Domain Name System
Part I

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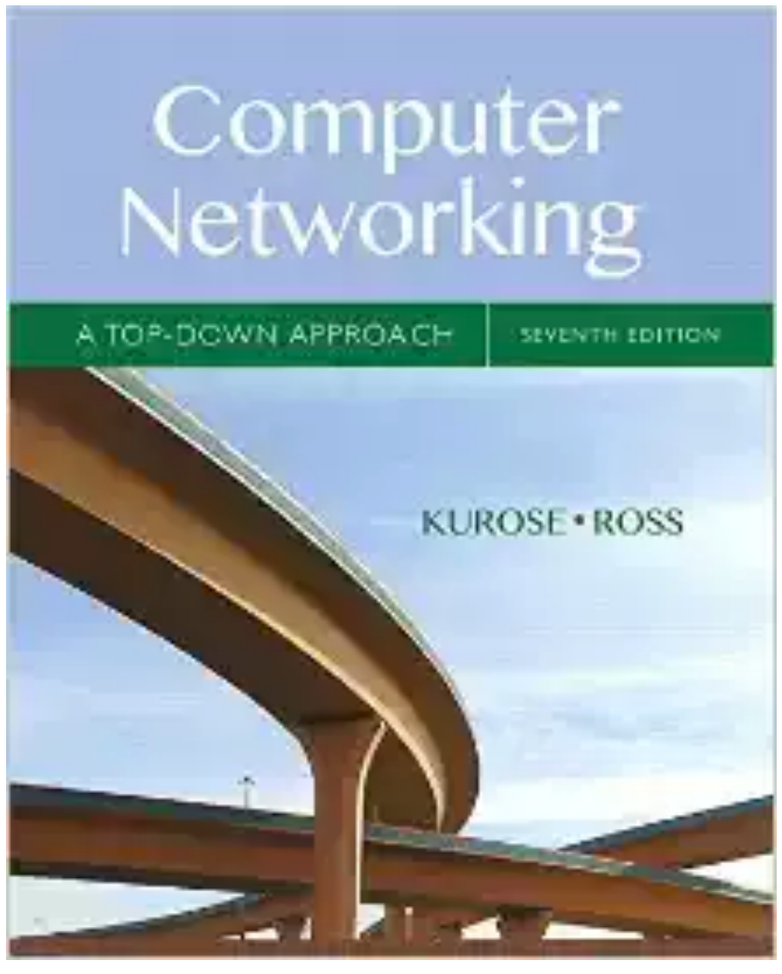
"my, my, my, … these are lawless times …"

These slides are more-or-less directly from the slide set developed by Jim Kurose and Keith Ross for their book "Computer Networking: A Top Down Approach, 5th edition".

The slides have been lightly adapted for Mark Allman's EECS 325/425 Computer Networks class at Case Western Reserve University.

Reading Along ...



- DNS is chapters 2.4 (application layer)

Domain Name System

- `gethostbyname ()`

DNS: Domain Name System

people: many identifiers:

- SSN, name, passport #

Internet hosts, routers:

- IP address (32 bit) - used for addressing datagrams
- "name", e.g., www.yahoo.com - used by humans

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Domain Name System:

- distributed record store implemented as hierarchy of many authoritative name servers
- application-layer protocol host, routers, name servers communicate to resolve names (address/name translation)
  - note: core Internet function, implemented as application-layer protocol
  - complexity at network's "edge"

DNS

DNS services

- hostname to IP address translation
- host aliasing
  - Canonical, alias names
- mail server aliasing
- load distribution
  - replicated Web servers: set of IP addresses for one canonical name

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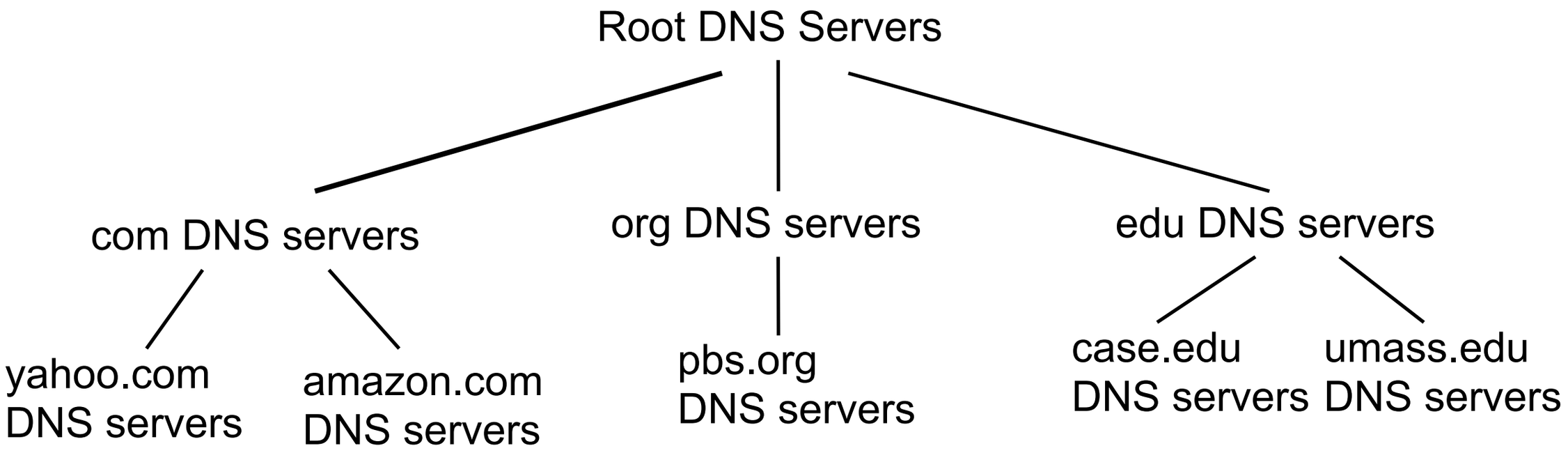
Why not centralize DNS?

- single point of failure
- traffic volume
- distant centralized database
- maintenance

doesn't scale!

