

M2M and IoT

Internet of Things

Rahul Shandilya

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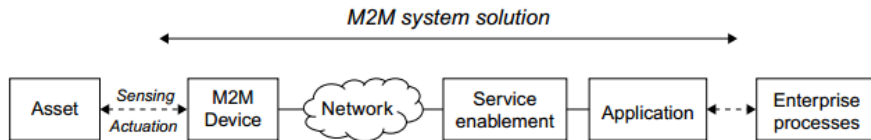
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- ▶ The form of communication is left open to the application. It may very well be the case that an M2M device uses no inherent services or topologies for communication.
- ▶ An M2M system may communicate over non-IP based channels as well, such as a serial port or custom protocol.

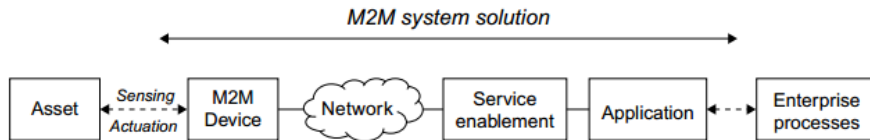
M2M System overview

The M2M system solution is used to remotely monitor and control enterprise assets of various kinds, and to integrate those assets into the business processes of the enterprise in question. The asset can be of a wide range of types (e.g. vehicle, freight container, building, or smart electricity meter), all depending on the enterprise.



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The system components of an M2M solution are as follows:

- **M2M Device.** This is the M2M device attached to the asset of interest, and provides sensing and actuation capabilities. The M2M device is here generalized, as there are a number of different realizations of these devices, ranging from low-end sensor nodes to high-end complex devices with multimodal sensing capabilities.

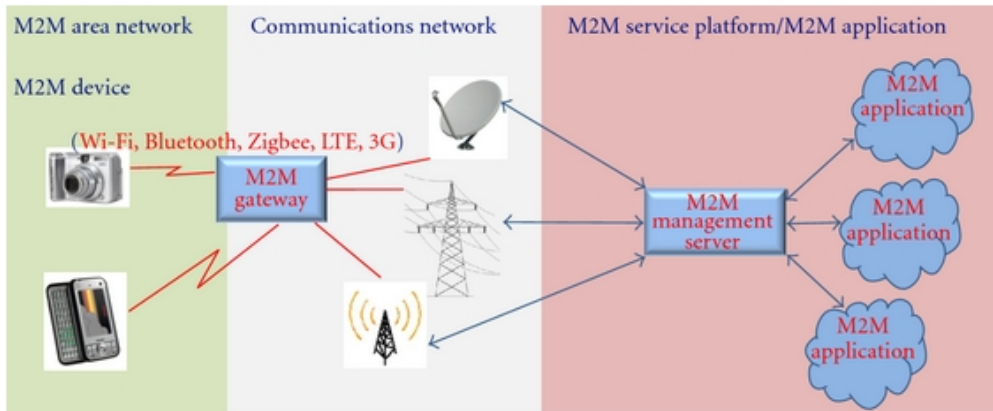
- *Network.* The purpose of the network is to provide remote connectivity between the M2M device and the application-side servers. Many different network types can be used, and include both Wide Area Networks (WANs) and Local Area Networks (LANs), sometimes also referred to as Capillary Networks or M2M Area Networks

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- ▶ *M2M Application*. The application component of the solution is a realization of the highly specific monitor and control process. The application is further integrated into the overall business process system of the enterprise.

M2M Architecture

Machine-to-Machine (M2M) refers to networking of machines (or devices) for the purpose of remote monitoring and control and data exchange. Figure shows the end-to-end architecture for M2M system comprising of M2M area networks, communication network and application domain.



