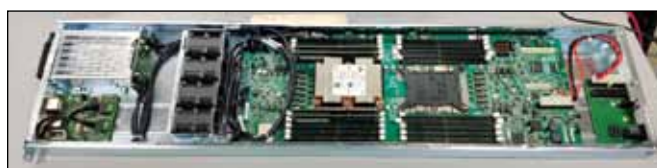
System software stack has been developed that comprises C-Chakshu, CHReME, Ganglia, Nagios, XDMoD, OSTicket, OpenHPC, Lustre, PARAVIEW, MVAPICH2, Intel Cluster Studio, GNU Tools, CUDA Toolkit and others. These are used for cluster building, cluster monitoring and management and are being used by supercomputing facilities established under NSM. These supercomputing facilities are being leveraged by 75 institutions and thousands of active researchers and academicians over National Knowledge Network (NKN).

Build Approach Developments under NSM

Under Build Approach R&D and Phase-III, various activities have been taken up such as development of indigenous server node, interconnect switch, storage and system software stack.

Indigenous Server Platform: Rudra

An indigenous Server Platform Rudra based on 2nd Generation Intel Xeon Scalable Processor Cascade Lake, has been developed. The Rudra server system along with the full software stack from C-DAC is the first of its kind server platform made in India to meet the HPC requirements of Governments and PSUs.



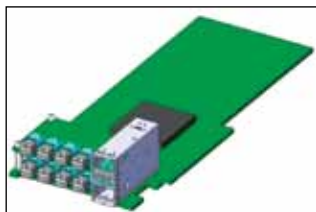
Rudra Server Board

HPC Network – Trinetra

A next generation scalable HPC network “Trinetra” has been developed. The Board design of interconnect switch (Trinetra) for 40/100 Gbps with an aggregated bandwidth of 240/600 Gbps (which is State-of-the art as on date) has been completed and tested. A pilot testing of the network with multiple nodes using Rudra servers is being done to test system performance. A suite of critical system software components has also been developed.



Trinetra-A NIC



Trinetra-B NIC

Design and Development of Direct Contact Liquid System (DCLC)

MeitY has collaborated with IIT Mumbai to validate the cooling technology solutions developed by IIT Mumbai for large scale HPC system by experiments and CFD analysis. The objectives of this initiative are to design a modular PWC_A&EC (Panel Water Cooler with Provision of Air and Evaporative Cooling) and to demonstrate the effectiveness of this technology to handle 30 kW heat load generated from a DCLC based HPC system. During the year, a CFD model for two tubes and three tubes in a channel was developed and carried out a CFD simulation study.

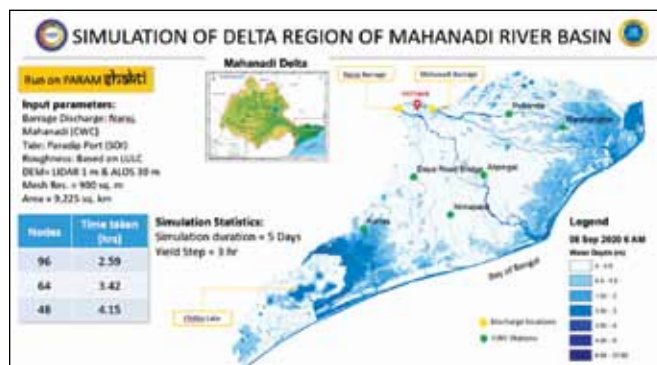
NSM HRD

Under the Human Resource Development (HRD) activities of NSM, four Nodal Centres for training in HPC and AI have been established at IIT Kharagpur, IIT Madras, IIT Goa and IIT Palakkad. Considering the pandemic situation, an online course on “Basics of High-Performance Computing” was jointly planned by the four IITs along with C-DAC. More than 800 students across the country enrolled for the course.

NSM Applications

Early Warning System (EWS) for Flood Prediction in the River Basin of India

MeitY collaborated with Central Water Commission (CWC), IISc Bangalore and PEC Chandigarh for this initiative. The prediction simulation is being aided by ANUGA Hydro. It is a free and open source software tool for 2D hydrodynamic modeling, suitable for predicting the consequences of riverine flooding. Between May and October 2020, EWS conducted daily flood prediction (5-day simulation) with actual/predicted data for Mahanadi Delta (9,225 sq. km) on its software (implemented using ANUGA Hydro) which is running on NSM Supercomputing infrastructure.



Early Warning System (EWS) for Flood Prediction

Multi-sectorial Simulation Lab and Science-based Decision Support Framework

MeitY collaborated with multiple institutions including IIT Bhubaneswar, IISc Bangalore, IITM Pune for this initiative to address urban environment issues. The objective was to develop an online fully coupled urban’ meteorology and hydrology, CFD and air quality’ modeling system to capture the urban representation of micro-scale city environmental conditions. In 2020, sensitivity studies, air quality forecast research & real-time air quality, coupled hydrology for urban modeling and CFD simulation of atmospheric flows & pollution dispersion for urban modelling on NSM infrastructure were carried out.

HPC software suite for seismic imaging to aid oil and gas exploration

MeitY has collaborated with IIT Roorkee, Osmania University Hyderabad, NGRI Hyderabad, ONGC Dehradun for this initiative. A parallel 2D & 3D acoustic based RTM (reverse time migration) software suitable for state-of-the-art hybrid computing platform is being developed.

Bigdata Tools for Bioinformatics

NSM related products like DPICT – parallel molecular visualizer, Bioaviator – Cloud based NGS analysis solution, Cimulate – indigenous molecular dynamics code and Bigdata tools for Bioinformatics data are being developed during this year.

5.1.2 R&D and IP Development

5.1.2.1 R&D in IT

Centre for Excellence in Quantum Technology:

Quantum Technology is one of the most important emerging technologies. To develop Quantum Technology in country, starting with construction and optimization of its elementary building blocks, “Centre for Excellence in Quantum Technology” has been initiated at Indian Institute of Science (IISc), Raman Research Institute (RRI) and Centre for Development of Advanced Computing (C-DAC), Bengaluru. The initiative aims at laying a solid foundation for the field of Quantum Technology in the country. The focus is on developing necessary elementary hardware components, a 4-qubit quantum processor, quantum teleportation over long fiber link of over 100 Kilometer for secured communication and demonstration of quantum sensing technology. The centre will develop technical and manpower skills in the Quantum Technologies.

Under the Quantum Computing Toolkit and Capacity Building initiative focus is on development of Quantum Simulator, workbench and generating skilled manpower in this technology area by offering short-term courses.

Post-Quantum Digital Signature for Document Signing:

Digital signatures and public key encryption (and key encapsulation) are the backbone for any infrastructure for achieving online authentication and data confidentiality. A research project “Post-Quantum Digital Signature for Document Signing” is being implemented at Society for Electronic Transactions and Security (SETS) Chennai to analyze, implement, benchmark digital signature schemes which are resilient to attacks by quantum computers.

Child Face Age Progression and Regression to Trace Missing Children:

A project has been initiated at MNIT Jaipur to develop a system for tracing the long-term lost children and teenagers by using more precise and objective age progression techniques for the prediction of their current appearance. This would help in finding missing children which were lost at an early age. MNIT Jaipur has developed and published a novel model namely, “ChildFace: Gender Aware Child Face Aging” in the 19th International Conference of the Biometrics Special Interest Group (BIOSIG 2020). The web portal namely “**KHOJ अपनो की**”, is being developed to host the developed system and make it widely available.



Visual Speech Training Software (VSTS) for the Hearing Impaired:

A Computer-based tool for visualization of the vocal-tract, for providing visual feedback of speech articulation/parameters for the Hearing Impaired Children is being developed by Digital India Corporation (DIC) and IIT Bombay. This technology aims for enhancing the quality of life and competitiveness of persons with hearing

impairment. The web & mobile based VSTS system consists of speech processing algorithm for vowels & vowel-like sounds and supra-segmental features to provide visual feedback for vowels, vowel-like utterances.



Visual Speech Training Software

Diagnostic System for Alzheimer's Disease

(AD): A research project is initiated at NBRC, Manesar to develop a technology for early predictive diagnostic system for AD to sustain a normal living for AD patients. A substantial database comprising of MRI and MRS information from AD, Mild Cognitive Impairment (MCI) and Healthy Old (HO) has been generated for identification of most significant biomarkers to distinguish between AD, MCI, and HO. The system would be utilizing MRS information in predicting AD as metabolic changes in the brain during the progression of MCI and AD provides breakthrough information in identifying the expression for neurodegenerative disorders.

Chest X-Ray Image Processing Solution for Computer Aided Diagnosis:

A project has been initiated at C-DAC Chennai to develop a software solution for Chest X-Ray Computer Aided Diagnosis to perform multi-level classification for common thorax diseases. The Chest X-Ray classification algorithm currently has an AUROC of 0.83. The accuracy improvement with novel deep learning methods for Chest X-Ray classification algorithm and heatmap generation algorithm are being developed.



Fig 1. Screenshot of x-ray computer aided diagnosis software-Doctor's page



Fig 2. Screenshot of x-ray computer aided diagnosis software-Uploaded images

Affordable Deep Learning Based Point of care Cardiac Monitoring for heart attack survivors:

A project has been initiated to develop a Low cost, multi analyte sensors platform (biochip) for Acute Myocardial Infarction (AMI) biomarkers monitoring for Cardiac Infraction Survivor. The proposed IoT-enabled system incorporates cardiac biomarkers alongside vital signals in decision making which could be reviewed by human experts. The aforementioned system would be available at home and affordable.

Multi-modal analytics framework for machine-assisted diagnosis of pediatric pneumonia:

Paediatric pneumonia is very common problem in or country. A project has been initiated at C-DAC to develop a system for machine assisted diagnosis of paediatric pneumonia.

Facial Paralysis Clinical Assessment Tools:

A computer vision and machine learning based system for quantitative analysis of facial paralysis.

Neuroinformatics and simulation platform for evaluation and treatment of movement disorders:

In the spirit of Atmanirbhar Bharat, a research project is being implemented at IIT Hyderabad to develop an indigenous bio-digital movement technology to simulate human movement, help build therapies and devices for movement disorders.

Artificial Intelligence (AI) Driven High Throughput Phenotyping using Unmanned Aerial Vehicle (UAV):

A system to measure Phenotyping traits and crop management to

provide efficient, cost-effective, non-invasive, and automated mechanisms to Breeding scientists is being developed at IIT Hyderabad. It will also develop algorithms to analyze the hyperspectral images of the crop for nitrogen deficiency, water stress, and canopy biomass.



a) Experimental field b) Leasy Scan Platform c) HSI system setup on UAV

Figure : UAVs mounted with imaging sensors flying in crop fields at ICRISAT.

“Krishi Mantrana”: An AI-Based Multimodal Dialog-System for Farmers: A project is being implemented jointly by C-DAC Noida, C-DAC Kolkata, Birsa Agricultural University (BAU) Ranchi, Bihar Animal Sciences University (BASU), Patna to develop an Artificial Intelligence based System to provide advice and to address farmer’s field queries in Hindi and Bengali language.



Development of Application oriented AI System”: A research project in Consortium mode has been initiated to develop innovative solutions using Artificial Intelligence technologies in different sectors such as education, agriculture robotics, human health, human living, process automation, cognitive system & cognitive intelligence, transportation, multimedia perception etc., The project is being implemented by a consortium of

20 institutions (IITs, IISc, IIIT, NITs, etc) with IIT Jodhpur as Consortium Leader.

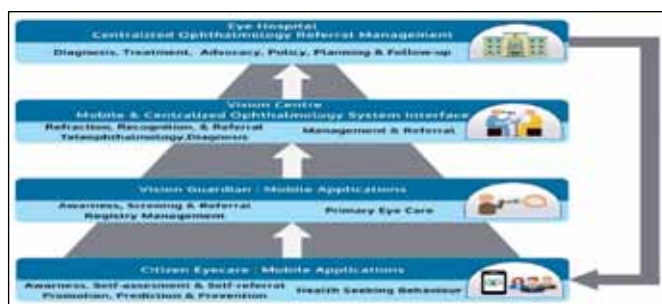
A Prototype of an Auto-navigating E-cart using Multispectral Imaging: A project is being implemented jointly at the Indian Institute of Information Technology (IIIT) Manipur and the North-Eastern Regional Institute of Science and Technology (NERIST), Arunachal Pradesh to develop a hardware prototype of an autonomous, driverless and environmental-aware E-Cart vehicle which can travel along a desired global trajectory via smart computer vision and advanced path planning algorithms.

Digital Solutions for the Weavers/Designers and Artisans of North-Eastern Region (Mizoram):

A project is being implemented jointly at Digital India Corporation (DIC) and Krishi Vigyan Kendra (KVK) college of Veterinary Sciences & Animal Husbandry, Central Agricultural University, Selesih, Mizoram for the enhancement of existing CAD applications i.e. DigiBunai™ and Chic™-CAD Plus to suit the requirement of embroidery/weaving of North-Eastern Region (Mizoram) and testing of these applications with the artisans and weavers/designers of Mizoram.



Interactive Mobile Enabled Centralized Remote Eye Care Delivery System: A project is being implemented jointly at Digital India Corporation (DIC) and PBMA’S H.V Desai Eye Hospital to develop an interactive mobile-enabled centralized remote eye care delivery system, to improve the health care behaviour of the community.



Cost Effective, Mobile Enabled Centralized Remote Eye Care Delivery Ecosystem

Development of Tool(s) for Enabling Binary Program Analysis:

Binary Analysis is an important requirement for checking the quality of the software and finding out the bugs. Tools for conversion from binary code to IR are very critical. A project has been initiated jointly at C-DAC, Hyderabad & SASTRA University, Tamil Nadu for the development of translation tool(s) (working prototype) for converting binary code to LLVM (open-am analysis) IR (Intermediate Representation) for MIPS architecture.

Forest Fire Detection System: The forest fire is one the major threats to the environment. A system has been developed to detect forest fire in real time with the help of wireless sensor network and drone.



Fig. Forest Fire Wireless Sensor Node



Fig. Forest Fire Nodes @ deployment site



Fig. Image captured by Drone @ deployment site

Anaemia Detection Kit: A large population of India is badly affected by Anaemia which is a serious public health problem as Anaemia affects physical and mental development of an individual. A Smartphone based Artificial Intelligence enabled Portable Low-cost non-invasive Anemia Detection Kit is being developed at NIT Durgapur.

Detection of Chronic Illness from Retinal Images:

A project entitled “Design & Development of Artificial Intelligence framework using Data Analytics for detection of Chronic Illness from Retinal Images” has been initiated at C-DAC Mohali and Government Medical College & Hospital- Chandigarh. The project aims at development of Artificial Intelligence empowered Disease Diagnostic system for detection of Chronic illnesses from retinal fundus images.

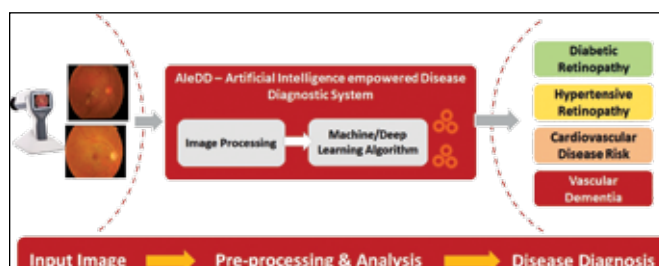


Figure: Disease Diagnostic Ecosystem

Digital Solutions for Empowerment of Citizens of North-East India:

To empower citizens of North-East India by providing digital solutions to ease their job and enhance the productivity & livelihood with special focus on Farmers, Artisans, Weavers and Teachers (special schools), a project entitled “Customization, Enhancement & Deployment of

Digital Solutions for Empowerment of Citizens of North-East India” has been initiated. The said project is being implemented by Digital India Corporation. The project includes deployment of mobile based personalised advisory system “Interactive Information Dissemination System(IIDS)” for farmer, deployment and customization of CAD Tools (DigiBunai™ and Chic™ CAD Plus) for weavers and deployment of ICT Tool “Punarjani™” for Teachers from Special School.

ICT Solutions for India’s North-East Heritage:

A project is being implemented jointly at C-DAC Pune, C-DAC Silchar and NEHU Shillong, to provide a State-of-the art ICT solutions for the digitization, preservation, protection, dissemination and promotion of the North-Eastern heritage. The beta version of North-East Heritage portal (NE portal) <http://www.northeastheritage.in> provide integrated search and retrieval over various digitized collections from the museums from north east states. This portal is meant to offer online visibility to the North-East Heritage and boost the tourism. The user interface of the portal is updated with localization in various North-East languages like Assamese, Mizo, Bodo, Manipuri, Khasi, Karborok, Bengali and Hindi.

Big Data Analytics for Crime Deterrence: A system is being developed to know crime trends, accused search, hotspot analysis using big data analytics by C-DAC Chennai.

5.1.2.2 Microelectronics Development and Nanotechnology Initiatives

Under Microelectronics Development Initiatives-2 Patents (National) filed and about 100 research papers have been published/presented in National journals and conferences of repute in FY 2020-21. The details of National Patents are as follows:

- Amplitude dependent variable sampling frequency based sigma delta modulator

- Reconfigurable and unified signal processing apparatus for generating variable length Hamming and Hanning window functions.

Under Nanotechnology Initiatives, more than 107 research papers have been published in National and International journals. Some of the Patents published/filed this year are as follows:

International Patent

- Microfluidic POC-immunosensor for Non-invasive Plasmonic Detection of Tear Biomarkers, TEMP/E-1/29690/2019-KOL, Patent Appl. No. 201931028121. Date of Filing November, 2020 , International Patent filed
- A microfluidic device for the POC detection of oleophilic biomarkers in hydrophilic analytes, Sagnik Middya, Tanushree Ghoshal, Dipankar Bandyopadhyay, E-12/255/2019/KOL, Patent Appl. No. 201931052707, Date of Filing Nov 2020; Publication Date: 03/01/2020. International Patent filed.
- POCT Device to Detect Cervical Cancer Specific Biomarker, Mitali Basak, Shirsendu Mitra, Ankita Jain, Saurabh Kumar Agnihotri, Akanksha Vyas, Madan Lal Brahma Bhatt, Rekha Sachan, Surjendu Maity, Nayanjyoti Kakati, Monika Sachdev, Dipankar Bandyopadhyay, TEMP/E-1/38296/2020-KOL, Patent Appl. No. 202031034400, Date of Filing 11th August, 2020. International Patent filed.
- Methods of manufacturing 2-dimensional semiconductor transistors, Ansh, Hemanjaneyulu Kuruva and Mayank Shrivastava Indian Patent Application, No. 201741033081.
- Portable Energy-Efficient Optothermal Temperature Cycler for Small-Volume Chemical Reactions R Poorna, SS Gorthi, BJ Toley, Application, No 202041016123 Indian Patent

- A Portable Fluorescence Readout Device R. Srinivasan, KS Rawat, VV Sujith, SS Gorthi, Application No 202041015152, Indian Patent.
- An Adaptive Sequencing Device, VV Sujith, SS Gorthi, Application No 202041014907, Indian Patent.
- “Microneedle and Micropump based Fluid Delivery System”, Richa Mishra, T. K. Bhattacharyya, T. K. Maiti, Indian Patent published, application no. 201831017171.

5.1.2.3 Convergence, Communications & Broadband Technologies and Strategic Electronics

Convergence, Communications & Broadband Technologies (CC&BT) have been recognized as key technologies for economic growth and development. R&D in the next generation Communication and Broadband Technologies has been the engine for economic growth and infrastructure for promoting innovation, Research and Development in cutting-edge technologies to ensure that citizens can take full advantage of increasingly pervasive digital services across the plethora of existing and emerging use cases and verticals.

In order to support the digital eco-system, R&D initiatives in Convergence Communications, Broadband Technologies, Strategic Electronics is aimed to develop indigenous capability in the thrust areas like Next Generation Networks (NGN) and Communication technologies, 5G and beyond, next generation mobile technologies, Broadband Wireless Technologies, Green Communications, Quantum Communication, Vehicular Communication, Cyber Physical System, Artificial Intelligent enabled Communication, Big Data Analytics and Internet of Things for societal applications & disaster management, Machine-to-Machine Communication and Strategic Electronics with applications in both Civil and defence domains and innovative backhaul Communication Technologies.

The Technologies/solutions developed under this program spur the nation to the next wave of digital transformation. Activities in R&D project are focused towards creating IPs which leads to patents, designing innovative algorithms that will make up the product design and also in developing prototypes that can give a head start in developing Technological solutions/prototypes. The activities and outputs from these projects will contribute immensely to achieve the goals set for ‘Make in India’ and ‘Digital India’ initiatives of the Government of India.

R&D initiatives in Convergence Communications, Broadband Technologies and Strategic Electronics are aimed at developing indigenous capability in the thrust areas which include - Next Generation Communications & Convergence Technologies (Massive MIMO, Software Defined Radio (SDR), Software Defined Networks (SDN), Network Function Virtualization (NFV), Cognitive Radio, Heterogeneous Wireless Networks); Green Communication; Cyber Physical Systems, Internet of Things (IoT) & Machine to Machine (M2M) Communications, Wireless Sensor Networks; Convergence of wired/wireless networks and fixed mobile convergence; ICT applications in strategic sector; Broadband Wireless Access Technologies; Visible Light Communication (VLC), Vehicular ad-hoc Networks (VANET); IP based products/services; Electro-magnetic wave applications; High power RF/microwave tubes; Terahertz (THz) wireless systems; Radar Systems etc.

Achievements

A number of R&D projects initiated at various Academic institutions/R&D organisations across the country in the thrust areas were successfully completed. Next Generation Communications and Convergence technologies have yielded notable achievements in the year which include “Converged Cloud Communication Technologies”. As an outcome of the project, 3GPP RAN1 accepted the

proposal on $\pi/2$ BPSK DMRS sequences as part of Rel-16 5G standard. This feature improves the overall performance of $\pi/2$ BPSK with spectrum shaping waveform over the rel-15 specification. This feature will become the dominant implementation mode of $\pi/2$ BPSK waveform in the future. 16 additional patents have been filed as outcome of the project.

Indo-Dutch Collaboration

The following Indo-Dutch collaborative R&D projects have been completed successfully:

- **Data Mining and Prediction in Airlines Operations (SAPPAO)**

This project has dealt with two critically important issues that influence any airline's business viability and competitiveness. In that, the issues of reducing the variability between actual flight time and scheduled block time (SBT) for that flight, and pairing of crew with flights to fulfil an airline's flight schedule in minimum cost have been tackled. While the former directly impacts the fuel cost, CO2 emissions and an airline's competitive stature, the later constitutes the second largest cost component for an airline (the largest being the fuel cost). These issues have been tackled through different work packages, namely: (a) Feature Construction for Improved Flight Predictability and Reduced Airline Operating Cost (b) Airline Crew Pairing Optimization for Large Scale Complex Flight Network have been developed. Also, one patent has been filed as outcome of the project.

- **Lightweight Code Self-verification for IoT Devices (Parallax)**

The objective of the project is to protect IoT devices and also to save their resources that will soon be integrated in to the human's life and will be used in strategic areas such as Government and defence agencies and use

Return Oriented Programming (ROP) as a defensive mechanism (instead of an offensive technique) to prevent mounting attack on a resource constrained IoT device. Also, by judiciously deciding on the ROP chains, reduce the power requirements (energy) on IoT devices. The ROP chains inserted into the code, will automatically verify the integrity of the code running on the IoT device, if they malfunction.

A 3-layer M2M model has been implemented in which IoT nodes collect data from various sensors and transfer data to gateway. The gateway pre-processes sensory data, aggregates values and sends it to the server. At the server level, Complex Event Processing (CEP) engine is run.

Code tempering attacks on IoT node were prevented by using novel technique like RoP, Core profiling and Canaries etc. The strength of the developed techniques were measured and verified through RIPE bench mark developed a tool in JAVA that automatically finds out ROP gadgets from an IoT code. A Prototype IoT testbed implemented at BITS Hyderabad Campus.



Fig. Sensors connected to gateways



Fig. Energy sensors connected to an embedded board

Some of the technologies developed/being developed indigenously under the R&D projects are as follows:

Development of Unified IP Based Communication Platform for Voice Video Data and Chat Services.

The primary aim of the project was to develop

and enhance features and capabilities of unified communication system to support voice over IP and messaging services that will empower and support manufacturing telecom platform within India. The project focuses in the domain of IP communication covering IP call routing, support for IPv6, telephony applications development and adding features to system for improving scalability and inter-operability. The major achievements are:

- Development of product named “Nah-Sanchar” which is an Open source based IP-PBAX.
- Registered Trademark for Nah-Sanchar obtained.
- The testing of the product for Technology Approval is presently on for Interface Type-1, Type-II and Type-III. The GR (No. TEC/GR/SW/PBX-005/01/SEP-16 and TSTP (No. TEC/TG/SW/PBX-305/01/JAN-17) at Telecommunication Engineering Center (TEC), MINISTRY OF COMMUNICATIONS DEPARTMENT OF TELECOMMUNICATIONS, GOVERNMENT OF INDIA
- Patent Published (patent numbered 201911048091 dated 25-11-2019) on “A SYSTEM FOR DETECTION AND MITIGATION OF SECURITY ATTACKS IN HIGH AVAILABILITY SIP-BASED COMMUNICATION”



The promotion of R&D in the area of applied microwave electronics & engineering is being further strengthened by establishing Two Centres

of SAMEER. Centre specializing in high power microwave tubes/components, in collaboration with IIT Guwahati is being established. The Centre will focus on R&D of 3.1 MW magnetron at 2.998 GHz, design and development of 3 kW circulator at 2.998 GHz and 6 kW RF load at 2.998 GHz. Another Centre for Electromagnetic Environmental Effects (E3) is being established at Visakhapatnam for highly specialized state-of-the-art EMI/EMC test facilities including Electromagnetic Pulse (EMP) and Pulse Current Injection (PCI) set up to meet the requirements as per International EMC Standards. This is a unique facility in the country to address critical Infrastructure protection against EMP to qualify defense electronics systems as per the EMP requirements. India's largest outdoor RS105 EMP test facility along with other highly specialized facilities like Pulsed Current Injection (PCI), UltraWide Band Test Facility, EMI/EMC testing laboratory and 3D Modelling and Analysis Laboratory have been established successfully.



Fig: EMP Facility

Ongoing Activities

On-going projects supported in the identified thrust areas include Converged Cloud Communication Technologies, Development of Digital Mine Using Internet of Things, Design and Development of Antennas for Communication in TV White Space Frequency Band, Data Processing of ST Radar Data and development of Software for NKN, Design and Fabrication of Autonomous Passenger Drone, Free Space Optics Communication (FSOC) for connectivity at Kohima Science College from Kohima Secretariat, Nagaland etc.

Indo-Dutch Collaboration

Under Phase-I of Indo-Dutch collaboration for collaborative research in Pervasive Communications & computing, following two projects are in progress:

Big Imaging Data Approach for Oncology (BIONIC)

The objective of this project is to develop Big Data technology that opens up petabytes of Medical imaging data stored in hospitals worldwide and to use it to learn of decision support Systems for cancer treatments.

BIONIC Project Achievements

Big Imaging in Oncology the Netherlands India Collaboration (BIONIC) is an Indo-Dutch collaboration project funded by MeitY. Medical image archives in hospitals are increasing every year and oncology lies heavily on imaging for detection, diagnosis, treatment and follow-up of cancer patients. Radiation oncologists spend considerable amount of time to reduce the imaging to information such as stage of the disease, maximal uptake of a marker, one-dimensional measurement of size and contouring region of interest. BIONIC project aims to leverage and combine high-throughput automated image analysis using big imaging pipeline based on Radiomics image information extraction methods and a distributed framework to flexibly integrate the information with Semantic Web.



Figure: Big Imaging Pipeline



Figure: BIONIC Dashboard

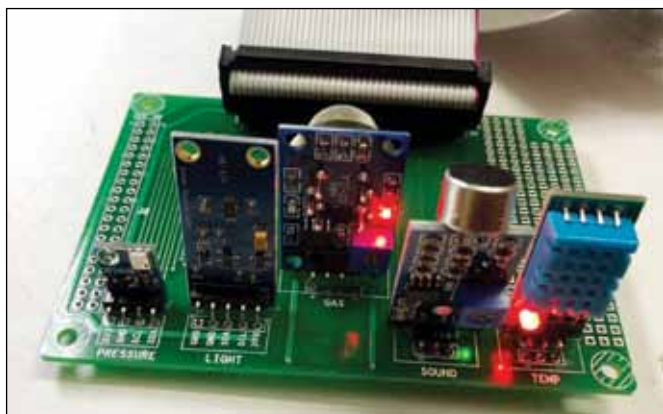
The project has developed a big imaging pipeline that automates the extraction of the image derived features from medical images. The semantic web based Dashboard provides a web based interface to view the image derived features, clinical features, and use SPARQL based end-point for query and perform data analysis combining clinical and image based features in one-go. The prediction models developed as part of the project are validated and useful in lung, head and neck and rectal cancers and survival prediction for the line of treatment and stage/phase of cancer. The model can selectively work for EGFR positive and negative for lung cancer diagnosis, SPN and Non-SPN cancers. NLP based models work on associated nuclear medicine and radiology report for better predictability.

Cooperating Objects for Privacy Aware Smart public buildings (COPAS)

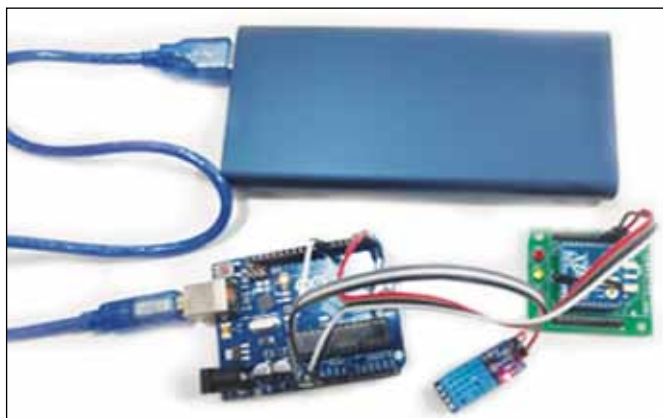
The objective of this project is to develop a Framework for cloud based WSNs for Data Assimilation and Data Analytics for energy efficiency and Privacy Aware Smart Public Buildings.

The following are the achievements of the project:

- Development of a Test bed using open source involving design and implementation of a. Testbed architecture b. Environmental Sensor Card c. IoT device client software d. ELK configuration
- Development of Wi-Fi based localization method, comfort management, occupancy detection and emergency evacuation Algorithms and integrated with testbed
- Application of Software Defined Networking for IoT systems
- IoT security, Privacy and Ethics study
- 18 Peer reviewed papers published



Developed environmental sensor card



End point Arduino UNO with Xbee, battery and DTH11 End point

Under 2nd phase of Indo-Dutch collaboration, following three projects in the area of Big Data and IoT are in progress:

- Data-Driven E-Commerce order Fulfilment, (DAREFUL)
- Personal health Train for Radiation oncology in India and the Netherlands (TRAIN) and
- Digital twin for Pipeline TRANSport Network (DP-Trans)

Design and Fabrication of Autonomous Passenger Drone

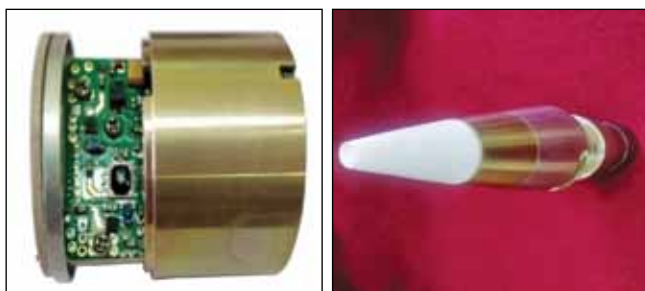
Following progress has been achieved under the project:

- Modular design concept was developed for autonomous passenger drone

- Mechanical structure was designed and analysed using finite element methods
- Component procurement and testing is in Progress
- A sensor fusion work was initiated and navigation and sensor subsystems have been integrated with an existing drone for field trials.
- Preliminary experimental and simulation work was completed for long range communication

Multi-Option Proximity Sensors

SAMEER is developing the multi-option 'fuzes' for warhead detonation application in artillery, mortar and rocket stores. The legacy fuzes presently in use are either 'impact' based or 'time' based, both, which have the limitation of not optimising the strike power of the warhead. For this to happen it is required to accurately determine the height (altitude) over ground at a pre-determined set height of inflicting maximum detonation energy over the intended area of strike. Traditional fuzes lack this capability and are also affected by wind conditions, weather and angle errors during launch etc., The RF based sensor circumvents these problems as it measures the height over ground in real-time during the flight. Thus, the RF based sensor lends an all-weather capability to the artillery/rocket store. The RF sensor developed by SAMEER has advanced processing functions with good measurement accuracy. The 'timer' and 'safe' mode has been built onto the same hardware and it also provides an override for the 'impact' mode making it a very potent (multi-option) MOPS fuze. In-situ programmability of flight parameters just before the launch vide the Snap-off umbilical connector are huge advantages adding several degrees of performance. The MOPS is design has been achieved for the very small customised form factor of Ø25-35 mm × 25-30 mm ht.) The developed MOPS sensor is a fully indigenous design and can find ready application is PINAKA rockets, Artillery Guns, Air dropped stores, Naval Proximity sensors etc.



Ø25mm MOPS for Artillery Fuze applications



Field Testing on Octo-copter for Rocket Fuze applications

Establishment of MIL STD EMC Test Laboratory

‘Establishment of MIL STD EMC Test Laboratory’ is a Grants-in-aid project, executed by SAMEER-CEM, Chennai and is intended for the establishment of world class MIL Standard EMI/EMC test facilities to support all electronics manufacturing companies in the country. Expected outcome of the project in physical terms are one 3 meter Shielded Anechoic Chamber (SAC) and another 5 meter Shielded Anechoic Chamber. These chambers and associated test systems are capable of providing MIL Standard, EMI/EMC testing services to all electronics manufacturing companies in India.

The proposed facility will engage in basic R&D in EMI/EMC measurements that will enhance the confidence/repeatability of EMI/EMC measurements with reduced uncertainties in the country.

Many private industries in addition to Government labs will be involved in the development and production of electrical and electronic products/equipments for defence. Consequently, the requirement of MIL Standard qualification of such

equipments will be mandatory before induction into armed forces. This provides an opportunity for MIL Standard EMC laboratory to play major role in ‘Atmanirbhar Bharat’ and ‘Make in India’ initiatives by offering its design, test, measurement and consultancy services. The establishment of MIL chambers will address and benefit the manufacturing/developing industries, driven by ‘Atmanirbhar Bharat’ and ‘Make in India’ initiatives, especially in defence sector. Thus, the need for MIL Standard chambers becomes all the more important where, private and public sector industries can have all their EMC compliance requirements at one place, namely SAMEER-CEM, which will be a nodal agency.

The proposed MIL standard EMC test facility will be a value addition to SAMEER-CEM in terms of enhancement of customer base and revenue potential. SAMEER-CEM is bound to generate huge revenue in the years to come because of the luxury in providing all civilian and MIL EMC facilities at one place for the customers. In addition, it will be the National facility for Quality research in the field of EMI/EMC.



Visible Light Communication based LED Lighting Solution

Smart LED down light as VLC Transmitter

LEDs are low-cost and energy-efficient. They are replacing traditional bulbs as the primary source of illumination in residential and public environments. With additional hardware and software the existing

LED lights can be made to act as a VLC transmitter. As LEDs respond quickly to ON/OFF signals, data can be modulated at desired frequencies which does not cause disturbance to the lighting at the same time enables wireless communication.

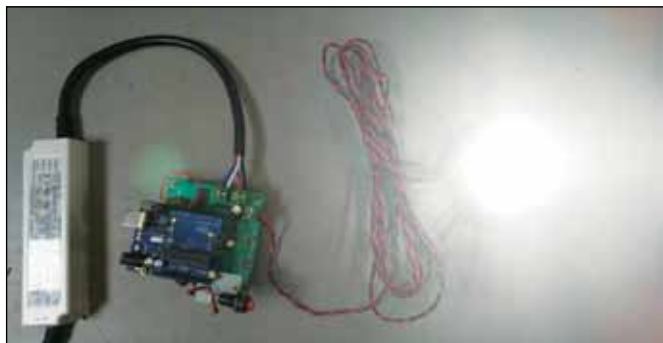


Fig (a)

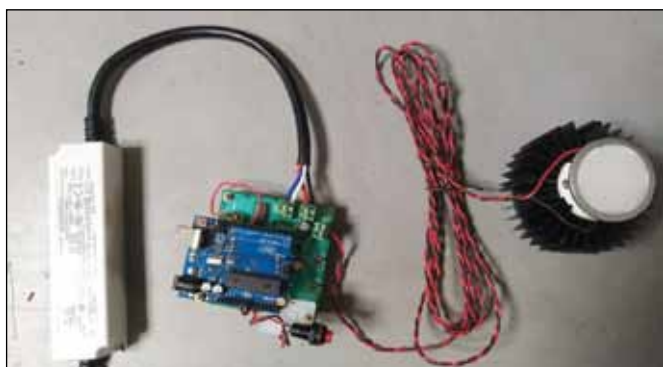


Fig.(b) Prototype model of Smart LED Down light as VLC Transmitter developed by C-DAC Chennai

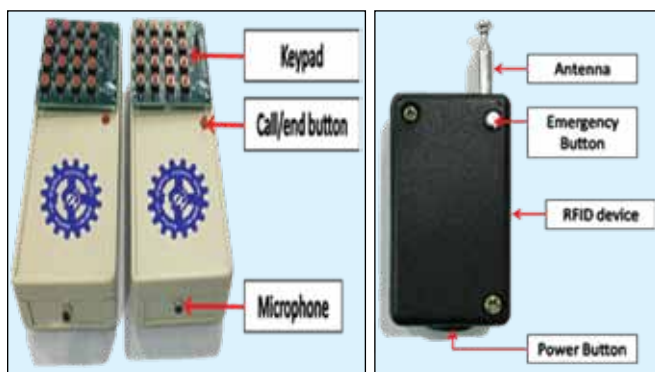
Fig.(a) and (b) depicts the prototype model of smart LED down light developed by C-DAC Chennai. The developed prototype model acts as a VLC transmitter module is programmed to broadcast its location information (unique ID). Receiver module can be camera/photodiode that receives the unique ID and locates the position of the person.

Digital Mine using IoT

Under the project, an integrated monitoring and hazard prediction system has been developed for improving safety and productivity in underground mines. The integrated system includes different modules covering hardware and software for:

- (i) Environment and gas monitoring,
- (ii) Strata monitoring,
- (iii) Fire and explosivity status monitoring,
- (iv) Miners tracking and voice communication,
- (v) Water level monitoring and stowing practices,
- (vi) On-line production and dispatch monitoring,

(vii) Store inventory management, (viii) Personnel management, (ix) On-line form submissions and e-Governance, (x) Training module, etc. The system uses IoT-enabled sensors and control units, flameproof and ingress protected devices, and data acquisition and prediction software.



Acoustic Gunshot Detection System for Strategic Applications (AGDS)

The Acoustic Gunshot Detection System detects and conveys the location of gunfire using an array of acoustic sensors. Design, development and integration testing of Standalone Static configuration of AGDS has been completed.

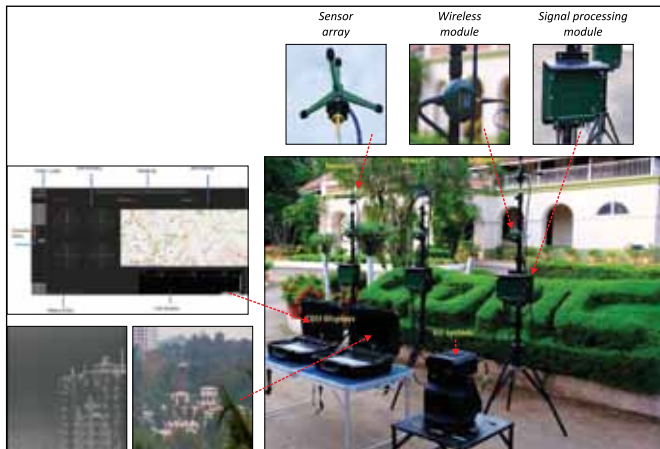
Technical achievements

The following hardware modules have been Designed, Developed and Tested successfully:

- 3 Sensor arrays which listens to acoustic events
- (ii) Analog and Digital Processing modules
- (iii) Wireless Network for communicating the gunshot localization parameters from sensor arrays to a remote Control and Display Unit (CDU)
- (iv) CDU which displays Gunshot location in geographic map, and also the images/videos captured by the Electro Optical system
- Successfully Designed, Developed and Tested the following software modules:
- Algorithms for (i) Identification of Shock Wave and Muzzle Blast signals in a gunshot

(ii) Multipath rejection algorithm to reject the acoustic reflections from field (iii) Computation of localization parameters

- Communication, Control and Display software for (i) Receiving localization data and Display of the results in geographic map (iii) Integration with EO system to control and display the images/videos from the system, for a visual display of detected gunshot location
- Successfully performed the integration of the Static Configuration of AGDS consisting of Sensor arrays, Processing Units, Wireless network, Gunshot Display Unit and EO system Display Unit



Development of Software Defined Networking (SDN) and Network Function Virtualization

Development of Software Defined Networking and Network Function Virtualization (VNF) based Network Service Delivery Platform for Enterprise and Service Providers

The project aims to develop an indigenous agile network service delivery platform with smart network edge boxes and service orchestration software. The smart network edge box, which is based on generic purpose hardware, is capable of running multiple Virtual Network Functions (VNFs) for Routing, Switching, Firewalling etc. The service orchestration software is capable of chaining multiple such VNFs to form a network service such as Software Defined

Wide Area Network (SDWAN) or Network Security Services. The solution has a wide applicability in the impending 5G deployments. Moreover, through the softwarization of networks, much agility can be achieved in the way the network services are deployed by network service providers and enterprises. By eliminating the need for specialized hardware for network functions much savings can also be achieved on the hardware cost. The project is currently in development stage

Design of Dynamic MAC and PHY SoC for Low Power and Long-Range Networks

The main objective of the project is to create, develop and prototype a Digitally Intensive Technology Scalable Low-power reconfigurable IEEE 802.15.4e Transceiver PHY SoC and a MAC-PHY for long range networks. Through this, we can improve the technology available for smart cities and next generation industrial internet of things in India. At this point of time, following sub-systems have been designed. Phase Locked loop, which is one of the sub-systems of PHY layer has been fabricated using UMC 65 nm technology and the photograph of the fabricated die is shown in Fig. (a). With respect to MAC layer, it has been implemented in open SDR GNU radio platform and nRF 52840 microcontroller with ADF7242 Radios as shown in Fig. (b).

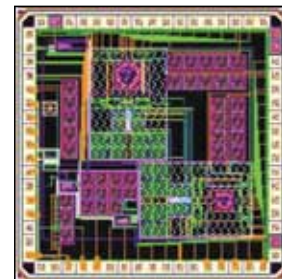


Fig. (a) Die (Chip area = 1.8 mm × 1.8 mm)



USRP as Transmitter

nRF as Receiver

Fig. (b)

Other R&D initiatives: Multi-Model Framework for Monitoring Active Fire Locations (AFL) and precision in Allied Agricultural Activities using Communication Technologies, Capacity Building and Research Entrepreneurship Centre in Artificial Intelligence Big Data and IoT for SC/ST, a Low power 8-16 Gb/s/Pin Full Duplex Wireline transceiver, Multiple Gigabit Wireless System (MGWS) at 60 Ghz for 5G and beyond, Tribe Connecting Integrated Smart Tribal Eco Platform a Proof of Concept in Chattisgarh, Design and Implementation of Intelligent Receiver over randomized Environment by Statistical and Machine Learning Approach. Design and Fabrication of Autonomous Passenger Drone, Acoustic Gunshot Detection System for Strategic Applications, Development of SDN and NFV based Agile Network Service Delivery Platform for Enterprise and Service, Cognitive Radio for Strategic Applications, Development of a prototype wideband RF frontend & Waveform for Spectrum Sensing based Interference Mitigation, Development of 4G/5G based UAV Augmented Intelligent Monitoring and Surveillance System, Conformal Jamming Systems for RCIED, Development of Multi-Option Proximity Sensors (MOPS) for Artillery and Mortars, Intelligent Video Surveillance and Video Analytics System, Efficient Multicarrier Waveform Design for Next Generation Non-Orthogonal Multiple Access for Wireless Mobile Communication.

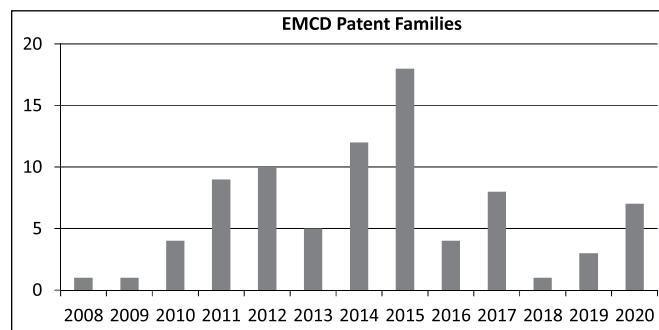
New Initiatives in the 2020-21

Some of the new projects are Design and Development of X-band High Power Passive and Active Devices, Ensuring QoS in Internet Of Medical Things (IoMT) Using Software-Defined Networking (SDN), Middleware, Applications & Platform for 5G Environment, Design and Development of e-Learning Platform for assisting underprivileged SC/ST school students in Rourkela region.

5.2 Translation R&D

5.2.1 Initiatives under Electronics Components and Material Development

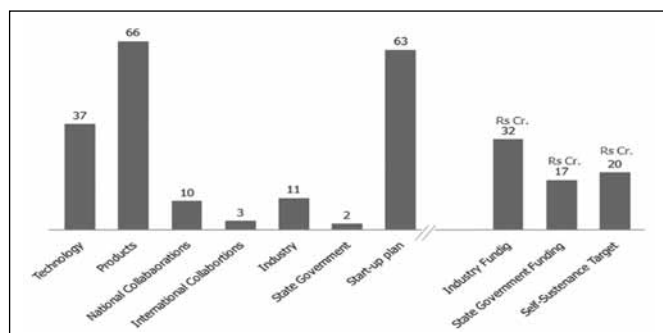
Electronics Components & Material Development Programme (EMDP) has been promoting research and development activity since 1986 to nurture electronics development in the country for boosting local manufacturing. EMDP's core areas of research are electronics materials, components and process technology, photonics and electronics waste recycling (e-waste). In last ten years, a total of 77 patents families have been filed under EMCD. This year seven new patents have been filed in the area of hybrid battery, EMI shielding, FiWi and Few Mode Optical Fibre. Schematic showing year wise EMCD patent filling is provided in figure below:



The current focus of the program is development of technologies in the areas of energy storage, additive manufacturing, printed circuit board substrates, antenna, EM absorber material, optical technologies including optical fiber, optical computing using silicon photonics, laser systems, optoelectronics packaging, environment & E-waste and process technology & machine development leading to product development, technology transfer and commercialization. In this regard, EMDP has initiated five Centre of Excellences in the areas of e-waste, rechargeable battery (Li-ion and Na-ion), additive manufacturing, silicon photonics and Li-ion battery (post-cell). To promote commercialization, key structures such as national

& international collaborations, industry involvement and funding, State Government involvement and funding, Start-up plans, self-sustenance plans and manpower trainings have been introduced under the projects. Details of all five CoEs are provided in section 5.3. Total planned targets under the 5 Centre of Excellences are provided below:

CoE targets under EMCD



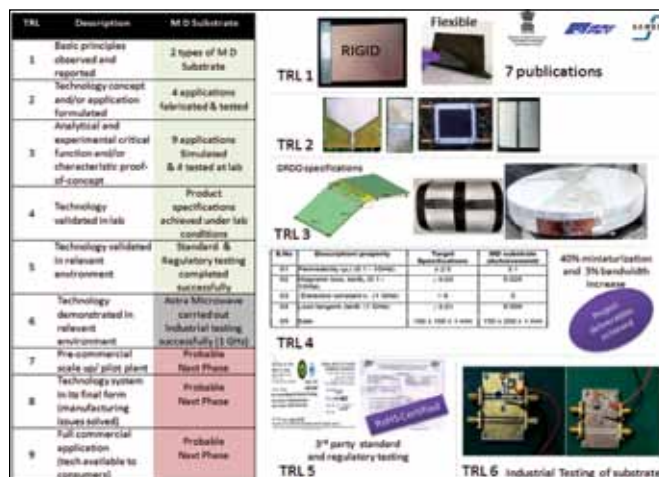
Other ongoing technology developments under EMDP are provided below:

Supercapacitor-based Power Modules (SCPM) for applications in VVPAT of EVM: Currently, power requirement of Voter Verifiable Paper Audit Trail (VVPAT) which is a part of Electronic Voting Machine (EVM) is met from high power battery module comprising 30 alkaline cells. During the printing of voters slip the machine requires current pulse of 3-5 A for a short duration of 1 to 2 seconds. In this project, carbon aerogel supercapacitors being a high power energy storage device which can deliver high power to the load have been explored as power source for VVPAT along with batteries. Use of carbon aerogel supercapacitor will reduce consumption of alkaline batteries leading to a cost reduction along with the enhancement of life of power module. In this connection, C-MET has delivered 75 numbers of 25 F carbon aerogel supercapacitor to ECIL Hyderabad for testing of VVPAT machine. The carbon aerogel based prototype power module could able to achieve > 65% of the target voting cycle. The further developments are underway to achieve the targeted voting number.



Magneto-dielectric Printed Circuit Board

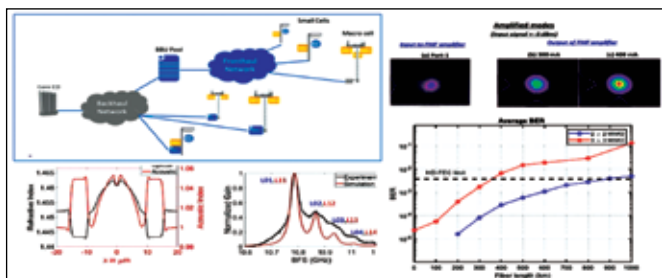
Substrates: Magneto Dielectric (MD) materials are artificially developed materials with permittivity and permeability values greater than unity which gives the material properties that can miniaturise antenna and components operating at Ultra High Frequency Range (UHF) and Very High Frequency Range (VHF) with minimal impact on the bandwidth of the antenna. The technology development has now completed TRL 5 with successful standard and regulatory testing by 3rd party; and TRL 6 with successful industrial testing by M/s Astra Microwaves. The development work also achieved its final target specifications of 40% miniaturization with 3% enhancement in bandwidth. The best miniaturization of 85.9% was found for absorber applications using the material.



Mode Division Multiplexing using Few Mode

Fibers: The bandwidth required in short and long-haul communication systems is increasing dramatically with the advent of advanced wireless communication systems and the proliferation of data centres. The maximum achievable capacity of

single mode fibres used commercially today is limited by the non-linear effects in the fibre. The use of space division multiplexing—with multicore and Few Mode Fiber (FMF) is expected to increase capacity in long haul and access networks. A technology demonstrator program for the technology has been undertaken at IIT, Madras. The technology has been successfully demonstrated for short distance (<10Km) and 3 patents have been filed.



Indigenous Antenna for Navigation with Indian Constellation (NavIC) Antenna: Navigation with Indian Constellation (NavIC) is an independent regional navigation satellite system developed in the country. It is designed to provide accurate positioning information service to users in India as well as the region extending up to 1,500 km from its boundary. It is expected to provide indigenous navigation system, which would give information on location and time in all weather conditions. Each NavIC satellite signal transmits one L-band carrier frequency L5 at 1176.45 MHz and one S-band frequency at 2492.028 MHz. GPS is currently using only L-band signals (L1 at 1575.42 MHz and L2 at 1227.60 MHz) where as NavIC uses both L and S Band. NavIC is going to work better than GPS in crowded places, since the signals are coming vertically from stationary reference. Moreover, NavIC accuracy is expected to be better (~5 meters) compared to GPS (~20 meters) not only for cities but every rural part of the country since both L and S bands are used. The design of circularly polarized L1 and L5 band antennas using high frequency structure simulator (HFSS) are completed. The different dielectric substrates have been prepared

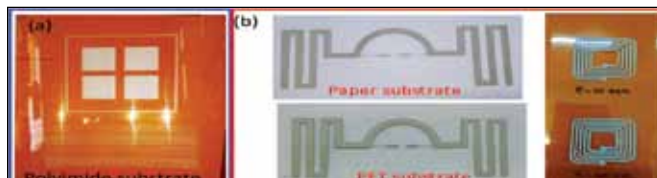
using phase pure high dielectric microwave ceramic filler materials and the antenna structures suitable for NavIC systems have been fabricated. The antenna design on ceramic and composite substrate are optimized for NavIC applications.



Fabricated NavIC antenna (a) coupled shorting strip (CSS) and (b) L5 ceramic antenna

Printable Silver thick film ink for RFID Tags: RFID

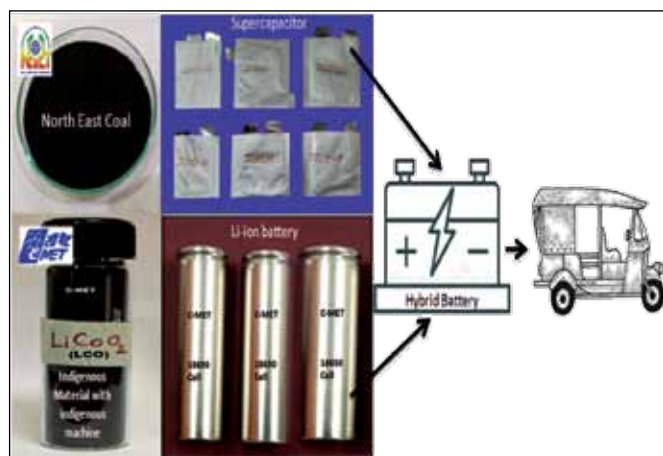
Tags are used in a variety of applications such as access management, tracking of goods, tracking of persons and animals, toll collection and contactless payment, machine readable travel documents, Telecom, Banking, Retail and IT Industries for contactless payments, Airport baggage tracking logistics and identification of LPG cylinders during bottling, distribution and supply chain management. Technology development for indigenous printable silver ink has been undertaken by MeitY through C-MET. Printable nanosilver conducting paste/ink composition compatible to flexible substrate. Antenna tag for Ultra-High Frequency (UHF) and Microwave range (869 MHz, 902-928 MHz and 2.45 GHz) RFID applications will be demonstrated using the indigenous printable silver ink on flexible substrate. C-MET has developed organics system for the formulation of screen printable silver paste curable below 100°C and screen & inkjet printable Silver ink/paste for flexible substrates (PET, polyimide, paper).



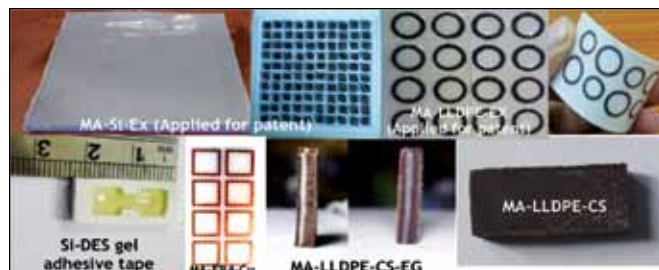
Test Pattern: a) Inkjet printable silver ink
b) silver paste on various substrates

Hybrid battery power module with indigenously developed super-capacitor and Li-ion cell:

Carbon is the largest input raw material by weight for lithium-ion cell and supercapacitors. A technology development for Li-ion battery and supercapacitor cell based on North-East coal as carbon has been initiated by MeitY through CSIR-NEIST, Jorhat. Hybrid power module using supercapacitor from NEIST, Li-ion battery from C-MET and custom build BMS from industry is being developed to power e-rickshaw.

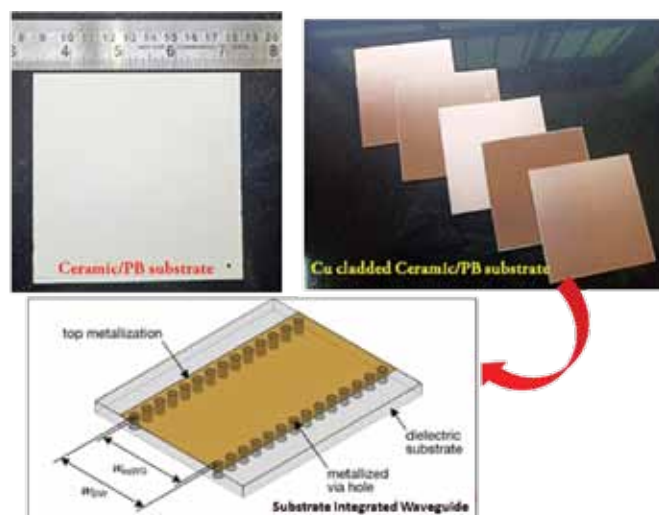


EMI Shielding materials: Electro Magnetic Interference (EMI) shielding materials with thickness less than 4mm with reflection coefficient of at least -20 dB and covering a bandwidth of approximately 2-4 GHz in X and C band. The material will be light weight, conformal, with high mechanical stability and cost effective. The developed absorbers are successfully tested for their absorption performance and mechanical stability. The absorbers are thin (≤ 3.5 mm), lightweight, cover the whole X-band with reflection coefficient ≥ -30 dB. Further, commercial size absorbers have been developed and tested. Besides, another milestone has been achieved by in-house development of free-space measurement set-up. The products developed under the project are ready for commercialization and is on the verge of possible Transfer of Technology and is in the TRL-7th Stage.



Polybutadiene/ceramic composite laminates for Substrate Integrated Waveguides (SIW) applications:

Microwave substrates are extensively used for variety of high end microwave circuit applications such as high power solid State amplifiers, patch antennas, missile guidance, mobile base stations etc. Polybutadiene based composite laminates provides high dielectric and low loss microwave substrates. More than 70% of the cost of any microwave device accounts for the base microwave circuit board and requirements of high frequency circuit boards are fully met through imports. Availability of Polybutadiene based composite laminates for microwave and millimetre wave circuit applications are going to reduce import cost and boost Indian manufacturing. The project envisages development of five different substrate products of different dielectric properties and demonstrates applications based on Substrate Integrated Waveguide (SIW) circuits on the developed substrates.



5.2.2 Technology Development & Demonstration for Indian Industries

5.2.2.1 National Mission on Power Electronics Technology (Phase-III)

The National Mission on Power Electronics Technology Phase-III (NaMPET-III) program is being carried out with an objective to strengthen the power electronics technology base in the country. Various activities like Technology development & deployment, technology transfer, Awareness creation and strengthening the industry interactions with R&D and academic institutes through collaborative research are in progress.

Development of Wide Band Gap Device based magneticfield/Currentsensor, design&development of planar magnetic, Low Voltage Direct Current (LVDC) based power pack deployment in house boat, electrical vehicles charging system, Wireless Charger for Light Electric Vehicles, deployment of micro-grid, Interconnection of micro-grids are progressing in different stages. LVDC in house boat is being field tried and it is near completion. A futuristic project on “Realization of Gallium Oxide based Power Devices” has been initiated. An industrial conclave on e-Mobility and five short term courses on specialized applications of power electronics have been conducted in different parts of the country.

5.2.2.2 Realization of Series Connection of Silicon Carbide (SiC) Devices in Converters with High Frequency Link Bidirectional DC-DC Converter for Grid Interfaces

To address the challenges in conventional Silicon based power converters in the emerging applications which require high power density, higher efficiency, reduction in energy consumption etc., and to meet the requirement of next generation high voltage devices, this project has been progressing at IIT Madras. Active gate drivers for series connections

of SiC devices have been successfully developed and demonstrated with double pulse circuit.

5.2.2.3 Spectroscopic Platform for Detection of Adulteration in Milk

This project is progressing at CEERI, Pilani for development of a portable system for detection of adulterants like urea, sugar, malto-dextrine, melamine and vegetable oil in milk through spectroscopic method. Design and development of the complete system has been completed and prototype of the system has been developed and tested in laboratory successfully. Industrial trials are in progress.

5.2.2.4 Development of Electric Vehicle Sub-System:

Keeping in view the present and future technological requirements of Electric Vehicles (EVs) and to enhance the local manufacturing of the subsystem, technology development in the areas of electric motor/controller etc., for EVs such as two wheeler, three wheeler and e-Rickshaws have been progressing at three institutes i.e. Delhi Technological University, New Delhi, IIT Kharagpur and IIT Madras in a consortium mode. Technology of 1.4 KW PMSM motor/Controller has been developed, tested and ready for transfer to two interested companies for production/commercialization. Prototype of the 1 KW BLDC motor/controller has been completed and it is ready for transfer of technology to industries.

5.2.2.5 Autonomous Last Mile Vehicle (ALIVE)

In order to have our own technology for Autonomous vehicle suitable for Indian traffic conditions, this project has been evolved and initiated. It will be a prototype autonomous vehicle with limited autonomy to move in a predefined area. Literature survey to identify state-of-the-art approaches for LIDAR based obstacle detection has been completed. Sensor placement on vehicles in the

simulation platform (CARLA), testing the LIDAR-Camera Cross calibration, and integration with the computing infrastructure within the vehicle is in process.

5.2.3 Medical Equipments/Tools

Deployment of 6 MeV Linear Accelerator (LINAC) for cancer treatment:

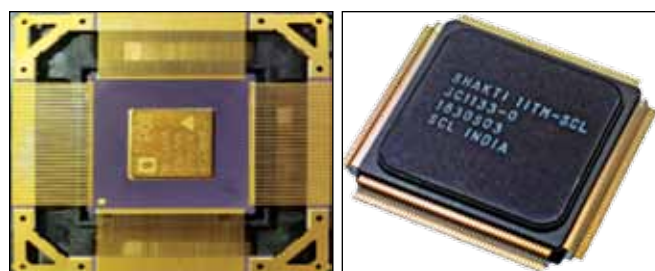
Four 6MV LINAC were developed under the project. One LINAC Machine has been deployed at Indian Institute of Head and Neck Oncology, Indore is being used for patient treatment. On an average, 30 patients are being treated per day on this machine. The second LINAC machine has been installed and commissioned at Amaravati Cancer Foundation, Amravati. Treatment of the Cancer patients has started since August 2018 with an average 30 exposure per day. The deployment of third LINAC Machine at BKL Walawalkar Hospital, Chiplun, Maharashtra is in progress and Mechanical alignments, calibrations, Optical-radiation-Mechanical congruence and sub-system wise QA, radiation testing has been accomplished. Identification of new hospital is in progress for deployment of the forth machine.

5.2.4 Initiatives under Microelectronics Development

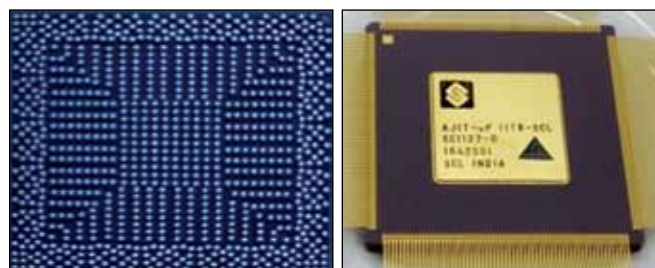
Some of the technologies developed/being developed indigenously under the R&D projects initiated by Microelectronics Development and Nanotechnology Initiatives Divisions are:

Microprocessor Development Programme

Family of 32-bit/64-bit Microprocessor being indigenously designed using Open Source ISA (Instruction Set Architecture) along with reusable IP cores by C-DAC, IIT Madras & IIT Bombay. Following Microprocessors variants designed indigenously are being explored for their usage in strategic & industrial applications:



32-bit Microprocessors (Embedded & Controller Class) fabricated by IIT-M at SCL Mohali foundry



64-bit Microprocessors fabricated by IIT-M at Intel foundry

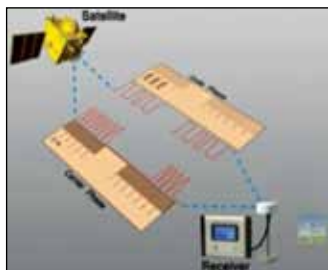
32-bit Microprocessors fabricated by IIT-B at SCL Mohali foundry

Swadeshi Microprocessor Challenge - Innovate Solutions for #Aatmanirbhar Bharat:

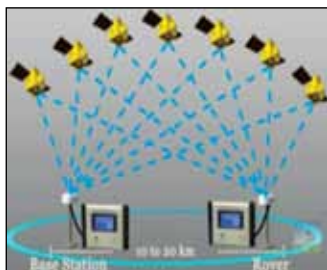
To provide further impetus to the strong ecosystem of start-ups, innovators & researchers in the country, MeitY launched the Swadeshi Microprocessor Challenge on 18th August, 2020 to promote a culture of innovation and entrepreneurship by taking up complex designs in the country and innovate frugal solutions around home-grown processors (IIT Madras (SHAKTI processors) and C-DAC (VEGA processors)) ecosystem, catering to both global and domestic requirements. The call for ideas is to provide a jump-start to solutions by sculpting innovation with Technical support, Business mentorship augmented with Hardware, Software and funding support to applicants at various stages of the Challenge. The Challenge will continue till 30th June, 2021. Under the Challenge, 6,170 Registrations (from 10,000 participants) have been received from Start-ups, Students from Education Institutions & Innovators across the country, which have been made part of Quarter Final Stage wherein the proposals for development of innovative prototype solutions around SHAKTI &

VEGA Microprocessors are being taken forward for further stages.

Design & Development of NavIC Receiver: For effective use of Navigational services based on Indian Constellation of Satellites, named NavIC (Navigation with Indian Constellation), a proof-of-concept working prototype for NavIC User Receiver is being developed using the ingeniously developed- RF Front-end and Digital SoC (including Microprocessor and Navigation algorithms) with Multi-Constellation support (i.e. NavIC (L5 and S frequency band) & GPS (L1 frequency band)) by SAMEER Mumbai in collaboration with IIT Mumbai, IIT Madras, IIT Jodhpur & IIST Thiruvananthapuram. The Standard Positioning Service (Position, Velocity & Time) offered by NavIC Receiver will find huge application in Terrestrial, Aerial and Marine Navigation particularly for- Disaster Management, Vehicle tracking and fleet management, Integration with mobile phones, Terrestrial navigation aid for hikers and travelers, Mapping and Geodetic data capture etc. While the RF ASIC, designed and fabricated at 65nm UMC foundry was successfully demonstrated, the design of Digital SoC is ready of tapeout.



NavIC Receiver



Constellation of 7 Satellites

5.2.5 Initiatives under Nanotechnology

- A start-up namely Innovodigm has been incubated at IIT Kharagpur for the development of novel prefilled auto injectors with integrated microneedles.
- Technology for soil Moisture sensors developed by IITB and IISc has been

transferred to a start-up called Soils-Sens incubated at IITB.

- Transfer of know-how and technology for NO_2 , O_2 and N_2H_4 and H_2 sensors by IISc Bangalore to SCL, Mohali for complete mask design and wafer processing has been initiated and is in process.
- A Project entitled “Nanoelectronics Network for Research & Applications (NNetRA)” being implemented by IIT Bombay, IIT Delhi, IIT Madras, IIT Kharagpur and IISc Bengaluru has been initiated in collaboration with DST & Implementing agency as an umbrella programme for a period of four years with the vision of making India Knowledge rich in Nanoelectronics. Under NNetRA following are the achievements:
 - Gas Sensors for H_2 , O_2 , NO_2 , N_2H_2 have been developed at IISc and deployed at SHAR, ISRO for the validation of complete sensor system and user feedback for further improvements. Continuous monitoring of deployed sensors is being carried out for possible reliability issues. O_2 sensors are also being customized for its use in the ventilators being developed at IISc during the COVID-19 pandemic.
 - Around 75 soil moisture sensors have been deployed at various fields to generate data base and reliability.
 - Prototype of Monolithic Microwave Integrated Circuits (MMICs) and RF modules for strategic and high-end applications using GaN High Electron Mobility Transistors (HEMTs) are being developed at IITB.
 - A prototype of ultrasensitive Magnetic field sensors based on (Super Quantum Interference Device (SQUID)) has been

developed at IITD. An MoU with Dr. K.S. Krishnan Geomagnetic Research Laboratory, Jhunshi, Prayagraj, Uttar Pradesh is being signed for measuring magnetic moment of rocks by using the developed SQUID sensors of 1-0.1nT range.

- Three-Dimensional Nanostructure based Miniaturized and Flexible rechargeable lithium batteries for flexible electronics are being developed at Centre for Materials for Electronics Technology (C-MET), Pune by using shape-conformable solid-state electrolyte/separators, flexible electrode materials for RFID applications. A prototype of Flexible rechargeable lithium batteries for flexible electronics has been developed.

5.3 Centres of Excellence

5.3.1 Nanoelectronics Centres

Nanotechnology Initiatives Division at MeitY has established several Centre of Excellence in Nanoelectronics at IISc Bangalore to take the basic R&D outcomes to the prototype and then to manufacture Nano devices, subsystems, systems for the social benefits.

Nano Fabrication Prototyping Facility for SMEs and Start-ups in the area of Micro Electromechanical Systems (MEMS) & Nano Electromechanical Systems (NEMS) at IIT Bombay.

A National Prototype Facility has been created, commissioned & fully operational to enable researchers and industrial partners/incubator companies to fabricate and manufacture nanoscale devices. This facility aims to provide facilities for scaling-up of nano-manufacturing operations in contamination and quality controlled environments also it will be an accessible platform to bring technologies from Technology Readiness Level

TRL 4 to TRL 9. Fabrication unit processes have been optimized for silicon to release diaphragms, fabrication of microcantilevers and micro-heaters.

Centre of Excellence in R&D in Theranostics Devices at IIT Guwahati

Centre for Nanotechnology at IIT Guwahati has been created to provide a platform for the scientific and technological developments in the North-Eastern region of the country. Research & Development efforts at this centre have resulted in many publications, patents, proof of concepts, prototypes and transfer of technologies based on chemical, biological, and environmental sensors, transistors and MEMS/NEMS applications.

5.3.2 E-waste

C-MET, Hyderabad has been actively engaged in E-waste related research area for the past 10 years and already established environment friendly e-waste recycling processes of spent Printed Circuit Boards (PCBs) at pilot plant scale. In addition, C-MET has also established strong association with industries working in similar lines for further scaling up of the processes. The purpose of establishing Centre of Excellence (CoE) in E-waste Management is to create physical infrastructure and knowledge hub for the development of cost-effective technology for E-waste recycling and dissemination of E-waste solutions from dismantling to recycling to precious metal separation in collaboration with Government, Industries, and academia. This will enable the empowerment of informal E-waste recyclers in the country, safe disposal of end of life electrical and electronic devices, recovery of precious metals from E-waste, strengthening of current engineering ecosystem to improve the process efficiency, vanquish the export of PCB boards, safe recovery of precious metals and thereby huge savings on foreign currency, dissemination of knowledge base for human resource development, Skill development for prosperous entrepreneurs, and nurturing of

start-ups. First year progress of the CoE involves launching of M. Tech program on E-waste in IIT, Hyderabad; recycling of Li-ion battery and un-shredded mobile mother board, extraction of Rare Earth materials from permanent magnet; and launch of Grand Challenge on E-waste management.



5.3.3 Rechargeable Battery Technology (Pre-cell)

Lithium-ion batteries are ideal power source for consumer electronics, e-mobility and power sectors. These batteries are also expected to find niche applications in e-Governance electronics such as VVPAT machines. Current energy storage market in India includes applications such as mobile handsets and their accessories, solar rooftop, grid solar integration, wind integration, electric vehicles, inverter back-ups, telecom, UPS, rural micro-grid and off-grid applications, diesel replacement, railways etc. India has vibrant Lead Acid battery manufacturing industry and needs to augment Li-ion battery cell manufacturing to meet current and future demands of energy storage. India primarily imports Li-ion cells and manufactures battery packs of different capacity for various applications. Government support in form of R&D funding for development of cost-effective end-to-end indigenous technology for manufacturing of rechargeable battery (Li-ion and post lithium) suited for Indian environment is vital for meeting the future demands. The support for R&D is expected to lower up-front investment cost, utilize Indian supply chain, improve profit margin and bring SMEs into play

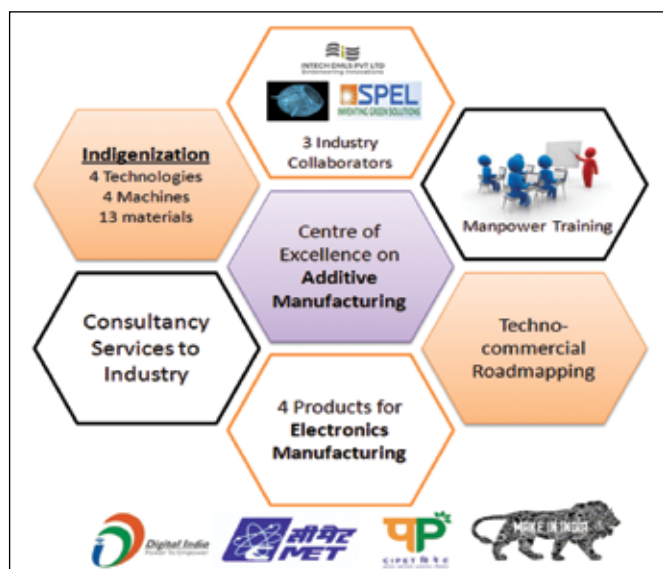
for manufacturing industrial units of rechargeable battery cell manufacturing eco-system. In this direction, MeitY has recently initiated a Centre of Excellence (CoE) on Rechargeable Battery Technology (Pre-cell) at C-MET for scale up and transfer of indigenous technology on Lithium-ion battery and Sodium-ion battery (post lithium) to Indian SMEs for manufacturing of battery cells. The CoE has now completed SME business plans for its indigenous technology showing profitability under current market conditions, provided paid services to 20 industries, achieved breakthrough in electrode manufacturing to reduce investment and running cost. CoE will create at least 25 start-ups in next five years in collaboration with its industrial partners.



5.3.4 Additive Manufacturing

Additive Manufacturing (AM) are disruptive set of technologies which are bringing fundamental change in how manufacturing is carried out in many sectors due to its ability for mass customization. AM is an enabler for digital manufacturing which has capability in producing products directly from design data by adding layers of material to obtain the final shape with minimal waste, supporting Industry 4.0. The Ministry of Electronics and Information Technology (MeitY) has initiated a Centre of Excellence on Additive Manufacturing at Centre for Materials for Electronics Technology (C-MET), Pune in collaboration with Central Institute of Plastics Engineering & Technology (CIPET),

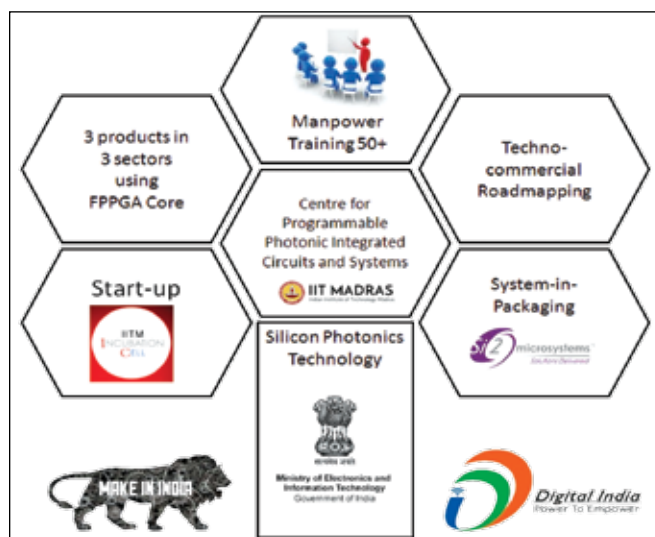
Bhubaneswar. The objectives of the centre are to support Indian Additive Manufacturing Eco-system through focused and coordinated research, design and development in collaboration with 3 participating industries. The centre is expected to achieve self-sustenance and focus on developing indigenous materials and machine technologies for electronics manufacturing sector. In current phase of the project, 4 technologies with 4 different machines, 13 materials and 4 different electronics application products are slated to be developed. The project is also bringing opportunities for Indian companies to develop their own AM material and machine technologies for global market at much reduced R&D cost for any sector (not limited to electronics) such as aerospace, medical, automotive etc., The centre is also going to train manpower to support growth of AM economy in India.



5.3.5 Silicon Photonics

Field Programmable Photonic Gate Array (FPPGA) core technology is a multipurpose photonic processor platform which can cater to multiple sectors with multiple applications such as Quantum Computing, Quantum Communication, 5G/6G communications, IoT, Radar and Avionics etc. The Ministry of Electronics and Information Technology

(MeitY) has initiated a Centre for Programmable Photonic Integrated Circuit and Systems (CPPICS) at IIT Madras in collaboration with industry to design, manufacture and develop applications based on FPPGA cores using Silicon Photonics. The centre is slated to become self-sufficient in 5 years time, commercialize the products through Start-up and train manpower to boost the eco-system of such manufacturing. The centre is collaborating with M/s Si2 Microsystems, Bangalore for System-in-Package solutions for the proposed silicon photonics FPPGA cores which will create commercially viable products for proposed start-up.



5.3.6 Centre of Excellence (CoE) on Post-Cell Value Chain of Li-ion Battery

Lack of design capability in Indian mobile handset and accessories manufacturing severely hampers domestic companies to introduce new models, customize features for the customers which leaves the market wide open to competitors with this coveted ability. India is also losing valuable foreign exchange to international design hubs in other countries. Thus for long term success of Indian electronics manufacturing, research and innovation supporting design centre needs to be based in India. The setting-up of industrial parks, creation of eco-system for electronic industries may be the

only solution to reduce the import dependency. To make India self-reliant and Aatma Nirbhar in this sector, a Centre of Excellence (CoE) on Post-cell value chain for power bank technology is proposed to be set up at C-DAC Noida with the requisite infrastructure, equipment, R&D facilities etc. The CoE is expected to seed a design hub for SMEs in the power bank industry and other Indian mobile handset and accessories eco-system products based on Li-ion cells, leading to reduced foreign exchange outgo and employment generation.



5.3.7 Innovation & IPR

India is home to one of the most vibrant start-up ecosystems in the world with 21 unicorns and over 50 soon to be unicorns and start-ups are growing at 12-15 per cent Y-O-Y with 9,000+ start-ups incepted over 2014-19. Post-COVID, the world's third-largest start-up ecosystem is recovering faster than expected. In fact, four Indian start-ups gained the unicorn status during the slump. With restrictions getting curbed, the sector is crawling back on track and is witnessing growth. A shift to digital consumption has provided the necessary tailwind to sectors such as education, healthcare, and commerce; while several sectors like travel,

hospitality, and mobility, that were negatively impacted, are now on a recovery path. Tech start-ups are crucial for self-reliant India and must cease their dependence on foreign investment for growth. A majority of these start-up companies are focusing on emerging technologies such as Internet of things, Artificial Intelligence, Big Data, Machine Learning, Cloud Computing etc., to chart out their growth trajectory. However, it is also true that many Start-ups do not reach their full potential due to limited guidance and access.

