

Interaction of ITS-2015 batch Officer Trainees with Hon'ble Vice-President of India

Officer Trainees of ITS-2015 Batch interacted with Hon'ble Vice-President of India at Vice-President House, New Delhi on 27th November, 2017. Hon'ble Vice-President of India Sh. Shri M. Venkaiah Naidu blessed the young officers of DoT and said that the technology has to be used for the

betterment of humanity. He further said that the future of our nation is Digital India and we must equip ourselves to meet the aspirations of the people. The Vice President added that the Government is taking up several initiatives like Stand-up India, Start-up India, Digital India, Incubation, Innovation for the unemployed youth of this country. We must make use of these programmes initiated by the Government and prove that we are not job seekers, but job givers. The world has become smart and everyone is living in LPG - Liberalization, Privatization and Globalization. He further said that technology advancement should lead to online services which are free from delays and misuse. The Vice President asked the Trainees to come out with out-of-box ideas.

The Union Minister for Electronics & Information Technology and Law & Justice, Shri Ravi Shankar Prasad, Sh. Lav Gupta, the then Sr. DDG (TEC/ NTIPRIT), Sh. H S Jakhar, DDG (T&A), Sh. Subhash Chand, Director (Training) and Sh. Manoranjan, ADG (Training & WA) were present during the deliberations.



(Sitting from left Shri Lav Gupta, the then Sr. DDG (TEC/NTIPRIT), Shri M. Venkaiah Naidu Hon'ble Vice president of India and Shri Ravi Shankar Prasad, Hon'ble Minister for Electronics & Information Technology and Law & Justice, Standing: ITS-2015 batch Officer Trainees and officers of NTIPRIT)

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M2M / IoT in Automotive Sector

Abstract: As per projection by GSMA (GSM Association) and Machina Research (World's leading advisor on M2M, Internet of Things and Big Data), there may be around 24 billion connected devices in the world around 2020, with a business impact of around US \$ 4.3 trillion. Later on CISCO / Ericsson / ITU projected this to be around 50 billion. Such projections entice the industry to explore and tap a wide range of opportunities that the M2M (Machine to Machine) communication / Internet of Things (IoT) concept offers, enabling novel business cases, enhanced workflow, efficiency and improved quality of life. These devices may be in various verticals such as Automotive, Power, Health care, Safety & Surveillance, Water management, Waste management, Smart homes, Environment monitoring and pollution control, Intelligent buildings etc. These verticals will work as pillars for the smart cities. India may have around 2.6 billion connected devices by 2020. Power sector (smart metering and smart grid) and Automotive Sector will have major deployment of M2M devices.

1.0 M2M / IoT

1.1 What is M2M Communication?

It refers to the technologies that allow wired / wireless system to communicate with the devices of same ability. M2M uses a device (sensor, meter etc.) to capture an 'event' (motion, video, location, speed etc.), which is relayed through a network (wireless, wired or hybrid) to an application (software program), that translates the captured event into meaningful information. A conceptual picture of which is shown below:

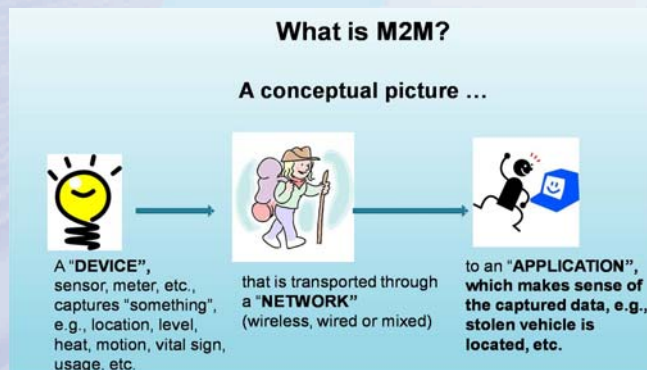


Figure 1: Conceptual Picture of M2M

M2M is a subset of IoT. IoT is a more encompassing phenomenon because it also includes Human-to-Machine communication (H2M). With IoT, the communication is extended via Internet among all the things that surround us.

