

Domain Name Service (DNS)

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Break



Hierarchical and Distributed Implementation

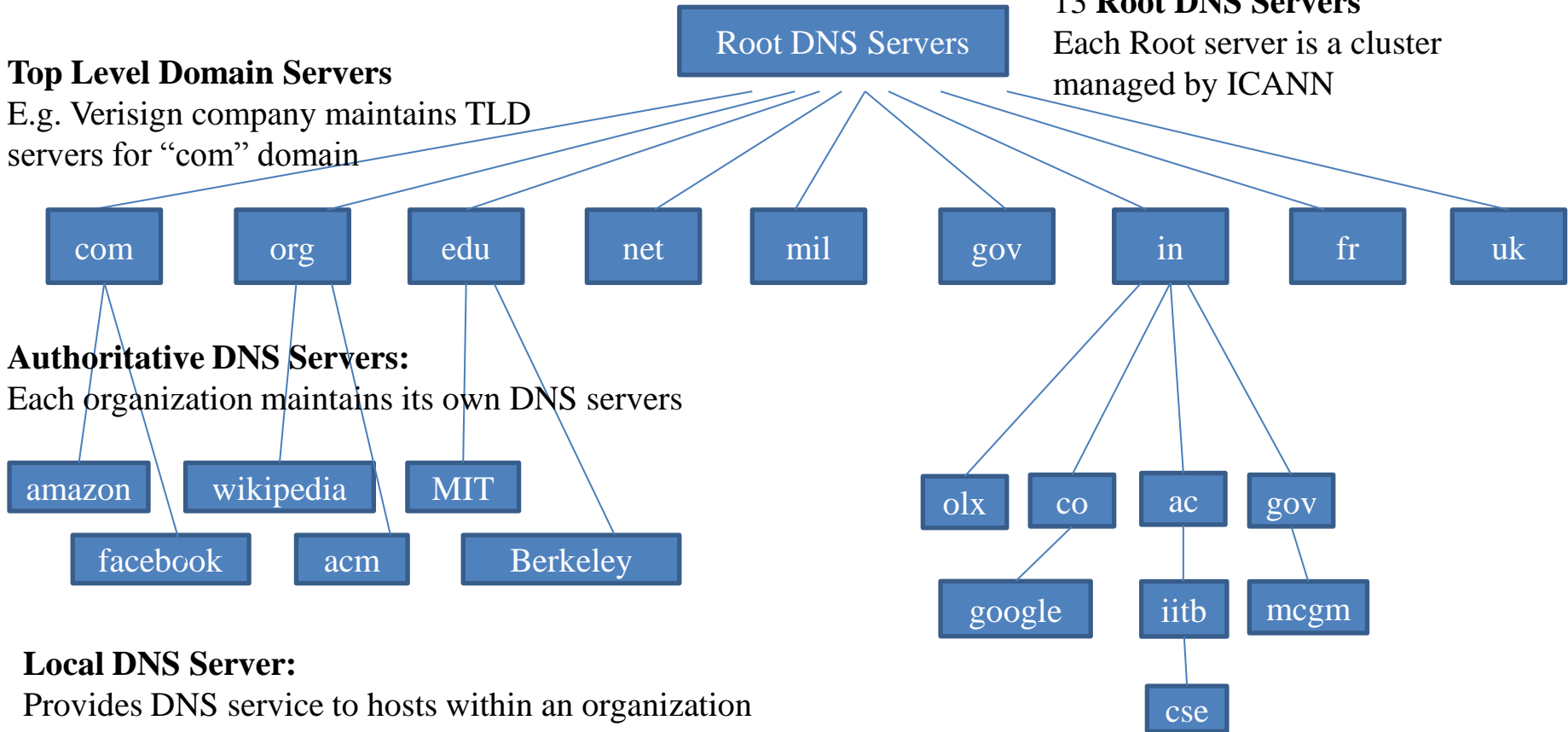
13 Root DNS Servers

Each Root server is a cluster managed by ICANN

Root DNS Servers

Top Level Domain Servers

E.g. Verisign company maintains TLD servers for “com” domain



Authoritative DNS Servers:

Each organization maintains its own DNS servers

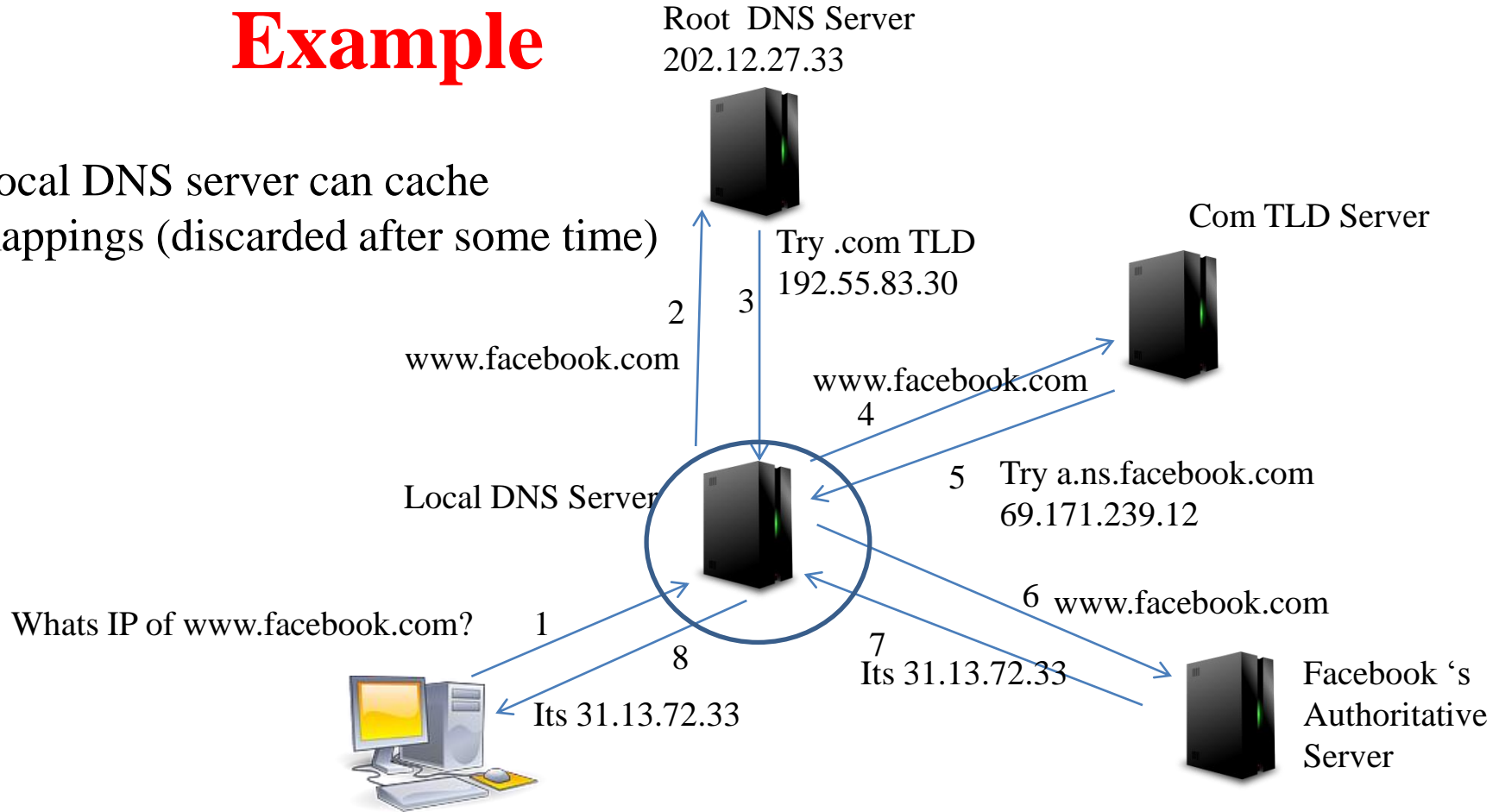
Local DNS Server:

Provides DNS service to hosts within an organization

Hosts obtain local DNS server's IP address often via DHCP

Example



Local DNS server can cache mappings (discarded after some time)



DNS Server Database

- Store Resource Records (RRs)
- Four Tuple: [Name, Value, Type, TTL]
- Type=A; Name: Hostname; Value: IP Address
 - E.g. [star.c10r.facebook.com, 31.13.72.33, A, 17]
- Type=NS; Name: Domain; Value: host-name of the authoritative name server
 - E.g. [facebook.com, a.ns.facebook.com, NS, 172797]

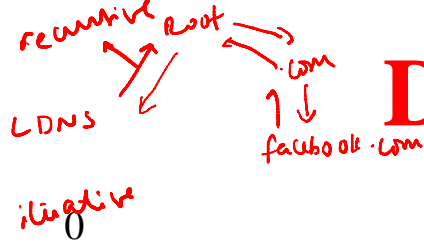
DNS Database

- Type=CNAME; Name: Hostname; Value: Canonical hostname
 - E.g. [www.facebook.com, star.c10r.facebook.com, CNAME, 2362]
- Type=MX; Name: ^{Domain}~~Hostname~~; Value: Canonical name of the mail server
 - E.g. [facebook.com, msgin.t.facebook.com, MX, 300]

