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Class 12th

Unique Notes

COMPUTER SCIENCE & ENTREPRENEURSHIP

Prepared for the Session 2026-27
According to the New Curriculum of PECTAA 2025-26



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UNIQUE NOTES, COMPUTER 12th

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Chapter 01

COMPUTING SYSTEMS

1. Introduction to Computer Networks
2. Network Architecture & Basic Concepts
3. Types of Computer Networks
4. Networking Devices
5. Network Topologies
6. Network Models & Layers
7. Network Protocols & Services
8. IP Addressing & Subnetting
9. Home Network Setup & Configuration
10. Wi-Fi Security & Router Configuration
11. Network Diagnostic Tools & Commands
12. Network Performance
13. Network Load Balancing
14. Network Security
15. Data Backup & Recovery
16. Usability & Security Tradeoffs

Introduction

This chapter introduces the fundamental concepts of computer networks and explains how devices communicate with each other. Students learn about network architecture, key components, and the basic working of networks. It covers network models and layers, particularly the OSI model, along with different network topologies and types. The chapter also explains common networking devices such as NICs, switches, routers, modems, and Wireless Access Points (WAP).

Students are introduced to essential protocols and services like TCP/IP, HTTP, FTP, and DNS, as well as concepts of IP addressing, IPv4/IPv6, subnetting, and NAT. They learn how to set up and configure home networks, including wired and wireless connections, and understand Wi-Fi security and encryption. The use of network diagnostic tools such as ping and ipconfig is also discussed. Finally, the chapter highlights network performance, security measures, and real-world practices to ensure safe and efficient communication.

Q.1 Define a computer network. Explain its importance and uses in daily life. 12501001

Ans. ★ Key Points: Computer Network | Importance of Computer Network | Uses of Computer Networks

A computer network allows different devices to connect and communicate with each other. It helps in sharing information quickly and easily. Communication through networks saves time and effort. Computer networks are used in homes, schools, offices, and businesses. Modern life depends heavily on computer networks for daily tasks. Networks can

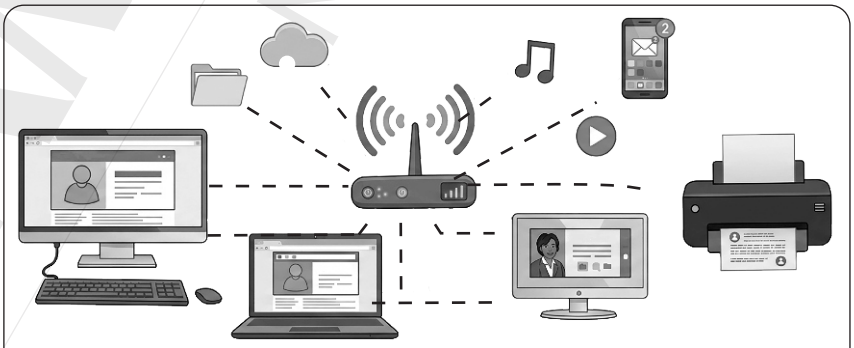


Figure 1.1: A computer network connects multiple devices to share data and resources.

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connect computers, mobile phones, printers, and other digital devices. These devices communicate using cables or wireless signals. A network allows data, files, and resources to move from one device to another. Networks can be small or large depending on the need.

Importance of Computer Networks

- Networks make communication fast and easy.
- They allow users to share files and information.
- They help people work together from different locations.
- They save time and improve productivity.
- They support online learning, business, and entertainment.
- They make it easy to share resources such as printers and Internet connections.

TIDBIT	
Q.	**How do computer networks support online learning, remote work, and business operations?** **12501001a**
Ans.	Networks support online learning and remote work. Businesses rely on networks for daily operations.

Uses of Computer Network

- Internet browsing is a common use of computer networks.
- Mobile phones use networks for calls, messaging, and applications.
- Schools use networks for online classes and learning management systems.
- Banks use networks for online banking, fund transfers, and ATM services.
- Social media platforms operate through computer networks.
- Smart homes use networks to connect and control smart devices. **(OR)**

Uses of Computer Networks in Daily Life

- **Internet Browsing:** People use networks to access websites, search for information, watch videos, and read news online.
- **Communication:** Networks allow people to send emails, text messages, make voice calls, and attend video meetings.
- **Online Learning:** Students can attend online classes, submit assignments, and access educational materials through networks.
- **Business Operations:** Companies use networks to share data, communicate with employees, and manage daily activities.
- **Online Banking:** Banks use networks to provide online banking services, money transfers, and ATM transactions.
- **Social media:** Applications such as Facebook, Instagram, WhatsApp, and YouTube work through computer networks.
- **Resource Sharing:** Networks allow multiple users to share printers, files, storage devices, and Internet connections.
- **Smart Homes:** Smart devices such as cameras, lights, air conditioners, and security systems use networks to work together.

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Q.2 Explain network architecture and describe the main components of a computer network. **12501002**

Ans. ★ Key Points: Network Architecture | Components of Network Architecture

Network architecture is the overall design of a computer network. It shows how computers, servers, and other devices are arranged. It also defines how data is transmitted across the network. Network architecture includes hardware, software, and communication rules. A good architecture helps the network work efficiently. It also supports future expansion of the network.

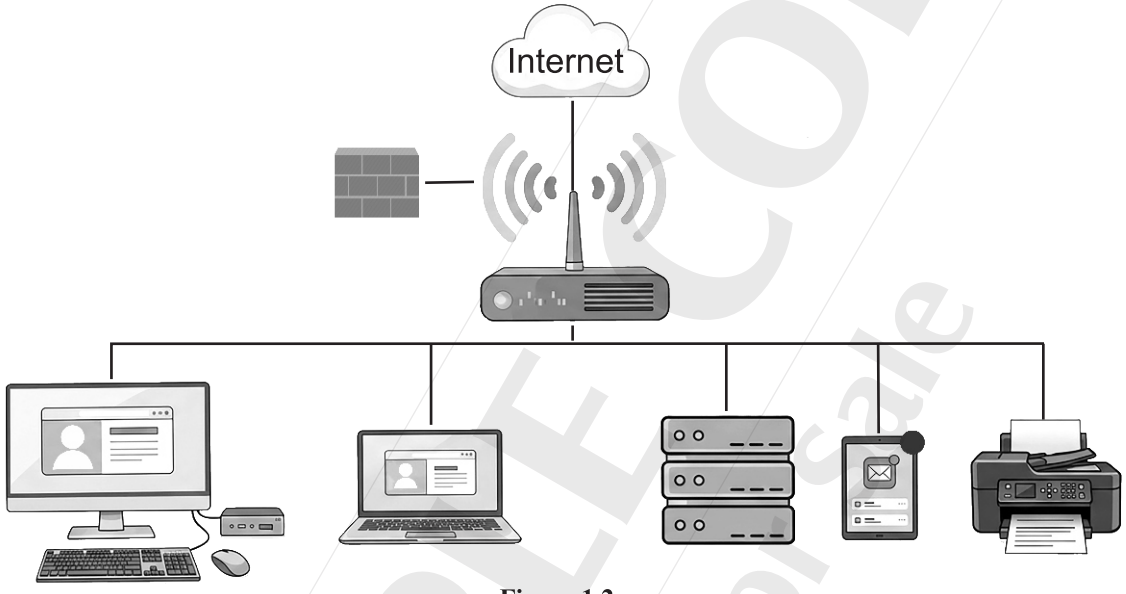


Figure 1.2:
Network architecture shows how devices and components are organized in a network.

A network works by sending data from one device to another. Data is broken into small packets before transmission. These packets travel through cables or wireless signals. Networking devices guide packets to the correct destination. The receiving device reassembles the packets into the original data. This process allows smooth and fast communication.

Main Components of a Computer Network

1. **Devices (Nodes):** Computers, servers, printers, and other devices connected to the network are called nodes.
2. **Network Interface Card (NIC):** NIC a device used to connect and communicate over the network.
3. **Transmission Media:** The communication path through which data travels from one device to another, such as cables (Ethernet, fiber optic) or wireless (Wi-Fi).
4. **Networking Devices:** Hardware that connects and manages the network, including:
   - **Switch:** Connect devices and sends data to the correct device.
   - **Router:** Connects different networks together.
   - **Modem:** Connects a local network to an Internet Service Provider (ISP).
5. **Protocols:** Rules that control data communication, such as **TCP/IP** and **HTTP/HTTPS**.

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Q. How is data transmitted across a computer network? 12501002a

Ans. Data is sent from one device to another. It is divided into small packets. **Packets** travel through the network path. Devices guide packets to the destination. The receiving device combines packets.

Q.3 Explain the different types of computer networks. (OR) 12501003
Explain the types of computer networks. Describe LAN, WAN, and the Internet.

Ans. ★ **Key Points:** LAN | WAN | The Internet

Computer networks are classified based on size and coverage area. Different types of networks are used for different purposes. Each type connects devices in a specific way. The most common types are **LAN, WAN,** and the **Internet (Public WAN).** These networks help in communication and data sharing.

DO YOU KNOW?

Q. How are computer networks classified? 12501003a

Ans. Computer networks are classified based on distance and coverage area.

1. Local Area Network (LAN)

A Local Area Network connects devices within a small area. This area can be a home, school, or office. LAN provides high data transfer speed. It is usually owned and managed by a single organization. Ethernet and Wi-Fi are commonly used in LANs. LAN is cost-effective and easy to maintain.

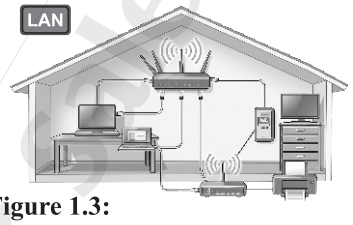


Figure 1.3: Local Area Network

2. Wide Area Network (WAN)

A Wide Area Network covers a large geographic area. It connects networks in different cities or countries. WAN uses leased lines, satellites, or the Internet. Data transfer speed is slower than LAN. WAN is expensive to install and manage. The Internet is the largest example of a WAN.

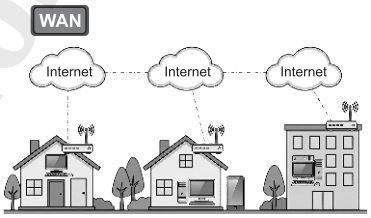


Figure 1.4: Wide Area Network

3. The Internet (Public WAN)

The Internet is a global network connecting millions of devices. It allows sharing of information worldwide. Services like email, websites, and cloud storage use the Internet. It uses standard protocols for communication. The Internet supports education, business, and entertainment. It plays an important role in daily life.

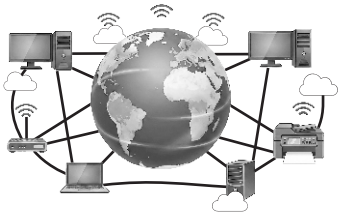


Figure 1.5: The Internet

DO YOU KNOW?

Q. What do you know about DSL and ISP? 12501003b

Ans. DSL (Digital Subscriber Line): Internet through telephone lines; allows calling and browsing at the same time. **ISP (Internet Service Provider):** Company that provides Internet access to users.

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Q.4 Describe the main networking devices used in a computer network and explain their functions. **12501004**

Ans. ★ Key Points: NIC | Switch | Router | Modem | Wireless Access Point (WAP)

Network devices are used to connect computers and other devices in a network. These devices control flow of data. Each device has a specific role in communication.

1. Network Interface Card (NIC)

A Network Interface Card allows a device to connect to a network. It can be wired or wireless. Each NIC has a unique address called **MAC (Media Access Control)** address. The NIC sends and receives data from the network. Without a NIC, a device cannot communicate on a network. NICs are built into most modern devices.

Function: Connects a device to the network and sends/receives data.

