Quality of Service
Active Queue Management

Date: Spring
Duration: 45 min.

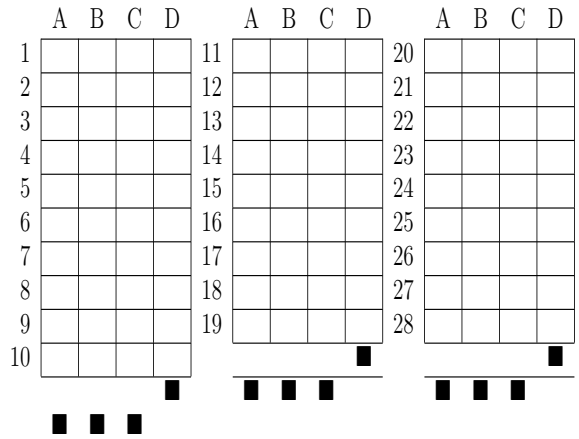
- There is only one correct answer for each multiple choice question.
- Each correct answer adds 1 point.
- Each incorrect answer has a penalty of $\frac{1}{3}$ points.
- No score is awarded for unanswered questions, neither positive nor negative.
- Mark out your answers with an "X". Make sure that the "X" reaches the corners of the rectangle. ⊠
- No score is awarded if you mark more than one answer.
- Pad your NIA with 0s on the left to complete the NIA field.

Write your personal data clearly.

Last name:	
First name:	
Group:	

Permutation: A

NIA:



1.- What is a bad queue?

(a) A queue that is never full.
(b) A queue that is always full.
(c) A queue that is always empty.
(d) A queue that drop packets.

2.- What is window scaling?

(a) A technique to detect packet loss.
(b) A technique used to fill long fat pipes.
(c) A technique to prevent that the queues fill up.
(d) A technique to separate linux traffic from windows traffic.

3.- What is TCP global synchronization?

(a) A protocol that synchronizes the TCP flows of the internet to prevent congestion.
(b) The problem that arises in taildrop queue when all the TCP connections traversing a router suffer packet drop.
(c) The combination of TCP and UDP to combine the advantages of both protocols.
(d) An AQM mechanisms that notifies the sending end of the congestion without discarding any packet.

4.- How does RED compute the dropping probability?

(a) As a function of a hash of the protocol field, two IP addresses and the two ports of the IP packet.
(b) As a function of the average queue occupancy, which is computed using an EWMA.
(c) Using the packet size and the packet delay.
(d) The dropping probability in RED is always one.

5.- What is the reaction of TCP when a single packet is lost (detected thanks to the reception of duplicate acks)?

(a) Activating the ECN flag.
(b) Halving the congestion window.
(c) Doubling the contention window.
(d) Enabling quality of service.

6.- What is an advantage of CoDel compared to RED?

(a) It is easier to configure.
(b) It works at the application layer.
(c) It can be used for UDP traffic.
(d) It does not drop packets.

7.- To compute the dropping probability in RED, a router takes into account ...

(a) the average queue occupancy.
(b) the size of the packets.
(c) the content of the packets.
(d) the number of flows.

8.- What should we do to prevent packet re-ordering?

(a) Map all the packets of the same class of service to the same queue.
(b) Use a policer to control the amount of traffic that is directed to each of the queues.
(c) Distribute the packets of a class of service among the different queues.
(d) Have a different queue for each class of service.

9.- Which is the maximum in-flight (not aknowledged data) in a TCP communication?

(a) The maximum of the congestion window and the receiver (or advertised) window.
(b) 65536 bytes.
(c) The minimum of the congestion window and the receiver (or advertised) window.
(d) The mininimum of the congestion window and the receiver (or advertised) window.

10.- What is a characteristic of Random Early Detection?

(a) It drops (or marks with ECN flag) packets before the queue is full.
(b) It uses Weighted Deficit Round Robin.
(c) It detects congestion but it does not take any action.
(d) It is unnecessary and should never be used.

11.- What is the purpose of the Explicit Congestion Echo?

(a) To activate RED.
(b) To notifiy the other routers in the network that congestion has occurred.
(c) To notify the sending end that the network is congested.
(d) To drop the packets causing the congestion.

12.- Which windows are used in a TCP communication?

