1) DNS

a) Generate the delegation chain for www.cs.wisc.edu. Present your results in a table like the one above.
Each NS query will typically return two or more answers; choose among them at random. If you query a
server and get a timeout, choose an alternate server.

a-root-servers.net -- a.edu-servers.net, c.edu-servers.net, d.edu-servers.net, ...
 a.edu-servers.net -- dns2.itd.umich.edu, adns1.doit.wisc.edu, adns2.doit.wisc.edu, ...
 adns1.doit.wisc.edu -- cs.wisc.edu, dns.cs.wisc.edu, dns2.cs.wisc.edu, dns2.itd.umich.edu

b) Generate the delegation chain for www.cs.mit.edu. If you receive a CNAME record, perform queries for
the domain name specified in the record, starting with the DNS server for the top-level domain (which
you should already know from earlier queries).

a-root-servers.net -- a.edu-servers.net, c.edu-servers.net, d.edu-servers.net, ...
 a.edu-servers.net -- usw2.akam.net, asia1.akam.net, asia2.akam.net, ...
 usw2.akam.net -- CNAME eecs.web.mit.edu

a-root-servers.net -- a.edu-servers.net, c.edu-servers.net, d.edu-servers.net, ...
 a.edu-servers.net -- usw2.akam.net, asia1.akam.net, asia2.akam.net, ..

Note: After receiving CNAME you were supposed to perform queries for the domain name
specified in the record, starting with the DNS server for the top-level domain – Some of you did
not do it from the top-level domain

2) HTTP

The answers to most of questions in this section will vary. The answers given below is based on one
such reading I got. We were checking whether your answers

a) URL: www.livedoor.com
   i.  How many HTTP requests were made?
      ~ 60
   ii. What were the locations (origins) for all the requests?
Some usual locations include Japan, Akamai, Mountain View CA, Google, Redwood City CA, Cambridge MA, Ashburn VA, New York NY, Amazon CloudFront, Chesterfield MO, Toronto Canada etc.

Note:
1. Some of you had only one origin. For this website you will find more than 1 origin when you see all the requests.
2. Some of you displayed the url and also some .jp, .jpeg ... files. This was not asked in the question.

iii. What is the Last-Modified date for the first second response?
   Wed, 19 Nov 2014 02:50:27 GMT


iv. How many HTTP requests were made for each?
~4 for m.facebook.com, 72 for www.facebook.com.

v. Is there any difference in the number of HTTP requests? If yes, Can you explain why?
   Yes. Mobile websites are usually lightweight and don't have a lot of objects (mainly for speed and performance purposes).

c) URL: https://github.com/mininet/mininet/wiki/Introduction-to-Mininet

vi. How many HTTP requests needed a DNS lookup?
~5

vii. Which request had the longest Content Download time?
https://assets-cdn.g...d9a2cb9c547ac0914.js

viii. How many bytes were downloaded & uploaded for the 2nd, 4th and 6th request?
   Download: 46.9 KB, 53.6 KB, 106.0 KB
   Upload: 0.7 KB, 0.7 KB, 0.8 KB
   Note: Some answers did not have the number of bytes uploaded for the 2nd, 4th and 6th request.

3) CDNs

   a) Run dig from a machine in the CS department to determine the IP address, and CNAMEs if any, for
www.nytimes.com, a1.nyt.com, and static01.nyt.com. You can simply run dig as follows to get this information:
a1.nyt.com -- CNAME assets-origin.nytimes.com.edgesuite.net, CNAME a1269.g1.akamai.net, A 205.213.114.154, 205.213.114.179
static01.nyt.com -- CNAME static.nytimes.com.edgesuite.net, CNAME a1158.g1.akamai.net, A 205.213.114.179, 205.213.114.186

b) Which of the domain names resolve to a CDN node? How do you know this?
   a1.nyt.com and static01.nyt.com resolve to CDN nodes; you can tell this because of the
   CNAMEs containing akamai

c) Use the website http://www.digwebinterface.com to perform the same lookups using other DNS
   resolvers (other than the CS department DNS server). Specifically, perform the lookups using the AT&T,
   Google, and Level3 resolvers. Are any of the CNAMEs different? Are any of the IP addresses different?
   Why?
   CNAMEs are the same, but addresses are different because Akamai's DNS servers are
   responding with an address for a CDN node that is closest to the DNS server that performed the
   query
   Note: Some did not answer the why part of the question.

4) Mobile IP

   a) What performance problem does this introduce?
      Traingular routing -- packets must be sent to the home agent and then be forwarded to the
      foreign agent

   b) Suppose we could add some extra features to the correspondent node (i.e., remote server). How could
      we change mobile IP, using extra capabilities at the correspondent node, to address this inefficiency?
      Foreign agent can inform the server of the care-of-address for the mobile node, and the server
      can send directly to the care-of-address

5) TCP

   a) When closing a TCP connection, why is the two-segment-lifetime timeout not necessary on the
      transition from LAST_ACK to CLOSED?
      Opposite side has already closed the connection and its FIN has been ACK'd, so we know we
      won't receive anything else from the opposite side after our FIN is ACK'd
b) Explain why TIME_WAIT is a somewhat more serious problem if the server initiates the close than if the client does? Describe a situation in which this might reasonably happen?

   Server will accumulate lots of TCBs (uses a lot of server resources)

   Note: The question was why TIME_WAIT is a problem when server initiates close. There were some answers that explained why not having a TIME_WAIT is a serious problem.

c) Show a packet exchange timeline (of the form illustrated below) for the case where a client initiates an HTTP connection with a server. The client sends a simple GET request that is 100B long including headers. The server responds with a 3000B long response, including headers. Assume maximum TCP segment size is 1500B. Assume that the initial sequence numbers picked by the client and server are 1001 and 3501, respectively.

   Refer to next page