

Lecture 2

NETWORK TOPOLOGIES

Topics Covered

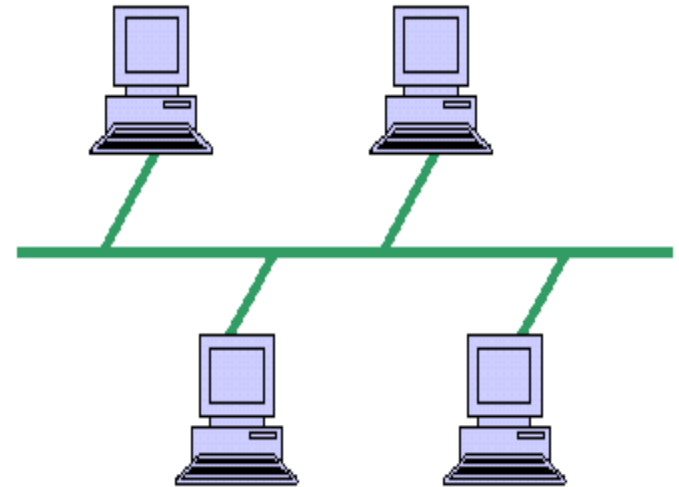
- Topologies
- Bus topology
- Star
- Ring
- Tree
- Hybrid
- Fully connected or Complete (Mesh)
- Applications

Topologies

- The physical topology of a network refers to the configuration of cables, computers, and other peripherals
- Star
- Ring
- Bus
- Hybrid
- Tree
- Complete
- Irregular

BUS Topology

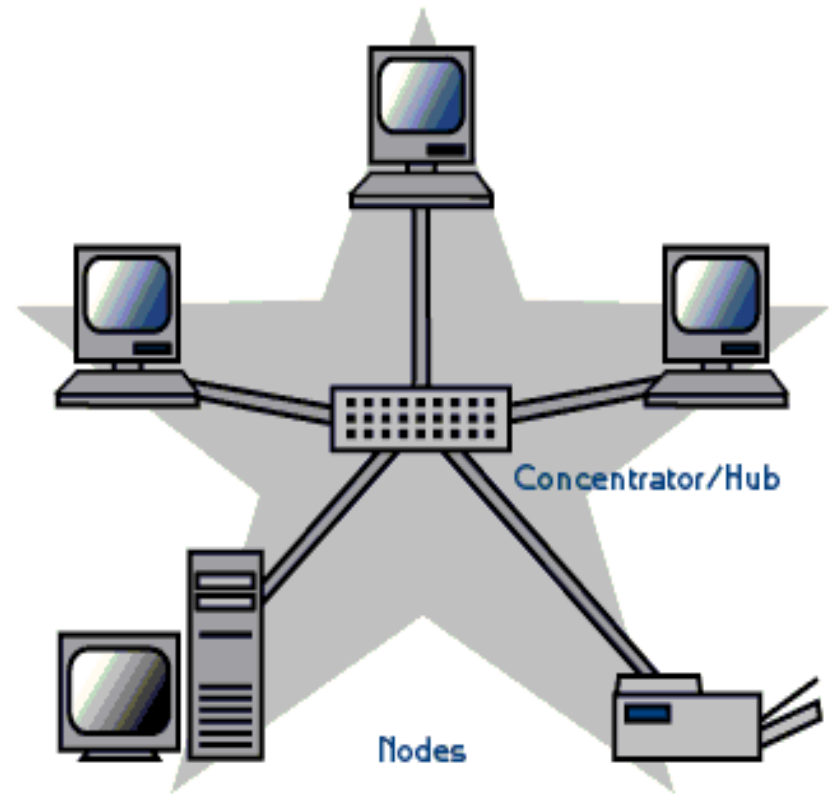
- Each machine is connected to a single cable.
- Each computer or server is connected to the single bus cable through some kind of connector.
- A signal from the source travels in both directions to all machines connected on the bus cable until it finds the address on the network that is the intended recipient.
- If the machine address does not match the intended address for the data, the machine ignores the data.
- Alternatively, if the data does match the machine address, the data is accepted



Advantages	Disadvantages
Cheap and easy to implement	Network disruption when computers are added or removed High cost of managing the network
Require less cable	Single point of failure. A break in the cable will prevent all systems from accessing the network.
Does not use any specialized network equipment.	Difficult to troubleshoot.

