MESSAGE

From the desk of....

Sr DDG & Head TEC

Dear Readers,

I am delighted to bring to you the TEC Newsletter in its new Avatar, providing insight about TEC's standardization and other telecommunication activities.

I sincerely hope that you will enjoy reading it.

We look forward to your continued support to further improve the quality of the newsletter.

I congratulate my entire team of TEC for their sincere efforts.

With Best Wishes and warm regards-

Deepa Tyagi

5G VULNERABILITIES

Each generation of Mobile Technology tries to fill the gap in the security capabilities of the previous generation. 3GPP has specified security features for the 5G network which is more efficient than its immediate predecessor i.e. LTE.

For smooth transition to 5G SA, Mobile operators are currently running NSA 5G networks, which are based on previous-generation 4G LTE core infrastructure. NSA 5G networks have risk of attack because of known vulnerabilities in the Diameter and GTP protocols. Operators are gradually migrating to standalone infrastructure, but this also has security considerations of its own. In respect of 5G, the 5G network has nine network functions (NFs) which take care of registering subscribers, managing sessions and subscriber's profiles, storing subscriber data, and connecting UE to the Internet.

As 5G is an upcoming technology, which is currently under the process of adoption by the operators, very few studies are available which detail the security vulnerabilities in 5G. However, with the pervasiveness of internet – millions of devices are going to be supported by 5G network under mMTC, URLLC etc. that are low power low cost devices which may be susceptible to security vulnerabilities and also that the 5G core network design has adopted a lot of web/internet design principles; studying 5G vulnerability and tracking it through implementation is important. As per research available, one of the main issues causing security vulnerability in the system architecture is the service based interface responsible for session management (SMF), which uses the PFCP (Packet Forwarding Protocol). The Packet Forwarding Control Protocol (PFCP) that is used to make subscriber connections has been identified by researchers as having several potential vulnerabilities such as Denial of Service, cutting subscriber access to the internet and redirecting traffic to an attacker, allowing them to downlink the data of a subscriber etc. Further HTTP/2 Protocol, which is used for NFs for registering and storing profiles on 5G Networks, has several vulnerabilities. Due to such vulnerabilities, attackers may impersonate any network service using details such as Authentication Status, Current Location and Subscriber settings for Network Access, and may also delete NF profiles which can cause financial loss and depletion of subscriber trust. There is a need to further assess all such vulnerabilities so that the networks can be strengthened through use of best practices and appropriate changes in the standards.

3GPP, which develops the technical specifications for the 2G/3G/4G and 5G, has developed the 3GPP TS 33.501 "Security architecture and procedures for 5G system" as the foundation 5G security document and it was first published in Release 16. 3GPP's 5G security architecture is designed to integrate 4G equivalent security. In addition, the reassessment of other security threats such as attacks on radio interfaces, signalling plane, user plane, masquerading, privacy, replay, bidding down, man-in-the-middle and inter-operator security issues have also been taken in to account for 5G leading to further security enhancements. Another important 3GPP Security spec is 3GPP TS 33.51 Security Assurance Specification (SCAS) for the next generation Node B (gNodeB) network product class, which is part of Release 16. As new features are added with every release, the 3GPP security specifications will also evolve correspondingly.

– Contributed by:
Mobile Technology (MT) Division

BLOCKCHAIN TECHNOLOGY

WHAT IS BLOCKCHAIN

Blockchain is essentially a set of distributed ledger technologies (data structure) which offers great potential to steer various sectors including telecom sector with its unique combination of characteristics such as decentralization, immutability, security, efficiency and transparency. It is a database system that maintains and records data in a way that allows multiple organizations and individuals to confidently share access to the same data in real-time, while mitigating concerns around security, privacy and control. Based on a peer-to-peer (P2P) topology, blockchain allows data to be stored globally on thousands of servers – while letting anyone on the network see everyone else's entries in near real-time. That makes it difficult for one user to gain control of the network.

While it was initially explored by the financial services industry, the realized potential of this emerging technology has expanded to include energy, telecoms, health care etc.

