

IMT Atlantique

Département Informatique
Technopôle de Brest-Iroise - CS 83818
29238 Brest Cedex 3
URL: www.imt-atlantique.fr



Cybersécurité des systèmes maritimes et portuaires
Networking Introduction
Fall 2021

Introduction to Mininet

Edited: September 3, 2021
Version: non versionné

Report filled-in by:



IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

1. Objective

- Get familiar with the network emulator Mininet [1]

2. Pre-Lab

Before coming to the lab:

- make sure you have read the Mininet Section of this lab.
- done and understood Mininet walkthrough <http://mininet.org/walkthrough/>
- study the linux commands `ip` (`ip address`, `ip route`), `ifconfig`, `ping`, `route`. You can refer to their man pages by typing on a console `man <command>`.

3. Mininet

During some labs of the course we are going to work with a network emulator called Mininet [1].

Mininet provides a high-level python API that allows to easily create emulated networks (host, routers, switches, and their connections through links). It also provides some built-in topologies. During this lab we are going to emulate a given topology by executing a python script.

Underneath the high-level APIs we are going to use to create emulated networks, mininet uses Linux process-based virtualisation and network namespaces to create network-isolated nodes. Each of the nodes of the emulated network will look to us as a Linux system, where we can perform routing, switching (through virtual switches) and so on. All this will be transparent to you during the courses labs, but if you are curious, and we encourage you to be so, find out more about mininet through [1] or surfing the Internet.

Mininet is already installed in the VM of the course. In order to get a mininet console we can run the command `mn` or execute a python script that does this for us. In any case, in order to use mininet we need superuser privileges (run commands with `sudo`). From a mininet console, we can access and control any of the nodes of the emulated network.

4. Hands on

We are going to work here with the network shown in Fig. 1, used in the ARP Lab.

Question 1.

Explain with words the different components of the network in Fig 1.

4.1. Getting Familiar with Mininet

For the moment, you will get familiar on how to interact with a traditional network emulated in mininet [1]. You will work on a new approach to control a network in the SDN Lab.

- 1) Run the course VM
- 2) **Using a terminal** inside the VM, check the presence of the `net_labs` directory, if it is present, update your copy of the repository:

```
cd net_labs
git pull origin master
```

If it is not present, clone the repository and move to the `net_labs` directory

```
git clone https://redmine.telecom-bretagne.eu/git/net_labs
cd net_labs
```

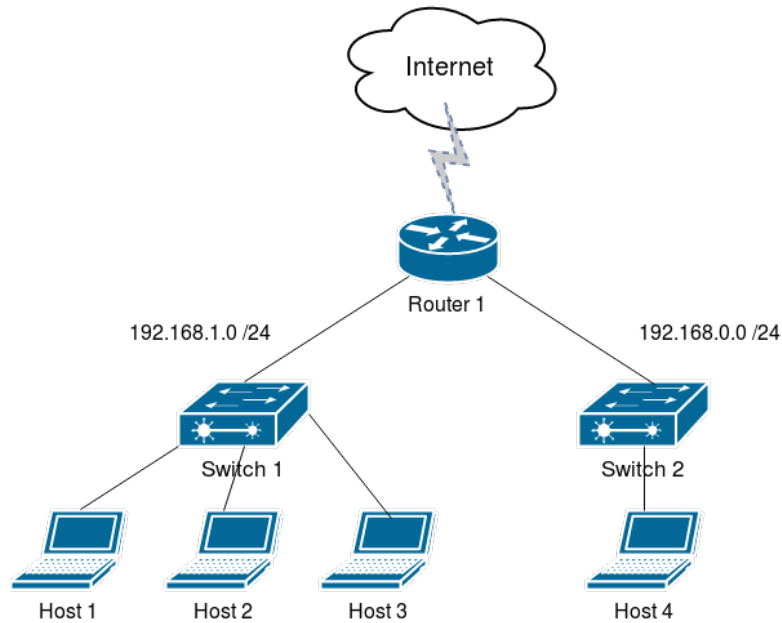


Figure 1: Topology 1

- 3) Go to the arp directory, for that type: `cd arp`
- 4) Verify the existence of the files called `topo_arp.py`, `createOVSSwitchStandAlone.sh` and `killOVSSwitch.sh` (you can use the command `ls`)
- 5) Verify that you have execution permissions for the `.sh` files, these scripts are going to be called by the python script. For that type `ls -lh` and verify the presence of an `x` at the first column of the output.
- 6) Execute the python script to emulate the network `sudo python topo_arp.py`. This will build up the topology and open a mininet console (`mininet>`)
- 7) Try the following mininet commands, and figure out what each of those commands do.

```
mininet> help
mininet> nodes
mininet> net
mininet> dump
```

Mininet also allows to run any unix command in any of the components of the network, by first indicating the name of the component as known to mininet.

- 8) Try the following unix commands typed from mininet console, and figure out what each of those commands do.

```
mininet> h1 ip address
mininet> h1 ip route
mininet> h2 ip a
mininet> h2 route -n
mininet> h2 ls
mininet> r1 ifconfig
```

REFERENCES

```
mininet> h1 ping h2
mininet> h4 ping r1
```

Note that you can stop a ping with keys `ctr+c`.

Mininet also allows to open a terminal at any of the network equipments.

- 9) Try, for instance, the following

```
mininet> xterm h1
mininet> xterm r1
```

Note that this command opens a root terminal in the equipment.

- 10) Now, to exit from the mininet console type `exit`. You will also need to close each opened `xterm`.

At any moment, you can clean up the emulation and start all over again, if you are experimenting any problem with mininet, typing on a **terminal of the VM** `sudo mn -c`.

- 11) In order to start the next lab of the course from a clean state, run

```
sudo mn -c
```

References

- [1] Mininet, An Instant Virtual Network on your Laptop (or other PC) [online] <https://mininet.org>