MODULE-1

FUNDAMENTAL CONCEPT OF INTERNET OF THINGS

Internet of things

Network of physical things sending,receiving or communicating information through using internet.

Things in iot

Things is the iot device having unique identities and can perform sensing,actuating and monitoring.

devices ,include
- IoT interfaces for sensors
- IoT Interfaces for internet connectivity
- Memory and storage interfaces

Characteristics of iot

1. Dynamic and self adapting:

    iot device & system may have the capability to dynamically adapt with the changing context & take actions based on the their operating conditions.eg:CCTV

2. Self-configuring:

    IOT allowing a large number of devices to work together to provide certain functionality.

3. Interoperable communication protocol:
    Iot device may support a no.of interoperable communication protocols & can communicate with other devices .
4. Unique identity:
    Each IOT devices has a unique identifier(IP address,URL)
5. Integrated into information network:
    Iot devices are usually integrated into the information n/w that allows them to communicate & exchange data with other devices and systems.

Application of iot

1.agriculture

2.consumer use

3.health care

4.smart cities

5.industrial automation

6.smart retail

Iot enabling technologies

Wireless sensor network:-
- Sensor used to monitor the environmental and physical conditions
- WSN consists of number of end nodes, routers and a coordinator
- End nodes have several sensors attached to them and also act as routers

- Routers are used for routing the data packet from end nodes to the coordinator
- The coordinator node collect the data from all the node coordinator and also act as a Gateway that connect the WSN to internet.

Cloud computing:-
- Informative paradigm that delivering application and services over the internet
- Delivering of computing is the delivery of computing services-including servers,storage,database,networking,software,analytics and intelligence over the internet to offers faster innovation,flexible resources and economics of scale
- "pay as you go"
  You typically pay only for cloud services you use,helping you to lower your operating costs,run your infrastructure more efficiently and scale as your business needs change.

Big data analytics:-
- Big data analytics used to describe a huge set that is defined by 3 characteristics known as 3vs-Volume,Velocity,Variety
- Big data analytics help to make sense of the data and information that is gathered by IOT devices
  - 3v's
    Volume:-it refers to the amount of data you have
    Velocity:-defines the speed of data processing
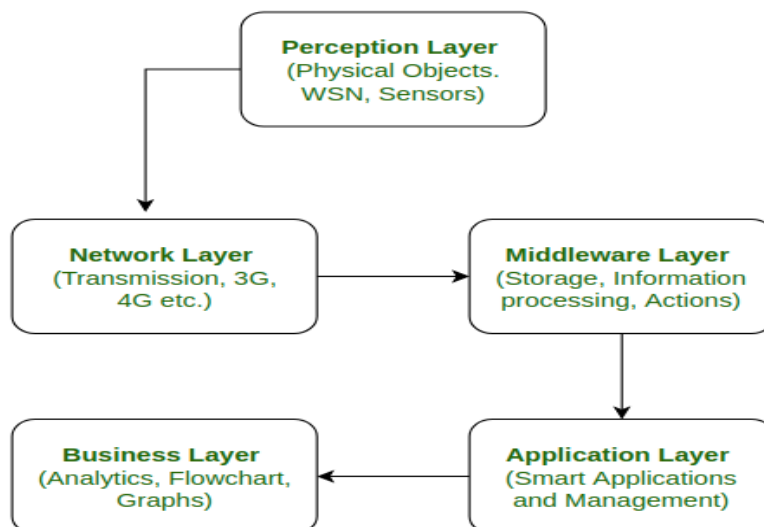   Variety:-different type of big data

Communication protocol:-
- Communication protocol allow devices to exchange data over the network.
- It defines the data exchange formats and data encoding schemes for devices and routing of packet from source to destination.

Embedded system:-
- It's a computer system that has computer hardware and software embedded to perform specific task.
- Embedded system include microprocessor,microcontroller,RAM,ROM,networking unit,I/O device,display and storage etc.

5 Layer Architecture of Internet of Things

Perception Layer :
This is the first layer of IoT architecture. In the perception layer, number of sensors and actuators are used to gather useful information like temperature, moisture content, intruder detection, sounds, etc

Network Layer :

it is the connecting layer between perception and middleware layer. It gets data from perception layer and passes data to middleware layer using networking technologies like 3G, 4G, UTMS, WiFI, infrared, etc

