Domain Name System
Part 2

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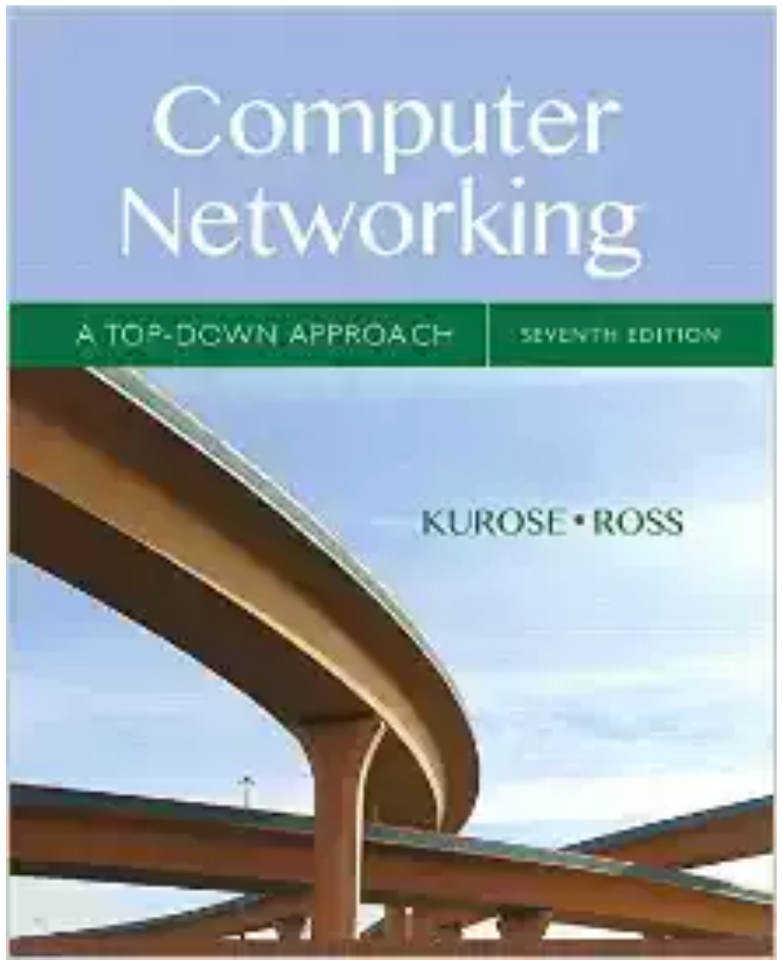
These slides are more-or-less directly from the slide set developed by Jim Kurose and Keith Ross for their book "Computer Networking: A Top Down Approach, 5th edition".

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

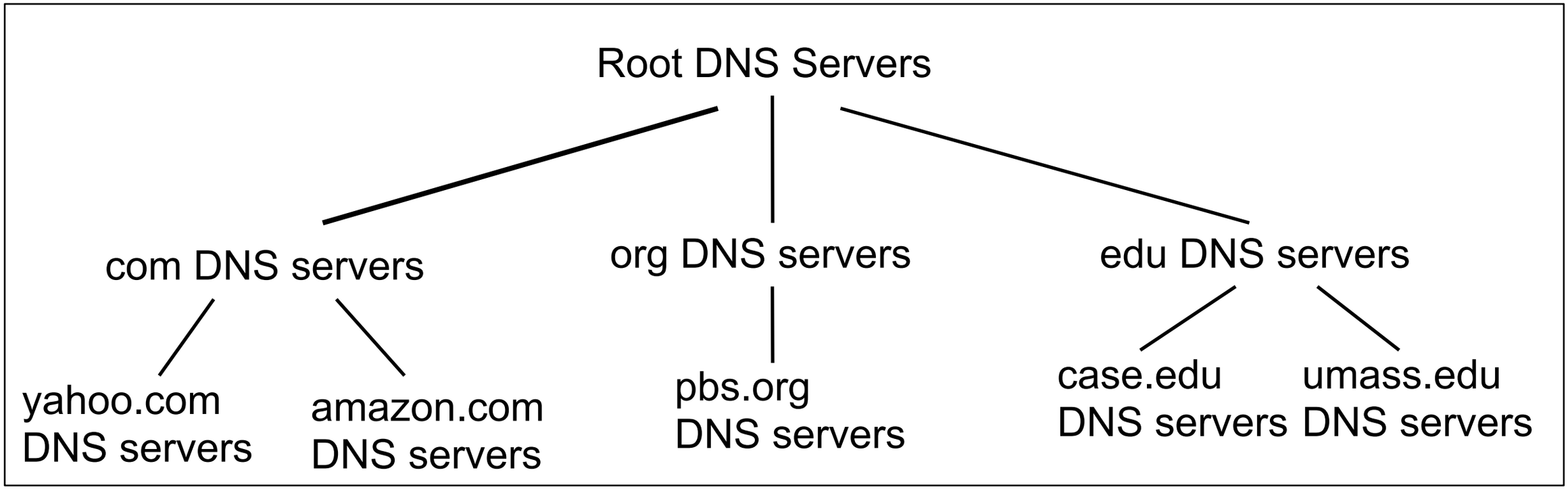
Reading Along ...



- DNS is chapters 2.4 (application layer)

