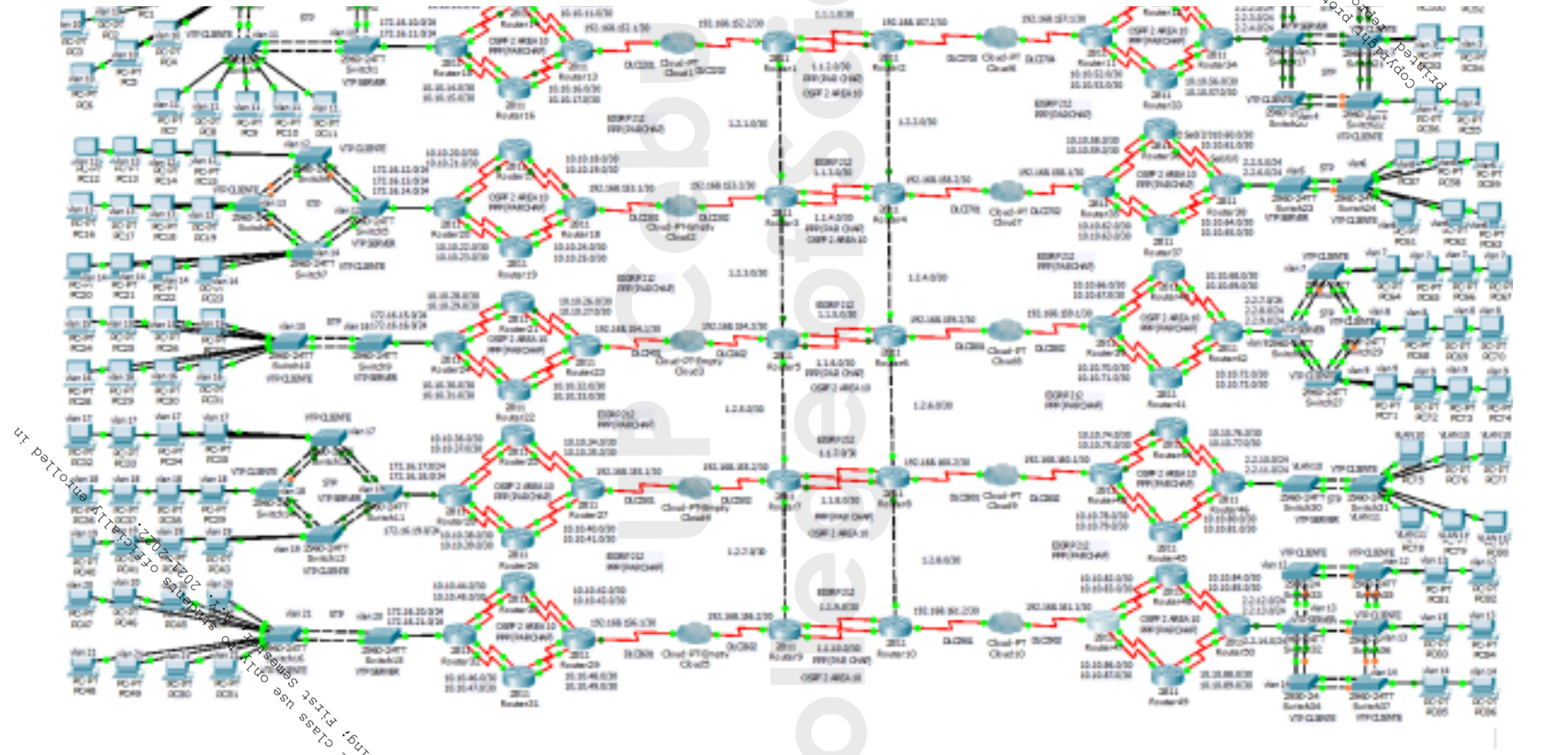


# Network Topology

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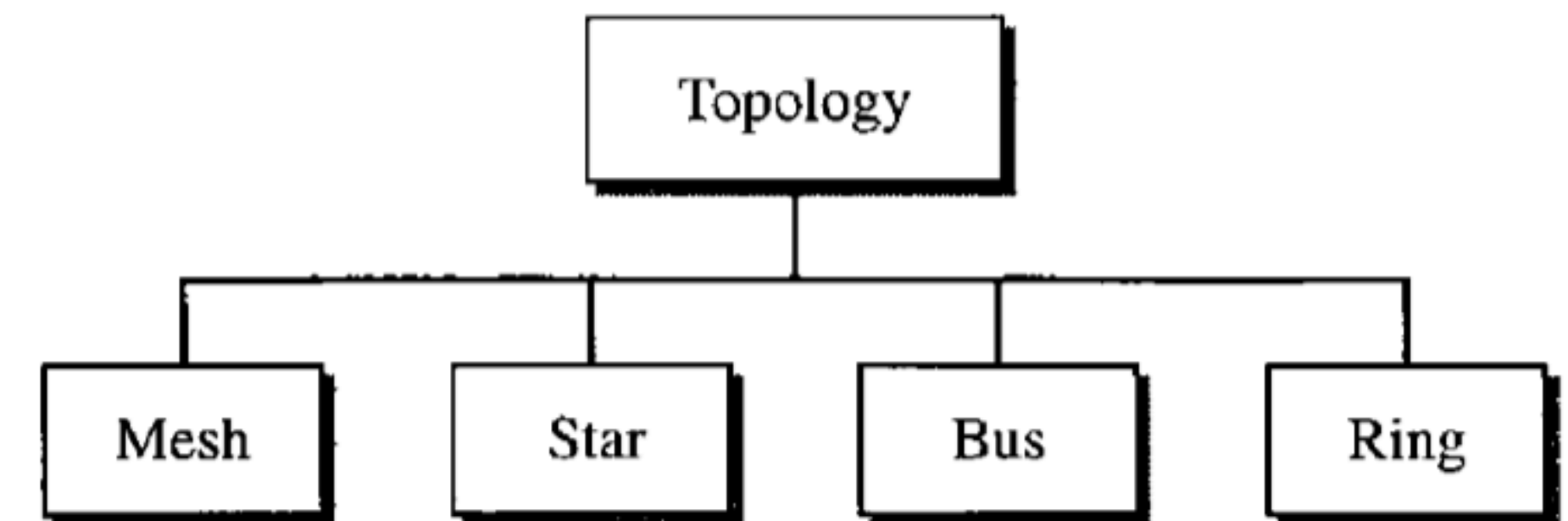
# Physical Topology

- the term refers to the way in which a network is laid out physically

# Network Topology

- the geometric representation of the relationship of all the links and linking devices (nodes) to one another
- four basic topologies:
  1. mesh
  2. star
  3. bus
  4. ring
- 5. *line or point-to-point*
- 6. *tree*
- 7. *hybrid*

