# Introduction

This lab is to create the Virtual Machines that will be used in ensuing labs. It is critical to complete these labs. The VMs will be created on the */scratch* directory of your workstation. When done the VMs should be copied to a safe storage area. It should be copied to two places: 1) your USB storage device and 2) your network\_storage directory. The lab is to be done individually.

**Warning:** be sure to shut down your VMs before logging off or shutting down the workstation. Corruption of your VMs may ensue otherwise and you will need to recreate the VM.

# Part1 – New Linux tricks

The first part is to familiarize you with a new aspect of Linux. This is an individual exercise.

1. Start system and log on with your id:
One student per machine. Linux has several pure command line interfaces available, each emulating a teletype (tty). The default is the GUI logon screen (tty7). You can use the <ctrl>+<alt>+<Fn> keys to select different CLI screens. For example <crtl>+<alt>+<F2> switches to screen tty2, the screen for logical teletype 2.
	1. Using tty2:
		1. <crtl>+<alt>+<F2>
		2. Login with your base Debian ID: enter your user id (same as your 49er ID) and pw. The initial PW should have been emailed to you from TSO.
		3. Change your password with the ***passwd*** command if not done so in the previous lab:
			1. Hint: use **man passwd** to check the syntax
		4. Try the ***whoami***, **who am i**, and ***who*** commands
		5. Leave this terminal open
	2. Using tty3:
		1. <crtl>+<alt>+<F3>
		2. Login with a generic ID (usernn). The pw is the same as the userid.
		3. Try the ***whoami*** , **who am i**, and ***who*** commands again and note the differences

Note the differences between whoami, who am i, and who for 1.a and 1.b above. \*\*

***Important:*** *At the end of Step1, type “exit” at each TTY you logged into to logout, or else you’ll stay logged into that terminal when you leave.*

***Note:****<crtl>+<alt>+<F*n*> will, in general, switch to terminals 1-7. Replace* n *with the appropriate number. F7 has historically been the GUI terminal. However, the latest versions of Debian may have a different number of terminals or the GUI terminal may be different than <crtl>+<alt>+F7. Experiment!!!!*

Part2 – Install Linux VMs

You will create 2 distributions – Debian and CentOS as virtual machines (VM)

This part of the lab is to familiarize students with virtual machines (VMs) and create two distributions (distros) of Linux. The key to creating independent VMs is that each VM image will be in its own directory, with each one having its own set of files*.*  The names of the files can be the same, even if they are for different OSs, as long as they are in different directories. However, having different VMs with the same name can be confusing to whoever wants to use them, so be sure to give each VM a unique name. Each VM set of files should be in a different directory to help the system keep track of the separate support files (those that contain information about the state of the VM when last used, virtual hard drive information, etc.)

Each of the workstations in the lab has a special directory called */scratch* to which students can read and write files and directories. The /*scrat*ch directory is in the root directory (*denoted by the /*) Each student should create a directory in /*scratch* to hold the files for each virtual machine. Please make the creator (owner) of the directories contents obvious by using your last name and first initial, e.g tkombol. Directories with no obvious owners will be deleted on sight. To help identify which are your VMs in a workstation’s */scratch* directory use the following convention for directory names: concatenate your userid to the distro name, e.g. tkombolDebian or tkombolCentOS. Be sure not to have any blanks in your directory or file names.

**Important:** you will need a root password you can remember. For both systems, use ***rootpw*** as the root password. This is definitely not “secure” but with a well-known password the TA or instructor can quickly help you fix broken things.

