

IST198

OpenStack

Administration

Version 1: 2017-08-18

These exercises will guide the student through the concepts and topics learned in chapter 9, launch a CentOS 7 instance with a customization script and manage attached volumes

Launch a CentOS 7 Instance with a customization script and manage volumes



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Attributions:



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Introduction

You have been hired as an intern with CLOUDTech Inc. CLOUDTech is a Cloud Computing consulting firm and Cloud Provider supporting thousands of clients in the region. The company provides a wide range of services to support migrating client Information Technology infrastructure to a Private, Hybrid or Public Cloud environment. You learned that the company has multiple departments and you will start your internship working with the Cloud hosting department customer support team.

The Cloud hosting department provides multiple platform and vendor Cloud hosting services for Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) and many other as a service offerings. The support team is responsible for helping customers with any issues related to their Cloud infrastructure hosted at and provided by CLOUDTech.

You will perform hands-on exercises to learn about the OpenStack Cloud implementation CLOUDTech uses to host customer Cloud environments.



Module Objectives

Learner will be able to:

- Launch a CentOS 7 Instance with a customization script from the OpenStack Dashboard and manage volumes.

Labs 22-24

These labs will guide the student through launching a CentOS 7 Instance with a customization script, creating a volume, attaching the volume, creating data on the volume, and moving the volume, with its data, to a new CentOS 7 instance.

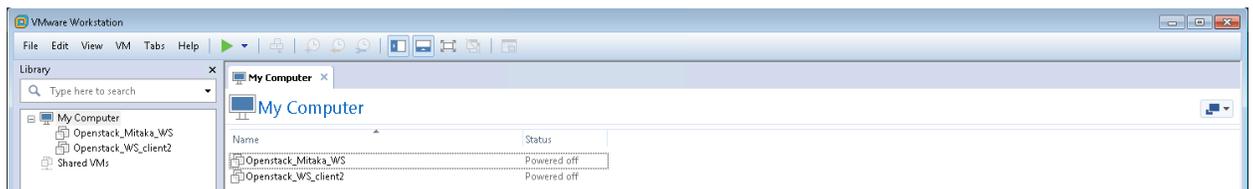
(Note: This lab is designed to be completed on an NDG NETLAB System with the IST198_OpenStack_HXXX POD installed. The labs can also be completed on a physical machine with the appropriate software packages installed, or a PC that has VMware Workstation installed with the appropriate virtual machines configured).



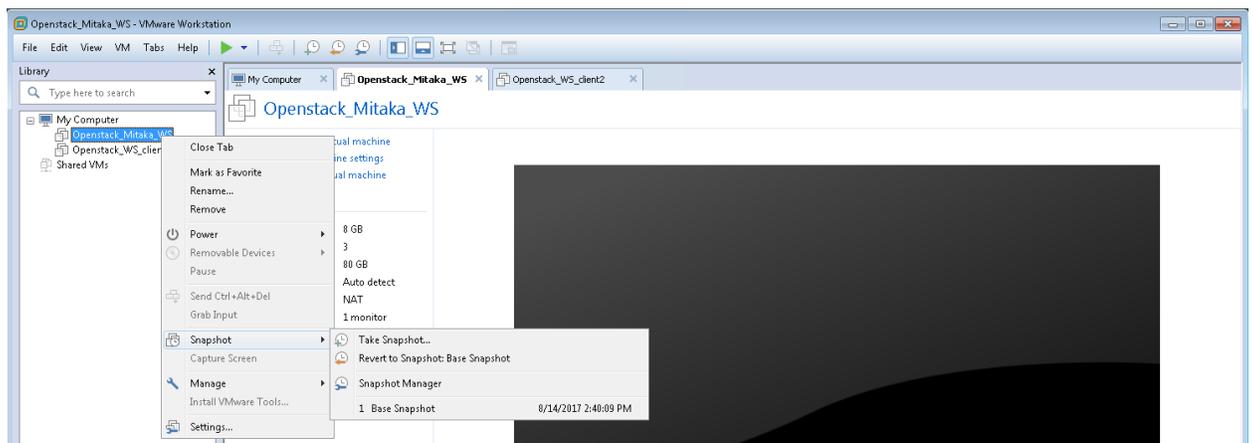
Prepare the OpenStack Virtual Machines



1. **Launch the VMware Workstation Pro application**

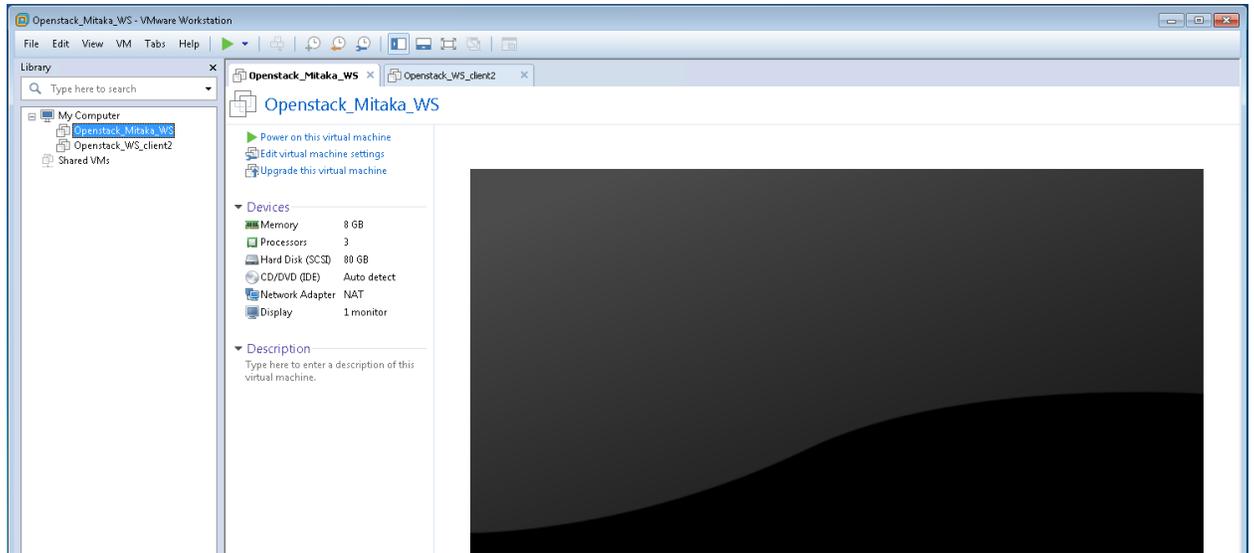


2. Workstation should have two virtual machines (VM) installed; Openstack_Mitaka_v2 and Openstack_Mitaka_client2.



3. Ensure that the Openstack_Mitaka_WS is at the correct starting point by reverting to the base snapshot. Right Click on Openstack_Mitaka_WS then Snapshot>Base Snapshot. Repeat for the Openstack_WS_client2 VM.

Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



4. **Power on** both VMs by selecting one of the two VMs and **clicking on Power on this virtual**

Lab Scenario

As part of CLOUDTech’s customer support team, this is the final field visit to XYZ Company. During this visit, you will assist the customer in creating a CentOS 7 and CentOS7#2 instance, creating a volume with data, and attach that volume to the instances.

Lab Settings

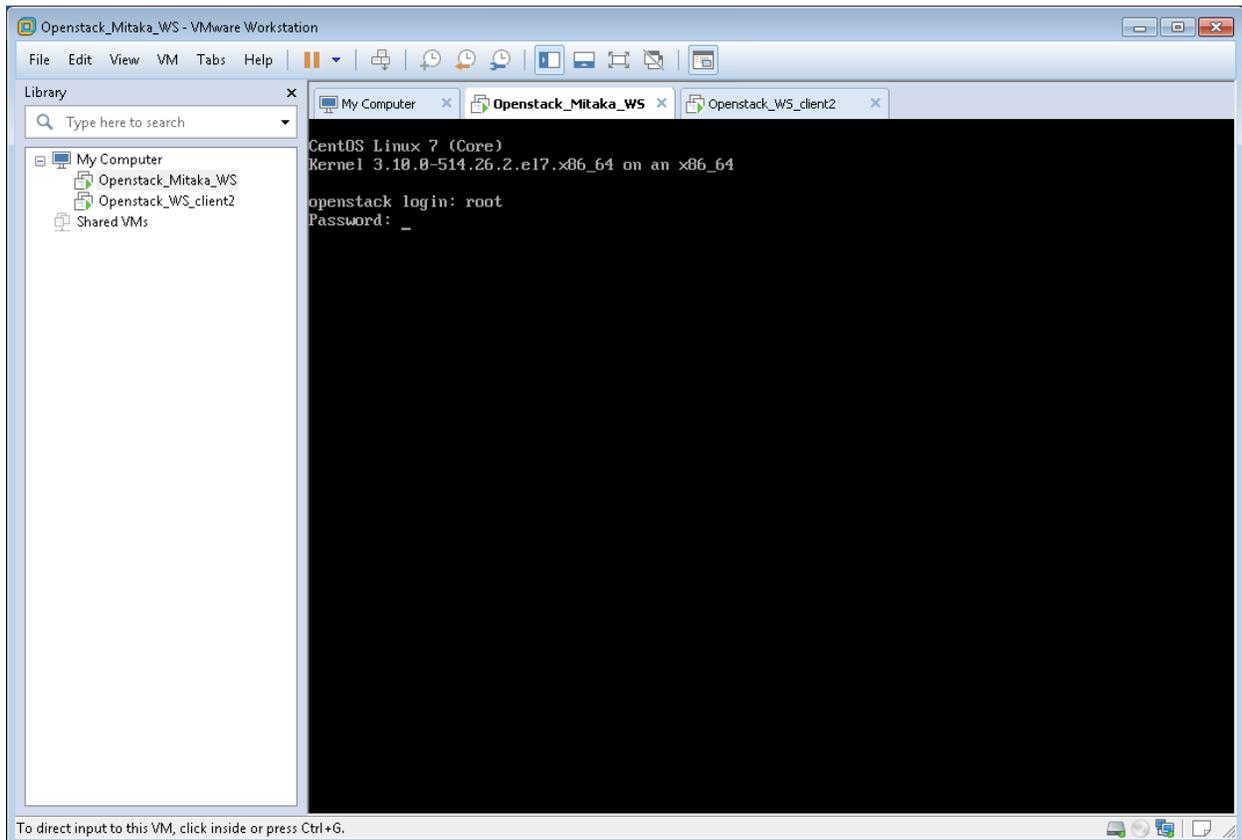
The information in the table below will be needed in order to complete the labs. The task sections that follow provide details on the use of this information

Virtual Machine (VM)	IP ADDRESS	Account	Password	VM Type
Client2	10.220.0.2	Student	P@ssword	CentOS 7 Client
Server1	10.220.0.30	root	P@ssword	OpenStack Mitaka
OpenStack Dashboard	10.220.0.30	Student	P@ssword	Web Page Login credentials

Note: The OpenStack PODs are Normal PODs, in NDG terminology, which means they revert to a snapshot after you are finished with the Lab(s), e.g. click I’M DONE on the Lab Topology. This means that you can explore or experiment without fear of damaging the POD. If you make a mistake that you can’t recover from, then end the reservation and make a new POD reservation and everything will be back to a known starting point.



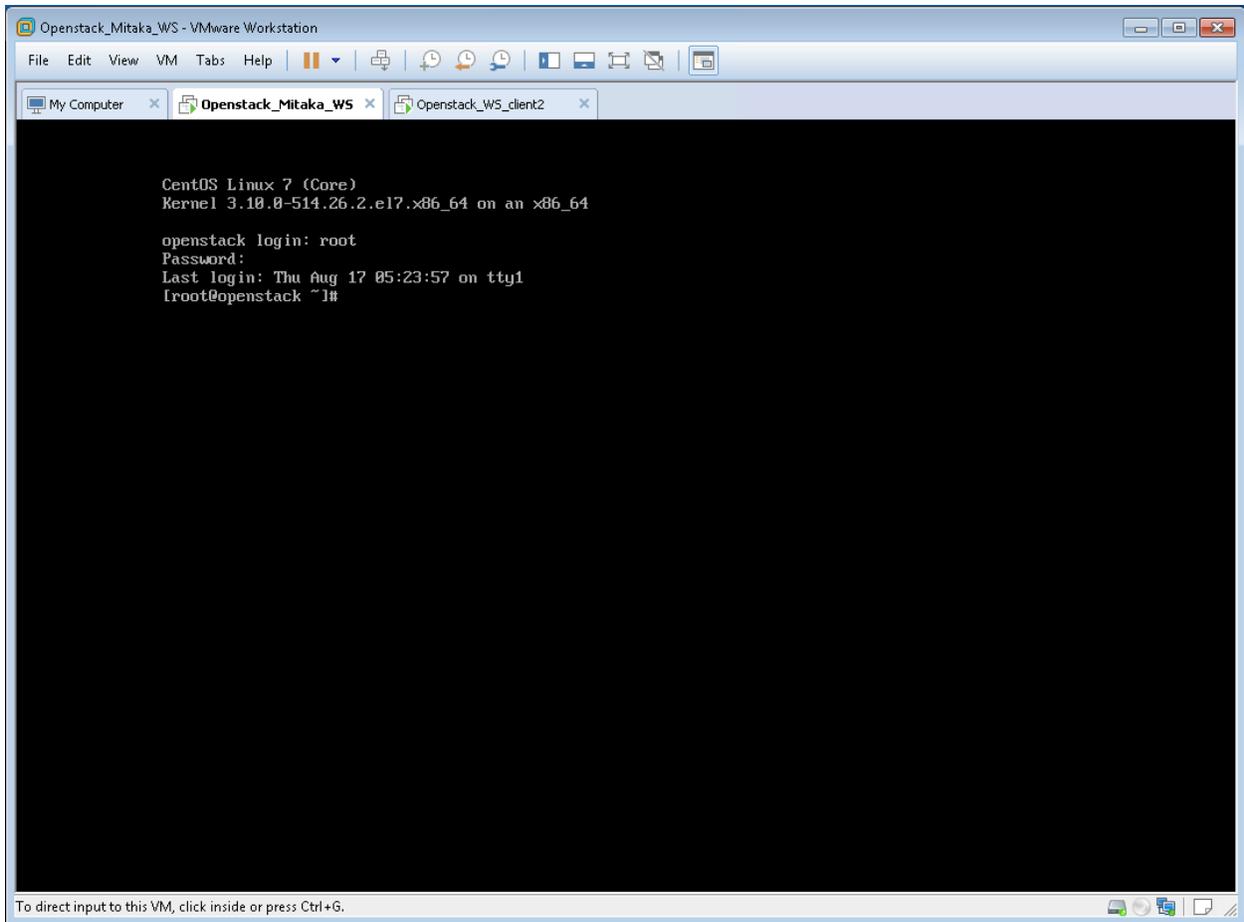
Run the lab setup script



1. Log in as **root** with the Password: **P@ssword**

Note: The password is NOT visible as you type it

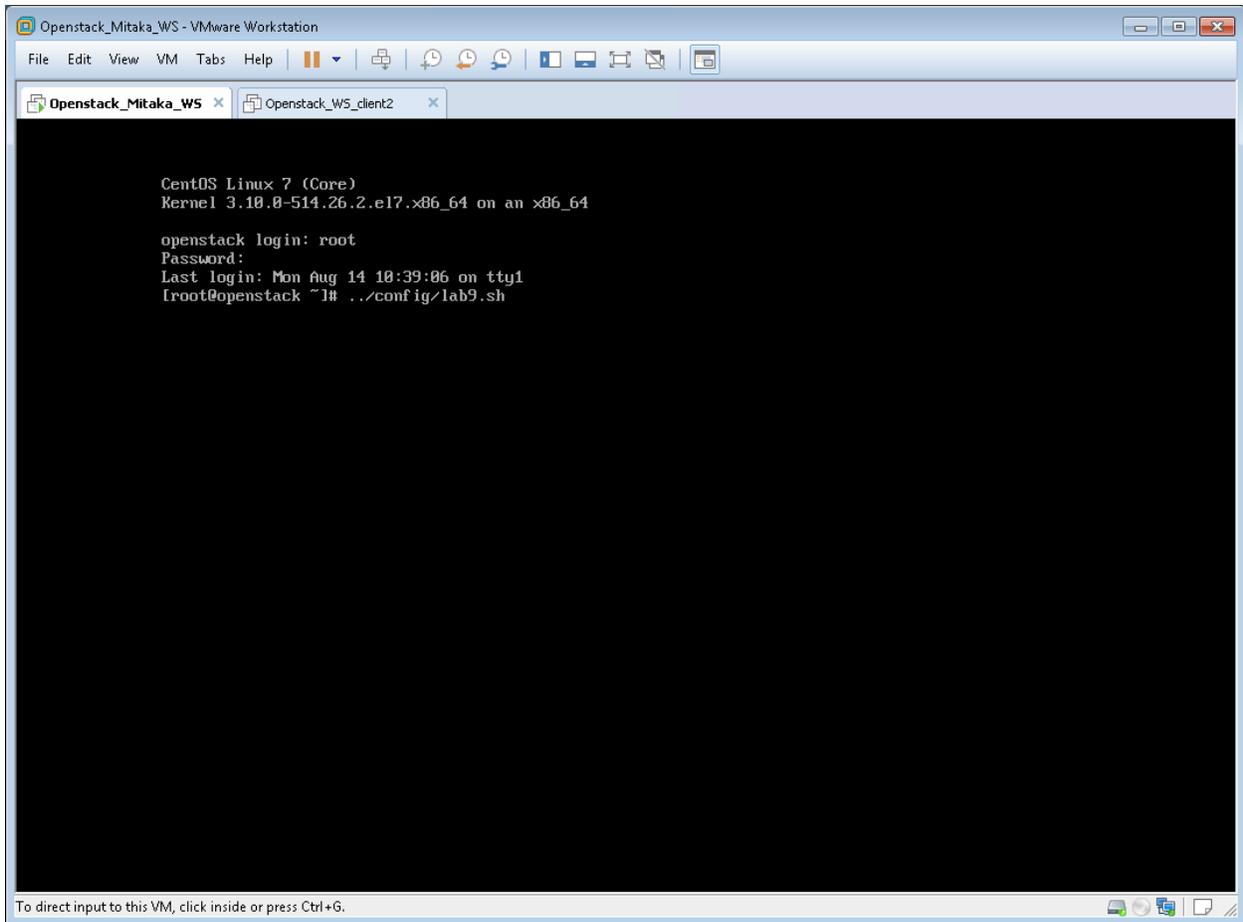
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



2. After successfully logging in as root, you should see this screen. Continue to the next page



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



The screenshot shows a VMware Workstation window titled "Openstack_Mitaka_WS - VMware Workstation". The terminal window displays the following text:

```
CentOS Linux 7 (Core)
Kernel 3.10.0-514.26.2.el7.x86_64 on an x86_64

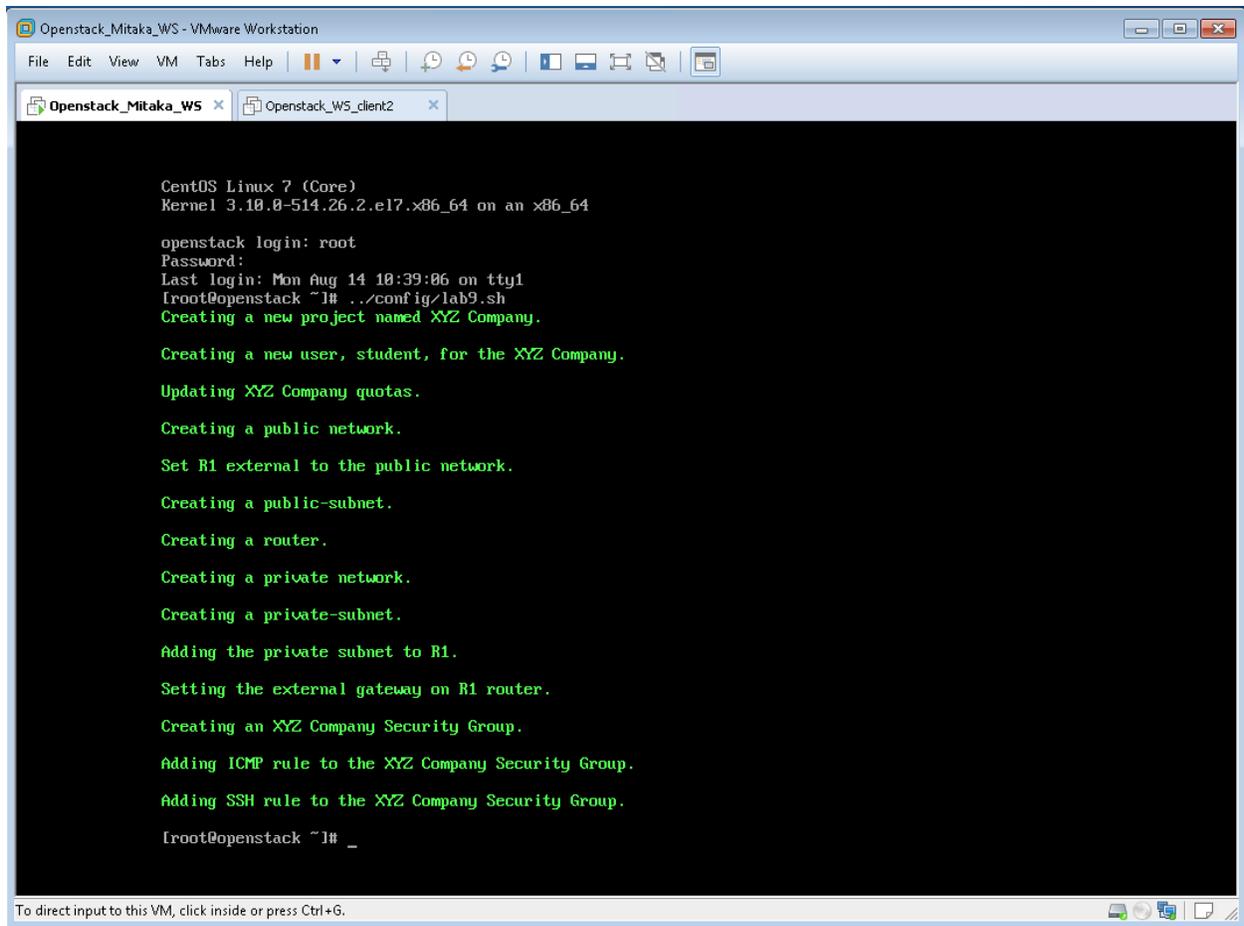
openstack login: root
Password:
Last login: Mon Aug 14 10:39:06 on tty1
root@openstack ~]# ../config/lab9.sh
```

At the bottom of the terminal window, there is a status bar that reads: "To direct input to this VM, click inside or press Ctrl+G."

3. Type the command; **`../config/lab9.sh`** and **press Enter** as shown in the screen capture above to run the Module 9 setup script



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



```
Openstack_Mitaka_WS - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS x Openstack_WS_client2 x

CentOS Linux 7 (Core)
Kernel 3.10.0-514.26.2.el7.x86_64 on an x86_64

openstack login: root
Password:
Last login: Mon Aug 14 18:39:06 on tty1
[root@openstack ~]# ./config/lab9.sh
Creating a new project named XYZ Company.

Creating a new user, student, for the XYZ Company.
Updating XYZ Company quotas.

Creating a public network.

Set R1 external to the public network.

Creating a public-subnet.

Creating a router.

Creating a private network.

Creating a private-subnet.

Adding the private subnet to R1.

Setting the external gateway on R1 router.

Creating an XYZ Company Security Group.

Adding ICMP rule to the XYZ Company Security Group.

Adding SSH rule to the XYZ Company Security Group.

[root@openstack ~]# _
```

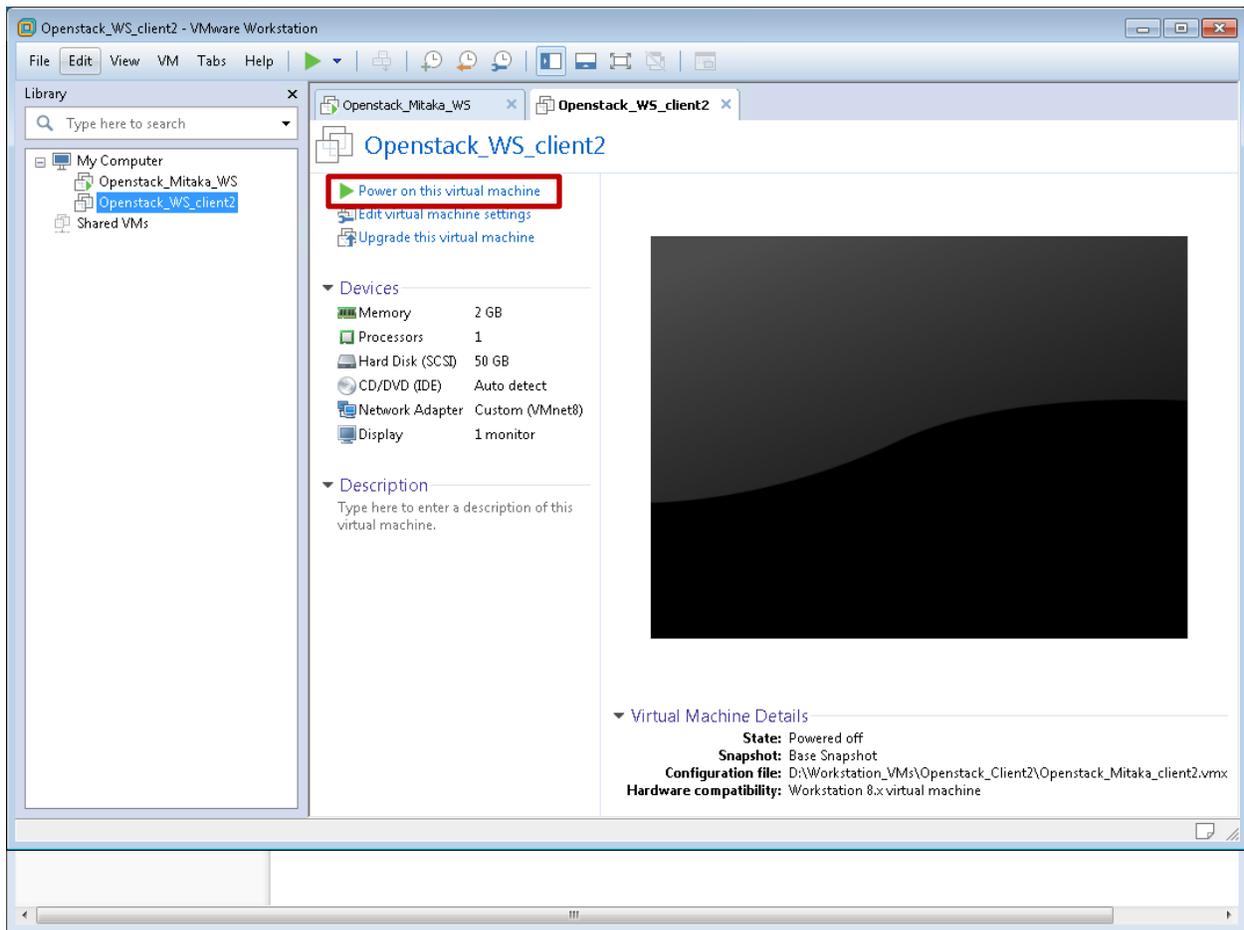
To direct input to this VM, click inside or press Ctrl+G.

