

Scaling on Cloud Infrastructure

Our GPA grade calculator has taken off and gone viral -- how do we scale our website for millions of users every day?

DNS - Domain Name Services

What we know:

- We know that TCP connects two remote hosts together through the internet via an IP address.
- However, most remote hosts we connect to we do so via a domain name (“ex: cs.illinois.edu”).

DNS:

FQDN: _____

- Format:
- Read backwards:
 - Ends with the root DNS server:
 - Then a Top Level Domain (TLD):
 - Then a Second Level Domain (2LD/SLD):
 - Optionally, additional level domains:

DNS Resolution: The DNS root contains only **13** authoritative name servers/clusters for the entire Internet!

[Root Servers]:

[DNS Zones]:

DNS Records:

- Every DNS record is a set of key/value pairs that with a TTL (“Time to Live”) field.
- The record may be cached by intermediate servers for as long as the TTL is set (ex: 2 hours) before being updated.
- Notable keys in a DNS record:
 - “**A**” (Host, IPv4) Record:
 - “**AAAA**” (Host, IPv6) Record:
 - “**CNAME**” (Alias) Record:
 - “**MX**” (Mail Exchanger) Record:

Optimization: How do we use DNS to make our viral app better?

(1): Redundant Servers, Redundant Records

(2): Content Delivery Networks (CDNs)

[Overview]:

[Technical Implementation]:

[Advantages]:

[Disadvantages]:

CDN as a Service:

Many offerings for CDN services available commercially:

- AWS “Cloudflare”
- Google “Cloud CDN”
- Microsoft “Azure CDN”
- ...and others...

...and extremely cheap (Cloudflare pricing):

- Cost per HTTPS requests: \$0.000001 /request
(== \$0.01 /10,000 requests)
- + \$0.005 per path requested for invalidation.
- + standard bandwidth costs (~\$0.085 /GB)

Example: 1,000,000 requests each receiving 100 KB of static data from the CDN, without any cache invalidations:

Impact of CDN on Modern Apps:

On many, many, many websites, you may arrive to the website to see a spinning loading circle:

- Website is delivered as “static” content, via the CDN.
- Data is separate from the webpage, may be static or dynamic.

Examples: