

Application of Machine-To-Machine Communication for Smart Homes

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Abstract

The application of machine-to machine or M2M communication has increased in the modern era and this helps in the development of smart homes. This involves streamlining communication between human and machine that typically monitor the confidential objects within homes. Technology should be advanced with the implementation of network connection. The home networking system should be connected with a LAN network that helps in M2M communication. Wired and wireless connectivity are major categories in M2M communication. In this concern, wireless connection is formed in advantageous conditions that can be used in the home appliance and make a direct connection with the phone to get easy information. The information is received with a messaging system through internet connection that is mainly vital with usage of COAP and SIP protocol that potentially impact on communication. This type of communication in smart homes provides protection from fraudulent activity as this required sensor. Moreover, the IoT technology is also often used in this communication that forms a better chance in network connectivity.

Keywords

M2M communication, network, technology.

INTRODUCTION

Machine-to-machine communication is a technological implementation which involves streamlined and automatic sharing of information between various separate devices. M2M communication is typically used for monitoring and controlling various innovations that assist in smart application [1]. This technological application enables inventory management, smart processing, environmental monitoring and tracking activity. Innovative advantage in this technology is to gather data and proceed with wireless connectivity which helps in proper connection. The use of M2M technology embedded with several home applications which have real control and operation along with proper ability that is specifically to create a communication between human and machine.

The “machine-to-machine” connectivity helps demand the usage of supervisory and telemetry which is controlled with the proper data acquisition. This is done with the help of telemetry which is quite different from automatic remote transmission for measuring data. Communication network of M2M communication is conducted on the basis of “Integrated Service Digital Network (ISDN)” which is attached with local networks to have effective connection [2]. In this concern, the smart home is preceded with a major presence of sensor connectivity. A smart home is defined as a home that is controlled by homeowners. “Global System for Mobile Communication (GSM)” happens with the mobile network that assists in creating smart homes. Infrastructure monitoring helps in tracking, monitoring the most common implementation of technology that helps to create a peer connection within home.

M2M is especially viewed as the set of system, process, data and networks that creates specific activity for different purposes. There are some common examples in Machine-to-machine technology such as: wearable technologies, automated supply chain management (SCM), asset tracking, vehicle telemetry services and smart home meters [3]. These aspects are important in the application of remote-control software, traffic control, logistics management along with security maintenance. These are mainly conducted with the help of better automotive technology. Smart homes are a really vital creation which helps in automated applications to protect homes [4]. M2M communication mainly helps in giving secured protection of any home due to sensor touch and advanced robotic application.

MATERIALS AND METHODS

This article has been done with clear knowledge and information gained from authentic sources which is conducted followed by qualitative methods. In this concern, the researcher has chosen a secondary data collection method which helps in gathering informative data from several journals or articles of recent publication. Secondary data is mainly gathered from authentic sites, peer-reviewed journals, articles, several books and magazines that help to conduct proper justification related to the main topic [5]. The researcher has chosen qualitative design which can help to create in-depth study based on machine-to-machine communication within smart homes. The researcher should choose an inductive approach as this helps in proper investigation on the importance of machine-to-machine communication in creating a smart home.

The researcher should gather secondary data and not gather numerical data which can make a better approach on making standard applications. Ethical consideration can prove with the help of application of inductive approach and qualitative design to gain better results. The researcher should choose an inductive approach due to in-depth study on M2M communication. The researcher has collected secondary data based on M2M communication from authentic peer-reviewed journals which must be published after 2019. Secondary information should not choose from peer-reviewed journals which are published before 2019.

RESULTS

Concept of Machine-to machine communication

Machine-to-machine communication is often known as M2M or IoT, which is the next generation internet revolution. M2M is used for communicating point-to-point connection machines, hardware, and sensors with the help of IoT systems over wired or cellular networks [6]. This innovative process mainly refers to the automated application that involves machines or devices communication within which the network is worked out without human intervention. Sensor and communication modules are especially specified with the M2M devices which can easily transmit from one device to another with the help of both wired and wireless networks. M2M is revolutionized to perform within several sectors, business and devices which need this highly which get a better advantage with communication networks.

