

**LAN** is the acronym for Local Area Network. A LAN network is a group of connected computers within close geographical proximity. This could be within an office building, a home or a school. LANs provide such benefits as sharing resources like files, printers and applications and can be built with inexpensive hardware such as Ethernet cables, hubs and network adaptors.

**WANs** (Wide Area Networks) can be used to connect devices and LANs or other networks, over a significant distance. Many WANs are made for organisations and are kept private, but the Internet is an example of a public WAN. Just like LANs, WANs provide the benefit of connection and resource sharing, but can be expensive and sometimes slow, with the need for increased security.

## Topologies

A **Bus Topology** is a set of nodes that are connected by a shared communications line or bus. These are easy to implement and extend, and are suited for temporary or small networks, while being cheaper and the linear nature means that faults in communication line are easy to identify. However this topology can be more expensive to run long-term and the single communication line means that the number of nodes is limited, with the performance degraded each time a new node is added.

**Ring Topology** involves each node having connections to two other nodes, creating a single pathway for signals through each node. Data travels in one direction around the ring, with each node handling every packet. As there is only one pathway, in one direction, the network can be disrupted when one section fails, and can be very slow under normal operational levels, with moving of devices potentially affecting the network. This topology does not require a network server or hardware.

A **Star Topology** consists of a central switch or similar hardware, which transmits messages, connected to each node through an independent cable. This topology means that when one segment of the network (other than the switch) is removed or fails, the rest of the network is still operational. The star topology allows for better performance, as data packets are not sent unnecessarily to nodes. However, there is a high dependence on the functioning of the central hub, which if it fails, then network is rendered useless, with all nodes isolated. reduce

A **Tree topology** combines a bus and star topology, with Star topologies of nodes connected to the servers through a bus network. This allows for many servers on the one network, with the ability to expand and branch the network. This network can be very complex to configure and may not suit small organisations and can involve a lot of expensive cables. Additionally, if the bus network line fails, the entire network would fail.

A **Mesh Topology** involves all nodes being connected to each other, with some connected more than once. This network configuration means that if one node fails, the network can find a new path for data transfer, thus decreasing the chances of a network breakdown. However the amount of cables required can be significantly expensive, with this topology mainly implemented only where system failure would be disastrous.

## Communication Protocols

**TCP/IP** (Transmission Control Protocol/Internet Protocol) is the communication protocols for communication between computers on the internet. TCP involves the creation and reassembling of data packets. If some messages get delayed TCP asks for the specific packet to be resent. IP directs the packets to their destination, containing the data to be transmitted as well as the senders and recipients IP addresses.

**CSMA/CD** (Carrier Sense Multiple Access/Collision Detection) is a communication protocol. Carrier Sense means the node waits for a break in traffic on the communication line before sending information. Multiple Access allows for nodes are aware of other nodes' transmissions. While CSMA aims to prevent the occurrence of collisions, they still occur, which is where Collision Detection is involved. CD detects a collision and tells each node to each wait a random amount of time before resending.

**ATM** (Asynchronous Transfer Mode) combines the best of packet switching (breaking data into many packets) and circuit switching (setting up a dedicated channel for communicating data in one packets). This allows for the fast and reliable transmissions in real time, and is especially useful in video and voice messages

The **Token Ring** communication protocol involves a token that travels around a ring topology. In order to communicate, a node must possess and add the data to the token, which is then sent around the network until it reaches its destination. Only the computer possessing the token can communicate, resulting in elimination of transmission collisions, message into the token.