FACULTAD DE INGENIERÍA

UASLP
Universidad Autónoma de San Luis Potosí

Session 7 Report

cabling

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7.1 Summary:

In this session, we investigated communications and transmission media cables.

7.2 Introduction:

7.2.1 Transmission media:

- Transmission media is a communication channel that carries the information from the sender to the receiver. Data is transmitted through the electromagnetic signals.
- It is a physical path between transmitter and receiver in data communication.

7.3 Content:

7.3.1Structured cabling:

There are many benefits for using the system. A structured cabling can standardize your cabling systems with consistency so that the future cabling updates and troubleshooting will be easier to handle. In this way, you are able to avoid reworking the cabling when upgrading to another vendor or model, which prolongs the lifespan of your equipment. All the equipment moves, adds and changes can be simplified with the help of structured cabling. It is a great support for future applications.

7.3.1.1 What is it?:

Is an infrastructure that's made up of smaller, standardized elements. You can install structured cabling systems in a building or across a campus. It's this kind of network cabling that can support all of the rapidly-advancing technology coming to the workplace.

7.3.1.2 Components:

Structured cabling components include twisted pair and optical cabling, patch panels and patch cables.

7.3.1.2.1 Horizontal Cabling

The horizontal cabling is all the cabling between telecommunications outlets in a work area and the horizontal cross-connect in the telecommunications closet, including horizontal cable, mechanical terminations, jumpers and patch cords located in the telecommunications room or telecommunications enclosure, multi user telecommunications outlet assemblies and consolidation points. The maximum distance allowed between devices is 90 meters. Extra 6 meters is allowed for patch

cables at the telecommunication closet and in the work area, but the combined length of these patch cables cannot exceed 10 meters.

7.3.1.2.2 Backbone Cabling

Backbone cabling is also known as vertical cabling. It offers the connectivity between telecommunication rooms, equipment rooms, access provider spaces and entrance facilities. The cable runs on the same floor, from floor to floor, and even between buildings. Cable distance depends on the cable type and the connected facilities, but twisted pair cable is limited to 90 meters.

7.3.1.2.3 Work Area

Work area refers to space where cable components are used between communication outlets and end-user telecommunications equipment. The cable components often include station equipment (telephones, computers, etc.), patch cables and communication outlets.

7.3.2 Twisted-pair : STP y UTP

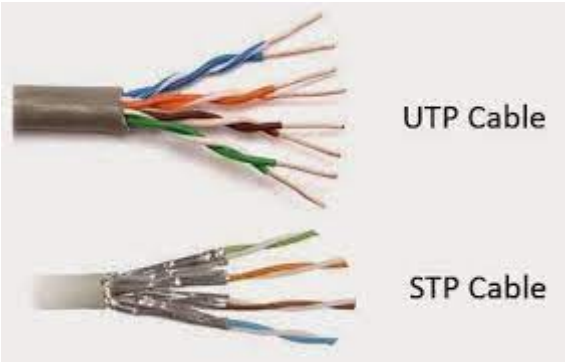

Fig.7.1.UTP & STP cable.

7.3.2.1 UTP(Twisted pair):

Twisted pair cabling is a type of wiring in which two conductors of a single circuit are twisted together for the purposes of improving electromagnetic compatibility.

Compared to a single conductor or an untwisted balanced pair, a twisted pair reduces electromagnetic radiation from the pair and crosstalk between neighboring pairs and improves rejection of external electromagnetic interference. It was invented by Alexander Graham Bell.

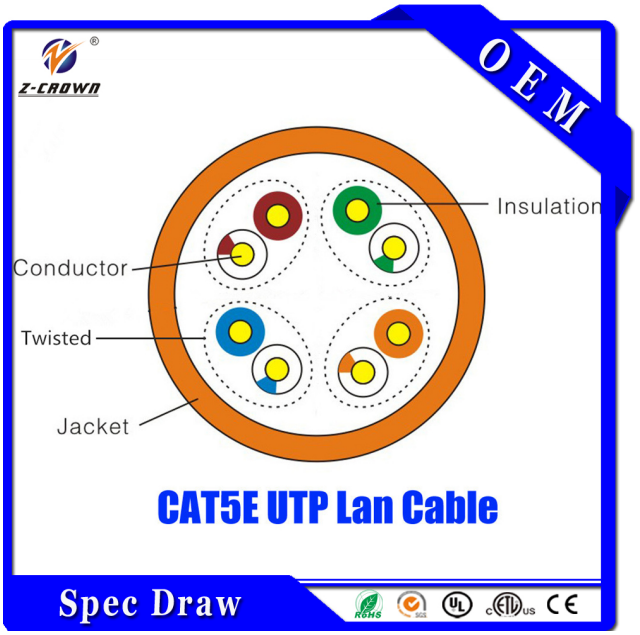

Fig.7.2.UTP cable diagram.

