

Fifth Generation IOT Application System

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ABSTRACT

Internet of things (IoT) is stated to as smart devices linked to the internet. A smart device is an electronic device, which may attach to other devices or are part of a network such as Wi-Fi. The increase of IoT policies has aided with advancing technology in many areas of society. Application of IoT in 5G devices has provided many profits such as providing different ideas that can become projects for tech companies, and providing several ways of communicating. This has also had an effect on how companies progress their business with the use of progressive technology. However, the fast growth of IoT has presented a new stand for cybercriminals to attack. There has been available security measures on IoT to help contract with such risks and vulnerabilities. This review paper will discover IoT in relative to smart homes, smart cities, wearables and connected cars. The profits, risks and vulnerabilities will be discussed that comes along with using such strategies related to the internet.

Keyword : - Internet of Things (IoT), 5G, IoT Advantages, IoT Challenges, 5G Communication with IOT.

1. INTRODUCTION

Developments made to devices have introduced new ways of staying connected to the internet. There are also protocols on using IoT, for example, 'CoAP, IEEE 802.15.4, RPL, Quic, CCIN, etc' [1]. Table 1 shows the layers involved in IoT with protocols included.

Real-time records is possible due to the effort towards IoT. This has permitted strategies to be controlled in several ways without much human communication, for example, the advent of smart cities such as Amsterdam, Barcelona and Singapore. This is a vision to create efficiency within the city with the use of technology [2] For example, IoT devices have provided new infrastructure for managing traffic daily. Wireless network technology has been used to distinguish surrounds. Installing sensors on traffic lights helps to offer the best path for vehicles to avoid postponements or traffic congestion. Integration of technologies has enabled automatic decision making for traffic lights [3]. smart devices inside homes that can be used as following, this is a way of educating safety when not at home. Such devices can be connected to a smart phone to see and record who is near the house [4]. Security systems have been implemented with the use of advanced technology. This has made it more difficult for criminals to avoid getting caught when trespassing

The 5G offers the path to the billions of smart devices to automatically interact and share the data. Nowadays, diversified applications of the various instruments are found and create trouble for the IoT systems to identify that devices are capable or not to fulfil the need of the application [7]. Present IoT systems use the Bluetooth Low Energy ZigBee, etc. technologies for specific applications. In addition to some other data transfer or communication medium like Wi-Fi, low-power wide-area (LP-WA) networks, cellular communications (e.g. MTC using 3GPP, 4G (LTE)), etc. [3]. The IoT systems are moving constantly at a higher rate with the new concepts and technologies and expanding in the new application areas also. The evolving 5G infrastructure are capable enough to resolve the abovementioned issues. It proposals the high data with low latency and large area of coverage for MTC communication as compared to 4G. In fact, the machine-to-machine (M2M) message can establish the communication between a big number of smart devices. Figure 1 shows the IOT 5G-based application organization [3]. The achievement of IoT is based not only on wired but equally on wireless communication capabilities. The wireless communication systems have enabled multifold faster growth and the execution of IoT systems as the systems are/now can be mobile. An IoT system essentially requires the data is communicated in small packets at low transmission rate(s), decreasing the bandwidth requirements. Typically, the bandwidth requirement applications is less than 1 MHz For IOT. Due to their reliable propagation features, sub-GHz bands (Europe utilizes 868 MHz band and the USA uses the 915 MHz band) are often preferred. Although these frequency bands see a smaller amount traffic with respect to other bands in the spectrum.

