Cloud and Virtualization Concepts

Lab 2: Virtual Machine Files and Snapshots

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Contents

Introduction

In this lab, *Cloud and Virtualization Concepts Lab 2: Virtual Machine Files and Snapshots,* we will explore how the storage of a virtual machine functions and how to save the state of a virtual machine by creating snapshots.

Objectives

- Identify the virtual machine files
- Identify where virtual machine settings are stored
- How to work with snapshots
- What files change when a snapshot is taken

Lab Topology

Lab Settings

The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

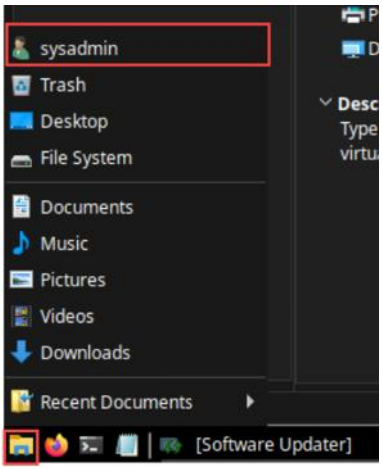
Virtual Machine	IP Address	Account (if needed)	Password (if needed)
Workstation	192.168.14.1	sysadmin	Train1ng$

1 Identify the Files of the VM

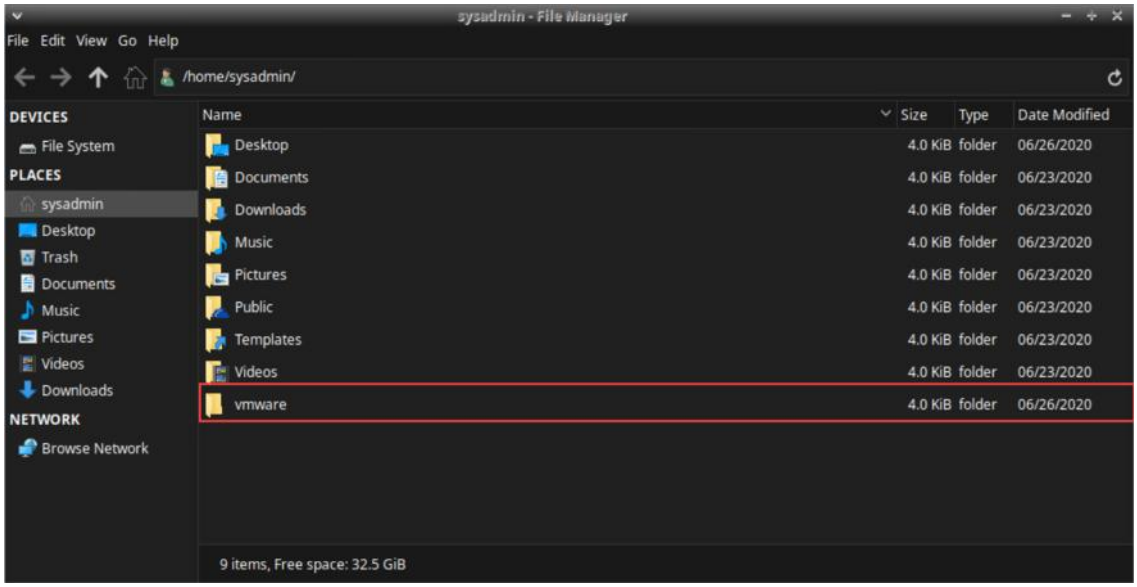
Identify multiple files associated with a virtual machine. Virtual machines are loaded with multiple files such as vmdk, vmx, vmxd, vmxf, log files, and snapshot files, with each serving a purpose for functionality.

1. Open the *VMware Workstation* application. On the desktop, double-click the **VMware Workstation** icon. Wait a few seconds for the program to load.

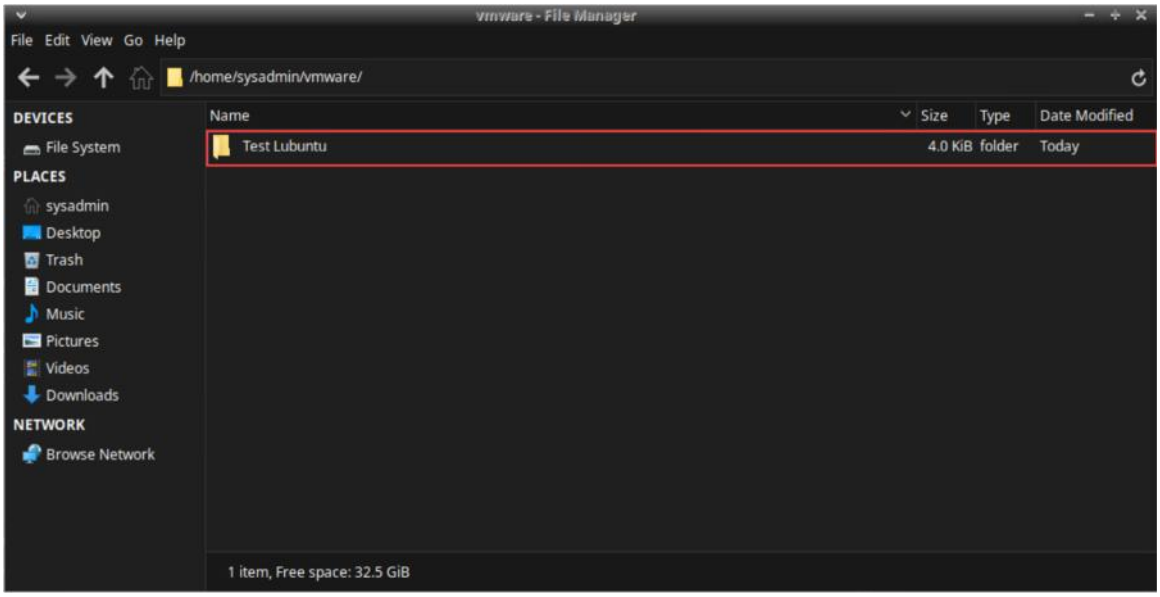
2. Click the **File Manager** icon located on the bottom toolbar, followed by clicking **sysadmin**.



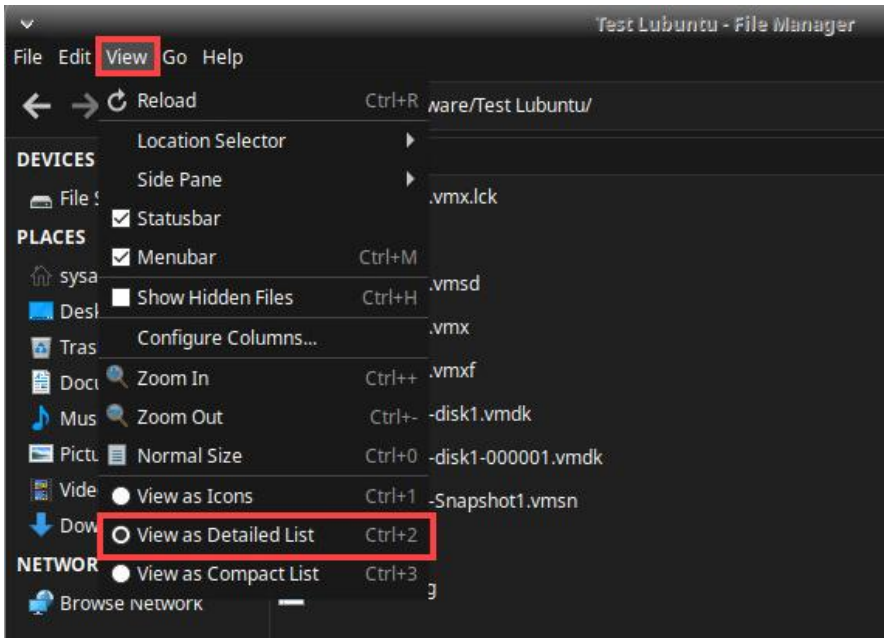
3. In the file manager window, double-click the **vmware** folder.



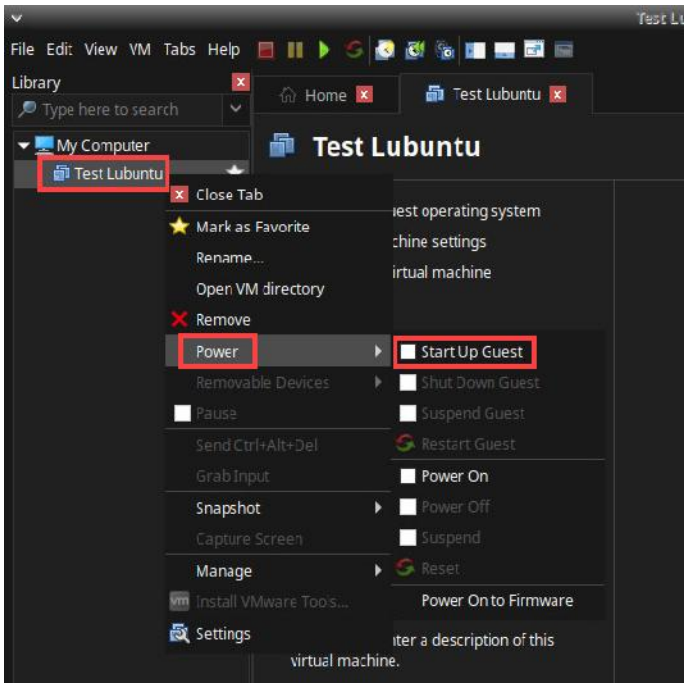
4. Double-click the **Test Lubuntu** virtual machine folder.



5. When in the *Test Lubuntu* folder, click the **View** tab and verify that **View as Detailed List** is selected.



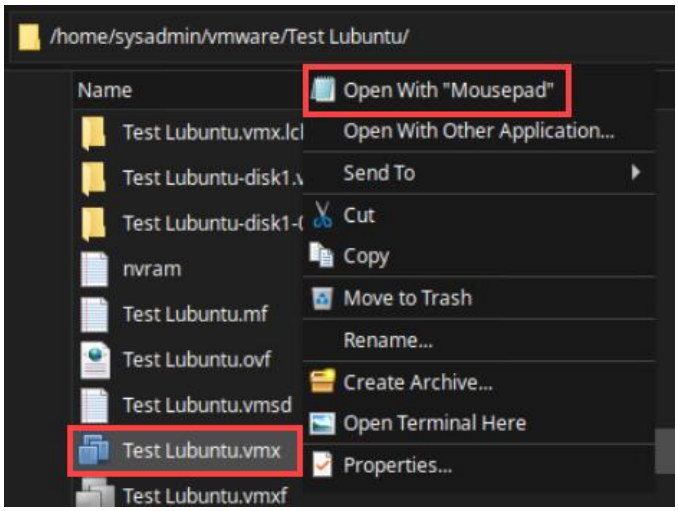
6. Change focus to the **VMware Workstation** application, right-click **Test Lubuntu** from the left navigation pane and select **Power > Start Up Guest.** Wait for the virtual machine to boot.



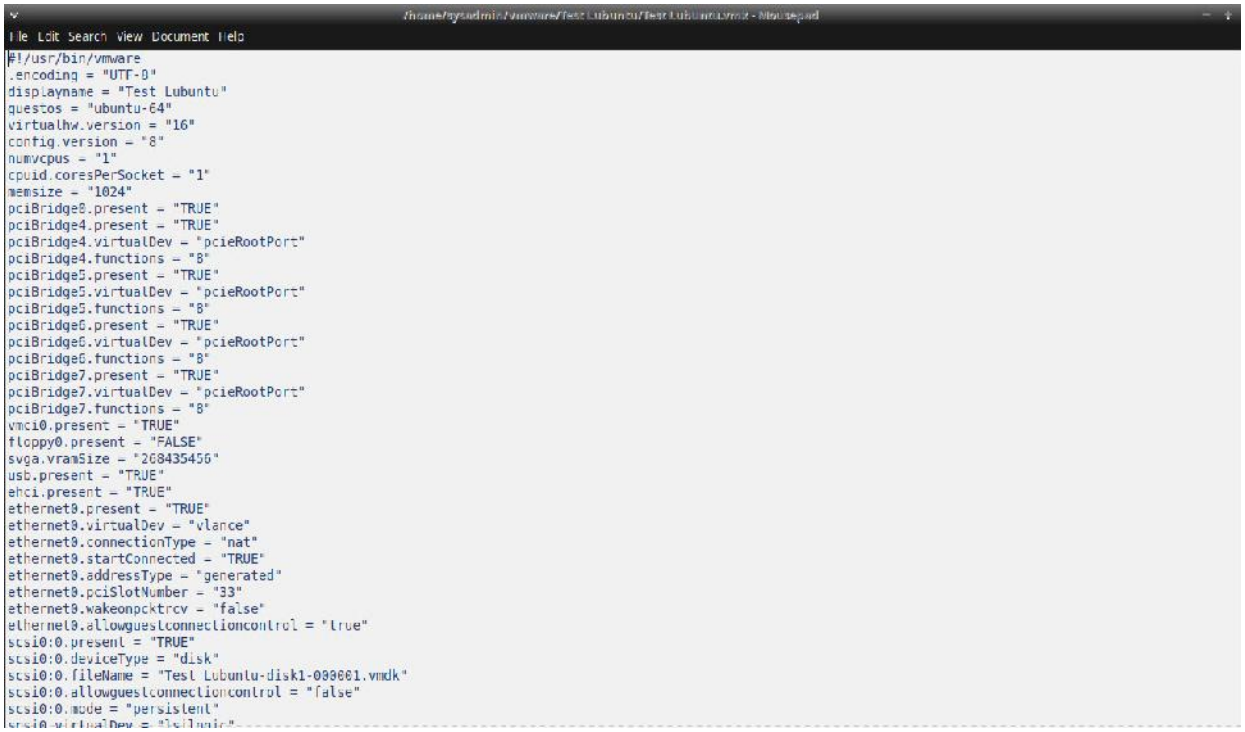
If a performance warning appears, select **Never show this hint again** and click **OK**.

If prompted with a question, select **I Moved It**.

7. Change focus back to the **File Manager** window with the *Test Lubuntu* folder opened. Here we have the various *vmdk*, *vmx*, *vmxd*, *vmxf*, and *log* files for various disk drives or snapshots. In the *Test Lubuntu* folder, right-click the **Test Lubuntu.vmx** file and click **Open with "Mousepad"**.



8. The contents of the *Test Lubuntu.vmx* folder will show the configuration settings of the *Test Lubuntu* VM.



9. Leave the *Mousepad* application window open to continue with the next task.

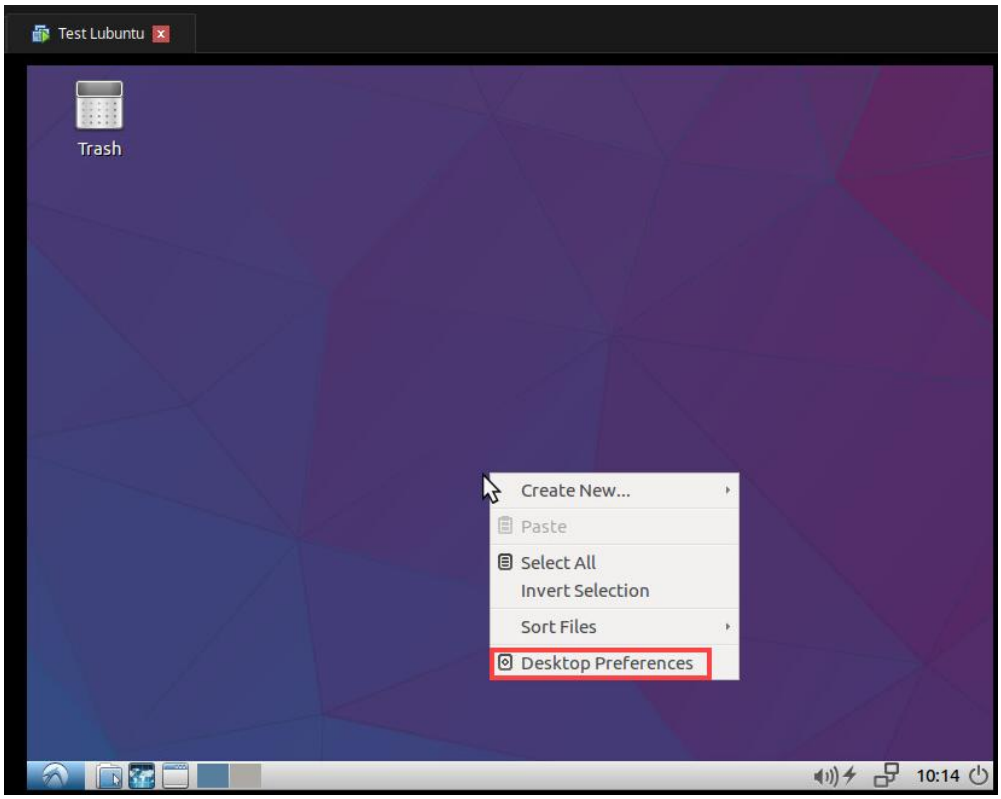
2 Identify the VM Settings and Where They Are Stored

Identify virtual machine hardware specifications. When looking at the vmx file for a given virtual machine, notice that the hardware assigned to the virtual machine are listed as configurable line items. These same line items can be seen when viewing the settings of a virtual machine within the graphical user interface.

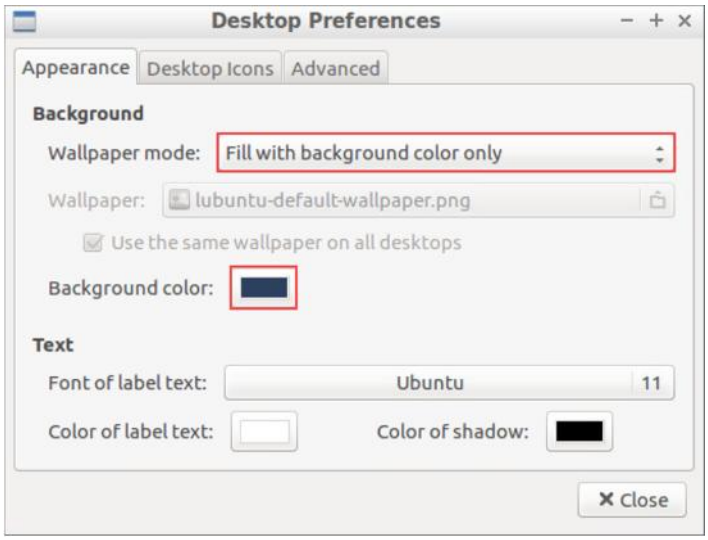
1. When viewing the *Test Lubuntu.vmx* file contents, observe the *memsize = "1024"* line. This is the VM's current memory size. Close the *Mousepad* application window when finished viewing the file contents.

```
#!/usr/bin/vmware
.encoding = "UTF-8"
displayname = "Test Lubuntu"
guestos = "ubuntu-64"
virtualhw.version = "16"
config.version = "8"
numvcpus = "1"
cpuid.coresPerSocket = "1"
memsize = "1024"
pciBridge0.present = "TRUE"
pciBridge4.present = "TRUE"
pciBridge4.virtualDev = "pcieRootPort"
pciBridge4.functions = "8"
pciBridge5.present = "TRUE"
pciBridge5.virtualDev = "pcieRootPort"
pciBridge5.functions = "8"
pciBridge6.present = "TRUE"
pciBridge6.virtualDev = "pcieRootPort"
pciBridge6.functions = "8"
pciBridge7.present = "TRUE"
pciBridge7.virtualDev = "pcieRootPort"
pciBridge7.functions = "8"
vmci0.present = "TRUE"
floppy0.present = "FALSE"
svga.vramSize = "268435456"
usb.present = "TRUE"
ehci.present = "TRUE"
ethernet0.present = "TRUE"
ethernet0.virtualDev = "vlance"
ethernet0.connectionType = "nat"
ethernet0.startConnected = "TRUE"
ethernet0.addressType = "generated"
```

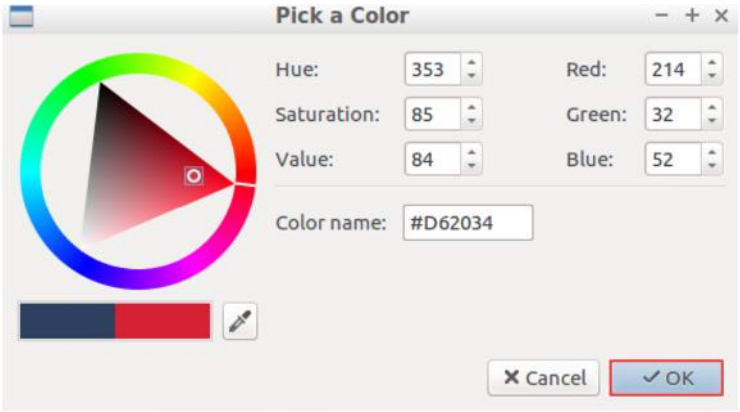

2. Change focus to the **VMware Workstation** window to interact with the *Test Lubuntu* VM desktop. Right-click on any empty space within the desktop and select **Desktop Preferences**.



