IoT, Sustainable Development Goals and Urban Agendas

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Telecommunication Engineering Centre (TEC)

A brief introduction

➢ TEC develops telecom product specification and interoperability (Interface) specification for seamless working of telecom networks and devices. These also cover safety and security requirement.

➢ TEC provides support and advice to Department of Telecom (DoT) on technology, spectrum and licensing related issues and produces standards related documents.

Telecommunication Engineering Centre (TEC)

➢It strives to enhance Indian contribution in the development of international standards so that the national interests are adequately safeguarded.

➢Various divisions in TEC chair the National working Groups (NWGs) corresponding to the study group of ITU-T.

➢TEC also chair NWG-5 corresponding to study group 5 of ITU-R, which *inter-alia* deals standards for mobile radio systems.

➢TEC is having IPV6 Ready Logo test lab, Specific Absorption Rate (SAR) lab and Next Generation Network (NGN)/ Transport lab.

➢TEC also has MRA with Singapore for product certification

Challenges of Major Indian Cities

➢ **Transportation: Average speed in most of the congested roads   – 10 -15 Km/ Hr**

  ▪ US $ 10 B worth fuel is lost due to congestion every year.

➢Parking

➢Pollution

➢ Waste management

➢Power

➢Safety & Surveillance

➢**Water management- Drinking Water shortage**
   Non revenue water (NRW) figure **:** Singapore < 5%, USA : 12- 15%
                                           India : 40 - 65%
➢ Health Care

How to address these challenges efficiently:

➢ needs to create **Smart Infrastructure** to manage complexities of public services, reduce expenses, increase efficiency and improve the quality of life.

➢ Use M2M/ IoT and ICT to make all the verticals smart - will provide data in real time.

➢ Big data analytics to create intelligence.

➢ Use intelligence for planning and operational activities.

Goal : To improve the quality of life.

IoT definition as per ITU-T

➢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.

➢ITU-T created a Study Group (SG)-20 in 2015 to study IoT and its applications in Smart cities and communities.

M2M / IoT market: Projections

- 26 billion connected devices globally by 2020, business impact to be worth US$ 4.3 Trillion.
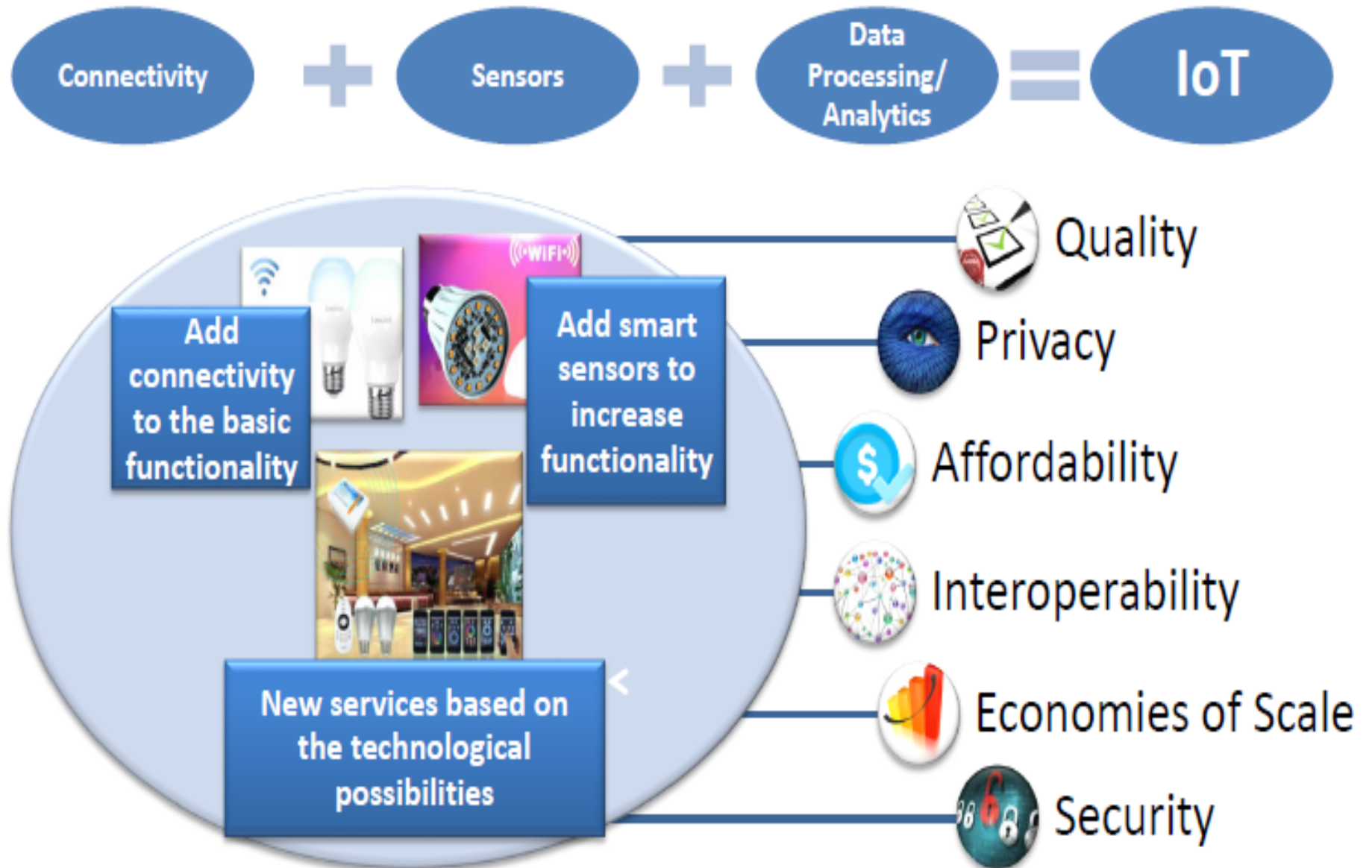- $1.3 trillion revenue opportunities for mobile network operators

