Centre for Development of Telematics

Telecom Technology Centre of Government of India

सी-डॉट
C-DOT

ANNUAL
REPORT
2023-24

VISION
To become the world class telecom technology development centre.

MISSION
To design and develop state-of-the-art technologies, products and solutions. To meet the telecom needs of India particularly of national importance in strategic sectors and rural areas.

Centre for Development of Telematics (C-DOT) was established in 1984 is a premier R&D center of the Department of Telecommunications, Government of India. With its world class research labs equipped with the state-of-the-art infrastructure and a pool of the brightest engineers from the top institutes of the nation, C-DOT has been strongly committed to fulfilling the overarching objectives of national development through its targeted research initiatives addressing the specific connectivity needs of our diverse country.

During the year 2023-24, C-DOT achieved significant progress in many technology areas. C-DOT started the Pan India commercial roll-out of its indigenously developed 4G/5G NSA core in BSNL network. On the RAN side, multiple 4G-RAN prototypes have been built & the trials were conducted in the field and technology were transferred to many licensees for large scale manufacturing and deployments. Trials are ongoing in South Central Railways (SCR) for 4G LTE-R solution. The complete concept of LTE-for-Railways (LTE-R) has been implemented over the 25km stretch in SCR and demonstrated along with Mission Critical Applications (MCX). MoU has been signed with Railways for "Trials of 4G LTE-R systems for 500 Km in South Central Railway". Four C-DOT RAN partners have been selected to be part of the 500km PoC. Development of disaggregated 5G Bharat RAN solution in collaboration with consortium partners is under progress.

In the area of Cyber Security, indigenous traffic probes were installed at multiple gateways for generating real time alerts and securing country's infrastructure from malicious attacks. Enterprise Security solution was successfully rolled out in C-DOT Delhi and Bengaluru. Hon'ble MoS inaugurated Enterprise Security Operation Centre (ESOC) monitoring lab, setup at C-DOT Campus, Delhi. C-DOT received Technology Approval Certificate for QKD system from Telecom Engineering Centre (TEC). Transfer of Technology (ToT) agreements have also been signed with multiple partners. C-DOT launched Sanchar Saathi Portal in May 2023. It is a citizen centric portal of DOT, that hosts citizen centric services and helps in blocking and tracing lost/stolen mobiles across mobile networks and lets a subscriber know connections working in his/her name apart from various other services. ASTR, the Pan-India SIM subscriber fraud detection solution has also been completed and several lakhs of fraudulent connections disconnected.

C-DOT's ITU-CAP based early warning platform for disaster management is operationalized in all 36 states and integrated with various alert generating agencies. Billions of messages were been sent through this platform during the disasters. C-DOT Cell broadcast solution has been deployed in BSNL, MTNL and Reliance Jio at Pan India level. Unified communication solution (mSigma) was rolled out in the Indian Army network for secure chat and call.

Apart from some of the technologies mentioned above, many other solutions have been designed, developed and deployed in the field. The details of all the solutions have been briefly mentioned in the Annual report.

The year 2023-24 saw our revenues jump from Rs 257.87 Cr in FY 2022-23 to Rs 406.64 Cr. During the year we received numerous patents reflecting our innovative capabilities. C-DOT also received many awards from ELCINA, IETE and Aegis Graham Bell for its cutting-edge technologies and innovations which demonstrates C-DOT's passion for developing the best technologies.

I am pleased to share this annual report with you as we embark on our journey - 4 decades of continually growing stronger, more agile and more aware of the responsibilities and trust that the Govt and strategic agencies repose on us, the commitment of creating a self-reliant India.

Thank you

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Dr Rajkumar Upadhyay,

Chief Executive Officer

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C-DOT MANAGEMENT

Governing Council

Chairman
Hon'ble Minister of Communications

Vice Chairman
Hon'ble Minister of State for Communications

Members
Chairman, Digital Communications Commission & Secretary (T), DoT

Chairman, DRDO & Secretary, Department of Defence (R&D)

Secretary, MeitY

Member (In charge - C-DOT), DCC

Member (Finance), DCC

CMD, BSNL

Chief Executive Officer, C-DOT

Directors, C-DOT

Steering Committee

Chairman
Chairman, Digital Communications Commission & Secretary (T), DoT

Vice Chairman
Member (In charge C-DOT), DCC

Members

Chairman & Managing Director, ITI Ltd.

Director (Planning), BSNL

Sr. DDG, Telecom Engineering Centre

DDG (B&PF), Department of Telecommunications

Sr. Director, MeitY

Chief Executive Officer, C-DOT

Directors, C-DOT

Project Board

Chairman
Dr. Rajkumar Upadhyay
Chief Executive Officer, C-DOT

Members
Dr. Pankaj Kumar Dalela
Director-I, C-DOT

Ms. Shikha Srivastava
Director-II, C-DOT

Dr. Dilip Krishnaswamy
Director-III, C-DOT

Overview

Centre for Development of Telematics (C-DOT) was established in 1984 as an autonomous Telecom R&D Centre of the Department of Telecommunications (DOT), Ministry of Communications, Government of India. C-DOT has been in the technology forefront building indigenous capabilities in the design, development & production of cost-effective telecom technologies and innovative solutions. Its R&D endeavors are aimed at meeting the telecom requirements of the nation with key focus on rural connectivity and emerging dynamics of security and strategic communications landscape. It has successfully executed various projects of national & strategic importance that have played a pivotal role in achieving self-reliance, reducing dependence upon technology imports, boosting entrepreneurship, augmenting Intellectual Property (IP) assets and creating an ecosystem for indigenous telecom manufacturing. C-DOT solutions involve multiple industry stakeholders including System Integrators, Component Manufacturers, Telecom Service Providers, Internet Service Providers, etc. for proliferation of indigenous solutions.

C-DOT has made significant contributions towards several flagship missions of the Government of India viz. "Digital India", "Make in India" and "Skill India". C-DOT has been steadfast in its commitment towards building an "Aatmanirbhar Bharat" as envisioned by the Hon'ble Prime Minister.

Accomplishments and Activities

1. Key Project Achievements

- **4G Core** – C-DOT designed 4G Core deployed in BSNL network at Chandigarh is providing service to mobile subscribers in Punjab and Haryana.

- **5G Core** – Indigenous End-to-End 5G solution consisting of 5G Standalone (SA) Core, along with indigenously developed BharatRAN2 prototype system was successfully demonstrated at IMC 2023 in front of Honourable Prime Minister of India at Pragati Maidan on 27th October 2023.

- **IMS** – IMS Load Testing of 1mn SIP session/hour together with registration /re-registration and 1Lakh Mobile Originating/Terminating SMS per hour has been demonstrated. IMS Proof of Concept and friendly launch of VoLTE services using C-DOT IMS Core is targeted for May 2024.

- **4G RAN -** Multiple prototypes of radios built for various bands (600MHz, 700 MHz, 800 MHz, 850 MHz, 900 MHz, 1800 MHz, 2100 MHz and 2500 MHz). TEC Technology Approval certificate has been awarded for 700MHz/Band-28 eNodeB. Technology transfer agreements (TOT) signed with ITI, BEL, ECIL and MoU signed with Railtel. RAN built by ITI are undergoing trial in BSNL network at Ambala and is close to completion. Also undergoing trials in Secunderabad for LTE-R solution for Indian Railways.

- **5G RAN** – Collaborative agreement signed with second consortium consisting of Lekha Wireless, Sooktha, Resonous and Signaltron for development of disaggregated 5G Bharat RAN solution. The first such agreement was signed with VVDN Technologies Private Limited and WiSig Networks Private Limited to develop 5G Open RAN.

- **4G for Railways**

  a) **25km PoC:** The complete concept of LTE-for-Railways (LTE-R) has been implemented over the 25km Lingampally and Secunderabad stretch and demonstrated along with Mission Critical Applications (MCX). C-DOT RAN deployed at ten sites and demonstrated required technical performance. Ruggedized LTE Routers (2 nos) supplied and installed in two locomotives. End-to-end coverage with good throughput demonstrated for region with towers. 3rd Party audit under progress. PoC expected to be completed by April 2024.

  b) **500km PoC:** MoU signed with Railways for "Trials of 4G LTE-R systems in 500 Km in South Central Railway. Four C-DOT RAN partners selected to be part of the 500km PoC.

- **ASTR** Pan-India SIM subscriber fraud detection Phase-1, Phase-2 & Phase-3 completed and several lakhs (~59 lakhs) of fraudulent connections disconnected.

- **Post Quantum Cryptography (PQC) -** Successful field trials of revised rapid prototype of Quantum secure smart Video IP phone with Compact Encryption Module (CEM) accomplished at strategic sites. Successful implementation of Key Generation System (KGS) based on module lattice post-quantum cryptography (PQC) algorithm for third party secure products. C-DOT has signed Transfer of Technology (ToT) agreement for CEM with a private sector entity.

- **QKD -** C-DOT received Technology Approval Certificate for QKD system from Telecom Engineering Centre (TEC). C-DOT organized CDOT Quantum Hackathon (CQuHACK 2023) to explore any vulnerabilities in its QKD protocols. Transfer of Technology (ToT) agreements signed with one PSU and three private sector entities for QKD solutions. C-DOT demonstrated Key Relay functionality over PRL QKD system in the Quantum Conclave 2024 event at Vigyan Bhawan.

- **TSOC-** Deployed additional 18 IPFIX probes of 200/400G capacity at ISP gateway locations (with total deployed sites of 131). TSOC DC with 40 racks installed at ITI

Bengaluru and the same for TSOC DR site installed at BSNL Faridabad. DC-DR failover has been implemented.

- **5G Front Haul system -** Mobile Front haul solution developed and live system demonstrated in "Workshop on advances in optical communication" at IIT, Madras in July 2023 and at India Mobile Congress, New Delhi in Oct 2023.

- **CAP Compliant Early Warning platform for disaster management -** Pan India deployment (phase 1) of NDMA CAP done and operational. PoC commissioning for AIR Radio, Railways, TV and Cell Broadcast Platforms completed.

- **C-DOT Cell broadcast solution:** The solution has been deployed in BSNL, MTNL and Reliance Jio at Pan India level.

- **PM-WANI** Central Registry project has been successfully completed as per the scope of the project mentioned in the project proposal.

- **M2M:** 111 Industry partners/Startups registered under Centre of Innovation (COI) and Entrepreneurship Cell setup at C-DOT.

- **Indigenous Wi-Fi** – TEC Certification received for DOA (Low-cost Wi-Fi5 Dual Band Outdoor Access Point). In Kamathana GP, Bidar district, Karnataka, Wi-Fi Mesh and P2P network established through WiFi5 Access points and integrated with DVB-S2 for providing TV channels & educational content through Wi-Fi and internet service through PM-WANI.

- **C-DOT Intelligent Attendance system (CIAS):** ToT completed, CIAS Field deployments for TCIL HQ & Project Office done. CIAS Android mobile App developed. MoU signed between C-DOT & Mashmari Consultants Private Limited targeting face recognition applications in education sector.

- **Enterprise Security Operation Centre (ESOC)** solution successfully rolled out in C-DOT Delhi and Bengaluru. ESOC monitoring lab set up at C-DOT, Delhi and inaugurated by Hon'ble MoS

- **Telecom Analytics for Fraud Management and Consumer Protection (TAFCOP)** -(Know Your mobile connection) launched for Pan India in May 2023, Central

equipment Identity register (CEIR) also now operational Pan India. Chakshu (Report Suspected Fraud Communication), RICWIN (Report Incoming International Call with Indian Mobile Number) and KYI (Know Your Wireline Internet Service Provider) new services were launched on sancharsaathi citizen centric portal for Indian Citizens.

- **Platform for Online Certification of Telecom Equipment for NCCS:** NCCS web portal has been launched by Secretary (T) in December 2023.

- **Unified Communication for Tactical networks**– Unified communication solution (mSigma) rolled out in strategic network (Army).

- **Samvad** – TAL4 certification of Samvad for Navy by SAG completed.

- **e-Health Platform** – Developed for aspirational district program of NITI Aayog.

- **WayFinder** deployed in new Parliament building. However, it was not commissioned due to some security concerns.

- **NMS** – Purchase order for NMS to monitor and manage BharatNet Phase-2 devices received from TATA Project Limited for Chhattisgarh state.

- **UNMS** deployed for multivendor 4G technology (Railways) for POC trials.

2. The Progress made in Major Technology Programs

2.1 CoE for Mobile Communication-4G/5G and Beyond

✦ **4G LTE IMS Converged Core- Rollout and Commercialization**

- **4G - BSNL** Commercial beta Launch of 4G successfully done in July 2023 with 200 RAN sites (eNodeBs) deployed in Punjab Circle across three cities of Firozpur, Pathankot and Amritsar - parented to the C-DOT 4G POC Core at Chandigarh. Currently, around 1500 sites are parented to 4G core and handling around 40TB traffic per day in Punjab and Haryana.

  BSNL Zonal Core deployments at 4G Primary & Geographical Redundant Main Data Centre sites is under progress along with the setting up of Mini Data

Centres. Commercial Go-live for Punjab, Haryana and Himachal Pradesh is targeted by June 2024 with commercial launch of services in the other zones being planned for Q2 of FY 2024-2025.

IMS Load Testing of 1mn SIP session/hour together with Registration/Reregistration and 1Lakh Mobile Originating/Terminating SMS per hour has been demonstrated. IMS Proof of Concept and friendly launch of VoLTE services using C-DOT IMS Core is targeted for May 2024.

• **4G - Railways**

LTE for Railways POC in 25 KM stretch at South Central Railways: The complete concept of LTE-for-Railways has been implemented and demonstrated with most of test cases cleared. Worked with multiple 3rd parties to create an end-to-end LTE-for-Railways PoC system involving the following network components: LTE Core, C-DOT RAN/eNodeB, C-DOT Cell-site Router, 3rd party RAN/eNodeB, LTE-Cab Router, C-DOT Rail-Sampark MCX Solution, Mobiles/Smartphones, Application Servers and EMS/NMS for managing the network solution.

C-DOT RAN/eNodeB installed in ten sites out of total 11 sites (with a portion of equipment manufactured by ITI). Conducted Multiple Drive/Walk tests, verified that end-to-end handover/mobility successfully and achieved good range/ throughput. C-DOT LTE Router installed in locomotives. Multiple drive tests done with UE/smartphone inside passenger train and LTE Cab Router. For all the regions where towers are provided by Railways, seamless radio coverage has been demonstrated. PoC undergoing 3rd party audit. Expected to complete by end of Apr 2024.

LTE for Railways POC in 500 Km stretch: MoU between C-DOT and Railways signed for conducting 500 Km trial with the objective of building Vendor and OEM eco system for equipment required for the POC. Multiple C-DOT partners selected for the said trail. 4 eNodeB Vendors and 3 LTE-Router vendors are based on C-DOT Technology. The Proof of Concept is in progress.

✦ **4G Radio Access Network (4G RAN)**

C-DOT's LTE/4G RAN eNodeB technology received TEC technology certification for Band-28 in Jul-23 making C-DOT RAN the first TEC certified eNodeB/RAN technology in the country. 4G RAN technology prototypes in various bands (Band 1, 3, 5, 8, 28, 20, 41 and Band-71 (600MHz) ready. Built 25+ prototypes of RRH of various bands and 30 BBUs for internal testing and Railways PoC. QM-333, Environmental and Safety testing completed for BBU, Band -28 and Band-8 RRH.

ITI manufactured (C-DOT designed) Band-28 & Band-8 systems deployed in field undergoing PoC as pilot order in BSNL network. Band-1, Band-3 and Band-41 expected to be ready and deployed in Q2 of FY24-25. BSNL DTR testing ongoing for Band-28 at Ambala, expected to complete in Q1 of FY24-25. BSNL DTR testing for the remaining four bands expected to complete in Q2 of FY24-25. ToT agreements signed with ITI, ECIL, BEL. C-DOT RAN ToT partners ITI, ECIL, BEL and Railtel among shortlisted RAN suppliers in "LTE for Railways" 500km PoC.

✦ **4G & 5G Network Management system & Automation**

UNMS for multivendor 4G technology (25 km) deployed at site (Railways), 500 Km development is in progress. CDOSM (C-DOT Orchestrator- 4G Core Nodes) – Release v3.0.0 under validation. Development of 5G SMO, Non-RT RIC, RT-RIC, AI/ML are in progress, first version released. 5G SA OSS development is in progress. LTE NMS has been deployed at BSNL Ambala site.

✦ **5G-Standalone (SA) CORE**

5G Standalone (SA) Core was successfully demonstrated at IMC 2023 in front of Honourable Prime Minister of India at Pragati Maidan on 27th October 2023, along with indigenously developed BharatRAN2 prototype system as an end-to-end 5G solution. Development of 5G core for NIB (Network in a Box) / enterprise network is completed. Ruggedization of 5G core for enterprise network is in progress. Discussions for conducting PoCs for enterprise end-to-end 5G solution has started.

✦ **5G Non-Standalone (NSA) Core**

The 5G NSA enhancements have been implemented over the 4G core software release.

✦ **5G-RAN (Radio Access Network)**

✓ CDOT-VVDN-WiSig 5G Bharat RAN2 under development and testing. Integration and testing of CU, DU and RU modules in progress. Campus trials initiated.

✓ MOU signed with IITM for collaborative development of 5G RAN. 3 units of gNodeB systems will be supplied by IITM during July 2024.

✓ C-DOT signed an agreement with second consortium consisting of Lekha Wireless, Sooktha, Resonous and Signaltron for the collaborative development of disaggregated 5GRAN solution (Bharat RAN1) under C-DOT collaborative research program. Development of gNodeB consisting of CU, DU and RU is in progress.

✓ Test Equipment for 5G RAN - 5G UE Simulator, RU wraparound tester, CU wraparound tester, RF chamber and PTP Grandmaster have been procured.

✓ Integration of DU and RU modules completed.

✓ Open fronthaul interface tested.

✦ **5G RAN Test Bed – C-DOT Bangalore and Delhi**

✓ 5G RAN testbed at C-DOT Delhi has been setup which includes indoor and outdoor lab facility, 5G SA core and prototype 5G RAN with 5G smartphones/ tablets. UE simulator supporting upto 256 UEs is procured and available for end-end testing. BharatRAN2 prototype system (High Power Radio Unit) and 5G RAN system from VVDN/ Wisig installed and integration testing completed. Further testing for changes been done for ruggedizing the end-to-end 5G system for PoC is in progress.

✓ Test instruments for the conformance/ interoperability testing of Open RAN compliant subsystems (RU, CU, DU) are under procurement at C-DOT Delhi.

✓ 5G RAN testbed at C-DOT Bengaluru has completed 90% of site planning, commissioning of physical infrastructure.

✦ **Mission Critical Applications for Indian Railways** 3GPP complaint Mission Critical Push to Talk (MCPTT) First Release developed and under deployment in South Central Railways in LTE-R network.

2.2 CoE for Advanced Optical and Quantum Communication Technologies

✦ **Quantum Key Distribution (QKD)**

Software development of QKD Manager and Controller is under development to manage QKD network. C-DOT organized Quantum Hackathon (CQuHACK 2023) to explore any vulnerabilities in its QKD protocols. Two teams participated in the hackathon and C-DOT provided lab infrastructure to support them. However, no one has been successfully able to breach to extract secure key from QKD system. Proposal to connect 10 strategic offices submitted to DOT in January 2024. A proposal has also been sent to NTIPRIT to set up a quantum communication lab. Another proposal has been sent to Ramrao Adik Institute of Technology (RAIT) - D Y Patil University, Navi Mumbai for setting up a small-scale quantum communication lab for academic uses and the same is in advanced stage of approval. C-DOT has taken up the indigenous development of "Quantum Key Distribution (QKD)" solution for securing communication links carrying critical and sensitive information. The system helps preventing eavesdropping by adversary possessing infrastructure with infinite computational power (Quantum computers). The QKD system generates completely secure identical random keys, used to encrypt / decrypt data during transmission.

✦ **Measurement Device Independent-QKD**

Measurement-Device-Independent Quantum Key Distribution (MDI-QKD) is a secure communication method that eliminates vulnerabilities in the measurement devices. It uses entanglement and interference between quantum states from two parties to generate a shared secret key. The architecture finalization and procurement have been completed for the project. The project is in advanced stages of development.

This project is partially funded by the NSCS. MDI-QKD

architecture finalised, capital and consumable items procurement completed. Time synchronisation is achieved between Alice, Bob and Charlie. Lab prototype for wavelength locking, time-of-arrival overlapping, and polarisation matching for optical pulses coming from Alice and Bob to Charlie to achieve Hong-Ou-Mendel (HOM) interference, which is one of the most critical parameters for MDI-QKD, has been developed and consistent HOM interference visibility of more than 40% has been observed. Automatic polarisation control of the pulses coming from Alice and Bob at the Charlie node has been achieved. Generation of optical pulses for Z and X basis (i.e., sending pulses in either early or late time bins and superposition of early and late time-bins) completed. Integration of Superconducting Nanowire Single-Photon Detector (SNSPD) for better performance has been completed.

✦ **Post-Quantum Inline Network Encryptor (PINE)**

C-DOT is working on Indigenous design & development of advanced security solutions to safeguard national networks from the threats posed by advancements in Quantum Computers. 1Gbps throughput layer-3 Post-Quantum Inline Network Encryptor (PINE) project is in an advanced stage of design and testing. Software for Crypto-grade 1Gbps PQC IP Encryptor ready & tested on reference boards.

✓ National Security Council Secretariat (NSCS) funded 1Gbps throughput layer-3 Post-Quantum Inline Network Encryptor (PINE) project is in an advanced stage of design and testing.

✓ Software for Crypto-grade 1Gbps PQC IP Encryptor ready & tested on reference boards. Custom hardware board has been fabricated and assembled.

✦ **Quantum-safe cryptography & Commercial Grade Post Quantum Encryptor (CPQE)**

✓ Testing of two PQC channels, using Compact Encryption Module (CEM), between Sanchar Bhawan (DOT) & C-DOT and TEC & C-DOT for post-quantum security of C-DOT's Video Conferencing (VC) solution, has been successfully completed by TEC.

✓ Enhanced 80Mbps Quantum-safe IP encryptor has been modified to work as a VPN Client or a VPN Server. Software for Commercial-grade Post Quantum Encryptor (CPQE) tested on reference board. ToT agreement of CEM has been signed with a ToT partner.

✦ **Commercialization of Quantum Secure Smart Video IP Phone**

✓ Successful field trials of revised & reworked rapid prototype of Quantum-safe Smart Video IP Phone with CEM accomplished at strategic possible customers.

✓ First iteration of Security Evaluation has been completed with SAG-DRDO for TAL4 certification. Second iteration has been submitted. End-to-end security implemented for captive networks.

✓ TOT of Video IP Phone is under process of finalization with prospective TOT partner

✓ Procurement of components for production of phones for large scale field trials is in final stages.

✦ **Intensity Modulator Driver and Phase Modulator Driver Module for QKD**

Development of Lab prototype of Active Bias Controller for Intensity Modulator and Phase Modulator Driver completed.

✦ **Single Photon Detector (SPD) Module for QKD**

✓ Development of Lab prototype of Temperature Controller for Single Photon Detector completed.

✓ Development of Lab prototype of the detector with active and passive quenching schemes and temperature control is completed.

✦ **Carrier Transport for 5G**

Highly optimized and customized architecture for 12T capacity needed for BSNL tender has been completed. ToT agreement has been signed with UTL and BEL. Data path tested for 4.8Tbps OTN Cross Connect (OTN XC). Hardware design completed for 8Tbps and 12Tbps OTN XC. Integration testing of 4.8T OTN system is in progress. Development of 8T and 12T OTN XC Modules, fabrication of modules required for 5 node setups as per TEC test configuration, is in progress.

✦ **Advanced Optical Communication (AOC) Test Bed**

The architecture of AOC testbed has been finalized. List and specifications of test and measurement equipment has been finalized. The component procurement for the systems/sub-systems has been initiated.

2.3 CoE for Advanced Telecom Security

✦ **TSOC (Telecom Security Operation Centre)**

✓ TSOC is a security sensitive solution and established for effective management of national Telecom infrastructure from security incidents including identification and prevention. The responsibility of deployment of TSOC project costing Rs 762.68 Crores over a period of 6 years is assigned to C-DOT. TSOC provides real time visibility of suspicious malicious events and attacks on the National Telecom Network & National Critical Infrastructure.

✓ TSOC DC with 40 racks installed at ITI Bengaluru and the same for TSOC DR site installed at BSNL Faridabad. DC is commissioned on 5th February 2024, receiving the traffic from all 131 IPFIX probes at ISP gateways. DR with 40 racks is operational at BSNL Faridabad.

✓ High-end state of the art data center network designed and implemented with 800Gbps backbone connected to the 160 high end servers. Big data platform with 1000 of nodes implemented.

✓ DC-DR failover has been implemented.

✓ The Information Sharing and Response Portal (ISRP) has been implemented, security certification from CERT-in emplanned vendor completed the portal is operational for users.

✦ **Digital Intelligence Unit (DIU)**

✓ C-DOT has undertaken the development of Digital Intelligence Unit (DIU) Project of DoT costing Rs. 228.16 Cr over a period of 5 years to prevent misuse of telecom resources in cyber-crime and financial frauds. Under this project with the help of C-DOT Sanchar Saathi portal (www.sancharsaathi.gov.in) has been launched by Department of Telecommunications in May 2023. It is a citizen centric portal that hosts

following citizen centric services:

a. Report suspected fraud communications (Chakshu)

b. Know the mobile connections issued in their name and report the mobile connections for disconnection which are either not required or not taken by them (TAFCOP),**c.** Report the stolen / lost mobile handset for blocking and tracing (CEIR),

d. Report the incoming international calls received with Indian telephone number as calling line identification (RICWIN),

e. Check the genuineness of mobile handset while buying a new/old device (KYM),

f. Check the details of licensed wireline Internet Service Providers (KYI).

✓ Under the DIU project, C-DOT also developed AI and big data analytics-based tools to identify the fraudulent mobile connections. A total of about 67 lakhs of suspected fraudulent mobile connections have been identified out of which about 59 lakh mobile connections were disconnected after re-verification by the telecom service providers.

✓ In addition, Digital Intelligence Platform (DIP) has been implemented under DIU project to share the telecom related intelligence with the relevant stakeholders like DoT field units, law enforcement agencies, telecom service providers, banks / financial institutions, document issuing authorities etc.

✓ C-DOT launched Sanchar Saathi Portal in May 2023. It is a citizen centric portal of Department of Telecommunication, Govt. of India that hosts citizen centric services like CEIR (Central Equipment Identity Register) and TAFCOP (Know Your mobile connection) which were also launched for Pan India in May 2023.

✓ Digital intelligence platform(DIP) has been implemented with Suspected POI/POA, Exceeding prescribed limit for Phase-0, Phase-01, Phase-02, Phase-03, data analysis, dashboard and summary report generation for LSAs/TSPs. Intelligence DoT & stakeholders data analysis with DIP. Grey Market Reporting, CLI Reporting and Call center integration

(1963) implementation with DIP. MNRL data repository management and data sharing with OTTs/FI's/I4C and its ATRs. KYM app integration over Umang and Sancharsaathi platforms. POC of Sancharsaathi Know Your Caller(KYC) mobile application.

✓ Chakshu (Report Suspected Fraud Communication), RICWIN (Report Incoming International Call with Indian Mobile Number) and KYI (Know Your Wireline Internet Service Provider) new services were launched on sancharsaathi citizen centric portal for Indian Citizens. TAFCOP feedback module for general public has also been implemented on the SancharSaathi portal

✓ ASTR Pan-India SIM subscriber fraud detection Phase-1, Phase-2 & Phase-3 completed and several lakhs (~59 lakhs) of fraudulent connections disconnected. LSA-wise TSP-wise suspected mobile numbers which were taken on fake/forged documents and failed in re-verification present on DIP portal. The activity to find all the active mobile connections taken on these faces on pan India basis is completed. All the suspected mobile connections detected during phase-1, phase-2 and phase-3 checked against the PoS (Point of Sale) faces on pan India basis for fraudulent activities.

✦ **Centralized International Out Roamer (CIOR)**

✓ Design initiated for preventing call spoofing through ILD gateways. Interface testing with TSPs ongoing, POC to be done. CIOR application development and load testing is also completed on Google cloud services.

✓ The Detailed Project Report (DPR) of COIR has been submitted to DOT, approval awaited.

