

Terms and Acronyms In IoT Connectivity:

IoT

IoT (Internet of Things): A development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data. A state in which physical objects (things) having embedded technology to sense and communicate, being connected via an identifier such as a SIM. This will serve the communication among those things, closing the gap between the real and the virtual world and creating smarter processes and structures that can support us without needing our attention.

M2M (Machine-to-Machine): This is when multiple machines interact with one another without any human interface.



IoT Ecosystem

Hardware Components:

SIM Card (Subscriber Entity Module): This is a smart card that stores identification information that pinpoints a smart device to a specific network. In IoT, the SIM cards are a variation of the traditional SIM card used in personal mobile devices (smart phones) with additional features designed for IoT which includes greater durability, security, and flexibility.

Sensors or Devices: Physical things that interact with the environment. There are 2 types, Sensors, and Actuators. Sensors are devices that gather information about the environment and measure it's physical parameters like temperature, motion, people flow etc. Actuators are devices that perform a physical action on things after they get such a demand.

Gateways or Router: A physical device that acts as an intermediate between the sensors and the central cloud and in the opposite direction. The Gateway is responsible for the communication, management, and data processing. Some functions include Data Aggregation, Communication, Security, Protocol Translation, Load Balancing and Latency Reduction.

Applications or User Interface (UI): this is the graphical user interface that provides remote control and management devices connected to the Internet of Things ecosystem.

Software Components:

Cloud: In IoT, the Cloud refers to the service that provides the management, storage, and processing of the data that is generated by the devices.

Connectivity: Device connectivity is essential in the successful operation of an IoT application. It enables the communication between devices. It can be based on 2G, 3G, LTE (4G), LTE-M or 5G depending on the specific use case.

Terms and Acronyms In IoT Connectivity:



Networks

3GPP (Third Generation Partnership Project): This is a set of standards that provide the foundation for the development of new technologies, such as 5G, the Internet of Things (IoT), and mobile broadband. These standards also ensure interoperability and seamless roaming between different mobile networks across the globe.

LTE vs. LTE-M: LTE and LTE-M are two technologies that could be described as mother and daughter. LTE is 4G and LTE-M is 4G optimized for connected objects that need to be highly mobile or consume less energy.

LPWAN (Low Power Wide Area Network): A type of wireless network designed to allow long-range communications with low power consumption for IoT devices. This is the fastest growing type of wireless network used in cellular IoT. Type of LPWANs include, NB-IoT, LoRaWAN and 4G

LTE-M (Long Term Evolution Machine): A type of LPWAN that is ideal for long-range mobile applications like asset tracking, but they're also well-suited for applications like law enforcement body cams, tracking teams of firefighters, and analytics-related devices. The more data you need to send or receive, the better LTE-M is in comparison to NB-IoT. It can transmit and download faster, which means your device stays online for less time.

LoRa (Long Range): technology that transmits data over an unlicensed spectrum. This technology is ideal for applications that transmit small chunks of data with low bit rates. This technology does not necessarily rely on the internet or WiFi for communications.

LoRaWAN (Long Range Wide Area Network): A type of LPWAN that doesn't rely on cellular connectivity, and they use specific unlicensed frequency bands that vary from country to country.

NB-IoT (Narrowband IoT): A type of LPWAN technology standardized by 3GPP for IoT devices that require long battery life and low data rates. This type of network also enables efficient communication for IoT devices over cellular networks.

CAT-M (Category M): This is also a type of LPWAN technology that is designed to support purpose-built devices for IoT like tractors or water meters that transmit small to medium amounts of data over wide ranges, even in the most challenging and remote environments. This technology is part of the LTE (Long Term Evolution) technology group. This is the most cost-effective and energy efficient alternative to traditional cellular connectivity options.

4G LTE-M (Fourth generation of cellular networks): Is a type of LPWAN. LTE-M is an abbreviation for long-term evolution machine type communication. Also known as CAT-M1, 4G LTE-M is an extension of 4G LTE technology that utilizes the same power-saving features as NB-IoT.

5G (The fifth generation of cellular network): technology, offering higher speeds, lower latency, and increased capacity compared to previous generations.

Terms and Acronyms In IoT Connectivity:

SIMs

eSIM (embedded SIM): A programmable SIM card embedded in devices, allowing for remote provisioning and management of cellular connectivity.

SIM Form Factor: SIM cards are manufactured in various sizes known as form factors. The five SIM form factors are 1FF (the largest), 2FF, 3FF, 4FF and MFF2 (the smallest).

1FF-4FF Formats – the SIM chip is incorporated into the dedicated physical card, which is inserted and removed from the device.

MFF2 Format – Also known as an eSIM, a vacuum-sealed SIM chip is soldered directly onto a board within the device. This format often incorporates a type of software standard known as eUICC.



EUICC (Embedded Universal Integrated Circuit Card): A software standard that allows a single chip to host multiple SIM profiles. It also makes it possible to add, remove and manage these profiles over the air via a method called Remote SIM Provisioning (RSP). Usage of eUICC is not confined to Embedded SIM. It can be deployed with other SIM form factors, too. In short, with an eUICC, you can switch between carriers without the hassle of swapping SIM cards.

