

# Network Topologies

# Objectives

- Describe the basic and hybrid LAN physical topologies, and their uses, advantages and disadvantages
- Describe the backbone structures that form the foundation for most LANs

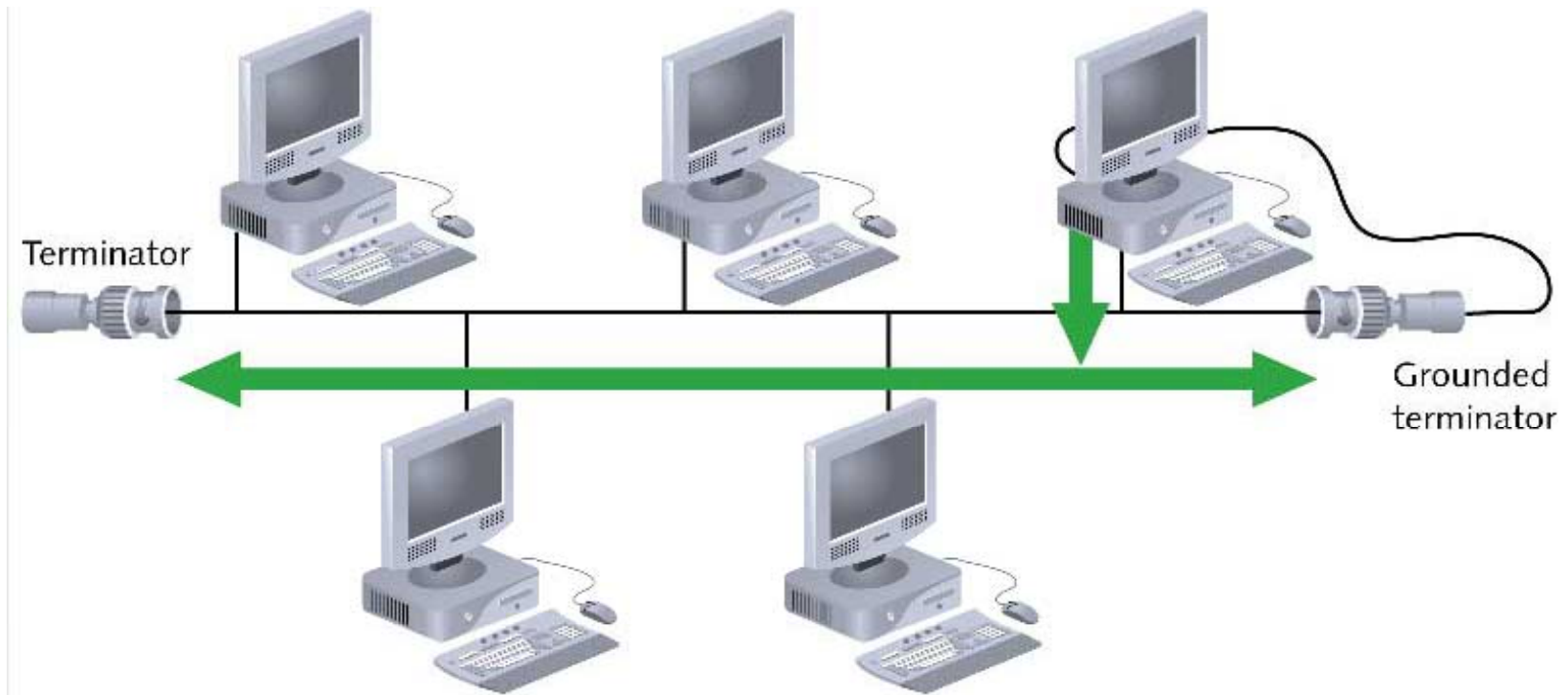
# Simple Physical Topologies

- Physical topology: physical layout of nodes on a network
- Three fundamental shapes:
  - Bus
  - Ring
  - Star
- May create hybrid topologies
- Topology integral to type of network, cabling infrastructure, and transmission media used

# Bus

- Single cable connects all network nodes without intervening connectivity devices
- Devices share responsibility for getting data from one point to another
- Terminators stop signals after reaching end of wire
  - Prevent signal bounce
- Inexpensive, not very scalable
- Difficult to troubleshoot, not fault-tolerant