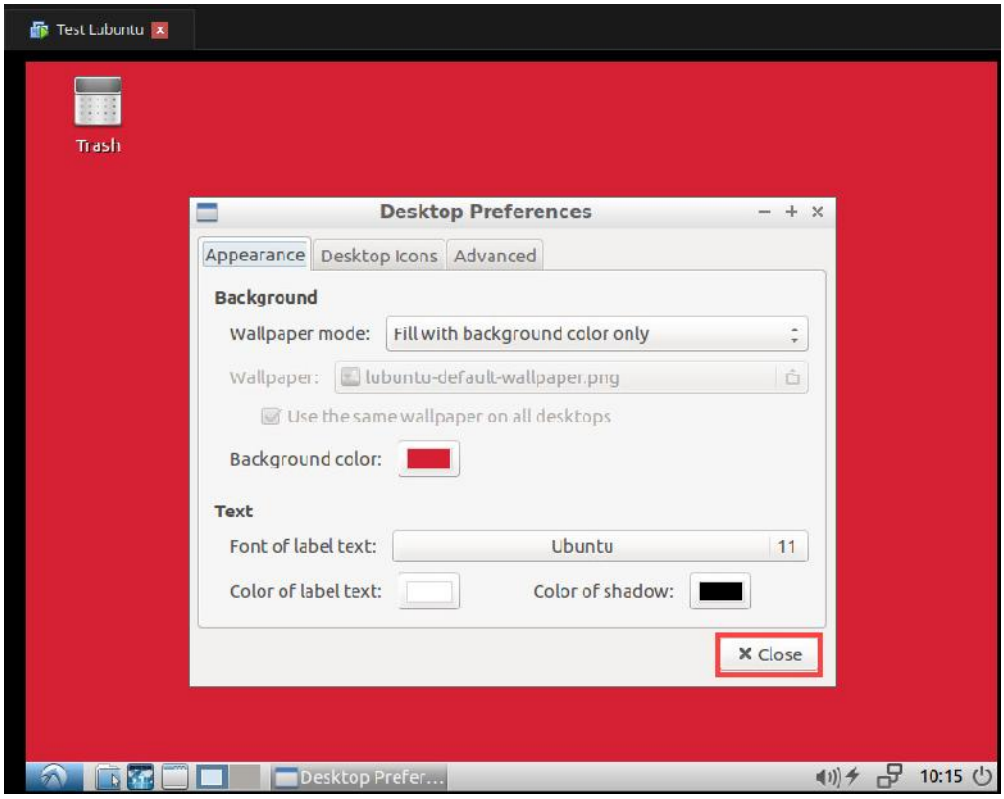
3. Select **Fill with background color only** from the *Wallpaper mode* dropdown menu. Pick a different background color for the desktop by clicking the menu for *Background color*.



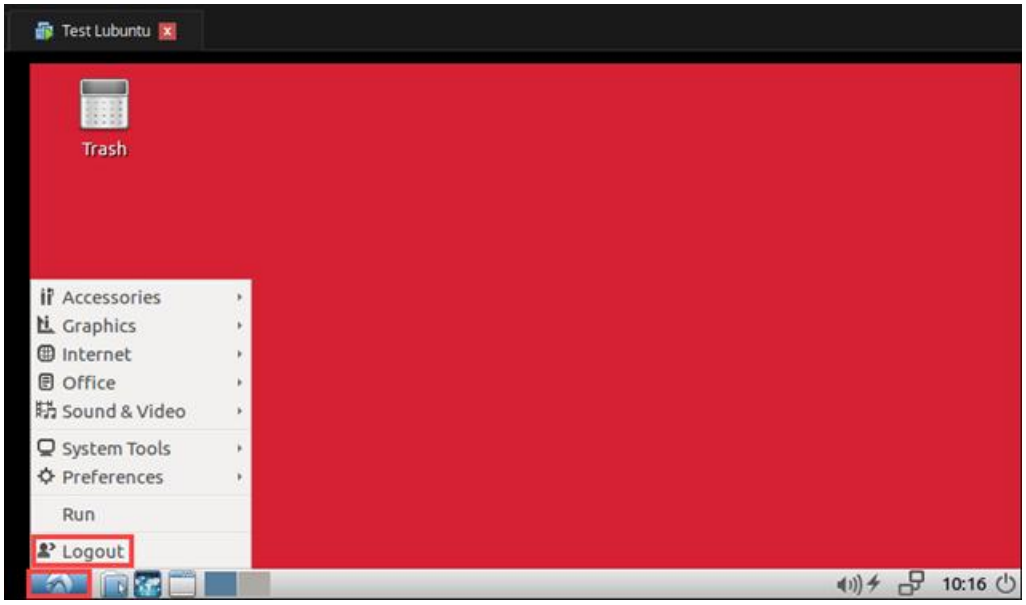
4. In the *Pick a Color* window, pick any color from the color prism. Click **OK**.



5. Click **Close** to exit *Desktop Preferences*.



6. In the *Test Lubuntu* VM console window, click on the **Start Menu** and select **Logout**.

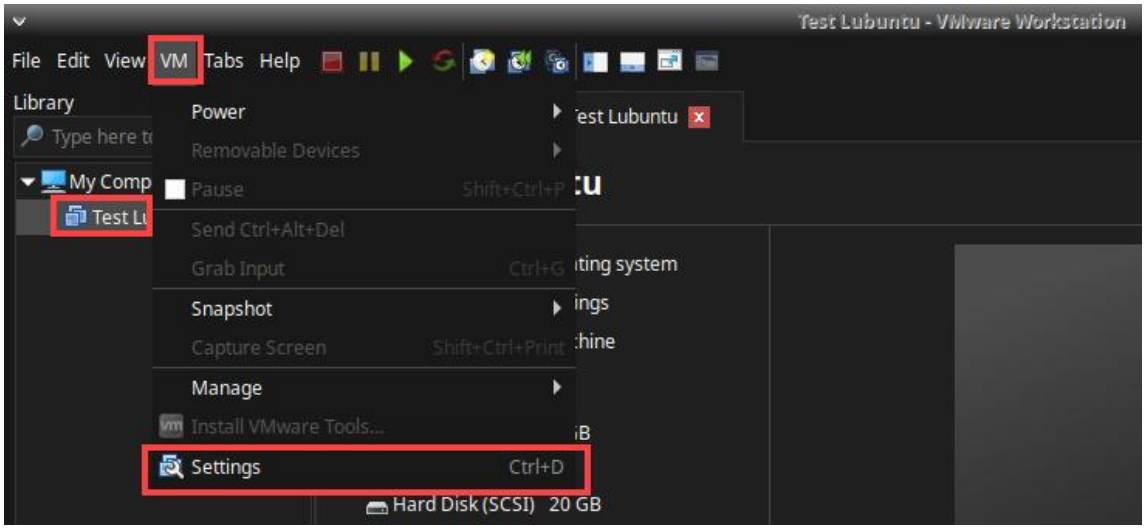


7. Power off the machine by choosing **Shutdown**.

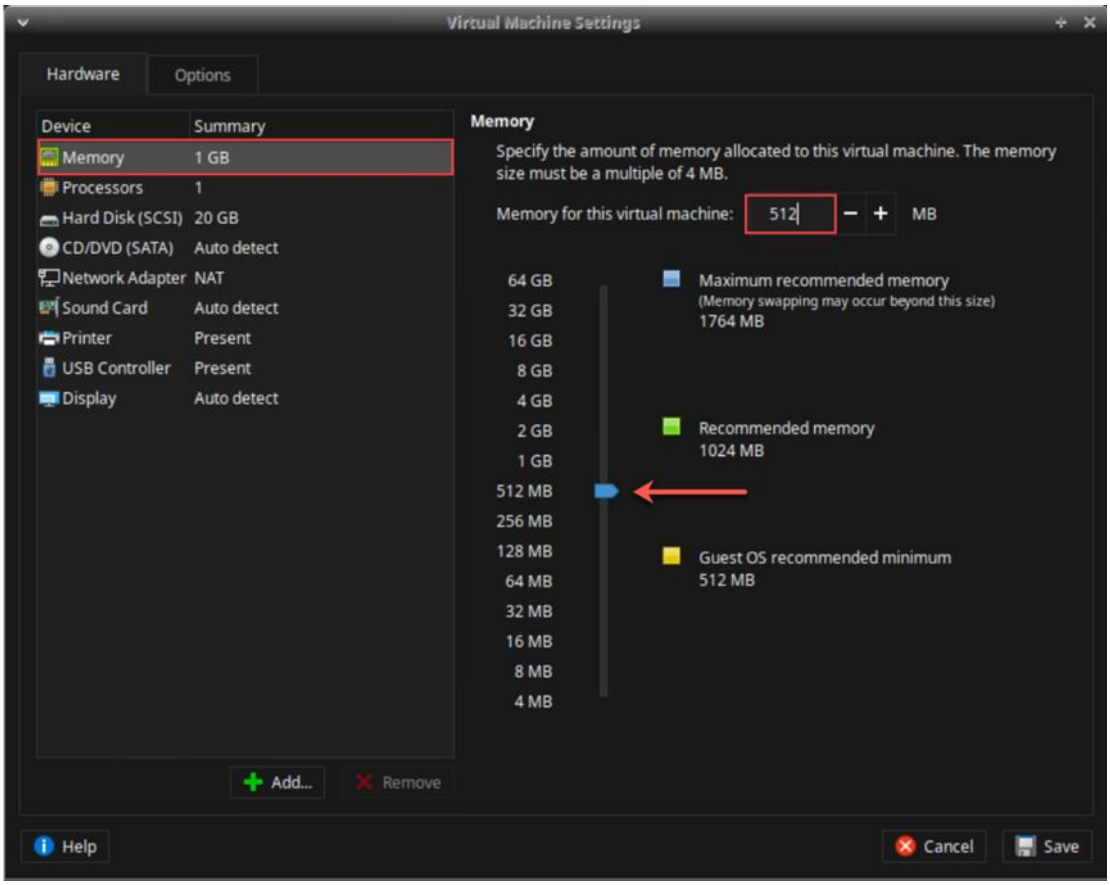
Please Note

If prompted with a question regarding *VMware Tools*, check the check-box for **Never show this hint again** and click **OK**.

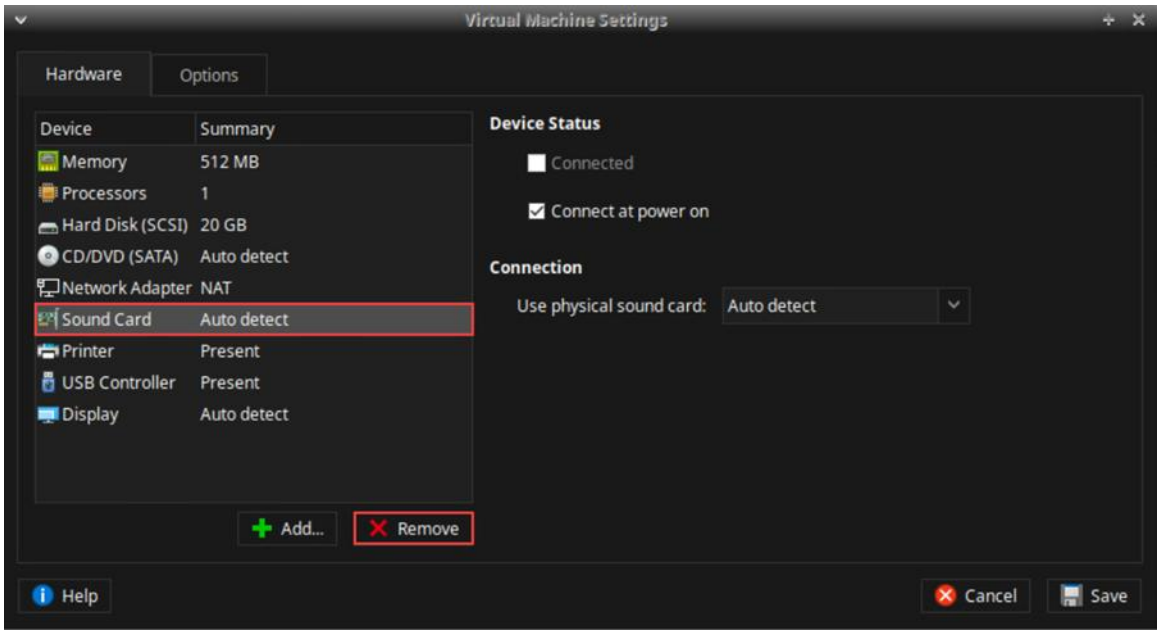
8. While **Test Lubuntu** is selected from the left navigation pane, select **VM > Settings** from the *VMware Workstation* application menu.



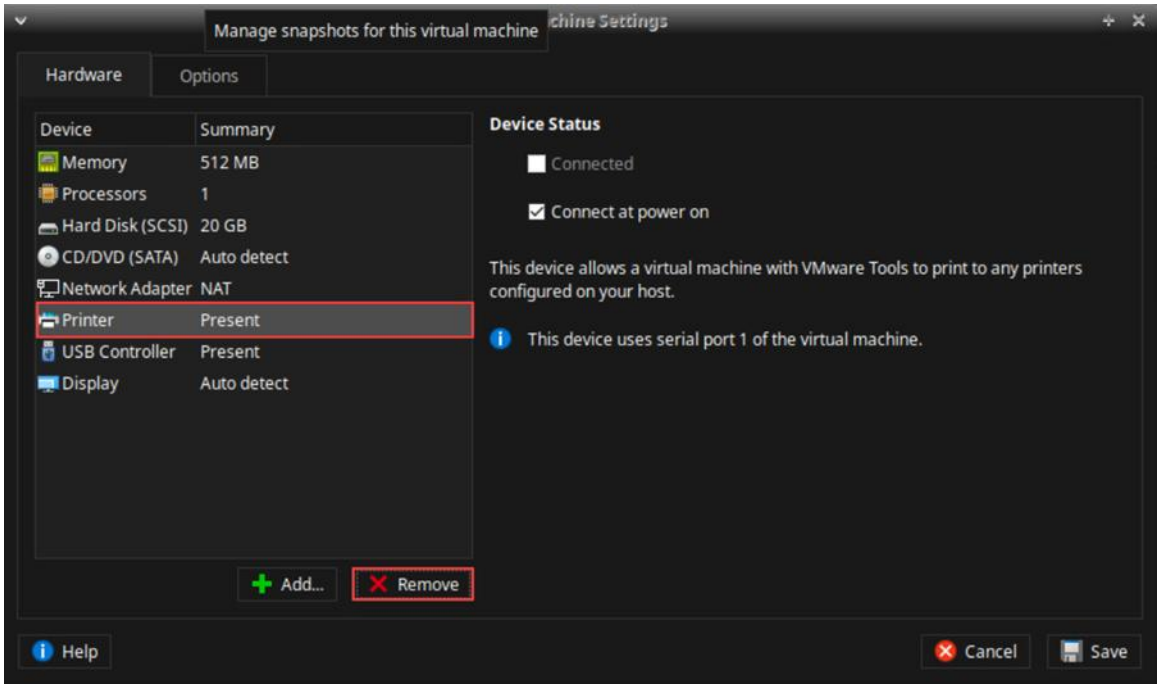
9. Specify a new amount of memory to allocate to the *Test Lunbuntu* VM. On the left pane of the *Virtual Machine Settings* window, select **Memory**. Type **512** into the *Memory for this virtual machine* text field and press the **Enter** key.



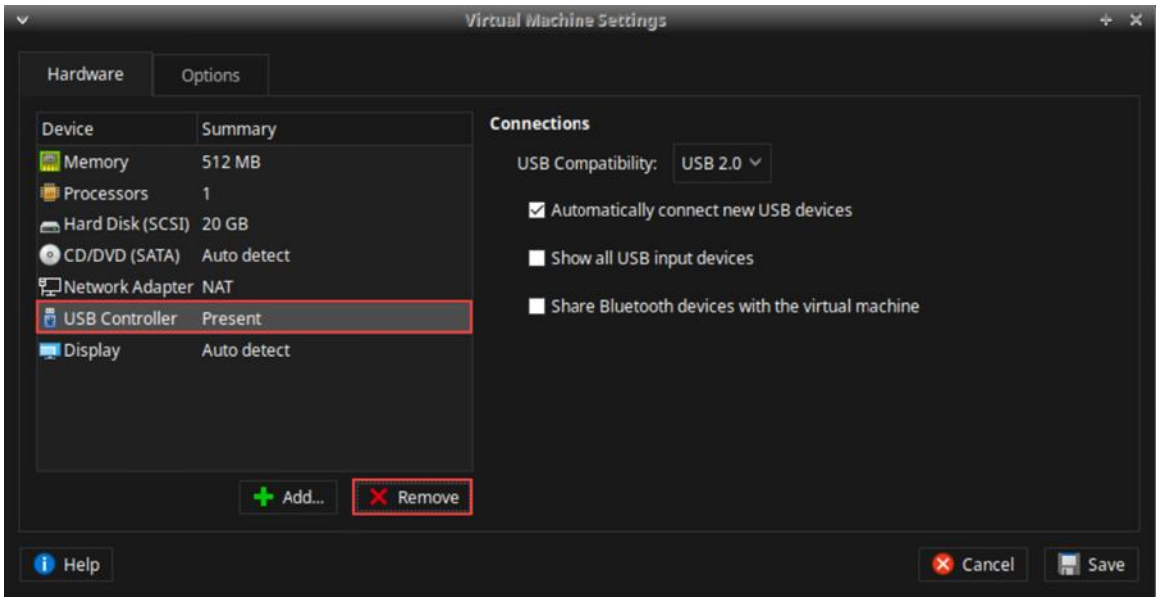
10. Remove the *Sound Card* device from the VM's hardware list. On the left pane of the *Virtual Machine Settings* window, select **Sound Card** and click the **Remove** button.



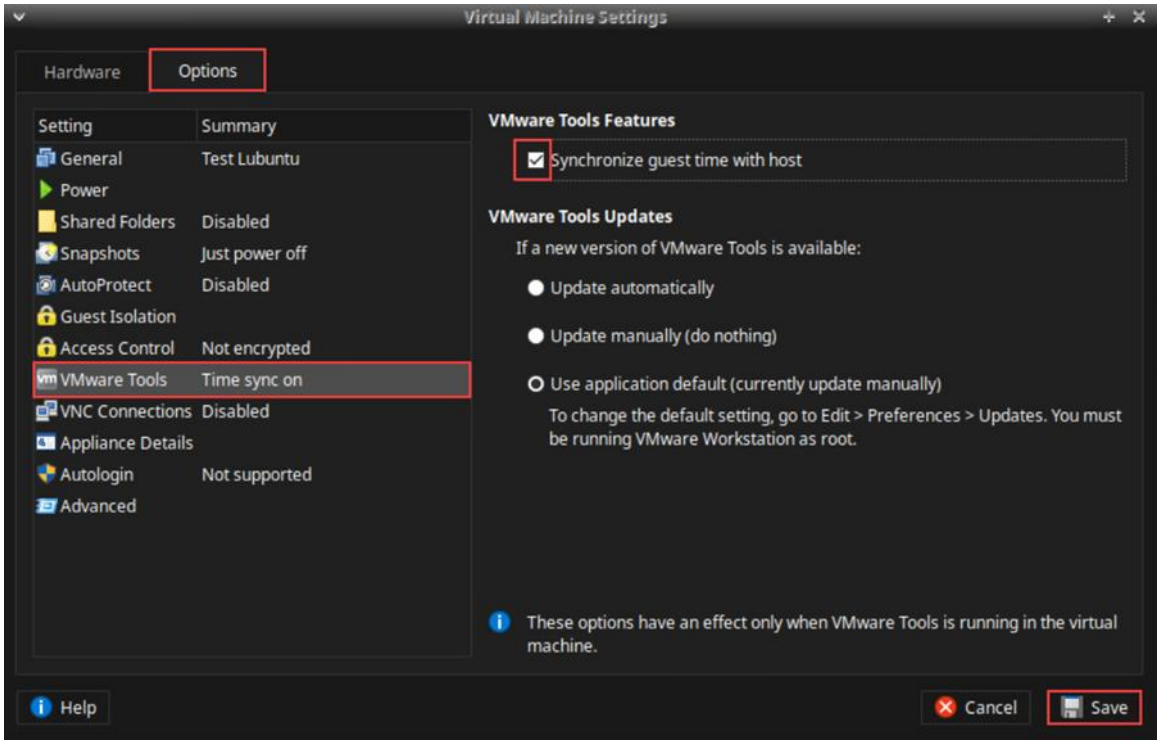
11. Remove the *Printer* hardware device from the VM's hardware list. On the left pane of the *Virtual Machine Settings* window, select **Printer** and click **Remove**.



12. Remove the *USB Controller* hardware device from the VM's hardware list. On the left pane of the *Virtual Machine Settings* window, select **USB Controller**. Click **Remove**.



