



Directorate of Distance and Online Education

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Page No- 01

Ques①

Importance of Network Topologies

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Network Topologies play a crucial role in designing & implementing computer networks. They define the physical & logical layout of interconnected devices and communication links within a network. There are various key aspects of importance that can be considered:

- ① Efficiency and Performance: Different network topologies offer different levels of efficiency and performance. Some topologies such as star topology, provide central management, while others like mesh topology provide efficiency in terms of fault tolerance.
- ② Scalability: Network topology also influences the scalability of any network. Scalability means the network's capacity to accommodate growth in terms of number of devices and users.
- ③ Reliability and Fault Tolerance: Network failure & downtime can have severe consequences for different organizations. Certain topologies such as mesh topology, ring topology have various built-in fault tolerance mechanisms & (bidirectional) redundant paths to acquire so.
- ④ Cost and Resource Utilization: Network topologies impact the cost of network infrastructure and resource utilization. Some topologies may require extensive cabling and hardware leading to higher implementation costs.
- ⑤ Security: Security is another aspect influenced by the topology. Different topologies have different aspects of threat protection & vulnerabilities.
- ⑥ Management: Management & Administration of the network is also impacted by the choice of topology.

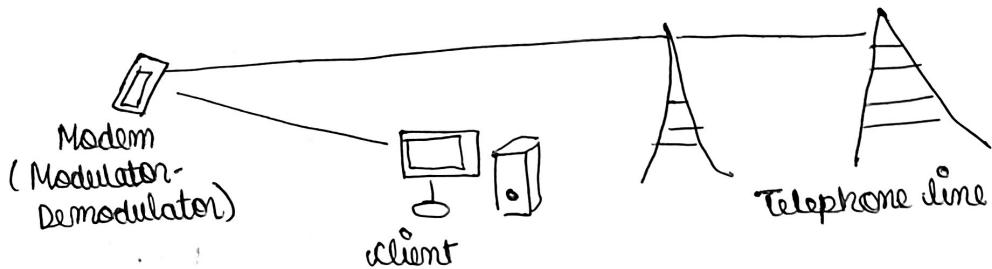
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Different Access Method

Different Access Technologies

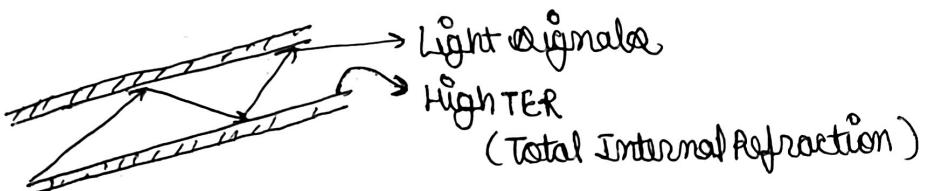
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- ① Dial Up Access: This technology uses a standard telephone line and a modem to establish the connection between device and the internet.

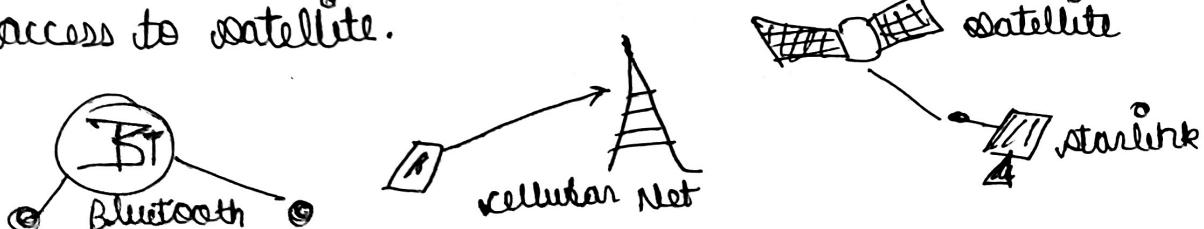


- ② DSL (Digital Subscriber Line): It uses a special high frequency modem, where the data could be transferred over the telephone line with voice calls alongside.

- ③ Fiber Optics: Fiber optics technology uses optical fibers to transmit data using light signals. It has a high refractive index that allows refraction of light. It is capable of very fast data transfer.