Star Topology

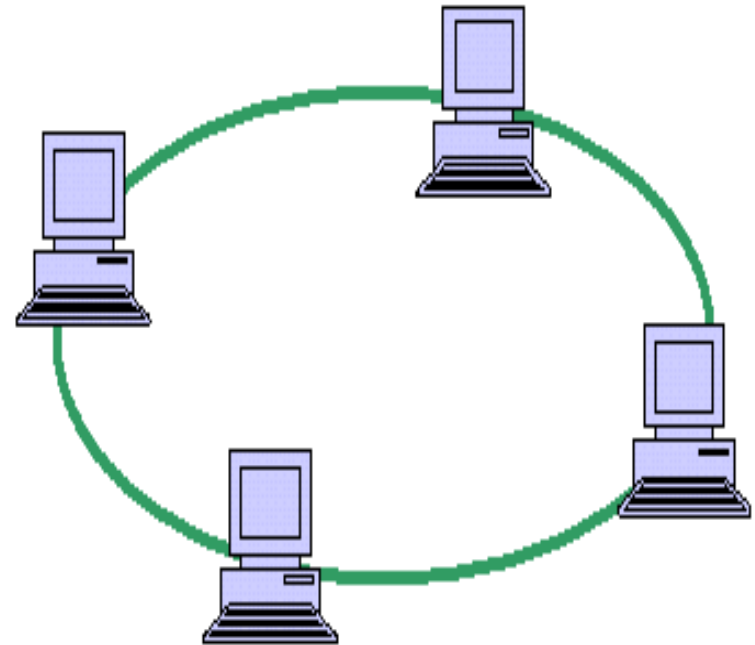
- Each machine is connected to a central hub or switch.
- It allows each machine on the network to have a point to point connection to the central hub.
- All of the traffic which transverses the network passes through the central hub.
- The hub acts as a signal booster or repeater which in turn allows the signal to travel greater distances.
- Most widely implemented
- Hub is the single point of failure



Advantages	Disadvantages
Easily expanded without disruption to the network	Requires more cable
Cable failure affects only a single user	A central connecting device allows for a single point of failure
Easy to troubleshoot and isolate problems.	More expensive than bus topologies because of the cost of the hubs

Ring Topology

- Each computer is connected to the network in a closed loop or ring
- Each machine or computer has a unique address that is used for identification purposes
- The signal passes through each machine or computer connected to the ring in one direction
- Ring topologies typically utilize a token passing scheme, used to control access to the network
- By utilizing this scheme, only one machine can transmit on the network at a time.



Advantages

Cable faults are easily located, making troubleshooting easier

Ring networks are moderately easy to install

Disadvantages

Expansion to the network can cause network disruption

A single break in the cable can disrupt the entire network.

Tree

- **Tree:** A collection of busses connected by a branching cable with no closed loops
 - Allows users to create networks using bridges
 - Message from any site can be received by all other sites, until it reaches an end point
 - End point controller absorbs a message if it reaches end point controller without being accepted by a host
 - **Advantage:** Message traffic can still flow through the network even if a single node fails

Tree (continued)

