



1st Assignment Network Protocols and Architectures, WS 14/15

Question 1: (10 + 10 = 20 points) *Circuit Switching vs. Packet Switching*

- Compare circuit switching to packet switching with respect to delays that occur. Which parts / processes contribute to the delay in circuit switching and in packet switching?
- A link with a bandwidth of 50 MBit/s is to be used by several users. Each user needs 1 MBit/s to send, but is only in 10% of the time active. How many users can be connected if circuit switching is used? Explain your answer briefly.

Question 2: (20 points) *Layering*

The textbook by Kurose and Ross compares layers in networks to actions when taking an airplane trip. Read the analogy in the first chapter and come up with another human analogy similar to the airport example to discuss layered architectures. If you do not have a hardcopy of the textbook, you can use the online version¹ (Hint: username/password is provided in first slide set).

Question 3: (10 + 10 + 10 = 30 points) *Hands-on Experiments with ping*

The tool `ping` can be used to check whether a given host in the Internet is reachable and how long it takes to get an answer back from this host. Familiarize yourself with the tool. (Under Windows you can invoke the tool from the command line.)

- Select three universities within Germany, five universities in different European countries and five universities in different countries outside of Europe². We will call these universities “targets” in the remainder of this problem. Ensure that these targets are “pingable”, and record the average time in milliseconds it takes to get a reply back from the target (RTT in ms).
- Determine the distance of the target to the location in meters where you perform the experiment (e.g., use some Internet service³) and note it. Can you find targets that have a smaller RTT but a higher distance than other targets? Why can this happen?
- As the last thing to do, use your favorite tool to visualize the data and plot the time from part a) against the distance from part b) into a diagram showing distance on the x axis and the corresponding time on the y axis. (You could, e.g., use `gnuplot` or OpenOffice Spreadsheet.)

Please turn!

¹http://www.net.t-labs.tu-berlin.de/teaching/computer_networking/01.07.htm

²Check out http://en.wikipedia.org/wiki/Lists_of_universities_and_colleges_by_country if you have problems finding universities

³The following sites should yield useable information: <http://www.timeanddate.com/worldclock/distance.html>, <http://www.geobytes.com/CityDistanceTool.htm>

Question 4: (10 + 10 + 10 = 30 points) *HTTP*

- (a) What is the difference between persistent HTTP with pipelining, and persistent HTTP without pipelining? Which of the two is used by HTTP / 1.1?
- (b) Describe how Web caching can reduce the delay in receiving a requested object. Will Web caching reduce the delay for all objects requested by a user or only for some of the objects? Why?
- (c) Telnet into a Web server and send a multi-line request message!⁴ Include in the request message the `If-modified-since:` header line to force a response message with the 304 Not Modified status code. (Include a log of the telnet session in your solution.)

Due Date: Wednesday, October, 29th 2014 only until 14:00 h s. t.

- **As PDF files (no MS Office or OpenOffice files):** Uploaded via ISIS (<https://www.isis.tu-berlin.de/2.0/course/view.php?id=2560>)
- Put your name, StudentID number (Matrikelnummer) **and** the name of your tutor on your solution.

⁴You will find useful information in the textbook by Kurose and Ross!