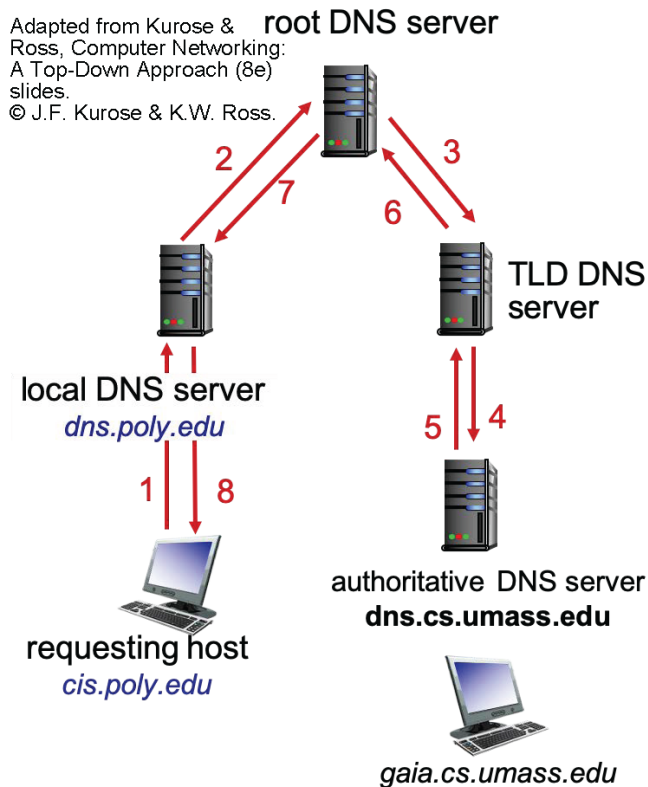


Question 1: The DNS queries in this figure are:



- A iterative (1 to 8).
- B recursive (1 and 8) and iterative (2 to 7).
- C iterative (1 and 8) and recursive (2 to 7).
- D recursive (1 to 8).

Question 2: A DNS lookup query response consists of:

- A an ANSWER, AUTHORITY and (optionally) ADDITIONAL sections
- B an ANSWER and AUTHORITY sections only
- C an ANSWER and ADDITIONAL sections
- D an ANSWER and (optionally) AUTHORITY sections

Question 3: In BitTorrent, each peer can distribute any part of:

- A a file it has fully or partially to any other peer but a server/tracker is initially needed.
- B chunks it has received to any other peer and no server/tracker is needed.
- C a file it has fully received to any other peer, regardless of server/tracker assistance.
- D a file it has fully or partially received to any other peer, regardless of server/tracker assistance.

Question 4: Assuming no upload from a server, BitTorrent is faster than the centralised client-server approach:

- A when there is more than one client/peer downloading a file.
- B when every peer is unchoked.
- C when the sum of the upload rates of the peers is higher than a single server.
- D always.

Question 5: If a BitTorrent tracker becomes unavailable:

- A everything remains the same because BitTorrent is P2P.
- B new downloads can be started if there are other peers in the network, ongoing downloads can continue but may eventually stop.
- C no new downloads can be started, ongoing downloads can continue but may eventually stop.
- D all downloads/uploads stop.

Question 6: When a new peer joins BitTorrent without any chunks, how can it get the first chunk?

- A By default the tracker immediately sends F/N rarest chunks to the new peer, which will send and receive chunks to/from its neighbours.
- B A neighbour peer will eventually randomly pick the new peer, which will then be optimistically unchoked and will receive chunks.
- C A list of neighbour peers will be downloaded from the tracker and these can immediately send the rarest chunks to the new peer.
- D A new peer joining BitTorrent starts as unchoked and therefore will receive chunks from neighbours as long as it also sends some in return.

Question 7: When accessing a web page for the first time, the use of a local DNS:

- A reduces the total time needed to download the page if it has multiple referenced objects in the same domain name.
- B reduces the total time needed to download the page only for persistent HTTP connections, regardless of the web page.
- C reduces the total time needed to download the page only for non-persistent HTTP connections, regardless of the web page.
- D reduces the total time needed to download the page, regardless of the web page and used HTTP connection-type.

Question 8: Typically, when accessing email (reading) the application-layer protocols likely being used are:

- A DNS.
- B IMAP.
- C DNS and IMAP (or HTTP for web clients).
- D SMTP.

Question 9: A client uses a local DNS resolver. At time $t=0$, the resolver has no cached entries for `www.example.com`. The client resolves `www.example.com` successfully. At time $t=30s$, the same client resolves `www.example.com` again. Assume the DNS record TTL is 120s and nothing else changes. Which statement best describes what happens at $t=30s$?

- A The resolver answers from its cache and does not contact root/TLD/authoritative servers.
- B The resolver must contact a root server again, because root servers are always queried first.
- C The resolver must contact the authoritative server again, because only the client caches DNS records.
- D The resolver contacts root and TLD again, but not the authoritative server.

Question 10: A file of size $F = 1$ Gbit must be distributed to $N = 10$ peers. Each peer has download rate $d = 20$ Mbit/s and upload rate $u = 1$ Mbit/s. The server has upload rate $u_s = 5$ Mbit/s. Assume ideal scheduling and that peers can upload while downloading. Which option is correct?

- A P2P is always faster as soon as $N > 1$, regardless of upload rates.
- B Both approaches must take exactly the same time because everyone downloads the same file size F .
- C P2P can be faster here because the aggregate peer upload helps; client-server is bottlenecked by $N \cdot F / u_s$.
- D Client-server is always faster when the server upload rate is larger than each peer upload rate.