GSMA & Machina research

- 50 billion connected devices globally by 2020

CISCO / Ericson / ITU

Global projections varies from 26 billion to 50 billion

There may be around 2.6 billion connected devices by 2020 and 8 billion by 2026 and 24 billion by 2032 in India.

What is IoT ?

Connectivity ➕ Sensors ➕ Data Processing/ Analytics = IoT

Add connectivity to the basic functionality

Add smart sensors to increase functionality

New services based on the technological possibilities

Quality

Privacy

Affordability

Interoperability

Economies of Scale

Security

M2M / IoT Applications

S. No.	Industry / Vertical	M2M applications
1.	Smart City	Intelligent transport System, Waste management, Smart Street Light system, Electric vehicle charging, Water management, Smart Parking, Intelligent buildings, Safety & Surveillance, Remote health management, e-ICU
2.	Automotive / Intelligent Transport System	Vehicle tracking, e-call (911 in USA, 112 in Europe), For e-call 112 adopted in India, V2V and V2I applications, traffic control, Navigation, Infotainment, Fleet management, asset tracking, manufacturing and logistics
3.	Safety & Surveillance	Commercial and home security monitoring, Surveillance applications, Video analytics and sending alerts, Fire alarm, Police / medical alert
4.	Utilities / Energy	Smart metering, smart grid, Electric line monitoring, gas / oil / water pipeline monitoring.

M2M / IoT Applications

S. No.	Industry / Vertical	M2M applications
5.	Health care	Remote monitoring of a patient after surgery (e-health), remote diagnostics, medication reminders, Tele-medicine, wearable health devices, e-ICU
6.	Smart Homes	Video monitoring of home, Security & Alarm, Door control, HVAC control, Smart lighting, Smart appliances.
7.	Financial /Retail	Point of sale (POS), ATM, Kiosk, Vending machines, digital signage and handheld terminals.
8.	Water	Smart metering, Water leakage management, quality of water in real time
9.	Agriculture	Remotely controlling the irrigation pump by use of Mobile phone, Soil testing devices
10.	Industrial IoT	Industry automation, Remotely monitoring the machine parameters, Supply chain management etc.