Figure 1.4 *Categories of topology*



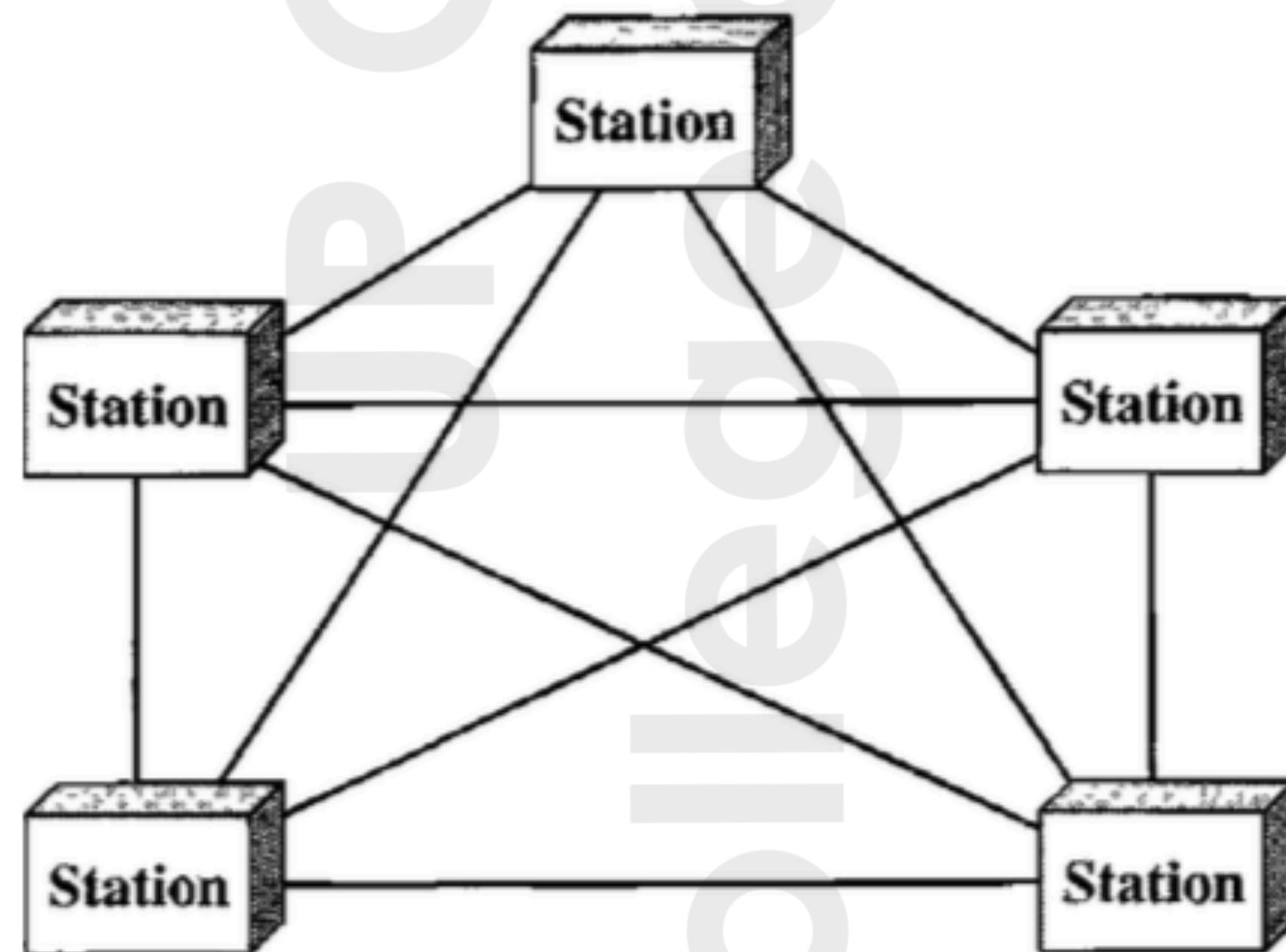
# 1. Mesh Topology

- two types:
  1. fully connected mesh
  2. partially connected mesh

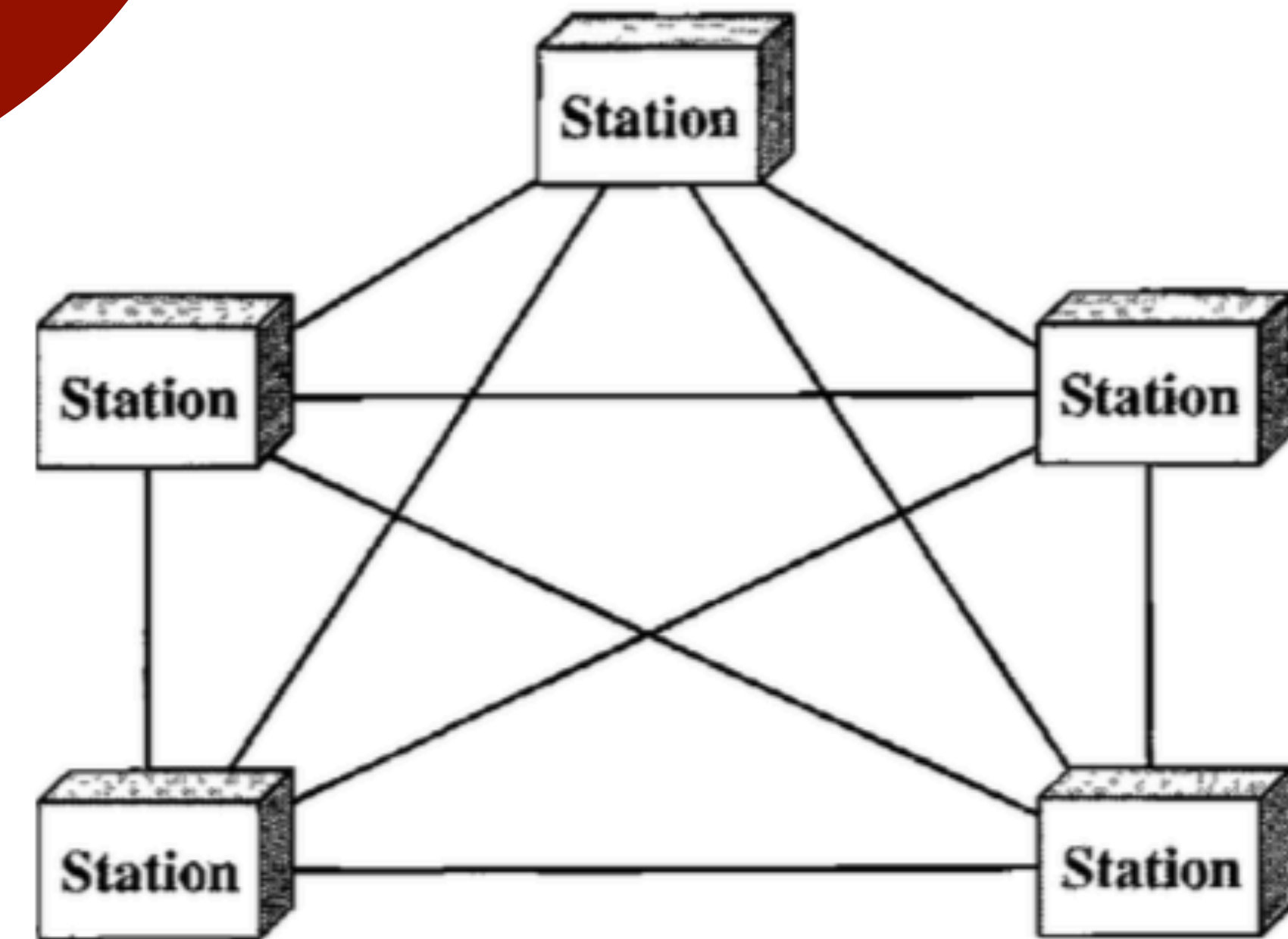
# 1. Fully Connected Mesh

- every device has a dedicated point-to-point link to every other device
- physical links:  $n(n-1)$
- duplex mode:  $n(n-1) / 2$

Figure 1.5 *A fully connected mesh topology (five devices)*



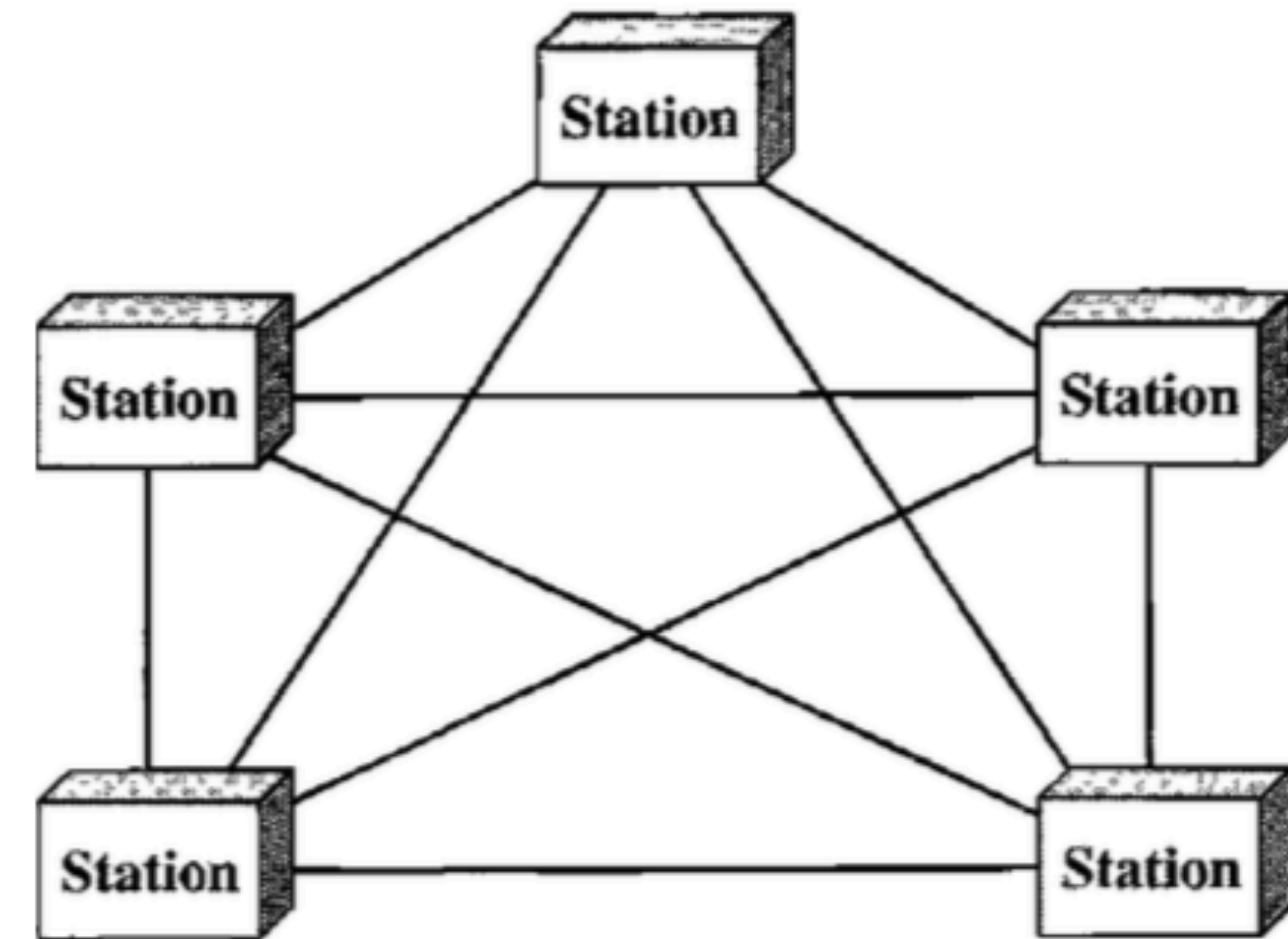
What do you think are the *advantages* and *disadvantages* of the *mesh topology*?





