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Subject: Internet of things (20CS735)

Unit-I :

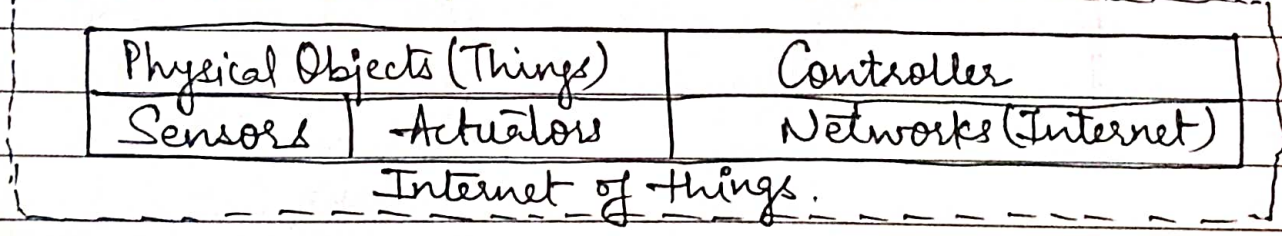
Chapter.1 : Introduction

- What is the Internet of things
- Components of IOT
- IoT Applications
- Different ~~Diff~~ Definitions & Similar Concepts
- Sensing
- Actuation
- Smart Objects
- Smart Applications

What is Internet of things?

The Internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Internet of things (IoT) is a network of physical objects or people called "Things" that are embedded with software, electronics, network, and sensors that allows these objects to collect and exchange data



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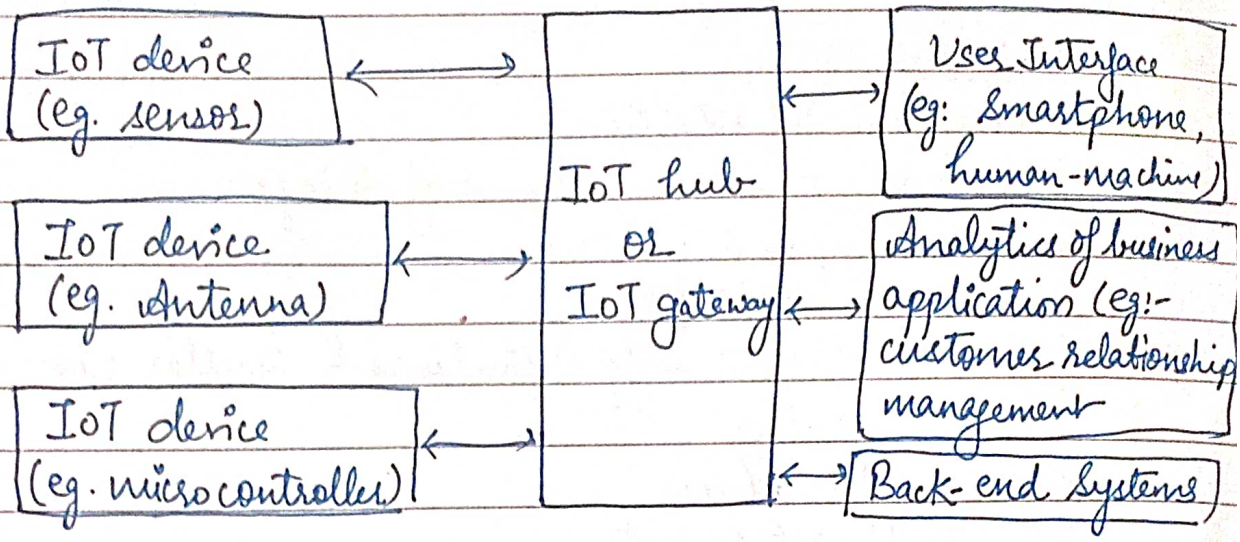
How IoT system works?



IoT Ecosystem

Internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate home, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations.

IoT enables companies to automate processes and reduce labor costs. It also cuts down on waste and improves services delivery, making it less expensive to manufacture and deliver goods, as well as offering transpency into customer transactions.

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Components of an IoT system.

There are four fundamentals components of an IOT system.

1. Sensor/Devices
2. Connectivity
3. Data Processing
4. User Interface.

(1) Sensors/Devices.

Sensors or devices are a key components that helps to collect live data from the surrounding envisonment. All this data may have various levels of complexities.

—A device may have various types of sensors which perforns multiple tasks apart from sensing. eg:- A mobile phone is a device which has multiple sensors like GPS, camera, ~~boat~~ and many more.

