CentOS 7 MATE Desktop Install

In this tutorial, I will demonstrate how to install the Mate desktop on a CentOS 7 minimal install virtual machine. The **MATE Desktop** uses minimal system resources. This will ensure the virtual machine will only need 1024MB (1.0GB) of RAM and your host system will only need to delegate a minimum amount of resources when the VM is running.

After the **MATE Desktop** install demo, I will show you how to install VirtualBox's **Guest Additions** so that you can make use of a **shared clipboard** and **drag'n'drop** between host and guest. These are the two features I use regularly but for detailed information on guest additions, refer to this link.

Please note that I will be using a virtual machine that was created in my other tutorial, **CentOS 7 Server Install**, accessible here.

Refer to the prerequisites listed below to complete this tutorial.

Prerequisites

- VirtualBox VM with a CentOS 7 minimal installation
- non-root user with **sudo** privileges
- Active Internet Connection

For instructions on how to install VirtualBox and extension pack, see my **VirtualBox Install** tutorial here.

If you do not already have a virtual machine, with a minimal install of CentOS 7, my other tutorial can be accessed here.

Steps to complete tutorial:

1. Take Post CentOS 7 Install Snapshot
2. Create non-root user with **sudo** privileges
3. Update CentOS 7
4. Take Pre MATE Desktop Snapshot
5. Install MATE Desktop
    a. Install EPEL package repository
    b. Install X Window System packages
    c. Install MATE Desktop packages
    d. Change Default Target to Graphical
    e. Boot to Graphical Target
6. Take Post MATE Desktop Snapshot
7. Install VirtualBox Guest Additions
8. Take Post Guest Additions Snapshot

Take Post CentOS 7 Install Snapshot

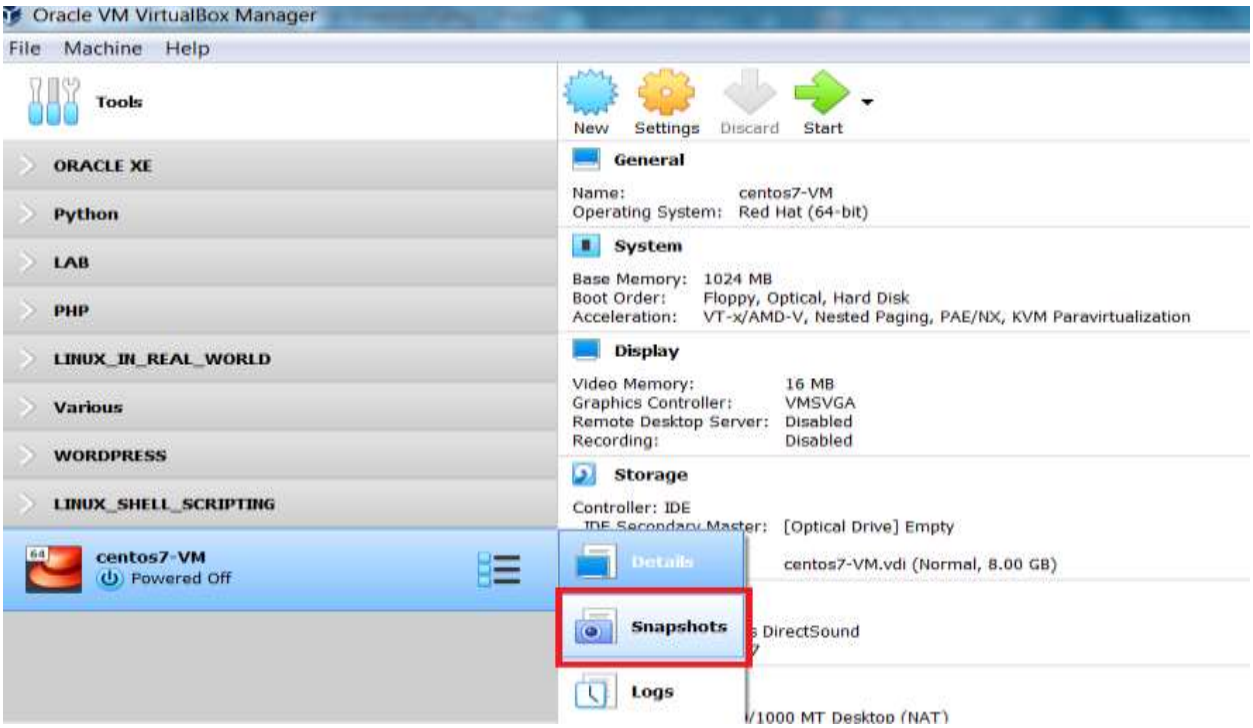
The reason I want to take a snapshot, before we begin, is that we will be making a number of major changes to the virtual machine. After successfully completing a major change, I find it helpful to create (take) a snapshot to act as a fallback mechanism. If something goes wrong during a major change, we can revert back to a working snapshot (previous stable state).

If you've completed my **CentOS 7 Server Install** tutorial, then, you've already taken this snapshot and can skip to the next step (Update CentOS 7).

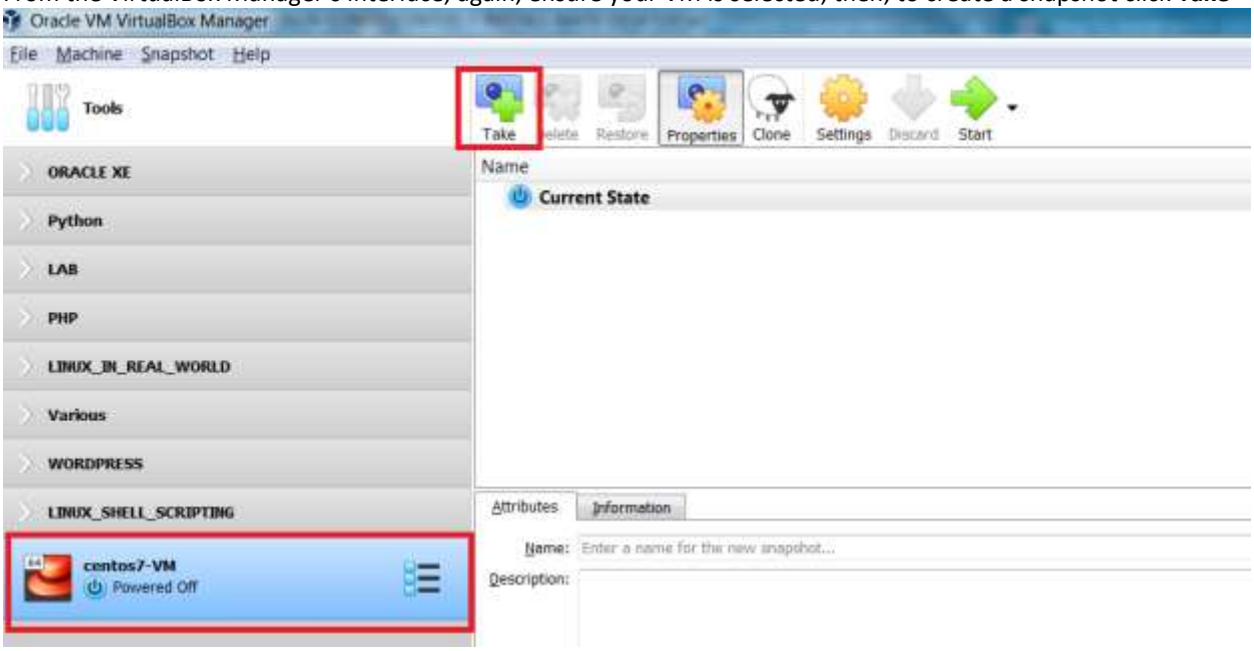
If you already have a CentOS 7 minimal install VM. I suggest taking a snapshot before continuing with the tutorial, to ensure that you have a starting point to revert back to.

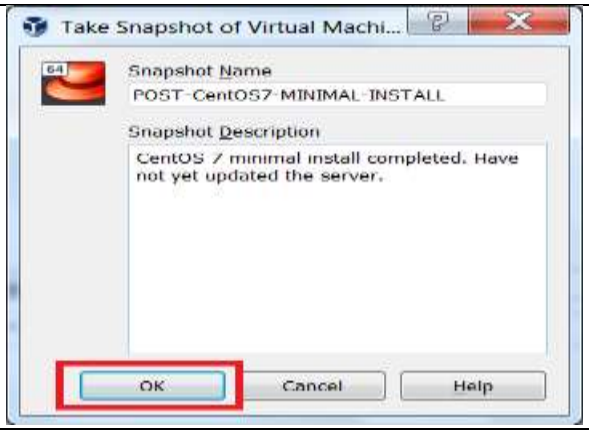
Please note that you can name the snapshot whatever you like, just remember which snapshot is associated with which state of the virtual machine.

In the VirtualBox Manager interface, we are currently in **Details** view. To switch to **Snapshots** view, click the list icon next to the virtual machine name, and select **Snapshots**.



The "**Snapshots**" view will show you a listing of the snapshots created for the virtual machine.
From the VirtualBox Manager's interface, again, ensure your VM is selected, then, to create a snapshot click **Take**



Enter a name for the snapshot, as well as, a short description, then, click **OK** I've taken a snapshot "**POST-CentOS7-MINIMAL-INSTALL**" to ensure that I have a starting point to revert back to, if needed. Before installing the **MATE Desktop**, we will ensure that our CentOS 7 install is up to date. To perform a CentOS 7 system update, we need a non-root user with **sudo** privileges.	

Create non-root user with sudo privileges

If you already have a non-root user with **sudo** privileges, please skip to the next step (Update CentOS 7)

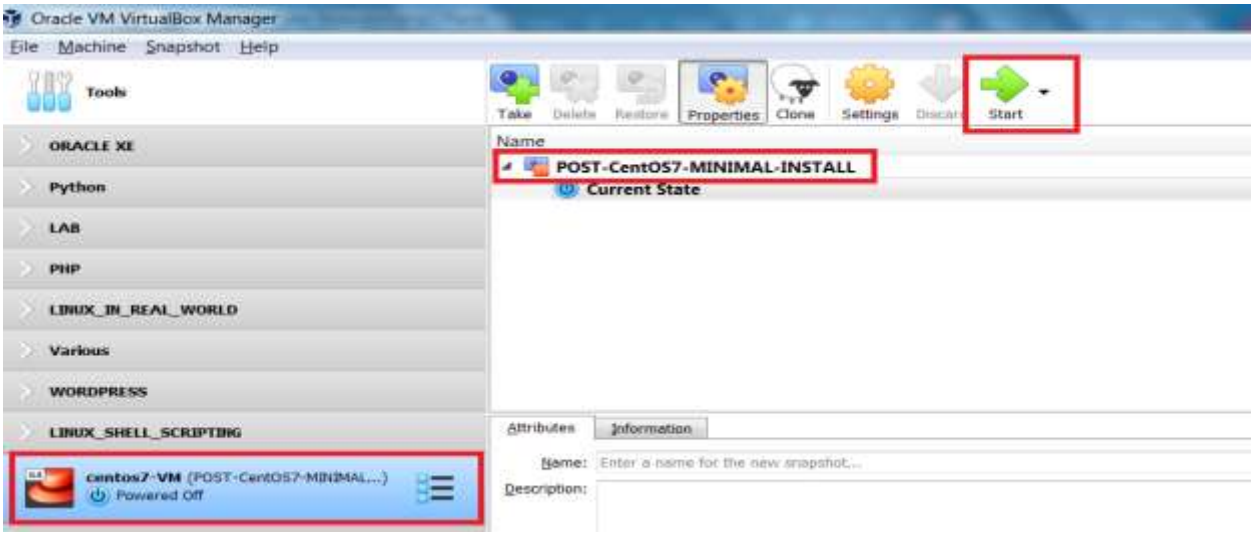
To be able to update CentOS 7, install new packages, as well as, do most management tasks, the user performing the operations must have **sudo** privileges, or, the operations must be performed by the root user.

In a production environment, it is good practice **NOT** to login as the root user, and to **NEVER** perform operations while logged in as the root user.

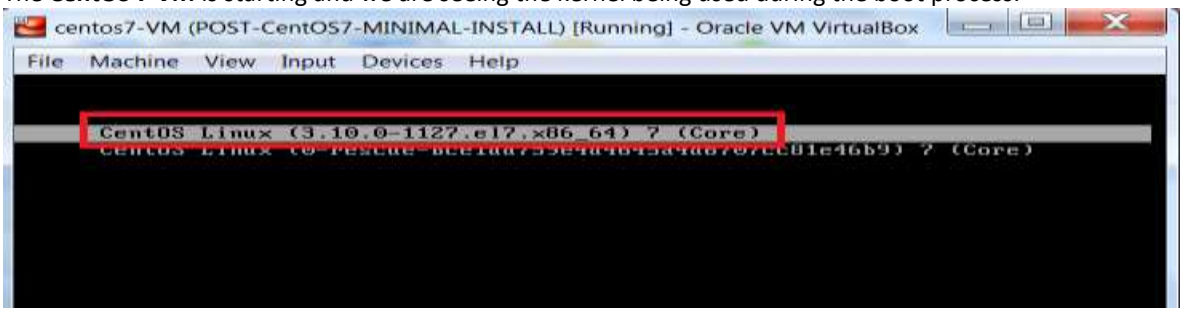
Since this is a lab environment, I will demonstrate the creation of a non-root user that has **sudo** privileges, while logged in as the root user.

On the VirtualBox Manager interface, you will notice that we successfully took a snapshot. This ensures that we can always revert back to a working virtual machine with a minimal version of **CentOS 7** installed.

From the VirtualBox Manager interface, ensure your VM is selected and click **Start**



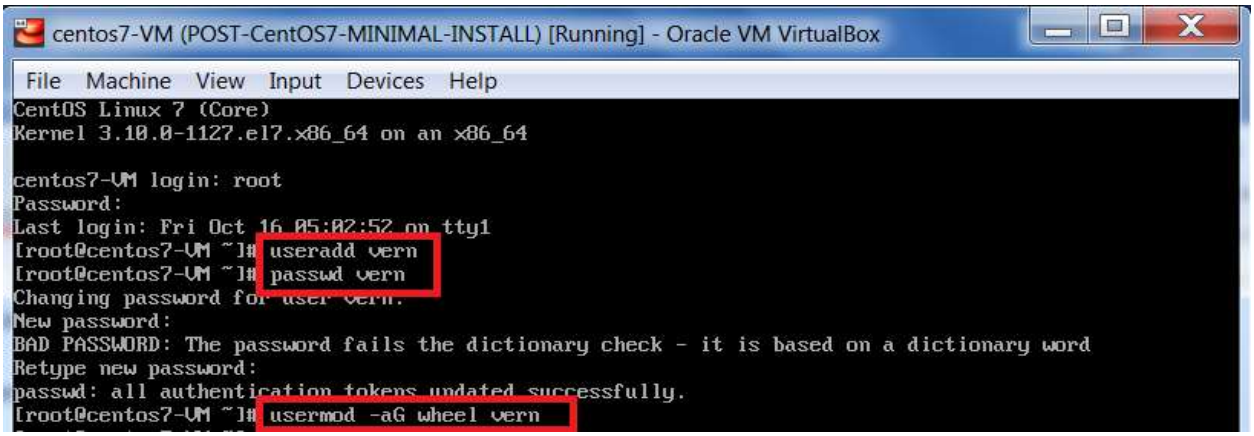
The **CentOS 7 VM** is starting and we are seeing the kernel being used during the boot process.



Once CentOS 7 has started, on the login screen, enter the root user's credentials.
Now that we are logged in as the root user, we will create a non-root user with **sudo** privileges.

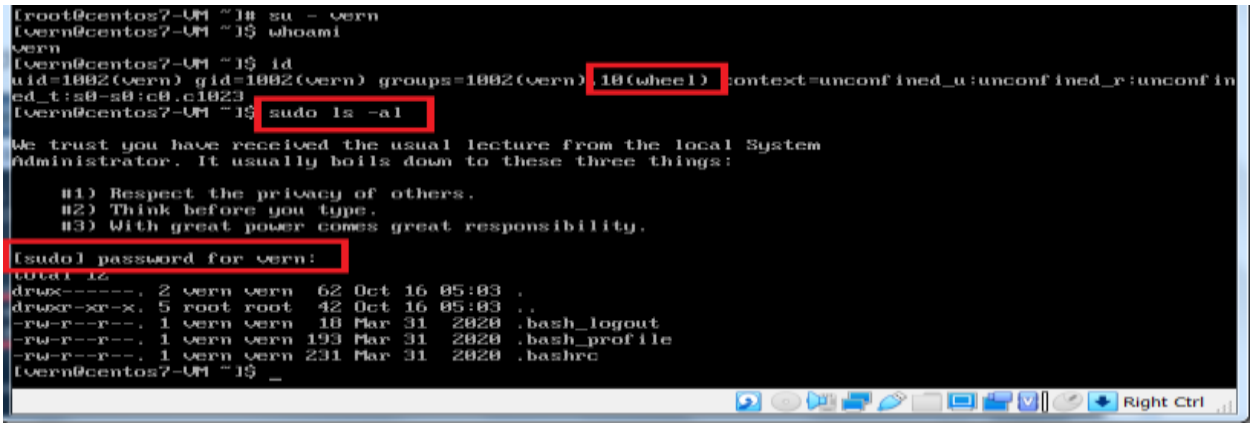
On the command line, execute the following commands (one after the other & enter password, when prompted):

```
useradd vern
passwd vern
usermod -aG wheel vern
```



Now we will verify that our newly created non-root user has **sudo** privileges.
On the command line, execute the following commands (one after the other & enter password, when prompted):

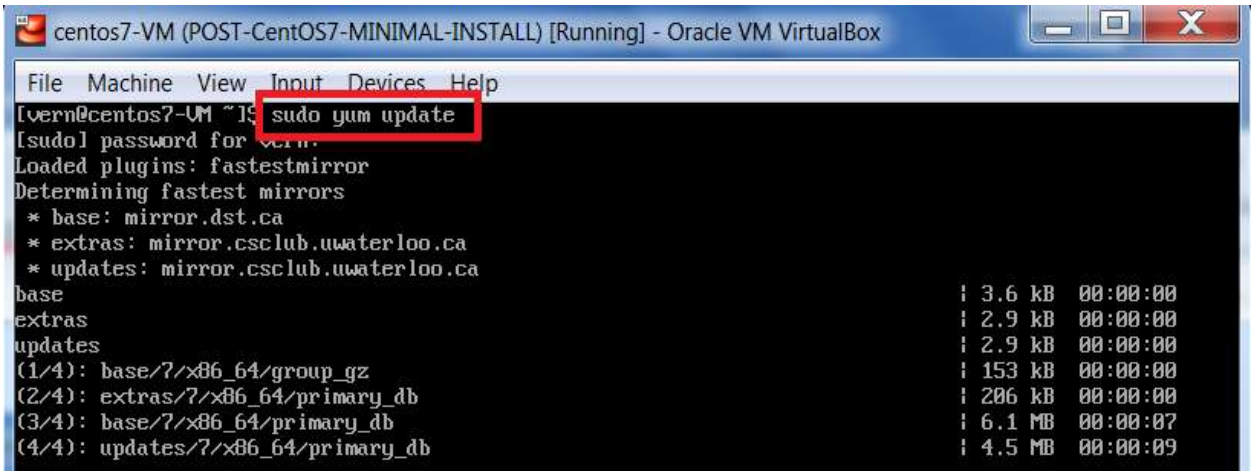
```
su - vern
whoami
id
sudo ls -al
```



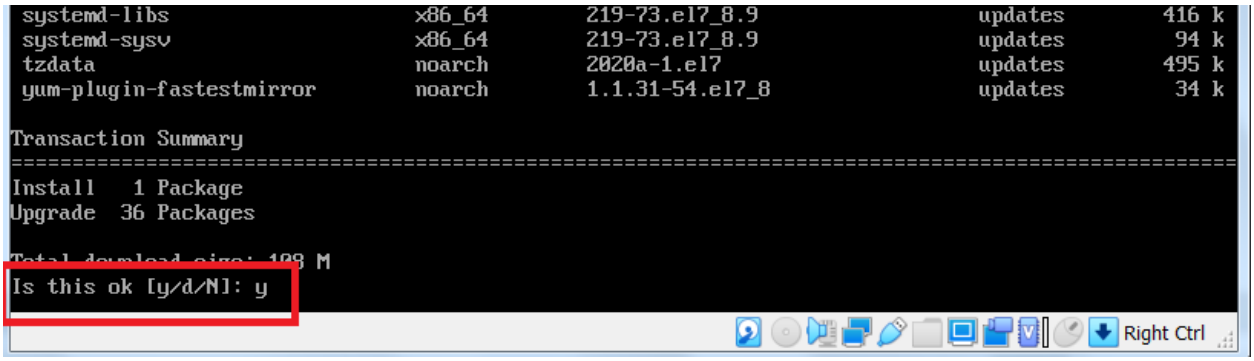
Now that we have a non-root user with **sudo** privileges (‘**wheel**’ group member), we are ready to update **CentOS 7**.

