**Intro**

Well, I will start with the presentation. My name is santiago vietto a student of Systems Engineering, and the topic I chose is transmission media in communication structures. I selected this topic because I like all things related to telecommunications, and I hope to work in that field in the future. And in case you're wondering, I studied this topic in the course "telecommunications Networks 1" in the fourth year of the career.

It’s important to know that in a data transmission system, the transmission medium is the physical path between transmitter and receiver. As you can see we have two big groups of transmission media, in one side we have guided media and in the other side we have unguided media. In both cases, communication takes place using electromagnetic waves. The Electromagnetic waves are a physical concept that underlies all communications. We are not going to talk about it because it's very technical, but it’s the way data travels.

For guided media, electromagnetic waves are guided along a solid medium, and for unguided media, wireless transmission occurs through the atmosphere, outer space, or water. The characteristics and quality of a data transmission are determined both by the characteristics of the medium and the characteristics of the signal. In the case of guided media, the medium itself is more important in determining the limitations of transmission. For unguided media, the bandwidth of the signal produced by the transmitting antenna is more important than the medium itself.

**Guided Media**

Let’s talk about guided media. In this case we have the three most well-known media, which are twisted pair cable, coaxial cable, and optical fiber.

Twisted Pair Cable

UTP: this is the most commonly used medium, it is the cheapest of all, simple to handle, and easy to install. It’s made of copper.

* It is used in LAN networks, primarily in the Wi-Fi connection of a home or office, and we can see it in Ethernet cables that connect to routers. However, it’s primary use is in telephone systems.
* It is susceptible to interference and has limited bandwidth, meaning it cannot transmit large amounts of data at high speeds.

STP: it has the same quality considerations as UTP, but it has a metal casing that surrounds the cables, which helps with interference.

Coaxial Cable

\_ Coaxial cable is highly versatile, making it suitable for a variety of applications. For example, it is used to connect the television antenna to the modem, is used in long-distance telephony and Wi-Fi router connections.

* It is more expensive than twisted pair.
* As we can see, it has multiple layers that protect the initial conductor from interference.
* The bandwidth of this cable is greater than the bandwidth of twisted pair, allowing for the transmission of more data.
* It can be faster or slower than fiber optic cable.
* However, it’s not used as much anymore.

Optical Fiber

\_ This is one of the most significant technological advancements in data transmission. It’s the preferred medium for long-distance telecommunications. It has a cylindrical shape and is composed of three principal sections: the core, the cladding, and the jacket.

* it’s flexible.
* it’s immune to interference because the transmission is through a beam of light instead of electricity.
* A signal can be transmitted over kilometers without the need for repeaters.
* it’s highly secure due to it’s structure.
* It has a higher bandwidth, because data rates are not limited by the medium.

\_ but:

* It is more expensive than the other two.
* It requires complex installation and maintenance.
* It is fragile, because the glass fiber is more prone to breakage than the cable.

\_ The width of the fiber is very thin.

**Unguided Media**

Now, let’s talk about unguided media. In this case we have terrestrial microwave, satellite transmission and broadcast radio. Basically, this is wireless communication.

Terrestrial microwave

\_ Here we have communication between two antennas that capture electromagnetic energy. Both antennas are fixed to achieve line-of-sight transmission, which means a clean path without obstructions between the transmitting and receiving antennas. The antennas are placed at considerable heights to extend the range between them and allow transmission through intermediate obstacles. The communication is directional, and the signal quality depends on the weather.

\_ Some applications include:

* Telecommunication services
* Voice and television transmission
* Communication between buildings
* Television broadcasting
* Mobile systems.

Satellite Microwave

\_ In satellite communication, we have a ground station that transmits information from Earth, a satellite receives that signal and then retransmits it to the same or another ground station. There are three types of satellites:

* Geostationary (GEO) satellites: these satellites remain in a fixed position, and as the Earth rotates, they stay in the same position 24 hours a day, 365 days a year, which is why they are considered superior compared to the others.
* Medium Earth Orbit (MEO) and Low Earth Orbit (LEO) satellites: These appear to us as moving stars as they orbit around the Earth.

\_ Some applications include:

* Television broadcasting.
* Long-distance telephone transmission.
* Private network connections.

\_ Some disadvantages include interference caused by natural factors such as galactic noise, solar noise, or atmospheric noise.

Broadcast Radio

\_ Lastly, we have broadcast radio, where the main difference between broadcasting and terrestrial microwave is that broadcasting is omnidirectional, meaning the signal propagates in all directions but within a smaller radius. That's why dish-shaped antennas are not required, and they don't need to be aligned. A clear example is FM radio.