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Course/Section: CPE31S22	Date Submitted: August 30, 2022
Instructor: Dr. Jonathan V. Taylor	Semester and SY: 1 st Sem - 2022-2023
Activity 3: Install SSH server on CentOS or RHEL 8	
1. Objectives: 1.1 Install Community Enterprise OS or Red Hat Linux OS 1.2 Configure remote SSH connection from remote computer to CentOS/RHEL-8	
2. Discussion: CentOS vs. Debian: Overview CentOS and Debian are Linux distributions that spawn from opposite ends of the candle. CentOS is a free downstream rebuild of the commercial Red Hat Enterprise Linux distribution where, in contrast, Debian is the free upstream distribution that is the base for other distributions, including the Ubuntu Linux distribution. As with many Linux distributions, CentOS and Debian are generally more alike than different; it isn't until we dig a little deeper that we find where they branch. CentOS vs. Debian: Architecture The available supported architectures can be the determining factor as to whether a distro is a viable option or not. Debian and CentOS are both very popular for x86_64/AMD64, but what other archs are supported by each? Both Debian and CentOS support AArch64/ARM64, armhf/armhfp , i386 , ppc64el/ppc64le. (Note: armhf/armhfp and i386 are supported in CentOS 7 only.) CentOS 7 additionally supports POWER9 while Debian and CentOS 8 do not. CentOS 7 focuses on the x86_64/AMD64 architecture with the other archs released through the AltArch SIG (Alternate Architecture Special Interest Group) with CentOS 8 supporting x86_64/AMD64, AArch64 and ppc64le equally. Debian supports MIPSel, MIPS64el and s390x while CentOS does not. Much like CentOS 8, Debian does not favor one arch over another—all supported architectures are supported equally. CentOS vs. Debian: Package Management Most Linux distributions have some form of package manager nowadays, with some more complex and feature-rich than others. CentOS uses the RPM package format and YUM/DNF as the package manager. Debian uses the DEB package format and dpkg/APT as the package manager.	

Both offer full-feature package management with network-based repository support, dependency checking and resolution, etc.. If you're familiar with one but not the other, you may have a little trouble switching over, but they're not overwhelmingly different. They both have similar features, just available through a different interface.

Task 1: Download the CentOS or RHEL-8 image (Create screenshots of the following)