7.3.2.1 STP(Twisted pair):

STP Cabling is twisted-pair cabling with additional shielding to reduce crosstalk and other forms of electromagnetic interference (EMI).

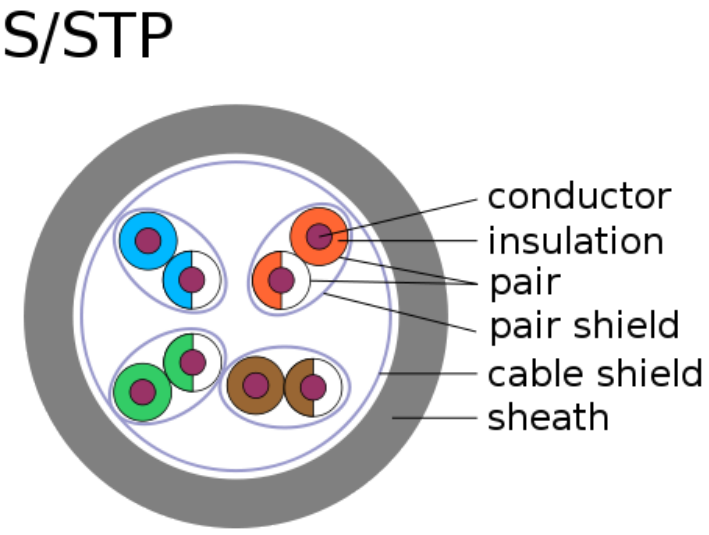

Fig.7.3.S/STP cable diagram.

7.3.3 Categories for Ethernet cables:

CATEGORY	SHIELDING	MAX TRANSMISSION SPEED (AT 100 METERS)	MAX BANDWIDTH
Cat 3	Unshielded	10 Mbps	16 MHz
Cat 5	Unshielded	10/100 Mbps	100 MHz
Cat 5e	Unshielded	1000 Mbps / 1 Gbps	100 MHz
Cat 6	Shielded or Unshielded	1000 Mbps / 1 Gbps	>250 MHz
Cat 6a	Shielded	10000 Mbps / 10 Gbps	500 MHz
Cat 7	Shielded	10000 Mbps / 10 Gbps	600 MHz
Cat 8	Shielded	25 Gbps or 40Gbps *	2000 MHz

Fig.7.4.Ethernet cable performance summary

A variety of different cables are available for Ethernet and other telecommunications and networking applications. These network cables that are described by their different categories, e.g. Cat 5 cables, Cat-6 cables, etc, which are often recognised by the TIA (telecommunications Industries Association) and they are summarised below:

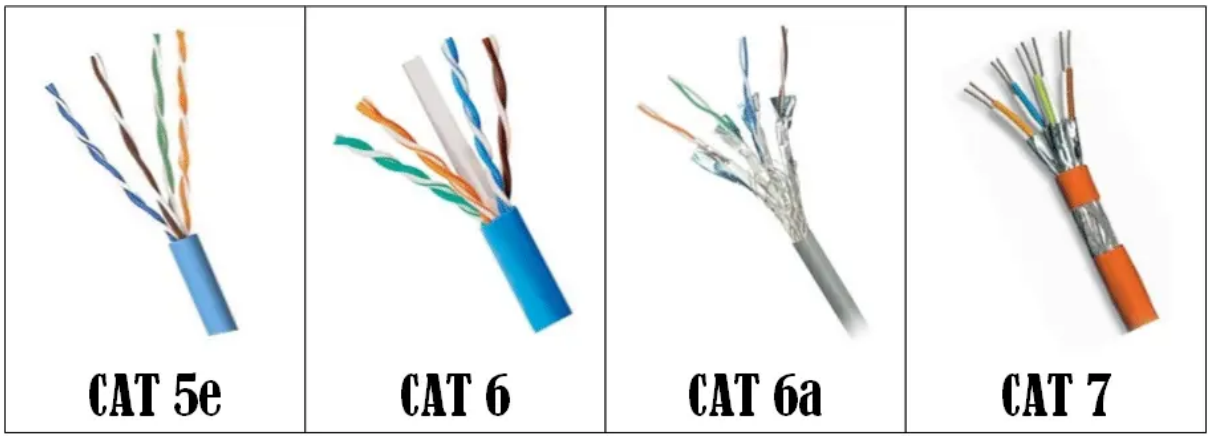

Fig.7.5.Some pictures of cables categories.