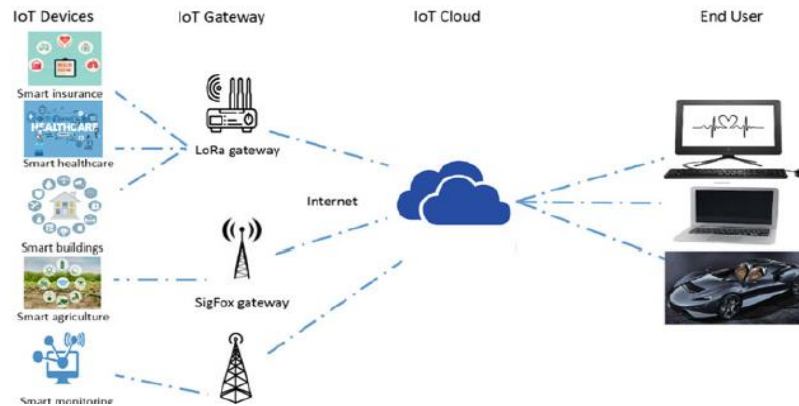


Fig -1: A typical network infrastructure for 5G IoT applications

2. EVOLUTION OF TECHNOLOGY FROM 1G TO 5G

In the era of advancement in the wireless communication system, 5G communication technology takes the outstanding part because of its prominent features. Previously, a decade ago from 1980 to 1990, the 1G-based communications was 596 S. Sharma et al. used, in which the simple voice service is used by the purchaser with analog-based protocols. At this time only voice service was under thought with PSTN (public switched telephone network) and PDMA (packet division multiple access) techniques. 1G technology is functioned over the frequency of 150 MHz/900 MHz with the narrower bandwidth of 30 KHz and lower speed of 2.4 kbps. It has the several drawbacks like bad voice quality, large size and poor battery life of cell phones. At this time, it is better than nothing; at least it's wireless and mobile. After that from 1991 to 2000, 2G communication had exposed using the new digital technique of GSM and CDMA. It is the first digital standard era of wireless communication with improved coverage area and capacity of no. of users than 1G technology. It is operated at the frequency of 1.8 GHz/900 MHz with the moderate bandwidth of 25 MHz and data rate of 64 kbps. It permits the text messaging service also, and the signals are also stronger than 1G. In this range, 2.5G comes with the GPRS cellular technique. It has the additional structures of web browsing and e-mail services. At this time, the cell phones are joint with camera also. After the development takes place from 2.5G to 3G wireless system from 2000 to 2010, it has the frequency range of 1.6–2.0 GHz with bandwidth of 100 MHz. It is considered by CDMA, UMTS and EDGE techniques to provide the digital broadband and increased speed. It is the first main mobile with broadband data services [11, 12]. At this time, the cell phones/mobile become the smart mobile with the extra features of fast communication, video call and broadcasting, mobile TV, etc. It also has the outstanding value of data rates of 144 kbps to 2 Mbps with increased no. user capacity.

2.1 5G Communication

Wireless networks have made an extraordinary development in the past few years. The demand of more bandwidth and lower latency has been a motivation to develop efficient systems. 5G is the fifth-generation mobile network, and this is the wireless communication technology which enhances user experience with the help of its features to personalize mobile communication experience. 5G is intended to offer higher data speeds (multi-Gbps), better reliability, increased availability, enormous network capacity, ultra-low latency and a better than before uniform user experience. Improved performance and enhanced efficiency allow new as well as better user experiences. 5G provides the infrastructure which will increase the performance and capabilities of the communication network. 5G includes high carrier frequencies, unprecedented number of antennas, massive bandwidths and device density. 5G emerged from orthogonal frequency-division multiplexing (OFDM). OFDM is the method of modulating a digital signal across numerous different channels to reduce interference. Sub-6 GHz and mm-wave which have wider bandwidth are used in 5G technology. The same mobile networking principles like 4G LTE are used in 5G OFDM. In addition to it, 5G air interface further increases OFDM to give a better scalability and flexibility. As a result, more people can have access to 5G technology [14]. 5G provides a seamless compatibility with dense heterogeneous network.

2.2 5G-Enabled IoT Applications

The upcoming years of 5G communication will totally progress the insight of lifestyle on society, industry and business field also. It is a radical technology with unique and substantial research areas like in healthcare, smart city, robotics and virtual reality-based systems. The IoT technology is incorporated with network in the 5G communication network to attain the tremendous outcomes in every perception of human life. IoT defines as the in which the things are integrated with various new technologies, software and sensors for the result to obtain the exchange of data and information over the network. 5G with IoT applications defines as a new initial generation for integration of brainpower with comfort and security [16–18].

1. Transition from normal to smart communication
2. Excellence of services
3. Internet of Things to everything
4. Artificial intelligence and edge intelligence
5. Vehicular technology in 5G and beyond
 - (a) Intelligent aerial vehicles
 - (b) Intelligent car without man
 - (c) Intelligent transportation
 - (d) Intelligent robotics system

3. APPLICATIONS OF IOT

There are many devices that have been applied in dissimilar zones of society. IoT plans have presented various methods on how to break associated to the internet. this has produced a new area for concerns to generate more revenue for themselves. IoT has, therefore, had an effect on the economy in many cities. The use of IoT is also estimated to ‘grow to over 80% by 2025, leading to a potential global economic uplift’ [7].

