

### Lab Sheet #1

In this lab, you will first setup a small IPv4 network with static forwarding tables. In the second step, you will enable the routing protocol OSPF and see how it reacts to link failures.

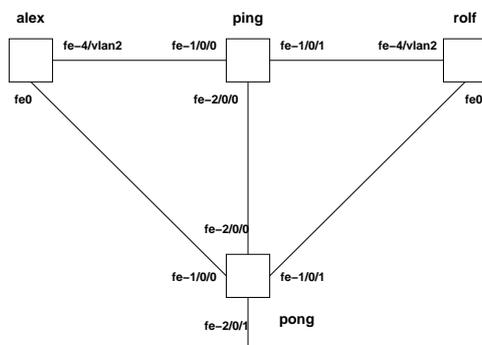


Figure 1: Planned network topology

The network topology is shown in Figure 1. ping and pong are two Juniper J6300 routers and alex and rolf are Cisco C1802 routers.

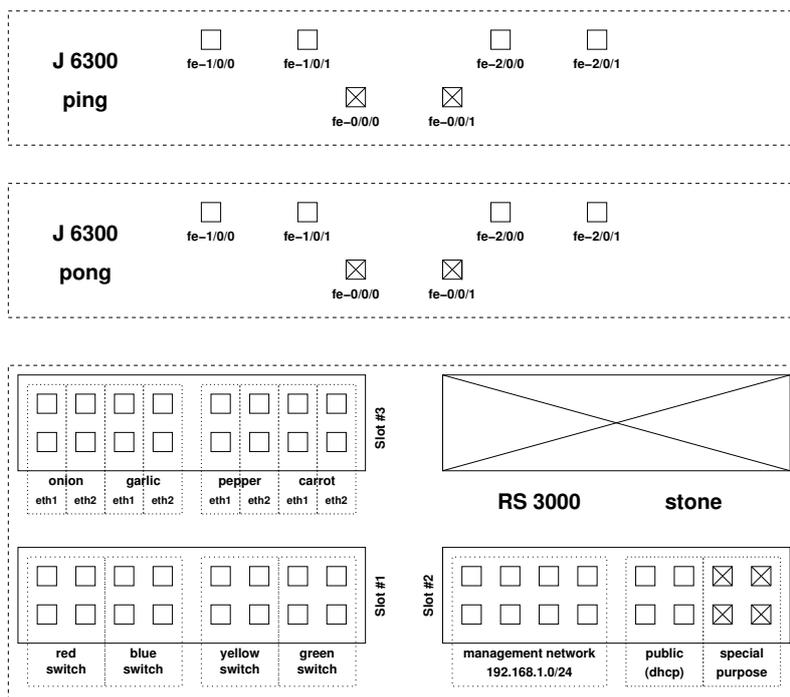


Figure 2: Juniper J6300 router and Riverstone RS 3000 bridge

Figure 2 shows the layout of the ports on the J6300 routers and the configuration of the ports on the Riverstone RS 3000 bridge. The RS 3000 will allow you to connect a laptop onto the network segment (see problem description below). To setup the topology shown in Figure 1, you simply connect cables between the Juniper and Cisco routers. We will guide you through the commands peculiar to each of the devices directly in the lab, however we encourage you to explore commands for address assignments, static route creation, as well as other steps in problems described below. Furthermore, make sure to revise RIP and OSPF protocols, IPv4 addressing schemes, sub-netting, and different IPv4 address notations.

**Problem 1.1: static IPv4 forwarding**

(0 points)

Below is a short description of the steps you should perform in order to setup static IPv4 forwarding:

1. Determine which IPv4 addresses should be assigned to the interfaces and define the forwarding tables that will establish connectivity in the network. You must use addresses from the private 172.16.0.0/16 IPv4 prefix for this experiment.
2. Establish the topology shown in Figure 1 by plugging cables. Do not touch the ports which are marked with a cross in Figure 2.
3. Configure the interfaces on the Juniper and Cisco routers. Install the static forwarding tables in the routers by issuing an appropriate commands.
4. Verify the setup by using tools such as `ping` and `traceroute`. Develop a test plan which ensures complete coverage.
5. As the final step, you should connect the network to the global Internet. The RS 3000 provides an uplink port `et.2.15` which has the IPv4 address 172.16.254.1. The RS 3000 expects that the J6300 interface has the IPv4 address in the 172.16.254.1/24 subnet. (Note that the RS 3000 provides appropriate network address translation services for you to reach out into the global Internet.)

All devices will be accessed via SSH connections. Username and password information will be provided at the lab.

**Problem 1.2: OSPF routing**

(0 points)

Below is a short description of the steps you should perform.

1. Start anew by assigning IPv4 addresses to the router interfaces as in the previous problem. You must use addresses from the private address range 172.16.0.0/16.
2. Configure the network interfaces and mark them as OSPF interfaces. Enable OSPF and check that a suitable loop-free routing topology is being created.
3. Connect your laptops to the topology and use a packet analyzer, such as `wireshark` to capture the OSPF traffic and to analyze it. Feel free to make use of the bridges red, blue, yellow, and green on Riverstone RS 3000.
4. Remove one of the cables (which is equivalent to bringing down a link) and see how OSPF reacts to it. How does the new established routing topology look like?
5. How much time does OSPF need to establish a new loop-free routing topology? What are the parameters carried in OSPF `hello`, `LSU` and `LSA` packets?
6. Name 3 types of OSPF `Link State Advertisements` and the routers of their origin. Which parameters can be tweaked to influence the topology being established by OSPF?

Please do not forget to bring your notebooks with `wireshark` installed!

The lab takes place in RI, Room 51. Located next to the entrance of CS Lecture Hall.