1.2 Internet of Things (IoT)

What we think about IoT: The Internet of Things will revolutionize and change the way all businesses,

governments, and consumers interact with the physical world. This level of disruption will have a significant impact on the world in improving the quality of life. ITU-T in its Recommendation ITU-T Y.2060 (06/2012) has defined Internet of Things (IoT), as a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

2.0 Problems in Automotive Sector

Automotive sector is the back bone of any country. In India due to rapid rise in number of vehicles with respect to existing infrastructure and slow rate of development in infrastructure sector recent studies show that India faces

- An average Indian spends about 90 minutes a day travelling in major cities, with an average speed of 10 – 15 km/hr on some major roads,
- Due to congestion, slow speed of freight and waiting time at toll plazas, there is a loss of approx. Rs. 600bn (US \$10.8bn) per annum,
- In India, around 5 lakhs road accidents happen, causing a loss of around \$20 billion, with 6 lakhs people injured and 1.5 lakhs killed,
- Every year, nearly 36,000 vehicles are stolen, which amount to Rs. 115 crore with only about 14,500 getting traced, often in un-roadworthy conditions, with many components missing,
- Vehicles are the major contributor to AIR pollution.

The rapidly increasing vehicle population in India puts a heavy demand on traffic management in metropolitan cities and other towns. Intelligent Transportation System is an established route to address this and minimize traffic problems.

Traffic jams cost huge loss in terms of time, money & pollution. Widening of roads and creating more lanes cannot be the long term sustainable solution. Use of M2M / IoT technology along with ICT infrastructure can help / solve the jams occurring to a large extent. With limitation for growth infrastructure there is a strong need to depend on technology (IoT/M2M) to address challenges, currently faced by the industry. M2M enabled transportation system include telematics and all types of communications in vehicles, between vehicle and citizens/Authorities (car to application), between vehicles (e.g. car-to-car), and between vehicles and fixed locations (e.g. car-to-infrastructure).

M2M Communication can leverage sensor ecosystem, communication modules, network channel, real-time processing, big data and cloud computing to optimize emergency services and save lives, reduce congestion on roads and generate revenue, provide road safety to

commuters and to monitor and regulate driving behaviour, manage traffic by optimizing route.

Furthermore, M2M adoption results in enhancing convenience to use public transport, connecting para transit and mass transit modes, monitoring and managing personal car, enabling vehicle manufacturers to provide VAS to consumers, creating Vehicle to Vehicle and Vehicle to Infrastructure communication systems, monitoring and reducing traffic violations, enabling parking assistance and road tolling.

3.0 M2M / IoT applications in Automotive Sector

With Vehicle tracking, e-call (911 in USA / 112 in Europe), V2V and V2I applications, traffic control, Navigation, Infotainment, Fleet management, asset tracking, manufacturing and logistics.

India: 112 has been adopted as a common emergency number in line with ITU-T Recommendation E.161.1 (09/2008) "Guidelines to select emergency numbers for public telecommunication network". All existing helpline numbers such as 100- Police, 101- Fire, 102/ 108- Ambulance service will be migrated to 112.

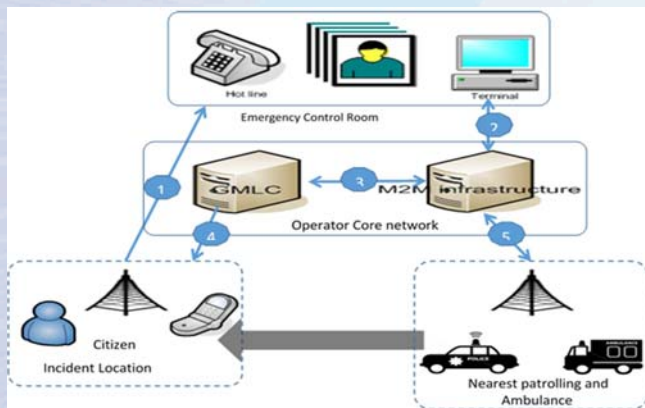


Figure 2: e-call, call flow diagram

M2M communication / IoT will make the verticals smart by providing the data in real time and will enable to take the decision for planning, operation and other related activities.

