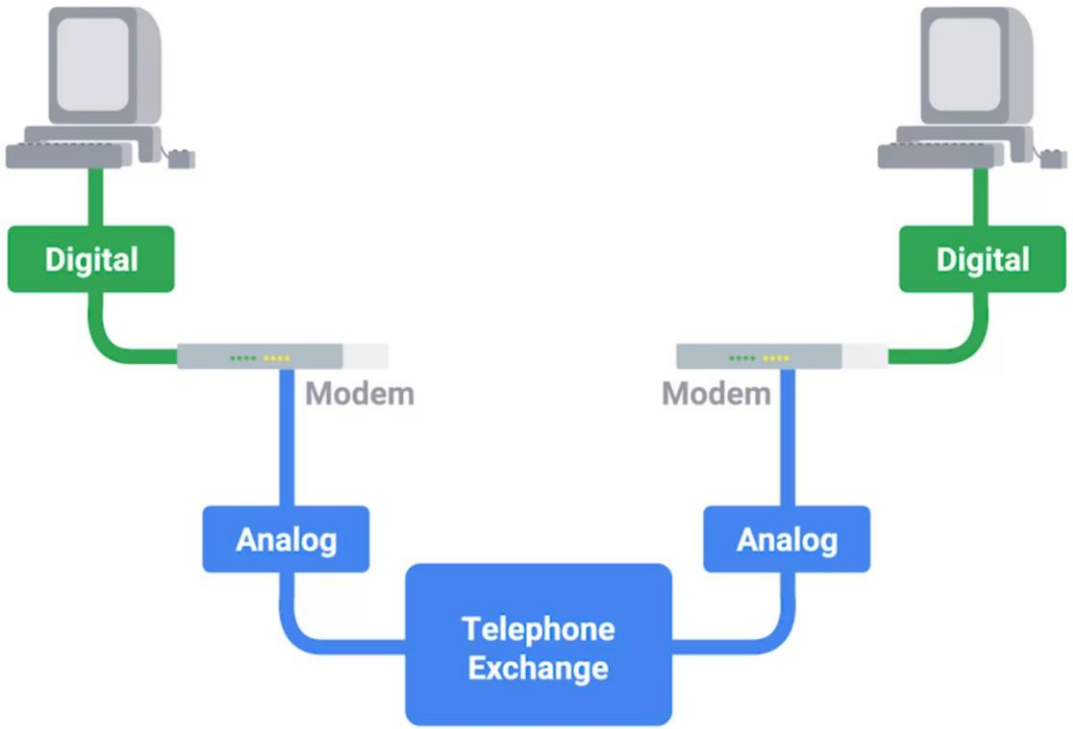
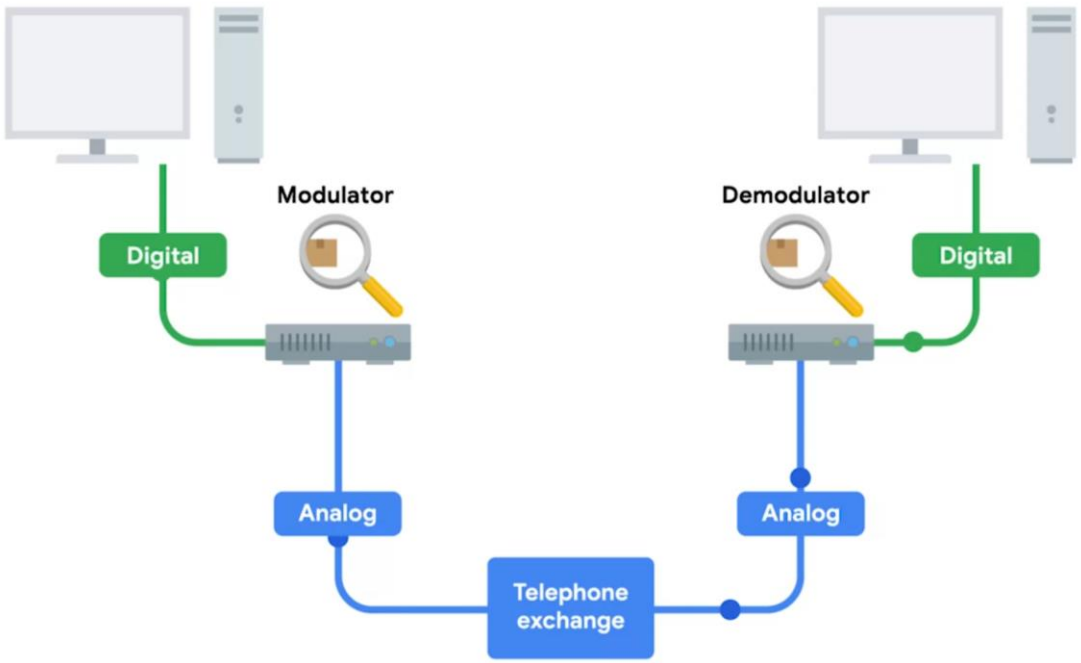
Dial-up, Modems and Point-to-Point Protocols



A dial-up connection uses POTS for data transfer, and gets its name because the connection is established by actually dialing a phone number.

Public Switched telephone network (PSTN) | Plain Old Telephone Service (POTS)



Baud rate

A measurement of how many bits can be passed across a phone line in a second

What is broadband?

