**NETWORK ASSIGNMENT**

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**2ND YR. 4TH SEM**

GUIDED AND UNGUIDED MEDIA:

First of all what is transmission media, we know that a computer uses signal to represent data. Hence to transfer these signals we need something. This transmission facility is provided by the transmission media. It is located below the physical layer. The signals can be transmitted over large distances over these mediums using electromagnetic energy.

Transmission media can be broadly categorized as:

1. Guided Media : Wired
2. Unguided Media : Wireless
3. GUIDED MEDIA :

The guided media provide a conduit from one device to another for example, twisted pair cable, coaxial cable and optical fiber cable.

1. Twisted Pair Cable :

A twisted pair consists of two conductors (normally copper) each with its own plastic insulation, twisted together.

One of the wires / conductors carry signals to the receiver and the other is used only as a ground reference.

The receiver uses the distance between the two.

Why twisting is done?

The twisting increases the probability that both the wires affected by the noise (if any) introduced in the same manner, thus the difference at the receiver end remains same.

Hence the unwanted signals are mostly cancelled out.

Also, twisting is considered as an important factor in judging the quality of the wire.

Types:

* 1. Shielded Twisted Pair Cable :

It has a metal foil or metal braided mesh covering to reduce interferences

It is more expensive than UTP

Also it is harder to handle

* 1. Un-Shielded Twisted Pair Cable:

It does not have any extra covering like such hence it suffers environmental hindrances.

It is cheaper.

It is easy to handle

Eg : Telephone Cables.

Categories:

The EIA has classified the UTP into seven different categories which was determined based on the standards by itself. Each category has specific use.

1. UTP in Telephones used in telephone with data rate limit <0.1 Mbps.
2. UTP originally used in T-Lines used in T-1 lines with data rate limit equal to 2 Mbps.
3. Improved CAT2 used in LANs used in LANs with data rate limit=10 Mbps.
4. Improved CAT3 used in Token Ring networks used in LANs with data rate limits=20 Mbps.
5. This cable wire is normally 24 AWG with a jacket and outside sheath with data rate limit=100 Mbps for LANs.
6. This is an extension to Cable 5 with features to reduce crosstalk and EM interference with data rate limit=125 used in LANs.
7. Category with matched components from the same manufacturers tested at a 200-Mbps data rate used in LANs.
8. SSTP (Shielded Screen twisted pair). Each pair is individually wrapped in a helical metallic foil followed by a metallic foil shield in addition to the outside sheath. The shield decreases the effect of crosstalk and increases data rate up to 600 Mbps and again is used in LANs.

Performance:

The twisted-pair cable suffers increased attenuation with increasing frequency.

Application:

1. TP are used in telephone lines to provide voice and data channels.
2. The DSL lines are used by Telephone companies which use the high bandwidth capability of UTPs.
3. LANs such as 10Base-T and 100Base-T use these cables.

Connectors:

Common UTP connector is RJ45 (Registered Jack, it is a keyed connector).

1. COAXIAL CABLE:

Structure:

Coax carries signal of higher frequency ranges

Coax has a central core conductor of solid or stranded wire enclosed in an insulating sheath, which is, in turn, encased in an outer conductor of metal foil, braid, or combination of two.

Outer metallic wrapping serves two purposes: as a shield, and as a second conductor to complete circuit.

Standards and Categories:

The cables have been categorized according to RG (Radio Government) ratings. RG number denotes a unique set of physical specification (eg wire gauge of inner conductor , thickness and type of inner insulator etc)

|  |  |  |
| --- | --- | --- |
| Category | Impedance | Use |
| RG-59 | 75 Ohm | Cable TV |
| RG-58 | 50 Ohm | Thin Ethernet |
| RG-11 | 50 Ohm | Thick Ethernet |

Connectors:

BNC (Bayone-Neill- Councelman) connectors are used to connect Coax.

