

IOT : TRENDS, CHALLENGES AND APPLICATIONS

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ABSTRACT

Today the world is entering into a new era of technology i.e., Internet of Things (IoT). It covers a wide range of applications and provides a never-ending opportunity to connect the devices and equipments. This paper is to bring a review on the elements of IoT, its implementation and application. Moreover the security issues in IoT have also been discussed.

Keyterms : Internet of Things, sensors, cloud.

I. INTRODUCTION

Internet of things (IoT) term represents a general concept for the ability of network devices to sense and collect data from around the world and then share the data across the Internet where it can be processed and utilized for various useful purposes [1]. It enhances data collection, operations and many more through smart devices and enables a powerful technology. Even it is a new evolution it uses the present internet standards to provide services for data transmission, connections and applications. The IoT uses the emerged technology of sensing, networking and robotics.

The main idea behind the development of IoT is to improve our day by day activities and society. It can support human activities to a very large extends. The internet connection has led to a mass interconnection

between people to a tremendous limit. Now anyone, from anytime and anywhere can have connectivity for anything and that these connections will extend and create an entirely advanced dynamic network [2]. These changes in the technology have given a rise in the development of many smart home applications, smart cities, smart agriculture, health care monitoring applications and many more.

2. IoT Technologies

The IoT is a broadband network that uses standard communication protocols [3, 4]. Some of the IoT-related technologies are discussed here.

RFID (Radio Frequency Identification)

This system uses tags or labels attached to things to be identified. By using this technology the readers transmit the observations. The RFID components on the tags have two parts: a microchip which stores and processes information and an antenna to receive and transmit signal.

Wireless Sensor network

Wireless Sensor network is a dominant technology of IoT [5]. A mobile wireless sensor network consists of tiny sensor nodes which has three basic components: a sensing subsystem for data acquisition from the physical surrounding environment, a subsystem for local data processing and storing a wireless transmission subsystem for data transmission.

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Furthermore, a battery is critical for a sensor node. All the sensors send data that they have sensed from the given region to the base station. [14].

Addressing

For an IoT to be successfully implemented the key holds in uniquely identifying "Things" [6]. Through unique identification of devices we could be able to remotely connect to different devices through internet with IPv6, it is much simpler for an IoT device to obtain a global IP address, which enables efficient peer-to-peer communication [7]. Another important development in addressing is the light-weight IPv6 which helps to enable addressing home applications in a very unique manner.

Network Technologies

The next vital element in the IoT is the network technology which plays an important role to transmit the signals collected by sensors. Connecting different parts of networks to the sensors can be done by using Wi-Fi, Low Power Wi-Fi, WiMax, Bluetooth, LTE (Long Term Evaluator) and with the recent usage of Li-Fi (using light as a medium of communication).

Data Storage

The next important key element is the data storage. The IoT has led to store a huge amount of data. All the collected information's through sensors has to be stored in a very effective manner so that it helps in providing a reliable data to the end users. Using the cloud technology, it paves a best way to store the data which can be accessed by anyone, at anytime, at anywhere. By using the cloud technology, the data can be collected from the sensors and by using efficient data analysis techniques the useful information can be extracted from the raw data. This information can be accesses

globally by anyone from the cloud.

Data Visualization

To provide any user an effective IoT a proper visualization technique is required. Advances in touch screen, display devices, smart phones have fulfilled this need. 2D and 3D technologies have made data visualization for end users more interactive and efficient [6].

3. Challenges in IoT

Since IoT is an upcoming technology there are many research challenges which are based on different applications. Some of the common challenges and issues incorporated in this field are as below:

Privacy and Security: This is one of the most challenging issues in the Internet of Things. When all the data are collected and analyzed in a common IoT platform, the system can face many several attacks [8]. Some of the issues like confidentiality, authenticity and integrity of data sensed are exchanged by things [9]. Furthermore, multitenancy of this system can also bring out the security issues and cause the leakages of data [10]. Some of the common threats in the security of IoT are as below [11]

- Unauthorized access to data
- Threats to Internet
- Denial of service attack
- Virus or malware attacks

Reliability : The occurrence of various smart devices causes reliability challenges in terms of their failures [12]. Each devices works on different platforms and the concept of IoT has to support in all the different devices to achieve a reliable results.

Standard Protocols : IoT components are by networks using various wireless and wired technologies and protocols. There is not a standard protocol to provide an enveloped connectivity. Existing transport protocol fails in the IoT scenario.

Complexity : Some IoT systems are more complicated in designing, deployment and maintenance. Since multiple technologies are used to a large set of different devices it is very complex to provide an efficient use to the end-user.

Low-energy sensors: Since sensors works on battery, it is very essential to utilize the energy level of sensors. Still researchers are doing research to extend the life time of the sensors.

4. Applications

The IoT uses the internet to connect different devices with each other. The internet of things is about the precious insight enabled by identifying and analyzing the information from the devices that has been connected across the globe. Smart is the new green whether the green products and services can be replaced by smart products and services [15]. Some of the applications are as follows:

Smart Cities:

1. Smart Parking - monitoring the available space for parking.
2. Structural health - monitoring the materials which are used by buildings.
3. Smart lightning - monitoring the street lights whether it is needed to turn on or off.

4. Smart Environment:

1. Air Pollution - Monitoring the pollution level in the air.

2. Earthquake detection - Early detection of earthquake can be done.
3. River floods - Monitoring f water variations in rivers, dams and reservoirs.

Smart Agriculture:

Farmers can use their smart phones to monitor the equipment, crops and to measure the humidity.

Home Automation:

1. Remote control application - Switching on and off remotely home applications.
2. Intrusion Detection - Detection of door openings to prevent intruders.

Health Monitoring

Monitoring the elderly persons and disable persons.

5. Conclusion

This paper has revealed the importance of IoT and its key elements. Also reviewed the challenge which arises in IoT is discussed. Some of the application areas of IoT have been mentioned. In future, research on IoT will remain as a hot issue.

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