Middleware Layer :
Middleware Layer has some advanced features like storage, computation, processing, action taking capabilities. It stores all data-set and based on the device address and name it gives appropriate data to that device.
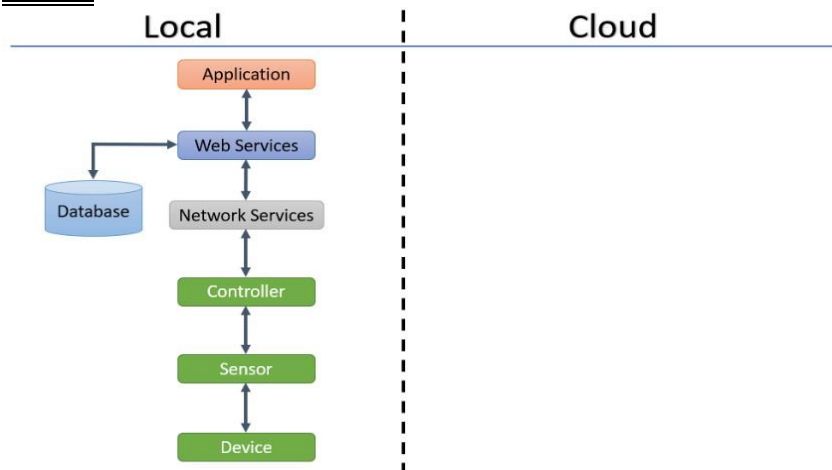
Application Layer :
The application layer manages all application process based on information obtained from middleware layer.

Business Layer :

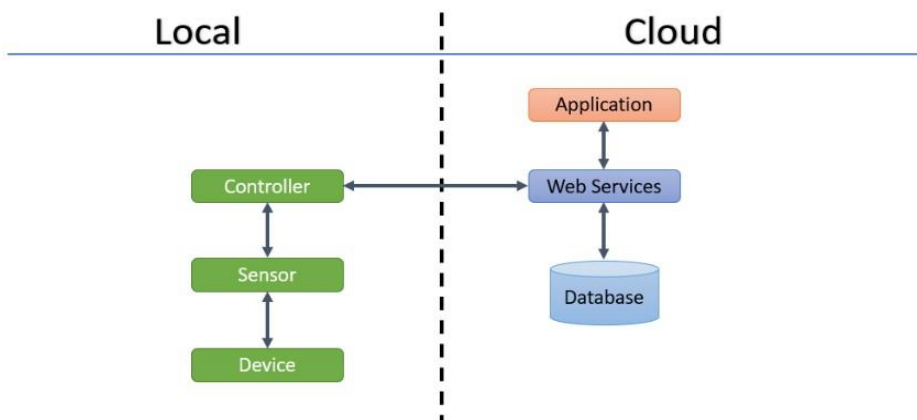It involves making flowcharts, graphs, analysis of results, and how device can be improved, etc.

Explain IOT Levels

Level 1

- In this all components are deployed locally
- Ther is no cloud or external network involved in this process
- Sensors,routers,cloud components,application etc ,all are at the user's end
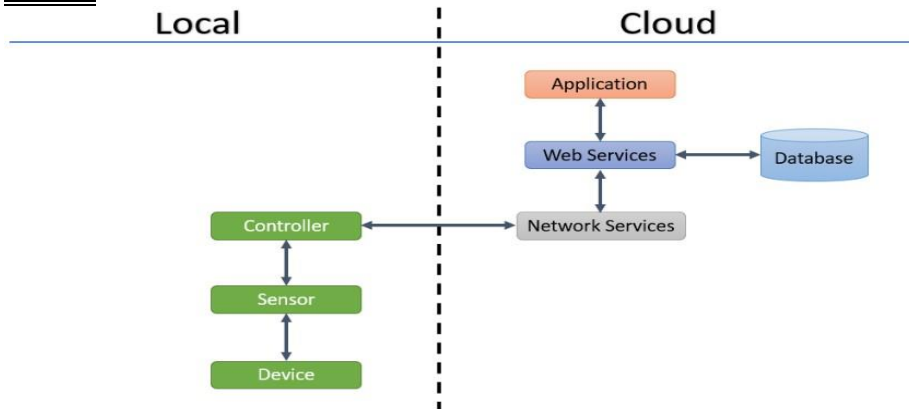
Level 2

- In this level all the components are deployed locally except the servers.
- There is a cloud or an external network involved in this process.
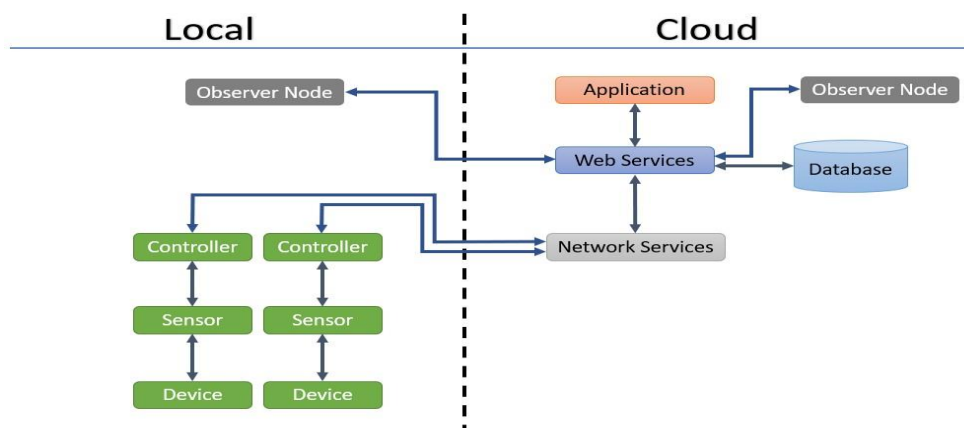- At the user's end there are only sensors,controllers and application