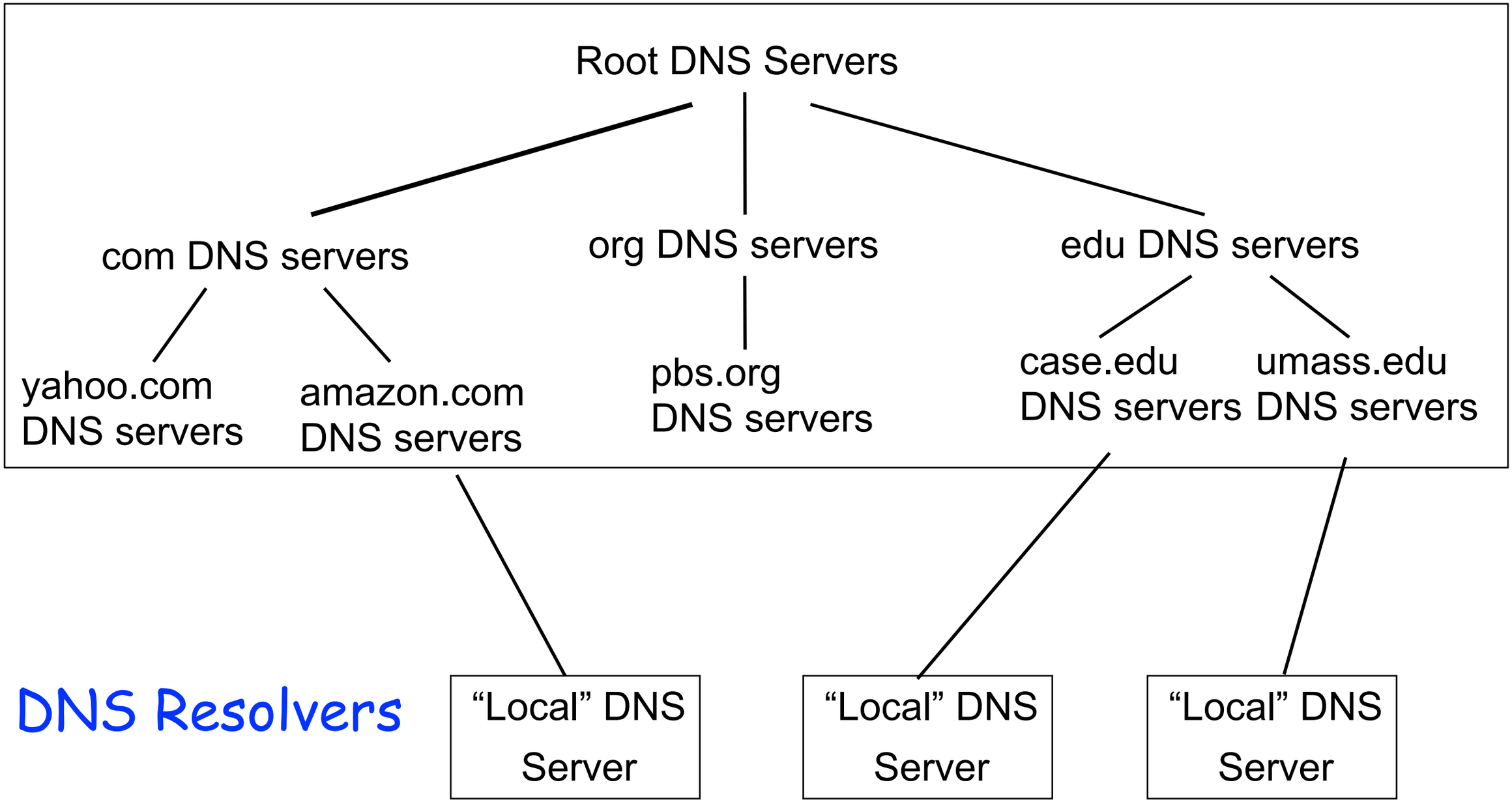
Domain Name System

Authoritative Name Servers



Domain Name System

Authoritative Name Servers



DNS Resolvers

DNS: caching and updating records

- once (any) name server learns mapping, it caches mapping
  - cache entries timeout (disappear) after some time
  - TLD servers typically cached in local name servers
    - Thus root name servers not often visited

DNS records

DNS: distributed db storing resource records (RR)

RR format: `(name, value, type, ttl)`

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- **name** is hostname
- **value** is IPv6 address

DNS records

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Type=A

- **name** is hostname
- **value** is IPv4 address

Type=AAAA

- **name** is hostname
- **value** is IPv6 address

Type=CNAME

- **name** is alias name for some "canonical" (the real) name
- `www.ibm.com` is really
  `servereast.backup2.ibm.com`
- **value** is canonical name

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Type=NS

- **`name`** is domain (e.g., foo.com)
- **`value`** is hostname of authoritative name server for this domain

DNS records

DNS: distributed db storing resource records (RR)

RR format: `(name, value, type, ttl)`

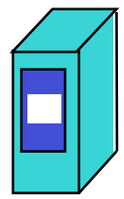
Type=NS

- **`name`** is domain (e.g., foo.com)
- **`value`** is hostname of authoritative name server for this domain

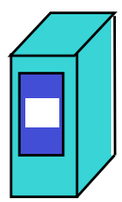
Type=MX

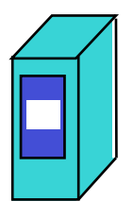
- **`value`** is name of mailserver associated with **`name`**

