भाग 22 / अंक 4 अक्तूबर 2018 त्रैमासिक पत्रिका

ISO 9001 : 2008

TEC

दूरसंचार अभियांत्रिकी केन्द्र
TELECOMMUNICATION ENGINEERING CENTRE

टी ई सी संचारिका
NEWSLETTER

Telecom News: At a Glance

National Digital Communications Policy-2018 has been approved by Government of India and issued vide gazette notification No. 341 dated 22-10-2018. This policy seeks to unlock the transformative power of digital communications networks - to achieve the goal of digital empowerment and improved well-being of the people of India; and towards this end, attempts to outline a set of goals, initiatives, strategies and intended policy outcomes. NDCP-2018 envisages three Missions: **Connect India, Propel India, Secure India.**

The Policy aims to accomplish the following Strategic Objectives by 2022:

a. Provisioning of Broadband for All,
b. Creating 4 Million additional jobs in the Digital Communications sector
c. Enhancing the contribution of the Digital Communications sector to 8% of India's GDP from ~ 6% in 2017
d. Propelling India to the Top 50 Nations in the ICT Development Index of ITU from 134 in 2017
e. Enhancing India's contribution to Global Value Chains
f. Ensuring Digital Sovereignty

For detail information for NDCP-2018, visit www.dot.gov.in

Interaction of ITS-2016 and IP&T BWS-2016 batch Officer Trainees with Hon'ble President of India

As part of Induction Training, Hon'ble President of India, Sh. Ram Nath Kovind was called on by ITS-2016 and IP&T BWS 2016 batch officer trainees on 11th July, 2018 at Rashtrapati Bhavan. Hon'ble President, in his address, said that ITS & IP&T BWS services provide you an enormous opportunity for serving the nation and you will be responsible for managing important projects in different domains and serve the crucial Telecommunications sector. Hon'ble President also said that the telecom sector is a critical component for achieving rapid economic progress and socio-economic development. Therefore, Indian Telecommunication Service officers have an important role to play as we seek to connect the unconnected, especially in our rural and remote areas. It is yours's responsibility to ensure that we have in place an enabling policy paradigm and conducive licensing and regulatory framework. The job of P&T Building Works service officers is equally important as they have to ensure quality and efficiency in construction and maintenance of office and residential complexes, electrical and architectural works both in Department of Telecommunication and Department of Posts.

ITS-2016/ IP&T BWS-2016 batch officer trainees with Sh. Ram Nath Kovind, Hon'ble President of India; Ms. Aruna Sundararajan, Secretary & Chairman Telecom Commission; Sh. Deepak Sinha, Member (S) DOT; Sh. Debatosh Manna, Advisor (NTIPRIT) and other senior officers of DoT & NTIPRIT

Other Telecom News

1. **Making India 5G Ready: Report of the High Level Forum** was released by Hon'ble Minister of State for Communications (Independent Charge) on 23-08-2018. 5G technology (IMT-2020) has the potential for ushering a major societal transformation in India by enabling a rapid expansion of the role of information technology across manufacturing, educational, healthcare, agricultural, financial and social sectors. This report covers the recommendations of Steering Committee (appointed by High Level Forum) on followings;

   a. Spectrum Policy
   b. Regulatory Policy
   c. Education and Awareness Promotion Program
   d. Application and Use Case Labs
   e. Development of Application Layer Standards
   f. Major Trials and Technology Demonstration
   g. Participation in International Standards

2. **'In-Principle MoU'** was signed between TEC & ITI for setting up the testing lab of Safety, EMI/EMC etc. by ITI in the event of '**ICT & IoT start up Tech Expo'** held on 1st & 2nd Sep, 2018 at Bengaluru.

