Machine to Machine Measurement (M3) Framework for Web of Things

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Abstract

Web of Things (WoT) is one among the prominent research today. Due to sudden growth it has a massive reach amongst global tech communities. Recently few challenges limits the expansion of WoT such as data interoperability, data interpretation spawned by WoT devices and prompt solutions for this issues supports developers in accomplishing their tasks. Due to present advancement on standards to address this challenges among organizations we can attain solutions through one M2M based design with semantic WoT architecture. The current release one M2M standard has not obtained any solid tool or solution for semantic treatment of WoT data. Recently developed Machine to Machine Measurement (M3) framework supports semantic based WoT application developers to develop smart applications without massive challenges. Since the effectiveness and innovative aspects of M3 framework this research proposes for seamless integration it with one M2M architecture. Machine to machine integration in WoT is reinventing the manufacturing industry. They are giving birth to the smart intelligence enabling newfound levels of productivity and predictability.

Keywords: Machine to Machine, data interoperability, Web of Things, data Interpretation

Introduction

Machine to Machine (M2M) is a standard term which can support to characterize any tools that enables associated devices to share information and to   perform   different task necessitating human support. The web of Things (WoT) is an innovative standard

which is modelling the development of the future Web by outspreading the connectivity of Web to physical components such as sensors, RFID tags and actuators. This multimodal components can function with extremely disseminated and independent characteristics.

2. WoT -M2M Framework

M2M is an exchange of conversation or sharing of information between two machines with distinct characters without human interaction. In vision of Business WoT, M2M comprises sequential connection, wireless communications (WI-FI) and power line connections.M2M communication sharing supports switching over to WI-FI for communications and used frequently for monitoring machines or devices remotely.

  M2M –WoT framework supports various sectors like Business Firms, Education institutions, Medicine applications etc. The example for M2M –WoT in business firms is used to maintain the product Reorder Level(RL) in which a retailing machine can alert or communicate the supplier's system, or machine, when a specific product item stretches RL, retailing machine will send a request or alert to supplier for further orders . M2M-WoT is an enabler of tracking and monitoring of assets illuminating in Figure-1. M2M is vibrant in Warehouse Management Systems (WMS) and Supply Chain Management (SCM). Most of the service sector companies often rely on M2M embedded devices with its applications not limits in sectors such as oil and gas, in oil and gas sectors fields supports to detect onsite factors, such as density, temperature and equipment status with support to customers for billing through smart meters [2],

Figure.1.M2M- WOT Framework

In widespread, term M2M communication often concerning cellular communication for embedded gadgets [3]. Some of the examples of M2M communications it would be selling machines transfers out inventory records or ATM machines being authorized to dispense cash to its customers.

Now the companies are realized the demand of M2M, it has taken on a trademark with a title Web of things (WoT). WoT and M2M has comparable assurances to fundamentally substitute the manner in various sector functions. Alike to WoT, M2M technology assists and lead people with the support of sensors anyone can track any structure, surroundings with automatic responses without human interventions.

In simple team M2M and WoT are nearly equal where M2M can deliberate with any two machines stressed out or WI-FI whereas the exception on WoT normally refers to wireless communications.[4]

2.1.M2M Data:

This makes M2M data exchange, management, processing and interoperability a daunting task for developers. But the challenges have to be solved to provide some fundamental requirements in any WoT platform discovery, naming & addressing of things and (ii) information storage, exchange, representation and unified interpretation of data.[5]

2.2. WoT – M2M Connectivity

To access remote devices WoT and M2M have to be different largely on their approaches. M2M is being governed by on point-to-point communications with the support embedded hardware components of a machine. These machines communications being through wired or cellular networks through committed software application.   WoT being dependent on protocol based IP networks to edge device data to a cloud or middleware platform. While M2M functions with isolated system of sensors and keys of remotely collected and measured data, WoT congregates dissimilar systems into an extensive system to empower advanced applications.

The most integral part of applications with WoT and M2M is capacity to boost up the performance of a business via a remotely connected power-driven collection of data. Nevertheless, good to note that each solution differs in the way to use these data.

WoT- M2M Framework supports efficient machine to machine transmissions of data that are only leveraged in maintenance related unique simple applications [6]. Most of the service management applications are using M2M data where data incorporation of enterprise mobile applications happens occasionally. M2M hardly supports the advanced technologies like device integration, sensors with big data applications, analytics, mobile applications but WoT supports vice versa. It supports to improve business progressions and functioning through predictive maintenance. Data from M2M and WoT are unquestionably valuable for the business forms for their development of business. Applications of M2M and WoT retains different competencies to leverage the anticipated benefits for users with solutions.[7] New terrain has begun for M2M providers with additional competences via cloud technologies WoT suppliers stress more on the capabilities on software's which supports enterprise integration (Example home equiepment) which is Illustrated in figure.2.

