

Internet & Home Networking

best for security and streaming



Life Long Learning Club

Life is Too Short to Be Bored

Before we begin...

- Questions or comments from our last session on TVs
- **Slides** and **Calendar** found at:
www.life-long-learning.club





Gordon Moore

1929-2023

Moore's Law "The number of transistors on a microchip doubles about every two years, though the cost of computers is halved"; 1965

Goal



Informed consumers make better decisions by gaining insights with knowledge and data

Topics

What is the Internet

- Web browsers
- Email
- Cloud computing

Home Networking

- Modem and Router
- Wifi vs. wired
- How much speed do I need?
- Security
- Smart Home

What is the Internet?

- Funded by the U.S. Department of Defense, the first prototype of the Internet came in the late 1960s with the creation of ARPANET
- The Internet is a collection of interconnected networks, allowing people to share and access information from anywhere in the world



What is the World-Wide Web?

- World-Wide Web is often confused with the Internet. The World-Wide Web is a common means of accessing data online in the form of websites
- The World Wide Web was created at a physics lab in Switzerland called CERN
- The internet is like a highway system. It is a network of roads that connect different cities and towns.
- The web is like a map. It is a way of organizing information so that it can be easily found and accessed.



Internet Backbone

- Interstate highway system is made up of interconnected roads
- Internet backbone is made up of interconnected cables
- Most countries access is open – not in Russia, China and others
- 800,000,000,000 bits per second – 800Gbs
 - What is a “bit” (flipchart)



Locate things on the Internet

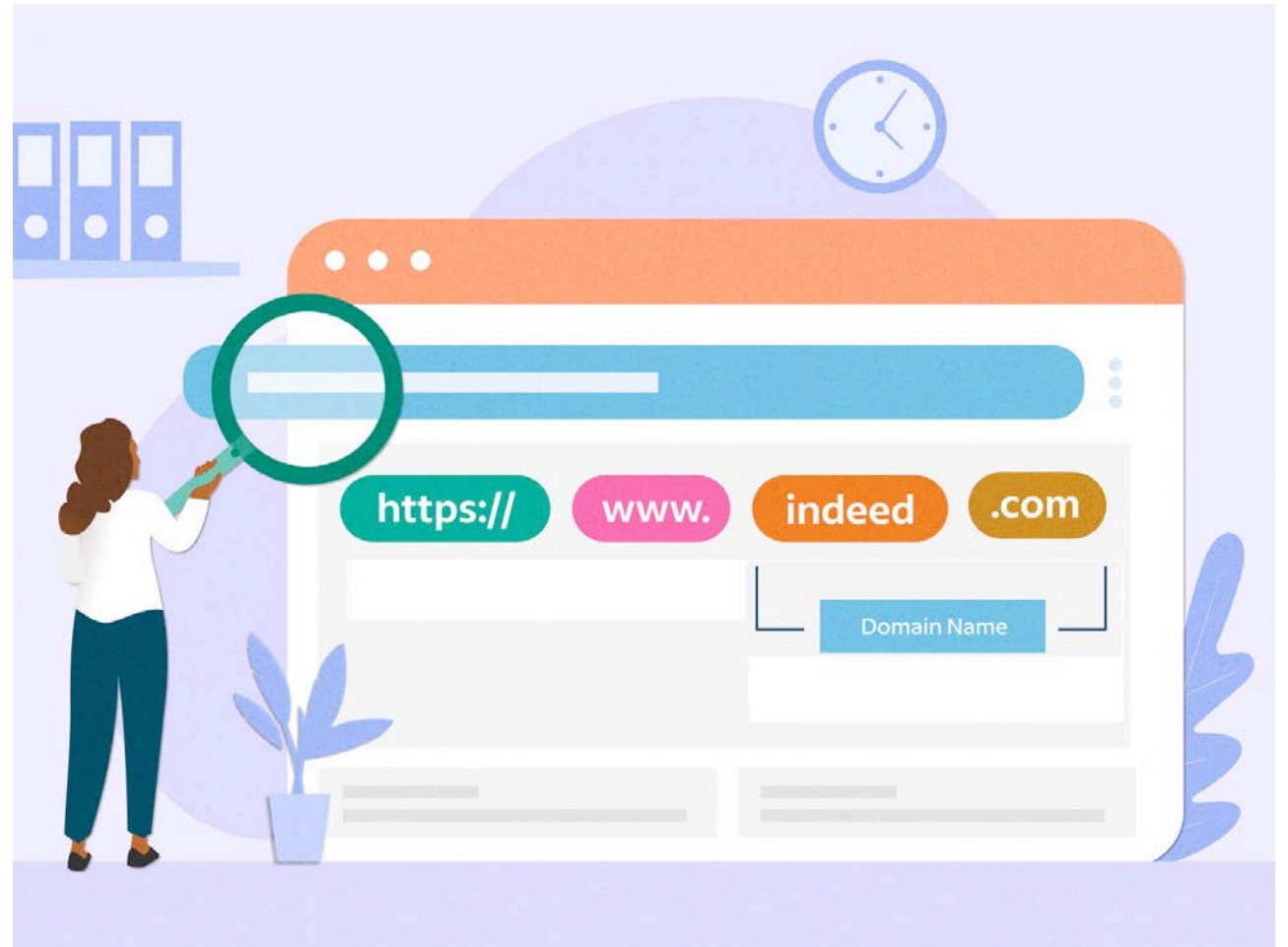
- Places on the Internet need a delivery address
 - Like your home mail address
- It's called the **Internet Protocol Address** - IP