4.0 Enabling technologies for M2M/IoT

- Sensor networks, Radio frequency Identification (RFID) chips, Global Positioning System (GPS), Location-Based Services (LBS), nanotechnologies, cloud services, data analyticsetc.
- WLAN (IEEE 802.11), Bluetooth Low Energy (BLE), Near Field communication (NFC), Dedicated Short range communication (DSRC) for short range communication.
- Cellular 2G/ 3G/ LTE / LTE MTC / Satellite for Long range communication depending upon the applications.

- Wire line BB / Lease line to connect infrastructure
 - Low Power RF for LAN / FAN such as 6LowPAN, ZigBee, Zwave etc
 - **Low power wide area network (LPWAN):** Non cellular LPWAN technologies such as LoRa, Sigfox, Ingenu etc. are being deployed mostly in unlicensed band. 3GPP has developed specifications in its Rel 13 to convert existing cellular networks in LPWAN. These LPWAN technologies in cellular domain are EC-GSM, NB-IoT and LTE MTC.
 - **M2M SIM:** The normal SIM card is not suitable for harsh conditions of vehicles like vibrations, temperature, and humidity. GSMA has created specifications for embedded M2M SIM, with Over-the-Air (OTA) provisioning. Temperature variation range is from -40 degree to +125 degree Celsius. Embedded SIM technology offers big opportunities for auto manufacturers as the lifecycle of an eSIM is, around 10-15 years. International standards for eSIM have evolved. Embedded SIM will be quite useful for vehicle tracking services. Embedded SIM may have the subscription from more than one telecom service providers (up to five) and switching is possible from one TSP to another remotely or non-availability of signal from the main TSP. Details about the M2M SIM are available in the technical report released in TEC on V2V/ V2I Radio Spectrum and Embedded SIM and available on www.tec.gov.in/technical-reports. Embedded SIM will be the game changer in the IoT domain.
 - **DSRC (Dedicated Short Range Communication):** This technology is based on IEEE 802.11p WLAN standards, called as Wireless Access in Vehicular Environment (WAVE). It is working in the frequency range 5.850 -5.925 GHz. FCC has allocated 75 MHz spectrum in the 5.9 GHz band and European Telecommunications Standards Institute (ETSI) has identified of 30 MHz spectrum in the 5.9 GHz band for ITS. It also supports low latency, Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication. Main uses of V2V and V2I communication services are to transmit information for: Road side beacons, Traffic signals, Toll collections, Petrol pumps and charging centers (for electric vehicles), Digital signage, Safety applications like red light violation, overloading or crossing speed limit, eCall (911 in USA and 112 in Europe), Maintenance, Navigation.
- Its main uses are Vehicle Safety service, Commercial transaction via cars, Toll collection, Traffic management etc. This technology is being used in USA, Europe, Japan, Korea and Singapore etc.
- **Automotive Radar Services:** European Union: A 'temporary' frequency band has been opened at 24 GHz is allocated for radar technology; A 'permanent' band has been allocated at 79 GHz, allowing for long-term development of this radar service.