Distributed, Hierarchical Database



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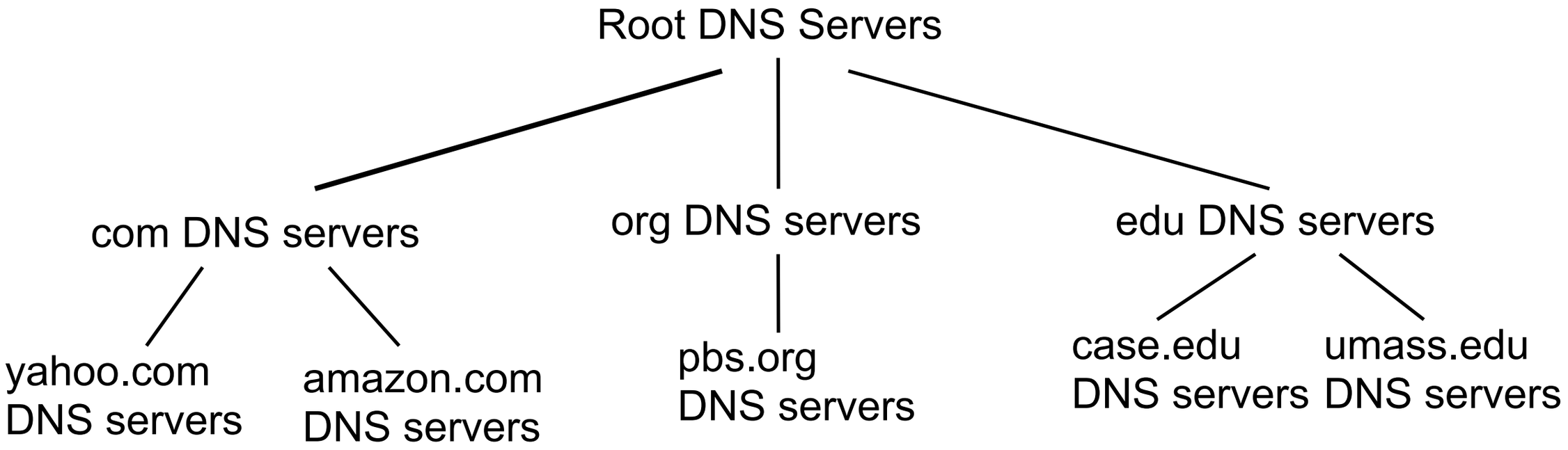

client wants IP for www.amazon.com; 1st approx:

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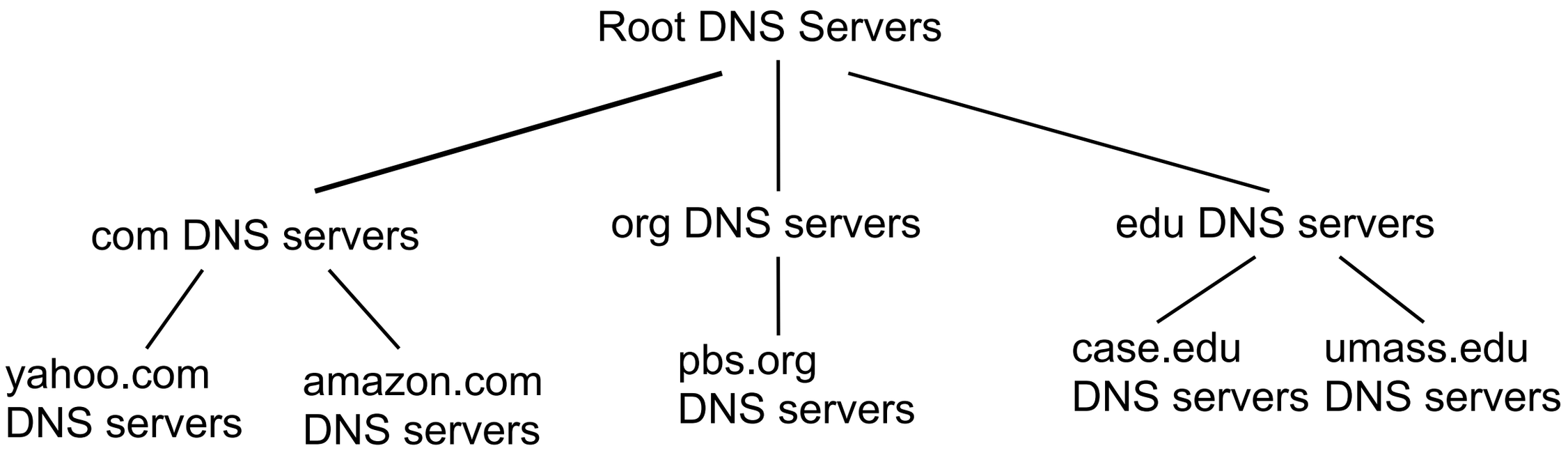

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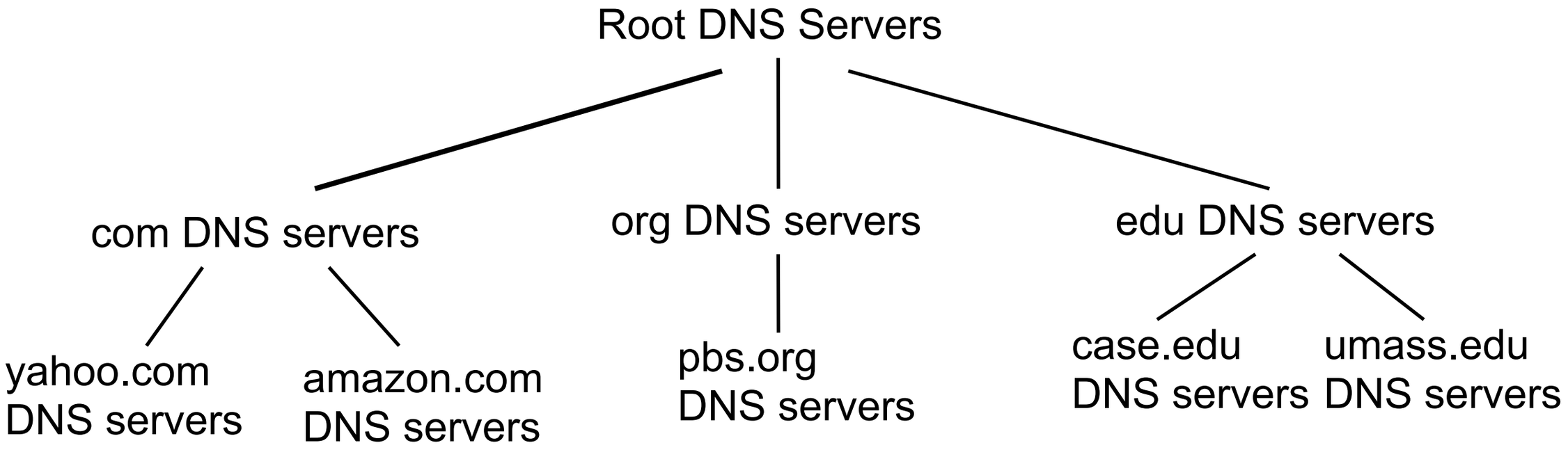

