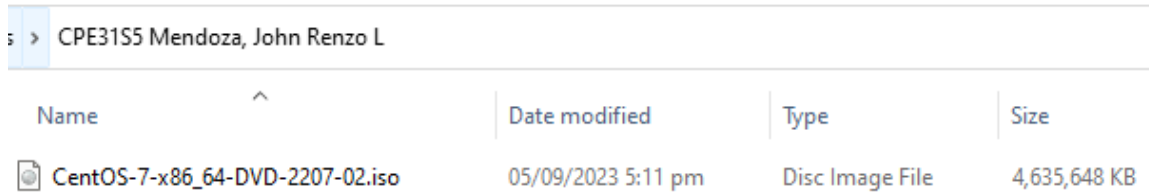


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<b>Course/Section:</b> CPE31S5	<b>Date Submitted:</b> September 06, 2023
<b>Instructor:</b> Engr. Roman Richard	<b>Semester and SY:</b> 1st Semester 2023-2024
<b>Activity 3: Install SSH server on CentOS or RHEL 8</b>	
<p><b>1. Objectives:</b></p> <p>1.1 Install Community Enterprise OS or Red Hat Linux OS</p> <p>1.2 Configure remote SSH connection from remote computer to CentOS/RHEL-8</p>	
<p><b>2. Discussion:</b></p> <p><b>CentOS vs. Debian: Overview</b></p> <p>CentOS and Debian are Linux distributions that spawn from opposite ends of the candle.</p> <p>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.</p> <p>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.</p> <p><b>CentOS vs. Debian: Architecture</b></p> <p>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?</p> <p>Both Debian and CentOS support AArch64/ARM64, armhf/armhfp , i386 , ppc64el/ppc64le. (Note: armhf/armhfp and i386 are supported in CentOS 7 only.)</p> <p>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.</p> <p>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.</p> <p><b>CentOS vs. Debian: Package Management</b></p> <p>Most Linux distributions have some form of package manager nowadays, with some more complex and feature-rich than others.</p> <p>CentOS uses the RPM package format and YUM/DNF as the package manager.</p> <p>Debian uses the DEB package format and dpkg/APT as the package manager.</p> <p>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.</p>	

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

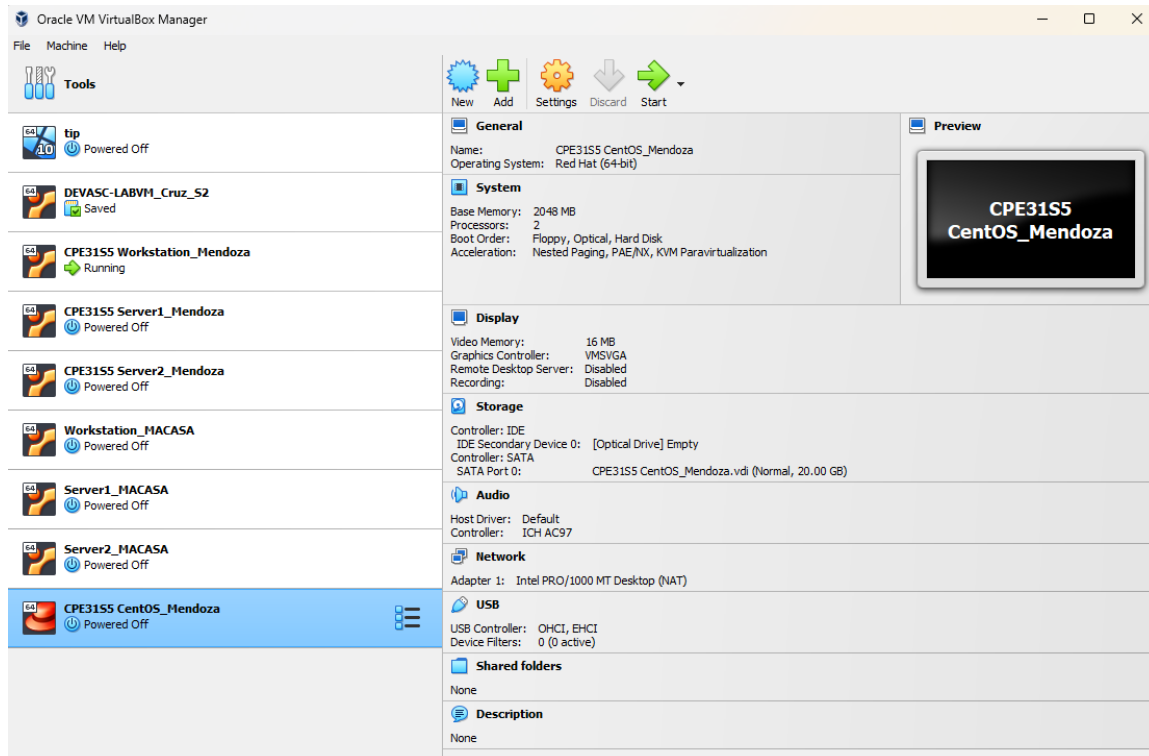
1. Download the image of the CentOS here: [http://mirror.rise.ph/centos/7.9.2009/isos/x86\\_64/](http://mirror.rise.ph/centos/7.9.2009/isos/x86_64/)



