Australian Journal of Science and Technology

ISSN Number (2208-6404)
Volume 2; Issue 4; December 2018

Review Article

A nobel approach of cloud- and internet of things-based machine-to-machine communication

Rifat Bin Emdad*

Department of Computer Science and Engineering, Jahangirnagar University, Savar, Dhaka, Bangladesh

ABSTRACT

Machine-to-machine (M2M) communication is the only one element of smart cities that are connected to the internet, using a variety of fixed and wireless networks, and communicate with each other and the wider world as an active communication devices. M2M is enabled by ubiquitous connectivity. When M2M is combined with the logic of cloud and internet of things (IoT) Services, remote operation and interaction that these types of applications and works become "smart." The main issues faced by IoT are security and privacy which can be solved using M2M communication and cloud computing facility. For increased surveillance and tracking, difficulty, data collection, and the aggregating IoT data streams can be solved using cloud computing. In this paper, we discussed a nobel approach of cloud- and IoT-based M2M communication which helps us to store vast resources by enabling reliable and real-time communication from objects to applications and vice versa. This approach is ease of maintenance and a combination of IoT with M2M communication and cloud computing.

Keywords: Big data, Cloud computing, Internet of things, Machine-to-machine communication, Real-time communication, Security

Submitted: 16-11-2018, **Accepted:** 04-12-2018, **Published:** 29-12-2018

INTRODUCTION

Usage of internet in day-to-day life is so high that data that we are sharing around the world are beyond our imagination. We need to store all these big data and need it back whenever we wish. Cloud computing and internet of things (IoT) will provide to store and analyze these data to take necessary action. During 2008, the number of things connected to the internet exceeded the number of people on earth.[1] That is why people are easily connecting to things. We have to make the use of things properly. The IoT is the internet that extended in providing connection, communication, and internetworking between devices and physical objects, or "Things." For big data, data collection is one of the main concerns, and IoT can play an important role for data collection and data sharing. The number of billions of connected devices enable this. Devices can be access from anywhere. For big data, data are nothing without real business value insight. The real value of IoT is on data. Cloud offers everything as a service business model for IoT and big data.[2] Services or data are hosted on remote infrastructure. IoT is a king, big data is a queen, cloud is a palace, and machine–to-machine (M2M) is the communication method. Here, the main added features of the combination of cloud and IoT with M2M communication are the vast storage, resources, and protection with security and privacy. An ideal M2M communication technology would allow instantaneous secure access to the internet at any speed from anywhere in the world.[3] It would work equally well indoors and outdoors with unlimited range, throughput, and zero latency. When M2M is combined with the logic of cloud and IoT services, remote operation and interaction of applications become smart and intelligent.

CLOUD-CENTRIC IOT PLATFORM

Cloud-centric IoT mainly works to bring the IoT functionalities in cloud.[4,5] Where cloud platform provides instant software updates, unlimited storage capacity with increased data reliability and universal document access including latest version availability. The basic cloud service model is shown in Figure 1. On the basis of this model, we have also established a cloud-centric IoT platform which is shown in Figure 2.

Address for correspondence: Rifat Bin Emdad, Department of Computer Science and Engineering, Jahangirnagar University, Savar, Dhaka, Bangladesh. E-mail: Rifat.engr@gmail.com

The main purpose of cloud-centric IoT platform is to bring IoT data in the cloud in a safe and secure way.[2,6] IoT will process and compute the data and deploy management tools in cloud network. IoT infrastructure will provide the opportunities to take services, workloads, applications, and large amounts of data and deliver it all to the network. This platform will provide the cognitive capability to all devices which are connected into the IoT cloud platform. These devices will able to store and retrieve data in a secure way when any information is needed from the cloud-centric platform which is basically IoT based.

M2M ARCHITECTURE AND METHODOLOGY

The term M2M communication describes devices that are connected to the internet, using a variety of fixed and wireless networks, and communicate with each other and the wider world.[7] They are active communication devices. It may seem that M2M communications and IoT denote the same thing, but in reality, M2M is only a subset of IoT. The basic M2M architecture is shown in Figure 3.

