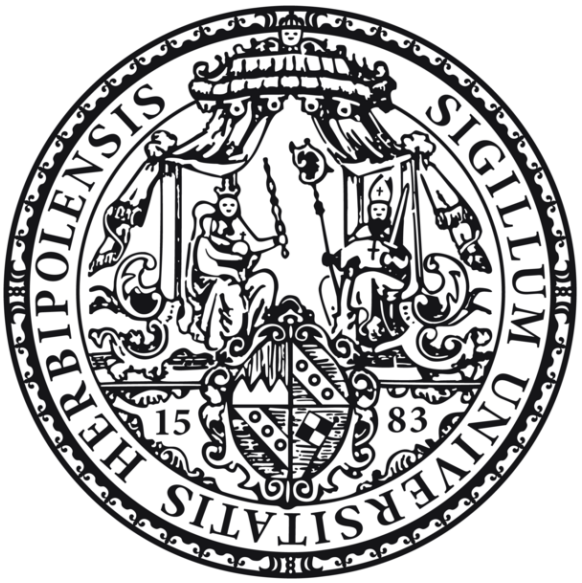
Hardwarepraktikum Internet-Technologien

Comprehension Questions of Task 5: Router Configuration



Julius-Maximilians-Universität Würzburg

Chair of Computer Science III

A project report submitted by **group 11**

Enrique Mesonero Ronco

Manuel Calvo Martín

Pablo E. Ortega Ureña

Summer term 2022

May, 2022

Contents

1. The MAC address of an interface is unique. So why is it not used for end-to-end communication directly, but a new addressing on layer 3 is invented? (multiple reasons)

Because each router modifies the MAC addresses MAC addresses of a packet so that it can be forwarded to the next router by the premises.

To perform this end-to-end transport the Network Layer uses four basic processes:

-Addressing: mechanism for addressing these end devices. If individual sections of data are to be addressed to an end device, this device must have a unique address.

-Encapsulation: adds a header, when a packet is created, the header must contain, among other information, the address of the host to which the packet is being sent. The Layer 3 header also contains the address of the source host.

-Routing: the network layer must provide the services to route these packets to their destination host. The source and destination hosts are not always connected to the same network. In reality, the packet could traverse many different networks.
The intermediate devices that connect the networks are the routers. The function of the router is to select routes and direct packets to their destination.

-Decapsulation: The host examines the destination address to verify that the packet was addressed to that device.

2. What happens if the standard gateway or the subnet mask of an end device are set incorrectly?

No connection or pinging to the other end devices is possible.

3. Can the Raspberry still be reached from outside (10.X.5.0/24) with a ping? If yes, how so?

You can ping, but ping the port directly, in this case ping 10.11.5.254 -p 10022.

4. Consider the situation from Figure 11. PC A sends an HTTP request to PC B, which replies (via the same connection) with a website. Which source port does the HTTP request have? Which destination port?

A random port from the list of unregistered ports (Source port).

The default port, for an HTTP server on a computer, is port 80. Other ports such as 8000 or 8080 can be used. (Destination port).

5. Name for the resulting TCP/IP packets in both directions, before and after passing the NAT router:

a) the source MAC address (PC A, PC B, router or Internet),

MAC addresses do not change.

b) the destination MAC address (PC A, PC B, router or Internet),

MAC addresses do not change.

c) the source IP address,

PC A: 10.1.2.254

PC B: 132.187.1.114

d) the destination IP address,

PC B: 128.65.210.8

PC A: 10.1.2.3

e) the source TCP port,

For the origin, insert a random one that is not in use.

f) and the destination TCP port.

For the destination port, change the port to the corresponding port according to the forwarding table.

6. In this task, your routes were automatically created by the router after you assigned IP addresses to the interfaces. This applies to directly connected IP address ranges. In reality, however, several networks are separated from one another by several routers. So consider the networks from Figure 12. You want to configure the routers so that packets from network A (red arrow) can reach network C (green). What information do you need to add to your routing tables for this? Based on the structure of the MikroTik's routing table, explain which entries have to be inserted in which routers (A, B, C and D) so that network C can be reached from anywhere (especially from network A).

Networks B and D need the destination address of C and the gateway of router C.

Then for network A, the destination address of C would have to be reached via gateway B or D, depending on the administrative distance between the two, whichever is smaller.

7. In practice, instead of static routes, routing protocols are often used (RIP, OSPF, IS-IS, ...) to automate the configuration of the router. They exchange information independently and regularly with their neighbors via the accessible networks and constantly recalculate their routes. What (two) advantages and disadvantages do you see with static routing compared to dynamic routing? Hint: Think about performance indicators than can be measured (bandwidth, CPU utilization) and qualitative aspects such as security, management, and flexibility.

Static routing is really easy to implement in a small network. It is very secure, as no advertisements of the components of the network are sent. It is predictable, as the route to the destination is always the same, and no routing or update algorithms are needed, meaning less CPU and memory consumption. However, it is only suitable for small networks. The complexity of its configuration scales in a big factor as the network grows. Also, if a link fails, a static route cannot be rerouted, and manual maintenance is required.

Dynamic routing on the other hand, is suitable for all topologies, no matter the network size. A dynamic route will be adapted if a link fails whenever

possible. Nevertheless, they are more complex to initially implement, and are less secure due to the broadcast and multicast routing updates. Additional configuration settings are required to increase such security. They also require more CPU and memory resources, to run the algorithms and store the information.

8. (Extra comprehension question) Why does static routing require the IP address of the next router to be entered as the gateway to establish a connection between the terminals? Why was the interface not sufficient here?

For point to point interfaces: you can use static routes that point to the interface or to the next hop address. There is only one possible next hop and its L2 address will be used to build the L2 frame.

For multipoint/Broadcast interfaces, it is more suitable to use static routes that point to a next hop address to avoid the need for resolving every destination address to its L2 address. As you have seen above it is still possible to use static routes pointing to the interface but it is not a scalable solution.

9. (Extra comprehension question) Why do we use the network 10.0.0.0/30 for the connection between the two network devices? Why don't we also use a /24 subnet mask here? How many IP addresses are needed in this subnet and why?

The /30 subnet mask provides the most efficient use of IP addresses by not wasting any IP addresses when it is applied to a point to point network connection. It only uses the 2 IP addresses a /30 subnet provides, apart from the network and broadcast addresses.