13. From the **Options** tab, select **VMware Tools** on the left. On the right pane, check **Synchronize guest time with host**. Click **Save**.

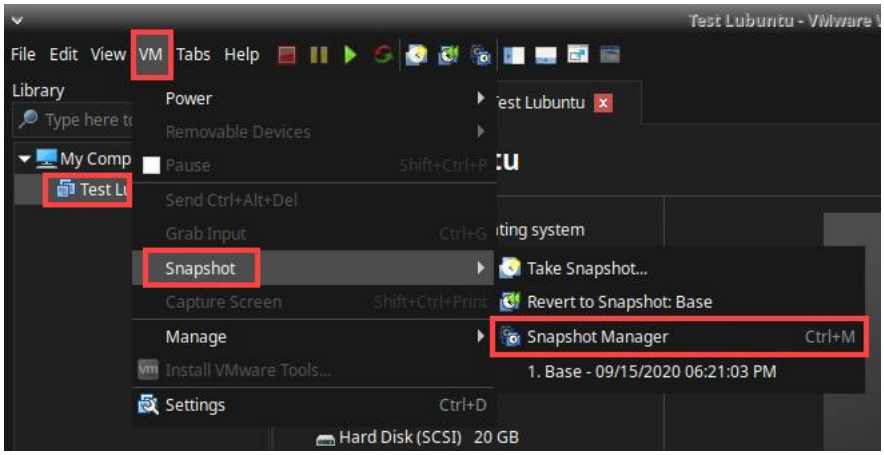


14. Leave the *VMware Workstation* application window open to continue with the next task.

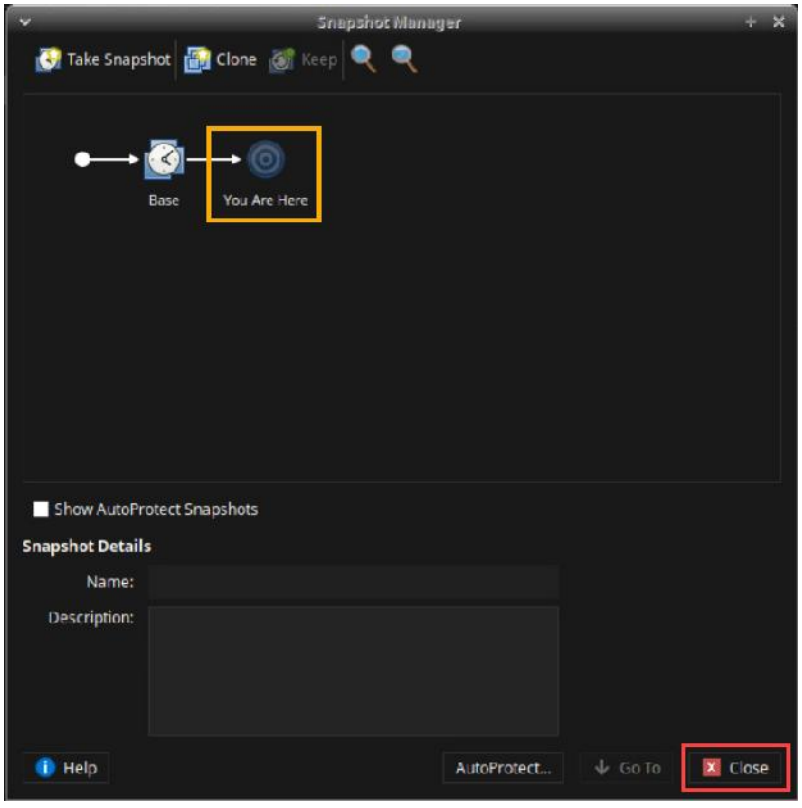
3 Working with Snapshots in VMware Workstation

Learn how to take new snapshots and how to revert back to a snapshot while identifying changes to virtual machine files. Snapshots are a great feature to utilize when making changes or conducting updates to a virtual machine. Snapshots allow you to take your virtual machine back in time to previous configurations of the virtual machine.

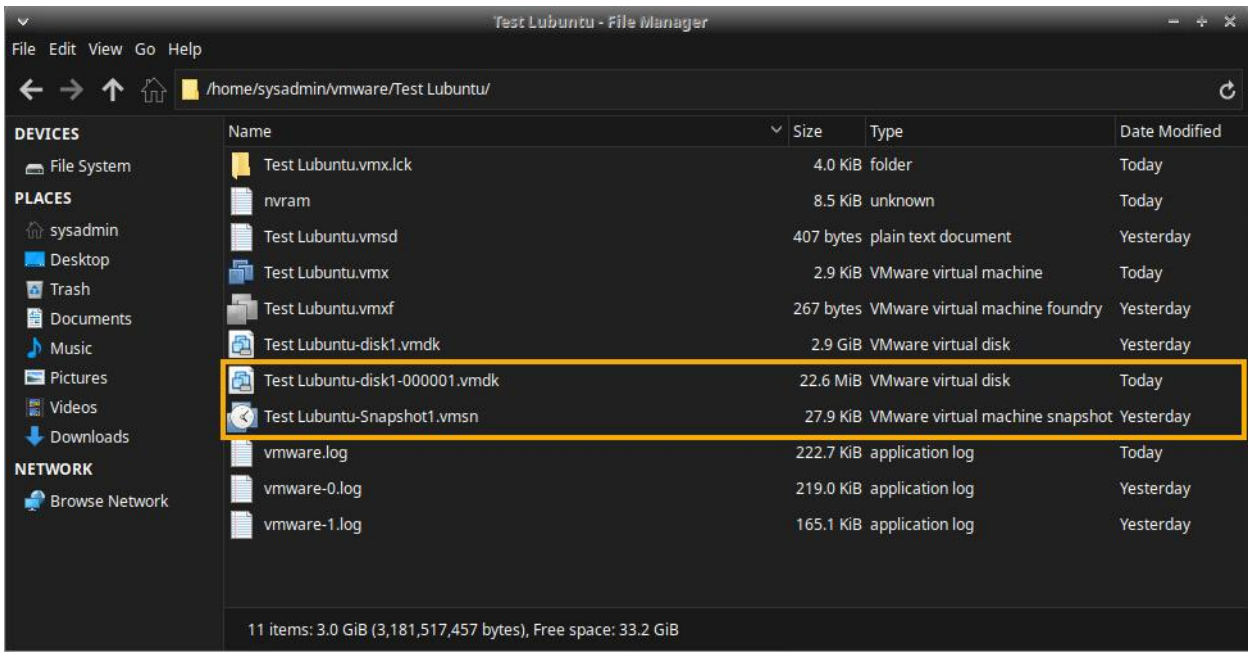
1. View the current state of the VM. While **Test Lubuntu** is selected from the left navigation pane, go to **VM > Snapshot > Snapshot Manager**.



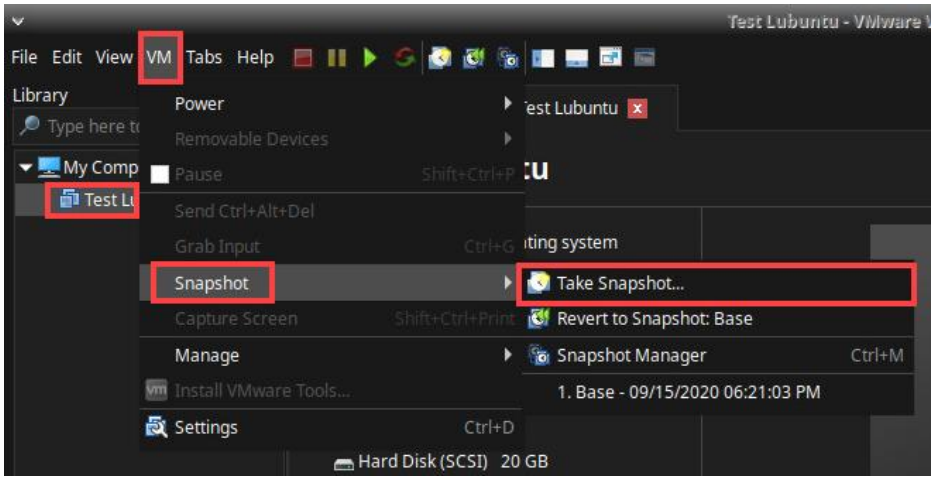
2. The *Snapshot Manager* maps out the saved states of the VM. Notice you are at the original *Base* snapshot state. Click the **Close** button to exit the *Snapshot Manager*.



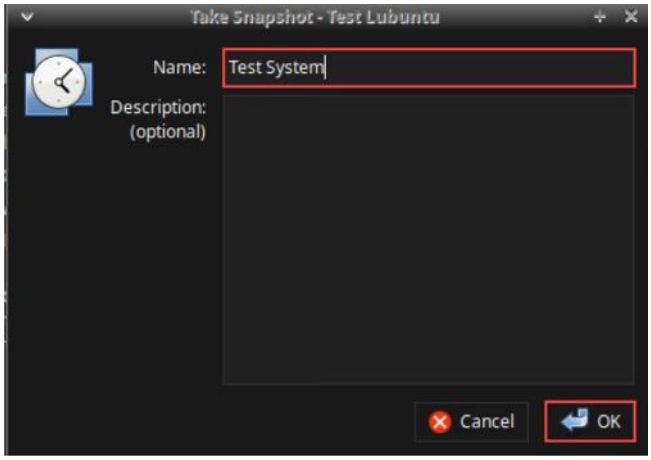
3. Change focus to the **File Manager** window with the *Test Lubuntu* folder opened from *Task 1*.
4. In the *Test Lubuntu* folder, notice the set of virtual machine disk files starting with *Test Lubuntu-000001*… These sets of files are snapshot files that represent the difference between the current state of the virtual disk and the state that existed at the time a previous snapshot was taken. The VM is currently at the *Base* state and no other snapshot has been taken. Therefore, these are snapshot files that represent the state of the virtual disk at the first *Base* snapshot.



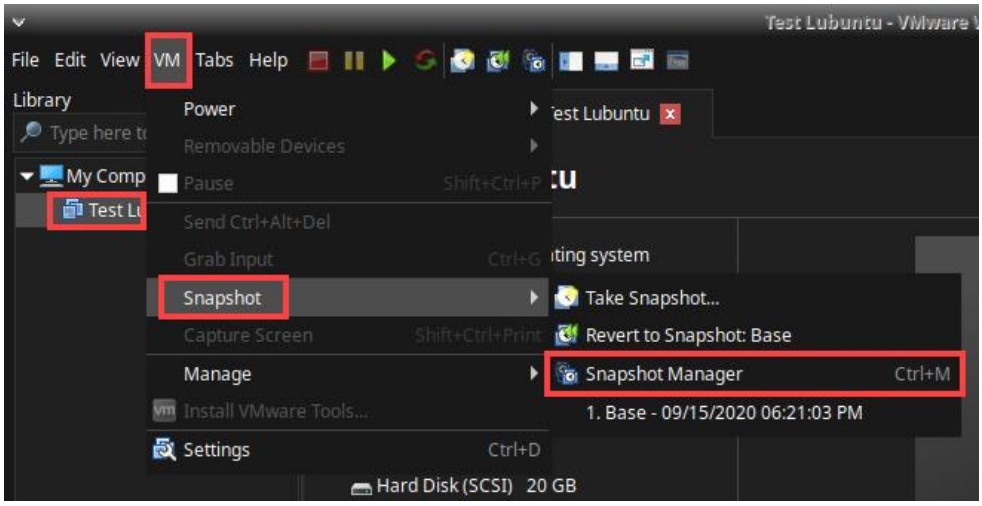
5. Take a snapshot of the *Test Lubuntu* VM in its current state to save the changes made to the machine's hardware settings in the previous steps. Change focus back to the *VMware Workstation* window and make sure **Test Lubuntu** is selected. Select **VM** and then select **Snapshot > Take Snapshot**.



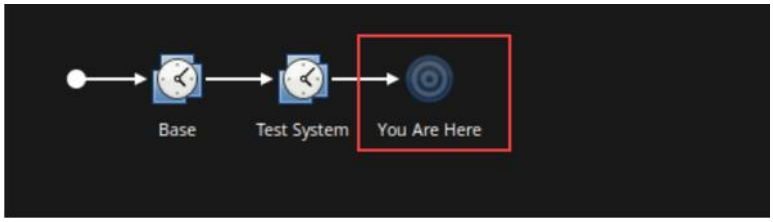
6. In the *Name* text field, name the snapshot **`Test System`**. Select **OK**.



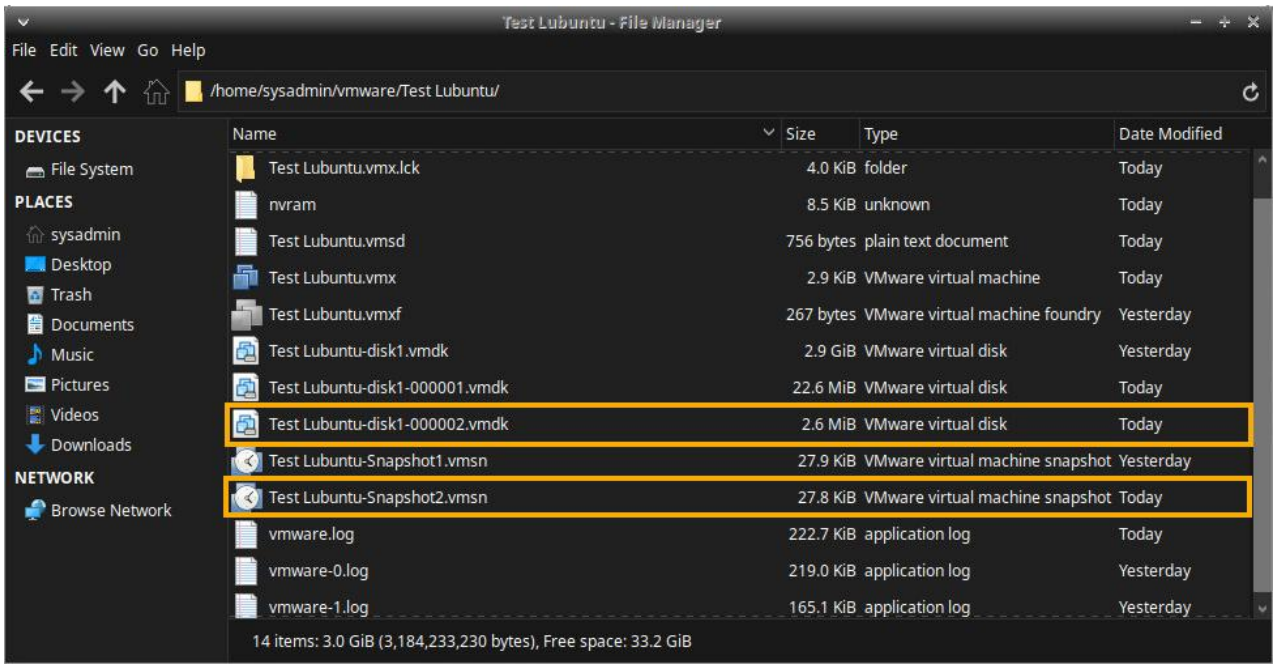
7. View the current state of the VM. While having **Test Lubuntu** selected, go to **VM > Snapshot > Snapshot Manager**.



8. Notice you are at the *Test System* snapshot just created.



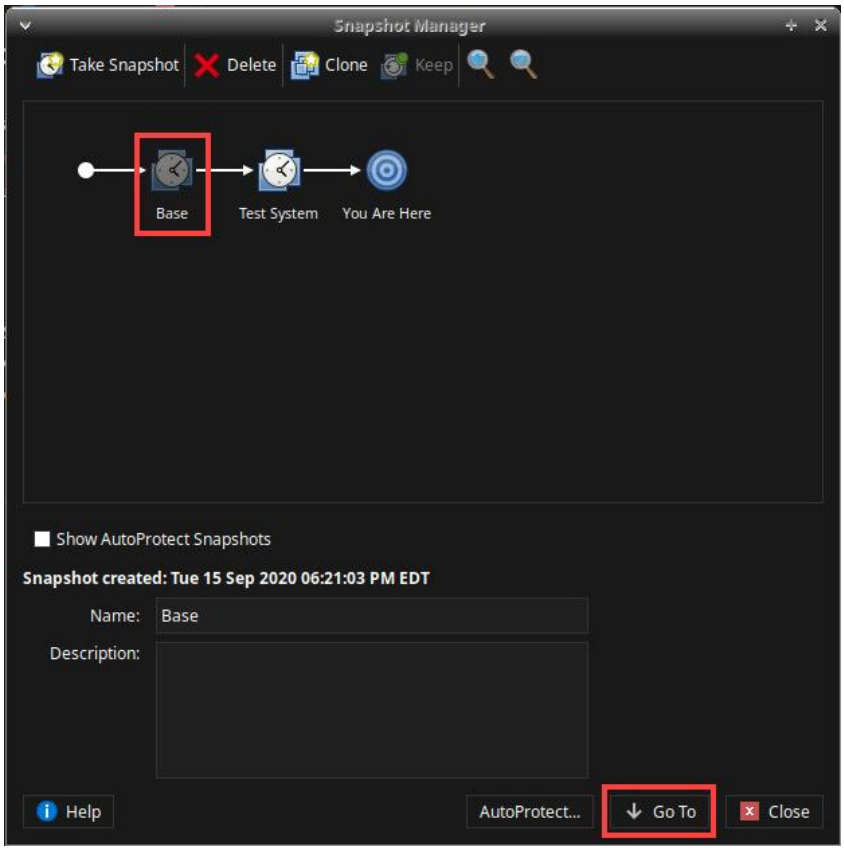
9. Change focus to the **File Manager** window and examine the contents of the *Test Lubuntu* folder. Notice a new virtual disk file was created along with a VMware virtual machine snapshot file. The "*.vmdk*" and "*.vmsn*" files were created when the new snapshot was taken. Any changes to the file system while running off of this snapshot will be recorded in these files.



The filename uses the following syntax, *vmname-000002.vmdk* where *vmname* is the name of the virtual machine (in this case *Test Lubuntu*). The six-digit number, *000002*, is based on other snapshot files that already exist in the directory.

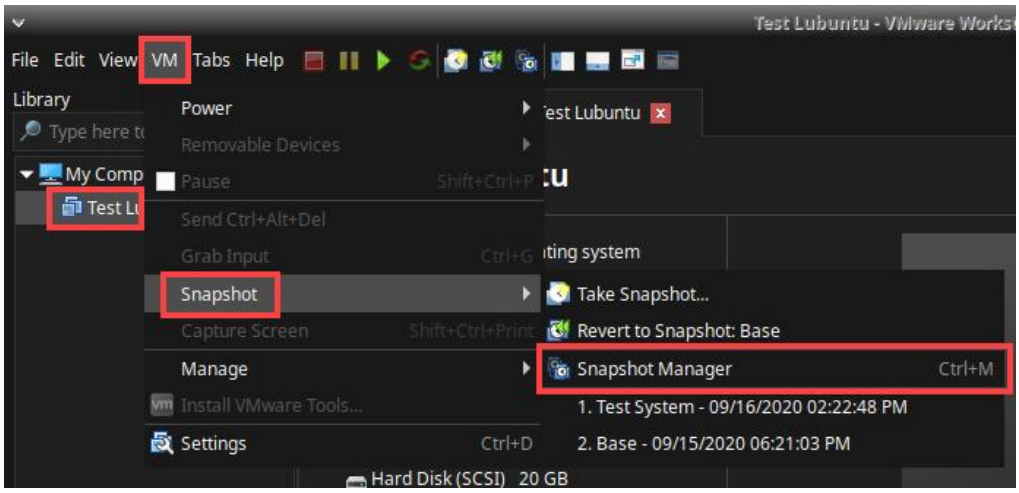
Except for the original set, *000001*, the six-digit number is chosen arbitrarily and does not necessarily correspond with the snapshot number.

10. Change focus to the **VMware Workstation** application window. On the *Snapshot Manager*, restore the VM state to its base state by clicking the **Base** snapshot thumbnail and clicking the **Go To** button.

