CS 484/504
Computer Networks 1
Fiber Optics

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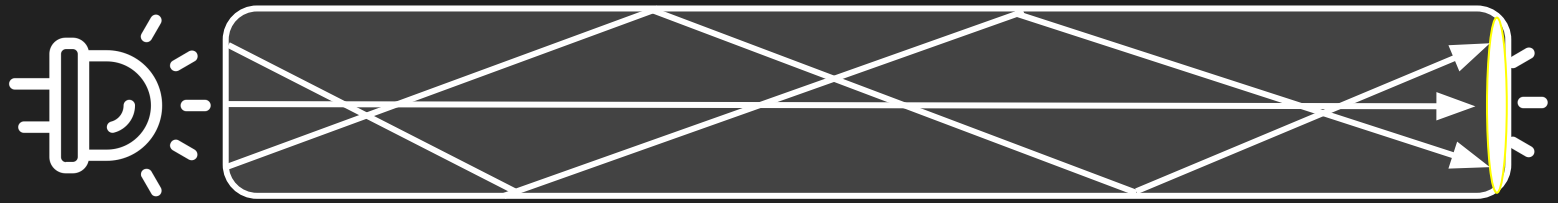
Physical Layer: Fiber Optics

Total Internal Reflection
No interference
Tapping is difficult



Fiber Optics Demo

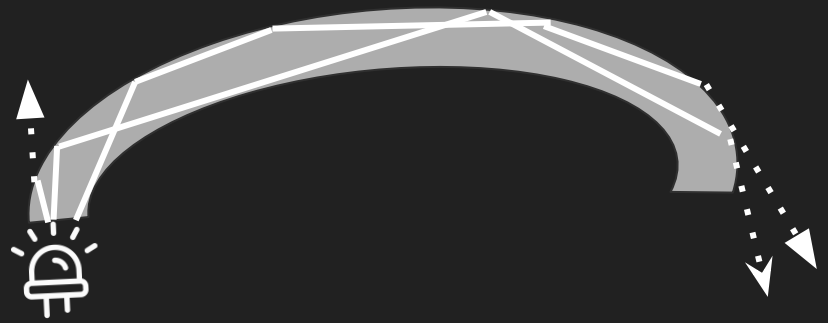
Fiber Optics Like to Run Straight

Refractive Index: How much light bends at the boundary of a medium.

Ex. a straw in water appears to bend at the surface line

Maintaining total internal reflection requires a large index of refraction.

A bent cable requires more refraction to keep total internal reflection



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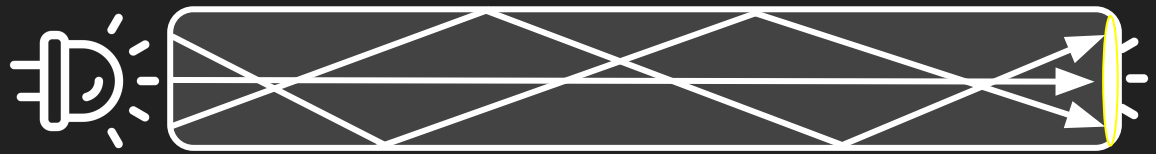

Internet Backbones

100-400 Gbps links connecting major parts of the Internet.

Privately owned in the US (Verizon, Level3, Comcast, etc.)

Have to acquire and maintain fiber cables over huge distances

Difficult for new companies to compete because of huge costs in land, leases, lobbying to cross public land, etc.

They make money by metering traffic from Internet Service Providers (ISPs) Or they sell Internet access as ISPs, themselves

Visibility into tons of data

Handy collection point for government monitoring

Undersea Fiber Optic Cables

https://www.submarinecablemap.com/

Which countries are strongly connected?

Which places would lose Internet access if their only fiber line were damaged?

Should import/export rules apply to data like it would to air or sea cargo?

Wrapping up the physical layer

https://www.youtube.com/watch?v=TNQsmPf24go

What does thousands of miles of undersea cable look like?

Is Internet access a human right?

Even Project Loon went out of business. How can we bring physical layer connections to places that are unprofitable?

Image Credits

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