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Internet of Things a Vision of Future and the Technological Growth

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Abstract—This paper addresses the impact of Internet of Things (IoT) in the whole world. The effort of IOT is to provide a communication between the network, common devices or human to other devices through the internet. Ten years back the IoT is considered as a futuristic vision and now it becomes the reality and the growth is unbelievable for the people. The wide-reaching implementation of IoT devices strongly trust that the rigorous change may happen in the way we live in the computerized society. To achieve the changes in the society of computer, the IoT is modified and new innovations are developed and also many companies and peoples are working on it. There are many IoT devices available such as internet enabling appliance, home automation component, and energy management devices, wearable fitness and health care monitoring system and network enabled medical devices. In these fields, the IoT place an important role and many number of companies and resource organizations are focusing on the impact of IoT.

Keywords— *Internet of things (IoT); Edge Computing; Sensor; Data Analysis; Wireless Sensor Network; Near Field Communication.*

1. Introduction

Internet of things is a network which makes human or other devices to connect with other devices for the reason of exchanging information and communication through the information sensing devices in accordance with agreed protocol. Internet of things is a recent communication design that visualizes a near future. The IoT is labeled as the next "technological revolution" because of the way it will change design of the system, work, entertain and travel as well as how government and business interact with the world. For an example, a brand new car that comes preloaded with a bunch of apps those smart home devices let you control the thermostat and play music with a few word. IoT may be a fitness tracker on your wrist that let your friends and family know how your exercise is going. Other than this, they make applications in many different domain such as home automation, industrial automation, medical aids, mobile healthcare, elderly assistance, intelligent energy management and smart grids automation, traffic management and many. The IOT Devices also have some issues in energy, intelligent, communication, integration and standards [10]. Normally the IOT devices can work with a four components that are sensors, connecting devices, data processing devices and the user interface.

1.1 Sensor

The sensors are the device which is used to sense the objects and transfer the information about the object. There are many sensors which is used for all types devices but for IoT devices, we can use only the limited sensors. Particularly for IoT devices, we are using pressure, temperature, humidity, magnetometer, accelerometer, gyroscope, inertial, image .These sensors helps the gadgets to collect data.

1.2 Connecting Devices

When we come to connectivity, we all know that the basic of all connectivity is WAN, MAN, PAN and LAN. While we preferring WAN network, we connect free to the world but we face lot of difficulties like we cannot use it for long range purpose [9]. If we use PAN, it uses the smart phone as a gateway for connectivity. LAN will not create any problem when we use for home and companies. These are enough for wired connectivity when we focus on the IoT devices that 'live on their own'. For example, the Fitbit One tracks your steps, floors climbed, calories burned, and sleep quality. We can use the wireless technology for the connectivity. In table I, the wireless connecting devices are ranges only the short distance. For example, the Bluetooth ranges only 50-150 m. When we are gets out of range then you will lose the connection. But to overcome these there are some other devices to make far away connections such as sigfox, neul, LoRaWAN. This connectivity helps in accessing the devices from the long distance.

1.3 Data Processing

The data can be processed by the device in three steps. The first is actuators that are to make the data that is happen through sensors. The second step is that the centralize system which helps in collecting and organizing the data. Last and the final stage of the data processing is the use of data for historical purpose. The information can be sent to the centralized node at that point it has to decide which platform the data has to be created in table I and how it process the historical data. For retrieve the historical data,

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Table I. The Wireless Technology used in IoT

Standard	Frequency	Range	Data Rates
1.Bluetooth 4.2 core specification	2.4GHz (ISM)	50-150m (Smart/BLE)	1Mbps (Smart/BLE)
2.ZigBee 3.0 based on IEEE802.15.4	2.4GHz	10-100m	10-100m
3.Z-Wave Alliance ZAD12837 / ITU-T G.9959	900MHz (ISM)	30m	9.6/40/100kbit/s
4.RFC6282	adapted and used a variety of networking media like Bluetooth Smart (2.4GHz) or low-power RF (sub-1GHz) or ZigBee	N/A	N/A
5.Thread, based on IEEE802.15.4 and 6LowPAN	2.4GHz (ISM)	N/A	N/A
6.Based on 802.11n	2.4GHz and 5GHz bands	Approximately 50m	600 Mbps maximum
7.GSM/GPRS/EDGE (2G), UMTS/HSPA (3G), LTE (4G)	900/1800/1900/2100MHz	35km max for GSM; 200km max for HSPA	35-170kps (GPRS), 120-384kbps (EDGE), 384Kbps-2Mbps (UMTS), 600kbps-10Mbps (HSPA), 3-10Mbps (LTE)
8.ISO/IEC 18000-3	13.56MHz (ISM)	10cm	100–420kbps
9.Sigfox	900MHz	30-50km (rural environments), 3-10km (urban environments)	10-1000bps
10.Neul	900MHz (ISM), 458MHz (UK), 470-790MHz (White Space)	10km	Few bps up to 100kbps
11.LoRaWAN	Various	2-5km (urban environment),15km (suburban environment)	bps.

we can use the protocol such as MQTT, HTTP and CoAP are the most common standard protocols used.

