Lesson 0
Installing Oracle Linux and Linux Basics (Warm-up Exercises)

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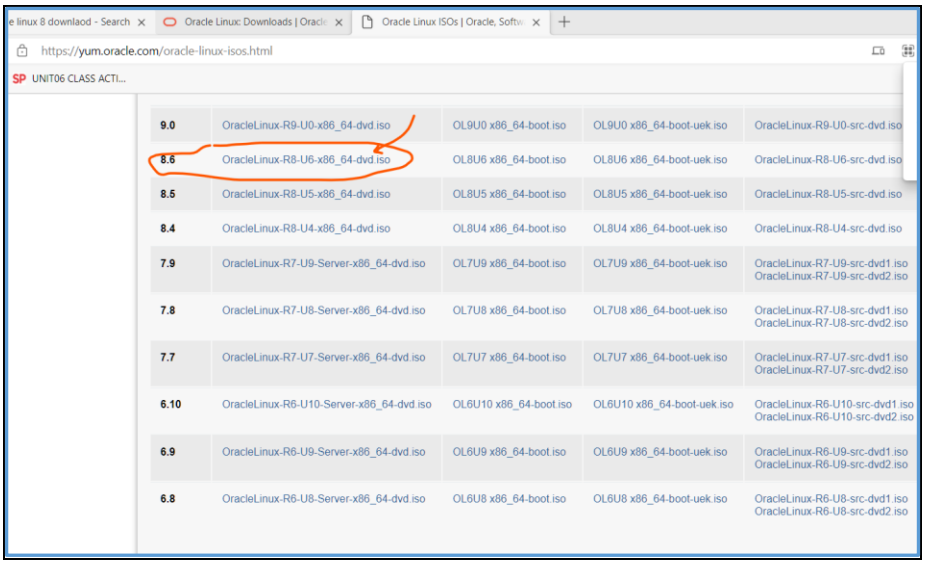
1. ST2412 Lab setup overview

You need to obtain an Oracle 8.6 installation DVD image: "OracleLinux-R8-U6-x86_64-dvd.iso". You need to download it from the one of official download sites.



https://yum.oracle.com/oracle-linux-isos.html ~visited on 11 Sep 2022

You will need two Linux VMs for this module.

Server	Client
One VM will act as your Linux server. You will be doing most of your configuration on the server.	One VM will act as your Linux client. This is used for testing your server.

In common practices, Linux administrators are often carrying out their work at the command line. It is because command line(s) can be easily embedded in script files for repeating and/or batch mode processing. In recent years, it is getting more popular to setup server instances at the cloud platforms. Command line based administration is more suitable for this type of environment too. This module will also be focus on command line based operation model although both VMs are having their GUI enabled.

Please ensure you have downloaded the "OracleLinux-R8-U6-x86_64-dvd.iso" before proceeding to the next step.

2. Installing Oracle Linux to setup your first VM

[Optional - highly recommended to complete this section after your class in week 1]

You may skip this section and go straight to section 3 at below.

1. Watch and follow this step by step video to setup your own las-server VM from the

Oracle Linux DVD image. (Take Note: The following only shows how to install version 8.4. The Installation of Oracle Linux 8.6 is similar.)

Here is the URL to the video (duration-33:23): This link

3. Create your second VM by cloning

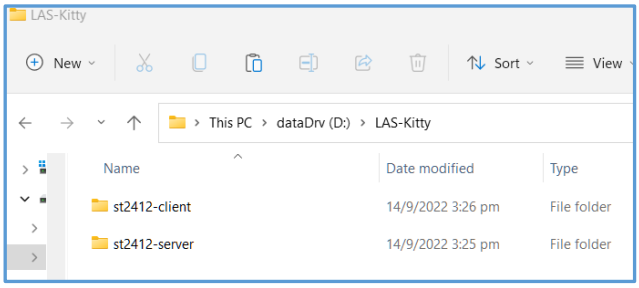
In case you have skipped the Installation exercise described in section 2

1. Create a folder "D:\LAS-*yourname*" (e.g. D:\LAS-kitty).
   (In case your notebook does not have D: drive. You can use C:\LAS-yourname)
2. Download the LAS_ORA_86_server.zip (url: https://www.dropbox.com/scl/fi/3ps0yxj1ymvz00zed5g64/LAS_ORA_86_server.zip?rlkey=3h1ga3ubkgjbf8jofqg212miq&dl=0) and unzip the content into your D:\LAS-*yourname* folder.
3. Ensure the content is stored in the folder, "st2412-server", immediately under your D:\LAS-yourname.
4. That's it. You have your st2412 server VM now.

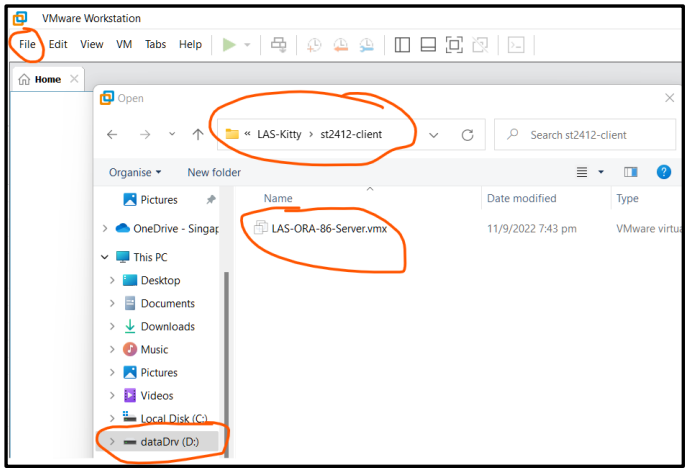
Setting up another Oracle Linux VM to act as the client

You will now clone from the existing st2412-server VM to create the client VM.

1. Copy the folder D:\LAS-*yourname*/st2412-server to D:\LAS-*yourname*/st2412-client. You now have 2 folders, each containing one Oracle Linux VM image.

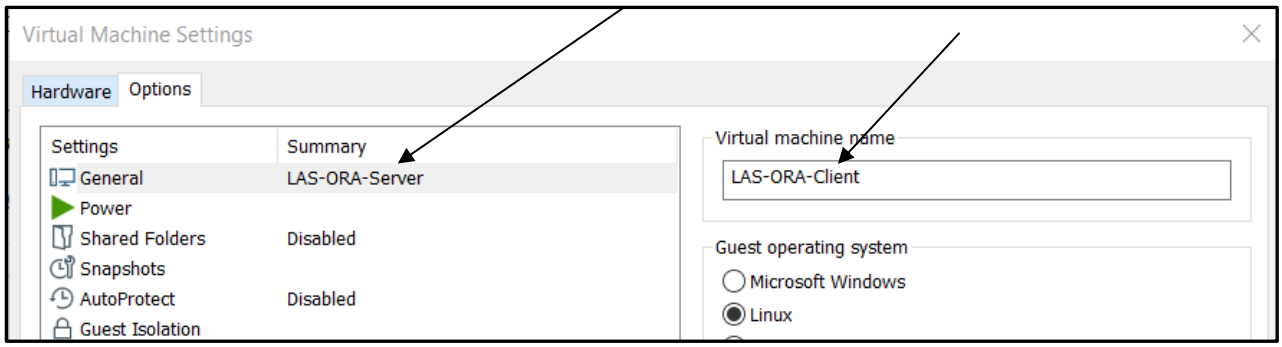


2. Use VMware Workstation to **open** the st2412-client VM.
   - Double click on the LAS-ORA-86-Server.vmx file in the st2412-client folder.



3. Click on “Edit virtual machine settings”.

4. Click on Options tab. Change the virtual machine name from "LAS-ORA-Server" to "LAS-ORA-Client".



5. Save your setting for now. You do not need to start this client VM yet.

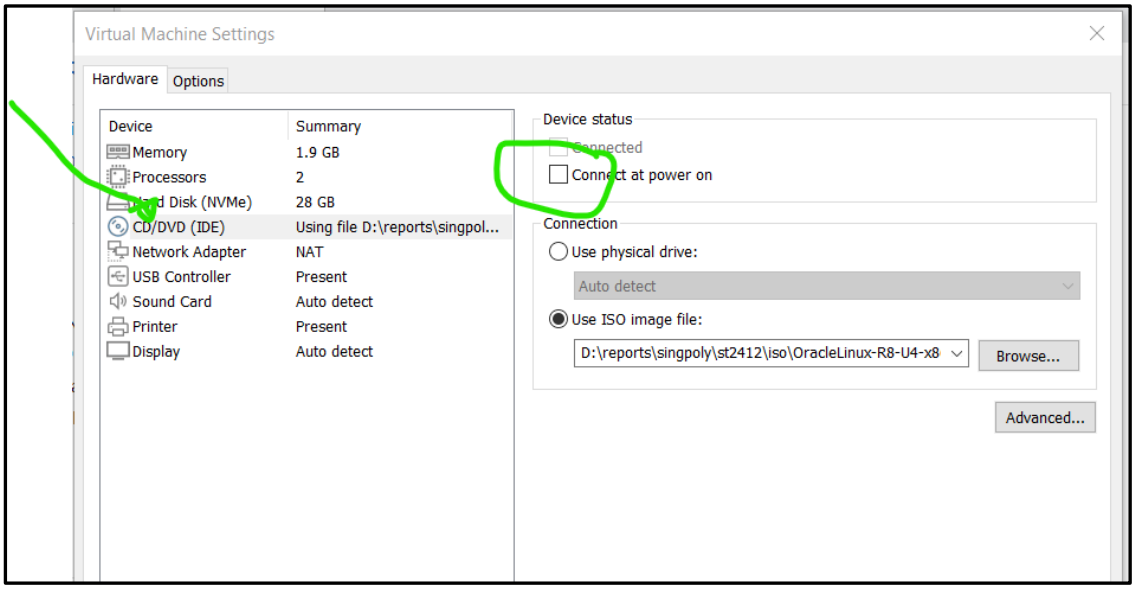
4. Configure the CD/DVD settings and start your VM the first time

Now procced to open the Server VM with VMWare Workstation.

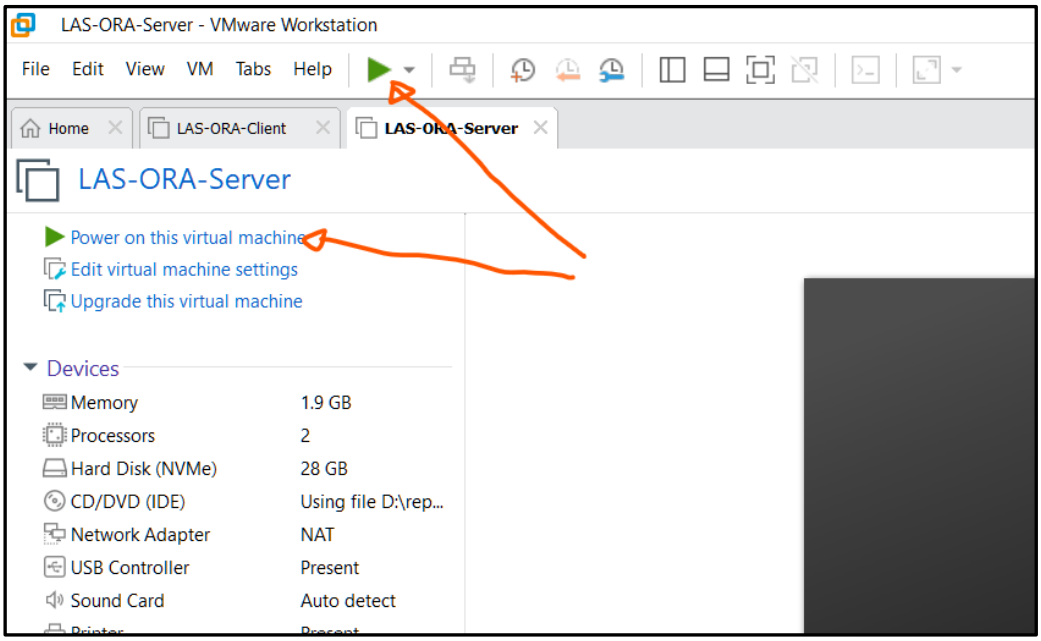
<u>On server VM:</u>

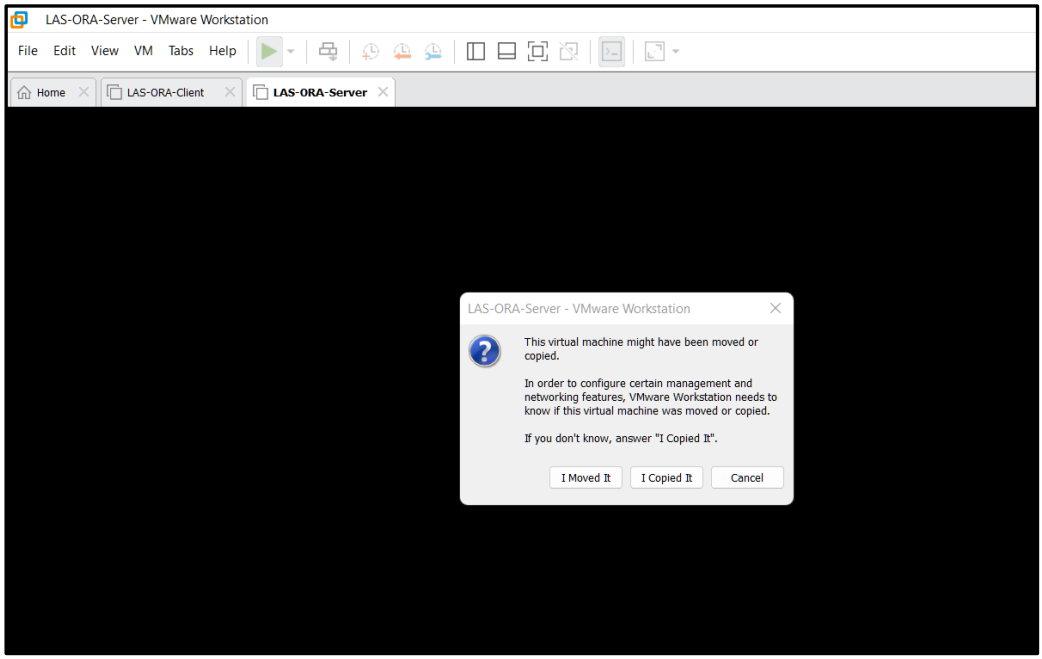
1. Edit Virtual Machine settings and check/update the CD/DVD setting to disable the CD/DVD connection for now.

   Clear the checkbox of "Connect at power on".



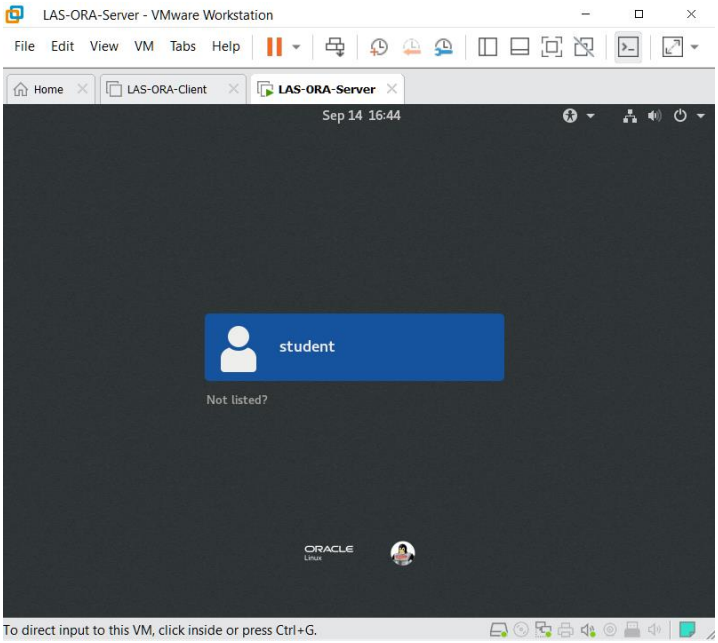
2. Try to start it for the first time*.
   You may click on the Play button on the Menu Bar or the Power on this virtual machine option to start the LAS-ORA-Server.





Press "I Copied it" when you see the popup like the one shown at the above.

