one M2M
The IoT Standard

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India's Telecom SDO
Telecommunications Standards Development Society, India

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IoT/M2M Deployment scenarios & possibilities in context of oneM2M –

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IOT/M2M framework and ecosystem in Nepal

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Regulatory framework for IoT/M2M application in Nepal

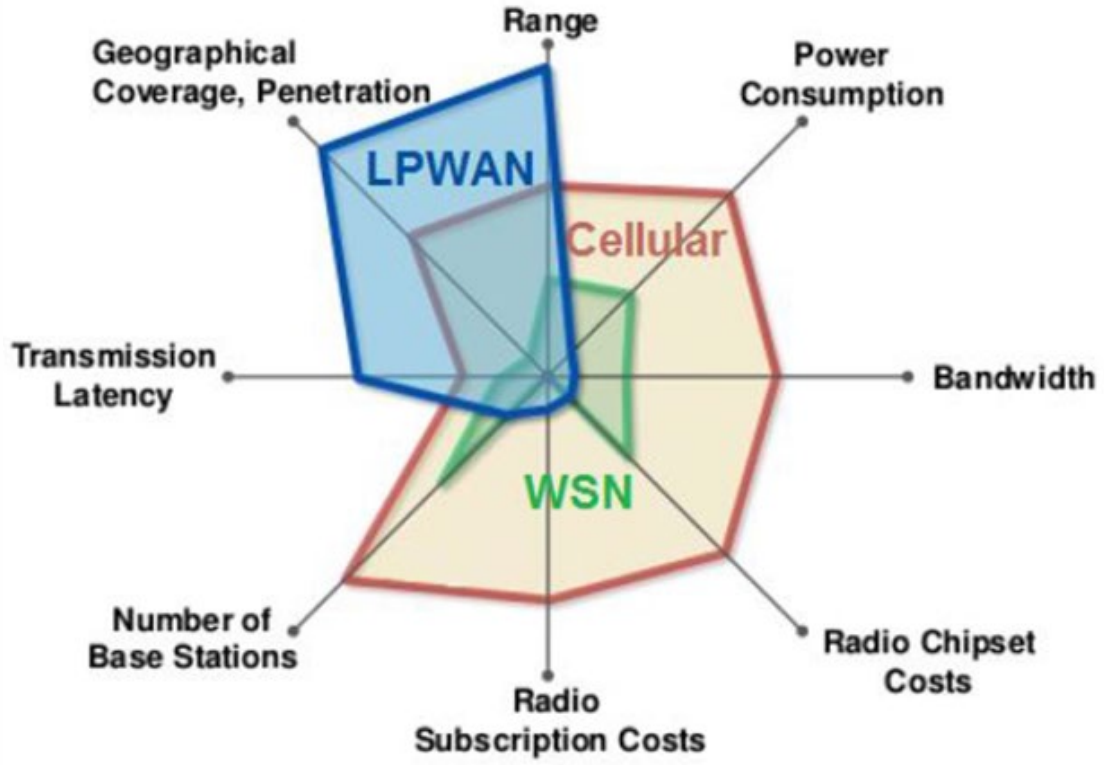
1. **Policy level document for IoT/M2M application is "IoT/M2M Regulatory Framework, 2079"**
2. **Classification of IoT/M2M application/services based on spectrum/technology as per the "IoT/M2M Regulatory Framework, 2079"**
   a. **Cellular IoT/M2M services: IoT/M2M services provided by using data SIM cards of mobile networks like 2G, 3G, 4G and/or following generations.**
   b. **Non-cellular IoT/M2M services:**
      i. **Wireless Local Area Network (WLAN) :** wireless radio communication system used for transmission of data via WiFi
      ii. **Wireless Personal Area Network (WPAN):** Personal network of low powered, short-distance wireless devices such as Infrared, Bluetooth or Zigbee
      iii. **Satellite IoT:** Network of IoT devices in which connectivity is achieved via satellite links.
      iv. **Low Power Wide Area networks (LPWAN):** Wireless network technologies that interconnect low bandwidth, low powered devices having over a long range. **865-868 MHz** is allocated for proprietary LPWAN by NTA.

Low Power Wide Area networks (LPWAN):

Low-power WAN (LPWAN) is a wireless wide area network technology that interconnects low-bandwidth, battery-powered devices with low bit rates over long ranges.

LPWAN is created for machine-to-machine (M2M) and internet of things (IoT) networks, LPWANs operate at a lower cost with greater power efficiency than traditional mobile networks. They are also able to support a greater number of connected devices over a larger area.

