

TELECOMMUNICATION ENGINEERING CENTRE

Telecommunication Engineering Centre (TEC) is a Standard Setting Organization (SSO) in telecommunication / ICT sector under Department of Telecommunication (DoT), Ministry of Communications in India. TEC is primarily responsible to formulate standards for promoting quality of equipment, systems and services for harmonious growth of communication infrastructure. It also develops new standards for emerging technologies and services. Further, TEC provides testing & certification of goods and services for ensuring inter-operability, quality and safety, apart from advising Government in technological matters.

Keeping pace with the changing roles and policies of the Government, Telecommunication Engineering Centre has evolved into a knowledge hub, advisory body and think tank in the Telecommunications and Information & Communication Technologies (ICT) sector to provide technical expertise to the Government and industry for sustainable and harmonized growth of communication infrastructure in the country.

TEC shall leverage its status as a "Centre of Excellence" in Telecom to position India as a "Lead Telecom Knowledge and Manufacturing Hub" of Asia-Pacific Nations by driving Telecom Standards, Manufacturing Support and Network Building Skill sets in the interests of this region and market.



Develop new specifications and update the existing ones in order to keep pace with the global development.

Establishment of state-of-art telecom laboratories.

Active participation in professional bodies such as ITU, IETF, APT etc. to protect country's interest.

Technology approval for C-DoT in order to develop telecom technology aimed specifically for local manufacturer.

TEC has its head office at New Delhi and four regional offices, one each at Delhi, Kolkata, Bengaluru and Mumbai. The regional offices of TEC are primarily responsible for testing of the telecom products under different certification schemes.

RTEC (NR)

NEW DELHI

RTEC (WR)

MUMBAI

RTEC (SR)

BENGALURU

RTEC (ER)

KOLKATA

Telecommunication Engineering
Centre,
Gate No. 5, Khurshid Lal Bhawan,
Janpath, New Delhi - 110001



<https://www.tec.gov.in/>



@TEC_DoT_India

FUNCTIONS OF TEC

STANDARDIZATION

- ◆ Formulation of Standards in Telecom / ICT Domain
- ◆ Adoption of standards of SDOs as National Standards
- ◆ Representation of India in International Standardisation Bodies such as ITU, 3GPP, OneM2M, APT, IEEE etc.
- ◆ Policy for Cross Sector Standardization and coordination activities thereof.
- ◆ Preparation of Technical Reports as latest technological developments
- ◆ Standards for Broadcasting sector related to Conditional Access System (CAS) and Subscriber Management System (SMS)

TESTING AND CERTIFICATION

- ◆ Mandatory Testing & Certification of Telecom Equipment (MTCTE)
- ◆ Voluntary Testing & Certification of Telecommunication Equipment/ Interfaces/ Services
- ◆ Field trials and validation of Technology/ Product
- ◆ Designation of domestic Conformance Assessment Bodies (CAB) and Certification Bodies (CB).
- ◆ Managing advanced Test Labs viz. NGN Control lab, NGN Transport lab, Green Passport lab, and IPv6 Ready Logo lab for testing of telecom products

NATIONAL ENQUIRY POINT FOR TELECOM SECTOR UNDER WTO-TBT AGREEMENT

TBT ENQUIRY POINT

Contact Person: DDG (IMP&TEP)
Address: Room No. 374, Khurshid Lal Bhawan, Janpath, New Delhi-110001
Contact Number: +(91)-11-23324703
Email ID for TBT related queries: tbt enquiry@tel.tec.gov.in

- ◆ TEC is designated National Enquiry Point of India for Telecom Sector under World Trade Organization (WTO) – Technical Barrier to Trade (TBT) Agreement https://www.wto.org/english/tratop_e/tbt_e/tbt_e.htm
- ◆ The TBT Agreement is part of a broader category of WTO agreements dealing with non-tariff measures (NTMs). NTMs, includes technical regulations, standards and conformity assessment procedures.