# Advantages of Full Mesh

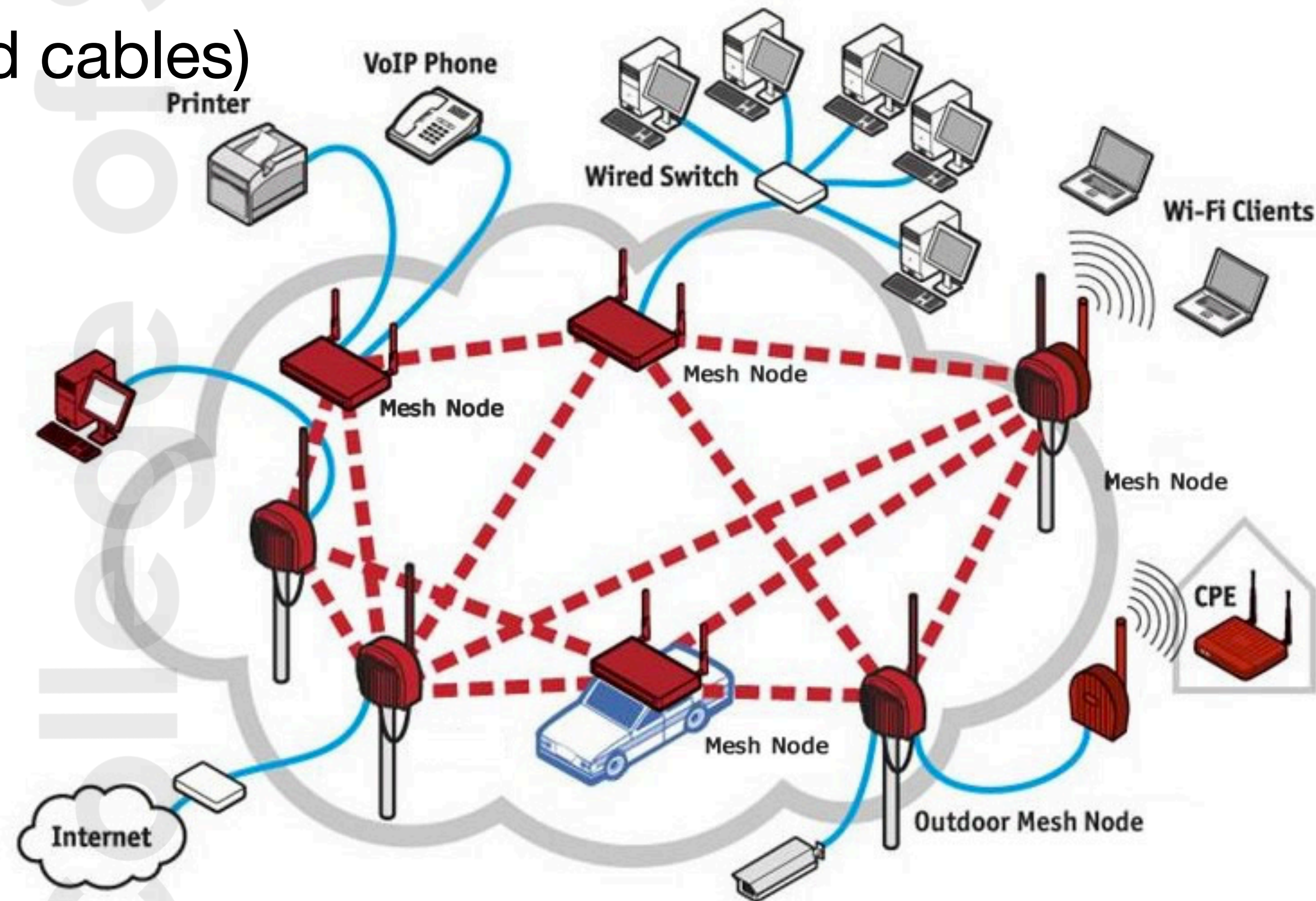
1. Eliminates traffic problems
2. Robust
3. Privacy or Security
4. Easy fault identification and fault isolation





# Disadvantages of Full Mesh

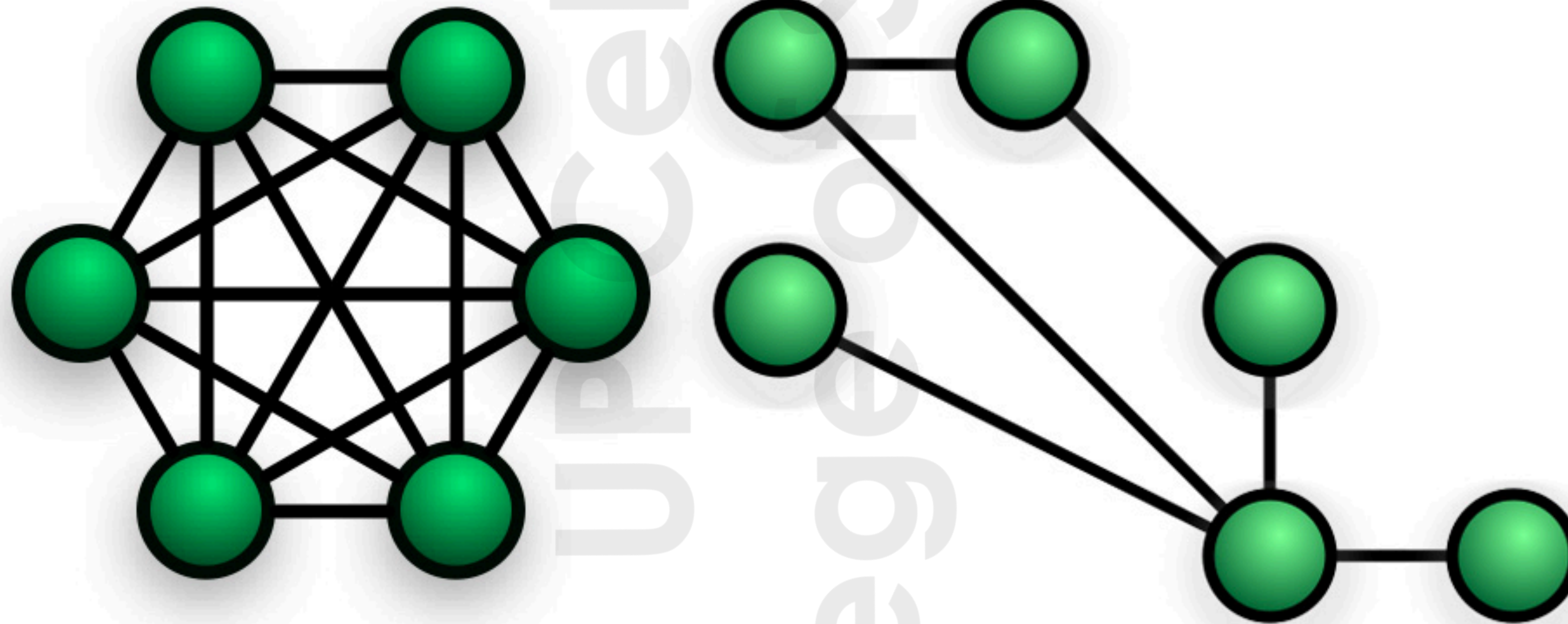
1. High amount of cabling and I/O ports
2. Difficult installation and reconnection
3. Bulk of wiring limit space
4. Expensive hardware (I/O ports and cables)





## 2. Partially Connected Mesh

- at least two of the computers in the network have connections to multiple other computers in the network