1. Download the image of the CentOS here:
http://mirror.rise.ph/centos/7.9.2009/isos/x86_64/

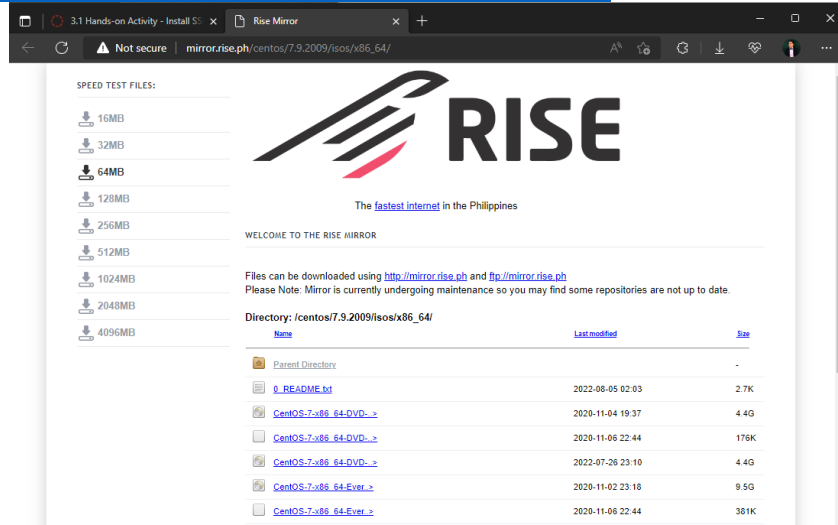


Figure 1: Downloading of CentOS

2. Create a VM machine with 2 Gb RAM and 20 Gb HD.

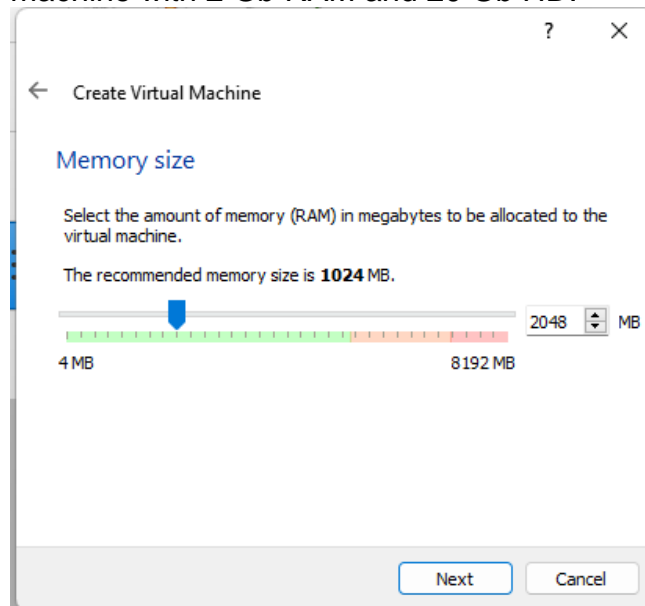


Figure 2: Virtual Machine with 2 GB RAM

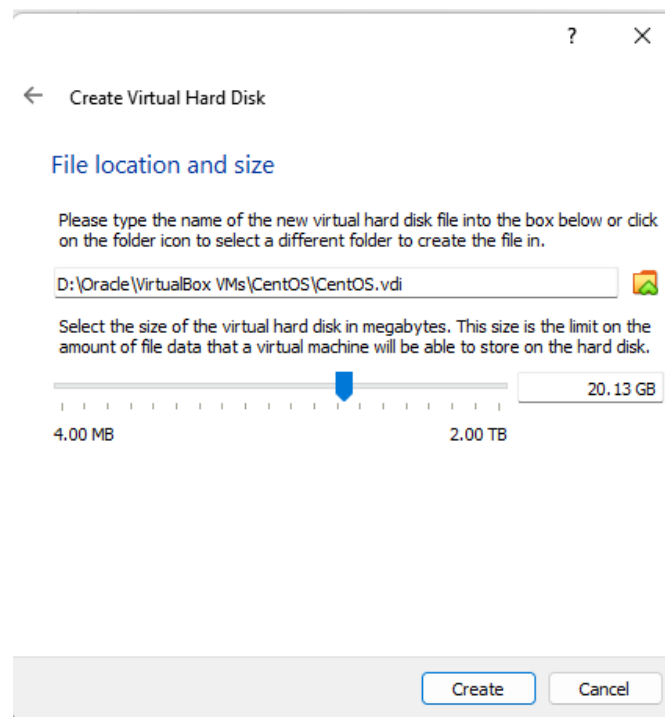


Figure 3: Virtual Machine with 20 GB Virtual Hard Disk

3. Install the downloaded image.

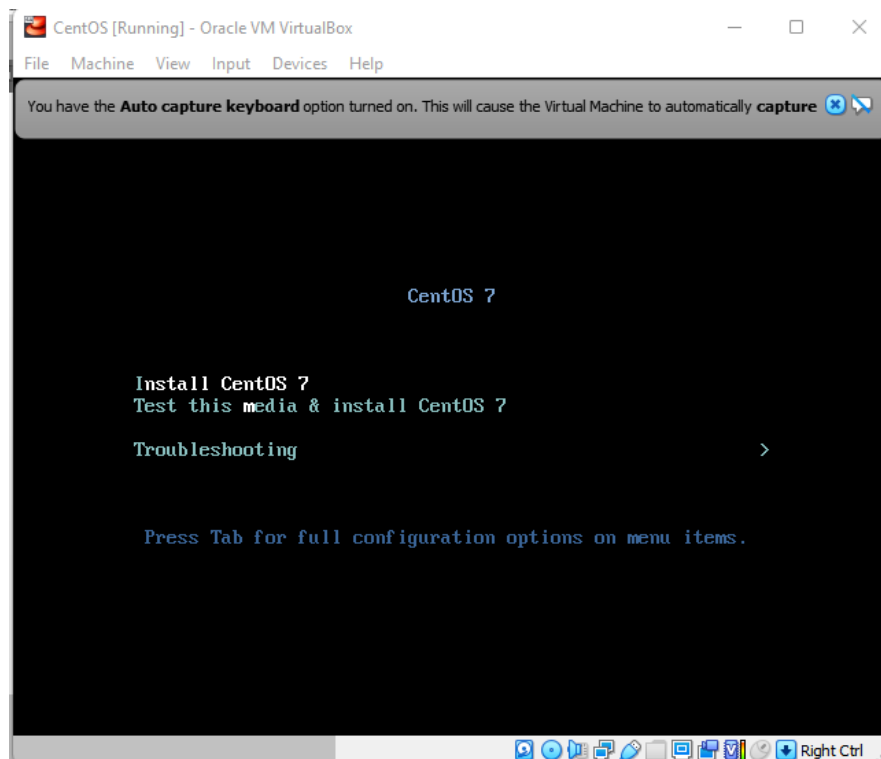


Figure 4: Installing the Downloaded Image

4. Show evidence that the OS was installed already.

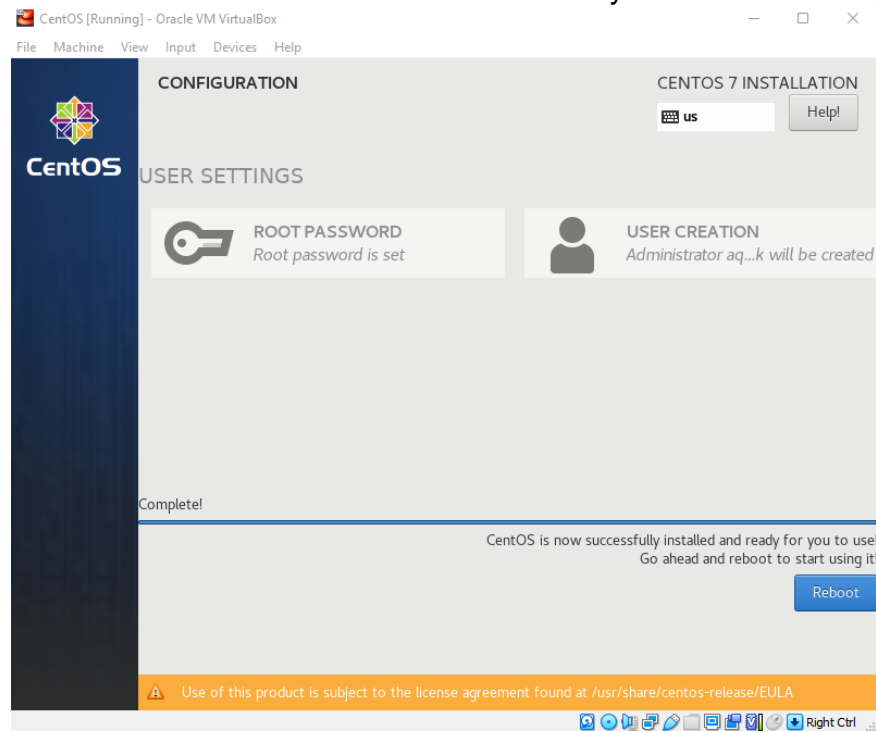


Figure 5: CentOS is now successfully installed

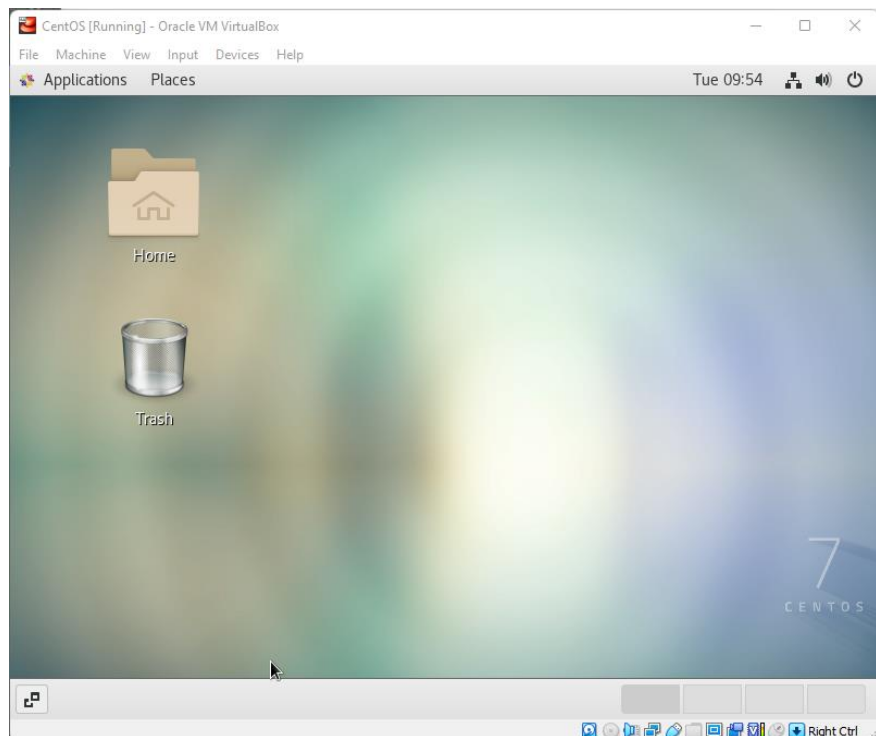
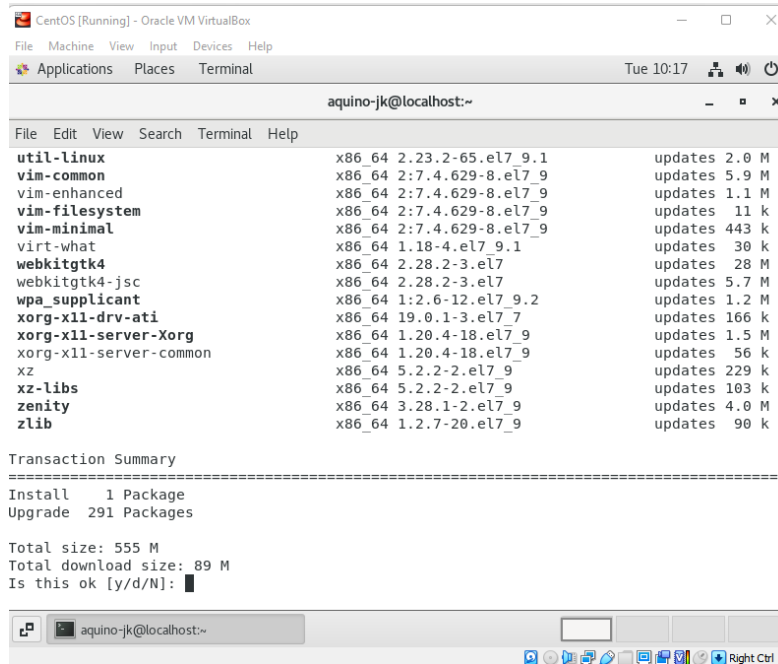


Figure 6: Installed CentOS

clear

Task 2: Install the SSH server package *openssh*



```
CentOS [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal Tue 10:17
aquino-jk@localhost:~

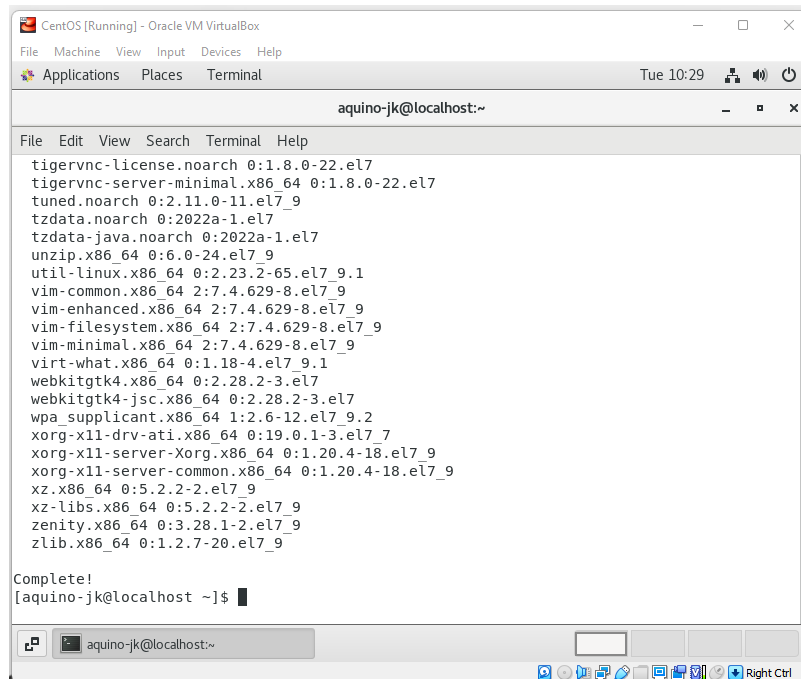