DNS name resolution example



root DNS server

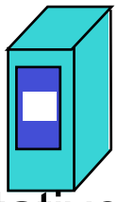




TLD DNS server

local DNS server
dns.case.edu

requesting host
eecs.case.edu

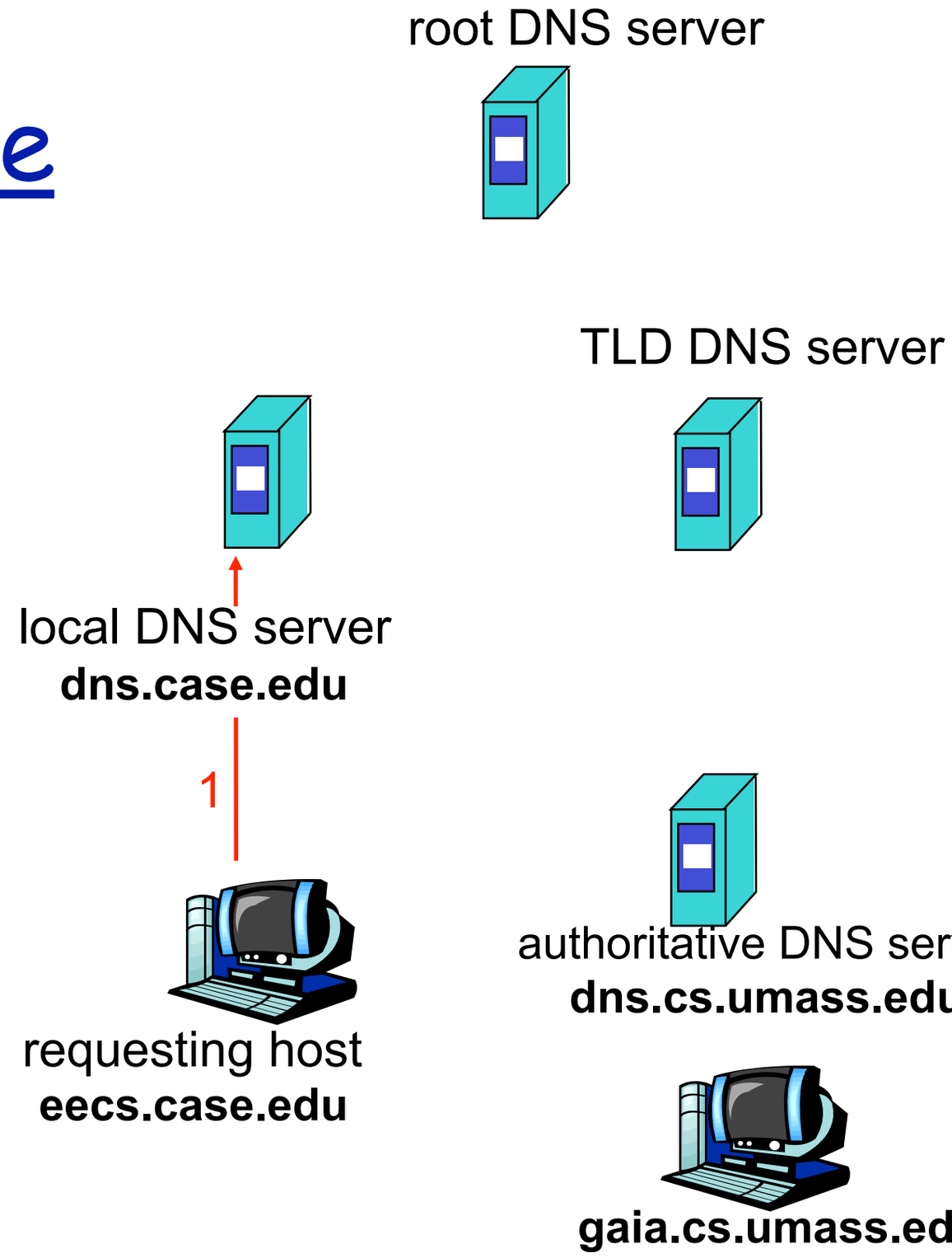


authoritative DNS server
dns.cs.umass.edu

gaia.cs.umass.edu

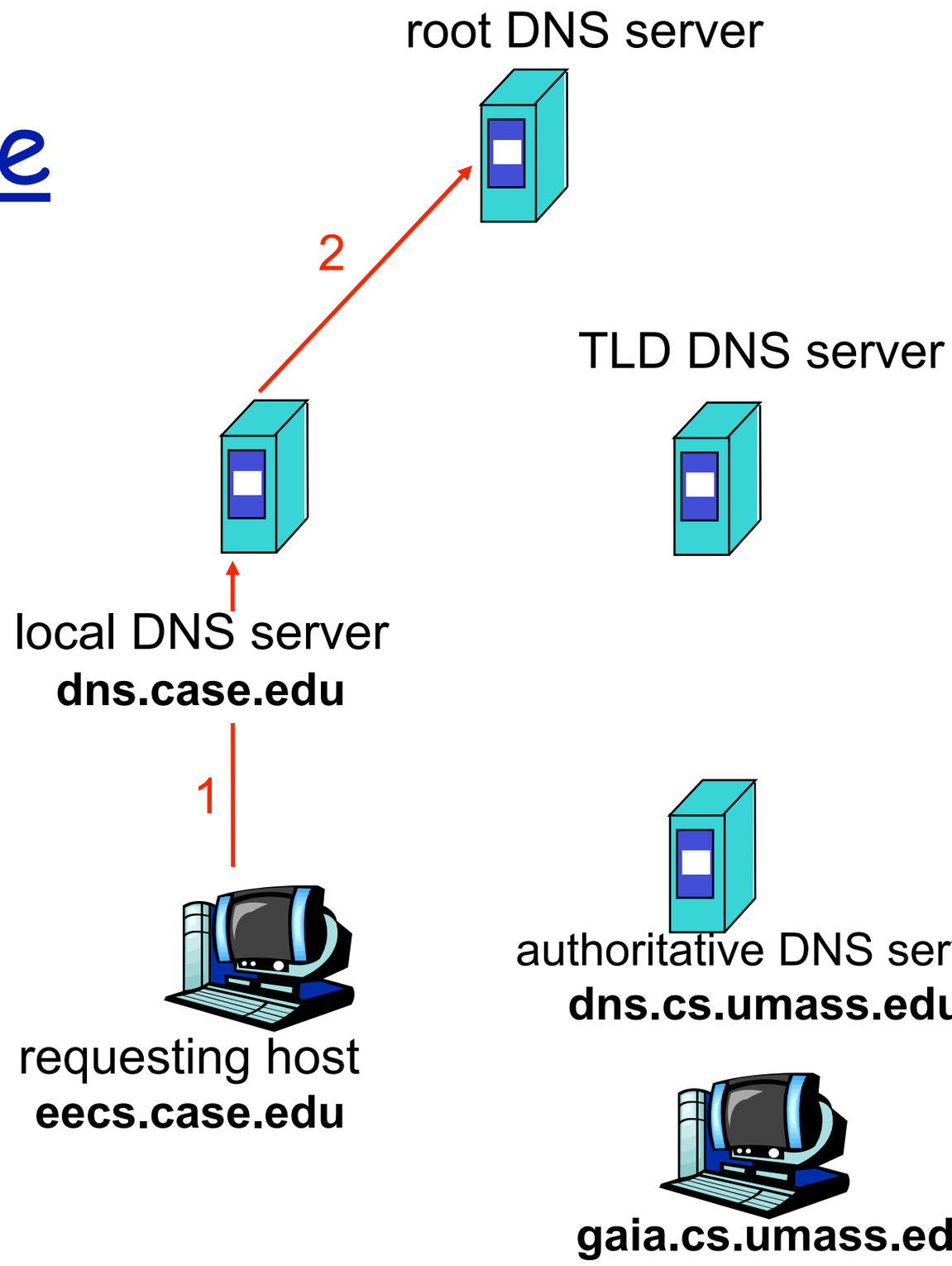
DNS name resolution example

- 1: *A gaia.cs.umass.edu?*



DNS name resolution example

- 1: A gaia.cs.umass.edu?
- 2: A gaia.cs.umass.edu?



DNS name resolution example

- 1: A gaia.cs.umass.edu?
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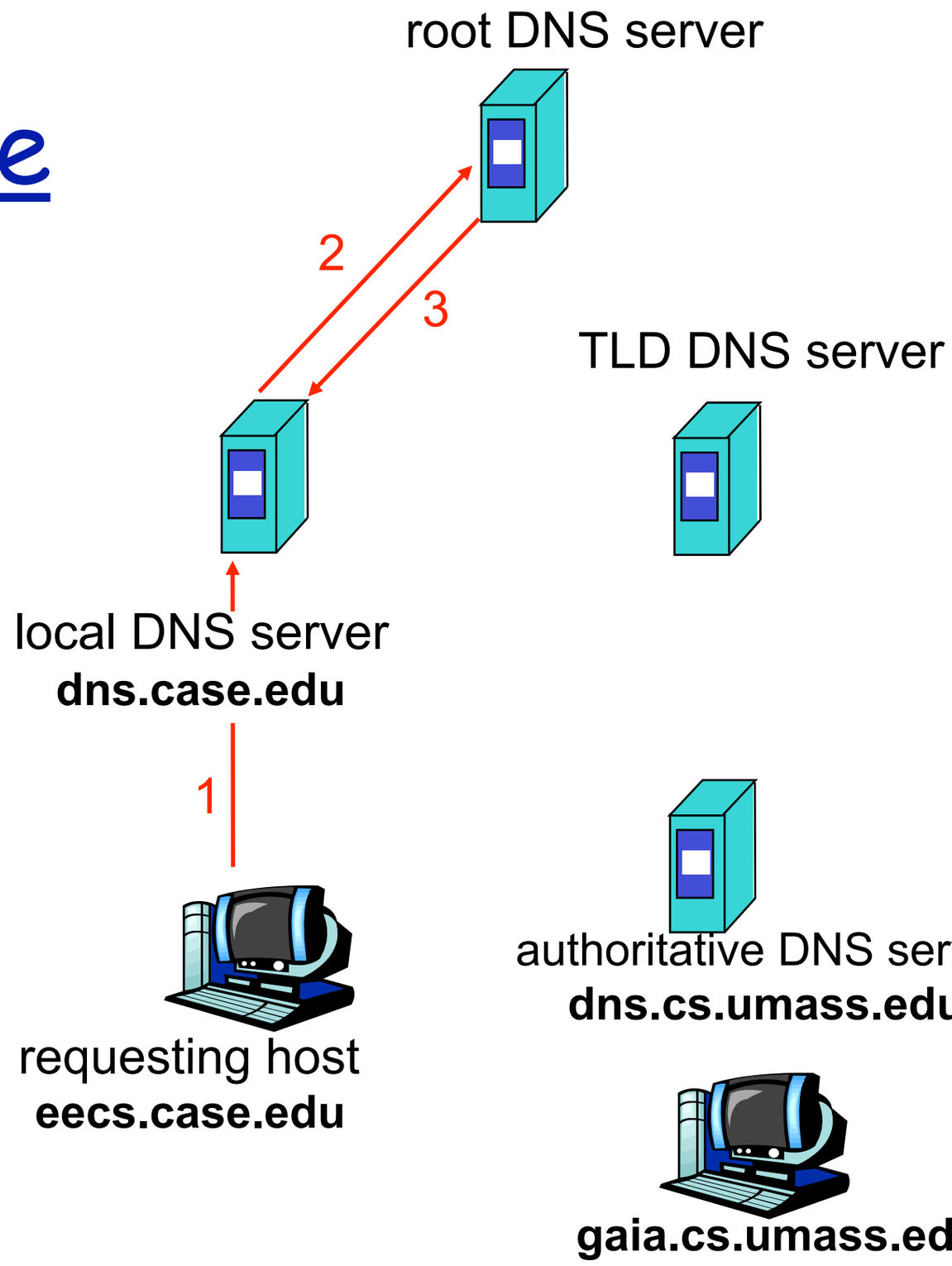
- 3: NS: TLD DNS server
  A TLD DNS server=1.2.3.4