# Bus (continued)



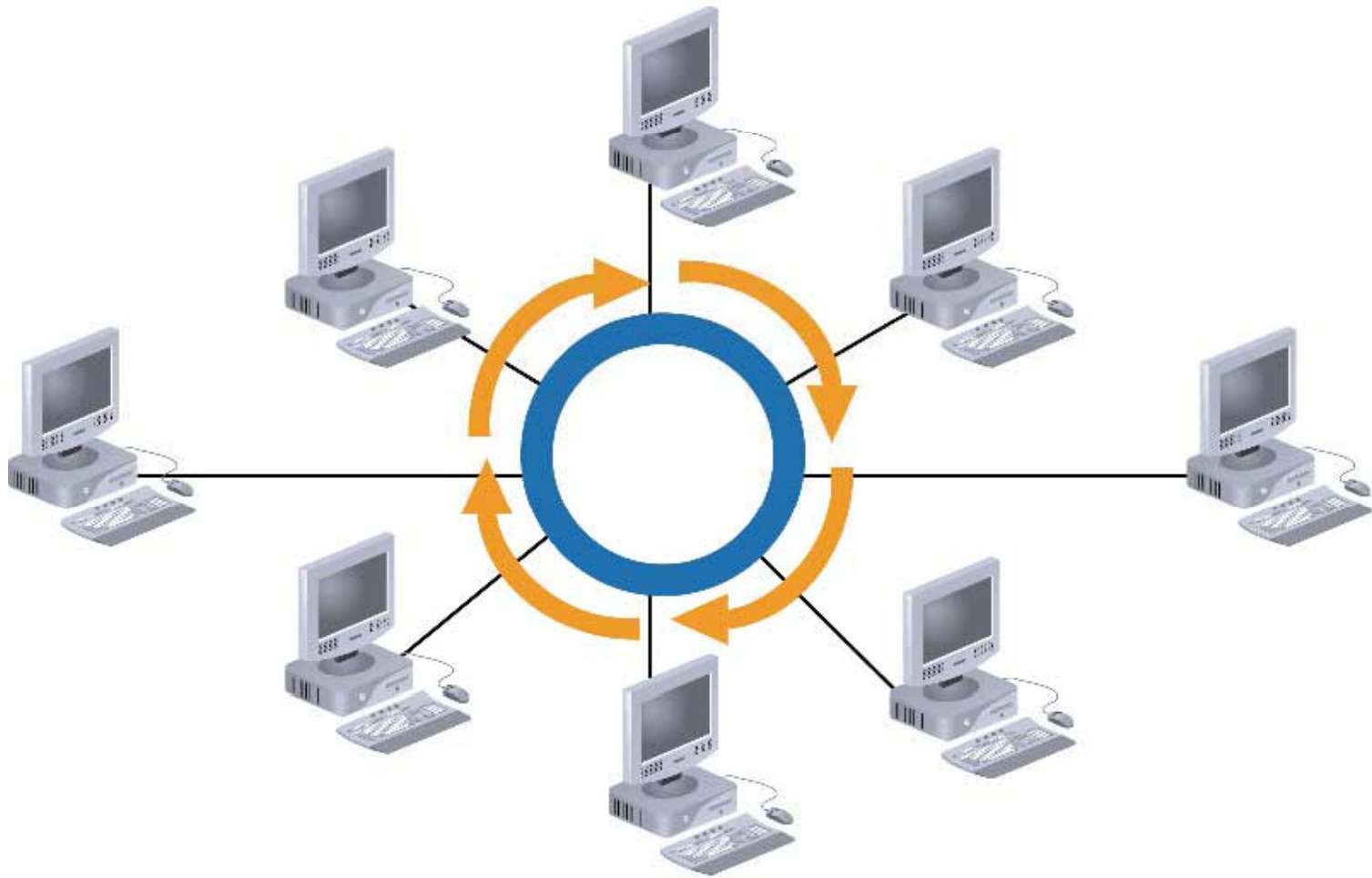
# Advantages of Bus Topology

- Works well for small networks
- Relatively inexpensive to implement
- Easy to add to it

# Disadvantages of Bus Topology

- Management costs can be high
- Potential for congestion with network traffic

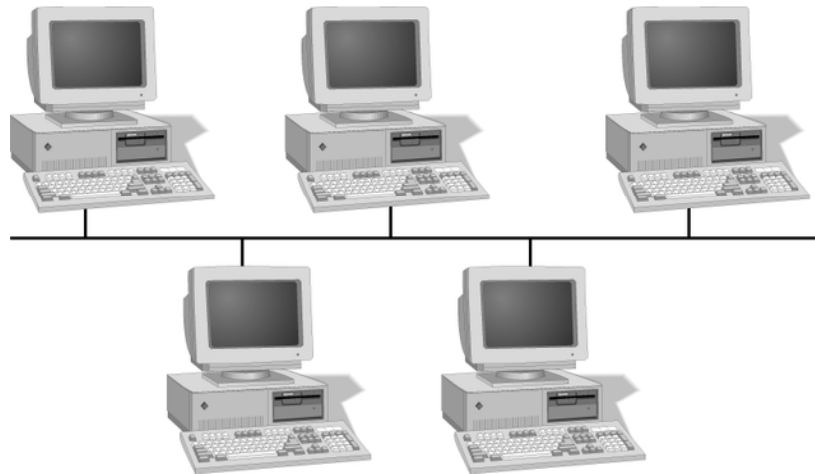
# Ring





# Simple Physical Topologies

- Physical topology
  - Physical layout of a network
- A **Bus topology** consists of a single cable—called a **bus**— connecting all nodes on a network without intervening connectivity devices