4. After the setup command completes, you can **minimize VMware Workstation**.

Note: The script is complete when the **[root@openstack ~]#** prompt returns



Access the OpenStack Dashboard

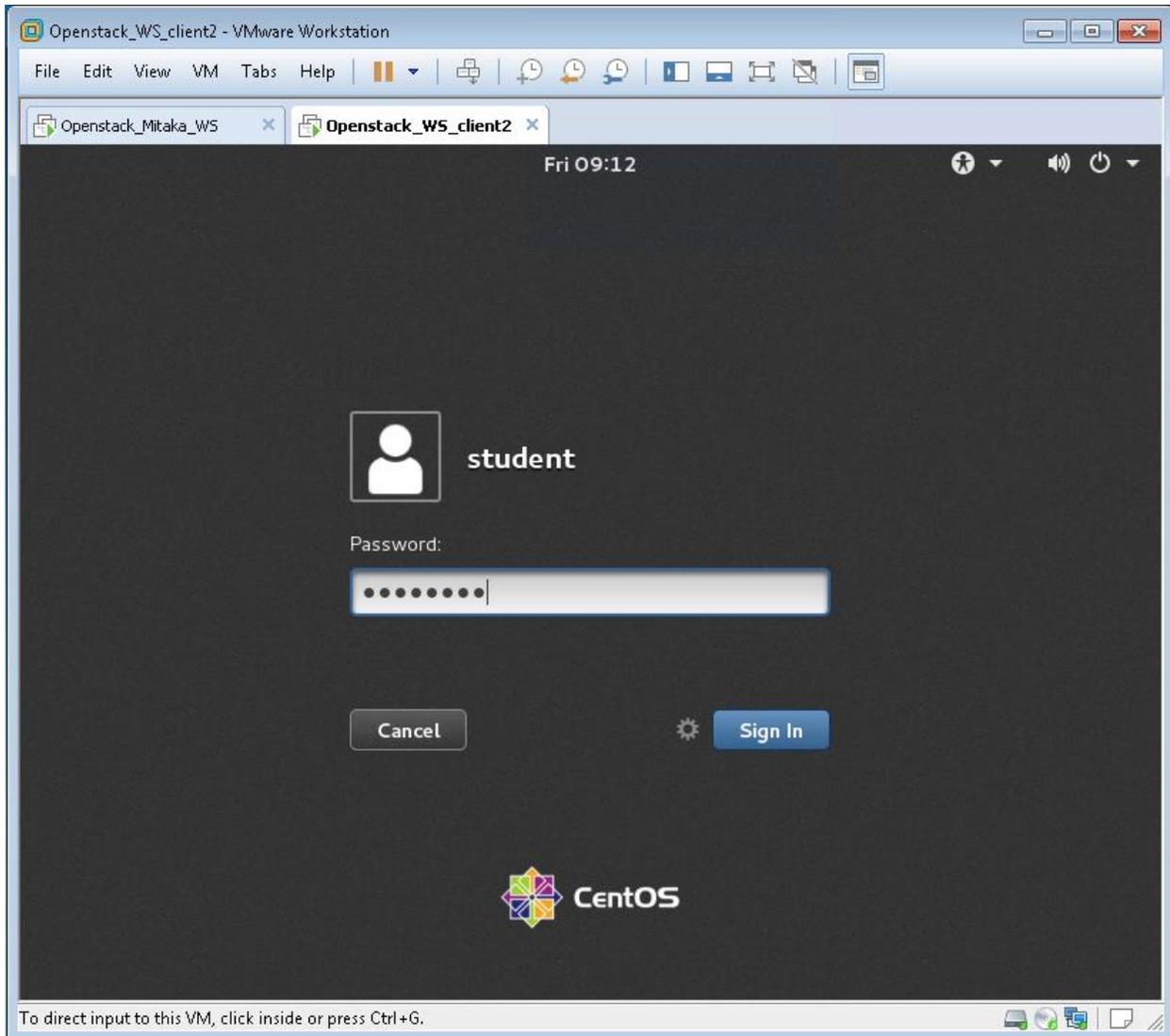


1. **Power on the Openstack_WS_client2 VM in Workstation.**

Note: Do not use the Windows host for this lab.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

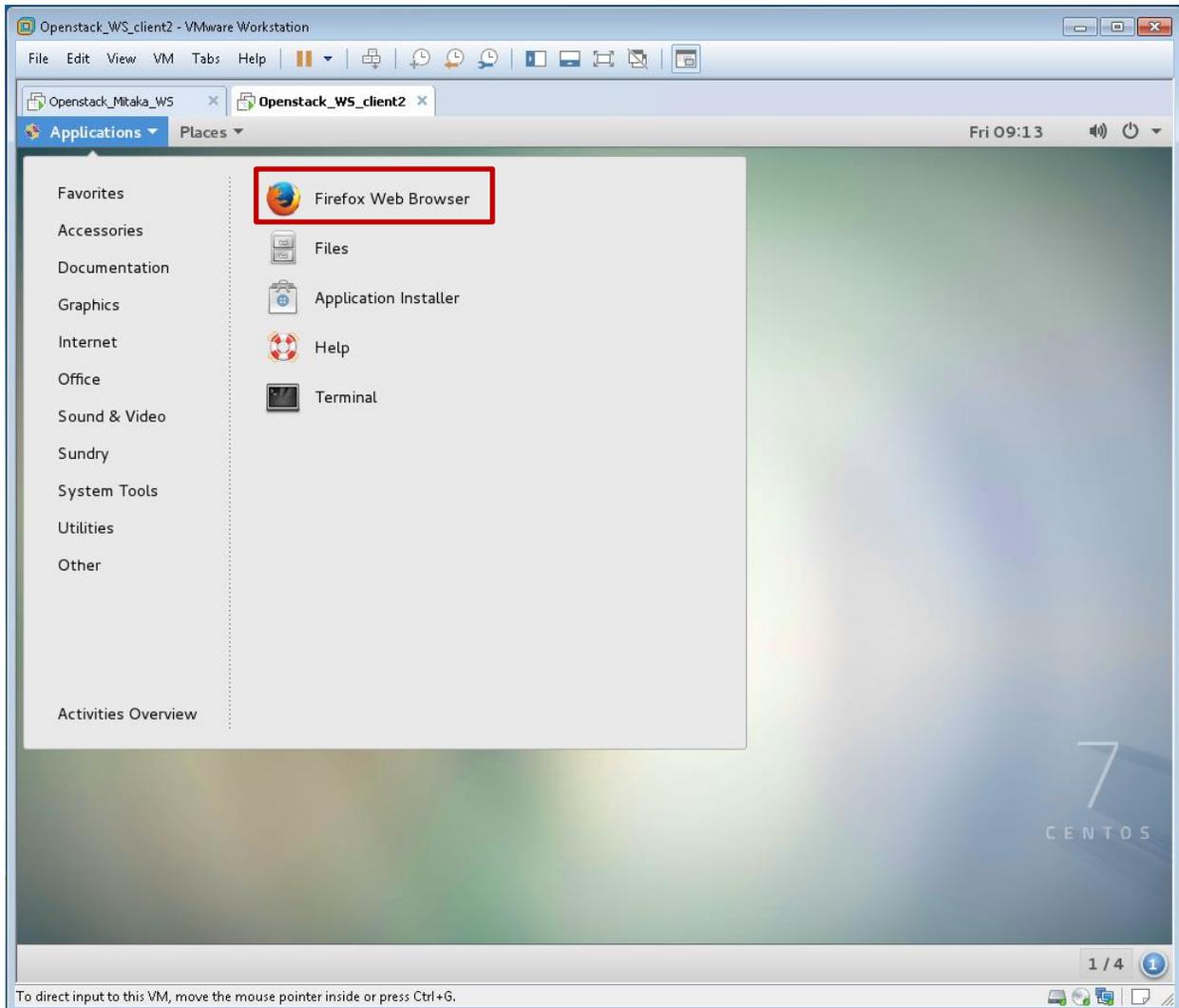


2. **Enter** the password of **P@ssword** to access the CentOS 7 Client virtual machine.

Note: If the screen is black, tap the spacebar to wake up the VM.



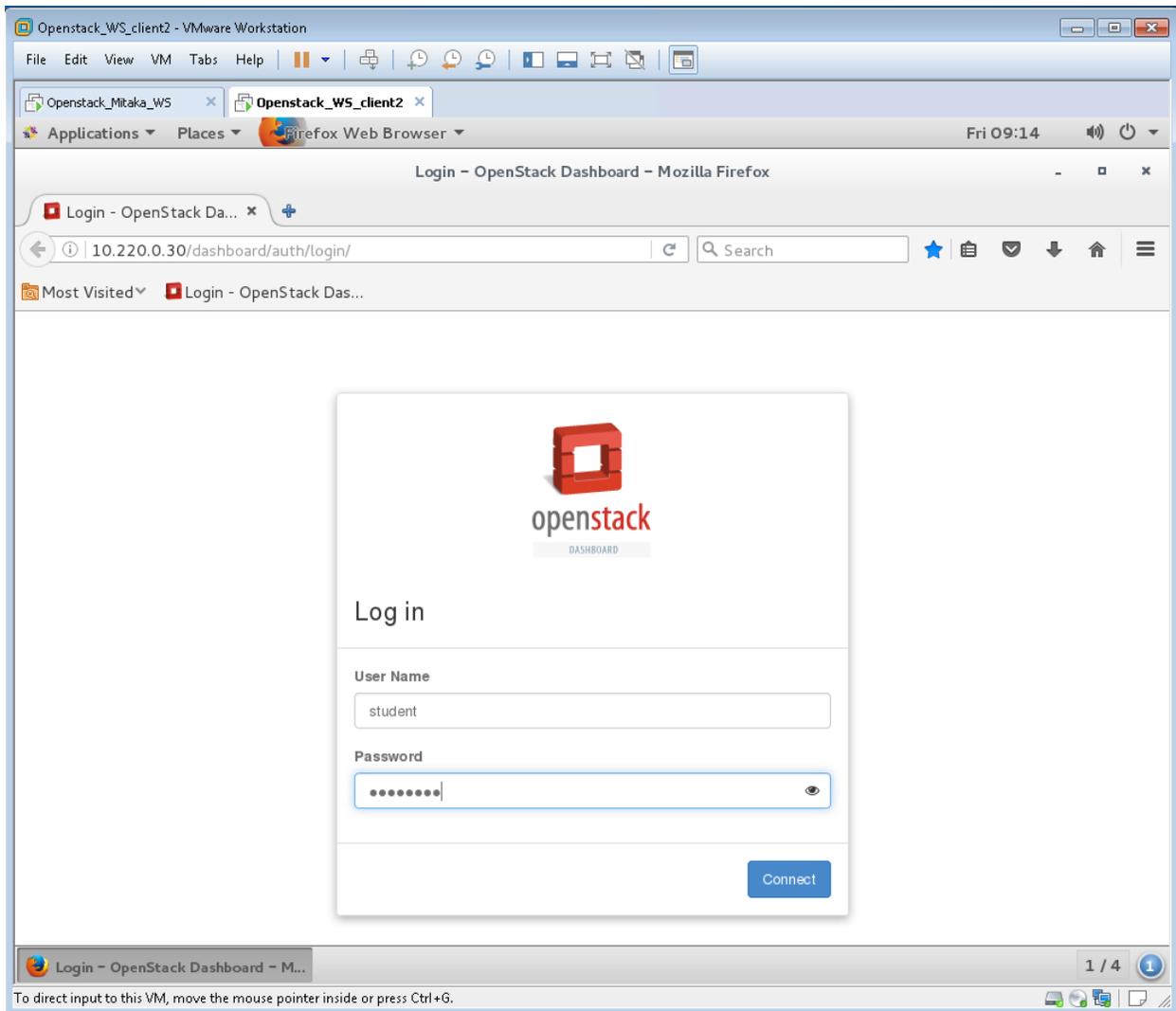
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



3. **Open Firefox Web Browser from Applications>Firefox Web Browser to access the OpenStack Dashboard log in page.**



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



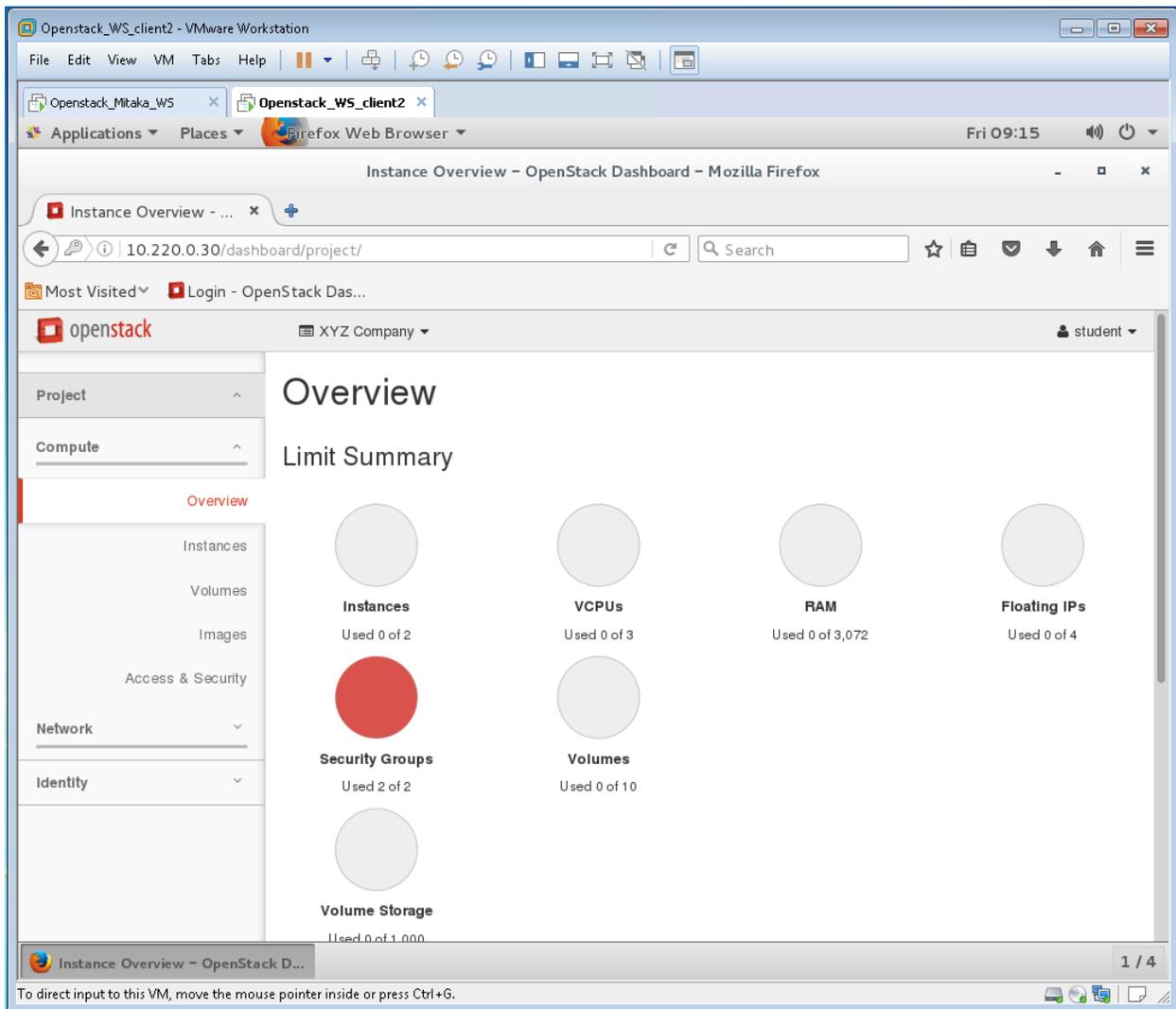
4. **Login** to the OpenStack Dashboard with the username **Student** and **P@ssword** and press **enter** or **click Connect**.

Note: User Name entries are not case sensitive, passwords are.

Note: In the Openstack_WS_client2 VMs the Firefox home page is set to open the OpenStack Dashboard Login page.

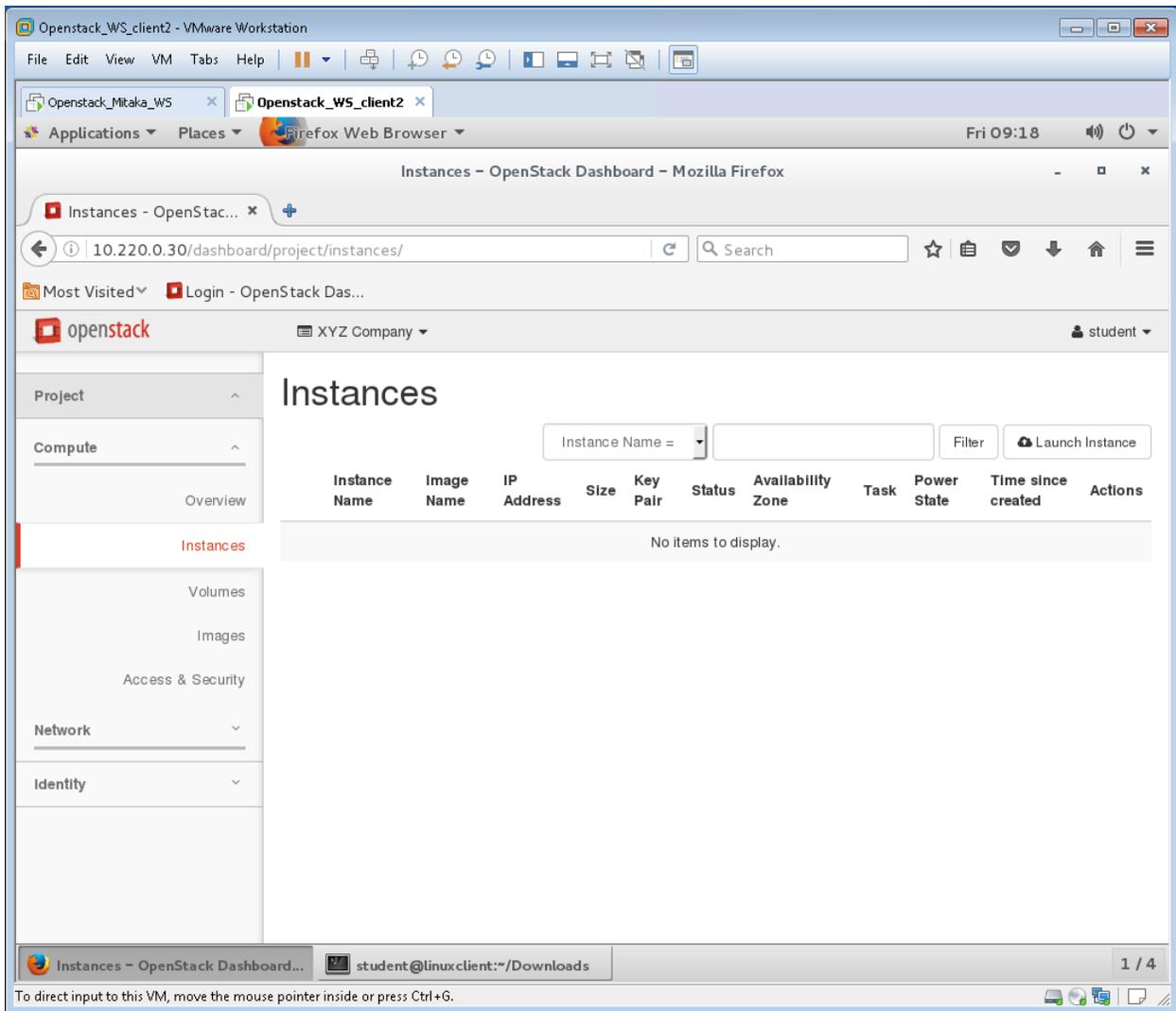


Lab 22: Launch a CentOS 7 instance with a customization script



1. Using the command line, extract the public key from the private key file, using the techniques learned in the previous lab.

