Lecture 19: Computer Networking

CSE 29: Systems Programming

Aaron Schulman

UCSDCSE

Computer Science and Engineering

A “Simple” Task

- Send information from one computer to another

Host

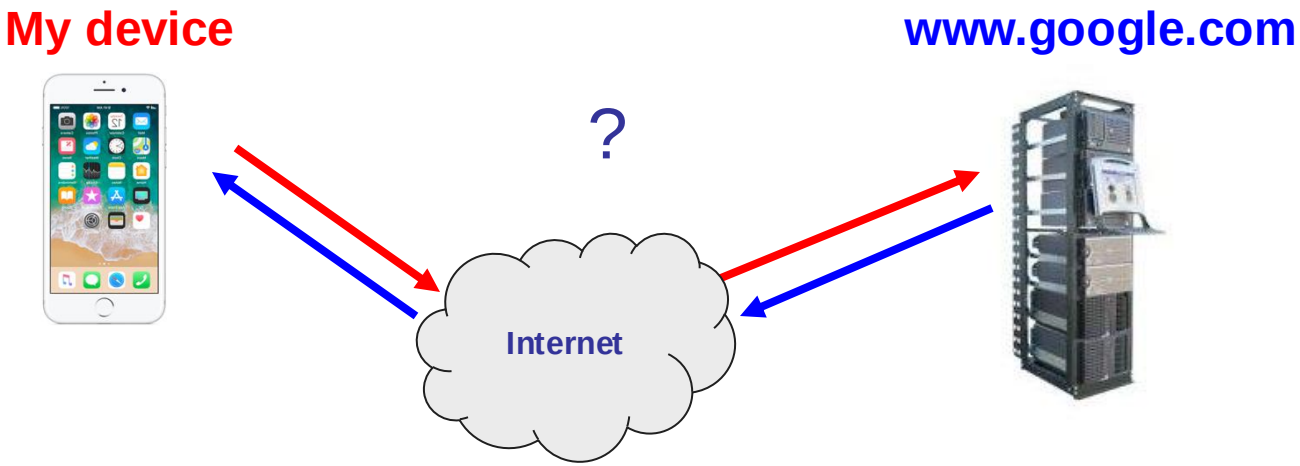
- Endpoints are called hosts
  - Could be computer, iPhone, laptop, etc.
- The plumbing is called a link
  - We don’t care what the physical technology is: Ethernet, wireless, cellular, etc.

Link

Host

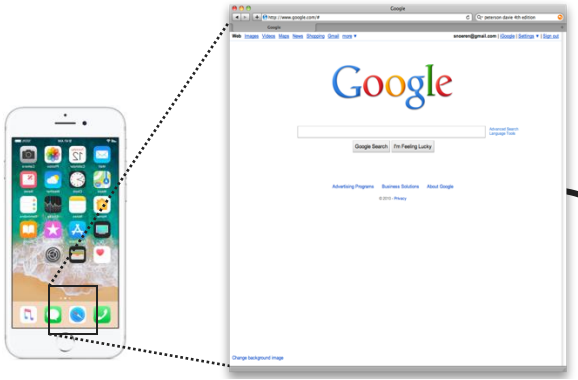
Actually Quite Complicated

- **ROUGHLY**, what happens when I click on a Web page from UCSD?



Web request (HTTP)

- Turn click into HTTP request



GET http://www.google.com/ HTTP/1.1
Host: www.google.com
Connection:keep-alive
…

Name resolution (DNS)

- Where is www.google.com?