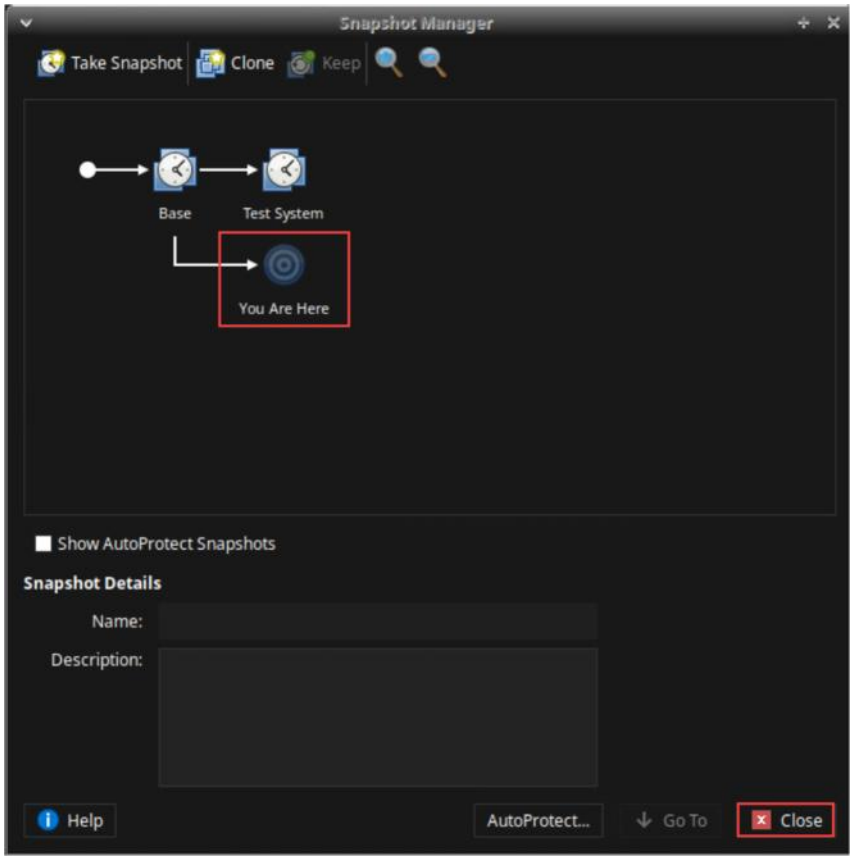


11. When prompted, click **Yes** to continue.

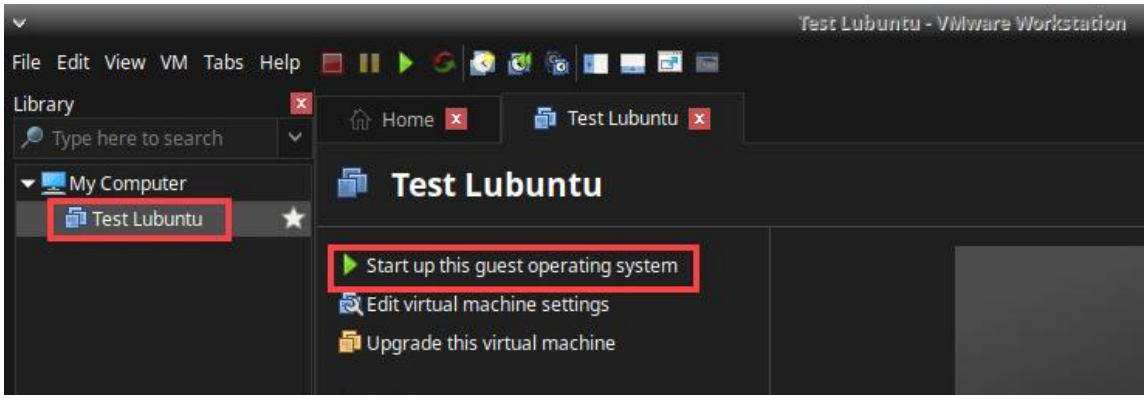
12. Go to **VM > Snapshot > Snapshot Manager**.



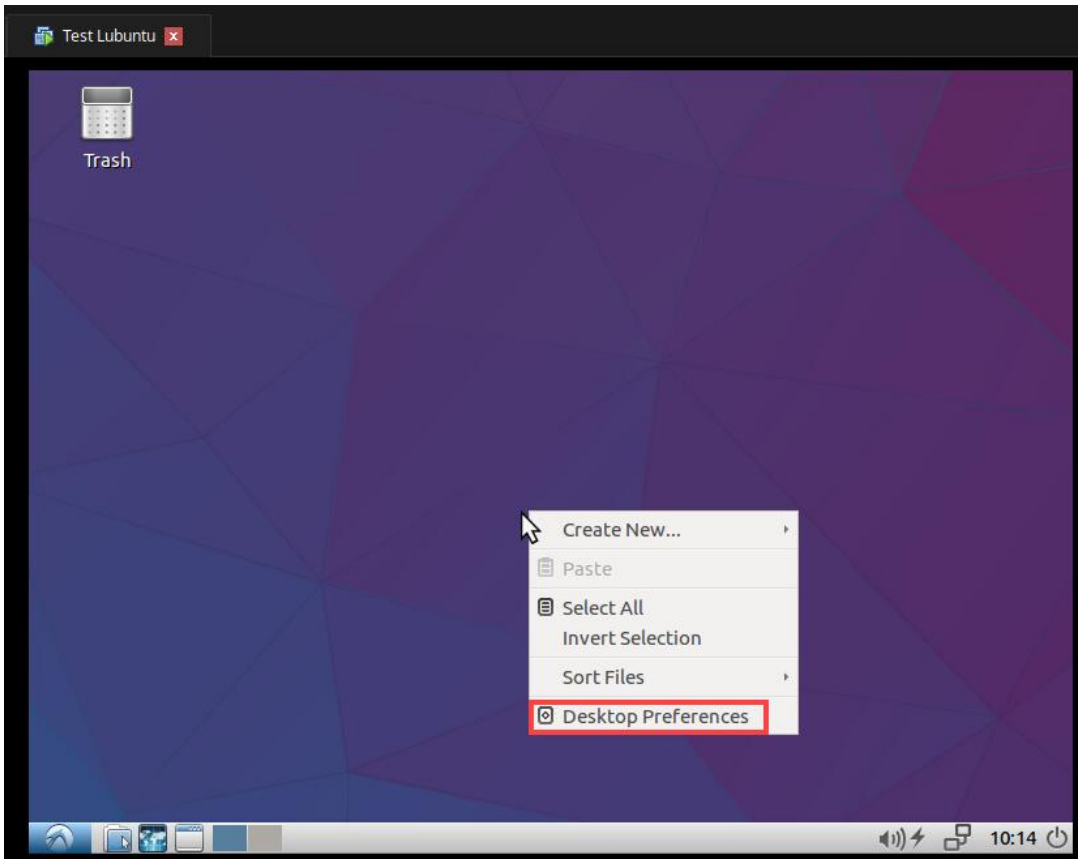
13. Verify that you are at the *Base* VM state, as shown below. Click the **Close** button.



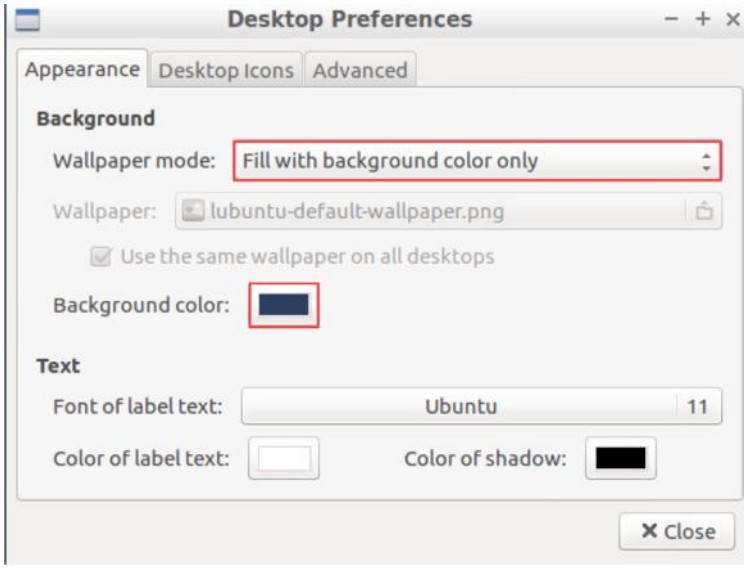
14. On the *VMware Workstation* window, click the **Start up this guest operating system** button while having **Test Lubuntu** selected.



15. Notice the wallpaper is configured as it originally was on first boot up. Right-click on the **Test Lubuntu** VM desktop and select **Desktop Preferences**.

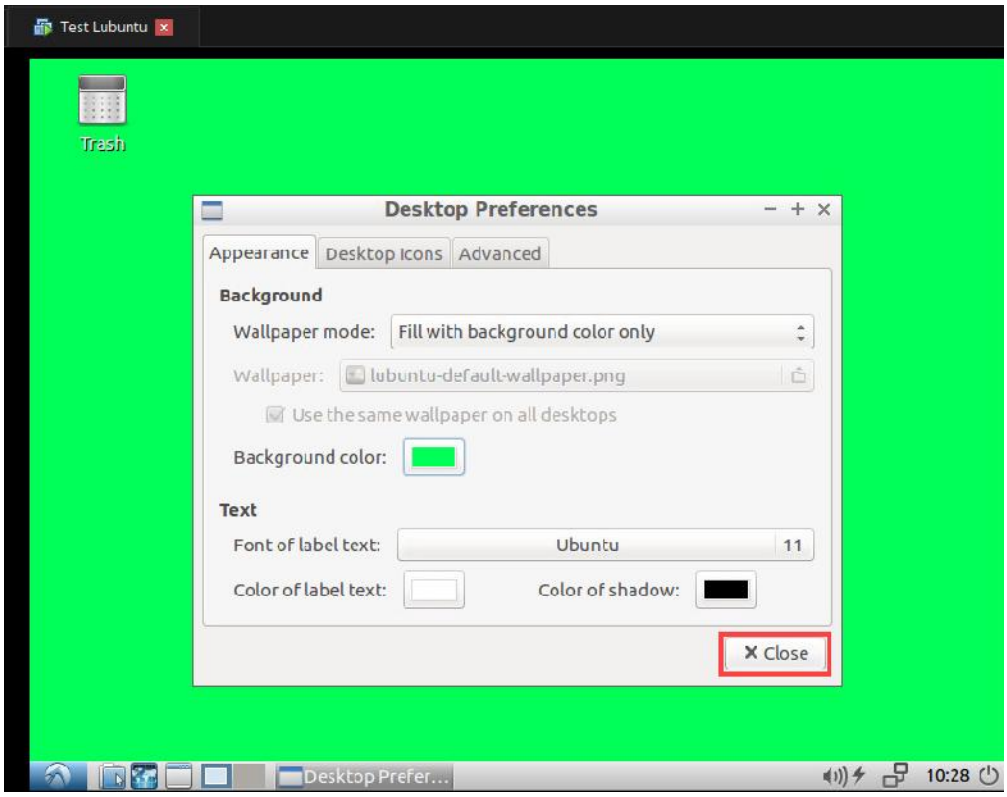


16. On the *Desktop Preferences* window, select **Fill with background color only** from the *Wallpaper mode:* menu. Pick a different background color for the desktop by clicking the menu for *Background color*.

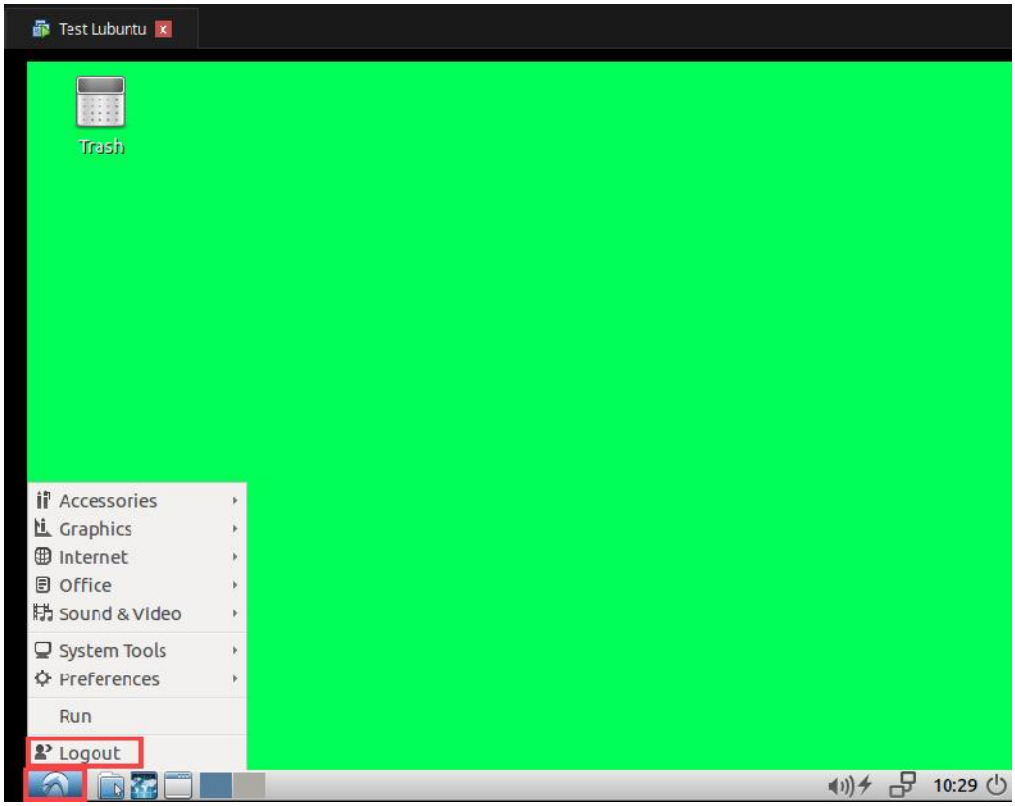


17. Pick a different color on the left color prism, click **OK**.

18. Click **Close** to exit *Desktop Preferences*.



19. In the *Test Lubuntu* VM console window, go to **Start > Logout**.



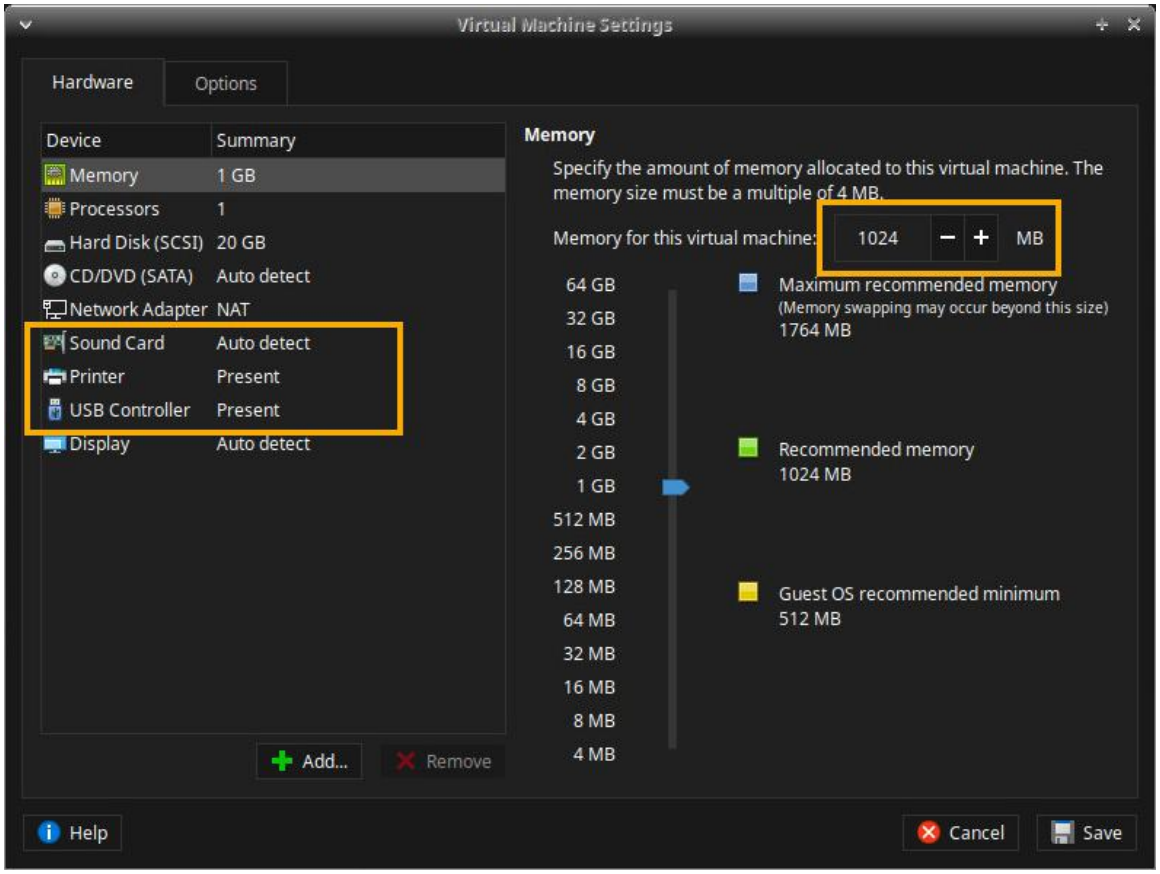
20. Power off the virtual machine by selecting **Shutdown**.

21. Leave the *VMware Workstation* application window open to continue with the next task.

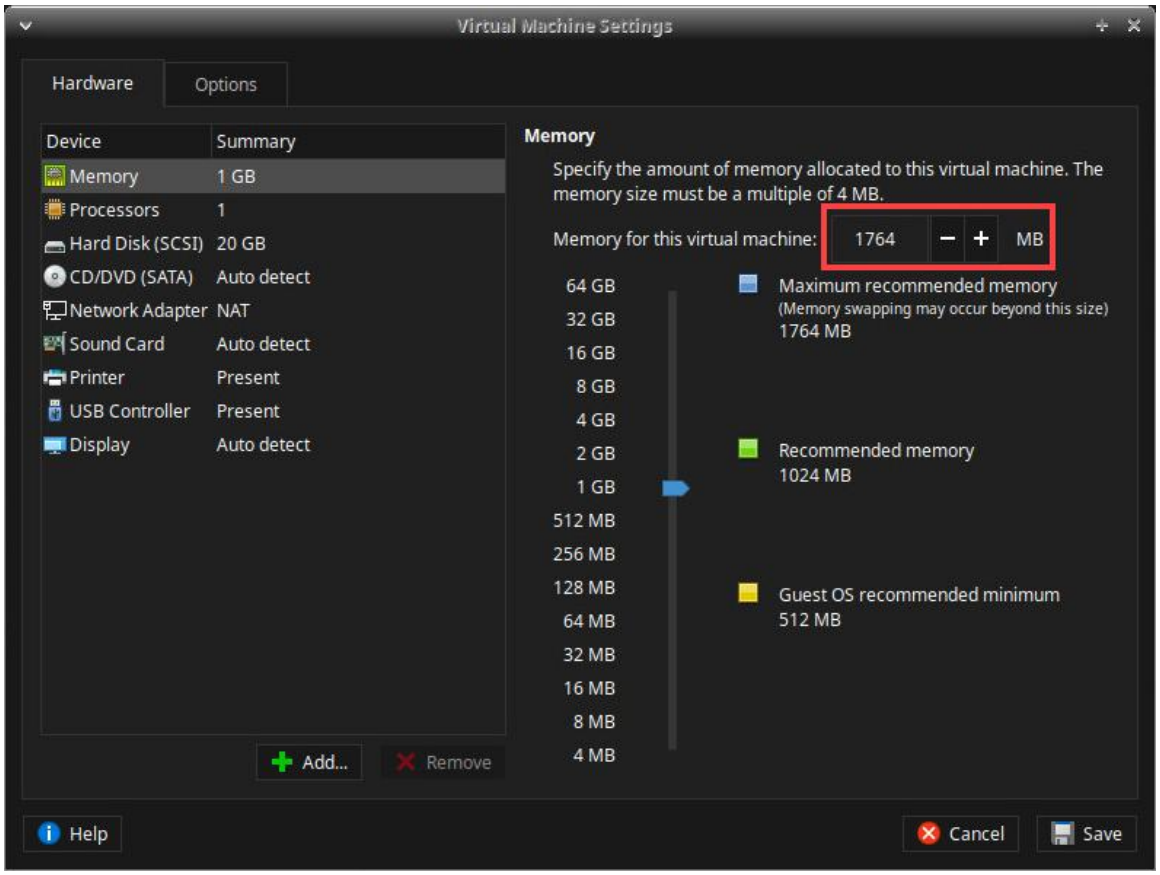
4 View Changes in the VM Files When Using Snapshots

Continue using the snapshot feature and identify the changes reflected on the disk files for the virtual machine. When taking snapshots, new disk files are created to record all changes made in-between snapshots.