WEB PORTALS



<http://www.mtcte.tec.gov.in/>



<https://tec.gov.in/scp/>



<https://tec.gov.in/PPPMII/>

IMPORTANT ACTIVITIES AT TEC

STANDARDIZATION ACTIVITIES

Mobile Technologies

ORAN, 4G-5G Core, ESIM, Mobile Number Portability

Non Geostationary Orbit (NGSO) Satellite Communication Networks in Fixed Satellite Service (FSS), Bandpass filter for C-band satellite earth receivers

Satellite Communication

Radio

Radio Modems in Unlicensed Band, SAR for wireless communication device, Drone Communication, Measurement of Electromagnetic field from Base Station Antenna

Fairness Assessment and Rating of AI Systems, AI Robustness

Artificial Intelligence

Internet of Things

oneM2M, IoT Gateway, Feedback Device, Tracking device, Smart Electricity Meter, End Point Device for Environmental Monitoring

Quantum Key Distribution System, Post Quantum cryptography, Quantum Random Number Generator

Quantum Technologies

Information Technology

Routers, LAN Switch, NTP Server, Firewall system, Intrusion Detection System, Intrusion Prevention System, Server, Integrated Disaster Management System using Common Alert Protocol (CAP), Precision Time Protocol (PTP) Slave Clock, PTP Grandmaster Clock

Hybrid Set Top Box, Converged Gateway Node for Delivering Broadcast Content to Portable Devices, Conditional Access System and Subscriber Management System

Broadcasting

Transmission Technologies

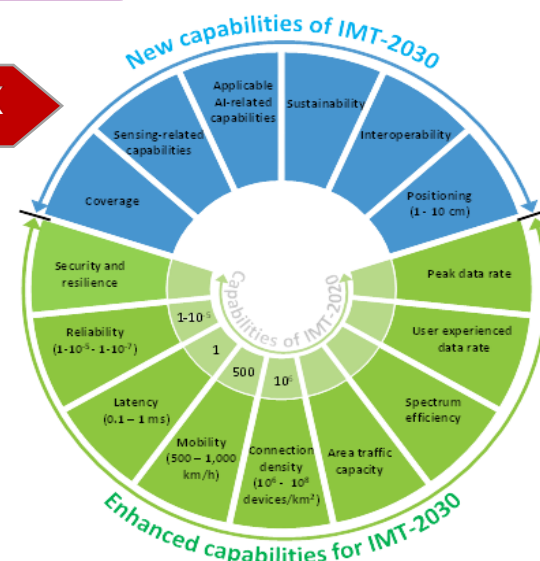
Armoured (Ribbon) Optical Fibre Cable for Underground Duct Application, Ribbon Optical Fibre Splicing Machine, Aerial Drop Optical Fibre Cable for Last Mile Applications

50G Higher Speed PON System, Optical splitter and WDM Coupler, Converged Multi-Service Application Access Equipment, SMPS Based Power Plants, Lithium Ion Battery, Hybrid (AC+DC) Uninterrupted Power Supply System

Fixed Access Technologies

KEY ROLE IN SHAPING ITU 6G VISION FRAMEWORK

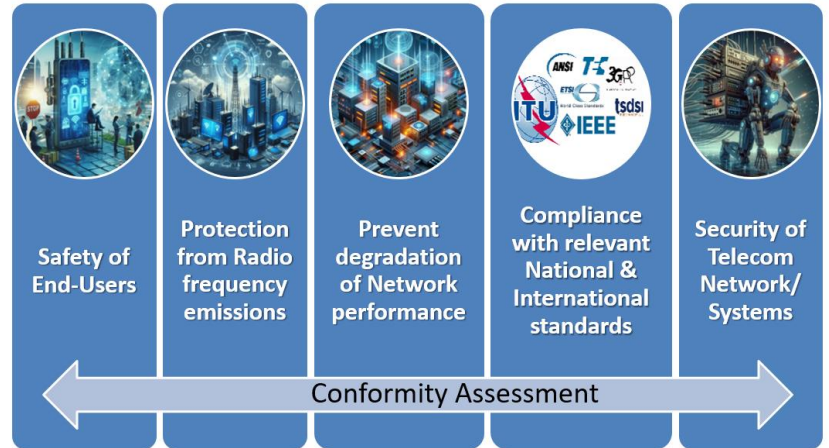
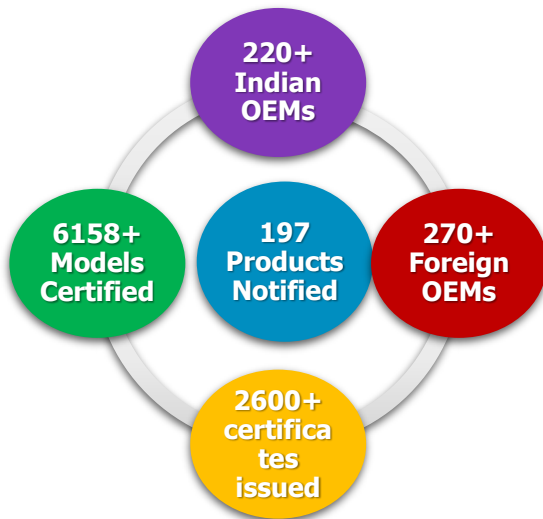
Telecommunication Engineering Centre (TEC), has contributed significantly in ITU standardization framework for IMT 2030 (6G) which has successfully resulted in the adoption of ubiquitous connectivity, ubiquitous intelligence, and sustainability as the key elements of the 6G technology.



