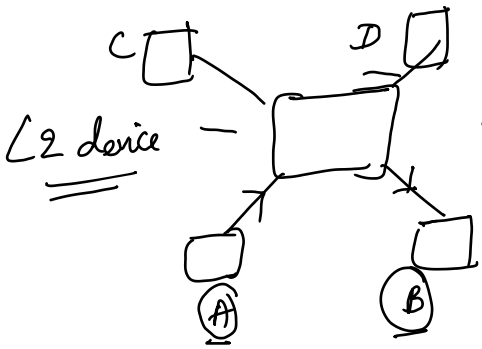
Switches Working explained

22 February 2024 22:33

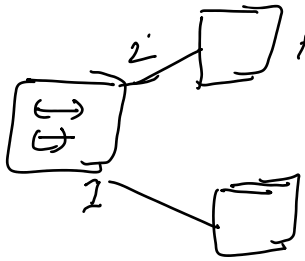
Switch = forwards a frame based on port.



L2 device — Sends a packet (frame) to B

Layer 2 device

Switch - How does the switch know which port has which host?



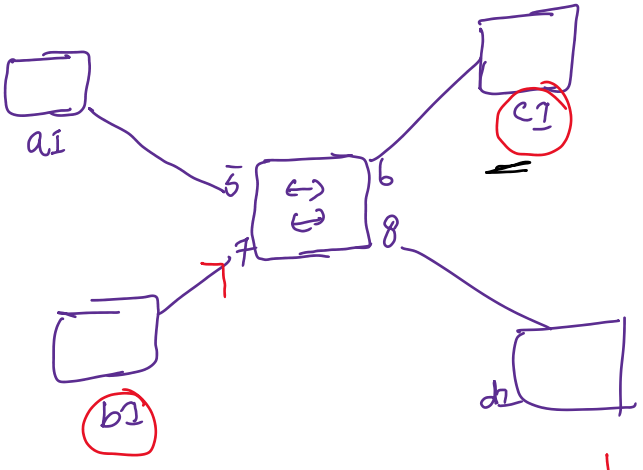
AA:AA:AA:AA:AA:AA MAC address

BB:BB:BB:BB:BB:BB - MAC address

How does the switch know which port has which address?

Working of a Switch

Three functions. — Learn, Flood, Forward } Actions



Every switch - MAC address table.

MAC address	Port NO
b1	7

1) The frame with S:MAC: b1 reaches the switch "Learns" the MAC address of the first.

= Learning mode -

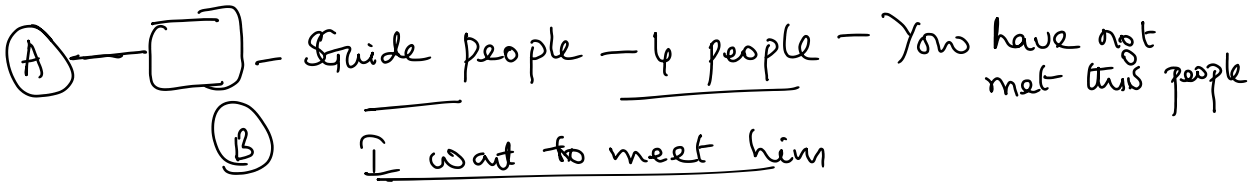
= Learning mode (First)

