

KUMOLU BOLAJI STELLA
MATRIC NO: RUN/CMP/24/17877

TOPICS

- **HISTORY OF INTERNET**
- **DIFFERENT TYPES OF NETWORK TOPOLOGY (ADVANTAGES AND DIADVANTAGES)**
- **COMPARISON OF DIFFERENT TYPES OF NETWORK TOPOLOGY**

COURSE CODE: CSC 828

INTERNET TECHNOLOGY

LECTURER IN CHARGE: DR.
S.A. ADEPOJU

HISTORY OF INTERNET

One of the most transformative innovations in modern history is the internet. It evolved from several researches and development initiatives targeted at improving communication and data sharing among computers. Internet is a global system of interconnected computer networks that uses TCP/IP to link several computers all over the world together. Its history can be traced back to the 1960s, during the Cold War, when the United States Department of Defense funded a project called ARPANET (Advanced Research Projects Agency Network). ARPANET, developed by the ARPA (now DARPA), was the first network to implement packet-switching technology, which allowed data to be broken into blocks and transmitted between nodes efficiently (Leiner et al., 2009). In 1969, ARPANET connected its first four nodes: UCLA, Stanford Research Institute, UC Santa Barbara, and the University of Utah. This small but revolutionary network demonstrated that computers could communicate over long distances, forming the foundation of what would become the Internet (Abbate, 2000).

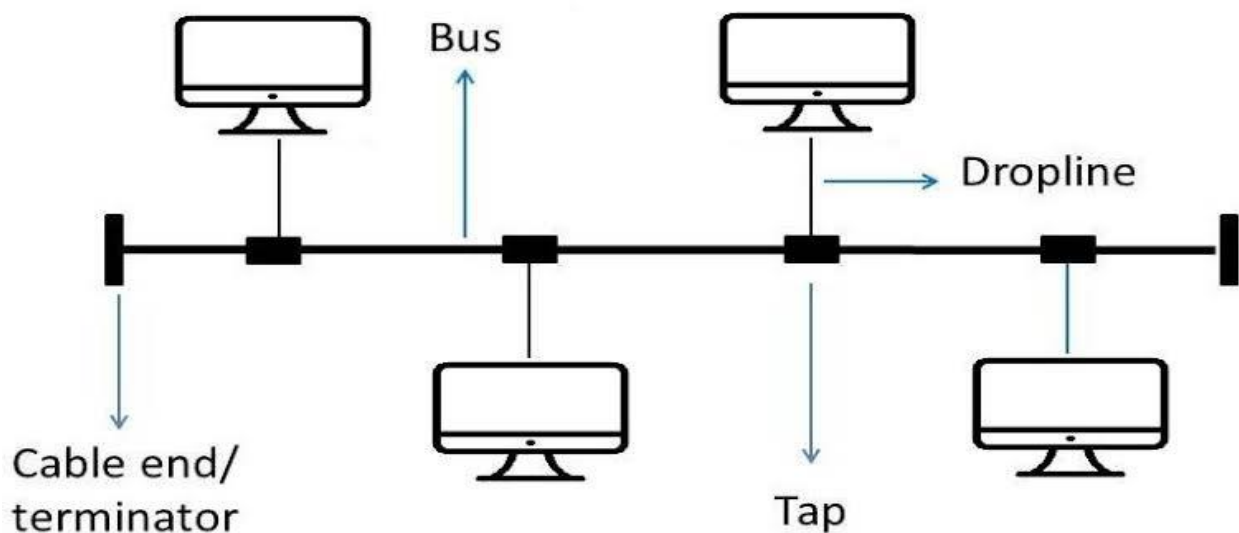
By the 1970s, researchers like Vinton Cerf and Robert Kahn developed the Transmission Control Protocol/Internet Protocol (TCP/IP), which enabled different networks to interconnect and communicate reliably. TCP/IP was adopted as the standard networking protocol in 1983, marking the true birth of the modern Internet (Leiner et al., 2009). The next major milestone came with the invention of the World Wide Web (WWW) in 1989 by Tim Berners-Lee, a British scientist working at CERN (Counceil Europeen pour la Recherche Nucleaire). The Web provided a graphical interface, hyperlinks, and easy access to information through browsers such as Mosaic (later Netscape), which launched in 1993. This innovation made the Internet accessible to the general public and sparked a global digital revolution (Berners-Lee, 2000).