# Advantages of Bus Topology

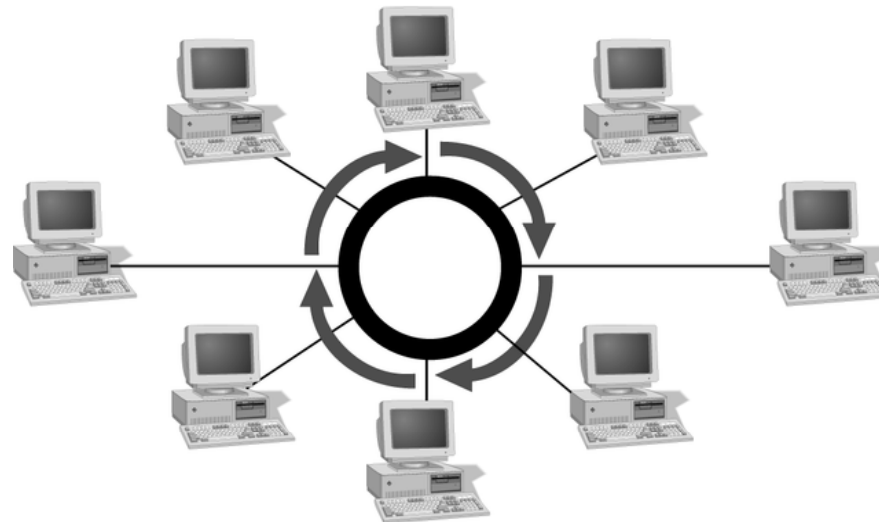
- Works well for small networks
- Relatively inexpensive to implement
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# Disadvantages of Bus Topology

- Management costs can be high
- Potential for congestion with network traffic

# Simple Physical Topologies

- Ring topology
  - Each node is connected to the two nearest nodes so the entire network forms a circle
  - One method for passing data on ring networks is **token passing**
- Active topology
  - Each workstation transmits data



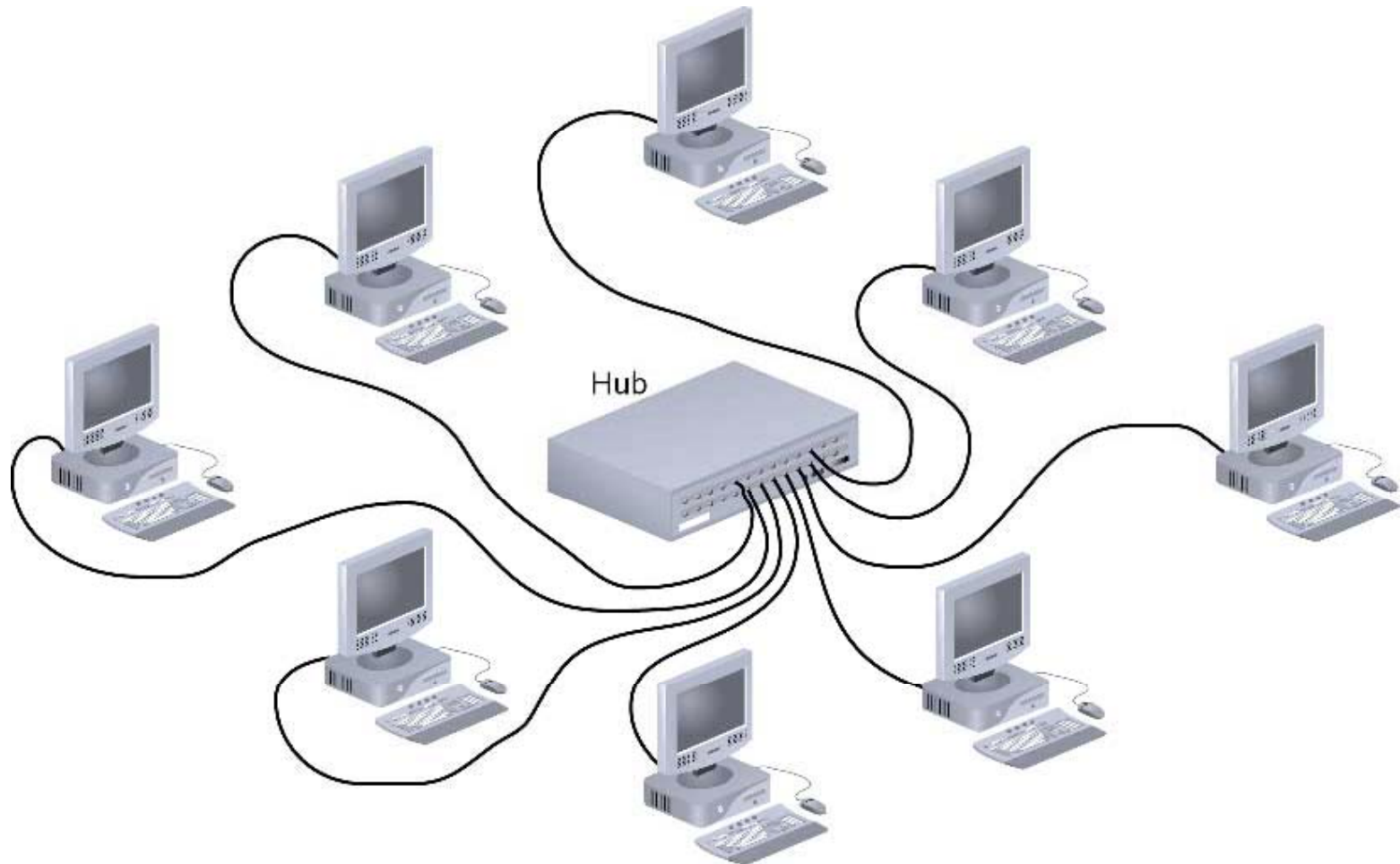
# Advantages of Ring Topology

- Easier to manage; easier to locate a defective node or cable problem
- Well-suited for transmitting signals over long distances on a LAN
- Handles high-volume network traffic
- Enables reliable communication

