Linux Howtos

Home Linux Networking Lab (129)
CIS 191 - Fall 2008

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This Howto shows how to recreate the CIS Lab environment at home.

Supplies:

- A fast PC
  - 2 GB memory minimum
  - 40 GB free disk space
- VMWare Server 1.08
  - http://www.vmware.com/products/server/
- VMs (available in the CIS Lab)
  - Celebrian, Arwen, Frodo, Elrond, Sniffer, Legolas, Sauron, Fang and Nosmo
- USB flash drive (to transport VMs home from school)

Overview

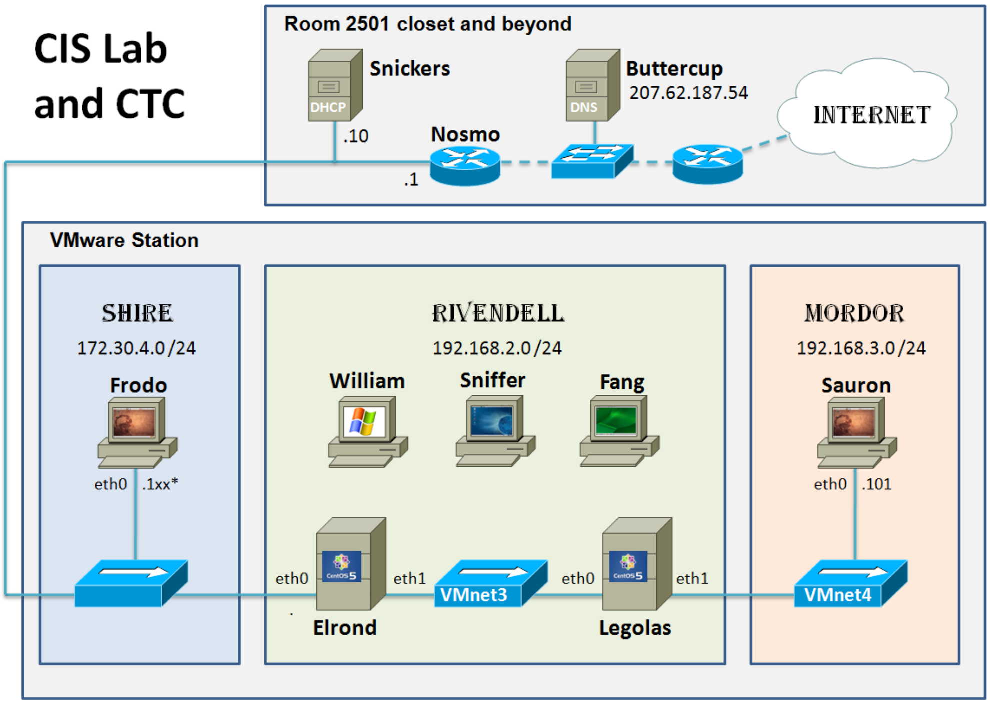
The network environment in the CIS Lab can be recreated at home. The lab assignments make use a number of systems running on virtual machines that can be "cabled" together in a variety of way using virtual networks and virtual serial connections.