Broadband

Any connectivity technology that isn't dial-up internet

If we use POTS to download a single image:

One smartphone photo = 2 Megabytes
2 Megabytes = 16,777,216 bits
16,777,216 bits at 14.4 kilobits/sec = 1165 seconds
1165 seconds = 19.4 minutes

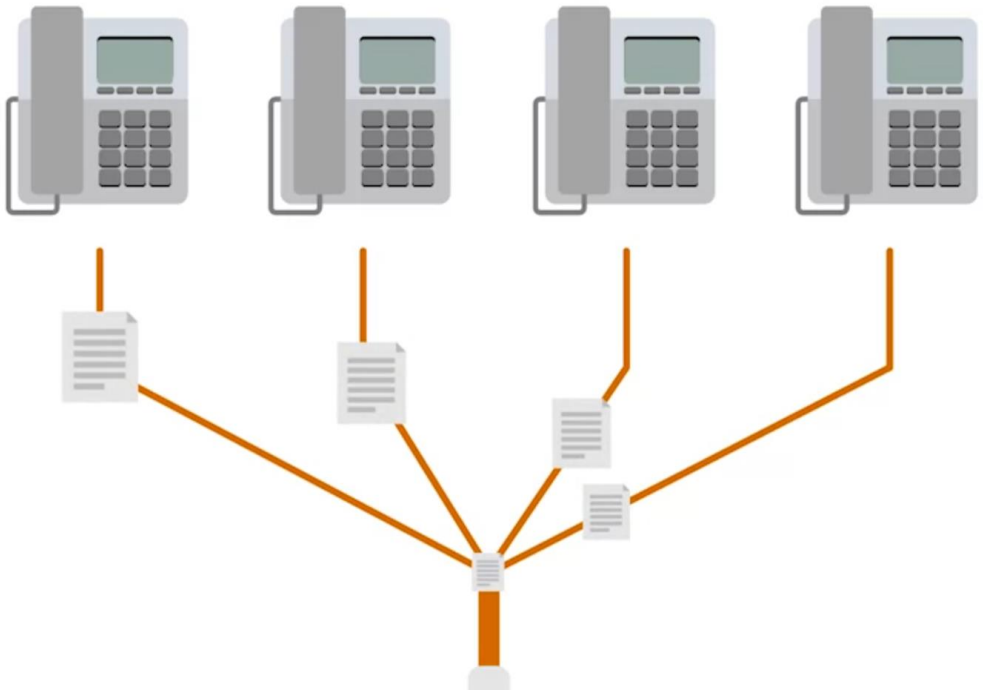
One of the most common broadband technology (business)

T-carrier technologies

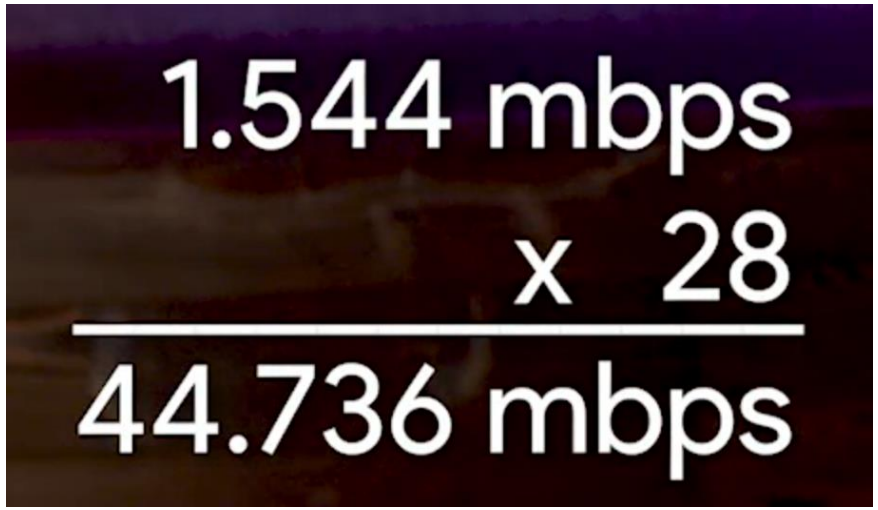
Originally invented by AT&T in order to transmit multiple phone calls over a single link

T-Carrier Technologies (dial-up connections)

T1 line(Transmission System 1) is a twisted copper cable, each one could transfer data individually

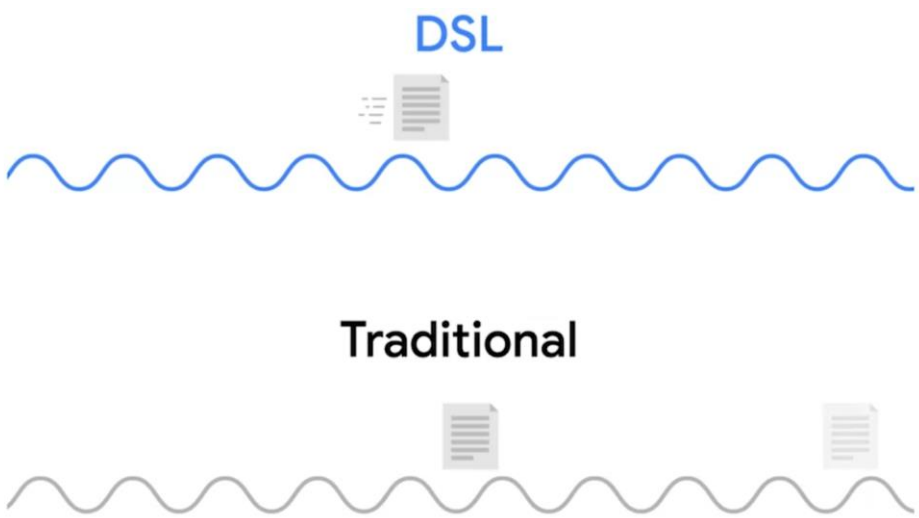


Speed of T3 cable (made by 28 T1 lines)