3. The following will be shown if the VM has been started successfully*.

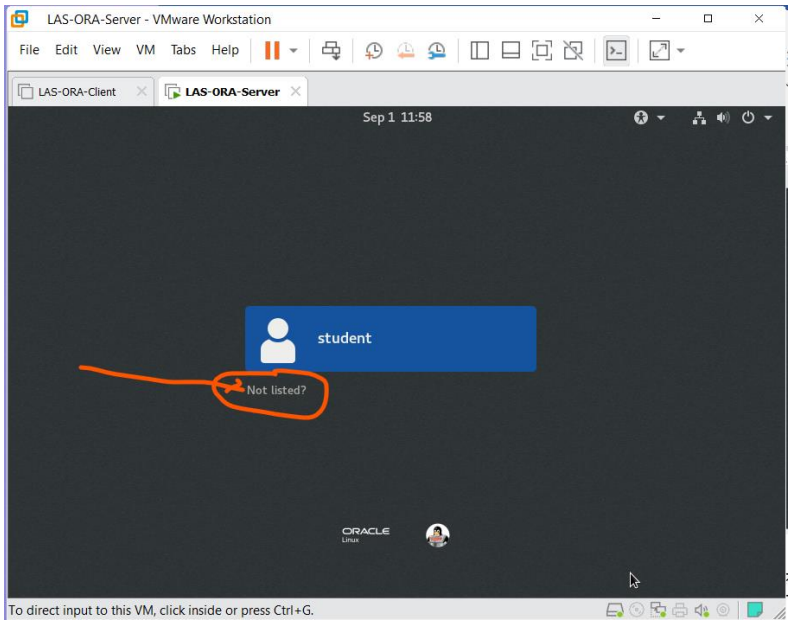


**If you have problem to start the VM, ask help from your tutor. The most probable reasons are the host machine does not enable the Intel VT-x (Virtualization Technology Extension) feature or your Windows Host system has enabled the Hypervisor platform (Refer to Appendix A).*

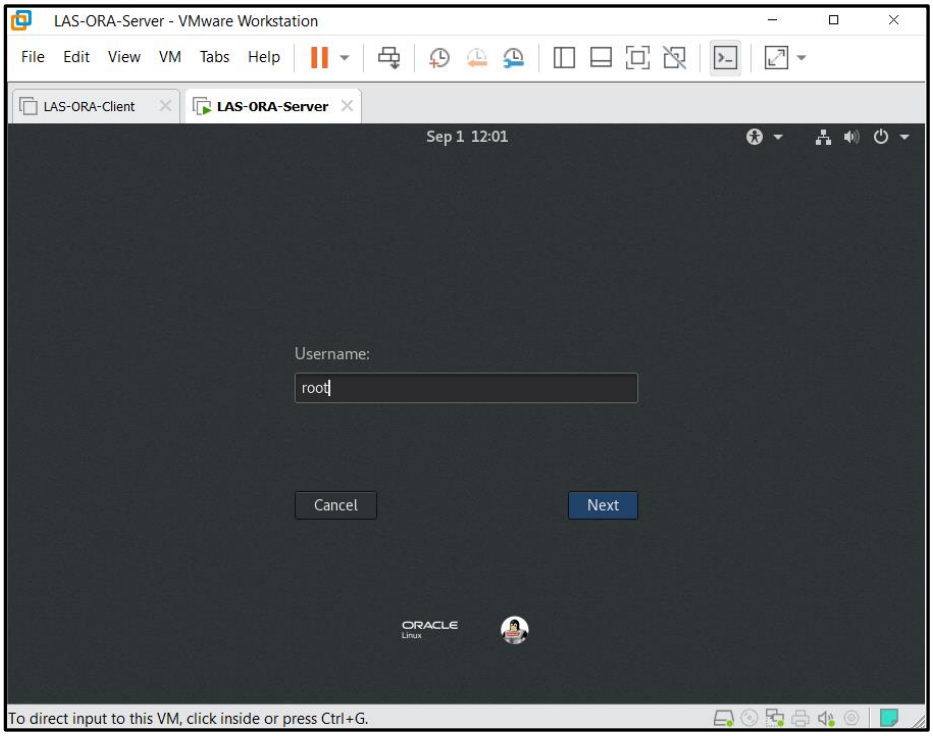
5. View and configure the IPv4 settings and the hostnames for your server and client VMs.

<u>On server:</u>

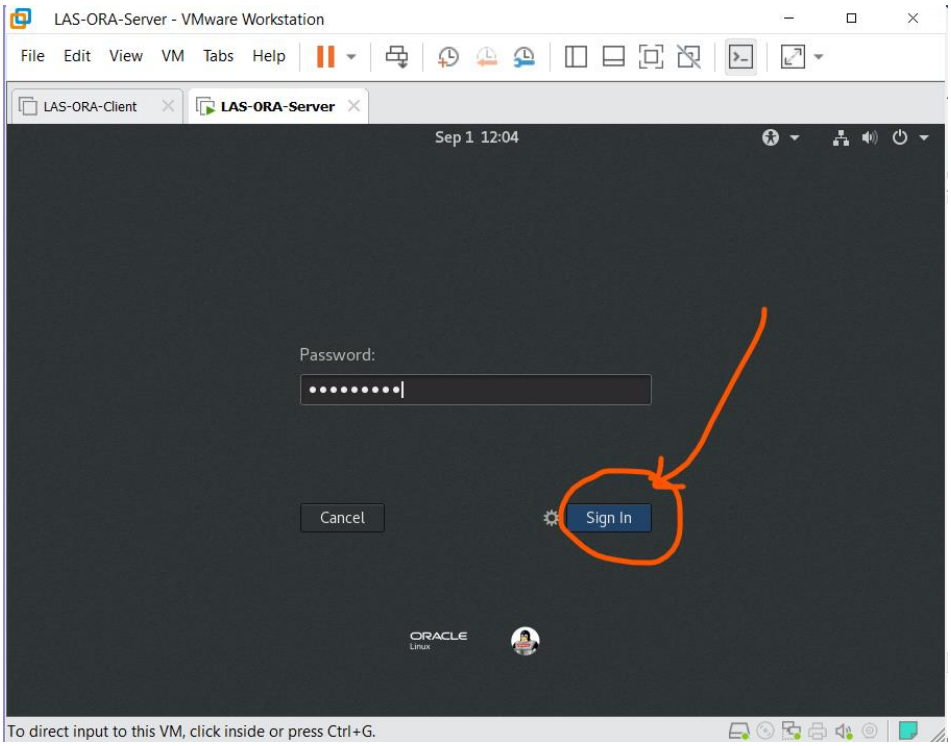
1. Click at the "Not listed?" to bring up the generic login screen.



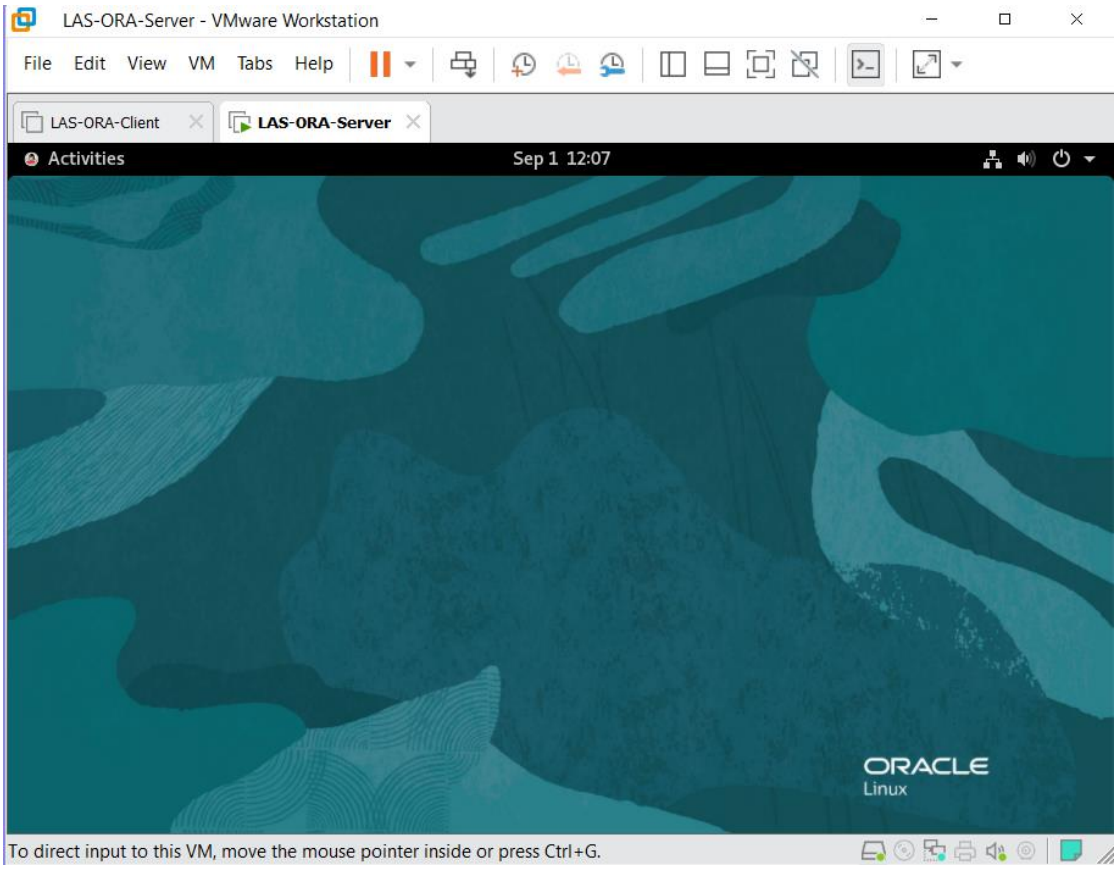
2. Login as root.



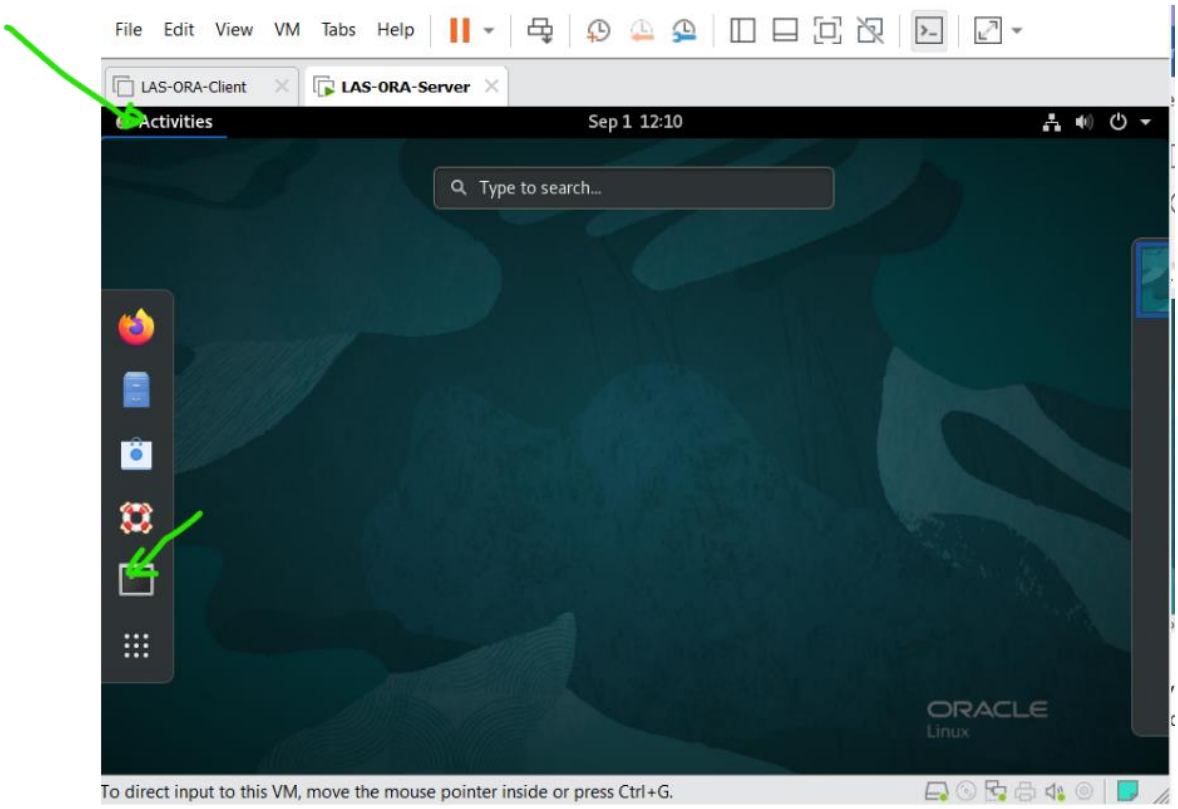
3. Enter the password 1qwer$#@! and click Sign In button to complete the login.



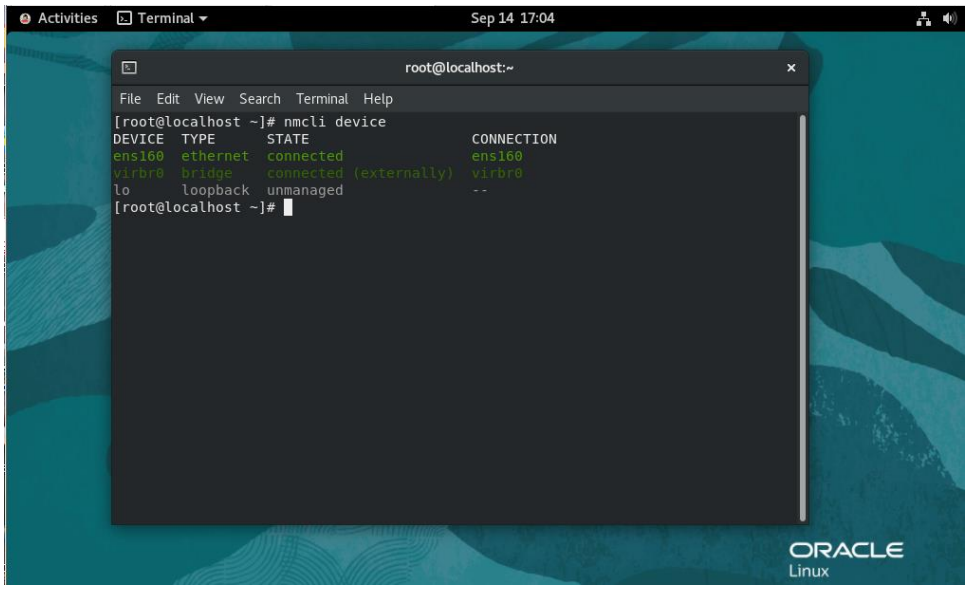
4. As this is your first login session, you will be prompted with a few introduction menus. After you have clear all of these, you will see the default desktop:



5. Click on the Activities tab and bring up the command panel. Client on the terminal icon to bring up a new terminal window.



6. At the command line prompt, type "nmcli device" (or just "nmcli d") to view your current network devices under the control by the Network Manager. You need to find out the name (identifier) of your Ethernet connection.



7. In the above sample, we find out the **ethernet** connection name is 'ens160'.
(Observe the other possible types of network devices)

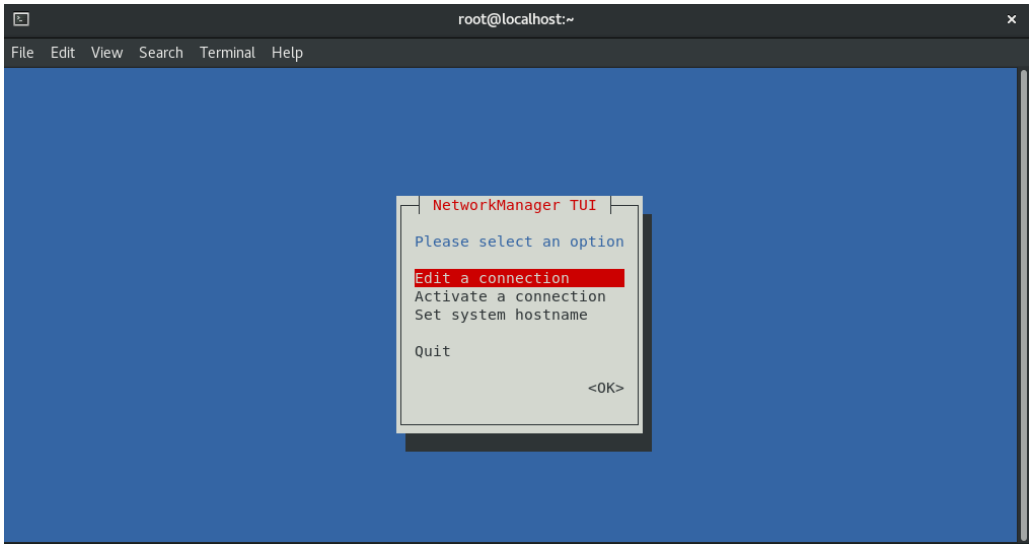
8. Type "nmcli d show ens160" to display all the detail information of your current ethernet connection.

```
[root@localhost ~]# nmcli device show ens160
GENERAL.DEVICE:                         ens160
GENERAL.TYPE:                           ethernet
GENERAL.HWADDR:                         00:0C:29:9A:96:FF
GENERAL.MTU:                            1500
GENERAL.STATE:                          100 (connected)
GENERAL.CONNECTION:                     ens160
GENERAL.CON-PATH:                       /org/freedesktop/NetworkManager/ActiveConnection/1
WIRED-PROPERTIES.CARRIER:               on
IP4.ADDRESS[1]:                         192.168.30.128/24
IP4.GATEWAY:                            192.168.30.2
IP4.ROUTE[1]:                           dst = 0.0.0.0/0, nh = 192.168.30.2, mt = 100
IP4.ROUTE[2]:                           dst = 192.168.30.0/24, nh = 0.0.0.0, mt = 100
IP4.DNS[1]:                             192.168.30.2
IP4.DOMAIN[1]:                          localdomain
IP6.ADDRESS[1]:                         fe80::20c:29ff:fe9a:96ff/64
IP6.GATEWAY:                            --
IP6.ROUTE[1]:                           dst = fe80::/64, nh = ::, mt = 100
IP6.ROUTE[2]:                           dst = ff00::/8, nh = ::, mt = 256, table=255
[root@localhost ~]#
```

9. Based on the output from your own VM, write down your current IPv4 Settings:
   - address (with netmask prefix) : _____ (Sample: 172.16.10.128/24)
   - gateway:_____ (Sample: 172.16.10.2)
   - DNS:_____ (Sample: 172.16.10.2)
10. Now you may write down the static IP address for your server here: _____.88 (If your IP address is 172.16.10.128, the static IP address of the server should be 172.16.10.88). We use 88 here is mainly because it is easy to remember and host id >= 128 is usually reserved for DHCP allocation.

