

PA2 Tutorial

CS 4740 Cloud Computing

Department of Computer Science, University of Virginia, USA

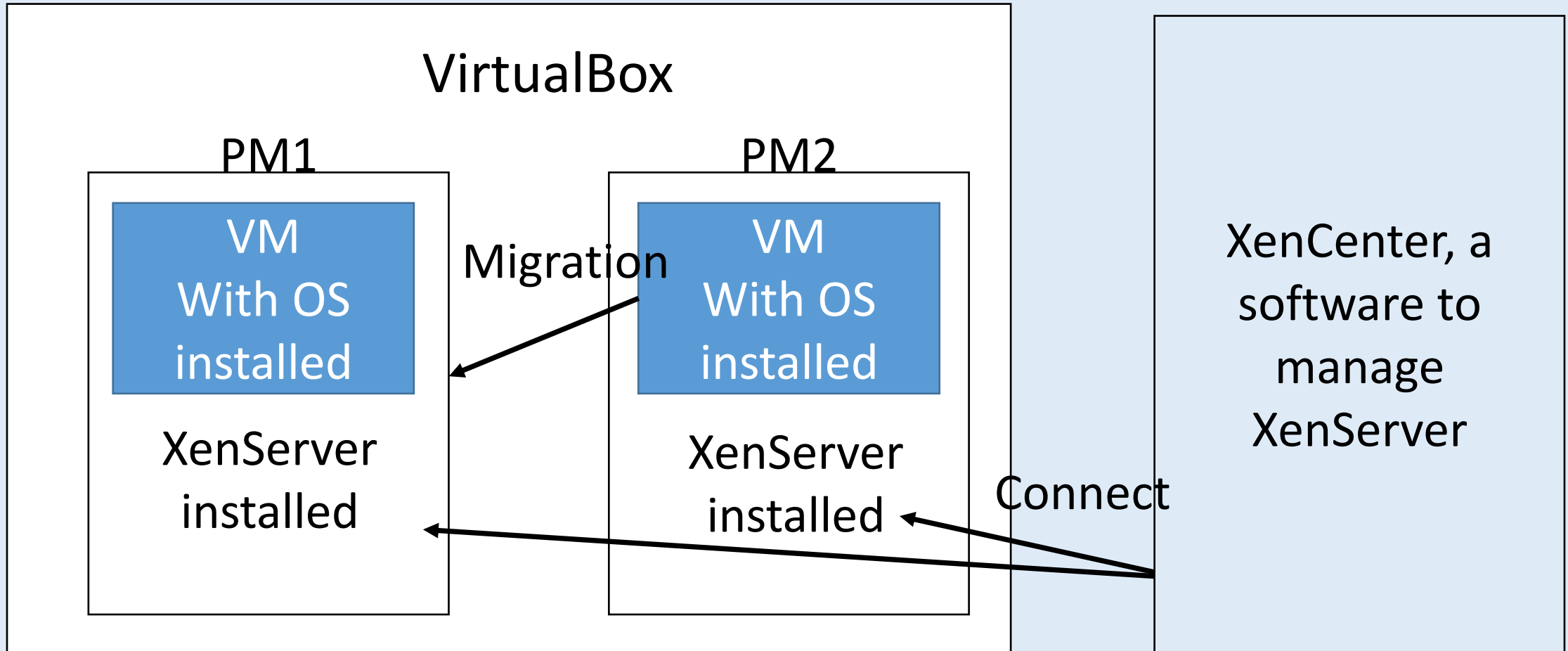
Goal of this PA

- Gain hand-on experience about virtualization technique of type-1 hypervisor Xen
- Know about VM creation
- Try live migrations

Why installing Xen on VirtualBox?

- Type-1 hypervisor
 - Bare-metal hypervisor
 - Should be installed directly beyond hardware without host OS
- Your PC is installed with Windows (or other OS)
- You do not want to install Xen on your PC directly

Your PC (Windows OS)



Steps of the assignment

1. Install Virtual Box
- 2 . Open VirtualBox, create two new VMs ---- here we use the two new VMs to emulate two PMs.
3. When you create VMs on VirtualBox, you will need to specify the name of your VM.