IMSI (International Mobile Subscriber Identity): is a unique number automatically generated and stored in the SIM. It identifies every mobile phone subscriber on a UMTS or GSM network. The number is stored on the SIM card and is not moved or changed when that mobile number (MSISDN) is ported to a different SIM card.

MEF (Mobile Equipment Identifier): A unique identifier associated with a device that connects to a cellular network, enabling network operators to manage and track devices.

Multi-SIM: The capability for a device to have multiple SIM cards, enabling it to switch between different networks or services for enhanced connectivity reliability.



Terms and Acronyms In IoT Connectivity:

Cellular IoT

Cellular IoT Gateway: A device that connects IoT devices to the cellular network, acting as an intermediary for data transmission and communication.

Cellular IoT Module: A hardware component embedded in IoT devices to enable cellular connectivity, typically including a SIM card slot and cellular modem.

Roaming: The ability of IoT devices to maintain connectivity and data services when moving between different cellular networks or geographic areas.

Edge Routing: A network boundary enabling internal and external connections. They serve as gateways between different networks and handle large volumes of traffic from various sources.

Satellite IoT: The integration of satellite networks and IoT devices to enable seamless connectivity and data exchange.

Network Slicing: A feature of 5G that allows for the creation of multiple virtual networks within a single physical network, enabling customization for different IoT use cases. A virtual network instance within a larger cellular network that can be customized to meet the specific requirements of IoT applications.

QoS (Quality of Service): Parameters that define the level of service quality provided by the cellular network, such as latency, reliability, and bandwidth.

Network Congestion: The condition where the network experiences high traffic volume, potentially affecting the performance of IoT devices in terms of data transmission and reception.

IoT Security

Encryption: encryption is the process of encoding information. This process converts the original representation of the information, known as plaintext, into an alternative form known as ciphertext.

API (Applications Programming Interfaces): are what make it possible to communicate with a connected device, based on a set of rules. APIs are critical in IoT, both to communicate with the device and to leverage the information from the device.

VPN (Virtual Private Network): this is an encrypted connection over the Internet from a device to a network. The encrypted connection helps ensure that sensitive data is safely transmitted. It prevents unauthorized people from eavesdropping on the traffic and allows the user to conduct work remotely.



Terms and Acronyms In IoT Connectivity:

Protocols

IP (Internet Protocol) Address: a unique identity number for a piece of connected hardware. It allows a device to communicate with other devices (which will also have their own IP addresses too) over an IP-based network like the internet.

Dynamic vs. Static IP Addresses

Dynamic IP: An IP address that can change each time a connection to the internet is made. It's the type of address that your network provider will issue with your mobile package. This continuous change provides a good level of security, and this type of IP address also generally costs less. The downside of a dynamic IP address, however, is that it can be more difficult to remotely access your device as there is no way of knowing what the IP address is going to be.

Static or Fixed IP: An IP address that never changes if you stay with the same provider or same server. This is a much better option for M2M and IoT applications as connected devices can communicate automatically without any human intervention, and you can also remotely connect with your devices as the IP address will never change.

Public vs. Private IP Address

How the communication will take place and whether the fixed IP address needs a Private or Public profile.

Fixed Private IP Address: This type of address will always retain the same IP address, but it will have a private profile that's not hosted in the public domain. This means that the IP address is visible within your own network, but it can't be seen over the internet. This is great for devices that need to communicate with each other across an internal network, but to be able to remotely access connected devices over the web, a secure VPN would need to be in place.

Fixed Public IP Address: This type of IP address stays the same but it's hosted in the public domain so it can be accessed over the Internet. This type of IP address needs to be provisioned by your supplier and, due a national shortage of available public IP addresses, they are chargeable. However, the cost is outweighed by the benefits of gaining full access to your connected devices from other devices or terminals, particularly for applications where remote access is critical, such as CCTV and digital signage.

APN (Access Point Name): This is a point of entry onto an IP network for a mobile device.

Private APN: This type of entry gives more control on how to secure and configure their IoT SIM cards.



Terms and Acronyms In IoT Connectivity:

Connectivity

CMP (Connectivity Management Platform): A solution that allows customers to manage, control and automate their SIM or eSIM deployments. It also enables customers to manage the different types of cellular connectivity in a cost-efficient way.

Remote SIM Provisioning: A specification that allows businesses to remotely activate the SIM embedded in a device. RSP offers a secure, robust, and highly scalable solution for addressing the traditional SIM challenges. It allows device owners to change network operators remotely by securely switching operator profiles over the air. This remote profile management removes the need for physical access. IoT devices benefit from existing SIM functionality, but all wrapped up in new, smaller and more reliable SIM form factors such as the eSIM and iSIM

Data Pooling: Data pooling in IoT involves aggregating and sharing data from multiple IoT devices to optimize data usage, improve insights, and drive efficient operations.

Network Redundancy: This term refers to a backup source of connectivity that guarantees uninterrupted internet access and ongoing functionality of products, services, and business when the primary internet connection fails.