

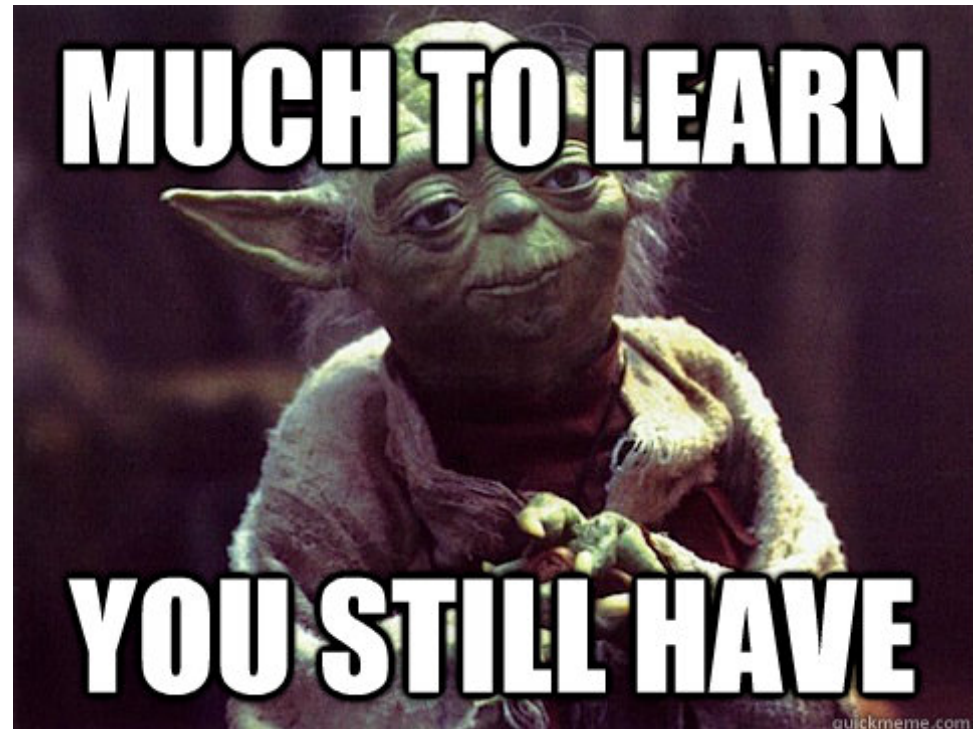
# Networking for the Mildly Curious

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## Goals for today

1. Learn technical definition of the Internet
2. Learn how the Internet works
3. Build a piece of the Internet
4. Profit



# What is a network?

- "A thing that lets two or more things send and get stuff in a familiar way."

# Nerdy definition of network

- A tool that lets two or more **nodes** (or **devices** or **endpoints**) communicate via a **protocol**
- Nodes exchange data using **packets**

# internet or Internet?

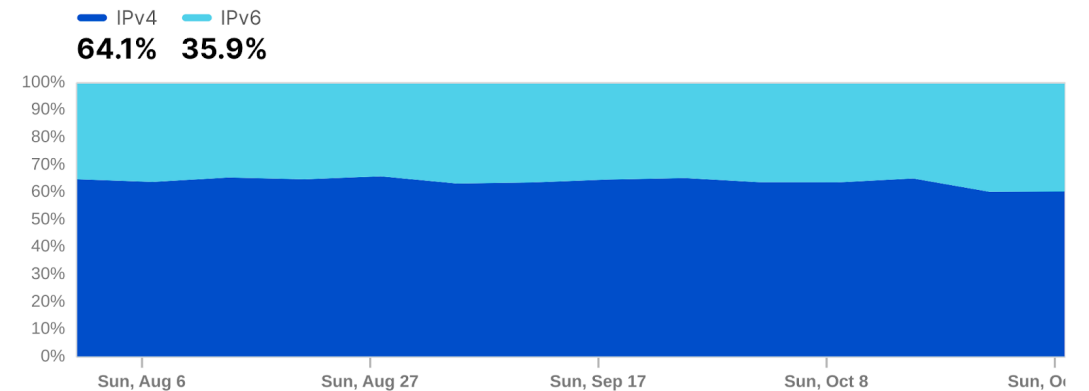
- internet = interconnected network
- Internet = global (for now) internet that uses TCP/IP protocol