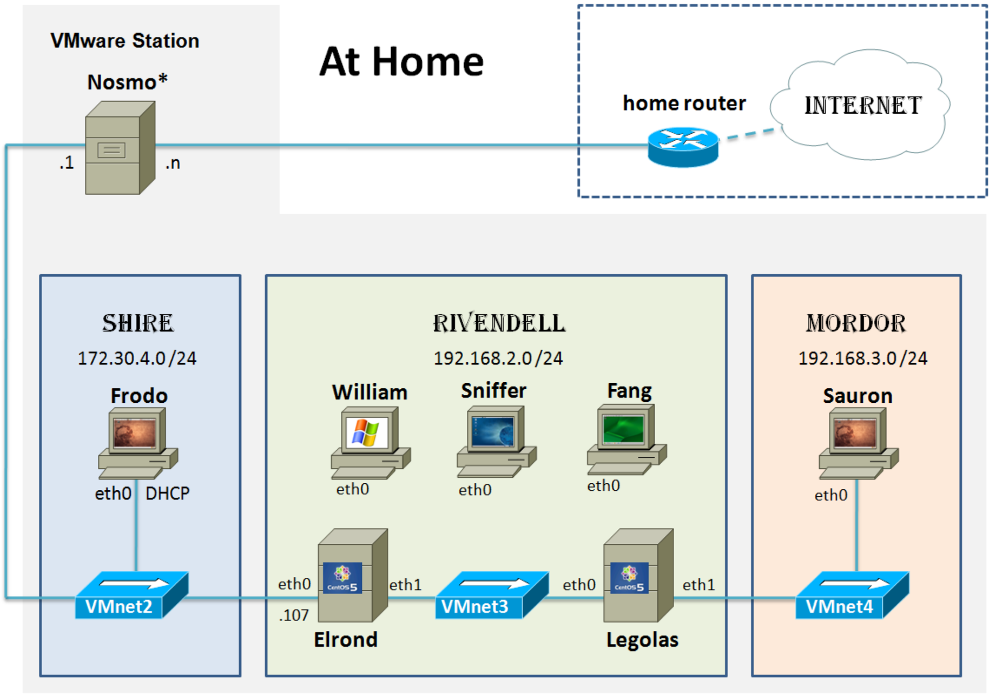
In the Lab assignments you will often be asked to ping the router at 172.30.4.1, use 207.62.187.54 as the DNS server, and power on Shire hosts that are using DHCP. To do this at home, there are some resources that need to be simulated so you can use the same network commands and configuration settings at home that you would use at school:

- A router at 172.30.4.1.
- Cabrillo's DNS server, buttercup.cabrillo.edu at 207.62.187.54
- The DHCP service on Snickers that assigns IP addresses on the Shire network in the range 172.30.4.150 to 172.30.4.199.

The Nosmo VM uses good old Red Hat 9. Nosmo is named after the Cisco router we use in the 2500 building. The Nosmo VM has two interfaces and routes between them. On one side is your regular home network. On the other side is the 172.30.4.0 /24 Shire network which uses VMnet2. The firewall on Nosmo translates any packets for 207.62.187.54 to your home router (or whatever DNS address you normally use at home). It also runs a DHCP service to assign IP addresses for hosts in the Shire network.

The Nosmo VM will need some modifications to properly work with your home networking environment.





* The nosmo VM can be used to replicate the CIS Lab network on home systems.

Step 1 – Setup VMware at Home

You will need to obtain and install the free VMware Server product on either a Windows or Linux PC. Make sure you meet the minimum hardware requirements noted above.

Step 2 – Obtain the Linux Networking VMs

At the time of writing this document the VMs above take about 35 GB. Using USB flash drives of sufficient size or quantity is the best way to transport these VM's home. You may have to make multiple trips.

Step 3 – Configure Nosmo VM with a static IP address on your home network

Without any modification, the Nosmo eth0 interface will be configured with a static IP address of 192.168.0.2, a network mask of 255.255.255.0 and a default gateway of 192.168.0.1. To change this you will need to edit the following file and change the information in red to an available address on your home network.

```
[root@nosmo root]# cat /etc/sysconfig/network-scripts/ifcfg-eth0
DEVICE=eth0
BOOTPROTO=static
BROADCAST=192.168.0.255
IPADDR=192.168.0.2
NETMASK=255.255.255.0
NETWORK=192.168.0.0
ONBOOT=yes
[root@nosmo root]#
```

Step 4 – Configure Nosmo VM for your home's DNS address

Without any modification, the Nosmo VM will redirect any packets sent to the Cabrillo DNS server (207.62.187.54) to 192.168.0.1. If you use a different DNS address for your home systems then you must modify the firewall (iptables) on Nosmo. You can do this with the following command and change the 192.168.0.1 to the DNS address you use at home:

```
iptables -t nat -R PREROUTING 1 -d 207.62.187.54 -j DNAT --to-destination 192.168.0.1
```

