Domain Name Service (DNS)

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Break

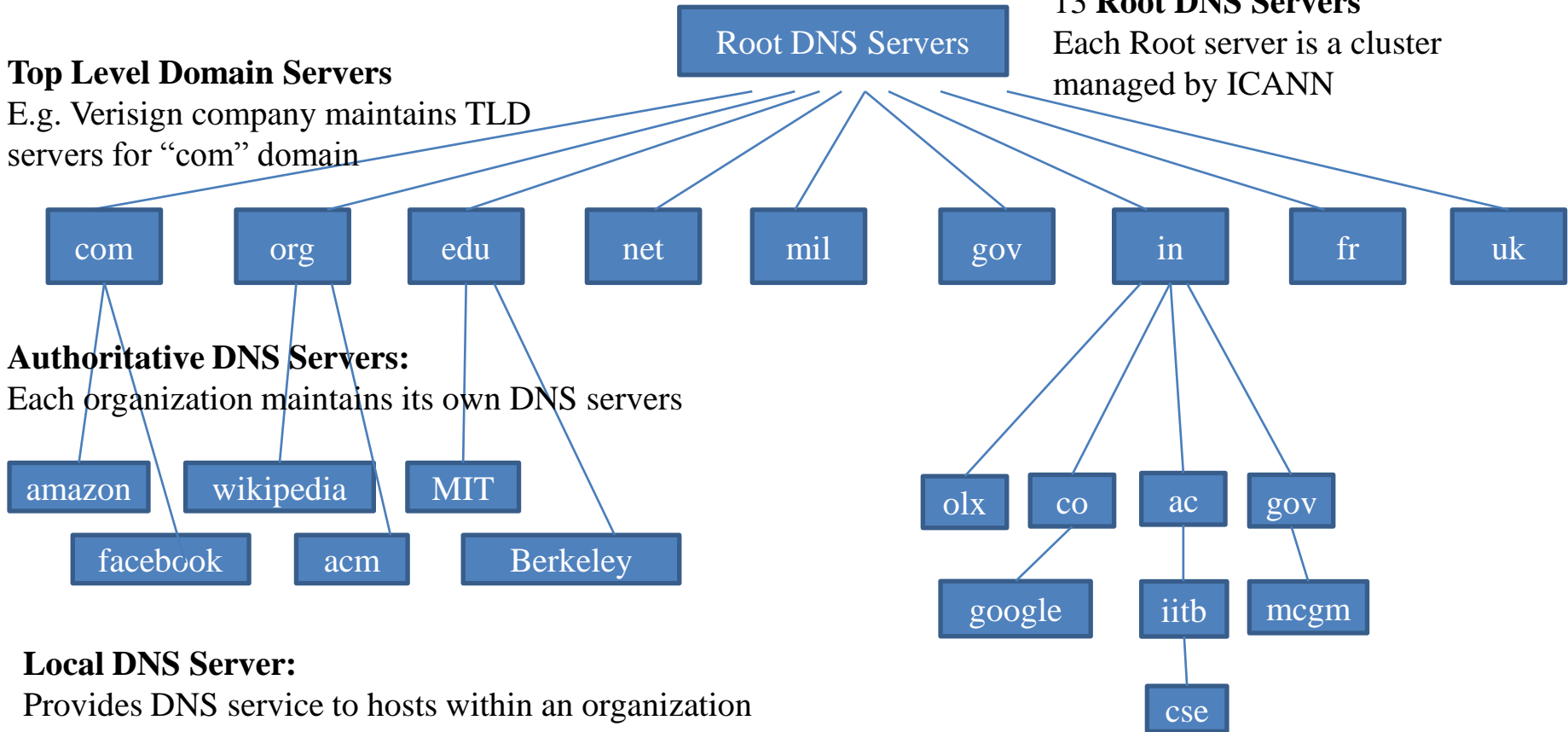# Hierarchical and Distributed Implementation

Root DNS Servers

13 **Root DNS Servers**
Each Root server is a cluster
managed by ICANN

Top Level Domain Servers
E.g. Verisign company maintains TLD
servers for "com" domain

