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Internet of Things: Future of World

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ABSTRACT: Smart devices when interconnected refers to Internet of Things. This Internet of Things (IoT) is used in different domains. Concept of IoT becomes reality by using strong framework of cloud computing, sensors, actuators. It is expanding right from smart homes to smart cities, from domestic field to industries. Smart homes, wearable's, smart grids, connected car, connected health, connected retail are in- trend applications of IoT. This paper explains current trends in IoT and future of IoT. This IoT is having bright future and it trends in number of devices. There are still some challenges in social and technical domains. Various important concepts such as sensors, Network function virtualization, IoT IoE IoNT, smart objects and smart environment are explained in this paper.

KEYWORDS: The internet of Things, smart devices, IoNT, Network Function Virtualization, machine learning, cloud computing.

I. INTRODUCTION

This term IoT is used to represent smart objects connected to the internet. Scope of this concept is widening beyond just machine to machine communication. IoT will definitely make impact of internet more intimate in daily life. It is network of networks which utilizes electronic devices such as sensors and actuators to fulfill its purpose which results in optimum performance of the system. Peter. T. Lewis introduced the term "Internet of things" first time in 1985. According to him it is integration of process, technology with connectable device, sensors and people. It can be used to enable remote monitoring and evaluation of trends of smart devices. MIT's Auto CAD center gave IoT more popularity in the year of 1999. Use of IoT is growing rapidly. There has been linking of various technologies like machine learning, cloud computing, real time analytics. To enable IoT there is much more contribution of wireless sensor networks, automation and traditional fields of embedded systems.

II. TRENDS

A. SENSORS:

Sensor is an electronic entity which is used for measuring physical properties. To minimize the logic circuits and make our system more efficient sensors can be used. Wireless sensor network is an important concept which is now used in various fields. Its purpose is to provide output based on environment parameter sensing [2]. Heterogeneous wireless sensors are capable of measuring water level, water, soil moisture and temperature etc. Wireless sensor network perform the activity of collecting real time environmental data by sensing and then passing it to the server.

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B. NETWORK FUNCTION VIRTUALIZATION:

Network function virtualization is a novel concept which provides automated control and management of network resources. NFV enabled IoT architecture is highly scalable and it leverages the benefits of NFV on traditional IoT[1]. This architecture is evaluated in modern, innovative operating room environments called Operating room Innovation Centre (OPIC). To connect both sensors and controllers RESTful web services are used for designing of this architecture [4]. This architecture is working in an environment where IoT devices are connected via IoT gateways [3].

C. IoT IoE IoNT:

Many people have misconception that internet of things and internet of everything are same concepts. Analysis of Internet of things, Internet of Everything and Internet of Nano things clearly differentiates these concepts [9]. These approaches include internet into various societal and personal applications. By observing the relevant literature review we examined the current status and various applications of these concepts.

Internet of everything consists of four major parts as people, things, data and process. It also expands industrial and business processes to enhance lives of people. Independent devices are connected to each other with the help of internet of everything. Internet of everything is not more about 'things' but it is about "connections among people, processes, data and things". IoE helps to achieve economic as well as social goals. Automated and people based processes are used by IoE to extract and analyze real time data from millions of sensors connected to it. Applications of IoE are achieved by connecting "everything" online. Cities are going to have most positive impact and they are going to be most benefited in terms of using information intelligence to address city specific concerns. IoE along with Big Data Processing will be having more impact as cities become smart cities. In future public-private partnership is going to help to enhance living conditions of the citizens. The concept of IoE is being fully extended to its fullest by the implementation of the Internet of Nano Things. Nano sensors and Nano networks are two important concepts in Internet of Nano Things [10].

D. SMART OBJECTS AND SMART ENVIRONMENT:

Smart objects and smart environments are the two important concepts related to internet of things. Smart objects are nothing but physical objects in which sensors, network topology, data storage systems are embedded. Core component of IoT is the ability of smart objects to communicate effectively with their environment. Smart environment is the concept which emphasizes physical extent to which smart objects are interacting and deployed. Large number of organizations across academia, industry is working on IoT.

E. STORAGE MANAGEMENT CONSIDERATIONS:

There is requirement to concentrate on storage capacity as well as whether business can use IoT data in efficient manner.

F. PEOPLE AND PROCESS CONSIDERATION:

Security complexity is going to increase with the deployment of various smart devices. This is going to have impact on personal safety, availability requirements [5].

G. CONSUMER PRIVACY CONSIDERATIONS:

Huge amount of user related data provides information on users' personal use of devices, if this information is not secured, will result in breach in security. This issue is becoming challenging as the generated information by IoT is the key to bring better services [5].

H. SERVER INVESTMENT CONSIDERATIONS:

The effect of IoT on the server market will be focused on expenditure in key industries and their related organizations where IoT can be beneficial.

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I. STORAGE MANAGEMENT CONSIDERATION:

Many industries are facing problem with increased digitization and automation of several devices which are deployed across various regions of modern urban environment.