40 GIGABIT NEXT GENERATION PASSIVE OPTICAL NETWORK (NGPON2)

1.0 Introduction

NGPON2 can be best understood in terms of stacks of XGSPON (10G Synchronous Passive Optical Network). It shall be capable of providing 40 Gbps downstream and 10 Gbps upstream, using four wavelengths which can be extended to 80 Gbps downstream and 40 Gbps upstream, using eight wavelengths. It can also provide symmetrical service from as low as 2.5 Gbps to as high as 80 Gbps. Additionally, it supports PtP WDM (Point to Point Wavelength Division Multiplexing) overlay over the same ODN. It is one of the candidate technology for 5G because of its capability of high constant bit rate of 10Gbps and very low latency and jitter. The most significant characteristic of NGPON2 which differentiate it from its PON family is that it set to address front haul requirement of 5G like high bit rate, low latency and jitter in transmission over digitized radio over fibre (D-RoF) apart from redundancy and resilience and power reduction.

2.0 NGPON2 architecture

In a multiple wavelength passive optical network (PON) system, such as next generation passive optical network 2 (NG PON2), the optical line terminal (OLT) is conceptually composed of multiple OLT channel terminations (CTs) connected via a wavelength multiplexer (WM). The associated reference logical architecture and its reference points are given in Figure (1). A multi-system OAN (Optical

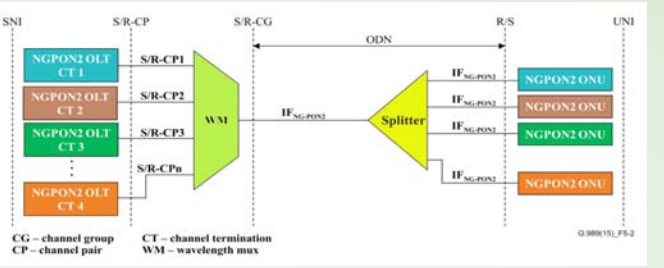


Figure (1): NGPON Architecture

Access Network) architecture for NG-PON2 coexistence with legacy systems is represented in Figure (2). During coexistence, mitigation techniques may be necessary to avoid inter-system impairments. This architecture allows both point-to-multipoint connectivity [TWDM (Time and Wavelength division multiplexing) PON] and virtual point-to-point connectivity (PtP WDM PON) as given in figure (2). Each ONU (Optical Networking Unit) is equipped with a tunable transmitter and a tunable receiver. The tunable ONU transmitter/ receiver must be able to adjust to the allocated upstream/downstream TWDM or PtP WDM wavelength channels within the bands specified in Table (1).

ITU recommendation specifies a minimum of four, with extension up to eight, TWDM channels. A minimum of four PtP WDM channels is supported with a maximum not specified. The number of wavelength channels supported by a given equipment implementation or network instance is not specified.

2.1 NGPON2 with PtP WDM

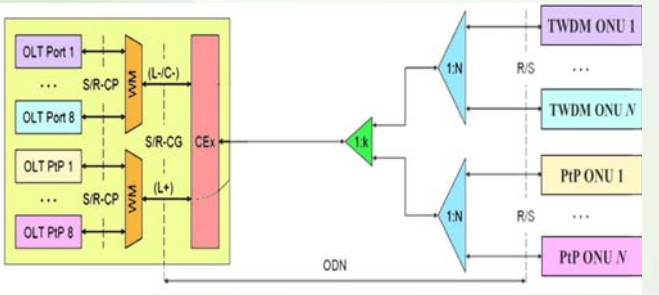


Figure (2): NGPON2 with PtP WDM

2.2 NGPON2 with Legacy Network

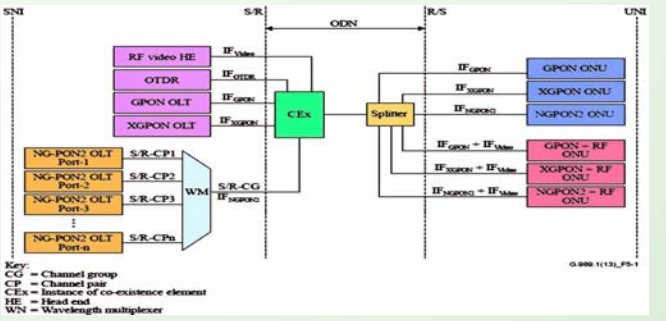


Figure (3): NGPON2 with Legacy Network

2.3 Wavelength plans for NG-PON2

Table (1) specifies the wavelength plans for both TWDM PON and PtP WDM PON. The NG PON2 wavelength plan is specified to enable the coexistence through wavelength overlay with legacy PON systems. Shared spectrum allows full coexistence with G-PON, XG-PON1, radio frequency (RF) video overlay and TWDM. The expanded spectrum option of PtP WDM PON supports spectral flexibility. Expanded spectrum can be used in the absence of any one of these coexistence systems.

