

The Internet of Things is arrangement of inter-related processing gadgets, advanced machines, items, creatures individual that are furnished with the capacity to move info over a system without expecting Human-Human communication.

In a simple way to put it, you have things that sense and collect the data and send it to internet and history starts in 1982 and it is increasing.

5 stages using IOT :-

- ① Connect :- coll' of information
  - ② Data Monitoring :- analyzing
  - ③ Data Analytics :- filtration {training}
  - ④ Integrate :- comm' with hardware
  - ⑤ Solution :- whether getting appropriate result or not.
- } Software      } Hardware

Major Components of IOT :-

- ① A device or a Sensor
- ② Cloud
- ③ Analytics
- ④ Software / User Interface.

Why IOT :-

Challenges :-

- ① Meeting Customer Expectation
- ② Easing Security Concern.
- ③ Keeping IOT Hardware Updated.
- ④ Overcoming connectivity issue.
- ⑤ Waiting for government regulation.

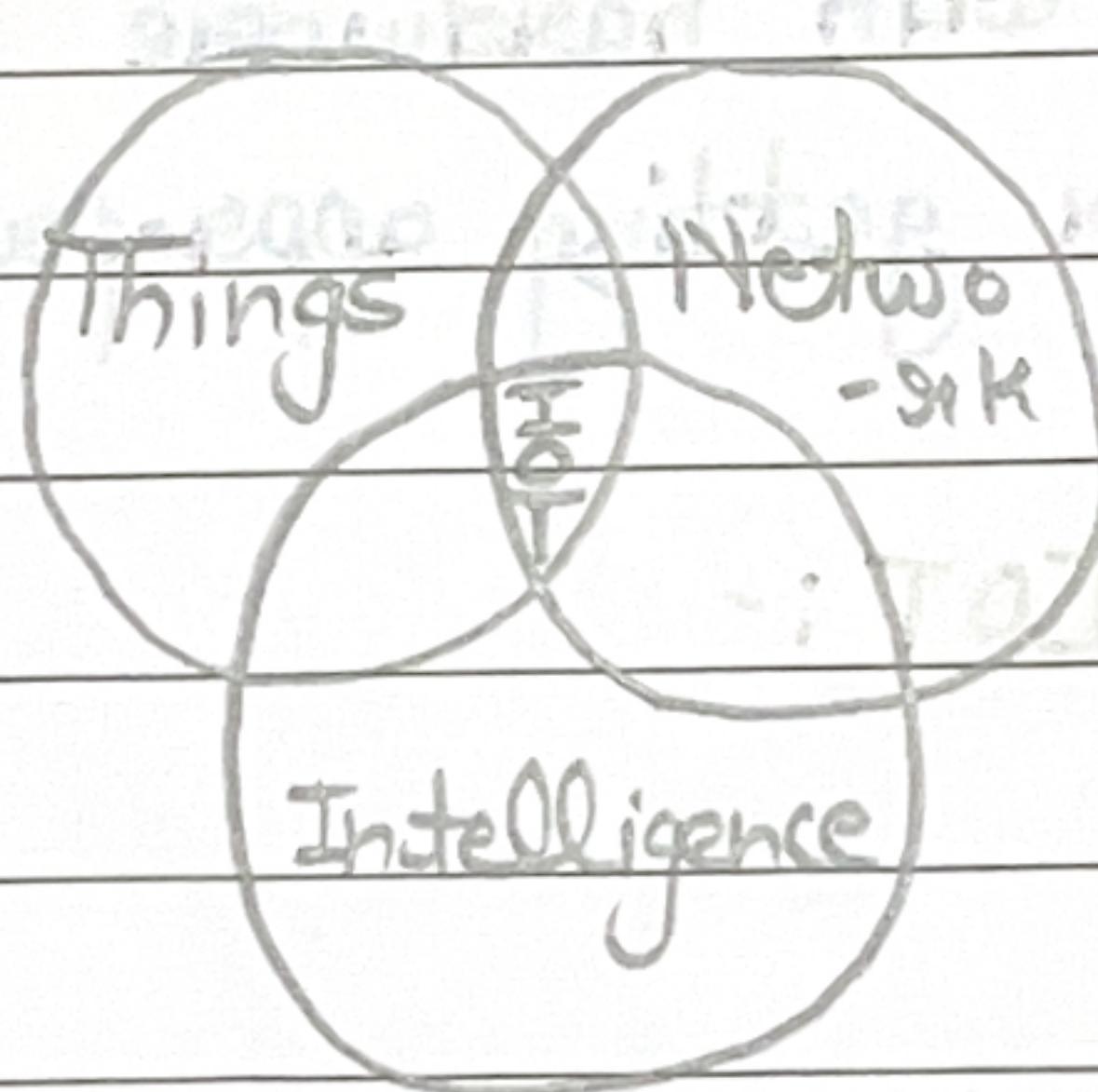
## Future of IOT :-

- ① In India, Nearly 120 companies and 70% of start-ups are offering IOT enabled solution.
- ② From 2015 till now, around 60 Million has been invested in IOT which has given birth to a new way of working and living.