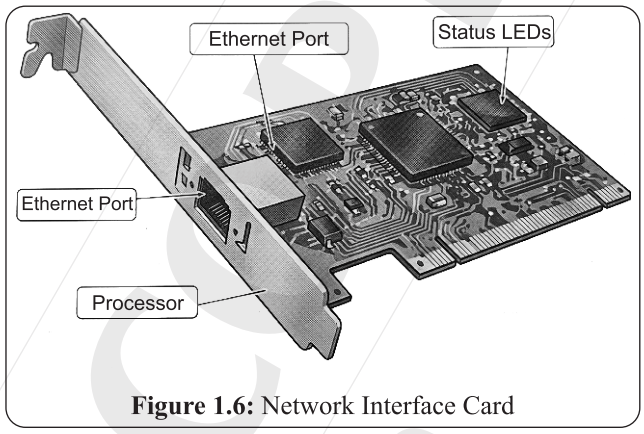


Figure 1.6: Network Interface Card

2. Switch

A switch connects devices and sends data to the correct device. Switches improve network speed and efficiency. Switches are common in modern networks.

Function: Connects devices in a LAN and forwards data to the correct destination.

3. Router

A router connects different network together. It directs data packets to their correct destination. Routers manage/connect local networks to the Internet. They use IP addresses to send data. Routers improve network security and manage network traffic. Home and office networks use routers widely.

Function: Connects different networks and routes data packets between them.

4. Modem

A modem connects a local network to an **Internet Service Provider (ISP).** It converts digital data into signals suitable for transmission (modulation). It also converts incoming signals back into digital data (demodulation). Modems are used with cable, **DSL (Digital Subscriber Line),** or fiber connections. Internet access depends on a modem. Modems often work with routers.

Function: Connects the network to the ISP by converting digital and analog signals.


Figure 1.7: Wireless Access Point

5. Wireless Access Point (WAP)

A wireless access point provides Wi-Fi connectivity. It allows wireless devices to connect to a wired network. Access points are used in large buildings and campuses. It extends signal strength, stability and network coverage. Wireless access points support mobile connectivity.

Function: Provides Wi-Fi access and connects wireless devices to the network.

Q.5 What is network topology? Explain its types with advantages and disadvantages.
(OR) Define network topology. Explain bus, star, ring and mesh topologies with advantages and disadvantages. **12501005**

Ans. ★ Key Points: Network Topologies | Bus | Star | Ring | Mesh | Tree | Hybrid

Network topology refers to the **layout (Arrangement)** of a computer network. It explains how devices and cables are **arranged.** Topology can be physical or logical. Physical topology shows actual connections. Logical topology shows how data flows in the network.

1. Bus Topology

In bus topology, all devices are connected to a single main cable (Backbone). Data travels along this cable to reach devices. It is simple and low in cost. Failure of the main cable can stop the entire network (as shown in Figure 1.8). It is suitable for small networks. Bus topology is not good for large networks.

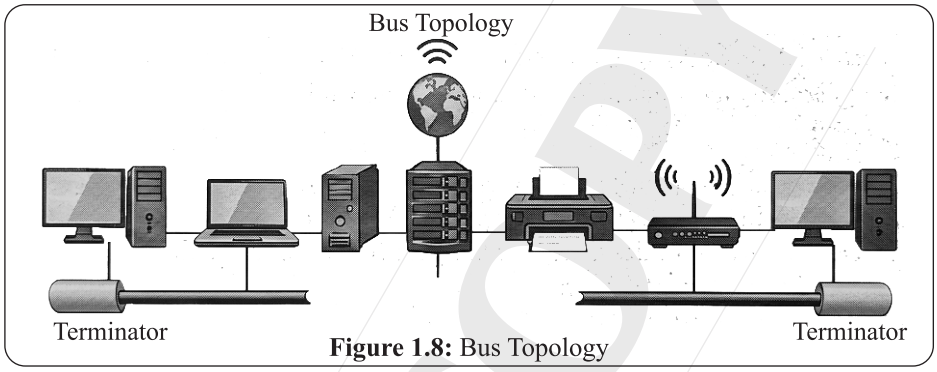


Figure 1.8: Bus Topology

Advantages:

- Simple and easy to install
- Requires less cabling
- Cost-effective for small networks

Disadvantages:

- Single point of failure (main cable failure affects whole network)
- High chance of data collisions
- Difficult to detect and fix faults

2. Star Topology

In star topology, all devices connect to a **central hub or switch** (as shown in Figure 1.9)**.** Data passes It is easy to manage and expand. Failure of one device does not affect others. Star topology is widely used in modern networks.

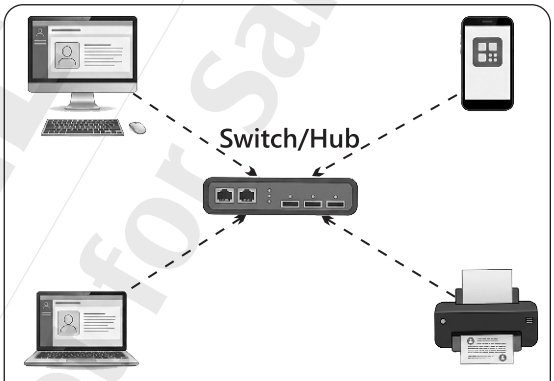


Figure 1.9: Star Topology

Advantages:

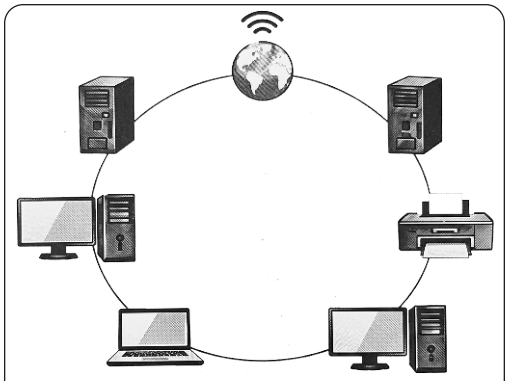
- Easy to install and manage
- Failure of one cable or device does not affect others
- Easy to add or remove devices

Disadvantages:

- Requires more cabling
- Central switch/hub failure stops the entire network
- Higher cost due to cabling and central device

3. Ring Topology

In ring topology, devices are connected in a **circular path** (as shown in Figure 1.10)**.** Data moves in one direction around the ring. Each device receives data and passes it to next device. Failure of one device can affect the whole network. It is more complex than bus topology. Ring topology is rarely used today.


Figure 1.10: Ring Topology

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Advantages:

- Data flows in an organized manner (clock-wise or anti-clockwise)
- No data collisions (due to token passing)
- Equal access for all devices

Disadvantages:

- Single point of failure (one device failure affects whole network)
- Difficult to add or remove devices
- Troubleshooting is challenging (Detect of fault is difficult)

4. Mesh Topology

In mesh topology, devices are connected to many other devices. **Multiple** paths exist for data transmission. Data can travel through any path to reach its destination. It increases reliability and fault tolerance. Failure of one link or path does not stop communication. Mesh topology is expensive and complex. It is used in large and critical networks. Figure 1.11 shows a mesh topology network. In this topology, each device is connected to many other devices. Data can travel through multiple paths to reach its destination. If one connection fails, data can use another path. This figure explains why mesh topology is very reliable but complex.

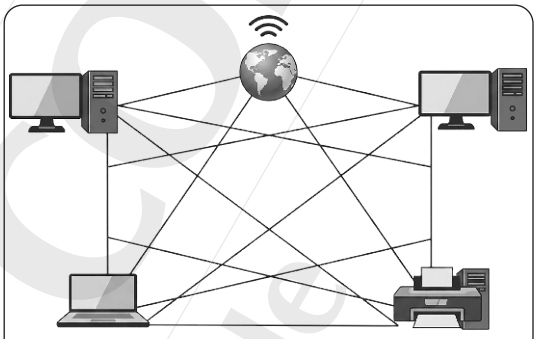


Figure 1.11: Mesh Topology

Advantages:

- Highly reliable and fault tolerant
- High security and privacy
- Good performance and low latency

Disadvantages:

- Very expensive due to massive cabling connections
- Complex installation and management
- Difficult to expand

5. Tree Topology

In tree topology, devices are arranged in a **hierarchical structure like a tree** (as shown in Figure 1.12)**.** It combines features of bus and star topologies. It is easy to expand and manage large networks. However, failure of the backbone can affect the entire network. Tree topology is commonly used in large organizations.

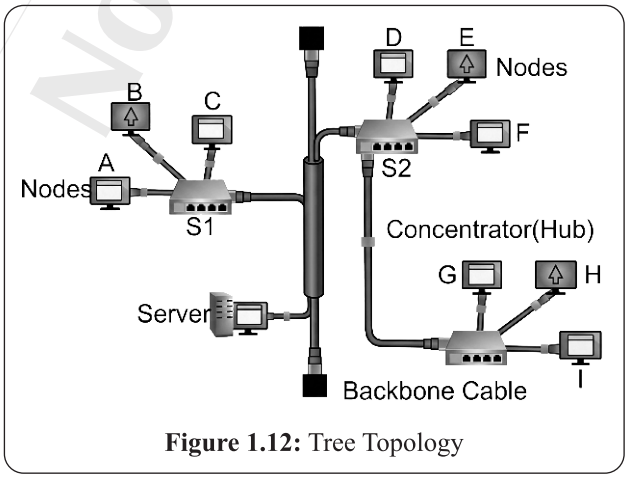


Figure 1.12: Tree Topology

Advantages:

- Extremely reliable and fault-tolerant
- Multiple paths exist between any two devices
- Very good performance with low latency

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Disadvantages:

- Backbone failure affects the whole network
- Complex setup
- Requires more cabling

6. Hybrid Topology

Hybrid Topology is a combination of two or more different network topologies (such as Star, Bus, Ring, or Mesh) (as shown in Figure 1.13). It is also called **Mixed Topology**. **For example,** a network may use Star topology in one department and Mesh in the backbone, or

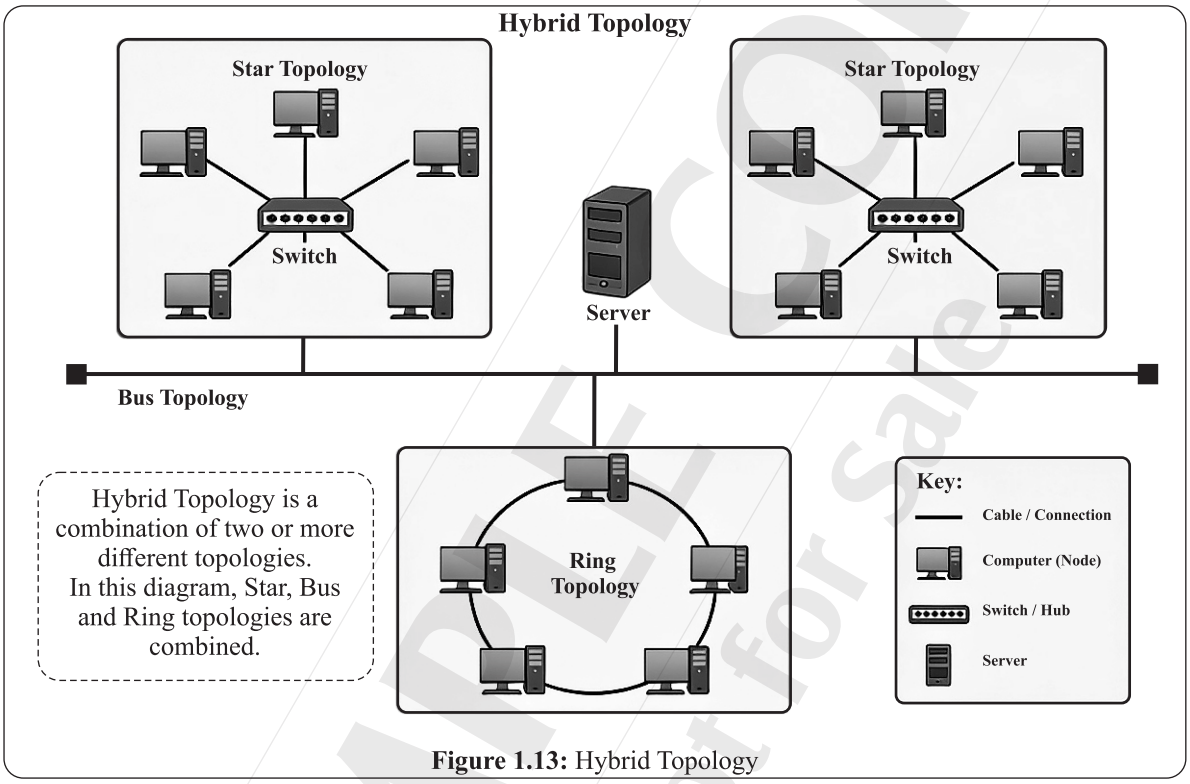


Figure 1.13: Hybrid Topology

Star topology connected to Bus topology. It is one of the most flexible and commonly used topologies in large organizations.