# Disadvantages of Ring Topology

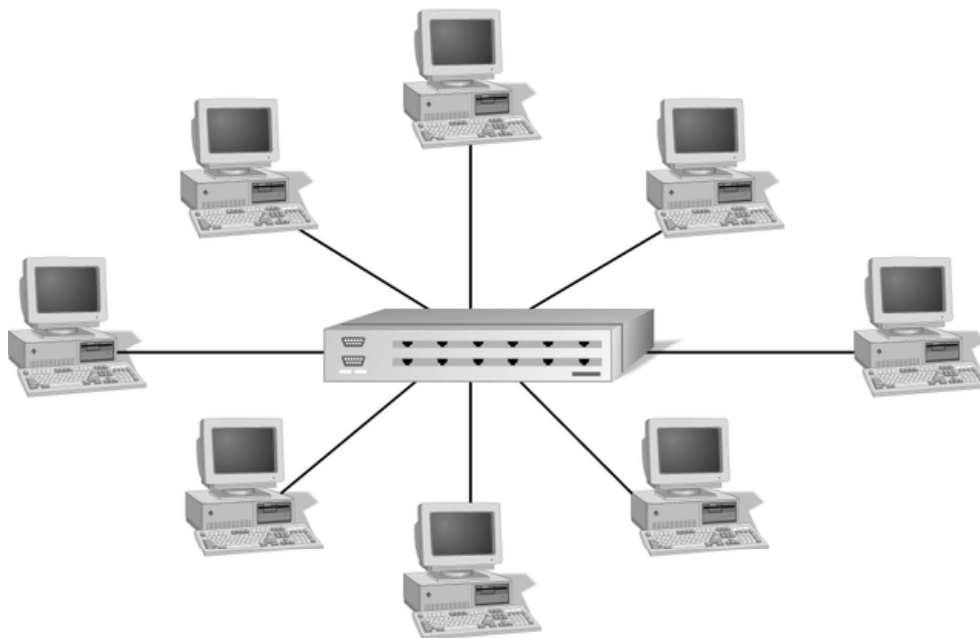
- Expensive
- Requires more cable and network equipment at the start
- Not used as widely as bus topology
  - Fewer equipment options
  - Fewer options for expansion to high-speed communication

# Star



# Simple Physical Topologies

- Star topology
  - Every node on the network is connected through a central device





# Star (continued)

- Any single cable connects only two devices
  - Cabling problems affect two nodes at most
- Requires more cabling than ring or bus networks
  - More fault-tolerant
- Easily moved, isolated, or interconnected with other networks
  - Scalable
- Supports max of 1024 addressable nodes on logical network

