EXP .2 Part -1-

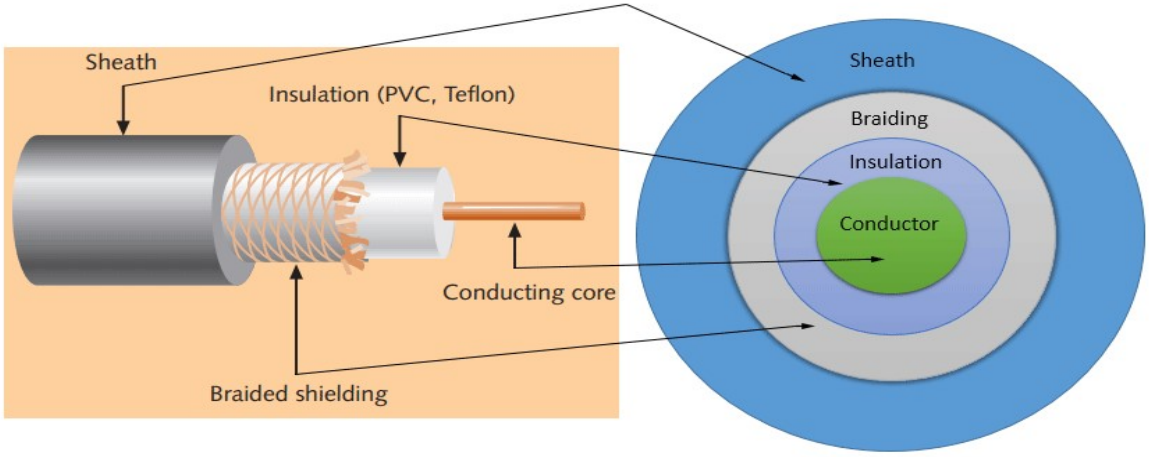
Network Cable Types and Specifications

This experiment explains the types of network cables used in computer networks in detail. Learn the specifications, standards, and features of the coaxial cable, twisted-pair cable, and the fiber-optical cable.

To connect two or more computers or networking devices in a network, network cables are used. There are three types of network cables; coaxial, twisted-pair, and fiber-optic.

Coaxial cable

This cable contains a conductor, insulator, braiding, and sheath. The sheath covers the braiding, braiding covers the insulation, and the insulation covers the conductor.



Components of Coaxial cable

Sheath

This is the outer layer of the coaxial cable. It protects the cable from physical damage.

Braided-shield

This shield protects signals from external interference and noise. This shield is built from the same metal that is used to build the core.

Insulation

Insulation protects the core. It also keeps the core separate from the braided-shield. Since both the core and the braided-shield use the same metal, without this layer, they will touch each other and create a short- circuit in the wire.

Conductor

The conductor carries electromagnetic signals. Based on conductor a coaxial cable can be categorized into two types; ***single-core coaxial cable and multi-core coaxial cable.***

A single-core coaxial cable uses a single central metal (usually copper) conductor, while ***a multi-core coaxial cable*** uses multiple thin strands of metal wires. The following image shows both types of cable.

Single core coaxial cable

Multi-core coaxial cable

Coaxial cables in computer networks

The coaxial cables were not primarily developed for the computer network. These cables were developed for general purposes. They were in use even before computer networks came into existence. They are still used even their use in computer networks has been completely discontinued.
At the beginning of computer networking, when there were no dedicated media cables available for computer networks, network administrators began using coaxial cables to build computer networks. Because of low-cost and long durability, coaxial cables were used in computer networking for nearly two decades (80s and 90s). Coaxial cables are no longer used to build any type of computer network.

Specifications of coaxial cables

Coaxial cables have been in use for the last four decades. During these years, based on several factors such as the thickness of the sheath, the metal of the conductor, and the material used in insulation, hundreds of specifications have been created to specify the characteristics of coaxial cables.

From these specifications, only a few were used in computer networks. The following table lists them.