Consistent with Government of India's Digital first strategy in navigating the digital revolution, the Ministry of Electronics & Information Technology (MeitY) has also undertaken a slew of proactive, preemptive and graded measures to spur the technology led startup-innovation ecosystem in the country to stay at the forefront of initiatives shaping up contemporary digital narrative. In tune with the times, this approach builds from established best practices designed to strengthen the overall tech start-up development infrastructure by overcoming persistent bottlenecks to work grounds up seamlessly. Some of these initiatives have been elucidated here:

MeitY Start-up Hub (MSH): To give wings to MeitY's vision of promoting technology innovation, start-ups and creation of Intellectual Properties, a nodal entity called MeitY Start-up Hub (MSH) has been setup under its aegis. MSH is a dynamic, singular and collaborative platform for tech start-up community towards building meaningful synergies in the Indian start-up space. MSH's quick value additions to domestic tech start-ups in terms of improving scalability, market outreach and domestic value addition and setting-up innovative partnerships with various stakeholders has been a key differentiator in MSH's efforts to catapult the tech start-up ecosystem in the country. MSH also has a mandate for capacity building of different tech incubation centres pan India, capitalizing on

strengths of different centers to pull out moderately weaker centres into mainstream activity. MSH to act as a hub and ensure synergies among all the TIDE 2.0 Centres, theme based incubation centres, Centre of Excellences on Emerging Technologies and other existing platforms for facilitating criss-crossing of technology resources, sharing best practices and ideas across the entire innovation and start-up ecosystem. Today MSH with an aggregation of over 2,000 start-ups, 360 incubators, around 300 mentors, 22 State-of-the-art Centres of Excellence (CoEs) is a singular, dynamic, collaborative platform for the tech start-up community towards building meaningful synergies in the Indian tech start-up space.

Technology Incubation and Development of Entrepreneurs (TIDE) Scheme: Technology Incubation and Development of Entrepreneurs (TIDE) Scheme was put in place by MeitY in 2008 to promote innovation by nurturing start-ups in Information Technology, Communications & Electronics (ICTE) domain. Under the TIDE Scheme, financial assistance is provided to Institutions of Higher Learning to strengthen their Technology Incubation Centres for enabling young entrepreneurs to create technology start-up companies for commercial exploitation of technologies developed by them. Under this scheme, 27 TIDE Centres and 2 Virtual TIDE centres have been supported at institutes of higher learning all over India.

The following are the main outcomes of the TIDE Scheme:

- 27 TIDE Centres and 2 Virtual TIDE centres supported at IITs/IIMs/NITs/Premier Institutes all over India.
- 207 start-ups benefited.
- 384 entrepreneurs emerged and out of which 34 are women entrepreneurs.
- 52 start-ups attracted Venture Capitalists

resulting in investments of Rs.172.39 crore

- Out of 207 start-ups, 95 have successfully graduated till date.
- More graduations are likely to follow as some of the start-ups have been incubated in recent years.
- 74 successful patents have been registered based on the products developed by the start-ups.
- Till date, 243 products have been developed by these start-ups.
- 2,846 jobs created through 27 TIDE Centres.

TIDE 2.0 Scheme: To promote tech entrepreneurship through financial and technical support to incubators engaged in supporting ICT start-ups primarily engaged in using emerging technologies such as IoT, AI, Blockchain, Robotics etc., in seven pre-identified areas of societal relevance. The Scheme will be implemented through 51 incubators through a three tiered structure with an overarching objective to promote incubation activities at institutes of higher learning and premier R&D organisations, eventually leading to handholding of approximately 2000 tech start-ups over a period of five years. The scheme also aims to provide a mechanism, whereby establishing necessary collaboration among the incubation activities so as to benefit them through complementary strengths. To support tech start-ups addressing societal challenges in seven select thematic areas were identified based on National priorities particularly in the realm of (i) Healthcare, (ii) Education, (iii) Agriculture, (iv) Financial inclusion including digital payments, (v) Infrastructure and transportation, (vi) Environment and clean tech & (vii) Clean Energy Solutions.

As of now, 51 TIDE 2.0 Incubation Centres have been approved and made operational. Within a short span of time, TIDE 2.0 scheme has gained a lot of traction. Under the scheme, more than 1,200 applications were received by the start-ups

out of which 232 start-ups were on-boarded till date including 110 as TIDE-EiR and 122 as TIDE-Grant. In addition, a total of 169 start-up engagement activities were conducted by these Centres including Hackathons, Challenge Grants, Deep and Low Engagement Programmes and workshops for start-ups.

Accelerator Programmes: Cohort based Accelerator Programmes offer an intensive, constructive, support system to a competitively selected group of cohort firms in their quest for self-reliance. These business accelerator packages run by some of the best names in the industry specializing in speeding up the growth of start-up companies are bringing in seed investment, mentorship, industry connect and relevant components for transforming start-ups to worthy enterprises. The start-up accelerator programmes aims to support and scale-up the start-ups emerging from the start-up promotional programmes/scheme and helping them to attain success by cohort-based programs that include seed investments, connections, mentorship, educational components to accelerate growth etc. MeitY had recently approved following cohort based 3 Accelerator Programmes so as to bring-in seed investment, mentorship, industry connect and relevant components.

- **Start-up to Scaleup Accelerator by The GAIN, Bangalore:** THE GAIN is a Growth Enabler of cross border start-ups and SMEs to access the India and global markets through mentoring and business support. The whole program will consist of Two Cohort of 10 start-ups each for a period of six months with Primarily in the areas of health-tech and Edu-tech
- **Scaleup Programme by Thub Foundation, Hyderabad:** T-Hub has been established to further the cause of start-ups and entrepreneurship in the region. This accelerator programme consist of cohort

programme of 12-15 start-ups over a duration of one year involving start-ups in the area of electronics hardware manufacturing and agri-tech.

- **Bharat Virtual Accelerator (BVA) by The FinTech Meetup (TFM):** TFM run is India's largest Fintech Start-up connect program "The Fintech Yatra" and Fintech Accelerator "Mumbai Fintech Accelerator". The programme has a single cohort programme to support 13 start-ups over a duration of one year in the area of FinTech.

Scheme for Accelerating Start-ups around Post COVID Technology Opportunities (SASACT):

With an aim to support electronics hardware/ICT based tech entrepreneurial initiatives of start-ups for developing or re-purposing technologies, tools, systems, solutions to respond to the post COVID-19 scenario, MeitY has initiated a project titled "सशक्त 'SASACT' Scheme for Accelerating Start-ups around Post COVID Technology Opportunities" by the designated four implementing agencies (IAs) (i) 'Foundation for Innovation and Research in Science and Technology (Start up Incubation and Innovation Centre SIIC), IIT Kanpur'; (ii) 'Society for Innovation & Entrepreneurship (SINE), IIT Bombay'; (iii) 'Coimbatore Innovation and Business Incubator (Forge Accelerator), Coimbatore' and (iv) 'KIIT Technology Business Incubator, KIIT University, Bhubaneswar' through STPI with over a duration of 1 year. The call for proposal for inviting applications for SASACT Scheme was launched and subsequently, 40 proposals from start-ups are being supported to augment the technology solutions repurposing post covid.

Support for International Patent Protection in E&IT (SIP-EIT) Scheme for SMEs:

A significant initiative of MeitY is the SIPEIT scheme which within a short span of time has become one of the flagship schemes of the Ministry. SIP-EIT scheme provides financial support to MSMEs and tech

start-ups for international patent filing so as to encourage innovation and recognize the value and capabilities of global IP and establish competitive advantage. The scheme is for a period of 5 years with the mandate to support 200 international ICT patent applications. As of now, 67 applications from start-ups, MSMEs have been supported since the inception of the scheme. The Scheme provides reimbursement upto a maximum of Rs.15 lakh per invention or 50% of the total expenses incurred in filing and processing of patent application upto grant whichever is lesser.

IP Awareness Programme for E&IT Sector: In order to enhance innovation, competitiveness and economic growth in India, it is imperative to harness IP. More specifically, with the phenomenal growth of Indian E&IT sector and its need to move up the value chain it is important to foster innovation and legally protect and exploit IPRs generated in India. To address specifically these challenges, the Ministry of Electronics and Information Technology (MeitY) has initiated a scheme to provide financial support to academic institutions, industry bodies and MeitY's autonomous societies for conducting IPR awareness workshops pan-India. Till now, 84 IPR awareness workshops have been supported including 2 International seminars.

IPR Facilitation for MeitY R&D/Innovation Outcomes: To translate the Ministry's various efforts for creating state-of-the-art R&D paradigm in the country, MeitY has been supporting its R&D societies and grantee institutions in filing IPRs which includes patents, copyrights, industrial designs and trademarks. MeitY's IPR portfolio now consists of a total of 65 granted patents with 281 patents filed, 494 copyrights and 87 registered Trademarks.

Centre of Excellence (CoE) in Intellectual Property Rights: With the growth of the IT industry as well as other technical sectors, an urgent need is felt to protect the IPR generated out in India.

To cater this aim, a Centre of Excellence (CoE) on Intellectual Property Rights (IPR) is being implemented by C-DAC, Pune and operational at MeitY and C-DAC Pune. The aim of the project is to encourage the growth of IP in the field of ICT by way of providing various IP related services, awareness creation, proliferation, education and training and also promoting IPR in the field of ICT and conducting prior art searches and patent facilitation.

Centre of Excellence (CoE) on FinTech at Chennai: MeitY has initiated a Centre of Excellence (CoE) on FinTech at STPI, Chennai to provide infrastructure, resources, coaching/mentorship, technology support and funding to emerging start-ups in the FinTech sector. The proposed CoE would establish ecosystem around FinTech with the latest trends and technologies in the financial services sector through a collaborative approach including NPCI, UIDAI and Partner Banks. The purpose of the FinTech CoE is to create holistic ecosystem so as to enable start-ups to experiment their innovative financial products or services within a well-defined space and duration. The project aims to support 58 start-ups over a period of 5 years.

IoT OpenLab-a Centre of Excellence (CoE) for Internet of Things at STPI Bangalore: An IoT OpenLab - a Centre of Excellence (CoE) for Internet of Things in partnership with Arrow Electronics at STPI Bangalore has been initiated to provide academic and business mentoring of the start-ups in the IoT emerging technology area for developing products and/or services around IoT along with networking opportunities for the start-ups. The IoT OpenLab intends to support and nurture 100 start-ups per year with an overall target to support 500 start-ups over a period of 5 years.

ESDM Incubation Centre at Bhubaneswar by STPI: MeitY has approved ESDM Incubation Centre with the objective of creating a holistic

eco-system to promote ESDM innovation, R&D and create Indian Intellectual Property in the Eastern Region of the country. The centre will be operated through STPI, Odisha in collaboration with Government of Odisha, IIT Bhubaneswar and IESA. It aims to leverage 40 start-ups over the period of 5 years. This eco-system is necessary to develop, promote, incubate, mentor and create breakthrough innovations towards development of product and IP creation in the ESDM sector.

Centre of Excellence (CoE) on Medi-Electronics & Health Informatics at Lucknow: MeitY has initiated a Centre of Excellence (CoE) on Medi-Electronics & Health Informatics at Lucknow to stimulate the establishment and growth of technology-based start-ups in the field of medical electronics and health informatics by providing the necessary infrastructure, mentoring, marketing, funding and eco-system required for their success and growth. The Medi-Electronics & Health Informatics CoE is being setup at SGPGI, Lucknow with Department of IT and Electronics, UP Government as funding partner, AiMED as industry partner, AMTZ as industry and seed funding partner and Kalam Institute of Health Technology as academic partner. The project aims to support 50 start-ups over a period of 5 years.

Extending industry connect, market access and global outreach to emerging technology start-ups: With an aim to provide industry connect, market access of the technologies/products developed and global outreach to emerging start-ups, a series of Memorandum of Understanding (MoUs) has been signed with more 20 organizations/institutions majorly such as (i) IESA, (ii) CII, (iii) Qualcomm, (iv) HSBC, (v) PHDCII, (vi) ASSOCHAM, (vii) ELCINA, (viii) USISPF, (ix) The FinTech Meetup, (x) ISBA, (xi) NASSCOM, (xii) IESA (Solar), (xiii) Alumni Association IIT Kanpur, (ix) Innovate-UK, (x) PayPal, (xi) JETRO, (xii) JSC Technopolis Moscow etc.,

Establishment of Incubator for Electronics Start-ups in Delhi-NCR (Electropreneur Park): The Electropreneur Park established in collaboration with Software Technology Parks of India (STPI), India Electronics & Semiconductor Association (IESA) and Delhi University (DU) with State-of-the-art facilities at South Campus, Delhi University. The project aims to support 50 start-ups. As on date, the Electropreneur Park has supported 39 start-ups till date out of which 24 start-ups incubated and 7 start-ups pre-incubated in the Electropreneur Park. As on date, 12 start-ups are graduated out of which 8 start-ups are generating revenues. As an outcome, 21 new products, 18 working prototypes have been developed, 9 patents filed, 43 crore VC/Grants/CSR received by the onboard start-ups and 320 number of employment generated by the start-ups.

Electronics Incubator by IIITM-Kerala and KSUM at Cochin, Kerala: The project for setting-up of Consumer Electronics Incubator at Cochin, Kerala by Indian Institute of Information Technology and Management Kerala (IIITM-K) and M/s Kerala Start-up Mission (KSUM) aims to create new enterprises focusing on Consumer Electronics through a holistic incubation ecosystem. This Incubator will incubate 40 start-ups over a period of 4 years. Infrastructure setup is completed. Testing and Equipment/IoT, Robotics Lab and Prototyping Room for SMT Assembly Line completed. As an outcome, 80 start-ups are incubated in the IC out of which 30 start-ups have reached productisation stage, 55 Patents filed out of which 8 patents granted, 40 companies have got its 1st order, 382 employment generated and 34.80 crore funding VC/Grants/CSR received to the onboard start-ups till date.

Setting-up of Incubation Centre in the area of ESDM with focus on Medical Electronics at IIT Patna: The incubation facility developed through MeitY and State Government partnership aims to incubate 50 start-ups over a period of 5 years. The

primary objective of this is to promote innovation and entrepreneurship with the aim to identify, nurture and translate technological ideas and innovation in the broad area of ESDM sector with a focus in Medical Electronics. Till date, 49 start-ups have been supported out of which 31 start-ups are on-board at present including 13 in healthcare and 18 in ESDM sector whereas 7 patents have been filed by the start-ups.

Fabless chip design incubation centre at IIT Hyderabad: The objective of the fabless chip design incubator is to incubate start-ups in semiconductor design. The vision is to provide one-stop service to start-ups intending to enter this space. This Incubator will incubate 50 start-ups over a period of 5 years. 8 start-ups have joined the Incubation Center as well as 3 more Eols have been received.

Industry Innovation Programme on Medical Electronics through BIRAC: With an aim to promote scientific and technological research in Medical Electronics sector and to address the pressing challenges associated with the development of innovative medical electronics and making it available, accessible and affordable to the people at the bottom of the pyramid, a project has been initiated at Biotechnology Industry Research Assistance Council (BIRAC). Under this program support will be provided at Seed or idea to PoC, Early transition and transitions to scale stages. 25 proposals are being supported through BIRAC under the program out of which, 18 proposals are in Idea-to-PoC stage, 5 proposals are in Early Transition stage and 2 proposals are in Transition to Scale stage.

5.3.8 Artificial Intelligence

National AI Portal has been implemented as a one stop online portal for AI related developments in India, sharing of resources details of start-ups, investment funds in AI, companies and educational institutions related to AI in India. The

portal currently has the following major sections – News, Articles, Case-Studies, Research Reports, Listing of Start-ups, Listing of Investment Funds, Colleges, Companies, Countries, People, Videos, Datasets, Courses, Initiatives of State and Central Ministries. At present, 107 Central Initiatives, 28 State Initiatives, 33 Research reports, 219 News and 178 Articles etc., are available.

Centers of Excellence for Internet of Things (CoEs-IoT)

Under the Digital India initiatives, MeitY along with NASSCOM and State Govts has set up Centres of Excellence on Internet of Things at Bengaluru, Gurugram, Gandhi Nagar and Visakhapatnam. First centre on IoT was established in Bengaluru in Year 2016 along with Government of Karnataka and NASSCOM. One of the objectives of these centres is to enable India emerge as innovation hub in IoT through democratization of innovation and realization of prototypes. Centres of Excellence on IoT, connects various entities such as start-ups, enterprises, venture capitalists, Government and academia. It enables start-ups in areas of IoT, Big Data, Augmented Reality/Virtual Reality, Artificial Intelligence and Robotics to reach their maximum potential. CoE-IoT, Gurugram was operationalized in Year 2018. CoE-Gandhi nagar was operationalized in 2019. The focus areas of these centres is on Healthcare, Industry 4.0, Agriculture, Automobiles etc. Presently, more than 468 start-ups have been incubated in these centres, 41 societal projects have been undertaken, 56 solutions related to Industry 4.0 & Healthcare developed and 34 IPs filed.

Centre of Excellence for Virtual and Augmented Reality (VARCoE) at IIT Bhubaneswar

Virtual Reality and Augmented Reality (VR and AR) have massive innovation potential across a wide range of industries and research fields. This research and innovation is currently in domains across a

range of industries including such as product and skill development, Health and medical science, art and architecture, transport, construction, tourism, entertainment, education, and productivity software. With an objective to explore the opportunities in this niche area, Government of India in partnership with Government of Odisha, Software Technology Parks of India (STPI), IIT-Bhubaneswar and a philanthropist has recently established Centre of Excellence for Virtual and Augmented Reality (VARCoE) at IIT-Bhubaneswar. Presently, nine major projects on AR&VR applications in various domains involving 12-15 highly qualified faculty and researchers of IIT Bhubaneswar are in progress.

Centre of Excellence Gaming, VFX, Computer Vision and AI at Hyderabad (IMAGE CoE)

This CoE has been set up in collaboration with STPI, Gaming industry and Government of Telangana in January, 2020 to provide resources such as mentoring, technology support and funding for Gaming, Animation, VFX, Computer Vision and AI start-ups. IMAGE offers integrated programs, CVLAB and Game Lab, for start-ups to scale up through its incubation facility. The centre has been branded as IMAGE.

The IMAGE accelerator program includes premium plug and play co-working space for start-ups and offers access to the ecosystem which comprises of IP owners, mentors, investors and a platform to support Go To Market strategy. At present, around 18 start up have been on-boarded.

Centre of Excellence in Blockchain (Apiary)

The STPI Apiary, a Centre of Excellence in Blockchain Technology is setup in collaboration with MeitY, STPI, Government of Haryana, Pad up Venture Private Limited, IBM, Intel, GBA and FITT in March 2020. This is an initiative, to identify and evaluate promising start-ups in the field of Blockchain Technology that will be hosted in the STPI Gurugram Incubation Facility.

5.4 Cyber Security R&D

Cyber Security R&D is one of major initiatives identified for securing cyber space and it is aimed at promotion of development & technology, demonstration, proof of concept and R&D test bed projects for enhancing indigenous skills and capabilities in the Cyber Security. Research and development is carried out in the thrust areas of Cyber Security including (a) mobile device security, (b) SCADA security, (c) end point security, (d) cryptography and cryptanalysis, (e) network and system security, (f) cyber forensics, (g) threat intelligence and AI-based threat-modelling.

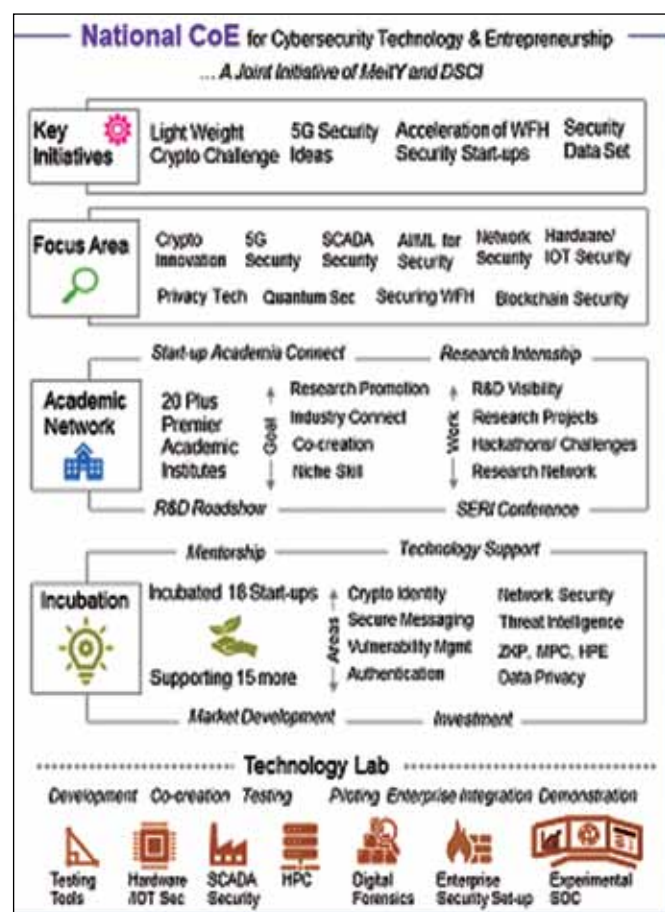
New projects are formulated/initiated in thrust areas identified on continuous basis to enable enhancement of expertise/skills in R&D for Cyber Security. Accordingly, R&D projects in the area of Cyber Security have a special focus and emphasis on R&D infrastructure creation, capacity building and enhancement of skills and expertise in the interest of a conducive R&D ecosystem in the country. In addition, specific efforts have been made to nurture institutions and capacity enhancement in the entire North-Eastern Region.

Cyber Security R&D Projects

During the year 2020-21, R&D efforts were continued and strengthened. Six new projects have been initiated which includes: (i) Feature Augmented Password Cracking for Cryptographically Strong Steganography Tools using High Performance Computing, (ii) Design and Development of a Mobile Device Security Solution Addressing Emerging Threat, (ii) CI Protection Framework with Asset Management tool and SOC, (iv) Building Trust on Computing Platform and Training of Secure Coding of Security Chips, (v) A Technology Framework for & Healthy usage of Internet, "SAFE-NET, (vi) Security of implantable devices. Ongoing projects were reviewed from time to time and follow up actions have been taken. Efforts in the

on-going projects have resulted in the development of certain indigenous security solutions which are deployed/being deployed at user organisations. These included:

National Centre of Excellence in Cyber Security (NCoE)



The National CoE for Cyber Security Technology and Entrepreneurship is a joint initiative of the Ministry of Electronics and IT (MeitY) and Data Security Council of India. The National CoE is equipped with technology lab infrastructure to support research in hardware and IoT security, forensics, enterprise security solutions, threat research, and AI/ML for cyber security. The lab infrastructure supports high-speed computing requirements. It has deployed an enterprise security set-up, including SOC and SOAR capabilities, to support start-ups' piloting and integration requirements.



NCoE has incubated deep-tech security start-ups, about 18 since it started in March, 2019, focusing on cryptography, identity & authentication, secure messaging, network security, vulnerability management, attack surface management, and data privacy. Apart from incubated start-ups, it works with cyber security start-up and product companies, more than 230, to create a conducive market and improve the investment ecosystem. The CoE emphasizes technology research and has built a network of 20 plus premier research-focused academic institutions. It is mobilizing security research communities with programs such as 'Crypto Innovation Series,' 'Cybersecurity R&D Roadshow,' 'Light Weight Crypto Challenge,' '5G Security Ideas,' and 'Security Education, Research, & Innovation [SERI] Conference.'

During COVID-pandemic, special initiative has been undertaken by NCoE to enable the Cyber Security Ecosystem in the 'Work-from Home' Regime. A special report encompassing the Start-ups and MSME working in the area of security solutions for WFH ecosystem has been created under NCoE. National CoE scouted for innovative technologies and security solutions for WFH which may emerge in the coming times and can be deployed immediately or in the near future. The purpose of the compilation is to create visibility of the innovation and efforts made in this area, increase the awareness about the ideas & solutions to solve the problems of the new paradigm, enhance the market potential, explore opportunities

for the investment and engage with govt. start-up initiatives targeted at the COVID-19 pandemic. The report has been released by Secretary, MeitY on Aug 06, 2020. The report has been well –accepted in Cyber Security industry and acts as catalyst for start-ups working in this area.



Establishment of Security Evaluation, Research & Exploratory Testing Centre (SERET)

- Security Evaluation, Research & Exploratory Testing Centre (SERET) has been set-up at STQC Kolkata. The objective of the Centre. The objective of the Centre is developing capacity and capability for undertaking research & exploratory testing for:-
 - Promoting design & development best practices for improving overall security posture of a product or system
 - Developing security testing and assessment methodologies to proactively address the most critical security issues in new areas of technology (products, systems, networks and communication) by proactive identification/early detection of unspecified functionalities and unknown (zero day) vulnerabilities before deployment of the newly released application/software/product

- Awareness creation & helping the Government and other organizations to operate in a safer and more secure world.



Under this project, several key capabilities such as developing security testing and assessment methodologies to proactively address the most critical security issues in new areas of technology (products, systems, networks and communication) by proactive identification/early detection of unspecified functionalities and unknown (zero day) vulnerabilities before deployment of the newly released application/software/product has been developed. The focus areas of Technologies are IoT Devices, Cryptographic products, Medical devices and Critical infrastructure Mobile Apps etc., Besides SAG , DRDO (for defence products), this would be only such facility in India .

Crypto Module Validation Project (CMVP)

Under Crypto Module Validation Project, IISc Bangalore and C-DAC Bangalore has developed Cryptographic Module Validation Software (CMVS) and Cryptographic Algorithm Validation Software (CAVS) as per the international Standard NIST-FIPS 140-2. This is the first time such capability has been developed in India for various Cryptographic Module Validation Software for civilian and security applications. The Software is presently being used by Bharat Electronics Limited for evaluation of Cryptographic products developed. Efforts has been initiated for integration of CMVS and CAVS towards evolving Crypto Certification Authority Management System, so that they may be used by Certification Authorities for certifying the Cryptographic products.

Distributed Centre of Excellence for Blockchain Technology

The outcome of the project is (i) a developed and piloted Property Record Management System (PRMS) for Shamshabad district of the Government of Telangana. PRMS is under consideration, as a global use case for publication in ISO/TC307 Blockchain and Distributed Ledger Technologies standards, (ii) Blockchain and AI lab has been set up in VJTI Mumbai, (iii) Course on Blockchain Technology is retrofitted at the final year of B.Tech at VJTI Mumbai and offered as elective to circuit branches – in the first year 2019 Fall – 129 students have completed this course. In 2020 fall – 182 students have registered and are doing the course.

A Collaborative and Comprehensive Live Cyber Operations Specific Exercise Training Facility for Indian Cyber Space (Cyber CLOSET):

The project aims to setup and establish a State-of-Art Collaborative and Comprehensive Live Cyber Operations Specific Exercise Training Facility (Cyber CLOSET) for Indian Cyber Space to prepare and enable an organization to test the Physical Infrastructure, Processes and People (PPP) against cyber-attacks. A wardrobe of around 300 live, real time, simulative and readymade Cyber Security exercises have to be developed for capacity building and cyber preparedness for about 1000 personnel to cope up with and recover from a hostile cyber-attack which in turn will help the organizations to identify weaknesses in their existing Cyber Security implementations and improve their security measures and policies.

Under mentorship of Cert-In, a unique architecture of Cyber CLOSET with 47 licensed and open source tools has been designed and developed using Hyper Converged Infrastructure (HCI) including Cloud and Software Defined Network (SDN) features.

Total 22 training programmes have been conducted and 650 officials have been trained from various organizations like IB, MoD, DoT, VigyanPrasar NCIIPC, NABM, BSF, CISF, Indian Oil, ONGC, POSOCO, NRLDC, GAIL, IRCTC, NSG, Tata Power, Ordinance Board etc.



Development of C-DAC Digital Forensics center with Artificial Intelligence based knowledge support tools:

This multi-activity, multi-institutional project has three major part, one is the Development of a Digital Forensic Lab(DIGIFAI Lab) at Patna, Bihar equipped with C-DAC Cyber Forensic Tools, second one is to give training to the users/stakeholders and the third one is to develop AI-enabled Digital Forensic Toolset; a joint responsibility of C-DAC, Kolkata and IIT, Patna.



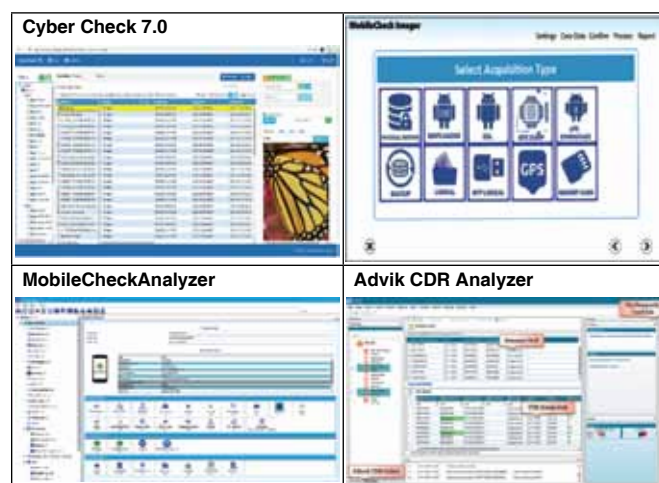
DIGIFAI Lab at BISCOMAUN Bhawan, Patna, Bihar

Use Case Clearing House in Cyber Security:

The project use case clearing house is to identify white spaces/gaps in the current Cyber Security ecosystem in terms of technology solutions that can be utilized by start-ups and IT Industry entrepreneurs to fast track their innovation and connect them with potential investors for commercialization support in product development, thereby building Cyber Security industry in the country. In the project so far, 6 use cases has been identified through workshops and various one-on-one discussions with the subject matter experts and alignment of the identified use cases with the indicative domain areas captured in the proposals (IoT, Banking, Forensics, Smart cities and Healthcare).

Design and Development of Forensic Data Analytics Tool for Investigators Project aims in the design and development of such a tools that shall enable the forensicators to dig deeper into the evidence data and provide with unusual transactions or anomalies which helps in making better inferences. This project aims in enhancing

existing cyber forensics tool to analyse artifacts of modern/latest software and mobile phones. This would help the investigator in finding more relevant evidences. C-DAC Thiruvananthapuram has developed a number of tools in different areas of Cyber Forensics fields such as Computer Forensics, Network Forensics, Mobile Forensics and Live Forensics and have been deployed to various law enforcement agencies in the country.



Detecting Spoofing and Digital Attacks on Face Images: The expected outcome of the project is to develop a tool with simple graphical user interface that can detect physical and digital presentation attacks.

Design and Development of a Solution for Vulnerability Detection in Embedded Device Firmware: The expected outcome of the project will be i) Solution for detecting backdoors (authentication bypass, specific IP and connecting backdoors) in embedded devices when firmware is not available, ii) Enhanced solution for detecting backdoors, when firmware is retrievable and binaries are extracted, to cater to a wider range of embedded devices in multiple domains & complex devices like high end enterprise routers, iii) Evaluation Framework with procedures for detecting backdoors which can be applied across wider range of embedded devices and iv) The project outcome would be demonstrated on complex devices with known backdoors.

Design and Development of a Solution for Predicting Multistage Attacks using Machine Learning:

The objectives of the project is (a) Creation and enhancement of malign and benign dataset repository (b) Evolve a setup for capturing essential parameters of attack for dataset generation (c) Development of engine for data transformation and feature extraction (d) Machine Learning model generation and evaluation along with feature selection and regeneration of model (e) Test-bed for evaluating the model and (f) Pilot deployment in C-DAC network.

The R&D activities in the programme will be carried forward during 2021-22 to promote research and development of indigenous Cyber Security solutions, proof of concepts and prototypes and skilled manpower in the thrust areas of Cyber Security with special focus on mobile device security, cloud security and cloud forensics, malware detection and advanced cyber forensics.

Efforts/activities in North-East

The Ministry of Electronics and Information Technology (MeitY), Government of India has taken initiative as per North-Eastern Vision 2022, with the broad vision of providing cyber-crimes investigation skills effectively in North-Eastern region, by establishing:

- Cloud based Cyber Forensics Centre and Virtual Training Environment” for Eight North-Eastern States. These labs will provide trainings to police, judiciary and LEAs through workshops on investigation of cyber-crimes. NIELIT Kohima is the nodal centre for these 8 labs.



- The major objectives of the project are:
 - Setting-up Digital Forensic Data Centre with latest hardware and software tools for digital forensic investigation of cyber-crimes. This facility will be available for online analysis of the data from the digital devices associated in the cyber-crimes to the eight labs.
 - Virtual Training Environment (VTE) has been setup to provide hands-on practical training on cyber forensic investigations to police, judiciary and other LEAs, so that they acquire investigative skills in this specialised area. This facility will be available to all the eight labs.

The establishment of the 8 Cyber Forensic Centres will enhance the cyber profile of the North-Eastern region in the following ways:

Capacity Development-Trainings on Cyber Forensic investigations : Through this project, 7000 personnel from police and judiciary from North-Eastern States will be trained on a few different skill levels of cyber forensic investigations during the next 5 years, so that cases of cyber-crimes are handled efficiently & effectively by the trained police & judiciary.

Cyber Forensic Investigation Services to Police and Judiciary : Aforesaid eight digital forensic labs, besides providing skills to police & judiciary on cyber-crime investigations, will also be available to provide services for the cases referred by judiciary & police for cyber forensic data acquisitions and analysis of the digital devices associated in cyber-crimes.

Aforesaid 8 Cyber Forensics Labs are proposed to be enhanced in future to be listed as certified labs under Section 79A of IT Act, 2000.

Future Direction:

Several new projects in the areas of the Quantum

Cryptography, 5G Security, AI-ML applications in Threat Intelligence, Network Security and other emerging areas of Cyber Security are being evolved and initialized.

5.5 Societal Reach R&D

5.5.1 Medical Tools, Equipment and Software

Design and Development of 1.5 Tesla Magnetic Resonance Imaging (MRI) Systems: The objective of the proposed project is to design, develop and test an indigenous 1.5 Tesla MRI System for medical imaging. Magnetic Resonance Imaging (MRI) is a medical imaging technique used in radiology to visualize internal structures of the body with high contrast images. Various subsystems such as Image Reconstruction, Image Visualization, RF systems, RF coil etc., have been developed. The coils and software have been integrated with commercial scanner for testing purpose. Software for imaging reconstruction have been developed and integrated. Also IMRI Superconducting Magnet has been designed and its component developed and tested. The IMRI software platform is implemented and modules focusing on scalability, customization, standards compliance and plug-play features are developed.



Fig- Sample Image from Indigenous MRI

High energy 30 MeV Linear Accelerator (LINAC): The objective of the project is to design & develop 30MeV electron linear accelerator with 5-10 kW beam power. The proposed LINAC will generate Molybdenum (Mo-99) which will be used to elute

radio isotope Technetium (Tc-99m). The novel Tc-99m radio labelled analogues generated will also be clinically assessed. Various sub system have been designed, fabricated and being tested. Integration of the system is expected by mid of 2021.

Design & Development of Indigenous Colour Doppler Ultrasound Scanner with Centralized PNDDT Database Compliance: NIELIT, Calicut has developed Lab Model Prototype of Colour Doppler Ultrasound Scanner System with Prenatal Diagnostic Technique (PNDDT) Compliance. The machine has unique ID and any movement of the machine will be automatically tracked with in-built GPS facility. The machine also supports Aadhaar based authentication of doctor and patient undergoing scanning. Lab Model Prototype System with B-Mode, CW Mode and PW Mode has been integrated and under validation.



Fig- Indigenous Colour Doppler Ultrasound System (Lab Model)

Studies on detection of cancer, processing infrared images and developing appropriate Instrumentation system for initial deployment in North-Eastern States: The IR based breast Cancer detection system named “The Karkat Nirnay Yantra” has been developed and handed over to Cachar Cancer Hospital and Research Centre, Silchar and system is in operation. A system for IR Based Breast Cancer Detection has been awarded from DG, C-DAC for excellence in

Core Research Category by C-DAC on 15th August, 2019. Validation has shown accuracy of more than 87% so far, which is satisfactory from doctors' point of view.



Fig-Karkat Nirnay Yantra-IR based cancer Detection System

Certification Schemes for Compliance with EHR Standards: This project will make it possible to implement standardized Electronic Health Record at National/State level for e-Governance in Health Care Sector. It will also help public and private healthcare operators to become compliant to notified EHR standards of the Ministry of Health & Family Welfare. Towards certification of EHR standards compliance, C-DAC in collaboration with STQC has developed techniques, methodologies, and tools for evaluation, test engineering and related technology for evaluation and certification of EHR related systems. STQC is in the process to launch EHR Certification scheme.

Maxillo-Facial Surgery Planning and Simulation System: A reliable planning and simulation system for maxillo-facial surgery which enables precise 2D cephalometric analysis and interactive manipulations of 3D reconstructions of the facial tissues in order to visualize the patient's postoperative appearance is being developed. C-DAC team along with AIIMS has developed an initial integrated version of the application Integrated 3D simulation module into the GUI application. This technique ability for a 3D picture of pre and post-surgical appearance of patient has which would be helpful for decision making for the patient as well

as the surgeon. Simulation software is completed and the validation/review is in progress. The software can accept both 2D cephalometry images obtained from CT/CBCT scanners and 2D slices of images. The software has been validated over 53 patient cases and further extensive validation is in progress.



Fig- 2D Images obtained from Maxillo-Facial Surgery Planning and Simulation Tool

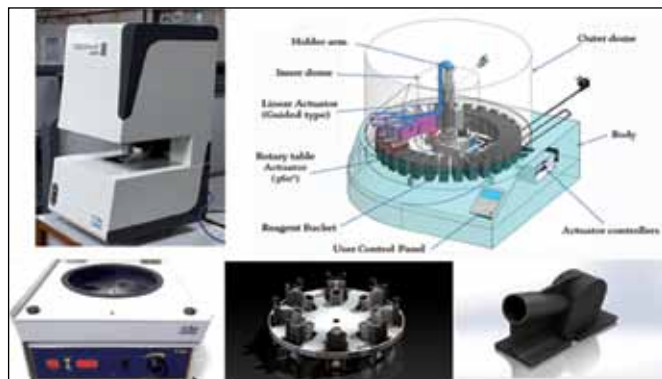
Development of Thermal Tomography for the Detection of breast cancer and to predict the Size and Location of the Cancerous Tissue: The main objective of the project is to develop an analysis system for accurate prediction of human breast abnormality using thermal tomography. C-MET has developed a wearable jacket using high sensitivity thermal sensors for the early detection and screening of breast cancer along with 2D analysis system which works on open-source platform. C-MET is further improvising on the S/W to develop 3D thermal tomography for finding out location and size of the cancerous tissue. Bio heat transfer-based 3D thermal modelling of human breast has been developed and process for transfer of technology of the developed software has been initiated.

Development of Low-Cost Automated Screening System for Cervical Cancer (CerviSCAN-II): The project targets the development of indigenous Artificial Intelligence (AI) based technology for cost effective, affordable and automated

screening for cervical cancer. The project is a multi-institutional programme involving research, development and deployment of technology solution for cervical cancer screening. AI based screening system consisting of Slide scanner equipment and Deep Learning software solution developed by C-DAC has been validated on over 2,000 pap smear slides with the support of four collaborative institutes, Regional Cancer Centre (RCC-Thiruvananthapuram), National Institute of Cancer Prevention and Research (NICPR-Noida), Dr. Bhubaneswar Borooah Cancer Institute (Dr. BBCI-Guwahati) and RCC-Agartala. The project is funded jointly by the Ministry of Electronics and Information Technology (MeitY) and Department of Health Research (DHR).

Technology features:

- Indigenized slide scanner with integrated opto-electro-mechanical components to digitize cervical smear with sub-micrometer precision.
- Deep Learning pipeline for efficient and reliable analysis and screening of cervical cancer using digitized smear.
- Digital Cytology Workflow facilitating cytopathologist to perform analysis without using a microscope.
- Indigenized programmable Rotary Slide Stainer to address various Laboratory needs
Indigenized cyto-centrifuge to prepare mono-layered specimen.



CoIOSENS: An Affordable Colorimetric Diagnostic Instrument and Field Validation at Imphal, North-East India:

CoIOSENS will focus to develop low-cost indigenous devices towards detection of diarrhoea causing agents like virus (Rotavirus or Norovirus) and bacteria (Escherichia coli or Salmonella) simultaneously. Initially, the selection and optimization of commercially available bio-receptors will be taken into consideration. The selected array of optimized receptors like sensitive monoclonal antibodies, synthetic receptors will be integrated with colorimetric and/or electrochemical signal transducer. Conventional microplate Enzyme-Linked Immunosorbent Assay (ELISA) will be performed in parallel to benchmark the proposed solution. The project is currently developing the optical biochemical detection technique for Escherichia coli and Rotavirus through image processing and analysis.

Artificial Intelligence in Oncology: Harnessing Big Data and Advanced Computing to provide personalized diagnosis and treatment for Cancer patients: The objective is to establish the methodology for early detection of the India-centric cancer by interrogating the medical and non-medical data sets using AI technology (e.g. Machine and Deep-Learning) and develop the algorithms that predicts the patient prognosis leveraging the available outcome data.

5.5.2 Agriculture

5.5.2.1 Smart Warehouses Technology

The technology development and deployment have been completed for safe storage of rice grains. The development includes sub-systems like Conveyorized System with On-line identification of bags, Moisture Measurement, Thermal disinfection, Fumigation, measurement of concentration of gases etc., Entire system and sub-systems have

been developed, commissioned and field trialed at a godown of Food Corporation of India (FCI), Raipur. As per the requirement of the FCI, few additional developments like reverse operation of machine, better accuracy of moisture meter have also been completed. The field trials of the final systems are in progress. FCI has shown interest to deploy such system in others godown. The developed technologies are ready for transfer to industries.

5.5.2.2 Design and Development of Automated Aquaponics System for Vertical Farming in India

The design, development and deployment of Automated Aquaponic System with real-time monitoring and control of Electrical Conductivity (EC) and other nutrient in solution for vertical farming has been completed along with field trials at Guru Angad Dev Vetrinity and Science University, Ludhiana. A highly Optimized ratio of plants and fishes along with their varieties have been provided for better yield of both the products (plant and fishes). The project has been completed successfully and technology is ready for transfer to industries.

5.5.2.3 Development of IoT and Drone based Agriculture Monitoring System with objective of Skill development of socially deprived Community:

This project has been initiated under budget provision made for SC community. Here, Rearch & Development will be carried out using IoT and Drone based technology for agriculture uses. Technical training will be provided to students and locals. Energy detection for generalised air to ground and ground to ground communication channel is completed. Deployment of different sensors, such as temperature, infrared, humidity, etc., at farmland and analysis of different soil characteristic is visualized on web portal. Also, the utility of drones in agriculture and other sectors is demonstrated through different applications, such as pesticide spraying, medical kit delivery, etc.

5.5.2.4 Development and Deployment of Knowledge based Integrated Sustainable Agriculture Food Network (KISAN) Cloud using Electronic Soil Nutrients Analyser (ESNA)

This project has been initiated under special budget provision made for ST community for development and deployment of soil tester, skill development and entrepreneurship creation. Online web framework for the registration and training of students has been completed. Entrepreneurship training of the students/locals is under process. Design and simulation of the ESNA kit for the identified soil parameter is under process.

5.5.2.5 Development of Autonomous Multipurpose Agricultural Robotic Platform

The aim of the project is to design and develop a battery powered /Hybrid (Fuel and battery based) autonomous multipurpose Field Robotic Platform (MFRP) to carry out activities like Sowing of seeds using direct seeding technique, Spraying of pesticides, weedicides and fertilizers, monitoring of crop health for further usage, development of Human Machine Interface (HMI). The assembly of the scaled-down version of the robot has been completed and tested in laboratory. Tele-operation of Scaled down Robot using Joystick based tele-operation using Wi-Fi has been completed, Autonomous Navigation of Scaled down Robot using positioning of low-cost RTK GPS is progressing. Tracked Mobile manipulator for the pesticide is under laboratory testing.

5.5.3 Electronic Waste Awareness programme:

The Ministry of Electronics & Information Technology (MeitY) has implemented "Awareness Programme on Environmental Hazards of Electronic Waste" during 2015 to 2020 to create awareness among the public about the hazards of e-waste recycling in informal sector on pan India basis. The programme had created training tools, content materials, films, printed materials, videos and jingles etc., for every strata of the society which are freely available

on the dedicated website [<http://greene.gov.in/>] and Greene app. Further, social media platforms (Twitter handle and Facebook page) and mobile app had also been created to provide online status of the activities and show-case the activities/workshops/carnivals etc., conducted under the programme. The programme was successfully able to conduct 1,918 workshops and activities in various cities in 31 States/UTs, which were attended by 16,52,031 participants from school, colleges, RWA, manufacturer, informal operators, bulk consumer, dealers and refurbishers etc.,. The programme had covered 5,789 Government officials in various States. Besides, 1,247 GreenE Champions/trainers had also been trained. The mass awareness amongst youth of the country, nearly 20.12 crore audience, had also been created by covering 2,813 cinema halls. Suitable course content on this subject for Standard 7 to 9 class students was also developed and handed over to the Ministry of Education using NCERT's DIKSHA digital platform.

5.5.4 Special Efforts for COVID-19 pandemic

EMCD through C-MET provided very good efforts to develop products which were need of the hour for COVID-19 pandemic. Product details are provided below:



Development of low-cost polymer swab for COVID testing kits. Considering the acute shortage of testing kits in the country during first quarter of financial year, Centre for Materials for Electronics Technology (C-MET), Pune, developed polymer swabs with locally sourced materials. Sri Research for Tissue Engineering PVT. Ltd, Bangalore has carried out clinical and ethical trials. Result is satisfactory. Significant cost reduction was possible as compared to international substitutes.

Development of indigenous technology of anti-viral and anti-bacterial masks. C-MET, Pune, has developed anti-viral and anti-bacterial masks with metal/metal semiconductor nanoparticles like Ag@ZnO and Cu@ZnO as; a cost effective alternative of N95 masks in Indian market. Yshawantrao Chavan Institute of Science, (YCIS) Satara has carried out testing of the masks for anti-bacterial properties and pathogen tests and shown encouraging results.

Development of cost-effective point of care plasmonic portable sensor for COVID-19 virus antigen in blood. C-MET, Thrissur, has developed a point of care plasmonic portable sensor with disposable semiconductor based chips to detect antibody with presence of covid 19 virus in blood. The sensor was tested for food borne pathogens by Rajiv Gandhi Centre for Biotechnology (RGCB), Thiruvananthapuram. Fictionalization of the sensor and the docking efficiency analysis are being carried out on the designed bio receptors with different pathogenic strains. First version of the biosensor is under validation at RGCB. This technology is now being modified for antibody testing in blood for COVID-19 patient. Such portable devices would be extremely useful for random testing of patients at affordable cost.

5.5.5 Device for Early Breast Cancer Screening & Detection

C-MET, Thrissur has developed a cost effective wearable device for early detection of breast cancer in a project sponsored of MeitY with joint implementation of C-DAC and MCC Kannur. The said innovation was awarded National Award "Nari Shakti Puraskar" (Women Power Award) by Hon'ble President of India in Rastrapati Bhavan on 08-03-2019. This innovation was also nominated for Hon'ble Prime Minister innovation award on Civil Service Day and subsequently awarded National Award on Outstanding Efforts for Women's Development through Application of Science and

Technology (DST, 2018). This indigenous product was launched by Hon'ble MoS, Electronics & IT in the medical Camp organized for breast cancer screening on 27th July, 2019 at Akola, Maharashtra for national benefit.

C-MET has filed one US patent (Application 15/926,935, Date of Filing: 20/03/2018) and two Indian patent applications (No.: 201741017186 and No.: 201711047118) for this technology. The salient features and advantages of the device are:

- Privacy of the women is ensured
- Easy to operate. Even an ASHA worker can operate
- Portable, Works on battery power
- Ideal for rural India
- Economical
- Do not inflict any pain and no radiation exposure
- Suitable for any age group of women

The developed technology already has been transferred to M/s Murata Business Engineering India Private Limited (MBEI), Hyderabad, a wholly owned subsidiary of a Multinational Company Murata Manufacturing Company, Japan on 22.01.2019 for commercialization.



The NOC for Nationwide Commercial launch of developed device has been obtained on 24.09.2020 from Directorate General of Health Services (DGHS), Medical Device Division by industry

partner M/s Murata Business Engineering India Pvt. Ltd., Hyderabad. The developed device shall be commercialized in India shortly.

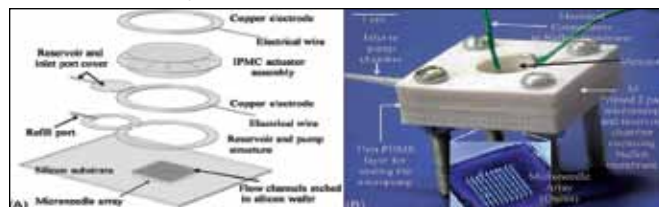
5.5.6 Healthcare

5.5.6.1 Initiatives Taken under Nanotechnology:

Nanoengineered Painfree Drug Delivery solutions at IIT Kharagpur

Hollow micro needles to pierce human skin successfully without breaking and deliver the required drug dosage have been fabricated, characterized and tested. An MoU has been signed between AIIMS and IIT Kharagpur for the fabrication of Insulin delivery device; In-vitro and animal studies to check the efficacy and safety of the IDD, followed by initiation of pilot clinical studies. Collaboration and partnerships with around 9 organizations, industries and academia such as Transform SciTech, Hyderabad has been accomplished for the manufacturing of these needles.

It is proposed and published in various newspapers and media that these micro needles can be used even in COVID-19 vaccination in future, besides for insulin delivery.



Conceptual layout of the microneedle assembly and (B) PLA-based Insulin delivery device fabricated by 3D printing with SU-8 hollow microneedle array in the inset

Development of Flexible Humidity and Temperature Sensors for Sleep Apnea and Chronic Obstructive Pulmonary Disease (COPD) at IIT Kharagpur

Flexible humidity and temperature sensors system developed at IIT Kharagpur is being explored for the detection of various critical diseases, like sleep apnea, asthma, pneumonia and Chronic

Obstructive Pulmonary Disease (COPD) etc., by monitoring breathing pattern with the help of various hospitals. Undiagnosed and untreated obstructive sleep apnea syndrome can lead to abnormal physiology that can have serious implications including increased cardiovascular disease, stroke, metabolic disease, excessive daytime sleepiness, work-place errors, traffic accidents and death.

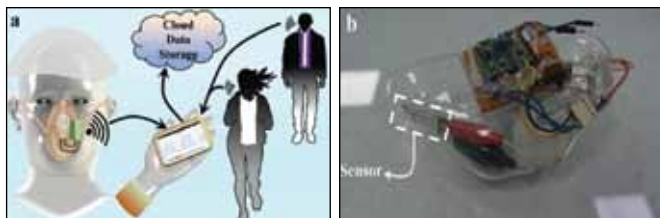


Figure (a) Typical block diagram of IoT-MD. (b) Prototype of smart-mask developed for sleep apnea and COPD detection.

5.5.7 Societal Miscellaneous

5.5.7.1 Collaborative Intelligent Transportation Systems Endeavour for Indian Cities

The indigenous technology/product development in the areas of Intelligent Transportation System (ITS) has been started on the project. The major component of ITS covered for investigation include the Traffic Simulator, Integrated 3D Driving Simulator, Development of V2X for Better Mobility, Data-driven Models and Decision Support Tools for Advanced Public Transportation Systems (APTS) in Indian Cities, Smart Vision Sensors for Industrial and Road traffic applications, Command, Control and Management Software for Intelligent Transportation Systems (ITS) with Common Service Layer based on Global Protocol, Bus Priority System at Signalized Intersection and Promotion of Road Safety through Deployment of Driver Assistance and Warning system etc., The Design, development and assembling of vehicle mount unit and preliminary plans for vehicle test runs have been completed. Fabrication work on mmWave radar is in progress. The field testing of On Board Unit (OBU) and Road Side Unit (RSU) for trip planner activity and bus priority is in progress.

The specification of Smart Vision Sensors camera has been finalized and fabrication is in progress.

5.5.7.2 Automated Machine Vision System for Leather Surface Quality Discriminant Function Analysis

The development of an integrated online machine vision based inspection system for detection and classification of defects in finished leather is progressing at CEERI, Chennai. An XY table has been designed, developed and modified as per the requirement of the leather industry. Initial trials with camera and other accessories have been completed. The development of related software modules for the colour analysis, classification of the leather defect is in advance stage.



XY table for leather image collection

5.5.7.3 Design and development of Anti-Eve Teasing Device for Women Safety

The development of a wearable women safety device to provide safety instantly has been developed at NIT-Jalandhar. The technology is unique in nature as it can provide safety to women in case of distress without needing the physical help from others. A wearable women safety device, which converts the whole body as a shock generating source for attacker has been designed and developed. The project was successfully completed after laboratory and limited field trials. The technology is ready for transfer to industries.



Prototype of anti-eve-teasing device

5.5.7.4 Implementation of Distributed Automation System for State-owned Electrical Substations in North Sikkim

The implementation of MeitY developed ASTeC products, a state-of-the-art configurable Automation System, in the Electrical distribution Substations located at Maltin, Lachung and Rabom have been completed. These sub-stations belong to Energy and Power Department (EPD), Government of Sikkim. The entire system has been field trialed and handed over to local authorities for continuous operations. The technology is ready for replication in other North-Eastern States.

5.5.7.5 Enhancement, Field Testing, Training and Maintenance of DigiBunai™ (Open Source CAD Tool for Weaving)

Development of DigiBunai™ software package incorporating the feature like Dobby module, Double cloth functionality, Jacquard module with extra warp functionality, Cataloguing & tagging of different garments, Visualization of Tanchoi design, Integration of different electronic jacquards & power-looms, Customization for dress material & clothing accessories, Customizing for multiform factor devices, Fabric simulation, IKAT design enhancement etc., have been completed. Deployments and dissemination of the developed software package were done at seven places around the weaving cluster of the country. DigiBunai™ software package is ready for the commercialization.

5.5.7.6 MEAN: Measuring Endocrine Disrupting Chemicals (EDC) and Aquatic Diagnostics through Bio-Sensory Network with a special reference to North-East India

This project has been taken up to address the increasing level of pesticide concentration in wastewater and aquatic ecosystems. Under the project, a point of care handheld device for

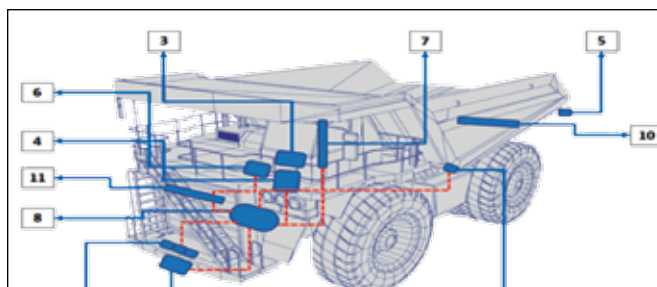
detection of pesticide will be developed. Exploration of bio-receptor for pesticide and Aeromonas family detection in water has been completed. Optimization of bio-receptor for pesticide is in process.

5.5.7.7 Development of DLMS/COSEM (Device Language Message Specification/Companion Specification for Energy Metering) Testing Tool for Smart Energy Meter

This project has been initiated recently at CPRI Bangalore to develop an automatic testing tool of DLMS/COSEM for Smart Energy Meters of different variants like Near-me Area Network (NAN) & Wide Area Network (WAN) communication modules as per standard requirements. Software architecture of Conformance Test Module and Parameter Verification Test Module have been designed.

5.5.7.8 Development of Vision Enhancement System for Foggy Weather

The Vision Enhancement System will help to reduce the shut-down period in open-cast mines. Under the project, different sub-system that consist of thermal Imaging, Image Processing, Proximity Radar, Anti-Collision Laser, Roof & Bumper mounted Fog Lamps, GPS (Global Positioning System), Adjustable side operated IR cameras, High Intensity LED Rear Lights, Electromagnetic Parking Sensors, Retro reflective LED vest, Helmet mounted thermal camera etc., have been developed and fine tuned as per the mine environment. The system integration, deployment in field and field testing is under progress at Bacheli Mines of Chhatisgarh.



Internet Governance and Security of Cyber Space



6.1 Internet Governance

Overview:

Internet Governance, broadly defined, is the development and application by Governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision making procedures and programmes that shape the evolution and use of the internet. It includes development and coordination of technical standards, operation of critical infrastructure and public policy issues.

Conceptually Internet Governance includes following layers:

- Physical Infrastructure Layer
- Code or logical layer
- Content layer
- Security layer

Internet Governance involves IP addressing, Domain Name System (DNS), Routing, Technical Innovations, Standardizations, Security, Public Policy, Privacy, Legal Issues, Cyber Norms, issues pertaining to Intellectual Properties and taxation.

6.1.1 Achievements

Some of the significant achievements of MeitY includes representation of India's Public Policy concerns on global platforms, creating awareness on Internet Governance, encouraging greater participation in Internet Engineering Task Force (IETF) working groups, engagement with Internet Society (ISOC) promotion of Multistakeholder model of Internet Governance in India etc.

6.1.1.1 Engagement in International Forums/ Meetings

Engagement with Internet Corporation for Assigned Names & Numbers (ICANN): MeitY

is actively involved with the activity of ICANN and participates in its proceedings through Government Advisory Committee (GAC) and other public engagement fora. The GAC's key role is to advise ICANN on issues of public policy and especially where there may be an interaction between ICANN's activities or policies and national laws of international agreements.

IGF- The Internet Governance Forum: Serves to bring people together from various stakeholder groups as equals, in discussions on public policy issues relating to the internet. India's concerns on the issues of public policy of the internet and its governance are appropriately voiced in meetings of the IGF through regular participation, multi-lateral and bi-lateral meetings. With the renewal of its mandate by United Nations in December 2015, the IGF consolidates itself as platform, to bring people together from various stakeholders' groups as equals. While there is no negotiated outcome, the IGF informs and inspires those with policy making power in both the public and private sector at their annual meetings, delegates discuss, exchange information and share good practices with each other. The IGF facilitates a common understanding on how to maximize internet opportunities and address risks and challenges that may arise.

Multi-stakeholder consultations: India supports multi-stakeholder model of Internet Governance, which would involve all stakeholders and helps to preserve the character of the internet as unified, dynamic engine for innovation and which encourage equity and innovation.

6.1.1.2 The Research, Development and awareness agenda under Internet Governance

Various projects have been initiated to have evidence-based research which will build capacity for India's participation in multiple international fora and also strengthening domestic policy related to internet. The projects would lead India to become

a model Centre and provide thought leadership in DNS and DNS security related technologies, conducting high-end research in DNS Security, building internal competencies in DNS Security by offering advanced training programs and establish a test-bed of DNS for research and training. The outcomes of the projects in IG would enable meaningful and sustained engagement in internet governance institutions (International) and processes with particular focus on the Internet Corporation for Assigned Names and Numbers (ICANN), IETF, IGF etc.

Projects under Internet Governance Division:

Advanced Internet Operations Research in India (AIORI) by Software Technology Parks of India (STPI): Project seeks to improve the security, stability, and understanding of the Internet's DNS infrastructure in India by advanced Internet Operations research and it plans to do so by:

- Building relationships among its community of members and facilitate an environment where information can be shared confidentially.
- Enabling knowledge transfer by organizing workshop.
- Research with operational relevance through data collection and analysis.
- Increasing awareness of the DNS's significance.
- Offer useful, publicly available tools and services.

IG SIM- Internet Governance Structured Implementation Module by C-DAC, Delhi: The objective of the project & envisages, providing technical and policy support to conduct of research, training workshops and preparation of white paper, technology reports on various Internet Governance policy and Technology related issues. This will include providing ongoing implementation support to IG related activities of the Government of India,

Ministry of Electronics and Information Technology (MeitY) and review the global Internet policy and Technology landscape and provide assistance w.r.t. structured implementation on matters related to Internet Governance, taking into account rapid technical developments and dynamically changing needs.

Promotion of Universal Acceptance for India for Internet in India- for Devangari Script by Internet & Mobile Association of India (IAMAI):

The major objective is to reach out to the Internet businesses, developers and start-up community to create awareness about the critically of Universal Acceptance (UA) and the technical solutions being developed and to facilitate integration of Indian script in the internet via UA, thereby helping provide internet content in Indian local languages that in turn will enable greater internet penetration and usage in the country. 6 Workshops have already been conducted at various locations. Website www.भारतभाषा.भारत has been developed.

Centre of Excellence in DNS Security by C-DAC, Bangalore (Funded by NIXI): Objectives of the project are:

- To become a model Centre and provide through leadership in DNS and DNS security related technologies
- To conduct high-end research in DNS Security
- To build internal competencies in DNS Security by offering advanced training programs.
- Establish a test-bed of DNS for research and training

ICANN Research and Multi-stakeholder Engagement Assistant Programme by ICRIER (Funded by NIXI): The objective of the project is to enable meaningful and sustained engagement in Internet Governance institutions and processes with particular focus on the Internet Corporation for Assigned Names and Numbers (ICANN), updated and contextualize the various stakeholder positions

to bring out Indian perspective and crystallize the issues to be raised by Indian stakeholder in various multi-stakeholder processes; develop capacity and build expertise of Indian stakeholder on ICANN related Internet Governance issues. The project will support ICANN engagement for stakeholder and clearly understand the position and status of India stakeholder engaging with ICANN, with particular focus on developing a repository of research for GAC engagement.

6.2. National Internet Exchange of India (NIXI)

NIXI is a not-for-profit organization set up under Section 25 of the Companies Act, 1956 (now Section 8 under Companies Act, 2013) for peering of ISPs among themselves and routing the domestic traffic within the country, with seed funding from Department of Information Technology. NIXI is performing the following three activities :

- Internet Exchange
- .IN Registry and Internationalized Domain Names (IDNs)
- National Internet Registry (NIR)

Internet Exchange: Nine Internet Exchange Nodes are functional at Delhi (Noida), Mumbai (Cyquator DC), Mumbai (GPX DC), Chennai, Kolkata, Bengaluru, Hyderabad, Ahmedabad and Guwahati. The Internet Exchange Nodes have been successful in ensuring peering of ISPs among themselves for the purpose of routing the domestic traffic within the country, instead of taking abroad, thereby resulting in better quality of service (reduced latency) and reduced bandwidth charges for ISPs by saving on International Bandwidth. The maximum volume of Internet traffic being handled by NIXI at present is 207 Gbps.

Recently NIXI has introduced Bilateral peering along with existing Multilateral peering. CDNs are allowed to connect at NIXI exchange points free of cost (zero port charges). Once CDNs are on-board

more and more ISPs shall connect at Exchange points.

All functional NIXI nodes are IPv6 ready. NIXI also undertakes training and workshop for Network managers and other Technical engineers in co-operation with Asia Pacific Network Information Centre (APNIC). NIXI has also prepared an audio visual of comparison of IPv6 with IPv4 and launched it in various social media platforms. NIXI has also hired a training agency for providing training on IPv6 fundamentals by way of video recordings.

.IN Registry and Internationalized Domain Names (IDNs):

Since 2005, NIXI also manages the .IN Registry (www.registry.in). At present, 138 Registrars have been accredited to offer .IN domain Name registration worldwide to customers. This has helped proliferation of web hosting in the country and promotion of Indian language content on the Internet. Over 24.23 lakh .IN Domain names have been registered till December, 2020.

IDN's in all 22 official languages are launched and over 3,700 IDNs domain names have been registered till date. Following schemes are launched to ensure adoption of IDN domains and inclusive growth of internet in India:-

- Wikipedia content creation contest
- Competition for creating a website in regional/local language
- Free IDN (.Bharat) to academia
- Bundled free email with every .Bharat domain
- Free IDN with every .IN

National Internet Registry (NIR):

Since March, 2012 NIXI is also running the National Internet Registry(NIR) for India named as Indian Registry for Internet Names and Numbers (IRINN). IRINN is responsible for allocation of IP addresses and AS Numbers within the country. As on 31st

December, 2020 over 2,988 affiliates have joined IRINN. NIXI has delegated over 7.8 billion IPv6 and over 10.9 million IPv4 addresses till date.

6.3 Security of Cyber Space

Cyberspace refers to the virtual computer world and more specifically, is an electronic medium used to form a global computer network to facilitate online communication and dissemination of information. It is a complex environment of people, software, hardware and internet. Today, cyberspace is the common platform being used by citizens, civil society, businesses and Governments for communication and dissemination of information online. As the cyberspace is virtual, borderless and offers complete anonymity, as a result, attacks can be launched from anywhere in the world with limited possibility of traceback and positive attribution. The emerging technologies such as Internet of Things (IoT), 5G, etc., are going to add various connected devices in cyberspace in near future.

Cyberspace has been facing many security challenges due to emerging cyber threats and its widespread use for social media and e-transactions. During the COVID-19 period, there has been a spurt in cyber incidents. Cyber criminals are taking advantage of victims' increased craving for information about the Novel Corona virus due to fear and uncertainty associated with it. Utilizing the panic created by the COVID-19, the attackers are targeting a wide spectrum of users starting from individuals to corporates and Governments.

Government of India has taken several legal, technical and administrative policy measures for addressing Cyber Security challenges in the country. This includes National Cyber Security Policy (2013), framework for enhancing Cyber Security (2013), enactment of Information Technology (IT) Act, 2000 and setting-up of Indian Computer Emergency Response Team (CERT-In) for 24x7 cyber incident response, and National

Critical Information Infrastructure Protection Centre (NCIIIPC) for protection of Critical Information Infrastructure under the IT Act, 2000, Cyber Security Research & Development (R&D) and Capacity Building in Cyber Security.

6.3.1 National Cyber Security Policy

National Cyber Security Policy was released for public use in July 2013. The Policy caters to the Cyber Security requirements of Government and non-Government entities as well as large, medium & small enterprises and home users. The policy recognises the need for objectives and strategies that need to be adopted both at the national level as well as international level. The policy aims at facilitating creation of secured computing environment and enabling adequate trust and confidence in electronic transactions and also guiding stakeholders' actions for protection of cyber space.

Considering the developments in cyber technology, delivery of services through cyber space and the changing nature of cyber threats over the years, Government of India has initiated the development of National Cyber Security Strategy 2020, which will enhance objective and implementation of National Cyber Security Policy.

6.3.2 Cyber Surakshit Bharat

The "Cyber Surakshit Bharat" (CSB) programme was initiated in partnership with Industry consortium in Public Private Partnership (PPP) mode with the objective to educate & enable the Chief Information Security Officers (CISOs) & broader IT community of Central/State Governments, Banks and PSUs to address the challenges of Cyber Security. The technical content of the training was developed after intense discussion with Industry consortium and knowledge partners. So far 17 batches of deep dive training have been conducted in 6 cities in physical and online mode, and 626 CISOs/IT officials from

Government, PSUs, Banks and Government organisations have been trained by December, 2020. The target is to train 1,200 officials/CISOs.



Figure: Sixteenth batch of training of CISOs at IIPA Delhi

The calendar for online training upto July, 2021 has been announced.

6.3.3 Grand Challenge for Start-ups

Grand Challenge for Start-up in the area of the Cyber Security was conceptualized with the objective to promote innovation and entrepreneurship culture in the country to give an opportunity for entrepreneurs and researchers to work on a real big problem of Cyber Security and come out with a world-class product. Data Security Council of India (DSCI) is acting as partner.



MeitY launched the Cyber Security Grand Challenge for Start-ups in January 2020 to develop Cyber Security product on six identified unique Cyber Security Problem Statement(s) most relevant to the current challenges faced in the cyber space ecosystem. The Challenge has three (3) stages namely Idea stage, Minimum Viable Product (MVP) stage and Final stage. In the idea stage, based on

the concept, the approach is proposed to build a product out of the 6 problems. In this stage, the jury will shortlist top 12 teams for moving to the MVP Stage. While solving the problem Government will facilitate them with the mentorship as well as monetary support during each stage of the product development life cycle.



In Idea (1st) stage, based on the 'concept' & 'approach proposed' to build a product for one of the problem statement(s), the jury shortlisted top 12 teams for moving to the MVP (2nd) Stage. Each of them was given a sum of Rs.5 lakh and mentorship support. In the MVP (2nd) stage, based on their 'approach', 'USPs and Value Proposition', 'Deployability' and 'Product Market Fit', Jury shortlisted the top six (6) teams, each of whom were given a further sum of Rs.10 lakh. The 6 teams have and moved up to the Final Stage. The final results will be declared with 3 top winners with 1st Winner getting a cash prize of Rs.1 crore, the 1st Runners-up will get Rs.60 lakh and the 2nd Runner-up will get Rs.40 lakh. At present, the Grand Challenge has completed the 2nd stage i.e. MVP stage and has entered the Final Stage wherein the 6 shortlisted teams will submit their final products. The final results will be declared in May, 2021.

6.3.4 Notification for Preferential Market Access for Cyber Security Products

In furtherance of the Public Procurement (Preference to Make in India) Order 2017, notified by the Department of Industrial Policy and Promotion (DIPP) vide notification No. P-45021/2/2017-B.E.-II dated 15.06.2017 and partially modified order No.P-45021/2/2017-PP(BE-II) dated 28.05.2018,

to encourage 'Make in India' and to promote manufacturing and production of goods and services in India with a view to enhancing income and employment, Ministry of Electronics and Information Technology (MeitY) notified an order on 2nd July, 2018 for promoting indigenous Cyber Security products. As per the notification Cyber Security being a strategic area, preference shall be provided by all procuring entities of Central Governments to domestically manufactured/produced Cyber Security products.

The revised notification to include (a) indicative categories of Cyber Security products and (b) a format for self-declaration regarding 'local supplier' was issued on 6th Dec 2019.

6.3.5 Online Cyber Security Training of Officers of Central Government Ministries/Departments

MeitY has taken initiative for conducting following two types of Cyber Security training Courses for officers of Central Government Ministries/Departments:

- Generic Online Training in Cyber Security (Awareness training) of about 6-8 hrs duration for all the officers/staff of Government of India
- Online Foundation Training (Advance Level) in Cyber Security for technically qualified or with requisite aptitude in Cyber Security/IT.

The first batch for both Generic as well as advanced online training started on 2nd December, 2020 and 7th December, 2020 respectively. The whole programme for the training of Government officials is proposed to be completed within the next six months.

6.3.6 Notification of Forensic Labs as 'Examiner of Electronic Evidence' under Section 79A of the Information Technology Act, 2000

Section 79A of the Information Technology Act, 2000 mandates the Central Government to notify Examiner of Electronic Evidence for the purpose of

providing expert opinion on electronic form evidence before any court or other authority. For identification and selection of Examiner of Electronic Evidence, Ministry of Electronics & Information Technology (MeitY) has designed and developed a scheme, initially to access and notify Examiner of Electronic Evidence on the pilot basis. Till now, eight Cyber Forensics Labs have been notified by MeitY.

6.3.7 North-Eastern Regional Computer Security Incident Response Team (NERCSIRT)

A vision document named “Digital North-East Vision 2020” was released by MeitY in the year 2018 to extend the reach of Digital India to North-Eastern part of the country. It is envisaged in the vision document to set up a NERCSIRT with an estimated investment of Rs.100 crore in five years.

A proposal has been received from Government of Assam for setting-up NERCSIRT and presently the proposal is being examined in MeitY.

6.3.8 R&D Projects under NCCC

Two R&D projects for development of indigenous tools to be used in NCCC, have been funded under NCCC as described below:

- **Scalable Attack Data Capturing and Analysis Framework for Cyber Threat Intelligence** - The objective of the project is creation of scalable framework for attack capturing and analysis. This will result in the nation-wide deployment of honey-pot sensor and the creation of an adaptive framework for attack modelling and generation of Cyber Threat Intelligence. So far threat capturing honey-pot sensors have been deployed in 60 locations. Framework for attack modelling and generation of Cyber Threat Intelligence has been developed and it was integrated with NCCC central location.
- The project was completed successfully and the solution developed as part of the project

is being used in CERT-In for the generation of cyber threat intelligence.

- **Development of Big Data based indigenous Security Information and Event Management (SIEM) and integrated Security Analytics for detection of Security Attacks-** The objective of the project is to create an indigenous Security Information and Event Management (SIEM) system with integrated big data analytics to derive situational awareness in Indian cyber space. The system will also integrate with indigenously developed Traffic Flow Analytics, DNS Analysis and BGP attack detection systems. The system (SIEM) is already installed at central location of NCCC and at other locations/organizations identified by CERT-In.
- The project was completed successfully and it has been integrated with the set-up of the National Cyber Coordination Centre (NCCC) in CERT-In

6.3.9 Cyber Law

Ministry of Electronics and Information Technology (MeitY) is custodian of Information Technology Act, 2000 and its amendment in the year 2008. Comprehensive legal framework in terms of Information Technology Act, 2000 and its amendment provides for:

- Collection and sharing of information related to cyber incidents (Sections 69B & 70B) for effective proactive/reactive actions by CERT-In and investigative actions by law enforcement agencies
- Prescription and implementation of security best practices and guidelines to prevent occurrence and recurrence of security incidents (Section 43A & 70B)
- Protection of critical information infrastructure (Section 70A)

- Effective deterrence provisions (Sections 43, 43A, 66, 66B, 66C, 66D, 66E, 66F, 67, 67A, 67B, 72 & 72A) in terms of compensation/penalty and punishment to deal with cyber crimes such as damage to computer system, computer related offences, sensitive personal data leak, identity theft, cheating by personation, violation of privacy, cyber terrorism, online pornography including child pornography, breach of confidentiality and privacy, breach of lawful contract etc.

With the widespread use of social media platforms/apps and availability of other online services such as online news, Video on Demand (VoD) and many digital services, a need was felt to amend the IT Act, 2000. An Internal Committee has been constituted to look into possible amendment in the IT Act, 2000. The Internal Committee has conducted several meetings to decide on possible amendments in the IT Act, 2000.

6.3.10 Indian Computer Emergency Response Team (CERT-In)

The Indian Computer Emergency Response Team (CERT-In) is a statutory organisation under Ministry of Electronics and Information Technology, Government of India. CERT-In has been designated under Section 70B of the Information Technology Act, 2000 to serve as the National agency to perform the following functions in the area of Cyber Security:

- Collection, analysis and dissemination of information on Cyber Security incidents
- Forecast and alerts of Cyber Security incidents
- Emergency measures for handling Cyber Security incidents
- Coordination of Cyber Security incident response activities
- Issue guidelines, advisories, vulnerability notes and white papers relating to information security practices, procedures, prevention, response and reporting of cyber incidents
- Such other functions relating to Cyber Security as may be prescribed.

CERT-In creates awareness on security issues through dissemination of information on its website (<http://www.cert-in.org.in>) and operates 24x7 incidence response Help Desk. CERT-In provides Incident Prevention and Response services as well as Security Quality Management Services. The activities carried out by CERT-In during January 2020- December 2020 were comprised of the following:

S.No.	Activities	Total
1	Security Incidents handled	11,58,208
2	Vulnerability Notes Published	450
3	Advisories Published	93
4	Security Alerts issued	496
5	Security Drills	6
6	Trainings Organized	15

Cyber Security during COVID-19

- CERT-In incident response were operational and manned 24x7 during pandemic lockdown
- CERT-In issued 23 advisories on various topics such as Secure use of web conferencing software, Securing mobile devices and apps, Secure use of Virtual Private Network (VPN), Security Best Practices for Working from Home, security measures for Healthcare Sector, Online Safety of Children, various Phishing attack campaigns pretending to be from popular Apps and services, Securely managing Business Continuity during crisis situation due to COVID-19 Pandemic etc.
- 300+ threat intelligence alerts were sent to over 700 CISOs of key organizations and stakeholders in the country advising Indicators of compromise for enabling

proactive preventive actions and security cyber infrastructure at entity level

- 40+ Cyber Threat Information Bulletin were released by CERT-In related to COVID-19 cyber-attack campaigns.
- 3 cyber crisis exercises were conducted for organizations during July and August, 2020 to train and guide them to respond to COVID-19 pandemic related cyber-attacks wherein 72 organisations including key stakeholders participated.
- Interaction sessions were conducted with auditing organizations to formulate audit guidelines to continue quality audits in pandemic situations. Guidelines have been issued in public domain.
- Workshops conducted in collaboration with Data Security Council of India (DSCI) for CISOs, IT Managers, regarding threat landscape during COVID-19 and work-from-home scenario.
- Workshop on Information Security for hospitals conducted in collaboration with Consortium of Accredited Healthcare Organisations (CAHO)
- Seminar in collaboration with Confederation of Indian Industry (CII) on Cyber Security threat landscape, challenges and gaps during COVID-19 and how effective public private partnerships can contribute.

Cyber Security Assurance

Under Security Assurance Framework, Indian Computer Emergency Response Team (CERT-In) has created a panel of 'IT security auditing organizations' for auditing, including vulnerability assessment and penetration testing of computer systems, networks & applications of various organizations of the Government, critical infrastructure organizations and those in other sectors of Indian economy. As of December 2020,

CERT-In has empanelled 35 Information Security Auditing organizations, on the basis of stringent qualifying criteria, to carry out information security audit, including the vulnerability assessment and penetration test of the networked infrastructure of Government and critical sector organizations. In addition, 128 organizations are in different phases of evaluation for empanelment. This list of CERT-In empanelled auditing organizations is being consulted frequently by the entities in Government and critical sectors for their auditing requirements. CERT-In conducted 2 interaction sessions in June 2020 with 30 empanelled auditing organizations and prepared guidelines for conducting quality Cyber Security audits in COVID-19 pandemic situation. In addition, CERT-In also completed technical skills re-verification of already empanelled auditing organizations.

Cyber Crisis Management Plan

CERT-In, MeitY has formulated Cyber Crisis Management Plan (CCMP) for countering cyber-attacks and cyber terrorism for implementation by all Ministries/Departments of Central Government, State Governments/UTs and organizations under their administrative control. Along with the CCMP, CERT-In has developed "Guidance Framework for CCMP" which may be used as a template by various entities including Central Government Ministries/Departments/States/UTs and entities under their administrative control to prepare & implement their own CCMP. CCMP outlines a framework for dealing with cyber related incidents for a coordinated, multi-disciplinary and broad based approach for rapid identification, information exchange, swift response and remedial actions to mitigate and recover from malicious cyber incidents. CERT-In has conducted nine workshops since January- 2020 to appraise various organizations under the Central Ministries/States/UTs about the implementation of CCMP and cyber security best practices and all necessary assistance is being provided to them with regard

to implementation of CCMP. Till date, 93 CCMP enabling workshops have been conducted. In wake of COVID-19 induced disruptions, an advisory on Cyber Crisis Management Plan and Secure Business Continuity in Critical Sector Organizations was prepared and issued by CERT-In.

Cyber Security Exercises/Drills

Cyber Security Exercise is an effective tool to help entities in assessing cybersecurity preparedness to counter cyber-threats and building cyber-resiliency. CERT-In regularly conduct Cyber Security Exercises for critical sector organizations.

“Black Swan” Series of Exercises to counter COVID-19 pandemic induced disruptions and cyber-attacks

COVID-19 pandemic has caused changes in workplace-culture, data flow and infrastructure of the organizations. CERT-In conducted 3 “Black Swan” Cybersecurity Breach Table Top Exercise on COVID-19 pandemic themed cyber-attacks to sensitize organizations to counter disruptions and cyber-threats in July, 2020 to August, 2020. 73 organizations including key stakeholders and critical organizations participated in these exercises.

Till now, CERT-In has conducted 49 Cyber Security exercises of different complexities, including table top exercises, with participation from about 400 organizations covering various sectors of Indian economy from Government/Public/Private including Defense, Paramilitary forces, Space, Atomic Energy, Telecommunications (ISPs), Finance, Power, Oil & Natural Gas, Transportation (Railways & Civil Aviation), IT/ITeS/BPO sectors and State Data Centres.

A total of three Cyber Security table top exercises have been conducted by CERT-In during the period April-2020 to December-2020 to enhance the preparedness of participants in handling Cyber Security challenges which emerged due to

COVID-19 Pandemic.