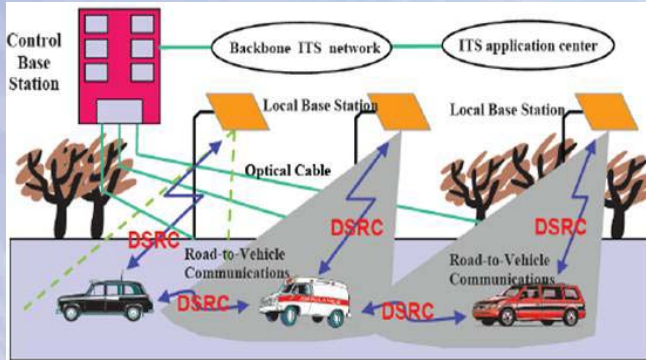
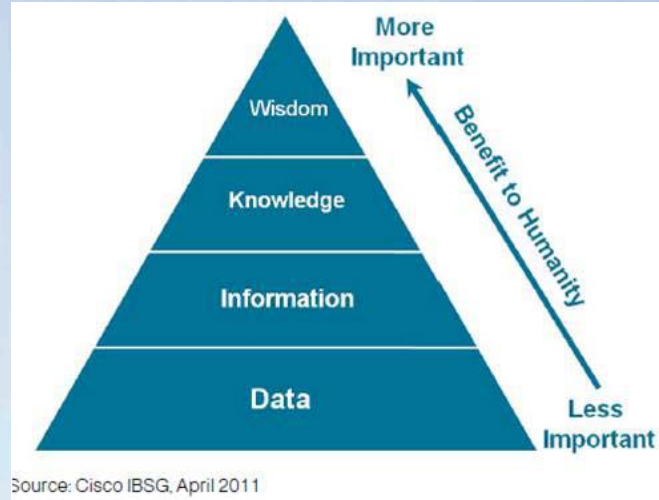


Figure 3: V2V Communication using DSRC

- **LTE Technology:** Cellular 3G and 4G networks were developed keeping consumer voice and data in mind. 3GPP release 12 talks about LTE direct / LTE MTC (machine type communication)/ LTE D2D (device to device). Based on Release 13 and beyond, cellular networks may be converted to EC-GSM, NB-IoT and LTE MTC.
- **5G Technology:** 5G will provide Enhanced mobile broadband with peak data rate of 10 Gbps, Mission critical services (Ultra reliable & low latency communication (URLCC) with RAN latency < 1ms and Massive M2M/ IoT services. URLCC will be quite useful for self-driving vehicles, drones and V2V/ V2I services.
- The standards for 5G will be frozen in 2020 and may take further 2-3 years for deployment. However, pre standards based deployment are in progress in few cities of USA, in South Korea for 2018 winter Olympic games and in Japan, China etc. 5G deployment is also expected in India around 2020.
- High end vehicles are using a large number of sensors for different applications such as motion sensors, weather sensors, parking sensors, Tyre pressure sensor, road status, temperature sensors fuel sensors, temperature sensors, door sensors etc.
- **Geographic Information System (GIS):** GIS plays an important role in creating maps, model, query, and analyse large quantities of data within a single database according to their location. It is a powerful tool to create maps, integrate information, visualize scenarios, present powerful ideas, and develop effective solutions.
- **High speed internet services** on fixed line broadband connection as well as on mobiles (Smart phones). Fixed line Broad band modem / Smart phones may work as a gateway.
- ICT infrastructure, public and private clouds for storing and sharing data.
- **Big data analytics to create intelligence:** A huge amount of data will be generated from the sensors/ devices. Raw data has got no meaning. Big data analytics may be used to create intelligence. Intelligence may be used in various planning and operational activities.



Source: Cisco IBSG, April 2011

Figure 4:

- Static IP for the devices / Gateways, which are to be connected directly to PSTN / PLMN switches: - IPv4 addresses are going to exhaust. Standardization and adoption of IPv6 in telecom and ICT organizations will provide an opportunity of having billions of devices which can be IP enabled and seamlessly addressable through mobile or wired broadband connections.

5.0 Various use cases in Automotive Sector

There may be a large no. of use cases depending upon the local requirements. Important use cases are:

Vehicle tracking, e-call (911 in USA and 112 in Europe), V2V and V2I applications: - Traffic control, Navigation, Infotainment, Fleet management, Asset tracking, Manufacturing and logistics, Intelligent transport System, Waste management, Water distribution, Smart Parking and School bus tracking etc.

A number of use cases have been described in detail in the Technical Report on M2M enablement in Intelligent Transport System, (www.tec.gov.in/technical-reports/).

Government of India has already mandated to install GPS/ GRPS devices with video camera and panic button in all public transport with cellular connectivity to police stations for woman safety in public transports.

