

# Our course reps

- Thanks to our diverse student volunteers!

- B01: Sam Finke
- B02: Preet Toor
- B03: Victor Kamel
- B04: Nubia De La Torre
- B05: Samantha Carter
- B06: Serena Wollersheim
- their uvic email address on brightspace



- AAA: Aggregate, Amplify and Anonymize
  - we do welcome student feedback directly too

# Computer Networks

## Domain Name System

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### Local DNS name server

- ❖ does not strictly belong to hierarchy
- ❖ each ISP (residential ISP, company, university) has one
  - also called “default name server”
- ❖ when host makes DNS query, query is sent to its local DNS server
  - has local cache of recent name-to-address translation pairs (but may be out of date!)
  - acts as proxy, forwards query into hierarchy

Application Layer 3-94



# Common *mistakes* in P1

- *“The server does not support multiple clients”*
  - please see p1 spec on concurrent clients
  - select()
- *“Some students are using a library called ...”*
  - don’t wrap around an existing HTTP module
  - please do not shortcut the learning process
- *“Many students have just started reading Tutorial 1”*
  - please follow the weekly schedule in the spec
  - late-start actually takes much more time

# Review: Web/HTTP

- Web
  - URI/URL, HTML tags
  - embedded vs linked objects
- HTTP
  - request and response
  - persistence, statefulness
  - web caching, content delivery
- Where is `www.google.com`?

# Today's topics



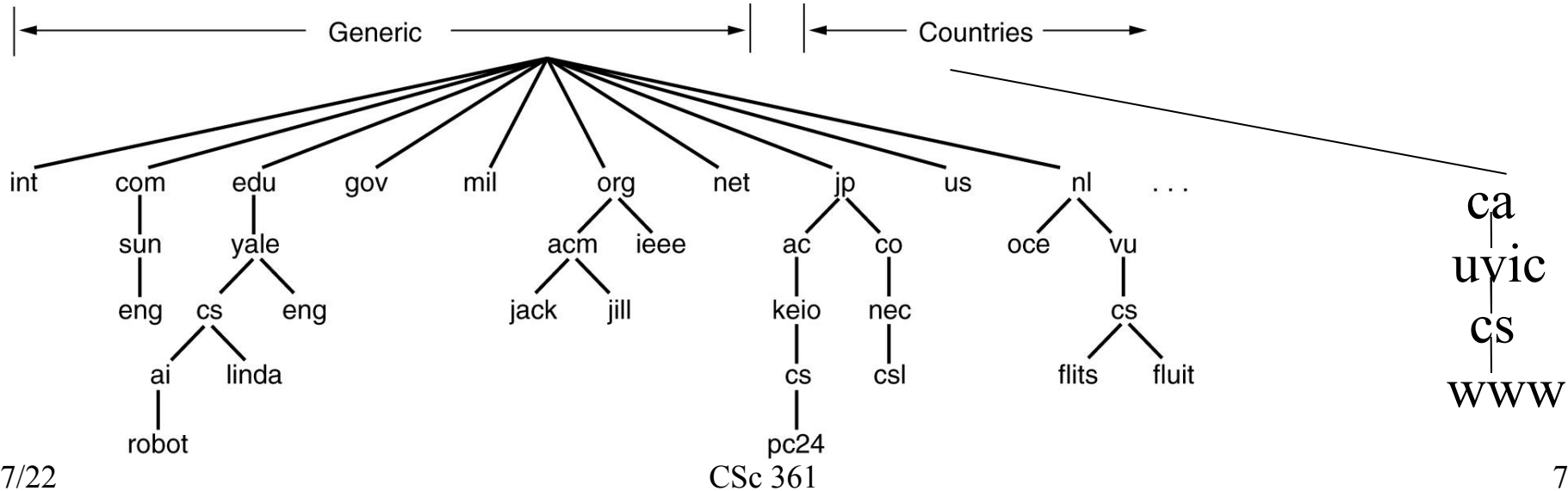
- Domain Name System (DNS)
  - DNS basics
    - host and domain names
    - DNS hierarchies
  - how to register your name-address mapping
    - DNS resource records
  - how to get your name-address mapping resolved
    - DNS resolution queries

# Domain names

- You say “www.google.com”
  - host name: www
  - domain name: google.com
- I say “66.102.7.104”
  - IPv4 address (4 bytes)
- Name-address mapping
  - initially, centralized hosts.txt
  - doesn’t scale!

