

Coursework 2: OSPF routing

This coursework aims to assess your understanding of network configuration and the OSPF routing protocol. To complete the required tasks, you should use the Integrated Multiprotocol Network Emulator/Simulator (IMUNES). You can access IMUNES through the SCC.203 VM you used in the labs.

You will have to submit a document (pdf, docx, doc) with your answers to every task. When a task requires it, you also need to submit screenshots and the IMUNES topology files (.imn) with your network configuration.

These files (zipped together as a single submission) should be submitted as usual (via Moodle).

Task 1

Create the topology shown in Figure 1. Each router should have the OSPFv2 protocol activated, and the RIP/RIPng protocols deactivated. Make sure the router names and interface names are the same as in Figure 1. Submit your IMUNES topology file with name: "task1_topology.imn".

[5 marks]

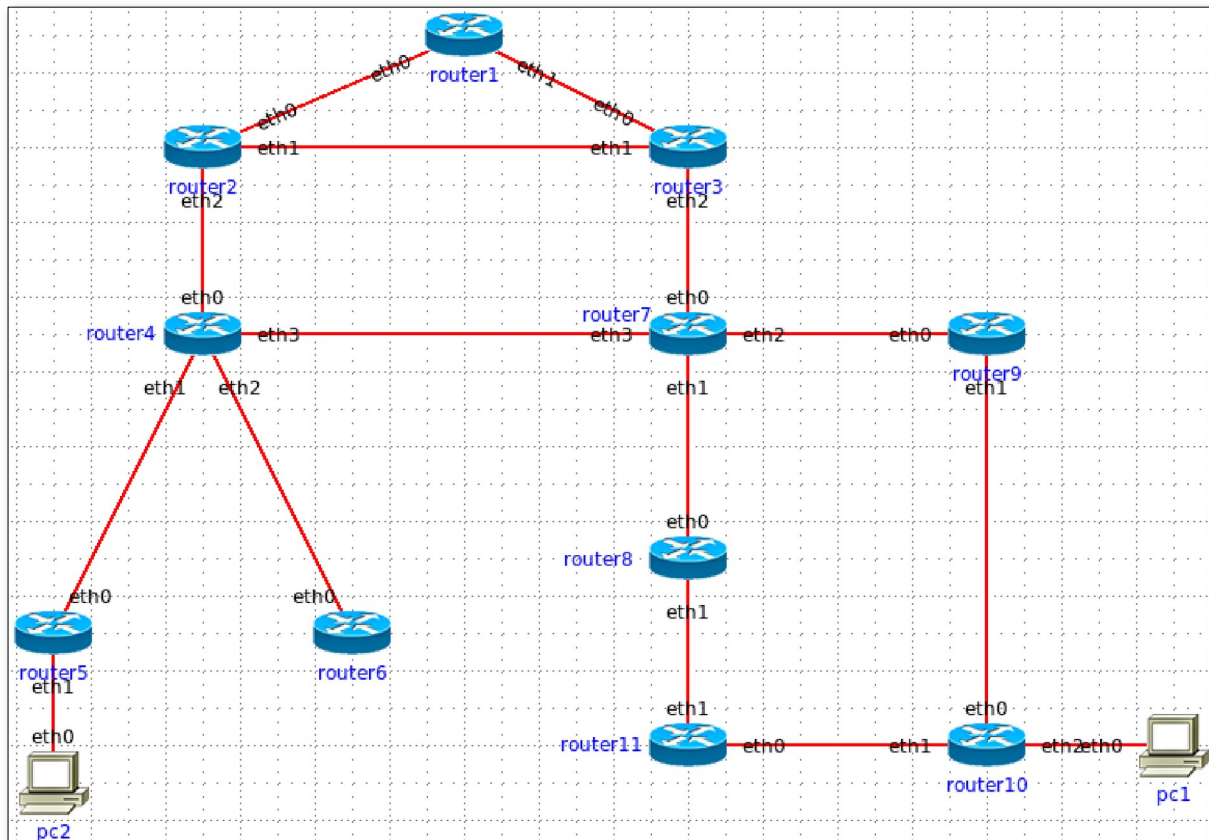


Figure 1: IMUNES topology to reproduce for task 1

Task 2

Execute the experiment and query the OSPF routing table of router9. Then answer the following questions and post screenshots of the results:

- Which command did you use? [4 marks]
- What is the next hop to the eth3 IP of router4? [4 marks]
- What is the cost of the path to the eth3 IP of router4? [4 marks]
- Compare the path installation times for the path to the IP of router5, and the path to the IP of router7. Which path was installed first in the routing table? Explain why. [5 marks]

[17 marks]

Task 3

Measure the IP-level path, effective bandwidth and total latency from pc2 to pc1. Then answer the following questions:

- Which command did you use to measure the IP-level path? Provide a screenshot of the result. [3 marks]
- Which command did you use to measure the bandwidth? Provide a screenshot of the result. [3 marks]
- Write the sequence of routers for the path between pc2 and pc1 [5 marks]
- What is the RTT between pc1 and pc2? [3 marks]

[14 marks]

Task 4

Split the OSPF topology to three different areas as shown in Figure 2. The green area should have area ID 0.0.0.0, the blue area should have ID 1.0.0.0 and the red area should have ID 2.0.0.0. Make sure the router names and interface names are the same as in Figure 2. Submit your IMUNES topology file with name: "task4_topology.imn".