(a) Windows Vista and Windows 7.
(b) Maximum window to limit the maximum number of in-flight packets and minimum window to to limit the mininum number of packets.
(c) Congestion window for congestion control. Receiver window (or advertised window) for flow control.
(d) Slow start and congestion avoidance.

13.- What is the bandwidth-delay product of a satellite link with a bandwidth of 1Mbps and a RTT of 400ms.

(a) 1 megabyte.
(b) 100 Kbits.
(c) 1.2 seconds.
(d) 400 Kbits.

14.- What is the difference between RED and WRED?

(a) WRED supports larger bandwiths because it is more efficient than RED.
(b) WRED is used in core routers and RED in the edge routers.
(c) In WRED different dropping profiles are applied to packets with different dropping precedence.
(d) In WRED the dropper marks the dropped packets with a flag.

15.- Do TCP and UDP react in the same way to packet loss?

(a) Yes. They both increase their transmission rate.
(b) No. UDP slows down while TCP does not react.
(c) No. TCP slows down while UDP does not react.
(d) Yes. They both slow down.

16.- What is the benefit of ECN?

(a) The enpoints of a TCP flow can be notified about congestion without packet drop.
(b) The size of the queues can be increased.
(c) Only the lesser important UDP packets are dropped.
(d) The TCP receiver does not need to send acknowledgement packets.

17.- What is the maximum number of bytes in-flight when no window scaling is used?

(a) 1460 bytes.
(b) 2^10 bytes.
(c) 2^16 bytes.
(d) 2^20 bytes.

18.- RED relies upon ...

(a) the fact that TCP reduces its receiver window after activating the FIN flag.
(b) the fact that TCP reduces its congestion window after a packet loss.
(c) the fact that TCP reduces its receiver window after a packet loss.
(d) the fact that TCP reduces its receiver window after activating the SYN flag.

19.- In a weighted taildrop queue we have ...

(a) different schedulers for in-contract and out-of-contract traffic.
(b) different queue sizes for in-contract and out-of-contract traffic.
(c) different schedulers for large packets and small packets.
(d) different queue sizes for large packets and small packets.

20.- Which technique makes it possible to achieve congestion control without dropping packets?

(a) Expedited Forwarding.
(b) Policing.
(c) Explicit Congestion Notification.
(d) Random Early Detection.

21.- What is the name of the queue that drops only those packets that arrive to a full queue?

(a) Dropbox.
(b) Taildrop.
(c) Tailend.
(d) Full-drop.

22.- What are long fat networks?

(a) Networks with strict QoS constraints. A policer is needed to keep the traffic under control.
(b) Networks that use more than 100 Km of coaxial cable.
(c) Networks that are slow and it takes a very long time for a packet to reach the other end.
(d) Networks that can contain a lot of data. TCP has to push a lot of data to fill the pipe.

23.- What is the purpose of a packet queue?

(a) To discard packets.
(b) To increase the delay.
(c) To change the order of packets.
(d) To absorb transient data bursts.

24.- What kind of problems can appear in the absence of active queue management?

(a) Overbloat and packet loss.
(b) TCP flow control.
(c) Sustained link utilization.
(d) TCP global synchronization and bufferbloat.

25.- To be used, ECN needs to be supported by ...

(a) ... the endpoints'TCP and UDP stacks.

(b) ... the routers and the network administrator.

(c) ... the routers and the endpoints'TCP stack.

(d) ... the core routers of the network.

26.- What happens when the last packet of a TCP communication is lost?

(a) It is re-transmitted after receiving a dupblicate ack.

(b) It is re-transmitted after a time-out. This has an important negative impact on the performance of the application.

(c) It is necessary to establish a new TCP session using the same conngestion window as the previous TCP session.

(d) It is re-trasnmitted using UDP.

27.- What is the reaction of TCP when a timeout expires?

(a) It doubles the congestion window.

(b) It moves back to the slow start phase.

(c) It halves the congestion window.

(d) It moves back to the congestion avoidance phase.

28.- Why is bufferbloat a problem?

(a) Because it makes it difficult to separate traffic in different queues.

(b) Because it unnecessarily increases the delay.

(c) Because the routers overheat and start dropping packets.

(d) Because it assumes a fluid model and data packets behave differently.