Sectoral Cyber Security Drills – FinEx-2020 and TransEx-2020

CERT-In along with RBI conducted FinEx-2020, a 2 days’ exercises on Advanced Persistent Threats for 69 urban cooperative banks in February, 2020. Banks were trained for enhancing their cyber monitoring capabilities and incident response to the cyber crisis. Indian Cyber Crisis Exercise (ICCE) - a 3 phased Cyber Security crisis exercise for 23 cooperative banks has been conducted by CERT-In on “Evolving Cyber Threats in banking Sector”. Exercise helped participants to build Incident Response capabilities against emerging cyber threats. CERT-In also conducted TransEx2020 for 50 power sector utilities in February, 2020 on hypothetical cyber crisis scenario in which disruption and destruction to the control systems was the primary theme. Exercises helped entities to understand and prepare their Cyber Crisis Management Plan.

International Cyber Security Exercises

CERT-In participated in the APCERT Annual drill 2020 in March, 2020 which was conducted with the objective to test the response capability of leading Computer Security Incident Response Teams (CSIRT) within the Asia Pacific economies. The theme of this year’s APCERT Drill was “Banker doubles down on Miner – Data Breach via cyber-attacks”. CERT-In also acted as exercise coordinator (EXCON) for international CERTs in the Drill.

CERT-In participated in the Arab Regional and Organization of The Islamic Cooperation – Computer Emergency Response Teams (OIC-CERT) Cyber Security Drill in September, 2020. This year theme of the exercise was ‘Remote working and cyber threats’.

CERT-In participated in ASEAN CERT Incident

Drill (ACID) – 2020 in October, 2020. The theme of this year's ACID Drill was 'Malware Campaign Leveraging the Pandemic situation'.

CERT-In participated in 6 days International Telecommunication Union (ITU) 2020 Global Cyber Drill in October and November, 2020. This year theme of the Drill was 'Cyber threats and Challenges around Healthcare Sector due to COVID-19 Pandemic'.

CERT-In Participated in Quantum Dawn V exercise. Quantum Dawn is a global exercise series conducted by Securities Industry and Financial Markets Association (SIFMA). The objective of Quantum Dawn V was to enable key public and private bodies around the globe to practise coordination and exercise incident response protocols, both internally and externally, to maintain smooth functioning of the financial markets when faced with a series of sector-wide global cyberattacks.

CERT-In participated in 2 days (4 scenarios) International Telecommunication Union (ITU) Pacific Cyber Drill 2020 in December 2020. The theme of this year's drill was 'COVID-19 pandemic situation affecting Information and Communication Technologies (ICTs)'.

As a lead of Secure Digital Payment Working Group at Asia Pacific Level (APCERT), CERT-In developed and released the working group report in the Annual General Meeting (AGM) Conference of APCERT.

CSIRT-FIN (Finance Sector Computer Security Incident Response Team)

CSIRT-Fin has been established and is operational since 15th May, 2020. CERT-In is providing the requisite leadership for the CERT-Fin operations under its umbrella. In addition to responding to, containment and mitigation of Cyber Security incidents reported from the financial sector, CERT-In is sharing malware and vulnerability feeds on a

daily basis in an automated manner with designated Chief Information Security Officers (CISOs) of the respective Financial entities, so as to enable them to take necessary proactive actions at their end for ensuring safety and security of the financial ICT infrastructure.

CSIRT-Fin is participating in BRICS Rapid Information Security Channel (BRISC) formed as part of BRICS cooperation in the sphere of information security in the banking and finance sector.

Financial Stability Board (FSB): CSIRT-Fin is contributing to the "Effective Practices for Cyber Incident Response and Recovery" toolkit. This is a range of effective security practices for financial institutions to respond to and recover from a cyber incident to limit any financial stability risks as envisaged by G20 Finance Ministers and Central Bank Governors.

Cooperation and Collaboration

Strengthening cooperation with all stakeholders to effectively deal with Cyber Security issues has been one of the main focus areas of the Government. As such, this aspect is being dealt with by way of security cooperation arrangements in the form of Memorandum of Understanding (MoU) between Indian Computer Emergency Response Team (CERT-In) and its overseas counterpart agencies that are willing to work together and share information in a timely manner for preventing cyber attacks as well as collaborating for providing swift response to Cyber Security incidents. At present, such MoUs have been signed with counterpart agencies/CERTs of United Kingdom, South Korea, Singapore, Brazil, Israel, France, Finland, Estonia, Vietnam, Bangladesh, Seychelles and Uzbekistan. CERT-In is an operational member of Asia Pacific Computer Emergency Response Teams (APCERT). CERT-In is the convener of two working groups across APCERT namely "IoT Security

Working Group” and “Secure Digital Payments Working Group” to address security threats and evolve best practices to secure these domains. The first report of the “Secure Digital Payments” working group was completed and circulated to the APCERT operational members.

CERT-In is also member of various other working groups under APCERT such as Information Sharing Working Group, Drill Working Group, Malware Mitigation Working Group and Training Working Group.

CERT-In is a member of global Forum of Incident Response and Security Teams (FIRST). The membership in FIRST enables incident response teams to more effectively respond to security incidents in a reactive as well as proactive manner.

CERT-In is a member of “Cyber Threat Signal 2021” publication working group. Cyber Threat Signal 2021 is a joint collaborative work of CERT-In along with AusCERT (Australia CERT), KrCERT/CC (South Korea CERT) and Sri Lanka CERT|CC (Sri Lanka CERT) regarding the most pertinent cyber threats that could be witnessed in the year 2021.

CERT-In presented a research paper on “Metrics for Country-wide Cyber Security Assurance: Experiments and Experiences of Indian Computer Emergency Response Team (CERT-In)” at National Computer Security Incident Response Team (NatCSIRT), Carnegie Mellon University (CMU) for participants from Global CERTs in December 2020.

CERT-In is regularly coordinating with leading service providers and product vendors within and outside the country to obtain advance information on latest cyber threats and attack trends as well as devise appropriate proactive and preventive measures.

Collaboration with Industry

To deal with the complex, sophisticated cyber-

attacks, sharing and exchange of threat intelligence, CERT-In partnered with Cyber Security organizations from industry. CERT-In signed 3 such Memorandum of Understandings (MoU) for collaboration in the area of Cyber Security with MicroWorld Technologies, K7 Computing and Kaspersky.

National Centre for Excellence for Cybersecurity Technology and Entrepreneurship is a joint Initiative of DSCI and Ministry of Electronics and IT. It has been set up for multiplying efforts in cybersecurity R&D, translating it to commercial products, and creating an ecosystem for cybersecurity start-ups. CERT-In is contributing to this initiative by providing key inputs to the National CoE strategic programs. CERT-In is involved in evaluation for the incubation of security start-ups, which has incubated 18 start-ups until now. In addition, CERT-In is also participating in the evaluation of the proposals under research incentivisation scheme of the National CoE. It is meant for funding research ideas, which would be taken for piloting with industry by the CoE. It has funded 9 projects until now.

Cyber Swachhta Kendra (Botnet Cleaning and Malware Analysis Centre)

Cyber Swachhta Kendra, under the aegis of Indian Computer Emergency Response Team (CERT-In) was launched on 21st February, 2017 as part of the Government of India’s Digital India initiative under the Ministry of Electronics and Information Technology (MeitY). Cyber Swachhta Kendra is a citizen centric service provided by CERT-In, which extends the vision of Swachh Bharat to the Cyber Space.

Cyber Swachhta Kendra aims to secure India’s digital IT Infrastructure by creating a dedicated mechanism for providing timely information about Botnet/Malware threats to the victim organization/user and suggesting remedial actions to be taken by the concerned entity.

CSK is playing a very proactive role in a continuously evolving cybersecurity environment identifying new botnet/malware, understanding their threat level and subsequent Information dissemination to organizations. During 2018-20 (January 2018 – December 2020), more than 580 botnet/malware types were tracked and reported to collaborating ISPs/organizations. Malware/Botnet infections include Trojans, IoT bots, Ransomware, Cryptocurrency miners, POS Malware, Worm, Botnets, Adware etc. Further, systems with vulnerable services were also tracked and reported to organizations.

Currently, CSK is covering ~94% of the subscriber base for notifications about botnet/malware infection. At present, a total of 328 organizations from various sectors including Telecom (Internet Service Providers), Finance, Healthcare, Transport, IT & ITeS, Government, Academia, Industries & Manufacturing, Energy and Utilities are collaborating and being benefitted by using CSK services.

During October 2020, CSK participated in National Cyber Security Awareness Month (NCSAM 2020) in coordination with Internet Service Providers (ISP) and Antivirus Companies for spreading awareness and information regarding Cyber Security threats, challenges and safeguarding citizens against them.

CSK, not only provides reports to organizations/ISPs, but also provides remedial solution. CSK provides a Free Bot Removal Tool (FBRT) developed in collaboration with “QuickHeal Technologies” which has seen a very good response from users with 13.02 lakh downloads recorded till December 2020. Also, during the National Cyber Security Awareness Month (NCSAM October 2020), CSK, CERT-In signed a MoU and collaborated with Antivirus company “MicroWorld Software Services

Pvt. Ltd. (eScan)” to provide second FBRT to citizens via our portal/website for disinfecting Google Android and Microsoft Windows based systems/devices. eScan tool also received a good response and ~2800 downloads were recorded during NCSAM 2020 and 4993 downloads overall till December, 2020. Both the FBRTs are being regularly updated with new signatures/detections for recent botnet/malware observed.

CERT-In is collaborating with various Antivirus companies to develop free tools for multiple operating systems including Windows, Android and iOS so as to offer them through CSK.

Cyber Swachhta Kendra has won many accolades for its accomplishments in last 3 years. Some of which include:

- Cyber Swachhta Kendra was awarded as one of 51 “Gems of Digital India 2018” in June 2018 and awarded “SKOCH Order-of-Merit and Gold Award” for Cost Effective Cyber Security Model in the month of December 2018.
- CERT-In and its project “Cyber Swachhta Kendra” awarded for “Special Recognition in Cyber Security” in CISO MAG AWARDS INDIA 2019.
- Cyber Swachhta Kendra was awarded “Best of Tech 2021” by Coeus Age, supported by Microsoft in July 2020.

Infrastructure Group CERT-In

Infrastructure at the Disaster recovery site has been augmented with additional security appliances being deployed at the gateway and Application layer. DNS Servers have been deployed at the Disaster recovery site to have additional Secondary Name servers for the CERT-In Fully Qualified Domain

Name (FQDN). Sand Blast Environment has been created in High availability mode to provide protection from malicious attacks on CERT-In IT infrastructure. Incident tracking system at CERT-In has been fine tuned for enhanced monitoring and effective Incident response. Distributed Denial of Service attack (DDOs) protection has been ensured by deployment of dedicated equipment at the main Site and Disaster recovery operations.

Cyber Forensics

Cyber Forensics Lab at CERT-In is equipped with the equipment and tools to carry out processing and analysis of the raw data extracted from the digital data storage and mobile devices using sound digital forensic techniques. The primary task of the lab is to assist the Incident Response (IR) team of CERT-In on occurrence of a cyber incident and extend digital forensic support. In addition, Cyber Forensics Lab is being utilised in investigation of the cases of Cyber Security incidents and cyber crimes, submitted by Central and State Government Ministries/Departments, public sector organisations, law enforcement agencies, etc., The Cyber Forensics Laboratory at the Indian Computer Emergency Response Team (CERT-In) has been notified as 'Examiner of Electronic Evidence' under section 79A of the Information Technology Act, 2000.

Scientists at Cyber Forensic Lab impart training through training workshops organised by CERT-In on computer forensics and mobile device forensics through lectures, demonstrations and hands on practical sessions, which covers seizing, preservation, processing and analysis of the raw data extracted from the digital items. CERT-In also supports other institutes in imparting trainings on various aspects of cyber forensics by delivering lectures along with demonstrations.

CERT-IN Cyber Threat Intelligence Sharing Activities

A core part of CERT-in mission as the Indian Cyber Security responder with respect to Incident Response and Security Teams is to provide a trusted community platform for sharing Cyber Threat Intelligence and situational awareness. Based on analysis, CERT-In releases Indicators of Compromises (IoC's)- operational, tactical and strategic-, Alerts, Advisories & Vulnerability notes to update the Government and critical sector organizations about the threats and suitable necessary actions to counter those threats. CERT-In envisages that implementing threat intelligence profoundly elevates Government/Critical organization's security posture, enabling the respective security team to understand and effectively predict the cyber threats that imperil their organization's key assets. Empowering organizations to anticipate who may attack next, and how, allows security teams to focus on prioritizing resources so they can respond effectively to future cyber attacks.

CERT-In started an email based threat intelligence sharing activity viz. CERT-In malware Threat eXchangewith CISOs of critical sector organisations in 2015. Till now, more than 700 CISO's of various organizations are getting benefitted by the curated operational and tactical threat intelligence digest in the form of indicators of compromise largely covering Advanced Persistent Threats in Indian Cyber space.

CERT-In has established and made operational CERT-In Threat Intelligence eXchange platform [based on STIX and TAXII standards] in August 2018 to facilitate bidirectional sharing of operational, strategic, enriched tactical threat intelligence to various counterparts and stakeholders in near real time in automatic fashion, thus helping to build a cyber-resilient ecosystem in the Indian cyber

space in addition to the CERT-In Malware Threat eXchange [CMTX] email based regular threat alerts.

The platform collects, correlates, enriches, contextualizes, analyses, integrates, tags with Traffic Light Protocol (TLP) and pushes to the partners in near real time. The shared data can be consumed by the recipients into their automated workflows so as to streamline the threat detection, management, analysis, and defensive process and track it through to completion by leveraging its powerful API integrations with supporting SIEMs, firewalls, and other endpoint protection solutions.

During the year 2020, CERT-In via its automatic platform, distributed details to its constituency regarding 158 malicious campaigns, provided details of 79 threat actors, made available facts related to 3,94,650 malicious domains/URLs, 65,842 malicious IPs, 7,863 malware hashes.

Security awareness, skill development and training

In order to create security awareness within the Government, Public and Critical Sector organizations, CERT-In regularly conducts trainings/workshops to train officials of Government, critical sector, public sector industry, financial & banking sector on various contemporary and focused topics of Cyber Security. This year due to the lockdown caused by the COVID pandemic and subsequent restrictions and the Government guidelines of minimizing the gathering of people, CERT-In had started the online trainings/workshops on various issues relating to Cyber Security. During the period January, 2020 - December, 2020, CERT-In has conducted 15 trainings on various specialized topics of Cyber Security. 708 officers including System/Network Administrators, Database Administrators, Application developers, IT Managers, Chief Information Security Officers

(CISOs)/Chief Information Officers (CIOs), and IT Security professional have been trained.

CERT-In undertook mass citizen outreach campaign through websites and social media channels during the National Cyber Security Awareness Month – October 2020, including via Doordarshan TV channels.

National Cyber Coordination Centre (NCCC)

Continuously evolving cyber threat landscape and its impact on well being of Information Technology, National Economy, and Cyber Security necessitates the need for near-real time situational awareness and rapid response to Cyber Security incidents. Realizing the need, Government has taken steps to set up the National Cyber Coordination Centre (NCCC) to generate macroscopic views of the Cyber Security threats in the country. The Centre will scan the cyberspace in the country at meta data level and will generate near real time situational awareness. NCCC is a multi-stakeholder body and is being implemented by Indian Computer Emergency Response Team (CERT-In) at Ministry of Electronics and Information Technology (MeitY). The centre is facilitating various organizations and entities in the country to mitigate cyber attacks and cyber incidents on a near real time basis. The phase – I of NCCC has commenced its operations since July, 2017. Implementation of NCCC phase-II has been started and will be completed in incremental stages.

NCCC aims to create a structured system to facilitate coordination effort among strategic stakeholders by sharing with them strategic inputs in terms of information about threats/attacks and possible extent which in turn enables immediate remedial actions by the stakeholders.

Awards

CERT-In received the “Cyber Frontliners of the

Country” award at the DSCI Excellence Awards 2020.

6.3.11 Online capacity-building on Cyber Law, Crime Investigation, and Digital Forensics

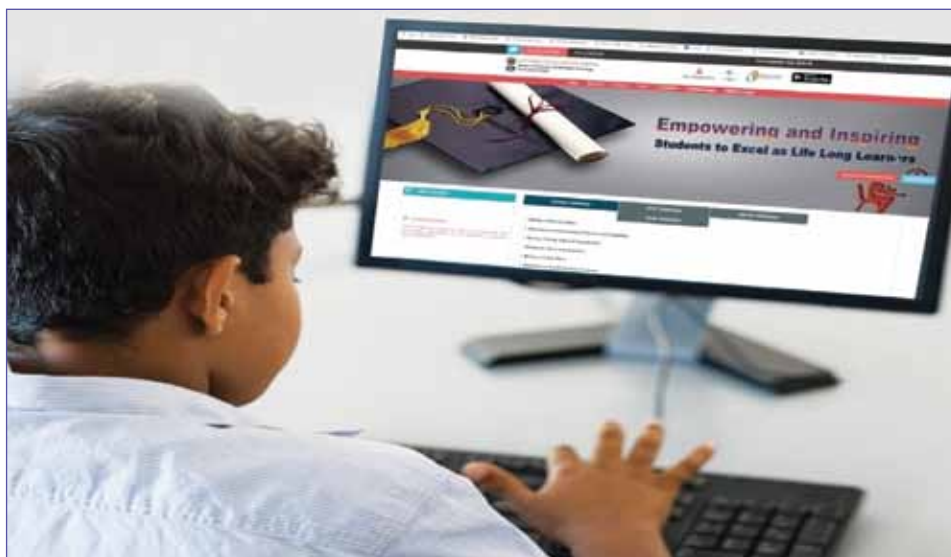
Online capacity-building programme on Cyber Law, Crime Investigation, and Digital Forensics through Learning Management System (LMS) has been initiated, where “Online PG Diploma in Cyber Law, Crime Investigation & Digital Forensics” will be offered to 1,000 officials of State Police working in cyber cells, Prosecutors and Judiciaries using Learning Management System (LMS) in a phased manner.

The project was officially launched on 9th November, 2020 and nominations have been received from various State Governments for this course.

6.4 CERT-In Initiatives towards Security including Digital Payments

- The Indian Computer Emergency Response Team (CERT-In) issues alerts and advisories regarding latest cyber threats and countermeasures on regular basis to ensure safe usage of digital technologies. Regarding securing digital payments, 28 advisories have been issued for users and institutions.
- All authorised entities/banks issuing PPIs in the country have been advised by CERT-In through Reserve bank of India to carry out special audit by empanelled auditors of CERT-In on a priority basis and to take immediate steps thereafter to comply with the finding of the audit report and ensure implementation of security best practices.
- Government has issued guidelines for Chief Information Security Officers (CISOs) regarding their key roles and responsibilities for securing applications/infrastructure and compliance.
- Government has empanelled 76 security auditing organisations to support and audit implementation of Information Security Best Practices.
- All organizations providing digital services have been mandated to report Cyber Security incidents to CERT-In expeditiously.
- Government has formulated Crisis Management Plan for countering cyber attacks and cyber terrorism for implementation by All Ministries/Departments of Central Government, State Governments and their organizations and critical sectors.
- Cyber Security mock drills and exercises are being conducted regularly to enable assessment of Cyber Security posture and preparedness of organizations in Government and critical sectors. 38 such exercises have so far been conducted by CERT-In where organisations from different sectors such as Finance, Defence, Power, Telecom, Transport, Energy, Space, IT/ITeS etc participated. 3 exercises were conducted in coordination with Reserve Bank of India in November, 2018 for senior management and Chief Information Security Officers (CISOs) of banks.
- CERT-In conducts regular training programmes for Network/System Administrators and Chief Information Security Officers (CISOs) of Government and critical sector organizations regarding securing the IT infrastructure and mitigating cyber attacks. 22 trainings covering 746 participants conducted in the year 2018 (till November).
- Government has launched the Cyber Swachhta Kendra (Botnet Clearing and Malware Analysis Centre). The centre is providing detection of malicious programs and free tools to remove the same.

Skill India: Capacity Building



7.1 Skill India

Activities of MeitY are targeted to support availability of trained human resources for the manufacturing and service sectors of Electronics and Information Technology industry. Initiatives include identifying gaps emerging from the formal sector and planning programmes in non-formal and formal sectors for meeting these gaps. This includes skill development in the domain of Electronics and IT and related areas. In the succeeding sections, various ongoing initiatives, including skill development and an indicative list of major schemes/projects are presented.

The skill development activities of the Ministry are primarily being taken up by its two autonomous societies viz. National Institute of Electronics and Information Technology (NIELIT), and Centre for Development of Advanced Computing (C-DAC). In

addition, the various organisations/attached offices under the Department viz. ERNET India, Digital India Corporation, CSC E-Governance Services India Limited, STQC, NIC etc., are also engaged in training of various stakeholders in small numbers. The following schemes/activities pertaining to Human Resource Development for Electronics and ICT sector are under implementation.

7.1.1 Post Graduate and Doctorate Level

Visvesvaraya PhD Scheme for Electronic System Design and Manufacturing [ESDM] and IT/IT Enabled Services [IT/ITeS]

MeitY initiated “Visvesvaraya PhD Scheme for Electronics and IT” to (i) enhance the number of PhDs in Electronics System Design and Manufacturing (ESDM) and IT/IT Enabled Services (IT/ITeS) sectors in the country (ii) give thrust to Research and Development (iii) create an innovative

ecosystem and enhance India's competitiveness in these knowledge intensive sectors.

The scheme supports full-time and part-time candidates in ESDM and IT/ITeS sectors. The scheme also targets to support 200 Young Faculty Research Fellowships (YFRF) in the areas of ESDM and IT/ITeS with the objective, to retain and attract bright young faculty members in these sectors. It also provides for infrastructural grant of Rs.5 lakh per full-time candidate to the academic institutions for creation/up-gradation of laboratories. Part-time PhD candidates also get one time incentive on completion of the PhD. The scheme was initiated in 2014 for a period of nine years with a total estimated cost of Rs.466 crore.

Under the scheme (till December, 2020) 884 full-time and 309 part-time PhD scholars are pursuing PhD at 97 academic institutions (Central Universities/Institutions and Colleges/Institutions of National importance/State Universities/Deemed Universities/Institutions) across the country. The scheme is also supporting 158 "Young Faculty Research Fellows" to encourage and recognize young faculties involved in research and technology development.

Periodical research workshops are organised to improve the quality of research being pursued by the PhD scholars and young faculty research fellowship (YFRFs) and to assess their research work. In these workshops, selected scholars and YFRFs present their research work to the Academic Committee and other research experts. Experts review and evaluate research work of PhD Scholars/YFRFs and also provide critical comments and suggestions to improve their research work.

A total of 5 Workshops for Research Fellows (in Mumbai, Bengaluru, Visakhapatnam, Jaipur and Chandigarh covering around 950 Research

Scholars) and 3 workshops for YFRF awardees (at IISc Bengaluru) were held during FY 2019-20.

The PhD Scheme was also evaluated by Mid-Term Evaluation committee consisting domain experts. The Committee appreciated the Scheme and observed that it has helped to develop capacity building in niche areas of electronics, IT and computer sciences coupled with infrastructure development. It further recommended the continuation of the scheme with more full time PhD seats and introduction of "Post-Doctoral Fellowship".

7.1.2 Graduate level

Scheme of Financial Assistance for setting-up of Electronics and ICT Academies

Ministry of Electronics and Information Technology (MeitY) in November 2014 had approved the scheme for setting-up of seven (07) Electronics and ICT Academies in the country to address the requirement of training the faculty in the latest as well as upcoming/emerging areas of Electronics and ICT for Engineering and other streams. The scheme implementation would improve the employability of graduates/diploma holders in various streams. As per the Scheme approval, Seven (07) Electronics and ICT academies have been set up and are operational at premier and leading academic institutions viz. (i) NIT Warangal (ii) IIITDM Jabalpur (iii) IIT Guwahati (iv) NIT Patna (v) IIT Kanpur (vi) IIT Roorkee and (vii) MNIT Jaipur.

The original outlay of the scheme was Rs.147.48 crore (Grant-in-Aid - Rs.103.98 crore; Internal Revenue : Rs.43.50 crore) with a duration of 5 years (i.e up to 30th November, 2019). Subsequently, based on the internal approval the outlay of the scheme has been revised to Rs.87.69 crore (Grant-

in-Aid - Rs.77.26 crore; IR : Rs.10.43 crore). The duration of the scheme has been extended up to 31st March, 2022 with the original target to train 92,800 faculties.

These academies have been conducting the 'Faculty Development Programs' (FDPs)/courses in Conventional Classroom mode, NKN mode and online mode. The duration of courses is ranging from 40 Hours to 80 Hours.

Under the scheme, 1,60,819 beneficiaries have been trained under 1,230 Faculty Development Programmes (Faculty: 69,290; Students/Others: 91,529) by the academies as on 31st October, 2020.

7.1.3 Vocational Skill Development Level

7.1.3.1 Two Schemes on Skill Development in ESDM Sector are under implementation:

(a) Scheme for financial assistance to select States/UTs for Skill Development in ESDM sector

The scheme has been approved with a target of skilling 90,000 candidates (at 5 levels). The scheme is under implementation in following States/UTs viz. Andhra Pradesh, Telangana, Jammu & Kashmir, Ladakh, Karnataka, Punjab, Uttarakhand (for two levels only) and Uttar Pradesh.

(b) Scheme for 'Skill Development in ESDM for Digital India'

This expanded scheme has been approved with a target of skilling 3.28 lakh candidates for implementation in 32 States/UTs.

Under the above two schemes, training is imparted in 65 NSQF aligned courses and 1 NOS based course, through 2,717 training partners duly registered with NIELIT/Electronics Sector Skill Council of India (ESSCI)/Telecom Sector Skill

Council (TSSC). So far under both the above schemes, a total of 3.79 lakh candidates have been enrolled for training in various States/UTs, out of which 3.76 lakh candidates have been trained and 2.26 lakh candidates have been certified.

7.1.3.2 Generation of Greater Participation of Industry through Sector Skill Councils - Electronics, Telecom, IT/ITeS

MeitY is actively associating and supporting the various skill development activities of the following Sector Skill Councils (SSCs) concerning the domains addressed by this Ministry:

- Electronics Sector Skill Council of India (ESSCI)
- Telecom Sector Skill Council (TSSC)
- IT- ITeS Sector Skill Council (NASSCOM)

The above Sector Skill Councils have taken up various courses for skilling of candidates in their respective domains. The Ministry has also supported development of new job roles/NOSs with ESSCI, TSSC and NASSCOM IT/ITeS Sector Skill Council in the area of Electronics and IT.

7.1.3.3 Training Programmes for Scheduled Caste & Schedule Tribe Communities and North-Eastern Communities of India:

EMDP programme has been building knowledge on electronics manufacturing for last several decades and as part of its outreach for weaker sections of the societies EMDP has initiated several projects on manpower training among SC/ST and North-Eastern communities. These projects are supporting entrepreneurship programmes in the areas of supercapacitor based solar lanterns which can be charged in minutes, digital thermometer based on indigenous sensors, and E-waste management. Additionally, training for RoHS laboratory manpower

has been initiated. In total, the outreach is for 16,440 citizens in 20 States. State Governments are also taking active participation in these projects through State Pollution Control Boards (SPCB) and Institute of Human Resource Development (IHRD). First batches of entrepreneurship programmes are already passing out and few are on process to establish MSMEs on manufacturing of digital thermometers.



Electronics Knowledge Helping to build Skills and Business among weaker sections of society

7.1.4 Capacity Building in Niche Areas

Special Manpower Development Programme in Chips to System Design (SMDP-C2SD)

- An umbrella Programme under 'Digital India Programme' has been initiated in December, 2014 with an outlay of Rs.99.72 crore at 60 Academic/Research & Development institutions spread across the country including all IITs, NITs, IISc, IIITs & other Engineering Colleges with an aim to train 50,000 number of specialized manpower over a period of 5 years in the area of VLSI design and inculcate the culture of System-on-Chip/System Level Design at Bachelors, Masters and Research level. Major achievements under the program so far are:
 - About 50,756 number of manpower at B.Tech, M.Tech & PhD level trained in VLSI/System design area.
 - 15 projects are in progress for development of working prototype of Systems/Sub-systems/ SoCs along with the development of about 137 Application Specific Integrated Circuits (ASICs) and 30 Field Programmable Gate Array (FPGA) based board level designs.
 - VLSI design labs equipped with State-of-the-art EDA Tools & Hardware Equipment setup at 60 participating institutes for implementing VLSI/System design projects.
 - About 111 designs fabricated till date at SCL Mohali & other foundries and 39 designs are ready to be sent for fabrication.
 - 15 Instruction Enhancement Programmes (IEP) organized to train the faculty members of institutes participating under SMDP-C2SD in the area of VLSI/System design.
 - M.Tech programme in VLSI/embedded system design initiated at 18 SMDP-C2SD institutions that did not have these courses earlier.
 - Website for SMDP-C2SD developed (www.smdpc2sd.gov.in) for dissemination of educational material, web based project administration for all the institutions participating in the program and maintaining repository of reusable IPs/IEPs/Video Lectures etc.
 - About 21 Patent (National/International) filed and ~1500 research papers published in Conference proceedings/Journal publications.
 - To make available industry-ready specialized manpower in VLSI/System design area, about 200 students from SMDP-C2SD institutions sent to Intel for internship of 6 Month - 1 Year.

Out of these, 30 students provided job offer by Intel.

Skill Development School for Paramedical Training by JSV Innovations Private Limited has been established at Centre for Nanotechnology, IIT Guwahati.

Information Security Education and Awareness (ISEA) Project Phase-II

The Information Security Education and Awareness (ISEA) Project Phase-II was approved with the objectives of capacity building in the area of information security, training of Government personnel and creation of mass information security awareness for various user segments. The project aimed at training of 1.14 lakh candidates in various formal and non-formal courses, faculty training, etc., and training of more than 13,000 Government officials in the area of information security, besides creating mass awareness for approximately 3 crore internet users through direct/indirect mode. A total of 52 institutions are carrying out the implementation of academic activities under the project.

Under the project so far, a total of 61,063 candidates have been trained/under-going training in various formal/non-formal courses in Information Security through 52 institutions (further, 5 Technical Universities participating under the project have reported around 2.53 lakh candidates as trained/under-going training in formal courses in their respective affiliated colleges). Besides this, 11,388 Government Officials have been trained in various short term courses through direct/e-learning mode. As a part of Awareness, 1,227 awareness workshops have been conducted across the country through direct/virtual mode covering 1,80,447 participants and around 3.25 crore (estimated) beneficiaries have been covered under indirect mode through 15 awareness weeks; Cyber

Security curriculum designed for 3-12 standard & submitted to CBSE/NCERT for adoption, 65,810 school teachers trained as master trainers through direct/virtual mode; 25 editions of bi-monthly newsletters published; 60 programs broadcasted through Doordarshan/All India Radio on various Cyber Security related topics; design/development/dissemination of multilingual awareness content viz. 13 hand books, 59 multimedia short videos (2 mins.), 128 multilingual posters, etc., through print, electronic, social media, etc., disseminated through www.isea.gov.in and www.infosecawareness.in.

During COVID-19 situation (April – December 2020), under the project a special focus was made on organizing online programmes in the area of information security and many programmes were organized (i.e. Webinars (two-around 2,947 participants), Online courses (two-around 800 participants), e-faculty training programme (one-around 691 participants), School teachers training (eleven- 64,337 participants) and awareness workshops (seventy five-around 17,781 participants)) covering more than 82,118 participants. In addition, around 1,305 Government Officials were registered in 10 short-term courses in the area of information security offered through the self-paced technology-enhanced learning portal (www.isea-got.in), out of which, 816 Government officials were certified during the said period. As per the mandate given by Hon'ble Prime Minister for training of Government officials in Cyber Security, a new initiative for Online training of select Government personnel of Union Ministries/ Departments in Cyber Security has been approved under the ambit of ISEA Project. As on 11.12.2020, 1st batch of Generic Online Course on Cyber Security (4 hrs. through webinar + 2 hrs. self-learning mode) and Online Foundation Course on Cyber Security (40 hrs. through VILT + 20 hrs. self-

learning mode) were organized covering 340 and more than 59 participants respectively from various Central Ministries/Departments.

7.1.5 Grass Root Level

“Pradhan Mantri Gramin Digital Saksharta Abhiyan” (PMGDISHA)

The Government of India has approved a scheme titled “Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA)” to usher in digital literacy in rural India by covering 6 crore rural households (one person per household). To ensure equitable geographical reach, each of the 2,50,000 Gram Panchayats across the country are registering an average of 200-300 candidates.

Special focus of the said Scheme is on training the beneficiaries on use of Electronic Payment System. The outcome measurement criteria include undertaking at least 5 electronic payments transactions by each beneficiary using UPI (including BHIM app), USSD, PoS, AEPS, Cards, Internet Banking.

The total outlay of the above Scheme is Rs.2,351.38 crore (approx.). It is being implemented as a Central Sector Scheme by the Ministry of Electronics & Information Technology through an Implementing Agency, namely, CSC e-Governance Services India Limited, with active collaboration of all the State Governments and UT Administrations.

The Implementing Agency of the Scheme has conducted 144 State level workshops and 1221 district level awareness workshops for the training centres till March, 2020. As on 30th November, 2020, a total of 3.87 crore beneficiaries have been enrolled, out of which training has been imparted to 3.14 crore beneficiaries, out of this more than 2.27 crore beneficiaries have been certified under the PMGDISHA Scheme.

7.1.6 Create Skill Development Facilities in Deprived Areas through Strengthening of National Institute of Electronics and Information Technology (NIELIT)

Ministry of Electronics and Information Technology (MeitY) is implementing a Project titled “Development of North-Eastern Region by enhancing the Training/ Education capacity in the Information, Electronics & Communication Technology (IECT) Area” with budget outlay of Rs.287.00 crore (GIA of Rs.259.67 crore). The project objective includes up-gradation of the three existing NIELIT centers located at Imphal, Aizawl, Gangtok; Setting up of seven new Extension centers at Senapati and Churachandpur in Manipur; Dibrugarh, Jorhat and Kokrajhar in Assam; Lunglei in Mizoram; Pasighat in Arunachal Pradesh; and Upgradation of two existing extension centers located at Chuchuyimlang in Nagaland and Tezpur in Assam to increase the training capacity from 3,080 per year to 14,400 per year from the 5th year onward. As of now, the annual training capacity of these centers (including six centers operational from temporary locations at Guwahati and Silchar in Assam; Itanagar and Tezu in Arunachal Pradesh; Shillong and Tura in Meghalaya) is around 20,000 candidates. The above 12 NIELIT Centres/Extension Centres are at different stages of construction under the project and also offering training programs to the youth of North-Eastern region. As of now total 21 NIELIT Centers/Extension Centers are offering training programs in all 8 North-Eastern states out of which, 14 Centers/Extension Centers have permanent Campus facilities (covering Kohima and Agartala). As on 30th November, 2020 (since April, 2012), approx. 1.66 lakh candidates have been trained by these centers in various short-term, long-term, formal, non-formal courses in Electronics & ICT domain.

7.1.7 IT for Masses Programme

IT for Masses Programme under Manpower Development scheme is aimed at narrowing digital divide by initiating/promoting activities in ICT for focus groups (Women, Scheduled Caste, Scheduled Tribe, Senior Citizen, Differently Abled & Economic Weaker Section) and under-privileged areas (North-Eastern Region, Backward Districts and Blocks & Districts having more than 40% SC/ST population) for inclusive growth of IT Sectors through Infrastructure Creation, Training, Capacity Building & Entrepreneurship Creation activities in IT domain.

The Ministry is earmarking funds for Development Action Plan for Scheduled Caste (DAPSC), Scheduled Tribe Component (STC) and General component. The Programme caters exclusively for the benefit/development of focus group i.e. Women, Scheduled Caste, Scheduled Tribe, Senior Citizen, Differently Abled & Economic Weaker Section.

During the F.Y. 2020-21, so far, the projects implemented in 6 States and a UT which have directly benefitted about 2,652 (SC:1919, ST:93 & Women:640) no. of candidates. The following projects initiated/on-going:

Development of Weaker Sections

Projects are listed as under covering Scheduled Caste (SC)/Scheduled Tribe (ST), Differently Abled (PwD), Senior Citizens and Economic Weaker Section (EWS) beneficiaries

- Empowerment of SC/ST Youth & Women on Enhancement of Livelihood activities using IT & Tool and PMU for IT for Masses- West Bengal
- Development of IT solution (Mobile/web App) in Hindi Language on self-employment

schemes for empowerment of SCs, STs and women in Himachal Pradesh – Himachal Pradesh

- Skill Development Training of Unemployed SC & ST youths of Tripura towards enabling entrepreneurship & sustainable development – Tripura
- Training of Visually Impaired Persons in Manipur on “Course on Computer Concepts (CCC) of NIELIT – Manipur
- Skill Development Training for the Masses under ICT – Maharashtra
- Creation of R&D culture in Electronic Materials among SC/ST and Women students from the remote areas in Maharashtra – Maharashtra
- Awareness Campaigns/Events for empowerment of Senior Citizens in e-Services through ICT Tools – Maharashtra
- Skill Development of youths in Aspirational Districts in the area of IECT leading to enhancement in Employability – PAN India
- Enhancement of livelihood activities for SC candidates of Delhi NCR Through Capacity Building using ICT – Delhi
- Skill Training programme for Empowering SC/ST in Kerala and Karnataka – Kerala and Karnataka
- Capacity Building Programme to enhance employability of the Engineering Graduates in emerging technologies – Tamil Nadu
- Skill Development Training for the Masses under ICT – Karnataka
- Capacity Building in Information Technology for SC candidates in State of Haryana – Haryana

- Facilitating Skill Development and Enhancing Employability in IT-ITes Sector for SC/ST Candidates – PAN India
- IT enabled Incubation Centre for Handloom and Handicraft Sector – Ladakh UT

Development of Women/Girls using ICT

Gender Empowerment through ICT has been one of the major initiatives of the Government. MeitY has also been implementing various ICT training/capacity building projects for the empowerment of women in different States/UTs.

The following projects initiated/on-going:

Projects covering Gender (Women) beneficiaries

- Development of IT solution (Mobile/web App) in Hindi Language on self-employment schemes for empowerment of SCs, STs and women in Himachal Pradesh – Himachal Pradesh
- ICT Intervention for Development & Livelihood Enhancement through Self Help Groups (SHGs) in Majhwa block of Mirzapur (a backward district) – Uttar Pradesh.
- Skill Development Training for the Masses under ICT – Maharashtra
- ICT based capacity building for empowerment in the area of health and livelihood for the women belonging to SC/ST community in Latur district of Maharashtra – Maharashtra
- Creation of R&D culture in Electronic Materials among SC/ST and Women students from the remote areas in Maharashtra
- Skill Development of youths in Aspirational Districts in the area of IECT leading to enhancement in Employability

Fee-reimbursement Programme

As per the directions and guidelines received from NITI Aayog (erstwhile Planning Commission) by MeitY (erstwhile DeitY) vide their communication No.D.O.No.M-13054/2/2005-BC dated 05.09.2007, no fee should be charged from the SC and ST candidates for educational and skill development programmes by the Government and autonomous institutions and the expenditure for the Scheme should be accounted for from the SCSP and TSP fund of the respective Ministries/Departments.

Since 2007-08, National Institute of Electronics and Information Technology (NIELIT) is implementing the “Fee Reimbursement to SC/ST” Programme. The aforesaid Programme is DBT on-boarded scheme in which free training is being provided to the SC/ST candidates in various formal, non-formal and IT literacy courses at NIELIT’s own centers under budgetary support of MeitY.

For the direct benefit of beneficiaries, MeitY has issued Gazette Notification on 13.08.2019 for the use of Aadhaar as mandatory for any SC/ST candidate desirous of availing the benefit under the aforesaid Programme. Further, the Guidelines for Fee Reimbursement to SC/ST has been issued on 20.04.2020 for better implementation of the programme and an MIS portal has been developed and on-boarded for constant monitoring of the programme. Also, the aforesaid Programme has been on-boarded on UMANG portal. As on 30th December, 2020, a total of 54,986 Scheduled Caste and 1,60,606 Scheduled Tribe Candidates have been benefitted under the Fee-reimbursement programme.

7.1.8 Re-skilling/up-skilling of IT Professionals

The job scenario in IT-BPM Industry is undergoing a transformation due to adoption of automation

and emergence of newer technologies (including disruptive technologies). The existing workforce would require re-skilling/up-skilling to stay relevant and a large number of these professionals would require re-skilling/up-skilling on continual basis. To cater to these requirements, MeitY and NASSCOM have jointly conceived a new initiative titled “Future Skills PRIME (Programme for Re-skilling/Up-skilling of IT Manpower for Employability)”, with an aim to create a re-skilling/up-skilling ecosystem for B2C in emerging and futuristic technologies (i.e. Artificial Intelligence, Internet of things, Big Data Analytics, Robotic Process Automation, Additive Manufacturing/3D Printing, Cloud Computing, Social & Mobile, Cyber Security, Virtual Reality and Blockchain etc.) to facilitate continuous skill as well as knowledge enhancement of the professionals in line with their aspirations and aptitude in a self-paced digital skill environment. The Future Skills PRIME has been approved with a target to cover 4.12 lakh beneficiaries (4 lakh Professionals, 10,000 Government Officials and 2,000 Trainers).

The Future Skills PRIME is being built on an innovative “Aggregator of Aggregators” framework with rich catalogues of courses and multiple skilling options. It aims to map good quality industry relevant online content with the future Job Roles, and offer them as skilling options to candidates along with other value-added services. Further, to strengthen physical and digital connectivity, the existing pan-India presence & skilling capabilities of training providers (SSC NASSCOM, NIELIT, C-DAC etc.), are also leveraged. Towards this, 40 C-DAC/NIELIT Centres are identified as Lead & Co-Lead Resource Centres (RCs) to institutionalize the blended-learning training Programmes in a hub and spoke mode for the 10 emerging technologies.

The beta version of Future Skills PRIME portal i.e.

www.futureskillsprime.in has been made live on 18th November, 2020 with the initial set of free digital fluency content, i.e., bite-sized content to build an awareness of what these technologies are, and how they are impacting lives and livelihood. The platform with full functionalities including subscription-based learning pathways and other value-added features is expected to be made operational by early 2021.

Statutory Organisations



8.1 Authentication Framework under the IT Act, 2000 - CCA

The Information Technology Act, 2000 facilitates acceptance of Electronic Records and Electronic Signatures through a legal framework for establishing trust in e-Commerce and e-Governance. For authentication of electronic transactions using electronic signatures, the Controller of Certifying Authorities (CCA) licenses Certifying Authorities to issue Electronic Signature Certificates under the IT Act, 2000. Currently, 15 Certifying Authorities (CAs) are operational. The total number of Electronic Signature Certificates (ESC) issued in the country are 16.61 crore (out of which 13.93 crore ESCs are for eSign) (till 31st December, 2020) & continues to grow rapidly and is expected to increase significantly with the launch of various e-Governance/e-Commerce programmes.

8.1.1 Compliance Audits

For ensuring continued trust in this authentication framework, Annual Compliance Audits of Certifying Authorities were conducted as per the requirements of the Information Technology Act, 2000. In addition to the regular Annual Compliance Audits, Special Audits were also carried out for ensuring compliance to the Identity Verification Guidelines (IVG) to be followed in the Digital Signature Certificate (DSC) issuance process.

8.1.2 eSign- Online Electronic Signature Service

12 licensed CAs empanelled as eSign Service Providers (ESPs) (viz. eMudhra, Safescrypt, nCode, RISL, Verasys, C-DAC, NSDL e-Gov, CSC, Capricorn, CDSL Ventures Ltd, PantaSign, and IDSign) are providing eSign service in the country. 05 out of 12 ESPs (Safescrypt, RISL,

CDSL Ventures, PantaSign and IDSign) have been empanelled this year. Initiatives are being taken through coordinated interactions between the e-Governance/e-Commerce Application Service Providers and these ESP/CAs to facilitate the maximum use of eSign.

8.1.3 Root Certifying Authority of India (RCAI) Infrastructure

The Root Certifying Authority of India (RCAI) set up by the CCA is at the root of trust for authentication through Digital Signatures. Certificate Signing Requests (CSR) of licensed Certifying Authorities are signed using private key of CCA at RCAI. Repository containing certificates issued by CCA to the licensed CAs is being maintained by the Office of CCA. Established Time synchronization mechanism from National Time Source for RCAI systems. Also, security surveillance, access control, setup for the Root CA has been revamped. The Certificates issued by the licensed CAs to subscribers are checked for compliance with the Interoperability Guidelines and for Statistical Purposes. The Disaster Recovery Site for the RCAI continues to be operational.

8.1.4 Enabling Paperless Mode of DSC Issuance

In the traditional mode, the Digital Signature Certificates (DSC) to the subscriber were issued based on the paper based application form & duly attested supporting documents including address and identity proof of the applicant. This whole process has been dispensed with after the issuance of guidelines along with KYC to be provided through alternate mode like Aadhaar offline eKYC, banking KYC, organizational KYC and PAN based eKYC. Existing Certifying Authorities namely eMudhra, Verasys, Safescrypt, nCode Solutions, PantaSign and Capricorn have started paperless mode of DSC issuance.

8.1.5 Licence granted/renewed to operate as Certifying Authority

Licensed three new Certifying Authorities namely CDSL Ventures Ltd. CA, IDSign CA and PantaSign CA and renewed the licence of C-DAC CA during this period.

8.1.6 Applications for CA Licence under pipeline

New Certifying Authorities namely, IGCAR, Reliance Payments Solutions Ltd, Airtel Payment Bank Ltd, and Indian Navy are in various phases of implementation of their CA development process and some of them are under audit process. These CAs will start issuance of DSCs to various subscribers.

8.1.7 PKI Body of Knowledge

As part of its promotional role for boosting the electronic transactions for e-Commerce and e-Sign application, the Office of CCA conducts awareness programmes in the country for users who are beginners and also for application developers and relying parties. These awareness programmes are conducted across the length and breadth of the country through C-DAC, Bangalore. The proposal for funding the project has been awarded to C-DAC. Three PKI webinars have been conducted regarding trusted electronic transactions in COVID-19 era, Secure workflows in Pandemic environment and Digital Signature and Public Key Awareness.

8.1.8 New Scheme for Remote Key Storage

Office of CCA has taken initiative for introducing a new scheme based on Remote Key Storage to facilitate ease of use of Digital Signatures. The enabling law has been included in the Second Schedule of the IT Act, 2000.

8.1.9 eSign using online Aadhaar eKYC service

Aadhaar authentication for eSign services has

been permitted under Section 4(4)(b)(i) of the Aadhaar Act 2016. Accordingly, licensed Certifying Authorities have been enabled to provide eSign services based on online Aadhar eKYC service.

8.1.10 Digital Locker Authority (DLA)

Under the Digital India Programme, Government of India has planned to provide shareable private space on a public cloud and to digitize all documents and records of the citizens and make them available on a real-time basis. These mechanism of 'e-Document repositories' and 'Digital Lockers' will greatly improve citizen convenience and usher in paperless transactions across the entire ecosystem of public services. The framework for the Digital Locker Ecosystem has been set up by the Controller of Certifying Authorities (CCA) who has been given additional charge to function as 'Controller of Digital Locker Authority (CDLA)'.

A new Digital Locker Service Providers (DLSP) data exchange model has been proposed as the existing framework of Digital locker was having dependency on Aadhaar and usage of same was restricted by the verdict given by Supreme Court of India. This new model allows each DLSP to be in conformity to the updated Aadhaar act and still be able to provide their users access to issuer data within the Digital Locker ecosystem. Each DLSP will be free to further add more documents from these issuers to their system, while also providing users access to documents available via MeitY DigiLocker system.

8.2 Unique Identification Authority of India (UIDAI)

8.2.1 Introduction

The Unique Identification Authority of India (UIDAI) is a statutory authority established under the provisions of the Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and

Services) Act, 2016 (referred as "Aadhaar Act 2016") on 12th July, 2016 by the Government of India, under the Ministry of Electronics and Information Technology (MeitY). The Aadhaar Act 2016 has since been amended by the Aadhaar and Other Laws (Amendment) Act, 2019 (14 of 2019) which was notified on 24.07.2019 and its provisions came into force on 25.07.2019.

Prior to its establishment as a statutory authority, UIDAI was functioning as an attached office of the then Planning Commission (now NITI Aayog) vide its Gazette Notification No. A-43011/02/2009-Admn.I dated 28th January, 2009. Later, on 12th September, 2015, the Government revised the Allocation of Business Rules to attach the UIDAI to the Department of Electronics & Information Technology (DeitY) of the then Ministry of Communications and Information Technology.

The Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016 (No. 18 of 2016); The Aadhaar and Other Laws (Amendment) Ordinance, 2019 (No. 9 of 2019) and the Aadhaar and Other Laws (Amendment) Act, 2019 (14 of 2019)

The Aadhaar Act, 2016 provides for good governance, efficient, transparent and targeted delivery of subsidies, benefits and services, the expenditure for which is incurred from the Consolidated Fund of India or the Consolidated fund of the State, to individuals residing in India through assigning of unique identity numbers (called Aadhaar numbers) to such individuals and for matters connected therewith or incidental thereto.

The Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Bill, 2016 was published in the Official Gazette of India, Extraordinary, Part-II, Section 1, dated 26th March, 2016 (Act No. 18 of 2016; referred to as "Aadhaar

Act, 2016"). Different provisions of the Aadhaar Act, 2016 came into force on 12.07.2016 and 12.09.2016.

Subsequently, a number of writ petitions were filed before various High Courts and the Supreme Court, inter-alia, challenging the validity of Aadhaar; both prior to and after the notification of Aadhaar Act, 2016. All these writ petitions were tagged by the Supreme Court with the main writ, Justice K.S. Puttaswamy and Others Vs Union of India, W.P. No.(Civil) 494/2012. The final judgment in W.P. No.(Civil) No.494/2012 was pronounced on 26.09.2018 by a five Judge Constitution Bench of the Supreme Court, upholding the constitutional validity of Aadhaar with few restrictions and changes.

Following the judgment, a decision was taken to bring necessary changes in the Aadhaar Act to incorporate safeguards to ensure privacy, prevent misuse of personal information and prevent denial of services and benefits to eligible persons as per the directions of the Supreme Court and recommendations of Justice B.N. Srikrishna (Retd.) Committee. Besides, changes were also required in the Indian Telegraph Act, 1885 and Prevention of Money Laundering Act, 2002 to allow voluntary use of Aadhaar authentication for obtaining SIM cards and opening of bank accounts respectively. Accordingly, the Aadhaar and Other Laws (Amendment) Bill, 2019 was passed by the Lok Sabha on 4th January, 2019 but could not be taken up by the Rajya Sabha as it was adjourned sine die. Later on, the Aadhaar and Other Laws (Amendment) Ordinance, 2019 (No. 9 of 2019) was promulgated by the President on 02.03.2019 and came into force at once.

Subsequently, the said Ordinance was replaced by the Aadhaar and Other Laws (Amendment) Act, 2019 (14 of 2019). This amended Act inter-alia provides for use of Aadhaar authentication by the State Government, for the purpose of establishing

identity of an individual as a condition for receipt of a subsidy, benefit or service for which the expenditure is incurred from, or the receipt there from forms part of, the Consolidated Fund of State.

Salient features of the Aadhaar and Other Laws (Amendment) Act, 2019

- To provide for alternate numbers generated by the Authority to conceal the actual Aadhaar number of an individual
- To give an option to children to cancel their Aadhaar number on attaining the age of eighteen years
- To provide for voluntary use of Aadhaar number in physical or electronic form by authentication or offline verification or other mode(s)
- Authentication or offline verification of Aadhaar number can be performed only with the informed consent of the Aadhaar number holder
- Prevention of denial of services for refusing to, or being unable to undergo authentication
- To place safeguards and restrictions on performing authentication
- To lay down the procedure for offline verification
- To confer power upon the Authority to give such directions, as it may consider necessary, to any entity in Aadhaar ecosystem
- For establishment of Unique Identification Authority of India Fund
- To enhance the restrictions on sharing of information
- To provide for civil penalties, its adjudication and appeal
- To omit Section 57 of the Aadhaar Act
- To allow the use of Aadhaar number for authentication on voluntary basis as

acceptable KYC document under the Telegraph Act, 1885 and the Prevention of Money-Laundering Act, 2002

- To allow the State Government also for the purpose of establishing identity of an individual as a condition for receipt of subsidy, benefit or service for which the expenditure is incurred from the Consolidated Fund of State under Section 7 of the said Act.

Rules/Regulations notified under the Aadhaar Act, 2016

- Unique Identification Authority of India (Terms and Conditions of Service of Chairperson and Members) Rules, 2016
- Unique Identification Authority of India (Transaction of Business at Meetings of the Authority) Regulations, 2016 (No. 1 of 2016)
- Aadhaar (Enrolment and Update) Regulations, 2016 (No. 2 of 2016)
- Aadhaar (Authentication) Regulations, 2016 (No. 3 of 2016)
- Aadhaar (Data Security) Regulations, 2016 (No. 4 of 2016)
- Aadhaar (Sharing of Information) Regulations, 2016 (No. 5 of 2016)
- Aadhaar (Enrolment and Update) (First Amendment) Regulations, 2017 (No. 1 of 2017)
- Aadhaar (Enrolment and Update) (Second Amendment) Regulations, 2017 (No. 2 of 2017)
- Aadhaar (Enrolment and Update) (Third Amendment) Regulations, 2017 (No. 3 of 2017)
- Aadhaar (Enrolment and Update) (Fourth Amendment) Regulations, 2017 (No. 5 of 2017)
- Aadhaar (Enrolment and Update) (Fifth Amendment) Regulations, 2018 (No. 1 of 2018)
- Aadhaar (Enrolment and Update) (Sixth Amendment) Regulations, 2018 (No. 2 of 2018)
- The Unique Identification Authority of India (Returns and Annual Report) Rules, 2018
- The Unique Identification Authority of India (Form of Annual Statement of Accounts) Rules, 2018.
- The Aadhaar (Pricing of Aadhaar Authentication Services) Regulations, 2019 (No. 1 of 2019)
- The Aadhaar (Enrolment and Update) (Seventh Amendment) Regulations, 2019 (No. 3 of 2019),
- The Unique Identification Authority of India (Appointment of Officers and Employees) Regulations, 2020 (No.1 of 2020)
- The Unique Identification Authority of India (Salary, Allowances and other Terms and Conditions of Service of Employees) Regulations, 2020 (No. 2 of 2020)
- The Aadhaar Authentication for Good Governance (Social Welfare, Innovation, Social Welfare, Innovation, Knowledge Rules, 2020)
- The Aadhaar (Enrolment and Update) (Eighth Amendment) Regulations, 2020 (No. 3 of 2020).

8.2.2 Value Proposition of Aadhaar

8.2.2.1 Uniqueness

Any individual, irrespective of age and gender, who is a resident in India and satisfies the verification process laid down by the UIDAI, can enroll for Aadhaar. An individual is required to enroll only once; the process is free of cost. In case, the

resident enrolls more than once, only one Aadhaar shall be generated, as the uniqueness is achieved through biometric de-duplication.

Authentication

One of the challenges the resident frequently faced was to establish his/her identity. Aadhaar's property of authentication enables an Aadhaar holder to authenticate with a service provider anytime, anywhere in the country to prove his/her identity. To facilitate this, UIDAI has established an ecosystem based on best global practices to ensure data privacy and reliability of authentication, with UIDAI being agnostic to the purpose of authentication.

8.2.3 Approach and Strategy: Enrolment Ecosystem

The first Aadhaar of a resident was made in September, 2010. As on 31st December 2020, 127.59 crore Aadhaar have been generated against the projected population (2020) of about 137.05 crore. However, the actual number of Aadhaar holders would always be lesser due to deaths. Hence, the concept of "Live Aadhaar" has been introduced to estimate the number of alive persons holding Aadhaar. As such, 123.28 crore Live Aadhaar have been generated since inception in September, 2009. Thus, UIDAI has covered 89.95% of the projected population. The statistics as on 31st December, 2020 with information in respect of children in the age group 0 < 5 years and 5 < 18 years is provided as below:

Age Band	Population (Projected 2020)	Live - Aadhaar Generated	Aadhaar Saturation
Overall	137.05 crore	123.28 crore	89.95%
Population 5<18 years	37.67 crore	28.70 crore	76.19%
Population 0 < 5 years	12.83 crore	3.47 crore	27.06%

As majority of the adult population has already enrolled for Aadhaar, UIDAI is also focusing on

Aadhaar update. UIDAI is providing assistance for successful Aadhaar enrolment and mandatory biometric update done through its Permanent Enrolment Centers (PECs) opened by scheduled banks, India Post, CSC, State Registrars, etc.

The aforementioned PECs are providing both enrolments as well as update facilities to residents. Consequent to the saturation in Aadhaar Enrolment, Aadhaar update has become a major activity at such PECs. While some update requests will be necessary as per Aadhaar's process, other will arise based on needs of individuals.

The following categories of residents require to update their Aadhaar :

- a) Mandatory biometrics update
 - i) Children on attaining the age of 5 years
 - ii) Children on attaining the age of 15 years
 - iii) Residents with difficulties in authentication
- b) Individual need driven update requests:
 - i) Changes due to life events such as change of name on marriage, change of address on migration to a new location, etc.
 - ii) Change of mobile number or email

Aadhaar Seva Kendra (ASK)

The Unique Identification Authority of India (UIDAI) has set up exclusive 'Aadhaar Seva Kendra' (ASK) as a single stop destination for all Aadhaar services for the residents. The ASK offers dedicated Aadhaar enrolment and update services to residents in a state-of-the-art environment.

As on 31st December 2020, 46 ASKs have been made operational. These include dedicated centres in all metro cities, all State capitals and Union Territories and major cities. ASKs offer a comfortable air conditioned environment to residents. They are wheel-chair friendly and have special provisions to service the elderly or specially-abled.

Residents can visit any ASK for the following services:

- Aadhaar enrolment
- Update of any demographic information in their Aadhaar - Name, Address, Gender, Date of Birth, Mobile number or Email Id
- Update of biometric data in their Aadhaar – Photo, Fingerprints and Iris Scans
- Download & Print Aadhaar

These services are available for any resident of India (including NRIs) at all ASKs across the country.

In addition to ASK, CSC-SPV has been permitted to provide Aadhaar enrolment/update services to the residents from its own State/UT level offices and from those district level offices, where ASKs are not present. Accordingly, 21 State/UT level CSC ASKs and 100 District level CSC ASKs are operational.

With the easing of COVID-19 lockdown, the Aadhaar enrolment/update activities are resuming and 48,814 enrolment stations are operational across the country under various Registrars as on 31st December, 2020 as per details given below:

1.	State Government Registrars	20,460
2.	Deptt of Posts	9,790
3.	Banks	10,663
4.	ASKs	473
5.	BSNL	337
6.	CSC (including BC)	4,073
7.	UTIITSL	18
	Total	48,814

To make Aadhaar update easier for residents, UIDAI has permitted those CSCs which are designated banking correspondents (BCs) of banks to offer Aadhaar update services. This will allow about 15,000 such CSCs to offer demographic update service to the residents, out of which 3,805 centers are operational.

In addition to the existing address update, the online SSUP portal has been upgraded for residents to update their Name (minor correction), Date of Birth, Gender and Regional Language, for which the residents will be charged at the rate of Rs.50/- per request. If the resident furnishes request to update more than one field at a time, the same shall be considered as one request.

8.2.4 Customer Relationship Management & Logistics

I. Aadhaar Support Services

UIDAI has set up an Aadhaar Sampark Kendra (Contact Centre) which facilitates in resolving residents queries and grievances related to Aadhaar life cycle and related services. Main objectives of Aadhaar Sampark Kendra are as follows:

- To provide a pan India accessible toll free number and email, using which the residents can contact Aadhaar Sampark Kendra
- To provide support in multiple regional languages to cater to complaints and queries from all parts of India
- To provide an Interactive Voice Response (IVR) system for the residents calling the Aadhaar Sampark Kendra
- To provide residents to interact with Aadhaar Sampark Kendra executive in case they wish to do the same
- The residents can also lodge the complaint through Resident Portal of UIDAI
- To create and maintain a common Customer Relationship Management (CRM) application to support residents in addressing their queries & complaints.

II. Infrastructure and Technology of Aadhaar Sampark Kendra:

Currently Aadhaar Sampark Kendra consists of:

- a) **Toll-free-number 1947:** Toll free number

is accessible from anywhere in India. The short code '1947' is a Category-I toll free number allotted by the Department of Telecommunications (DoT) to UIDAI. The DoT has also approved use of the short code '1947' for inbound and outbound SMS services to residents.

- b) Contact Centre Infrastructure:** Contact centre infrastructure comprises trunk lines, PBX solution, IVR system, automatic call distributor (for call distribution across call centre facilitators), computer telephony integration unit and voice logger system. The IVRS interacts with the callers in duplex mode through synthesized recorded voice in Hindi/English/regional languages depending on State from where call is placed to service their enquiries. Hindi, English, Gujarati, Kannada, Marathi, Telugu, Bengali, Punjabi, Odia, Tamil, Assamese and Malayalam languages are currently supported in IVRS.

Following features are currently available in IVRS:

- Frequently Asked Questions
- Aadhaar enrollment status based on 14 digit EID search
- Aadhaar update status with 14 digit URN number
- Intelligent selection of language options on IVRS based on caller's area.
- Status of already logged complaints
- Know your Aadhaar number
- Route calls to Aadhaar Sampark Kendra executive, if desired by the caller.

- c) Chatbot Services** – UIDAI has launched a chat service which is available through UIDAI official website (<https://uidai.gov.in>) under tagline "Ask Aadhaar". This Chatbot is trained to respond to the resident queries

based on the predefined Standard Response Templates (SRTs) and therefore, improving the resident's experience. Chatbot also has additional features like locate PEC, check Aadhaar enrolment/update status, file a complaint and video frame integration.

d) Aadhaar Letter Printing and Delivery

- Once the Aadhaar is generated, it has to be ensured that the same is printed and delivered to the resident within permissible time limits.
- Each Aadhaar letter comprises a printed and laminated document with a photograph, date of birth, demographic information of the resident, Aadhaar number and two secure Quick Response (QR) codes digitally signed by UIDAI containing enclosed photograph and demographic details.
- For the printing of Aadhaar letters, UIDAI has on-boarded two printers at different locations. Currently, the installed printing capacity is 2.60 lakh letters per day in 13 different regional languages.
- The Department of Post is the partner for delivery of the Aadhaar letters to the residents at the registered address provided at the time of enrolment/update.
- UIDAI sends Aadhaar letters for new enrolments as well as for updates. Since inception and till 31st December 2020, more than 126.56 crore Aadhaar letters have been printed and dispatched to the residents through India Post as First Class Digitally Franked articles. Similarly, 28.20 crore Aadhaar letters have been updated and dispatched to the residents through India Post as First

Class Digitally Franked articles from inception till 31st December, 2020.

- e) **e-Aadhaar:** UIDAI provides e-Aadhaar portal for downloading the Aadhaar letter in PDF format from its official website (www.uidai.gov.in).

An Aadhaar number, in physical or electronic form subject to offline verification and other conditions, as may be specified by regulations, may be accepted as proof of identity of the Aadhaar number holder. As such, the e-Aadhaar, which is digitally signed, is a valid and secure electronic document treated at par with the printed Aadhaar letter. e-Aadhaar is also printed with two secure Quick Response (QR) codes containing photographs and demographic details. In the Aadhaar system, the resident's details can be verified through an established online authentication process. Therefore, e-Aadhaar is acceptable as a valid proof of identity. The relevant circulars have been posted on the website of UIDAI. e-Aadhaar downloads till 31st December, 2020 were 120.88 crore.

- f) **Order Aadhaar Reprint:** UIDAI provides "Order Aadhaar Reprint" service on its website www.uidai.gov.in to facilitate the residents to obtain their Aadhaar letter reprinted and delivered through the Speed Post service of India Post by paying a nominal charge of Rs.50. This service has been discontinued following introduction of 'Order Aadhaar Card' service.
- g) **Order Aadhaar Card:** UIDAI provides "Order Aadhaar PVC Card" service on its website www.uidai.gov.in to facilitate the residents to obtain/receive their Aadhaar PVC card delivered through the Speed Post Service of India Post by paying a nominal charge of Rs.50. Aadhaar PVC card is durable and convenient to carry. All forms of Aadhaar

(Aadhaar Letter, e-Aadhaar, mAadhaar and Aadhaar Card) are equally valid. The resident has the choice to use any of these forms of Aadhaar issued by UIDAI.

8.2.5 Authentication Eco System

Aadhaar Authentication

Aadhaar authentication means the process by which the Aadhaar number, along with demographic information or biometric information of an individual, is submitted to the Central Identities Data Repository (CIDR) for its verification and such Repository verifies the correctness, or otherwise, on the basis of information available with it.

Authentication implementation Model

UIDAI provides authentication and e-KYC services through agencies called as Authentication User Agency (AUA), e-KYC User Agency (KUA) and Authentication Service Agency (ASA), which are appointed as per Regulation 12 of the Aadhaar (Authentication) Regulations, 2016.

Authentication Service Agency (ASA)

ASA is the agency that has secured leased line connectivity with CIDR. ASAs transmit authentication requests of AUAs to the CIDR. They play the role of enabling intermediaries through secure connection established with the CIDR. ASAs receive CIDR's response and transmit back the same to the AUAs. As on 31st December, 2020, 22 ASAs were active in UIDAI ecosystem.

Authentication User Agency (AUA)

AUA is any Government/public/private legal agency registered in India that uses Aadhaar authentication for providing its services to the residents/customers. An AUA is connected to the UIDAI data centre/ Central Identity Data Repository (CIDR) through an ASA (either by becoming ASA on its own or taking services of an existing ASA) using a secured protocol. As on 31st December, 2020, 185 such entities are live in UIDAI ecosystem as AUAs and

5,076.31 crore authentication transactions have been performed since inception.

KYC User Agency (KUA)

KUAs are extension of AUAs that use e-KYC Services of UIDAI. As on 31st December, 2020, 172 KUA entities are active on Aadhaar platform and 875.63 crore e-KYC transactions have been performed.

The Aadhaar Authentication for Good Governance (Social Welfare, Innovation, Knowledge) Rules, 2020

In accordance with the Section 4(4)(b)(ii) of the Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016, the Aadhaar Authentication for Good Governance (Social Welfare, Innovation, Knowledge) Rules, 2020 have been notified by MeitY on 05.08.2020. Rule 3 of these Rules provides that the Central Government may allow Aadhaar authentication by requesting entities in the interest of good governance, preventing leakage of public funds and enabling better access to services promoting ease of living, for the following purposes, namely:

- Usage of digital platforms to ensure good governance
- Prevention of dissipation of social welfare benefits and
- Enablement of innovation and the spread of knowledge.

The Ministry or Department of Central/State Government desirous of utilizing Aadhaar authentication for a purpose specified in Rule 3 shall prepare a proposal along with justification and submit the same to MeitY (as Central Government). MeitY, on recommendation of UIDAI, may allow Aadhaar authentication to the applicant Government for the approved purpose. In this regard, Circular dated 18.08.2020 has also been issued by MeitY providing application proforma and guidelines for submission of proposals.

8.2.6 Training, Testing and Certification Ecosystem

For success of any program, especially of the scale such as that of UIDAI, it is imperative that there is sufficient emphasis given to quality of data collected during enrolment. Additionally, it is equally important that the people who are responsible for capturing and using the Aadhaar data are adequately trained. To ensure this, UIDAI has worked diligently to create a Training, Testing and Certification ecosystem. This ecosystem consists of (1) Content Development Agency and (2) Testing and Certification Agency.

To maintain the quality of data collected at the time of Aadhaar enrolment or update, UIDAI only engages Certified Operators, Supervisors and Child Enrolment Lite Client (CELC) operators. For adequate and effective training of all the stakeholders involved in Aadhaar enrolment/update various training methodologies including Mega Training and Certification Camps and Refresher/Orientation Training Program are adopted by the UIDAI. This has led to well-organized enrolment and close to almost 100% enrolment in most of the States. Also, to increase the usage of Aadhaar across various Government organizations in delivery of services, Master Trainings on Aadhaar Seeding, Authentication and e-KYC were organized for Government officials.

- **Master Training on Aadhaar Authentication, Offline Verification and Aadhaar Seeding**

The training content covers all the major processes involved in Aadhaar Seeding, Authentication and e-KYC. A total of 75 Master Training sessions on Aadhaar seeding and authentication has been conducted from 1st April, 2020 to 31st October, 2020, in which 2,170 Government officials were trained.

- **Mega Training & Certification Camps**

UIDAI undertakes an exercise through Mega Training & Certification camps to create a

large pool of certified operators/supervisors to ensure no disruption of momentum in enrolments. A total of 32 Mega Training and Certification camps on Aadhaar Enrolment have been conducted from 1st April, 2020 to 31st October, 2020, in which 2,452 individuals were trained and certified.

- **Orientation Program**

Orientation programs are being carried out for newly appointed Enrolment staff to make them well versed with the enrolment process. 137 Sessions have been conducted from 1st April, 2020 to 31st October, 2020, in which 6,556 individuals were imparted training.

- **Refresher Program**

To make certified enrolment staff understand the changes involved in Aadhaar processes, many refresher programs and training of Trainer programs were conducted. 493 programs were conducted from 1st April, 2020 to 31st October, 2020, in which 18,917 individuals were trained.

As on 31st October, 2020, approximately 10,07,605 Enrolment Operators, Supervisors and CELC Operators had been certified. This includes certification of 595 candidates from Private/PSU Banks, 640 from the Department of Post, 546 from Education Department, 144 from Health, 216 from BSNL and other Departments/Ministries.

8.2.7 Intranet & Knowledge Management Portal

'Intranet & Knowledge Management Portal' (KM Portal) is an online community based platform established by UIDAI to promote internal communications, better information exchange and teamwork amongst UIDAI staff. KM Portal has KM Dashboard where latest office orders, circulars, tenders, other UIDAI related documents, etc., are uploaded by various divisions, Regional Offices and Managed Service Provider.

8.2.8 UIDAI Website

The UIDAI website (<https://www.uidai.gov.in>) is the single click Aadhaar online service window

Details of Training Imparted (01.04.2019-31.10.2020)

S. No.	Type of Training	Participants	No. of Sessions	Number of Participants Trained
1	Orientation program- Enrollment Staff	New/Fresh Enrolment Staff	137	6,556
2	Mega Training-- Enrollment Staff	Government Officials nominated to become Enrolment Staff	32	2,452
3	Refresher Training-- Enrollment Staff	Existing Enrolment Staff	493	18,917
4	Master Training- Authentication and Seeding	Government Officials and Authentication User Agency Staff	75	2,170
	Total		737	30,095

for residents of India, as well as the primary web information centre for various ecosystem partners and the public at large. Bulk of residents in India seeks Aadhaar services and related information via mobile. In order to reach out to those mobile users and to ensure the accessibility of the Aadhaar services is improved, the UIDAI website and Aadhaar service portals have recently been revamped and made multi device friendly. In addition, the information is available in English, Hindi and 11 Indian regional languages for diverse demographics of the country. The home page of the website and other service portals are shown below:-



UIDAI website has the following features:

- The responsive UX to ensure mobile users have better user experience while accessing the Aadhaar services and information.
- Instead of placing the most sought after Aadhaar services deep within the website the UIDAI website provides direct access to Aadhaar online services up front. Crisper information architecture, seamless two step navigation, universally understandable labels and search feature ensure that the residents get access to the right information at the right time.
- Informative documents on Aadhaar enrolment, authentication technologies, UIDAI ecosystem that provide administrative and technical details on enrolment and authentication

systems/processes and various Aadhaar services are available on the website.

- Regular updates of latest news, press releases, videos, events, workshops and campaigns, FAQs, etc.
- The contact section in the website provides contact details of various divisions and functionaries at the Headquarters as well as at the Regional Offices and Tech Centres.
- The website is integrated with Rapid Assessment System (RAS) of the Government of India, which provides the user a portal to share their feedback on the website and other available Aadhaar online services. The FAQs section on Aadhaar services is contextually linked to specific Aadhaar services to provide guidance to the residents. FAQs on various topics are provided in 13 Indian languages, viz., –English, Hindi, Assamese, Bangla, Gujarati, Kannada, Malayalam, Marathi, Odia, Punjabi, Tamil, Telugu, and Urdu. The website displays analytics relating to the total numbers of Aadhaar generated and authentications done across country. The website is certified for CSS and HTML by W3C and is currently undergoing audit by STQC for GIGW compliance. Social media section provides residents to view the latest updates and participate on the UIDAI's Facebook and Twitter pages.

UIDAI Website as Common Repository

The UIDAI website functions as a common repository of the following:

- Policies, guidelines, checklists and other on-boarding documents which are critical for ecosystem partners. The same is available in the Resources section.
- The Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016, and associated Rules, Regulations,

Notifications and Circulars are prominently placed under Legal section.

- MoUs with State and non-State Registrars, Tenders and related documents for business users are available under enrolment documents and UIDAI documents in the Resources section.
- News, press releases, Aadhaar related campaigns, videos and FAQs, in downloadable format, are available under Media section.

Single-point access to Online Aadhaar Services and other Portals

The UIDAI website also provides a direct link to the following services, analytics and business specific portals:

- Locate an Enrolment Centre
- Book an appointment
- Check Aadhaar Status
- Download Aadhaar
- Retrieve Lost or forgotten UID/EID
- Update Aadhaar at Enrolment/update Centre
- Check Aadhaar update Status
- Address Update Request (Online)
- Request for Address Validation Letter
- Check online address update status
- Aadhaar Update History
- Verify an Aadhaar Number
- Verify Email/Mobile Number
- Lock/Unlock Biometrics
- Aadhaar Lock and Unlock service
- Check Aadhaar/Bank Account Linking Status
- Aadhaar Authentication History
- Aadhaar Paperless offline e-KYC
- Virtual ID (VID) Generator
- Order Aadhaar Reprint

- Check status of Aadhaar Reprint
- Order Aadhaar PVC Card
- Check Aadhaar PVC Card status

Aadhaar Dashboard: The analytic dashboard displays the big data for Aadhaar enrolment, update, and authentication and e-KYC services.

8.2.9 Unified Mobile App

UIDAI has recently released an upgraded version of mAadhaar App that unifies the previously developed mobile application (mAadhaar, Resident App and QR Code Scanner) into one single app. The app is available in both Android and IOS version and features an array of Aadhaar services that can be accessed both in online and offline mode. The App provides a personalized section for the Aadhaar holder, who can carry Aadhaar information in the form of a softcopy instead of carrying a physical copy all the time. Residents with or without Aadhaar can install this App in their smart phones. However, to avail of personalized Aadhaar services the resident will have to register their Aadhaar profile in the App. To reach out to residents in different parts of the country, the App has been made available in English, Hindi and 11 Indian languages.

8.2.10 Security and Privacy of Aadhaar

Privacy and Security of Aadhaar data is of utmost importance to Government. UIDAI has a well-designed, multi-layer robust security system in place and it is being constantly upgraded to maintain highest level of data security and integrity. The architecture of Aadhaar ecosystem has been designed to ensure data security and privacy, which is an integral part of the system from the initial design to the final stage. For further strengthening of security and privacy of data, security audits are conducted on regular basis and all possible steps are taken to make the data safer and protected.

The Government accords utmost priority to privacy of Aadhaar data which is evident from the

fundamental binding principles on which Aadhaar has been designed and which have been further reinforced through the various provisions of the Aadhaar Act and the Regulations framed thereunder. Section 29 of the Aadhaar Act prohibits sharing or disclosure of core biometric for any purpose, violation of which is punishable under Section 37 of the Act with imprisonment up to three years. Unauthorized access to Central Identities Data Repository (CIDR) is punishable with imprisonment up to 10 years (Section 38). Tampering of data in CIDR is also punishable with imprisonment up to 10 years (Section 39).

Regulations under the Aadhaar Act have been promulgated to ensure that enrolment, authentication and other associated activities are carried out strictly in accordance with law. Aadhaar (Enrolment and Update) Regulations, 2016 ensure that enrolments are done under a secure and legal process wherein responsibility and accountability of all the agencies involved in the process are clearly defined. Further, the Aadhaar (Authentication) Regulations 2016 have been framed to ensure that authentications are done in secure conditions.

Privacy and Security by Design:

Security and privacy of personal data have been fundamental in design of Aadhaar system without sacrificing utility of the identity system. Aadhaar system is focused on identity. It only collects minimal data necessary to provide unique identity, issue the Aadhaar number after biometric de-duplication, manage lifecycle changes of that identity record and provide an Application Programming Interface (API) for verifying the identity (online authentication) for various applications requiring identity verification. Designing the Aadhaar system as an identity platform allowed clear separation of duties and leaves usage of identity to other partners and their various applications which may be built on top of the Aadhaar platform. Aadhaar number is a random number with no built-in intelligence or profiling

information. A 12-digit number was chosen based on the identification needs of the population in the next couple of centuries.

Aadhaar enrolment through a secure process

UIDAI has set up a nationwide infrastructure for Aadhaar enrolment of residents of India through a network of registrars and accredited enrolment agencies. The registrars are largely the Government Departments, agencies and public sector banks. Enrolment agencies are selected through rigorous selection criteria. A resident is enrolled by a UIDAI certified operator through UIDAI software under a highly robust, controlled, non-repudiable and secure process. Residents are enrolled for Aadhaar across the entire country through more than 40,000 certified operators, who are selected on the basis of a rigorous examination and test process. The operator also has to obtain his own Aadhaar number first and then sign each and every enrolment through his own finger-prints and Aadhaar number. In this manner, a complete account is maintained as to which operator enrolled whom, where and when so that in case of any default accountability of the enrolment operator and agency can be immediately fixed. Then, the biometric data of people, who are enrolled, are matched against the entire data base of the existing Aadhaar holders, which are presently more than 127 crore, when no match is found, Aadhaar numbers are generated. Biometric matching of this scale is done in a time span of 24 hours. All enrolment data including biometrics are encrypted by 2048 bit encryption key at the time of enrolment and is not accessible to any agency, except UIDAI, which can access these data only through a secure decryption key available to UIDAI only. It is worth mentioning that it may take the fastest computer on the earth billions of years to break this encryption key. So far, not a single incident has come to the notice wherein core biometrics of a resident enrolled for Aadhaar has been leaked.

Minimal Data with No Linkage

Since Aadhaar system has data of all Aadhaar holders of the country in a central repository, it was designed to capture minimum data so as to provide identity related functions (issuance and authentication). This design philosophy is derived directly from the fact that UIDAI respects privacy of the residents and does not hold non-essential data within its systems. In addition to having minimal data (4 attributes – name, address, gender and date of birth - plus 2 optional data – mobile, email), this central database does not have any linkage to existing systems/applications that use Aadhaar. This essentially creates a set of data islands containing resident data across various applications/systems (a federated model for resident data) rather than a centralized model, eliminating the risk of a single system having complete knowledge of resident and her transaction history.

No Pooling of Data

Aadhaar system is not designed to collate and pool various data and hence does not become a single central data repository having all knowledge about residents. It has no linkage information (such as PAN, Driver's License Number, PDS card number, EPIC number, etc.) to any other system. This design allows transaction data to reside in specific systems in a federated model. This approach allows resident information to stay in distributed fashion across many systems owned by different agencies.

Authentication

Aadhaar authentication responds only with yes/no answer. Aadhaar authentication allows applications to verify the identity claim by the resident while servicing them and still protecting their data privacy. A balance between 'privacy and purpose' is critical to ensure convenience as well as protection of resident's identity data. External user agencies do not have access to the Aadhaar database. Aadhaar e-KYC service allows resident to authorize UIDAI to

share electronic version of their Aadhaar letter. For every Aadhaar e-KYC request, only after successful resident authentication, demographic and photo data is shared in electronic format.

Optimal Ignorance

Authentication is designed in such a way that neither the "purpose" of authentication nor any other transaction context is known to Aadhaar system. This design was precisely to create a "zero-knowledge" system to protect privacy. Authentication of an Aadhaar number holder by an agency does not entitle Aadhaar system to know the objective for which authentication is carried out.