RFID based Electronic Toll Collection devices have been deployed in India on Delhi- Mumbai National Highway, in the sub Ghz band 865 MHz – 867 MHz band.

5.1 Digital Identity: The Aadhaar ACT, 2016 has already been promulgated to provide for, as a good governance, efficient, transparent, and targeted delivery of subsidies, benefits and services. It assigns unique identity numbers to all the Indians. Aadhaar may be used as a digital identity (e-KYC) as the authorities may verify the credentials of the individuals

from UIDAI server on open APIs. For companies, digital certificates may be used.

5.2 Aadhar based Driver Identification: Aadhar based Driver Identification system should be implemented. Use of M2M SIM and Digital Identity for enablement of Vehicle Registration and Transfer may resolve a large no. of issues related to industry, citizens and the Government as this process may ensure the ownership transfer to be in Sync both for vehicle and device connection.

A number of use cases may be developed using digital identity and embedded SIM, for example vehicle registration and transfer for connected car.

Connected Cars (Vehicles) are growing rapidly as the industry moves towards deploying new technologies that benefit the connected car ecosystem – vehicle manufacturer, vehicle user, vehicle owner, fleet manager, insurer (insurance based on driving behavioural pattern), service agency and the Government – to name a few.

6.0 Network Quality of Service (QoS) requirement

M2M communication is different from the voice communication as size of data in M2M may vary from few bytes (meter reading) to several MBs (surveillance video in). In Automotive sector depending upon the use case data size will vary. But the umbrella coverage is required for the vehicles in movement. M2M services requirement are

- Timely transmission is of utmost important.
- Communication network is required to be more reliable with low latency.

To meet these requirements, telecom service providers should design/ expand their network with following:

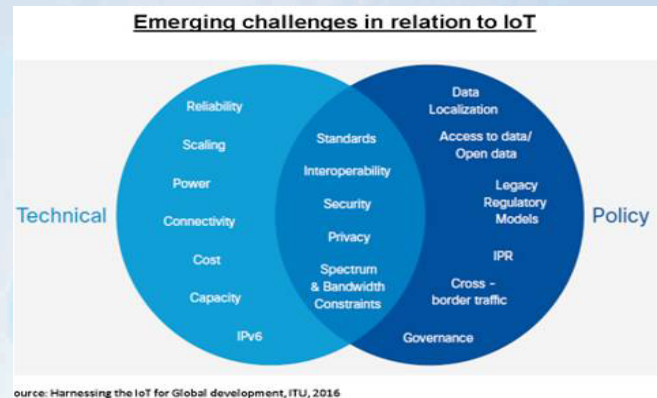
- **Availability:** Connectivity may be required in locations not yet considered.
- **Reliability:** If networks are critical parts of the business, they must be as reliable as any other critical equipment.
- **Scalability:** Service providers must manage the significant additional traffic load of the IoT
- **Flexibility:** With the varied needs of different applications, enterprises will demand flexible pricing schemes that match their network utilization needs.
- **Response time:** In case of problems, TSPs should respond quickly.

To have an appropriate level of safety and security, and also to avoid unwanted vulnerability, connected devices are required to be tested against EMC (Electromagnetic compatibility), Safety, Security and other Technical requirements related to communication technology and functional capabilities [SAR (specific absorption rate), IPv6, RoHS etc] before deployment.

- **Security and safety:-** E2E security of data is required ie from device to head end system.

7.0 Challenges related with the technology and policy

A number of challenges related to policy and technology as shown in figure-5 are required to be resolved for the fast and smooth growth of this domain. Due to lack of standardization and interoperable technologies, Industries are working in silos and on proprietary solutions. There should be interoperability at device, Network and application levels.



source: Harnessing the IoT for Global development, ITU, 2016

Figure 5: Emerging challenges in relation of IoT domain, [2]

Technologies for sustainability / long life batteries is required for sensors. There is a need to generate indigenous IPR for creation of standards and further contribution in global SDOs. Reliable connectivity, localization of data in cross border traffic, spectrum requirement for low power devices and slow deployment of IPv6 are some of the challenges to be resolved.

