Unit – 01: Introduction to IOT

- Basics of IoT, concepts of IoT,
- History of IoT, Applications of IoT
- Basic IoT System and its building blocks
- Various platforms for IoT (e.g. AWS, AZURE, GCP)
- Introduction to Python programming

Questions to be discussed:

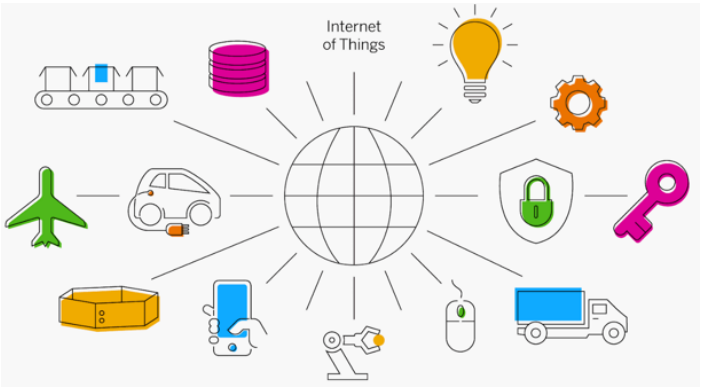
1. Define the term IoT. What are the application of IoT?
2. Discuss the functions of each block of the Basic IoT system.
3. What is IoT Platform? Explain its type in brief.
4. What is python? Explain the basic features of python programming.
5. Write short notes on:
   a. AWS IoT Platform
   b. GCP IoT Platform
   c. AZURE IoT Platform
   d. Python programming

What is internet?

- It connects millions of computers, webpages, websites, and servers.
- Using the internet we can send emails, photos, videos, messages or many more.
- It creates a communication medium to share and get information online.
- If your device is connected to the Internet then only you will be able to access all the applications, websites, social media apps, and many more services.
- Internet nowadays is considered as the fastest medium for sending & receiving information.

"Things" in IoT

- Things refer to IoT devices with unique identities that have actuating, monitoring, and remote sensing capabilities.
- Things are the primary component of IoT applications.
- IoT devices can be of various types, including smartwatches, sensing devices, smart electronics appliances, automobiles, wearable sensors, and industrial machines.
- IoT devices generate data in some form which leads to useful information when processed.



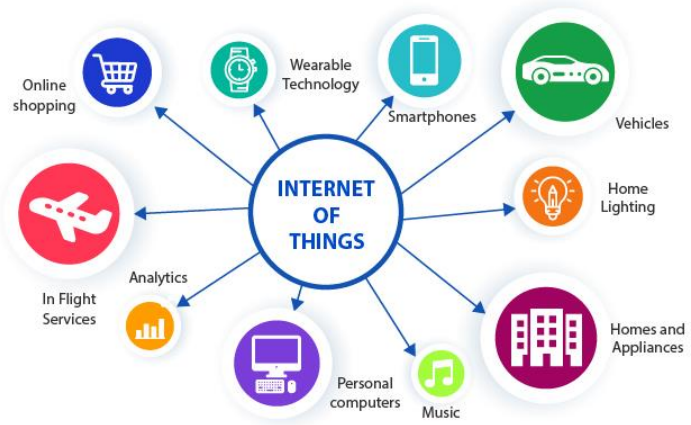
Define the term IOT:

- IOT stands for internet of things.
- The term 'Internet of Things' was introduced in 1999 by the computer scientist Kevin Ashton.
- The IoT denotes the connection of devices, machines, and sensors to the Internet.
- IOT is a world of interconnected things.
- Taking everyday things, embedding them with electronics, software, sensor and then connecting to them with the internet and enabling them to collect and exchange data without human intervention is called internet of things.
- The life cycle of IOT is collect, communicate, analyze and act.
- The IoT refers to the billions of physical devices around the world that are now connected to the internet to collecting and sharing data.

Advantage and disadvantage of IOT :

Advantage :

- Efficient utilization of resources
- Minimum human effort and save time
- Lead to more automation
- Help in improving the technology
- Help us to reduce waste and use our natural resources effectively.