# TCP/IP

- Transmission Control Protocol/Internet Protocol suite
- Developed in 1970s by Vint Cerf & Robert Kahn
- Every node on a network requires at least one **address**, every service has a **port number**
- IPv4 (1983): very-widely, showing its age, supports 4 billion addresses (4,294,967,296)
- IPv6 (2017): usage increasing, path to the future, supports 340 undecillion addresses (340,282,366,920,938,463,463,374,607,431,768,211,456)
- Up to 65K ports per node

## IPv4 vs. IPv6 (Worldwide)

Distribution of traffic by IP version

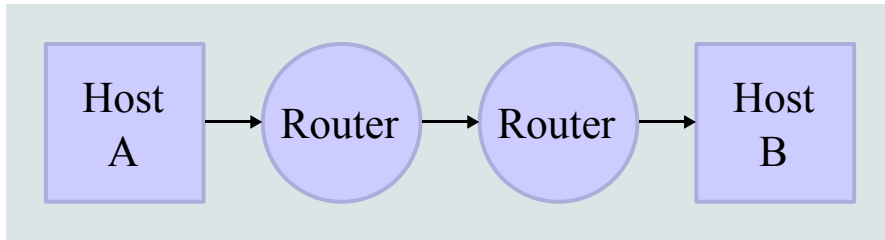


Cloudflare Radar

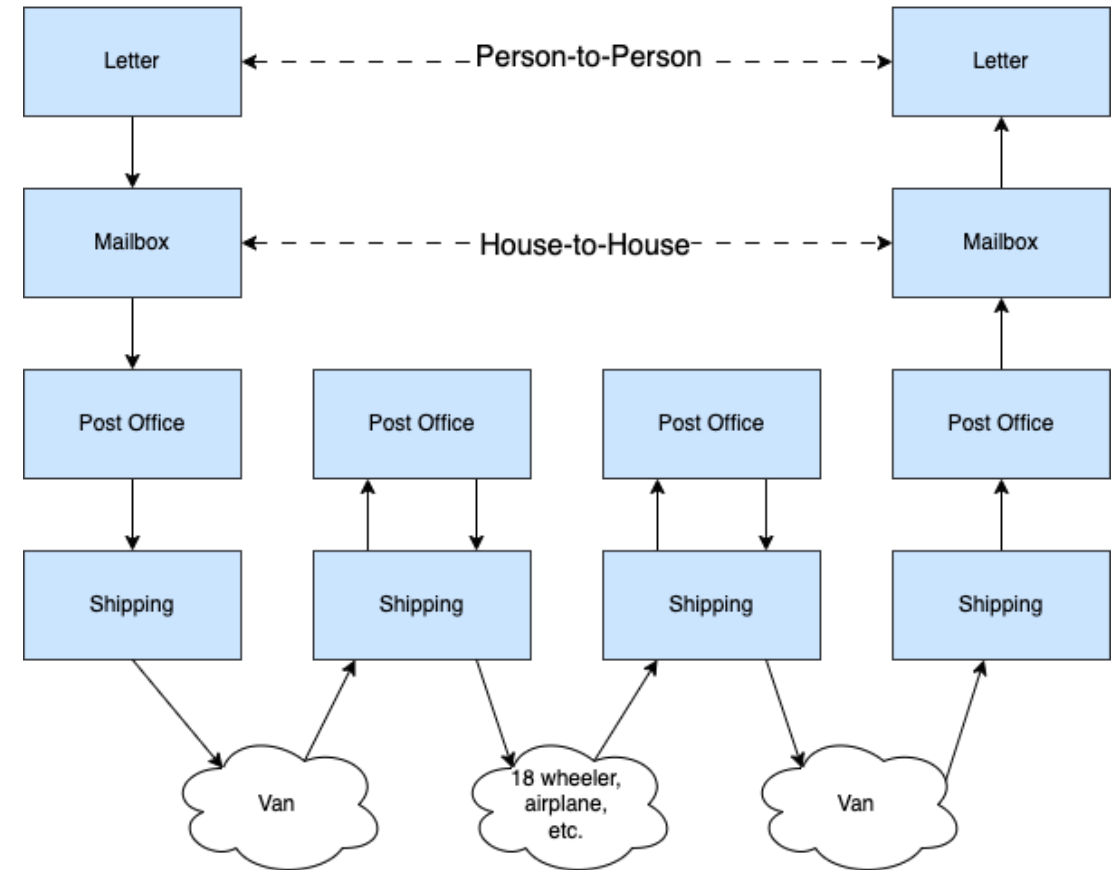
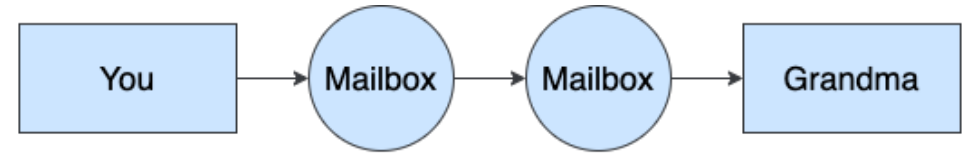
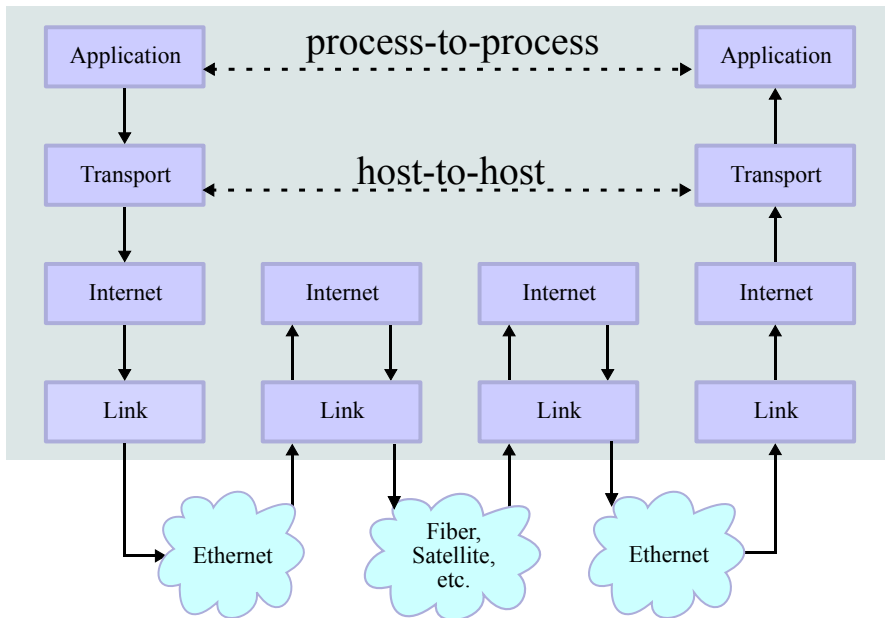
Aug 1 2023 00:00 UTC → Oct 31 2023 00:00 UTC