Update CentOS 7

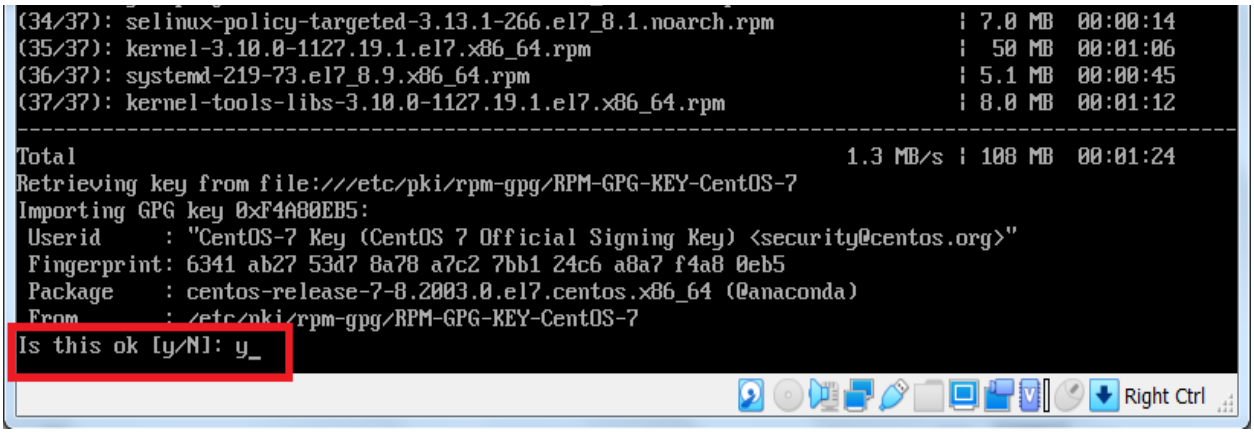
Now to update CentOS 7. From the command line, execute the following:
`sudo yum update`



When prompted, enter **y** to accept the packages to be downloaded, installed and upgraded.

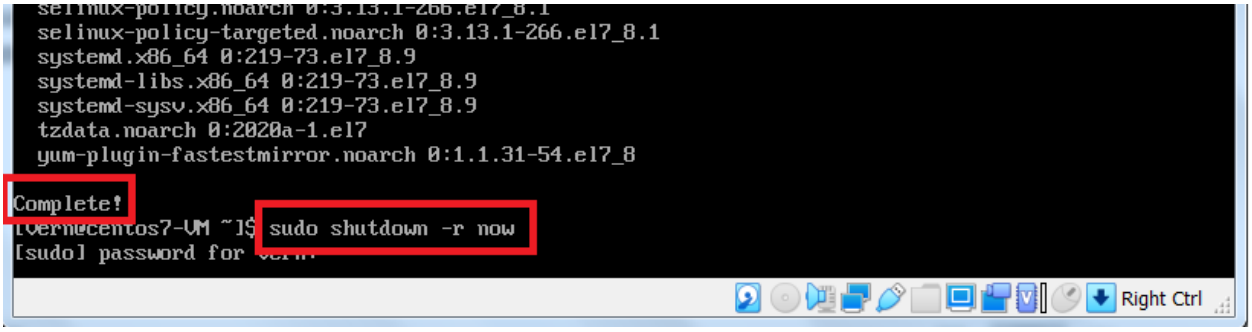


When prompted to use the local CentOS 7 Signing key to validate the downloaded packages, enter **y**

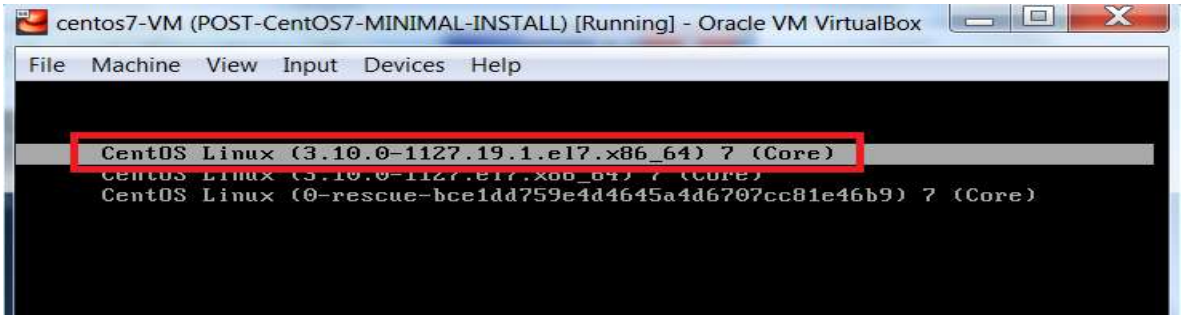


Your CentOS 7 system is now up to date. Let's reboot to ensure the newly installed kernel will be used as the core interface between the computer's hardware and its processes.

Remember to use your non-root user's password to acknowledge the following command:
`sudo shutdown -r now`



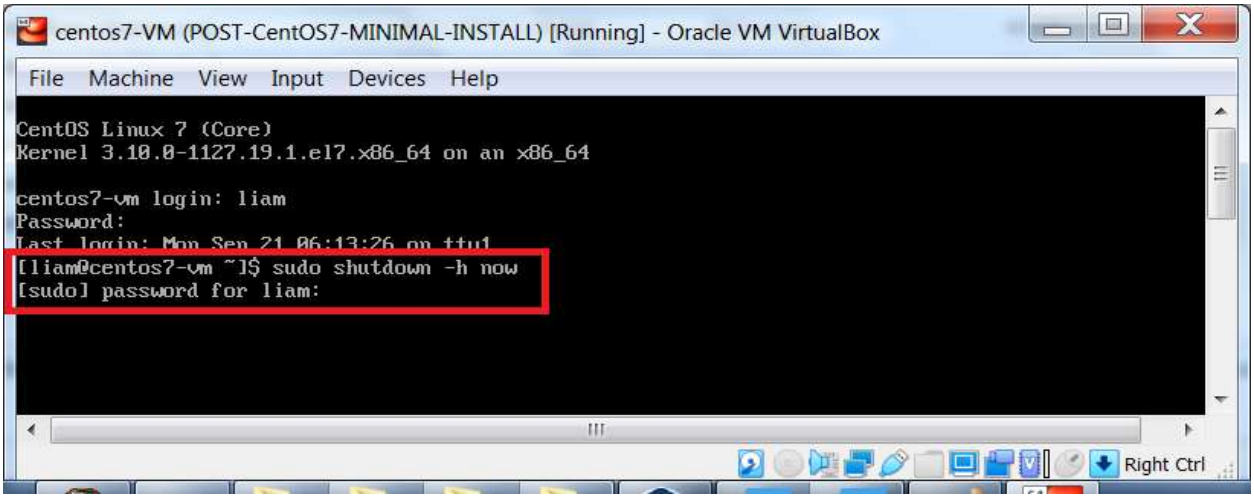
You should notice that the newly installed kernel is now being used



*Please note that, for the rest of the tutorial, I will be using a different non-root user account (**liam**), that also has **sudo** privileges.*

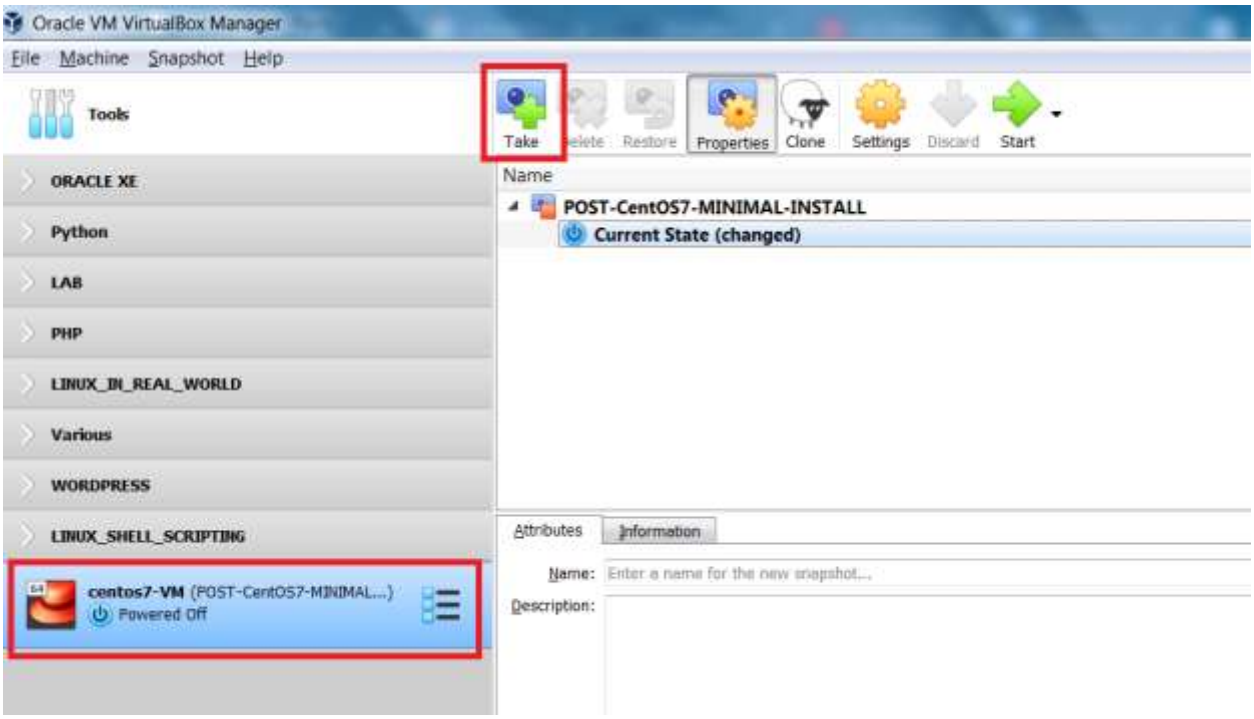
Now that our CentOS 7 install is up-to-date, let's shutdown the VM and create another snapshot.

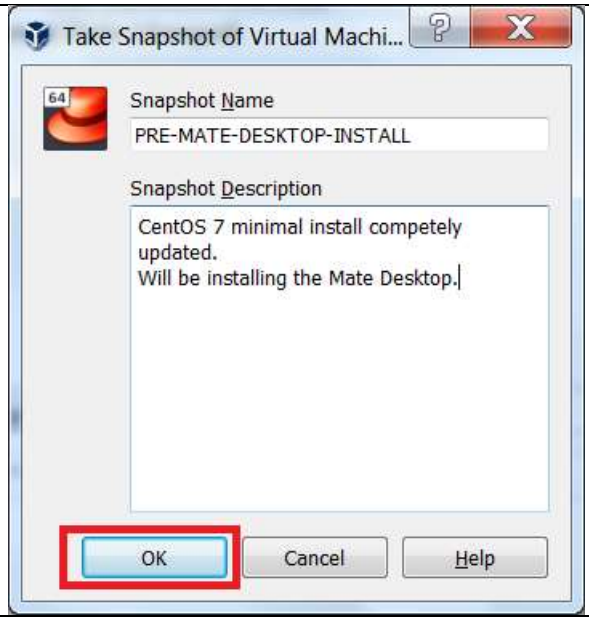
Remember to use your non-root user's password to acknowledge the following command:
`sudo shutdown -h now`



Take Pre MATE Desktop Snapshot

Again, from the VirtualBox Manager interface, ensure your VM is selected and you are in "**Snapshots**" view.
To create the snapshot, click **Take**

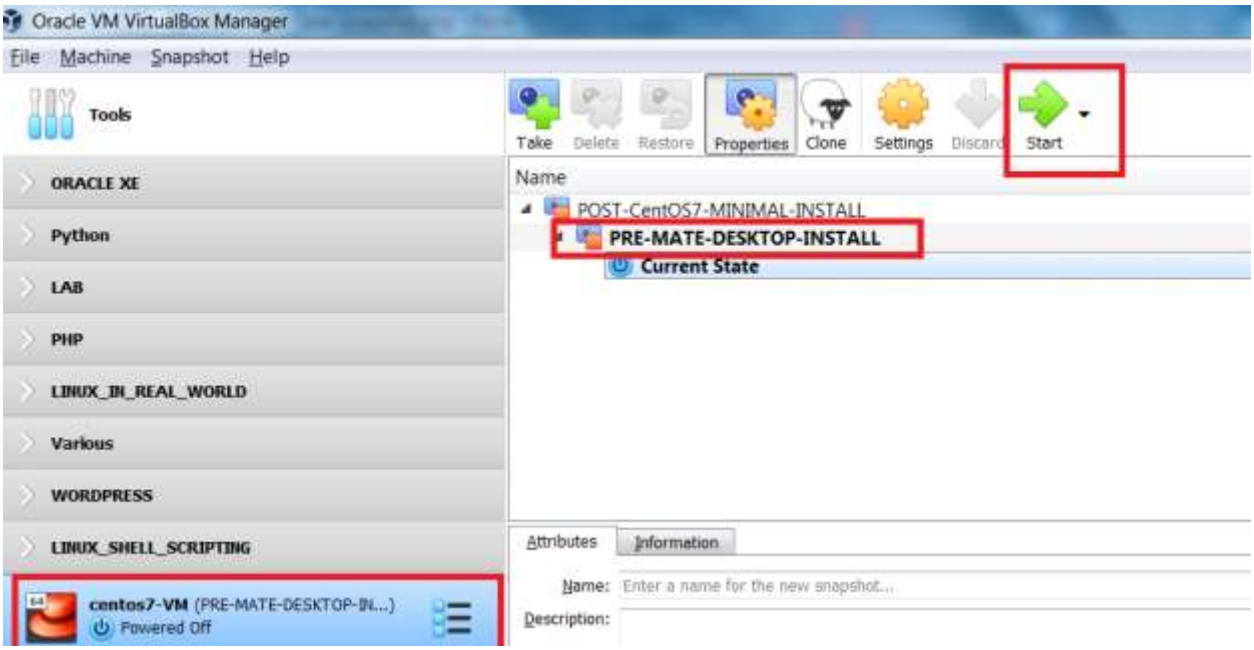


Enter a name for the snapshot, as well as, a short description, then, click **OK** I've taken a snapshot "**PRE-MATE-DESKTOP-INSTALL**" to ensure that we have an updated CentOS 7 minimal install we can revert back to. Now that we have our snapshot in place, we are ready to install the **MATE Desktop**.	

Install MATE Desktop

Now that our system is up to date, we can begin the installation of the **MATE Desktop**.

From the VirtualBox Manager interface, ensure your VM is selected and click **Start**



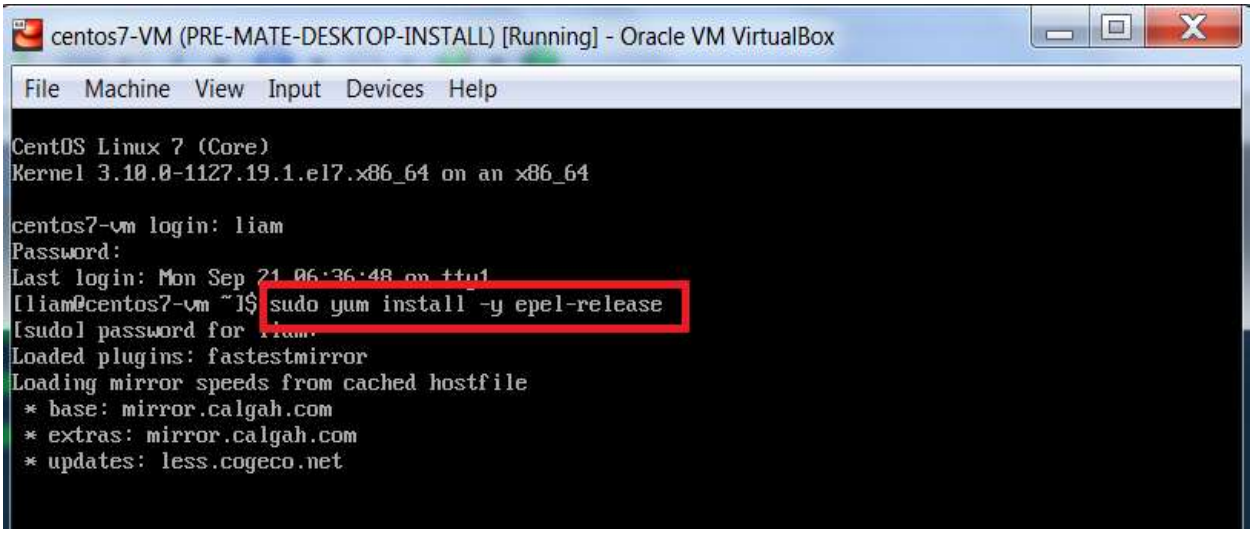
Install EPEL package repository

First, we must install the **EPEL** (Extra Packages for Enterprise Linux) package repository. This repository contains the packages required by the MATE Desktop.