✦ **National Trust Centre (NTC) for IoT/M2M**

✓ User Requirement Specification and System Requirement Specifications (SRS) are finalized after discussions with all the stakeholders. Software Requirement Specification has been prepared and interaction with stakeholder is ongoing. Database design is completed. Requirements finalized for device manufacturer portal. Mechanism identified for

interface with platform provider.

✓ Identification of different modules and components their interworking, Identification of framework, designing of UI screens is in progress. Discussions with one of the M2M Service Providers M/S Idemia is in progress regarding the data to be transmitted between IoT platform and NTC for device details.

✦ **High capacity IPFIX Probe**

Administrative approval received from NSCS and Project for the development of 800G IPFIX probe initiated. Technical and Commercial Evaluation has been completed for procurement of servers and FPGA cards required for probe Software development.

✦ **Enterprise Security Solution**

✓ C-DOT's indigenous security platform for catering to technical (detective and preventive) security controls for enterprises has been developed and deployed at C-DOT Delhi and Bengaluru Campus.

✓ Trials in Kerala Police and BSF successfully completed, discussion is in progress for commercials. DOT Meerut trial has also been completed successfully.

✓ Trials in CBI and Indian Army are ongoing.

2.4 CoE for Advanced Telecom Applications

✦ **CAP Compliant Early Warning Platform for Disaster Management**

Phase -I of the project has been completed. High level project review by NDMA has been conducted. Letter of Intent for Phase -II of the project has also been received from NDMA, working on Phase-II deliverables. Mauritius has shown interest in CAP project and advance level discussion is going on.

✦ **C-DOT Cell broadcast solution**

✓ The solution has been deployed in BSNL, MTNL and Reliance Jio at Pan India level.

✓ The solution has been extensively tested and positive user experience certificate has been received from Reliance Jio and BSNL.

✓ C-DOT is actively working with Indian Air Force and Mauritius for conducting the PoC trials of Cell

Broadcast solution.

✦ **M2M Communication**

✓ Centre of Innovation for (COI) for IoT/M2M formally launched. 111 Industry partners/Startups registered, testing completed with 29 and ongoing with 4 others.

✓ Integration of CCSP done with CRIS IRNIYANTRAC for using CCSP in their 40,000 IFDs devices of IR-NIYANTRAC application and with CRIS WGPS for using CCSP in their Wagon tracking IoT application for 3,00,000 WGPS devices.

✓ Engagement for defining Data Format & Flow (based on oneM2M standards) for Railways RDPMS (Remote Diagnostic & Preventive Maintenance system) for Signaling gears.

✦ **Unified Communication & Collaboration Solution for tactical networks**

✓ Integration done with various stakeholders at IITM Pravartak Testbed.

✓ PoC was completed successfully and unified communication solution (mSigma) rolled out in strategic network (Army).

2.5 CoE for Artificial Intelligence

✦ **C-DOT Intelligent Attendance system (CIAS)**

✓ CIAS system deployed at TCIL headquarters, Delhi after succesfull testing. Additionally, PO has been received from TCIL for CIAS installation for its Pan-India offices and they have also been deployed through C-DOTs TOT partner. The CIAS system has been deployed in C-DOT Delhi office. CIAS Android mobile App developed

✓ Face Recognition based remote attendance with 4G Module enabled edge device solution developed

✓ Face recognition-based access control system developed. Fast embedding generation, occlusion detection over face, disguised face clustering completed. Visitor Management System developed.

✦ **Applied AI for Real Time Security Solutions**

Study of streaming mechanism for supporting more cameras on the edge device is being carried out.

✦ **AI in Cyber Security for 5G and Beyond**

Study of various cyber security agendas is in full swing. Research Paper on the matter has also been published in IEEE Explore.

2.6 Non-COE/Generic Program

✦ **PM-WANI Central Registry**

PM-WANI Central Registry project has been successfully completed as per the scope of the project mentioned in the project proposal. Project is currently under enhancement and support phase. Open sourcing of WANI Service Delivery Platform is under progress.

✦ **Enhancements, Design & Field Support for GPON, TWDM PON and other optical technologies**

✓ C-DOT has received Technology Approval Certificate for two variants of 4 Port OLT, ONT17A, ONT24, ONT23, ONT23A, ONT27 and ONT28 from Telecom Engineering Centre (TEC) for compliance with TEC GR. Commercial order from BSNL to supply 1600 nos. of 4 Port OLT (Office OLT3) has been awarded to C-DOT licensee.

✓ ToT signed with Alpha Bridge, Ehoome, AdoptNet and ITI for OfficeOLT-2, OfficeOLT-3, ONT17, ONT17A, ONT23, ONT24, ONT27 & ONT28. Design completed for 40 port GPON OLT compact chassis capable to support upto 40 GPON ports. Software development and Integration is in progress. Design and development of ONT29 supporting PoE is completed and internal validation is in progress

✓ Mobile Fronthaul solution has been developed and live system demonstrated in "Workshop on advances in optical communication" at IIT, Madras in July 2023. Internal Validation of WDM based 5G Front-haul Solution completed.

✓ Design completed for indigenous built 12 slots and 6 slots (300Watt/slot) chassis capable of supporting upto 24/12 lambdas per chassis. Hardware and software development and integration is in progress.

✓ Design is in progress for 600G Xponder supporting 400Gbps and 200Gbps per wavelength and 1U Optical

Line Unit (OLU) ILA.

✦ **C-DOT Routers and Switches**

✓ Additional numbers of C-DOT's high-capacity Data Center switch/Routers are deployed in 4G solution at BSNL. The TEC ER Certification has been achieved for Secure Router (CRTR-210) and Data Center Switch Cum Router (CTX-2000). The security testing of High-capacity routing system by NCCS is ongoing. The final phase of the testing for EAL-3 certification of CRTR-210 has started.

✓ C-DOT STBR is being positioned for additional requirements of CMS-IMS network and some of the other strategic and in-house requirements. BEL is manufacturing these STBR system.

✓ The branch router has been integrated with QKD system of C-DOT and other vendor(s) as per standard and deployed in strategic network. The assembly of additional prototypes of branch router has been initiated. The ToT of Data Center Switch Cum Router(CTX-2000) has been announced. The ToT for dual V.35 adapter is being signed with ECIL, as they have already received a confirmed order for the deployment of additional units.

✓ The first prototype of 8 port and 48 port L2/L3 switch have been assembled. The software testing on the prototype system is in-progress.

✓ The Branch Router(BRTR-10) and Secure Router(CRTR-210) is being supplied to defence network through a ToT partner.

✦ **Platform for Online Certification of Telecom Equipments for NCCS**

NCCS web portal has been launched by Secretary (T) in December 2023. The portal is operational and live.

The development is in-progress for some additional modules/ feature enhancements - Log Management and Communication modules released in March. Digital Signature module integration and testing with eMudhra SW is in progress.

✦ **e-Health Platform**

e-health platform developed and is being integrated with various 3rd party medical solutions. The solution was also demonstrated to Niti Aayog and to Indian Army.

✦ **Samvad and Video Conferencing Solution**

Solution is integrated into Unified communication solution for tactical network. PoC of the same has been successful in Army. Samvad TAL4 certification completed by SAG, DRDO for Navy.

✦ **Smart Energy Meter**

Smart Energy Meter (SEM) development in progress. Preliminary lab testing has been done and three meters have been sent to ITI Palakkad Unit for error, acceptance, profile, tamper and DLMS testing. Following the testing the feedback shall be incorporated and the meter would be sent for type testing to the designated laboratory. After the certification process, transfer of technology to interested manufacturers shall be done.

✦ **NMS solution enhancements, roll-outs and customization**

Unified Network Management System (UNMS) for monitoring "State Led, Satellite & BharatNet Phase I and II projects" has been deployed. Enhancements & support for the same is in progress. Support and maintenance of Business Exchange Gateway (BEG) for BBNL is also in progress. BEG integration for satellite (TCIL and BSNL) completed.

CiSTB billing solution integrated with Payment gateway. Mobile App has also been developed and deployed by C-DOT in BharatNet. CNMS-IP for Chhattisgarh State (BharatNet Phase 2) is under development, C-DOT has received PO for the same from Tata Project Limited (TPL).

Collaborative Research & Development Programs

★ Under C-DOT Collaborative Research Program (CCRP) initiative, two agreements for "Collaborative Development of O-RAN Compliant Disaggregated 5G RAN Solution have been signed. Both will be developing 5G RAN solution as indigenous product. Additionally, C-DOT is in the process of signing an agreement for the Collaborative development of CV-QKD solution.

★ Further, C-DOT is the designated Implementing Agency (IA) for proposals in the area of telecommunication and associated technologies, under the Telecom Technology Development Fund (TTDF) scheme of USOF(DOT). Under this program C-DOT has signed so far 7 agreements and is under process of signing 4 more agreements. These are in the areas of optical communication, 6G/5G, switches and routers etc.

★ C-DOT also contributes to technical evaluation of proposals received under the TTDF scheme of USOF(DOT) for recommendation to Technical Evaluation Committee (TEC) for evaluation of proposals and has evaluated more than 32 proposals under this activity.

★ Further, preliminary screening has been done for 205 proposals under TTDF2.0 scheme. Next level of screening is under progress.

★ C-DOT Incubation Programs/ Centers of Innovation (COI) at Delhi and Bengaluru shall provide "idea to scale" support for technology-based entrepreneurship and facilitate the conversion of research activity into entrepreneurial ventures. As part of COI, C-DOT had opened up applications on website for onboarding startups in the domains of interest to C-DOT. Recently AI4GOOD contest has been launched on website inviting startups having AI solutions aligned with UN SDGs. Top two selected startups shall get a chance to showcase their solution at ITU's 'AI for Good Global Summit' at Geneva, Switzerland.

★ C-DOT has also sent letters to top 20 engineering institutes as per NIRF 2023 ranking for providing Scholarship to PhD students who have their areas of research in domain areas of interest to C-DOT.

C-DOT MANAGEMENT

Governing Council

Chairman
Hon'ble Minister of Communications

Vice Chairman
Hon'ble Minister of State for Communications

Members
Chairman, Digital Communications Commission & Secretary (T), DoT

Chairman, DRDO & Secretary, Department of Defence (R&D)

Secretary, MeitY

Member (In charge - C-DOT), DCC

Member (Finance), DCC

CMD, BSNL

Chief Executive Officer, C-DOT

Directors, C-DOT

Steering Committee

Chairman
Chairman, Digital Communications Commission & Secretary (T), DoT

Vice Chairman
Member (In charge C-DOT), DCC

Members

Chairman & Managing Director, ITI Ltd.

Director (Planning), BSNL

Sr. DDG, Telecom Engineering Centre

DDG (B&PF), Department of Telecommunications

Sr. Director, MeitY

Chief Executive Officer, C-DOT

Directors, C-DOT

Project Board

Chairman
Dr. Rajkumar Upadhyay
Chief Executive Officer, C-DOT

Members
Dr. Pankaj Kumar Dalela
Director-I, C-DOT

Shikha Srivastava
Director-II, C-DOT

Dr. Dilip Krishnaswamy
Director-III, C-DOT

Overview

Centre for Development of Telematics (C-DOT) was established in 1984 as an autonomous Telecom R&D Centre of the Department of Telecommunications (DOT), Ministry of Communications, Government of India. C-DOT has been in the technology forefront building indigenous capabilities in the design, development & production of cost-effective telecom technologies and innovative solutions. Its R&D endeavors are aimed at meeting the telecom requirements of the nation with key focus on rural connectivity and emerging dynamics of security and strategic communications landscape. It has successfully executed various projects of national & strategic importance that have played a pivotal role in achieving self-reliance, reducing dependence upon technology imports, boosting entrepreneurship, augmenting Intellectual Property (IP) assets and creating an ecosystem for indigenous telecom manufacturing. C-DOT solutions involve multiple industry stakeholders including System Integrators, Component Manufacturers, Telecom Service Providers, Internet Service Providers, etc. for proliferation of indigenous solutions.

C-DOT has made significant contributions towards several flagship missions of the Government of India viz. "Digital India", "Make in India" and "Skill India". C-DOT has been steadfast in its commitment towards building an "Aatmanirbhar Bharat" as envisioned by the Hon'ble Prime Minister.

Accomplishments and Activities

1. Key Project Achievements

- **4G Core** – C-DOT designed 4G Core deployed in BSNL network at Chandigarh is providing service to mobile subscribers in Punjab and Haryana.

- **5G Core** – Indigenous End-to-End 5G solution consisting of 5G Standalone (SA) Core, along with indigenously developed BharatRAN2 prototype system was successfully demonstrated at IMC 2023 in front of Honourable Prime Minister of India at Pragati Maidan on 27th October 2023.

- **IMS** – IMS Load Testing of 1mn SIP session/hour together with registration /re-registration and 1Lakh Mobile Originating/Terminating SMS per hour has been demonstrated. IMS Proof of Concept and friendly launch of VoLTE services using C-DOT IMS Core is targeted for May 2024.

- **4G RAN -** Multiple prototypes of radios built for various bands (600MHz, 700 MHz, 800 MHz, 850 MHz, 900 MHz, 1800 MHz, 2100 MHz and 2500 MHz). TEC Technology Approval certificate has been awarded for 700MHz/Band-28 eNodeB. Technology transfer agreements (TOT) signed with ITI, BEL, ECIL and MoU signed with Railtel. RAN built by ITI are undergoing trial in BSNL network at Ambala and is close to completion. Also undergoing trials in Secunderabad for LTE-R solution for Indian Railways.

- **5G RAN** – Collaborative agreement signed with second consortium consisting of Lekha Wireless, Sooktha, Resonous and Signaltron for development of disaggregated 5G Bharat RAN solution. The first such agreement was signed with VVDN Technologies Private Limited and WiSig Networks Private Limited to develop 5G Open RAN.

- **4G for Railways**

  a) **25km PoC:** The complete concept of LTE-for-Railways (LTE-R) has been implemented over the 25km Lingampally and Secunderabad stretch and demonstrated along with Mission Critical Applications (MCX). C-DOT RAN deployed at ten sites and demonstrated required technical performance. Ruggedized LTE Routers (2 nos) supplied and installed in two locomotives. End-to-end coverage with good throughput demonstrated for region with towers. 3rd Party audit under progress. PoC expected to be completed by April 2024.

  b) **500km PoC:** MoU signed with Railways for "Trials of 4G LTE-R systems in 500 Km in South Central Railway. Four C-DOT RAN partners selected to be part of the 500km PoC.

- **ASTR** Pan-India SIM subscriber fraud detection Phase-1, Phase-2 & Phase-3 completed and several lakhs (~59 lakhs) of fraudulent connections disconnected.

- **Post Quantum Cryptography (PQC) -** Successful field trials of revised rapid prototype of Quantum secure smart Video IP phone with Compact Encryption Module (CEM) accomplished at strategic sites. Successful implementation of Key Generation System (KGS) based on module lattice post-quantum cryptography (PQC) algorithm for third party secure products. C-DOT has signed Transfer of Technology (ToT) agreement for CEM with a private sector entity.

- **QKD -** C-DOT received Technology Approval Certificate for QKD system from Telecom Engineering Centre (TEC). C-DOT organized CDOT Quantum Hackathon (CQuHACK 2023) to explore any vulnerabilities in its QKD protocols. Transfer of Technology (ToT) agreements signed with one PSU and three private sector entities for QKD solutions. C-DOT demonstrated Key Relay functionality over PRL QKD system in the Quantum Conclave 2024 event at Vigyan Bhawan.

- **TSOC-** Deployed additional 18 IPFIX probes of 200/400G capacity at ISP gateway locations (with total deployed sites of 131). TSOC DC with 40 racks installed at ITI

Bengaluru and the same for TSOC DR site installed at BSNL Faridabad. DC-DR failover has been implemented.

- **5G Front Haul system -** Mobile Front haul solution developed and live system demonstrated in "Workshop on advances in optical communication" at IIT, Madras in July 2023 and at India Mobile Congress, New Delhi in Oct 2023.

- **CAP Compliant Early Warning platform for disaster management -** Pan India deployment (phase 1) of NDMA CAP done and operational. PoC commissioning for AIR Radio, Railways, TV and Cell Broadcast Platforms completed.

- **C-DOT Cell broadcast solution:** The solution has been deployed in BSNL, MTNL and Reliance Jio at Pan India level.

- **PM-WANI** Central Registry project has been successfully completed as per the scope of the project mentioned in the project proposal.

- **M2M:** 111 Industry partners/Startups registered under Centre of Innovation (COI) and Entrepreneurship Cell setup at C-DOT.

- **Indigenous Wi-Fi** – TEC Certification received for DOA (Low-cost Wi-Fi5 Dual Band Outdoor Access Point). In Kamathana GP, Bidar district, Karnataka, Wi-Fi Mesh and P2P network established through WiFi5 Access points and integrated with DVB-S2 for providing TV channels & educational content through Wi-Fi and internet service through PM-WANI.

- **C-DOT Intelligent Attendance system (CIAS):** ToT completed, CIAS Field deployments for TCIL HQ & Project Office done. CIAS Android mobile App developed. MoU signed between C-DOT & Mashmari Consultants Private Limited targeting face recognition applications in education sector.

- **Enterprise Security Operation Centre (ESOC**) solution successfully rolled out in C-DOT Delhi and Bengaluru. ESOC monitoring lab set up at C-DOT, Delhi and inaugurated by Hon'ble MoS

- **Telecom Analytics for Fraud Management and Consumer Protection (TAFCOP)** -(Know Your mobile connection) launched for Pan India in May 2023, Central equipment Identity register (CEIR) also now operational Pan India. Chakshu (Report Suspected Fraud Communication), RICWIN (Report Incoming International Call with Indian Mobile Number) and KYI (Know Your Wireline Internet Service Provider) new services were launched on sancharsaathi citizen centric portal for Indian Citizens.

- **Platform for Online Certification of Telecom Equipment for NCCS:** NCCS web portal has been launched by Secretary (T) in December 2023.

- **Unified Communication for Tactical networks**– Unified communication solution (mSigma) rolled out in strategic network (Army).

- **Samvad** – TAL4 certification of Samvad for Navy by SAG completed.

- **e-Health Platform** – Developed for aspirational district program of NITI Aayog.

- **WayFinder** deployed in new Parliament building. However, it was not commissioned due to some security concerns.

- **NMS** – Purchase order for NMS to monitor and manage BharatNet Phase-2 devices received from TATA Project Limited for Chhattisgarh state.

- **UNMS** deployed for multivendor 4G technology (Railways) for POC trials.

2. The Progress made in Major Technology Programs

2.1 CoE for Mobile Communication-4G/5G and Beyond

✦ **4G LTE IMS Converged Core- Rollout and Commercialization**

- **4G - BSNL** Commercial beta Launch of 4G successfully done in July 2023 with 200 RAN sites (eNodeBs) deployed in Punjab Circle across three cities of Firozpur, Pathankot and Amritsar - parented to the C-DOT 4G POC Core at Chandigarh. Currently, around 1500 sites are parented to 4G core and handling around 40TB traffic per day in Punjab and Haryana.

  BSNL Zonal Core deployments at 4G Primary & Geographical Redundant Main Data Centre sites is

under progress along with the setting up of Mini Data Centres. Commercial Go-live for Punjab, Haryana and Himachal Pradesh is targeted by June 2024 with commercial launch of services in the other zones being planned for Q2 of FY 2024-2025.

IMS Load Testing of 1mn SIP session/hour together with Registration/Reregistration and 1Lakh Mobile Originating/Terminating SMS per hour has been demonstrated. IMS Proof of Concept and friendly launch of VoLTE services using C-DOT IMS Core is targeted for May 2024.

• **4G - Railways**

LTE for Railways POC in 25 KM stretch at South Central Railways: The complete concept of LTE-for-Railways has been implemented and demonstrated with most of test cases cleared. Worked with multiple 3rd parties to create an end-to-end LTE-for-Railways PoC system involving the following network components: LTE Core, C-DOT RAN/eNodeB, C-DOT Cell-site Router, 3rd party RAN/eNodeB, LTE-Cab Router, C-DOT Rail-Sampark MCX Solution, Mobiles/Smartphones, Application Servers and EMS/NMS for managing the network solution.

C-DOT RAN/eNodeB installed in ten sites out of total 11 sites (with a portion of equipment manufactured by ITI). Conducted Multiple Drive/Walk tests, verified that end-to-end handover/mobility successfully and achieved good range/ throughput. C-DOT LTE Router installed in locomotives. Multiple drive tests done with UE/smartphone inside passenger train and LTE Cab Router. For all the regions where towers are provided by Railways, seamless radio coverage has been demonstrated. PoC undergoing 3rd party audit. Expected to complete by end of Apr 2024.

LTE for Railways POC in 500 Km stretch: MoU between C-DOT and Railways signed for conducting 500 Km trial with the objective of building Vendor and OEM eco system for equipment required for the POC. Multiple C-DOT partners selected for the said trail. 4 eNodeB Vendors and 3 LTE-Router vendors are based on C-DOT Technology. The Proof of Concept is in progress.

✦ **4G Radio Access Network (4G RAN)**

C-DOT's LTE/4G RAN eNodeB technology received TEC technology certification for Band-28 in Jul-23 making C-DOT RAN the first TEC certified eNodeB/RAN technology in the country. 4G RAN technology prototypes in various bands (Band 1, 3, 5, 8, 28, 20, 41 and Band-71 (600MHz) ready. Built 25+ prototypes of RRH of various bands and 30 BBUs for internal testing and Railways PoC. QM-333, Environmental and Safety testing completed for BBU, Band -28 and Band-8 RRH.

ITI manufactured (C-DOT designed) Band-28 & Band-8 systems deployed in field undergoing PoC as pilot order in BSNL network. Band-1, Band-3 and Band-41 expected to be ready and deployed in Q2 of FY24-25. BSNL DTR testing ongoing for Band-28 at Ambala, expected to complete in Q1 of FY24-25. BSNL DTR testing for the remaining four bands expected to complete in Q2 of FY24-25. ToT agreements signed with ITI, ECIL, BEL. C-DOT RAN ToT partners ITI, ECIL, BEL and Railtel among shortlisted RAN suppliers in "LTE for Railways" 500km PoC.

✦ **4G & 5G Network Management system & Automation**

UNMS for multivendor 4G technology (25 km) deployed at site (Railways), 500 Km development is in progress. CDOSM (C-DOT Orchestrator- 4G Core Nodes) – Release v3.0.0 under validation. Development of 5G SMO, Non-RT RIC, RT-RIC, AI/ML are in progress, first version released. 5G SA OSS development is in progress. LTE NMS has been deployed at BSNL Ambala site.

✦ **5G-Standalone (SA) CORE**

5G Standalone (SA) Core was successfully demonstrated at IMC 2023 in front of Honourable Prime Minister of India at Pragati Maidan on 27th October 2023, along with indigenously developed BharatRAN2 prototype system as an end-to-end 5G solution. Development of 5G core for NIB (Network in a Box) / enterprise network is completed. Ruggedization of 5G core for enterprise network is in progress. Discussions for conducting PoCs for enterprise end-to-end 5G solution has started.

✦ **5G Non-Standalone (NSA) Core**

The 5G NSA enhancements have been implemented over the 4G core software release.

✦ **5G-RAN (Radio Access Network)**

✓ CDOT-VVDN-WiSig 5G Bharat RAN2 under development and testing. Integration and testing of CU, DU and RU modules in progress. Campus trials initiated.

✓ MOU signed with IITM for collaborative development of 5G RAN. 3 units of gNodeB systems will be supplied by IITM during July 2024.

✓ C-DOT signed an agreement with second consortium consisting of Lekha Wireless, Sooktha, Resonous and Signaltron for the collaborative development of disaggregated 5GRAN solution (Bharat RAN1) under C-DOT collaborative research program. Development of gNodeB consisting of CU, DU and RU is in progress.

✓ Test Equipment for 5G RAN - 5G UE Simulator, RU wraparound tester, CU wraparound tester, RF chamber and PTP Grandmaster have been procured.

✓ Integration of DU and RU modules completed.

✓ Open fronthaul interface tested.

✦ **5G RAN Test Bed – C-DOT Bangalore and Delhi**

✓ 5G RAN testbed at C-DOT Delhi has been setup which includes indoor and outdoor lab facility, 5G SA core and prototype 5G RAN with 5G smartphones/ tablets. UE simulator supporting upto 256 UEs is procured and available for end-end testing. BharatRAN2 prototype system (High Power Radio Unit) and 5G RAN system from VVDN/ Wisig installed and integration testing completed. Further testing for changes been done for ruggedizing the end-to-end 5G system for PoC is in progress.

✓ Test instruments for the conformance/ interoperability testing of Open RAN compliant subsystems (RU, CU, DU) are under procurement at C-DOT Delhi.

✓ 5G RAN testbed at C-DOT Bengaluru has completed 90% of site planning, commissioning of physical infrastructure.

✦ **Mission Critical Applications for Indian Railways** 3GPP complaint Mission Critical Push to Talk (MCPTT) First Release developed and under deployment in South Central Railways in LTE-R network.

2.2 CoE for Advanced Optical and Quantum Communication Technologies

✦ **Quantum Key Distribution (QKD)**

Software development of QKD Manager and Controller is under development to manage QKD network. C-DOT organized Quantum Hackathon (CQuHACK 2023) to explore any vulnerabilities in its QKD protocols. Two teams participated in the hackathon and C-DOT provided lab infrastructure to support them. However, no one has been successfully able to breach to extract secure key from QKD system. Proposal to connect 10 strategic offices submitted to DOT in January 2024. A proposal has also been sent to NTIPRIT to set up a quantum communication lab. Another proposal has been sent to Ramrao Adik Institute of Technology (RAIT) - D Y Patil University, Navi Mumbai for setting up a small-scale quantum communication lab for academic uses and the same is in advanced stage of approval. C-DOT has taken up the indigenous development of "Quantum Key Distribution (QKD)" solution for securing communication links carrying critical and sensitive information. The system helps preventing eavesdropping by adversary possessing infrastructure with infinite computational power (Quantum computers). The QKD system generates completely secure identical random keys, used to encrypt / decrypt data during transmission.

✦ **Measurement Device Independent-QKD**

Measurement-Device-Independent Quantum Key Distribution (MDI-QKD) is a secure communication method that eliminates vulnerabilities in the measurement devices. It uses entanglement and interference between quantum states from two parties to generate a shared secret key. The architecture finalization and procurement have been completed for the project. The project is in advanced stages of development.

This project is partially funded by the NSCS. MDI-QKD architecture finalised, capital and consumable items procurement completed. Time synchronisation is achieved between Alice, Bob and Charlie. Lab prototype for wavelength locking, time-of-arrival overlapping, and polarisation matching for optical pulses coming from Alice and Bob to Charlie to achieve Hong-Ou-Mendel (HOM) interference, which is one of the most critical parameters for MDI-QKD, has been developed and consistent HOM interference visibility of more than 40% has been observed. Automatic polarisation control of the pulses coming from Alice and Bob at the Charlie node has been achieved. Generation of optical pulses for Z and X basis (i.e., sending pulses in either early or late time bins and superposition of early and late time-bins) completed. Integration of Superconducting Nanowire Single-Photon Detector (SNSPD) for better performance has been completed.

✦ **Post-Quantum Inline Network Encryptor (PINE)**

C-DOT is working on Indigenous design & development of advanced security solutions to safeguard national networks from the threats posed by advancements in Quantum Computers. 1Gbps throughput layer-3 Post-Quantum Inline Network Encryptor (PINE) project is in an advanced stage of design and testing. Software for Crypto-grade 1Gbps PQC IP Encryptor ready & tested on reference boards.

✓ National Security Council Secretariat (NSCS) funded 1Gbps throughput layer-3 Post-Quantum Inline Network Encryptor (PINE) project is in an advanced stage of design and testing.

✓ Software for Crypto-grade 1Gbps PQC IP Encryptor ready & tested on reference boards. Custom hardware board has been fabricated and assembled.

✦ **Quantum-safe cryptography & Commercial Grade Post Quantum Encryptor (CPQE)**

✓ Testing of two PQC channels, using Compact Encryption Module (CEM), between Sanchar Bhawan (DOT) & C-DOT and TEC & C-DOT for post-quantum security of C-DOT's Video Conferencing (VC) solution, has been successfully completed by TEC.