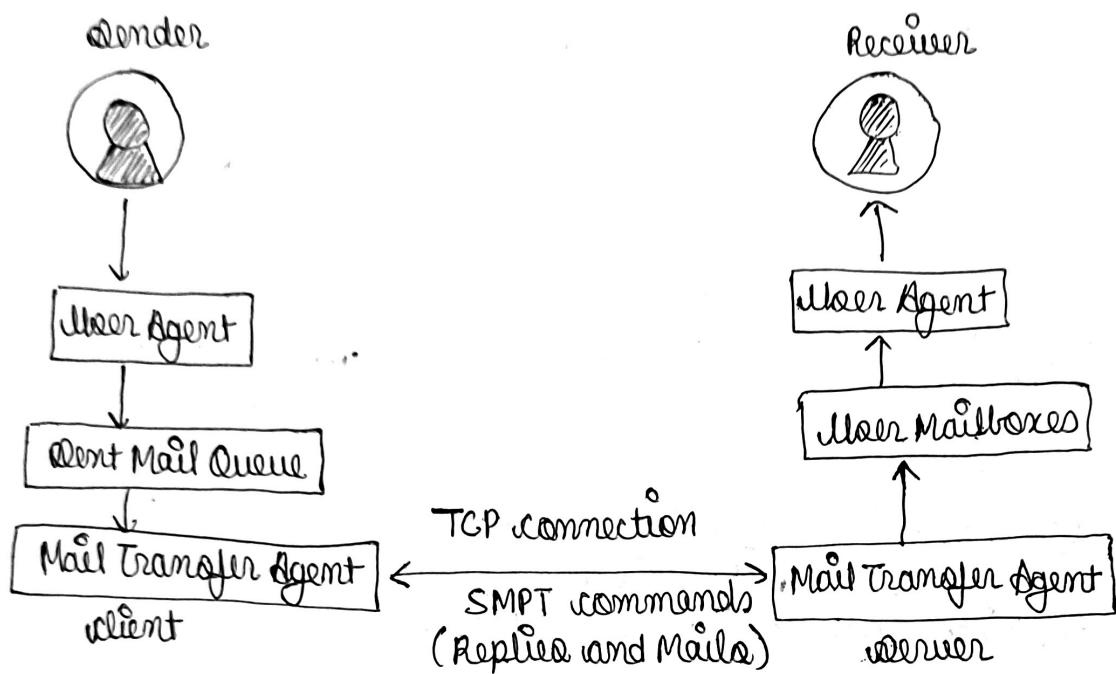
- ④ Wireless Access (Wireless fidelity, Bluetooth): Wireless technology uses various zones of light spectrum for access to network. WiFi uses radio waves similar to Bluetooth (Short Radio UFC). Infrared uses infrared for data transfer. Even Lifi is getting common these days. Cellular Networks are also used for data transfer using Mobile Broadband. And devices like starlink directly have access to satellite.



Ques 3

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Working of SMTP



- ① Sender's Mail client: Sender composes mail from his mail client, like Google's gmail, or MS's outlook.
- ② Communication to SMTP server: Mail client establishes connection with the mail server regarding the composed mail. ~~DNS~~ DNS is used to locate receiver's SMTP server using mail exchange records (MX records).
- ③ Message transfer: Sender's SMTP server sends/transfers mail to Receiver's SMTP server using SMTP (Simple mail transfer protocol) commands over internet.
- ④ Receiver's Mail Client: Message is sent to user's (receiver) mail client & stored in user mailboxes of the receiver.