File Edit View Search Terminal Help

util-linux x86_64 2.23.2-65.el7_9.1 updates 2.0 M
vim-common x86_64 2:7.4.629-8.el7_9 updates 5.9 M
vim-enhanced x86_64 2:7.4.629-8.el7_9 updates 1.1 M
vim-filestystem x86_64 2:7.4.629-8.el7_9 updates 11 k
vim-minimal x86_64 2:7.4.629-8.el7_9 updates 443 k
virt-what x86_64 1.18-4.el7_9.1 updates 30 k
webkitgtk4 x86_64 2.28.2-3.el7 updates 28 M
webkitgtk4-jsc x86_64 2.28.2-3.el7 updates 5.7 M
wpa_supplicant x86_64 1:2.6-12.el7_9.2 updates 1.2 M
xorg-x11-drv-ati x86_64 19.0.1-3.el7_7 updates 166 k
xorg-x11-server-Xorg x86_64 1.20.4-18.el7_9 updates 1.5 M
xorg-x11-server-common x86_64 1.20.4-18.el7_9 updates 56 k
xz x86_64 5.2.2-2.el7_9 updates 229 k
xz-libs x86_64 5.2.2-2.el7_9 updates 103 k
zenity x86_64 3.28.1-2.el7_9 updates 4.0 M
zlib x86_64 1.2.7-20.el7_9 updates 90 k

Transaction Summary
=====
Install 1 Package
Upgrade 291 Packages

Total size: 555 M
Total download size: 89 M
Is this ok [y/d/N]:
```

