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Lightweight Machine - To - Machine Communication Solution on Android Platform

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Abstract: ***The term "machine - to - machine communication," or "M2M, " refers to a variety of technologies that deal with machine autonomy in communication. In order to manage equipment remotely, a variety of business sectors have been using M2M solutions for the past ten years. The fact that they are all expensive and necessitate infrastructure adaptation is a feature shared by almost all of those alternatives. Additionally, they are frequently created from a number of interconnected systems, which means that maintenance is needed for a number of them. The idea of creating a simple replacement for current M2M solutions using only widely available hardware and communication standards is examined in this study. Here, the term "lightweight" refers to a system that is movable on both ends, adaptable, and inexpensive to set up and operate. The technology might be made available in new business sectors by creating a lightweight M2M architecture, and new service categories might emerge as a result. The prototype's goal is to empirically demonstrate if it is feasible to create a lightweight M2M solution in this way. The solution uses a Cinterion TC65T as a slave device to which the sensors can be connected and the Android platform for the backend and user interface. Although the built system has security and performance limitations, it nonetheless serves as a proof of concept for this type of M2M solution.***

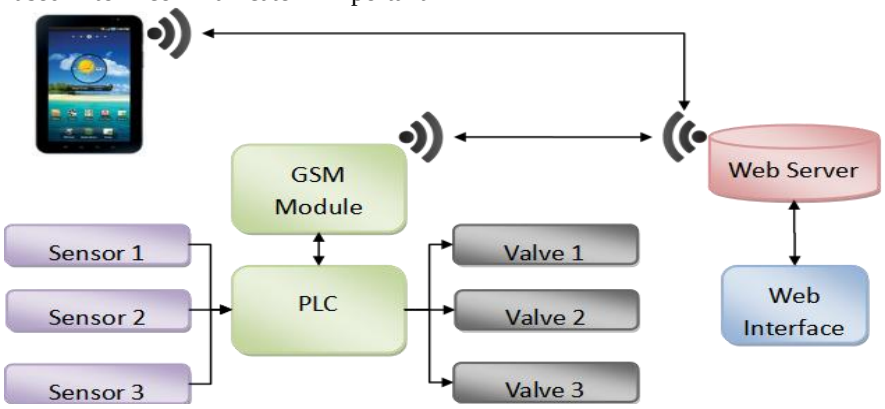
Keywords: M2M communications, sensors, light authentication, and industrial IoT.

1. Introduction

Due to the exponential growth of "connected devices" (i. e., smartphones, iPads, Kindles, and digital television) brought on by technological advancement over the past ten years, everyone now uses a growing number of devices. Additionally, the number of mobile devices has already surpassed 6 billion, and people are beginning to use multiple devices at once. In relation to this, connections must be made in order to build machine - to - machine (M2M) connections. Innovative technology that records a real - time event from one device and sends the recorded event details to another device via wired or wireless communication, with M2M techniques used to communicate important information. broader categories like sensors, due to the availability of the internet, items such as actuators, smart devices, people, and other things will be able to connect with one another at any time and from any location.

The M2M solution structure an idea emerged. The idea was that it may be possible to remove the web server and communicate directly between the mobile device and the GSM module. This would allow for a more simple solution that has a lower hardware and installation cost.

Currently there are a lot of different M2M solutions on the market. Most of them are very expensive to acquire due to specialized hardware and customer.



original M2M solution. A PLC (Programmable Logic Controller) controls a set of valves and collects data from a set of sensors. The PLC communicates with a web server via a GSM Module. The web server then communicates with both a web interface as well as a mobile device for representing the values of the sensors and controlling the valves, requires the infrastructure to be adopted to the system. This reduces the target group to large companies, and companies which heavily rely on M2M to operate. By building more cost - efficient M2M architectures and implementations new types of services may become available for new tiers of equipment in new types of businesses.

