Interoperability and Regulatory Challenges in Smart Cities
World Urbanization Prospects

- UN Department of Economic and Social Affairs (UN DESA), Population Division, 2018 revision
  - 55% of the world’s population living in urban areas;
  - Expected to increase to 68% by 2050.
  - Projections show that the overall growth of the world’s population could add another 2.5 billion people to urban areas by 2050;
  - Close to 90% of this increase taking place in Asia and Africa
Challenges due to Urbanization

Population growth
- Migration, ageing, social inclusiveness

Climate change
- Disaster management, mitigation and adaptation

Resource scarcity
- Food, water, energy, waste management

Economic feasibility
- Low-carbon economy, jobs, innovation, infrastructure
The United Nations Economic Commission for Europe (UNECE) and International Telecommunications Union (ITU), October 2015

“A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects”
Role of ICT in SSC:
turning traditional infrastructure into smart infrastructure

• ICT Tools
  • Wireless communications
  • Sensor networks
  • Data analytics,
  • Platforms and applications,
  • Cloud computing,
  • Technical standards.

• Better data = better decisions
• Intelligent infrastructure
• Economic competitiveness
• Green and sustainable Low carbon businesses
• Social inclusiveness
• Citizen’s engagement
1. All IP Core network: Converged ICT systems
2. Broadband Access Network: Integration of wireline, wireless, copper, fibre and other access nodes
3. Building intelligence: environment management systems, mobility and transport system, smart buildings, smart grid etc.
4. E-services to citizens: by information sharing, e-healthcare, e-education, entertainment, culture, commerce etc.
Inter-operability-Needs and Benefits
Inter-Operability between IoT devices

• The Internet of Things (IoT) ecosystem promises tremendous opportunity but only when interoperability is ensured.

• **Optimum solution:** A common service layer to ensure seamless communication between applications and devices.

• One M2M organisation is facilitating, implementing and promoting IoT standardization and interoperability.
Collaboration is important to reach common understanding, avoid overlap and build **interoperable** IoT ecosystems globally.
Benefits of Inter-operability

**Lower Costs**

CAPEX
- Lower cost of deployment (library of functions)
- Programmers can focus on applications (not on underlying communications)
- Economies of scale for horizontal service layer (common functions for diverse use-cases)

OPEX
- Efficient communications (policy-driven and event triggered)
- Sensor data sharing (produce once, consume many times)
- Transport economics (use best transport network for business needs)

**Simplifies the development of applications**
- Common services layer for different verticals and segments eliminates the need for application-specific platforms

**Creates mass-market economies of scale**

**Accelerates IoT adoption**
Inter-operability-Functions

Service Functions

- Registration
- Discovery
- Security
- Group Management
- Data Management & Repository
- Subscription & Notification
- Device Management
- Application & Service Management
- Communication Management
- Network Service Exposure
- Location
- Service Charging & Accounting
Ultimate Goal: IoT cross-domain interoperability

Without Inter-operability

- Highly fragmented market with limited vendor-specific applications
- Reinventing the wheel: Same services developed again and again
- Each silo contains its own technologies without interop

With Inter-operability

- End-to-end platform: common service capabilities layer
- Interoperability at the level of communications and data
- Seamless interaction between heterogeneous applications and devices
Smart Cities—Regulatory Challenges
M2M Regulatory Framework

Issues for IoT/M2M

- Licensing framework for:
  - Connectivity Provider
  - M2M Service Provider
- KYC norms for SIM embedded IoT/M2M Devices
- Spectrum for IoT/M2M
- Roaming
- Embedded devices (KYC, activation and roaming)
- QoS
- Data Security & Privacy
Smart Cities-Regulatory Framework (Proposed by TRAI, Accepted by Govt)
All access service providers’ viz. CMTS, UASL, UL (AS) and UL holders using licensed access spectrum shall be allowed to provide M2M connectivity within the area of their existing authorizations.