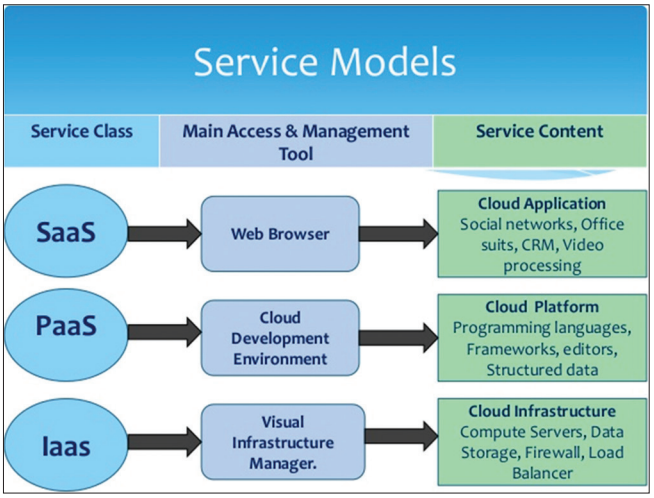

Figure 1: Cloud service models

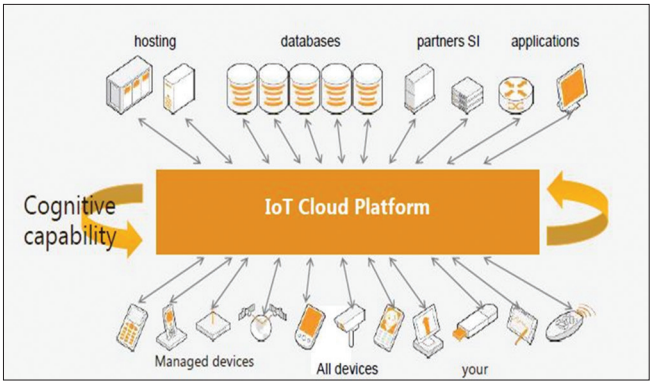

Figure 2: Cloud-centric IoT platform

For M2M communication, MQ telemetry transport (MQTT) is needed that is a lightweight message queueing and transport protocol which is suited for the transport of telemetry data (sensor and actor data). MQTT is well suited for M2M, Wireless Sensor Networks, and ultimately IoT scenarios. MQTT client (=publisher, subscriber): Clients subscribe to topics to publish and receive messages. Thus, subscriber and publisher are special roles of a client.[8] MQTT server (=broker): Servers run topics, i.e., receive subscriptions from clients on topics, receive messages from clients, and forward these, based on client's subscriptions, to interested clients. A session identifies a possibly temporary attachment of a client to a server. All communication between client and server takes place as part of a session. Unlike sessions, a subscription logically attaches a client to a topic [Figure 4].

When subscribed to a topic, a client can exchange messages with a topic. Messages are the units of data exchange between