IMPORTANT ACTIVITIES AT TEC

CONFORMITY ASSESSMENT

Conformity assessment under the MTCTE scheme of the telecom equipment being used in the telecom network is being carried out to ensure the safety of the end users and compliance of the products with the international standards.



COLLABORATION WITH R&D INSTITUTIONS



TEC has signed Memorandum of Understanding (MoU) was signed with AMRITA UNIVERSITY and IIIT Delhi, to drive innovation in the realm of Trustworthy and Responsible Artificial Intelligence Systems.

WORKSHOPS AND SEMINARS

ITU/ FAO Workshop on "Cultivating Tomorrow: Advancing Digital Agriculture through IoT and AI" at New Delhi

9th Meeting of the ITU/FAO Focus Group on "AI and IoT for Digital Agriculture" at New Delhi

International Quantum Communication Conclave at Vigyan Bhawan, New Delhi

ITU-T Study Group 9 Meeting at Bengaluru

International Workshop on 6G Standardization at IMC, 2023

National Workshop on enhancing participation in Telecom Global Standards Bodies at New Delhi



STANDARDIZATION ACTIVITIES AT TEC

- ◆ Formulation of Standards in Telecom / ICT Domain:
- ◆ Standards for Broadcasting sector related to Conditional Access System (CAS) and Subscriber Management System (SMS)
- ◆ Representation of India in International Standardization Bodies such as ITU, 3GPP, OneM2M, APT, IEEE etc.
- ◆ Contribution and participation in the ITU-T Study Group meetings
- ◆ Adoption of standards from Standard Development Organizations (SDOs) as National Standards
- ◆ Policy for Cross Sector Standardization and coordination activities thereof.
- ◆ Preparation of Technical Reports as latest technological developments
- ◆ Administration of National Working Groups (NWGs) analogous to ITU-T Study Groups (SGs).



Objectives of Standardization

- ◆ To unleash India's potential to play a leading role in the international arena of Telecommunications/ICT through enhanced participation in Telecommunication standardizations activities in ITU-T and other international standardization bodies.
- ◆ To position India as a champion of ICT development across the world.
- ◆ To increase intellectual contributions by the Indian industry and academia and thereby contribute to the development of the standard making process of these international standardization bodies (ITU-T, APT, and IEEE etc).
- ◆ To promote Indian industries/ startups in the global value chain by facilitating for active participation in global standardization activities and in promoting business of industries / start-ups through Standard Essential Patents (SEP) mechanism.

WORLD TELCOMMUNICATION STANDARDIZATION ASSEMBLY 2024

- ◆ TEC has been assigned as the nodal point for the standardization activities during the WTSA meeting, shaping the ITU-T's work plan for the upcoming Study Period. TEC coordinated with the stakeholders from Industry, Academia, R&D Institutions, Government Organizations, etc. preparing Indian contributions on the various resolutions and played a key role in the finalization of APT proposals during the meetings of APT Preparatory Group for WTSA-24, leading 12 of the 45 APT proposals for WTSA-24.
- ◆ To take leadership positions in ITU-T and make a significant impact in the development of global standards, TEC played a key role in shortlisting candidates for Chair/Vice-chair positions for various Study Groups.