My device
(132.239.9.64)

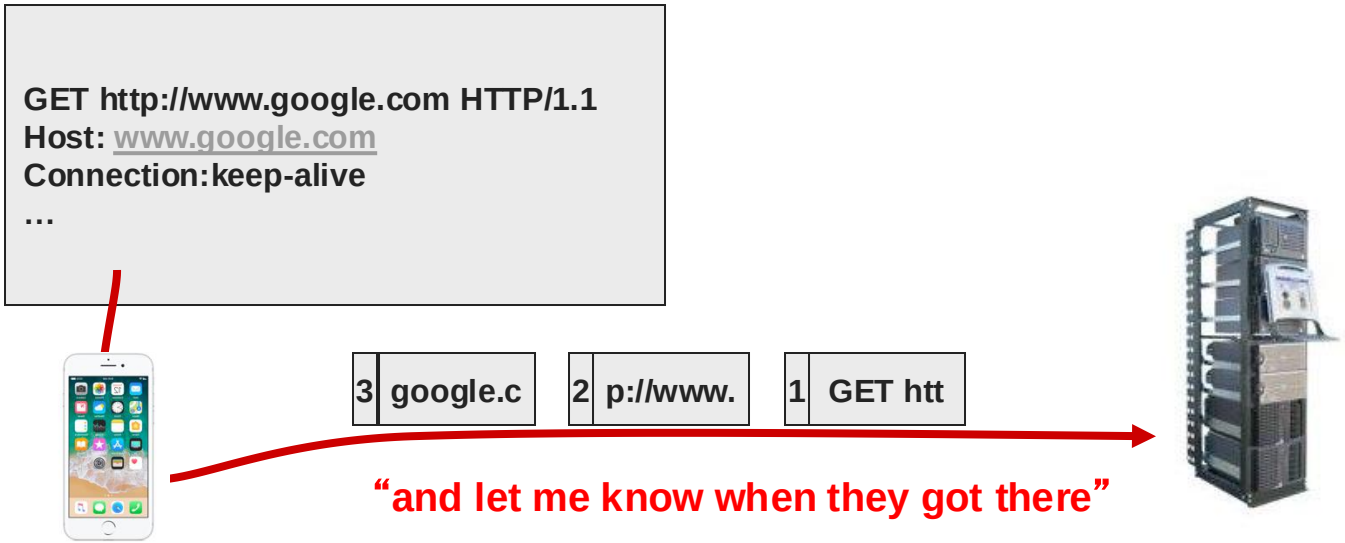
What's the address for www.google.com

Oh, you can find it at 66.102.7.104

Local DNS server
(132.239.51.18)

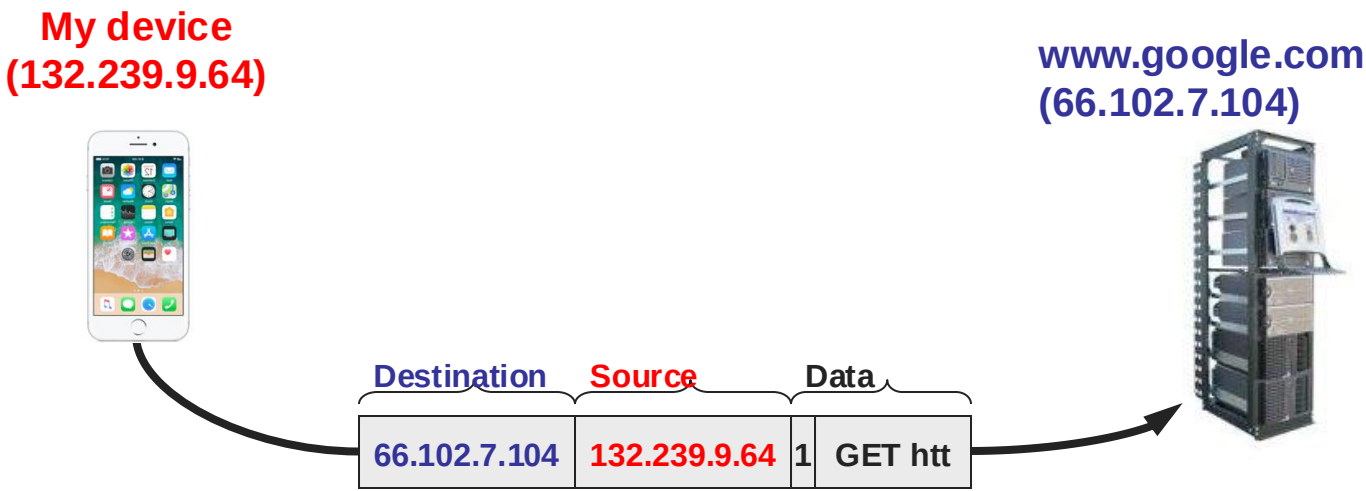
Data transport (TCP)

- Break message into packets (TCP segments)
- Should be delivered reliably & in-order



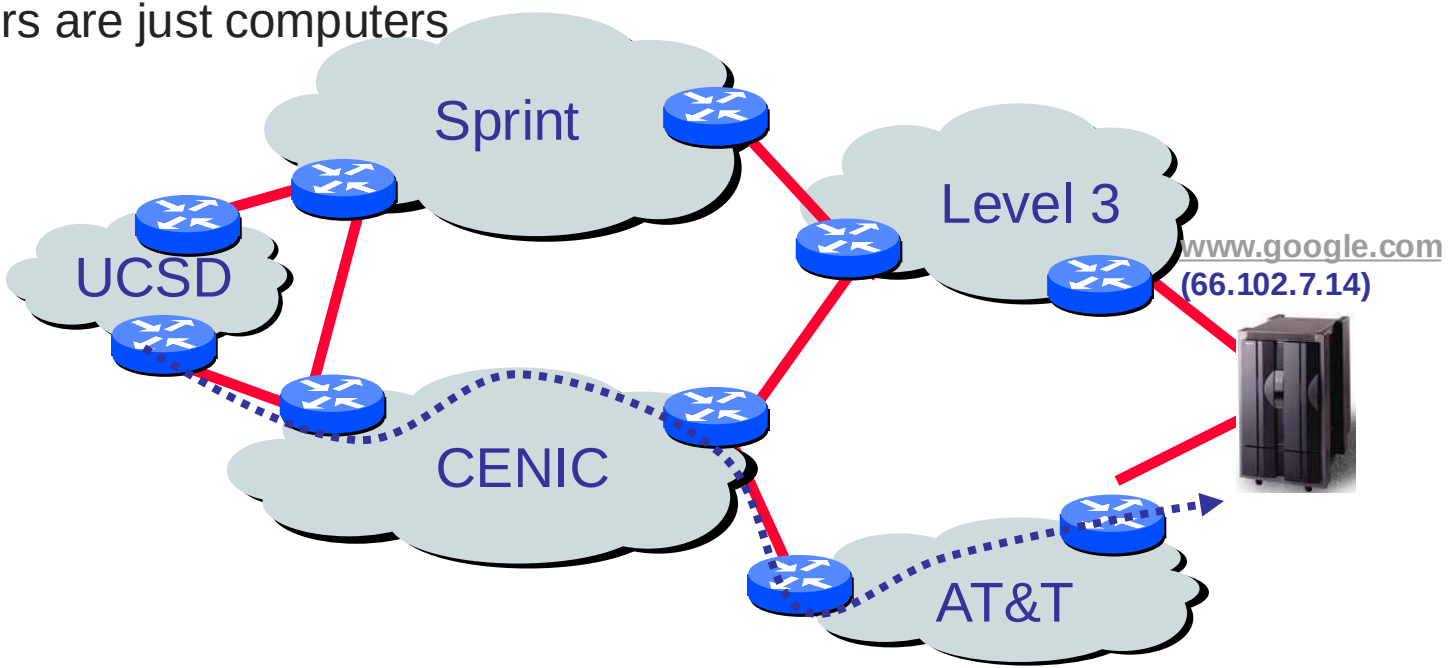
Global Network Addressing

- Address each packet so it can traverse network and arrive at host



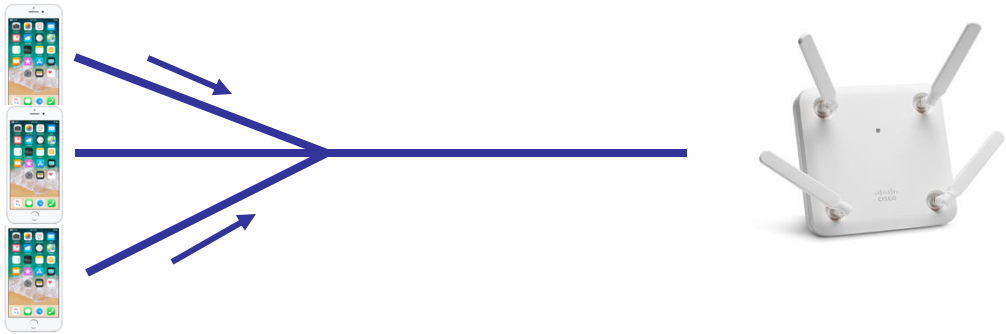
