Review: Trends of IOT-Past, Present and Future

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ABSTRACT

A few years ago, the device can be controlled by manual on-off switch. After the invention of the internet and other mobile technology,the device can be connected through theinternet and controlled automatically is called IOT. Then much research has been carried out on IOT application. IOT are used in many applications like Home automation, Farming and Agriculture, Healthcare, Transportationand many more. This paper gives information about the past of IOT, current IOT application, Brief overview about the protocol used in IOT, challenges faced in IOT and future of IOT.

Keywords

IOT (Internet of Things), Applications of IOT, protocol for IOT, challenges in IOT, Future of IOT.

I. INTRODUCTION

IOT means internet connected things. It is a unique model that is rapidly increasing in wireless telecommunication. It is a network of physical equipment that is planted with electronics, software, sensors, actuators, and connectivity which enables this equipment to connect and exchange data. [1]

In 1999, IOT wasfirst found by Kevin Ashton. He is a co-founder of MIT's Auto-ID Lab and the father of IOT.

IOT collects the data from the devices like homes, our body, building, farms, industry etc. It sends data at high speeds across network like cloud computing, private data center, home network etc. Then analyses data and creates a useful information from the data and taking an action based on data/information available. The transmission of data is being done automatically.

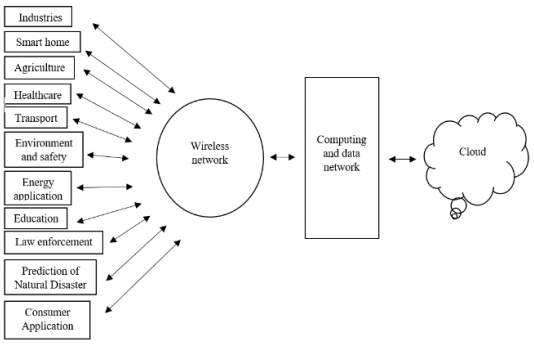

Figure-1 Basic architecture of IOT [Author 1]

The most common IOT architecture is three layer, five layer, middleware based and SOA based which helps to get better functionality of IOT. There are six main elements needed to handover the functionality of IOT. Identification contains naming and addressing, sensing, communication, computation contains hardware and software, service and semantic are the IOTelements. Thus,the IOT provide services globally by the various interconnecting devices using global infrastructure. For IOT there are so many cloud services available such as google cloud platform, Microsoft Azure IOT hub, amazon web service IOT platform, oracle, salesforce, etc.[11]

II. PAST OF IOT

The IOT research work is going on from 1980s. The first IOT connected device saw in 1982 that is coke vending machine. The first 'house of future' saw in 1989 in the Netherlands.At that time, the house had targeted the communication between the man and machine. The toaster was attached to the internet in 1990 and it was modified by inventor in 1991. The first machine to the machine MQTT protocol is standard publish-subscribe based messaging protocol which invented by IBM in1999.In same year, it become more popular at auto id center located at MIT and related market analysis-publications.

The smart refrigerator was promoted by LG in 2000. It had LCD screen which displays the information like recipes, nutrition information, the freshness of stored foods and temperature. The first IOT conference done in 2008 at Zurich in Switzerland. Self-driving google car concept is released by Google in 2010. Then day by day new innovation is going on.[2][3][7]

III. APPLICATIONS OF IOT

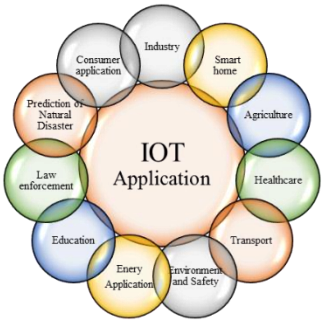

Figure-2 Applications of IOT [Author 1]

1. IOT in Industry:

IOT provides digitally connected factory; it monitors the flow of production; it provides inventory management, plants safety and security; it monitors the quality control; it monitors the environment gases like oxygen, ozone. It observes the asset management or asset tracking with the help of Bluetooth device, Wi-Fi device or LoRaWAN device.[4][5]

2. IOT for Smart home:

The following area to observe the home automation using IOT: Lighting control, Better Home safety and security, Smart Switches,HVAC, in landscape maintenance,monitoring gadgets, monitoring air and water quality, more customized delivery of Infotainment, Artificial intelligence voice assistance and digital experiences,Smart Locks. Smart Energy Meters using various IOTcomponents like gateways, sensors, firmware's, cloud and databases, protocols and middleware (if required). Modern smart home can be controlled by a smart phone, computer and tablet.[4][5][8]

3. IOT for Agriculture:

IOT in agriculture help farmers to reduce generated wastes and enhanced productivity. IOT is used in precision farming that makes the farming procedure more accurate and controlled for raising and growing of crops by using different component like sensors, autonomous vehicles, automated hardware, controlled system, robotics, etc. agriculture drones are also used for crop assessment, irrigation, planting, soil and field analysis. IOT used in livestock management and smart greenhouses.[4][5]

4. IOT in Healthcare:

IOT is used to monitor and check the progress of the patient's health condition. IOT has introduced various wearable devices like hearable, ingestible sensors, mood-able etc. which comforts the patient's life. The IOT are applied in the diseases like dementia, diabetes, Alzheimer cardiac arrhythmia, etc.so by using IOT in healthcare we can minimize cost and maximize the quality of patient's health.

