EKSAMEN / EXAM	TTM4100	02	06	2023

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Q1

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.1.1	c)
Q1.1.2	d)
Q1.1.3	d)
Q1.1.4	c)
Q1.1.5	c)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.2.1	b), c), e)
Q1.2.2	b)
Q1.2.3	d)
Q1.2.4	d)
Q1.2.5	a), b), c), d)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.3.1	c)
Q1.3.2	b), c)
Q1.3.3	a), b), d)
Q1.3.4	a), b), d), e)
Q1.3.5	c)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.4.1	a)
Q1.4.2	d), h)
Q1.4.3	a), c), e)
Q1.4.4	a), c), d), e)
Q1.4.5	a), c)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.5.1	a), b), c), d)
Q1.5.2	c)
Q1.5.3	b), c), d)
Q1.5.4	d)
Q1.5.5	d)

Kontroller:	Eksamensvaktens signature / Invigilator's signature
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Q2

Q2.1

Flow Control	**Congestion Control**
Control traffic from sender to receiver	*Control network traffic*
When the receiver is not able to handle the incoming data, flow control takes effect.	*When there is indication that the network starts to get congested, congestion control starts.*
Sender adjusts the sending rate, according to the receiver's receiving capacity.	*The transport layer slows down the transfer of data to reduce traffic in the network*
Found in Transport Layer and Link Layer	*Transport Layer, assisted by Network Layer*

Q2.2

For flow control, it can be found in Link Layer. The scenario that the receiver may not be able to handle incoming data can happen also in Data Link Layer, but not in Physical Layer or Network Layer.

For congestion control, Network Layer is involved to indicate (implicitly or explicitly) congestion happening in the network. Physical Layer and Link Layer are not involved.

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Q3

Q3.1

*The (IP) address of the host is "**145.254.160.237**". The (IP) address of the server is "**65.208.228.223**".*

Q3.2

There are **20 bytes** in the IP header**.**

There are 28 bytes in the payload of the IP datagram. The "Total Length" field tells the entire packet size, including header and data, in bytes, which is 48. The IP header length is 20. So, the payload of this IP datagram is 48 – 20 = 28 bytes.

Q3.3

The sequence number of the TCP SYN initiating the TCP connection is **0**.
The Flag bits value "**0x02**" indicates that this segment is a SYN segment.

The TCP port number of the host used for the connection is: **3372**.
The TCP port number of the server used for the connection is: **80**.

Q3

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Q3.4

The sequence number of the SYNACK segment sent by the server in reply to the SYN is ***0***

Q3.5

There are 1380 bytes of data carried by the TCP segment of Packet 6.

Explanation:

- *In TCP segment of Packet 5 (Line 5-this packet is sent from the server to the host), Seq=1, telling that, for this TCP segment, the sequence number is 1.*
- *In TCP segment of Packet 7 (Line 7-sent from the host to the server), ACK=1381, implying the host has received all data preceding the ACK sequence number 1381.*
- *So, ACK=1381 in TCP segment of Packet 7 implies that, data bytes corresponding to sequence numbers 1, 2, …, 1380 have been received, which in total are 1380 bytes.*
- *This means, there are total 1380 bytes of data are carried by TCP segments in Packet 5 and Packet 6.*
- *Note that for Packet 5, the TCP segment payload "Len=0", i.e. there is no data carried by it.*
- *Hence, the TCP segment of Packet 6 carries 1380 bytes of data.*

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Q4

Q4.1

Interface 0 (T)

Q4.2

Interface 1 (T)

Q4.3

Interface 4 (T)

Q.4.4

Interface 2 (T)

Q4.5

Interface 4 (T)

Q4.6

Forwarding	Routing
Refer to moving packets in a switch/router from one input interface to an appropriate output interface.	Refers to the network-wide process of deciding the end-to-end route/path taken by a packet from the source to the destination.
It is made locally, based on a local forwarding table.	Routing decision is made network-widely, based on which the forwarding table at each router is built / updated.
implemented in the data plane.	implemented in the control plane.
Fast, in a time scale of one packet transmission time at the router, e.g. 1ms.	Slow process, e.g. in a time scale of seconds

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Q5

Q5.1

Due to the use of non-persistent HTTP, the process involves total 6 TCP connection setups, one for the main page and one for each of the 5 images. For each TCP connection setup, at least one RTT, i.e. 150ms x 2 = 300ms, is needed. In addition, for downloading each of the 6 objects, at least another RTT of 300ms, for the browser to send the GET message and the server to send back the related object, in addition to the transmission time of the object which is 200 kbits / 100Mbps = 2ms. So, the total time is:

6x(300ms + 300ms + 2ms) = 6x602ms =3.612s.

Q5.2

The delays associated with this scenario are: **300 + 302 + 300 + 310 = 1212 ms = 1.212 sec**

- 300 ms (RTT) to set up the TCP connection that will be used to request the base file.
- 302ms for downloading the base file: 150 ms (one way delay) to send the GET message for the base file, and have the message propagate to the server, plus 2ms (200 kbits/100Mbps) to transmit the base file, plus 150 msec for the base file to propagate back to the client (for a total of 302 msec).
- 300ms for setting up parallel connections: The client now sets up parallel TCP connections. 300 msec (RTT) is needed to set up the 5 TCP connections (since they are set up in parallel).
- 310ms for downloading the 5 images: 150 msec (one way delay) to send the 5 GET messages in parallel for img01.jpg through img5.jpg and have the GET messages propagate to the server. It will take the server 10 ms to transmit the 5 jpeg files, since each object's transmission time is 2ms, plus 150 msec for the last jpeg file to propagate back to the client.

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Q5

Q5.3

300+ 302 + 5 x 302 = 2112 msec = 2.112 sec

The delays associated with this scenario are:

- 300 ms (RTT) to set up the TCP connection to request the base file.
- 302ms for downloading the base file.
- No additional TCP setup is needed.
- 302ms for each image: 150 msec (one way delay) to send the GET message for img01.jpg and have it propagate to the server, plus 2 ms to transmit the img01.jpg file, plus 150 msec for the img01.jpg file to propagate back to the client.
- The last step above is repeated for the rest four image files.

Q6

Q6.1

- All traffic from outside to inside, and vice versa, passes through the firewall.
- Only authorized traffic, as defined by the local security policy, will be allowed to pass.
- The firewall itself is immune to penetration.

Q6.2

In a traditional packet filter, filtering decisions are made on each packet in isolation, while a stateful packet filter actually tracks TCP connections and use this knowledge to make decisions.