WHY IT MATTERS TODAY

This capability creates completely new ways of thinking about how to transform processes, drive resiliency across complex networks like supply chains, facilitate trust, verify the digital identity of people and objects, and build new model with increased efficiency, security and transparency.

BLOCKCHAIN ARCHITECTURE

In general, blockchain has the core characteristics of decentralization, accountability, and security. This technique can improve operational efficiency and save costs significantly. Blockchain usually comprises of following components:

- **HASHES**: A hash is a function that is created using an algorithm which converts an input of letters and numbers into an encrypted unique output of a fixed length for an input of nearly any size (e.g., a file, some text, or an image). The resulting encrypted value is a series of numbers and letters that do not resemble the original data and is called a hash. A hashing algorithm used in many blockchain technologies is the Secure Hash Algorithm (SHA) with an output size of 256 bits (SHA-256).

- **TRANSACTION**: A transaction is a recording of a transfer of assets (digital currency, units of inventory, etc.) between parties. Each block in a blockchain contains multiple transactions.

- **LEDGERS**: A ledger is a collection of transactions. Usually, ledgers have been stored digitally, often in large databases owned and operated solely by centralized "trusted" third parties on behalf of a community of users. A ledger implemented using a blockchain will be copied and distributed amongst every node within the system instead of 'centralized' mechanism.

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- **BLOCKS**: A block contains a set of validated transactions. Validity' is ensured by checking that the providers of funds in each transaction (listed in the transaction's 'input' values) have each cryptographically signed the transaction. This verifies that the providers of funds for a transaction had access to the private key which could sign over the available funds. After creation, each block is hashed thereby creating a digest that represents the block. Transaction are added to blockchain when mining nodes publishes a block.

- **ADDRESSES**: A user's address is a short, alphanumeric string derived using a hash function, along with some additional data (used to detect errors). Addresses are used to send and receive digital assets. The idea is to give a user a unique address every transaction

BLOCKCHAIN USE CASES

1. IoT: A blockchain can enable secure and error free peer-to-peer connectivity for thousands of IoT devices with cost-efficient self-managed networks. Implementing Blockchain in IoT means that every element in the IoT environment can have a unique identity, which can be replicated across all other elements, making it harder for a third party to gain access. Blockchain allows a further layer of security, because even if a network is compromised it is very difficult for an attacker to use fraudulent ID within the system. With Blockchain, M2M can be successfully conducted in a secure and efficient way

2. 5G: Blockchain makes use of cryptography that means all the information is encrypted and secured. The combination of Blockchain with the 5G can transform privacy and security by providing distributed trust models, thus making 5G capable of protecting users as well as themselves from the security and privacy breaching.

3.Artificial Intelligence: The collaboration of AI with Blockchain technology can bring futuristic innovations. Smart Computing Power, Creating Diverse Data Sets, Data Protection, Data Monetization, Trusting AI Decision Making are some examples of AI in Blockchain. Blockchain could also make AI more coherent and understandable so that experts can trace and determine why decisions are made in machine learning. Blockchain and its ledger can record every data and variable that goes through a decision taken under machine learning.

4. Supply chain Management: Telecom enterprises can enhance their supply chain management with the help of blockchain. As supply chains grow more complex in nature, involve diverse stakeholders, and mainly rely on a number of external intermediaries, blockchain emerged as a strong contender for de-tangling all the data/ documents/ communication exchanges happening within the supply chain ecosystem.

5. Blockchain as a Service (BaaS): BaaS is one of the promising blockchain trends for several startups and businesses. It is a cloud-based service that enables users to build their own digital products with blockchain technology.

6. Other use cases: Blockchain can create a lot of automation in internal processes of telecom operators, like billing, roaming and fraud prevention etc.

- **Internal processes:** The processes such as OSS (Operation Support System) and BSS processes (Business Support System) such as billing and number portability databases can be streamlined using blockchain. The interest groups can validate billing without hassle, using an intercompany blockchain shared among telecom companies, customers, and OSPs.

