

## Challenges in Internet of Things

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### Introduction

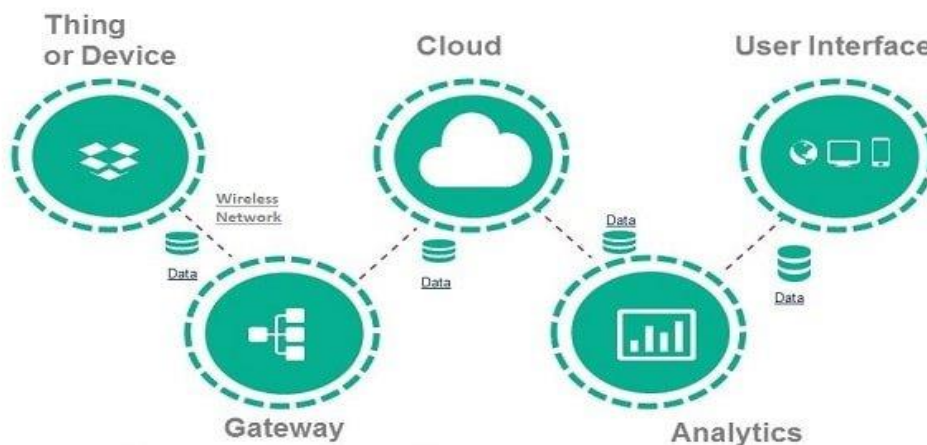
The IoT is an intelligent network which gives services to interact and exchange data through the sensing devices. It aims at tracking, monitoring, smart identifying and managing things. Internet of things (IoT) consists of sensors which sense the data supported the context and transfer it to the central database system through wired or wireless network like Bluetooth, wireless Fidelity(Wi- Fi), 3G or 4G. The interaction is between automatic data processing system and people. Hence the nearby environment is sensed and controlled by wireless sensor network.

Today, Internet application development demand is incredibly high. Therefore IoT could be a major technology by which we are able to produce various useful internet applications. IoT could be a basic network by which all physical objects are connected to the net through network devices or routers and exchange data. It allows objects to be controlled remotely. IoT could be an excellent and intelligent technique which reduces human effort and is easily accessible to physical devices. It also has autonomous control feature to control any devices without any human interaction.

**Keywords:** Sensor, 3G, 4G& Bluetooth

### Components of IoT

#### Major Components of IoT



**(i) Smart devices and sensors – Device connectivity**

The smart sensors of the device connectivity layer are continuously collecting data from the environment and transmits the information to the next layer. Recent techniques in the semiconductor technology are capable of producing micro smart sensors for various applications.

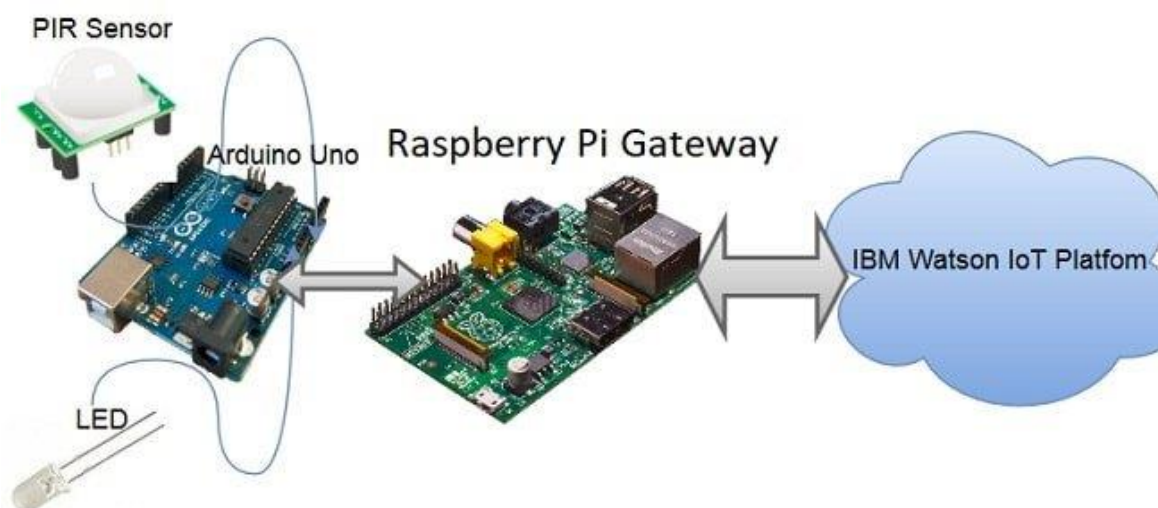
Common sensors include temperature and pressure sensors, humidity / moisture level sensors, light intensity and proximity detectors.

