

Machine-to-Machine Communication - Connecting Devices Together

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Abstract: This paper looks into the future prospects of Machine-to-Machine (M2M) communication, particularly in the area of mobile wireless networks. The paper defines M2M devices as machines that communicate through wired and wireless networks. These devices are not different from ordinary computers, and they use internet in their communication. At the moment, it is estimated that nearly five billion devices are connected to mobile networks, but, this number is expected to reach fifty billion in the next ten years. The paper offers good examples of how M2M is used in the present day. From these examples, it is clear that M2M has a great potential of improving the economic sector and also enhancing social development.

However, to realize these benefits, the paper asserts that policy makers may be forced to review telecommunication and regulatory policies. For instance, there is need to reexamine aspects such as mobile wholesale markets for companies, numbering regulations, frequency regulations as well as privacy and security. All these aspects have a direct impact on M2M accessibility.

This report shows that use of M2M has remarkably transformed the market and presented users with thousands of options. On the other hand, business users have been presented with millions of devices they can use as M2M. Indeed, business users enjoy more flexibility in-terms of their internet use, as they can have their own or outsource where need be. Yet again, regulations limit this flexibility enjoyed by business users. In addition, lack of proper infrastructure may hinder efficient application of M2M services in many countries.

To enhance the use of M2M, it is suggested that more liberalization should take place in the wireless market. There is also the use of ensuring that enough spectrum is availed. Certainly, all these changes need the input of governments as major stakeholder in use of M2M.

1. INTRODUCTION

Machine to Machine (M2M) is defined as technologies that allow both wireless and wired devices to communicate with each other.

Three main technologies which are effective in machine to machine communication is wireless sensor, the internet and personal computers. Machine to machine can take in the industrial instrumentation as a good platform to develop and synthesize. In industrial automation M2M can comprise of a

device to capture the physical parameters that are embedded through a network and then to an application which translate it into a meaningful information. Such network are possible only through remote network of machines which relay information back to central system for processing and analysis and then routed to personal computers [1,6].

We can take example of car's engine embed with chip which can study its performance in various condition and work to maximize its fuel economy.

However, modern M2M communication has extended beyond a one-to-one connection and transformed into a system of networks that transmits data to individual appliances. The growth of IP networks across the world has made it far easier for M2M communication to take place and has narrowed the amount of power and time necessary for information to be communicated between machines. These networks also allow a selection of new business opportunities and associations between consumers and producers in terms of the merchandise being sold.

There have been estimates that there will 50 billion mobile devices user which will be connected to internet by 2020 and total number of devices connected to internet may reach 500 billion [4].

If this much user use the wireless network then it may affect economy in one our other way, it may mixed the economy with the network you can take the example of tag system of Delhi metro system any loss in the network may lead to big loss to government or any business.

This network is mainly based on three concepts:

Internet of things- it mainly consists of application that involve radio frequency identification (RFID). It uses so called tags which start transmits data when they is in the range of EM field.

Machine to machine communication uses devices that are connected to the internet using wired or wireless connection to wider world.

Other thing includes smart living which includes metering, grids, water levy to improve the living.

2. DESIGN OF M2M SERVICE

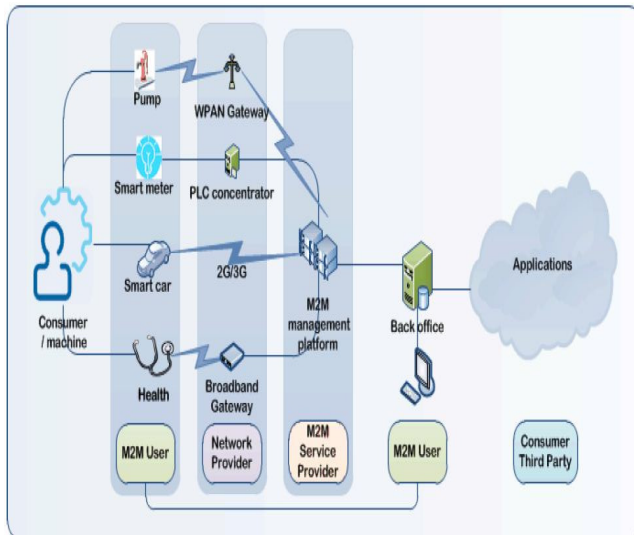


Fig.-1. Element and Controls of M2M Communication

M2M system consist chains of step which passes on the required data to complete the system for example Health monitoring system in health services helps in monitoring of vital sign shown by patient, now this system of health monitoring system need some kind of network to send back the data to the system. We can take another example of fault detection system in industries the parameters which are collected in one area can be used to solve problem by other end user using wired or wireless network and cloud computing [7].

2.1 Characters which influence m2m communication

As M2M can consist of many applications we should be specific with the type of network used according to the business models and other issues

Mobile and dispersed applications

Long distance travelling cargo ships, planes and trucks is long been based on M2M communication. It helps not only to record location but also various parameter of interest to owner such as temperature etc.

Fixed, dispersed and concentrated applications

Many application works in a fixed area in this type owner may want to monitor them for information like status of work, machine etc. This all can be done through M2M communication the use of M2M connections allows all this monitoring. For example monitoring of motor pumps and

checking water level is in use already, monitoring of elevators, ATM etc. In concentrated application we can take the example of monitoring of households, control of production process in industries. It is also possible to make IP enabled fridge which contains the monitoring of food it contains. Control of T.V., music system, garden using various sensor and mobile phone can be taken as another example.

Mobility at a specific location

M2M applications which are mobile at specific location like loading and unloading of loads by robots can fully automate through this communication. Hospitals can be taken as another location where mobility is needed at specific place monitoring patient while he is moving through the hospital and other parameters [3].