Type	Ohms	AWG	Conductor	Description
RG-6	75	18	Solid copper	Used in cable network to provide cable Internet service and cable TV over long distances.
RG-8	50	10	Solid copper	Used in the earliest computer networks. This cable was used as the backbone-cable in the bus topology. In Ethernet standards, this cable is documented as the 10base5 Thicknet cable.
RG-58	50	24	Several thin strands of copper	This cable is thinner, easier to handle and install than the RG-8 cable. This cable was used to connect a system with the backbone-cable. In Ethernet standards, this cable is documented as the 10base2 Thinnet cable.
RG-59	75	20 -22	Solid copper	Used in cable networks to provide short-distance service.

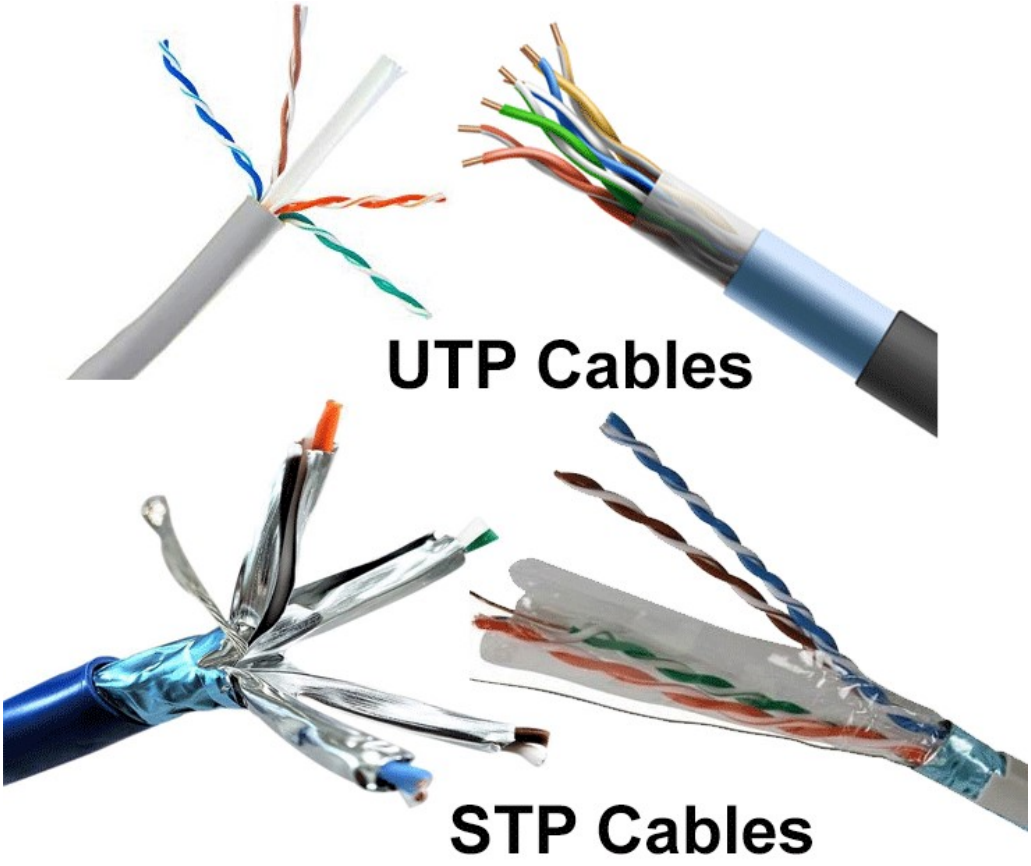
Coaxial cable uses RG rating to measure the materials used in shielding and conducting cores.
RG stands for the Radio Guide. Coaxial cable mainly uses radio frequencies in transmission. Impedance is the resistance that controls the signals. It is expressed in the **ohms**.
AWG stands for American Wire Gauge. It is used to measure the size of the core. The larger the AWG size, the smaller the diameter of the core wire.