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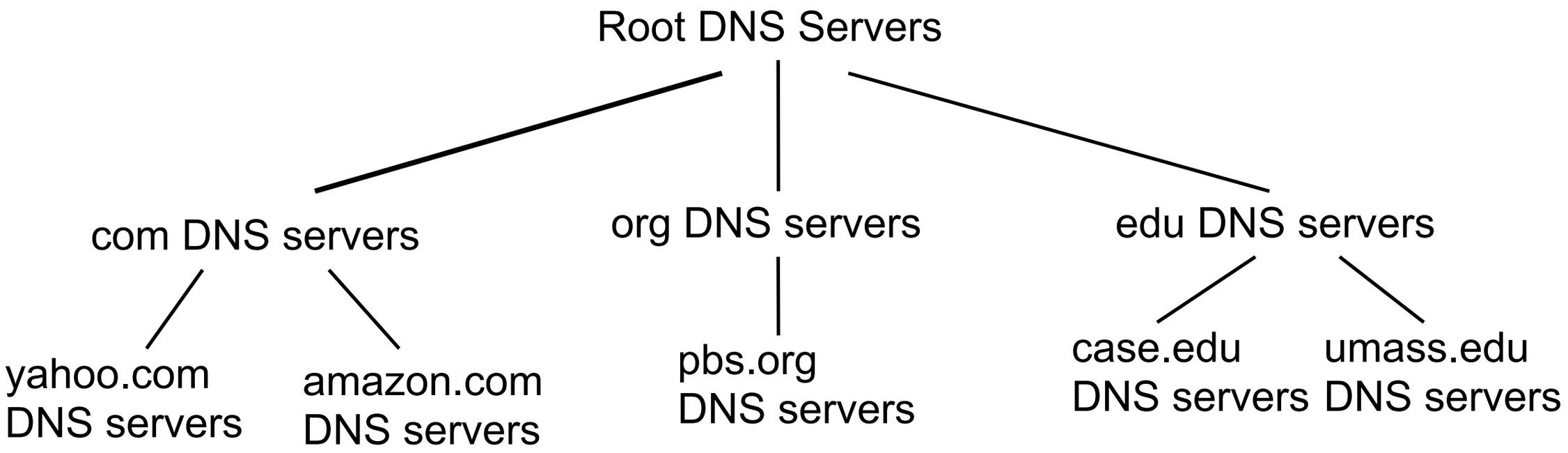
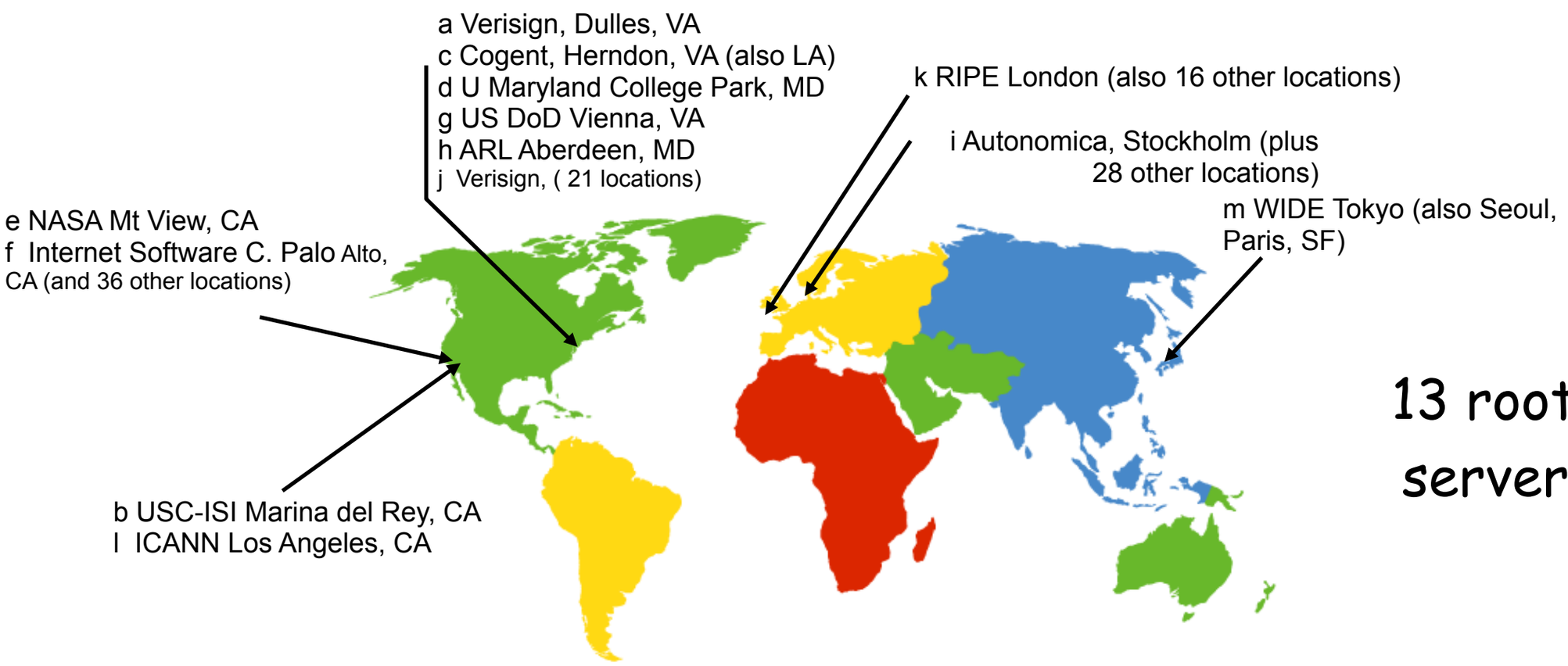


client wants IP for www.amazon.com; 1st approx:

- client queries a root server to find .com DNS server
- client queries .com DNS server to get amazon.com DNS server
- client queries amazon.com DNS server to get IP address for www.amazon.com