**(ii) RFID tags**

Most of the modern smart devices and sensors can be connected to low power wireless networks like Wi-Fi, ZigBee, Bluetooth etc. Wireless technologies has its own pros and cons in terms of data transfer rate, power and overall efficiency.

**(iii) Gateway**

IoT Gateway manages the bidirectional data traffic between different networks and protocols. Gateway also translates different network protocols and makes sure the interoperability of the connected devices and sensors. Gateways perform pre-processing of the collected data from many sensors locally, before transmitting it to the next stage. IoT gateway offers security for the network and transmitted data with higher order encryption techniques which acts as a middle layer between cloud and devices to protect the system from malicious attacks and unauthorized access.

**(iv) Cloud**

Internet of things creates massive data from applications, devices and users which has to be managed in an efficient way. IoT cloud offers tools to collect, process, manage and store huge

amount of data in real time. Industries and services can easily access these data remotely, which is used to take decisions at critical situations. IoT cloud is a sophisticated high performance network of servers, optimized to perform high speed data processing of several billions of devices, traffic management and deliver accurate analytics. Distributed database management systems is one of the most important components of IoT cloud. Cloud system integrates several billions of devices, sensors, gateways, protocols, data storage and provides predictive analytics. Companies use these analytics data for improvement of products and their services, preventive measures and build their new business model accurately.

#### **(v) Analytics**



Analytics is the process of converting analog data from several billions of smart devices and sensors into useful insights which can be interpreted and used for detailed analysis. Smart analytics solutions are inevitable for IoT systems for the management and improvement of the entire system. Real time smart analytics is one of the major advantages of an efficient IoT system. This helps engineers to find out the irregularities in the collected data and act quickly to prevent an undesired scenario. Service providers move on to further steps if the information is collected accurately at the right time. Big enterprises use the massive data collected from IoT devices and utilize the insights for their future business opportunities. On careful analysis it will help organizations to predict trends in the market and plan ahead for a successful implementation. Information is very significant in any business model and predictive analysis ensures success in concerned area of business line.

#### **(vi) User interface**

User interfaces are the visible, tangible part of the IoT system which can be accessible by users. Designers will have to make sure of a well designed user interface for minimum effort for

users and encourage more interactions. Modern technology offers much interactive design to ease complex tasks into simple touch panels controls. Multicolor touch panels have replaced hard switches in our household appliances and this trend is utilized in almost every smart home devices. User interface design has higher significance in today's competitive market, it often helps the user to choose a particular device or appliance. Users will be interested to buy user friendly devices or smart gadgets that are compatible with common wireless standards.

### **Applications of IoT**

The versatility of IoT has become very popular in recent years and there are many advantages of having a device based on IoT. There are lots of applications available in the market in different areas. Here are some.

#### **(i) The Smart Home**

It is like making your home smart. You can control and automate the lights, room heater, ventilation, air condition, and security system by yourself. Home appliances such as washer/dryers, ovens and refrigerators can be remotely monitored and automatically operated.

#### **(ii) The Smart Cities**

The city officials interact directly with the city infrastructure management and government department for solving real day to day problems faced by the city citizens. They are able to monitor the different events occurring in the city, and render a better quality of life to their citizens. The IoT devices can solve traffic issues, reduce noise, crime, and air pollution with the assets like local government departments, security & information systems, schools, libraries, transportation systems, hospitals, power plants, water supply networks, waste management, law enforcement, and other community services.