Illustration of Step 3: Creating VM in Virtual box: Naming and OS

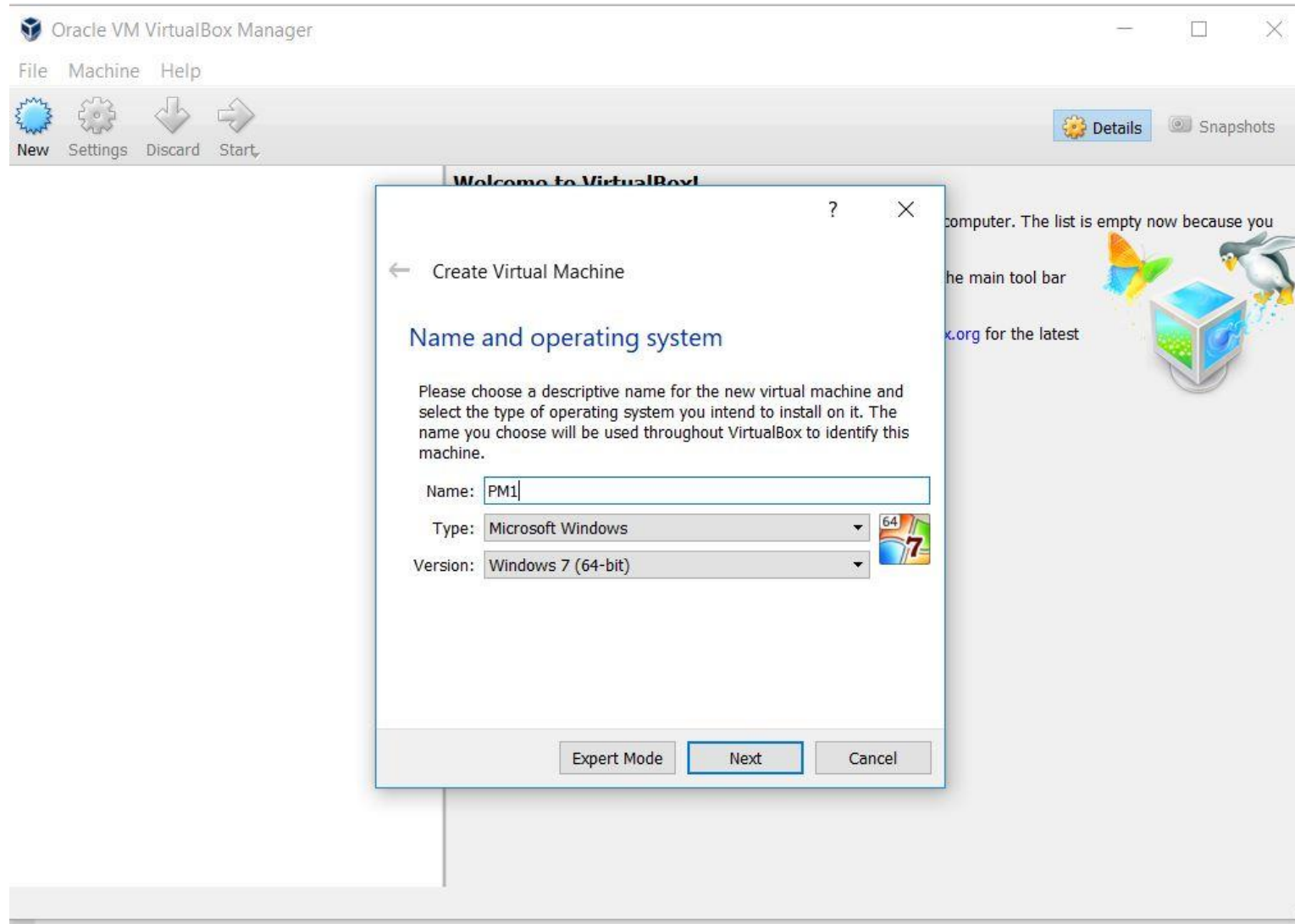


Illustration of Step 3: Creating VM in Virtual box: Setting memory size

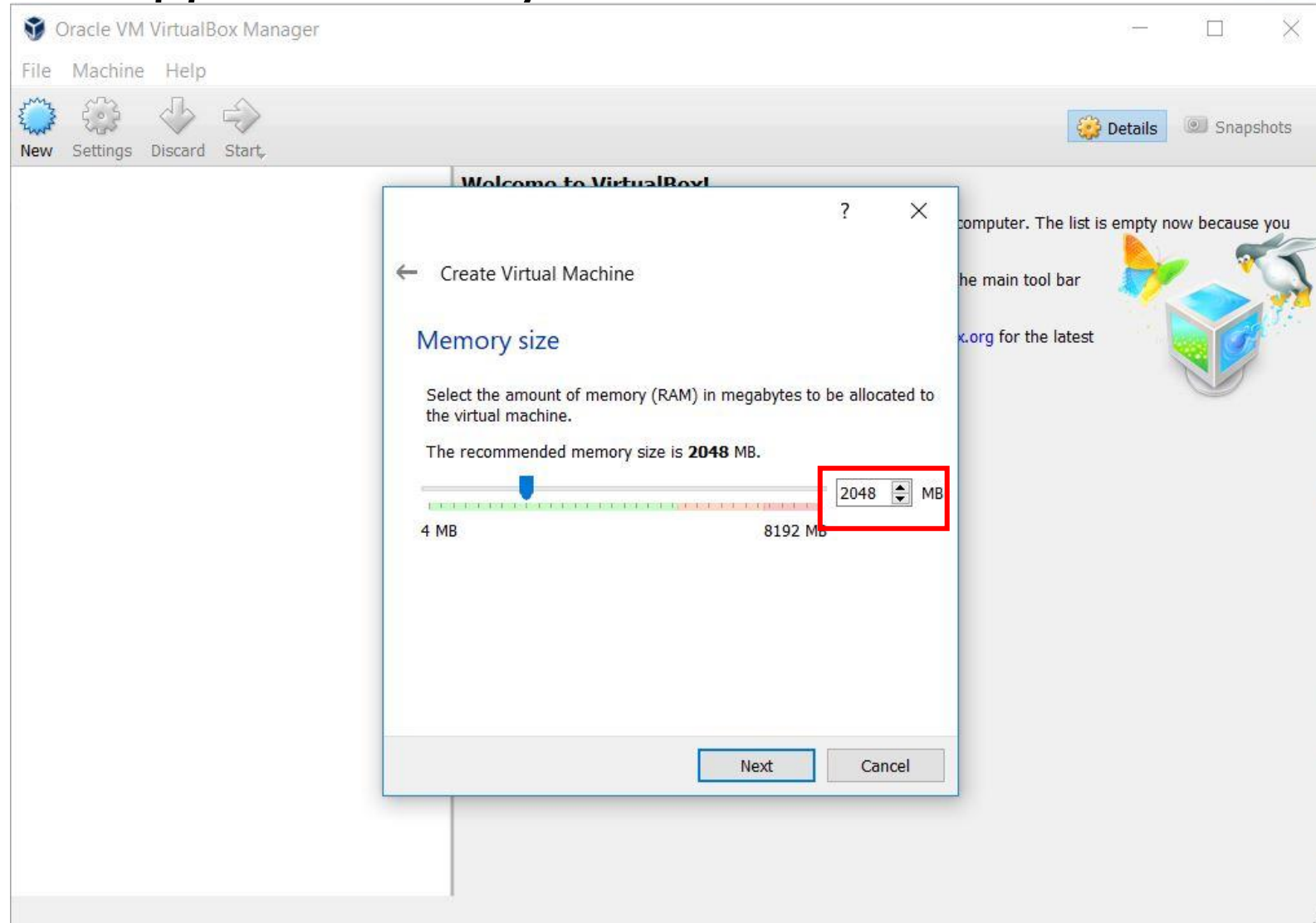


Illustration of Step 3: Creating VM in Virtual box: Creating Virtual disk

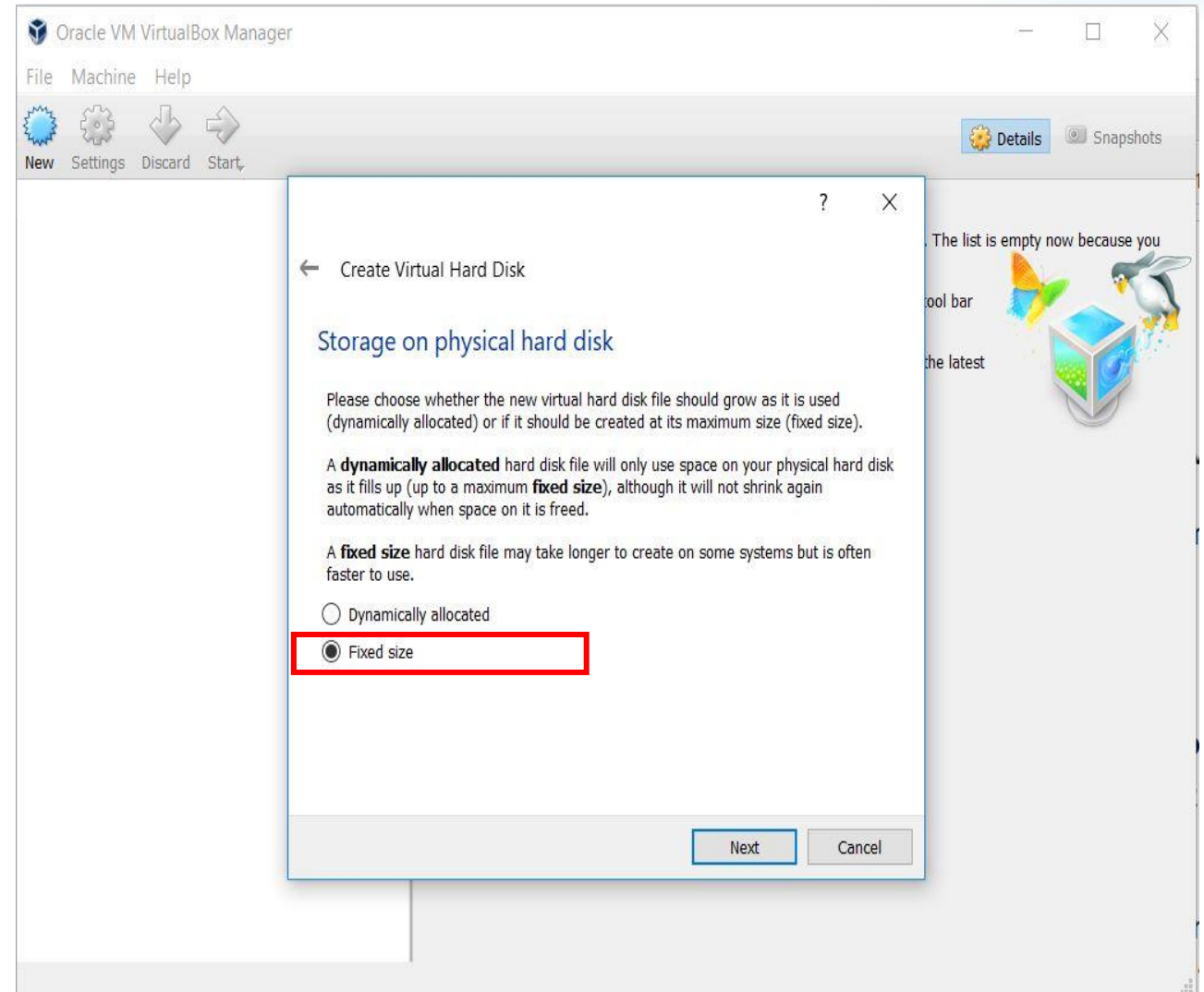
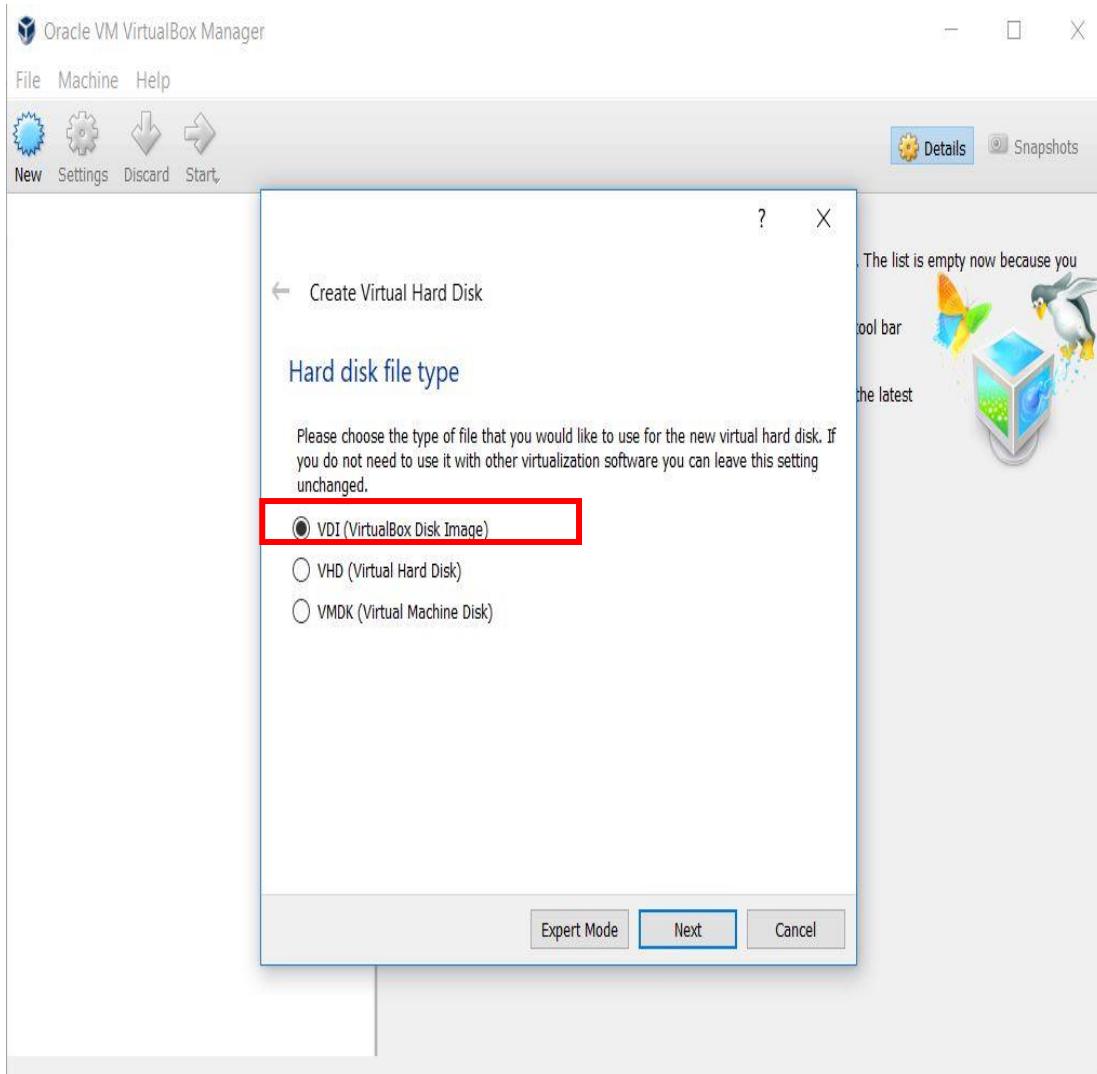
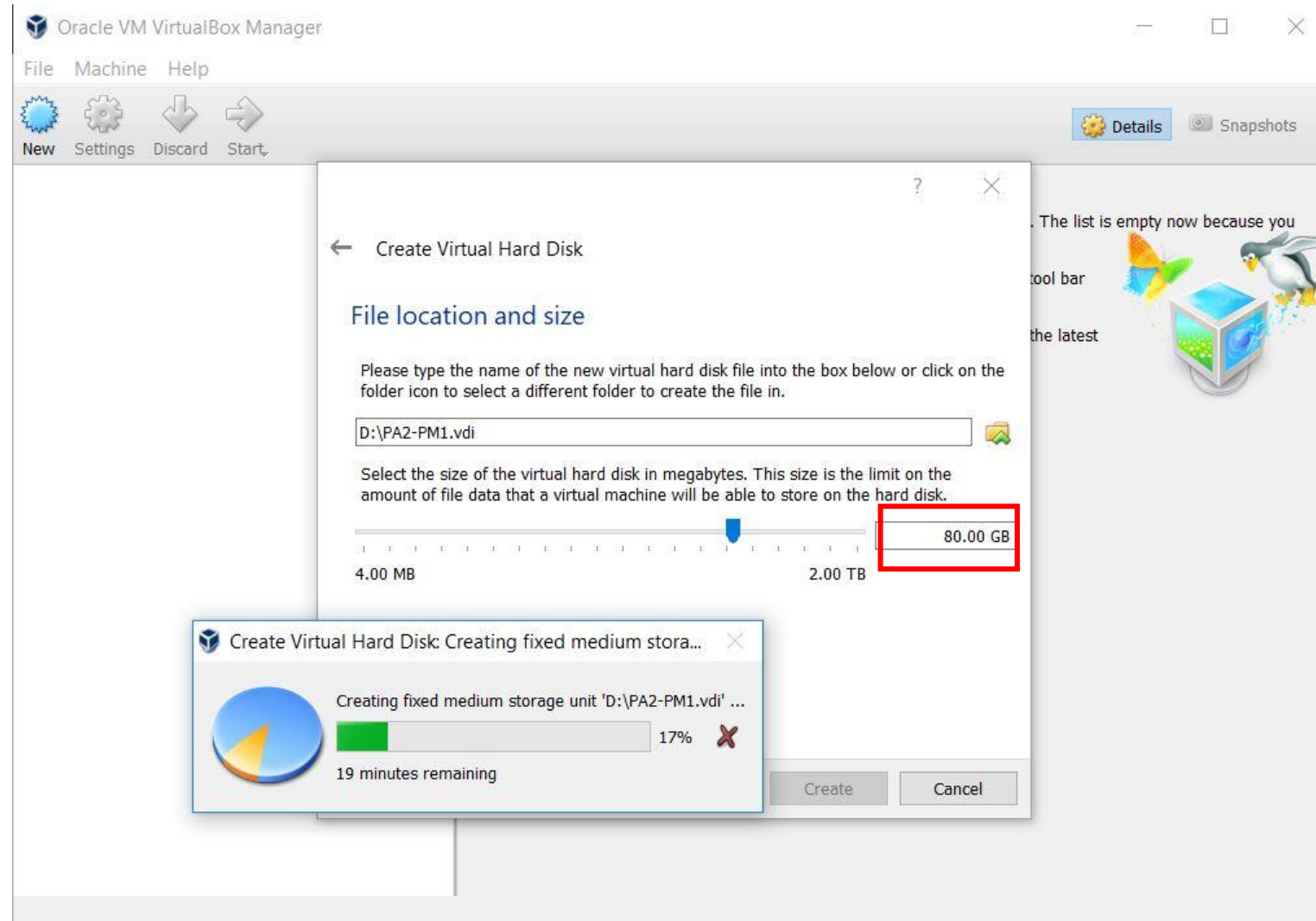


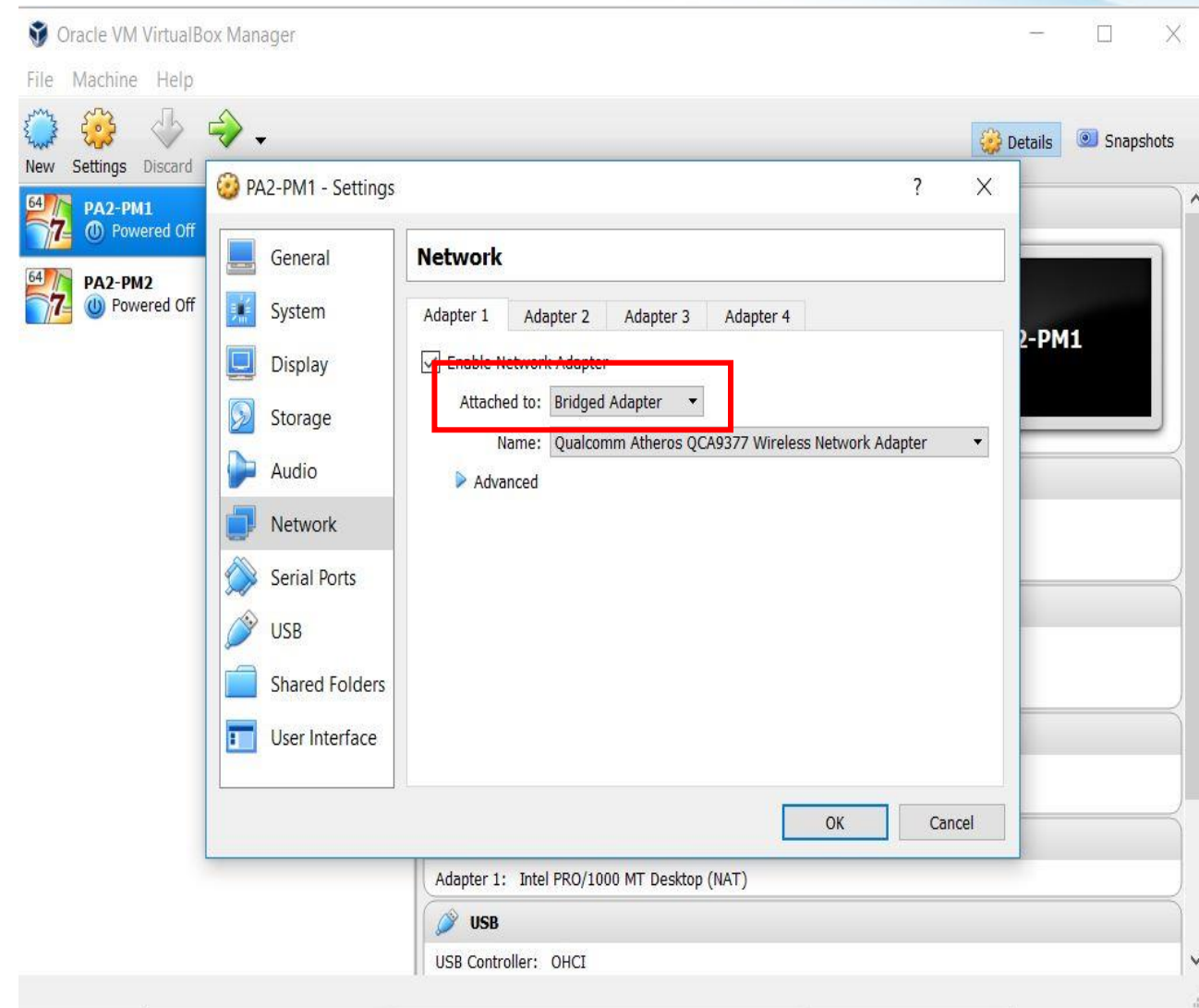
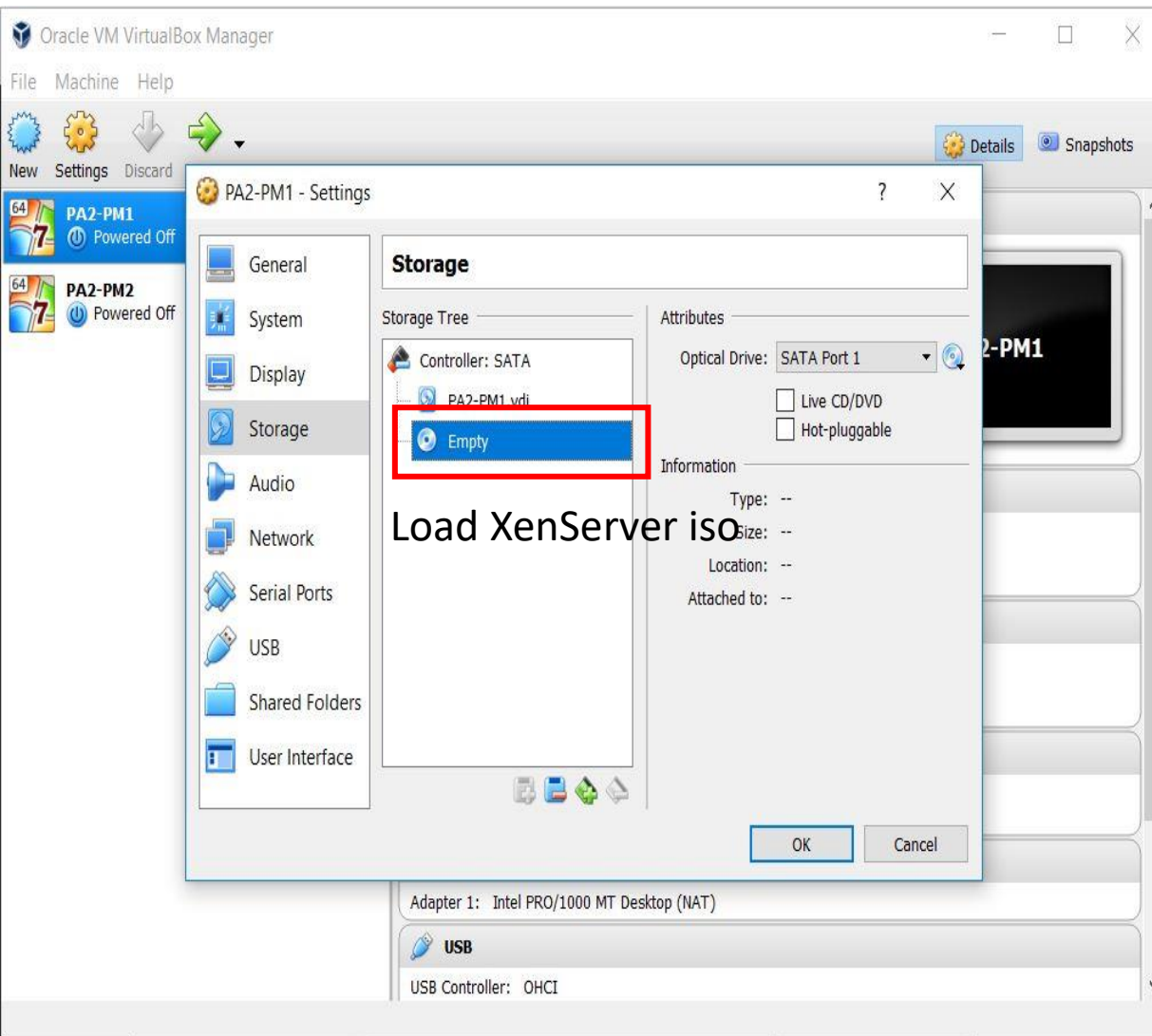
Illustration of Step 3: Creating VM in Virtual box: Recommended size of the virtual disk