Twisted-pair cables

Usually, there are four pairs. Each pair has one solid color and one stripped color wire. Solid colors are blue, brown, green and orange. In stripped color, the solid color is mixed with the white color.
Based on how pairs are stripped in the plastic sheath, there are two types of twisted-pair cable; UTP and STP. In the UTP (Unshielded twisted-pair) cable, all pairs are wrapped in a single plastic sheath.
In the STP (Shielded twisted-pair) cable, each pair is wrapped with an additional metal shield, then all pairs are wrapped in a single outer plastic sheath.

Similarities and differences between STP and UTP cables

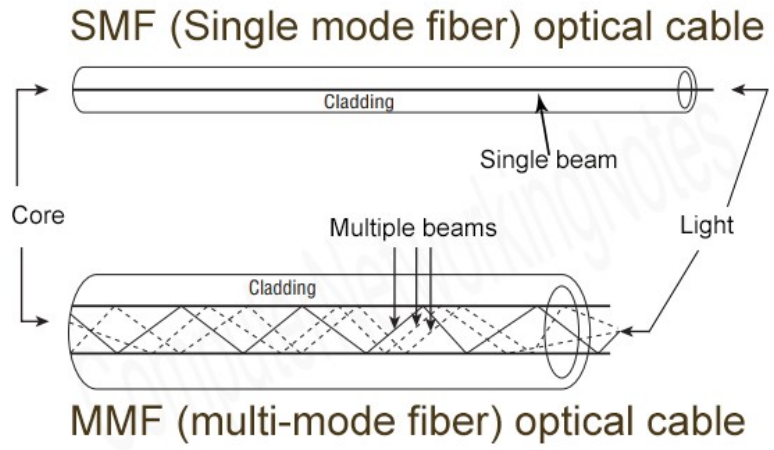
STP	UTP
can transmit data at 10Mbps, 100Mbps, 1Gbps, and 10Gbps.	can transmit data at 10Mbps, 100Mbps, 1Gbps, and 10Gbps.
the STP cable contains more materials,	the UTP cable contains less materials,
it is more expensive than the UTP cable	it is less expensive than the STP cable
Both cables use the same RJ-45 (registered jack) modular connectors.	Both cables use the same RJ-45 (registered jack) modular connectors
The STP provides more noise and EMI resistant than the UTP cable.	The UTP provides less noise and EMI resistant than the STP cable.
The maximum segment length for both cables is 100 meters or 328 feet.	The maximum segment length for both cables is 100 meters or 328 feet.
Both cables can accommodate a maximum of 1024 nodes in each segment.	Both cables can accommodate a maximum of 1024 nodes in each segment.



Fiber optic cable

This cable consists of core, cladding, buffer, and jacket. The core is made from the thin strands of glass or plastic that can carry data over the long distance. The core is wrapped in the cladding; the cladding is wrapped in the buffer, and the buffer is wrapped in the jacket.

Core carries the data signals in the form of the light. Cladding reflects light back to the core.
Buffer protects the light from leaking. The jacket protects the cable from physical damage.
Fiber optic cable is completely immune to EMI and RFI. This cable can transmit data over a long distance at the highest speed. It can transmit data up to 40 kilometers at the speed of 100Gbps.
Fiber optic uses light to send data. It reflects light from one endpoint to another. Based on how many beams of light are transmitted at a given time, there are two types of fiber optical cable; SMF and MMF.



SMF (Single-mode fiber) optical cable

This cable carries only a single beam of light. This is more reliable and supports much higher bandwidth and longer distances than the MMF cable. This cable uses a laser as the light source and transmits 1300 or 1550 nano-meter wavelengths of light.

MMF (multi-mode fiber) optical cable

This cable carries multiple beams of light. Because of multiple beams, this cable carries much more data than the SMF cable. This cable is used in shorter distances. This cable uses an LED as the light source and transmits 850 or 1300 nano-meter wavelengths of light.

That's all for this tutorial. In the next part of this article, we will understand the types of connectors that are used to connect cables with networking devices. If you like this tutorial, please don't forget to share it with friends through your favorite social channel.