NATIONAL WORKING GROUPS (NWGs)

At ITU-T, Standardization work is carried out by the technical Study Groups (SGs) in which representatives of the ITU-T membership develop Recommendations (standards) for the various fields of international telecommunications. National Working Groups (NWGs) have been constituted in TEC that are coterminous with ITU-T's Study Group (SG).

- ✦ To contribute to ITU standardization activities keeping in view the interests of the Indian Telecom Sector.
- ✦ To engage with the Indian stakeholders from industry, academia, startups, patent holders government organizations etc. and prepare contributions for ITU-T meetings
- ✦ Standards coordination Portal (SCP) has been developed for submission of any contribution to NWG. (www.tec.gov.in/scp)

ITU-T Study Group	DOMAIN	NATIONAL WORKING GROUP (NWG)
STUDY GROUP 2	Operational aspects of Service provision and Telecommunication Management	NWG-2, Chair: DDG(RC), TEC
STUDY GROUP 3	Tariff and Accounting Principles and international telecommunication/ICT economic and policy issues	NWG-3, Chair: Member (F), DoT NWG-3, Vice Chair: DDG(C&B), TEC
STUDY GROUP 5	Environment and circular economy	NWG-5, Chair: DDG(R), TEC
STUDY GROUP 9	Broadband Cable and TV	NWG-9, Chair: DDG(C&B), TEC
STUDY GROUP 11	Protocols and Test Specifications	NWG-11, Chair: DDG(TC), TEC
STUDY GROUP 12	Performance, QoS and QoE	NWG-12, Chair: DDG(MT), TEC
STUDY GROUP 13	Future Networks (&Cloud)	NWG-13, Chair: DDG(MT), TEC
STUDY GROUP 15	Transport, Access and Home	NWG-15, Chair: DDG(FA), TEC
STUDY GROUP 16	Multimedia and related digital technologies	NWG-16, Chair: DDG(IT), TEC
STUDY GROUP 17	Security	NWG-17, Chair: DDG(TS), TEC
STUDY GROUP 20	IoT, smart cities & communities	NWG-20, Chair: DDG(IoT), TEC

Members from Industries/Startups, Academia and R&D Institutions willing to participate in the standardization process should contact the concerned NWG through the SCP portal.



Certification For Conformity

Ensuring Product
Compliance

<https://mtcte.tec.gov.in>



Regulation

- The Indian Telegraph (Amendment) Rules, 2017 notification mandates that any telecom equipment which is used or capable of being used with Indian telecom network, shall have to undergo prior Mandatory Testing & Certification. TEC follows a complete transparent and online process for issuing the certificates under MTCTE scheme.

Objectives

- Safety of End-Users
- Protection from Radio frequency emissions
- Prevent degradation of Network performance
- Security of Telecom Network/ Systems
- Compliance with relevant National & International standards

Benefits

- **Facilitate Market Access:** Certified equipment can be legally sold and used in India.
- **Build Consumer Confidence:** Certification assures consumers of the interoperability and safety of the equipment.
- **Regulatory Compliance:** Avoid legal issues and penalties by complying with MTCTE regulations
- **Enhances Brand Reputation**
- **Promotes Innovation**

Compliance By

Indian OEM

- Before sale of Telecommunication Equipment in India

Importer/
Foreign OEM

- Before importing and sale of Telecommunication Equipment

Sellers

- Before sale of Telecommunication Equipment

Licensee

- Before installation of Telecommunication Equipment in its network

End to End online Process



491+ OEMs Registered

197 Telecommunication Equipment Notified

73 Designated Conformity Assessment Bodies

6 Designated Telecom Security Test Labs

6158 ++

Models Certified



Ensure 9 Digit Certificate
Number before Buying
Equipment

https://mtcte.tec.gov.in/certified_equipments



CONFORMITY ASSESSMENT BODY (CAB) DESIGNATION

DESIGNATION OF LABS AS CONFORMITY ASSESSMENT BODY (CABS)



Under the flagship vision of Aatma-nirbhar Bharat, Govt. of India has initiated a program in TEC for building ICT Lab ecosystem in the country. TEC designates domestic Conformity Assessment Bodies (CABs) and Certification Bodies (CBs) for carrying out conformity assessment and certification of telecommunication equipment in accordance with TEC's technical standards and/or specifications.