# TCP/IP "Stack"

## Network Topology

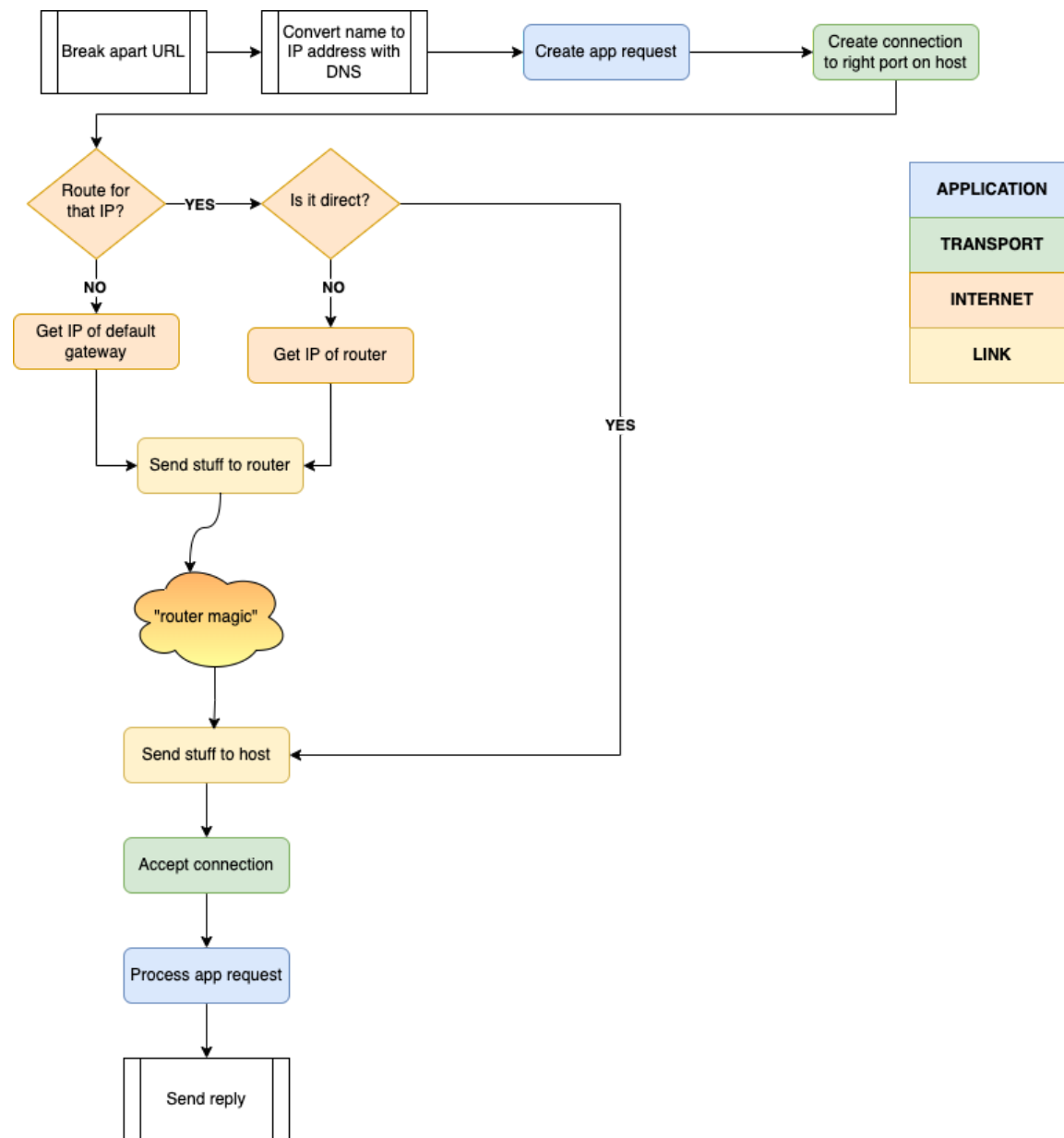


## Data Flow



# Peek behind the curtain

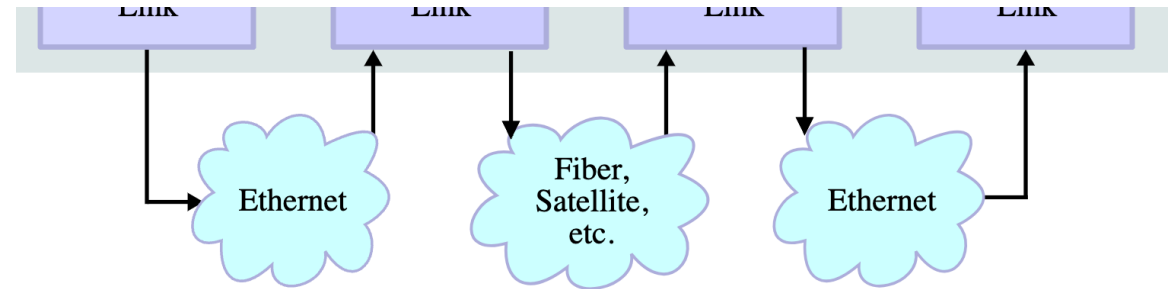
- Uniform Resource Locator (URL):  
`protocol://host/path`
- Domain Name System (DNS)
- IP address v4: `10.9.8.7`
- IP address v6:  
`2001:0db8:85a3::8a2e:0370:7334`
- Port: like a room in a building





# Physical Layer

- Cables: Coaxial, Unshielded Twisted Pair (UTP), Shielded Twisted Pair (STP)
- Fiber: Multi-mode (orange, aqua, violet, lime green), single-mode (yellow)
- Wireless: Wi-Fi (2.4, 5, 6, or 60 GHz), LTE & 5G, satellite



# Crimping UTP cable (TIA-568B standard)

