DNS

Domain Name System

Need of DNS

- What is your voter's id number?
- What is your driving license number?
- What is your voter's id number?
- What is your university register number?
- What is your name?

Need of DNS...

- One identifier for a host is its **hostname.**

- **Hostnames** are mnemonic and are therefore appreciated by humans.

- such as:
  - cnn.com,
  - www.yahoo.com,
  - gaia.cs.umass.edu and
  - surf.eurecom.fr

Need of DNS…

- Hostnames provide little information about the location within the Internet of the host.

- A hostname such as surf.eurecom.fr, which ends with the country code .fr, tells us that the host is in France, but doesn't say much more.

- Furthermore, because hostnames can consist of variable-length alpha-numeric characters, they would be difficult to process by routers.

- For these reasons, hosts are also identified by so-called **IP addresses.**

Need of DNS...

- An IP address consists of four bytes and has a rigid hierarchical structure.

- An IP address looks like 121.7.106.83, where each period separates one of the bytes expressed in decimal notation from 0 to 127.

- An IP address is hierarchical because as we scan the address from left to right, we obtain more and more specific information about where the host is located in the Internet. (like a postal address)

- An IP address is included in the header of each IP datagram, and Internet routers use this IP address to route datagram towards its destination

Services Provided by DNS

- Among the two identities people prefer the more mnemonic hostname identifier, while routers prefer fixed-length, hierarchically-structured IP addresses.

- Hence we need a directory service that translates hostnames to IP addresses.

- This is the main task of the Internet's **Domain Name System (DNS).**

Services Provided by DNS...

The DNS is

(i) a distributed database implemented in a hierarchy of name servers and

(ii) an application-layer protocol that allows hosts and name servers to communicate in order to provide the translation service.

Services Provided by DNS...

- DNS is commonly employed by other application-layer protocols -- including HTTP, SMTP and FTP - to translate user supplied host names to IP addresses.

- In order for the user's machine to be able to send an HTTP request message to the Web server www.someschool.edu, the user's machine must obtain the IP address of www.someschool.edu.

Services Provided by DNS...

- The same user machine runs the client-side of the DNS application.

- The browser extracts the hostname, www.someschool.edu, from the URL and passes the hostname to the client-side of the DNS application.

- As part of a DNS query message, the DNS client sends a query containing the hostname to a DNS server.

- The DNS client eventually receives a reply, which includes the IP address for the hostname.

Services Provided by DNS…

- The browser then opens a TCP connection to the HTTP server process located at that IP address.

- All IP datagrams sent to from the client to server as part of this connection will include this IP address in the destination address field of the datagrams.

- The IP datagram(s) that encapsulate the HTTP request message use this IP address

Services Provided by DNS...

- DNS provides a few other important services in addition to translating hostnames to IP addresses:

    - **Host aliasing:**

    - **Mail server aliasing:**

    - **Load Distribution:**

Host aliasing

- A host with a complicated hostname can have one or more alias names.

- For ex: relay1.west-coast.enterprise.com

  could have, say, two aliases such as enterprise.com and www.enterprise.com.

- In this case, the hostname relay1.west-coast.enterprise.com is said to be **canonical hostname.**

- DNS can be invoked by an application to obtain the canonical hostname for a supplied alias hostname as well as the IP address of the host.

Mail server aliasing

- The email address must be mnemonic like bob@hotmail.com.

- The canonical hostname might be something like relay1.west-coast.hotmail.com

- DNS can be invoked by a mail application to obtain the canonical hostname for a supplied alias hostname as well as the IP address of the host.

Load Distribution

- DNS is also being used to perform load distribution among replicated servers, such as replicated Web servers.

- Ex: www.google.com directed to www.google.co.in

- A set of IP addresses is associated with one canonical hostname.

Working of DNS

- Centralized design
- Problems of centralized design
  - A single point of failure.
  - Traffic volumes.
  - Distant centralized database.
  - Maintenance

Working of DNS…

- DNS uses a large number of name servers, organized in a hierarchical fashion and distributed around the world.

- three types of name servers:
  - local name servers,

  - root name servers,

  - and authoritative name servers.