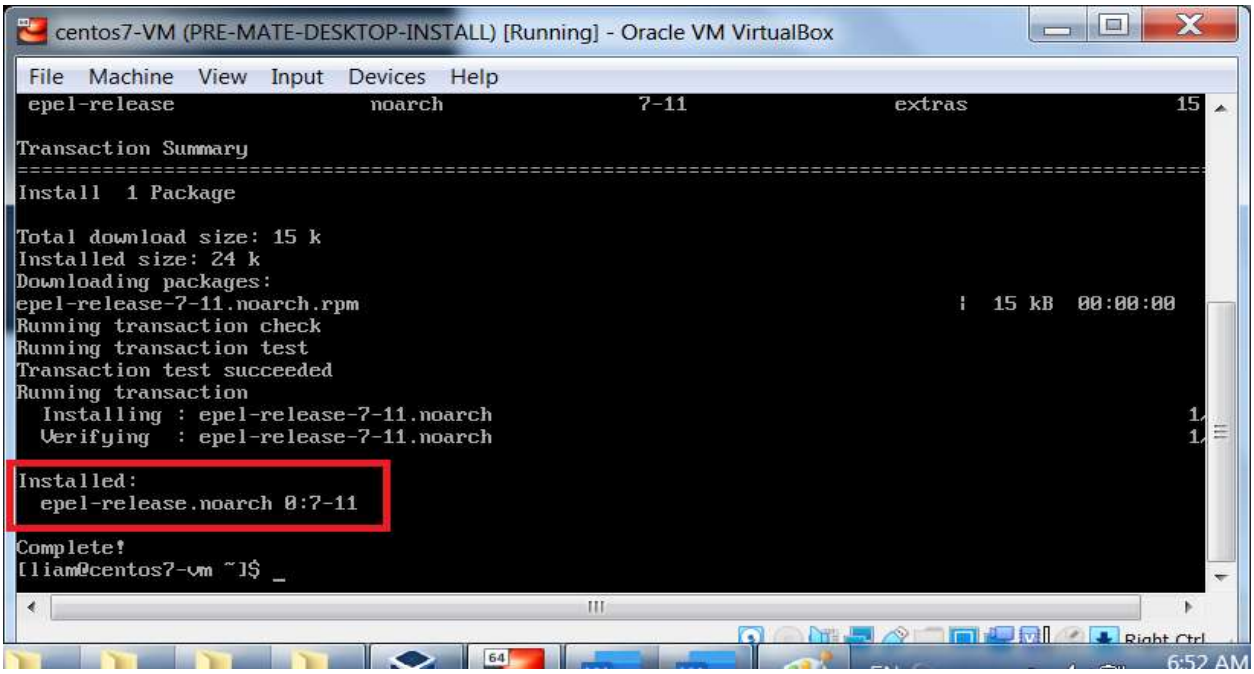
Note in the next command I have included the "**-y**" command option. This will ensure that we are not prompted to accept the execution of the command.

From the command line, execute the following command:

```
sudo yum install -y epel-release
```



You will notice that the epel-release package was successfully installed.

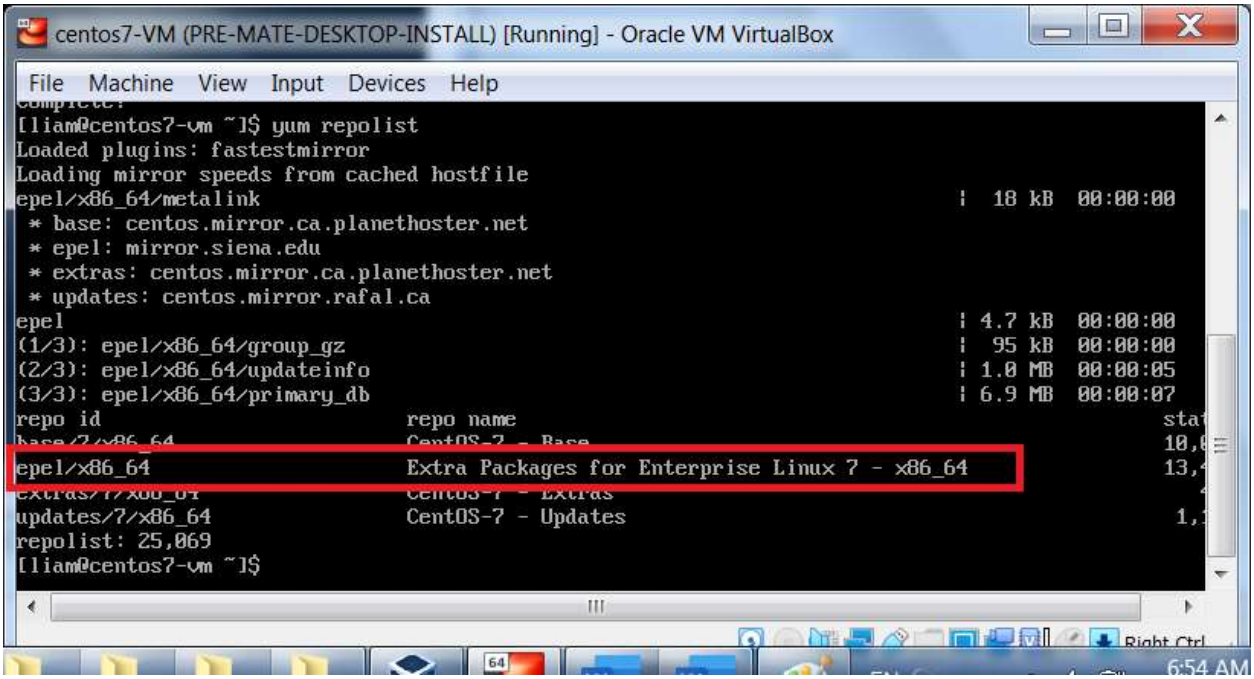


Let's confirm that the EPEL package repository is available to us to complete the installation of the **MATE Desktop**.

From the command line, execute the following:

```
yum repolist
```

You should now see the EPEL package repository listed.

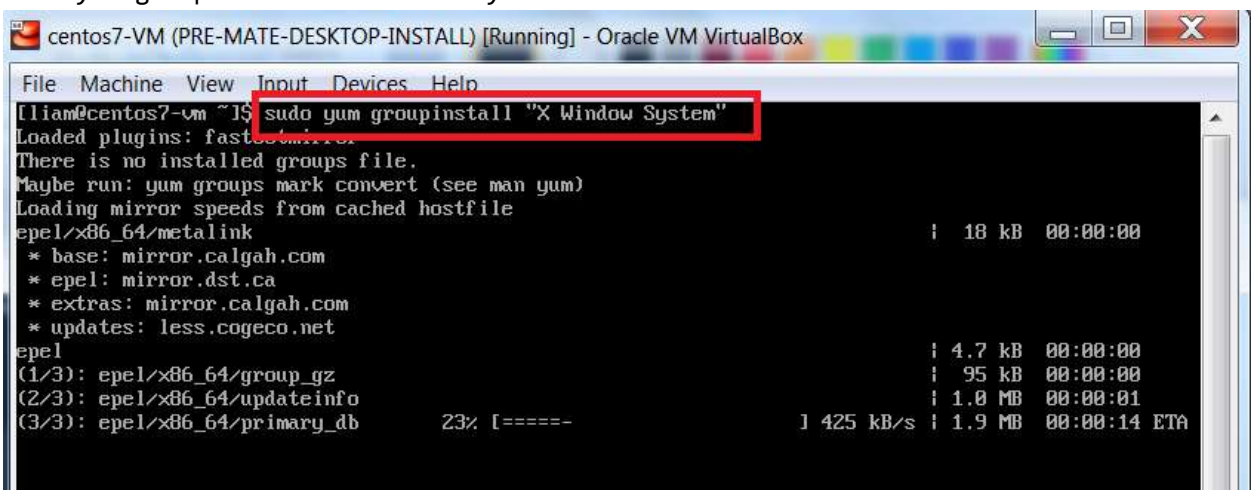


Install X Window System packages

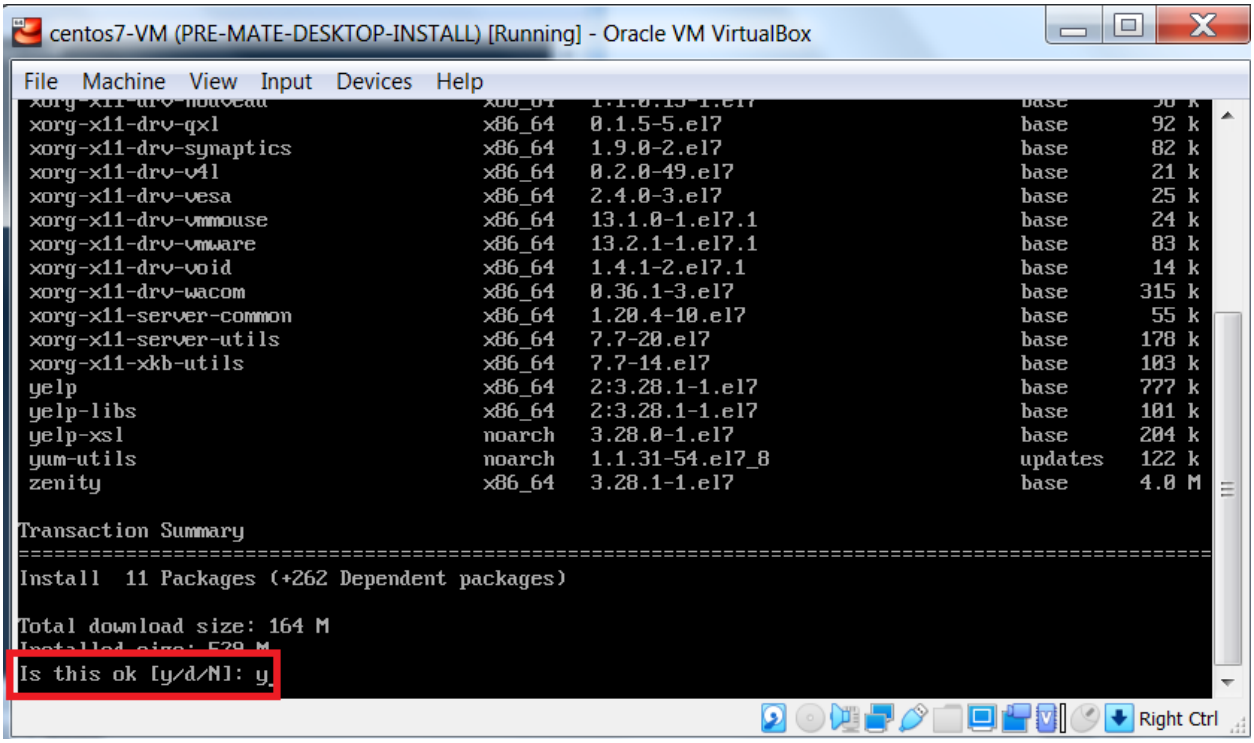
Now we will need to install the **X Window System** which will act as our base for the MATE Desktop.

From the command line, execute the following:

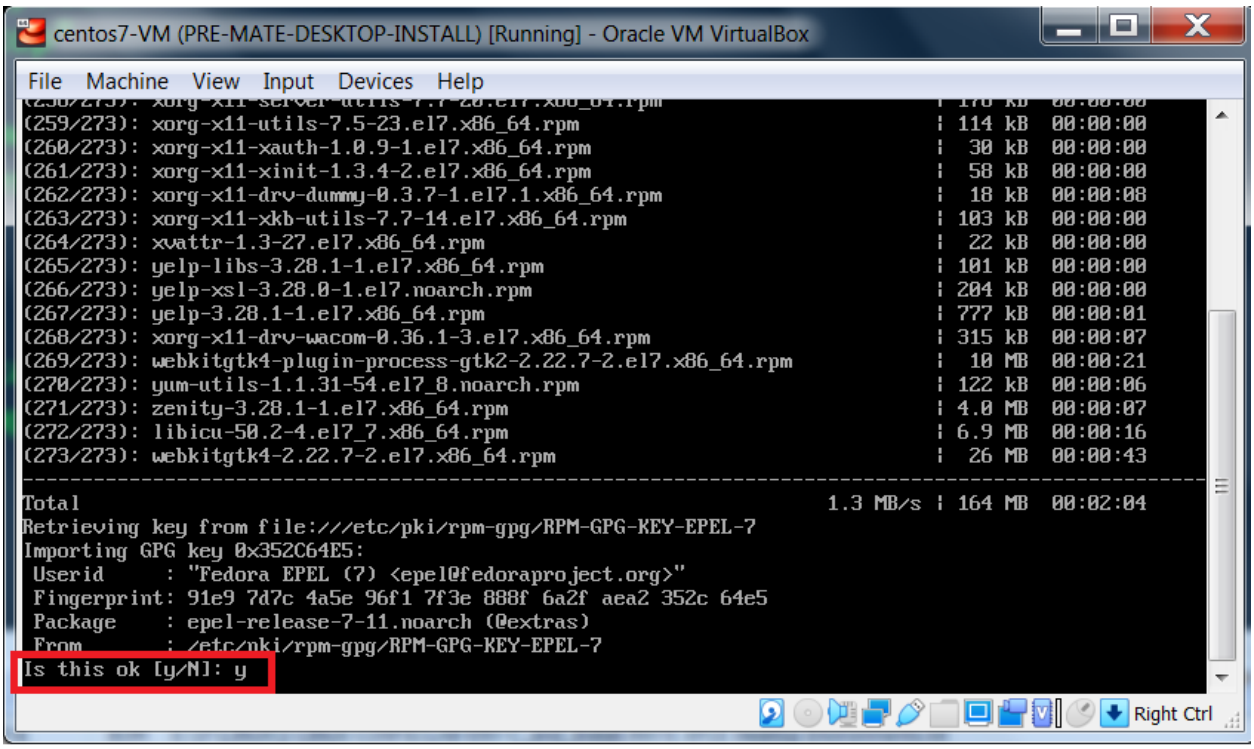
```
sudo yum groupinstall "X Window System"
```



After entering your user's password to acknowledge the command being run with **sudo** privileges, enter **y** to accept the packages to be downloaded and installed.



When prompted to use the local CentOS 7 Signing key to validate the downloaded packages, enter **y**

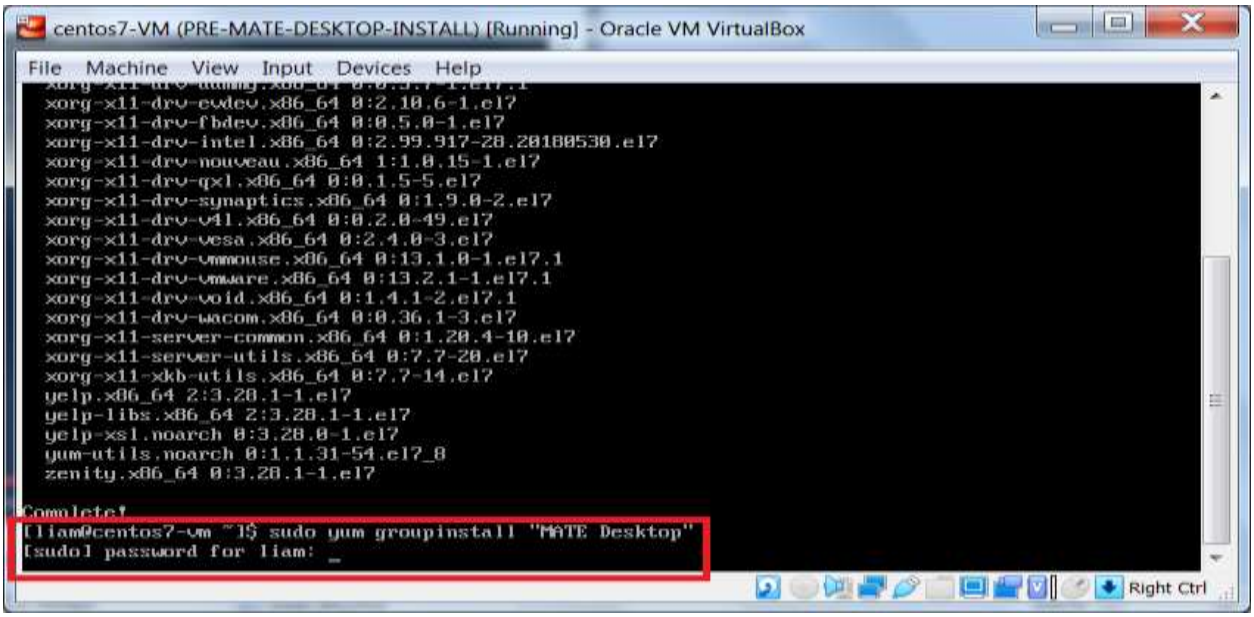


Install MATE Desktop packages

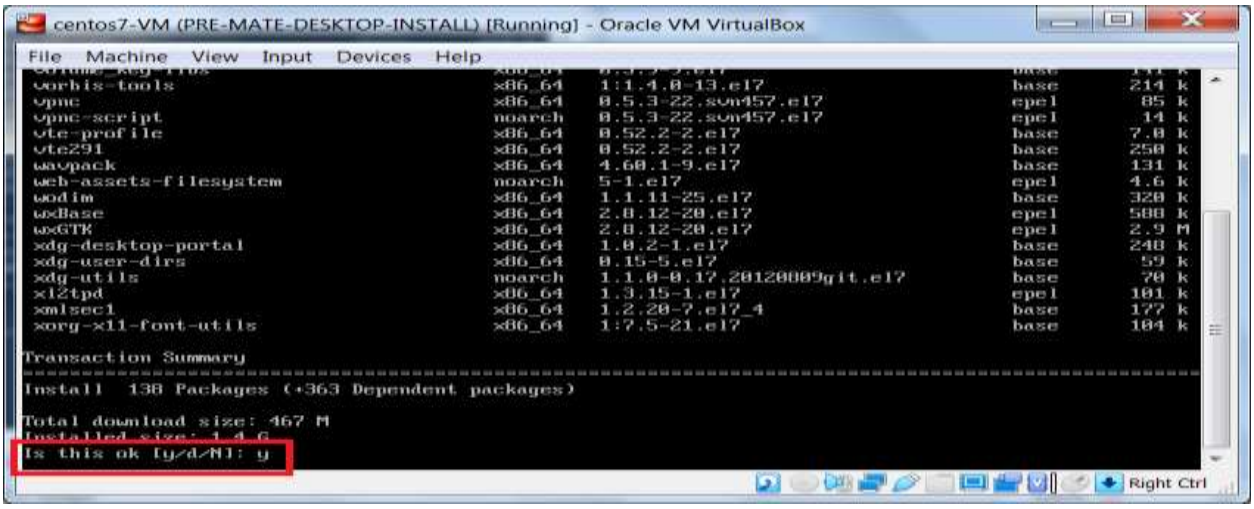
Below, you will notice that the **X Window System** packages were successfully installed. Now we can install the **MATE Desktop** packages.