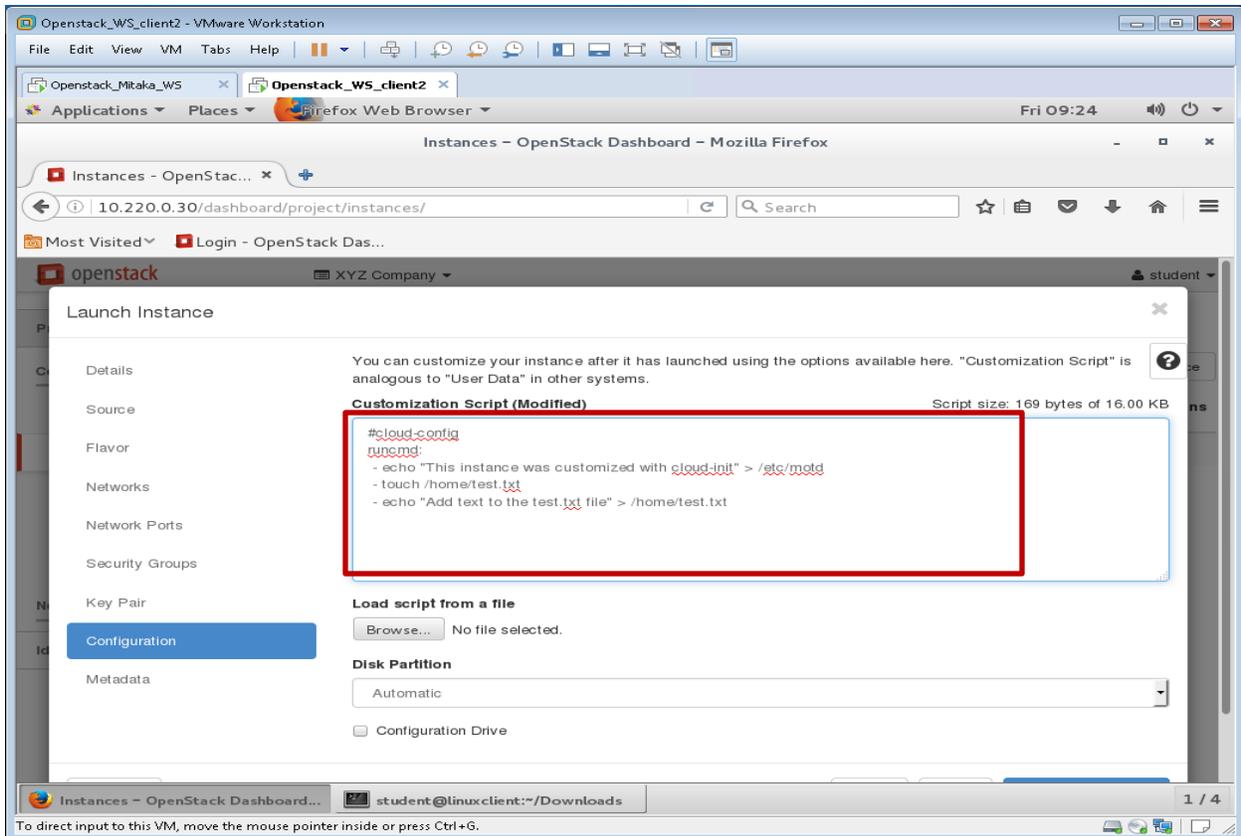
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



- Using the techniques learned in previous labs, **prepare** to **launch** an **instance** using the information in the table below. **DO NOT launch the instance yet!**

Instance Name	CentOS 7
Source	CentOS (see next page for more information)
Flavor	m1.small
Network	Private
Security Group	XYZ Company
Key Pair	Student
Configuration	Customization script
Floating IP Address	10.220.0.12





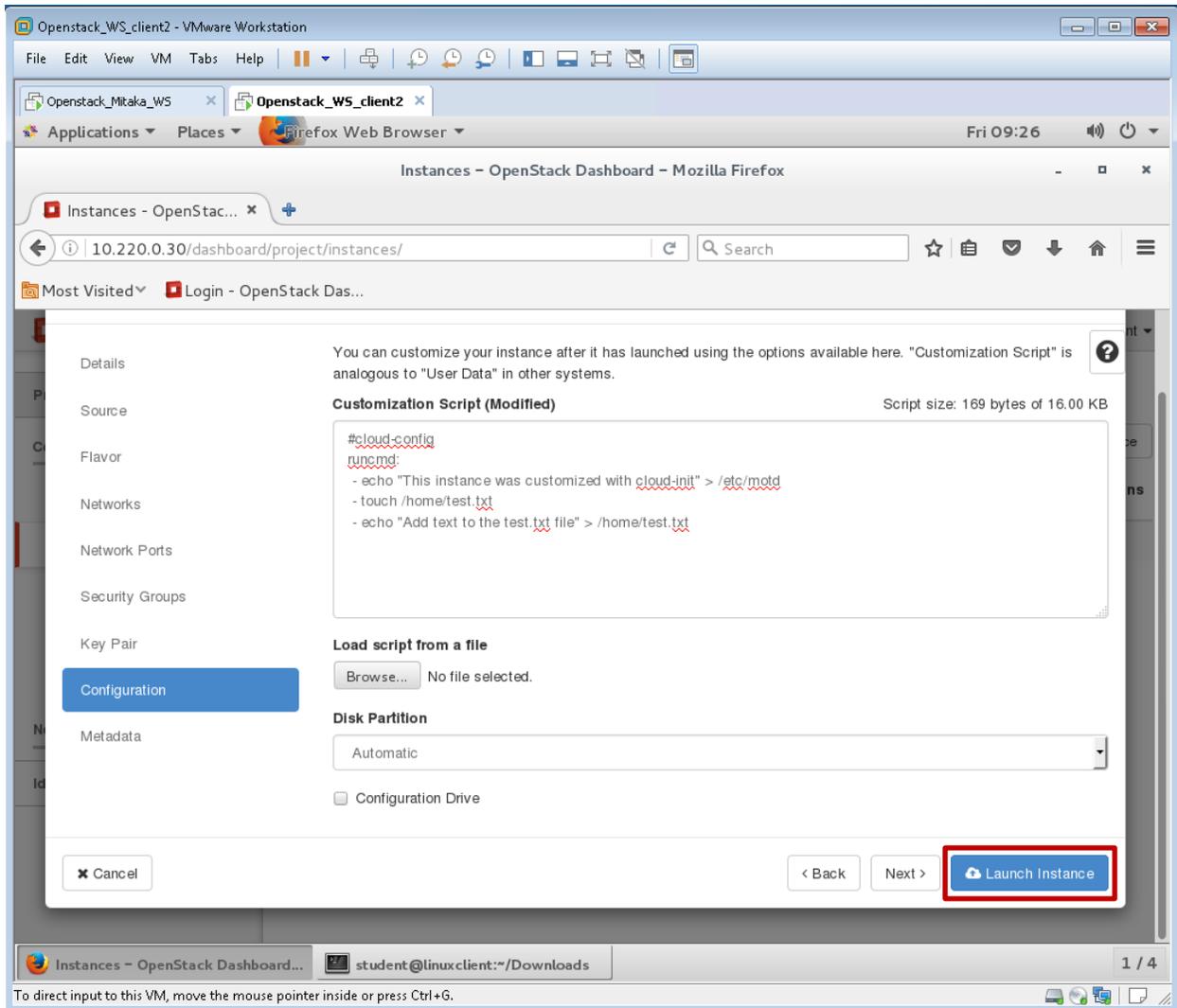
3. **Configuration:** After entering the information into the Details through Key Pair tabs, continue to the Configuration tab where you will enter the commands listed below needed to customize this instance. This is similar to the user_data.txt file that was used in the previous lab.

```
#cloud-config
runcmd:
  - echo "This instance was customized with cloud-init" > /etc/motd
  - touch /home/test.txt
  - echo "Add text to the test.txt file" > /home/test.txt
```

Note: The Customization Script commands are written in YAML syntax, which means that white space is critical and any stray white space will render the customization script useless. The first two commands, (**#cloud-config** and **runcmd:**), are aligned left and the remaining commands **contain a space before and after the hyphen**. If this is not clear, you can use the <http://yamllint.com> website on your internet connected host machine to verify the syntax before launching the instance.



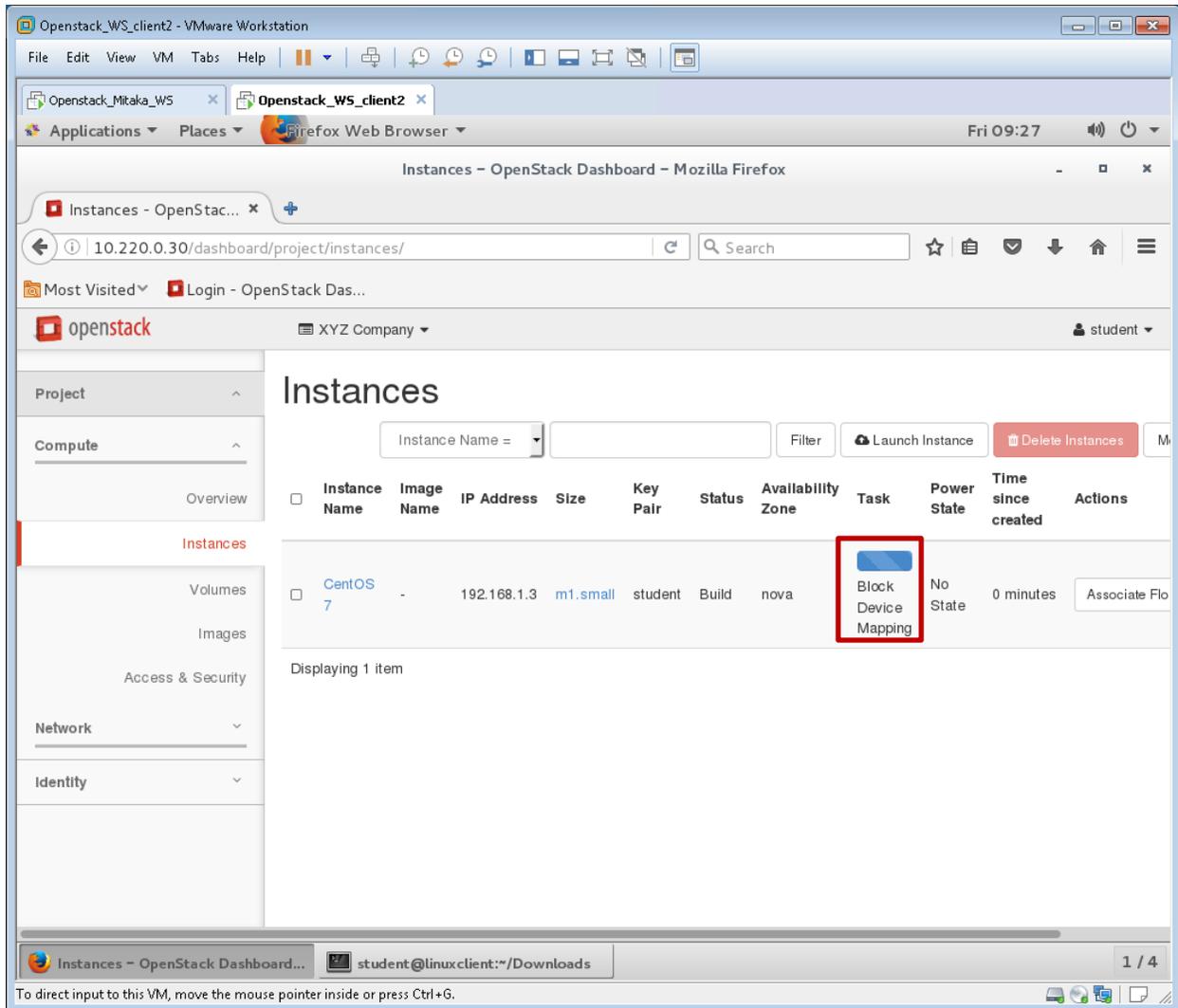
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



4. Click on Launch Instance.

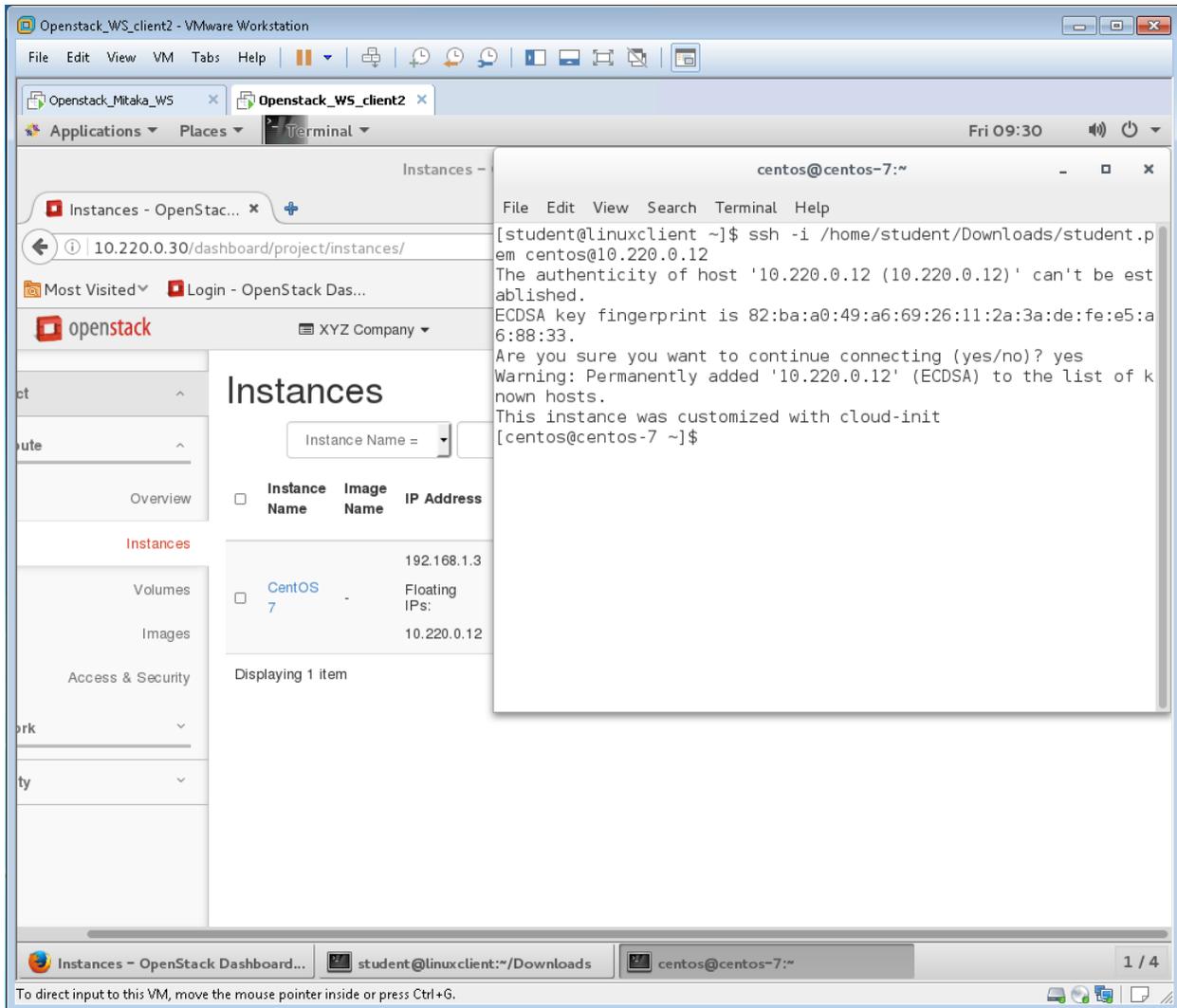


Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



5. The CentOS 7 instance should begin spawning. Associate a Floating IP address to the instance after verifying that the installation has completed.

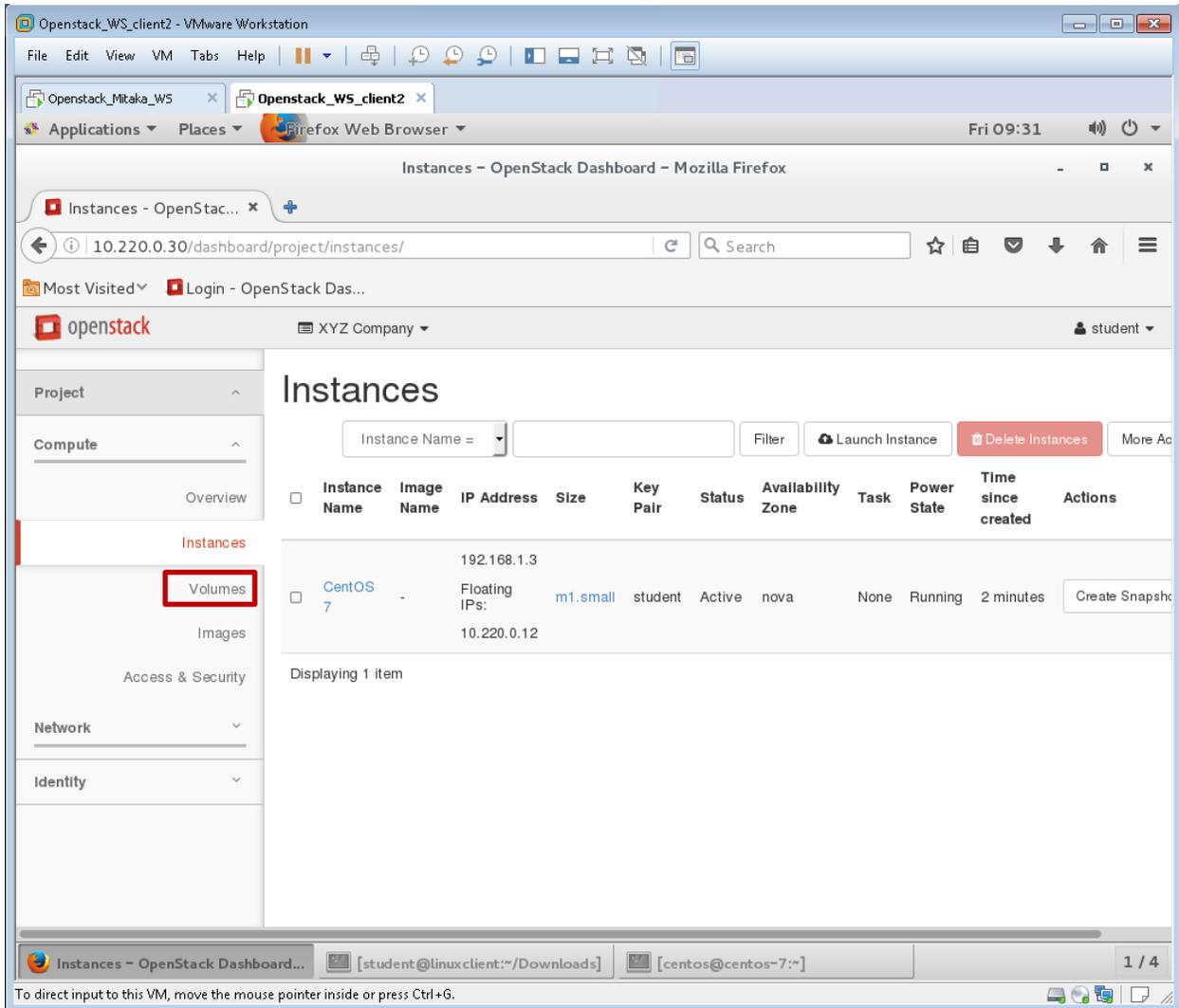
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



- SSH into the CentOS 7 instance and you should see the “This instance was customized with cloud-init” MOTD, the test.txt file in the /home directory and the text string that was added to the test.txt file. If you do not see any of the information mentioned, then the most likely cause is a stray white space or two was present when typed the commands into the configuration page, delete the instance and try again. Continue to Lab 23.



Lab 23: Create a volume, attach it to the CentOS 7 instance, mount the volume and create some data on the volume



1. Return to the Openstack Dashboard on the client2 VM. **Click on the Volumes tab.**

Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

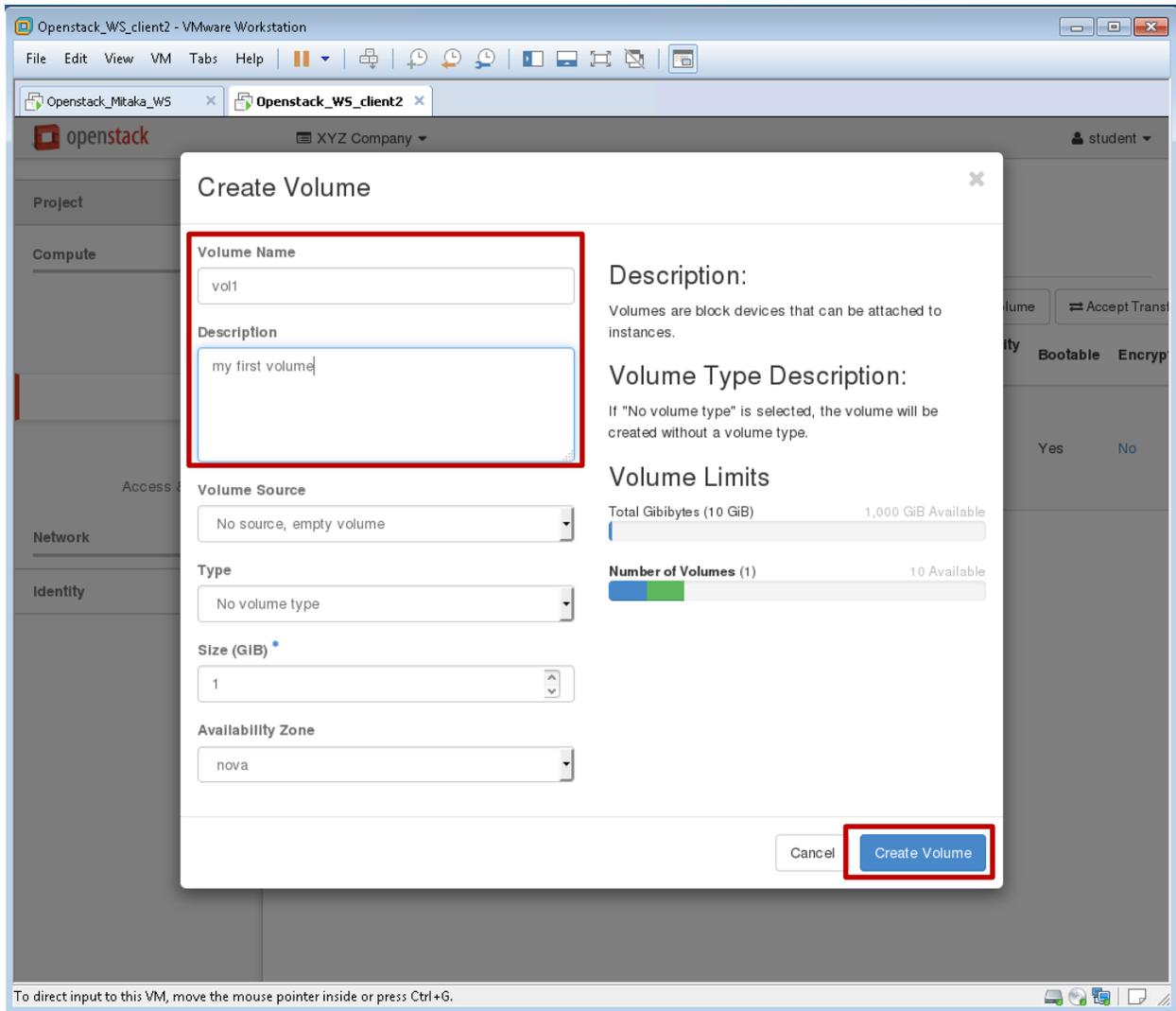
The screenshot shows the OpenStack Dashboard in a browser window. The dashboard is titled "Volumes - OpenStack Dashboard - Mozilla Firefox" and the URL is "10.220.0.30/dashboard/project/volumes/". The user is logged in as "student" under "XYZ Company". The dashboard displays a table of volumes with the following columns: Name, Description, Size, Status, Type, Attached To, Availability Zone, Bootable, and Encrypted. A single volume is listed with the ID "9fef3c05-82e1-4f59-87f5-1734ae3f3143", a size of 10GiB, and a status of "In-use". It is attached to a CentOS 7 instance on the /dev/vda device. The "Create Volume" button is highlighted with a red box.

Name	Description	Size	Status	Type	Attached To	Availability Zone	Bootable	Encrypted
9fef3c05-82e1-4f59-87f5-1734ae3f3143	-	10GiB	In-use	-	Attached to CentOS 7 on /dev/vda	nova	Yes	No

2. You should see the 10GB volume that was created for the CentOS 7 instance. **Click on Create Volume.**



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



3. Enter **vol1** as the **Volume Name** and add something to the **Description** block, and leave the remaining blocks at their default settings. Click **Create Volume**.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

The screenshot shows the OpenStack Volumes dashboard. The table below represents the data shown in the interface:

Name	Description	Size	Status	Type	Attached To	Availability Zone	Bootable	Encrypted	Actions
vol1	my first volume	1 GiB	Available	-	-	nova	No	No	Edit Volume
9fef3c05-82e1-4f59-87f5-1734ae3f3143	-	10 GiB	In-use	-	Attached to CentOS 7 on /dev/vda	nova	Yes	No	Edit Volume

- The **vol1** volume should appear and be marked as **Available** in the **Status** column. Select the dropdown menu on the vol1 row.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

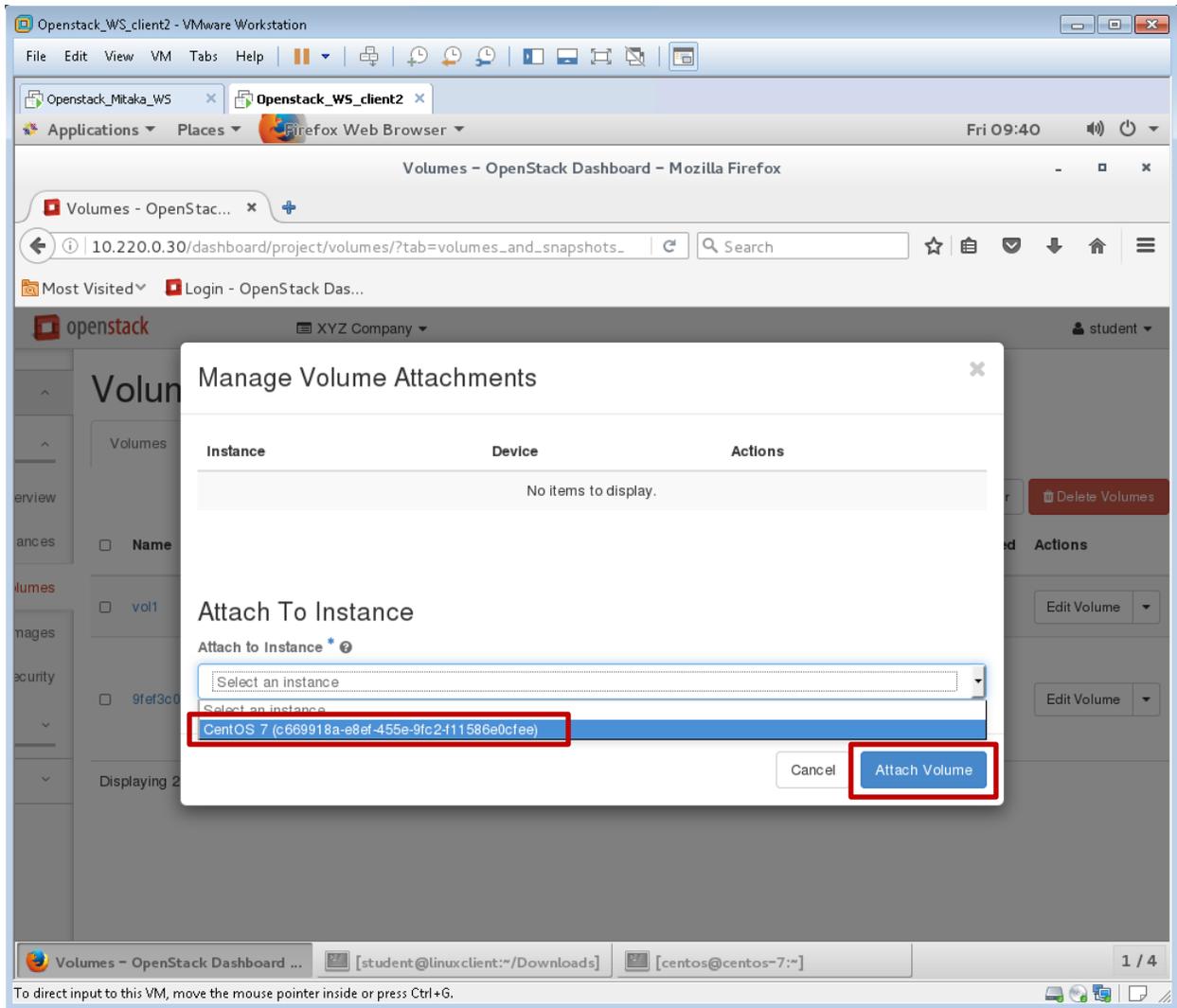
The screenshot shows the OpenStack Dashboard interface in a browser window. The page title is "Volumes - OpenStack Dashboard - Mozilla Firefox". The URL is "10.220.0.30/dashboard/project/volumes/?tab=volumes_and_snapshots...". The dashboard shows a table of volumes with columns: Name, Description, Size, Status, Type, Attached To, Availability Zone, Bootable, Encrypted, and Actions. Two volumes are listed: "vol1" (1 GiB, Available) and "9fef3c05-82e1-4f59-87f5-1734ae3f3143" (10 GiB, In-use). The "vol1" volume is attached to "CentOS 7 on /dev/vda". A dropdown menu is open for the "vol1" volume, showing options: "Extend Volume", "Manage Attachments" (highlighted with a red box), "Create Snapshot", "Change Volume Type", "Upload to Image", "Create Transfer", and "Delete Volume".