Figure 7: sudo yum update command issued



```
CentOS [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal Tue 10:29
aquino-jk@localhost:~

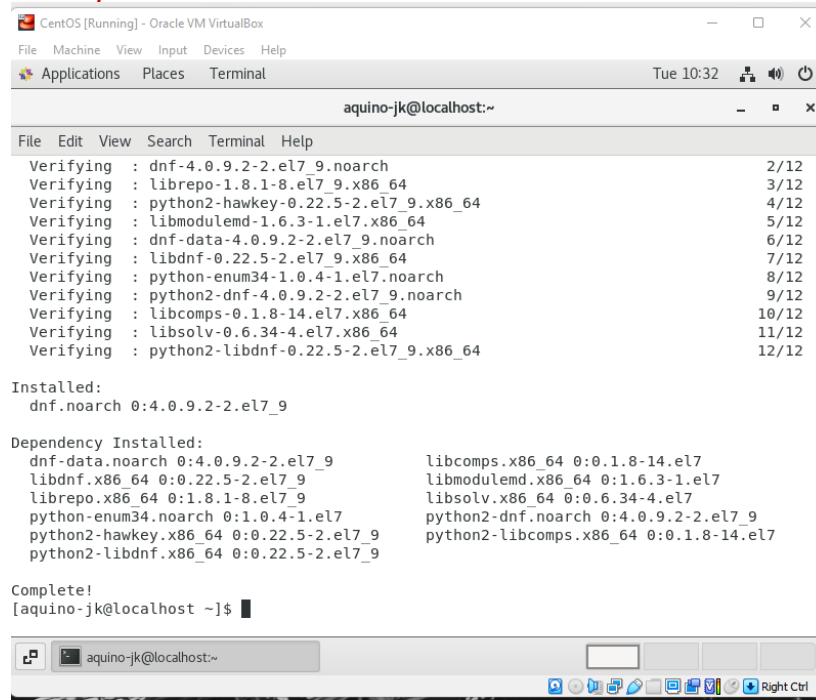
File Edit View Search Terminal Help

tigervnc-license.noarch 0:1.8.0-22.el7
tigervnc-server-minimal.x86_64 0:1.8.0-22.el7
tuned.noarch 0:2.11.0-11.el7_9
tzdata.noarch 0:2022a-1.el7
tzdata-java.noarch 0:2022a-1.el7
unzip.x86_64 0:6.0-24.el7_9
util-linux.x86_64 0:2.23.2-65.el7_9.1
vim-common.x86_64 2:7.4.629-8.el7_9
vim-enhanced.x86_64 2:7.4.629-8.el7_9
vim-filestystem.x86_64 2:7.4.629-8.el7_9
vim-minimal.x86_64 2:7.4.629-8.el7_9
virt-what.x86_64 0:1.18-4.el7_9.1
webkitgtk4.x86_64 0:2.28.2-3.el7
webkitgtk4-jsc.x86_64 0:2.28.2-3.el7
wpa_supplicant.x86_64 1:2.6-12.el7_9.2
xorg-x11-drv-ati.x86_64 0:19.0.1-3.el7_7
xorg-x11-server-Xorg.x86_64 0:1.20.4-18.el7_9
xorg-x11-server-common.x86_64 0:1.20.4-18.el7_9
xz.x86_64 0:5.2.2-2.el7_9
xz-libs.x86_64 0:5.2.2-2.el7_9
zenity.x86_64 0:3.28.1-2.el7_9
zlib.x86_64 0:1.2.7-20.el7_9

Complete!
[aquino-jk@localhost ~]$
```

Figure 8: sudo yum upgrade command issued

1. Install the ssh server package *openssh* by using the *dnf* command:
\$ dnf install openssh-server



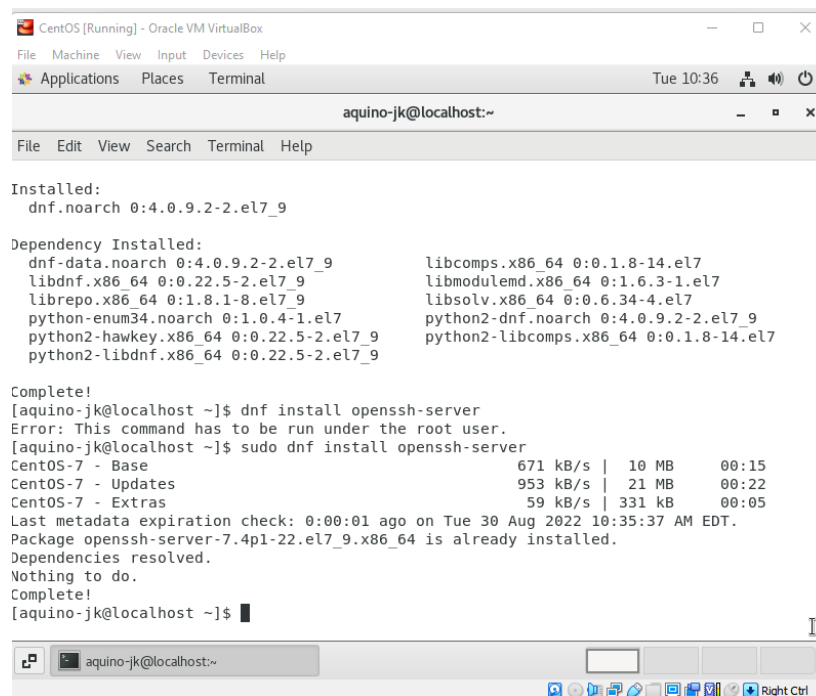
```
CentOS [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Tue 10:32
aquino-jk@localhost:~
File Edit View Search Terminal Help
Verifying : dnf-4.0.9.2-2.el7_9.noarch 2/12
Verifying : librepo-1.8.1-8.el7_9.x86_64 3/12
Verifying : python2-hawkey-0.22.5-2.el7_9.x86_64 4/12
Verifying : libmodulemd-1.6.3-1.el7.x86_64 5/12
Verifying : dnf-data-4.0.9.2-2.el7_9.noarch 6/12
Verifying : libdnf-0.22.5-2.el7_9.x86_64 7/12
Verifying : python-enum34-1.0.4-1.el7.noarch 8/12
Verifying : python2-dnf-4.0.9.2-2.el7_9.noarch 9/12
Verifying : libcomps-0.1.8-14.el7.x86_64 10/12
Verifying : libsolv-0.6.34-4.el7.x86_64 11/12
Verifying : python2-libdnf-0.22.5-2.el7_9.x86_64 12/12

Installed:
dnf.noarch 0:4.0.9.2-2.el7_9

Dependency Installed:
dnf-data.noarch 0:4.0.9.2-2.el7_9 libcomps.x86_64 0:0.1.8-14.el7
libdnf.x86_64 0:0.22.5-2.el7_9 libmodulemd.x86_64 0:1.6.3-1.el7
librepo.x86_64 0:1.8.1-8.el7_9 libsolv.x86_64 0:0.6.34-4.el7
python-enum34.noarch 0:1.0.4-1.el7 python2-dnf.noarch 0:4.0.9.2-2.el7_9
python2-hawkey.x86_64 0:0.22.5-2.el7_9 python2-libcomps.x86_64 0:0.1.8-14.el7
python2-libdnf.x86_64 0:0.22.5-2.el7_9

Complete!
[aquino-jk@localhost ~]$
```