The major application of machine-to-machine performance is done with the help of automation technology in which artificial intelligence is specified for more attractive communication. The M2M communication is applied with robotic methods in any room or any engines. The technological application can be done with the help of smart application and advanced technological appearances. In wired M2M communication, the data transfer between devices occurs within a medium of wire transfers [7]. The communication between devices in the LAN network is connected with only connection which is a part of M2M communication. Moreover, wired networks are mainly used in the place in which wireless signals are interfered. This networking system at home is used in legacy systems that can upgrade communication networks.

The wireless M2M communication machine uses a communication methodology which creates a connection between user and machine with the help of a sensor. The radio waves used in the major communication have been done with the help of the latest technology that is 5G. RFID technology is identified with old technology that can stand for testing within a particular time for transferring data [8]. This technology is related to major communication with the help radio wave and this measures radio frequency for tracking wave frequency. On the other hand, near field communication (NFC) is similar to the Radio wave technology which helps in transferring data within a short distance.

This is used for controlling the payment system as it is crucial for the transaction of money, though this is not used in the homes. In this concern, Wi-Fi or wireless technology access the internet with wireless systems. The same network helps in transferring data while having devices that are connected through the Wi-Fi network. This network in M2M communication is mainly used at home for transferring data and getting better facility of network connection [9]. This Wi-Fi is the latest technology that is approved with 6e help in defining better effects on communication at home.

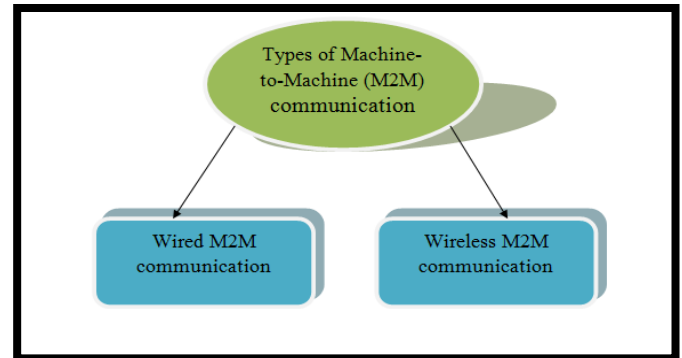


Figure 1: Types machine-to-machine communication

Concept of Smart home

Smart homes are getting popular in the recent era which mainly provides facilities with technological upgradation. This allows control of appliances, thermostat, lights and other devices remotely by using several smart objects and tablets [10]. Smart homes are especially set up with wireless connections which allow proper advantage to the human on getting better information related to privacy aspects. The smart home is created to provide security and protect homes from every fraud and theft activity. There are some major security components which are mainly used with some components such as: security camera, motion detectors, electronic door locks, garage door openers, and fully fledged smart home security [11]. There are some benefits for having a smart home such as: this creates improvement in functional appliances, and also increases energy efficiency.

There is huge flexibility in new devices and appliances which maximize home security and also increase energy. This also helps in giving information in smart phones as sensors are attached within smart objects and phones.

Machine-to machine communication for smart home

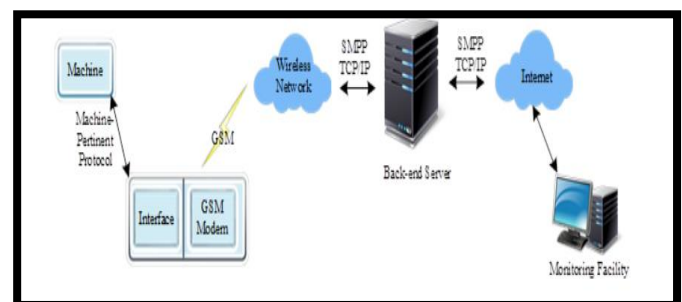


Figure 2: Executing a Machine-to-machine application over a GSM network

The communication network in M2M application is identified as the central connection components between data end point and data integration. The local area network is established with the integration of digital network, public telephone network along with GSM. Wireless M2M connection is developed within larger distances with the means of GSM mobile networks that form physical connections within the network [12]. This is worked out at a wide range with M2M technology which combines with smart phones that play a crucial role in smart homes. M2M communication is applied with protocols names such as the “Constrained Application Protocols (COAP)” and “Session Initiation Protocols (SIP)”. These mainly apply on the basis of several controls of remotes. M2M is viewed as the supporting system of a network which processes data that connects machines with machines for getting different advantages that support multiple activities in the internal requirement of home. GSM modem is connected with the help of implementation of M2M communication.