Five main challenges have to be overcome for IoT

Robust connectivity:
Latency, availability, coverage, cost

1

Standardization:
Standard connectivity for billions of things

2

5
Domain knowledge:
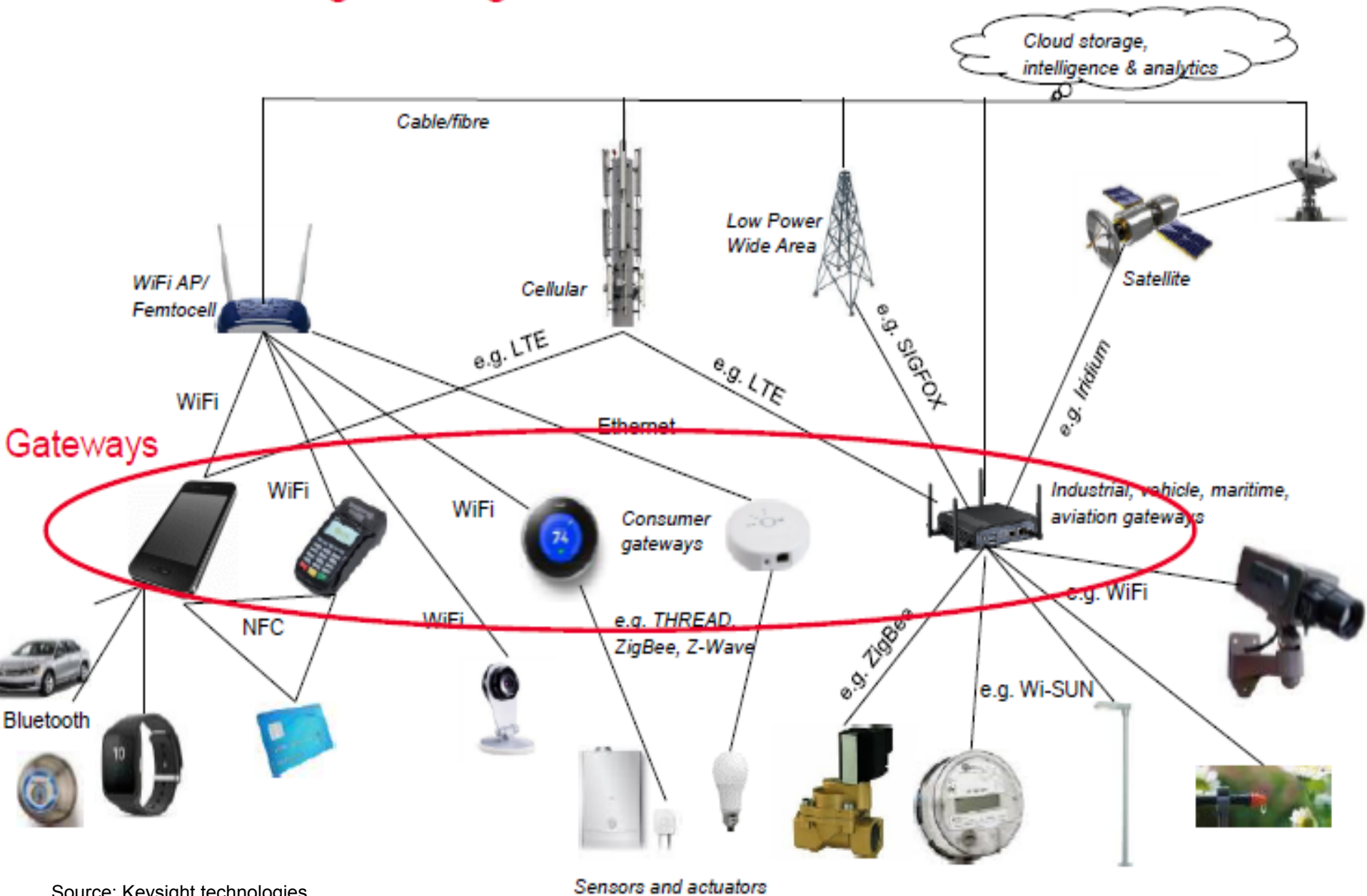Deep, vertical-specific insights

3

Interoperability and open interfaces:
Enabling platforms to talk with each other

4

Privacy and security:
Prevent malware injection and data misuse

Connecting "Things" to the Cloud

Source: Keysight technologies

Enabling technologies …..