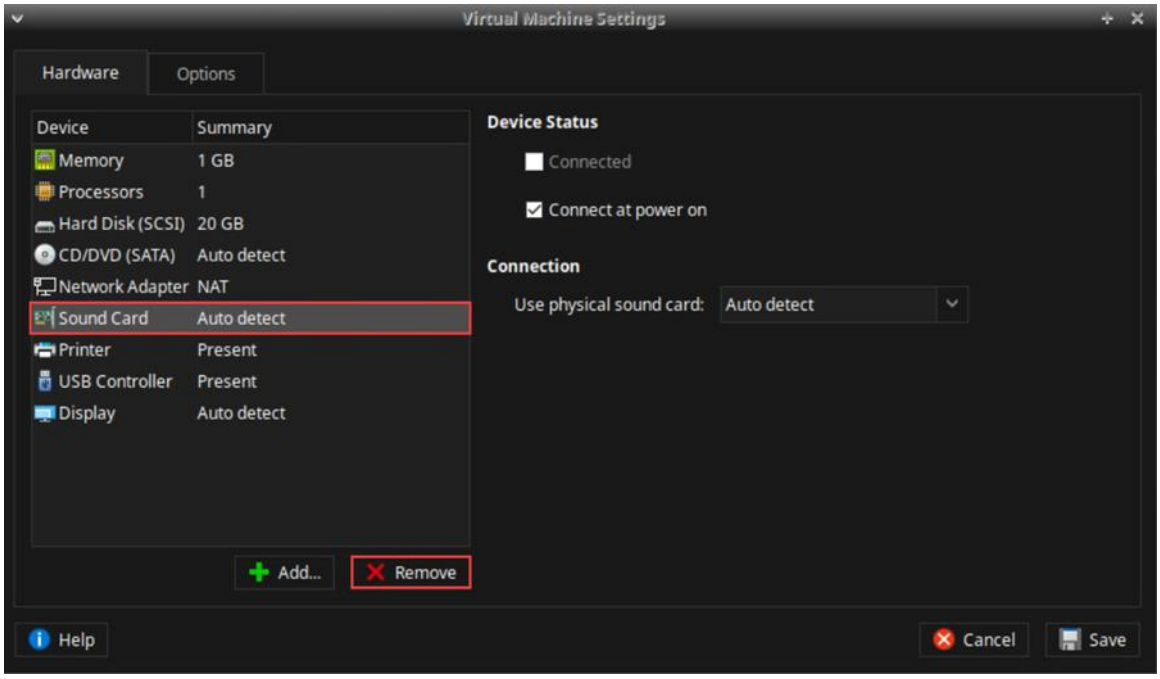
1. In the *VMware Workstation* window, while having **Test Lubuntu** selected, navigate to **VM > Settings**. Verify that the memory size is back to the *Base* state setting of *1024 MB* and that the previously deleted *Sound Card*, *Printer*, and *USB Controller* hardware devices are available again.



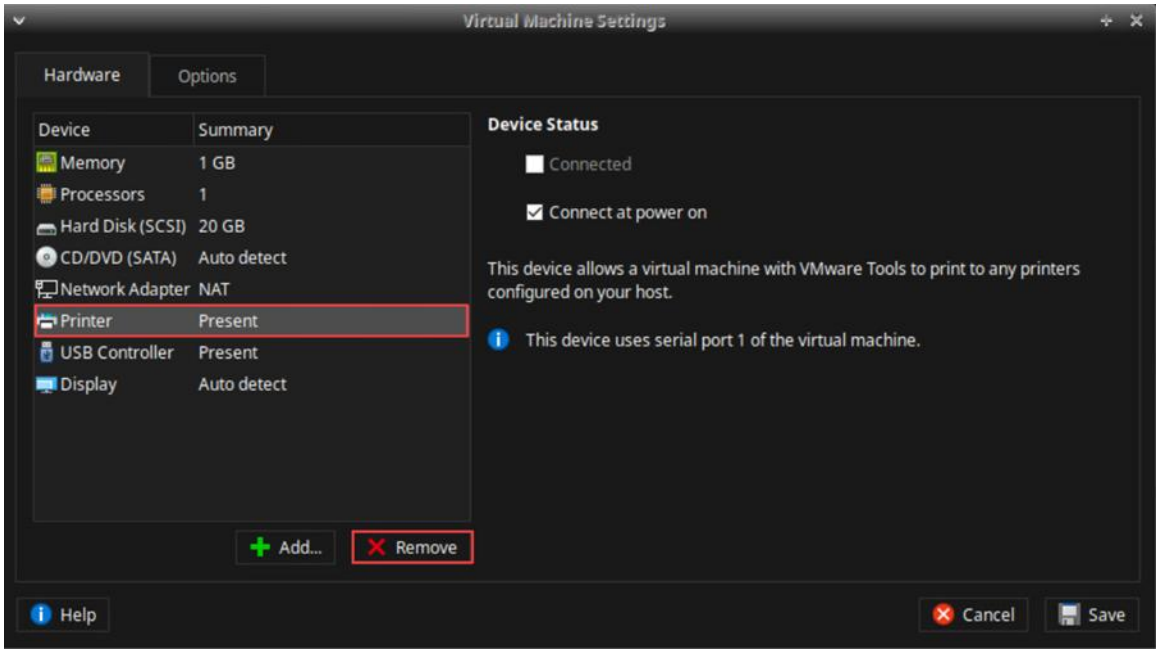
2. Enter **1764** MB as the new value for the memory allocated to the machine.



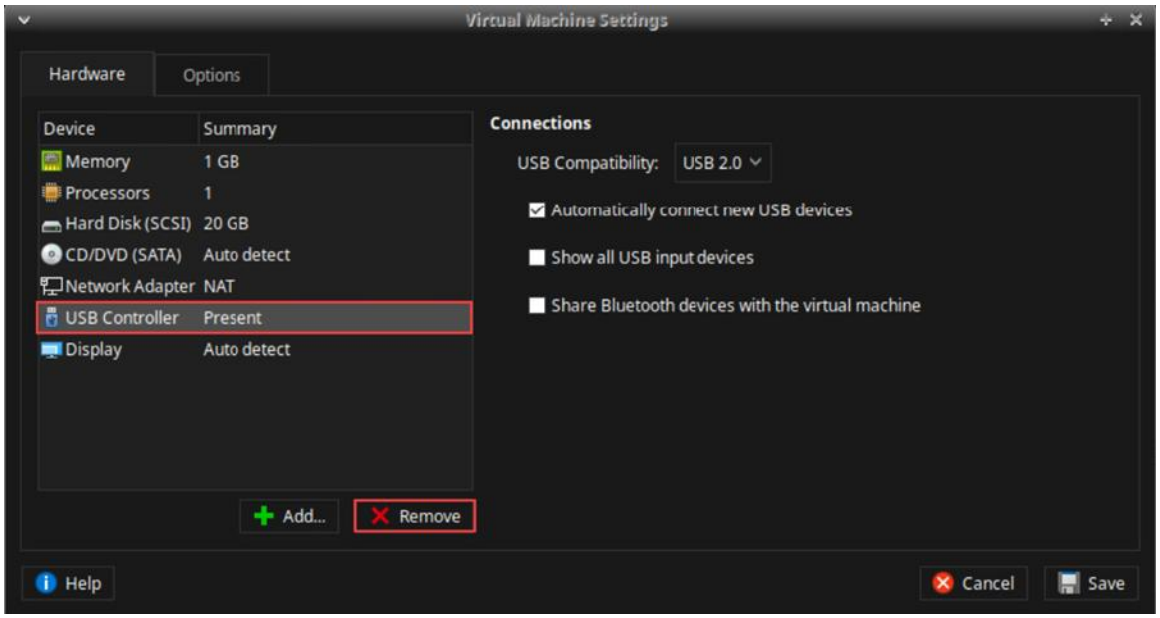
3. Remove the *Sound Card* device from the VM's hardware. On the left side of the *Virtual Machine Settings* window, select the **Sound Card** and click **Remove**.



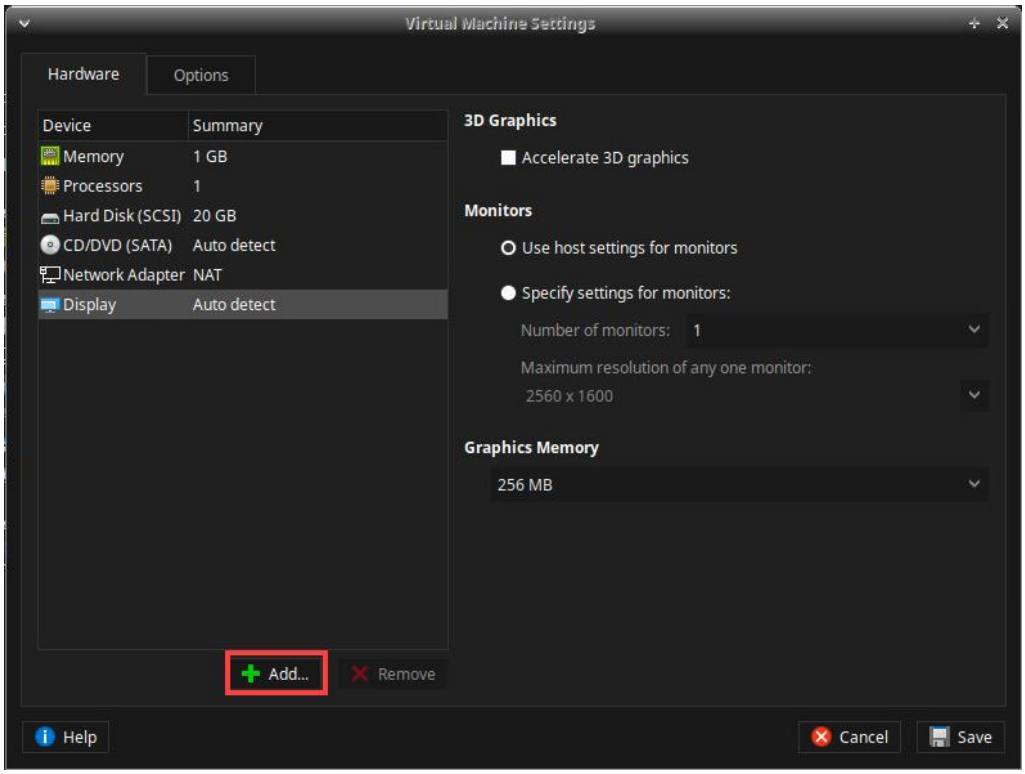
4. Remove the *Printer* device from the VM's hardware list. On the left side of the *Virtual Machine Settings* window, select the **Printer** and click **Remove**.



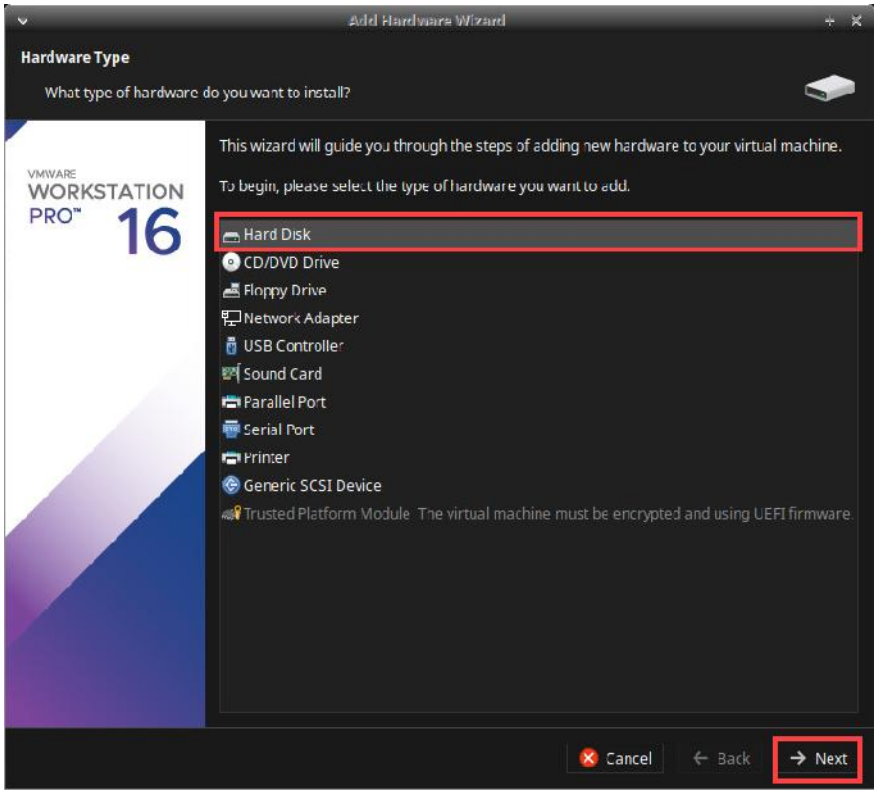
5. Remove the *USB Controller* device from the VM's hardware list. On the left side of the *Virtual Machine Settings* window, select the **USB Controller** and click **Remove**.



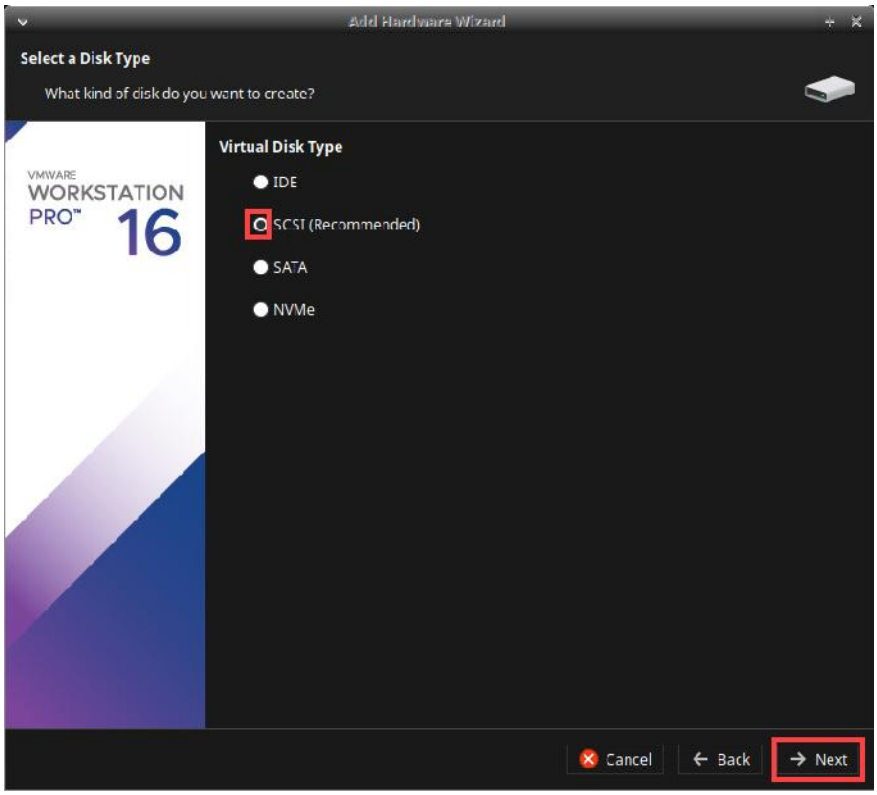
6. Add a hardware device to the VM. Click the **Add** button.



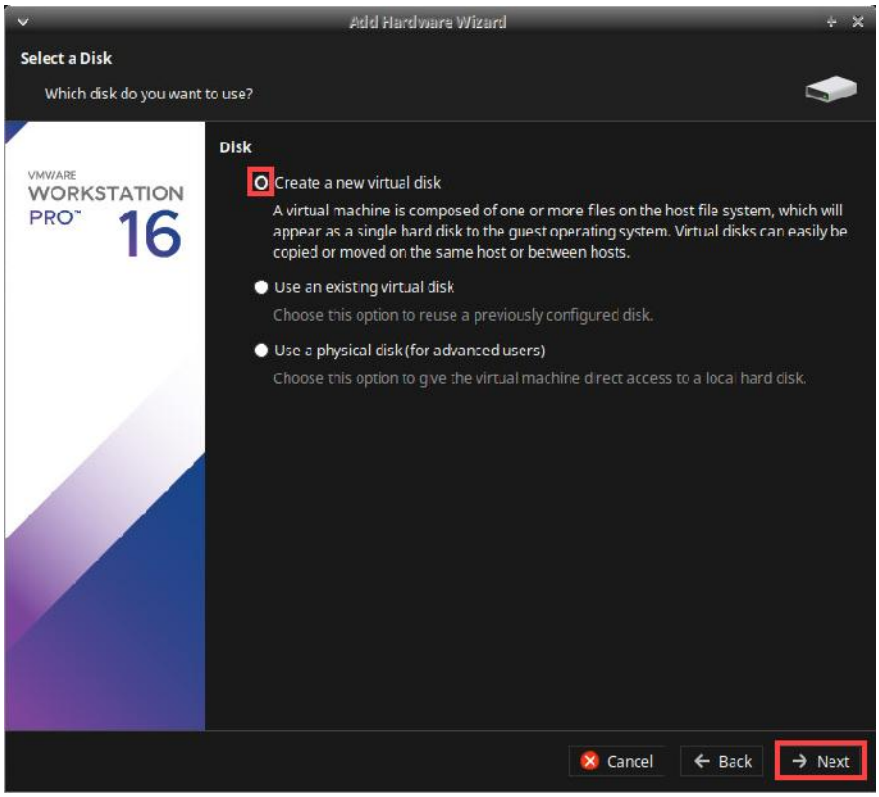
7. In the *Add Hardware Wizard* window, on the *Hardware Type* step, select **Hard Disk**. Click **Next**.



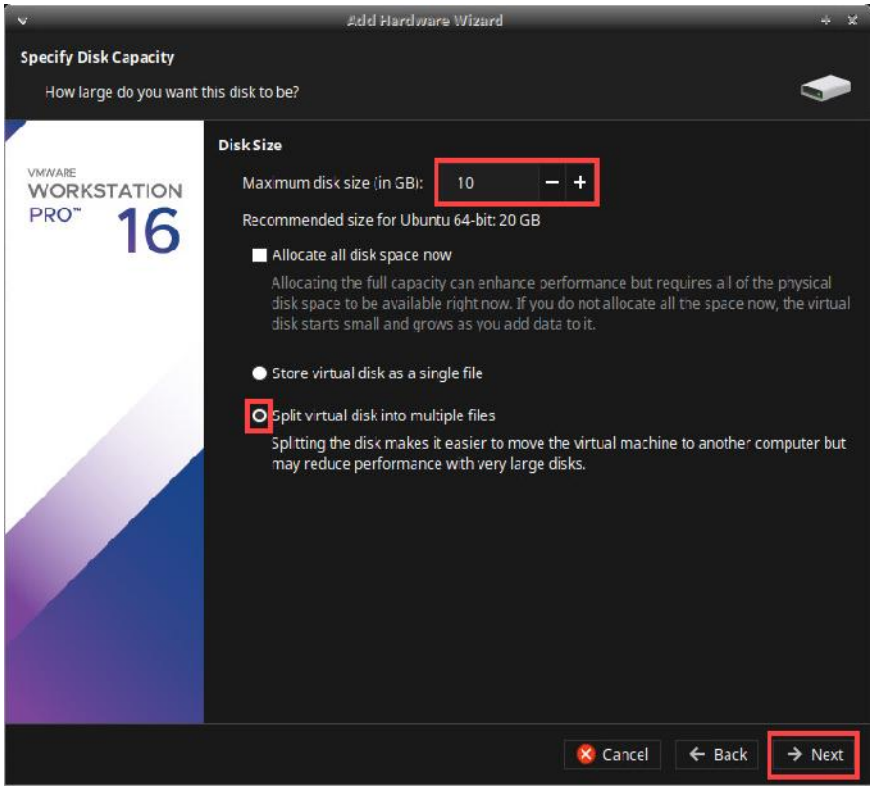
8. On the *Select a Disk Type* step, select the radio button **SCSI (Recommended)** virtual disk type. Click **Next**.



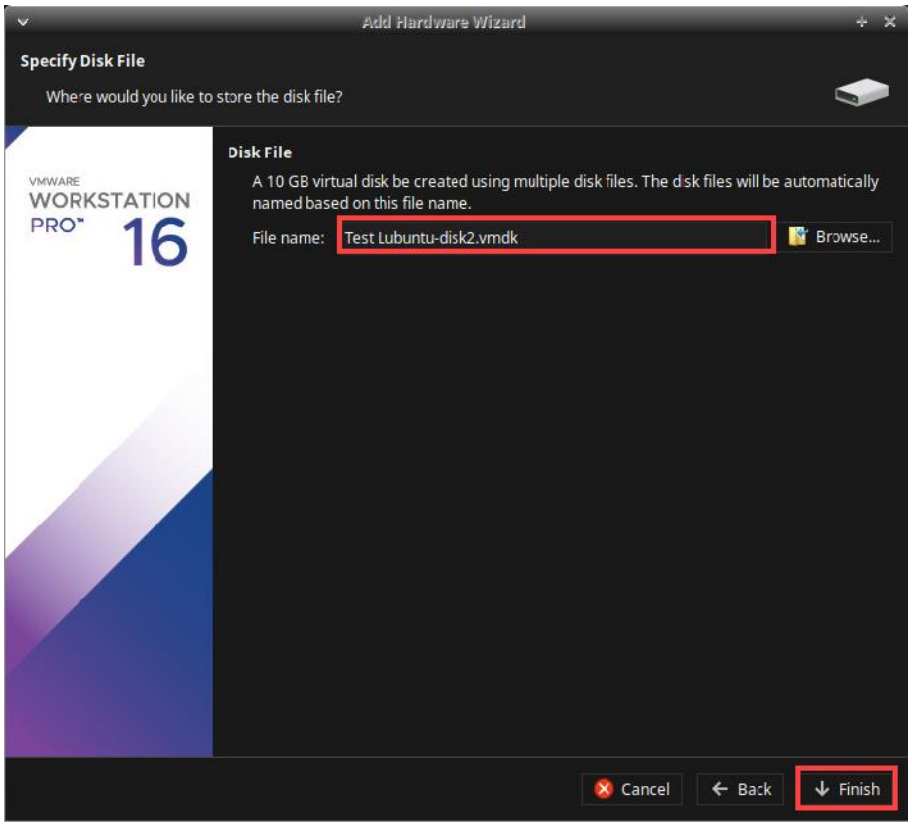
9. On the *Select a Disk* step, select **Create a new virtual disk** and click **Next**.