Table(1) –NG-PON2

Wavelength compatible systems	TWDM PON		PtP WDM PON
	Downstream	Upstream	Upstream/ downstream
GPON, RF video, XG-PON1	1596-1603 nm	Wideband option 1524-1544 nm	* Expanded spectrum 1524-1625 nm
		Reduced band option 1528-1540 nm Narrow band option 1532-1540 nm	* Shared spectrum 1603-1625 nm

*The selection of the operating band option in the PtP WDM PON sub-bands depends on the coexistence requirements.

3.0 Protection and resilience in NGPON2

PON resilience will become more important in supporting business applications and high value consumer applications, such as IPTV, especially in the node consolidation scenario. A redundancy mechanism is required to avoid service disruption to potentially thousands of users in the event of fibre cable or equipment failure. Besides the usual hardware redundancy requirements at the OLT and in the backhaul transmission equipment (towards the metro/core), networks require feeder and/or OTL line (optical Transmission line) redundancy options to avoid large scale customer outages as well as full redundancy for business services requiring end-to-end type C protection. For PON redundancy, use cases and guidelines are defined in [b-ITU T G-Sup.51]. The following sub clauses show one example in figure (4) of network protection in the case of multi-wavelength access systems. All possible use cases are given in table (2).

3.1 PON Protection with dual homing:

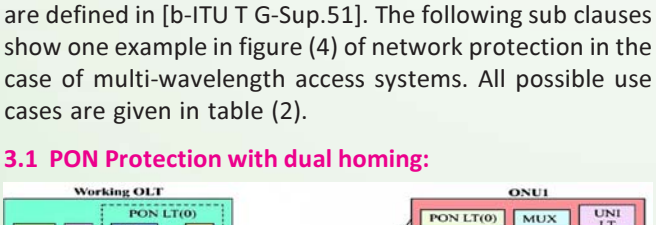


Figure (4):

Table (2) Protection category

Type	Sub category	Dual parenting	Protected subject	ONU tuning	Extra equipment for protection
A	1:1	No	Feeder fibre	No	Spare fibre Optical switch and 2:n s
B	1:1	No	OLT and feeder fibre	No	Backup OLT, 2:n splitter, and extra feeder fibre
		Yes			
	1:n	No	OLT CT and feeder fibre	No	Backup OLT CT, 2:n splitter and extra feeder fibre
		Yes	OLTs and feeder fibres	No	Backup OLT, 2:n splitters, 1:n optical switch and extra feeder fibres
C	1+1	No	OLT, feeder fibre, drop fibres and ONUs	No	Backup OLT, 2:n splitters, extra feeder fibres, extra drop fibres and extra LTs (ONUs).
W	1:n	No	OLT CT	Yes	None
	(n+1): n			No	Tunable TRx, 2:n splitter, and extra fibre
	2n:n	Yes	OLT	Yes	Backup OLT, feeder fibre

4.0 Power reduction

Power saving in telecommunication network systems has become an increasingly important concern in the interest of reducing operational costs and reducing the network contribution to greenhouse gas emission. NG-PON2 systems is designed in the most energy-efficient way. This applies to the OLT side and even more to the ONU side since the energy consumption is not shared at the ONU except for FTTC/B (Fibre Termination to the cabinet/ building). For time and wavelength division multiplexing (TWDM) channels, the mechanisms to attain better power savings at the ONU side, include the watchful sleep mode, which allows network operators to adjust the balance between the impact on the performance and the power-saving effect. Mechanisms at the OLT side include the wavelength re-tuning. Control protocols for realizing these mechanisms shall be supported in an NG PON2 system.

