Domain Name System (DNS)

Practical 9

UCD School of Computer Science

November 2018

Domain Name System - Introduction

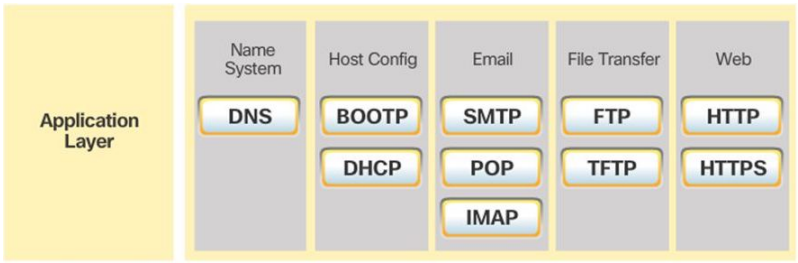


Figure: DNS at Application layer

- **Domain Name System (DNS)**
  - To resolve the host name to IP address.
  - **Distributed** and **hierarchical** database
  - `UDP` and `TCP` port 53

Why DNS ?

- **User friendly**
  - We don't need to remember IP address.
- **Load balancing**
  - One domain name may have various IP addresses (see example below)
- **Decoupling**
  - Can move DNS server to different networks or ISP, etc.

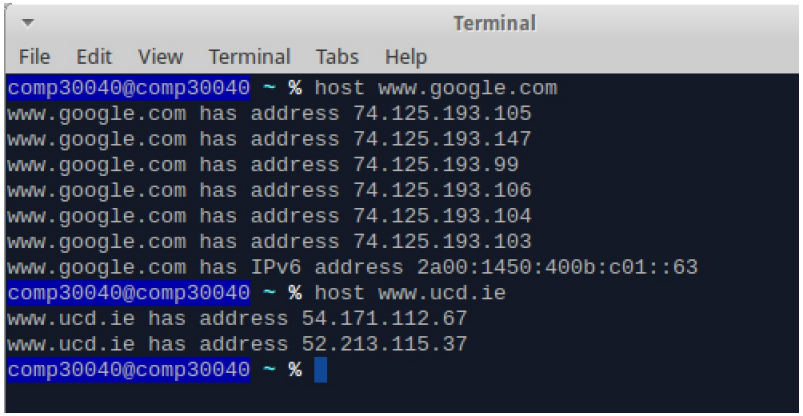


Figure: Example of translating from domain name to IP address

DNS Hierarchy

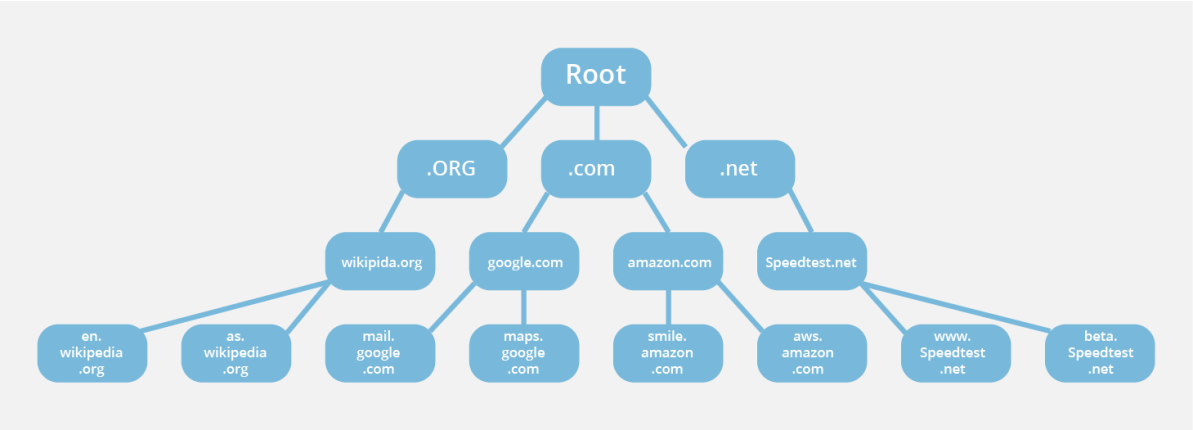


Figure: DNS Hierarchy

- Domain Names are hierarchical, each part of a domain name is referred to as either:
  - **Root** at the top of hierarchical tree
  - **Top Level Domains (TLDs)**, e.g., `.com`; `.org`; `.gov`; `.ie`; etc.
  - **Second Level Domains**, e.g., `.ucd`; `.mci`; etc.
  - **Sub-domains**, e.g., `csi`; etc.
  - **Host name** (a resource record)