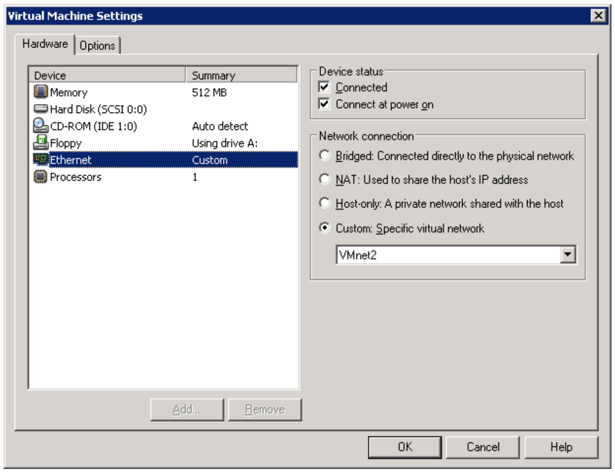
Step 5 – Configure Nosmo VM's DNS address

Without any modification, the Nosmo VM will use 192.168.0.1 as its DNS server. If you use a different DNS address for your home systems then you must modify the /etc/resolv.conf on Nosmo. You can do this with the following command and change the red 192.168.0.1 to the DNS address you use at home:

```
echo nameserver 192.168.0.1 > /etc/resolv.conf
```

Step 6 – "Recable" Frodo and Elrond to use VMnet2

In the CTC and the CIS Lab, the Frodo and Elrond VMs have their Ethernet device configured to be bridged (to use the physical Shire network). At home the Shire network is virtual, so you must reconfigure these devices to use VMnet2 instead as follows:

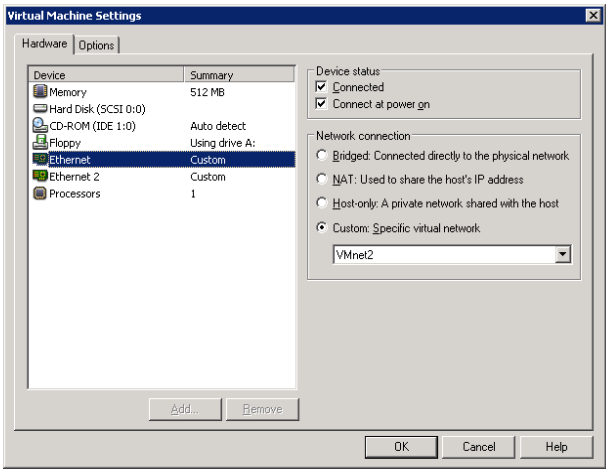


Device	Summary
Memory	512 MB
Hard Disk (SCSI 0:0)	
CD-ROM (IDE 1:0)	Auto detect
Floppy	Using drive A:
Ethernet	Custom
Processors	1

Device status
☑ Connected
☑ Connect at power on

Network connection
○ Bridged: Connected directly to the physical network
○ NAT: Used to share the host's IP address
○ Host-only: A private network shared with the host
● Custom: Specific virtual network
VMnet2

Frodo



Device	Summary
Memory	512 MB
Hard Disk (SCSI 0:0)	
CD-ROM (IDE 1:0)	Auto detect
Floppy	Using drive A:
Ethernet	Custom
Ethernet 2	Custom
Processors	1

Device status
☑ Connected
☑ Connect at power on

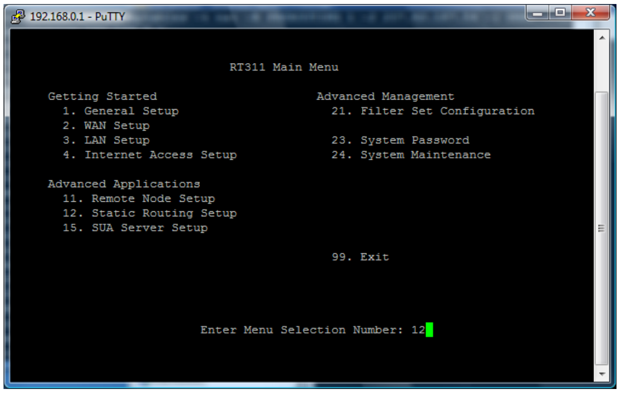
Network connection
○ Bridged: Connected directly to the physical network
○ NAT: Used to share the host's IP address
○ Host-only: A private network shared with the host
● Custom: Specific virtual network
VMnet2

