

A Brief Review on the Future and Challenges of Internet of Things (IoT)

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Abstract- In today's scenario, the researchers have a keen interest in IOT, as it is important as well as interesting technology that makes possible communication and interface between machines, devices and humans. IOT is the technology that deals with the real world, by using various types of sensors attached to the devices which are connected and operated by the use of internet either wired or wirelessly. These sensors are used by connecting via RFID, Wi-Fi and Bluetooth to connect over a wide area using different kinds of technologies together such as GPRS, 3G and LTE Volte. By the use of IOT, we can share information and the behavior of any devices with respect to its surrounding environment. Because of the IOT, we become smart and our lifestyle will become easier because it automates the devices so that we can operate any machine using mobile phones or by voice control. Therefore, it saves the time and energy as the work will be completed automatically. It has so many advantages in the form of smart cities, smart homes and buildings. The Internet or the net in simple term can be described as the worldwide system of an interconnected network that uses the IP Suit- TCP/IP. Our main objective of writing this paper is to give a generalized idea about this most important technology "Internet of Things".

I.INTRODUCTION

We have reached that stage where the life without Internet becomes impossible. The advancement of Internet technology takes us where everything around us is connected with each other and the technology is named as IOT (Internet of Things). It is a huge concept which is evolving day by day. The number of IOT users and the internet services in the devices keeps on increasing either they are connected via wires and wireless. Before its invention, there were only two types of communication either human-human or human-devices, but the invention of IOT made it possible to establish communication between machine-machines. The aim of this paper is to present the Internet of Things Applications, Future Technologies and Challenges.

II.APPLICATIONS OF IOT

Internet of Things promises many applications in our life for making our life easier, safe and smart and these are described below.

A. Smart Cities: Smart cities will be viewed as cities of the future and smart life, therefore for creating smart cities, it will become very important to use the IoT technology in cities development [1]. For this everyone has

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to implement the IoT technology in every aspect. By the IOT, the condition of cities can be improved in many levels, by improving public transportation reducing traffic congestion, infrastructure and keeps citizens safe and healthy. IoT will connect all the systems like transportation system, healthcare system, weather monitoring system etc by the Internet for accessing the database of airports, railways, hospitals under some protocols, through which the cities will become smarter by smarter

B. Smart Home and Buildings: In home automation, Wi-Fi technology is primarily used due to the networked nature of TVs & mobile devices which are supported by Wi-Fi [3]. Wi-Fi is becoming a part of the home IP network and due to the increasing rate of adoption of mobile computing devices like smart phones, tablets, etc. Many companies are considering developing platforms that integrate the building automation with entertainment, healthcare monitoring, energy monitoring and wireless sensor monitoring in the home and building environments [4]. By the use of IoT, homes and buildings can operate a number of devices and objects smartly. The applications of IOT in smart homes and buildings are smart media, air control and central heating, smart lightning and security.

A. Smart Health: The attention that required by patient whose physiological condition should be monitored regularly can be done by using IoT technologies. For smart health many sensors are used to collect the physiological information and then store it using cloud and then send the analyzed data to the caregiver for further analysis. It makes the work of the health professional easier who came at regular interval to check the patient condition, but now the continuous data will be provided to him. This way the quality of care improves by reducing the cost of traditional ways of care for data collection and analysis.

B. Smart Transportation and Mobility: The development in transportation is the factor that indicates the evolution of the country [6]. The main concept of smart transportation and mobility is to apply the principles of crowd sourcing and participatory sensing. IOT can also be used in transportation in an electric vehicle, which used to reduce both the fuel cost and the impact of global warming in the environment.

C. Smart Environment: Environment plays a major role in human life. Polluted environment affects the health of all the creatures. Making a healthy environment is not an easy task because of waste released from the industries and automobiles [7]. Therefore, the environment needs a smart ways and technologies for monitoring and management. So, Smart environment is the technology developed for the solutions of many environmental applications such as water and air pollution, weather and radiation monitoring, waste management, natural disaster, and other environment indicators. This technology is used for tracking, sensing and monitoring objects of environment which provide benefits to our sustainable life or adversely effects our life.[8]. The IOT technology is used for monitoring and managing the air quality, to measure the levels of pollution in water, and in weather forecasting by collecting data from remote sensor across the city.