2.2 Various parameter for M2M

A good M2M communication allow access to internet anywhere in the world and it works same on all situations it should have unlimited range with very less consumption of energy. As this technology provides a lot it also has some general necessities and tradeoffs which are [2,9]:

- *Penetration and range:* More penetration through the walls, windows if range is good but we know-range=1/power consumption.
- *Power consumption:* Lower power consumption can result in good use of battery operated devices.
- *Number of devices:* If more devices are used it may affect performance.
- *Types of network supported:* There are many different topologies like star, mesh ,tree etc every topology has its own advantages and drawbacks.
- Apart from these *Ease of maintenance, Lifetime, Global use, Application supported, Mobility, Security and privacy*, etc. also comes in its long list, but it is not easy as to choosing the right M2M solution and bolting a communications device onto a machine. Previous M2M projects on choosing a stage of important parameters become failed because of changing requirement nullify past choices. Smart metering was successful projects but companies looking for a single or group of technologies that work for all M2M projects like smart metering project has.

There is a clear picture to policy makers when depend on M2M in some form to support policies that these trade-offs impact the property of the project at every level [11,6].

Wiring system

Many residence or business are fixed in one location in these there may be a single device which can connect them all to a

network and make them available for M2M communication not only the machine even the socket and plug can be connected to the network as it can help in saving energy, prevent overload as well.

For example, using principles like X10, Universal Powerline Bus and the HomePlug standard. With 10 billion sockets in North America alone, there is a huge potential to make communicating devices that use interior electrical wiring. The settlement of using interior electrical wiring is that practically all households are already able to work there is no need of any new machines.

Functioning can be as easy as plugging in a machine or plugging a fresh M2M-enabled socket in the active socket. It can work well with alive principles like Ethernet, which is the leading Local Area Networking technology.

Wired networks

It uses wired computer network technology which can be used for serial communication in many industries using copper and fiber based network. Its advantage is that it can make secure private network only problem is of maintenance.

Wireless Personal Area Networks (WPAN)

It is mainly used for short range networks. It can consist of network like Bluetooth, wireless USB and Zigbee etc. this help in the connection of wide variety of devices also they are low powered technology only problem is its range it didn't connect to the internet and its cloud services. [5]

PSTN

The public switched telecommunication network (PSTN) has been worn in many behavior to hold up older versions of M2M communication. It is used for electronic payment terminals, alarm installation, elevators etc. PSTN is very easy to use and is available widely but it doesn't support high bandwidth.

Wi-Fi

It is one of the most successful standards designed for connecting almost any laptops or smart phones with high speed internet wirelessly. Its power consumption is high as it needs permanent source of electricity and its settlement at residence is not yet popular.

Broadband

This technology consist DSL, fiber and cable and is choice of many users. Broadband can become the idle network to be used for M2M communication only problem is its connectivity for example in health monitoring system can it embed easily? or will this service works with any ISP or to specific ISP? Or

there can be increase of malfunctioning cases who will handle that?. Due to these all queries it can be difficult task to embed this to M2M system.

2G/3G/4 G mobile wirelesses

It is most successful communication network in terms of ease of access. For M2M it can easily be embedded. In many cases this technology best suited for M2M application it is because –

- Global availability
- Range
- Control through SIM cards

Also there are some drawbacks but is mainly on some application.

Power line communications-

Power line communication suited best when there is need of communication between equipments of power system.

There are some important drawbacks that will effect in a partial use for PLC in smart metering. These are:

- It can take up to 24 hours to restart the system
- No ability for real-time messaging [3].

Satellite

It can be used for long distance communication or where other networks are not possible as an alternative. Mainly it is used for remote monitoring and tracking.

The main drawbacks of this network are:

- Line of sight for satellite is sometimes harder to use in urban or mountainous region.
- It uses bulk equipment
- Low data rates

Instead of drawbacks it's the only communication suited for remote parts of World Sea.

Authentication methods

Authentication process is very important in M2M communication as any breaching can lead to malfunctioning of many types of equipment. It mainly works on three principles [8] -

- What you know-password to trusted
- What you have-type of network
- What you are-fingerprinting and iris matching

In order for a device to be different it should have unique number so that network can differentiate it. There should be some control room which can control on flow of data and processes.

To avoid duplication of unique IDs there are diverse sources that M2M users turn to:

- A self-administered unique IDs which can be changed by user itself
- A trusted third party which can help to control the IDs.

For network same privacy rules should be applied to this network which is in use right now by mobile as well as internet user. Network should use encrypted communication which makes the network more private.

3. THE IMPLICATIONS OF M2M ON BUSINESS MODELS

As in market business can be grown faster by the use of M2M communication. Recent experience has also found that there is need of new technology which can control the many business parameters at one. A consumer oriented company has to control many subscribers at one which may then increase in need of M2M communication. The stress by M2M clients on communication companies, in terms of Organization, roaming, range and provider switching are very diverse than what is at present the norm. New business technologies can be related to insurance, Digital content distribution industries, Service providing company [7].

4. CONCLUSION

By the study of various technologies it is clear that 2G/3G/4G wirelesses meet many objectives, for maximum uses, and it

can be used for both fixed and mobile situation with a large distribution. We have found that 2G/3G/4G are most versatile for the development of M2M communication technology. Other technology which can be considered for indoor network is WPANs as it is inexpensive and easy to use. As 2G/3G/4G is global network it can be easily embed in many parts easily and there is also advantage as this network is easily usable just by use of SIM card. As this network also provide more security to user, so this can be taken in mind for development of M2M communication.

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