Steps of the Assignment

4. After you create PM1 and PM2, right click and choose setting for them. In the “Storage” tab, you can see an empty drive. Load the **XenServer.iso** into the drive. Then, in the “Network” tab, select the “Bridge Adapter”. After the configuration, start PM1 and PM2. This will lead you to the XenServer installation.

Illustration of Step 4



Steps of the Assignment

5. Follow the instructions on the screen to install XenServer. For the network, choose “Automatic configuration (DHCP)”.

Specify the host names for PM1 and PM2 as “your UVa Computing ID + 1” and “your UVa Computing ID + 2” for grading purpose.

For network time protocol (NTP), select manually time entry.

Illustration for Step 5: automatic configuration (DHCP)

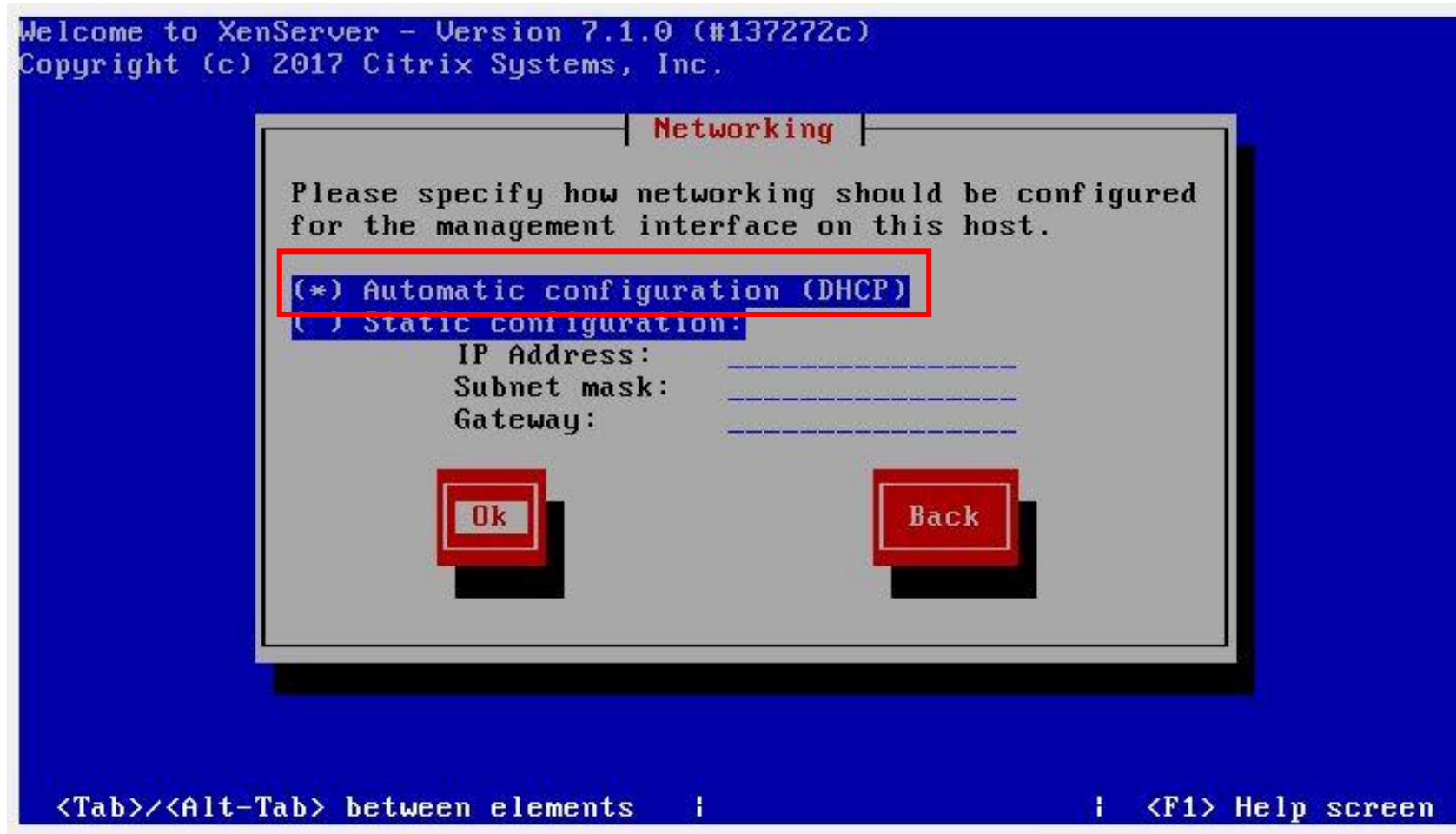


Illustration for Step 5: Setting host name

Welcome to XenServer - Version 7.1.0 (#137272c)
Copyright (c) 2006 Citrix Systems, Inc.

Hostname and DNS Configuration

Hostname Configuration

☐ Automatically set via DHCP

☒ Manually specify: ts5xm-1

DNS Configuration

☒ Automatically set via DHCP

☐ Manually specify:

DNS Server 1: _____

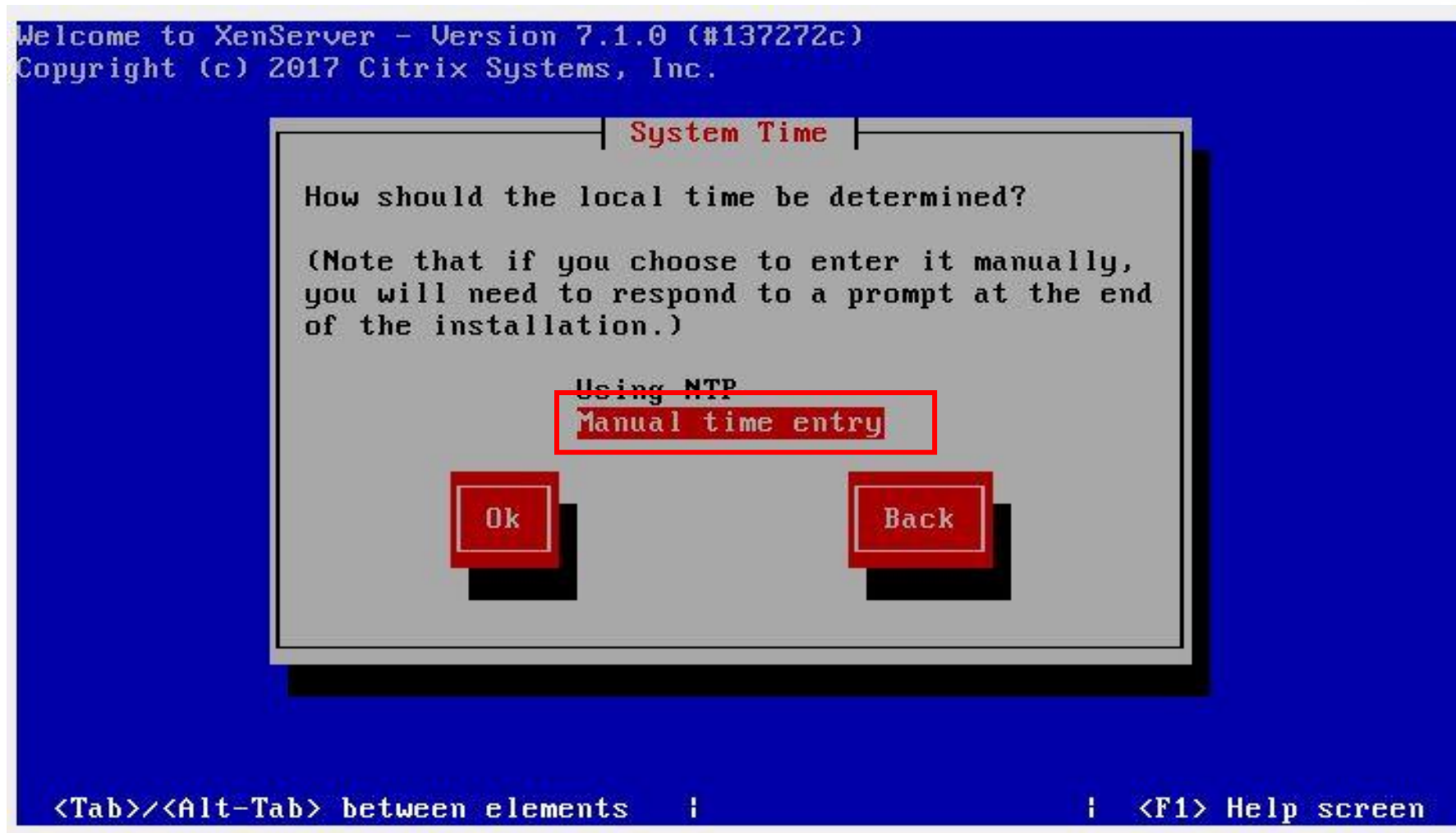
DNS Server 2: _____

DNS Server 3: _____

Ok **Back**

<Tab>/<Alt-Tab> between elements | <F1> Help screen

Illustration for Step 5: NTP manual entry



Steps of the Assignment

6. After the installation, you will enter the XenServer interface. You will be able to see IP address on the “Status Display” tab.