M2M applications represent a unique connection and manageable application which addresses reliable network connectivity. Devices regarding M2M often power the consumption of specific software initialization. This is mainly applied with “software development Kit (SDKs)” with particular mechanisms with the application management and device. This development leads with major developers and OEMs which are locked through particular hardware. This hardware is preferred by the vendor and major framework of management.

Major protocol use in the M2M application is designed with the requirement of highly resourced devices for standard protection of home. Some protocols which are used in the smart home are Hypertext Transfer protocol (HTTP) within TCP, which is not much effective in the application of M2M and IoT applications. This has a close gap between microcontroller based and not much power back up and web of things. In this concern, COAP is developed with application of layer design for using simple resources and electronic devices. COAP is layered protocols that help in proper communication facilities that cover the internet for control and remote supervision purposes which can easily be integrated with the help of web technologies [13]. This protocol is deeply embedded with the application of communication implementation that is vital for multicast support with limited computing power.

COAP is important in M2M and IoT applications with an Internet Engineering task Force (IETF) state to get a restful environment. This helps in proper connection between various nodes that perform deep tasks in making interconnection between personal devices like smart phones and a variety of appliances. COAP protocol assists in the transaction of information and instruction from anywhere. COAP protocol helps in developing top User Datagram Protocol (UDP) with significantly low support within multicast activity [14]. This is responsible for standard connectivity within proper specification of data transmission.

This makes a better attachment and also form proper impact on privacy settings and owners can easily understand about any fraudulent activity and this makes them aware of getting better steps for detection.

SIP is a protocol that can easily apply in controlling multimedia sessions of communication which can make perfect responses within internet telephony. SIP protocol can easily be used with instant messaging advantages throughout the IP networks [15]. This helps in the application of M2M communication which forms a better establishment to connect reliable networks without any destruction. This helps similar activity like HTTP which defines the message directed between endpoints to develop major termination. The layer protocol is more specific than that of SIP as this helps in network connection between layers and make advantages within formation of interconnectivity [16]. The SIP protocol can be used in two ways; the first one is used with the help of response messages and is conducted with codes with the request.

The second one of the SIP protocol is worked out with a string of characters to identify the name of resources. This type helps in major indication of various characters used to investigate the name of source from which the request has appeared. The second one helps in assessing activity and the home owners can easily understand by reading characters rather than code languages. Network devices and applications help in simplification of various tasks that are available with transformation of data. This way, home automation solutions are standard in highlighting energy management, in which remote technology is the main thing that helps to control every electronic object and appliance with several advantageous conditions [17]. Smart home application is especially offered with open-ended homeware and also helps in entertainment. The smart home makes nature attractive in the internal culture of home which performs entertaining moments as there is not hectic self-action.

The smart home is developed with the help of various applications and several usages of protocols that are fruitful with regards to the heterogenous environment. Home automation is referred to as a set of home networks with application of M2M technology with development of comfort requirements and advanced communication. The automation in homes can form huge differences from traditional methods of technology which can easily make networking systems for certain advantages of homeowners that connect every room with sensors. Moreover, this advanced technological connectivity is especially divided into two aspects such as sensor and actuators or may both be used in such communication systems [18]. Sensors especially play a major role in the way of controlling the environment of home. All the architectural activities in smart homes are specifically attracted towards the computational capabilities which can build unique computation and a centralized formation of data transformation. Smart home architecture is mainly found with standard computation facilities to have better facilities

for owners.