No Location Awareness

UIDAI authentication system does not have location awareness i.e. Aadhaar Authentication is oblivious to the location from where the authentication request is sent thereby eliminating the risk of a resident being tracked.

Federated Data Model & One Way Linkage

By its very design, Aadhaar database does not have all domain specific transaction data and hence the resident's specific transactional data remains federated across many user agencies' databases rather than centralized into a common database. It is also important to note that the various systems may have made references to the UIDAI (through the use of the Aadhaar number), but the UIDAI does not maintain reverse links to any of these systems. Aadhaar seeding is, therefore, strictly a one-way linkage wherein the Aadhaar number is incorporated into the beneficiary database without pooling any data from the said database into the UID database.

Security of Aadhaar Data

UIDAI uses one of the world's most advanced encryption technologies in transmission and storage of data. Aadhaar based authentication is robust and secure as compared to any other

contemporary systems. Aadhaar system has the capability to inquire into any instance of misuse of Aadhaar biometrics and initiate action.

UIDAI certified as ISO 27001

UIDAI has established the Information Security Management System and has obtained the ISO 27001:2013 certification from STQC.

UIDAI certified as ISO/IEC 29100:2011 & ISO/IEC 27701:2019

UIDAI has also been declared ISO/IEC 29100:2011 (Information Technology – Security Techniques – Privacy Framework for Central Identities Data Repository (CIDR)) and ISO/IEC 27701:2019 (Privacy Information Management System) certified by M/s BSI Group India Pvt Ltd.

Declaration of CIDR Infrastructure as “Protected System”

Security of UIDAI-CIDR information is of paramount importance for safeguarding resident data. Confidentiality, integrity and availability of the information are maintained at all times through controls that are commensurate to the criticality of the information assets, so as to protect the information systems from all types of threats. UIDAI-CIDR has also been declared as “Protected System” by National Critical Information Infrastructure Protection Centre (NCIIPC) adding another layer of IT security assurance.

Governance Risk Compliance and Performance Service Provider (GRCP-SP)

The aim of GRCP framework is to facilitate creation of a robust, comprehensive and secure environment for UIDAI to operate. The GRCP-SP provides UIDAI management with oversight of UIDAI and partner ecosystem in terms of visibility, effectiveness and control.

Information Security Assessment of External ecosystem partners

UIDAI's security has been enhanced further through regular Information Security Assessments of various ecosystem partners.

Fraud Management System at UIDAI

UIDAI has a well-designed, multi-layer approach and robust fraud management system in place. With the establishment of Forensic lab, the fraud investigation capacity of UIDAI has increased substantially.

8.2.11 Aadhaar - A Tool for Governance Reform

I) Aadhaar and Financial Inclusion

Aadhaar is a unique digital identity which remains unchanged throughout the lifespan of an individual. When linked with a bank account of an individual, Aadhaar becomes a financial address of that individual which helps to accomplish the country's goal of financial inclusion. The 12-digit Aadhaar is sufficient to transfer any payments to an individual. Few years ago, in order to transfer money to a beneficiary, the Government needed to know the bank account of the beneficiary along with other details like IFS Code, bank branch details etc, which are prone to changes. However, with the introduction of Aadhaar, direct benefit transfer (DBT) to an individual's bank account takes place by just using his Aadhaar number without being affected by any changes in his bank account. Different types of payment systems which use Aadhaar number are described below:

a) Aadhaar Payment Bridge (APB)

This is largely a Government-to-Citizen (G2C) and Business-to-Consumer (B2C) platform for remitting funds to an Aadhaar holder by just quoting his Aadhaar number. Bank account linked with Aadhaar automatically receives the funds coming through APB. Currently, some of the flagship schemes with large number of beneficiaries viz. DBTL (PAHAL), PM-KISAN, MGNREGS, NSAP, various Scholarship

Schemes and TPDS etc., are transferring cash benefits and subsidies directly to the beneficiaries' bank accounts through APB.

As on 31st December, 2020, 72.32 crore unique Aadhaar holders have linked their Aadhaar with multiple bank accounts across 991 banks including all nationalized banks, RRBs and many cooperative banks. An amount of Rs.3,63,159 crore has been remitted so far through over 741.66 crore successful transactions. (*Data source: NPCI*).

b) Aadhaar Enabled Payment System (AEPS)

AEPS is the platform using which an Aadhaar holder, who has linked his Aadhaar in the bank account, can do basic banking transactions, including cash withdrawal, cash deposit, balance enquiry, fund transfer etc in an interoperable fashion from any Bank's MicroATMs (Point of Sale devices carried by Bank Mitras).

AEPS has transformed the way the marginalized customers are dealt with by the banks. It has empowered the customer to do an interoperable transaction on their account from any microATM in the neighbourhood, hence making the market customer driven and resulting in competition among all banks. As on 31st December, 2020, 847.21 crore successful transactions have been done cumulatively on this platform across nearly 40.57 lakh microATMs. (*Data source: NPCI*)

II) Aadhaar and DBT

To achieve targeted delivery of welfare services in a more transparent and efficient manner, the Government of India had launched Direct Benefit Transfer (DBT) through Aadhaar Payment Bridge (APB) and other channels in January 2013. DBT was implemented in phases for all Central Sector Schemes and Centrally Sponsored Schemes. Several DBT schemes are leveraging APB to

transfer cash benefits to the Aadhaar linked bank accounts of the beneficiaries. As on 31st December 2020, multiple schemes including PAHAL had paid over Rs.3,63,159 crore across 741.66 crore successful transactions. It has been made possible by linking Aadhaar with the bank accounts of the beneficiaries. (*Data source: NPCI*)

III) Notifications issued under Section 7 of the Aadhaar Act 2016 by central Ministries/ Departments for DBT Schemes

In order to use Aadhaar of the beneficiaries under various schemes which are funded from the Consolidated Fund of India, the concerned Department/Ministry administering the Scheme is required to issue a Gazette notification under Section 7 of the Aadhaar Act, 2016. As per the decision of the Cabinet Secretariat, UIDAI has been mandated to facilitate the Ministries/Departments in drafting and issuance of such notifications by them in compliance with the Aadhaar Act, 2016, with due vetting by the Ministry of Law and Justice. Till 31st December, 2020, UIDAI has coordinated with 46 Ministries/Departments to issue 174 notifications under Section 7 of Aadhaar Act covering a total of 309 Schemes (Centrally sponsored or Central sector). (*Data source: Compiled from eGazette. nic.in*)

IV) Use of Aadhaar under Section 7 of the Aadhaar Act 2016 (as amended by the Aadhaar and Other Laws (Amendment) Act, 2019) by the State Governments for the schemes funded out of Consolidated Fund of State

Post passing of the Aadhaar and Other Laws (Amendment) Act, 2019 (notified on 24th July, 2019) by the Parliament, which *inter-alia*, amended section 7 of the Aadhaar Act 2016 to include Consolidated Fund of State, UIDAI issued detailed guidelines to all States on 25th November, 2019 regarding use of Aadhaar under Section 7 of the Aadhaar Act 2016 by the State Governments for the schemes funded

out of Consolidated Fund of State. The guidelines included two templates of Section 7 notifications for the adult and children beneficiaries separately. States/UTs have started notifying their schemes accordingly for use of Aadhaar of the beneficiaries.

8.2.12 Implementation of Official Language Policy in UIDAI

UIDAI is implementing Official Language Policy of Government of India in its Headquarter as well as its all 8 Regional Offices and ensuring the compliance of various provisions envisaged in the Official Languages Act and Official Languages (Use for Official Purposes of the Union) Rules, as well as orders of the Government of India, issued from time to time in this regard.

During the year 2020-21, three meetings of Official Language Implementation Committee were held at Headquarter in which, among other items/subjects, progressive use of Hindi was discussed and decisions had been taken to increase the use of Hindi in official work.

Progressive use of Hindi in Headquarter and all 8 Regional Offices of UIDAI was discussed and reviewed in the Internal Review Meeting held on 19th August 2020 under the Chairmanship of CEO, UIDAI and necessary guidelines were issued to the Regional Offices for promoting use of Hindi as per Government directions specially for original correspondence in Hindi to Region A, B and C as per targets prescribed in Annual Program 2020-21 of the Department of Official Language, Ministry of Home Affairs. During the year, 01 Hindi workshop was organized for sensitizing the officials with the Official Language Policies/Rules. 23 officers/staff participated in this workshop.

On the occasion of Hindi Diwas, a Hindi sandesh of CEO has been promulgated to all divisions/sections of Headquarters as well as Regional Offices of UIDAI. To promote use of Official Language in

official work, every year UIDAI carries out an incentive scheme for noting and drafting in Hindi at its Headquarter as well as in all the Regional Offices independently. Six employees of Headquarter were found eligible for cash prizes and certificates for the year 2020-21.

8.2.13 Details of Budget & Expenditure for the period from 01st April 2020 to 31st December 2020

During 2020-21 (upto 31st December, 2020), an expenditure of Rs.626.88 crore has been incurred against Budget Estimate of Rs.985.00 crore. Since inception, the total expenditure incurred is Rs.12,608.15 crore.

8.3 Indian Computer Emergency Response Team (CERT-In)

The Indian Computer Emergency Response Team (CERT-In) is a statutory organisation under the Ministry of Electronics and Information Technology, Government of India. CERT-In has been designated under Section 70B of the Information Technology Act, 2000 to serve as the National agency to perform the following functions in the area of Cyber Security:

- Collection, analysis and dissemination of information on Cyber Security incidents
- Forecast and alerts of Cyber Security incidents
- Emergency measures for handling Cyber Security incidents
- Coordination of Cyber Security incident response activities
- Issue guidelines, advisories, vulnerability notes and white papers relating to information security practices, procedures, prevention, response and reporting of cyber incidents
- Such other functions relating to Cyber Security as may be prescribed.

Further details are available in Chapter 6, Section 6.3.3.

Attached Offices and Societies



9.1 Centre for Development of Advance Computing (C-DAC)

Centre for Development of Advanced Computing (C-DAC) is a premier R&D organization of the Ministry of Electronics and Information Technology (MeitY) for carrying out R&D in IT, Electronics and associated areas. In addition to carrying out research and development in High Performance Computing, the R&D of C-DAC expanded to various other areas such as Cloud Computing, Multilingual Computing, Heritage Computing, Professional Electronics including VLSI and Embedded Systems, Cyber Security and Cyber Forensics, Health Informatics, Software Technologies and Education related to these technologies. C-DAC Advanced Computing Training School (ACTS) is a well-known brand in the area of High-end training in Electronics and IT in the country.

During the year 2020-21, C-DAC made significant

advancements in carrying out research and development in electronics and Information Technology, developing and deploying various solutions, collaborating with organizations of repute both at national and international level, providing trainings and organizing events etc.

Key technological achievements of C-DAC during this year in each of its focus areas are outlined below:

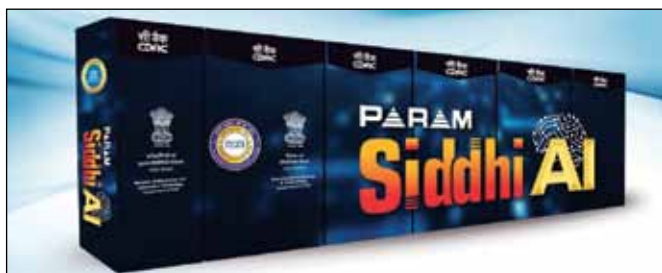
9.1.1 High Performance Computing (HPC) and Cloud Computing

National Supercomputing Mission

“National Supercomputing Mission (NSM): Building Capacity and Capability” was approved by the Cabinet Committee on Economic Affairs (CCEA) on April 9, 2015 is being implemented jointly by MeitY and DST with IISc Bangalore and C-DAC being the executing agencies.

India's fastest Supercomputer - PARAM Siddhi 210 AI PetaFlop System

"PARAM Siddhi – AI", is today the largest and fastest Supercomputer in India and ranked at No. 63 position in 'TOP500 Supercomputer List – November 2020' declared at Supercomputing Conference 2020 held through virtual mode at United States. PARAM Siddhi - AI of 210 AI Petaflops with 2.4 Million cores and 6.5 Petaflops Peak DP is based on the NVIDIA DGX SuperPOD reference architecture along with indigenously developed HPC-AI engine, Software Frameworks, Cloud Platform by C-DAC. "PARAM Siddhi – AI, the State-of-the-Art large-scale HPC-AI scalable infrastructure shall play a pivotal role in developing a vibrant ecosystem for research and innovation in science and engineering.



PARAM SIDDHI India's First and Fastest 210 AI Petaflop Scalable Supercomputer

With three decades of expertise in AI and augmenting the AI and Language Computing Mission Mode Program of C-DAC, this infrastructure will accelerate experiments and outcomes for India specific grand challenge problems in Health Care, Education, Energy, Cyber Security, Space, Automotive and Agriculture. It will also catalyze partnerships with the Academia, Industry, MSMEs and Start-ups."

Supercomputing Facilities

C-DAC installed HPC systems developed under 'build approach' during Phase II of NSM inline with the 'Atmanirbhar Bharat' vision of Government of India. During the year, Under Phase-II, C-DAC

commissioned one system of 1.3 PF (1.6PF Peak) at IIT Kanpur and two systems of 650 TF (800TF Peak) each at IIT Hyderabad and C-DAC Bangalore. Details of usage of other supercomputing systems established under NSM are as given below:

- PARAM ShivaY (800 TF) at IIT BHU has successfully executed 5,42,087 jobs until December 2020
- PARAM Brahma (800 TF) at IISER Pune has successfully executed 7,12,638 jobs until December 2020
- PARAM Shakti (1.6 PF) at IIT Kharagpur has successfully executed 1,66,808 jobs until December 2020

In order to make India a supercomputing major, an MoU was signed between C- DAC and 9 host institutes under NSM on October 12, 2020 for the establishment of Supercomputing facilities under Phase-II of the mission. C-DAC also signed MoU with 4 host institutes for establishment of Nodal Centres, for training in HPC and AI. As per the MoU, C-DAC will be establishing Supercomputing Infrastructure with assembly and manufacturing of critical components in various premier institutions across India including IISc-Bangalore, IIT-Kanpur, IIT-Roorkee, IIT-Hyderabad, IIT-Guwahati, IIT-Mandi, IIT-Gandhinagar, NIT-Trichy, NABI Mohali. C-DAC in collaboration with IIT-Madras, IIT-Kharagpur, IIT- Goa and IIT-Palakkad will be giving training in HPC and AI to fulfil the objectives of the NSM HR development activities.



Online signing of MoU for establishing Supercomputing facilities

PARAM AMBAR at ISRO-NARL

PARAM AMBAR Supercomputing facility is designed and installed at ISRO-National Atmospheric Research Laboratory (NARL) Gadanki, Andhra Pradesh by C-DAC. It consists of 196 compute nodes and 8 GPU nodes with peak computing capacity of 1.658 PFs performance. The system is using system software stack developed by C-DAC. The system has been commissioned on November 20, 2020 by the Chairman of ISRO.



Commissioning of PARAM AMBAR at ISRO-NARL

HPC System Software

C-DAC has developed System software stack that comprises C-Chakshu, CHReME, Ganglia, Nagios, XDMoD, OSTicket, OpenHPC, Lustre, PARAVIEW, MVAPICH2, Intel Cluster Studio, GNU Tools, CUDA Toolkit and others. These softwares are used for cluster building, cluster monitoring and management and are being used by supercomputing facilities established by C-DAC. These supercomputing facilities are being leveraged by 75 institutions and thousands of active researchers, academicians over National Knowledge Network (NKN).

Build Approach Developments under NSM

Under Build Approach R&D and Phase-III, various activities have been taken up such as development of indigenous server node, interconnect switch, storage and system software stack.

Indigenous Server Platform: Rudra

C-DAC has developed its Indigenous Server Platform Rudra based on 2nd Generation Intel Xeon

Scalable Processor Cascade Lake. Rudra based server system along with the full software stack from C-DAC is first of its kind which is made in India to meet the HPC requirements of Governments and PSUs.



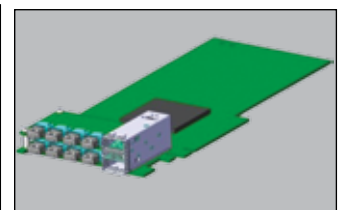
Rudra Server Board

HPC Network – Trinetra

A next generation scalable HPC network “Trinetra” has been developed. Board design of interconnect switch (Trinetra) for 40/100 Gbps with an aggregated bandwidth of 240/600 Gbps (which is State of the art as on date) has been completed and tested. A pilot testing of the network with multiple nodes using Rudra servers is being done to test system performance. A suite of critical system software components has also been developed.



Trinetra-A NIC



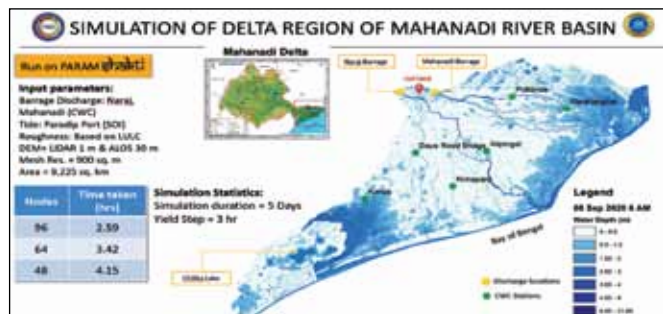
Trinetra-B NIC

NSM Applications

Early Warning System (EWS) for Flood Prediction in the River Basin of India

C-DAC has collaborated with Central Water Commission (CWC), IISc Bangalore and PEC Chandigarh for this initiative. The prediction simulation is being aided by ANUGA Hydro. It is a free and open source software tool for 2D hydrodynamic modelling, suitable for predicting the consequences of riverine flooding. During the year between May and October 2020, EWS conducted

daily flood prediction (5-day simulation) with actual/predicted data for Mahanadi Delta (9225 sq km) on its software (implemented using ANUGA Hydro) running on NSM Supercomputing infrastructure.



Early Warning System (EWS) for Flood Prediction

Multi-sectorial Simulation Lab and Science-based Decision Support Framework

C-DAC has collaborated with multiple institutions including IIT Bhubaneswar, IISc Bangalore, IITM Pune for this initiative to address urban environment issues. The objective is to develop an online fully coupled urban 'meteorology and hydrology, CFD and air quality' modeling system to capture the urban representation of microscale city environmental conditions. During the year, C-DAC carried out sensitivity studies, air quality forecast research & real time air quality, coupled hydrology for urban modelling and CFD simulation of atmospheric flows & pollution dispersion for urban modelling on NSM infrastructure.

Design and Development of Direct Contact Liquid System (DCLC)

C-DAC is collaborating with IIT Mumbai to validate the cooling technology solutions developed by IIT Mumbai for large scale HPC system by experiments and CFD analysis. The objectives of this initiative are to design a modular PWC_A&EC (Panel Water Cooler with Provision of Air and Evaporative Cooling) and to demonstrate the effectiveness of this technology to handle 30 kW heat load generated from a DCLC based HPC system. During the year, C-DAC has developed a CFD model for two tubes

and three tubes in a channel and carried out a CFD simulation study.

Bigdata Tools for Bioinformatics

NSM related products like DPIC- parallel molecular visualizer, Bioaviator – Cloud based NGS analysis solution, Cimulate – indigenous molecular dynamics code and Bigdata tools for Bioinformatics data are getting developed during this year.

NSM HRD

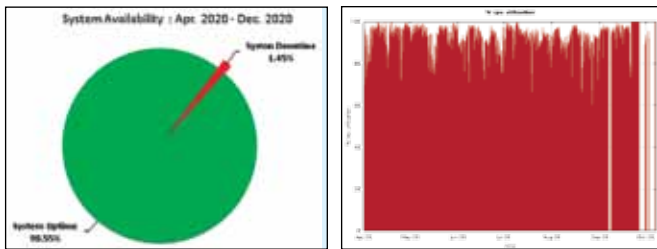
C-DAC, under the Human Resource Development (HRD) activities of NSM has established four Nodal Centres for training in HPC and AI at IIT Kharagpur, IIT Madras, IIT Goa and IIT Palakkad. Considering the pandemic situation, an online course on "Basics of High-Performance Computing" was jointly planned by four IITs along with C-DAC. More than 800 students across the country enrolled for the course.

C-DAC formed a consortium of next generation of supercomputer experts comprising more than 3,000 students, researchers, and faculties through organization of multiple Faculty Development Programs (FDP), Workshops, Bootcamps, and Hackathons. The courses including FDP were conducted online as well as in classroom mode as per the declared training calendar. During October 2020, C-DAC arranged a 4-day online workshop on HPC and Deep Learning for GUJCOST Gujarat. Students, researchers and faculty members from different colleges associated with GUJCOST attended the workshop.

Supercomputing Systems and Facilities

PARAM Yuva-II: C-DAC's National PARAM Supercomputing Facility

Since its commissioning in February, 2013 at C-DAC's National PARAM Supercomputing Facility (NPSF), PARAM Yuva II has been widely used by scientists and engineers for research. PARAM Yuva II system has processed 4,75,699 (till December 2020).



NPSF usage Graphs

Utilization of NPSF has remained above 90%. Usage of NPSF's HPC services has been acknowledged in 376 publications and 53 PhDs so far. About 1233 users including 286 PhD scholars across 132 institutions executed their jobs on PARAM Yuva II for their scientific research covering a large no. of cross functional domains. NPSF has announced Storage Incubation and Experience Centre (SIEC) to facilitate HPC users who are in need of High Capacity, High Bandwidth and High IOPS Storage for their HPC Applications. Sizable Storage capacity of around Half a Petabyte is offered through SIEC. Some of the NPSF resources have been offered for Innovations under Nation-wide Hackathons.

Bioinformatics Resources and Applications Facility (BRAf)

Bioinformatics Resources and Applications Facility (BRAf) facilitated more than 200 academic researchers in this year for their PhD and high-end computational biology research. BRAf also supported multiple national /international collaborations like ACTREC, Mumbai, University of Pune, etc., and NCI, U.S.A.

PARAM Shavak

During the year, C-DAC installed twenty-five PARAM Shavak HPC and Param Shavak Deep Learning Systems at various academic institutes under Gujarat Council for Science and Technology (GUJCOST), KIET Ghaziabad, SETS Chennai, etc., During COVID-19 restrictions on travel (under lockdown), C-DAC provided remote support and monitoring of PARAM Shavak HPC and Param

Shavak Deep Learning systems located across. Installation process of multiple applications from scientific and engineering domains on PARAM Shavak was simplified by integrating HPC applications with OS image. As a part of Ministry of External Affairs (MEA) initiative, C-DAC exported PARAM Shavak systems to Al Hussein Technical University (HTU), King Hussein Business Park, Amman, Jordan.

HPC Applications

Panorama– Marine Forecast Visualization System

After successful completion and deployment of Panorama-I in the naval ships of Indian Navy sailing across the globe, C-DAC is engaged in development of Panorama-II based on the support from Naval Research Board, DRDO. This initiative is funded by Naval Research Board, DRDO. Panorama-II phase deliverables are Advanced Marine Forecast Visualization System (MFVS), MFVS lite version for friendly foreign navies, Advanced Forecast Dashboard, Integrated 3-D Visualization, Advanced Data Compression/Decompression and Interface for INCOP – Marine Weather Prediction Layer. Development of Advanced Marine Forecast Visualization System (MFVS) and MFVS lite version for friendly foreign navies has been completed. The Panorama System processes numerical weather and ocean State global and regional forecast output, global observations and satellite images to aid the naval operations at sea. It enables user-friendly onboard 2D visualization of the atmosphere as well as the ocean forecast for 10 days.

Forest Fire Spread Model in Sikkim Himalayas using HPC System

C-DAC in collaboration with IIT Kharagpur and DST Sikkim is engaged in development of a predictive system of forest fire spread in the event of fire break out. A spatial 3D computational fluid dynamic (CFD) and non-CFD model is being developed on

High Performance Computing (HPC) system. The models shall be validated based on the satellite-based observations/field investigations/available records with forest department (Sikkim). The model will be analysed for various scenarios, which will be helpful in understanding forest fire spread patterns in geospatial domain, once a fire is broken out. This will be useful for forest department to mobilise the resources for firefighting.

Large Scale Model of the Himalayan Crust and its effect on strong Ground Motion

This initiative is aimed to provide a reliable model of subsurface of the Himalayan crust using high frequency data. This will be used to model the response of site amplification that can be further used to simulate actual strong ground motion at various sites in the central seismic gap region. The main outcome of the initiative will be detailed subsurface velocity model of Kumaon Himalaya and demarcation of areas of high and low site amplification.

HPC software suite for seismic imaging to aid oil and gas exploration

C-DAC is collaborating with IIT Roorkee, Osmania University Hyderabad, NGRI Hyderabad, ONGC Dehradun for this initiative. C-DAC has been developing a parallel 2D & 3D acoustic based RTM (reverse time migration) software suitable for state-of-the-art hybrid computing platform.

Bioinformatics

VIVIDHA: Variant Analysis & Visualization Interface for Dynamic High Throughput Applications

VIVIDHA is a computational methodology deployable on cloud-based big data clusters that enables large scale variant analysis. Variant calling plays a significant role in genetic associations with disease and analysis of mutations. This requirement centric data processing solution on the cloud will alleviate the analysis for genomics

data. Medical genomics is going to contribute to the anticipated diagnosis so that it can be intervened early. This evolutionary technique can transform medicine, healthcare and the human condition in the country. The product is being developed as a part of the NSM project and will be bundled as part of the NSM software repository under NSM-PPM software stack.

GenoVault: A Cloud based Genomics Repository

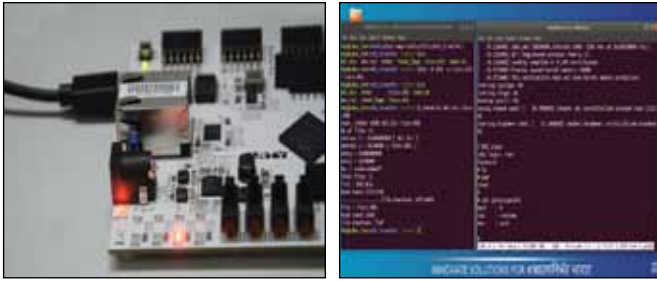
GenoVault is a centralized genomic repository for researchers using private cloud infrastructure. It provides a Genomics repository with easy to use interfaces and cloud-based services for researchers using private cloud infrastructure. It is implemented using OpenStack Swift for Object Storage solution of genomic data both for archival and retrieval along with analytical engines.

9.1.2 Professional Electronics, including VLSI and Embedded Systems

9.1.2.1 National Level Initiatives

Microprocessor Development Programme (MDP)

As part of this initiative, a portfolio of 32/64 bit processors named VEGA is being developed. The development of the 64-bit Quad core out-of-order Processor, VEGA AS4161 has been completed. It is validated on FPGA platform, Linux booted and benchmark programs, application programs etc., were executed successfully. ASIC implementation of two SoCs based on the VEGA processor (Single/ Dual core) as part of Phase-II of the project is in progress. Two new 32-bit and 64-bit in-order processor variants, VEGA ET1031 and VEGA AS1061 have also been developed. THEJAS32 and THEJAS64 SoCs based on these two processor variants along with the full development ecosystem have been offered for the Swadeshi Microprocessor Challenge by MeitY, launched in August 2020.



C-DAC's Indigenous Microprocessors

Emergency Response Support System (ERSS)

ERSS is an integrated system that provides a common platform to receive distress signals in the form of voice, message, email, panic signal etc., and to dispatch various services such as police, fire rescue and health. The common single number 112 is designated for this purpose. C-DAC has signed an MoU with Ministry of Home Affairs (MHA), Government of India for the development and deployment of this system across the country. Installation of ERSS/112 App has been completed in 30 States till date.

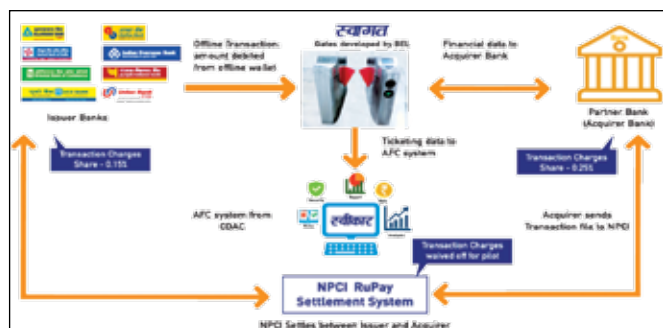
National Common Mobility Card (NCMC) Ecosystem

National Common Mobility Card (NCMC) ecosystem consists of indigenously developed Automatic Fare Collection (AFC) ecosystem based on RuPay Card and includes the Automatic Fare Collection (AFC) Software, Validation Terminals/Electronic Ticketing Issuing Machines (ETIMs), Metro Gates and Interfacing Software with Banking system for fare settlement. This envisages seamless multi-modal transit across the country using Metros, Rail, Bus, Taxi, Auto etc., besides being used for toll, parking and also for retail shopping. NCMC Interface specifications developed by C-DAC were released by the Ministry of Housing and Urban Affairs (MoHUA) for adoption across the country on May 12, 2020 by various Road Transport Corporations, Urban Transport Operators, Metro Rail Corporations, BRTS operators etc., for all existing and future AFC operations. In order to prove the efficacy of the proposed NCMC ecosystem,



Launch of Emergency Response Support System (ERSS)

a pilot implementation at DMRC was completed successfully. C-DAC has extended the AFC system developed for Metro for use by the city/inter-state bus operators with a cloud-based implementation approach. The field trial for this Centralized AFC implementation is scheduled to start in Mumbai BEST from November 2020.



NCMC based AFC system at Metro Rail

National Mission on Power Electronics Technology (NaMPET)

NaMPET is a mission programme involving research, development, deployment/demonstration and technology transfer for commercialization of Power Electronics (PE) technology, infrastructure and awareness creation, R&D laboratories and industries with C-DAC as the Nodal Centre. Technology outcomes expected during the year include Indigenous technology for EV Chargers to empower national e-mobility eco system, Planar magnetic inductor (40uH, 5Apk, 200kHz) and transformer (380V/24V, 300VA, 200kHz), Green power solution for Houseboat in tourism sector, Technology for micro-grid to support weak grid in rural area to provide reliable power, New



Vehicle Control Unit (VCU) - Train Communication Network (TCN) Technologies

generation WBG material based high performance Hall Effect current sensors and Vehicle Control Unit (VCU) Technology proliferation in Indian Railways etc. Currently around 600 Trains are running with the C-DAC VCU systems supplied by technology partners. During the year, VCU system was configured for High speed Push Pull operation of Passenger trains (TEJAS), the first of its kind achievement for CLW.

Robotics and Sensor based Solutions

Autonomous Multipurpose Agricultural Robotic Platform

C-DAC is engaged in an initiative to develop a mobile robot that would traverse in the agriculture field autonomously in a pre-defined path and would perform various operations related to paddy cultivation so as to ease out the life of the farmer. This is being carried out in collaboration mode with academic institutions like Birsa Agricultural University, Ranchias domain knowledge partners and industry partners. This four wheeled robot uses a processor consisting of ARM Cortex core along with 256 crore GPU with Ubuntu Linux as the operating system. The software is built on a ROS framework to make the system modular and efficient. The intended operations of the mobile robot include navigation in the muddy and uneven agriculture field (paddy), sowing of seeds, spraying of fertilizer, spraying of weedicide to destroy unwanted weeds, spraying of pesticide, health monitoring of paddy plants and plant disease detection (blast and brown spot) etc.



Scaled down version of the Multipurpose Agricultural Robot

Aquaponics

C-DAC in collaboration with Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) Ludhiana, Punjab has developed “Automated Aquaponics System for Vertical Farming in India” and aids in their efforts to implement the system in the fields. Aquaponics is the integration of recirculating aquaculture and hydroponics in one production system. In an aquaponics unit, water from the fish tank cycles through filters, plant grow Gullies and then back to the fish. This process allows the fish, plants and bacteria to thrive symbiotically and to work together to create a healthy growing environment for each other, provided that the system is properly balanced.



Aquaponics Facility Inauguration by Sh. Sanjay Dhotre, (Hon'ble MoS)



Aquaponics Facility Demo to Sh. Sanjay Dhotre, (Hon'ble MoS)

The facility was inaugurated by Sh. Sanjay Dhotre, Hon'ble Union Minister of State for Education, Communications and Electronics & Information Technology, Government of India at C-DAC Mohali on October 13, 2020.

• Solutions for Smart Cities

Safe City Project of Delhi Police

Safe city is the vision of Ministry of Home Affairs (MHA), Government of India, to launch CCTV Surveillance at public places to aid Delhi Police to combat women safety related challenges in Delhi and at the same time reducing the overall criminal activities in the city. As a part of this initiative, C-DAC is implementing systems to capture key activities at the places under surveillance, generate alarms, warnings in case of any potential threat to women's safety followed by real-time technology aided assistance to women in distress. Detailed Project Implementation Plan along with RFP, Technical Specification, Schedule of Requirement, Bill of Quantities etc., have been prepared and MoUhas been signed.

Intelligent Transportation System (ITS) Framework

Intelligent Transportation System (ITS) framework for SMART Transportation dashboard has been developed to display details from Advanced Traffic Management Systems (ATMS), Traffic Enforcement System, Traveller Information System and Advanced Public Transportation Information System (APTS) with open standards compatible for cloud deployment. Multiple deployments of in-house developed products Traffic signal monitoring and management solution and Red-light Violation detection system were integrated. Products developed by IIT Madras have been integrated viz. Bus information system and advanced Traveller information system.



Mobility Man Machine Interface

Adaptive Traffic Management System

Adaptive Traffic Management System has been implemented in 32 intersections and 2 pedestrian midblock locations at Hubli-Dharwad Bus Rapid Transit System corridor (Karnataka) using C-DAC make traffic signal controller (model: CUTE) and TraMM-EnV & CoSiCoSt software. Transfer of Technology (ToT) process for Traffic Signal Remote Monitoring and Management Software (TraMM-EnV) has been initiated.

Smart Post Kiosk

C-DAC's autonomous self-operated article booking system, "Smart Post Kiosk" is an IoT solution which can provide any-time any-where availability of postal services like booking of registered post and speed post articles. This system brings the convenience of multi-lingual interactive touch-based interface, on-screen assistance, cashless digital payment through any BHIM-UPI enabled wallet/payment apps etc., During the year, a pilot system has been commissioned for public use at the museum road post office, Bengaluru.



Smart Post Kiosk

Smart Garbage Bin (Garb0)

Garb0 is a garbage management sensor module which would cater to the needs of the people of the society. This system is an IoT based waste management system, where sensors are attached to each of the garbage bin. The sensors are equipped to measure the level of waste by an ultrasonic sensor. The data processing happens in the cloud and alerts and notifications are generated on the mobile device.

Smart Water Level Systems

This is an indigenously developed long range, low power and ultrasonic sensor-based water level sensing system to ascertain the level of water in residential and overhead tanks. Moisture condensation and temperature variation effects are automatically compensated, making the system robust and reliable for outdoor deployments.

Smart Water Meter (SWM)

This is a cloud enabled, IoT based smart water meter which uses hall-effect sensing mechanism to measure the volume of residential water supply and LoRa based wireless communication. The system is designed for measuring flow-rates in residential areas and is equipped with mechanism for remote monitoring.



IoT Based SmARtWatEr Solutions (iSAWE)

C-DAC TETRA Network (CTN)

TETRA (Terrestrial Trunked Radio) is an open standard developed by the European Telecommunications Standards Institute (ETSI) for critical communication. C-DAC TETRA portfolio offers about 25 products and an indigenous TETRA solution available in India. During the year, C-DAC has carved out ToT/Licensing Agreement of the same with industry partner. The system shall be used in “Helo Deck Communication System” (HDCS) onboard Indian Navy ships.

- **Quantum Computing**

Centre of Excellence in Quantum Technology

C-DAC in collaboration with IISc Bangalore and RRI Bangalore is setting-up Centre of Excellence in Quantum Technology. Key objectives include development of quantum computation hardware, quantum communication hardware, study leading to the demonstration of quantum sensing technology and related work leading to quantum algorithms, quantum simulator incorporating noisy gates, QKD protocols and post-quantum cryptography. C-DAC is developing the FPGA based system to interface with quantum processors, python-based software interface for the quantum measurement hardware. During the year, study of impact of classical control electronics (FPGA based) on the qubit fidelity was done along with design and development of the project website.

Quantum Computing Toolkit

In association with IISc Bengaluru and IIT Roorkee, C-DAC is developing a quantum-computing toolkit to build the capability/capacity in QC research in the nation. It shall comprise QC Toolkit including simulator & workbench, QC Course and QC capacity building. As part of this initiative, exploration of quantum computing frameworks and indigenous simulator is being carried out. Experimentation has been carried out on the indigenous simulator by

running it on high-end machines with high capacity RAM and possibility of increasing the capacity in terms of Qubits is being explored. Porting of the simulator is carried out for the identified latest versions of the Qiskit quantum-computing framework and Design and development of the first set of QC algorithms is made. Design and Development of QC workbench UI/UX is in progress.

9.1.3 Artificial Intelligence, Language Computing & Heritage Computing

Natural Language Translation Mission (NLTM)

NLTM is a collective effort of Government, Academia and Start-ups to nurture language technology ecosystem by leveraging strengths of each in such a way that language technology gets developed and delivered to the market in the shortest possible time frame. During the year 2020-21, C-DAC is working on English-to-Indian Language Machine Translation, Centre of Excellence (CoE) and start-up engagement under Natural Language Translation Mission (Bahu-Bhashak Ecosystem).

Language Computing and Speech Technologies

Kanthasth: Translation Memory

The main characteristic of “Kanthasth” is translation memory system that allows a translator to re-use the already translated segments while translating a new file, either through complete match or partial match. This system is made available to all by the Department of Official Language, Ministry of Home Affairs and Government of India, free of cost. During the year, many trainings were imparted to the Ministries/Departments of Government of India under Training of Trainer (TOT) Programme.

ICT Solutions for India's North-East Heritage

Beta version of North-East Heritage portal (NE portal) has been developed and deployed for integrated search and retrieval over various digitized collections from the museums from North-

East States. Representative sample digitized data received from Manipur State Museum, Namgyal Institute of Tibetology, Loktak Folklore Museum, Kalakshetra Museum, Guwahati, Assam State Museum has been integrated in the portal. The user interface of the portal has been updated with localization in various North-East languages such as Assamese, Mizo, Bodo, Manipuri, Khasi, Karborok, Bengali and Hindi. JATAN software is deployed in North-East State museums of Tripura, Sikkim and Manipur. The Crowdsourcing Software framework for Mobile Tourist Guide has been developed for North-East Monuments. The arts and crafts web portal and a supported android app have been prepared which has the profiles of the artisans and their products from the North-East region. Visitor Activity Tracking System (VATS) has been implemented to monitor visitor preferences using BLE based scanners and tags.

Knowledge & Resource Centre for Accessibility in ICT

C-DAC is carrying out an initiative that aims to evolve standards for Accessibility requirements for ICT products and services along with STQC & BIS. The standard is being formulated by studying various global standards in context of India specific requirements and in consultation with stakeholders from Industry, Academia & User community. During the year, C-DAC has been carrying out Review of International Standards and preparation of draft report. Awareness workshops for members from software companies, differently abled community, social justice, Government procurement and testing agencies etc., are also envisaged under this initiative.

9.1.4 Health Informatics

9.1.4.1 Healthcare Solutions

Deployment of e-Aushadhi Drug Warehousing Solution

C-DAC's "e-Aushadhi" is a web-based Supply

Chain Management System for the distribution and supply of drugs and vaccines in the healthcare system of the country. As per mandate for nationwide rollout from the Ministry of Health and Family Welfare (MoHFW), Government of India (GoI), C-DAC's e-Aushadhi is currently operational in 18 States. The solution has also been implemented under 5 national programmes of the MoHFW. During the year, C-DAC is engaged in development and implementation of 'Integrated Pharmaceuticals Database Management System – IPDMS' for Price and Shortage Monitoring of Drugs and Equipment for National Pharmaceuticals Pricing Authority, Department of Pharmaceuticals, Ministry of Chemical & Fertilizers.

e-RaktKosh - Blood Bank Management System

e-RaktKosh is a comprehensive national portal to address the problem by providing means to collect, disseminate, standardize and streamline the standard operating procedures and guidelines of blood banks across India. The portal reflects statistics on the total blood stock availability at blood banks and provides information on blood camps, blood components, nearest blood banks etc., Various hospitals' blood banks such as RML Delhi, IRCS Delhi have adopted e-RaktKosh in their day to day work. Currently, more than 2,100 blood banks in 32 States/UTs across the country have been on-boarded the system.

e-Sushrut - Hospital Management and Information System

C-DAC has indigenously designed and developed the "e-Sushrut", a full-fledged Hospital Management Information System (HMIS). The solution provides an indispensable mechanism for digitizing & streamlining the workflow of hospital services and is a major step towards adapting technology to improve healthcare. During the year, C-DAC has been carrying out implementation of HMIS at All India Institute of Medical Sciences (AIIMS) for 2 locations

namely; Bhubaneswar and Gorakhpur, thereby bringing the total number of HMIS implementations for AIIMS to 8 locations, which include Patna, Raebareli, Mangalagiri, Raipur, Bathinda, and Nagpur. At present, pilot initiatives are underway for C-DAC's HMIS solution in the States of Punjab, Telangana and Odisha. Recently, the Government of Maharashtra initiated the statewide rollout of HMIS after successful completion of POC at 2 hospitals.

AAKANKSHA- Radiation Treatment Planning System (TPS)

The AAKANKSHA system is an indigenously developed Radiation TPS for Telecobalt Radiation machines and High Dose Rate Brachytherapy machines. Aakanksha Radiation TPS is being developed under an ongoing initiative funded by the Department of Atomic Energy (DAE) through Tata Memorial Centre (TMC), Mumbai. The system provides radiation experts (oncologists and physicists) visual tools and controlled workflow to ensure treatment efficacy and patient safety by assisting in planning approach path, radiation level & exposure etc., During the year, the TPS system was deployed at Tata Memorial Centre on pilot basis for verification and validation of the system for dosimetry, overall planning process, accuracy and efficacy of treatment planning. The benchmarking for the system has been done bringing out the efficacy of the system.

9.1.4.2 C-DAC's Telemedicine Solutions

e-Sanjeevani (AyushmanBharat)

'e-Sanjeevani', is a web-based comprehensive telemedicine solution that extends the reach of specialized healthcare services to masses in both rural areas and isolated communities. The "Doctor to Doctor" version is being implemented nationally at 1.55 lakh Health and Wellness Centres in all States. eSanjeevani (AyushmanBharat) has been rolled-out at around 4,350 health facilities in 14

States/UTs and 17,104 users have been trained and around 1,25,638 tele-consultations have been completed in this national doctor to doctor telemedicine network.

Mercury™ Nimbus Suite

C-DAC's "Mercury™ Nimbus Suite", extends healthcare services to remote locations using Information Technology and digital health platform. It offers variety of Electronic Medical Records (EMR)/Electronic Health Records (EHR) functions including exchange of EMR of individuals between remote and specialty end. The solution is being utilized by Odisha State Government connecting 5 State Specialty Hospitals, 30 district hospitals, and 13 e-ICU centres of Odisha State and by National Thermal Power Corporation (NTPC) connecting 3 remote centres and 2 Specialty centres.

National Resource Centre for EHR Standards (NRCeS)

National Resource Centre for EHR Standards for India established as Centre of Excellence by the Ministry of Health and Family welfare Government of India to accelerate and promote adoption of EHR standards in India. NRCeS has issued 65 affiliate licenses for use/incorporation of SNOMED CT healthcare terminology during the year, bringing the total to 551 for India. 12 training programs, 5 Webinars by Industry Experts and 1 event have been conducted during the year under NRCeS where 704 people have been trained and sensitized for adoption and use of EHR standards. NRCeS has developed multiple FOSS tools and technologies to support quick and easy integration of EHR standards.

9.1.5 Cyber Security and Cyber Forensics

Distributed Centre of Excellence for Blockchain Technology

Blockchain based Property Record Management System (PRMS) application is developed and

deployed for Telangana State by taking the benefits of Blockchain Technology into existing workflow of property registration application. During the year, the system was leveraged for recording Property Registration transactions on to blockchain and also worked on expansion plan for scaling the deployment.

9.1.5.1 Artificial Intelligence & Machine Learning for Cyber Security

Predicting multistage attacks using Machine Learning

As a part of this initiative, C-DAC has evolved an architecture for predicting multistage attack and built various prototypes for detecting malicious executables, running processes, traffic and predict the adversary stages. C-DAC has evolved a process for labelling dataset, built labelled dataset and trained various machine learning models to detect malicious executables, process and traffic. Currently, these prototypes are being tested on real time data along with enhancement to the machine learning dataset.

Digital Forensics Platform

C-DAC is engaged in development of a Digital Forensics Platform which facilitates automatic analysis of digital evidence for forensics purpose using cutting edge technologies. An AI based Toolset, DIGIFAI, having three major components has been developed: (a) Machine Learning based Text analytics Tools (DIGITEXT), (b). Image Processing Based Document Forensic Tools (DIGIDOC) and (c) DIGIMONITOR for monitoring purposes.

9.1.5.2 Proactive Security Solutions

Cyber View Cyber Threat Management System (CTMS)

This frame work has been developed for large scale attack data capturing, collection and analysed which

is being leveraged by National Threat Situational Awareness Program (TSAP) centre and is used for generation of cyber threat intelligence. The threat capturing sensors are deployed at different organizations of various sectors.

Live-Virtual-Constructive Hybrid Testbed as a Service

Live-virtual-constructive (LVC) hybrid testbed has been setup with a combination of physical, simulated and emulated components. This testbed is made as a service for better control, to reduce capital expenditure and operational expenditure. There are various phases involved in the process to provide this testbed as a service i.e. modelling phase, simulation of attacks and vulnerability analysis phase. SCADA components including the Master Terminal Unit (MTU), Human Machine Interface (HMI), Remote Terminal Unit (RTU), De Militarized Zone (DMZ), database server are provided as service. The SCADA Protocol Anomaly Detector (SPADE) is also integrated into the LVC testbed and made available as a service.

9.1.5.3 Solution for Detecting Malware and Emerging Threats

Malware Detection in Embedded Systems

This initiative addresses the backdoor attacks on internet facing embedded devices. A framework is designed with 5 components: (i) Firmware retrieval and extraction (unpacking) (ii) Binary & script level Analysis (iii) Web application analysis (iv) Firmware Update analysis and (v) Network packet analysis & Network fuzzing. A Lab is setup with the Hardware, opensource and commercial software tools. In order to meet the objectives of the initiative, following techniques are being used: static & dynamic binary analysis, advanced binary analysis, device emulation/porting to a hardware platform for carrying out runtime analysis and network packet analysis & network fuzzing.

Mobile Device Security for Emerging Threats

As part of this initiative, C-DAC performed a survey on the latest mobile threat vectors and a detailed literature survey on the various approaches for the detection of cloned applications & fake applications. Several features have been developed such as App Locker, Detection of Hidden Apps & Analysis of device security status for performing payments. Currently, testing of the developed features and development of new features is under progress.

Tools for enabling Binary Program Analysis

Under this initiative, C-DAC is engaged in development of tools for Binary Program Analysis and carried out various activities during the year such as recovery of the binary control flow, implemented the instruction decoder for initial set of 25 MIPS instructions, implemented the semantic translation for these initial set of instructions, and generated LLVM IR for these initial set of instructions.

SDN based Middleware for 5G

C-DAC is engaged in an initiative titled Middleware, Application and Platform for 5G Environment towards 5G/QoS experimentation for telemedicine and healthcare application. PARAM Shavak based SDN experimental sandbox environment is being setup to carry out various trials and interactions. During the year, C-DAC has successfully demonstrated voice-enabled health application for 5G Networks in IEEE 5G World Forum 2020.

Information Security Education and Awareness (ISEA) Phase- II

As part of this initiative, total of around 3,96,394 candidates have been trained/under-going training under various formal/non formal courses through 52 institutions including 3,35,705 candidates in affiliated colleges of 5 Technical Universities participating in the initiative. In addition, institutions have reported more than 1,003 technical paper publications. Additionally, 11,030 Government

officials have been trained. As part of the Information Security for Government officials, it is proposed to conduct Technology Enhanced Learning (TEL) for Government officials till December, 2020.

As part of overall progress under the National Awareness component, 1203 awareness workshops have been conducted covering 1,74,347 participants in direct mode. Multilingual awareness material on information security has been designed and disseminated through these workshops, print/electronic/digital mode and multilingual portal. C-DAC also designed and developed 22 pages booklet on “Secure Remote Desktop Access – Advisory” 40 pages booklet on “Online Safety Tips for Children” in English and Telugu and 32 pages booklet on “Online Safety Tips” for working women @ Home during COVID-19 outbreak and carried out extensive Social Media promotion on good practices to prevent COVID-19.

9.1.6 Software Technologies, including FOSS

9.1.6.1 Platforms and Frameworks

e-Praamaan: A National e-Authentication Service along with Aadhaar

e-Praamaan is a national e-authentication service developed by C-DAC to authenticate users of various Government services. It provides various authentication mechanisms based on password, OTP, digital certificate (IndianCAs), biometric and Aadhaar Ecosystem. Total 268 Departments have been integrated and 12.08 crore transactions have been completed as part of this initiative.

Mobile Seva

Mobile Seva initiative of C-DAC enables integration of the mobile platform with the common e-Governance infrastructure consisting of SDCs, SWANs and SSDG/NSDG and facilitates delivery of public services over mobile devices using mobile based channels such as SMS, USSD, IVRS and

m-Apps. 163 Government Departments and agencies have integrated their services with this mobile seva platform and 3,440 crore push SMS transactions have been made.

e-Hastakshar – C-DAC's eSign Service

As part of Government's Digital India Initiative, C-DAC has developed e-Hastakshar – C-DAC's eSign service that facilitates instant signing of documents online based on Aadhaar authentication. During the year, C-DAC carried out integration with Government applications and more than 2.05 crore e-Sign have been offered by C-DAC till December 2020.

9.1.6.2 Free and Open Source Software and Collaborative Portal

Deployment and Proliferation of BOSS

The latest Release of Bharat Operating System Solutions (BOSS) GNU/Linux is version 8.0 (unnati). BOSS GNU/Linux has been developed by C-DAC for enhancing the use of Free/Open source software throughout India for Desktops, Laptops, Tablets, Servers that supports various architectures such as Intel/AMD/32-bit & 64-bit systems. During the year, C-DAC upgraded BOSS Linux in Integrated Defence services (IDS) and is in the process of upgrading systems for PAN Indian Army.

Vikaspedia - Collaborative Knowledge Sharing Portal

Vikaspedia is a multilingual, multi-sectoral knowledge portal developed by C-DAC and is accessible in all 22 scheduled languages of the country, besides English. During the year, utility of Vikaspedia as a knowledge platform for Aspirational Districts has been initiated in 50 Aspirational Districts covering 15 States. 230 webinars have been organized on digital content access & sharing in Indian languages for about 25,000 first level services providers

from across the country in various languages. An outreach campaign through Community Radio to promote Atmanirbhar and PM GaribKalyan Yojana was also taken up in the Aspirational Districts and Northern and North-Eastern States of the country, covering a population of about 1.1 crore citizens.

e-Governance Standards and Guidelines

C-DAC is carrying out an initiative in collaboration with Standardization Testing and Quality Certification (STQC) for preparing e-Governance standards, guidelines, and frameworks, to make Government services accessible to common man. This involves formulation and review of the Standards, Guidelines and Frameworks supported by Research and development, Promotion, Training and Capacity building, Conformity Assessment and Supporting tools and technologies for e-Governance.

9.1.7 Education and Training

9.1.7.1 Post Graduate Diploma in Advanced ICTE areas

Considering the pandemic scenario of COVID-19 prevailing in all the States and lockdown conditions in the States, C-DAC Education and Training division has initiated the online training with the help of online video conferencing platforms. C-DAC has launched the six months (600 Hours duration) online Diploma in four domains which are being conducted online using the video conferencing and e-learning platforms. The four online Diploma courses are as follows which commenced from September 2020:

- e-DAC-Diploma in Advanced Computing
- e-DBDA-Diploma in Big Data Analytics
- e-DAI-Diploma in Artificial Intelligence
- e-DMC-Diploma in Mobile Computing

A total of 1750 students are undergoing the training currently online across the C-DAC training centres.

9.1.7.2 Solutions for Online Examination

Process Automation for Competitive Exams

C-DAC has designed and developed Process Automaton for Competitive Exams System which has been used for GATE (past 8 years), JAM (past 7 years), AIIMS (4 years) and NBE (2 years). The system handles more than 11 lakh applicants every year.

Comprehensive Recruitment Solution for Indian Air Force

C-DAC continued to conduct online recruitment examinations including Air Force Common Admission Test (AFCAT) for Officer's cadre and Test for Airmen Recruitment (STAR) for Airmen cadre for Indian Air Force (IAF) with its indigenously developed software. C-DAC conducted IAF AFCAT during October, 2020 in around 214 centres across 86 cities of 33 States & Union territories including Leh, Laddkah and Andaman & Nicobar Islands. STAR was conducted during November, 2020 in around 250 centres across 86 cities of 33 States & Union territories.

Rally Registration System for IAF Recruitment

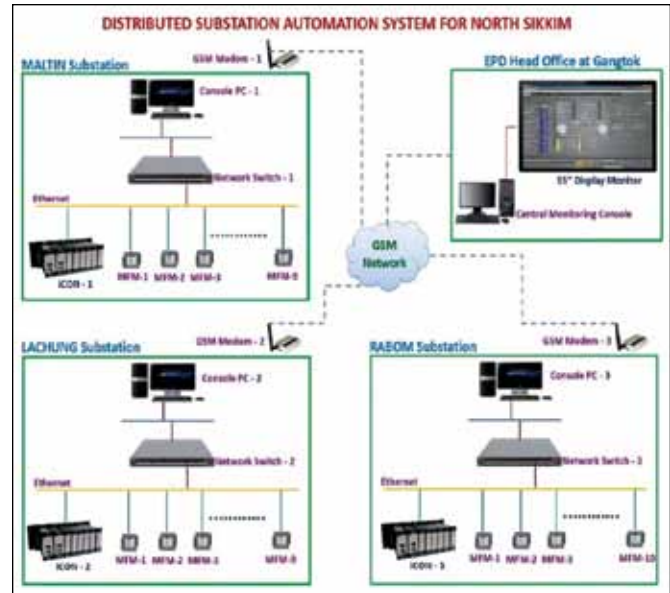
An Online Registration System has been developed by C-DAC for IAF recruitment rally registrations. Rally registration was completed for Bangalore, Angul (Odisha) and Vadodra (Gujarat) during September 8-10, 2020. Rally registration was carried out for Jodhpur, Ambala, Patna (Bhita) during September 27-28, 2020 using the system.

9.1.8 North-East Initiatives

Distributed Automation system

C-DAC has completed Implementation of the distributed automation system at three sub-stations in North Sikkim namely, RABOM, MALTIN and LACHUNG featuring system reliability and fault tolerance at the processor unit level and

communication network level. Generation of customized reports on the electrical parameters are provided at the Central Monitoring Station to analyse power distribution pattern. The system has been handed over to the Energy and Power Department of Sikkim, for operation.



Distributed Substation Automation System for North Sikkim

Cyber forensic Lab and Training Lab

C-DAC is also engaged in setting-up of Cyber Forensic Lab and Training Lab at Police Training Centre for Arunachal Pradesh Police under Cyber Crime Prevention against Women and Children (CCPWC) Scheme.

e-courses in Health & Medical Science Education

As part of this initiative, Virtual Teaching Portal and Learning Management system have been customized and upgraded. Six previously developed e-courses in Health & Medical Science, with AIIMS, New Delhi, have been refurbished and uploaded on the Virtual Teaching platform of C-DAC and the provision to access of these courses, has been started to the medical students of the identified NER medical colleges. A total of 400 students are currently accessing these courses. Development of 3 courses is under progress.

9.1.9 International Initiatives

Various activities carried out during the year including setting-up of centres of excellence and computer labs in various countries as listed below:

- Setting up of Centre of Excellence in Software Development and Training (CESDT) in Cambodia, Lao PDR, Myanmar & Vietnam and appropriate accreditation to these training courses by C-DAC.
- Setting up of Centre of Excellence in IT at Al Azhar University Cairo, Egypt
- India – Fiji Centre of Excellence in IT (CEIT) at FNU in Suva
- India – Nauru Centre of Excellence in IT (CEIT) at Yaren
- India – Cook Islands Centre of Excellence in IT (CEIT) at USP in Rarotonga
- Setting up of India – Namibia Centre of Excellence in ICT & HPC at NUST in Windhoek
- Capacity building in Research, Development & Innovation in ICT & Electronics through AITI-KACE by C-DAC
- India – Papua New Guinea Centre of Excellence in IT (CEIT) at Port Moresby
- India – Vanuatu Centre of Excellence in IT (CEIT) at Port Vila
- India – Guyana Centre of Excellence in IT (CEIT) at Guyana
- India – Samoa Centre of Excellence in IT (CEIT) at Apia
- India – Niue Centre of Excellence in IT (CEIT) at Alofi
- Extension of India Myanmar Centre for Enhancement of IT Skills at Yangon as ATC of C-DAC for 3 years
- Supply of 150 Desktops Computers & Associated Software to Sao Tome & Principe

- Setting up of NexGen Centre of Excellence in IT at Hashemite Kingdom of Jordan
- Setting up of India – Solomon Islands Centre of Excellence in IT at Honiara

9.1.10 C-DAC COVID-19 Initiatives

SAMHAR COVID-19 Initiatives

Computational Drug Repurposing Studies on SARS-CoV-2 RNA Dependent RNA Polymerase

C-DAC has performed drug repurposing studies on crucial targets of SARS_COV2. The drugs from the FDA approved, SWEETLEAD and phytochemicals database of various Indian medicinal plants were docked against the COVID-19 protein targets. For more than 15000 drug molecules docking studies were performed using the high throughput docking pipeline developed under NSM project. High-throughput molecular docking against the FDA approved database consisting of more than 2500 drug molecules was performed under the NSM project. This approach led to identification of three drugs, which were obtained as the best hits namely, Remdesivir, ceftazidime and Rutin. The role of ayurvedic compounds was studied against few of these proteins from SARS-CoV-2. Studies on Ayurvedic phytochemical lead to the identification of molecules from Giloy and Ashwagandha as potent molecules for inhibition of viral replication. All these studies were performed on the high-performance computing cluster commissioned under the National Supercomputing Mission.

SAMHAR COVID-19 Hackathon

C-DAC under the aegis of NSM, a MeitY and DST initiative, in association with NVIDIA & OpenACC, announced the Supercomputing using AI, ML, Healthcare Analytics based Research (SAMHAR) COVID-19 Hackathon for combating COVID-19. This provided researchers an opportunity to find solutions for Identifying, Tracking and Forecasting outbreaks of COVID-19 and

facilitating drug discovery as well. The hackathon was open to Researchers, Academicians, MSMEs, Start-ups and Industries. Overwhelming response of 487 entries were received for the same and 25 Innovative Implementable Idea (I3 Award) were selected and the 6 Awards under 3 Categories were selected, after the teams demonstrated Proof of Concept of their ideas.

Drug Discovery Hackathon along with MHRD, CSIR, AICTE and C-DAC

C-DAC played an important role in providing the virtual tool room facility for research based on HPC infrastructure of C-DAC & NSM for the Drug Discovery Hackathon 2020 organized by the MHRD and CSIR. This was inaugurated by Dr. Harshvardhan, Hon'ble Union minister for Health and Family Welfare on July 02, 2020 along with Shri Ramesh Pokhriyal Nishank, Hon'ble Minister of Human Resource Development (HRD) and Shri Sanjay Dhotre, Hon'ble Minister of State for HRD.

NAADI Platform

National Analytical Platform for Dealing with Intelligent Tracing, Tracking and Containment of COVID-19 for infected persons and quarantined people (NAADI). NAADI offers Comprehensive Multi-Level, Multi-modal and Multi-lingual Tracing, Tracking and Containment of COVID-19 Quarantined/Under Observation/Infected individuals. This has been implemented across Puducherry, Ladakh and Daman & Diu UTs.

C-DAC's Telemedicine Solution-eSanjeevani OPD

Post COVID-19 since April, 2020, C-DAC has enabled e-Sanjeevani OPD which is a patient to doctor tele-consultation system. It has been developed for MoHFW for providing teleconsultation services to patients through safe and structured video-based clinical consultations between doctors in a hospital and patients in the confines of their

home. System has been rolled out in Twenty-five States/UTs and has completed over 10,24,337 teleconsultations. 10,613 doctors from various States have already been trained and on-boarded.

C-DAC's Mission Mode Programmes and Roadmap

C-DAC with its focus in Advanced Computing is uniquely positioned to establish dependable and secure Exascale Ecosystem offering services in various domains. C-DAC has crafted its strategic practical roadmap keeping in perspective the paradigm shift in the global technological ecosystem and ever-dynamic area of national ICT scenario. Accordingly, the roadmap has been devised with four-pronged approach based on the Core as HPC & Cloud., viz. Futuristic Research, Applied R&D, Applications and Services covering 28 thrust areas. Towards realisation of the roadmap, six mission mode programmes were evolved to research, develop and deliver the futuristic technologies/solutions.

- Exascale Computing Mission
- Microprocessor and Professional Electronics Mission
- Quantum Computing Mission
- AI and Language Computing Mission
- IoE, Dependable and Secure Computing Mission
- GenNext Applied Computing Mission

During the year, C-DAC firmed up all the six missions along with activities/projects, deliverables and timelines have been firmed up.

9.2 Society for Applied Microwave Electronics Engineering and Research (SAMEER)

9.2.1 Laboratories and Core Competence

Society for Applied Microwave Electronics

Engineering & Research (SAMEER) is an autonomous R&D institution under the Ministry of Electronics and Information Technology, Government of India. SAMEER has five centres located at Mumbai, Chennai, Kolkata, Visakhapatnam and Guwahati. SAMEER specialises in the areas of Medical Electronics, Radar Instrumentation, Atmospheric Instrumentation, Signal Processing, High Power Radio frequency, Photonics, Antennas, Communications, EMI/EMC/EMP, Digital Signal Processing, Electronics packaging, Microwave and Millimeter-wave (MMW) components and systems for various users in the country. SAMEER has established a state-of-the-art millimeter wave laboratory with test, measurement, simulation, fabrication and assembly facilities and a Compact Antenna Test Range (CATR) facility for evaluation of antennas, radomes and scattering study with support of the MeitY at its Centre at Kolkata.

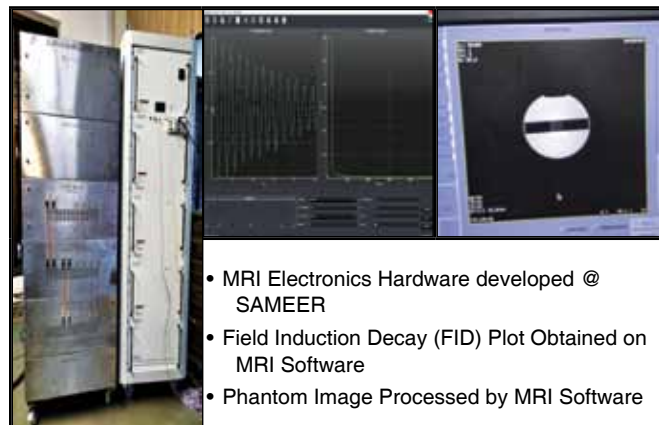
NABL accredited EMC test and measurement facilities have been established at Mumbai, Chennai & Kolkata and offers comprehensive test, consultancy, training, engineering and research services to national agencies and electronics industries in India. The new facility at SAMEER, Visakhapatnam specializes in a variety of capabilities, ranging from box level to complete system level testing to cater to the increasing requirement from the strategic sectors.

High power microwave tubes/components as well as research and development activity for design and development of magnetrons and circulators at GHz at its new facility at Guwahati.

Indigenous MRI Project

Successful Integration of all electronic Subsystems including Spectrometer, Head Birdcage Coil and Front End, Gradient Amplifier with software & Magnet has been completed. Field Induction Decay (FID) and Phantom Image were successfully obtained. Tied up with Bombay Veterinary College

(BVC) for Animal Trial. Signed an umbrella MoU with Nanavati Hospital for collaboration in the Research and Development activities of SAMEER in the field of Medical Sciences.



A virtual Summit with Industry/Start-ups on Indigenous Magnetic Resonance Imaging (IMRI) – A National Mission was conducted on 4th December 2020 to engage potential industry collaborators in taking technology forward to make it commercially available in India. The initiative is expected to improve affordable healthcare access in India and have potential to generate jobs with indigenization of technology.

NAVIC Receiver ASIC Development

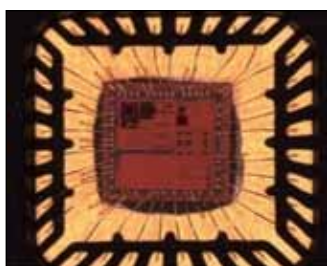
SAMEER is implementing a multi institutional collaborative project with funding from the MeitY for the design and development of the NAVIC Receiver (Tri Band L5 & S NAVIC, L1 GPS). The tri-band desktop receiver has been developed and the first version tri-band RF ASIC is fabricated and tested successfully. Dual band(L5/S) RF ASIC components have been fabricated and 32 channel Baseband Correlator Hardware was tested with PVT firmware on ARM processor of zynq FPGA. Correlator Coprocessor hardware integrated with AJIT processor successfully. SHAKTI processor 32 channel Baseband Correlator Hardware is undergoing validation at present.

CMOS based frontend chip is being designed using

65nm process of IMEC-UMC Foundry Services. RF front end, LNA, Mixer and the IF sections have been designed. Two separate PLL architectures for L5- and S-bands have been adopted. Preliminary design of the chip incorporates separate sections for the RF frontend, IF Section and PLL in an overall size of 4 mm × 4 mm has been completed and is presently under fabrication at IMEC (UMC65 nm). The design and fabrication of test benches for characterization of the designed sub-systems is under progress.



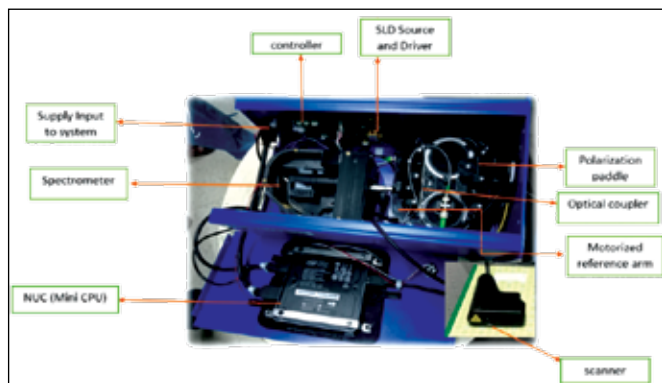
Desktop Receiver



RF ASIC "Dhurva"

Spectral Domain Optical Coherence Tomography (SD-OCT)

A Spectral-Domain Optical Coherence Tomography (SD-OCT) optics engine has been successfully developed and demonstrated in November, 2020. This optics engine will be integrated with signal processing and image processing units and used for the diagnosis of retinal diseases.



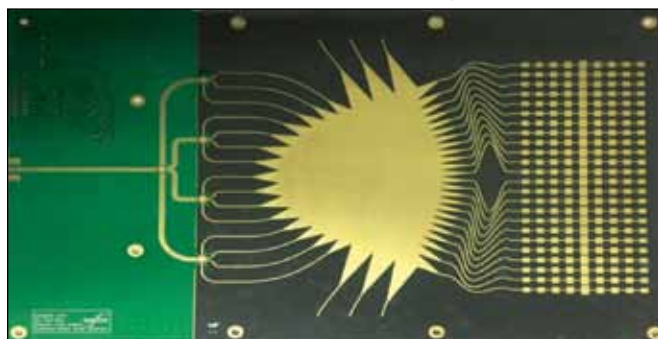
Design and development of Electromagnetic (EM) Shields based on Frequency Selective Surfaces

The application is for the shielding of devices

with intentional radiators or wireless receptors. Such devices will require the frequency band of the wireless signal to be allowed for transmission through the enclosure of the device. While conventional metallic shielding blocks the entire signal, FSS can achieve the selective shielding as required above.

Indigenous END-to-END 5G Test Bed

As with any major advancement in communication technology, 5G presents a whole new set of technical challenges with unpredicted Bandwidth up to 100 MHz in sub 6 GHz band and 400 MHz in mm-wave bands. To accomplish the 3GPP specifications for 5G, for both medium and long range 5G base stations, a massive MIMO antenna at sub 6 GHz band with 64T64R configurations is developed and demonstrated with independent RF channel for digital beam forming. Similarly, an mm-wave phased array antenna, fully integrated with RF and digital beam-former chips is developed and demonstrated at mm-wave frequency band of 5G. As an alternative approach to 1D, switched beam is developed at mm-wave band of 5G with 15 pre-determined beam positions. The required EIRP is achieved by cascading more elements at each output port of Switched beam array.



mm-wave Switched beam array antenna

Magneto Dielectric Substrate for Antenna Miniaturization Applications

Magneto Dielectric (MD) materials are the artificially developed materials with permittivity and permeability values greater than unity. The

existing materials that are available naturally do not possess the values of permittivity and permeability greater than unity simultaneously. Magneto Dielectric (MD) substrate has higher permittivity and permeability values simultaneously when compared to the conventional substrates. MD substrates with various characteristics are explored to miniaturize the low frequency antennas and RF absorbers. Antenna designs were incorporated on FR4 substrate with $\epsilon_r = 4.4$, $\mu_r = 1$, $\tan \epsilon_e = 0.02$ and $\tan \epsilon_m = 0$ and on various MD substrates with distinct ϵ_r , μ_r , $\tan \epsilon_e$, and $\tan \epsilon_m$ values. It was observed that 60% miniaturization was achieved with minor variations in other parameters of the antenna.



PIFA on FR4 and
MD substrate

Quadrature (90°)
Hybrid Coupler

Indigenous Development of L-Band (IFF/TACAN) Conformal Antennas

Conformal antennas are divided into singly and doubly curved antennas, depending on how many curvatures the geometry has and their radiation characteristics. An initiative to develop conformal shared aperture antennas indigenously for Indian Defence systems is launched. This development covers both IFF and TACAN bands in a single shared aperture conformal configuration. The proposed conformal antenna will replace the L-band blade antenna. Analysis of RCS and Masking studies are also being explored.

Design & Development of Multiband Antennas for Electronic Countermeasure Applications

A wide band circularly polarized antenna is being designed over a wide frequency range. Antenna incorporates a modified travelling wave antenna configuration as radiating element.

Conformal Jamming Antenna for RCIED

A shared aperture, stacked patch antenna configuration was developed for dual band operation with operating bands of 0.8-1 GHz and 1.6-2.8 GHz respectively. In the vertically stacked patch arrangement, lower patch is responsible for operation in 0.8-1 GHz band whereas upper patch is responsible for 1.6-2.8 GHz band operation. The stacked patch configuration is backed by a metallic cavity. Antenna design parameters were optimized to achieve the required performance. A prototype antenna was fabricated based on the optimized parameters. Evaluated the antenna for its impedance and radiation characteristics. Measured results indicate that antenna exhibits stable radiation characteristics in both the operating bands. Prototype antenna outlines an overall dimension of 250mm × 250mm × 60mm.



Dual band shared aperture antenna

Secured Two-way Communication System

Secured Two-way Communication Systems has been designed and developed for an important mission. The uplink data is modulated, spread and transmitted to a Code Division Multiple Access based Spread Spectrum Receiver. This contains highly secured data. In the receiver, this data is demodulated, de-spread and decoded to get the raw data. The raw data is used in the mission. In the reverse direction, the down link is modulated with QPSK scheme and demodulated in the six channel receiver. The test and evaluation of the complete system is in progress. The units will be delivered to the user agency for deployment.

Design of miniaturized S-band LNA, using high dielectric substrate for space applications” is in progress. With state-of-the-art ‘Low Temperature Co-Fired Ceramic (LTCC)’ technology, it is possible to reduce the dimensions of electronic circuits. For space applications, any small reduction in dimension of electronic circuits can save lot of space, weight etc., In this core programme, S-Band Low Noise Amplifier is proposed to be designed using LTCC technology.

Concurrent engineering approach for optimization of “Thermal performance, Signal Integrity (SI) and Power Integrity (PI) of identified high speed digital board(s)” is being carried by the Scientists of Communication Systems and Electronic Packaging Design. This core programme aims to systemize the concurrent design of thermal, Signal Integrity and Power Integrity. In continuation of the existing domain of SAMEER, this will buildup knowledge in SI, PI and thermal area to design and deliver reliable hardware systems.

Up-gradation of Distributed Data Acquisition & Control System (D-DACS) for RIB facility, VECC, Kolkata

SAMEER has developed the D-DACS system for control and monitoring of RIB facility at VECC, DAE, Kolkata. The system is installed in the year 2011 and maintained by SAMEER till date, through technical support and periodic maintenance. VECC has awarded a project for up-gradation of Embedded Controllers (EC) used in the “Control Consoles” due to the obsolescence of the boards/modules used in the system delivered during the year 2011. The development of new embedded controller modules EC1 and EC2 is successfully completed and tested with the D-DACS test setup.



Up-graded version of EC1 and EC2 modules of D-DACS system

Thermal Design of Spacecraft Electronics Packages

Thermal design of spacecraft electronics packages are being carried out for U R Rao Satellite center, ISRO, Bangalore. Thermal model of spacecraft packages are developed by SAMEER with the details of thermally critical components, layer details of PC Boards etc., Novel heat transfer mechanisms are applied to conduct the heat from the critical devices to the metallic enclosure and further to external ambient. With this approach, the case temperature of semi-conductors, ICs, etc., is significantly reduced to meet the reliability needs. The packages undertaken by SAMEER for Thermal analysis have been used in HRSAT, NISAR and ADITYA-L1 satellites.

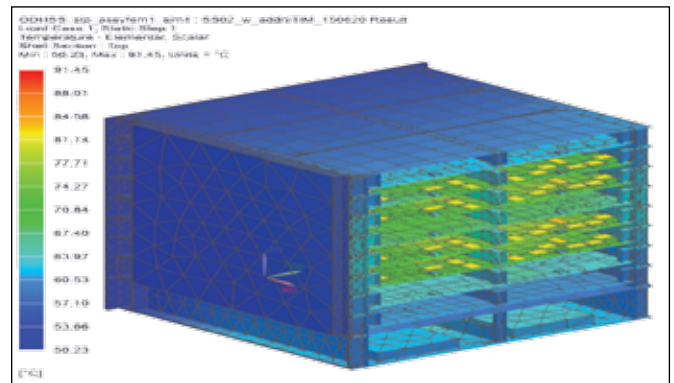


Fig: Temperature Profile of Space Electronics system

Development and Delivery of C-band Data Link Antennas

The objective of the project is to realize, qualify and deliver eight sets of C-band data-link antennas. Each of these set contains 4 compact linearly polarized cavity backed slot antennas. Two of these antennas will be mounted on the rear section and remaining two will be on the belly section of a large asymmetrical air-borne object. These enable reception and transmission of signals even in harsh environmental conditions. The antenna exhibits half-power beamwidth of $120^\circ \times 60^\circ$ with a gain of about 5dBi. All these antennas have been successfully delivered to the end user.



(a)

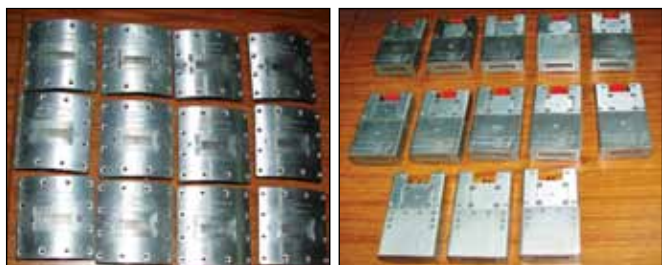


(b)

Fig. C-band data link antennas, (a) for belly section, and (b) rear section.

Realization and Delivery of C-band Data Link Antennas:

With an objective to realize, qualify and deliver 28 sets of C-band data-link antennas (identical to the earlier antennas), this project was sponsored by another Government R&D lab. Every set consist of 4 linearly polarized antennas. Two of these shall be fitted at the back section and the other two on the belly of an asymmetrical air-borne object. 5dBi element gain with 3dB beamwidth of $120^\circ \times 60^\circ$ was the requirement. Total 112 antennas have been fabricated, tested, qualified and successfully delivered to the end user.



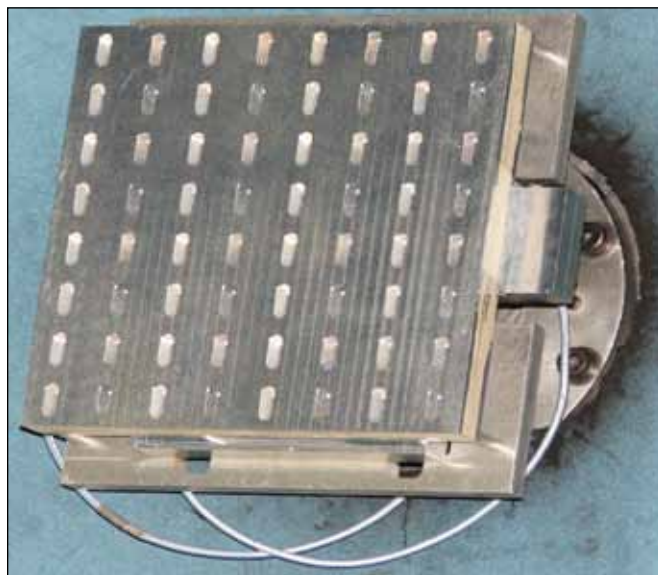
(a)

(b)

Data link antennas for C-band, (a) for belly section, and (b) back section.

X-band Monopulse Antenna and Comparator for Field Target Radar Simulator System (FTRSS)

This is a sponsored project with an objective to develop a Radar Target Simulator System. As a building block, a high gain corporate fed slotted waveguide array monopulse antenna and a low profile single layer comparator has been designed and developed at X band. The measured impedance bandwidth is higher than 400 MHz. This displays half power beamwidth of $8^\circ \times 8^\circ$ with a gain of 26dBi. Side lobe -as low as -19dB is demonstrated with 32 dB depth of the difference nulls in both the azimuth and elevation plane. Isolation between the comparator output ports is about 27dB.

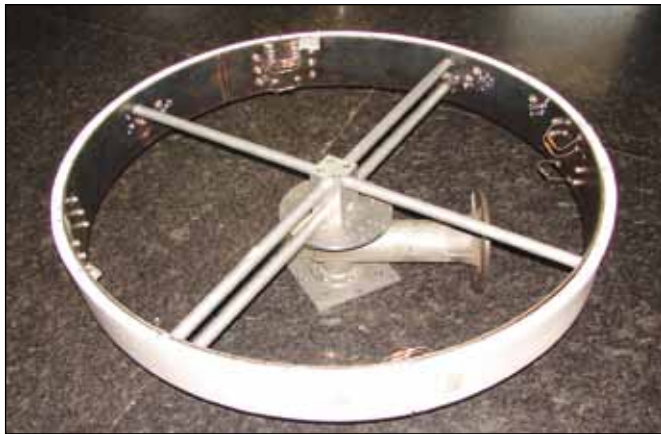


Prototype of X-band monopulse antenna with comparator

Multiband wrap around Antenna

This project is to design and implement a multiband microstrip wrap around antenna which will reduce the number of existing cut-outs in the onboard platform. The antenna excites various bands. These include S-band telemetry (linear polarization), S-band transponder (circular polarization), C-band transponder (circular polarization) and Ka-band telemetry (linear polarization). Various configurations have been simulated using commercial solver, especially at the C- and S-band

transponder frequency range. Their relative performances in respect of the angular coverage have been critically examined and documented. A complete prototype has been realized (1m diameter, 150mm width, 3.14m length) using RT Duroid substrates and covered with 10mm thick Teflon radome. Higher than 82% coverage (at -10dB level) in the azimuth plane has been achieved at S- and C-bands. A beam-squint of 55° in the elevation plane is the additional requirement at Ka-band. The inter-band isolations were evaluated by : - (1) Transmission measurement using network analyzer and (2) Pattern measurement with simultaneous transmission of signals/powers of all bands. Measured isolation is higher than 37dB at each of these bands. The simultaneous transmission has also demonstrated insignificant effect on the coverage. The antenna has been delivered to the end-user.