Figure 9: sudo yum install dnf command issued



```
CentOS [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Tue 10:36
aquino-jk@localhost:~
File Edit View Search Terminal Help

Installed:
dnf.noarch 0:4.0.9.2-2.el7_9

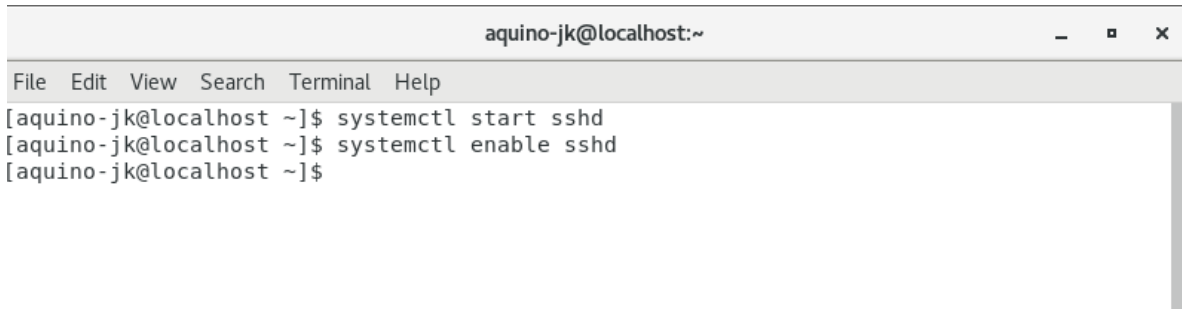
Dependency Installed:
dnf-data.noarch 0:4.0.9.2-2.el7_9 libcomps.x86_64 0:0.1.8-14.el7
libdnf.x86_64 0:0.22.5-2.el7_9 libmodulemd.x86_64 0:1.6.3-1.el7
librepo.x86_64 0:1.8.1-8.el7_9 libsolv.x86_64 0:0.6.34-4.el7
python-enum34.noarch 0:1.0.4-1.el7 python2-dnf.noarch 0:4.0.9.2-2.el7_9
python2-hawkey.x86_64 0:0.22.5-2.el7_9 python2-libcomps.x86_64 0:0.1.8-14.el7
python2-libdnf.x86_64 0:0.22.5-2.el7_9

Complete!
[aquino-jk@localhost ~]$ dnf install openssh-server
Error: This command has to be run under the root user.
[aquino-jk@localhost ~]$ sudo dnf install openssh-server
CentOS-7 - Base 671 kB/s | 10 MB 00:15
CentOS-7 - Updates 953 kB/s | 21 MB 00:22
CentOS-7 - Extras 59 kB/s | 331 kB 00:05
Last metadata expiration check: 0:00:01 ago on Tue 30 Aug 2022 10:35:37 AM EDT.
Package openssh-server-7.4p1-22.el7_9.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
[aquino-jk@localhost ~]$
```

Figure 10: sudo dnf install openssh-server command issued

2. Start the *sshd* daemon and set to start after reboot:

```
$ systemctl start sshd  
$ systemctl enable sshd
```

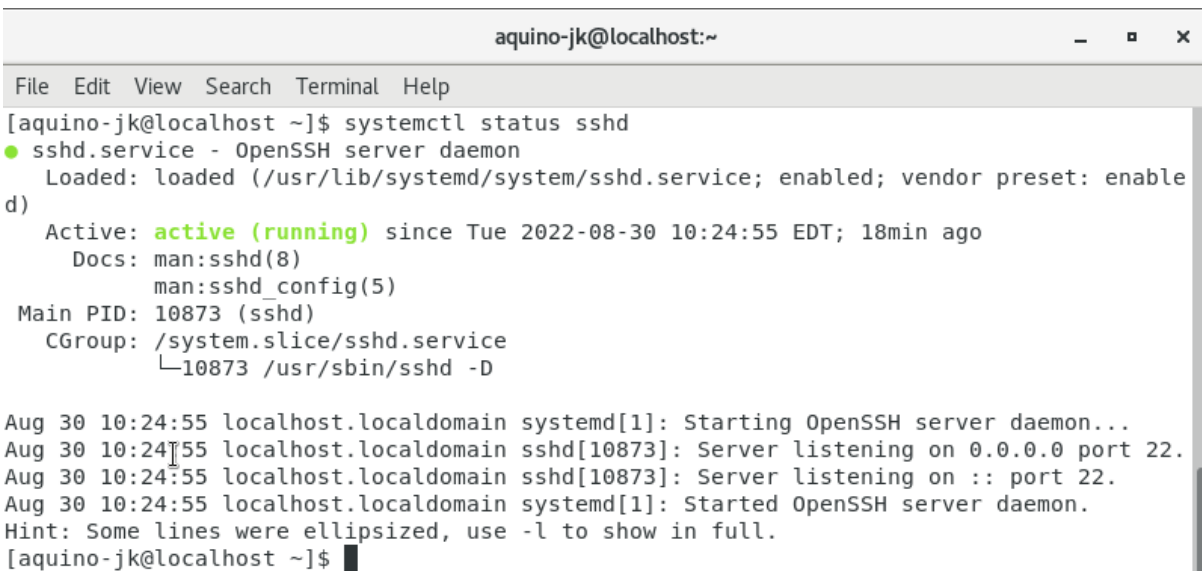


```
aquino-jk@localhost:~  
File Edit View Search Terminal Help  
[aquino-jk@localhost ~]$ systemctl start sshd  
[aquino-jk@localhost ~]$ systemctl enable sshd  
[aquino-jk@localhost ~]$
```