By the mid-1990s, the Internet had transitioned from a research tool to a commercial and social platform. The rise of web services, email, e-commerce, and later social media platforms dramatically altered how people communicate, conduct business, and share information. In the 21st century, the Internet continues to evolve through developments such as broadband, Wi-Fi, cloud computing, and the Internet of Things (IoT). It has become an essential infrastructure for education, healthcare, finance, business and virtually every aspect of daily life, reflecting its deep integration into global society.

DIFFERENT TYPES OF NETWORK TOPOLOGY (ADVANTAGES AND DIADVANTAGES)

BUS TOPOLOGY

In bus topology, all nodes are connected to a single central communication line called the bus. Data travels bidirectionally, and each node listens to data transmitted on the bus. Endpoints are terminated to prevent signal reflection.



ADVANTAGES

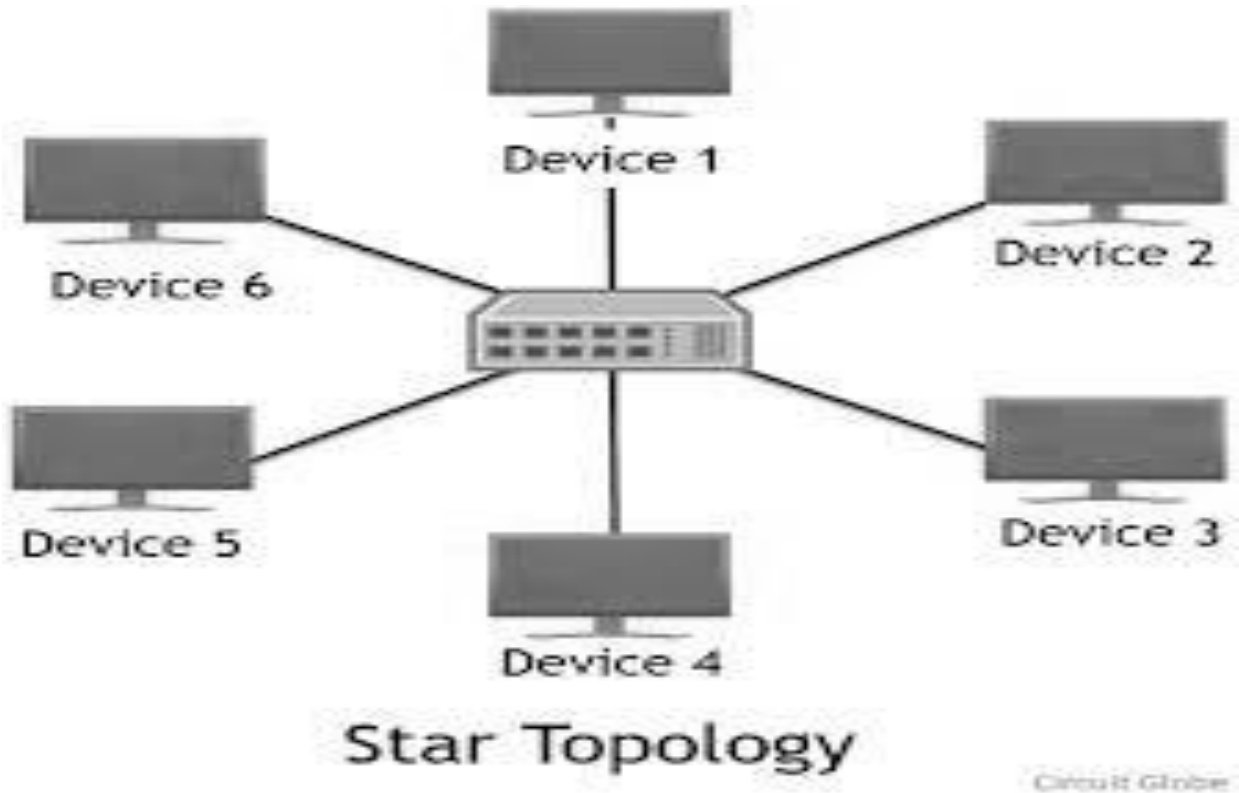
- Simple architecture and low cost.
- Less cabling compared to other topologies.
- Easy to extend with new nodes.

DISADVANTAGES

- Single point of failure—if the main cable fails, the network goes down.
- Poor scalability due to data collisions.
- Difficult to isolate faults.

STAR TOPOLOGY

In this topology, each node is individually connected to a central hub, switch, or router. All communication passes through the central device.