Advantages:

- Flexible and highly scalable
- Combines benefits of multiple topologies
- Very reliable and efficient

Disadvantages:

- Expensive to implement
- Complex design and management
- Difficult to troubleshoot

TIDBIT

Q. What factors should be considered when choosing network topology? 12501005a

Ans. Some topologies are simple and cheap. Others are reliable but costly. Some are easy to expand. Others are difficult to manage. Choice depends on needs.

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Q.6 Explain network models and network layers. Describe the OSI Model with its seven layers and their functions. (OR) 12501006
What is the OSI model? Explain its layers and their functions.

Ans. ★ Key Points: Network Models | Network Layers | OSI Model

Network models explain how data moves from one device to another in an organized way. These models divide communication into different layers. Each layer performs a specific task in data transmission (as shown in Figure 1.14). Layered models make networks easier to understand and manage. They also help in troubleshooting network problems. Network models are used as standards in networking.

DO YOU KNOW?

Q. Why network models are used? 12501006a

Ans. Network models are used to understand complex network communication in simple steps.

Network Layers

Network layers divide the communication process into smaller parts. Each layer has a specific responsibility. Data passes through these layers step by step. This structure makes network design simple and organized. Changes in one layer do not affect other layers. Layered communication improves reliability and control.

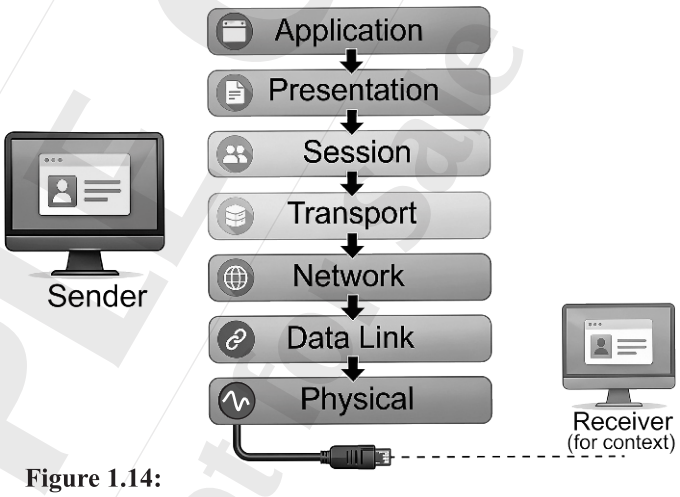


Figure 1.14:
OSI Model on the Sender Side Showing Data Flow from the Application Layer to the Physical Layer.

OSI Model (Open Systems Interconnection)

The OSI model stands for **Open Systems Interconnection.** It is a standard model used to understand network communication. The OSI model has seven layers. Each layer performs a different function. This model is used for learning and designing networks. It helps different systems communicate properly.

Functions of OSI Model Layers: Each layer of the OSI model has a specific role in data communication.

- The **Physical Layer** transmits raw data signals.
- The **Data Link Layer** ensures error-free data transfer between adjacent devices.
- The **Network Layer** handles data routing between networks.
- The **Transport Layer** ensures reliable end-to-end data delivery.
- The **Session Layer** manages communication sessions between devices.
- The **Presentation Layer** handles data formatting, encryption, and compression.
- The **Application Layer** provides network services directly to end users.

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TIDBIT

Q. What are the functions of lower, middle and upper layers of OSI model? 12501006b

Ans. **Lower layers** handle physical data transfer. **Middle layers** manage routing and delivery. **Upper layers** support user applications. Each layer works independently. Together, they ensure proper communication.

Each OSI layer has a specific role in data communication:

1. **Physical Layer**: Sends raw data as electrical, optical, or radio signals over the medium. It defines hardware aspects such as cables, connectors, voltage levels, and data transmission rates.
2. **Data Link Layer:** Ensures error-free data transfer between directly connected nodes, handles framing, error detection/correction, and controls access to the shared transmission medium.
3. **Network Layer:** Responsible for routing data from source to destination across different networks. It manages logical addressing (IP addresses) and determines the best path for data delivery.
4. **Transport Layer:** Provides reliable and ordered delivery of data between devices. It performs error recovery, flow control, and segmentation of data into smaller units.
5. **Session Layer:** Establishes, maintains, and terminates communication sessions between applications. It manages session checkpoints and recovery in case of interruptions.
6. **Presentation Layer:** Translates data into a format understandable by the application layer. It handles data encryption, compression, and format conversion.
7. **Application Layer:** Provides services directly to end users and applications. It supports protocols like HTTP, FTP, and email services for communication and data exchange.

Q.7 What is TCP/IP Model? Explain common network protocols. (OR) What are network protocols? Explain TCP/IP, HTTP, FTP and DNS. 12501007

Ans. ★ **Key Points:** TCP/IP | HTTP | FTP | DNS

Network protocols are a **set of rules** for communication. It defines how data is formatted and transmitted. Protocols control error handling and data delivery. All devices in a network must follow the same protocol. Protocols ensure smooth data exchange. **Examples** include TCP/IP and HTTP.

DO YOU KNOW?

Q. What are network protocols? 12501007a

Ans. Protocols are like languages that computers use to talk to each other.

Common protocols include

- **Transmission Control Protocol and Internet Protocol (TCP/IP):** TCP/IP stands for Transmission Control Protocol and Internet Protocol. It is the main protocol used on the Internet. TCP ensures reliable data delivery. IP handles the addressing and routing of data. Together, TCP/IP enables communication between devices. It is used in almost all networks.
- **Hypertext Transfer Protocol (HTTP):** HTTP stands for Hypertext Transfer Protocol. It is used to transfer web pages. HTTP works between a web browser and a web server. It allows users to view websites. HTTP does not encrypt data. **Secure websites** use HTTPS instead. HTTPS is the **secure** version of HTTP. It uses encryption to protect data

transmitted between the web browser and a web server. This encryption is provided using Secure Sockets Layer/Transport Layer Security (SSL/TLS) protocols, which ensure that sensitive information such as passwords, personal details, and payment data cannot be easily intercepted by attackers.

- **File Transfer Protocol (FTP):** FTP stands for File Transfer Protocol. It is used to upload and download files. FTP allows file sharing between computers. It is commonly used by web developers. FTP can transfer large files. Secure versions of FTP are also available.
- **Domain Name System (DNS):** DNS stands for Domain Name System. It converts website names into IP addresses. DNS makes websites easy to access (as shown in Figure 1.15). Users do not need to remember numbers. DNS servers perform this translation process. It plays a key role in Internet use.

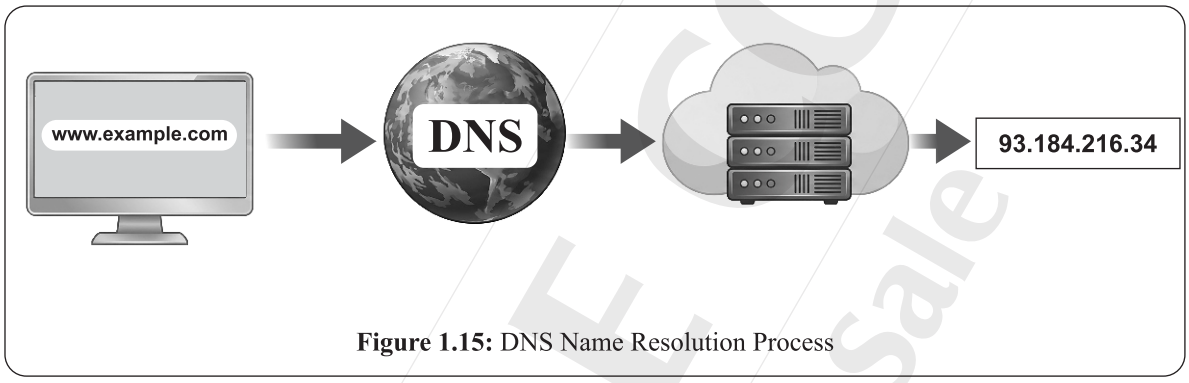


Figure 1.15: DNS Name Resolution Process

DO YOU KNOW?

Q. When does DNS works? **12501007b**

Ans. DNS works behind the scenes every time a website is opened.

Q.8 Explain IP addressing. Describe IPv4, IPv6, the default gateway, subnetting and NAT. **12501008**

Ans. ★ Key Points: IP Addressing | IPv4 | IPv6 | The Default Gateway | Subnetting | NAT

An IP address is a unique number assigned to a device. IP stands for **Internet Protocol**. It helps identify devices on a network. Data uses IP addresses to find its destination. Every network device must have an IP address. Communication is not possible without it.

IPv4 and IPv6

IPv4 is an older version of IP addressing. It uses **32-bit** numeric addresses. IPv4 has a limited number of addresses. **IPv6** is the newer version with **128-bit** addresses. IPv6 provides more address space. It supports modern Internet needs.

IPv4

- **Example:** 192.168.1.10
- IPv4 has 4 numbers, each can range between (0-255), separated by dots (.).
- Each number = 1 Byte = 8 bits
- Total = 32 bits

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Breakdown of IPv4

Part	Value	What it means
Network part	192.168.1	Identifies your local network, like "Gulshan Block Street 3"
Host part	10	Identifies your specific device on that network, like "House #10"

DO YOU KNOW?

Q. How many IPv4 addresses are possible? **12501008a**

Ans. Total IPv4 addresses possible: **4.3 billion**

IPv6

- **Example:** 2001:0db8:85a3:0000:0000:8a2e: 0370:7334
- IPv6 has 8 groups of 4 hexadecimal digits, separated by colons (**:**).
- Each group = 16 bits (As each hexadecimal digit can have 4 bits).
- Total = 128 bits (8 groups × 16 bits each = 128 bits)

Breakdown of IPv6

Part	Value	What it means
Global routing prefix	2001:0db8:85a3	ISP/region, like "Pakistan, Sindh, Karachi"
Subnet ID	0000:0000	Your local network inside the ISP, like "Gulberg area"
Interface ID	8a2e:0370 :7334	Your specific device, like "Your laptop"

DO YOU KNOW?

Q. How many IPv6 addresses are possible? Can IPv6 run out? **12501008b**

Ans.
- IPv6 addresses comprise: $2^{128} \approx 3.4 \times 10^{38}$ total addresses.
- IPv6 will never run out; it is an astronomically massive number.

The Default Gateway

A default gateway is a router or network device that forwards data from a local network to remote network when the destination is outside the local network.

Subnetting

Subnetting divides a network into smaller parts. Each part is called a **subnet** (as shown in Figure 1.16). It reduces network traffic. Subnetting improves performance. It increases security. Large networks use subnetting for management.

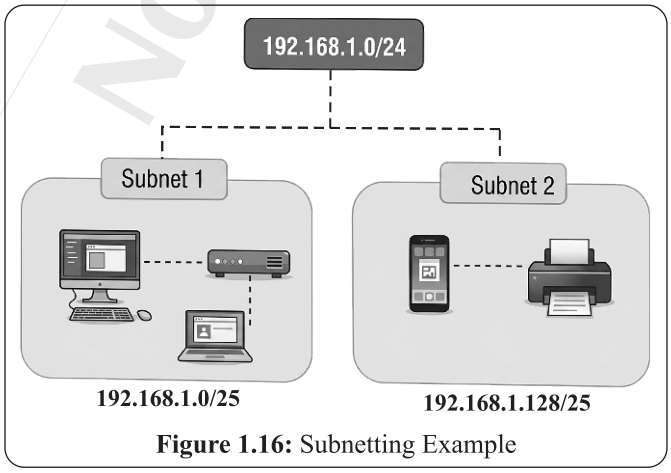


Figure 1.16: Subnetting Example

NAT (Network Address Translation)

NAT stands for Network Address Translation. It allows many devices to share one public IP address. NAT is performed by routers. It hides private IP addresses. This improves network security. NAT is commonly used in networks.