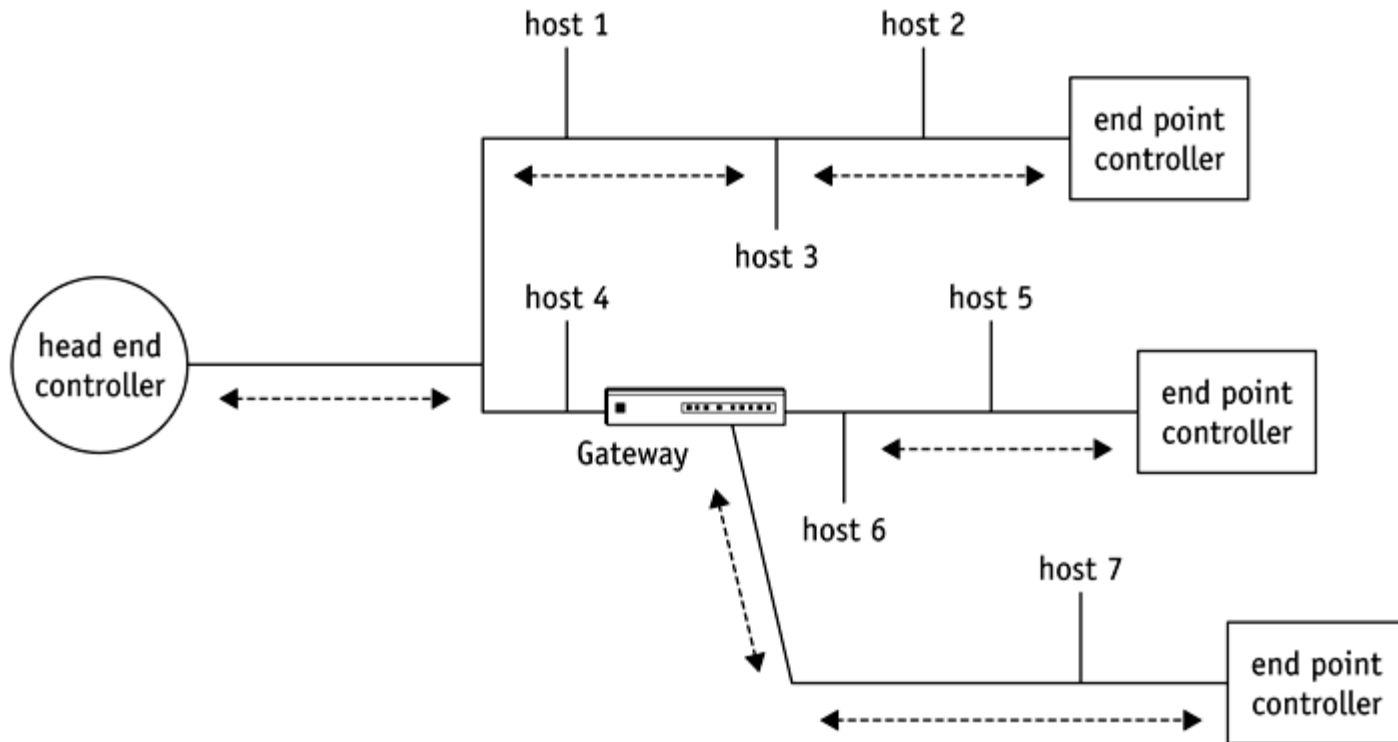


Figure : Tree Topology

Hybrid

Selects among the strong points of each topology and combines them to meet that system's communications requirements most effectively