The OLT-port sleep mode can offer power savings because when there is less traffic in the TWDM PON system (4 Type W wavelengths) as shown in Figure (5), all the OLT-ports will keep working even though the total traffic could be accommodated by a single OLT-port. However, by connecting all of the ONUs to the same OLT-port (CT1) with the use of wavelength re allocation, the other OLT-ports (CT 2,

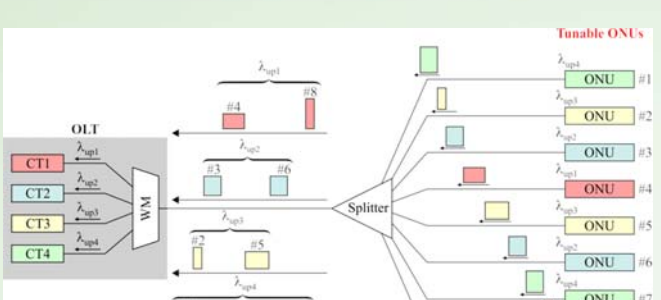


Figure (5): Example of OLT-port sleep mode (before starting sleep mode)

CT 3 and CT 4) can be forced into sleep mode as shown in Figure (6).

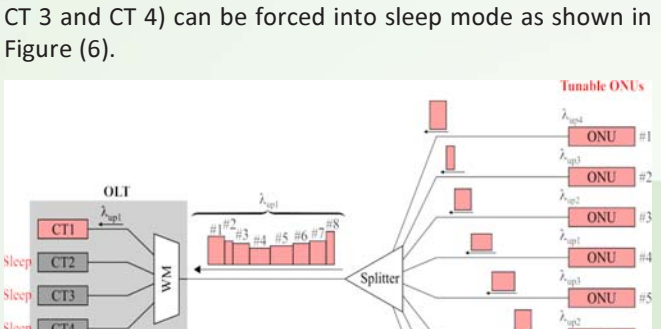


Figure 6: Example of the OLT-port sleep (CT 2, CT 3 and CT 4 are in the sleep mode)

5.0 Transport of wireless fronthaul links over the access system

To achieve a fronthaul transport solution over the access system, three fronthaul protocols should be taken into consideration: namely CPRI, OBSAI and ETSI-ORI. In all of these fronthaul protocols the radio signal is digitized radio over fibre (D-RoF).

NG-PON2 systems are required to fully support the various fronthaul services for mobile applications. Furthermore, for these mobile applications, NG-PON2 must achieve:

- Capability to support a fixed and continuous symmetrical bandwidth allocation capacity compatible with any fronthaul bit rate between 614.4 Mbit/s to 10.1376 Gbit/s.
- The fronthaul latency considered applies to the round trip time between SNI to UNI to SNI. It is required to be less than 500 µs including the fibre propagation time. A more stringent delay requirement is preferred when fronthauling legacy base station equipment.
- The maximum contribution *df/f*0 of jitter from the fronthaul link to the radio base station frequency accuracy budget must not exceed ±2 ppb (2.10-9).
- The extended outside temperature range may be needed in many of the envisaged fronthaul applications for the ONU
- Optionally, an antenna site management interface could be transported over the access system.
- Optionally, an additional synchronization signal (e.g., a GPS signal) could be transported over the access transmission.
- Optional capability to support the multiplexed transport of fronthaul protocols (e.g., CPRI over OTN).

6.0 Interface support

It supports a combination of interfaces at UNI and SNI as per user requirements. Details of interfaces that may be available is given in table 3-4.