From the command line, execute the following:

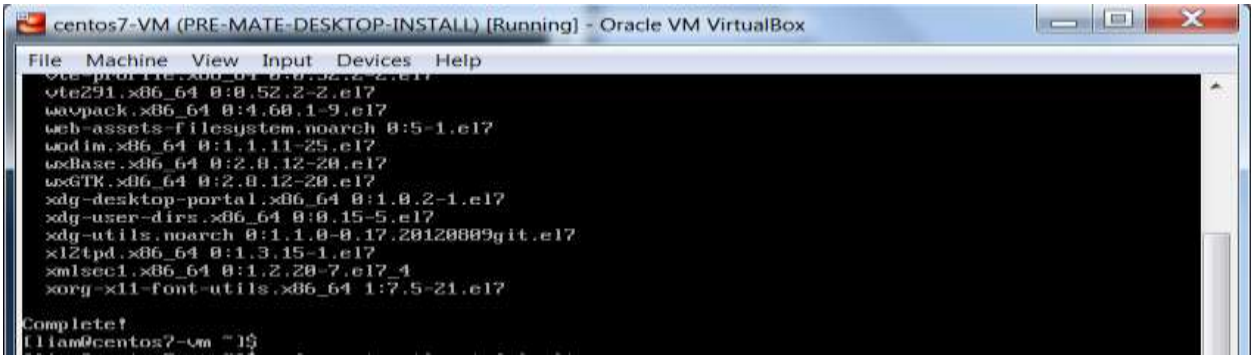
```
sudo groupinstall "MATE Desktop"
```



Again, enter **y** to accept the packages to be downloaded and installed.



Below, you will notice that the **MATE Desktop** packages were successfully installed.

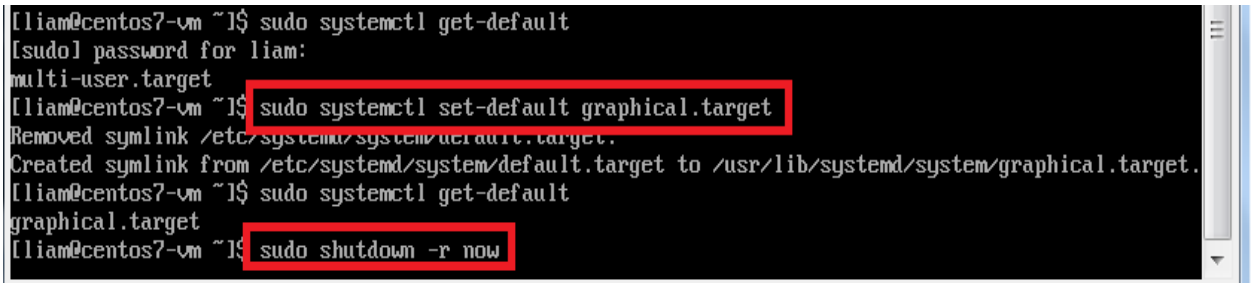


Change Default Target to Graphical

We will now need to change from runlevel 3 (text console mode) to runlevel 5 (graphical mode).
Since runlevels were used in the older **SysVInit** environments and CentOS 7 uses **systemd**, we will need to change from the **multi-user.target** (text console mode) to the **graphical.target** (graphical mode) to ensure that, when we boot our system, we use the newly installed **MATE Desktop**.

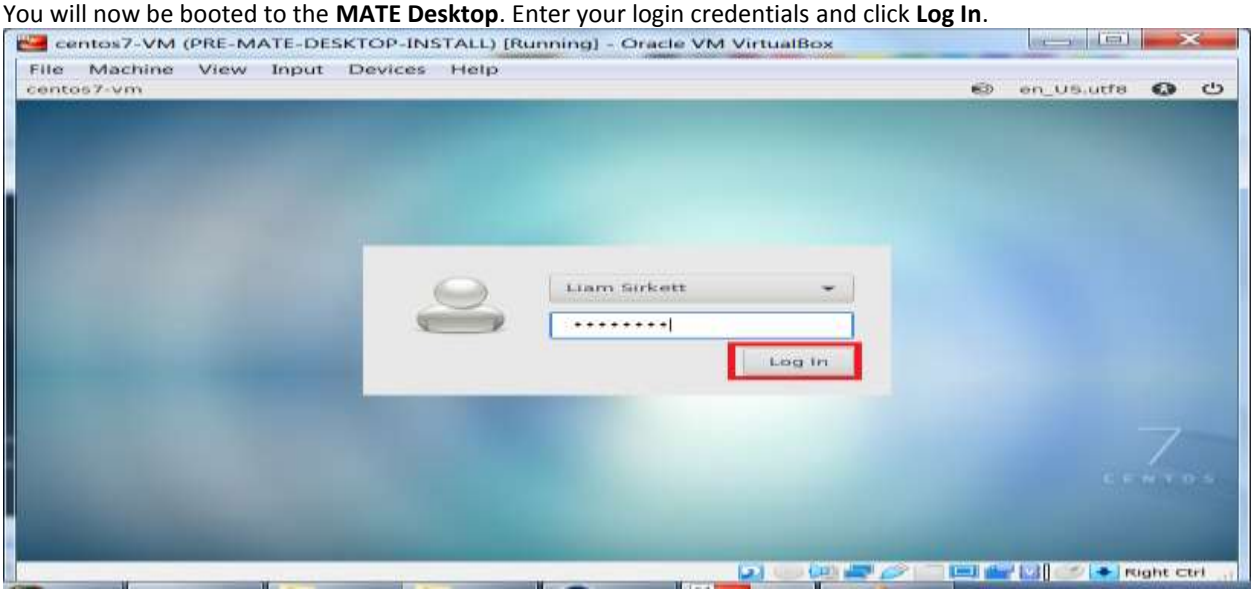
From the command line, execute the following:

```
sudo systemctl set-default graphical.target
sudo shutdown -r now
```

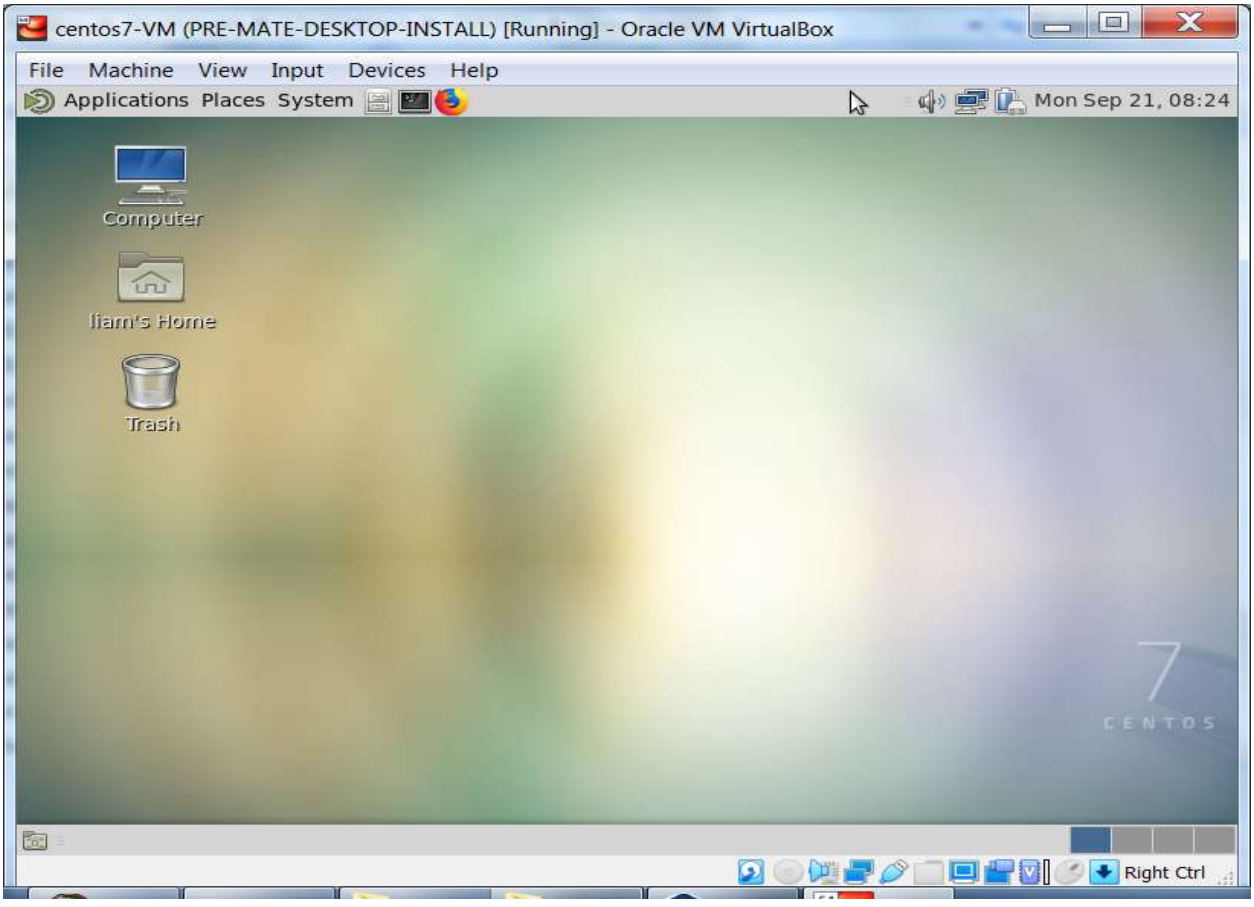


Boot to Graphical Target

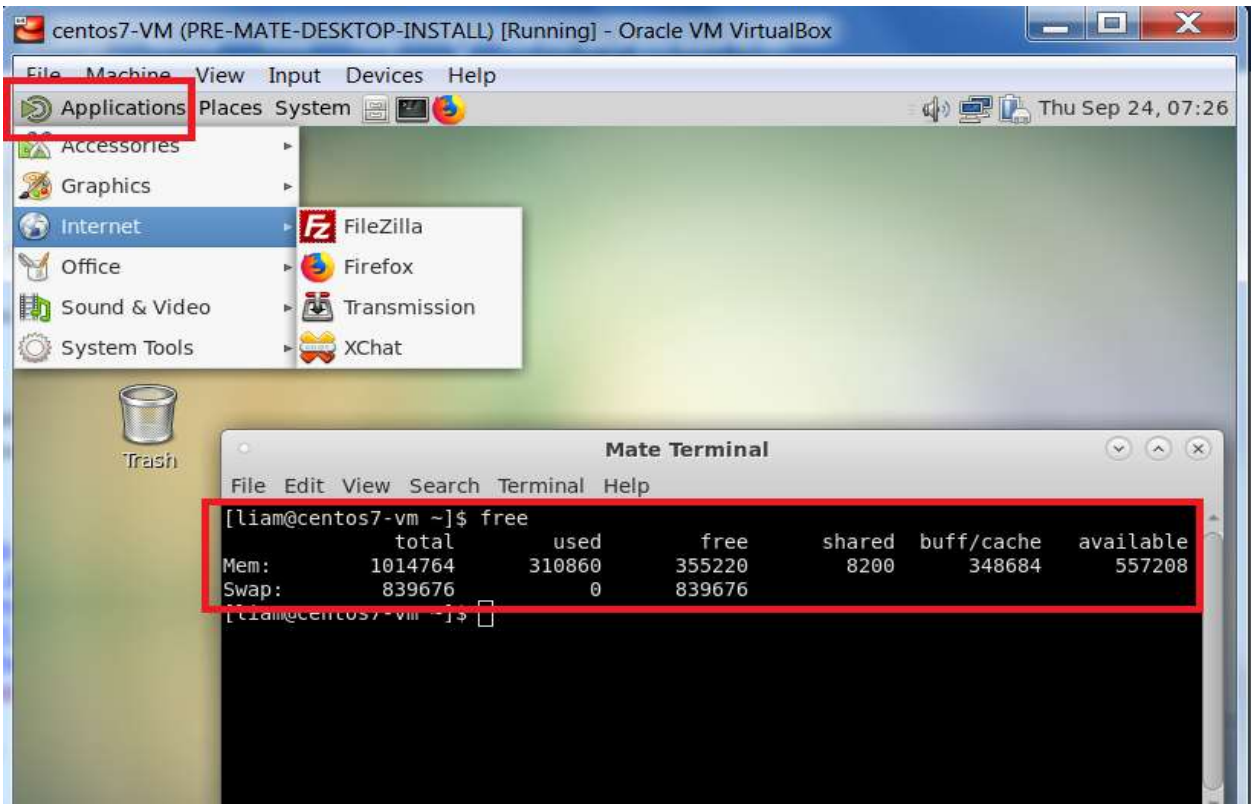
You will now be booted to the **MATE Desktop**. Enter your login credentials and click **Log In**.



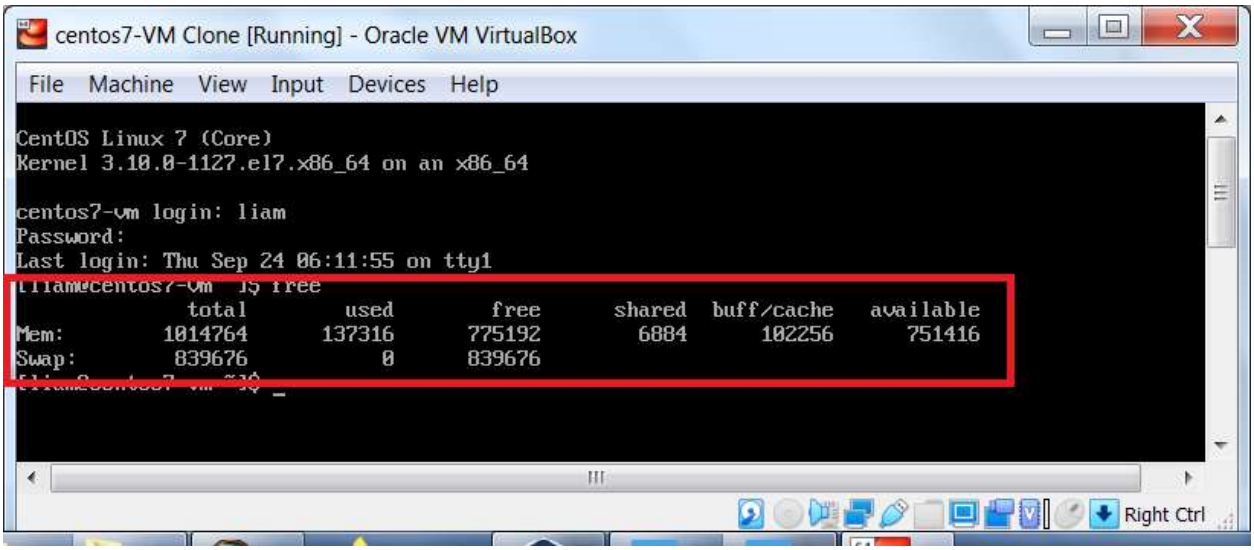
You are now logged in to the **MATE Desktop** environment.



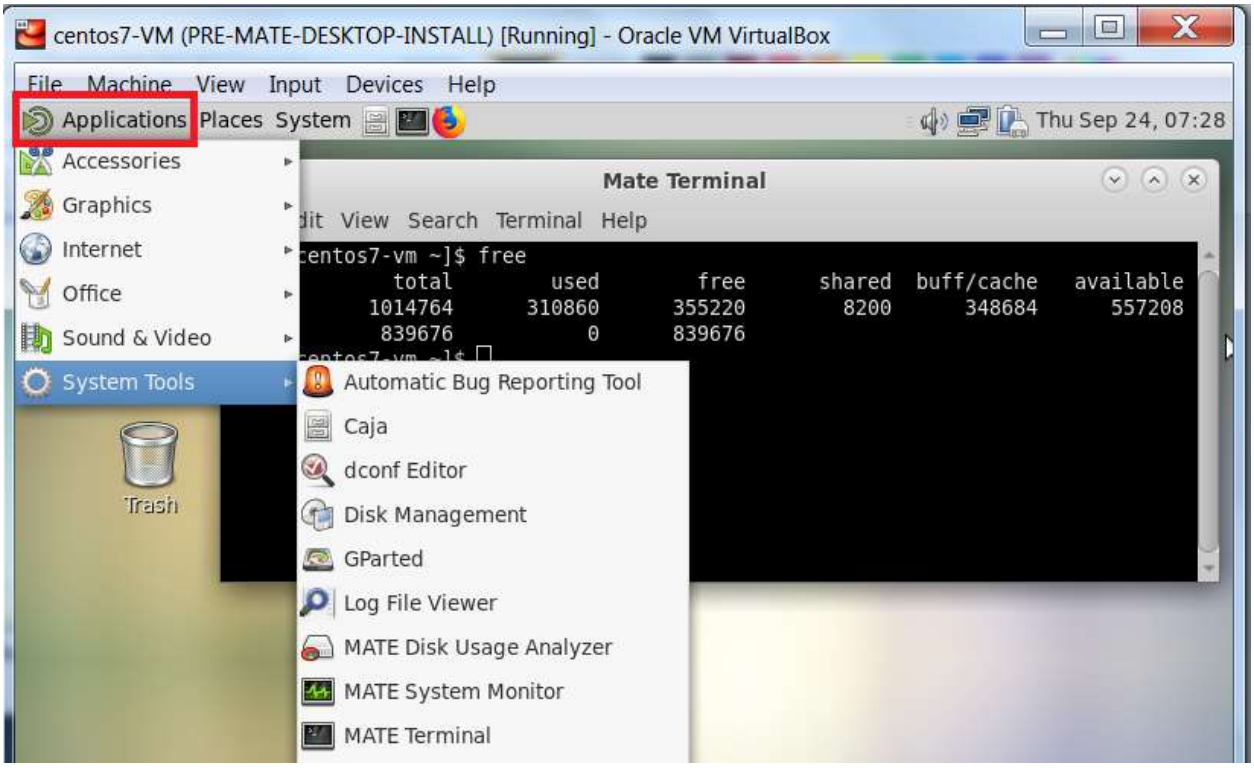
From the **Applications** menu, you will notice useful applications such as **Firefox** and **FileZilla**. I also opened a terminal and executed the **`free`** command to show that the minimum amount of RAM is needed to power the MATE Desktop environment. Compare this output with the RAM required for a CentOS 7 minimal install (image below this one).