DNS name resolution example

- 1: A gaia.cs.umass.edu?
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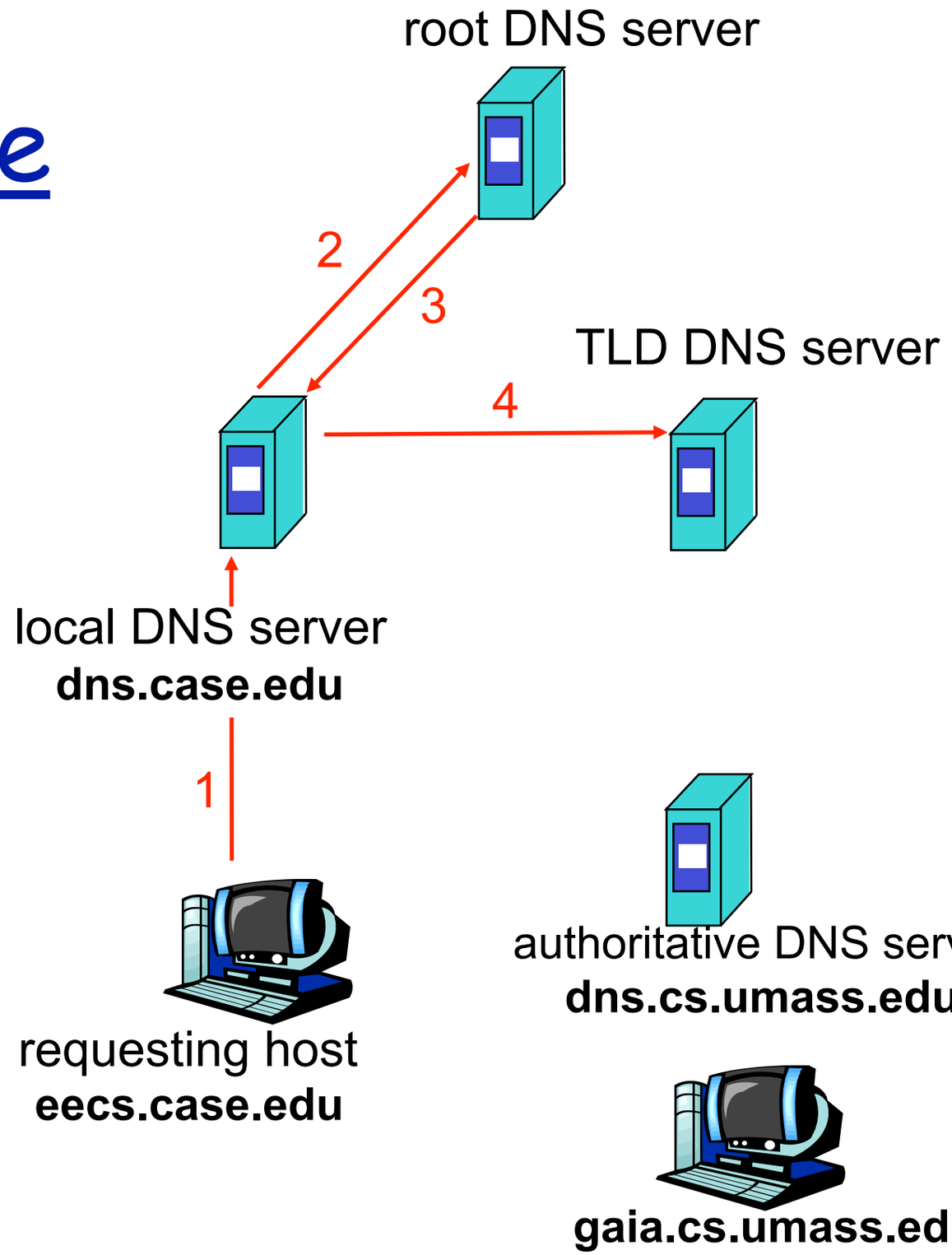
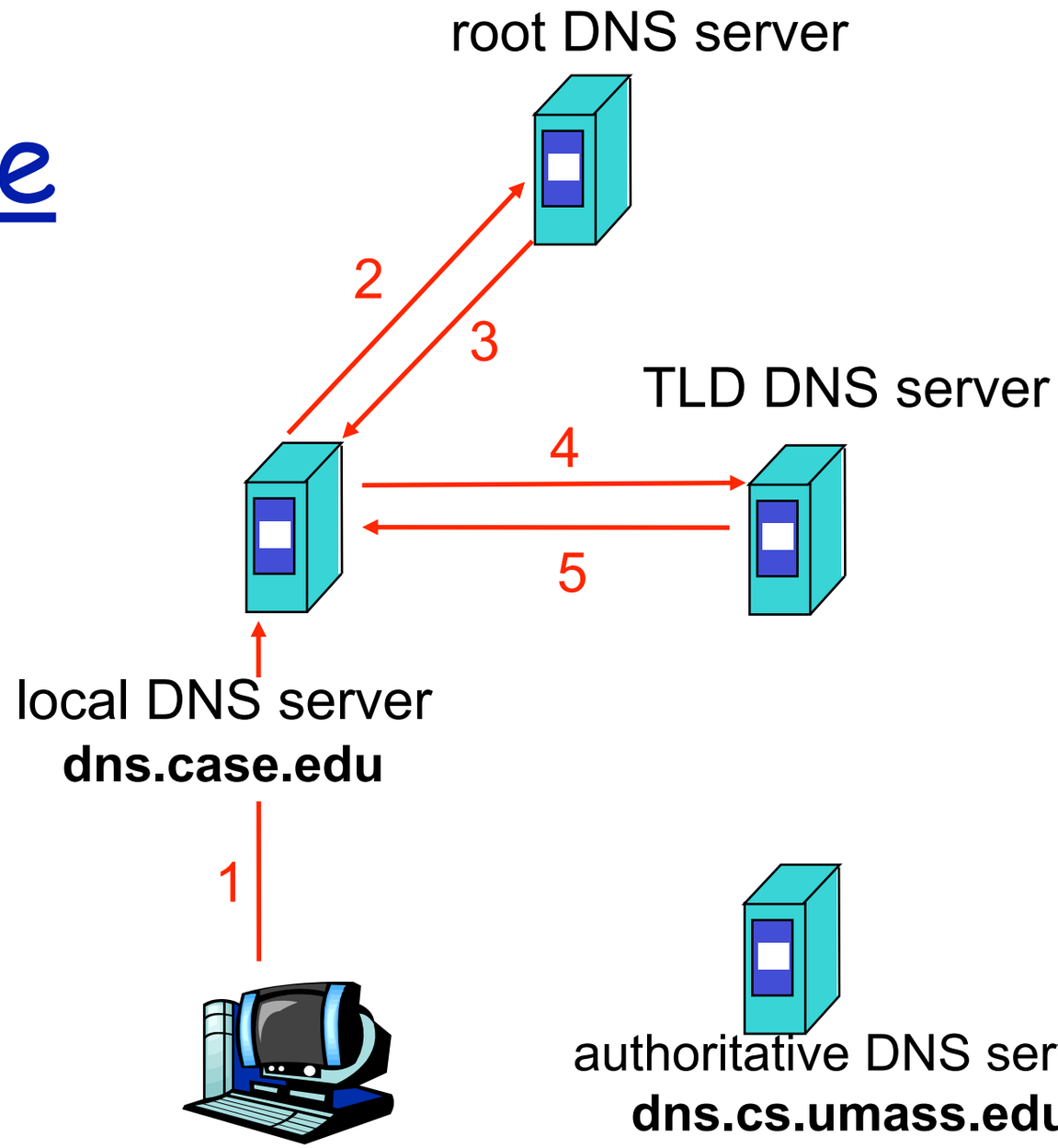