There are many areas of application for IoT, not all smart strategies can be simply recognized or edited for more information. For this paper, four areas have been nominated to slim down and discover IoT devices. These areas have been selected because they are broadly known and will help to open conversation for further review as IoT devices develop over time. The focus will be based on the following areas of application for IoT:

3.1 Smart Homes

Home automation system with the use of IoT provides a new approach to controlling and connecting devices. This provides more features to household various items such as air conditioners, lights, security systems, TV, etc. Many features can include sensors, cameras, commanding or performing actions [8]. New devices continue to be introduced to provide more of a proficient approach to using household devices.

3.2 Smart Cities .

Smart city with the use of IoT was introduced as a way of having an embedded operational system through information technology integration [9]. This also involves a ‘comprehensive application of information resources’ [10]. A smart city is an approach through strategic planning to change the functioning of people’s lives in cities. Using IoT devices has been used as a way of coming up with new ideas to face various challenges. These challenges are in relation to the increasing population in various cities, particularly in urban areas. A smart city is a movement towards using technology to find solutions to make improvements to the environment.

3.3 Wearables

Wearables in relation to IoT, these devices have enabled companies to come up with new trends and ideas with the use of technology. For example, fitness tracking devices have used as a way of monitoring health [11]. Wireless devices have introduced more flexibility regarding wearables. This has enabled devices to be used almost everywhere. Other examples include smart glasses, smart watches and health fitness trackers.

3.4 Connected Cars

A connected car is part of the IoT by being able to access the internet. Car manufacturers have had an interest and explored the emergence of connected cars. There have also been discussions regarding self-driving vehicle with the

use of connecting to the internet [12]. A connected car can provide communication between the passenger's smartphone and the vehicle itself.

4. BENEFITS OF IOT DEVICES

4.1 Mobility and Health

This illustrates that IoT devices can be developed to make everyday tasks easier. There are many control devices connected to the internet being continuously made for ease of use. Companies have put forward various wireless network devices for different purposes; this would benefit many businesses by being creative with technology (Figure 2).

Some wearables are comparable to the purpose of some IoT devices for smart cities, smart homes and connected cars by focusing on safety. However, wearables may also be beneficial in terms of monitoring health. For example, the use of IoT in suitability bands can be alternative method to health caution application.

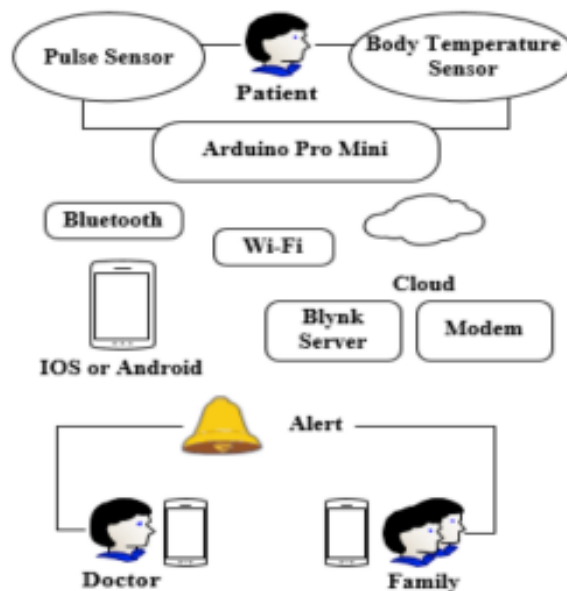


Fig -2: Iot In Remote Health Monitoring

There have been reviews on how IoT could be beneficial for getting real-time data on health. This shows how wearable IoT devices not only help with monitoring health but could potentially help patients get treated fast to avoid further health risks. Wearable IoT devices can, therefore, be used as a way of improving health care services or coming up with new solutions. This idea is comparable to the idea of connected cars discussed previously, using IoT devices to alert others to get immediate attention. IoT devices in many areas might be beneficial in finding new approaches to improve interaction and communication.

5. CONCLUSIONS

IoT devices have produced in several areas of society and have dissimilar or multiple resolves. IoT can both enhance but also threaten the security of homes, cities, cars and wearables. It is difficult to manage the risks of IoT, yet IoT is being used to manage other problems in society such as traffic management and home security system. Overall it depends on how IoT devices are made to prevent security threats, however, it is useful to become aware of how criminals are coming up with new ways to breach IoT devices. There continues to be a movement towards both the need for IoT devices and the concerns that come with using such devices. It can be easily incorporated with 5G-enabled applications and IoT-based applications also. As the upcoming era will become fully 5G and IoT-enabled communication, then proposed antennas as self-diplexing, self-triplexing and self-quadplexing antennas are of great and fit choice for RF researchers and engineers.

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