Hyper Text Transfer Protocol (HTTP) provides an appropriate method for providing data transfer between devices and central systems. It initially developed for client-server architecture. But now, it supports everyday web browsing in more specialised services around Internet of Things devices [2]. MQTT is a protocol for machine-to-machine and internet of things deployments. It is to retrieve the data from the data base through the centralized system that act as a broker. CoAP is another standard developed for low-power low-bandwidth environments. CoAP is focusing on one-to-one connection.

1.4 User Interface

In user interface, the user can collect information of the devices, that are computer or another devices but now it is only focused on the smart phones and the mobile applications. These are the works which is available in the IoT devices. The entire paper discusses the detail about furthermost work and the growth behind upcoming devices.

2. Exiting Work

The IoT will make the collected objects to interchange its data using embedded sensors like thermostats, cars, light, refrigerators, and more appliances that can be connected to the IoT. In next thermostat likewise the another IoT, the current devices are wearables that is apple watches on the market have turned our wrists into smart phone hotslers by enabling text message, phone call, and more [4]. A device such as FITBIT is another ongoing device for smart cities system is Barcelona, which is to enhance smart parking and the environment. The devices such as AT&T are another device for vehicles which is equipped with internet access and wireless network in a home or office. More vehicles are started to equip with this functionality and so soon we can see more apps in future cars.

2.1 Disadvantages

Loss of Privacy and Security - Many home appliances and devices are now a day using the internet to save lots of data. These information has a danger of hacked by the intruders.

Compatibility - Because of the interconnection of different manufactured devices it became compatible. *Complexity* - Power failure will let to lose the data which is currently used.

3. Proposed System

Now a day, for all IoT devices we are using efficient machine to machine (M2M) communication and the development of multiple protocols (IPV6, MQTT, XMPP (D2S), DDS (D2D) etc.) and development and integration of enabling technologies (Nano-electronics, embedded

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system, software and cloud computing etc.) and it also supports smart living concept. The four distinct components of the IoT will work for the thermostats uses, the sensor called temperature sensor and other sensors like optical sensors and pressure sensors. Likewise for the connectivity we are currently using WIFI, Thread ,Zigbee, Bluetooth, RFID and NFC (Near Field communications). The network topology we used are the point to point (P2P), star, mesh and hybrid. The wireless network plays a major role in this so we talk about the infrastructure and ad-hoc networks. The infrastructure is needed when the wireless network requires a physical structure to support it. In the other hand we have that Ad-hoc wireless networks which do not require a set infrastructure to work.

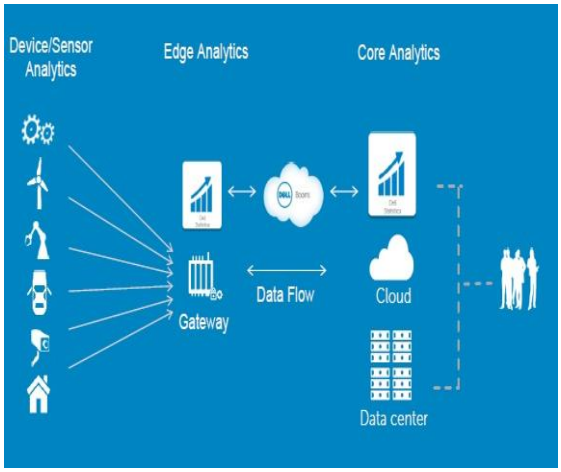

Fig.1: Data Flow between the Edge Nodes and the Devices Communication in WIFI

WIFI is used as an infrastructure for the network. The data processing in IoT devices only uses the "big data", but it lets to power consumption due to continuous flow of data. This issue is over come by using the "edge computing".

3.1 Advantages

The IoT systems will automatically analysis the state of the devices by its own way.

Efficiency and Time Saving - The device to device communication provide the best efficiency and also save the time.

Money Saving - *Optimum* edge makes the IoT to monitor the data and save it in a safe way for reuse let us to save money.

Better Quality of Life - The ease of use quality of IoT is also increase the quality of life.

4. Methodology

In IoT device, the data analytics and storage plays a major role. The data center directly connects due to continuous access of data by the sensor. In this paper, we are introducing the technique called "edge computing" where, edge is the node which is placed in between the database and the user interface. It is to send large bandwidth of data .and let the device to communicate with the database. The analysis may happen either on the device itself or the gateway. The features of edge nodes are given below.