11. Next, we will try to change the configuration of your network IP setting from dynamic allocation based to static based. nmcli is a very powerful Network Manager command tool which can be used to configure your ens160 interface. However, let us first try to use an easier tool, nmtui, to configure your IPv4 setting.

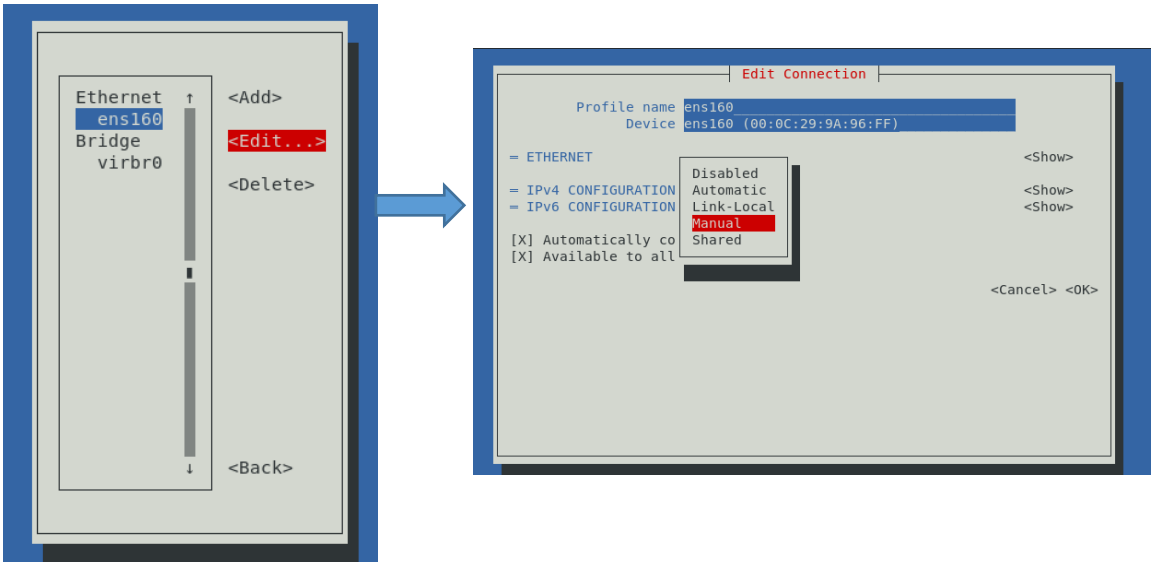
12. Type in **nmtui** at the command promt to bring up the Network Manager Text UI utility.



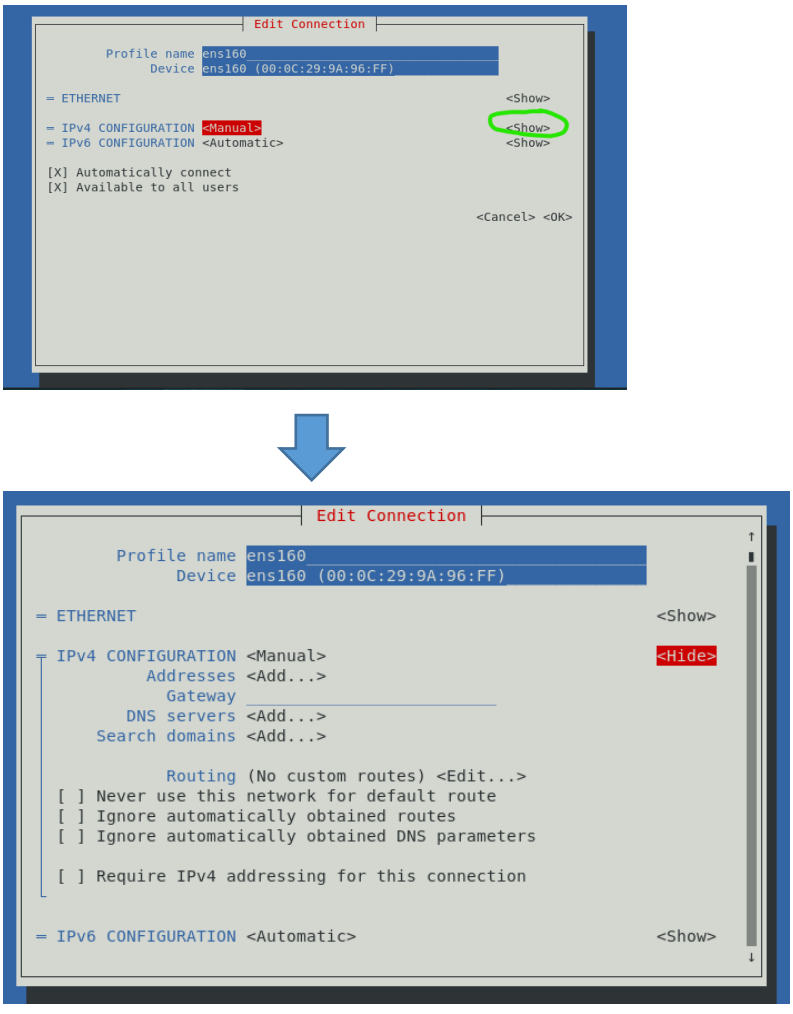
Select Edit a connection option and click <OK>. (Use arrow key to select and Tab key to choose the <OK>, press ENTER Key to proceed.)

13. In the next menu, select ens160 under the Ethernet Section and highlight the <Edit...>

option. Press ENTER Key to proceed. In the Edit Connection menu, select the IPv4 CONFIGURATION entry and press ENTER Key. Then choose Manual option as shown , press ENTER Key to proceed.



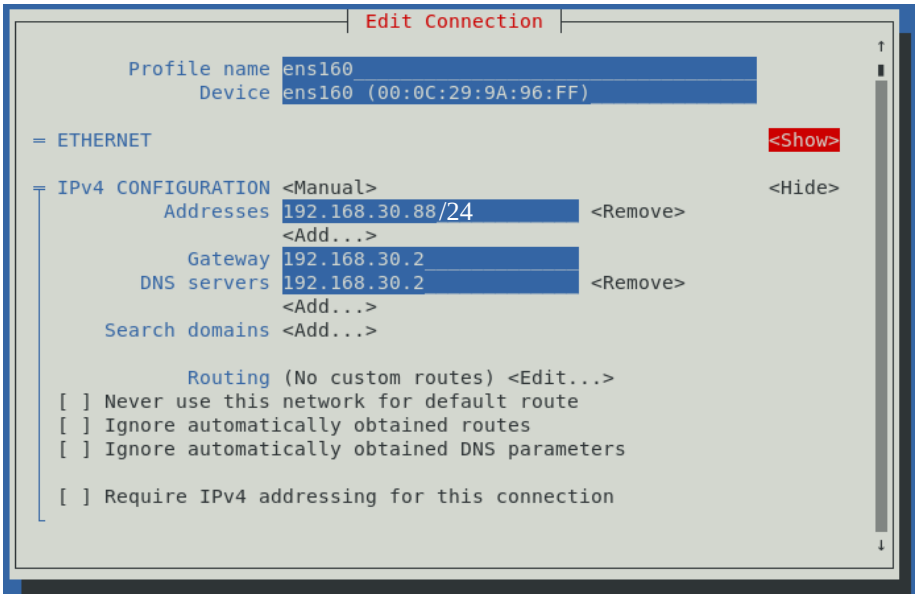
14. Once the IPv4 CONFIGURATION is set to Manual, select the corresponding <SHOW> option and press ENTER Key to expand and display the complete IPv4 CONFIGURATION.



15. Now you can edit the Addresses, Gateway and DNS servers settings.

    These values are related to the output values from the earlier nmcli command.

    Take note that you need to provide the static IP address with the CIDR Subnet Mask Notation.

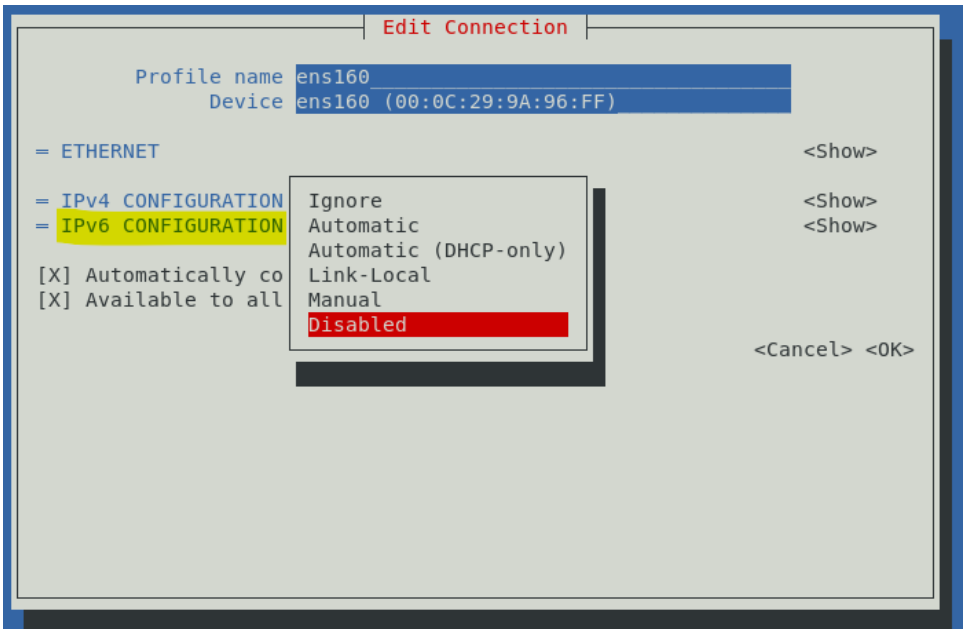


    You may also take note that, you may enter more than one IP address in the Addresses and DNS servers fields. For now, we only bind one single IP address to the ethernet interface and only define one single DNS server.

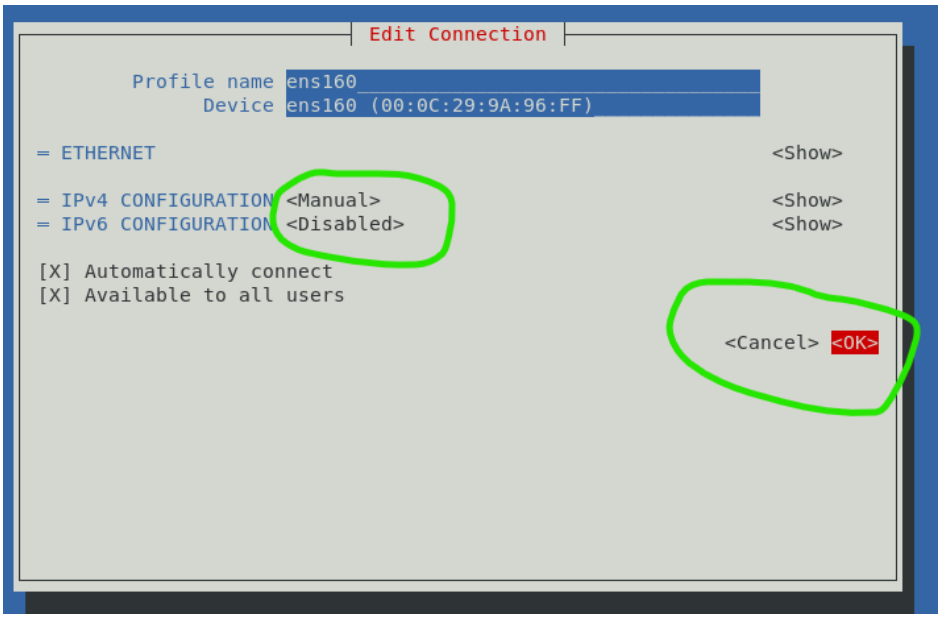
    In VMWare Network, the gateway and DNS server are both provided by the VMWare Workstation software, they share the same IP address. Gateway is responsible to connect your VM to the outside network (Internet), and the DNS server will listen on port 53 (UDP) to provide the DNS service to your VM.

16. Next is to disable the IPv6 protocol for your ethernet interface.

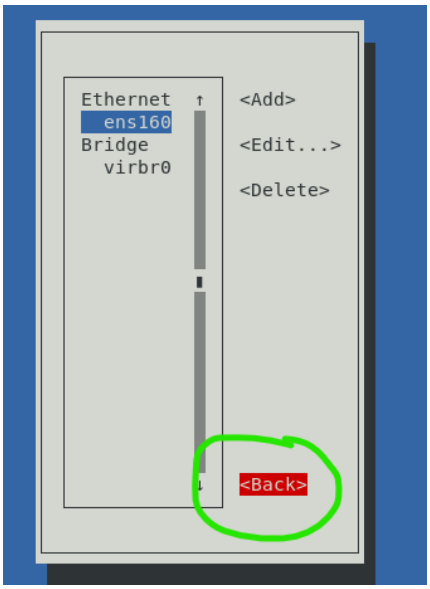
    First, hide your IPv4 Configuration to restore the screen size.



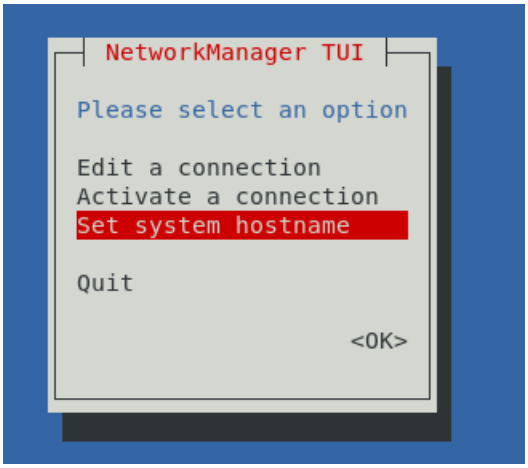
17. You may commit all the changes by **scrolling down to the bottom** of the menu and click on the OK option. It will bring to back to the previous menu.



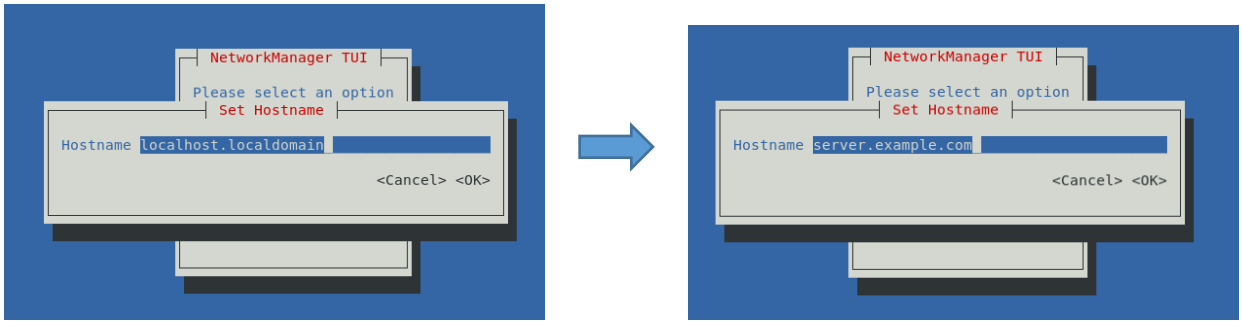
18. In the next screen, you may press on the <Back> button to return to the main menu.