DNS name resolution example

- 1: *A gaia.cs.umass.edu?*
- 2: *A gaia.cs.umass.edu?*
- 3: NS: TLD DNS server
  A TLD DNS server=1.2.3.4
- 4: *A gaia.cs.umass.edu?*
- 5: NS: dns.cs.umass.edu
  A dns.cs.umass.edu=1.2.3.5



DNS name resolution example

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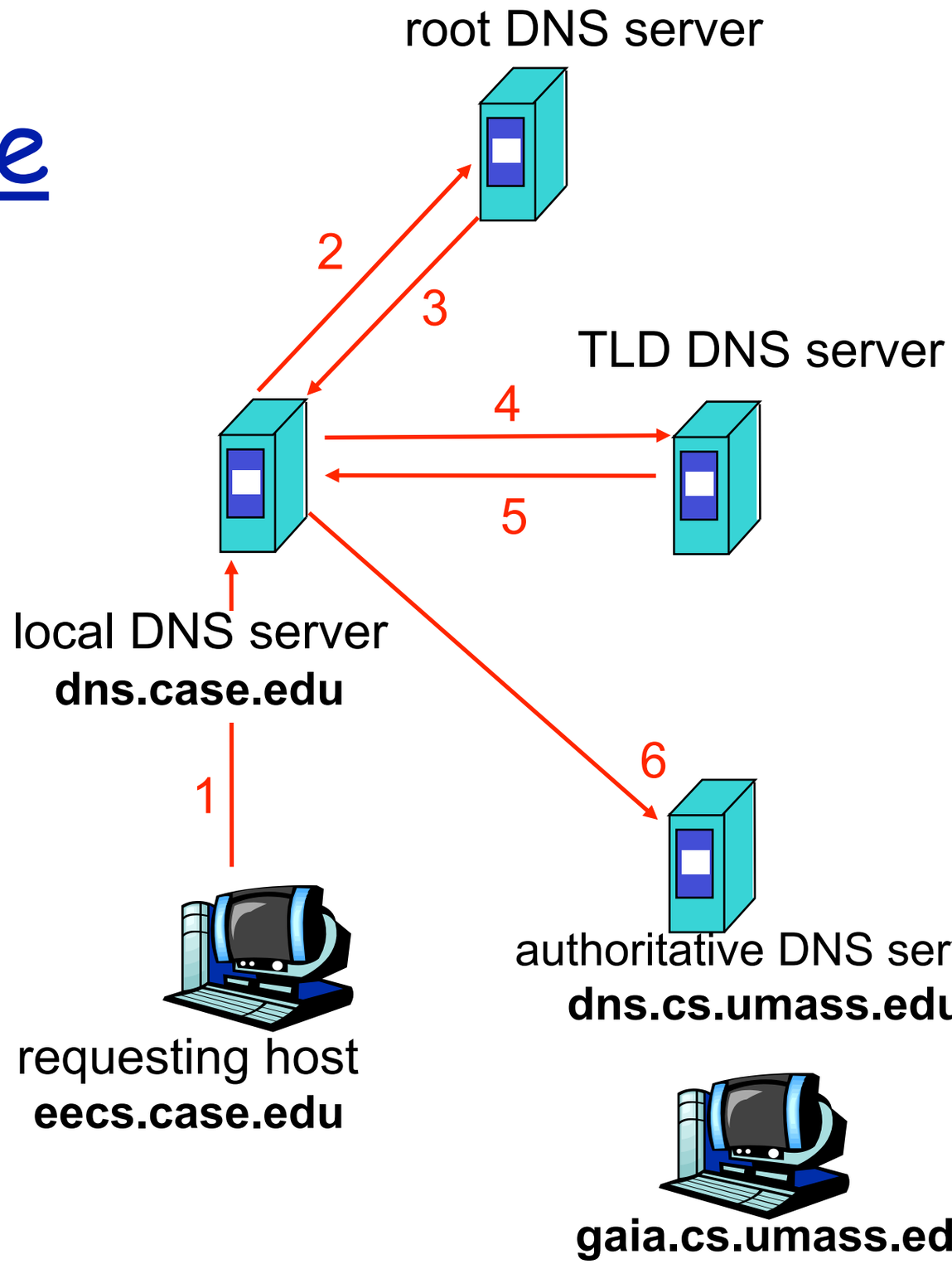

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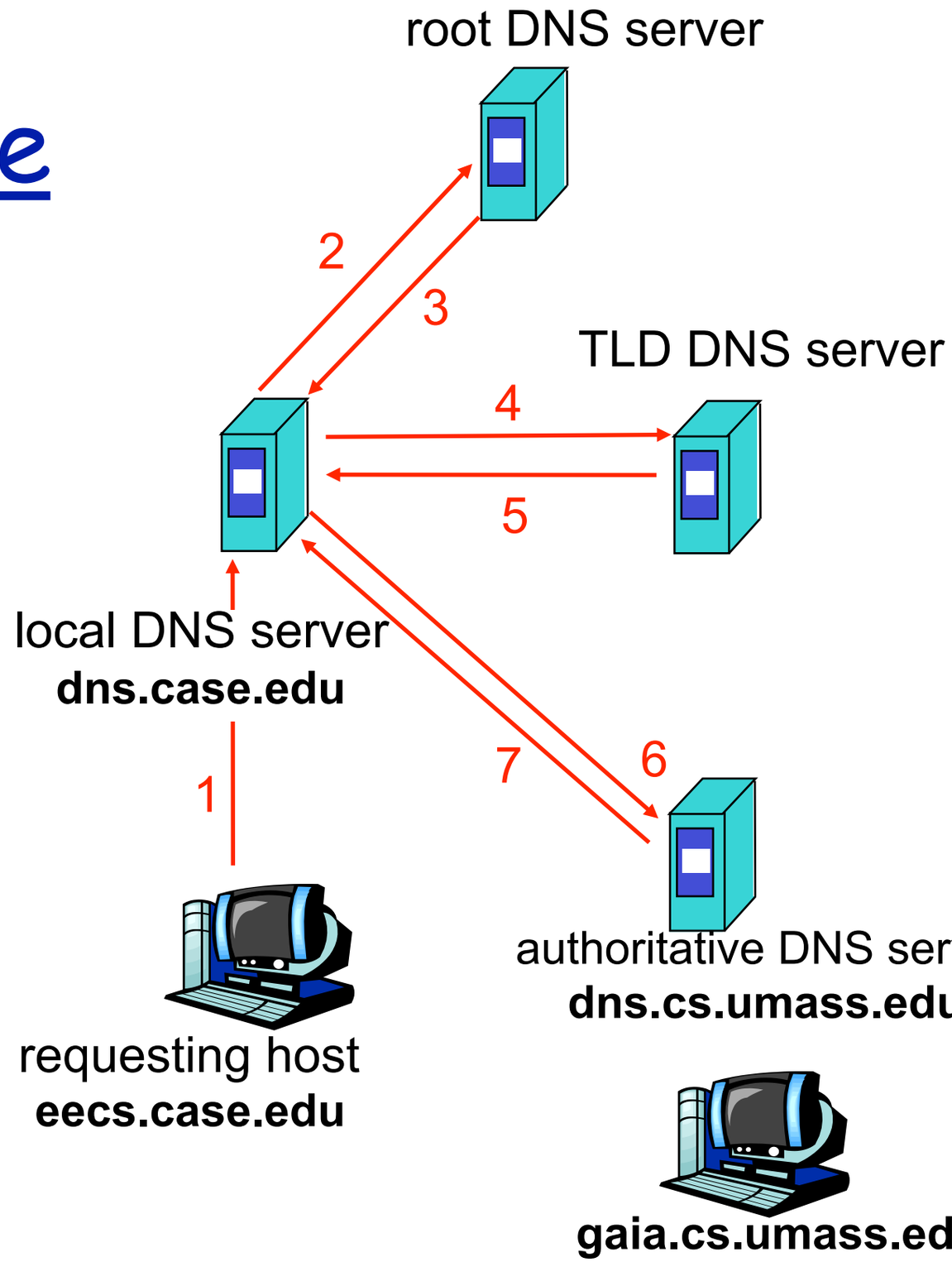
- 5: NS: dns.cs.umass.edu
  A dns.cs.umass.edu=1.2.3.5
- 6: *A gaia.cs.umass.edu?*
- 7: *A gaia.cs.umass.edu* = 128.119.245.12