## Some definitions for IOT:-

- ① The term IOT has come to describe a number of technologies and research disciplines that enable the internet to reach out into real world of physical objects.

The term IOT refers to collective network of connected devices and technology that facilitates comm<sup>n</sup> b/w devices and cloud.



## Sensors :-

A device that provides a usable output in response to a specified measurement. The sensor attains a physical parameter and convert it into a signal suitable for processing the characteristics of any device or material to detect the presence of particular physical quantity.

eg:-	Temperature Sensor	Smoke Sensor
	Pressure "	Humidity "
	Image "	
	Water Quality "	

Actuator :-

It is a machine component or system that moves or control the mechanism of system.

Sensor

- ① A device that detects events or A component of machine that is responsible for changes in environment and sends that signal for moving and controlling info to other electronic devices. the mechanism.
- ② Connected to I/O port of system. Connected to O/P port of system.
- ③ Helps to monitor changes in environment. Help to control environment or physical changes.
- ④ Output is an electrical signal. Output is a movement.

Component used for/in IOT :-

- ① Sensor and Actuator.
- ② Controller :- It controls all the sensors. It provides proper electrical power to them.
- ③ Processor :- It takes only digital signals from the controller and process them before storing in cloud server as data.
- ④ Gateway :- It makes the data ready to transmit to cloud server through internet. It transmit data through diff' protocols.
- ⑤ Cloud Server :- It stores all data sent from application area or implementation phase. Also it serves data with user when they request for it.
- ⑥ User Devices :- This is main user device that can be mobile or computer where actual status are observed through application or software. Also, user can control all devices from here.

## Smart Objects :-

The concept of smart in IoT is used for physical objects that are active, digital, and can operate to some extent automatically and has local control of the resources.

The smart objects need energy and data storage.

A smart object is an object that enhances the interaction with other smart objects as well as people.

\* The world of IoT is the network of interconnected heterogeneous objects.

→ Eg of Smart Object :- Smartphone, TV, Tablet, etc.

### Advantages

- ① Improved customer engagement.
- ② Technology optimisation.
- ③ Reduced waste.
- ④ Enhanced data collection.

### (IoT)

### Disadvantages

- ① Security.
- ② Privacy.
- ③ Complexity.
- ④ Flexibility, Compliance.

## Chapter-2 → IoT Application for Industry.

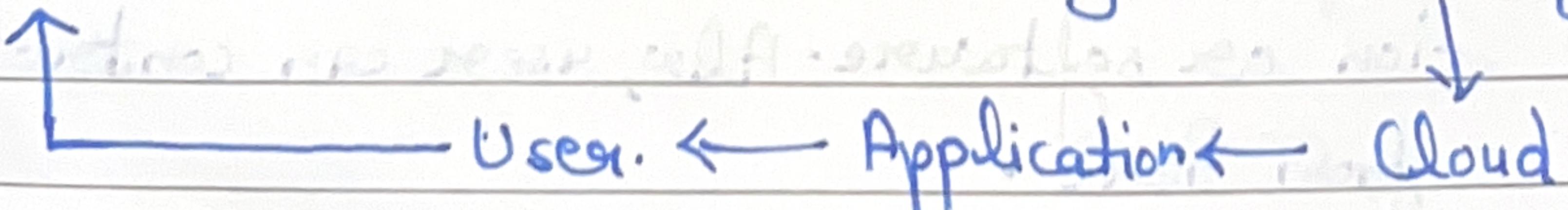
### Value Creation :-

Value creation is basically

Values can be generated and may show-up as a result of combination of IoT applications with other systems or processes or can originate in new human behaviour or new interactions.

### IoT Ecosystem :- 7 components.

IoT device → Network → Security → Gateway



Value Creation  
5 layers :-

\* IoT as Network  
An IoT Net  
gadgets, app  
other and  
human inter

7 layers

People and Process :-

Applications :- applica

Data Analysis :- Repo

Data Investigation :-

Global Infrastructure

Connectivity, Edge Comp

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## Value Creation Layers in IOT :-

5 layers :-

- 5: Digital Services (services provided)
- 4: Analytics
- 3: Connectivity
- 2: Sensor/Actuator

Layer-1: Physical Thing (device/hardware)

### \* IOT as Network - Network :-

An IOT Network refers to collection of devices such as sensors, gadgets, appliances and software that communicate with each other and exchange information & data without need for human interaction.

## 7 layers of IOT :-

People and Process :- user requirement.