- **Roaming:** Blockchain can solve the age-old problem of operators to integrate high-cost systems and provide access/authentication settings for enabling roaming calls across networks and operators. Blockchain can enable complex datasets across multiple parties, in real time with high trust and security, particularly for establishing subscriber identity.

- **Identity management:** By leveraging the features of blockchain, operators could develop identity management tool that can be used across organizations, devices and applications

RELATED ITU-T ACTIVITIES

Study Groups
- **SG13** – Future Networks (& Cloud)
- **SG17**- Security
- **SG20**- IoT, Smart Cities & Communities

Contributed by–
Future Networks (FN) Division, TEC

STANDARDIZATION

TEC CONTRIBUTIONS TO ITU

1. A contribution on **Y.SRC "Requirements for deployment of smart services** (such as e-governance, tele-health, tele-education, precision agriculture etc.) in rural communities" was submitted in virtual meeting of **ITU- T SG-20** WP1, **2-5 Nov 2020**. It was presented by **DDG (IoT)**. This contribution was included in the TD**.**

2. A contribution **C529**-Proposal for modifications in draft Recommendation ITU-T Q.39_FW_Test_ID_IoT "The framework of testing of identification systems used in IoT" was presented by **AD (MRA)** in ITU-T **SG-11** meeting held virtually from 22-31 July 2020. The contribution was accepted and resulted into final draft Recommendation ITU-T Q.4063 (formerly Q.39_FW_Test_ID_IoT). AD (MRA) was also added as **Editor** for ITU-T Q.4063. In continuation, AD (MRA) attended ITU-T Working Party 3/11 virtual meeting on 04.12.2020. In this meeting, **ITU-T Q.4063 "The framework of testing of identification systems used in IoT"** was issued as Pre Published recommendation of ITU-T.

3. **Y.3056** (formerly Y.OBF_trust) **"Framework for bootstrapping of devices and applications for open access to trusted services in distributed ecosystems"** under **ITU-T SG-13** has been developed by the members of the National Working Group (NWG)-13 - **DDG(MT)**, **Dir (MT)**, **ADG (MT)** from TEC and Mr. Sharad Arora and Mr. Jonas Haggard from M/s Sensorise. The work was initiated by India in January 2019 and was consented as ITU-T Rec. in December 2020 meeting of ITU-T SG-13. The framework provides mechanisms for open access to trusted services in distributed ecosystems using the inherent security capabilities and mechanisms already present in the devices and the underlying networks.

DO YOU KNOW?

The World Telecommunication Standardization Assembly (WTSA) is held every four years and defines general policy, next period of study, and adopts working methods and procedures for ITU-T. WTSA-20 is planned to take place in Hyderabad, India, from 1 to 9 March 2022 preceded by the Global Standards Symposium on 28 February 2022.

ITUWTSA-20

TEC CONTRIBUTIONS TO APT WTSA

1. TEC coordination and participated in the virtual interim meeting of the working groups of the **APT-WTSA 20** held from 13-16 October 2020. Various officers from TEC were appointed as editors cum drafting group leaders for preparation of Joint drafting PACP documents as follows:

- **DDG (Radio)**
    - **Resolution 73** - ICT,   environment, climate change and circular economy.
    - **Resolution 72** - Measurement and assessment concerns related to human exposure to electromagnetic fields
- **DDG (Mobile Tech)**
    - **Resolution 88** - International mobile roaming
- **Director (IT)**
    - **Resolution 58** -Encouraging the creation of national computer incident response teams, particularly for developing countries
- India proposed a revision/modification to   **resolution 88** on **International Mobile Roaming.** The modification were prepared and presented in the meeting by **DDG (MT).**

2. Coordination and Participation in the 4th meeting of the APT Preparatory Group for WTSA 20 held from 16 – 20 November 2020. In the meeting-

- **Sr. DDG TEC** took charge as one of the Vice – Chairmen of APT Preparatory Group for   ITU – WTSA 2020.
- India proposed **modification/revision to resolution 55 on promoting gender equality** in ITU Telecommunication Standardization Sector Activities. The modification to the resolution was prepared and presented in the meeting by **Director (T)** and **ADG (TS)**.
- India Proposed a **new Resolution on Enabling Open and Shared Resources for Equitable Access to AI/ ML technology via Networks**. The resolution was prepared and presented by officers of **MT division**, TEC.