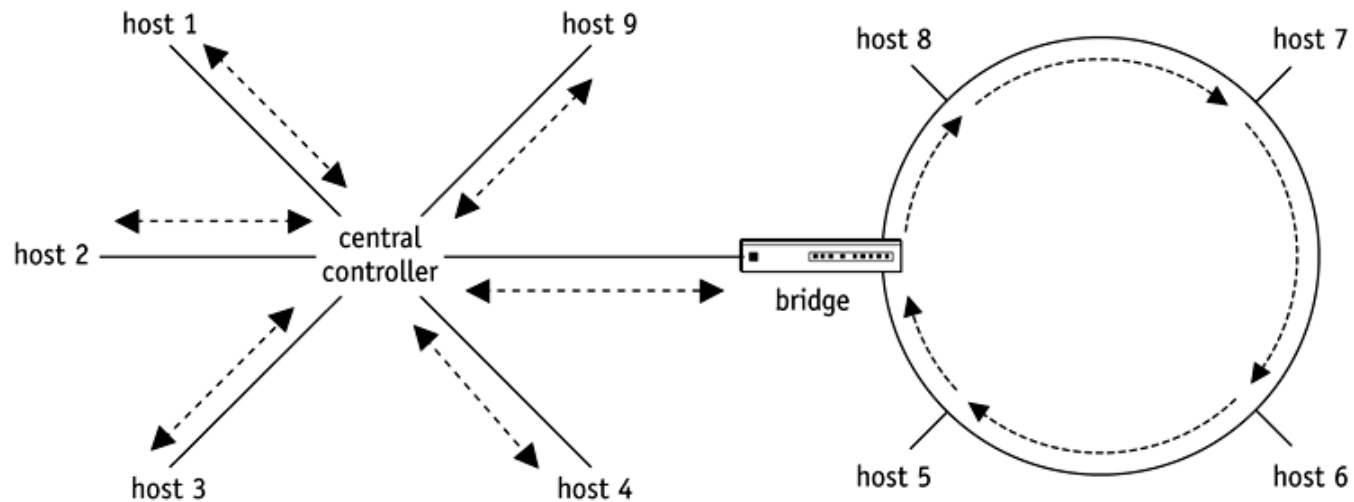


Figure : Hybrid topology combining a star and a ring using a bridge

Hybrid (continued)

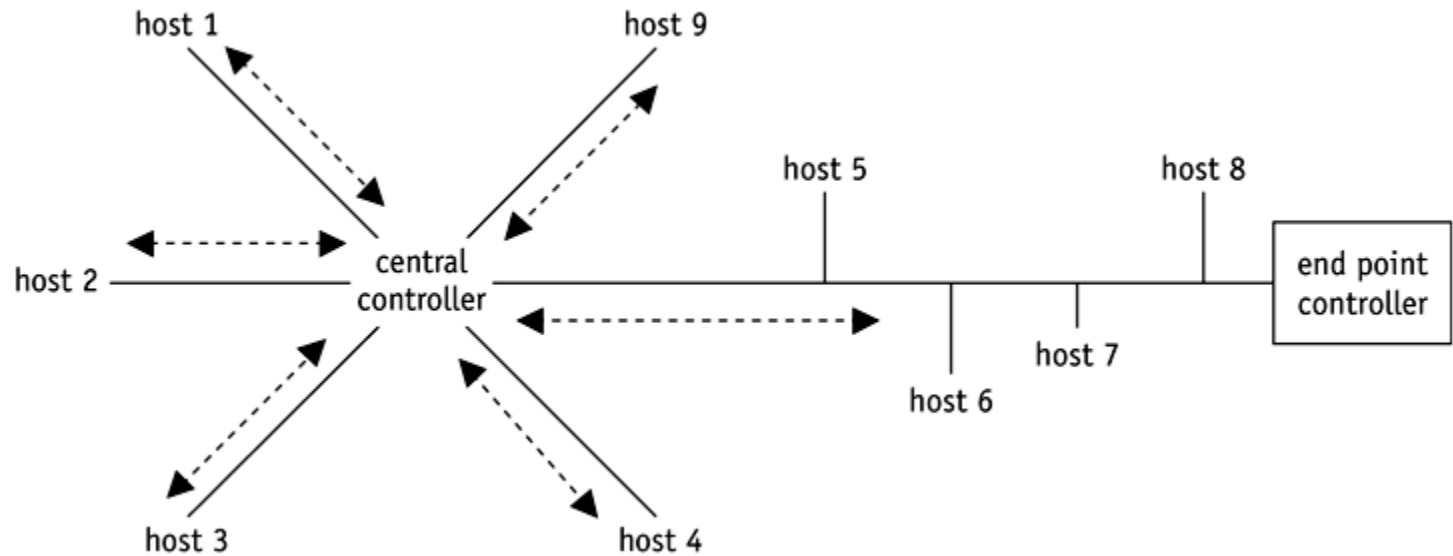
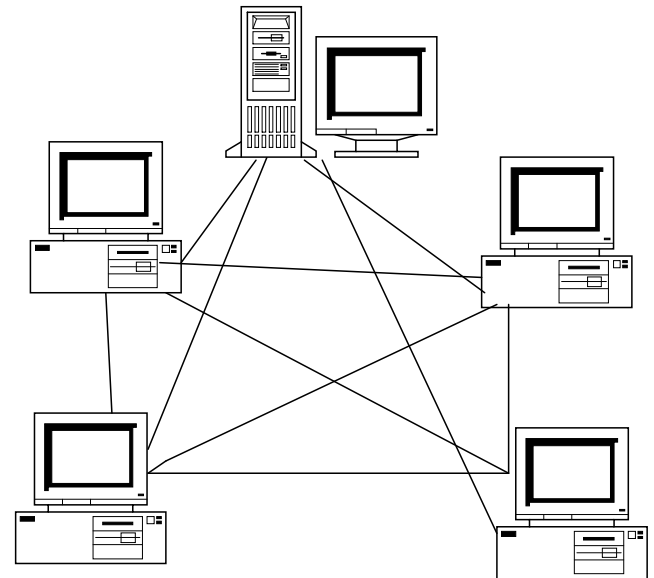