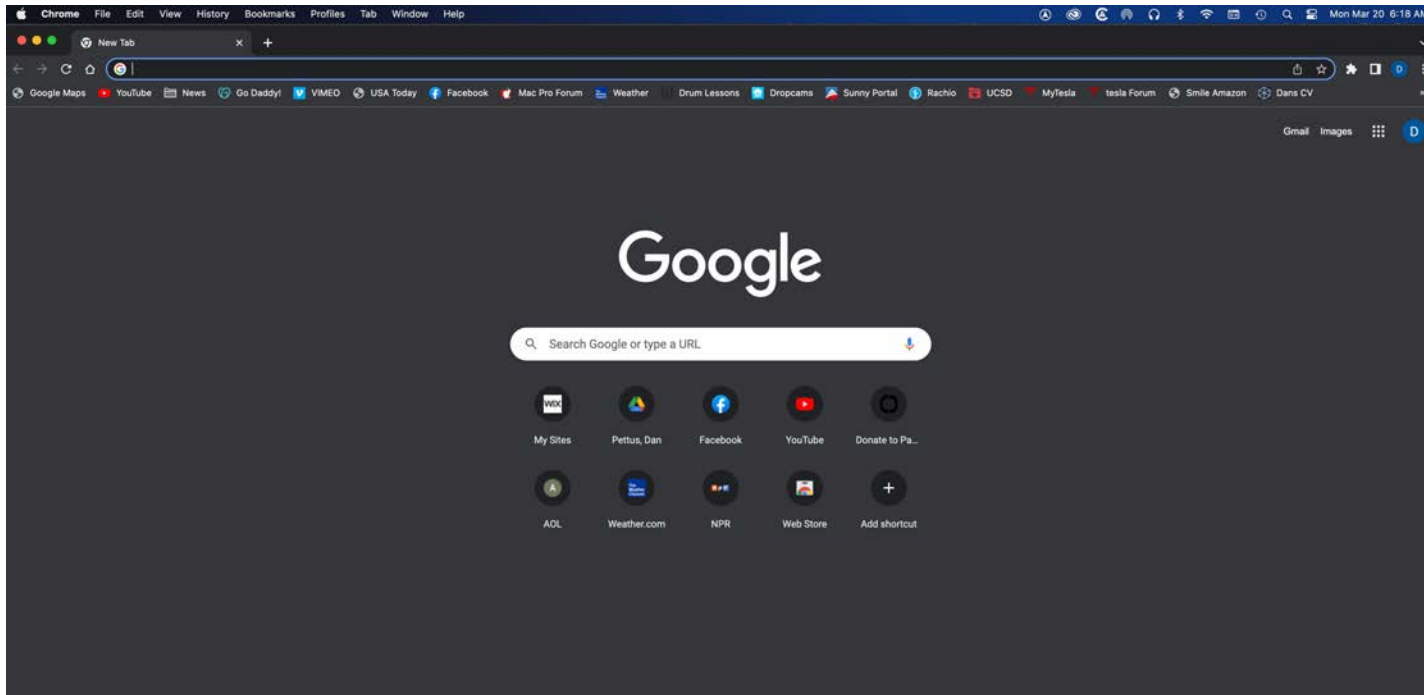
My IP Address
63.255.173.183

Domain name – makes it easy to find

- Domain names are a directory to a site's IP Address



www.indeed.com = 162.159.129.67

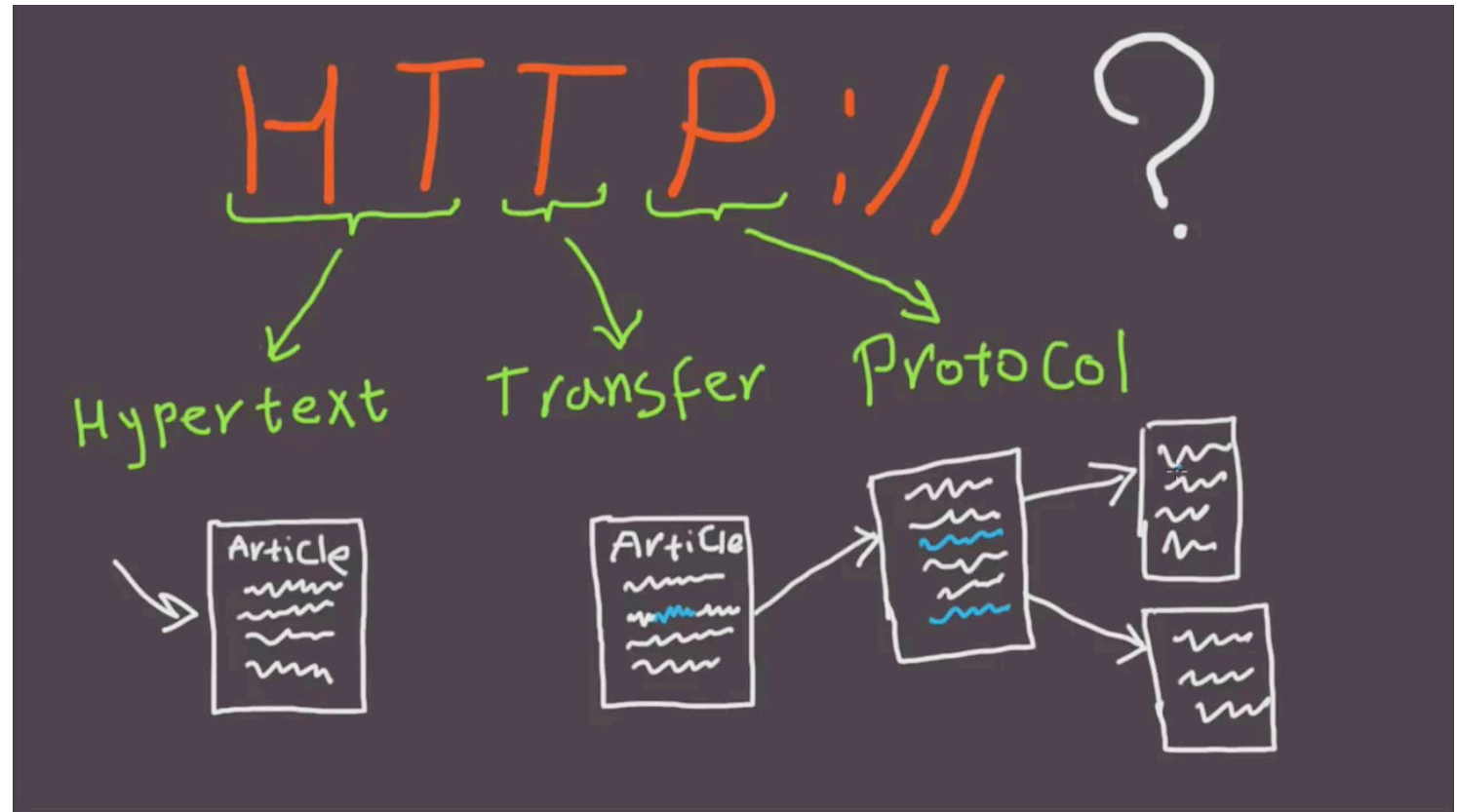


Web Browser

- A web browser is a software application to view websites, interact with web pages, and navigate
- Some of the most popular web browsers include Chrome, Firefox, Apple Safari, and Microsoft Edge

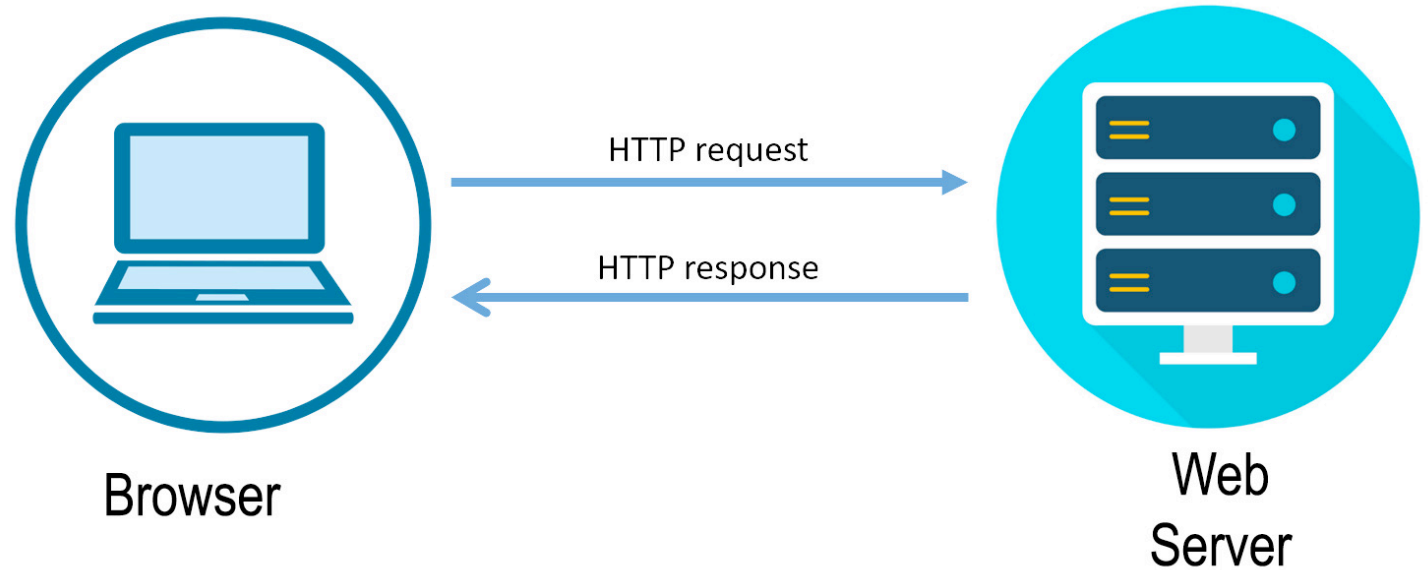
HTTP://

- Hypertext Transfer Protocol is the method a browser uses to decode data into a page for viewing and navigation
- Made up of text, pictures, videos, audio (music), and links to other pages



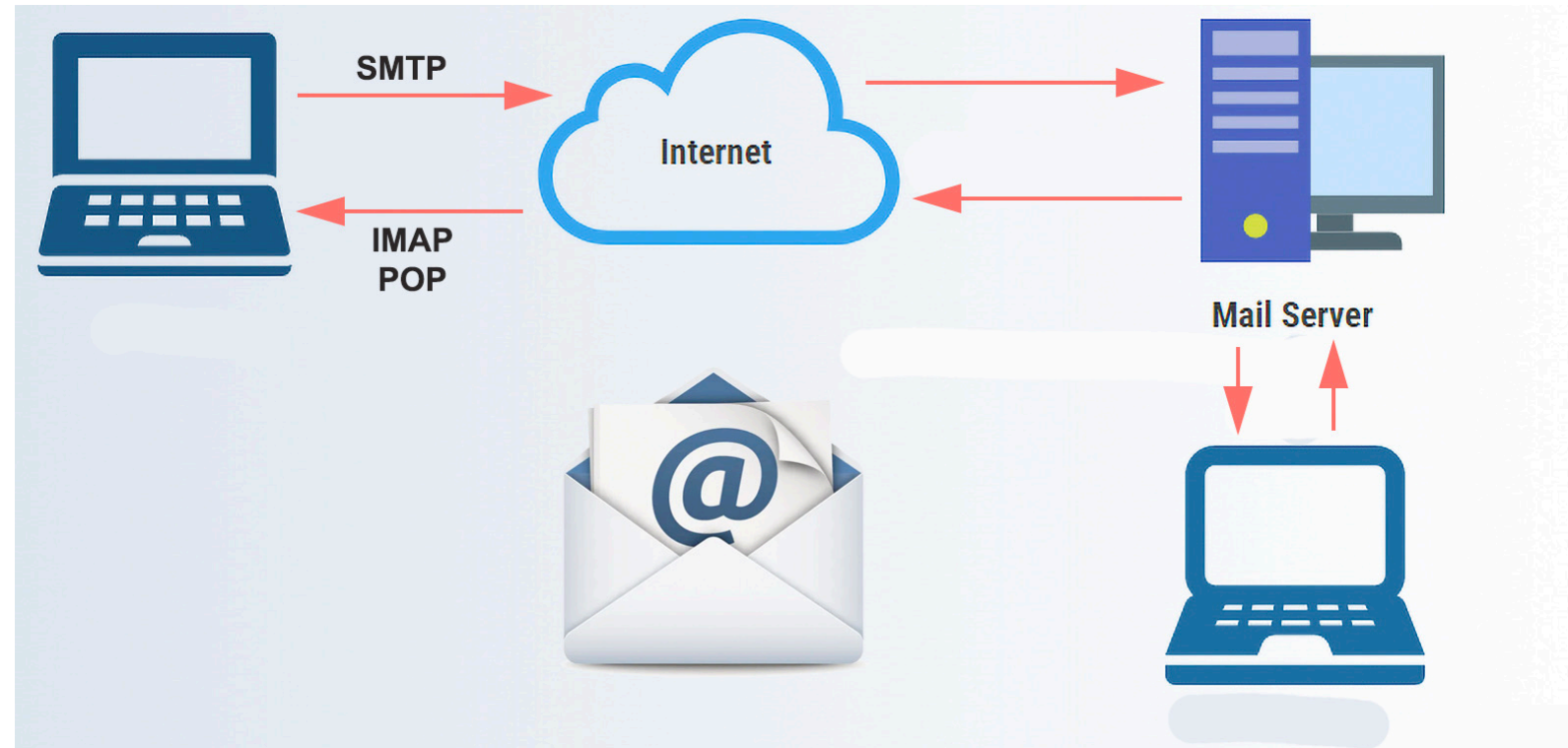
You Request – They Respond

- A browser session starts with a **HTTP Request**
- The Web Server will respond with a **HTTP Response**



Email

- Send using Simple Mail Transfer Protocol - **SMTP**
- Receive using Internet Message Access Protocol **IMAP** or Post Office Protocol **POP**
- Which is better?
 - Flipchart



Like it or not, A.I. is here

- **Self-driving cars:** Self-driving cars use AI to navigate the roads and avoid obstacles
- **Medical diagnosis:** AI is being used to diagnose diseases faster than humans
- **Financial trading:** AI is being used to make financial trades more quickly and accurately than humans
- **Machine learning:** Machine learning is a type of AI that allows computers to learn without being explicitly programmed



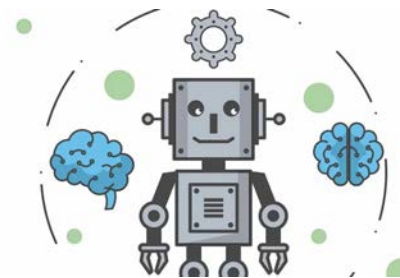
Close but...

I asked CHAT GPT *"What's it like to live at the 4 Seasons in Murrieta California?"*

"The community is designed for adults aged 55 and older who are looking for a resort-style living experience. The Four Seasons offers a range of amenities, including a clubhouse, fitness center, swimming pool, spa, tennis courts, and a **golf course**.

Living at the Four Seasons can be a unique experience, as you'll be surrounded by like-minded individuals who enjoy an active and social lifestyle. The community offers numerous clubs and activities, including fitness classes, social events, and group outings. The Four Seasons also has a full-time activities director who coordinates events and activities to keep residents engaged and entertained.

