HOMEWORK 2B

1. Why do HTTP, SMTP, and IMAP run on top of TCP rather than on UDP?

2. Suppose Alice, with a Web-based e-mail account (such as Hotmail or Gmail), sends a message to Bob, who accesses his mail from his mail server using IMAP. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application-layer protocols that are used to move the message between the two hosts.

3. Is it possible for an organization's Web server and mail server to have exactly the same alias for a hostname (for example, foo.com)? What would be the type for the RR that contains the hostname of the mail server?

4. Look over your received e-mails, and examine the header of a message sent from a user with a .edu e-mail address. Is it possible to determine from the header the IP address of the host from which the message was sent? Do the same for a message sent from a Gmail account.

5. In BitTorrent, suppose Alice provides chunks to Bob throughout a 30-second interval. Will Bob necessarily return the favor and provide chunks to Alice in this same interval? Why or why not?

6. Consider a new peer Alice that joins BitTorrent without possessing any chunks. Without any chunks, she cannot become a top-four uploader for any of the other peers, since she has nothing to upload. How then will Alice get her first chunk?

7. DNs typically adopt one of two different server placement philosophies. Name and briefly describe them

8. a) Use nslookup on your local host to send DNS queries to three DNS servers: your local DNS server and the two other DNS servers. Try querying for Type A, NS, and MX reports. Summarize your findings.
   b) Use nslookup to find a Web server that has multiple IP addresses. Does the Web server of your institution (school or company) have multiple IP addresses?

9. Imagine that you are trying to visit www.enterprise.com, but you don't remember the IP address the webserver is running on.

   Assume the following records are on the TLD DNS server:
   - (www.enterprise.com, dns.enterprise.com, NS)

- (dns.enterprise.com, 146.54.224.15, A)

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

- (www.enterprise.com, east2.enterprise.com, CNAME)
- (east2.enterprise.com, 142.81.17.206, A)
- (enterprise.com, mail.enterprise.com, MX)
- (mail.enterprise.com, 247.29.162.145, A)

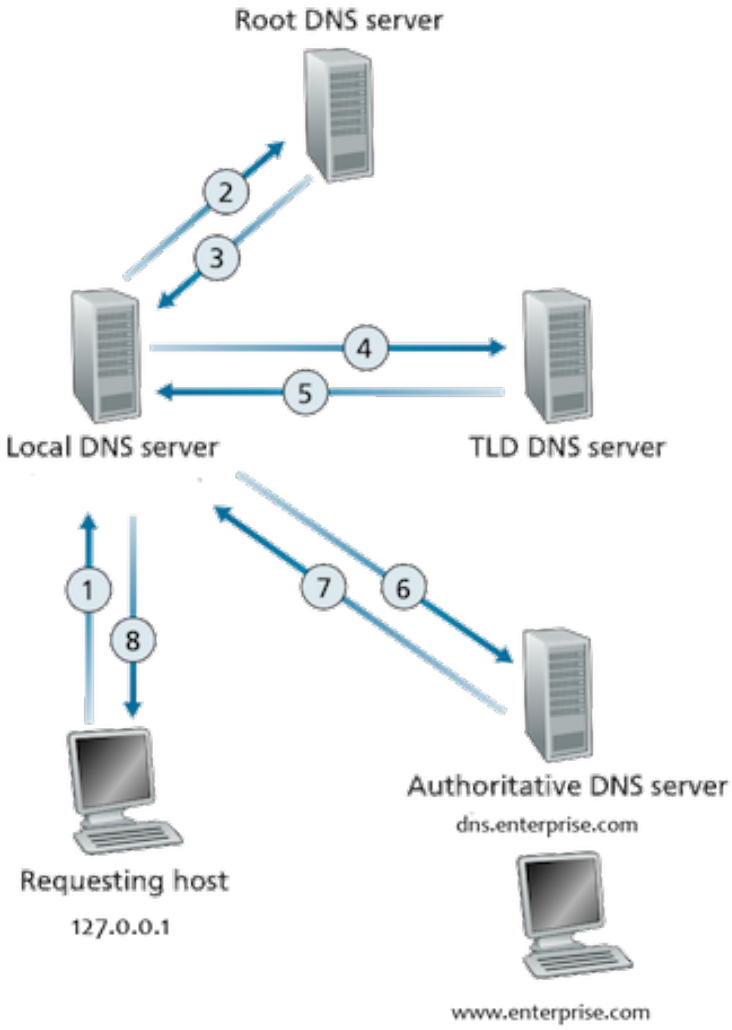

Figure 1

Assume your local DNS server only has the TLD DNS server cached.

a. What transport protocol(s) does DNS use: TCP, UDP, or Both?
b. What well-known port does DNS use?
c. In the above example, how many unique types of Resource Records (RR) are there at the authoritative enterprise.com DNS server?
d. Can you send multiple DNS questions and get multiple RR answers in one message? Answer with Yes or No

e. To which DNS server does a host send their requests to? Answer with the full name
f. Which type of DNS server holds a company's DNS records? Answer with the full name
g. In the example given in the problem, what is the name of the DNS server for enterprise.com?
h. 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?
i. In the previous question, there were two responses, one was a NS record and the other an A record. What was the content of the A record? Answer with the format: "name, value" -
j. Assuming that the enterprise.com website is actually hosted on east2.enterprise.com, what type of record is needed for this? –
k. Now imagine we are trying to send an email to admin@enterprise.com, and their mail server has the name mail.enterprise.com. What type of record will contain the name of the enterprise.com domain and the name of its mailserver(s)?
l. In that MX record, what are the contents? Answer with the format: "name, value"
m. Does your local DNS server take advantage of caching like web requests? Answer with Yes or No

10. Assume that a user is trying to visit gaia.cs.umass.edu, but his browser doesn't know the IP address of the website. In this example, examine the difference between an iterative and recursive DNS query.

