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- How it works: AMQP allows IOT devices to send and receive messages across different platforms in a standardized and secure manner, ensuring the message delivery even if the connection is lost temporarily.

- Use Case: Smart city applications or industrial IOT, where reliable and guaranteed message delivery is crucial.

- Advantages :-
  - Guaranteed message delivery.
  - High scalability.
  - Support for complex routing and message patter

Security Considerations in IoT Protocols :-

- Security is a critical aspect in IOT environments because many IOT devices are resource-constrained, making traditional security measures challenging to implement.

- TLS/DTLS (Transport Layer Security / Datagram TLS): Ensures secure communication between devices in protocols like MQTT or CoAP.

- AES (Advanced Encryption Standard) :- Commonly used for encrypting communication in Zigbee and LoRaWAN.

- OAuth 2.0 :- Used to provide secure access to

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- Channel Access :-

1) Contention Based Method (Carrier - Sense Multiple Access with Collision Avoidance Mechanism) :-
2) Contention Free Method (Coordinator dedicates a specific time slot to each device (Guaranteed Time Slot (GTS)))

- Zigbee Applications :-

① Home Automation
② Medical Data Collection
③ Industrial Control Systems
④ meter reading system
⑤ light control system
⑥ Commercial
⑦ Government Markets Worldwide
⑧ Home Networks.

Network Layer Protocol :-

Network layer is responsible for the transmission of data or communication from one host to another host connected in a network. Rather than describing how data is transfered, it implements the technique for efficient transmission. In order to provide efficient communication protocols are used at the network layer. The data is being grouped into packets or in the case of extremely large data it is divided into smaller sub packets. Each protocol used has specific

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features and advantages.

- Functions of Network layer:-

The network layer is responsible for providing the below-given task:-

- Logical Addressing:- Each device on the network needs to be identified uniquely. Therefore network layer provides an addressing scheme to identify the device. It places the IP address of every sender and the receiver in the header. This header consists of the network ID and host ID of the network.

- Host-to-host Delivery of Data:- The network layer ensures that the packet is being delivered successfully from the sender to th receiver. This layer makes sure that the packet reaches the intended recipient only.

- Fragmentation:- In order to transmit the larger data from sender to receiver, the network layer fragments it into smaller packets. Fragmentation is required because every node has its own fixed capacity for receiving data.

- Congestion Control:- Congestion is defined as a situation where the router is not able to

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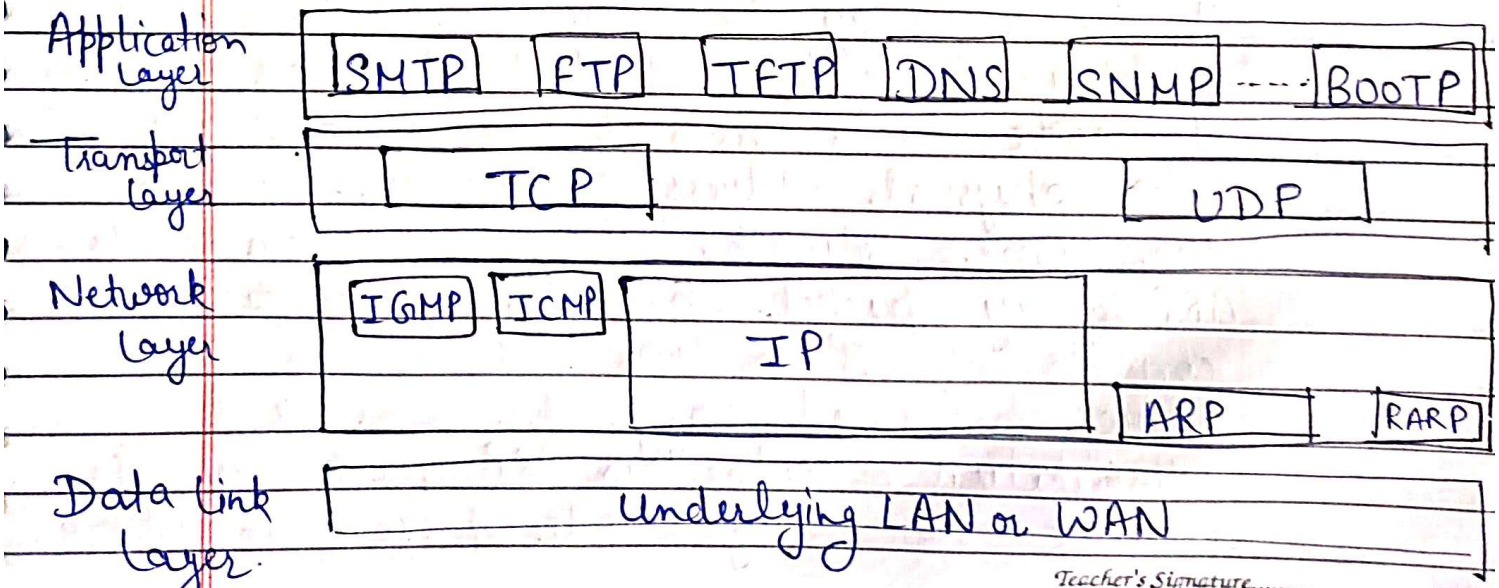
route the packets property which results in aggregation of packets in the network. Congestion occuss when a large amount of packets are flooded in the network. Therefore network layer controls the congestion of data packets in the network.

- Routing and Forwarding :- Routing is the process that decides the route for transmission of packets from sender to receiver. It mostly chooses the shortest path between the sender and the receiver. Routing protocols that are mostly used are path vector, distance vector routing, link state routing etc.