The homes at the Four Seasons are typically spacious and well-appointed, with features such as high ceilings, open floor plans, and upscale finishes. The community offers a range of housing options, including single-family homes, **attached villas, and condominiums**."

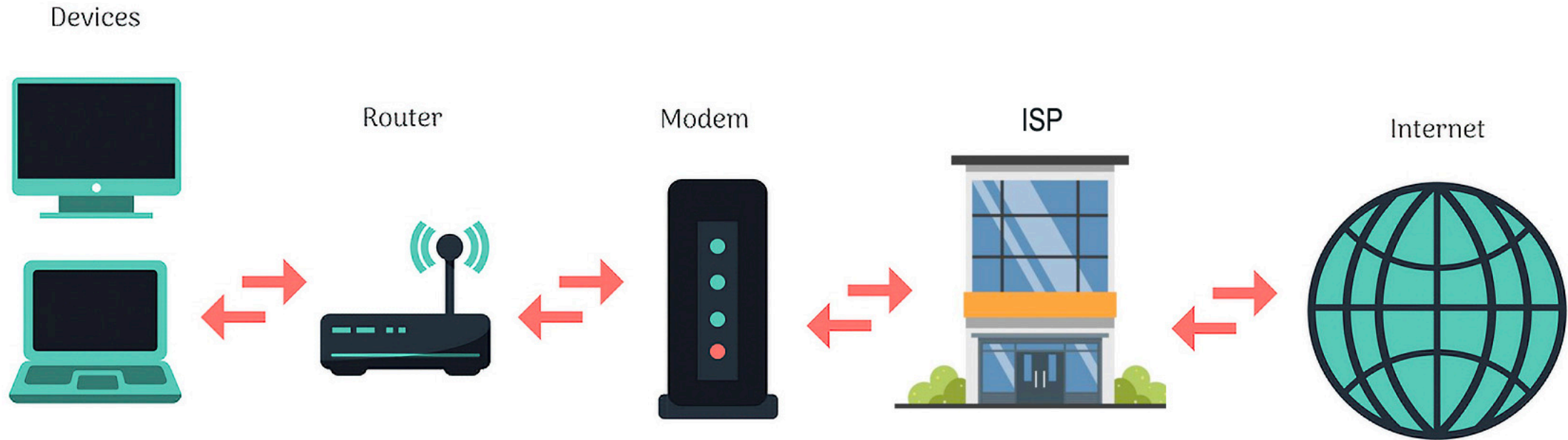


Optimizing Home Network

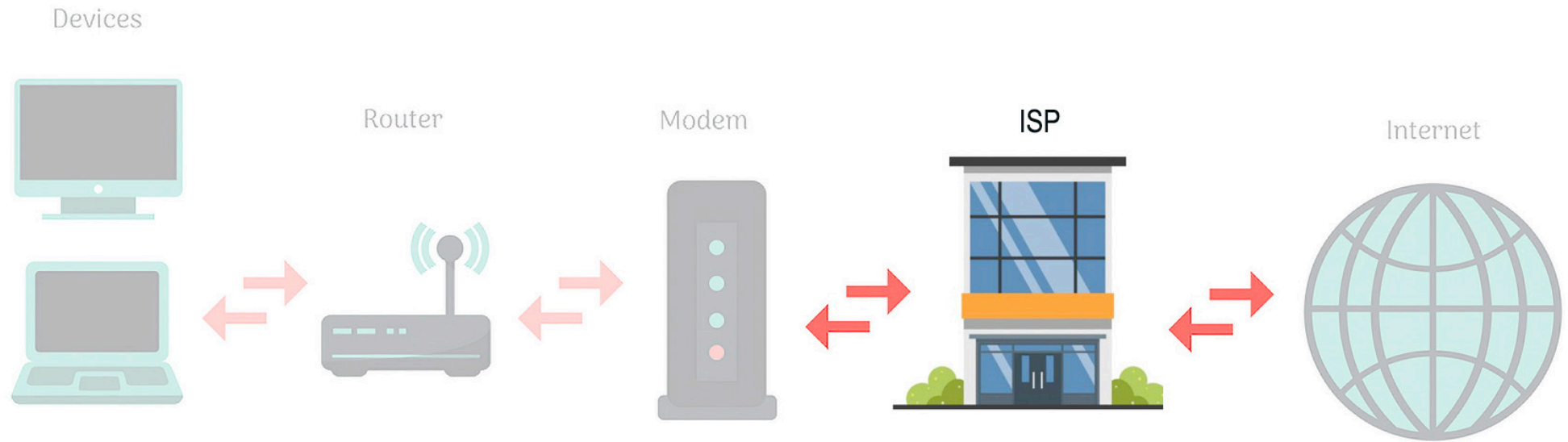


Home Internet Connection

Internet to ISP to Modem to Router to Devices

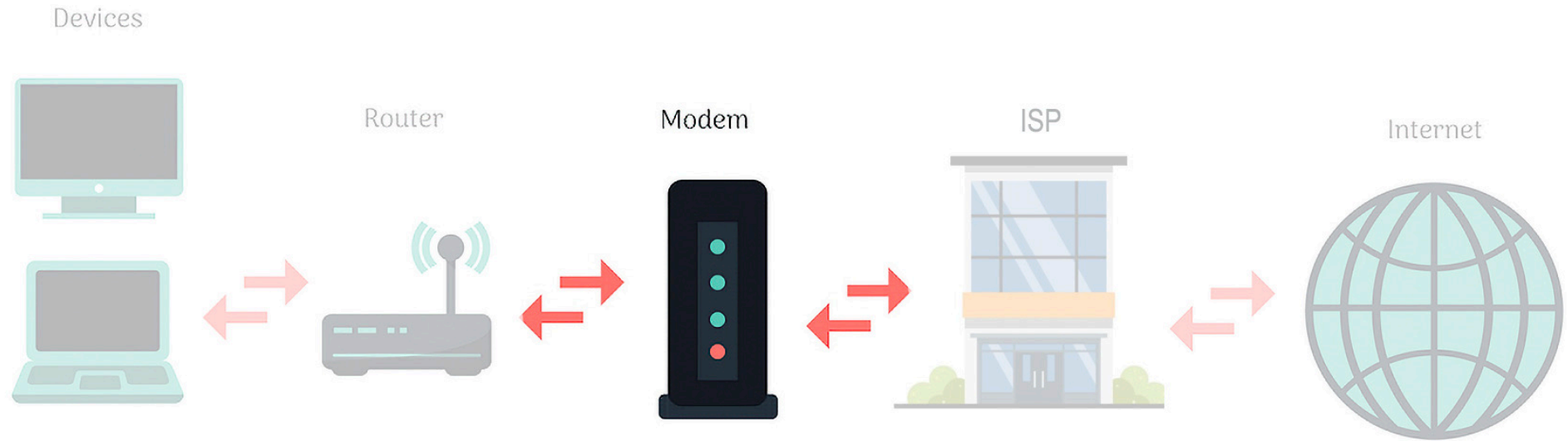


ISP



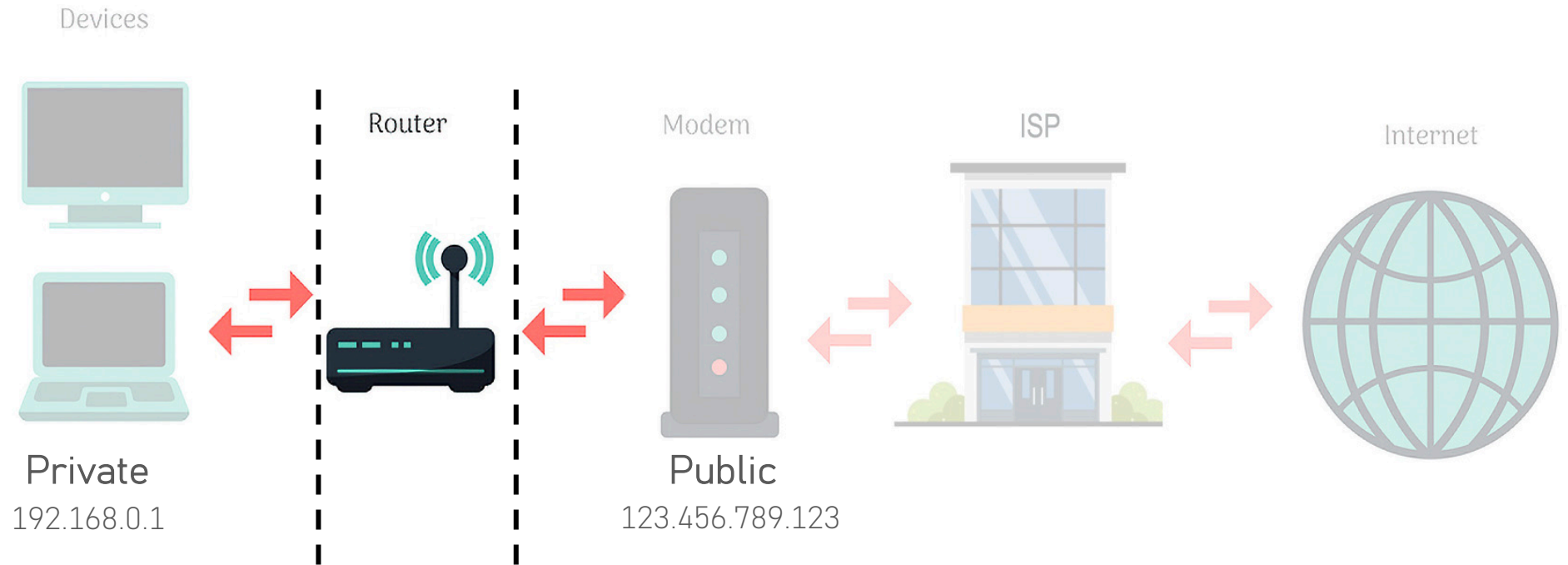
- ISP stands for **Internet Service Provider**
- Acts like a Post Office for Internet traffic
- It's your Internet company
 - Spectrum or Frontier

Modem



- Modulator - Demodulator
- Convert Spectrum or Frontier to Ethernet
- What is Ethernet?

Router



- Private local network for your Home
- Some routers are dual function supporting both wired and wireless connectivity

Ethernet Wired Switch

- A device used to extend a wired network
- It is not a router



Wifi

- Wireless Fidelity (Wifi)
- Based on Ethernet using radio frequencies
- 2.4GHz older but still in use
- 5GHz newer and preferred
- What is a GHz?
- FCC limits radio power to 0.2 watt – approx. 100 ft.

NOTE: Did you know your microwave oven is also 2.4GHz?