PM1

```
XenServer 7.1 15:25:03 ts5xm-1
Configuration

Customize System
Status Display
Network and Management Interface
Authentication
Virtual Machines
Disks and Storage Repositories
Resource Pool Configuration
Hardware and BIOS Information
Keyboard and Timezone
Remote Service Configuration
Backup, Restore and Update
Technical Support
Reboot or Shutdown
Local Command Shell

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VirtualBox
XenServer 7.1.0-137272c

Management Network Parameters
Device eth0
IP address 10.164.6.48
Netmask 255.255.255.0
Gateway 10.164.6.1

Press <Enter> to display the SSL key
fingerprints for this host

<Enter> OK <Up/Down> Select <Enter> Fingerprints <F5> Refresh
```

PM2

```
XenServer 7.1 22:39:12 ts5xm-2
Configuration

Customize System
Status Display
Network and Management Interface
Authentication
Virtual Machines
Disks and Storage Repositories
Resource Pool Configuration
Hardware and BIOS Information
Keyboard and Timezone
Remote Service Configuration
Backup, Restore and Update
Technical Support
Reboot or Shutdown
Local Command Shell

innotek GmbH
VirtualBox
XenServer 7.1.0-137272c

Management Network Parameters
Device eth0
IP address 10.164.6.141
Netmask 255.255.255.0
Gateway 10.164.6.1

Press <Enter> to display the SSL key
fingerprints for this host

<Enter> OK <Up/Down> Select <Enter> Fingerprints <F5> Refresh
```

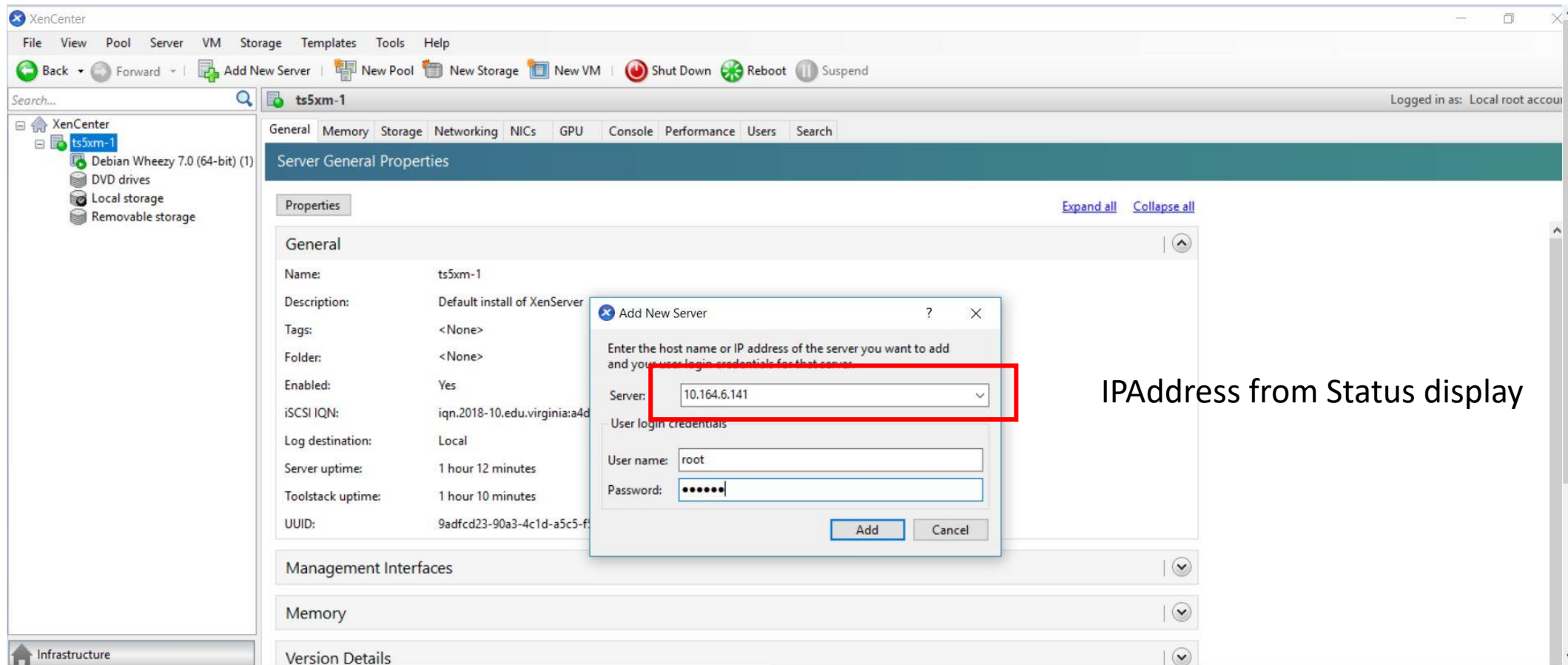

Steps of the Assignment

7. Install XenCenter on your PC.

- **ATTENTION:** please do not install XenCenter on PM1 or PM2. Install it on your PC with Windows OS.

Steps of the Assignment

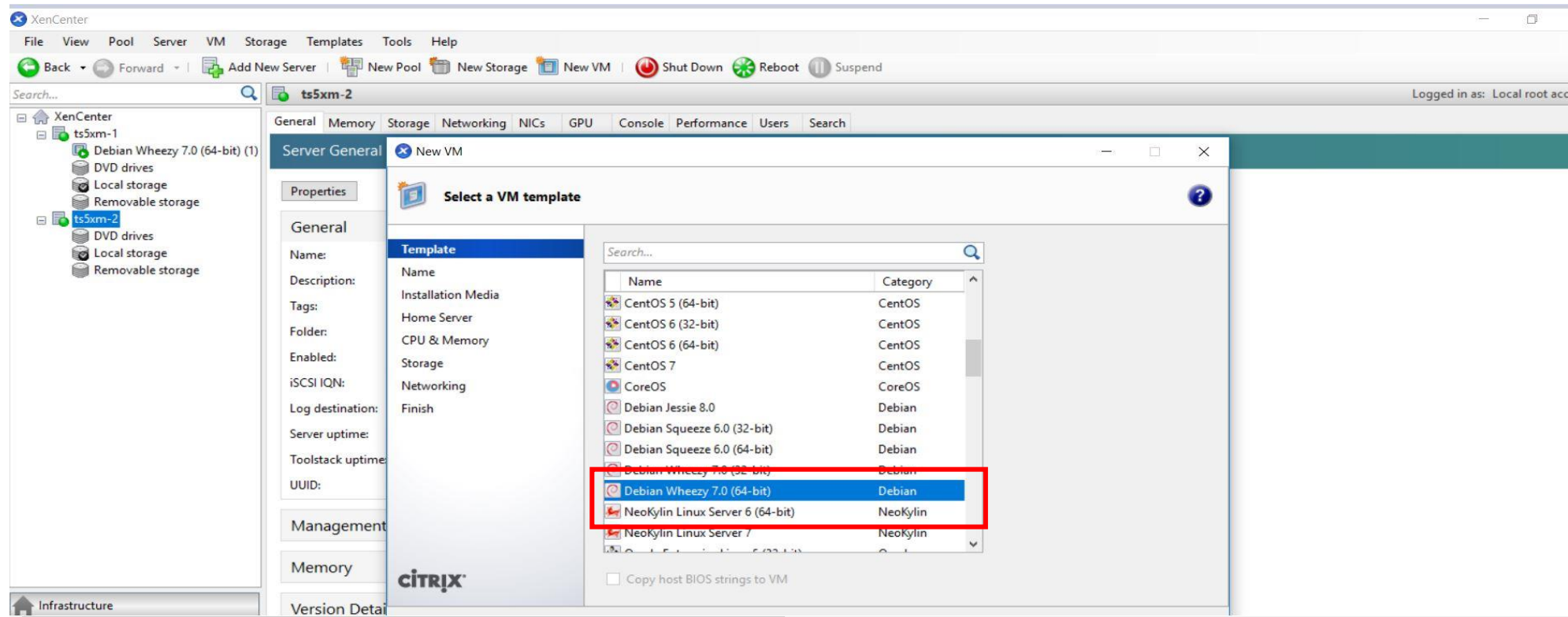
8. Open XenCenter. Connect to PM1 and PM2 using the IP addresses.



Steps of the Assignment

9. Create a VM in each PM and install OS on the VMs using XenCenter. To create, simply select “NEW VM”

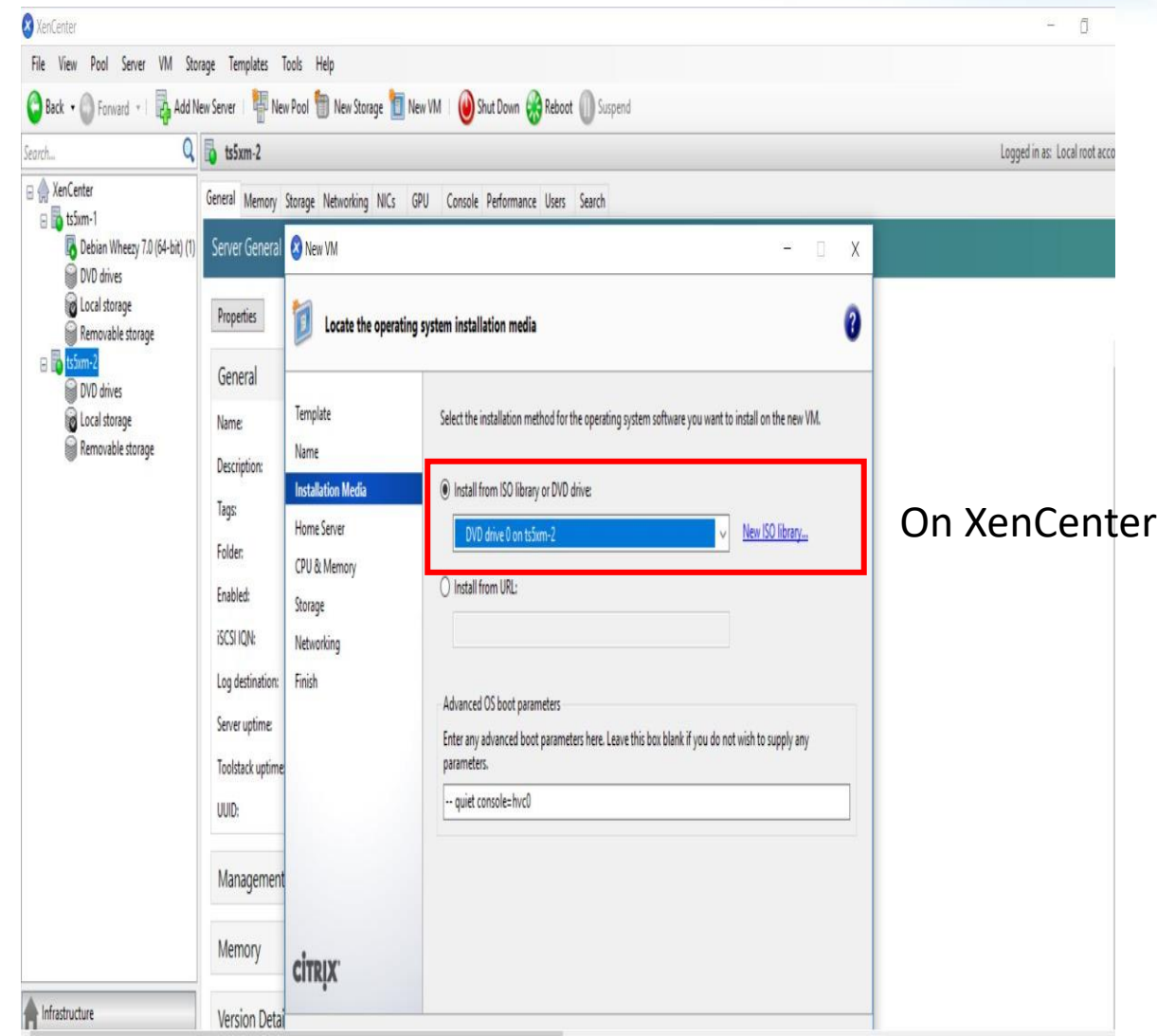
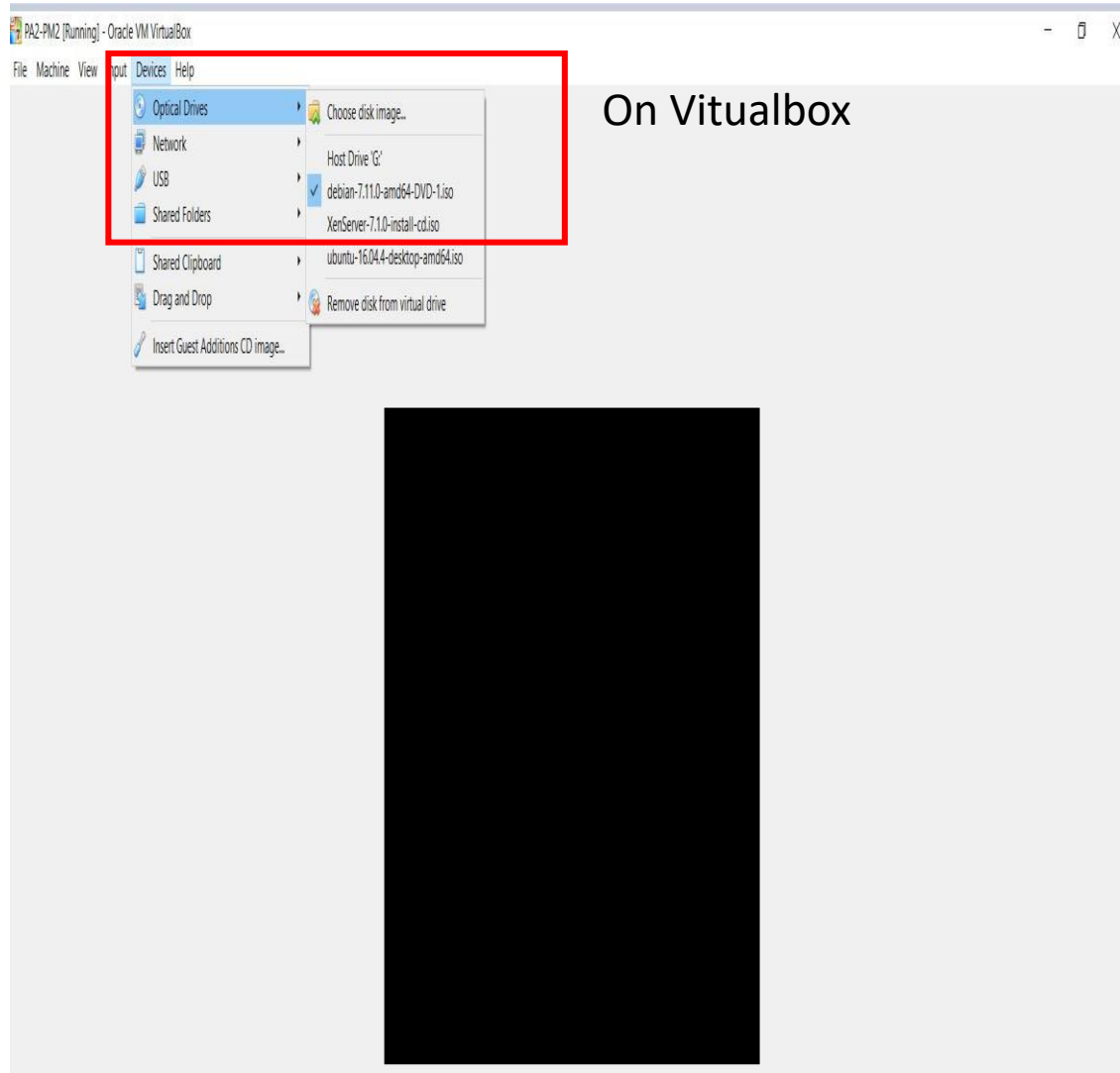
9 (i) Select “Debian Wheezy 7.0 (64-bit)” as the template.