3. Communication Channels and Applications

Communication channels are the important medium to attain predicted results. Point to Point commination is used for M2M between machines, hardware's, sensors via cellular and wired networks and modems. To avoid data traffic on web WoT sensors are using standard IP protocols for transferring information's.[8] M2M and WoT are not identical. In Figure.3 illustrates the dissimilar solutions for the enterprise. Connectivity terms of M2M and WoT are primarily dissimilar based on connectivity, aim to connect, scale and data utilized. Nonetheless, machine to machine and the Web of Things both envision a world where all devices are endowed with "smart" capabilities that enable them to communicate and interact with other devices remotely.

Figure.2.WoT M2M Applications – Home Equipment

4. Improvement of Business Performance

Data centricity is one of the main advantage of WoT and M2M applications. Based on its provided connectivity, data collected for evaluation based on user experience, performance and maintenance of these technologies,[9] For example data collected form M2M systems mainly supports to identify system errors which leads to reduction of maintenance cost rapidly. Especially WoT and M2M connectivity data highly allows the business firms, Educational institutions, marketing agencies to predict, analysis their insights for further leverage of the system. This technologies definitely segments on common aspects with a similarity to use machine data for communication among machines without human involvement. .[10]   Both WoT and M2M have massive advantages on storages, resources and protection. Some of the most unique feature of M2M is short sessions with less payload, backup capacity and diversified QoS requirement. Main benefits of M2M is its connectivity through cellular network gateways, provision for easy rollout and maintenance, broad range, least latency, high throughput and less energy. Another value added feature M2M technology act   occasionally to handle supply chain and distribution [11]. For example, devices used agricultural based applications are often out of usage on unseasonal period of crop cultivation, and telehealth device based applications are used only when it's needed. M2M strategies a feature which can suspend service during these downtimes and only pay for the months when the device is actually in use.

Figure.3.IoT vs M2M – Business Performance

4. WoT Integration with Systems

With the greater vision M2M and WoT positions itself a new era where billions of devices will need to communicate each other with information exchange in order to fulfill their needs. Where in figure.4. illustrates the Integration of web technology with M2M communication   which is the place suppose it's going to happen [12] and   hit into the widespread knowledge assimilated with architectures in   experiences with the Web over the previous   decades.   Simple integration of massive technologies M2M and WoT with lead a the global product development giants for user friendly smart home, industry management device oriented applications   with a target of more complex interactions where partnerships of devices and systems is taking place.

Figure.4.M2M Integration In WOT

4.1.M2M requirements

- Scalability : M2M system should provide better efficiency if additional onjects are added on the existing pool of devices

- Anonymity : The M2M system should not restrict the device identity subject to governing requirements and to prevent from vulnerable attacks.

- Log Management: M2M systems should have a provision to monitor and store more information's about its connections like connection attempts, success, failed attempts, connection duration etc.

- M2M communication principles - M2M systems should have a provision to access its application across its network via through its gateway such applications like SMS, IP.

- M2M Delivery method : Models which supports M2M are unicast, multi cast and broad cast and any cast.

- Message communication path selection – Fault tolerance M2M policies which supports to eliminate transmission failures, transmission delays.

4.2.M2M security

M2M devices come across a number of threats such as intrusion via unauthorized access, remote inference, hacking etc these threats are recognized via information security, data privacy and prominence. M2M Measurements patronized business firms, industries to control their machines with its performance remotely. Best outcome from M2M is to associate this technologies with cloud which is easy to manage device and data anytime from anywhere. [11] WoT is one of the most demandable technologies for business people. Scope for WoT on consumers, Industries, Transportation and Logistics, Utilities, Oil & Gas sector, Engineering & Technology, Agriculture, Healthcare, Smart cities , Smart Buildings and cross domain colorations.

5. Conclusions

M2M communication often involves group of devices. M3 frame work with a visualization of WoT position makes a new era with a high scope for connections of billions of heterogeneous devices to exchange or share information to achieve their needs. Web of Technologies supports most of this communications are going to happen with an extensive experience since few decades. Proposed integration directs the business firms to promote M2M communications for their day to day activities without human interventions and promotes device collaborations.

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