Table (3) Interface at UNI

UNI	Physical interface	Service
10 Mbit/s/100 Mbit/s/1 Gbit/ Ethernet [IEEE 802.3]	10/100/1000 BASE	Ethernet
MoCA 2.0	–	MoCA 2.0
1 Gbit/s fibre UNI	–	Ethernet
10 Gbit/s fibre UNI	10BASE	Ethernet
[b-ITU-T G.8261]; [b-ITU-T G.8262]	–	Synchronous Ethernet
[b-ITU-T Q.552]	–	POTS
ISDN [b-ITU-T I.430]	–	ISDN
VDSL2 [b-ITU-T G.993.2], ADSL2plus [b-ITU-T G.992.5]	xDSL	xDSL
[b-ITU-T G.703]	PDH	DS3, E1, E3
[b-ATIS 0900102] and [b-ATIS 0600107]	PDH T1	T1, DS0, DS1, DS3
OTN [b-ITU-T G.872], [b-ITU-T G.709]		OTU1, OTU2
CPRI/OBSAI/ETSI ORI		

Table (4) Interfaces at SNI

SNI	Physical interface	Service
1 GigE [IEEE 802.3]	1000BASE	Ethernet
10 GigE [IEEE 802.3]	10GBASE	Ethernet
40 GigE [IEEE 802.3]	40GBASE	Ethernet
100 GigE [IEEE 802.3]	100GBASE	Ethernet
[b-ITU-T G.8261];[b-ITU-T G.8262]	-	SyncE
[b-ITU-T G.965]	V5.2	POTS

SNI	Physical interface	Service
[b-ITU-T G.703]	PDH, STM-1e	DS3, E1, E3,STM-1, DS1, DS0
[b-ITU-T G.957]	STM-1, 4,16,64	E1, E3, DS1, DS3, GFP, E4, STM-n, DS0
[b-ATIS 0600107]	PDH	DS0, DS1, DS3
SDH/SONET	SDH/ SONET	OC3-OC192, STM1-STM64
OTN [b-ITU-T G.872],[b-ITU-T G.709]	OTN	OTU1, OTU2, OTU3
CPRI/OBSAI/ETSI ORI		

7.0 ODN optical path loss classes

The optical path loss for each class is specified at $IF_{NG-PON2}$ of one side of the ODN and at $IF_{NG-PON2}$ of the other side of the ODN in each direction. It takes into account a 15 dB differential optical path loss and optical path penalty (OPPs) as given in table 5.

Table (5) Path loss classes

ODN Class	Max Attenuation	Min Attenuation	Differential ODN Loss
N1	29db	14db	15db
N2	31db	16db	15db
E1	33db	18db	15db
E2	35db	20db	15db

ODNs including gain elements, wavelength couplers or low split ratio power splitters may have optical path losses less than the stated minimum loss values given in the table 5 above. In such a case, the ODN must contain measures (e.g., optical attenuators) to guarantee the minimum optical path loss for the given class to prevent BER degradation and/or potential damage to receivers.

8.0 Use Cases

NGPON2 with channel bonding feature and manageability of bandwidth is a flexible transport device which allows it work in different deployment scenario. Most of its deployment is expected within the operator's network itself or in business. It may also find use in some residential areas too. Detail deployment scenario is given in Figure-7.

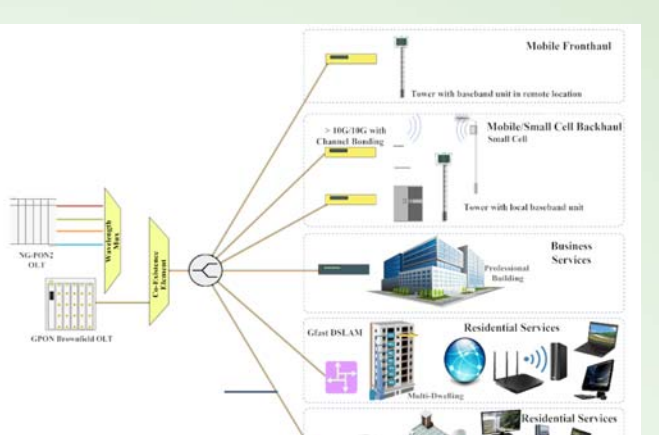


Figure 7: Deployment Scenario

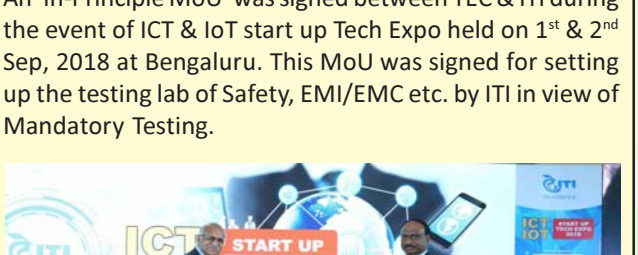
References and for further study:

- ITU-T G.989: Definitions, abbreviations and Acronyms
- ITU-T G.989.1: General requirements
- ITU-T G.989.2: Physical media dependent (PMD) layer specification
- ITU-T G.989.3: Transmission convergence layer specification
- ITU-T G.988: ONU management and control interface (OMCI) specification

[Prepared by Fixed Access Division, TEC]

MoU Signed between TEC and ITI

An 'In-Principle MoU' was signed between TEC & ITI during the event of ICT & IoT start up Tech Expo held on 1st & 2nd Sep, 2018 at Bengaluru. This MoU was signed for setting up the testing lab of Safety, EMI/EMC etc. by ITI in view of Mandatory Testing.



Exchanged of MoU between by Shri Mahabir Parsad Singhal, Sr. DDG, TEC and Shri K. Alagesan, CMD, ITI in presence of Shri Manoj Sinha, Hon'ble Minister of State (IC).

Mandatory Testing and Certification of Telecom Equipments (MTCTE)

Notification of MTCTE procedure: Procedure for implementation of MTCTE scheme has been notified and the same has been made available on TEC website.

Extension of date for Mandatory Certification of Telecom equipment

1. The following Telecom Equipment imported or sold in India on or after 1.1.2019 shall be subjected to testing and certification as envisaged in Indian Telegraph (Amendment) rules 2017:

Telephone Instrument, Modem, Audio conferencing equipment, Fax Machines, ISDN CPEs, Radio and Transmission products including Microwave, UHF and VHF equipment, MRTS Equipment, Satellite Equipment, Wi-Fi Access points and controllers, DWDM Equipment, Digital Cross Connect, Multiplexing Equipment, SDH Equipment and Cordless Phone

2. The following Telecom Equipment imported or sold in India on or after 1.4.2019 shall be subjected to testing and certification as envisaged in Indian Telegraph (Amendment) rules 2017:

GPON Equipment, DSL Equipment, IP Terminal, PABX, Media Gateway, Signaling Gateway, SBC, Soft Switch, Mobile Devices, BTS, Repeater, Compact Cellular Network, Router, Lan Switch, IOT devices and any other Telecom equipment not indicated in para 1.

Brief of the Zonal Workshops: Zonal workshops to spread the awareness about MTCTE among its various stakeholders viz manufacturers, importers, telecom service providers and testing laboratories were organized at Mumbai and at Bengaluru on 28th August, 2018 and 18th September, 2018 respectively. The forenoon session was aimed towards manufacturers, importers, telecom service providers and the afternoon session was dedicated for test labs. Both the sessions of workshops held at Mumbai and Bengaluru were well attended by the representatives of various stakeholders. The participants of the workshop were mainly from respective zones. Participants actively participated in the workshop and most of the doubts raised by the participants were clarified by DDG TC and DDG MRA. This outreach programme by TEC was very much appreciated.

Activities at NTIPRIT (JUL-18 to SEP-18)

1. **Induction Training:** Induction Training of the following batches of Officer Trainees of ITS/BWS probationers were conducted during the period:

   i. ITS-2015batch (34 officers)

   ii. ITS-2016 batch (34 officers)

   iii. BWS-2015 batch (1 officer)

   iv. BWS-2016 batch (3 officers)

   v. BWS-2017 batch (2 Officers)

   Various training programs like technical modules and Field Attachments with LSAs/ field units, Study visit to telecom installations, Attachment with ITPC, BSNL for ITS/ BWS batches, were conducted during this period as per training calendar.