## Installations

### Debian VM

1. Start Oracle VM VirtualBox from Applications->System Tools->Oracle VM VirtualBox
2. Create a VirtualBox install image file in your */scratch* directory
	1. Click on "New”
	2. Type in a name (unique for yourself with Debian in the name )
	3. Ensure Type and Version are set to “Linux” and “Debian (64 bit)” respectively
	4. Click on ‘Nextw’ to advance through the following steps:
	5. Leave the defaults for:
		1. Memory size (512 MB)
		2. Check “Create a virtual hard drive now”
			1. Click “Create”
		3. Check “VDI”
		4. Check “Dynamically allocated”
	6. File location and size
		1. **Important:** follow these steps carefully!
		2. Click on the little green arrow on the right side of the screen
		3. Select “File system” then “Scratch”
		4. Click on “Save”
		5. Click on “Save” again
		6. Click “Create”
	7. Click on “Settings”
		1. Select “System”
		2. Under **Boot Order** check “Network”
		3. Click on **Network** in the left hand column
			1. All boxes should now be checked
		4. On **Attached to** select “Bridged Adaptor”
		5. Click “OK”
	8. Click on green Start Arrow
	9. Click “Start” button
	10. Debian installation window should show with “Debian 7.0 (64-bit)” selected
		1. If the installation window does not show you will need to start over
	11. Hit Enter to start installation and to go to the next page
		1. Use defaults until the “Domain Name” prompt shows
		2. At the “Configure the Network” window
			1. You can change the *Hostname* from “debian” to a name you like then hit enter
			2. Set *Domain name* to “hades.lab”
			3. Use tab to highlight the <continue> selection and hit enter
	12. **Important:** On the panel named “Choose a mirror…”
		1. Scroll to top and select “Enter information manually”
		2. Change *mirror* to *lab302-repo.hades.lab*
		3. Leave */debian/* as is
		4. Leave the HTTP proxy entry blank
	13. Set root password to “rootpw”
	14. Create your user id
		1. Typing in your full name will generate a user id
			1. You may override the system generated ID if you wish
		2. You may use any password for your personal user account
	15. Select “Eastern” on the *Configure the clock* window
3. When asked about partitioning the disk
	1. Choose: “Guided – Use entire disk”
	2. Remember you are setting up the virtual disk here for the virtual machine
	3. Choose the defaults (just hit enter) for the rest of the partition questions
	4. Eventually you will be asked to write the changes to disks.
		1. Change from the default answer of <no> to <yes> and continue
	5. Wait, wait, and wait some more….
	6. Choose <no> to participate in the survey
4. Under “Software Selection,” make sure entries “Desktop environment” and “Standard System” are checked. You should uncheck “Print Server” (saves some space.)
	1. Use the space bar to toggle selections
	2. Wait some more…
5. Any other questions you see can be left with their default value
6. When the installation is finished, the VM will reboot
7. Log into the new Debian VM you just created with the ID you created in step above
	1. Take a screenshot of your VM running to include in your report. \*\*
		1. Don’t forget to give it an appropriate caption.
	2. Note: Gnome 3 might fail to load. This will not be a problem, you can use the fallback.
8. Shut down the VM when you’re done
	1. You can do any of the following:
		1. Run /sbin/poweroff as root (su first, if necessary)
		2. Click on your user id and select Shut Down…
		3. Click on Machine in the top of Virtual Box and Check Close
			1. Click Power off… then OK

### CentOS VM

Steps 1 through 2.e are pretty much the same as for Debian but be careful of some subtle differences.

#### ISO image

An ISO image is required for the install. Check in the Places 🡪 Computer 🡪File system 🡪 network-storage 🡪 iso directory. If there is an entry with CentOS in the name ending with .iso you may use that. Note this directory name for the install later. Otherwise open a browser and download a copy:

1. Open Iceweasel
2. Enter the url lab302-web.hades.lab
	1. Look for a directory labeled 3110 and click on it
	2. Click on the CentOS directory
	3. Click on the entry with CentOS in the name and ending with .iso
	4. Click on “Save file”
3. After the download is done you should have a copy in your Home Download directory (/home/userid/Downloads). Note this directory name for the install later.

