Segon control de Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		14/5/2015	Primavera 2015
NAME	**SURNAME**	**GROUP**	**DNI**

Duració: 1h15m. El test es recollirà en 25 minuts. Respondre el problemes en el mateix enunciat.

4 points
There are Multi-answer (MA) and single-answer (SA) questions
The single-answer ones have a value of 0.8 points if the answer is correct, and -0.2 if not.
The multi-answer ones (MA) count 0.2 points each correct answer marked, and the same the incorrect ones left "unmarked".

1. (SA) We have a Stop & Wait connection with a transmission rate of 10^8 bps. We want to calculate its efficiency, without errors, considering negligible the ACK time. If we transmit 1000 bits through a channel with Vp = Vp=2x10^8 m/s,

What is the maximum distance to which we can transmit, to achieve an efficiency of 80%?

- ☐ 200 m
- ☐ 250 m
- ☐ 500 m
- ☐ None of the previous answers is correct.

2. (MA) The TCP messages summary listed below shows a fragment from a trace captured with tcpdump. Deduced from the trace which of the following

```
1. ...
2. 15:54:02.090726 IP 192.168.249.128.1025 > 147.83.34.125.19: . ack 69885 win 4380
3. 15:54:02.090867 IP 147.83.34.125.19 > 192.168.249.128.1025: . 69885:71345(1460) ack 1 win 64240
4. 15:54:02.090881 IP 147.83.34.125.19 > 192.168.249.128.1025: P 71345:72805(1460) ack 1 win 64240
5. 15:54:02.091224 IP 192.168.249.128.1025 > 147.83.34.125.19: . ack 72805 win 0
6. 15:54:02.313596 IP 192.168.249.128.1025 > 147.83.34.125.19: . ack 72805 win 4380
7. 15:54:02.313660 IP 147.83.34.125.19 > 192.168.249.128.1025: . 72805:74265(1460) ack 1 win 64240
8. ...
```

Use this trace to deduce which of the following statements are true:

- ☐ _One of the terminals hasn't sent any byte of information (of the application level).
- ☐ _One of the terminals is faster than the other (sends information before the other is ready to read it).
- ☐ _Some segments have been lost.
- ☐ _The information is transferred (from application level) in the client-server direction.

3. (MA) Tick the sentences that are true, from TCP perspective:

- ☐ One of the header flags is the RESET one.
- ☐ The timestamp choice can be used to calculate the retransmission Time-Out (RTO).
- ☐ The PDU,s with the SYN or FIN flags activated don't consume any sequence number.
- ☐ Both, client and server select a random initial sequence number, independently one from the oher.

4. (MA) Assume that in a link, the transmission delay between sender and receiver is 10 µs (in each sense), the transmission time of an information PDU is of 5 µs, and that of an ACK is negligible. Tick the sentences that are true in a protocol of window W:

- ☐ If W=1 the maximum efficiency will be 25%
- ☐ If W=3 the maximum efficiency will be 60%
- ☐ The optimal window is W=5
- ☐ If the information PDUs have 500 bytes and W=5, effective speed will be 800 kbps

5. (SA) The time elapsed since a client initiates a connection, and the time it is able to send the first bytes of data (assuming vt infinite and RTT = 100 ms) is:

- ☐ 100 ms
- ☐ 200 ms
- ☐ 300 ms
- ☐ 400 ms

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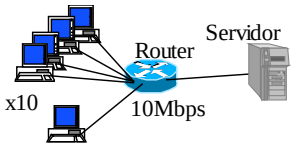
Pregunta 1. (6 punts)



In the network of the figure 10 PCs send a large file to the server, each with a TCP connection. Assume the following for the next questions: (1) All links are 10 Mbps; (2) the router has 500 kB of memory (500 10^3 bytes) which can store the datagrams until they are transmitted (and discarded when the memory is exhausted); (3) all TCP sockets of the PCs and del server have a reception buffer of 100 kB; (4) for the sake of simplicity assume that TCP and IP headers are 0 and MSS is 1500 B; (5) link delays are 0; (6) acks are never lost and arrive immediately. Justify briefly your answers.

1.A (0.5 punts) Compute the throughput of each TCP connection.