Network Routing

- Each router forwards packet towards destination
- Routers are just computers



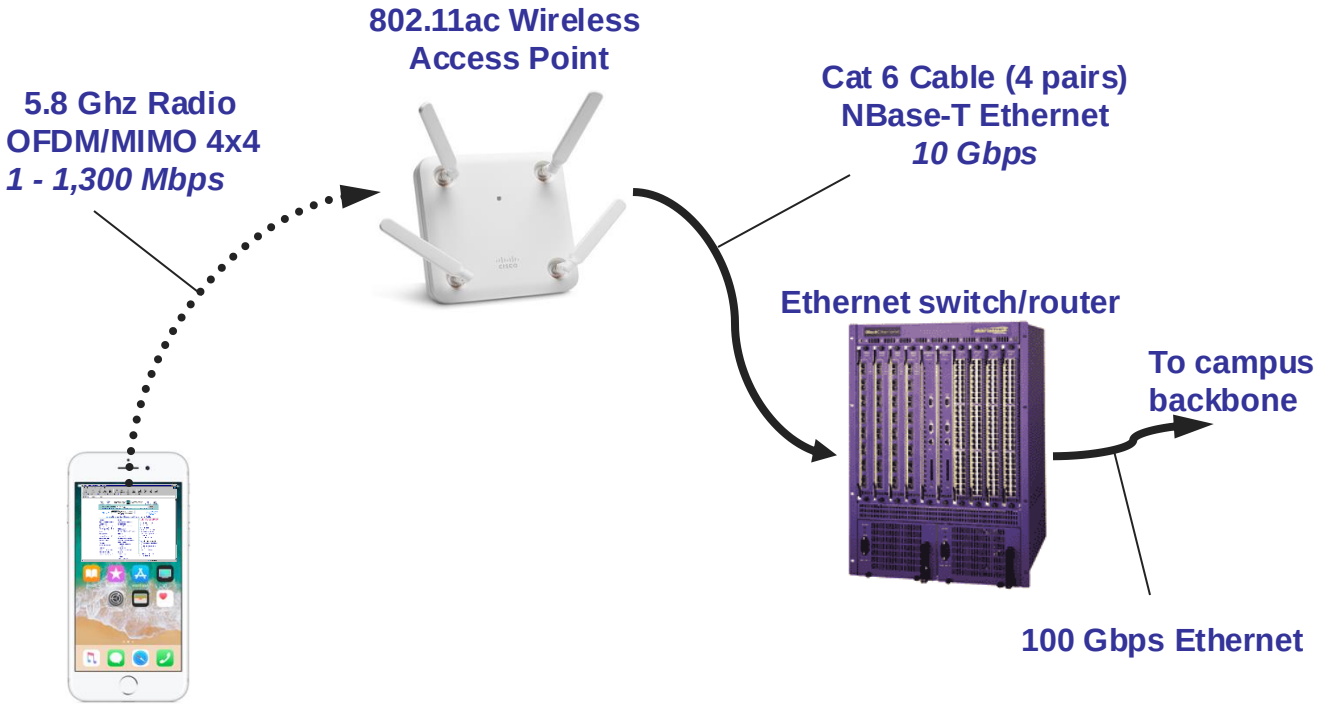
Link management (WiFi)

- Break message into frames
- Media Access Control (MAC)
  - Can I send now? Can I send now?

