Lab Report 3

Exercice 1

1- ping -c 5 10.10.10.21 5 packets transmitted
ping -c 5 10.10.20.1 network is unreachable
ping -c 5 10.10.30.41 network is unreachable
2- ICMP and ARP Packets between PC1 and PC2
3- ICMP are requests and replies of the ping command, ARP are used find the MAC addresses of the hosts involved using IP addresses.
4- PC1 cannot reach any machines outside of the subnet 10.10.10, i.e router 1 and PC4 because they are on different subnets.

Exercice 3

Explanation for routing tables entries

- the first column are ip-address of available destinations

- the second column shows the gateway if there is one, this is indicated with "via". The parameter after via gives the IP address of the nexthop router. Then the “dev“ =device (eth0), that is used for connection. “proto“ to identify the routing protocol, here kernel, what means that the route was installed by the kernel during auto configuration.

- the third column shows the correspondend interface

- the fourth column indicates if the route was installed by kernel during auto-config

- the fifth column indicates the scope of the address, link means that the address is only valid on this device

- the sixth column is a hint to the kernel about what ip-address to select for a source address on outgoing packets on this interface

Exercice 5
We applied the given configuration

Exerice 6
Initially the subnet 10.10.20.0 is set to route through interface FastEthernet0/0 and subnet 10.10.30.0 is set to route through interface FastEthernet0/1. After the change, the subnet 10.10.10.0 can now be reached by routing through PC2.

Exercise 7
Traceroute sends out a series of packets, each time incrementing the time to live of the packet. This means that every host on the way to the packet's goal will experience time to live exceeded in transit and send a corresponding message back to PC1. Traceroute uses the messages from each host to list all the hops on the way to the packet's destination.

E xercice 8
`See Wireshark Captures`
3. When router receives a packet from PC1 meant for PC4, it sends out an ethernet packet addressed to PC4 from itself containing IP packet addressed from PC1 to PC4.
Exercise 9
2. 10.10.30.9 has 3 matches
10.10.30.14 has 2 matches
10.10.40.1 has 1 match
10.10.40.1 has only one match (`ARP Who has 10.10.10.71? Tell 10.10.10.11`)
since only the short prefix 10.10.0.0/24 matches it. 10.10.30.14 has 2 matches, but PC1 sends the packet to PC2 since that was the listing with the longest prefix matching 10.10.30.14 in the routing table (`ARP`

`Who has 10.10.10.21? Tell 10.10.10.11`
). 10.10.30.9 has an exact match in the routing table, therefore the packet is routed according to that matching routing entry (`ARP Who has 10.10.10.81? Tell 10.10.10.11`) although two other entries with shorter prefixes also matched this address.
Linux always chooses the routing entry with the longest matching prefix.

Exercise 10

See Files:
ex10_ping
ex10_wiresharkPC1
ex10_wiresharkPC2eth0
ex10_wiresharkPC2eht1.

Exercice11

6- Since PC4 believes it belongs to network 10.0.0.0/8 it sends its ARP request to router1. Since router1 is functioning as a Proxy ARP, it tells PC4 where it can find PC1 (in this case, using the router's MAC address).
`See Files`
Since PC2 is set up for IP forwarding, it forwards the packet from router 1 to PC1. That is why the packet reaches PC1 successfully.
After disabling Proxy ARP it is not possible to reach PC1 from PC4 anymore.

Exercise 12

1. For PC2 there is a difference directly after the redirect message - the cache now contains information about the redirect.
2. The redirect was gone from the cache.
3. Initially we had set PC2 to route traffic intended for subnet 10.0.1.0/24 via 10.0.2.2. When we sent a ping from PC2 to PC1, router 2 responded with an ICMP redirect message which saved the redirect from PC2 to subnet 10.0.1.0/24 via router 1. Then the ping was sent correctly from PC2 to PC1.
Routing entry on PC2:
4. Because an entry in its routing table tells it to redirect all traffic intended for the subnet 10.0.3.0/24 through 10.0.2.2.
`S 10.0.3.0 [1/0] via 10.0.2.2`

Exercise 13

1. No, only ICMP requests were sent.
2. No, because time to live gets exceeded at a certain point and the routers stop forwarding them.

Exercise 14

1. In step 3 when sending the first ping, PC1 has to send it through the router because it has no routing entry for the subnet 10.0.2.0/24 and the router is its default gateway. Therefore PC1 has to broadcast a request for the address of the router while sending the first ping, but when sending the second ping it does not need to do so as the address is already in its cache.
PC1 broadcasts searching for the address of the router:

Ping to PC3 (no intervening ARP requests indicating that PC1 has cached the router's MAC address):

2. No, PC3 would be unable to reply to a ping from PC1 because it wouldn't get an answer to its broadcast request for PC1's address. The same goes for reaching PC2 and PC4 from PC3 because PC3 is on a different subnet so those 2 PCs would not be directly reachable.