Steps of the Assignment

- 9 (ii) You will need to specify the Debian OS ISO on PM1 and PM2. To do so, go to the screen of PM1 and PM2 on VirtualBox, select the “Device -> Optical drive” tab and load the **Debian.iso** (see figure below). Then go back to the screen of XenCenter, select DVD drive 0 on XXX (should be the default option).

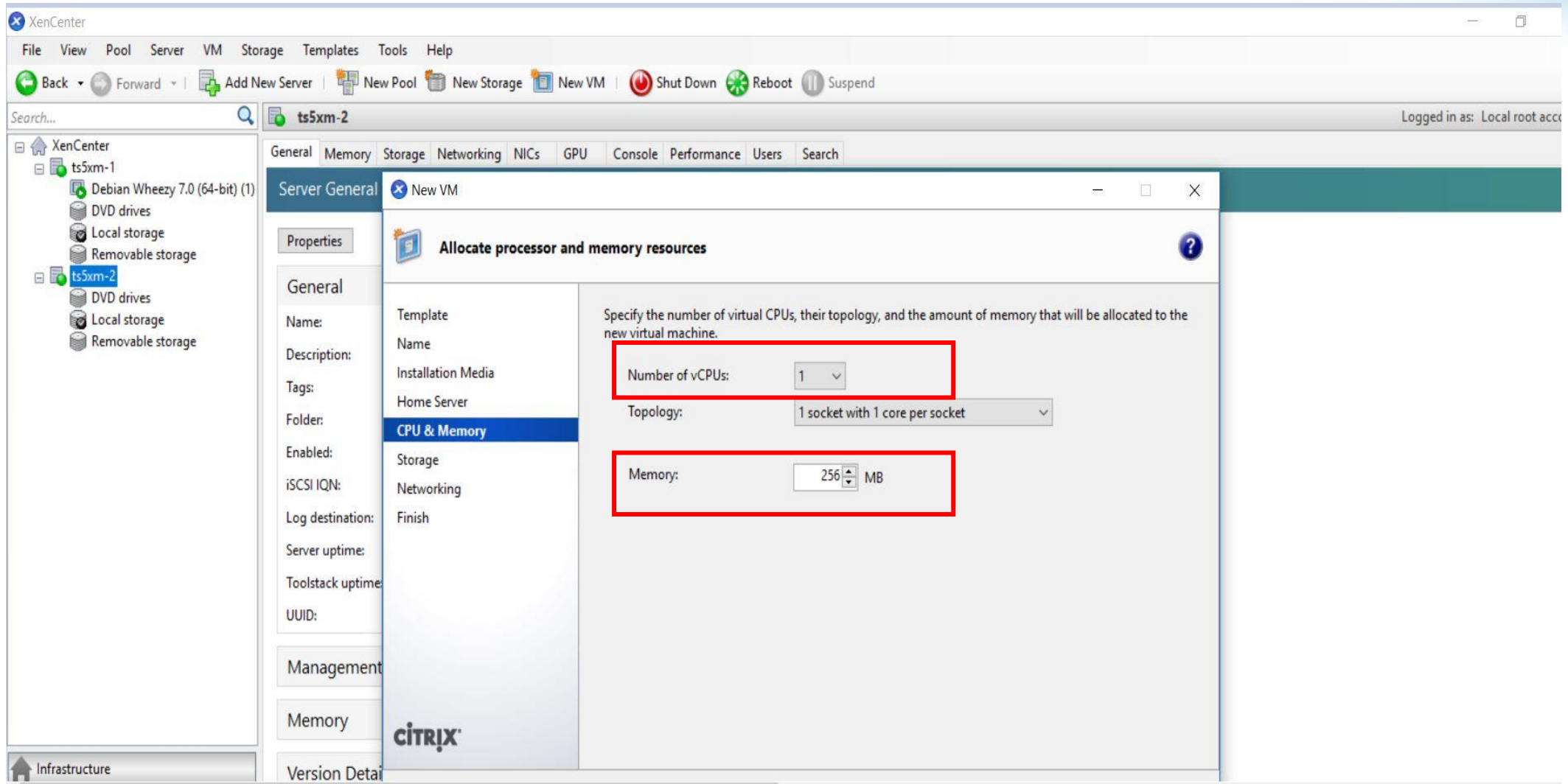
Illustration of Step 9(ii)



Steps of the Assignment

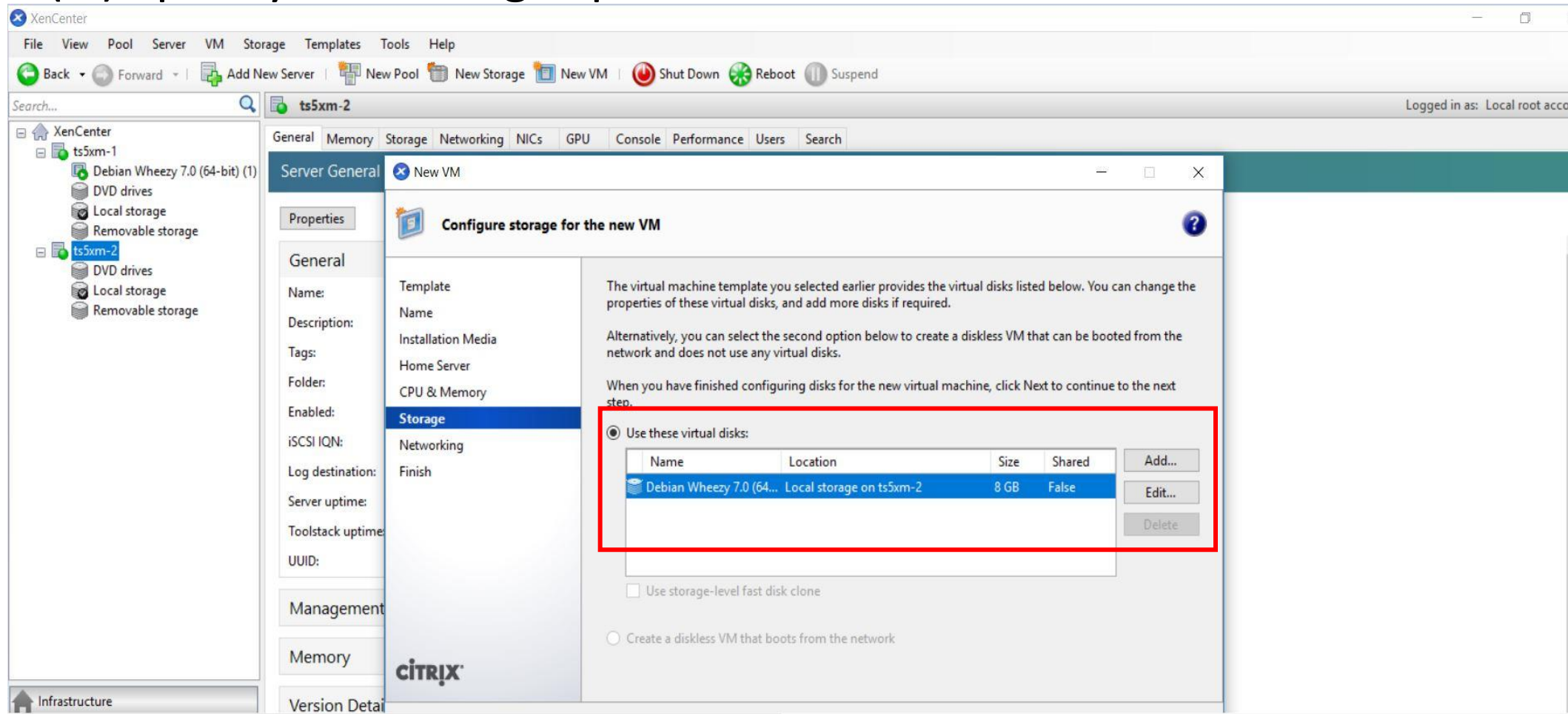
- 9(iii) Specify the number of vCPU cores -- 1 is sufficient. Specify the memory size (recommendation: 256-512MB), based on the memory size of the PM1 and PM2. You should not use more than half of the memory size of the PM1 and PM2, as we need to leave sufficient memory space for migration.

Illustration of Step 9(iii)



Steps of the Assignment

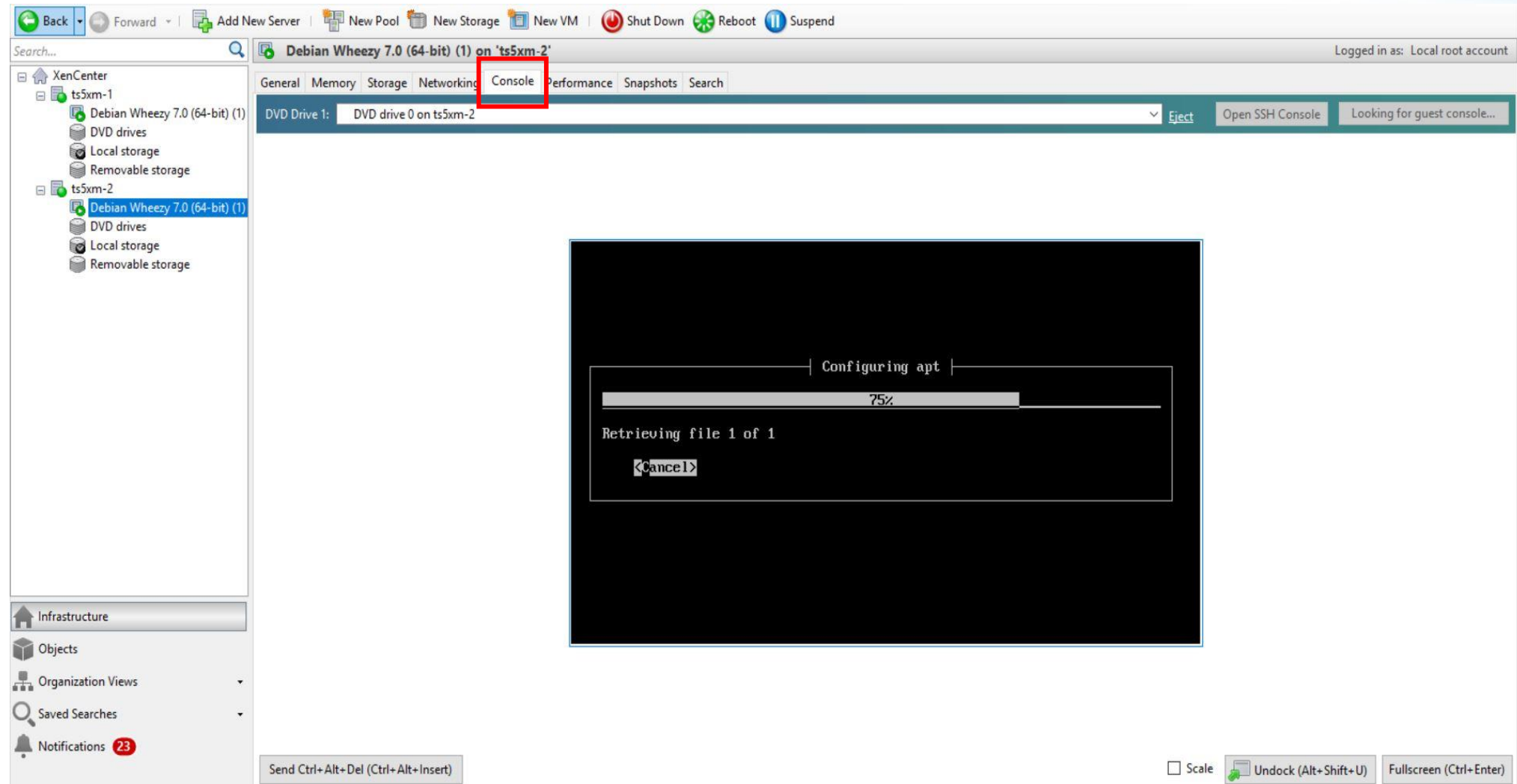
9(iv) Specify the storage space – default is sufficient.