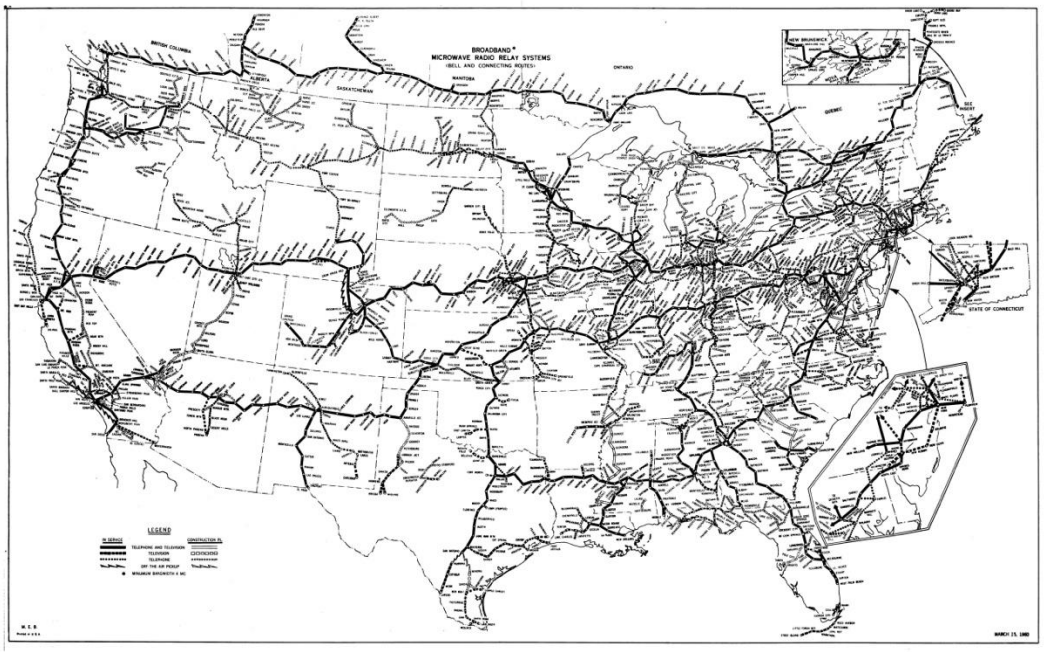


- Send frame

Physical layer



How do packets travel across the country?



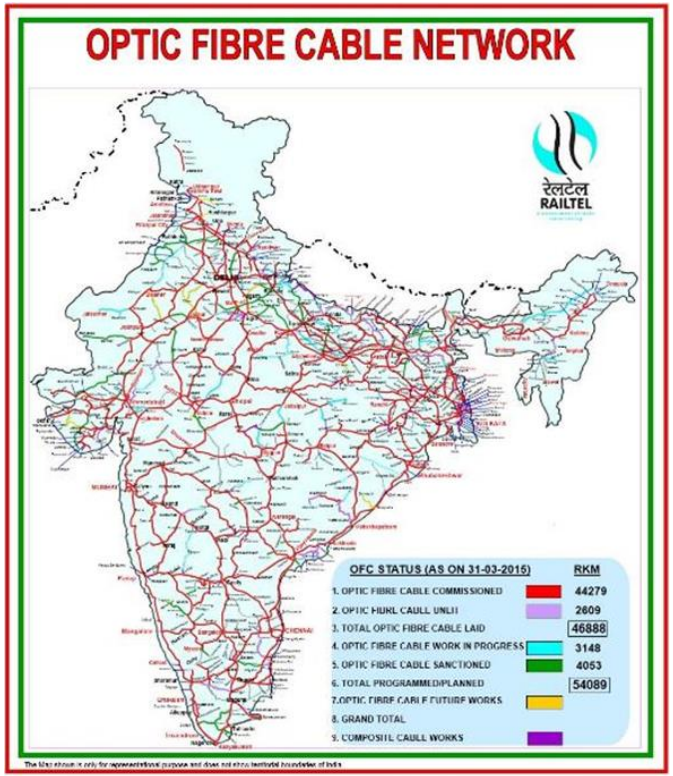
It started as microwave links between towers

Hillcrest, San Diego Site

Directional microwave antennas pointing northeast

This building holds the core routers for all of AT&T San Diego

The railroads brought the ultra-high speed Internet we have today



Undersea cables interconnect continents