Name	Description	Size	Status	Type	Attached To	Availability Zone	Bootable	Encrypted	Actions
vol1	my first volume	1 GiB	Available	-	-	nova	No	No	Edit Volume
9fef3c05-82e1-4f59-87f5-1734ae3f3143	-	10 GiB	In-use	-	Attached to CentOS 7 on /dev/vda	nova	Yes	No	-

5. Select **Manage Attachments** from the Edit Volume dropdown menu.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



6. **Select the CentOS 7 instance from the Attach to Instance dropdown menu. Click on Attach Volume.**

Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

The screenshot shows the OpenStack Volumes dashboard in a browser. The page title is "Volumes - OpenStack Dashboard - Mozilla Firefox". The URL is "10.220.0.30/dashboard/project/volumes/". The dashboard displays a table of volumes with the following data:

Name	Description	Size	Status	Type	Attached To	Availability Zone	Bootable	Encrypted	Actions
vol1	my first volume	1GiB	In-use	-	Attached to CentOS 7 on /dev/vdb	nova	No	No	Edit Volume
9fef3c05-82e1-4f59-87f5-1734ae3f3143	-	10GiB	In-use	-	Attached to CentOS 7 on /dev/vda	nova	Yes	No	Edit Volume

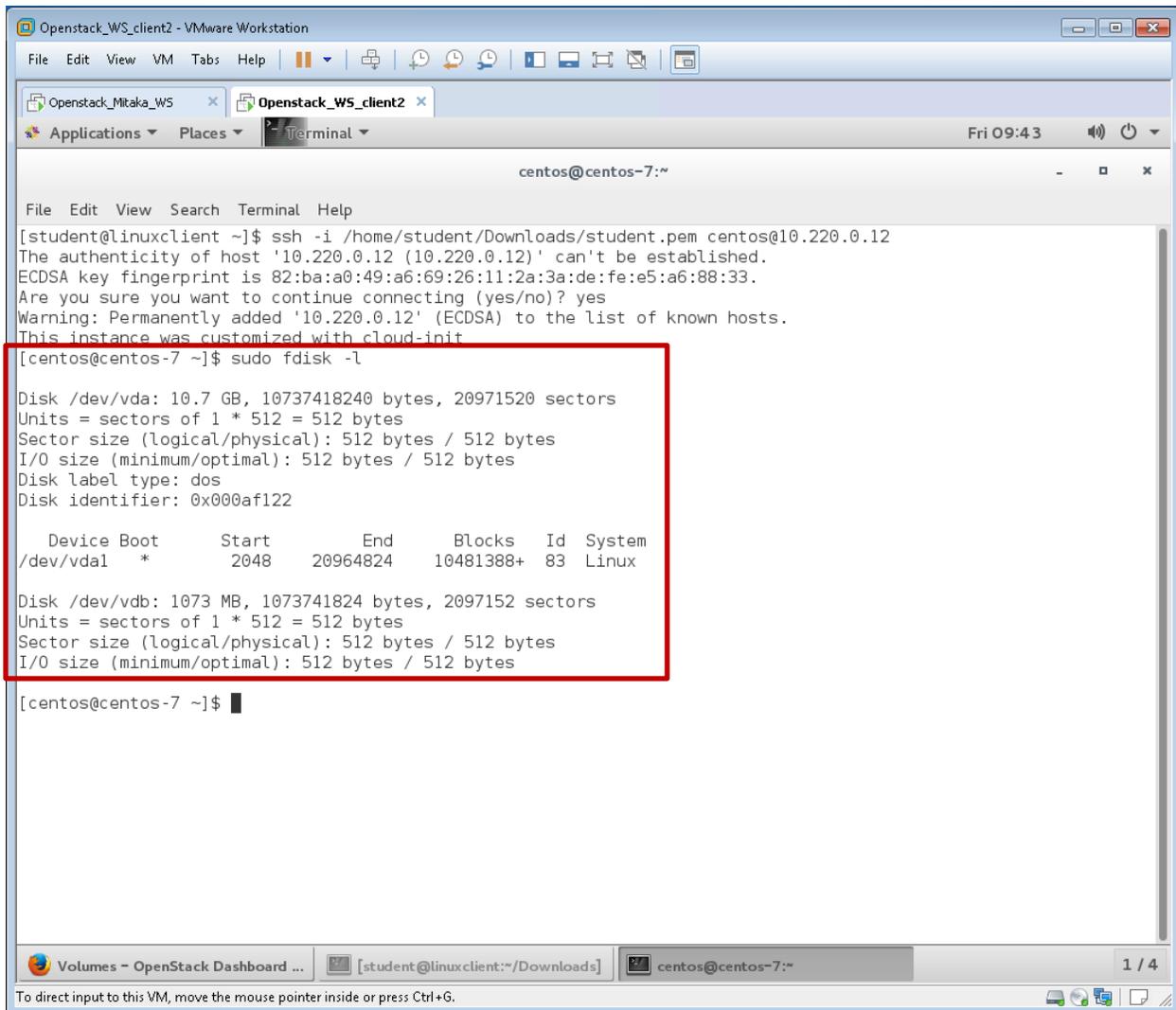
The first row is highlighted with a red box. The "Attached To" column for the first volume shows "Attached to CentOS 7 on /dev/vdb".

7. The **vol1** volume should show that it is **Attached to CentOS 7 on /dev/vdb** on the Attached to column.

Note: Make a note of **/dev/vdb**, you will need that information to mount the volume on the CentOS 7 instance.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS Openstack_WS_client2
Applications Places Terminal Fri 09:43
centos@centos-7:~
File Edit View Search Terminal Help
[student@linuxclient ~]$ ssh -i /home/student/Downloads/student.pem centos@10.220.0.12
The authenticity of host '10.220.0.12 (10.220.0.12)' can't be established.
ECDSA key fingerprint is 82:ba:a0:49:a6:69:26:11:2a:3a:de:fe:e5:a6:88:33.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.220.0.12' (ECDSA) to the list of known hosts.
This instance was customized with cloud-init
[centos@centos-7 ~]$ sudo fdisk -l
Disk /dev/vda: 10.7 GB, 10737418240 bytes, 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000af122

   Device Boot      Start         End      Blocks   Id  System
   /dev/vda1  *          2048     20964824     10481388+  83  Linux

Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

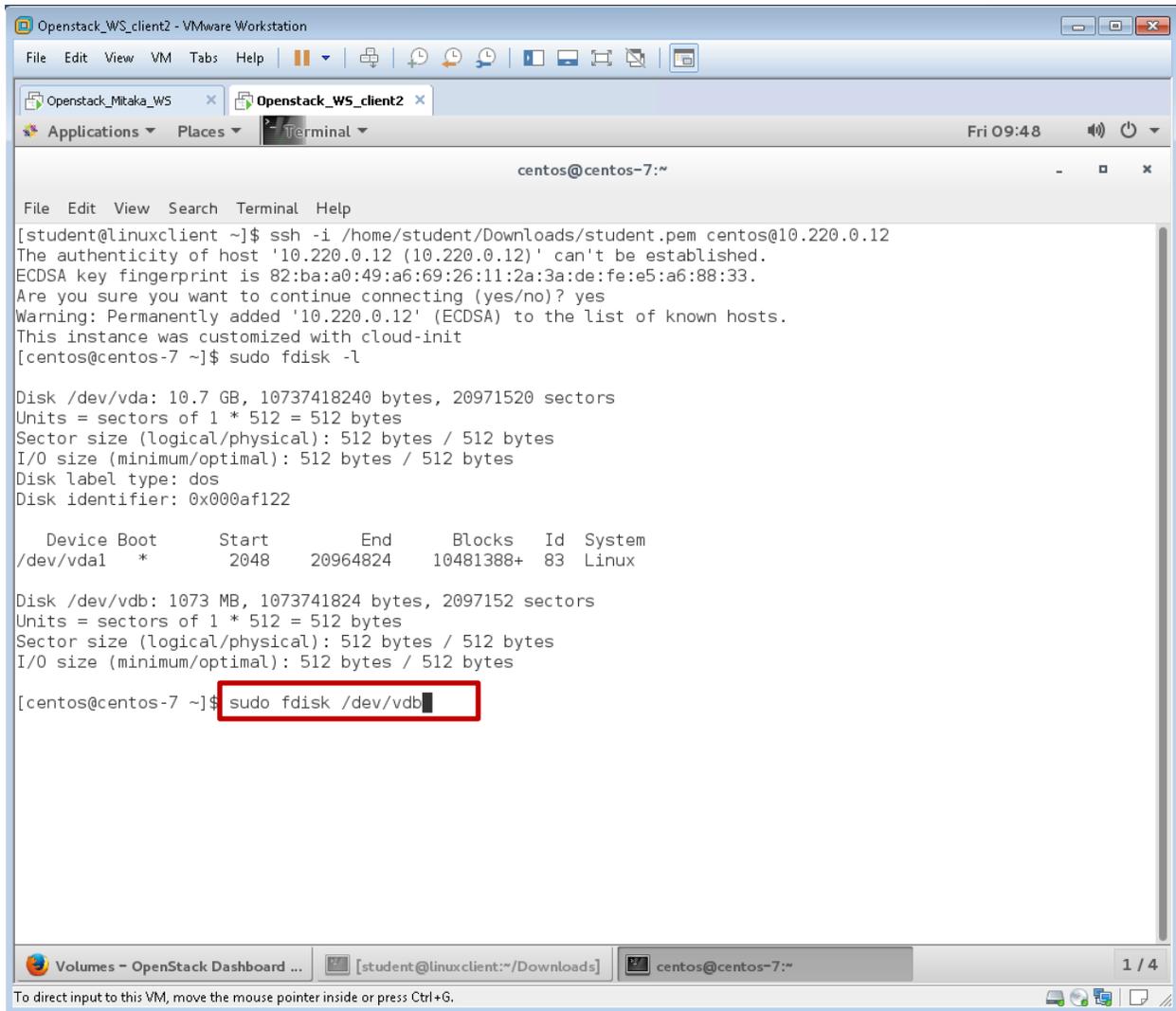
[centos@centos-7 ~]$
```

8. Return to the SSH session for the CentOS 7 instance and run the command **#sudo fdisk -l** the command should list the two disks **/dev/vda** and **/dev/vdb** that are present on the CentOS 7 instance. The **/dev/vda** is the disk that the CentOS 7 is installed on and the **/dev/vdb** is the **volume** (disk) that you just created and attached. Although the disk is present, it's not useable yet.

Note: Reminder, you must use **sudo** for any commands that you are running in a Linux instance, because the root user is disabled by default.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



The screenshot shows a terminal window titled 'centos@centos-7:~' within a VMware Workstation environment. The terminal output shows the following sequence of commands and their results:

```
[student@linuxclient ~]$ ssh -i /home/student/Downloads/student.pem centos@10.220.0.12
The authenticity of host '10.220.0.12 (10.220.0.12)' can't be established.
ECDSA key fingerprint is 82:ba:a0:49:a6:69:26:11:2a:3a:de:fe:e5:a6:88:33.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.220.0.12' (ECDSA) to the list of known hosts.
This instance was customized with cloud-init
[centos@centos-7 ~]$ sudo fdisk -l

Disk /dev/vda: 10.7 GB, 10737418240 bytes, 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000af122

   Device Boot      Start         End      Blocks   Id  System
  /dev/vda1    *          2048     20964824    10481388+  83  Linux

Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

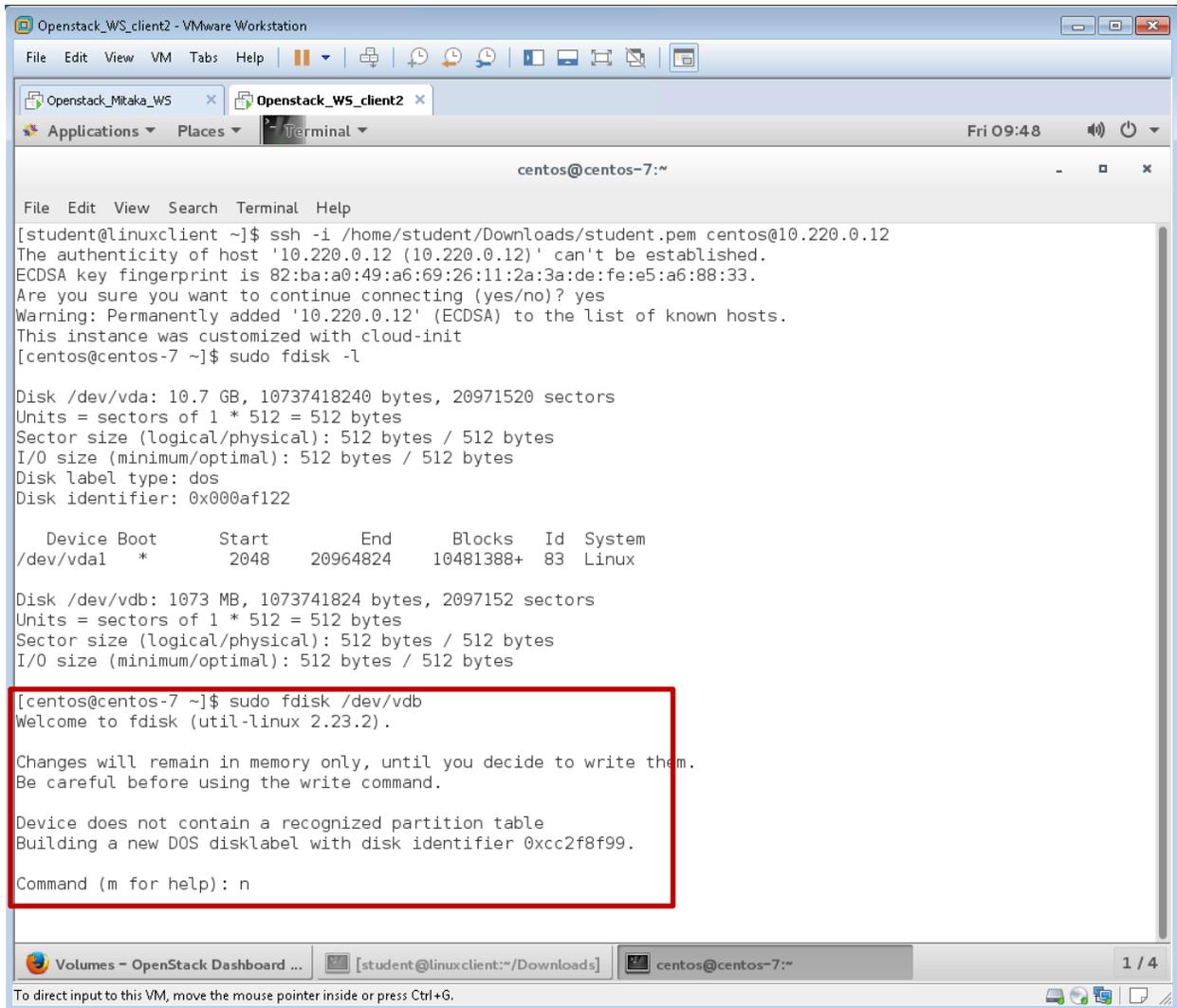
[centos@centos-7 ~]$ sudo fdisk /dev/vdb
```

The command `sudo fdisk /dev/vdb` is highlighted with a red box in the terminal output.

9. Run the `# sudo fdisk /dev/vdb` command to create space on the `/dev/vdb` disk for the new drive.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



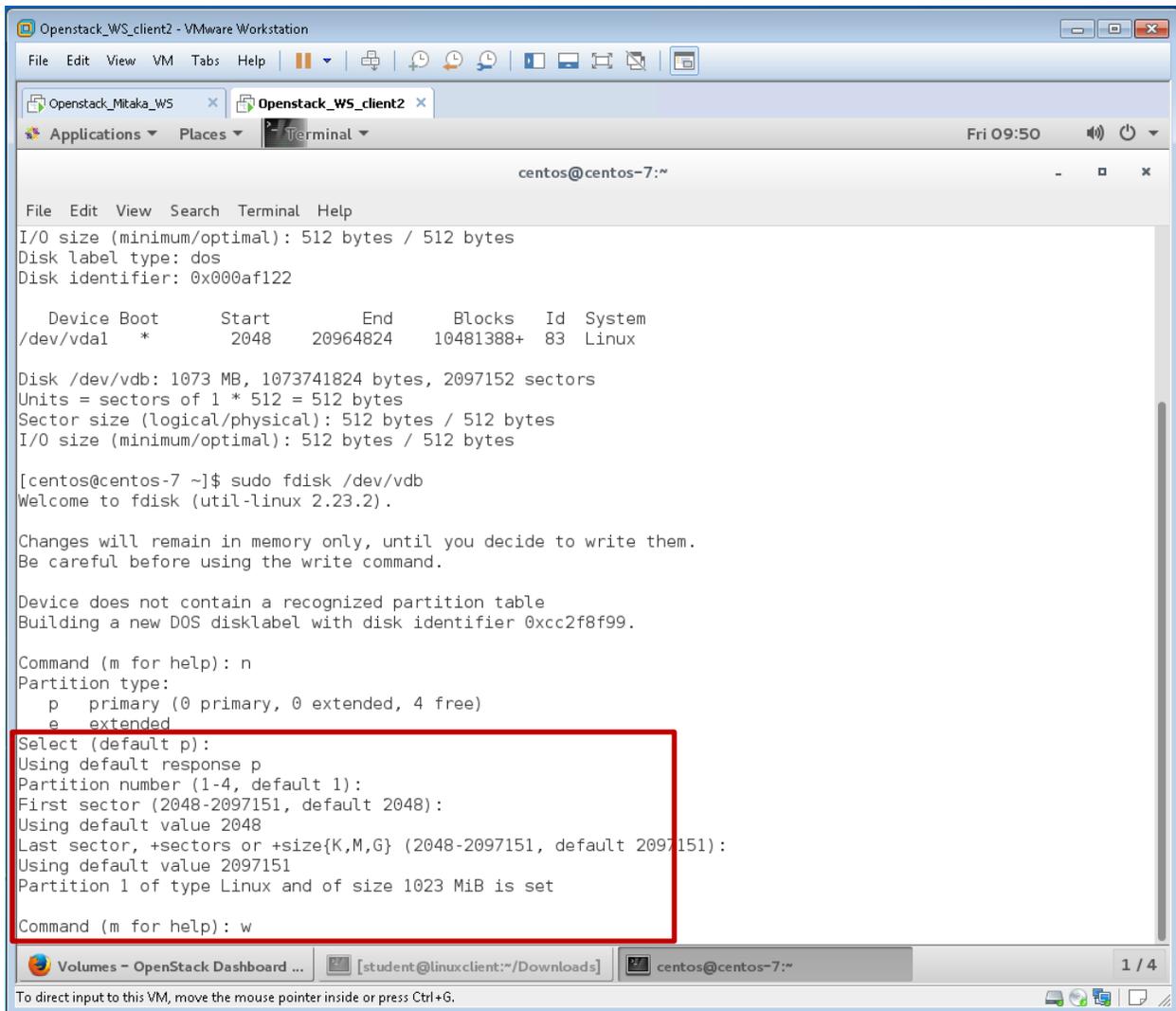
The screenshot shows a terminal window within a VMware Workstation environment. The terminal is connected to a CentOS 7 instance. The user has executed an SSH command from a Linux client to connect to the CentOS instance. After logging in, the user runs `sudo fdisk -l` to list disk information. The output shows two disks: `/dev/vda` (10.7 GB) and `/dev/vdb` (1073 MB). The user then runs `sudo fdisk /dev/vdb` to create a new partition on `/dev/vdb`. The terminal shows the fdisk utility's welcome message and instructions. The user is prompted to enter a command, and they enter `n` to create a new partition. The terminal output is as follows:

```
centos@centos-7:~  
File Edit View Search Terminal Help  
[student@linuxclient ~]$ ssh -i /home/student/Downloads/student.pem centos@10.220.0.12  
The authenticity of host '10.220.0.12 (10.220.0.12)' can't be established.  
ECDSA key fingerprint is 82:ba:a0:49:a6:69:26:11:2a:3a:de:fe:e5:a6:88:33.  
Are you sure you want to continue connecting (yes/no)? yes  
Warning: Permanently added '10.220.0.12' (ECDSA) to the list of known hosts.  
This instance was customized with cloud-init  
[centos@centos-7 ~]$ sudo fdisk -l  
  
Disk /dev/vda: 10.7 GB, 10737418240 bytes, 20971520 sectors  
Units = sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk label type: dos  
Disk identifier: 0x000af122  
  
   Device Boot      Start         End      Blocks   Id  System  
/dev/vda1 *          2048     20964824    10481388+  83  Linux  
  
Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors  
Units = sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
  
[centos@centos-7 ~]$ sudo fdisk /dev/vdb  
Welcome to fdisk (util-linux 2.23.2).  
  
Changes will remain in memory only, until you decide to write them.  
Be careful before using the write command.  
  
Device does not contain a recognized partition table  
Building a new DOS disklabel with disk identifier 0xcc2f8f99.  
Command (m for help): n
```

10. At the first prompt enter **n** for a new partition: Command (m for help): n



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS Openstack_WS_client2
Applications Places Terminal Fri 09:50
centos@centos-7:~
File Edit View Search Terminal Help
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000af122

Device Boot      Start         End      Blocks   Id  System
/dev/vda1 *        2048     20964824   10481388+  83  Linux

Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

[centos@centos-7 ~]$ sudo fdisk /dev/vdb
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0xcc2f8f99.

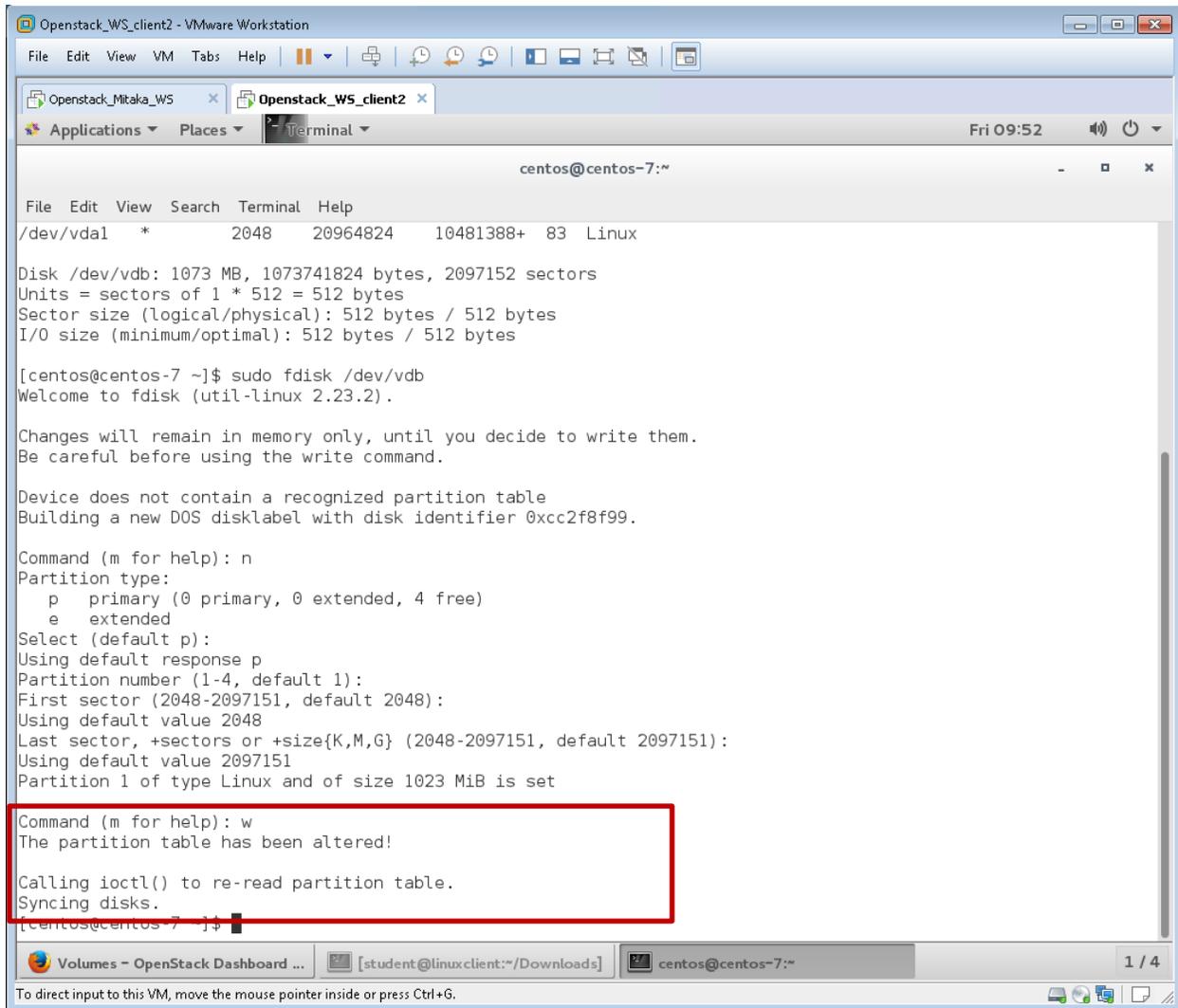
Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p):
Using default response p
Partition number (1-4, default 1):
First sector (2048-2097151, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-2097151, default 2097151):
Using default value 2097151
Partition 1 of type Linux and of size 1023 MiB is set

Command (m for help): w
```

11. Use the **defaults for the Partition type p, Partition number 1, First sector, and Last sector** and **enter w** to write the new partition to the `/dev/vdb` disk.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS Openstack_WS_client2
Applications Places Terminal Fri 09:52
centos@centos-7:~
File Edit View Search Terminal Help
/dev/vda1 * 2048 20964824 10481388+ 83 Linux
Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
[centos@centos-7 ~]$ sudo fdisk /dev/vdb
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0xcc2f8f99.

Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p):
Using default response p
Partition number (1-4, default 1):
First sector (2048-2097151, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-2097151, default 2097151):
Using default value 2097151
Partition 1 of type Linux and of size 1023 MiB is set

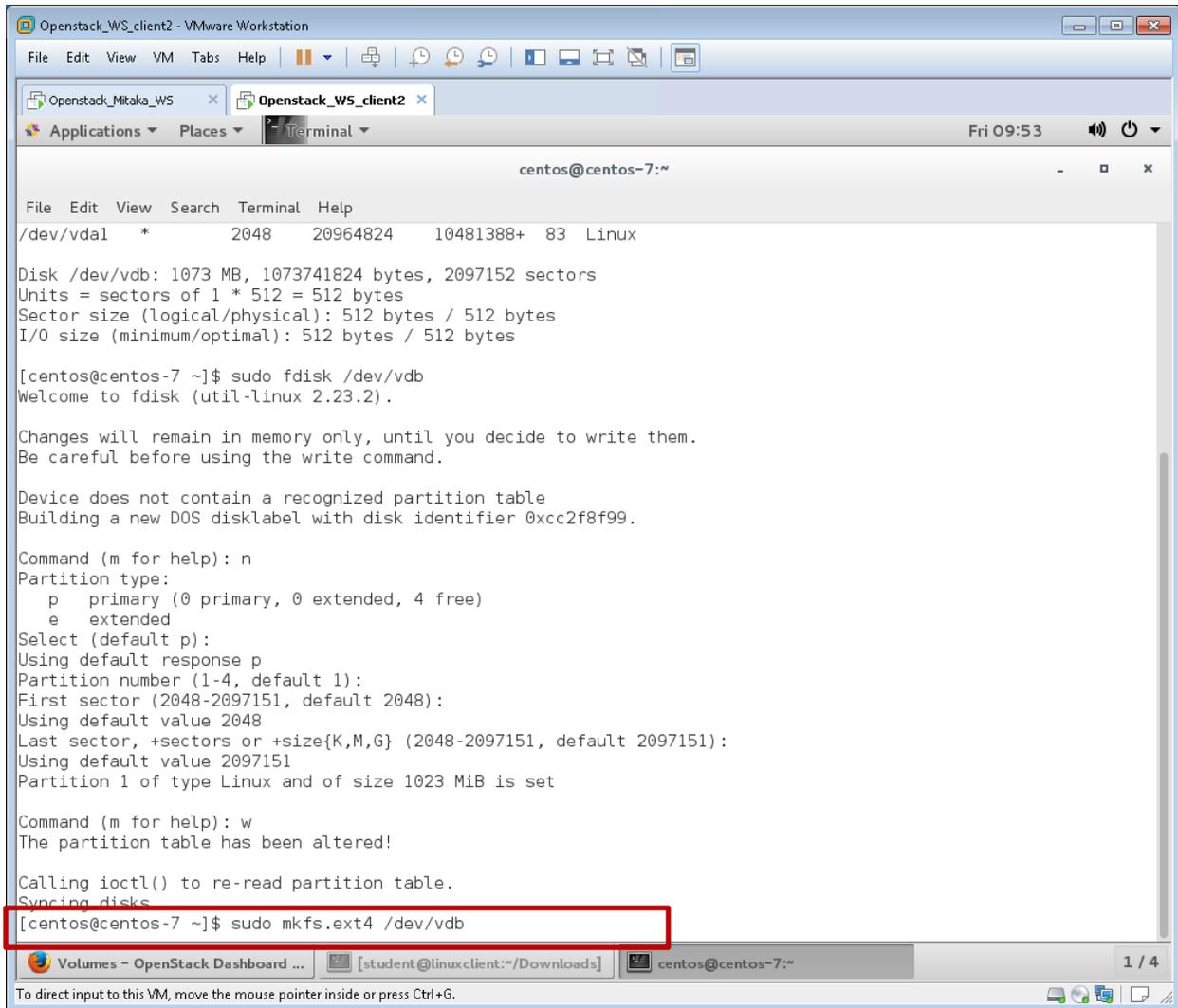
Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
[centos@centos-7 ~]$
```

12. After entering `w` and pressing enter, you should see the “The Partition table.....syncing disks.” output, as shown in the screen capture. Next you will create a file system on the new partition.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

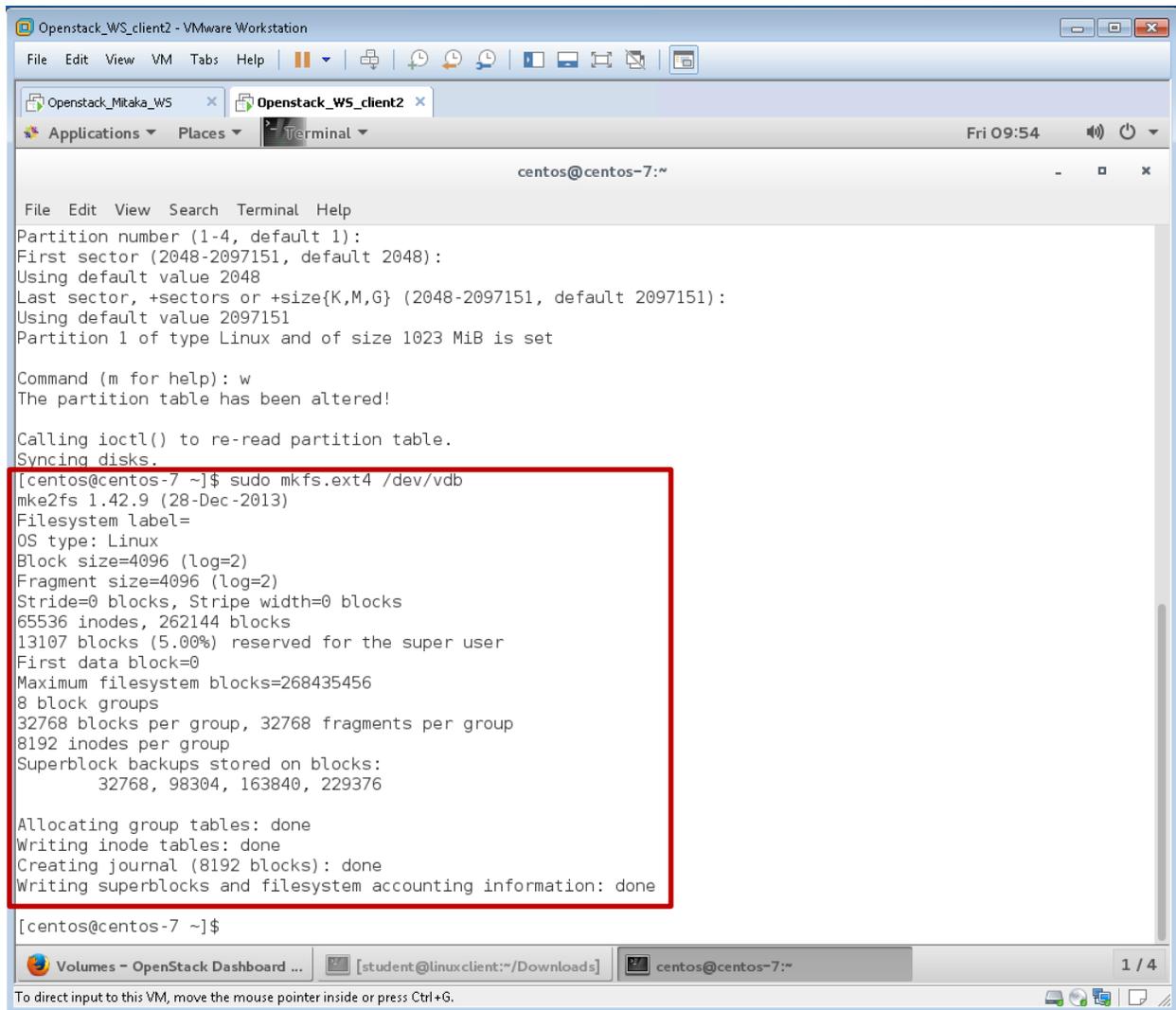


```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS Openstack_WS_client2
Applications Places Terminal Fri 09:53
centos@centos-7:~
File Edit View Search Terminal Help
/dev/vda1 * 2048 20964824 10481388+ 83 Linux
Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
[centos@centos-7 ~]$ sudo fdisk /dev/vdb
Welcome to fdisk (util-linux 2.23.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0xcc2f8f99.
Command (m for help): n
Partition type:
  p   primary (0 primary, 0 extended, 4 free)
  e   extended
Select (default p):
Using default response p
Partition number (1-4, default 1):
First sector (2048-2097151, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-2097151, default 2097151):
Using default value 2097151
Partition 1 of type Linux and of size 1023 MiB is set
Command (m for help): w
The partition table has been altered!
Calling ioctl() to re-read partition table.
Syncing disks.
[centos@centos-7 ~]$ sudo mkfs.ext4 /dev/vdb
Volumes - OpenStack Dashboard ... [student@linuxclient:~/Downloads] centos@centos-7:~ 1 / 4
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
```

13. Create a file system on the new volume (disk) `/dev/vdb`. Enter `# sudo mkfs.ext4 /dev/vdb`



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS Openstack_WS_client2
Applications Places Terminal Fri 09:54
centos@centos-7:~
File Edit View Search Terminal Help
Partition number (1-4, default 1):
First sector (2048-2097151, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-2097151, default 2097151):
Using default value 2097151
Partition 1 of type Linux and of size 1023 MiB is set

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
[centos@centos-7 ~]$ sudo mkfs.ext4 /dev/vdb
mkfs2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
65536 inodes, 262144 blocks
13107 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=268435456
8 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376

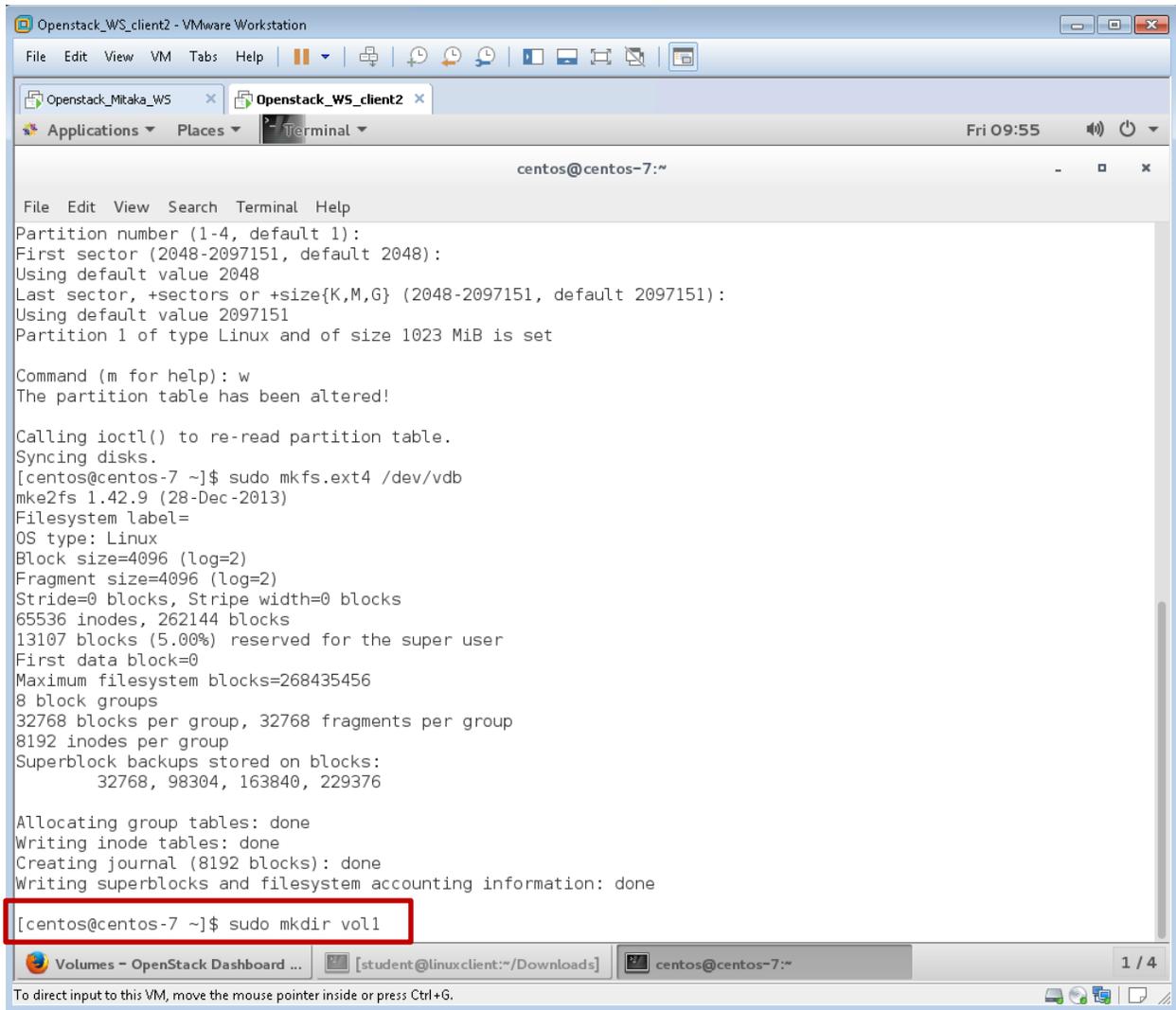
Allocating group tables: done
Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information: done

[centos@centos-7 ~]$
```

14. You should see similar output, as shown in the screen capture above, as the OS writes the ext4 file system to the /dev/vdb disk.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



The screenshot shows a terminal window within a VMware Workstation environment. The terminal is running a CentOS 7 instance. The user has just finished creating an ext4 filesystem on a device. The output of the previous command is visible, showing the partition details and the successful creation of the filesystem. The current command being entered is `sudo mkdir vol1`, which is highlighted with a red box. The terminal output shows the following steps:

```
Partition number (1-4, default 1):
First sector (2048-2097151, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-2097151, default 2097151):
Using default value 2097151
Partition 1 of type Linux and of size 1023 MiB is set

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
[centos@centos-7 ~]$ sudo mkfs.ext4 /dev/vdb
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
65536 inodes, 262144 blocks
13107 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=268435456
8 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376

Allocating group tables: done
Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information: done

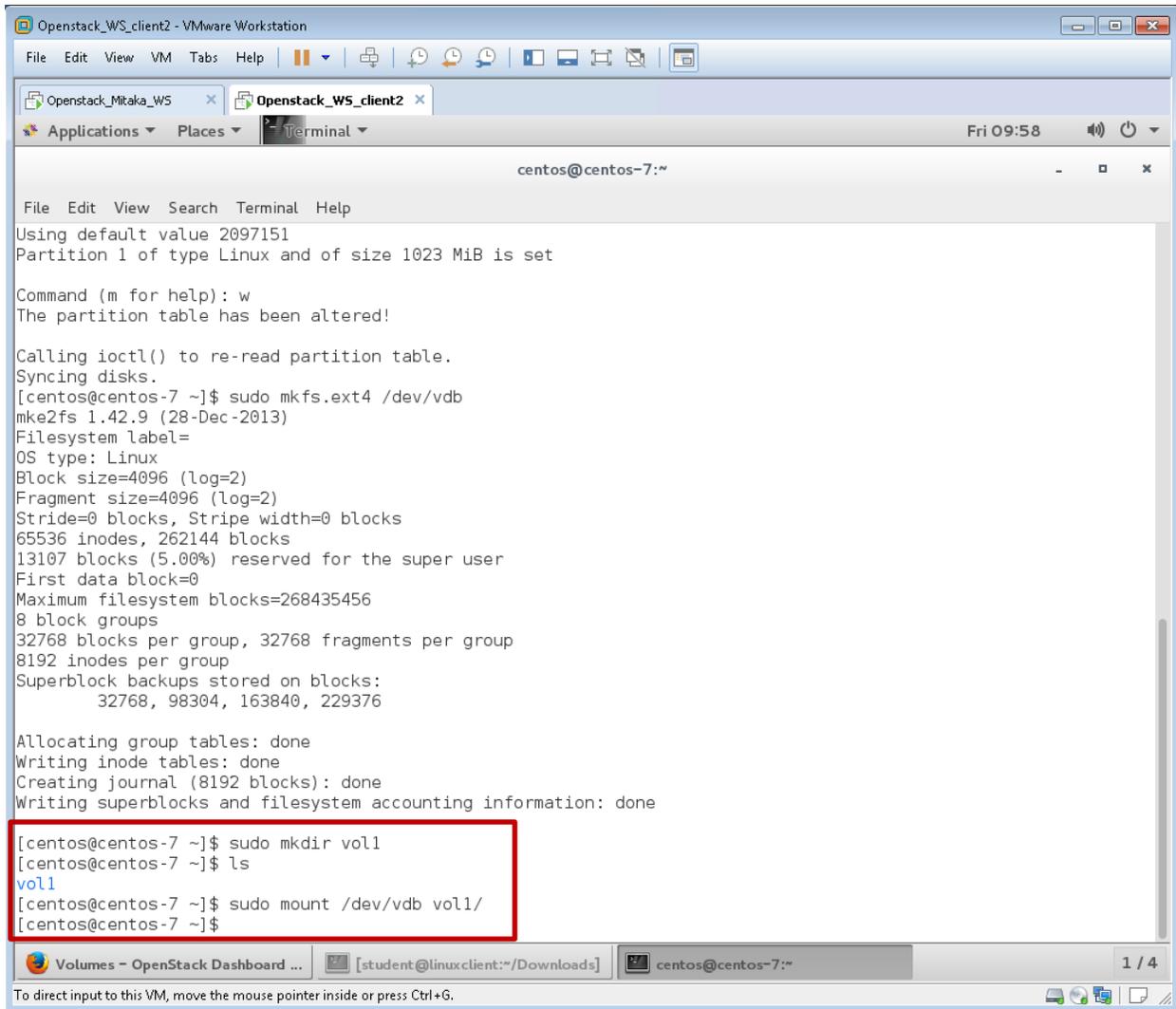
[centos@centos-7 ~]$ sudo mkdir vol1
```

15. Create a new directory to mount the new volume. Enter **# sudo mkdir vol1**

Note: The system doesn't produce any output after making the new directory, so you can run the `ls` command to verify that the new `vol1` directory is present.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



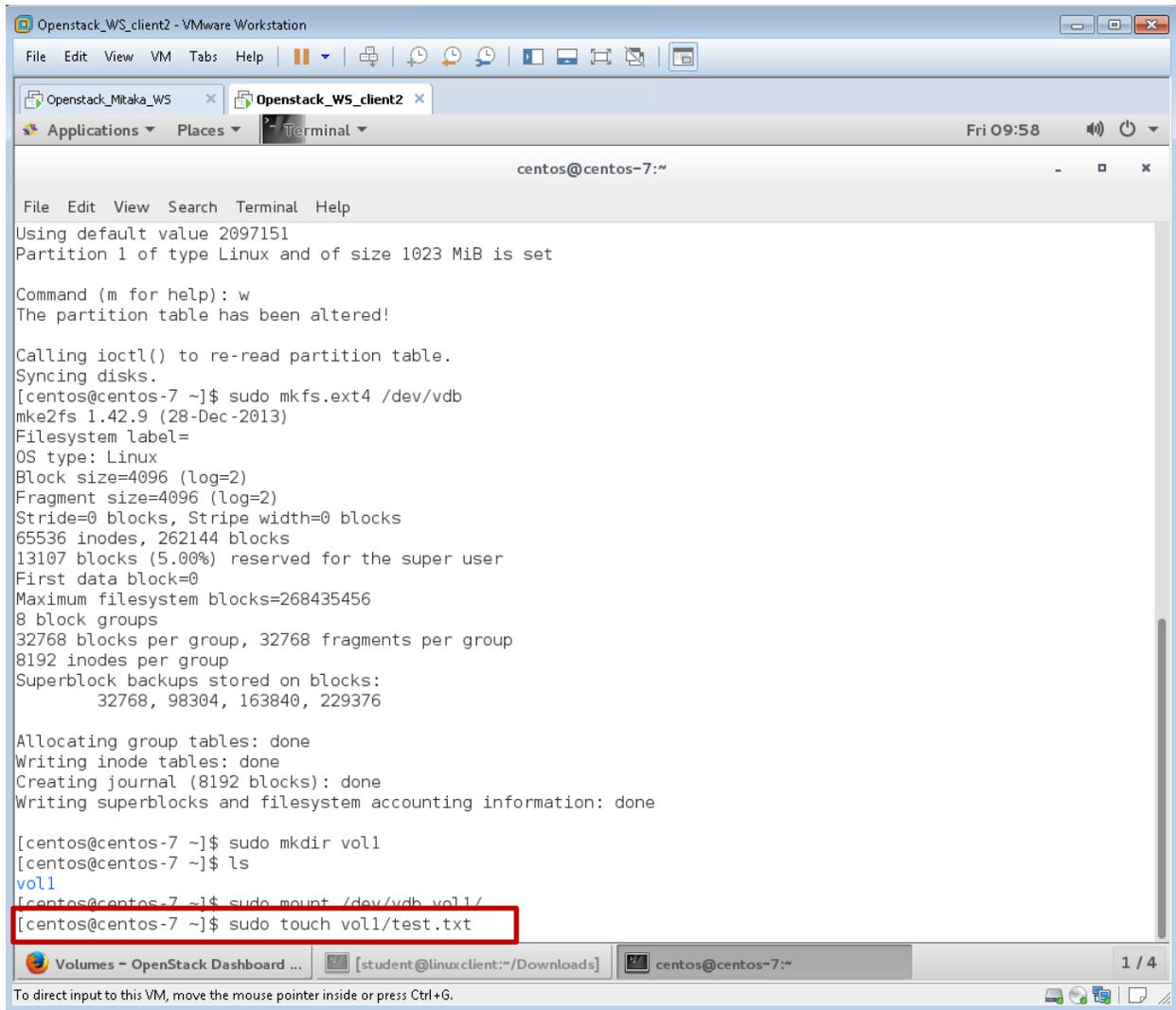
```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS x Openstack_WS_client2 x
Applications Places Terminal Fri 09:58
centos@centos-7:~
File Edit View Search Terminal Help
Using default value 2097151
Partition 1 of type Linux and of size 1023 MiB is set
Command (m for help): w
The partition table has been altered!
Calling ioctl() to re-read partition table.
Syncing disks.
[centos@centos-7 ~]$ sudo mkfs.ext4 /dev/vdb
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
65536 inodes, 262144 blocks
13107 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=268435456
8 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376
Allocating group tables: done
Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information: done
[centos@centos-7 ~]$ sudo mkdir vol1
[centos@centos-7 ~]$ ls
vol1
[centos@centos-7 ~]$ sudo mount /dev/vdb vol1/
[centos@centos-7 ~]$
```

16. Mount the /dev/vdb volume (disk) to the new vol1 directory. Enter **# sudo mount /dev/vdb vol1/**

Note: The system doesn't produce any output confirming that the volume was successfully mounted, only errors will produce an output.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



