IT341 Introduction to System Administration
Project II – Setting up our LAN

Before we start, please make sure that you have a **<u>snapshot</u>** of your finished VM/base installation from Project 1, so that you can easily restore it – if you should somehow break your system during this project's process.

In the following we set up our local area network. This involves configuring the server, it20 (**<u>which I do</u>**) and the clients[1], *itvm21-yz*, *itvm22-yz*, … *itvm28-yz* (**<u>which you do</u>**). It is important that you understand the differences between the two sections in this and the following project documents.

<mark>You **DO NOT** do the sections labeled **On the Server**. I do those. You just need to understand them and *write about them in your lab report for Project 2*. This will apply for</mark> **all** <mark>projects that have an "**<u>On the Server</u>**" section.</mark>

Our server (*it20*) has two NICs (network interface cards) named *eth0* and *eth1*. *eth1* is attached to the *cs.umb.edu* network (outside). Each of our clients can be attached (through a switch) to the server's *eth0*. The *eth0* NIC on the server is connected to the <u>right-hand side</u> (RHS) network drop through a switch. At this time, you should move your network connection to the <u>RHS RJ45</u> network drop so you are connected to the server and the *it.cs.umb.edu* domain (inside) – if your cable is not already there. For all future projects, you will need to be connected to the RHS.

In both the server and the clients, we must configure our interface, which configures the NIC and the hosts file, which associates IP addresses with each of the hosts (both virtual and real). On the server, I must also configure the IP tables so as to forward packets out from and into our LAN, and to use NAT to implement masquerading so that the outside sees just one host, our server *it20* (more about this later). Finally, on the server (*it20*), we implement DHCP (only on *it20*) for allocating IP addresses. *You will write about this in the questions at the end of your lab report.*

<u>On the Server</u>

(This is what I have already done. You **DO NOT** do this but you need to read it, look at it on *it20*, understand it and *write about it in your lab report entries.*)

NB: you can log onto *it20* as user *it341* using ssh. The password is *Intro2sys*. You will be able to read system files but not modify them.

1. First, define the interfaces file */etc/network/interfaces*, configuring the NICs on the server *IT20*:

   ```
   # This file describes the network interfaces available on your system
   # and how to activate them. For more information, see interfaces(5).

   # The loopback network interface
   auto lo
   ```

---

[1]Remember y represents your section and z represents your group ID.

```
iface lo inet loopback

# eth1 (outside)
# This interface connects it20 to the cs.umb.edu domain.
# This is the "primary" interface; one might think that eth0
# would be the primary interface, but not on this box!
# We rely on it20's dhcp to allocate an appropriate ip address.

auto eth1
iface eth1 inet dhcp

# eth0 (inside)
# This interface connects it20 to its subdomain clients: it21,..it28
# and all the VM's itvm2x-yz, for x=1..8, y=2/3, z=a/b
auto eth0
iface eth0 inet static
network 10.0.0.0
address  10.0.0.1
broadcast 10.0.0.255
netmask 255.255.255.0
```

2. Define the hosts file, /etc/hosts, associating ip addresses with the hosts. _Look at this file_
   on the server IT20. What does the hosts file do? Write about this in your lab report.
   Here is a small part of it:

3. Download and install dhcp (N.B. – **do not** do this on your machine!)

   ```
   sudo apt-get install dhcp3-server
   ```

4. Backup the default dhcp configuration:

   ```
   sudo cp /etc/dhcp/dhcpd.conf  /etc/dhcp/dhcpd.conf.bak
   ```

5. And define a new configuration, _/etc/dhcp/dhcpd.conf_:
   In this file, I will do two things:
   a. I restrict the computers to which _it20_ assigns ip addresses, using their MAC
      addresses. See the file _/etc/dhcp/dhcpd.conf_ on the server for a complete listing.
   b. Also I need to modify this file to activate your virtual machine and I need to enter
      the MAC of your virtual machine so the DHCP server sends your VM the correct
      IP address.)

