Cabrillo College

CIS 192 Linux Lab Exercise

Lab 1: Using the CIS 192 Lab Resources
Spring 2013

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The purpose of this lab is to become familiar with the CIS Lab resources and to start practicing some old and new Linux commands.

Resources

- The Opus server
- CIS VLab (Virtual Lab) VMs
- The CIS Student Help Forum

Opus Server

The Opus server is available to students via an SSH connection. Opus is used as a repository for common files and submitting lab assignments.

The VMs in the CIS VLab (Virtual Lab)

We will be using a number of different Virtual Machines (VMs) in VLab for this course.

	CentOS	Ubuntu	Windows
VMs	Arwen	Frodo	William
	Celebrian	Sauron	
	Elrond		
	Legolas		

These VMs can be accessed remotely from on or off campus.

CIS Student Forum

A phpBB forum, at http://oslab.cabrillo.edu/forum/, has been set up for use by CIS students and instructors to collaborate, share information and help each other.

Procedure

For this lab you are going to record information in a text file named *lab01* in your home directory on Opus. To start, make a copy of the *lab01* file in */home/cis192/depot*. When finished submit your work by copying your *lab01* file into the instructor's *turnin* directory.

Every student is assigned their own pod of VMs, static IP addresses (for the CIS Lab network) and virtual networks.

Task 1 - Connect Celebrian and Arwen to the private Shire network

Where XX designates your pod VMs and switch

Interfaces

p*XX*-celebrian   p*XX*-arwen

eth1   eth0
.1   .2
shire-XX
192.168.20.0/24
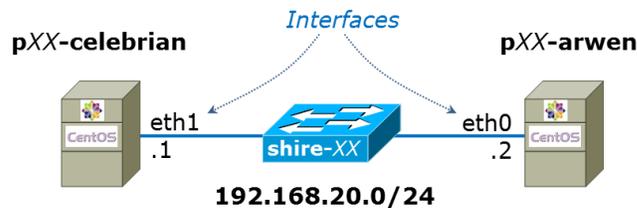
☐ Find your pod and virtual network in: http://simms-teach.com/docs/cis192/Pod-Assignments-192-sp13.pdf.

☐ Power on your Celebrian and Arwen VMs.

☐ Cable (by editing the VM settings) your Celebrian and Arwen VMs as shown above.

☐ Login as cis192 and become root using **sudo -i** on both systems.

☐ Use the: **ifconfig eth***x xxx.xxx.xxx.xxx/pp*
command to configure IP addresses the Celebrian eth1 and Arwen eth0 interfaces. This configuration will last till the system or network service is restarted - it is NOT permanent!

☐ Use the: **ifconfig eth***x*
command to examine the configuration and status on both interfaces.

☐ Ping Arwen twice from Celebrian using: **ping -c2 192.168.20.2**

☐ Ping Celebrian twice from Arwen using: **ping -c2 192.168.20.1**

❖ **Record** in your *lab01* file:
  o The ifconfig commands used to configure the interfaces
  o The MAC (HWaddr) address of both interfaces

Task 2 - Observe packets on the network

☐ On Arwen, start monitoring network traffic using: **tcpdump**

☐ On Celebrian, fire a single ping (with the **-c1** option) at Arwen.

☐ On Arwen, observed the captured traffic. Note any ARP requests and replies. Note the incoming ping (echo request) and outgoing response (echo reply).

☐ Notice that the ARP replies state "oui Unknown". Use Google to research this.   After you understand what an OUI is, use http://standards.ieee.org/develop/regauth/oui/public.html to identify the owner of the unknown OUI.

☐ On Celebrian, fire continuous pings (no **-c** option) at Arwen.

☐ Disconnect Arwen from the network (use VM Edit Settings) and wait a minute or two.

Observe what happens with the continuous pings on both Celebrian and Arwen. Note the error message displayed by the ping command.

 Now let's monitor traffic on Celebrian as well. Without disrupting the continuous ping, switch to another tty like tty2 (**Ctrl- Windows-Alt + Space + f2**). On tty2 run tcpdump. Observe the packets being sent by Celebrian. Are they pings (echo requests) or ARP requests?

 Reconnect Arwen to the network again. You should see ping replies (echo replies) now in response to each ping request (echo request).