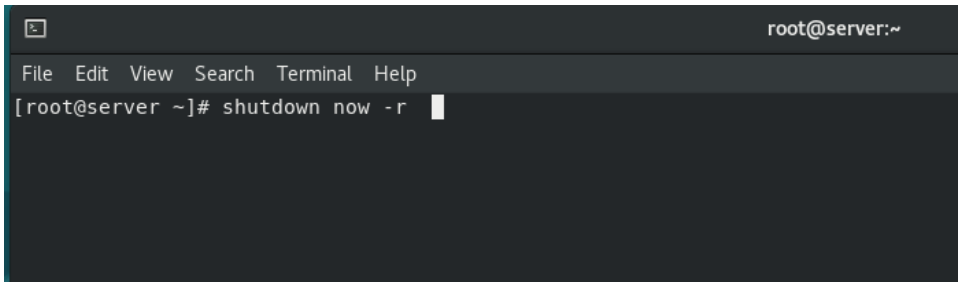
19. When you are back to the main menu of the nmtui, you can select the ''Set system hostname" to view and set your current hostname.



20. Change your hostname from the default, localhost.localdomain, to server.example.com and commit the change.



21. At this point, your hostname should be changed already. However, you must restart your server to let the updated IPv4 address take effect. **Restart your server now.**



There are many ways to restart your Linux VM, one old fashion is to enter the 'shutdown' command with three options:

now

-r

now - (without it, the shutdown will begin in 1 minute later. A notification message will be broadcasted to all logged on users to prompt them to stop their working tasks and logout. Since we are the only user in the system. Using now option is fine.)

Try 'man shutdown' to find out what is the function of the -r option.

Extra Information:

You can also set hostname by other ways:

For instance, by hostnamectl command

Type `hostnamectl` to view your current hostname.

Use the hostnamectl command to set your hostname to “server.example.com”

Type `hostnamectl set-hostname server.example.com`

Or by updating the system configuration file /etc/hostname

You can also set the hostname by editing the file /etc/hostname and you will need to restart the system for the change to take effect.

Tips on Auto-Complete. Remember you can always use the tab key to auto-complete your commands. For example, if you know that the command to change hostname start with the string “host”, you can type “host” and then hit the tab key to see the available commands. Continue hitting the tab key to see the possible options.

On client :

1. Disable the CD/DVD connection at the VM setting manual.
2. Power on the client.
3. Login as root. (The root password is "1qwer$#@!")
4. Check that the client VM IP address settings using the "nmcli d show ens160" command.

```
[root@localhost ~]# nmcli d show ens160
GENERAL.DEVICE:                         ens160
GENERAL.TYPE:                           ethernet
GENERAL.HWADDR:                         00:0C:29:A6:1B:AD
GENERAL.MTU:                            1500
GENERAL.STATE:                          100 (connected)
GENERAL.CONNECTION:                     ens160
GENERAL.CON-PATH:                       /org/freedesktop/NetworkManager/ActiveConnection>
WIRED-PROPERTIES.CARRIER:               on
IP4.ADDRESS[1]:                         192.168.30.130/24
IP4.GATEWAY:                            192.168.30.2
IP4.ROUTE[1]:                           dst = 192.168.30.0/24, nh = 0.0.0.0, mt = 100
IP4.ROUTE[2]:                           dst = 0.0.0.0/0, nh = 192.168.30.2, mt = 100
IP4.DNS[1]:                             192.168.30.2
IP4.DOMAIN[1]:                          localdomain
IP6.ADDRESS[1]:                         fe80::20c:29ff:fea6:1bad/64
IP6.GATEWAY:                            --
IP6.ROUTE[1]:                           dst = fe80::/64, nh = ::, mt = 1024
lines 1-17/17 (END)
```

(You may need to press Ctrl-C to exit from the nmcli command.)

5. Write down your current assigned IP address :_____.
6. You will let the client VM continue uses dynamic IP setting.
7. Use the hostnamectl command to check the current host name.

```
[root@localhost ~]# hostnamectl
   Static hostname: localhost.localdomain
         Icon name: computer-vm
           Chassis: vm
        Machine ID: 54ea622497f44d3a94b4539bcfd728f9
           Boot ID: 678b73449ef24ff4a87a4b9fbf0c2a12
    Virtualization: vmware
  Operating System: Oracle Linux Server 8.6
       CPE OS Name: cpe:/o:oracle:linux:8:6:server
            Kernel: Linux 5.4.17-2136.307.3.1.el8uek.x86_64
      Architecture: x86-64
[root@localhost ~]#
```

8. Set your 'static hostname' to 'client.example.com' using the hostnamectl command:

```
hostnamectl set-hostname client.example.com
```

```
[root@localhost ~]# hostnamectl set-hostname client.example.com
[root@localhost ~]# hostnamectl
   Static hostname: client.example.com
         Icon name: computer-vm
           Chassis: vm
        Machine ID: 54ea622497f44d3a94b4539bcfd728f9
           Boot ID: 678b73449ef24ff4a87a4b9fbf0c2a12
    Virtualization: vmware
  Operating System: Oracle Linux Server 8.6
       CPE OS Name: cpe:/o:oracle:linux:8:6:server
            Kernel: Linux 5.4.17-2136.307.3.1.el8uek.x86_64
      Architecture: x86-64
[root@localhost ~]#
```

On server and client:

1. Check that the client and server hostname are both set correctly

i.e. at the client command prompt, type `ping client.example.com -c 5`

at the server command prompt, type `ping server.example.com -c 5`

For example:

```
[root@server ~]# ping server.example.com -c 5
PING server.example.com (192.168.30.88) 56(84) bytes of data.
64 bytes from server.example.com (192.168.30.88): icmp_seq=1 ttl=64 time=0.055 ms
64 bytes from server.example.com (192.168.30.88): icmp_seq=2 ttl=64 time=0.160 ms
64 bytes from server.example.com (192.168.30.88): icmp_seq=3 ttl=64 time=0.152 ms
64 bytes from server.example.com (192.168.30.88): icmp_seq=4 ttl=64 time=0.095 ms
64 bytes from server.example.com (192.168.30.88): icmp_seq=5 ttl=64 time=0.157 ms

--- server.example.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4075ms
rtt min/avg/max/mdev = 0.055/0.123/0.160/0.044 ms
[root@server ~]#
```

2. Check that the client is able to ping the server and vice versa.

e.g. at the client command prompt, type `ping <IP address of your server> -c 5`

at the server command prompt, type `ping <IP address of your client> -c 5`

3. Verify that the hostnames are only working in their own systems

e.g. at the client command prompt, type `ping server.example.com -c 5`

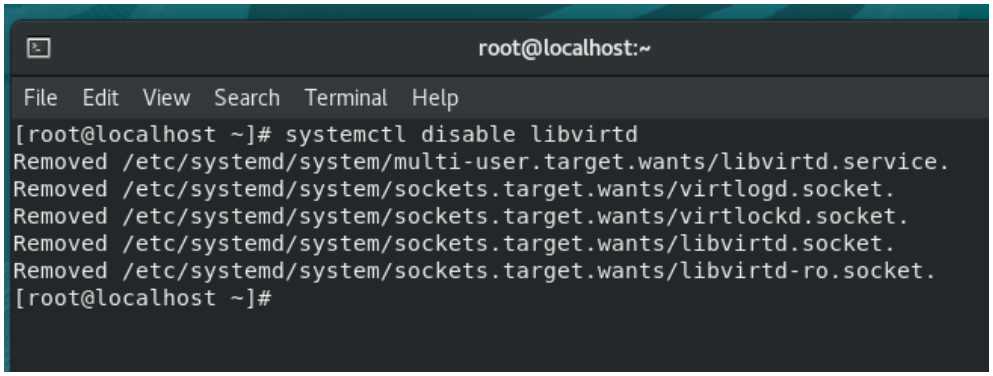
at the server command prompt, type `ping client.example.com -c 5`

The above two ping operations should not work (unless it pings to a real external server with the matched host names, but the ip addresses will be different.).

4. Disable the annoying virbr0 device from the two systems.

Virbr0 is a virtual network bridge device for the Linux's own virtualization solution (To run virtual machines in the Linux system). In our case, we will not run any vms in our Oracle Linux systems. Thus we shall remove this virbr0 device from the system. To do that, we simply disable the 'libvirtd' service (user the systemctl command) and reboot the system:

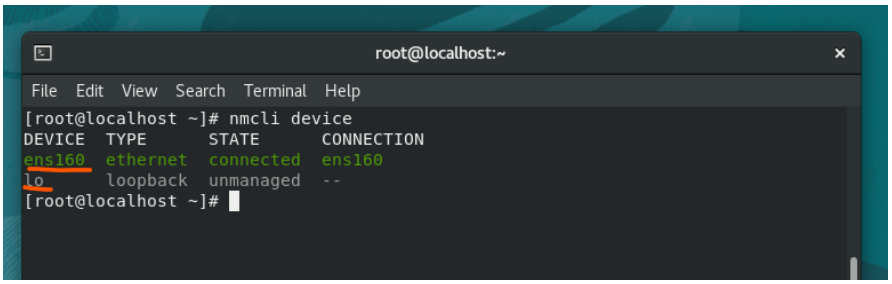
at the client command prompt, type `systemctl disable libvirtd`



Now reboot the client system.

Repeat the same step for the server system.

After both systems are restarted, try to run 'nmcli device' to check if the virbr0 device is disappeared.



6. su to another user account

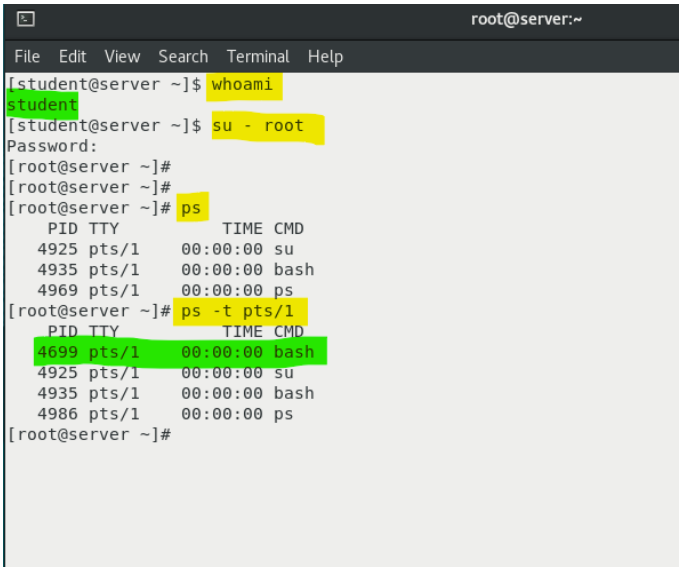
su is the command to substitute your current login session with another user's account.
It is useful for the system administrator to troubleshoot user issues.
On the other hand, user can also use su command to switch to a privileged account (if the password is known), though this practice is not recommended.

On server:

1. Login as user student. (the password is 'user'.)
2. Open a new terminal, at the command prompt, do a su to user root.

   `su - root`

   This command let a user create a shell session with the root user's identity (and the same privilege)



In the above screen shot:

- We use the 'whoami' command to display my login id.
- We then use the ps command to identify the current virtual terminal device (ie. pts/1) with all the processes that run on my current login session.
- First we can see the **su** process (with the process id 4925.) and we can see a **bash** (Terminal shell session with the process ID 4935) is running and assocating with pts/1.
- The process with a smaller process id implies it starts earlier. Therefore, we can tell the **bash** is created after the **su** process. In fact, the **bash** is created by the **su** process.
- Next, we can use the `ps –t pts/1` command to verify that there are two bash (shell) sessions running in the virtual terminal device pts/1.
- One for the student account (the PID is smaller - means created earlier) and the other

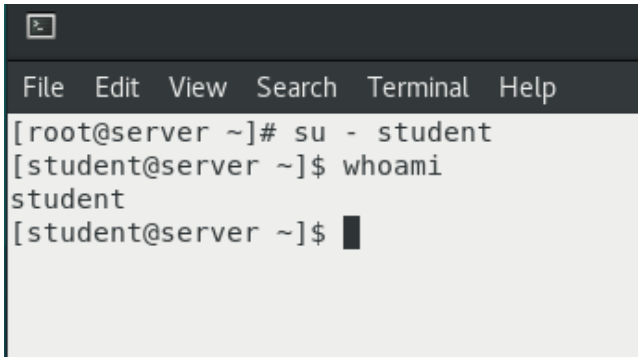
(with a larger PID number) is invoked by the su command.

3. Type exit to exit the **su** command (and close the corresponding bash)
4. Logout from the student account and login to the root account.

(Follow the above, in case you do not know how to logout from the GUI.)

5. After successfully login to the system as root. Open a new terminal , at the command prompt, do a **su** to user student.

`su - student`



As you can see, root user can use **su** command to assume the identity (and the corresponding privilege) of another user too. It is a very useful for troubleshooting issues that user is facing. In this case, no password prompt is required.

6. Remember to type exit to quit from the **su** session and resume to the root user session.

7. Just one minor remark : when su – is running without the user id, the default is to substitute to the root account.

`su -` is a shortcut for `su - root`

7. Virtual Consoles and GUI desktop.

<u>On server:</u>

1. Login as root.
2. Use Control-Alt-F2 to F6 to toggle between the virtual (tty) consoles (tty2 to tty6).
3. Use Control-Alt-F1 to bring you to a new GUI desktop login screen.
   Note: Every time you press Control-Alt-F1 will give you a new GUI Display.
4. Login to the student account
5. Use Control-Alt-F7 to F9 to look for your previously root GUI display.
   Note: Your existing GUI display will be shifted when new GUI display is created.
6. Find all your GUI display and logout from them.

To Summarize:
Control-Alt-F2 : your first GUI display.
Control-Alt-F3 to Control-Alt-F6: your virtual text terminals.
Control-Alt-F1: Start to login to a new GUI display.
Control-Alt-F7 to Control-Alt-F9: additional GUI sessions you have created via Control-Alt-F1.

Caveat: Pressing Control-Alt-F1 and logging on to new GUI sessions may use up your system resource very fast.

Can you suggest one or two use cases for these virtual consoles?

8. Creating user accounts

On server: (login as root)

1. Create three new user accounts: peter, paul and mary by using the **useradd** command.

```
useradd peter
useradd paul
useradd mary
```

Tips: You may use the Up Arrow Key to retrieve your previous input line. It helps a lot when you are executing a few similar commands.

2. Verify that all these users are belonging to different user group (the group name is the same as their login id)

   Use **groups** command to print the groups of a user account.

   e.g.

```
[root@server ~]# useradd peter
[root@server ~]# useradd paul
[root@server ~]# useradd mary
[root@server ~]#
[root@server ~]# groups peter
peter : peter
[root@server ~]# groups paul
paul : paul
[root@server ~]# groups mary
mary : mary
[root@server ~]#
```

3. The useradd command only adds the user account and define a default home directory for the user id. However, there is no password set for the new account.

   We shall set the passwords for the three newly created accounts with the **passwd** command.

   Let's set their passwords to be same as their login id.

   passwd peter

   passwd paul

   passwd mary

```
[root@server ~]# passwd peter
Changing password for user peter.
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: all authentication tokens updated successfully.
[root@server ~]# passwd paul
Changing password for user paul.
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: all authentication tokens updated successfully.
[root@server ~]# passwd mary
Changing password for user mary.
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: all authentication tokens updated successfully.
[root@server ~]#
```

   As shown at the above, the passwd command complains the passwords we have set are too short. However, we can force the system to accept them.

9. Creating user groups

On top of the default user group being created for each user account. We can assign an account to additional user groups.

On server: (login as root)

1. Create a new group ppm with the command **groupadd**.

   groupadd ppm

2. Add * the users peter, paul and mary to the group ppm with the command **usermod**.

```
usermod –aG ppm peter
usermod –aG ppm paul
usermod –aG ppm mary
```

*The -a option in the above usermod command works with the -G option. It states that the user will be 'ADD' to the new group. The user remains in their primary group. Missing the -a option will move the user from the original primary group to the newly assigned group.

3. Verify the groups these three user accounts belong to:

   You can use one single groups command to check for all :

```
[root@server ~]# groups peter paul mary
peter : peter ppm
paul : paul ppm
mary : mary ppm
[root@server ~]#
```

4. How to remove a user from a group ?

   Interesting enough, usermod only provides append user to a group : 'option a'. There is no remove from a group option with the usermod command.

   In our case, if we want to remove mary from the ppm group we can do this:

   `usermod -G mary mary`

   Using -G without the 'a' will set the group membership for the user. In the above command, it sets user, mary, only belongs to group, mary.

```
[root@server ~]# groups mary
mary : mary ppm
[root@server ~]# usermod -G mary mary
[root@server ~]# groups mary
mary : mary
[root@server ~]# usermod -aG ppm  mary
[root@server ~]# groups mary
mary : mary ppm
[root@server ~]#
```

   The above demonstrate how to 'remove' mary from and add her back to the ppm group.

