Midterm Exam I (Problems and Answers)

CSE4175: Introduction to Computer Networks

Dept. of Computer Science and Engineering

Spring 2013

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합계	

Name: _____ Student Number: _____

Total points 100

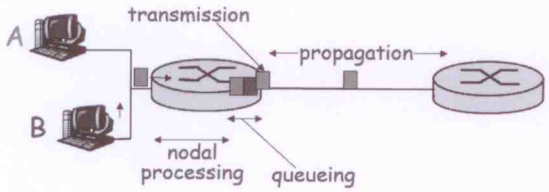
Problem 1: (20 points total, 5 points each) Delay components []
Briefly describe the following four sources of packet delay.

a) nodal processing delay. **Answer:**
b) queuing delay. **Answer:**
c) transmission delay. **Answer:**
d) propagation delay. **Answer:**

- 1. nodal processing delay:
  - check bit errors
  - determine output link
- 2. queueing delay:
  - time waiting at output queue for transmission
  - depends on congestion level of router

3. Transmission delay:
- R=link bandwidth (bps)
- L=packet length (bits)
- time to send bits into link = L/R

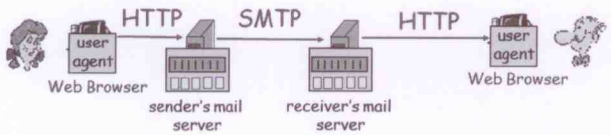
4. Propagation delay:
- d = length of physical link
- s = propagation speed in medium (~2×10^8 m/sec)
- propagation delay = d/s



Problem 2: (10 points) SMTP []
We know that messages must be carried in ASCII in SMPT protocol. Explain how then the binary multimedia data such as image can be delivered using SMTP protocol.
Answer: messages must be in 7-bit ASCII. So, this requires binary multimedia data to be encoded to ASCII. (For email service, BASE64 encoding scheme is being used.)

Problem 3: (10 points) email service []
Briefly describe the Web-based email service.
Answer: Users (both sender and recipient) use HTTP protocol to access their mail servers.

Web-Based E-mail



- User agents for sender and recipient: ordinary Web browser
- The user communicates with its remote mailbox via HTTP
  - convenient for the user on the go

Problem 4: **(15 points total) HTTP**
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 10 DNS servers are visited before your host receives the IP address; visiting them incurs an RTT of RTT_1 per DNS. Further suppose that the Web page associated with the link contains 8 very small objects (separate from the base HTML file). Suppose the HTTP running is non-persistent and let RTT_0 denote the RTT between the local host and the server for each object. Assuming the zero transmission time of each object, how much time elapses from when the client clicks on the link until the client receives all the objects?

Answer:
(5 points) 10 RTT_1 to get the IP address of the URL.
(5 points) 2 RTT_0 to establish TCP connection between the client and the server.
(5 points) 8 x 2 RTT_1 to get 8 very small objects. In total, 10 RTT_1 + 18 RTT_0.

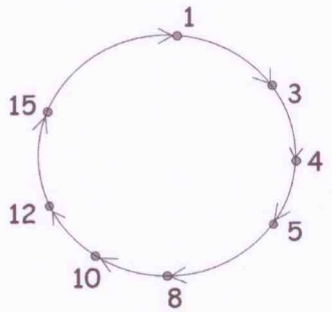
Problem 5: **(10 points) DNS aliasing**
Is it possible for the Web server and mail server of an organization to have exactly the same alias for the hostnames? It is important to *explain* your answer. **Answer:** possible. The MX record is used to map the *mail server's alias* to its (canonical) host name. The CNAME record will be used to map *the alias name for some Web server's canonical name.* The A record will map the host name to the corresponding IP address. Notice the (canonical) host name of the mail server should be different from the canonical name of a Web server.

Problem 6: **(20 points total, 10 points each) BitTorrent**
At any given instant of time, a peer in a torrent has a subset of chunks and will know which chunks its neighbors have. With this information,

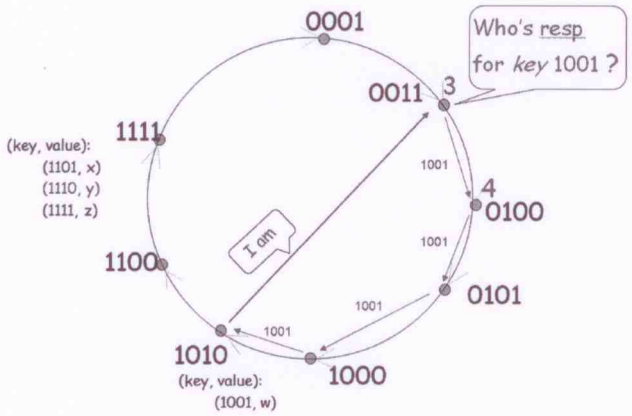
a) how does it decide which chunks it should request first from its neighbors? You should also *explain* your answer.
Answer:
(5 points) rarest first. (5 points) To make the distribution of chunks even and more peers to participate in the file distribution (Kurose: In this manner, the rarest chunks get more quickly redistributed, aiming to (roughly) equalize the number of copies of each chunk in the torrent)

b) to which of its neighbors should it send requested chunks? You should also *explain* your answer.
Answer:
(5 points) top 4 neighbors which send it chunks at the highest rate. This is to implement the tit-for-tat policy. (5 points) And periodically selects one neighbor at random. This will give a peer having no or small number of chunks the chance to be active member in the current torrent.

Problem 7: **(15 points total) Circular HDT**
Consider a network shown below using the circular DHT discussed in the class. In this network, four bits are used to identify both the nodes and keys, and the shaded circles represent the nodes. Recall that the (key, value) pair is assigned to the node that is the immediate successor of the key.



a) (5 points) Determine which node is responsible for key, 1001. **Answer:** node 10 (in binary form, 1010)
b) (10 points) Show how node 3 (in binary form, 0011) responds to a query to find the responsible node for key, 1001. **Answer:** Each node in the circular DHT maintains the successor node identifier. Node 3 compares the key value with its successor node id which is 0100. Since its successor node id is smaller than key, 1001, node 3 forwards the query to its successor node 4.


0001
Who's resp
for key 1001 ?
0011
3
1111
(key, value):
(1101, x)
(1110, y)
(1111, z)
1001
4
0100
I am
1100
1001
0101
1001
1001
1010
(key, value):
(1001, w)
1000