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Q.9 Explain the setup and configuration of a home network along with wired and wireless network connections. 12501009

Ans. ★ Key Points: Home Network | Components of Home Network | Wired Network | Wireless Network

A home network is used to connect different devices in a house. It helps computers, mobile phones, and printers to communicate with each other. A router is the main device in a home network. Proper configuration improves network speed and safety.

Components of a Home Network

A home network has different important components. A router connects all devices in the network. A modem connects the home network to the internet service provider. Computers, laptops, and mobile phones are network devices. Network cables are used for wired connections. Wireless devices use Wi-Fi signals to connect.

- **Wired Network Connections:** A wired network uses cables to connect devices. Ethernet cables are commonly used in wired networks. Devices are connected directly to a router or switch. Wired connections provide high speed and stable performance. These networks are more secure than wireless networks. However, devices cannot move freely because of cables.
- **Wireless Network Connections:** A wireless network connects devices without using cables. It uses radio signals to send and receive data. Wi-Fi is the most common wireless technology used in homes. Devices can move freely within the network range. Wireless networks are easy to install and use. They may be slower than wired networks in some cases.

Q.10 Explain the importance of Wi-Fi security in protecting data and improving network performance. Describe how the router web interface is used to manage settings. 12501010

Ans. ★ Key Points: Wi-Fi Security | Router Web Interface | Router Configuration | Wi-Fi Encryption | Router Configuration | Guest Network

Wi-Fi security protects the network from unauthorized access. Without security, anyone can use the internet. Hackers can steal personal information from unsecured networks. Secure Wi-Fi keeps data safe and private. It also prevents slow internet speeds. Strong security improves overall network performance.

Router Web Interface

1. Router Configuration: The router web interface is used to manage router settings. It is opened using a web browser. The user enters the router's IP address to access it. A username and password are required to log in. The interface allows changes in Wi-Fi (Wireless Fidelity) name and password. It also helps control security settings.

2. Wi-Fi Encryption: Encryption protects data sent over the network. It converts data into a secure form. WPA2 (Wi-Fi Protected Access 2) and WPA3 (Wi-Fi Protected Access 3) are common encryption methods. Older methods like WEP (Wired Equivalent Privacy) are not secure. Strong encryption prevents data theft. Users should always select the latest encryption method.

3. Router Configuration: A default gateway connects a local network to other networks. It is usually a router. Data meant for outside networks goes through the gateway. The gateway forwards data to the correct network. Internet access depends on it. Proper gateway setting is necessary.

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Guest Networks: A guest network allows visitors to use the internet. It is separate from the main home network. Guest users cannot access personal devices. This increases network safety and privacy. Guest networks help control internet usage. They are useful in homes and offices.

Q.11 Why network diagnostics tools and commands are used? **12501011**

Ans. ★ **Key Points:** Network Diagnostic Tools | Ping Command | Ipconfig and ifconfig Commands | Telnet, PuTTY, and Secure Shell (SSH)

Network diagnostic tools are used to find network problems. They help check internet and network connections. These tools show whether devices can communicate properly. Commands are entered using the command prompt or terminal. It helps identify slow or broken connections.

Network troubleshooting is done to find and fix network issues. It helps detect connection and speed problems. Troubleshooting checks cables, devices, and settings. It reduces network downtime and errors. It helps maintain smooth communication. Proper troubleshooting improves network performance.

Ping Command

The ping command is used to test network connectivity. It checks if a device is reachable. The ping command sends small data packets to another device (as shown in Figure 1.17) and measures response time from the destination. This command helps detect network delays. It is commonly used to check internet connection.

Ping Command:
C:\> ping google.com
Sample Output:
Pinging google.com [142.250.190.14] with 32 bytes of data:
Reply from 142.250.190.14: bytes=32 time=25ms TTL=118
Reply from 142.250.190.14: bytes=32 time=24ms TTL=118
Reply from 142.250.190.14: bytes=32 time=26ms TTL=118
Reply from 142.250.190.14: bytes=32 time=25ms TTL=118

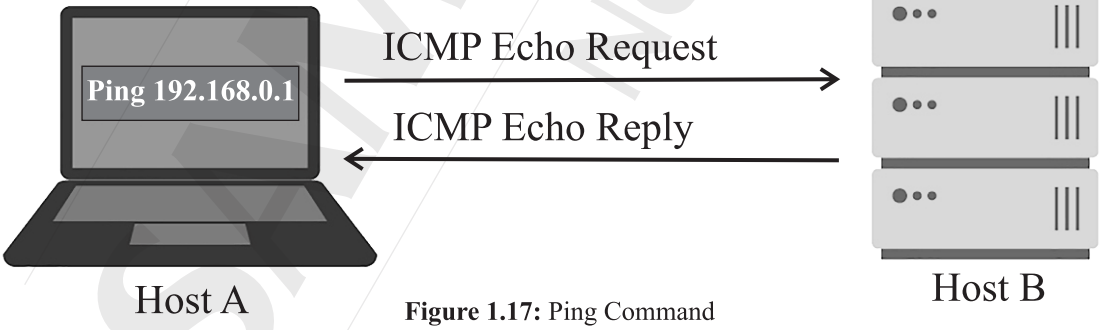


Figure 1.17: Ping Command

Ipconfig and ifconfig Commands: Ipconfig is used in Windows operating system. Ifconfig is used in Linux and macOS systems. These commands display network settings. They show IP address and subnet mask. They also show gateway and network status. These commands help in network troubleshooting.

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Telnet, PuTTY, and Secure Shell (SSH): Telnet is used for remote device access. It sends data without encryption. **PuTTY** is a popular tool for remote login. **SSH** is a secure method for remote access. SSH encrypts data for safety. These tools help manage network devices.

Q.12 Explain the concepts of network performance, which factors affect the network performance. **12501012**

Ans. ★ Key Points: Network Performance | Network Bandwidth | Network Latency | Causes of Network Delay

Network performance means how well a network works. It shows the speed and quality of data transfer. Good performance allows fast and smooth communication. Poor performance causes slow internet and delays. Network performance depends on many factors, such as bandwidth and latency.

Network Bandwidth

Network bandwidth is the amount of data sent in a given time. It shows how much data a network can carry. Bandwidth is usually measured in Mbps. Higher bandwidth means faster data transfer. More devices use more bandwidth. Low bandwidth can cause slow internet speed.

Network Latency

Network latency is the time taken by data to travel. It is the delay between sending and receiving data. Latency is measured in milliseconds. Low latency means faster response. High latency causes lag and delay. Online games and video calls need low latency.

Causes of Network Delay

Network delay happens due to many reasons:

- Too many users can slow the network.
- Poor-quality cables can cause delay.
- Long distance between devices increases delay.
- Network congestion affects data speed.
- Hardware problems also cause network delay.

Q.13 Define the concept of Network Load Balancing, and also write its benefits and methods. **12501013**

Ans. ★ Key Points: Network Load Balancing | Benefits of Load Balancing | Basic Load Balancing Methods

Network load balancing is used to manage network traffic. It distributes work among multiple servers or links. This helps prevent overloading of one device. Load balancing improves network speed and reliability. It is used in large networks and data centers. Proper load balancing ensures smooth performance. It helps networks handle more users.

Benefits of Load Balancing

- Improves network speed and response time.
- Reduces the risk of server failure.
- Ensures that if one server fails, other servers continue working.
- Provides a better user experience.

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- Helps handle high network traffic efficiently.
- Increases network reliability.
- Improves network availability.

Basic Load Balancing Methods

There are different methods of load balancing. **Round Robin** method sends requests one by one. **Least Connection** method sends traffic to less busy servers. **IP Hash** method uses IP address to decide traffic. These methods balance the network load. Simple methods are easy to implement.

Q.14 Describe the importance of network security and explain the role of firewalls, encryption, and access control in protecting networks. Also, write about common network security threats. **12501014**

Ans. ★ Key Points: Network Security | Firewall | Encryption | Access Control | Common Network Security Threats

Network security is used to protect computer networks. It keeps data safe from unauthorized access. Security helps prevent data loss and damage. Many users connect to networks daily. Without security, networks become unsafe. Network security uses different tools and rules. It is important for homes and organizations. Network security protects personal and important information. It stops hackers from entering the network. Security keeps data private and safe. It also protects devices from malware. Secure networks work smoothly without interruptions. Every network needs basic security measures.

Firewalls

A firewall is a security device or software. It controls incoming and outgoing network traffic. Firewalls block harmful or unwanted data. They act as a barrier between trusted and unsafe networks. Firewalls protect computers from attacks. They are used in homes and offices.

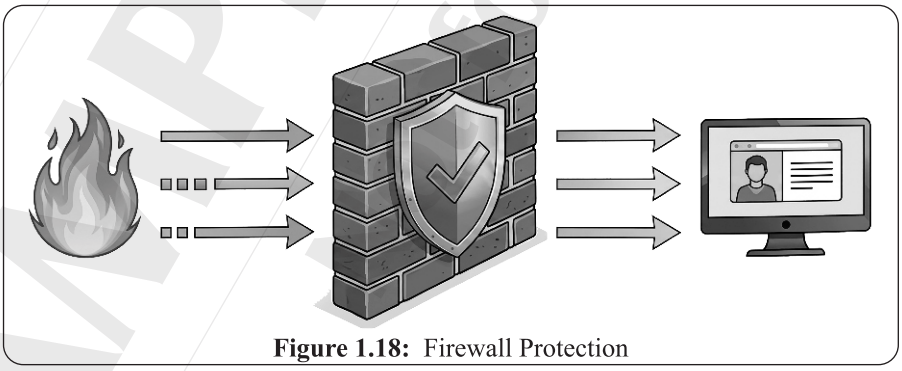


Figure 1.18: Firewall Protection

Encryption

Encryption changes data into a secret form. Only authorized users can read encrypted data. It protects data during transfer. Encryption is used in emails and online banking. Strong encryption improves data security. It prevents data theft.

Access Control

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Access control decides who can use the network. It allows only authorized users to enter. Usernames and passwords are common access controls. Permissions limit what users can do. Access control protects important data/resources and helps manage network usage.

Common Network Security Threats

There are many threats to network security. **Viruses** and **malware** damage systems. **Hackers** try to steal data. **Phishing** tricks users into sharing information. **Denial of Service (DoS)** attacks stop network services. Backing up data helps reduce these threats.

Q.15 What is data backup and Recovery? Also define types of data backup and data recovery methods. **12501015**

Ans. ★ Key Points: Data Backup and Recovery | Full Backup | Incremental Backup | Differential Backup | Data Recovery Methods

Data backup means making a copy of important data. It helps protect data from loss or damage. Data can be lost due to viruses or hardware failure. Backup allows data to be restored easily. **Recovery** is the process of getting data back. Backup and recovery are very important for safety. Every user should back up data regularly.

Types of Data Backup

There are different types of data backup:

- **Full backup** saves all data at once.
- **Incremental backup** saves only changed data.
- **Differential backup** saves changes since last full backup.

Backups can be stored on hard drives, cloud storage, or backup tapes.

Data Recovery Methods

Data recovery is used to restore lost data. Backup files are used for recovery. Recovery software helps get deleted files. System restore can recover system data. Professionals can recover data from damaged devices. Recovery methods help reduce data loss.

Q.16 Explain the tradeoffs between usability and security. Why is it important to maintain a balance between them? **12501016**

Ans. ★ Key Points: Usability and Security | Tradeoffs between Usability and Security

Usability means how easy a system is to use. A usable system is simple and clear. Users can learn it quickly. Tasks can be done without confusion. Good usability saves time and effort. It improves user satisfaction.

Security means protecting systems and data. It prevents unauthorized access. Security protects against viruses and hackers. It keeps information private and safe. Strong security reduces risks and damage. Every system needs basic security.

Tradeoffs Between Usability and Security

- Increasing security can make systems harder to use.
- Strong passwords are difficult to remember.
- Extra login steps slow down users.
- Simple systems are easy to use but less secure.
- Removing security increases risk.
- A balance is required for safe and easy use.

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TOPIC WISE SHORT QUESTIONS (ADDITIONAL)

Introduction to Computer Networks

Q.1 What is a computer network and how does it function? 12501017

Ans. A computer network allows different devices to connect and communicate with each other using cables or wireless signals. It helps in sharing information quickly and easily by allowing data, files, and resources to move from one device to another.