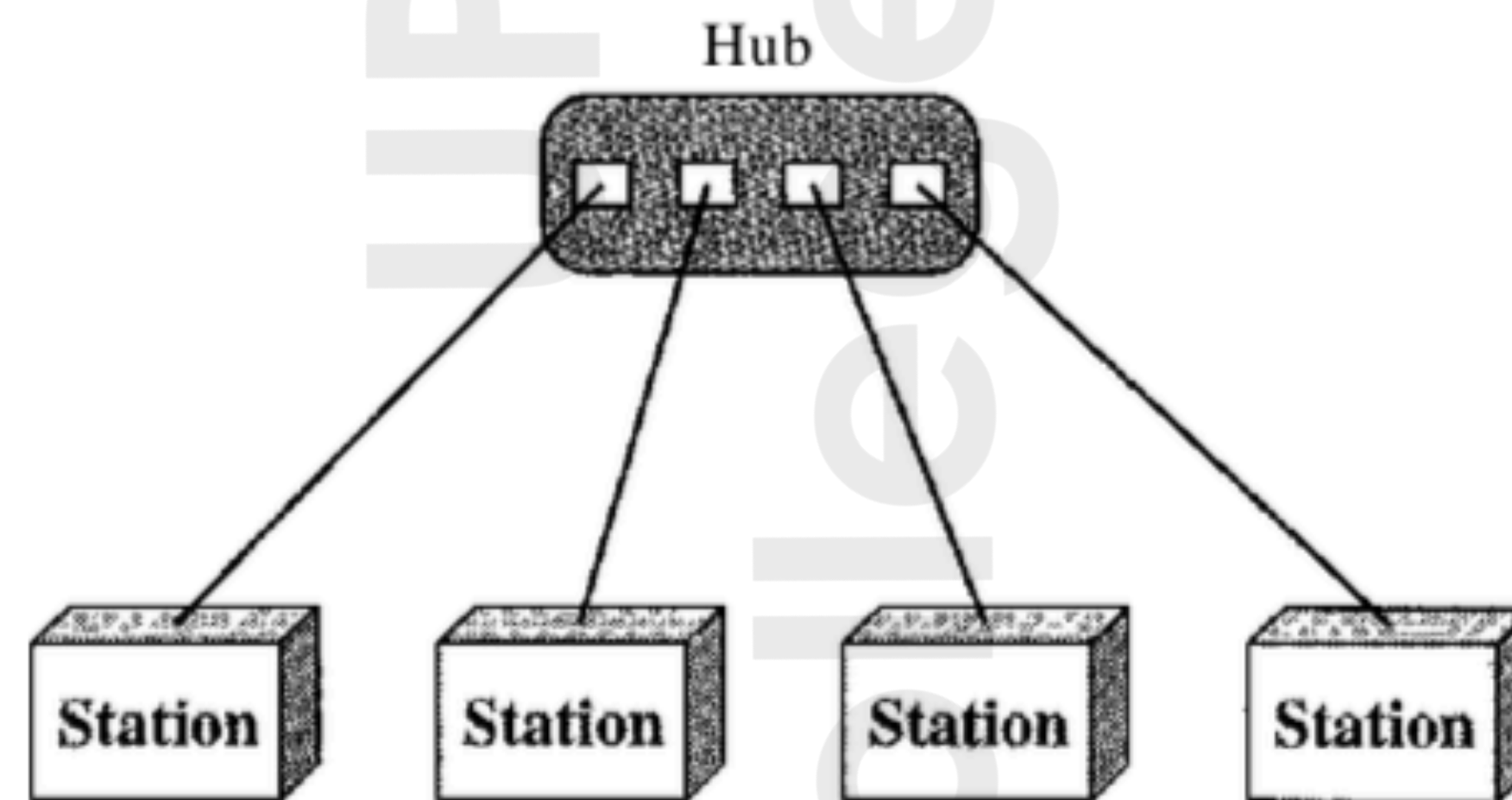


<https://www.extremetech.com/computing/179066-what-is-mesh-networking-and-why-apples-adoption-in-ios-7-could-change-the-world>

## 2. Star Topology

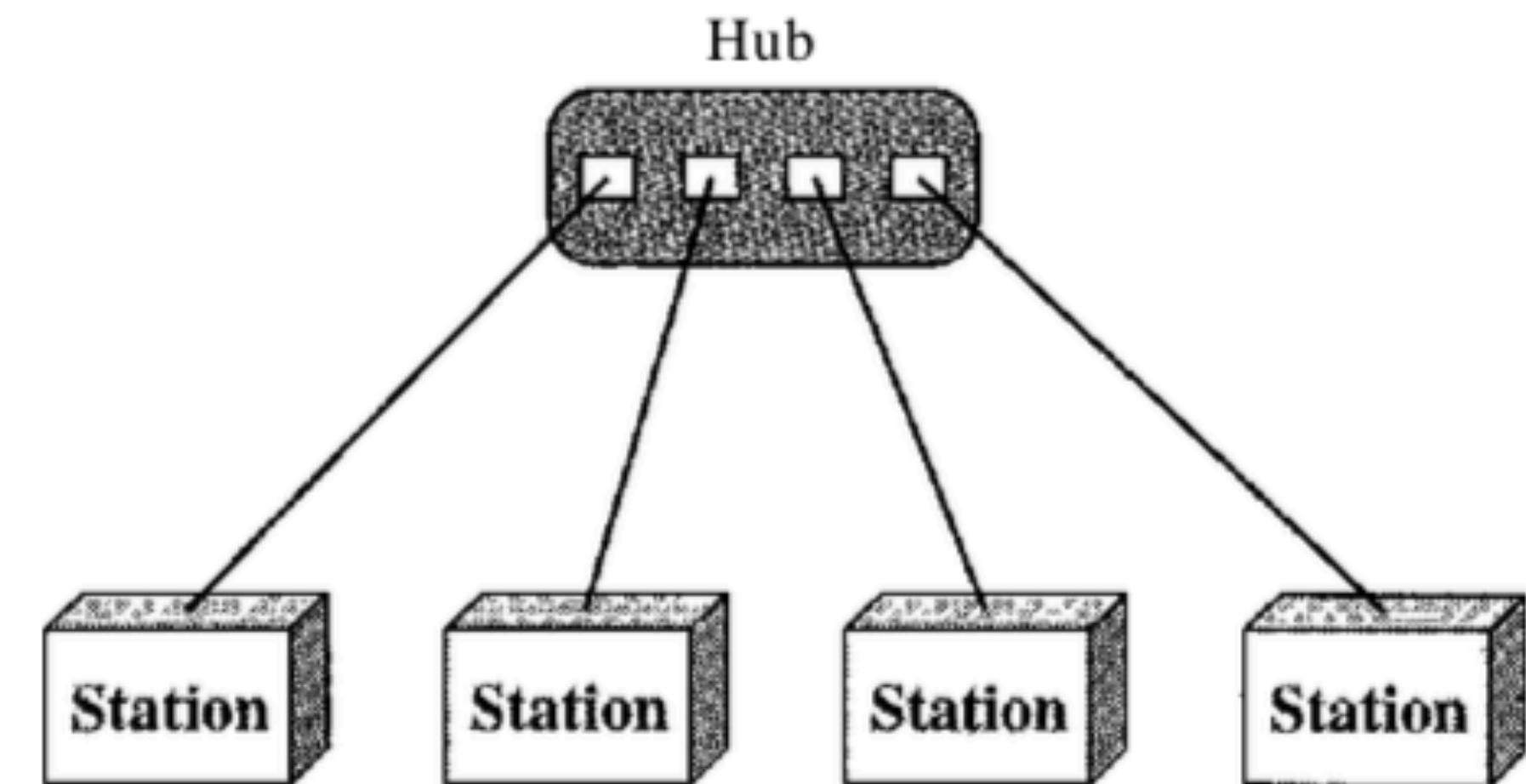
- used in local area networks (LANs)
- each device has a dedicated point-to-point link only to a central controller, usually called a hub
- devices are not directly linked to one another
- the controller acts as an exchange