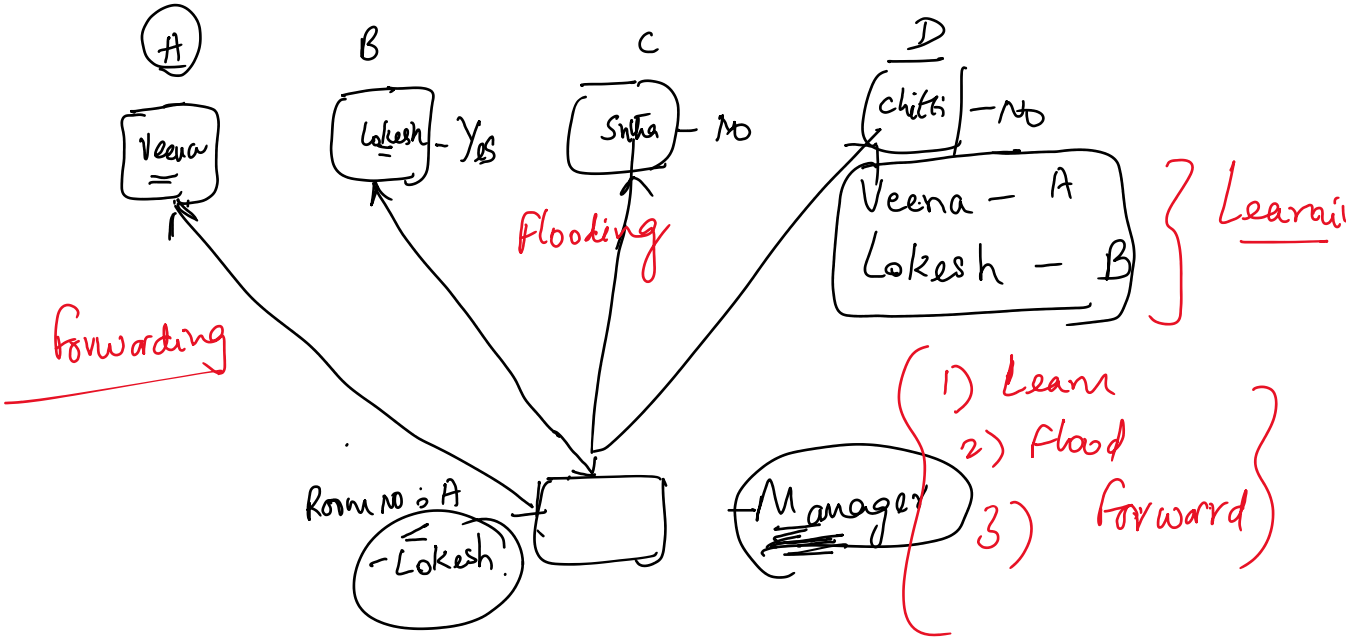
Gets a frame from the MAC address not present in the table -

2) Now the switch sees the destination MAC address
- Does it know where the destination is ?
- It floods the network - Sends the frame to all the hosts
- Broadcast frame

Flooding - Broadcasting
— Send a broadcast,
Destination MAC: FF:FF:FF:FF:FF:FF
Frame - { Broadcast Frame }

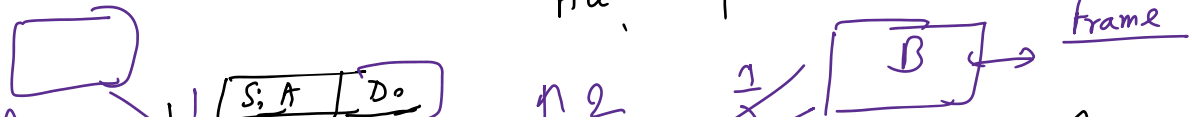
All the devices/hosts connected to the switch.