Applications :- application developed.

Data Analysis :- Reporting, Machine learning etc.

Data Investigation :- Big data.

Global Infrastructure :- cloud infrastructure.

Connectivity, Edge Computing :- communication, protocol network, Wi-Fi, cellular

Things :- can be device, sensor, controller etc.

## Importance of IOT :-

I) Better life quality.

II) Automation of process.

III) Data driven decision.

IV) Real-time Monitoring. e.g.: Camera.

Need of IOT in different areas :-

- ① Smart Energy
- ② Smart Agriculture
- ③ Retail
- ④ Industrial level
- ⑤ Health
- ⑥ Smart Water
- ⑦ Waste Management
- ⑧ Sports
- ⑨ Smart Buildings
- ⑩ Environment
- ⑪ Smart Home.

Critical for Human Progression :-

Applying IOT in a particular country or city is a big help imagine using a unique centralized system that can minimize traffic, detect crime easily or even accidents can be detected in a real-time with a fast response from respective supports. (sports)  
eg:- Car, Homes etc.

Challenges or Barriers in IOT :-

- ① Lack of government support.
- ② Safety of patients.
- ③ Security and Personal privacy.
- ④ Design based challenge.
- ⑤ Human-In Loop :- (no documentation)
- ⑥ Connectivity.

Ques-1 Explain the  
Ques-2 Explain the

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Ans-2 IoT Device  
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Ques-1 Explain the ecosystem for IOT.

Ques-2 Explain different type of sensors.

Ay-1 - Ecosystem of IOT consists of 7 main components :-

- ① IoT Device :- IoT device is first and major component as everything depends on it. There are different - different IoT devices present in market for different uses such as temperature sensor to find temperature of anything; humidity sensor for calculation of humidity in air which helps in different areas like agriculture etc.
- ② Network :- IoT depends on internet so network plays a very crucial role in IoT as without internet IoT is of no use. When any device is connected to internet through a network it becomes smart device and help us to ease our life.
- ③ Security :- This is third component present and security is also very important in different areas like we can take example of smooth doors; it automatically opens when someone comes in that radius but it cannot detect that whether that person is a good one or a bad one.
- ④ Gateway :- This provides a way to transfer the data from device over to any cloud through a network. Gateway is a medium to transfer data from your IoT device to cloud by using different protocols.
- ⑤ Cloud :- Cloud is that where the user data or device data is stored. We need a place where we can store this data and whenever we are in need we can fetch it from there.

VI Application :- Different applications are present out there to design and work on any IOT device. First we create or compile the old codes present in application like Arduino to create or to train device to perform action and then with that we can use that in different areas like in sensors etc.

VII User :- This is the final layer of ecosystem in which any device that is designed for a particular purpose can be used by User to make life easy. User gives the review about that device; which means whether that is good for that purpose or not.

## Q-2- Different types of Sensors :-

I Temperature Sensor :- This sensor help us to maintain the temperature of any device, room etc. With help of this sensor we can control temperature or maintain it wherever required.

II Pressure Sensor :- This type of sensor is mainly used in areas where/which are underground; in submarines for to maintain pressure as if pressure increases it can cause trouble.

III Water quality sensor :- To maintain or to find the quality of water it is used and with help of this we can find whether the water is good for that purpose or not.

IV Chemical Sensor :- To know the index (PH) of any chemical it is used; it can help with the caution taken on any chemical.

- (V) Gas Sensor :- It is used to find gas present in that chamber whether it is hazardous or not.
- (VI) Smoke Sensor :- This sensor is used in safety purpose mainly where it detects the smoke and buzz alarm in case if there is any fire.
- (VII) Level Sensor :- The most common example of this type of sensor is that when we fill tank in our house it shows the level if it is filled or not.
- (VIII) Image Sensor :
- (IX) Motion-Detection :- This sensor is compiled with different IOT devices like whenever we move from one place to another and it is dark out there then by catching any motion lights are turned on on its own.
- (X) Humidity Sensor :-

## IOT Network :-

### Wireless Sensor Network :-

A wireless sensor network is a self network of small sensor nodes communicating among them using radio signals and deployed in quantity to sense the physical world.

There are 5 main elements of Sensor :-

- (i) Processor
- (ii) Power Source
- (iii) Memory
- (iv) Radio Signals
- (v) Sensors

### Categories of Sensors :-

Sensors are broadly divided in 3 categories :-

- (i) Physical Sensor :- Temp./Pressure -
- (ii) Chemical Sensor :- Optical/Gas/Smoke -
- (iii) Biological Sensor :-

### Network Access and Technology :-

- (i) LPWAN :- Low Power Wide Area Network
- (ii) Cellular Data
- (iii) BLE :- Bluetooth low Energy.
- (iv) NFC :- Near Field Communication.
- (v) RFID :- Radio Frequency Identification.
- (vi) Wi-fi :-
- (vii) Ethernet
- (viii) IPv6
- (ix) LOWPAN :- Low Power Wireless Personal Area Network.
- (x) RPL :- Routing Protocol for Low-Power.