**Figure 1.6** *A star topology connecting four stations*



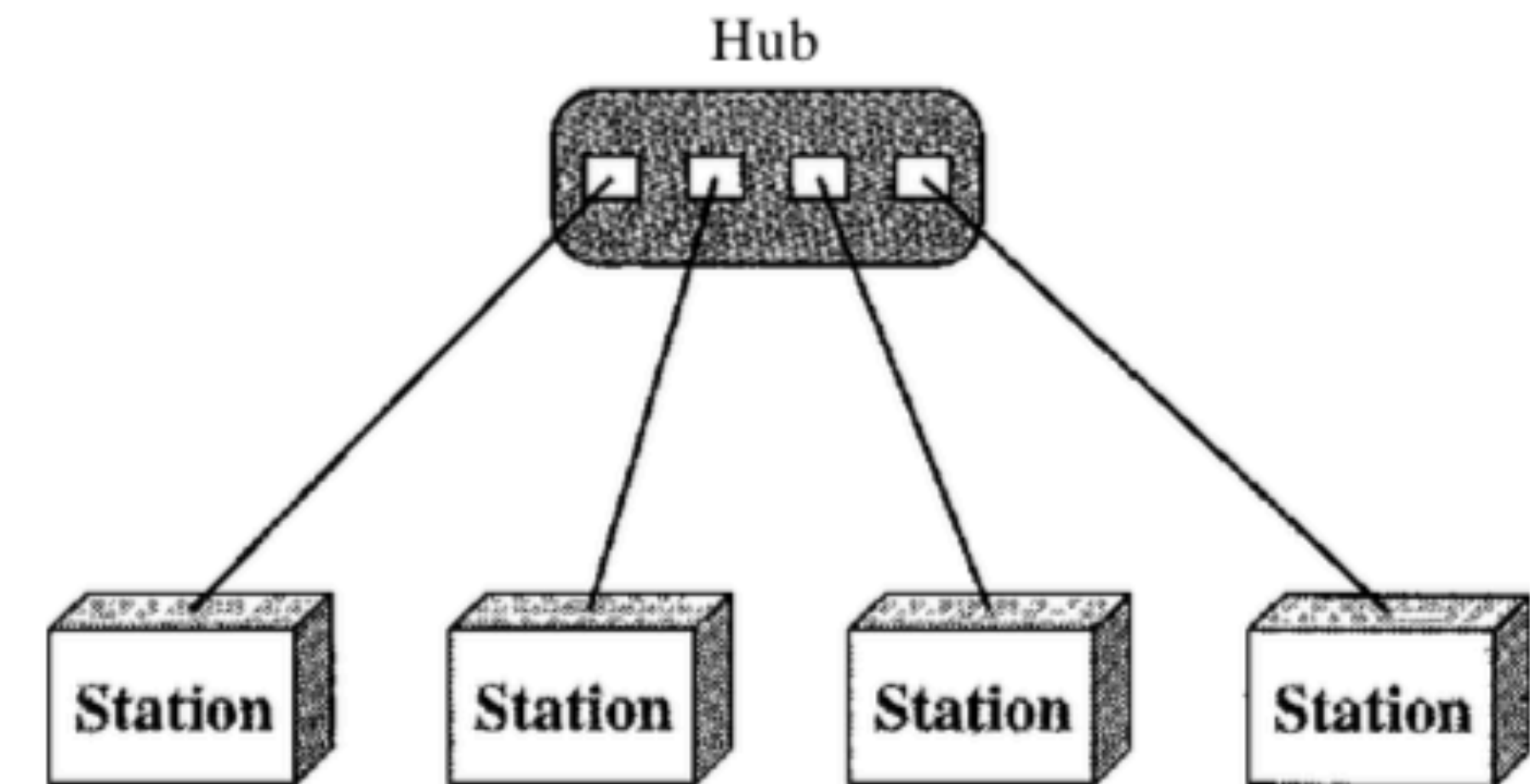


What do you think are the  
*advantages* and *disadvantages* of  
the *star topology*?



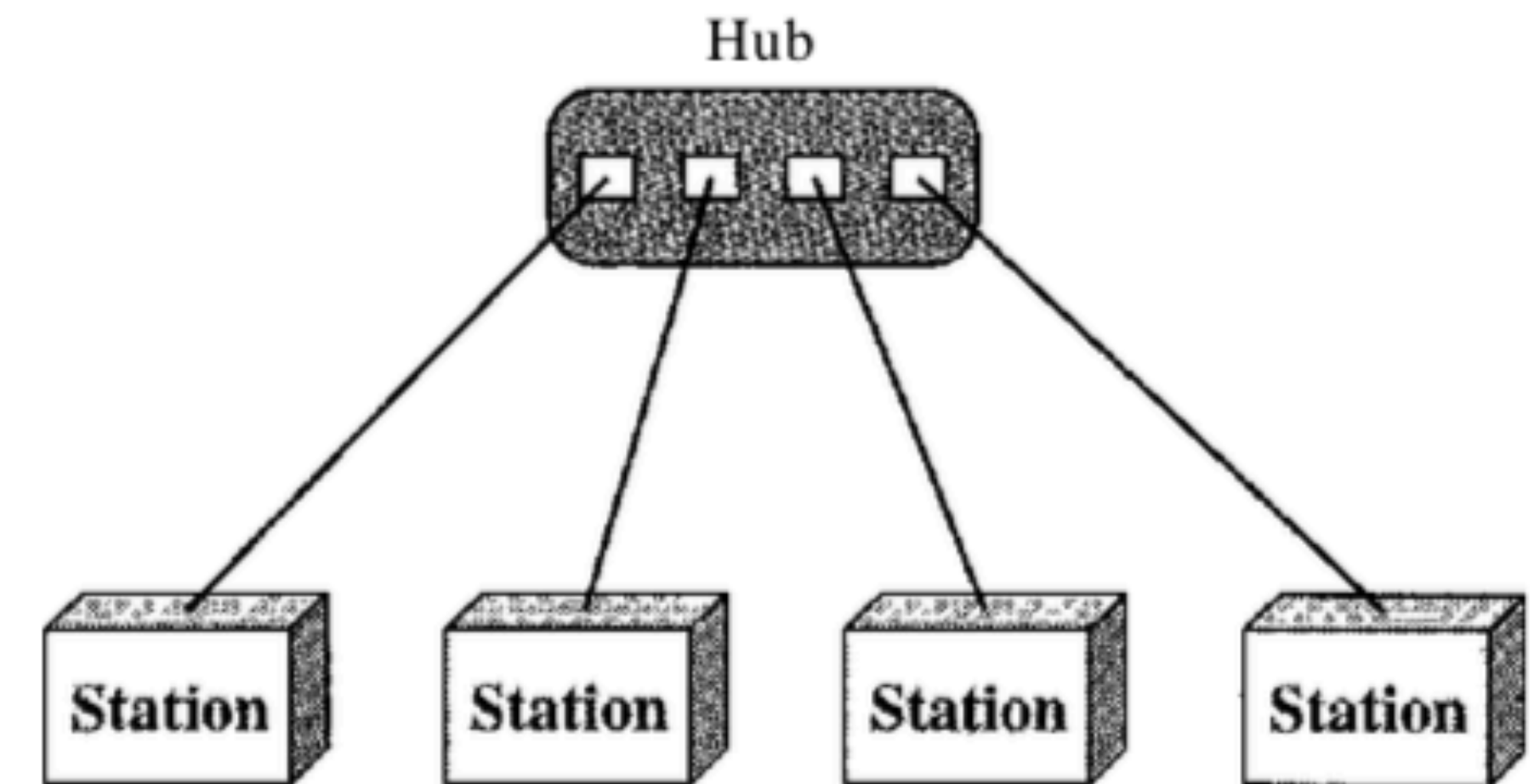
# Advantages of Star Topology

1. Less expensive than mesh
2. Needs only one link and one I/O port to connect
3. Easy to install and reconfigure
4. Additions, moves and deletions involve only one connection
5. Robust
6. Easy fault identification and fault isolation (as long as hub is working - used to monitor problems)



# Disadvantages of Star Topology

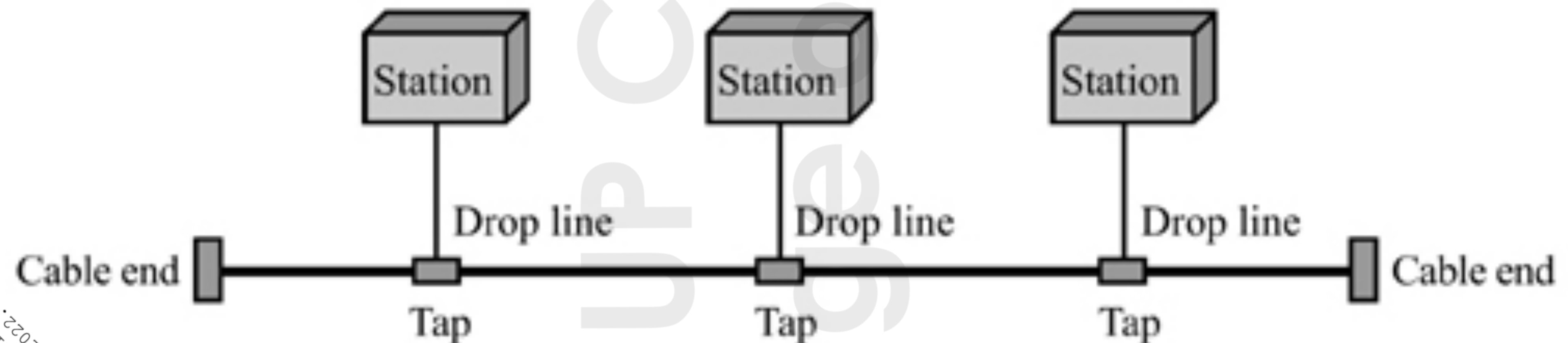
1. Dependency on one single point - the hub
2. More cabling than in other topologies (such as ring or bus)





# 3. Bus Topology

- used to be popular for Ethernet LANs
- multipoint versus point-to-point
- one long cable acts as a backbone to link all the devices in a network
- nodes are connected to the bus cable by drop lines and taps