Steps of the Assignment

- After you create the VMs on PM1 and PM2, you can click the VMs and go to “Console”. Follow the instructions on the console to install Debian 7.0. Select the default options during installation.
- **Please NOTE that do not turn off your PC or lose your internet connection when you are doing the following steps. Otherwise, you might need to install Debian again.**

Illustration of Step 10



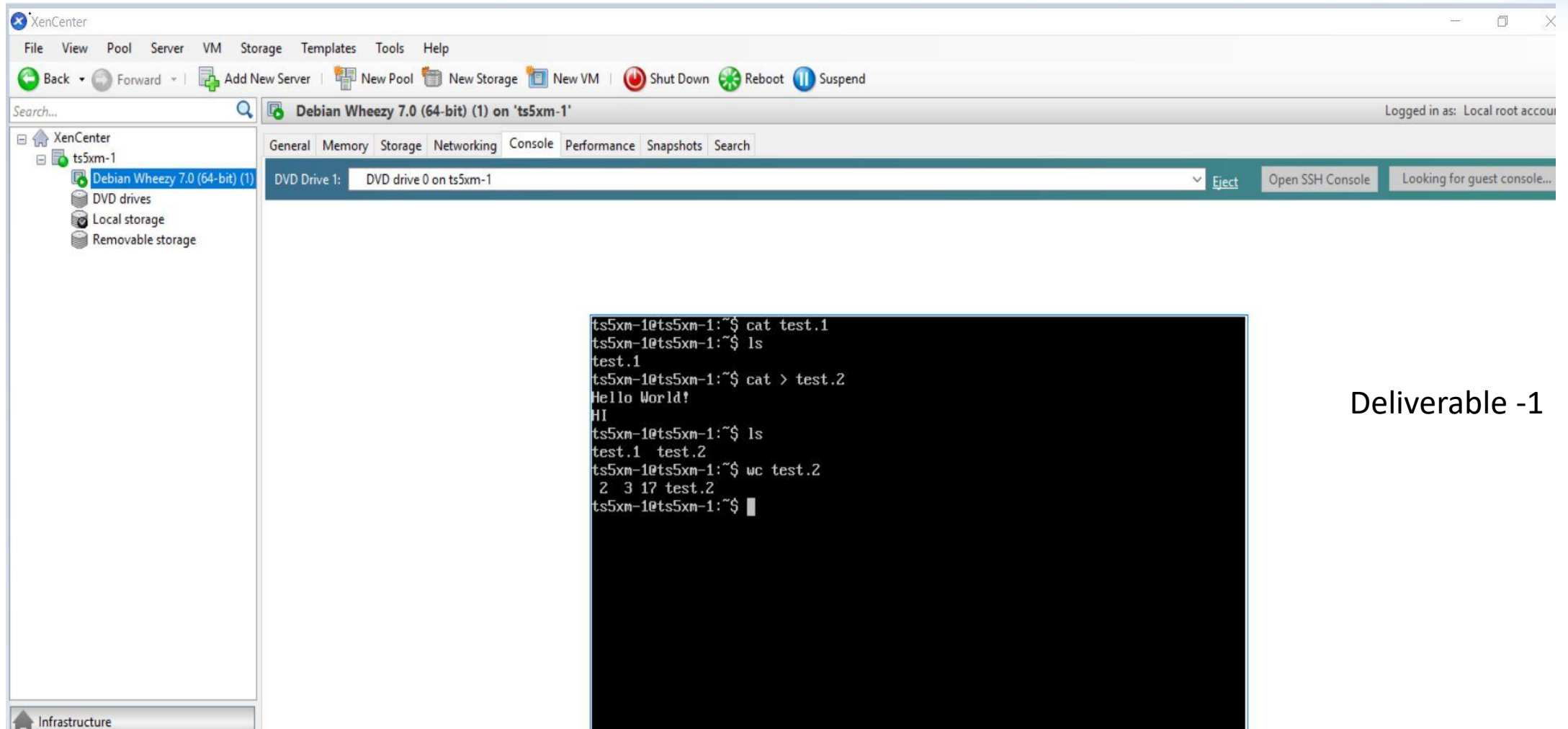
Steps of the Assignment

11. To verify that the VMs are created correctly, please create some simple text files and run word count command (i.e., `wc`) on the VMs through the XenCenter console.

Take screenshots on the XenCenter for the VMs to show that we can run commands on them successfully.

- **Please NOTE that do not turn off your PC or lose your internet connection when you are doing the following steps. Otherwise, you might need to start over from the beginning.**

Illustration of Step 11



The screenshot displays the XenCenter application window. The left sidebar shows the 'XenCenter' tree with 'ts5xm-1' selected, containing 'Debian Wheezy 7.0 (64-bit) (1)', 'DVD drives', 'Local storage', and 'Removable storage'. The main pane shows the configuration for 'Debian Wheezy 7.0 (64-bit) (1) on 'ts5xm-1''. The 'General' tab is active, showing 'DVD Drive 1: DVD drive 0 on ts5xm-1'. The 'Console' tab is also visible. A terminal window is overlaid on the bottom right, showing the following commands and output:

```
ts5xm-1@ts5xm-1:~$ cat test.1
ts5xm-1@ts5xm-1:~$ ls
test.1
ts5xm-1@ts5xm-1:~$ cat > test.2
Hello World!
HI
ts5xm-1@ts5xm-1:~$ ls
test.1 test.2
ts5xm-1@ts5xm-1:~$ wc test.2
 2  3 17 test.2
ts5xm-1@ts5xm-1:~$
```

The terminal window is titled 'ts5xm-1@ts5xm-1:~\$' and shows the output of the commands. The output of 'cat test.1' is 'test.1'. The output of 'cat > test.2' is 'Hello World!' and 'HI'. The output of 'ls' is 'test.1 test.2'. The output of 'wc test.2' is '2 3 17 test.2'.

Deliverable -1

Steps of the Assignment

- 12. To perform VM migration, you will need to first put both PM1 and PM2 in one pool. Just create a pool and put them inside the pool. You will need to turn off the VMs to put in one pool. After putting the PMs in one pool, remember to turn on the VMs again.