8.0 Standardization at Global Level

8.1 International Telecommunication Union (ITU): In June 2015, ITU-T has created a new Study Group-20 to work on IoT and its applications including Smart Cities and communities. Different Questions are under study in ITU-T SG-20. Details are available at ITU-T website (www.itu.int/en/ITU-T/studygroups/2017-2020/20/Pages/default.aspx). Details of TEC participation in ITU-T SG-20 has been given in point no. 9.2.

8.2 One M2M: ETSI (Europe), TTC, ARIB (Japan), ATIS, TIA (USA), TTA (Korea) CCSA (China) had come together and created a partnership project OneM2M, to avoid creation of competing M2M standards. They are working to create standards for the common service layer. From India, TSDSI is the member of OneM2M. At present there are around 250 members in OneM2M. OneM2M has released first set of specifications in Jan 2015 and its IInd release in March 2016.

9.0 Standardization work in Telecommunication Engineering Center (TEC)

TEC formed eleven multi-stake holders working groups in the last 2- 3 years to work in M2M and IoT domain. Eight working groups are in the verticals namely Power, Health, Safety and Surveillance, Intelligent Transport Systems, Smart Cities, Smart Homes, Smart Village & Agriculture and Environment & Pollution control. Three working groups are in the horizontal area common to all the verticals, namely M2M Gateway & Architecture, Security in IoT domain and Communication Technologies in M2M/ IoT domain. Eleven technical reports have been released so far and available on TEC website (www.tec.gov.in/technical-reports/). These technical reports may be quite useful in preparing eco system for the Smart Cities. Following Technical reports are related with the automotive sector:

1. M2M Enablement in Intelligent Transport System: -This document covers the Indian scenario, challenges, use cases, available standards and further course of action.
2. V2V/ V2I Radio Spectrum and Embedded SIM: -This document covers the technologies related to V2V/ V2I communication and the spectrum requirement. Embedded SIM is the innovation in SIM technology and based on GSMA guidelines.

9.1 Actionable points emerged from the technical reports and submitted to concerned division in TEC/ DoT for further action:

1. 13 digit M2M Numbering plan for SIM based devices/ Gateways.
2. Devices / Gateways, which are to be connected directly to PSTN / PLMN, should have IPv6 or dual stack (IPv6 and IPv4).

- DoT has approved this scheme and issued orders to all the Telecom Service Providers (TSPs) for its implementation.
- Five codes of 3 digit each (559, 575, 576, 579 and 597) have been allotted as a M2M identifier.

3. Embedded SIM:- Based on the technical report "V2V / V2I Radio Communication and Embedded SIM" released in November 2015, Interface Requirement (IR) has been prepared in TEC and it is expected to be approved / released in near future.
4. Spectrum requirement for M2M domain: - Based on the technical report on "Spectrum requirements for "PLC and Low Power RF Communications", and "V2V/ V2I radio communication and Embedded SIM" further study of recommendations and earmarking the spectrum is in progress.

5. Licensing and registration of different types of services in M2M domain: - Based on the technical report on "M2M Gateway & Architecture" released in TEC, a note was sent for consideration for licensing / registration requirement for M2M service providers.

Ministry of Road Transport and Highways in India has released the AIS 140 Standard which specifies the conditions and specifications for the use of connected devices in vehicles. <https://araiindia.com/hmr/Control/AIS/921201744153PMAIS-140.pdf>

6. Multi-protocol Gateways
7. Licensing of non-cellular LPWAN public service providers

9.2. Interaction with International bodies: TEC has created National Working Group (NWG) -20 on the lines of SG-20 for submitting technical contribution on Indian requirements in ITU. NWG-20 is having members from all stake holders. Contributions were submitted in ITU-T SG-20 meeting being held. Contributions were presented by Indian delegation and were accepted for further discussion in e-meetings and next SG-20 meeting. Some of the important contributions submitted from India and in discussion are use cases based on e-call system, Embedded SIM and digital identity, Remote monitoring the health of a patient, Smart Homes etc. One contribution submitted from India has been converted into ITU-T draft Supplement Y.IoT-Use-Cases "IoT Use Cases".