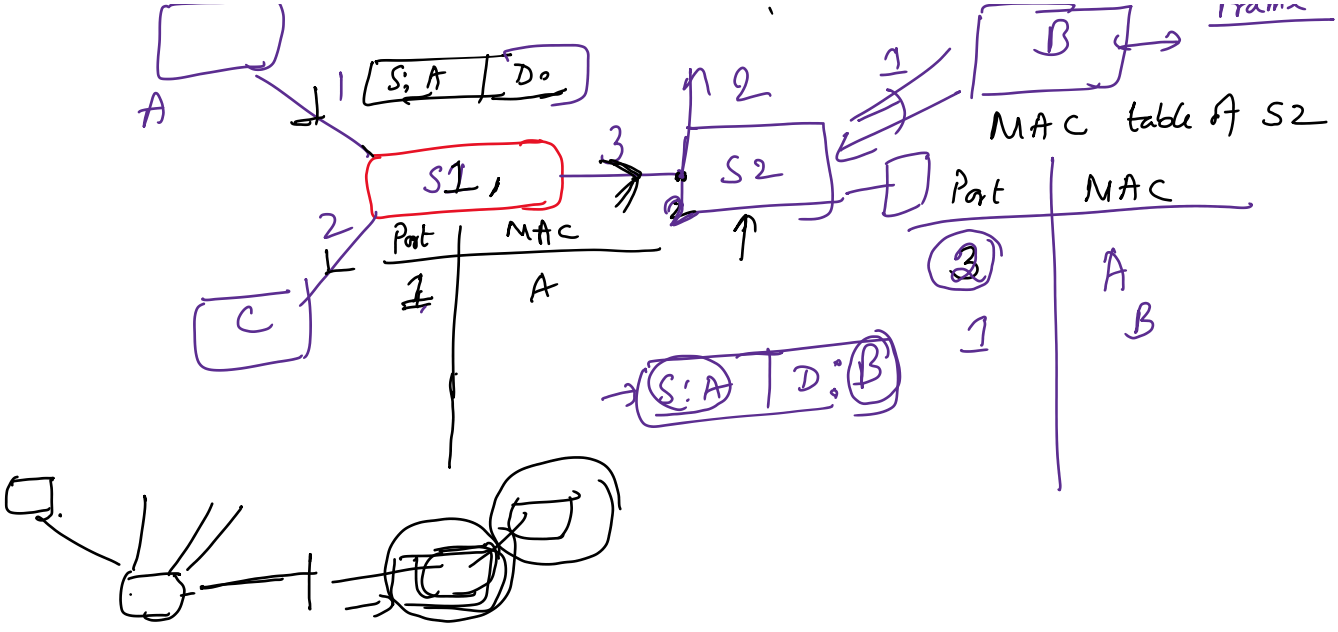




A → B

All the ports (Rooms)




A
S: A
D:
S1
S2
B
C
Port
MAC
MAC table of S2
S: A
D: B

SSL VPN Explained

22 February 2024 22:33

SSL VPN – Remote access VPN

Site to Site VPN – IPsEc tunnel.

1) Two gateways / VPN gateways – Routers / Firewalls.

2) IPsEc protocol suite

The main concept of a VPN is to provide "anonymity" and hides the real location – Privacy Internet – Hidden – Identity

– Encapsulation –

1) All communication in the internet happens from public IP to Public IP.

Private → Public

Private → Private

Public → Private

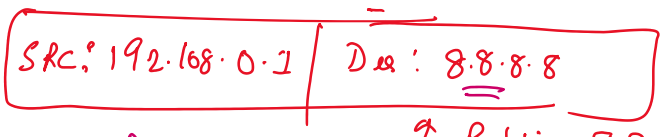
Public → Public

Internet

Home network – IP – private – NAT – Private to Public

Public IP – Routable IPs

Public → Public



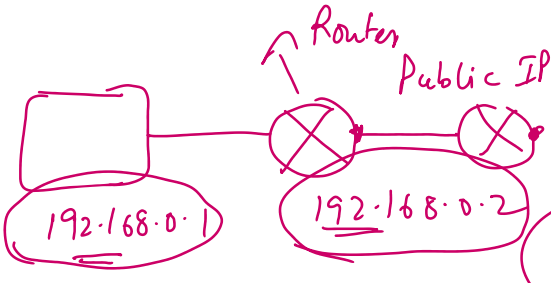
↑ Private IP → Public IP

↑ Public IP

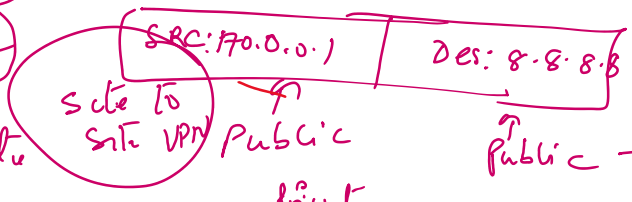
Host

Router → Router → Internet

(IP)



Possible



– Home → Internet ✓

↑ Private

UPN – {Anonymity, Privacy}

Private — Site VPN / Public — Public — Anonymity
{Privacy}

- Home → Internet ✓
Home 1 → Home 2 — ✗ ↑ ↑ Private

Int. — Ext.

