

Lab Meeting 2 — Using Mininet

Due: November 5, 2015

Your second programming assignment will be to implement the forwarding functionality of an IP router. The goal of this exercise is to create virtual machine configurations in which you can complete this project and to familiarize you with the basics of the environment these VMs will provide.

The software we will use to complete this project, was implemented at Stanford University. They distribute both the software and sample exercises though the website <http://mininet.org>. You will be completing their “Simple Router” exercise. I would emphasize, however, that “Simple Forwarder” might be a better title. The code you write will not implement OSPF, RIP, BGP, or any other routing algorithm. It will assume that the forwarding table such a routing algorithm would normally generate is already available and use it to perform packet forwarding in an emulated virtual network. To do this, you will have to implement IP packet forwarding including the basics of the ARP protocol.

The example network provided in the online handout from Stanford is a bit boring. It only has one router acting as a hub connecting several machines. The router can deliver any packet it receives by using ARP to get the destination’s address and then sending the packet directly to the recipient. It never has to forward the packet to another router. I hope to fix this soon! That is, I plan to modify the configuration of the virtual network to include some paths that traverse multiple routers. So, as you complete your code do not rely on the simple structure of the network described in the online writeup.

I assume you are eager to see this online handout, so let’s configure some virtual machines so you can. Each group of you that plan to work together should configure just one VM for the group. I have asked Mary Bailey to create group ids for us so that we can set access permissions in a way that will let you share the VM files.

One issue that complicates this project is that the VM files are a bit huge. Mary does not want the to end up in your account directories. Instead, the should end up in the /big-scratch partition on our server. As long as you follow the instructions below carefully, that is where they should end up.

1. Start your engines! (i.e., log in to one of the machines in the Unix lab).
2. In a terminal window, launch the virtualbox application:


```
virtualbox &
```
3. Put your account’s virtualbox VM directory on /big-scratch:
 - (a) Select “Preferences” from the virtualbox File menu.
 - (b) Click the mouse on the icon to the right of the field holding the name of your “Default Machine Folder” and select “Other”.
 - (c) Navigate to “/big-scratch/temp”.
 - Click on “File System” under the heading “Places”.
 - Click on /big-scratch and then on temp.
 - (d) Create a new folder with a name that identifies you or your group.
 - (e) Click OK.
4. Add a host-only network adapter to your virtualbox configuration.
 - (a) Select Preferences from the File menu.
 - (b) Click on Network.

- (c) Click on Host only Network.
 - (d) Click on the green + icon.
 - (e) Click OK.
5. Import a virtual machine configuration for Ubuntu with Mininet installed.
- (a) Select “Import appliance” from the virtualbox File menu.
 - (b) Choose the file UbuntuFor336Mininet.ova found in /big-scratch/temp/tom.
 - Click the little folder icon to the right of the field for the name of the file to import.
 - Click on “File System” under the heading “Places”.
 - Click on /big-scratch, then on temp, then on tom, and finally on UbuntuFor336Mininet.ova.
 - (c) Press Next.
 - (d) Press Import.
 - (e) Wait a long time.
6. Start your virtual engines...
- (a) Press start.
 - (b) Read about full screen mode so you know how to escape from it. Then, forget what you just learned because it turns out a menu that lets you escape will pop up if you just move the mouse to the bottom of the screen.
 - (c) Dismiss all the annoying messages at the top of your screen. Please don't read them.
7. Log in.
- (a) Your account name is mininet and the password is mininet.
 - (b) Change your account password using the system setting application.
8. Read about the assignment
- (a) Launch Firefox. The assignment web page should appear as your default home page within this virtual machine.
 - (b) DO NOT do any of the steps in the handout related to “Setting up the environment.” I have been very, very busy recently figuring out how to actually set up an environment that works, so you don't have to perform these steps. Instead...
 - (c) Read up to “Get Started” and then skip to “Start Mininet emulation by using the following command.”
 - (d) After you perform their “wget” experiment and before you stop the sr_solution code, type

```
server1 wireshark &
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You are now running wireshark on one of the simulated machines that belongs to the virtual network Mininet has created. You can configure wireshark to capture HTTP packets and then do the wget again. You should see the packets used to transfer the index.html page. This ability will be very useful when you are trying to figure out why your router is not delivering packets correctly.
9. Read more about the assignment. (Possibly on your own time.)