

Domain Name System (DNS)

CSE 461 Section (Week 0x02)

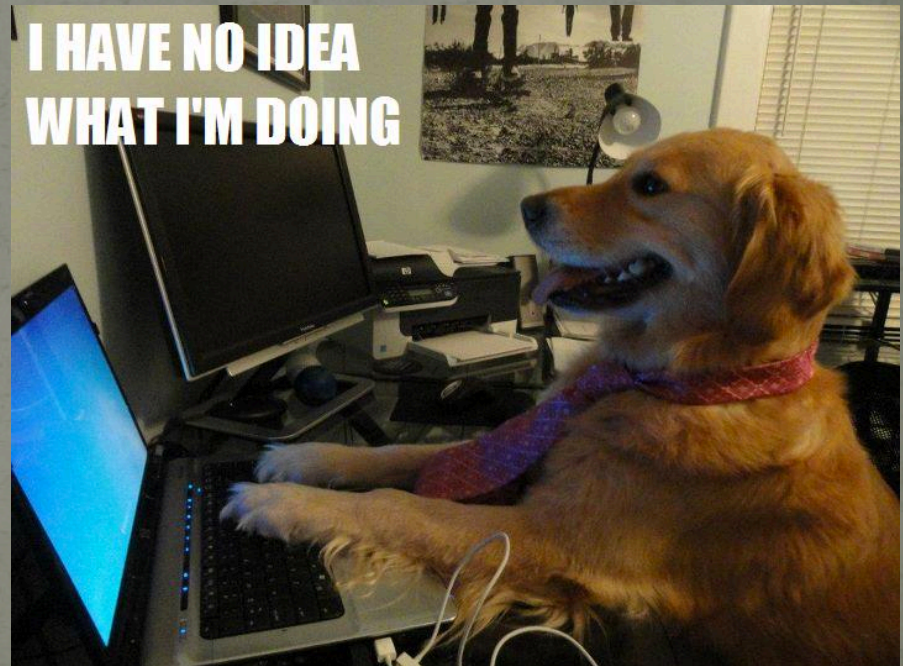
Addressing So Far

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



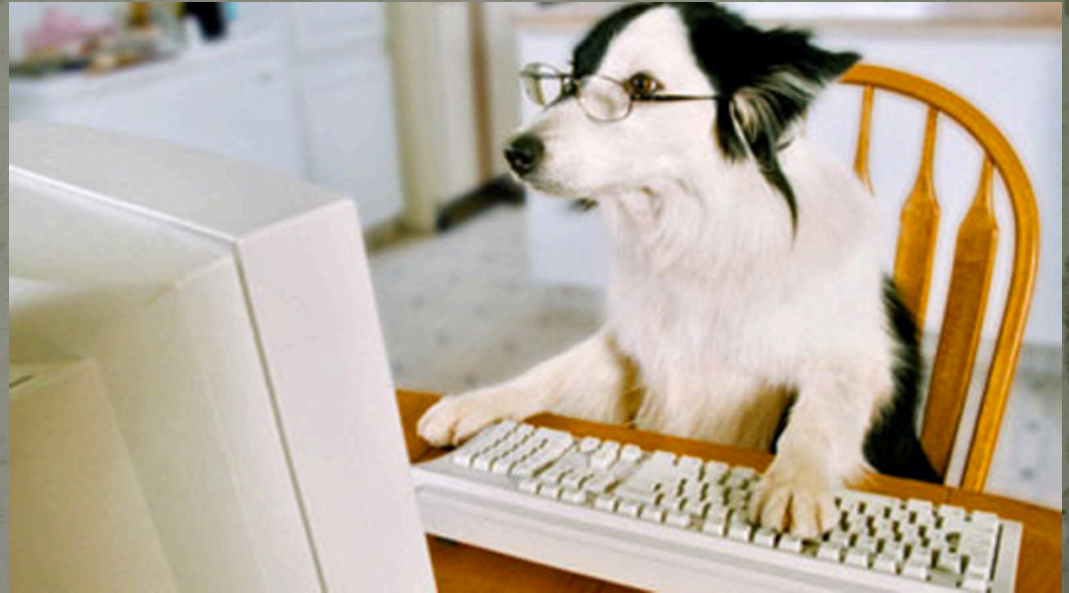
Problems with MACs/IPs/Ports

- 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
- Why is this useful?
- Demo



Attacks and Other Fun

- What are some ways this system can break?
 - DoS attacks on DNS server
 - Done before, in 2002 and 2007
 - Not much impact due to filtering and caching
 - Return incorrect IP address to a DNS request
 - Could even return the IP of our own server!
 - Commonly done by ISPs
 - Compromise root servers
- Google DNS



DNS Story



Questions?