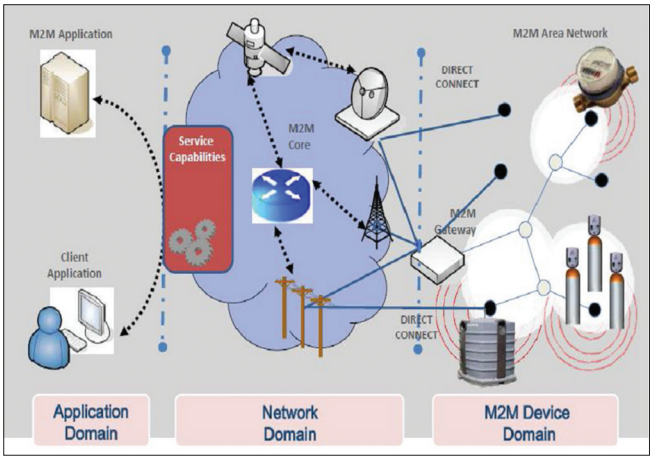

Figure 3: Machine-to-machine architecture

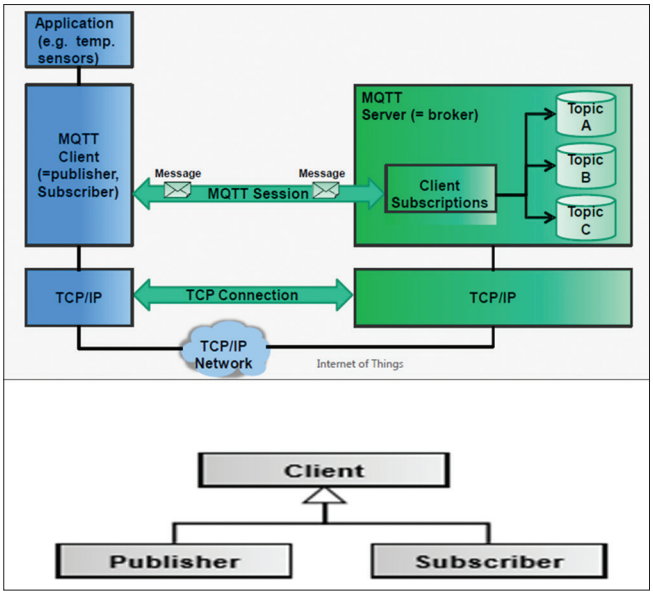

Figure 4: MQTT Model and MQTT client's link

topic clients. The basic requirements for M2M Architecture are as follows: It would work equally well indoors as outdoors within an unlimited range, zero latency, unlimited throughput, and consume no energy. It would provide access and management to data necessary to use M2M efficiently while ensuring the protection of privacy.[4] Types of network supported are star, mesh, tree, and peer-to-peer topologies. It should have the ease of roll-out, maintenance, and option of mobility. According to our approach, the architecture model of cloud- and IoT-based M2M communication is established as shown in Figure 5, which will provide the vast storage, resources, and protection of the M2M communication with IoT and cloud computing.

RESULTS AND DISCUSSION

The IoT is the Internet that extended in providing connection, communication, and internetworking between devices and physical objects or "Things."[9] The IoT is the network of physical objects, devices, vehicles, buildings, and other items embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data. We need to store and analyze these big data and need it back whenever we wish.[10] It is difficult to prioritize the action need to be taken or its boring to do all routine works (checks). The key requirements of IoT, scalability, real-time, security and privacy, intelligent and dynamic, distributed and decentralized.[11] All of these requirements are fulfilled here for M2M communication. The mesh connection of M2M communication is shown in Figure 6. According to our model here, things will be able to connect to things.

In future, for any smart network, the M2M communication will be mandatory not an option. According to CISCO, there are 50 billion connected objects in the online database.[12] We should try to utilize these in a correct manner by Ensuring flexibility, scalability, and dynamicity [Figure 7].

The basic result is that IoT touches every facet of our lives. It makes developing applications easier with hardware, software, and support to get anything connected within the IoT.[13] We can assume that the combination of cloud- and IoT-based M2M communication will lead the smart cities network in future.[14]

APPLICATIONS AND FUTURE WORK

The M2M communication is safe and efficient for all kinds of home, medical, industrial as well as business processes. As a result, when we need information, we have to just retrieve correctly, and the operator will be able to interpret it more effectively and will be able to draw better conclusions. In fact, electronic devices at your home and workplace are only able to communicate with each other due to this common networking designed between them known as the M2M communication.[13] The basic applications of M2M communication are utility companies, traffic control, telemedicine, security in businesses, military, telemetry, agriculture, and health. On the basis of our approach, we construct a future network system of food processing system and health disease detection technique paradigm according to IoT- and cloud-based M2M communication [Figures 8-10].[15,16]