III. CHALLENGES IN THE IOT

Apart from the various applications IOT are also faced with some challenges which are discussed below:-

- A. Scalability:** IOT is different from the conventional computers internet, because here things are cooperated within an open environment. Communication and service discovery needs to function equally efficiently in both small scale and large scale environments. Therefore IOT requires new techniques to gain an efficient operation for scalability.
- B. Data volumes:** IoT will gather information from different sensor networks or from large scale networks and then collect that huge amount of data on central node. The term used to describe this phenomenon is big data which is used for storing, processing and management of all databases.
- C. Interoperability:** Different smart objects in IoT have different information, processing and communication capabilities which are subjected towards different conditions such as the energy availability and the bandwidth requirements. For proper communication and cooperation among objects, some protocols are required.
- D. Software Complexity:** In order to operate the smart objects, there is a need of an extensive software infrastructure because the software system in smart objects will function with minimal resources as in conventional embedded system.
- E. Fault tolerance:** Objects in IOT is more dynamic in mobile rather than computers, and they changed very rapidly. Therefore structuring an IOT technology in a robust and trustworthy way must require redundancy and ability to adapt the unexpected changed conditions.

IV. FUTURE TECHNOLOGIES IN IOT

The future technologies which are the base of IoT need to be fully controlled and managed smartly. Some of them are described below:-

- A. Cloud Computing:** The cloud and IoT are the two words which are different from each other but often complement to each other. Cloud is used for IOT application to enabling data collection and data processing, in addition to rapid setup and integration of new things [9]. On the other hand, IoT is used in cloud by extending its scope to deal with real world thing in more dynamic manner. Many time clouds is used as an intermediate layer between the things and the applications by hiding all the complexity and functionality [10]. That's why it will become a future application where a large amount of information gathering, processing and transmission will generate a new challenge.
- B. Big Data:** The volume of data on the Internet and the web servers are growing rapidly and around 2.5 quintillion bytes of data are created daily. The information available from social media such as facebook, tweeter, whatsapp and observation from the physical world also provide a huge amount of data which is known as Big Data [11]. Integration of data from different places such as physical, cyber, and social resources with the IOT are used to developed applications and services that can incorporate situation and used for decision making mechanisms can create smarter applications and enhanced services, with large volumes of distributed data, issues related to this are interoperability, automation, and data analytics will require common description and data representation frameworks in addition to machine readable and interpretable data descriptions[12].
- C. Security And Privacy:** As IoT becomes a key element of the future internet, therefore the need of security for the IOT infrastructure becomes more important. A large scale applications and services which are based on the IOT are increasingly vulnerable to disruption from attack or information theft. Therefore new security methods are required to make the IOT data secure from attacks, theft and many more security problems like DOS/ DDOS attacks, compromised nodes, and malicious code hacking attacks, because the IOT is susceptible towards such attacks and require some advanced techniques to ensure that transport, energy, city infrastructures cannot be disabled [13]. For this the IoT needs to be handled virtually all the nodes of operation by itself without relying on human control.
- D. Distributed Computing:** Distributed computing compromises a group of networked computers for the

same computational goal. Distributed computing has several issues with concurrent and parallel computing, as all these fall in the scientific computing field. Today, a large amount of distributed computing technologies integrate with hardware virtualization, service oriented architecture and utility computing. IOT with distributed computing represents an idea in which the Internet extends into the real world. As physical items are connected with the virtual world, but it will be remotely controlled and can act as a physical access points to Internet services [14].

E. **Fog Computing:** Fog computing is related to the edge computing in the cloud. Like cloud, fog platforms described as dense computational architecture at the network's edge. Characteristics of such platforms include low latency, location awareness and use of wireless access. While edge computing or edge analytics refers to performing analytics at devices that are on, or close to, the network's edge, a fog computing architecture perform analytics on anything from the network centre to the edge. IOT may more likely to be supported by fog computing in which computing, storage, control, and networking power may exist anywhere along the architecture, either in data centres, cloud, edge devices such as gateways or routers, edge equipment itself such as a machine, or in sensors[15].

