Mininet Installation Instructions

Learning Objective:

- Learn how to use Mininet on CSE Lab machines
- Learn the basic commands and facilities of Mininet

> **Notation**: In the examples below, we have used the $ sign to represent the prompt from the command interpreter (shell). The actual prompt may look quite different on your computer (e.g. it may contain the computer's hostname, or your username, or the current directory name). You should only type the name of the command and then press return. In the example interactions, all of the things that the computer displays are in `this font`. The commands

Mininet VM

Mininet is a network emulator which runs a collection of end-hosts, switches, routers, and links on a single Linux kernel. It uses lightweight virtualization to make a single system look like a complete network, running the same kernel, system, and user code. The easiest way to get started is to use a pre-packaged Mininet/Ubuntu virtual machine (VM). This VM consists of Mininet itself, all OpenFlow[1] binaries and tools pre-installed, and tweaks to the kernel configuration to support larger Mininet networks.

> Note: You can also install Mininet through source codes and packages. Find the details in
> http://mininet.org/download/.

For your convenience, we already installed a recent Mininet VM image, Mininet 2.2.1, on CSE lab machines. These instructions describe how to use the VM on the CSE lab machines. If you want to install the Mininet VM on your personal computer you can follow the instructions at http://mininet.org/vm-setup-notes/.

Setting up your VM

You should first log in to a CSE lab machine and obtain a terminal console. Now run the following command on the terminal.

```
$ vm mininet
```

This launches a Mininet VM for you. Once the VM is up, you can see a login prompt as shown in the figure on the next page

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[1] OpenFlow is communication protocol between switches and controllers. We do not need to know the details of the OpenFlow protocol in this course.
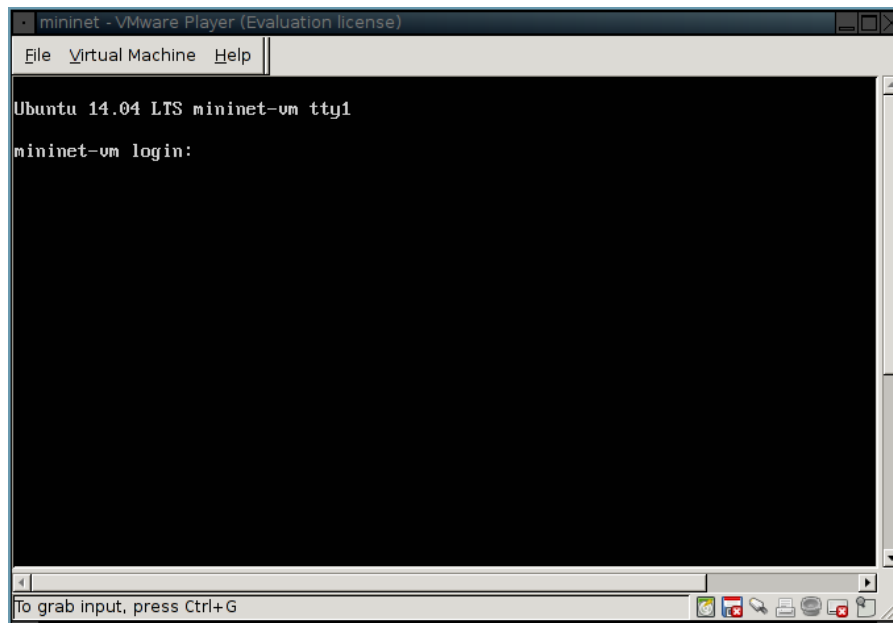
Log in to VM

Once the Mininet VM is up, you can log in to the VM, using the following username and password:

```
mininet-vm login: mininet
Password: mininet
```

The *root* account is not enabled for login; you can use *sudo* to run a command with superuser privileges (just as in a Unix-based machine).

