



Vidyavardhini's College of Engineering and Technology
Department of Artificial Intelligence & Data Science

AY: 2025-26

Class:	T.E.	Semester:	V
Course Code:	CSC501	Course Name:	COMPUTER NETWORKS

Name of Student:	SHRUTI GAUCHANDRA
Roll No. :	16
Assignment No.:	01
Title of Assignment:	Apply the concepts of data communication and appropriate topologies for end-to-end,
Date of Submission:	21/07/25
Date of Correction:	28/07/25

Evaluation

Performance Indicator	Max. Marks	Marks Obtained
Completeness	5	05
Demonstrated Knowledge	3	03
Legibility	2	02
Total	10	10

Performance Indicator	Exceed Expectations (EE)	Meet Expectations (ME)	Below Expectations (BE)
Completeness	5	3-4	1-2
Demonstrated Knowledge	3	2	1
Legibility	2	1	0

Checked by

Name of Faculty : Mrs. SNEHA YADAV

Signature :

Date :


28/07/25

Apply the concepts of data communication and appropriate topologies for end-to-end communication.

Q1.

a) You are setting up a home network with both wired and wireless devices. Using the understanding of modems, routers, and access points to design the setup, find devices that you will use and how they interact.

→ ① To setup a home network that supports both wired and wireless devices, you need to use combination of networking hardware that works together; to provide stable and secure internet access throughout your home.

② The core device is the modem, which connects directly to your Internet Service Provider (ISP) via a ~~cable~~, DSL or fibre line. Its main job is to bring internet to your home.

③ However, a modem alone cannot create a home network or provide Wi-Fi. That's where the router comes in.

Modem has two functions:

- (i) Converts ISP signals into Ethernet signals.
(ii) Connected to the router's WAN port provided by ISP.

④ The router connects to the modem using the Ethernet cable. It acts as the central hub of your network, distributing internet access to multiple devices, both wired and wireless.

⑤ The router assigns IP addresses to connected devices.

manages data traffic, provides firewall protection and usually includes built-in wi-fi capability for wireless devices like smartphones, tablets and laptops.

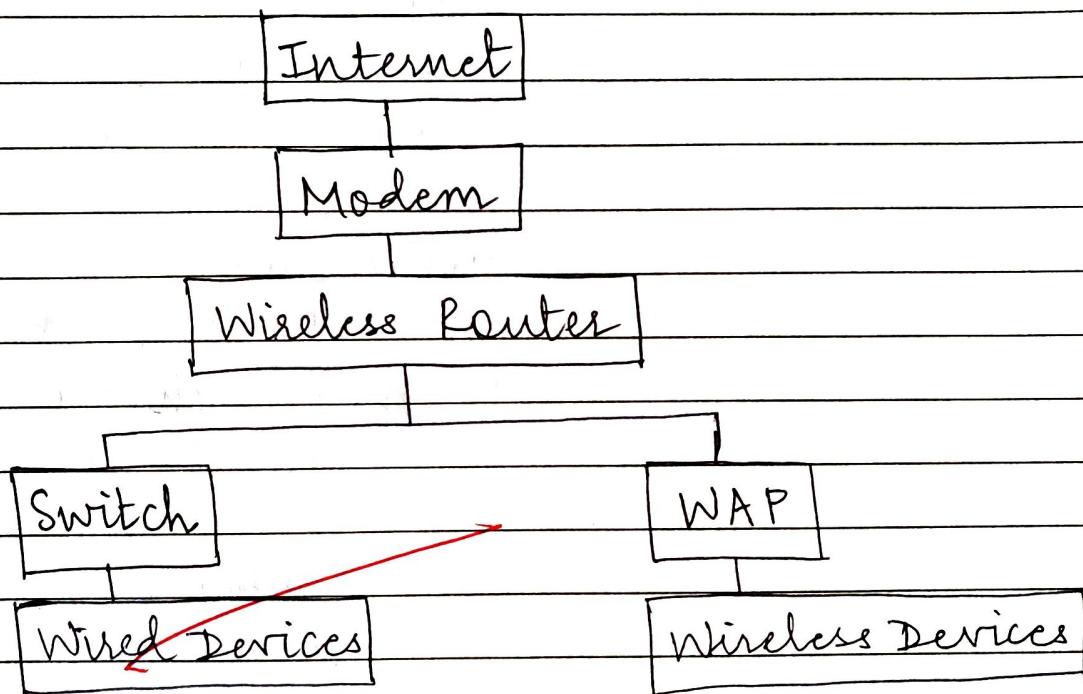
- ⑥ For wired devices like desktop PCs, smart TVs or gaming consoles, ethernet cables are used to connect them directly to router.
- ⑦ If you need more Ethernet ports then the router provides, you can use a network switch, which expands the number of wired connections available.
- ⑧ Switch connects to the router and allows multiple additional devices to join the network via wired connections.
- ⑨ In larger homes or areas with weak Wi-Fi signals a wireless access point (WAP) can be added to extend the network's range.
⑩ The access point connects to the router using a wired connection and broadcasts wifi to areas the main router can't reach.
- ⑪ By integrating the modem, router and optional access points, you can create a seamless home network that ensures fast and reliable connectivity for both wired and wireless devices.
- ⑫ Router :
 - (i) Assigns private IP addresses, performs NAT and acts as a firewall.
 - (ii) Connected between the modem and rest of the network, routes data between LAN & the internet