DNS: Root name servers

- contacted by local name server that can not resolve name
- root name server:
  - returns authoritative name server of TLD



13 root name servers worldwide

TLD and Authoritative Servers

Top-level domain (TLD) servers:

- responsible for com, org, net, edu, aero, jobs, museums, and all top-level country domains, e.g.: uk, fr, ca, jp
- Verisign maintains servers for .com TLD
- Educause for .edu TLD

Authoritative DNS servers:

- organization's DNS servers, providing authoritative hostname to IP mappings for organization's servers (e.g., Web, mail).
- can be maintained by organization or service provider

Local Name Server

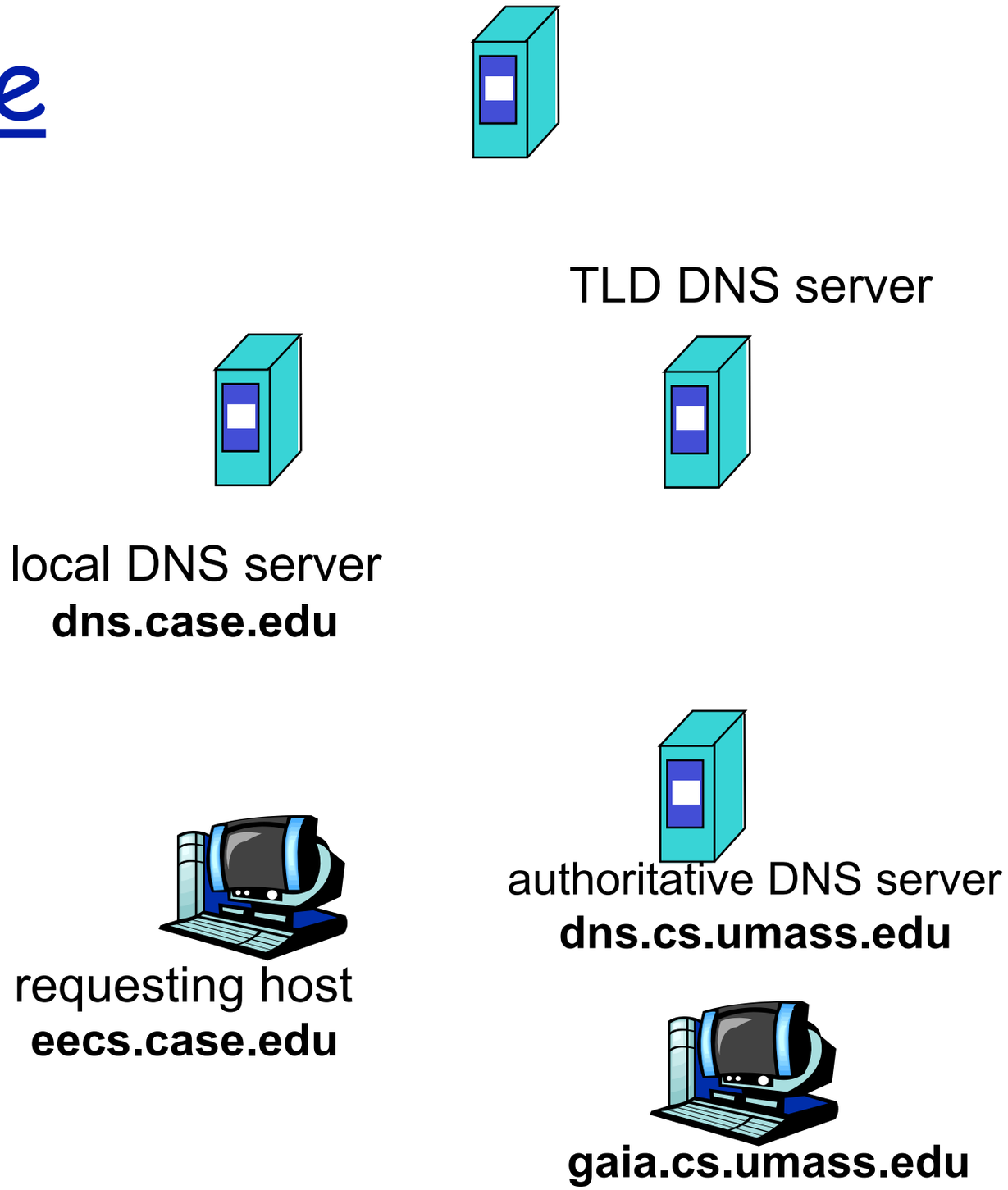
- does not strictly belong to hierarchy
- each ISP (residential ISP, company, university) has one
  - also called "default name server"
- when host makes DNS query, query is sent to its local DNS server
  - acts as proxy, forwards query into hierarchy

DNS name resolution example

- host at eecs.case.edu wants IP address for gaia.cs.umass.edu

iterated query:

- contacted server replies with name of server to contact
- "I don't know this name, but ask this server"



