DNS

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Contents

1 DNS Reminder

- DNS maps host/domain names to IP addresses
- It can also map IP addresses to domain names

2 Why do we need DNS

- All domain names used to be stored on a file called `hosts.txt`
  - File was held by a single Information Centre and was distributed between hosts
- This only worked for a short while as the size of file grew astronomically and clearly it wasn't very smart

3 DNS overview

- DNS is *distributed* and *hierarchical*
- Operates on port 53
- Mostly uses UDP to function
- Domain names are delegated from ICANN through Top Level Domain (TLD) registrars

3.1 Example domain name

uglogin.soton.ac.uk

- Nominet control the `.uk` **TLD**
- The delegate the `ac.uk` to JISC
- Who delegate `soton.ac.uk` to the University
- How host an authoritative name server and can create a record for `uglogin.soton.ac.uk`

4 DNS record Types

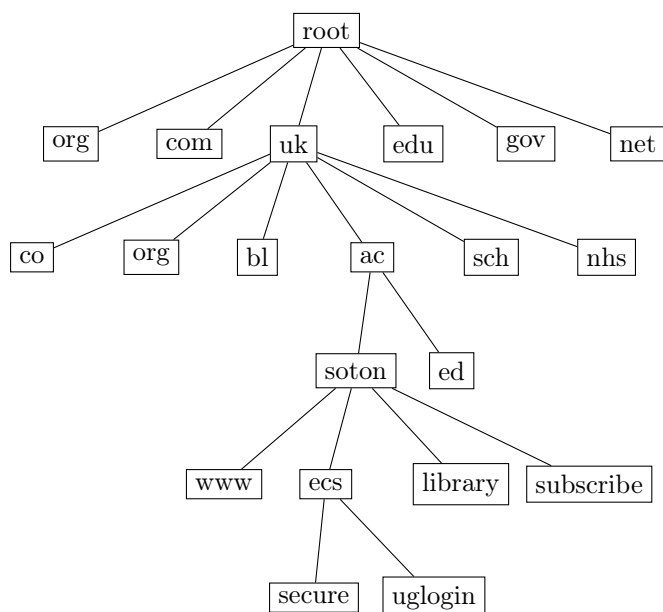| Type	Description	Value
SOA	Start of authority	Zone parameters.
AAAA	IPv6 record	128-bit Address.
A	IPv4 record	32-bit Address.
MX	Mail exchange	Mail servers that accept mail for this domain.
NS	Name server	Authoritative nameservers for this zone.
CNAME	Canonical name	Alias of one name to another. DNS lookup continues with the new name.
PTR	Pointer to a canonical name	Pointer to a canonical name. DNS lookup does not continue. Used for reverse DNS lookups and DNS-SD.
SRV	Service location	Used as a general service record for newer services instead of creating protocol-specific records like MX.
TXT	Text Record	Originally an uninterpreted text record. Now used for RFC1464, SPF, DKIM, DMARC, DNS-SD, etc.
HINFO	Host information	Minimal-sized response to an ANY query.

5   Looking Up Data

- Most common lookup is **host name to IP**
- This implicity requires that clients know about a DNS server they can send queiries to
    - May be the ADSL router in a home network
    - Or a DNS server run on the uni campus
    - There are also public DNS servers

6   DNS Terminology

- **Resolver** - Program that extracts information from name servers
- **Iterative Mode** - Server responds with a referral to another server
    - Generally runs iteratively (hierarchical)
- **Recursive Mode** - Server responds from local cache or resolves the query before replying to the client
- **Forwarder** - Sends query to a different DNS server

7   DNS Hierarchy

7.1   DNS Zones

- A DNS zone is a continuous chunk of name space. For example, `soton.ac.uk` is a zone.
- Each zone has an associated set of name servers. For instance, `soton.ac.uk` has its own name servers.
- Zones can be further divided into subzones. For example, `ecs.soton.ac.uk` is a subzone of `soton.ac.uk`, and it is created by the administrators of `soton.ac.uk`.

7.2   Zone Delegation

- Zones require the owner to delegate subzones
- Records within a zone should be stored redundantly

- Manually update primary name server
- Secondary name servers updated by zone transfer

8   Anycast

- Allows a client to reach the nearest instance of a service
- You can advertise the same IP to clients, and anycast will always give the nearest instance on.
  - This is done by routers based on topological distance via the routing system