Network Technology and Programming Lab
Assignment 3

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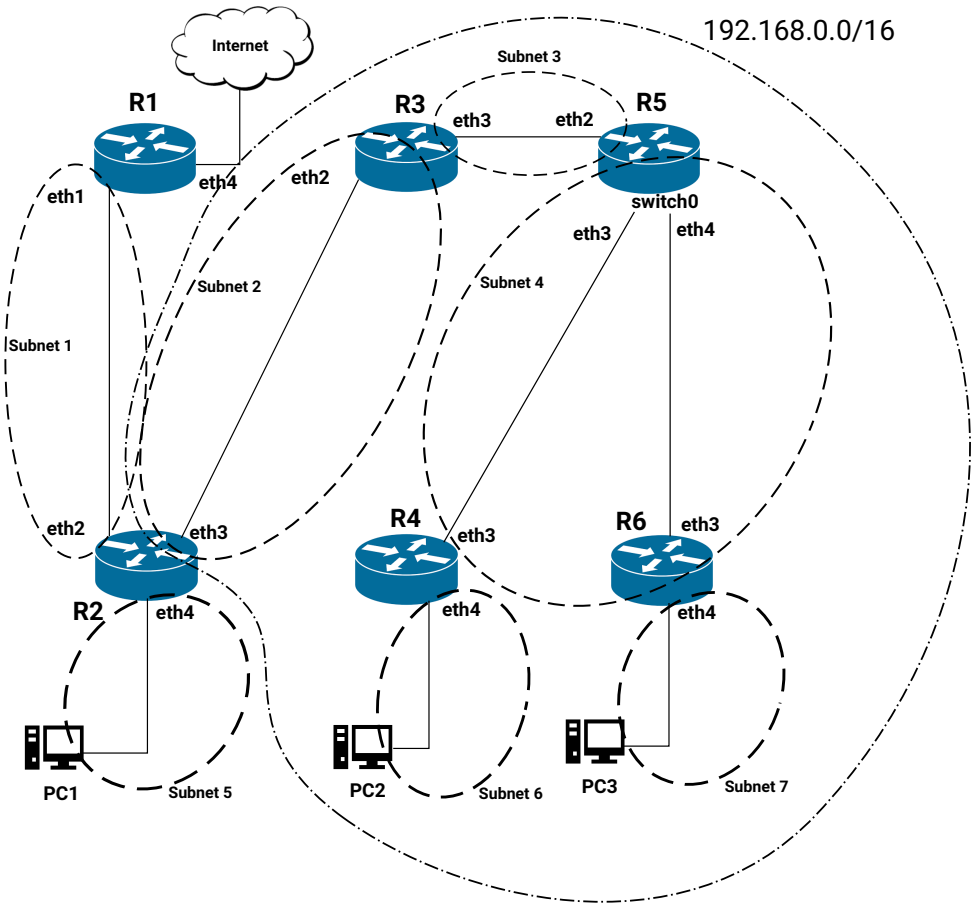

Figure 1: Assignment 3 Topology

Intro

The goal of this assignment is for you to familiarize with routing, subnetting and the CIDR notation.

On the control panel of the lab you will find 7 routers (Ubiquity EdgeRouter X) and 2 switches (EdgeSwitch 24, EdgeSwitch 8). You have full access on the R2-R7 and on the EdgeSwitch 8. Access on the R1 and on EdgeSwitch24 is read-only and no configuration is allowed. For easily accessing the available equipment, a management VLAN (ID: 1000) is configured and accessible using the management port 24 of the EdgeSwitch 24. This port is configured to automatically apply VLAN tagging on all incoming untagged packets. Therefore, you can plug a PC on this port and access without any further configuration the available devices. For your convenience, a DHCP server runs on the management VLAN that will assign a proper IP address on the plugged host automatically.

The management ports are the *eth0* for the routers and the port 1 for the EdgeSwitch 8.

In order to save time and possible problems due to misconfiguration, lets assume that the rule is to never change the configuration of these ports. If you do so, please reset the device and upload the default configuration, so other teams can access them easily. The assignments will not require to configure the management ports. At the end of your session, re-upload the default configuration on the devices and reset any changes in the interface parameters of the Comm hosts.

The IP addresses for accessing the WebUI of each device are listed in the table below:

Device	Address
R1	192.168.4.1
R2	192.168.4.2
R3	192.168.4.3
R4	192.168.4.4
R5	192.168.4.5
R6	192.168.4.6
R7	192.168.4.7
EdgeSwitch 24	192.168.4.8
EdgeSwitch 8	192.168.4.9

The username for the devices with full access is *hy435* and the password *hy435@csd*. For the R1 and the EdgeSwitch 24, a read only account with username *student* and password *hy435@csd* exists.

