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Computer network

A **computer network** is a set of computers sharing resources located on or provided by network nodes. Computers use common communication protocols over digital interconnections to communicate with each other. These interconnections are made up of telecommunication network technologies based on physically wired, optical, and wireless radio-frequency methods that may be arranged in a variety of network topologies.

The nodes of a computer network can include personal computers, servers, networking hardware, or other specialized or general-purpose hosts. They are identified by network addresses and may have hostnames. Hostnames serve as memorable labels for the nodes and are rarely changed after initial assignment. Network addresses serve for locating and identifying the nodes by communication protocols such as the Internet Protocol.

Computer networks may be classified by many criteria, including the transmission medium used to carry signals, bandwidth, communications protocols to organize network traffic, the network size, the topology, traffic control mechanisms, and organizational intent.

Computer networks support many applications and services, such as access to the World Wide Web, digital video and audio, shared use of application and storage servers, printers and fax machines, and use of email and instant messaging applications.

History

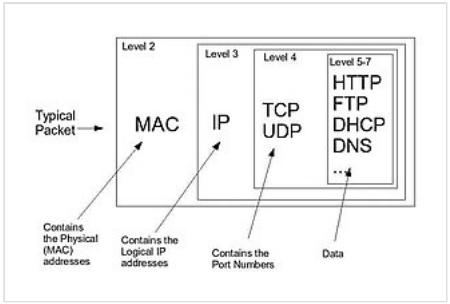
Computer networking may be considered a branch of computer science, computer engineering, and telecommunications, since it relies on the theoretical and practical application of the related disciplines. Computer networking was influenced by a wide array of technological developments and historical milestones.

- In the late 1950s, a network of computers was built for the U.S. military Semi-Automatic Ground Environment (SAGE) radar system[1][2][3] using the Bell 101 modem. It was the first commercial modem for computers, released by AT&T Corporation in 1958. The modem allowed digital data to be transmitted over regular unconditioned telephone lines at a speed of 110 bits per second (bit/s).
- In 1959, Christopher Strachey filed a patent application for time-sharing and John McCarthy initiated the first project to implement time-sharing of user programs at MIT.[4][5][6][7] Strachey passed the concept on to J. C. R. Licklider at the inaugural UNESCO Information Processing Conference in Paris that year.[8] McCarthy was instrumental in the creation of three of the earliest time-sharing systems (the Compatible Time-Sharing System in 1961, the BBN Time-Sharing System in 1962, and the Dartmouth Time Sharing System in 1963).
- In 1959, Anatoly Kitov proposed to the Central Committee of the Communist Party of the Soviet Union a detailed plan for the re-organization of the control of the Soviet armed forces and of the Soviet economy on the basis of a network of computing centers.[9] Kitov's proposal was rejected, as later was the 1962 OGAS economy management network project.[10]
- In 1960, the commercial airline reservation system semi-automatic business research environment (SABRE) went online with two connected mainframes.

access and use resources provided by devices on the network, such as printing a document on a shared network printer or use of a shared storage device. A network allows sharing of files, data, and other types of information giving authorized users the ability to access information stored on other computers on the network. Distributed computing uses computing resources across a network to accomplish tasks.

Network packet

Most modern computer networks use protocols based on packet-mode transmission. A network packet is a formatted unit of data carried by a packet-switched network.



Network Packet

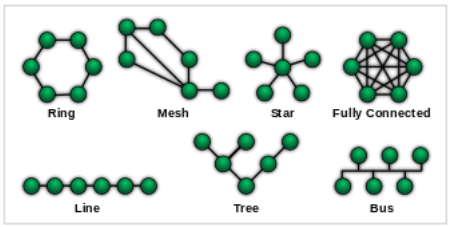
Packets consist of two types of data: control information and user data (payload). The control information provides data the network needs to deliver the user data, for example, source and destination network addresses, error detection codes, and sequencing information. Typically, control information is found in packet headers and trailers, with payload data in between.

With packets, the bandwidth of the transmission medium can be better shared among users than if the network were circuit switched. When one user is not sending packets, the link can be filled with packets from other users, and so the cost can be shared, with relatively little interference, provided the link is not overused. Often the route a packet needs to take through a network is not immediately available. In that case, the packet is queued and waits until a link is free.

The physical link technologies of packet networks typically limit the size of packets to a certain maximum transmission unit (MTU). A longer message may be fragmented before it is transferred and once the packets arrive, they are reassembled to construct the original message.

Network topology

The physical or geographic locations of network nodes and links generally have relatively little effect on a network, but the topology of interconnections of a network can significantly affect its throughput and reliability. With many technologies, such as bus or star networks, a single failure can cause the network to fail entirely. In general, the more interconnections there are, the more robust the network is; but the more expensive it is to install. Therefore, most network diagrams are arranged by their network topology which is the map of logical interconnections of network hosts.



Common network topologies

Common topologies are:

- Bus network: all nodes are connected to a common medium along this medium. This was the layout used in the original Ethernet, called 10BASE5 and 10BASE2. This is still a common topology on the data link layer, although modern physical layer variants use point-to-point links instead, forming a star or a tree.
- Star network: all nodes are connected to a special central node. This is the typical layout found in a small switched Ethernet LAN, where each client connects to a central network switch, and