5. IOT in transport:

There is major AI based development is happening in transportation services. The merger of various autonomous processes like processing of information, Controlling and Decision Making and Communication between other devices are being done by IOT devices for the services like Auto Traffic Management, Auto Parking, Electronic based Toll collection system, Road safety and road assistance etc. In future we can minimize pollution and maximize efficiency of mobility also we can significantly reduce vehicle accidents and save lives. Autonomous vehicles will more helpful to the human who have disabilities or who are unable to drive. By using autonomous vehicles, the human becomes more mobile and get around independent. [4][5]

6. IOT in environment and safety:

It contains city planning, defense, economic management, law enforcement, etc. In the city planning IOT observes different factors like population growth, zoning, mapping, water and food supply, social services, land use and transportation pattern. It collects data, analysis it and gives more accurate output. [9]

7. IOT in energy application:

IOT provides various types of monitoring and energy control function for various devices and energy sources with application in commercial and residential use. By using IOT devices we can easily locate and fix leak or damage in device or in supply lines.

8. IOT in education:

This technology allows improving the quality of education, professional development, managing cost, facility management improvement etc. [9]

9. IOT in law enforcement:

It is used in policing and court system. In a court system IOT improves satisfaction, reduce costs, manage corruption, eliminates excessive court procedures, storage of evidence, superior analytic. [9]

10. IOT in prediction of natural disaster:

By using sensors and its self-governing coordination and simulation will give to predict the occurrence of natural disaster and then take proper steps in advance. [9]

11. IOT in Consumer Application:

IOT technology enhances human way of life, workplace and play. IOT acts like as an advisor, personal assistants and provides security. In way of human life, IOT behaves as butler, gardener, security guard, chef and Repairman. At work place, IOT follows your

routine work and adjust surrounding environment, according to human requirement like temperature. IOT acts as consultant and manager, increase output and reduce working time.

IOTprovides professional supports as mention by manufacturer. Apart from this, they can be train to take care of personal needs and likes changes in human behavior, surrounding weather, level of comfort, etc. [9]

Because of so many IOT devices having single wireless connection for interaction if one device become vulnerable it will become security issue for all devices in the network.

IV. IOT PROTOCOL

There are so many IOTcommunication protocol, which is classified in two ways:

- Low power wide area network that is Sigfox,cellular
- A short range network that is Bluetooth, ZigBee, RFID,NFC,Z-wave, 6lowPAN.

We can use any protocol according to its characteristic like frequency band, topology, network, power, data rate, security, range, modulation type. [6]

V. IOT CHALLEGES

Security is a critical issue in industrial application. There is a possibility of data hacking. The other challenges are absence of standard means in industry, there are used many protocols for manufacturing and industrial setting, but there is no any standardization to ensure the interoperability.

One protocol is HTTP which is not supported by some systems; required safe hash algorithm has not available yet. The introduction of HTTPs uses more power consumption.

The major challenges in agriculture is the adoption of new technology.

Most common challenges are internet availability, cost of IOT enabled system, overall infrastructure, lack of skilled resource in India.

Many IOT devices does not support for any modification or upgradation. Most of the application is on IOT. There may be big data, data complexity.

Many IOT devices fail to provide transparency with respect to their functionality so users cannot access their process and sometime there is no any control over unwanted functions or data collection. Suppose any upgradation of device, it may also come with more unwanted function.

The unpredictable behavior of the IOT device means any system is well designed, defined and within administration control, but there is noany assurance about how it interacts with the others.[4][9]

VI. FUTURE OFIOT

The usage of IOT is exponentially increasing. The entire world is going toward the IOT.IOT has great impact on human lives in the coming years. The IOT is changing the path of human communicate, work and live. In future there will be connectivity everyone for everything, and everywhere byIOT.

There are a number of factors which affect the adoption of IOT such as device connection, better sensors, mobility and evolution of life style.

In India, the government has started to take the initiative and prepared a policy to develop a smart system using IOT based on our country need. Startups provides knowledge and

awareness about IOT with the help of different talks, hackathons, workshops, DIY sessions in India. [10]

VII. CONCLUSION

IOT really can connect up all things, and in doing so, contribute to safer environments, and create efficiencies that save time, money, energy and other resources.IOT is the future technology and it will make human life more easy and comfortable.

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