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M2M communications: Roadmap, challenges and regulations in India

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Introduction

Machine-to-machine (M2M) communication is an emerging area in telecom technologies. This system involves machines or devices communicating with each other through a wireless or wired network without human intervention. The major use cases of M2M technology are sensors and communication modules embedded within M2M devices, enabling data to be transmitted from one device to another device through wired or wireless communications networks.

M2M communications represent tremendous opportunities as rollout becomes more widespread across various sectors. They are expected to advance the vision of a smart city by revolutionizing the performance of various sectors, such as health, telemetry, farming and irrigation, home appliances and health monitoring.

Besides M2M, other terms like IoT are also used to describe this technology. It is a connected network of embedded devices capable of communicating with each other without human intervention. When communicating with each other, M2M devices, combined with the logic of cloud services and remote operation, become "Smart" devices.

In May 2015, a National Telecom M2M Roadmap was released in India. The government of India recognized the potential of M2M and emphasized this in the National Telecom Policy 2012. (Reference 8, 21)

India's telecom market

According to the India Brand Equity Foundation (IBEF), India is the world's second-largest telecommunications market, with a subscriber base of 1,170.75 million as of January 2023. In 2019, India surpassed the US to become the second-largest market in terms of app downloads. As of March 2023, the tele-density in India stood at 84.51% and total broadband subscriptions grew to 846.57 million.

The aggregated data consumed as of December 31, 2022, was 14,024,519 GB. Total wireless data usage in India grew at a rate of 0.96%, from 40,126 PB in September 2022 to 40,512 PB in December 2022. The contribution of 2G, 3G and 4G data usage to the total volume of wireless data usage was 0.14%, 0.93% and 98.93%.

The Department of Telecommunications (DoT) released the draft Telecom Bill 2022. This bill combines three acts (The Indian Telegraph Act (1885), The Indian Wireless Telegraphy Act (1933) and The Telegraph Wires (Unlawful Protection Act 1950). (Reference 19, 20)

2.1 Increasing penetration of 4G and upgradation of 5G

- Factors like affordable rates, expanding 4G coverage and the advent of 5G are shifting customer consumption patterns; the government's initiatives to strengthen India's domestic telecom manufacturing capacity and a favorable regulatory environment contributed to the industry's exponential expansion in recent years.

- According to the IBEF, increased mobile phone penetration and lower data costs would bring 500 million new internet users across the country over the next five years, offering new business opportunities.

2.2 Growth of data and messaging services

- In India, the demand for data and messaging services has been rising with an increase in telecom tower services nationwide. For instance, the Indian telecom tower sector grew by 65% in the last seven years. Mobile towers increased from 0.4 million in 2014 to 0.66 million in 2021. Moreover, the number of mobile base transceiver stations climbed by 187%, from 0.8 million in 2014 to 23 million in 2021.

- Smartphones are a major source of data consumption and messaging services in India. According to the Global System for Mobile Communications (GSMA), India is on the path to becoming a significant smartphone market by 2025, with approximately one billion installed devices. It is predicted to have 920 million unique mobile customers by 2025, including 88 million 5G connections. 5G technology is expected to add USD 450 billion to the Indian economy between 2023 and 2040.

- The DoT formed a sixth-generation (6G) innovation group to drive the development of 6G technologies.

- Among the primary factors that lead to the segment's rise are the use of more than one device per user, high rates of replacement and people transitioning from traditional phones to smartphones as prices drop.

2.3 End of Life for 2G/3G

- Reliance Jio is a 4G/5 G-only network and does not operate in 2G/3G.

- Airtel is shutting down 3G services, operating only 2G/4G and now 5G.

- Vodafone-Idea has 2G/3G/4G. Yet to launch the 5G services.

Note: Till 4G coverage is ubiquitous, 2G will survive tentatively till around 2030 or may be even beyond.

2.4 LTE / 5G Trends

- All urban Tier-1 and Tier-2 cities have almost 100% LTE penetration.

- Both Airtel and Reliance Jio have launched 5G services (Airtel on 5G-NSA and Reliance Jio on 5G-SA) with aggressive plans for 5G rollout.

- Jio 5G services are live in 406 cities/towns at present. Airtel plans to cover all major cities in India by Dec'2023 (as per a press release).

2.5 Regional roaming and network quality issues

2.5.1 Necessity of cross-regional roaming

- India is a country with 22 telecom circles.
- There are no additional charges for national roaming. Incoming calls are free for all postpaid and prepaid connection subscribers when roaming anywhere in India.
- Indian government issues spectrum through auction.
- Indian TSPs bid for specific telecom circles based on business cases.
- However, over the past 10 years, many consolidations have resulted in only active private telecom players with valid licenses in all 22 telecom circles.
- TSPs leverage each other's networks to provide a better (seamless) user experience (wherever their network coverage is poor), retain their customer base and avoid heavy capital investment (subject to business case).