SRC: 192.168.0.1	Des: 192.168.1.1

Site to Site VPNs

☐ Encapsulation ☐ — Different Subnets

Private → Private

Logical

1) Is the communication possible? — No

→ VPN → {From one network → one network} {Virtual Private Network} → Real ✗

DNS – Domain Name Service

Domain names – IP address.
– DNS

DNS – Hierarchy – From top to bottom.

DNS
↓
Root Servers
↓
TLD servers

Root
↓
TLD
↓
Authoritative DNS
↓
Local DNS
Cache / Server

Hierarchy

Root DNS Server:

1) Root DNS is the first point of contact.
DNS Query / Root server / DNS

Local DNS – Cache – www.google.com – Visit
↳ Stores the IP address
DNS Query
Google IP
www.google.com – 168.194.194.194
DNS Cache – Local DNS –
Full Query – Root → TLD → Authoritative

Root DNS Server

Root – First point of contact
Root for all the communication – Starts from here.

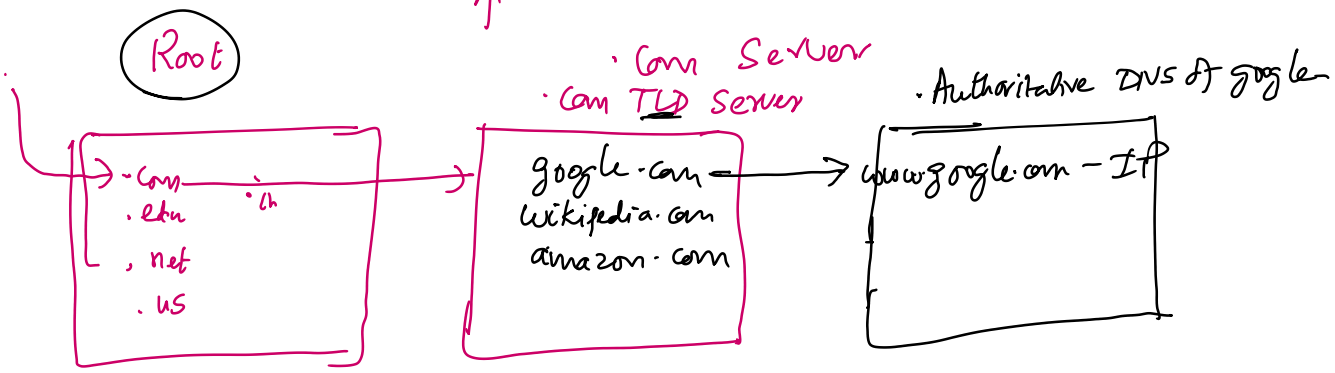
↑ Root of all the Servers – Contains the IP address of all the TLD Servers
↓
IP address of all the Top level Domain Servers. (TLD)

Root Server – Contains the IP address of all the {TLD Servers}
(.com, .edu, .net, .gov, .in)

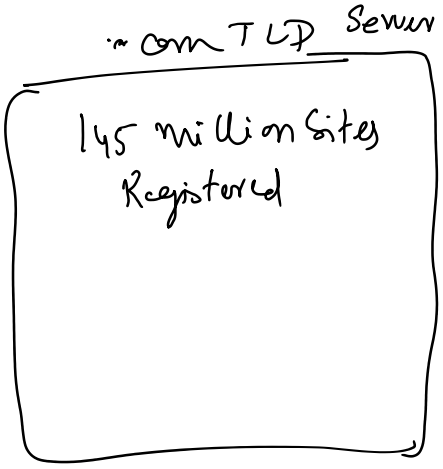
(TLD servers)
.com, .edu, .net, .gov, .in

DNS Query

www.google.com – DNS Query



.com TLD servers – Distributed around
- Centralized
- Based on Region
- Nearest part
- Spread out across different regions.



Global

CDN – Distributed Networks
- Global level – Spread

Root DNS – IP addresses of the TLD Servers.
server

- 13 DNS Servers (Root)
- Misleading

3 unique IP addresses.