- Network Layer Protocol :-

These are various protocols used in network layer. Each protocol is used for different task.



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5 Layer Architecture of IOT :-

IOT includes many smart devices connected to a broad Internet network with the help of various networking technologies. Mostly these technologies are wireless. This makes the structure more complex and difficult to manage. Therefore, architecture is required. An architecture is a structure for the specification of a network's physical components and their functional organization and configuration, its operational principles and procedures, and data formats used in its operation. The development of IOT depends on the technologies used, application areas and business aspects. There are various IOT architectures are available for IOT devices. However, the "5 Layer Architecture is considered as the best-proposed architecture of IOT."

1) Perception Layer :-

This is the first layer of IOT architecture. In the perception layer, a number of sensors and actuators are used to gather

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useful information like temperature, moisture content, intruder detection, sounds, etc. The main function of this layer is to get information from surroundings and to pass data to another layer so that some actions can be done based on that information.

2) Network Layer :-
As the name suggests, 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. This is also called communication layer because it is responsible for communication between perception and middleware layer. All the transfer of data done securely keeping the obtained data confidential.

3) Middleware Layer :-
Middleware layer has some advanced features like storage, computations, processing, action taking capabilities. It stores all data-set and based on the device address and name it gives appropriate data, to that devices. It can also take decisions based on calculations done on data-set obtained from sensors.

4) Application Layer :-
The application layer manages all application process based on information obtained from

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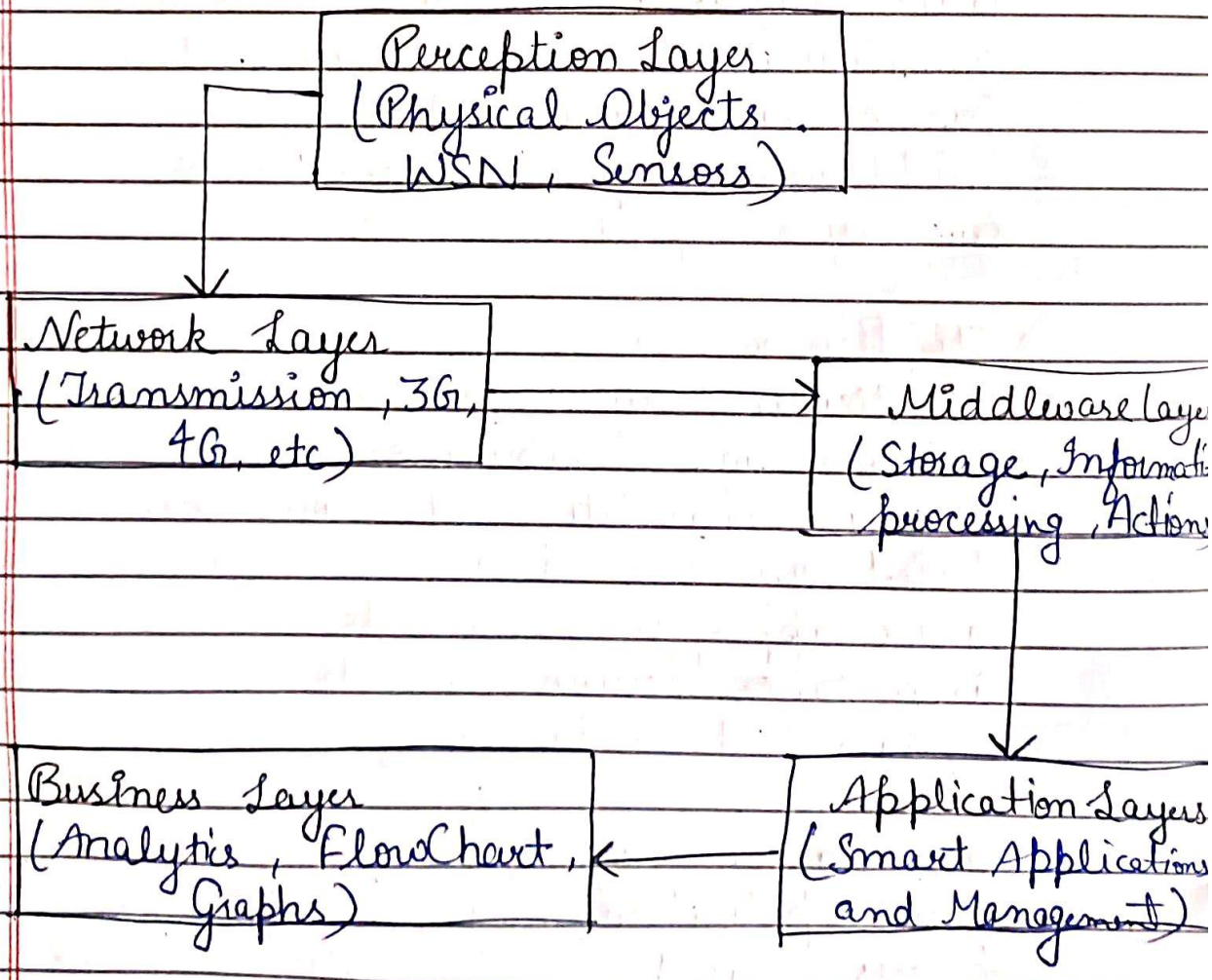
middleware layer. This application involves sending emails, activating alarm, security system, turn on or off a device, smartwatch, smart agriculture etc.

5) Business Layer:-
The success of any device does not depend only on technologies used in it but also how it is being delivered to its consumers. Business layer ~~doesn't~~ does these tasks for the device. It involves making flowcharts, graphs, analysis of results, and how device can be improved etc.



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