Note that once the VM starts, it controls the input devices including mouse and keyboard. If you want to release the input from the VM, press Shift+Ctrl+Alt. If you want to return back to the VM, click on its window.
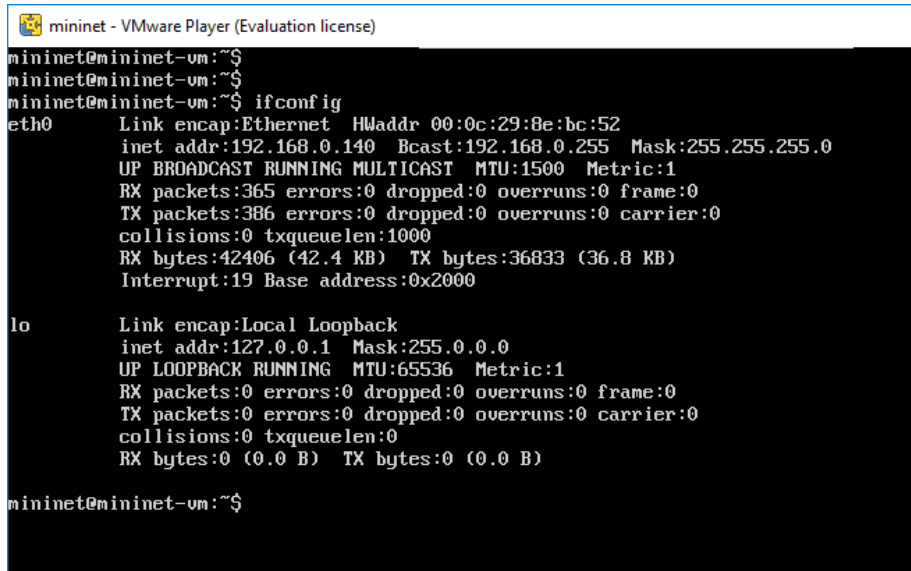
> **For security reasons, it is highly recommended that you change the password of the *mininet* user after launching the Mininet VM. To this end use the *passwd* command at the Mininet prompt and select a new password. Please change the password each time you login to the Mininet VM.**

SSH into VM

The mininet VM boots into a text console of a fixed resolution. You may find it useful to be have a console with a larger resolution which is also capable of running applications with a GUI (e.g., gedit). For this we recommend that you start up a new terminal and SSH into the VM. The lab machines have a host entry for the IP address of the Mininet VM. Thus, the simplest way to SSH into the VM is to use the following command:

```
$ ssh –Y mininet@mininet
```

You can also try to find the VM's IP address, which for VMware is probably in the range 192.168.x.y. To this end, in the VM console, run the command **ifconfig**. The following figure shows a sample output of the command where the VM's IP address is *192.168.0.140*.

Mount your CSE home directory (VERY IMPORTANT)

> It is worth noting that the disk storage in the Mininet VM is not persistent. Thus, all the new files that you create will disappear after you logout.

Since the disk on Mininet VM is not persistent, you will need to store your experiments including your source code and results on a persistent disk, e.g. your CSE home directory. One way to do this is to copy all of your files into your CSE home directory using SCP. Another solution (which we recommended) is to mount your CSE home directory into the Mininet VM. For this, run the following command, where **Account** must be replaced with your CSE account name.

```
$  sshfs Account@cse.unsw.edu.au:/home/Account/  /home/mininet/cse
```

Note that the above command will ask you for the password of your CSE account. This command will mount your CSE home directory at */home/mininet/cse* in the VM. After that, you have access to your CSE home directory (which is a persistent disk) in the Mininet VM. You should store all your files in the above directory.

IMPORTANT: You will have to mount your CSE home directory in the VM each time you login to the Mininet VM. Please remember to do so else all your work will be lost.

Mininet Walkthrough

You are now ready to do the first lab on your Mininet VM: *Introduction to Mininet*. It is also highly recommend that you read through the Mininet Walkthrough at the following link: http://mininet.org/walkthrough/ and follow the tutorials.

Useful Resources

Useful introduction to Mininet (Recommended Reading)

1. https://github.com/mininet/mininet/wiki/Introduction-to-Mininet
2. https://github.com/mininet/mininet/wiki/FAQ

Useful Background for Using Mininet

You will need some basic knowledge of Python programming for using Mininet. The following links are excellent resources for picking up the basics:

1. Python documentation is a good place to start: http://docs.python.org/tutorial/index.html
2. Beginner's guide: http://www.python.org/about/gettingstarted
3. Importing Python modules: http://docs.python.org/tutorial/modules.html
4. Invoking system utilities from Python: http://docs.python.org/library/subprocess.html
5. Parsing output files in your own format: http://docs.python.org/library/re.html
6. Passing command line arguments to your script:
   http://docs.python.org/dev/library/argparse.html