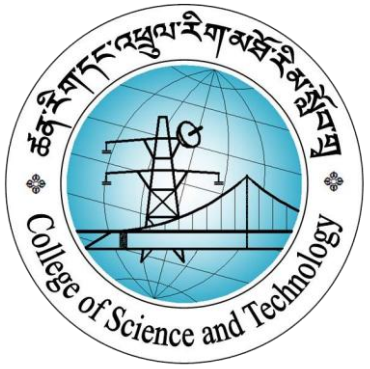

DNS

More on DNS : Root Servers

What are root servers?

- Root servers are the foundational component of the global Domain Name System (DNS).
- They are the starting point for virtually all domain name resolution on the internet.

What Root Servers Do?

- Root servers answer the question: "Where do I find information about this Top-Level Domain (TLD)?"

Their Specific Role:

- TLD Directory: They don't know about individual websites, but they know which servers are responsible for each TLD (.com, .org, .net, etc.)
- First Step in Resolution: When your DNS resolver doesn't know where to find a domain, it starts by asking the root servers
- Referral Service: They refer queries to the appropriate TLD name servers

The Resolution Process

- Here's how root servers participate in looking up www.example.com:

Their Specific Role:

- Step 1: Your Computer → "Where is www.example.com?"
- Step 2: Your Resolver → Root Servers: "Who handles .com?"
- Step 3: Root Servers → "Ask these .com TLD servers: [list]"
- Step 4: Your Resolver → .com TLD: "Who handles example.com?"
- Step 5: .com TLD → "Ask these example.com servers: [list]"
- Step 6: Your Resolver → example.com servers: "IP for www?"
- Step 7: example.com → "IP is 192.0.2.1"

The 13 Root Server "Letters"

13 root server identities, named A through M:

a.root-servers.net
b.root-servers.net
c.root-servers.net
d.root-servers.net
e.root-servers.net
f.root-servers.net
g.root-servers.net
h.root-servers.net
i.root-servers.net
j.root-servers.net
k.root-servers.net
l.root-servers.net
m.root-servers.net

Root Server

Why only 13 root servers..?

Benefits of This Design

1. Performance

- Users connect to the geographically closest instance
- Reduced latency for DNS resolution

2. Reliability

- If one instance fails, traffic routes to others
- No single point of failure

3. Scalability

- Can add more instances as demand grows
- Handles billions of queries daily

4. DDoS Resilience

- Attack traffic gets distributed across instances
- Hard to take down all instances simultaneously

Practical Examples

See all root server addresses

dig . NS

Trace DNS Resolution:

dig +trace cst.edu.bt

Find Your Nearest Root Server:

traceroute a.root-servers.net

Root Zone Management:

- Managed by IANA (Internet Assigned Numbers Authority)
- Operated by Verisign under contract with US Government
- Oversight by ICANN and various stakeholders

Summary

Root servers are:

- The DNS system's starting point and directory assistance
- 13 logical identities with hundreds of physical instances
- Critical internet infrastructure operated by various organizations
- Designed for maximum reliability, performance, and security
- The first step in translating human-readable domain names to machine-readable IP addresses
- They form the foundation that makes the internet's naming system work at a global scale!

DNS Commands (nslookup)

Basic lookup

nslookup cst.edu.bt

Query specific DNS server

nslookup cst.edu.bt 8.8.8.8

Query specific record type

nslookup -type=MX cst.edu.bt

nslookup -type=NS cst.edu.bt

nslookup -type=TXT cst.edu.bt

DNS Commands (dig)

Basic DNS lookup

dig www.rub.edu.bt

Short answer format

dig +short www.rub.edu.bt

Query specific DNS server

dig @8.8.8.8 www.rub.edu.bt

Trace DNS resolution path

dig +trace www.rub.edu.bt

Specific record types

dig www.rub.edu.bt A

dig www.rub.edu.bt MX

dig www.rub.edu.bt NS

dig www.rub.edu.bt TXT

DNS Commands

Reverse DNS lookup

dig -x IPAaddress

nslookup IPAaddress

DNS Cont..

dig and nslookup command difference?