Elrond

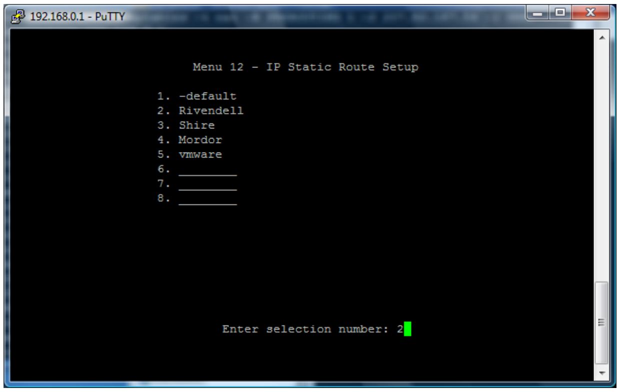
Step 7 – Configure static routes on your home router

To allow Internet access from the VMs and to be able to use utilities like Putty and Filezilla on your host computer to access your VM's you will need to set up some static routes on your home router. This is needed so your home router knows where to deliver packets headed for the Shire (172.30.4.0 /24), Rivendell (192.168.2.0 /24) and Mordor (192.168.3.0 /24) networks.

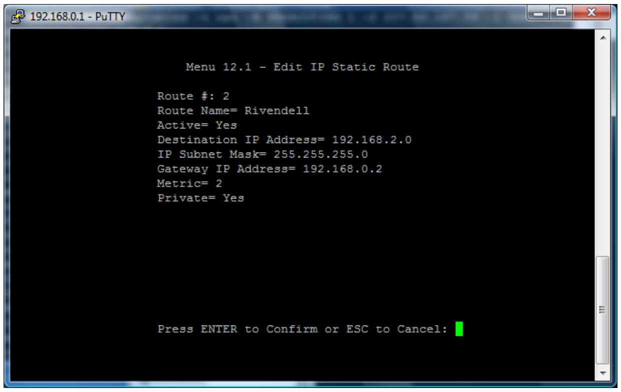
Check your router manual on how to do this. The following screenshots show static routes on a Netgear RT311 router. Any packets for Shire, Rivendell or Mordor will be sent to the Nosmo VM on 192.168.0.2. Nosmo will handle it from there.



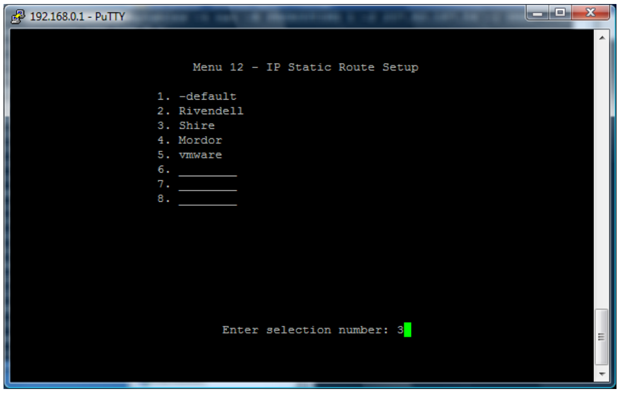
```
                          RT311 Main Menu

     Getting Started                      Advanced Management
       1. General Setup                     21. Filter Set Configuration
       2. WAN Setup
       3. LAN Setup                         23. System Password
       4. Internet Access Setup             24. System Maintenance

     Advanced Applications
       11. Remote Node Setup
       12. Static Routing Setup
       15. SUA Server Setup

                                            99. Exit



                     Enter Menu Selection Number: 12
```