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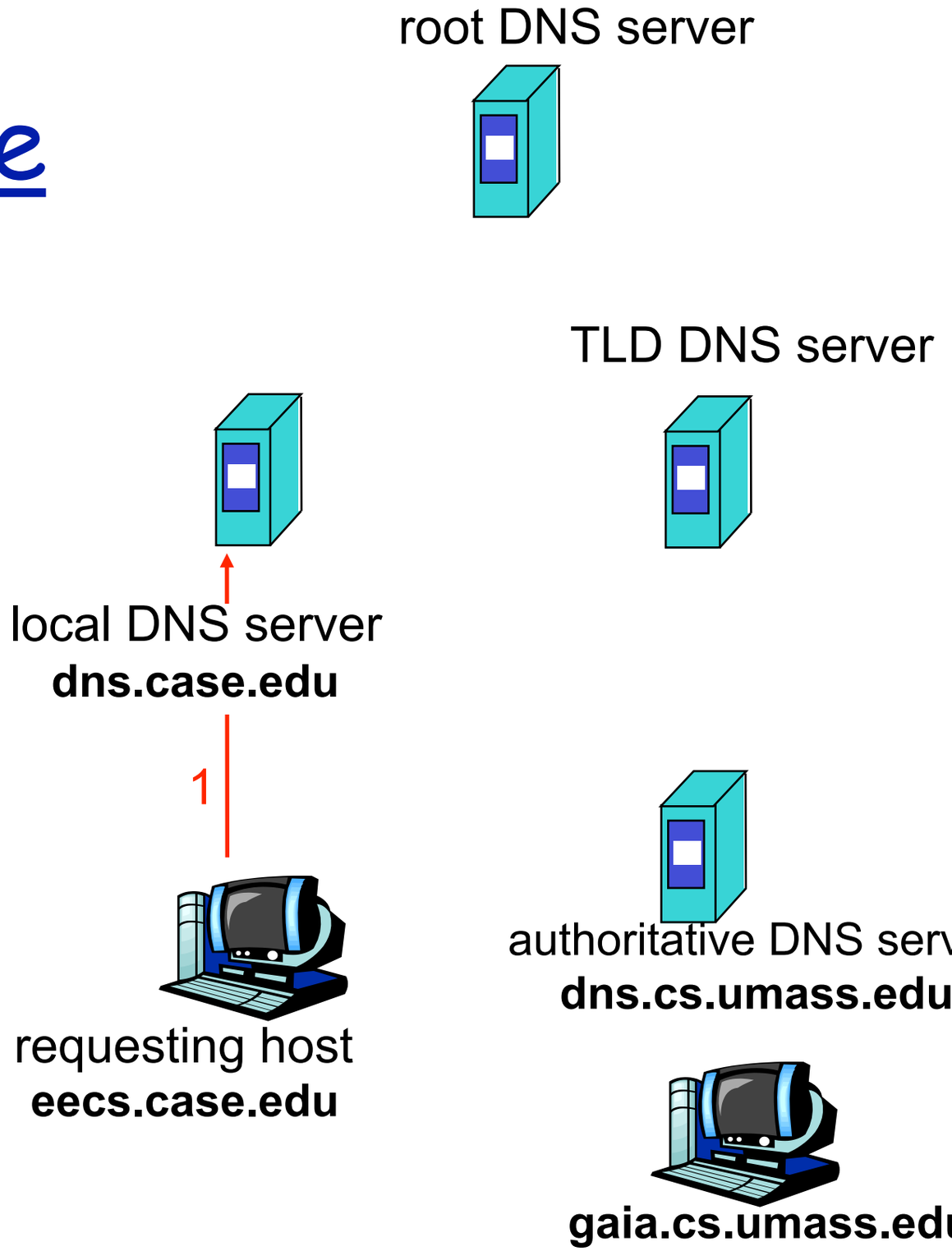

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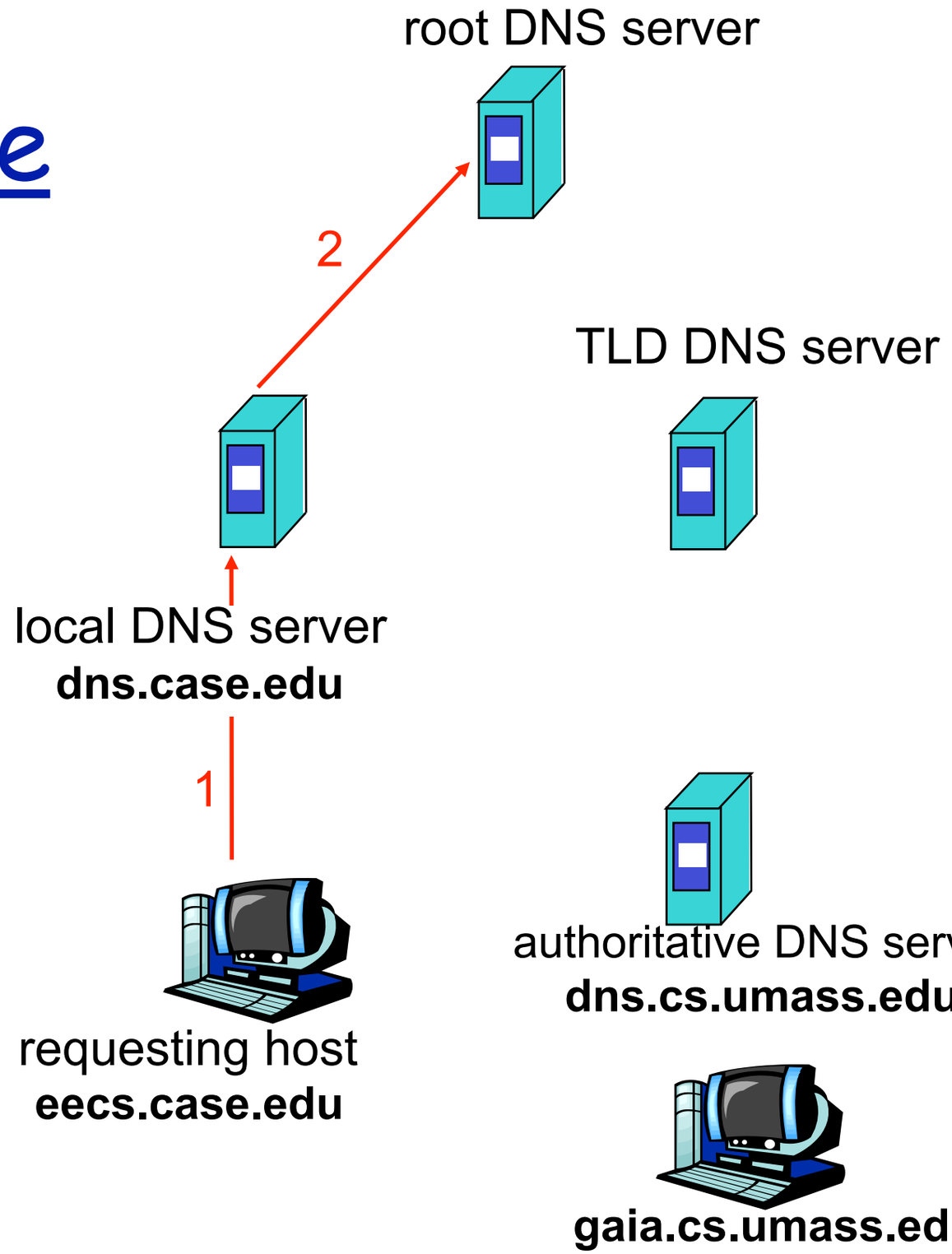

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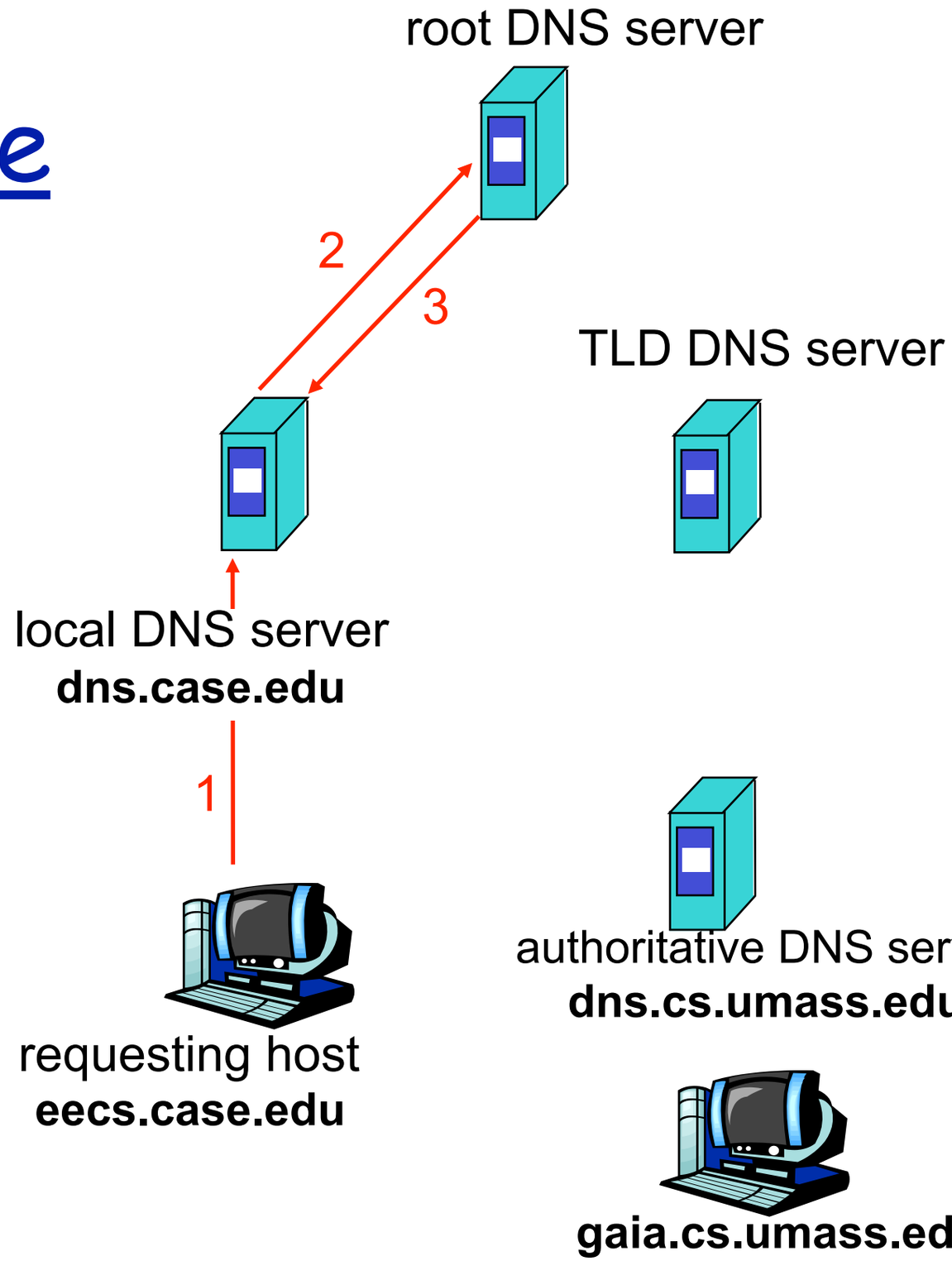

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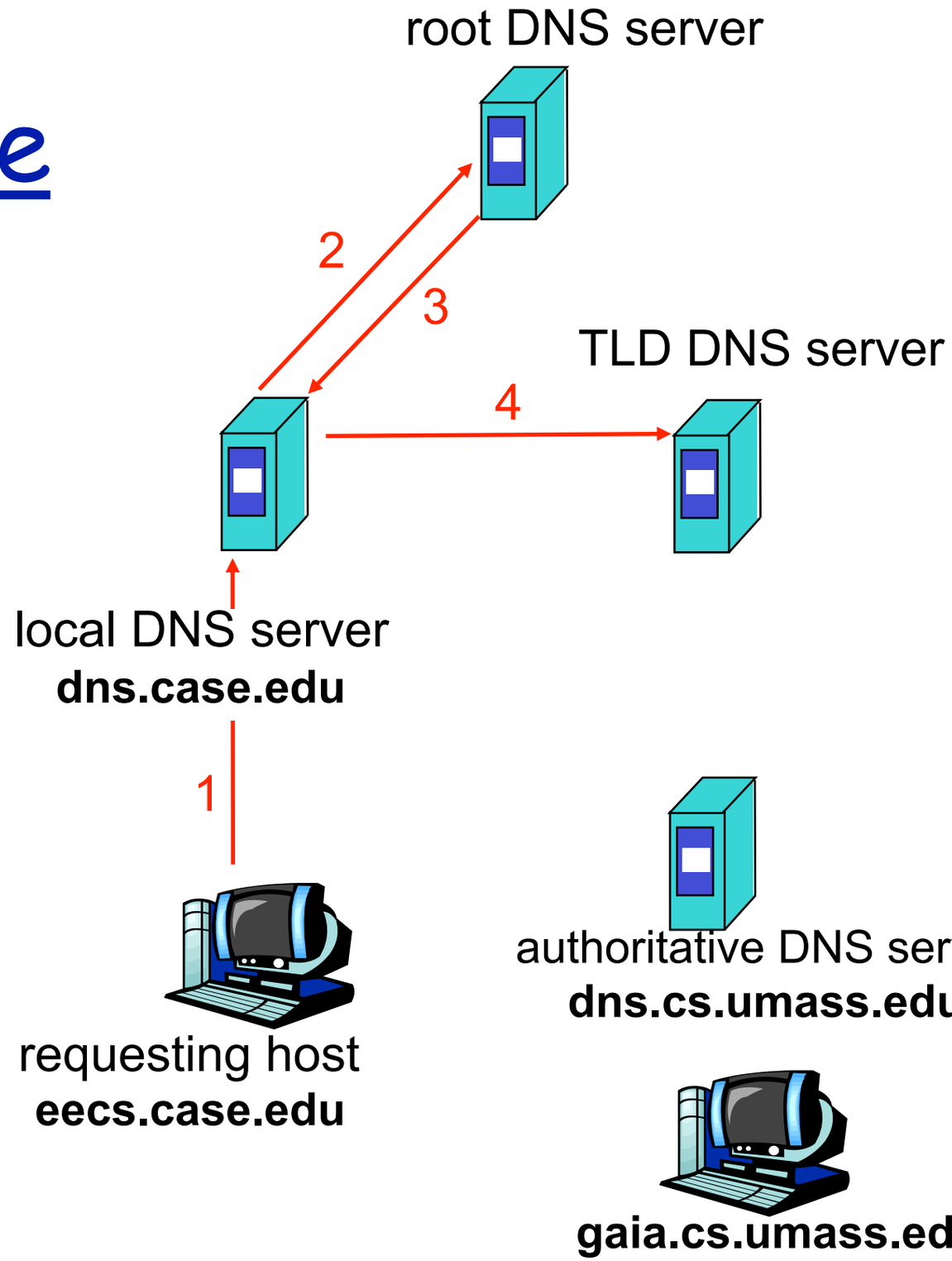

