[DNS]

Domain Name System

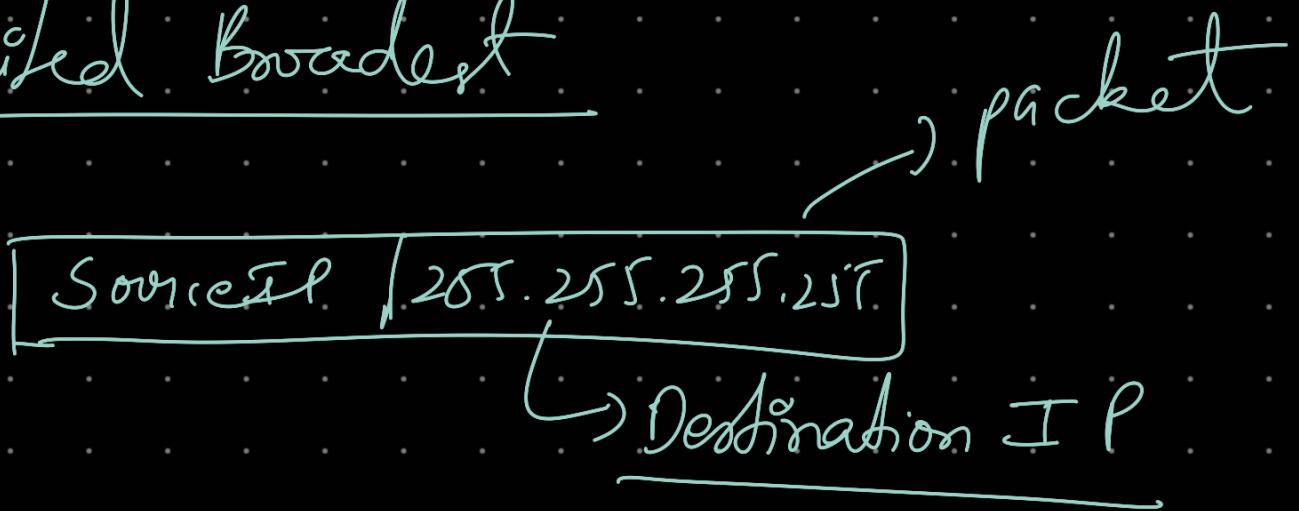
[Casting]

① Unicast → one host to another host

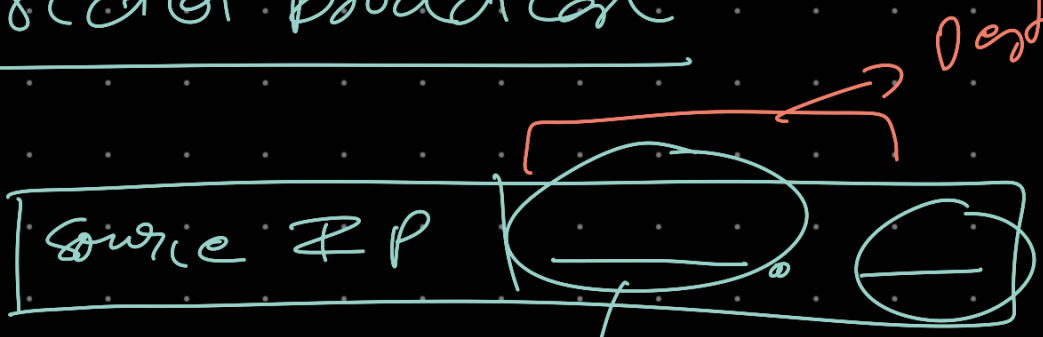
② Broadcast → one host to multiple host

- Limited Broadcast
  - Send packet to all host within same network
- Directed broadcast
  - Send packet to all hosts within another network

Limited Broadcast



Directed Broadcast



③ Multicast

Data sent from one sender to a group of receivers who have explicitly requested to receive the data.

→ Video streaming

④ Anycast

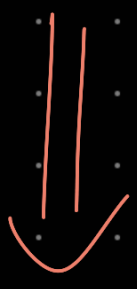
* Data is sent from one sender to the nearest (Best) receiver from group of potential receiver based on routing metrics

[Power of DNS]

Assumption

① New device → never connected to Network

② No Caching in OS, router, ISP



Need of DNS?

Machine 1 (IP$_1$)

Machine 2 (IP$_2$)

* For Machines IP is good, but for human we need something that we can remember.

⇓

This increases complexity

⇓

Need mapping (Domain ⟷ IP)

① One big Machine that stores this mapping → X not scalable
↳ SPOF

② Multiple Server Machine / distributed across globe.