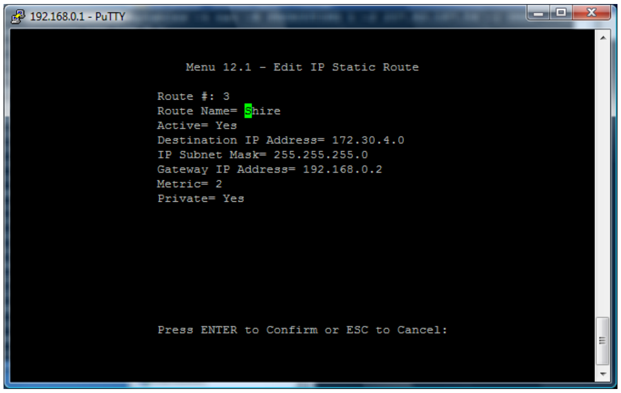
```
                 Menu 12 - IP Static Route Setup

            1. -default
            2. Rivendell
            3. Shire
            4. Mordor
            5. vmware
            6. ________
            7. ________
            8. ________



                   Enter selection number: 2
```



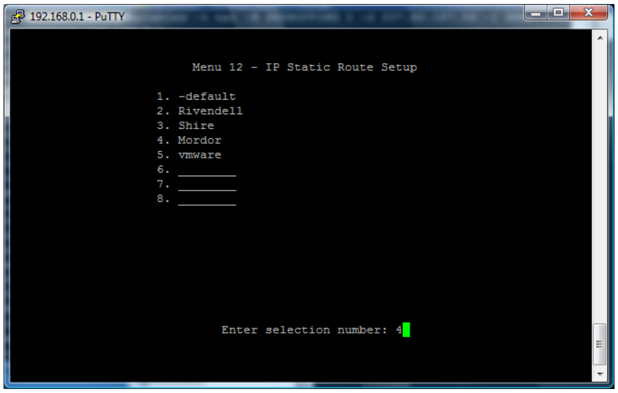
```
                 Menu 12.1 - Edit IP Static Route

             Route #: 2
             Route Name= Rivendell
             Active= Yes
             Destination IP Address= 192.168.2.0
             IP Subnet Mask= 255.255.255.0
             Gateway IP Address= 192.168.0.2
             Metric= 2
             Private= Yes



             Press ENTER to Confirm or ESC to Cancel:
```



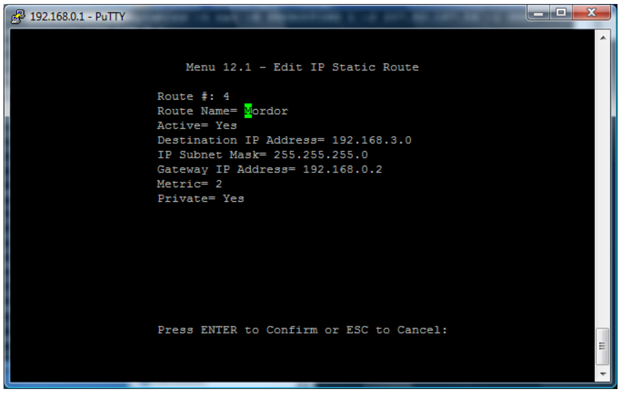
```
                 Menu 12 - IP Static Route Setup

            1. -default
            2. Rivendell
            3. Shire
            4. Mordor
            5. vmware
            6. ________
            7. ________
            8. ________



                   Enter selection number: 3
```



```
                 Menu 12.1 - Edit IP Static Route

             Route #: 3
             Route Name= Shire
             Active= Yes
             Destination IP Address= 172.30.4.0
             IP Subnet Mask= 255.255.255.0
             Gateway IP Address= 192.168.0.2
             Metric= 2
             Private= Yes



             Press ENTER to Confirm or ESC to Cancel:
```



```
                 Menu 12 - IP Static Route Setup

            1. -default
            2. Rivendell
            3. Shire
            4. Mordor
            5. vmware
            6. ________
            7. ________
            8. ________



                   Enter selection number: 4
```



```
                 Menu 12.1 - Edit IP Static Route

             Route #: 4
             Route Name= Mordor
             Active= Yes
             Destination IP Address= 192.168.3.0
             IP Subnet Mask= 255.255.255.0
             Gateway IP Address= 192.168.0.2
             Metric= 2
             Private= Yes



             Press ENTER to Confirm or ESC to Cancel:
```

Step 8 – Verify your changes.