- Cat-1: This is not recognised by the TIA/EIA. It is the form of wiring that is used for standard telephone (POTS) wiring, or for ISDN.
- Cat-2: This is not recognised by theTIA/EIA. It was the form of wiring that was used for 4Mbit/s token ring networks.
- Cat-3: This cable is defined in TIA/EIA-568-B. It is used for data networks employing frequencies up to 16 MHz. It was popular for use with 10 Mbps Ethernet networks (100Base-T), but has now been superseded by Cat-5 cable.
- Cat-4: This cable is not recognised by the TIA/EIA. However it can be used for networks carrying frequencies up to 20 MHz. It was often used on 16Mbps token ring networks.
- Cat-5: This is not recognised by the TIA/EIA. This is the network cable that is widely used for 100Base-T and 1000Base-T networks as it provides performance to allow data at 100 Mbps and slightly more (125 MHz for

1000Base-T) Ethernet. The Cat 5 cable superseded the Cat 3 version and for a number of years it became the standard for Ethernet cabling. Cat 5 cable is now obsolete and therefore it is not recommended for new installations.

Cat 5 cable uses twisted pairs to prevent internal crosstalk, XT and also crosstalk to external wires, AXT.

Although not standardised, the Cat 5 cable normally uses 1.5 - 2 twists per centimetre.

- Cat-5e: This form of cable is recognised by the TIA/EIA and is defined in TIA/EIA-568, being last revised in 2001. It has a slightly higher frequency specification that Cat-5 cable as the performance extends up to 125 Mbps.

  Cat-5e can be used for 100Base-T and 1000Base-t (Gigabit Ethernet). Cat 5e standard for Cat 5 enhanced and it is a form of Cat 5 cable manufactured to higher specifications although physically the same as Cat 5. It is tested to a higher specification to ensure it can perform at the higher data speeds. The twisted pairs within the network cables tend to have the same level of twisting as the Cat 5 cables.

- Cat-6: This cable is defined in TIA/EIA-568-B provides a significant improvement in performance over Cat5 and Cat 5e. During manufacture Cat 6 cables are more tightly wound than either Cat 5 or Cat 5e and they often have an outer foil or braided shielding. The shielding protects the twisted pairs of wires inside the Ethernet cable, helping to prevent crosstalk and noise interference. Cat-6 cables can technically support speeds up to 10 Gbps, but can only do so for up to 55 metres - even so this makes them relatively long Ethernet cables.

  The Cat 6 Ethernet cables generally have 2+ twists per cm and some may include a nylon spline to reduce crosstalk, although this is not actually required by the standard.
- Cat-6a: The “a” in Cat 6a stands for “Augmented” and the standard was revised in 2008. The Cat 6a cables are able to support twice the maximum bandwidth, and are capable of maintaining higher transmission speeds over longer network cable lengths. Cat 6a cables utilise shielded which is sufficient to all but eliminate crosstalk. However this makes them less flexible than Cat 6 cable.
- Cat-7: This is an informal number for ISO/IEC 11801 Class F cabling. It comprises four individually shielded pairs inside an overall shield. It is aimed at applications where transmission of frequencies up to 600 Mbps is required.

- Cat-8: Cat 8 cables have now been released and provide a huge step up in data rate / bandwidth. Accordingly these Cat 8 cables are generally more expensive than the older versions like Cat 6, or even Cat 7.

7.3.4 EIA/TIA 568A & EIA/TIA 568B standards

TIA/EIA 568A and TIA/EIA 568B refer to the two major standards used in the networking and telecommunications industries. These standards determine the order of the wires placed in a RJ45 connector. With the only difference between the two standards is the placement of cable pairs on set pins, functionally both standards are the same. Knowing the different uses and pinout positions of each cable is essential to ensure a network's proper functionality.

7.3.4.1 Pinots positions:

Pinout positions refer to the arrangement of pins on an integrated circuit. The difference between the two standards is the location of the orange and green pins.

7.3.4.2 The Pinout Positions of TIA/EIA 568A:

- Pin 1: white and green stripe
- Pin 2: green
- Pin 3: white and orange stripe
- Pin 4: blue
- Pin 5: white and blue stripe
- Pin 6: orange
- Pin 7: white and brown stripe
- Pin 8: brown

7.3.4.3 The Pinout Location of TIA/EIA 568B:

- Pin 1: white and orange stripe
- Pin 2: orange
- Pin 3: white and green stripe
- Pin 4: blue
- Pin 5: white and blue stripe
- Pin 6: green
- Pin 7: white and brown stripe
- Pin 8: brown