Figure : Hybrid topology combining a star and a bus

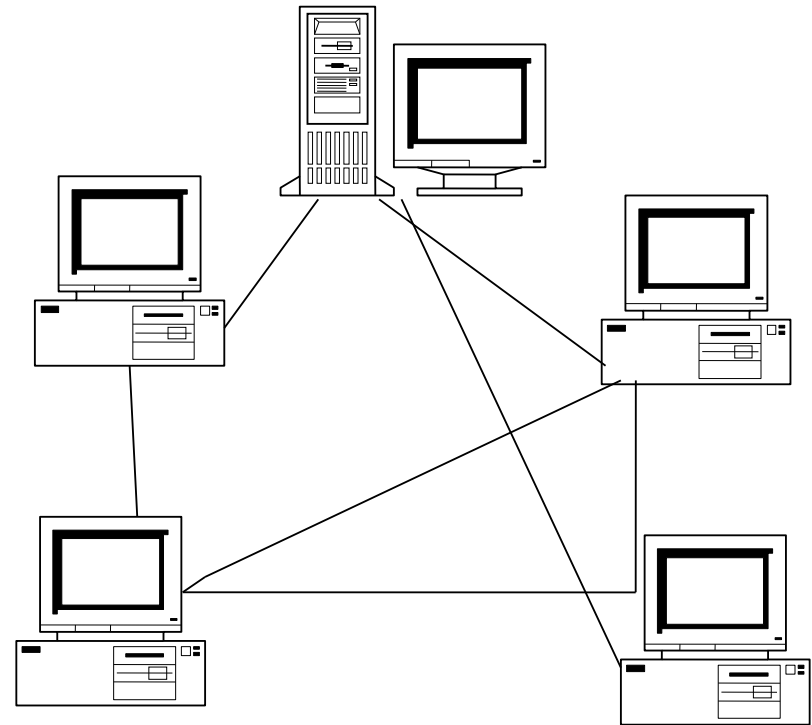
Fully connected or Complete (Mesh)

- In A mesh network each station is connected directly to every other station in the network.
- It is a viable solution only for smaller networks.
- The huge cabling cost and awkwardness of laying so many direct links make the mesh topology unattractive for LAN's with a large number of stations.
- On the other hand since all stations are directly linked to all other stations on exclusive links, this topology allows simultaneous communications between a number of pairs of stations.



Irregular network

- An irregular network is similar to the fully connected except that the requirement of connecting every computer to every other is removed.
- The cost and the flexibility to add a new computer is reasonable.
- The effect of failure depends on the exact network topology.



Applications

- **News Groups**
- **Internet Telephony (VoIP)**
- **Video Conferencing**
- **Chat Groups**
- **Instant Messengers**

Scope of Research

- Improved Network Connection using better Topologies.