

Wired communication media

[Sociology](#), [Communication](#)



Abstract Tons of data is transmitted on day to day basis from one point to another. Data comes in all various forms, physical and virtual. All different application comes with different requirements for data transfer. There is lots of data sitting at one place that needs to be transmitted for various different purposes. So, there is a definite need of transmitting data. Author in this paper is attempting to address all the possible available wires and cables in the wired communication media for transmission.

Author will also be analyzing their history, invention, types, categories, applications, advantages and disadvantages of the transmitting channel available. Keywords: Data, Signals, Wires, Cables, ? Introduction Communication has been around since the beginning of the mankind in one form or another. Its existence has been recognized even before formal language came into being. People have been communicating through various different vocal indications, signals and gestures. Almost all organization in the world relies on data and signals in some form or the other to run their regular operations and accomplish their goals.

Data comes in all forms physical and virtual. Businesses need data, its transmission and storage for smooth functioning. The main concern is transmission of virtual data from one machine to another. This can be for various discrete reasons such as read-only, modifications and updating. Thus, a reliable means of communication is needed for transfer of data (William & Sawyer, 2007). There are plenty different kinds of communication media (channels) currently used to satisfy the growing needs of people. Communication media is largely divided into two groups wired media (conducting media) and wireless media.

Wired media provides a path for the signal through wires (optical fiber is also included). It was the wired communication media which pioneered in transforming the way the people talked to one another over greater distances or through previously impenetrable barriers. In wireless media, the communication medium is either air or the atmosphere or space through which the signal travels. Although the current trends are increasingly moving towards use of wireless communication systems but wired systems are still as relevant as they possibly have been because wires still an important element in achieving high speeds for both data and signal can either analog or digital. (Ray & Acharya, 2004). Need for Data Transfer In today's data driven world, there is no cap on form or type of information that needs to be shared between employees, business partners and clients. Organizations just cannot trust anyone to handle their most sensitive data. Thus, a secured passage for data transmission from one device to another is certainly critical.

Data usually is collection of lots of forms of information which needs to be stored and maintained for several as per needed purposes. It is normally stored on disks and tapes but when it needs to be transmitted it needs to be converted into signals for transfer. In order for the travelling signals to transmit, there are different types of media available to facilitate communication. A type of them, wired media are briefly explained in the following section of this paper (Kittler, 1996). Wired Communication Media – Wires and Cables

Wired communication media typically refers to data transmission over a wire based communication technology. Wired communication generally refers to physical cabling within a network where the signals are transmitted onto the

physical medium i. e. wires. These wires are no longer made up of metal, but glass. These are also called as conducting transmission technologies such as telephone network, internet access, cable television and fiber optic communication. Electromagnetism which is wave guide used for high power applications is also considered as wired line.

Alternatively, transmissions of data which don't rely on wires (cables) are considered as wireless communication technologies (William & Sawyer, 2007). There are several different conducting transmission technologies presently available for data transmission. Network requirement for each application can be different, so choosing the right type of transmitting media is very crucial. The different conducting media are discussed as below:

Twisted pair wire It was invented by Alexander Graham Bell in 1888. A twisted pair wire is made up of a pair of conducting copper wires twisted with each other over insulation. The number of twisted pair wires within the outer insulation varies. The reason it's called twisted wire because the two wires are insulated to prevent wire crossing are primarily twisted together. The twist and the outer insulation help to reduce lines from not only crossing and interfering with each other but also regulate the self and mutual induction. When two wires are running parallel to each other carrying a signal, the possibility of induction between them increases. When you hear else's conversation while being on phone with your friend is a perfect example of it.

This is called as crosstalk due to inductions. Such crosstalk is very low in lines passing perpendicular to each other. Thus, lines are twisted to avoid running parallel to each other as perpendicular is quite impossible. There are 7 different types of twisted pair wires available which are further divided into

7 categorized which are described as follows:

- CAT – 1: Basically used to transmit analog voices. Provides speeds up to 1 Mbps. There used over the years has decreased drastically.
- CAT – 2: It is almost identical to CAT- 1, but has slightly better performance in terms of attenuation.

This kind can transmit data up to 4 Mbps.

- CAT – 3: It provides speed up to 10 Mbps but the signal attenuates after distance of 100 meters. To mitigate this problem, a repeater can be used to transmit data over 100 meters with low attenuation.
- CAT- 4: It provides speed up to 20 Mbps but they can transmit data only within 100 meters without much attenuation.
- CAT- 5: With greater number of twisted pairs, they can transmit data at 100 Mbps providing much better quality of wires as compared to previous versions.
- CAT- 5e: They can transmit data at 125 Mbps but can support up to 1000 Mbps on certain cases.
- CAT- 6: Their cost is almost same as prior categories but can provide speeds up to 200 Mbps.
- CAT- 7: These category wires are heavily shielded but are rarely used because of their exceptional high costs. They can support higher speeds of 600 Mbps. Twisted pair wires can also further be classified into shielded twisted pair and the unshielded twisted pair. Shielded twisted pair carries an extra shield of insulation on top to avoid any external induction. All of the categories except CAT- 7 are available in both types.