 On Celebrian, switch back to tty1 and use **Ctrl-C** to stop the continuous ping.

 On Arwen, use **Ctrl-C** to stop monitoring traffic by tcpdump.

❖ **Record** in your *lab01* text file:
   o The ping command you used on Celebrian to send a single ping to Arwen.
   o The ping command you used to Celebrian to send continuous pings to Arwen.
   o The unknown OUI and who owns the unknown OUI in ARP replies displayed by tcpdump.
   o The ping error message displayed on Celebrian when Arwen is disconnected.
   o The keystrokes used to switch virtual terminals to tty2.

Task 3 - Connect Celebrian to the CIS Lab network using DHCP
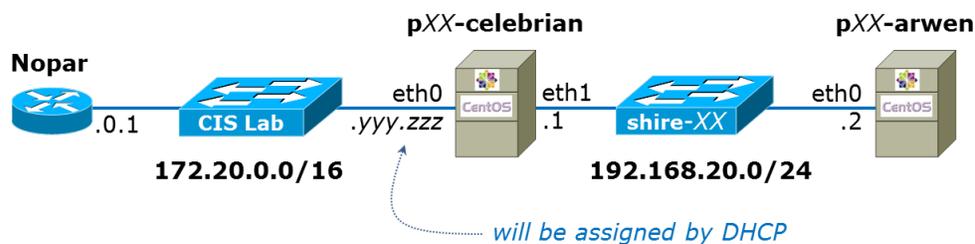
 Cable Celebrian's eth0 interface to the CIS Lab network.

 On Celebrian try to ping google.com. The CentOS VMs are configured to boot up without any network configuration so you shouldn't be able to ping any Internet addresses.

 Use **dhclient -v eth0** to obtain an IP address, a default gateway and one or more DNS name servers.

 Can you ping google.com? You should be able to now.

 Use **ifconfig eth0** to determine the IP address assigned to the eth0 interface.

 Use **route -n** to show the default gateway assigned. Look for the IP address in the Gateway column that has a corresponding destination of 0.0.0.0.

 Use **cat /etc/resolv.conf** to show the DNS name server(s) assigned.

 Can you still ping Arwen? You should be able to. Note the difference in TTL (Time To Live) values on ping replies from Arwen and google.com. The TTL in the ping reply packet is decremented every time it travels through a router.

❖ **Record** in your *lab01* text file:
  - o The IP address, gateway and DNS server(s) you were assigned by the DHCP server.
  - o The TTL of the echo reply from google.com.
  - o The TTL of the echo reply from Arwen.

Task 4 - Connect Celebrian to the CIS Lab network using a static IP address
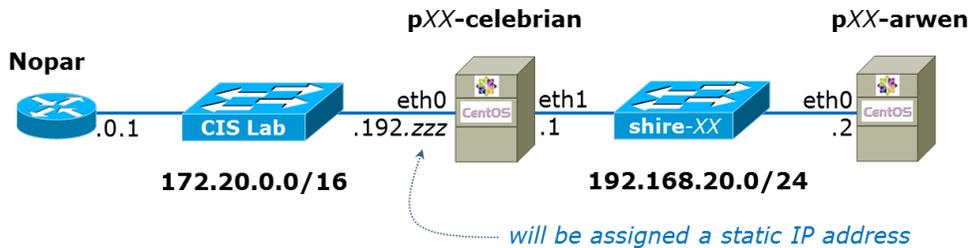
☐ Use **dhclient -r eth0** to release the IP address, gateway and DNS name server(s) obtained in the last task.

☐ Can you ping google.com? This should not work now.

☐ Choose a unique static IP address from those assigned to you in: http://simms-teach.com/docs/cis192/Pod-Assignments-192-sp13.pdf

☐ Use **ifconfig eth0 172.20.192.***zzz***/16** to configure your unique IP address on eth0. This configuration will last till the system or network service is restarted - it is NOT permanent!

☐ Use **route add default gw 172.20.0.1** to configure the default gateway. This configuration will last till the system or network service is restarted - it is NOT permanent!

☐ Verify your changes with **ifconfig eth0** and **route -n.**

☐ Add the following line to */etc/resolv.conf* to configure a DNS name server:
     nameserver   172.30.5.8

☐ Verify by catting /etc/resolv.conf.

