Quiz-2 Solutions
(CS-3530/CS-301)

---

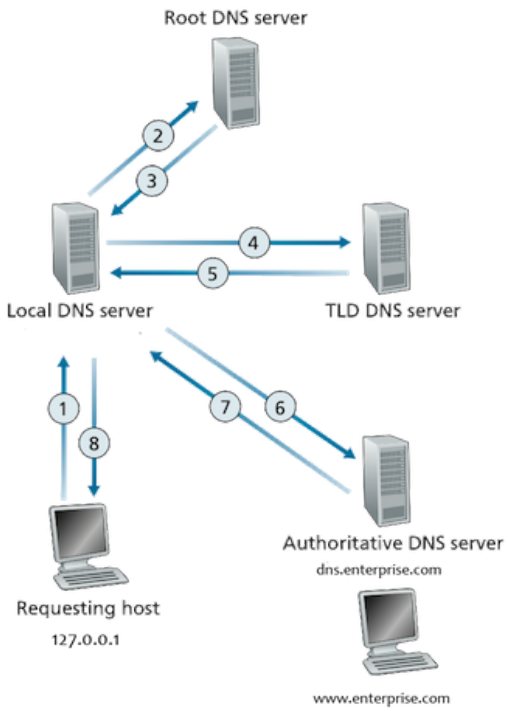
1. Imagine that you are trying to visit www.enterprise.com, but you don't remember the IP address the web-server is running on. **[3 marks]**

Assume the following records are on the TLD DNS server:

a. (www.enterprise.com, dns.enterprise.com, NS)
b. (dns.enterprise.com, 146.54.90.117, A)

Assume the following records are on the enterprise.com DNS server:

c. (www.enterprise.com, east5.enterprise.com, CNAME)
d. (east5.enterprise.com, 142.81.17.206, A)
e. (enterprise.com, mail.enterprise.com, MX)
f. (mail.enterprise.com, 247.29.60.134, A)

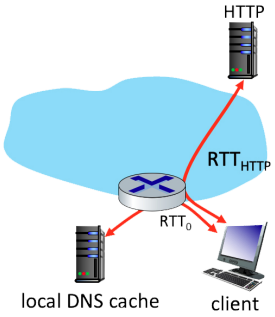


Q1: In the above example, how many unique type of Resource Records (RR) are there at the authoritative enterprise.com DNS server?
Ans: 3 (CNAME, MX, A)

Q2: Which type of DNS server holds a company's DNS records?
A: Authoritative DNS server

Q3: When you make the request for www.enterprise.com, your local DNS requests the IP on your behalf. When it contacts the TLD server, how many answers (RR) are returned?
A: 2 (NS, A)

2. Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that only one DNS server, the local DNS cache, is visited with an RTT delay of RTT0 = 5 msecs. Initially, let's suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Suppose the RTT between the local host and the Web server containing the object is RTT_{HTTP} = 100 msecs. **[4 marks]**



Q1: Assuming zero transmission time for the HTML object, how much time (in msec) elapses from when the client clicks on the link until the client receives the object?
A: 205 (5 + 2xRTT)

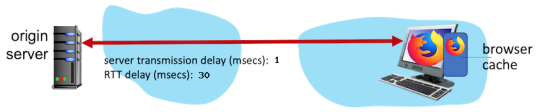
Q2: Now suppose the HTML object references 10 very small objects on the same server. Neglecting transmission times, how much time (in msec) elapses from when the client clicks on the link until the base object and all 10 additional objects are received from web server at the client, assuming non-persistent HTTP and no parallel TCP connections?
A: 5 + 200 + 2000 = 2205

Q3: Suppose the HTML object references 6 very small objects on the same server, but assume that the client is configured to support a maximum of 5 parallel TCP connections, with non-persistent HTTP. How much time (in mesc) utill the base object and all the 6 objects are received?
A: 5 + 200 + 200 + 200 = 605

Q4: Suppose the HTML object references 7 very small objects on the same server, but assume that the client is configured to support a maximum of 5 parallel TCP connections, with persistent HTTP. How much time (in mesc) utill the base object and all the 7 objects are received?

A: 5 + 200 + 100 + 100 = 405

3. Consider an HTTP server and client as shown in the figure below. Suppose that the RTT delay between the client and server is 30 msecs; the time a server needs to transmit an object into its outgoing link is 1 msecs; and any other HTTP message not containing an object has a negligible (zero) transmission time. Suppose the client again makes 90 requests, one after the other, waiting for a reply to a request before sending the next request. Assume the client is using HTTP 1.1 and the IF-MODIFIED-SINCE header line. Assume 60% of the objects requested have NOT changed since the client downloaded them (before these 90 downloads are performed) **[3 marks]**



How much time elapses (in milliseconds) between the client transmitting the first request (after establishing connection using persistent connection), and the completion of the last request?