Illustration of Step 12: Shutting down a VM

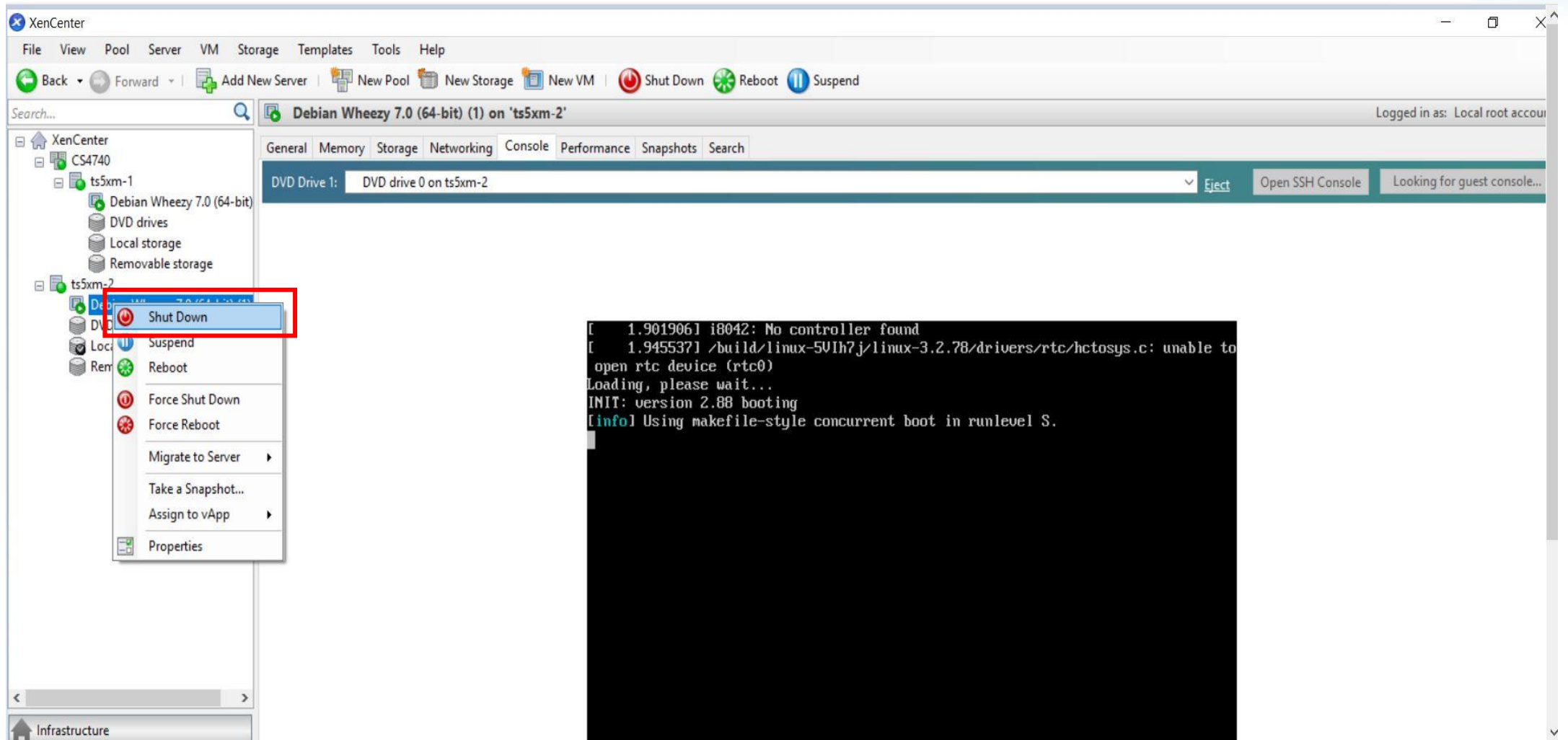


Illustration of Step 12: Creating a pool

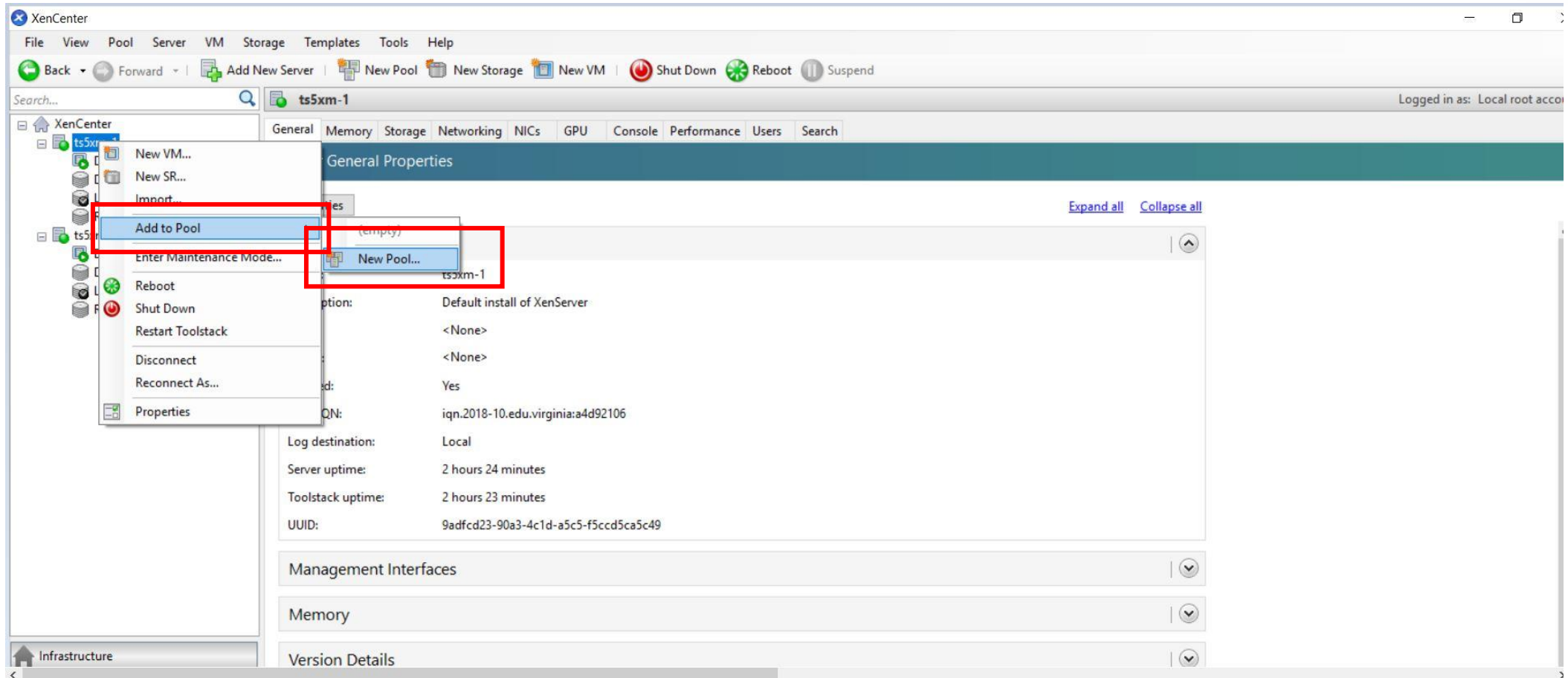


Illustration of Step 12: Naming a pool

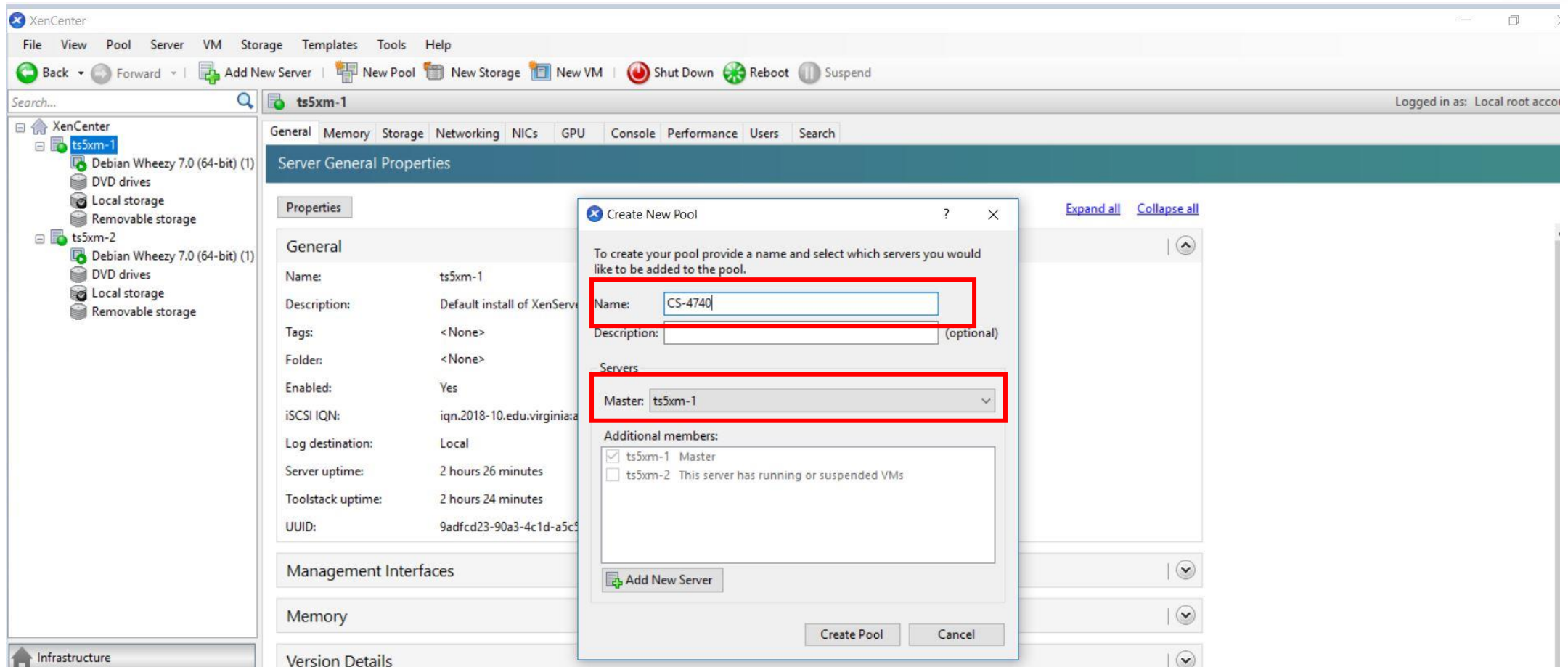


Illustration of Step 12: Adding PM2 to the pool

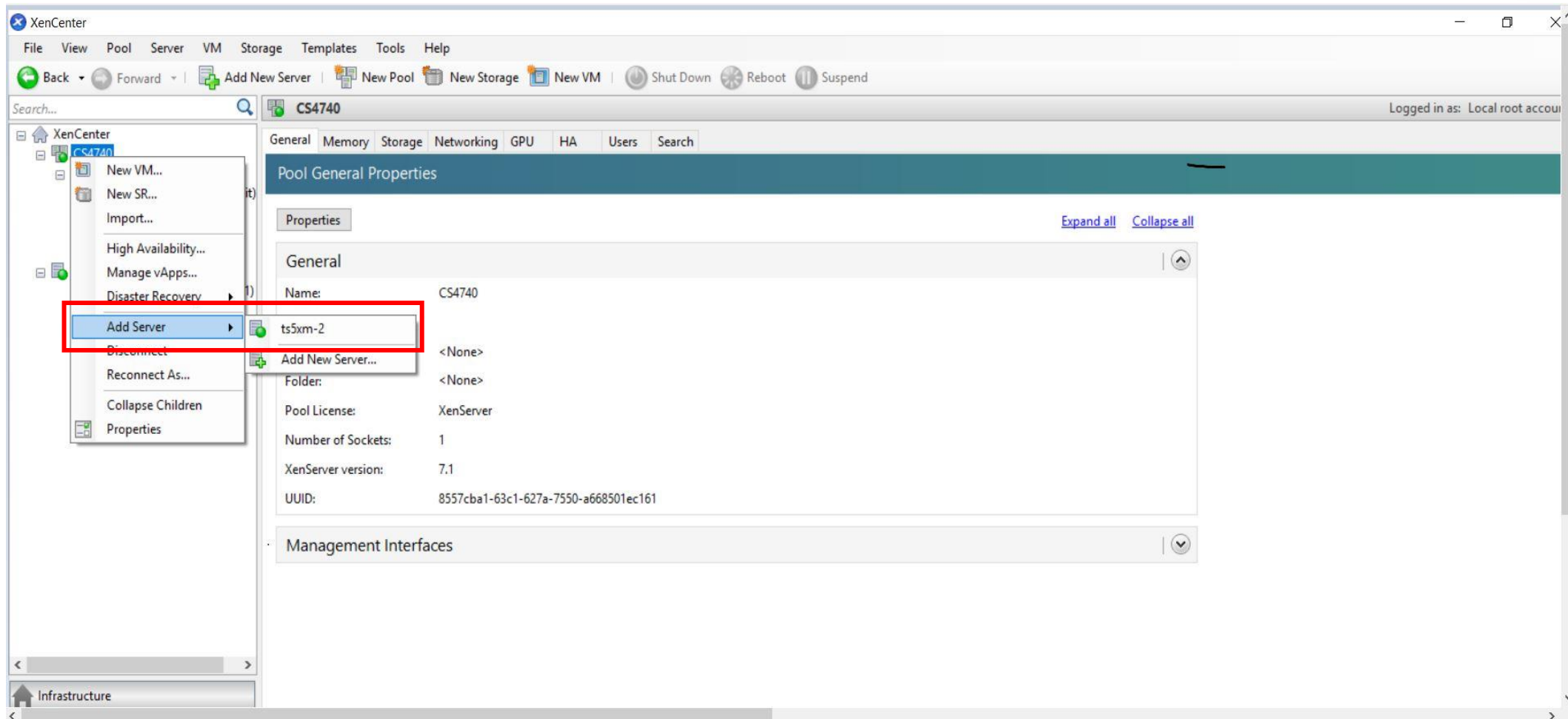
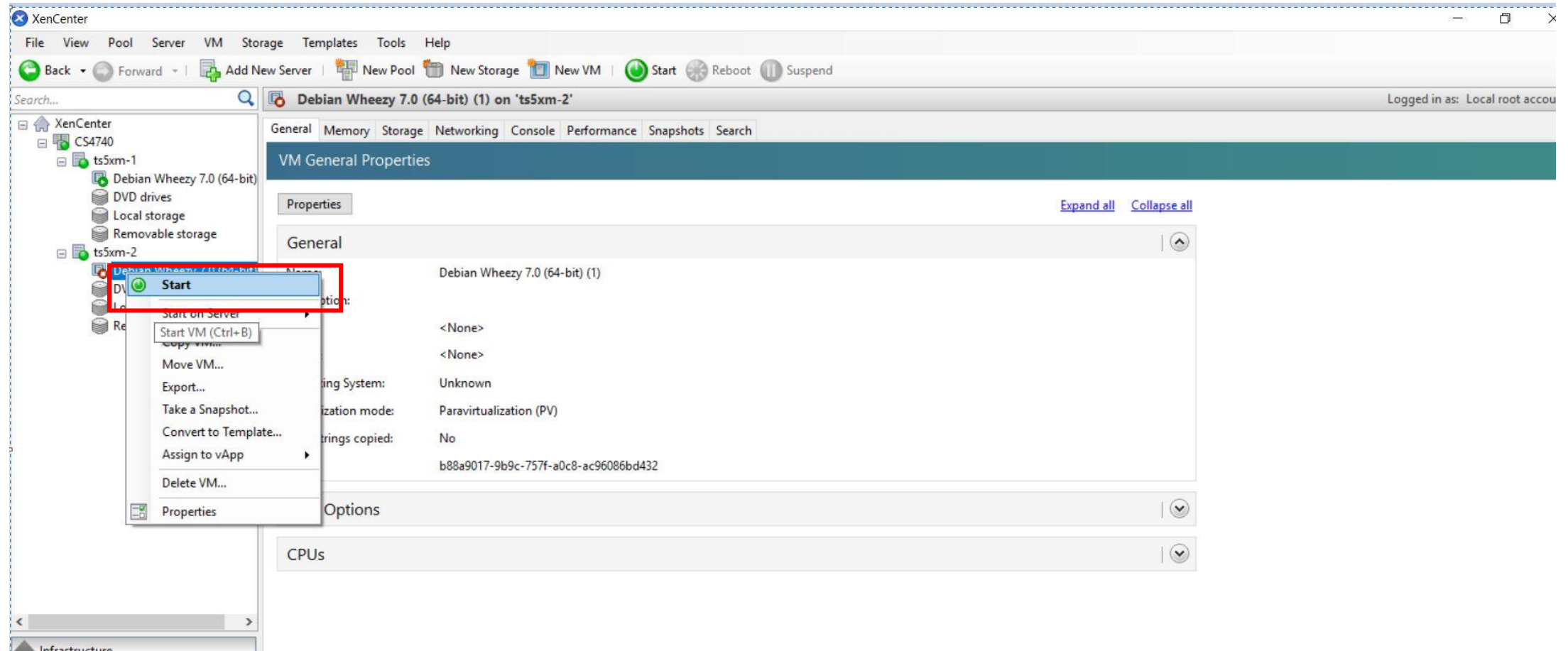


Illustration of Step 12: Starting the VM



Steps of the Assignment

13. Now we can migrate the VM. Select one VM from one PM (say PM2) and right click, and migrate it to PM1. The process will take several minutes. You will see that the VM is still running during migration.