2.5.2 Network quality issues

- With the government's emphasis on Digital India, all three private TSPs (Reliance Jio, Airtel and Vodafone) are investing a lot towards the modernization of their network, including radio towers, Backhaul, CORE network to strengthen network reach and ensure seamless network connectivity. BSNL is also deploying and expanding its 4G network across all different circles in India.
- Alternate solutions (as per enterprise use cases])can be IBS (In-Building Solution), Wi-Fi offloading, private LTE/5G, FWA etc.

2.6 Multi-profile and carrier swap

2.6.1 Multi-profile usage

- In India, many people are using more than one SIM.
- Most Android-based phones come with dual SIM configuration
- It increases the possibility of better coverage and connectivity while traveling and roaming to different places in India, as a single operator cannot cover all places in India.
- The Indian Government has restricted the maximum number of SIMs held by individuals to 18 (it was 9 earlier).

2.6.2 Carrier swap

- Carrier swap is primarily known as number portability, i.e., porting the same mobile number from one network or carrier operator to another network or carrier operator.

- The government has simplified the carrier swap procedure. It takes three working days to swap carriers within the same circle and five working days to swap carriers within two different circles or states.

2.7 eSIM trend in India

- Need a compatible handset or mobile device that supports eSIM.
- Airtel, Jio and Vodafone started offering eSIM.
- Carrier swap with eSIM happens in approximately two to three hours
- 25% of smartphones in India to leverage eSIM by 2027.
- Latest Apple and Samsung models support eSIM. (Reference 2, 5)

Challenges in global movement

Many market segments, such as the agriculture, automobile industry, power grid etc., are global in scope. As farming equipment or sensors or vehicles cross borders from one country to another via exports or travel, etc., the below requirements arise:

- Requirement of 'roaming'
- SIMs need to be robust to handle different climatic conditions
- The SIM number should adhere to a standard policy, etc.
- Spectrum licensing – Whether imported devices support a specific spectrum allowed in other countries.
- Data protection
- Other regulatory issues – Other regulatory issues include subscriber registration, etc.

M2M guidelines and regulatory trends in India from 2018

A summary of Telecom Regulatory Authority of India (TRAI) guidelines is as follows: (Reference – 6)

4.1 Roaming

4.1.1 National

a. National roaming for M2M/ IoT shall be under the ceiling as per prevailing Telecom Tariff Orders for access service.

b. Generally, as per the current tariff plans provided by TSPs, national roaming is free across India within respective networks.

c. Inter roaming across different networks, TSPs shall enter into mutual commercial agreements to cater their roaming requirements for M2M subscribers. For example, Vodafone and Airtel entered into an agreement with BSNL.

4.1.2 International

a. Devices with pre-fitted eUICC should be allowed to be imported only if they can be reconfigured 'Over-the-air' (OTA) with a local subscription. GSMA-approved guidelines shall be followed for remotely provisioning new profiles with an 'Over-the-air' (OTA) mechanism.

b. Devices fitted with eUICC shall be allowed to operate in roaming for a maximum of three years from the date of activation of roaming in the Indian TSP network and mandatorily converted/ reconfigured into Indian TSP's SIM within the stipulated period or on change of ownership of the device, whichever is earlier. The Authority/ Licensor shall review the condition based on developments and requirements.

c. In case imported equipment to which the SIM/ device is fitted, such as automobiles or machines (like earthmovers), arms, etc. (requiring mandatory registration at local authorities such as RTO, state/district administration), is transferred/sold to another party before three years, the roaming device (eUICC) shall also be immediately configured with local subscription/eUICC of Indian TSP.

4.2 Location and connectivity guidelines

While building M2M networks, connectivity and physical location of various elements is equally important. Below are the suggestions from TRAI:

a. On the network side of M2M, communication should be done over Internet protocol (IP) so that everyone adopts common standards.

b. From a security perspective, it is recommended that all M2M Gateways and application servers servicing Indian customers be physically located in India, though this shall be in accordance with national security decisions.

4.2.1 Maintenance of Subscription Profile

These have been classified as separate entities in eUICC, viz.,

a. Subscription Management Data Preparation (SM-DP) - part of Mobile Network Operator (MNO) Network that builds personalized profiles and installs in eUICC.

b. Subscription Management Secure Routing (SM-SR)

TRAI has mandated all businesses that want to send SMS to register their business entity, headers (SMS sender IDs), content templates and consent templates on BSNL, Vodafone, Jio True Connect or other Distributed Ledger Technologies (DLT) platforms. (Reference – 18)

4.2.2 Data protection framework

The definitions of "Data" as provided under the Information Technology Act, 2000 and "Personal Information" and "Sensitive Personal Data and information" as provided under Sensitive Personal Data and Information Rules, 2011, as reproduced below, are adequate for the present. (Reference - 22)

a. "Data" is defined in section 2(1)(o) of the Information Technology Act, 2000 as a representation of information, knowledge, facts, concepts or instructions that are being prepared or have been prepared in a formalized manner and is intended to be processed, is being processed or has been processed in a computer system or computer network and may be in any form (including computer printouts magnetic or optical storage media, punched cards, punched tapes) or stored internally in the memory of the computer.

b. "Personal information"– defined in the Sensitive Personal Data and Information Rules, 2011, as any information that relates to a natural person, which, either directly or indirectly, in combination with other information available or likely to be available with a body corporate, is capable of identifying such a person.