⑬ Switch:

- (i) Connects multiple wired devices and prevents data collisions using micro-segmentation.
- (ii) Connected to the router's LAN port, and devices connect to the switch.

⑭ Wireless Access Point (WAP):

- (i) Provides WiFi coverage for wireless devices
- (ii) Connected to the router via Ethernet Broadcasts SSID for wireless connection.



b) Given a network scenario with high traffic, which device would you use to manage data collisions effectively, and why?

Apply your understanding of networking devices to justify your choice.

- ① In a high-traffic network scenario, the most effective device to manage data collisions is a network switch, especially a managed switch.
- ② Switches are devices that ^{are} designed to intelligently forward data to the exact device that needs it, using MAC addresses to identify each connected device.
- ③ This targeted communication prevents unnecessary data flooding across the network and reduces the risk of data collisions, which are common in simpler devices like hubs that broadcast data to all ports.
- ④ Each port on a switch creates its own collision domain meaning devices connected to different ports can send and receive data simultaneously without interfering with each other.
- ⑤ Managed switches provide even more controls and efficiency.
- ⑥ They allow network administrators to monitor traffic, limit bandwidth usage, and prioritize certain types of data through Quality of Service (QoS) settings.

⑦ Full-Duplex Communication:

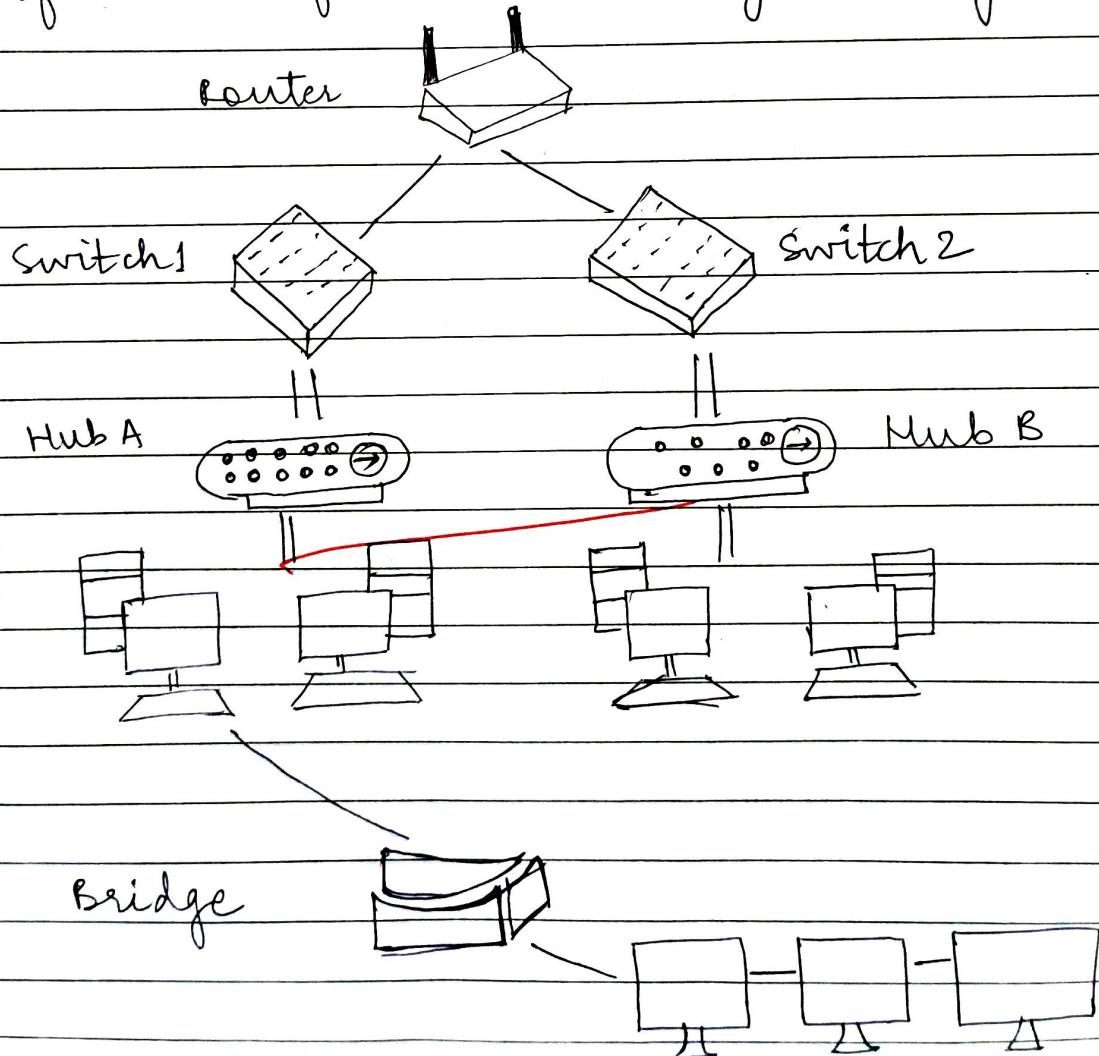
Unlike hubs, switches support full-duplex mode allowing simultaneous sending and receiving of data eliminating collisions.