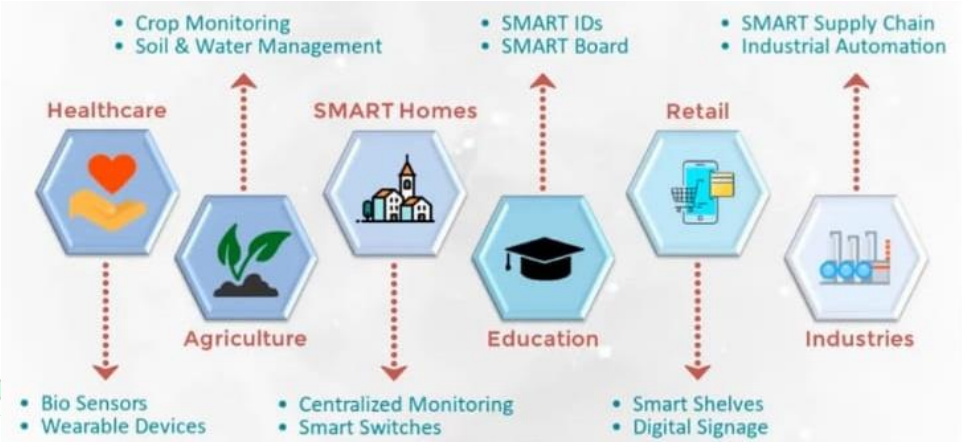


Disadvantage :

- Security of confidential data
- Can lead to various types of network attacks
- Maintaining privacy is a challenge

Application of IOT :

- Healthcare
- Agriculture
- SMART Homes
- Education
- Retail
- Industries
- Smart city application



What are the characteristics of the Internet of Things ?

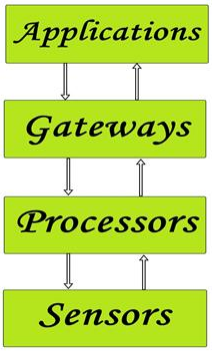
The following are the major characteristics of the Internet of Things:

1. Connectivity
2. Identity of Things
3. Data
4. Intelligence
5. Network – Communication
6. Scalability
7. Architecture – Common Ecosystem
8. Security

Define the function of each blocks of the basic IoT system :

- The Internet of Things denotes the connection of devices, machines & sensors to the Internet.
- An IoT system comprises four basic building blocks : sensors, processors, gateways, and applications.

Sensors :



- These form the front end of the IoT devices.
- These are the so-called “Things” of the system.
- Their main purpose is to collect data from its surroundings.
- These have to be uniquely identifiable devices with a unique IP address.
- Sensors are classified into two types: active and passive sensors.
- Active sensors use to collect real-time data (ex.: GPS, X-ray, radars).
- Passive sensors use energy from external sources (ex: cameras).

Processors :

- Processors are the brain, the main part of the IoT system.
- They process the raw data captured by the sensors and extract valuable information.
- Examples of processors are microcontrollers and microcomputers.

Gateways

- Gateways are the combination of hardware & software used to connect one network to another.
- It provides network connectivity to the data.
- Network connectivity is essential for any IoT system to communicate.
- LAN, WAN, PAN, etc are examples of network gateways.

Applications:

- It provide a user interface and effective utilization of the data collected.
- Applications are essential for proper utilization of all the data collected.
- Examples of applications are home automation apps, security

What is an IoT Platform?

- An IoT platform is a tool for managing IoT systems.
- It works as a mediator between the world of physical objects and the world of actionable insights.
- IoT Platform connects sensors and devices.
- IoT platform handles different software communication protocol and hardware.
- IoT platform provides security and authentication for sensors and users.
- It collects, visualizes, and analyzes the data gathered by the sensor and device.
- There are several IoT Platforms available that provides facility to deploy IoT application actively:
  1. Amazon AWS IoT Core
  2. Microsoft Azure IoT Hub
  3. Google Cloud IoT Platform
  4. Cisco IoT Cloud Connect
  5. Oracle IoT Platform
  6. Cumulocity IoT Platform
  7. IBM Watson IoT platform etc.

AWS IoT platform:

- AWS stands for Amazon Web Services.
- It offers a set of services that connect to several devices and maintain the security as well.
- This platform collects data from connected devices and performs real-time actions.

Microsoft Azure IoT platform:

- Azure IoT platform offers strong security mechanism and easy integration with systems.
- It uses standard protocols that support bi-directional communication between connected devices and platform.
- It processes a large amount of information in real-time generated by sensors.

Google Cloud Platform(GCP) IoT Platform:

- GCP stands for Google Cloud Platform.
- GCP is a global cloud platform that provides a solution for IoT devices and applications.
- It handles a large amount of data using Cloud IoT Core by connecting various devices.
- It allows to apply Big Query analysis or to apply Machine learning on this data.