☐ Ping the lab router with **ping 172.20.0.1** which should work.

☐ Ping the DNS nameserver with **ping 172.30.5.8** which should work.

☐ Ping google.com. That should work too.

☐ Can you still ping Arwen? You should be able to. Note the difference in RTT (Round Trip Time) values between ping replies from Arwen and google.com.

❖ **Record** in your *lab01* text file:
  - o The command you used to configure your IP address on eth0
  - o The average RTT to ping google.com
  - o The average RTT to ping Arwen.

Task 5 - Connect Frodo to the CIS Lab network

- ☐ Cable your Frodo's eth0 interface to the CIS Lab network .

- ☐ Power up your Frodo VM.

- ☐ Login as cis192 (CIS 192 Student) and open a graphical terminal (use Ctrl-Alt-t).

- ☐ The Ubuntu VM is configured to automatically obtain IP information from a DHCP server during boot. Note the IP address, default gateway and DNS server(s) obtained from the DHCP server.

- ☐ Can you ping google.com? You should be able to.

- ☐ Using Celebrian's IP address, ping Celebrian from Frodo. That should work too.

- ☐ Can you ping Arwen at 192.168.20.2 from Frodo? This will not work because there is no route to Arwen. The ping echo requests get directed out towards the Internet never to return! If you wish to see this use **mtr 192.168.20.2** to watch how far they get. Don't worry, we will learn how to route packets to private networks in future labs.

- ☐ Ping the cisvdc host using **ping cisvdc** or **ping 172.30.5.8**. The hostname is in our local DNS server which allows you to ping it by hostname. Examine the TTL values in the ping output and determine which (OS) Operating System family is most likely running on cisvdc.

- ☐ **Record** in your *lab01* text file:

    - o The IP address, gateway and DNS server(s) configured on Frodo.
    - o The OS that is most likely running on cisvdc.

Task 6 - Login to your VMs from Opus using ssh

Opus

eth0 .20

172.30.5.0/24

Nopar

.0.1   **CIS Lab**

172.20.0.0/16

p*XX*-celebrian

eth0   eth1
.192.*zzz*   .1   **shire-*XX***

192.168.20.0/24

p*XX*-arwen

eth0
.2

has a unique static IP address
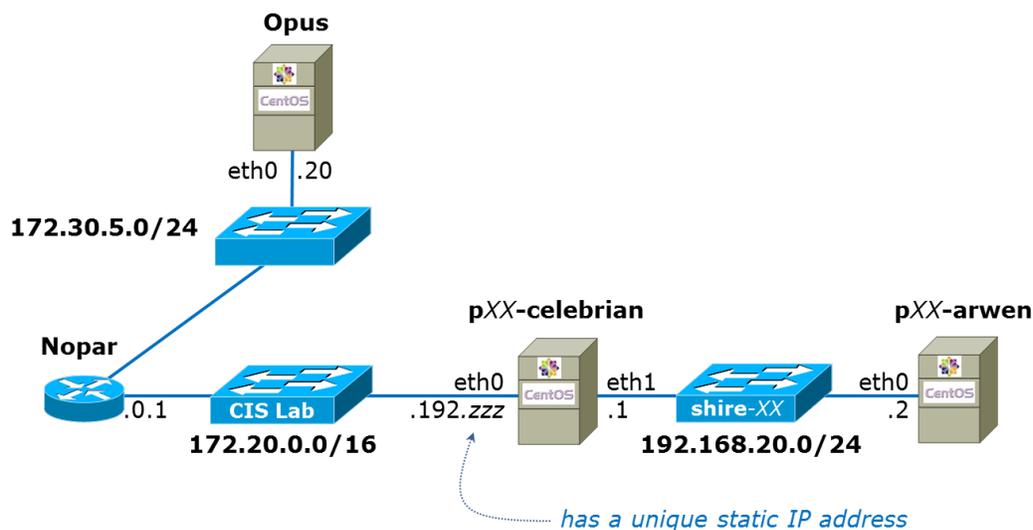
- ☐ Log into Opus from home using another login session.

- ☐ Note the IP address being used by Opus. It should match the diagram above.

- ☐ Note the default gateway and DNS servers configured on Opus.

Determine your IP address or hostname you are using at home to connect to Opus. Use the **who** command on Opus to get this information. Verify by pinging your home IP address from Opus.