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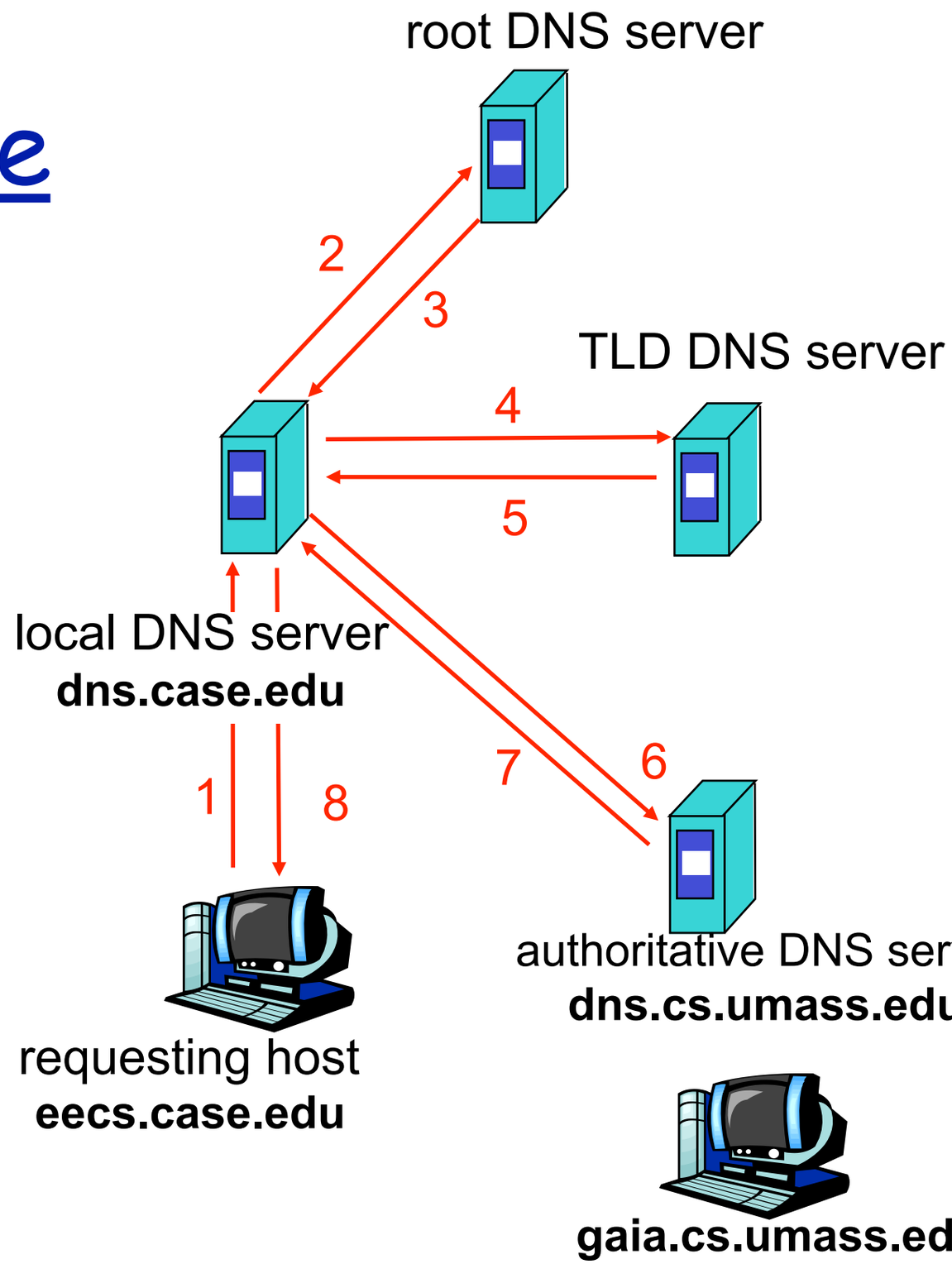
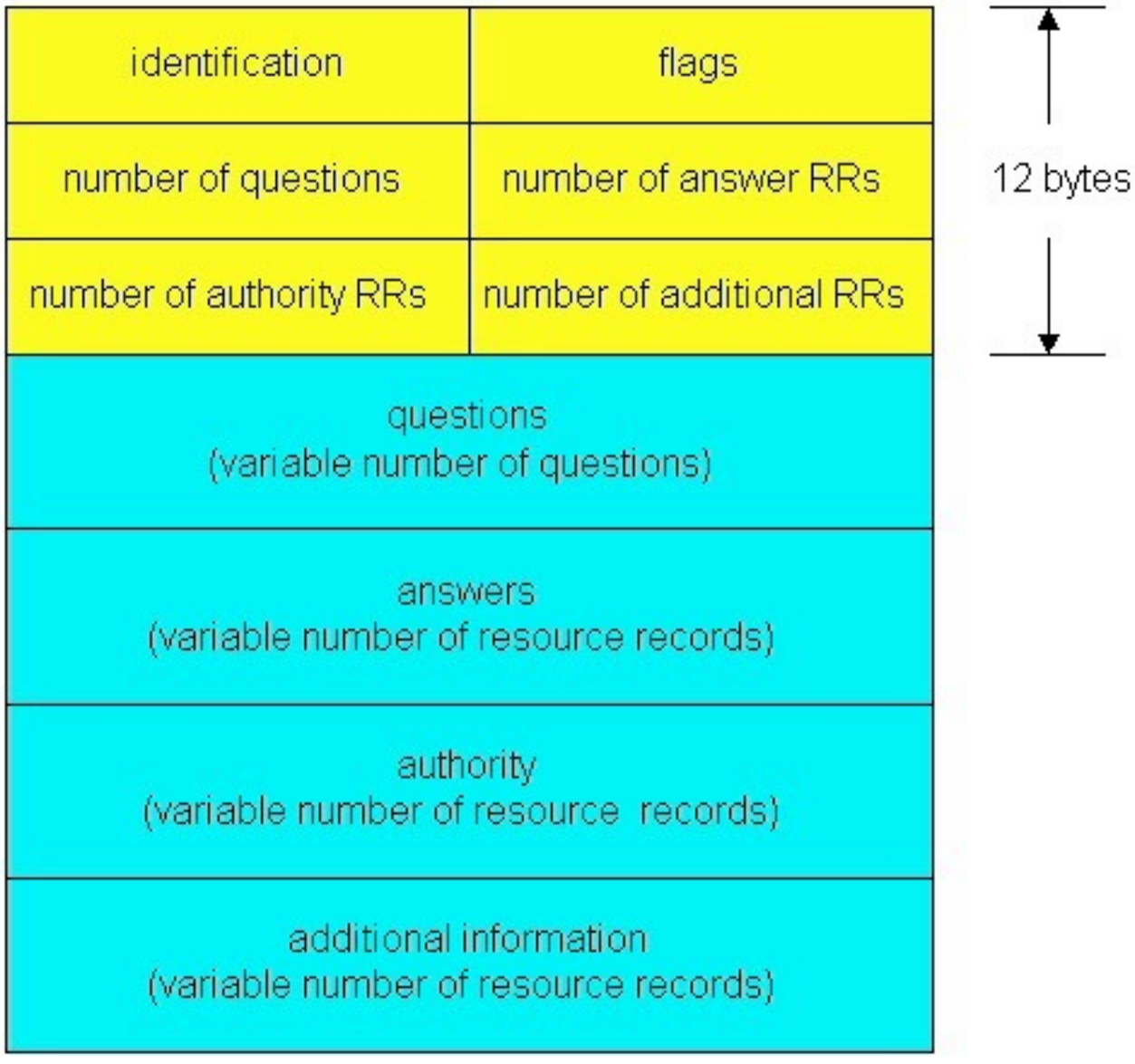