SALIENT FEATURES OF SCHEME FOR DESIGNATION AS A CAB

- The applicant lab shall be an entity legally identifiable and located in India.
- The applicant lab shall be accredited by any Indian national accreditation body, in accordance with ISO/IEC 17025:2017 in the relevant areas of stipulated requirements for telecom equipment.
- The applicant lab shall have the knowledge, capability, technical competence and equipment to perform the tests for conformity to stipulated requirements.

Recent Development to CAB Designation Scheme

- Scheme for **Reimbursement of testing and certification charges for startup and telecom MSEs** has been launched.
- Renewal Fee for CAB Designation has been reduced **by 50 %**.
- Special provision has been made for **reduction in application fee by 50% for Start-Ups, MSEs & Woman Entrepreneurs**.
- Nil application fee for CAB Designation for Govt. (Central/State Govt.) Testing Agencies/ Organizations/Institutes/IITs and other Government Autonomous Bodies

DESIGNATED LABS

As on date TEC has designated more than **73 No.** of labs as Conformity Assessment Bodies for EMI/EMC, Safety and Technical parameters testing. Some of them are as under: - [For detailed information about TEC CAB please visit <https://www.tec.gov.in/>].

Name of Standard	No. of Designated CABs
IT Safety	42
EMI/EMC testing	31
Environmental Testing (QM-333)	24
Radio Safety- IEC 60215	6
SAR TESTING	4

Name of Standard	No. of Designated CABs
IPv4 & IPv6 Testing	7/5
1G/10G/40G/100G Optical Interface	9
GSM/LTE/WCDMA	7
GPON Interface	7
Optical Fibre/ Optical Fibre Cable	4/6

VOLUNTARY CERTIFICATION SCHEME



TEC issues the following certificates after conformance testing against relevant TEC Standards / Manufacturer's Specifications and prototype of a telecom product based on the request from the manufacturer:

1. Type Approval Certificate (TAC)
2. Interface Approval Certificate (IAC)
3. Certificate of Approval (CoA)
4. Technology Approval

TYPE APPROVAL

Type Approval is the process of testing and certification of telecom & related ICT product, in accordance with TEC Test Guide for conformance with the Standard for Generic Requirements for a Product/Equipment issued by TEC.

INTERFACE APPROVAL

Interface Approval is the process of testing and certification of telecom and related ICT product, in accordance with TEC Test Guide, for conformance with the Standard for Interface Requirements for a Product/Equipment issued by TEC.

CERTIFICATE OF APPROVAL

Certificate of Approval is the process of testing and certification as per Manufacturer's specifications, in cases where Generic/ Interface Requirements of the product are not available.

TECHNOLOGY APPROVAL

Technology Approval is a process of testing and certification of prototype of a telecom and related ICT product developed by C-DoT, both public and private Academic Institutions/ Research Organizations / Startups in the field of Telecom sector. It is given against the Standard for Generic Requirements of the Product.



Encourage indigenization of technologies (Make in India)/ToT.

Encourage production of competitive consumer products

Motivate industries and R&D institutions for product

PRODUCTS GRANTED VOLUNTARY CERTIFICATION IN 2024

TYPE APPROVAL

- ◆ Millimeter Wave (E-Band) Microwave Equipment
- ◆ WiFi Access Point (AP)
- ◆ 4G LTE RAN eNodeB
- ◆ Radio Modems in Unlicensed (2.4/5GHz) Band
- ◆ GPON technology with Mini-OLT
- ◆ Quantum Key Distribution System
- ◆ IP-PABX with Media Gateway
- ◆ Fibre Distribution Management System for OFC
- ◆ PLB HDPE Duct



WiFi AP

INTERFACE APPROVAL

- ◆ PABX for Network Connectivity
- ◆ Interchange of STM-1/4/16/64 signals
- ◆ Interchange of ETHERNET signals
- ◆ Interchange of Digital Signals at 2Mbit/s, 8Mbit/s, 34 Mbit/s, 45 Mbit/s and 140 Mbit/s ports



eNodeB

CERTIFICATE OF APPROVAL

- ◆ Virtual Network Expert (VNE)
- ◆ Free space Optical Wireless Communication (FSOC)
- ◆ Vyom Configuration Server (VCS)
- ◆ Virtual Wireless Expert (VWE)
- ◆ SNAP-Mobile App



Mini OLT

CAS-SMS CERTIFICATION

- ◆ Conditional Access System (CAS)
- ◆ Subscriber Management System (SMS)



Radio Modem



Free Space Optical Communication (FSOC)



E-band Microwave



Quantum Key Distribution

ONLINE MODULE FOR VOLUNTARY CERTIFICATION

An online module for Voluntary certification has been developed to promote ease of doing business and expedite the issuance of TEC approval certificates.