ADVANTAGES

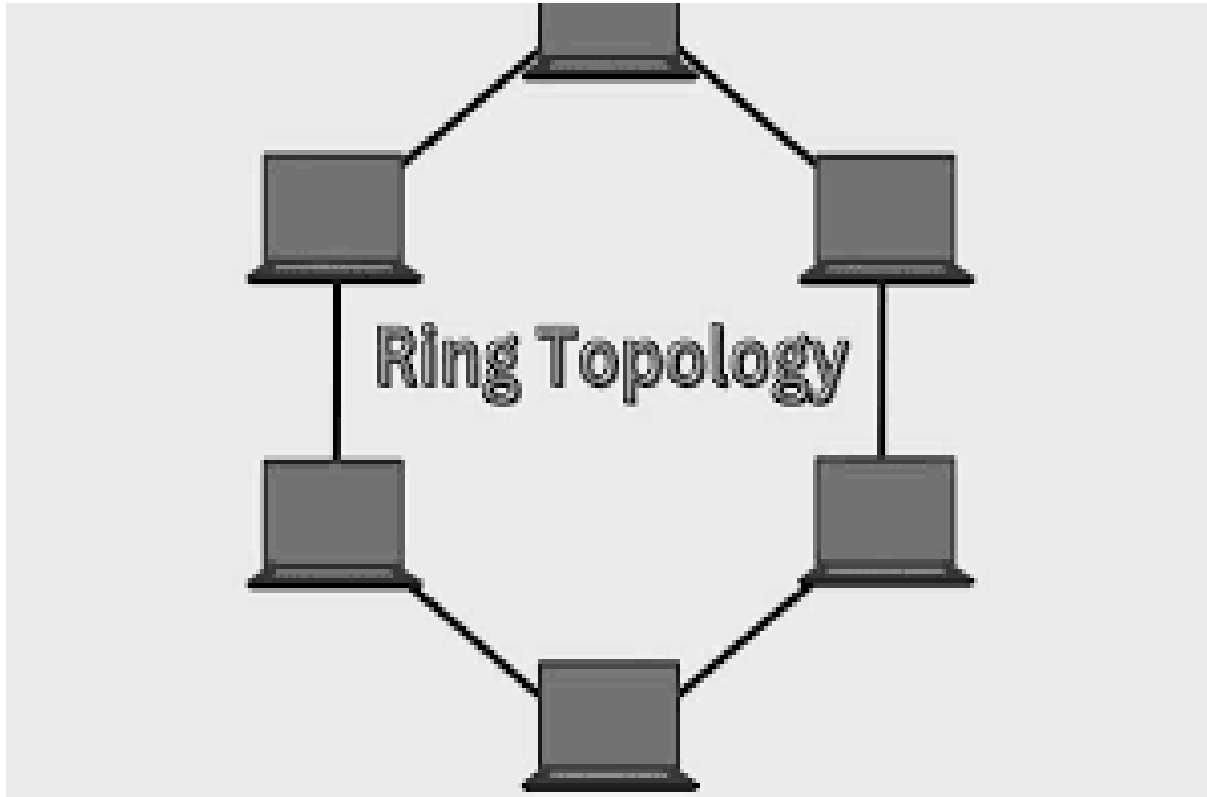
- It is easy to manage, troubleshoot, and scale.
- Failure of one node does not affect the others.
- Centralized control and monitoring possible.

DISADVANTAGES

- Failure of the central device leads to entire network failure.
- It requires more cabling than bus topology.
- Network performance depends on central hub's capacity.

RING TOPOLOGY

Each node connects to exactly two other nodes, forming a closed loop or ring. Data travels in one direction (unidirectional) or both (bidirectional).



ADVANTAGES

- Equal access to the network for all nodes.
- Predictable network performance under load.
- Easy to detect location of faults (if monitoring is in place).

