Domain Name System (DNS)

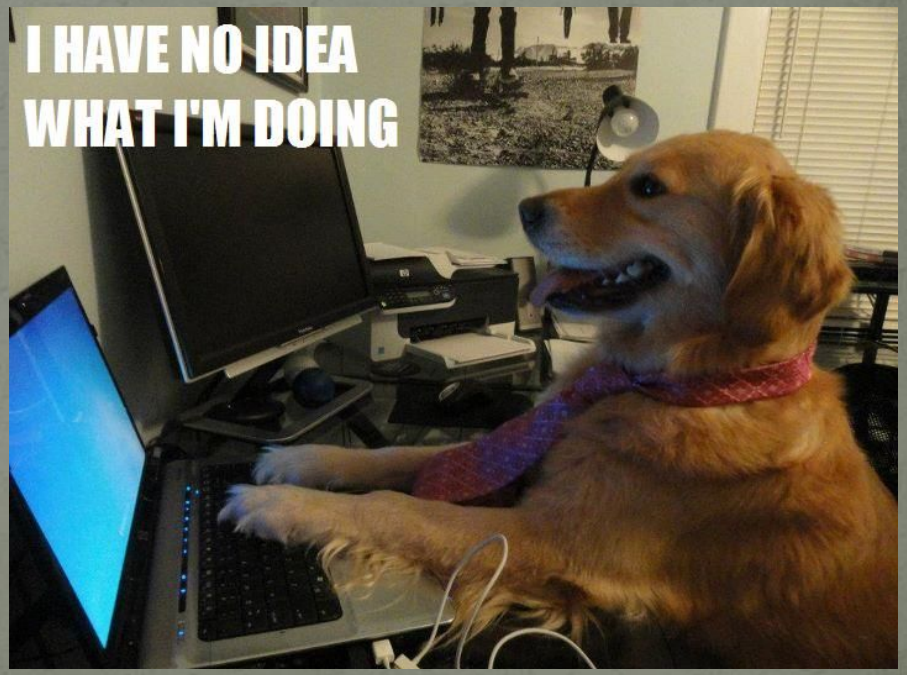
CSE 461 Section (Week 0x02)

Addressing So Far

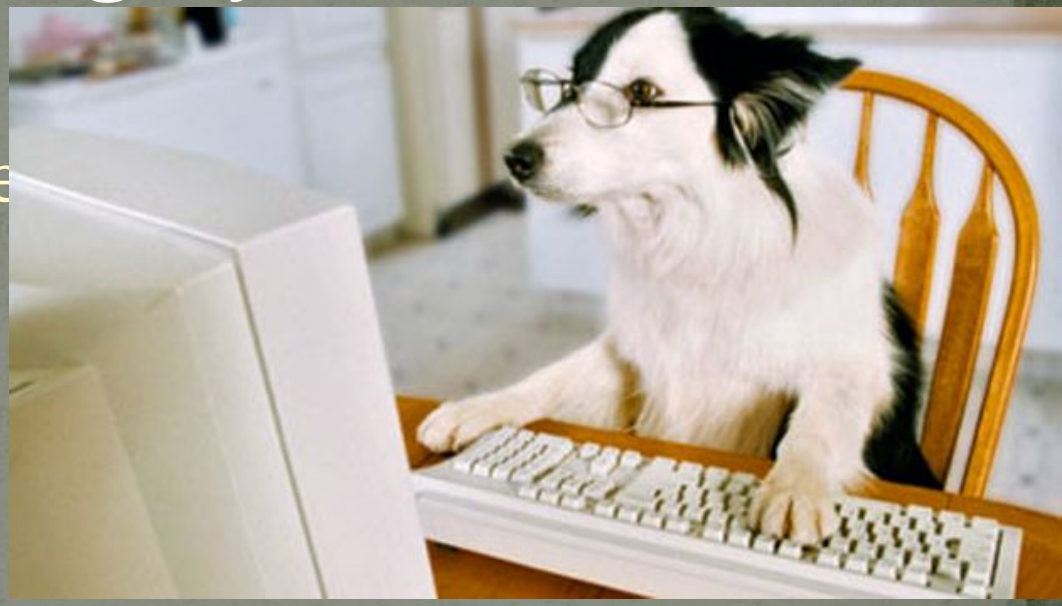
- Port numbers for applications
- MAC addresses for hardware
- IP addresses for a way to send data in a smart, routable way

Problems with MACs/IPs/Ports

- Humans (and dogs!) are bad at remembering strings of numbers
- We need a human-friendly naming system!



Requirements for Human-Readable Naming System



- What do we need?
  - As short as possible
  - Easy to memorize (i.e., not arbitrary)
  - Unique
  - Customizable
  - Hierarchical
  - Reflect organizational structure
  - A way to quickly translate to and from the existing, computer-friendly addressing systems
  - Ideally, we'd like to address specific resources as well

Enter…. Domain Names!

- Human-readable "domain names" map to IP addresses (names < 254 characters)
- A human can type www.google.com into their browser, and the browser will (somehow) know to go to 173.194.33.179
- But how might this be done?
  - Some sort of hash (not really practical)
  - A file of all of the mappings
  - Separate servers to provide the mappings

In the Beginning…

- All domain name/IP address mappings stored in /etc/hosts
- Live demo
- But this sucked… why?
  - Doesn't scale to large number of domain names
  - Not authoritative
  - Errors common

DNS Servers Are the Answer!

- Systems keep a small cache of mappings they know
- When a domain name is used that isn't in the cache, the system queries a name server
- Simple communication on port 53
- Database is distributed
- Hierarchical namespace: it's name servers all the way down

Resolving a Domain Name

- If I type shop.spacex.com, what happens?
  - Check /etc/hosts
  - Check DNS cache (note: negative caching exists!)
  - Check local DNS server
  - Go down hierarchy and ask:
    - Ask . DNS root server
    - Ask .com TLD (Top Level Domain) server
    - Ask spacex.com's NS
    - Send HTTP request to the IP address obtained
- Demo

Domain Names in Practice

- Who's purchased a domain name before?
- Name registrars
- ICANN
  - Internet Corporation for Assigned Names and Numbers
- Propagation delays
- Demo

Multiple IP Addresses and Aliasing

- DNS servers can return different IP address results for the same domain name
- Why is this useful?
- Demo
- Also, multiple domain names can map to one IP address (shared web hosting)
- Why is this useful?
- Demo

Questions?