1) Define IOT. Discuss the evolutionary phases of the internet.

IOT refers to the network of interconnected physical devices embedded with sensors software & other technologies enabling them to collect & exchange data.

Broadly categorized into 3 phases :-

1) Internet 1.0 (1960s - 1990s) :- This phase focused on creating the foundational infrastructure for connecting computers & sharing information. It laid the groundwork for email, basic file sharing & development of the WWW.

2) Internet 2.0 (2000s - 2010's) :- characterized by the rise of interactive & dynamic content, social media & e-commerce

3) Internet 3.0 (2010's onwards) :- characterized phase involves the proliferation of IOT, artificial intelligence & increased connectivity. It aims to create more intelligent & context aware internet

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2) Describe the IOT reference model published by IOT world Forum.

It includes the layer as

1) Perception layer :- It involves sensors & actuators that collect data from the physical environment.

2) Network layer :-
Focuses on communication protocols & technologies to transmit data between devices & the cloud.

3) Middleware layer :-
Manages data processing, storage & communication b/w the edge & cloud components.

4) Application layer :-
Utilizes processed data to provide specific services & applications, often involving analytics & decision-making.

5) Business layer :-
Encompasses business process applications & services that utilize IOT data for strategic decision making.

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3) Identify the data related problems that are needed to be addressed. Explain how data is managed with fog computing.

Data related problems.

* Data volume :-
The sheer volume of data generated by IOT devices can overwhelm networks & storage systems.

* Data velocity :-
The speed at which data is generated & needs to be processed, especially in real time scenarios.

* Data variety :-

IOT devices produce diverse data formats requiring flexible & scalable data management solutions.

* Data veracity :-

Ensuring data accuracy & reliability, as errors or inconsistencies can lead to incorrect insights.

* Data security :-

protecting sensitive IOT data from un-authorized access, manipulation or breaches

Fog computing.

1) Data processing at the edge.

* Fog computing allows data processing to occur closer to where it is generated at the edge of the network, rather than relying solely on centralized cloud servers

* It enables quicker analysis & response time.

2) Data storage :-

Fog nodes may have local storage capabilities allowing them to store & manage data locally.

* This helps in situations where continuous connectivity to the cloud may not be guaranteed or when quick access to data is essential

3. Data Filtering & preprocessing :-
Fog nodes can filter & preprocess data at the edge before transmitting it to the cloud. This reduces the amount of raw data sent to the central cloud, optimizing bandwidth usage.

4. Security & Privacy :-
It enhance data security by keeping sensitive information closer to its source, reducing the risk of data breaches during transit to the cloud.

Privacy concerns can be addressed by processing & storing data locally, minimizing the need for transmitting sensitive information over the network.

5. Dynamic resource allocation :-
Based on specific requirements of applications & devices at the edge.

This adaptability enhances overall system performance & efficiency.

6 Collaboration with cloud :-
Fog computing is often integrated with cloud services, processed & filtered data can be sent to the cloud for further analysis, long-term storage, (or) to leverage additional computational resources.

4) difference between IT & OT

1. Information technology:

→ Focus:- IT primarily deals with information, data & communication technology.

→ Application:- It is commonly associated with business applications, data management, software development, networking, & cyber security.

→ Example devices:-
computer, server, router, switches, database & personal devices like laptops & smartphones are part of IT domain

→ Goal:- It aims to enhance business process improve efficiency & manage information for decision making.

2) Operational technology:

→ Focus:- OT is concerned with the physical process & industrial control system and to monitor & control physical device & process.