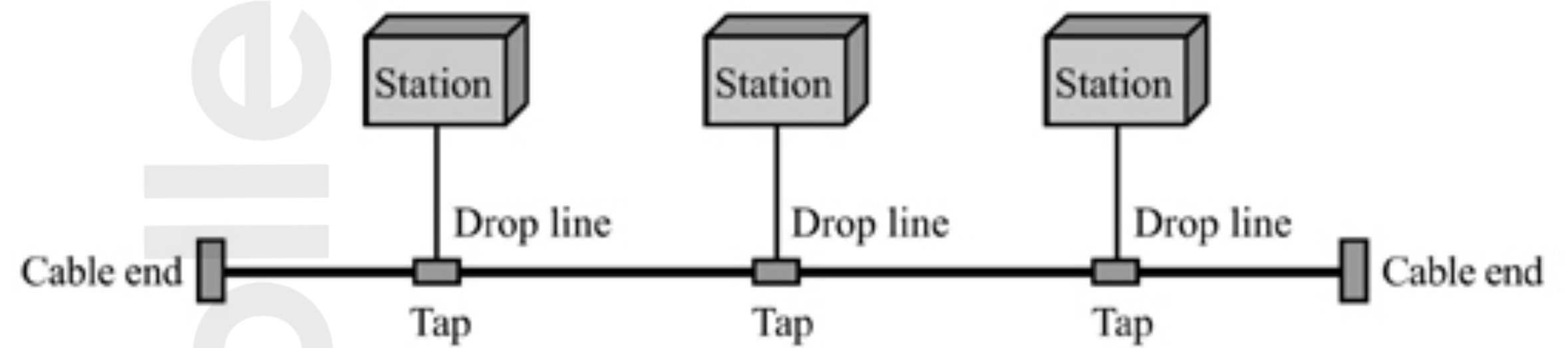
## Drop Line

- a connection running between the device and the main cable

## Tap

- a connector that either splices into the main cable or punctures the sheathing of a cable to create a contact with the metallic core

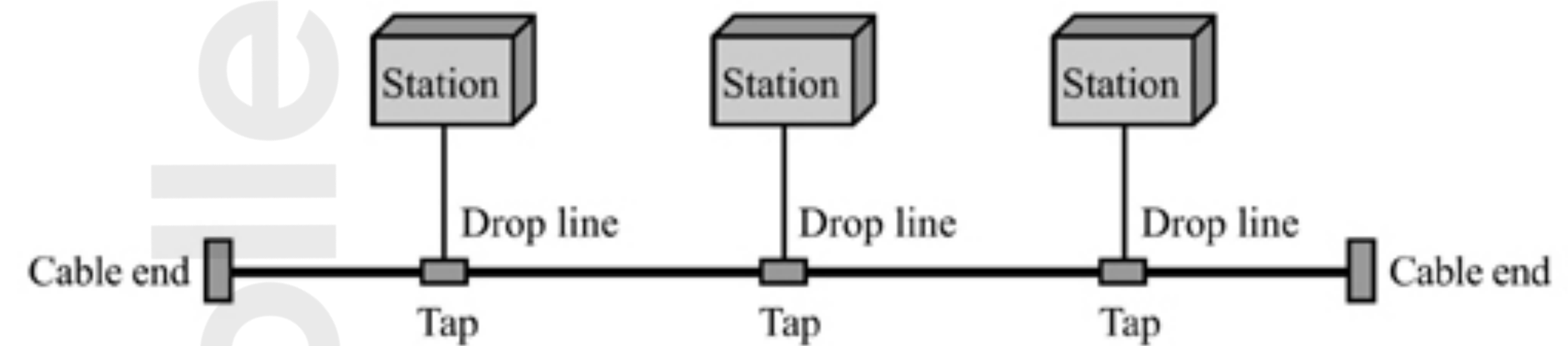
What do you think are the  
*advantages* and *disadvantages* of  
the *bus topology*?



# Advantages of Bus Topology

17

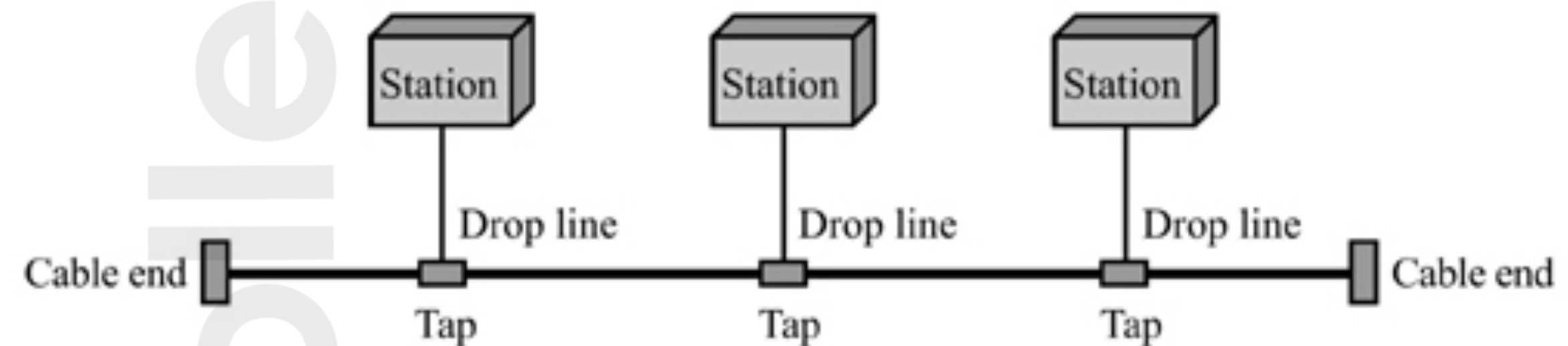
1. Ease of installation
2. Less cabling than mesh and star topologies





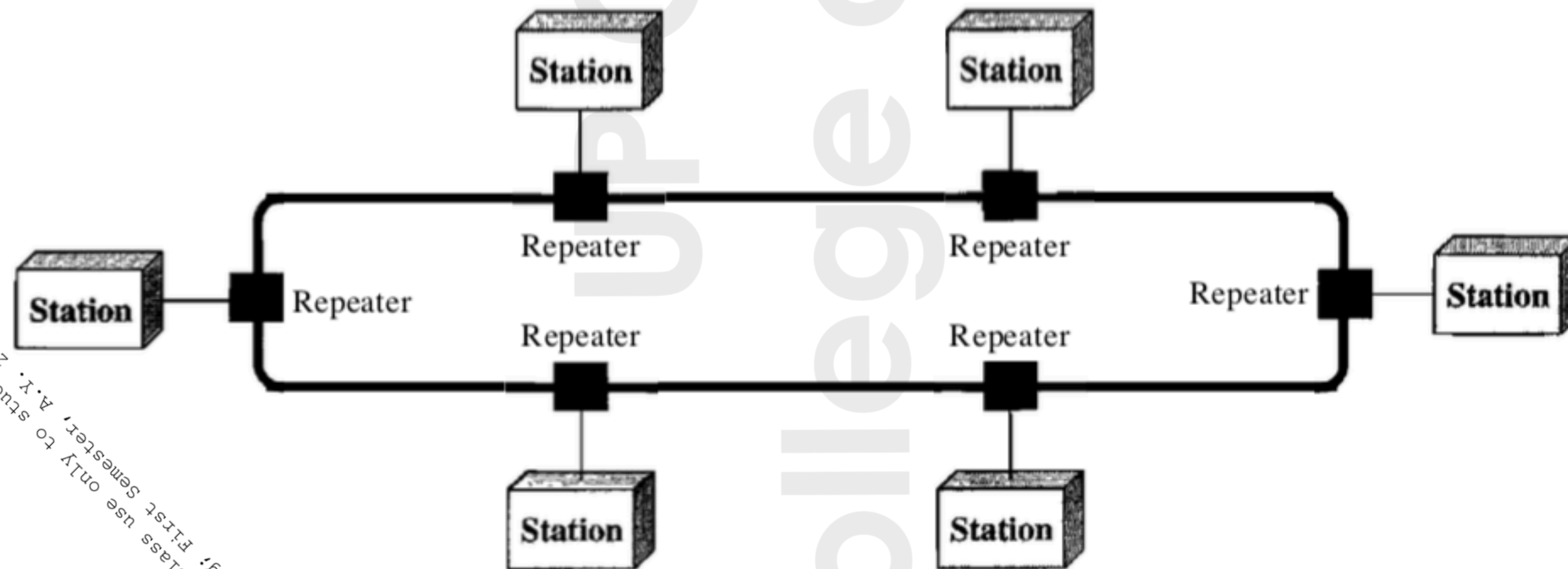
# Disadvantages of Bus Topology

1. Limited number of taps and distance between taps
2. Difficult reconnection and fault isolation
3. Difficult to add new devices (designed for optimal efficiency during installation)
4. Signal reflection at the taps can cause degradation in quality (controlled by number of taps and spacing between them)
5. Fault or break in the bus cable stops all transmission (even between devices on the same side of the problem)