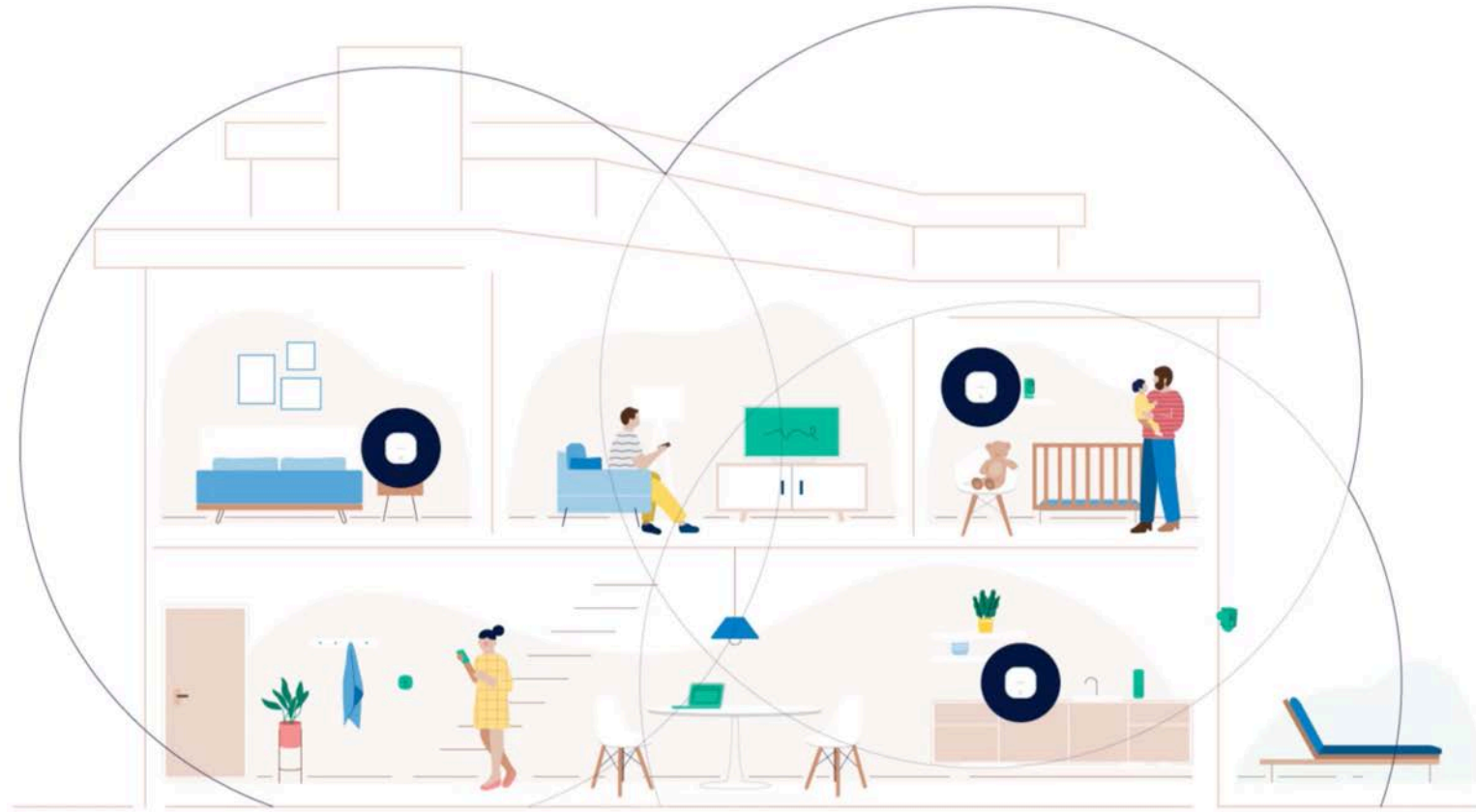
Wifi Extenders

- Re-amplify wireless radio signal
- Install in areas where Wifi is weak
- Range same as wireless router (0.2 watt maximum)



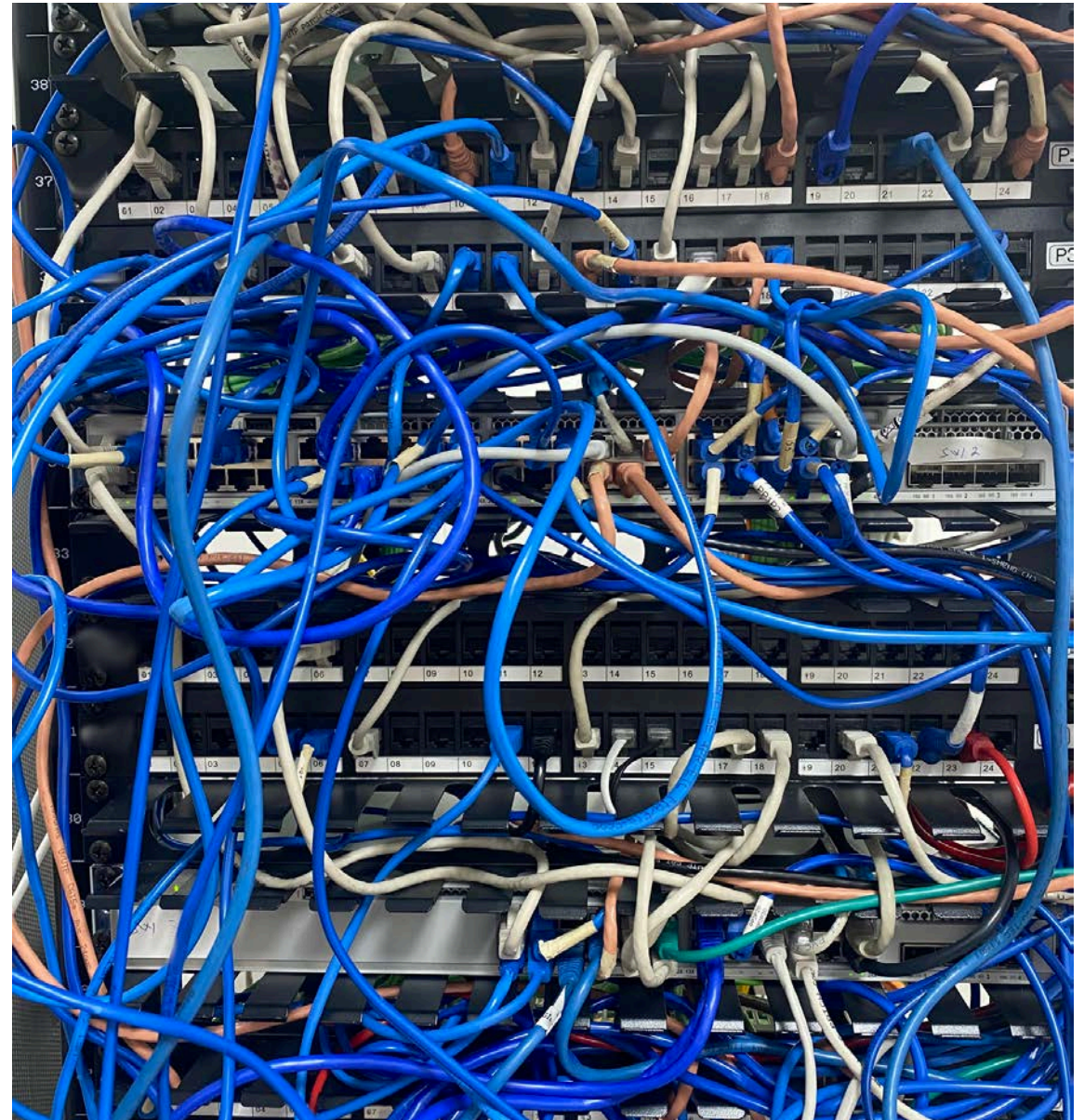
Wifi Mesh

- Each mesh node is like a smart wireless extender
- Mesh nodes communicate together throughout your home routing traffic to reduce drop-offs and dead spots
- Range same as wireless router (0.2 watt maximum each node)



Maximum Number of Connections

- Wired or wireless router maximum number of connections is **256**
- **256** is limited by unique IP addresses on your private network:
xxx.xxx.xxx.000 to xxx.xxx.xxx.255
- Most home routers cannot handle more than approximately **100** connections



Wired vs. Wifi



- Wired PRO
 - Fast
 - Secure
 - Reliable
- Wired CON
 - Wires thru walls
 - Not mobile

- Wifi PRO
 - Mobile
 - Easy
 - Some devices are Wifi only
- Wifi CON
 - Security – radio goes thru walls
 - Slower than wired
 - Not as reliable

Dan's wired

- Combination of wired and wireless
- Wired to entertainment and desktop computers
- Wireless for everything else



First time

New laptop online

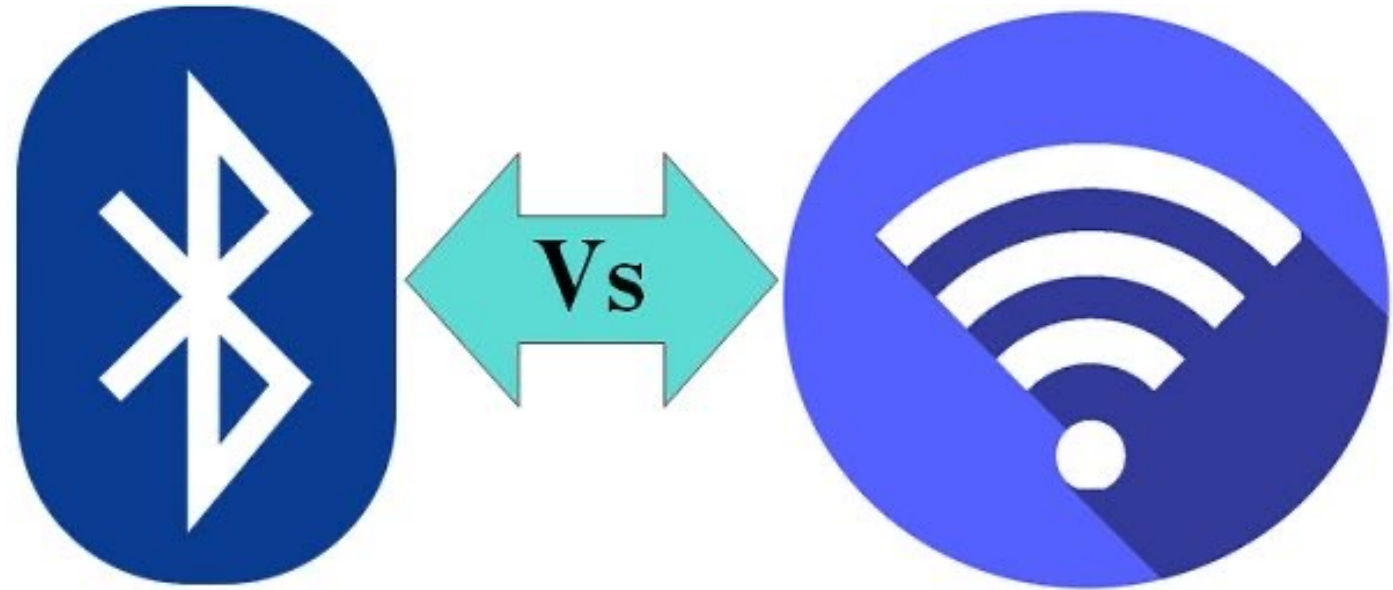
1. Find your wireless network and enter passcode



2. Router will assign an IP address to the laptop
3. Laptop is now connected to your private network
4. Router connects to modem and you're on the Internet!