System Model

M2M could be a computing and communication system devoid of human interaction that offers services that let machine to machine or device to device connection. It almost reminds one of an industrial SCADA system for supervisory control and data collecting. Machine to machine (M2M) technologies are intended for cross - platform integration, whereas SCADA is intended for isolated

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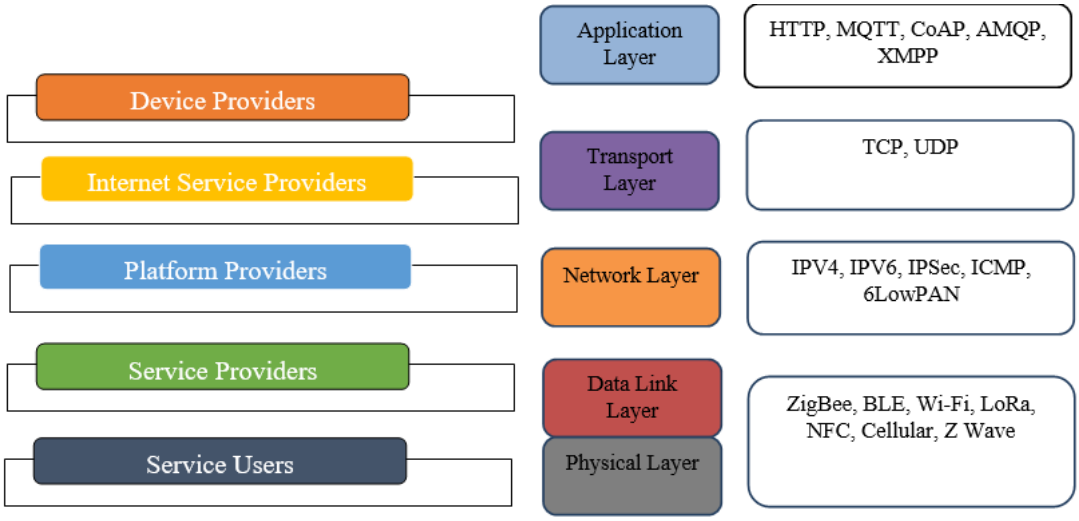
systems employing proprietary solutions. End users can acquire information about events from assets, such as temperature or inventory levels, via machine - to - machine solutions. Environmental monitoring, public safety and civil protection, healthcare, the energy and utility distribution business (smart grid), intelligent transportation systems (ITSs), and supply chain management are a few examples of M2M applications. (SCM), home networks, building automation, agricultural applications, and military applications. On the other hand, M2M solutions often do not provide a large - scale data interchange or the connection of devices to the internet. Additionally, M2M contains large numbers of nodes or devices, low cost and power consumption, little traffic for small machines or devices, massive data collecting, intervention - free M2M, and human reaction needed for operational sustainability. M2M uses three different types of nodes. They are nodes with high, mid, and low ends. The features of each kind of sensor node differ, as do the surroundings in which they are used



M2M device platform
It allows accessing things or devices connected to the web anytime, anywhere. Saved machines or devices are able to create a database which includes managers, users and other services which can easily access the stored data. Manage device profiles, like location, sort of device, address and contour. Also, the authentication and authorization key management functionalities are carried out by this.

M2M user platform
This platform manages user profiles of the M2M service and provides features such as modification of user registration, recharging and searching. In addition, it interacts with device's platform and handles the complete ban on device, object network, and service user access. An administrative advantage could be provided to Service providers and device managers on their devices or networks as well. The administrators can manage the devices through controlling and monitoring the devices

M2M application platform
It enables integrated services to utilise datasets gathered by devices. Diverse devices' heterogeneous data can be combined and used to build new services. Additionally, it gathers information from the Control device management processing logbooks by interacting with the platform for the device. For transparent services, management of the relationship with the relevant network is offered.

M2M access platform
It provides services through this platform to M2M devices, also provides app management for smart device apps. Application management manages application registration by developers and provides the plotting relationship between applications and the devices. The mapping feature issues a file of applications for suitable machines.

Overview of IoT protocols
Internet of things ecosystem can a raise not dissimilar to the present web, where ever as devices, networks and application levels are inter linked. Machine to machine communication technologies are sensor nodes with networks, radio - frequency identification (RFID), mobile internet, wire line and wireless communication network, Bluetooth LE/Smart, IEEE 802.15.4 ((low - rate wireless personal area networks (LR - WPAN); e. g. ZigBee, internet engineering task force (IETF), IPv6 - enabled low - power wireless personal area networks (6LoWPAN), routing protocol for low power and lossy networks (RPL), constrained application protocol (CoAP), ISA100.11a, and Wireless HART), M - BUS, Wireless M - BUS, KNX, power line communication (PLC), and IPv4/IPv6. In personal area network (PAN) /home area network (HAN) /local area network (LAN) /field area network (FAN), low power wireless communication technologies such as Wi - Fi, Bluetooth low energy (BLE), ZigBee, and 6LoWPAN, Z - wave may also be used to connect devices to the M2M Gate way node. GSM 3G/4G or fixed bandwidth/FTTH could also be used to connect machine to machine communication gateway node to the main server