✓ Enhanced 80Mbps Quantum-safe IP encryptor has been modified to work as a VPN Client or a VPN Server. Software for Commercial-grade Post Quantum Encryptor (CPQE) tested on reference board. ToT agreement of CEM has been signed with a ToT partner.

✦ **Commercialization of Quantum Secure Smart Video IP Phone**

✓ Successful field trials of revised & reworked rapid prototype of Quantum-safe Smart Video IP Phone with CEM accomplished at strategic possible customers.

✓ First iteration of Security Evaluation has been completed with SAG-DRDO for TAL4 certification. Second iteration has been submitted. End-to-end security implemented for captive networks.

✓ TOT of Video IP Phone is under process of finalization with prospective TOT partner

✓ Procurement of components for production of phones for large scale field trials is in final stages.

✦ **Intensity Modulator Driver and Phase Modulator Driver Module for QKD**

Development of Lab prototype of Active Bias Controller for Intensity Modulator and Phase Modulator Driver completed.

✦ **Single Photon Detector (SPD) Module for QKD**

✓ Development of Lab prototype of Temperature Controller for Single Photon Detector completed.

✓ Development of Lab prototype of the detector with active and passive quenching schemes and temperature control is completed.

✦ **Carrier Transport for 5G**

Highly optimized and customized architecture for 12T capacity needed for BSNL tender has been completed. ToT agreement has been signed with UTL and BEL. Data path tested for 4.8Tbps OTN Cross Connect (OTN XC). Hardware design completed for 8Tbps and 12Tbps OTN XC. Integration testing of 4.8T OTN system is in progress. Development of 8T and 12T OTN XC Modules, fabrication of modules required for 5 node setups as per TEC test configuration, is in progress.

✦ **Advanced Optical Communication (AOC) Test Bed**

The architecture of AOC testbed has been finalized. List and specifications of test and measurement equipment has been finalized. The component procurement for the systems/sub-systems has been initiated.

2.3 CoE for Advanced Telecom Security

✦ **TSOC (Telecom Security Operation Centre)**

✓ TSOC is a security sensitive solution and established for effective management of national Telecom infrastructure from security incidents including identification and prevention. The responsibility of deployment of TSOC project costing Rs 762.68 Crores over a period of 6 years is assigned to C-DOT. TSOC provides real time visibility of suspicious malicious events and attacks on the National Telecom Network & National Critical Infrastructure.

✓ TSOC DC with 40 racks installed at ITI Bengaluru and the same for TSOC DR site installed at BSNL Faridabad. DC is commissioned on 5th February 2024, receiving the traffic from all 131 IPFIX probes at ISP gateways. DR with 40 racks is operational at BSNL Faridabad.

✓ High-end state of the art data center network designed and implemented with 800Gbps backbone connected to the 160 high end servers. Big data platform with 1000 of nodes implemented.

✓ DC-DR failover has been implemented.

✓ The Information Sharing and Response Portal (ISRP) has been implemented, security certification from CERT-in emplanned vendor completed the portal is operational for users.

✦ **Digital Intelligence Unit (DIU)**

✓ C-DOT has undertaken the development of Digital Intelligence Unit (DIU) Project of DoT costing Rs. 228.16 Cr over a period of 5 years to prevent misuse of telecom resources in cyber-crime and financial frauds. Under this project with the help of C-DOT Sanchar Saathi portal (www.sancharsaathi.gov.in) has been launched by Department of Telecommunications in May 2023. It is a citizen

centric portal that hosts following citizen centric services:

a. Report suspected fraud communications (Chakshu)

b. Know the mobile connections issued in their name and report the mobile connections for disconnection which are either not required or not taken by them (TAFCOP),c. Report the stolen / lost mobile handset for blocking and tracing (CEIR),

d. Report the incoming international calls received with Indian telephone number as calling line identification (RICWIN),

e. Check the genuineness of mobile handset while buying a new/old device (KYM),

f. Check the details of licensed wireline Internet Service Providers (KYI).

✓ Under the DIU project, C-DOT also developed AI and big data analytics-based tools to identify the fraudulent mobile connections. A total of about 67 lakhs of suspected fraudulent mobile connections have been identified out of which about 59 lakh mobile connections were disconnected after re-verification by the telecom service providers.

✓ In addition, Digital Intelligence Platform (DIP) has been implemented under DIU project to share the telecom related intelligence with the relevant stakeholders like DoT field units, law enforcement agencies, telecom service providers, banks / financial institutions, document issuing authorities etc.

✓ C-DOT launched Sanchar Saathi Portal in May 2023. It is a citizen centric portal of Department of Telecommunication, Govt. of India that hosts citizen centric services like CEIR (Central Equipment Identity Register) and TAFCOP (Know Your mobile connection) which were also launched for Pan India in May 2023.

✓ Digital intelligence platform(DIP) has been implemented with Suspected POI/POA, Exceeding prescribed limit for Phase-0, Phase-01, Phase-02, Phase-03, data analysis, dashboard and summary report generation for LSAs/TSPs. Intelligence DoT & stakeholders data analysis with DIP. Grey Market

Reporting, CLI Reporting and Call center integration (1963) implementation with DIP. MNRL data repository management and data sharing with OTTs/FI's/I4C and its ATRs. KYM app integration over Umang and Sancharsaathi platforms. POC of Sancharsaathi Know Your Caller(KYC) mobile application.

✓ Chakshu (Report Suspected Fraud Communication), RICWIN (Report Incoming International Call with Indian Mobile Number) and KYI (Know Your Wireline Internet Service Provider) new services were launched on sancharsaathi citizen centric portal for Indian Citizens. TAFCOP feedback module for general public has also been implemented on the SancharSaathi portal

✓ ASTR Pan-India SIM subscriber fraud detection Phase-1, Phase-2 & Phase-3 completed and several lakhs (~59 lakhs) of fraudulent connections disconnected. LSA-wise TSP-wise suspected mobile numbers which were taken on fake/forged documents and failed in re-verification present on DIP portal. The activity to find all the active mobile connections taken on these faces on pan India basis is completed. All the suspected mobile connections detected during phase-1, phase-2 and phase-3 checked against the PoS (Point of Sale) faces on pan India basis for fraudulent activities.

✦ **Centralized International Out Roamer (CIOR)**

✓ Design initiated for preventing call spoofing through ILD gateways. Interface testing with TSPs ongoing, POC to be done. CIOR application development and load testing is also completed on Google cloud services.

✓ The Detailed Project Report (DPR) of COIR has been submitted to DOT, approval awaited.

✦ **National Trust Centre (NTC) for IoT/M2M**

✓ User Requirement Specification and System Requirement Specifications (SRS) are finalized after discussions with all the stakeholders. Software Requirement Specification has been prepared and interaction with stakeholder is ongoing. Database design is completed. Requirements finalized for device manufacturer portal. Mechanism identified for interface with platform provider.

✓ Identification of different modules and components their interworking, Identification of framework, designing of UI screens is in progress. Discussions with one of the M2M Service Providers M/S Idemia is in progress regarding the data to be transmitted between IoT platform and NTC for device details.

✦ **High capacity IPFIX Probe**

Administrative approval received from NSCS and Project for the development of 800G IPFIX probe initiated. Technical and Commercial Evaluation has been completed for procurement of servers and FPGA cards required for probe Software development.

✦ **Enterprise Security Solution**

✓ C-DOT's indigenous security platform for catering to technical (detective and preventive) security controls for enterprises has been developed and deployed at C-DOT Delhi and Bengaluru Campus.

✓ Trials in Kerala Police and BSF successfully completed, discussion is in progress for commercials. DOT Meerut trial has also been completed successfully.

✓ Trials in CBI and Indian Army are ongoing.

2.4 CoE for Advanced Telecom Applications

✦ **CAP Compliant Early Warning Platform for Disaster Management**

Phase -I of the project has been completed. High level project review by NDMA has been conducted. Letter of Intent for Phase -II of the project has also been received from NDMA, working on Phase-II deliverables. Mauritius has shown interest in CAP project and advance level discussion is going on.

✦ **C-DOT Cell broadcast solution**

✓ The solution has been deployed in BSNL, MTNL and Reliance Jio at Pan India level.

✓ The solution has been extensively tested and positive user experience certificate has been received from Reliance Jio and BSNL.

✓ C-DOT is actively working with Indian Air Force and Mauritius for conducting the PoC trials of Cell Broadcast solution.

✦ **M2M Communication**

✓ Centre of Innovation for (COI) for IoT/M2M formally launched. 111 Industry partners/Startups registered, testing completed with 29 and ongoing with 4 others.

✓ Integration of CCSP done with CRIS IRNIYANTRAC for using CCSP in their 40,000 IFDs devices of IR-NIYANTRAC application and with CRIS WGPS for using CCSP in their Wagon tracking IoT application for 3,00,000 WGPS devices.

✓ Engagement for defining Data Format & Flow (based on oneM2M standards) for Railways RDPMS (Remote Diagnostic & Preventive Maintenance system) for Signaling gears.

✦ **Unified Communication & Collaboration Solution for tactical networks**

✓ Integration done with various stakeholders at IITM Pravartak Testbed.

✓ PoC was completed successfully and unified communication solution (mSigma) rolled out in strategic network (Army).

2.5 CoE for Artificial Intelligence

✦ **C-DOT Intelligent Attendance system (CIAS)**

✓ CIAS system deployed at TCIL headquarters, Delhi after succesfull testing. Additionally, PO has been received from TCIL for CIAS installation for its Pan-India offices and they have also been deployed through C-DOTs TOT partner. The CIAS system has been deployed in C-DOT Delhi office. CIAS Android mobile App developed

✓ Face Recognition based remote attendance with 4G Module enabled edge device solution developed

✓ Face recognition-based access control system developed. Fast embedding generation, occlusion detection over face, disguised face clustering completed. Visitor Management System developed.

✦ **Applied AI for Real Time Security Solutions**

Study of streaming mechanism for supporting more cameras on the edge device is being carried out.

✦ **AI in Cyber Security for 5G and Beyond**

Study of various cyber security agendas is in full swing. Research Paper on the matter has also been published in IEEE Explore.

2.6 Non-COE/Generic Program

✦ **PM-WANI Central Registry**

PM-WANI Central Registry project has been successfully completed as per the scope of the project mentioned in the project proposal. Project is currently under enhancement and support phase. Open sourcing of WANI Service Delivery Platform is under progress.

✦ **Enhancements, Design & Field Support for GPON, TWDM PON and other optical technologies**

✓ C-DOT has received Technology Approval Certificate for two variants of 4 Port OLT, ONT17A, ONT24, ONT23, ONT23A, ONT27 and ONT28 from Telecom Engineering Centre (TEC) for compliance with TEC GR. Commercial order from BSNL to supply 1600 nos. of 4 Port OLT (Office OLT3) has been awarded to C-DOT licensee.

✓ ToT signed with Alpha Bridge, Ehoome, AdoptNet and ITI for OfficeOLT-2, OfficeOLT-3, ONT17, ONT17A, ONT23, ONT24, ONT27 & ONT28. Design completed for 40 port GPON OLT compact chassis capable to support upto 40 GPON ports. Software development and Integration is in progress. Design and development of ONT29 supporting PoE is completed and internal validation is in progress

✓ Mobile Fronthaul solution has been developed and live system demonstrated in "Workshop on advances in optical communication" at IIT, Madras in July 2023. Internal Validation of WDM based 5G Front-haul Solution completed.

✓ Design completed for indigenous built 12 slots and 6 slots (300Watt/slot) chassis capable of supporting upto 24/12 lambdas per chassis. Hardware and software development and integration is in progress.

✓ Design is in progress for 600G Xponder supporting 400Gbps and 200Gbps per wavelength and 1U Optical Line Unit (OLU) ILA.

✦ **C-DOT Routers and Switches**

✓ Additional numbers of C-DOT's high-capacity Data Center switch/Routers are deployed in 4G solution at BSNL. The TEC ER Certification has been achieved for Secure Router (CRTR-210) and Data Center Switch Cum Router (CTX-2000). The security testing of High-capacity routing system by NCCS is ongoing. The final phase of the testing for EAL-3 certification of CRTR-210 has started.

✓ C-DOT STBR is being positioned for additional requirements of CMS-IMS network and some of the other strategic and in-house requirements. BEL is manufacturing these STBR system.

✓ The branch router has been integrated with QKD system of C-DOT and other vendor(s) as per standard and deployed in strategic network. The assembly of additional prototypes of branch router has been initiated. The ToT of Data Center Switch Cum Router(CTX-2000) has been announced. The ToT for dual V.35 adapter is being signed with ECIL, as they have already received a confirmed order for the deployment of additional units.

✓ The first prototype of 8 port and 48 port L2/L3 switch have been assembled. The software testing on the prototype system is in-progress.

✓ The Branch Router(BRTR-10) and Secure Router(CRTR-210) is being supplied to defence network through a ToT partner.

✦ **Platform for Online Certification of Telecom Equipments for NCCS**

NCCS web portal has been launched by Secretary (T) in December 2023. The portal is operational and live.

The development is in-progress for some additional modules/ feature enhancements - Log Management and Communication modules released in March. Digital Signature module integration and testing with eMudhra SW is in progress.

✦ **e-Health Platform**

e-health platform developed and is being integrated with various 3rd party medical solutions. The solution was also demonstrated to Niti Aayog and to Indian Army.

✦ **Samvad and Video Conferencing Solution**

Solution is integrated into Unified communication solution for tactical network. PoC of the same has been successful in Army. Samvad TAL4 certification completed by SAG, DRDO for Navy.

✦ **Smart Energy Meter**

Smart Energy Meter (SEM) development in progress. Preliminary lab testing has been done and three meters have been sent to ITI Palakkad Unit for error, acceptance, profile, tamper and DLMS testing. Following the testing the feedback shall be incorporated and the meter would be sent for type testing to the designated laboratory. After the certification process, transfer of technology to interested manufacturers shall be done.

✦ **NMS solution enhancements, roll-outs and customization**

Unified Network Management System (UNMS) for monitoring "State Led, Satellite & BharatNet Phase I and II projects" has been deployed. Enhancements & support for the same is in progress. Support and maintenance of Business Exchange Gateway (BEG) for BBNL is also in progress. BEG integration for satellite (TCIL and BSNL) completed.

CiSTB billing solution integrated with Payment gateway. Mobile App has also been developed and deployed by C-DOT in BharatNet. CNMS-IP for Chhattisgarh State (BharatNet Phase 2) is under development, C-DOT has received PO for the same from Tata Project Limited (TPL).

Collaborative Research & Development Programs

★ Under C-DOT Collaborative Research Program (CCRP) initiative, two agreements for "Collaborative Development of O-RAN Compliant Disaggregated 5G RAN Solution have been signed. Both will be developing 5G RAN solution as indigenous product. Additionally, C-DOT is in the process of signing an agreement for the Collaborative development of CV-QKD solution.

★ Further, C-DOT is the designated Implementing Agency (IA) for proposals in the area of telecommunication and associated technologies, under the Telecom Technology Development Fund (TTDF) scheme of USOF(DOT). Under this program C-DOT has signed so far 7 agreements and is under process of signing 4 more agreements. These are in the areas of optical communication, 6G/5G, switches and routers etc.

★ C-DOT also contributes to technical evaluation of proposals received under the TTDF scheme of USOF(DOT) for recommendation to Technical Evaluation Committee (TEC) for evaluation of proposals and has evaluated more than 32 proposals under this activity.

★ Further, preliminary screening has been done for 205 proposals under TTDF2.0 scheme. Next level of screening is under progress.

★ C-DOT Incubation Programs/ Centers of Innovation (COI) at Delhi and Bengaluru shall provide "idea to scale" support for technology-based entrepreneurship and facilitate the conversion of research activity into entrepreneurial ventures. As part of COI, C-DOT had opened up applications on website for onboarding startups in the domains of interest to C-DOT. Recently AI4GOOD contest has been launched on website inviting startups having AI solutions aligned with UN SDGs. Top two selected startups shall get a chance to showcase their solution at ITU's 'AI for Good Global Summit' at Geneva, Switzerland.

★ C-DOT has also sent letters to top 20 engineering institutes as per NIRF 2023 ranking for providing Scholarship to PhD students who have their areas of research in domain areas of interest to C-DOT.

IPR Asset Status

Intellectual Property Asset	No.	Related Project / Product	Subject invention
Patents Granted	17	Quantum Key Distribution (QKD)	Device and Method of Synchronization in Quantum Key Distribution (QKD) System-(INDIA)
		GPON	A Learning-Based Method and System for configuring an Optical Time-Domain Reflectometer in A Gigabit Passive Optical Networks- (INDIA and USA)
		GPON	A Method and a Mirrored Serial Interface (MSI) for Transferring Data-(INDIA)
		Central Equipment Identity Register (CEIR)	System And Method for Real-Time cloning Detection and Blocking of Cloned and Stolen Mobile Devices in A country's Mobile Network-(NIGERIA)
		DWDM System	System And Method for Data Communication Among Transceiver Cards Over a Common Data Bus-(INDIA)
		Optical Core Networks	Method For Equipment Selection in Generalized Multiprotocol Label Switching-(INDIA)
		Deterministic Ethernet Network	A Real-Time Distributed Engine Framework of Ethernet virtual connections-(INDIA)
		Geo-Intelligence	GIS based Centralized Fiber Fault Localization System-(INDIA)
		1.6T P-OTP System	Data Communication Method and System-(INDIA)
		Centralized Monitoring System (CMS)	Method, System and Apparatus for Multilingual and Multimodal Keyword Search in A Mix lingual Speech Corpus- (INDIA and USA)
		BBWT	An Off Ground System in Mid-air to cover inaccessible areas with Wi Fi (India)
		CiSTB	System And Method To Monitor Quality Of Service At A Set Top Box (India)
		GyanSetu	Gesture based human machine interface using marker (India)
		Study Project- Network Optimization	System and Method For Facilitating Optimization and Analytics of A Managed Network (India)

Intellectual Property Asset	No.	Related Project / Product	Subject invention
		Interoperable STB	A Method And An Information Appliance Device For Preventing Security Breach In Information Appliance Device (India)
Patents Filed	15	Integrated CAP	System And Method for Geo-Targeted
		Alert system	Automated Emergency Alerting Through Analog Radio Broadcast (CHINA, GHANA, FINLAND)
		Internet of Things/Machine to Machine communication (IoT/M2M)	Method for Notification aggregation in Group Management function of M2M-(INDIA)
		4G/5G/ front Haul	A Method and a System for tuning tunable optical transceivers- (USA and CHINA)
		Design & Development of Quantum Key Distribution (QKD)	Apparatus and Method for adjusting the Phase-Modulator's Modulating signal time reference in a Quantum-Key-Distribution System (USA and EP)
		1.6T P-OTP System	Frame Pulse Synchronization in a Packet Optical Transport Platform (P-OTP)-(INDIA)
		Content Delivery Network for Next Generation Networks	Geographical Area based Addressing for Free-To-Air (FTA) Set-Top-Box (STB) (India)
		4G RAN Manufacturing Test Automation	ATX Form Factor Compliant In-Circuit Functional Tester (India)
		4G RAN Manufacturing Test Automation	Battery-Free Wireless Probe For Testing Assembled Printed Circuit Board (India)
		C-DOT Converged Service Delivery Platform	System And Method For Automatic Broadcast Offload For Broadband Networks (India)
		C-DOT Converged Service Delivery Platform	Method And System For Video Transmission Over FM (India)

Intellectual Property Asset	No.	Related Project / Product	Subject invention
		C-DOT Converged Service Delivery Platform	User assisted Broadcast off-load for cellular networks using local area wireless (India)
Copyrights Granted	7	Digital Video Broadcasting (DVB-S2)	FPGA Implementation Of Real Time Programmable Multi-Rate Digital Down Converter (India)
		Digital Video Broadcasting (DVB-S2)	Design Of DSP-Based MF-TDMA Baseband Demodulator For DVB-S2/Rcs Hub System (India)
		WiFi Tech Enchancement	EMS Software Management system for Wireless Access Points (India)
		WiFi Tech Enchancement	EMS Software to Control, Configure and Monitor Wireless Access Controller (India)
		WiFi Tech Enchancement	EMS Software to Control, Configure and Organize Wireless Access Points (India)
		C-DOT IPTV Solution	Android Mobile App for watching IP TV content (India)
		C-DOT IPTV Solution	Launcher and IP TV App for Android STBs and Android TVs (India)
Copyrights filed	7	Integrated Alert system	Sachet Mobile Portal-(INDIA)
		Integrated Alert system	Sachet Web Portal-(INDIA)
		Integrated Alert system	Sachet Dashboard Portal-(INDIA)
		Quantum safe cryptography (QSC)	ETSI Standard compliant client application to fetch crypto keys from QKD system-(INDIA)
		C-DOT Unified Network Management System	C-DOT Unified Network Management System For TSPs, ISPs (India)
		C-DOT IPTV Solution	Android Mobile App For Watching IP TV Content (India)
		C-DOT IPTV Solution	Launcher And IP TV App For Andriod STBs And Andriod TVs (India)
Designs Granted	2	Packet Optical Transport Platform	Data Switching Subrack (8t OTN Cross Connect Platform)

Intellectual Property Asset	No.	Related | Project / Product	Subject invention
		OCN-HW	Mini Line Card Platform-(INDIA)
Designs Filed	2	Packet Optical Transport Platform	High Performance Multi-Protocol Data switching Sub rack (12T OTN Cross Connect Platform)-(India)
		OCN-HW	Mini Line Card Platform-(INDIA)
Trademarks Granted	3	IPTV CAS	C-IPCAS (India)
		LTE RAN	cTarang (India)
		LTE RAN	c-Tarang (India)
Trademarks Filed	2	ESOC (Enterprise security operation Centre)	Trinetra –(INDIA)
		NDMA Project – CAP Compliant (Early Warning Platform)	Need-NavIC Enabled Emergency Alerting Device-(INDIA)
Papers presented and published	12	Face Recognition Technology (COELI)	Optimal Latent Space For Low Shot Face Recognition IEEE IRI 2023, 04th -6th August 2023,BELLEVUE, WA, USA
		WayFinder (COELI)	InPosNet: Context Aware DNN for Visual SLAM IEEE IRI 2023, 04th -6th August 2023, SANTA CLARA, CALIFORNIA
		5G-MANO	Scalable Fault Handling Strategy, 8th International Conference For Convergence In Technology, I2CT Pune, Maharashtra, India
		e-health (COELI)	Comparative Study Of Cardiovascular Disease Prediction Using Machine Learning IETE International Conference India-2023' IICI-23 on "AI & ML Driving 5G & Beyond, Bangalore, India
		4G	TPM based Boot in embedded systems,3rd International Conference On Secure Cyber Computimg And Communications, Jalandhar, India
		WayFinder (COELI)	Statiscally matched DWT based novel DNN framework for Visual Slam,10th International Conference On Pattern Recognition And Machine Intelligence, Kolkata, India

Intellectual Property Asset	No.	Related | Project / Product	Subject invention
		Face Recognition Technology (COELI)	Enforcement of DNN with LDA-PCA-ELM for PIE invariant Few-shot Face Recognition,10th International Conference On Pattern Recognition And Machine Intelligence, Kolkata, India
		5G	Analytical Perspective of 5G PCF with Proxy BSF, Asia Pacific Conference On Communications 2023, Australia
		QKD	Quantum Key Distribution Over Existing Optical Fibre Carrying Traffic Comsnets, Quantum Communication Workshop 2024, Bangalore, India
		Optical Technology	Deep Dive into under water optical communication for publishing in Electronics for you (EFY) magazine
		QKD	Practical Challenges of Deploying a Quantum Key Distribution Link: An Indian Perspective10th ETSI-IQC Quantum-Safe Cryptography Conference on 14TH -16TH May 2024, SINGAPORE
		Integrated Alert system	A Multi modal approach towards public alerting and effective communication in Disaster Scenarios: Implementation in Indian context, 8th IFIP WG5 .15 Conference on Information Technology in Disaster Risk Reduction (ITDRR2023),TOKYO, JAPAN

The Department of Telecommunications, Government of India has directed C-DOT to frontend IPR management for Indian Technology entities who desire to seek assistance of the Government of India to deal with the issues of Standard Essential Patents (SEPs). Accordingly, C-DOT has been authorized to support Indian Technology companies in the Telecom space to frontend IPRS/SEPs/License management with domestic and global entities. In this regard, C-DOT engaged with various stakeholder of industry and academia and prepared the detailed consultation paper on IPR-FE front ending recommending the policy for telecom IPR facilitation, institutional framework for IPR and IPR management.

Business Promotion Activities
FY 2023-24

- **Events and Exhibitions**

- **C-DOT presented Ist Annual Intellectual Property (IP) awards to its researchers on 4th April, 2023**

Dr Rajkumar Upadhyay, CEO, C-DOT, presenting IP awards to CDOT engineers

Glimpses of Annual Intellectual Property (IP) Awards Ceremony at Bengaluru

- ### Sh. S.K. Mishra, Advisor (F), DOT visited C-DOT on 25th April, 2023

Sh. S.K. Mishra, Advisor (F), DOT visited C-DOT and offered his valuable suggestions to researchers on achieving wider proliferation, outreach & commercialisation of indigenous technologies amid demonstration of C-DOT's diverse Telecom solutions at its Delhi campus.

Advisor (F), DOT, visiting C-DOT labs and witnessing the demonstration of C-DOT technologies

- C-DOT showcased the live demonstration of its home-grown Telecom solutions including 5G & AI/ML applications at IETE (The Institution of Electronics and Telecommunication Engineers) International Conference India (IICI) 2023 at Bengaluru on 4th May, 2023

C-DOT researchers showcasing the home-grown Telecom solutions at IICI 2023

- **C-DOT demonstrated various innovative solutions related to Disaster Management, e-health, IoT, 5G & Smart metering developed in collaboration with startups at National Technology Day2023 Exhibition on 11th May, 2023**

Sh K. Rajaraman, Secretary (T), witnessing the technology demonstration at the stall

- **Launch of citizen centric portal 'SANCHAR SAATHI' by Hon'ble Union Minister Shri Ashwini Vaishnaw on 16th May, 2023**

Hon'ble Union Minister for Communications, Electronics & IT and Railways Shri Ashwini Vaishnaw launched a citizen centric portal 'SANCHAR SAATHI' developed by C-DOT.

Hon'ble Union Minister addressing C-DOT and DOT officers during the launch

- **Demonstration of various innovative solutions related to e-health & IoT by Hon'ble Union Minister Shri Devusinh Chauhan Ji on 17th May, 2023**

Hon'ble Union Minister of State for Communications, Shri Devusinh Chauhan Ji witnessed the demonstration of various innovative solutions related to e-health & IoT, indigenously developed by C-DOT in collaboration with startups – Salcit, SSwaasa, Easiofy & JNE Smart at the World Telecom Day 2023 celebrations in New Delhi.

Ms. Shikha Srivastava, Director, C-DOT giving a brief of
C-DOT's solutions to Hon'ble Minister, Shri Devusinh Chauhan Ji

- **Launch of C-DOT's Open RAN testbed project during the World Telecom Day on 17th May, 2023**

Hon'ble Union Minister of State for Communications, Shri Devusinh Chauhan Ji launched the C-DOT's Open RAN testbed project for conformance, certification & interoperability testing of O-RAN based solutions during the World Telecom Day 2023 celebrations in New Delhi .

Launch of ORAN test-bed project by Hon'ble MoS for Communications, Shri Devusinh Chauhan Ji

- ### Launch of C-DOT Broadcast to Broadband Gateway (BBG) solutions on 20th May, 2023

Hon'ble Minister of State for Communications, Shri Devusinh Chauhan Ji launched C-DOT Broadcast to Broadband Gateway (BBG) solutions enabling content delivery and village level entrepreneurship at Varanasi in the august presence of Hon'ble Minister of State for Commerce and Industry, Smt. Anupriya Patel Ji.

Launch of C-DOT's BBG solution by Hon'ble MoS for Communications, Shri Devusinh Chauhan Ji

- **Chadian delegation visited C-DOT Campus, Delhi on meeting requirements of Chadian Networks on 22nd May, 2023**

The Chadian delegation visited C-DOT Campus, Delhi and visited various C-DOT labs for the demonstration of C-DOT's home-grown Telecom technologies and held insightful deliberations with C-DOT researchers on meeting requirements of Chadian Networks.