Performance:

Attenuation rates in Coax Cable are found to be higher in comparison to TP Cable. Hence, it needs frequent use of repeaters.

Application:

Cable TV networks use Coax Cables. Also Ethernet LANs is an application of Coax Cable.

1. FIBER OPTIC CABLE:

Structure:

Made up of glass or plastic.

Transmits data in form of light.

Concept:

It uses reflection to guide light through a channel. A glass or plastic core is surrounded by less denser cladding .The difference between the density of the two materials must be such that a beam of light moves through the core.

Mode:

There two possible propagation mode :

1. SINGLE MODE:

* Uses step index fiber
* Highly focused source of light is required that limits beams to a small range of angles
* Manufactured with a much smaller diameter
* All beams arrive at the destination “together” and can be recombined with little distortion to the signal.

1. MULTIMODE:

* Multiple beams of light source move through the core in different paths.
* Two possible types are : Step index fiber and Graded index fiber
* Step-Index Fiber: In this fiber an abrupt change occurs due to a lower density cladding which results in alteration of the beam’s path. This might result in distortion of the signal as it passes through the fiber.
* Graded-Index Fiber: In this type of the fiber, the density is higher at the center of the core and decreases gradually to its lowest at the edge. Hence reducing distortion in the signal.

Categories:

Different Sizes of the fiber possible are:

|  |  |  |  |
| --- | --- | --- | --- |
| TYPE | CORE(mu m) | CLADDING(mu m) | MODE |
| 50/125 | 50.0 | 125 | MULTIMODE,GRADED INDEX |
| 62.5/125 | 62.5 | 125 | MULTIMODE,GRADED INDEX |
| 100/125 | 100.0 | 125 | MULTIMODE,GRADED INDEX |
| 7/125 | 7.0 | 125 | SINGLE MODE |

Composition:

The outer jacket is made of either PVC or Teflon. Inside the jacket are Kevlar strands to strengthen the cable. Below it is another plastic coating to cushion the fiber.

Connectors:

It uses three types of connectors. SC (Subscriber Channel) connector (used for Cable TV) .ST (Straight-tip) Connector (to connect with networking devices). MT-RJ(same size as RJ-45)

Performance:  
The optical fiber is faster. Also the attenuation rates are much lesser in comparison to the other two cables .Hence a few repeaters are required.

Application:

We can use this cable for Cable TV network, for Wave division Multiplexing and Ethernet LANs.

Advantages:

* Has a higher bandwidth
* Suffers less attenuation
* Almost immune to EM interferences
* And is made of corrosion-resistive material.
* Light weight
* Greater immunity to tapping

Disadvantages:

* Difficult installation and maintenance
* Unidirectional light propagation
* Highly expensive.

1. UNGUIDED MEDIA:

Unguided media transport electromagnetic waves without using a physical conductor. This type of communication is often referred to as wireless communication.

The three most common wave forms we use are:

1. Radio Wave
2. Micro Wave
3. Infrared
4. RADIO WAVE:

* radio is omnidirectional and microwave is directional
* Radio is a general term often used to encompass frequencies in the range 3 kHz to 300 GHz.
* Mobile telephony occupies several frequency bands just under 1 GHz.
* Radio waves are used for multicast communications, such as radio and television, and paging systems.

1. MICROWAVE:

* Have frequency between 1 and 300 GHz
* These are unidirectional.
* Characteristics:

1. This is a line of sight type of propagation.
2. Very high frequency microwaves cannot penetrate walls.
3. Its frequency band is relatively wide.
4. Use of certain portions of band requires permission.

* For transmission in cellular phones, satellite networks and wireless LANs

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1. INFRARED:

* It uses frequency between 300 GHz to 400 THz.
* Uses transmitters/receivers (transceivers) that modulate non-coherent infrared light.
* Transceivers must be within line of sight of each other (directly or via reflection).
* Unlike microwaves, infrared does not penetrate walls.