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DATA COMMUNICATION WEEK 12

1.Network Topology Comparison

Topology	Diagram (Conceptual)	Key Characteristics	Advantages	Disadvantages	Typical Use Case
Bus	`Device — Device — Device — Terminator`	All computers share a single communication line or backbone cable.	Simple and inexpensive to set up for small networks.	A fault in the main cable can bring down the whole network; performance decreases with more devices.	Small home networks or early LAN systems.
Star	`All Devices → Central Hub or Switch`	Every device is individually connected to a central hub or switch.	Easy to install, manage, and expand; one cable failure doesn't affect others.	The entire network depends on the central hub; requires more cabling.	Modern Ethernet LANs in schools, offices, and companies.
Ring	`Device → Device → Device → back to first`	Data travels in one direction around a closed loop.	Predictable performance and equal access for all devices.	A break in the ring disrupts the whole network; difficult to add or remove nodes.	Older token ring networks and industrial systems.
Mesh	`Every Device ↔ Every Other Device`	Each device connects to all others, forming multiple paths.	Extremely reliable and fault-tolerant; supports heavy data traffic.	Very expensive and complex to install and maintain.	Military, industrial, or wireless mesh networks.

SUMMARY

The **star topology** has become the most common layout for modern wired LANs because it is efficient, reliable, and easy to manage. In this design, every device connects directly to a central hub or switch, which handles all communication between computers. This makes troubleshooting simple since a problem in one cable or device does not affect the rest of the network. It is also easy to expand, as new devices can be added without interrupting others. The star topology reduces data collisions and allows high-speed communication, which is essential for today's office and campus environments. Although it relies on the central hub's performance, modern switches are highly reliable, making this weakness minimal. Overall, the star topology

provides the best combination of speed, stability, and scalability, which is why it has become the standard structure for wired LANs in schools, businesses, and institutions.

2.Case Study: Multiprotocol Label Switching (MPLS) WAN

Introduction
Multiprotocol Label Switching (MPLS) is a wide area network (WAN) technology used by Internet Service Providers (ISPs) and large organizations to connect multiple sites efficiently. It operates between the Data Link Layer and Network Layer, often referred to as "Layer 2.5," because it combines the speed of switching with the intelligence of routing.

Topology and Implementation
In an MPLS network, data packets are assigned short labels instead of long network addresses. These labels define pre-established paths known as Label Switched Paths (LSPs). Routers in the MPLS core—called Label Switch Routers (LSRs)—forward packets based on these labels, allowing faster and more predictable data transfer. The overall topology is usually a **mesh or partial-mesh**, meaning most routers are interconnected to provide multiple paths for reliability. Enterprises connect their branch offices (Customer Edge devices) to the provider's MPLS backbone through edge routers.

Scale and Usage
MPLS networks can span entire countries or continents, supporting thousands of connections. For example, global companies like Cisco and IBM use MPLS to link regional offices, data centers, and cloud services under one managed network. MPLS supports advanced features such as Quality of Service (QoS), ensuring that important traffic—like voice and video—gets priority delivery. It also offers Virtual Private Networks (VPNs), giving organizations private and secure communication channels across the public infrastructure.

Conclusion
MPLS has become a foundation of modern WANs due to its scalability, reliability, and flexibility. It simplifies traffic management, reduces latency, and improves performance for real-time applications. Because of its ability to integrate multiple types of traffic and maintain strong service quality, MPLS remains one of the most widely used WAN technologies for businesses and service providers around the world.