- The cloud part is having the servers configured for the purpose of storage and analysis
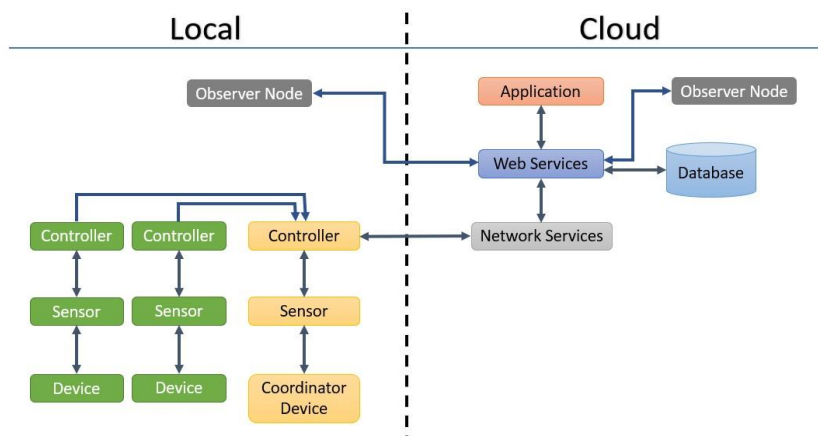
Level 3

- In this level all the components are deployed locally except the server and the network connectivity part.
- There is cloud or an external network involved
- The cloud part having the essential network for connectivity and servers configured for the purpose of storage and analysis
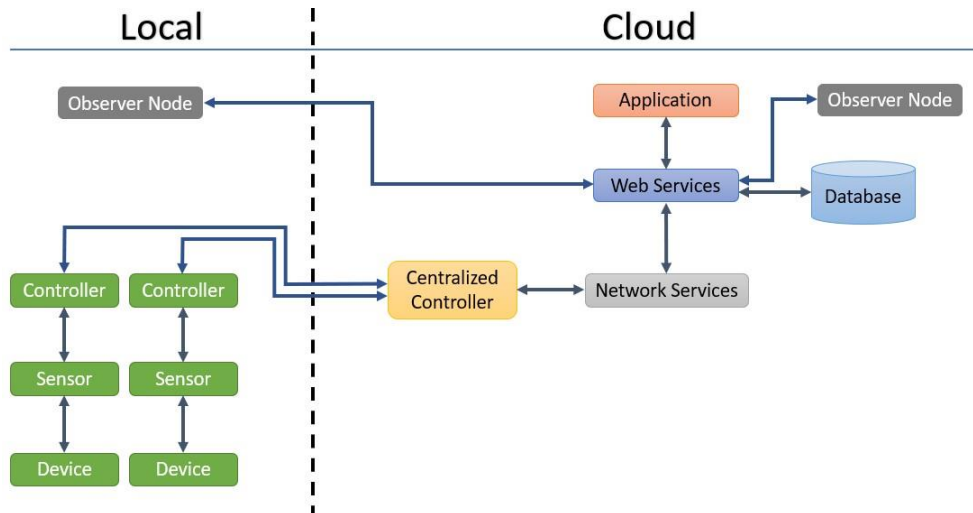
Level 4

- All the components are deployed locally except servers and the network connectivity.in some cases sensors are also in the cloud
- At the user's end there is only the application
- The cloud part is having the essential network for connectivity and server configured for the purpose of storage and analysis.

Level 5

- Almost same as level 4 but with one major advancement. In level 5 coordinator device are also there in the local part
- A coordinator device coordinates a certain set of sensing devices.
- There is an observer node also in the cloud part that observe the entire process.

Level 6

- Similar to level 5
- Coordinator devices are replaced by a single component that is centralized controller that is placed in the cloud part

Challenges in iot
- Lack of encryption
- Insufficient testing and updating
- Brute forcing and the risk of default passwords
- Security challenges
- Design challenges
- Increment in cost
- System security
- Battery size
- Connectivity
- Need of skill test