The Chadian delegation visiting C-DOT labs

- C-DOT showcased its indigenous Telecom technologies at CommunicAsia 2023, Singapore; Mr. P. Kumaran, High Commissioner of India to Singapore visited C-DOT booth and appreciated C-DOT's Telecom R&D endeavors on 7th June, 2023

A glimpse of C-DOT booth at CommunicAsia 2023, Singapore

- **C-DOT showcased its indigenous solutions for meeting the emerging requirements of ISP (Internet Service Provider) networks at IISPC, Ist India ISP Conclave, Pune on 12th June, 2023**

Dr Rajkumar Upadhyay, CEO, C-DOT delivering his lecture at the event

A glimpse of C-DOT booth at IISPC, Pune

- **C-DOT Delhi and Bengaluru participated in the International Yoga day celebrations on 21st June, 2023**

C-DOT staff at Delhi and Bengaluru campuses performing Yoga on Yoga day

• Visit of Dr. P.D. Vaghela, Chairman, TRAI at C-DOT, Bengaluru on 22nd June, 2023

Dr. P.D. Vaghela, Chairman, TRAI visited C-DOT, Bengaluru & held insightful discussions with C-DOT researchers on emerging dimensions of Telecom technology landscape amid demonstration of C-DOT's indigenous R&D endeavours.

Chairman, TRAI in discussion with C-DOT engineers

Chairman, TRAI witnessing the demonstration of C-DOT developed solutions

• **Delegation from UK Research and Innovation India (UKRI) visited C-DOT Delhi on 22nd June, 2023**

The delegation from UK Research and Innovation India (UKRI) visited C-DOT Delhi & held insightful interactions with C-DOT researchers for collaboration in varied areas of Telecom & ICT.

Presentation and discussion on C-DOT technologies at C-DOT Delhi campus

A visit to C-DOT labs by the UKRI delegation

• **Delegation from the Universal Communications Service Access Fund (UCSAF)-Tanzania visited C-DOT, Delhi on 5th July, 2023**

The delegation from the Universal Communications Service Access Fund (UCSAF)-Tanzania visited C-DOT, Delhi, and held interactions with C-DOT researchers on digital solutions for boosting rural connectivity and delivery of citizen-centric services amid demonstration of C-DOT's home-grown technologies.

UCSAF delegation visiting the C-DOT labs

- **C-DOT demonstrates its indigenously developed advanced Telecom Security solutions at the G20 Conference on 'Crime & Security in the Age of NFTs, AI & Metaverse' on 13th July, 2023**

C-DOT demonstrates its indigenously developed advanced Telecom Security solutions for shielding the networks from the emerging cyber threats at the G20 Conference on 'Crime & Security in the Age of NFTs, AI & Metaverse' at Gurugram.
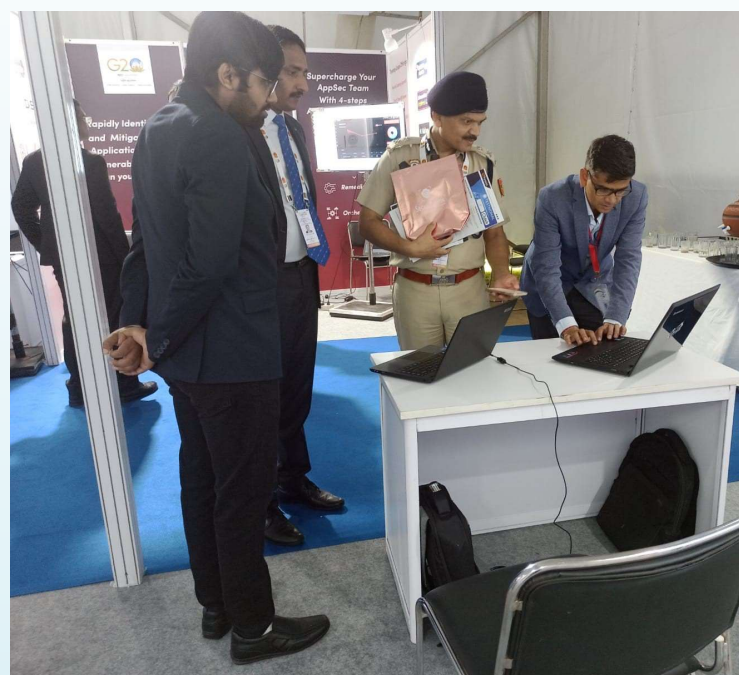
Glimpse of the C-DOT's booth at G20 Conference on
"Crime & Security in the Age of NFTs, AI & Metaverse" at Gurugram

- **Beta launch of indigenous 4G Services in Punjab on 15th July, 2023**

Beta launch of indigenous 4G Services in Punjab; C-DOT is proud of being a part of this eventful journey with Swadeshi 4G that is fueled by the home-grown 4G Core developed by C-DOT.

C-DOT, BSNL and TCS officials at the launch event in Chandigarh

- **C-DOT showcased the demonstration at Strategic Electronics Summit 2023, Bengaluru on 17th July, 2023**

C-DOT showcased the demonstration of its indigenous Telecom technologies & innovative solutions for defense & strategic applications at Strategic Electronics Summit 2023, Bengaluru.

C-DOT's Booth at SES 2023 Exhibition

- **C-DOT demonstrates its home-grown AI solutions at the Artificial Intelligence Summer School (AISS), IIIT, Delhi on 19th July, 2023**

C-DOT 's showcase of Telecom solutions at IIIT, Delhi

- **C-DOT participated in the 'Workshop on Advances in Optical Communication' at IIT Madras on 23rd July, 2023**

C-DOT participated in the 'Workshop on Advances in Optical Communication' at IIT Madras; Hon'ble Minister of State for Communications, Shri Devusinh Chauhan Ji visited C-DOT booth and held insightful interactions with researchers on strengthening national communications networks with indigenous technologies.

C-DOT booth at the event

Dr. Rajkumar Upadhyay, CEO, C-DOT, explaining the solution to Hon'ble Union Minister Shri Devusinh ji

- **C-DOT & TRAI signed MoU on 25th July, 2023**

C-DOT & TRAI signed MoU for cooperation in the areas of Telecom & Broadcasting technologies in the august presence of Dr. P.D. Vaghela, Chairman, TRAI & Shri K Rajaraman, Chairman, DCC & Secretary (Telecom).

MoU signing between C-DOT and TRAI

- **TEC Technology Approval Certificate for C-DOT 4G/LTE eNodeB on 28th July, 2023**

C-DOT received the TEC Technology Approval Certificate for C-DOT 4G/LTE eNodeB from Shri K Rajaraman, Chairman, DCC & Secretary (Telecom).

Dr. Rajkumar Upadhyay, CEO, C-DOT receiving the TEC Technology Approval Certificate from Secretary (Telecom)

• C-DOT demonstrated its indigenous technologies & innovative solutions built in collaboration with startups to NITI AAYOG team led by Ms. V Radha, IAS, Additional Secretary, NITI Aayog amid discussions on aspirational blocks & districts on 3rd August, 2023

C-DOT staff showcasing the solutions to Ms. V Radha, IAS, Additional Secretary, NITI Aayog

- **C-DOT demonstrated its home-grown Telecom technologies at India Africa ICT Expo, Ethiopia on 9th August, 2023**

C-DOT demonstrated its home-grown Telecom technologies with focus on specific requirements of Africa to H.E. Huria Ali Mahdi, State Minister to the National ICT & Digital Economy, Ethiopia at India Africa ICT Expo, Ethiopia.

C-DOT staff demonstrating the solutions to dignitaries at India Africa ICT Expo, Ethiopia

- **C-DOT showcased its home-grown Telecom technologies and digital solutions at the G20 Digital Alliance Innovation (DIA) Mega Summit, Bengaluru on 17th August, 2023**

C-DOT showcased its home-grown Telecom technologies and digital solutions at the G20 Digital Alliance Innovation (DIA) Mega Summit, Bengaluru. Dr. Rajkumar Upadhyay, CEO, C-DOT talked about boosting 'Digital Innovation for One India' amid discussions with domain experts.

A glimpse of C-DOT booth at G20 DIA MegaSummit, Bengaluru

- **C-DOT participated in the 26th National e-Governance Conference and exhibition at Pune on 24th August, 2023**
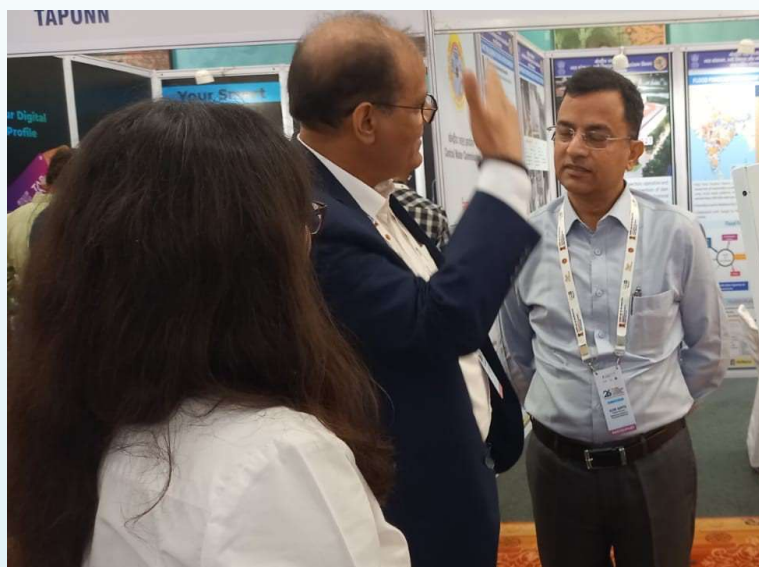
Visit of dignitaries at the C-DOT booth

• Inauguration by Shri Devusinh Chauhan Ji on C-DOT 40th Foundation Day on 25th August, 2023

C-DOT celebrated Ist 40th Foundation Day on 25 Aug 2023; Hon'ble Minister of State for Communications, Shri Devusinh Chauhan Ji inaugurated exhibition showcasing the live demonstration of indigenous technologies & innovative solutions developed by C-DOT & its ecosystem partners at C-DOT's 40th Foundation Day.

Hon'ble Minister of State for Communications, Shri Devusinh Chauhan Ji inaugurating the exhibition on C-DOT's 40th Foundation Day

Launch of C-DOT's ESOC platform by Shri Devusinh Chauhan, Hon'ble Minister of State for Communications on C-DOT's 40th Foundation Day

- ## Technical conference on 'Artificial Intelligence & Machine Learning' as part of its 40th Foundation Day

C-DOT conducted a technical conference on 'Artificial Intelligence & Machine Learning' as part of its 40th Foundation Day celebrations; Field experts deliver insightful talks on diverse themes of AI & ML.

A glimpse of the technical conference on C-DOT's 40th Foundation Day

• Secretary (T), DOT Dr Neeraj Mittal visited C-DOT campus and witnessed the demonstration of C-DOT's key technologies on 7th September, 2023

Demonstration of ITU-T CAP solution to Secretary (T) and Member (S), DOT

Demonstration of ESOC solution to Secretary (T) and Member (S), DOT

- **C-DOT participated in ITU Regional Development Forum for Asia and the Pacific (RDF-ASP) 2023 on 14th September, 2023**

C-DOT participated in ITU Regional Development Forum for Asia and the Pacific (RDF-ASP) 2023, Bangkok and committed one contribution & two pledges to strengthen Innovation & Digital Transformation in collaboration with the ITU Area Office & Innovation Centre, New Delhi.

Presentation by C-DOT at the event

A glimpse of ITU Regional Development Forum for Asia and the Pacific (RDF-ASP) 2023, Bangkok

- **C-DOT and National Physical Laboratory (NPL), CSIR signed agreement on 21st September, 2023**

C-DOT and National Physical Laboratory (NPL), CSIR signed agreement for development of NavIC based IST traceable Primary Reference Time Clock (PRTC) for time synchronization of Telecom networks, 'One Nation One Time', ensuring cyber security and providing an alternate to GPS.

Signing of agreement between C-DOT and NPL

- **Demonstration of home-grown Telecom technologies & innovative solutions at MWC (Mobile World Congress) Las Vegas on 27th September, 2023**

C-DOT showcased the demonstration of its home-grown Telecom technologies & innovative solutions at MWC (Mobile World Congress) Las Vegas, 26 – 28 Sep 2023. Dr. Neeraj Mittal, Chairman, Digital Communications Commission & Secretary (Telecom) and Shri Rakesh Adlakha, Deputy Consul General of India in San Francisco, USA inaugurated C-DOT booth at Telecom Equipment and Services Export Promotion Council (TEPC) India Pavilion in MWC 2023, LasVegas.

Inauguration of C-DOT booth at India Pavilion in MWC 2023, LasVegas

C-DOT's showcase of indigenous Telecom prowess at MWC 2023, Las Vegas

- **SwachhtaHiSeva Shramdaan cleanliness drive at C-DOT campus on 30th September, 2023**

C-DOT staff enthusiastically participated in the SwachhtaHiSeva Shramdaan cleanliness drive at C-DOT campus & reaffirmed their firm resolve to build a cleaner, greener & GarbageFreeIndia.

C-DOT engineers participating in the cleanliness drive outside the office campus

- **Innovative solutions spanning e-health, e-education, remote connectivity, street lighting and water management at the Sankalp Saptah organised by NITI Aayog on 30th September, 2023**

C-DOT and ist start-ups partners showcased innovative solutions spanning e-health, e-education, remote connectivity, street lighting and water management at the Sankalp Saptah organised by NITI Aayog for strengthening the Aspirational Blocks Programme in New Delhi.

Dr Rajkumar Upadhyay, CEO, C-DOT with C-DOT engineers at the Sankalp Saptah Exhibition

- **Sankalp Saptah exhibition where Hon'ble Prime Minister, Shri Narendra Modi Ji interacted with the C-DOT researchers and start-ups representatives on 30th September, 2023**

Hon'ble Prime Minister, Shri Narendra Modi Ji interacted with the C-DOT researchers and start-ups representatives at the Sankalp Saptah exhibition. He also spoke with the beneficiaries of innovative solutions deployed by C-DOT and its start-ups partners at Vidisha, Madhya Pradesh.

Hon'ble Prime Minister Shri Narendra Modi Ji, interacting with the C-DOT researcher at Sankalp Saptah

- C-DOT shared its technology perspectives on the vulnerability of mobile devices at the Inter-American Telecommunication Commission (CITEL) seminar on industry advances in mobile devices security against the threat of alteration of the unique identifier on 3rd October, 2023
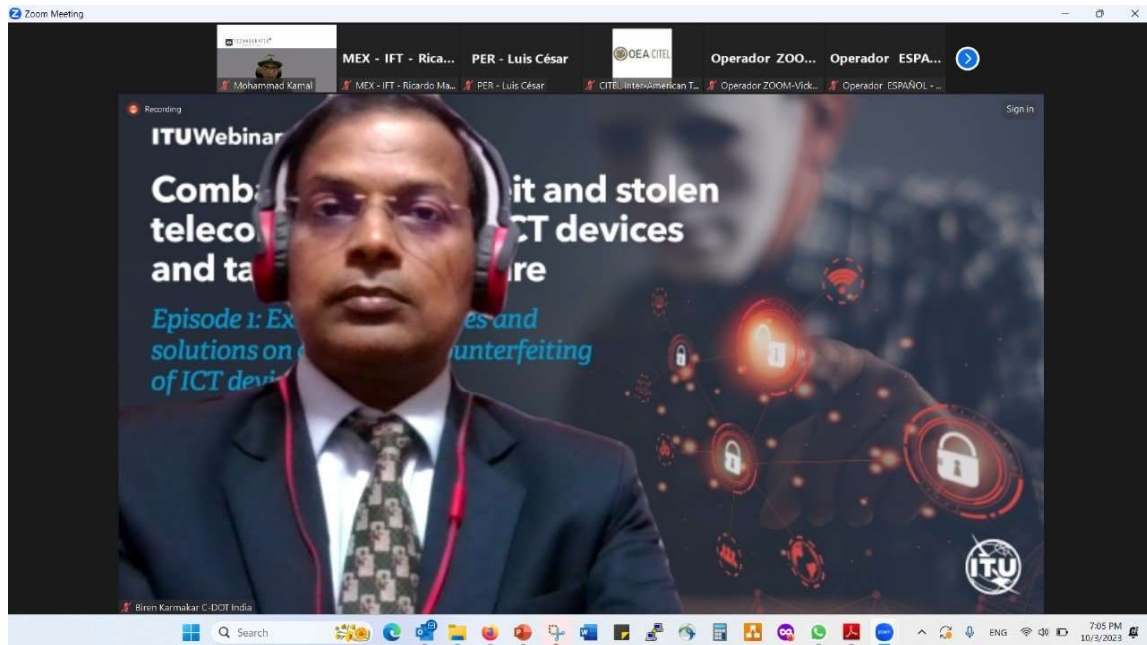
C-DOT's technology expert speaking at the seminar

- **Visit of ITU delegation led by Dr. Bilel Jamoussi, Chief, Study Groups Department, ITU-T at C-DOT Campus, Delhi on 5th October, 2023**

The ITU delegation led by Dr. Bilel Jamoussi, Chief, Study Groups Department, ITU-T visited C-DOT Campus, Delhi and held interactions with the C-DOT researchers on strengthening mutual engagement and collaboration on various Telecom technology initiatives.

ITU delegation at ITU Area Office & Innovation Centre, C-DOT, Delhi

Dr. Rajkumar Upadhyay, CEO, C-DOT, discussing C-DOT's technologies and innovations with the ITU-T delegation

- **Address at Broadband India Summit (BBIS) 2023 by Dr. Rajkumar Upadhyay on 5th October, 2023**

Dr. Rajkumar Upadhyay, CEO, C-DOT delivered the inaugural address at Broadband India Summit (BBIS) 2023 and spoke on the need and ways to connect the unconnected & steps taken by the Government of India to fund telecom start-ups with TTDF & CCRP schemes for extending seamless connectivity to rural & remote areas.

Dr. Rajkumar Upadhyay, CEO, C-DOT lighting the lamp at BBIS 2023 as guest of honour

Dr. Rajkumar Upadhyay, CEO, C-DOT delivering the lecture at the event

- **C-DOT's TRINETRA Solution for Enterprise Security Operation Centre & other Security products at cocon 2023 on 7th October, 2023**

Dr Pankaj Kumar Dalela, Director, C-DOT delivered a talk to various LEAs representatives on C-DOT's TRINETRA Solution for Enterprise Security Operation Centre & other Security products at cocon 2023 - Cyber Security & Hacking Conference in Kochi, Kerala.

Dr. Pankaj Kumar Dalela, Director, C-DOT making a presentation on C-DOT's home grown Security solutions

- **Visit of Prof. Ajay Kumar Sood, Principal Scientific Advisor to the Govt. of India at C-DOT Campus, Delhi on 11th October, 2023**

Prof. Ajay Kumar Sood, Principal Scientific Advisor to the Govt. of India visited C-DOT Campus, Delhi and offered key insights into the emerging realms of R&D & aligning indigenous endeavors with the global market trends for the proliferation of home-grown technologies.

C-DOT researchers giving a brief of Quantum-Safe Cryptography solutions to Prof. Ajay Kumar Sood, Principal Scientific Advisor to the Govt. of India
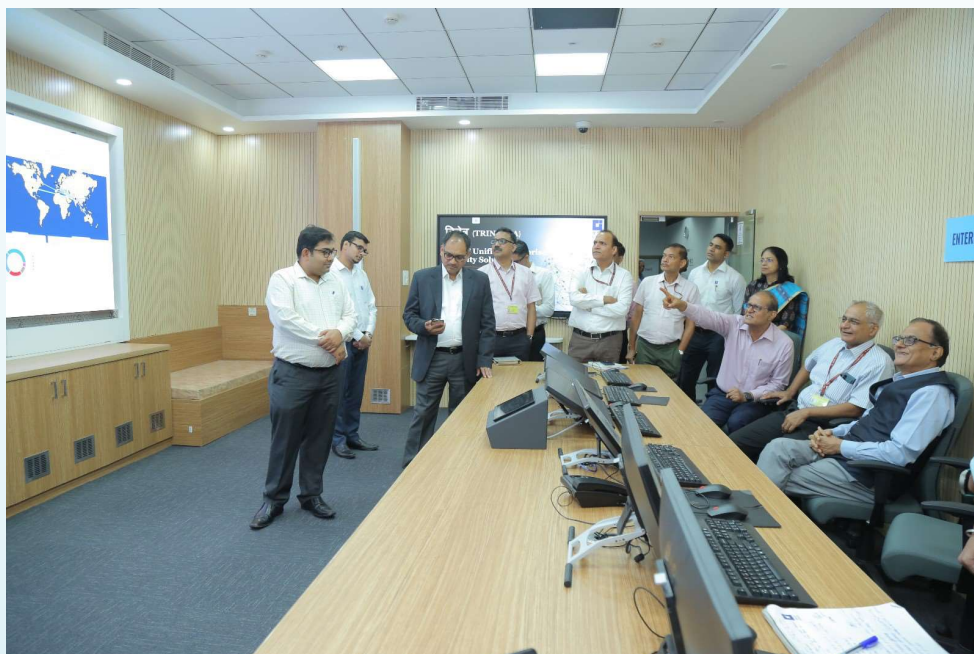
Prof. Ajay Kumar Sood, Principal Scientific Advisor to the Govt. of India and Dr. Neeraj Mittal, Chairman, DCC & Secretary (T) witnessing the demonstration of C-DOT's Cyber Security solutions

- **Common Alerting Protocol (CAP) Workshop in Geneva, Switzerland on 13th October, 2023**

C-DOT participated in the Common Alerting Protocol (CAP) Workshop in Geneva, Switzerland and briefed the participants about the efficacy of its CAP based Early Warning Platform in reducing the loss of lives and property during various natural disasters.

C-DOT's presentation at the CAP workshop in Geneva

- **ITU Workshop on 'Combating counterfeiting & stolen ICT devices' at Geneva on 14th October, 2023**

C-DOT participated in the ITU Workshop on 'Combating counterfeiting & stolen ICT devices' at Geneva and made presentation on its citizen-centric solutions covering the diverse aspects of its successful implementation in India.

Participants of the ITU Conference

- **Visit of Ms. Gunjan Dave, Member (Technology), Digital Communications Commission, Government of India at C-DOT Campus, Delhi on 18th October, 2023**

Ms. Gunjan Dave, Member (Technology), Digital Communications Commission, Government of India visited C-DOT Campus, Delhi and held insightful deliberations with the researchers on emerging Telecom technology trends amid demonstration of C-DOT's home-grown technologies.

Dr. Rajkumar Upadhyay, CEO, C-DOT demonstrating the functioning of Quantum Secure Phone to Member (T)

● **Visit of Hon'ble Prime Minister Shri Narendra Modi Ji at C-DOT booth at IMC 2023 on 27th October, 2023**

C-DOT demonstrated its indigenous Telecom technologies and innovative solutions at India Mobile Congress (IMC) 2023. Hon'ble Prime Minister Shri Narendra Modi Ji visited C-DOT booth at IMC 2023 and witnessed the demonstration of C-DOT's home-grown technologies including 5G, Quantum Communication & Cyber Security.

Hon'ble Prime Minister Shri Narendra Modi Ji, visiting C-DOT booth at IMC 2023

Dr. Rajkumar Upadhyay, CEO, C-DOT demonstrating C-DOT's indigenous solutions to Hon'ble Prime Minister, Shri Narendra Modi Ji at IMC 2023

- **Visit of Hon'ble Union Minister Shri Ashwini Vaishnaw Ji at C-DOT booth at IMC 2023 on 27th October, 2023**

Hon'ble Union Minister Shri AshwiniVaishnaw Ji appreciated C-DOT's indigenous 4G, 5G, Quantum & Cyber Security solutions at C-DOT booth at IMC 2023.

Dr. Rajkumar Upadhyay, CEO, C-DOT demonstrating C-DOT's Post-Quantum Cryptography based solutions to Shri Ashwini Vaishnaw, Hon'ble Minister of Railways, Communications, Electronics & IT at IMC 2023

- **Visit of Hon'ble Union Minister Sh Devusinh Chauhan Ji at C-DOT booth at IMC2023 on 28th October, 2023**

Hon'ble Union Minister Sh Devusinh Chauhan Ji visited C-DOT booth at IMC2023 & witnessed the demonstration of C-DOT's home-grown Telecom technologies including 5G, Quantum & Cyber Security.

Dr. Rajkumar Upadhyay, CEO, C-DOT demonstrating C-DOT's 4G and Quantum communication solutions to Sh Devusinh Chauhan Ji, Hon'ble Minister of state for Communications at IMC 2023

- **Vigilance Awareness Week 2023 with the integrity pledge administered by Dr. Rajkumar Upadhyay on 30th October, 2023**

C-DOT observed the Vigilance Awareness Week 2023 with the integrity pledge administered by Dr. Rajkumar Upadhyay, CEO, C-DOT to the C-DOT staff urging them to participate actively in the fight against corruption.

Dr. Rajkumar Upadhyay, CEO, C-DOT administering the integrity pledge

C-DOT staff during the pledge taking ceremony at the C-DOT Delhi Auditorium

- **Celebration of Rashtriya Ekta Diwas & tribute to Sardar Vallabhbhai Patel on 31st October, 2023**

C-DOT celebrated Rashtriya Ekta Diwas & paid tributes to Sardar Vallabhbhai Patel for his pioneering contribution towards national integration. Dr. Rajkumar Upadhyay, CEO, C-DOT administered the Unity Pledge to the C-DOT staff.
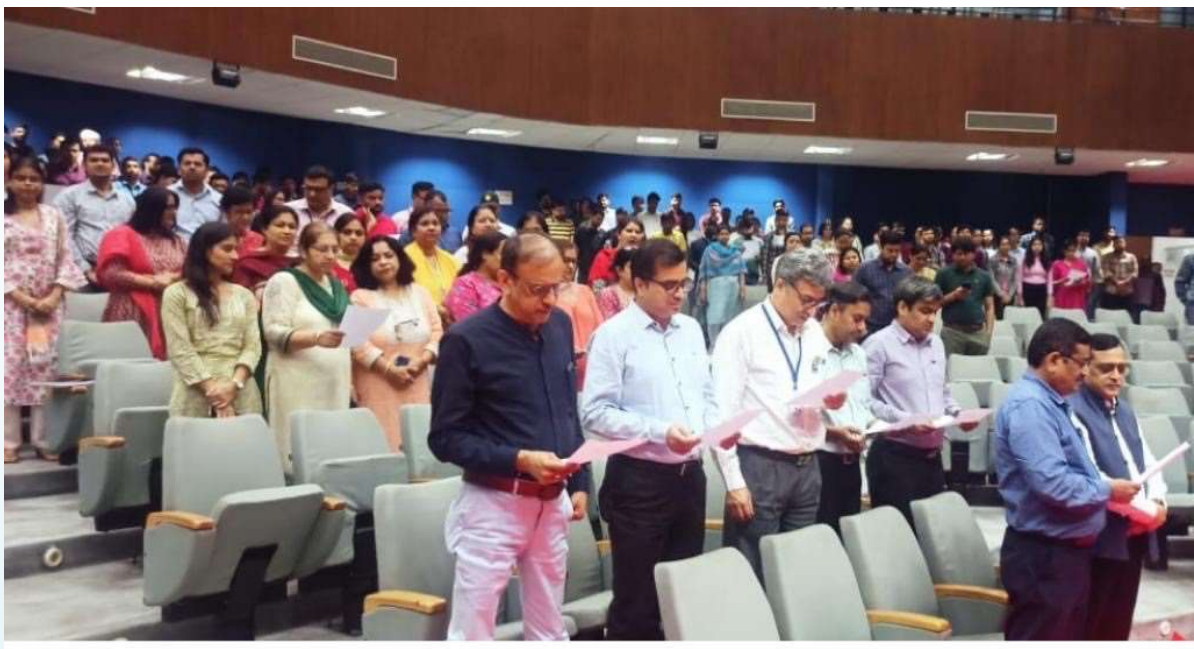
C-DOT staff taking the unity pledge being adminsistered by Dr. Rajkumar Upadhyay, CEO, C-DOT

- **Demonstration of its indigenous Telecom technologies and innovative solutions to United Nations delegation led by Mr. Shombi Sharp, UN Resident Coordinator for India and Ms. Atsuko Okuda, Ph.D, Regional Director, International Telecommunication Union on 31st October, 2023**

Centre for Development of Telematics (C-DOT) demonstrated its indigenous Telecom technologies and innovative solutions including Disaster Management, Cyber Security and 4G/5G to United Nations delegation led by Mr. Shombi Sharp, UN Resident Coordinator for India and Ms. Atsuko Okuda, Ph.D, Regional Director, International Telecommunication Union at C-DOT Campus, New Delhi amid discussions on enhancing India's participation in global ICT initiatives.