Member (T), Sh. Prabhash Singh, during his address of ITS-2016 batch Officer Trainees on 18.07.2018

2. **In-Service Courses conducted and other events at NTIPRIT during the period:**

   i. Training course on "Cyber & Telecom Network Security", (12-13 Jul, 2018) [19 Participants]

   ii. Training course on "Advances in Transmission Technologies", (25-26 Jul, 2018) [10 Participants]

   iii. Training course on "Role of Telecom in Disaster Management", (02-03 Aug, 2018) [13 Participants]

   iv. Training course on "e-Procurement", (27-29 Aug, 2018) [20 Participants]

   v. Training course on "Electromagnetic Radiation", (05-06 Sep, 2018) [15 Participants]

   vi. Workshop on "Grey Market Complaint Investigation", (14 Sep, 2018) [28Participants]

   vii. Training course on "Lawful Interception & Monitoring System", (18-19 Sep, 2018) [14 Participants]

Participants attending in service Course on Cyber & Telecom Network Security

3. **Two Weeks Study visit of telecom Installations by ITS / BWS-2016 Batch in Hydrabad, Bangalore, Mumbai & Ahemadabad during 30-7-2018 to 10-08.2018**

Group Photo during field attachment

हिंदी पखवाड़ा एवं कार्यशाला का आयोजन

दूरसंचार अभियांत्रिकी केंद्र, नई दिल्ली में 14 से 28 सितंबर, 2018 तक हिंदी पखवाड़े का आयोजन सफलतापूर्वक एवं उत्साहपूर्वक किया गया। पखवाड़े का शुभारंभ श्री महाबीर प्रसाद सिंघल, वरिष्ठ उप महानिदेशक द्वारा दीप प्रज्वलित कर किया गया। इस अवसर पर श्री सिंघल जी ने माननीय गृह मंत्री जी का संदेश पढ़कर सुनाया। हिंदी पखवाड़े के दौरान कुल 10 प्रतियोगिताओं का आयोजन किया गया। पखवाड़े के दौरान आयोजित प्रतियोगिताओं में अधिकारियों/कर्मचारियों ने बढ़–चढ़कर भाग लिया।

समारोह का समापन समारोह दिनांक 03 अक्तूबर, 2018 को श्री महाबीर प्रसाद सिंघल, वरिष्ठ उप महानिदेशक की अध्यक्षता में सम्पन्न हुआ जिसमें सभी विजेताओं को पुरस्कार राशि एवं प्रमाण–पत्र प्रदान किए गए। उन्होंने सभी उपस्थित अधिकारियों/कर्मचारियों को हिंदी के प्रचार–प्रसार हेतु अधिक से अधिक योगदान करने के लिए प्रेरित किया।

दूरसंचार अभियांत्रिकी केंद्र में दिनांक 23.08.2018 को एक हिंदी कार्यशाला का आयोजन किया गया। इस कार्यशाला में कुल 27

अधिकारियों/कर्मचारियों ने भाग लिया। इस कार्यशाला के अतिथि वक्ता श्री अभय शंकर वर्मा, उप महानिदेशक (एमटी) द्वारा कंप्यूटर पर हिंदी में कार्य करने हेतु यूनिकोड सक्रिय करने, यूनिकोड से हिंदी में कार्य करने, गूगल वॉइस टाइपिंग, गूगल– ट्रांसलेशन आदि के बारे में विस्तार से बताया गया एवं अभ्यास कराया गया।

