Exercise 5 – Mininet Setup

In this exercise you will setup the Mininet environment for future exercises. For that, please follow the instructions below.

1. Downloading and Installing Files (0P)

First, you need to download the software required for the setup of our experimentation environment. This software bundle comprises the following components:

a. A Mininet virtual machine image
b. Virtualization software
c. X Server (on some OSes)
d. A terminal client (on some OSes)

To check which software you need, please refer to the table below. Install the software you have downloaded.

OS Type	Virtual Machine Image
Ancient hardware and Windows	Image
Modern hardware and other OSes	Image

OS Type	OS Version	Virtualization Software	X server	Terminal
Windows	7+	VirtualBox	Xming	Putty
	XP			
Mac	OS X 10.7-10.9		XQuartz	Built-in
	OS X 10.5-10.6		X11 or XQuartz	
Linux	Ubuntu 10.04+		Built-in	

2. Configuration (0P)

a. Start VirtualBox and import the .ovf image you have downloaded in task 1. (File -> Import Appliance -> Select .ovf file and press import). After the import is finished, you should see your mininet VM listed in the top left corner.

b. Select the mininet VM and open the settings for the VM (right click -> settings OR hit CTRL+S). Then go to Network->Adapter 2. Select "Enable adapter" and attach the adapter to "host-only network").

c. Start your VM. A new window should appear, in which the VM is now booted. After the boot process has finished, you should be able to login with the combination login=mininet/password=mininet (this user has sudo rights)

d. Now, we have to setup the desktop environment to enable further tools to supervise our mininet environment. For that, we will use X forwarding, for which we need SSH access. In the VM window, try to find the IP of the virtual machine by typing:

```
$ ifconfig -a
```

You should see three interfaces, and the interfaces starting with eth (e.g., eth0 and eth1) should have an IP address assigned. If not, type:

```
$ sudo dhclient <interface_without_IP>
```

Write down the IP address for the host-only network (starts with 192.168….).

e. Try to ping your VM with that IP either via terminal or the Windows CMD tool.

f. **FOR MAC OS and LINUX:** In a terminal, type:

```
$ ssh -X mininet@host-ip-you-just-wrote-down
```

Afterwards, start Xterm:

```
$ xterm
```

If you get the error 'xterm: DISPLAY is not set error', make sure that Xterm is installed correctly.

g. FOR WINDOWS:

You can also install a GUI on the VM itself. This is more convenient but consumes more disk space. In the VM window (not in SSH!), type:

```
$ sudo apt-get update && sudo apt-get install xinit lxde
```

The process will take a while. After completion, you can start the GUI with:

```
$ startx
```

ALTERNATIVELY, start the Xming server you have downloaded in 1) by simply double-clicking on it.

Afterwards, use PuTTY to do a SSH login to your VM. In this case, you need to enable X11 forwarding before connecting. For that, in PuTTY, check:
Connection->SSH->X11->Enable X11 Forwarding

Connect to your VM via SSH. In the SSH terminal (not in the VM itself!) type:

```
$ xterm –sb –sl 500 &
```

A new terminal should appear (in white). This is the window you will actually be working in. The –sb and –sl 500 options will give you a scrollbar and 500 lines of scrollback to properly debug your upcoming code.

3. Setup FlowVisor (0P)

To install FlowVisor, we first have to make sure that your VM has a Java SDK installed.

```
$ sudo apt-get install openjdk-7-jdk
```

Afterwards, get the FlowVisor package from [here](#) and upload it to your VM. Install FlowVisor by executing:

```
$ sudo dpkg -i <path_to_your_flowvisor.deb>
```

Then, generate the basic configuration file for flowvisor:

```
$ sudo -u flowvisor fvconfig generate /etc/flowvisor/config.json
```

Finally, start FlowVisor to test your installation:

```
$ sudo /etc/init.d/flowvisor start
```

4. Show your system to the instructor (0P)

Once you have finished all the steps above, show evidence that your mininet environment is operating to a course instructor.