Management VM Looking Glass

Each Internet has a management VM with a link to the HOUS router of every AS in the Internet. The password for the management VM will be posted on Piazza.

You can access the management VM with SSH:

> ssh -p 3099 byoi-lg@<internet-ip>

Inside the management VM, there are virtual interfaces that connects to other VMs. These interfaces are named asX, with X the AS number they are connected to. For example, the virtual interface connected to the AS 11 is named as11. You can see all interfaces using **ip link**.

With this management VM, you are able to launch pings and traceroutes from any AS to any other AS using **nping**. Nping is a very powerful networking tool as it gives you the ability to craft almost any field in packet headers. In your case, when you will launch a ping or a traceroute, you will have to specify the source IP address, the destination IP address, the destination MAC address, the interface to use in the management VM, as well as a few additional parameters to customize your measurements. We strongly recommend you to look at the nping manual page to understand all the possible options.

Note: You will **not** switch to the root user on the management VM via **sudo su -**. Instead, you will use **sudo** to run the arping and nping binaries as shown in the example below.

Example: Pinging a NEWY-host in AS20 from AS10's HOUS router

For example, if you want to launch a ping, from AS10, towards the host connected to NEWY in AS20 (IP 20.101.0.1), you do the following two steps. In the example code, we are putting **<...>** around the parameters that you will need to modify for the specific measurements you want to make, but when calling the commands you will NOT include "<" or ">".

1. Determine the MAC address of the mgt interface on the HOUS in AS10 with arping.

Recall that in Stage C each AS should have configured the mgt interface at HOUS to have address X.0.199.1/24, where X is the AS number. We can use arping to send an ARP request for this address to determine the interface's MAC address.

> sudo arping <10.0.199.1>
ARPING 10.0.199.1
42 bytes from 92:6a:a5:fa:2e:98 (1.0.199.1): index=0 time=14.630 msec

From the above, we know that the interface's MAC address is **92:6a:a5:fa:2e:98**, as that MAC address is responding to ARP requests for 10.0.199.1

2. Send a ping packet via HOUS's mgt interface with nping, specifying the destination MAC (of the first hop, into the AS you want to measure from), source and destination IP address, and the interface to send the packet via.

Please always use X.0.199.2 (IP of interface asX) as the source IP, with X the AS number you wish to issue pings/traceroutes from.

> sudo nping --dest-mac <92:6a:a5:fa:2e:98> --interface <as10> --source-ip <10.0.199.2> --dest-ip <20.101.0.1> -v0

The above will create an IP packet with source IP 10.0.199.2 and destination IP 20.101.0.1, and then put it in an Ethernet frame with destination MAC address 92:6a:a5:fa:2e:98. Finally, it will send the Ethernet frame on interface as10.

To launch traceroutes, just add the parameter --traceroute (or --tr). For example, the following command launches a traceroute from AS10 towards the host connected to SALT in AS20.

> sudo nping --dest-mac <92:6a:a5:fa:2e:98> -- interface <as10> --source-ip <10.0.199.2> --dest-ip <20.107.0.1> -v0 --tr

If you want, you can also set the initial TTL value by yourself with the option **--ttl**.