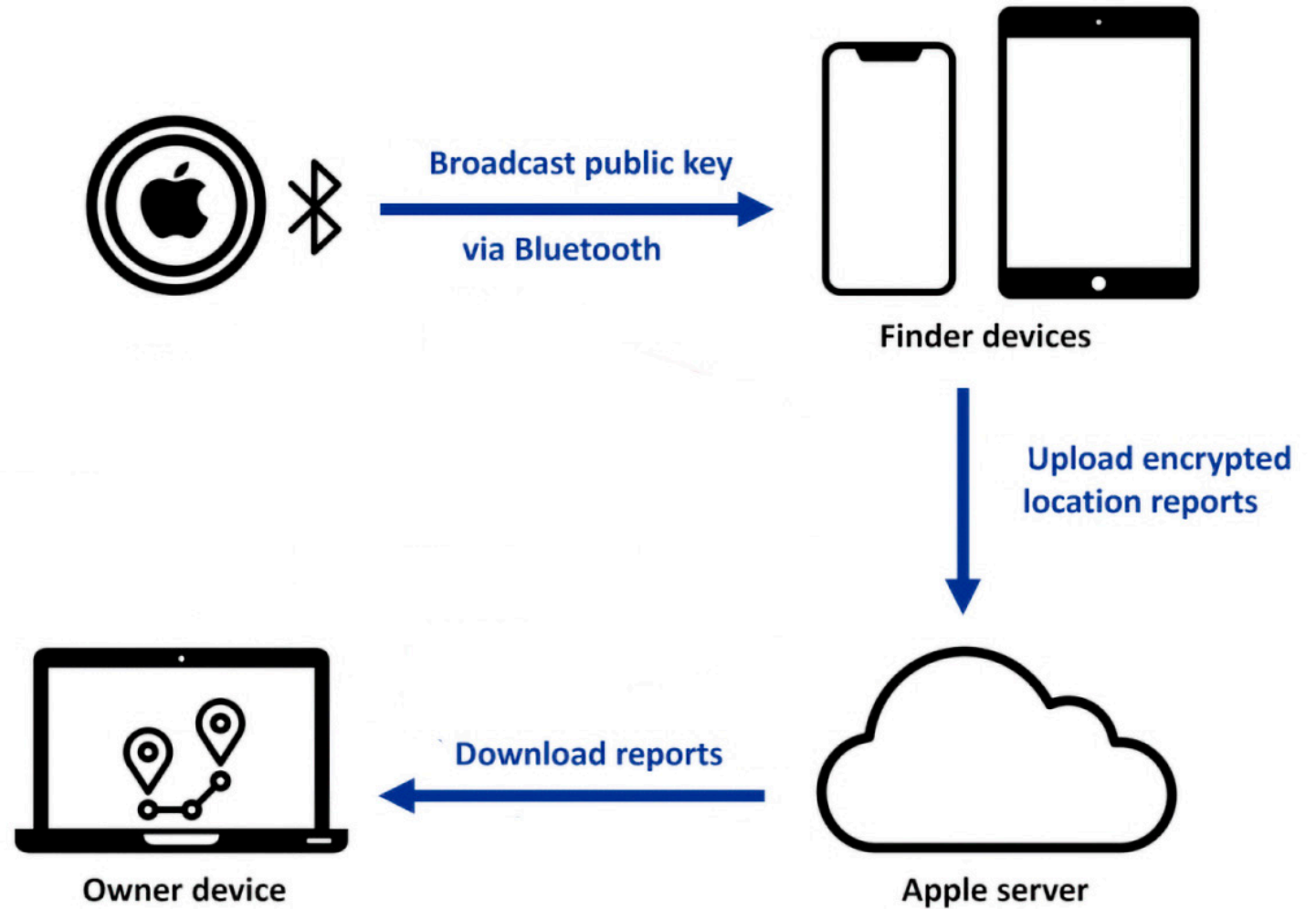
Bluetooth

- Short-range and low power – approximately 33 feet range
- 'Near field' 1:1 connectivity
 - Headphones, remotes, cell phone to car, etc.
- 2.4 GHz



Apple Airtags

- Crafty use of Bluetooth
- Owners of “Finder” devices are unaware

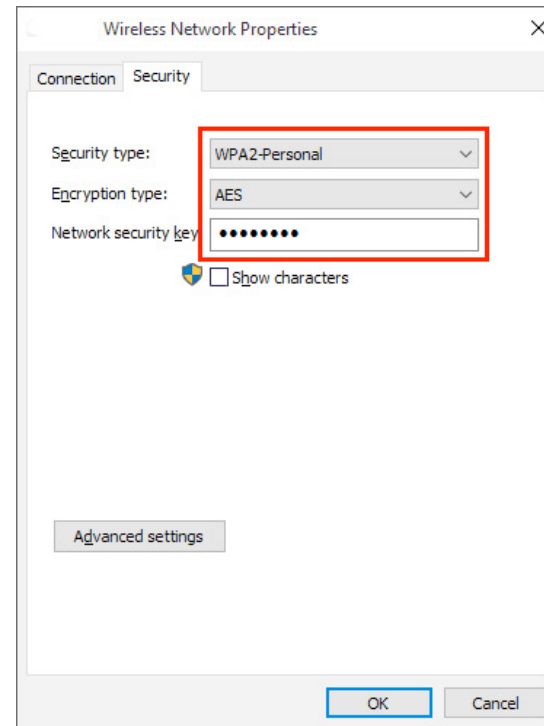


Security



Wifi Security

- Your Wifi signals can be seen by anyone nearby
- Lockdown Wifi by enabling high security standards
- WPA-2 or WPA-3
- Select AES if available