V. CONCLUSION

The use of IOT spreads widely across the globe. In the study, we have learned that in the near future IOT is going to make an individual's life simpler and easier than now. By the Internet of things many smart applications becomes real in our life, which enables us to reach and contact with everything in addition to facilitates many important aspects for human life.

IOT FACE TWO MAJOR CHALLENGES AND THEY ARE:-

1. Today different networks coexist
2. The big data size of the IOT.

Other current issues, such as address restriction, automatic address setup, security functions such as authentication and encryption, and functions to deliver voice and video signals efficiently will probably be affected in implementing the concept of the IOT but by ongoing in technological developments these challenges will be overcome. The internet of things promises future new technologies such as cloud, fog, and distributed computing, big data, and security. By integrating all these issues with the IOT, smarter applications will be developed as soon. This paper surveyed some of the most important applications of IOT with particular [16]

focus on what is being actually done in addition to the challenges.

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REFERENCES

- [1] https://www.thingworx.com/ecosystem/markets/smart-connected_systems/smart-cities/
- [2] <http://www.7wdata.be/article-general/how-big-data-and-internet-of-things-builds-smart-cities/>
- [3] Fakheen Fatima, atel. Internet of things: A survey on Architecture, Applications, Security, Enabling Technologies, Advantages & Disadvantages. International Journal of Advanced Research in Computer and Communication Engineering vol.4, Issue 12, December 2015.
- [4] Jukka Suhonen Experiences and future plans for WSN-enabled service Development in Home Environment. Realin white paper 2013.
- [5] Bill Chamberlin. Healthcare Internet of Things: 18 trends to watch in 2016. IBM Centre for Applied Insights.<https://ibmca1.com/2016/03/01/healthcare-internet-of-things-18-trends-to-watch-in-2016/>
- [6] Vahid Mirzabeiki. An overview of the Freight Intelligent Transportation Systems; Division of Logistics and Transportation,Chalmers University of Technology. [http://www.bth.se/tek/intelligent_gods.nsf/bilagor/Mirzabeiki,2010,ITS%20World%20Busan_pdf/\\$file/Mirzabeiki,2010,ITS%20World%20Busan.pdf](http://www.bth.se/tek/intelligent_gods.nsf/bilagor/Mirzabeiki,2010,ITS%20World%20Busan_pdf/$file/Mirzabeiki,2010,ITS%20World%20Busan.pdf)
- [7] Bhattacharjee and R.Bera. Development of smart detachable wireless sensing system for environmental monitoring. International journal on smart sensing and intelligent systems vol.7, No.3, September 2014.
- [8] Nomusa Dlodlo. Adopting the Internet of things technologies in environmental management in South Africa. International conference on Environmental Science and Engineering, IPCBEE Vol.32, (2012) IACSIT Press, Singapore.
- [9] Isna Khan, Prof. S.D. Savant. A review on Integration of cloud Computing and Internet of Things. International Journal of Advanced Research in Computer and Communication Engineering vol.5, issue 4, April2016.
- [10] Yu Liu, Beibei Dong, Benzhen Guo, Jingjing Yang and Wei Peng. Combination of cloud computing and Internet of Things (IOT) in Medical Monitoring Systems. International Journal of Hybrid InformationTechnology 8(12)(2015)367-376.
- [11] Hele-Mai Haav. Linked data connections with emerging information technologies: A survey, International Journal of computer Science and Applications vol.11, No.3, (2014)21-44.
- [12] Rebecca Sawyer. The impact of New Social Media on Intercultural Adaptation. University of Rhode Island, 2011. <http://digitalcommons.uri.edu/cgi/viewcontent.cgi?article=1230&context=srhonorsprog>
- [13] <http://www.cloud-council.org/deliverables/cscc-cloud-security-standards-what-to-Expert-and-what-to-Negotiate.pdf>
- [14] Virendra Dilip Thoke. Theory of distributed computing and parallel processing with applications, advantages and disadvantages. International Journal of Innovation in Engineering, Research and Technology. http://www.ijiert.org/admin/papers/1452798652_ICITDCEME% E2%80%9915.pdf
- [15] <https://www.rtinsights.com/what-is-fog-computing-open-consortium/>