Q.2 Where are computer networks used and why are they important? 12501018

Ans. Computer networks are used in homes, schools, offices, and businesses for various daily tasks. They are important because modern life depends heavily on computer networks because communication through networks saves time and effort in sharing information.

Q.3 List some common uses of computer networks in everyday life? 12501019

Ans. Some common uses of computer networks are given below:

- Mobile phone calls and messages use computer networks.
- Schools use computer networks for online classes.
- Online banking transactions use computer networks.
- Social media platforms work through computer networks.
- Smart home device controls also work through computer networks.

Network Architecture and Basic Concepts

Q.4 What is network architecture and what does it include? 12501020

Ans. Network architecture is the overall design of a computer network that shows how computers, servers, and other devices are arranged. It includes hardware, software, and communication rules to define how data is transmitted across the network.

Q.5 Why is good network architecture important? 12501021

Ans. A good architecture helps the network work efficiently by organizing devices and components properly. It also supports future expansion of the network, ensuring it can grow and adapt to new needs over time.

Q.6 How is data transmitted across a network? 12501022

Ans. Data is broken into small packets before transmission and travels through cables or wireless signals. Networking devices guide these packets to the correct destination, where the receiving device reassembles them into the original data for smooth communication.

Types of Computer Networks

Q.7 How are computer networks classified and what are the common types? 12501023

Ans. Computer networks are classified based on distance and coverage area to serve different purposes. The most common types are **LAN, WAN,** and **the Internet**, which help in communication and data sharing by connecting devices in specific ways.

Q.8 What are the key characteristics of a Local Area Network (LAN)? 12501024

Ans. A Local Area Network connects devices within a small area like a home, school, or office, providing high data transfer speed. It is usually owned by a single organization, is cost-effective, easy to maintain, and commonly uses Ethernet and Wi-Fi technologies.

Q.9 How does a Wide Area Network (WAN) differ from a LAN? 12501025

Ans. A Wide Area Network covers a large geographic area, connecting networks in different cities or countries using leased lines, satellites, or the Internet. Unlike LANs, WANs have slower data transfer speeds and are more expensive to install and manage.

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Q.10 What is the role and significance of the Internet as a Public WAN? 12501026

Ans. The Internet is a global network connecting millions of devices worldwide, allowing the sharing of information through services like email, websites, and cloud storage. It plays an important role in daily life by supporting education, business, and entertainment using standard communication protocols.

Networking Devices

Q.11 What is the primary role and importance of networking devices? 12501027

Ans. Networking devices are used to connect computers and other devices in a network, controlling the flow of data where each device has a specific role. They are important because they enable communication, facilitate data and resource sharing and improve network performance.

Q.12 What is a Network Interface Card (NIC) and why is it essential? 12501028

Ans. A **Network Interface Card** allows a device to connect to a network, either via wired or wireless means, and has a unique **MAC** address for identification. It is essential because it sends and receives data from the network.

Q.13 How do switches and routers differ in their functions within a network? 12501029

Ans. A **switch** connects devices within a single network and forwards data to the correct device to improve speed and efficiency. In contrast, a **router** connects different networks together, such as a local network and the Internet, directing data packets to their correct destination using **IP** addresses while also improving security.

Q.14 What are the functions of modems? 12501030

Ans. A **modem** provides Internet access by connecting a local network to an **ISP,** converting digital data into signals for transmission and back again.

Network Topologies

Q.15 Define Wireless Access Point. 12501031

Ans. A wireless access point provides Wi-Fi connectivity, allowing wireless devices to connect to a wired network and extending signal strength and stability in large areas.

Q.16 What is network topology and how does it impact a network? 12501032

Ans. Network topology refers to the layout of a computer network, explaining how devices and cables are arranged in either physical or logical forms. It significantly affects network performance and maintenance by determining how data flows and how connections are structured within the system.

Q.17 Describe the characteristics of Bus Topology. 12501033

Ans.

- All devices are connected to a single main cable (backbone).
- Simple and easy to install.
- Low-cost because it requires less cable.
- Suitable for small networks.
- Easy to extend by adding new devices.

Q.18 Describe drawbacks/limitations of Bus Topology. 12501034

- The main cable is a single point of failure; if it breaks, the entire network stops working.
- Performance decreases as more devices are connected.
- High chances of data collisions when multiple devices transmit at the same time.
- Difficult to identify and troubleshoot faults.
- Limited cable length and number of connected devices.

Q.19 Why is Star Topology widely used in modern networks? 12501035

Ans. Star topology is widely used because all devices connect to a **central hub or switch,** making it easy to manage, expand, and troubleshoot without affecting other devices if one fails.

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Q.20 What are the key features and disadvantages of Mesh Topology? 12501036

Ans. Mesh topology connects devices to many others, providing multiple paths for data transmission which ensures high reliability, fault tolerance, and excellent redundancy. Despite these benefits, it is very expensive and complex to install and manage due to the large number of cables required, making it less practical for standard large networks.

Q.21 How does Hybrid Topology combine different network structures? 12501037

Ans. Hybrid topology is a combination of two or more different network topologies, such as connecting Star and Bus structures, offering flexibility and scalability for large organizations.

Network Models and Layers

Q.22 What is the purpose of network models and why are they important? 12501038

Ans. Network models explain how data moves from one device to another in an organized way by dividing communication into different layers where each performs a specific task. These layered models make networks easier to understand and manage, while also helping significantly in troubleshooting network problems.

Q.23 What is the OSI Model and what is its primary use? 12501039

Ans. The OSI Model stands for Open Systems Interconnection and is a standard model used to understand network communication through 7 distinct layers. Each layer performs a different function, and this model is primarily used for learning concepts and designing efficient network structures.

Q.24 What are the functions of the lower three layers (Physical, Data Link, and Network) of the OSI Model? 12501040

Ans. The **Physical Layer** transmits raw data bits over physical media like cables, while the **Data Link Layer** ensures error-free transfer between directly connected devices using MAC addresses. The **Network Layer** handles routing of data packets across different networks using logical addressing like IP addresses to determine the best path.

Q.25 How do the Transport and Session layers manage data delivery and communication? 12501041

Ans. The Transport Layer provides reliable end-to-end data delivery, ensuring data is transferred without errors or loss using protocols like TCP and UDP. The Session Layer manages communication sessions between applications by establishing, maintaining, and terminating connections, while also providing synchronization and recovery options.

Q.26 What roles do the Presentation and Application layers play in the OSI Model? 12501042

Ans. The Presentation Layer acts as a translator that handles data encryption, decryption, and compression to ensure data is in a usable format. The Application Layer is the topmost layer that provides network services directly to end-user applications, supporting protocols like HTTP and SMTP for web browsing and email.

Network Protocols and Services

Q.27 What are network protocols and why are they essential for communication? 12501043

Ans. Network protocols are a **set of rules** and standards that define how data is transmitted, received, and processed between devices in a computer network. They ensure that all devices communicate in a consistent manner by specifying how data is formatted and addressed, making it possible for different systems to understand each other.

Q.28 What is the role of the TCP/IP protocol suite in networking? 12501044

Ans. TCP/IP is the fundamental protocol suite of the Internet that serves as the backbone for communication across networks. It ensures reliable, ordered, and

error-checked delivery of data through TCP, while IP is responsible for addressing and routing packets from the source to the destination across multiple networks.

Q.29 How do HTTP and HTTPS facilitate web communication? 12501045

Ans. HTTP is the protocol used for transmitting web pages and resources over the World Wide Web, allowing clients like web browsers to communicate with web servers. The secure version, **HTTPS,** uses encryption to protect data during transmission, ensuring safer interactions between users and websites.

Q.30 What is the purpose of FTP in network operations? 12501046

Ans. FTP (File Transfer Protocol) is a standard network protocol used for transferring files between a **client** and a **server** on a computer network. It enables users to upload, download, and manage files on remote servers, making it commonly used for website maintenance and sharing large files.

Q.31 How does the Domain Name System (DNS) act? 12501047

Ans. DNS acts like the phonebook of the Internet by translating human-readable domain names, such as www.example.com, into machine-readable IP addresses like 192.0.2.1. This system makes it easier for users to access websites without having to remember complex numerical IP addresses.

IP Addressing and Subnetting

Q.32 What is an IP address and why is it essential for network communication? 12501048

Ans. An IP address is a unique number assigned to a device on a network that helps identify devices and ensures data reaches its correct destination. Without an IP address, devices cannot be located on the network, making successful data transmission impossible.

Q.33 What are the key characteristics and limitations of IPv4? 12501049

Ans. IPv4 uses 32-bit addresses written in decimal format with four octets, providing approximately 4.3 billion unique addresses. While it is simple, well-established, and widely supported, it suffers from limited address space, requiring techniques like NAT to conserve addresses, and has less inherent security.

Q.34 How does IPv6 improve upon IPv4 and what are its main features? 12501050

Ans. IPv6 uses 128-bit hexadecimal addresses, offering a virtually unlimited number of addresses to solve the shortage problem faced by IPv4. It includes built-in security with IPSec, supports auto-configuration, eliminates the need for NAT, and provides better performance and routing efficiency, though it is not backward compatible with IPv4.

Q.35 What is subnetting and how does it help in network management? 12501051

Ans. Subnetting is the process of dividing a large network into smaller, more manageable sub-networks called **subnets** by splitting the host portion of an IP address. This technique helps in organizing networks efficiently, improving security, and reducing network congestion by keeping the network portion intact while creating smaller segments.

Q.36 What is the function of Network Address Translation (NAT)? 12501052

Ans. NAT is a technique that allows multiple devices on a private network to share a single public IP address for accessing the internet. It helps conserve public IP addresses, which is particularly useful in IPv4 networks where address space is limited, by masking private IP addresses behind a public one.

Home Network Setup and Configuration

Q.37 What is the primary purpose of a home network? 12501053

Ans. A home network is designed to connect various household devices, such as computers, smartphones, and printers, allowing them to communicate and share data seamlessly.

Q.38 What are the essential components required to set up a home network? 12501054

Ans. Setting up a home network requires several key components, primarily a router to connect internal devices and a modem to link the home to the Internet Service Provider (ISP). The network also includes various end-user devices like laptops and phones, which connect using either physical Ethernet cables or wireless Wi-Fi signals.

Q.39 What are the advantages and disadvantages of using wired network connections? 12501055

Ans. Wired network connections use physical Ethernet cables to link devices directly to a router, providing a highly stable and secure connection. This physical setup ensures excellent data transfer speeds and is generally much more reliable than wireless alternatives. However, the main **drawback** is that devices are physically tethered (connected) to the cables and cannot move freely around the house.

Q.40 How do wireless network connections work and what are their main benefits? 12501056

Ans. Wireless networks utilize radio signals, commonly known as Wi-Fi, to connect devices without the need for any physical cables. This technology offers convenience because users can move their devices freely anywhere within the network's coverage range. Also, it is very easy to install and use.

Wi-fi Security and Router Configuration

Q.41 Why is Wi-Fi security important for a home or office network? 12501057

Ans. Wi-Fi security is essential because it protects the network from unauthorized access and prevents hackers from stealing personal information. Without proper security, anyone could use the internet, which can also lead to slow internet speeds for legitimate users.

Q.42 How do you access and use the router web interface for configuration? 12501058

Ans. The router web interface is accessed by entering the router's specific IP address into a web browser and logging in with a valid username and password. Once logged in, users can manage various router settings, such as changing the Wi-Fi name and password.

Q.43 What is Wi-Fi encryption and why should users choose modern methods like WPA2 or WPA3? 12501059

Ans. Wi-Fi encryption is a security measure that protects data sent over the network by converting it into a secure, unreadable form to prevent data theft. Users should always select modern encryption methods like WPA2 or WPA3 because older methods, such as WEP, are no longer considered secure.

Q.44 What is the role of a gateway in connecting a local network to the internet? 12501060

Ans. A gateway, which is usually a router, acts as a crucial connection point between a local network and other external networks. It ensures that any data meant for outside networks is properly forwarded to the correct destination network.

Q.45 How do guest networks improve the safety and privacy of a main network? 12501061

Ans. A guest network provides internet access to visitors through a separate connection that is completely isolated from the main home or office network. This separation ensures that guest users cannot access personal devices or sensitive data on the primary network.