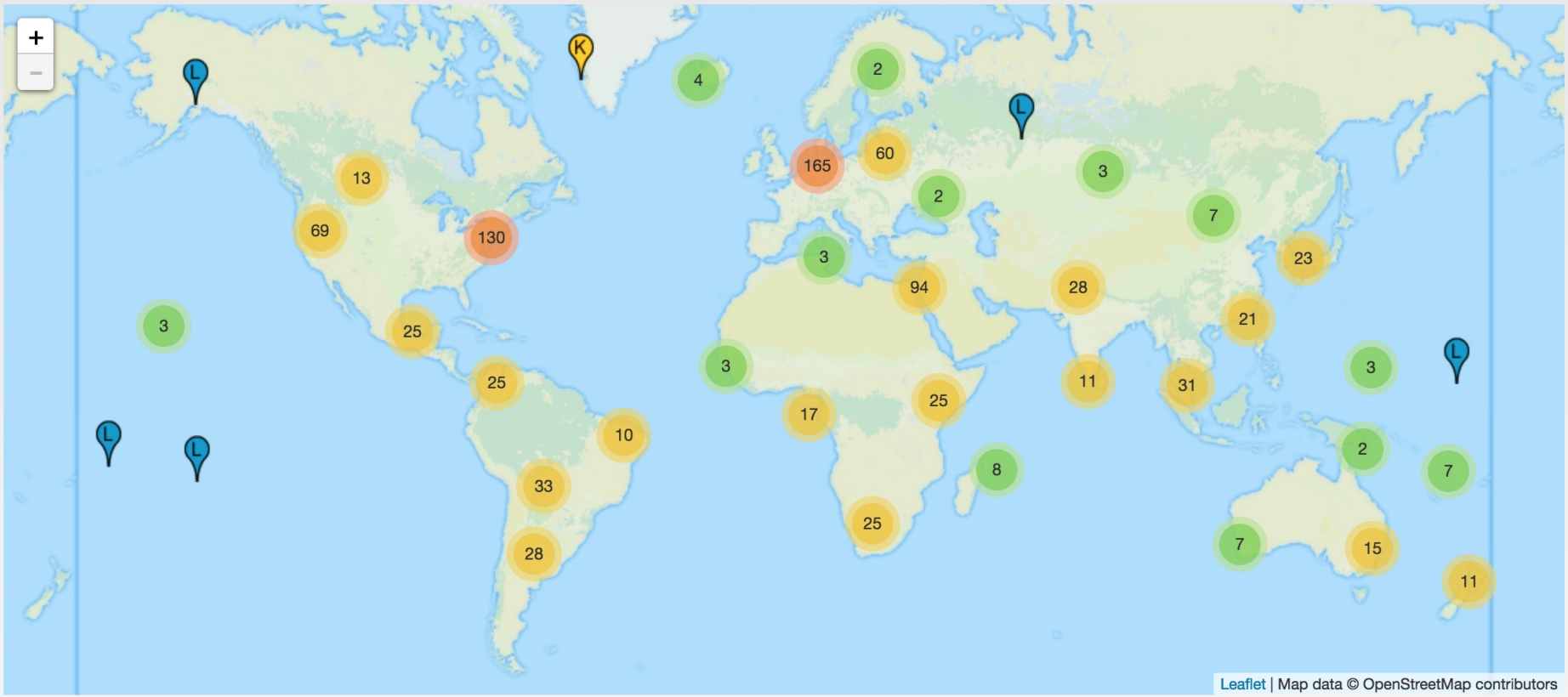
- **Top Level Domains (TLDs)**

Table: Top Level Domains (TLDs) examples (Source: ICANN)

Domain Name	Entity
`.com`	commercial
`.net`	network
`.org`	organization
`.edu`	education
`.gov`	government
`.mil`	military

Root name servers

- The 13 root name servers are currently operated by 12 independent organizations.



As of 2018-11-16, the root server system consists of 919 instances operated by the 12 independent root server operators.

Figure: Source http://www.root-servers.org/

Domain Name System - How it works?

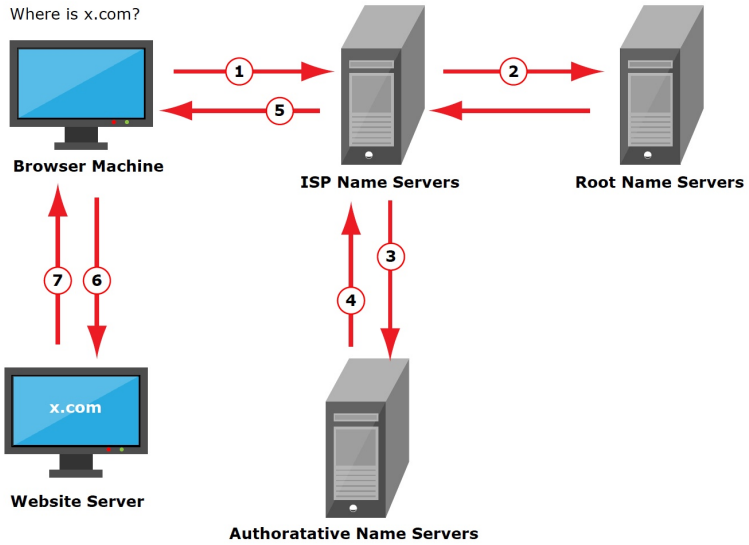


Figure: Working procedure of DNS

1. Web-browser asks ISP name server for the domain's IP address
2. If ISP's name server does not know $\rightarrow$ it queries **root name server** about the **authoratative name server**
3. ISP name server then queries **authoratative name server** about IP address of the domain.
4. **Authoratative name server** sends the domain's IP address back to ISP name server.
5. After the response from **authoratative name server**, ISP name server sends the domain's IP address to the Web-browser.
6. Web-browser now can use IP address of the domain to request web-page from the website server.
7. The domain's website server sends web page to the Web-browser (`html`, etc.)

DNS Resource Record

- Resource Records define data types in the Domain Name System (DNS)

Table: Some DNS Resource Record types (Source: IANA)

Type	Meaning
`A`	IPv4 address for given host.
`AAAA`	IPv6 address for given host
`NS`	authoritative name server for given host.
`SOA` (Start of Authority)	mark the start of a zone of authority
`MX` (Mail Exchange)	mail exchange server for a DNS domain name

ENJOY !!!