RAM required for a CentOS 7 minimal install.

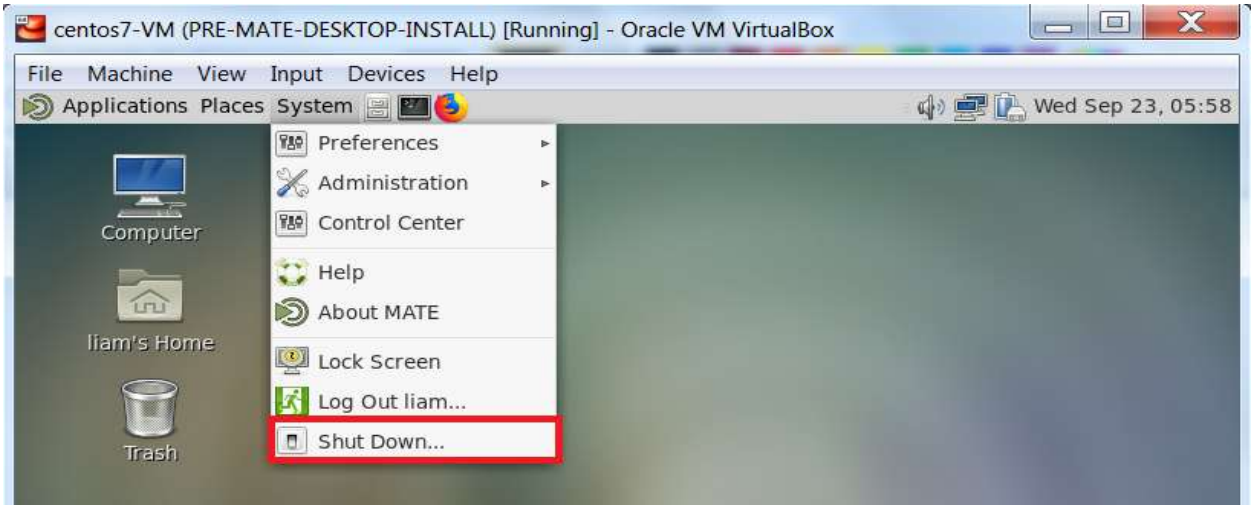


There are also a number of **System Tools** to manage your system.



Now that we have successfully installed the **MATE Desktop**. Let's shut down the VM and take a snapshot before installing VirtualBox's **Guest Additions**.

From the **System** menu, click **Shut Down**.

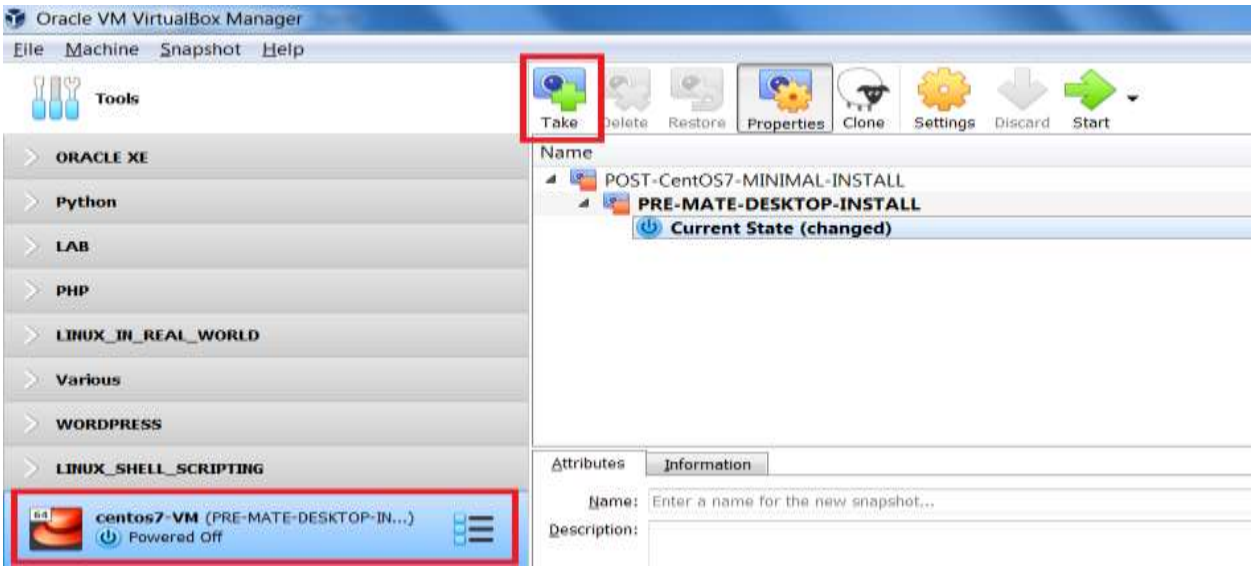


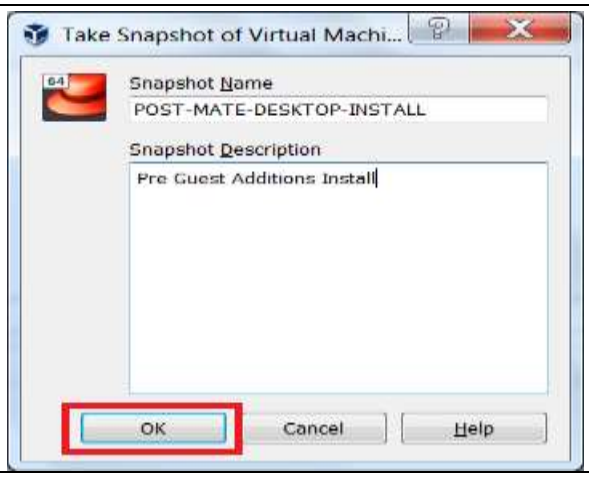
Then, click **Shut Down** to shut down your system.

Take Post MATE Desktop Snapshot

From the VirtualBox Manager interface, ensure your VM is selected and you are in "**Snapshots**" view.

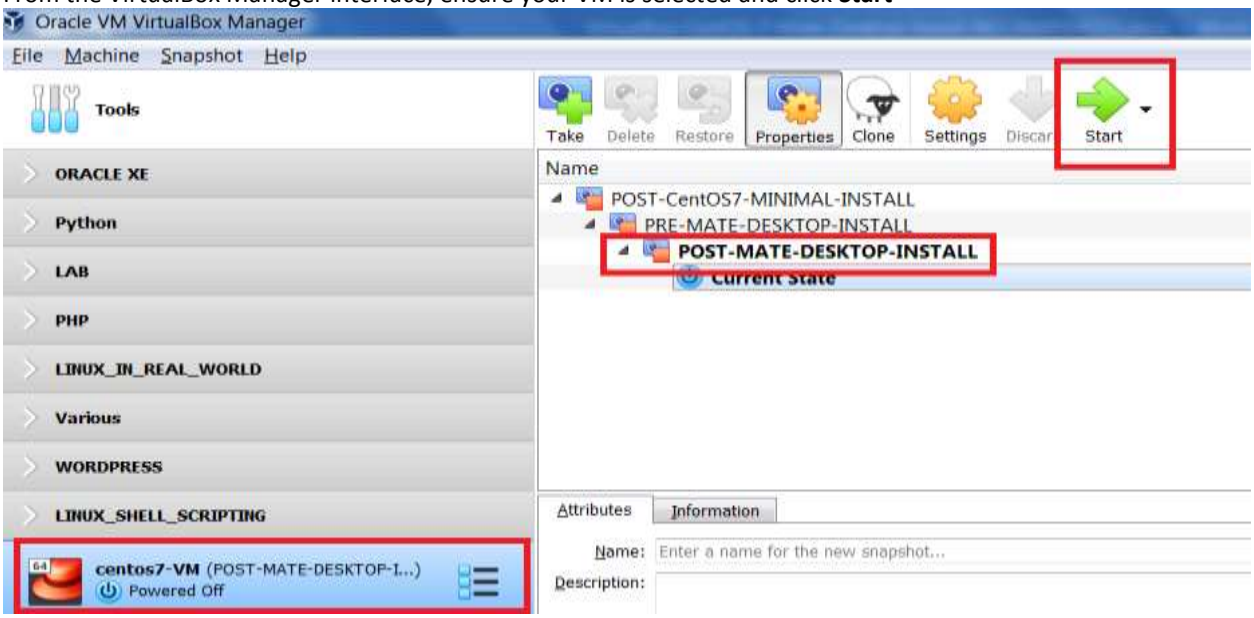
To create the snapshot, click **Take**



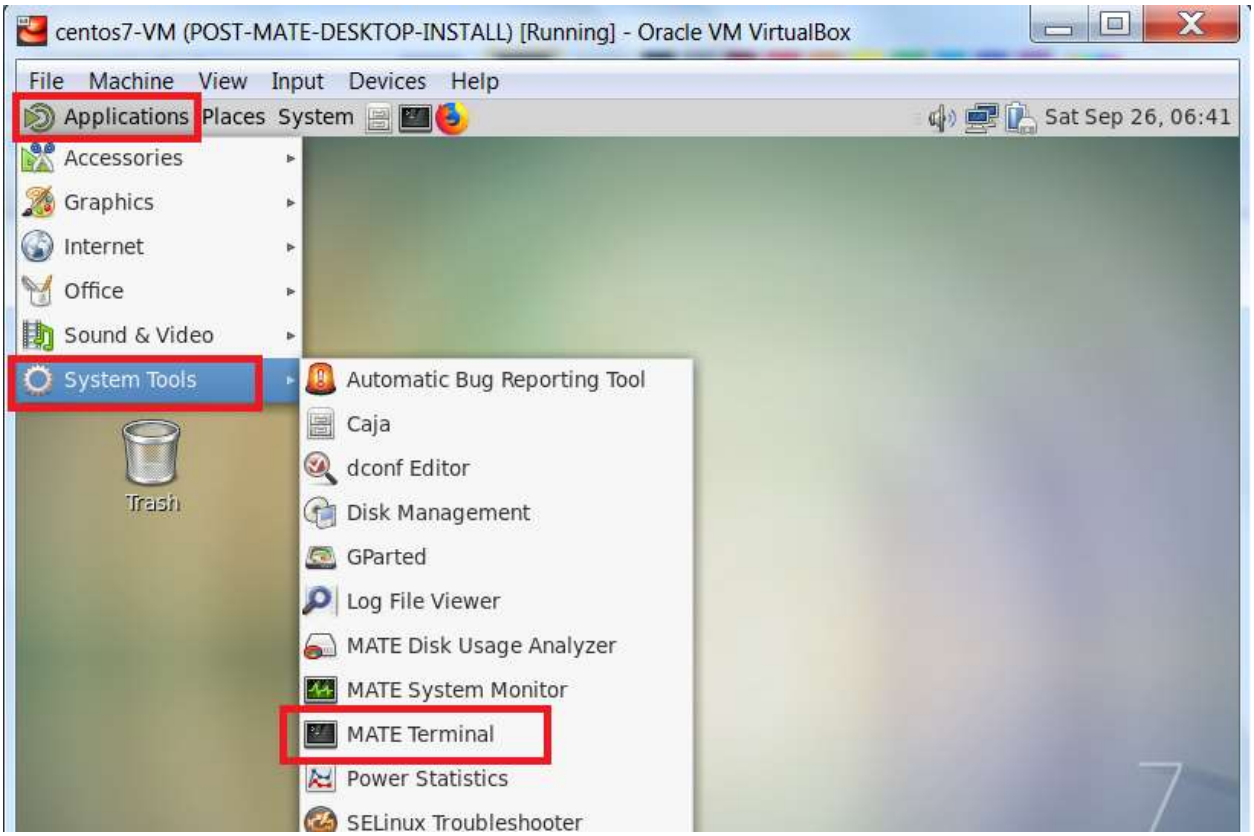
Enter a name for the snapshot, as well as, a short description, then, click **OK** I've taken a snapshot "**POST-MATE-DESKTOP-INSTALL**" to ensure we have an updated CentOS 7 server, with a GUI, that we can revert back to, if needed. Now that we have our snapshot in place, we are ready to install VirtualBox's Guest Additions.	

Install VirtualBox Guest Additions

From the VirtualBox Manager interface, ensure your VM is selected and click **Start**

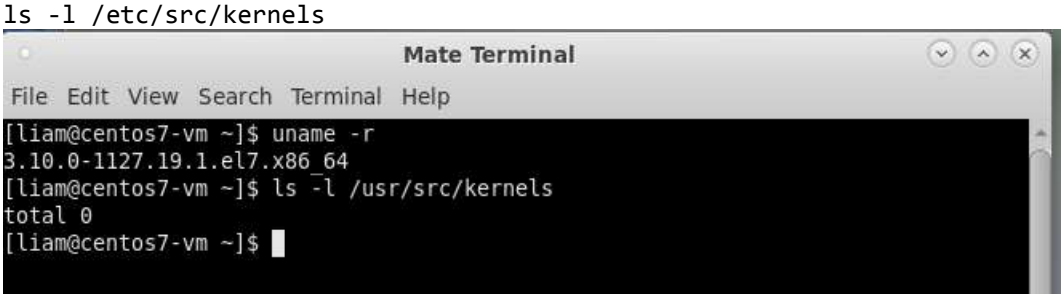


Before we can install VirtualBox's **Guest Additions**, we will need to ensure our current kernel has the corresponding kernel-headers. First, we will verify whether, or not, the kernel-headers exist.
To open a terminal, from your **MATE Desktop**, click **Applications -> System Tools -> MATE Terminal**



We will need to display our active kernel to determine which kernel-headers we need. To do this, from the command line, execute the following commands (one after the other):

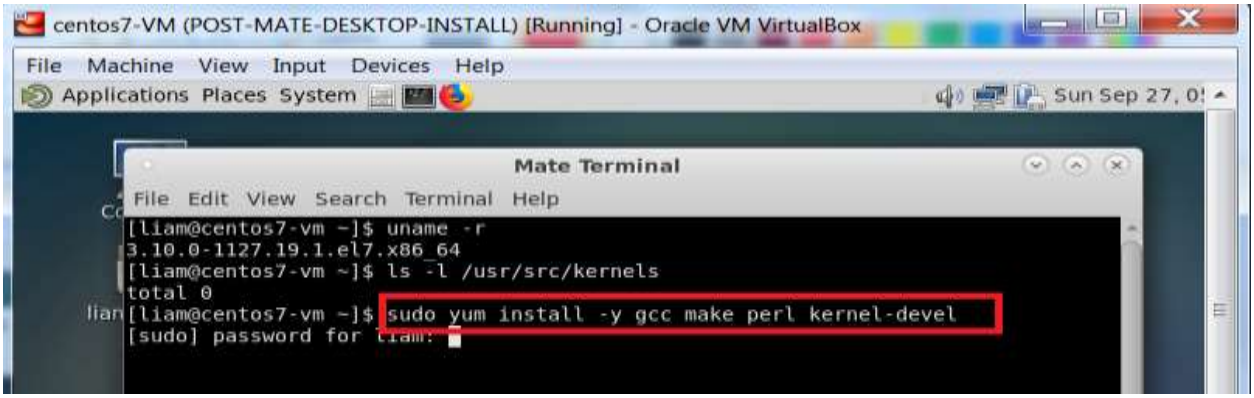
```
uname -r
ls -l /etc/src/kernels
```



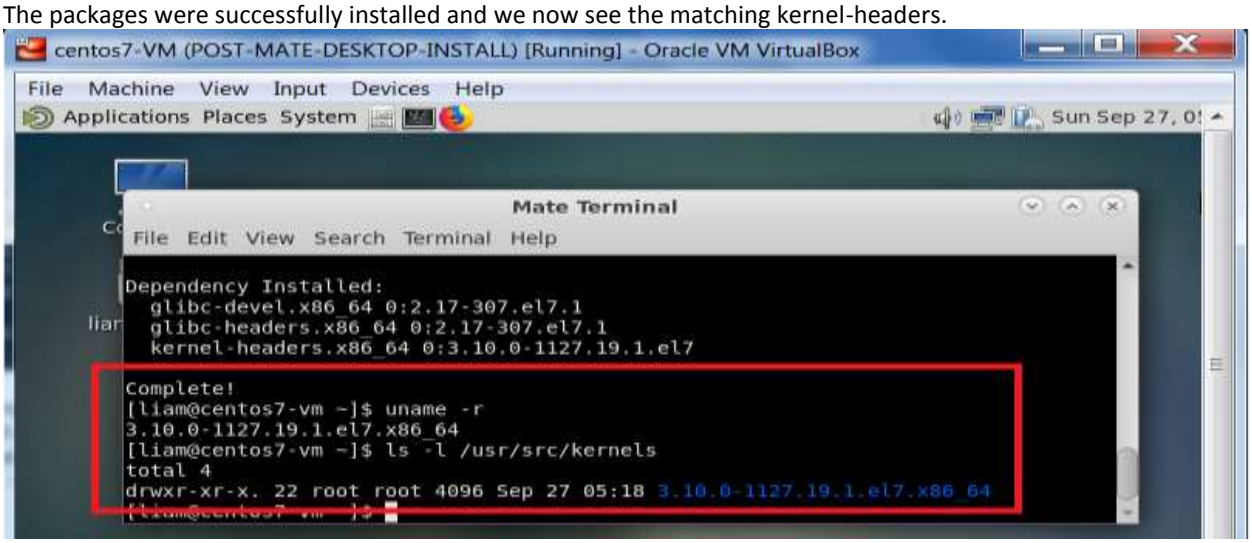
We see that no matching kernel-headers exist so we will need to install the **kernel-devel** package which provides **kernel-headers**. We will also need to install a few packages (**gcc, make, perl**) that the VirtualBox **Guest Additions require to rebuild kernel modules**.