com   org   edu   net   mil   gov   in   fr   uk

Authoritative DNS Servers:
Each organization maintains its own DNS servers

amazon   wikipedia   MIT
facebook   acm   Berkeley

olx   co   ac   gov
google   iitb   mcgm
cse

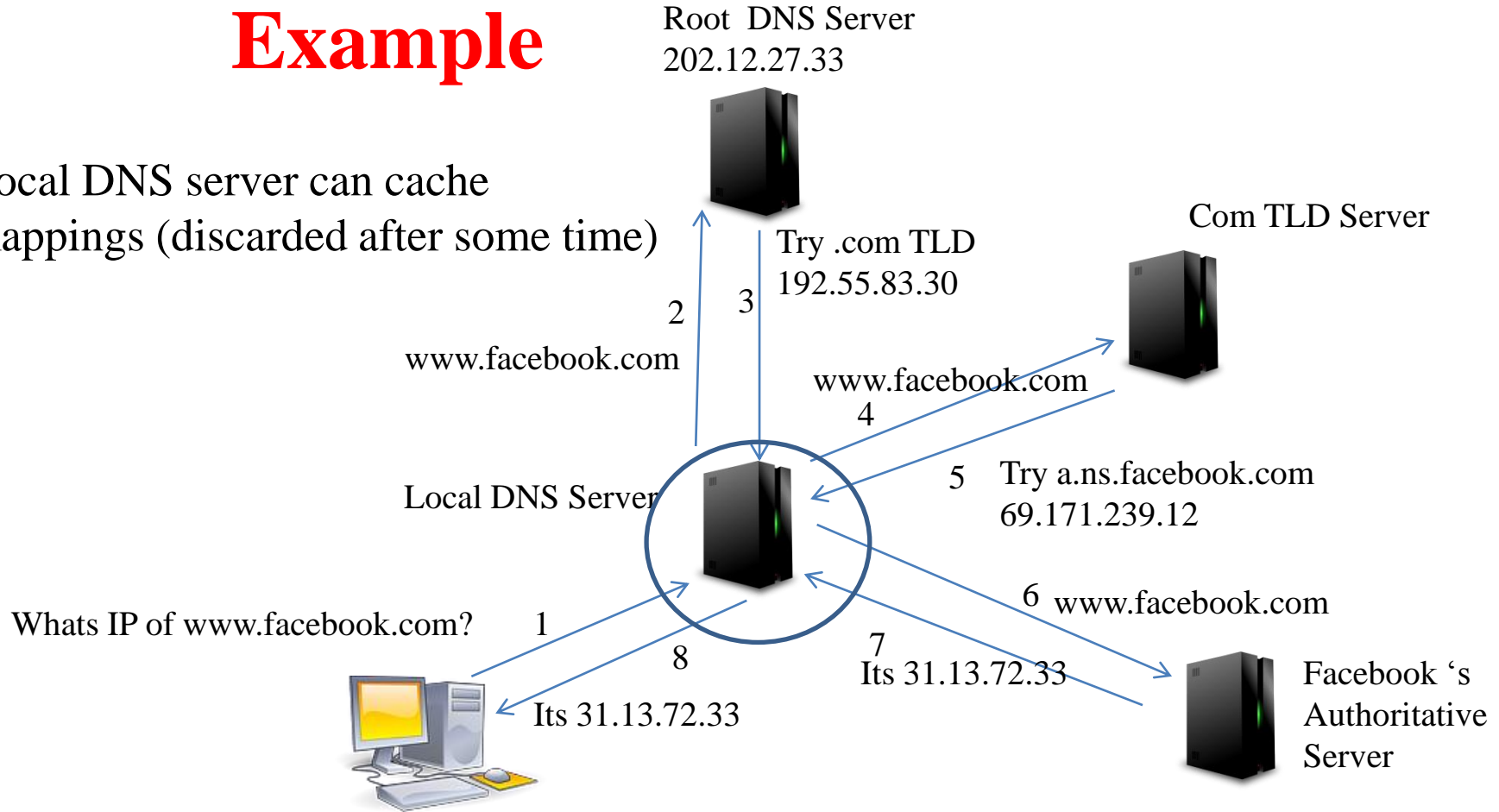**Local DNS Server:**
Provides DNS service to hosts within an organization
Hosts obtain local DNS server's IP address often via DHCP

Example

Root DNS Server
202.12.27.33

Com TLD Server

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

Try .com TLD
192.55.83.30

2   3

www.facebook.com

www.facebook.com
4

5   Try a.ns.facebook.com
69.171.239.12

Local DNS Server

6   www.facebook.com

Whats IP of www.facebook.com?   1

8   7

Its 31.13.72.33

Its 31.13.72.33

Facebook 's
Authoritative
Server

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]
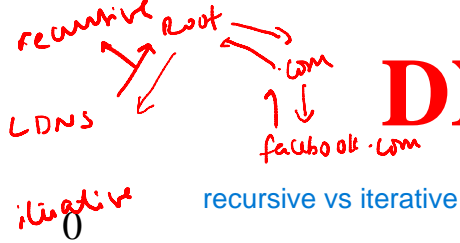
domain