The screenshot shows a file manager window with a search bar containing 'CPE31S5 Mendoza, John Renzo L'. Below the search bar is a table with columns: Name, Date modified, Type, and Size. A single file is listed: 'CentOS-7-x86\_64-DVD-2207-02.iso' with a date of '05/09/2023 5:11 pm', type of 'Disc Image File', and size of '4,635,648 KB'.

Name	Date modified	Type	Size
CentOS-7-x86_64-DVD-2207-02.iso	05/09/2023 5:11 pm	Disc Image File	4,635,648 KB

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



The screenshot shows the Oracle VM VirtualBox Manager interface. On the left, a list of VMs is shown, with 'CPE31S5 CentOS\_Mendoza' selected. The main pane displays the settings for this VM, categorized into General, System, Display, Storage, Audio, Network, USB, Shared folders, and Description. The General tab is active, showing the name 'CPE31S5 CentOS\_Mendoza' and operating system 'Red Hat (64-bit)'. The System tab shows 2048 MB of base memory and 2 processors. The Display tab shows 16 MB of video memory. The Storage tab shows a single IDE controller with a 20.00 GB VDI disk. The Audio tab shows the default host driver. The Network tab shows an Intel PRO/1000 MT Desktop adapter. The USB tab shows an OHCI controller. The Shared folders and Description tabs are empty.

**General**

Name: CPE31S5 CentOS\_Mendoza  
Operating System: Red Hat (64-bit)

**System**

Base Memory: 2048 MB  
Processors: 2  
Boot Order: Floppy, Optical, Hard Disk  
Acceleration: Nested Paging, PAE/NX, KVM Paravirtualization

**Display**

Video Memory: 16 MB  
Graphics Controller: VMSVGA  
Remote Desktop Server: Disabled  
Recording: Disabled

**Storage**

Controller: IDE  
IDE Secondary Device 0: [Optical Drive] Empty  
Controller: SATA  
SATA Port 0: CPE31S5 CentOS\_Mendoza.vdi (Normal, 20.00 GB)

**Audio**

Host Driver: Default  
Controller: ICH AC97

**Network**

Adapter 1: Intel PRO/1000 MT Desktop (NAT)

**USB**

USB Controller: OHCI, EHCI  
Device Filters: 0 (0 active)