Website Link: <https://www.mtcte.tec.gov.in/>



Internet of Things (IoT), TEC



Study of Internet of Things (IoT)/ Machine to Machine (M2M) communications to finalize specifications for Indian ecosystem in sync with global SDOs.

Framing GR / IR/ ER for the devices related to M2M / IoT domain.

Providing technical / policy inputs to DoT, BIS, TSDSI, NITI Aayog and MoHUA on M2M / IoT and 5G related issues.

Preparing Technical Reports on emerging technologies and use cases.

Establish a National Trust Centre (NTC) for developing secure & trusted IoT/M2M ecosystem.

IoT division is leading National Working Group- 20 (NWG-20) for submission of contributions in ITU-T SG -20 on IoT and Smart Cities & Communities.

TEC/DoT Initiatives in IoT/M2M Domain

To facilitate the growth of sustainable, secured and trusted IoT ecosystem in the country, TEC has released **22 Technical Reports**, covering various verticals such as Power, Automotive (Intelligent transport system), Remote Health Management, Safety & Surveillance, Smart homes, Smart cities, Smart Village & Agriculture etc., and also in the horizontal layer (requirements common to all the verticals) such as M2M Gateway & Architecture, Communication Technologies, EMF Exposure from IoT devices and Security aspects in M2M/ IoT domain (<https://tec.gov.in/M2M-IoT-technical-reports>).

International Telecommunication Union (ITU) has posted the following seven TEC Technical Reports on its Digital Transformation Resource Hub in IoT sections, recognizing as insightful technical resource for the benefit of global community (<https://www.itu.int/cities/dt-resource-hub/iot/>):

- ❖ Revolutionizing Agriculture: The Digital Transformation of Farming
- ❖ Security by Design for IoT Device Manufacturers
- ❖ Framework of National Trust Centre for M2M/IoT Devices and Applications
- ❖ IoT/ ICT Standards for Smart Cities
- ❖ Emerging Communication Technologies & Use Cases in IoT Domain
- ❖ Code of Practice for Securing Consumer Internet of Things (IoT)
- ❖ IoT/ ICT Enablement in Smart Village and Agriculture

Essential Requirements under MTCTE

To ensure compliance and standardization, TEC has prepared the Essential Requirements (ERs) for the following telecom equipment under MTCTE:

IoT Gateway

Feedback Device

End Point Device for Environmental Monitoring

Tracking Device

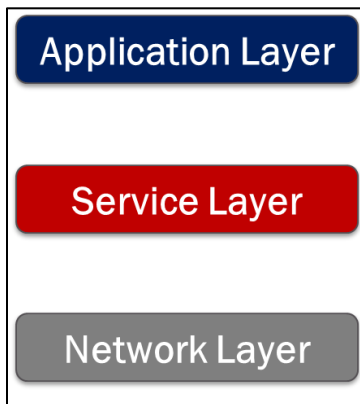
Smart Electricity Meter

oneM2M

The IoT Standard

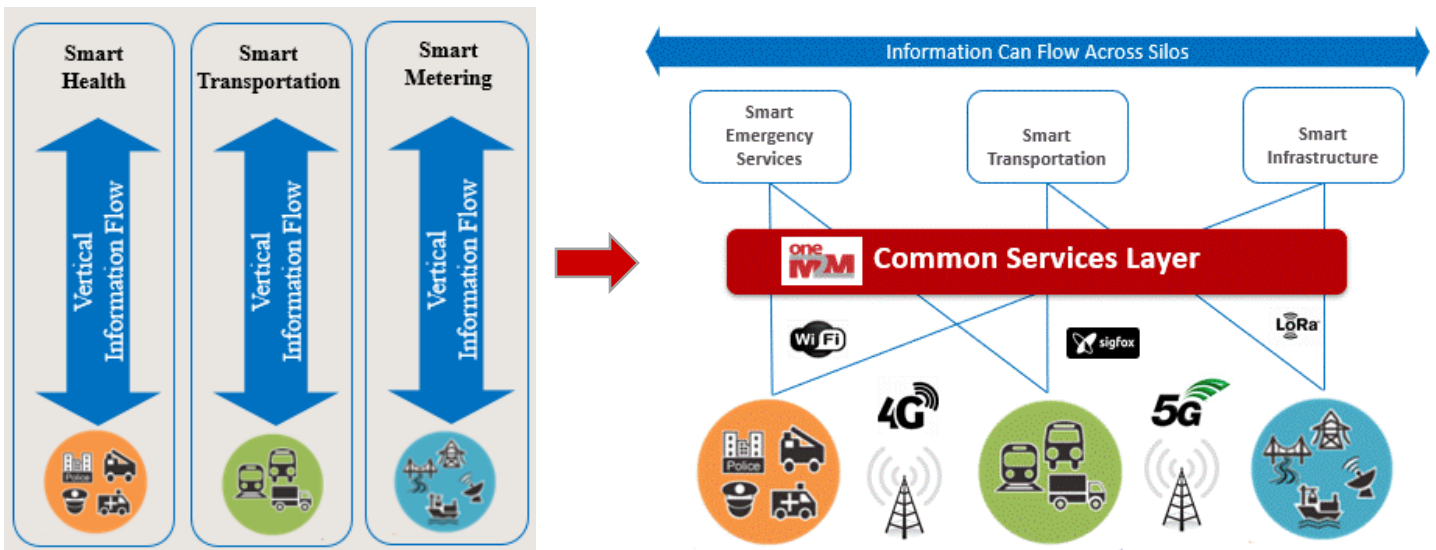
oneM2M is an IoT standard which enables interoperable, secure, and simple-to-deploy services for the IoT ecosystem. oneM2M standards are open, accessible and internationally recognized.

TEC has adopted oneM2M Release 2 and Release 3 Specifications as National Standards in 2020 and 2022 respectively.



This is a middleware layer that operates between applications and the underlying communication hardware/software, typically on top of the IP protocol stack. It provides essential functions for various industry applications via APIs enabling distributed intelligence, data sharing, access control, and event notifications

oneM2M Breaks down the Silos Structure



The important benefits of implementing oneM2M standards-based solution includes interoperability of device & application; authentication & authorization of devices; and Data security & Privacy. These specifications will enable the development of standardized IoT ecosystem in the country including smart cities.



QUANTUM TECHNOLOGIES, TEC

The advancements in quantum computing presents a significant threat to the existing classical cryptographic algorithms used for secure transmission of sensitive data. As a result, there is a need for quantum communication technologies to address the evolving demands of secure communication in a quantum-enabled era. Quantum Technologies Division in TEC is working towards the standardization, testing and certification activities to promote the various solutions for Quantum security being developed.