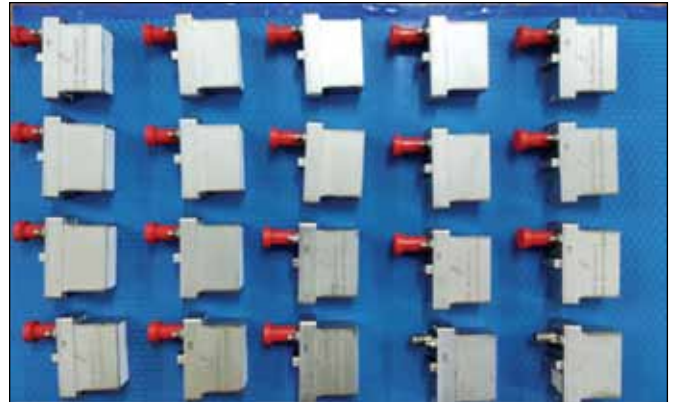


The realized prototype of the Multiband wrap around Antenna.

Ka-band Squinted Beam Antenna

20 numbers of independent Ka-band cavity backed squinted beam antennas with 20mm thick Teflon radome were the other requirement in this project. These antennas have been realized using qualified SS material and Teflon, in view of its' onboard application. The Teflon radome uses steps to resist its movement during flight. The twenty prototypes have been realized and their performances have been successfully demonstrated to the end-user.

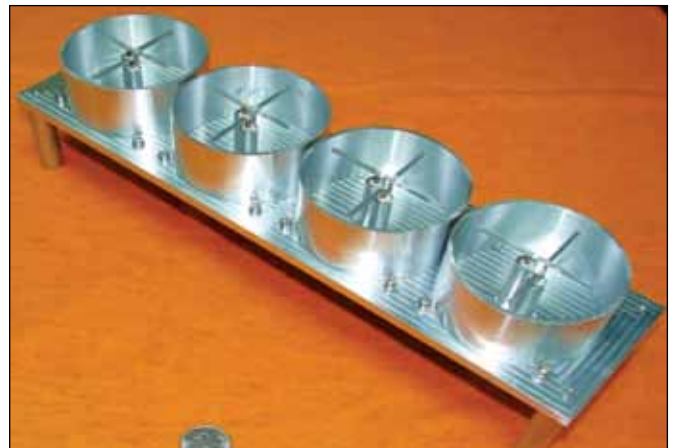
A beam squint of $\gg 55^\circ$ with a 6dB beamwidth $\geq 48^\circ$ and gain ≥ 9 dBi are the key achievements. Acceptance test (AT) of all these antennas was successfully completed. Qualification tests for one unit are nearing completion.



The realized squinted beam antennas.

S-band Phased Array Antenna

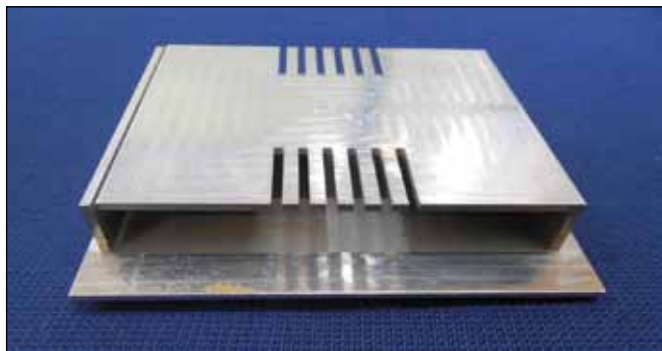
A small (4x1 array) dual linearly polarized phased array antenna (2.2-2.3 GHz) has been designed and developed. It conceives dual linearly polarized cross dipole as the element with enhanced beamwidth and isolation. Two dedicated co-axial ports have been considered for each of the cross-dipoles for the excitation /reception of horizontally and vertically polarized signal. Digital phase shifters have been used to produce the inter-element phase differences. A 4x1 microstrip power combiner has been integrated at the final stage.



The S-band phased array antenna

A Compact UHF Antenna

A novel compact planar inverted-F antenna (PIFA) has been designed and developed 445 MHz. In a conventional shorted plate PIFA configuration, the antenna resonates for a patch length of $\approx l/4$. Substantial size reduction has been realized by conceiving a capacitive wall near the open edge of the PIFA, and the proposed patch length has been reduced to $\leq l/8$. Few edge slots parallel to the shorted wall also cause a minor size reduction. The linearly polarized (LP) antenna yields an impedance bandwidth of $\gg 2.46\%$ with a gain of -3dBi for a small ground plane of $l/7 \times l/7$, which are improved compared to the earlier investigations. The overall dimensions of the antenna are 100 mm x 100mm x 17.5 mm.



Realized Compact UHF Antenna

W-Band Coherent Transceiver with Two Receiver Channels

The objective of this project is the indigenous design and development of a 2-channel W-band coherent transceiver system which finds application in the RF frontend of various short range radars. One of the 2-channels is dedicated for the sum-signal, whereas the other channel is time division multiplexed between the azimuth and elevation differences. All the necessary and critical components have been indigenously designed and developed at SAMEER, Kolkata. Frequency multipliers, amplifiers, oscillators, exciters are to name a few of them. Receiver gain of 55 dB with a noise figure lower than 11dB has been realized. One

QT (Qualification Test) unit has been developed, experimentally demonstrated and delivered to the end-user.

The heart of the exciter module is a crystal oscillator. With reference to this oscillator, a number of signals are derived at different frequencies. These include a 200MHz signal (CW), three 1.525GHz signals (pulsed), two 11.55GHz signals (CW) and one 11.75GHz signal (pulsed). Till now three exciter modules have been realized.



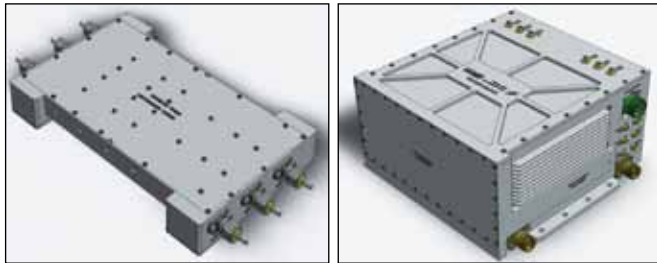
The realized exciter module for the W-band Transceiver.

X-band RF Subsystems

With an objective to indigenously develop an X-band monopulse transceiver for seeker application, this design and development project has been sponsored from a Government R&D lab. It consists of different RF subsystems namely RF Front End, Exciter, SSPA based transmitter and IF receiver. The exciter section generates the drive signal for the transmitter and the local oscillator signals for RF Front End and IF Receiver. It also generates different types of monitoring signals, pilot signal, reference clock and ADC clock for the radar signal processor unit. A 70 MHz modulated signal is up-converted to X-band by two stage up-conversion. The upconverted signal from the exciter drives a solid State device based transmitter to produce X-band pulsed RF output with peak power of 100 W.

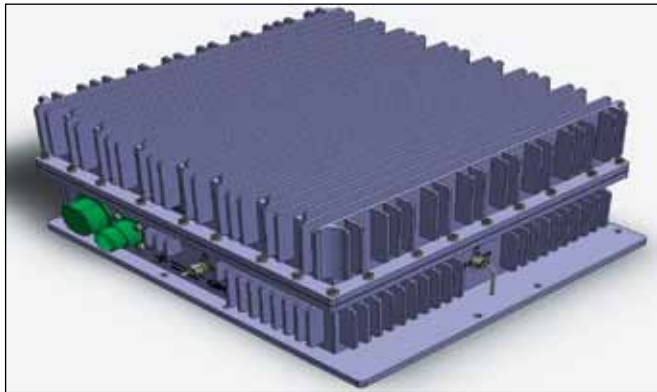
The RF front end section receives signals from the Sum, Azimuth and Elevation ports of a monopulse antenna and down converts them to L-band (IF1). The IF receiver further down converts L-band signal to 70 MHz IF (IF2) and provides inputs to radar signal processing unit.

3 numbers each of the subsystems (RF front end, Transmitter, Exciter-IF Receiver) are to be delivered. Design and simulation optimizations have been completed and are presently being critically reviewed. Fabrication and assembly of RF Front End is completed and testing is under progress.



(a)

(b)



(c)

(a) RF Front End Unit, (b) Exciter-Receiver Unit,
and (c) Transmitter Unit

3-Channel W-band Coherent Transceiver Front-end:

This W-band 3-channel transceiver is being developed in a sponsored activity from a R&D Lab of Government of India for air-borne tracking system. The transmitter section generates high peak power of 40 Watt at W-band frequency with a low

duty ratio of 0.3%. The receiver section has three channels for monopulse tracking. It down converts the received W-band frequency to IF frequency of 75 MHz for further processing. Each of the receiver channels has a gain of 60 dB with a noise figure of 8 dB. The phase and amplitude between the channels can be controlled digitally using RS 422 interface. Two units have been developed and tested for the required electrical parameters. The developed units have been qualified for mechanical vibration, mechanical shock, temperature sock and EMI/EMC (MIL-STD-461E).



The W-Band 3-Channel Transceiver Unit

Data Link RF Transceiver at X band:

This project is sponsored from a Government R&D lab with an objective to indigenously design and develop X-Band transmitter and receiver system for an onboard two way data link communication system. The high power transmitter, receiver with high sensitivity, power supply section and the control sections are arranged (collocated) within a dimension of 125mm x 110mm x 53mm. Two different configurations are developed for the projectile and its launcher units. Total four units have been realized (two for the launcher and the other two for the projectile system). In each of these configurations, the transmitter section generates the maximum CW power of 10W. The launcher section contains two dedicated output ports for the low and high power, whereas in the projectile both are delivered to a single output port. The center

frequency can be reconfigured in 38 different frequencies within a bandwidth of 200 MHz.

The receiver section for each of these configurations down converts the X-band frequency to IF frequency at 70 MHz using two stages of down conversion. Similar to the transmitter, the projectile section has one port and the launcher section has two ports for power /signal reception. In both configurations the receiver section has a dynamic range of 60 dB with constant output power of +4 dBm. The receiver demonstrates a low noise figure of 3 dB with a gain as high as 95 dB. The developed units are qualified for CEMILAC screening and EMI/EMC test (MIL-STD-461E). The developed units have been tested for end-to- end communication at bench level.

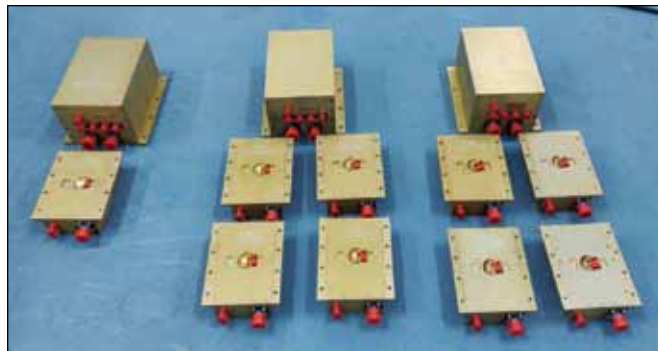


The Transceiver Unit for projectile (left) and launcher (right).

Ka-band telemetry transmitter system

This development is sponsored from a Government R&D lab. The Ka-band transmitter system consists of a base unit and four amplifier units. The base unit up-converts a 70MHz signal from the modulator card into an S-band signal. After the second stage of up-conversion, the Ka-band signal is generated. The Ka-band signal is equally divided among four channels and gives low power output at the base unit. The four amplifier units amplifies those Ka-band signals and feed to four squinted beam antennas. Total deliverables are five numbers of such systems which includes five base units and twenty amplifier units. Out of which, three base units and nine amplifier units have already been realized. Out of

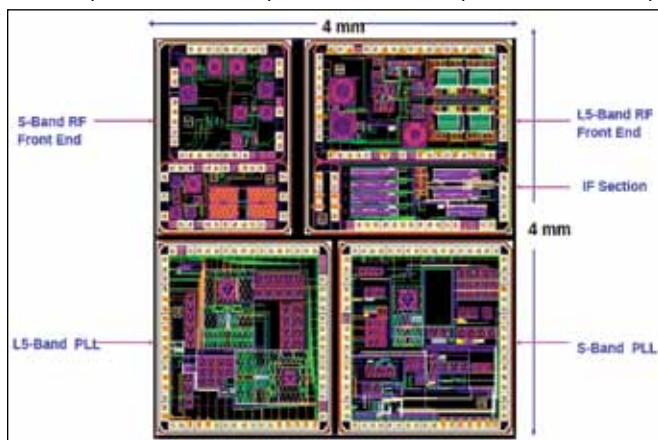
these deliverables, a base unit and an amplifier unit have been selected at random for the qualification tests (QT). ESS (pre-random vibration, thermal cycle, post-random vibration), shock, acceleration, altitude test have been successfully completed as a part of QT. The remaining base and amplifier units developed so far have successfully complied with the acceptance tests (AT) criteria.



The developed base and amplifier units.

Design and Developments of RFIC based NAVIC Receiver

With an objective to develop NAVIC receiver, the Ministry of Electronics and Information Technology (MeiTy), Government of India has sponsored this project. SAMEER Mumbai (nodal agency) in collaboration with SAMEER Kolkata, IIT Bombay, IIST Trivandrum and IIT Jodhpur is executing the project. SAMEER Kolkata is entrusted with the development of the RFIC based receiver-frontend at L5- (1176.45 MHz) and S-Bands (2492.028MHz).

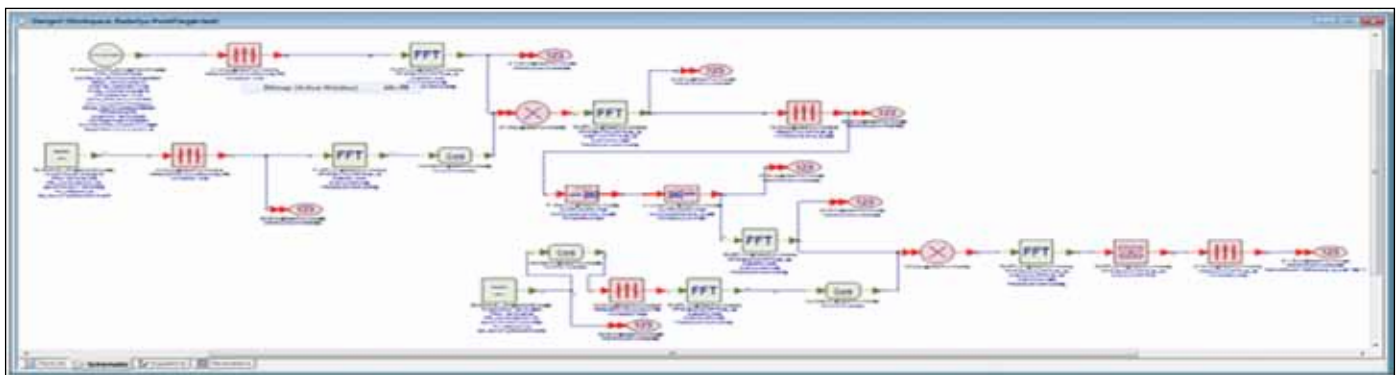


The designed RFIC Chip (4mm x4mm) sent for fabrication.

Feasibility Study and Simulation of W-band InSAR

The objective is to study and simulate an Interferometric Synthetic Aperture Radar (InSAR) for millimeterwave imaging application. InSAR is a coherent active microwave imaging system with day-and-night operational capability and allows accurate measurement of the signal's travel path. The system involves two identical antennas for receiving signals from two different angles that

provides the range information of a target, with sub-centimeter resolution. From the phase difference between these two signals, a 3D digital image is constructed. By comparing multiple maps over time, object motion can be tracked. In this study project, a W-band InSAR design has been investigated. Simulation of the radar has been performed using SystemVue simulation software. The block diagram for the radar has been evaluated through literature survey and simulations.

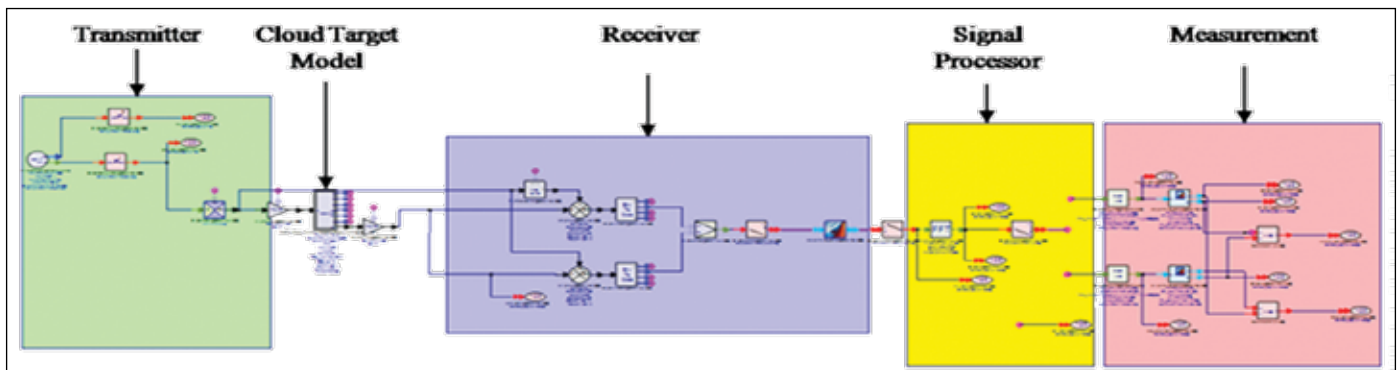


SystemVue simulation model for SAR processing

Feasibility Study and Simulation of W-band Cloud Radar

This activity was undertaken for study and simulation of W-band cloud radar with high temporal and range resolution for atmospheric application. The radar gives information about the atmospheric scatterers such as cloud particles, raindrops, and snowflakes. This can determine the cloud boundaries. It can estimate cloud's properties such

as particle size and mass content from which the reflection, absorption and transmission due to cloud can be assessed. In this study project, the cloud profiling radar has been explored. The origin of the different measurable parameters and their relation to the cloud parameters has been investigated and documented for future reference. A W-band FMCW based low power cloud radar has been successfully modeled in SystemVue environment and parametric dependencies have been examined.



SystemVue setup of FMCW cloud radar at 95 GHz.

Dual Channel Radiometer

A bench-top model of a dual-band radiometer RF front-end for humidity and temperature profiling over 20-32 GHz and 50-60 GHz respectively have been designed and developed using off-the-shelf components. This contains two dedicated broadband front-end receivers. This system uses a single heterodyne, double sideband down converter and a digitally tuned frequency synthesizer for frequency selection. Measured small signal gain and noise figures at Ka-band are higher than 75 dB and lower than 7 dB respectively. These figures realized at V-band are higher than 85 dB and lower than 5.5 dB respectively.



(a)

(b)

Developed dual-band radiometer, (a) perspective view, and (b) top view.

EMI/EMC Services

- In spite of lock down followed by several restrictions on attendance of manpower, travel etc., few of the EMI/EMC and Safety compliance testing assignments were undertaken as per various IEC/CISPR, MIL-STD-461 E/F at our laboratory as well as at outstation locations. The testing assignments include Radiated Emission measurement of moving train as per IEC 60121-2-1 for Nagpur Metro and MEMU train at Nagpur division and EMI/EMC measurements of 'Automatic Voltage Regulator (AVR) & Alternator' for BHEL/KOEL/DMRL as per MIL-STD-461 E.
- Provided EMC test services to as many as 9 users for their products, conducting more than 15 tests during the period.

- Provided accredited EMC instrument calibration services to 5 laboratories services during the year.



Radiated Emission measurement of MEMU train for M/s. Medha drives at Nagpur

- Test and evaluation as per Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC) standards completed for 84 products.



- Calibration of EMI/EMC Test and measurement equipment's completed for 58 numbers.
- Testing and calibration service offered to 70 industries in Electronics/Electrical/Medical/Telecom sector. Total revenue generated: Rs.107 lakh.

Test and Evaluation of Drones

- Drone and remote controller evaluated for Wireless Communications/Intentional Radiators as per the regulations of Wireless Planning and Co-ordination wing of the Department of Telecommunications.



- The product has been developed by Centre for Aerospace Research, Madras Institute of Technology, Chennai. The Greater Chennai Corporation has used this Drone for spraying Disinfectants in the roads and streets of Chennai during COVID-19 lock down period in a safe and efficient manner. The Drones could be used to serve narrow streets of Chennai as well.



Test and Evaluation of Ventilators

- EMI/EMC evaluation for the Medical Ventilator, developed by M/s Phoenix Medical Systems Pvt. Ltd., Chennai for PM-CARES has been completed during this period.

Electrical Safety & Environmental Test Services

- Extended the Safety and Environmental test facility to the manufacturers/importers of the above mentioned product family for compliance as per requisite standards. Total of 9 users utilized the Safety & Environmental test services wherein 15 products (17 tests) have been tested till date during the current calendar year of 2020.

Establishment and Commissioning of EMI/EMC Test Facilities as per MIL-STD-461 F/G

The RF Shielded Semi-anechoic chamber of 22m x 16m x 11m installed & commissioned for carrying out EMI/EMC test & calibration measurements at center as per Military & commercial standards.

- Facility is open to cater services to Indian industry.
- SAMEER is the only laboratories in the country providing EMI/EMC tests facilities fully complied as per MIL-TSD-461G both in terms of test frequencies and test levels.
- Successfully completed Two Testing Assignments after commission of the facility and many more are in pipe-line



Consultancy service for EMI/EMC compliance of Advanced Light Weight Torpedo (ALWT) developed by NSTL, DRDO, Visakhapatnam

- Consultancy works, identified EMI gap areas after detailed Study of each sub system of ALWT system. Suitable rectifications suggested without changing major design for improving the system for EMC compliance.
- EMI/EMC measurements as per MIL-STD 461 E were carried out on complete ALWT Torpedo at SAMEER laboratory.



Evaluation and Qualification of Indigenous EMP Point of Entry(POE) System for Indian Industry

- Electrical Point-of-Entry (POE) protection devices, viz. HEMP combination filters Developed by following Indian Industry under Make in India for national importance projects
- CCE (Indian ARMY) Projects, New Delhi for Strategic use of Indian Military.
- M/s. Paras Defense& Space Technologies Limited, Mumbai providing EMP Filters for SPIC, DRDO are evaluated for Pulsed Current Injection (PCI) test as per MIL-STD-188-125-1&2 using the established PCI test facility at Centre.



PCI Testing of EMP POE Filter

Accreditation & Listing

- National Accreditation Board for Testing & Calibration Laboratories (NABL) conducted reassessment audit for EMI/EMC Test as per amended standard, ISO/IEC 17025:2017 during 17-18 October 2020. The scope of accreditation for EMC test laboratory will be enhanced.
- National Accreditation Board for Testing & Calibration Laboratories (NABL) had conducted pre-assessment followed by final audit for Electrical Safety & Environmental Test facility and awarded accreditation for the same valid through 21-06-2021.
- The EMI/EMC division is listed with Telecommunication Engineers (TEC) for the

EMI/EMC and Safety test facilities for the testing needs of telecom products.

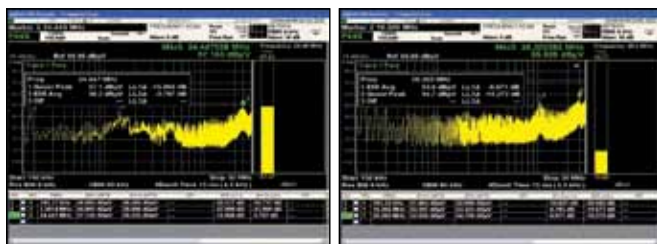
- TEC (Telecom Engineering Centre, DOT, GOI) has accredited the EMI/EMC facility of SAMEER Kolkata as conformity assessment body (CAB) for the EMC assessments of telecom equipments. TEC is going to implement EMC certification mandatory for all electronic telecom products.
- M/s Urban Engineering Association, Kolkata has availed measurement services and design consultancy assistance towards achieving CE compliance for their developed DC-DC converter for railway application.



Photograph of the CE measurement set up for the DC-DC converter of M/s Urban Engineering Association.



(a)

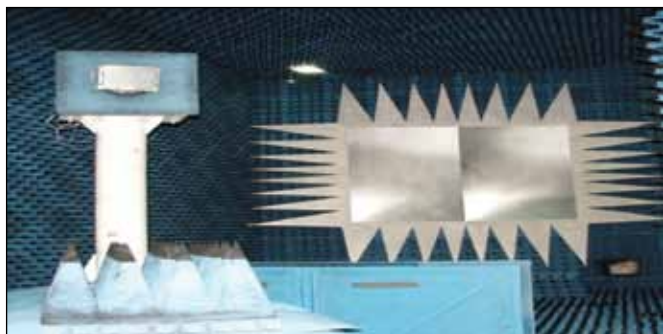


(b)

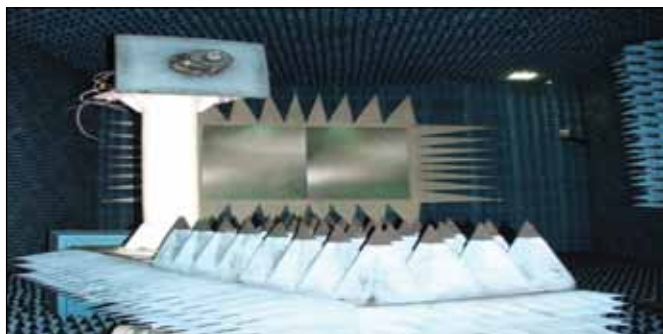
Emission from the negative and positive line of the DC-DC converter, (a) before circuit modification, (b) after circuit modification.

Measurement Services

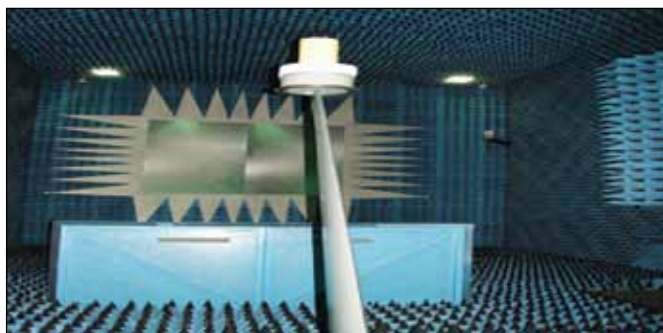
The Compact Antenna Test Range (CATR) is being utilized by private industries and Government Labs to estimate the radiation performances of antennas and radomes for diverse military and civilian relevance. The facility is equipped to evaluate the antenna performance over 1—110GHz and scattering over 1—40GHz. So far in this financial year, the facility has been availed by 5 different customers.



Photograph of the pattern measurement set-up of an X-band Monopulse Antenna.



The radiation pattern measurement set-up of a C-band Data-Link antenna.



The RCS measurement set-up of an absorber coated cylinder.

9.3 Centre for Materials for Electronics Technology (C-MET)

Centre for Materials for Electronics Technology (C-MET) was set up as a registered Scientific Society in March 1990 under the Department of Electronics (now Ministry of Electronics & Information Technology) as a unique concept for development of viable technologies in the area of materials mainly for electronics with the objectives of:

- To establish technology up to pilot scale for a range of electronic materials and transfer the same to industry for commercialization.
- To establish relevant characterization facilities.
- To undertake applied research activities in the areas of its operation.

9.3.1 Core Competence at C-MET Laboratories

C-MET's R & D activities have been implemented in three laboratories i.e. Pune, Hyderabad and Thrissur. In the campus of Pune laboratory, C-MET headquarter is functioning which monitor the administrative activity and central technical coordination. Each of these laboratories has its own area of specialization with requisite infrastructure and expertise. This approach has proven to be successful in creating core competence at each laboratory.

- Pune laboratory:** Pune laboratory is mainly focusing on cutting edge R & D research on materials for electronic packaging, renewable energy, energy storage, sensors and nano-materials/composites. These key areas of research have been thrived out into various inter-disciplinary applications.
- Hyderabad laboratory:** C-MET, Hyderabad has evolved as a unique facility for high pure materials in the country and is working independently in a focused manner to

create excellent national facility for ultra-pure materials, compound semiconductors, refractory metals, alloys, Restriction of Hazardous Substances (RoHS) and e-waste recycling.

- c) **Thrissur laboratory:** Major thrust area of C-MET Thrissur includes microwave material (including microwave dielectrics and substrates), energy materials (Carbon aerogel and Graphene based super capacitors), Sensors and Actuators (Thermal sensors, Piezo ceramics and Piezo actuators) and Nanomaterial (nano structured oxides, thin films, thick films and materials for Plasmonic application).

9.3.2 Products Developed by C-MET for different Applications

a) **Products Developed for ISRO and DRDO under the program “Indigenization of materials”**

- Preparation of 100gm NMC with characterization and supplied to ISRO.
- Fabricated graphene, MOS_2 , MOSe_2 , WS_2 , WSe_2 and their heterostructures and supplied to BRNS.
- Hafnium sponge for Vikram Sarabhai Space Centre (VSSC) for their space applications in rocket nozzles.
- Resistor paste for hybrid microelectronic circuits.
- Solder paste for hybrid circuits and surface mount technology.
- PTFE/woven cloth microwave substrates for patch antenna applications.
- Ring type actuators for MEMS based microvalves and cystobalite for re-entry launch vehicle.
- Silican oxycarbide coating on carbon foams for thermal protection applications.
- 7N pure Germanium and Zinc for SSPL, DRDO & IGCAR, Kalpakam

b) **Product Developed for Department of Atomic Energy (DAE)**

- Development of Flextensional (FT) actuators equivalent to that of APA 400MML actuator for DEBEL (DRDO), Bangalore
- Fabrication of flexible substrates for RCI radome application.

c) **Products/technologies developed to support Indian industry:**

- Development of active material systems (electrodes) for Li-ion batteries.
- Low temperature co-fired ceramic (LTCC) based multilayer circuits and gas sensors.
- Nanostructured materials for hydrogen energy from sunlight by splitting H_2O and H_2S splitting.
- Silicon carbide (SiC) semi-insulating (SI) single crystals suitable for high temperature, high voltage applications.
- Recovery of precious metals like gold, silver, copper, palladium, etc., from electronic waste, i.e., printed circuit boards at pilot plant scale with capacity of 100 Kg batch at C-MET and 1000 Kg/ batch at industry.
- Ultra High pure (>7N purity) materials such as cadmium, tellurium, gallium, etc., for strategic applications.
- Thermal sensor based monitoring system for the early breast cancer detection.
- Sensors for radiosonde weather monitoring applications.
- Carbon aerogels and graphene based super capacitors for energy storage.
- Microwave substrates and resonators for wireless communication applications.

- Piezoelectric based multilayer actuators, flextensional actuators and bimorph for strategic are commercial applications.
- Kesterite (CZTS) based thin film solar cells.
- Magneto dielectric substrates for miniaturized substrates.
- Light weight X-ray absorption materials for medical fraternity.
- Photoconductor based light sensors and detectors.
- Nanomaterials for purification of petroleum products.
- Preparation of aerogel carbon @ 2 Kg/batch by new cost-effective gel drying technique.
- Fabricated supercapacitors around 50 F/g using the indigenous aerogel super capacitor with resistance in the range of 30-35 mOhm.

d) C-MET's R&D Initiatives to combat COVID-19

- **Development of Polymer swab for PCR testing of kits**
 - C-MET has developed the polymer swab with plastic shaft/rod Physical dimensional & chemical tests were satisfactory for COVID test. NIV, Pune (ICMR) certified the swabs for collection human samples. Raw materials are sourced locally. Cost substantially reduced. Imported cost: Rs.500, Indigenous cost: (Rs.7 ~ Rs.20)



Polymer swab developed at C-MET

- Nanoparticle coated Masks for antiviral & antibacterial protection
 - Ag-ZnO (yellow)/AgBi-ZnO (white) nanoparticle coated low cost mask developed by C-MET to replace N95. DRDE, Gwalior did Virology test. 1kg materials can produce 15000 masks. i.e. 60-80mg/mask. Cost of Nanoparticles : Rs 3000/kg, mask coating material cost 30 paisa per mask



Antiviral and antibacterial mask developed by C-MET

e) Center of Excellences (CoE)

Three Center of Excellences (CoEs) were initiated during 2020-21 in C-MET. Two from C-MET Pune and one from C-MET, Hyderabad. The aims and objectives are as follows:

Centre of Excellence in Rechargeable Battery Technology, C-MET, Pune

- Advanced materials development at 500 gm scale and characterization
- Modeling and simulation
- Battery fabrication at pilot scale and testing facilities
- Failure and post-mortem analysis of spent batteries
- COE aims in developing Alternative batteries:
 - Li-ion polymer battery
 - Flexible batteries
 - Solid State batteries
 - New battery chemistries
 - Regeneration of cathode and anode from used Li-ion batteries

- IPR and ToT
- Technical and consultancy services to prospective users

Center of Excellence on Additive Manufacturing (CoE AM), C-MET, Pune

- Additive Manufacturing Materials related to electronics products/components (metal, ceramic, semiconductor and composite)
- Basic R&D for Additive Manufacturing Materials related to electronics products/components (metal, ceramic, semiconductor and composite)
- Development of materials and machine for AM technology for current and next generation electronic components/products

Centre of Excellence (CoE) in E-waste Management, C-MET, Hyderabad

- Building Innovation ecosystem at State level with appropriate partnerships & associations, investment opportunities, and policy engagements
- Identify industry best practices to build a knowledge repository and provide industrial and entrepreneurial consulting services
- Capacity building at State level with focus on skilling, training, maximizing awareness, and prototyping assistance.

9.3.3 Technologies Transferred to Industries

- Technology for the “Recovery of valuable and precious metals from spent Printed Circuit Boards” has been transferred to M/s. Namo E-Waste Private Limited, Faridabad on 10.01.2020.

9.3.4 Technologies Ready for Transfer to Industry

- 3D analysis system for wearable device for the prediction of tumour parameters.
- 3YSZ Ceramic Tapes for Oxygen sensor applications

9.3.5 Research Performance Indicator

- 38 research publications in peer-reviewed journals
- 32 presentations in conferences and symposia
- 85 invited talks
- 14 awards and honours
- 5 patent applications
- 1 technology transferred

9.3.6 C-MET’s futuristic area of research:

The following activities are planned to explore the cutting edge technologies in advanced electronic materials:

- High energy storage devices by researching on active materials for batteries for e-vehicle applications (supercapacitors, lithium ion battery).
- Development of 3-D printing inks and microwave devices for strategic and commercial applications.
- Development of 3-D printing machine and materials for fabrication of LTCC packages and circuits.
- LTCC based liquid cooling devices for high performance computing.
- Development of Perovskite and thin film Solar Cells.
- Indigenous sensors for internet of things (IoT) and smart cities applications.
- Microwave substrates, terahertz and milli meter wave materials.
- Cost effective and environmentally friendly recycling technologies and RoHS testing.
- Silicon carbide electronic device grade substrates for strategic applications.
- NTC materials for low temperature applications for airport weather monitoring system (-90°C to +50°C).

- EMI-shielding materials, nanopowders of aluminum, iron, boron, Boron nitride, boron carbide, aluminum nitride for strategic applications.
- Graphene based electrical, optical and acoustic attenuators for medical, consumer and strategic applications.
- Plasmonic for photostable nanoparticles in medical applications.
- Medical electronics.
- Stretchable electronic devices.
- COE on rechargeable batteries.
- Additive manufacturing.
- MXene based 2D materials for electronics applications.
- Plasmonic devices for cancer detection.
- Development of Si_3N_4 based high speed RADOMES.

9.4 ERNET India

9.4.1 VSAT Network

ERNET India has a VSAT network operating in C-band on GSAT satellite which provides Internet & Intranet access to education and research institutions located all over the country. The Master Earth Station (MES) is located at Bengaluru and is functioning as the Network Operations Centre (NOC). The network provides three types of VSAT links, viz., DVB-S2 ACM/MF-TDMA based Broadband VSATs; Normal SCPC VSATs and High Capacity SCPC VSATs. Presently, the satellite bandwidth of the network is enhanced to 111MHz on GSAT and this bandwidth is successfully used in providing connectivity services to remotely located educational institutes in North-East States, Andaman & Nicobar Islands and Lakshadweep Islands. The following are major projects under VSAT Network:

VSAT connectivity for Internet/Intranet access in the North-Eastern States of the country

ERNET India has established VSAT connectivity for Internet/Intranet access at 60 educational institutes/schools in the North-Eastern states of India funded by MeitY, Government of India. The connectivity is provided at all 60 sites up to 22.2.2020 for 03 years period. Thereafter, it is extended for 1 more year, i.e. up to 22.2.2021, at 37 schools on MeitY funding. The objective of the project is to connect schools and institutes located in the remote parts of North-Eastern states of the country through satellite based VSAT links, where reliable terrestrial connectivity is not available, for promoting equitable and sustainable development of these remote areas.

High Capacity SCPC VSAT link for NKN

ERNET India has established two High Capacity SCPC VSAT links for NKN project of MeitY located at (i) NKN Kavaratti, the U. T. of Lakshadweep Islands functional from 1.3.2017; and (ii) NKN Port Blair, the U. T. of A & N Islands functional from 9.1.2018; which are individually providing data rate of 47 Mbps at both locations. The National Knowledge Network (NKN) is using these links for providing connectivity to the knowledge institutions of the respective areas.



Figure: High Capacity SCPC VSAT at Kavaratti, the U.T. of Lakshadweep Island for NKN

High Capacity SCPC VSAT link for LITSS Lakshadweep

ERNET India has established nine High Capacity SCPCVSAT links for Lakshadweep Information Technology Services Society (LITSS) in 09 Islands of Lakshadweep viz., Agatti, Amini, Andrott, Chetlat, Kadmat, Kalpeni, Kavaratti, Kiltan and Minicoy. The satellite bandwidth of 25.5 MHz is allotted w.e.f. 31.10.2019, which is further enhanced to 42.6 MHz w.e.f. 23.2.2020 among these 09 sites. All the links are functional and are being used by LITSS.

9.4.2 eduroam Services- One Global Wi-Fi Network

eduroam stands for education roaming services. It is the secure, world-wide roaming access service developed for the research and education community. It allows students, researchers and staff from participating institutions to obtain Internet connectivity across campus and when visiting other participating institutions. 'eduroam' service is available in 106 territories worldwide.

ERNET India is a National Roaming Operator for providing eduroam services in India. This eduroam facility has been successfully availed by Indian and foreign participants in the universities/institutions. Academic and Research Institutions including IITs, IIMs, NITs, Central and State Universities and various other renowned institutions are benefited from these services. For more details: <http://www.eduroam.ernet.in>



Fig: eduroam worldwide presence

9.4.3 Setting-up ICT Infrastructure in Government Schools to Familiarize Usage of Personalized Adaptive Learning- Technology for every Student, a Globe for every Classroom

ERNET is taking initiative for learning through innovative and leading technology. In this regard, a project has been sanctioned by the Ministry of Electronic and Information Technology (MeitY). The objective of the project is to create ecosystem for Personalized adaptive learning. Activities include:

- Setting-up the advanced Digital ICT lab Infrastructure in 40 Government schools in 8 North-East States by using latest Tools and Technologies.
- To conduct awareness workshops across the 8 States towards enhanced, Digital Learning for teachers and Students.
- To provide training of Virtual Reality (VR) contents using project infrastructure to teachers.



9.4.4 Creation of Gamified Platform for Cyber Security

ERNET has developed Gamified Platform for Cyber Security through advanced Virtualization Technology - Virtual Reality (VR) & Augmented Reality (AR). Through this platform, ERNET will educate officials in the area of Cyber



Security like phishing, Social Media and Online Payment Security, Information Type - Personal Data, Internal use, Confidential level, Daily Actions

in case of attack and Advance Persistent Threat etc., through emerging experience in AR & VR.

9.4.5 Setting up Wi-Fi enabled campus

As part of Digital India initiative, ERNET India has set up Model Wi-Fi enabled Campus Network in below given 5 Universities as a Proof of Concept with tier-3 architecture upgraded to 10 Gigabit Fiber optic redundant backbone:

1. Allahabad University (AU), Prayagraj, U.P.
2. Savitribai Phule Pune University (SPPU), Pune, Maharashtra
3. Osmania University (OU), Hyderabad, Telangana
4. North-Eastern Hill University (NEHU), Shillong, Meghalaya
5. Utkal University, Bhubaneswar, Odisha

The Wi-Fi projects have been successfully completed in Allahabad University, SPPU, NEHU and Osmania University and phase-II is under process in Utkal University. The above WiFi projects are funded by MeitY.

It is a Controller based High speed Wireless access to Internet & Intranet resources with Security & Centralized Monitoring & Management Systems. The Wi-Fi Network enables students, faculty, teachers, staff, guests to have entry to Cyber world having intelligent Wi-Fi devices like Tablets, Smartphone, Laptop Computers to access, retrieve and post information at any-time-any-where basis across the Wi-Fi coverage area. Ease of availability of high speed Wireless access to Internet & Intranet resources enhance user's participation where user from all parts of the world can collaborate & share information/data for research & development & Education. The availability and accessibility to information & knowledge via the Internet has created opportunities for users such as distance learning, e-teaching, Internet banking, job opportunities, expansion of work circle, etc.

9.4.6 Domain Registration

ERNET India is an exclusive domain registrar for education and research domains; registering the domains under ac.in, edu.in & res.in from 2005. The domain registration, renewal & modification process has been fully automated with online payment facility for registering and renewing domain names on just a click. The automated website is GIGW compliant and runs on dual stack IPv4 and IPv6. In automated system customer can modify online their DNS entries and other permissible information related to their institution avoiding security breaches. ERNET also registers domain names under विद्या.भारत under Internationalized Domain Names (IDN)

9.4.7 Development/renovation of Government/ State Government websites accessible for Persons with Disabilities (PwD) as per GIGW /WCAG. 2.0 (A, AA level)

Under Accessibility India Campaign, one of the targets is to make all Government/State Government websites accessible to all. For this, the Department of Empowerment of Persons with Disabilities (DEPwD) has funded ERNET India to make State Government websites accessible as per GIGW and WCAG2.0 (A,AA level). ERNET has been given 917 websites of 23 States and UTs of the country to make them accessible and responsive. Accessibility of all websites will be achieved by making them responsive, CMS based and compliant as per Guidelines for Indian Government Websites (GIGW) & Web Content Accessibility Guideline (WCAG) 2.0 (A, AA level).

Significant progress has been made in converting State Government websites Accessible with work on more than 82% of the allocated websites having being completed.

Awareness as well as hands-on training on the websites developed by ERNET is given on a regular basis at State capitals so that the initiative

of developing and maintaining accessible websites is continued and enhanced.

During COVID-19, online hands-on training have been provided in Chandigarh, Puducherry, Himachal Pradesh, Rajasthan, Delhi etc.

9.4.8 Innovate for Accessible India (IAI)

As part of its outreach to support Innovation in the Accessibility domain, ERNET India, along with the DEPwD & DST came forward to help identify products and innovative ideas under the 'Innovate for an Accessible India' (IAI), an initiative of Microsoft and NASSCOM Foundation.

ERNET was also a key stakeholder in the evaluation and selection of the finalists and will also provide mentorship in the future as per need.

9.4.9 Smart Education & Emerging Technologies Division:

The division focus areas include following verticals:

- Smart Education & Next Gen SVC.
- Smart Village.
- Skills & Capacity Building.
- R&D Activities.
- Participation in International Collaborations
- Centre of Excellence (CoE).

9.4.9.1 Smart Education & Next Gen SVC:

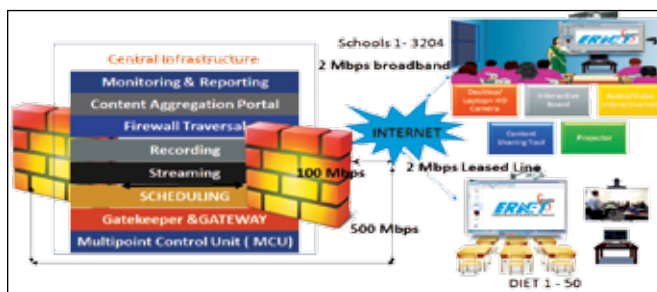
Enabling Schools with Smart Virtual Classroom Facility:

Smart Virtual Classroom (SVC) is a pre-scheduled, online, teacher-led pedagogical intervention where, unlike conventional classrooms, teachers are not present with learners physically but instead interact through public network in an online learning environment.

ERNET India "Smart Virtual Classroom" solution has established an ICT based virtual classroom facilities

in 3,204 Government owned/controlled schools plus 50 DIETs in seven pilot States - Himachal Pradesh, Gujarat, Rajasthan, Tripura, Haryana, Andhra Pradesh and Tamil Nadu. Project aimed to improve the 'quality of education' to students in remote/rural parts of the country. A Centralized control system was established in Delhi at ERNET's data centre which hosted the Multipoint Control Unit (MCU), Streaming/Recording server and other associated components for multiparty audio/video interaction and offline access of classroom sessions round the clock for learning/collaboration between all the stakeholders.

The SVC project created technology enhanced classrooms to foster opportunities for teaching and learning by integrating learning technology, such as computers, electronic white boards, projectors, specialized software, interactive audio-video systems, etc. The operational training of SVC infrastructure was provided to the School and DIETs teachers under the project.



Smart Virtual Classroom project achievements:

- Established 01 Central Location for Hosting MCU, scheduling s/w, Recording/Streaming Solution for enabling storage of live sessions, offline access and multiparty conferencing.
- Established 50 high-end smart virtual classrooms in each of the identified 50 DIETs, equipped with hardware based Video Conferencing & electronic teaching aid equipments.
- Established 3,204 smart virtual classrooms in 07 States, equipped with Software based

Video Conferencing & electronic teaching aid equipments. (Andhra Pradesh, Tamil Nadu, Gujarat, Rajasthan, Haryana, Himachal Pradesh, Tripura).

- Established Knowledge aggregation portal acting as a single platform for scheduling of sessions, data analytics, accessing off-line repository of sessions through a unique user name password.
- Imparted operational hands-on training to the DIETs/school staff with a training manual.

Project usage statistics:

- A total of 3100+ such sessions have been conducted from January, 2020 to till now so far which have been attended by more than 1 lakh students during this duration.
- After the funding support from MeitY ended on 31st December, 2019, ERNET India is managing the operations & maintenance of Smart Virtual Classroom infrastructure installed at 280 Schools & 4 DIETs of Himachal Pradesh and 699 Schools & 11 DIETs of Gujarat through State funds for the duration of 1st January, 2020 to 31st December, 2020.
- More than 19,476 sessions conducted through Smart Virtual Classroom since the inception of this concept.
- More than 65,092 teachers have been trained till now under the project for operational skill set.
- More than 70,77,600 students attended the live sessions till now and increasing on daily basis



Contribution during lockdown period:

- The central infrastructure established under the project has been maintained and kept operational with funds from Himachal Pradesh and Gujarat.
- Considering the pandemic, ERNET India is also facilitating other project States (Haryana, Rajasthan and Tamil Nadu) in conducting the Smart Virtual Classroom sessions/classes by supporting School teachers in taking lectures from their home.
- During the lockdown period ERNET India has ensured that using software based solution, classes were running in the State of Himachal Pradesh, Gujarat, Rajasthan, Haryana, and Tamil Nadu.
- Teachers are conducting the Smart Virtual Classroom sessions/lectures from their home by utilizing the software based Smart Virtual Classroom video conferencing solution through a generated webcast link. Students are clicking on the webcast link and attending the lectures/sessions live on mobile phone/laptop by sitting at their home.
- During lockdown period since April 14th, 2,900+ sessions have been conducted till date benefitting more than 1 lakh students.
- Promotion of AarogyaSetu Application were conducted during this pandemic.
- The State of Himachal Pradesh and Haryana acknowledged, appreciated and also published ERNET India's contribution during the pandemic in their local newspapers.



Social Initiatives Undertaken by ERNET through Smart Virtual Classroom (SVC)

Social Focus

Various sessions/lectures have been conducted regularly towards social awareness and Vocational focus. Social focus includes Environmental Education, Human Right Education, E-waste Management, Dengue Awareness, Disaster Management, Personal Hygiene, Swachhta Awareness, AarogyaSetu Awareness, etc.

Promotion of “AarogyaSetu” App

During COVID-19 pandemic, AarogyaSetu application's awareness sessions were conducted.

S. No.	Details	Overall Numbers w.r.t Promotion (starting from 1 st May, 2020 to 17 Sept. 2020)
1	No. of sessions conducted	1,869 Sessions
2	No. of Students attended the sessions	1,07,711 Students



Digital Krishi School

Education and training needs are for all domains and hence ERNET India progressively identifies need of technology in various domains. ERNET India approached agriculture domain and scheduled various online interactive expert sessions with farmers by utilizing the established Smart virtual classroom infrastructure. The successful idea gave

birth to the concept of Digital Krishi Schools. Digital Krishi Schools are scheduled, online, agricultural expert-led pedagogical intervention where experts are not present physically with farmers but instead experts interact through network in an online learning interactive live environment.

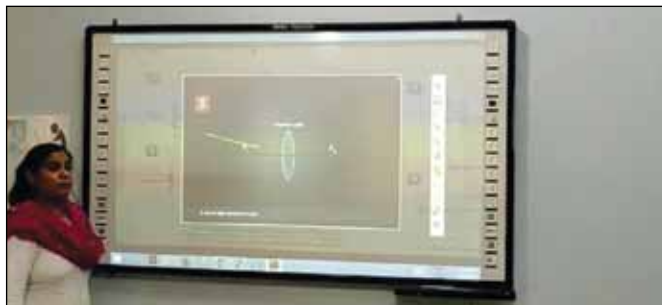
This is just like a real classroom, wherein a farmer and agricultural expert are logged into the interactive video conferencing sessions and experience the virtual classroom environment by making use of electronic interactive equipment's such as board, projector and professional desktop. The farmers attend the concurrent live and interactive sessions taken via mentor location. The Mentor location is the location from where specialized agricultural experts take lectures and those lectures can be viewed & interacted live at remote IARI Centres. ERNET is planning to build such Digital Krishi Schools in the coming years and support the agriculture domain in the education and training objective.



NextGen SVC

In order to support the Smart Virtual Classroom infrastructure with the latest technology augmentations, ERNET India plans to augment the student's learning with more advanced & latest technological tools/solutions advancements in education domain. This will aid student's learning, increase their knowledge retention, improve teacher student engagement and students will remain motivated during learning. We are planning to bring in e-content from Pre-primary to class 12th,

source digital content using Immersive technologies & working to build assessment and classroom engagement mechanisms using AI (Artificial Intelligence) and AR (Augmented Realty).



ERNET India has Conducted a Need Assessment & Need Generation survey with 14 States and 2 UTs (Odisha, Bihar, Uttar Pradesh, Jharkhand, Maharashtra, West Bengal, Chattisgarh, Goa, Karnataka, Kerala, Punjab, Telangana, Uttarakhand, Jammu and Kashmir, Puducherry, Lakshadweep) and informed them about ERNET India working on bringing in Solution in Digital E-Learning Content and Augmented Reality (AR).

Supporting other Ministries/Departments for establishment/expansion of SVC

With the experience gained from implementation of Smart Virtual Classroom, ERNET India has started supporting the other Ministries for establishment/expansion of Smart Virtual Classrooms.

- In line with the same, ERNET India has been bestowed a project from North-Eastern Council (NEC) titled as “Tele-education project- Establishment of Smart Virtual Classrooms in Aspirational District of NER” for setting-up of Tele-Education facilities by establishing Smart Virtual Classroom in 75 Schools & 4 DIETs: In phase-1, it includes:
 - 3 Aspirational Districts of Assam (i.e. 12 Schools in Barpeta, 11 Schools in Dhubri and 9 Schools in Goalpara).
 - 1 Aspirational District of Sikkim (i.e. 43 Schools in West Sikkim).

The overall project is envisaged for aspirational and other districts of North-Eastern States having facility of internet connectivity.

- ERNET India is also in an advance stage of discussion with Navodaya Vidyalaya Samiti for establishment of Smart Virtual Classroom in Jawahar Navodaya Vidyalaya across the country.

Smart Village

To support on-going flagship scheme of Government of India named as “BharatNet” for provision of broadband access to the citizens in rural and remote areas thereby bridging the digital divide, ERNET India is aiming to contribute towards leveraging the “BharatNet” by enabling Smart Elements in villages towards utilizing the “BharatNet” available at the Gram Panchayat. The concept “Smart Village” is envisaged to make the villages smarter through innovation in Information and Communication Technology (ICT)/Internet of things (IoT) technology to improve the service delivery, safety, security, health care, education and internet connectivity, information dissemination at villages by implementing the respective smart elements infrastructure.



The concept was discussed with various States and in consultation with Kerala, ERNET India has finalized the smart elements (Landslide Monitoring, Animal Intrusion Detection, Smart Street Lighting, Public Address System, Environmental Monitoring Station and Command & Control Centre) based

on their local issues/problem areas. ERNET India has also successfully finalized the smart elements to be deployed in Sikkim (Surveillance, Smart Classroom, Smart Health, Smart Street Lighting, Public Address System, Variable message sign board and Command & Control Centre). Further, ERNET India is also in discussion with Chhattisgarh to identify the problem areas and finalize the smart elements for their solutions.

The proposals towards the implementation of Smart Village Concept has been submitted by ERNET India to DoT and e-infrastructure division of MeitY for the funding support.

Skills & Capacity Building:

Future Tech Learning & Skilling Center (FTLSC)

Emerging technologies is 'Future of Work' and it is essential that we quickly leverage the advantages of the newer technologies. In order to build skilled Manpower capacity for Future Technologies like 5G/AI IoT etc., ERNET India is aiming to provide specialized technical training by establishing a Future Tech Learning and Skilling Centre (FTLSC) with a concept of Competency development and skilling of Manpower on future technologies starting with 5G, Technologies standards, BlockChain, Software coding skills, Li-Fi, IoT, etc., the concept will be an incessant and sustainable effort to cater to the current and upcoming future technology skilling demand.



FTLSC aims to provide specialized trainings via following modes:

- Contact Classroom + Hands on Workshops based trainings with Short Term/Mid Term Courses (1-6 days).
- Online Self-Paced Learning Programs/ Massive Open Online Courses.
- Virtual Mode (Webinars, GoToMeetings, Interactive VC Meetings)

To begin with, in collaboration with academia and industry, ERNET India has implemented the program by organizing a series of 4 technical webinars on "5G and Emerging Technologies" which was attended by 200+ participants.

Information Security Education Awareness ISEA – Phase-II

ERNET India is one of the implementing agencies for Government officials training under the project Information Security Education & Awareness (ISEA) Phase-II, funded by MeitY for the duration of 5 years (2015-2020). Under this project, ERNET India has organized 12 training programs in which 299 Government officials have been trained in Tamilnadu and Karnataka regions. The training program covered topics on Information & Network Security, Smart Grid Security, IoT Security and relevant hands on session for the benefit of Government officials. The participants came from various Government organizations like Indira Gandhi Centre for Atomic Research (IGCAR), Commissionerate of Municipal Administration (CMA), Tamil Nadu Electricity Generation and Distribution Corporation (TANGEDCO), National Institute of Ocean Technology (NIoT), National Institute of Wind Energy (NIWE), Defence Research and Development Organisation (DRDO) and Indian Meteorological Department (IMD). Due to COVID-19, the training sessions are being planned in on-line mode.

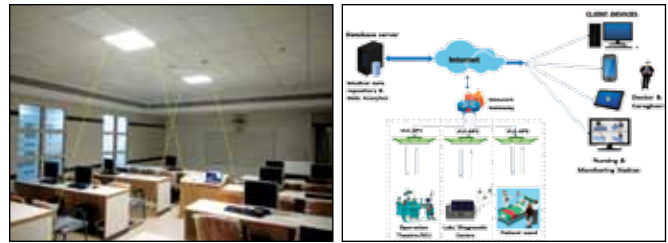
R&D Activities

Optical Wireless Access Network for Rural and Urban Communication

ERNET India has earlier executed an internally funded Li-Fi project jointly with IIT Madras with an objective to study Li-Fi as an alternate Communication Technology and perform visible light communication experiments. Under this project, indoor Li-Fi Multi user testbed was setup at ERNET Chennai and various Li-Fi experiments are being carried out. The experimental results based on channel characterization for user mobility was studied.

ERNET India is currently executing a joint project with IIIT Delhi funded by MeitY on 'Optical Wireless Access Network for rural and urban communications' that received administrative approval by MeitY on 15.10.2019. Under this project, the objective is to provide Optical Wireless (OW) connectivity for rural and urban communication scenarios: (i) OW connectivity for Rural includes designing a relay broadcast unit and rooftop receiver unit for end-to-end bidirectional last mile communication. (ii) OW connectivity for Urban includes developing a Hybrid Li-Fi-Wi-Fi testbed, AP selection and resource allocation algorithm and link aggregation experiments. The outcome will be demonstrated in real-field with use case scenarios like auditorium/hospital environment. Both ERNET and IIIT Delhi are jointly working towards setting-up Hybrid Li-Fi-Wi-Fi testbed for the experimental work.

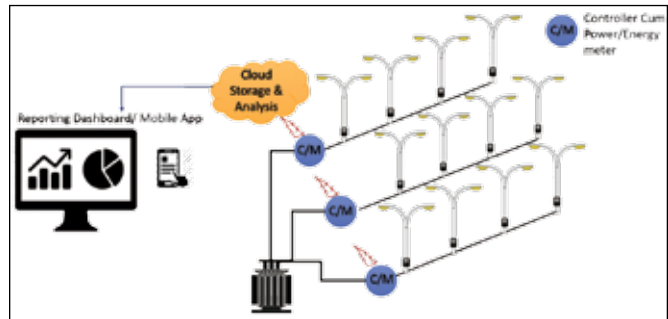
ERNET had carried out indoor Li-Fi experiments to study the channel characteristics and formulate the problem statement to address some of the challenges. The performance results of the experiments were published in an International conference. Currently, ERNET is jointly working with IIIT Delhi for the development of algorithms for mobility management in a hybrid Li-Fi-Wi-Fi environment.



Publication: Li-Fi experimental work on 'Indoor Visible Light Communication Channel Characterization for User Mobility: A Use-Case Study', International Conference on Visible Light Communication and Positioning (ICCLCP 2020), July 16-17, 2020, Stockholm, Sweden.

Internet of Things (IoT) Management Framework for Smart Cities

ERNET India's joint work with Indian Institute of Science (IISc), Bangalore on experimental LoRaWAN network integrated with smart streetlights for real-time experimentation has resulted in Book Chapter publication. As part of the project, the LoRaWAN smart streetlights deployed in IISc campus were considered for experimentation to understand LoRaWAN performance and scalability aspects in real time.



Based on the outcome and experience with LoRa enabled Smart Streetlights developed under this project, a proposal was submitted to Tamil Nadu e-Government Agency (TNeGA) on 'Smart Streetlight Monitoring and Control for villages' jointly with IIT madras in March, 2020. This is currently being discussed with TNeGA for funding and executing as a pilot in 3 villages of Tamil Nadu.

Subsequently, Smart Village proposal combining IoT & ICT based approach utilizing BharatNet has been created and submitted to MeitY for funding.

Publication: The outcome of the project has resulted in a book chapter titled “LoRaWAN for smart cities: experimental study in a campus deployment” in the book titled “LPWAN Technologies for IoT and M2M Applications” and it was published in March 2020 by Elsevier.

Smart Building Power Line Communication (PLC) Testbed

ERNET India and IIT Madras has setup a Smart Building PLC testbed towards energy efficient buildings as part of IEEE initiative. Under this project, indoor parameters like air quality, temperature, ambient light, occupancy including power consumption are measured over PLC. Currently, PLC testbed is setup at ERNET Chennai and development of APIs are in progress for data collection and analysis. The outcome of this project will create opportunities for the deployment of PLC testbed in a Government Departments/Ministerial building to show case Proof of Concept (PoC) and also deliver large-scale deployments/proposals for PLC based sensing applications in smart buildings. This project is sponsored under the IEEE PLC testbed initiative supported by ST Microelectronics & SLSCorp.



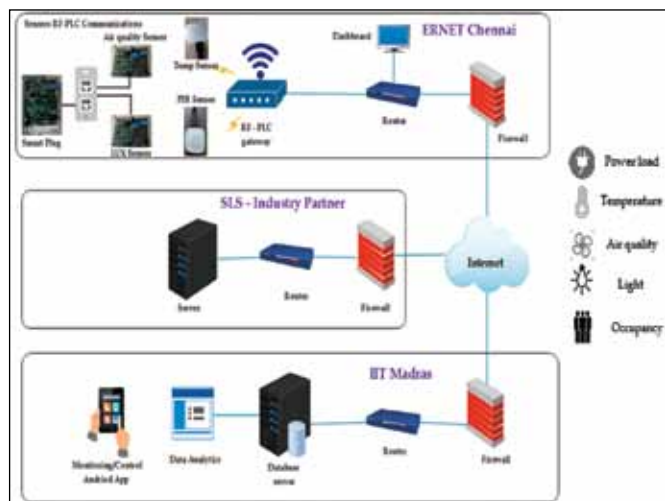
Published in IEEE IoT Newsletter, November 2020 - 'Smart Building PLC Testbed Leveraging IoT Network Technologies', <https://iot.ieee.org/newsletter/november-2020/smart-building-plc-testbed-leveraging-iot-network-technologies>.

Free Space Optics Technology

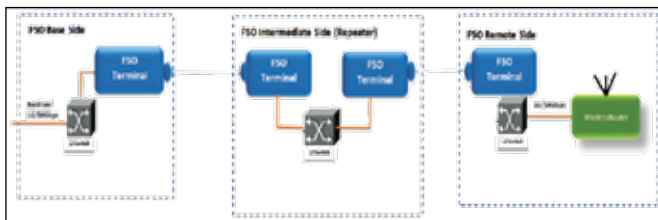
The “Free Space Optics Technology (FSOC) for providing the connectivity to Kohima Science College from Kohima Secretariat, Nagaland” is MeitY funded R&D pilot project with the overall aim of providing the high speed network connectivity and measuring the performance of the established FSO link.

Free Space Optics is a line-of-sight technology that uses invisible beams of light to provide optical bandwidth connections that can send and receive voice, video, and data information. The technology propagate the light in free space means air, outer space, vacuum, or something similar to wirelessly transmit data for telecommunication and computer networking. It operates between the 780–1600 nm wavelengths bands and use O/E and E/O converters. This optical connectivity doesn't require expensive fiber-optic cable or securing spectrum licenses for Radio Frequency (RF) solutions. With this project implementation, ERNET sees a great opportunity to deploy FSOC technology in places where other connectivity solutions cannot be used due to various factors such as difficult terrain.

The existing Kohima Secretariat office NKN/SWAN connectivity will be extended by Free Space Optics Link (FSOL) from Kohima Secretariat to Kohima



Science College. This extension of network will benefit the students of Science College of Kohima. The project R&D will result in understanding the impact of Kohima's weather conditions on FSO technology by measuring the FSO Link performance during the Pilot which will help in preparing the guidelines for selecting the other locations which can be connected via FSO. The project will explore another promising means of High Speed infrastructure connectivity provisioning.



Participation in International Collaborations

Cyber Performance and Tech-Culture fusion programs under APAN Asi@ Connect initiative

ERNET India as part of the APAN Asi@Connect initiative had collaborated in Cyber Performance Phase-I. Under this project, ERNET had participated in the tech-culture fusion platform including training programs and Cyber Performances with 6 beneficiary countries, namely India, Vietnam, Malaysia, Bangladesh, South Korea and Pakistan. During the Live Cyber performances, artists/musicians from India, Vietnam, Pakistan, Malaysia, Korea and Bangladesh have performed together over the TEIN and National Research Education Network (NREN) of each country exchanging high quality video/audio.

The follow up project, Cyber Performance Phase-II was initiated for focusing production and broadcast of multinational cultural contents created by the beneficiary nations to document/broadcast aspects of local culture, history, ethnography, agriculture, health, musical and theatrical performance. The project partners are from India, Bangladesh, Malaysia, Nepal and Pakistan with the project period of 18 months starting from December, 2019.



Centre of Excellence (CoE)

MeitY-ERNET-NASSCOM CoE for IoT was setup in June, 2015 in Bangalore with the overall objective of enabling India as technology hub for emerging technologies. The CoE is funded 50:50 on Public Private Partnership (PPP) model between MeitY and NASSCOM through its industry partners. Under COE-IoT Bengaluru, a number of start-ups have been incubated and are getting uninterrupted access to advanced equipment. The start-ups have an opportunity to make direct connects with various strategic partners of NASSCOM and get validated by experts of the industry. The following are the highlights of CoE- IoT, Bangalore:

- 93 Start-ups enrolled in house, connected with 1,522 start-ups pan-India
- 117 IoT researchers incubated
- 76 Prototypes showcased
- 23 Papers presented in global conferences
- IP's applied -19, Received- 9
- 34 Societal projects executed
- Employment Generated- 1076
- Partners Signed up: Strategic-18, Co-create-2, Innovation-8, Infrastructure-6, Technology-3, Ecosystem-3, International-2
- Event Organized/Participated: 99/143 Thought leadership events till date across pan India Focused on - Industry 4.0, Automotive/ Transportation, Healthcare, Energy, Agriculture, Smart Cities.

9.4.10 Terrestrial WAN Activities

Setting-up of e-classroom in 50 medical colleges under NMCN Scheme

ERNET India had successfully implemented the Ministry of Health and Family Welfare (MoHFW) project for setting-up of e-classroom Infrastructure in 50 Government Medical colleges spread across the country. This project named as National Medical College Network (NMCN). The installation, commissioning and Go-Live activities have been completed in all 50 medical colleges under NMCN Scheme. The established E-Classroom Infrastructure is being used extensively and till date 18,000+ sessions (initiated/attended) have been conducted in the fields of Radiology, Microbiology, Gastro Surgery, Pediatrics, Urology, Palliative Care, CGR, CPC etc., on NMCN by various Medical Colleges benefitting Medical students/staff of 50 Medical Colleges across the country. The e-classroom infrastructure in the 50 medical colleges being maintained and managed by ERNET India for 5 years.

Telemedicine during COVID Period through NMCN Project

National Medical College Network has acted as boon to deliver Medical education through video conferencing and web conferencing. Approximate 3000 no of sessions conducted by Medical college professor so far since April. Many Professors used this network to provide telemedicine services across country.

It is proposed that each and every Medical college shall connect through this network to tap the benefits of Digital technology. This network will do miracle and take the medical consultancy of best professor upto Rural India.

Video Conferencing Session through National Medical College Network (NMCN) during the Inauguration of “COVID-19 National Teleconsultation Centre” at AIIMS New Delhi by Hon’ble Minister of Health & Family Welfare Shri Harshvardhan on 28th March, 2020.



Medical Classes conducted during COVID period



Implementation of ISO 27001:2013

ERNET India has initiated the process for implementing ISO 27001:2013. It will help ERNET to establish, implement, maintain and continually improve an information security management system within the context of the organization. Documentation & Internal Auditing has already been completed. It is expected that ERNET India will get ISO 27001:2013 by January’2021 end.

Web and Email Hosting

ERNET India is providing web hosting services to the various Educational/Academic & Research Institutes, Departments/Organisations. ERNET INDIA has setup a web hosting infrastructure on Cloud. Currently, ERNET India is providing web hosting services to Educational institutes. Name of few institutes are:-

1.	National Bureau of Animal Genetic Resources
2.	National Institute of Agricultural Economics and Policy Research
3.	Directorate of Weed Science Research
4.	Central Council for Research in Unani Medicine
5.	Hemvati Nandan Bahuguna University
6.	National Book Trust (NBT)
7.	G B Pant Engineering College, Pauri Garhwal
8.	National Institute of Research on Jut & Allied Technology, Kolkata
9.	Indian Institute of Farming Systems Research
10.	Sant Longowal Institute of Engineering & Tech., Sangrur
11.	Central University of Punjab
12.	National Institute of Fashion Technology
13.	Indian Maritime University

9.4.11 National Pension Scheme (NPS) awarded ERNET India as “Best Central Autonomous Body” for F.Y. 2018-19

“ERNET India migrated to National Pension Scheme (NPS) in February’ 2017. After one year of its implementation, ERNET India’s compliances with the scheme parameters were recognised by PFRDA and ERNET India was awarded as Best Central Autonomous Body for F.Y. 2018-19”.



9.5 Government’s IT infrastructure: National Informatics Centre (NIC)

9.5.1 About NIC

Established in the year 1976, National Informatics Centre has emerged as a promoter of digital opportunities for sustainable development. NIC has rich experience in providing ICT & eGovernance support in last 4 decades. By establishing the ICT Network, “NICNET”, NIC has facilitated the institutional linkages with all the Ministries/ Departments of the Central Government, 37 State Governments/Union Territories, and about 720+ District Administrations of India. NIC has aligned itself with mission and vision of Digital India Programme. Generic, configurable e-Governance products/applications have been developed using cutting edge technologies including mobile, cloud, data analytics, BI and advanced GIS. Various centres of excellence have been created to strengthen the nationwide digital infrastructure and services playing catalytic role in the country’s road to digital transformation in the next decade.

The data centres of NIC host more than 8,000+ websites of the Government in the secured environment. The NIC National Cloud (Meghraj) is presently hosting a number of critical applications on over 20,000 virtual servers supporting over 1200 e-Governance projects/User Departments under Digital India. NIC's video conferencing service is helping Government officials to connect remotely and effectively with each other.

In present post pandemic scenario of increasing remote working, work from home culture and demand for more online services, NIC is providing smart e-Governance solutions to cater these requirements. NIC has successfully created a digitally enabled ecosystem for the Government in carrying out essential services during the lockdown as well in post pandemic time.

NIC products and Services have also been recognized internationally with many countries showing keen interest in taking NIC's support in IT & e-Governance.

9.5.2 Network Services

9.5.2.1 NICNET

Core of NICNET backbone is fully upgraded to multiple 10 Gbps capacity with sufficient redundancy. States are connected through multiple 1/10 Gbps links and districts 34/100 Mbps links with redundancy built at State and District links. Last mile redundancy for NICNET has been extended to more number of districts, with primary link from BSNL and secondary links from Railtel/PGCIL. Most of the Bhawan Links at Delhi are upgraded from 100 Mbps to 1Gbps depending upon the requirement.

Direct peering of NICNET with BSNL, PGCIL and Railtel are completed at Delhi and Hyderabad for saving Internet Bandwidth and faster access of each other's Network and Data Centre. Peering with Google, Microsoft, facebook and Akamai Content

Delivery Network has facilitated faster access to Google services and other important International web sites. Re-structuring of Videoconferencing network has enabled to minimize delay and handle large-scale important video conferencing such as PRAGATI and GST Council Meetings.

High speed Internet services are provided to all National data centres to ensure applications hosted are accessible to users across the globe with minimum latency. Capacity planning and upgradation of Internet Gateway at regular interval has been undertaken to provide smooth Internet access to all NICNET users throughout the country. To maintain accurate timing and synchronization of all network elements and servers on the network, Stratum-1 clocks are installed at Delhi and Hyderabad.

NIC VSAT network NICNET has been offering Ku-Band satellite based connectivity for providing data, video conferencing services for delivering e-Governance services in geographically difficult locations where terrestrial connectivity is either not available or reliable. For running VSAT services, NIC has leased transponder bandwidth from DoS/ISRO on GSAT-18 satellite.

9.5.2.2 NKN

NKN empowers Digital India, as it is the primary backbone for all e-Governance initiatives in the country. It is the only network globally, that carries R&E, Internet and e-Governance traffic as independent verticals under one umbrella. NKN has multiple 10G links that are combining a core bandwidth of close to 1000G, providing secured and highly resilient connectivity across major Institutions for research, education and e-Governance.

NKN has a strong backbone connectivity with 31 Points of Presence (PoPs) in various State Capitals and 92 core links connected with meshed topology. Moreover, currently over 700 Gigabits (reaching a

peak of 5 Petabytes) of data is flowing within the NKN backbone every day. Over 40 links (premium Institutes, SDC (State Data Centres) & SWAN of many States) have been upgraded to 10 Gbps. NKN has also established a High Capacity SCPC VSAT Connectivity at Kavarati, Lakshadweep and Port Blair, Andaman & Nicobar Island.

9.5.3 Data Centre & Cloud Services

9.5.3.1 Data Centre

NIC is providing Data Centers Services from National Data Centres at Delhi, Hyderabad, Pune and Bhubaneswar. Kubernetes and Container based Cloud services have been also started from this NDC Bhubaneswar.

National Data Centre at Delhi was upgraded with 2.8 PB Enterprise class storage, latest & high throughput Network Load Balancers and AAA Servers. ICT infrastructure of number of projects of national importance were hosted/enhanced, some of these are PFMS, e-Courts and e-Transport. Deployed Chassis based Firewalls for E-Way Bill Application. Data center link was upgraded from 30 Gbps to 40 Gbps. Internet links were upgraded from 20 Gbps to 40 Gbps. ACI based SDN infrastructure was enhanced to connect more than 250 servers. Web Gateway was deployed to access network device securely via web browser over NIC VPN.

NIU Hyderabad has rack space has been enhanced to over 200 racks with the provisioning of energized space of 100 racks. The enhancement of Data Centre Physical Infrastructure with adequate redundancies involved enhancement of power capacity by over 70% to facilitate primary hosting and DR of various critical e-Governance Applications. This rackspace is being populated with the ICT Infrastructure required for Cloud, Network, Storage, Cyber and Application Security in the phased manner.

NDC Pune network security devices has been upgraded to high speed network and has provided

DR hosting to e-hospital, e-court and MCD project. ICT Infrastructure and services were strengthened for enhancement of NIC Cloud services from NDC Pune.

9.5.3.2 National Cloud

NIC launched National Cloud Services in year 2014 under Megh Raj Government of India Cloud Initiative. NIC Cloud Services are being provided from multiple locations of National Data Centre. Various new services are now offered on Cloud including Application Programme Monitoring (APM) Service, Data Analytics (DA) Service, Resource Monitoring (RM) Service and Container Service. In order to cater to the projects envisioned under Digital India Programme and growing requirements of existing Projects, over 20,000 Virtual Servers were provisioned and allocated to over 1,200 Ministries/Departments for e-Governance Projects.

Establishment of NIC State Clouds: State Clouds are operational in fourteen States & during this period state cloud will also be operational in four more States.

Software as a Service is a delivery model wherein Cloud provides various readymade Services for direct consumption of its users. NIC is presently offering following Software Services over its National Cloud:

WAF as a Service: It provides effective protection mechanism against cyber-attacks at web layer. It blocks an ever-expanding and sophisticated web-based intrusion & attacks listed under Open Web Application Security Project (OWASP). It would also help in tracking emerging attack vectors at application level and helps in restricting the same.

Agile as a Service: provides is combination of frameworks, tools and software practices for development and delivery of fast paced user centric software solutions. Practices and frameworks touch upon all the aspects of software development from

planning (Scrum) to deployment and monitoring (DevOps).

Gol Search (GOI-S) as a Service: It is a managed Search service on the Gol Search Platform that makes it easy to set up and manage search interface on any website/portal or online web application. Gol SaaS enables to search large collections of data such as web pages (HTML documents) and document files like PDF, Open Office documents (.odt, .ods, .odp) & MS Office documents (.doc, .xls, .ppt) etc., With Gol-SaaS, the website owners can quickly add search capabilities to their websites.

Resource Monitoring as a Service enables a cloud user to have real-time as well as past visibility of cloud resource usage like VM uptime, CPU & Memory, disk, network, etc., It also enables users to monitor availability applications & websites through remote network ports or URLs.

Data Analytics (DA) as a Service enables users to build infrastructure for examining & analysis of large data sets to underline insights, patterns from retrospective to prospective in helping the decision makers to look into the future and plan accordingly. Infrastructure hosted in the NIC National Cloud and provides an alternative for data analytics infrastructure. Users can either choose Hadoop (Big Data) or ELK stack to build their ICT infrastructure.

Application Performance Management (APM) Service is an agent-based solution for managing the performance and user experience of applications in the NIC Cloud. This requires installation of monitoring agent software for collection of performance data from various components of application. The data is analysed in the APM server for actionable insights through a dashboard.

Load Testing as a Service helps users in validating their application design and server Infrastructure on Cloud for expected concurrent user load wherein the system's response is tested under varying load conditions simulating concurrent virtual users

accessing the application under test.

Chatbots as a Service: Conversational AI in form of virtual assistants, chatbots and voice-bots have gained popularity, it gives users new ways to interact with product by building engaging text-based conversational interface i.e. Chatbot, powered by Artificial Intelligence (AI). Chatbots helps to conduct a conversation via auditory or textual methods and are often designed to simulate how a human would behave as a conversational partner. Its use can expedite processes in user organisations with automated answering systems in their applications.

e-Granthalaya as a Service is a Library Management Software useful for automation of in-house activities of libraries for rendering online member services. The software provides built-in Web OPAC interface to publish the library catalogue over Internet. The software is UNICODE Compliant thus, supports data entry in local languages.

9.5.3.3 Command and Control Centre

Command & Control Centre (CCC) has been operational at NIC HQ with the objective of providing single window solution for monitoring, troubleshooting and technical support for applications hosted in NIC Cloud, National and NIC Mini data centres across the country. In last one year the demand of services offered by CCC has been increased manifold CCC has been providing following services:

Resource Monitoring Service has been using open source "Open NMS" for service and resource monitoring of ICT infrastructure hosted across NIC Data centres and applications on NIC Cloud on 24x7 basis.

Application Performance Management: On demand APM service to troubleshoot and streamline application performance.

Application Load Testing : CCC has started self service model for application load testing for the applications hosted on NIC cloud and data centers.

Troubleshooting & Technical support: Support to applications in resolving various issues ranging from basic OS/software configuration to troubleshooting issues in live applications, software upgrades and patching, resolving security issues (VA), SSL configuration and renewals etc.,

CDN Service : Many critical websites/applications have been using CDN service including Static Aarogya Sethu, MyGov, PM India, PM Cares, National Portal, MHA, MoHFW, Min of Ayush, Digi Locker, Umang etc., More than 16 TB per day traffic has been served through CDN.

Webcast Service: Live/On-demand webcast to Central and State Government In view of COVID-19 pandemic situations, the demand for live webcast has been grown manifold. Now days more than 100 webcasts have been extended per month.

9.5.4 Cyber Security

Cyber security incorporates the security standards and procedures followed to ensure protection of sensitive data, personal information, Intellectual Property etc., Multi layered access mechanisms are implemented on information systems for prevention from security breach and unauthorized access.

To prevent the misuse of the power of social media, Indian Cyber Crime Coordination Centre (I4C) has set up a workflow-based Open Source Information Sharing System (OSISS) through NIC. This initiative aims to provide a secure platform to various stakeholders like Ministries, States, Law Enforcement Agencies (LEAs), Specialized Cyber Space Agencies and senior officers in MHA to feed and share open-source threat data among them for proactive, preventive, and protective actions by individual entities. The information is crawled to OSISS with the help of open source social media

analytic tools and Hydra application. OSSIS has been hosted in NIC cloud and integrated with Single Sign-on (SSO) platform, Parichay of NIC.