Network Diagnostic Tools and Commands

Q.46 What is the purpose of the Ping? 12501062

Ans. Ping command is used to test network connectivity. It checks if a device is reachable on the network. Pind sends small data packets to another device. It measures response time from the destination.

Q.47 How does the Ipconfig command assist in network troubleshooting? 12501063

Ans. Ipconfig displays the current TCP/IP network configuration of a computer, showing details like IP address, subnet mask, default gateway, and DNS server addresses. It allows users to troubleshoot configuration issues, refresh IP addresses using /release and /renew, or clear the DNS cache with /flushdns.

Q.48 What do you know about Telnet and PuTTY? 12501064

Ans. Telnet is used for remote device access; it sends data without encryption. **PuTTY,** is a popular tool for remote login.

Q.49 Why is SSH used for remote access and what are its key features? 12501065

Ans. SSH (Secure Shell) is a secure protocol used for remote login and command execution on another computer or server, encrypting all communication between client and server. It is commonly used by network administrators for secure remote management and allows secure file transfer using SCP (Secure Copy Protocol) or SFTP (Secure File Transfer Protocol).

Network Performance

Q.50 What is network performance and on which factors it depends.? 12501066

Ans. Network performance refers to how well a network operates, specifically showing the speed and quality of data transfer between devices. The overall performance of a network primarily depends on key factors such as **bandwidth** and network **latency.**

Q.51 What do you know about bandwidth and latency? 12501067

Ans. Network **bandwidth** is the maximum amount of data that can be sent in a given time, where higher bandwidth allows for much faster data transfer. Network **latency** is the time taken for data to travel; it is the delay between sending and receiving data. It is measured in **milliseconds.** Low latency means a fast response and high latency causes lag (latency/delay).

Q.52 What are the common causes of network delay and how do they impact users? 12501068

Ans. Network delay can happen for several reasons:

- Too many users on the network can cause delays.
- Poor-quality cables can reduce network performance.
- Long physical distances between devices increase transmission delay.
- Network congestion can slow down data transfer.
- Hardware problems can significantly reduce data transmission speeds.

Network Load Balancing

Q.53 What is network load balancing and what are its main benefits? 12501069

Ans. Network load balancing is a technique used to manage and distribute network traffic evenly across multiple servers or communication links to prevent overloading. This process greatly improves network speed and response times while significantly reducing the risk of a complete server failure. It provides better user experience.

Q.54 What are the basic methods used to distribute traffic in load balancing? 12501070

Ans. There are several basic methods used to balance network load, such as the **Round Robin** method, which sends requests to servers one by one in a continuous cycle. The **Least Connection** method directs new traffic to the servers that are currently the least busy to maintain maximum efficiency. Additionally, the **IP Hash** method uses the user's specific IP address to consistently decide which server should handle the incoming request.

Network Security

Q.55 What is the primary function of a firewall in network security? 12501071

Ans. A firewall is a security device or software that controls incoming and outgoing network traffic by acting as a barrier between

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trusted and unsafe networks. It blocks harmful or unwanted data to protect computers from attacks, making it essential for use in both homes and offices.

Q.56 How does encryption contribute to data protection? 12501072

Ans. Encryption changes data into a secret (unreadable) form so that only authorized users can read it, thereby protecting data during transfer. It is commonly used in emails and online banking to prevent data theft and improve overall data security through strong encoding methods.

Q.57 What is the role of access control in managing network security? 12501073

Ans. Access control decides who can use the network by allowing only authorized users to enter through methods like usernames and passwords. It protects important data by limiting what users can do through permissions, helping to manage network usage effectively.

Q.58 What are some common threats to network security and how can they be mitigated (reduced)? 12501074

Ans. Common threats include viruses, malware, hackers stealing data, phishing scams, and Denial of Service attacks that stop network services. To reduce the impact of these threats, it is important to implement security measures and regularly back up data to ensure recovery if an attack occurs.

Data Backup and Recovery

Q.59 What is the purpose of data backup and why is it important? 12501075

Ans. Data backup means making a copy of important data to protect it from loss or damage caused by viruses or hardware failure. It is crucial for safe data management because it allows data to be restored easily, ensuring that information is not permanently lost.

Q.60 What are the different types of data backup methods? 12501076

Ans. The main types include:

- **Full backup**, which saves all data at once.
- **Incremental backup** saves only the data that has changed since the last backup.
- **Differential backup** saves changes made since the last full backup.

These backups can be stored on hard drives, cloud storage, or backup tapes.

Q.61 How is data recovery performed and what methods are used? 12501077

Ans. Data recovery is the process of getting lost data back, often using previously created backup files or specialized recovery software to retrieve deleted files. Other methods include system restore for recovering system data and professional services for retrieving data from physically damaged devices.

Usability and Security Tradeoffs

Q.62 What does usability mean? Why is it important? 12501078

Ans. Usability refers to how easy a system is to use, ensuring it is simple, clear, and allows users to learn quickly without confusion. Good usability saves time and effort for the user, which significantly improves overall user satisfaction and efficiency when performing tasks.

Q.63 What is the role of security in protecting systems and data? 12501079

Ans. Security involves protecting systems and data from unauthorized access, viruses, and hackers to keep information private and safe. It is essential for all system as strong security measures reduce risks and potential damage, ensuring that sensitive data remains protected.

Q.64 What are the tradeoffs between usability and security in system design? 12501080

Ans. Increasing security often makes systems harder to use, such as requiring strong passwords that are difficult to remember or adding extra login steps that slow down users. Conversely, while simple systems are easier to use, they are often less secure, so a balance is required to ensure both safety and ease of use.

TOPIC WISE MULTIPLE CHOICE QUESTIONS (ADDITIONAL)

Introduction to Computer Networks

1. What is the main purpose of a computer network? 12501081
(a) To Play Games
(b) To Store Data Only
(c) Connect and Communicate
(d) To Print Documents

2. What does modern life depend on for daily tasks? 12501082
(a) Computer Networks
(b) Landline Phones
(c) Manual Typing
(d) Paper Mail

3. How do schools use networks? 12501083
(a) For Sports (b) For Cleaning
(c) For Lunch (d) Online Classes

4. What do banks use networks for?
(a) Building Walls 12501084
(b) Hiring Staff
(c) Online Transactions
(d) Printing Money

5. How do social media platforms work? 12501085
(a) By Mail (b) Through Networks
(c) By Radio (d) Offline Only

6. What do smart homes use networks for?
(a) Growing Plants 12501086
(b) Cooking Food
(c) Controlling Devices
(d) Painting Walls

Network Architecture and Basic Concepts

7. What is network architecture? 12501087
(a) User Manual (b) Overall Design
(c) Hardware List (d) Software Code

8. Which of the following components are included in architecture? 12501088
(a) Only Users
(b) Hardware/Software/Rules
(c) Only Servers
(d) Only Cables

Types of Computer Networks

9. On what basis are computer networks classified? 12501089
(a) By Software Type
(b) By Speed and Color
(c) By Distance and Coverage Area
(d) By Cost and Brand

10. What is the coverage area of a LAN?
(a) Entire Country 12501090
(b) Global
(c) Small Area (Home/Office)
(d) Multiple Cities

11. Who typically owns and manages a LAN? 12501091
(a) Internet Providers
(b) Multiple Companies
(c) The Government
(d) A Single Organization

12. What is used to connect networks in a WAN? 12501092
(a) Bluetooth
(b) Local Switches
(c) Leased Lines or Satellites
(d) USB Cables

13. Which services rely on the Internet?
(a) Standalone Games 12501093
(b) Local Printing
(c) Email and Cloud Storage
(d) Offline Typing

14. What does the Internet use for communication? 12501094
(a) Manual Switching
(b) Proprietary Codes
(c) Random Signals
(d) Standard Protocols

Networking Devices

15. What is the primary role of networking devices? 12501095
(a) To Generate Electricity
(b) To Display Graphics
(c) Control Data Flow and Connect Devices
(d) To Store Data Permanently

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16. Which address is unique to every NIC? 12501096
(a) MAC Address (b) URL Address
(c) Email Address (d) IP Address

17. How does a switch improve efficiency? 12501097
(a) Providing Wi-Fi
(b) Converting Signals
(c) Sending Data to Correct Device
(d) By Blocking All Data

18. What is the main function of a router? 12501098
(a) Store Web Pages
(b) Connect Different Networks
(c) Provide Wi-Fi Only
(d) Connect Single Device

19. Who does a modem connect the network to? 12501099
(a) Another Switch
(b) Monitor
(c) Local Printer
(d) Internet Service Provider (ISP)

20. What is the function of a Wireless Access Point? 12501100
(a) Store Passwords
(b) Provide Wi-Fi Connectivity
(c) Connect Cables
(d) Block Internet

Network Topologies

21. What does network topology refer to? 12501101
(a) Cost of Cables
(b) Type of Software
(c) Layout of Network
(d) Speed of Data

22. In bus topology, how are devices connected? 12501102
(a) To Every Device
(b) To a Single Main Cable
(c) In a Circle
(d) To a Central Hub

23. What is a major disadvantage of bus topology? 12501103
(a) Complex Setup
(b) Too Many Cables
(c) High Cost
(d) Single Point of Failure

24. In star topology, where do devices connect? 12501104
(a) To a Ring
(b) To a Bus
(c) To Central Hub/Switch
(d) To Each Other

25. What happens if one device fails in star topology? 12501105
(a) Data Collides
(b) Speed Increases
(c) Whole Network Stops
(d) Others Remain Unaffected

26. Why is ring topology rarely used today? 12501106
(a) Too Fast
(b) No Collisions
(c) Complex/Single Failure Risk
(d) Too Cheap

27. What is a key feature of mesh topology? 12501107
(a) Central Hub (b) Linear Cable
(c) Single Path (d) Multiple Paths

28. Why is mesh topology considered reliable? 12501108
(a) Fault Tolerance/Redundancy
(b) Less Cabling
(c) Low Cost
(d) Simple Setup

29. Tree topology combines which two types? 12501109
(a) Bus and Mesh (b) Ring and Mesh
(c) Bus and Star (d) Star and Ring

30. What structure does tree topology use? 12501110
(a) Linear Only (b) Hierarchical
(c) Circular (d) Random

31. What is hybrid topology? 12501111
(a) Outdated Design
(b) Wireless Only
(c) Combination of Topologies
(d) Single Type Only

32. What is an advantage of hybrid topology? 12501112
(a) No Expertise Needed
(b) Cheap
(c) Flexible/Scalable
(d) Simple

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Network Models and Layers

33. What is the main purpose of network models? 12501113
(a) Organize Data Movement
(b) To Increase Cost
(c) Slow Down Traffic
(d) Hide Errors

34. How do layered models help management?
(a) Mix Functions 12501114
(b) Easier to Understand
(c) Remove Layers
(d) Make It Harder

35. How many layers are in the OSI model? 12501115
(a) Eight (b) Seven
(c) Six (d) Five

36. Which layer handles MAC addresses?
(a) Data Link (b) Physical 12501116
(c) Network (d) Transport

37. What is the main function of the Network Layer? 12501117
(a) Session Management
(b) Error Correction
(c) Routing Packets
(d) Data Encryption

38. Which protocol is used for reliable delivery in Transport Layer? 12501118
(a) FTP (b) UDP
(c) TCP (d) HTTP

39. What does the Session Layer manage?
(a) Communication Sessions 12501119
(b) Data Encryption
(c) Bit Transmission
(d) Routing Paths

40. What is the role of the Presentation Layer? 12501120
(a) Managing Sessions
(b) Routing Data
(c) Connecting Cables
(d) Data Translation/Formatting

41. Which task is handled by the Presentation Layer? 12501121
(a) Flow Control
(b) Physical Signaling
(c) Encryption/Decryption
(d) IP Addressing

Network Protocols and Services

42. What are network protocols? 12501122
(a) Physical Cables
(b) Hardware Devices
(c) Rules for Data Transmission
(d) Software Applications

43. Why are protocols necessary? 12501123
(a) Increase Costs
(b) Hide Data
(c) To Slow Down Networks
(d) Ensure Consistent Communication