10. Editing and Viewing Text Files

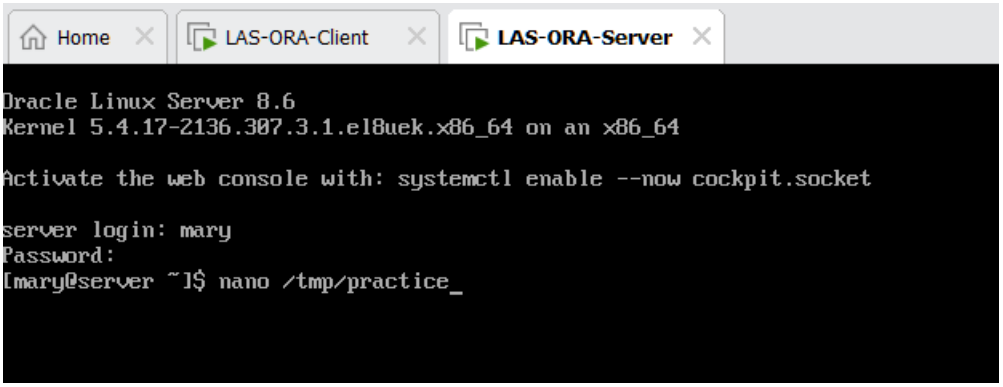
In this module, we need to edit and maintain many configuration files. Using a simple command line based text editor is more appropriate for this type of operations.

On server:

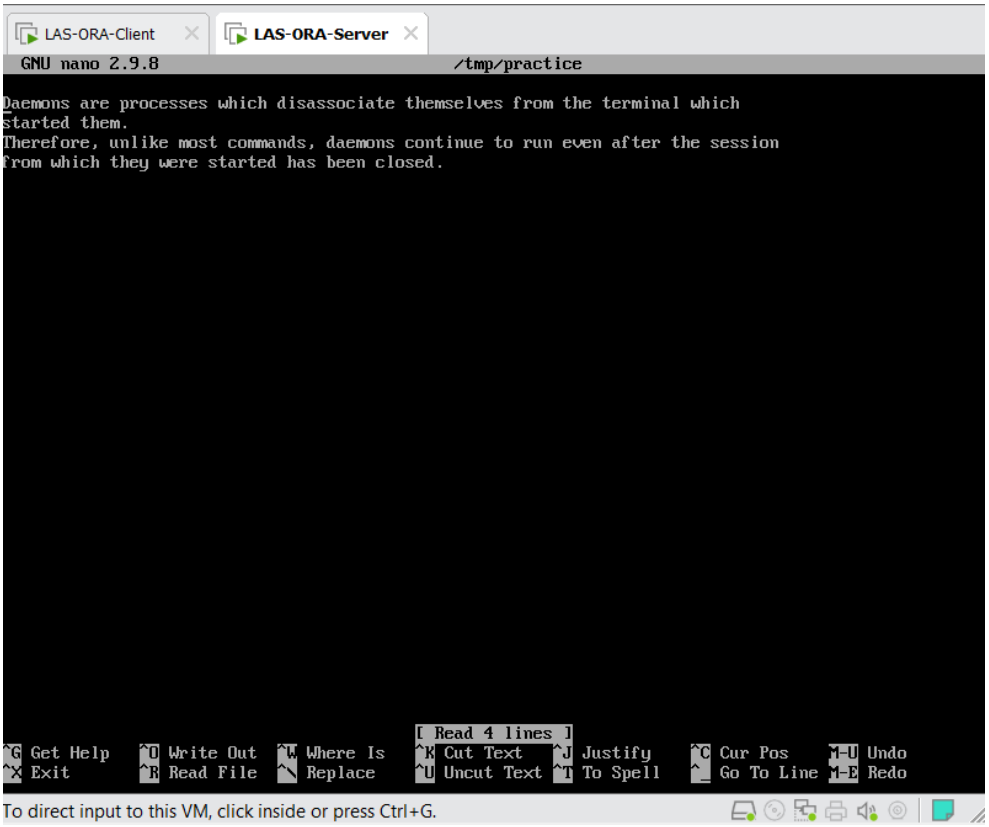
1. Use Ctrl-Alt-F3 to bring up a virtual text console. Login as user mary via this console. Use an editor to create a file called "practice" in the /tmp directory. Enter the following data into the file :

> Daemons are processes which disassociate themselves from the terminal which started them.
>
> Therefore, unlike most commands, daemons continue to run even after the session from which they were started has been closed.

If you are not familiar any Linux text editor you may use **'nano'**, which is the easier to use text editor. Please try to avoid to over relying on any GUI based text editor (e.g. gedit). For a simple reason, whenever there is need for a Linux administrator to access to a system for urgent troubleshooting or system rescue operations, the GUI, most probably will not be available. That also explains why almost all experienced Linux administrators are familiar with 'vi' and/or 'Emacs', (perhaps the two most powerful text editors - https://en.wikipedia.org/wiki/Editor_war).



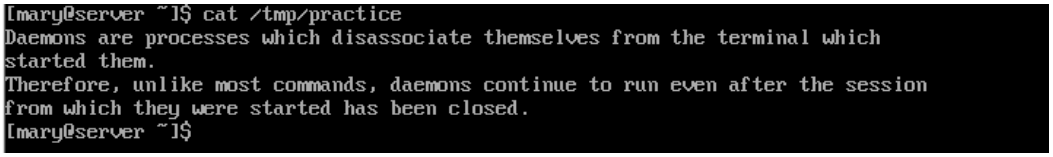
(The above console screen is brought up by pressing Ctrl-Alt-F3 at the server system.)



Use Ctrl-X to exit the nano editor when you are done.

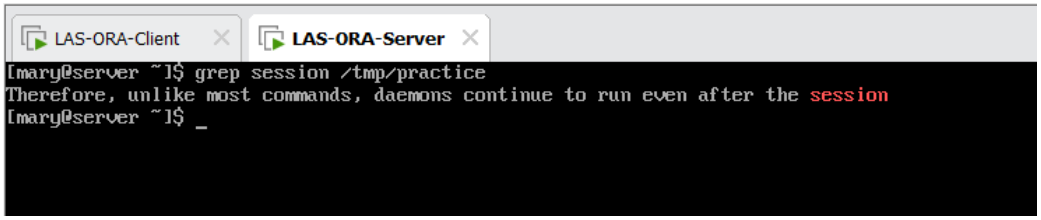
2. View the file contents using the cat command.

```
cat /tmp/practice
```



3. Search for lines that contain the string “session”.

```
grep session /tmp/practice
```



11. File Ownerships and Permissions

Continue from the previous section:

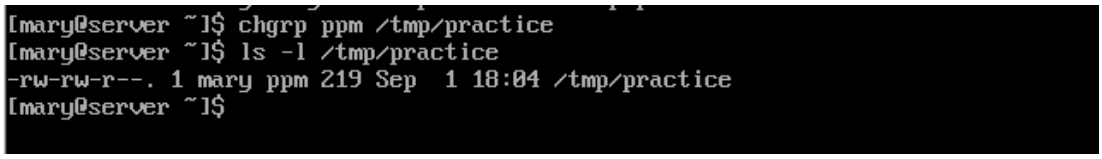
1. List out the current file attributes of /tmp/practice using ls -l /tmp/practice.

The current owner id and group id of the file are both set to 'mary'.

2. Change the group id of the file to ppm by using the **chgrp** command.

```
chgrp ppm /tmp/practice
```

3. List out the file attributes one more time to observe the chgrp effect.



4. Set the file permissions to the following by using the **chmod** command:

   User : Read and Write

   Group : Read only

   Other : No permission

   There are two ways* to use chmod command to accomplish the requirement.

   (*You may refer to this short YouTube video to find out these two ways)

   First way is the octal-mode approach:

```
chmod 640 /tmp/practice
```

The other way is the symbol mode approach:

```
chmod u=rw   /tmp/practice
chmod g=r    /tmp/practice
chmod o=     /tmp/practice
```

The targeted users will be referred using the combination of [ugoa]

ie. each letter represents one type of user: [u]ser, [g]roup,[o]ther, [a]ll

The effective file permissions will be the combination of [+-=] and [rwxXst]

The above three chmod commands can also be combined in one line:

```
chmod u=rw,g=r,o= /tmp/practice
```

Take note that, no extra spaces is allow between the ',' in the above command.

5. As user peter or paul, test that you can read but not modify the file.
6. As user student, test that you do not have permission to neither read nor modify the file.
7. After completed all the above tests, shutdown your Server VM.

Up to this point, this lesson helps you to recap some of the basic Linux commands and their usages. The remaining sections are more challenging, as you will need to setup your own Software Package Repository at the server VM. This repository can then support other system to get and install the software packages available in the server VM via the network.

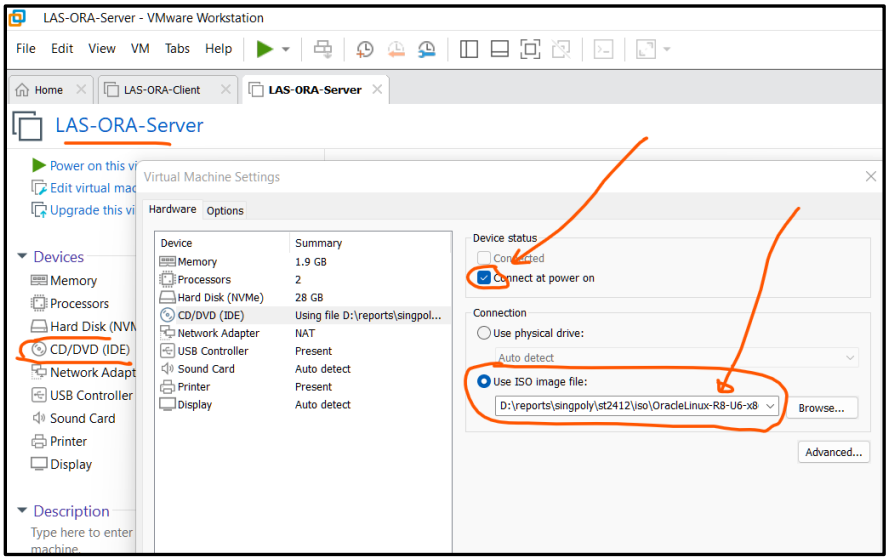
12. Copy all the rpm files from the DVD to the Server VM

The Oracle Linux installation DVD contains software files (called rpms) which we will copy to our system. You should have already downloaded the iso image from the Oracle Linux site. (Note: Look for the exact version that match with your installation - "OracleLinux-R8-U6-x86_64-dvd.iso".)

On server:

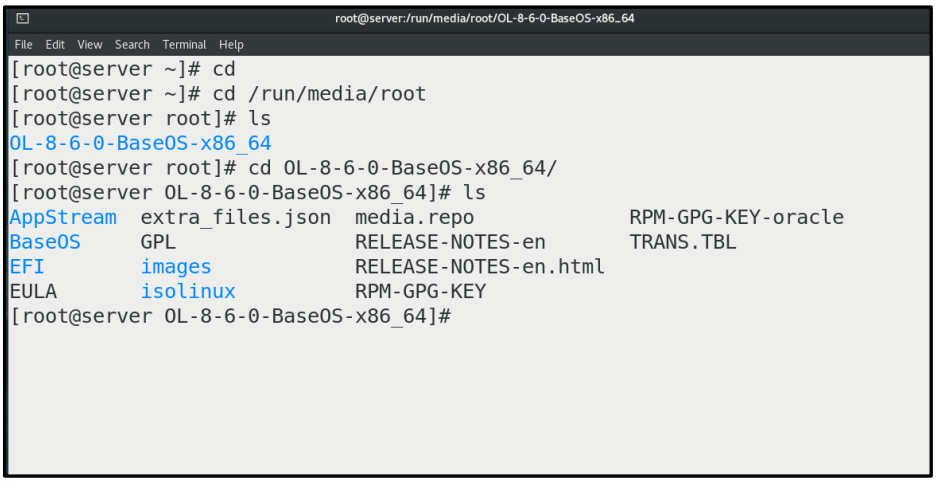
1. Assume the VM is at power off state.
2. In the VMware menu, click on VM, Settings.
3. Select CD/DVD. Ensure the Use ISO image file has set to the Oracle Linux 8.6 iso file. (e.g. D:\reports\singpoly\st2412\iso\st2412\iso\ OracleLinux-R8-U4-x86_64-dvd.iso). Take note that, the location of the iso file **may not be** the same as the path shown in the following sample screen shot.
4. Ensure the Connected at power on check box is selected.

   (If the VM is already in powered on state, you can click the 'Connected' check box, to simulate inserting the DVD to the system.)



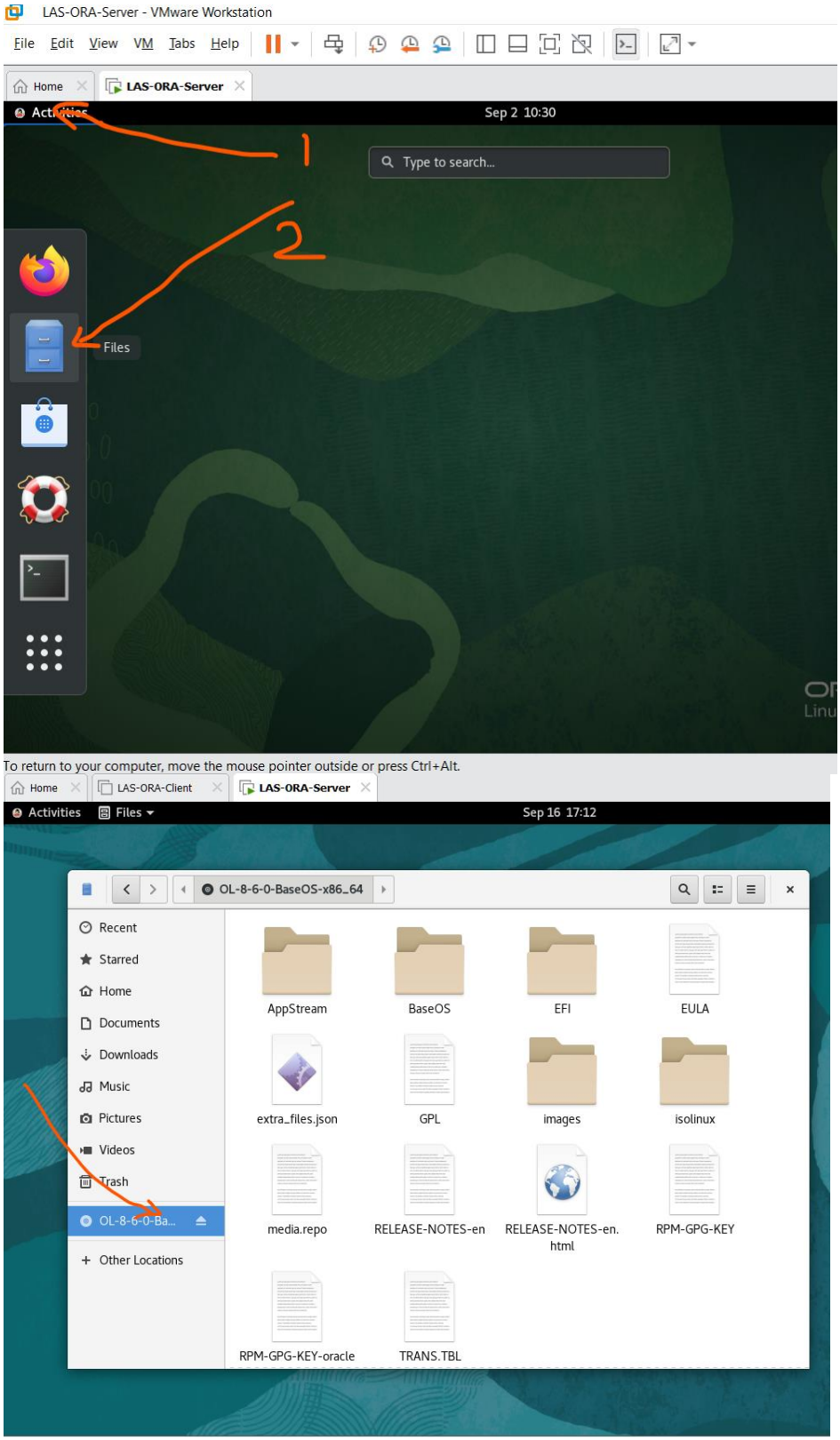
5. Click OK.
6. If your server is not started, start it now.
7. Login as root.
8. Open a new terminal. Locate and verify the whereabouts of the DVD content. By default, you should be able to find it at /run/media/root*

```
cd /run/media/root
ls
cd  OL-8<Tab>
ls
```



(Note: Remember to use the auto-complete feature instead of typing in the DVD folder name. If you are logged in as student at the GUI, the DVD will be mounted under /run/media/student)

9. Another way to verify the DVD is 'mounted' to the system, you may use the 'Files' application. Click on the Files Icon you will see the file system and the dvd.



