

Circuit Switching

- Circuit switching is a methodology of implementing a telecommunications network in which two network nodes establish a dedicated communications channel (circuit) through the network before the nodes may communicate.
- The circuit guarantees the full bandwidth of the channel and remains connected for the duration of the communication session.
- The circuit functions as if the nodes were physically connected as with an electrical circuit.

Circuit Switching

- In circuit switching, the bit delay is constant during a connection.
- Each circuit cannot be used by others until the circuit is released and a new connection is set up.
- Even if no actual communication is taking place, the channel remains unavailable to other users.
- Channels that are available for new users are said to be idle.
- Circuit switching is commonly used for connecting voice circuits.

Packet Switching

- Packet switching is a digital networking communications method that groups all transmitted data into suitably sized blocks, called packets.
- Packet switching features delivery of variable-bit-rate data streams (sequences of packets) over a shared network.
- When traversing networks packets are buffered and queued, resulting in variable delay and throughput depending on the traffic load in the network.

Packet Switching

- Connectionless packet switching, also known as datagram switching.
 - In the first case each packet includes complete addressing or routing information.
 - The packets are routed individually, sometimes resulting in different paths and out-of-order delivery.
 - At the destination, the original message/data is reassembled in the correct order.

Packet Switching

- Connection-oriented packet switching, also known as virtual circuit switching.
 - A connection is defined and preallocated in each involved node during a connection phase before any packet is transferred.
 - The packets include a connection identifier rather than address information, and are delivered in order.

Networking Components

- Network Hardware (Components) refers to equipment facilitating the use of a computer network.
 - This includes routers, switches, hubs, gateways, access points, network interface cards, Networking cables, network bridges, modems, firewalls and other equipment.
- In the most common modern computer systems, Wireless networking has become increasingly popular, however, especially for portable and hand held devices.

Routers

- A device that forwards data packets between computer networks, creating an overlay internetwork.
- A router is connected to two or more data lines from different networks.
 - When data comes in on one of the lines, the router reads the address information in the packet to determine its ultimate destination.
 - Then, using information in its routing table or routing policy, it directs the packet to the next network on its journey.

Switches

- A network switch or switching hub is a computer networking device that connects network segments.
 - Unmanaged switches — These switches have no configuration interface or options.
 - Managed switches — These switches have one or more methods to modify the operation of the switch.
 - Smart (or intelligent) switches
 - Enterprise Managed (or fully managed) switches
- Mid-to-large sized LANs contain a number of linked managed switches.

Hub

- An Ethernet hub, active hub, network hub, repeater hub or hub is a device for connecting multiple twisted pair or fiber optic Ethernet devices together and making them act as a single network segment.
- A network hub is an unsophisticated device in comparison with, for example, a switch.
- A hub does not manage any of the traffic that comes through it: any packet entering any port is rebroadcast on all other ports.

Gateway

- A network node equipped for interfacing with another network that uses different protocols.
- The activities of a gateway are more complex than that of the router or switch as it communicates using more than one protocol.
- A gateway is an essential feature of most routers, although other devices (such as any PC or server) can function as a gateway.

Access Points

- A wireless access point (WAP) is a device that allows wireless devices to connect to a wired network using Wi-Fi, Bluetooth or related standards.
- The WAP usually connects to a router (via a wired network), and can relay data between the wireless devices (such as computers or printers) and wired devices on the network.
- Home networks WAPs are mostly wireless routers, meaning converged devices that include the WAP, a router, and, often, an ethernet switch. Many also include a broadband modem.

Network Interface Cards

- A network interface controller (also known as a network interface card, network adapter, LAN adapter and by similar terms) is a computer hardware component that connects a computer to a computer network.
- Although other network technologies exist (e.g. token ring), Ethernet has achieved near-ubiquity since the mid-1990s.
- Every Ethernet network controller has a unique 48-bit serial number called a MAC address, which is stored in read-only memory.

Networking Cables

- Networking Cables are used to connect one network device to other or to connect two or more computers to share printer, scanner etc.
- Different types of network cables like Coaxial cable, Optical fiber cable, Twisted Pair cables are used depending on the network's topology, protocol and size.
- The devices can be separated by a few meters (e.g. via Ethernet) or nearly unlimited distances (e.g. via the interconnections of the Internet).

Network Bridges

- Bridging is a forwarding technique used in packet-switched computer networks.
- Bridging generally refers to Transparent bridging or Learning bridge operation which predominates in Ethernet.
- A bridge uses a forwarding database to send frames across network segments.
- The forwarding database is initially empty and entries in the database are built as the bridge receives frames.

Modems

- A modem (modulator-demodulator) is a device that modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information.
- The most familiar example is a voice band modem that turns the digital data of a personal computer into modulated electrical signals in the voice frequency range of a telephone channel.
- These signals can be transmitted over telephone lines and demodulated by another modem at the receiver side to recover the digital data.

Firewalls

- A firewall is a device or set of devices designed to permit or deny network transmissions based upon a set of rules and is frequently used to protect networks from unauthorized access while permitting legitimate communications to pass.
 - Many personal computer operating systems include software-based firewalls to protect against threats from the public Internet.
 - Many routers that pass data between networks contain firewall components and, conversely, many firewalls can perform basic routing functions.