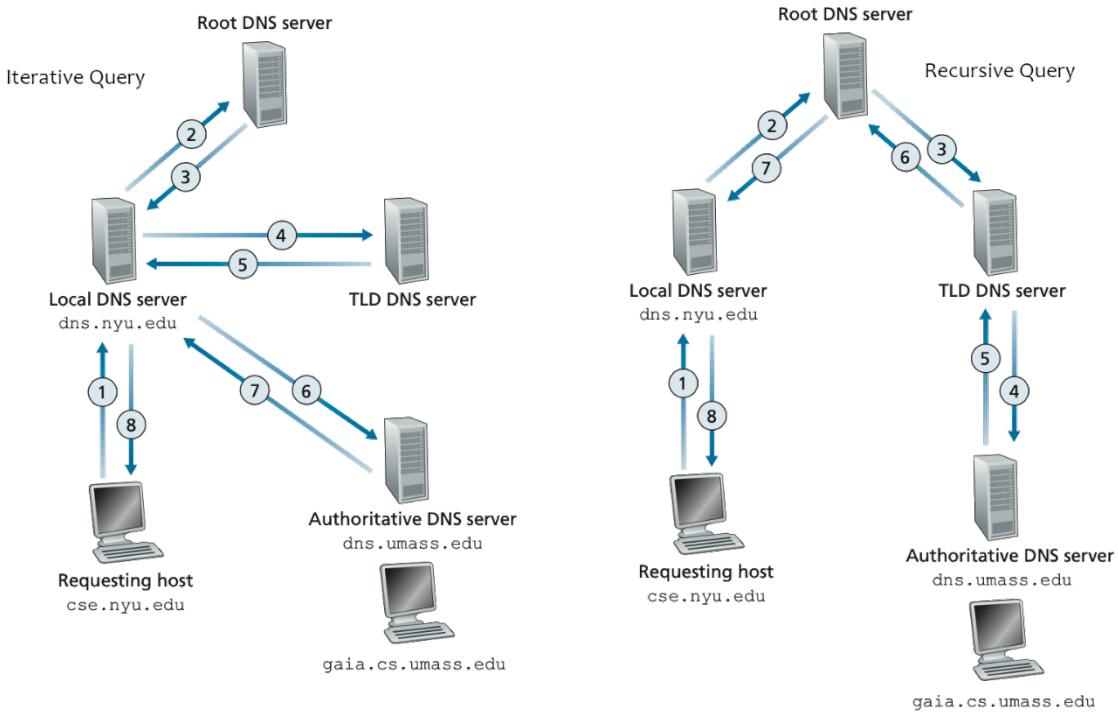

Figure 2

a. Between steps 1 and 2, where does the Local DNS server check first? Answer with 'User', 'DNS Local', 'DNS Root', 'DNS TLD', or 'DNS Authoritative'.
b. Between steps 2 and 3, assuming the root DNS server doesn't have the IP we want, where does the response link? Answer with 'DNS Local', 'DNS Root', 'DNS TLD', or 'DNS Authoritative'.
c. Between steps 4 and 5, assuming the TLD DNS server doesn't have the IP we want, where does the response link? Answer with 'DNS Local', 'DNS Root', 'DNS TLD', or 'DNS Authoritative'.
d. Between steps 6 and 7, the authoritative DNS server responds with the IP we want. What type of DNS record is returned?
e. Which type of query is considered best practice: iterative or recursive?

11. 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 three DNS servers are visited before your host receives the IP address from DNS. The first DNS server visited is the local DNS cache, with an RTT delay of RTT_0 = 3 msecs. The second and third DNS servers contacted have RTTs of 17 and 27 msecs, respectively. 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 RTTHTTP = 41 msecs.

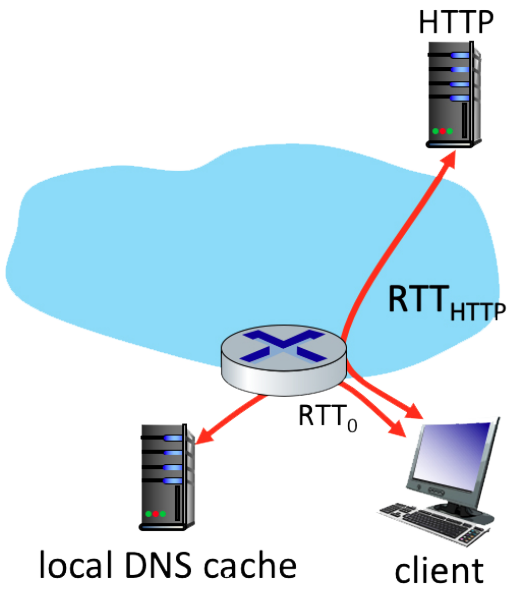

Figure 3

a. 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?
b. Now suppose the HTML object references 2 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 2 additional objects are received from web server at the client, assuming non-persistent HTTP and no parallel TCP connections?
c. Suppose the HTML object references 2 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.
d. What's the fastest method we've explored: Nonpersistent-serial, Nonpersistent-parallel, or Persistent-parallel? Consider distributing a file of F = 20 Gbits to N peers.

12. The server has an upload rate of us = 30 Mbps, and each peer has a download rate of di = 2 Mbps and an upload rate of u. For N = 10, 100, and 1,000 and u = 300 Kbps, 700 Kbps, and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P distribution.

13. Explain about Dynamic Adaptive Streaming over HTTP.