c. Sensitive personal data or Information"– defined in the Sensitive Personal Data and Information Rules, 2011, as such personal information which consists of information relating to:- passwords, financial information such as bank account or credit card or debit card or other payment instrument details; physical, physiological and mental health condition; sexual orientation; medical records and history; biometric information; any detail relating to the 69 above clauses as provided to body corporate for providing service; and any of the information received under above clauses by body corporate for processing, stored or processed under lawful contract or otherwise: provided that, any information that is freely available or accessible in public domain or furnished under the Right to Information Act, 2005 or any other law for the time being in force shall not be regarded as sensitive personal data or information for these rules. (b) Each user owns their personal information/ data collected by/ stored with the entities in the digital ecosystem. The entities controlling and processing such data are mere custodians and do not have primary rights over this data. (Reference – 23, 24)

For data privacy and security of telecom networks, The Authority (TRAI) recommends that (Reference 8):

a. To ensure the security and privacy of telecommunication consumers, their personal data should be encrypted during motion and storage in the digital ecosystem. Decryption should be permitted on a need-basis by authorized entities in accordance with the consumer's consent or as required by law.

b. All entities in the digital ecosystem, including TSPs, should be encouraged to share information relating to vulnerabilities, threats, etc., in the digital ecosystem/ networks to mitigate losses and prevent the recurrence of such events.

c. All entities in the digital ecosystem, including TSPs, should transparently disclose information about privacy breaches on their websites, along with the actions taken to mitigate and prevent such breaches in the future.

The DoT has been continuously issuing regulatory guidance to operationalize the entire M2M ecosystem consisting of users, application service providers, M2MSPs and network operators (TSPs). Earlier, the DoT had issued a notification prescribing KYC norms for issuing SIM cards for enabling M2M communications. Additionally, the DoT amended the unified license and unified license (Virtual Network Operator) agreements, enabling TSPs to provide M2M connectivity within the area of their existing authorizations. These guidelines seek to provide regulatory clarity to M2MSPs and WPAN/WLAN connectivity providers for providing M2M connectivity for commercial purposes, operating in unlicensed spectrum. (Reference - 13)

4.3 Personal data protection

The government has passed the Digital Personal Data Protection Bill, 2022 to provide the processing of digital personal data in a manner that recognizes individuals' right to protect their personal data and the need to process personal data for lawful purposes and for matters connected in addition to that or incidental to it. (Reference – 9)

4.4 Trade Secret Information (Reference – 10)

As a signatory to the TRIPS Agreement, India is obligated under Article 39 to protect "undisclosed information." Further, as Article 10bis of the Paris Convention and Article 39(2) to 39(3) of the TRIPS Agreement allow member states to have sui generis mechanisms, Indian courts have availed common law principles to protect such "undisclosed information."

Trade secrets have been protected through various means, such as:

- Constitution of confidentiality clubs
- Non-disclosure agreements
- Other contractual obligations.

In the case of breach of such contractual agreement, the owner of trade secrets can bring an action for (among others):

- Specific performance
- The tort of misappropriation under common law
- Criminal breach of trust
- Theft
- Damages

To protect certain information as confidential, the following conditions should be met, as held in Beyond Dreams Entertainment v Zee Entertainment Enterprises (2016) 5 Bom CR 266:

- The information must be confidential
- It must have been disclosed in circumstances from which an obligation of confidentiality arises
- The confidant should be attempting to use or disclose the information.

4.5 M2M Products Certification

The Indian Telegraph (Amendment) Rules, 2017, direct that all telecom equipment undergo mandatory testing and certification prior to sale or import for use in India.

Telecommunication Engineering Center (TEC) is a regulatory and technical body for telecom products in India. It acts as the standard development body for telecom products' testing and develops specifications of common standards for telecom network equipment, services and interoperability.

TEC also functions as a certification body for telecom products that need to be placed in the Indian market by issuing interface approvals, certificate of approvals, service approvals and type approvals.

It has published a large number of standards on generic requirements (GR), interface requirements (IR) and service requirements (SR).

TEC is also doing product certification. TEC designates labs for this. Testing or certification is done under the following categories:

a. Interface approval is used to set conformity towards connecting onto networks.

b. Type approval – overall product certification applicable only for products to be deployed in telecom and data networks.

c. Certificate of Approval—TEC is directly engaged in product certification and assists designated Conformity Assessment Bodies (CABs)/ Certification Bodies (CBs) located in India and abroad to test and certify telecom products and publish the report. (Reference 8,11,12,14,15,16)

Conclusion

M2M technology has the potential to transform every aspect of our modern-day surroundings. Automobiles, Utility Meters, Consumer electronics, Telehealth or Medical devices, Farming equipment and other machines will become networked using M2M in the coming years.

With the advent of smart devices M2M will become a transforming technology that enables businesses to simplify, renovate and enhance. in new ways. Coupling these devices with a robust network of service enablement and delivery platforms makes these deployments scalable, delivering actionable data directly into enterprise applications. It enables dynamically managing end-to-end solutions from deployment to product lifecycle. (Reference 7)

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