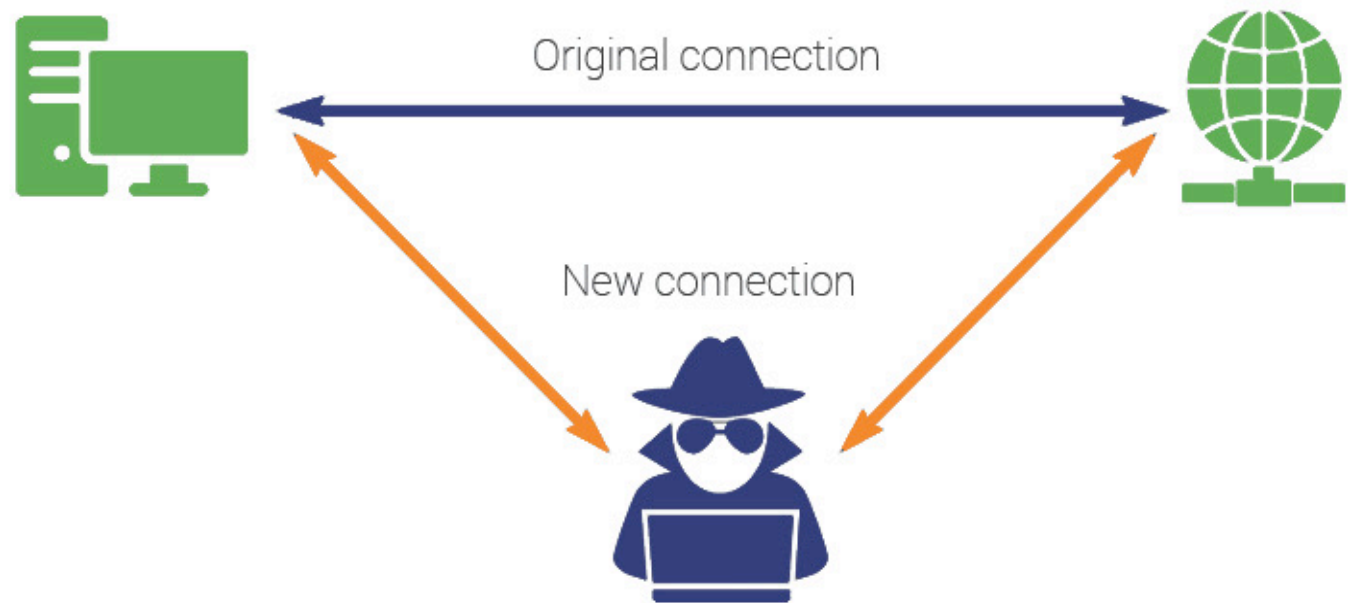
Windows 10



Apple Mac OS

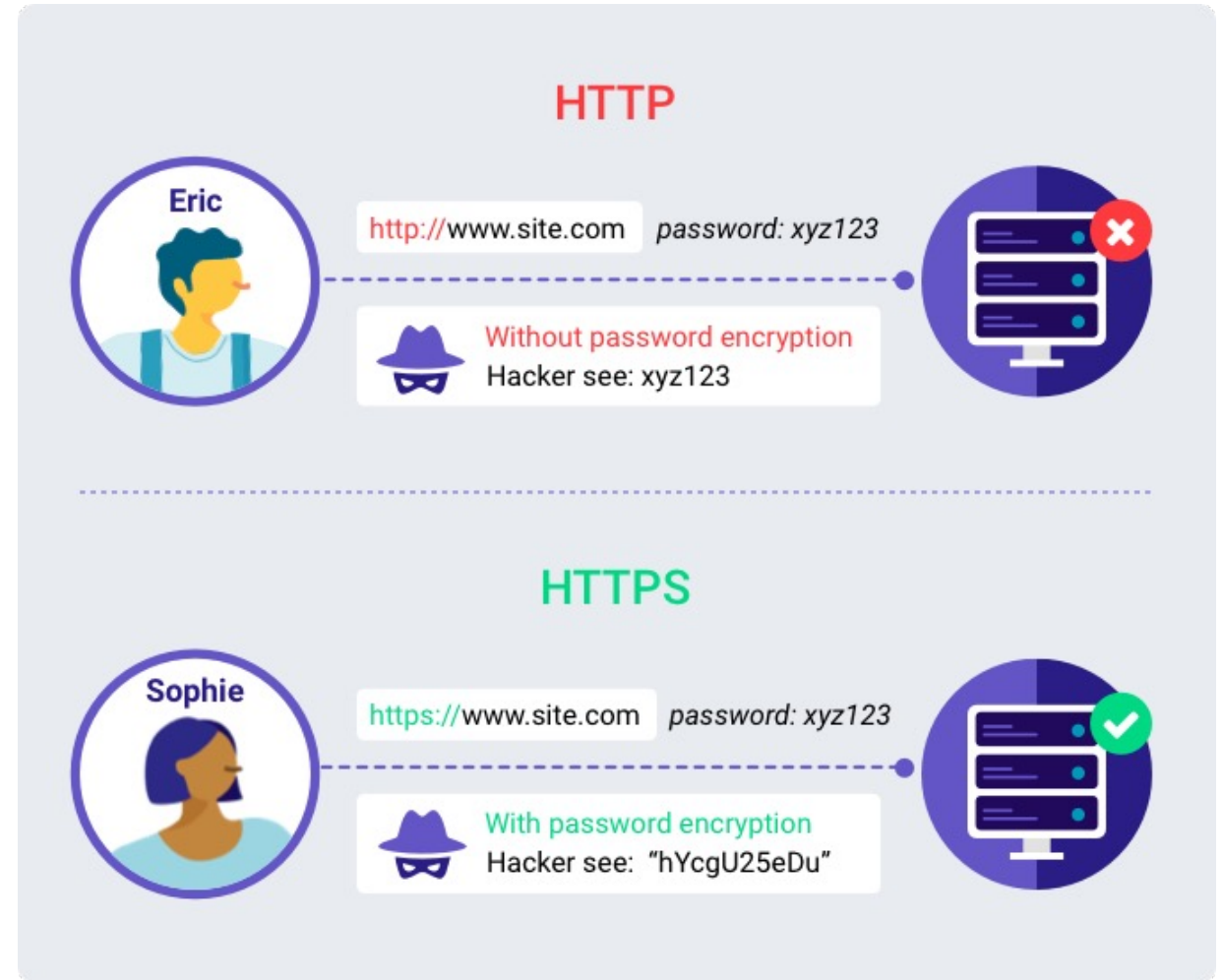
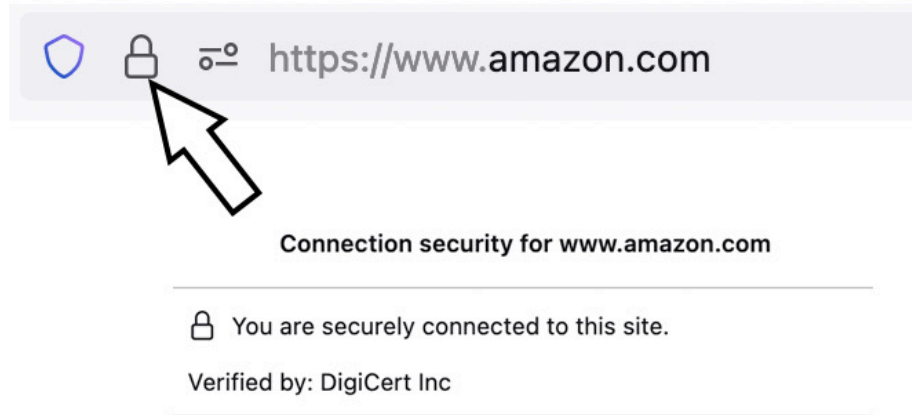
Man in the Middle Attack

- Yikes! It looks real



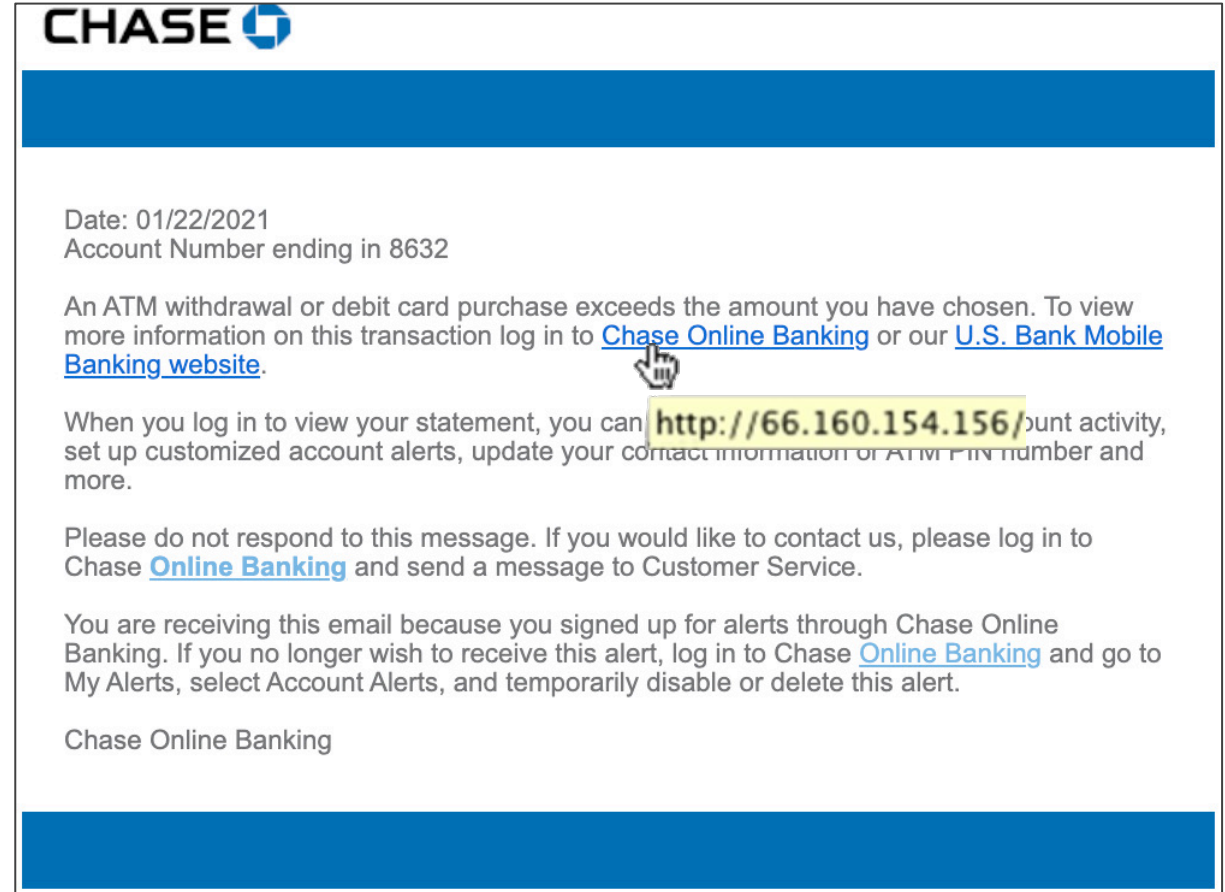
Secure Exchanges

- Look for **https://** and the lock symbol
- Site verification and encryption



How do you know?

- Emails can look real
- Don't use links in emails
- Go directly to the site



2-Factor Authentication

- Extra layer of security beyond the standard username and password
- Requires a second step usually as a PIN on a cell phone



What is a VPN

- Virtual Private Network
- Hides your public IP address
- Extra level of encryption

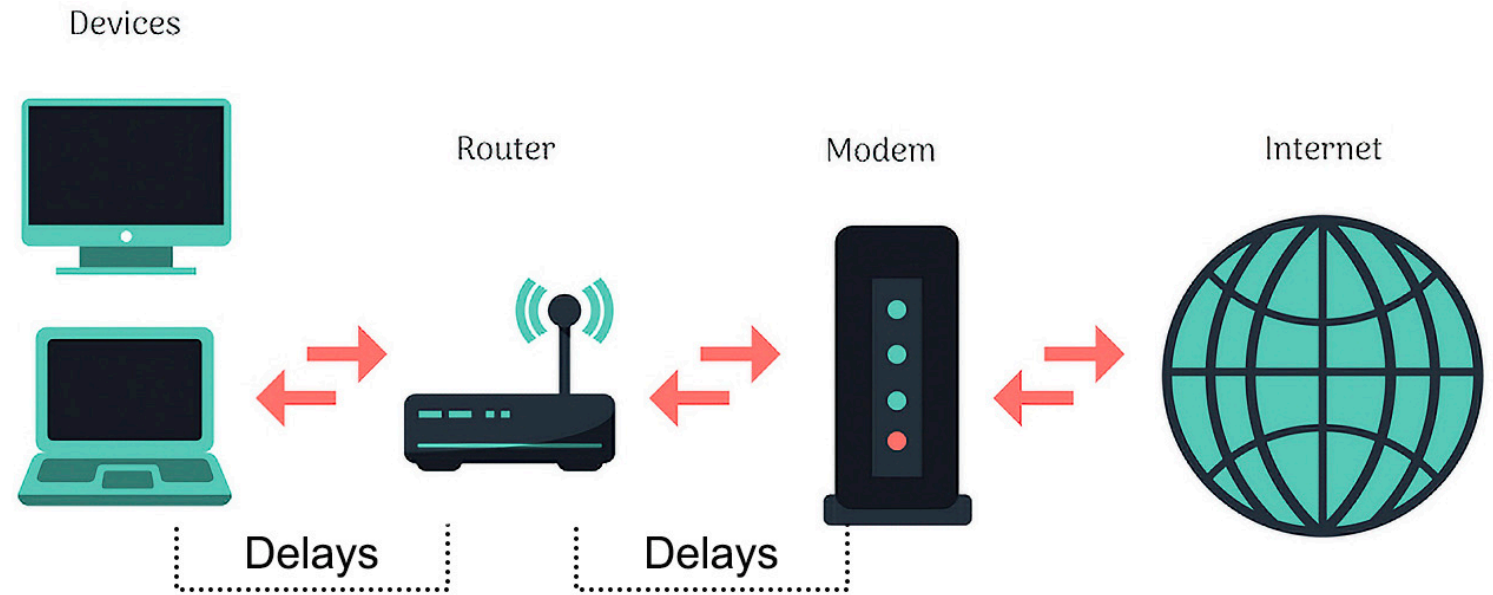


Internet Speed



Internet speed isn't the whole story

- Each connection point can introduce delays
- Total load = sum of all devices at the same time
- Weakest link and load will affect overall speed