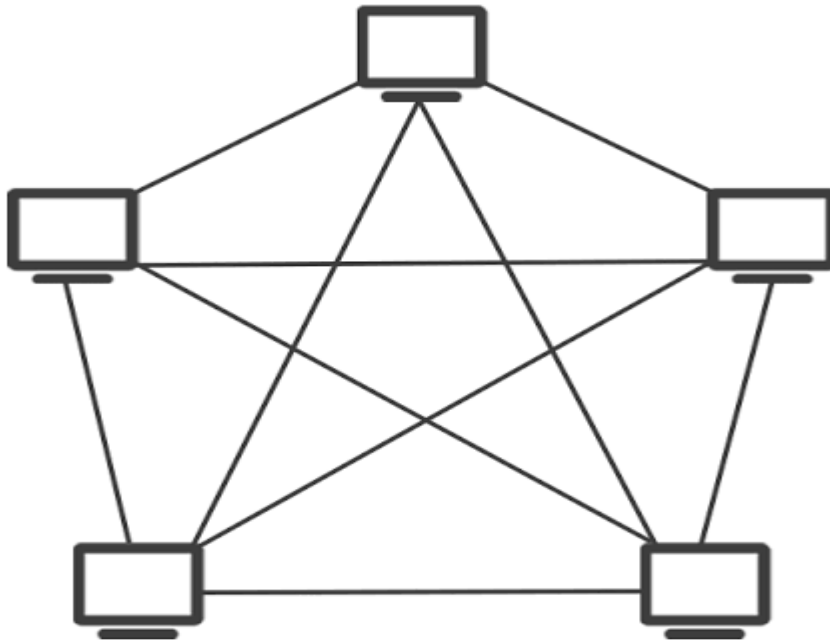
DISADVANTAGES

- Failure in any one link disrupts the entire network.
- More difficult to reconfigure or troubleshoot than star topology.
- Performance degrades with more devices.

MESH TOPOLOGY

In mesh topology, nodes are interconnected with multiple redundant paths. In full mesh, every node connects to every other node. In partial mesh, only some nodes have multiple connections.

MESH TOPOLOGY



ADVANTAGES

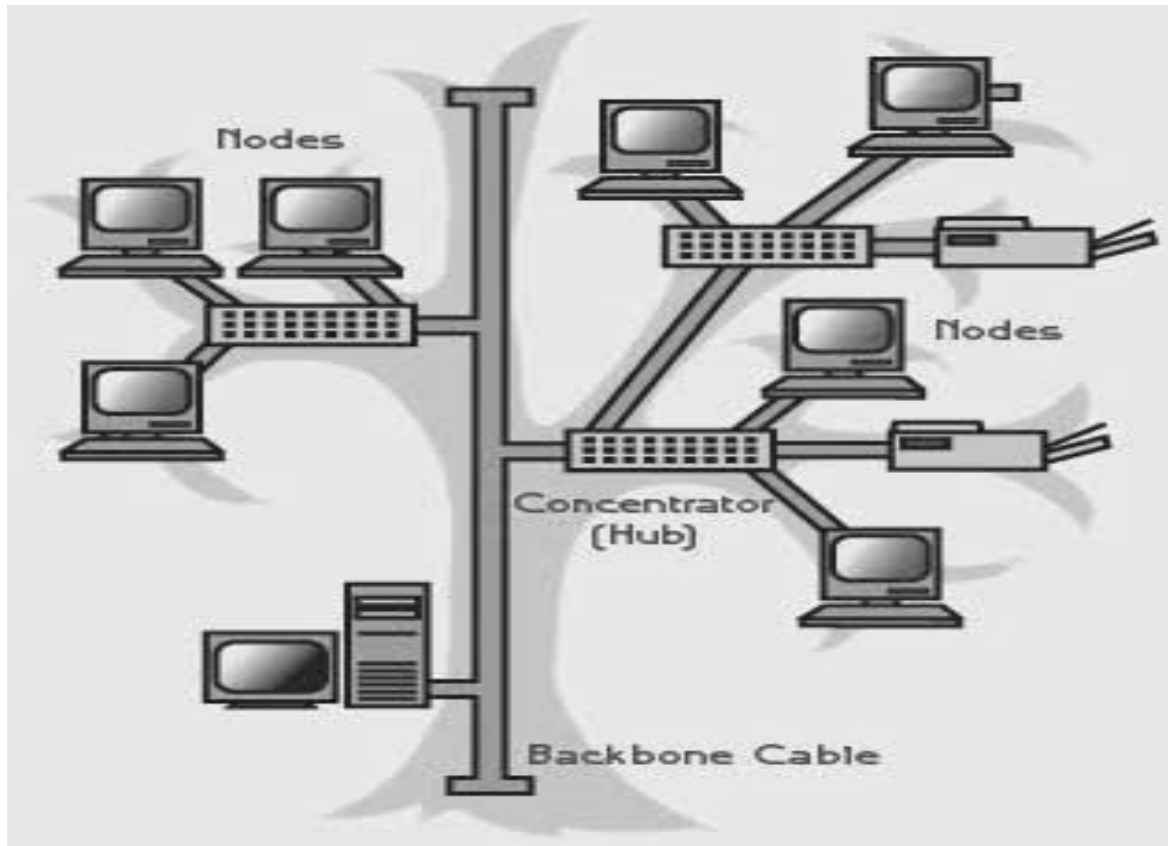
- High fault tolerance, failure of one link doesn't affect the network.
- Data can be rerouted through alternate paths.
- Provides robust security and reliability.