[15 marks]

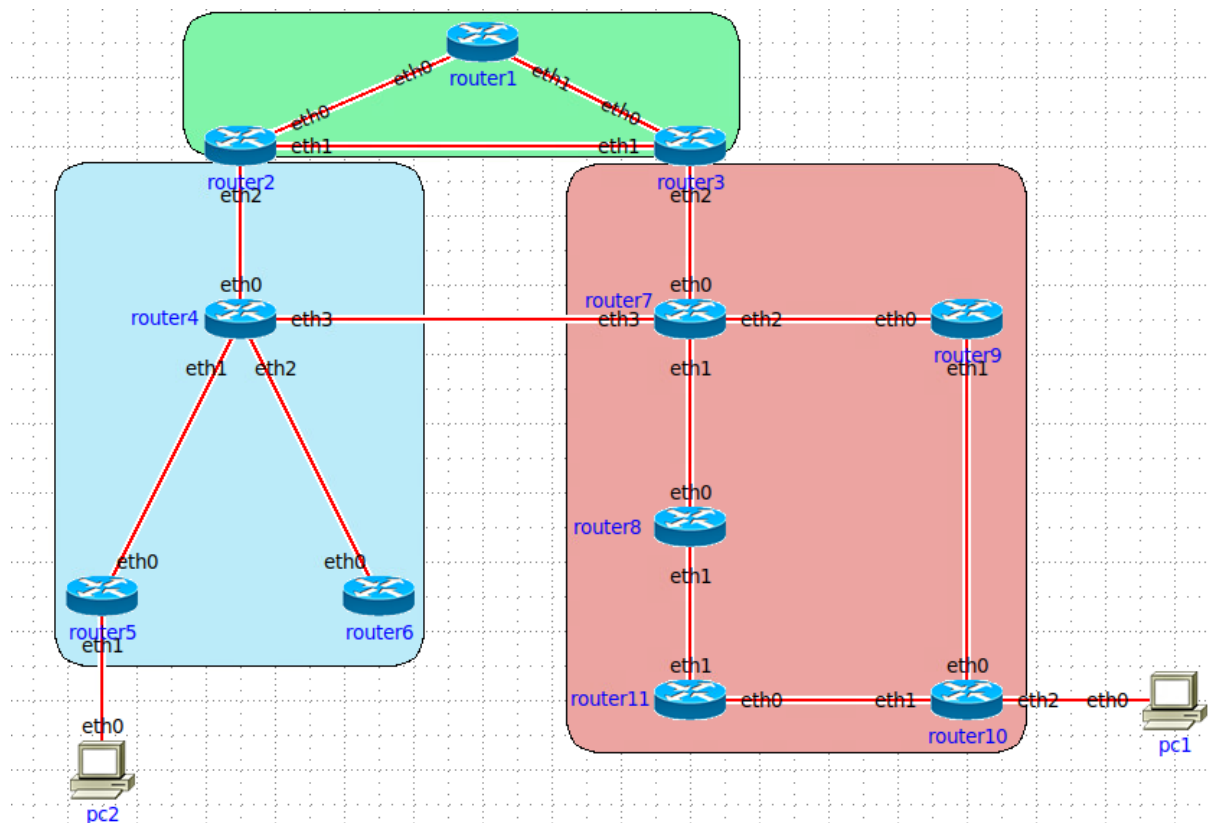


Figure 2: OSPF topology divided in three different areas

Task 5

Answer the following questions about the topology you created in Task 4:

- Which area is the backbone area of the topology? [5 marks]
- Query again the OSPF routing table of router9. Compare the next hop, and path cost with the values you found for Task 2.b and Task 2.c. Did any of the two values change and why? (you can also compare the IP-level paths to back your answer) [5 marks]

- c. Measure the following IP-level paths:
 - i. router4 to router7 (interface eth3)
 - ii. From router7 to router9 (interface eth0)
 - iii. From router4 to router9 (interface eth0)

Is path (iii) the same as the concatenation of path (i) and path (ii)? Explain your answer.

[5 marks]

[15 marks]

Task 6

Answer the following questions. If you have not completed Task 4, you can answer these questions for the topology of Task 1.

- a. Change the configuration of router10 so that it routes its traffic using router11 as its next hop. Save and submit the topology file with name "task6a_topology.imn" [6 marks]
- b. Find the sequence of router hops for the following two paths
 - i. From router10 to router 5
 - ii. From router5 to eth2 interface of router10

Are these two paths symmetric? Specifically, do they traverse the same routers? Explain why. [6 marks]

- c. Undo the configuration change you did for Task 6.a in router10. Can you change the configuration of router8 and router11 so that router10 still uses router11 as its next hop? Submit the topology file with name "task6c_topology.imn" [6 marks]

[18 marks]

Task 7

Consider the included file coursework_task7.imn.

Some configuration errors in this topology prevent router3 from reaching router7. Fix these configuration errors and confirm that the two routers are reachable using the command of your choice. Submit the fixed topology file with name "task7_topology.imn"

[16 marks]