Dr. Rajkumar Upadhyay, CEO, C-DOT making a presentation on C-DOT's technology programs to UN delegation

- **C-DOT demonstrated its CAP based Integrated Alert System for Disaster Management at the 6th World Congress on Disaster Management at Dehradun on 29th November, 2023**
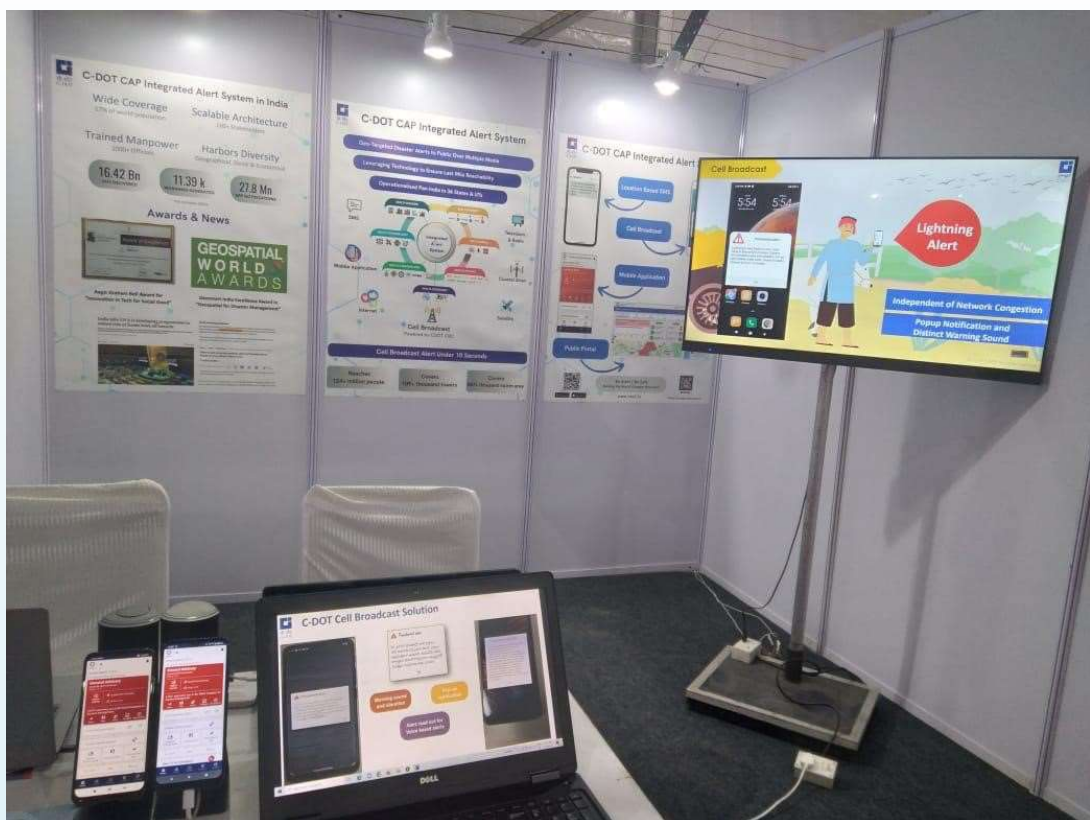
C-DOT's ITU-T CAP based disaster managment solution on display at the event

- **Demonstration of Telecom technologies & innovative solutions including 5G, Cyber Security, Disaster Management & Quantum Communications at Bengaluru Tech Summit on 30th November, 2023**

C-DOT showcased the demonstration of its indigenous Telecom technologies & innovative solutions including 5G, Cyber Security, Disaster Management & Quantum Communications at Bengaluru Tech Summit.

Visitors at the C-DOT stall during the exhibition

- **Visit of Lt Gen Rajeev Kumar Sahni, VSM, DGIS, Indian Army at C-DOT Campus, Delhi on 6th December, 2023**

Lt Gen Rajeev Kumar Sahni, VSM, DGIS, Indian Army visited C-DOT Campus, Delhi & discussed the opportunities for mutual technological collaboration for defence-centric use-cases.

Lt. Gen. Rajeev Kumar Sahni, VSM, DGIS, Indian Army and Dr Rajkumar Upadhyay, CEO, C-DOT
with senior officers of C-DOT and Indian Army at C-DOT Campus, Delhi

A presentation and discussion on C-DOT technologies and solutions with the Indian Army

- **Address by CEO, C-DOT Dr Rajkumar Upadhyay at 4th IndoEU Summit, New Delhi on 7th December, 2023**

CEO, C-DOT Dr Rajkumar Upadhyay stressed upon strengthening collaboration between India & EU in the emerging technologies including 6G, Quantum Communication, Cyber Security, AI/ML & M2M/IoT in his address at 4th IndoEU Summit, New Delhi.

Dr. Rajkumar Upadhyay, CEO, C-DOT delivering lecture at 4th IndoEU Summit, New Delhi

- **Visit of Ambassador of Denmark to India & Prof. Jan W Thomsen, NielsBohr Institute at C-DOT on 8th December, 2023**

Ambassador of Denmark to India & Prof. Jan W Thomsen, NielsBohr Institute visited C-DOT discussed future cooperation in emerging areas including Quantum & Security.

Presentation on C-DOT technologies and solutions by Dr. Rajkumar Upadhyay, CEO, C-DOT to dignitaries from Denmark

Visit to C-DOT labs by the dignitaries from Denmark

- **C-DOT developed NCCS portal for security certification & its integration with MTCTE (Mandatory Testing & Certification Testing) portal on 21st December, 2023**

Secretary (T) , Dr. Neeraj Mittal inaugurated C-DOT developed NCCS portal for security certification & its integration with MTCTE (Mandatory Testing & Certification Testing) portal.

*Inauguration of the NCCS portal by Dr. Neeraj Mittal, Secretary (T) , DOT in the presence of Sh A.K. Sahu, Member (S)
and Dr. Rajkumar Upadhyay, CEO, C-DOT at Sanchar Bhawan, New Delhi*

*Dr. Neeraj Mittal, Secretary (T), DOT, Sh A.K. Sahu, Member (S), DOT, Ms Tripti Saxena, Sr. DDG (TEC) and
Dr. Rajkumar Upadhyay, CEO, C-DOT along with other senior officers from DOT and C-DOT
during the event at Sanchar Bhawan, New Delhi*

- **Launch of online modules for CoA & Technology Approval by Member(S), DOT Sh A.K.Sahu on 29th December, 2023**

Member (S), DOT Sh A.K.Sahu launched online modules for CoA & Technology Approval under TEC's voluntary certification scheme, streamlining processes to boost Start-ups, MSMEs in Telecom & ICT.

Sh A.K. Sahu, Member (S), DOT, Ms. Tripti Saxena, Sr. DDG TEC and
other Senior officers of DOT and C-DOT during the launch event

- **Visit of General Anil Chauhan, PVSM UYSM AVSM SM VSM, Chief of Defence Staff (CDS), Indian Armed Forces, along with his team from Indian Army, Indian Navy and Indian Airforce at C-DOT on 11th January, 2024**

General Anil Chauhan, PVSM UYSM AVSM SM VSM, Chief of Defence Staff (CDS), Indian Armed Forces, along with his team from Indian Army, Indian Navy and Indian Airforce visited C-DOT and witnessed the demonstration of C-DOTs security and strategic solutions for use in Indian defense establishments.

Dr. Rajkumar Upadhyay, CEO, C-DOT demonstrating C-DOT technologies to General Anil Chauhan at C-DOT, New Delhi

General Anil Chauhan at the Entreprise Security Operation centre at C-DOT Campus Delhi

- **Visit of Cuban Delegation led by HE Wilfredo González Vidal, Deputy Minister(Minister of State) for Communications of the Republic of Cuba at C-DOT Delhi on 16th January, 2024**

Cuban Delegation led by HE Wilfredo González Vidal, Deputy Minister(Minister of State)for Communications of the Republic of Cuba visited C-DOT Delhi and had an interesting discussion while C-DOT presented its solutions on 4G/5G, Quantum Key Distribution, ITU-CAP early warning system, Post Quantum Cryptography, Cyber Security, GPON, DWDM, OTN, routers/switches, SAMVAD, etc.

Dr. Rajkumar Upadhyay, CEO, C-DOT dicsusing C-DOTs technology solutions with the Cuban delegates

Visit of the Cuban delegation to C-DOT labs

- **Convergence India Expo 2024 held at Pragati Maidan, New Delhi from 17th-19th January, 2024**

C-DOT showcased groundbreaking and indigenous telecom products like BHARAT 4G/5G, CAP Based Disaster Alert Management System, Quantum Key Distribution (QKD), Post Quantum Cryptography (PQC), Secure Optical Transport Solutions, iOT Middleware Core, Enterprise Cyber Security Solution at Convergence India Expo 2024 held at Pragati Maidan, New Delhi.

C-DOTs booth at Convergence India 2024 at Pragati Maidan, New Delhi
showcasing its cutting edge technologies and innovations

- **Visit of Shri Neeraj Mittal, Secretary(T) at C-DOT stall during Bharat Telecom 2024 Expo. on 30th January, 2024**

  C-DOT showcased its indigenous solutions during Bharat Telecom 2024 expo. Shri Neeraj Mittal, Secretary (T), graced the C-DOT stall with his presence, providing valuable guidance during the showcasing of its indigenous telecom solutions.

Shri Neeraj Mittal, Secretary (T), at C-DOT stall during Bharat Telecom 2024

- **Talk by Dr. Rajkumar Upadhyay, CEO, C-DOT at Wireless Broadband Alliance (WBA)'s Session on Wi-Fi Proliferation on 30th January, 2024**

  Dr. Rajkumar Upadhyay, CEO, C-DOT, delivered a talk at Wireless Broadband Alliance (WBA)'s Session on Wi-Fi Proliferation. Dr. Upadhyay sheds light on bridging the Digital Divide through PM-WANI, a groundbreaking solution for rural connectivity, empowering communities through WiFi hotspots.

Dr. Rajkumar Upadhyay, CEO, C-DOT, delivering a talk at Wireless Broadband Alliance (WBA)

- **Participation of C-DOT in GSMA APAC Asia-Pacific Humanitarian Connectivity Charter Workshop in the Philippines on 1st February, 2024**

C-DOT participated in the GSMA APAC Asia-Pacific Humanitarian Connectivity Charter Workshop in the Philippines, where the CAP Integrated Alert System and Cell Broadcast solution was showcased. Emphasis was placed on the need for Early Warning Systems and technologies available with C-DOT.

C-DOT's technology expert speaking at the seminar

- **Mid Career Training Program conducted by National Telecommunications Institute for Policy Research, Innovation and Training (NTIPRIT) at C-DOT's campus on 2nd February, 2024**

As part of Mid Career Training Program conducted by National Telecommunications Institute for Policy Research, Innovation and Training (NTIPRIT) at C-DOT's campus, Dr. Rajkumar Upadhyay, CEO, C-DOT, and his team presented an in-depth overview of C-DOTs indigenous technologies and cutting-edge solutions to senior ITS officers from the 1989 and 1990 batches.

Dr. Rajkumar Upadhyay, CEO, C-DOT with senior ITS officers during the Mid Career Training Program conducted by National Telecommunications Institute for Policy Research, Innovation and Training (NTIPRIT) at C-DOT's campus

- **Visit of Lt. Gen. Tumul Varma, AVSM, SM, VSM, DG EME & Senior Colonel Commandant, Corps of EME, and senior officers of Indian Army on 8th February, 2024**

Lt. Gen. Tumul Varma, AVSM, SM, VSM, DG EME & Senior Colonel Commandant, Corps of EME, and senior officers of Indian Army visited C-DOT Campus, Delhi. C-DOT displayed state-of-the-art inventions, demonstrating its steadfast dedication to strengthening national defence through technology and moving closer to digitization.

CEO C-DOT, Dr. Rajkumar Upadhyay with Lt. Gen. Tumul Varma at C-DOT campus

- **Second International Quantum Communication Conclave, being held in Vigyan Bhawan, Delhi on 15th February, 2024**

Dr. Rajkumar Upadhyay, CEO C-DOT, sharing his thoughts on "R&D Initiatives in Quantum Communication" during a session on Development of Quantum Ecosystems, at the Second International Quantum Communication Conclave, being held in Vigyan Bhawan, Delhi. Dr. Upadhyay stressed upon the importance of indigenous R&D initiatives in the field of Quantum Secured Communications.

Dr. Rajkumar Upadhyay, CEO, C-DOT, delivers a talk at
Second International Quantum Communication Conclave, Vigyan Bhawan, Delhi

- **Showcase of QKD, PQC, and Quantum Phone at the Second International Quantum Communication Conclave held on 15th February, 2024**

C-DOT showcased indigenous Quantum Communication products - QKD, PQC, and Quantum Phone at the Second International Quantum Communication Conclave.

Shri Prof. Ajay Kumar Sood, Principal Scientific Adviser to the Government of India and Dr. Neeraj Mittal, Secretary (T) visiting C-DOT stall at Second International Quantum Communication Conclave, Vigyan Bhawan, Delhi

- **3rd edition of OpenRANIndia2024 International Conference & Exhibition where Dr. Upadhyay stressed up on indigenous Open RAN initiatives in the country on 16th February, 2024**

Chief Guest, Dr. Rajkumar Upadhyay, CEO, C-DOT, addressed and shared his valuable insights during the 3rd edition of OpenRANIndia2024 International Conference & Exhibition where Dr. Upadhyay stressed up on indigenous Open RAN initiatives in the country and called upon maximum participation of domestic industry / academia to come forward to develop solutions including Chips that will be funded and help contribute to the vision of " AatmanirbharBharat".

Dr. Rajkumar Upadhyay, CEO, C-DOT, delivers a talk at 3rd edition of OpenRANIndia2024 International Conference & Exhibition

- **Second International Quantum Communication Conclave, moderating a panel on "Applications of Quantum Technologies" at Vigyan Bhawan, Delhi on 16th February, 2024**

Dr. Rajkumar Upadhyay, CEO, C-DOT, chairs Second International Quantum Communication Conclave, moderating a panel on "Applications of Quantum Technologies" at Vigyan Bhawan, Delhi.

Dr. Rajkumar Upadhyay, CEO, C-DOT, moderating a panel during
Second International Quantum Communication Conclave

- **Celebration of C-DOT 40th Annual Day, PHOENIX on 16th February, 2024**

C-DOT celebrated its 40th Annual Day, PHOENIX, with unparalleled passion and enthusiasm! The event was a vibrant showcase of culture and talent, featuring captivating dance performances and engaging skits that left everyone mesmerized.

Dr. Rajkumar Upadhyay, CEO C-DOT, with Dr. Neeraj Mittal, Secretary (T), Shri Niraj Verma (Administrator USOF),
Shri S. K. Singhal, DDG AS (DOT) and Shri A Robert J Ravi, DDG (SRI) DOT during the the celebration

- **SAMVAD App successfully passed security tests conducted by DRDO, Ministry of Defence, Govt. of India on 20th February, 2024**

  SAMVAD App, indigenously developed at C-DOT, successfully passed security tests conducted by DRDO, Ministry of Defence, Govt. of India, achieving a Trust Assurance Level (TAL) 4.

SAMVAD App getting recognised and achieving a Trust Assurance Level (TAL) 4

- **Visit of H.E. Mr. Henri Verdier, French Ambassador for Digital Affairs at C-DOT Campus, New Delhi on 21st February, 2024**

  H.E. Mr. Henri Verdier, French Ambassador for Digital Affairs visited C-DOT Campus, New Delhi. We proudly displayed state-of-the-art technologies, demonstrating our steadfast dedication to strengthening our cooperation.

*Dr. Rajkumar Upadhyay, CEO, C-DOT, with H.E. Mr. Henri Verdier, French Ambassador
for Digital Affairs and his team during 5G demonstration*

- **C-DOT participated in Mobile World Congress (MWC) Barcelona held from 26th-29th February, 2024**

C-DOT participated in Mobile World Congress (MWC) Barcelona, where C-DOT showcased its cutting-edge indigenous products including 5G , ITU-CAP based disaster management system, Cell broadcast technology, Quantum communication, cyber security, etc.

Dr. Neeraj Mittal, Secretary, Telecom and Shri Dinesh Patnaik, Ambassador of India
to Spain inaugurate C-DOT stall at MWC, Barcelona

- **Dr Rajkumar Upadhyay, CEO, C-DOT, interacted with telecom players during the Mobile World Congress (MWC) event in Barcelona from 26th-29th February, 2024**

Dr Rajkumar Upadhyay, CEO, C-DOT, interacted with telecom players during the Mobile World Congress (MWC) event in Barcelona and shared key insights on how C-DOT is paving path to become pioneer in telecom technology ecosystem.

Dr. Neeraj Mittal, Secretary, Telecom and Dr. Rajkumar Upadhyay, CEO, C-DOT, meeting key people
from Cisco, Nokia and Ericsson at MWC, Barcelona

- **Visit of Deputy NSA, USA, Ms. Anne Neuberger at C-DOT stall during Mobile World Congress (MWC) held at Barcelona from 26th-29th February, 2024**

Deputy NSA, USA, Ms. Anne Neuberger visited C-DOT stall during Mobile World Congress (MWC), at Barcelona and explored the innovative telecom solutions. Ms. Anne also showed great interest in the security and CAP solutions offered by C-DOT to reduce the risk of climate and cyber calamities.

Dr. Rajkumar Upadhyay, CEO, C-DOT, demonstrating cutting-edge technology to Ms. Anne Neuberger, Deputy NSA, USA, at C-DOT stall during MWC, Barcelona in the presence of Secretary (T), Dr. Neeraj Mittal

- **C-DOT collaborated with Qualcomm Technologies Inc at MWC, Barcelona held from 26th-29th February, 2024**

C-DOT collaborated with Qualcomm Technologies Inc at MWC, Barcelona, to establish a strategic partnership that will foster innovation in India and support India based developers and start-ups working on innovative products and use cases.

Dr. Neeraj Mittal, Secretary (T) and Dr. Rajkumar Upadhyay, CEO, C-DOT during MOU signing with Qualcomm Technologies at MWC, Barcelona

- **Visit of ASEAN Secretariat delegates, led by Telecom Regulatory Authority of India(TRAI) officers at C-DOT Delhi office on 3rd March, 2024**

ASEAN Secretariat delegates, led by Telecom Regulatory Authority of India(TRAI) officers visited C-DOT Delhi office and they were presented with an in-depth overview of our indigenous technologies and cutting-edge solutions.

Dr. Rajkumar Upadhyay, CEO C-DOT and Dr. Pankaj Kr. Dalela, Director, C-DOT,
with ASEAN Delegates led by officers from TRAI

- **Visit of Dr. Neeraj Mittal, Secretary(T) at C-DOT Bengaluru campus on 3rd March, 2024**

Dr. Neeraj Mittal, Secretary(T), visits C-DOT Bengaluru campus where our engineers showcased our cutting-edge technology labs and incredible indigenous solutions.

Dr. Neeraj Mittal, Secretary (T) with Dr. Rajkumar Upadhyay, CEO, C-DOT
exchanging thoughts with C-DOT Bengaluru team

- **Visit of Senior Officers from defence establishments at C-DOT campus on 11th March, 2024**

Senior Officers from defence establishments visited C-DOT campus where C-DOT engineers provided a comprehensive overview of indigenous technologies and cutting-edge solutions, showcasing the relentless R&D efforts contributing to AtmanirbharBharat.

Senior officials from defence establishments during a lab visit at C-DOT campus

- **Visit of Prof. Abhay Karandikar, Secretary- Department of Science & Technology at C-DOT campus on 18th March, 2024**

Prof. Abhay Karandikar, Secretary- Department of Science & Technology visited C-DOT campus where he witnessed live demonstrations of C-DOT's in-house developed solutions in our state-of-the-art labs.

Dr. Rajkumar Upadhyay, CEO, C-DOT, Dr. Pankaj Kr. Dalela & Ms. Shikha Srivastava, Directors of C-DOT,
along with C-DOT engineers during the demostration of outdoor 5G solution to Prof. Abhay Karandikar, Secretary (DST)

- **Visit of Mr. Seizo ONOE, Director-Telecommunication Standardization Bureau of International Telecommunication Union at C-DOT Delhi campus on 20th March, 2024**

Visit of Mr. Seizo ONOE, Director-Telecommunication Standardization Bureau of International Telecommunication Union, to C-DOT Delhi campus along with his team which stood as an invaluable opportunity to exchange insights on telecom standardization and emerging technology development.

C-DOT researchers showcasing the home-grown Telecom solutions to Mr. Seizo ONOE during the visit

- **Hindi Event was organized at C-DOT Delhi to emphasize the importance of using Hindi in our work, which was also attended by officials from the Department of National Language from the Department of Telecommunications on 20th March, 2024**

Discussion during Hindi Event at C-DOT along with officials from Department of Telecommunications

- **Address by CEO C-DOT, Dr. Rajkumar Upadhyay on "Envisioning the Connected Future" at the 23rd Voice&Data Telecom Leadership Forum on 22nd March, 2024**

CEO C-DOT, Dr. Rajkumar Upadhyay, delivered a keynote address on "Envisioning the Connected Future" at the 23rd Voice&Data Telecom Leadership Forum where he focused on the achievements of the Indian telecom sector in various fields such as fastest 5G deployment, mobilephone manufacturing , Patents SEPs, Cybersecurity, AIRevolution, and more.

Dr. Rajkumar Upadhyay, CEO, C-DOT, delivering a keynote address at the 23rd Voice&Data Telecom Leadership Forum, Delhi

- **Visit of Chief of the Air Staff, Air Chief Marshal VR Chaudhari, PVSM, AVSM, VM, ADC alongwith senior officers of Indian Air Force at C-DOT on 26th March, 2024**

Chief of the Air Staff, Air Chief Marshal VR Chaudhari, PVSM, AVSM, VM, ADC, visited C-DOT alongwith senior officers of Indian Air Force. C-DOT proudly showcased cutting-edge innovations, reaffirming our dedication to fortifying national defense through technology and making efforts in contributing to the PM's vision of "AatmanirbharBharat".

Dr Rajkumar Upadhyay, CEO, C-DOT discussing latest innovations in technologies with Air force officers

Awards and Recognition

- ## Awards

- ### Dr. Rajkumar Upadhyay, CEO, C-DOT receiving the "Telecom Person of the Year" Award in the "22nd Voice and Data Telecom Leadership Award 2022" on 19th April, 2023

  C-DOT along with TCS, Tejas Networks and BSNL was conferred with the "Telecom Person of the Year" Award in the "22nd Voice and Data Telecom Leadership Award 2022" for the Made-in-India 4G technology solution.

Dr. Rajkumar Upadhyay, CEO, C-DOT receiving the "Telecom Person of the Year" Award

- ### First Prize for "Excellence in R&D - Large Scale" at Electronic Industries Association of India (ELCINA) Defennovation Awards on 17th July, 2023

  C-DOT received the First Prize for "Excellence in R&D - Large Scale" at Electronic Industries Association of India (ELCINA) Defennovation Awards during Strategic Electronics Summit 2023 in Bengaluru.

Dr. Rajkumar Upadhyay, CEO, C-DOT receiving the ELCINA Award

- **IETE (Institution of Electronics and Telecommunication Engineers) Corporate Award 2023 for Performance in Computer and Telecommunication Systems on 17th September, 2023**

C-DOT has been conferred with IETE (Institution of Electronics and Telecommunication Engineers) Corporate Award 2023 for Performance in Computer and Telecommunication Systems in the Large Enterprises Category.

Dr. Pankaj Dalela, Director, C-DOT receiving the award

A snapshot of the IETE Award plaque

- **First prize in the R&D category at the 48th Electronic Industries Association Of India (ELCINA) Awards on 29th September, 2023**

C-DOT received the first prize in the R&D category at the 48th Electronic Industries Association Of India (ELCINA) Awards for its cutting-edge indigenous endeavors in the area of Quantum Secure Encryption.

C-DOT declared the winner in the R&D category at ELCINA Awards

- **1st prize for Excellence in Innovation at the 48th Electronic Industries Association of India (ELCINA) Awards on 29th September, 2023**

  C-DOT received the 1st prize for Excellence in Innovation at the 48th Electronic Industries Association of India (ELCINA) Awards for its citizen-centric technology initiative, Central Equipment Identity Register (CEIR).

C-DOT team lead by Dr. Rajkumar Upadhyay, CEO, C-DOT receiving the ELCINA Award

- **Sanchar Saathi Portal indigenously developed by C-DOT recognized as a 'Bharat Ratna Atal Bihari Vajpayee Tech Titan of India 2023' in Comm Tech Category for empowering citizens.**

- **C-DOT marks a hat-trick by winning 3 awards at the 14th Edition of Aegis Graham Bell Award on 23rd February, 2023**

C-DOT secured 1st position in following categories and products:

Category	Project
Innovation in Telecom	Quantum Key Distribution (QKD)
Innovation in AI	ASTR
Innovation in Social Good	CEIR (Central Equipment Identity Register) solution

Receiving Award for "Innovation in Telecom" Category

Receiving Award for "Innovation in AI" Category

Receiving Award for "Innovation in Social Good" Category

Dr. Rajkumar Upadhyay, CEO, C-DOT with his team with all the three awards

- **Cell Broadcast Emergency Alerting Solution gets quailified for the next round at WSIS2024 prizes on 31st March, 2024**

  Cell Broadcast Emergency Alerting Solution gets quailified for the next round at WSIS2024 prizes in "C7 - Benefits in all aspects of life - E-environment" Category. Cell Broadcast Solution (CBS) is an indigenously developed end-to-end state-of-the-art solution for instant delivery of critical life-saving emergency information on mobile phones through cellular telecom networks in a broadcast mode.

HR Initiatives in C-DOT

Women Empowerment

C-DOT's Management has always been sensitive to gender issues and has consistently worked towards creating organizational culture reflecting gender equality. Presently, about 29.09% of staff in C-DOT are women.

Existing Policies:

- All female staff members are allowed to avail up to 180 days maternity leave & up to 90 days leaves subsequent to that (270 days inclusive of 180 days maternity leave). For miscarriage/abortion, leave of a total of 45 days in the entire service span is permissible.

- Child Care leave is also granted to eligible female staff on their applying for the same, as per rules.

- C-DOT offers accommodation and transport benefits to all its female employees with different options that maybe availed as per individual needs. This ensures the safety and security of all female employees in the company.

- Reimbursement for residential telephone expenses is admissible to 100% of the female staff.

- Career growth opportunities are available to female employees in C-DOT.

- In management cadres (Team Leaders, Group Leaders, Technical Experts and Director) about 15.8% are women.

- As per the directives of Supreme court, C-DOT has a Complaint Committee for its Centres, at Delhi and Bangalore in case of any complaints relating to Sexual Harassment of female staff at work place for fair and justified view of the complaints, if any, and recommend suitable action on the same to the C-DOT Board.

Employee's Welfare

- For the purpose of coverage for hospitalization expenses, C-DOT has taken a Tailor-made group medi-claim insurance from National Insurance Company Ltd. for Staff members (and their families). The staff in EI grade and below have a coverage of 3.5 lakhs and above and Staff in EII grade and above have a coverage of 5 lakhs and above (7.5 Lakhs , 10 Lakhs and 15 Lakhs). The Group Medi-claim policy has been made effective from 01 April 2006.

- C-DOT has Grievance redressal mechanism for its staff to provide them with an easy & readily accessible machinery for prompt disposal of their day-to-day grievances.

Recruitment of SC/ST and persons with Special Abilities

- For recruitment of persons with special abilities and candidates belonging to SC/ST category, C-DOT follows government rules providing for reservation in jobs in C-DOT.

- C-DOT has a system in place to look after the welfare of persons belonging to these categories and address any problems/complaints that may come up.

Benefits for persons with disabilities

- C-DOT follows guidelines issued by the Government of India with respect to reservations in jobs for specially abled persons.

- The specially abled employees are eligible for double the rates of transport allowance.

- The C-DOT Campus at Delhi has been constructed in such a manner so as to ensure barrier free environment for the especially abled employees. The main entrance/exit can be approached through a ramp together with stepped entry. The elevators connecting the various working areas have been installed in way to facilitate especially abled employees to move around freely from one wing to another.