Rules

A hostname⁷, IP address

- An authoritative name server (for a given host) will always contain type A record of that host
- A non-authoritative name server will contain a type NS record for the domain and the type A record of the domain's authoritative server
 - ✓ [facebook.com, a.ns.facebook.com, NS, 172797]
 - [a.ns.facebook.com, 69.171.239.12, A, 172575]



DNS Message Format

Query/reply; Authoritative flag;
Recursion desired;
Recursion available

Identification ✓	Flags 31
Number of questions ✓ ✓	Number of answer RRs ✓ ✓
Number of authority RRs ✓	Number of additional RRs ✓
Questions	
Answers	
Authority	
Additional Information	

DNS runs over UDP and uses port 53

Inserting Records

bi.com

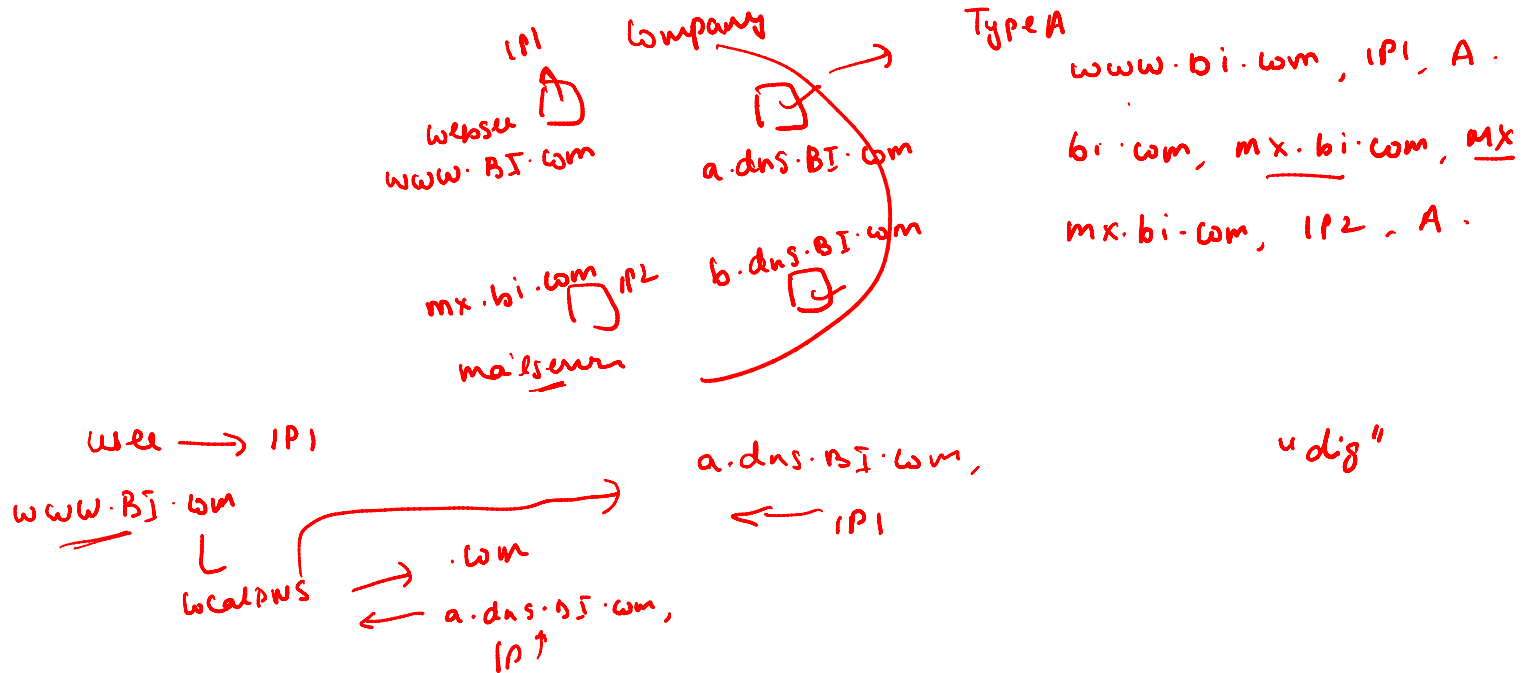
- Register domain name with a Registrar
- Provide names and IP addresses of your primary and secondary authoritative DNS servers to Registrar
 - 4 entries (type NS and A) entered in the TLD (or higher up) server

company
a.dns.bi.com IP
b.dns.bi.com IP

"bi.com"
TLD

Inserting Records

- Within your authoritative server, provide type A and type MX entries for you web and email server



Summary

- DNS a core Internet functionality implemented at application layer
 - Provides many services
- Employs a hierarchical distributed architecture for scalability purposes
- Database maintains resource-records which are retrieved to enable communication