Freie Universität Berlin
Computer Science
Computer Systems & Telematics
Prof. Dr.-Ing. Jochen H. Schiller

Telematics – Exercises No. 10

Winter Term 2011/12, January 5th, 2012

Exercise 1, IPv6 Privacy:

IPv6 will be (probably) more persistent and each address contains an interface ID. Isn't this a privacy issue?

Exercise 2, IP layer vs. Ethernet Multicast:

1. A source sends an IP multicast packet. What happens on the data link layer? Hint: Think about the destination MAC address.
2. Discuss if a switch, a hub, or both can implement efficient multicast delivery.
3. When the underlying hardware does not support multicast, IP multicast uses hardware broadcast for delivery. Is there any advantage to using IP multicast over such networks?

Exercise 3, IP layer Multicast:

1. Explain the difference between group management and multicast routing.
2. Discuss why multicast applications do not use TCP as transport protocol.
3. A multicast receiver intends to inform a multicast source about its service requirements (e.g., quality of a transmitted video). Discuss if this is possible?
4. Over 50% of the Internet paths are asymmetric. Discuss why this is a problem for multicast delivery in contrast to unicast. Hint: Think about tree construction.

Exercise 4, Address Translation:

Answer the following questions regarding Network Address Translation (NAT):

1. What is NAT and why is it necessary?
2. What types of NAT are available and what are their differences?
3. What problems can arise when using NAT?

Exercise 5, ICMP:

Answer the following questions regarding the Internet Control Message Protocol (ICMP):

1. What services are provided by ICMP?
2. Which of these services are superseded by other protocols or used very rarely?

Exercise 6, Evolution of the IP Model:

Read the RFC 6250 "Evolution of the IP Model" by Dave Thaler.

1. Host A intends to establish a video conference with host B. Assume that host B can reach host A. Why it is not ensured that A can start the video conference? Discuss your answer with respect to the network layer.
2. What is a multi-homed host?

3. Discuss how addresses, host names, and routing are correlated and if an application programmer should use addresses or names to establish a connection?

Exercise 7, IPv6:

1. Discuss the differences of the Internet Protocol version 4 and 6.
2. How long does the IPv6 address space last, when an IPv6 address is assigned every pico-second (assume that all addresses can be used).
3. How can the two versions of IP coexist?
4. Is ARP required for IPv6 and does ICMP still exist?

Exercise 8, Stateless vs. Stateful Address Auto Configuration:

Discuss the difference between stateless and stateful address configuration!

Exercise 9, Routing:

1. Discuss the terms routing and forwarding.
2. Where are the corresponding services implemented in a hierarchical network architecture?
3. Which devices that are between a source and destination node participate in the routing?

Exercise 10, Static vs. Dynamic Routing:

Discuss the advantages and disadvantages of static and dynamic routing.

Exercise 11, Routing Protocol Types:

Classify the different routing approaches. Consider aspects like maintenance, scope, and information distribution.

Exercise 12, Routing Metrics:

List metrics that can be used by routing protocols. Discuss suitable application scenarios where these metrics could be used.

Exercise 13, Routing Table:

A router has the following routing table:

Destination	Router	Genmask	iface
160.45.0.0	134.14.13.1	255.255.0.0	eth0
160.45.12.0	134.14.14.1	255.255.255.0	eth1
164.13.128.0	74.125.128.1	255.255.128.0	eth2
164.13.0.0	74.125.122.1	255.255.0.0	eth2
default		0.0.0.0	eth0

Over which output interfaces are the datagrams with destination addresses 160.45.1.1, 193.99.144.80, 164.13.130.0, and 160.45.12.1 forwarded?

Exercise 14, Policy Routing:

What is policy routing and why is it necessary in today's networks? Have a look at the book Policy Routing With Linux - Online Edition by Matthew G. Marsh.

Exercise 15, Symmetric Paths:

Assume that all intra-domain routing protocols use a shortest paths metric. Why can we not assume symmetric paths within the Internet?