Recruitment of senior officers

- Recruitment process for 10 nos of Scientist-G positions in Level-14 of 7CPC was completed in 2023-2024.

- Recruitment for the post of Head-P&HR and Legal was also completed in 2023-24.

Technology Commercialization

MoUs and Project Agreements

#	Executable Project	Organisation concerned	Purpose
A	**Next Generation Mobile Technology**		
1	**Academic Interaction on 4G and 5G technology**		
i	4G and 5G technology development	IIT Bombay, India	Joint collaborative research projects in the areas of 4G and 5G
ii	4G and 5G technology development	MoU Ghana	Development of a reliable and cost effective world class communications infrastructure and services in Ghana.
2.	**Development of 4G/5G**		
i	Development of 5G	IIT Roorkee, India	5G technology and related communication system
ii	Development of 5G	NUICC	Manufacturing and delivery of innovative and advanced telecommunication products/services to customers and service providers
iii	Development of 5G	IIT Madras	• High frequency RF modules • Air Interface layer 1 Algorithm and optimization • Massive MIMO baseband algorithm
iv	C-DOT 4G/LTE/IMS for Defense Networks	Alpha Design Technologies Pvt. Ltd., Bengaluru	Framework of cooperation between C-DOT and ADTL for the concerned projects
v	Joint development of 4G Core	Tata Consultancy Services Ltd.	Framework of cooperations of the parties in research and development activities related to the field of telecommunications.
vi	Development of 5G	King's College London, UK	Establishment of 5G Test Bed, M2M/NBIOT, Cloud RAN, End-to-end orchestration
vii	Development of 5G	University of Surrey, UK	Establishment of 5G Test Bed, M2M, Cloud RAN
viii	Development of 5G	University of Bristol, UK	Establishment of 5G Test Bed, Cloud RAN, Machine Learning/AI, Mobile Edge Computing

#	Executable Project	Organisation concerned	Purpose
ix	Development of 5G	Institute for Development and Research in Banking Technology (IDRBT)	• Establishment of a collaborative working partnership in the areas of 5G and Quantum Security in Banking use cases; Deep learning and cryptography Techniques for Banking use cases; • Communications and Networking technologies and products for Banking use cases; Inclusion of indigenously developed Wi-Fi 6 technology/product based on latest IEEE 802.1 lax standard in 5G Testbed for financial inclusion and better connectivity; • Inclusion of indigenously developed Post-Quantum-Cryptography based Encryptor as well as Quantum Key Distribution product in IDRBT 5G testbed for enhanced futuristic security; • Networking, communication and security aspects of BFS use-cases.
x	Development of 4G / 5G	Lekha Wireless Solutions Pvt Ltd	Collaboration in 4G & 5G Technologies.
xi	Collaborative Research Work in 4G/5G	Centre for Development of Advance Computing (C-DAC)	Collaborative Research Work in 4G/5G, broadband, IOT/M2M, packet core, computing etc.
xii	Collaborative Research Work in 4G/5G	Galore Networks Pvt. Ltd.	Collaborative Research in 4G/5G Network Technology.
xiii	Collaborative Research Work in 4G/5G	Society for Applied Microwave Electronics Engineering & Research (SAMEER)	Agreement to implement project under TTDF Scheme: Development of 6G, THz Test Bed with orbital angular momentum and multiplexing
xiv	Collaborative Research Work in 4G/5G	WiSig Networks Pvt.Ltd. Owner Registration Form Escrow No.AT14AE23ML-SBC	Consortium Agreement for collaborative development of disaggregated 5G radio access network solution called as BHARAT RAN
xv	Collaborative Research Work in 4G/5G	Sooktha Consulting Pvt.Ltd	Consortium Agreement for collaborative development of disaggregated 5G radio access network solution called as BHARAT RAN
xvi	Collaborative Research Work in 4G/5G	Resonous Technologies Pvt.Ltd	Consortium Agreement for collaborative development of disaggregated 5G radio access network solution called as BHARAT RAN
xvii	Collaborative Research Work in 4G/5G	Signaltron System Pvt.Ltd	Consortium Agreement for collaborative development of disaggregated 5G radio access network solution called as BHARAT RAN

#	Executable Project	Organisation concerned	Purpose
xviii	4G Radio access network	Indian Institute of Technology, Madras (IITM)	Non-Exclusive License Agreement 16/32/64 antenna FR1 Remote Radio Head (RRH) @3.5 GHz, Integrated antennas, Base band unit (BBU), which is card that fits into a standard server which runs the L2/L3 stack.L1 (Physical Layer) stack compatible with 3GP release 15.3.0.
		Indian Institute of Technology, Kanpur (IITK)	
		Society for Applied Microwave Electronics Engineering & Research (SAMEER)	
B	**Enhancements, upgradations, adaptations and technical support for developed technologies**		
i	Applicable to all relevant projects	Bharat Electronics Limited (BEL), India	Framework for R&D, manufacturing, creation, delivery of solutions, services and support.
ii	Applicable to all relevant projects	ITI Limited	Synergy between R&D efforts and expertise in manufacturing, creation and delivery of innovative telecommunication services and support activities of mutual interest.
iii	Creation of advanced technologies for establishing secure high-speed communication network and services	Centre for Artificial Intelligence and Robotics (CAIR), Defence, India	For establishing secure high-speed communication network and services.
iv	Geo-intelligence and technology planning for NOFN, NMS for NOFN	Bharat Broadband Network Limited (BBNL), India	Establishing a frame-work for cooperation in telecommunication R&D, creation and delivery of innovative telecommunication services and support activities relating to the telecommunication equipment management and services.
v	C-DOT 4G/LTE	ITI Ltd.	To establish a framework for cooperating in Technology transfer of LTE/LTE-A/4G technology based wireless communication systems for ITI to mass manufacture and supply it to potential customers.
vi	Support for Switches & Routers: Routers for Indian Defense Networks	Alpha Design Technologies Pvt. Ltd. (ADTL), Bengaluru	Framework of cooperation between C-DOT and ADTL for the concerned projects.
vii	Support for Switches & Routers: Layer2/Layer3 Ethernet Switches for Indian Defense Networks	Alpha Design Technologies Pvt. Ltd. (ADTL), Bengaluru	Framework of cooperation between C-DOT and ADTL for the concerned projects.

#	Executable Project	Organisation concerned	Purpose
viii	Educational and research programmes under the C-BUDDHI Program of C-DOT	The Institution of Electronics and Telecommunication Engineers (IETE)	To establish skill-based training, educational and research programmes under the C-BUDDHI Program of C-DOT
ix	Educational and research programmes under the C-BUDDHI Program of C-DOT	Global IEEE Institute for Engineers (GIEEE)	To establish skill-based training, educational and research programmes under the C-BUDDHI Program of C-DOT
x	Usage of C-DOT products in RailTel Portfolio of Products	RailTel Corporation	Usage of C-DOT products in RailTel Portfolio of Products that is used to fulfil the customer services that includes RailWire, Internet Bandwidth, MPLS VPN etc.
xi	LTE for railways	Ministry of Railways	Trials of 4G LTE-R Systems in 500 RKM in South Central Railway
xii	NSCS PINE PROJECT	ITI Ltd	Post quantum Inline Network Encryptor
xiii	Indian Railway Network	VISTA INFORMATION SYSTEMS PVT LTD.	To Modernize Signalling System on the Indian Railway Network.
xiv	C-DOT Interoperable Set top box	Modern Communication & Broadcast Systems Pvt. Ltd.	Mutual Interest of the Parties with respect to Set Top Box (STB Projects)
xv	Mass Manufacturing of LTE/LTE-A/4G systems	ITI Limited	Technology Transfer of LTE/LTE-A/4G technology based wireless communication systems for ITI to mass manufacture and supply it to potential customers.
xvi	Applicable to All products	ITI Limited	Dissemination of telecommunication products designed, developed and engineered by the parties.
xvii	IOT/M2M/Cyber Security	IIT Delhi	The list of proposed technology field for projects between IITD & C-DOT are: i) OneM2M based Software Platform for enabling M2M/IoT Communication. ii) Software Application based on Artificial Intelligence and Machine Learning iii) Cyber Security based Solution 5G & Beyond Communication Technology based solution for commercial and strategic applications.

#	Executable Project	Organisation concerned	Purpose
xviii	DVB Wi-Fi Gateway Solution	Eduisfun Technologies Pvt. Ltd (EIF)	Mutual interest of the parties with respect to integration of EIF's stepapp with C-DOT's DVB Wifi gateway solution.
xix	Machine to machine communication	Telecommunications Consultants India Ltd. (TCIL)& ITI Ltd.	M2M based IOT solutions
xx	Generic technologies	Indian Institute of Science (IISC)	.Project Agreement for consultancy
xxi	Optical technology programs	North forge Innovations Inc.	Amending Agreement No.12 to the Service Agreement dated 21.12.2017 (Agreement No. CDO06012017)Supplement POTP Project Services
xxii	Optical technology programs	Indian Institute of Technology, Kharagpur (IIT Kharagpur)	Agreement to Implementation Projects Under TTDF "Prototype Development for XGS-PON OLT and ONU"
xxiii	5G and beyond networks using AI	Indian Institute of Technology Jodhpur (IIT, Jodhpur)	Agreement to Implementation Projects Under TTDF "Automated service management in 5G and beyond networks using AI"
xxiv	CAS STB	M/s City Online Media Pvt. Ltd.	C-DOT IPTV/ OTT STB Solutions
C	Communication and security research and monitoring		
i	CMS	National Technical Research Organisation (NTRO), India	Joint R&D for shared interests and mutual benefits.
ii	CMS	Department of Telecommunications (DOT)	Service level agreement (SLA) AMC Support for CMS Project
iii	CMS	National Remote Sensing Centre (NRSC)/ ISRO	Provision of Bhuvan Map Services to C-DOT under CMS Project & Collaborative Hand Holding Support
iv	CMS national roll-out	BSNL, India	For infrastructural work of RMC DC.
v	R&D for security management for Law Enforcement Agencies: CMS	Centre for Artificial Intelligence & Robotics, (CAIR), Defence, India	• For IP multimedia system (IMS) • Integration with CMS

#	Executable Project	Organisation concerned	Purpose
D	**Synergizing efforts of various public sector understanding and autonomous bodies under DOT for increasing operational efficiency.**		
i	PM-WANI	M/s. Matrecomm	• Sharing of roaming exchange software for PM-WANI for Railtel tender (Tender No. RAILTEL/TENDER/LT/CO/Marketing/2021-22/PM-WANI/02 dt. 02.08.2021)
ii	Joint Exploration of usage of C-DOT Products	Telecommunications Consultants India Ltd. (TCIL)	• Joint Exploration of usage of C-DOT Products and identify other business opportunities in India and abroad.
E	**Synergizing Indian Research and Development efforts in telecommunication with delivery and implementation of C-DOT's innovative and advanced telecommunication solutions and services to manufacturers and customers.**		
i	In the field of IT infrastructure for fibre and wireless networks, NMS, CDOT XPON variants, IoT, M2M, NGN	MOU with Burundi Backbone System, Burundi, Africa	• To establish ICT Industry base in Burundi Backbone System • Broadband delivery in Burundi Backbone System • To monitor, configure and manage the communication elements in Burundi Backbone System for optimal performance. • For extending connectivity in Burundi Backbone System. • Technology based planning of suited telecom network architecture for rural Burundi backbone system. • C-DOT will advise/assist as needed in providing Smart City Solutions for Burundi Backbone System. • Wi-Fi technology enhancement and roll outs, optical aggregation access system, NGN. • Consultancy Services, advice and assist as needed in selection of technologies and planning and implementation. • Advise/Assist as needed in establishment of Centre for Excellence at Burundi Backbone System.
ii	Mathematical Programming in Parallel Laboratory program	C-DAC, C-DOT and IISc (tripartite agreement for MPPLab)	To deal with High Impact Applications of Optimization and Statistics (Big Data).
iii	Telecom solutions	Qualcomm Technologies, Inc. (QTI)	Innovative Telecom Solutions
iv	Machine to machine communication	Rail Vikas Nigam Limited (RVNL)	M2M based IOT solutions
v	Advanced optical communication test bed	Indian Institute of Technology, Madras (IITM)	Agreement to implement project under TTDF Scheme: Development of advance optical communication test bed

#	Executable Project	Organisation concerned	Purpose
F	**NMS technology for BharatNet**		
i	NOFN – For providing broadband connectivity to the rural areas initially by laying incremental fiber cable from nearby blocks.	MOU with BBNL, India	• To monitor configure provision and manage BBNL Network as per signed agreement dated 22.04.2014 • To provide integrated tools for fault localization • Field trial of new GPON technologies in BharatNet and to provide the support for implementation of GPON based networking solutions • To provide software solutions for structured rule based transparent business interactions across stakeholders of BharatNet Project • To provide converged NMS solutions for integration of State lead NMSs/EMSs of multi-vendor systems with centralized NMS Systems (UNMS) of BBNL • Extending the use of broadband delivery from ONT and Use for point to point and point to multipoint communication.
G	**Centre of excellence for Lawful interception**		
i	Post- Quantum Cryptography	IIT Ropar, India	Commercial Hybrid post-quantum SW implementation planned in VoIP, IP encryptor along with an FPGA based post-quantum implementation on an FPGA reference board.
ii	Quantum Key Distribution	Physical Research Laboratory (PRL)	Framework of cooperation of the parties for creation and delivery of innovative Quantum Optical Communication technologies and products.
iii	Quantum technology program	Indian Institute of Technology, Bombay (IITB)	Quantum information, computing Science and Technology (CoE-QuICST) & Semiconductor technology (SemiX)
H	**Disaster Management**		
i	Early Warning Platform	National Disaster Management Authority (NDMA)	Early warning platform for Disaster Management
I	**Quantum Communication**		
i	MDI-QKD	JayPee Institute of Information Technology (JIIT)	Collaboration and partnership for Quantum Communication.
ii	Post-Quantum Cryptography	CRRao AIMSCS	Collaboration for Post Quantum Cryptography
J	**Carrier Networks Transport Technology**		
i	Packet Optical Transport Platform	Priyaraja Electronics	Collaboration Agreement for Optical Cross Connect and Optical Line Systems

#	Executable Project	Organisation concerned	Purpose
K	**C-DOT Collaborative Research Framework**		
i	5G RAN technology	VVDN Technologies Pvt Ltd. & WISIG Networks Private Limited	For the following Products • Single Box Integrated Gnb • O-RAN Macro Cell Gnb
ii	5G RAN technology	Escrowtech India Pvt. Ltd.	Software Escrow Agreement - Multiple Owner Single Beneficiary -with Account No. OR11AF23MLSB 5G radio access network solution called as BHARAT RAN
iii	C-DOT Collaborative program	collaboration Agreement VVDN Technologies Pvt. Ltd. & WISIG Networks Pvt. Ltd.	Consultancy Agreement for Design & Build, Site Preparation, Supply, Installation, Testing & Commissioning of Data Centre on Turnkey Basis at C-DOT, Delhi

Campus Infrastructure

C-DOT having fully developed and integrated 40 acres of green campus at Mandi Road, New Delhi. C-DOT has achieved selfsufficiency to meet it's water demand of 286 KLD through in house 4 no's of bore wells duly approved by the Central Ground Water Authority. The rain water harvesting system in the C-DOT Campus is a valuable resource for enriching ground water table of this area. C-DOT Campus having Sewerage Treatment Plant (STP) of capacity 125 KLD. All the treated sewerage is recycled within the campus for horticulture purposes. Under the Swachh Bharat Mission, C-DOT has installed the AAGA community composter as a solution for managing the waste at source for all bulk waste generators. The power is supplied by BSES directly from the grid of 66 KV. To achieve ecofriendly campus, 1.157 MWp Roof Top Solar (Solar RTS) System has been installed at C-DOT Delhi campus in partnership with Central Electronics Limited (CEL). These systems are installed for 600 KWp and 557 KWp at C-DOT Delhi and Bengaluru Campuses respectively and operating successfully. C-DOT Delhi campus has 3 no. of DG sets each having capacity 1500kVA as a power backup. C-DOT has recently renovated one Block at CDOT Campus and handed over to ITU for its Area Office for South Asia and Innovation Center in India.

Two more labs (Quantum Key Distribution Lab Common Platform for Early Warning System) have also been developed at C-DOT main Technical Block. Infrastructure work has also been initiated to develop 5G Test Bed at C-DOT campus with outdoor testing facility.
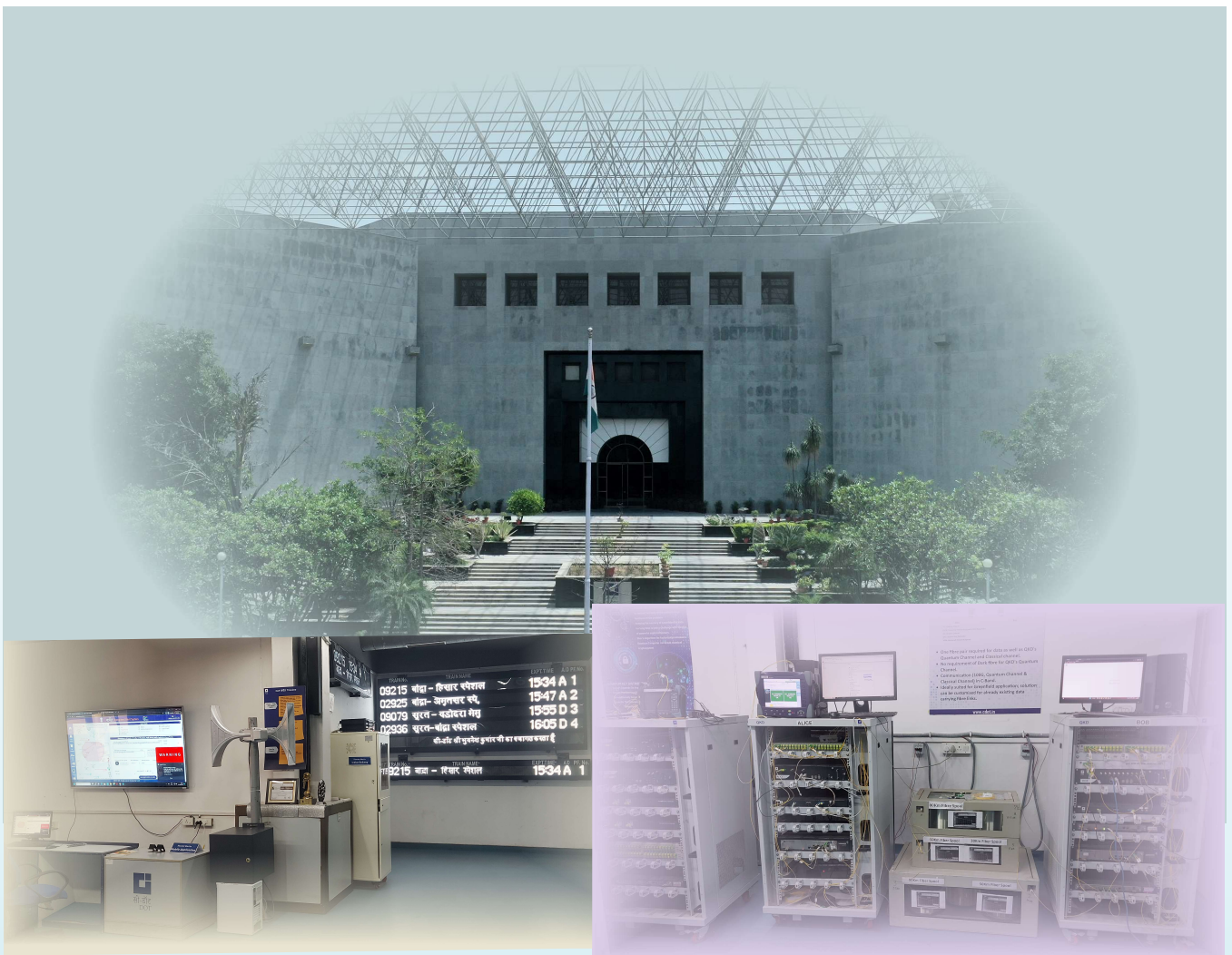
Organizational Processes and Practices

Organizational processes and practices for Sustenance of CMMI Maturity Level 5

The Organization was successfully appraised for CMMI Maturity Level 5 in 2014 for the first time and after the expiry of validity period, successfully re appraised in 2017, for its processes related to hardware as well as software development projects. During FY 2020-21, C-DOT was appraised successfully for sustenance at CMMI ML5 for 3 years.

C-DOT is continuing the sustenance of CMMI ML3 practices through internal quarterly process audits.
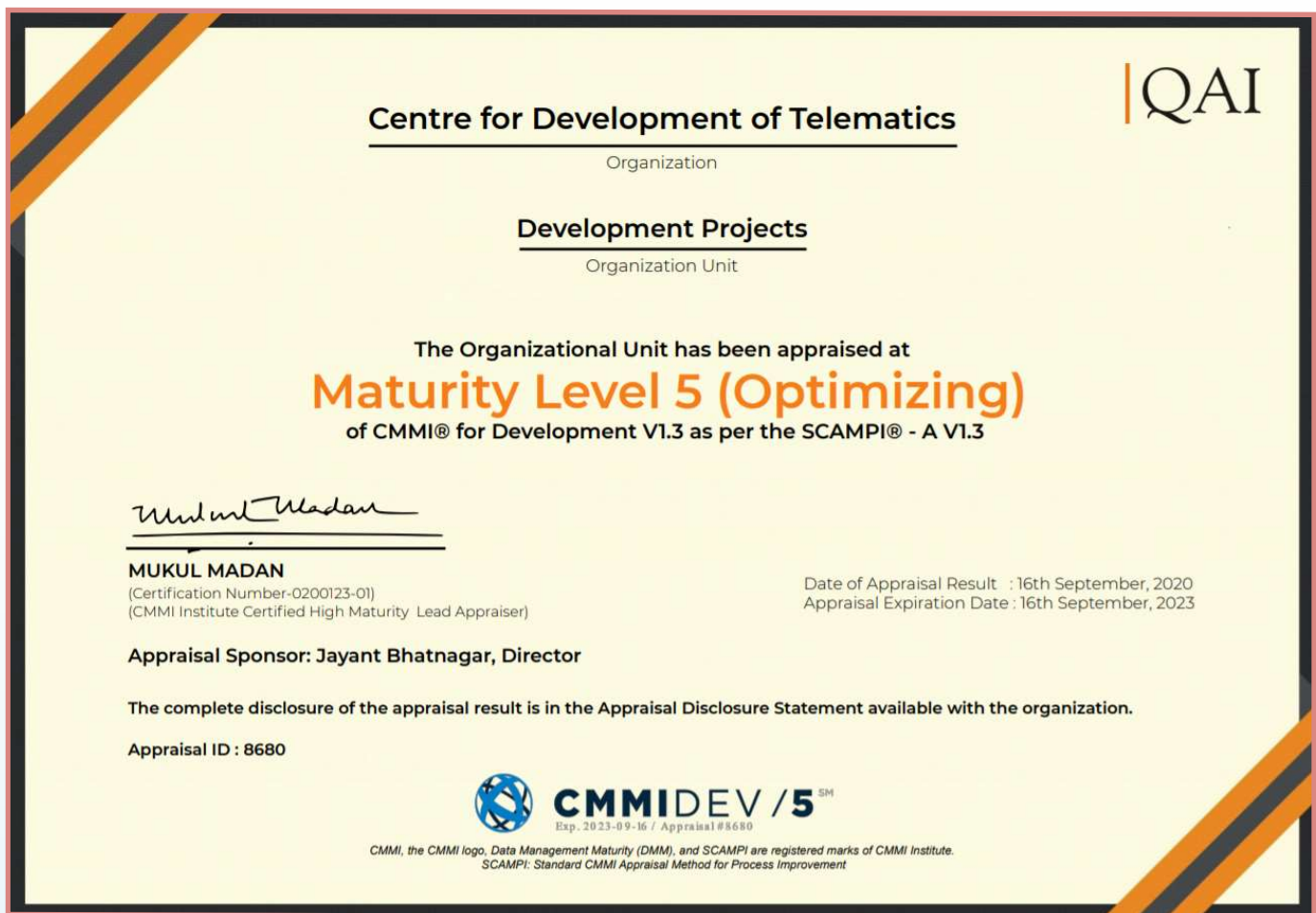
Swachhata Action Plan

 Under the initiative of Swachh Bharat Mission, C-DOT has been proactively taking all the necessary measures to maintain a regular clean and hygienic environment within its campus. As a part of the Mission, "Swachhata Hi Sewa" campaign was observed during the period 15th September to 2nd October 2023.

Regular day-to-day cleaning and hygiene maintenance activities such as deep cleaning, pest control, scrap disposal in the C-DOT premises were taken up during the period. Initiative for the disposal of Single Use plastic (SUP) items was started up for installation of Automatic Recycling Machine can be used for recycling of all kinds of SUP plastic items like plastic bottles, disposable cups, plates, boxes etc. and similar items.

Under "Swachhata Hi Sewa" (SHS) campaign pledge taking ceremony was organized and swachhata pledge was administered on 28th September 2023 in C-DOT with the active participation of all the staff members. Further, as a part of this campaign, there was a cleaning drive (Shramdan Activities) held on 1st October 2023 for an hour in C-DOT Campus and the surrounding areas around the C-DOT Campus. C-DOT Staff members and Senior Officers participated in the cleaning drive (Shramdan Activities) on the day with full zeal and enthusiasm.

Under Swachh Bharat Mission 2.0,' Swachh Diwali Shubh Diwali' campaign was   launched in C-DOT from 6th - 12th November 2023 which aimed at invoking the cultural significance of Diwali with the journey of Swachh Bharat and the principles of Lifestyle for Environment (Mission LiFE). This campaign was aimed at engaging the C-DOT Staff members to prioritize cleanliness of not just homes but also of their neighborhoods, practice source segregation of waste to convert waste to wealth, abstain from Single Use Plastics (SUP) to ecofriendly materials and promote 'Vocal for Local' so as to have clean and eco-friendly celebrations. C-DOT Staff members actively participated in this campaign by taking 'Swachh Diwali Shubh Diwali' pledge on MyGov Platform and also participated in the Signature campaign.

Vigilance Awareness Initiatives

During the year 2023-24 a number of initiatives were undertaken to carry out our vigilance activities, primarily preventive Vigilance, as per the directives of CVC. Practices and procedures related to Operation and Maintenance for various services were reviewed and monitoring mechanisms were strengthened. Pending disciplinary cases / PIDPI complaints have been investigated and concluded as per CVC advice from time to time. Annual Property Return and intimation for acquiring movable/immovable property have now been digitized and are now filled and verified online through Aadhaar authentication. It has been extended henceforth to Group B officers as well.

Further, processing of Vigilance Clearance cases for resignation/ superannuation/ clearance of no dues/ promotions (lateral and vertical)/ foreign travel etc. have been made on-line and process has been improved further.

Integrity Pact has been implemented in C-DOT with the appointment of Independent External Monitor (IEM) and meetings with IEM are being held regularly. Moreover, most of the procurement is done either through Central Procurement Portal (CPP) or Government e-Marketplace (GeM).

Vigilance Awareness Week 2023 was observed enthusiastically in C-DOT (both at Delhi and Bengaluru campus) from 30th Oct to 5th Nov-2023. Integrity pledge was administered by Dr. Rajkumar Upadhyay, CEO, C-DOT. All employees of C-DOT have also taken integrity e-pledge.

Various events like poster making, slogan writing and Quiz competition were organized during the week and winners were suitably awarded. CEO, C-DOT Dr. Rajkumar Upadhyay presided over the prize distribution function.

Transfer of Technology

In support of the Government's Make in India and Digital India programs, C-DOT is promoting the indigenous technology development and manufacturing eco-system in the country.

During the FY 2023-24, 22 ToTs have been signed for 13 technologies with 14 different licensees. As on date, a total of 151 (59 PSUs, 92 PVTs) ToTs have been signed for 47 Technologies, with 43 different Licensees (9 PSUs, 34 PVTs).