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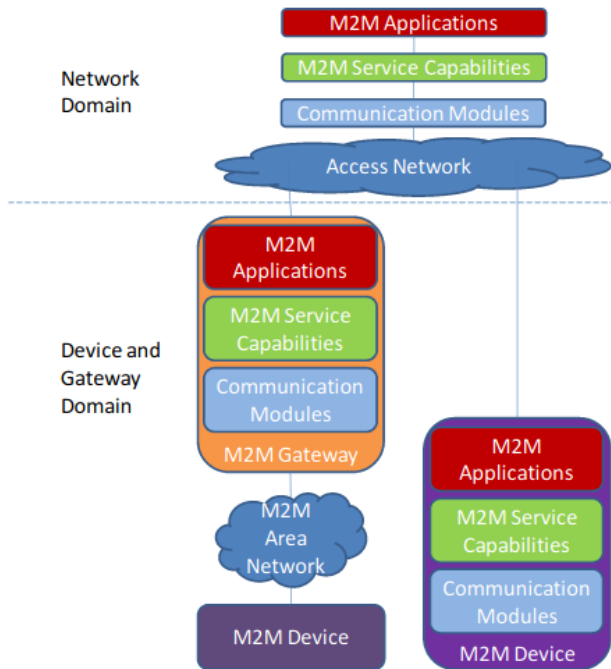
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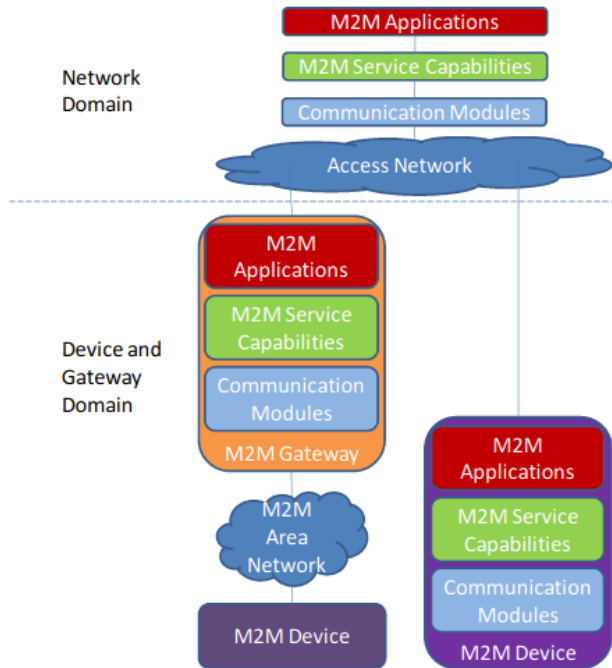
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- ▶ M2M gateway performs protocol translations to enable IP-connectivity for M2M area networks. M2M gateway acts as a proxy performing translations from/to native protocols to/from Internet Protocol (IP).

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- ▶ M2M has various application domains such as smart metering, home automation, industrial automation, smart grids, etc. M2M solution designs (such as data collection and storage architectures and applications) are specific to the M2M application domain.



Application of M2M

TELEMATICS

Connected cars used for safety and security, services and infotainment.



METERING

Meters to report consumption, mainly electricity.



REMOTE MONITORING

Sensors connected to assets are tracked and monitored in real-time.



FLEET MANAGEMENT

Vehicles can be managed and tracked through the path they go.



SECURITY

Connectivity used for home and small business security alarms.



ATM / POINT OF SALES

ATM and POS devices are connected to a centralized secure environment.



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- ▶ *Fleet management* includes a number of different applications, like data logging, goods and vehicle positioning, and security of valuable or hazardous goods.
- ▶ *Security applications* are mainly those related to home alarms and small business surveillance solutions. The final market segment is **Automated Teller Machines (ATM)** and **Point of Sales (POS)** terminals.