The default configurations of the routers can be found here: https://github.com/plevridi/configs Don't forget to save (download) your own configurations before leaving the lab and apply(upload) the default configs. Never reset the devices!

1. Set up the network

Figure 1 depicts the topology that you will setup in this assignment. Take a good look at it, and comprehend it. You will now build it step-by-step.

Configure **Subnet 1** by setting the interfaces of R1 and R2 accordingly. Do not add any additional routing table entry yet. The details of **Subnet 1** are the following:

Subnet 1: 192.168.21.0/24
R1:eth0 = 192.168.21.4
R2:eth2 = 192.168.21.3

Configure the rest of the subnets in a similar manner:

Subnet 2: 192.168.21.0/30
R3:eth2 = 192.168.21.1
R2:eth3 = 192.168.21.2

Subnet 3: 192.168.20.0/30
R3:eth3 = 192.168.20.1

R5:eth2 = 192.168.20.2

Subnet 4: 192.168.0.0/22

This subnet requires a little extra effort to setup. To reduce the number of different network devices, the interfaces eth3 and eth4 of R5 belong to the same network. However, due to a limitation of the EdgeOS, it is not possible to route traffic to specific interfaces that belong to the same network. To overcome this issue, you can use the switch functionality that the ER-X router provides. The router provides a special interface called **switch0**. Assign to this interface the eth3 and eth4 interfaces. Then assign to the **switch0** an IP and use it a normal interface.

R5:switch0 = 192.168.0.3
R4:eth3 = 192.168.0.1
R6:eth3 = 192.168.0.2

Subnet 5: 147.52.20.148/28

R2:eth4 = 147.52.20.149
PC1 = 147.52.20.150

Subnet 6: 192.168.8.0/24

R4:eth4 = 192.168.8.1
PC2 = 192.168.8.2

Subnet 7: 192.168.9.0/24

R6:eth4 = 192.168.9.1
PC3 = 192.168.9.2

2. Configure the Routing Tables

Now that your network is in place, you will need to configure the routing tables of routers R2 to R6 so that connectivity between all 3 hosts (PC1, PC2, PC3) is accomplished. In addition, PC1 should be able to reach a host on the Internet, whereas PC2 and PC3 should be able to ping **eth4** of R1.

Note that in the R1 you have read-only access, but the routing tables are already configured. If you need additional routing tables on the R1, contact the TAs.

2.1 Roadmap

The network topology that you have to build is quite complex. Is essential to build it in parts and ensure connectivity before moving on. The following roadmap will help you to achieve faster and easier your goal.

1. Configure the IP addresses and the subnets on the routers and hosts
2. Check if PC2 can reach R4. Apply proper routing tables on both host and R4
3. Check if PC3 can reach R6. Apply proper routing tables on both host and R6

4. Check if PC1 can reach R2. Apply proper routing tables on both host and R2
5. Apply routing so PC3 can reach R5
6. Apply routing so PC2 can reach R5
7. Apply routing so PC1 can reach R3
8. Apply routing so R3 and R5 can communicate
9. Apply routing so PC2,3 can reach PC1
10. Apply routing so PC1 can reach the Internet
11. Apply routing so PC2,3 can reach **eth4** of R1

Note that for accessing the equipment configuration interface, you can use the management VLAN. Details how to access the management network are available on the Assignment 1. Do not forget to backup your configuration and restore the default prior leaving the lab.

3. Backup Connectivity

Make all the necessary changes on the routing tables, so the network can operate normally even if R3 router goes off. You are allowed to use only one additional ethernet cable!!! Note that the backup link should be part of the 192.168.0.0/16 supernet.

Report and submission

- Report in text form all the routing tables of the hosts and the R2-R6
- Report the traceroutes for the following cases:
  - PC2 →PC3
  - PC3 →PC2
  - PC2 →PC1
  - PC3 →PC1
  - PC1 →8.8.8.8
  - PC2 →R1:eth4
  - PC3 →R1:eth4
- Can you ping 8.8.8.8 from PC2 or PC3? Report and explain briefly
- Report again the traceroutes of the affected links using the backup link that you configured

- Submit also the configurations of the routers

The submission deadline is 02/06/2022 22:00 via turnin

Have fun!