DNS protocol, messages

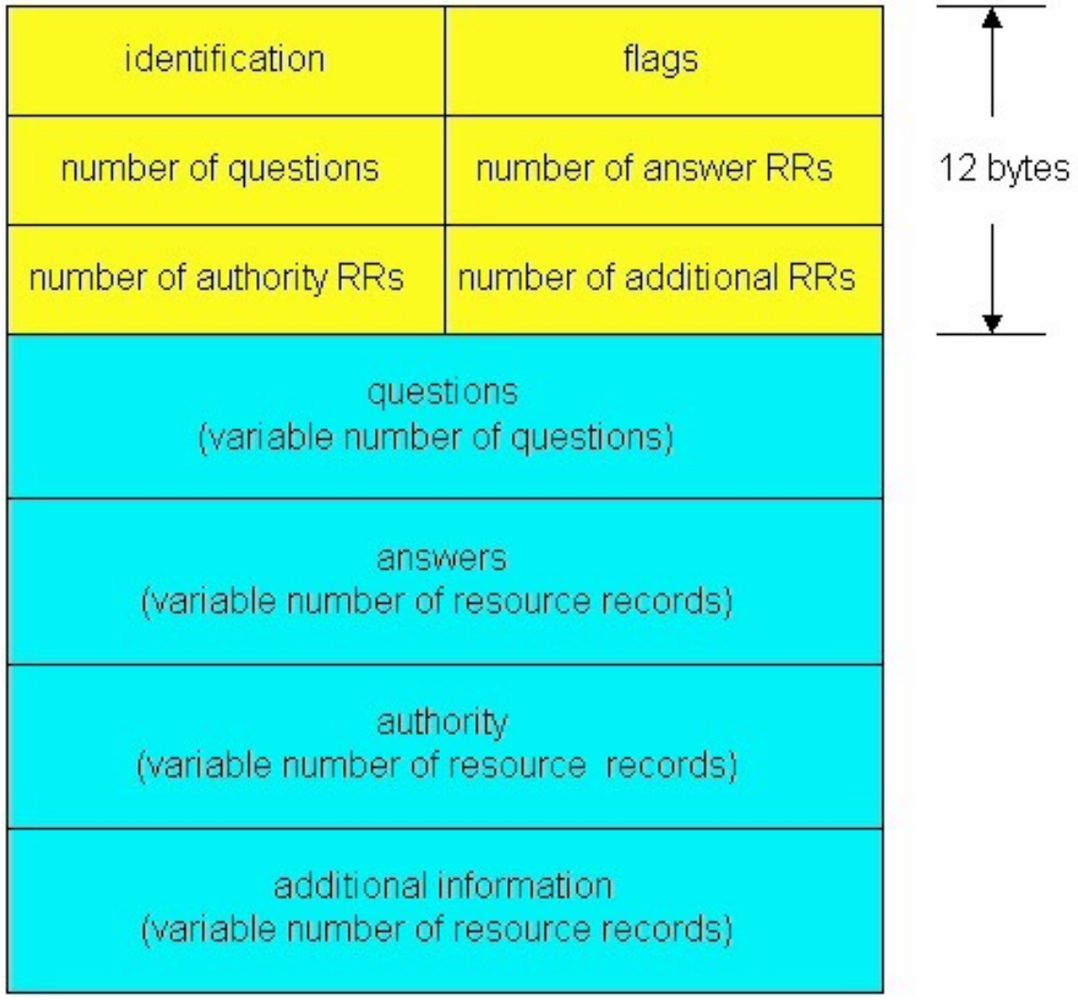
DNS protocol : query and reply messages, both with same message format

msg header

- identification: 16 bit # for query, reply to query uses same #
- flags:
  - query or reply
  - reply is authoritative
  - etc.

