Types by Physical Medium: Guided Physical Media

Now that we've discussed the infrastructure of the edge of the Internet let's discuss some actual hardware components.

We'll cover the following

Communication Media

Data needs to be transmitted from one end system to another over a medium. There are two kinds of media: **guided** and **unguided**. Each has its own advantages and disadvantages. Let’s discuss the common *guided* ones in more detail now.

Guided Media

A medium in which the signal is transported on a **confined pathway** is called *guided*. Some commonly used examples are given below.

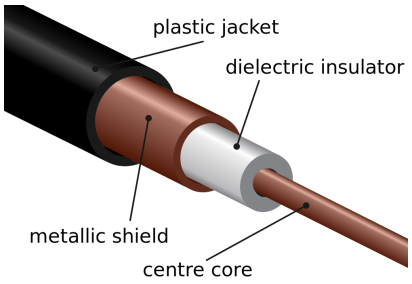
Twisted pair copper wire taken from https://commons.wikimedia.org/wiki/File:TwistedPair_S-FTP.jpg under GNU free documentation license

Twisted Pair Copper Wire

This kind of wire is used in DSL and Dial-Up. It consists of pairs of copper wires that are twisted together to reduce electrical interference. Each wire is about a milimeter thick and is one communication link. Generally, several pairs are bundled together in a protective plastic or rubber wrapping.

Coaxial Cable

Cable Internet runs on coaxial cables. A coaxial cable consists of one copper wire surrounded by an insulating material, followed by a mesh-like cylindrical metallic shield, followed by another insulating cover.



Coaxial Cable taken from https://en.wikipedia.org/wiki/File:Coaxial_cable_cutaway.svg under CC-BY-3.0

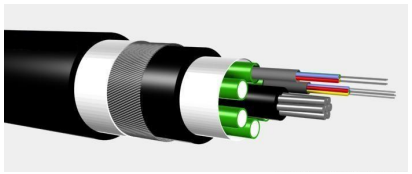
Fiber Optics

Fiber optic cables carry light instead of electrical signals.

Metallic media suffer from electrical noise and interference from nearby electrical sources such as mains wiring. Since optical fiber carries signals in the form of light, it is **not susceptible to the abundant electrical noise and interference**.

Interference from other light sources is easily mitigated by opaque covering around the optic fiber. Hence, these cables can have incredibly fast transmission rates and can be stretched out over long distances, unlike the rest.

Optical fibers are frequently used in public and enterprise networks when the distance between the communication devices is larger than one kilometer.



fiber optic cable taken from https://commons.wikimedia.org/wiki/File:Optical_fiber_cable.jp under CC-BY-SA 3.0

There are two main types of optical fibers: **multimode and single mode**.

Multimode

- Multimode uses LED send signals.
- Therefore it’s, significantly cheaper than counterpart.
- It can work over several tens of kilometers.
- Multiple light signals travel through the same

optic fiber while reflecting off the edges of the

fiber at different angles.