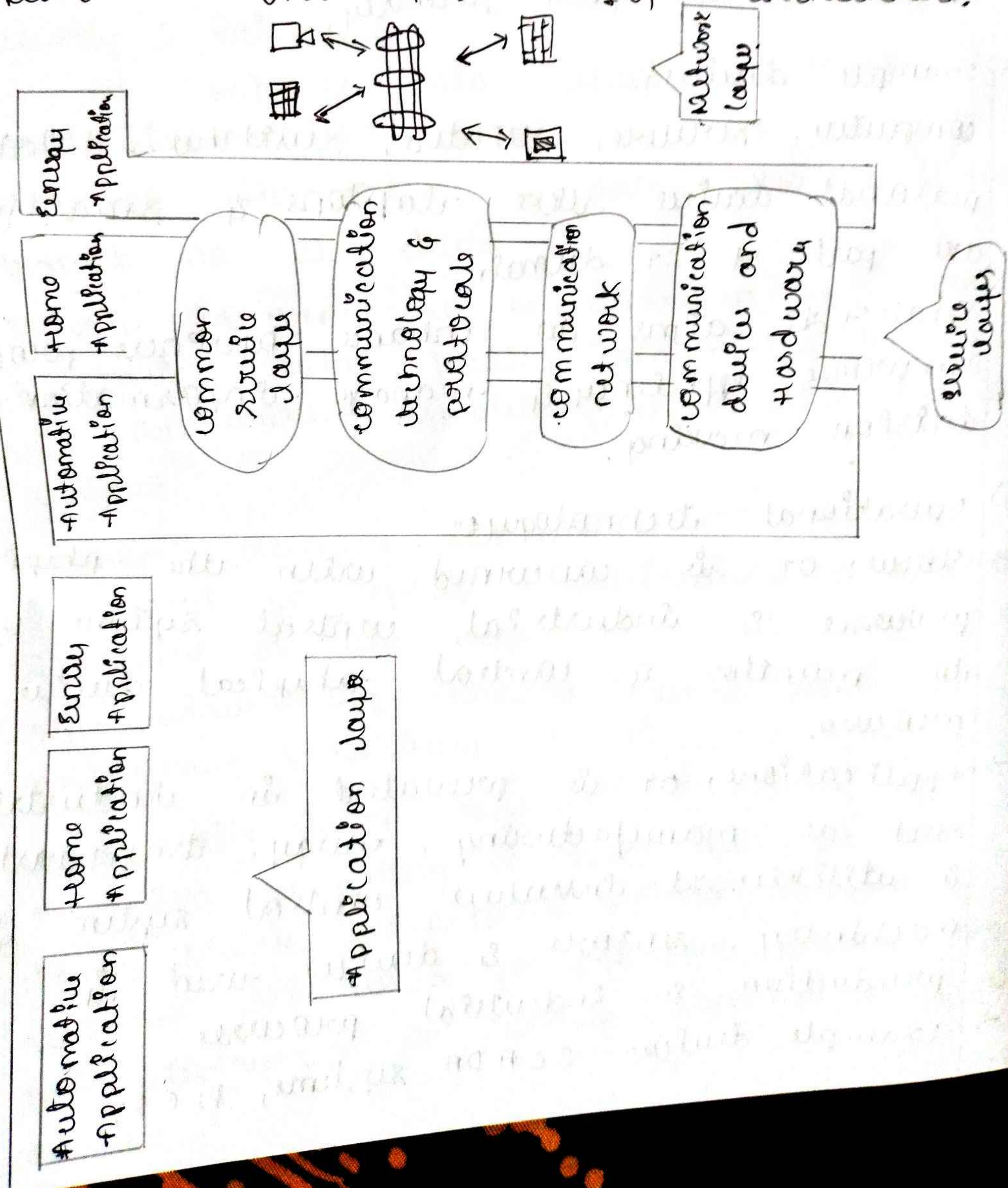
→ Applications:- OT is prevalent in industries such as manufacturing, energy, transportation & utilities. It involves control system for machinery, sensors & devices used in production & industrial process

→ Example devices:- SCADA systems, PLCs;

Industrial robots, sensors & fall under OT domain

→ Goals: OT aims to monitor, control & optimize physical process to ensure the smooth operation of Industrial systems

5) Describe one M2M IOT architecture.



It has 3 major domains:-

1) application layer:-

The one M2M architecture gives major attention to connectivity between devices & their applications. The domain includes the application layer protocols and attempts to standardize north bound API definition for the interaction with business intelligence (BI) system.

2) service layer:-

This layer is shown as a horizontal frame that covers the vertical industry applications. At this layer, horizontal modules include the physical network that the IOT application run (or) the underlying networks, VPN's & so on.

3) Network layer:-

This is the communication domain for the IOT devices & endpoints. It includes the devices themselves & the communication network that links them.