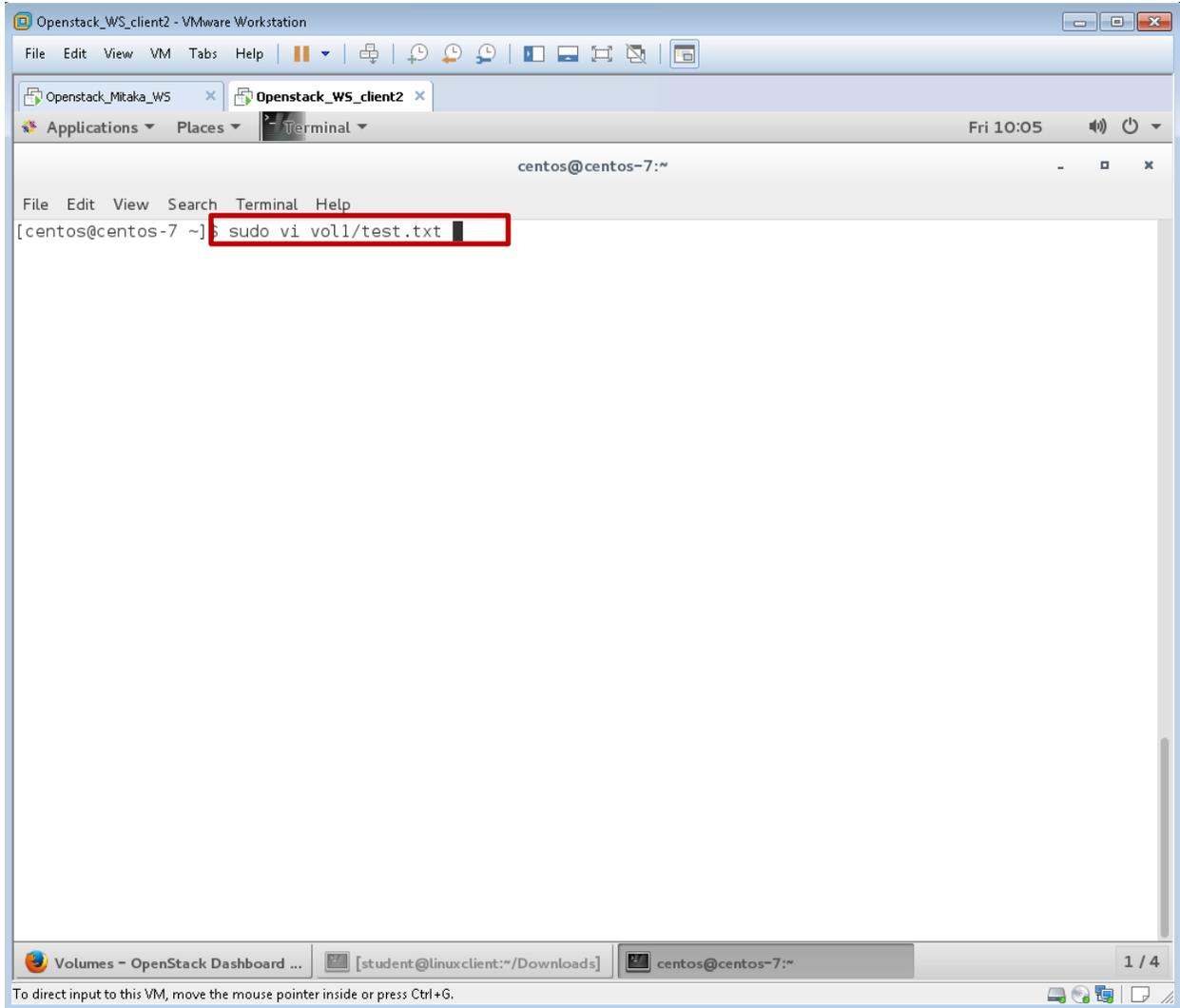
The screenshot shows a terminal window within a VMware Workstation environment. The terminal is running on a CentOS 7 instance. The user has executed several commands to create and format a file system on a virtual disk. The output shows the partition table being altered, the file system being created, and the directory being mounted. The final command, `sudo touch vol1/test.txt`, is highlighted with a red box.

```
centos@centos-7:~  
File Edit View Search Terminal Help  
Using default value 2097151  
Partition 1 of type Linux and of size 1023 MiB is set  
  
Command (m for help): w  
The partition table has been altered!  
  
Calling ioctl() to re-read partition table.  
Syncing disks.  
[centos@centos-7 ~]$ sudo mkfs.ext4 /dev/vdb  
mke2fs 1.42.9 (28-Dec-2013)  
Filesystem label=  
OS type: Linux  
Block size=4096 (log=2)  
Fragment size=4096 (log=2)  
Stride=0 blocks, Stripe width=0 blocks  
65536 inodes, 262144 blocks  
13107 blocks (5.00%) reserved for the super user  
First data block=0  
Maximum filesystem blocks=268435456  
8 block groups  
32768 blocks per group, 32768 fragments per group  
8192 inodes per group  
Superblock backups stored on blocks:  
    32768, 98304, 163840, 229376  
  
Allocating group tables: done  
Writing inode tables: done  
Creating journal (8192 blocks): done  
Writing superblocks and filesystem accounting information: done  
  
[centos@centos-7 ~]$ sudo mkdir vol1  
[centos@centos-7 ~]$ ls  
vol1  
[centos@centos-7 ~]$ sudo mount /dev/vdb vol1/  
[centos@centos-7 ~]$ sudo touch vol1/test.txt
```

17. Create a file in the new directory. Enter **# sudo touch vol1/test.txt**



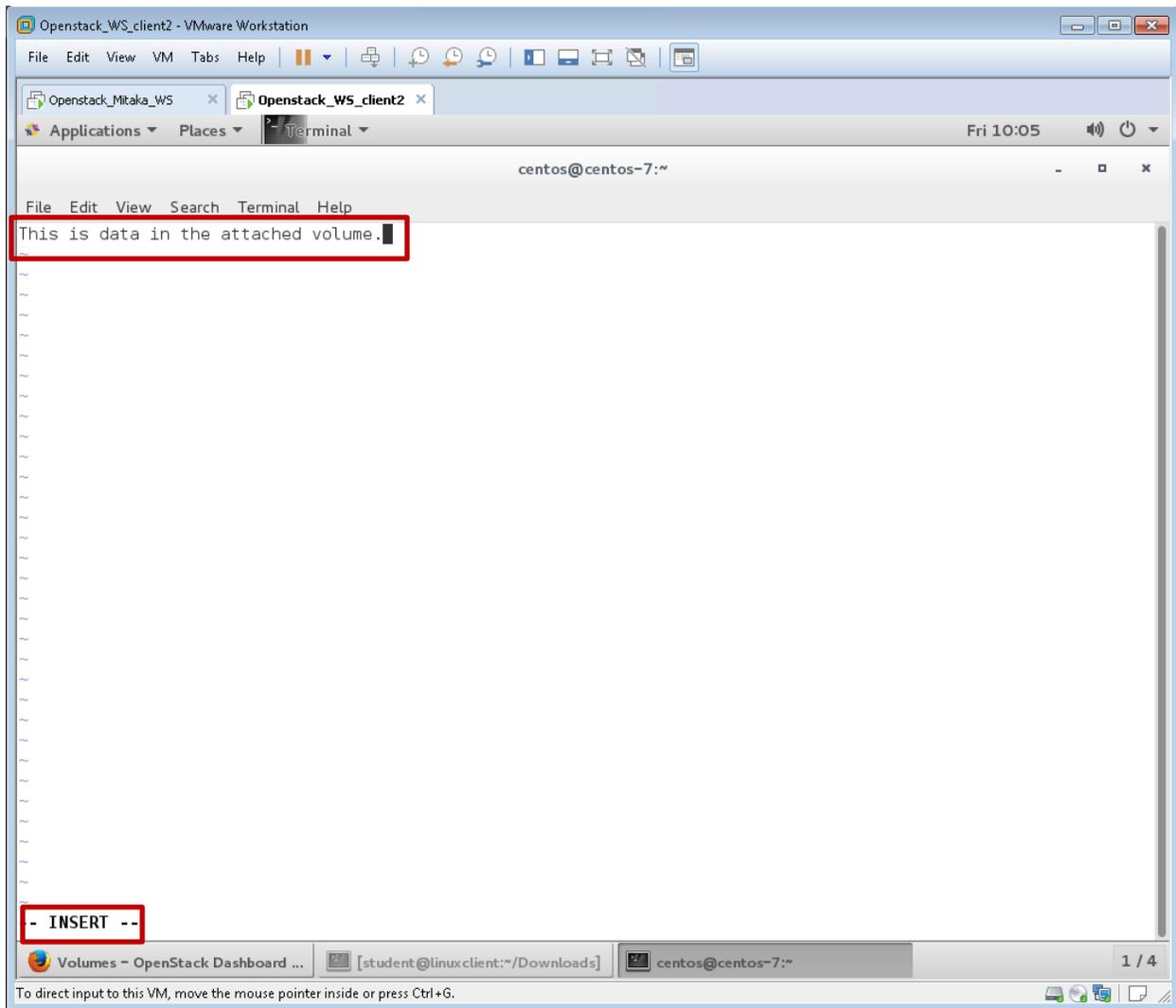
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



18. Create some data on the new vol1 volume. Enter # **sudo vi vol1/test.txt**



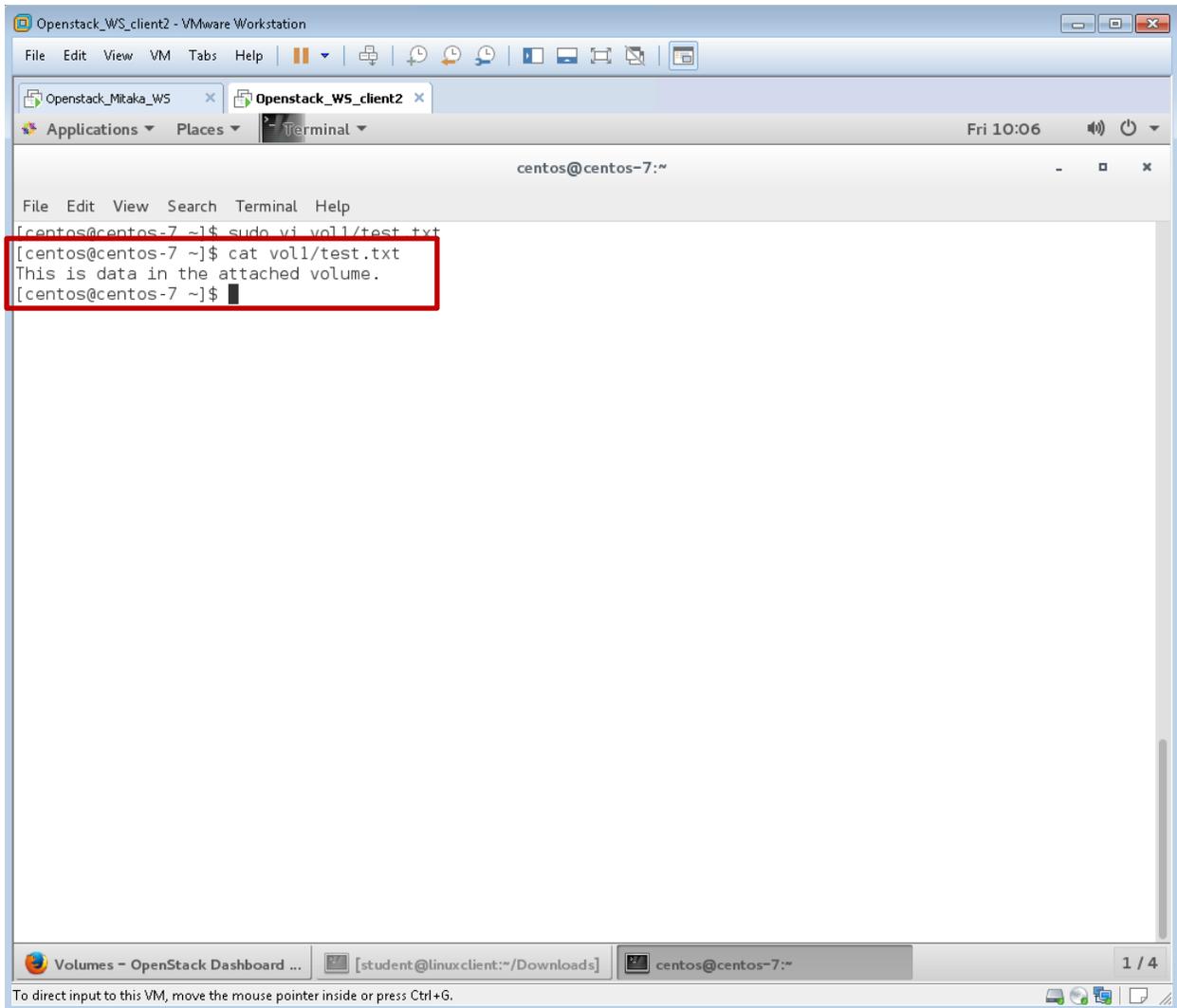
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



19. Press the **insert** button on your keyboard and add some text to the file. For example; "This is data in the attached volume."



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

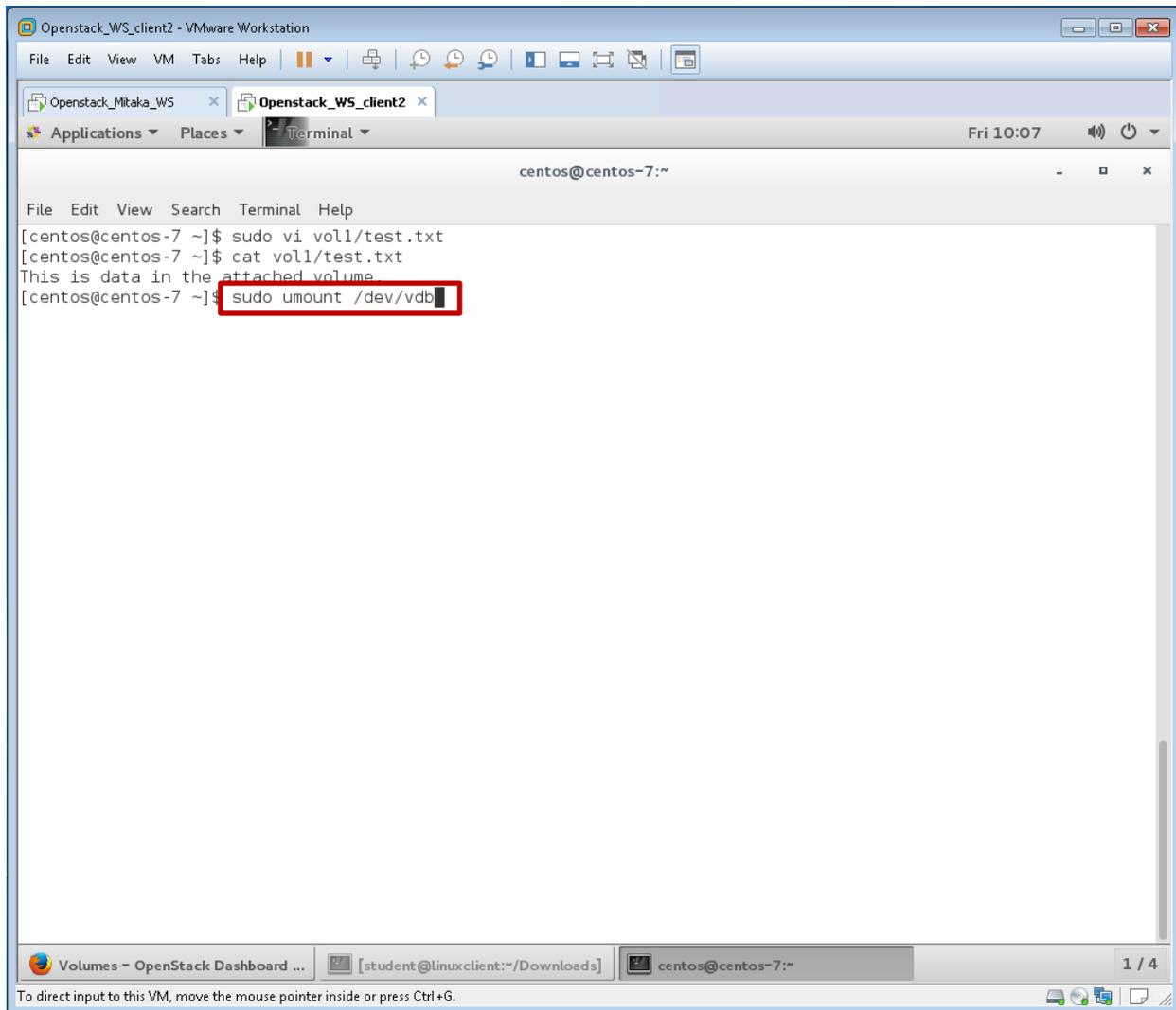


```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_W5 Openstack_WS_client2
Applications Places Terminal Fri 10:06
centos@centos-7:~
File Edit View Search Terminal Help
[centos@centos-7 ~]$ sudo vi vol1/test.txt
[centos@centos-7 ~]$ cat vol1/test.txt
This is data in the attached volume.
[centos@centos-7 ~]$
```

21. Verify that the data is present with the **cat vol1/test.txt** command.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

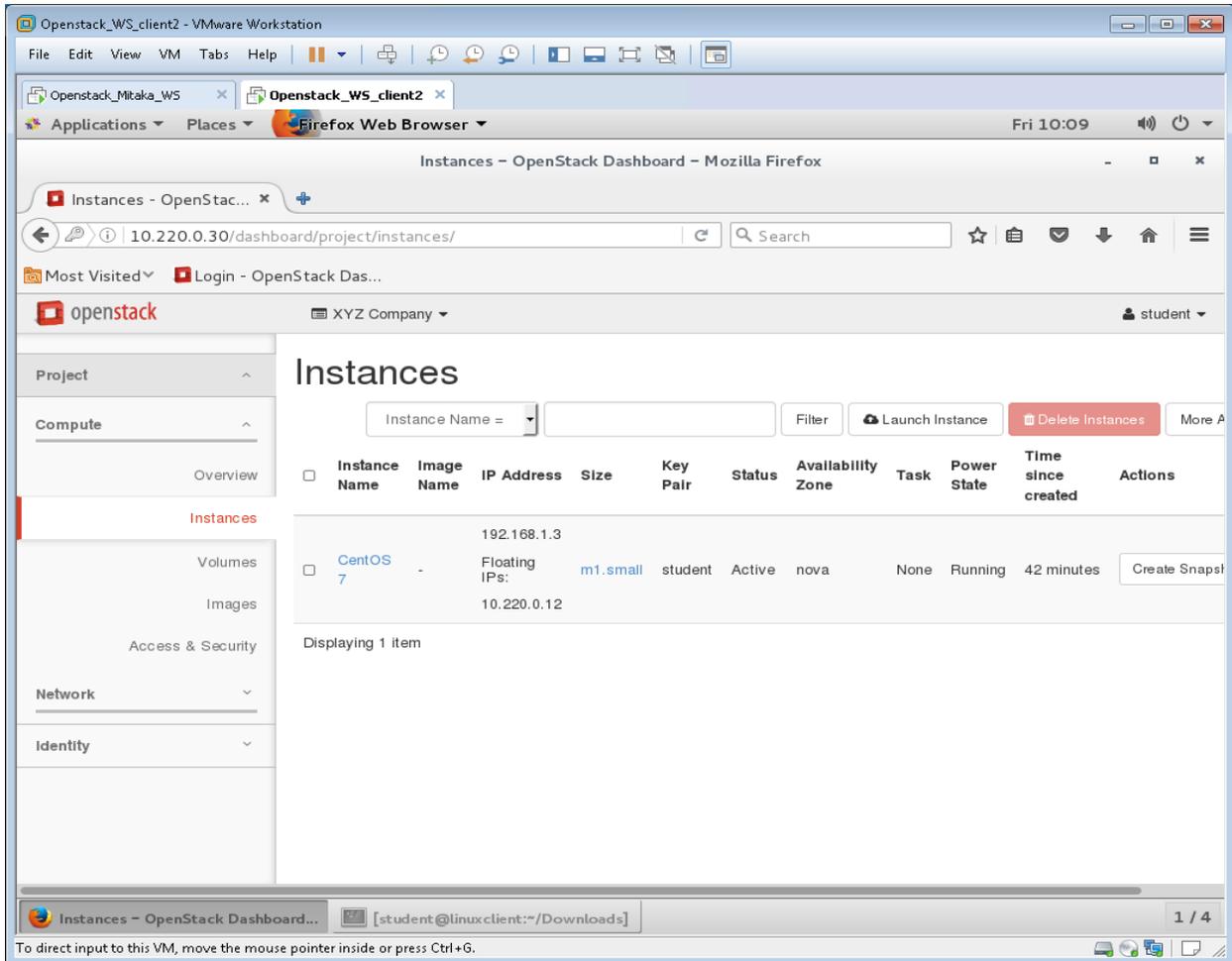


22. Detach the volume from the CentOS 7 instance using the **# sudo umount /dev/vdb vol1/** command. Close the terminal window and return to the Openstack Dashboard.

Continue to Lab 24



Lab 24: Launch a CentOS7#2 instance and attach the volume with data from CentOS 7 to the CentOS7#2 instance.



1. Create a new CentOS instance using the same techniques as the first CentOS 7 instance with the exception of the customization step. **DO NOT use the Create New Volume feature for this instance.**

Instance Name	CentOS7#2
Source	CentOS
Flavor	m1.small
Network	Private
Security Group	XYZ Company
Key Pair	Student
Floating IP Address	10.220.0.13

Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

The screenshot shows the OpenStack Dashboard 'Instances' page. The page title is 'Instances - OpenStack Dashboard - Mozilla Firefox'. The URL is '10.220.0.30/dashboard/project/instances/'. The page header includes the OpenStack logo, 'XYZ Company', and a user profile 'student'. The main content area is titled 'Instances' and features a search bar, a 'Launch Instance (Quota exceeded)' button, and a 'Delete Instances' button. Below this is a table of instances:

Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions		
<input type="checkbox"/>	CentOS7#2	centos	192.168.1.4	Floating IPs:	m1.small	student	Active	nova	None	Running	1 minute	Create Snapshot
			10.220.0.13									
<input type="checkbox"/>	CentOS 7	-	192.168.1.3	Floating IPs:	m1.small	student	Active	nova	None	Running	45 minutes	Create Snapshot
			10.220.0.12									

Displaying 2 items

2. Your instances page should match the screen capture shown. **Switch to the Volumes tab.**



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

The screenshot shows the OpenStack Dashboard interface in a Firefox browser window. The page title is "Volumes - OpenStack Dashboard - Mozilla Firefox". The URL is "10.220.0.30/dashboard/project/volumes/". The dashboard header includes the OpenStack logo, "XYZ Company", and a user profile for "student".

The main content area is titled "Volumes" and has tabs for "Volumes", "Volume Snapshots", and "Volume Consistency Groups". Below the tabs is a filter input and three buttons: "+ Create Volume", "Accept Transfer", and "Delete Volumes".

A table displays the following data:

Name	Description	Size	Status	Type	Attached To	Availability Zone	Bootable	Encrypted	Actions
vol1	my first volume	1GiB	In-use	-	Attached to CentOS 7 on /dev/vdb	nova	No	No	Edit Volume
9fef3c05-82e1-4f59-87f5-1734ae3f3143	-	10GiB	In-use	-	Attached to CentOS 7 on /dev/vda	nova	Yes	No	

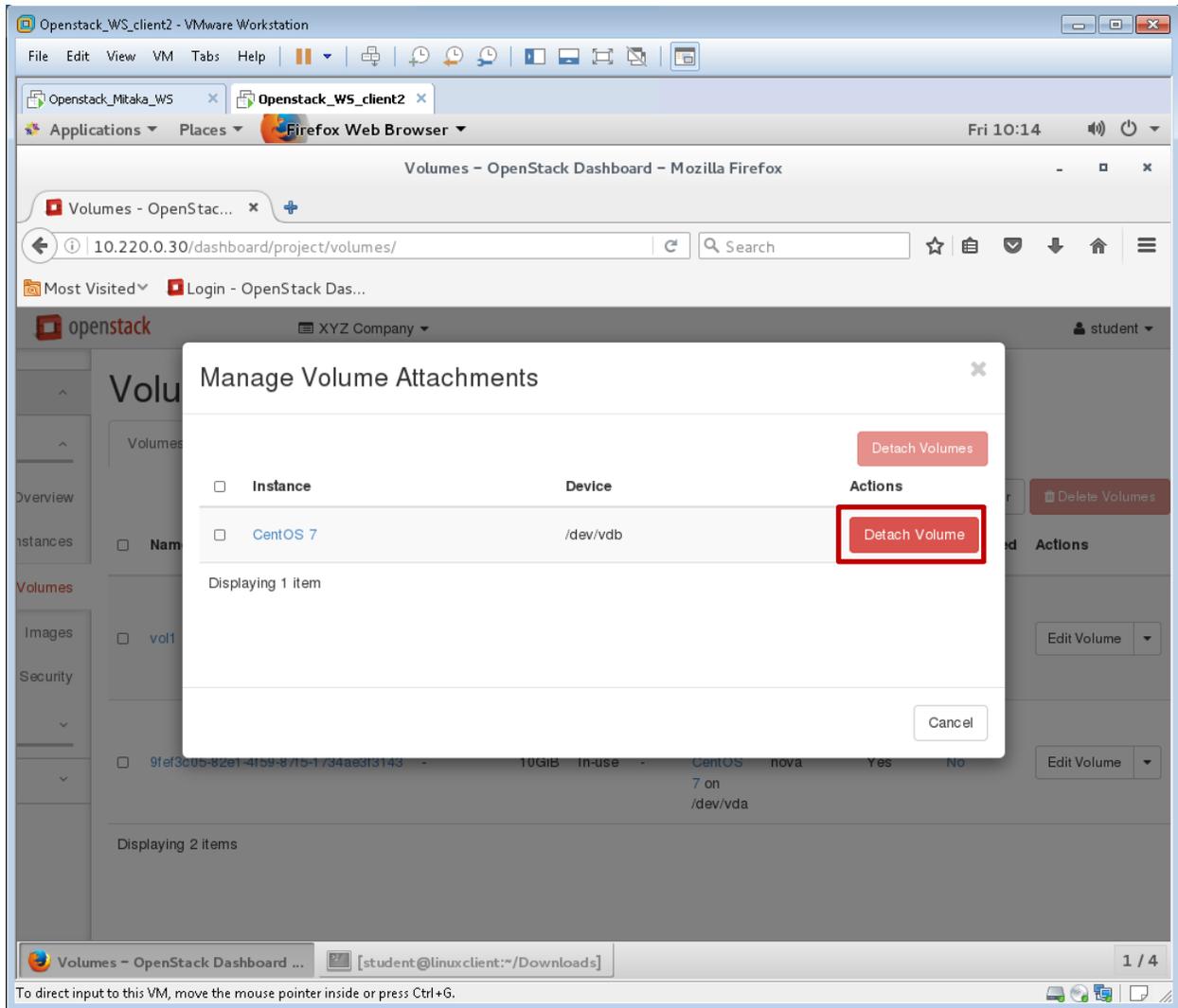
The "Edit Volume" dropdown menu for the first row is open, showing the following options: "Manage Attachments" (highlighted with a red box), "Create Snapshot", "Change Volume Type", and "Upload to Image".