Figure 11: systemctl start sshd and systemctl enable sshd command issued

3. Confirm that the sshd daemon is up and running:

```
$ systemctl status sshd
```

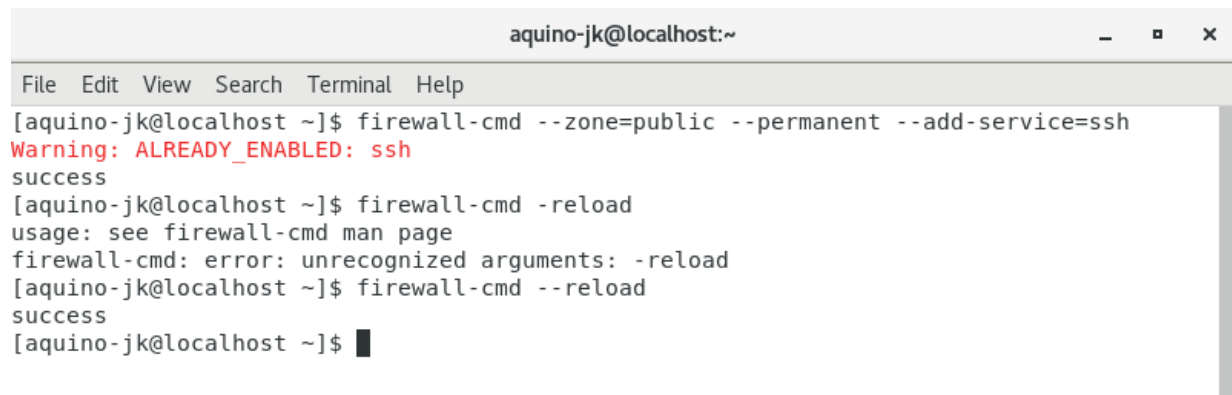


```
aquino-jk@localhost:~  
File Edit View Search Terminal Help  
[aquino-jk@localhost ~]$ systemctl status sshd  
● sshd.service - OpenSSH server daemon  
   Loaded: loaded (/usr/lib/systemd/system/ssh.service; enabled; vendor preset: enable  
d)  
   Active: active (running) since Tue 2022-08-30 10:24:55 EDT; 18min ago  
     Docs: man:sshd(8)  
           man:sshd_config(5)  
  Main PID: 10873 (sshd)  
    CGroup: /system.slice/ssh.service  
            └─10873 /usr/sbin/sshd -D  
  
Aug 30 10:24:55 localhost.localdomain systemd[1]: Starting OpenSSH server daemon...  
Aug 30 10:24:55 localhost.localdomain sshd[10873]: Server listening on 0.0.0.0 port 22.  
Aug 30 10:24:55 localhost.localdomain sshd[10873]: Server listening on :: port 22.  
Aug 30 10:24:55 localhost.localdomain systemd[1]: Started OpenSSH server daemon.  
Hint: Some lines were ellipsized, use -l to show in full.  
[aquino-jk@localhost ~]$
```

Figure 12: systemctl status sshd command issued

4. Open the SSH port 22 to allow incoming traffic:

```
$ firewall-cmd --zone=public --permanent --add-service=ssh  
$ firewall-cmd --reload
```

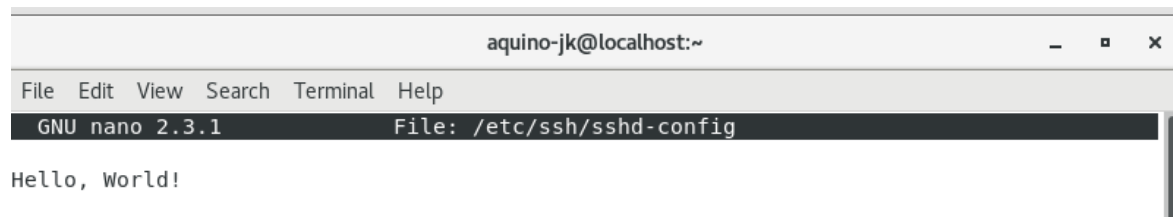


```
aquino-jk@localhost:~  
File Edit View Search Terminal Help  
[aquino-jk@localhost ~]$ firewall-cmd --zone=public --permanent --add-service=ssh  
Warning: ALREADY_ENABLED: ssh  
success  
[aquino-jk@localhost ~]$ firewall-cmd --reload  
usage: see firewall-cmd man page  
firewall-cmd: error: unrecognized arguments: -reload  
[aquino-jk@localhost ~]$ firewall-cmd --reload  
success  
[aquino-jk@localhost ~]$
```

Figure 13: Opening of SSH port 22

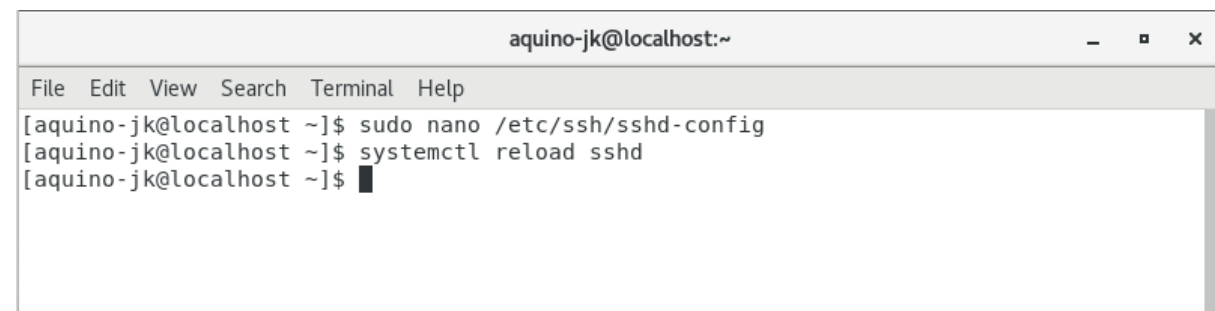
5. Locate the ssh server man config file */etc/ssh/sshd_config* and perform custom configuration. Every time you make any change to the */etc/ssh/sshd-config* configuration file reload the *sshd* service to apply changes:

```
$ systemctl reload sshd
```



```
aquino-jk@localhost:~  
File Edit View Search Terminal Help  
GNU nano 2.3.1 File: /etc/ssh/sshd-config  
Hello, World!
```