6. Start the dhcp server by typing:

   If we are running Ubuntu Server 14.04 LTS then we use the upstart command:

   ```
   sudo service isc-dhcp-server start
   ```

Now our server should be operational.

On the Clients

(You should do these on your virtual machine, *itvm2x-yz*:)

1. First, look at the interfaces file, configuring the NICs. (Check the file to confirm it looks like the example below.)

   /etc/network/interfaces:

   ```
   # This file describes the network interfaces available
   # on your system and how to activate them.
   # For more information, see interfaces(5).

   # The loopback network interface
   auto lo
   iface lo inet loopback

   # ens33
   # This interface connects to it20 via a switch.
   # We rely on dhcp on it20 to give us an ip address
   auto ens33
   iface ens33 inet dhcp
   ```

   Second, edit the *hosts* file. It is <u>almost</u> like that for the server, and tells us where everyone is. The appropriate number of your host replaces the **y** below, e.g. 5 for *it25*. You only need to install the block of 16 IP virtual machine addresses that conform to your section. You also need to install the block of 8 IP addresses that conform to the physical machines. Remember to install the line defining the gateway server on the *IT20* machine.

   /etc/hosts:

   ```
   # Associate ip addresses with names

   # Myself (loop back)
   127.0.0.1    localhost
   127.0.1.1    itvm2x-yz.it.cs.umb.edu itvm2x-yz

   # Our (Gateway) Server
   10.0.0.1     it20.it.cs.umb.edu it20

   # Inside virtual clients for your section
   # instead of -y, use -1 for section 1 of it341,
   # -2 for section 2 of it341 and so forth.
   #
   # For the xxx's, see /etc/hosts on it20;
   # To view this file, see the directions at the end
   # of this PDF for logging onto the server it20 as
   # the user it341

   10.0.0.xxx  itvm21-ya.it.cs.umb.edu itvm21-ya
   10.0.0.xxx  itvm22-ya.it.cs.umb.edu itvm22-ya
   10.0.0.xxx  itvm23-ya.it.cs.umb.edu itvm23-ya
   10.0.0.xxx  itvm24-ya.it.cs.umb.edu itvm24-ya
   10.0.0.xxx  itvm25-ya.it.cs.umb.edu itvm25-ya
   10.0.0.xxx  itvm26-ya.it.cs.umb.edu itvm26-ya
   ```

```
10.0.0.xxx  itvm27-ya.it.cs.umb.edu itvm27-ya
10.0.0.xxx  itvm28-ya.it.cs.umb.edu itvm28-ya

10.0.0.xxx  itvm21-yb.it.cs.umb.edu itvm21-yb
10.0.0.xxx  itvm22-yb.it.cs.umb.edu itvm22-yb
10.0.0.xxx  itvm23-yb.it.cs.umb.edu itvm23-yb
10.0.0.xxx  itvm24-yb.it.cs.umb.edu itvm24-yb
10.0.0.xxx  itvm25-yb.it.cs.umb.edu itvm25-yb
10.0.0.xxx  itvm26-yb.it.cs.umb.edu itvm26-yb
10.0.0.xxx  itvm27-yb.it.cs.umb.edu itvm27-yb
10.0.0.xxx  itvm28-yb.it.cs.umb.edu itvm28-yb


# Inside real clients
10.0.0.240  it21.it.cs.umb.edu it21
10.0.0.241  it22.it.cs.umb.edu it22
10.0.0.242  it23.it.cs.umb.edu it23
10.0.0.243  it24.it.cs.umb.edu it24
10.0.0.244  it25.it.cs.umb.edu it25
10.0.0.245  it26.it.cs.umb.edu it26
10.0.0.246  it27.it.cs.umb.edu it27
10.0.0.247  it28.it.cs.umb.edu it28

# The following lines are desirable for IPv6 capable hosts
::1     localhost ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

2. Once you are sure you have these files correct, log out and power down your virtual machine, and change the network settings so, *instead of using NAT for networking, use **_bridged_**;* you can select this on the panel for networking for your virtual machine. Then power up the computer again and log in again as **sysadmin**. *Look these up, because you will address them in the questions at the end of your lab report.*

3. At this point you *will not* get an IPv4 address because I need to modify the *dhcp.conf* file to activate your virtual machine. To do this I need to enter the MAC of your virtual machine so the DHCP server sends your VM the correct IP address so...

   • Get the MAC of your virtual machine using the ***ifconfig*** command, and...

   • Give it to me, along with your machine name.

4. After I modify the *dhcpd.conf* file on *it20* and restart the dhcp service using the command

   ```
   sudo service isc-dhcp-server   (I do this)
   ```

   you need to restart your networking using the command

   ```
   sudo /etc/init.d/networking restart   (You do this)
   ```

Then you should do an *ifconfig* and confirm that you have the correct <u>IPv4</u> address. Where will you find the correct <u>IP</u> address for your virtual machine?

5. We should now test the networking. See if you can...

ping www.yahoo.com   **ping cs.umb.edu**   **ping it20**

ping it2x for an x other than your own.

ssh sysadmin@itvm2x-yz for an x other than your own.

Come up with some more tests, and write about them (as well as the tests above) in your lab report.

6a. Now let's try setting up a **static** interface, rather than relying on *it20*'s dhcp to give us an ip address. First, **save** the <u>current</u> interfaces file,

sudo cp /etc/network/interfaces /etc/network/interfaces.saved

Then we edit */etc/network/interfaces*; see */etc/hosts* for the appropriate value for **y** below:

```
# This file describes the network interfaces available
# on your system
# and how to activate them. For more information, see
# interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

# ens33
# This interface connects it2x to the it20.cs.umb.edu domain.
auto ens33
iface ens33 inet static

network 10.0.0.0
address 10.0.0.y   # see /etc/hosts for your own y
gateway 10.0.0.1
broadcast 10.0.0.255
netmask 255.255.255.0
```

6b. One needn't do a complete restart to take advantage of this new file: we can simply restart networking:

```
sudo /etc/init.d/networking restart
```

6c. We should now test this. See if you can,

ping www.yahoo.com   **ping cs.umb.edu**   **ping it20**

ping it2x for an x other than your own.

ssh ubuntu@it2x for an x other than your own.

Come up with some more tests, run them, and write about them (as well as the ones indicated above) in your lab report.

7. **Restore** the previous (saved) interfaces and restart networking (again):

```
sudo cp /etc/network/interfaces.saved /etc/network/interfaces

sudo /etc/init.d/networking restart
```

8. Again, test. When you are confident that you have completed the Project 2 tasks successfully, be sure to take a **snapshot** of your virtual machine for safety's sake.

9. Don't forget to <u>shutdown</u> your virtual machine and <u>log off</u> of your desktop -- **UNLESS** you choose to leave it running for remote access (see below).

Questions:

6. What is DHCP? Why do we use DHCP? Please explain.

7. What is the hosts file, and what does it do?

8. Please define and explain the networking settings of "NAT" and "bridged" in VMWare.

9. Now is a good time to read about (in the Van Vugt text) and experiment with ping (again), ifconfig, route, traceroute, and netstat. Write about these, both from your reading and your experiments during Project 2.

Remote Access to Your Virtual Machine:

Presumably, some teams will want to be able to access their VMs remotely, which should be possible for you, as of the completion of Project 2, following the steps given below:

1. Be sure that the Ethernet cord for your physical machine is plugged into the RHS.

2. Log out of sysadmin but **DO NOT** shutdown your VM.

3. Rather than logging off of your Windows account on the physical machine...you should **lock** it, instead.

4. Then, to access the VM, ssh into *it20.cs.umb.edu* as user *it341* with the (case-sensitive) password *Intro2sys*

5. From there, ssh into <u>your VM</u> as *sysadmin*, using your usual password for sysadmin. For example:
   `ssh sysadmin@itvm24-3b`

6. At that point, you should be able to do your usual command-line work, just as you would sitting in front of the physical machine.

7. Log out of your VM <u>and</u> out of it20, when finished.