DNS Records 13 IP or IP addresses.

A Records = DNS – Introduced – IPV4 Root DNS Records
name IP

IPV4 Root DNS Record – 32 bytes.

IPV4 address – 32 bits

32 bytes

DNS

512 bytes – UDP

32 bytes – 96 bytes are reserved

IPV4 address - 32 bits

1 - 32 bytes

Root DNS Record - 32 bytes

416 bytes

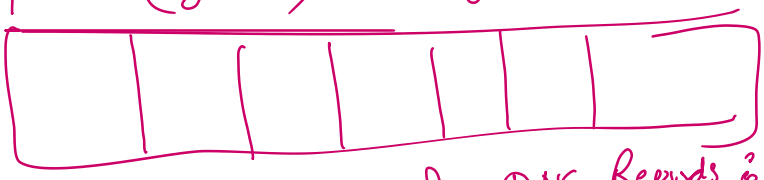
$32 \times 13 = 416$ bytes

96 bytes - Protocol information

96 bytes are reserved

$416 \div 32 = 13$

UDP packet (Segment)



- Max. no. of DNS Records in

DNS - UDP

512 bytes

UDP Segment

why 13 ?

→ Maximum no. of Root DNS Records you can fit in one UDP Segment is 13.

"13 Root DNS IP addresses"

$13 \times 32 = 416 + 96$ (bytes)

