Network Technology and Programming Lab

Assignment 4: OSPF routing

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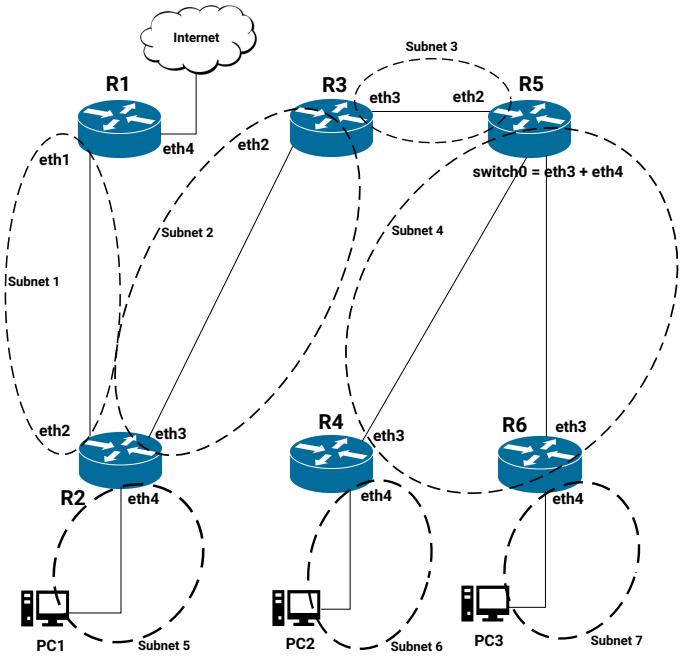

Figure 1: Assignment 4 Topology

Intro

The goal of this assignment is for you to familiarize with the OSPF routing protocol. The network topology should be able to automatically configure the routing tables and provide backup connectivity with minimum effort.

1. Before you start

Before you start take a good look at the slides about OSPF that have been presented during the lab session. Read carefully the OSPF manual of the Vyatta OS and make sure that you fully understand all the OSPF parameters available from the Web UI of the EdgeRouter.

In addition, have in mind that the EdgerouterX routers have a special configuration that two or more interfaces, can be switched together to form up a single interface with multiple ports. This may be useful in situations where two gateways are on the same subnet and no additional network equipment (e.g switch) is available.

2. Set up the network

This assignment uses a topology similar to the topology used in assignment 2.

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: 10.0.0.0/24
R1:eth1 = 10.0.0.1
R2:eth2 = 10.0.0.2

Configure the rest of the subnets in a similar manner:

Subnet 2: 192.168.21.0/24
R3:eth2 = 192.168.21.1
R2:eth3 = 192.168.21.2

Subnet 3: 192.168.20.0/24
R3:eth3 = 192.168.20.1
R5:eth2 = 192.168.20.2

Subnet 4: 192.168.0.0/24
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

3. OSPF configuration

The network should be divided into 3 different OSPF areas, as Figure 2 depicts. In the backbone area belong the R2-R3-R4 routes, whereas in area 1.1.1.1 R1-R2 and in area 2.2.2.2 R4-R5-R6 respectively.

The default route announcement is enabled in R1. Use this option with caution in the rest of the routers.

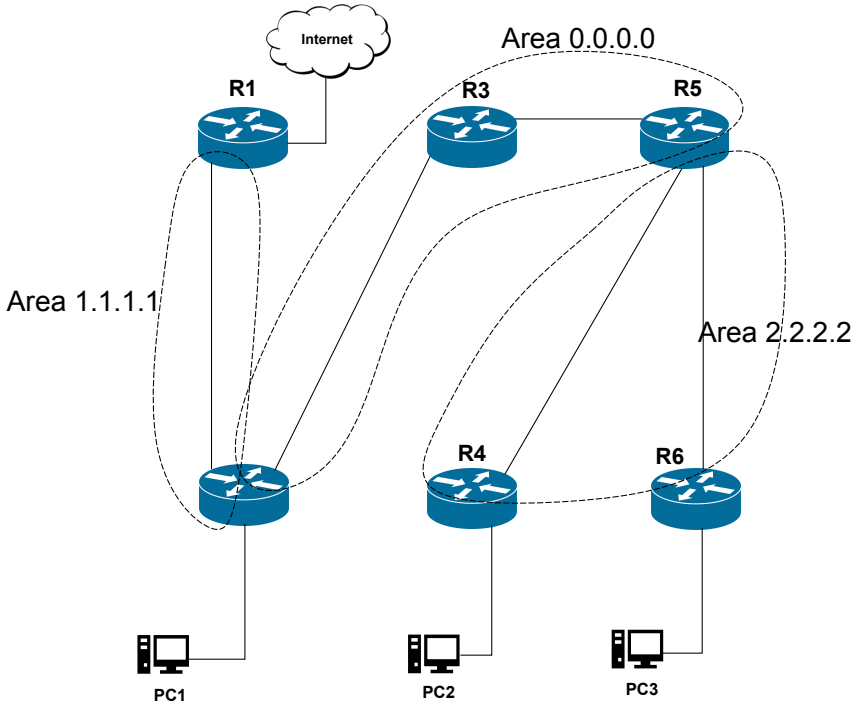

Figure 2: Assignment 4 Topology

4. 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.

4.1 Roadmap

It is a good practice in an OSPF enabled topology to start from the routers of the backbone area. After establishing communication within the backbone area, move to the rest of the OSPF areas. Leave last any static routing configuration on R2, R4, R6 and the PCs. It is essential to establish communication between the routers first and then move to the PCs. Do not use the Web UI console. Connect through SSH to the corresponding router and get a proper terminal.

Do not forget to backup your configuration and restore the default (found at CSD Gitlab) prior to leaving the lab.

5. Backup Connectivity

Make all the necessary changes on the backbone, so the network can operate normally even if R3 router goes off. This requires a backup link from R2 to R5. However, as you may (or should) know, OSPF uses the shortest path to forward the packets towards the desired destination. The result will be the packets to be forwarded through this backup link (R2-R5) and not the primary one (R2-R3-R5). Use any necessary means, so the primary link remains the (R2-R3-R5).

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 ➔147.52.17.85
  - PC2 ➔R1:eth4
  - PC3 ➔R1:eth4
- Break the primary path for R2-R3-R5. Report again the traceroutes of the affected links using the backup link that you configured
- Submit the configurations of the routers and your report

The submission deadline is 19/05/2025 23:59 via turnin
Have fun!

Oral Examination

All the students who have submitted their exercises are requested to attend the oral exam session, in order to present their solutions. A short quiz will also take place during that time. You will need to choose a timeslot for the oral exam using Doodle. More details will be sent to you via email.

Attention

- Each team will only be examined during the timeslot chosen.
- During this session both the Assignments 3, 4 and 5 will be examined.
- Both the timely submission and the oral exam session will contribute to the grading of the assignments.