STANDARDIZATION

STANDARDS RELEASED

1. **No: TEC13016:2020**
   Specific Absorption Rate (SAR) for Wireless Communication Devices used in close proximity to human body   **(Radio Division)**

2. **No: TEC 74046:2020**
   Energy Consumption Rating and **Energy Passport for Telecommunications Products, Equipment and Network/ Services**   **(Fixed Access Division)**

3. **No: TEC59190:2020**
   Media Resource Function
                (Next Generation Switching (NGS) Division)

4. **No: TEC61030:2020**
   Network Protocol Analyser
                (NGS Division)

TEC released the **Revised Procedure and Guidelines for formulation of TEC Standards/ Documents** in December 2020, superseding the earlier document No. CSSP 01 MAY 08. The revised Document includes revised Numbering Scheme, timelines for formulation of documents (erstwhile (GR/IR/SR etc), ERs with the launch of MTCTE, ER formulation and other related matter.

IPV6 READY LOGO

TEC has been designated as **vice chair for the Asia Pacific region,** and reviewed the results of 10 devices and IPv6 Ready logo certificate has been awarded to all the devices.

TOWARDS DOVELOPING THE INDIAN AI STACK

A cross functional committee under the Chairmanship of Sh. Robert Ravi, DDG, AP LSA, was constituted by Telecom Engineering Centre (TEC), DoT comprising officers from DoT HQ, LSAs, TEC, BSNL etc to work on AI standards & develop the Indian AI stack. The committee deliberated on various aspects of standardization in AI technologies and came up with a draft document called **Indian AI Stack**. The Draft document on Indian AI Stack was circulated for public comments in September 2020. The comments received from the diverse 34 stakeholders like GSMA, IECA, NASSCOM, US India Business Council, COAI, CII, BIF, Ericsson, Nokia etc. To carry forward the standardization activities in AI technology, the committee has reconstituted all **5 Working Groups (WGs)** by including the members from various stakeholders like industry, academia, R&D organizations, industry organizations as below–

1. **Working Group 1** – Standardization of the functional network architectures, AI architecture, data structures.
2. **Working Group 2** – Standardization of the type of interfaces and protocols, Technologies employed, Systems deployed, Benchmarking practice
3. **Working Group 3** – Standardization in Trustworthiness, digital rights and ethical standards in AI, Preserving algorithm openness, Security and compliance aspects
4. **Working Group 4** – Interoperability standards, technological mapping and leveraging AI for national missions
5. **Working Group 5** – Discussion Paper, Outreach, Hackathon, Indian AI stack

These Working Groups will suggest/ give recommendations to AI Committee for finalization of standards in AI technology and Indian AI Stack.

for updates visit: www.tec.gov.in
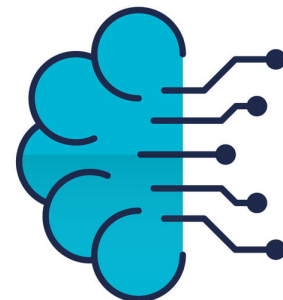
MTCTE ACTIVITIES

(MANDATORY TESTING AND CERTIFICATION OF TELECOMMUNICATION EQUIPMENT)

UPDATES

- **A Web Conference with all designated CABs** was held at on 01/12/2020 under the chairmanship of Sr. DDG, TEC to review the progress on implementation of MTCTE procedures.

- Acceptance of Test Reports from Labs Accredited by ILAC Signatories for all parameters of ER except EMI/EMC and Safety requirements has been extended up to 30.06.2021 vide addendum dated 13.11.2020.

- List of Incremental Parameters in ERs of MTCTE Phase-2 Roll-out w.r.t. GRs/IRs has been uploaded on MTCTE portal for ready reference of applicants who have valid Interface Approval/ Type Approval Certificates for the their telecom product.