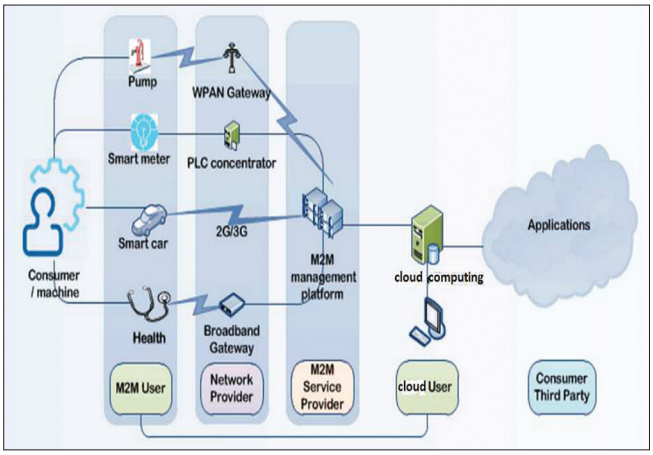

Figure 5: Cloud- and internet of things-based machine-to-machine communication

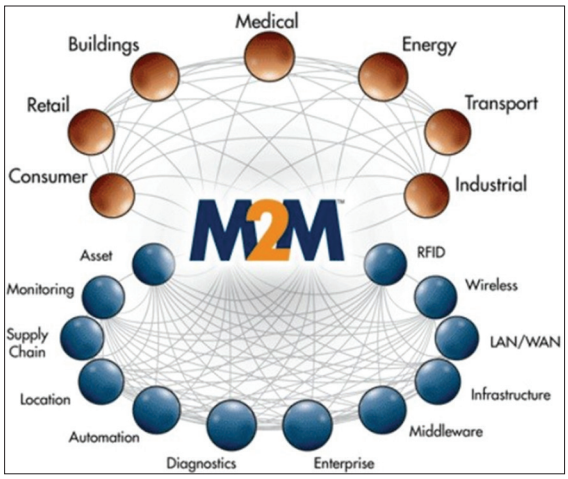

Figure 6: The mesh of machine-to-machine communication

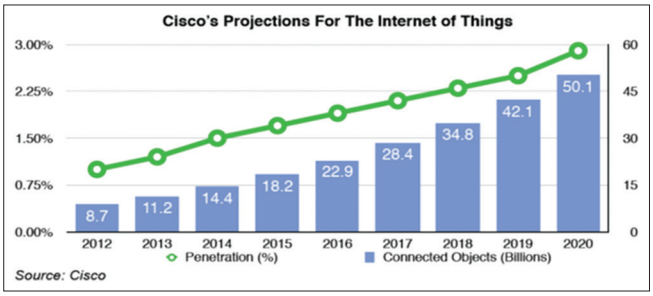

Figure 7: The increasing level of connected objects

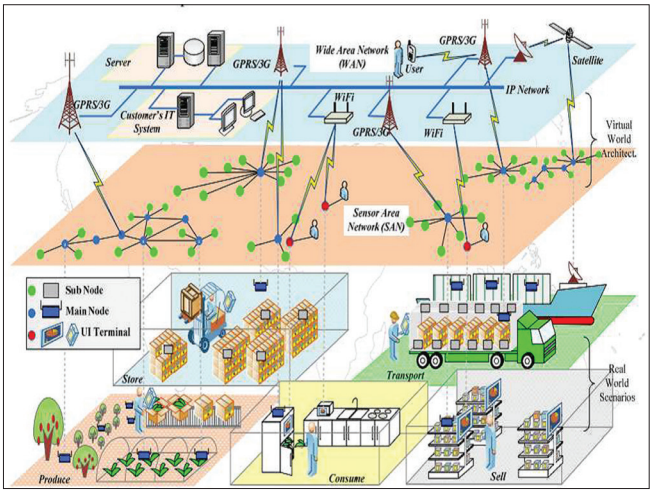

Figure 8: Food supply chains according to cloud- and internet of things-based machine-to-machine communication

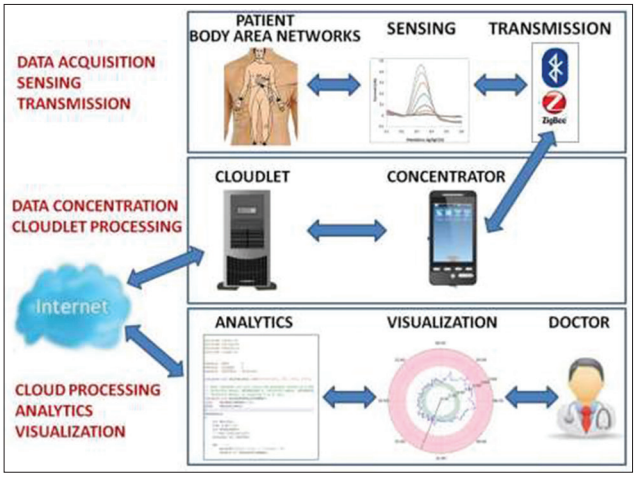

Figure 9: Patient monitoring remotely according cloud- and internet of things-based machine-to-machine communication