# DNS name space

- Hierarchical, distributed
  - gTLD: generic top-level domain
  - ccTLD: country-code top-level domain



9/27/22

\* internationalized domain names

Q: [www.cs.uvic.ca](http://www.cs.uvic.ca)

# Name hierarchy

- `www.cs.uvic.ca.`
  - root: `.`
  - ccTLD: `ca.`
  - UVic: `uvic.ca.`
  - CS@UVic: `cs.uvic.ca.`
- address hierarchy: `142.104.70.161`
  - UVicNet: `142.104 (*)`
  - EngrNet: `142.104.64~95`
    - moved from `142.104.96~127`



# DNS: client's view

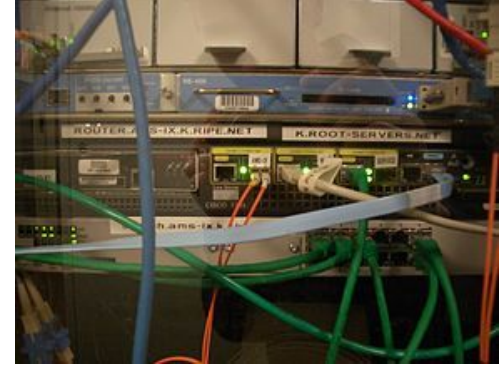
- Local DNS resolver: `gethostbyname()`
  - `/etc/host.conf`
    - `order`            `hosts,bind`
  - `/etc/hosts`
    - `1.2.3.4`        *nameserver*
  - `/etc/resolv.conf`
    - **nameserver**    `1.2.3.4`
- Local DNS server: does the real job!
  - DNS “proxy”; more at DNS queries part

# DNS: servers

- Local DNS server
  - where's `www.cs.uvic.ca`.
- Root DNS server (.): `{a..m}.root-servers.net`
  - ask `ca0{1..6}.cira.ca.`, `ns-ext.isc.org`
- TLD DNS server (.ca.): `ca0{1..6}.cira.ca`
  - ask `dns{1|2}.uvic.ca.`, `ns3.uvic.ca.`, `ns.pinc.com`
- Authoritative DNS server
  - primary, secondary

# Root DNS servers

- {a..m}.root-servers.net.



k.root



13 root name  
servers worldwide

# root-servers with mirror/anycast



```

; Authoritative data for cs.vu.nl
cs.vu.nl.      86400   IN  SOA      star boss (952771,7200,7200,2419200,86400)
cs.vu.nl.      86400   IN  TXT      "Divisie Wiskunde en Informatica."
cs.vu.nl.      86400   IN  TXT      "Vrije Universiteit Amsterdam."
cs.vu.nl.      86400   IN  MX       1 zephyr.cs.vu.nl.
cs.vu.nl.      86400   IN  MX       2 top.cs.vu.nl.

```

```

flits.cs.vu.nl. 86400   IN  HINFO    Sun Unix
flits.cs.vu.nl. 86400   IN  A        130.37.16.112
flits.cs.vu.nl. 86400   IN  A        192.31.231.165
flits.cs.vu.nl. 86400   IN  MX       1 flits.cs.vu.nl.
flits.cs.vu.nl. 86400   IN  MX       2 zephyr.cs.vu.nl.
flits.cs.vu.nl. 86400   IN  MX       3 top.cs.vu.nl.
www.cs.vu.nl.   86400   IN  CNAME    star.cs.vu.nl
ftp.cs.vu.nl.   86400   IN  CNAME    zephyr.cs.vu.nl

```

```

rowboat         IN  A        130.37.56.201

```

```

little-sister   IN  A        130.37.56.201
                 IN  HINFO    Mac II

```

```

laserjet        IN  A        192.31.231.165
                 IN  HINFO    "HP LaserJet"

```

# DNS

## resource

## records

Type	Meaning	Value
SOA	Start of Authority	Parameters for this zone
A	IP address of a host	32-Bit integer
MX	Mail exchange	Priority, domain willing to accept e-mail
NS	Name Server	Name of a server for this domain
CNAME	Canonical name	Domain name
PTR	Pointer	Alias for an IP address
HINFO	Host description	CPU and OS in ASCII
TXT	Text	Uninterpreted ASCII text

# SOA, NS

- **dig soa cs.uvic.ca**

- cs.uvic.ca. 43200 IN SOA active.uvic.ca.  
gduncan.dns.engr.uvic.ca. 705181509 3600 300 604800 1800
  - origin = active.uvic.ca; mail addr = gduncan.dns.engr.uvic.ca;  
serial = 705181509; refresh = 3600 (60 minutes); retry = 300 (5 minutes); expire = 604800 (7 days); minimum = 1800 (0.5 hour)
  - replication consistency control

- **dig ns cs.uvic.ca**

- cs.uvic.ca. 40800 IN NS dns1.uvic.ca.
- cs.uvic.ca. 40800 IN NS active.uvic.ca.

- dig **mx** cs.uvic.ca
  - cs.uvic.ca. 43200 IN MX 0 mta.cs.uvic.ca.
    - priority = 0 (highest)
    - often at least 2 for each domain for email resilience
- dig **a** cs.uvic.ca
  - cs.uvic.ca. 43200 IN A 142.104.100.110
- dig **cname** www.cs.uvic.ca
  - www.cs.uvic.ca. 42383 IN CNAME thing2.cs.uvic.ca.
- dig **a** thing2.cs.uvic.ca
  - thing2.cs.uvic.ca. 43200 IN A 142.104.100.111
- dig **ptr** 111.100.104.142.in-addr.arpa
  - 111.100.104.142.in-addr.arpa. 43200 IN PTR thing2.cs.UVic.CA.