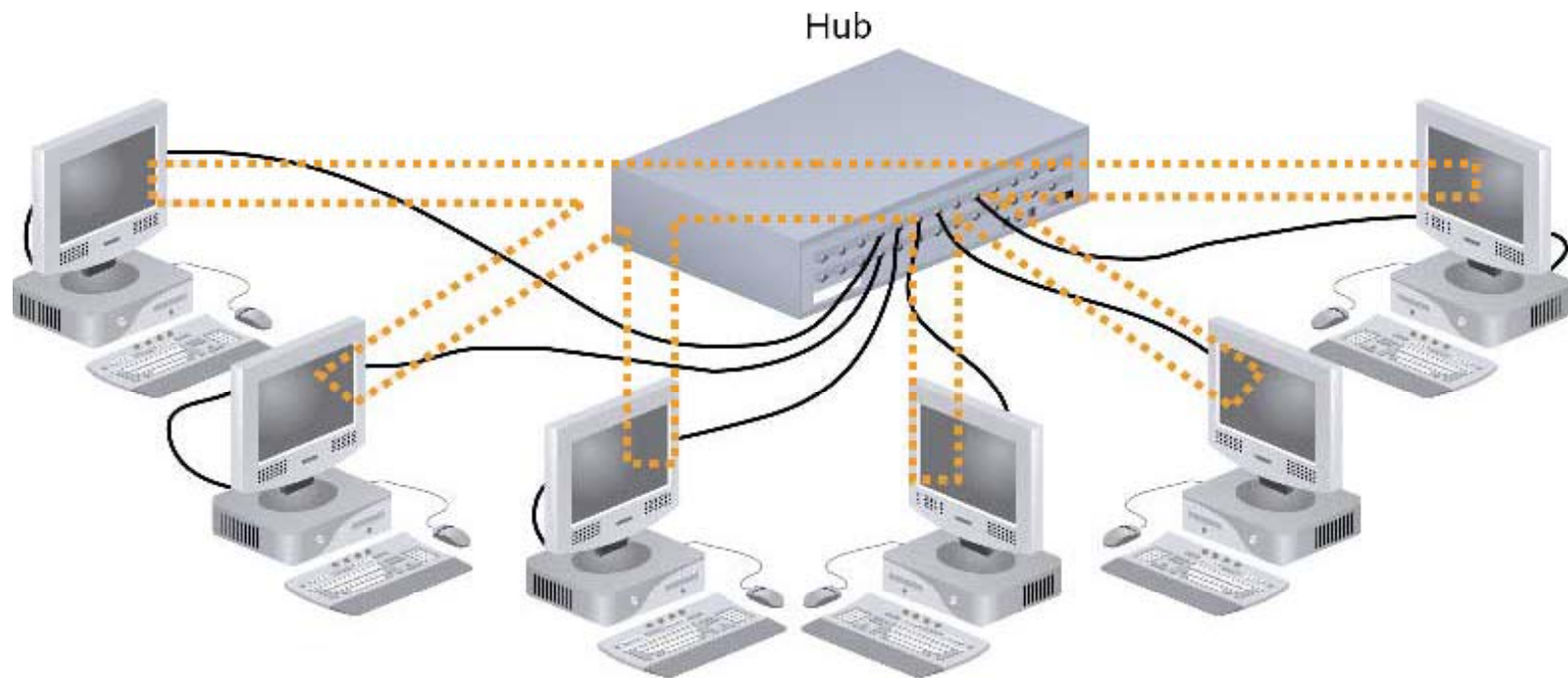
# Advantages of Star Topology

- Good option for modern networks
- Low startup costs
- Easy to manage
- Offers opportunities for expansion
- Most popular topology in use; wide variety of equipment available