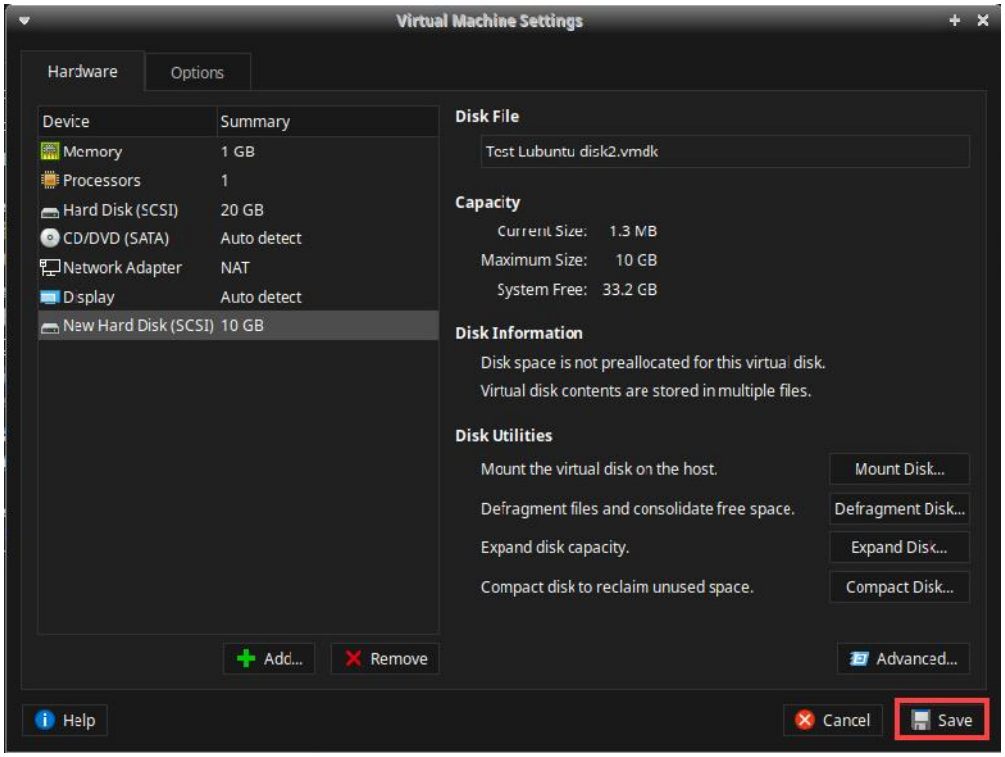
10. On the *Specify Disk Capacity* step, make the new hard disk size **10GB** by changing the *Maximum disk size (in GB):* field to **10**. Select the **Split the virtual disk into multiple files** option. Click **Next**.



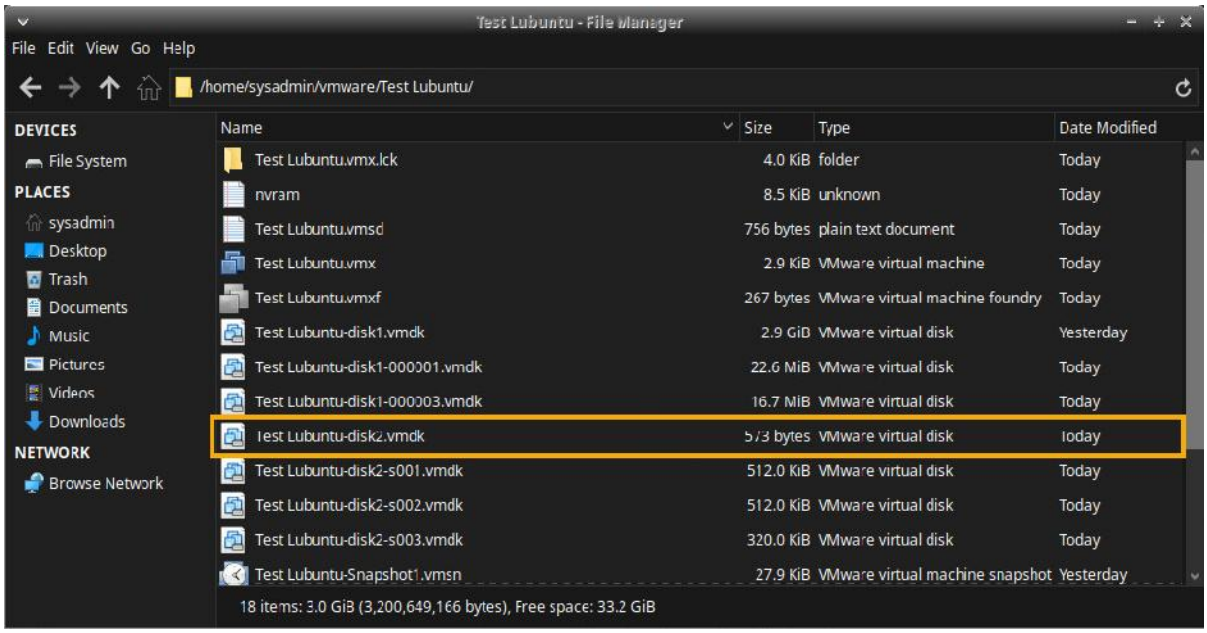
11. On the *Specify Disk File* step, enter the file name **Test Lubuntu-disk2.vmdk** to help distinguish the name of the new disk drive in the *File name* text field. The new disk capacity will be stored using this file name. Click **Finish**.



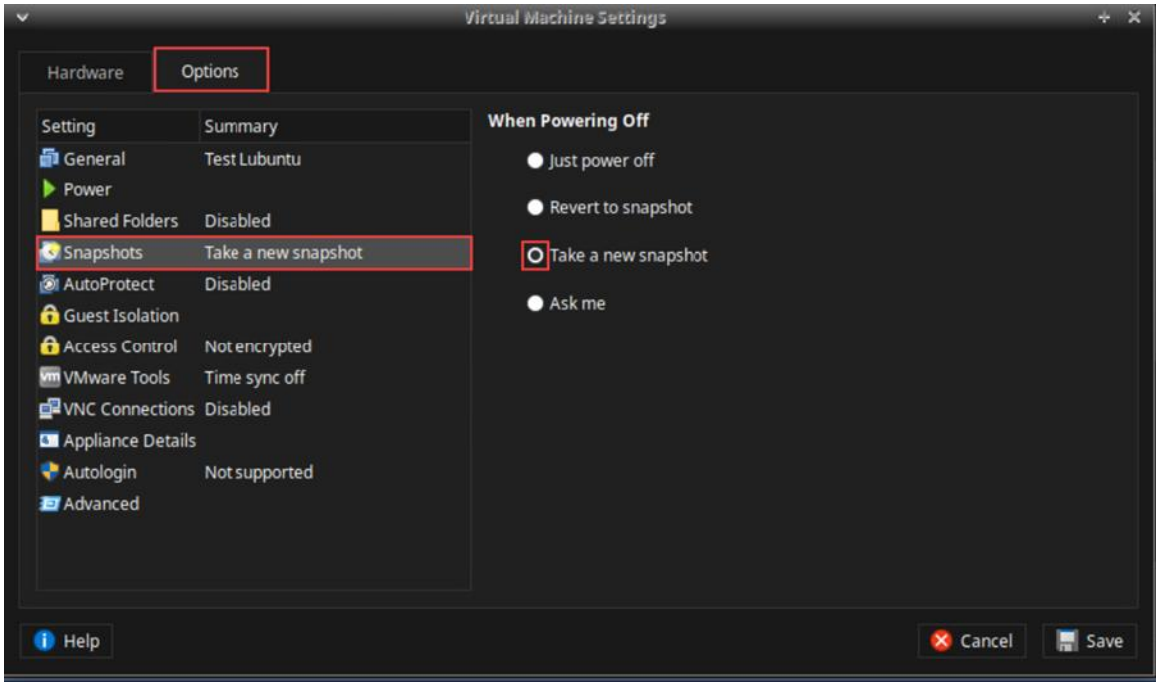
12. Back on the *Virtual Machine Settings* window, click **Save**.



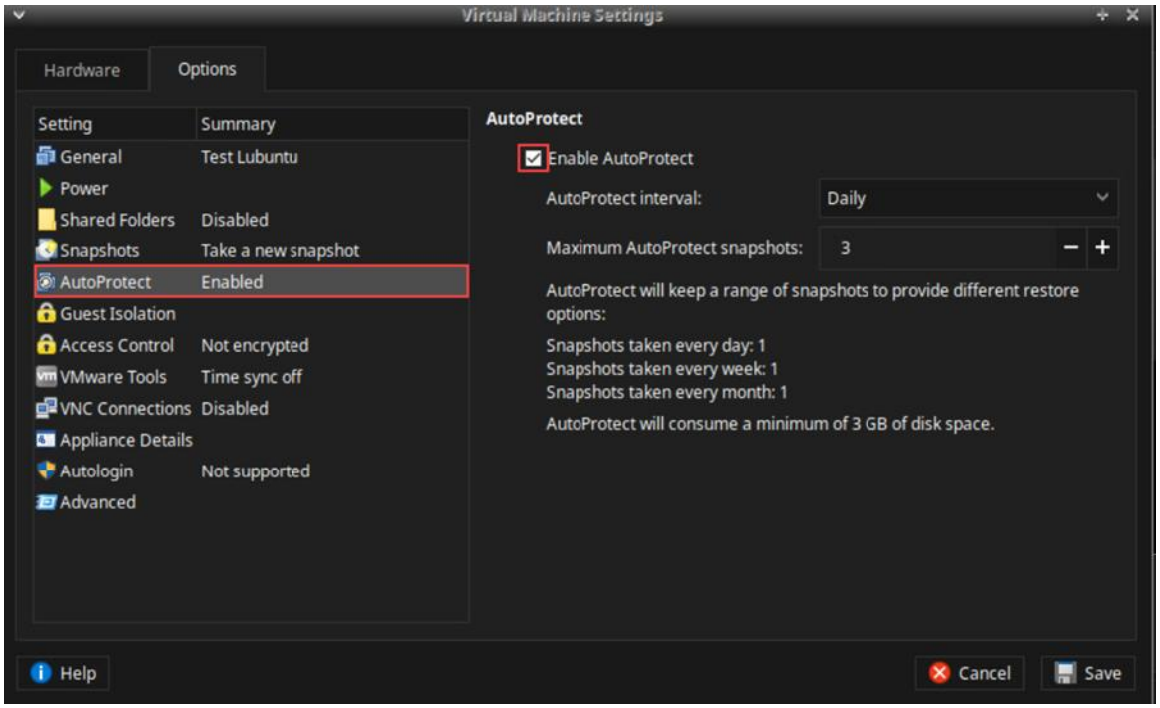
13. Change focus to the **File Manager** window with the **Test Lubuntu** VM folder opened. Notice the new *Test Lubuntu-disk2.vmdk* file specified when creating the new hard disk is now in the *Test Lubuntu* VM file folder.



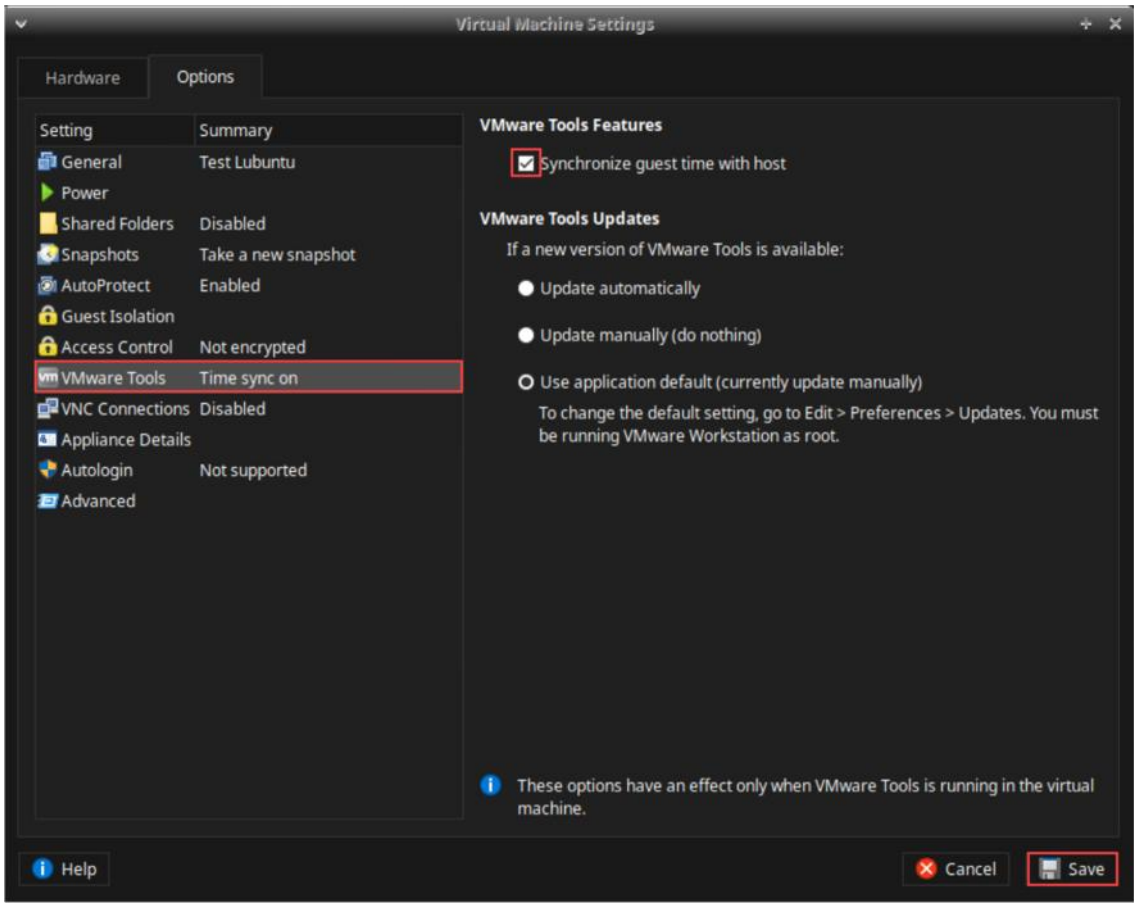
14. Go back to the **VMware Workstation** application window and navigate to **VM > Settings**. In the *Virtual Machine Settings* window, click the **Options** tab. Select **Snapshots** under the *Setting* column on the left. Select the **Take a new snapshot** radio button.



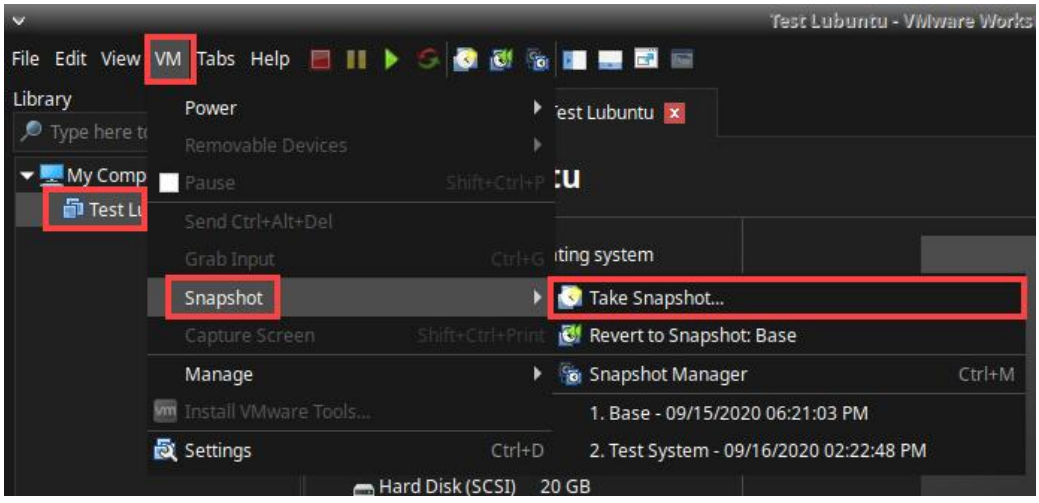
15. Select **AutoProtect** from the same *Setting* column. In the pane on the right, check the **Enable AutoProtect** box.



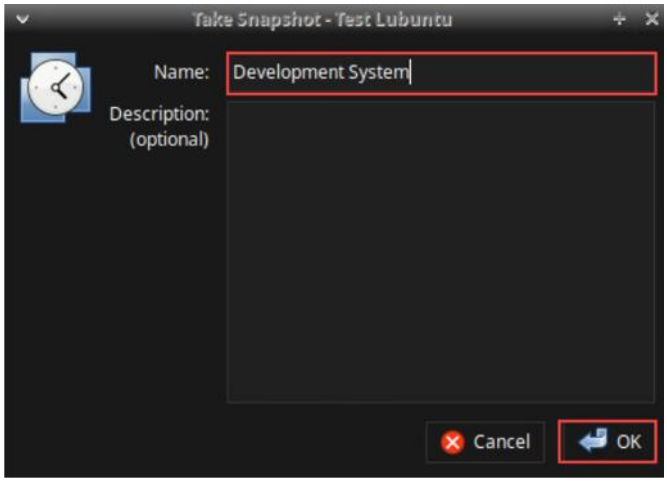
16. Select **VMware Tools**. In the pane on the right, check the **Synchronize guest time with host** box. Click **Save**.



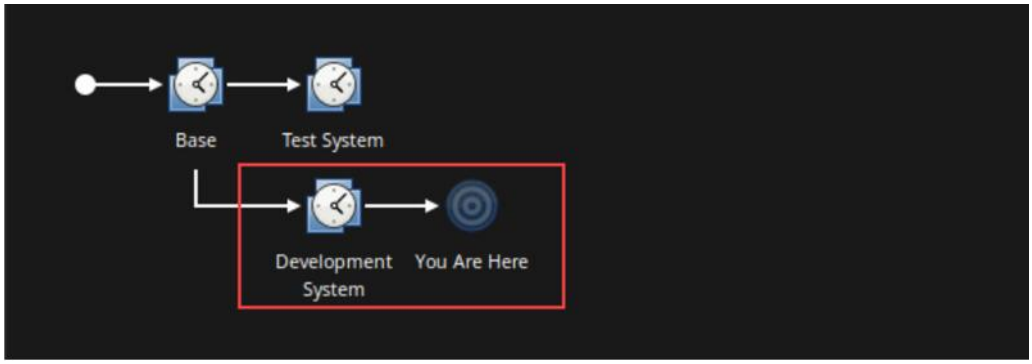
17. Take a snapshot of the changes made to the *Test Lubuntu* VM. In *VMware Workstation*, go to **VM > Snapshot > Take Snapshot**.