ToT Agreements Signed with Prospective Manufacturers

No. of technology	CDOT Technologies / Products	Licensees/TOT Partners as on 31st March 2024					
		PSUs Partners	Total	Private Partners	Total	Total
1.	GPON Damini	BEL BLR, ITI RBL	2	SIS,SMCEL, UTL,VMC,HFCL	5	7
2.	Bhavan Damini	BEL BLR,ITI RBL	2	SIS, VMC,UTL, HFCL	4	6
3.	Daksh Damini	ITI RBL	1	HFCL, Tejas, RHPL, CYIENT, KAYNES	5	6
4.	Mini OLT - 16 Port			HFCL	1	1
5.	4P Mini OLT	ITI	1	GOIP, PEL, SURBHI, CANDID Optronix, Aggressive, VVDN, Ehoome, AdoptNet Tech	8	9
6.	6 slot OLT/Damini	RBL	2	VMC, UTL, HFCL	3	5
7.	GPON OLT 5X	BEL BLR,ITI RBL	2	VMC, UTL, HFCL, SCTSPL, CYIENT, KAYNES	6	8
8.	Chatur Damini &Titli Damak			HFCL , CYIENT, CSC, KAYNES	4	4
9.	Titli Damak	ITI	1	Tejas, VMC	2	3
10.	COLT (Joint Dev.)			Tejas	1	1

No. of technology	CDOT Technologies / Products	Licensees/TOT Partners as on 31st March 2024					
		PSUs Partners	Total	Private Partners	Total	Total
11.	ONT 11			Tejas,CSC ,KAYNES	3	3
12.	ONT 17, 17A, 23, 24, 27, and 28	ITI (17,17A) add-V, ITI (23A , 24, 27, 28 & 4P GPON OLT)	2	PEL, Surbhi, VVDN, GOIP, Alpha Bridge	5	7
13.	ATM	BEL BLR	1			1
14.	MAX-NG	ECIL, IL-KOTA ITI-MKP, BEL-KOT	4			4
15.	AN RAX	ECIL, IL-KOTA ITI-BLR, BEL-KOT	4			4
16.	AN RAX (Extn.)	KELTRON (2), ITI-MKP, IL-Kota	4	RTL	1	5
17.	256 P RAX/SBM (Extn)					0
18.	BBWT Basic	ECIL, ITI-MKP	2	HFCL, SCTSPL, COMINT, Tarangg (MSME)	4	6
19.	BBWT Solar	ITI-MKP	1	COMINT, TARANGG	2	3
20.	BBWT Long Range	ITI-MKP	1	COMINT, TARANGG	2	3
21.	CEM			Scytale	1	1
22.	LTE Router	ECIL	1	Aggressive-EMS	1	2
23.	BBWT (SOLAR NEW)	ITI, BEL-KOT	2	Cyient, Elcom, KAYENS, Aggressive	4	6
24.	Way Finder SW App			Syook, Gaia	2	2
25.	BBWT(HSAP)	ITI, BEL-KOT	2	Cyient, Elcom, KAYNES, Aggressive	4	6
26.	BRTR-10		0	VVDN	1	1
27.	PDO			RCV LTD., KAYNES	2	2
28.	Mini PDO	ITI	1	RCV	1	2
29.	CIAS		0	Aggressive-EMS	1	1

No. of techn ology	CDOT Technologies / Products	Licensees/TOT Partners as on 31st March 2024					
		PSUs Partners	Total	Private Partners	Total	Total	
30.	EAP,XAP,DOA &WGR	ITI	1	PEL, Surbhi, Aggressive	3	4	
31.	QKD	ECIL	1	Scytale, New AgeInst, Chipspirit	3	4	
32.	LTE-RAN	BEL KOT(2), ECIL(2),ITI BLR	3			3	
33.	STBR /Extn.	ITI-MKP	5	HFCL, VVDN	2	7	
34.	CRTR-210	BEL-KOT	1	VVDN	1	2	
35.	L2 Switch /Extn.	BEL KOT	2	HFCL	1	3	
36.	Enhanced L2 Switch	BEL-KOT	1			1	
37.	DRAX/Gyan Setu	ECIL ,ITI	2			2	
38.	NGSG Card	BEL BLR	1			1	
39.	GPSU (75W/125W)	ITI-Naini	1	SCTSPL, Tarangg (MSMS)	2	3	
40.	GPSU (250W)	ITI-Naini	1			1	
41.	CGRAN	ITI-MKP	1			1	
42.	Power Amplifier			TPSED	1	1	
43.	STB	ITI	1	Surbhi	1	2	
44.	C-CAS			Rurutek	1	1	
45.	WAP	ITI	1	Aggressive-EMS	1	2	
46.	OTN Cross Connect & DWDM	BEL-KOT	1	UTL	1	2	
47.	C-IPCAS			MCBS, Catvision	2	2	
Total Technologies-47		Total PSU Partners	9	Total Pvt Partners	34	Total ToTs	
Total ToT Partners		43	PSU ToTs	59	PVT.ToTs	92	151

Promotion of Hindi

Activities of the Rajbhasha Ekak during the year 2023-2024

C-DOT is the leading telecom technology research and development center of the Government of India and it is doing all out efforts to ensure the implementation and compliance of the Official Language Act in C-DOT. The Rajbhasha Ekak (Official Language Cell) has been striving hard to create awareness about Official Language policy of India and to inculcate pride towards Hindi and other Indian languages along with doing its bit to fulfill all the prerequisites.

The year 2023-24 saw significant progress in the promotion of the official language, with various activities being initiated with the aim to promote the usage of Hindi across the organization. In order to motivate engineers and scientists of C-DOT to do their day-to-day official work in Hindi without any hesitation and with ease, Rajbhasha Ekak keeps sharing all relevant information on various aspects of the official language Hindi through the internal e-mail system.

Compliance of Section 3(3) of the Official Languages Act, 1963

In compliance with Section 3(3) of the Official Languages Act, 1963 in C-DOT, all office orders, notifications, contracts, agreements, tender forms, administrative and other reports have been issued bilingually in C-DOT.

Samvaad: Hindi Workshops

As part of the awareness campaign to sensitize employees about the importance of usage of Hindi in official communication workshops, seminars and presentations were held at regular intervals throughout the year. Organising Hindi workshop – Samvad quarterly has been proven to be helpful in changing the mindsets of the employees.

Meetings of Official Language Implementation Committee

Quarterly meetings of the Official Language Implementation Committee were held at regular intervals in both Delhi and Bangalore offices to review the progress made in the implementation of the Official Language.

Member of Town Official Language Implementation Committee (South Delhi-1)

C-DOT is a member of the Town Official Language Implementation Committee (South Delhi – 1). As a key member of TOLIC, C-DOT is also playing an important role as a nodal office for 9 out of 78 offices falling under TOLIC, South Delhi-1 and monitoring the progress made in the implementation of Official Language in these offices at regular intervals.

Apart from this, C-DOT officers actively participated in various competitions organized under the aegis of TOLIC and have won prizes.

Translation of Documents

To facilitate all employees, Rajbhasha Ekak provides translation services to all groups/ divisions. All important documents – Office Orders, Notifications, Tenders, Advertisements etc. have been translated into Hindi by the Official Language Unit.

Hindi Utsav'2023

C-DOT celebrates Hindi Fortnight as Hindi Diwas with enthusiasm. This year also, Hindi Utsav was organised in both the locations in the month of September. Rajbhasha Ekak staff participated in the Third All India Official Language Conference in Pune, inaugurated by Honorable Shri Amit Shah, Home and Cooperation Minister, organized by the Department of Official Language, Ministry of Home Affairs. On occasion of Hindi Divas, a message from Dr. Raj Kumar Upadhyay, Chief Executive Officer, C-DOT was issued. He exhorted all C-DOT officers and employees to do their official work in Hindi.

All staff members were encouraged to participate in innovatively designed competitions, awareness programmes, various talks on relevant topics and Kavi Sammelan during Hindi Utsav.

✦ Traditional Indian Greetings

As in the previous years, this year too competition was organized to promote Indian traditional greetings during Hindi Utsav. During the Utsav, the volunteers of Official Language Unit made surprise calls to the C-DOT members at different times throughout the month and the members who responded with traditional Indian greetings like Namaste, Namaskar, Aadab, Sat Shri Akal, Salaam, Namo Narayan, Ram Ram, Jai. Did Shri Krishna, Jai Gurudev, Jai Sai Ram etc. were honored with a memento.

✦ Essay Writing Competition

An essay writing competition was organized with the aim of promoting writing skills among C-DOT employees. The topic of the essay was shared through e-mail 5 minutes before the start of the competition and the participating members were given permission to write an essay within the time frame of 1 ½ hour on the answer sheet provided by Official Language Unit. Separate prizes were kept for Hindi and non-Hindi speaking persons.

✦ Translation, Noting, Drafting and Official Language Knowledge Competition

In order to maintain the zeal and enthusiasm of the employees in Hindi Utsav, "Translation, Noting, Drafting and Official Language Knowledge Competition" was organized. In the competition, translation was to be done in Hindi and English and interesting questions related to language knowledge were asked. For Noting-Drafting, three situations were given, and the staff had to prepare a draft of noting/letter for one of them. In this competition, separate prizes were kept for Hindi and non-Hindi speaking people.

✦ Story-Writing Competition

A story-writing competition was organized to encourage writing skills and creativity among C-DOT members. An excerpt from the story "Dukh Ka Adhikar" by famous writer Yashpal was given in the answer book of the competition. The participants had to write their own story using this excerpt at the beginning, middle and end of their story and had to come on stage and present the story within the time limit of 5 minutes.

✦ Self-composed poetry recitation competition

To highlight the creative talent among C-DOT personnel, a self-composed poetry recitation competition was organized during the Hindi Utsav. The participants expressed their love for the official language Hindi and presented other burning problems by weaving them into poetic garlands.

✦ Elocution Competition

'Declamation Competition' was organized for the development of vocabulary skills, oratory skills and self-confidence etc. in the official language Hindi among the C-DOT members. In this competition, the participants had to come on the stage and speak for 3 minutes on the topic chosen by them from among the many topics given. Separate awards were kept for Hindi and non-Hindi speaking people.

Overall, Hindi Utsav was celebrated with great enthusiasm and joy in C-DOT in which about 270 members participated with enthusiasm.

⦿ C-DOT Rajbhasha Shri Award

C-DOT Rajbhasha Shri Award has been instituted for promotion of official language and usage of Hindi language in day-to day official work in C-DOT. Four staff members were honored with Rajbhasha Shri Award this year for doing maximum work in Hindi/contribution in the promotion of use of Hindi in daily work. They were awarded a citation and a cash prize of Rs 5000 each. This award is in addition to the regular incentive schemes.

⦿ Kavi Sammelan

To create a conducive environment towards Hindi, Urdu and other regional languages in C-DOT organises Kavi Sammelan/ Mushaira every year. Celebrity poets of eminence like Padmashree Surendra Sharma, Dr. Sita Sagar, Shri Laxmi Shankar Bajpai, Dr. Sarita Sharma, Shri Chirag Jain, Mrs. Mamta Kiran were invited this year on 6 October'2023.

Their creative poetry ignited young minds and the atmosphere was filled with feelings of pride towards Indian language and culture, unity and linguistic harmony.

Official Language Inspection of C-DOT

Shri Anirban Kumar Bisvas, Deputy Director, Regional Implementation Office (South), Department of Official Language, Ministry of Home Affairs visited C-DOT Bengaluru Office on 29 February 2024 to review the implementation of Official Language Policy in C-DOT. He addressed the staff and motivated them to do their maximum official work in Hindi. A team of senior officers of the Department of Telecom visited C-DOT Delhi Office on 20 March 2024 for reviewing the implementation of Official Language policy in C-DOT. The meeting was chaired by Dr. Raj Kumar Upadhyay, CEO, C-DOT and senior officers attended it. A presentation showing C-DOT's technical achievements and Official Language related accomplishments was given by Executive- OL.

The inspecting officers were greatly impressed by the steps taken for promotion of the official language in C-DOT.

Special Mention

C-DOT, Bangalore office achieved target of 100% bilingual correspondence which is way beyond the set target of 55% despite being located in Region "C", through collective efforts of the staff.

In the year 2023-24, the implementation of Hindi as official language in C-DOT has witnessed commendable efforts and achievements. Presently the Official Language Unit is an integral part of the mainstream and everyone from senior most officers to new research engineers participate enthusiastically in all Hindi programs.

Kavi Sammelan

Prize Distribution

C-DOT Delhi Inspection by Department of Telecommunications' Officers

C-DOT Bengaluru program

Knowledge Management

TRAINING AT C-DOT DELHI

Training is an important cornerstone for the growth and sustenance of an organization. So to enhance knowledge and upgrade skills of our employees regular internal & external training programmes are conducted across the year. And employees are encouraged to participate in various seminars and conferences. Various internal and external trainings on technical, managerial and soft-skills are arranged for the employees.

Following are the key trainings conducted during the FY 2023-24:

✦ Induction and Orientation Training of three batches of REs 2023

✦ Training module on "4G Architecture, File Tracking System & Insure + + Profiling Tool"

✦ Training Session on "Prevention of Sexual Harassment at Workplace (POSH) & Holistic, Smart, Stress free & Productive Life for Working Professionals"

✦ Multiple Batches of MDP Residential training Programme at IIM-L

✦ Training module on "IPR Awareness, 4G IMS Call flow & ChatGPT"

✦ Anytime Access for staff to thousands of e-learning courses through i-GOT/C-DOT LMS platform

Training Metrics for 2023-24

S.No.	Training Details for C-DOT Delhi	No. of Persons Attended	Total Time in Trainings (in hrs)
1.	1st Quarter of FY	176	2876
2.	2nd Quarter of FY	192	5079
3.	3rd Quarter of FY	180	2890
4.	4th Quarter of FY	69	735
	Total	**617**	**11530**

Student Training At Delhi for 2023-24

Summer/Winter Student Trainees

Applications Received	Offer Letter Issued	Joined
66	66	58

Winter Student Trainees

Applications Received	Offer Letter Issued	Joined
25	25	21

Induction and Orientation Training of REs 2023 Batches

Induction and Orientation Training of REs 2023 Batches

Visit of IRRS Officers at C-DOT Delhi

Session on Productive & Stress-Free Life for Professionals
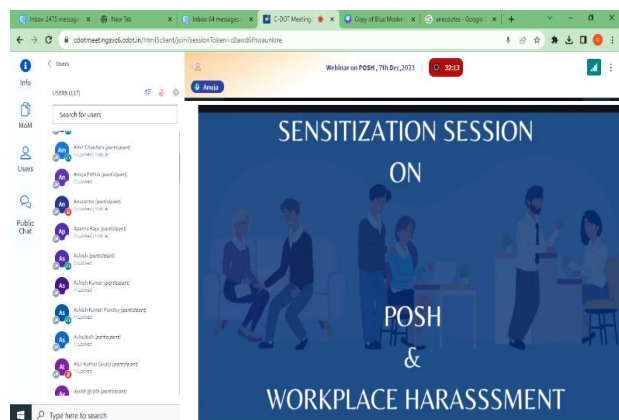
Online Session on POSH

External Trainings - 2023-24

Training & Visits of ITS/IRRS/IPTAFS/JTOs Officers at C-DOT Delhi :

FY 2023-24	No. of Trainings/Visits	No. of Officers	Training Days
Quarter 1	6	93	6
Quarter 2	2	42	6
Quarter 3	3	72	3
Quarter 4	3	85	8
Total	14	292	23

Training Facilitated at NTIPRIT by C-DOT Delhi :

	No. of Trainings	Training Hrs
FY 2023-24	13	19

KMG Delhi also circulates regular mails on topics of employee's development and relevant technical articles. Information related to useful webinars, workshops and events is regularly broadcasted to C-DOT staff on various topics like Webinar on "Data Centre Operations& Maintenance, Security and Certification framework", "The Telecommunications Act 2023", Webinar on "The New ABCs of Application Security", Tech Horizons - Residential Conclave at C-DAC, Programme on "Team Building & Leadership" By NPC, ITU Journal Webinar Series, Webinar on 'Procurement on GEM Portal'.

Knowledge Management Centre, Delhi

Knowledge Management Centre has been established to provide latest scientific and technical information to support C-DOT research and development activities. It includes a rich collection of more than 19,289 technical books, 2199 Hindi books and over 50 periodicals and magazines besides country's 13 leading Newspapers and Newsletters (across locations). For the year 2023 -2024 a total of 60 books were added to the library collections.

C-DOT also subscribes to IEEE and ACM digital library through MCIT consortia. The IEEE Xplore digital library is a powerful resource for discovery of and access to scientific and technical content published by the Institute of Electrical and Electronics Engineers (IEEE) and its publishing partners. The ACM Digital Library (DL) is the most comprehensive collection of full-text articles and bibliographic records in existence today covering the fields of computing and information technology. The full-text database includes the complete collection of ACM's publications, including journals, conference proceedings, magazines, newsletters, and multimedia titles.

Apprenticeship Training

The scheme of Apprenticeship training provides opportunities for practical training to graduate engineers, diploma holders (Technicians) and 10+2 vocational pass outs from about 10,000 industrial establishments/ organizations as per the policies and guidelines laid down by the Central Apprenticeship council (CAC) which is an apex Statutory body constituted under the Apprenticeship Act, 1961. As per these guidelines C-DOT also takes apprentices (graduate, diploma and ITI) on yearly basis.

Category	On roll as on 31-3-2023	Period from 1st April 2023 - 31st March 2024				Present strength as on 31-03-2024
		Inducted	Absent	Resigned	Completed	
Graduate	4	10	0	4	4	6
Diploma - Technical	1	6	0	1	1	5
ITI	0	0	0	0		0
Total	**5**	**16**	**0**	**5**	**5**	**11**

Knowledge Management Group Bengaluru

Training

Continuous efforts are made to enhance the skill sets of C-DOT employees. Employees are encouraged to participate in various seminars and conferences. Various internal and external trainings on technical and managerial skills are arranged for the employees. Knowledge Management Group, Bangalore also broadcasted the notifications of webinars conducted by other institutions on various topics to update the skill set of staff.

Topics on which training were arranged are Standard essential patent and Fair, Reasonable and Non-Discriminatory (FRAND) licensing, 5G essentials, 5G RAN Intelligent Controller, 5G Core, 5G Coverage, Capacity, Optimization and Troubleshooting, 5G NR and ORAN , Hands on Routing of DDR4 and DDR5, PCIe 4.0 and higher standards , Soft skill development and record management, Vigilance awareness, POSH etc. The trainings conducted this year are:

S.No.	Type of Training	No. of Trainings conducted	Participants benefitted
1.	Organizational Training	18	1179
2	Group Specific Training	12	61

Knowledge Management Centre, Bengaluru

Library, Knowledge Management Centre at Bangalore has been established to provide latest scientific and technical information to support C-DOT research and development activities. It includes a rich collection of more than 13000 (technical, Hindi books and Digital medias). It also subscribes periodicals, magazines and newspapers. Library stock verification for 2023-24 was completed. For the year 2023_2024 a total of 109 new books were added to the library collections. Purchase of library books, magazines, Hindi books are governed by Library committee members.

Apprenticeship Training

The scheme of Apprenticeship training provides opportunities for practical training to graduates (engineers and non-engineers), diploma holders (Technicians) and 10+2 vocational pass outs from about 10,000 industrial establishments/organizations as per the policies and guidelines laid down by the Central Apprenticeship council (CAC) which is an apex Statutory body constituted under the Apprenticeship Act, 1961. As per these guidelines C-DOT also takes apprentices (graduate, diploma and ITI) on yearly basis.

Category	On roll as on 31-03-2023	Period from 1st April 2023 to 31st March 2024				Present strength as on 31-3-2024
		Inducted	Absent	Resigned	Completed	
Graduate	17	17	0	6	13	15
Diploma - Technical	0	2	0	0	0	02
Total	17	19	0	6	13	17

Student Internship

As per C-DOT's internship policy, KMG Bangalore engages students pursuing Bachelors and Masters Degrees enrolled in recognized University / Institution within India, as "Interns". The purpose of this scheme is to allow short term exposure of young academic talent to various Verticals / Divisions / Units within C-DOT and be associated with C-DOT's work for mutual benefit. Under this scheme, 47 students got benefitted in FY 23-24.

Institutional Membership

C-DOT holds the following memberships:

Sl. No.	Membership	Membership Details
1	All India Management Association (AIMA)	Institutional Membership since 1994
2	Broadband India Forum, Internet Protocol Television Society (IPTV)	Corporate Membership since 2015
3	Asia Pacific Network Information Centre (APNIC)	Associate Membership since 2005
4	Current Science Association	Institutional Membership since 2016
5	Delhi Management Association(DMA)	Patron Membership since 1996
6	Electronic Industries Association of India (ELCINA)	Associate Membership since 2010
7	European Telecommunication Standards Institute (ETSI)	Associate Membership since 1999
8	3GPP	Individual Membership through TSDSI since 2014
9	India Electronics & Semiconductor association (IESA)	Corporate Membership since 2013
10	Institute of Directors (IOD)	Institutional Membership since 2015
11	Institution of Electronics and Telecommunication Engineers (IETE)	Organizational Membership since 2010
12	International Telecommunication Union (ITU)	Academia Membership since 2019
13	ITU-APT Foundation of India	Institutional Membership since 2018
14	National Association of Software and Service (NASSCOM)	Associate Membership since 1996
15	O-RAN Alliance	Academic Membership since January 2022
16	PICMG	Associate Membership since 2015
17	Telecom Equipment & Services Export Promotion Centre (TEPC)	Corporate Membership since 2015
18	Telecommunications Standards Development Society, India (TSDSI)	Institutional Membership since 2014
19	VoICE	Membership since December 2021
20	IEL and ACM	Institutional Membership since 2004
	Library Memberships	
21	British Council Library	Access 10 Membership
22	Delnet (Developing Library Network)	Institutional Membership

Sl. No.	Membership	Membership Details
20.	Telecommunications Standards Development Society, India (TSDSI)	Institutional Membership since 2014
21.	VoICE	Membership since December 2021
22.	DLMS	Regular Membership since 2022
23.	5G-MAG	Membership since December 2021
24.	IEL and ACM	Institutional Membership since 2004
	Library Memberships	
25.	British Council Library	Access 10 Membership
26.	Delnet (Developing Library Network)	Institutional Membership

Statement of Accounts 2023-24

- Independent Auditor's Report
- Audited Financial Statements
- Notes on Accounts
- Significant Accounting Policies

INDEPENDENT AUDITOR'S REPORT

To
The Members of the Board
Centre for Development of Telematics (C-DOT)
New Delhi

Qualified Opinion

We have audited the accompanying financial statements of **Centre for Development of Telematics (C-DOT)** a society registered under Societies Registration Act, 1860 bearing registration no S/14839 of 1984 (the "Society"), which comprises the Balance Sheet as at 31st March, 2024 and the Statement of Income & Expenditure for the year ended on that date, and Notes to the financial statements, including a summary of significant accounting policies.

In our opinion and to the best of our information and according to the explanations given to us, except for the possible effects of the matter described in the *Basis for Qualified Opinion* section of our report the accompanying financial statements give a true and fair view of the financial position of the society as at 31st March, 2024, and of its financial performance for the year ended on that date in accordance with the Accounting Standards issued by the Institute of Chartered Accountants of India (ICAI).

Basis for Qualified Opinion

a) The Society does not collate and maintain the proper details of MSME Vendors registered under Micro Small and Medium Enterprises Development (MSMED) Act, 2006. Hence, compliances of procurement; provision for interest, if any, on outstanding dues to MSME units could not be verified. We, therefore, are unable to determine the delay, if any, in making the payment to such entities and liability of interest and compliance on such delayed payments in terms of provisions of MSMED Act.

b) Project-ISP which was jointly performed with Centre for Artificial Intelligence & Robotics (CAIR) and a portion of revenue was to be shared. Revenue to be shared that was earned during the period 2010-2024 amounts to Rs. 1860.66 Lakhs out of which amount of Rs. 249.54 Lakhs is booked for the Financial Year 2023-24 and total amount remains unpaid as on 31-03-2024.In the absence of supporting documents (Except for one initial document dated 26th December'2008), Confirmation etc., we cannot comment if the liability is correctly calculated and payable as on date.

We conducted our audit in accordance with the Standards on Auditing (SAs) issued by ICAI. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements Section of our Report. We are independent of the entity in accordance with the ethical requirements that are relevant to our audit of the financial statements, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our qualified opinion.

Emphasis of Matter

We draw attention to:

a) Note 3(b)(i) of Schedule 14 Outstanding dues amounting to Rs.3343.27 lakhs included in Sundry debtors, due from one of the licensees, were to be adjusted by transfer of land and building at Bangalore unit. The matter of transfer of land & building was referred by M/s ITI Ltd. To Administrative Mechanism for Resolution of CPSEs Dispute(herein after referred as AMRCD) and as per the AMRCD order dated 01.07.2024, ITI shall transfer the ownership of land and building to C-DOT for a consideration of Rs.200 Crores. As per the above order of AMRCD, there shall be no dues payable by ITI to C-DOT and by C-DOT to ITI, after the execution of the sale deed and the payment of the sale consideration.

b) Note No.3(b)(ii) of Schedule 14 that Sundry debtors of Rs.4524.07 lakhs, remain unconfirmed. Out of above, most of the dues are from PSU's and Govt. Agencies, recovery of which are being under Synergy initiative of Ministry, hence considered good.

c) Para No 5 of Schedule 13 whereby inventories comprising of components, stores, spares of Rs. 6,937.46 Lakhs which are intended to be used for in-house research & development and are held till obsolescence of entire technology of project and valued at cost, and net realizable value is not considered as the sale of components, stores are not intended. Also, in the absence of complete and readily available details of non-moving inventory for more than 5 years we cannot comment on the adequacy of the provision made and whether 5% value kept after provision is sufficient or otherwise.

d) Para No 8 of Schedule 13 that revenue is recognized when it is not unreasonable to expect ultimate collection.

Our report is not modified in respect of above matters.

Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with the aforesaid Accounting Standards, and for such internal control as management determines it necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the society's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the society or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the society's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

For Doogar & Associates

Chartered Accountants

Firm Reg. No. 000561N

Mukesh Goyal

Partner

Membership No. 081810

UDIN: 24081810BKFMRP8100

Place: New Delhi

Date: 26-07-2024

BALANCE SHEET AS ON MARCH 31, 2024

(in Rupees)

Particulars	Schedule No.	2024	2023
CORPUS/CAPITAL FUND AND LIABILITIES			
Corpus/Capital fund	1	10,46,15,34,168.60	8,25,49,95,138.89
Current liabilities and provisions	2	3,18,02,43,706.70	2,88,01,24,350.46
TOTAL		**13,64,17,77,875.30**	**11,13,51,19,489.35**
ASSETS			
Fixed assets	3		
Gross block		7,61,52,43,815.20	6,71,05,20,916.38
Less :- Depreciation		6,22,12,49,605.39	5,76,14,52,153.97
Net block		**1,39,39,94,209.81**	**94,90,68,762.41**
Capital work-in-progress	4	1,18,80,479.50	72,46,064.50
Current assets, loans, advances and deposits	5	12,23,59,03,185.99	10,17,88,04,662.44
TOTAL		**13,64,17,77,875.30**	**11,13,51,19,489.35**
Significant accounting policies	13		
Contingent liabilities and Notes on accounts	14		

Schedules 1 -14 form an integral part of the Financial Statements.

As per our report of even date .
For Doogar & Associates
Chartered Accountants
Firm Regn. No. 000561N

For and on behalf of
Centre for Development Of Telematics

  Sd/-
(Mukesh Goyal)
Partner
Membership No.081810

Sd/-
(Mahinder Singh)
Chief Finance Officer

Sd/-
(Dr. Rajkumar Upadhyay)
Chief Executive Officer

Place : New Delhi
Date: July 26, 2024
UDIN: 24081810BKFMRP8100

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED MARCH 31, 2024

(in Rupees)

Particulars	Schedule No.	2024	2023
INCOME			
Income from TOT, Royalty, TSR/FSR & Publications	6	3,54,32,26,652.62	2,32,27,15,646.47
Interest earned	7	43,57,54,764.14	23,53,71,139.19
Other income	8	8,78,42,152.70	3,76,49,582.04
TOTAL (A)		**4,06,68,23,569.46**	**2,59,57,36,367.70**
EXPENDITURE			
Establishment expenses	9	3,96,42,73,770.71	3,47,43,15,925.19
Operational expenses	10	2,74,86,47,959.85	1,21,91,12,356.96
Other administrative expenses	11	58,70,08,808.32	48,96,63,269.95
Depreciation	3	45,32,85,963.42	26,08,47,238.04
TOTAL (B)		**7,75,32,16,502.30**	**5,44,39,38,790.14**
Excess of expenditure over income for the year [(B)-(A)]		3,68,63,92,932.84	2,84,82,02,422.44
Add/(Less) :-			
Adjustments pertaining to prior period items (Net)	12	70,68,037.45	1,07,62,259.87
Balance being excess of expenditure over income		**3,69,34,60,970.29**	**2,85,89,64,682.31**
Add :- Excess of expenditure over income of previous years		40,35,91,58,023.23	37,50,01,93,340.92
Balance being deficit carried to Corpus / Capital fund		**44,05,26,18,993.52**	**40,35,91,58,023.23**
Significant Accounting Policies	13		
Contingent Liabilities and Notes on Accounts.	14		

Schedules 1 -14 form an integral part of the Financial Statements.