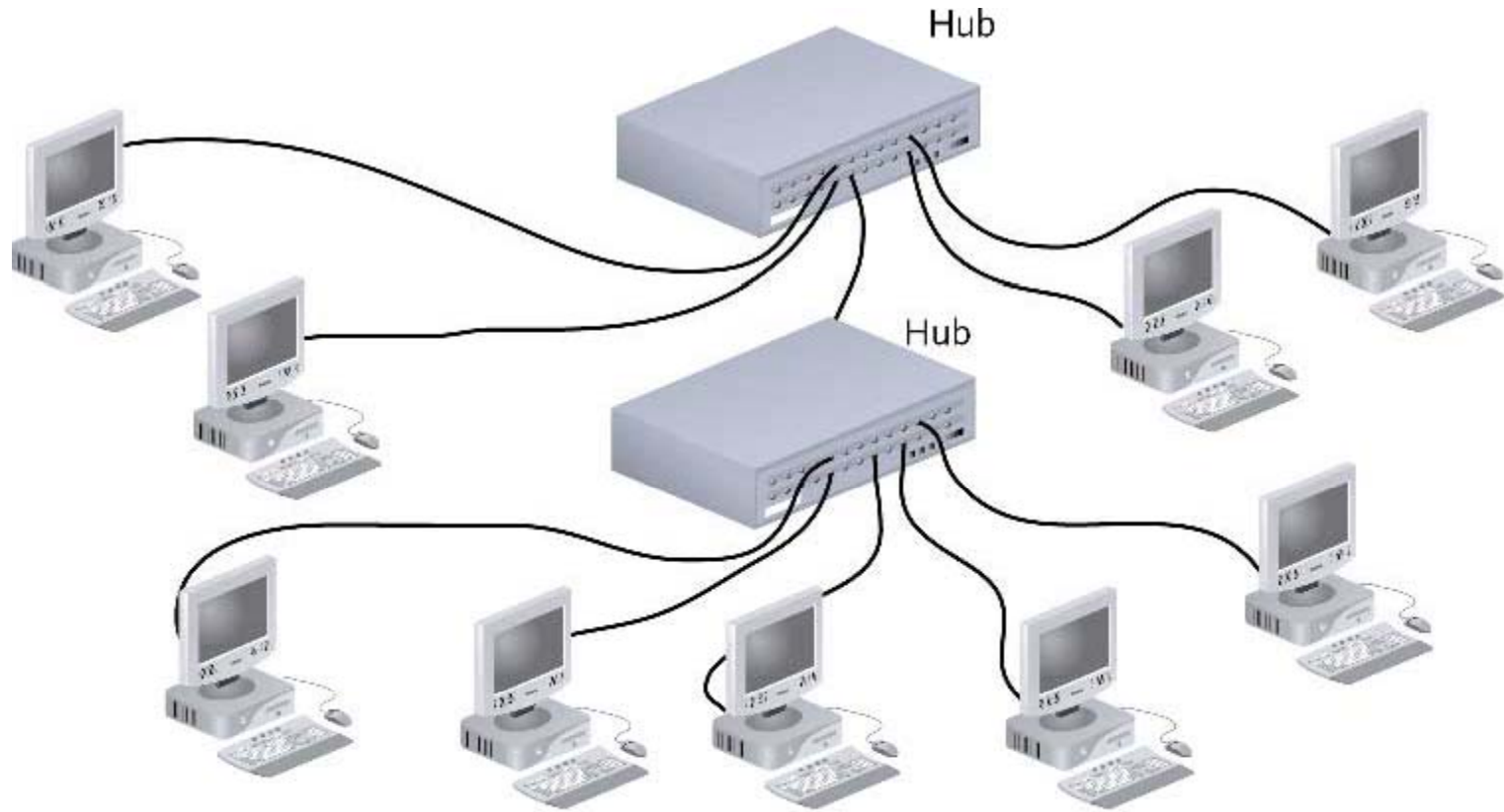
# Disadvantages of Star Topology

- Hub is a single point of failure
- Requires more cable than the bus

# Hybrid Physical Topologies: Star-Wired Ring



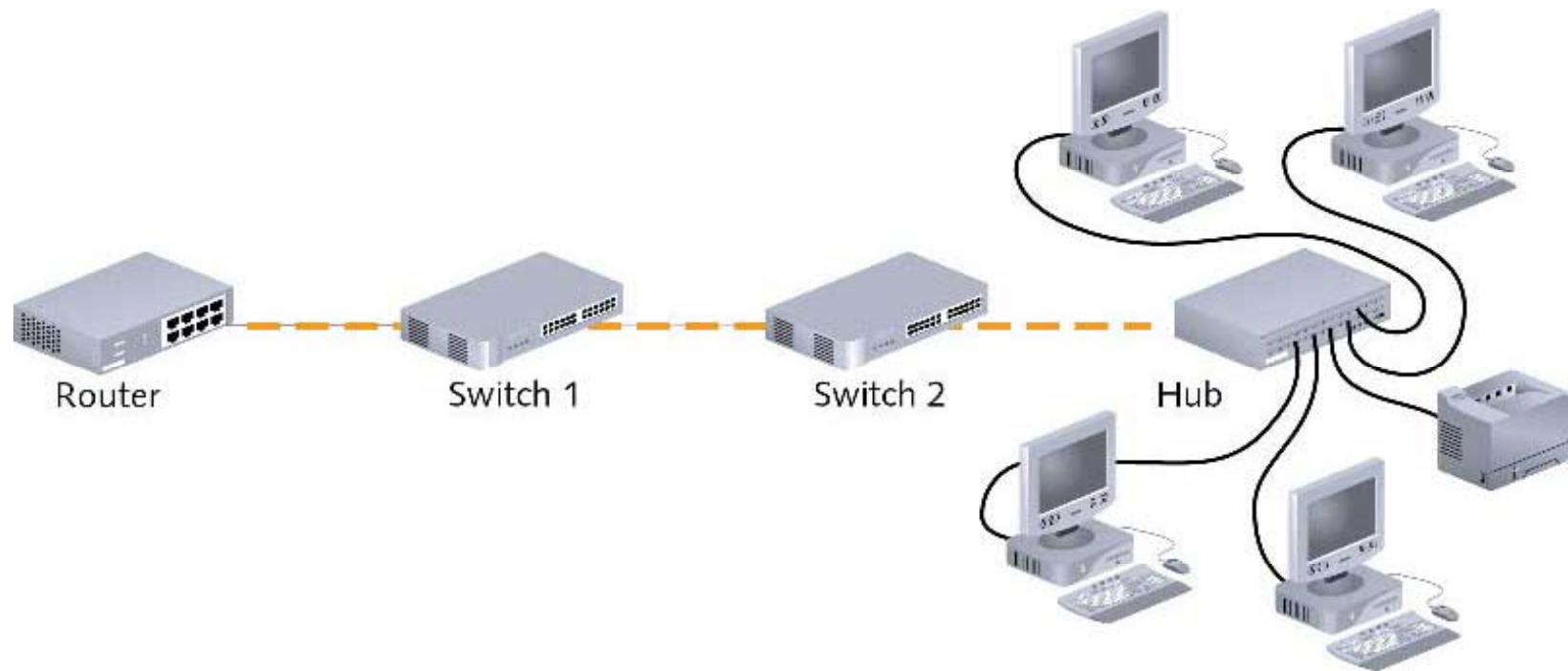
# Star-Wired Bus



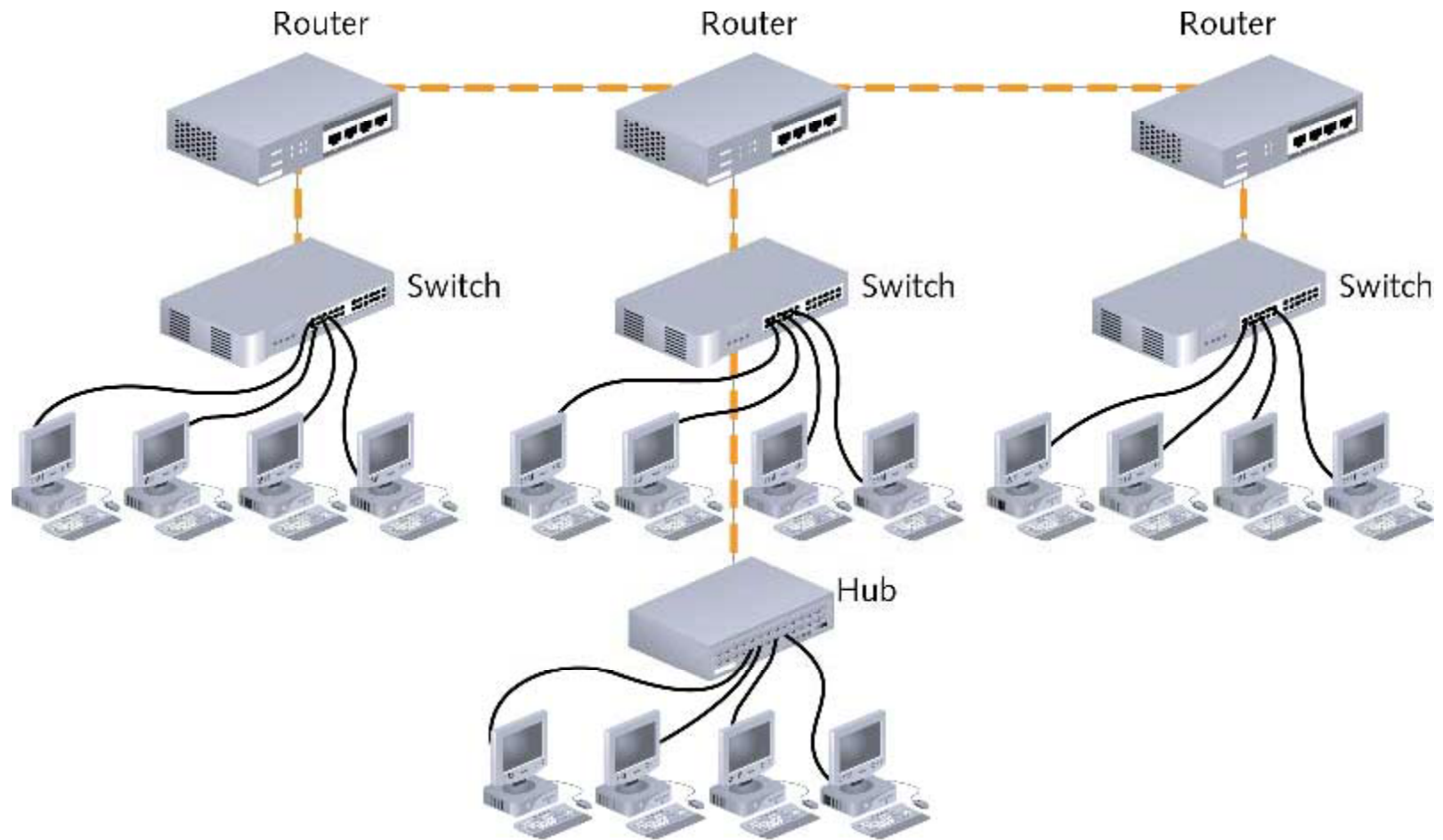
# Backbone Networks: Serial Backbone

- Daisy chain: linked series of devices
  - Hubs and switches often connected in daisy chain to extend a network
- Hubs, gateways, routers, switches, and bridges can form part of backbone
- Extent to which hubs can be connected is limited