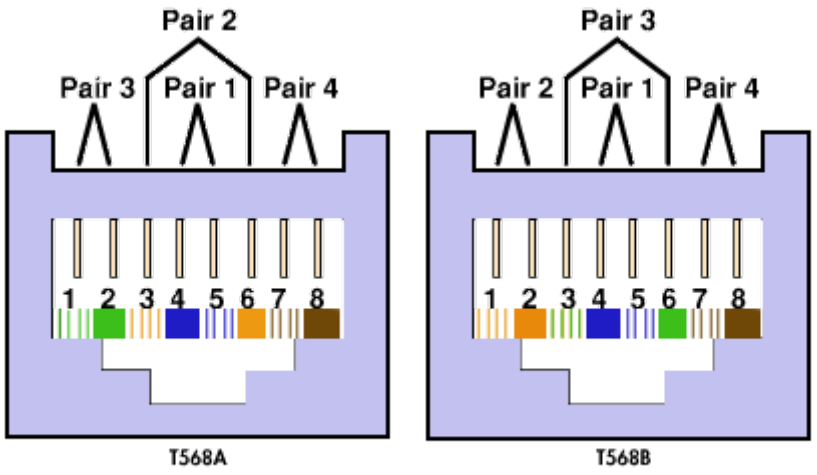

Fig.7.6.T56A and T568B comparison 1.

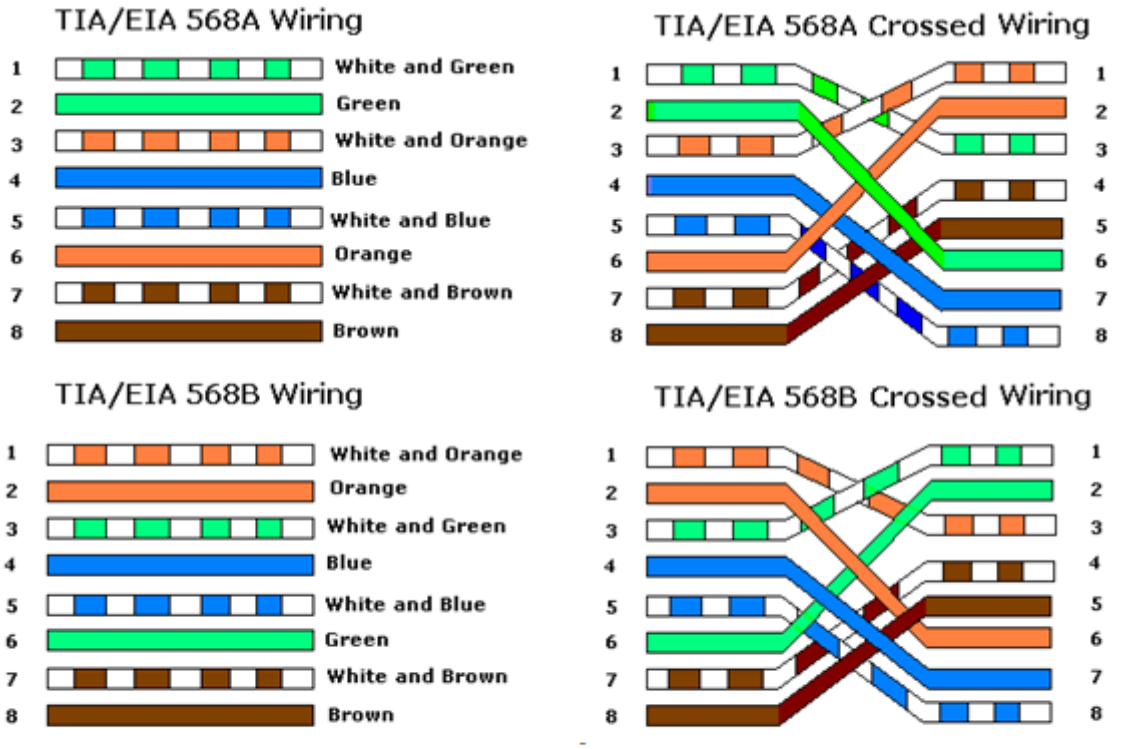

Figure A

Shows the Pin Out of Straight through Cables

Figure B

Shows the Pin Out of Crossover Cables

Fig.7.6.T56A and T568B comparison 2.

7.3.5 How to wire an RJ45 jack videos:

the next video explained basics of cabling and types of cables:
https://www.youtube.com/watch?v=_NX99ad2FUA

this video explained detailed and step by step how to truly wire RJ45 jacks:
https://www.youtube.com/watch?v=lBgETHJakas

7.3 Conclusion:

cables are essentials for conect networks, of any kind. this type of cabling like the structured one is used in LANs due to the distance that the cables can perform for communications.