IoT protocols
Very small size data are often sent by low - power wide - area network (LPWAN) technologies which include Sigfox and LoRa. Release of 3GPP, it is possible for a cellular operator to design an LPWAN, which they would call EC - GSM - IoT, LTE - M, or NBIoT. Enrolling firms, such as telecom and information technology (ICT) businesses, in

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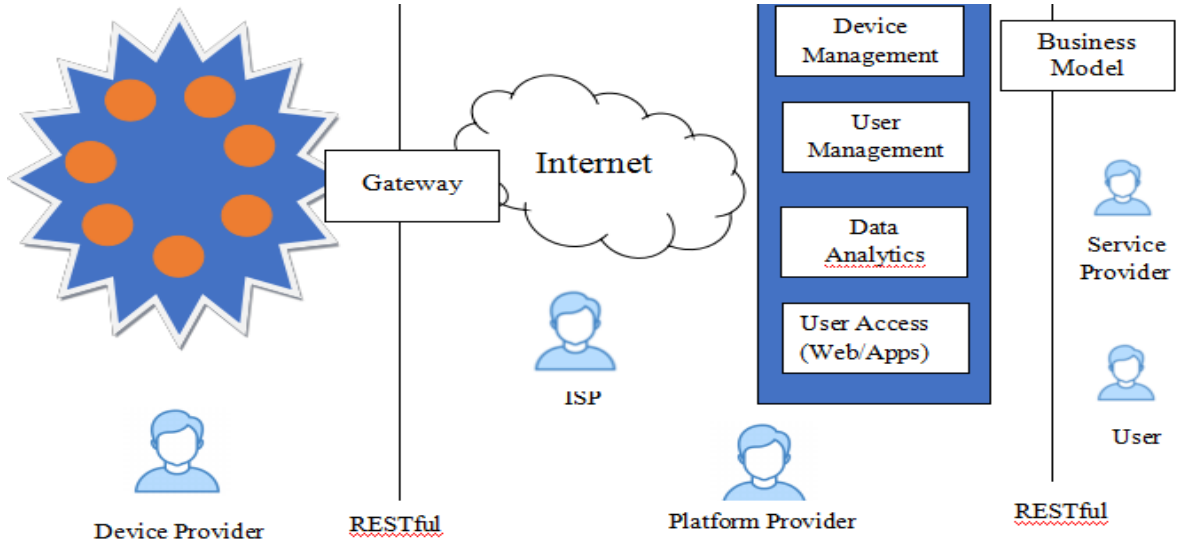
IPv6 addressing can present an opportunity to reach billions of devices that can be internet protocol (IP) - enabled and fully addressable over mobile or wired broadband connections.

Availability of heterogeneous network in IoT, which has devices that have an IP address and others that do not have an IP address connected through IP gateways. We are getting closer to having the IoT platform connected to the gateways. Some form of batch - level sensor data is generated as a natural consequence of using sensors, and this would necessitate large - scale data analytics, which might be applied to framing intelligence, which could be utilized for several other purposes including planning and operational optimization.

Recently, throughput efficiency was enhanced by the standard IEEE 802.11n. High throughput was obtained by IEEE 802.11ac, focusing in 5 GHz band. IEEE 802.11ah allows number of network device to cooperate greater than 1 GHz (ISM) band. The main focus is to increase the efficiency and also to exploit the collaboration to extend the range. This standard aims in fast development of internet of things and machine to machine application which exploit burst–such as transmissions. They possess similarity as of traditional wireless sensor network (WSN) theories, which includes the technologies namely 6LoWPAN, RPL, and