Application of language processing and IoT cloud in smart home

Home equipment, lighting, heating and various electronic devices are controlled by sensor connectivity and advanced technological upgradation. Smart homes are generally controlled remotely with sensors attached throughout the room that make connections between different objects and appliances [19]. There are autonomous devices that help in generating huge amounts of regular data. These data are actually understandable messages that are used to inform users. Natural movement leads to high movement and interaction between physical and social environment. The transparent effect can make a better approach with making relationships with social activity. In addition, integration of smart homes helps in better application of connected appliances such as air conditioners, TV, light switches and a social relationship with similar machines that make through orientation.

The major improvements that make effective results over internal development that approximately create proper data transmission with easy process and also make better chance in a suggestive way to have a reliable environment within the home. Smartphone creativity helps in the transmission of large data sets which develop proper activity with a framework. This has less memory and power for storing and this more to generalize data with the help of cloud based technology [20]. The major computation is to help measure every objective of the domain that the cloud provides. Cloud technology in this application helps to create an attachment between the nature of communication and engagement that involves smart objectives.

The M2M communication is specifically based on the major effect of a large volume of data that creates a cloud environment within home to get advantage from protective action. M2M communication for smart homes specifically happens with the help of IoT that tracks sensor data with improving personal involvement and boosting usage of scalability. This is especially created with the application of high performance, reliability, security, cost efficiency and recoverability [21]. Sensor data can create an opportunity with help of application of IoT that leads to reliable activity in home. Sensor data is maintained in the usage of cloud servers for processing smart home applications. In this application automation technology is the major effect that analyzes large amounts of data analytics. The usages of automation technology and robotics method help in proper attempts to have introduction of Natural Language processing in certain smart home applications [22]. The language processing helps in monitoring and controlling smart appliances that proceed with advanced computing technologies.

This certain application is set up with a state of art survey on the field of NLP and IoT which is based on domain. Remote monitoring leads to the proper mechanism that analyzes large amounts of data to communicate with home appliances such as refrigerators and air conditioners with

automation systems. The smart home automation system is used with the help of internet of things which is especially attached with sensors which can easily control cloud research laboratories. The IoT cloud technology may occur with the potential resources such as codes and high protective key codes which cannot form fraud activities [23]. The digital database is used for helping institutional and professional effects that help in superior specification of communities. Scientific and professional communities help in providing sufficient amounts of home disciplines.

The advanced technological application leads to huge maintenance of every appliance that can clearly make information based on technology. This assists homeowners in having language facilities, an advantage in giving instructions for starting any home appliances through sensor touch. IoT and cloud technological implementation can form better proposals which are figured out with communication protocols which are different from other technology [24]. The communication network, protocols, devices and software are used for the implementation of executing securities within home. The communication protocols help in establishment of users and systems with various methods through mobile phones.

Usage of Internet of things in implementation of smart home

The scope of connection beyond machine to machine communication is highly meant to the processes of smart characteristics. This specifically identifies the ability to transfer data without having an activity of human-to-human interaction. A smart home uses things of technology to create automation effects for maintenance of confidential objects in home [25]. Moreover, autonomous computing, collaboration and communication among devices have an important activity in the transformation of the digital world. Technology is growing in the recent era to get faster and more comfortable services. This has given a chance to develop a smart home in each city, in which advanced technological effects have been shown. This application is based on the IoT application in smart homes, in which some applications are: safety sensor, security system, and Temperature control, in doors, kitchen, windows, home routines, lighting and more. Password hacking may hamper the management of smart homes. Hence, this becomes security issues; in that case data safety malware should be provided in all the connectivity. In addition, security key code should be strong and should change with time. IoT applications are secured with the help of user authentication, accessing right management, data encryption and general security best practices.