(2) Connectivity

Although the "i" in IoT stands for Internet. There are different kinds of networks available for communications among devices and with the platforms. Choosing the right ~~no~~ networking ~~tec~~ technology depends on the characterstics and requirements of the IoT. The main factors to take into account when choosing a networking technology for IoT are—

1) Devices
2) Required data rates
3) Network coverage.

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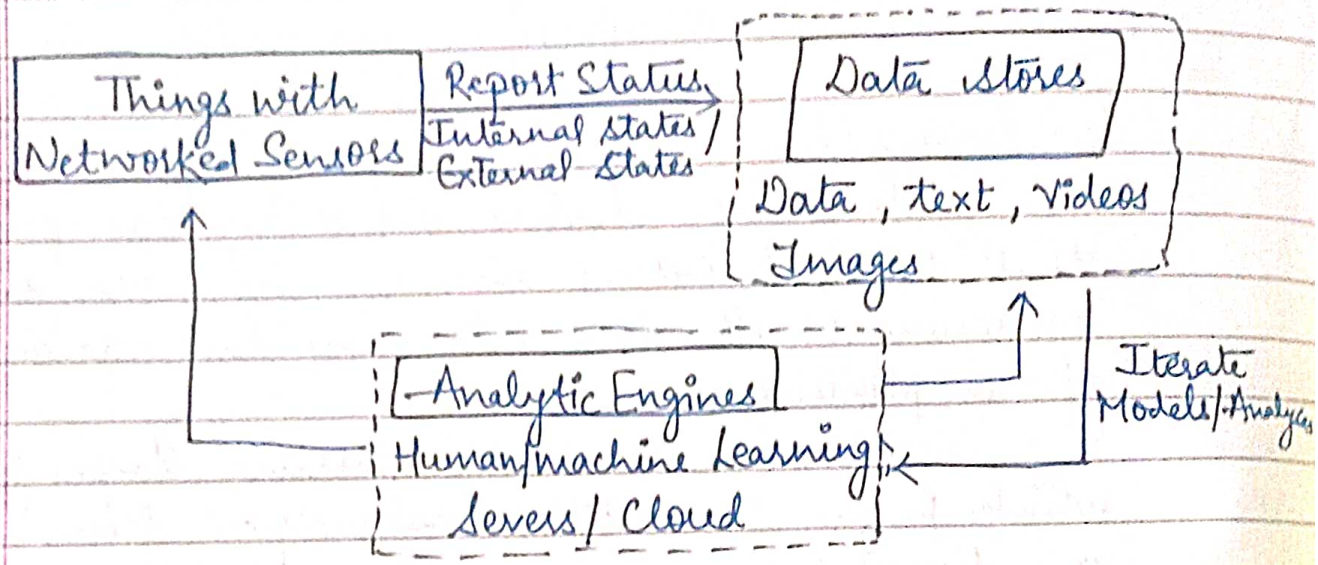
(3) Data Processing

Once the data is collected and it gets to the cloud, the software performs processing on the acquired data.



(4) User Interface

Next, the information made available to the end-user in some way. This can be achieve by triggering alarms on their phones or notifying through texts or emails.

Also, a user sometimes might also have an interface through which they can actively check in on their IOT system.

Depend upon application and complexity of the system, the user may also be able to perform an action that may backfire and affect the system.

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Applications of IoT

Different applications are related to various industries —

(1) IoT Applications in Agriculture

For indoor planting, IoT makes monitoring and management of micro-climate conditions a reality, which in turn increases production.
For outside planting, devices using IoT applications technology can sense soil moisture and nutrients, in conjunction with weather data, better quality control smart irrigation and fertilizes systems. If the ~~spring~~ sprinkler system dispense water only when needed.

(2) IoT Application in Healthcare

First and foremost, wearable IoT devices reducing hospital stays while still providing upto the minute real-time information that could save lives.
In hospitals, smart beds keep the staff informed as to availability, thereby cutting wait time for free space.
Putting IoT sensors on critical equipment means fewer breakdowns and increased reliability, which can mean the difference between life and death.

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(3) IoT Applications in Manufacturing

RFID and GPS technology can help a manufacturer track a product from its start on the factory floor to its placement in the destination store, the whole supply chain from start to finish. These sensors can gather information on travel time, product condition, and environment conditions that the product was subject to.

Sensors attached to factory equipment can help identify bottlenecks in the production line, thereby reducing lost time and waste. Other sensors mounted on those machines can also track the performance of the machine, predicting when the unit will require maintence, thereby preventing costly breakdowns.

(4) IoT-Application in Retail

IoT technology has a lot of offer the world of retail. Online and in-store ~~application~~ shopping sales figures can control warehouse automation and robotics, information gleaned from IoT sensors.

IoT can help analyze mall traffic so that stores located in malls can make necessary adjustments that enhance the customer's shopping experience while reducing overhead.

