

GENERAL APPROACH AND STRUCTURAL DESIGN WITH THE APPLICATION AREA OF MACHINE-TO-MACHINE (M2M) COMMUNICATION SYSTEM

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Abstract: Machine-to-Machine (M2M) communication defined as technology which communicates by wireless and wired system with further machines/devices. It is a system of data exchange among machines in an automatic manner. M2M communication system creates a pure constant and intellectual surrounding where machines are active and can communicate with each other without any human intervention. This communication has various applications areas such as home appliances, transportation, health monitoring, security alert, businesses, utilities (power, water, gas etc) supplies and manufacturing etc. sectors. This paper will introductory exorcise of M2M which contains its brief overview, essential architecture, network technology with application area. These things explicate the various opportunities towards several mentioned sectors by serving them and explore better technological solution to enhance way of completing task and procedures within less time taken at lower cost.

Keywords: M2M, Technology, Constant, Intellectual, Human Intervention and Architecture.

1 Introduction

Machine-to-Machine (M2M) communication is a budding technology which establishes communication among machines and makes a set up various devices for communication with information exchange to each other. This communication may either wireless or wired with other devices of the identical capability. Basically, M2M is a communication between computers, entrenched processors, sensors with smart features, mobile devices and actuators with no human intervention or with a very limited intervention of human. In broad way, it can said that M2M is a novel innovative business aspect that is utilize for measurement of data through remote, initiated by telemetry technological sources and complete automatic transmission by wire, radio or other communication means. [1] [2] [3]

M2M Communication is closely as it echoes: two machines “communicating,” or switch over data, without human being interaction. It consist wire or wireless communications, connection in serial manner, power-line connection (PLC) or Internet of Things (IoT) based connections. Switch on wireless technology made M2M much easier and enabled more applications to be connected for communication.[4] M2M is straight or direct transmission between devices by any transmission or conveying way it may be wired or wireless. [5][6]

Basically, M2M communication system operate, manage and control machines and devices meters, sensor etc. to observe actions and events at several level which are conveyed though a network by wired or wireless or hybrid etc. to the program/applications which capture the actions and convert into a consequential understandable information.[7] Theodore Paraskevagos (American-Greek inventor), first

conceptualized M2M by combining computing and telephony devices during researching on his identification system of phone's caller line in the year of 1968 that patented later in the United State as on 1973. So, he is often known as inventor of Machine-to-Machine communication system. [8] It is an extensive labeled which is utilize for describing every technology [9] which to transmit information and execute events without any manual assistance of humans by enabling the devices of specific network. Artificial-Intelligence (AI) and Machine-Learning (ML) make easy conveying by enabling them to build up an autonomous alternative. M2M was the initial adopted technology in industrial situation, somewhere further technologies like SCADA (Supervisory Control and Data Acquisition) and monitoring, managing and controlling the equipment. The concept of M2M could be taken over networks of mobile communication such as GSM, CDMA, GPRS, EVDO etc. It is totally true that in M2M, the responsibility of network of mobile is broadly confined to give out as a transmit system. Sensors use to capture the data at different types of machines that execute diverse tasks.

2 Features of M2M

The term Machine-to-Machine sounds little complex, but the energetic thought behind it pretty simple. Fundamentally, Machine-to-Machine communication is a closely similar to LAN and WAN but it usually sensors and machines to communicate monitor and control by enabling devices for actions. It permits a control unit of intelligence to evaluate, What is happen on across entire network system?. It gives more suitable directions toward associated machines. M2M works on four fundamental principles those find out by M2M surrounding features first one is obtain data by linked devices, sensors and radio-frequency identification (RFID), second is conveys the data by channel of network, third one is make verdict via intellectual application base solutions and fourth is trigger an event (action), based on predetermined rules and analyzed data. M2M will rapidly and constantly grow in this decade according to preceding predictions. [10] Although their many positive aspects of M2M communication out of them following are the some key points of M2M communication to explore its features:

- **Very less power utilize by the entire m2m communication system to transmit data and respond as the data received.**
- **Low Mobility:** Devices of M2M communication system either do not move or move only within a certain area.
- **Monitoring:** M2M provides functionality to detect events but not mean to stop theft.
- **Controlling on Time:** within the within a certain pre-defined period **Time**.
- **Time Tolerant:** In M2M communication some time transfer of data may be deferred for some time.
- **Switched in Packets:** Network hand to serve switched packet services with/without an Mobile Station International Subscriber Directory Number (MSISDN)
- **Location Specific Triggering:** Planed to activate M2M communication in a specific part e.g. wake-up the appliance.
- **Data-Transmission as Online:** Machine Type Communication Devices often throw or take delivery of tiny set of facts and records as data.