Again, from the command line, execute the following:

```
sudo yum install -y gcc make perl kernel-devel
```

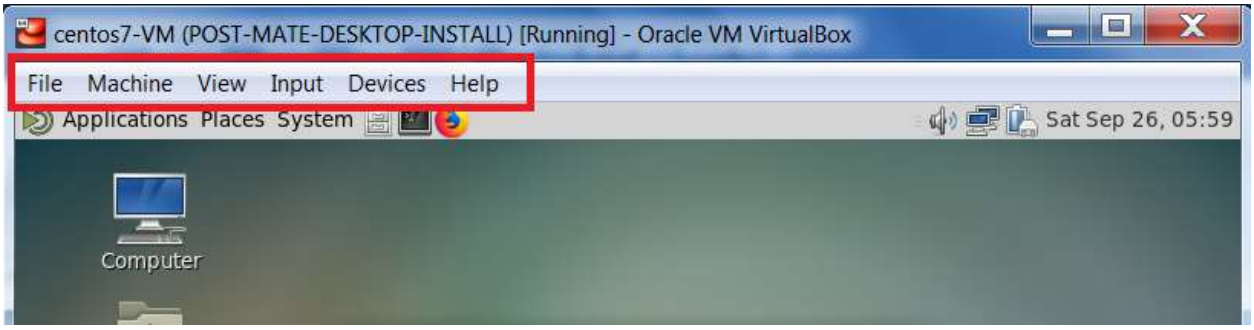


The packages were successfully installed and we now see the matching kernel-headers.



We are now ready to install VirtualBox's Guest Additions.

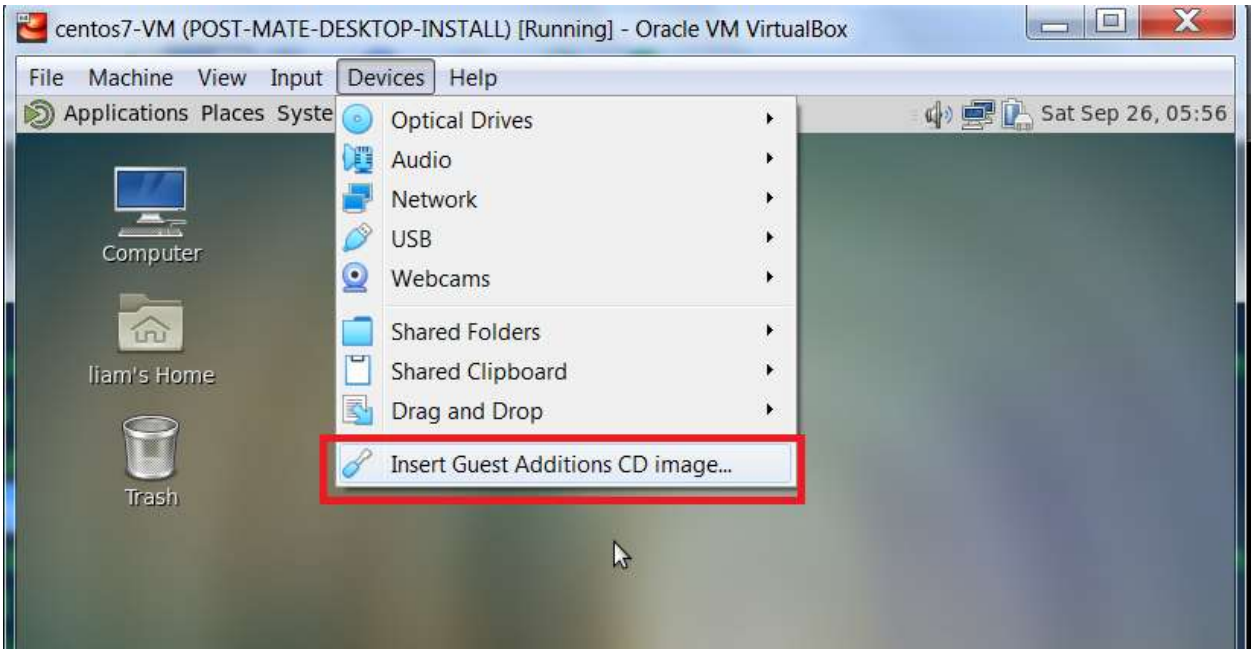
Please note, in order to access the virtual machine's **main menu**, you will need to exit the **guest** (virtual machine) interface and return to the **host** machine interface, by hitting your **Host key**.



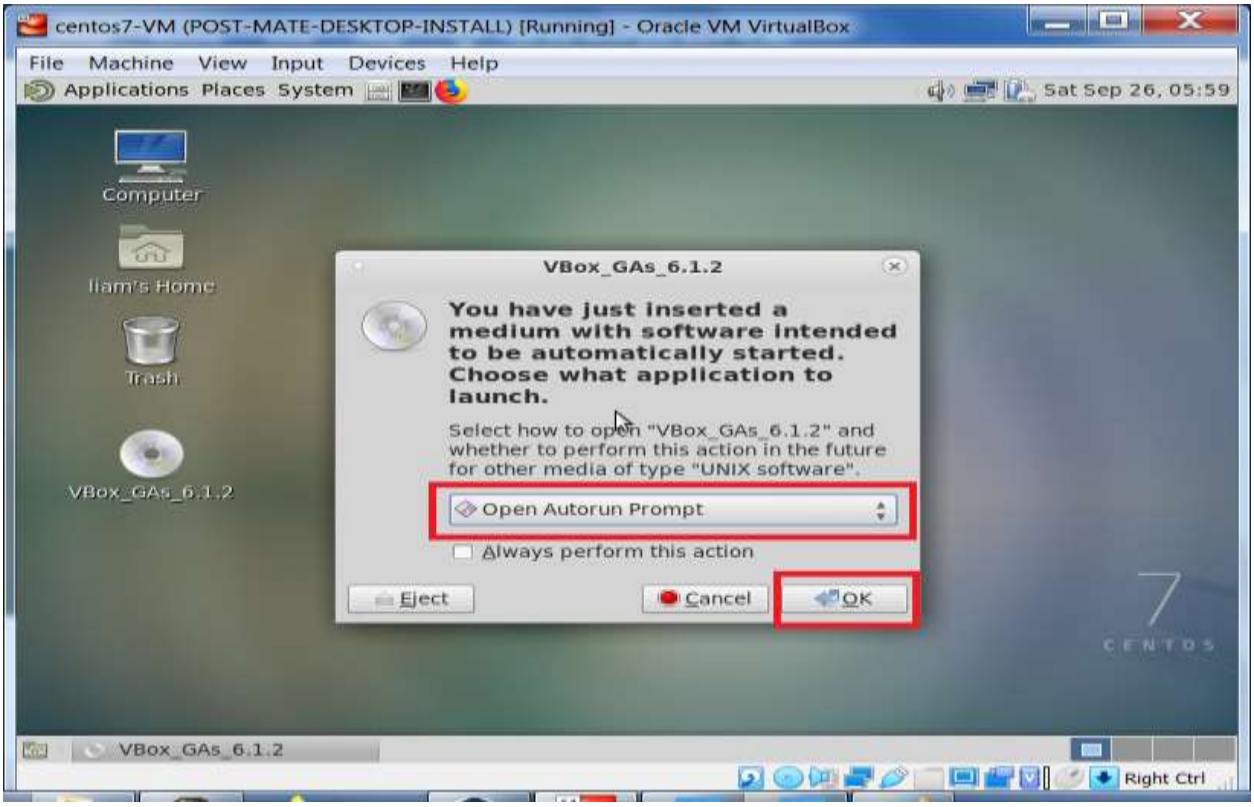
Check the bottom right-hand corner of the virtual machine's interface to determine what your **Host key** is.
For my Windows 7 host machine, my **Host key** is the **right Ctrl key** (see image below).

Now you know how to exit the guest interface to access your virtual machine's main menu.

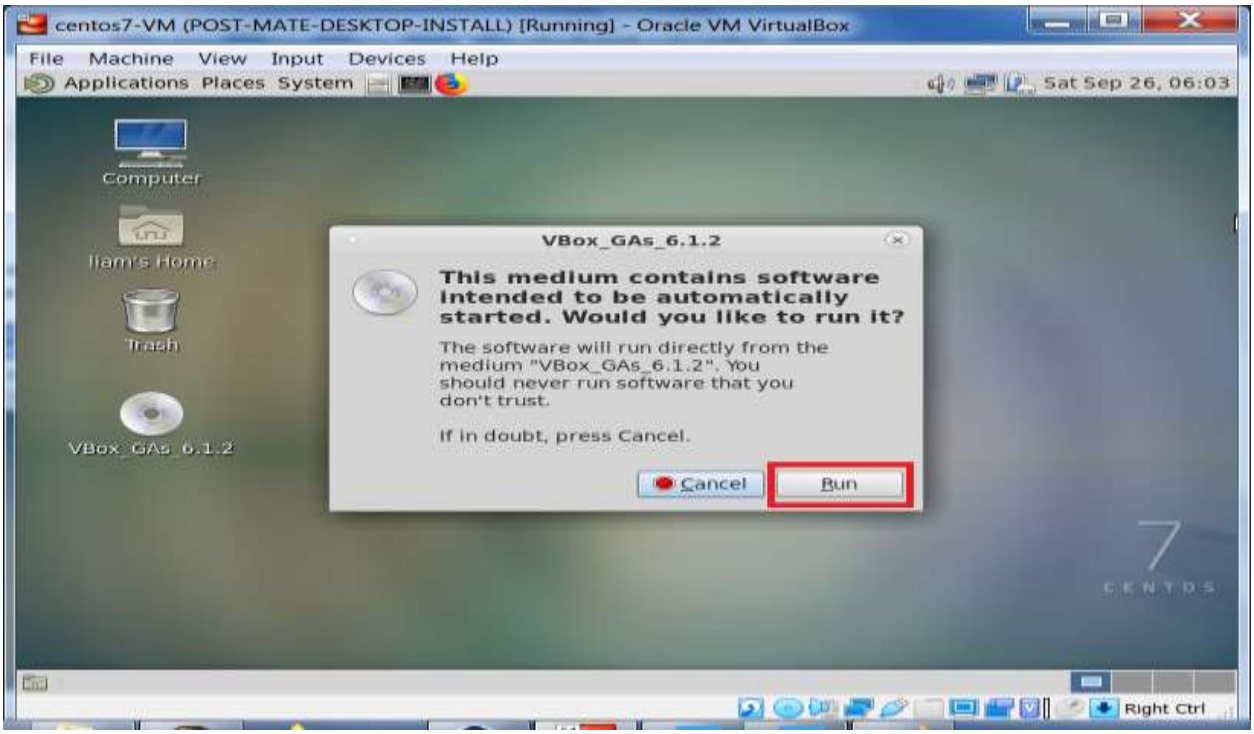
From the virtual machine's main menu, select **Devices**, then click **Insert Guest Additions CD image**



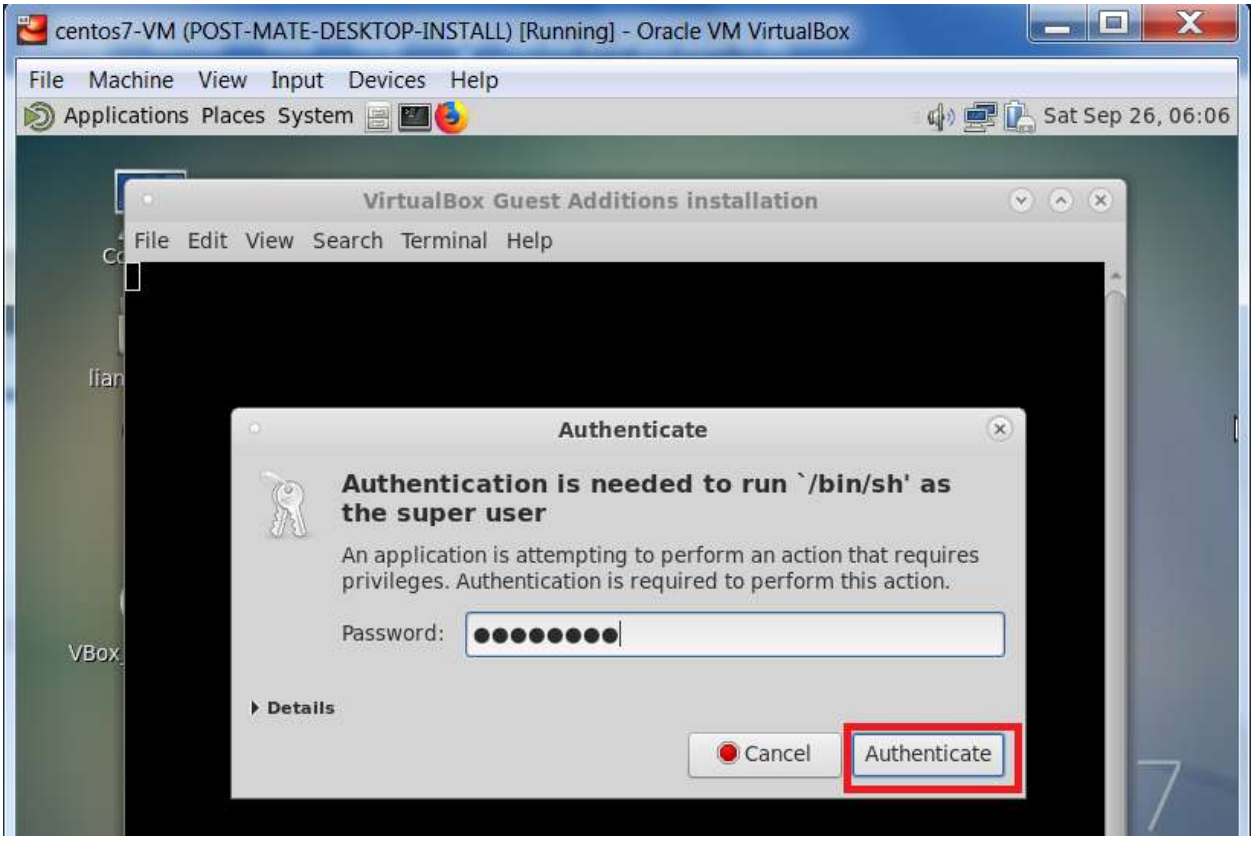
When prompted, ensure **Open Autorun Prompt** is selected and click **OK**.



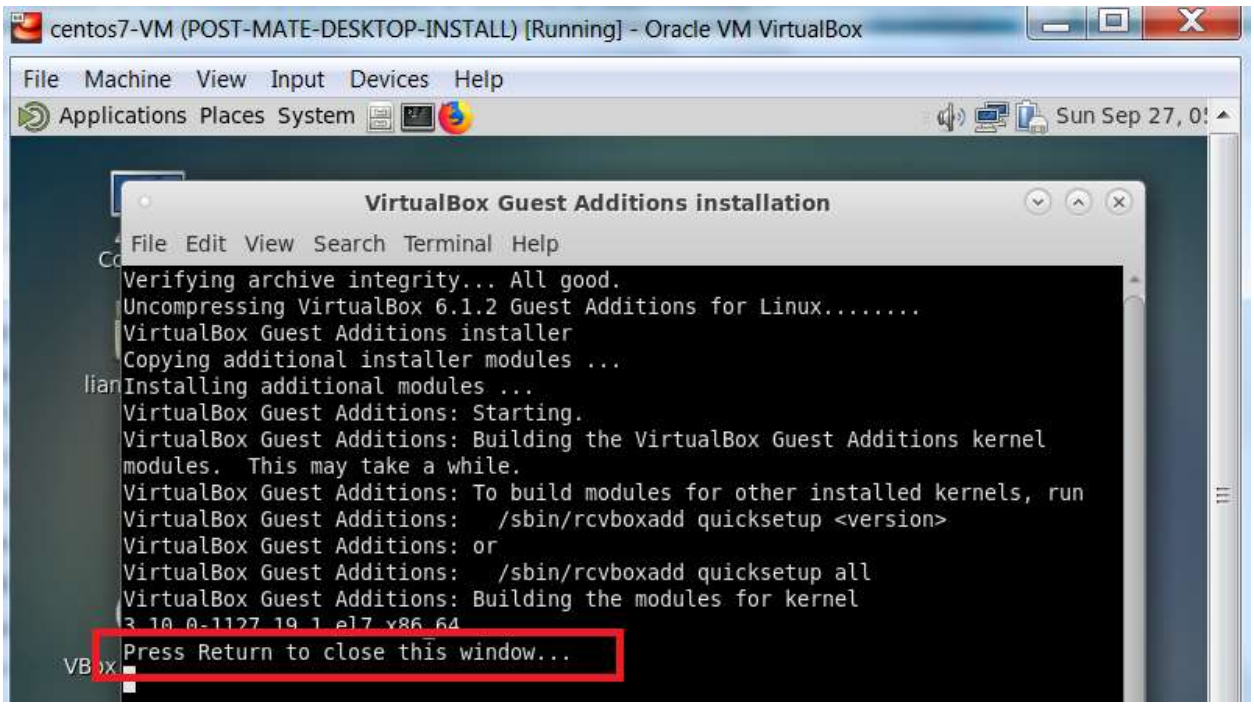
On the following screen, click **Run**.