Approvals from JUL-18 to SEP-18

Sl. No.	Name of the Manufacturer/Trader & Name of Product & Model No.
A	**NEC Technologies India Pvt. Ltd.**
1	PABX For Network Connectivity, SV9500
2	PABX For Network Connectivity, SV9300
3	PABX For Network Connectivity, SL2100
B	**Verifone India Sales Pvt. Ltd.**
4	POS Terminal, V200t 2G/D/E
C	**Nx Value Solutions India Pvt Ltd**
5	Interchange of Digital Signals at 2, 8, 34, 45 & 140 Mbps Ports, Mediant 1000B
D	**Intellicon Pvt. Ltd**
6	PABX For Network Connectivity, KAREL DS200
E	**Arivind Limited (Telecom Division)**
7	PABX For Network Connectivity, NEOS INFINITY
8	PABX For Network Connectivity, NEOS
F	**Crescent India Polymers**
9	Double Walled Corrugated HDPE Ducts (DWC), DWC HDPE 63 mm dia PIPE
G	**Huawei Telecommunications India Co Pvt Ltd**
10	IP Media Gateway, UMG 8900 with Software version V200R010
11	IP Media Gateway, UMG 8900 with Software version V200R010
H	**Nomus Comm- Systems Private Limited**
12	High Speed Line Driver, Gateway e
I	**ALE India Private Limited**
13	IP PABX with Media Gateway, OmniPCX Enterprise

Important Activities of TEC during JUL 18 to SEP 18

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

Representation of TEC in Training/Seminar/Meetings

- ITU-T SG-5 and SG-13 meetings at Geneva
- ITU-T Focus Group meeting on ML5G (Machine Leaning and 5G) at Santa Clara, USA
- Audio Conference call of Working Group on Communication Technologies in IoT domain
- ICT & IoT Start Up Tech Expo-2018 held in Bengaluru
- GSMA-360 degree: Digital Societies Conference organised by GSMA held in Bangkok
- Workshop on '5G Spectrum' organised by ITU-APT Foundation of India,
- Workshop on '5G and standards' organised by Qualcomm
- Telecom Convergence summit '5G for the future' by CII at New Delhi
- SRTC Concurrence meet related to MTCTE framework at Gurugram
- Conference on Innovation for the road ahead by Intel-Mobileye in Delhi

Study/white paper issued:

- Sustainability Assessment of Bharatnet Project, NGPON2

GRs/IRs/SDs/ERs issued:

- GR on Session Border Controller, IR on Session Border Controller
- Errata no. 1 issued on GR on Raw Material for Manufacturing optical fibre cable
- Standard on SIGTRAN
- 5 ERs issued (L3 switch, L2 switch, IPv4 router, IPv6 router, MPLS router)

DCC meeting conducted for:

- GR on 10 G capable symmetric passive optical network (XGS-PON) technology for FTTX based broadband applications
- GR on IDS, IPS,
- IR on IP Media Gateway
- Amendment of GR on Adhesive PVC tape and GR on UPS system

Sub DCC meeting conducted for:

- GR on FTTX based broadband access applications using gigabit Passive Optical Network (GPON) technology with Mini OLT
- GR on 10 G Passive Optical Network (XG-PON) technology for FTTX based Broadband applications
- GR on 100 G Ethernet Traffic Analyser (HH)
- GR on RF Monitoring system for continuous measurement of Electromagnetic Radiation

Contributions submitted to ITU-T/R/D

- 01 contribution in SG-11 & SG-5, 02 contribution in SG-13, 03 contributions in SG-15, 04 contributions in SG-20 and 02 contributions in SG-17 were submitted.

Other Activities

- Meetings of NWG - 5, 12, 13, 15 & 20 and NSG-5 in TEC
- 10 new Labs have been designated as CAB of TEC
- Various Technical presentations were given by stakeholders in TEC.
- Video Conferencing Equipment by M/s Ingram,
- Demo use cases based on LoRa Communication Technology by M/s TCL & M/s SenRa,
- Sigfox Communication Technology & related use cases by M/s SIGFOX,
- IoT Security by M/s Trusted Objects
- Technology & use cases on G.Fast by M/s Nokia, ,
- e-SIM remote provisioning and security by M/s Taisys
- A workshop on IEEE standards on IoT, 5G, wired/ Wireless, 802 standard & standard development process was organised in TEC.
- Webinar on 'NGPON2' and 'Sustainability Assessment of Bharatnet Project' conducted in TEC.

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

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