



Media and Topologies part 1

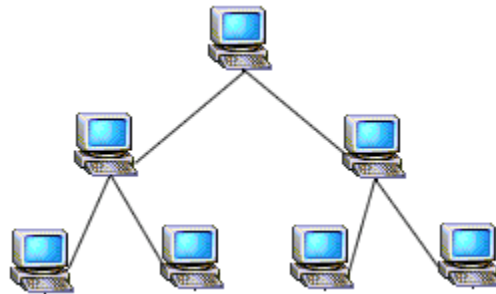
»1.1 Recognize the following logical or physical network topologies given a schematic diagram or description:

If computers are connected in a row, along a single cable this is called a bus topology, if they branch out from a single junction or hub this is known as a star topology. When computers are connected to a cable that forms a continuous loop this is called a ring topology.

Star/hierarchical



Star



Hierarchical or cascading star

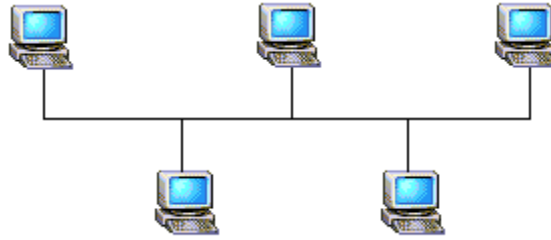
Computers in a star topology are connected by cables to a hub. In this topology management of the network is made much easier (such as adding and removing devices), because of the central point. However because it is centralized more cable is required.

Because most star topologies use twisted-pair cables, the initial installation of star networks is also easier.

If one computer fails the network will continue to function, but if a hub fails all computers connected to it will also be affected.

Star topologies are, or are becoming the topology of choice for networks.

Bus

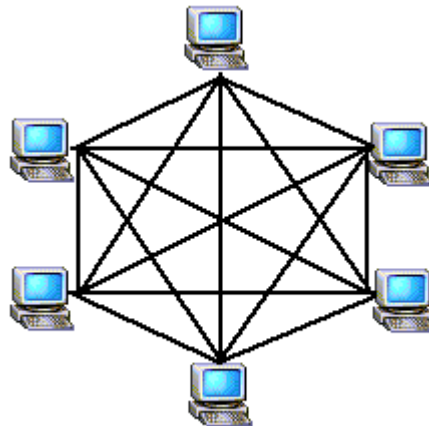


In bus topologies, all computers are connected to a single cable or "trunk or backbone", by a transceiver either directly or by using a short drop cable. All ends of the cable must be terminated, that is plugged into a device such as a computer or terminator. Most bus topologies use coax cables.

The number of computers on a bus network will affect network performance, since only one computer at a time can send data, the more computers you have on the network the more computers there will be waiting send data. A line break at any point along the trunk cable will result in total network failure.

Computers on a bus only listen for data being sent they do not move data from one computer to the next, this is called passive topology.

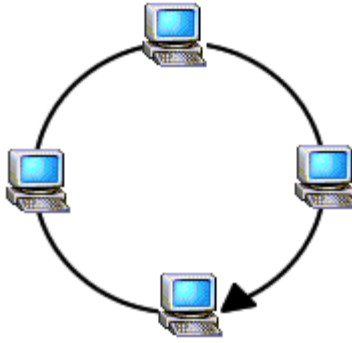
Mesh



A Mesh topology Provides each device with a point-to-point connection to every other device in the network. These are most commonly used in WAN's, which connect networks over telecommunication links. Mesh topologies use routers to determine the best path.

Mesh networks provide redundancy, in the event of a link failure, meshed networks enable data to be routed through any other site connected to the network. Because each device has a point-to-point connection to every other device, mesh topologies are the most expensive and difficult to maintain.

Ring



In a ring topology network computers are connected by a single loop of cable, the data signals travel around the loop in one direction, passing through each computer. Ring topology is an active topology because each computer repeats (boosts) the signal before passing it on to the next computer.

One method of transmitting data around a ring is called token passing. The token is passed from computer to computer until it gets to a computer that has data to send.

If there is a line break, or if you are adding or removing a device anywhere in the ring this will bring down the network. In an effort to provide a solution to this problem, some network implementations (such as [FDDI](#)) support the use of a double-ring. If the primary ring breaks, or a device fails, the secondary ring can be used as a backup.

Wireless

A wireless network consists of wireless NICs and access points. NICs come in different models including PC Card, ISA, PCI, etc. Access points act as wireless hubs to link multiple wireless NICs into a single subnet. Access points also have at least one fixed Ethernet port to allow the wireless network to be bridged to a traditional wired Ethernet network, such as the organization's network infrastructure. Wireless and wired devices can coexist on the same network.

»1.2 Specify the main features, including speed, access method, topology, and media of:

802.3 (Ethernet) Carrier Sense Multiple Access with Collision Detection (CSMA/CD) LAN Ethernet

A type of media access control. With CSMA/CD, a computer listens to the network to determine whether another computer is transmitting a data frame. If no other computer is transmitting, the computer can then send its data. While the computer is listening for a data signal, that would be the carrier sense part. Multiple access means, there are multiple computers trying to access or send data on the network at the same time. Collision detection indicates that the computers are also listening for collisions, if two computers try to send data at the same time and a collision occurs, they must wait a random period of time before transmitting again.