 Check that you can ping your Frodo and Celebrian VMs from Opus. You should not be able to ping your Arwen VM because packets will be sent towards the Internet and lost forever.

 On Opus, login to your Celebrian VM using the **ssh cis192@172.20.192.**_zzz_ command. For _zzz_ use the IP address you configured previously on the eth0 interface of Celebrian.

 Notice your shell prompt has changes when you login to Celebrian. Prove to yourself that you are on Celebrian by using the **hostname** and **ifconfig eth0** commands. Use the **who** command to show you logged into Celebrian from Opus.

 From Celebrian you can ssh into your Frodo or Arwen VMs. Note that though you could not ping Arwen from Opus however you can get there via ssh. Use **ssh cis192@192.168.20.2** to login to Arwen.

 You are now accessing your Arwen VM from home using ssh. Pretty cool huh?

 Use **exit** to back out of Arwen.

 Use **exit** to back out of Celebrian.

 Use the commands you learned in previous steps to note the default gateway and name servers used by Opus.

 Record in your _lab01_ text file:

  o   The IP address configured on the Opus eth0 interface.
  o   The IP address or hostname you are using at home to connect to Opus.
  o   The default gateway used by Opus.
  o   The DNS name servers used by Opus.

Task 8 - Shut down all your VMs

As root you can use the **init 0** command to rapidly shutdown a system. It's OK to do this on a VM where you are the only one logged in. Why would you not want to do **init 0** on a production system with multiple users logged in?

 Shutdown your Frodo and Arwen VMs.

 If you plan to do the extra credit below you may wish to keep Celebrian powered on.

 Exit vSphere to end the VLab session.

Task 9 - Using the CIS Help Forum

Browse to the forum at http://oslab.cabrillo.edu/forum/, locate the CIS 192 forum and read the current posts. Be sure to register if you haven't already. When you register, be sure to select a username that is your first and last name separated by a space to get credit for your posts.

Make a post on the forum. You can post anything you like but if you are having trouble picking a topic here are some suggestions:

- A post introducing yourself.
- A question about this lab that you would like someone to respond to.
- Share a tip on how to do this lab that might save others time and effort.
- Reply to an existing post.

To turn in

Fill out all the header information at the top of your *lab01* test file on Opus. This should include your name, pod number and the dates/time spent on this lab. The time spent should reflect the total number of hours you spent preparing, implementing and troubleshooting this lab. Be sure and clean up your *lab01* file so it looks professional before submitting.

To submit your work:

cp lab01 /home/rsimms/turnin/cis192/lab01.$LOGNAME

Submit as many times as you like up to the deadline. Each new submittal will overwrite the previous one.

Remember, **late work is not accepted**, so please start early, plan ahead for things to go wrong and use the forum to collaborate.

Grading rubric (30 points)

>3 points for a correct submittal to the CIS 192 turnin directory
>3 points for including all the header information in your submittal
>4 points for correct information recorded for Task 1
>4 points for correct information recorded for Task 2
>4 points for correct information recorded for Task 3
>4 points for correct information recorded for Task 4
>4 points for correct information recorded for Task 5
>4 points for correct information recorded for Task 6

Extra Credit (3 points)

The ping command sets the shell variable $? to 0 when the ping is successful. Review the man page on ping and write an original short script, named *monitor*, on Opus that loops forever and monitors your Celebrian VM. Don't ping more than once every 10 seconds. You should set the ping timeout to 1 second for faster notification when Celebrian is unavailable. Only output UP/DOWN status and throw all other output into */dev/null*. Test by connecting and disconnecting Celebrian's connection to the CIS Lab network. Record your script in your *lab01* file.

The output of this script would look something like this:

```
[milhom192@oslab ~]$ ./monitor
Enter IP address to monitor: 172.20.192.91
172.20.192.91 is UP
172.20.192.91 is UP
172.20.192.91 is UP
172.20.192.91 is UP
172.20.192.91 is DOWN
172.20.192.91 is DOWN
172.20.192.91 is DOWN
172.20.192.91 is DOWN
172.20.192.91 is UP
172.20.192.91 is UP
172.20.192.91 is UP
172.20.192.91 is UP
172.20.192.91 is UP
```

< Ctrl-C to end >