#### Install:

1. Start Oracle VM VirtualBox from Applications->System Tools->Oracle VM VirtualBox
2. Create a VirtualBox install image file in your scratch directory
	1. Click on "New”
	2. Type in a name (unique for yourself with CentOS in the name)
	3. Ensure Type and Version are set to “Linux” and “Red Hat (64 bit)” respectively
	4. Leave the defaults for:
		1. Memory size – change to 4096 MB
			1. Note: if you wish to use your VM at home do not make bigger than the amount of memory on your home computer
		2. ~~Set the Processor to 4 CPUs~~
			1. ~~Again, if going to use your VM at home do not set to more than the number of processors you have on your computer at home~~
		3. Create a virtual hard drive now
			1. Click “Create”
		4. VDI
		5. Dynamically allocated
		6. File location and size
			1. Set the File Location and Size to 10 GB. This will allow more programs to be installed
			2. Click “Create”
	5. Click on “Settings”
		1. Select “System”
		2. Under Boot Order uncheck *Floppy*
		3. Click on Network in the left hand column
			1. On “Attached to:” select *Bridged Adaptor*
		4. Click “OK”
3. Still in “Settings”:
	1. Under Storage:
		1. At “Controller: IDE” click the LITTLE ‘Circle +’ icon (add cd/dvd device)
			1. Click “Choose disk”
			2. Select “File system” from the left column
			3. Here you will select the directory you identified in the “ISO images” section above
			4. CentOS item in that directory and “Open”
			5. Under “Controller: IDE” select the CentOS item you selected above
			6. Click on the little CD icon under Attributes and select the CentOS item again
			7. Click OK
		2. Now you may click the green start arrow at the top of the window
	2. In the new window use the up and down arrows to select “Install CentOS 7”
	3. Hit <Enter> and the installation will begin.
		1. Much of the remaining selections will be using the defaults, use the following a guide, and note when deviations are made
	4. Select English, then continue
	5. The next window has a bunch of setup. It must be done in the correct order
	6. Click on *Network and Hostname*
		1. Select the entry and click the switch to *on*
		2. Click *Done* at the top
	7. In *Installation Source*
		1. In “On the network” enter *lab302-repo.hades.lab/centos/*
		2. Click Done
		3. The warning message should go away, if not investigate and fix
	8. In *Software Selection*
		1. For the Base: GNOME Desktop
		2. For Addons: GNOME Applications
		3. Click Done
	9. In *Installation Destination*
		1. Open it and leave the defaults
		2. Click Done
	10. If all warnings are off click “Begin Installation”
		1. Otherwise investigate the problem and fix
	11. While the software is installing your can set the root password and create a userid
		1. Set the root password to rootpw
		2. Since you have a weak password you will need to click “Done” twice
		3. Create any id you want with any password
			1. You will use the id for normal work on the VM
	12. Wait, Wait, and Wait some more
4. The system will need to be rebooted
5. Accept the License
	1. Click *Accept*
	2. Select *Done*
	3. Click “*Finish configuration*”
6. Scan the info on the KDUMP screen
	1. Click “Forward”
7. Logon to the system
8. Select English
	1. Next
9. Select English (US)
	1. Next
10. Skip “Connect…”
	1. Next
11. Start Using CentOS Linux
	1. Take a screenshot of your VM running to include in your report. \*\* Don’t forget to give it an appropriate caption.
	2. Hint: use the right Ctrl key to release the mouse from the VM window!
12. To make a backup:
	1. See Step 4 below for the procedure to export to an OVA

Reminder: When switching to "superuser" don't forget the – after su. Otherwise you become root without the authority.

# Part 3 – Network Configuration

This part will use the two VMs you created above, the Debian and the CentOS VMs. If they are not running start them now. Both VMs will be running on your workstation at the same time.

First, the two virtual machines will be set up to ping each other.

You will use a Class B address for your VMs, the same as the lab. They will have the form: 172.16.nn.yy where nn is the your assigned subnet number. The numbers are listing on the wall and on the 2110 Web site. yy will be a number you choose in the range 2-254. The number for yy must be different for the Debian VM and the CentOS VM. I would suggest using 172.16.nn.10 for Debian IP and 172.16.nn.20 for CentOS IP. Avoid using 1 for yy as that is the default host address for many routers in a network.

**Note:** Some network configurations do not allow a leading 0 in the octets when you enter the data. If you get an error get rid of leading 0s in the octets.
**Note:** These examples assume your network interface is *eth0*, your machines may have the interfaces labeled *eth1* or *eth2* or some other naming convention. Modify the examples accordingly to your machines convention if this is not the case.
**Hint:** when editing these files, do not delete lines you don’t need. Instead, comment them out (insert a # at the start of the line). That way you can easily uncomment the lines to restore their function in the file at a later date.
**Hint:** to edit network files in Linux you must have root authority