At the bottom of the dashboard, it says "Displaying 2 items". The browser's address bar shows the user is logged in as "student@linuxclient:~/Downloads".

3. **Select Manage Attachments** on the same row as the vol1 volume.



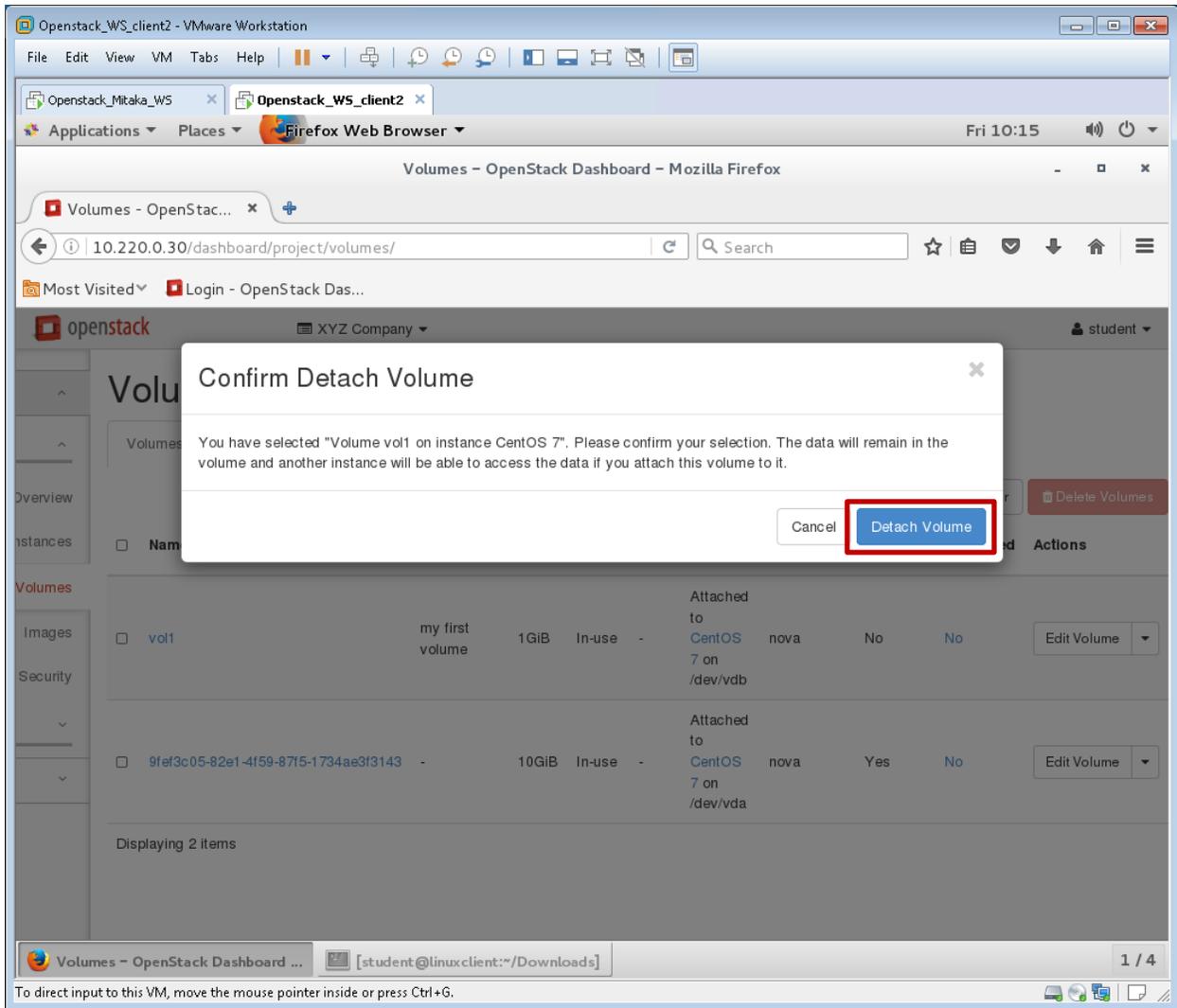
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



4. Select the **Detach Volume** button to remove the `/dev/vdb` from the CentOS 7 instance.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



5. Confirm Detach Volume.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

The screenshot shows the OpenStack Dashboard interface for managing volumes. The page title is "Volumes - OpenStack Dashboard - Mozilla Firefox". The URL is "10.220.0.30/dashboard/project/volumes/". The user is logged in as "student" under "XYZ Company".

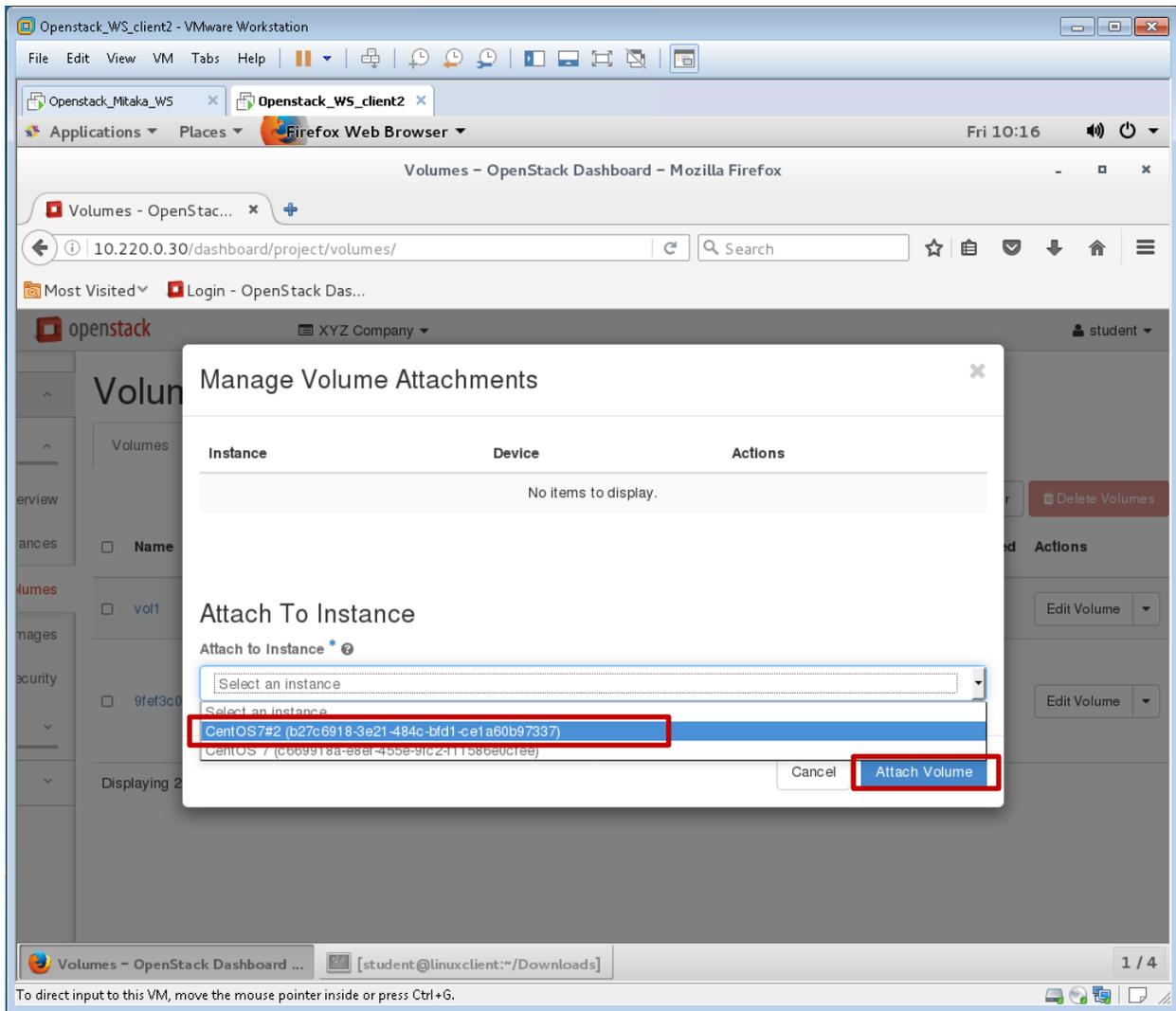
The "Volumes" section is active, showing a table of volumes. The table has columns: Name, Description, Size, Status, Type, Attached To, Availability Zone, Bootable, Encrypted, and Actions. Two volumes are listed:

Name	Description	Size	Status	Type	Attached To	Availability Zone	Bootable	Encrypted	Actions
vol1	my first volume	1 GiB	Available	-	-	nova	No	No	Edit Volume
9fef3c05-82e1-4f59-87f5-1734ae3f3143	-	10 GiB	In-use	-	Attached to CentOS 7 on /dev/vda	nova	Yes	No	Extend Volume, Manage Attachments, Create Snapshot, Change Volume Type, Upload to Image, Create Transfer, Delete Volume

The "Manage Attachments" option in the context menu for the second volume is highlighted with a red box.

6. **Confirm** that the **vol1** is **Available** in the Status column. **Click on Manage Attachments.**

Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



7. Select the **CentOS7#2** instance and click on **Attach Volume**.

Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

The screenshot shows the OpenStack Volumes dashboard. The browser window is titled "Volumes - OpenStack Dashboard - Mozilla Firefox" and the URL is "10.220.0.30/dashboard/project/volumes/". The dashboard header includes the OpenStack logo, "XYZ Company", and a user profile "student". The left sidebar shows navigation options for Project, Compute, Network, and Identity. The main content area is titled "Volumes" and has tabs for "Volumes", "Volume Snapshots", and "Volume Consistency Groups". A table of volumes is displayed with the following data:

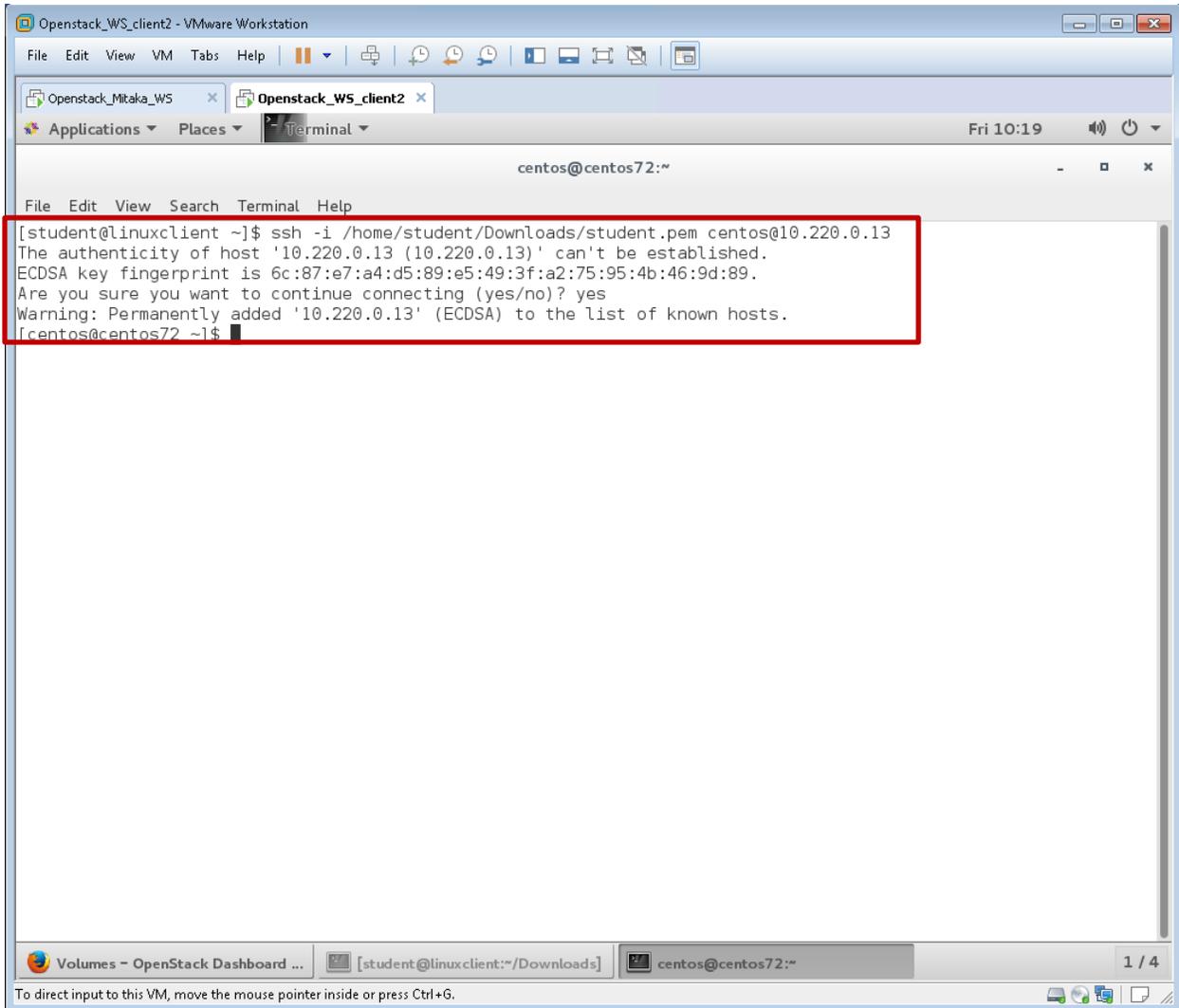
Name	Description	Size	Status	Type	Attached To	Availability Zone	Bootable	Encrypted
vol1	my first volume	1GiB	In-use	-	Attached to CentOS7#2 on /dev/vdb	nova	No	No
9fef3c05-82e1-4f59-87f5-1734ae3f3143	-	10GiB	In-use	-	Attached to CentOS 7 on /dev/vda	nova	Yes	No

The first row of the table is highlighted with a red box. The status bar at the bottom of the browser window shows "Volumes - OpenStack Dashboard ..." and "[student@linuxclient:~/Downloads]".

8. Verify that vol1 is Attached to CentOS7#2 on /dev/vdb



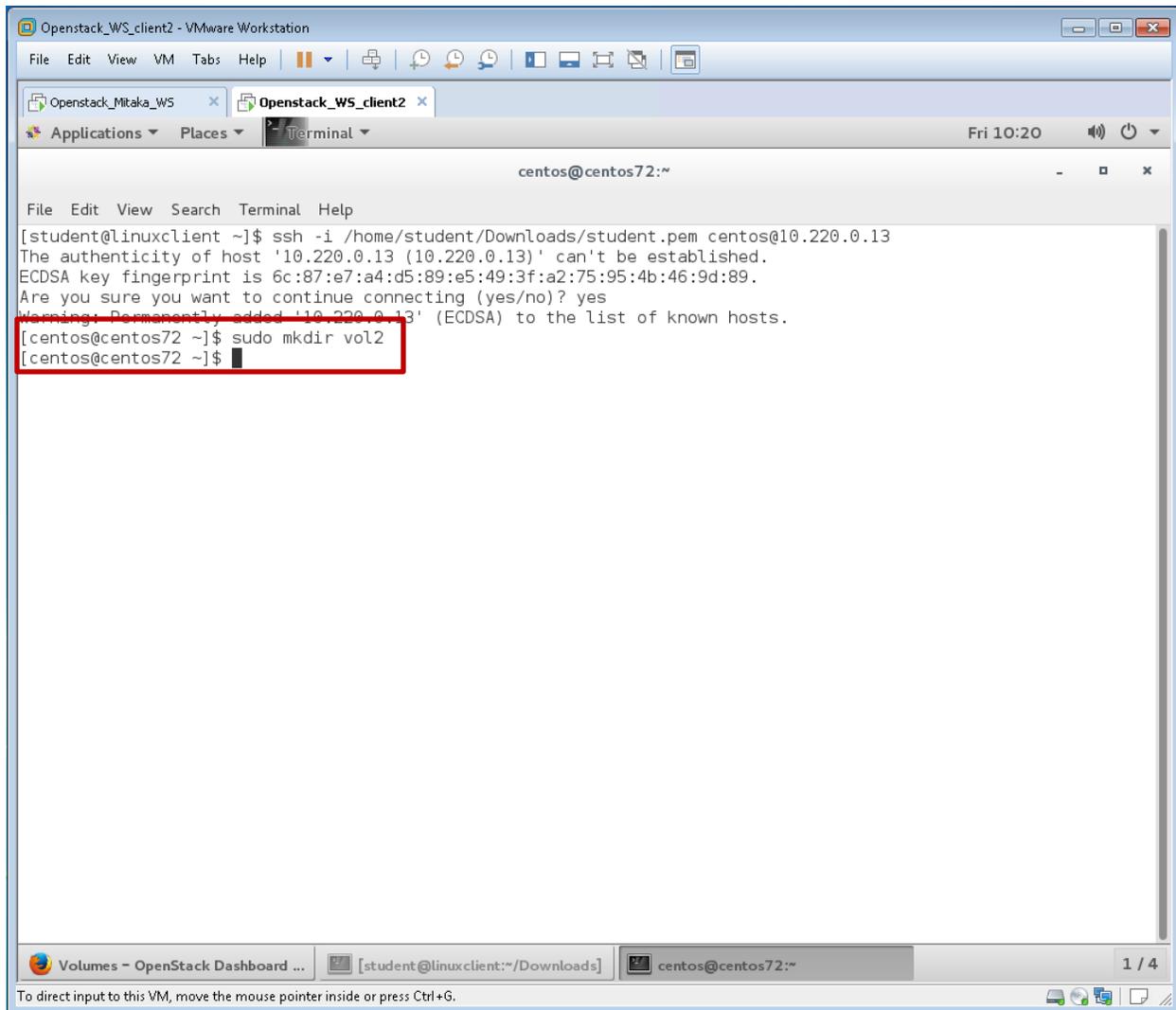
Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



9. SSH into the CentOS7#2 instance.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



The screenshot shows a VMware Workstation window titled "Openstack_WS_client2 - VMware Workstation". Inside, there is a terminal window titled "centos@centos72:~". The terminal output shows the following commands and responses:

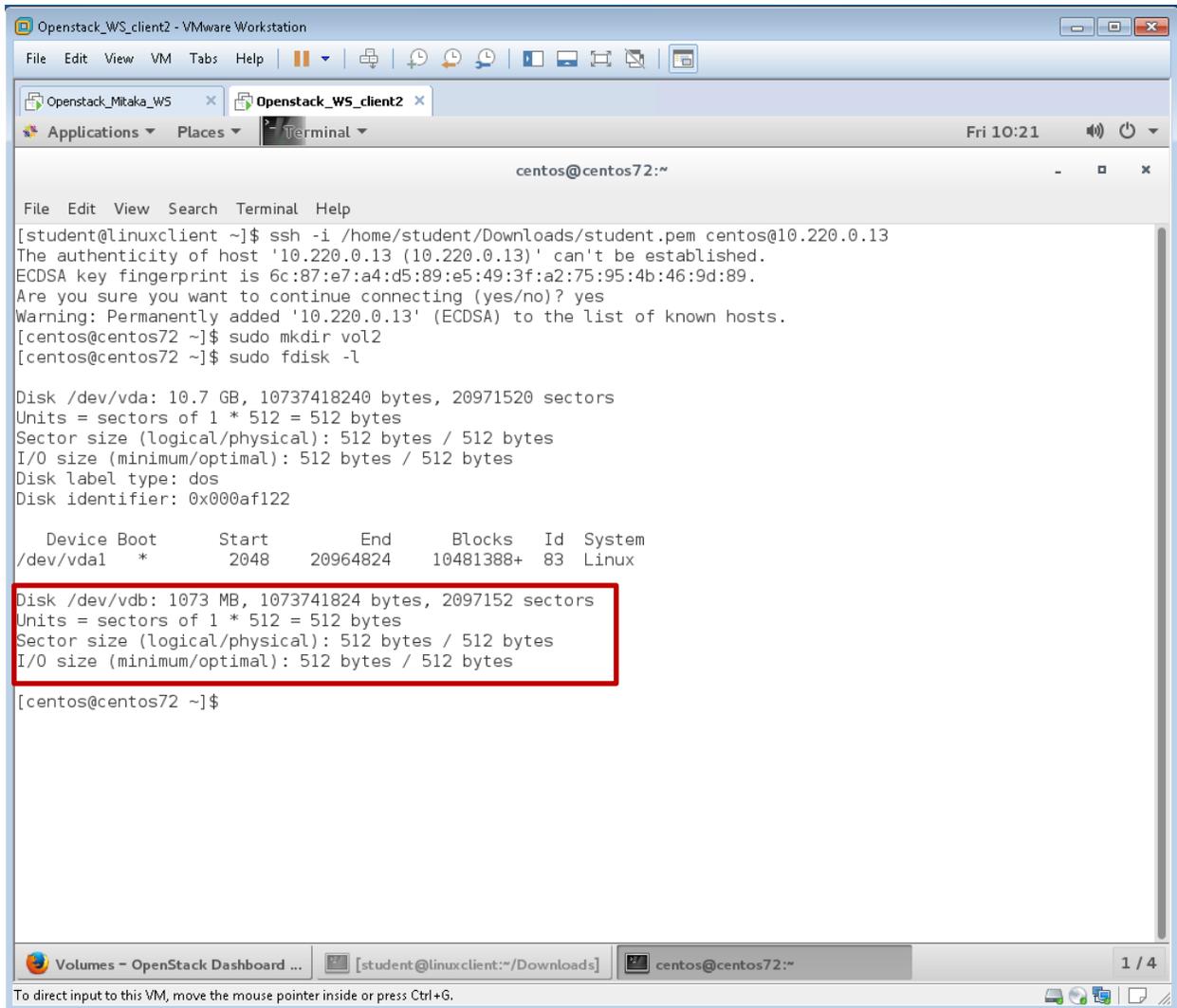
```
[student@linuxclient ~]$ ssh -i /home/student/Downloads/student.pem centos@10.220.0.13
The authenticity of host '10.220.0.13 (10.220.0.13)' can't be established.
ECDSA key fingerprint is 6c:87:e7:a4:d5:89:e5:49:3f:a2:75:95:4b:46:9d:89.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.220.0.13' (ECDSA) to the list of known hosts.
[centos@centos72 ~]$ sudo mkdir vol2
[centos@centos72 ~]$
```

The command `sudo mkdir vol2` is highlighted with a red box in the original image. The terminal window also shows a menu bar with "File", "Edit", "View", "Search", "Terminal", and "Help". The bottom status bar of the terminal window shows "Volumes - OpenStack Dashboard ..." and "centos@centos72:~".