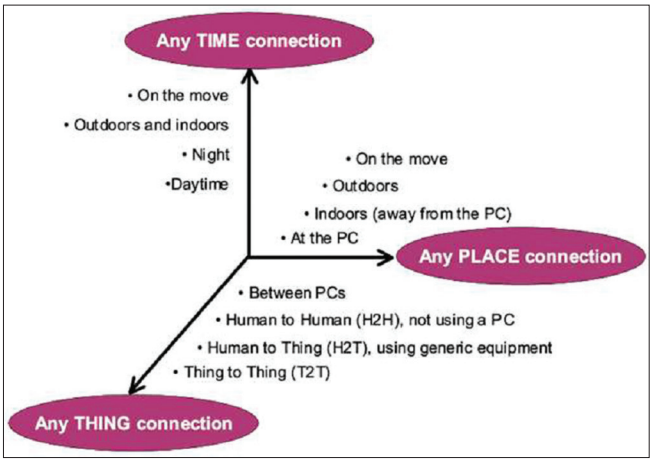

Figure 10: Future works on the basis of our approach

CONCLUSIONS

IoT, big data, cloud, and M2M are the future of the world. IoT is an element of a smarter environment that can be used in conjunction with M2M communication and cloud services.[17,18] According to this approach, large protection and data collection and processing of the data are possible. The secure data transport, less bandwidth utilized, faster response, lesser battery usage, and it will work well in latency network too are added advantages. This enables devices to communicate status and information, which in turn can be aggregated, enriched, and communicated internally or onward to other units. The standardization of the network for M2M-specific service will lead to better support of M2M communications.

ACKNOWLEDGMENT

This paper was done to get more clear view and enabling the reliable and real-time communication through M2M which is IoT and cloud based. The author would like to thank the numerous researchers on whose work these design patterns are based.

REFERENCES

1. Evans D. The Internet of Things: How the Next Evolution of the Internet Is Changing Everything. New York: Cisco Internet Business Solutions Group (IBSG); 2011.
2. Liu T, Duan Y. Application of Cloud Computing in the Emergency Scheduling Architecture of the Internet of Things, Software Engineering and Service Science (ICSESS). IEEE International Conference; 2015.
3. 4G Wireless Broadband to Boost M2M Services. Posted by Neil. Available from: https://iot.telefonica.com/blog/en/all/all/industry?language=en&page=5. [Last accessed on 2013 May 21].
4. M2M Solution. Testing and Prototype in Emerging Global M2M Standards. M2M Summit 2013. Dr. Ing Adel Al Hezmi, FRAUNHOFERFOKUS; 2013.
5. M2M Standards Overview. Release in Nov. Huwaei: 2013. Available from: http://www.huwaei.com. [Last accessed on 2014 Jan 16].
6. Smith JO. Chief Technology Officer of Numerex. Chair of the GSC M2M Standardization Task Force (GSC MSTF). Available from: (JSmith@numerex.com), (NASDAQ: NMRX, www.numerex.com). [Last accessed on 2017].
7. Rhoton J. Cloud Computing Protected: Security Assessment Handbook. Wuxi, China: Published Recursive, Limited; 2013.
8. Yang K, Jia X, Ren K, Zhang B. DAC-MACS: Effective Data Access Control for Multi Authority Cloud Storage Systems. Proceedings IEEE INFOCOM. Vol. 7. 2013. p. 2895.
9. Perera C, Liu CH, Jayawardena S. The Emerging Internet of Things Marketplace From an Industrial Perspective: A Survey. Germany: IEEE Transactions on Emerging Topics in Computing; 2015.

10. Javier L, Ruben R, Feng B, Guilin W. Evolving privacy: From sensors to the internet of things. Future Gener Comput Syst 2017;75:46-57.
11. The Place Where m2m Experts Connect With You-Telefonica. [Last accessed on 2013 Dec 17].
12. ETSI M2M. Onem2m and the Need for Semantics by Joerg Swetina (NEC). Available from: http://www.(joerg.swetina@neclab.eu).
13. Machine-to-Machine (M2M). Communication Challenges Established (U) SIM Card Technology-GD. U.S. Patent #3,812,296/5-21-1974, 21; 2014.
14. Rani K, Mayuri A. Paper on basics of internet of things. Int J Emerg Trends Sci Technol Impact Factor 2016;3:06.
15. Kumar NV, Sindhujadevi D. Efficient searching in social internet of things. APRN J Eng Appl Sci 2018;11:2239.
16. Internet of Things: An Overview. Understanding the Issues and Challenges of a More Connected World; 2015.
17. Floerkemeier C, Langheinrich M, Fleisch E, Mattern F, Sarma SE, editors. The Internet of Things. First International Conference, IOT 2008, LNCS 4952. Springer; 2008.
18. Internet of Things Global Standards Initiative. ITU. [Last accessed on 2016 Jun 01].