10. The GUI approach looks easier to locate and access the DVD content, however, for our exercises, we are focus on the command line approach to complete the desired operations.

    Our goal: Clone the entire DVD content to /var/ftp/pub/local_repo.

    There are over 8000 files to be cloned so the process may take a while.

    How to do it ?

First, you need to ensure the /var/ftp/pub/local_repo folder is properly created.

You may use the **mkdir** command to accomplish that. (Use the **-p** option is to ensure the path will be created)

```
[root@server ~]# mkdir -p /var/ftp/pub/local_repo
[root@server ~]#
```

Next is to use the **tar** command (**tape archive,** a file archive command) to start the cloning process. The tar command can preserve the file permissions and owner ids during the backup and restore operations. This is what a simple **cp** (copy) command cannot provide.

Change to the top level of the DVD folder then execute the following command:

```
cd /run/media/root/OL-8-6-0-BaseOS-x86_64/
tar cvf - . | (cd /var/ftp/pub/local_repo/; tar xvf -)
```

```
[root@server OL-8-6-0-BaseOS-x86_64]# cd /run/media/root/OL-8-6-0-BaseOS-x86_64/
[root@server OL-8-6-0-BaseOS-x86_64]# tar cvf - . | (cd /var/ftp/pub/local_repo/; tar xvf -)
```

11. After the cloning operation has completed, you may want to list out the content in the /var/ftp/pub/local_repo folder.

```
[root@server ~]# cd /var/ftp/pub/local_repo/
[root@server local_repo]# ls
AppStream  EULA              images      RELEASE-NOTES-en       RPM-GPG-KEY-oracle
BaseOS     extra_files.json  isolinux    RELEASE-NOTES-en.html  TRANS.TBL
EFI        GPL               media.repo  RPM-GPG-KEY
[root@server local_repo]#
```

12. You may also try the **diff** command which can help you to verify that two folders (source and destination) are containing the exact same content. [Optional]

    The **diff** command can be used to compare the source folders with the newly copied folders under /var/ftp/pub/local_repo .

```
[root@server local_repo]# cd
[root@server ~]# diff -r /run/media/root/OL-8-6-0-BaseOS-x86_64/  /var/ftp/pub/local_repo/
[root@server ~]#
```

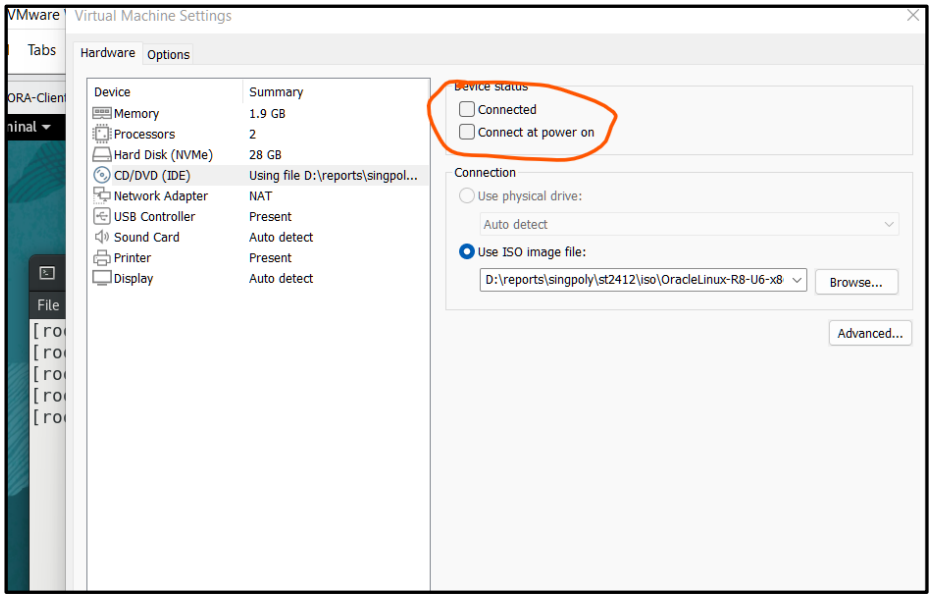
    Neither warning messages nor output shown implies the two folders' content is identical.

13. You can now eject the DVD (iso image) by using the **umount** command.

```
cd
umount  /run/media/root/OL-8-6-0-BaseOS-x86_64
```

```
[root@server media]# cd
[root@server ~]#
[root@server ~]# umount /run/media/root/OL-8-6-0-BaseOS-x86_64
[root@server ~]#
[root@server ~]#
```

14. In the VM Settings, change the CD/DVD settings uncheck the connected checkbox.



15. Let's try to use rpm utility to install a rpm package from the cloned folder to your system:

    Note: Sometimes, we may need to install a third party package from other source and the package is not available in the official repositories. In this case, we may download a rpm package and use the rpm utility to install it into the system. When you are taking this approach, you need to be careful and make sure the new package is validated before the installation. In this exercise, we are not going to download any third party rpm package. We just try out the rpm utility using one of the rpm packages from the local_repo folder.

    Run the following 'find' command to locate our target rpm package, telnet, from your own local_repo folder:

```
find /var/ftp/pub/local_repo/ -name telnet*
```

```
[root@server ~]# cd
[root@server ~]# find /var/ftp/pub/local_repo/ -name telnet*
/var/ftp/pub/local_repo/AppStream/Packages/telnet-0.17-76.el8.x86_64.rpm
/var/ftp/pub/local_repo/AppStream/Packages/telnet-server-0.17-76.el8.x86_64.rpm
[root@server ~]#
[root@server ~]#
```

As shown at above, the find command has located two rpm packages that related to telnet. One is the client and the other is the server.

We can use 'rpm -i' to install any one of them.

Type in :

```
rpm -i  <the full path of the rpm file>
```

```
[root@server ~]# cd
[root@server ~]# rpm -i /var/ftp/pub/local_repo/AppStream/Packages/telnet-0.17-76.el8.x86_64.rpm
warning: /var/ftp/pub/local_repo/AppStream/Packages/telnet-0.17-76.el8.x86_64.rpm: Header V3 RSA/SH
A256 Signature, key ID ad986da3: NOKEY
[root@server ~]#
```

The above install the telnet client utility. However, the output shows a warning message.

The warning message states that there no proper key to verify the digital signature of the package, we are taking a risk to install such package into the system.

In a production system we should not accept / allow any unverified packages to be installed.

Despite of the warning, the telnet client package should be installed. You can verify if you have the telnet client installed by starting a telnet session :

```
[root@server ~]# telnet
telnet> help
Commands may be abbreviated.  Commands are:

close           close current connection
logout          forcibly logout remote user and close the connection
display         display operating parameters
mode            try to enter line or character mode ('mode ?' for more)
open            connect to a site
quit            exit telnet
send            transmit special characters ('send ?' for more)
set             set operating parameters ('set ?' for more)
unset           unset operating parameters ('unset ?' for more)
status          print status information
toggle          toggle operating parameters ('toggle ?' for more)
slc             change state of special charaters ('slc ?' for more)
z               suspend telnet
!               invoke a subshell
environ         change environment variables ('environ ?' for more)
?               print help information
telnet> status
No connection.
Escape character is '^]'.
telnet> quit
[root@server ~]#
```

16. To resolve the NOKEY issue (ie. no key to verify the digital signature of the package.), first we should uninstall the package by using rpm command with the -e option:

    rpm -e telnet

```
[root@server ~]# rpm -e telnet
[root@server ~]# telnet
bash: /usr/bin/telnet: No such file or directory
[root@server ~]#
```

17. Each rpm file is signed with a gpg digit signature by the publisher. rpm maintains the public keys of its trusted publisher and it will use these public keys to verify the package upon the installation. The rpm file we are using is published by oracle, so we need to ensure the rpm command has the public key of oracle.

    In fact, the oracle public key comes with the installation DVD. It is stored in a file with the name RPM-GPG-KEY-oracle at the top level of the DVD content.

    In fact, we can find it in the /var/ftp/pub/local_repo : (as we have cloned the DVD there).

```
[root@server misc]# cd /var/ftp/pub/local_repo/
[root@server local_repo]# ls
AppStream  EULA              images      RELEASE-NOTES-en       RPM-GPG-KEY-oracle
BaseOS     extra_files.json  isolinux    RELEASE-NOTES-en.html  TRANS.TBL
EFI        GPL               media.repo  RPM-GPG-KEY
[root@server local_repo]#
```

    Let's import this public key to the key repository of the rpm by the following command:

```
rpm --import  /var/ftp/pub/local_repo/RPM-GPG-KEY-oracle
```

```
[root@server ~]# rpm --import /var/ftp/pub/local_repo/RPM-GPG-KEY-oracle
[root@server ~]#
```

    Again, no output nor warning messages shown implies the import is successful. (That' why some people call Unix/Linux is a 'quiet' operating system.)

18. Now we can retry the rpm -i installation for the telnet client:

    ```
    rpm -i /var/ftp/pub/local_repo/AppStream/Packages/telnet-0.17-76.el8.x86_64.rpm
    ```

```
[root@server ~]# rpm -i /var/ftp/pub/local_repo/AppStream/Packages/telnet-0.17-76.el8.x86_64.rpm
[root@server ~]#
```

    As shown at the above, the installation is done without any warning regarding the verification issue.

    Now you have learned how to use rpm to install/remove individual rpm package to the system.

19. There are other commonly used rpm optons:

    Query installed package using rpm :

    ```
    rpm -q <package name>
    ```

    Query / list all installed package using rpm :

```
rpm -qa
```

20. Erase (uninstall) the telnet package using rpm :

```
rpm -e telnet
```

```
[root@server ~]# rpm -e telnet
[root@server ~]# rpm -q telnet
package telnet is not installed
[root@server ~]#
```

13. Setting up Yum/DNF* repositories on your server (For local access only)

All software on a Linux system is divided into packages that can be installed, uninstalled, upgraded, queried, and verified. A Linux system may connect to various online software repositories to download and install the software packages it needs. As there are different types of packaging formats, it is common that a Linux system is using more than one type of software package utilities to access to different types of online repositories. For Oracle Linux (or RHEL) system, we may use yum or dnf utilities to access and install RPM based software packages. Both yum and dnf can connect to the same type of specific online repository, download the required rpm files and facilitate the update and/or installation.

In this section, we will setup an FTP based repository (or we can call it a Yum/DNF repository) which contains rpm package files at our Oracle Linux server. Any client which wants to install software can connect to our server via ftp protocol using 'yum' or 'dnf' command to download and install the necessary rpm files/packages.

***Yum/DNF**

RPM Package Manager (RPM) (originally Red Hat Package Manager) is a free and open-source package management system. RPM was intended primarily for Linux distributions.

YUM stands for yellow dog update, Modified. It is the primary package management tool for installing, updating, removing, and managing software packages in Red Hat Enterprise Linux.

DNF stands for Dandified YUM. DNF is the next-generation version of YUM and intended to be the replacement for YUM in RPM-based systems. It is powerful and has robust features than you'll find in yum. DNF makes it easy to maintain groups of packages and capable of automatically resolving dependency.

~https://en.wikipedia.org/wiki/RPM_Package_Manager#cite_note-max-5

~https://www.redhat.com/sysadmin/how-manage-packages

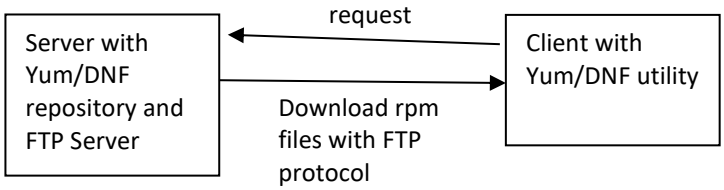
~https://blog.eldernode.com/what-is-different-between-dnf-and-yum/

We will now create a yum repository on the server VM. We have already copied the entire Oracle Linux 8.6 DVD content into the /var/ftp/pub/local_repo folder in the previous section.

The Oracle Linux 8.6 DVD contains 2 repositories: BaseOS and AppStream (Application Stream).

The BaseOS repository consists of the requisite packages required for the existence of a minimal operating system. On the other hand, AppStream comprises the remaining software packages, dependencies, and databases.

The next step is, we need to configure an FTP service on the server VM to host these two repositories. (We should have installed vsfptd server in the server VM already.(



On server:

1. Login as root via the GUI.
2. Open a new Terminal.
3. Create a new local repository definition file /etc/yum.repos.d/las.repo using the simple touch command.

#touch /etc/yum.repos.d/las.repo

```
[root@server local_repo]# cd
[root@server ~]# touch /etc/yum.repos.d/las.repo
[root@server ~]# cd /etc/yum.repos.d/
[root@server yum.repos.d]# ls
las.repo  oracle-linux-ol8.repo  uek-ol8.repo  virt-ol8.repo
[root@server yum.repos.d]#
```

As shown in the above, the las.repo has been created. There are a few other pre-defined repo files co-exist in the same folder.

If you take a closer look with the ls -Z command, you will find the 'context' of the newly created file is not the same as the other repo files.

```
[root@server yum.repos.d]# ls -Z
unconfined_u:object_r:system_conf_t:s0 las.repo
    system_u:object_r:system_conf_t:s0 oracle-linux-ol8.repo
    system_u:object_r:system_conf_t:s0 uek-ol8.repo
    system_u:object_r:system_conf_t:s0 virt-ol8.repo
[root@server yum.repos.d]#
```

This context values are part of the enhanced security measure in the system. To ensure the repo file is functioning correctly, we need to set the las.repo file with the expected 'context'.

We can use the restore context command : 'restorecon' to resolve the issue.

```
restorecon -vF las.repo
```

```
[root@server yum.repos.d]# restorecon -vF las.repo
Relabeled /etc/yum.repos.d/las.repo from unconfined_u:object_r:system_conf_t:s0 to system_u:object_r:
system_conf_t:s0
[root@server yum.repos.d]# ls -Z
system_u:object_r:system_conf_t:s0 las.repo
system_u:object_r:system_conf_t:s0 oracle-linux-ol8.repo
system_u:object_r:system_conf_t:s0 uek-ol8.repo
[root@server yum.repos.d]#
```

```
[root@server yum.repos.d]# restorecon -vF las.repo
Relabeled /etc/yum.repos.d/las.repo from unconfined_u:object_r:system_conf_t:s0 to system_u:object_
r:system_conf_t:s0
[root@server yum.repos.d]# ls -Z
system_u:object_r:system_conf_t:s0 las.repo
system_u:object_r:system_conf_t:s0 oracle-linux-ol8.repo
system_u:object_r:system_conf_t:s0 uek-ol8.repo
system_u:object_r:system_conf_t:s0 virt-ol8.repo
[root@server yum.repos.d]#
```

Basically, the restorecon command will base on the current folder location to set (restore) the appropriate context for the file placed inside. This command requires root privilege to run. Imagine if an adversary managed to place a harmful repository definition file in this folder, the added repository will not work as its context is incompatible in this folder.

(Note*: we will revisit this 'context' concept in the later topic of SELINUX)

4. Now use your text editor to replace the content the las.repo with the following:

```
[las_ol8_appstream]
name=Oracle Linux 8 Application Stream ($basearch)
baseurl=file:///var/ftp/pub/local_repo/AppStream/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1

[las_ol8_u6_baseos_base]
name=Oracle Linux 8.6 BaseOS ($basearch)
baseurl=file:///var/ftp/pub/local_repo/BaseOS/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1
```

Save the las.repo file and exit the editor.

5. Now verify / update the las.repo to allow everyone to read with the chmod command.

```
#chmod 0644 las.repo
or
#chmod g=r,o=r las.repo
```

```
[root@server yum.repos.d]# chmod g=r,o=r las.repo
[root@server yum.repos.d]# ls -l
total 16
-rw-r--r--. 1 root root  379 Sep 16 20:55 las.repo
-rw-r--r--. 1 root root 2961 May 11 02:40 oracle-linux-ol8.repo
-rw-r--r--. 1 root root  470 May 12 06:21 uek-ol8.repo
-rw-r--r--. 1 root root  243 May 12 06:21 virt-ol8.repo
```

6. Now is the time to clear the DNF / YUM cache as shown.

```
[root@server yum.repos.d]# dnf clean all
29 files removed
[root@server yum.repos.d]#
```

7. To confirm that the system will get packages from the locally defined repositories, run the command:

dnf repolist

OR

yum repolist

```
[root@server ~]# cd
[root@server ~]# dnf repolist
repo id                    repo name
las_ol8_appstream          Oracle Linux 8 Application Stream (x86_64)
las_ol8_u6_baseos_base     Oracle Linux 8.6 BaseOS (x86_64)
ol8_UEKR6                  Latest Unbreakable Enterprise Kernel Release 6 for Oracle Linux 8 (x86_64)
ol8_appstream              Oracle Linux 8 Application Stream (x86_64)
ol8_baseos_latest          Oracle Linux 8 BaseOS Latest (x86_64)
[root@server ~]#
```

We have added two repositories (local ones) into our Server VM.