DNS Database

- Type=CNAME; Name: Hostname; Value: Canonical hostname

  - E.g. [www.facebook.com, star.c10r.facebook.com, CNAME, 2362]

- Type=MX; Name: ~~Hostname~~ *Domain*; Value: Canonical name of the mail server

  - E.g. [facebook.com, msgin.t.facebook.com, MX, 300]

Rules

A   hostname , 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

recursive vs iterative

(handwritten annotations) recursive, Root, .com, facebook.com, LDNS, iterative

0   31

Identification	Flags
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

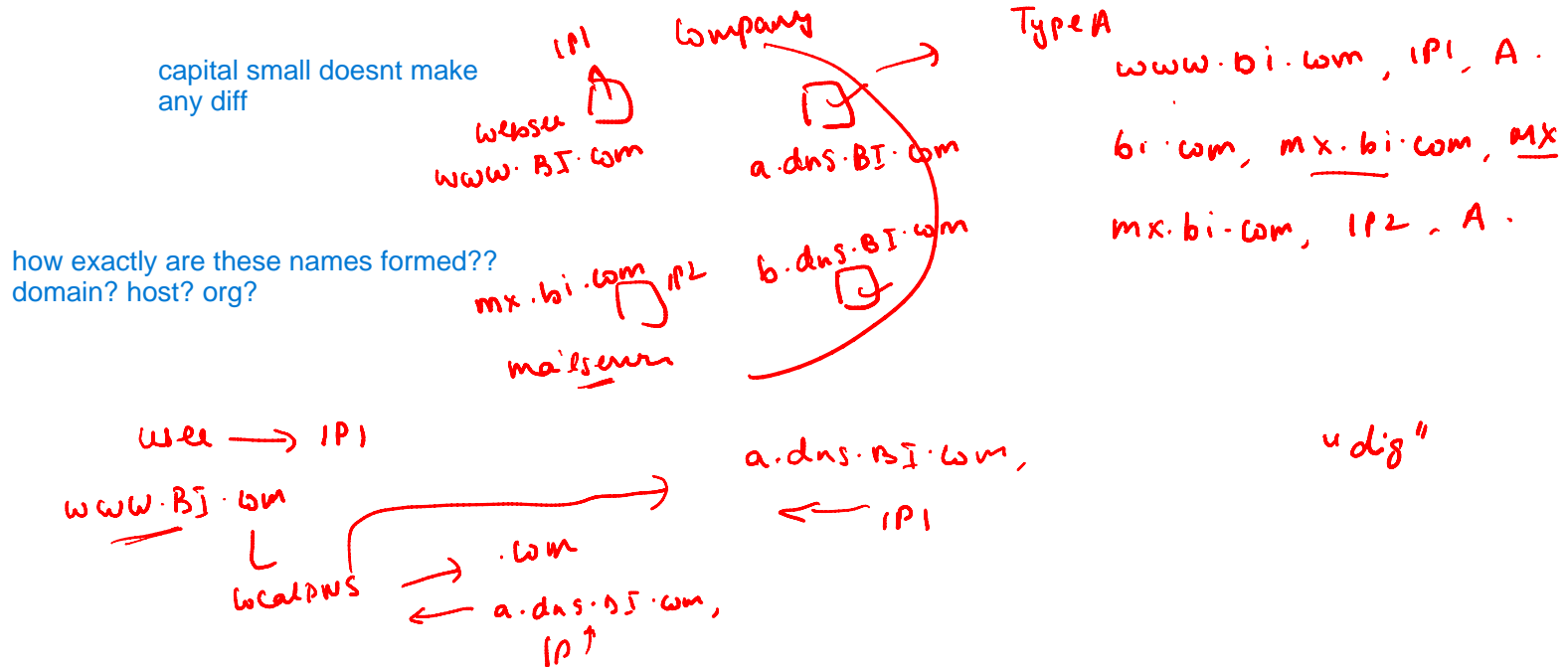# **Inserting Records**

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

"·com"
TLD

Inserting Records

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

capital small doesnt make any diff

how exactly are these names formed?? domain? host? org?

IPI

A

Webse

www. BI . Com

Company

a . dns . BI . Com

b . dns . BI . Com

mx . bi . Com IPL

mailserver

Type A

www . bi . Com , IPI , A .

bi . Com , mx . bi . Com , MX

mx . bi . Com , IP2 . A .

wee → IPI

www . BI . Com

L

localDNS →

. Com

a . dns . BI . Com ,

← IPI

← a . dns . DS . Com ,

IP

"dig"

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