- Key Contact Person details and Testing Capability Details of TEC Designated CAB's uploaded on MTCTE portal (last updated on 01-10-2020).

- Two Standing Empowered Committee meetings were conducted in Q3 to discuss various issues related to exemption and applicability of various parameters in PON products launched under MTCTE Phase-2

CERTIFICATES ISSUED:

- Total **Companies registered** – **109**

- Total A**pplications Registered** till Dec-20 – **165**

- **Certificates issued** in Q3 (Oct to Dec-20) – **24**

- **Total Certificates issued till Dec-20** –**109**
  (**55** under GCS and **54** under SCS scheme)

ABOUT MTCTE

The Indian Telegraph (Amendment) Rules, 2017, provides that every telecom equipment must undergo mandatory testing and certification before its sell or import. The detailed procedure for Mandatory Testing and Certification of Telecom Equipment (MTCTE) is given in MTCTE procedure document. The testing is to be carried out by TEC designated labs and based upon their test/reports; certificate shall be issued by TEC.

For MTCTE updates visit: https://www.mtcte.tec.gov.in/

CAB DESIGNATION ISSUED BY TEC

NEW CERTIFICATE ISSUED:

1. M/s NRTC, Parwanoo and
2. M/s Criterion Network Labs, Bengaluru)

CERTIFICATE RENEWED:

1. M/s Sun Ren, Mumbai
2. M/s TUV Rhineland India Pvt. Ltd, Bengaluru

CERTIFICATE ENHANCED:

1. M/s Sunren, Mumbai
2. M/s Tarang Labs, Wipro Limited, Bengaluru

Total Number of TEC Designated CABs is 58 [Safety Testing: 45, EMI/ EMC Testing: 25, Technical Parameters Testing: 08, Other (SAR): 03].

VOLUNTARY TESTING SCHEME

TYPE APPROVAL CERTIFICATES ISSUED

1. Product– **Two** models of **WiFi Access Point (AP)**; Manufacturer– M/s HFCL, Solan, HP

2. Product– **Permanently Lubricated HDPE Telecom Ducts**; Manufacturer– M/s Vahini Irrigation Pvt Ltd, Karnataka

3. Product– **STM-16 Synchronous Multiplexer**; Manufacturer– M/s Tejas Networks Ltd., Bangalore

In the current financial year (from 01.04.2020 till date), 12 certificates have been issued

Testing and Certification of Telecom Equipments

KNOWLEDGE DISSEMINATION
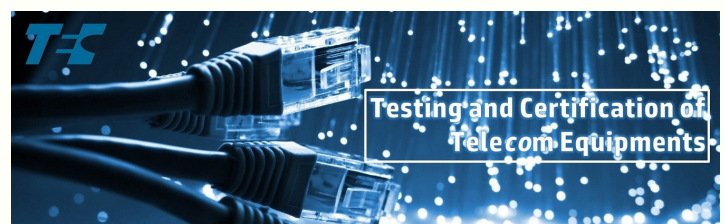
STUDY PAPER RELEASED BY TEC

1. "25/50Gbps Passive Optical Network (PON)"

This study paper enumerates previous, current, and future work in PON, prevailing ecosystem and challenges particularly with respect to 25Gb/s interface requirement of 5G fronthaul.

Published in Nov 2020   (FA Division)

Link: https://bit.ly/3rdKnGi

2. "Direct Air to Ground Communication"

This study paper explores alternative means of providing the connectivity between the aircraft and the ground, called DA2GC, as compared to satellite backhaul. DA2GC or Direct Air to Ground Communication provides a method for connectivity to the terrestrial communication networks for providing communications services to the passengers by using an onboard antenna.

Published in October 2020   (MT Division)

Link: https://bit.ly/3bcxc1N

TALKS

- An **online meeting** under the chairmanship of **Sr. DDG, TEC** was held on 06.10.2020 with NABL Accredited Labs for ascertaining the **technical capability and testing capacity of the NABL Accredited Labs** for testing Technical Parameters for **Mobile User Equipment.**

- **Sr. DDG TEC** delivered an introductory note on **IoT eco-system in India**, in an **international conference on IoT Security on 4th Dec 2020,** organised by India future foundation in association with the office of National Cyber Security coordinator.