DISADVANTAGES

- Complex and expensive setup.
- Scalability issues in large networks.
- High maintenance and cabling cost.

TREE TOPOLOGY

It is also called hierarchical topology, this structure connects star topologies in a tree-like fashion. It typically has a root node and branches of subordinate nodes.



ADVANTAGES

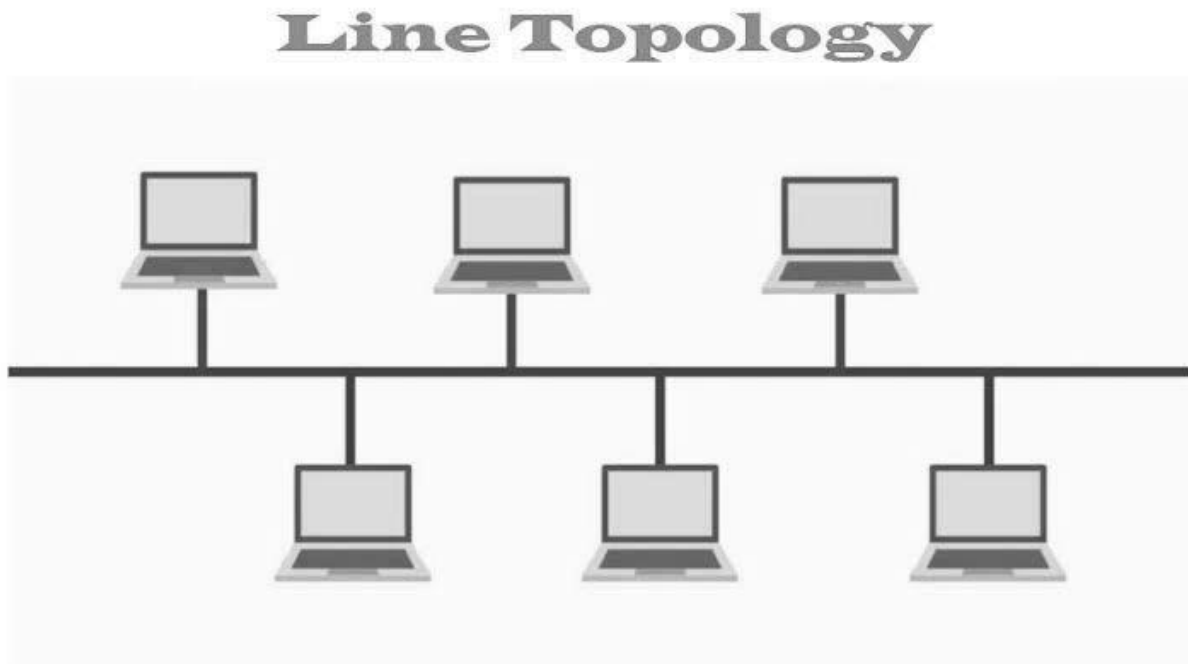
- Scalable and manageable—suitable for large organizations.
- Enables segmentation and isolation of network parts.
- Supports both centralized and decentralized structures.

DISADVANTAGES

- Failure of root node can bring down the whole network.
- Complicated to configure and maintain.
- High cabling cost as the network expands.

LINE TOPOLOGY

It is also known as linear bus topology, it is a simplified version of bus topology where devices are arranged in a straight line and data flows in one or both directions.