Monomode

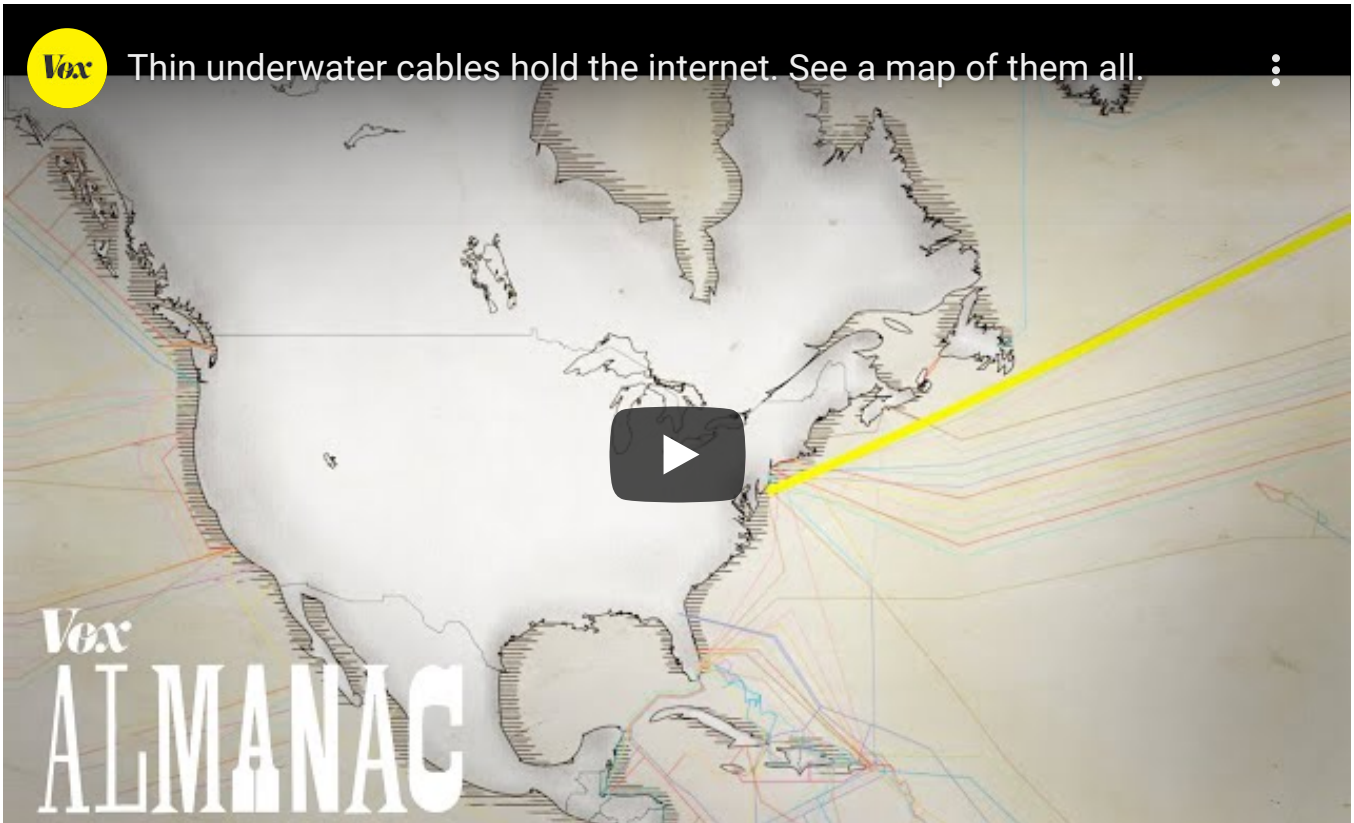
- Monomode uses **laser** for transmission.
- It's more expensive than multimode.
- Monomode fibers can only work over a few kilometers.

However, fiber optic has not dominated over the rest, because of the high cost of optical devices. However, **fiber to the home** is becoming increasingly common.

Also, check out the Optical Carrier transmission rates. They specify the transmission rates of fiber optic cable. At the time of writing, they range from to 51.84 Mbit/sec to 200 Gbit/sec!

The Internet Is Under the Sea, Not in the Clouds!

Most cross country connections, in fact, are made over fiber optic cable under the sea. If you're more interested in how underwater cables work, here is an interesting YouTube video by Vox called "*Thin underwater cables hold the Internet. See a map of them all.*"



Quick Quiz!

1 Why is fiber optic cable not as popular for commercial use as one would expect considering the advantages of high speed minimal loss transmission?

- A) Fiber optic cable is expensive
- B) Laying it down under the sea uses significant resources
- C) Optical devices are very expensive
- D) Coaxial cable and twisted pair copper wire work just as well for a fraction of the cost

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In the next lesson, we'll look at **unguided physical media**!