Advanced Networking 2018

Lab #3: Build a net

Total points: 75 pts

Author: Paola Grosso, Ralph Koning, Niels Sijm, Marijke Kaat and Arno Bakker
Email: p.grosso@uva.nl, r.koning@uva.nl, niels.sijm@os3.nl, kaat@surfnet.nl, arno.bakker@os3.nl
University of Amsterdam

Abstract

Create the 'coolest' network you can, with what you have. At the end you will have built your network and you will present its architecture and prepare a short demo which shows its features.

Team and group building

Form two teams of 11 people: team Chico and team Zaza. Each team is assigned one Juniper T1600: team Chico gets Chico, team Zaza gets Zaza.

Further divide the teams in four groups:

- Chico-1..4 = Lab 3 groups 1..4 on Blackboard

- Zaza-1..4 = Lab 3 groups 5..8 on Blackboard

Each group is assigned:

- one Nortel 5530

- two Cisco 3750 with IPSERVICES firmware

- a box containing:

    - 3 x SC-LC single mode fibers (short)
    - 2 x SC-SC single mode fibers (long)
    - 2 x SFP 1 Gbps 1310 nm (LR,blue handle) fiber module
    - 1 x LC-LC single mode (short)
    - 1 x LC-LC single mode (long)
    - 4 x SFP 1 Gbps 850 nm (SR,black handle) fiber modules
    - 2 x LC-LC multi mode fiber (orange,aqua)

- If your are in group Router-X, use the equipment labeled Router-X.

- One of the Ciscos for each group also has a 1 Gbps 1310 nm (LR,blue handle) module installed. Please do not remove this and be careful inserting and removing fiber.

- In addition there is an Arista 7124S(X) on each side of the aisle, that the groups on that side can use collectively. There are 4 x 10 Gbps fiber modules preinstalled, and some extra LC-LC fibers available.

- In addition, there is a box of Cisco stacking cables in the server room that you can use.

- Do not wind up the fibers in any tighter loop than they are in the packaging. This will destroy, in particular, the single-mode fibers. Please keep all the packaging and protection for the fibers in the box, such that they can be put back later.

- Each group should use the same hardware. So no extra hardware is allowed, unless you bring enough for everybody.

Documentation

The documentation for the switches can be found at:

- Nortel 5530: http://software.os3.nl/AdvancedNetworking/Nortel/v5

- Juniper T1600: https://www.juniper.net/techpubs/en_US/junos10.4/information-products/pathway-pages/product/10.4/

- Local info on T1600: http://software.os3.nl/AdvancedNetworking/Juniper

- Cisco 3750: http://software.os3.nl/AdvancedNetworking/Cisco/3750*

- Arista 7124S: http://software.os3.nl/AdvancedNetworking/Arista

Note: the serial console of the Nortel requires a NULL modem cable or converter, and you need to press Ctrl-Y to get access to the menu/CLI. There are four small orange NULL modem converters in the server room. Share them and set up console access via ssh/telnet as soon as possible, such that you can all work in parallel. As before, there are serial console servers on each side that can be accessed via 10.0.1.3 (Zaza) and 10.0.1.4 (Chico), respectively, on the management network (see below).

Username is: dialout
Password: os3xsjun

The Nortels will DHCP for an IP address. If needed, the MAC addresses of the switches can be found in http://software.os3.nl/AdvancedNetworking/Nortel/dhcpd.conf. You can use the grey and white cables that run from your desktop to the patch panel in the server room to attach e.g. your laptop and work from your desk.

Task 0: Logically divide the Juniper

In this task you work with the whole team.

There is a management network with switches labeled Mgmt for both teams. You can hook your systems up to these Mgmt switches such that all groups in the team can access their logical slice of Juniper in parallel.

The two routers are telnet accessible via the Mgmt switches at their management addresses:

- Chico: 10.0.1.22 or fd42::1234::678::1/48

- Zaza: 10.0.1.42 fd42::1234::567::1/48

- (Reserved: 10.0.1.1-10.0.1.63)

Username is: sne
Password: os3xsjun

You need to logical partition the Juniper T1600 such that each one of the groups gets assigned a logical router with 3 x 10 Gbps XENPAK interfaces, and 2 x 1 Gbps SFP interfaces (right-bottom corner).

See: http://www.juniper.net/techpubs/en_US/junos11.4/information-products/topic-collections/security/software-all/logical-systems-config/index.html?topic-54092.html

Define on your logical router a user with the name of your group. Once this is done you will always telnet directly into your logical router or alternatively you can use the 'set cli' command from the main account to move into your logical router.

You have 90 minutes to accomplish this, after this time you need to give us the configuration running on the Juniper to show how far you were. If you don't manage you will get a stub configuration from us.

Task 1: Network architecture (50 points)

Take stock of the routers and switches you have been given and their capabilities. Next, brainstorm. Decide how you are going to connect the routers and switches. Create a topology drawing of your network which clearly indicates the:

- Connections between devices
- Connections to servers

Which services can you provide? Think also how you are going to demonstrate its features:

- In terms of traffic patterns supported
- Resilience to failures (of a switch or of a line card if applicable)

When designing your network think of using LACP, (V)STP, MPLS, vlans, QinQ QoS, VRRP, routing protocols (EGPs and IGPs), etc.

Explain the rationale behind your choices in your report. Implement your design on the hardware.

The lasers in the fiber modules are Class 1 laser products, so should be safe. But better to NOT LOOK INTO THE INTERFACES OR FIBERS! They emit high intensity light outside the humanly visible spectrum!

If you are unsure about connecting a fiber, consult a lab teacher. The fibers do not need to be attenuated (light output reduced).

Task 2: External connections (20 points)

Choose another group to cooperate/peer with. Connect your network to their network and demonstrate connectivity from one side to the other. You will need to show a working peering relation during the presentation/demo in the last lab.

Think ahead about the peering relation, what are you going to advertise and why, what metrics will you use? And what are you going to accept, in short, how would you define your networks routing policy? Also think about security, you are setting up a connection to the "outside world". Is one connection enough or could you distribute traffic in a better way? Explain your decisions in your report.

Task 3: Secure and monitor your network (5 points)

Make sure you take adequate measures to secure your infrastructure, this may include access control, firewalling, strong authentication, logging, etc, etc. Explain which measures you took and how they are implemented. A network is not only built, it has to be maintained as well, which asks for certain choices and measures.

Submission

The submission must contain following:

1. The final devices' configurations (DUMP).

2. Report containing the final version of the topology (drawing) where you explain the role of each device and the functions it fulfills, with references to the configuration. Include the description of the connectivity to the peer group. (PDF file)

3. Your grade is based on the report.