## Debian VM

1. First, if the network is started stop it. To do this open a terminal and log in with root authority.
Enter:
	1. *ifdown eth0*
		1. Note: if the network has not been configured or started you may get an error which can be ignored
		2. Note: change the value *eth0* if your interface has a different number or name – this number can be seen in the interfaces file ( see below)
	2. **This step is critical.** If you skip this step, your IP address may revert randomly until the virtual machine is rebooted
2. Edit /etc/network/interfaces with vi, vim, or vim.tiny (use which one works on your VM) e.g.:
	1. vi /etc/network/interfaces
	2. Edit the file to look like the example at the end of this section.
		1. You may need to add lines to the original.
		2. Comment out the dhcp line as below if it is not already commented (# starts a comment).
	3. ***Note***: replace DEBIAN\_IP with your address (in the form 192.168.nn.yy – see above)
3. Bring networking back up
	1. *ifup eth0*
4. Check IP address
	1. */sbin/ifconfig*
		1. Hint: on some systems the explicit directory location /sbin/ is not required. Try *ifconfig* on your system and see if it works.

# Comment out the line below

#iface eth0 inet dhcp

# New definition of eth0. Lines are indented with tabs.

# Replace DEBIAN\_IP address below with your Debian VM IP.

iface eth0 inet static

address **DEBIAN\_IP**

netmask 255.255.255.0

## CentOS VM

Again, as in Debian, you must have root authority to edit or run many of the network files and programs. Also, notice on the CentOS systems the directory names, file names and commands are different than Debian. Be sure you have root authority before editing or running network files.

1. First, shut down the network. Use:
	1. *ifdown eth0*
		1. Note: the name for the NIC will probably be different. Find the name (either ifconfig or look in the directories for the name) and substitute the name of the interface with your name. This name is also typically seen as part of some file names.
	2. **This step is critical.** If you skip this step, your IP address may revert randomly until the virtual machine is rebooted
2. Edit the following file:/etc/sysconfig/network-scripts/ifcfg-eth0
(How you did it in Debian? Remember, to get root authority in CentOS is different than Debian)

**Note:** the example at the end of this section is from the previous version of CentOS, yours will probably look different. We may have an addenda sheet available for the example of a current CentOS configuration file.
3. Bring the network back up
	1. *ifup eth0*
4. Check IP address
	1. */sbin/ifconfig*

DEVICE=eth0

BOOTPROTO=none

# Do not change this line! It contains your VM’s MAC address

HWADDR=00:0c:29:??:??:??

ONBOOT=yes

NETMASK=255.255.255.0

# Replace the IP address below with your CentOS VM IP

IPADDR=**CENTOS\_IP**

TYPE=Ethernet

USERCTL=no

IPV6INIT=no

PEERDNS=no

*Make a copy of the results (as text) of the edited Ethernet config file for both VMs to turn in with the lab report \*\**

# Step 4

## Save your VM images

### To export to an OVA file

1. Shut the VM down
2. In VirtualBox Manager select the VM to back up
3. Under File click Export Appliance
4. Make sure your VM is still selected and click Next
5. Select the location to save it
	1. Either your home network\_storage directory or your USB drive
	2. Name the backup and click save
		1. Do not need to include the .ova extension
	3. Verify the settings and click <Next>, then Export
		1. This will take a couple minutes on the network
		2. USB times will vary by the USB speed

### Copy to personal network directory (NFS file)

Copy your VM images on your local machines drive space (/scratch) to your private network directory – network\_storage. Copy the whole directory and its contents.

### Copy to an off line storage device (USB drive)

Also copy the images from the scratch space to your own device. . Copy the whole directory and its contents. Note how fast it copies compared to the home directory network\_storage copy.

### Delete your VMs from scratch

Remove the VMs you created from the /scratch directory on your workstation.

### “Move” your VM

1. Switch workstations with someone else.
2. Copy one of your VMs from for a saved location (either your USB device or network\_storage.
3. Import then start the VM.
4. Note that it is exactly the same VM you used on the other workstation.

Comment on what differences, if any, there are with the VM on a different workstation. \*\*

# Notes:

Remember, items noted with a \*\* are the key concepts for this lab. Pay special attention to what is done at these steps and why.

# General Notes:

* Safest way to start your VM
	+ Always run your VM from the /scratch directory on your workstation
		- Running your VM from network\_storage ***WILL*** cause you much pain and suffering!
		- Running your VM from your USB device ***usually*** works IF you know what you are doing.
			* It is safer NOT to do it.
	+ After copying your VM to the /scratch directory:
		- Change into your VM directory and locate the XML file for your VM
		- Right click it and tell it to run Virtual Box