Sample Midterm Solution

Q1. Multiple Choice Questions

1.1 Which of the following utility allows you to query the DNS database from any computer on the network and find the host name of a device by specifying its IP address, or vice versa?

(a) ipconfig

(b) tracert

(c) nslookup

(d) wireshark

1.2 Which of the following does UDP guarantee?

(a) reliable data transmission

(b) end-to-end connection

(c) secure data transmission

(d) none of the above

1.3 Which of the following is **NOT** an application layer protocol?

(a) HTTP

(b) IMAP

(c) SMTP

(d) TCP

1.4 Assume that both client and server are running HTTP/1.1. A Web user needs to send the server some information. Which of the following request line method the user should use?

(a) GET

(b) HEAD

(c) SEND

(d) POST

1.5 Which one of the following does **NOT** belong to network core?

(a) mesh of interconnected routers

(b) packet-switching

(c) circuit-switching

(d) network edge

Q2. Assume that store-and-forward is used in a packet-switching network. Answer the following questions

(a) Briefly explain what are queuing and loss in a packet switching network.

Solution

If arrival rate (in bits) to link exceeds transmission rate of link for a period of time

(1) packets will queue, wait to be transmitted on link

(2) packets can be dropped (lost) if memory (buffer) fills up

(b) The end-to-end delay of sending a packet consisting L bits from source to destination over a path consisting N links each of rate R is (NL/R). Generalize this formula for sending P such packets back-to-back over the N links.

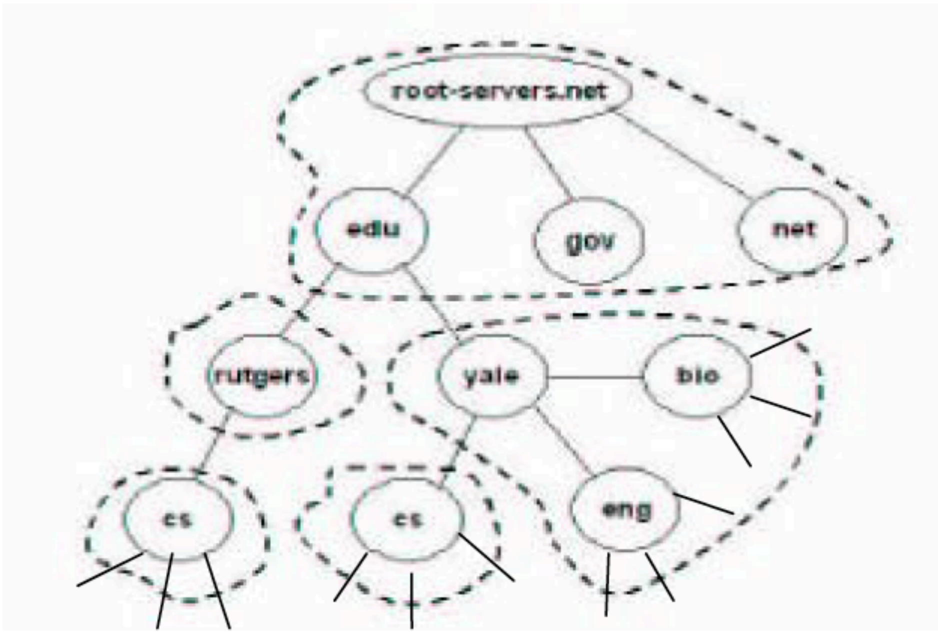
Solution:

At time N*(L/R) the first packet has reached the destination, the second packet is stored in the last router, the third packet is stored in the next-to-last router, etc. At time N*(L/R) + L/R, the second packet has reached the destination, the third packet is stored in the last router, etc. Continuing with this logic, we see that at time N*(L/R) + (P-1)*(L/R) = (N+P-1)*(L/R) all packets have reached the destination.

Q3. Suppose that a browser on host A wants to retrieve an HTML document (D), and an embedded image (I), from a host B. Assume that A does not initially know the IP address of B, but A's local name server S has B's IP address. Also, assume that the browser on A uses HTTP/1.0 (the non-persistent version). Show the chronological sequence of transport layer protocols and the respective application layer protocols used by filling in the following table.

S/N	Source	Destination	Transport layer protocol	Application layer protocol
1	***A***	***S***	***UDP***	***DNS***
2	***S***	***A***	***UDP***	***DNS***
3	***A***	***B***	***TCP***	
4	***B***	***A***	***TCP***	
5	***A***	***B***	***TCP***	***HTTP***
6	***B***	***A***	***TCP***	***HTTP***
7	***A***	***B***	***TCP***	
8	***B***	***A***	***TCP***	
9	***A***	***B***	***TCP***	***HTTP***
10	***B***	***A***	***TCP***	***HTTP***

Q4. Consider the DNS topology in the figure below, in which different DNS zones are indicated with a dashed line. There is only one DNS server per each zone, and it happens to have the same name as the highest node in that zone: yale.edu, cs.yale.edu, ruthgers.edu, cs.rutgers.edu, and rootservers.net. The only servers supporting recursive querying are cs.yale.edu and cs.rutgers.edu.



For each of the queries below, list in order all the DNS servers contacted by the resolver (located in the OS of the machine running the query). Assume there is no caching performed at any level of the hierarchy.

A machine called *lab1.bio.yale.edu* exists in the biology department at Yale, and a user on *eden.rutgers.edu* launches this query: "nslookup lab1.bio.yale.edu".

Solution:
rutgers.edu
root-server.net
yale.edu

At the prompt of *paul.cs.rutgers.edu* somebody launches this query: "**nslookup lab1.bio.yale.edu**".

Solution:
cs.rutgers.edu

On *lab1.bio.yale.edu* somebody queries: "**nslookup paul.cs.rutgers.edu**".

Solution:
yale.edu

root-server.net
rutgers.edu
cs.rutgers.edu