Status Check:

At this point, we have successfully added two 'local' YUM/DNF repositories to the server VM. Together with the three (ol8_UEKR6, ol8_appstream, ol8_baseos_latest) online repositories, the server VM is now able to get software updates from these 5 sources. Of course, the server VM will pick the three online repositories as the preferred sources, as they contain more up to date packages. The system may fall back to use the local access repositories if the network connection is down.

In the next section, we will enable these local repositories with network accessibility (vis FTP) to allow your client VM to use them as its primary software repositories.

14. Setting up an ftp service at the server to enable remote Yum/DNF client access

On server:

1. Login as root via the GUI.
2. Open a new Terminal.
3. To verify the server VM has already installed with the ftp service:

   systemctl status vsftpd

and/or

netstat -tunalp | grep ftp

```
[root@server ~]# systemctl status vsftpd
● vsftpd.service - Vsftpd ftp daemon
   Loaded: loaded (/usr/lib/systemd/system/vsftpd.service; disabled; vendor preset: disabled)
   Active: inactive (dead)
[root@server ~]#
[root@server ~]# netstat -tunalp | grep ftp
[root@server ~]#
[root@server ~]#
```

Based on the above, we found that the vsftpd (Very Secured FTP daemon) has been **installed** but it is not yet enabled. To enable it , we can use the systemctl command:

```
systemctl enable vsftpd
systemctl start vsftpd
```

```
[root@server ~]# systemctl enable vsftpd
Created symlink /etc/systemd/system/multi-user.target.wants/vsftpd.service → /usr/lib/systemd/syste
m/vsftpd.service.
[root@server ~]# systemctl start vsftpd
[root@server ~]# systemctl status vsftpd
● vsftpd.service - Vsftpd ftp daemon
   Loaded: loaded (/usr/lib/systemd/system/vsftpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2022-09-16 21:06:48 +08; 5s ago
  Process: 38346 ExecStart=/usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf (code=exited, status=0/SUCCESS)
 Main PID: 38347 (vsftpd)
    Tasks: 1 (limit: 11408)
   Memory: 772.0K
   CGroup: /system.slice/vsftpd.service
           └─38347 /usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf

Sep 16 21:06:48 server.example.com systemd[1]: Starting Vsftpd ftp daemon...
Sep 16 21:06:48 server.example.com systemd[1]: Started Vsftpd ftp daemon.
[root@server ~]# netstat -tunalp | grep ftp
tcp6       0      0 :::21                   :::*                    LISTEN      38347/vsftpd

[root@server ~]#
```

The above shows the vsftpd is running fine and it is listening on port 21 (default). We will have dedicated exercises to cover more detail of vsftpd configurations in the future lessons.

4. We need to configure the ftp service to allow anonymous access (ie. not require user login) to offer any remote clients to access to our repositories. To do that, we need to modify the vsftpd configure file, /etc/vsftpd/vsftpd.conf

As shown at above, we need to comment out three setting entries by placing a '#' at the first position of the line. remember to save your file before exiting from the editor.

What are these three lines doing?

Comment out 'anonymous_enbable=NO' is same as setting anonymous_enable=YES

Comment out 'local_enable=YES' is to deny local linux user account to login to the vsftpd server. But anyone also can login with the special userid 'anonymous' (without password).

Comment out 'write_enable=YES' is simply to protect the file content not to be modified.

You also need to restart the vsftpd service, to let the vsftp server to run with the updated configurations.

To do so by running the following command:

```
systemctl restart vsftpd
```

5. Adjust the firewall at the server so that clients can connect to the FTP service. (By default, the firewall has been installed and enabled, and it blocks most of the incoming connections.)

   An easier way to configure the firewall setting is to use the GUI interface. Let's install it first with the dnf command to install the firewall GUI utilities:

```
dnf install firewall-config
```

```
[root@server ~]# dnf install firewall-config
Oracle Linux 8 Application Stream (x86_64)                    211 MB/s | 7.5 MB     00:00
Oracle Linux 8.6 BaseOS (x86_64)                              194 MB/s | 3.3 MB     00:00
Oracle Linux 8 BaseOS Latest (x86_64)                         3.4 MB/s |  50 MB     00:14
Oracle Linux 8 Application Stream (x86_64)                    3.3 MB/s |  38 MB     00:11
Latest Unbreakable Enterprise Kernel Release 6 for Oracle Linux 8  3.4 MB/s |  54 MB     00:16
Last metadata expiration check: 0:00:01 ago on Fri 16 Sep 2022 09:21:28 PM +08.
Dependencies resolved.
================================================================================================
 Package                Architecture   Version                    Repository                Size
================================================================================================
Installing:
 firewall-config        noarch         0.9.3-13.0.1.el8           las_ol8_appstream         161 k

Transaction Summary
================================================================================================
Install  1 Package

Total size: 161 k
Installed size: 1.1 M
Is this ok [y/N]:
```

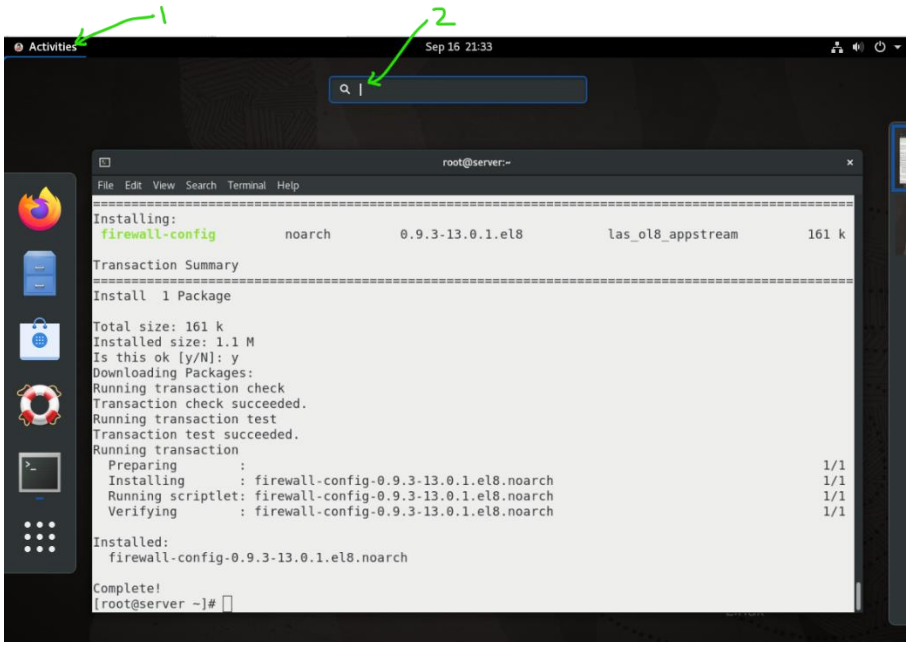
As shown at the above, the dnf command will first carry out an update checking from all the online repositories. As a result, the command has identified 1 new package (firewall-config) to be installed from the ol8_appstream repo.

You need to confirm the installation by input an 'y' at the prompt, then press the enter key. You may need to entre more 'y'(s) if the system prompts you for more confirmations.

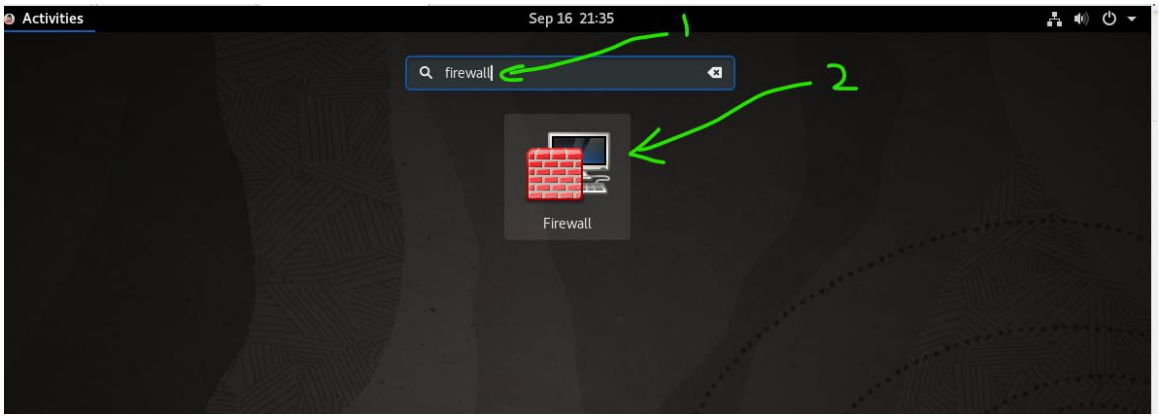
6. When the installation is completed successfully. You will see the following:

```
Downloading Packages:
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :
  Installing       : firewall-config-0.9.3-13.0.1.el8.noarch
  Running scriptlet: firewall-config-0.9.3-13.0.1.el8.noarch
  Verifying        : firewall-config-0.9.3-13.0.1.el8.noarch

Installed:
  firewall-config-0.9.3-13.0.1.el8.noarch

Complete!
[root@server ~]#
```

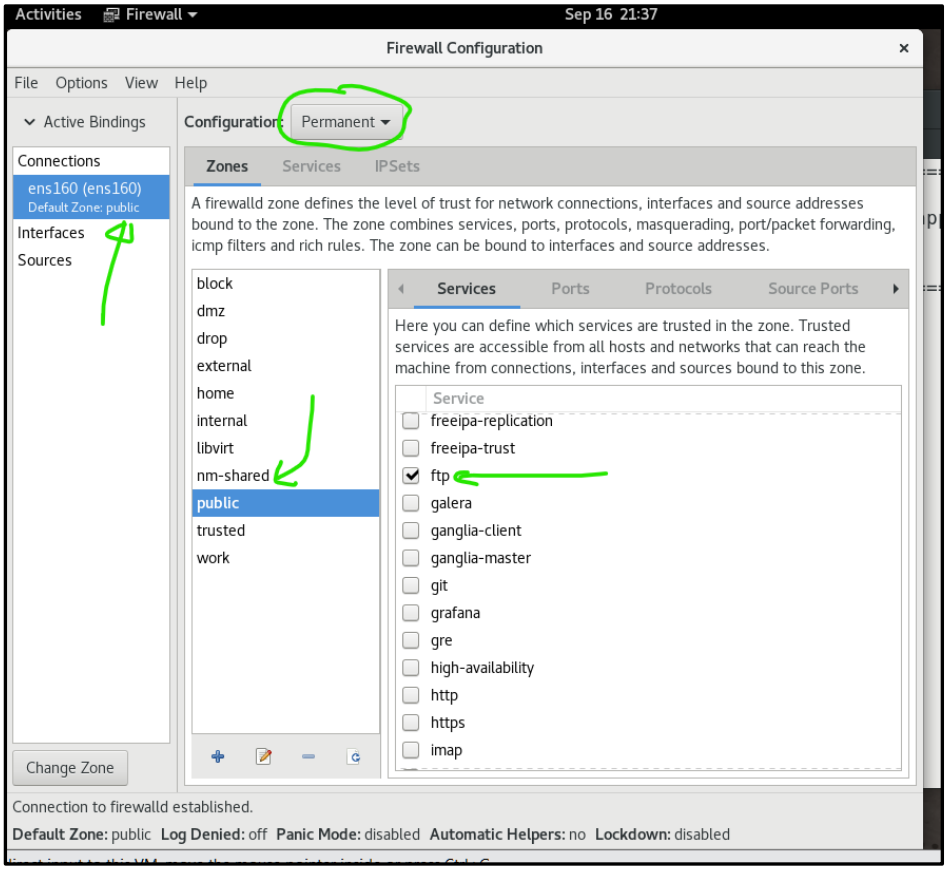
7. At the GUI Desktop, click at the Activities tab to bring up the App panel and the search box.



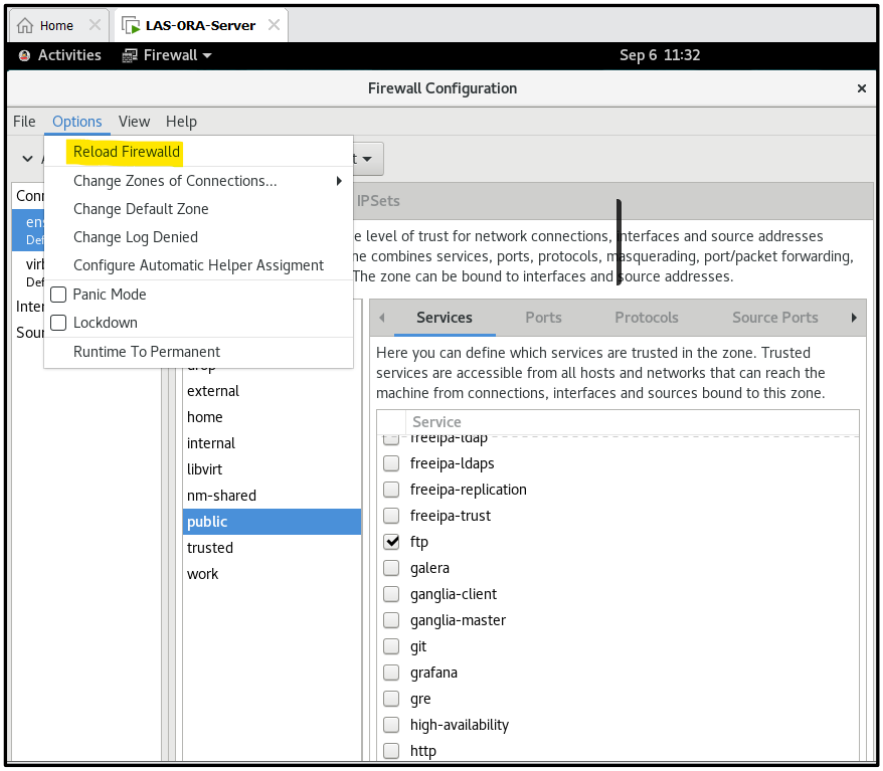
8. Type in 'firewall' at the search box, you will then see the firewall icon. Click on it will start the firewalld GUI (Firewall Configuration App).



9. At the Firewall Configuration menu, select the ens160 connection (should be in public zone) then select the Permanent Configuration option. At the zones tab, select public. At the services panel, select the check box next to the ftp service, it will allow the ftp traffic goes pass the firewall.



10. To make the firewall setting taking immediate effect, you need to click on the top option menu and choose the **Reload Firewalld** option.



11. Testing the ftp service:

    <u>On Client (Turn it on, if it is not powered on.)</u>

12. Login as student (password: user)

13. Open a new Terminal.
14. User the curl command to test the connection to the ftp service.

```
curl ftp://<server ip address>
```

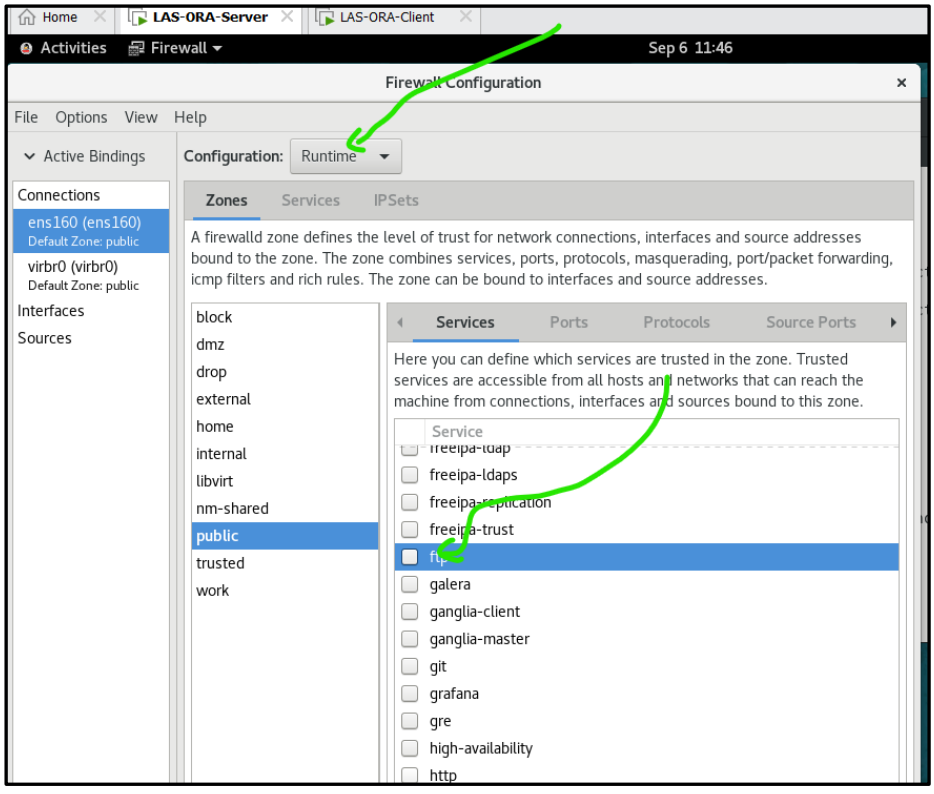
```
[student@localhost ~]$ curl ftp://192.168.30.88
drwxr-xr-x    3 0        0              24 Sep 16 09:16 pub
[student@localhost ~]$
```

As shown at the above, the client can access to the server via ftp. The server IP is 192.168.30.88.