A: 2736 (54x30 + 36x31)

4. Look at the scenario below, where Alice sends an email to Bob. **[3 marks]**

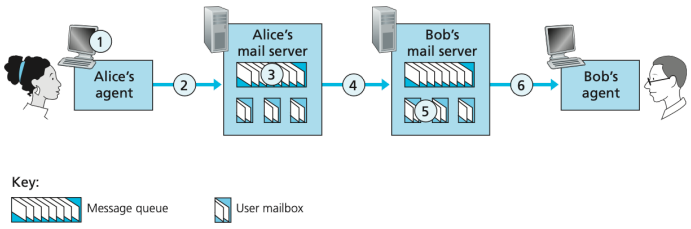


Figure 2.15 ♦ Alice sends a message to Bob

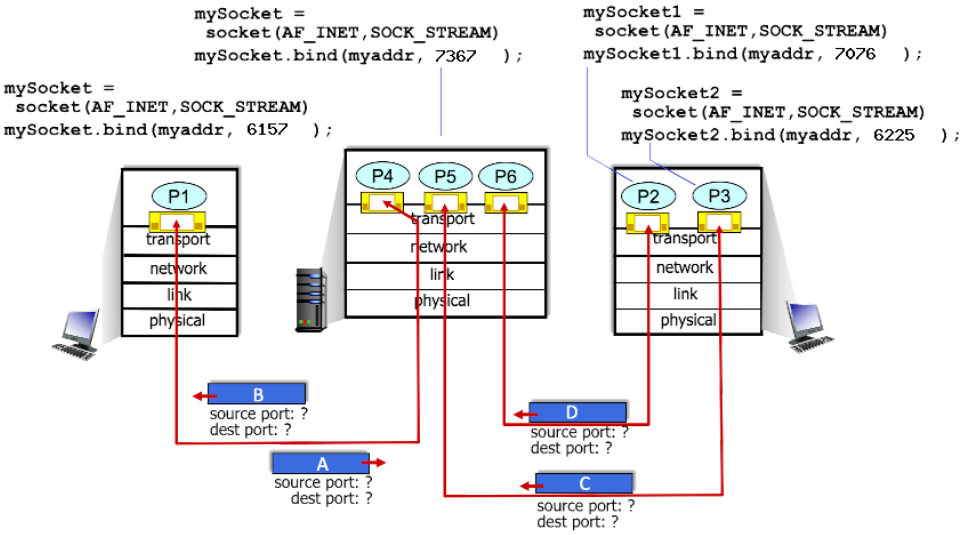
Q1: At point 2 in the diagram, what protocol is being used?
A: SMTP
Q2: At point 4 in the diagram, what protocol is being used?
A: SMTP
Q3: At point 6 in the diagram, what protocol is being used?
A: IMAP
Q4: Does SMTP use TCP or UDP?
A: TCP
Q5: Is SMTP a 'push' or 'pull' protocol?
A: push
Q6: Is IMAP a 'push' or 'pull' protocol?
A: pull

5. Map questions 1-4 below with A-F. **[2 marks]**

1. A unit of video, each of which may be encoded at multiple different rates, stored in different files.	A. Over The Top (OTT) B. Chunk C. Enter deep D. Manifest E. Video frame F. DASH
2. A file containing the location and encoding rate of files corresponding to video segments in a video.	
3. An approach that allows a client to adapt the encoding rate of retrieved video to network congestion conditions.	
4. A CDN approach that stores content in access networks, close to clients.	

A: 1-B(Chunk), 2-D(Manifest), 3-F(DASH), 4-C(Enter Deep)

6. In the scenario below, the left and right TCP clients communicate with a TCP server using TCP sockets. The Python code used to create a single welcoming socket in the server is shown in the figure (the welcoming socket itself is not shown graphically); code is also shown for the client sockets as well. The three sockets shown in server were created as a result of the server accepting connection requests on this welcoming socket from the two clients (one connection from the client on the left, and two connections from the client on the right). **[2 marks]**



Write source port and destination port numbers of all four packets A, B, C, D.

Answer:

Packet	Source Port	Destination Port
A	6157	7367
B	7367	6157
C	6225	7367
D	7076	7367

7. Compute the Internet checksum value for these two 16-bit words: **[3 marks]**

11000011 10101011
10110010 11010000

Answer: (11000011 10101011)
+
(10110010 11010000)
=
01110110 01111100 (With 1 wrapped around)

One's complement of above:

10001001 10000011 (final Answer)