The platform assists to search from open-source contents and enter the events related to Threat Categories like Cyber Crime, Left Wing Extremism, North-East, J&K Terrorism, National Sentiments Separatist, Trending issues, Radicalization, JMB, etc., Now the system is being rollout in all the States to make it wider utilization.

9.5.4.1 Network Security

The Network Security Division (NSD) has ensured round the clock Cyber Security of NICNET in general and National and State Data Centres in particular during the year, in spite of the lock-down due to COVID-19 pandemic. The Division was constantly engaged in maintenance and administration of security appliances and solutions deployed in its security span comprising of various Data Centres, over 1,000 LANs of Government offices and MPLS networks, more than 2 lakh endpoints and a series of networking devices deployed across the country. The 24x7 Security Monitoring Centre has functioned uninterrupted during the period and taken care of real time monitoring, detection, prevention, analysis and reporting of cyber threats and attacks. Asset owners were alerted on attack attempts and remedial measures were suggested on a regular basis. Important events like publication of election and examination results, downloading of admit cards and JEE/NEET counselling sessions were closely monitored to ensure smooth delivery of services.

Antivirus protection during working from home (WFH) was provided for home computers using roaming client solution and by enabling OS specific inbuilt mechanisms. Infected clients making C&C connections to malicious destinations were identified and blocked at Unified Threat Management (UTM) appliances deployed across NICNET.

More desktops and servers were brought under automated Patch Management solution as a part of System hardening activity. Distributed Denial of Service (DDoS) attacks towards NIC infrastructure were prevented using Anti-DDoS Appliances deployed at gateway level. Latest signatures were regularly deployed in Network Intrusion Prevention Systems (NIPS) and deep packet analysis was carried out in monitoring and blocking mode. Geo-fencing of applications was also facilitated wherever needed and feasible. Additional/upgraded links were provisioned at Firewalls (wherever needed) to cater to the increased Network traffic requirements of NDCs and SDCs. Requests for opening of ports in Firewalls were implemented in a time-bound manner in coordination with server owners and request initiators. Internal audit of Network and Security appliances at Data Centres and Bhawans were carried out from time to time. Vulnerability Assessment of devices and servers were undertaken on periodic basis as well as on demand and coordinated with the asset owners to fix the vulnerabilities detected. Policies, Guidelines, Advisories and SOPs (Standard Operating Procedures) related to Cyber Security were prepared, updated and circulated among NICNET users. Several awareness programs were conducted on Cyber Security challenges during COVID-19 pandemic with special emphasis on working from home and usage of online meeting platforms.

9.5.4.2 NIC-CERT

NIC-CERT has been setup with the objective of creating a comprehensive security and incident response framework that integrates world class security components and inbuilt threat intelligence for detection, prevention and incident management. Using the tools, the team monitors and correlates events that would help in generating a canvas of the attack surfaced and identify the vulnerabilities and possible exploits. The mission of NIC-CERT

is to collectively lead and coordinate the Cyber Security incident response and strengthen the Cyber Security posture of National Informatics Centre. The core mission activities of NIC-CERT include:

- To co-ordinate and respond to Cyber Security incidents happening in NIC
- To provide Intelligence or advisory on the prevailing Cyber Threats and vulnerabilities, for proactively securing NIC's network and assets.
- To Establish and Maintain a centralized Log Management system for NIC and maintain a Knowledge base of Cyber Security Incidents handled by NIC-CERT

Some of the key milestones achieved by NIC-CERT are:

- Published around 200 Security Advisories and 220 Threat Intelligence Alerts.
- Played a crucial role in securing Government IT Infrastructure by proactively identifying over 2,500 vulnerabilities affecting Government ICT Infrastructure.
- Identified many security compromises, Government credential compromise, investigated hacking/defacement incidents, phishing incidents, typo-squatting domains, fake Government websites etc.,
- Undertook initiative to secure the Government LAN/WAN, by proactively identifying potential compromises and malicious traffic in the network.
- Sent regular Security Overview reports to the Chief Information Security Officers (CISOs) of various Ministries and Departments.

9.5.4.3 Application Security

NIC is formulating and updating the Security Policies for NICNET as and when required. Security Audit of Web Applications/Websites, Penetration Testing and Vulnerability Analysis, SSL compliance

testing, Version Detection for application hosting environment with infrastructure compliance checks are also done as per user requirement. Critical Web applications are secured through Web Application Firewall (WAF) to counter Application layer threats, Management and administration of deployed WAF solutions, configuration of critical sites including CMF (Drupal) based portals, WAF service support at NIU Hyderabad for non-compliant web applications and 24x7 monitoring service. The Application Security group also undertakes Incident Handling and Malware Analysis, Sanitization of security controls based on analysis results, Issuing advisories to NICNET users and is also aiming for provisioning of WAF as a Service Solution(WaaS) protection for NICNET hosted websites.

9.5.4.4 VPN

Virtual Private Network is a secure and cost-effective method of connecting private networks and mobile users over Internet. NIC's VPN service is used by Government officials, Central and State Government Departments, PSUs and Autonomous bodies under Central and State Governments to update their web sites and remotely manage the servers hosted in NIC's Data Centres. These also include NIC Cloud users for administration and management of VM Servers/Cloud platform. NIC is also offering new remote access technologies like WebVPN. This customized product is completely Indian and in addition to being lightweight and scalable (requires only a Web Browser) is also secure (through two factor authentication). NICNET has been extended through site-to-site VPN with other independent networks like Indian Missions Abroad. VPN services are secured using best of security practices and routine detailed log analysis.

9.5.5 Web, Messaging and Support Services

9.5.5.1 Domain Name Registration

NIC being an exclusive registrar of GOV.in since

1st Jan 2005, provide domain name registration service to all the Government Ministry/department/ States through the portal <https://registry.gov.in> .

There are currently 4,799 3rd level active domain and 1, 38,248 4th level active domain registered under it.

9.5.5.2 Email

eMail forms the backbone for all e-Governance initiatives in the Government. As part of the mandate under the Digital India program, Government of India is providing a secure eMail service to its officials for secure communication. NIC as the implementation agency, is providing secured email service along with 24/7 support to the Government, both at the Centre and State. All services under e-mail are offered free of cost to all officials under Ministries, Departments, Statutory Bodies, Autonomous Bodies, States and UTs.

The service, with the primary domain of @gov.in, is one of the largest eMail services in India. The service supports more than 1,276 virtual domains with over 2.7 million accounts, the growth in terms of complexity has been evident. The daily email traffic is more than 4.5 crore eMails per day.

The eMail service is based on five Primary Pillars: Security, Performance, Redundancy, Service Continuity and Rich feature Set. The service provides plethora of features to the users, some of the prominent features are: Supports 11 Languages, (currently with Hindi and English), supports Internationalized domain name (IDN)-with user ID as, assigning multiple templates per user as per roles of the officer and Kavach providing Geo Fencing and Device Mapping. NIC also provides eMail distribution list for bulk email for official purpose.

This service has been a lifeline for all communication during the ongoing pandemic.

9.5.5.3 SMS

SMS gateway service is also provided by NIC as a part of its messaging solution. The service is available to all Government applications both at the centre and State. It has various advance features like PUSH, PULL, block out time, scheduling, localization of content, international SMS, OBD (Outbound dialling), Missed call service, SMS analytics/visualisation etc., Currently around 2200 e-Gov applications are integrated with the gateway which includes various critical projects like Mann Ki Baat, MyGov, Sampark, Digital India portal, eHealth, National Scholarship portal, Jeevan Pramaan, BAS, Mother and Child Tracking, Khoya Paya, Income Tax, Vahan, Sarathi, eProcurement, e-way bill, GST etc., The average monthly traffic is about 97 crore SMS. The service also offers multilingual SMS options for localization in different parts of our country.

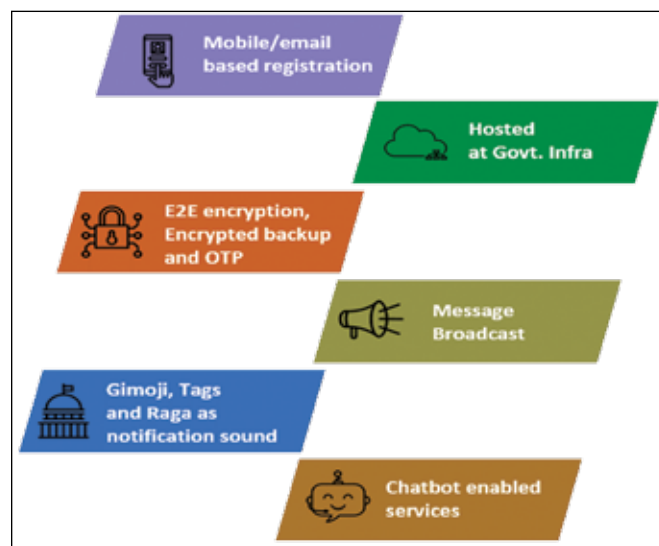
9.5.5.4 Single Sign On “Parichay”

Under messaging services the Single Sign On platform “Parichay” has been released. This platform enhances the security posture of all Government applications as it provides a secure sessions based access and provides two factor authentication. It has over 100 applications integrated and has a citizen platform named “Jan-Parichay” that is offered to all Citizen centric applications. Citizens can self board on any citizen service using any attribute like Aadhar, Mobile number, email address, Driving License, PAN etc., The platform offers both a central and federated architecture with seamless citizen/user movement. It has in-depth analytics for security.

9.5.5.5 Government Instant Messaging System (GIMS)

GIMS is an open source based, secure, cloud enabled, and indigenous platform developed by NIC for instant and secured messaging amongst Government and citizens. The Mobile App, the

Portal and the Gateway are the three major components of GIMS. The App can be configured to manage messaging and is integrated with other Government Apps. The management portal is for the organisation and employee on-boarding, group management, employee verification, broadcasting messages, dashboard and analytics. The messaging gateway manages the messaging and integration with other Government Apps. GIMS is presently hosted at NDC Shastri Park and the Android and iOS versions are available at <https://gims.gov.in>.



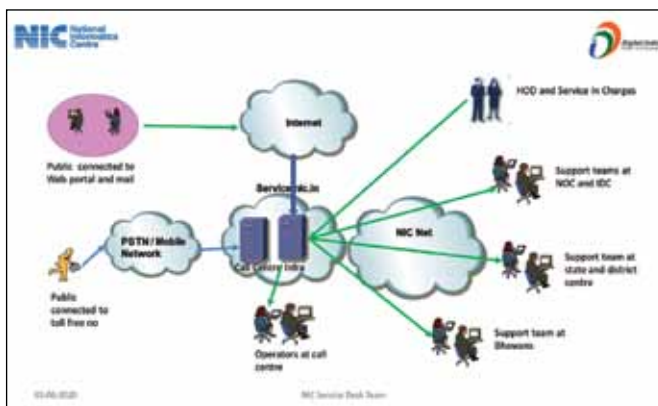
Around 50,000 users of 150 Organisations have participated in the POC of the App. Highlights of GIMS include email and mobile based self-registration, one to one messaging, group messaging supporting official, casual and list groups, file and media sharing, audio/video call, profile and contact management, message broadcasting and chatbot enabled dashboard. The use of pluggable E2EE algorithm, secure OTP and secure backup makes GIMS a secure platform for instant communication. GIMS Web version enables a user to send and receive messages from the web browser. Audio/video conference facility, enhanced chatbot and option for remote backup and wipe-out of data are some of the major milestones in the future roadmap.

9.5.5.6 Service Desk

The NIC Service Desk is a centralised complaint management system providing 24x7 support to various NIC Services and applications that have been on-boarded. It is a G2G grievance redressal system for Government employees and users where assistance related to NIC services are provided. The complaints are being registered by user through the NIC Service Desk Portal “servicedesk.nic.in” or by calling call center at the Toll Free Number 1800111555.

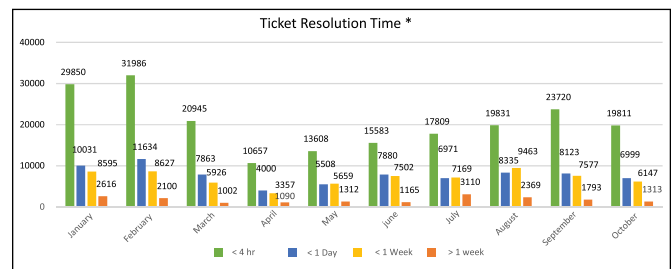
The Call Centre agents would understand the area of concern and provide First Time Resolution in case the issue is addressed in the FAQs. In case the resolution is not to the satisfaction of the complainant, a Ticket for the same is raised. The FMS/Service queue executive and admin of the concerned service divisions redress/attend the complaints/service requests. Presently in Service Desk 36 NIC core services as eOffice, IDC, Cloud, Network, Wifi, NKN, VC, eMail, SMS, AEBAS, VPN etc and projects as Jeevan Praman, Sparrow, NRLM, SAGY etc are on-boarded for complain registration.

The NIC service is being used by users from 1,500+ Institutes, 3,000+ State Departments, 600+ Districts and 350+ Central Ministries and Department. More than 4,000+ support engineers and administrators use this platform for providing timely resolutions and attending the complaints.



Key Features:

- Centralized Platform for Resolution
- Automated Ticket generation/Management with email intimation
- Automated work flow
- Maintenance of Ticket History
- Provides Transparency
- Ensures accountability
- Aims for speedy resolution
- User friendly
- Chatbot integration



9.5.5.7 IVRS

IVRS is used as the cheapest mode to collect/ disseminate data across the world. It provides a 24x7 support-contact mode for people on the move and for those with just the basic phone facility. It is seen as a major mode to disseminate information in the e-Gov era, to touch base with the grass roots level through the basic phone.

Hon'ble PM's Mann Ki Baat (MKB) Data collection on 60 lines for approx. 15 days a month. IVFRT e-TVoa 24x7 Help Desk, application status and general information clocking the maximum no of calls by people from abroad seeking eVISA support. Kailash Mansarovar Yatra (KMY) Helpline with 8x5 help desk, application status, draw and waiting list status and general information from February to September (during yatra period). Additional work done for updating the Live Yatra progress and dissemination of the information on the existing IVRS. National Dental and Oral Health Awareness (NDOHA) - Hindi Version helpline is on IVRS. CBSE

10th & 12th Results is disseminated over IVRS. A POC Voicebot with speech recognition was also created to cater to the NIC Service Desk. One of the other major applications launched this year was Bilingual Voice support for PM Kisan Samman Nidhi Yojana status to farmers in English & Hindi receiving around a lakh call per day, Other are Lok Sabha secretariat, case status for Hon. Uttarakhand High Court, Case status of National Commission for Consumer case redressal (CONFONET) and Voter ID application status for CEO Delhi. Total call counts registered by IVRS facility of NIC in 2020 is 2,27,58,102.

9.5.5.8 VANI

Social Inclusion using AI is one of the objectives for which NIC has been working. Towards that end it has worked with Ministries and Government Departments to provide conversational bots to facilitate Citizen interactions with Government in both English and Hindi in text and speech. To provide these bot services, NIC has come up with a generic framework called VANI (Virtual Assistant by NIC). Major Chatbots released are Sarathi parivahan queries for RTO licenses getting a lakh hits per month, MHA Cybercrime getting 1.3 lakh hits per month, eWay bill getting half a lac hits/month, CONFONET (Consumer Case Status) etc., and some bots like Niti Aayog, PDS etc., are on the anvil. Many chatbots for States like e-District for Delhi getting half a lakh hits/month, Gujarat OJAS (for Gujarat Public Service Commission), eVigilance & eAwas Chandigarh, COVID-19 for Meghalaya in English, Khasi & Garo languages, iKhedut chatbot in Gujarati & English for farmers, Himachal Pradesh Sahayak & eTourism Puducherry are in production with help of VANI framework.

9.5.6 Video Conferencing

Videoconferencing facilitates direct interaction with concerned stake holders and saves time & money. Videoconferencing services are being used

for monitoring of various Government Projects, Schemes, Public Grievances, monitoring of law and order, Hearings of RTI cases, Tele-education, Tele-medicine and Launching of new schemes etc. NIC's VC services are being extensively used by Hon'ble President of India, Vice President of India, Prime Minister, Union Ministers, Governors, Chief Ministers of states, Cabinet Secretary and Chief Secretaries, Chief Information Commissioner and various other senior officials across country. NIC is also providing web-based desktop videoconferencing services to users of various Departments of central Government & State Governments.



Video Conferencing Services were extensively used by Central and State Governments Departments during the COVID-19 Pandemic this year. It was used for meeting, training, events, monitoring activities/projects etc. It facilitated users to participate either from office or home.

9.5.7 GIS & Utility Mapping

9.5.7.1 GIS

In order to fulfill the objectives of Digital India and to establish end to end geo-spatial electronics delivery systems as part of National GIS Mission Mode Project, GIS Platform established by NIC, MeitY, using NICMAPS Services has been revamped as "BHARATMAPS". This depicts core foundation data as "NICMAPS", an integrated multi-scale, multi-resolution base map service using reference data

from Survey of India, ISRO, FSI, and RGI and so on. This encompass large number of layers containing administrative boundaries, transport layers such as roads & railways, forest layer, settlement locations etc., including many base map services.

Map Services are being provided to various Ministries and Departments like Ministry of Sanitation and Drinking Water for SBM (Gramin), Drinking water Portal etc., Similar Services are being provided to Department of Land resources, Department of Labour, Vahan/Sarathi Project, CGHS, HMIS etc. STATE GIS PORTAL empowered by BharatMaps is a simplified user interface for all the states and union territories of India (URL <https://stategisportal.gov.in/>). Six Centres of Excellence in GIS have been established in Madhya Pradesh, Tamil Nadu, Odisha, Bihar, Andhra Pradesh and Assam. They are also offering GIS services to various Departments.

Svavitva Dashboard Application is one of the major achievements. It provides role based access to update status on Key Performance Indicators of SVAMITVA scheme dealing with drone survey of village abadi area and activities involved there on ultimately resulting in Property card generation and distribution. The key stakeholders are Ministry of Panchayati Raj, Survey of India, State Governments and NIC. The Portal was also used to distribution property card to about one lakh beneficiaries through SMS.

COVID-19 Application Support: NIC has provided GIS support to various wings of Government–MOHFW, ICMR, PMO and NCDC for developing various dashboards and Data Analytics.

9.5.7.2 Utility Mapping

Utility Mapping Division plays a crucial role in the management and planning of utility service systems. It lends order and meaning to the chaos by generating detailed and precise digital maps of these systems. Utility Mapping Services mainly

includes; Global Positioning System, CORS, Topographic/Cadastral Mapping, UAV/drone survey Photogrammetry and AM/FM/GIS.

Some of the major projects in Utility Mapping Division accomplished in this financial year are Yamuna Expressway Industrial Development Authority (YEIDA) and Slum Rehabilitation Authority (SRA), One Map Gretaer Noida Geo portal, Mega City Portal, Delhi Jal Board, E-Dharti web Portal [<http://umd.nic.in/edharti>] and Assistance to Goa State Urban Development Agency (GSUDA) for creation of geo referenced land record portal, Smart Solution for Storm water Management (SSSM) for Delhi Jal Board with the available Water and Sewage Network on top of Delhi Basemap in which faults can be uploaded on real-time basis.

9.5.8 Digital NIC

DigitalNIC, an one-stop solution for employees to access various G2E services provided by NIC unifying all services of Administration and Personnel, thus gives users real time view of the various information such as Online APAR, Leave, LTC, Medical, Leave Encashment, Tuition Fee Reimbursement, Telephone/Newspaper Bill Reimbursement, MPR, IPR etc. Almost all activities related to employees have been digitised. DigitalNIC has become a centralised repository for not only employee data but also the websites registered with or maintained by NIC. The unified Sanction Management API of DigitalNIC helps in paperless generation of sanctions and pushing them to PFMS. eSignature/Digital Signature has been integrated with most of the application in order to simplify the workflow and to reduce uses of paper. Over time, the Digital NIC portal has grown to encompass numerous other applications and serve as a common dashboard for Office of DG NIC, NIC Administration, Personnel, Finance, various other sections as well as the NIC administrations in States.

9.5.8.1 Project Repository Information System and Management (PRISM)

Project Repository Information System and Management (PRISM) application has been envisaged as a Digital platform for NIC Projects, initiated both either at State or Headquarters level encompassing various sectors and user Departments across the country. PRISM also facilitates to map each employee with their existing Project and Activities. Thus, PRISM is continuously evolving to become a single repository of all NIC projects - an in house tool that keeps a track on projects being taken up in NIC to ensure solution stability and sustainability using its intellectual knowledge resources, IT tools and system resources. It aims to help project teams to prepare proposals guiding them in areas of data & business ownership, indemnification, technical artefact rights, cost/time overrun etc.

9.5.8.2 NIC Meet

NICMEET is an open source VC Solution customized by NIC Haryana having all features of a commercial VC Application like Inviting others to join room, Joining others Room, Scheduling a VC, Recording a VC, Inviting guest to join VC etc., It delivers a good quality video streaming, sound and can accommodate up to 100 participants in a single VC with a very small infrastructure. (<https://nicmeet.nic.in>). It is completely secure, scalable and easy to use solution.

NICMeet was launched on August 2020 for internal use by NICians.

9.5.9 Capacity Building

NIC Training Division was established with an aim to develop technical and program management skills covering all the NIC officials at NIC-HQ, Central Government Informatics Support, State/District Informatics Support and also Finance, Personnel & Admin, Purchase and Stores officials.

Training in NIC broadly includes continuous up gradation of technical/technological knowledge and leadership skill development. In view of changed environment in all the spheres of governance and the emerging challenges being faced due to technological disruptions, a blended approach of e-Learning (VidyaKosh, Webcon and Webinar) and Classroom modes of training is designed that provide flexibility to get the subject specific knowledge more efficiently and effectively.

9.5.9.1 e-Learning Mode

Major advantage of e-learning is its accessibility and cost effectiveness as the trainings are available online and costs associated with travel and accommodation of participants at offsite locations can be eliminated.

9.5.9.1.1 VidyaKosh – A Learning Management System (LMS)

Vidyakosh is a National Digital Repository to store, index, preserve, distribute and share the digital learning resources with NIC employees. It is the new e-learning initiative of NIC, for providing anywhere, any time and any pace learning to the learner by providing a rich set of courses and facilitates efficient administration of self- learning for all NIC officials. Variety of courses under different verticals like AI & ML, Python, Security, Database Systems, Software Development, Data Analytics, System Admin, Cloud and Infrastructure have already been made available in Vidyakosh. More than 3000 NIC S & T officials are getting benefitted from these courses.

9.5.9.1.2 Webcon– A NIC Virtual Class Room

Virtual Classroom Setup- ‘Webcon’ is well established and being used regularly by different divisions of NIC for product, technology training and project implementation. These sessions are being attended by NIC officers from all over NIC offices in states and districts across the country.

Total no. of 1216 virtual class room sessions (with the participation of 16,107 officials) was held during 2020-21.

9.5.9.1.3 Webinar

NIC has created a Webinar platform, aimed at sharing knowledge among the peer group, updating individual knowledge on the Emerging Technologies, sharing various technical experiences & challenges faced in work, and also improving communication skills. This year around 230 Webinars have been conducted so far and theme based webinar is also introduced this year, in which a continuous five days webinar sessions are presented on a chosen topic. So far 12 such theme based series are conducted on topics Data Analytics, Artificial Intelligence, NIC Open Source Software Services, Network Security, SW Quality Assurance, Application Security, Micro Services, Load testing with JMeter 5.0, Testing Software Applications.

9.5.9.2 Organizing TechQuiz during COVID-19

Training Division in collaboration with TAG and NIC Odisha organized Online Series of Quizzes (TechQuiz Series) on various ICT domains i.e. AI/ML, Python, ELKStack, GuDApps, Cyber/Application Security, Software Quality, Mobile App Development and Block Chain etc during COVID-19 pandemic. This test series provided NIC officers an opportunity to sharpen their ICT skills and also self-evaluate themselves. Total participation in quiz was 3,485 during the COVID-19 pandemic.

9.5.9.3 Classroom based Training Programs

Training Division has been instrumental and driving force in organizing various Needs and Assessment based Training Programmes for all NIC Officers at NIC and Other Institutions as well. Various Training Programmes have been conducted in NIC itself making best use of existing Infrastructure VC Facility, International Class room, webcast, and also tied up with other premium organizations

such as IIMs, IITs, ISTM, NIFM etc to utilize their Infrastructure and faculty to make the participation in training programmes feasible for all the officers across country.

Training Division, NIC has conducted training programmes and workshops on Emerging Technologies namely, Artificial Intelligence and Deep Learning, ELK Stack for Data Analytics, Internet of Things etc, Geographic Information System (GIS), Development of Mobile Apps on Android and iOS Platforms, Network Technologies and its components, Enterprise Architecture, Cyber Security, Cloud and Data Centre, API Management, Agile Development & DevOPs, Software Quality etc.

9.5.9.4 Executive Briefings

NIC initiated Executive Briefings (EB), a series of Short duration sessions of two-hour duration on varied Topics for senior officers of NIC. Topics on Emerging Technologies are addressed by the Invitees/Speakers from the Industry, NIC, Institutes, Government Organizations etc., So far, 15 Executive Briefings session have been conducted on Block Chain Technology, Physical and Digital Records, Social Media: IT Act and Digital Marketing, Software Intelligence, Micro Film Technology, Artificial Intelligence, Micro Services etc.

9.5.10 e-Governance-Services

NIC is playing an instrumental role in executing key IT projects, in close collaboration with Central and State Governments, making the last-mile delivery of Government services to the citizens a reality, through a variety of digital solutions. NIC endeavours to cater to ICT needs at all levels of governance including central, state, districts, judiciary, and legislative layer.



9.5.10.1 My Gov: A platform for citizen Engagement towards Good Governance

MyGov platform has been able to provide the citizens a voice in the governance process of the country. The Platform has also created grounds for the citizens to become stakeholders not only in policy formulation but also in implementation through actionable tasks and discussions.

In the year 2020-21 MyGov Platform has reached 146.76+ lakh registered users mark. During the year, MyGov State Instances like Himachal (himachal.mygov.in), Uttarakhand (uttarakhand.mygov.in) and Tamil Nadu (tamilnadu.mygov.in) were also launched. Till December 2020; 71 'Mann Ki Baat' episodes have been on air. Now, MyGov has launched MyGov Saathi, this is the Government of India's Corona Helpdesk to create awareness and help citizens in keeping safe during the pandemic. The platform of MyGov provided major attributes to Discussion (by inviting suggestions), Do (including tasks and activities), Talks (to facilitate live interaction), Polls, Blogs (about the activities managed by MyGov), MyGov Survey (to take citizens' feedback in the form of survey) and Creative Corner (includes logo design, deciding name of the schemes, layout designs etc.) MyGov upgrades existing point system that would enable a citizen to accumulate and earn points based on his/her engagement/contribution to MyGov. A total of 146.76 + lakh people have already registered

on the platform with 65 Groups, 816 discussion themes, 865 tasks, 249 Polls and 646 Blogs. 29.8 lakh user's download MyGov Android App and 129.1 K user's download MyGov iOS till Dec 2020.

9.5.10.2 India Portal

India Portal India Portal, a Mission Mode Project that provides a 'single-window access' to information and services that are electronically delivered from all Government Departments, institutions and organizations. It has been a popular source of information to a wide range of stakeholders - from citizens, to Government, business and Indian Diasporas. It is a gateway to access Indian Government websites at Centre, State and district levels. The portal is also integrated with PIB, DD, AIR, MyGov and Open Data Platform to present the citizen engagement activities and open data across various sectors. The National Portal had over 31.43 million visitors (77.59 million-page views) in year 2020 and has 5.74 lakh registered users. National Portal keeps the users updated by sending monthly newsletters. Important Government events/activities are showcased through monthly spotlights. The National Portal also has a social media presence. Other initiatives/activities under the aegis of India Portal are:

Guidelines for Indian Government websites (GIGW) were formulated under the India Portal project and have been helping achieve the objective of making the Indian Government websites Usable, User-Centric and Universally Accessible.

9.5.10.3 National Government Services Portal

To facilitate the availability of online services that are provided by various Government entities from one platform, in a citizen centric manner under categories like health and wellness, education and learning, money and taxes etc., the National Government Services Portal has been developed. The portal lists 9963 services that can be searched

by categories and had over 20.94 million visitors (48.49 million-page views) in year 2020.

9.5.10.4 S3WaaS

S3WaaS (Secure, Scalable & Suganya Website as a Service) is a website generating framework designed and developed by National Informatics Centre (NIC). Aimed at Uniformity, Standardization and Universal Accessibility of Government websites, S3WaaS leverages technology to generate responsive, search integrated, secure websites using GIGW 2.0 compliant templates which are highly customizable and can seamlessly be deployed on a scalable software defined infrastructure. The platform enables Government entities to create citizen centric and user friendly websites for publishing specific information and deliver services without much effort and technical knowhow.

The S3WaaS generated websites are W3C Web Content Accessibility Guidelines 2.0 compliant with special focus on website aesthetics and content. The platform supports multiple languages to cater to the needs of a diverse audience as a lot of people are more comfortable using websites in their regional language.

Implementation and Adoption of S3WaaS:

The S3WaaS solution has been implemented and adopted by 620 District Sites, 11 Divisional Commissioner, 32 NIC State centres and 18 Departments so far.



Accessibility Certification Scheme for S3WaaS Websites

S3WaaS themes have been developed using the best practices in coding to ensure that they meet the highest standards in terms of quality, usability and accessibility. The Accessibility Certification Scheme for S3WaaS Websites launched by STQC aims to deliver the certificate for assuring the accessibility of websites that are generated using S3WaaS. Currently 39 District websites have already obtained the Certified Accessible website logo and 20 others are in the pipeline in the current year.

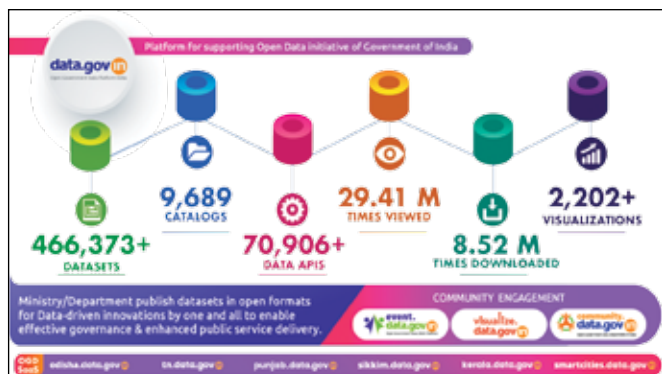
9.5.10.5 OGD-Open Government Data 2.0

Open Government Data (OGD) Platform India (data.gov.in) is developed under the aegis of NDSAP, serve as a single window Platform to host freely available datasets from Central Government Ministries/Departments in machine readable formats. Since 2012 OGD Platform has been in the forefront to create an ecosystem around Open Data in India.

To take forward Open Data Initiative, In April 2020, Ministry of Electronics and Information Technology (MeitY) has approved Open Government Data 2.0 - Micro Services Based Architecture Leveraging Cloud Technology project for the next five years. Accordingly, new development activities have started with primary focus on: Data Contribution by default through Web-services/APIs, Access through Data APIs for all the open datasets available on Platform, Micro Level and Real Time Data, Specific Data Dashboards - Sector, SDG Indicators & State/UT and Engagement with Industry, Start-ups and Community.

Till 31st December, 2020 OGD India has 4,66,373 dataset resources under 9,689 catalogs contributed by 174 Ministry/Departments (87 Central and 87 States) through 354 Chief Data Officers (106 Central and 248 States). And this has been achieved by doing more than 600 visits/online interactions with Ministry/Departments for Sensitization/Training/

Meetings/Support-Sessions. 2,202 Visualizations and 70,906 Datasets Application Programming Interfaces (APIs) have been created for auto consumption of datasets. OGD India has 29.41 million times viewed and 8.52 million times datasets have been downloaded.



OGD Platform is also available as Software as a Service (SaaS), which can be utilized to create own Open Data Portal. Till date dedicated State data portal instances of Sikkim, Odisha, Tamil Nadu, Punjab, Kerala, Karnataka have been created. Smart City Mission has also launched dedicated open data portal for 100 Smart Cities using OGD SaaS.

For sensitization and awareness on COVID-19, OGD PMU team has been creating Infographics on COVID-19 since April 2020. The datasets are being sourced from Ministry of Health and Family Welfare (MoHFW). All these infographics are available at community.data.gov.in/all-infographics. A dedicated real-time COVID-19 Dashboard has also been created using the MoHFW datasets. The dashboard can be accessed at data.gov.in/major-indicator/covid-19-india-data-source-mohfw.

9.5.10.6 e -Taal

National Informatics Centre (NIC), under the Ministry of Electronics and Information Technology (MeitY) has developed eTaal (Electronic Transaction Aggregation and Analysis Layer), URL: <https://etaal.gov.in>, an electronic dashboard, with the

objective of providing overall real-time aggregated view of e-Services, being delivered across the country under various e- Governance applications implemented. eTaal provides an aggregated view of e-Transactions performed through e-Governance applications. eTaal automatically pulls the e-transaction count from the applications integrated with it using Web Services/API technology.



Growth of eTransactions over the Financial Years

eTaal has been in nation-wide operation since Jan 2013 and approx. 3,935 e-Services from 21 Central Ministries and all 36 States and UTs have been linked to the dashboard with over 22,745 crore e-transactions recorded till December. This reflects the Government wide acceptability of the eTaal Dashboard in terms of its utility and importance. The dashboard also facilitates the quick analysis of transaction data of various applications in tabular as well as graphical form enabling users to drill down to the lowest level of detail without impinging on the privacy of the service-seeker or the security and integrity of the application software.

Major activities/solutions in mitigation of COVID-19 pandemic:

The e-Governance Services were monitored through the eTaal Dashboard which required no physical monitoring during COVID-19 pandemic.

The eDistrict and eCourt team utilized BI Analysis report generated on eTaal 2.0 Dashboard during review meetings.

9.5.10.7 Direct Benefit Transfer (DBT) 2.0

Direct Benefit Transfer (DBT) is a major reform initiative, where benefits cash or in-kind, are delivered directly to identified beneficiaries using Aadhaar. It envisages efficiency and inclusion in the delivery processes leading to greater accountability and transparency in the system. DBT Bharat Portal has been conceptualized and implemented as a single point of information related to DBT ecosystem in the Country. This Portal also functions as an aggregator for all DBT applicable schemes of Government of India and State Governments. DBT applicable schemes provide their Monthly Progress Report preferably through web-service and with district level granularity strictly complying with Local Government Directory. On the basis of data received from the Ministries/Departments, various reports are prepared for public at large to ascertain overall progress on DBT implementation in the country. In additions, it also ranks Schemes, Ministries/Departments and States/UTs on various DBT related parameter to promote a healthy competition among the stakeholders and to fast track the DBT implementation in the country. It supports aggregation of transactional data of Schemes from Ministries/Departments or States/UTs or PFMS and providing compiled data to different agencies like PMO, PRAYAS etc.



9.5.10.8 eSamikSha 2.0

eSamikSha 2.0 is a Digital Governance Platform, that supports an Easy, Instant and Secure Way of Digital Information Exchange. It supports Online Monitoring and fast tracking the compliances of all types of interlinked governance categories like Meeting Oriented, Issue Oriented, Court Case Oriented or any Reference Oriented. Various features of this platform are SSO Enabled, Inbuilt ePatrachar, Meeting Lifecycle Management, Easy and Instant Data Collection Facility, Flexi Dashboard, Log Analysis Mechanism Enabled, Working Group of Ministers (WGoM) Recommendations Monitoring System, Sectoral Groups of Secretaries (SGoS) Recommendation's Progress Monitoring System, COVID-19 Pandemic Action Points Monitoring System, Cabinet Decisions Monitoring System, Cabinet Observations Monitoring System, MoU Tracking System, Centre State Coordination Issues System/Inter-Ministerial issues Monitoring System, Outreach, and Multi-Tenancy Enabled.

9.5.10.9 DigiDhan Dashboard for monitoring Digital Payment Transactions

To help Government achieve target for monitoring Digital transactions, DigiDhan Dashboard was launched in April 2017. The Digital Dashboard can be accessed from the URL – <https://digipay.gov.in/dashboard/Default.aspx>. The Dashboard reports the total digital transactions across various modes on a single platform and help to promote digital payments and digital infrastructure for development of a cashless economy. The DigiDhan dashboard is the only portal which provides a consolidated view of currently 16 digital payment modes such as Unified Payment Interface (UPI), Immediate Payment Service (IMPS), Debit Card, Credit Card etc., from RBI, National Payment Corporation of India (NPCI) and 110 banks, 100 Smart Cities, State and Ministries.

Key stakeholders for DigiDhan & associated dashboards are Prime Minister's Office (PMO), MeitY, Reserve Bank of India (RBI), National Payments Corporation of India (NPCI), 110 banks (public sector banks, private sector banks, payments banks, regional rural banks and foreign banks), Ministries such as Ministry of Railways, Ministry of Civil Aviation, Ministry of Road and Transport, Ministry of Petroleum and Natural Gas, Ministry of Power, Ministry of Housing and Urban Affairs (MoHUA) Departments such as Department of Posts, Department of Telecom, Department of Power, Department of Financial Services, 100 Smart City Corporations etc.



All the Digital Payment Transactions were monitored through the DigiDhan & associated Dashboards (Smart City Dashboard, State Dashboard, Ministry Dashboard) during COVID-19 pandemic, which required no physical monitoring of transactions by the banks. The issues faced by the banks while operating from home, were resolved by the DigiDhan team actively during the pandemic and the dashboard operated successfully.

9.5.11 e-Governance Products

9.5.11.1 GePNIC

The Government eProcurement system, GePNIC developed by NIC in close coordination with Procurement Policy Division, Department of Expenditure, Ministry of Finance. The platform caters to the procurement/tendering requirements of the Government Departments and organizations. It is generic in nature and can easily be adopted for

all kinds of procurement activities such as Goods, Services & Works, by Government offices. The system has wide user base across the country by 30 States/UTs of India and by around 600 Central Government entities.

GePNIC has been recertified by World Bank, GFR 2017, STQC has Certificated all the 48 instances as per EPS guidelines mandated by MeitY.



GePNIC : PAN India Presence

Around 66 lakh electronic tenders worth over Rs.93.15 lakh crore have been processed successfully till 31st December, 2020. On an average one lakh tenders worth Rs 1.5 lakh crore are processed every month.

9.5.11.2 e-Counselling

NIC e-Counselling services web enabled solution to examination bodies, council/admission boards across the country for examination management, counselling and admissions. e-counselling services provide multifarious, configurable and efficient solution for conducting transparent admissions to geographical spread of institutions across the country with varying business rules and process flow.



End-to-End technical services/solution are provided for conducting more than 45 examinations by assisting premier organizing bodies and other institutions such as NTA, CBSE, UP, WB, Odisha, Punjab etc., NIC has been instrumental in partnering with various examination bodies in conducting central and State level examinations such as JEE (Main/Advanced), NEET, Common Management Admission Test (CMAT), and Central Teacher's Eligibility Test (CTET). In addition to this, it caters to counselling services for counselling boards across India for admission to premier institutions such as IITs, NITs, IIITs and Central/State funded universities/institutions in various domains like engineering (Degree, Diploma, ITI), medical, architecture, pharmacy, agriculture, hotel management, etc., catering to candidates from 8th/10th pass to Post Graduates. It has been conferred with excellence award in enterprise application category in Digital Technology Sabha 2020 organized by Express Computer. In the year 2020, 66 lakh applicant registration have been processed for admissions to over 9 lakh seats across the country. As part of result hosting services, around 2.78 crore student records have been processed. In response to the pandemic, counselling & admission services have been equipped with technological advancements like online reporting & document verification module to replace the physical reporting needs for seat confirmation and maintain social distancing norms for the students.

9.5.11.3 CAD Tool for Education (CollabCAD)

CollabCAD is an indigenous 3D CAD/2D Drawing/PLM Software system for desktop and collaborative network enabled for collaborative creation, and data management of industrial 3D Designs and 2D engineering drawings. It provides a total low cost IT solution for industrial applications including strategic sector, SME's and educational Institutions (schools, engg. colleges and polytechnics).

During 2020, CollabCAD was launched for Atal Tinkering Labs (ATL) jointly with Atal Innovation Mission, NITI Aayog under 'Tinker from Home' campaign for students of 5000 plus schools across the country. Under this campaign, latest version of CollabCAD (CollabCAD-ATL Version) desktop software on Windows and Linux OS was provided to schools registered with ATL's along with customized software download software web interface for 3D Design for 3D Printing. CollabCAD-ATL Version was launched 'virtually' during this COVID-19 lockdown period by DG, National Informatics Centre and Mission Director, Atal Innovation Mission. Aim of this launch is to provide access to NIC's indigenous 3D design software to students participating in the 3D printing program of Atal Tinkering Labs (ATLs) across the country. 3D Design challenge was also announced following this launch for the students of ATL schools registered on CollabCAD portal to upload and share their innovative designs.



An MoU between NIC and Central Board of Secondary Education for use and promotion of CollabCAD software for Engineering Graphics Practical curriculum of Class XI-XII students across the affiliated schools.

9.5.11.4 Jan Shikshan Sansthan

MIS portal for JSS has been developed by NIC for Ministry of Skill Development & Entrepreneurship (MSDE). Jan Shikshan Sansthan Scheme (JSS) scheme is being implemented through NGOs having unique ID of Darpan-NITI Aayog portal with annual recurring grant from the Government of India. The scheme focuses in imparting/upgrading skill training to the socio-economically backward and educationally disadvantaged group by providing them market relevant skill sets and livelihood creation opportunities which makes them at par with all groups of society. Portal has received three awards i.e., Governance Now Digital Transformation Award 2019 in the category of Digital Transformation in Skill Development, IDC Insights Awards 2019 in the category of Excellence in operations and CSI SIG e-Governance Awards 2019.

9.5.11.5 SANKALP (Skill Acquisition and Knowledge Awareness for Livelihood Promotion)

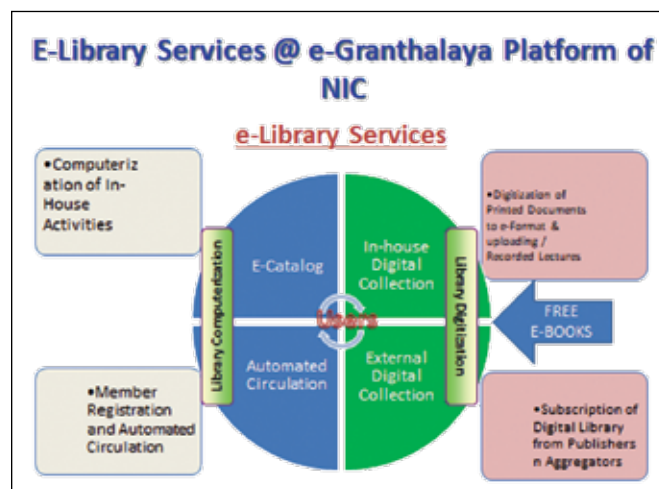
The newly developed web portal of SANKALP (<https://sankalp.msde.gov.in>) under Ministry of skill Development & Entrepreneurship developed by NIC has been launched on 18th September 2020. SANKALP aims to improve short term skill training qualitatively and quantitatively through strengthening institutions, bring in better market connectivity and inclusion of marginalised sections of the society. The outcomes in the project are measured through the Results Framework areas viz: (i) Institutional Strengthening at National, State & District level; (ii) Quality Assurance of skill development programmes; and (iii) Inclusion

of marginalized population in skill development programmes, and Disbursement Linked Indicators (DLIs) agreed between MSDE and World Bank.

9.5.11.6 e-Granthalaya

NIC e-Granthalaya- A Digital Agenda for Automation and Networking of Government Libraries is an Integrated Library Management Software useful for library computerization. The current version of the software is Version 4.0 – which is Cloud Ready Application, hosted in NIC cloud and provides web based solution for libraries. This helps to convert traditional libraries to e-Libraries.

The software has been implemented in 450 libraries during current year, and thus, total 5,400 libraries have been automated using this application, providing e-Library services. Out of these, 2,000 libraries are on NIC Cloud which have made available 87 lakh book catalog records with 7,000 e-Books made available for reading and downloading to their members.



9.5.11.7 eHRMS

For efficacious management of Human resource, the transition from a manual legacy system to a secured web-based application was entrusted by Department of Personnel & Training (DoPT) to National Informatics Centre (NIC) through design,

development, roll-out and maintenance of the eHRMS application.

Electronic Human Resource Management System or the eHRMS application is responsible for the maintenance of employee record in electronic form, from hiring to retiring. The project includes scanning/digitization of service book to capture the legacy data and provision of 28 online services through various modules; namely Service Book, Leave, LTC, Personal Information, Reimbursements, Advances, Tour, Helpdesk, etc., The application is also integrated with applications such as CGHS, Bhavishya, iGOT, SPARROW, APAR, EIS, PFMS, etc., providing a holistic system for the users, catering to their daily Human Resources related requirements. The application also has provision for Dashboards for a comprehensive view of data available in all e-service book, this enables Administrators/Polymakers to analyze and identify trends, further helping in effective decision making.

Currently, the eHRMS application has been rolled out in 60 Central Government Ministries/Departments and also in their 20 subordinate/attached offices, on-boarding more than 25,000 employees on the system. Apart from Central Government Ministries/Departments, the eHRMS application has been rolled out on pilot basis in the Maharashtra State Government in Local Language (Marathi) and Delhi Police for 80,000 users. The rollout of application has been planned in a phase wise manner.



9.5.11.8 IVFRT: Immigration, Visa and Foreigners Registration & Tracking

Immigration, Visa and Foreigners Registration & Tracking (IVFRT) is one of the Mission Mode Projects (MMP) undertaken by the Ministry of Home with core objective to develop and implement a secure and integrated service delivery framework that facilitates legitimate travelers while strengthening security. The MMP has global outreach since the scope of the project includes 190 Indian Missions, 108 ICPs (Immigration Check Posts), 12 FRROs (Foreigners Regional Registration Offices), and 674+ FROs (Foreigners Registration Offices) in the State/District Headquarters. Further, e-FRRO Service has been introduced for all Foreigners Regional Registration Offices (FRROs) and Foreigners Registration Offices (FROs) across the country.

The project has been implemented in 180 Indian Missions out of 190 Indian Missions abroad, 674+ Districts and 108 ICPs across the country.

e-Visa service has been extended to 171 Countries at 28 Indian airports and 5 Sea Ports. Since the launch of the scheme (November' 2014) approx. 96.54 lakh e-Visas have been issued till December, 2020.

Government of India has setup Kartarpur Sahib Corridor from Dera Baba Nanak Gurdaspur to Pakistan international border, to facilitate pilgrims from India visiting Gurdwara Darbar Sahib Kartarpur, round the year, in a smooth and easy manner. Portal "Praksahpurb550.mha.gov.in" has been operationalized with setup of Integrated Check Post.

With the outbreak of COVID-19 Virus, immigration authorities had dual responsibility of maintaining the immigration services while safeguarding the entry of infected passengers. Key activities carried out for passenger facilitation and safeguard against COVID-19 are : e-Visa, Regular Visa and Visa

on Arrival facility was temporarily suspended on online portal, facility of issuing Visas to Diplomats and emergency cases was provided to Indian Embassies/Consulates, near real-time publication of COVID-19 related advisories, sharing of customized immigration related reports and active support at ICPs for passenger clearance in Samudra Setu and Vande Bharat Mission in bringing back Indians Stuck abroad.

9.5.11.9 CollabCAD ERP CRM

CollabCAD ERP CRM is an initiative of NIC to provide the cost-effective, standards-based Enterprise Resource Planning (ERP), Customer Relation Management (CRM) software to Micro, Small and Medium Enterprises (MSMEs), Government Departments, Public Sector Enterprises, Universities, and Educational institutions.

CollabCAD ERP is a suite of enterprise applications that integrate and automate many of the business processes of an enterprise. These applications include Customer Relation Management (CRM), WMS (Workforce Management System, a Human Resource application), Catalog management, Accounting, Inventory management, Enterprise Asset Management(EAM), Manufacturing Resource Planning (MRP), Supply Chain Management(SCM).

9.5.11.10 Industrial Entrepreneur Memorandum and Industrial Licensing

To attain seamless and transparent approval process under I(D&R) Act, 1951 for processing of Industrial Entrepreneur Memorandum (IEM) applications and Industrial License (IL) applications received online through G2B portal, DPIIT has integrated the comments seeking process from various administrative Ministries with its G2B Portal. This has enabled paperless and quicker disposal of applications particularly in cases where comments from multiple Administrative Ministries and Departments are required.



9.5.11.11 Mobile Apps Store

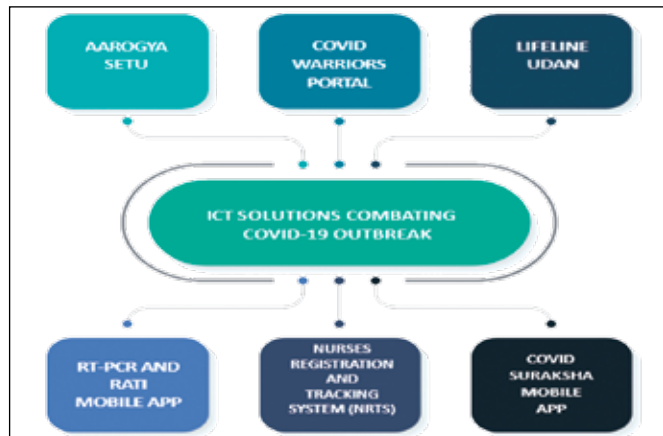
Mobile Application Division has Nodal center in NIC-HQ Delhi and four competency centers at Chennai, Shimla, Patna and Kannur. All the centers are collectively working for development and hosting of mobile apps in android and iOS. In order to bring all these apps under one umbrella for better visibility and global reach from single point of contact NIC has subscribed to user accounts in Google play store and iOS/iTune. Now all the Mobile apps developed in NIC are uploaded on play store under NIC account only. Total mobile app count reached to 441 published mobile apps on Android App store. Total count on iOS Account reached to 42.

Various NIC State centres/Departments/Ministry Cells have also published mobile apps related to management of COVID-19 pandemic. Such apps could be delivered in very short duration as excellency centers had requisite technical know how to design and develop the apps.

9.5.12 ICT Solutions during COVID-19

NIC has leveraged the technology at its best to support the Central, State and Local Governments in effective monitoring & management of different aspects of pandemic right from the dissemination of information, advisories, guidelines through different solutions like ePass systems, quarantine management systems, surveillance apps, complaint management systems, travel history

registration systems, hospital management, COVID tests management, telemedicine, tele-education, helpline portals and dashboards.



Video Conferencing services proved to be useful in the Government since COVID-19 lockdown brought in a State of isolation where physical meetings were not possible. Around 1400-1500 VC sessions, pan India were supported by NIC VC infrastructure daily during the lockdown period. Dedicated COVID-19 war rooms were established where senior Government officials monitored and reviewed COVID-19 preparedness and planning.



Hon'ble PM interacting with the Chief Ministers of all the States, to discuss various aspects related to COVID-19 situation in the country on 27th April, 2020.

Several key applications were quickly developed and implemented to facilitate and meet requirements of Prime Minister's Office, Ministries, Departments, State Governments and their subordinate organisations in their efforts in tackling COVID-19 situation.

These include PM Dashboard for COVID-19 Status/Updates, COVID-19cc portal, COVID-19 Data Hub, Apps such as RT-PCR, RATI for Sample collectors, Collection Centres, Labs etc., LifeLine Udan to transport essential medical cargo, COVID-19 Volunteers Database of MSME, Special Surveillance System(S3) for tracking COVID-19 patients, Nurses Registration & Tracking system, Management of Migration, Home Quarantine, Containment Zones, Hotspots, Management of Surveys, reporting systems to monitor supply of essential goods, essential services, distribution and e-commerce, Travel History Registration system, dedicated relief package portals and many more.

During the unprecedented times of crisis, NIC has supported the Government through its ICT solutions and infrastructural capability so that migrant workers and other beneficiaries can lift the food grains in their respective states during the countrywide lockdown. Further, by using Direct Benefit Transfer (DBT) through Public Financial Management System (PFMS), digital payments were facilitated for relief of farmers, stranded migrants and other beneficiaries during COVID-19 lock down through various Government schemes.

9.5.13 ICT Solutions for North-Eastern Region

Comprehensive ICT solutions have been developed and provided to various NER specific schemes viz. NESIDS (North-East Special Infrastructure Developmental Scheme), NLCPR (Non Lapsable central Pool of Resources, Hill Area Development Programme (HADP), Externally Aided Projects – NESRIO (North-Eastern States Roads Investment Programme) funded by Asian Development Bank, Finance Minister's Package SIDF (Social and Infrastructure Development Fund), Special packages for BTC (Bodoland Territorial Council), KAATC (Karbi Anglong Autonomous Territorial Council) & DHATC (Dima Hasao Autonomous Territorial Council) etc. A large nos of APIs have been published in OGD platform for the interested

citizen. Along with, e-Governance Supports have been provided to various NER specific institutions viz. North-Eastern Handicrafts and Handlooms Development corporation Ltd, Cane and Bamboo Technology Centre, North-Eastern Regional Agricultural Marketing Corporation Ltd etc.



Extensive use of VC system by MoS(IC) MDoNER

9.5.14 NICS

National Informatics Centre Services Inc. (NICS) is a Section 8 Company under the Companies Act, 2013 (erstwhile Section 25 Company under the Companies Act, 1956), a Government of India Enterprise under National Informatics Centre (NIC), Ministry of Electronics & Information Technology (MeitY). Its services include resource provisioning i.e. support for procuring and operationalizing state-of-the-art ICT infrastructure viz. hardware, networking etc. Data Centre Services, facilitating Project management, software design & development, GIS services, roll-out support, facility management, Help Desk operations etc. Some of the prestigious projects include National Data Centre at Lakshmi Nagar, New Delhi, enhancement of NIC Cloud Services, National Data Centre at Shastri Park, New Delhi, National Knowledge Network (NKN), enhancement of NIC Cloud Services, facilitating various projects like e-Procurement, e-Office, e-Hospital etc.



Extensive use of VC system by MoS(IC) MDoNER

Recently, iRAD, Diksha, Contactless Biometric Attendance System and TRIFED have been undertaken as some of the new initiatives along with NIC. Besides, dedicated IT support to Government Departments has been extended during COVID-19 period.

NICS achieved another milestone by setting-up a Product Business Division (PBD), with an aim to productize, standardize and promote Software Products developed by NIC/NICS at International Level. As part of promotional activities, NICS/NIC have attended various International Exhibitions & Conferences including IndiaSoft 2020, GES 2019, International Trade Fair 2019 in Greece, Alitex 2019 in Morocco etc. Besides, meetings with Common Wealth Secretary General, Ministry of External Affairs and AARDO have also taken place to explore opportunities for international implementation of NIC/NICS Products.

NICS signed Agreement with Mauritius Prison Service for ePrison Phase-I and Phase-II. Several foreign countries have expressed interest in NIC/NICS Software Products including Ecuador, Venezuela, Kazakhstan, Nigeria, Bangladesh, Paraguay, Guyana, UAE etc.

9.5.15 International Collaboration

During the post Pandemic period NIC is in touch with number of countries for fostering bilateral cooperation in the area of e-Governance Products and Platforms which include Bangladesh, Ecuador, UAE, Nigeria, Paraguay, Guyana, Philippines and Myanmar etc.

A Joint Forum/Group was formed comprising 8 members from Bangladesh and India for the regular knowledge sharing related to AarogyaSetu App.

The first capacity building programme on International best practices and case studies on e-Governance with emphasis on emerging technologies exclusively for a delegation of 20

NIC Officials was successfully organized at e-Governance Academy, Tallinn, Estonia from 10-14 February, 2020.

Institutional Research Collaboration between NIC and United Nations University Operating Unit on Policy-Driven Electronic Governance (UNUEGOV), Portugal was explored and two NIC Officers were guided to apply for UNUEGOV Government Fellowships Programme 2019.

A delegation from Guyana visited NIC Hqrs on on December 04, 2020 to discuss the development of a comprehensive Patient Medical Record System for Guyana, and to collaborate with NIC for other e-Governance Products.



Delegation from Guyana visited NIC

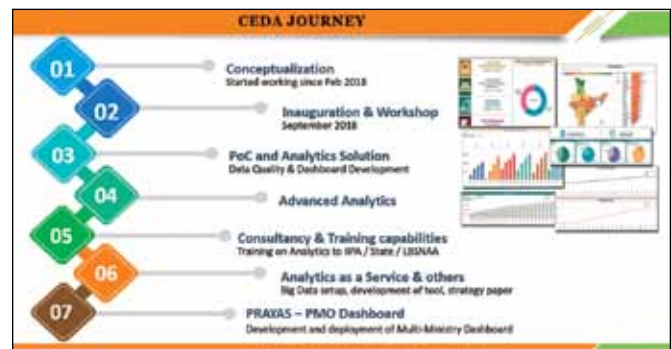
Earlier, The Hon'ble Secretary General, Commonwealth has also desired to implement various e-Governance Products of NIC in Common Wealth Countries through Commonwealth Secretariat.

9.5.16 Centre of Excellence and Software Development Unit (SDU)

9.5.16.1 Data Analytics

Centre of Excellence for Data Analytics (CEDA), a joint initiative of NICS and NIC completed nearly three years of operations. CEDA has created its strong presence within the Government sector and has executed major analytics projects including Trade Analytics for Department of Commerce, eWay Bill Analytics for GSTN, Scholarship for Ministry of Tribal affairs, IVFRT for Ministry of Home Affairs, Ministry of Steel, and Property

Registration etc. CEDA is also involved in other analytics allied activities like exploration/evaluation of tools, consultancy services for analytics, capacity building, Big Data, Advance analytics (Machine Learning) application etc. Additionally, CEDA is executing another prestigious project "Prayas – PMO Dashboard" for Prime Minister Office in collaboration with NIC, which was successfully demonstrated to Hon'ble Prime Minister on 4.9.2020.



9.5.16.2 Artificial Intelligence

Centre of Excellence (CoE) in Artificial Intelligence has been setup with a vision is to ensure that India is positioned to actively influence AI development path. This CoE has State of the art AI lab with supercomputing facilities and has been providing AI Development Platform as a Service to its's State units.

NIC has been diligently working for Social Inclusion using AI as one of the objectives.

CoE has taken up projects in domain of Computer Vision for Swachh Bharat Urban and Rural initiatives. MobileApp based group attendance for trainees and individual attendance in office has also been developed. Computer Vision project for COVID-19 Detection from Chest XRays has also been taken up.

In Natural Language Processing domain (NLP), project for Name Similarity Matching for Farmers Database across Soil Health Card, PM Fasal Bima Yojana, PM Kisan & Land Records has also been

taken up. Project for Motor Accident Claim Petitions Cognitive Search for Similar Cases for English & Hindi is underway as a part of NLP excellence.

As a part of Conversational AI, Chatbots in English, Hindi, Gujarati & Khasi languages have already been facilitated. 12 chatbots are in production for Ministries/Departments/States in addition to the NIC Service Desk Chatbot. Matra Transliteration services available in 11 Indian languages has facilitated States in creating Chatbots in their vernacular languages and Assamese & Urdu Chatbots are already in testing phase.

Bilingual IVRS in English & Hindi facilitated for 12 organizations like PM Kisan, MNRE, Lok Sabha Secretariat etc. vOPD Tele-consultancy services for patients & 3 more in offing. In-house Conversational AI Engine development is also under progress.

9.5.16.3 Blockchain Technology

The Centre of Excellence has been established at NIC Kendriya Sadan, Karnataka with a vision to build niche applications using Blockchain technologies in close coordination with the Government, which can be rolled out across the country. Departments can leverage on the services and the infrastructure to develop and deploy blockchain applications in the NIC data centres.

Centre of Excellence in Blockchain is dedicated to evaluate Blockchain technology frame works, to carry out Proof of concepts in different sectors and support integration with existing applications. It shall foster stronger collaboration between the Government, public and private sectors to ensure that the latest technological standards are available in a safe and trusted manner. The blockchain Centre of Excellence will be instrumental in prototyping, will create use cases, will offer Blockchain as a service and help capacity building within Government. It will also channelize to engage in Blockchain research, and act as a distribution channel for the research

with an objective to standardize the process of interoperable Blockchain adoption in the country.

The Honourable Union Minister of Law & Justice, Communications, Electronics and IT, Shri Ravi Shankar Prasad, inaugurated the Centre of Excellence in Blockchain Technology at Bengaluru, Karnataka on 18th January, 2020 digitally from Delhi through video conferencing.



9.5.16.4 Application Security

CoE in Application Security is established to provide state-of-the-art Security solutions & services for the Information Technology needs of the Government of India, and establishing best practices, standards and initiatives in Application security. The centres are located at Bhubaneshwar, Guwahati, Jaipur, Lucknow and Thiruvananthapuram.

9.5.16.5 NIC Software Development Units (SDU)

Software Development Units of NIC provide State of art services using latest tools and technology.

NIC Software Development and Training Centres are engaged in important e-Governance projects in respect of development of software on turnkey basis, implementation, project level training and subsequent support.

9.5.16.6 Open Technology Group (OTG)

Open Open Technology Group (OTG) provisions support services for adoption of OSS in various e-Governance projects and applications. OTG focus areas are to evaluate and recommend open source software for e-Governance Solutions,

maintain distribution repository of recommended open source software for usage across NIC, guide and handhold NIC teams in keeping their open source driven system secure and provide training on Open Source Software. Open Technology Group has been providing Customized 7.x CentOS Templates for NIC Cloud Environment, since 2015.

As of now, over 60 Plus customized templates for Base OS, web and Database stack were made available. The templates have been adopted in various projects and over 8000 plus virtual machines are running. OTG has offered 41 customized and hardened ISO Images, 74 RPMs PHP, PostgreSQL, Apache HTTPD, Apache Tomcat, Python, OpenSSL, MOD WSGI), 70 Update Tools (PHP, PostgreSQL, Apache HTTPD, Apache Tomcat, OpenSSL) from NIC CentOS Repository and 6 customized and hardened ISO Images, 4 QCOW2 Images for Open Stack, 111 DEB Packages for latest OSS tools (PHP, PostgreSQL, Apache HTTPD, Apache Tomcat, Python, OpenSSL, MOD WSGI). 99+ updates for 25 OSS tools were carried out to OSS Metadata on the OSS Tools repository for generating personalized advisory through DigitalNIC. 799 + total Tickets closed in the year 2020 as part of Service Desk & Support as part of Guide & Handhold NIC teams to stay secure with OSS.

9.5.16.7 Lal Bahadur Shastri National Academy of Administration

The NIC Training Unit (NICTU) at the Lal Bahadur Shastri National Academy of Administration (LBSNAA), Mussoorie is involved in the training activities of the Academy, right from planning to the delivery stages, for various courses throughout the year for the fresh recruits of All India Services, and serving IAS officers. LBSNAA is providing ICT consultancy, Infrastructure and coordination support to the Academy.

Some of the highlights during the year of COVID-19

pandemic, are: The Head NICTU successfully wrote a proctored exam and earned an internationally recognised TOGAF 9.2 certification in Enterprise Architecture (EA). NICTU's concerted efforts led to the implementation of the Academy's EA through the preparation of EA-based Solution Architectures for its ICT infrastructure upgrade and SARGAM2.0 ERP. LBSNAA contributed significantly to the online classes and videoconferencing sessions, throughout the year, with Hon'ble dignitaries, including the President of India, the Vice-President of India, the Chief Justice of India, the Union Ministers, the Cabinet Secretary/Secretaries to the Govt, the MD World Bank, and many subject experts from across the globe, implemented Blockchain concept in LBSNAA using the infrastructure of VJTI, Mumbai, and developed Proof of Concepts demonstrating the use of RPA, IoT, AI/ML, AR/VR, 3D-printers, Data Analytics tools, GIS, etc, in day-to-day public administration. LBSNAA also contributed to the testing of NIC's GIMS software.

9.5.17 Major Events

9.5.17.1 NIC TechConclave 2020

After the success of first technology conclave held in 2019, NIC hosted the second technology conclave on 21st and 22nd January 2020 at Pravasi Bhartiya Kendra, Chanakyapuri, New Delhi for spearheading deliberations on the technology trends and its impact e-Governance services. Themed as "Technologies for NextGen Governance", the two-day event was organized by the Technical Advisory Group (TAG), constituted by NIC, to enable project teams transform citizen centric services by developing strategic technology solutions.

The Union Minister for Law & Justice, Communications and Electronics & Information Technology, Shri Ravi Shankar Prasad inaugurated the Conclave by lighting ceremonial lamp, along with Shri Ajay Sawhney, IAS, Secretary, Ministry of Electronics and Information Technology, Dr. Neeta

Verma, Director General, NIC, Dr. Savita Dawar, Dy. Director General & Chairperson Technical Advisory Group, NIC, and Shri Sameer Garde, President, Cisco (India and SAARC). The event witnessed an enthusiastic participation of NIC officers from all over the country and erudite speakers, the technology and subject matter experts from the industry, who deliberated their domain experiences on various topics related to emerging technologies.

The webcast video covering the entire event is available at : <https://webcast.gov.in/techconclave-2020/>.

9.5.17.2 Gov Tech-Thon 2020

NIC being at the forefront of managing Government Information Technology needs creation and iteration of new ideas. With this aim NIC has participated in the event Gov-TechThon 2020 as a knowledge partner with IEEE and Oracle.

Shri Ajay Sawhney, Secretary (MeitY) has kicked off this virtual hackathon on 13th October, 2020 and on 30th October, 2020 this 36 hours virtual hackathon has been inaugurated.

NIC has shortlisted five key problem scenarios in collaboration with Ministries of Agriculture, Education and Transport, Government of India. These problem scenarios require immediate solutions.

Students, start-ups, freelancers across the country have participated in this virtual Gov-TechThon 2020 for developing prototypes for the problems.

9.5.17.3 AI-IdeaThon: For TechGov 2020

'AI-IdeaThon: For TechGov-2020' was launched 25.11.2019 for all NICians, to identify the real life problems and possible AI driven solution.



Total 90 completed ideas were submitted on the Innovate platform by participating teams. After several evaluations during lockdown due to the COVID-19, TAG in coordination with COE on AI concluded the hackathon and the result of AI:IdeaThon2020 was announced on 01.09.2020.

9.5.17.4 NIC Data Quality Challenge 2020

In recent times, efforts have been made by NIC to conduct awareness about necessity of ensuring Data Quality by publishing GuDApps Guidelines, Software Quality Guidelines, Guidelines for Securing Sensitive Personal Information etc.

Data Quality (DQ) Challenge has been launched on March 29, 2020 to spread awareness on importance of Data Quality and encourage Project development teams to evaluate their applications in terms of data quality being maintained. Total 108 applications were submitted for DQ Challenge by project teams and HoDs.

9.5.17.5 NIC Online National Hackathon on Cloud Technologies

NIC's National Cloud has been augmented by its NextGen Software Defined Cloud Platform based on Open Infrastructure and Cloud Native Methodology. Going forward to add more and more features & functionalities and services as well as building and institutionalize an Open Source Cloud Community within NIC ecosystem, NIC Online National Hackathon on Cloud Technologies has been launched on 29.09.2020. The hackathon is ongoing and till date 30 submissions have been received.

9.5.17.6 Digital India Awards 2020

National Informatics Centre (NIC) under the Ministry of Electronics & Information Technology (MeitY) has been conducting the biennial Digital India Awards (DIA) to promote innovation in e-Governance and digital transformation of Government service

delivery mechanism. In line with Digital India's vision, this is the first time that the entire process of the Digital India Awards was being conducted online from nominations to screening to the final awards ceremony.

The Hon'ble President of India Shri Ram Nath Kovind virtually conferred the Digital India Awards 2020 on 30th December, 2020 via video conferencing. The awards ceremony was graced by the presence of Shri Ravi Shankar Prasad, Union Minister for Law & Justice, Communications and Electronics & Information Technology, Shri Ajay Sawhney, Secretary (MeitY), Ms. Jyoti Arora, Special Secretary & Financial Adviser (MeitY), Dr. Rajendra Kumar, Additional Secretary (MeitY), Dr. Neeta Verma, Director General National Informatics Centre (NIC) and other Government officers from various Central, State & District offices.

Digital India Awards have been institutionalized under the ambit of the National Portal of India to honor exemplary initiatives/practices in Digital-Governance. The National Portal of India (<https://india.gov.in>) is a Flagship Project to facilitate single window access to Government Information and Services in cyberspace.

This year, the 6th Digital India Awards 2020 have been announced under six categories, with 24 winning teams:

1. Innovation in Pandemic
2. Excellence in Digital Governance – MINISTRY/ DEPARTMENT (Central):
3. Excellence in Digital Governance – STATE/ UT
4. Excellence in Digital Governance – DISTRICT
5. Open Data Champion
6. Exemplary Product

In addition to the above six categories, Jury Choice Award was also conferred to honor excellence in

design and implementation of the National Public Digital Platform.



9.5.18 Media and Outreach

Brand NIC - its products & services, projects, apps, software application are highlighted and promoted on various social media platforms - Twitter, Facebook, LinkedIn, Instagram and YouTube.



Various events organized by NIC are shared on social media through live tweets, posts along with the live webcast. Important events/programmes including states initiatives are covered on all digital platforms and print media. Short video/voice capsules of the flagship projects of NIC are publicized on Social Media platforms and on NIC's website. A film showcasing the journey of NIC since last 4 decades was released.

9.6 National e-Governance (NeGD)

DigiLocker

DigiLocker is a key initiative under Digital India, the Indian Government's flagship program aimed

at transforming India into a digitally empowered society and knowledge economy. DigiLocker ties into Digital India's visions areas of providing citizens a secure document access platform on a public cloud.

Targeted at the idea of paperless governance, DigiLocker is a platform for issuance and verification of documents & certificates in a digital way, thus eliminating the use of physical documents. DigiLocker has helped in bringing paradigm shift towards paperless governance i.e. It helped citizen and Departments to shift from paper based processes to paperless process thereby helping to contribute to Hon'ble Prime Minister's vision of Digital India.

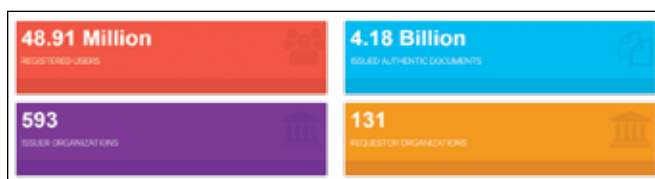
Some highlights are as follows :

In the last 4 years, DigiLocker has striven to provide critical Identity, educational, transport, financial and municipal documents to the citizen in the form of a digital wallet. In this pursuit a critical mass of over 418 crore authentic documents have been made available to the citizen of the country.

1. Overall more than 418 crore documents have been made available to the citizens.
2. DigiLocker like platforms can serve as boon during any catastrophic situations. A successful example was shown in case of Kerala Flood wherein IT department provided digital certificates to Kerala residents during Floods.
3. More than 37 crore Educational Documents are made available to Students across the country.
4. Digital DL/RC is made available to the citizens and a notification was issued by Transport department for the acceptance of such documents by enforcement authorities.

Identity documents through DigiLocker are now accepted at airports, railways and on roads by

traffic police and enforcement agencies. Current statistics as of 9th Nov 2020 are:



In order to scale the vision of Digital Locker project to the entire country, various public and private agencies will need to become part of the Digital Locker eco system. As a way to expedite adoption of the DigiLocker system MeitY has notified The Information Technology (Preservation & Retention of Information by Intermediaries Providing Digital Locker Facilities) Rules, 2016. The objective of these rules is to:

- Create a paradigm for usage of digital documents to enable paperless governance
- Create a level playing field for all service providers across public & private entities
- Build legal credibility under IT Act to bolster Issuer and Requester confidence
- Expedite creation of a larger DigiLocker footprint



Notable use cases include:

Education

- Over 37 crore authentic digital educational certificates from Central Boards as well as over 18 State Educational Boards.
- Same day publishing of CBSE X & XII marksheets for last 4 years
- Foreign Universities verifying data via DigiLocker repository via eSanad (MEA system) of academic documents

Traffic - Pan India usage by drivers to show DL & RC via DigiLocker mobile app

Railways & Airports - Pan India acceptance of DigiLocker produced ID for passenger verification

BFSI/Online Brokerages/FinTech

- Ministry of Finance (Department of Revenue): Amendment in Prevention of Money-laundering (Maintenance of Records) Rules, 2005 to accept digital KYC document through G.S.R. 582(E) on 20th August 2019.
- Numerous platforms using DigiLocker to do document verification

Kerala Flood Rehabilitation - Post floods Kerala govt fast tracked 8 Departments integrate with DigiLocker and allow residents to identify and claim critical document.



Additionally following agencies have also notified use of DigiLocker:

- Ministry of HRD (Ministry of Education) – DigiLocker notified as sole National Academic Depository (NAD) for digital academic awards management on 18 March 2020.
- RBI Master Master Direction on KYC – Inclusion of DigiLocker issued documents as part of customer KYC in Jan 2020.
- SEBI Circular for KYC – DigiLocker documents accepted as part account opening process in April 2020.
- Visit: <https://digilocker.gov.in>

Awareness and Communication

Awareness and Communication (A&C) is an integral component of Digital India. A&C performs the crucial role of generating and raising the level of awareness about Digital India, related services and service delivery channels amongst diverse stakeholders across the country. The main objectives of A&C activities are:

- Expand visibility of Digital India by informing, educating and communicating to citizens about various initiatives and services under “Digital India”, thereby empowering them
- Establish the brand “Digital India” by way of effective branding exercise across various platforms- Mass media, Rural Outreach, Social media and public interface touch points
- Help citizens understand benefits of Digital India
 - Facilitate demand creation for various services leading to more adoption of services
 - Increase in downloads of app based services
 - Increase in likes on Social Media platforms

Achievements

- RAISE 2020:** Organizing and Event Management of the mega event RAISE 2020 (Responsible AI for Social Empowerment) Virtual Summit from October 5-9, 2020. RAISE 2020 was a first-of-its-kind, global meeting of minds on Artificial Intelligence to drive India’s vision and roadmap for social transformation, inclusion and empowerment through responsible AI. Organized by NeGD, Ministry of Electronics and Information Technology and NITI Aayog, the event witnessed robust participation from global industry leaders, key opinion makers, Government representatives

and academia. RAISE 2020 had over 48 sessions spanning over 85 hours of insightful discourse on Responsible AI with 321 speakers from 21 nations. More than 79,000 users from 147 Nations registered for the Summit - a testimony of what's possible in a Virtual Summit- a reality of Post COVID World. The broad activities of "RAISE 2020" included (but not limited to) the following :-

- Event planning and preparation as per timelines
- Speaker Management of RAISE 2020: on-boarding speakers for various sessions, designing sessions for the 5 day Summit; Coordination with Industry partners for designing session structure
- Managing speaker profiles, photos and other details as a part website e-content, and social media pre-event and during event promotion
- On-boarding of Social Media and PR agencies for RAISE 2020
- Development of RAISE 2020 creatives- Social Media, Short Film
- Public Relation (PR) & Social Media Management for RAISE 2020
- Session Report preparation, bill processing and vendor payment
- All Branding Design- Web Banners, eMailers, Certificate, Video Graphics Virtual Banners etc.
- 5 Years of Digital India: To commemorate completion of 5 years of Digital India, a mega event was organized virtually on July 1, 2020. At the said event, the Hon'ble Minister of Electronics & IT, Communications and Law & Justice, Shri Ravi Shankar Prasad launched the new version of the UMANG App through a video spot that highlighted its new features, services, benefits. The Minister also launched

an eBook on services under Digital India and chaired a panel discussion organized over VC, with distinguished officers from Industry, Academia and the Government to mark the occasion. The broad activities included the following:

- Film Production on 5 Years of Digital India
- Video Spot on UMANG (in its new avatar highlighting its new features, services & benefits)
- eBook on 5 Years of Digital India

ACTIVITIES DURING 2020

SOCIAL MEDIA

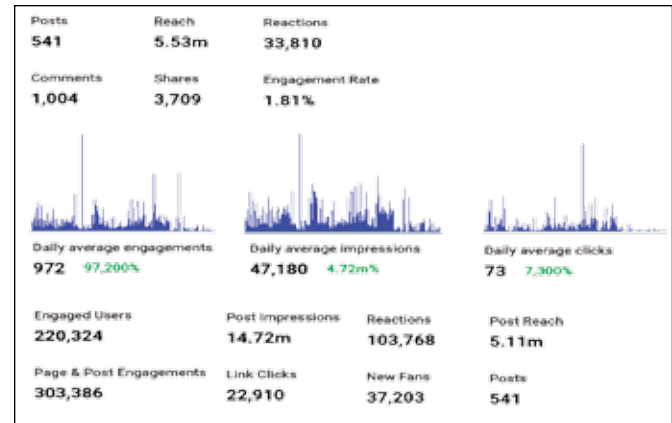
- Rigorous promotional activities of existing and latest Digital services and initiatives taken by the Gol across Digital India and Meity Facebook, YouTube, Instagram, Twitter & LinkedIn platforms
- Ministries specific trending news updates, launch, schemes etc covered with regular social media postings.
- Cross promotional activities of various initiatives covered by active Government social media pages
- Technology and AI specific initiatives covered on a regular basis with #VocalForLocalTech hashtag
- Coverage of RAISE 2020 on social media channels in terms of – event coverage with still creative copies, industry leaders' video testimonials, Facebook live coverage of the event, Live tweeting etc.,
- Digital India Portal Quiz (Fortnightly basis)
- Weekly social media organic activities across all channels with the help of weekly social media calendar in terms of – Still creatives, video/GIF content, video testimonials,

Facebook live sessions, live Tweets, audio podcasts media feeds, micro campaigns (Service/Initiative based), Twitter Q&A sessions.

- 2000+ social media posts are posted across Digital India, MeitY, NeGD, UMANG platforms on a monthly basis.
- Some campaigns carried out on social media handles (Facebook/Twitter/Instagram/LinkedIn/YouTube) of Digital India/MeitY/UMANG/NeGD are as under:-
 - Responsible AI for Social Empowerment 2020 (Ongoing)
 - Responsible AI for Youth- National Program (Ongoing)
 - New Education Policy 2020 (Ongoing)
 - India Fights Corona (Ongoing-COVID-19 Precautionary Measures)
 - Setu Mera Bodyguard (AarogyaSetu App)
 - Digital Bharat AatmaNirbhar Bharat (5 Years of Digital India)
 - AatmaNirbhar Bharat App Innovation Challenge
 - Swadeshi Microprocessor Challenge
 - CSC Diwas
 - Yoga Diwas
 - Electronics Manufacturing Schemes Launch (PLI, SPECS & EMC 2.0)
 - Corona Helpline Chatbots (My Gov Saathi, Whats App/Facebook Messenger/Telegram etc)
 - Hack the Crisis in India
 - Independence Day promotions
 - Promotion of UPI Chalega videos
 - National Challenge: Ideate for India: Creative Solutions Using Technology

- Launch of National Portal on AI
- Webinars Organised by NeGD on Capacity Building

Analytics of Digital India's Facebook Page (Date range: from January 1, 2020 to November 7, 2020), to give a glimpse of the social media numbers achieved:



CAMPAIGN on MYGOV INDIA- POSITIVE HARMONIES

MyGov's Positive Harmonies was initiated with the sole objective to bring positivity and joy in the lives of citizens of India, through the language of art- Music, Dance, Painting, Poetry or Photography, amid the difficult times of the COVID-19 pandemic. The aim was to mitigate stress, anxiety and negativity that people were going through, especially during the lockdown period. The idea was to bring together multiple Indian artists from various fields of art on one single platform to lift the spirits of people and entertain through their art. Artists were contacted from various parts of the country who recorded a video, right from their homes, to let citizens know that they were following all the advisories given by the Government and encouraged them to follow the same. Artists recorded a 3-5 minute video in which they presented a traditional/modern composition of their art form. To inspire citizens, the artists also recorded a short message to stay safe and take all necessary precautions to protect themselves

from COVID-19. Positive Harmonies was one such unique property conceptualized, planned and worked upon by A&C, which included contacting artists, coordination with them, editing of their videos and creation of supporting content for social media handles.