Illustration of Step 13: Start migration

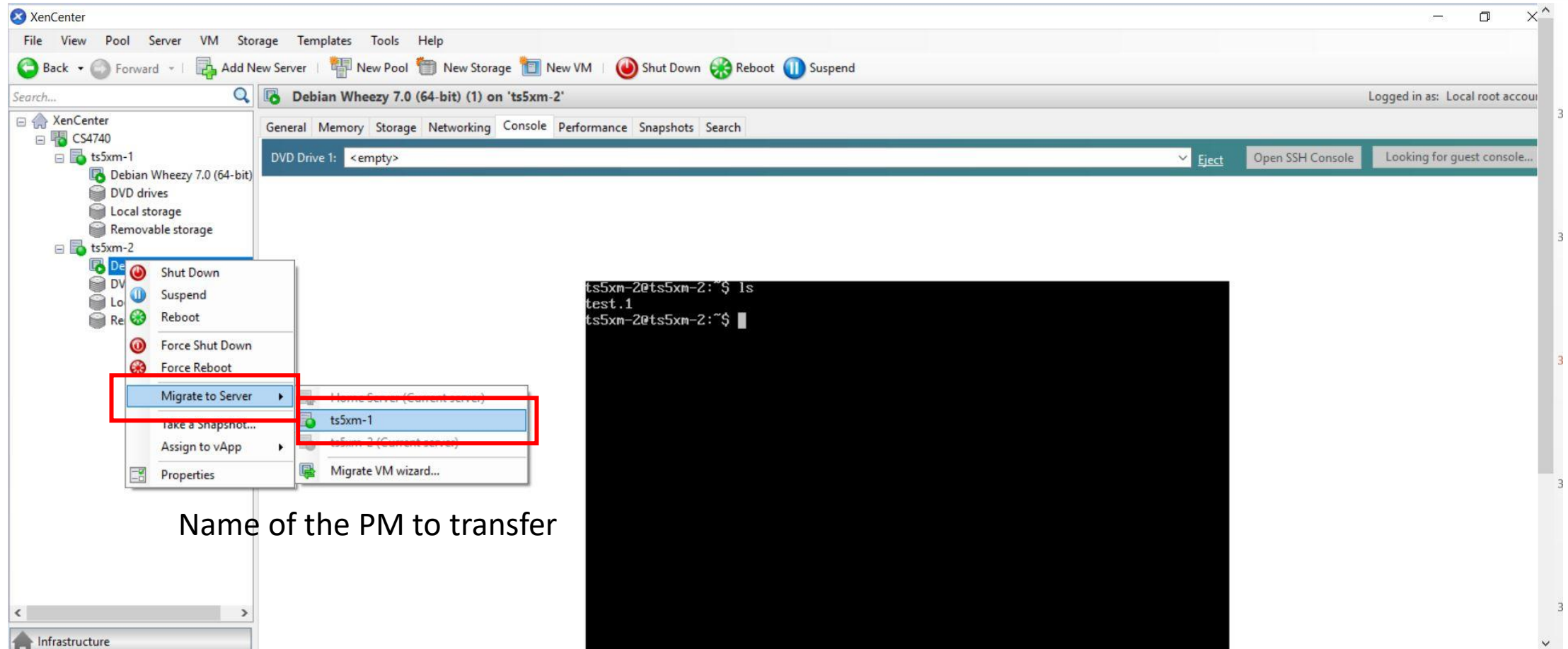
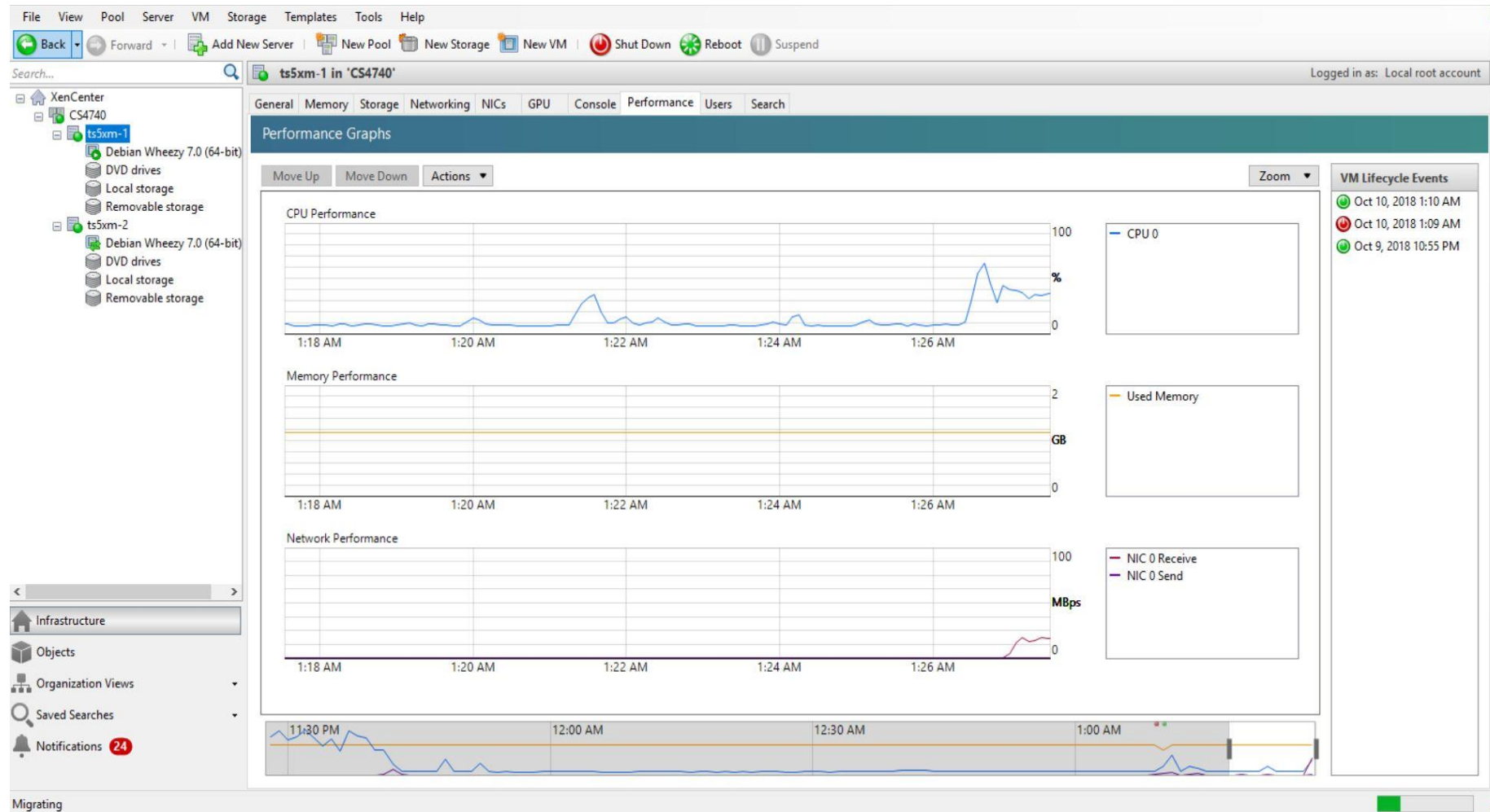
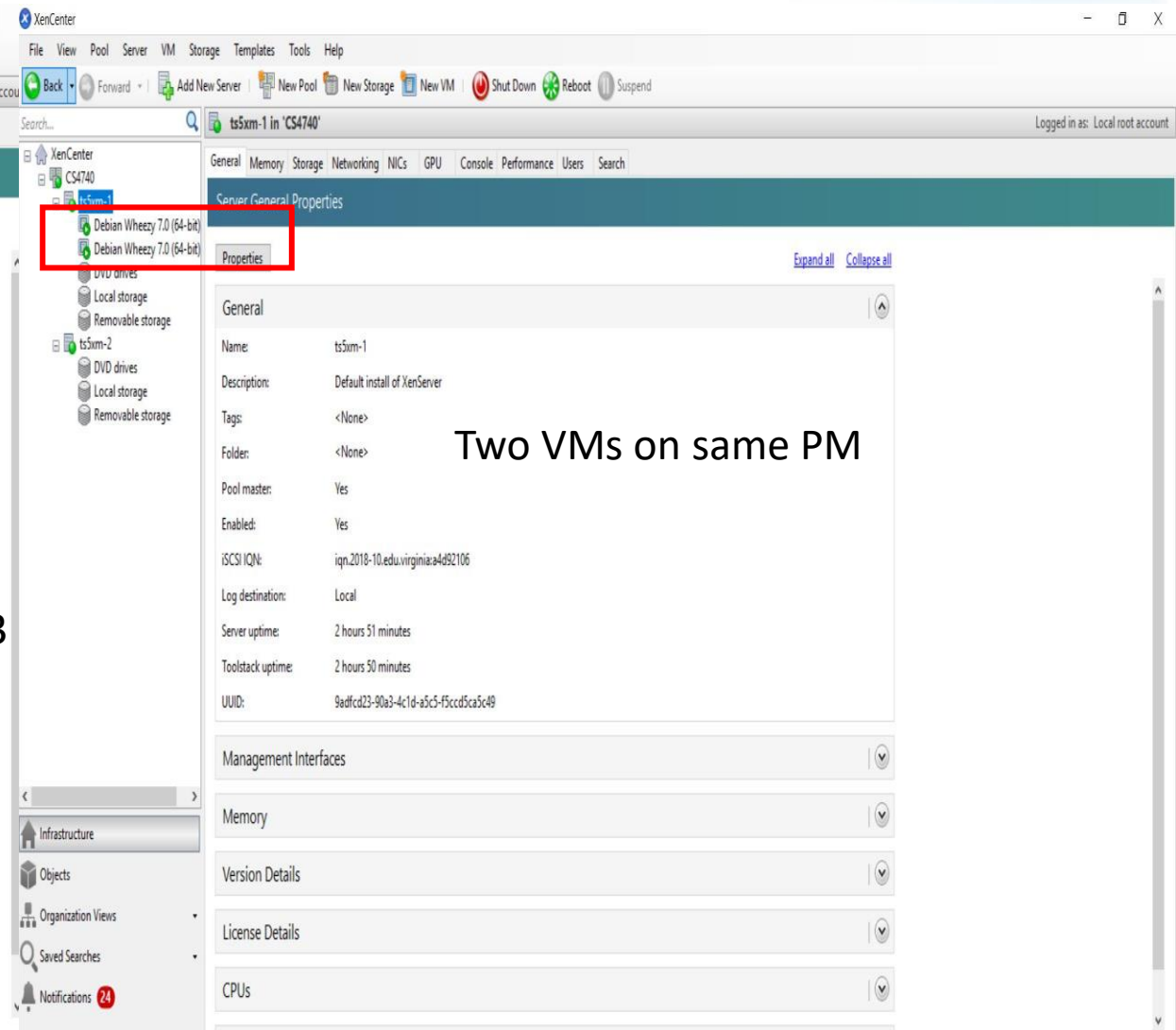
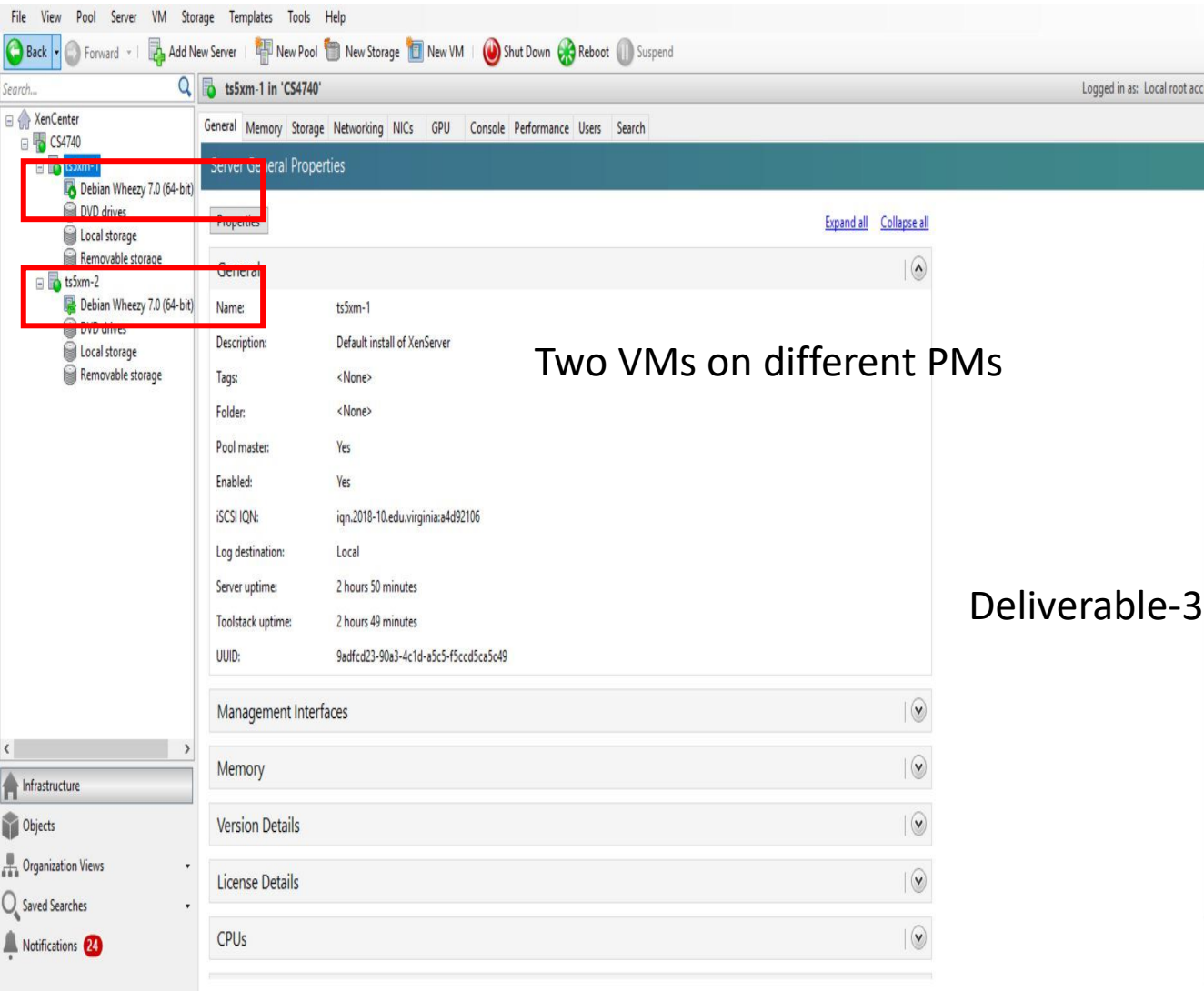


Illustration of Step 13: Performance of both PM



Deliverable-2
Performance for
both PMs

Illustration of Step 13: Location of VMs



Deliverable-3

Illustration of Step 13: EventList

The screenshot shows the XenCenter application window. The left sidebar contains navigation links: Alerts (1), Updates (22), and Events (1 error). The main pane displays the 'Events (1 error)' window. At the top of this pane, there are filter options: 'Filter by Status', 'Filter by Server', 'Filter by Date', and 'Dismiss All'. Below these filters is a table of events. The table has four columns: 'Message', 'Server / Pool', 'Date', and 'Actions'. The first event is highlighted in blue and shows a migration of a VM. The second event shows an error (red X icon) for starting a VM. The remaining events are successful (green checkmark icon).

Message	Server / Pool	Date	Actions
▶ Migrating VM 'Debian Wheezy 7.0 (64-bit) (1)' from 'ts5xm-1' to 'ts5xm-2'	ts5xm-2	Oct 10, 2018 1:33 AM	Dismiss ▼
▶ Migrating VM 'Debian Wheezy 7.0 (64-bit) (1)' from 'ts5xm-2' to 'ts5xm-1'	ts5xm-1	Oct 10, 2018 1:26 AM	Dismiss ▼
▶ Starting VM 'Debian Wheezy 7.0 (64-bit) (1)'	ts5xm-2	Oct 10, 2018 1:21 AM	Dismiss ▼
▶ Adding server 'ts5xm-2' to pool 'CS4740'	ts5xm-2	Oct 10, 2018 1:12 AM	Dismiss ▼
▶ Shutting down VM 'Debian Wheezy 7.0 (64-bit) (1)' on 'ts5xm-2'	ts5xm-2	Oct 10, 2018 1:11 AM	Dismiss ▼
▶ Starting VM 'Debian Wheezy 7.0 (64-bit) (1)'	ts5xm-2	Oct 10, 2018 1:10 AM	Dismiss ▼
▶ Starting VM 'Debian Wheezy 7.0 (64-bit) (1)'	ts5xm-1	Oct 10, 2018 1:10 AM	Dismiss ▼
▶ Creating new pool 'CS4740' with master 'ts5xm-1'	ts5xm-1	Oct 10, 2018 1:09 AM	Dismiss ▼
▶ Shutting down VM 'Debian Wheezy 7.0 (64-bit) (1)' on 'ts5xm-2'	ts5xm-2	Oct 10, 2018 1:09 AM	Dismiss ▼
▶ Shutting down VM 'Debian Wheezy 7.0 (64-bit) (1)' on 'ts5xm-1'	ts5xm-1	Oct 10, 2018 1:09 AM	Dismiss ▼
▶ Creating new pool 'CS-4740' with master 'ts5xm-1'	ts5xm-1	Oct 10, 2018 1:07 AM	Dismiss ▼
▶ Starting VM 'Debian Wheezy 7.0 (64-bit) (1)'	ts5xm-2	Oct 10, 2018 12:00 AM	Dismiss ▼
▶ Create VM 'Debian Wheezy 7.0 (64-bit) (1)'		Oct 10, 2018 12:00 AM	Dismiss ▼
▶ Connected to 10.164.6.141	10.164.6.141	Oct 9, 2018 11:53 PM	Dismiss ▼
▶ Starting VM 'Debian Wheezy 7.0 (64-bit) (1)'	ts5xm-1	Oct 9, 2018 10:55 PM	Dismiss ▼
▶ Create VM 'Debian Wheezy 7.0 (64-bit) (1)'	CS4740	Oct 9, 2018 10:54 PM	Dismiss ▼
▶ Deleting VM 'Debian Wheezy 7.0 (32-bit) (1)' from 'ts5xm-1'	ts5xm-1	Oct 9, 2018 10:54 PM	Dismiss ▼
▶ Starting VM 'Debian Wheezy 7.0 (32-bit) (1)'	ts5xm-1	Oct 9, 2018 10:52 PM	Dismiss ▼
▶ Create VM 'Debian Wheezy 7.0 (32-bit) (1)'	CS4740	Oct 9, 2018 10:51 PM	Dismiss ▼
▶ Connected to 10.164.6.140	10.164.6.140	Oct 9, 2018 10:46 PM	Dismiss ▼
▶ Removed connection to 192.168.1.49		Oct 9, 2018 10:45 PM	Dismiss ▼

Notes

- This assignment requires the students to have a PC with Windows OS installed (because of XenCenter). Therefore, **the assignment is a group assignment. Each group can have up to 3 students and only one student needs to submit the final PDF.**
- **Please start this assignment as early as possible and don't leave it to the last minute. Otherwise, you won't have enough time. It will probably take more than 4 hours to finish.**
- **You are highly recommended to finish the entire assignment continuously without pausing in the middle.**

Questions?