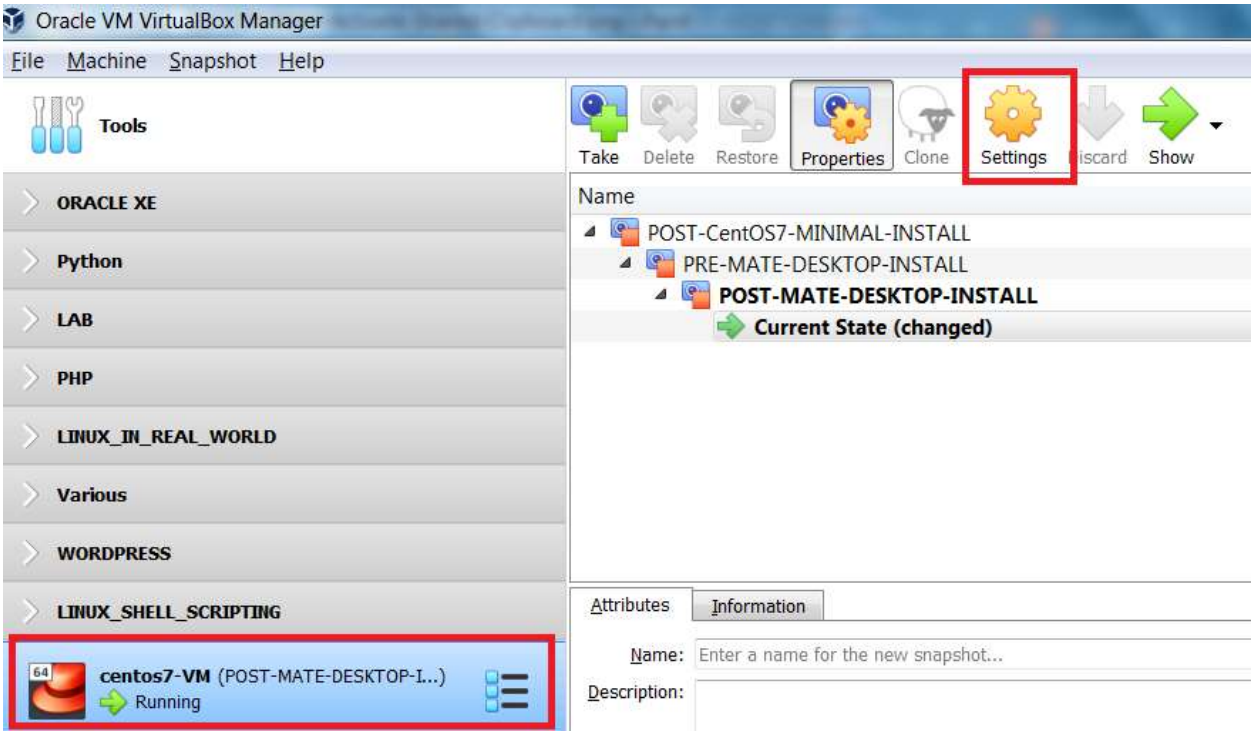
Note, to proceed, you will need to provide the root user's password. Enter root's password and click **Authenticate**



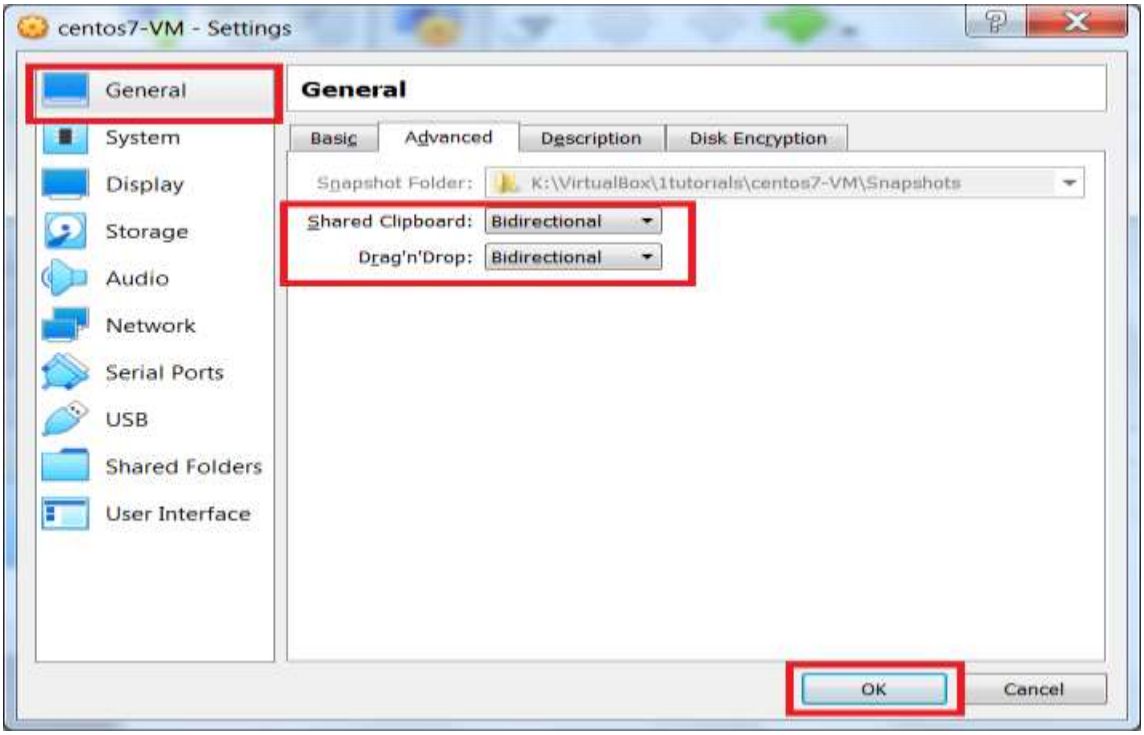
The VirtualBox **Guest Additions** installation will complete successfully. To continue, on your keyboard, hit **Enter**



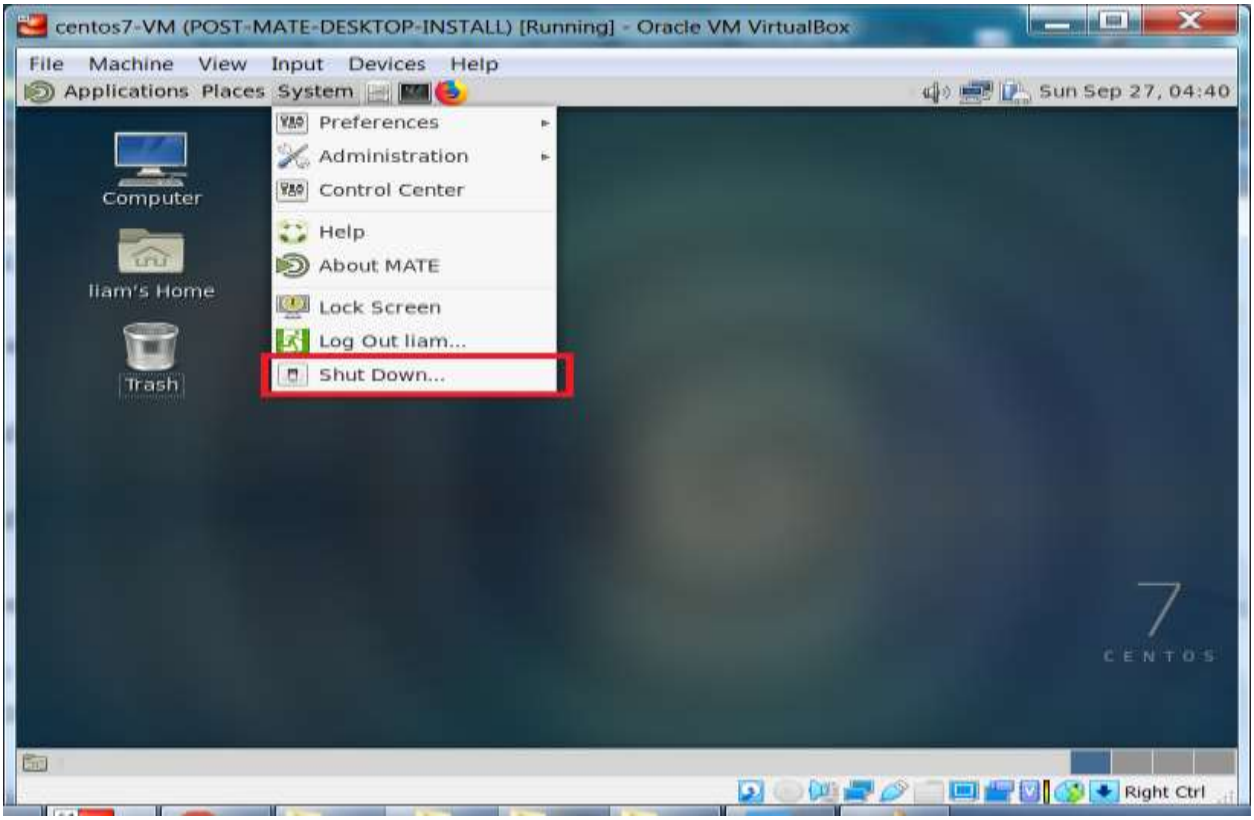
Before restarting the virtual machine to test the newly installed VirtualBox Guest Additions, return to the VirtualBox Manager interface, and click **Settings** for the running VM



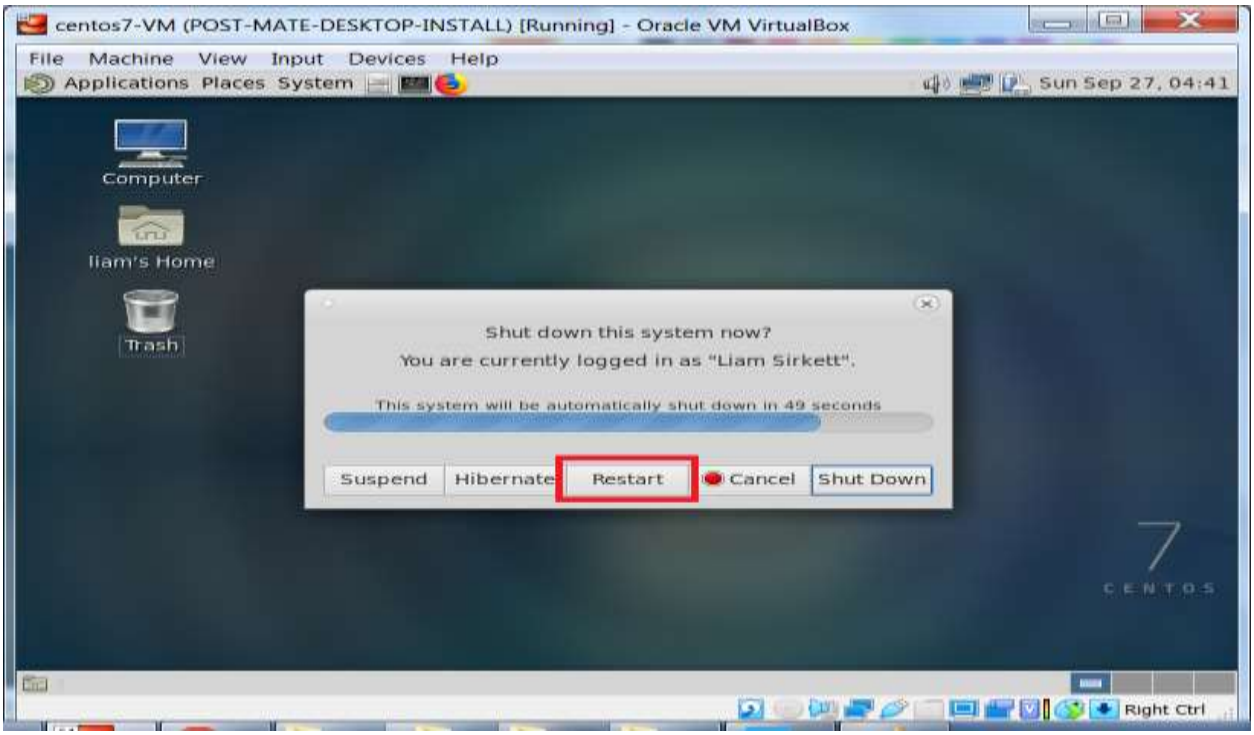
On the left, ensure **General** is selected. Under General, select the **Advanced** tab and change both the **Shared Clipboard** and **Drag'n'Drop** settings from **Disabled** to **Bidirectional**. To continue, click **Ok**



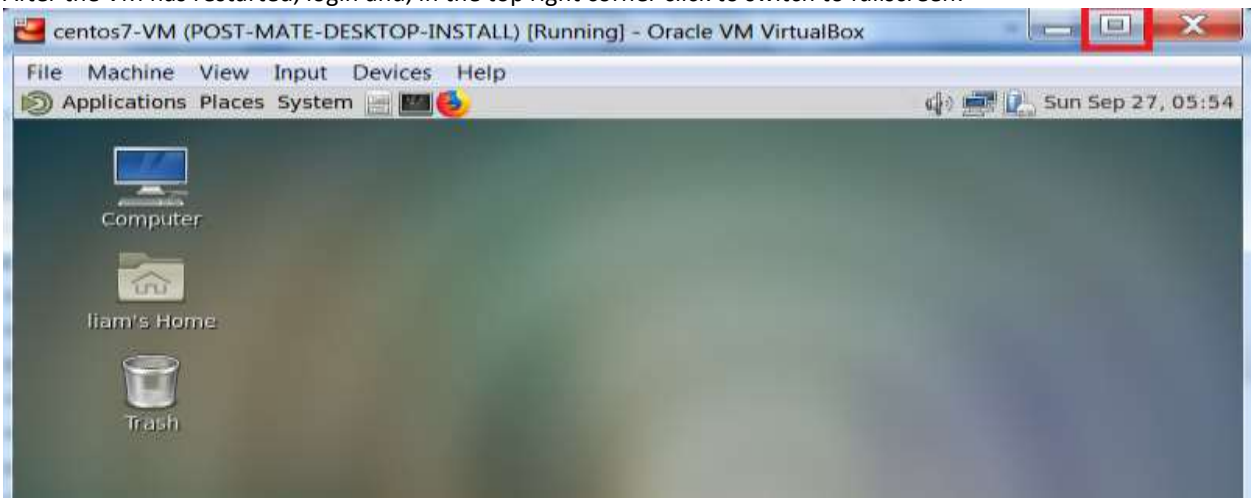
Now, return to the running VM and restart it by clicking **System -> Shut Down**



When prompted, click **Restart**



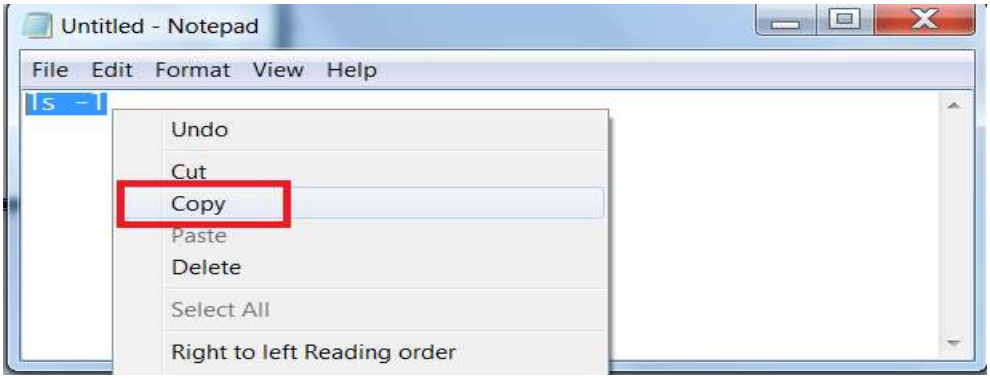
After the VM has restarted, login and, in the top right corner click to switch to fullscreen.



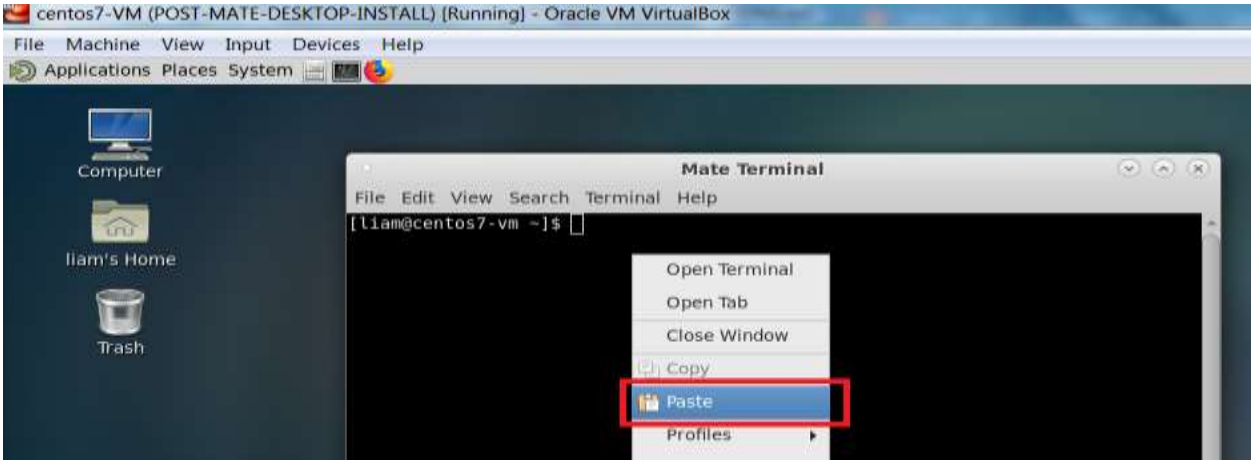
Now the VM can take up your whole screen. Next, we will test the **Shared Clipboard** and **Drag'n'Drop** settings.

My **Shared Clipboard** test will be to copy text from the **host** and pasting it into the **guest**. This involves copying the text `ls -l` from a text editor on my **host** machine and pasting it into a **MATE Terminal** in my **guest VM**.

