

Q1] Give an overview of IOT.

IOT systems allows users to achieve deeper automation, analysis & integration within a system. They improve the reach these areas & their accuracy. IOT utilizes existing & emerging technology for sensing, n/w & robotics.

IOT key Features:-

The most important feature of IOT include AI, connectivity, sensors active engagement & small device use.

* IOT Advantages

- Improved customer engagement.

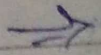
current analysis suffer from blind spots & significant flaws in accuracy, & as need engagement remains passive, IOT completely transforms this to achieve richer & more effective engagement with audiences.

- Technology optimization

The same technologies & data which improve the customer experience also improve device use, & aid in more patent improvements to technology. IOT unlocks a world of critical functional & Field data.

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Q2. Describe timeline history (evolution) of industry 4.0.



Industry 4.0 also known as the Fourth industrial revolution, represents a significant shift in the way industries operate & produce goods. It is characterized by integration of digital technology, data & the IOT into traditional manufacturing processes. with the stages set by 3 previous revolution. Industry 4.0 takes us into a new era of manufacturing. It builds upon the digitalization & automation of 3rd revolution but takes it to new height.

★ Here are some key aspects of industry 4.0:-

1) Connectivity :- Industry 4.0 thrives on interconnected systems. Machines & devices communicate with each other in real time through the IOT this connectivity allows for seamless exchange of information & data analysis.

2) Data & Analytics :- Data is the lifeblood of industry 4.0. It is collected from various sources & analyzed using advance analytics tools enabling manufacturers to make informed decision & optimize processes.

3) Smart Manufacturing
In industry 4.0 smart factories are equipped with machines that can make autonomous decisions. These smart machines are highly adaptable & can adjust to changing condⁿ & requirements.

4) Customization & Efficiency
With advanced technologies, manufacturing can produce highly customization products efficiently. This caters to the growing demand for personalized goods.

* Key Features of industry 4.0 :-

- ① Cyber-physical system
- ② Internet of Things
- ③ Big data and analytics
- ④ ML & AI
- ⑤ Digital twin technology
- ⑥ cloud computing
- ⑦ Smart factories

Q. Why fog computing is necessary for industrial analytics?

- ⇒
- Fog computing is a way to process data closer to where it's generated, instead of sending it to a far away cloud or server.
- Cloud computing is like sending your laundry to a distant factory to be washed.
 - Fog computing is like having a washing machine in your own home, so you can wash your cloths right away

Fog computing brings the processing power closer to the source of the data, so it can be analyzed & acted upon quickly, without having to travel far. This makes it especially useful for things like - real-time monitoring & control

- IOT Devices
- Industry Automation
- Smart cities
- Transportation systems

In simple words, fog computing is like having a "mini-cloud" near the source of the data, to process & analyze it quickly & efficiently. fog computing is necessary for industrial analysis because it addresses the challenges of big data, real time processing & security, enabling industries to make faster more informed decision.

4. Write a real life case study on application of IIOT in smart transportation system.

⇒ Case study :- smart traffic management system.

Background :- In pune's transportation network is one of the most efficient in India, but the city-state faces challenges like congestion & traffic accidents. To address these issues, the pune government implement on IIOT based smart traffic management system.

Solution :-

- 1) Sensor Deployment :- Installed sensors & cameras at major interesections & road to collect real time data on traffic volume, speed & incidents.
- 2) Data Analytics :- Used IIOT platforms to analyze data & predict traffic congestion, identifying potential bottlenecks.
- 3) Real time monitoring :- provided real-time traffic updates to drivers through mobile apps & digital signage.

• Benefits :-

- ① Reduced congestion :- Improved traffic flow & reduced congestion by up to 20%.
- ② Optimized maintenance.

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5. Write short note on cloud computing.

Cloud computing refers to the use of hosted services, such as data storage servers, database, networking & software over the internet. The data is stored on physical servers which are maintained by a cloud provider.