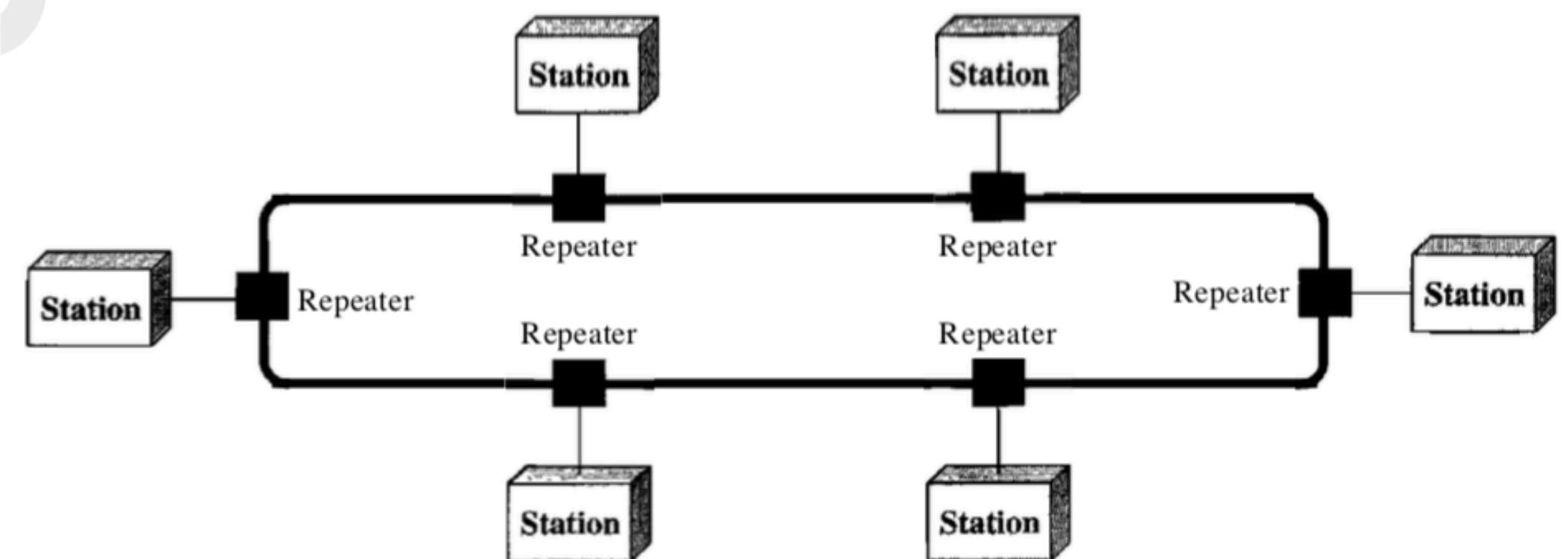


# 4. Ring Topology

- each device has a dedicated point-to-point connection with only the two devices on either side of it
- signal is passed along the ring in one direction, from device to device, until it reaches its destination
- each device in the ring incorporates a repeater



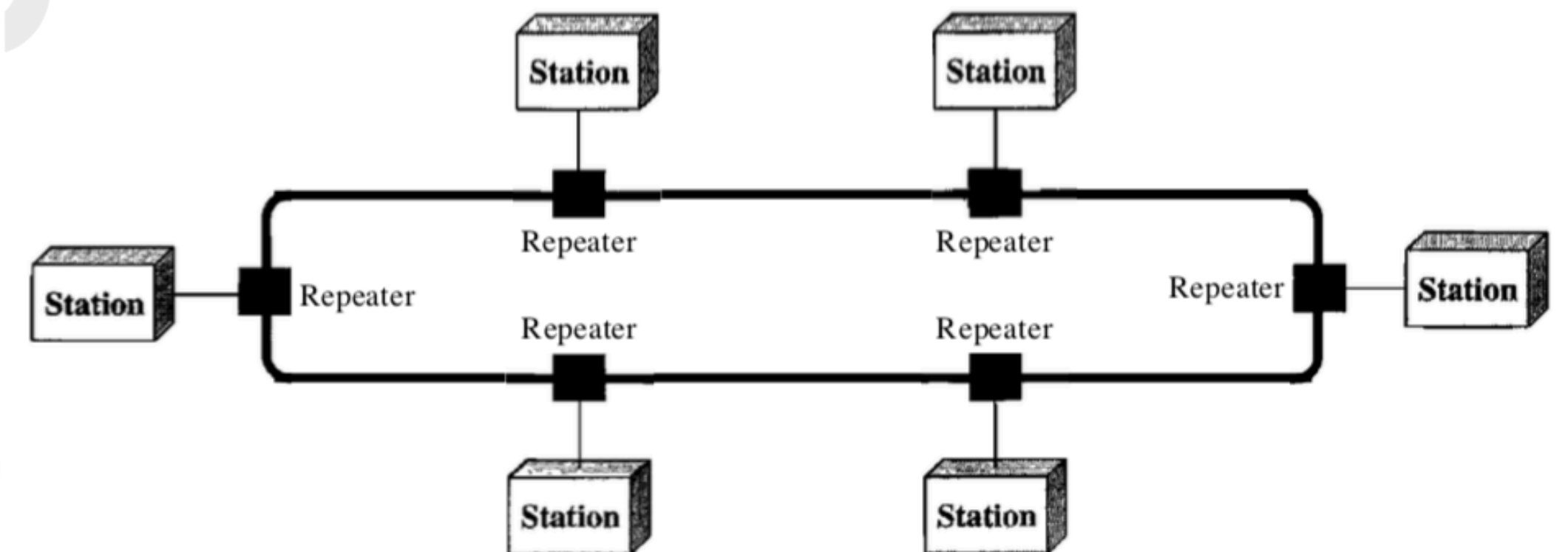
What do you think are the *advantages* and *disadvantages* of the *ring topology*?





