Freie Universität Berlin
Computer Science
Computer Systems & Telematics
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Telematics – Exercises No. 1

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General information about the exercises

Accompanying the lecture, we will hand out some assignments. These exercises should be solved but you do not have to submit your solutions. The solutions will be presented and discussed in the tutorial sessions. We expect each student to have solved the exercises. YES WE KNOW THAT MANY OF YOU WILL NOT LOOK INTO THE EXERCISES, BUT WE NEVER GIVE UP THE HOPE … PLUS THERE WILL BE AN EXAM…

Exercise 0, TI III / Prerequisites:

Make sure that you still master the contents of TI III or a similar course covering basic networking. Although this course touches many aspects already covered in TI III we just briefly touch them and go much deeper into some details plus cover new aspects.

Exercise 1, OSI model:

Name the layers of the OSI model starting from the top and their general (most important) functions.

Exercise 2, Path selection:

Which layer has the task to select the path/route in an inter-network?

Exercise 3, Physical layer:

What does the physical layer define?

Exercise 4, Routing Schemes:

Explain the differences of unicast, multicast, anycast, and broadcast transmissions. Give an example application for each transmissions type. Do you know what a concast and geocast is? What is the difference between a broadcast and flooding?

Exercise 5, Overhead:

Explain which service type has more overhead - connection-oriented or connection-less communication?

Exercise 6, Services in a layered communication system:

1. Explain why the layers of a n-level communication system should never use or provide services of/to other layers other than ones below resp. above?
2. Which alternative does exist to a layered communication model? Name an application where this model is more useful.

Exercise 7, Latency and bandwidth:
The terms latency and bandwidth have been introduced in the lecture. Discuss in which of the following application scenarios latency, bandwidth, or both are most important.

1. FTP (file transfer)
2. SSH (shell access)
3. Pay-TV video streaming
4. Remote controlled emergency shut-off system
5. Telemedicine in the surgery
6. Access to the world wide web
7. E-Mail

Exercise 8, Protocol Overhead:
Consider a layered network architecture with n levels. Each protocol on a level adds a header of h bytes. What fraction of the network bandwidth is lost due to the overhead when m bytes are generated by an application on the top-most layer?

Exercise 9, Asynchronous vs. synchronous transmission:
Name the advantages and disadvantages of asynchronous and synchronous data transmission schemes. Why is synchronization required?

Exercise 10, Connection Properties:
Explain the terms simplex, duplex, and half-duplex. Name an example medium of each type.

Exercise 11, Terminology:
Explain the terms signal, data, and information in the context of Telematics.

Exercise 12, Terminology 2:
Explain what the terms throughput, goodput, and packet delivery ratio describe in the context of computer networks.

Exercise 13, Race of Technologies:
A pigeon can reach speeds of up to 100 km/h and carry an USB mass storage device with 256 GByte. Up to which range has the pigeon a higher data rate than a 1 Gbit/s data line? Assume that the pigeon can keep this speed indefinitely.

Exercise 14, Networks in the Real World:
Discuss where you find computer networks in our daily life and which types of networks do you know? Have you heard of the "Internet of Things"?

Exercise 15, The core of the Internet:
Visit the following website http://www.caida.org/research/topology/as_core_network/ and have a look at the data and media they provide. Discuss the existence of an Internet core.