Module 2

Cables and Connectors

Twisted Pair

- Two wires that carry the data signals (one conductor carries a positive signal; one carries a negative signal).
- Two wires are twisted to reduce the effects of
  - EMI *(electromagnetic interference)*
  - Crosstalk
    - Between pairs in the same cable
    - NEXT – Near End Crosstalk

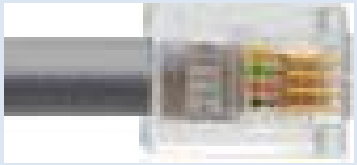
Twisted Pair Types

- Shielded Twisted Pair (STP) has a grounded outer copper shield around the bundle of twisted pairs or around each pair. This provides added protection against EMI.
- Unshielded Twisted Pair (UTP) does not have a grounded outer copper shield. UTP cables are easier to work with and are less expensive than shielded cables.

Type: (Connector) Description

- **Cat 3** (RJ-45) Designed for use with 10 Mb Ethernet
- **Cat 5** (RJ-45) Supports 100 Mb (up to 1Gb) and ATM networking.
- **Cat 5e** (RJ-45) Similar to Cat 5 but provides better EMI protection. Supports 1Gb (up to 10Gb)
  - Gb connections require the use of all four twisted pairs.
- **Cat 6** (RJ-45) Supports 10Gb Ethernet and broadband communications.

Twisted Pair Connectors

Connector	Description
	**RJ-11** **Has 4 connectors, Supports up to 2 pairs of wires, Uses a locking tab to keep connector secure in outlet, Used primarily for telephone wiring**
	RJ-45 **Has 8 connectors, Supports up to 4 pairs of wires, Uses a locking tab to keep connector secure in outlet, Used for Ethernet and some token ring connections**

Coaxial Cable

Coaxial cable is implemented with a bus topology. The ends of the cable must be terminated to avoid signal bounce.

- **Advantages :**
  - **Highly resistant to EMI (electromagnetic interference) and physical damage**
- **Disadvantages**
  - **Expensive, difficult to install and not supported by newer networking standards**

Coaxial Connectors

Connector	Description
F type	Twisted onto the cable, Used to create cable and satellite TV connections, Used to hook a cable modem to a broadband cable connection
BNC	Molded onto the cable, Used in 10Base2 Ethernet networks
AUI	DB15 serial connector, Used in 10Base5 Ethernet networks

Fiber Optic Facts

Advantages:

- **Totally immune to EMI ,** Highly resistant to eavesdropping, Supports extremely high data transmission rates, Allows greater cable distances without a repeater

Disadvantages :

- **Very expensive,** Difficult to work with. Special training required to attach connectors to cables.

Fiber Optic Types

Single Mode

- Transfers data through the core using a single light ray (the ray is also called a *mode)*
- The core diameter is around 10 microns
- Supports a large amount of data
- Cable lengths can extend a great distance

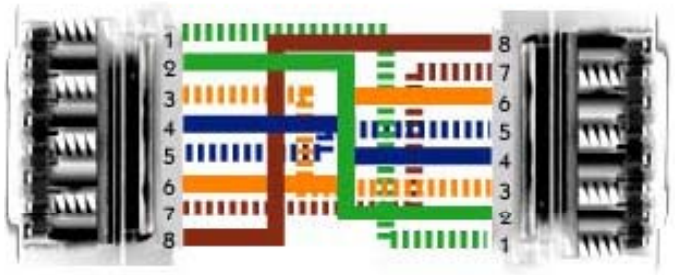
Multi-mode

- Transfers data through the core using multiple light rays
- The core diameter is around 50 to 100 microns
- Cable lengths are limited in distance

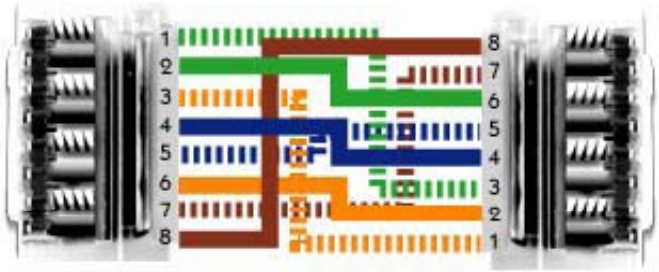
Fiber Optic Connectors

Type	Description
ST Connector	Keyed, bayonet-type connector (push in and twist connector), Nickel plated with a ceramic ferrule
SC Connector	Push on, pull off connector type , Uses ceramic ferrule to insure proper core alignment
LC Connector	Composed of a plastic connector with a locking tab similar to a RJ-45 connector. Half the size of other fiber-optic connectors
MT-RJ Connector	Composed of a plastic connector with a locking tab, Uses metal guide pins to ensure it is properly aligned

Making Cable



STRAIGHT THROUGH CABLE:
Computers connect to the network through a hub or switch with a straight-through cable. There are two standards: T568A and T568B



CROSSOVER CABLE:
The easiest way to create a crossover cable is to arrange the wires in the first connector using the T568A standard and arrange the wires in the second connector using the T568B standard.

Wiring Distribution Facts

Component	Description
Demarcation point (demarc)	The LEC (local exchange carrier) is responsible for all equipment on the outside of the demarc, the customer is responsible for all equipment on the inside of the demarc.
Main Distribution Frame (MDF)	The main distribution frame (MDF) is the main wiring point for a building.
Vertical cross connect	A vertical cross connect connects the MDF on the main floor to IDFs (intermediate distribution frame) on upper floors.
Horizontal cross connect	A horizontal cross connect connects IDFs on the same floor.
Patch panel	Device that typically connects individual stranded wires into female RJ-45 connectors.