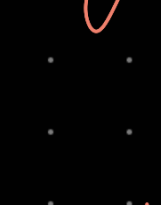
Domain → (DNS resolver) → IP

↳ could be running at ISP

↳ could be at router

↳ could be implemented at OS level as well

* www.google.com



DNS resolver

Root servers

↳ Total 13 root servers

↳ Not physical servers

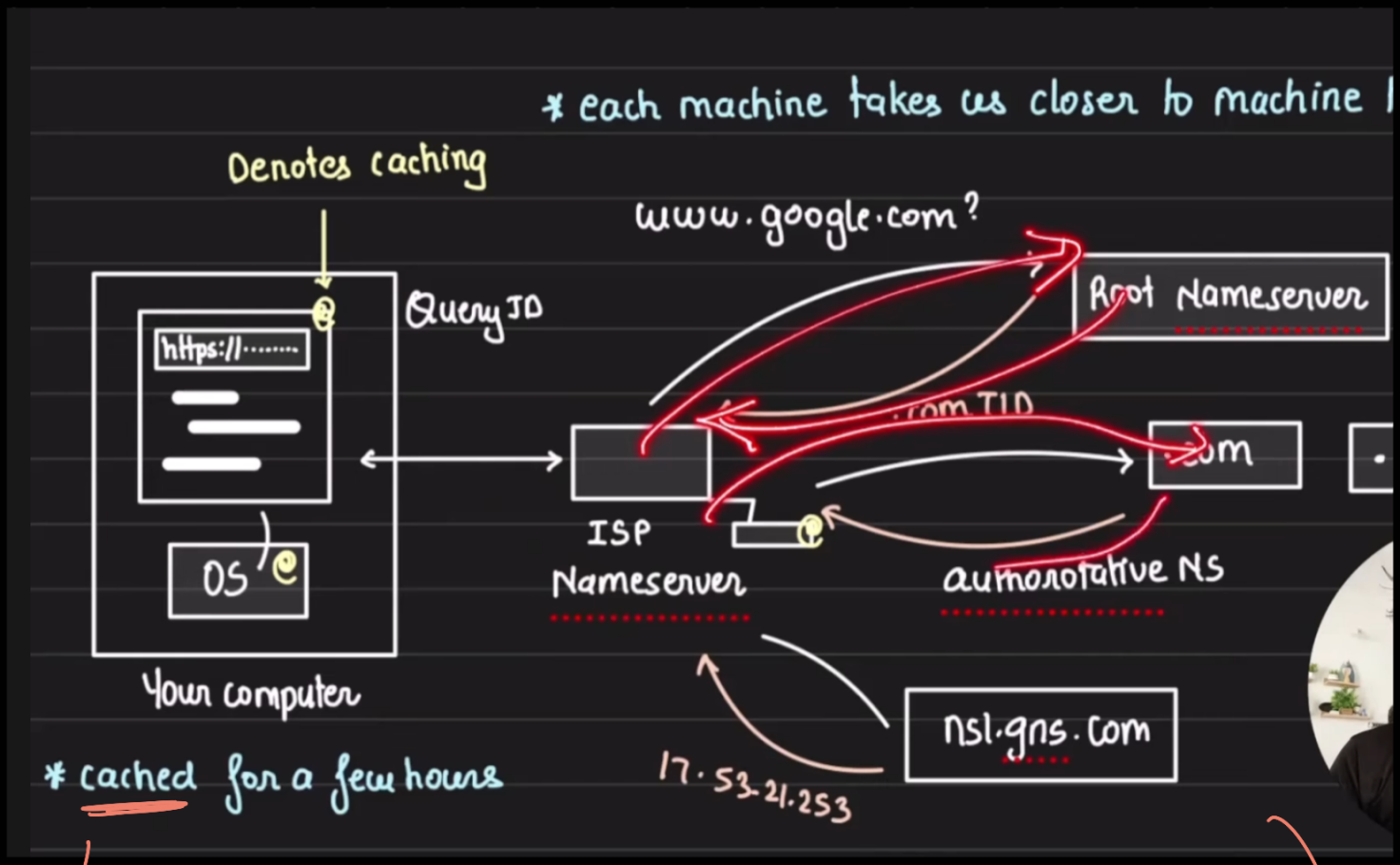
↳ 13 specific IP address

⇒ Anycast is implemented

* Root Name Servers are more

than 13 physically...