➤ Static IP (IPv6 or dual stack) but in future IPv6 only.

➤ Digital Identity : e-KYC for individuals and digital certificates for companies.

➤ Smart Phone will work as a Smart device

➤ Wireless spectrum (Licensed / Un licensed)

➤ High speed and reliable internet services on fixed line and Smart phones.

➤ ICT backbone

➤ Cloud, Edge computing

➤ RFID Tags :   e-tolling in 865-867 MHz band

➤ M2M SIM (Embedded SIM)

➤ **5G will bring ultra high reliability, ultra low latency, wide coverage and high security network, suitable for M2M / IoT.**

Projections related to connectivity technologies

- ➢ **GSMA study on IoT in 2014 – 40% of the total devices may be connected using SIM and a connection to mobile network.**

- ➢ **In MWC- 2016, Ericsson has   dropped the number of cellular connected IoT devices in 2020 from their previous estimate of (40%) 20 billion to just over (2%) 1 billion.**

- ➢ **In MWC – 2017, Ericson projected 1.5 billion connected devices out of 28 billion, on cellular network by 2022.**

- ➢ **In India SIM based devices / Gateways may be around 15-20%.**

- ➢ **It shows that the low power wireless network and LPWAN will have a major share in device connectivity.**

M2M Standardization at International level

Some of the standardization bodies are as given below:

- ITU

- ISO

- IEC

- IEEE

- OneM2M

- GSMA

- 3GPP

- Alliance for Internet of Things Innovation (AIoTI)

- Continua health alliance

➤ **11 Multi stake holders working groups have been created in the last 2-3 years.**

➤ **First set of following Technical Reports were released by Hon'ble MoC&IT in May 2015 along with National Telecom M2M roadmap**

    a) **M2M Enablement in Power Sector**

    b) **M2M Enablement in Intelligent Transport System**

    c) **M2M Enablement in Remote Health Management**

    d) **M2M Enablement in Safety & Surveillance Systemss**

    e) **M2M Gateway & Architecture.**

➢ IInd set of Technical Reports, released in Nov 2015

1. **M2M Number resource requirement and options**

2. **V2V / V2I Radio Communication and Embedded SIM**

3. **Spectrum requirements for PLC and Low Power RF Communications.**

4. **ICT Deployments and strategies for India's smart cities: A curtain raiser**

M2M/ IoT Standardization activities in TEC, DoT...

➢ **Technical Reports (TRs) released in 2017**

      1.   **M2M/ IoT Enablement in Smart Homes**

      2.   **Communication Technologies in M2M / IoT domain**

➢ **Technical reports (TRs) are available on www.tec.gov.in/technical-reports**

➢ **Work is in progress in Smart cities, Smart Village & Agriculture, Security and M2M Gateway & Architecture working groups (OneM2M specifications)**

Indian participation in ITU-T SG-20

➢ **National Working Group (NWG) - 20 formed in TEC, India, in 2015 to collaborate with ITU-T SG-20**

➢ **Based on the Technical reports released in TEC, contributions have been submitted in   ITU-T SG-20 meetings and are in the work item Y.IoT use cases**

1. **Vehicle emergency call system for automotive road safety**

2. **Digitization and automation of Vehicle Tracking, Safety, Conformance, Registration and Transfer via the application of e-SIM and Digital Identity**

3. **Remote monitoring the health of a patient**

4. **Connected Smart homes.**

Actionable points emerged from the Technical Reports (TRs): Some are listed as below:

1. Based on Technical report and consultations with all the stake holders, TEC proposed 13 digit M2M Numbering plan for SIM based devices/ Gateways which will co exist with existing 10 digit numbering scheme being used for mobile phones.

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

2. Embedded SIM : Based on Technical report released in TEC, DoT has approved the use of Embedded SIM with over the air (OTA) provisioning in India.

Ministry of Road Transport and Highways, India has already included Embedded SIM in AIS140 standard mandated for Vehicle location tracking services (VLTS) to be implemented for consumer vehicles in first phase.

3.   Based on TR, additional Spectrum requirement   for   Low power RF communications in Sub GHz band was recommended and in discussion.