10. Create a new directory vol2 to mount the volume (disk) to using the # **sudo mkdir vol2** command.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS Openstack_WS_client2
Applications Places Terminal Fri 10:21
centos@centos72:~
File Edit View Search Terminal Help
[student@linuxclient ~]$ ssh -i /home/student/Downloads/student.pem centos@10.220.0.13
The authenticity of host '10.220.0.13 (10.220.0.13)' can't be established.
ECDSA key fingerprint is 6c:87:e7:a4:d5:89:e5:49:3f:a2:75:95:4b:46:9d:89.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.220.0.13' (ECDSA) to the list of known hosts.
[centos@centos72 ~]$ sudo mkdir vol2
[centos@centos72 ~]$ sudo fdisk -l

Disk /dev/vda: 10.7 GB, 10737418240 bytes, 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000af122

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1  *           2048     20964824    10481388+  83  Linux

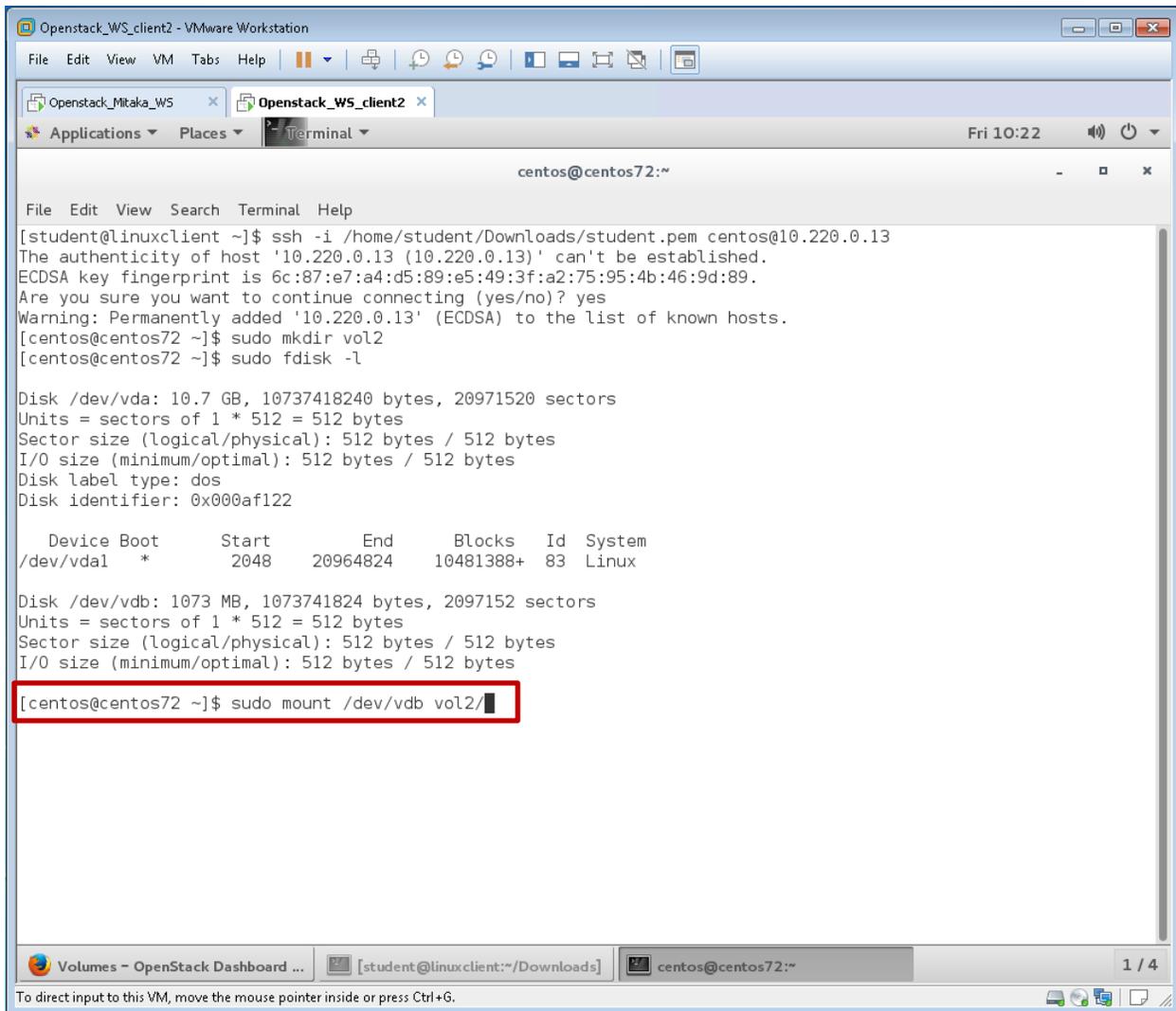
Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

[centos@centos72 ~]$
```

11. Using the # **sudo fdisk -l** command, verify that **/dev/vdb** is present.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



The screenshot shows a terminal window titled 'centos@centos72:~' within a VMware Workstation environment. The terminal displays the following sequence of commands and their outputs:

```
[student@linuxclient ~]$ ssh -i /home/student/Downloads/student.pem centos@10.220.0.13
The authenticity of host '10.220.0.13 (10.220.0.13)' can't be established.
ECDSA key fingerprint is 6c:87:e7:a4:d5:89:e5:49:3f:a2:75:95:4b:46:9d:89.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.220.0.13' (ECDSA) to the list of known hosts.
[centos@centos72 ~]$ sudo mkdir vol2
[centos@centos72 ~]$ sudo fdisk -l

Disk /dev/vda: 10.7 GB, 10737418240 bytes, 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000af122

   Device Boot      Start         End      Blocks   Id  System
  /dev/vda1  *        2048     20964824     10481388+  83  Linux

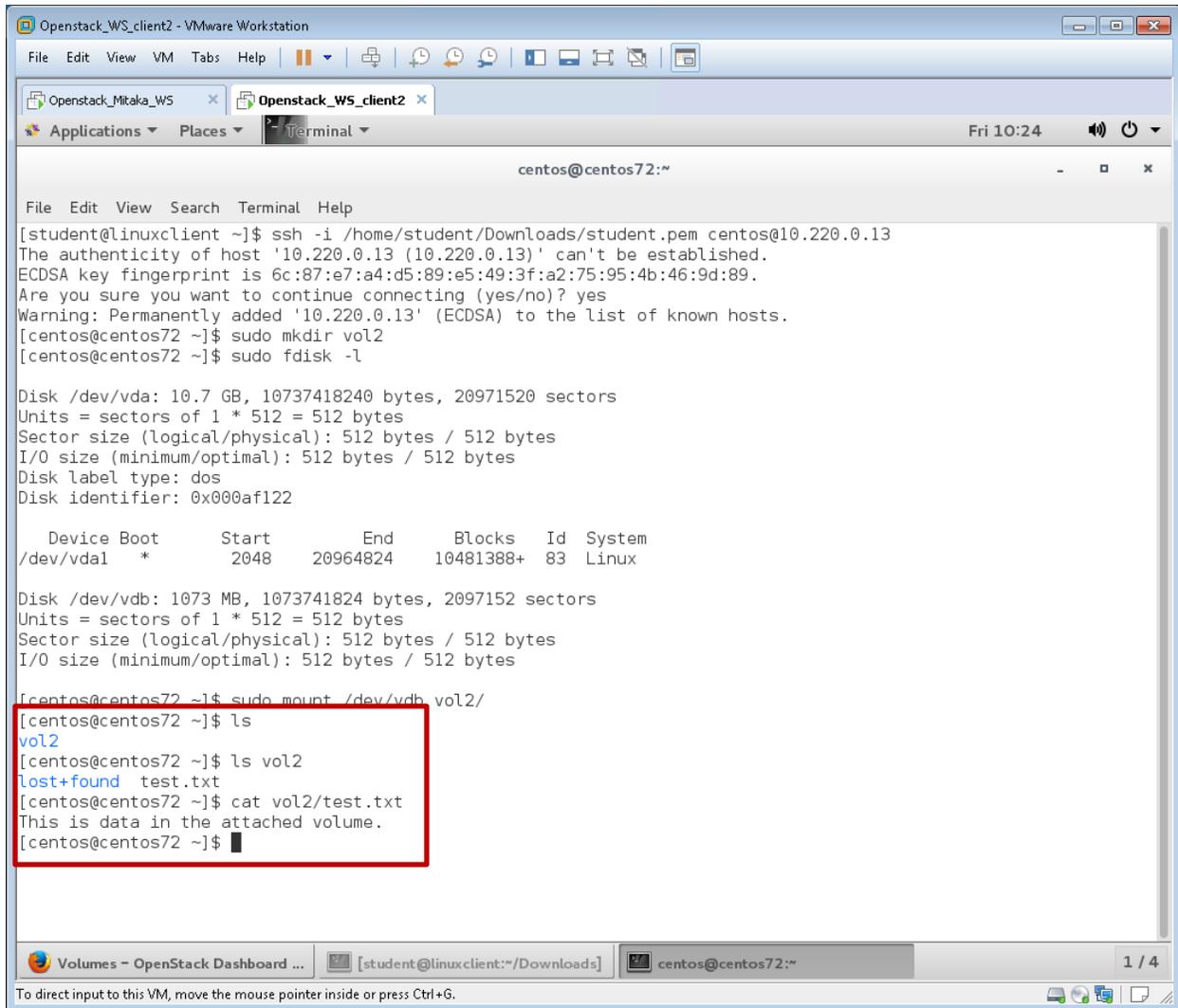
Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
[centos@centos72 ~]$ sudo mount /dev/vdb vol2/
```

The last command, `sudo mount /dev/vdb vol2/`, is highlighted with a red box in the original image. The terminal window also shows a taskbar at the bottom with a 'Volumes - OpenStack Dashboard ...' window and a status bar indicating '1 / 4'.

12. Mount `/dev/vdb` to the `vol2` directory using the `# sudo mount /dev/vdb vol2/` command.



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



```
Openstack_WS_client2 - VMware Workstation
File Edit View VM Tabs Help
Openstack_Mitaka_WS Openstack_WS_client2
Applications Places Terminal Fri 10:24

centos@centos72:~
File Edit View Search Terminal Help
[student@linuxclient ~]$ ssh -i /home/student/Downloads/student.pem centos@10.220.0.13
The authenticity of host '10.220.0.13 (10.220.0.13)' can't be established.
ECDSA key fingerprint is 6c:87:e7:a4:d5:89:e5:49:3f:a2:75:95:4b:46:9d:89.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.220.0.13' (ECDSA) to the list of known hosts.
[centos@centos72 ~]$ sudo mkdir vol2
[centos@centos72 ~]$ sudo fdisk -l

Disk /dev/vda: 10.7 GB, 10737418240 bytes, 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000af122

   Device Boot      Start         End      Blocks   Id  System
  /dev/vda1  *        2048     20964824     10481388+  83  Linux

Disk /dev/vdb: 1073 MB, 1073741824 bytes, 2097152 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

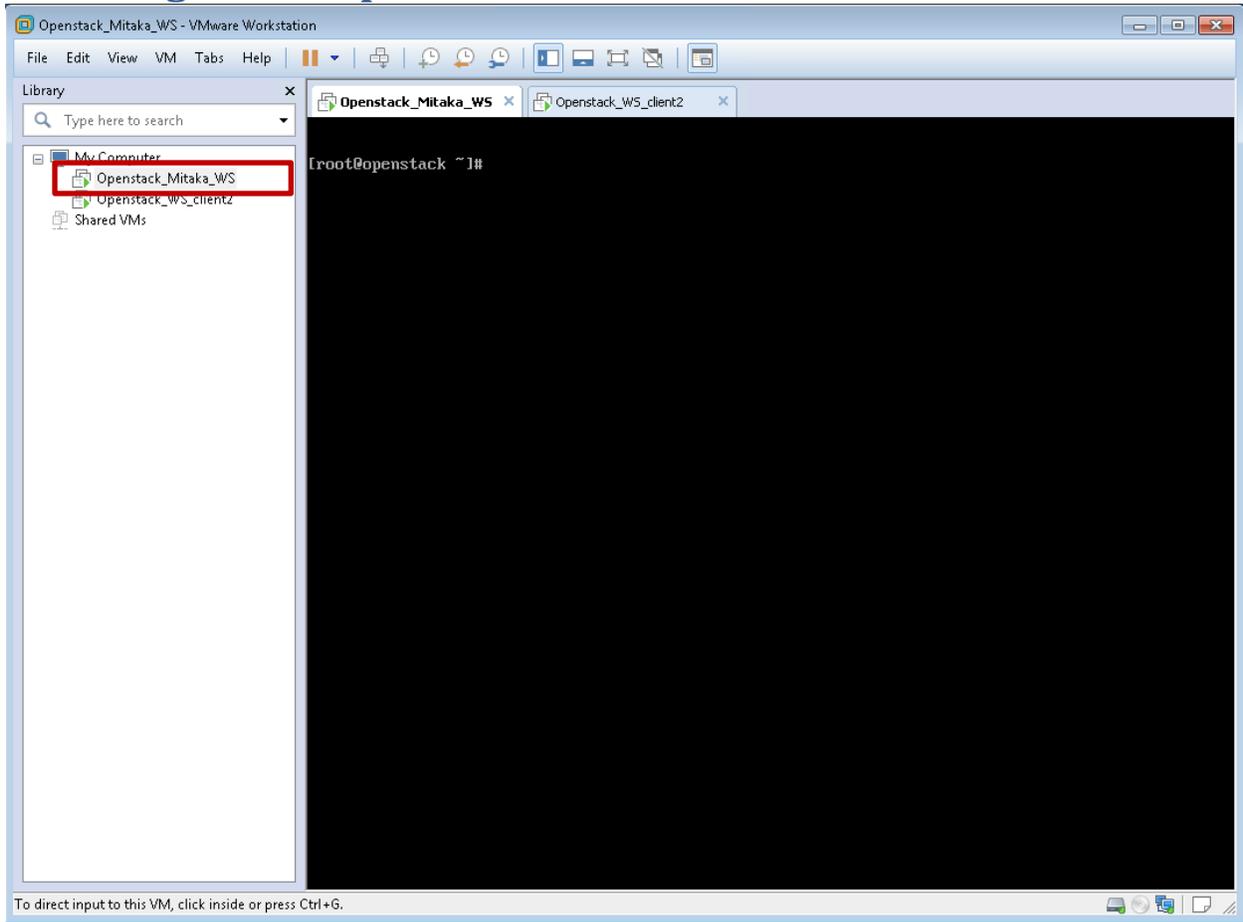
[centos@centos72 ~]$ sudo mount /dev/vdb vol2/
[centos@centos72 ~]$ ls
vol2
[centos@centos72 ~]$ ls vol2
lost+found test.txt
[centos@centos72 ~]$ cat vol2/test.txt
This is data in the attached volume.
[centos@centos72 ~]$
```

13. Using the `ls` and `cat` commands, verify that the data that was created on `vol1`, while attached to the CentOS 7 instance, is still present. The file system was retained and the only steps required were to create a directory and mount the `/dev/vdb` volume to that directory. Do not detach or unmount the volume, the grade script will look for the attached volume. This completes the Module 9 labs.

Continue to the grade script.



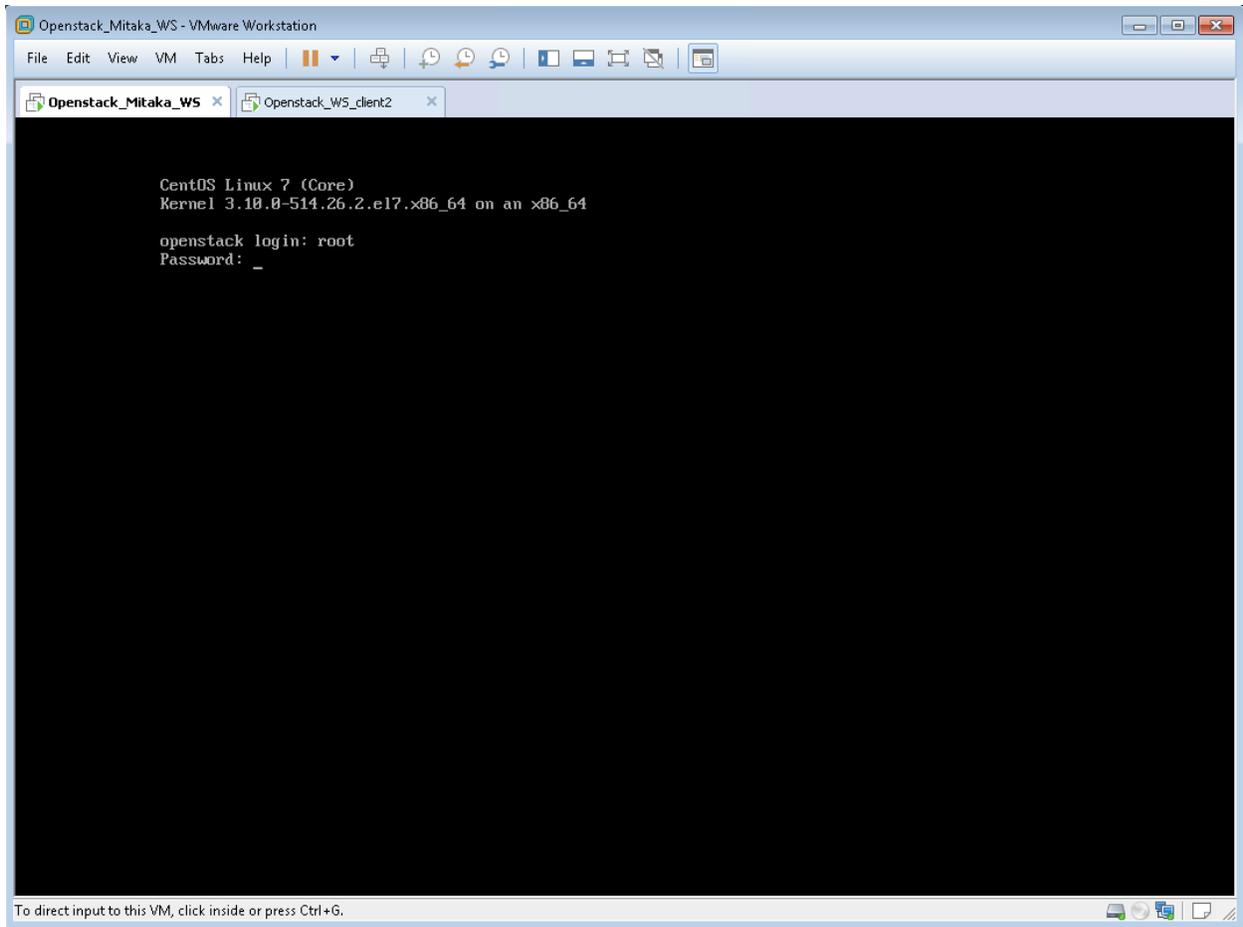
Run the grade script



1. Return to Workstation and **Click on OpenStack_WS VM**

Note: The OpenStack_WS console may still be open on your desktop from when you ran the setup script

Module 9: Launch a CentOS 7 instance with a customization script and manage volumes

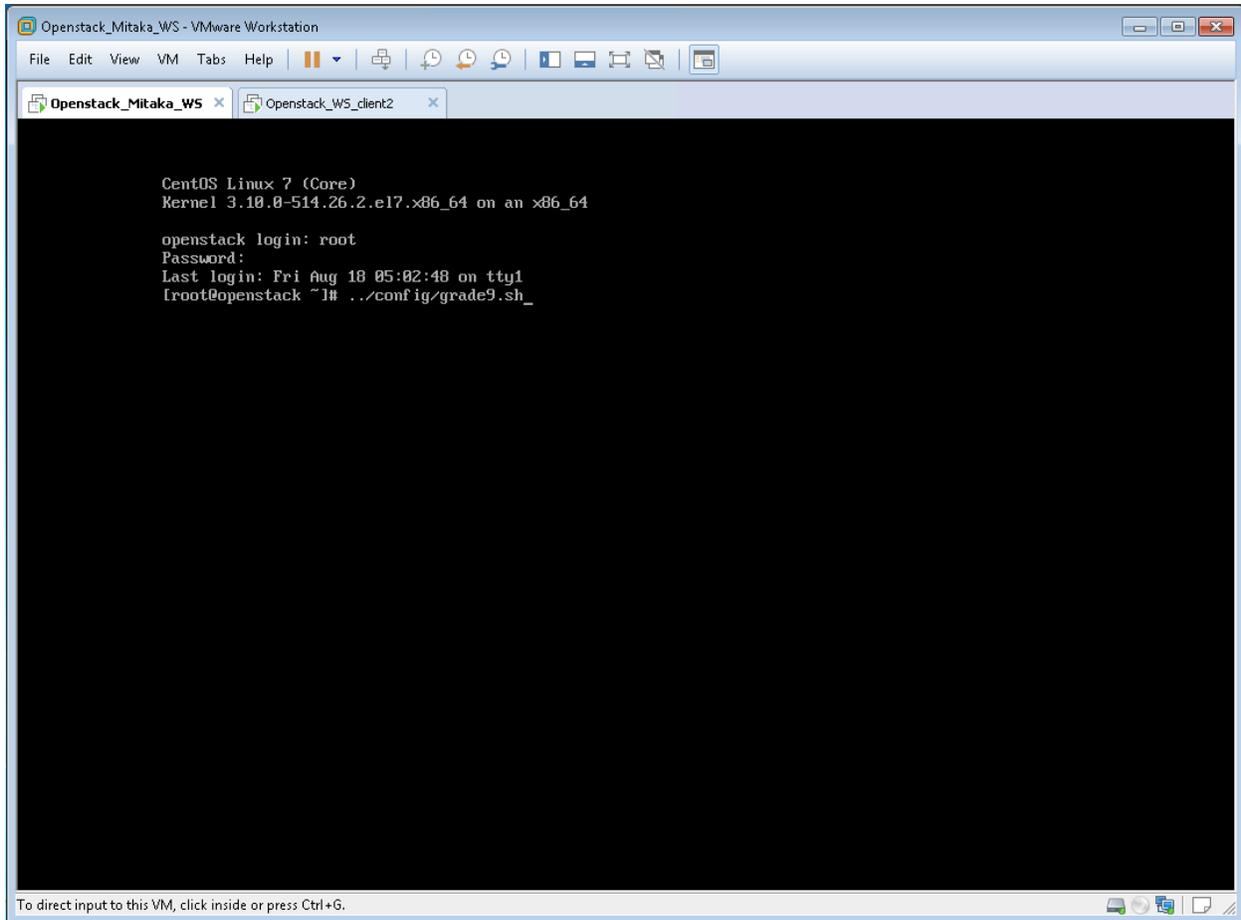


2. Log in as root with the Password: P@ssword

Note: The password is NOT visible as you type it



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



The screenshot shows a VMware Workstation window titled "Openstack_Mitaka_WS - VMware Workstation". The window contains two tabs: "Openstack_Mitaka_WS" and "Openstack_WS_client2". The active tab displays a terminal window with the following text:

```
CentOS Linux 7 (Core)
Kernel 3.10.0-514.26.2.el7.x86_64 on an x86_64

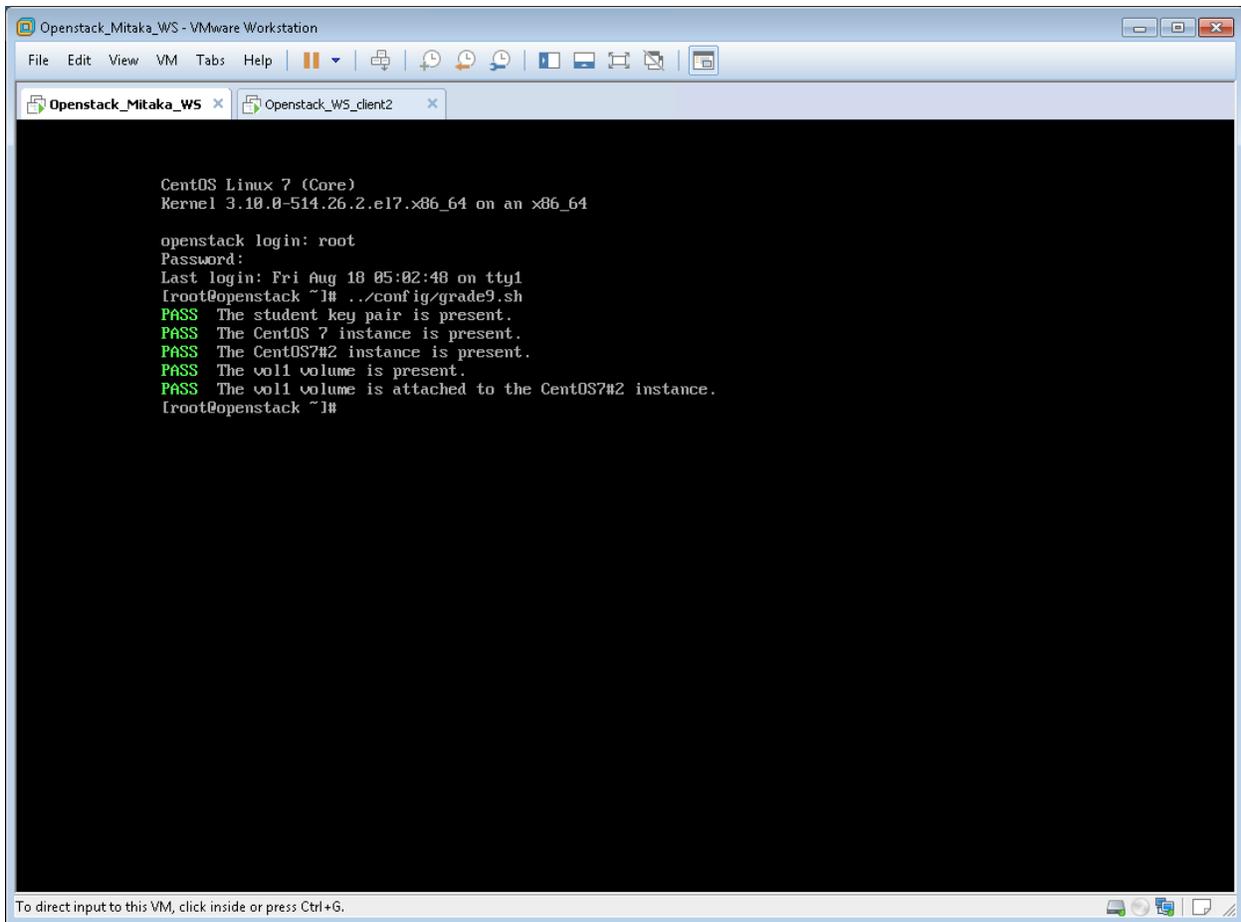
openstack login: root
Password:
Last login: Fri Aug 18 05:02:48 on tty1
root@openstack ~]# ../config/grade9.sh_
```

At the bottom of the terminal window, there is a status bar that reads: "To direct input to this VM, click inside or press Ctrl+G."

3. Enter the command; `../config/grade9.sh` and **press Enter**



Module 9: Launch a CentOS 7 instance with a customization script and manage volumes



```
CentOS Linux 7 (Core)
Kernel 3.10.0-514.26.2.el7.x86_64 on an x86_64

openstack login: root
Password:
Last login: Fri Aug 18 05:02:48 on tty1
root@openstack ~]# ./config/grade9.sh
PASS The student key pair is present.
PASS The CentOS 7 instance is present.
PASS The CentOS7#2 instance is present.
PASS The vol1 volume is present.
PASS The vol1 volume is attached to the CentOS7#2 instance.
root@openstack ~]#
```

4. The grading script will produce an output with **PASS** or **FAIL** for each of the categories, similar to the screen capture above. If you receive a **FAIL** on one or more of the categories, you can go back and fix the issue and run the grading script again, or you can revert the OpenStack_Mitaka_WS VM to the base snapshot and start over again.

This completes Module 9, continue to conclusion



Conclusion:

You have successfully assisted the customer in creating a CentOS instance with a customization script to enable the apache web service and demonstrated how to verify that the service is active. Your next field visit to XYZ Company will be to show the user how to create, attach, and detach a volume on several CentOS 7 instances.

