

# Computer networks

[Technology](#), [Computer](#)



Often, nodes are connected to the network via cables - Usually owned and managed by a single organization. - Have three (3) characteristic features:

- 1 . A diameter of not more than a few kilometers
2. A total data rate of at least several Mbps
3. Complete ownership by a single organization

2. Wide Area Network (WAN) Most WANs connect computers within a single country, but others (for example SITS which serves the international airline organizations) cover many countries using a communications channel that combines many types of media such as telephone lines, cables and airwaves. The Internet is the world's largest WAN. - Has the following characteristic features:

- 1 . Span greater distances than LANs. Typically span entire countries
2. Have much lower data rates usually under 1 Mbps
3. Owned by multiple organizations
4. WANs can be connected on demand or permanently connected; LANs have permanent connections between stations
5. WANs can use public or private network transports; LANs primarily use private network transports.

3. Metropolitan Area Network (MAN) - Covers an area of the size of a typical city, but uses LAN technology. They offer a simple, fast way to link different organizations for the exchange of information.

NETWORK TOPOLOGIES - Computers can be connected together in many different ways. - The layout or topology of the network will influence how reliable the network is and how easy it is to access. - The main physical topologies include wired or wireless networks. The main hierarchical wired topologies are: Star, ring, bus, with many other derivatives

Star Topology All devices are connected to a central device called a hub by a separate cable. Nodes communicate across the network by passing data through the hub.

Advantages include: ; New stations can be added easily and quickly ; A single cable failure won't bring down the entire network ; It is relatively easy to troubleshoot ; Total installation cost may be higher than that for a bus network because of the larger number of cables, but prices are constantly becoming more and more competitive. ; It has a single point of failure

Ring Topology All devices are connected to one another in the shape of a closed loop, so that each device is connected directly to two other devices, one on either side of it.

Data is transmitted on a ring network from device to device around the entire ring, in one direction. When a computer sends data, the data travels to each computer on the ring until it reaches its destination. Advantages: ; Growth of system has minimal impact on performance ; Each node (or workstation) in the network is able to purify and amplify the data signal before sending it to the next node, therefore introducing less signal loss as data travels. Can cover larger geographical areas where star implementations would be difficult.

Difficulties: ; A break anywhere in the n/w shuts down the entire network. ; Most expensive topology ; Failure of one computer may impact others ; Non-destination users may access data passing around the network when it reaches his/her computer. ; Difficult to add or subtract a station without bringing down the entire network (physical ring topology is hardly ever used)

All devices are connected to a single central cable, called the bus or backbone. Using the bus and a destination address, data is transmitted from the source device to the destination device (all along the single cable). Bus

topology is inexpensive and easy to install. You can attach & detach devices to the network at any point without affecting the rest of the network. ; Failure of one device usually doesn't affect the rest of the network. ; The transmission simply bypasses the failed device. Requires less cabling than a star network. Disadvantages: ; Entire n/w shuts down if there is a break in the main cable. ; Terminators are required at both ends of the backbone cable. ; Difficult to identify the problem if the entire network shuts down. Not meant to be used as a stand-alone solution to cover a large building. Mesh Topology Devices are connected with many redundant interconnections between network nodes. In a true mesh topology every node has a connection to every other node in the network. Tree Topology A hybrid topology. Groups of star-configured networks are connected to a linear bus backbone. - Each type of computer system has its own method of storing information and interfacing to the outside world. - A protocol defines the rules of procedure, which computers must obey when communicating with each other.

Layering of Protocols ( To reduce their design complexities, most networks are organized as a series of layers. Protocol functions Protocols are used to improve (and standardize) the communication process between two computers of different manufacturers. A protocol is a set of conventions or rules that the computers must follow to complete a data communication task. 1 . Starting the communication - Identify which computers are " hosts" & which are " slaves" communication starts automatically - Identify which computers are allowed to communicate .

Character identification - Rules for identifying frames of characters - Rules for identifying characters in frames 3. Message control - Whether - Frames (of several messages) may arrive (at the receiver) at random and must be assembled in order before being passed on to the user. 4. Error control - Rules for identifying electrical signals on the lines (transmission media) and provide feedback to the sender. Feedback may include a success or a failure message. 5. Ending the communication - Rules for terminating (normally & abnormally) communication between two computers.