All UL (VNO) holders shall also be allowed to provide M2M connectivity in their existing authorizations.

A provider using WPAN/WLAN technologies for M2M connectivity for commercial purposes, operating in unlicensed spectrum, should register with Licensor. Connectivity provider using LPWAN technologies operating in unlicensed spectrum to be under a new authorization under UL namely UL (M2M). May be allowed to bid for licensed spectrum to provide exclusively M2M services.
Government, through DoT, should identify critical services in M2M sector and these services should be mandated to be provided only by connectivity providers using licensed spectrum.

To facilitate smooth roll out of M2M services utilizing the license exempt spectrum, 1 MHz of spectrum from 867-868 MHz and a chunk of 6 MHz of spectrum at 915-935 MHz is recommended to be delicensed.

Devices with pre-fitted eUICC should be allowed to be imported only if it has the ability to get reconfigured ‘Over the air’ (OTA) with local subscription. GSMA approved guidelines shall be followed for provisioning of new profile remotely with ‘Over-the-air’ (OTA) mechanism.
Salient Features ... #3

Devices fitted with eUICC shall be allowed in operation in roaming for maximum three years from the date of activation of roaming in the network of Indian TSP and mandatorily converted/reconfigured into Indian TSP’s SIM within the stipulated period or on change of ownership of the device, whichever is earlier.

It should not be mandatory to use only domestically manufactured SIMs in M2M. Embedded SIMs with standard specifications can be imported and relevant information shall be submitted by importer while import of the devices/SIMs.

In the present stage of deployment of M2M devices and services, a duty cycle of 10% both at device level and network level would suffice to meet the requirements. These parameters can be reviewed once there is substantial deployment of M2M ecosystem in the country and sufficient data being made available for analysis of use cases.
Smartcities—challenges

Cyber-security
Security can be compromised due to user errors, equipment failures, natural disasters as well as deliberate attacks.

High investments
Establishing a network infrastructure along with sectoral needs is estimated to involve high levels of investment in Smart cities.

Data Security
Energy Data, Transport data, Health Care
Smart cities—challenges

Engaging relevant stakeholders
Stakeholder interaction is pertinent for the success of SSC initiatives.

Integration/ Synergy of various sectors:
SSC initiatives to be based on holistic planning and not merely sectoral development.

Public acceptance:
Lack of awareness of the benefits of ongoing smart city initiatives may lead to distrust among the general public.
Other Challenges

Demand of human capital,

Open and consistent data for development of applications,

e-waste management,

EMF radiation, etc
Conclusion

• Both Standardization of Devices for interoperability and Regulations are important for orderly growth of M2M/IoT services which are building blocks of smart cities

• Delicensed spectrum need to be identified additionally for quick proliferation of IoT and adoption in Smart Cities

• India is amongst the few countries which has brought out a concrete framework for IoT/M2M

• This will help in development of over 100 cities (Brownfield and Green Field)
Thank you!

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**Smart City Architecture**

**URBAN DYNAMICS**
- Urban Environments
- Human Activities

**Traces**
- In-situ geo-sensors
- Mobile sensors
- Human sensor (social media)

**Big Sensor Data**

**Bridges**
**Other data sources**
- Data integration
- Spatio-temporal processing and mining
- Platform for application developers

**Smart City concept**
- Smart Economy
- Smart People
- Smart Governance
- Smart Mobility
- Smart Environment
- Smart Living

**Citizens, Visitors & Governments**

**Supports decisions**
Structure of Smart City

Cloud Computing

Data Gateway

Firewall

IoT

Edge Computers

Digital Input

WSN

Audio Capture

Video Capture

WSN

Source: Advantech
ICT Infrastructure

Devices connected in home
ICT Infrastructure

Devices connected in a room

- Motion Sensor
- Door Control
- HVAC Control
- Environmental Control
- Light Control
- Security and Alarm
- Window Control
- Remote Control
- STB