# INR Lab Assignment
# BGP

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**Abstract**

Today we will be setting up BGP. As usual we will first start with the basics and later on will dive into more advanced configuration.

## Preparation

First you will work on connecting the LXC routers, which run inside your Xen DomU, to the OS3 Internet Exchange (IX) via a physical cable and a virtual ethernet.

**Task 1.**
- Physically connect the second interface of your Dom0/server to the switch marked "Mgmt" / "OS3 IX" at the top of each rack.
- The virtual ethernet consists of several parts, one on Dom0 (your server), one on DomU and one in **router2**, see Figure 2. The first part is a bridge that connects the second physical interface of your Dom0/server to an interface of the Xen DomU. To configure this part, you should create a bridge named `xenbr1` and attach the second interface (`eno2`) of your server to it, such that all traffic on that interface is delivered to the bridge.
- Next, you should connect this bridge `xenbr1` to a second interface on the Xen DomU/guest, using the following procedure. You can add a second interface called `eth1` to your Xen DomU by editing its `/etc/xen/<DomU-hostname>.cfg`. Xen can also directly attach this interface to the `xenbr1` bridge. To do all this, extend the "vif =" line in your `/etc/xen/<DomU-hostname>.cfg`, as follows. The MAC address is literally `00:16:3e:dd:ee:ff`, do not replace the d, e or f's. Because of the bridging, this particular MAC address does not matter.

  ```
  vif = [ 'mac=00:16:3E:42:DD:A0,bridge=xenbr0' ]
  ```

  becomes

  ```
  vif = [ 'mac=00:16:3E:42:DD:A0,bridge=xenbr0', 'mac=00:16:3e:dd:ee:ff,bridge=xenbr1' ]
  ```

**Task 2.** Get the latest version of the *pogo* script from gitlab. In the `configurations` directory you will find a blank configuration for your BGP network (Figure 3). Adjust it to match your own IP addressing scheme given in Figure 4). Create the network with *pogo*.

**Task 3.** Connect the `eth1` of the DomU VM to the correct openvSwitch instance using `ovs-vsctl add-port ogo-ovs{X} eth1`, where X is the number of the hub for the 172.16.0.0/24 peering network connected to **router2** in the `bgp.cfg` file (9 by default).

**Task 4.** Once that is done, you can log into **router2**. You should now have an `eth0` interface that connects to the OS3 IX.

Make sure that all your bridges and interfaces are up. Check if you can ping a machine in the OS3 IX LAN: `ping 172.16.0.42`

The virtual network you have built up now is shown in Figure 2. Note that the network through `xenbr0` is *routed*, whereas the network through `xenbr1` is completely on layer 2, until **router2**.

## Peering and Transit

**Task 5.** Set up BGP on **router2** using your assigned AS number. This will be your border router.

**Task 6.** Use your border router to peer with two of your colleagues. Test if the connectivity between the networks is as you expected, and document your findings. What does the network in your group look like, and what are the relations? Hint: Use "`neighbor a.b.c.d next-hop-self`" or BGP may take a short-cut over the shared LAN later.

**Task 7.** Configure your border router such that even though you have a direct peering relation with one of your colleagues, all the outbound traffic goes via your other colleague. Do the same for inbound traffic. Are you in full control of the routing? Explain.

**Task 8.** Document the current BGP routing table. Now choose a colleague from another group and setup peering with him. Write the peering setup on the board so that the rest of the class knows who is peering with whom. Describe the peering relations after you've added the new peer.

What new routes did you get? How did the AS Path lengths change?

**Task 9.** Setup peering with 172.16.0.42/AS64642. This BGP peer has been allocated the IP block 10.42.0.0/16 but it also advertises other ranges. Configure your BGP router such that it accepts only valid routes from this peer.

**Task 10.** Explain what the purpose of AS112 is.

**Task 11.** Perform a traceroute to 145.100.101.1 using the "Traceroute IPv4" tool on `https://www.transip.nl/netwerk/` and note the ASs that are traversed. Now trace 145.100.104.1. Why does this trace take a different route, although both addresses are part of OS3's 145.100.96.0/20 range?