44. What does TCP ensure? 12501124
(a) Reliable, Ordered Delivery
(b) Random Routing
(c) Physical Connection
(d) Fast but Unreliable Delivery

45. Which protocol is used for web pages?
(a) SMTP (b) HTTP 12501125
(c) DNS (d) FTP

46. What is FTP used for? 12501126
(a) Sending Emails
(b) Browsing Web
(c) File Transfer Protocol
(d) Resolving Names

47. What does DNS translate? 12501127
(a) Text to Binary
(b) HTTP To FTP
(c) Domain Names to IP
(d) IP to MAC

IP Addressing and Subnetting

48. What does IP stand for? 12501128
(a) Internet Protocol
(b) International Port
(c) Interconnected Path
(d) Internal Protocol

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49. What is the primary purpose of an IP address? 12501129
(a) Increase Speed
(b) Encrypt Data
(c) Identify Devices on a Network
(d) To Store Files

50. How many bits does IPv4 use? 12501130
(a) 128-Bit (b) 16-Bit
(c) 32-Bit (d) 64-Bit

51. What is a major disadvantage of IPv4?
(a) Slow Processing 12501131
(b) Limited Address Space
(c) Too Many Addresses
(d) Complex Security

52. How many bits does IPv6 use? 12501132
(a) 256-Bit (b) 128-Bit
(c) 64-Bit (d) 32-Bit

53. Why is NAT used in IPv4? 12501133
(a) Improve Security
(b) Simplify Routing
(c) Conserve Addresses
(d) To Increase Speed

Home Network Setup and Configuration

54. What is the main device in a home network? 12501134
(a) Hub (b) Router
(c) Switch (d) Modem

55. Which cables are commonly used in wired networks? 12501135
(a) Audio Cables
(b) USB Cables
(c) Ethernet Cables
(d) Power Cables

56. What is a key advantage of wired connections? 12501136
(a) High Speed/Stability
(b) Easy Install
(c) No Cables Needed
(d) Free Movement

57. What is the most common wireless technology in homes? 12501137
(a) Zigbee (b) NFC
(c) Wi-Fi (d) Bluetooth

58. What does a home network primarily help devices do? 12501138
(a) Save Electricity
(b) Print without Ink
(c) Communicate with Each Other
(d) Charge Faster

Wi-Fi Security and Router Configuration

59. What does Wi-Fi security protect against? 12501139
(a) Unauthorized Access
(b) Power Outages
(c) Hardware Failure
(d) Slow Cables

60. What can happen on an unsecured network? 12501140
(a) Better Privacy
(b) Automatic Updates
(c) Hackers Steal Info
(d) Faster Speeds

61. How is the router web interface accessed?
(a) Via Bluetooth 12501141
(b) Using a Web Browser
(c) Via USB Drive
(d) Using Mobile App only

62. What does Wi-Fi encryption do?
(a) Deletes Old Files 12501142
(b) Connects to ISP
(c) Converts Data Securely
(d) Speeds up Data

63. What is the purpose of a guest network?
(a) For Gaming Only 12501143
(b) For Visitors
(c) For Streaming
(d) For main Devices

64. How does a guest network improve safety? 12501144
(a) By Hiding the Router
(b) By Increasing Speed
(c) By Isolating Visitors
(d) By Removing Encryption

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Network Diagnostic Tools and Commands

65. What protocol does Ping use? 12501145
(a) FTP (b) TCP
(c) ICMP (d) HTTP

66. What does Ping measure? 12501146
(a) Round-Trip Time
(b) Disk Space
(c) Battery Life
(d) File Size

67. What is the main function of Ipconfig?
(a) Send Emails 12501147
(b) Trace Routes
(c) Display Network Configuration
(d) Remote Login

68. Which command shows detailed IP info? 12501148
(a) Tracert Detail (b) Ipconfig /all
(c) Ping All (d) Ipconfig

69. What is SSH primarily used for?
(a) Secure Remote Access 12501149
(b) Playing Games
(c) Web Browsing
(d) Printing Files

70. Which tool is used for remote command execution? 12501150
(a) Tracert (b) SSH
(c) Ping (d) Ipconfig

Network Performance

71. What does network performance indicate? 12501151
(a) Device Count
(b) Hardware Cost
(c) Speed and Quality
(d) Cable Length

72. What happens with poor network performance? 12501152
(a) High Bandwidth
(b) Faster Internet
(c) Zero Latency
(d) Slow Internet/Delays

73. How is bandwidth usually measured? 12501153
(a) Mbps (b) Gigabytes
(c) Hertz (d) Milliseconds

74. What is the result of higher bandwidth?
(a) More Delay 12501154
(b) Faster Data Transfer
(c) Slower Transfer
(d) Fewer Users

75. How is latency measured? 12501155
(a) Seconds Only (b) Mbps
(c) Milliseconds (d) Gigabytes

Network Load Balancing

76. What is network load balancing?
(a) Measuring Latency 12501156
(b) Encrypting Data
(c) Distributing Work/Traffic
(d) Increasing Bandwidth

77. Which is a benefit of load balancing?
(a) Limits Users 12501157
(b) Reduces Server Failure Risk
(c) Increases Latency
(d) Decreases Speed

Network Security

78. What is the main purpose of network security? 12501158
(a) Reduce Cost
(b) Share Files Freely
(c) Protect from Unauthorized Access
(d) To Increase Speed

79. What does a firewall control? 12501159
(a) Screen Brightness
(b) Keyboard Input
(c) Network Traffic
(d) Power Supply

80. Who can read encrypted data? 12501160
(a) Public
(b) Anyone
(c) Authorized Users
(d) Hackers

81. Where is encryption commonly used? 12501161
(a) Cable TV (b) Online Banking
(c) Offline Games (d) Local Printing

82. Which of the following is a threat that damages systems? 12501162
(a) Encryption (b) Firewall
(c) Backup (d) Viruses/Malware

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83. What is phishing? 12501163
(a) Securing Data
(b) Fishing Game
(c) Tricking Users for Info
(d) Blocking Traffic

84. What does a Denial-of-Service attack do? 12501164
(a) Encrypts Data (b) Backs Up Files
(c) Speeds Up Net (d) Stops Services

Data Backup and Recovery

85. Which of the following is the main purpose of data backup? 12501165
(a) Protect from Data Loss
(b) Increase Speed
(c) Hide Information
(d) To Delete old files

86. What does a full backup save? 12501166
(a) Changed Data Only
(b) System Settings
(c) All Data at Once
(d) Only New Files

87. What does incremental backup save?
(a) System Files 12501167
(b) All Data
(c) Nothing
(d) Only Changed Data

88. What does differential backup save?
(a) Deleted Files 12501168
(b) Changes Since Last Full
(c) Only New Changes
(d) All Data

89. Where can backups be stored? 12501169
(a) Only on Screen
(b) Only On USB
(c) Cloud/Hard Drives/Tapes
(d) Only on RAM

Usability and Security Tradeoffs

90. What does usability refer to? 12501170
(a) Cost (b) Ease of Use
(c) Data Size (d) System Speed

91. How do users learn a usable system? 12501171
(a) With Difficulty (b) Never
(c) Slowly (d) Quickly

92. What is the main goal of security?
(a) Simplify Tasks 12501172
(b) Reduce Cost
(c) Protect Systems/Data
(d) Increase Speed

93. Why are strong passwords a tradeoff?
(a) Easy to Remember 12501173
(b) Not Secure
(c) Too Short
(d) Difficult to Remember

94. What happens if security is removed? 12501174
(a) Risk Increases (b) Usability Drops
(c) Data Is Safe (d) Risk Decreases

ANSWERS KEY

1	c	2	a	3	d	4	c	5	b	6	c	7	b	8	b
9	c	10	c	11	d	12	c	13	c	14	d	15	c	16	a
17	c	18	b	19	d	20	b	21	c	22	b	23	d	24	c
25	d	26	c	27	d	28	a	29	c	30	b	31	c	32	c
33	a	34	b	35	b	36	a	37	c	38	c	39	a	40	d
41	c	42	c	43	d	44	a	45	b	46	c	47	c	48	a
49	c	50	c	51	b	52	b	53	c	54	b	55	c	56	a
57	c	58	c	59	a	60	c	61	b	62	c	63	b	64	c
65	c	66	a	67	c	68	b	69	a	70	b	71	c	72	d
73	a	74	b	75	c	76	c	77	b	78	c	79	c	80	c
81	b	82	d	83	c	84	d	85	a	86	c	87	d	88	b
89	c	90	b	91	d	92	c	93	d	94	a				

SOLVED EXERCISE

Multiple Choice Questions:

1. A computer network is: 12501175
(a) A single computer system
(b) A group of connected computers and devices
(c) A software programme
(d) A storage device

2. The device used to connect a computer to a network is: 12501176
(a) Monitor
(b) Keyboard
(c) Network Interface Card (NIC)
(d) Printer

3. A network that covers a small geographical area such as a school or office, is: 12501177
(a) WAN (b) MAN
(c) LAN (d) Internet

4. The topology that uses a central hub or switch is: 12501178
(a) Bus Topology (b) Ring Topology
(c) Star Topology (d) Mesh Topology

5. The OSI model contains: 12501179
(a) Five layers (b) Six layers
(c) Seven layers (d) Eight layers

6. The protocol mainly used to view web pages is: 12501180
(a) FTP (b) DNS
(c) TCP (d) HTTP

7. The main function of a router is to:
(a) Store data 12501181
(b) Connect devices within a network
(c) Connect different networks
(d) Display web pages

8. DNS is used to: 12501182
(a) Transfer files
(b) Protect data
(c) Convert domain names into IP addresses
(d) Connect hardware devices

9. The device that converts digital signals for Internet transmission is: 12501183
(a) Switch (b) Hub
(c) Modem (d) NIC

10. The topology that provides the highest reliability is: 12501184
(a) Bus topology (b) Ring topology
(c) Star topology (d) Mesh topology

ANSWERS KEY

1	b	2	c	3	c	4	c	5	c	6	d	7	c	8	c
9	c	10	d												

SHORT QUESTIONS

Q.1 What is a computer network? 12501185

Ans. A computer network allows different devices to connect and communicate with each other. It helps in sharing information, data, and resources quickly and easily. Networks are used in homes, schools, offices, and businesses.

Q.2 Write two uses of computer networks. 12501186

Ans. Two uses of computer networks are:

- Internet browsing and online communication.
- Online learning and business operations.

Q.3 What is network architecture? 12501187

Ans. Network architecture is the overall design of a computer network. It shows how computers, servers, and other devices are arranged and how data is transmitted across the network.

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Q.4 Name any two components of a computer network. 12501188

Ans.

- Network Interface Card (NIC)
- Router

Q.5 What is the OSI model? 12501189

Ans. The **OSI (Open Systems Interconnection)** model is a standard model used to understand network communication. It divides communication into **7** layers, each performing a specific function.

Q.6 Write the name of any two network topologies. 12501190

Ans.

- Bus Topology
- Star Topology

Q.7 What is a Local Area Network (LAN)? 12501191

Ans. A Local Area Network (LAN) connects devices within a small area such as a home, school, or office. It provides high data transfer speed and is usually managed by a single organization.

Q.8 What is the function of a router? 12501192

Ans. A router connects different networks together and directs data packets to their correct destination using IP addresses. It also manages network traffic and improves security.

Q.9 What is a network protocol? 12501193

Ans. A network protocol is a **set of communication rules** that define how data is formatted, transmitted, and received between devices on a network.

Q.10 What is the purpose of DNS? 12501194

Ans. DNS (Domain Name System) translates human-readable domain names, such as www.example.com, into machine-readable IP addresses. This makes it easier for users to access websites without remembering numerical IP addresses.

LONG QUESTIONS

Q.1 Define a computer network. Explain its importance and uses in daily life. 12501195

Ans. See Long Question No. 1

Q.2 Explain network architecture and describe the main components of a computer network. 12501196

Ans. See Long Question No. 2

Q.3 What is the OSI model? Explain its layers and their functions. 12501197

Ans. See Long Question No. 6

Q.4 Define network topology. Explain bus, star, ring and mesh topologies with advantages and disadvantages. 12501198

Ans. See Long Question No. 5

Q.5 Explain the types of computer networks. Describe LAN, WAN, and the Internet.