Figure 14: Custom configuration

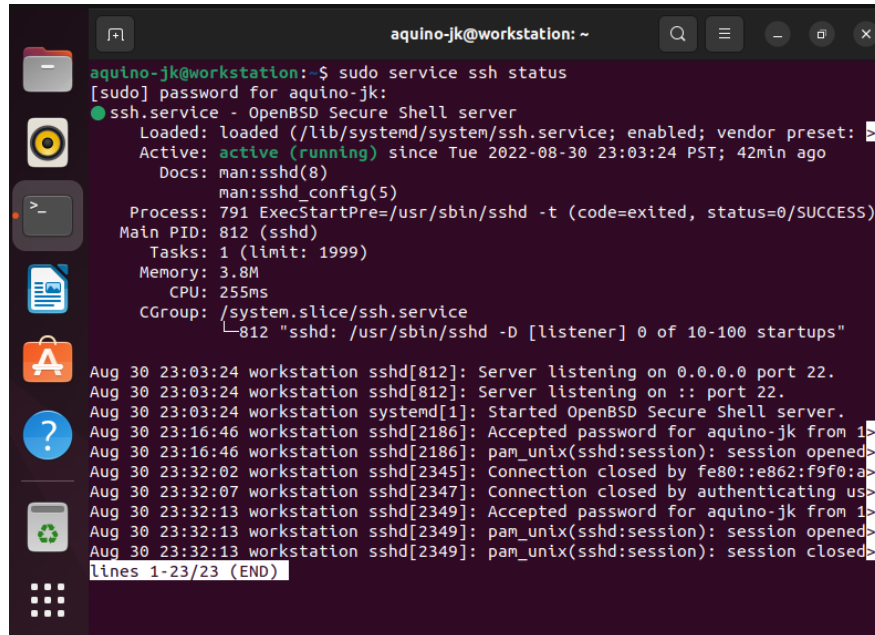


```
aquino-jk@localhost:~  
File Edit View Search Terminal Help  
[aquino-jk@localhost ~]$ sudo nano /etc/ssh/sshd-config  
[aquino-jk@localhost ~]$ systemctl reload sshd  
[aquino-jk@localhost ~]$
```

Figure 15: systemctl reload sshd command issued

Task 3: Copy the Public Key to CentOS

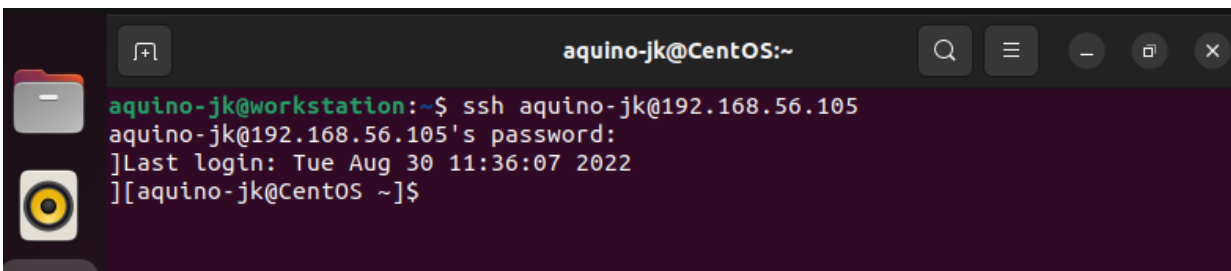
1. Make sure that **ssh** is installed on the local machine.



```
aquino-jk@workstation: ~  
aquino-jk@workstation:~$ sudo service ssh status  
[sudo] password for aquino-jk:  
● ssh.service - OpenBSD Secure Shell server  
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset:   
   Active: active (running) since Tue 2022-08-30 23:03:24 PST; 42min ago  
     Docs: man:sshd(8)  
           man:sshd_config(5)  
   Process: 791 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)  
    Main PID: 812 (sshd)  
       Tasks: 1 (limit: 1999)  
      Memory: 3.8M  
         CPU: 255ms  
    CGroup: /system.slice/ssh.service  
           └─812 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"  
  
Aug 30 23:03:24 workstation sshd[812]: Server listening on 0.0.0.0 port 22.  
Aug 30 23:03:24 workstation sshd[812]: Server listening on :: port 22.  
Aug 30 23:03:24 workstation systemd[1]: Started OpenBSD Secure Shell server.  
Aug 30 23:16:46 workstation sshd[2186]: Accepted password for aquino-jk from 1>  
Aug 30 23:16:46 workstation sshd[2186]: pam_unix(sshd:session): session opened>  
Aug 30 23:32:02 workstation sshd[2345]: Connection closed by fe80::e862:f9f0:a>  
Aug 30 23:32:07 workstation sshd[2347]: Connection closed by authenticating us>  
Aug 30 23:32:13 workstation sshd[2349]: Accepted password for aquino-jk from 1>  
Aug 30 23:32:13 workstation sshd[2349]: pam_unix(sshd:session): session opened>  
Aug 30 23:32:13 workstation sshd[2349]: pam_unix(sshd:session): session closed>  
lines 1-23/23 (END)
```

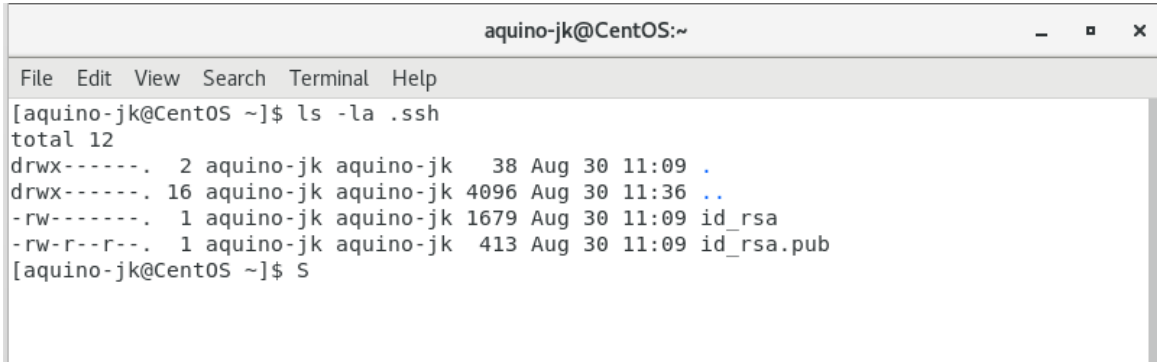
Figure 16: SSH is installed in local machine

