

# CSc 450/550

## Computer Networks

### Domain Name System

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## Review: HTTP

- URL
  - <http://www.cs.uvic.ca/~pan/csc450>
- HTTP
  - client-server model
  - request-reply transaction
- HTML
  - anchors
  - objects

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# Domain names

- You say
  - www.cs.uvic.ca
  - hostname+domain name
- I say
  - 142.104.100.111
  - IPv4 address
- Name-address mapping
  - initially, centralized hosts.txt; doesn't scale!

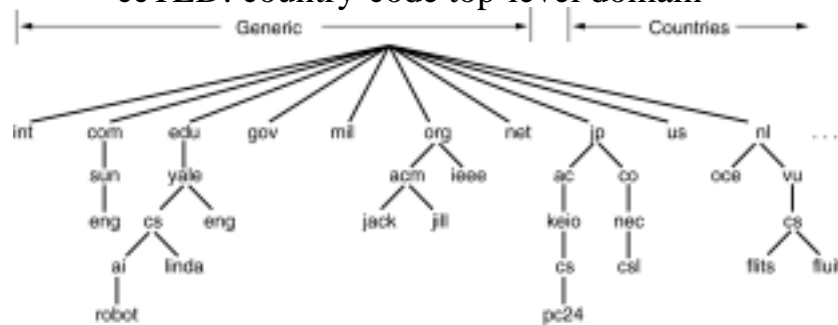
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# Name space

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



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## DNS: client 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
  - DNS “proxy”

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## DNS: servers

- Local DNS server
  - where's `www.cs.uvic.ca`.
- Root DNS server (`.`)
  - ask `ca01.cira.ca`.
- Top-level-domain DNS server (`.ca`)
  - ask `dns1.uvic.ca`.
- Authoritative DNS server
  - primary, secondary

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# Root DNS servers

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



## DNS resource records

```

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.

lits.cs.vu.nl. 86400 IN HINFO Sun Unix
lits.cs.vu.nl. 86400 IN A   130.37.16.112
lits.cs.vu.nl. 86400 IN A   192.31.231.165
lits.cs.vu.nl. 86400 IN MX   1 lits.cs.vu.nl.
lits.cs.vu.nl. 86400 IN MX   2 zephyr.cs.vu.nl.
lits.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
              IN MX   1 rowboat
              IN MX   2 zephyr
              IN HINFO Sun Unix

litle-sister
smerjet
  
```

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

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# DNS queries

- Local DNS resolver-server

```
#nslookup
>set debug
>www.cs.uvic.ca
QUESTIONS
    www.cs.uvic.ca, type = A, class = IN
ANSWERS
    -> www.cs.uvic.ca
    canonical name = thing2.cs.uvic.ca.
    -> thing2.cs.uvic.ca
    internet address = 142.104.100.111
```

### AUTHORITY RECORDS

```
-> cs.uvic.ca
nameserver = active.uvic.ca.
-> cs.uvic.ca
nameserver = dns1.uvic.ca.
```

### ADDITIONAL RECORDS

```
-> dns1.uvic.ca
internet address = 142.104.6.1
-> active.uvic.ca
internet address = 142.104.96.2
```

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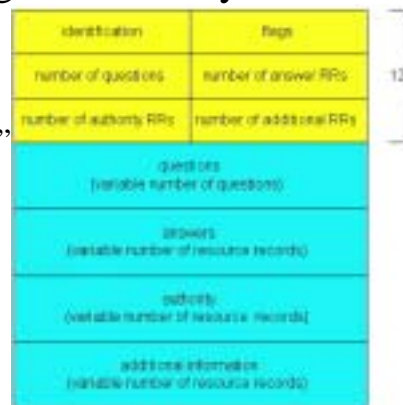
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# DNS queries: more

- Local DNS server and higher hierarchy

- recursive query
- iterative query
  - “you can ask someone else”

- Reply cache
  - time-to-live (TTL)
- Attacks on DNS
  - cache poisoning



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## This lecture

- DNS
  - DNS structure
  - DNS server
    - DNS resource records
  - DNS queries
- Explore further
  - BIND
    - /etc/named.conf, /var/named

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## Next lecture

- Content delivery networks
  - HTTP and DNS

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