LPWAN: e.g. NB-IOT, LoRa, LTE-MW
Cellular: using data SIM cards of 2G, 3G, 4G network
WSN (Wireless Sensor network): e.g ZigBee



IoT/M2M service in Nepal

- NB-IoT, LTE-M and LoRa are the dominant IoT Technologies in LPWAN network in global scenario.
- Though LPWAN is classified as Non-cellular IoT/M2M services in **IoT/M2M Regulatory Framework** NB-IoT and LTE-M are cellular based technology and LoRa is non- cellular proprietary technology.
- Hence it would be better to say 3GPP compliant (NB-IoT and LTE-M) LPWAN services and 3GPP non-compliant or proprietary (LoRa) LPWAN service.
- Nepal Telecom's existing 4G core network is capable of NB-IoT and test ongoing for RAN part. NT has its plan to complete the testing of NB-IoT by the end of this fiscal year.

Cellular connectivity based M2M Application in Nepal

1. **smart home solution:** Connects appliances like fridges, washing machines, and rice cookers via Home WiFi.
2. **Smart electricity metering:** NEA (Nepal Electricity Authority) uses 63,570 NT data SIMs for real-time smart meter data collection.
3. **Early warning system for disaster**: Department of Hydrology and Meteorology (DHM) uses sensors and 290 NT data SIMs to send risk alerts via SMS, saving lives and property.
4. **Water metering**: SCADA software monitors the Melamchi Tunnel, while Kathmandu Upatyaka Khanepani Limited (KUKL) uses 397 NT data SIMs for network control. However smart water meters have yet to be installed in households.
5. **Vehicle tracking and monitoring**: Public transport and fleet tracking systems use NT data SIMs. Department of Transport uses 100 SIMs, while Sipradi Trading uses 900.
6. **Digital payment**: Cellular-connected point-of-sale terminals support Nepal's growing digital payment ecosystem.

IoT deployments in Nepal

Globally, IoT technologies like LoRA, Zigbee, SigFox, NBIoT, and LTE-M are widely used, along with WiFi and Bluetooth for short-range connections. However, Nepal relies solely on cellular technologies (2G, 3G, 4G) for IoT/M2M, with no LPWAN networks available—posing a significant barrier to IoT deployment.

To address this, utilities, government agencies, and local bodies should collaborate with cellular providers to build a nationwide public IoT network, while start-ups play a crucial role in fostering IoT/M2M services.

Notable M2M Deployments in Nepal:

- Over 100,000 smart meters installed by NEA in Kathmandu Valley
- IoT monitoring of Kathmandu's pipelines
- Affordable smart toilets by AerosonSmart bins and waste collection by KMC
- Drone medical supply delivery in Pyuthan by WeRobotics
- Smart traffic lights by Lalitpur Sub-Metropolitan City (LMC).

List of organization using data SIMs from NT for M2M application

SN	Company Name	SIM quantity	Purpose
1	Nepal Electricity Authority (NEA)	63,570	Smart metering
2	Vehicle Tracking Systems (e.g., Sipradi, Trackon, Telemko, LunaGPS)	3,749	GPS and vehicle tracking
3	Payment Systems (e.g., City Tech, Mohar Digital, Bitskraft)	1,050	POS terminals and payment gateways
4	Decade International Pvt Ltd	1,180	
5	Slash Plus Pvt Ltd	800	Internet for public vehicles & GPS system
6	Department of Hydrology and Meteorology	390	Early warning system for disaster
7	KUKL	297	Water level measurement
8	Real-Time Applications (e.g., Real Time Solution, Sentinel Lab, Innovative Engineering Services)	755	Real-time applications and GPS
9	Civil Aviation (e.g., CAAN, Gautam Buddha Airport)	247	Smart energy meter
10	Other (e.g., EV charging, smoke detectors, unspecified use cases)	786	Mixed purposes

IoT ecosystem

The IoT ecosystem enables device interaction over the Internet, where devices collect data, send it across the network, and platforms aggregate it for use by agents.

The four key components of the IoT ecosystem are:

- **Device**: Sensors, actuators, and gateway devices integrated into the network.
- **Network**: Communication technologies like LPWAN and WiFi to support multiple application
- **Platform**: Multilevel technology for provisioning, management, and automation of connected devices.
- **Agent**: People who design and build IoT systems to enhance quality of life.

Nepal Telecom plans to build an NB-IoT network on LTE and procure an IoT platform for managing applications such as smart metering, healthcare, asset tracking, traffic monitoring, and public safety. Local suppliers, in partnership with global vendors, can manage devices, while global developers and local start-ups will provide and manage applications for IoT clients.

Policy and regulatory challenge for IOT ecosystem

Key Aspects for IoT Regulation:

- **Security:** Ensure IoT devices meet minimum vulnerability standards through certification schemes, addressing both cyber and physical security to prevent service interruptions, theft, and vandalism.
- **Data Protection**: Establish regulations and educate the public to safeguard personal data and build consumer trust.
- **Interoperability & Standards:** Facilitate interoperability tests and adopt international standards to ensure seamless integration across diverse IoT devices and networks.
- **Spectrum Allocation:** Provide sufficient licensed and unlicensed spectrum to support various IoT applications and technologies.

Thank You