3 Basic Architecture and Component of M2M

M2M is powerful innovations in communication technology for enabling devices to collect data at distribute level at real-time on a particular network structure that has a huge potential to connect millions of machines today and even more in the near future. It work on both electronic devices as well as mechanical devices to transmit data vice-versa immaculately and execute acts without intervention of human or very less intervention of any one. It can be said that “M2M plays a game of passing information to one appliance/s to another appliance/s”. It consists to/from door locks, burn (smoke) detectors, water meters, alarms, smart buildings, agriculture’s sensors, environment’s sensors, smart lighting and a numerous more. It is a utilization of radio resources in most appropriate way where each of them uses an individual procedure to manage and control/handle resources. Following figure 1 depicted for showing basic architecture (domains) of M2M systems. [11] [12]

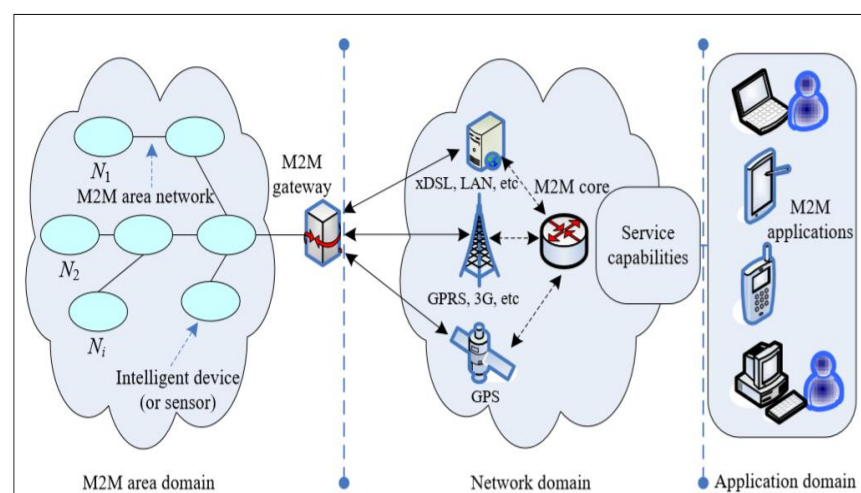


Fig.1. Basic Architecture of M2M (Domains of M2M Architecture)

M2M communication system includes many M2M nodes $\{N_1, N_2, N_3, \dots\}$ with a gateway of M2M which make a domain area. [13] Every node N_i is an elegant device which is very flexible to setup with a particular technology of sensing to monitor the real-time data. After monitor, gathered data-facts sensed. These communicable nodes those are associated in network will take an intellectual decision then switch sensory data packets towards gateway within a single/multi pattern of hop. After then packets from all kind of nodes, the gateway smartly maintain packet/s and supply well-organized paths to sending packets towards back-end server/s at remote level through domain network. In a domain network, huge hit of wired networks (e. g. PLC and xDLS) and ubiquity of wireless-networks (e.g., WiMAX, Wi-Fi and 3G cellular) deliver a consistent and cost effective mode to transmit the data packets by M2M domain area to application and server and domain.

M2M Applications will be fully depended on the network based infrastructural assets. Applications may either target at end-users which is user specific solution of M2M communication or at another applications suppliers to put further additional sophisticated structure blocked that can build suitable M2M services and solutions. Following figure 2 demonstrate the communication system of M2M with some applications examples to several components with applications.

