Midterm Exam I

CSE4175: Introduction to Computer Networks

Dept. of Computer Science and Engineering

Spring 2014

문제	점수
1	
2	
3	
4	
5	
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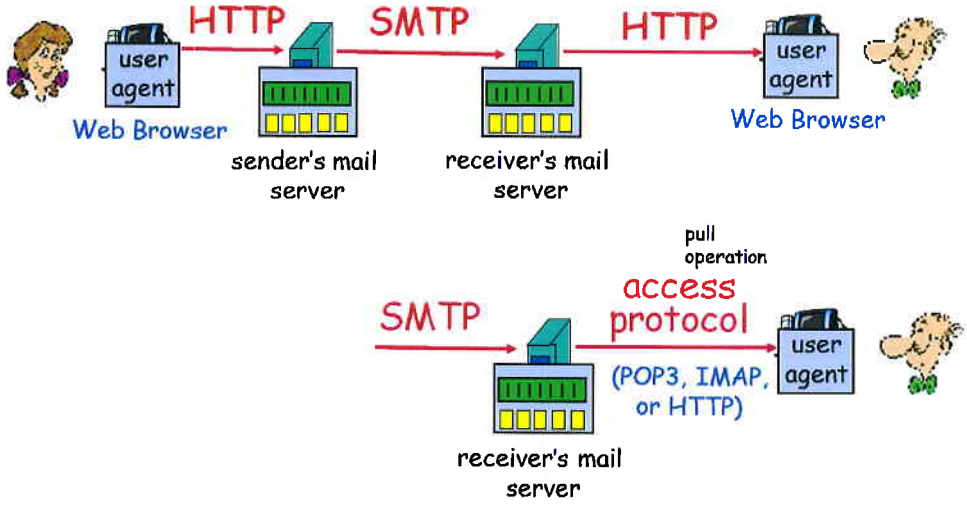
합계	

Name: _____ Student Number: _____

Total points 100

Problem 1: (10 points) Webmail service
Describe the Web-based email service in reasonable detail.
Answer:

Web-Based E-mail



Problem 2: (20 points total, 10 points each) BitTorrent
At any given instant of time, a peer of a swarm 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

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 3: (10 points) TCP vs. UDP
For IP Telephony and IP videoconferencing, which one of TCP and UDP would be preferrable? Justify your answer.
Answer:
Often, designers of IP telephony and IP videoconference applications choose to run their applications over UDP because they want to avoid TCP's congestion control.

Problem 4: (10 points)
This is 'true or false' question. Answer for the following argument in true or false. You should also explain your answer.

Host A is sending Host B a large file over a TCP connection. Assume Host B has no data to send Host A. Host B will not send acknowledgements to Host A because Host B cannot piggyback the acknowledgments on data.

Answer:
False.

Event at Receiver	TCP Receiver action
Arrival of in-order segment with expected seq #. All data up to expected seq # already ACKed	Delayed ACK. Wait up to 500ms for next segment. If no next segment, send ACK
Arrival of in-order segment with expected seq #. One other segment has ACK pending	Immediately send single cumulative ACK, ACKing both in-order segments

TCP ACK generation [RFC 1122, RFC 2581]

Event at Receiver	TCP Receiver action
Arrival of in-order segment with expected seq #. All data up to expected seq # already ACKed	Delayed ACK. Wait up to 500ms for next segment. If no next segment, send ACK
Arrival of in-order segment with expected seq #. One other segment has ACK pending	Immediately send single cumulative ACK, ACKing both in-order segments
Arrival of out-of-order segment w/ higher-than-expect seq. # . Gap detected	Immediately send duplicate ACK, indicating seq. # of next expected byte
Arrival of segment that partially or completely fills gap	Immediate send ACK, provided that segment starts at lower end of gap

Problem 5: (20 points total)
Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A.

a) (10 points) In the second segment sent from Host A to B, what are the sequence number, source port number, and destinatin port numer?
Answer:
sequence number = 127 + 80 = 207
source port number = 302
destination port number = 80

b) (5 points) If the first segment arrives before the second segment, in the acknowledgement of the first arriving segment, what is the acknowledgment number, the source port number, and the destinatin port number?
Answer:
acknowledgment number = 207
source port number = 80
destination port number = 302

c) (5 points) If the second segment arrives before the first segment, in the acknowdedgment of the first arriving segment, what is the acknowledgment number?
Answer:
acknowledgment number = 127

Problem 6: (10 points) RTO backoff
Each time TCP retransmits, it sets the next timeout interval to twice the previous value, rather than deriving it from the last EstimatedRTT and DevRTT. Why?

Answer:

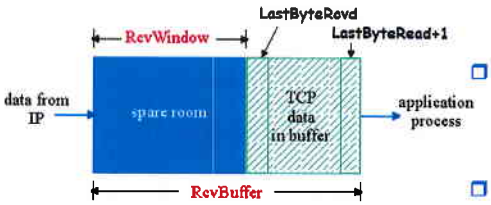
Exponential RTO Backoff [Stallings 1998]

- gives the internet more time to recover from network congestion as the number of retransmissions increases

Note that
- the timeout is probably due to network congestion
- Network congestion will be manifested as a *dropped packet* or a *long delay* in round-trip time.

Problem 7: (20 points) TCP flow control
Explain in detail how the TCP flow control mechanism works?
Answer:

TCP Flow control: how it works



- Rcvr advertises spare room by including value of `RcvWindow` in segments: receive window field
  - credit scheme
- Sender limits unACKed data to `RcvWindow`
  - LastByteSent - LastByteAcked ≤ RcvWindow
  - guarantees receive buffer doesn't overflow

Suppose TCP receiver discards out-of-order segments: for illustration purposes only

- spare room in buffer

= `RcvWindow`
= `RcvBuffer-[LastByteRcvd - LastByteRead]`