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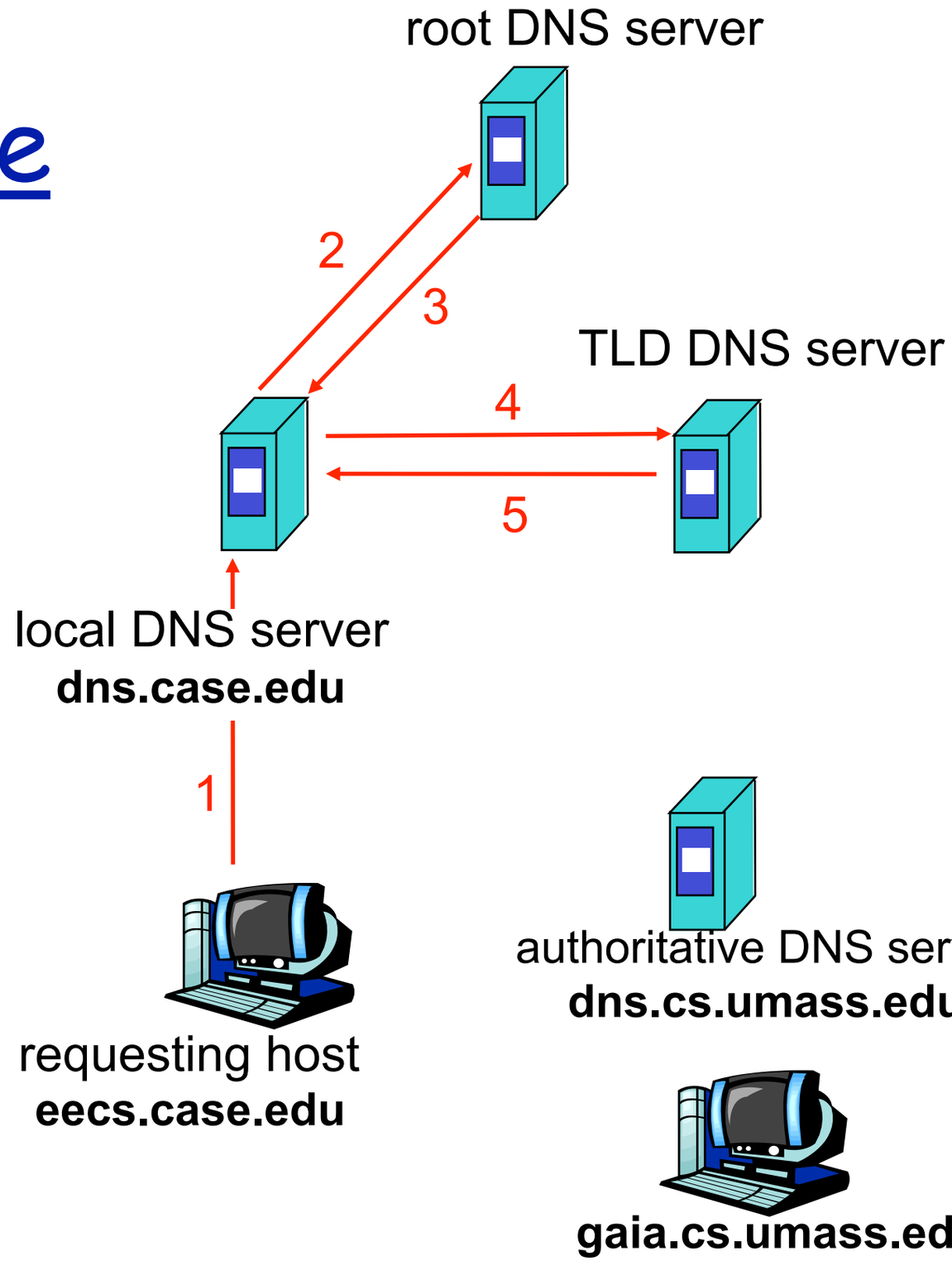