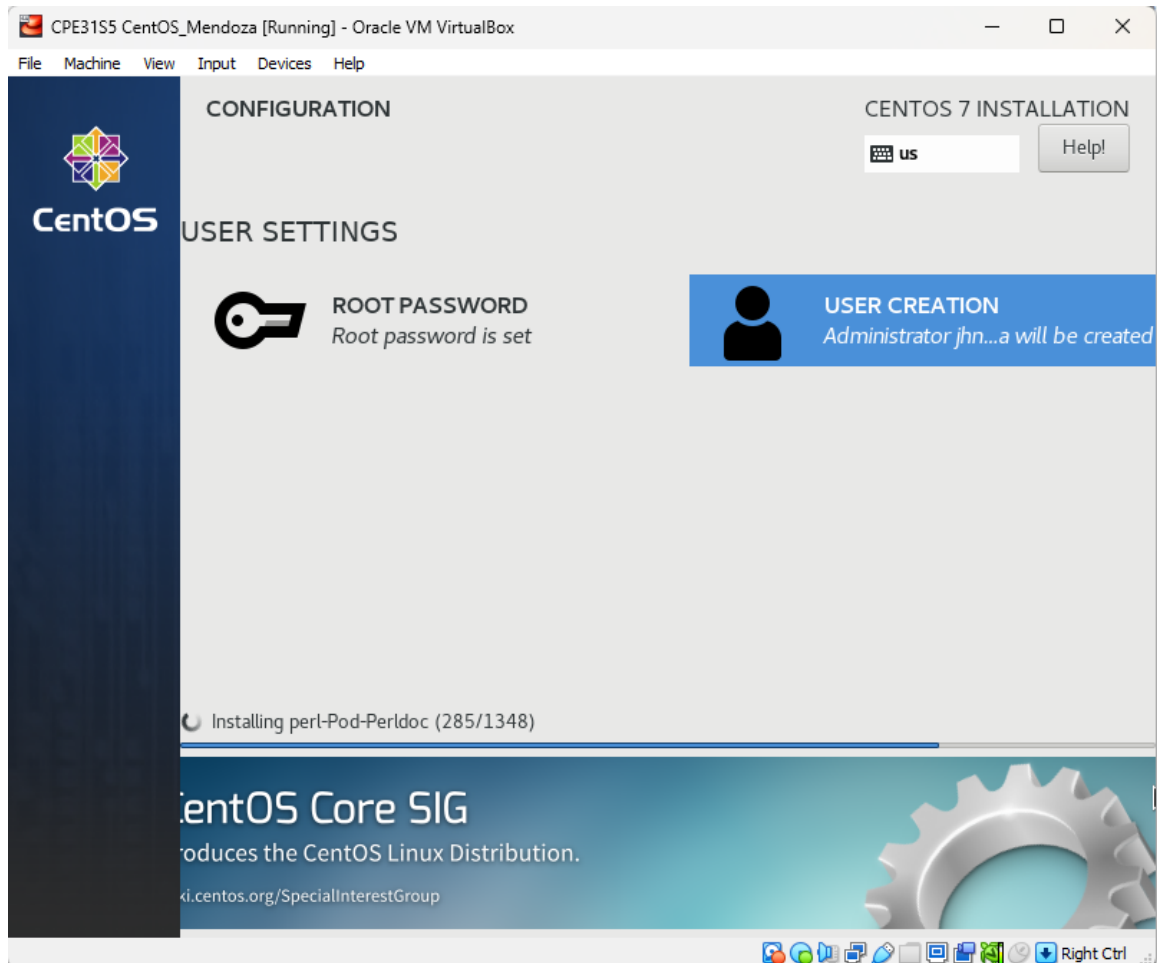
**Shared folders**

None

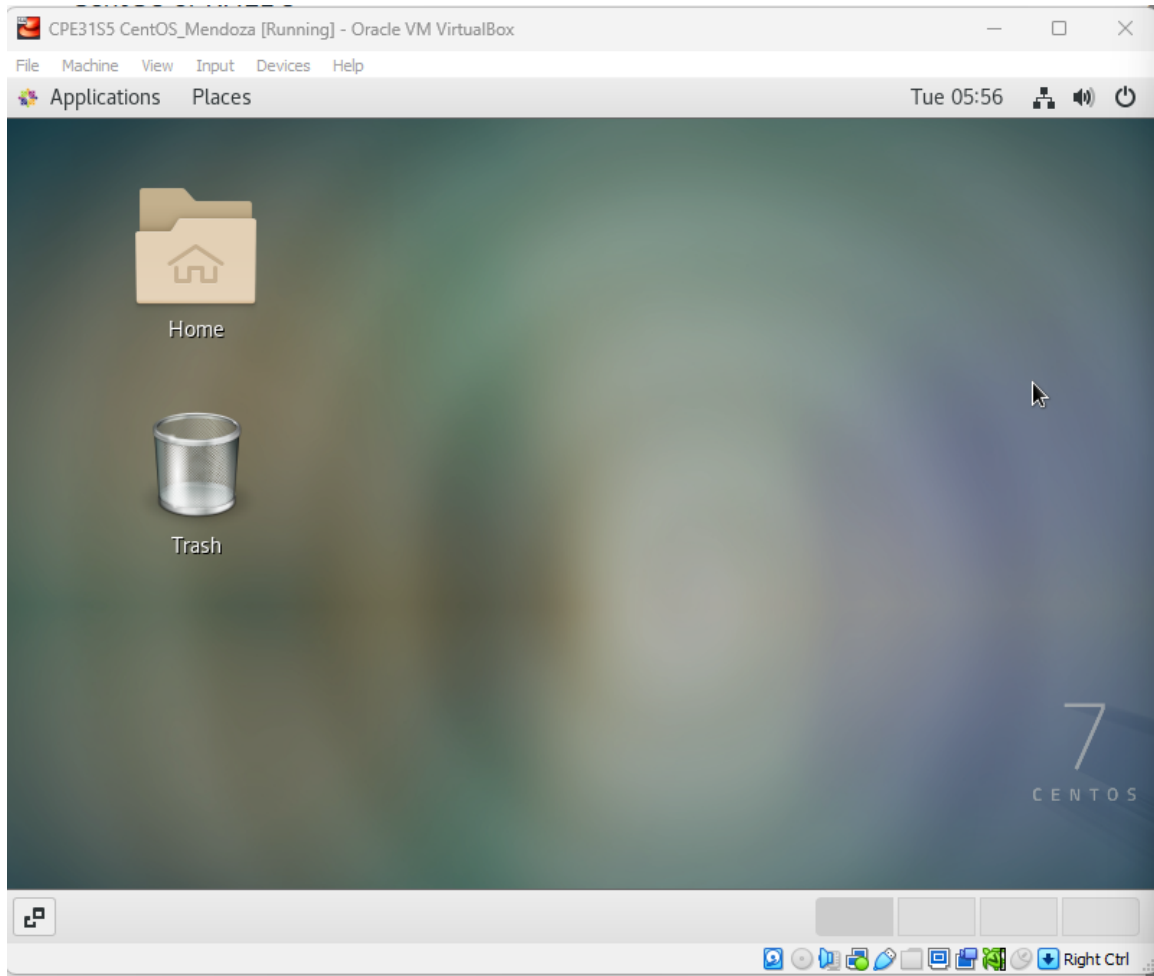
**Description**

None

3. Install the downloaded image.



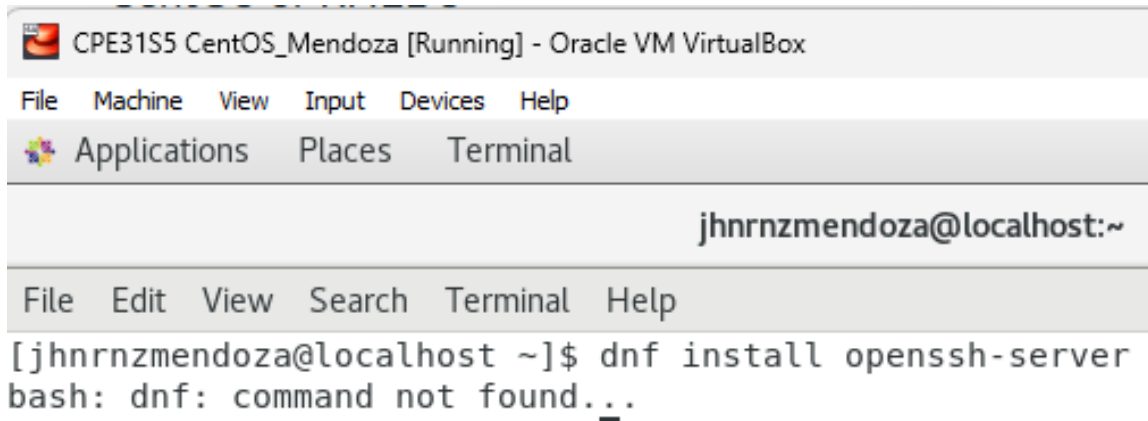
4. Show evidence that the OS was installed already.



## Task 2: Install the SSH server package *openssh*

1. Install the ssh server package *openssh* by using the *dnf* command:

*\$ dnf install openssh-server*



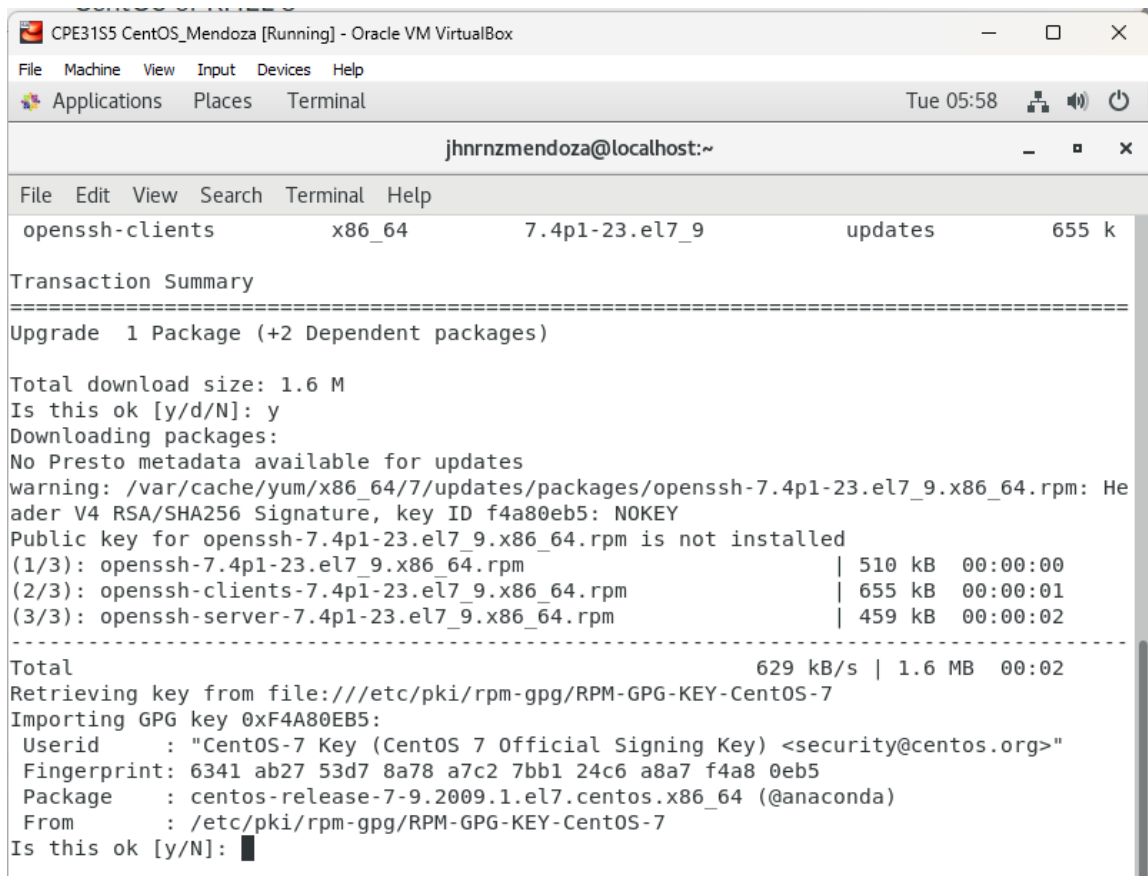
```
CPE31S5 CentOS_Mendoza [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal

jhnrmendoza@localhost:~

File Edit View Search Terminal Help

[jhnrmendoza@localhost ~]$ dnf install openssh-server
bash: dnf: command not found...
```