DISCUSSION

Machine-to-machine communication is highlighted in this article due to a certain amount of upgradation with the generation of internet revolution. The internet revolution makes advanced conduction that makes better conditions in the way of innovative growth that indicates automated

technological procedure [26]. The communication with the assistance of M2M can form a high approach with the help of a communication network that should be localized. Regarding this matter, the M2M communication is mainly done with the help of two communicators such as: wired and wireless connection. Wired connection is specifically done with the application of networking systems that are identified with traditional effects. On the other hand, wireless connection is especially done with the integration of sensor effects that make effectiveness in data transferring money can also be transferred through wireless connection. Hence, wireless connection is an effect of communication methods that is related to controlling any detection recording privacy setting.

Radioactive technology helps in maintaining and accelerating wireless connection within any room, working sector or any building. Wi-Fi is the wireless connection which affects the latest technological usages and highlights better facilities in internet connection. This terminology helps in the efficient rate of connection between network communications. New flexibility in smart effects of communication can be done with the help of attached sensors which creates major security on protection of homes with privacy aspects. Moreover, smart homes are mainly created based on the advanced IoT application and sensor touch in door locks, garage, door openers and home security that create a benefit to home owners with increasing rate of energy efficiency. This impacts the process of maximization of home security which leads to smart home development. There are some protocols like COAP and SIP that are used in the M2M communication for creating smart homes.

CONCLUSION

Machine-to-machine communication is implemented with involvement of automation and streamlining major connectivity. This communication is especially used due to monitoring and controlling major implementations and for tracking smart applications with enabling technological touch. This communication is applied at home to make smart appearances and help in demanding conditions of remote transmission which help in sensor connectivity to have effective communication. This connectivity especially happened with the "Integrated Service Digital Network (ISDN)" that relates with local networking systems. "Global system for mobile network (GSM)" happens with the assistance of smart home creativity. This helps in monitoring the most common implementation of technology that creates connections within homes. Apart from this, "automated supply chain management" is also controlled by automotive technology that is developed with robotics systems to protect various places.

Automation is a major aspect in smart home creation in which M2M helps in specification of old technology. RFID technology is used on the basis of communicating particular times for transferring data. On the other hand, Wifi connection makes a better facility with clear approval of 6e

that helps in potential impact to provide several smart objects. Smart homes create an advantage in allowing feasible connection between human and machine. This is mainly done with application of IoT. COAP and SIP protocol is used for more efficient action in network connectivity. HTTP protocol is also the best protocol for connection; though this cannot work out with the requirement of a wide range of processes that controls with the help of modem and "software development kit (SDKs)" is also used with particular mechanisms.

IoT technology is mainly used in the creation of smart homes which mainly specify the major impact with reliable connection. This is mainly happening without any human effort though IoT and intelligence is used that form authentication in connectivity. Remote monitoring and automated technology is mainly conducted on the basis of IoT technology that creates a huge attachment with developers. The protocol connectivity should be proper with the application of advanced security protection. Security protection should be proper to keep away from any fraud activity that may harm major connectivity. However, mobile phones are mainly connected with the sensor to get reliable communication and better transfer of information.

REFERENCES

- [1] Saranya, V., M. J. Carmel Mary Belinda, and G. R. Kanagachidambaresan. "An evolution of innovations protocols and recent technology in industrial IoT." *Internet of Things for Industry 4.0: Design, Challenges and Solutions* (2020): 161-175.
- [2] Bilami, Karam Eddine, and Pascal Lorenz. "Lightweight Blockchain-Based Scheme to Secure Wireless M2M Area Networks." *Future Internet* 14.5 (2022): 158.
- [3] Jurcut, Anca, et al. "Security considerations for Internet of Things: A survey." *SN Computer Science* 1 (2020): 1-19.
- [4] Shah, Syed Kashan Ali, and Waqas Mahmood. "Smart home automation using IOT and its low cost implementation." *International Journal of Engineering and Manufacturing (IJEM)* 10.5 (2020): 28-36.
- [5] Rasel, Md Ali, and Sandar Win. "Microfinance governance: a systematic review and future research directions." *Journal of Economic Studies* 47.7 (2020): 1811-1847.
- [6] Xu, Yi-Han, et al. "Deep reinforcement learning-based resource allocation strategy for energy harvesting-powered cognitive machine-to-machine networks." *Computer Communications* 160 (2020): 706-717.
- [7] Chander, Bhanu, et al. "Artificial intelligence-based internet of things for industry 5.0." *Artificial intelligence-based internet of things systems* (2022): 3-45.
- [8] Khan, Haider Ali, et al. "IoT based on secure personal healthcare using RFID technology and steganography." *International Journal of Electrical & Computer Engineering (2088-8708)* 11.4 (2021): 3300-3309.
- [9] Perwej, Yusuf, et al. "The internet of things (IoT) and its application domains." *International Journal of Computer Applications* 975.8887 (2019): 182.
- [10] Stojulescu-Crisan, Cristina, Calin Crisan, and Bogdan-Petru Butunoi. "An IoT-based smart home automation system." *Sensors* 21.11 (2021): 3784.