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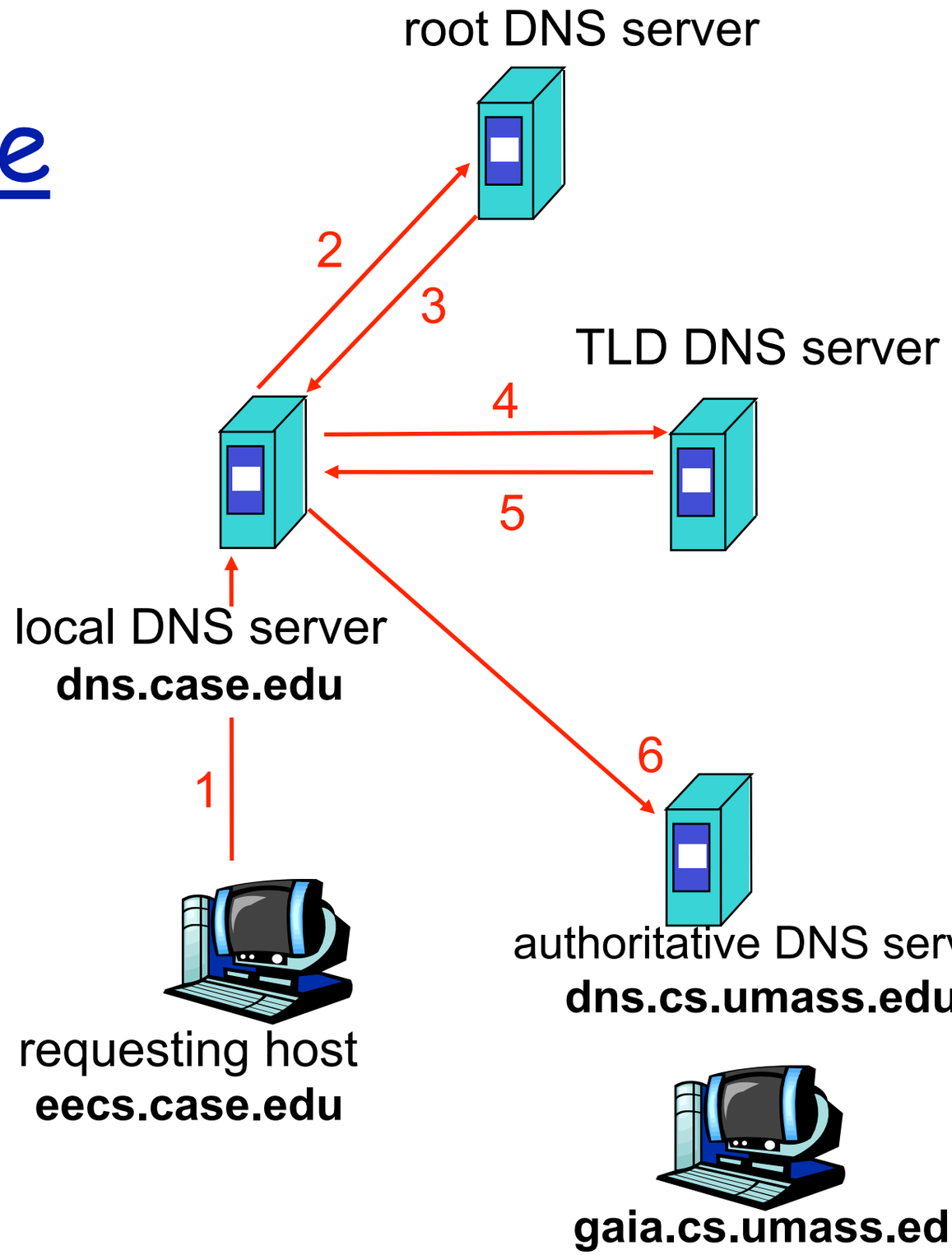

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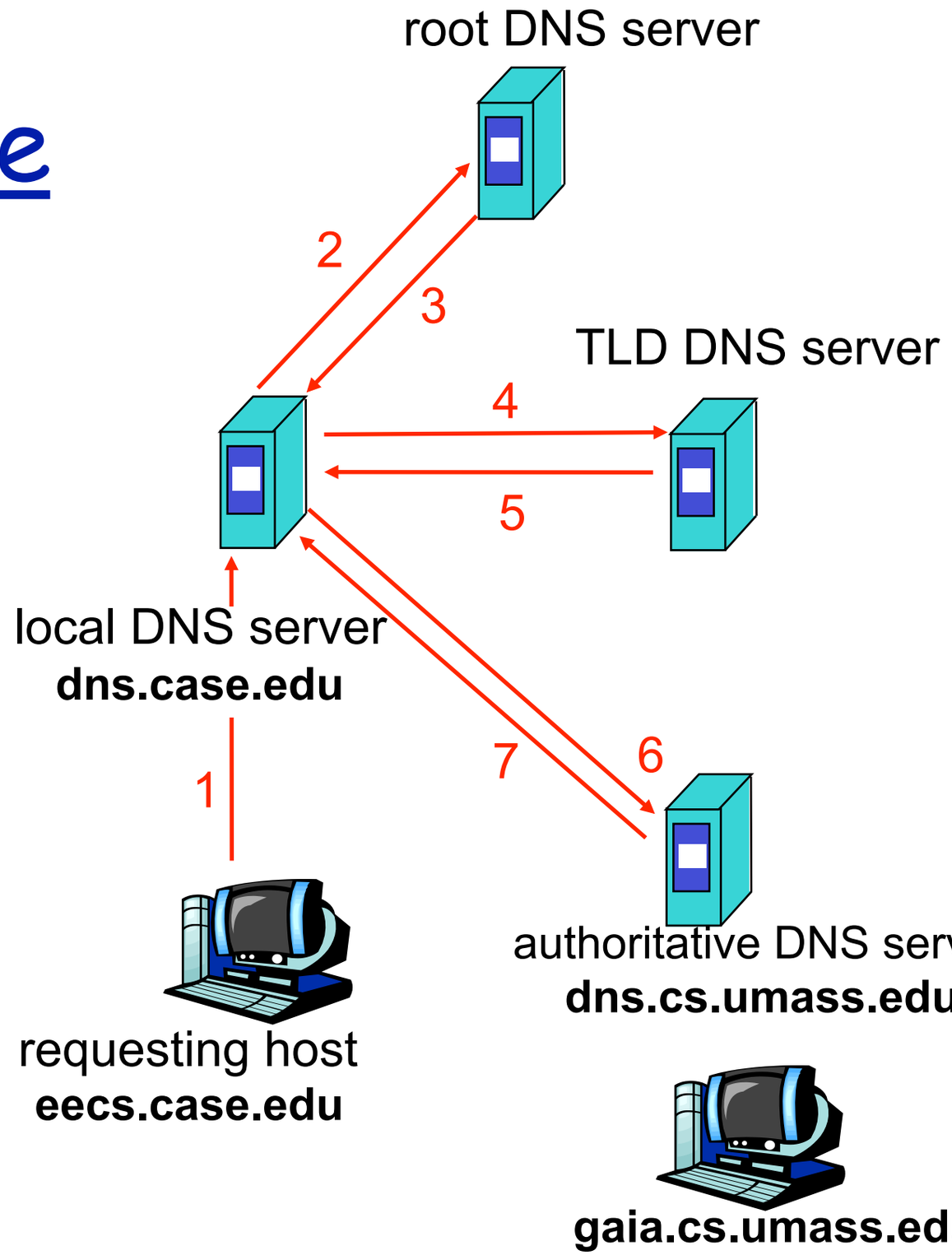

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