Using the Command **sudo yum install openssh-server**.



```
CPE31S5 CentOS_Mendoza [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal
Tue 05:58

jhnrmendoza@localhost:~

File Edit View Search Terminal Help

openssh-clients      x86_64      7.4p1-23.el7_9      updates      655 k

Transaction Summary
=====
Upgrade  1 Package (+2 Dependent packages)

Total download size: 1.6 M
Is this ok [y/d/N]: y
Downloading packages:
No Presto metadata available for updates
warning: /var/cache/yum/x86_64/7/updates/packages/openssh-7.4p1-23.el7_9.x86_64.rpm: Header V4 RSA/SHA256 Signature, key ID f4a80eb5: NOKEY
Public key for openssh-7.4p1-23.el7_9.x86_64.rpm is not installed
(1/3): openssh-7.4p1-23.el7_9.x86_64.rpm | 510 kB  00:00:00
(2/3): openssh-clients-7.4p1-23.el7_9.x86_64.rpm | 655 kB  00:00:01
(3/3): openssh-server-7.4p1-23.el7_9.x86_64.rpm | 459 kB  00:00:02
-----
Total | 629 kB/s | 1.6 MB  00:02
Retrieving key from file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
Importing GPG key 0xF4A80EB5:
  Userid      : "CentOS-7 Key (CentOS 7 Official Signing Key) <security@centos.org>"
  Fingerprint: 6341 ab27 53d7 8a78 a7c2 7bb1 24c6 a8a7 f4a8 0eb5
  Package     : centos-release-7-9.2009.1.el7.centos.x86_64 (@anaconda)
  From        : /etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
Is this ok [y/N]:
```

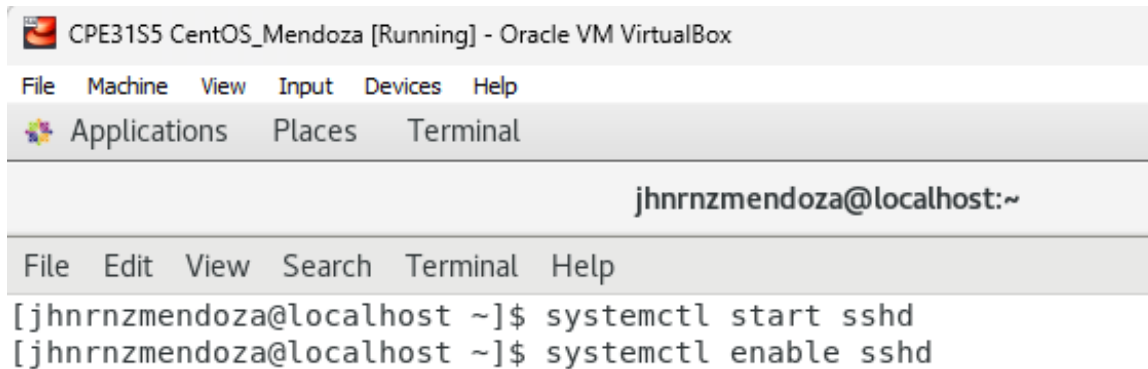
### Observation:

Since the given command *dnf install openssh-server* does not work. I have used the *yum* command as CentOS is within the RedHat distribution family and its package management tool to install packages is YUM.