Protocol

13 by Records

- 13 IP addresses

Root IP addresses -

13 Root DNS Servers — X

13 Root DNS IP addresses ✓

> 100 Root DN Servers

- Spread globally

13 IP addresses - ICANN

Root DNS IP - 2 of Verisign. Inc

13 Authorities - Manage - 13 IP addresses.

IPV4 - IPV6

32 bits 128 bits

127.0.0.1 - Localhost

own local IP

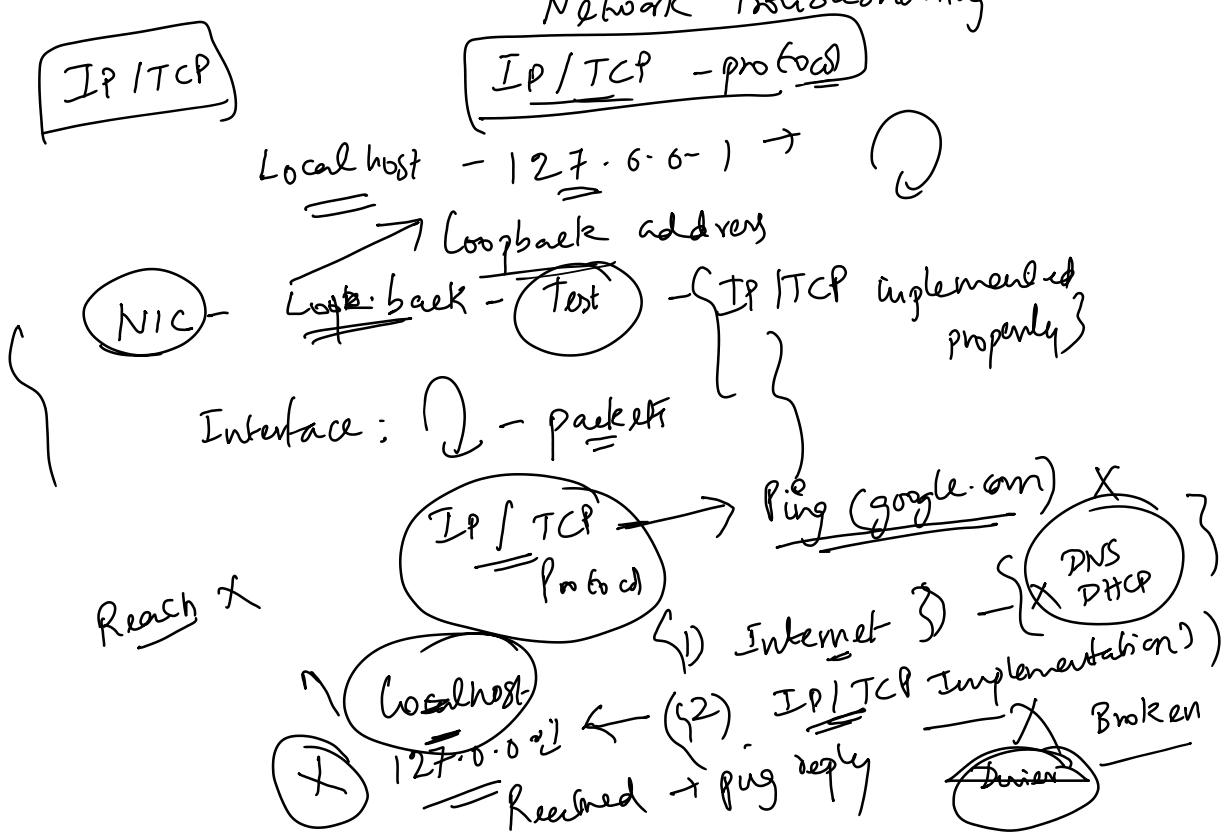
Home Host

Network troubleshooting

IP/TCP

IP/TCP - protocol

Network troubleshooting



Root DNS - IP - B
- Authority (Root zone)

13 Root DNS IPs

Many Root Servers - Around the world
- Spread globally.

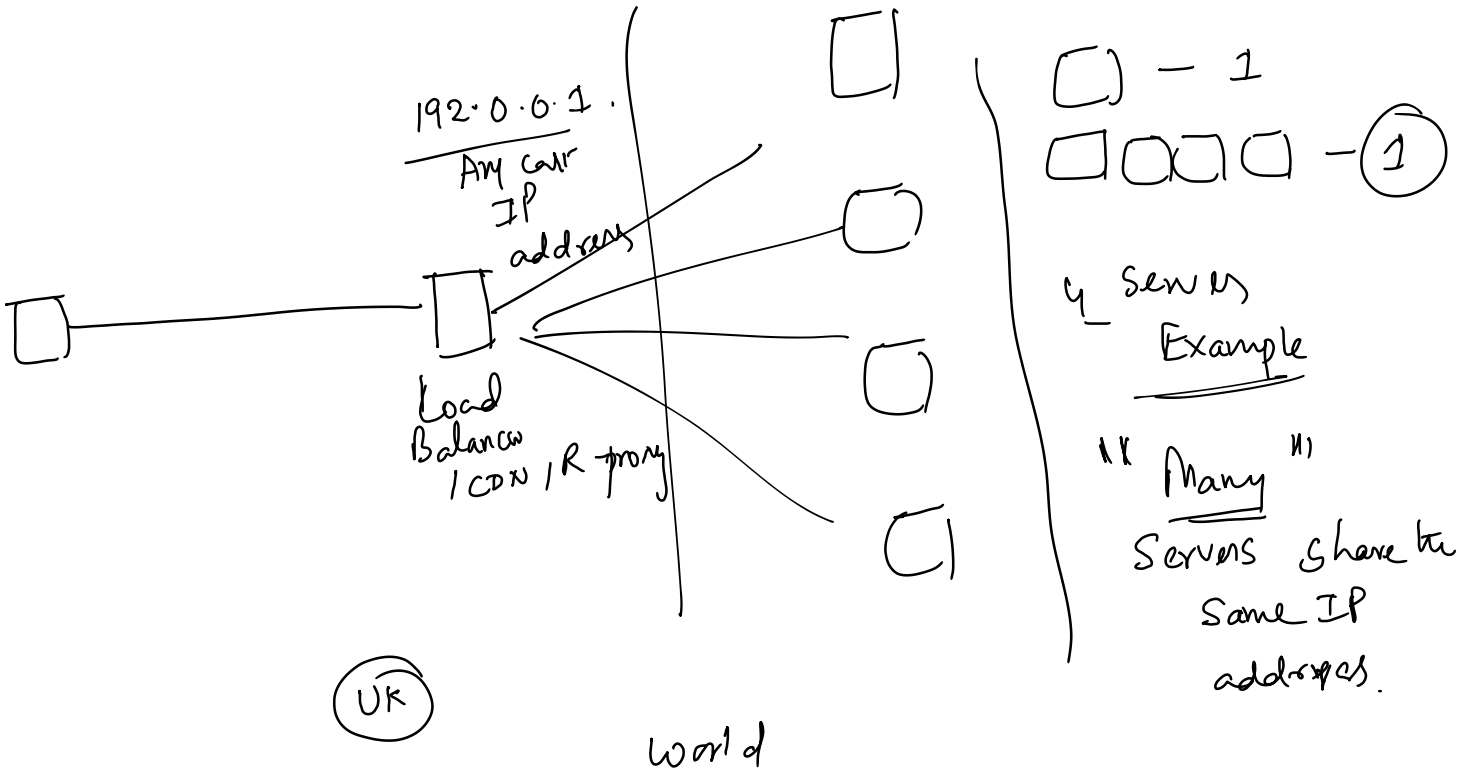
1000 Servers - 13 IP addresses.?