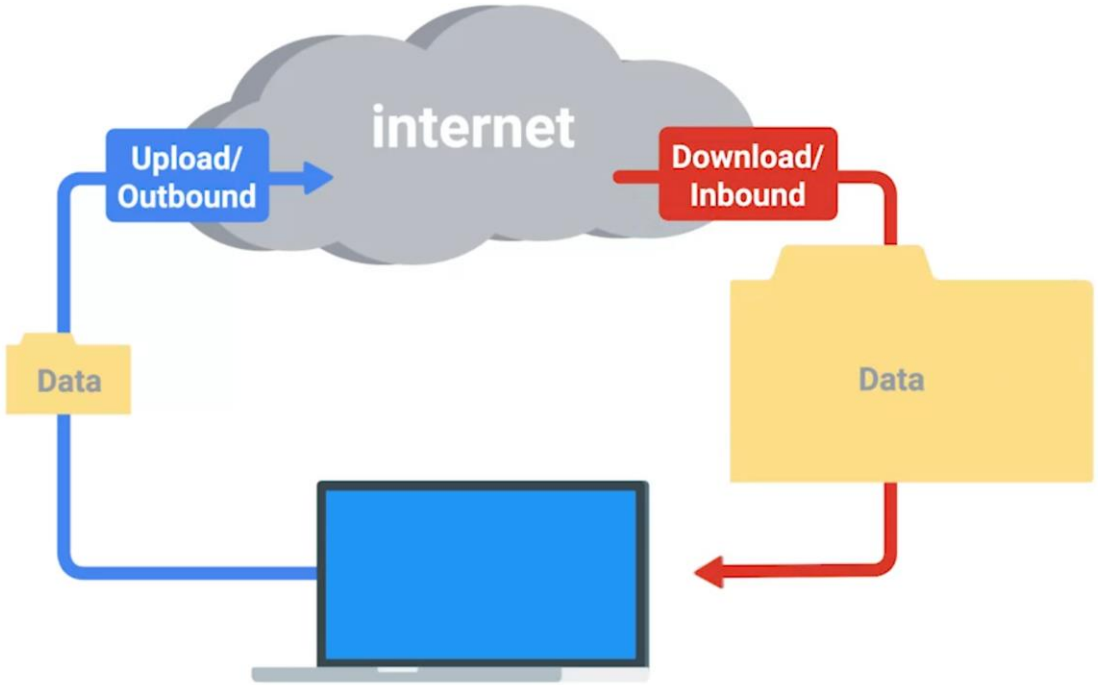


Digital Subscriber Lines

Use the copper cable (just like T-carrier) but **different frequency** to speed up the transfer rate. **It allow phone call and data transfer to occur at the same time**