J. MARKET SIZE:

Gartner forecasted that up to 2020 there are going to be 26 billion units installed and suppliers of IoT devices and services will generate revenue more than \$300 billion [5]. Businesses are looking forward to IoT. Cisco described Internet of Everything as IoT combined with more traditional devices. Cisco forecasted that by 2020 more than 5 million people will be connected.

K. BANDWIDTH CONSIDERATION:

Data transmission speeds are becoming critical issue, to connect and sustain this interconnected world. As per the moderate bandwidth requirement existing data center WAN links are designed [5]. IoT ensures to change these patterns by transferring huge amount of sensor data to data center which increases inbound data center bandwidth.

L. STANDARDIZATION

In order for different devices to communicate standardization is very crucial part. Some of the important standardization bodies and their standards are IETF, 3GPP, IEEE, OMA, OGC, W3C web of things [6]. There is need of future work in the standardization in the area of IoT platform.

III. ARCHITECTURE OF IOT

The basic architecture of IoT can be considered to be consisting of things which are connected to IoT platform through gateway or the connection can be direct. This connection depends on the ability of the thing [2]. If the thing consists of sensor, data readings are sent to IoT platform. IoT platform is usually located in cloud. IoT applications which are present in cloud can use collected data to provide applications to end user. To use this system end user can either use phone or computer. Things are integrated through software which is known as IoT platform. Its task is collection, consolidation and analytics of data. IoT application developers use services provided by IoT platform [6].

Different microcontrollers such as arduino, Gallileo are used for sensors. The price of such devices is very much low. These devices can be connected to gateways by using wired communication, wireless communication, mobile network, Bluetooth, wifi etc. Gateway is usually connected to cloud using broadband access.

IV. CHALLENGES OF IOT

A. NETWORK SECURITY:

Network security has become very important issue in recent years. There is possibility of very high security risk due to increase in the use of devices for accessing corporate network. Network of things is new concept which explains science behind Internet of things [5]. There are important primitive building blocks of Network of things which helps to get insight into internet of things.

B. STANDARDS:

Lack of standards can have major impact on working of IoT devices. Poorly designed and configured networking devices can have negative effect to the network resources they connect to. In the future there is need of thoughtful design and standardization of configuration of tools.

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C. POWER NEEDED TO SUPPLY THE SENSORS:

If you want IoT to be deployed successfully there is requirement of supplying reliable power to the sensors. It becomes major concern, if these sensors are deployed at remote or distant locations such as in space or underground.

V. APPLICATIONS OF IOT

Most important applications of IoT are e-Health, transportation, manufacturing; industrial supply and provisioning, security, precision agriculture etc. network and processing requirements are different for different applications. For example to prevent chain of accidents on road it is very crucial to have low latency communication between vehicles, this will provide road safety. In other example in surveillance area you are required to have enough bandwidth for video streaming.

D. E-HEALTH:

IoT is helpful to doctors for real time location services. Medical equipment's like wheelchairs, scales, pumps can be attached with sensors and easily located. In case of medical emergency real time monitoring via connected device can save lives. With the help of smart mobile apps patients can contact doctors in case of emergency.

E. CONNECTED CARS:

It is a vehicle which can upgrade its own operations, maintenance and comfort of passengers using internet connectivity and onboard sensors. Popular brands like apple, google, BMW are working on bringing next revolution in automobiles. Driverless cars do not have drivers and are sensible enough to take you to destination on their own.

F. SMART HOMES:

It is one of the most popular examples of IoT. It is designed to provide more convenience and security. Controlling lights of home by remote, turning on or off air conditioner from remote location or recording your favorite movie and watching it later are some of the concepts related to smart homes.

G. SMART TRAFFIC SURVEILLANCE:

IoT supported by RFID tags and sensors can track the vehicles. Tracking the vehicles which violate traffic regulations, accident and emergency identification and alert, speed limit alert, parking identification are some of the example of smart traffic surveillance.

H. IOT IN AGRICULTURE:

Demand for food is increasing with increase in population. To increase food production governments are helping farmers with advanced technologies. Smart farming is one of the best choices in agricultural field. To yield better return farmers are using meaningful insights from data. Some of the basic uses of IoT include controlling water usage for plant growth soil moisture and nutrients sensing.

I. SMART RETAIL:

There is increasing demand of IoT in retail sector. To improve the in-store experience of the customers, IoT provides opportunity to retailers to get connected with them. Smart phones are one of the best options for retailers to remain connected with customers even out of store.

V. CONCLUSION

This paper has presented recent trends in IoT, challenges to IoT and applications of IoT. Companies are thinking on introducing IoT in business. Here we explained recent developments and research in the field of IoT. Different

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government sectors are also working on different projects using IoT. While implementing IoT solutions, we have to consider security loopholes and these security issues are required to be taken care of. The most important part of IoT is sensors, and knowing different types of sensors and knowing their applications, we will be able to use it in various fields.

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