- **Director(FA)** made a presentation on the Topic **"5G transport",** in TEC on 08.05.2020

- **DDG (IoT)** delivered a talk on **"Internet of Things"** to the students and faculty of Siddaganga Institute of Technology, Tumakuru (Karnataka) on 11-12-2020, in a virtual conference organised by the Institute.

- **DDG (IoT)** delivered a talk in the **IEEE conference** on **Smart Villages** on 2nd Oct 2020.

- **DDG (IoT)** delivered talk on **"IoT technology and policy overview for smart cities, C-V2X, Private industries, Agriculture etc"** in an International conference, organized by VIT Business School, Chennai on 24th Oct.

WEBINARS CONDUCTED BY TEC

1. **"Telecom Equipment ecosystem with Open RAN"**

   Organized on - 20th October 2020

   Speakers- Experts from M/s Mavenir, Altiostar, Reliance Jio and Samsung

   (ogranised by MT Division)

2. **"Next Generation Transport solution"**

   Organized on- 27th October 2020

   Speakers- Experts from M/s Tejas

   (organised by Transmission Division)

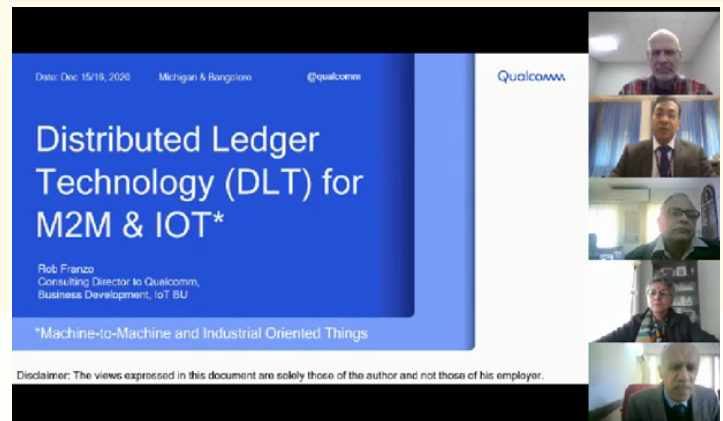3. **"Blockchain Technologies & its relevance to telecom sector"**

   Organized on- 23rd December, 2020.

   Speakers- Experts from Qualcomm, USA

   Sh Bharat Kumar Jog, Member (S), DCC, DoT was the he Chief Guest.

   Around 370 people from different organizations registered and participated.

   (organised by FN Division)

4. **"Virtualized RAN with Open Interfaces (Open vRAN)"**

   Organized on - 03 December 2020

   Speakers- Experts from Qualcomm.

   (organized by MT Division)

TEC NEWSLETTER

ITS 2018 Batch-TEC Attachment:

TEC provided training to officer trainees of ITS 2018 batch during their one week attachment (19-23 Oct 2020). Training includes the overview of working of TEC, various core division activities, familiarizations with TEC's standardization activities and its engagements with other SDOs like ITU, IEEE, APT etc.

TEC WELCOMES ON JOINING 🙏

- Smt Deepa Tyagi, who has joined and taken over the charge of Sr. DDG & Head TEC w.e.f. 14 December 2020
- Sh R.R.Mittar, DDG
- Sh Pawan Gupta, DDG
- Sh Sanjeev Kumar Arya, Director
- Sh Sushil Kumar, Director
- Sh Harish Aggarwal, Director
- Smt. Ashima, Director
- Ms. Madhavi singh, Director

TEC CONGRATULATES ON PROMOTION 💐

- Sh. Rajeev Kumar Tyagi got promotion in the SAG and joined as DDG (SN), TEC

TEC BIDS FAREWELL ON TRANSFER 😊

- Sh. U.K. Srivastav, Sr. DDG relieved for further reporting to NTIPRIT.
- Sh Kamal Bhagat, DDG relieved for further reporting to USoF, DoT.