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- [11] Gómez, Mauricio Castaño, Ana María López Echeverry, and Paula Andrea Villa Sánchez. "Review of the use of IoT technologies and devices in physical security systems." *Ingeniería y competitividad: revista científica y tecnológica* 24.1 (2022): 16.
- [12] Sharma, Teena, Abdellah Chehri, and Paul Fortier. "Review of optical and wireless backhaul networks and emerging trends of next generation 5G and 6G technologies." *Transactions on Emerging Telecommunications Technologies* 32.3 (2021): e4155.
- [13] Albalas, Firas, et al. "Security-aware CoAP application layer protocol for the internet of things using elliptic-curve cryptography." *Power (mw)* 1333 (2018): 151.
- [14] Domingo, Mari Carmen. "An overview of the Internet of Things for people with disabilities." *journal of Network and Computer Applications* 35.2 (2012): 584-596.
- [15] Baset, Salman Abdul, et al. "The Session Initiation Protocol (SIP): An Evolutionary Study." *J. Commun.* 7.2 (2012): 89-105.
- [16] Parmar, Navrattan, and Virender Ranga. "Performance analysis of webrtc and sip for video conferencing." *Int. J. Innov. Technol. Explor. Eng.(IJITEE)* 8.9S (2019): 679-686.
- [17] Balasingam, Sheshalani, Mohd Khuzaimi Zapiee, and Dharnishaa Mohana. "Smart Home Automation System Using IOT." *International Journal of Recent Technology and Applied Science* 4.1 (2022): 44-53.
- [18] Raza, Saleem, Muhammad Faheem, and Mesut Guenes. "Industrial wireless sensor and actuator networks in industry 4.0: Exploring requirements, protocols, and challenges—A MAC survey." *International Journal of Communication Systems* 32.15 (2019): e4074.
- [19] Yar, Hikmat, et al. "Towards smart home automation using IoT-enabled edge-computing paradigm." *Sensors* 21.14 (2021): 4932.
- [20] Dang, L. Minh, et al. "A survey on internet of things and cloud computing for healthcare." *Electronics* 8.7 (2019): 768.
- [21] Nawari, Nawari O., and Shriram Ravindran. "Blockchain and building information modeling (BIM): Review and applications in post-disaster recovery." *Buildings* 9.6 (2019): 149.
- [22] Maulud, Dastan Hussien, et al. "Review on natural language processing based on different techniques." *Asian Journal of Research in Computer Science* (2021): 1-17.
- [23] Yadav, Chandra Shekhar, et al. "Malware Analysis in IoT & Android Systems with Defensive Mechanism." *Electronics* 11.15 (2022): 2354.
- [24] Ali, Elmustafa Sayed, et al. "Machine learning technologies for secure vehicular communication in internet of vehicles: recent advances and applications." *Security and Communication Networks* 2021 (2021): 1-23.
- [25] Shouran, Zaied, Ahmad Ashari, and Tri Priyambodo. "Internet of things (IoT) of smart home: privacy and security." *International Journal of Computer Applications* 182.39 (2019): 3-8.
- [26] Azizi, Neda, et al. "IoT–blockchain: harnessing the power of internet of thing and blockchain for smart supply chain." *Sensors* 21.18 (2021): 6048.