10.0 Conclusion

M2M/ IoT will play a big role in making the automotive sector smart, which in turn will help in resolving a number of issues and improving the quality of life. Some services such as Vehicle tracking, geo fencing etc. are being provided in silos by the various device manufacturers / application providers. For large proliferation of the services and also to have economies of scale, standardization at device, network and application level is required. With the large scale deployment of LTE services and 5G to come in near future, V2V and V2I services may become a reality. Connected vehicle scenario may have bunch of technologies depending upon the availability of eco-system.

References:

1. TEC Technical Report on (a). M2M Enablement in Automotive Sector, (b). Communication technologies in IoT domain (www.tec.gov.in/technical-reports/)
2. Harnessing the Internet of Things for Global development by CISCO and ITU.

[Prepared by: Shri Sushil Kumar, DDG(IoT), TEC]

Shri Mahabir Prasad Singhal to Head TEC

Shri Mahabir Parshad Singhal took over the charge of Sr. DDG, TEC on 04.01.2018. He belongs to 1981 ITS Group 'A' batch. He has obtained his B.Tech in Electronics and Electrical Communications from Punjab Engineering College Chandigarh and Diploma in Management from IGNOU.



He has a vast experience of 35 years in Telecommunication and IT. During the period, Shri Singhal has worked in various capacity in the areas of Wireless Services, Information Technology and Computerization, Planning, Administration and HRD, Vigilance etc. He has played a major role in introductions of computerization for customer services, billing, Network management systems, ERP, Call center, Complaint handling systems, IVRS etc. From 1991 to 1996, he worked for Telecommunication network in Kuwait. During the period, he contributed for the planning, upgradation and rehabilitations of Telecom network for Ministry of Telecommunications, Kuwait. Before joining as Sr. DDG, TEC, Shri Singhal was associated with one of the prestigious project 'Bharatnet', the infrastructure project and one of the nine pillars of Digital India programme.

हिंदी कार्यशाला

दूरसंचार अभियांत्रिकी केंद्र, नई दिल्ली में दिनांक 19.12.2017 को एक हिंदी कार्यशाला का आयोजन किया गया। इस कार्यशाला में कुल 23 अधिकारियों/कर्मचारियों ने भाग लिया। इस कार्यशाला के अतिथि वक्ता श्री नगेन्द्र सिंह, तकनीकी निदेशक (राजभाषा विभाग) द्वारा गूगल-ट्रांसलेशन, गूगल वॉइस टाइपिंग, मोबाइल फोन पर गूगल वॉइस टाइपिंग, क्रोम ब्राउजर का प्रयोग करके हिन्दी/अंग्रेजी में डिक्टेसन देने और गूगल डॉक्स पर कार्य करने के बारे में विस्तार से बताया गया।



हिंदी कार्यशाला में उपस्थित अधिकारी एवं कर्मचारी

Activities at NTIPRIT (OCT-17 to DEC-17)

1. Orientation Program of ITS/BWS-2016 Batch (20.11.2017 to 24.11.2017)
ITS/ BWS-2016 Batch joined NTIPRIT on 20.11.2017. During one-week Orientation Program, Officer Trainees visited C-DoT campus and BSNL Bhawan New Delhi. During the period the officer Trainees were also addressed by CMD BSNL and CGM, ALTTCC



Interaction of Officer Trainees with CMD, BSNL



Group Photo of ITS/BWS-16 Batch with NTIPRIT faculties

2. Induction Training of the following batches of Officer Trainees of ITS/BWS was conducted:
 - i. ITS-15 batch (35 officers) & ITS-16 batch (34 officers)
 - ii. BWS-15 batch (1 officer) & BWS-16 batch (4 officers)
 - iii. JTO-2016 batch (5 officers)
 Various training programs like technical modules and DoT, TEC attachment and study visit to telecom installations for ITS/BWS were conducted as per respective training calendar.
3. In-service training courses for DoT Officers were conducted at NTIPRIT on the following topics:
 - i. Training course on "NGN Advance", (04-06 October, 2017) [15 Participants]
 - ii. Training course on "IPv6 familiarization", (12-13 October, 2017) [12 Participants]