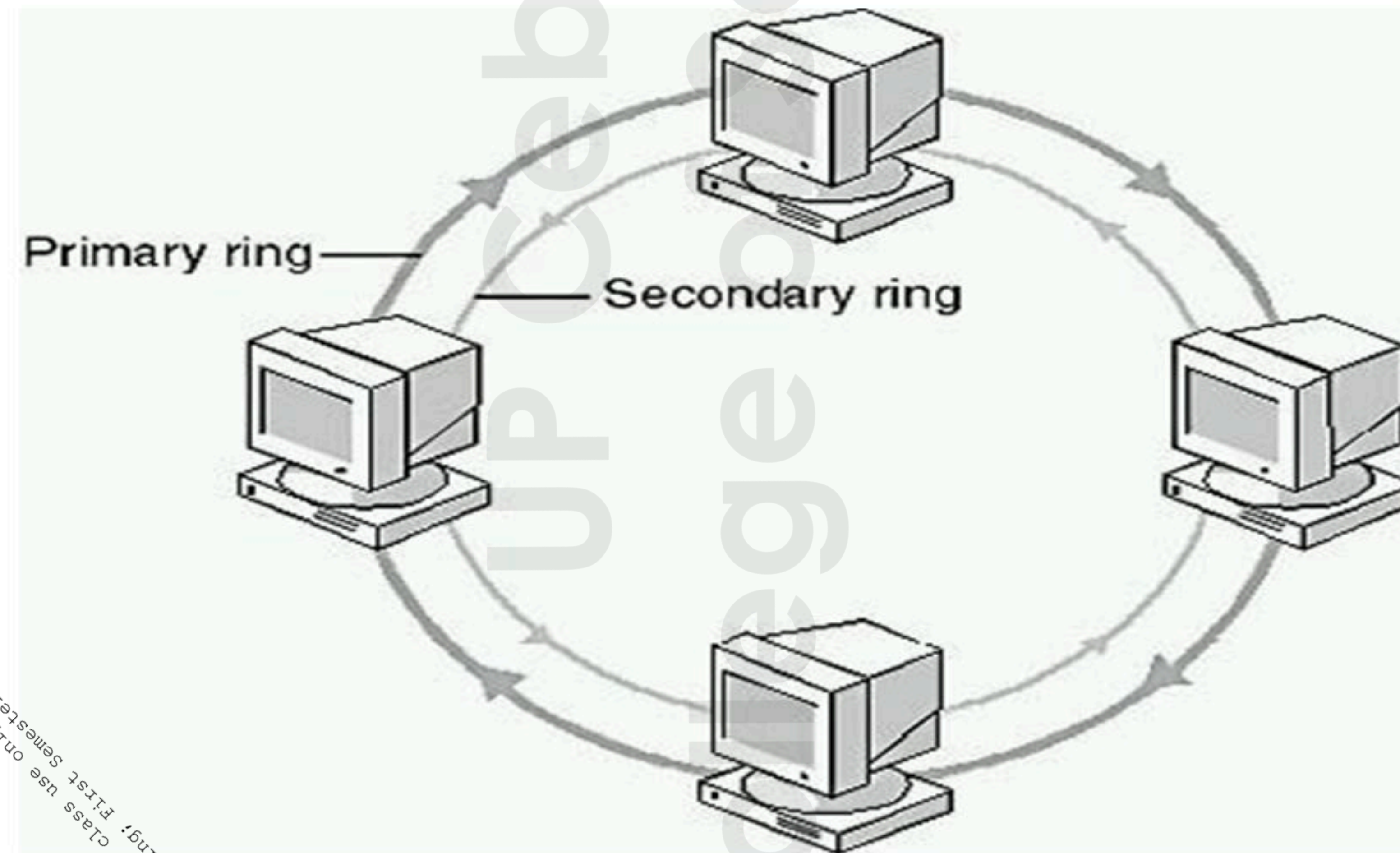
# Advantages of Ring Topology

1. Relatively easy to install and configure
2. Simplified fault isolation

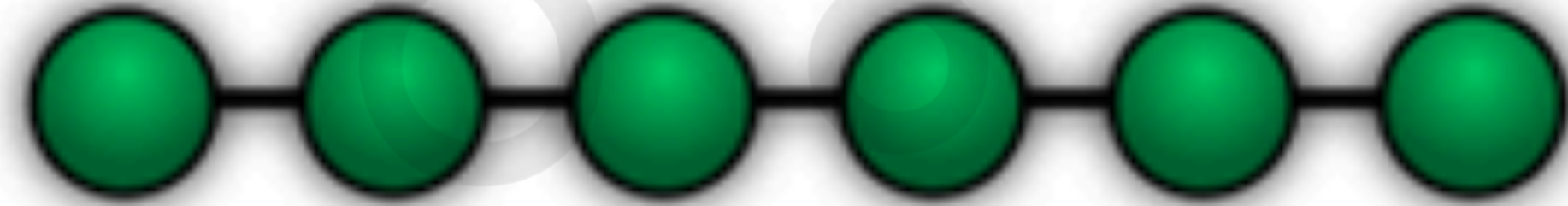


# Disadvantage of Ring Topology

1. A break in a ring (disabled station) can disable the entire network (solved by using dual ring)



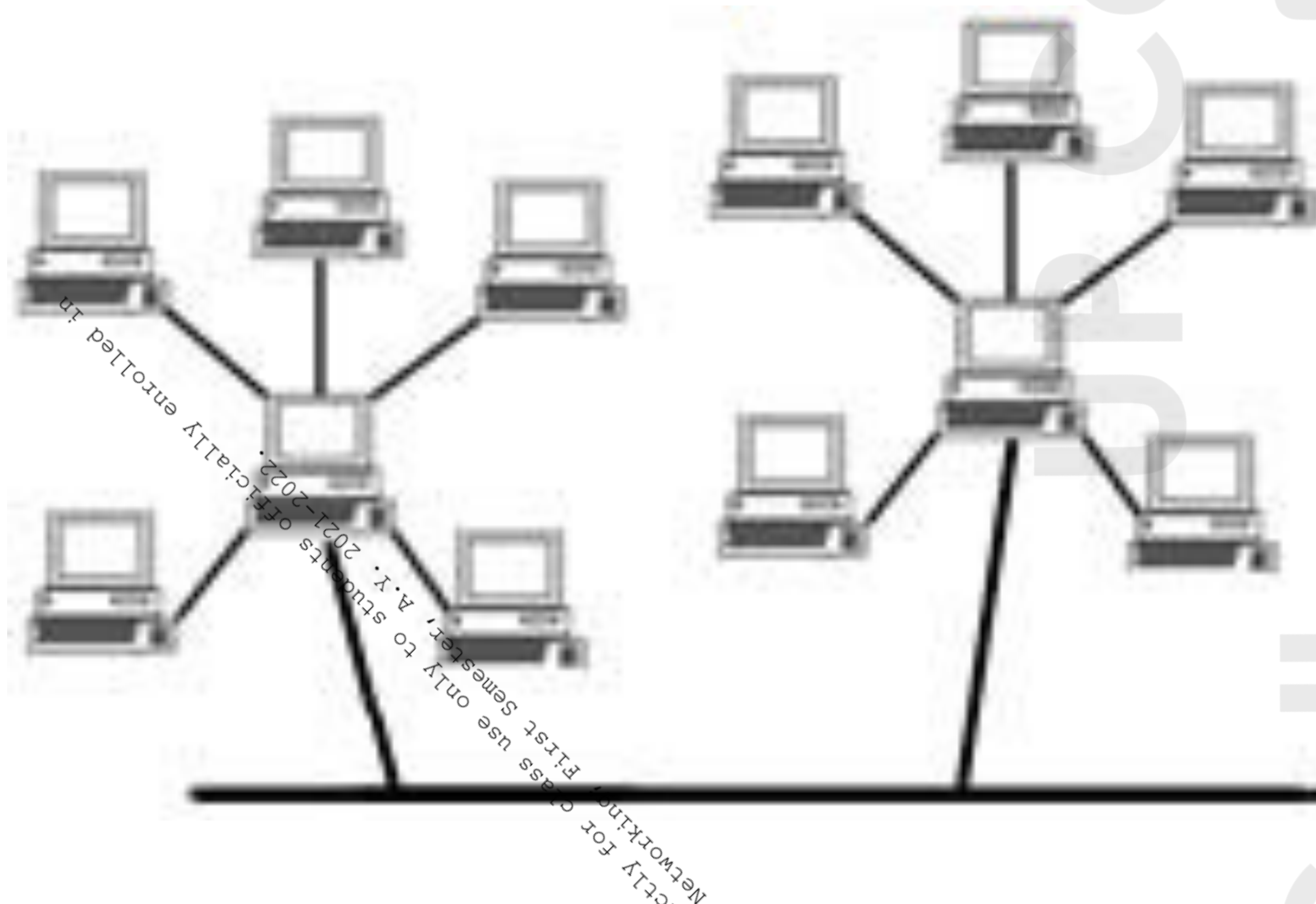
# 5. Line or Point-to-Point Topology





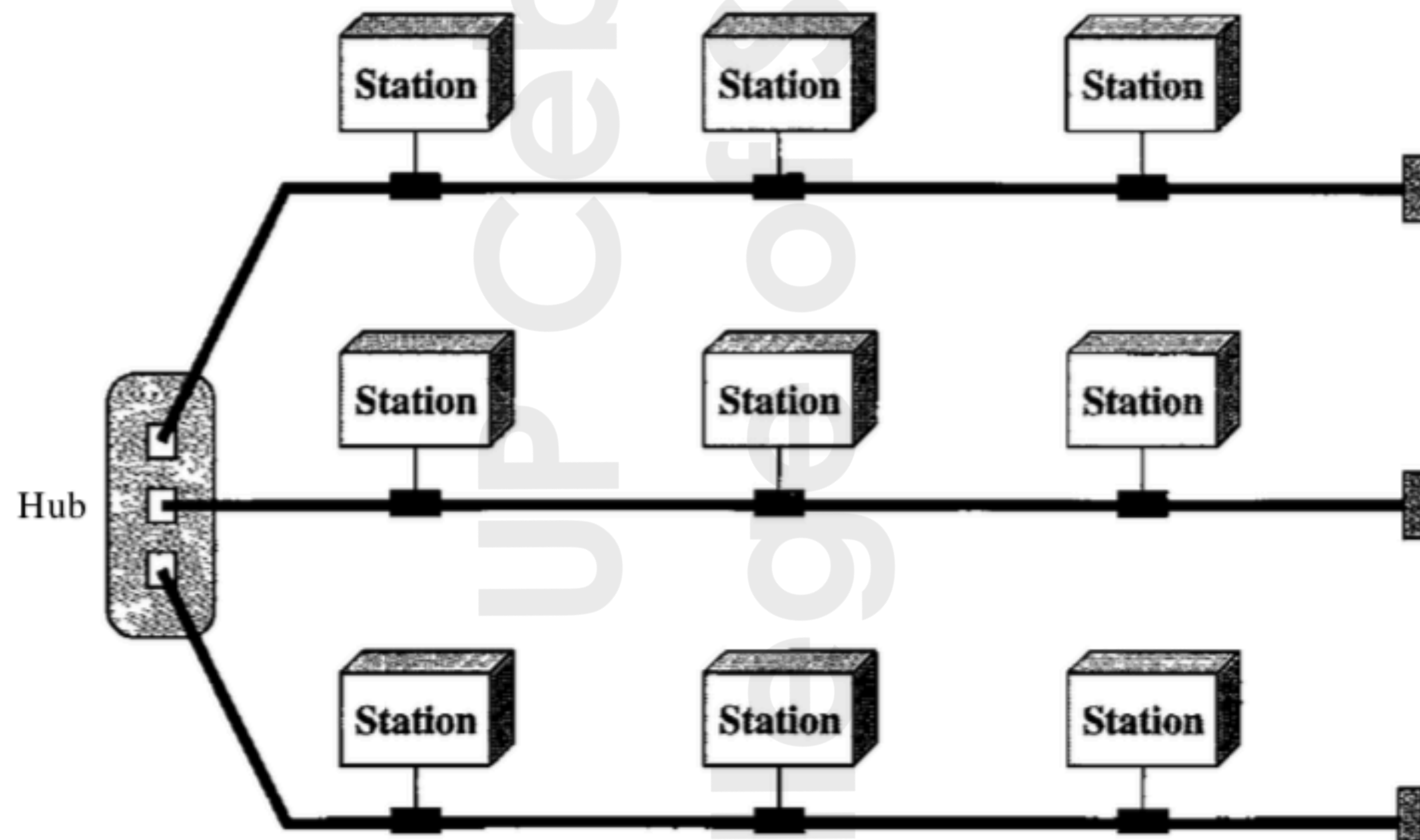
# 6. Tree Topology

- a.k.a star bus topology
- central nodes of star networks are connected
- hierarchy (parent-child)



# 7. Hybrid Topology

Figure 1.9 A hybrid topology: a star backbone with three bus networks





**Figure 1.12** *A heterogeneous network made of four WANs and two LANs*