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Ques 6

Services provided by Data Link Layer

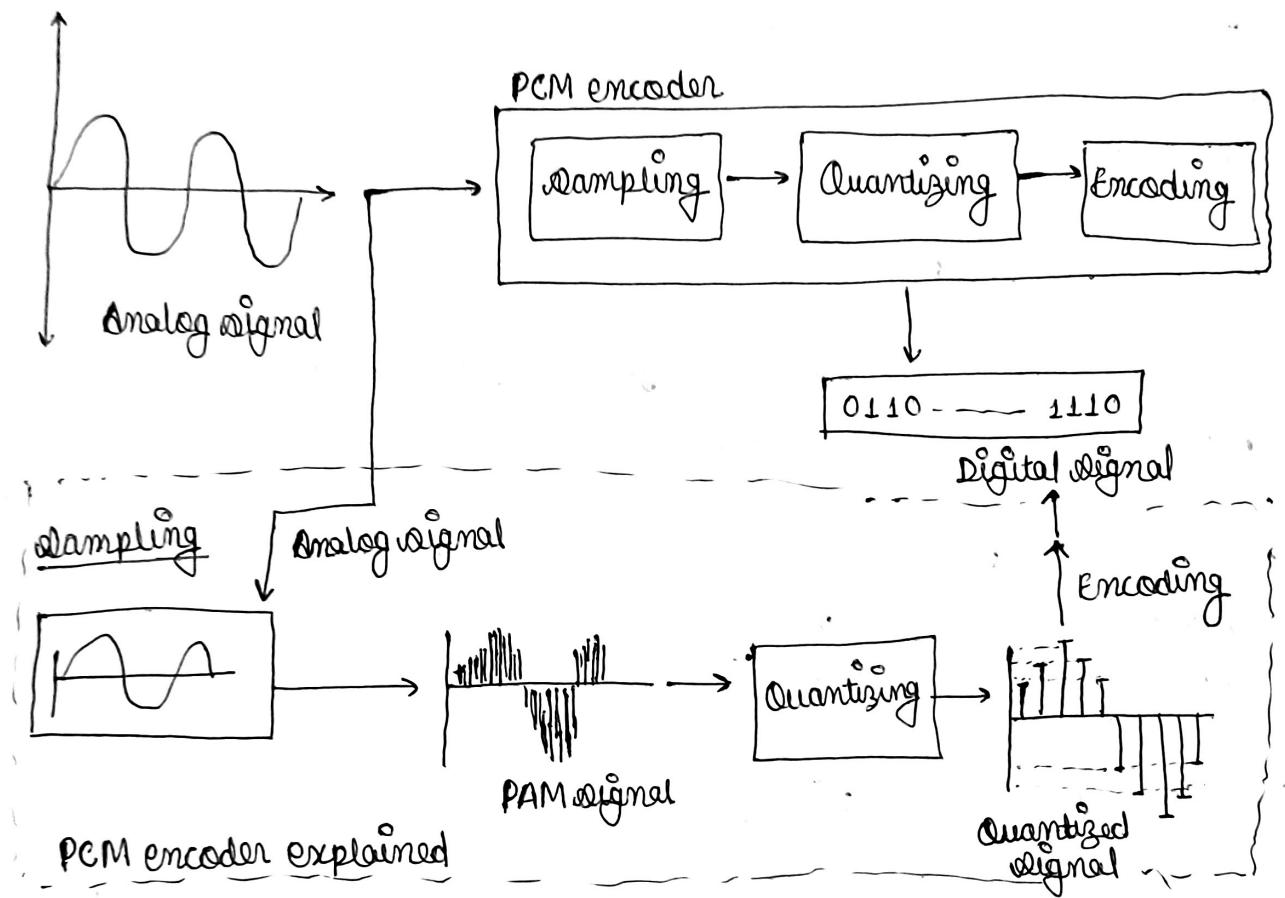
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The data link layer is the second layer in the OSI (Open Systems Interconnection) model responsible for providing reliable data transfer between adjacent network nodes. Some of the key services provided by Data Link layer are:

- ① Encapsulation & Framing: The data link layer encapsulates and converts the physical layer data into frames adding necessary control information to them. Framing divides continuous data into manageable units.
- ② Addressing: Data link layer also assigns unique physical addresses to network interface cards (NICs) to facilitate communication between devices on the same network segment.
- ③ Media Access Control: The data link layer manages access to physical medium, coordinating the transmission of data among various devices sharing same access medium. MAC protocols like CSMA/CA & CSMA/CD govern access to shared medium.
- ④ Error Detection & Control: The data link layer detects and even corrects the errors that can happen while data transmission over a physical medium. Techniques such as cyclic redundancy check (CRC) are used for this.
- ⑤ Flow control: Flow control mechanisms ensure the checks against events of data overflow & data underflow.
- ⑥ Link Establishment & Termination: Data link layer establishes & terminates the logical connection between various nodes available over the network physically.

Pulse Code Modulation

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The Pulse Code Modulation happens in following steps:

- ① Sampling: The analog signal is sampled at regular intervals to obtain discrete amplitude values.
- ② Quantization: Each sampled amplitude is quantized into a digital representation using a finite number of levels. These number of levels determine the resolution of quantization process.
- ③ Encoding: Final step is encoding where each quantized level amplitude is encoded/represented by a binary code.

The resultant is a binary code (digital) signal which represent amplitude of analog signal at various timesteps/instant.