Approvals from OCT-17 to DEC-17

Sl. No.	Name of the Manufacturer/Trader & Name of Product & Model No.
A	Intellicon Pvt Ltd
1	PABX for Network Connectivity, Karel IPG1000
2	IP PABX with Media Gateway, Karel IPG1000
B	FIBCOM India Ltd
3	STM-1 Synchronous Multiplexer, Fibcom 6325 Edge Node
C	Sunren Technical Solutions Pvt Ltd
4	Group 3 Fax Machine/Card, ProXpress C4060FX
5	Group 3 Fax Machine/Card, ProXpress LEX-M03-001
D	Matrix Comsec Pvt Ltd
6	PABX for Network Connectivity, Eternity GENX
7	PABX for Network Connectivity, Eternity LENX

Important Activities of TEC during OCT 17 to DEC 17

GRs/IRs issued:

- GR on PABX
- GR on Raw material for manufacturing optical fibre cable
- GR on Multi service optical transport network (OTN) platform with DWDM bearer transport system for metro and core network application
- IR on PABX for network connectivity
- GR on Electronic Telephone Instrument

DCC meeting conducted for:

- GR on Mini ADSL/VDSL DSLAM (24/48/96) Ports with 34 Mbps uplink and 24 Mbps downlink.
- GR on Asymmetrical Digital Subscriber Line 2+ system for central office & remote office applications
- GR on very high speed Digital Subscriber Line (VDSL) equipment central office & remote office applications
- GR on Server, IR on IVRS
- SR on Audio Conferencing

Sub DCC meeting conducted for:

- IR on Interchange of STM-1, STM-4, STM-16, STM-64 and STM-256 signals between different networks

Representation of TEC in Training/Seminar/Meetings

- Meeting of India Broder way forum in New Delhi
- Seminar organised by GCF in New Delhi
- ETSI Symposium on Interoperability in Bengaluru
- 4th International summit on cyber security in New Delhi
- NASSCOM DSCI summit in Gurgaon
- GCF/COAI workshop in New Delhi
- Broadband India Forum (BIF) on Digital India in New Delhi
- Workshop of IEEE on Inclusion Internet at ITC Mourya, New Delhi
- NDMA/DoT meeting on CAP managing in DoT HQ
- IPDR meeting in New Delhi
- Meeting on NTP-2018 for Digital India in DoT HQ

Brief About TEC

Telecommunication Engineering Centre (TEC) functions under Department of Telecommunications (DOT), Government of India. Its activities include:

- Issue of Generic Requirements (GR), Interface Requirements (IR), Service Requirements (SR) and Standards for Telecom Products and Services
- Field evaluation of products and Systems
- National Fundamental Plans
- Support to DOT on technology issues
- Testing & Certification of Telecom products

For the purpose of testing, four Regional Telecom Engineering Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

For more information visit TEC website

www.tec.gov.in

Other Activities

- Meeting of NWG-5, 12, 13, 15, 20 & NSG-5 in TEC
- Technical presentations on "Overview of 10 Gigabit capable system passive optical network (XGS-PON)" by Dir (FA) and on "5G" by Dir(MT) in TEC through webinar.
- Technical presentations on "FTTX end to end solution for HSIA infrastructure" by M/s Zyxel Ltd, on "Testing of LI equipment" by M/s Verint, on "Security in subscription management" by Gemalto in TEC.
- Technical presentations on "Tata Communication-SoC & Managed Security Solution in TEC.
- Testing w.r.t. Technology Approval for CDOT GPON system completed.

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Suggestions/feedback are welcomed, if any for further improvement.

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