2. Using the command **ssh-copy-id**, connect your local machine to CentOS.



```
aquino-jk@CentOS:~  
aquino-jk@workstation:~$ ssh aquino-jk@192.168.56.105  
aquino-jk@192.168.56.105's password:  
]Last login: Tue Aug 30 11:36:07 2022  
][aquino-jk@CentOS ~]$
```

3. On CentOS, verify that you have the *authorized_keys*.

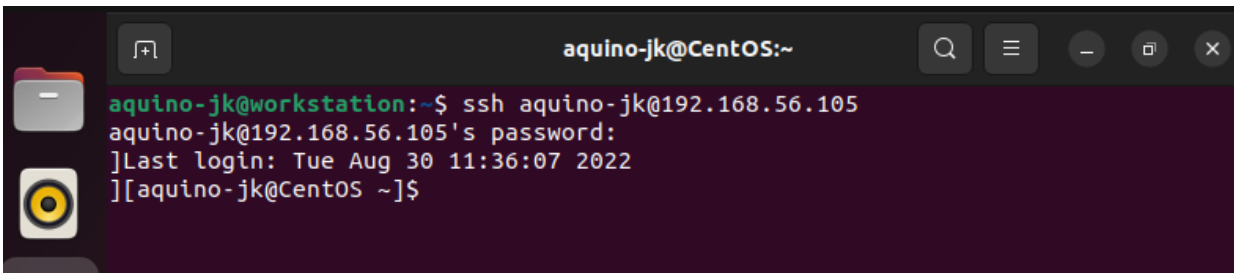


```
aquino-jk@CentOS:~  
File Edit View Search Terminal Help  
[aquino-jk@CentOS ~]$ ls -la .ssh  
total 12  
drwx-----. 2 aquino-jk aquino-jk  38 Aug 30 11:09 .  
drwx-----. 16 aquino-jk aquino-jk 4096 Aug 30 11:36 ..  
-rw-----. 1 aquino-jk aquino-jk 1679 Aug 30 11:09 id_rsa  
-rw-r--r--. 1 aquino-jk aquino-jk  413 Aug 30 11:09 id_rsa.pub  
[aquino-jk@CentOS ~]$
```

Verification of Key

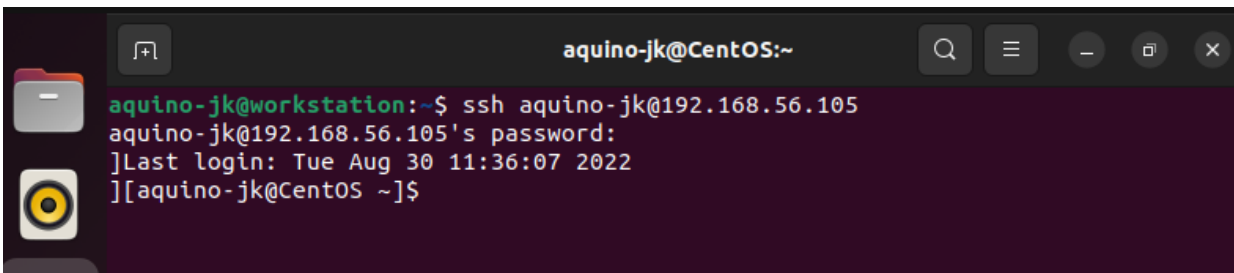
Task 4: Verify ssh remote connection

1. Using your local machine, connect to CentOS using ssh.

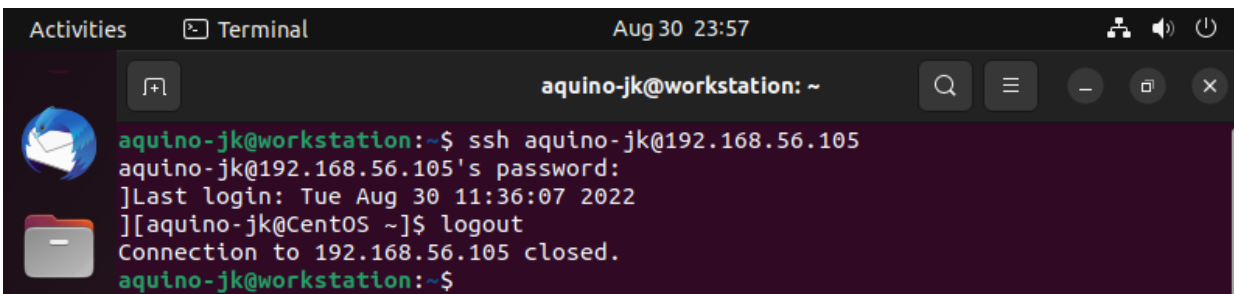


```
aquino-jk@CentOS:~  
aquino-jk@workstation:~$ ssh aquino-jk@192.168.56.105  
aquino-jk@192.168.56.105's password:  
]Last login: Tue Aug 30 11:36:07 2022  
][aquino-jk@CentOS ~]$
```

2. Show evidence that you are connected.



```
aquino-jk@CentOS:~  
aquino-jk@workstation:~$ ssh aquino-jk@192.168.56.105  
aquino-jk@192.168.56.105's password:  
]Last login: Tue Aug 30 11:36:07 2022  
][aquino-jk@CentOS ~]$
```



```
Activities Terminal Aug 30 23:57  
aquino-jk@workstation: ~  
aquino-jk@workstation:~$ ssh aquino-jk@192.168.56.105  
aquino-jk@192.168.56.105's password:  
]Last login: Tue Aug 30 11:36:07 2022  
][aquino-jk@CentOS ~]$ logout  
Connection to 192.168.56.105 closed.  
aquino-jk@workstation:~$
```

Reflections:

Answer the following:

1. What do you think we should look for in choosing the best distribution between Debian and Red Hat Linux distributions?
 - We should be considering its support, Red Hat is largely supported and it does accept bug reports submitted by the end users, while Debian is primarily community supported. What we should consider in choosing the best distribution is the Architecture, Upgrades, Kernel, Filesystems, Managements, and its supports.
 -
2. What are the main difference between Debian and Red Hat Linux distributions?
 - Their main difference is their system's architecture, support, somehow different in issuing the commands, and Debian has more support than red hat.