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System Design Basics 5: Domain Name System

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The Domain Name System (DNS) can be likened to the internet’s phone book. Just as we keep a contact list in our phones to avoid memorizing hundreds of phone numbers, DNS operates as a decentralized hierarchical naming system that converts easily readable website names into numerical IP addresses.

When we input a domain name such as google.com into our web browser, the Domin Name System (DNS) translates it into an IP address (like 142.251.211.238). This way, your computer understands where to route the request on the internet.

The overall coordination, security, and operation of domain names within DNS is managed by ICANN (Internet Corporation for Assigned Names and Numbers).

**ICANN and Domain Name Registrars**

The key question here is: who decides which domain name corresponds to which IP address and specifically, who it belongs to? For instance, google.com, why can’t just anyone come and claim it? To answer this, we need to understand ICANN and Domain Name Registrars and how they differ. Let’s consider an analogy.

Visualize opening a store in a shopping center. ICANN could be likened to the shopping center’s management company, while domain registrars resemble the individual store lease providers. Just as the shopping center’s management ensures the smooth operation of the mall, ICANN ensures the efficient running of the internet’s infrastructure.

When we aim to register a domain name, we engage with a domain registrar, much like how we would approach a leasing company to rent a store space in a mall. Domain registrars are certified by ICANN to offer domain name registration services. They assist us in searching for available domain names and oversee the registration procedure.

It’s crucial to understand the ICAAN doesn’t own domain names directly. Instead, domain names are sold by approved domain registars, such as GoDaddy, Google Domains, or HostGator, which are authorized y ICANN. These registrars maintain the registration records and ensure that the domain is registered in our name.

**DNS Records**

Within the DNS, DNS records serve to store information related to a domain or subdomain. The A (Address) record, the most common type of DNS record, associates a domain name with an IPv4 address. For instance, if a request is made to a website, the DNS record would include the corresponding IP address (such as 192.158.1.39) to direct the request to the server hosing the website.

A screenshot of a computer

Description automatically generated

**Anatomy of a URL (Uniform Resource Locator)**

A screen shot of a computer

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**Protocol (Scheme)**

In web browsers, URLs commonly start with either HTTP or HTTPS, indicating the protocol being used. This is also commonly referred to as the scheme. It indicates which protocol to use to access the resource. HTTPS has become the more dominant protocol for URLs on the World Wide Web. However, there are several other protocols that URLs can begin with, including FTP (File Transfer Protocol) and SSH (Secure Shel).

FTP, denoted by [ftp://](NULL), is utilized for accessing files and directories on remote servers. It serves as a means for transferring files between systems. On the other hand, SSH, denoted by “ssh://, is extensively employed for establishing secure remote connections to servers or computers.

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**Domain**

In our example, domains.google.com, the domain name can be divided into three components: the subdomain, the primary domain, and the top-level domain.

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