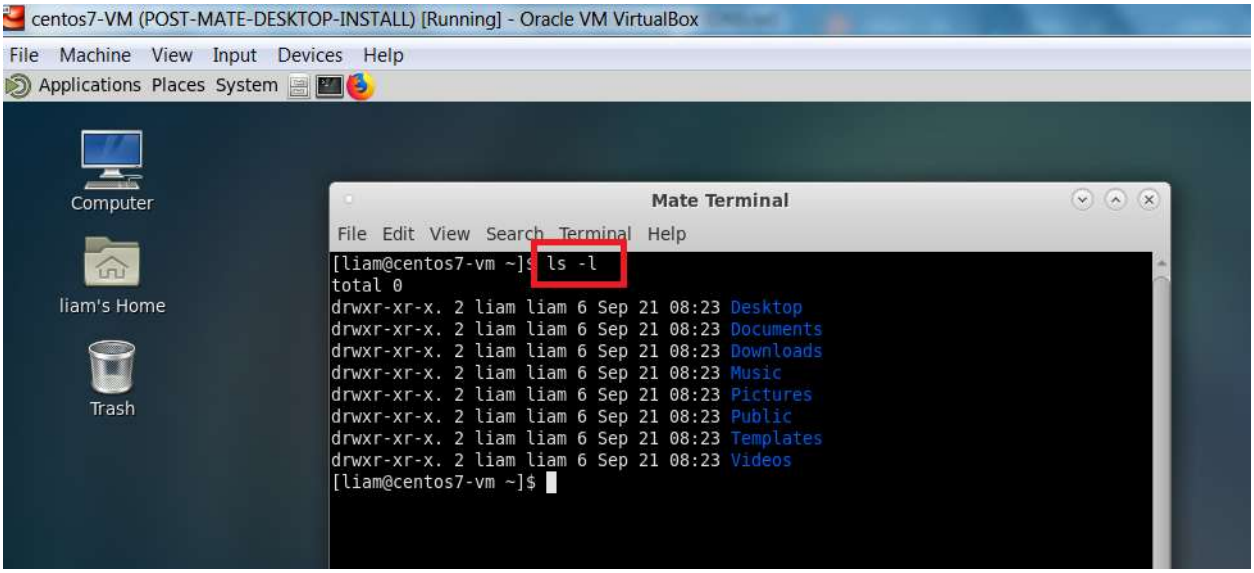
Step 1: Copy text from host machine



Step 2: Paste text into MATE Terminal in guest VM



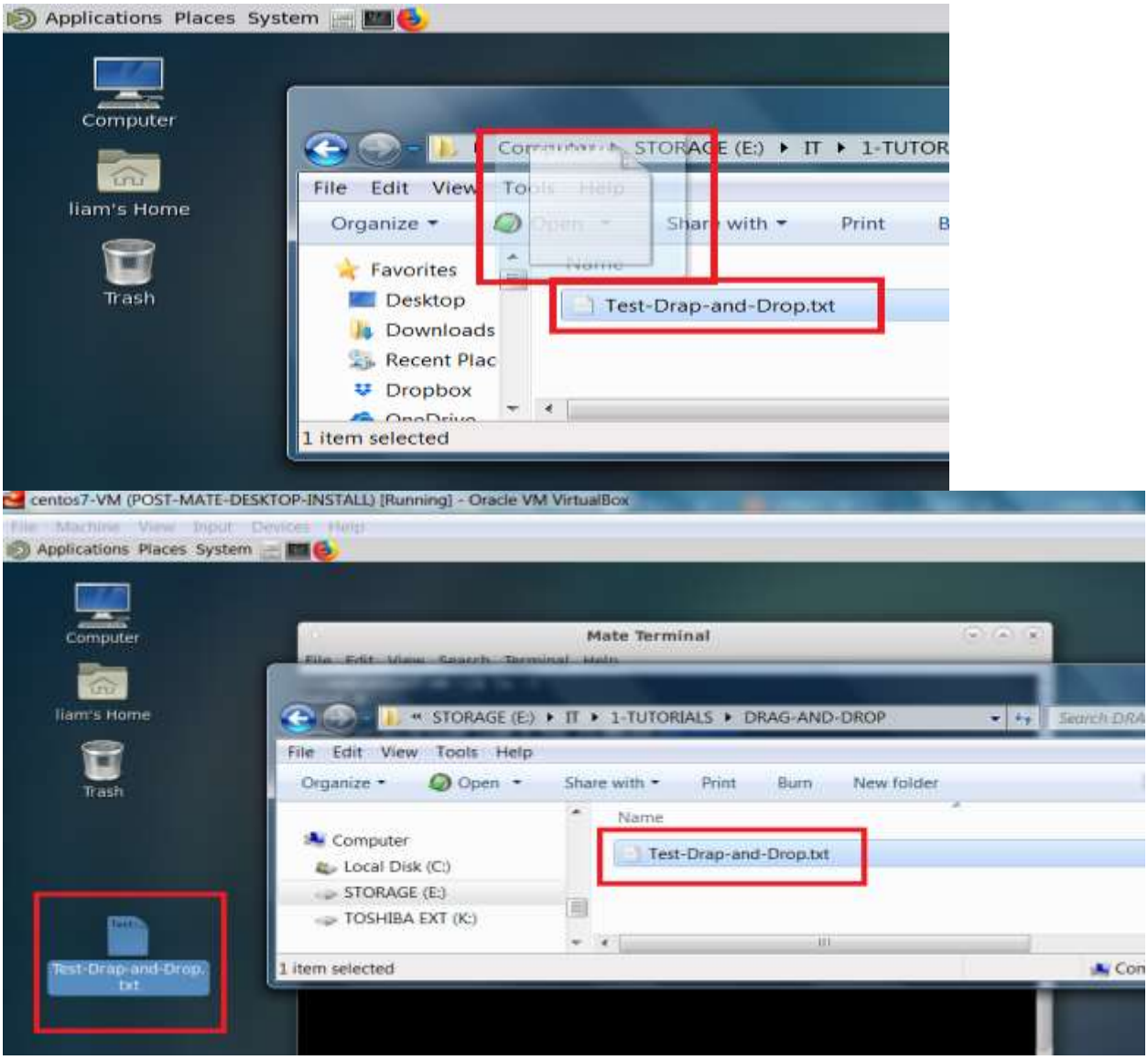
Step 3: Finalize paste operation and execute command



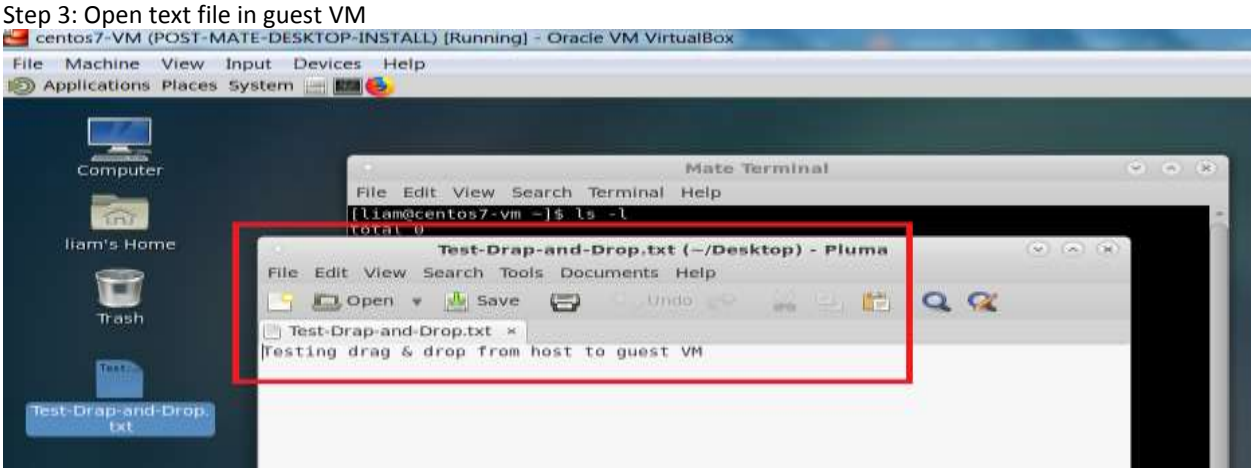
My **Drag'n'Drop** test involves creating a text file on my **host** machine and dragging it onto my **guest VM**'s desktop. Then, opening the file in the virtual machine.

Step 1: Create text file on host machine

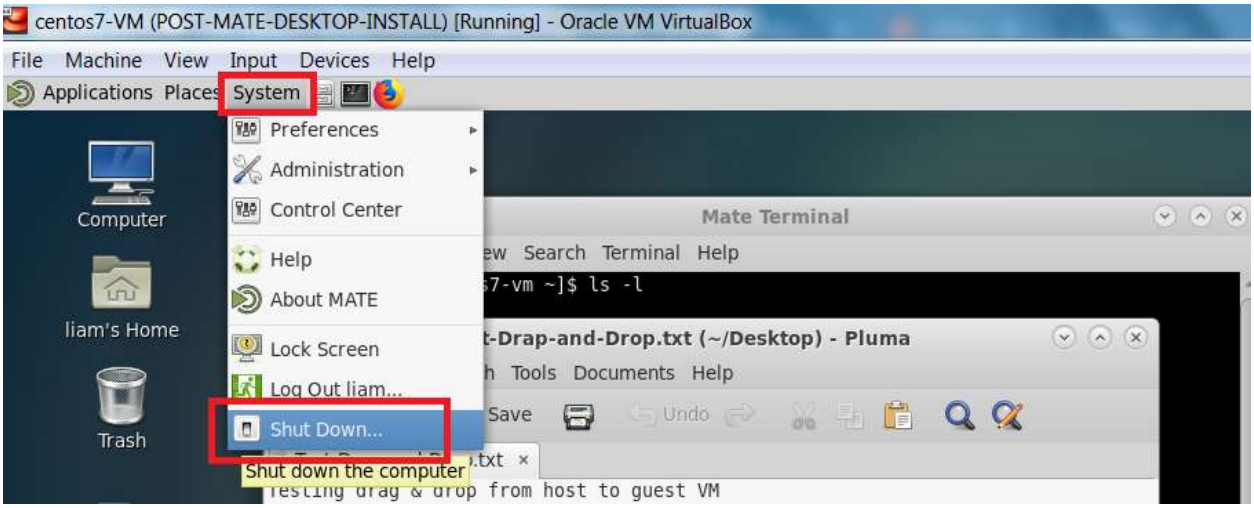
Step 2: Drag text file from host machine onto guest VM's desktop



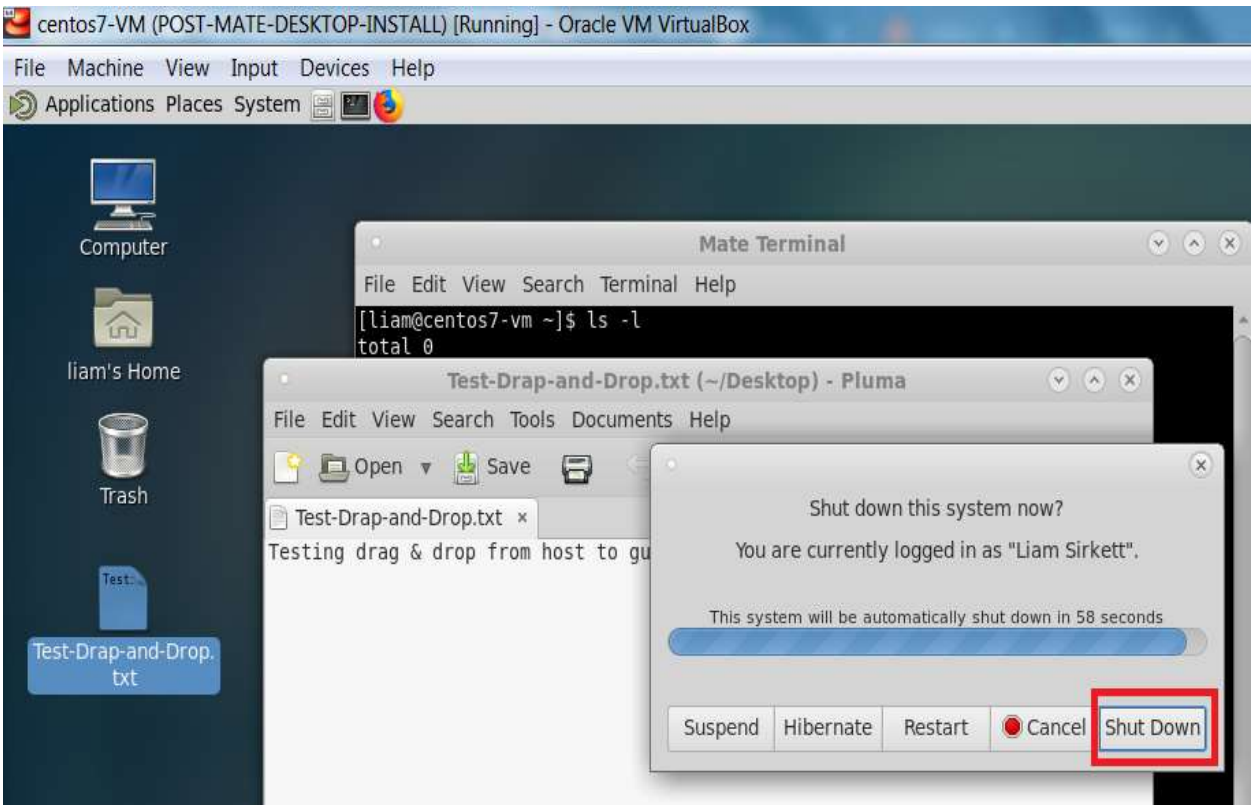
Step 3: Open text file in guest VM



We will now shutdown the virtual machine. From the **System** menu, click **Shut Down**.



Then, you can wait for the timer to expire or click **Shut Down** to shut down your system.

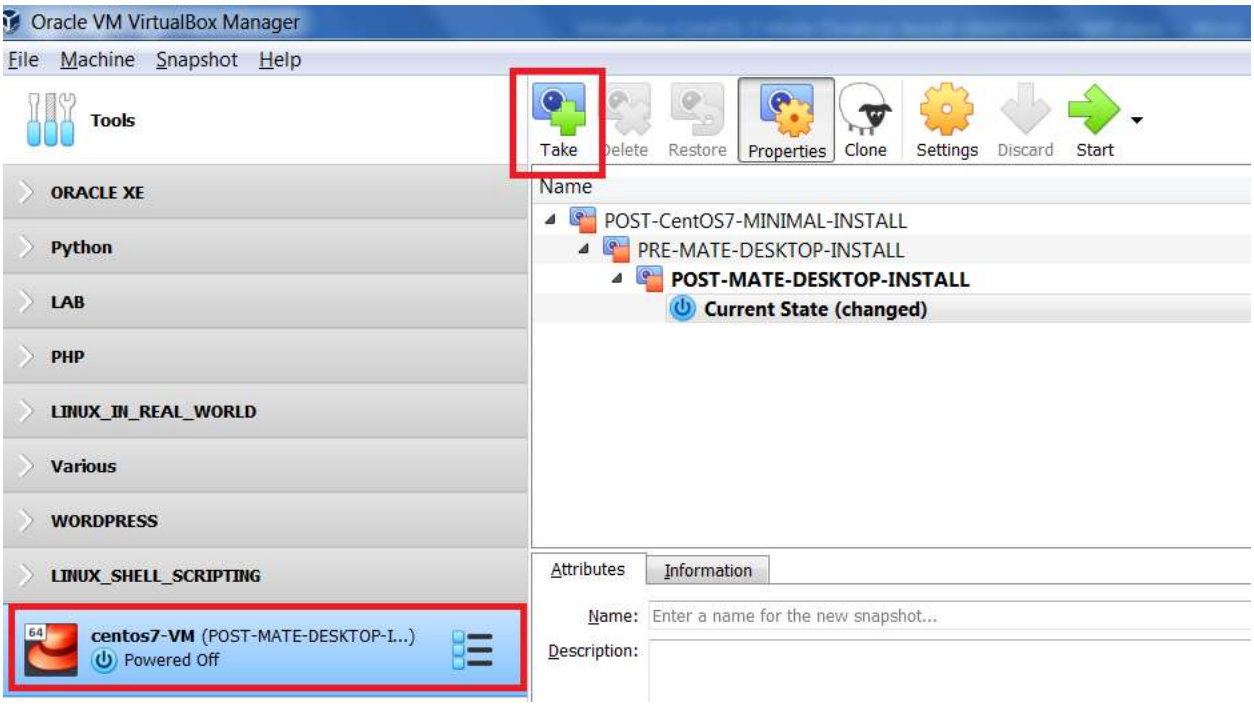


After shutting down our system, it would be a good idea to take a snapshot.

That way, if we ever need a CentOS 7 server with a GUI virtual machine that already has VirtualBox's Guest Additions installed, we can clone this snapshot in seconds.

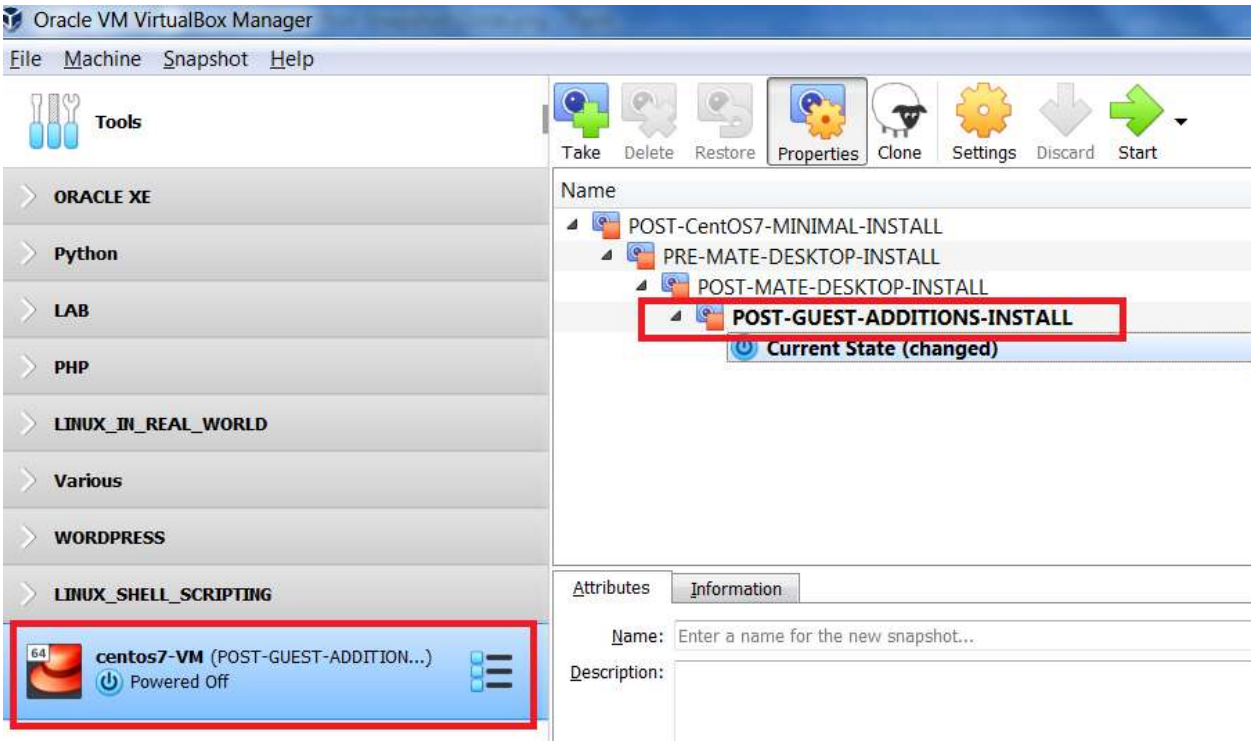
Take Post Guest Additions Snapshot

From the VirtualBox Manager interface, ensure your VM is selected and you are in "**Snapshots**" view.
To create the snapshot, click **Take**



Enter a name for the snapshot, as well as, a short description, then, click **OK**

I've taken a snapshot "**POST-GUEST-ADDITIONS-INSTALL**" to ensure that we have a CentOS 7 server with a GUI VM that has VirtualBox's Guest Additions installed, which can be cloned for future use.



We have successfully installed the **MATE Desktop**, as well as, VirtualBox's **Guest Additions** on a **CentOS 7 VM**.

Along the way we created a number of snapshots to act as fallback mechanisms. At any time, if a virtual machine becomes unresponsive, we can always revert back to a working snapshot. We can also clone a snapshot, as long as, the snapshot was taken when the virtual machine was powered off.

Hopefully, you've enjoyed completing this tutorial and found it helpful.

My main Tutorials page can be accessed **here**, (Linux, PowerShell, Shell Scripting, Vagrant, Docker) while my VirtualBox specific tutorials can be accessed **here**.

If you would like to see my other tutorials, they can be accessed **here**.

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