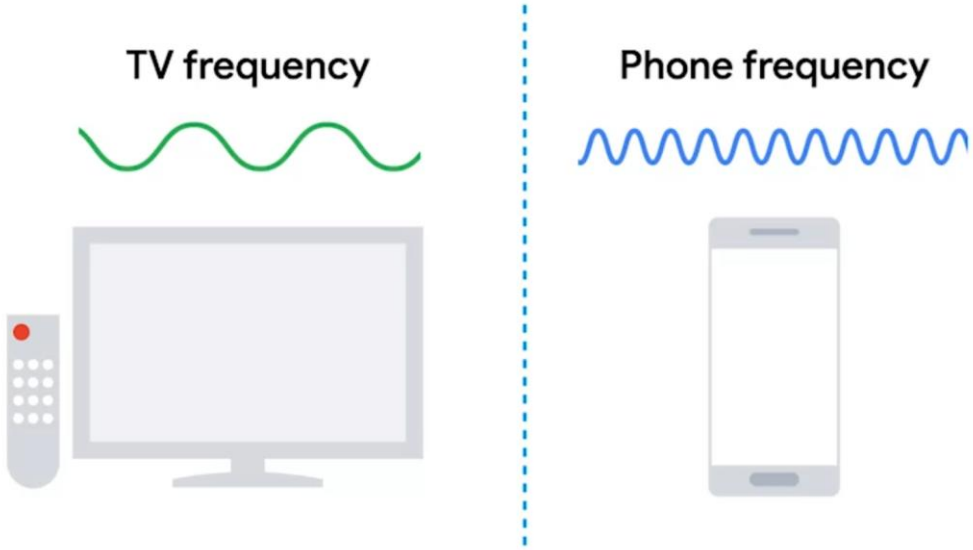


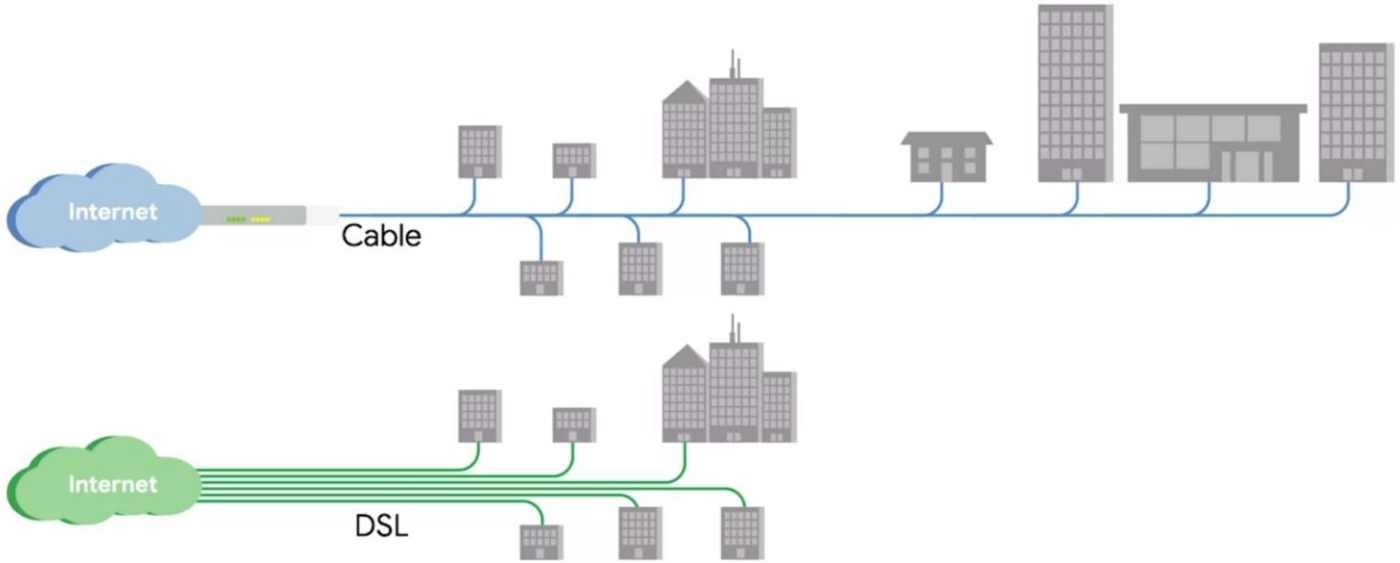
Asymmetric digital subscriber line (ADSL) have higher download speed but lower upload speed (for home user)



Cable Broadband (shared bandwidth technology)

Use the same cable but different frequency to host both TV and internet. It's managed by cable modem





Cable modem

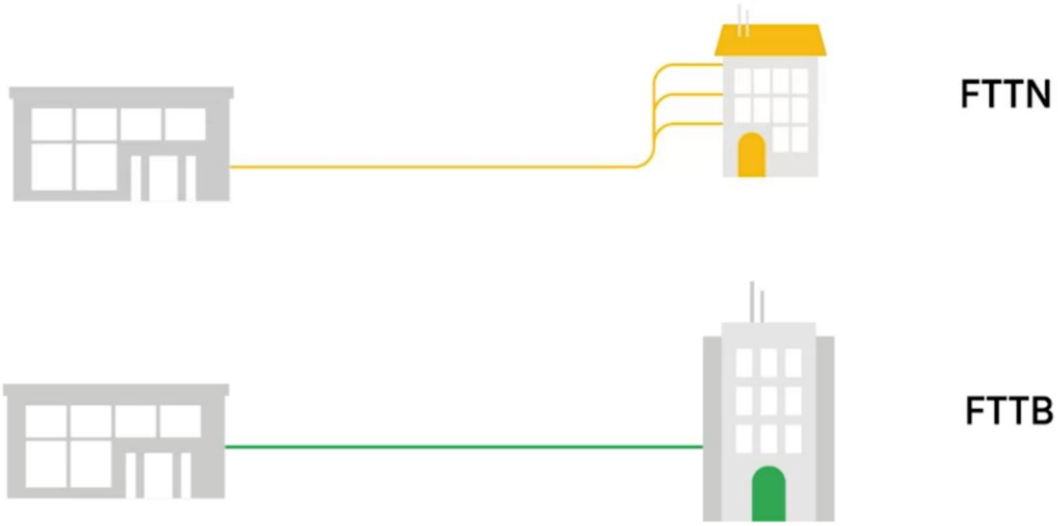
The device that sits at the edge of a consumer's network and connects it to the cable modem termination system, or CMTS