1.B (0,5 punts) What will be the maximum advertised window that can be sent? Will be the window scale option necessary to advertise this window?

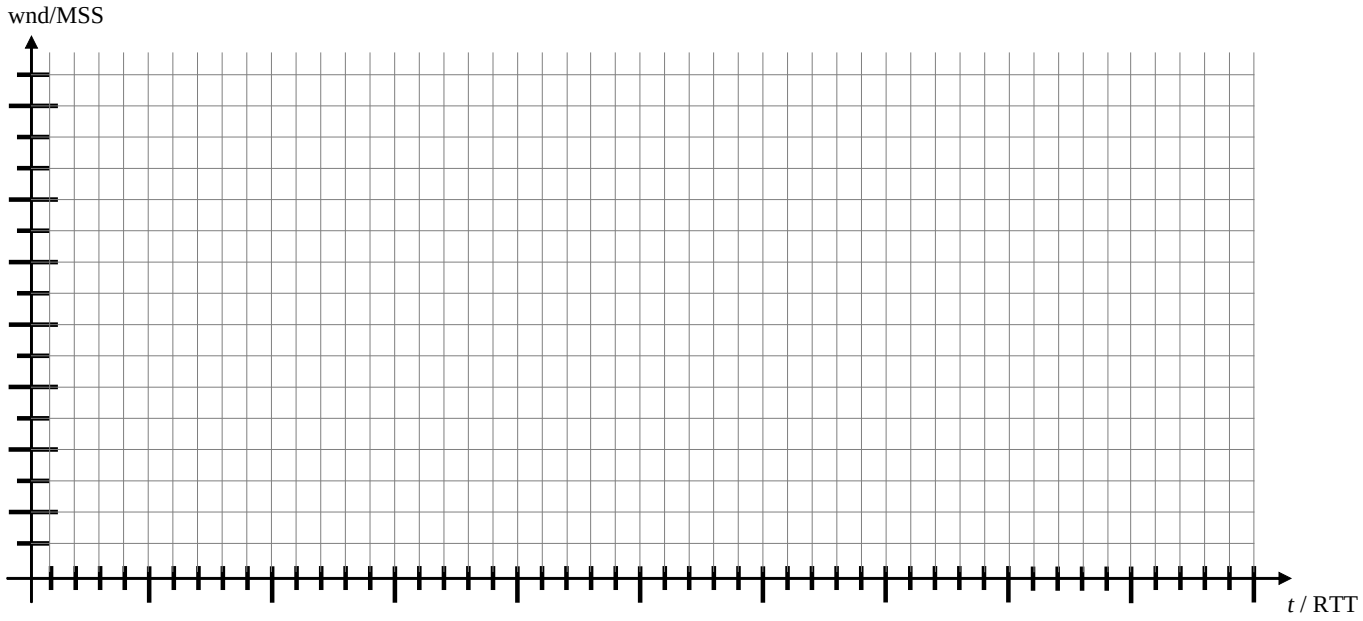
1.C (0.5 punts) Compute the maximum RTT (waiting time in the router queue).

1.D (0.5 punts) Estimate the average transmission window of a TCP connection.

1.E (0,5 punts) Assuming that the RTT and TCP window are constant and equal to the previous values you have computed, estimate what will be throughput of 1 TCP connection.

1.F (0,5 punts) Justify why losses will occur in the network.

1.G (1 punt) In order to answer this item, assume the following hypothesis (note that they might not be correct): (1) the transmission is in steady State (it has last a long time from the beginning); (2) the RTT is constant and equal to the one computed in item 1.C; (3) the window of each connection increases until the advertised window (awnd) and then losses occur; (4) this is repeated periodically. Do an approximated sketch that shows the evolution of the window of 1 TCP connection since the retransmission of a segment, until losses occur again and a new retransmission is done. Show in the figure the slow start, congestion avoidance phases and the value of the slow start threshold (ssth). Compute what will be the duration of each SS and CA phases in RTTs.



1.H (1 punt) Assuming the previous sketch, compute the throughput in steady State in Mbps.

1.I (1 punt) What will be the approximated throughput of the connections, that computed in items 1.A or 1.H? Justify what is the reason of the difference (that is, what is the approximation which is not correct, and produces the difference).