The reason CAT- 7 only comes in shielded form only due to its exceptionally high number of twists. It is been estimated that only a whole twisted pair wires can better serve a local area network of 100 meter range, being cost effective. Applications can be:

- Computer networking
- Ethernet cabling
- Video applications such as security cameras
- Telephone lines

Coaxial

Cable Coaxial cable was initially founded in 1929 but first used by AT&T in 1940. It consists of single copper wire which is surrounded by at least three layer containing an insulating material, braided wired and plastic coating.

It conducts electrical signals via an inner conductor also called as main conductor usually made up of copper or stranded copper wire. This main conductor is a straight wire surrounded by dielectric which actually separates inner main conductor and outer metallic shield. The outer metallic shield is typically made up of from 1 to 4 layers of metallic braid and metallic plate reducing the attenuation by obstructing the outer inducing fields from reaching the inner main conductor. This functionality of coaxial wires allows transmitting analog signals over a broad range of frequencies.

The final third layer protecting main conductor is jacket made usually up of thick plastic material. (Nahin, 2002) Please refer to figure 2 in appendix showing a coaxial cable construction with main conductor, dielectric, shield and jacket for better understanding. Coaxial cables are classified into two major categories depending upon the type of data they can transmit. These are:

- Baseband coaxial cable: Thin baseband coaxial cables are usually used in local area network connecting computers and mainframe computers. They carry one way digital data at speeds up to 10 Mbps.
- Broadband coaxial cable:

Thick broadband coaxial cables are used to transmit analog signals mainly television signals are used to transmit analog signals. A certain disadvantage is even a small continuous current along the imperfect placed shield on any coaxial cable will cause visible or audible interferences. But, there is a major disadvantage using the above discussed two types of coaxial cables that is

data theft. Data travelling through these types of wires can easily be trapped. However, fiber optic cables can be used to eliminate this problem. Fiber Optic Cable Fiber optic has made tremendous technological advances to transmit information in the last decade.

Telecommunication has been completely revolutionized by this innovated material. The telecommunications currently use electricity, radio or light to send data, images and sound. Fiber optic cable is made up of nothing but a thin glass tube which covered with a plastic shield. It transmits data in form of light pulses instead of sound waves without any interruptions. Since the information is transported in form of light and not electricity, this completely disregards the possibility of degradation of signal and interference due to electrical noise.

The photodiode on one cable end produces photons which travel at high speeds up to 100 Gps through the glass tube before it is collected by the photo receptor on the other receiving end of the cable. The fiber optic cable is made up of one or many thin fibers of glass or plastic of 50 to 125 micrometers in diameter which is approximately equivalent to thickness of a hair. It has a cylindrical region called nucleus which allows light propagation and the external zone of coaxial nucleus is called as coating, a plastic like cover. Please refer to figure 3 in the appendix for better understanding.

The main advantage of using fiber optic cable is it does not facilitate data tapping and is capable of producing high speeds, over long distances with very low attenuation as compared to other wired cables. For example, it is capable of transmitting an encyclopedia set equivalent to 40 million words in one second. However, there is some attenuation caused due to reflections

and refractions of the photons over the glass tube. Fiber optic cables tend to be expensive but with the availability of cheap LED's and photo diodes, make it much economical. There are basically two types of fiber optic cables: Single mode fiber – It facilitates data transmission with great speed over long distances. •Multi-mode fiber – They are further classified into two types: oMultimode step-index fiber: It is used to transmit data over short distances and in the conventional transference of images. oMultimode graded-index fiber: It is optimal medium to transmit data over intermediate distances. It has a refractive index of nucleus which gradually moves towards outside from center. Photonic Crystal Fiber Photonic crystal fibers were founded by the research group of Philip St. J.

Russell in the 1990s. They are generally constructed with the same methods as optical fibers. It is a honeycomb structured wires where the glass tube containing holes carry light signals 10 times longer as compared to fiber optic cable (Dr. Paschotta, 2012). Please refer to figure 4a and 4b in appendix for better understanding. Photonic crystal fibers are mainly divided into two major categories: •Index Guiding fibers which has a solid core. •Photonic Bandgap or air guiding fibers which have periodic micro-structured elements and a core of low index material (e. g. hollow core). Applications for photonic crystal fibers include: •Fiber lasers and amplifiers which include high power devices. •Fiber optic sensors of several different kinds. •Telecom components such as dispersion control, filtering and switching. •Quantum optics. •Also for various other purposes such as spectroscopy, metrology, biomedicine, imaging, industrial machining, and military. Conclusion So far in this paper, author showed us the working, application and pros and cons of

various wired transmission media. Nobody can decide the right medium on behalf of anybody.

It really comes down to speed cost, availability, current system requirement, its integration and future upgrade for growing needs for any particular user. All these requirements are analyzed before any wiring installation is done. Hence, selection of wires according to their functionality plays a very important role in constructing a reliable network. Remember: Communication technology is always developing and you will always find new stuff for various purposes, so plan and select accordingly. ? References

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