Over 160 videos published as part of Positive Harmonies Campaign.

PRINT MEDIA

Article on “Digital India Leading the Way to AatmaNirbhar Bharat” in INDIA TODAY Magazine

- Issue Date- August 15, 2020
- Languages- English

Article on “Digital Bharat AatmaNirbhar Bharat” in THE WEEK Magazine

- Issue Date- August 15, 2020
- Languages- English

Booklet- 5 Years of Digital India

EXCLUSIVE PROJECTS:

Responsible AI for Youth (Ongoing)- ‘Responsible AI for Youth’ - a national program for Government Schools was launched by the Hon’ble Minister of Electronics & IT, Communications and Law & Justice, Shri Ravi Shankar Prasad on May 30, 2020. The program is an initiative taken by NeGD under Ministry of Electronics and Information in collaboration with Intel India. With the objective to empower Government school students with appropriate new age tech mind-set, relevant skill-sets and access to required tool-sets, the program is training them in emerging technologies like AI and supporting them to become part of the skilled future workforce in an inclusive manner. The Program open to students from Government Schools, classes 8 – 12 across the country is planned to be implemented in a phase wise manner.

- In Phase I, the program reached out to teachers and students from across the country and provided them with orientation and online training sessions
- 50,666 students registered from 35 states and UTs (5,724 cities)
- 11,430 students completed first level of AI training
- 2,536 teachers from 2,252 schools from 35 states and UTs attended orientation sessions
- 2,704 ideas received from 2,441 students (some have submitted more than 1 idea and some are group entries)
- An independent agency was chosen, after due diligence, to evaluate the received entries. The judges were identified based on their expertise, level of understanding of AI, emerging technologies, and Indian scenario.
- Out of 2,704 ideas, 1,754 ideas fulfilled the eligibility requirements
- Each of these 1,754 ideas were then evaluated by 3 judges
- In Phase II, after following a detailed evaluation process, making use of the rubrics validated by experts, top 100 ideas have been shortlisted
- These 100 ideas are represented by 125 students from 25 States and UTs (Some ideas were submitted by a group of 2 – 3 students while some are individual entries)
- Out of these 125 students, there are
 - 67 girl students and 58 boy students
 - 94 students from State-run Government Schools
 - 23 from Central Government Kendriya Vidyalayas
 - 6 from Government Aided Schools
 - 2 from Navodaya Vidyalayas

These 125 students will now undergo deep dive AI training and work with AI experts and coaches to give shape to their ideas and create indigenous solutions to solve local issues and submit a final project video on the program website.

In Phase III - 50 shortlisted ideas/students will be invited to showcase their projects and top 20 innovative projects will be selected as winners.

OTHER WORK

- **AV PRODUCTION** - IndEA Film- India Enterprise Architecture (IndEA) framework, establishes best-in-class architectural governance, processes and practices using Information & Communication Technology infrastructure and applications to offer ONE Government experience to the citizens and businesses through cashless, paperless, and faceless services
- **DESIGNING**
 - 5 Years of Digital Bharat AatmaNirbhar Bharat Booklet
 - IIS (Industrial Information System) – Mobile App Design
 - ASI (Archaeological Survey of India) – Mobile App Design
 - Gallantry Awards – Website Design
 - Knowledge Repository Website Design
 - AVMS – SUPREMO Website Design for PMO
 - Appointment System Website Design for PMO
 - Positive Harmonies (Campaign on MyGov India) Logo Design
 - UMANG Newsletter
 - Digital India Website Newstrack – Weekly
 - Cyber Surakshit Bharat Brochure

- National Platform for Language Technology (NPLT) – Website Design
- The Week Magazine – Digital Bharat Aatmanirbhar Bharat
- Digital India Dialogue – Meghraj Cloud (Webinar Series)
- Delhi Police Museum Setup – (Digital India Theme)
- Annual Report for MeitY (Cover Page Design)

• LOGO AND FINANCIAL SUPPORT FOR WORKSHOPS/SEMINARS/ CONFERENCES/EXHIBITIONS:

- Webinar, FICCI AI India Conclave, Delhi, September 15, 2020 organized by FICCI
- Third technology conference “INFINITY 2020”, September 24 - 25, 2020 organized by Amity Business School, Amity University, Greater Noida, U.P

India Enterprise Architecture (IndEA)

We know that the United Nations e-Governance survey emphasized on a whole-of-Government approach, policy integration and use of big data analytics in order to provide better governance to citizens. These trends require breaking of sectoral barriers and silos and re-architecting the Government as a single enterprise.

In order to realize the vision of Digital India i.e. i) Digital Infrastructure as a Utility to Every Citizen, ii) Governance & Services on Demand and, iii.) Digital Empowerment of Citizens, there is a need for an interoperable ecosystem of data, applications and processes which will make the digital services digitally accessible in an integrated manner to citizens and businesses through multiple channels, such as web, mobile and common service delivery outlets.

Accordingly, MeitY prepared a generic India Enterprise Architecture (IndEA) framework, comprising of a set of architecture reference models, shall enable the Government of India to initiate EA transformation in Indian Governmental organizations, States and Indian Government as a whole. The IndEA framework is based on Federated architecture approach and recognizes need to accommodate both greenfield (new) and brownfield (existing/legacy) e-Gov initiatives.

The purpose of Enterprise Architectures for E-Government is to support transactional system interoperability, quicker response to Government enterprise wide issues, reduce complexity in IT landscape, enhance enterprise security, facilitate information based decision making while driving efficiency, cost benefits, sharing and reuse. Enterprise Architecture is extensively used by developed countries like South Korea, Singapore, Germany, USA, New Zealand, Australia etc.,

Under the India Enterprise Architecture (IndEA) project the mandate of NeGD is to:

- Drive the IndEA initiative across the Government.
- Maintain repository of IndEA core applications (e.g. DigiLocker, email gateway, rapid assessment system etc), repository of reusable artifacts, common use applications, best practices and model domain architectures
- Build capacity and enable knowledge sharing across Government.
- Empanel Consulting Organizations and experts for Enterprise Architecture and encourage industry participation
- Provide funding, hand holding support for IndEA blueprinting and pilot implementation in 2 Sectors and 2 States, to demonstrate the effectiveness of IndEA implementation.

Training has been conducted for 16 Ministries/ States/UTs including Meghalaya, Himachal Pradesh, Uttarakhand, Orissa, Telangana, Daman & Diu, Delhi Government, Jharkhand, Mizoram, Rajasthan, Chhattisgarh, Haryana MOFPI (Ministry for food Processing). A film on IndEA has been prepared to spread awareness about India Enterprise Architecture.

The IndEA repository has been enriched with Project documents, guidelines, e-learning material, architectural building blocks, reference architectures, model domain architectures, standardised templates, cases studies, best practices, lessons learnt, tools and artefacts etc.,

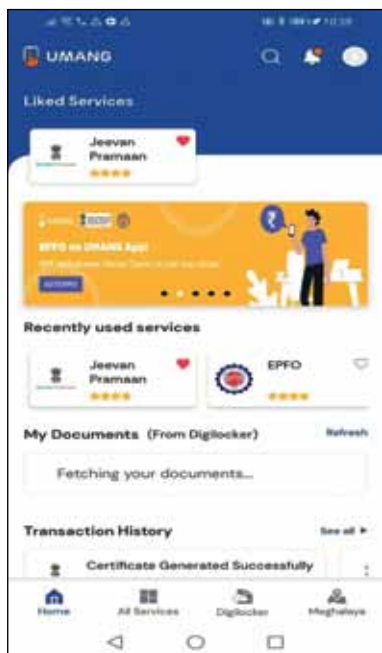
NeGD has empanelled EA experts and Consulting Agencies to aid Ministries and States for implementation of India Enterprise Architecture (IndEA).

Initially, the sectors for Health, Agriculture and Education along-with the State of Meghalaya were selected as pilot initiatives for preparation of architecture blueprint and segmented implementation as proof of concept. Later the scope of the architecture blueprint preparation has been expanded to other sectors i.e. Power & Energy, Rural Development, Land Records, Urban Development, Logistics, Industry/MSME, Public Safety & Integrated Criminal Justice, Women & Child, Skills & Employment, Social Justice, Railways etc.

The architecture blueprint prepared for Health included a federated architecture, a set of architectural principles, a layered system of architectural building blocks e.g. Core sectoral data sets, data exchange and consent management, applicable standards and regulations, group applications, common use applications, analytics and above all, multiple access channels for the citizen like call centres and integrated services portal. The National Digital Health Blueprint is

currently being implemented as National Digital Health Mission (NDHM) by National Health Authority (NHA).

The architecture blueprint is in advanced stages of implementation for the Ministry of Agriculture & Farmers Welfare and DoSE&L, Ministry of Education.



Unified Mobile Application for New-Age Governance (UMANG)

UMANG has been developed as a single mobile platform to deliver major Government services. Hon'ble Prime Minister has dedicated UMANG to the nation on 23rd November, 2017

UMANG has been developed as a single mobile platform to deliver major Government services with Core Platform integrated with DigiLocker, PayGov, Rapid Assessment System (RAS) etc.

- UMANG supports 12 Indian languages, in addition to English and has been hosted on cloud. UMANG aims to bring power to the finger tips of citizens.
- Till 31st October, 2020, UMANG has about 2039 services (860 – Central and State

Government services; 1179 –Bill Payment services) from 189 Departments of Central Government Departments and Government Departments of 27 States/UTs and many more are continuously being on-boarded.

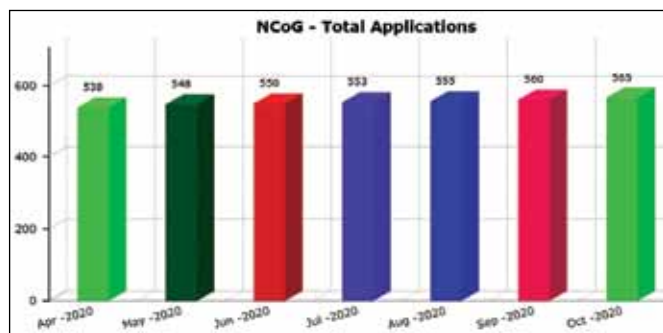
- Revamped UMANG Android app was launched with a new UI/UX providing more personalized and secure experience.
- UMANG International app will also be made available very soon which will allow access of Government services from other countries.
- MoU was signed between NeGD and CSC e-Governance Services India to facilitate delivery of UMANG app services through Common Service Centres (CSCs) in an assisted mode. Select services on UMANG app are now also available to citizens through the network of 3.75 lakh CSCs.
- In order to reach more and more residents of India, selected services of UMANG app are being made available on Feature Phones running on KaiOS Operating System (Jio phones). This will enable users who do not have smartphones to also avail services of integrated Departments on UMANG. 72 services of UMANG have been made live on KaiOS platform.
- Around 8.72 lakh Advance Claims (COVID -19) in EPFO were raised via UMANG Platform.
- 147 services of DBT (Direct Benefit Transfer) have been made live on UMANG during this period.
- PM Cares Service for collecting fund to fight against COVID was also made live on UMANG.

National Centre of Geo-informatics

National Centre of Geo-informatics (NCoG) is a single source Geographic Information System (GIS)

platform for sharing, collaboration, location-based analytics and decision support system, catering to Central and State Ministries/Departments/Agencies across the country. Under this project location-based datasets such as data related to central Government land banks, mining, forests, industrial parks, water resources etc., are collated with attribute related data to bring out insights that are useful to support decision making. User Departments can now pinpoint its operations, assets on a map and plan better. NCoG has provided mobile applications for geo-tagging and creating evidence of completed operations under the Government schemes. Key features of NCoG are:

- 1:5000 Basemap
- Open Source and in-house development – results in cost saving as there is no use of proprietary software
- Integration of technologies (web, mobile, GIS, GPS, image processing, mathematical models etc.)
- Compatibility to multi-purpose geodatasets
- Dynamic Query – Multiple customized reports and dashboards available
- Training – Two way capacity building
- Authentication – the representation of data on GIS platform is authenticated by the user/owner department/agency



Transformative Impact:

- NCoG has brought transparency and improved

planning. This has been made possible by the breakthrough GIS solutions rolled out in the form of web portals and custom mobile applications empowered by space technology.

- Good governance: Mining Surveillance System has helped curb illegal mining through automatic remote sensing detection. The district officials are notified and action taken by them is reported through mobile app.
- Monitoring: Mapping of all Central Government land parcels including that of CPSEs and enable identification of land for specific purposes.

96, 478 land parcels mapped

Area mapped: 15,113 Sq. Km

122 CPSEs onboard

50 Ministries/Depts. onboard

- Developmental Planning: Industrial Information System holds information of 3904 Industrial Parks, estates, clusters etc., Information ranges from Connectivity to rail, road, air and port. Availability of Raw Materials, urban infrastructure etc.
- Ease of Doing Business – It is easy to apply and obtain the NOCs for various industrial activities involving permissions that have to be obtained from Defence/Security Agencies through the GIS based NOC portals. Industrial Park Rating System helps rate the Industrial facility/infrastructure on a GIS based system, tenants and citizens can provide feedback.
- GIS web portal for 115 districts implemented with various layers for infrastructure, agriculture, demographic details, education, health, energy, forest, industry, infrastructure, water resources, water supply, banks, skill development etc. Disaster Management: Ready to use 3D profiling of the country. Crucial for developing flood simulation systems.

Industrial information System

- IIS as National Land Bank for Industries, launched by Commerce and Industry Minister August, 2020. The system holds information for 3904 Industrial Parks with across 31 States/UTs
- API based Plot level Integration with State Government GIS Platforms
- Details such as Plot Allotment, Vacancy, Industrial, Commercial Plots, Industrial Activity etc



Online NOC clearances for Power Projects and Offshore Oil exploration & naval surveys

was Launched by Hon'ble Defence Minister, Shri Rajnath Singh on 29th June 2020

- NOC clearances for setting-up a) Power projects and b) Offshore Oil exploration and naval surveys



Ayush Sanjivani – Mobile Application

- Launched by Hon'ble Health Minister, Dr Harsh Vardhan on 7 May 2020

- 5.22 lakh Downloads on Play Store (as on 2nd July 2020)
- Feedback app for AYUSH interventions for boosting immunity during COVID-19; data hosted on NCoG servers and accessed via a web portal



National Mission for Cultural Mapping

- Art Forms Database (301 so far)
- Artist Data Collection (14,53,194 artists registered so far)
- Proposals of New Art Forms from Public
- Verification of Proposed Art Forms
- Culture Schemes as per eligibility



Pradhan Mantri Adarsh Gram Yojana - To conduct the survey undertaken for PMAGY scheme in an offline mode for the Ministry of Social justice and Empowerment



Covid 19 Specific projects:

GovTalk: Launched by Commissioner, Delhi Police on April 14, 2020

Real-time communication of orders and notifications to on ground officers and personnel, especially to deal with COVID-19 outbreak.



COVID-19 APP for NAGALAND

Capturing and Disseminating information to Citizens and Health Workers related to COVID-19



COVID-19 SEAFARER REPATRIATION

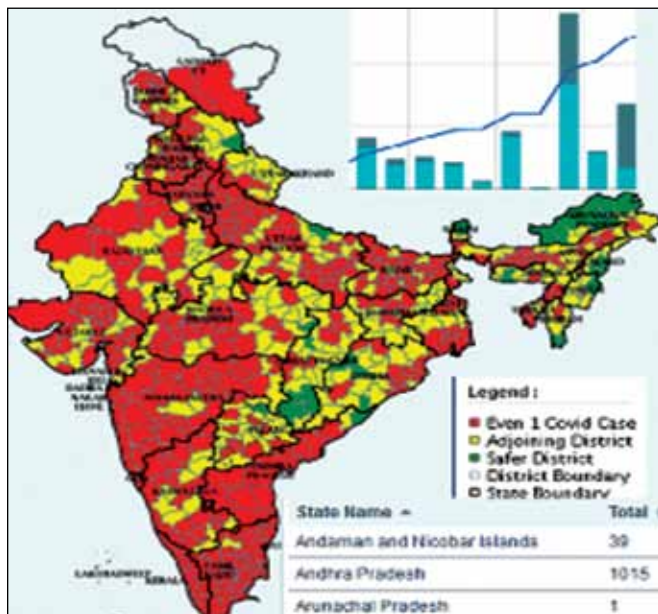
Capturing information for Seafarer's stranded internationally due to COVID-19 – for DG Shipping



COVID-19 GEO-MAPPING - STATES

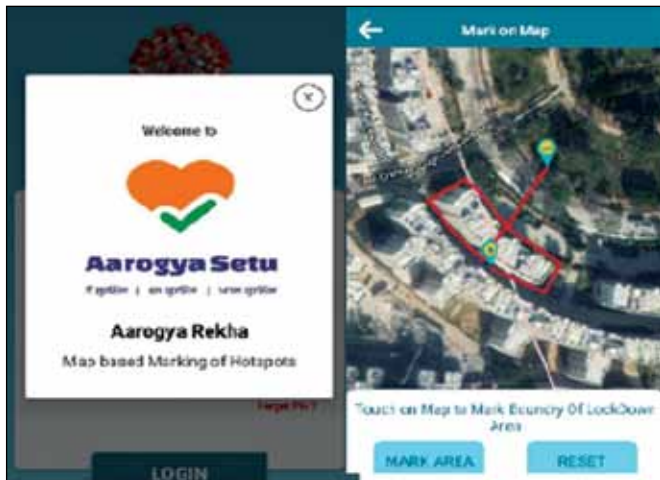


- Zone mapping – Red Orange Green
- Patient Mapping
- Health facility and infra mapping



Mobile Coverage Information System (12,600 towers mapped across India), ICMR Data Dashboard, ICMR Data Collection Management, Corona Kavach, COVID-19 Self Assessment Tool etc.,

AAROGYA REKHA



INLAND WATERS AUTHORITY OF INDIA - Indo-Bangladesh Voyage Permission



Ministry of Tourism



NOC for Structures across Waterways

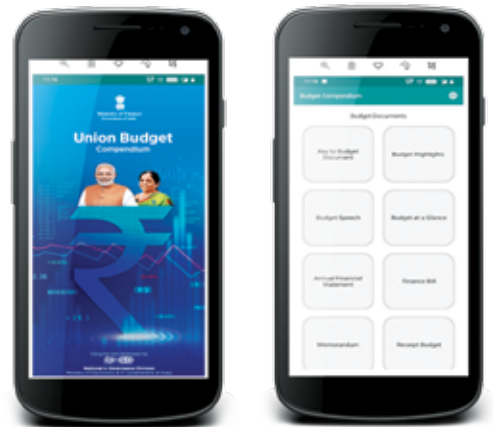


Indian Heritage Mission

Capturing GIS data of Central, State and unprotected monuments across India.



Union Budget – Mobile Application



NCoG Project

Government Land Information System

Water Resources GIS & Jal Sanchay GIS

Aspirational Districts GIS

Mining Surveillance System

Border Area Development Program GIS for Boader States

NHAI – GIS & Road Information System

MPLADS GIS

GIS for National Laboratory Directory

NCoG Project

GIS for Tribal Affairs

Soil Information System

Mobile Coverage Information System

Rail Land Information System

Tatpar Delhi Police

GIS for Security Agencies

AYUSH Ministry GIS Applications

PM-UDAY-Delhi Development Authority

Corona Kavach

National Mission on Cultural Mapping GIS

Rural Electrification System GIS

British India Corporation Ltd. GIS

National Textile Corporation Ltd.

9.7 Standardisation, Testing and Quality Certification (STQC) Directorate
9.7.1. Introduction

STQC Directorate is an attached office of Ministry of Electronics and Information Technology (MeitY), Government of India. STQC Dte. has established a network of fifteen testing and calibration laboratories in the country including North-Eastern region. STQC laboratories offer quality assurance services in the field of electronics and Information Technology including e-Governance applications as per national/international standards/best practices and obtained many national and international accreditations/recognitions. A gist of their country wide locations and services being offered are mentioned below –

Laboratories/Centres	Locations	Services offered
Electronics Regional Test Labs (ERTLs)	Delhi, Kolkata, Mumbai, Thiruvananthapuram	Testing and Calibration both for electronics products. and Information Technology.
Electronics Test & Development Centres (ETDCs)	Bengaluru, Mohali, Hyderabad, Chennai, Guwahati, Pune, Goa, Agartala, Jaipur, Solan and Ajmer	
STQC IT Centres	Delhi, Kolkata, Bengaluru, Thiruvananthapuram, Hyderabad, Chennai, Guwahati, Mohali, Pune, Agartala and Jaipur. (Co-located with respective ERTLs/ETDCs)	Testing for Information Technology products and services. (IT testing activities are taken up at all labs except Mumbai, Goa, Solan and Ajmer)
Indian Institute of Quality Management (IIQM)	Jaipur (Co-located with respective ETDC)	Training courses on Quality Management, Information Security, Website Quality testing etc.
Centre for Reliability (CFR)	Chennai (Co-located with respective ETDC)	Reliability testing
Regional Certification Centres	Delhi, Kolkata, Mumbai and Bengaluru (Co-located with respective ERTLs/ETDCs)	Certification services for Quality Management and Product Safety

Major Achievements during FY 2020-21

Major services offered - Information Technology (IT)

STQC IT centres have successfully executed testing and assessment of the number of e-Governance, Defence, Space and IT Projects of Central and State Governments. In the time of COVID-19 pandemic, our scientists have been facilitated to access office network office infrastructure from home for conducting audit activities with an intent to provide uninterrupted service to the clients. Some of the major jobs undertaken are indicated below -

Services offered	Name of the Project
IT Services	ERTL(North), Delhi Security Testing of CCTV Cameras (End Point Device-on sample basis) of RAILTEL from Indian Railway: Compliance for OWASP Application Security Verification Standard 4.0, 2019 - Appendix C: Internet of Things Verification Requirements. - Security Testing of PoS devices used for the sale of fertilizer for Department of Fertilizers with Embedded Linux and Android OS version. - NCMC card specifications and AFC system certification. - Assessment of L1 Biometric device fitted with certified PCH (submitted by M/s Smart Chip Pvt. Ltd.) as per the guidelines laid down by UIDAI in AADHAR technical specifications. - Testing of COVID-19 Tracing App 'Arogaya Setu' in association with ERTL(East). - Mobile Application security testing iGOT 2.0 of DoPT, Income tax Aayakar Kutumb and Way finder of C-DOT - Testing of Smart Cards under SCOSTA Certification scheme. Audit in progress for Trusted Electronics Value Chain scheme as per IEC/ISO 20243 - 1 & 2 for M/s. Idemia Pvt. Ltd., Noida for its product i.e. SIM Card (manufactured at Noida, UP) which is being audited as the 1st ICT product in compliance of Clause 5.11 of National Electronics Policy issued vide Gazette No.26(1)/2019-IPHW dated 25th February 2019. Testing & Evaluation of Major Central & State level e-Governance projects for e-Governance & Cyber Security Compliance : - EHRMS, - CBEC - ICEGATE, - e-SANCHIT - ICDS CAS (POSHAN)

Services offered	Name of the Project
	• iGOT Project of DoPT, • NJRS Project, • MCA 21, STPI, • NITI Aayog, • CRIS, • UPPCL, • NHA Project • Ayushman Bharat applications, • e-Procurement Systems such as : GEPNIC, GEM, EPTL, SJVN, ITC Goa, Link Star and BSNL EPS, • Carried out Independent Verification and Validation of Integrated Air Command & Control System of Indian Air force, Ministry of Defence developed by BEL, Ghaziabad. ERTL(East), Kolkata 1. Completed Conformity Assessment of e-Procurement and e-Auction platform of different organizations. The systems are successfully used in different e-Auction exercise of Government of India. 2. Undertaken Functional testing, Performance testing and Security Assessment of different modules [Centre and State, Online/Offline application] of National Crime Research Bureau (NCRB) applications. 3. Completed Functional testing of e-District Nagaland, Government of Nagaland Application and e-Billing (e-Shivsahi) application for Maharashtra State Transport Corporation. 4. Carried out special audit on Advanced Cloud Services as per Cloud Services Bouquet version 1 from MeitY for a leading Cloud Service provider of India. 5. New service started for Security Assessment of Mobile Apps for Android and iOS against the security requirements of OWASP for L1 + R. 6. Completed Security Assessment of mobile apps (both Android and iOS) and server-side application of two indigenous Video Conferencing applications. 7. Completed Security Assessment of CCTV IP Video Surveillance system of HIKVISION. The surveillance system includes IP camera, network video recorder, mobile network video recorder, face recognition server and external storage. 8. Completed Security Assessment of API-based EPIC Transfer application of Chief Election Commission, West Bengal.

Services offered	Name of the Project
	- Conducted SBI Security Compliance audit for payment gateway to receive payments across Powergrid Corporation of (I) Ltd. through SBI and Paygov Payment Gateway. - Completed CVS and IT Conformity Assessment of e-Procurement application of Ordnance Factory Board (OFB), e-Bidding application for allocation of spectrum and e-Auction application of different organizations. The systems are successfully used in electronic procurement and different e-Bidding/e-Auction exercises of Government of India. - Undertaken Security Vulnerability Assessment of the websites for Indian Missions, Ministry of External Affairs, Government of India. - About 50 web applications/websites from different Departments of Government of West Bengal, Tripura, Bihar, Jharkhand, Assam, Nagaland and Government of India have been assessed for Security Vulnerabilities and cleared for 'safe to host'. - Completed initial Security Assessment for about 30 Web applications/web sites from different organization including Integrated Payroll and Accounting System of CRIS and waiting for closures (by the developers) to issue final clearance. - Conducted Penetration test of Internet-facing IP addresses of about 30 IP addresses and Vulnerability Assessment of critical infrastructure of various Government of India and private organizations of 60 hosts. Necessary arrangements have been made for conducting Vulnerability Assessment remotely due to restrictions on movement in the pandemic. ETDC(Chn), Chennai - Carried out Application Security testing and Vulnerability Assessment for the Website of Kamaraj Port Trust. - Carried out the third party Conformity Assessment of Network of smart elements for the Pune Smart City project. The assessment primarily covers Review, Testing and Audit of project components such as Application Software, IT Infrastructure, Network Security and Service Operation processes and Service Quality (SLAs). ETDC(Bg), Bengaluru - e-Security Testing and Assessment services were provided to Health and Family Welfare Department, Hindustan Aeronautics Limited, KEONICS, CANBANK & Center of e-Governance (CeG), Karnataka. - Drafted and submitted Internet of Things Security & Privacy standard to LITD-17 and LITD-27 committees of BIS. - Assessed following products for compliance with "Guidelines for Compliance to Quality Requirements of e-Procurement Systems" which includes requirements of IT Act, CVC, GFR and ISO/IEC 27001 and Functionality Testing, Performance Testing, Application Security, Vulnerability Assessment and Penetration Testing :

Services offered	Name of the Project
	- “TenderWizard” e-Procurement System by M/s Antares System Limited was evaluated and certified. - Supplier Relationship Management e-Procurement System for Bharat Electronics (BEL SRM), a SAP based system, is under evaluation.
	4. Independent verification and validation service is provided for Akash Weapon System Simulator software developed by BEL.
	ETDC(Hyd), Hyderabad
	1. Undertaken Functionality testing of software of Varunastra (Combat Version), an embedded software used for firing torpedoes from ship developed by Naval Science Technological Laboratory, DRDO, Visakhapatnam.
	ERTL(South), Thiruvananthapuram
	1. Certification of Vikram Sarabhai Space Centre e-Procurement System, and Security Audit of the Internet Segment of Liquid Propulsion System Centre, ISRO is under progress.
	ETDC(Pune), Pune
	1. Undertaken various activities like Security testing & audit of Network of Smart Elements, Functional testing of the Application software, Physical Verification of Smart Elements like Variable Message Displays, Public Address System, Emergency Call Box, Environmental Sensors, Flood Sensors and Wi-Fi zones for “Conformity Assessment of Smart Elements in Pune Smart City” project in Pune.

Common Criteria (CC) Testing/Certification Infrastructure

Common Criteria Security Test/Evaluation Laboratory as well as a Certification Scheme based on Common Criteria standard have already been established at ERTL(East), Kolkata, ERTL(North), Delhi and ETDC(Bengaluru). The Common Criteria Test laboratories are operational. Following services have been provided:

By ERTL(East) :

- The lab completed successful Common Criteria (CC) evaluation of 4 IT security products at different EAL. One product is used by Indian Air Force of National importance having resilient security posture meeting the ever changing security dynamics of the organization to cater to the security needs and

real time responses/remediation of threats across the Indian Air force Command & Control System (IACCS) infrastructure. Other three products are related to telecommunication use.

- CC Testing lab is also conducting EAL 4+ CC evaluation of a Certificate Authority (CA) server and CC evaluation of Telecommunication network elements.

By ERTL(North) :

- CC Evaluation of IP Camera Firmware is progress
- Feasibility study of CC Evaluation of HPE Integrated Lights-Out for EAL-2.

By ETDC (BG) :

- Evaluation of Privileged Access Management

(PAM) for CC EAL-2 is under progress.

National facility for Quality Assessment of Biometric Devices :

In order to eliminate the use of stored biometrics, UIDAI has mandated the use of Registered Devices for Biometric authentication. Before deployment of Registered Biometric devices in the field, Hardware and RD services of the Registered Devices were certified by STQC for following categories :

- Biometric Device certification for Authentication
 - Discrete Finger Print Scanner (FPS) and IRIS devices
 - Integrated IRIS devices
- Biometric Device certification for Enrolment (Discrete FPS & IRIS devices)
- Registered Device (RD) Service certification for Authentication
- L1 Pre-certified H/W (PCH) certification
- L1 Biometric Authentication device using certified PCH (Discrete FPS & IRIS)
- QR Code Scanner certification scheme.

STQC labs have certified 22 Bio-metric products/ services, as per UIDAI technical specifications, for 27 vendors in various sub-schemes mentioned above.

Website Quality Certification Services

Website Quality Certification Scheme based upon national and International standards/best practices aims to help in hardening of websites from wide range of Security threats, increasing Accessibility, assuring commitment to services and ensuring compliance to the requirements of Guidelines for Indian Government Websites (GIGW).

The award of the mark “Certified Quality Website (CQW)” is a recognition that the website complies with the requirements of GIGW-2018 and the organization has adequate procedures and processes in place to provide reliable and dependable information and service through their website. Under the Website Quality Certification Scheme, 265 websites belonging to Central/State Governments/offices have been certified.

3. Major services offered – Testing and Calibration

STQC laboratories have provided test and calibration services to a large number of industry, public sector undertakings and Government organisations. Some of the major testing and calibration jobs undertaken during the period are indicated below -

Name of Laboratory	Services offered
ERTL (North), Delhi	• Tested RFID Tags for deployment in railway wagons for CRIS. • Tested & certified QR Code Scanner for UIDAI. • Rotary Switch 63A, IEC60947-5-1 • Ozone Air Purifier -Wall Mounting with 12V DC operated • VCL-16/32-E1/T1 over Ethernet(GE) Multiplexer • PA System Amplifier TZA-7000 DP, 500W with its accessories IEC 60065-2014/IS616-2017 • Amplifier with I/P Power 2000W & above, LXA-2000 • CDOT XGS PON system comprises CDOT XGS OLT(1n0.) & CDOT XGS ONTs Cush-44 2-in-1 Horn Loaded Speaker System with one 6430-25 watts Driver unit

Name of Laboratory	Services offered
	• Rugged Mobile Phone IEC 60950-1-2005 • Rugged Tablet IEC 60950-1-2005 • 4-Conductor Disconnect Terminal Block as per customer's specifications. • Fuse Disconnect Terminal Block as per customer's specifications. • 2-Conductor Disconnect Terminal Block as per customer's specifications. • Power Adaptor for LED Strip (PCB) • Mixer Grinder/Blender MG 1653, IEC60335-2-14-2002 • Rack Enclosure with -48V DC Power supply inside, 29 kg, small size • Kent Cold Pressed Juicer • Lab acquired Recognition by Telecommunication Engineering Centre (TEC) under Mandatory Testing & Certification of Telecommunication Equipment (MTCTE). • The following T & M equipment were installed for upgradation of Calibration, Environment, EMI-EMC, System & Safety test facilities : ○ Calibration Kit, N-Type , R&S, ZV-Z270 and Verification Kit, N-Type, R&S, ZV-Z470 ○ Alternating (AC and DC) Stray Magnetic Induction Test System, Make: METRO POWER SYSTEMS ○ Complex Load, Make: Metro Power Systems ○ High Temperature Test Chamber (Oven) Make: M/s Pacific Dynamics, Model PDEC-500 ○ Programmable Temperature & Humidity Chamber (340L), Make: CME, Model: PAC-380-A-3K ○ Low/High Test Chamber, 1000L(Rapid cooling/heating), Make: CME, Model: PAC-1000-B-6K ○ Electrometer/High Resistance Meter, Make: Keithley, Model: 8517B/E ○ High Stability/High Performance Ultra Low Temperature Deep well Liquid Calibration Bath with interface-it software for controlling the bath automatically, Make: Fluke, Model: 7381-25 ○ High Performance Superior Multi-Product Calibrator with 1.1GHz Oscilloscope Calibration option, Make: Fluke, Model: 5522A/1GHZ 240 ○ Hand- held Pressure Calibrator, Make: GE Druck, Model: DPI611-07 ○ Vibration Analyzer Make: NPP Kohtect, Ukraine, Model:107VF ○ Ingress Protection test set up (complete test system) for IPX1, IPX2 and IPX3, IPX4. Make: ENVISYS, Model: ER1000-IPX1-4 ○ Climatic Test Chamber for Damp Heat (Steady State) test; Make: KASCO Industries Pvt Ltd; Model : HLH-576-B-3-TS; ○ Dust Chamber, Make: ENVISYS, Model: EDC 1000

Name of Laboratory	Services offered
ERTL (East) Kolkata	- Conducted Safety testing of Smart as well as Conventional type Single & Three Phase Energy Meters as per IEC 62052-31 for STQC 'S' Mark scheme. - Conducted Type testing of Energy Meters & Tri-Vector Meters of various types up to 100A (Imax) for major Indian manufacturers under Licensing Scheme of BIS and requirements of Electricity Boards across the country. - Conducted testing of LED based Solar Lighting System, Battery and PV Modules as per MNRE, BIS and IEC Standards, - Conducted Climatic conditioning, Mechanical Endurance & Ingress Protection tests on Electrical/Electronic Equipment/System for Telecom, Defence, Railway & other Industrial applications - Conducted revalidation testing & certification of Flameproof Electrical Equipment intended to be used in potentially hazardous atmospheres in underground Coal/Oil Mines and Surface Industries dealing with hydro-carbon and other combustible materials as per 2014 edition of IS/IEC 60079-1 series for BIS Product Certification and DGMS & PESO approval. - Telecommunication Engineering Centre(TEC) has qualified lab's test facilities as 'Conformity Assessment Body (CAB)' for Environmental testing of Telecommunication products (QM-333) and testing for Safety Requirements for IT Products (IEC 60950-1). - Facility upgradation for calibration of Frequency parameter from 6 GHz to 20GHz through procurement of new 20 GHz Frequency Counter and GPS Controlled Frequency Standard.
ERTL (West), Mumbai	- Completed Remote Assessment for five Certification clients for QMS, ISMS and S-Mark as per STQC Remote Assessment policy. - Completed Functional, Infrastructure and Security testing of Kakinada Smart City, Pune Smart City, National stock Exchange - IT division and Maharashtra State Transport division for Cyber Security compliance. - Completed audit of Forensic Science Laboratories (Central & State) as per MeitY Scheme for Notifying Examiner of Electronic Evidence Under section 79A of the Information Technology Act 2000. - Completed the EMI/EMC & Safety evaluation of In-Vitro medical products like Fully Automatic Clinical Chemistry Analyser, Fully automated Elisa Plate Processor Fully automated Elisa plate Processor, Bio-chemistry Analyzer, Elisa Plate Analyzer. - Completed Safety evaluation of Medical Electrical Equipment like Infant Warmer, Transport Incubator and Phototherapy unit as per IEC 60601-1. - Calibration services of ERTL(W) extended to Aircraft Maintenance division, Airports Authority of India for calibration of avionics instruments like IFR 4000, IFR 6000&N/I Module.

Name of Laboratory	Services offered
	• Provided accredited calibration services to Universal Instruments Pune, IDEMI, Mumbai, ETDC Pune, BARC, Mumbai to maintain traceability to their Master Instruments during lockdown under COVID-19. • Completed testing of Indigenous manufactured temperature sensor such as General Purpose RTD with Thermo well, Miniature bearing PT-100 finding its application at NPCIL. • Completed testing of Indigenous manufactured products such as Development Driving Unit (DDU), IIF Driver Unit, Outtrigger Driver Unit (ODU) unit, Power Distribution Unit (PDU) etc., for Defence industries. • Completed testing of Control Electronics of WAG9 6000Hp & 9000Hp, railway traction instrumentation, B-scan Ultrasonic Double Rail Tester manufactured by Indian manufacturers, playing its vital role in safety measures of Indian railway. • Completed testing of Indigenous manufactured tablet based Digital Monitoring & Attendance system and Ingress Protection (IP) testing of Isolator Panels and Bileg Liquid Level switch. • Completed testing of PTac-Power Transformer Auto Controller, plays its vital role in safety measures of Indian Power transmission system. • Environment Stress Screening of Printed Circuit Boards manufactured by SSI units having an application in Defense (Naval). • Completed testing of various instruments such as Mixer Amplifier, MIG Welding machines, Digital Ultrasonic Flaw Detector with A-scan, SMPS, Tap Changer Control & Transformer monitoring system etc., all manufactured by Indian units.
ETDC (Bg), Bengaluru	• Testing of Solar products like Solar home lighting systems, Solar street lights, Charge controllers etc., as per MNRE specifications. • Compliance Testing as per EMC Standards : - Tested Medical equipment as per IEC 60601-1-2 : Surgical Navigation System, Defibrillator, Balance Eye, Lumen Eye, Electro Surgical Unit, New Born Hearing Scaring Device, Jacket Warmer, Spermfuge LAB Care, Patient Monitor, Orthopedic Heat Belt, UVC Sanitizer etc. - Tested IT equipment as per CISPR22/24/32 : STM Synchronous Multiplexer, 10G/1G IPE, QR Code Scanner, Temperature and Humidity Sensor, Proximity Sensor, 6 Port Edge Intelligent Hub, Digital Control System, Finger Print Scanner, Gigabyte Passive Optical Network (GPON) Mini OLT and ONT, Radio Modem, 2D Bar Code Scanner etc., - Tested Railway equipment as per IEC 60571/IEC 62236-3-2 : Man Machine Interface, Car Control DTC, In- Coach Display Unit, Side Destination Board, Head Code Unit, Passenger Emergency Communication Unit, ANM Unit, Primary Current Sensor, MICAS VCU for 3Phase Locomotive, Fire Detection Unit etc.

Name of Laboratory	Services offered
	- Tested industrial equipment as per CISPR-11 and IEC 61000-4-Series (Immunity parameters): Solar Grid Tie Inverter, Ash Level Monitoring System, Proximity Switch etc. - Tested household equipment like Smart Induction Ceiling fan, Climate Control System, Single Phase Smart Meter, Auto Dimmer and Auto Fan Controller Unit, Electronic Speed Control Mixie etc. • Safety Compliance testing : Tested following equipment/system under CRS scheme: - Thermal receipt Printer as per IEC 60950/IS 13252 - Synchronous Multiplexer as per IEC 60950-1 - Multi Function printer as per IS 13252 - Genset Controller as per IEC 61010 : 2010 - Temperature rise test for power connector as per IS 556:2018 • Environmental and Mechanical Simulation Ccompliance testing : Tested Portable Pressure Calibrator as per JSS:55555, HAL-ALH Compressor as per customer specification and IT Products as per IEC 60068 • A High Precision Calibration Centre is operational for electrical and non-electrical calibration parameters covering Multifunction Calibrators and high accuracy Digital multimeters through automated techniques to achieve enhance productivity and accuracy in reporting of results.
ERTL(South),	Environmental Testing : • Screening of Isolators used for mounting various electronic packages used in GSLV/PSLV launch vehicles. • ESS for various PCBs for Defense related projects. • Our Vibration Test facility is regularly utilized by VSSC and its ancillary units for testing their packages and modules as per space specification. Equipment Testing : • Tested and evaluated Navigation, Guidance and Control (NGC) packages of launch vehicles, Command Execution Modules (CEM) and Selection Logic Relay Unit (SLRU), ATS Stacks, Power modules and Data Acquisition Units used in GSLV/PSLV. • Actively contributed for Chandrayan Mission by way of test and evaluation of packages used in the Mark III Vehicle. Calibration : Providing service to organizations like KELTRON,C-DAC, Airport Authority of India, NPCIL, KEL etc.

Name of Laboratory	Services offered
ETDC(Chn), Chennai	- Carried out Laptop testing as per IS:14896 for various suppliers to evaluate fulfilment of the Acceptance criteria framed by ELCOT, as part of the Tamil Nadu Government's ambitious e-Education program. - Tested the Remote Terminal Unit (RTU Panel) which is a microprocessor controlled electronic device that interfaces objects in the physical world to a distributed control <i>system</i> or SCADA (Supervisory Control and Data Acquisition) <i>system</i> by transmitting telemetry data to a master <i>system</i>, and by using messages from the master supervisory. - Carried out testing of VAA-D a voltage operated rail relay, manufactured by GE T&D, Chennai, with high degree of mechanical stability. - Carried out testing, including communication option, for MiCOM Agile generator protection relays which provides flexible and reliable integration of protection, control, monitoring and measurement functions for large variable speed double fed induction pumped storage machines over the range 5 to 70 Hz. - Carried out testing of Fuel-Sea Water Separator Filter for submarines designed by CVRDE. - Carried out testing of GPRS/GSM based Automatic Meter Reading (AMR), manufactured by SANDS smart meter solutions. The system converts the existing meters into smart Electricity meters. - Tested Education Institutions Attendance System, a Tablet PC for OASYS & GPS NTP Time Server Signals & Systems, Chennai for its' functional compliance.
CFR, Chennai	- Carried out Reliability Prediction Analysis of Switched Mode Power Supply based Power plant developed by M/s Statcon India for Railway application. - Carried out Accelerated Reliability testing, Storage Life testing and Reliability Prediction of sub-assemblies of INVAR Missiles, manufactured by VCB Electronics, Pune and supplied to Bharat Dynamics Limited, Bhanur.
ETDC(Hyd), Hyderabad	- Tested e-Urban Primary Health Care (e-UPHC) software developed by M/s eVaidya Pvt. Ltd which is a Digital Clinic Management software for the Government of Uttar Pradesh. - Carried out the Functionality testing of GSM based street light automation system for Hyderabad Growth Corridor Limited (HGCL) - Undertaken third party testing of battery packs and thermal paper rolls for assembly elections.

Name of Laboratory	Services offered
ETDC(Goa)	Provided T & C services to following organizations in the region : - Goa Shipyard Ltd., - Mormugao Port Trust, - Nuclear Power Corporation Ltd., - Indian Navy, - Airport Authority of India Ltd., - Indian Oil Corp. Ltd., - IFB - Siemens - Goa Instruments - District Hospitals of Government of Goa, etc.,
ETDC , Pune	Following products were tested : - Batteries for VVPAT machines for ECIL - ICU Ventilator - HMI - Night Vision Binocular - Fevobolt

Medical Safety Test Facility

Medical Electronics facility at ERTL (South), Thiruvananthapuram is the lead lab in the country for testing medical electrical equipment. It has got accreditation for testing medical electrical equipment as per IEC 60601-1; 3rd edition for Defibrillator, Electro Cardiograph, Bed side monitors and High frequency surgical diathermy.

The latest testing includes safety testing of wearable ECG device which is up-graded as an IoT device too and can replace clinical ECG for monitoring of patients in a large hospital setup where the patient volume is huge.

Continuing participation in Space Programmes through Components Screening, Packages & Modules testing and Environmental testing :

ERTL (South) has carried out screening of components which includes discrete devices, high frequency Pulse transformers, low voltage crystal oscillators, ICs (digital & linear in different packages,

Leaded as well as SMDs) for ISRO units like Vikram Sarabhai Space Centre (VSSC) and ISRO Inertial Systems Unit (IISU). Lab has developed test set up for low voltage integrated circuits which are mainly SMD devices for deployment in Small Scale Launch Vehicles which saves power consumption and space (Miniaturization).

Contributed actively by screening of electronic components for Chandrayan mission. Qualification tests are being carried out regularly for different types of components for space application. The lab has carried out screening of RTD sensors and new types of Transient Absorption Zeners. Identified by VSSC as major test centre for screening of SMD devices. Started developing test facility for components used in Gaganyaan mission which is scheduled for 2021-22.

STQC Certification Activities :

STQC has established and operated 3rd party independent Certification schemes for industry and Government Departments namely :

- Quality Management System (QMS) as per ISO: 9001 standard,
- Information Security Management System (ISMS) as per ISO: 27001 standard,
- Product Safety Certification (S-mark) as per applicable ISO/IEC/IS standard,
- IT Service Management (ITSM) as per ISO: 20000-1.

In addition to these certification schemes, STQC also provided support to its Ministry (MeitY) for Assurance activities in the area of Compulsory Registration Order (CRO), e-Procurement System,

Digital Forensic labs as 'Examiner of Electronic Evidence' (Section 79 of IT Act) and empanelment of Cloud Service Provider(s). STQC clientele includes organizations like UIDAI, DRDO, ISRO, BHEL, IOCL, Mphasis, Hero MotoCorps etc.,

4. Major Service Offered - Training

Indian Institute of Quality Management provides training to industries and organizations in the area of Quality Management System (ISO/IEC: 9001), Laboratory Quality Management System (ISO/IEC: 17025), Information Security Management System (ISMS) (ISO/IEC: 27001). Following trainings have been provided by STQC labs -

Name of Laboratory	Services offered
ERTL(North)	• Presentation on Cyber Security Assessment Framework & Methodologies at Indian Institute of Public Administration New Delhi, under Cyber Surakshit Bharat Project of MeitY for CISO from various Ministries/Departments, under Skill India capacity Building programme.
ERTL-East	• Various knowledge-based and skill oriented training programmes for industries, laboratories, students & individuals in different areas of technology, such as, Industrial Automation, Test & Measurement, Measurement Uncertainties, Calibration Techniques, and Quality Assurance & Management Standard (ISO 9001:2015), Information Security Management System (ISO 27001:2013)
	• Number of training courses on Laboratory Quality Management Standard ISO/IEC 17025:2017 and NABL requirements. • Project based training programmes for engineering college students on Industrial automation (PLC). • Conducted Online training programmes using IT technological help through Video conference mode.
CFR-Chennai	• Conducted the Certified Reliability Professional (CRP) training, a flagship program, for practicing reliability professionals and engineers from India and abroad. • For the first-time an online design reliability evaluation training program for the industries was planned and conducted in Webex platform in view of the COVID-19 pandemic. • CFR, Chennai has entered into an agreement with DRDO laboratories all over India to impart online training program on design reliability evaluation techniques. As part of the program, the first training program was conducted during September 22-24, 2020.

5. Activities in North-East Region (NER)

ETDC, Guwahati and ETDC, Agartala are the two laboratories established by STQC Dte in North-East region. These laboratories have been extending the following services to eight states in the North-Eastern region:

- Test & Calibration services to the industries, technology users & service providers.
- Testing of e-Governance software as well as State portals/websites etc.
- Audit of IT Infrastructure/third party auditors for the e-Governance projects like State Data Centres (SDC)/SSDG/e-District/SWAN etc.
- Training services in the field of Electronics & Information Technology/Quality & Reliability.

Initiatives in Test & Calibration Services :

Test & Calibration services of ETDC Guwahati & ETDC Agartala are extended to the organizations in North-Eastern Region towards improvement of quality of their products and services. The services are received by most of the MSME industries covering the industrial sectors like – Oil & Natural Gas, Oil Refineries, Exploration units, Railways, Indian Air Force, Power - Generation, Transmission & Distribution, Paper, Cement & Building Materials, Food & Beverages, Cosmetics, Cable & Conductors, Fertilizers, Plywood, Carbon Products, Steel, and Service sectors like – Aviation, Engineering & Construction, Telecommunications, Automobile, Service & Maintenance units, R&D and Test Labs, Hospitals, Pharmaceuticals & Pathological laboratories etc., More than 198 calibration jobs being executed covering about 33 organizations in the region.

NABL Accreditation & Inter Laboratory Comparison (ILC):

Calibration services of ETDC, Guwahati are accredited by the National Accreditation Board

for Testing and Calibration Laboratories (NABL) in conformance with ISO/IEC : 17025 in the fields of Electro-Technical & Non-Electrical parameters like AC/DC Voltage, Current, Power & Energy, Frequency, Time, Resistance, Inductance & Capacitance, Thermal (Temperature), Mechanical (Acoustics, Pressure, Mass, Dimension & Volume) & Optical (Optical- Power, Wavelength & Stability) etc., Both the labs have also participated in Inter Laboratory Comparisons programmes organized from time to time to achieve satisfactory qualitative performance level.

Initiatives in IT Test & Assessment Services:

Initiatives have been taken towards facilitating services in the field of Testing or Assessment of Software Applications, Websites, Web Applications, IT Infrastructure under various e-Governance projects like – Website Quality, e-District, SSDG, State portals (SP), e-Forms, SDC, SWAN etc., being implemented in the states of North-East region. More than 215 websites from Government Organisations, PSUs, Research Labs, Academic Institutions, Universities have been tested as per Guidelines for Indian Government Websites (GIGW) and 104 nos. of IT infrastructure are executed by both the labs for their Functionality & Quality. ETDC (Agartala) has also undertaken Security Test/Assessment as per Security requirements of OWASP international guidelines for three nos. of web applications for organizations of North-Eastern Region. -

9.8 National Institute of Electronics and Information Technology (NIELIT)

9.8.1 Introduction

National Institute of Electronics and Information Technology (NIELIT), is an autonomous scientific society under the administrative control of Ministry of Electronics and Information Technology (MeitY), Government of India. NIELIT is actively engaged

in capacity building and skill development in the areas of Information Technology (IT); electronics; communication technologies; hardware; cyber law; Cyber Security; IPR; GIS; cloud computing; ESDM; e-waste; Internet of Things (IoT); e-Governance and related verticals.

It offers courses in the formal sector in association with State universities/technical board such as ME/M.Tech, BE/B.Tech, MCA, BCA programs, PG Diploma courses; Aurangabad Centre is also facilitating for conducting PhD program in the area of electronics.

Courses in the non-formal sector includes (a) Long Term Courses in IT, hardware, animation & multimedia under four levels, namely O, A, B and C Level in IT; O and A Level in Computer Hardware Manufacture (CHM); O Level in Multimedia and Animation. (b) Short term courses in niche areas and (c) IT literacy programmes for the proliferation of digital literacy in the country; besides specialized programmes in e-Governance targeted towards empowering the employees of the State Governments. In addition, NIELIT has also created expertise for the roll out of customized skill development programmes, as per specific needs of public and private sector firms.

NIELIT is also one of the national examination bodies which accredits institutes/organizations for the conduct of Electronics & IT courses in the non-formal sector. NIELIT is well represented in the country and has PAN India presence through a network of 43 own centres and a network of about 850+ accredited training partners and about 7,100+ digital literacy facilitation centres.

Engaged in Formal & Non-Formal education in the area of IECT besides development of industry-oriented quality education and training programmes in the State-of-the-art areas → IT, electronics, communication technologies, hardware, cyber law, Cyber Security, information security, cloud

computing, ESDM, e-Governance and related verticals and short-term courses (NSQF aligned). So far, NIELIT has aligned 85 Skill oriented courses with National Skills Qualifications Framework (NSQF) at different levels ranging from level 2 to 8.

NIELIT qualifications are widely accepted across the country. Owing to the quality, some of the NIELIT digital literacy courses are linked with both promotion & recruitment by number of State Governments viz; Arunachal Pradesh, Bihar, Chandigarh, Daman & Diu, Gujarat, Rajasthan, Sikkim, Uttar Pradesh.

Since inception, NIELIT has trained more than 65 lakh candidates. Taking into the account advancement in IT and Electronics and emergence of disruptive technologies, NIELIT has been making efforts to update its repertoire of courses in upcoming technologies such as Artificial Intelligence, IoT, Big Data, Cloud Computing, Robotics and 3D Printing. In this regard, NIELIT Centres at Aurangabad, Calicut, Kolkata have been identified as Technology Resource Centres to offer blended learning programmes under the Future Skills prime initiative which is being jointly conceived by MeitY and NASSCOM.

9.8.2 R&D, Innovation & Design:

9.8.2.1 Development of Ultrasound Transceiver Hardware for Medical Imaging Applications

As part of Indigenous Color Doppler Ultrasound Scanner with PNDT Compliance project, NIELIT Calicut has developed a 128-channel ultrasound transceiver board. The board can be directly interfaced with various medical ultrasound imaging transducers like linear, phased and convex array geometries. The board has 128 channel analog front-end signal conditioning circuits as well as high voltage pulsars to energize the transducers. The central processing unit of the transceiver hardware is an FPGA which controls the transmission and

reception of high voltage pulses and low voltage echoes. The designed hardware has 24 power rails including high voltage variable power supplies and it operates from a 12V power supply. A power management and debugger circuit, controls the entire power protection and on-off sequencing of the entire circuitry in the board. The average power consumption of the board is around 24 Watts. The size of the board is 42 x 30 cm and the PCB have 18 layers. The developed hardware is successfully tested and this is one of the stepping stone towards Make in India initiative in ESDM sector. The designed hardware will be integrated as part of Indigenous Color Doppler Ultrasound Scanner. The designed hardware will also enable high-end research in hardware acceleration of medical ultrasound imaging algorithms targeting high resolution imaging.



9.8.2.2 Indigenous Colour Doppler Ultrasound Scanner with PNDT Compliance

The project is being implemented by NIELIT Calicut with financial support of MeitY at an outlay of Rs.2.44 crore over a period of three years, with an objective to design and development of indigenous colour doppler ultrasound scanner prototype with PNDT compliance.



A significant feature of the machine is the automatic sex determination monitoring to prevent rampant female foeticide in India. The scanning details of the pregnant woman comes pre-filled in the PNDT form. Along with this, the biometric details will be stored on the server kept at Union Ministry of Health and Family Affairs in New Delhi. Thus, scanning at each stage is closely monitored leaving no room for abortion. The Indigenous Color Doppler ultrasound system is being integrated with in house hardware boards developed and basic B-mode image is being generated.



9.8.2.3 Setting-up State-of-the-art Digital Forensic Data Centre to Provide Forensic Services including Remote Forensics Live Acquisition and Analysis of Digital Evidence, Virtual Training Services to North-Eastern States

NIELIT Kohima, NIELIT Imphal and NIELIT Aizawl are jointly implementing the project with the financial support of MeitY of Rs.4.01 crore for a duration of 24 months, with following objectives:

- To set-up a digital forensic data centre with essential forensic tools, to offer forensic services by sharing the resources with virtual technology concept across North-Eastern States. The digital forensic data centre is proposed to act as a repository of digital forensics tools for North-Eastern States and the services will be offered through cloud environment.
- Creating web based virtual environment laboratory with training content covering latest

trends in cybercrimes, seizure/acquisition & analysis of digital evidence, building case scenarios with advanced forensics techniques to enable Law Enforcement Agencies (LEAs) officials to gain hands-on forensic investigative skills in various area like disk forensics, mobile forensics, network forensics, social media etc., through virtual mechanism.

- Based on the need expressed by LEAs, development and integration of web related evidence acquisition tool including automated screen capturing while acquiring web related evidences like media files and documents with forensically sound methods.

9.8.3 Capacity Building Projects

9.8.3.1 Future Skills Prime project (Programme for Re-skilling/Up-skilling of IT Manpower for Employability)

The FutureSkills PRIME (B2C) platform would leverage upon NASSCOM's B2B platform and would also provide integrated mechanisms to support the existing skilling/knowledge ecosystems within the country, including making available high-quality IT content from across the Globe accessible to beneficiaries.

The FutureSkills PRIME would provide reskilling/up-skilling opportunities in 10 Emerging Technologies, namely Virtual Reality, Internet of Things, Big Data Analytics, Artificial Intelligence, Robotic Process Automation, Additive Manufacturing/3D Printing, Cloud Computing, Social & Mobile, Cyber Security and Blockchain. The main objective of FutureSkills PRIME is "to create an up-skilling /re-skilling ecosystem in emerging and futuristic technologies to facilitate continuous enhancement of skills as well as knowledge of IT professionals in line with their aspirations and aptitude." With a physical target to up-skill/re-skill 4.12 lakh IT professionals, thereby ensuring their continued relevance in a rapidly changing technological environment.

The target beneficiaries for the project would involve a broad category of learners like IT employees, Non-IT employees, Re-skill/up-skill of existing employees, Central Government & State Government Employees including employees of PSUs etc., and Fresh Recruits. The total duration of the project is 3 years and the total project outlay is Rs 436.87 crore with a funding of 433.21 crore by MeitY and 3.66 crore by NASSCOM.

NIELIT is one of the implementing agencies. In every FutureSkills Technology, NIELIT Centers are either Lead or Co-Lead Resource Centre thus making NIELIT an import entity in implementation of the project Pan- India in 'Hub & Spoke' model to cover the entire country.

14 NIELIT Centres namely, Calicut, Aurangabad, Kolkata, Delhi, Chandigarh, Gorakhpur, Chennai, Patna, Srinagar/Jammu, Kohima, Agartala, Imphal, Guwahati, Gangtok are included as the implementing agency. NIELIT Calicut, Aurangabad and Kolkata are Lead RC for 3D printing/Additive Manufacturing, Robotics Process Automation (RPA) and Blockchain Technology respectively. All 14 Centres mentioned are also among Co-Lead Centres. The total target beneficiaries to be trained in all 5 Programs (Bridge Courses, Government Official Training, Training of Trainers, Foundation Courses, and Deep Skilling Courses) are 74,200 in 3 years.

9.8.3.2 Skill Development of youths in Aspirational Districts in area of IECT leading to enhancement in Employability

The project has been started with the objective to conduct Skill Development training program for 21,600 SC/ST/EWS (Women) youths belonging to 60 Aspirational districts in the area of IT & Electronics over a period of 3-years. MeitY approved the Project and released the 1st installment of the project of Rs.7.18 crore on 28th February, 2020. The total GIA for the project is Rs.29.81 crore.

Year-wise category wise distribution of targets is as follows:

#	Year	SC Candidates	ST Candidates	EWS (Women)	Total Candidates	GIA (in Rs.)
1	1 st	1920	1920	960	4,800	7,17,92,446
2	2 nd	3960	3960	1980	9,900	12,86,98,009
3	3 rd	2760	2760	1380	6,900	9,76,32,623
Total		8640	8640	4320	21,600	29,81,23,078

NSQF courses covered under the projects are as follows:

- Certification Course in Data Entry and Office Automation
- Diploma in Installation & Repair of Consumer Electronics Products
- Advance Diploma in Computer Application Accounting and Publishing
- Solar-LED Lighting Product (Design and Manufacturing)

9.8.3.3 “NIELIT-CII Centre of Excellence for Skills (NICCS)” at NIELIT Aurangabad

The project is being implemented by NIELIT Aurangabad with financial support of MeitY at an outlay of Rs.1.08 crore, over a period of 1 year with an objective to utilize cutting edge technology to improve learning outcomes and satisfy industry needs and enhance the employability of the youth of the country.

The CoE will host technologies like Augmented Reality (AR), Virtual Reality (VR), 3D models, RFID, Interactive video wall and Learning platforms to deliver vocational training courses in industry technology.

9.8.3.4 Empowerment of SC/ST Youth & Women on Enhancement of Livelihood activities using IT & Tool and PMU for IT for Masses

The project is being implemented by NIELIT Kolkata (in 2 selected districts of West Bengal i.e. Darjeeling and Alipurduar) with financial support of MeitY of Rs.1.78 crore and a PMU for IT for masses

with budget outlay of Rs.44.78 lakh over a period of 2 years, with an objective:

- Empowerment of SC/ST & Women on functional IT for enhancement of day-to-day livelihood activities and scope of employment generation/entrepreneurship development;
- To develop 800 IT skilled resource members from SC/ST & Women candidates through the developed infrastructure under capacity building programme.
- The household women are involved with various handloom products weaving during the free time as livelihood activities. Our role is to enhance the traditional livelihood activities using IT & Tools for new design creation and design printout for easy deployment process which will minimize the process time with modern design creation, increasing productivity and income;
- For handicrafts products, the concept will help and benefit the carpenter and the youth directly for product design creation/deployment. Darjeeling and Alipurduar districts are heritage for wood furniture products;
- This skill-oriented course on the assembly and installation procedure of solar panels and LED bulb manufacturing for day-to-day uses and prime focus now a days for entrepreneurship development.

9.8.3.5 Training of Visually Impaired Persons in Manipur on Course on Computer Concepts (CCC) of NIELIT

The project is being implemented by NIELIT Imphal with financial support of MeitY of Rs.30.21 lakh over a period of 2 years 6 months with an objective to train 200 visually impaired candidates of Manipur on Course on Computer Concepts (CCC) with 200

Hrs duration (4-weeks/1-month) covering NIELIT's CCC syllabus with soft skills, as a residential training programme. The training would be implemented by using Indian text to speech software titled "Shruti Drishti" with braille refreshable keyboard to train visually impaired students.

9.8.3.6 Skill Development Training of Unemployed SC & ST Youths of Tripura towards Enabling Entrepreneurship & Sustainable Development

The project is being implemented by NIELIT Agartala with financial support of MeitY at an outlay of Rs.1.32 crore with SC & ST component of Rs.65.79 lakh each, over a period of 2 years, with an objective to enable entrepreneurship & sustainable development among SC & ST youths of Tripura by providing skill development training to 1,940 unemployed SC & ST candidates of Tripura in (i) Graphic Designing, Data Entry and Office Automation, (ii) Repair & Maintenance of ECG and ICCU Equipment, (iii) Telecom Technician-PC Hardware and Networking, (iv) Repair & Maintenance of Power Supply, (v) Inverter & UPS and (vi) Installation of Repair of Consumer Electronics.

9.8.3.7 Enhancement of Livelihood Activities for SC Candidates of Delhi NCR through Capacity Building using ICT

The Project is being implemented by NIELIT Centre at Delhi with financial support of MeitY at an outlay of Rs.1,13,33,280/- over a period of two years, with following objectives:

- To promote inclusive growth among potential candidates from SC community as ICT professionals in the field of ITI Multimedia and Animation/Data Entry and Office Automation.
- To bring IT awareness among candidates from SC community.
- To promote the employability of SC candidates in ICT Sector.

- To promote entrepreneurs from SC community in ICT Sector in Delhi State.

9.8.3.8 Skill Training for Empowering SC/ST in Kerala & Karnataka

The Project is being implemented by NIELIT Calicut with financial support of MeitY at an outlay of Rs.1,92,48,450/- over a period of two years. The primary objective is to provide free training in job-oriented skill courses to 1,500 candidates belonging to SC/ST category in the selected districts of Kerala and Karnataka to increase entrepreneurship potential as well as employability in Government and Private Sectors.

9.8.3.9 Awareness Campaigns/Events for empowerment of Senior Citizens in e-Services through ICT Tools

The Project is being implemented by NIELIT Aurangabad with financial support of MeitY at an outlay of Rs.532.98 lakh over a period of two years, with an objectives to bring awareness among elderly persons about mobile applications for the fulfillment of various needs related to health monitoring needs, personal information needs, social needs commuting needs, leisure besides safety and privacy needs, to sensitize elderly persons about various Government schemes & programmes, informing them about various legislation, acts and personal laws enacted for their protection, usage of smart phones, precautions & security from common frauds, preventive and curative health care and to conduct yoga and fitness exercises for the betterment of elderly persons.

9.8.3.10 IT enabled Incubation Centre for Handloom and Handicraft Sector

The Project is being implemented by NIELIT Centre at Leh with financial support of MeitY at an outlay of Rs.708.79 lakh over a period of three (03) years, with the objectives of Modernization of the

development of looms and Crafts with the added value of Technological intervention through ICT in the right direction towards innovative products development, meet the global market, reduction of production cost, employability and involvement of newer generation with modern technological concept and finally to create a digital cluster (exclusive e-commerce portal) of Ladakhi artisans, who have acquired the unique skill sets from their ancestors and train them in Digital Technologies which includes Digital Photography, Digital Transaction and Information related to e-commerce websites etc. The broad objectives are as follows:

- Setting-up of 2 State-of-the-art incubation centers cum Design Labs/Modeling labs for giving facilities to create designs, develop prototypes leading towards production.
- Setting up of a State-of-the-art IT lab cum training centers at NIELIT for Handloom and Handicraft artisans as well as entrepreneurs.
- Trainings of 2,100 artisans using modern technologies and IT tools and Digital Literacy, Digital Marketing & soft skills, entrepreneurship skills etc.

9.8.3.11 Development of Cyber Forensic Training cum Investigation Labs in North-Eastern States and Cloud based Centralized Cyber Forensics Lab Infrastructures

The Project is being implemented by NIELIT Kohima with financial support of MeitY at an outlay of Rs.16.92 crore (Rs.9.2 crore to NIELIT Kohima and Rs.7.72 crore to C-DAC Kolkata) over a period of five (05) years, with objectives mentioned below:-

- To setup cyber forensic training cum investigation labs in 8 North-Eastern states equipped with associated cyber forensic system and tools having software license and maintenances with contract for the duration (5 Years) of the project.

- To create master trainers with latest skills and training at each of the NIELIT centres on Cyber forensics.
- Capacity building of various stakeholders of criminal justice system like police officers, Prosecutors, Judges, Investigation Officers of all Law Enforcement Agencies in each of the proposed State.
- Design and development of the course curriculum and its delivery for various stakeholders like Law Enforcement Agency (LEAs), Prosecution, Judiciary in the field of digital crime prevention, detection, mitigation & investigation (Cyber Forensics) etc., in respective States. The course curriculum will be based on the case' studies.
- Creation of resource portal along with e-learning methodologies over cloud and facilities for MIS, courseware dissemination, information exchange, resource personal organizations sharing of expertise among the 8 North-Eastern states.
- To create a centralized database facility for digital crime records for various research such as automatic evidence extraction and analysis for cyber forensics to enable
- Uniformity in tool profiling and usage of cyber forensic tools & reference library of various cyber forensic software tools for evidence extraction and analysis for cyber forensics.
- Design and development of digital crime database/repository for supporting various training and LEAs requirements.
- Cloud based infrastructure will be hosted and setup at NIC cloud for sharing of cyber forensic tools, content delivery & cloud based Virtual Training on Cyber forensics for LEAs of all eight north eastern states.
- To provide access to VTE from the 8 cyber forensic labs for training of the law enforcement agencies.

- Need based value addition/up gradation to existing course materials developed by C-DAC Hyderabad, NPA Hyderabad and NIELIT and host it at VTE.

9.8.4 Skill development in ESDM Sector:

889.8.4.1 Scheme for financial assistance to select States/UTs for skill development in Electronics System Design and Manufacturing (ESDM) sector

The employment in the electronics industry is estimated to grow phenomenally. Hence to facilitate skill development in ESDM sector focusing on students/unemployed youth at 9-10th standard onwards, ITI, diploma, non-engineering graduates, engineering graduates (in level 5) etc., to increase their employability to work in 'Manufacturing' and 'Service Support' functions, a 'Scheme for financial assistance to select States/UTs for skill development in Electronics System Design and Manufacturing (ESDM) sector' was approved by DeitY in November, 2013. 90,000 persons are to be supported under the scheme in the following States/UTs viz. Andhra Pradesh, Telangana, UT of Jammu & Kashmir, UT of Ladakh, Karnataka, Punjab, Uttarakhand (for 2 levels only) and Uttar Pradesh in 5 levels of vocational skill development courses. The outlay of the scheme is Rs.113.77 crore with Grant-in-Aid of Rs.100 crore (approx.). The scheme duration has been extended upto 31.03.2021.

9.8.4.2 Scheme for Skill development in ESDM for Digital India

Under the aegis of 'Digital India' programme launched by Hon'ble Prime Minister, the department has approved a scheme for "Skill Development in ESDM for Digital India" on 09.12.2014 to cover all the States/UTs of the country in order to facilitate creation of an eco-system for development of ESDM sector in the entire country for facilitating skill development for 3,28,000 persons in ESDM

sector at an outlay of Rs.411 crore. This is in continuation of the above mentioned 'Scheme for Financial Assistance to select States/UTs for skill development in Electronics System Design and Manufacturing (ESDM) sector' approved earlier. Both the Schemes are to be implemented concurrently.

These schemes provide for 75% of training fee as assistance for training courses identified by Electronics Sector Skills Council (ESSC), Telecom Sector Skills Council (TSSC), Health Sector Skill Council (HSSC) and NIELIT. The scheme also provides for 100% fee reimbursement to 40% of the seats which would be reserved for the candidates belonging to SC/ST/Economically weaker sections. Further, Registration-cum-Certification fee per candidate (for successfully certified candidates) would also be reimbursed to assessing/certifying agencies.

Government has notified the revised guidelines in November, 2018. The revised guideline has 60% seat allocation based on industry demand. The key implementing agencies (viz. ESSCI, NIELIT, TSSC, HSSC) shall submit a demand-based proposal which would include the details of tie-ups with industry/firms where the candidates are likely to be placed. These proposals may also indicate the category under which training is proposed, i.e., 'Place & Train' or 'Train & Place' and preference for allocation would also consider reasonable assurances of employability. The remaining 40% seats would be allocated only to training partners based on their past credibility in promoting employability of its candidates.

NIELIT is implementing both these schemes on behalf of MeitY and an ESDM-Programme Management Unit (ESDM-PMU) is set-up by MeitY under administrative control of NIELIT to monitor the project at ground level.

Under these ESDM Schemes, skill development

training in electronic sector is provided to students and unemployed youths through training partners which are registered under the four key implementing agencies viz. Electronics Sector Skill Council of India, Telecom Sector Skill Council, Health Sector Skill Council and NIELIT.

As on date, under both the above Schemes, 3.77 lakh candidates have been enrolled out of which around 3.75 lakh candidates have been trained in various States/UTs, out of which around 2.24 lakh candidates have been certified. The Scheme Duration has been extended upto 31.03.2021

9.8.5 Synergy through Collaborations & MoUs:

9.8.5.1 Training in Advanced Capabilities in Electronics Design & Manufacturing (TRIAC-EDM)

- Memorandum of Understanding (MoU) for “Joint Training Program in the field of Electronics and IT” for a period of five years was signed between National Institute of Electronics and IT (NIELIT) and Institute for Information Industry (III), Taiwan in “India Taiwan Industrial Collaboration Summit” held on 17th October, 2019 with the core objective of expanding and enhancing cooperation in training and skill development in the field of Electronics and Information Technology through the exchange of institutional experience, training and skill development. Project has been approved vide No. W-13/4/2019-ESDM-MeitY dated 09.06.2020 with total budget outlay of Rs.3,08,92,365 and GIA/MeitY’s contribution of Rs.1,41,59,365. In next 5 years, 5 training programs (one program in each year) will be conducted.
- First Batch of training is going to be conducted this year. Project “Training in Advanced Capabilities in Electronics Design & Manufacturing (TRIAC-EDM)” has been launched by Joint Secretary (Electronics (MeitY) on 14th October, 2020. In first batch,

a total of 39 trainees from Indian Industries, NIELIT and MeitY will get trained by Taiwanese Experts. Nomination process has already been started and can be viewed at: http://www.nielit.gov.in/content/Nominations_TRIAC_EDM2020.

9.8.5.2 MoU with Bihar Government:

NIELIT Patna signed an agreement with Bihar Gram Swaraj Yojna Society, Department of Panchayati Raj, Government of Bihar for training Panchayat Raj Functionaries on ‘PES (Panchayati Enterprise Suite), GPMS (Gram Panchayat Management System). Another agreement for the Training on “Skill development Programme” Sponsored by Department Industry, Government of Bihar, was signed between NIELIT Patna and Department of Industry, Government of Bihar.

9.8.5.3 MoU with Government Organizations in Delhi:

NIELIT Delhi has signed MoUs/Agreements with various Government organizations such as AICTE, Delhi High Court, NDMC, CRIS (Centre for Railway Information System) etc., for providing IT Resource persons for implementation of e-Gov projects.

9.8.6 Adoption of Technology enabled Teaching amid COVID-19

The COVID-19 pandemic has forced educational institutions in the country to temporarily suspend the conventional mode of class room teaching. While the pandemic has thrown unprecedented challenges to most of us, NIELIT have handled this disruption in the academic sector by deploying different modes of learning through a mix of technologies and adopting work from home culture.

NIELIT Centres have been actively engaging the students through various mode of online classes like cisco webex, google classrooms, Moodle servers, BigBlueButton etc. The practical sessions

are also being conducted on virtual labs. In order to avoid any apathetic approach towards online learning, the Centres have come up with various features to make online classes friendly and interactive thereby keeping boredom at bay and introducing active learning. Apart from live online video classes, various e-content training material are regularly uploaded in the virtual class room, periodic assessments, assignments, attendance monitoring are done using the Moodle Learning Management System. Query resolution sessions are also scheduled with students.

The technology enabled learning has made the student-teacher interaction more productive and effective as the students can login to the e-classes and listen to the lectures in a free and flexible environment. It is observed that in some batches, students' average attendance has also increased.

NIELIT Centre Chennai has deployed multiple Video Conferencing Server based on opensource BigBlueButton software to conduct virtual training and service in and around NIELIT centres.

1. <https://web.nielitchennai.edu.in> – BigBlueButton based Video Conference Server configured during April, 2020 to continue the regular PG Diploma/Diploma courses in Online mode with the Moodle Learning Management System (LMS).
2. <https://webconf.nielitchennai.edu.in> – BigBlueButton based Video Conference Server configured during May-2020 to conduct Online courses and meeting.
3. <https://conf.nielitchennai.edu.in> – New Production rack based BigBlueButton Video Conference Server configured to conduct meeting and regular/online courses with recording facility and the concurrent capacity of more than 200 live users (256 GB RAM, 96 vCPU & 1TB SSD).

The Centre has also deployed multiple Web

Meeting Server based on opensource Jitsi software to conduct web meeting and virtual training in and around NIELIT centres.

1. <https://meet.nielitchennai.edu.in> – Jitsi based Web Meeting Server configured during Apr-2020 to conduct meeting among NIELIT Staff and live lectures for training. This server is being used by NIELIT to conduct official meeting and regular courses in online with the concurrent capacity of 50 live users (32GB RAM, 32 vCPU & 1TB HDD).
2. <https://meeting.nielitchennai.edu.in> – Jitsi based Web Meeting Server configured during May-2020 to conduct Online courses and meeting with concurrent capacity of more than 200 live users (256GB RAM, 96 vCPU & 1TB SSD).

Within a week of lockdown, NIELIT Centres started dissemination of training through online mode using various platforms for the enrolled students. Some NIELIT Centres such as Calicut has also offered some high ended courses such as System Design using Verilog HDL, Big Data Analytics Tools, RTL Design Verification etc., in online mode. Some NIELIT Centres are in process to help other educational institutes to start e-classes for their students through the latest technological advancements. With all its pedagogic exercises, NIELIT Centres are committed towards delivering quality education to the students and creation of a digital learning ecosystem.

9.8.7 Digital Empowerment for Senior Citizens amid Corona Crisis:

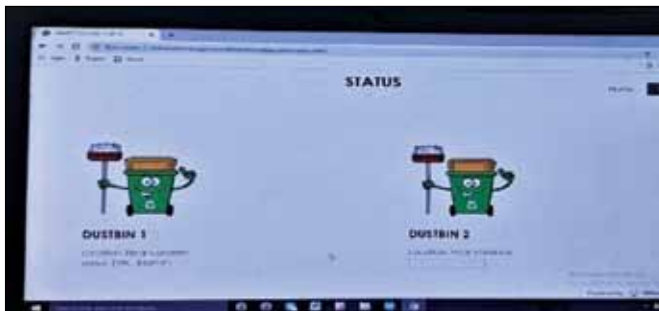
NIELIT Centre Haridwar has come forward to digitally empower the senior citizens and housewives so that they do not have to rely on human interaction and use technology at their convenience as the pandemic has prompted to embrace digital transformation in order to reduce human involvement.

A “One Week Awareness Programme” for “Senior Citizens/Housewives” on “Use of Mobile Applications for Digital Payment and e-Governance services” was designed to make senior citizens/housewives aware about the various e-Governance services like e-hospital, various apps launched by Government of India for the benefit of the citizens like AarogyaSetu, Jeevan Pramaan, Umang, BHIM, use of social media etc. The participants learnt about different Government and non-Government online platforms as well as about the precautions and security features necessary for safeguarding against common cyber frauds. This programme is being offered to senior citizens/housewives at free of cost.

9.8.8 Embedded and IoT Ventures

9.8.8.1 IoT based Dustbin Monitoring System

Clean and hygienic environments are the key needs in the human habitable environments. Smart bin is developed for having a gainful and dynamic waste administration framework. In public places dustbins are being overflowed and the waste spills out, spreading contamination. This increases the breeding of bugs drastically on the garbage. In the existing system, there is no proper monitoring regarding the overflow of the garbage which makes the city or town unhygienic.



This project proposes an IoT based Dustbin Monitoring System, which is designed to collect data regarding level of waste bin and to deliver it through wireless network. The system consists of

sensors to measure the level of the waste inside the bin. The system also adapts with network environment, to manage all the information from waste management. In this method, the sensor modules placed on the bin will send data to cloud continuously.

The Authorities can monitor the dustbin details through a webportal. Whenever the dustbin is filled, it alerts them that the bin is full and requires urgent replacement. The authorities can collect the waste and dispose it at the earliest. The prototype of the system is implemented using Node MCU Microcontroller system and ultrasonic sensors. The firmware development has been done using Arduino platform.



9.8.8.2 Gyro Spoon:

Parkinson's disease is a progressive sickness that affects the nervous system. The major sign of this disease is the tremors that plague the patients. It develops slowly, sometimes starting with a shaking in just one hand which will be hardly noticeable at all. But while the shaking may be the most well-known sign of Parkinson's disease, the sickness also commonly causes stiffness or slowing of movement.

This project aims at developing a supporting unit for the patients suffering from Parkinson's disease to help them eat food without depending on any external help. The unit is essentially a self-balancing robot which is made to help the patients with Parkinson's disease.

The main unit is an MPU sensor which contains both accelerometer and gyroscope which will detect the angle of tilt caused by the tremor and uses motors to correct it. The device comes with a companion mobile app for the caretaker of the patient. The mobile app can be used to send emergency alerts by patient to caretaker, reminders for the patient and a monitoring system for the evaluation of the condition of the patient.

9.8.8.3 Smart Food Waste Monitoring System

Food wastage is a serious issue in our society and it affects poor and rich countries equally. According to the Food and Agriculture Organization (FAO), almost half of all produced food will never be consumed. By wasting food, we also waste the time and energy that we have used to produce the food and as well our natural resources. Also, the limited available agricultural land is used up which could be handled in a much better and sustainable way.

This project is aimed at implementation of 'Smart Food Waste Monitoring System' in Canteens and Messes. It is creating a social awareness to reduce food wastage through measuring and displaying the amount of food wasted using data analysis collected over a period of time.



This system mainly consists of four major sections: food waste weighing system, people counting system, data analysis and database and display through web portal. Food weighing system is used

for measuring the weight of particular food item in each waste bin. And people counting system is used to collect information regarding the number of people who has taken the food on a particular day through webpage and this all data is taken over a period of time and displayed through a web portal.