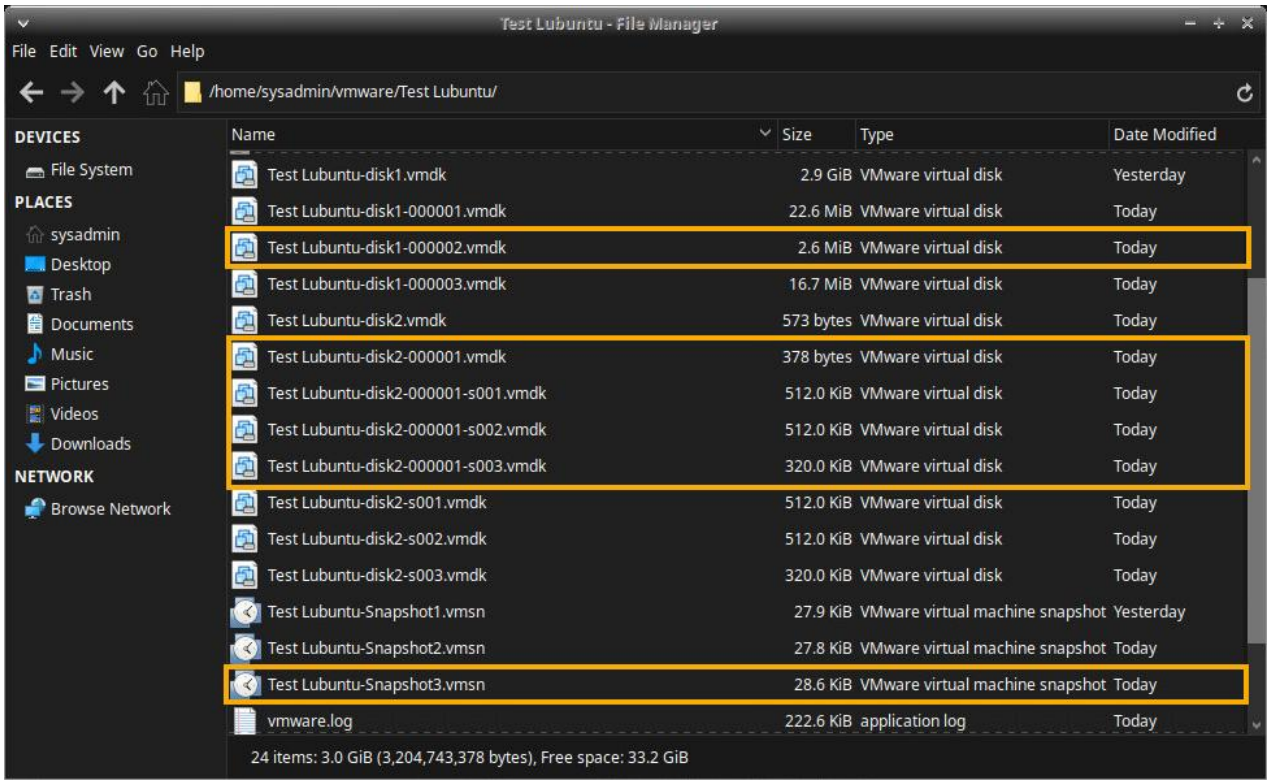
18. Name the snapshot `Development System` in the *Name* text field. Click **OK**.



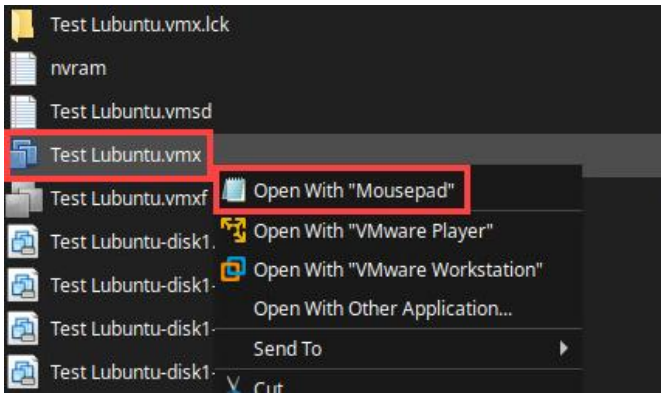
19. View the current state of the VM. Go to **VM > Snapshot > Snapshot Manager**. Your VM should be at the *Development System* state. Click the **Close** button to exit the *Snapshot Manager*.



20. Change focus to the **File Manager** window to view the *Test Lubuntu* folder. In the *Test Lubuntu* folder, scroll down to view the new set of snapshot files, which represent the latest *VMDK* files created from the latest snapshot taken.



21. While still in the *Test Lubuntu* folder, scroll up and right-click the **Test Lubuntu.vmx** file followed by selecting **Open with "Mousepad"**.



22. In the *Test Lubuntu.vmx* file, notice the *memsize* for the *Development System* snapshot state is configured as *1764MB*.

```
#!/usr/bin/vmware
.encoding = "UTF-8"
displayname = "Test Lubuntu"
guestos = "ubuntu-64"
virtualhw.version = "16"
config.version = "8"
numvcpus = "1"
cpuid.coresPerSocket = "1"
memsize = "1764"
pciBridge0.present = "TRUE"
pciBridge4.present = "TRUE"
pciBridge4.virtualDev = "pcieRootPort"
pciBridge4.functions = "8"
pciBridge5.present = "TRUE"
pciBridge5.virtualDev = "pcieRootPort"
pciBridge5.functions = "8"
pciBridge6.present = "TRUE"
pciBridge6.virtualDev = "pcieRootPort"
pciBridge6.functions = "8"
pciBridge7.present = "TRUE"
pciBridge7.virtualDev = "pcieRootPort"
pciBridge7.functions = "8"
vmci0.present = "TRUE"
floppy0.present = "FALSE"
svga.vramSize = "268435456"
ethernet0.present = "TRUE"
```

23. Scroll down and notice the *snapshot.numRollingTiers = "3"* line item. This represents the auto protect snapshot from *Task 4*, *Step 15* as the "*Maximum Autoprotect snapshots*" configuration.

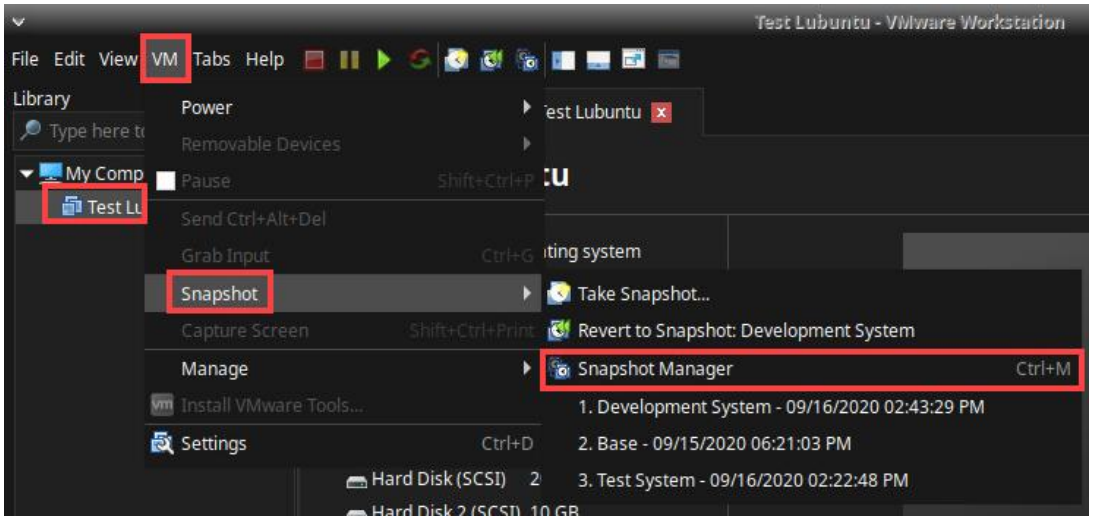
```
usb:1.deviceType = "hub"
usb:1.port = "1"
usb:1.parent = "-1"
svga.guestBackedPrimaryAware = "TRUE"
vmxnet3.serialNumberV2 = "FALSE"
sata0:1.fileName = "auto detect"
sound.autoDetect = "TRUE"
sound.fileName = "-1"
serial0.fileType = "thinprint"
serial0.fileName = "thinprint"
sound.pciSlotNumber = "37"
usb:0.present = "TRUE"
usb:0.deviceType = "hid"
usb:0.port = "0"
usb:0.parent = "-1"
scsi0:1.fileName = "Test Lubuntu-disk2-000001.vmdk"
scsi0:1.present = "TRUE"
snapshot.action = "autoCommit"
snapshot.numRollingTiers = "3"
rollingTier0.uid = "1"
rollingTier0.interval = "86400"
rollingTier0.baseTier = "0"
rollingTier0.baseTierInterval = "0"
```

24. Close the **Mousepad** application window.

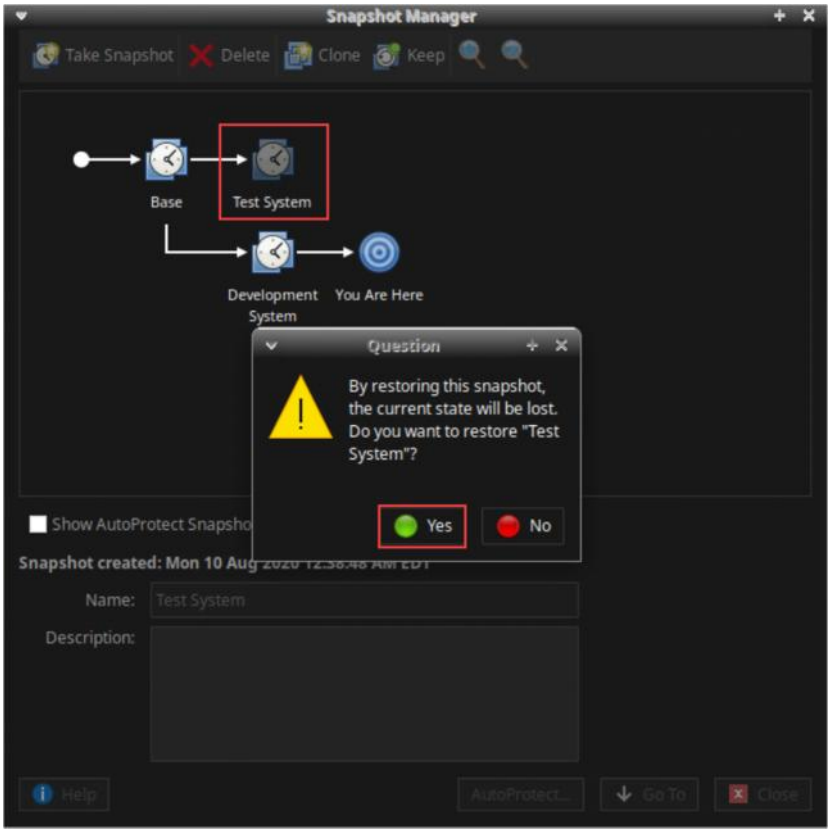
5 View Changes in VM File Size When Using Snapshots

Experience what happens when you revert back to a snapshot and how it preserves the virtual machine configuration. You will also configure unique *VMware* snapshot features dealing with automatically taking snapshots upon shutdowns and an automatic schedule of how many snapshots should be kept.

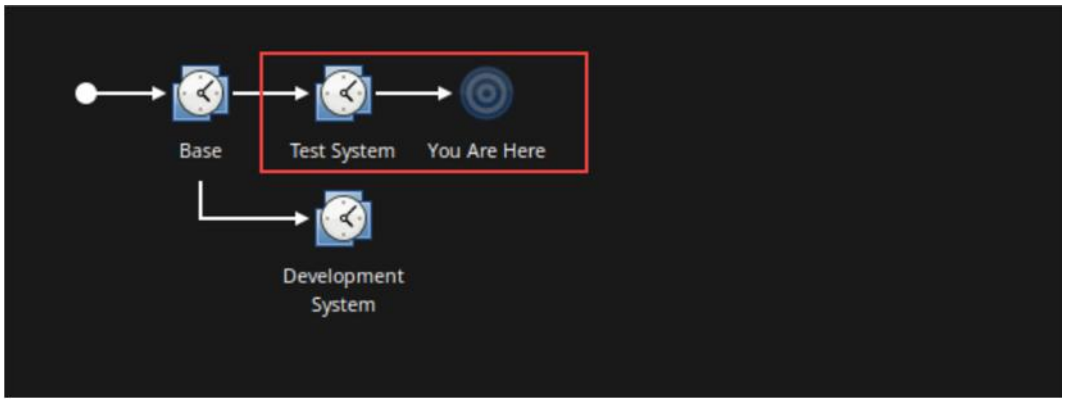
1. Change focus to the **VMware Workstation** window and navigate to the *Snapshot Manager* under **VM > Snapshot > Snapshot Manager**.



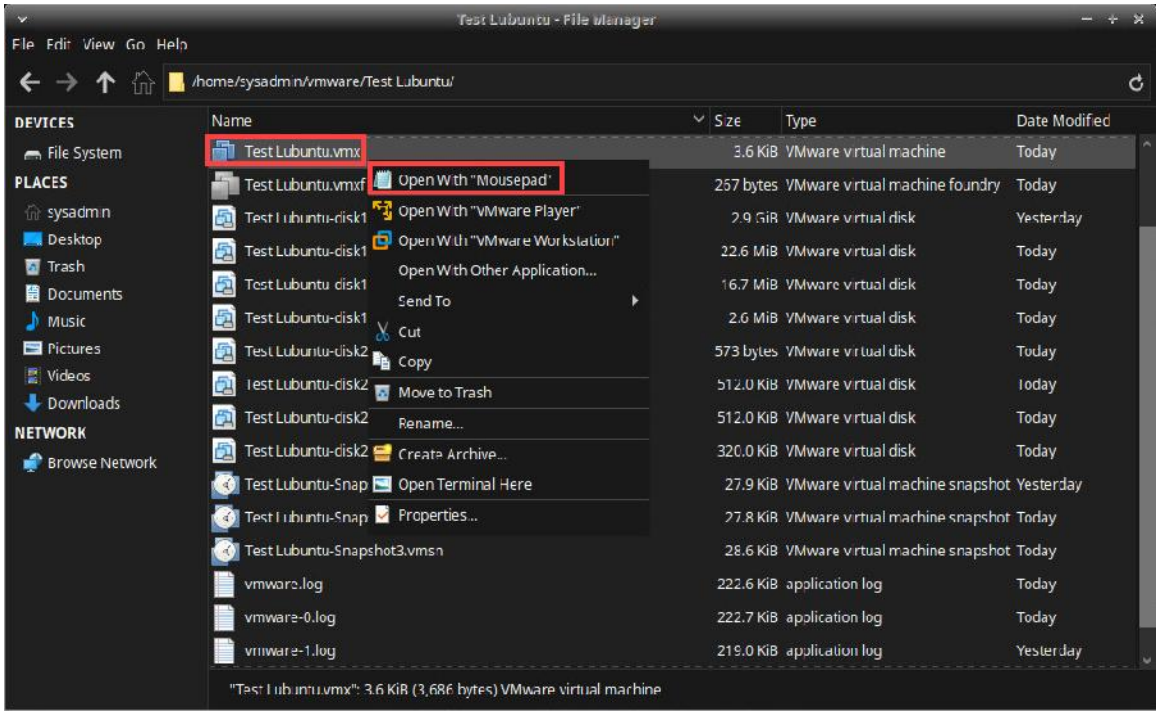
2. Double-click the **Test System** snapshot to revert to it. Click **Yes** to continue.



3. Go back to **VM > Snapshot > Snapshot Manager** and verify that *Test System* is the current state.



4. Click **Close** to close the *Snapshot Manager* window.
5. Change focus to the **File Manager** window, right-click the **Test Lubuntu.vmx** file followed by selecting **Open With "Mousepad"**.



6. In the *Test Lubuntu.vmx* window, notice the lines showing the memory size at *512 MB* for the *Test System* snapshot.

```
#!/usr/bin/vmware
.encoding = "UTF-8"
displayname = "Test Lubuntu"
guestos = "ubuntu-64"
virtualhw.version = "16"
config.version = "8"
numvcpus = "1"
cpuid.coresPerSocket = "1"
memsize = "512"
pciBridge0.present = "TRUE"
pciBridge4.present = "TRUE"
pciBridge4.virtualDev = "pcieRootPort"
pciBridge4.functions = "8"
pciBridge5.present = "TRUE"
pciBridge5.virtualDev = "pcieRootPort"
pciBridge5.functions = "8"
pciBridge6.present = "TRUE"
pciBridge6.virtualDev = "pcieRootPort"
pciBridge6.functions = "8"
pciBridge7.present = "TRUE"
pciBridge7.virtualDev = "pcieRootPort"
pciBridge7.functions = "8"
vmci0.present = "TRUE"
```

7. Notice the *tools.syncTime = "TRUE"* line, which represents the *VMware Tools* option to "Synchronize guest time with host". Then notice the *snapshot.action = "autoCommit"* representing the auto snapshot when powering off the VM. Also, notice the *snapshot.numRollingTiers = "3"* line representing the *Autocorrect Snapshot* feature that was configured in *Task 4*. Close the **Mousepad** application window once finished reviewing the contents.

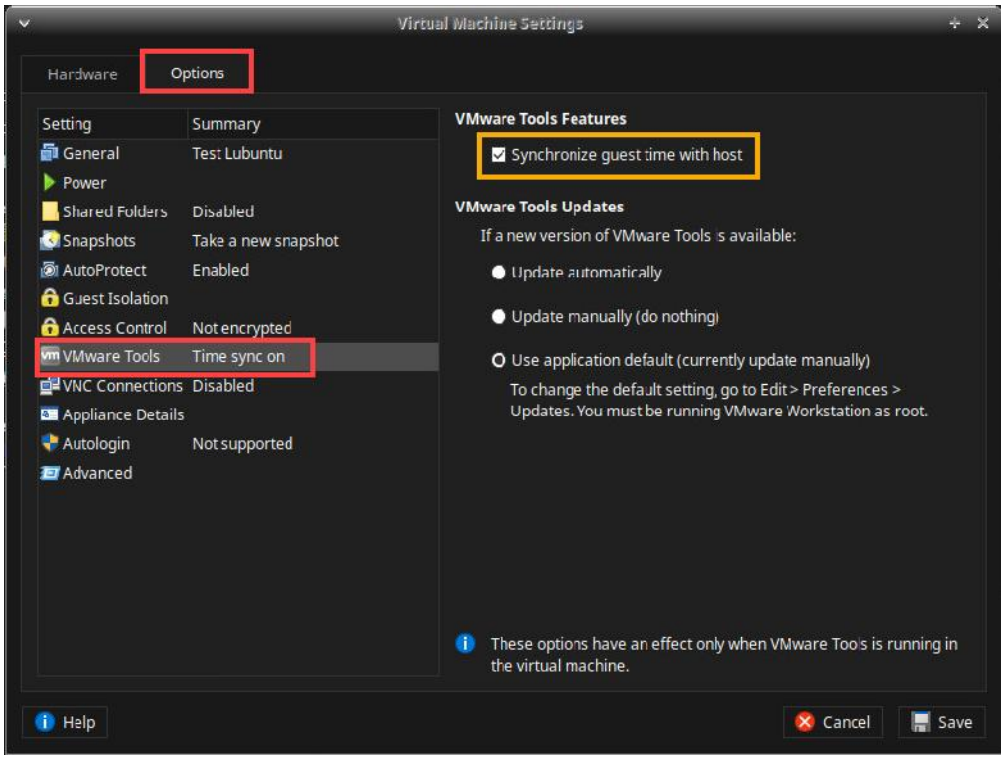
```
vcpu.hotadd = "true"
mem.hotadd = "true"
tools.syncTime = "TRUE"
toolscripts.afterpoweron = "true"
toolscripts.afterresume = "true"
```

```
usb:0.deviceType = "hid"
usb:0.port = "0"
usb:0.parent = "-1"
snapshot.action = "autoCommit"
snapshot.numRollingTiers = "3"
rollingTier0.uid = "1"
rollingTier0.interval = "86400"
```

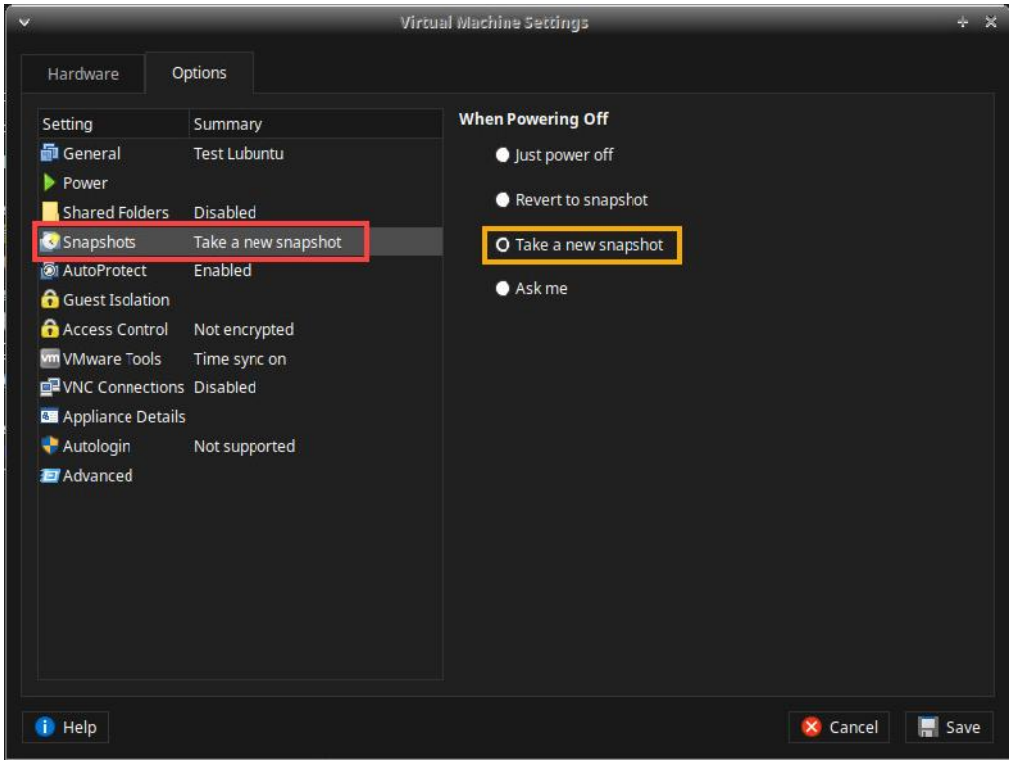
Notice how these configurations were made on the *Development System* snapshot but yet are consistent for the *Test System* snapshot even though they were not originally configured on the *Test System* snapshot.