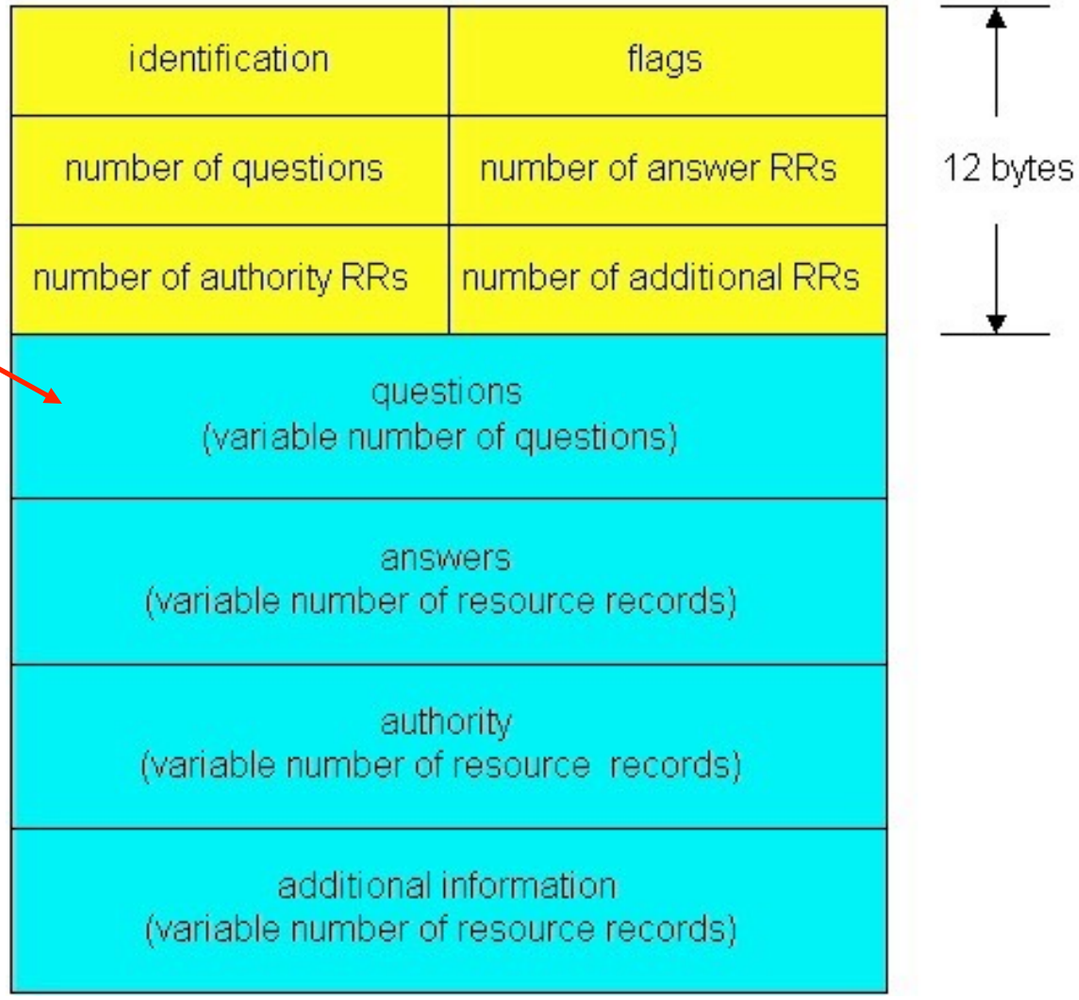


DNS protocol, messages



DNS protocol, messages

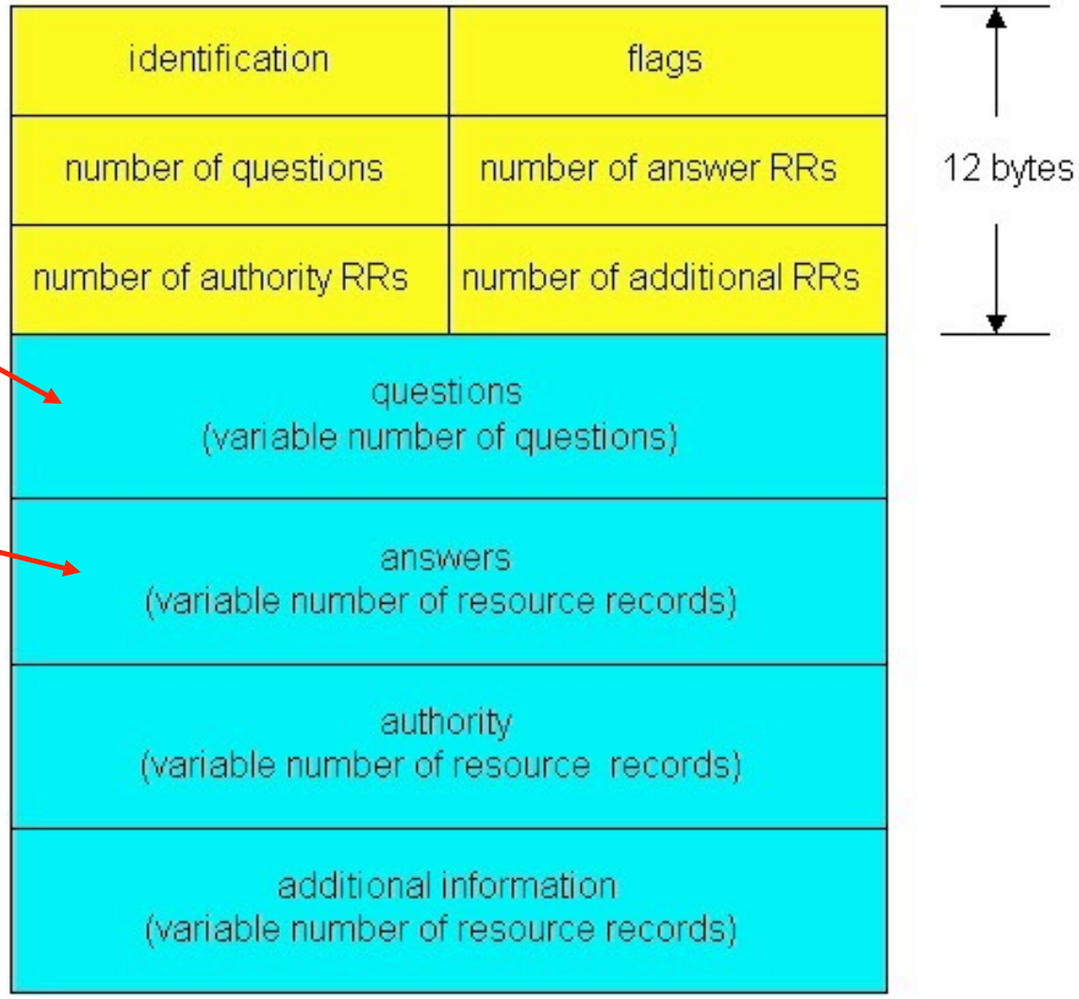
Name, type fields
for a query



DNS protocol, messages

Name, type fields for a query

RRs in response to query

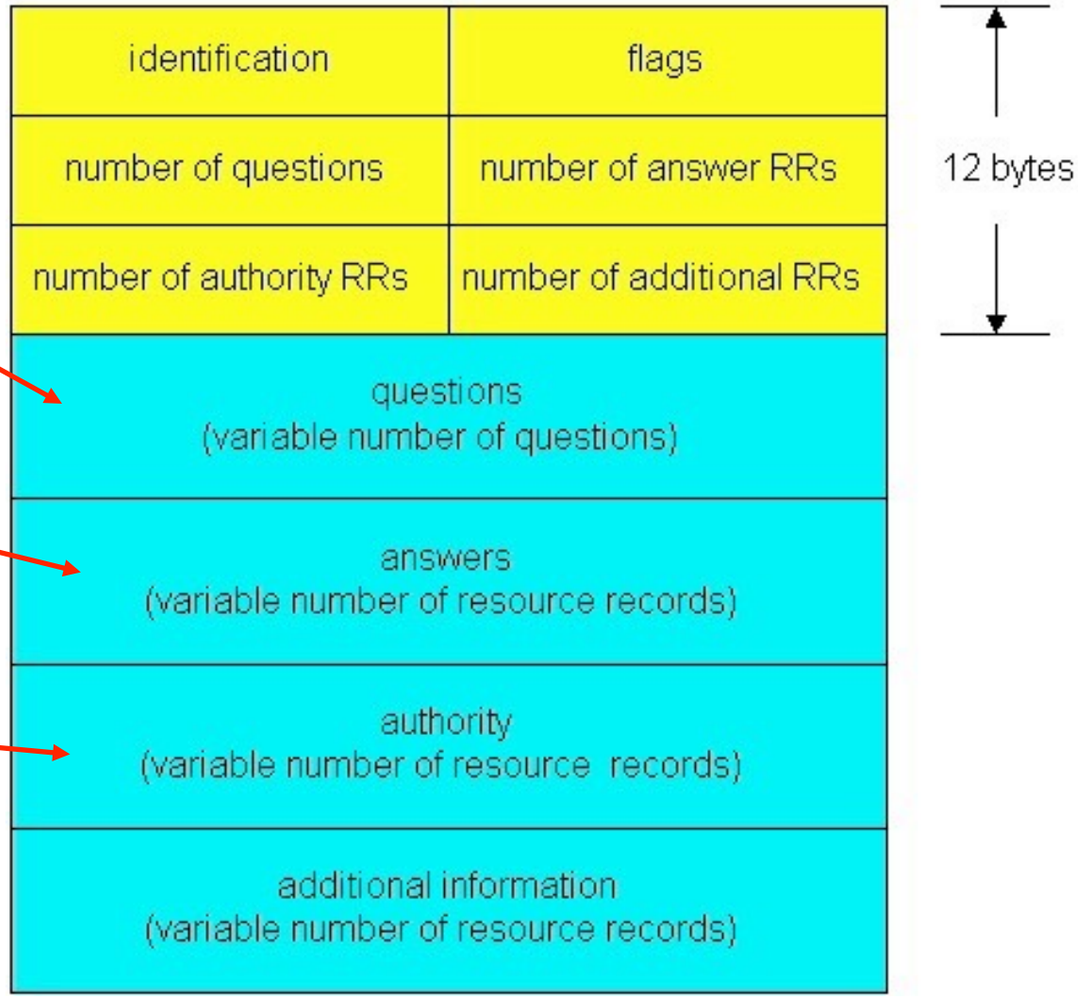


DNS protocol, messages

Name, type fields for a query

RRs in response to query

records for authoritative servers



DNS protocol, messages

Name, type fields for a query

RRs in response to query

records for authoritative servers

additional "helpful" info that may be used