9.8.8.4 Automatic Attendance Logging System using Face Recognition

This project makes use of the face of an individual to mark their attendance at a school, college, or institution. Conventional methodology for taking attendance is by calling the name or roll number of the student. Time consumption for this purpose is an important point of concern. Assume that the duration for class for one subject is around 60 minutes, to record the attendance for that class takes 5 to 10 minutes which adds up throughout the day.

In order to conserve the time spent doing so; an automated process is employed based on image processing. For this purpose, an image database is created with images of the students belonging to the institution. For the training portion of the process, it detects the faces of the subjects from the images in the database, extracts and encodes the facial features for the recognition portion of the process.

When the recognition process runs, it detects the face of the person in front of the camera, and performs the same procedure of extracting facial features and encoding them. This encoded image data is compared to all the encoded image data (created during the training process) stored in the database for a match. Once matched, it writes to a web server database from where the attendance awarded for the recognized student can be viewed.

9.8.9 Training summary: April - September 2020

NIELIT plays an important role of skilling people in the area of Information, Electronics and

Communication Technology (IET). Number of candidates skilled/trained in various courses during April to November, 2020 are as follows:

S. No.	Course Category	Number of Candidates Trained/Skilled
1	Formal Courses (M.Tech/BCA/MCA/3 Years Diploma etc.)	800
2	Non-Formal Courses (O/A) Level in IT/ Hardware/Multimedia etc., of one-year duration or more)	2,246
3	Short Term Courses (excluding Digital Literacy Courses)	25,917
4	Digital Literacy Courses (Number of Candidates appeared in Examination)	1,60,544
	Total	1,89,507

9.9 Software Technology Parks of India (STPI)

Introduction

Software Technology Parks of India was set up in 1991 as an autonomous society under the Ministry of Electronics & Information Technology, Government of India. STPI's main objective has been the promotion of software exports from the country. STPI acts as 'single-window' in providing services to the software exporters. The services rendered by STPI for the software exporting community have been statutory services, data communications services, incubation facilities, training and value-added services. STPI has played a key developmental role in the promotion of software exports with a special focus on SMEs and start-up units.

STPI has been implementing the Software Technology Park (STP) scheme and the Electronics Hardware Technology Park (EHTP) scheme for the promotion of IT/ITES/ESDM industry. The phenomenal success of the IT/ITES industry has been possible, inter-alia, due to pivotal role played by the STP Scheme. STP Scheme is a unique scheme, designed to promote the software industry and growth of Start-Ups and SMEs without any locational constraints. As on 31st December, 2020, 4,255 units are exporting under STP scheme and 70 units are exporting under EHTP scheme.

During the FY 2020-21 (till 31st December 2020), IT/ITES export from STP units are Rs.2,96,107 crore (tentative) and Electronics Hardware export of Rs.2,549 crore (tentative) under EHTP scheme.

STPI Centres

To provide statutory and incubation services to industry, major thrust was given on the establishment of new centres as well as revamping of existing centres. Till December, 2020, a total of 60 STPI centres/Sub-centres are operational across the country, out of which 52 centres are in Tier II and Tier III cities.

STPI is working closely with the respective State Governments/local authorities for creation of more space, equipped with state-of-the-art infrastructure facilities, for development of the software industry and increasing exports.

Services:

The main services rendered by STPI for the software exporting community are as below:

- **Statutory Services** - STPI provides Single Window Clearance to Software exporters under the STP Scheme. STP Scheme provides these units with various benefits making it a phenomenal success.
- **Incubation Facilities**- Business and technology incubation stimulate the growth of

start-ups. STPI is offering ultra-modern office facilities to small units and entrepreneurs. Plug-n-Play facilities for start-ups enable short gestation period. This has encouraged many entrepreneurs to start their own operations and grow in a competitive environment.

- **Datacom Services-** One of the STPI's remarkable contributions to the software-exporting sector is provision of High-Speed Data Communication (HSDC) services. STPI has designed and developed state-of-the-art HSDC network called SoftNET for software exporters. Local access to international gateways is provided through point-to-point and point-to-multipoint microwave radios which has overcome the last mile problem and enabled STPI to maintain an uptime more than 99%.
- **Consultancy Services-** STPI provides consultancy and Project Management Services and turnkey solution to various national and International organizations in the areas of Communication Networks, Network Operation Centres, Network Management Systems, Computerization, e-Governance networks etc., The technology capability coupled with process strengths has enabled STPI to secure a number of projects from time to time.

India BPO Promotion Scheme/North-East BPO Promotion Scheme

STPI is the nodal agency for implementation of India BPO Promotion Scheme (IBPS) and North-East BPO Promotion scheme (NEBPS) under Digital India Initiative. The objectives of the schemes are to create job opportunities for the local youths of smaller towns by setting-up BPO/ITES operations and also to attract investments in the respective regions for all round development. These schemes will help in creating right ecosystem required for

the growth of smaller towns and bring prosperity to those locations.

The schemes provide financial support along with several special incentives like encouraging employment to women and specially enabled persons, setting-up operations at other than State Capitals, promoting local entrepreneurs etc., up to Rs 1 lakh/seat in the form of Viability Gap Funding (VGF). 48,300 BPO/ITES seats have been provisioned across State(s)/UT(s) under IBPS and 5,000 seats for BPO/ITES Operations in North-East Region under NEBPS.

Under IBPS, as on 31st December 2020, 45,842 seats have been allotted to 163 companies to setup 236 BPO/ITES units distributed around 95 locations covering 21 States/UTs. Out of these, 234 units for 45,642 seats have started operation and reported employment of 38,663 persons. Total 124 claims for Viability Gap Funding (VGF) of amount Rs 36.73 crore have already been disbursed/approved under IBPS.

Under NEBPS, as on 31st December 2020, 1501 seats are allocated to 17 successful bidders to setup 20 BPO/ITES units covering 6 States of NE (Assam, Nagaland, Meghalaya, Manipur, Tripura and Arunachal Pradesh). Out of these, 12 units for 1125 seats have started operation and so far, reported employment of 646 persons. One claim for Viability Gap Funding (VGF) has been disbursed under NEBPS.

Electropreneur Park

Electronic System Design and Manufacturing (ESDM) is one of the fastest growing sectors of the Indian economy. In order to support the new entrepreneurs of this industry, STPI in association with University of Delhi and Indian Electronics and Semiconductor Association (IESA) has set up an Electropreneur Park in the Delhi University campus.

The initiative's aims to support 50 start-ups in

ESDM space and to create at least 5 global companies over a period of five years. The park focuses on local IP creation and indigenous product development resulting in increased domestic value addition and will witness a unique integration of academia, industry, Government and other incubative supportive elements. The initiative is first of its kind in the industry and it is likely to set a role model, which may go a long way in the annals of incubation centre.

Till 31st December 2020, EP has had 40 start-ups as its beneficiaries (32 Incubated, 8 Mentored). There has been a significant achievement by the start-ups during this period where they were able to take their product to the next step by filing national patents. Overall, 25 prototypes have been created with 25 new products as the achievements by EP's start-ups. Also, 30 IPRs have been filed by the EP start-ups. Additionally, 7 start-ups have received external funding support to the tune of Rs.11 crore and the total revenue generated by the start-ups is Rs.43 crore. Apart from the impressive figures, the start-ups at EP have been able to generate a value of over Rs.250 crore.

Fab Lab at Bhubaneswar

STPI has set-up its 1st Fab Lab at Bhubaneswar with the support of Electronics & IT Department, Government of Odisha and IIIT Bhubaneswar. The STPI FAB Lab Program would offer a vibrant ecosystem for creating a maker culture among the young tech-entrepreneurs, who are keen to develop their innovative technology idea into product prototypes with fine design functionalities. Several start-ups have availed the facility since the date of operationalization.

Centres of Excellence (CoEs)

To ensure India builds leadership in the emerging technologies such as IoT, BlockChain, FinTech, Artificial Intelligence, Augmented & Virtual Reality, Medical Electronics & Healthcare, Gaming &

Animation, Machine Learning, Data Science & Analytics, Cyber Security, Chip Designing, ESDM, etc and to build next wave of budding entrepreneurs, CoEs are being setup by STPI in collaborative approach in different domain across the country and each CoE shall act as single-window facilitation center to extend requisite plug & play space, lab support, funding, mentoring, industry & customer connect. The CoEs will have dedicated chief mentors & eminent experts who would also act as brand ambassador of particular CoE.

STPI has planned to establish more than 21 domain specific CoEs across Country. Out of these, 12 CoEs in different domain at different locations of country are operationalized whose details are given below:

FinBlue - CoE in FinTech at Chennai: MeitY has initiated a CoE in FinTech at STPI, Chennai in collaboration with Government of Tamil Nadu, IIT Madras, TiE Chennai and various industry partners such as Intellect Design, NPCI, Yes Bank, PayPal, Pontaq Ventures, RBS, Torus Innovations etc, to provide infrastructure, resources, coaching/mentorship, technology support and funding to emerging start-ups in the FinTech sector. Christened 'FinBlue', the CoE would establish ecosystem around FinTech with the latest trends and technologies in the financial services sector through a collaborative approach including NPCI, UIDAI and Partner Banks. The purpose of this CoE is to create holistic ecosystem so as to enable start-ups to experiment their innovative financial products or services within a well-defined space and duration. FinBlue aims to support 58 start-ups over a period of 5 years with special focus on areas like Trading, Banking, Lending, Remittance, Insurance, Risk & compliance, Wealth advisory, Financial inclusions, Saving, Payment and alike. FinBlue has selected 21 start-ups for on boarding

IoT OpenLab- CoE in Internet of Things at STPI Bangalore: IoT OpenLab in partnership with Arrow

Electronics at STPI Bangalore has been initiated to provide academic and business mentoring of the start-ups in the emerging technology area for developing products and/or services around IoT along-with networking opportunities. The IoT OpenLab intends to support & nurture 100 start-ups per year with an overall target to support 500 start-ups over a period of 5 years.

IoT OpenLab has selected 18 start-ups for on-boarding of the first batch of start-ups through Open Challenge Programme.

Electropreneur Park - an ESDM CoE at Bhubaneswar: Replicating the successful model of Electropreneur Park at New Delhi, establishment of EP-Bhubaneswar, an ESDM CoE with the objective of creating a holistic eco-system to promote ESDM innovation, R&D and create Indian Intellectual Property in the eastern region of the country has been initiated. EP-Bhubaneswar is being set-up through STPI in collaboration with Government of Odisha, IIIT Bhubaneswar and IESA. It aims to leverage 40 start-ups over a period of 5 years with special focus on areas like Energy, Process Control & Industrial Automation, Education, EP has been established in Bhubaneswar.

14 start-ups have been selected for on-boarding. Further, unraveling the treasures and potential for IT & ESDM” under Electrovibes, a knowledge series have been started.

Neuron – “Start-up Punjab Hub @ STPI” (SPHS) at Mohali: A Centre of Excellence in AI/ Data Analytics, IoT & AVG has been initiated in collaboration with MeitY, Government of Punjab, ISB-Mohali, PTU and industry. Neuron is an initiative, to identify and evaluate promising start-ups in the field of AI/Data Analytics, IoT and AVG that has been hosted in the SPHS Mohali Incubation Facility with a dedicated 500 seats co-working space and dedicated labs for AI/Data Analytics, IoT and AVG. Apart from physical & sector-specific infrastructure,

the hub will have the access to domain experts, technocrats, mentorship programs as well as funding. It is targeted to support 250 start-ups over a period of 5 years in key domains like AI, ML, DA, IoT & Virtual Reality to solve real world problems in Education, Agriculture, Healthcare et al.

18 start-ups have been selected for on-boarding. Multiple mentoring sessions have been conducted for selected star-ups under program NeuronSpeak.

Motion - Autonomous Connected Electric Shared (ACES) Mobility CoE at Pune: The future of automotive is electric, shared, autonomous, and connected. Accordingly, a CoE in “ACES Vehicles” called “Motion” i.e. *Mobility in Action* is being established at Pune in collaboration & partnership which includes Government of Maharashtra, M/s. Tata Motors, M/s. Kinetic, M/s. Visteon, M/s. MathWorks India, M/s. Intel, College of Engineering Pune (CoEP) and associations like ARAI, SAE-India, TiE-Pune etc., The ACES CoE is being established over 7000 sq. ft. of space (including lab & incubation) at STPI-Pune and targets to benefit 50 domain-specific start-ups over a period of 5 years in Autonomous, Connected, Electric & Shared (ACES) Mobility.

10 start-ups have been selected for on-boarding. Multiple mentoring sessions have been conducted for selected start-ups.

MediTech CoE at SGPGI Lucknow: Given the large dependence of India on imports (constituting 65% of India’s medical electronic equipment & consumables) and the fact that demand of medical products & services is going to rise exponentially, a CoE in Medical Electronics & Health Informatics at Lucknow has been initiated in collaboration with MeitY, Government of UP, SGPGI, AMTZ and AiMed to boost start-ups in this field and contribute to “Make-in-India”.

The MedTech CoE targets to support 50 start-ups over a period of 5 years. Selection process is

underway to onboard the first batch of start-ups.

Virtual & Augmented Reality CoE (VARCoE) at Bhubaneswar: With an intention to create an ecosystem for carrying out R&D in immersive visualization, give impetus to R&D, Incubation, IP Creation, Product Development, Skill development and Entrepreneurship in AR, VR and allied fields, the VARCoE has been set-up at IIT Bhubaneswar.

To further research & development of tools and technologies along with nurturing start-ups in the field of Augmented Reality and Virtual Reality, a Centre of Excellence has been established in IIT-Bhubaneswar. This CoE targets 300 incubatees including start-ups and individual researchers over 5 years in Health, Art and architecture, Transport, Construction, Tourism, Entertainment, and Education. The VARCoE has started operations with first set of projects working on various applications of VR/AR admitted. Currently, pan India Hackathon is underway inviting applications from entrepreneurs/start-ups doing innovative work in this area.

Presently nine major projects on AR&VR applications in various domains involving 12-15 highly qualified faculty and researchers of IIT Bhubaneswar are in progress.

IMAGE-CoE in Gaming, VFX, Computer Vision and AI at Hyderabad: This CoE has been set up in collaboration with STPI, STPINEXT, industry/industry association such as TiE, HYSEA, TVAGA, HA, academic institute like IIIT Hyderabad, and Government of Telangana in Jan 2020 to provide resources such as mentoring, technology support and funding for Gaming, Animation, VFX, Computer Vision and AI start-ups. IMAGE offers integrated programs, CVLAB and Game Lab, for start-ups to scale up through its incubation facility. The centre has been branded as IMAGE.

The IMAGE accelerator program includes premium plug and play co-working space for start-ups and

offers access to the ecosystem which comprises of IP owners, mentors, investors and a platform to support GoToMarket strategy. This CoE targets 140 start-ups in the domain of CV & AI and Gaming, Animation & VFX over a period of 5 years. Total 18 start-ups are selected in the first cohort wherein, 12 start-ups for Gaming and 6 start-ups for CV & AI.

APIARY- CoE in Blockchain at Gurugram : The STPI Apiary, a Centre of Excellence in Blockchain Technology is setup in collaboration with MeitY, STPI, STPINEXT, Government of Haryana, Padup Venture Private Limited, IBM, Intel, GBA and FITT in March 2020. This is an initiative, to identify and evaluate promising start-ups in the field of Blockchain Technology that will be hosted in the STPI Gurugram Incubation Facility.

A Centre of Excellence (CoE) is a domain-specific specialized incubation facility for start-ups in the area of emerging technologies where the highest-standards and best-practices in terms of infrastructure, technology, leadership, mentoring, training, research & development, funding, networking for the given focus area is made available.

This CoE targets 100 innovative start-ups over a period of 5 years. Total 23 start-ups have been selected through Open Challenge Programme.

OctaNE – CoEs in STPI-North-East Region: Under Digital North-East Vision 2022, eight Centers of Excellence with Start-Up Innovation Zone (SIZ) along with e-Commerce facilitation were envisioned to be established in the capital of each State of North-East Region. Accordingly, under Phase-I, 3 CoEs are approved and being established in three locations having technology/sector focus viz. IoT in Agriculture at STPI- Guwahati, Animation at STPI Shillong and AR/VR at Imphal.

Total 12 start-ups are selected in the first cohort wherein, 5 start-ups for IoT in Agri, 2 in Animation and 5 start-ups for AR/VR.

Further, Working group of MeitY have recommended for setting-up of five other CoEs+SIzS viz. Data Analytics & AI at Agartala, Gaming & Entertainment at Aizawl, GIS application (including drone technology) at Itanagar, IT application in Graphic Design at Kohima and IT application in Healthcare & Agritech at Gangtok in phase-II.

Next Generation Incubation Scheme (NGIS)

Ministry of Electronics & Information Technology (MeitY), Government of India has approved Next Generation Incubation Scheme (NGIS) under Champion Sector Services Scheme. STPI is implementing NGIS which is a comprehensive incubation scheme with a vision to drive the rise of India as a Software Product Nation so as to make India a global player in development, production and supply of Innovative, Efficient and Secure Software Products. The aim of NGIS is to provide vibrant software product ecosystem in Tier-II and Tier-III cities to complement the robust IT industry for continued growth, new employment and to enhance its competitiveness. NGIS has been launched from 12 STPI locations (Agartala, Bhillai, Bhopal, Bhubaneswar, Dehradun, Guwahati, Jaipur, Lucknow, Prayagraj, Mohali, Patna and Vijayawada). NGIS shall support an estimated 300 start-ups/Entrepreneurs/SMEs in the field of IT/ITeS/ESDM and generate 50+ patent/IPRs from them. NGIS has a duration of 3 years at total budgetary outlay of Rs.95 crore.

The application invitation for the first Start-up Challenge Contest under NGIS christened CHUNAUTI (Challenge Hunt Under NGIS for Advanced Uninhibited Technology Intervention) has ended on 07th September 2020. With 125+ Mentors, 46+ Knowledge Partners onboard and more than 15 outreach programs conducted online (in addition to other outreach activities done by STPI and MSH), CHUNAUTI has received

an overwhelming response in the form of 1820 complete applications and selection is in final stages.

Atal Incubation Centre

Under AIM, STPI is establishing an Atal Incubation Centre (AIC) at Bengaluru in collaboration with NITI Aayog. The AIC has focus on IoT and its applications in Health & Pharmaceuticals, E-Commerce, Big Data, Artificial Intelligence etc., For AIC, 10,000 sq.ft. of space shall be equipped with state-of-the art physical infrastructure, lab etc., and a dedicated team for conducting hackathons, idea challenges, workshops, trainings, technical/business mentoring sessions, assisting start-ups in the matters of IPR filing, legal, accounting etc., More than 65 innovative start-ups shall benefit from the AIC at Bengaluru.

Modified Electronics Manufacturing Cluster (EMC 2.0) Scheme

The EMC 2.0 scheme was notified on 1st April 2020 with an implementation period of 8 years (i.e. up to March 2028) and launched by Hon'ble Union Minister for Electronics & IT, Communications, Law and Justice on 2nd June 2020. The objective of the scheme is to create a comprehensive supply chain/ecosystem for strengthening electronics manufacturing base, attract Anchor Units to set up production along with their supply chain, development of World class Plug and Play infrastructure along with Standard Factory Sheds and reducing the infrastructure & logistics cost. Total budgetary support for Scheme is Rs.3,762 crore (including Admin expenses). STPI is the Project Management Agency (PMA) for implementation of the scheme. Till December 2020, 2 applications have been received on EMC 2.0 portal from Haryana State Industrial and Infrastructure Development Corporation and Andhra Pradesh Industrial Infrastructure Corporation.

Promotion of Small and Medium Entrepreneurs by creating a conducive environment in the field of Information Technology

STPI has been promoting SMEs and their cause by offering incubation services, organizing events, sponsoring/co-sponsoring events, participation in events and export promotion efforts. Some of the major events in which STPI participated/sponsored includes:

- 16th India Innovation Summit 2020 held during 14-17 September 2020 at through virtual platform
- CONNECT 2020 Chennai held during 15-19 September 2020 through virtual platform
- National Conclave on Self Reliant India held during 14-15 November 2020 through virtual platform
- Bengaluru Tech Summit 2020 held during 19-21 November 2020 through virtual platform
- INFOCOM 2020 held during 3-5 December 2020 through virtual platform
- TiE Global Summit 2020 held during 8-10 December 2019 through virtual platform

9.10 Digital India Corporation (DIC)

9.10.1 Introduction

Digital India Corporation (DIC) has been setup & promoted by Ministry of Electronics and Information Technology (MeitY), Government of India as a not for profit (Section 8 of the Companies Act, 2013) Company. The objective of the Company is to bring the benefits of Information & Communication Technologies (ICT) for socio-economic uplift at grass-root level of society. 'Innovation for Digital Inclusion' is its vision.

The Board of the Company is chaired by Hon'ble Minister for Electronics & IT and with other Directors being Hon'ble MoS for MeitY; Secretary, MeitY; AS & FA, MeitY and MD&CEO, DIC.

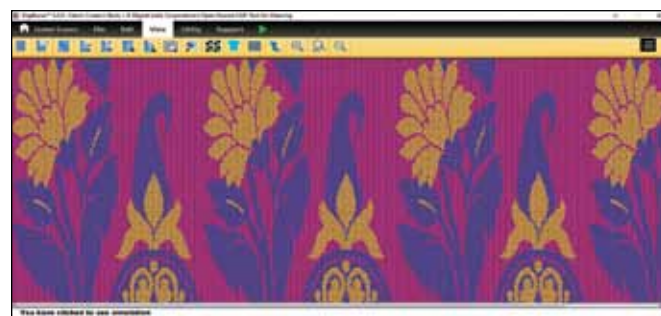
The application areas are Livelihood Enhancement (Farmers, Artisans and Weavers etc.), Healthcare and Empowerment of Persons with Disabilities (PwDs). In this endeavor it is working with Government (User Departments/Ministries), R&D Institutions, Academia, Industry, NGOs & other organizations/industries.

The Company focuses on 'Lab to Land' and 'Early Harvest' projects useful for the masses. In addition to its core activities, the Company is implementing a major programme for MeitY viz. Visvesvaraya PhD Scheme in Electronics & IT.

9.10.2 Achievements during 2020– 2021

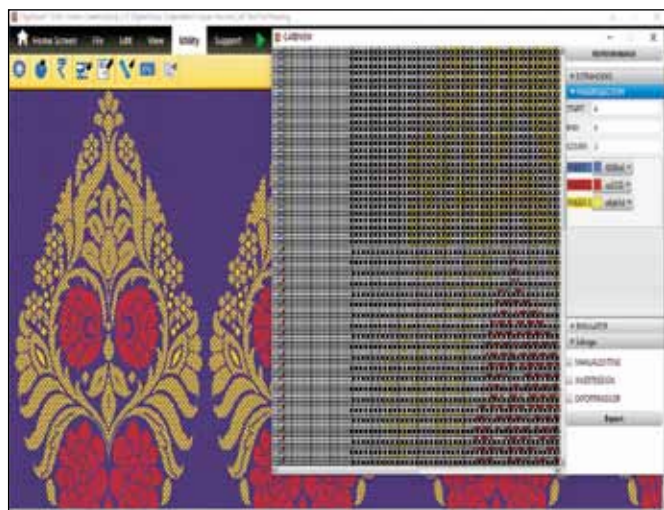
9.10.2.1 DigiBunai™-“An Open Source CAD Tool for Weaving”

Based on the experiences during the interaction with the users and to overcome the obstacle of non-access to the CAD software for weaving, Digital India Corporation developed an Indian CAD Software for textile designing i.e. DigiBunai™ (<https://digibunai.dic.gov.in/>). The software has been developed based on the need of the local designers/weavers (Indian) from the different aspects of designs, weaves, yarns, fabrics, clothes. The framework for the local Languages and related icons help to the designers/weavers for understanding the software in a better way. The software is bridging the digital divide in the local communities and creating a digital database of weaves, designs, yarns, colour catalogues.



Fabric Simulation

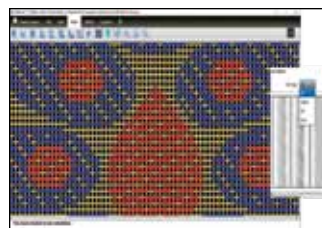
DigiBunai™ supports for Handloom as well as Power loom with Dobby & Jacquard weaving techniques. This is first of its kind Open Source Software which provides end to end functionality to the designers, weavers, artisans to efficient their process. This initiative helps them to increase the productivity resulting to enhancement in their livelihood. The design library created during the usage of the application strengthen the concept of re-use and reproduce. Digitization of ancient traditional designs preserve the heritage of India. The use of IT also attract the younger generation which saves the Indian culture and generate the self-employment.



Compatibility with Electronic Jacquard

The software has been enhanced with additional features to cater the wider user base:

- Fabric Simulation to visualize the close to real look of the fabric
- Yarn Editor to create a digital yarn
- Compatible with power loom and electronic jacquard
- Fabric Mapping on 2D Objects.
- Support to Ikat weaving technique.
- Extra Warp Designing with Dobby
- Colourways



Yarn Editor



Ikat Fabric



Colorways



2D Fabric Mapping



A user specific portal (<https://digibunai.dic.gov.in/>) developed for the delivery of developed technology to the user community with the training material (Brochure, User Manual, Installation Manual & Training Videos).



The developed Technology Deployed and Tested at various weaving clusters and textile institutes.

User Groups of DigiBunai™ application include Textile Designers, Graph Makers (textile designs), Jacquard Card punching vendors, Master Weavers and Next Generation (Students).

More than 230 users are using DigiBunai™ application including 36 Textile Institutions/Training Centers and 12 Weaving Clusters of India.

9.10.2.2 Digital Solutions for the Weavers/Designers and Artisans of North-Eastern Region (Mizoram)

Digital India Corporation is implementing the project to enhance and customise the ICT applications in the area of Embroidery & Weaving and its field testing in State of Mizoram for the benefits of Artisans & Weavers. The available technologies are being enhanced/customized to suit the local requirements. The technologies that are being customized for Mizo Artisans & Designers are:

- Chic™ (CAD Tool for Embroidery) DigiBunai™ (CAD Tool for Weaving/Designing)



Mizo Weaving

- So far, more than 208 weavers/designers/artisans have been trained.
- 57+ users installed the DigiBunai™ software including 4 intuitions viz. Department of Sericulture, Women Polytechnic Institute, Blitz Institute of Creative Arts (BICA), Mizoram University and community weavers/designers.



Designers Attending Training Session

- Conducted awareness sessions on COVID-19. Made and distributed 600 facemasks 32 PPE set and 22 face shield.
- Potential beneficiaries: 20,000+ Weavers/Designers/Artisans (as per All India Handloom Census 2019-20) of the state.



9.10.2.3 Customization, Enhancement & Deployment of Digital Solutions for Empowerment of Citizens of North-East India

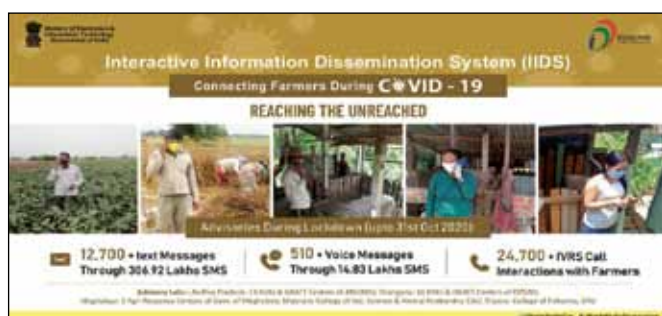
Digital India Corporation is implementing its applications in the area of CAD (Handloom & Handicraft) which are having potential for large scale deployment in North-Eastern States for the benefits of women/designers/weavers. DigiBunai™ and Chic™ CAD Plus are the technologies need to enhance/customize to meet the local requirements in the respective State (Meghalaya, Manipur, Assam, Arunachal Pradesh, Tripura, Sikkim) of NE.

Digital India Corporation working with the Textile Sector Skill Council to conduct the awareness and training sessions on DigiBunai™ CAD software in various states of North-East. An awareness building workshop conducted for the all Training Providers, Designers, Weavers, Entrepreneurs & Educational Institutes of North-East. The Local training Partners has been identified those are working in the Handloom sector of Manipur & Meghalaya to initiate the project activities.



9.10.2.4 Interactive Information Dissemination System (IIDS)

IIDS is a pull & push based system currently being used for delivery of agro-advisories. It is a combination of Smart Phone Application, Interactive Portal and Interactive Voice Response System. There is a mobile interface at front end and web interface at back end. Data is transmitted through voice, text, images and videos from both ends (farmers to experts & back).



Use of IIDS Platform During COVID-19

IIDS has become a useful tool in enhancing the outreach of Agriculture Universities & Institutions. It enables farmers to interact directly with local Agro-Scientists in their native languages (currently Telugu in AP & Telangana and Khasi & Garo in Meghalaya). The experts have access to knowledge & farmer database. It enables them to understand the farmers and appreciate their field problems in a better way - Know Your Farmer (KYF).

IIDS has been integrated with push based 'Text & Voice' message services under National Mobile Governance Initiative of MeitY.

IIDS Deployments during the year 2019-20 are as given below:

9.10.2.4.1 Annapurna KrishiPrasaarSeva(AKPS)

IIDS is deployed as AKPS along with Acharya N G Ranga Agricultural University (ANGRAU) and Prof Jayashankar Telangana State Agricultural University (PJTSAU) in 22 districts of Andhra Pradesh (AP) & Telangana.

During the year, 18,187 new farmers were registered for the services and a total of 1,02,788 farmers are now registered for AKPS services. 1408 queries were received from farmers on Agriculture, Animal Husbandry & Fisheries that have been resolved by KVKs/DAATTCs Scientists/ Experts through the toll free number. Need based 69.36 lakh text & 12.07 lakh voice messages were sent by KrishiVigyanKendras (KVKs) and District Agricultural Advisory and Transfer of Technology Centres (DAATTCs) to their respective farmers registered under the program.



9.10.2.4.2 Mobile based Agro Advisory System in Meghalaya - 1917iTEAMS

DIC signed an MoU with Government of Meghalaya (GoM) for implementation of IIDS with their integrated program for Connecting Farmers to Market viz. 1917iTEAMS. GoM has established a 45 seater Agriculture Response Center (ARC) at Shillong using DIC's IIDS2.0 platform. The existing communication infrastructure of DIC established at its Mumbai office is being used for program implementation. During the year, 33,705 new farmers from Meghalaya were registered under the project and with this the total no. of registered farmers has reached 57085. 1973 queries of the farmers were resolved by 1917iTEAMS. During the period 2,209 requests received from farmers to buy-sell their produce (Buy – 465 and Sell - 1744) and 9,936.34 Ton of farm produce transported in 984 trips as per the requests received from farmers.

IT platform (IIDS 2.0) has been enhanced by adding new features viz. facility to register farmers & buyers on call through Toll Free Number, facility for farmers to book a vehicle for transportation of their produce/crops, to take request and share information on buyer-seller and to provide technical advisories on agriculture, horticulture, livestock and fisheries.



9.10.2.4.3 Mizoram (Ran VulhtuteThian):

The project has been taken up in collaboration with College of Veterinary Sciences & Animal Husbandry, Central Agricultural University (CAU), Aizawl, Mizoram to empower the farmers (esp. livestock) by providing right information at right time through mobile based agro-advisory system. The project is supported by e-Governance Division, MeitY. During the month, following activities were undertaken:

10 Awareness programme; 4 Health Camps and 2 Training programme were conducted with 513 farmers, 261 farmers, and 21 project staffs respectively. Registration of farmers from projected villages initiated. Total 2534 farmers registered under the project during the period. Total 4803 calls received on the Toll Free number and 5057 outbound calls for registration, enquiry and advisory from farmers. 6989 text messages (3,70,566text SMS) and 133 voice messages (171063 voice SMS) and 6,989 transactional messages (Registration Messages – 2299, Advisory Messages – 4239, and Informative messages - 451) in local language were

pushed to farmers on various aspects of agriculture and animal husbandry. 4245 queries are resolved on Agriculture & Animal Husbandry over the toll free number.



9.10.2.4.4 Tripura (MatsyaVarta):

The project has been taken up in collaboration with College of Fisheries, Central Agricultural University (CAU), Tripura to empower the farmers (esp. fisheries) by providing right information at the right time through mobile based agro-advisory system. During the month, following activities were undertaken:

Registrations of farmers were done through the toll-free no.1800-102-3141 and Field coordinators and 4365 the total number of farmers were registered. 11 awareness programme meeting, 1 Health Camp, 5 Training were conducted with 560 farmers, 24 farmers, and 21 project staffs respectively. 6767 text messages (6,60,661SMS consumed) and 121 voice messages (1,33,481 voice SMS) and 6767 transactional messages (Registration Messages – 4292, Advisory Messages – 2183, and Informative messages - 292) were sent to registered farmers in local language on various aspects of agriculture and animal husbandry. 1565 calls were received on Toll Free number 5077 outbound calls for registration, advisory and enquiry purpose. 2160 queries are resolved on Veterinary, Fishery, Agriculture & Horticulture.



9.10.2.4.5 Customization, Enhancement & Deployment of Digital Solutions for Empowerment of Citizens of North-East India

DIC as an integrated approach with an objective to empower the citizens of North-East India by providing digital solutions to ease their job and enhance their productivity & livelihood with special focus on Farmers, Artisans, Weavers and Teachers (special schools).

The project is focused on deploying DIC technologies/applications in the area of ICT in Agriculture, Embroidery & Weaving and Differently Abled which have lots of potential for large scale deployment in all the North-Eastern States for the benefits of farmers, women, embroidery artisans, weavers and teachers of special schools. Following are the DIC technologies identified for customization and deployment based on its usability and potential in North-East Region:

- Interactive Information Dissemination System (IIDS): Empowering Agri Institutions & Farmers
- CAD Tools (DigiBunai™ & DigiKadhai): Empowering Weavers, Designers & Artisans
- Punarjjani™: Empowering Teachers of Special Schools & Children with Intellectual Disabilities

Following the implementation partners in the project:

- North-Eastern Space Applications Center (NESAC), Barapani, Department of Space, GOI
- 4 Colleges under Central Agricultural University (CAU), Imphal in 4 NER States
- Textile Sector Skill Council in 6 NER States
- 18 Special Schools in 8 NER states

Following is the status on the project:

Component 1 - IIDS Implementation: For providing 'right information on right time' by using mobile based agro advisory services in the native language/dialect of the farmers of North-Eastern Region

Sub-Components

- Implementation of Mobile Based Agro Advisory System (m4agri) in Manipur, Sikkim and Arunachal Pradesh
- Integration and Application of Unmanned Aerial Vehicle (UAV) for Crop Health Assessment and Monitoring with Integrated Information Dissemination System (IIDS) in Providing Evidence Based Agro-Advisory Services to Farmers of North-East India in Meghalaya

The project activities initiated from September 2020 onwards due to COVID-19 Pandemic situation from the last week of March 2020. Admin Approval and Funds have been released to the partner institutions to initiate the project activities. A project meeting held for sensitizing the project partners on the project activities. Meeting conducted by the Vice Chancellor of CAU, Director, NESAC and Senior Director DIC along with Dean and PIs/Co-PIs of all the project implementation Colleges. Project activities initiated in the proposed 2 states i.e Meghalaya and Manipur as per project proposal. A

committee is formed with PIs of all implementation colleges of CAU for conducting the baseline parameters and finalize the methodology.

Component 2- DigiBunai™ (CAD Tools) Implementation : Establishment of 'ICT Resource Centers for Embroidery & Weaving Artisans

The project activities initiated from September 2020 onwards due to COVID-19 Pandemic situation. Admin Approval sent to the partner institutions to initiate the project activities. Identified some of the local partners & institutions which are already working in Manipur & Meghalaya on the related activities. Inviting more training partners to conduct training program in Manipur & Meghalaya. Identified the locations/organizations for CAD lab establishment in Manipur & Meghalaya (coordinating with concerned department/organization).

Component 3 - Punarjjani™ Implementation: To assist special teachers in assessment of children (6 -18 years of age group) with Intellectual Disabilities (IDs)

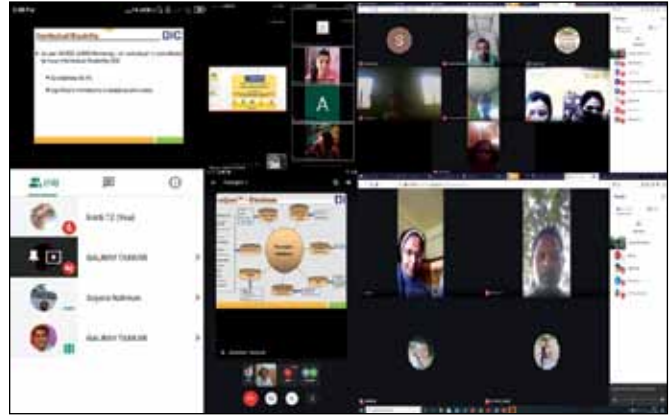
The project includes implementation of the tool in 18 Special Schools in North-Eastern region of the country through training of Special Educators, requisite hardware support for Special/Inclusive Schools, incentives for Special Educators and follow ups. In the first year of the project, the tool is to be implemented in 5 Special/Inclusive Schools in State of Assam.

Due to COVID-19, travel and conducting physical training sessions could not have been possible. Therefore online training sessions through video teleconferencing have been conducted for the following 4 Special/Inclusive Schools from the State of Assam:

- ShishuSarothe Centre for Rehabilitation & Training for Multiple Disability, Guwahati
- Prerona, the Spastic Society of Jorhat
- Mrinaljyoti Rehabilitation Centre, Dibrugarh

- Alphonsa School, Bongaigaon

Follow-ups with the Schools/Special Educators encouraging them to use the tool are going on.



Online Training Sessions on Punarjjani

9.10.2.4.6 Meghalaya Infra Project Monitoring Portal (IPMP)

DIC has signed an MoU with Department of Planning, Government of Meghalaya for development & deployment of ICT based initiatives as per the need of Department of Planning. DIC has developed and MIS and Dashboard to monitor Infra projects being implemented at various Departments in Meghalaya. A demonstration was given on the 'First Cut' of IPMP to Hon'ble CM Meghalaya in the presence of MD&CEO DIC and Senior officials from GoM. Following are features of IPMP:

- Major Components:
 - Management Information System(MIS) for Data Inputs from Departments
 - Dashboard with Drilldown options to track 'Physical & Financial' progress
- Web Based Application: Any Time AnyWhere Access (Mobile Responsive)
- RoleBased Logins : for MIS and Dashboard
- Customised access for each login – Project wise/Location wise
- Representation
 - Graphs & Charts
 - Reports & Analytics
 - Project Site Image/Video

- Facility to give recommendations/comment and Track issues raised by Department/Project In-Charge

The SeMT team from Meghalaya has trained and on-boarded 6 projects from 3 Departments (Dept of IT & Communications, Department of Sports & Youth Affairs and PWD) for pilot testing of the MIS & Dashboard.

9.10.2.4.7 QR Coded Check Post & Challan Management System (Q3CMS):

Q3CMS has been conceptualized by Government of Meghalaya with a vision to streamline the Challan & Check-post Management process for transportation of minerals, cement, forest products, etc., so as to significantly increase revenues for the State Government of Meghalaya through an IT-enabled Integrated System. DIC has developed and hosted the QR Code application (for a pilot run with 2-4 gates) for minerals (Limestone, Coal & Boulder) with an aim to eliminate duplicate or fake challans through QR code. DIC has developed web and mobile application with following features:

- Web Application for QR Code generation/printing/issuing
 - Generate QR codes based on : Minerals/Weight/Date of issue and Expiry etc
 - Dashboard and Reports : Real-time data on Dashboard and Report Generation
 - Manage Users : Admin/Department/Check Post
- Mobile App (Online) for scan/verification of QR codes
 - App to scan & verify QR code at Check Post along with GIS Coordinates
 - Alternate option to validate QR code with Unique ID (If QR reader is not working)
 - Can take image of Challan/Receipt/Vehicle at Check Gate along with QR Code
 - Entering Vehicle details, Mineral Transported and Vehicle Action Page

The Q3CMS Mobile and Web application is deployed in Department of Forest and being piloted at 2 gates. Total 23,675 QR codes have been scanned at 2 gates carrying Limestone and Boulder.

9.10.2.4.8 Ayusoft - Content Management System (CMS)

Digital India Corporation has undertaken implementation of an online Content Management System (CMS) for Ministry of Ayush, Government of India. The CMS will consist of an Ayurveda Encyclopedia (Text, Images, Audio& Video) and Ayurveda Keywords (Etymology, Definition, Reference, Literary Meaning, Implied Meaning, Elaboration, Synonym, Antonym, Contemporary Colloquial etc.). It will be helpful for Ayurveda Physicians, Researchers and Students.



9.10.2.4.9 Rural Women Technology Park at Basani, Varanasi

A Rural Women Technology Park (RWTP) has been setup for Women Empowerment through Skill Enhancement, Entrepreneurship Development and providing Market Linkages using ICT. The objective is to benefit more than 6,000 women through CAD (Computer Aided Design) tool for crafts for digital designs creation, Retail Management, Food Processing and Health Awareness. The progress made during the year is as follow:

Sr. No.	Training Programme	Beneficiaries during the year	Total Beneficiaries
1	Chic™ (CAD tool for Crafts)	268	497
2	Retail Management/ EDP	224	332
3	Food Processing/ Preservation	423	623
4	Health Awareness Programs	2409	3979
	Total	3324	5431

In addition, 270 khaka patterns and 22 finished products have been prepared during the year.



Women artisans receiving training on embroidery designs using Chic™ with hands-on experience

The project is being implemented with the support of Department of Science & Technology (DST) under its Science for Equity, Empowerment & Development (SEED) scheme.

9.10.2.4.10 'ICT Intervention for Development & Livelihood Enhancement through Women Self Help Groups (SHGs) in Majhwa block of Mirzapur (a backward district), U.P.

The main objective of the project is to provide Information & Communication Technology (ICT) based solutions for development, livelihood &

knowledge enhancement in Majhwan block of district Mirzapur (a backward district notified by MSME & NABARD). A Resource Centre equipped with the requisite equipments (hardware & software) and infrastructure has been setup to train/sensitize 4500 women on Chic™ (CAD tool for embroidery designing), Food Processing, Kitchen Gardening, Dairy Development, Entrepreneurship Development Program (EDP) including market linkages and health awareness using multimedia content. The progress made during the year is as follow:

Sr. No.	Training Programme	Beneficiaries during the year	Total Beneficiaries
1	Chic™ (CAD tool for Crafts)	213	488
2	Retail Management/ EDP	71	200
3	Food Processing/ Preservation	489	631
4	Kitchen Gardening	200	400
5	Dairy Development	305	350
6	Health Awareness Programs	1172	1903
	Total	2450	3972

In addition, 143 khaka patterns and more than 20 finished products have been prepared during the year.



Project Dashboard

9.10.2.4.11 ICT based capacity building for empowerment in the area of health & livelihood for the women belonging to SC/ST community in Latur district of Maharashtra.

The project has been undertaken with objective to empower women belonging to SC/ST community in the area of health & livelihood through ICT in Latur district of Maharashtra. The objective of the project is to bring direct benefits of ICT to 2000 SC/ST women and girls in the Latur district of Maharashtra by (a) setting-up an ICT resource center for women entrepreneurship development, (b) creation of digital tools & techniques to empower women entrepreneurs in the area of E-financing, E-commerce, e-market etc., & (c) establishment of Arogya-Sakhi model to provide preventative health awareness. The Center would offer mentors for entrepreneurial leadership and resource support for long term sustainability, domain specific knowledge and linkages for seed-fund capital (to selective beneficiaries) to expand or set up micro enterprise units. It is also expected to provide the affordable preventive health care facilities at the doorstep of the community.

Achievements:

- Launched Javsai Flax seed product and garments producer group
- Provided handholding support for branding and packaging of products.
- Provided handholding support to market supply and procuring raw material.
- Registered business mail account of 2 groups and provided ICT support on how to use.
- Registered business website of garments production unit



Javsai Flax Producer Group



EA Program

Activities		Achievements		
		Till month November, 2020	Month of December, 2020	Grand Total
		Events	Events	Events
Mobilization		3437	349	3437
Awareness	Door to door visit	1548	88	1636
	FGD	122	10	132
	Follow up	535	151	686
Profile Collection		832	127	959
Entrepreneurship awareness Program		72	5	77
Zoom Workshop		7	1	8
Capacity building Program		58	20	78
Digital capacity building Program		27	10	37
Health Awareness		1500	308	1808
Health Screening		362	126	488
Capacity Building Entrepreneur		832	127	959 /1000
Digital Capacity building Entrepreneur		527	292	819

9.10.2.4.12 Centralized System for Heart Rate variability (cHRV) Analysis System

The project is being executed in collaboration with AIIMS, New Delhi with objective to make HRVA technology available at remote places to digitally empower healthcare professionals across the country. HRV is an important human body performance indicator to assess the role of autonomic nervous system fluctuations in healthy individuals and patients. It offers prognostic information independent of and beyond that provided by traditional risk factors. Centralized HRV empowers medical community through reproducible and collaborative research platform. The system creates database on HRV & associated health for benchmarking, clinical utility and policy making.

During the year, the system has been customised based on feedback received from users. All the necessary module both at the user end and at the admin end has been developed and integrated into the application. All the necessary and required actions to host the cHRV application like setup of NodeJS environment, ExpressJS API server, Proxy configuration in Apache web server, build of angular app in production mode, mongoDB setup with all migrated data from MySQL database have been executed. The cHRV application with all new look and functionalities have been hosted on the Mumbai server with all dependencies. The application is now accessible through <https://chr.v.in/chr.v/> for testing purpose and soon will be available for the users.



cHRV Dashboard

9.10.2.4.13 Visual Speech Training System (VSTS) for children with Hearing Impairment (HI)

The project is being implemented in collaboration with IIT Bombay and AYJ National Institute of Speech & Hearing Disabilities, Mumbai with support of MeitY to develop a computer & mobile based VSTS-2 for children with hearing impairment.

During the year, the VSTS-2a and VSTS-2b applications have been developed.

VSTS-2a consist of (a) Signal Acquisition Panel allows user to Load or Record recording speech signal in real time and plotting as a waveform on matplotlib graph (b) Analysis Panel runs processing engine at backend to analyze vowels and vowel like sound signal (c) Animation Panel used for displaying graphics for animation using a single development platform that minimizing the processing delay for improving the effectiveness of the visual feedback for speech training. The VSTS-2a has been online demonstrated to 110 users for its usability.



Welcome Screen VSTS-2a

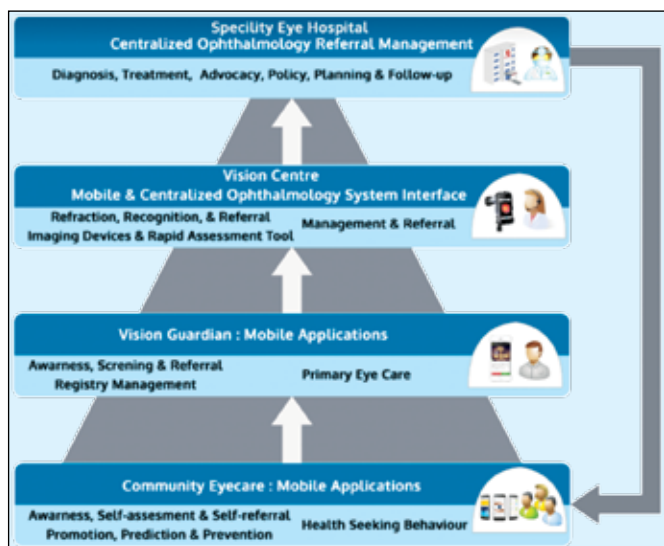
VSTS-2b consist of (a) Signal Acquisition Panel allows user to Load or Record live stream video recording using the OpenCV library (b) Analysis Panel runs processing engine at backend to analyse vowels and vowel like sound signal (c) Animation Panel used for displaying graphics for animation with video frames together to provide visual feedback for speech training. Video and Audio can be run with the delay of 1 sec, 2 sec, 5 sec, 10 sec and 20 sec



Welcome Screen VSTS-2b

9.9.2.4.14 Interactive Mobile Enabled Centralized Remote Eye Care Delivery System

The project is implemented by Digital India Corporation in partnership with PBMA'S H.V Desai Eye Hospital and supported by MeitY to strengthen remote eye care delivery in India. This project aims to develop an interactive mobile-enabled centralized remote eye care delivery system which will be a user-friendly, affordable, and replicable system across the country. In addition to this, it aims to produce various android mobile apps to improve the health care behavior of the community.



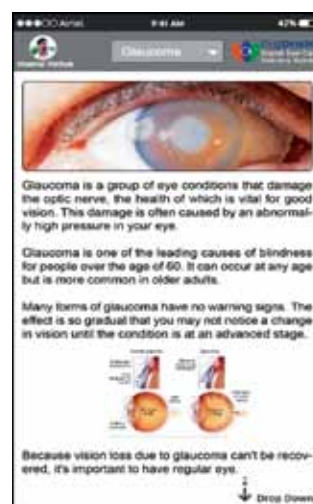
Citizen Eye care app

The purpose of this application is to improve the health-seeking behavior of the people by

creating awareness about different avoidable causes of blindness. It also aims to assist people in self-identification of eye condition using a self-assessment tool and for self-referral. We have prepared content for creating awareness about various eye conditions and about various patient support programs conducted by the Government. For self-assessment and prediction, a questionnaire has been prepared. We also have made provisions, which may enable people to find out people nearby eye care centers in the application.



Mobile App Designs



DigiDrishti System

Vision Guardian Application

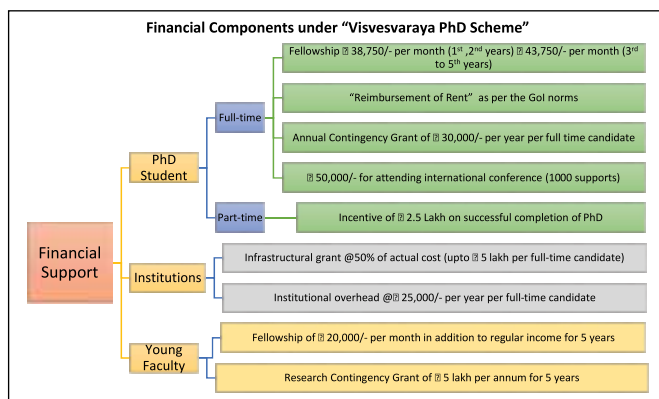
The vision guardians aim to assist vision guardians in creating awareness and to record people's demographic and primary eye care services provided in digital format. It also assists in referral. We have created a format for the registration of patients. Also, a medical record format for entering patient examination details (history, vision, and refraction screening, torchlight examination) is created. To refer patients to nearby vision centers, a referral format containing patient demographics, patient examination details, name and address of nearby vision centers, as well as the details of referred vision guardians, has been prepared. Awareness content about different avoidable causes of blindness has also been created.

Vision Center Application and Base Hospital

This is a web-linked Centralized Remote Ophthalmology System, aims to create EHR/EMR records of remote patients and to refer patients who require expert consultation to specialty eye hospitals using a broadband internet connection for real-time consultation. We are analyzing and comparing the contents available in similar software such as ICOM by Orbis, Community Vision Center software by Aravind Eye Care, SehathSathi, cHRV, iNetra to create a user-friendly, affordable and replicable system across the country.

9.10.2.4.15 Visvesvaraya PhD Scheme for Electronics & IT

MeitY has entrusted DIC with implementation of the Scheme to enhance the number of PhDs in Electronic Design & Manufacturing (ESDM) and IT/IT enabled Services (ITES) sectors. The objective is to support 3,000 additional PhDs students (1,000 full time + 2,000 part time) in ESDM and IT/ITES and to support 200 Young Faculty to encourage & recognize their work in research & technology development.



Financial Components under “Visvesvaraya PhD Scheme”

Status of the implementation of the Scheme:

- The fellowship under the scheme has been enhanced in Aug 2019 from current rates of Rs.31,500/- (for 1st two years of PhD) and Rs 35,000/- (3rd year onwards) to

Rs.38,750/- & Rs. 43,750/- respectively. The reimbursement of rent linked to fellowship has also been increased. The enhanced rates are applicable w.e.f. 1st April 2019.

- 1076 full-time and 746 part-time PhD seats have been allocated to 97 academic institutions under the scheme where 908 full-time & 305 part-time PhD candidates are currently enrolled.
- 158 faculty members were awarded ‘Young Faculty Research Fellowship (YFRF)’.
- The PhD Scholars are pursuing research in the emerging technology areas such as Big Data, Blockchain, Machine Learning, Artificial Intelligence, Internet of Things, Cloud Computing, Cyber Security, Mobile communication, 5G communication, Quantum Computing, VLSI Design, Medical Electronics, Biotechnology, etc.
- 25 Research Scholars from 17 institutions reported filing of 35 patents.
- 3646 Research Papers published by 878 Research Scholars.
- 127 PhD Candidates attended International Conferences.
- 180 PhD Candidates submitted their theses through PhD Portal.
- An Online Interaction of Visvesvaraya PhD Fellows working in the area of Artificial Intelligence (AI) & Analytics under Visvesvaraya PhD Scheme for Electronics & IT, with MD & CEO Digital India Corporation was conducted on September 15, 2020
- The scheme has been helping the Institutions in up-gradation/creation of laboratory, equipment, etc.; playing a vital role in research activity, encouraging the students & young faculty researchers in technology development & creation of Intellectual Property in ESDM & IT/ITES sector.

Other Matters



10.1 Use of Official Language Hindi in Official Work

In order to promote the use of Hindi in official work in the Ministry, a Monthly Incentive Scheme has also been started in addition to Annual Incentive Scheme for Noting & Drafting in Hindi. Under this Incentive Scheme, previously there were five prizes of Rs.500/- each but in order to make this scheme more attractive the prize money has been increased from the Rs.500/- per prize to Rs.1000/- per prize and officers/employees writing at least 2,000 words in Hindi during the month can participate in this Incentive Scheme.

Keeping in mind huge increase in number of cases of COVID-19 and to contain its spread, Hindi Pakhwada has not been organised in this Ministry during September 2020. Many competitions to be organized during this period shall be held by the end of FY 2020-21 if the situation of COVID-19

becomes normal and the winners shall be awarded. In order to promote the progressive use of Hindi in day to day official works various other competitions also be held from time to time.

To ensure the implementation of official language policy in the offices under the administrative control of this Ministry, official language inspection was done by Honourable Committee of Parliament on Official Language at NIELIT, HQ, New Delhi; UIDAI HQ, New Delhi; STPI, HQ, New Delhi; C-DAC, New Delhi and NIC HQ] New Delhi. Besides, official language inspection was done at UIDAI HQ, New Delhi and STPI, HQ, New Delhi at the level of ministry itself.

During the period under report, various important documents like Annual Report, Outcome Budget, various Cabinet Notes, and various Notes for Parliamentary Standing Committee, Replies of Parliament Questions, and Questionnaire based

on Demands for Grants, Power Point Presentation for Standing Committee, Follow-up Action Reports, Monthly Reports for the Cabinet and other miscellaneous documents were translated from English to Hindi.

10.2 RTI Matters

There is a RTI Cell in the Ministry, which is the central receiving point for RTI applications/appeals and responsible for overall coordination in respect of RTI matters of MeitY and its organisations. MeitY and its Attached/Subordinate Offices/Societies are separate Public Authorities in terms of Section 2 (h) of RTI Act, 2005. Each of these Public Authorities has its own Central Public Information Officers (CPIOs)/Appellate Authorities (AAs). For any information relating to these organisations, applications need to be submitted to the concerned Public Authorities as per provisions of RTI Act, 2005. All Public Authorities have also hosted relevant inputs/documents on their respective websites, as required under Section 4 of the RTI Act. The relevant contents are reviewed and updated periodically by the concerned Public Authorities.

During the period from 01.01.2020 to 31.12.2020, 2937 RTI applications (2,757 online and 157 physical) were received in this Ministry. 180 numbers of appeals (157 online and 23 physical) also received during the period from 01.01.2020 to

31.12.2020. The applications received were related to MeitY and organisations under it. Aadhaar, Cyber Law, Social Media, Digital Payment, e-Governance, online gaming and internet websites were the main subjects on which large number of RTI applications received during the period from 01.01.2020 to 31.12.2020.

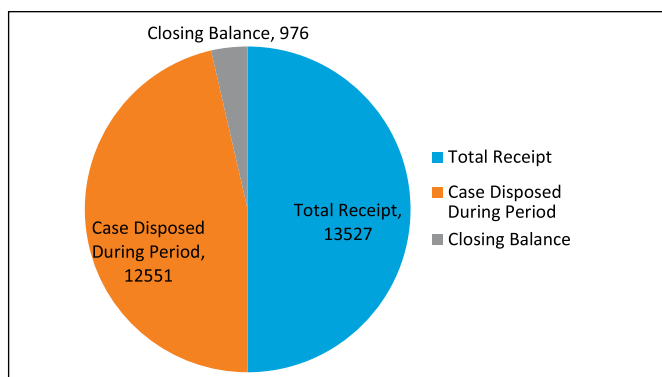
10.3 Public Grievances

Similar to RTI Cell, there is Public Grievances Cell in MeitY headed by Director (Public Grievance). The grievances received in PG Cell through CPGRAM portal and also offline mode were mainly relate to the following:

- CSC
- Digital India/e-Services
- Social Media
- Cyber Security
- NIC
- My Gov
- Digital Payment
- Aadhaar

During the period from 01.01.2020 to 31.12.2020, 13527 grievances were received and out of these, 12551 were disposed of. Detailed information for this year in tabulated form is shown below:

Grievance Source	Brought Forwarded	Receipt During Period	Total Receipt	Case Disposed During Period	Closing Balance
DARPG	25	318	343	301	42
Local/Internet	292	8918	9210	8605	605
Pension	3	46	49	41	8
PMO	215	3630	3845	3532	313
President Secretariat	13	67	80	72	8
Total	548	12979	13527	12551	976



Pie Chart showing the details of grievances received during the period from 01.01.2020 to 31.12.2020.

10.4 Information and Documentation Centre (Library)

This Ministry has a spacious well planned Library viz Information and Documentation Centre (I&DC), with an inventory of books and journals. It uses RFID based Library Management System to manage issue & return of Books/Journals. I&DC also provides various other services like inter-Library loan facility to the officials of the Ministry through DELNET (Developing Library Network) and also arranges books from libraries of various other Organizations. Services are also provided to the retired officials of the Ministry and trainees who undertake projects in the Ministry.

The Information & Documentation Centre possesses approximately 30,165/- books on various subjects including Electronics, Computer, IT, Computer Languages, Fiction. Also has some books on Hindi and English literature. I&DC procures on an average 50 books and approximately 50 Journals per annum. Currently, e-books service (Books 24x7) is also made available to the authorized users.

The Ministry is spearheading an Intra-Ministerial initiative viz the Library Consortium, Ministry of Electronics & Information Technology (MCIT). Consortium of the Ministry (MCIT Consortium) comprises the users from the National Informatics Centre (NIC), C-DAC, NIELIT, SAMEER, C-MET, STQC Directorate, STPI, CCAERNET India, C-DOT.

The Ministry provides on-line access to various e-resources i.e. IEEE Journals/Transactions/Proceedings, IEE Journals/Proceedings, ACM digital library and ISO Standards to its users through MCIT Library Consortium.

10.5 Parliament Matters

Parliament Matters:

During the year, 113 number of Parliament Questions in Lok Sabha (5 Starred & 108 Unstarred) and 94 number of Parliament Questions in Rajya Sabha (5 Starred & 89 Unstarred) were admitted and handled by the Parliament Section. These were mainly related to Digital Payments, National e-Governance Plan, Cyber Security, Aadhaar, Digital India Programme, Misuse of Social Media, Internet of Things, Data Protection and Privacy, Cyber Security, National Policy on Electronics, Electronics Manufacturing, Hacking incidents of Government Websites, National Policy on Information Technology, Employment to Youth, Cloud Technology, Investment in IT Sector, e-Literacy, Development of e-Skills, Internationalized Domain Name, Super Computers, Internet Related Polices, E-Governance at Grass root Level, National Digital Literacy Mission (NDLM) Programme, PMGDISHA, Online Child Sexual Abuse, Public Procurement Policy, Wafer Fabrication Facility, Performance of Schemes launched by Government, Money Spent by UIDAI, Circulation of Fake Clips, Vulnerabilities in App used in smartphones, Status of IBPS, GDPR, MSIPS, Momo Challenge game, UMANG App, Strengthening of internet security and Prevention of Cyber Crime.

Department related Parliamentary Standing Committee on Information Technology have laid following Reports on the Table of Lok Sabha and Rajya Sabha:

- Eleventh Report on Action Taken by the Government on the Observations/Recommendations of the Committee

contained in their Fifty-ninth Report (Sixteenth Lok Sabha) on 'Review of National Digital Literacy Mission (NDLM) – Problems and Challenges' on 20.03.2020 in Lok Sabha and Rajya Sabha.

- Demands for Grants (2019-20) of Ministry of Electronics and Information Technology on 10.12.2019 in Lok Sabha and Rajya Sabha.
- Fourth Report on Demands for Grants (2019-20) of the Ministry of Electronics and Information Technology on 13.03.2020 in Lok Sabha and Rajya Sabha.
- Fifth Report (Seventh Lok Sabha) of the Standing Committee on Information Technology (2019-20) on Demands for Grants (2020-21) of the Ministry of Electronics and Information Technology on 13.03.2020 in Lok Sabha and Rajya Sabha.

The Parliamentary Standing Committee on Information Technology has selected the following subjects for discussion during the year 2020-2021.

- Citizens' data security and privacy.
- Digital Payment and Online Security measures for data protection
- Review of functioning of Unique Identification Authority of India (UIDAI).
- Safeguarding citizens' rights and prevention of misuse of social/online news media platforms including special emphasis on women security in the digital space.
- Promotion of Electronics/IT Hardware Manufacturing Sector and measures for reduction of imports.
- Policy issues in Information Technology including cross border data flows, Artificial Intelligence (AI) and Internet of Things (IoT), etc.
- Technology initiatives taken by MeitY in the wake of COVID-19 pandemic
- Review of Cyber Security scenario in India.

The Annual Reports of following Societies of the Ministry of Electronics and Information Technology have been laid on the Table of the House (Lok Sabha and Rajya Sabha)

- UIDAI - 16.09.2020 (Lok Sabha) and 17.09.2020 (Rajya Sabha)
- C-MET - 16.09.2020 (Lok Sabha) and 17.09.2020 (Rajya Sabha)
- C-DAC - 16.09.2020 (Lok Sabha) and 17.09.2020 (Rajya Sabha)
- ERNET - 16.09.2020 (Lok Sabha) and 17.09.2020 (Rajya Sabha)

10.6 Gender Empowerment/Prevention of sexual harassment of women at work place

Only one sexual harassment has been received and the same has already been disposed off in respect of MeitY.

10.7 Activities undertaken for the benefit of Differently abled Persons - Punarjjani™ - Empowering Teachers of Special Schools & Children with Intellectual Disabilities

The project is related to implementation of the tool in 18 Special Schools in North-Eastern region of the country through training of Special Educators, requisite hardware support for Special/Inclusive Schools, incentives for Special Educators and follow ups. In the first year of the project, the tool is to be implemented in 5 Special/Inclusive Schools in State of Assam.

For details please see **9.10.2.4.5 (Component 3) of Chapter 9**

Accessibility India Campaign: Development/renovation of Government/State Government websites to make them accessible for Persons with Disabilities (PwD) as per GIGW/WCAG. 2.0 (A, AA level)

For details may please see 9.4.7 of Chapter 9.

Visual Speech Training System (VSTS) for children with Hearing Impairment (HI)

The project is being implemented in collaboration with IIT Bombay and AYJ National Institute of Speech & Hearing Disabilities, Mumbai with support of MeitY to develop a computer & mobile based VSTS-2 for children with hearing impairment. For details may please see 9.10.2.13 of Chapter 9.

Initiatives on Accessibility

ERNET India is executing a project funded by Department of Empowerment of Persons with disabilities (DEPwD), MoSJE to make 745 State Government websites ccessible as per the standards of Government of India guidelines for websites (GIGW) and web content accessibility guidelines WCAG 2.0 (AA). Details are available at paragraph 2.4.3. of Chapter 2.

10.8 Details related to the Vigilance Cases

Vigilance Unit, Ministry of Electronics and Information Technology (MeitY) is the nodal Office for handling all vigilance matters of the Ministry of Electronics and Information Technology (MeitY) and of the organisations under its administrative control. This Office is presently, headed by an Economic Adviser who has also been appointed as Chief Vigilance Officer (CVO) by Central Vigilance Commission. The CVO is assisted by a Deputy Director and a Section headed by a Section Officer. The CVO looks into the vigilance matters of all organizations under MeitY. Although, the Autonomous Societies under MeitY have their own CVOs, their appointment and the overall functioning of vigilance matters of these organizations vests with the CVO, MeitY. Each of the Attached/Subordinate Offices under MeitY have their own vigilance set up in their respective organisations who work in close coordination with the Vigilance Unit of this Ministry.

During the year 2020, a total number of 98 complaints were received in Vigilance Unit, MeitY out of which 39 complaints were received from

Central Vigilance Commission and 59 complaints from different platforms including Prime Ministers' Office, Public Grievance Portal etc. The complaints received related to MeitY and its attached/subordinate offices and Autonomous Societies under MeitY mainly alleging favouritism/nepotism and corruption in recruitment, violation of CVC guidelines in tender process, misuse of official position, insubordination, harassment, bribery, etc.,

The complaints were perused and those relating to concerned CVOs or which were administrative in nature were forwarded to the respective organisations for taking necessary action at their end. Besides, these, during the year, a total of 11 major complaints were investigated. Out of which 6 major cases have been concluded and the remaining 5 cases have almost reached the conclusion stage. The major cases have been processed in consultation with Central Vigilance Commission.

In order to mitigate potential risk of corruption, Vigilance Unit of MeitY arranges seminars/training programs on vigilance in the Offices under the administrative control of this Ministry situated in various parts of the country and also conducts token inspection of records from time to time. These programs are arranged for the benefit of all concerned to prepare the best practice chart at all levels to bring about change in the work culture and work ethics and to develop transparency and minimize discretionary powers.

In terms of the advice of the Central Vigilance Commission (CVC), MeitY this year decided to observe सतर्कता जागरूकता पखवाड़ा 2020 (Fortnight of Vigilance Awareness 2020) commencing from 27th October to 10th November, 2020 on the theme 'Vigilant India, Prosperous India'. The theme aptly reflects the underlying importance of constant vigilance by all citizens towards safeguarding integrity as a core value for economic growth and development of the country.

India is scripting a new narrative of social transformation, inclusive growth and empowerment, using the power of technology with massive participation of citizens. The effective use and proliferation of digital technologies under Digital India Programme is bringing about radical changes in the society, thus enabling us to progress ahead towards a self-reliant, strong, secure and sustainable Digital Economy. Participative and Good Governance that is transparent, responsible, accountable and efficient service delivery enabled by Digital India has ensured the inclusion of citizens in equitable manner. Towards this endeavour, while technology is playing crucial role, constant vigilance on part of every citizen is also essential to collectively combat the menace of corruption in all domains of governance to bring transparency and efficiency.

Therefore, to enthuse employees and public at large towards values of honesty, integrity, sincerity, responsibility, transparency and service to the nation, Vigilance Unit, MeitY undertook various interactive activities, such as expert talks through webinar series, competitions and trainings to engage citizens, youth and Government officials during the fortnight.

More than 7,000 people have participated in these competitions. The Fortnight of Vigilance Awareness 2020 began with the administering of Integrity Pledge virtually by Shri Sanjay Dhotre, Hon'ble Minister of State for Electronics & Information Technology. A half day training on Administrative and Preventive Vigilance was also got conducted through ISTM for disseminating knowledge to the employees of MeitY and its organisations. Webinar series on different topics related to cyber crime, women safety, stress management and Government's initiative for digitization through Aadhar Card were conducted online for the benefit of the mass public for building a vigilant and a progressive nation. These Webinar series were streamed across the citizens of our country

through Facebook and YouTube. The message of CVC and the suggestions sought by CVC for systemic improvements in the organisations were also communicated to all the employees of MeitY and its organisations. The CVOs of organisations under MeitY were directed to observe the Vigilance Awareness Week with zeal and enthusiasm and also share their best practices with CVO, MeitY.

On the occasion of observance of Fortnight of Vigilance Awareness, the Website of MeitY <http://www/meity.gov.in> and the platforms of NeGD, myGov and NIC were utilised for disseminating information to the employees of MeitY and its organisations and citizens in large.

Focus was also made on expediting completion of pending vigilance cases in MeitY. All organisations under MeitY were also advised to take sincere efforts in concluding cases pending with them for long.

In order to improve systems and procedures to reduce and eliminate corruption and use of discretionary powers, guidelines communicating preventive measures on recruitment/procurement/posting-transfer were issued by Vigilance Unit, MeitY at various intervals of time. In its routine functioning more than 300 requests for grant of Vigilance Clearance had been received from MeitY/its organizations which had been examined and necessary vigilance clearances communicated accordingly. Vigilance Unit has also been sending reports to CVC/Central Bureau of Investigation/Department of Personnel & Training in a time bound manner.



Integrity Pledge being taken virtually by officials of MeitY

Summary of Important Audit Observations

Sl. No.	Year	No. of Paras/PAC reports on which ATNs have been submitted to PAC after vetting by Audit	Details of the Paras/PAC reports on which ATNs are pending		
			No. of ATNs not sent by the Ministry even for the first time	No. of ATNs sent but returned with observations and Audit is awaiting their resubmission by the Ministry	No. of ATNs which have been finally vetted by audit but have not been submitted by the Ministry to PAC
1.	2002-03	-	Nil	-	Nil
2.	2003-04	-	Nil	-	Nil
3.	2004-05	-	Nil	-	Nil
4.	2005-06	-	Nil	-	Nil
5.	2006-07	-	Nil	-	Nil
6.	2007-08	-	Nil	-	Nil
7.	2008-09	-	Nil	-	Nil
8.	2009-10	-	Nil	-	Nil
9.	2010-11	-	Nil	-	Nil
10.	2011-12	-	Nil	-	Nil
11.	2012-13	-	Nil	-	Nil
12.	2013-14	-	Nil	-	Nil
13.	2014-15	-	Nil	-	Nil
14.	2015-16	-	Nil	-	Nil
15.	2016-17	-	Nil	-	Nil
16.	2017-18	-	Nil	-	Nil
17.	2018-19	-	Nil	-	Nil
18.	2019-20	-	Nil	-	Nil

Appendix II

Annual Budget 2021-22

Sl. No.	Scheme/Non-Schemes	Budgetary Support (Rupees in crore)
Non-Schemes		
1	MeitY Secretariat	109.33
2	National Informatics Centre	1400.00
3	Regulatory Authorities	345.00
3.1	Standardisation Testing and Quality Certification (STQC)	120.00
3.2	Cyber Security (CERT-In)	216.00
3.3	Controller of Certifying Authorities (CCA)	9.00
4	Assistance to Autonomous & Other Bodies	1060.00
4.1	Centre for Development of Advanced Computing (C-DAC)	200.00
4.2	Society for Applied Microwave Electronics Engineering and Research (SAMEER)	120.00
4.3	Centre for Materials for Electronics Technology (C-MET)	80.00
4.4	Bhaskaracharya National Institute for Space Applications and Geo-Information [BISAG(N)]	50.00
4.4	Digital India Corporation (DIC)	10.00
4.5	Unique Identification Authority of India (UIDAI)	600.00
	Sub-Total (Non-Scheme)	2914.33
5	Digital India Programme (Umbrella Scheme)	6806.33
5.1	Manpower Development	400.00
5.2	Electronic Governance (incl. EAP)	425.00
5.3	National Knowledge Network	500.00
5.4	Promotion of Electronics & IT Hardware Mfg (MSIPS, EDF & Manufacturing Clusters)	2631.32
5.5	Promotion of IT/ITeS Industries	150.00
5.6	R&D in IT/Electronics/ CCBT	700.00
5.7	Cyber Security Projects (NCCC & Others)	200.00
5.8	Promotion of Digital Payments	1500.00
5.9	Pradhan Mantri Digital Saksharta Abhiyan	300.00
5.10	Champion Services Sector Scheme	0.01
	Sub-Total (Scheme)	6806.33
	Total (Scheme & Non-Scheme)	9720.66

Employees' Structure

(Total and SCs/STs/PWDs as on 01.01.2021)

Group	Permanent/ Temporary	Total No. of Employees	SC	% of SC total employees	ST	% of ST total employees	Persons with disabilities	% of PWDs
Group 'A'	Permanent							
	(i) Other than lowest rung of class-I	174	26	14.94	11	6.23	02	1.15
	(ii) Lowest rung of Class-I	09	01	11.11	--	--	02	22.22
	Temporary	--	--	--	--	--	--	--
	Other than lowest rung of Class-I	01	--	--	--	--	01	100
	(ii) Lowest rung of Class-I							
Group 'B' (Gazetted)	Permanent	43	07	16.28	02	4.65	01	2.33
	Temporary	00	00	00	00	00	00	00
Group 'B' (Non-Gazetted)	Permanent	79	20	25.00	07	8.64	02	2.46
	Temporary	00	00	00	00	00	00	00
Group 'C'								
Multi-Tasking Staff	Permanent	165	39	23.63	10	6.06	05	3.03
Group 'C' (Erstwhile Group 'D')	Temporary	10	01	10.00	00	0.00	00	0.00
Total		481	94	19.54	30	6.23	13	2.70

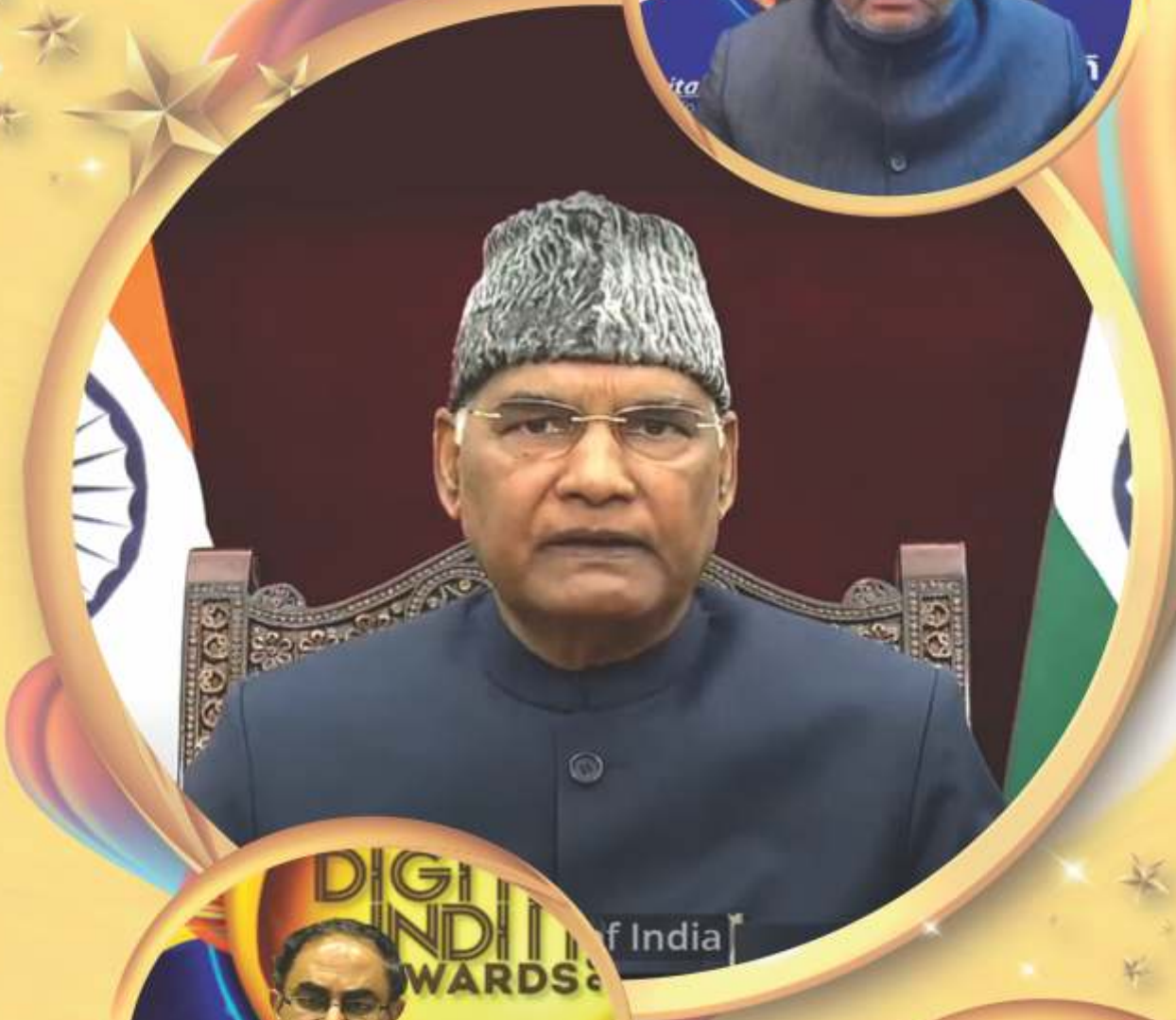
List of Abbreviations

AEPS	-	Aadhaar Enabled Payment System
AI	-	Artificial Intelligence
BHIM	-	Bharat Interface for Money
BOSS	-	Bharat Operating System Solutions
BSNL	-	Bharat Sanchar Nigam Limited
C-DAC	-	Centre for Development of Advanced Computing
CFC	-	Common Facility Centre
CSC	-	Common Services Centre
CTDP	-	Comprehensive Telecom Development Plan
C2SD	-	Chip to System Design
DoT	-	Department of Telecommunications
DIC	-	Digital India Corporation
DSC	-	Digital Signature Certificate
EMC	-	Electronics Manufacturing Clusters
ERNET	-	Education and Research Network
FINTECH	-	Financial Technologies
FOSS	-	Free and Open Source Software
FSOC	-	Free Space Optical Connectivity
GeM	-	Government eMarketplace
HRD	-	Human Resource Development
IIFPT	-	Indian Institute of Food Processing Technology
IIT	-	Indian Institute of Technology
IoT	-	Internet of Things
JAM	-	JanDhan, Aadhaar and Mobile
NCoG	-	National Centre of Geo-informatics

NeGD	-	National e-Governance Division
NER	-	North-Eastern Region
NERS	-	Nationwide Emergency Response System
NIC	-	National Informatics Centre
NIELIT	-	National Institute of Electronics & Information Technology
NLCPR	-	Non-Lapsable Central Pool of Resources
MHA	-	Ministry of Home Affairs
NKN	-	National Knowledge Network
MNRE	-	Ministry of New and Renewable Energy
MSDE	-	Ministry of Skill Development And Entrepreneurship
M-SIPS	-	Modified Special Incentive Package Scheme
ORS	-	Online Registration System
PFMS	-	Public Financial Management System
PMGDISHA	-	Pradhan Mantri Gramin Digital Saksharta Abhiyan
SDC	-	State Data Centre
SEZ	-	Special Economic Zone
SMDP	-	Special Manpower Development Programmes
SSDG	-	State Service Delivery Gateway
STPI	-	Software Technology Parks of India
SWAN	-	State Wide Area Network
MeitY	-	Ministry of Electronics and Information Technology
MDoNER	-	Ministry of Development for North-Eastern Region
NEBPS	-	North-East BPO Promotion Scheme
UIDAI	-	Unique Identification Authority of India
UMANG	-	Unified Mobile App for New-Age Governance
UPI	-	Unified Payment Interface
USOF	-	Universal Services Obligation Fund
USSD	-	Unstructured Supplementary Service Data
ZP	-	Zilla Parishad



सत्यमेव जयते





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