Type of cloud computing :-

cloud computing can either be classified based on deployment model or the type of service based on specific deployment mode. we can classify cloud as public, private & hybrid cloud. At the same time, it can be classified as IaaS, PaaS, SaaS, based on the service the cloud model offers.

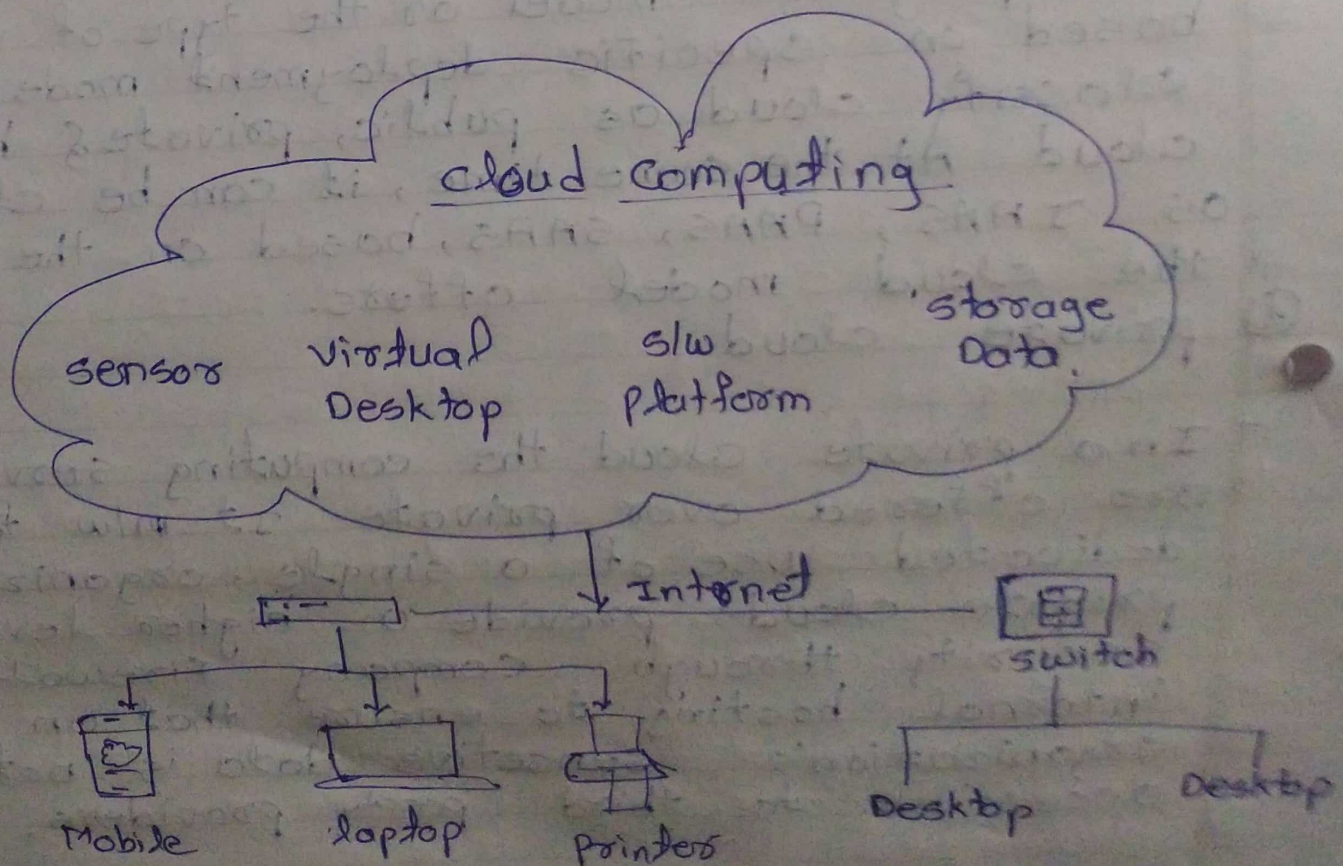
① private cloud

In a private cloud the computing services are offered over private. It mlw for the dedicated use of a single organization. private clouds provide a higher level of security through company firewalls & internal hosting to ensure that an organization's sensitive data is not accessible to third party providers.

