Local Area Network

Computer Network & Usage

A network is a collection of computers and devices connected by communication channels that facilitates communications among users and allows users to share resources with other users. Some examples of resources are data, information, hardware and software. The followings are explained the advantage of using a network.

1. **Facilitating communications.**
   Using a network, people and communicate efficiently and easily via e-mail, instant messaging, chat rooms, telephony, video telephone calls and video conferencing. Sometimes communications occur within a business network. Other times, they occur globally through the internet.

2. **Retrieving Remote Information:**
   Through computer networks, users can retrieve remote information on a variety of topics. The information is stored in remote databases to which the user gains access through information systems like the World Wide Web.

3. **Sharing data and information:**
   In a networked environment any authorized computer user can access data and information stored on other computers on the network. A large company, for example might have a database of customer information any authorized person, including mobile user using hand held computer to connect to the network, can access this database.

4. **Sharing software**   in a bank ,software canbe shared all computers as client-server network
   Users connected to a network can access software on the network. To support multiple user access of software, most software vendors sell network versions of their software. Sharing software via network usually costs less than buying individual copies of the software package for each computer.

5. **Sharing hardware.**   in an organization a printer canbe shared all computers
   In a networked environment, each computer on a network can access and use hardware on the network.

Communication Types

Simplex communication
Simplex data communication specifies the communication on a given channel can only flow in one direction. In this environment, only one entity is allowed to transmit and all others act as receivers.

It should be noted that the sending device can't receive data and the receiving entity can't transmit data.

Eg: Local radio station. This represents a one-way communication stream simplex communication data transfer in one direction only.

Half - Duplex communication
Unlike simplex communication, half – duplex communication allows each device to send and receive data, but only one device at a time can transmit.

A key point is that when you are transmitting the entire channel is being used for that purpose. You can't receive and transmit at some time.

The best examples of walkie-talkie.

Half – duplex communication data transfer both directions but only one direction at a time.

Full - Duplex communication
Full – Duplex communication provides for two way communicate at the same time.

Every day example of full-duplex communication would be your basic telephone system. Full-duplex communication allows both parties to transmit and receive at the same time.

Hosts on a network use similar message patterns to communicate.

Unicast addresses – represent a single LAN interface. A unicast frame will be sent to a specific device, not to a group of devices on the LAN.

Broadcast addresses – represent all devices on the LAN. Frames sent to a broadcast address will be delivered to all devices on the LAN.

Multicast addresses – represent a group of devices in a LAN. A frame sent to a multicast address will be forwarded to a group of devices on the LAN.

Communication Channel

A channel is an important aspect of communications. This the path through which information passes between two devices. Bandwidth is width of the communication channels. The higher of the bandwidth, the more data and the information the channel can transmit.

Transmission media consists of materials techniques capable of carrying one or more signals. When you send data from your computer, the signal carrying the data most likely travels over a variety of transmission media especially when the transmission is sent a long distance.

Types of transmission media / channels

Coaxial cable
Coaxial cable, typically called coax cable, uses a center core conductor that is insulated and surrounded by either a braded or solid thin foil aluminum shield.

Coax cable is very similar in appearance to the type use by television cables in your home. However, it should be noted that these are not the same and can't be interchanged.

Coaxial cable

Outside insulation

Insulation

Copper mesh

Copper wire
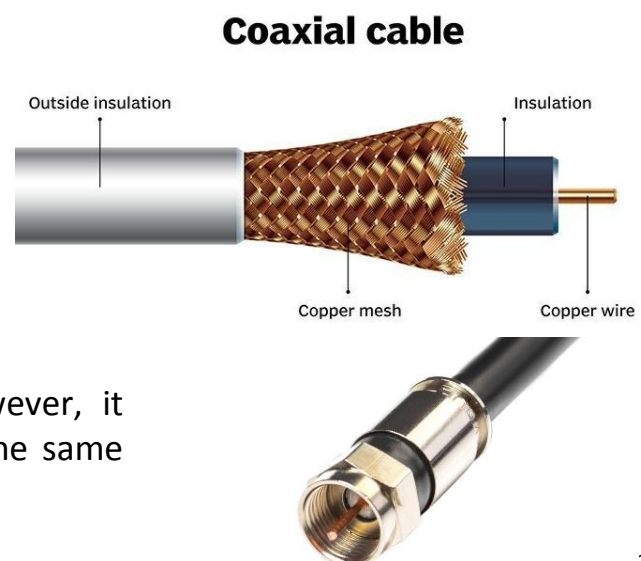
Due to the amount of shielding, coax cable is very resistant to cross talk and EMI (Electro Magnetic Interference)

A BNC connector is used to connect to a computer to a coaxial cable in 10 BASE -2 Ethernet network.

10 BASE – 2 Is a 10 MHz Base band network on a cable extending up to 185 meters – around in up to 200 meters without a repeater cable.

A BNC male connector has a pin that connects to the primary contacting wire and then is lock in place with an outer ring that turns into lock position.

Twisted pair

Twisted pair is an ordinary copper wire that connects home and many business computers to the network.