Difference between IOT and M2M

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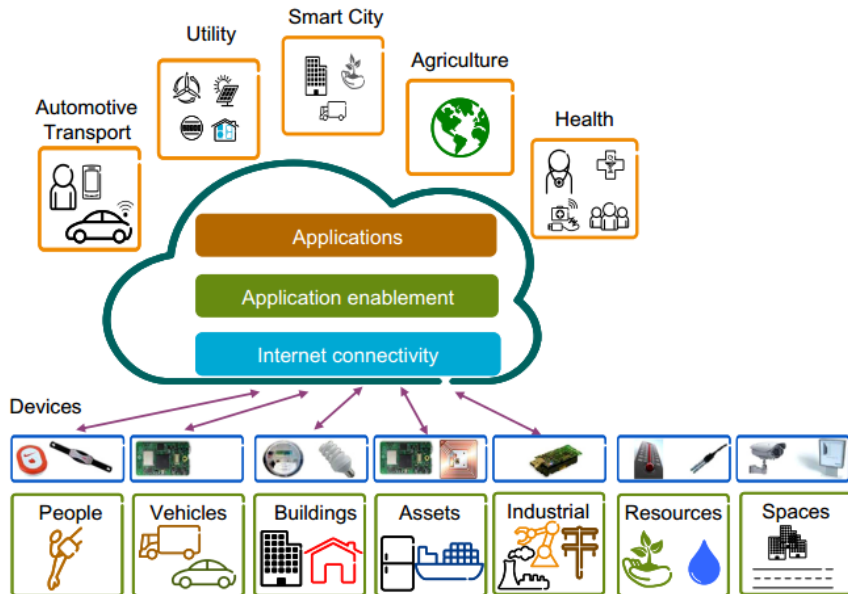
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- ▶ IoT systems may incorporate some M2M nodes (such as a Bluetooth mesh using non-IP communication), but aggregates data at an edge router or gateway. An edge appliance like a gateway or router serves as the entry point onto the internet.
- ▶ In the longer term, it is envisaged that an IoT ecosystem will emerge not dissimilar to today's Internet, allowing things and real world objects to connect, communicate, and interact with one another in the same way humans do via the web today.

Application of M2M



Difference with IoT

Communication Protocols

M2M and IoT can differ in how the communication between the machines or devices happens. M2M uses either proprietary or non-IP based communication protocols for communication within the M2M area networks. Commonly used M2M protocols include ZigBee, Bluetooth, ModBus, M-Bus, Wireless M-Bus, Power Line Communication (PLC), 6LoWPAN, IEEE 802.15.4, Z-Wave, etc. The focus of communication in M2M is usually on the protocols below the network layer. The focus of communication in IoT is usually on the protocols above the network layer such as HTTP, CoAP, WebSockets, MQTT, XMPP etc.

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Machines in M2M vs Things in IoT

The "Things" in IoT refers to physical objects that have unique identifiers and can sense and communicate with their external environment (and user applications) or their internal physical states. The unique identifiers for the things in IoT are the IP addresses (or MAC addresses). Things have software components for accessing, processing, and storing sensor information, or controlling actuators connected. IoT systems can have heterogeneous things, M2M systems, in contrast to IoT, typically have homogeneous machine types within an M2M area network.

Hardware vs Software Emphasis

While the emphasis of M2M is more on hardware with embedded modules, the emphasis of IoT is more on software. IoT devices run specialized software for sensor data collection, data analysis and interfacing with the cloud through IP-based communication.

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Data Collection & Analysis

M2M data is collected in point solutions and often in on-premises storage infrastructure. In contrast to M2M, the data in IoT is collected in the cloud (can be public, private or hybrid cloud). The analytics component analyzes the data and stores the results in the cloud database. The IoT data and analysis results are visualized with the cloud-based applications. The centralized controller is aware of the status of all the end nodes and sends control commands to the nodes. Observer nodes can process information and use it for various applications, however, observer nodes do not perform any control functions.

Applications:

M2M data is collected in point solutions and can be accessed by on-premises applications such as diagnosis applications, service management applications, and on-premises enterprise applications. IoT data is collected in the cloud and can be accessed by cloud applications such as analytics applications, enterprise applications, remote diagnosis and management applications, etc. Since the scale of data collected in IoT is so massive, cloud-based real-time and batch data analysis frameworks are used for data analysis.