4.   Any device / Gateway having direct connectivity with   PSTN / PLMN should   have static IP (IPv6 or dual stack). **Bureau of Indian Standards (BIS) has mandated IPv6 for Smart meters to be connected on Cellular technologies, IS16444.**

5.   Multi protocol gateways.

6.   M2M Network architecture and various   Service delivery models for providing services in M2M domain.

7.   Spectrum requirement for DSRC technology.

8.   Licensing for LPWAN   on non cellular technologies, providing public services.

9.   Common service layer requirement at the platforms, important for data sharing, Security and interoperability.

Testing and Certification requirements

- Gazette notifications issued. Available on TEC website.

- Regulatory and legal compliance requirements - Devices with communication facility needs testing and certification against

  - EMC (Electro magnetic compatibility),
  - Safety,
  - Technical protocols including Interoperability & Conformance testing,
  - Security
  - Others (SAR, IPv6 or RoHS)

- *Testing will be done in the accredited labs in India*

- *In case of MRA (Mutual Recognition Arrangement) with the other countries, devices may be tested there and no need of further testing in India.*
- *To be implemented from October 2018*

Test Once : Use any where

Policy for M2M / IoT ecosystem

➢ **National Telecom Policy – 2012 :-** thrust on high quality broadband services, Cloud computing, Mobile Internet, IPv6, Machine to Machine communication and telecom equipment manufacturing.

➢ **Telecom policy 2018 under preparation. It will focus on strengthening telecom infrastructure, IoT, 5G, AI, Cloud etc.**

➢ **M2M Road map** released in May 2015.   M2M Service provider policy expected in near future

➢ **TRAI recommendations** on Spectrum, Roaming and QoS related requirements   on M2M Communications   released recently are under discussion in DoT.

➢ Draft National Digital Communication policy 2018 released.

Major use cases

➢ Intelligent transport System

▪ Vehicle tracking : around 8 million passenger vehicles are expected to be provided this facility.
▪ Traffic control,
▪ Smart Parking : 20% to 30% congestion is done by drivers searching the parking lot in big cities.
▪ Emergency call system - 112 adopted in India
▪ V2V and V2I applications
▪ Navigation, Infotainment,

➢ Fleet management,
➢ Asset tracking,
➢ Waste management : Smart bin, geo fence of trucks, RFID, weight sensor
➢ Water distribution

➢ Feedback device
➢ Smart street lighting
➢ Smart metering

Major use cases

0.25 Million village panchayats are being connected on optical fiber cable to provide 100 Mbps bandwidth.

This bandwidth will be used to provide e-health, tele education, e-governance and other facilities in the rural areas.

Personal Health Devices : Interoperability Architecture approved by ITU

ISO 9001:2008

Personal Device

- Thermometer
- Pulse Oximeter
- Pulse / Blood Pressure
- Weight Scale
- Glucose Meter
- Cardio / Strength
- Independent Living Activity
- Peak Flow
- Medication Adherence
- Physical Activity
- Electrocardiogram
- Insulin Pump

Aggregation Manager

Telehealth Service Center

Health Records/ Networks

ISO
IEEE
Bluetooth
CERTIFIED USB
ZigBee

IHE HL7 W3C HL7 IHE

WiFi, 2G, 3G & 4G

PHR
EHR
NHIN
HIE

Personal Area Network (PAN) Interface

Wide Area Network (WAN) Interface

Health Record Network (HRN) Interface

How IoT will add value ?

ISO 9001:2008

➢Reduce congestion on the roads using Intelligent Transport Systems applications such as intelligent signalling, Electronic toll collection, Smart parking etc..

➢Geo fence will help in monitoring the vehicles deployed for specific task such as garbage collection, pick & drop etc.

➢Vehicle tracking will reduce crime.

➢ Surveillance will bring values to the cities as the citizens will feel safe. Real time video analytics may send alerts on the smart phones of police in that area

➢ Wearable health devices may help in monitoring the health parameters especially in rural areas for remote monitoring and advising, help in reducing burden on hospitals.

➢ Save electricity by using smart lighting system in cities and homes.

➢Share data across verticals to create value.

All these actions will improve the quality of life.

IoT as a Disruptive Technology is leading the next wave of Transformational Change

THANKS

(For detail, see the TR available on www.tec.gov.in/technical-reports/)

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