Computer Networks Quiz 1

Spring Semester 2018

Answer Sheet

Average  Median  Range
11.15 / 15 points  11 / 15 points  7 - 15 points

Total points distribution

ECDF of score
Q1: Packet switching vs. circuit switching: Which of the following statements is true?

(a) When using packet switching, it is more predictable beforehand which path the packets take.

Solution: Wrong. Packet paths are not established beforehand.

(b) Circuit switches automatically discover and use alternative routes when a next-hop circuit switch on a path fails.

Solution: Wrong. In circuit switching, every teardown & setup needs a considerable amount of time, while in packet switching packets can easily be routed to a switch that is still working.

(c) Neither of the above statements is true.

Q2: Which of the following statements about HTTP is true?

(a) HTTPS is an extension of HTTP (HTTP Stateful) which allows a server to store information about the connection on the client-side.

Solution: Wrong. HTTPS combines HTTP with TLS to create an authenticated & encrypted HTTP connection.

(b) Cookies can be set by a server with an HTTP response, and sent by the client with future requests. This can be used e.g., to store user preferences or the content of a shopping cart.
Q3: Consider the following statements about HTTP. Which are true according to the specifications? Select all that apply.

○ An HTTP POST request can always be safely resent multiple times without any unintended consequences.

**Solution:** Wrong. This is false because sending a POST request is not an idempotent action which means resending a POST request more than once could result in a different server state. As an example, the web browser asks if a form should be resubmitted when you go back to a webpage with a web form.

✓ An HTTP HEAD request can be used to check if a resource on a server is available.
Q4: Link provisioning: Assume that $N$ users share the same up-link to their Internet Service Provider. The link capacity is 20 Mbps. When online, a user will require 1 Mbps bandwidth. The probability of a user being online at any point in time is $P_{\text{online}}$ independent of other users.

In closed form, what is the probability that there is not enough available link capacity to fully satisfy the needs of the online users?

(a) $\sum_{x=21}^{N} x P_{\text{online}}$

(b) $\sum_{x=21}^{N} \text{Binomial}(x; P_{\text{online}}, N)$

(c) $\sum_{x=0}^{20} x P_{\text{online}}$

(d) $\sum_{x=0}^{20} \text{Binomial}(x; P_{\text{online}}, N)$

(e) $\sum_{x=0}^{20} x P_{\text{online}} \cdot x!$

Q5: If domain dnsExample.com maps to IP address a.b.c.d, which of the following statements is necessarily true?

(a) a.b.c.d hosts only the domain dnsExample.com.

(b) dnsExample.com only runs on one machine with the address a.b.c.d.

(c) Neither of the above.
Q6: Which components cache DNS queries?
   (a) Only browsers.
   (b) Only DNS servers.
   (c) Both of the above.

Q7: Recall that a.nic.ch is one of the .ch TLD name servers. Do you expect a “dig @a.nic.ch google.com” to return a:
   (a) A type record with an IP address for google.com.
   (b) NS record pointing to google.com’s DNS server.
   (c) CNAME record pointing to google.com’s DNS server.
   (d) None of the above.
Q8: You make a query “dig dnsExample.com”, and see in the response the following line. What does the “119” indicate?

dnsExample.com.  119    IN    A 172.217.18.110

(a) The returned IP address will definitely be different after 119 seconds.
(b) If you want to reach that domain after two minutes, you should make a new DNS query.
(c) You are not allowed to ask your local ISP name server the same query for another 119 seconds.

Q9: From a Top-Down point of view, what is the correct Internet layer stack?


Q10: Internet Layers stack: Which of the following statements are true? Select all that apply.

- All the intermediate nodes in the network implement L3 of the Internet Layer stack

✓ L2 moves frames across the network

- L3 moves segments across the network
Q11: Delay, Loss, Throughput: Which of the following statements are true? *Select all that apply.*

○ The main contributor of delay in the network is processing

✓ Queuing delay depends on the traffic pattern and it is usually statistically evaluated

○ For online gaming applications, the most important performance metric is throughput

✓ Loss in the Internet happens because of overloaded queues

![Bar chart showing the distribution of responses for Q11]

Q12: End-to-End principle: Which of the following statements are true? *Select all that apply.*

✓ The End-to-End principle states that reliability must be implemented at the end points of the communication

✓ Implementing reliability in the network can enhance performance.

○ Implementing reliability in the network reduces hosts complexity.

○ Implementing reliability in the network does not affect network complexity, as every intermediate network node implements a reliable communication protocol by default.
Q13: TCP & UDP: Which of the following statements are correct? Select all that apply.

- Increasing the bandwidth of the path to the server always reduces the time it takes to load a website substantially.

  **Solution:** Wrong. If the website can be returned in one packet, increasing the bandwidth does not reduce the load time.

- **✓** A difference between UDP and TCP is the lack of handshake messages which allows UDP to immediately send data packets.

Q14: Caching: Which of the following statements are correct? Select all that apply.

- Using a CDN instead of directly accessing the server always reduces RTT but never increases the achievable throughput.
Solution: Wrong. Both can be increased if the path to the server is congested.

✓ A reverse proxy is not effective for reducing latency if the network of the clients ISP experiences heavy congestion.

Solution: A forward proxy would be more effective in this case.

☐ When choosing a CDN replica to retrieve cached data from, a client should choose a CDN replica close to the server.

Solution: Wrong. Usually the opposite is the case, the path to the CDN replica should be minimal (e.g. with respect to RTT or congestion).

Q15: Why does buffer based adaption have a distinct startup phase based on immediate past throughput?

(a) Without a distinct startup phase, it would fetch the highest quality video first and then possibly rebuffer.

(b) Without a distinct startup phase, since the buffer is initially empty, it would retrieve the lowest quality video first and then gradually increase the quality.

(c) The size of the buffer needs to be estimated first by trying to get the highest quality video.