* public cloud

- Public cloud refers to computing services offered by third party providers over internet. It has available to everyone.

* Hybrid cloud uses a combination of public & private cloud features.



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Q Write short note on MQTT

Message Queuing Telemetry Transport is a communication protocol designed for IoT devices with extremely high latency & restricted low bandwidth.

It is a simple, lightweight messaging protocol used to establish communication between multiple devices. It is TCP based protocol relying on publish-subscribe.

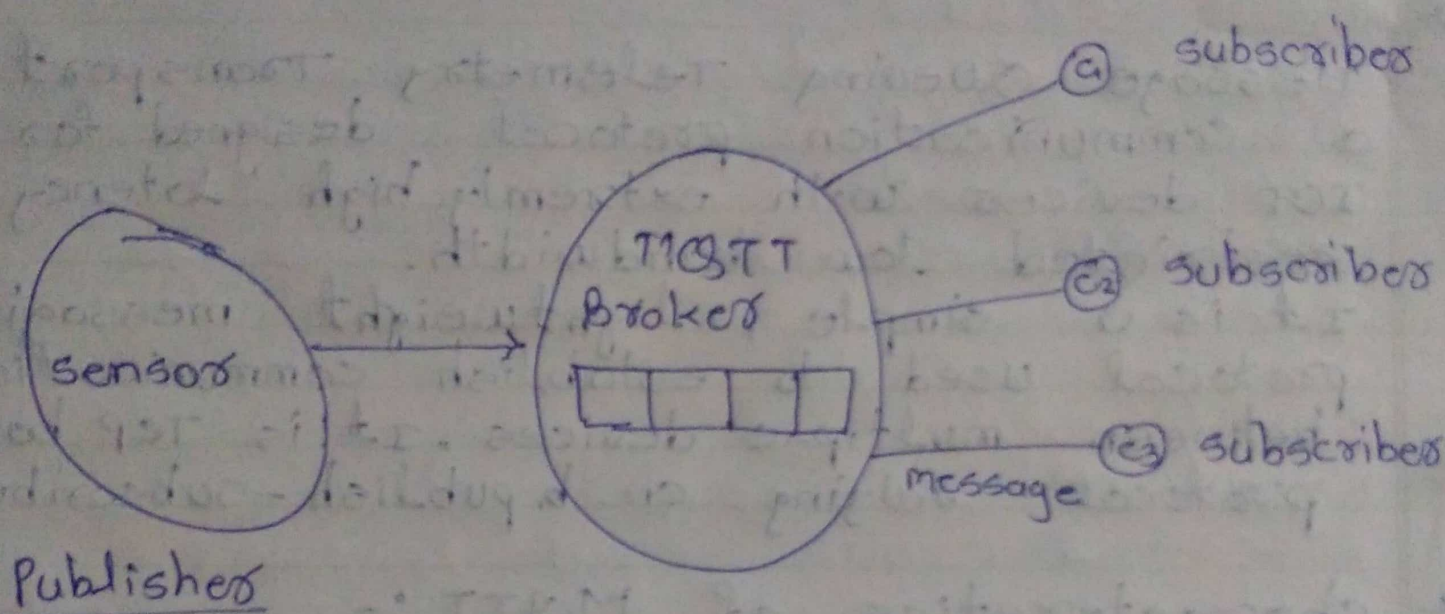
* Characteristics of MQTT :-

Lightweight :- MQTT is designed to be lightweight, making it suitable for use in constrained environments inclusive of embedded systems & low strength devices.

Publish-subscribe model :-

In publish-subscribe version, clients send message to subjects & different clients acquire message from subject of interest. It uses publish subscribe model, where a central broker receives messages from publishers & routes them to subscribers. The sender & receiver don't have a direct connection.

It is a standard-based messaging protocol, or set of rules, used for machine to machine communication.



MQTT Protocol