The Purpose of Edge Node - The increasing IoT devices will increase the data generation. In database we have many sensors which can access the same cloud, but it will create traffic and also affect the speed of the data due to the low bandwidth. To reduce the traffic, we introduced the edge node which acts as a data center for providing data to the IoT devices [11]. Edge computing usage will make many numbers of devices to access the data base and without any traffic or reduced speed.

Role of edge computing - In edge computing model, it will not produce only data, it also compute the data which is given. It can perform data computing offloading, data storage, caching and processing, as well as distributed request and delivery service from cloud to user.

5. Implementation

The cloud computing is the latest way to store data but, it has only low bandwidth. To transfer a large amount of data usage in 2020, we are starting to push to the" edge". By 2022, it estimates the average growth of the IoT will increases 50 internet connection devices in a home . The edge computing collects and analysis the data and so it also increases the use of IoT by 2020. In 2017 we are using more than 1,593 devices which are connected to the edge computing and in 2020 the connection will increase by 5,635.

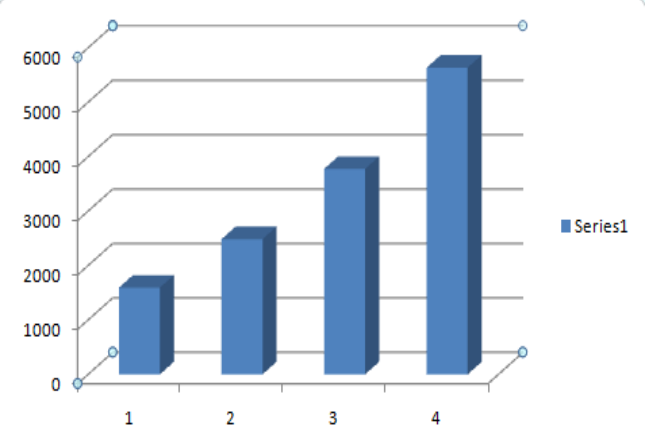

Fig.2: Graph for Edge usage

The figure 2 and 3 discribes the growth of the product and manifacture. This paper discuss that the IoT product increase its productivity by 50 billion in 2020 . In 2010 the smart object growth is 12.5 billion and in 2015 it becomes 25 billion but now its 30 billion.

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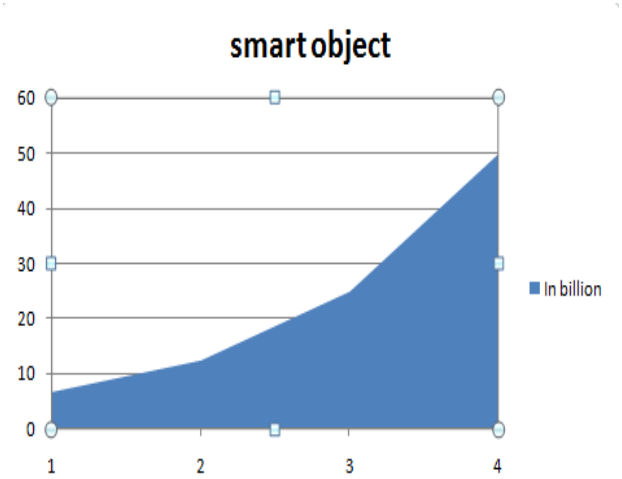

Fig.3: Graph for the usage of IoT

6. Conclusion

In this paper, the work done in IoT, working of its model and the structural design are explained. The internet of things is now reached some important level in the world. It is now playing a significant role in the life of the human like an information technology, cognitive science, communication technology, and low power electronics. Involvement of IoT in these type of field will also be makes the IoT design as a old thing. So year by year the requirement for the device is also increasing in huge. In the beginning of the IoT devices, the cloud computing was the famous, most advanced data collection and analysis method. But now it is reassembled by using a technology called edge computing. IoT have become an inevitable trend in the development of information industry, which bound to bring new changes to our lives.

7. Future Enhancement

The IoT will become battery-free sensors and we can also adopt internet protocol based sensor network using 6LoWPAN/IPV6 standard .to ensure familiarity than foisting IoT on consumers, companies are considered smartening their existing appliance with cheaper wireless chips and sensors. Billions of devices are expected to come online over the next 5 years. There will be machine to machine interfaces, where devices talk to each other. We may well see wearable devices and sensors that can help to make a lot of changes in our lifestyle and provide early detection for disease risks. IoT will lead to increased awareness about environmental and social issues as more population comes online and they have more access to new techniques and solutions for education, human rights, environmental hazards and education. All answers from climate change to disease prevention, from smart parking to traffic management, from water conservation to waste management will lie in the IoT and we have to find a better way to deal with it.

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