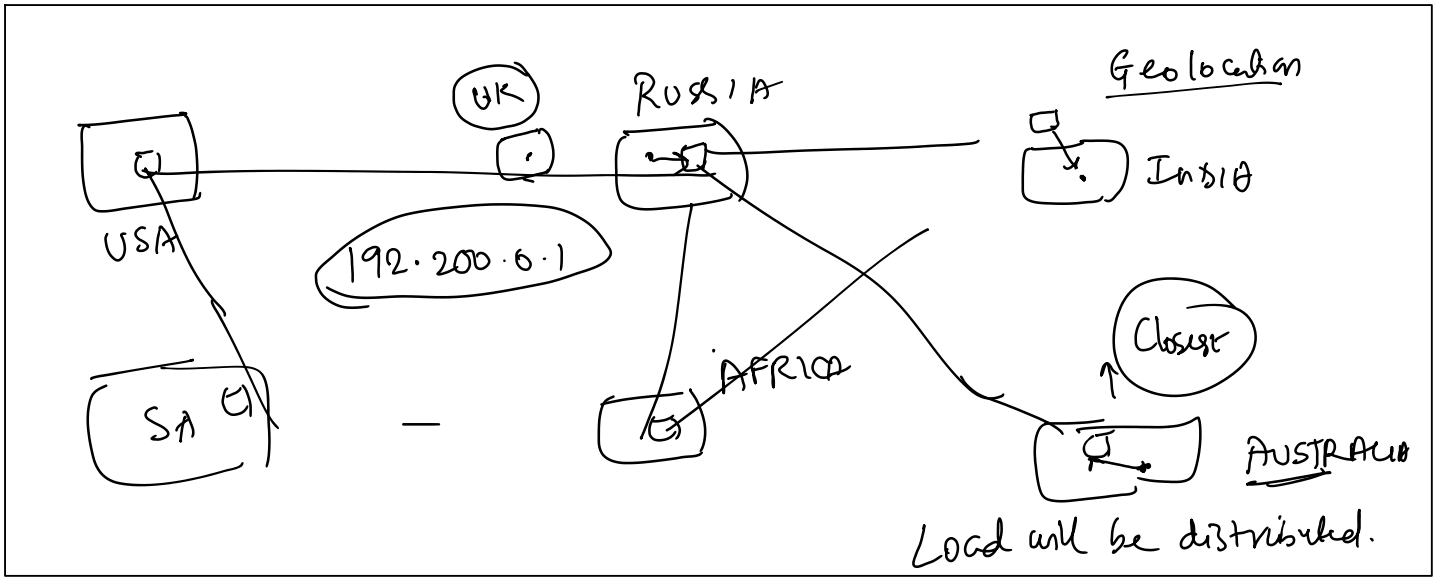
Anycast Address.