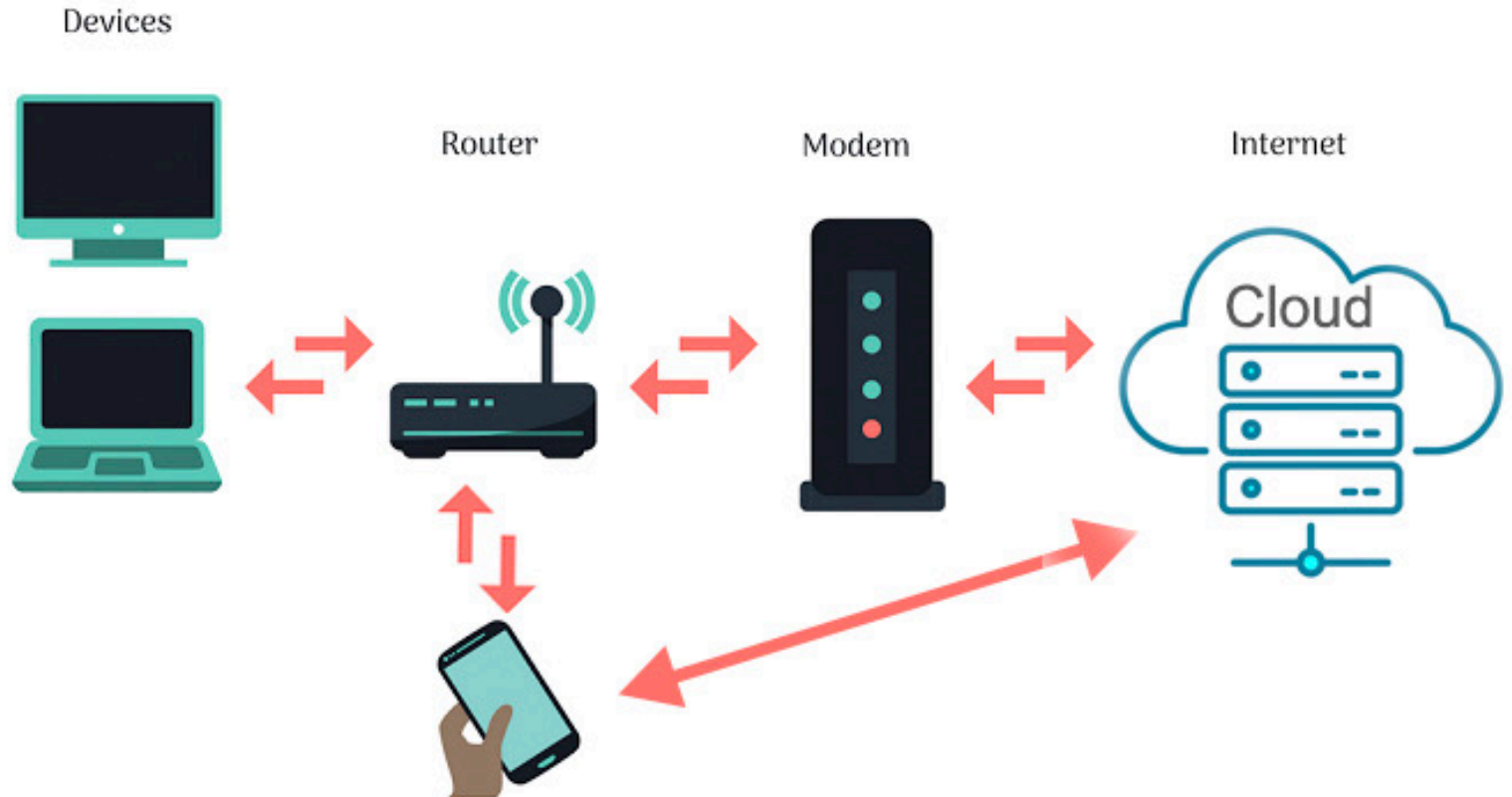
What do you need?

Task	Minimum	Recommended
Email	1 Mbps	1 Mbps
Web browsing	3 Mbps	10 Mbps
Social media	3 Mbps	10 Mbps
Streaming SD video	3 Mbps	10 Mbps
Streaming HD video	5 Mbps	25 Mbps
Streaming 4K video	25 Mbps	50 Mbps
Streaming music	1 Mbps	5 Mbps
One-on-one video calls	1 Mbps	5 Mbps
Video conference calls	2 Mbps	10 Mbps

Recommend the best deal for any guaranteed download speed of 300 Mbps and up

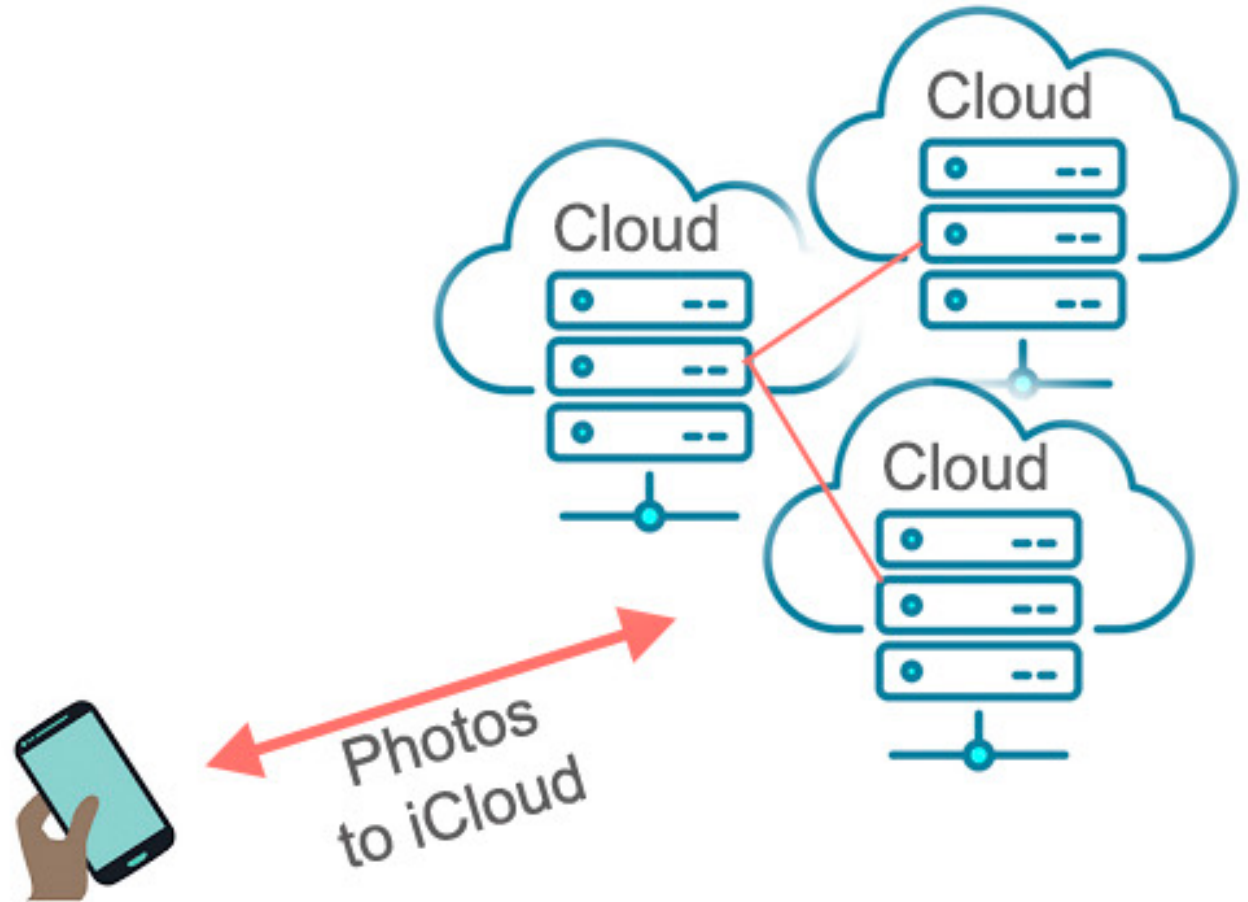
The Cloud

- Globally distributed web servers on the Internet
- It is still physical – hardware you can touch!



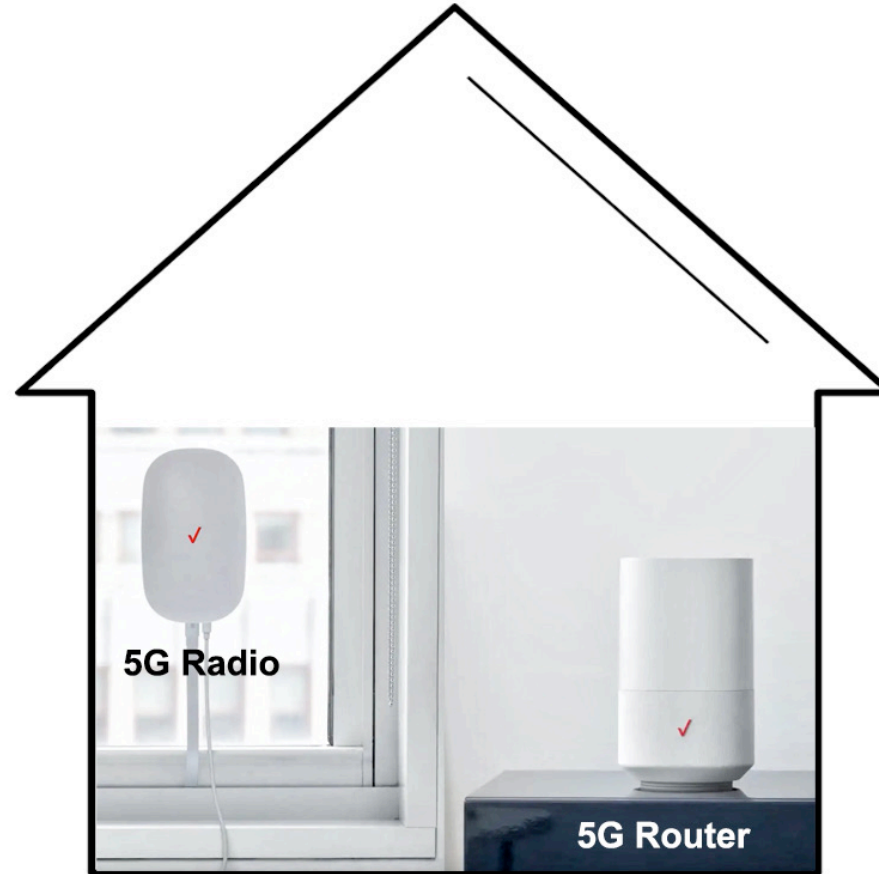
Stuff in the Cloud

- Example; Save iPhone photos to iCloud
 - Let Apple manage the how and where
- Fault-tolerant design



5G Replace Spectrum or Frontier?