15. You may use curl again at the Client VM to verify you can allow or deny ftp connections from others.

On server:

At the firewall configuration screen, select Runtime Configuration, and clear the ftp check box (This should disallow any ftp traffic to pass through immediately, no need to run the reload firewalld option.)



(Note: Any check or clear action at runtime configure mode is taking effect immediately, but it will not affect the permenant configurations.)

On Client:

Login as student via the GUI. Open a new terminal and try to ftp to your Server by using curl command again. You may see the following :

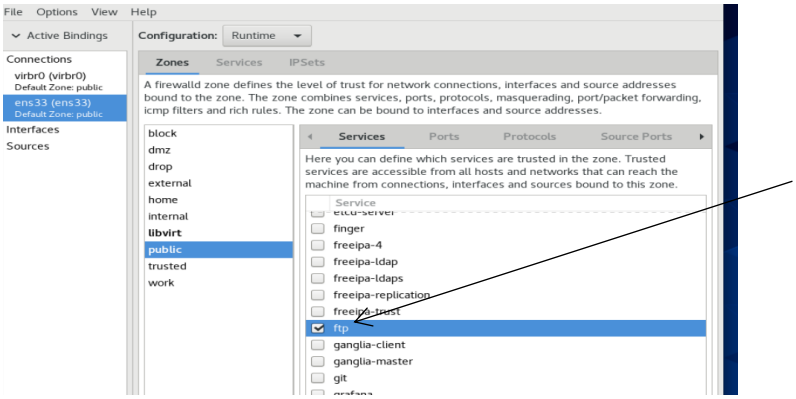
```
[student@localhost ~]$ curl ftp://192.168.30.88
curl: (7) Failed to connect to 192.168.30.88 port 21: No route to host
[student@localhost ~]$
```

The above shows that the service is no longer available. (It has been blocked by the firewall.)

Or

On server:

At the firewall configuration screen, select Runtime Configuration, and check the ftp check box (This should allow the ftp traffic to pass through)



On Client:

Now retry to ftp to the server again. You should be able to connect to the vsftpd service:

```
[student@localhost ~]$ curl ftp://192.168.30.88
curl: (7) Failed to connect to 192.168.30.88 port 21: No route to host
[student@localhost ~]$ curl ftp://192.168.30.88
drwxr-xr-x    3 0        0              24 Sep 16 09:16 pub
[student@localhost ~]$
```

As shown at the above, the connection is fine again.

15. Testing the connection to the Yum/DNF repository from the client

On client:

1. Login as root (or su to be root). Open a new terminal. View the existing client-side yum repository definition files.

```
ls /etc/yum.repos.d
```

```
[student@localhost ~]$ su -
Password:
[root@localhost ~]# cd
[root@localhost ~]# ls /etc/yum.repos.d/
oracle-linux-ol8.repo  uek-ol8.repo  virt-ol8.repo
[root@localhost ~]#
```

There are three repo files, and they may contain one or more 'enabled' reop entries.

You can use the 'dnf repolist' command to retrieve a corresponding list of 'active' repositories.

```
[root@localhost ~]# dnf repolist
repo id           repo name
ol8_UEKR6         Latest Unbreakable Enterprise Kernel Release 6 for Oracle Linu
x 8 (x86_64)
ol8_appstream     Oracle Linux 8 Application Stream (x86_64)
ol8_baseos_latest Oracle Linux 8 BaseOS Latest (x86_64)
[root@localhost ~]#
```

There are three 'enabled' entries found in the two repo files.

2. We shall disable all the currently active (enabled) repos at this point. To do that , edit the corresponding repo files of these active repo, to change the 'enabled' setting entries from '1' to '0'.

   You may need to open the two existing reop files and update their enabled settings.

```
 GNU nano 2.9.8                  oracle-linux-ol8.repo                  Modified

[ol8_baseos_latest]
name=Oracle Linux 8 BaseOS Latest ($basearch)
baseurl=https://yum$ociregion.$ocidomain/repo/OracleLinux/OL8/baseos/latest/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=0

[ol8_appstream]
name=Oracle Linux 8 Application Stream ($basearch)
baseurl=https://yum$ociregion.$ocidomain/repo/OracleLinux/OL8/appstream/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=0

[ol8_codeready_builder]
name=Oracle Linux 8 CodeReady Builder ($basearch) - Unsupported
baseurl=https://yum$ociregion.$ocidomain/repo/OracleLinux/OL8/codeready/builder/$basea$
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=0

[ol8_distro_builder]

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text ^T To Spell ^_ Go To Line
```

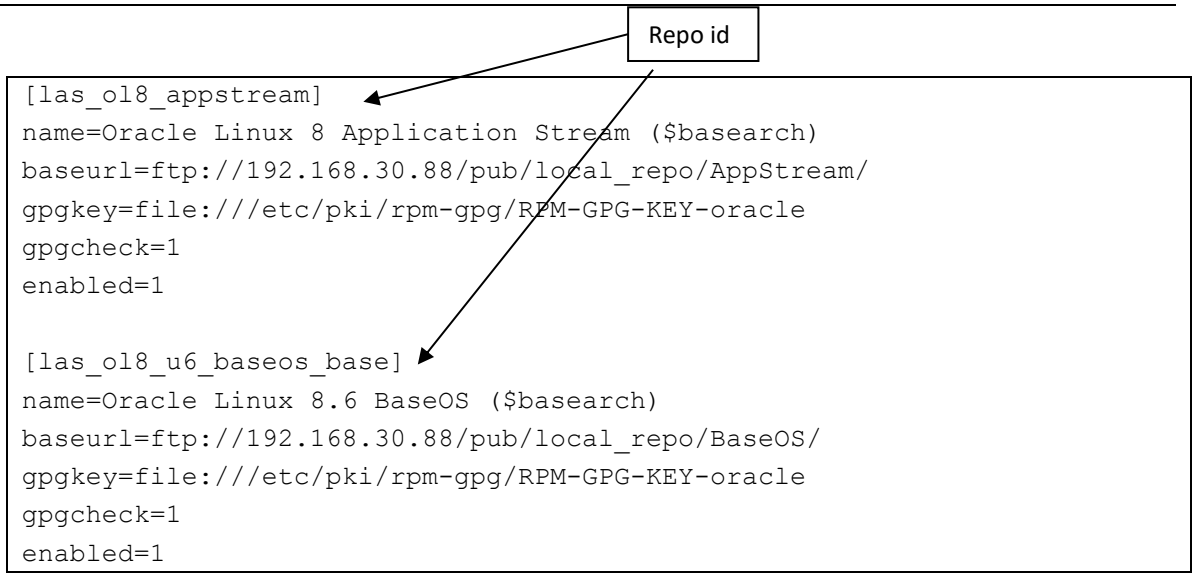
The above shows the two 'enabled=1' entries found in the oracle-linux-ol8.repo, they have been changed to 'enabled=0'.

3. After all the active repos have been disabled in the two files, rerun the commands:

   'dnf clean all' and 'dnf repolist' to verify.

```
[root@localhost yum.repos.d]# dnf clean all
0 files removed
[root@localhost yum.repos.d]# dnf repolist
[root@localhost yum.repos.d]#
[root@localhost yum.repos.d]#
```

4. Add in the repositories offered by your server as an additional repo for your client. Create a new file /etc/yum.repos.d/server.repo. The file can be any name but it must end with .repo extension. Enter the following text in the file. (replace *'192.168.30.88'* with your server IP address). Save the file.



5. Repeat the similar configuration you have done at the server side: Apply the chmod and restorcon commands to set up the file permission and context properly.

```
[root@client yum.repos.d]# ls -Z
system_u:object_r:system_conf_t:s0 oracle-linux-ol8.repo
system_u:object_r:system_conf_t:s0 server.repo
system_u:object_r:system_conf_t:s0 uek-ol8.repo
system_u:object_r:system_conf_t:s0 virt-ol8.repo
[root@client yum.repos.d]#
```

6. View all repositories that your client is configured to connect to, by running

   'dnf clean all' and 'dnf repolist'

   again.

```
[root@client ~]# dnf clean all
13 files removed
[root@client ~]# dnf repolist
repo id                     repo name
las_ol8_appstream           Oracle Linux 8 Application Stream (x86_64)
las_ol8_u6_baseos_base      Oracle Linux 8.6 BaseOS (x86_64)
[root@client ~]#
```

7. Try to view all installed and available packages from your Server Repository. You may receive an error about not being able to connect to the repository if your server VM is not running.

   ```
   dnf  list
   ```

   The output will consist of a list of packages.

```
[root@client ~]# dnf list
Oracle Linux 8 Application Stream (x86_64)       72 MB/s | 7.5 MB     00:00
Oracle Linux 8.6 BaseOS (x86_64)                 43 MB/s | 3.3 MB     00:00
Installed Packages
GConf2.x86_64                          3.2.6-22.el8         @AppStream
ModemManager.x86_64                    1.18.2-1.el8         @anaconda
ModemManager-glib.x86_64               1.18.2-1.el8         @anaconda
NetworkManager.x86_64                  1:1.36.0-4.0.1.el8   @anaconda
NetworkManager-adsl.x86_64             1:1.36.0-4.0.1.el8   @anaconda
NetworkManager-bluetooth.x86_64        1:1.36.0-4.0.1.el8   @anaconda
NetworkManager-config-server.noarch    1:1.36.0-4.0.1.el8   @anaconda
NetworkManager-libnm.x86_64            1:1.36.0-4.0.1.el8   @anaconda
NetworkManager-team.x86_64             1:1.36.0-4.0.1.el8   @anaconda
NetworkManager-tui.x86_64              1:1.36.0-4.0.1.el8   @anaconda
NetworkManager-wifi.x86_64             1:1.36.0-4.0.1.el8   @anaconda
NetworkManager-wwan.x86_64             1:1.36.0-4.0.1.el8   @anaconda
PackageKit.x86_64                      1.1.12-6.0.1.el8     @AppStream
PackageKit-command-not-found.x86_64    1.1.12-6.0.1.el8     @AppStream
PackageKit-glib.x86_64                 1.1.12-6.0.1.el8     @AppStream
```

These packages have been already installed. AppStream and Anaconda are the name of the installer program, or the repository.

...

...

```
xz-devel.x86_64                        5.2.4-3.el8          las_ol8_u6_baseos_base
xz-libs.i686                           5.2.4-3.el8          las_ol8_u6_baseos_base
yajl.i686                              2.1.0-10.el8         las_ol8_appstream
yelp-libs.i686                         2:3.28.1-3.el8       las_ol8_appstream
yp-tools.x86_64                        4.2.3-1.el8          las_ol8_appstream
ypbind.x86_64                          3:2.5-2.el8          las_ol8_appstream
ypserv.x86_64                          4.1-1.el8            las_ol8_appstream
yum-utils.noarch                       4.0.21-11.0.1.el8    las_ol8_u6_baseos_base
zlib.i686                              1.2.11-18.el8_5      las_ol8_u6_baseos_base
zlib-devel.i686                        1.2.11-18.el8_5      las_ol8_u6_baseos_base
zlib-devel.x86_64                      1.2.11-18.el8_5      las_ol8_u6_baseos_ba
zsh.x86_64                             5.5.1-9.el8          las_ol8_u6_baseos_ba
zsh-html.noarch                        5.5.1-9.el8          las_ol8_appstream
zstd.x86_64                            1.4.4-1.0.1.el8      las_ol8_appstream
zziplib.i686                           0.13.68-9.el8        las_ol8_appstream
zziplib.x86_64                         0.13.68-9.el8        las_ol8_appstream
zziplib-utils.x86_64                   0.13.68-9.el8        las_ol8_appstream
[root@client ~]#
```

These packages have not yet installed from the 'LAS-ol8_appStream repo.

8. Try to find out more about the 'xz' package by using dnf command with different options.:

   use '`dnf list xz`' and '`dnf info xz`'

```
[root@client ~]# dnf list xz
Last metadata expiration check: 0:05:45 ago on Fri 16 Sep 2022 10:40:36 PM +08.
Installed Packages
xz.x86_64                          5.2.4-3.el8                          @anaconda
[root@client ~]# dnf info xz
Last metadata expiration check: 0:06:30 ago on Fri 16 Sep 2022 10:40:36 PM +08.
Installed Packages
Name         : xz
Version      : 5.2.4
Release      : 3.el8
Architecture : x86_64
Size         : 422 k
Source       : xz-5.2.4-3.el8.src.rpm
Repository   : @System
From repo    : anaconda
Summary      : LZMA compression utilities
URL          : http://tukaani.org/xz/
License      : GPLv2+ and Public Domain
Description  : XZ Utils are an attempt to make LZMA compression easy to use on
             : free (as in freedom) operating systems. This is achieved by
             : providing tools and libraries which are similar to use than the
             : equivalents of the most popular existing compression algorithms.
             :
             : LZMA is a general purpose compression algorithm designed by Igor
             : Pavlov as part of 7-Zip. It provides high compression ratio while
             : keeping the decompression speed fast.

[root@client ~]#
```

Can you describe the different functions of dnf list <package> and dnf info <package> now ?

9. Type "dnf info vsftpd" to view information on the installed package vsftpd.
10. Type "dnf info httpd" to view information on the not-yet-installed package Apache HTTP Server.
11. Practise removing the installed vsftpd service package. (As we do not need it at the client system.)

    `dnf remove vsftpd`

If you want the dnf command to use back the original external repositories, you can revert the line "enabled=0" to "enabled=1" from the corresponding repo files.

16. Which are the packages have been installed?

'dnf list' shows all the installed and not-yet-installed packages from all the currently active repos. How can we just list out the installed packages ?

<u>On client or server:</u>

1. List the packages that have been installed on your system using rpm. (the old way)

   rpm -qa
2. Use grep to see if the gdb debugger package is already installed

   rpm -qa | grep gdb

3. List the packages that have been installed on your system from the Yum/DNF repository.

```
dnf list installed | less
```

3-2-1 Exit Poll

You may take the exit poll and earn General Performance Points :
(The poll only open between 24/10/2022 8:00 am and 04/11/2022 9:00 pm)

- Identify 3 new things you have learned in this practical exercise.
- Name 2 commands/keywords you would like to know more about.
- Identify 1 burning problem/question you have encountered at this moment.

Link to the Poll.
Or

Scan this QR code to access to the Poll ->

Additional Reference:

- How to Install Oracle Linux 8 {Step-by-Step with Screenshots} - https://www.linuxsysadmins.com/oracle-linux-8-step-by-step-install-guide/

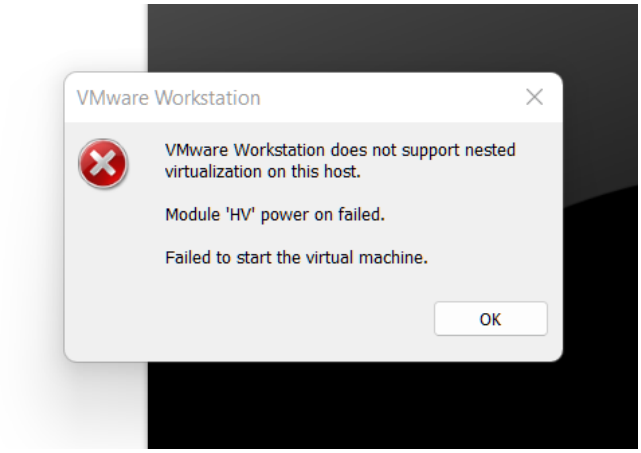
- Create a Local Yum Repository for Oracle Linux 8
  This reference shows you how to setup a local Yum Repository to enable client access via http services. It is very similar to the one we have completed in our lesson 0.
  https://oracle-base.com/articles/linux/create-a-local-yum-repository-for-oracle-linux-8

- What You Need to Know About Fedora's Switch From Yum to DNF - https://www.linux.com/training-tutorials/what-you-need-know-about-fedoras-switch-yum-dnf/

End of Practical

17. Appendix A – Running VMWare Workstation with Hypervisor Platform

If you have seen the following :



You need to check and turn off the Hypervisor flatform from your system. Hypervisor flatform is a feature that can be turned on or off via the Program and App configuration menu in your windows system.
Refer to the suggested method 1 and method 3 of this web page for the resolutions.