# Backbone Networks: Serial Backbone (continued)

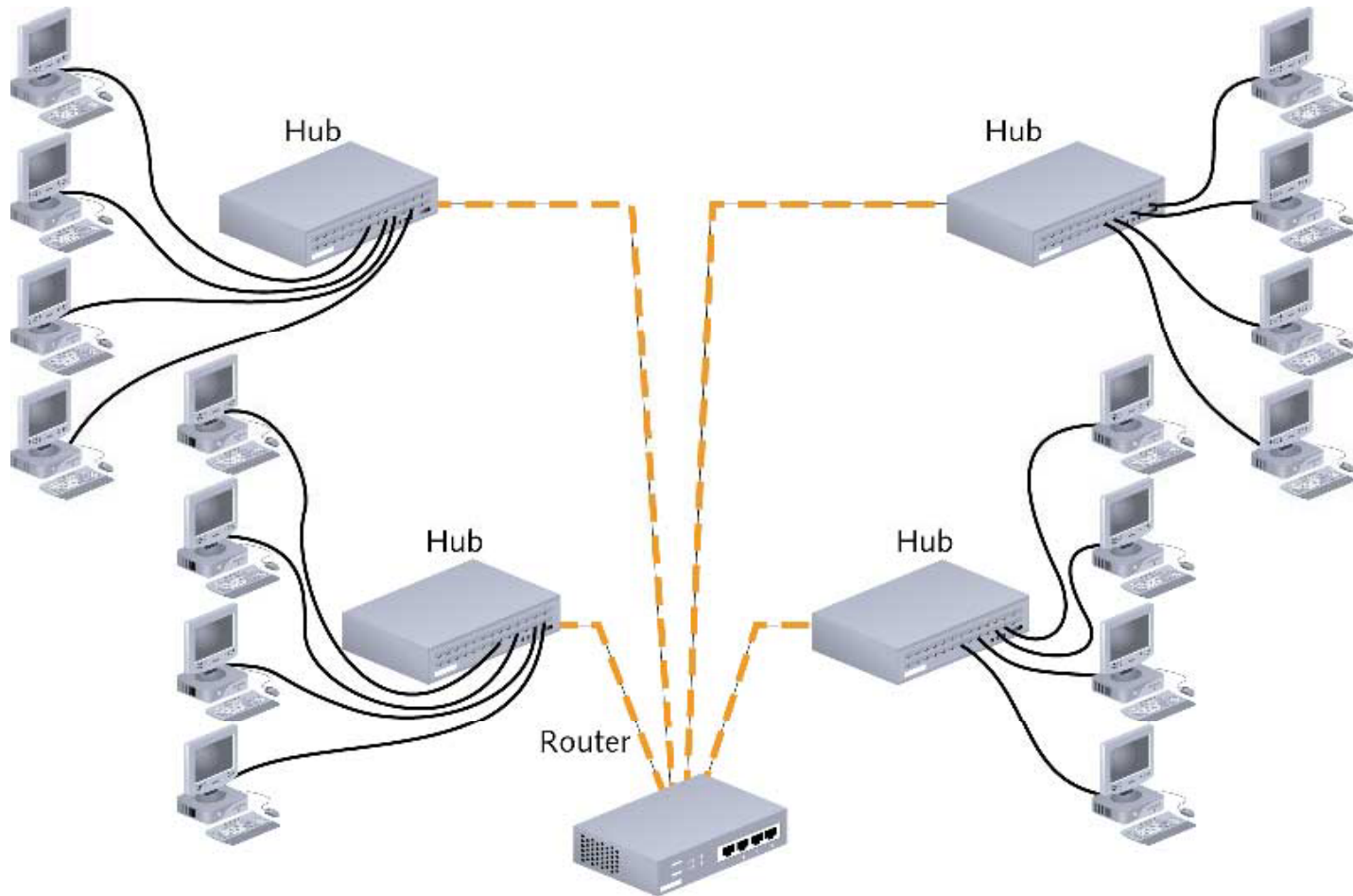


# Distributed Backbone

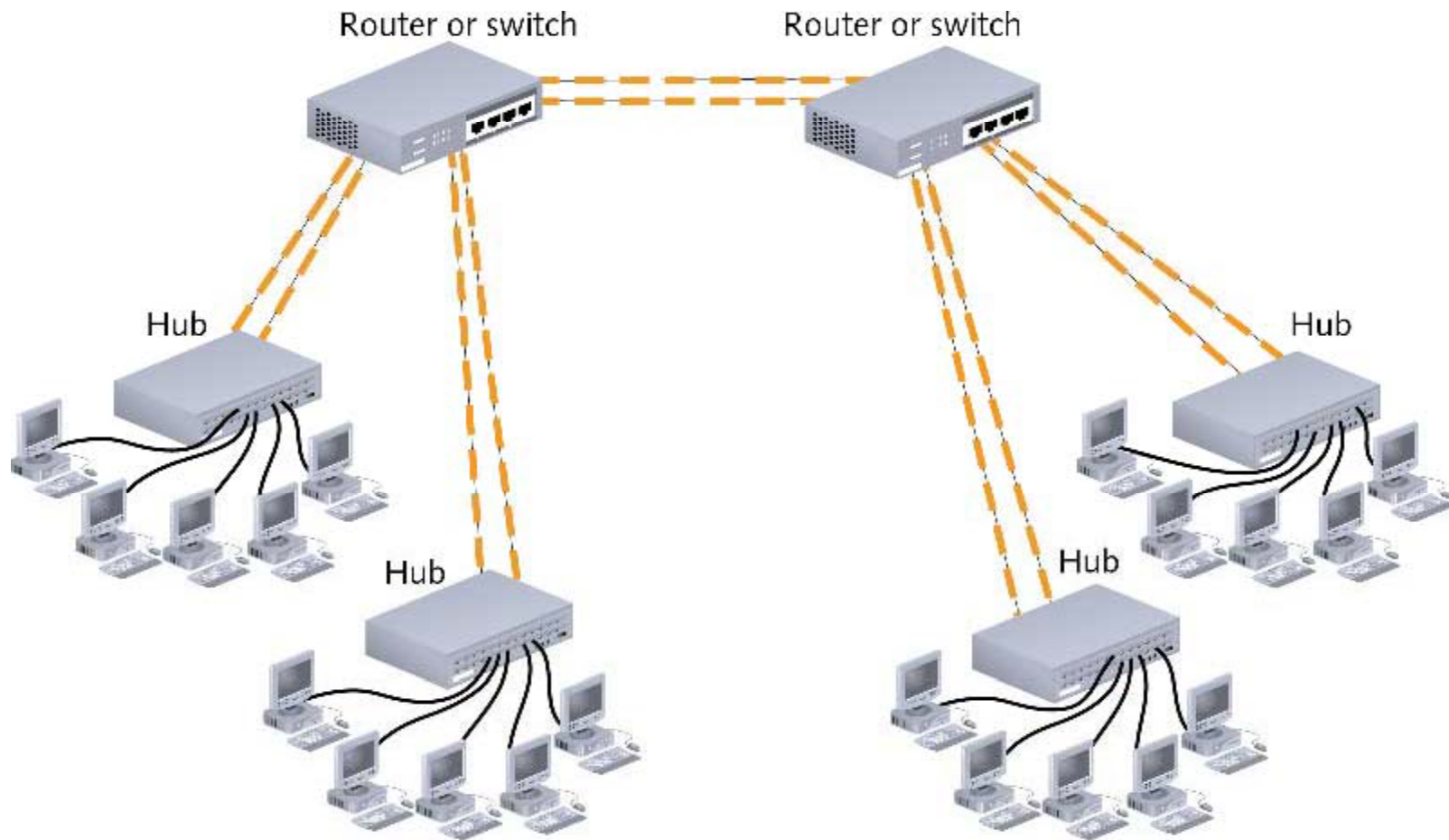




# Collapsed Backbone



# Parallel Backbone



# Logical Topologies

- Logical topology: how data is transmitted between nodes
  - May not match physical topology
- Bus logical topology: signals travel from one network device to all other devices on network
  - Required by bus, star, star-wired physical topologies
- Ring logical topology: signals follow circular path between sender and receiver
  - Required by ring, star-wired ring topologies