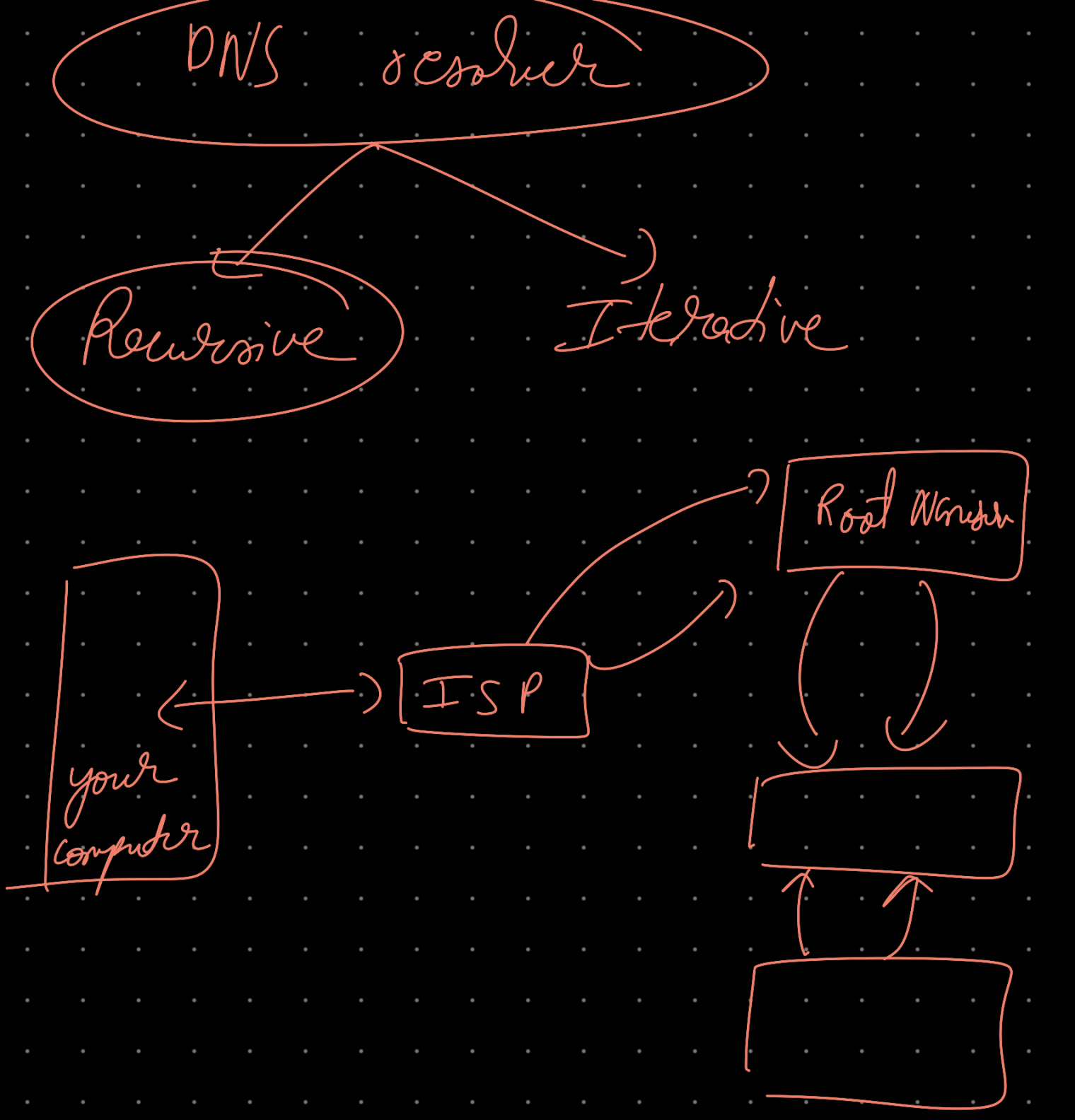
* DNS resolved goes to nearest root server



↳ Cached at ISP, router, OS

↓

Iterative



* DNS uses UDP in Transport layer

- **Domain Names**: These are human-readable names used to identify resources on the internet. They follow a hierarchical structure:
  - **Root domain**: Represented by a dot (.), at the top of the hierarchy.
  - **Top-Level Domain (TLD)**: The part after the root, like `.com`, `.org`, `.net`, country-specific domains like `.uk`, `.us`, etc.
  - **Second-Level Domain (SLD)**: The part before the TLD, like `example` in `example.com`.
  - **Subdomains**: Parts of the domain name that fall under a second-level domain, such as `www` in `www.example.com`.
- **DNS Records**: These are mappings between domain names and the resources they represent. Some common types include:
  - **A record (Address Record)**: Maps a domain to an IPv4 address.
  - **AAAA record (IPv6 Address Record)**: Maps a domain to an IPv6 address.
  - **CNAME (Canonical Name Record)**: Used to alias one domain name to another.
  - **MX (Mail Exchange Record)**: Directs email to the correct mail server.
  - **NS (Name Server Record)**: Specifies authoritative DNS servers for a domain.
  - **PTR (Pointer Record)**: Used for reverse DNS lookups.
  - **TXT (Text Record)**: Can hold arbitrary text and is used for verification purposes, such as in SPF or DKIM for email authentication.