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Speaking of customer engagement, IoT helps retailers target customers based on past purchases. Equipped with information provided through IoT, a retailer could draft a personlized promotion for their loyal customers, thereby eliminating the need for costly mass-marketing promotions that don't stand as much of a chance of success.

(5) IoT Applications in Transportation

→ Self-driving cars

→ GPS system is being utilized to help transportation companies plot faster and more efficient routes for trucks freight, thereby speeding up delivery ~~items~~. times.

(6) IoT Applications in Utilities/Energy

→ IOT sensors can be ~~emp~~ employed to monitor environmental conditions such as humidity, temperature and lighting. The information provided by IOT sensors can aid in the creation of algorithms that regulate energy usage and make appropriate adjustments, eliminating the human equations.

→ Other wearables includes virtual glasses and GPS tracking belts. These small and energy-efficient devices equipment with sensors and software collect and organize data about users.

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Different Definition of Internet of Things

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

IoT is an advanced automation and analytics system which exploits networking, sensing, bigdata, and artificial intelligence technology to deliver complete systems for a product or services.

The Internet of things (IoT) describes the network of physical objects — "things" — that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronic, software, sensors, actuators and connectivity to enable objects to exchange data with the manufacturer, operator, and/or other connected devices.

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The Internet of Things (IoT) is the network of devices such as vehicles and home appliances that contain electronics, software, actuators and connectivity which allows these things to connect, interact and exchange data.

Internet of Things refers to the networking capability that allows information to be send to and received from objects and devices (such as fixtures and kitchen appliances) using the Internet.

~~How IoT works~~ ?

Sensor and Actuators

Sensor

Sensors are technical components for qualitative or quantitative measurement of certain chemical or physical variables and properties, for example, temperature, light (intensity & color), acceleration, electricity and so on.

When a sensor is employed together with a processor (controller), a power supply, and a unit for data transmission, this is referred to as a sensor node.

A sensor node's primary function is to collect, pre-process and transmit sensor data from its environment to other sensor data nodes or a base station.

Sensor nodes are connected to an intermediary network that forward the data that they collect to a computer for analysis.

Sensor nodes are installed in their workspace to function for years, peferably without requiring any maintenances or human intervention. They must have a low energy requirement and have batteries that are functional over several years.

Actuators

Actuators convert electrical signals (eg:- commands emanating from the control computer) into mechanical motion or other physical variables (eg:- pressure or temperature) thus actively intervene with control system and/or set variables.

Types of actuators include hydraulic, pneumatic, electric, mechanical or piezoelectric. They convert signals or setting and regulation specifications of a control into mechnical work.

In robotics, the term effector is often used as an equivalent for actuators. Effectors allows a robot to grasp and manipulate objects, and thus produce an effect.

In computerized world of things, actuators play an important role in the ~~sole~~ realization of actions and effects as a counterpart of to the sensory-detect detected corresponding contexts.

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	Sensor	Actuator
1	A device that detect events or changes in the environment and sends that information to other electronic devices.	A components of a machine that is responsible for moving and controlling mechanism.
2.	Connected to the input ports of the system.	connected to the output ports of the system.
3.	Help to monitor the changes in the environment	Helps to control the environment or physical changes
4.	Output is an electrical signal	Output is a movement.
	eg:- biosensors, image sensor, motion sensors	eg:- electric motor, stepper motor.

Smart objects

A smart objects are an objects that chances the interaction with other smart objects as well as people also.

In a day to day life, people have a lot of objects with ~~interact~~ internet or wireless or wired connection such as—

1. Smartphones
2. Tablets
3. TV computers.

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Capabilities required in every smart objects

1. Unique Identity
2. Communication capability
3. Unique Name & Address
4. Processing Powers
5. Sensing abilities.
6. Physical & Shape.

Smart Applications

Smart Applications are innovative systems that gather tremendous amount of data from sensors and other sources, using machine learning algorithms or other predictive analytics to make this information actionable for users and to improve experiences.

Smart Applications are —

1. Intelligent – It use analytics, machine learning and AI services to make recommendations and predictions that guide users and things to take the next best action.

2. Contextual – Using personal, sensor and location data, Smart Applications are personalized, embedded in users processes and available on any channel/device.

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③ Proactive - Smart Application come to user versus the other way around, leveraging push notifications, chatbots and messaging services to proactively interact with users and give them smart recommendations of what to do and when.

Smart Applications V/s Traditional Application

	Smart Applications	Traditional Application
Data Orientation	Data driven	Data blind.
Architecture	Loosely coupled; microservices	Tightly coupled; monolithic
Evolution	Dynamic	Static
Personalization	Custom-tailored	One size fits all.