Ethernet

Designation	Supported Media	Maximum Segment Length	Transfer Speed	Topology
10Base-5	Coaxial	500 m	10 Mbps	Bus
10Base-2	Thin Coaxial (RG-58 A/U)	185 m	10 Mbps	Bus
10Base-T	Category 3 or above unshielded twisted-pair (UTP)	100 m	10 Mbps	Star, using either simple repeater hubs or Ethernet switches
1Base-5	Category 3 UTP, or above	100 m	1 Mbps	Star, using simple repeater hubs
10Broad-36	Coaxial (RG-58 A/U CATV type)	3600 m	10 Mbps	Bus (often only point-to-point)
10Base-FL	Fiber-optic - two strands of multimode 62.5/125 fiber	2000 m (full-duplex)	10 Mbps	Star (often only point-to-point)
100Base-TX	Category 5 UTP	100 m	100 Mbps	Star, using either simple repeater hubs or Ethernet switches
100Base-FX	Fiber-optic - two strands of multimode 62.5/125 fiber	412 meters (Half-Duplex) 2000 m (full-duplex)	100 Mbps (200 Mb/s full-duplex mode)	Star (often only point-to-point)
1000Base-SX	Fiber-optic - two strands of multimode 62.5/125 fiber	260 m	1 Gbps	Star, using buffered distributor hub (or point-to-point)
1000Base-LX	Fiber-optic - two strands of multimode 62.5/125 fiber or monomode fiber	440 m (multimode) 5000 m (singlemode)	1 Gbps	Star, using buffered distributor hub (or point-to-point)
1000Base-CX	Twinax, 150-Ohm-balanced, shielded, specialty cable	25 m	1 Gbps	Star (or point-to-point)
1000Base-T	Category 5	100 m	1 Gbps	Star

802.5 (token ring)

The IEEE 802.5 Token Ring standards define services for the OSI physical layer and the MAC sublayer of the data link layer. Token Ring computers are situated on a continuous network loop. A Token Ring controls access to the network by passing a token, from one computer to the next. Before they can transmit data they must wait for a free token, thus token passing does not allow two or more computers to begin transmitting at the same time.

Token Ring

Media	MAC Method	Signal Propagation Method	Speed	Topologies	Maximum Connections
Twisted-pair (various types)	Token passing	Forwarded from device to device (or port to port on a hub) in a closed loop	4 Mbps 16 Mbps	Ring Star-using Token Ring repeater hubs	255 nodes per segment

802.11b (wireless)

802.11b is a wireless Ethernet technology operating at 11MB. 802.11b devices use Direct Sequence Spread Spectrum (DSSS) radio technology operating in the 2.4GHz frequency band.

An 802.11b wireless network consists of wireless NICs and access points. Access points act as wireless hubs to link multiple wireless NICs into a single subnet. Access points also have at least one fixed Ethernet port to allow the wireless network to be bridged to a traditional wired Ethernet network.. Wireless and wired devices can coexist on the same network.

802.11b devices can communicate across a maximum range of 50-300 feet from each other.

FDDI networking technologies

Fiber Distributed Data Interface, shares many of the same features as token ring, such as a token passing, and the continuous network loop configuration. But FDDI has better fault tolerance because of its use of a dual, counter-rotating ring that enables the ring to reconfigure itself in case of a link failure. FDDI also has higher transfer speeds, 100 Mbps for FDDI, compared to 4 - 16 Mbps for Token Ring.

Unlike Token Ring, which uses a star topology, FDDI uses a physical ring. Each device in the ring attaches to the adjacent device using a two stranded fiber optic cable. Data travels in one direction on the outer strand and in the other direction on the inner strand. When all devices attached to the dual ring are functioning properly, data travels on only one ring. FDDI transmits data on the second ring only in the event of a link failure.

Media	MAC Method	Signal Propagation Method	Speed	Topologies	Maximum Connections
Fiber-optic	Token passing	Forwarded from device to device (or port to port on a hub) in a closed loop	100 Mbps	Double ring Star	500 nodes

»1.3 Specify the characteristics (e.g., speed, length, topology, cable type, etc.) of the following 802.3 (Ethernet) standards:

	Cable Type	Maximum Length	Speed	Topology
10Base-5	Coaxial	500 m	10 Mbps	Bus
10Base-2	Thin Coaxial (RG-58 A/U)	185 m	10 Mbps	Bus
10Base-T	Category 3 or above unshielded twisted-pair (UTP)	100 m	10 Mbps	Star, using either simple repeater hubs or Ethernet switches
100Base-TX	Category 5 UTP	100 m	100 Mbps	Star, using either simple repeater hubs or Ethernet switches
100Base-FX	Fiber-optic	412 meters (Half-Duplex) 2000 m (full-duplex)	100 Mbps (200 Mb/s full-duplex mode)	Star (often only point-to-point)
1000Base-LX	Fiber-optic	440 m (multimode) 5000 m (singlemode)	1 Gbps	Star, using buffered distributor hub (or point-to-point)
1000Base-T	Category 5	100 m	1 Gbps	Star