To reduce cross talk, Electro Magnetic induction between pairs of wires, two insulated copper wires are twisted around each other.

Each connection on twisted pair requires both wires. For some business locations, twisted pair is in closed in a shielded that function as grown. This is known as Shielded Twisted Pair (STP) ordinary wire to the home is Unshielded Twisted Pair (UTP).
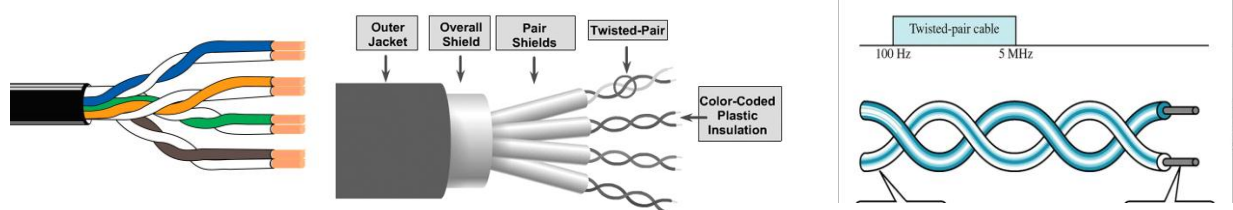
UTP doesn't have an added layer of shielding and is therefore thinner and cheaper to manufacture. UTP cables rated in categories. CAT 5 is better able to create a stable platform for data transmissions grater than 10 Mbps.

The main physical difference between CAT 3 and CAT 5 cable is the number of twists per inch. The CAT 5 cable has many more twists than CAT 3.

UTP Categories - Copper Cable				
UTP Category	Data Rate	Max. Length	Cable Type	Application
CAT1	Up to 1Mbps	-	Twisted Pair	Old Telephone Cable
CAT2	Up to 4Mbps	-	Twisted Pair	Token Ring Networks
CAT3	Up to 10Mbps	100m	Twisted Pair	Token Rink & 10BASE-T Ethernet
CAT4	Up to 16Mbps	100m	Twisted Pair	Token Ring Networks
CAT5	Up to 100Mbps	100m	Twisted Pair	Ethernet, FastEthernet, Token Ring
CAT5e	Up to 1 Gbps	100m	Twisted Pair	Ethernet, FastEthernet, Gigabit Ethernet
CAT6	Up to 10Gbps	100m	Twisted Pair	GigabitEthernet, 10G Ethernet (55 meters)
CAT6a	Up to 10Gbps	100m	Twisted Pair	GigabitEthernet, 10G Ethernet (55 meters)
CAT7	Up to 10Gbps	100m	Twisted Pair	GigabitEthernet, 10G Ethernet (100 meters)

Fiber optic

Fiber optic cable users a small strand of glass, instead of copper, as the core of cable it consists of a glass center core surrounded by a plastic sheath and a larger of gel or wire stands.

Fiber optic cables offer a major advantage over copper wire. It is almost completely immune to EMI and doesn't suffer from attenuation (loss of signal strength over distances) light copper cable tends to be very expensive as compared to copper wire.
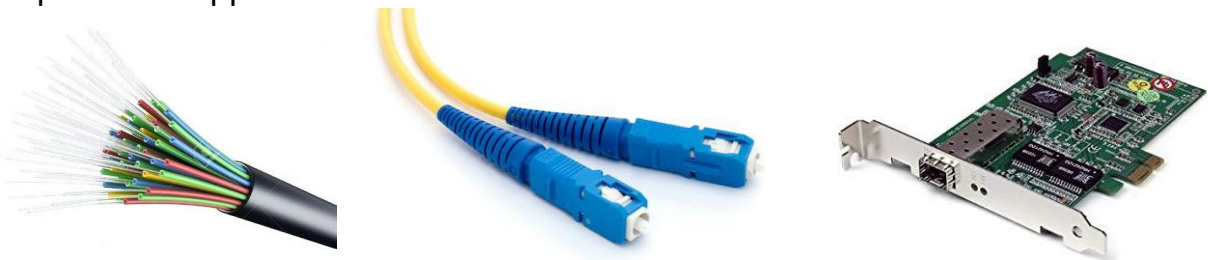
However, this cost variance should decrease as more companies choose to implement this technology.

Advantages over copper based media:
- ✓ Supports greater distance up to 4 kilometers.
- ✓ Immune to EMI.
- ✓ Immune to RFI (Radio Frequency Interface)

Disadvantages of fiber optic cable:
- ✓ More expensive than copper based media.
- ✓ Difficult to install and support.

Cables	Connectors	Cable system	Speed	Maximum cable
Coaxial (Thin)	BNC	10 BASE 2	10 Mbps	185 m
Coaxial (Thick)	AUI	10 BASE 5	10 Mbps	500 m
UTP or STP	RJ45	10 BASE T - 100 BASE T	4 to 100 Mbps	100 m
Fiber optics	ST or SC	100 BASE FL 1000 BASE FX	10 to 1Gbps	2 to 4 km