## Challenges of IOT Networking and Concentration :-

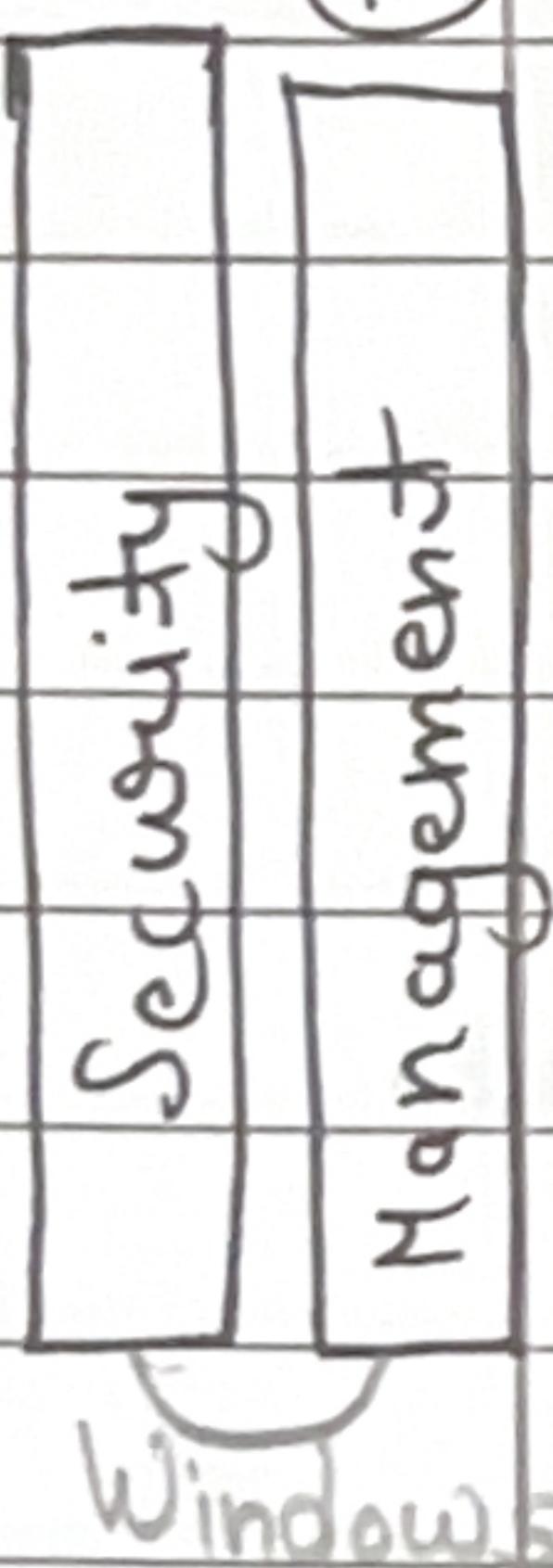
- (i) Range
- (ii) Bandwidth
- (iii) Power Usage
- (iv) Connectivity
- (v) Security

## IOT Architecture :-

### ① CISCO Architecture :- 7 layers.

7. Collaboration and Process (People & business process)
6. Application (Report and Control)
5. Data abstraction (aggregation and access)
4. Data accumulation (Storage)
3. H-Computing (Data element analysis and transformation)
2. Connectivity (Communication and Processing Unit)
1. Physical device and controller.

### ② Reference IOT Layered Architecture :- Made up of 6 layers + 2 windows.



6. Application Integration (Services & UI)
5. Integration (finds other things to communicate)
4. Context Management (Business Logics)
3. Data Management (Central Database)
2. Device Management (Controls the devices)
1. Device Integration (Includes diff' devices, measurement & action)

## Applications of IOT :-

### ① Smart Cities :-

- Traffic Management
- Lighting Control
- Water Management
- Energy

→ Waste Management

(II) Healthcare :-

- Clinical Care
- Bio Sensors

- Remote Monitoring
- 

(III) Smart Homes and Buildings :-

- Environment Control
- Intelligence Security
- Waste Management

- Smart Consumption.
- Water Management

(IV) Smart Energy :-

- Smart grids

- Fault detection monitoring.

(V) Smart Agriculture :-

- Quality Monitoring
- Safety Monitoring.

- Environment Monitoring

(VI) Smart Industry :-

- Optimized Production
- Safety Control

- Lighting Control
- Stock Control

(VII) Smart Environment :-

- Environment Monitoring
- Water Management

- Waste Monitoring
- Pollution Management.