Make sure that the Nosmo VM is up and running. Select the Frodo VM and revert it to its snapshot. Finally start up Frodo and check the following:

- □ Use **ipconfig eth0** to check it was assigned an IP address between 172.30.4.150 to 172.30.4.199.
- □ Make sure you can ping the lab router now at 172.30.4.1.
- □ Check DNS by pinging an Internet host like google.com.
- □ Check you can Putty to Frodo from your physical host PC or any other system on your home network.
- □ Likewise, check you can connect Filezilla on a system on your home network to Frodo.

Appendix

The network configuration files for Nosmo.

Firewall:

```
[root@nosmo root]# cat /etc/sysconfig/iptables
# Generated by iptables-save v1.2.7a on Thu Jan  8 16:04:13 2009
*nat
:PREROUTING ACCEPT [16:2930]
:POSTROUTING ACCEPT [1:108]
:OUTPUT ACCEPT [1:108]
-A PREROUTING -d 207.62.187.54 -j DNAT --to-destination 192.168.0.1
COMMIT
# Completed on Thu Jan  8 16:04:13 2009
[root@nosmo root]#
```

Static routes:

```
[root@nosmo root]# cat /etc/sysconfig/network-scripts/route-eth1
192.168.2.0/24 via 172.30.4.107
192.168.3.0/24 via 172.30.4.107
[root@nosmo root]#
```

NIC configuration:

```
[root@nosmo root]# cat /etc/sysconfig/network-scripts/ifcfg-eth0
DEVICE=eth0
BOOTPROTO=static
BROADCAST=192.168.0.255
IPADDR=192.168.0.2
NETMASK=255.255.255.0
NETWORK=192.168.0.0
ONBOOT=yes
[root@nosmo root]#

[root@nosmo root]# cat /etc/sysconfig/network-scripts/ifcfg-eth1
DEVICE=eth1
BOOTPROTO=static
BROADCAST=172.30.4.255
IPADDR=172.30.4.1
NETMASK=255.255.255.0
NETWORK=172.30.4.0
ONBOOT=yes
[root@nosmo root]#

[root@nosmo root]# cat /etc/sysconfig/network
NETWORKING=yes
HOSTNAME=nosmo
GATEWAY=192.168.0.1
[root@nosmo root]#
```

Routing:

```
[root@nosmo root]# cat /etc/sysctl.conf
# Kernel sysctl configuration file for Red Hat Linux
#
# For binary values, 0 is disabled, 1 is enabled.  See sysctl(8) and
# sysctl.conf(5) for more details.

# Controls IP packet forwarding
net.ipv4.ip_forward = 1

# Controls source route verification
net.ipv4.conf.default.rp_filter = 1

# Controls the System Request debugging functionality of the kernel
kernel.sysrq = 0

# Controls whether core dumps will append the PID to the core
filename.
# Useful for debugging multi-threaded applications.
kernel.core_uses_pid = 1
[root@nosmo root]#
```

DHCP server:

```
[root@nosmo root]# cat /etc/dhcpd.conf
ddns-update-style interim;
ignore client-updates;
option time-offset              -25200; #PDT
#
# Shire
#
subnet 172.30.4.0 netmask 255.255.255.0 {
option routers                  172.30.4.1;
option subnet-mask              255.255.255.0;
option domain-name              "Shire";
option domain-name-servers      207.62.187.54;

range dynamic-bootp             172.30.4.150 172.30.4.199;
default-lease-time              21600;
max-lease-time                  43200;
}
[root@nosmo root]#
```