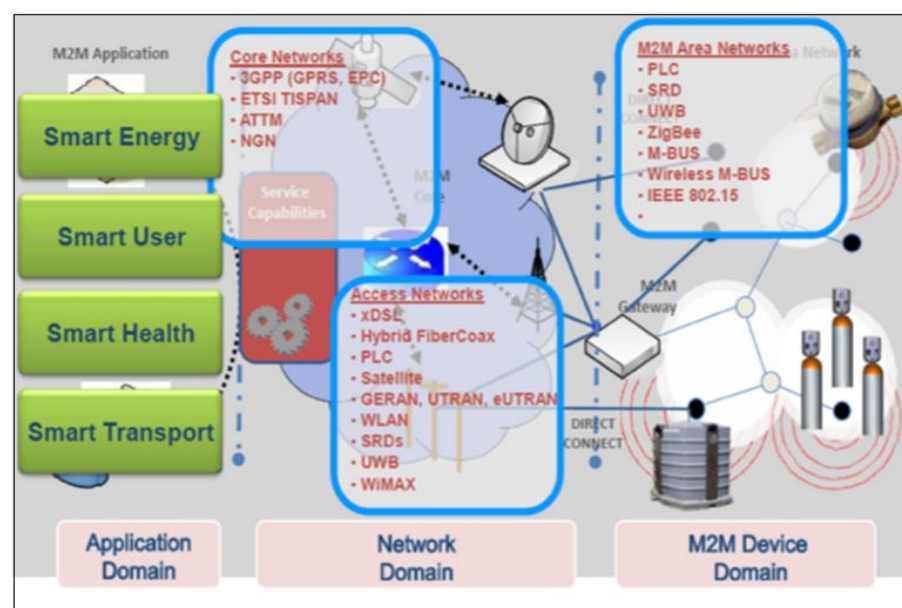


Fig.2. Components of M2M Communication system

5 Application Area of M2M

M2M reinforces and employs a convergence of several different kinds of technologies like IP, sensor networks, RFID, smart metering and home networks etc. M2M principles are explored in several different verticals of industries. [14] M2M serves advantages to companies, individuals and organizations in public-private fields across industries. Following figure 3 is showing the various application areas of M2M communications where M2M technology can be applied for better service deliverance using associated machines and devices.

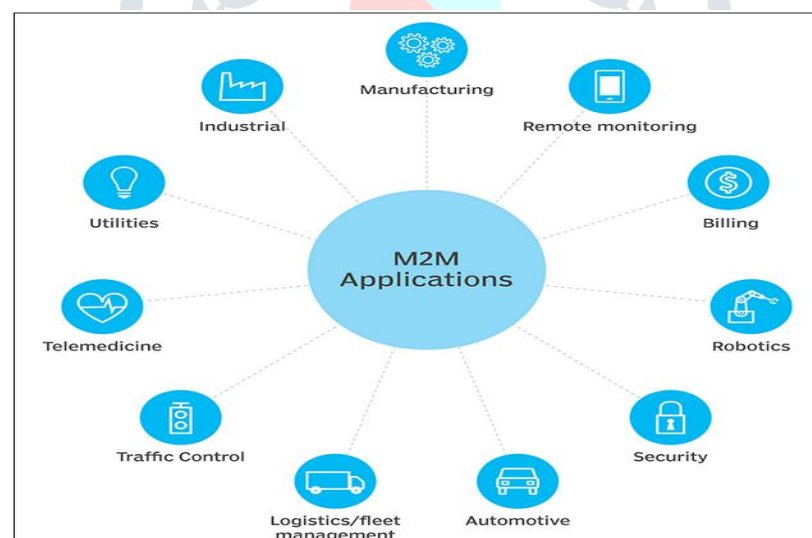


Fig. 3. Application Areas of M2M Communication System [15]

Machine-to-Machine (M2M) communication is generally used for monitoring by remote. M2M is very important in the SCM (supply chain management) and WMS (warehouse management systems). In asset tracking m2m system a superstore chain can have automated inventory tracking which can supervise the usufruct rates of store and report the exhaustion levels to the store managers on their mobile terminals. Utilities industries often use M2M communicable applications and devices towards not only bill customers but also harvest energy through smart meters that detect worksite factors like pressure, equipment status and temperature. Automated meters are already adapted by many utility companies all across the world to enhance in control, monitor and deliver a better service towards its customers. M2M communication can facilitates real time monitoring and controlling of patients' critical statistics in telemedicine, dispensing devices when need or track healthcare assets. For security system, the connected alarm e.g. a lot of alarm manufactures are currently moving into wireless technologies instead of fixed lines.

Conclusion

M2M communication is almost synonymous or compensatory of IoT to each other, the key difference is that IoT typically refers to wireless communications and internet is essential for the establish network while M2M refers to two devices /machines connected either with wire or wireless. M2M is a technical planned structure which use for data communication having one or more entities which does need human intervention as extremely fewer levels or almost none. M2M communication system have many M2M network nodes and an gateway to make a M2M area domain. It is explores a budding fields with its own aspects which includes sensors, servers on premises, scanning, storage and analytics devices. The essentiality of distant and isolated monitoring is about when focusing on length of duration M2M spends set up. Through M2M Communication several advantages can be inherited in the real world such as less mobility, less energy consumption, security monitory at every level, time controlling, reduce prospective safety intimidations by data breaches, hacking and illicit monitoring system and intend for triggering at specific area etc. Further, M2M communication technology improves people life style by utilization of wired and wireless resources in most appropriate way and working style of machines, including in monitoring, controlling and maintaining systems so It having an large impact on the several modern life's real world fields, helping us to change how we interact with our devices.

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