As per our report of even date .
For Doogar & Associates
Chartered Accountants
Firm Regn. No. 000561N

For and on behalf of
Centre for Development Of Telematics

Sd/-
(Mukesh Goyal)
Partner
Membership No.081810

Sd/-
(Mahinder Singh)
Chief Finance Officer

Sd/-
(Dr. Rajkumar Upadhyay)
Chief Executive Officer

Place : New Delhi
Date: July 26, 2024
UDIN: 24081810BKFMRP8100

SCHEDULE 1- CORPUS/CAPITAL FUND
(Forming part of the Balance Sheet as at March 31, 2024)

(in Rupees)

Particulars	2024		2023	
Grants (i) Grants from Department of Electronics & Information Technology (Formerly known as Department of Electronics) (ii) Grants from Department of Telecommunication	33,52,00,000.00	33,52,00,000.00	33,52,00,000.00	33,52,00,000.00
Balance at the beginning of the year Add - Contributions towards corpus/capital fund during the year	48,27,89,53,162.12 5,90,00,00,000.00	54,17,89,53,162.12	43,27,89,53,162.12 5,00,00,00,000.00	43,27,89,53,162.12
Total Grants (A) Less :- Balance of net expenditure transferred from the Income and Expenditure account (B)		**54,51,41,53,162.12** **44,05,26,18,993.52**		**48,61,41,53,162.12** **40,35,91,58,023.23**
TOTAL (A-B)		**10,46,15,34,168.60**		**8,25,49,95,138.89**

SCHEDULE 2-CURRENT LIABILITIES AND PROVISIONS
(Forming part of the Balance Sheet as at March 31, 2024)

(in Rupees)

Particulars	2024	2023
A. CURRENT LIABILITIES		
1 Sundry Creditors		
a) For Goods	19,34,36,982.10	49,51,21,394.31
b) Others	59,64,68,867.50	24,19,75,092.10
2 Advances received for funded projects		
a) Prebilled invoices	3,75,35,020.00	1,91,58,256.00
b) Others	87,38,41,768.10	82,79,51,343.35
3 Statutory Liabilities	7,28,67,612.96	10,45,12,128.98
4 Other Current Liabilities	29,64,57,061.04	3,54,99,924.49
Subtotal (A)	**2,07,06,07,311.70**	**1,72,42,18,139.23**
B. PROVISIONS		
1 Gratuity	--	12,34,46,140.23
2 Earned leave	1,10,96,36,395.00	1,03,24,60,071.00
Subtotal (B)	**1,10,96,36,395.00**	**1,15,59,06,211.23**
TOTAL (A+B)	**3,18,02,43,706.70**	**2,88,01,24,350.46**

SCHEDULE 3-FIXED ASSETS

(Forming part of the Balance Sheet as at March 31, 2024)

(in Rupees)

Particulars	Gross Block				Depreciation				Net Block	
	As at 01.04.2023	Additions	Adj./Write-Off	As at 31.03.2024	As at 01.04.2023	For the Year	Adj./Write-Off	As at 31.03.2024	As at 31.03.2024	As at 31.03.2023
(A) **Fixed Asset**										
Land - Free Hold	12,00,00,000.00	-	-	12,00,00,000.00	-	-	-	-	12,00,00,000.00	12,00,00,000.00
Building-Office	57,01,80,967.65	-	-	57,01,80,967.65	48,40,98,875.38	86,08,209.23	-	49,27,07,084.61	7,74,73,883.04	8,60,82,092.27
Building-Residential	2,36,27,434.00	-	-	2,36,27,434.00	1,76,47,460.36	2,98,998.68	-	1,79,46,459.04	56,80,974.96	59,79,973.64
R & D Equipment	2,06,31,61,312.68	28,16,47,754.49	-	2,34,48,09,067.17	1,72,68,60,420.78	9,27,16,362.81	-	1,81,95,76,783.59	52,52,32,283.58	33,63,00,891.90
R&D Computers	3,17,80,74,193.88	55,20,75,560.35	1,62,78,719.00	3,74,64,28,473.23	2,91,88,76,421.45	32,84,16,006.71	65,11,488.00	3,25,38,03,916.16	49,26,24,557.07	25,91,97,772.43
Office Equipments & Appliances	29,00,78,296.00	1,39,68,436.28	-	30,40,46,732.28	25,87,85,975.73	68,80,896.50	-	26,56,66,872.23	3,83,79,860.05	3,12,92,320.27
Furniture & Fixtures	40,46,07,297.79	4,04,35,363.66	-	44,50,42,661.45	29,43,91,585.89	1,60,48,424.45	-	31,04,40,010.34	13,46,02,651.11	11,02,15,711.90
Library Books	6,07,91,414.38	3,17,065.04	-	6,11,08,479.42	6,07,91,414.38	3,17,065.04	-	6,11,08,479.42	-	-
Total	**6,71,05,20,916.38**	**88,84,44,179.82**	**1,62,78,719.00**	**7,61,52,43,815.20**	**5,76,14,52,153.97**	**45,32,85,963.42**	**65,11,488.00**	**6,22,12,49,605.39**	**1,39,39,94,209.81**	**94,90,68,762.41**
Previous year's total	6,96,19,14,739.06	38,74,25,300.99	-63,88,19,123.67	6,71,05,20,916.38	6,12,20,72,951.26	26,08,47,238.04	-62,14,68,035.33	5,76,14,52,153.97	94,90,68,762.41	83,98,41,787.80
(B) **Assets in transit**									-	-

SCHEDULE 4-CAPITAL WORK IN PROGRESS
(Forming part of the Balance Sheet as at March 31, 2024)

(in Rupees)

Particulars	As at 01.04.2023	Additions	Trf. to fixed assets	As at 31.03.2024
Campus Delhi - Residential Complex	72,46,064.50	—	—	72,46,064.50
R&D Equipment	—	46,34,415.00	—	46,34,415.00
Total	**72,46,064.50**	**46,34,415.00**		**1,18,80,479.50**
Previous Year Balance	72,46,064.50	—	—	72,46,064.50

SCHEDULE 5-CURRENT ASSETS, LOANS, ADVANCES AND DEPOSITS

(Forming part of the Balance Sheet as at March 31, 2024)

(in Rupees)

Particulars	2024	2023
A. CURRENT ASSETS		
1 Inventories (as taken, valued and certified by the Management)		
a) Stores and spares	94,96,60,577.29	79,45,54,474.16
b) Inventory in transit	99,60,054.88	1,69,70,344.97
	95,96,20,632.17	81,15,24,819.13
Less:- Provision for unmoved stores & spares	16,70,73,109.00	9,43,12,964.00
2 Sundry debtors	**79,25,47,523.17**	**71,72,11,855.13**
a) Debts outstanding for a period exceeding six months	1,07,35,40,247.44	1,13,20,12,283.43
b) Others	19,60,69,333.62	28,26,67,332.64
	1,26,96,09,581.06	1,41,46,79,616.07
Less:- Provision for bad & doubtful debts	29,29,41,760.84	20,34,55,421.84
3 Bank Balances	**97,66,67,820.22**	**1,21,12,24,194.23**
a) With Scheduled banks		
- On Current Accounts	6,39,91,631.73	5,81,73,645.29
- On Deposit Accounts	7,66,70,55,149.00	5,54,49,73,293.00
- On Savings Accounts	1,51,98,27,269.24	2,09,67,84,626.15
	9,25,08,74,049.97	**7,69,99,31,564.44**
Total (A)	**11,02,00,89,393.36**	**9,62,83,67,613.80**
B . LOANS & ADVANCES		
1 Staff Loans	**27,03,177.00**	**30,54,235.00**
2 Advances and other Amounts Recoverable in Cash or in Kind or for value to be received		
a) Contractors & Suppliers	44,56,08,742.82	14,88,95,645.68
b) Employees	3,27,04,695.22	12,31,903.66
c) Prepaid expenses	2,02,78,287.34	1,96,94,725.15
	49,85,91,725.38	16,98,22,274.49
Less:- Provision for bad & doubtful deposits & advances	38,08,700.00	--
3 Income Accrued	**49,47,83,025.38**	**16,98,22,274.49**
a) Staff Loan	3,48,886.27	3,47,514.94
b) On Bank Deposits	12,12,76,529.78	9,62,60,395.00
c) Unbilled revenue (earned)	2,50,52,355.54	--
	14,66,77,771.59	**9,66,07,909.94**
4 Claims Receivable	**3,29,98,526.15**	**2,97,92,561.78**
5 Tax deducted at source	10,65,84,307.08	12,59,91,412.65
Less:- Provision for bad & doubtful income tax refunds	22,36,146.31	--
	10,43,48,160.77	**12,59,91,412.65**
6 Input Tax Credit	**29,51,37,110.74**	**11,44,64,653.78**
Total (B)	**1,07,66,47,771.63**	**53,97,33,047.64**
C. DEPOSITS		
1 Office Building	40,500.00	40,500.00
2 Others	13,91,25,521.00	1,05,83,501.00
3 EMD	--	80,000.00
Total (C)	**13,91,66,021.00**	**1,07,04,001.00**
TOTAL (A+B+C)	**12,23,59,03,185.99**	**10,17,88,04,662.44**

SCHEDULE 6-INCOME FROM TOT, ROYALTY, TSR/FSR & PUBLICATIONS

(Forming part of the Income & Expenditure Account for the year ended March 31, 2024)

(in Rupees)

Particulars	2024	2023
1) Income from Royalty	72,72,599.00	72,43,611.00
2) Income from Transfer of Technology (TOT)	41,50,000.00	26,00,000.00
3) Technology/Field support receipts (TSR/FSR)	3,53,18,04,053.62	2,31,28,63,035.47
4) Income from Publications	--	9,000.00
TOTAL	**3,54,32,26,652.62**	**2,32,27,15,646.47**

SCHEDULE 7-INTEREST EARNED

(Forming part of the Income & Expenditure Account for the year ended March 31, 2024)

(in Rupees)

Particulars	2024	2023
1) On term deposits with Scheduled Banks	38,87,42,404.00	21,44,82,563.00
2) On savings accounts with Scheduled Banks	2,82,46,637.78	1,95,81,553.00
3) On loans to employees	3,34,474.33	4,53,049.19
4) Others	1,84,31,248.03	8,53,974.00
TOTAL	**43,57,54,764.14**	**23,53,71,139.19**

SCHEDULE 8-OTHER INCOME

(Forming part of the Income & Expenditure Account for the year ended March 31, 2024)

(in Rupees)

Particulars	2024	2023
1) Gain due to foreign exchange translation	5,98,924.89	6,05,257.38
2) Miscellaneous income	6,50,14,023.66	3,70,44,324.66
3) Rental income	2,22,29,204.15	-
TOTAL	**8,78,42,152.70**	**3,76,49,582.04**

SCHEDULE 9-ESTABLISHMENT EXPENSES

(Forming part of the Income & Expenditure Account for the year ended March 31, 2024)

(in Rupees)

Particulars	2024	2023
a) Salaries and wages	3,11,65,29,671.00	2,66,77,85,987.00
b) Contributions to provident fund	26,78,99,183.80	24,85,69,390.54
c) Contributions to other fund	1,32,30,142.41	1,18,28,289.00
d) Gratuity provided for employees	3,09,95,951.50	12,34,46,140.23
e) Leave liability provided for employees	7,70,00,595.00	11,10,26,092.00
f) Staff welfare expenses	34,39,71,896.30	30,18,14,591.00
g) Rent on residentials	8,92,88,895.50	12,26,884.05
h) Recruitment and training expenses	2,53,57,435.20	86,18,551.37
TOTAL	**3,96,42,73,770.71**	**3,47,43,15,925.19**

SCHEDULE 10-OPERATIONAL EXPENSES

(Forming part of the Income & Expenditure Account for the year ended March 31, 2024)

(in Rupees)

Particulars	2024	2023
a) R&D components & consumables	61,74,46,288.27	43,80,57,847.70
b) Freight & forwarding charges	1,96,52,032.96	1,57,68,433.21
c) Liquidated Damages Expenses	6,180.91	10,000.00
d) Repair & maintenance - R&D/office equipments	8,97,84,856.10	5,88,33,685.96
e) Design, development & technology support expenses	1,68,01,74,498.93	54,62,01,640.01
f) Technical, Apprentice & Consultancy expenses	10,73,73,497.68	4,89,01,600.08
g) Testing charges	52,10,605.00	33,39,150.00
h) Collaborative research expenses	22,90,00,000.00	10,80,00,000.00
TOTAL	**2,74,86,47,959.85**	**1,21,91,12,356.96**

SCHEDULE 11-OTHER ADMINISTRATIVE EXPENSES

(Forming part of the Income & Expenditure Account for the year ended March 31, 2024)

(in Rupees)

Particulars	2024		2023	
a) Travelling and conveyance expenses		10,59,24,170.65		4,72,78,777.94
b) Vehicle hire charges		23,36,440.56		29,68,829.72
c) Rent, rates & taxes		2,38,50,494.62		47,76,027.00
d) Interest/ penalty paid		1,20,86,250.14		19,35,301.45
e) Electricity & water charges		12,86,21,610.55		11,56,06,241.07
f) Repair & maintenance - Others		11,97,23,574.96		10,44,80,010.32
g) Newspaper , periodicals & journals		89,03,354.27		78,72,062.20
h) Insurance charges		22,44,016.04		17,05,172.78
i) Printing, stationery, photocopy & admin consumables		47,19,027.61		1,20,22,763.38
j) Postage, telephone and communication charges.		1,80,79,265.28		1,08,90,591.95
k) Exhibition, advertisement & publicity expenses		2,63,86,947.09		2,03,67,601.96
l) Conference/ seminar/ membership fees		46,88,537.31		79,58,480.63
m) Legal, professional fees & honorarium		2,16,14,248.27		1,37,33,277.09
n) Patent fees		64,50,699.00		45,55,912.00
o) Remuneration to auditors				
Audit fees	6,60,000.00		6,60,000.00	
Out of pocket expenses	1,84,394.00	8,44,394.00	67,711.00	7,27,711.00
p) Hospitality/ entertainment expenses		2,44,927.70		2,24,305.82
q) Bank charges		42,65,286.80		9,81,877.67
r) Loss due to foreign exchange translation		4,63,328.99		13,15,375.13
s) Miscellaneous expenses		31,049.17		3,300.00
t) Bad debts provided for (receivables, credits & advances)		9,55,31,185.31		13,02,59,650.84
TOTAL		**58,70,08,808.32**		**48,96,63,269.95**

SCHEDULE 12-ADJUSTMENTS PERTAINING TO PRIOR PERIOD ITEMS (NET)

(Forming part of the Income & Expenditure Account for the year ended March 31, 2024)

(in Rupees)

Particulars	2024		2023	
	Debit	Credit	Debit	Credit
INCOME				
Income from TOT, Royalty, TSR/FSR & Publications	–	–	1,69,87,500.01	–
Interest earned	–	–	–	–
Other income	4,40,144.23	–	–	–
EXPENDITURE				
Establishment expenses	35,834.64	–	–	25,707.00
Operational expenses	18,83,061.00	–	–	52,77,394.03
Other administrative expenses	–	18,02,490.42	–	9,22,139.11
Depreciation	65,11,488.00	–	–	
TOTAL	**88,70,527.87**	**18,02,490.42**	**1,69,87,500.01**	**62,25,240.14**
NET TOTAL	**70,68,037.45**		**1,07,62,259.87**	

SCHEDULE 13: - SIGNIFICANT ACCOUNTING POLICIES
(Forming part of the financial statements for the year ended March 31, 2024)

1. Accounting Method

a) The financial statements are prepared on accrual basis of accounting under historical cost convention in accordance with generally accepted accounting principles and standards in India and provisions of the Societies Registration Act, 1860.

b) Being a not-for-profit organization engaged in R&D and allied activities for enhancement of R&D, accounting standards to the extent applicable to a Level IV entity as per Annexure I to the Compendium of Accounting Standards issued by the ICAI have been applied.

2. Use of estimates

a) Preparation of financial statements require estimates and assumptions to be made that effect the reported amount of assets and liabilities on the date of financial statement and the reported amount of revenues and expenses during the reporting period. Differences between actual results and estimates are recognized in the period in which the results are known/materialized.

3. Fixed Assets

a) Fixed Assets are stated at cost less accumulated depreciation and any impairment in value. Cost of fixed assets comprises the purchase price and any directly attributable cost of bringing the asset to its working condition for its intended use.

b) Asset, the individual cost of each of which is Rs 5,000 or less is also capitalized and depreciated in the year of acquisition itself at 100% value reduced by one rupee.

c) Library books are capitalized irrespective of the individual values thereof.

d) Subsequent expenditure related to an item of fixed asset is added to its book value only if it increases the future economic benefits from the existing asset beyond its previously assessed standard of performance.

e) The Management conducts physical verification of fixed assets at the year end and its reconciliation with financial records. Such exercise is undertaken, taking into account the nature /size of activities of the Centre.

4. Depreciation

a) The provisions of Appendix I to the Income Tax Rules, 1962(The Rules), as amended from time to time, are applied with the exceptions indicated below:

i. Assets put to use anytime during the year are depreciated at the full rate prescribed by the Rules.

ii. Library books purchased during the year are depreciated fully in the same year.

iii. Assets, which are sold or discarded or lost or disposed of during the year, do not suffer depreciation for that year.

5. Inventory Valuation

a) Stores and Spares (including machinery spares) are valued at cost. The cost is calculated on weighted average method. Cost comprises expenditure incurred in the normal course of business in bringing such inventories to its present location. Such costs are measured at five percent of the value towards freight, forwarding and customs duty charges, wherever applicable. Further,

i. Stores and spares lying in stock are intended to be used in in-house Research & Development.

ii. Sale of spares is not intended, in general. However, obsolete spares are scrapped and sold with the approval of the competent authority.

iii. The spares are acquired at different times for a particular project as they may be needed till the complete obsolescence of the entire technology used for the project.

iv. Since, the stores and spares are not intended to be traded, valuation of the same at Net Realisable Value is not considered practical as the same would be contrary to their nature and the valuation, therefore, is done as stated above.

b) Obsolete, slow moving and defective inventories are identified at the time of physical verification of inventories and, wherever necessary, provision is made for such inventories.

c) Provision is made at ninety five percent of the value for stores & spares unmoved for the preceding five years.

6. Investments

a) Current investments are valued at lower of cost and fair market value.

b) Long Term Investments, including in Joint Ventures, are carried at cost. Wherever necessary, provision is made to recognize decline, other than temporary, in valuation of Long Term Investments.

7. Accounting for Grants-In-Aid

a) Grants-in-aid received from the Government are treated as towards "Corpus / Capital Funds".

b) The Grants-in-aid are treated as accrued when sanction memos are issued by the Administrative Ministry.

c) Grants given under Collaborative research program are considered as revenue expenditure.

d) Interest earned during the year forms part of the internal accruals, considered at the time of allocation of Grants-in-aid.

8. Revenue Recognition

a) In respect of projects undertaken by the Centre for Telecom Operators and other agencies, the income in relation to these, are accounted for as income, only upon completion of the milestones related to project. Where the milestones/acceptances are not completed, the balances available in the Project account are shown under current liabilities in the balance sheet.

b) Revenue is recognized to the extent that it is possible to estimate/ascertain that the economic benefits will accrue to the Centre and the revenue can be realistically measured. When the Centre is unable to assess the ultimate collection with reasonable certainty, revenue recognition is postponed and is recognized as and when the revenue collection is reasonably certain.

c) Revenue & expenses are accrued as and when they are earned/ incurred and recorded in the financial statements of the periods to which they relate.

9. Foreign Currency Transaction

a) Foreign currency transactions are accounted at the exchange rate prevailing on the date of transaction and the difference between the date of transaction and payment / receipt /accrual are accounted for as income or expenditure, as the case may be.

b) Monetary Current Assets and Current Liabilities denominated in foreign currency are translated at the exchange rate as prevailing at the year end and the resultant gain / loss is adjusted to revenue account.

c) Contingent liabilities denominated in foreign currency are translated at the exchange rate as prevailing at the year end.

10. Retirement and other employee benefits

a) Provident Fund contributions are in the nature of defined contribution scheme. The Centre accounts for the monthly contributions towards Provident Fund which is mainly administered through duly constituted and approved Exempted Trust.

b) The Centre operates defined benefit plan for Gratuity to its employees. The costs of providing benefits under this plan are measured on the basis of actuarial valuation at the end of each year using projected unit credit method.

c) Provisions for compensated absences are accounted for based on actuarial valuation using the projected unit credit method at the year end.

11. Adjustments pertaining to earlier years

Adjustments necessitated during current year pertaining to one or more previous years are treated as prior period items only when the value in each such case exceeds Rs.5000/-.

12. Provisions and Contingent Liabilities

a) The Centre creates provision when there is a present obligation as a result of an obligating event that probably requires an outflow of resources and a reliable estimate can be made of the amount of outflow.

b) A disclosure for a contingent liability is made when there is a possible obligation or a present obligation that may, but probably will not, require an outflow of resources. Where there is a possible obligation or a present obligation in respect of which the likelihood of outflow of resources is remote, as per the view of the Management, no provision or disclosure is made.

SCHEDULE 14: - NOTES ON ACCOUNTS
(Forming part of the financial statements for the year ended March 31, 2024)

PART –A: Balance Sheet

1. **Fixed Assets:-**

   Fixed assets include land at New Delhi measuring 40 acres (same as previous year) which was acquired in 1993 from Government of India. This land has been considered free hold, however, formal conveyancing has not been done in favour of the Centre.

   Reconciliation of physical verification records is in process and will be done in due course.

2. **Capital work-in-progress:-**

   a. It represents cumulative expenditure, incurred since the financial year 2008-09, on proposed housing facility within the C-dot Campus at New Delhi, amounting to Rs. 72.46 lakhs as at 31.03.2024 (Previous year- Rs.72.46 lakhs) and expenditure incurred to procure R&D equipment's on a turnkey basis amounting to Rs.46.34 lakhs as at 31.03.2024 (Previous year- Nil).

   b. This expenditure under this head will be capitalized appropriately under "Fixed Assets", upon completion of the housing facility and the R&D equipment respectively.

3. **Current Assets, Loans, Advances and Deposits**

   a. Inventories:

   The value of components in Bangalore, which were purchased in past years, issued to the indentors and treated as consumed in the accounts of the year of issue, but part of which were returned to the stores during the current year by the indenting groups- Rs. 51.07 Lakhs (Previous year- Rs.76.53 lakhs).

   b. Sundry Debtors amounting to Rs. 12696.09 Lakhs as at 31.03.2024 (Previous year Rs.14146.80 lakhs) includes:-

   i. TOT, Royalty & Technology support dues amounting to Rs.3343.27 lakhs as at 31.03.2024 (Previous year- Rs.3343.27 lakhs) from M/s ITI Ltd. is met by the value of land and building at Bangalore belonging to M/s ITI Ltd. which was taken over by the Centre in the year 2005.

   The matter of transfer of land & building was referred by M/s ITI Ltd. to AMRCD and as per the AMRCD order dated 27.06.2024, ITI shall transfer the ownership of land and building to C-DOT for a consideration of Rs.200 Crores. As per the above order of AMRCD, there shall be no dues payable by ITI to C-DOT and by C-DOT to ITI, after the execution of the sale deed and the payment of the sale consideration.

   ii. Dues for technology/field support/other services rendered to Telecom companies amounts to Rs. 4524.07 lakhs as at 31.03.2024 (Previous year- Rs. 6050.89 lakhs). Letters for obtaining confirmation of the amount recoverable are sent to the respective parties. However, in majority of the cases the confirmations are not received back. Most of the recoverable amounts are due from Public sector undertakings and Government organizations. The dues have been taken up for realization during the synergy initiative by Nodal ministry. Pending finalization of such proceedings the management considers the said dues as good for recovery.

   iii. Provision for Bad & doubtful debts amounting to Rs. 894.86 lakhs (Previous year- 1302.60 lakhs) towards technical support dues has been made during the current year. Accumulated provision as at 31.03.2024 is Rs.2929.41 lakhs (Previous year- Rs.2034.55 lakhs).

   c. Bank balances:-

   Bank balances as at 31.03.2024 includes interest to be refunded on account of specified projects amounting to Rs.45.32 lakhs (Previous year- Rs.15.97 lakhs).

   d. Tax Deducted at Source:-

   Tax deducted at source receivable pertaining to various years, amount to Rs.1065.84 lakhs as at 31.03.2024 (Previous year- Rs.1259.91 lakhs). A provision for bad and doubtful income tax refunds has been made during the current year amounting to Rs.22.36 lakhs (previous year- Nil).

4. **Current Liabilities**

   Amount charged from the ISPs has been booked in the revenue to the tune of C-DOT's share and provision has been created for amount payable to the technology development and implementing partner. Amount as at 31.03.2024 on account of the above provision is Rs.1860.66 lakhs (Previous Year- Rs.1611.11 lakhs).

5. Contingent Liability:-

a. On account of pending legal cases, the amount outstanding is Rs.1805.35 lakhs as at 31.03.2024 (Previous year- Rs.2024.85 lakhs).

b. On account of pending Income tax assessment, the amount outstanding is Rs.321.67 lakhs as at 31.03.2024 (Previous year- Nil).

c. On account of pending service tax assessment, the amount outstanding is Rs.657.26 lakhs as at 31.03.2024 (Previous year- Nil).

6. Capital Commitments:-

Capital commitments as at 31.03.2024 amounts to Rs.14562.99 lakhs (Previous year Rs. 3990.09 lakhs).

PART – B: Income & Expenditure Account

7. Employees' Benefits:-

a. Gratuity:-

Net provision made towards Gratuity, using the Actuarial valuation method, based on existing pay and allowances is Rs.309.96 lakhs (Previous year- Rs.1234.46 lakhs). The Gratuity Trust, which is managed by a separate Board of Trustees comprising of employees of the Centre, is responsible to discharge the liability on this account.

b. Earned Leave (EL):-

As per Rules of the Centre, Earned Leave is encashable by serving employees as well as by those leaving the services, either on superannuation or otherwise. Net expenditure recognized in Income & Expenditure account towards leave liability, based on existing pay and allowances, estimated using actuarial valuation method is Rs.770.01 lakhs (Previous year- Rs.1110.26 lakhs). Accumulated provision as at 31.03.2024 is Rs.11096.36 lakhs (Previous year- Rs. 10324.60 lakhs).

8. Consumption of Components:-

a. Consumption is arrived at by reducing the value of closing stock from the aggregate of the values of opening stock and the purchases made during the year.

b. Components consumed during the current year were Rs.6174.46 lakhs (Previous year- Rs.4380.58 lakhs) which includes provision for stores and spares unmoved for preceding five years amounting to Rs.727.60 lakhs (Previous year-Rs.943.13 lakhs).

9. Foreign Exchange Fluctuations:-

a. The net results out of gains & losses due to fluctuations in Foreign Exchange on account of various transactions during the current year is a gain of Rs. 1.36 lakhs (Previous year loss- Rs.7.10 lakhs).

b. The gains and losses on account of foreign exchange fluctuations are disclosed in Schedule 8 and 11 respectively.

10. Adjustments Pertaining to earlier years (Net):-

It includes income of Rs. (-) 4.40 lakhs (Previous year Rs. (-) 169.87 lakhs) and expenditure of Rs. 66.28 lakhs (Previous year Rs. (-) 62.25 lakhs).

PART – C: General

Previous year's figures have been regrouped or rearranged, wherever necessary, to make them comparable.

Mahinder Singh
Chief Finance Officer

Dr. Rajkumar Upadhyay
Chief Executive Officer

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Canara Bank
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