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Exercise Sheet 5

Computer Engineering and Communication Networks

Handout: 15.11.2018
Discussion: 22.11.2018 (start 10:00 a.m.)

1. Introduction to Communication Networks

1.1. Fill in the gaps in the following sentence with one of the choices:
A network is a set of autonomous computers that provide information ---A--- and each machine operates based on dedicated ---B--- .
A: a) exchange b) change c) manipulation
B: a) applications b) switches c) routers d) hardware and software

1.2. Which components are the least necessary components to form a computer network?
a) End systems, Intermediate Systems
b) Intermediate systems connection, Connections (links)
c) End systems connections (Links)
d) Distributed systems, Links
e) End systems, Intermediate systems, Connections
f) Distributed systems, Intermediate systems, Connections
g) IP route intermediaries (routers), Intermediate systems, Connections
h) All listed components

1.3. Classification of Networks: for each example indicate which network class it is:

{LAN, MAN, PAN, SAN, GAN, ZAN, RAN}

a) A City-wide WiMAX network is being set up in Zurich:
b) A few friends meet and network their PCs to share files.

1.4. Signals, data, information and messages:

Imagine the following example and answer the questions a, b and c by choosing the correct choices form 1 to 5 for each question:
-Anna is at home and looks at a weather report online on her PC.

a) What are the Signals?
b) What is Data?

c) What is Information?

1) The statement how the weather will be
2) Packets transmitted by the server
3) Electrical Voltage in the cable
4) The symbols (characters) within the packages
5) None of the above

1.5. Which communication pattern describe the following examples of a, b and c? {Unicast, Anycast, Multicast, Broadcast, Dialog }

a) Heinz calls a support call center with an employee, who is currently free, answering the call. An end system in an Ethernet network does not know the MAC address associated with the destination address and therefore sends a message to all systems in the subnet.

b) Alice sends an SMS to Bob.

c) A supermarket chain sends brochures to registered customers in the neighborhood, with a bundle of brochures is delivered to the postman, which then serves the individual addresses.

1.6. Complete the following sentences about the layer model from the lecture: (multiple options may be possible)

a) One layer offers ---A--- to one layer ---B--- .

A.1) A log
A.2) An application
A.3) A service
A.4) An entity

B.1) Above that layer in the same machine
B.2) At the same level on another machine
B.3) All other layers on another machine

b) Two devices communicating with each other and use ---A--- of the same layer, have to use the same ---B---.
A.1) logs
A.2) Entities
A.3) Services

B.1) Protocol
B.2) Application
B.3) Service
B.4) Entity

1.7. List the ISO/OSI BRM layers, starting with the lowest layer.

1.8. Calculation of Data Rates:

You've trained your Bernhard Bernie to carry a box of four 8mm ribbons instead of a bottle of schnapps (if your hard drive is full, you have an emergency and Bernie must go). These tapes hold 10 gigabytes each. The dog can reach your whereabouts at a speed of 18km / h, no matter where you are. At what distance do Bernie and a 155 Mbps ATM line reach the same data rate? (Conversions from Mega to Giga, etc. are made in factor 1000 for simplicity (1000 MB = 1 GB). Assume that the overhead on the bands and the ATM line is the same.) Results in meters and rounded to integers:

a) 10
b) 1290
c) 10323
d) 46449
e) 371592

1.9. Assign the following protocols to the layers of the TCP / IP model:

HTTP- TCP- IP - ICMP - ARP - DHCP- PPP - RIP

A: Application Layer, B: Transport Layer, C: Networking Layer, D: Data Link Layer, F: Physical Layer

1.10. Complete the following sentences:
Compared to the OSI / ISO model, the TCP / IP model has/is ...

1) …. the presentation and communication control layer (session layer)
- contained in the application layer
- summarized to the session layer
- unchanged
- none of the above

2) …. the application and transport layer
- omitted
- renamed to Internet layer
- also available
- none of the above

3) …. the network layer
- omitted
- renamed to Internet layer
- also available
- none of the above

4) …. the link and physical layer
- omitted
- renamed to Internet layer
- also available
- none of the above

2. Topologies

2.1. Several computers are connected via a hub. Which topology is used here?
2.2. In a student hostel, every room has an Ethernet connection. Each of these ports are connected to a switch on each floor. Each switch has exactly one uplink to the router in the basement. Which topology is used here?
2.3. Several computers are connected via a router. Which topology is used here?
2.4. There are several people working in a study, all of them have computers connected to each other via an Ethernet cable. Which topology is used here?
2.5. Are these statements correct?
   a) By removing certain links in a mesh network, this can become a tree network.
   b) By removing certain links in a full mesh network, this can become a star network.

3. Multiplexing

3.1. Determine the Multiplexing method used in each of the following situations:

   a) The railway station in Beamholz has exactly one platform, but trains with different destinations being kept (waited) in a temporary parking.
   b) Various radio programs can be received over the airwaves.
   c) Various data are transmitted via the wires of a twisted-pair network cable.

3.2. For the statistical Multiplexing resources become ---A---. Packages will be added ----B---.

A:
1) allocated dynamically
2) assigned statically
3) distributed randomly but fairly

B:
1) immediately forwarded or discarded
2) selected or discarded depending on priority
3) temporary cashed

4. Physical Media

4.1. What is the data rate of a 3 km long fiber optic cable with a path capacity of 150 kilobits?
4.2. Franz bought a new cable (length: 5m) for his loudspeakers. The cable is certified for a bandwidth of 100 KHz. Which bandwidth could Franz use if he uses two of these cables together?
4.3. How long is the delay in seconds between transmitter and receiver when there is a 1.3 km long fiber optic cable between them?