Fiber Connections

Use light instead of electrical current to transfer data

FTTX fiber to the X. X have a lot of possibility

1. FTTN (Fiber to the Neighborhood)
2. FTTB (Fiber to the building)
3. FTTH (Fiber to the Home)



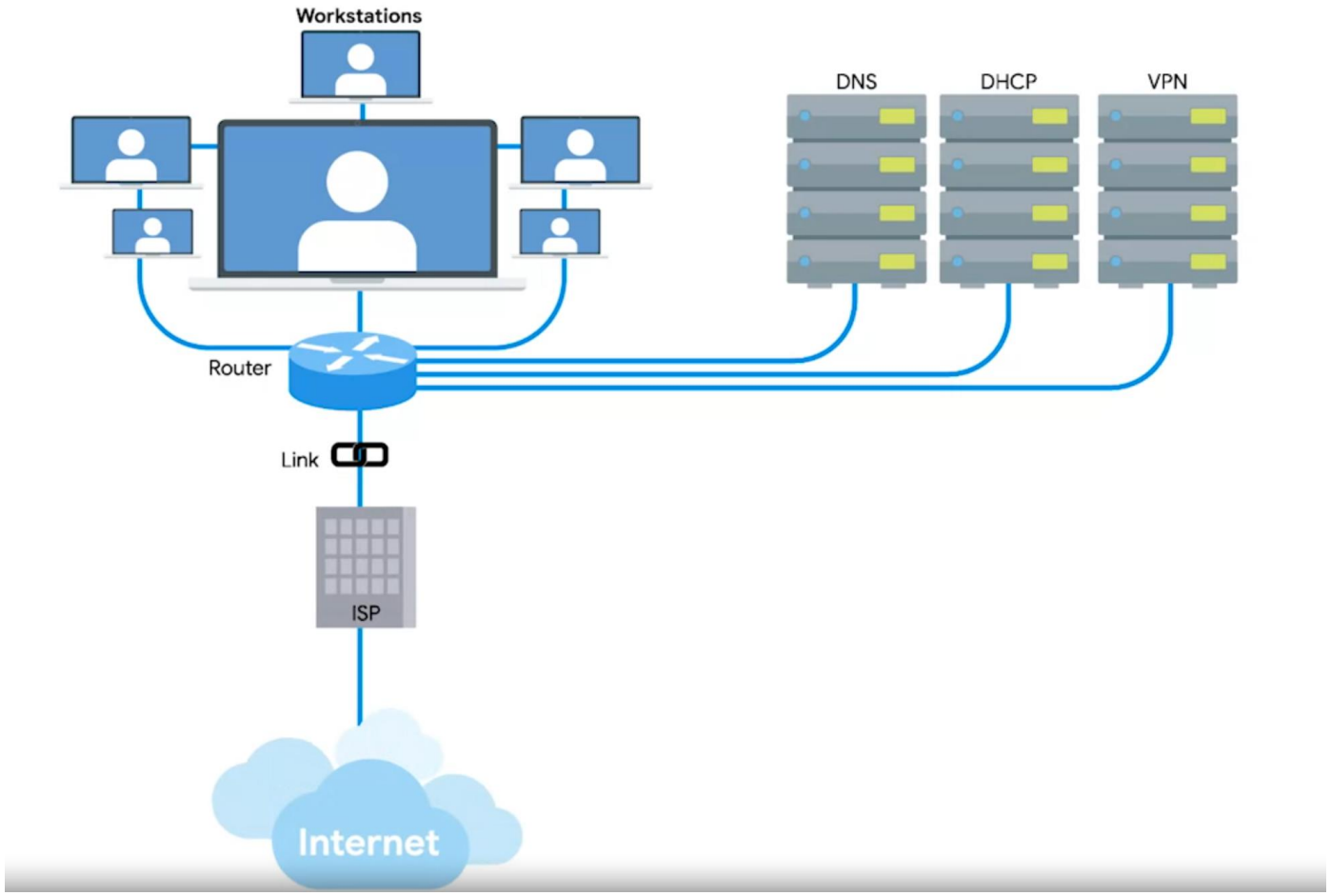
Optical Network Terminator (ONT)

Converts data from protocols the fiber network can understand, to those that more traditional, twisted-pair copper networks can understand

FTTB is a setup where fiber technologies are used for data delivery to an individual building.

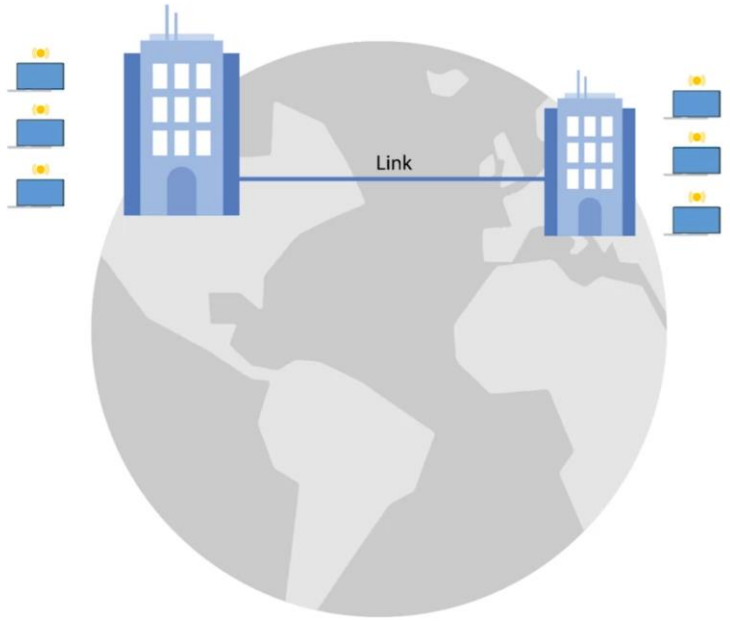
Wide Area Network Technologies (WAN)

WAN use some protocol that works at the data-link layer,
Like T-Carrier, Use ISP’S link to connect two networks together



Wide Area Networks (WAN)

Acts like a single network, but spans across multiple physical locations



Point-to-Point VPNs (Site to Site VPN)

Wireless Networking Technologies

Wireless networking

A way to network without wires

Frequency band

A certain section of the radio spectrum that's been agreed upon to be used for certain communications

802.11 = physical and data link layers

802 Protocol is used to Wireless networks.

In North America, FM radio transmissions operate between 88 and 108 MHz.