| Name | OS3-IX IP | AS | IPv4 Block |
|---|---|---|---|
| Kotaiba Alachkar | 172.16.0.11 | 64611 | 10.11.0.0/16 |
| Peter Bennink | 172.16.0.12 | 64612 | 10.12.0.0/16 |
| Kevin Csuka | 172.16.0.13 | 64613 | 10.13.0.0/16 |
| Tim Dijkhuizen | 172.16.0.14 | 64614 | 10.14.0.0/16 |
| Henk van Doorn | 172.16.0.15 | 64615 | 10.15.0.0/16 |
| Dirk Gaastra | 172.16.0.16 | 64616 | 10.16.0.0/16 |
| Lennart van Gijtenbeek | 172.16.0.17 | 64617 | 10.17.0.0/16 |
| Luc Gommans | 172.16.0.18 | 64618 | 10.18.0.0/16 |
| Rick van Gorp | 172.16.0.19 | 64619 | 10.19.0.0/16 |
| Sjors Haanen | 172.16.0.20 | 64620 | 10.20.0.0/16 |
| Bernardus Jansen | 172.16.0.21 | 64621 | 10.21.0.0/16 |
| Rik Janssen | 172.16.0.22 | 64622 | 10.22.0.0/16 |
| Isaac Klop | 172.16.0.23 | 64623 | 10.23.0.0/16 |
| Chris Kuipers | 172.16.0.24 | 64624 | 10.24.0.0/16 |
| Joost van Oorschot | 172.16.0.25 | 64625 | 10.25.0.0/16 |
| Peter Prjevara | 172.16.0.26 | 64626 | 10.26.0.0/16 |
| Adrien Raulot | 172.16.0.27 | 64627 | 10.27.0.0/16 |
| Swann Scholtes | 172.16.0.28 | 64628 | 10.28.0.0/16 |
| Henri Trenquier | 172.16.0.29 | 64629 | 10.29.0.0/16 |
| Shahrukh Zaidi | 172.16.0.30 | 64630 | 10.30.0.0/16 |
| Tim van Zalingen | 172.16.0.31 | 64631 | 10.31.0.0/16 |
| Alexander Blaauwgeers | 172.16.0.32 | 64632 | 10.32.0.0/16 |
| Vincent van Dongen | 172.16.0.33 | 64633 | 10.33.0.0/16 |
| Ivo van der Elzen | 172.16.0.34 | 64634 | 10.34.0.0/16 |
| Bart Hermans | 172.16.0.35 | 64635 | 10.35.0.0/16 |
| Jeroen van Heugten | 172.16.0.36 | 64636 | 10.36.0.0/16 |
| Fouad Makioui | 172.16.0.37 | 64637 | 10.37.0.0/16 |
| Andrey Afanas'yev | 172.16.0.38 | 64638 | 10.38.0.0/16 |
| Joao De Novais Marques | 172.16.0.39 | 64639 | 10.39.0.0/16 |
| Marcel den Reijer | 172.16.0.40 | 64640 | 10.40.0.0/16 |

Figure 1: AS and `10.ZZ.0.0` IP addresses per student

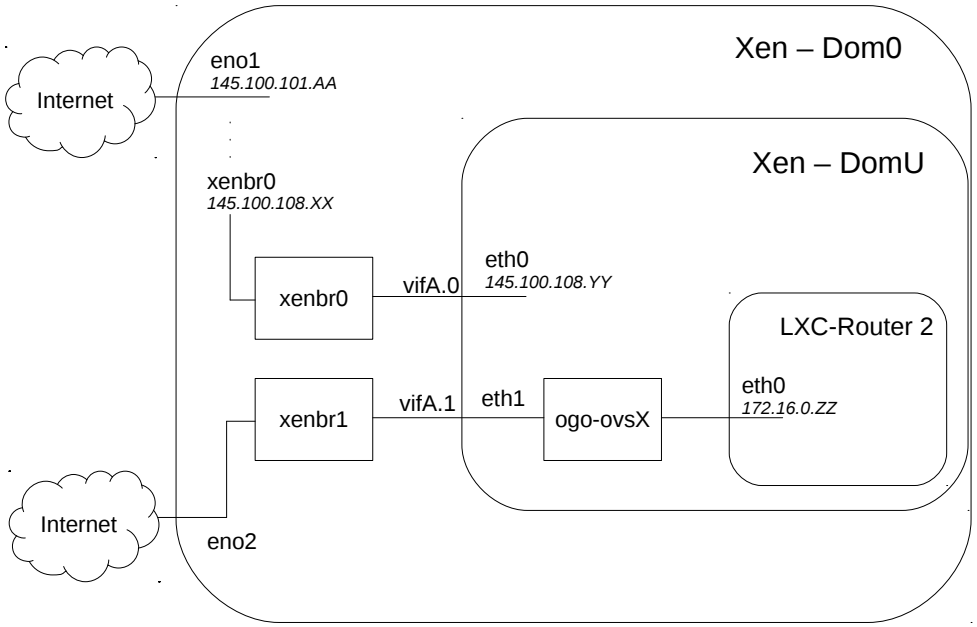


Figure 2: Overview of the virtual network

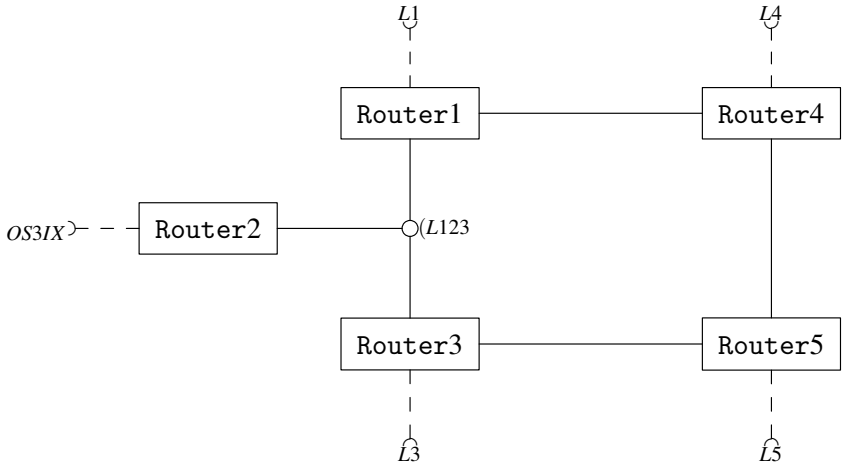


Figure 3: BGP Network

For L1 : `10.ZZ.1.0/24`
For L2 : `10.ZZ.2.0/24`
For L3 : `10.ZZ.3.0/24`
For L4 : `10.ZZ.4.0/24`
For L5 : `10.ZZ.5.0/24`
For L14 : `10.ZZ.14.0/24`
For L35 : `10.ZZ.35.0/24`
For L45 : `10.ZZ.45.0/24`
For L123 : `10.ZZ.123.0/24`

Figure 4: IP addressing scheme