【CN】Day17(2)

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Materials	Services of DNS and How it works
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【Ch2】Application Layer

2.4 DNS-The Internet's Directory Service

There are many ways that we can identify Internet hosts. One identifier for a host is its hostname. Hostnames-such as `www.facebook.com`-are mnemonic and are therefore appreciated.

However, it provides little information about the location within the Internet of the host. They are also difficult to process by routers.

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

2.4.1 Services Provided by DNS

We need a directory service that translates hostnames to IP addresses. This is the main task of the Internet's domain name system(DNS).

The DNS is a distributed database implemented in a hierarchy of DNS servers, and an application-layer protocol that allows hosts to query the distributed database.

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

As an example, consider what happens when a browser requests the URL `www.someschool.edu/index.html`. This is done as follows:

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

2. The browser extracts the hostname, www.someschool.edu from the URL and passes the hostname to the client side of the DNS application.
3. The DNS client sends a query containing the hostname to a DNS server
4. The DNS client receives a reply, which includes the IP address for the hostname.
5. Then the browser initiates a TCP connection to the HTTP server process located at port 80 at that IP address.

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

- Host aliasing. A host can have one or more alias names. For example, a hostname such as `relay1.west-coast.enterprise.com` could have two aliases such as `enterprise.com` and `www.enterprise.com`.

  In this case, the hostname is said to be a canonical hostname. DNS can be invoked to obtain the canonical hostname for a supplied alias hostname as well as the IP address of the host.

- Load distribution. Busy sites, such as `cnn.com`, are replicated over multiple servers, with each server running on a different end system and each having a different IP address.

  For replicated Web servers, a set of IP addresses is thus associated with one canonical hostname.

  DNS rotation distributes the traffic among the replicated servers.

2.4.2 Overview of How DNS Works

A simple design for DNS would have one DNS server that contains all the mappings. However, the problems with a centralized design include:

- A single point of failure: If the DNS server crashes, so does the entire Internet.
- Traffic volume: A single DNS server would have to handle all DNS queries.
- Distant centralized database: A single server cannot be “close” to all the querying clients.

- Maintenance: The single DNS server would have to keep records for all Internet hosts.

A Distributed, Hierarchical Database

The DNS uses a large number of servers, organized in a hierarchical fashion and distributed around the world. No single DNS server has all of the mappings for all of the hosts in the Internet.

To a first approximation, there are three classes of DNS servers-root DNS servers, top-level domain DNS servers, and authoritative DNS servers.

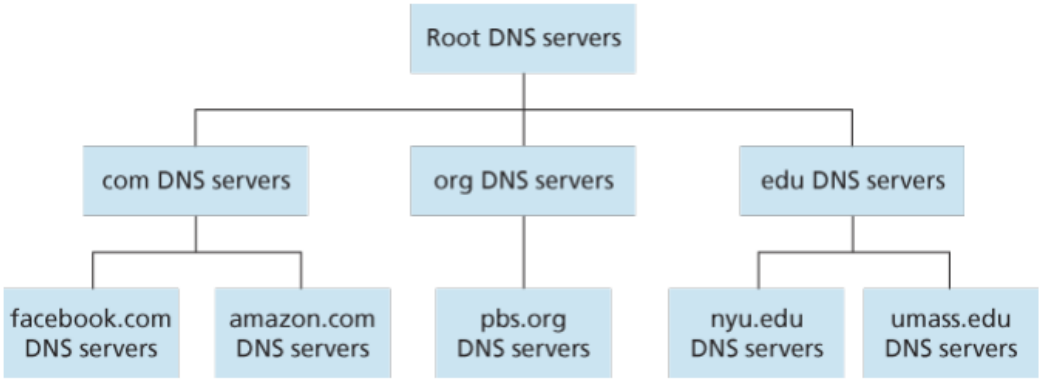

Figure 2.17 Portion of the hierarchy of DNS servers

For example, suppose a DNS client wants to determine the IP address for the hostname www.amazon.com.

1. The client first contacts one of the root servers, which returns IP addresses for TLD servers for the top-level domain `com`.
2. The client then contacts one of these TDL servers, which returns the IP address of an authoritative server for amazon.com
3. Finally, the client contacts one of the servers for amazon.com, which returns the IP address for the hostname `www.amazon.com`.

There is another important type of DNS server called the local DNS server. A local DNS server does not strictly belong to the hierarchy of servers but is nevertheless central to

the DNS architecture.

Each ISP has a local DNS server. When a host connects to an ISP, the ISP provides the host with the IP addresses of one or more of its local DNS servers.