It's called FM broadcast frequency. For WIFI, usually we use 2.4Ghz and 5Ghz

Duration field

It specifies how long the total frame is, so the receiver knows how long it should expect to have to listen to this transmission

Frame control field

Is 16 bits long and contains a number of subfields that are used to describe how the frame itself should be processed

Wireless access point

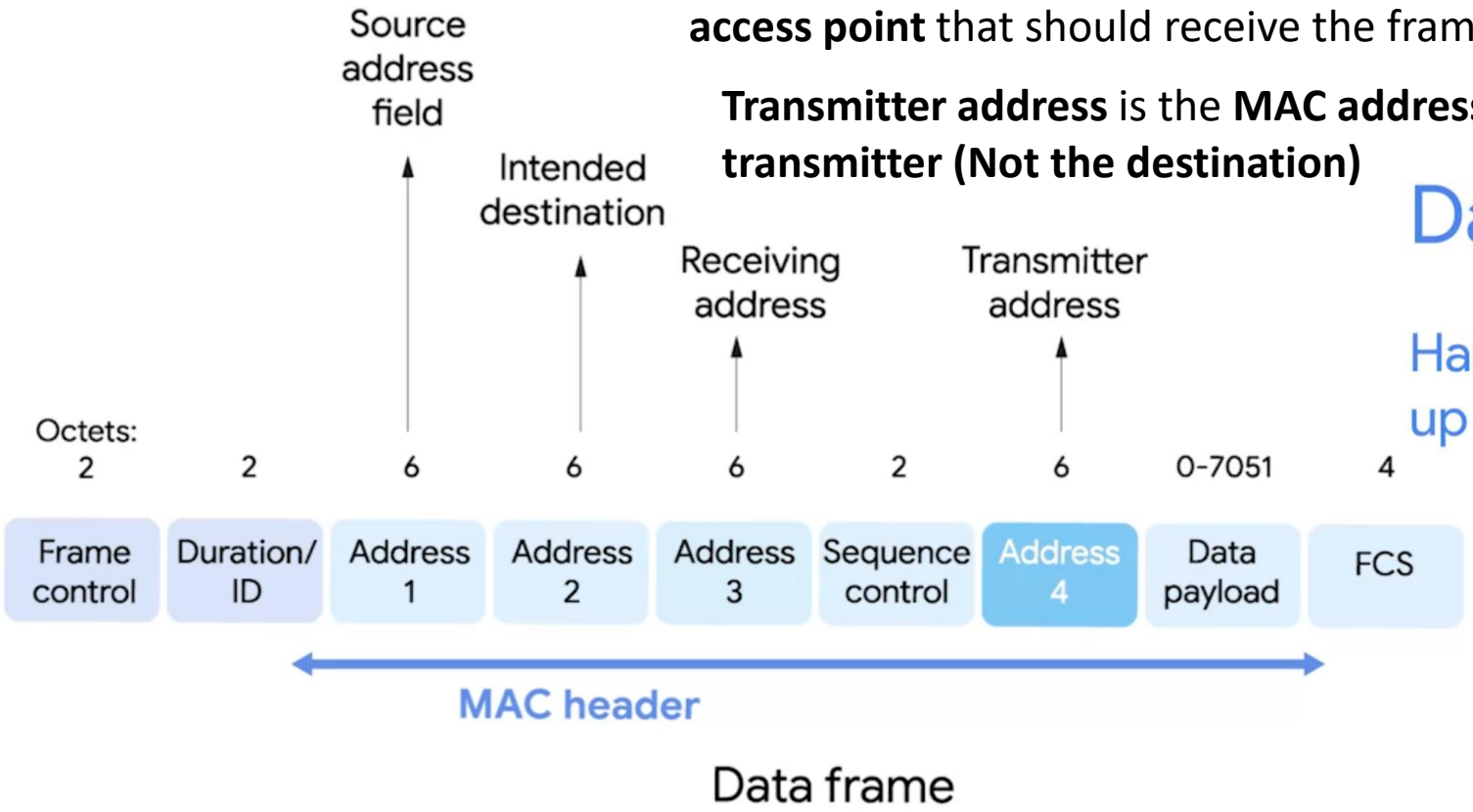
A device that bridges the wireless and wired portions of a network

Sequence control field

Is 16 bits long and mainly contains a sequence number used to keep track of the ordering of frames

Receiving address is the **MAC address** of the **access point** that should receive the frame

Transmitter address is the **MAC address** of the **transmitter (Not the destination)**