- Maybe – not anytime soon
- Swap cable modem & router with 5G radio & router

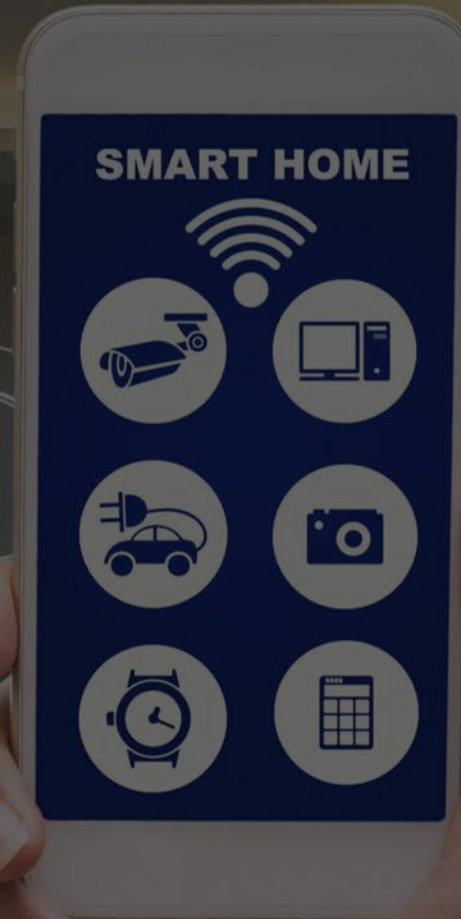


Optimize for Streaming

Best results in priority

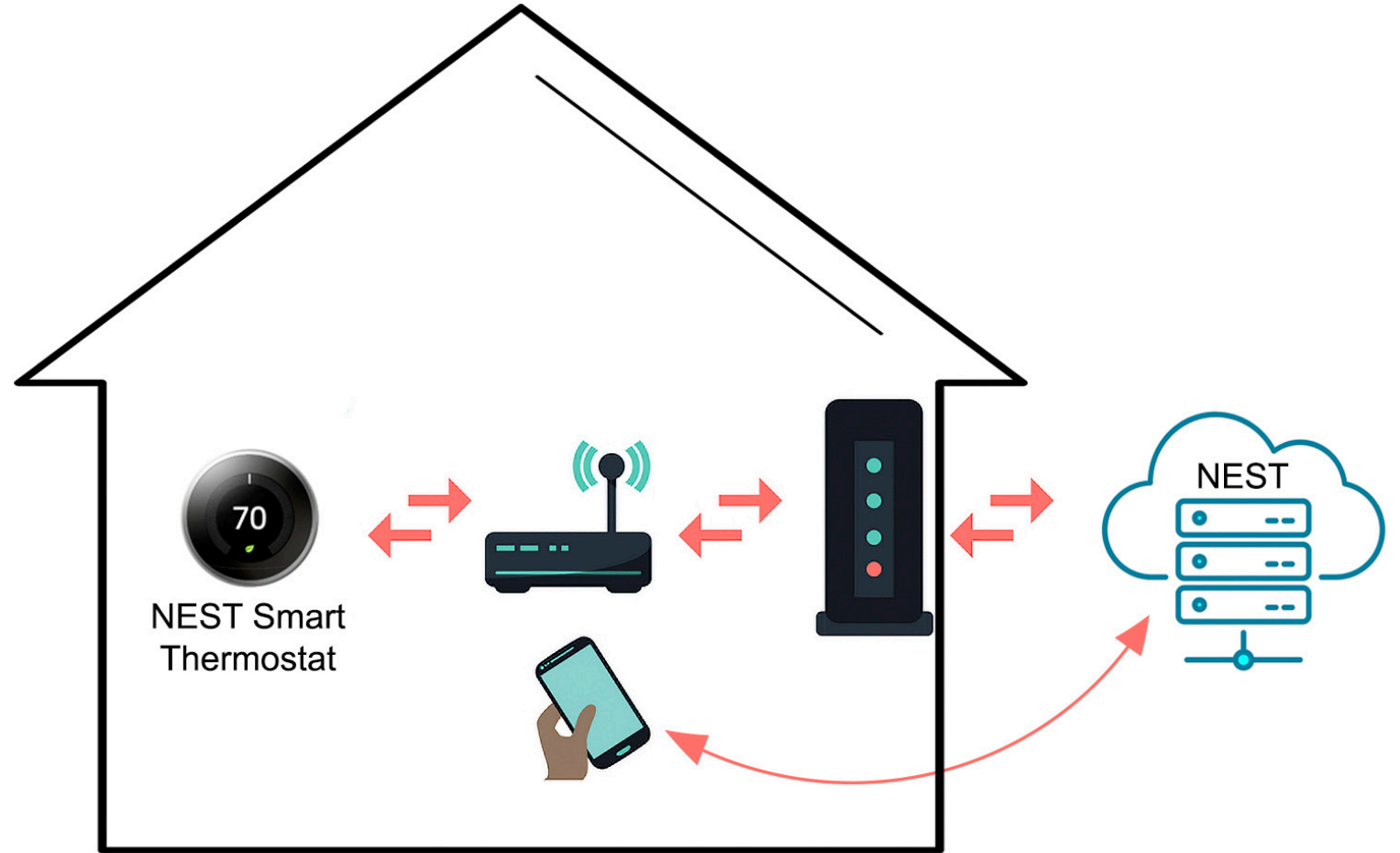
1. Wired Ethernet
2. Solid Wifi coverage
3. Mesh Wifi
4. Wifi Extenders

Smart Home



Smart Home Connectivity

- Currently, most smart devices are controlled thru the Internet
 - Thermostat, camera, smart door lock, alarm, smart speaker, etc.



Why *Matter* Matters



matter

- Matter is a new standard for home smart devices
- It does not require the Internet for local control
- Uses Internet outside your local home network

Sum it up by Example

- Order a pair of shoes from Amazon
 - First, using snail mail
 - Second, over the Internet



Steps

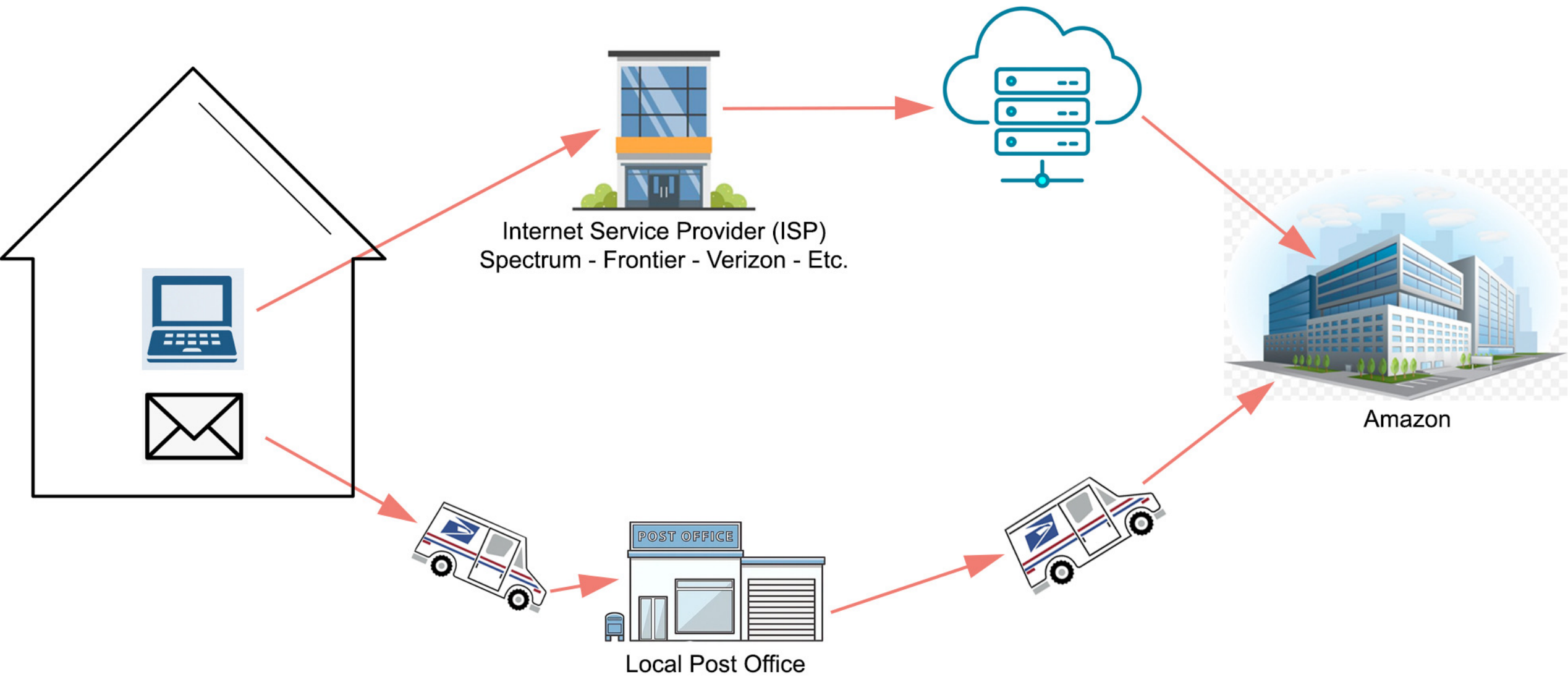


Snail Mail

1. Mail carrier picks up order
2. Delivers to Post Office
3. Post Office resolves physical address
4. Mail carrier delivers order to Amazon

Internet

1. Home browser requests Amazon.com
2. Local ISP resolves IP address
3. Session between home and Amazon
4. Browser opens online order



Questions