8. Change focus to **VMware Workstation**, click the **VM** tab and select **Settings**.

9. Click on the **Options** tab and verify that the settings match what was in the *Test Lubuntu.vmx* file. First, select **VMware Tools** and notice the *Synchronize guest time with host* is checked, which results in *tools.syncTime = "TRUE"*.

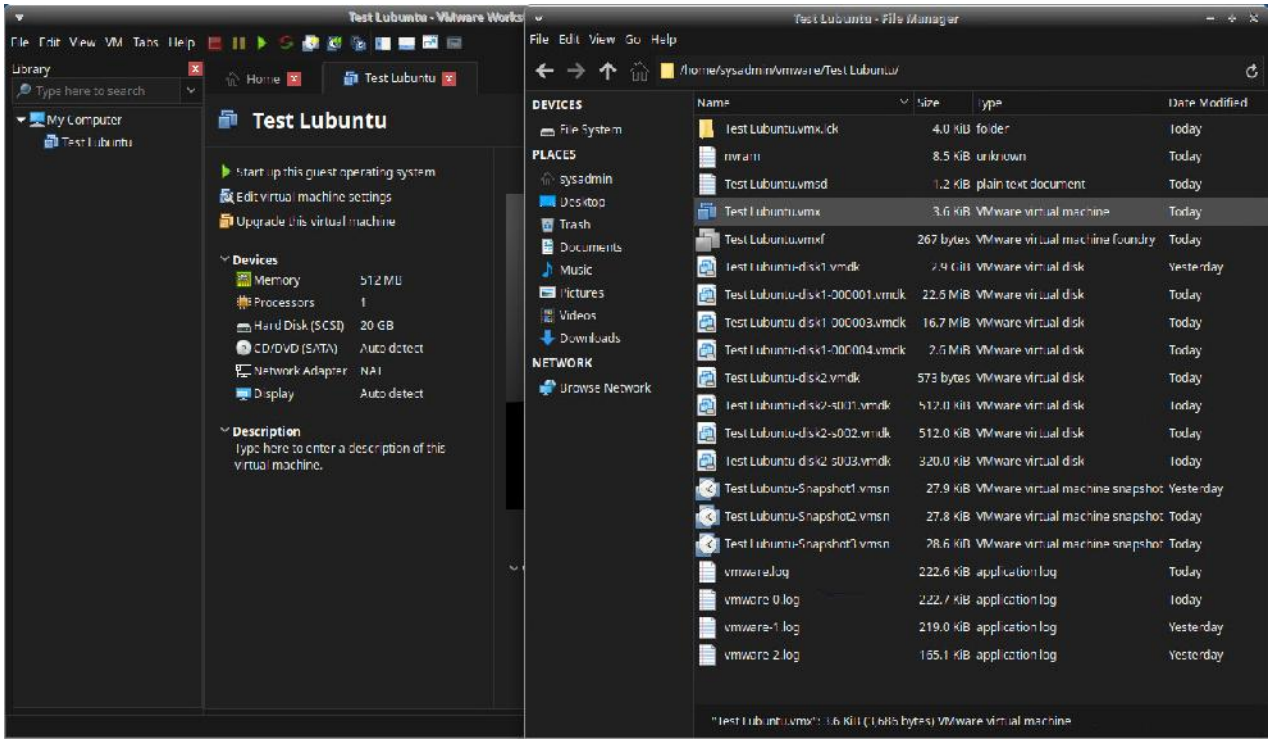


10. Select **Snapshots** and notice the *Take a new snapshot* radio button is selected, which results in *snapshot.action = "autoCommit"*.

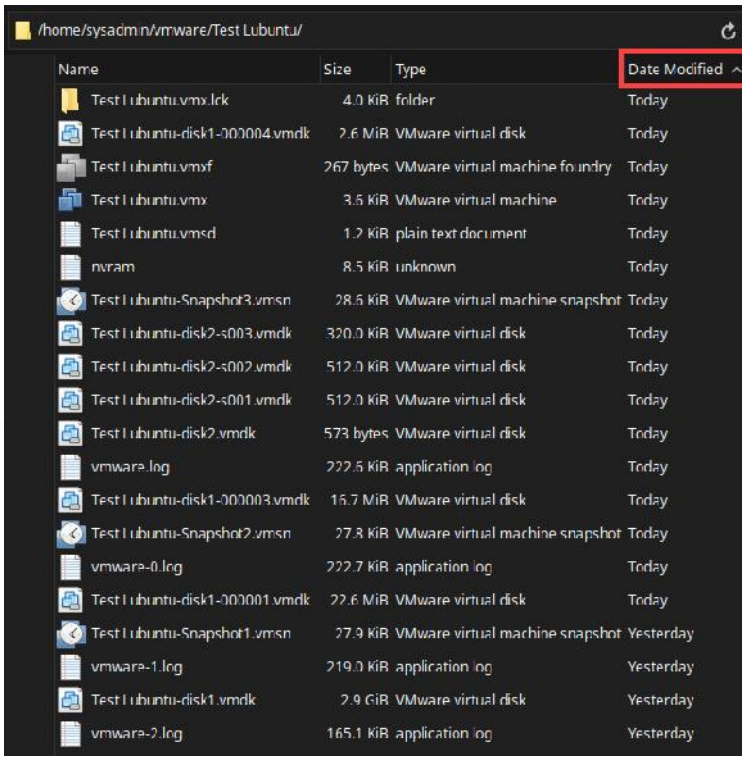


11. Select **AutoProtect** and notice the *Enable AutoProtect* checkbox is selected along with the *Maximum AutoProtect snapshots* set to *3,* which results in *snapshot.numRollingTiers = "3"*.

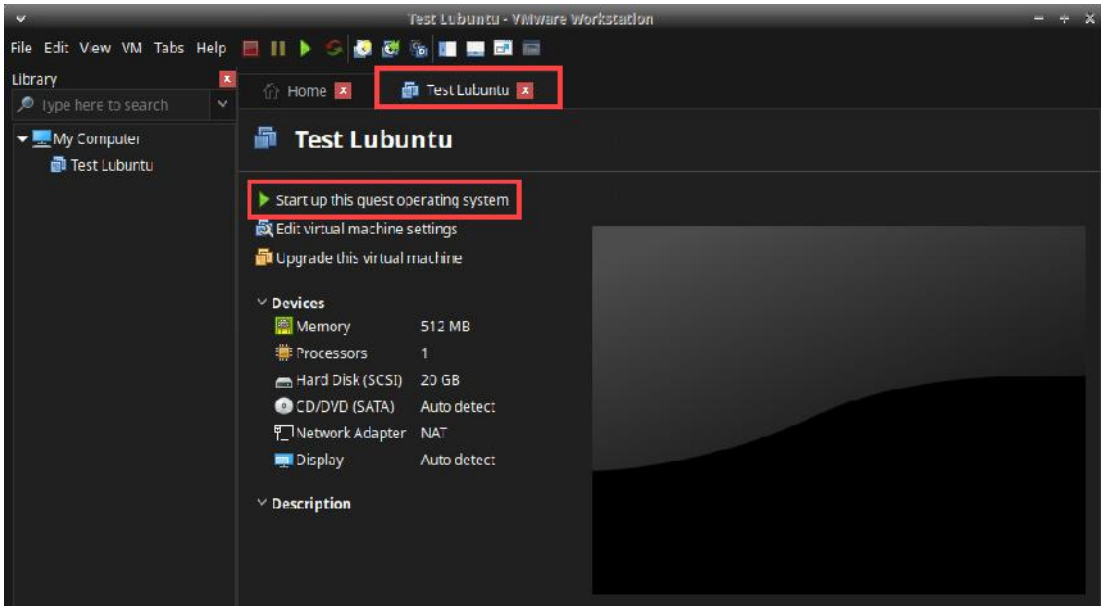
12. Click **Cancel** to close the *Virtual Machine Settings* window.
13. Change focus to the **File Manager** window with the *Test Lubuntu* folder opened and move the window to the right of the VM desktop, so it is next to the *VMware Workstation* window to view both windows side-by-side.



14. In the *Test Lubuntu* folder window, click twice on the **Date Modified** heading, so the arrow is pointing down. This will show the VM files most recently modified at the top by *VMware Workstation*.

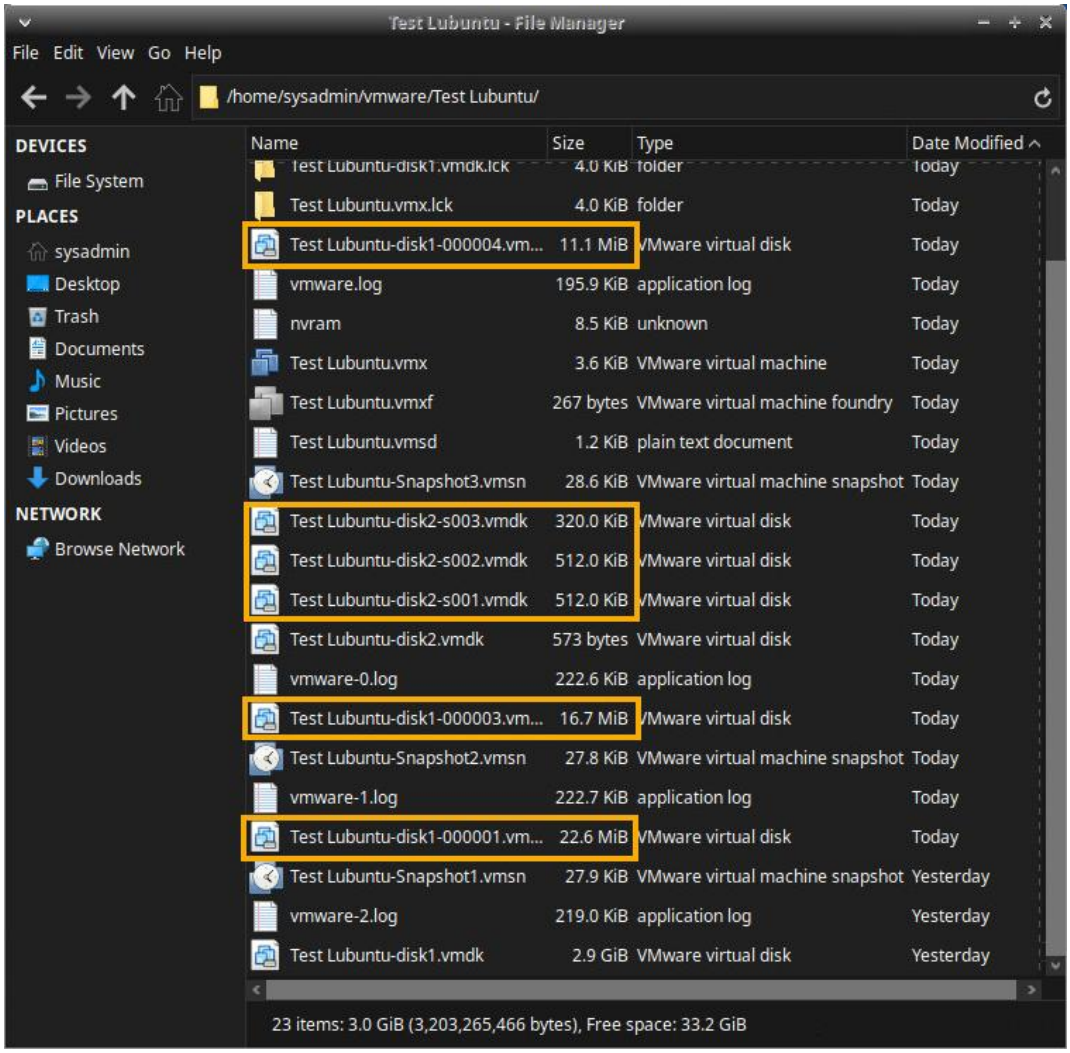


15. Change focus to the **VMware Workstation** application window and click the **Test Lubuntu** tab. Power on the machine by clicking **Start up this guest operating system**.



16. Once the VM is loaded, notice the VM's settings (desktop background) are reverted to the *Test System* state.

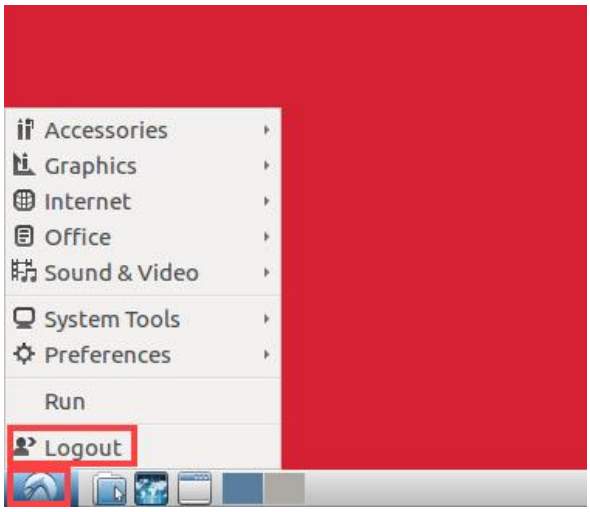
17. Change focus to the **Test Lubuntu - File Manager** window and observe the new *Test Lubuntu-disk1-000004.vmdk* as the VM starts up (move the scroll bar upwards). Notice that this file was created as a result of enabling a new automatic snapshot when the VM turns off.



6 Take Snapshots When Powering Off The VM

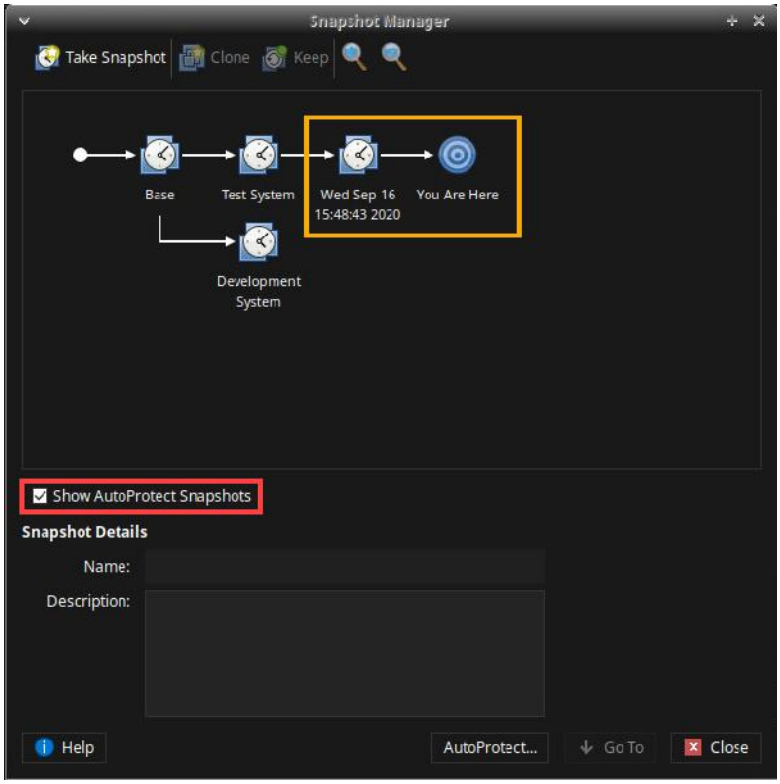
Test the *VMware AutoProtect* snapshot feature when powering down a virtual machine.

1. Test the auto snapshot setting applied previously that takes a new snapshot when powering off the machine. Change focus to the **VMware Workstation** window, navigate to the *Test Lubuntu* **Start Menu**, then select **Logout**.

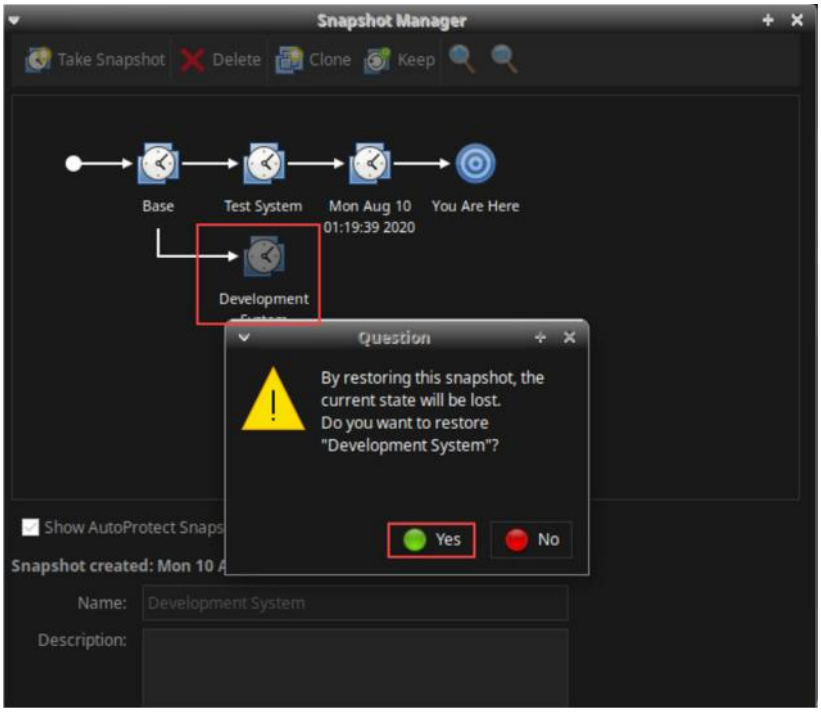


2. Click the **Shutdown** button.

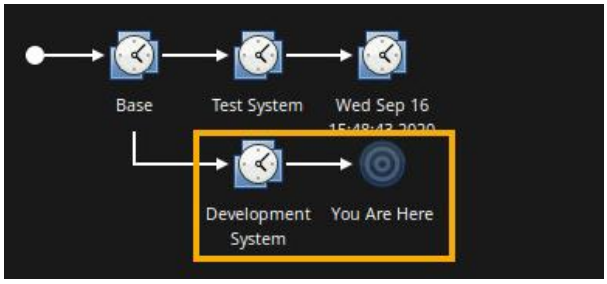
3. In the *VMware Workstation* application window, navigate to **VM > Snapshot > Snapshot Manager** and observe the current state of the VM. The current state should be at the most recent timestamped snapshot of the *Test System*. Select **Show AutoProtect Snapshots**.



4. Double-click the **Development System** snapshot to revert to it. At the popup warning, click **Yes**.

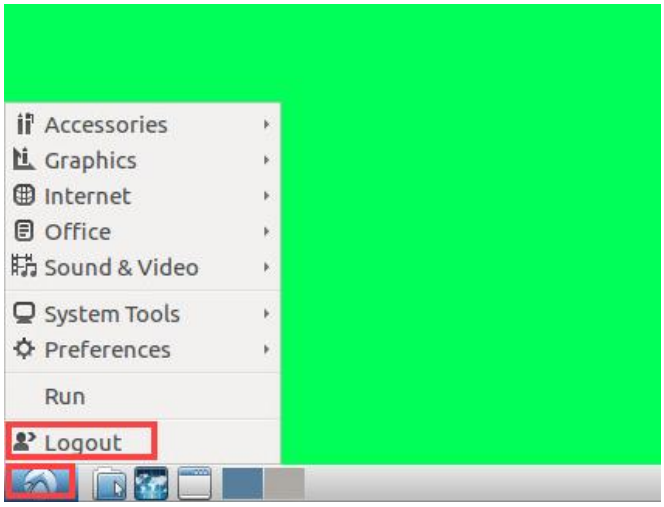


5. Go to **VM > Snapshot > Snapshot Manager** and verify you are at the *Development System* state.



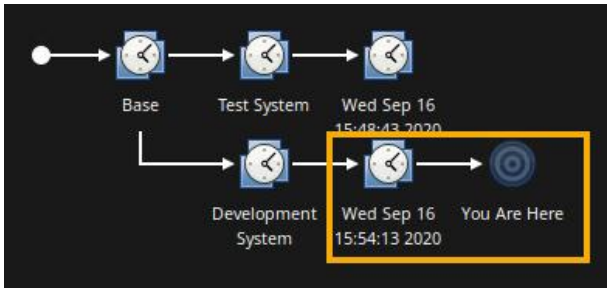
6. Click **Close** to exit the *Snapshot Manager*.
7. In the *VMware Workstation* application window, while viewing the **Test Lubuntu** tab, click on the **Start up this guest operating system button**.

8. Power off the machine to take a new auto snapshot. Navigate to the **Start** menu and click **Logout**.



9. Click the **Shutdown** button.

10. Go to **VM > Snapshot > Snapshot Manager** and observe the current state of the VM. The current state should be at the most recent timestamped snapshot of the *Development System*. Click **Close** to exit the *Snapshot Manager*.



11. The lab is now complete; you may end the reservation.

