



1st Assignment Network Protocols and Architectures WS 10/11

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 16 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) *Discussion: 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.

Note: Your result to this question is meant to be discussed in the tutorial. If you are not going to attend the tutorial, you can earn the respective points by including your discussion in the written report together with the solutions to the remaining questions on this sheet. If you are attending the tutorial, you do not have to write down the solution to this question.

Question 3: (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 “ping”able, and record the average time in milliseconds it takes to get a reply back from the target (RTT in ms).
If you find un“ping”able targets, please enter them in to the ISIS database named “List of unpingable Universities Database”, to warn the other students. Also use this database to avoid trying to ping the same target the others already entered as not “ping”able.
- Determine the distance of the target to the location in meter 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? If so, 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.)
- Enter your results into the ISIS database named “Results of Question 2” under <https://www.isis.tu-berlin.de/mod/data/field.php?d=1921>.

Please turn!

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

²Check out http://en.wikipedia.org/wiki/List_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 + 5 + 5 = 30 points) *Domain Name System*

- (a) Use one of the tools `nslookup` or `dig` to send DNS queries to three DNS servers: Your local DNS server (default DNS server) and the two DNS servers you found using a whois database⁴ for some domains. Issue a query for each of the different kinds of record types: `A`, `NS`, and `MX`. Summarize your findings.
- (b) Use any of the tools to find a Web server that has multiple IP addresses. Does the `www.net.tu-labs.tu-berlin.de` have multiple IP addresses?
- (c) If a hostname has multiple IP addresses which of the IPs is used? How and for which purpose can this be leveraged?
- (d) DNS is using UDP instead of TCP. If a DNS packet is lost, there is no automatic recovery. Does this cause a problem, and if so, how is it solved?

Due Date: Thursday, November, 4th 2010 only until 13:55 h s. t.

- **As PDF files (no MS Office or OpenOffice files):** Uploaded via ISIS (<https://www.isis.tu-berlin.de/course/view.php?id=3584>)
- **On paper:** Postbox in the Telefunkenhochhaus (basement, behind the doorman right)
- Put your name, StudentID number (Matrikelnummer) **and** the name of your tutor on your solution.

⁴See <http://www.ripe.net/whois>, <http://ws.arin.net/whois> or <http://www.denic.de/de/whois/index.jsp>.