Data frame

Data payload

Has all of the data of the protocols further up the stack

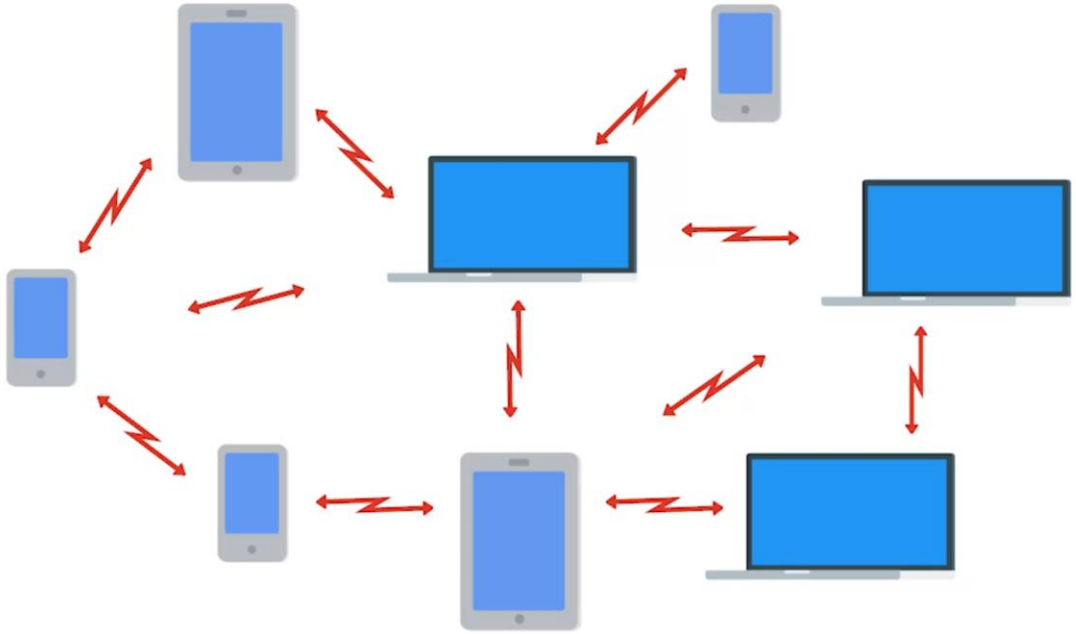
Frame check sequence field

Contains a checksum used for a cyclical redundancy check, just like how ethernet does it

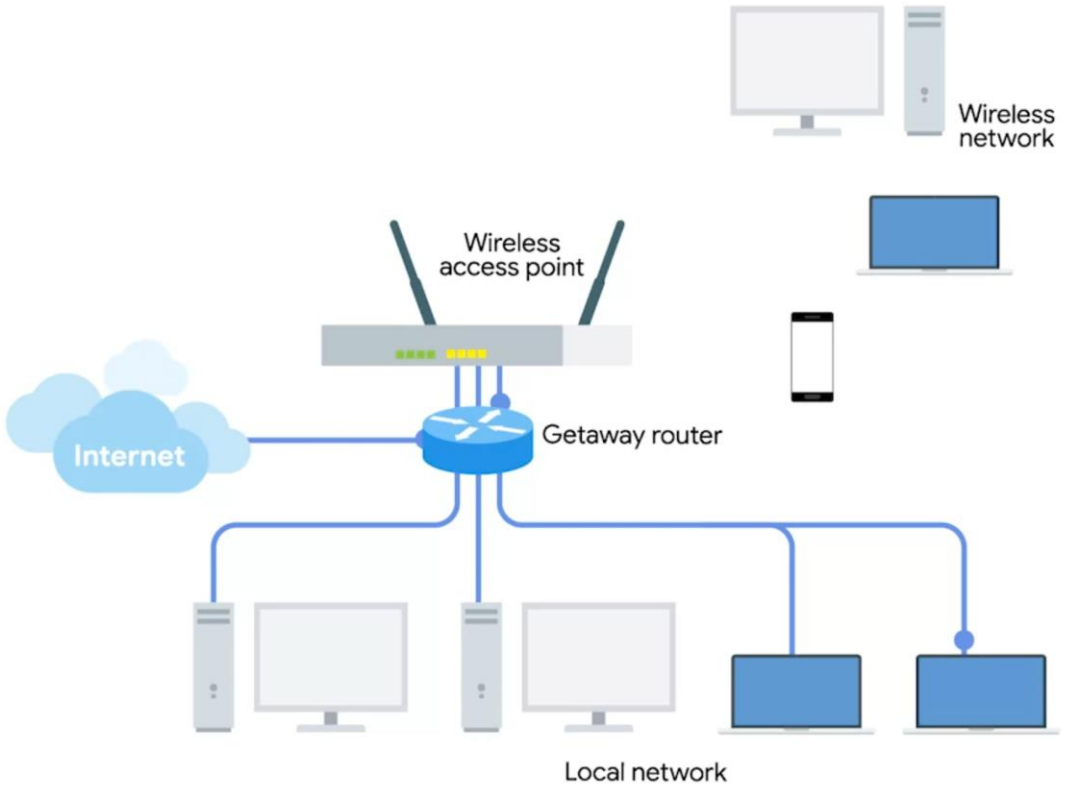
Wireless Network Configurations

Ad-hoc networks : all nodes speak directly to each other (effective under a disaster setting)
Wireless LANS (WLANS): one of more access points act as a bridge between a wireless and wired network (Most common)
Mesh networks: hybrid