TEC BIDS FAREWELL ON SUPERANNUATION 💐

- Sh R.L.Bharti, DDG, on 30.11.2020.
- Smt Sushma Chopra, ADG on 31.12.2020.

CONSTITUTION DAY CELEBRATION

TEC officers read out the preamble of the constitution on 26th November, 2020 on the occasion of the Constitution Day also known as National Law Day, which is celebrated in India every year to commemorate the adoption of the Constitution of India.

हिंदी गतिविधियाँ

- राजभाषा कार्यान्वयन समिति की त्रैमासिक बैठक का आयोजन किया गया ।
- हिन्दी की वार्षिक मूल्यांकन रिपोर्ट राजभाषा अनुभाग संचार भवन को भेजी गयी ।

- **Internal audit** for ISO 9001:2015 certification conducted.

PM- WANI

The Union Cabinet in Dec 2020 approved the establishment of **Prime Minister Wi-Fi Access Network Interface** (PM-WANI). It is being seen as an attempt by the government to elevate wireless internet connectivity in the country. These would be provided through Public Data Offices (PDOs), witthout levy of any License Fee under PM-MANI

KLI PROJECT

In December 2020, the Union Cabinet, chaired by the Prime Minister, Mr. Narendra Modi, approved the provision of submarine optical fibre cable connectivity between Mainland (Kochi) and Lakshadweep Islands (KLI Project).

INDIA MOBILE CONGRESS 2020

The fourth edition of the India Mobile Congress (IMC) 2020 was held virtually from 08-10 December 2020. This prestigious event was jointly organized by the Department of Telecommunications (DoT) and Cellular Operators Association of India (COAI). Prime Minister Shri Narendra Modi delivered inaugural address at the virtual India Mobile Congress (IMC) 2020. The theme for IMC 2020 was **"Inclusive Innovation - Smart, Secure, Sustainable"**. It aimed to align to the Prime Minister's vision to promote 'AatmaNirbhar Bharat', 'Digital Inclusivity', and 'Sustainable development, entrepreneurship & innovation'.

SPECTRUM AUCTION

The Indian government has approved plans for the next round of spectrum sales, with a total of **2,251.25MHz** to be put up for auction in March 2021. "A single auction process will be carried out for assigning spectrum blocks in various bands, viz. **700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz** and **2500 MHz.**

Prefix '0' for landline-to-mobile calls

The department of telecommunications (DoT) has made it mandatory to prefix 0 for all calls made from fixed lines to mobiles, effective 15 January, accepting the TRAI's suggestion.

- Telecommunication Engineering Centre (TEC) is an ISO 9001:2015 Organization. It plays a very important role in the telecom ecosystem of India. It is responsible for the development of technological standards in the form of Generic Requirement, Interface Requirement for Voluntary Testing and Essential Requirements (ERs) for Mandatory Testing of Telecom equipment in India.

- TEC has Core Technical Divisions which carry out the activities of formulation of technical requirements in harmony with international standards, for telecom equipment, interfaces, and services. This activity involves the participation of telecom service provisioning organizations, equipment manufacturers, industry associations, academia, government institutions, international and national standardization bodies, and other stakeholders.

- TEC provides technical support to DOT HQ, WPC, USOF, TRAI and other Government ministries.

- TEC coordinates and participates in the meetings of standards development organizations, viz., International Telecommunication Union (ITU), Asia Pacific Telecommunity, World Radiocommunication Conference (WRC), 3rd Generation Partnership Project (3GPP), European Telecommunications Standards Institute (ETSI), IEEE etc. TEC also interacts with stakeholders and associations, viz., COAI, AUSPI, ISPAI, SAI, TEMA, CMAI, FICCI, CII, etc.

Learning gives creativity, creativity leads to thinking,

thinking leads to knowledge, knowledge makes you great

— Dr. APJ Abdul Kalam

Suggestions/ feedback are welcome and may be sent at-

Email: ddgs.tec@gov.in

Website: www.tec.gov.in

K.L Bhawan, Janpath, New Dlehi

HAPPY *new year* 2021

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