CoAP

The basic structure of CoAP which is already available is free and operable for any kind of IoT device, it stables to be mostly overweight and power consuming for many IoT usage events. CoAPis meant in such how that it meets the wants of hypertext transfer. The IoT built on protocols such as hypertext transfer protocol (HTTP) or user datagram protocol (UDP), which utilizes UDP to ensure that communication between devices is highly secure. Units per transacation UPT, by being open to multi - casting and broadcasting, enables the use of a smaller amount of bandwidth, helping maintain fast communication speeds while also using a minimum amount of bandwidth. This makes it an honest fit for use in resource - constrained M2M applications. On the other hand, CoAP shares similarities with HTTP in that the RESTful framework for appliance endpoints can also enable an invitation/response communication mechanism. In addition, CoAP implements HTTP retrieve, post, post, and delete methods, which eliminates the possibility of misinterpretation in customer communication. It incorporates the datagram transport layer security (DTLS) to enable the transfer of IoT data as well as safe data exchange via the transport layer. The need for a light protocol to meet the demands of battery - powered or low - power devices is satisfied by CoAP, which fully meets these needs. Overall, when it concerns currently utilized web service - based IoT systems, CoAP may be a good fit.

Low - energy Bluetooth

The design of Bluetooth low energy (BLE) makes it both economical and energy - efficient. A lot of cell phones have it because of its excellent efficiency. Another notable technology that serves as the IoT's foundation is low power networks. One of the protocols that is regarded as the first utilised in actual tests and studies of wireless sensor networks is IEEE802.15.4.

The ISM standard allows for the usage of low - rate wireless personal area networks (LR - WPAN) at frequencies around 433 MHz, 868/915 MHz, and 2.5 GHz. Depending on transmission power level and selected band, the data rates are supported between 20 to 256 kbps. In active modes, the radio transceivers intake power intens of milli - Watts range which means that they are still insufficient in providing long battery life for continuous operation. During transmission and listening, radio duty cycling manages radio frequency integrated circuit (RFIC) active periods.

Wireless devices

The more recent derivatives ZigBee IP, ZigBee RF4CE, wireless HART, ISA 100. a inherit this technology at very fundamental step asIEEE802.15.4 defines the physical layer where numerous of low energy communications specifications have been created.

Message queuing telemetry transport:

A lightweight publishing or subscription type (pub/sub) messaging system is known as message queuing telemetry

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transport (MQTT). Typically, these are framed for battery - operated gadgets. MQTT has very little setup effort, is lightweight, and helps devices consume very little power. The subscriber, publisher, and broker concepts form the foundation of MQTT. In this approach, the publisher's job is to collect information and deliver it to subscribers via a brokerage of brokers. By comparing the credentials of publishers and subscribers, the publisher's main responsibility is to maintain security.
The MQTT will fulfil demands for things like using less energy, less bandwidth, operating across wireless networks, best dependability, small handling, and high memory resources.

Wi - Fi
Wi - Fi uses radio waves to transfer data at specific frequencies, such as 2.4 GHz or 5 GHz channels. Multiple channels are found in both frequency ranges, which allow different wireless devices to operate, this distributes the load in such a way that the individual connections of the devices are not disrupted. This often protects the wireless networks from overflowing. The 100 m limit is the standard limit for a standard Wi - Fi connection. However, 10 - 35 m is the most common range for Wi - Fi.

Extensible messaging and presence protocol
The availability of real - time organized and extensible data transfer among several network clients is guaranteed with the use of extensible messaging and presence protocol (XMPP). When XMPP was developed, it was generally accepted because it was utilized as a communication protocol. Over time and lightweight XMPP specification: Adding up with the advanced features of XMPP - IoT, it has been used in internet of things (IoT). As an open social support standard, the strengths of XMPP IoT are scalable capabilities and address, making it best suited for consumer - oriented IoT rankings.

2. Conclusion

Business models with autonomy in different sectors can be created by M2M and IoT, which uses the Internet of Things and embedded technologies, by which different kinds of small devices and things get connected to the internet. Implementing anything in a smart way is an attractive factor now a days. The future IoT depends on data, cloud, data analytics and knowledge - based technologies. Huge data handling in big data would increase the complexity and there is a need of automation in handling and managing data. Hence, now we are in need of a new evolving technology to make connected everything with anything that should beyond the Big Data. In this paper, the comparative analysis of different protocols and M2M architecture are carried out which gives an insight knowledge about the importance and technology needed for machine to machine regarding the future internet of things for the initiative of a truly smart, connected and sustainable world.

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