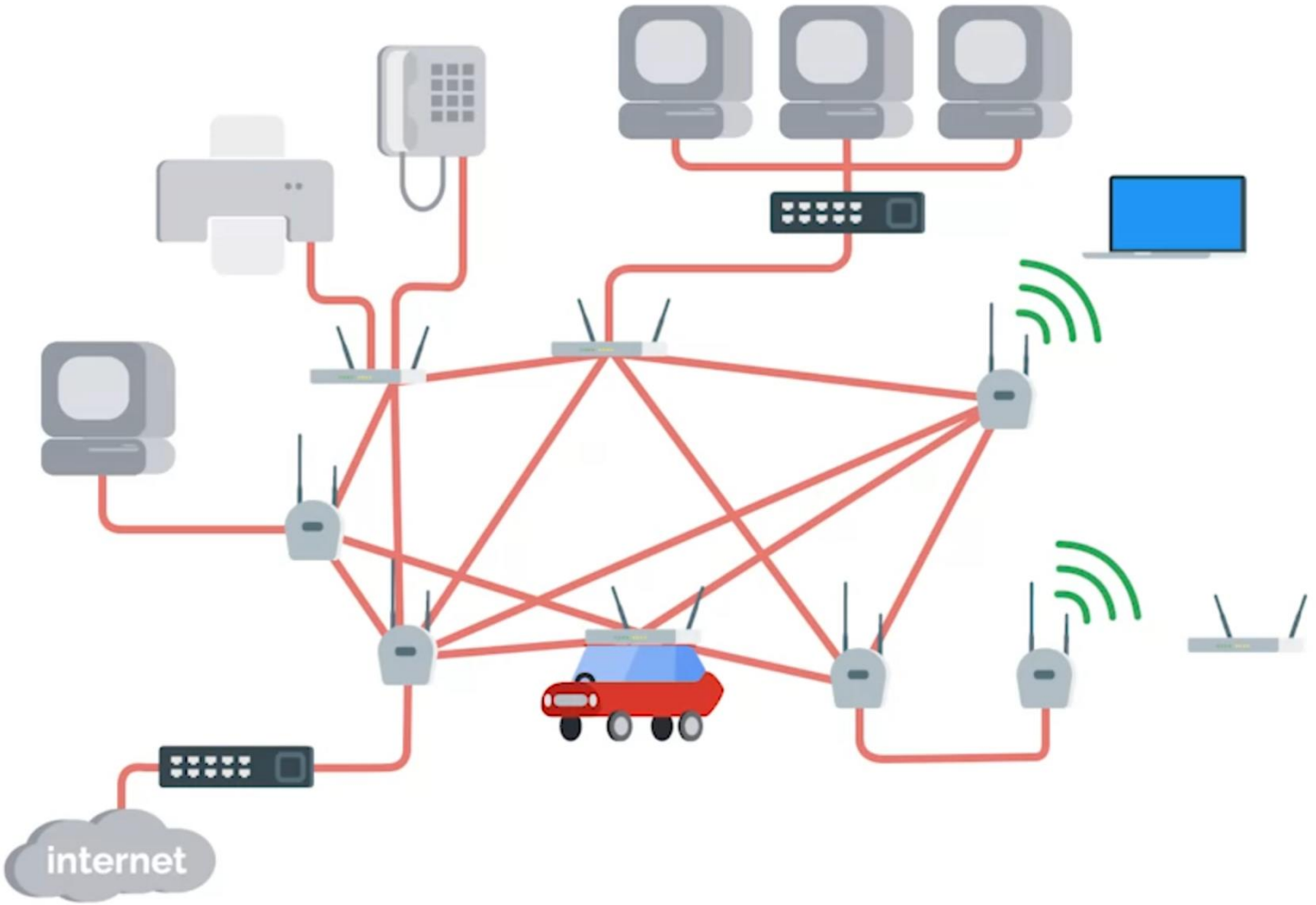
In an ad-hoc network, there isn't really any supporting network infrastructure.



WLANS



Mesh networks



Wireless Channels

Channels

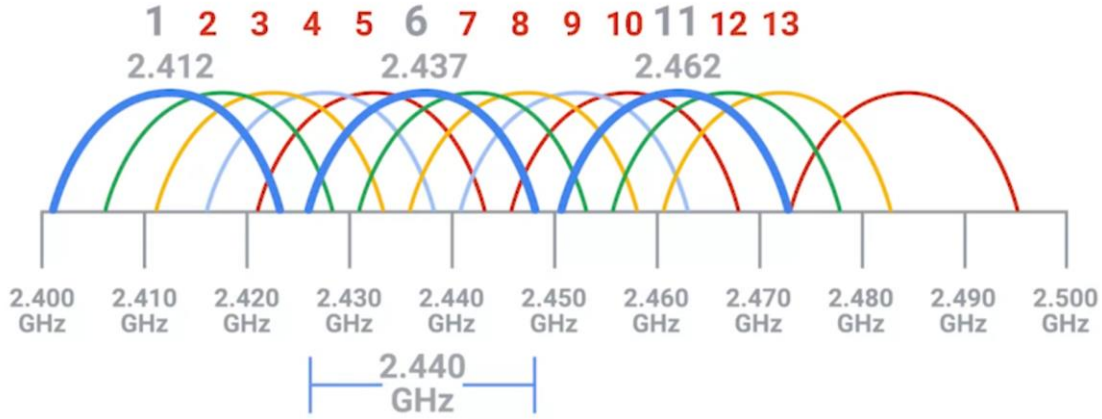
Individual, smaller sections of the overall frequency band used by a wireless network

Collision domain

Any one network segment where one computer can interrupt another

Avoid collision domains wherever you can

Channels for WLANS



Wireless Security

Wired Equivalent Privacy (WEP)

An encryption technology that provides a very low level of privacy

More bits in a key, the longer it takes for someone to crack the encryption (safer)
WEP use 40 bits for encryption keys (cracked in few minutes)
So it is been replaced by **WPA (WIFI Protected Access)**
WPA use 128 bits keys
WPA2 use 256 bits keys

MAC filtering

You configure your access points to only allow for connections from a specific set of MAC addresses belonging to devices you trust

Cellular Networking (Mobile Networking)