1) Unicast - 1 device - 1 IP address

2) Multicast / Broadcast - 255.255.255.255
↑ ↓
Sent to every one in the Subnet

3) Anycast - Multiple servers
- 1 IP address





Closest - DNS Servers

UK → Russia DNS ✓

US DNS

Location → Closest

Anycast DNS Servers - Work - Location

100-200 DNS — 13 IP addresses

Fixed address

13 fixed Root

DNS

Hardcoded

13 fixed Root DNS IP

DNS → Hardcoded

13 located – US – 13 IP address – Zones

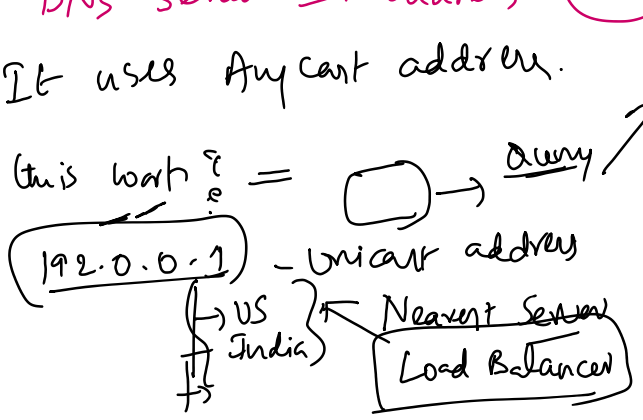
IP – Server → 13

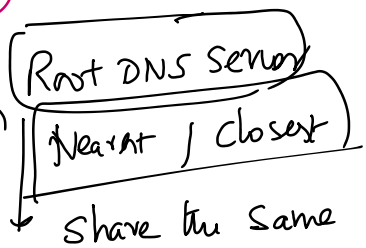
1) How many Root DNS Servers are present?
– Many, spread around the world

2) But, why do they say there are only 13?
– Root DNS server IP address – 13

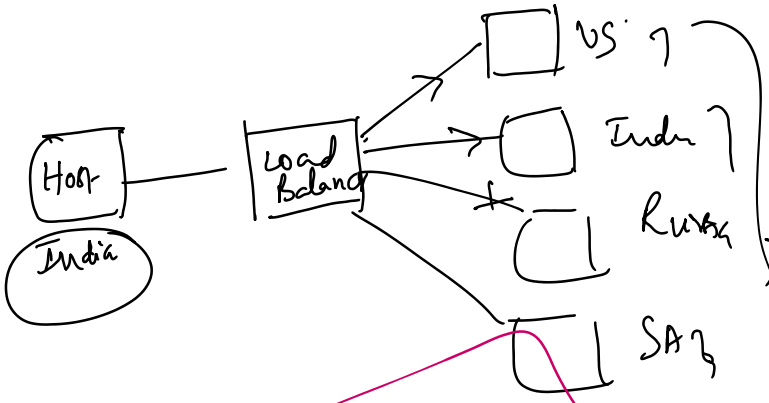
3) How? – It uses Anycast address.

4) How does this work?





Share the same IP address
– But are located at different place



Nearest

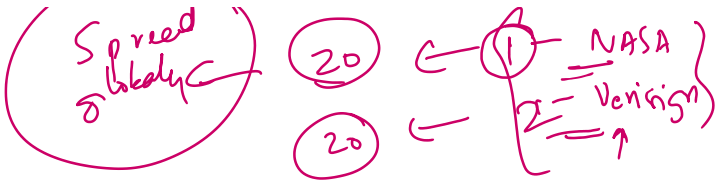
Root DNS are distributed network using Anycast IPs

Uni – 1
Any – any no. of devices

Anycast – IP – Root DNS Zone

13 Root DNS Zones – 13 IP – Zone → Organization

Spread globally – 20 – 1 – NASA – Verisign



13 Why only 13? maximum

In the earlier days of DNS, the packet size was only 512 bytes.
To send all the root DNS "IPv4 records" in one segment (UDP),
the maximum possible records are only 13. (13 x 32 = 416 bytes)

1 512 byte Segment - 13 Records

IPv4 Root DNS Record - 32 bytes

IPv4 address - ~~32 bits~~

IPv4 Root DNS Record - 32 bytes

512 - 13 Records

13 Root DNS IPs

∴ Anti-virus article.

Enough? - Any questions? - X

Okay.

— X —

End