Ans. See Long Question No. 3 12501199

Q.6 Describe the main networking devices used in a computer network and explain their functions. 12501200

Ans. See Long Question No. 4

Q.7 What are network protocols? Explain TCP/IP, HTTP, FTP and DNS. 12501201

Ans. See Long Question No. 7

Q.8 Explain IP addressing. Describe IPv4, IPv6, the default gateway, and subnetting.

Ans. See Long Question No. 8 12501202

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SOLVED ACTIVITIES

ACTIVITY-1

Provide pictures or names of devices. Students match device names with functions. Discuss answers. **12501203**

Solution:

Match Networking Devices with Their Functions

Objective: To identify common networking devices and understand their functions in a computer network.

Materials Required

- Pictures or names of networking devices
- Activity worksheet
- Pen/Pencil

Instructions:

Match the networking device in **Column A** with its correct function in **Column B**.

Column A (Device)	Column B (Function)
1. NIC	A. Provides Wi-Fi connectivity
2. Switch	B. Connects a computer to a network
3. Router	C. Sends data to the correct device in a network
4. Modem	D. Connects different networks together
5. Wireless Access Point	E. Connects a local network to an Internet Service Provider (ISP)

Student Attempt

Device	Matching Function
NIC	____
Switch	____
Router	____
Modem	____
Wireless Access Point	____

Solved

Device	Correct Function
NIC	B. Connects a computer to a network
Switch	C. Sends data to the correct device in a network
Router	D. Connects different networks together
Modem	E. Connects a local network to an Internet Service Provider (ISP)
Wireless Access Point	A. Provides Wi-Fi connectivity

Discussion:

Q.1 Which device allows a computer to connect to a network? **12501203a**

Ans. NIC (Network Interface Card)

Q.2 Which device is commonly used to connect a home network to the Internet?

Ans. Modem and Router **12501203b**

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Q.3 Which device provides wireless Internet access? 12501203c
Ans. Wireless Access Point (WAP)
Q.4 Which device forwards data packets between different networks? 12501203d
Ans. Router

ACTIVITY-2

Students list services that use the internet. Discuss its importance. 12501204

Solution:

Objective: To identify different services that use the Internet and understand their importance in daily life.

Instructions:

1. Make a list of services that use the Internet.
2. Discuss how these services help people in education, business, communication, and entertainment.
3. Share your answers with the class.

Examples of Internet Services:

- Email
- Web Browsing
- Social Media
- Online Banking (E-Banking)
- E-Commerce (Online Shopping)
- Video Conferencing
- Cloud Storage
- Online Learning Platforms
- Streaming Services (YouTube, Netflix, etc.)
- Online Gaming

Discussion Questions:

Q.1 Which internet service do you use most often? 12501204a
Ans. I use email, web browsing, and social media most often.
Q.2 How does the internet make communication easier? 12501204b
Ans. It allows instant communication through email, messaging, and video calls.
Q.3 Why are online banking and e-commerce important? 12501204c
Ans. They provide convenient access to financial transactions and online shopping.
Q.4 How has the internet changed education? 12501204d
Ans. It enables online learning and easy access to educational resources.
Q.5 What problems might occur if internet services are unavailable? 12501204e
Ans. Communication, online services, and access to information may be disrupted.

ACTIVITY-3

Teacher explains modem using signal conversion example. Students summarize. 12501205

Solution:

A modem **(Modulator-Demodulator)** is a networking device that enables communication between a computer and the internet. It performs signal conversion by converting digital

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signals from a computer into analog signals for transmission over communication lines (modulation). At the receiving end, it converts the analog signals back into digital signals (demodulation) so that the computer can understand the data. This process allows data to be transmitted over telephone or cable networks efficiently and enables internet connectivity.

ACTIVITY-4

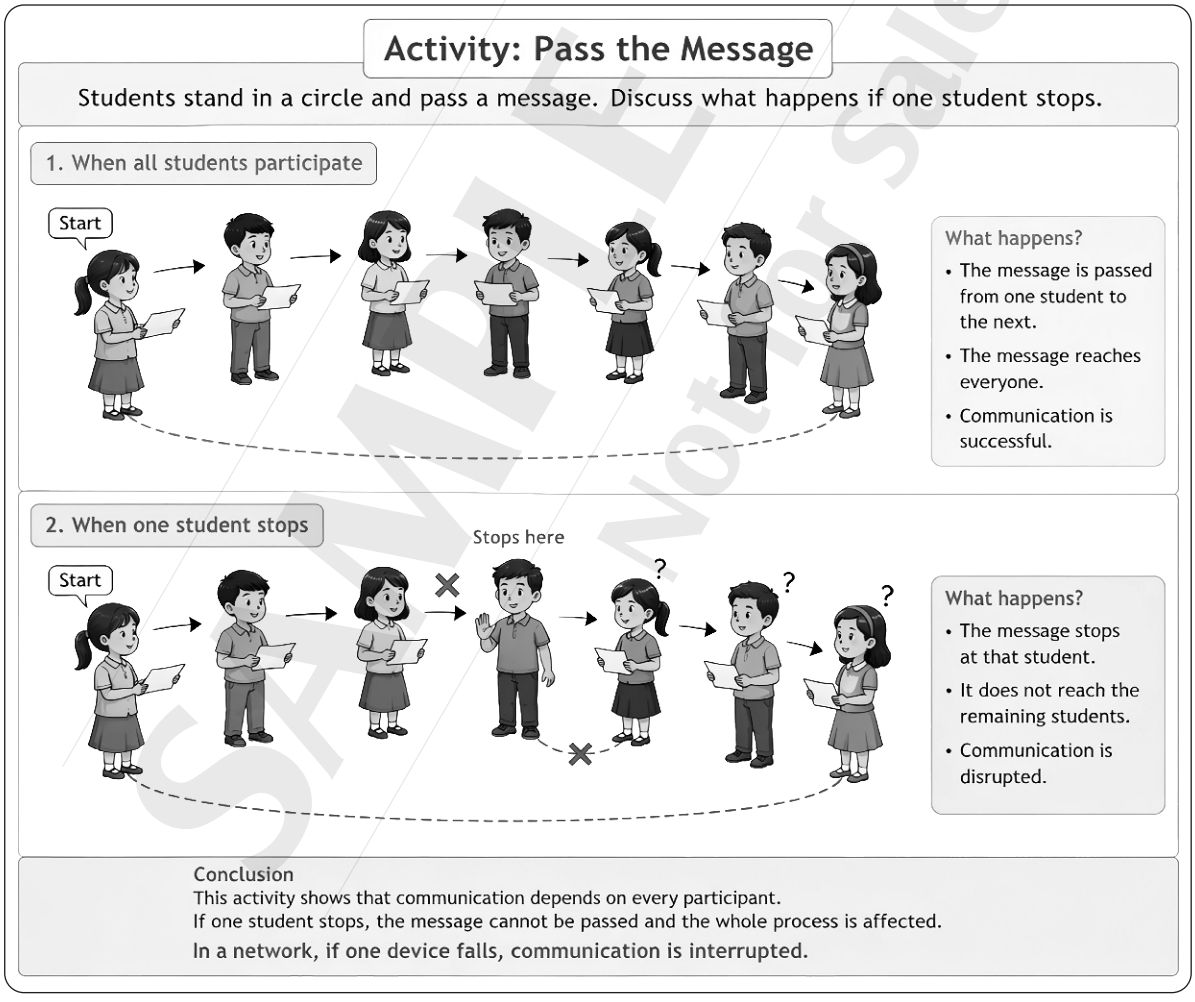
Students stand in a circle and pass a message. Discuss what happens if one student stops.

12501206

Solution:

This activity shows that communication depends on every participant in a system. When students pass a message in a circle, the message flows from one student to the next. If one student stops, the communication breaks and the message cannot be passed further. This results in disruption of the whole process, showing that all devices (or nodes) in a network must work properly for effective communication.

Pictorial Representation



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ACTIVITY-5

Create sample strong password with length of eight alpha-numeric. **12501207**

Solution:

A sample **strong 8-character alphanumeric password** is:

A7m9X2qP

It contains:

- Uppercase letters: **A, X, P**
- Lowercase letters: **m, q**
- Numbers: **7, 9, 2**

Other examples:

- **B4n8K7mQ**
- **R9t2W6pL**
- **M5x7C1vN**

These are 8 characters long and use a mix of letters and numbers, making them stronger than simple passwords.

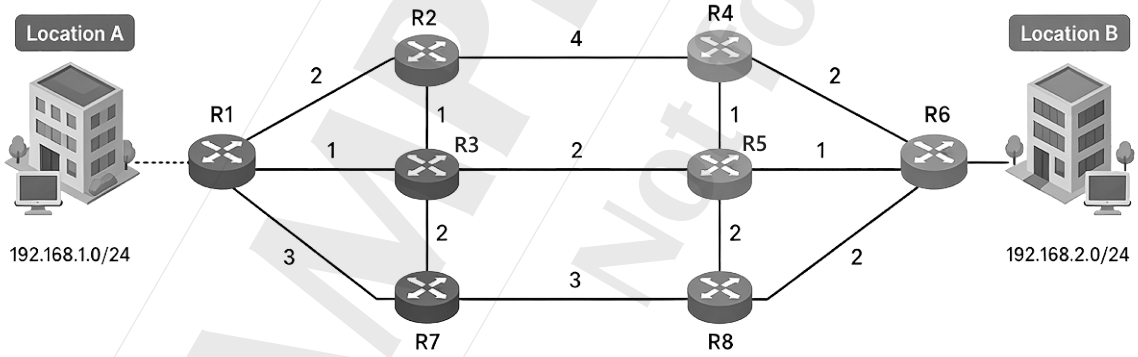
ACTIVITY-6

Map packet paths between two locations. **12501208**

Solution:

Map Packet Paths between Two Locations

Task: Map the packet paths from Location A to Location B using the given network diagram.



Legend

Router

Link (Cost)

LAN Connection

Packet Paths (Possible Routes)

Path No.	Route (From R1 to R6)	Total Cost
1	R1 → R2 → R4 → R6	8
2	R1 → R3 → R5 → R6	4
3	R1 → R7 → R8 → R6	8
4	R1 → R3 → R7 → R8 → R6	8
5	R1 → R2 → R3 → R5 → R6	6

Shortest Path

The best (lowest cost) path from Location A to Location B is:

R1 → R3 → R5 → R6

Total Cost = 4

Note: Packets may take the shortest path or alternate paths if a link or router fails.

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ACTIVITY-7

Identify possible causes of delay in a given scenario. **12501209**

Solution:

Possible Causes of Delay

1. **Too many users on the network:** When many devices are connected at the same time, the network becomes overloaded, causing slow data transfer and delays.
2. **Low bandwidth:** If the network has limited bandwidth, it cannot handle large amounts of data efficiently, resulting in slower speed.
3. **High latency (Delay):** When the time taken for data to travel is high, it increases response delay between sender and receiver.
4. **Network congestion:** Heavy traffic of data in the network reduces performance and causes delays in communication.
5. **Poor-quality cables or connections:** Damaged or low-quality hardware can interrupt or slow down data transmission.
6. **Long distance between devices:** Greater distance increases the time data takes to travel, leading to higher delay.
7. **Hardware problems:** Faulty routers, switches, or other network devices can reduce efficiency and cause delays.

These factors collectively reduce network performance and lead to slower internet speed and delayed communication.

ACTIVITY-8

Discuss how security protects sensitive data like CT scans of patients in a hospital. **12501210**

Solution:

Network security plays a vital role in protecting highly sensitive medical data such as CT scans of patients in a hospital. CT scans contain **Personal Health Information (PHI)** that must remain confidential, accurate, and available only to authorized personnel. Here's how network security protects this data:

1. Confidentiality (Preventing Unauthorized Access)

- Network security ensures that only authorized doctors, radiologists, and medical staff can access CT scans.
- Techniques like strong password authentication, role-based access control (RBAC), and two-factor authentication (2FA) are used so that no unauthorized person (e.g., hackers or non-medical staff) can view patient images.
- Encryption is applied to the data both when it is stored and when it is transmitted over the network. Even if someone intercepts the data, they cannot read it without the decryption key.

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