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

```
$ systemctl start sshd
```

```
$ systemctl enable sshd
```

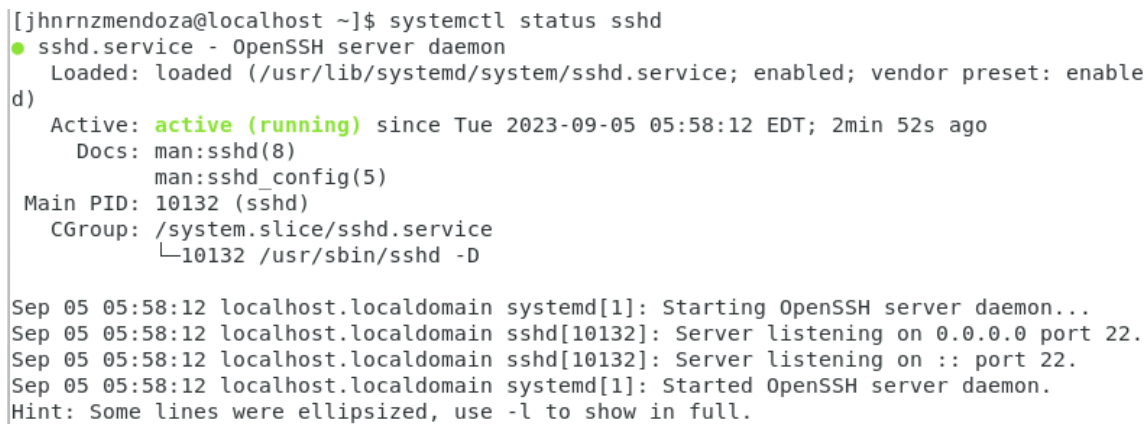


The screenshot shows a terminal window titled "CPE31S5 CentOS\_Mendoza [Running] - Oracle VM VirtualBox". The terminal has a menu bar with "File", "Machine", "View", "Input", "Devices", and "Help". Below the menu bar are tabs for "Applications", "Places", and "Terminal". The prompt is "jhnrmendoza@localhost:~". The terminal shows the following commands and output:

```
File Edit View Search Terminal Help
[jhnrmendoza@localhost ~]$ systemctl start sshd
[jhnrmendoza@localhost ~]$ systemctl enable sshd
```

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

```
$ systemctl status sshd
```



The screenshot shows the output of the command "systemctl status sshd". The output is as follows:

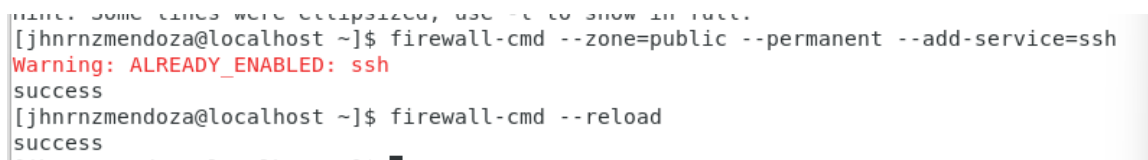
```
[jhnrmendoza@localhost ~]$ systemctl status sshd
● sshd.service - OpenSSH server daemon
   Loaded: loaded (/usr/lib/systemd/system/ssh.service; enabled; vendor preset: enable
d)
   Active: active (running) since Tue 2023-09-05 05:58:12 EDT; 2min 52s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
    Main PID: 10132 (sshd)
      CGroup: /system.slice/ssh.service
              └─10132 /usr/sbin/sshd -D

Sep 05 05:58:12 localhost.localdomain systemd[1]: Starting OpenSSH server daemon...
Sep 05 05:58:12 localhost.localdomain sshd[10132]: Server listening on 0.0.0.0 port 22.
Sep 05 05:58:12 localhost.localdomain sshd[10132]: Server listening on :: port 22.
Sep 05 05:58:12 localhost.localdomain systemd[1]: Started OpenSSH server daemon.
Hint: Some lines were ellipsized, use -l to show in full.
```