Preparation of Standards for Quantum Communication Technologies

Testing and Certification of Quantum Communication Technologies

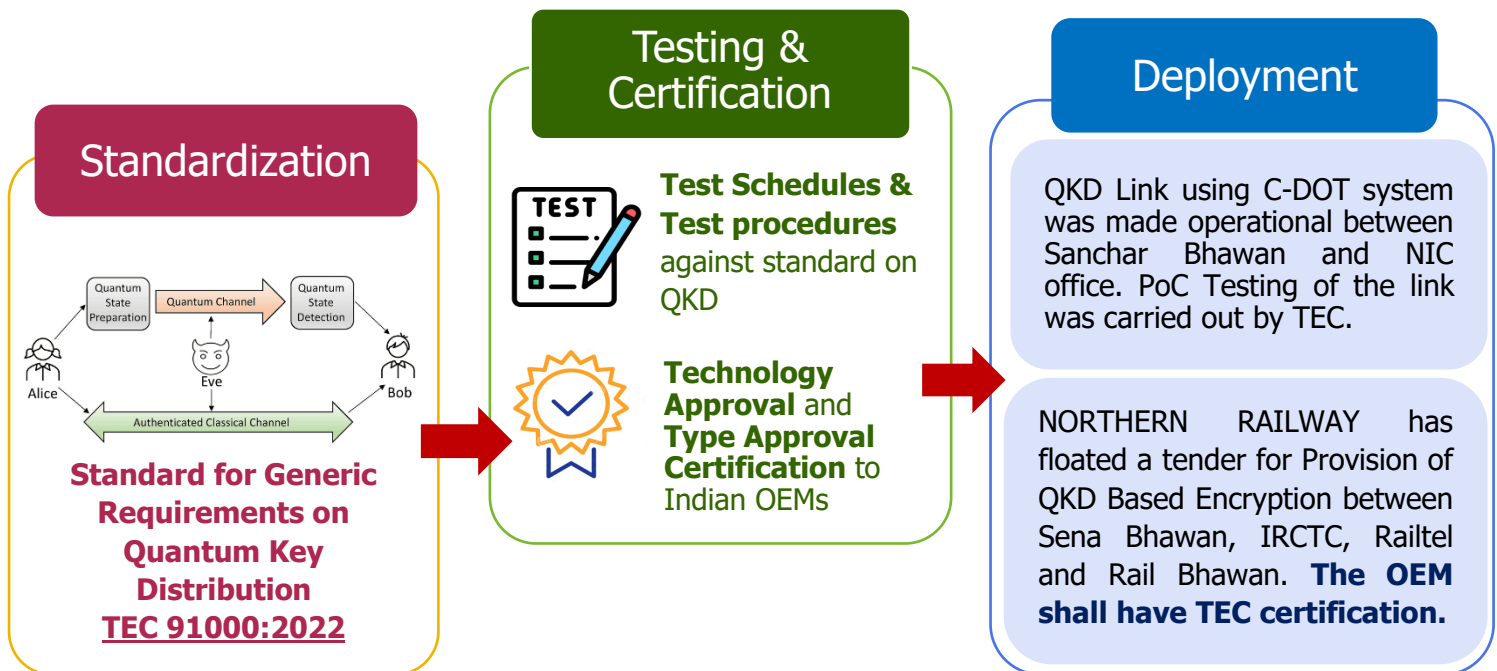
Contribution to Global standardization bodies such as ITU –T, IEEE, etc. in the area of Quantum Communication Technology

Study of the various technologies and preparation of study papers on latest technologies in the field of Quantum Communication.

Creating awareness and fostering collaboration among industry/start-ups, academia and R&D institutions in the areas of Quantum Communication Technologies.



QUANTUM KEY DISTRIBUTION



TEC INITIATIVES ON QUANTUM TECHNOLOGIES

POST-QUANTUM CRYPTOGRAPHY

Standardization

TEC 91010:2023: TEC Standard for Generic Requirements on Quantum Safe and Classical Cryptographic Systems

Deployment

Proof of concept of Quantum Secure Video Conferencing Solution was carried out between TEC, C-DOT and DOT HQ.

ONGOING ACTIVITIES

Standard on Quantum-secure core for 5G and beyond

Guidelines for Migration to Post Quantum Cryptography

Standards on Quantum Random Number Generator

Interface Requirements for Quantum Key Distribution Network

INTERNATIONAL QUANTUM COMMUNICATION CONCLAVE

To create awareness among all the stakeholders about the significant works/research being carried out in the areas of Quantum Communication and to bring synergy among the researchers and the industries working in Quantum Technologies, TEC conceptualized the "International Quantum Communication Conclave". The First edition of Quantum Conclave was held on 27-28 March, 2023 and second edition on 14-15 February, 2024 at Vigyan Bhawan, New Delhi.



NATIONAL WORKING GROUP ON QUANTUM TECHNOLOGY (NWG-QT)

To have a focused and coordinated approach on Quantum Technologies, TEC has constituted a "National Working Group on Quantum Technology (NWG-QT)" for contributing to standardization activities on Quantum Technologies at ITU-T in Study Groups 11, 13 and 17. The NWGs consists of stakeholders from industry, academia, government, research organizations etc. The NWGs build consensus and harmonize the interests of various stakeholders and proactively make necessary contributions to the global standardization bodies.