#### **(iii) Connected Car**

The vehicles that are connected with the Internet can share their access with others travelling on the same route, or another route to stay informed and safe.

#### **(iv) Utilities**

Smart metering, smart grid, and water monitoring system are the most useful applications in the various utility areas.

#### **(v) Medical and Health Care**

Some examples of IoT in medical field are remote health monitoring and emergency notification systems. The health patch health monitor can be used by the patient who cannot approach the doctors for taking ECG, heart rate, respiratory rate, skin temperature, body posture, fall detection, and activity readings remotely.

## **Benefits of IoT**

### **(i) Increases Business Opportunities**

IoT provides new business opportunities and helps companies benefit from new revenue streams developed by advanced business models and services. IoT-driven innovations build strong business cases, reduce the time to market and increase the return on investments. IoT transforms the way that consumers and business persons approach the world by leveraging the scope of the IoT beyond connectivity.

### **(ii) Enhanced Asset Utilization**

IoT will improve tracking of assets (equipment, machinery, tools, etc.) using sensors and connectivity, which helps organizations benefit from real-time insights. Organizations could more easily locate issues in the assets and run preventive measures to improve the asset utilization.

### **(iii) Efficient Processes**

Having connected a maximum number of devices to the internet, IoT allows businesses to be smarter with real-time operational insights, thereby reducing the operating costs. The data collected from factory floor, logistics network and supply chain will help to reduce the inventory, the time to market and downtime due to maintenance.

### **(iv) Improved Safety and Security**

IoT services integrated with sensors and video cameras monitor the workplace, ensures equipment safety and protect them against physical threats.

### **(v) Increase Productivity**

Productivity plays a vital role in the profitability of any business. IoT offers just-in-time training for employees, improve labor efficiency and reduce mismatch of skills while increasing the organizational productivity.

### **(vi) Cost Saving**

The improved asset utilization, productivity, and process efficiencies can save our expenditures. For example, predictive analytics and real-time diagnostics reduces the maintenance costs.

## **Challenges of IoT**

### **(i) Scalability**

Billions of internet-enabled devices get connected in a huge network and large volumes of data are needed to be processed. In the present era of IoT evolution everyday objects are connected with each other via Internet. The raw data obtained from these devices requires big data analytics and cloud storage for interpretation of useful data.

**(ii) Interoperability**

Technological standards in most areas are fragmented and they need to be converged. As the standardization process is still lacking, interoperability of IoT with legacy devices should be considered critical. This lack of interoperability is preventing one to move towards the vision of truly connected everyday interoperable smart objects.

**(iii) Lack of government support**

Government and regulatory bodies like FDA should set up a standard committee for safety and security of devices and people.

**(iv) Safety of Patients**

Most of IoT devices are left unattended, as they are connected with real-world objects. If they are used by patients as wearable devices, then any technical error in security can be life-threatening for patient.

**(v) Security and Personal Privacy**

No research has been established in security vulnerabilities and its improvements. Confidentiality, integrity and availability of personal data of patient should be ensured.

**(vi) Design Based Challenge**

With the development in technology, design challenges are increasing at a faster rate. There have been issues regarding design like limited energy, memory and computation power and they need to be sorted out.

**Conclusion**

Internet of Things offers some pretty interesting applications in making our lives easier like in healthcare, agriculture and transportation. However, various factors like privacy, security and data storage also need to be considered. It is also worth noting that things have been connected to networks for ages without the guise of "Internet of Things". The Internet of Things has changed our lifestyle. It is for common good, the need is the input and support of technologists and ordinary people to make it good for individuals and the society. This can be achieved by working together. For public safety, there must be a public discussion and solution. Internet of Things has been evolving few years back. New technologies and protocols joins IoT ecosystem to make it cost effective, more accessible, energy efficient and most importantly secure. We in future will witness a continuous development in IoT due to the huge demands in different sectors.

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