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

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

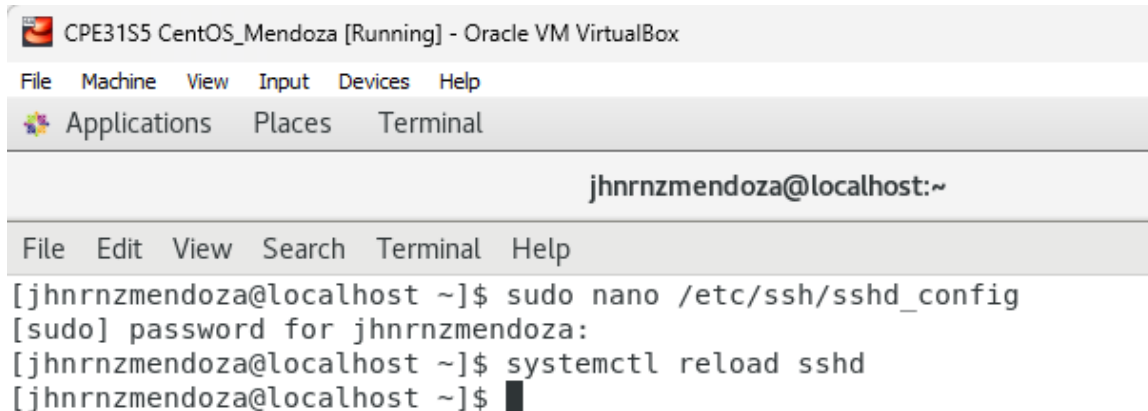
```
$ firewall-cmd --reload
```



The screenshot shows the output of the firewall commands. The output is as follows:

```
Hint: Some lines were ellipsized, use -l to show in full.
[jhnrmendoza@localhost ~]$ firewall-cmd --zone=public --permanent --add-service=ssh
Warning: ALREADY_ENABLED: ssh
success
[jhnrmendoza@localhost ~]$ firewall-cmd --reload
success
```

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`



```
CPE31S5 CentOS_Mendoza [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places Terminal

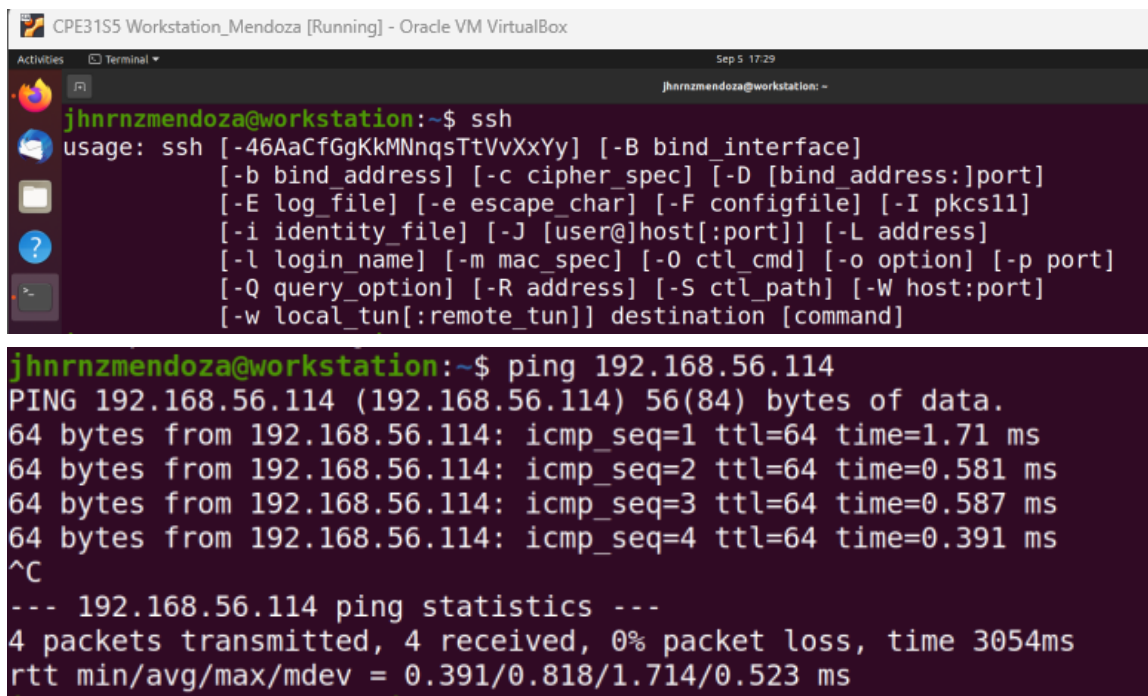
jhnrmendoza@localhost:~

File Edit View Search Terminal Help

[jhnrmendoza@localhost ~]$ sudo nano /etc/ssh/sshd_config
[sudo] password for jhnrmendoza:
[jhnrmendoza@localhost ~]$ systemctl reload sshd
[jhnrmendoza@localhost ~]$
```