⑧ MAC address learning:

Switches learn MAC addresses of connected devices and forward data only to the intended port, reducing unnecessary traffic.

⑨ Buffered Traffic:

Switches use internal memory to buffer and forward frames smoothly during congestion.



Q2. During a network expansion, the existing bus topology causes congestion. What changes would you make and why?

Apply your understanding to modify the network design effectively.

→ In bus topology, all devices are connected or all the devices share a single communication line, as more devices are added;

- (i) The traffic increases leading to frequent data collisions
- (ii) The devices must wait for the bus to be free before transmitting.
- (iii) The performance degrades significantly with high traffic.

The old topology was bus topology. The change made in the topology i.e., the new topology is star topology.

The star topology uses a central switch or router.

Advantages of star Topology:

- (i) It has dedicated links to switch; it eliminates collisions since each device has its own connection.
- (ii) Scalability:
It is easy to add more devices without affecting

existing ones.

(iii) Performance:

It has high-speed switches that support full-duplex and parallel transmission.

(iv) Fault-isolation:

A fault in one cable or device doesn't affect the entire network.

(v) Easy management:

The centralized control through a switch simplifies trouble-shooting and monitoring.

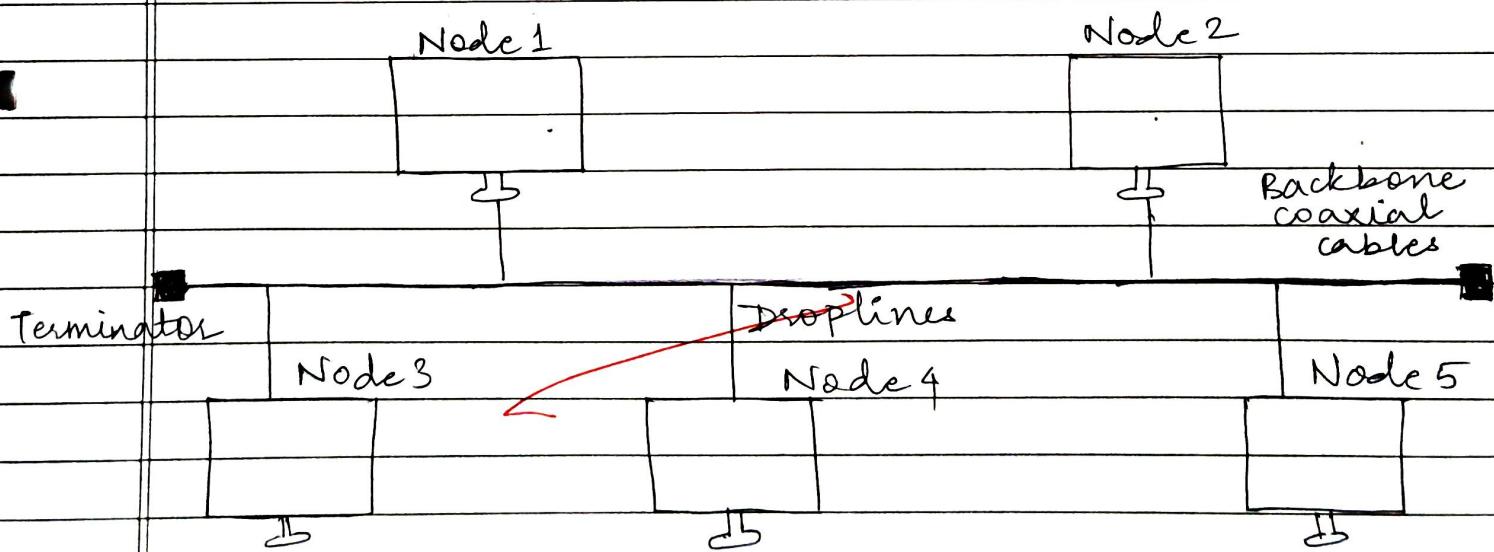
The devices that are needed to upgrade are:

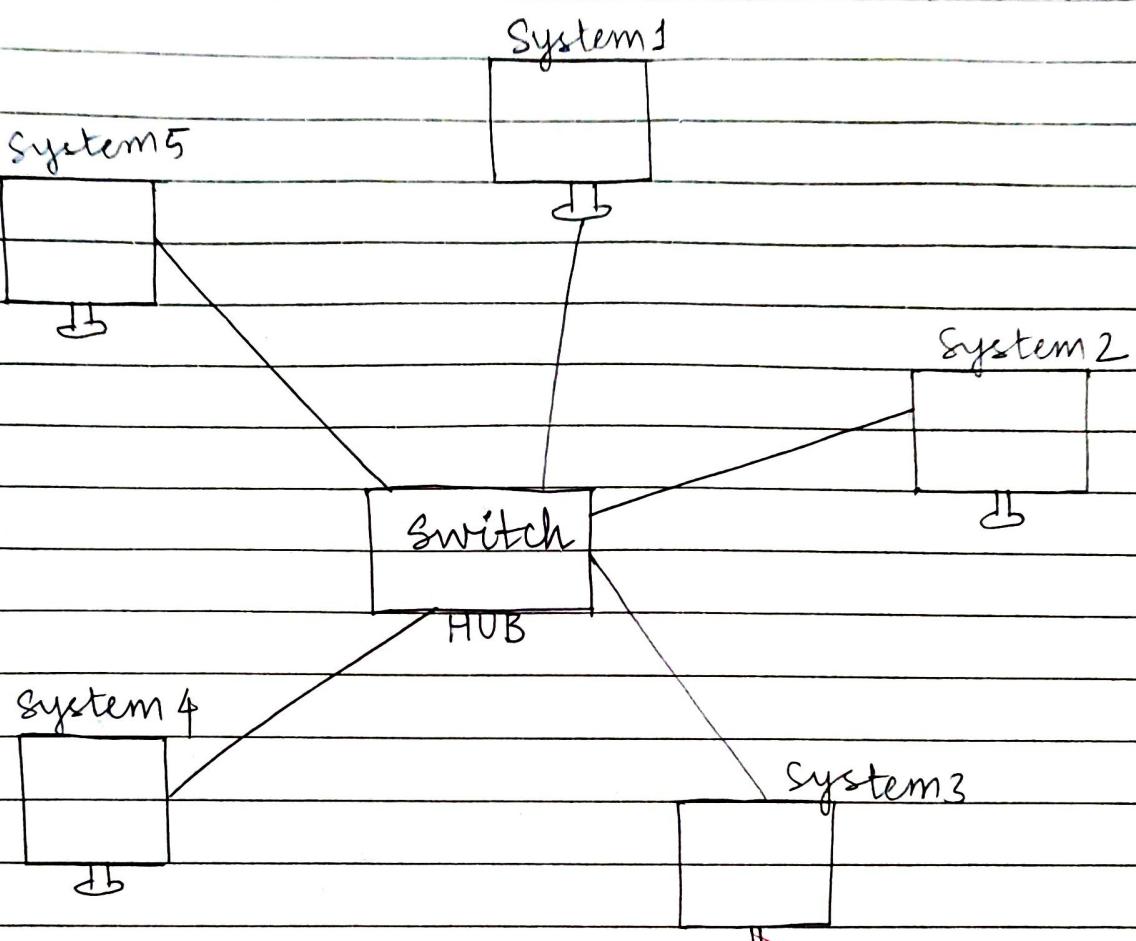
(i) Network switch

(ii) Ethernet cable

(iii) Network Interface cards (NIC's)

The following is the bus topology:





This picture demonstrates a Star Topology.