ADVANTAGES

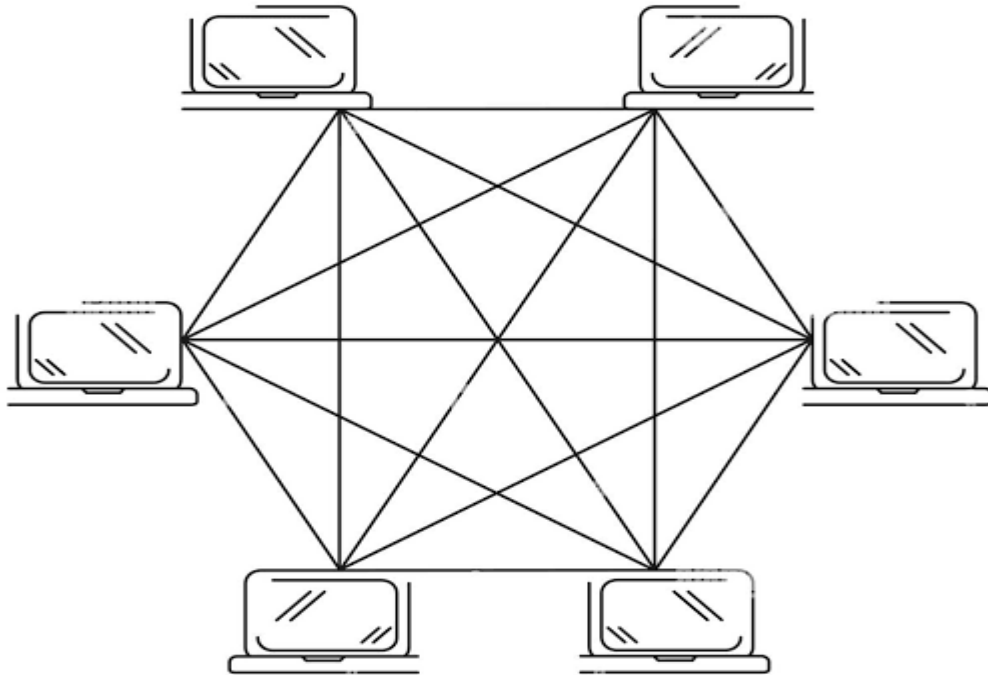
- Simple design and low implementation cost.
- Suitable for small, temporary networks.
- Minimum cabling required.

DISADVANTAGES

- No fault tolerance, one node or cable failure affects the whole network.
- Low performance under heavy traffic.
- Not scalable or secure.

FULLY CONNECTED TOPOLOGY

Every node is directly connected to all other nodes. This is a special case of full mesh topology.



FULLY CONNECTED

ADVANTAGES

- Maximum redundancy and fault tolerance.
- No data collision or congestion, as each connection is dedicated.
- It provides best performance and security.

DISADVANTAGES

- Extremely high cost and complexity in large networks.
- Impractical for general use used mainly in small, high-priority networks (e.g., military or financial sectors).
- It is difficult to install and maintain.

COMPARISON OF DIFFERENT TYPES OF NETWORK TOPOLOGY

	Bus Topology	Star Topology	Ring Topology	Mesh Topology	Tree Topology	Line Topology	Fully connected Topology
Structure	Single central cable connecting all nodes	Central hub connects to each node individually	Nodes connected in a closed loop	Every node connects to several or all others	Hierarchical branches from a central root	Devices connected in a straight line	Every node directly linked to every other
Cost	Low	Moderate	Moderate	High	High	Low	Very High
Scalability	Low	High	Moderate	Low (full), High (partial)	High	Low	Very Low
Reliability	Low	Moderate to High	Moderate	Very High	Moderate	Low	Extremely High
Fault Tolerance	Low (single cable failure)	Moderate (hub is critical)	Low (unless dual ring used)	High	Moderate	Very Low	Extremely High
Ease of maintenance	Moderate	Easy	Complex	Complex	Moderate to Complex	Simple	Very Complex
Use Case Suitability	Small networks, temporary setups	Offices, LANs, wireless networks	WANs, token ring networks	Backbone networks, military systems	Large organizations, ISPs	Point-to-point links, basic setups	Critical systems (e.g., finance, defense)

REFERENCES

Abbate, J. (2000). *Inventing the Internet*. MIT Press.

Berners-Lee, T. (2000). *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by its Inventor*. Harper San Francisco.

Leiner, B. M., Cerf, V. G., Clark, D. D., Kahn, R. E., Kleinrock, L., Lynch, D. C., ... & Wolff, S. (2009). A brief history of the Internet. *ACM SIGCOMM Computer Communication Review*, 39(5), 22–31. <https://doi.org/10.1145/1629607.1629613>

Forouzan, B. A. (2007). *Data Communications and Networking* (4th ed.). McGraw-Hill.

Tanenbaum, A. S., & Wetherall, D. J. (2011). *Computer Networks* (5th ed.). Pearson Education.

Kurose, J. F., & Ross, K. W. (2017). *Computer Networking: A Top-Down Approach* (7th ed.). Pearson.

Stallings, W. (2013). *Data and Computer Communications* (10th ed.). Pearson Education.