### Task 3: Copy the Public Key to CentOS

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



```
CPE31S5 Workstation_Mendoza [Running] - Oracle VM VirtualBox
Activities Terminal Sep 5 17:29
jhnrmendoza@workstation: ~

jhnrmendoza@workstation:~$ ssh
usage: ssh [-46AaCfGgKkMNnqsTtVvXxYy] [-B bind_interface]
          [-b bind_address] [-c cipher_spec] [-D [bind_address:]port]
          [-E log_file] [-e escape_char] [-F configfile] [-I pkcs11]
          [-i identity_file] [-J [user@]host[:port]] [-L address]
          [-l login_name] [-m mac_spec] [-O ctl_cmd] [-o option] [-p port]
          [-Q query_option] [-R address] [-S ctl_path] [-W host:port]
          [-w local_tun[:remote_tun]] destination [command]

jhnrmendoza@workstation:~$ ping 192.168.56.114
PING 192.168.56.114 (192.168.56.114) 56(84) bytes of data.
64 bytes from 192.168.56.114: icmp_seq=1 ttl=64 time=1.71 ms
64 bytes from 192.168.56.114: icmp_seq=2 ttl=64 time=0.581 ms
64 bytes from 192.168.56.114: icmp_seq=3 ttl=64 time=0.587 ms
64 bytes from 192.168.56.114: icmp_seq=4 ttl=64 time=0.391 ms
^C
--- 192.168.56.114 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3054ms
rtt min/avg/max/mdev = 0.391/0.818/1.714/0.523 ms
```

```
CPE31S5 Workstation_Mendoza [Running] - Oracle VM VirtualBox
Activities Terminal Sep 5 17:35
jhnrmendoza@workstation: ~
GNU nano 4.8 /etc/hosts
127.0.0.1 localhost
127.0.0.1 workstation
192.168.56.111 server1
192.168.56.112 server2
192.168.56.114 centos
```

```
jhnrmendoza@workstation:~$ ssh jhnrmendoza@centos
The authenticity of host 'centos (192.168.56.114)' can't be established.
ECDSA key fingerprint is SHA256:4xE+3a6ImgZCr4Vzdmxh6qjuCzRuxHSbdfvsRYcG3x4.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'centos,192.168.56.114' (ECDSA) to the list of known hosts.
jhnrmendoza@centos's password:
Last login: Tue Sep 5 06:13:02 2023
[jhnrmendoza@localhost ~]$
```

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

```
jhnrmendoza@workstation:~$ ssh-copy-id 192.168.56.114
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are
already installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to
install the new keys
jhnrmendoza@192.168.56.114's password:

Number of key(s) added: 1

Now try logging into the machine, with: "ssh '192.168.56.114'"
and check to make sure that only the key(s) you wanted were added.
```

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

```
[jhnrmendoza@localhost ~]$ ls -la .ssh
total 8
drwx-----. 2 jhnrmendoza jhnrmendoza 29 Sep 5 06:20 .
drwx-----. 16 jhnrmendoza jhnrmendoza 4096 Sep 5 06:20 ..
-rw-----. 1 jhnrmendoza jhnrmendoza 757 Sep 5 06:20 authorized_keys
```

Observation:

The command `ls -la .ssh` is used to display the `authorized-keys` file which stores the copied public key.



#### Task 4: Verify ssh remote connection

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

```
jhnrmendoza@workstation:~$ ssh jhnrmendoza@192.168.56.114
Last login: Tue Sep  5 06:17:53 2023 from 192.168.56.113
[jhnrmendoza@localhost ~]$
```

Observation:

Using the local machine, we remotely accessed the CentOS to prove that the previous configurations are working.

2. Show evidence that you are connected.

```
jhnrmendoza@workstation:~$ ping 192.168.56.114
PING 192.168.56.114 (192.168.56.114) 56(84) bytes of data.
64 bytes from 192.168.56.114: icmp_seq=1 ttl=64 time=0.498 ms
64 bytes from 192.168.56.114: icmp_seq=2 ttl=64 time=0.584 ms
64 bytes from 192.168.56.114: icmp_seq=3 ttl=64 time=0.478 ms
64 bytes from 192.168.56.114: icmp_seq=4 ttl=64 time=0.509 ms
█
```

Observation:

Using the local machine, we have pinged the CentOS by pinging its IP address. As we can observe, the terminal showed connectivity.

**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?

In selecting the best Linux distribution to use, we must consider the software support, the performance, and the purpose on where we will use it. These are some of the things that we also consider in selecting an Operating System together with the cost constraint.

**Software Support** because some distributions have a constant update cycle while others get updated randomly or rarely. System administrators or users in general might also have a hard time as they are not compatible or not used to the linux distribution as some only work on command line interface or graphical user interface.

**Performance** because some distributions are supported by developers which makes the distribution tested and the updates are stable. On the contrary, other distributions may not have a good support which makes it inefficient or unstable.

**Purpose** because some distributions are beginner friendly since the GUI or the syntaxes are easier to adapt. Other distributions require advanced knowledge about the syntax and may take time to learn especially the beginners.

2. What are the main differences between Debian and Red Hat Linux distributions?

The main difference between Debian and RedHat distributions are given on the bulleted format below:

Debian:

- The package management is DPKG (Debian Package) and APT (Advance Package Tool).
- Can be used as a Server and a Desktop
- Software License is Free

Red Hat:

- The package management is RPM (Red Hat Package Manager) and YUM (Yellowdog Updater, Modified).
- Can only be used as Server
- Software License is Open Source