

Основы виртуализации

Базовые понятия и практика

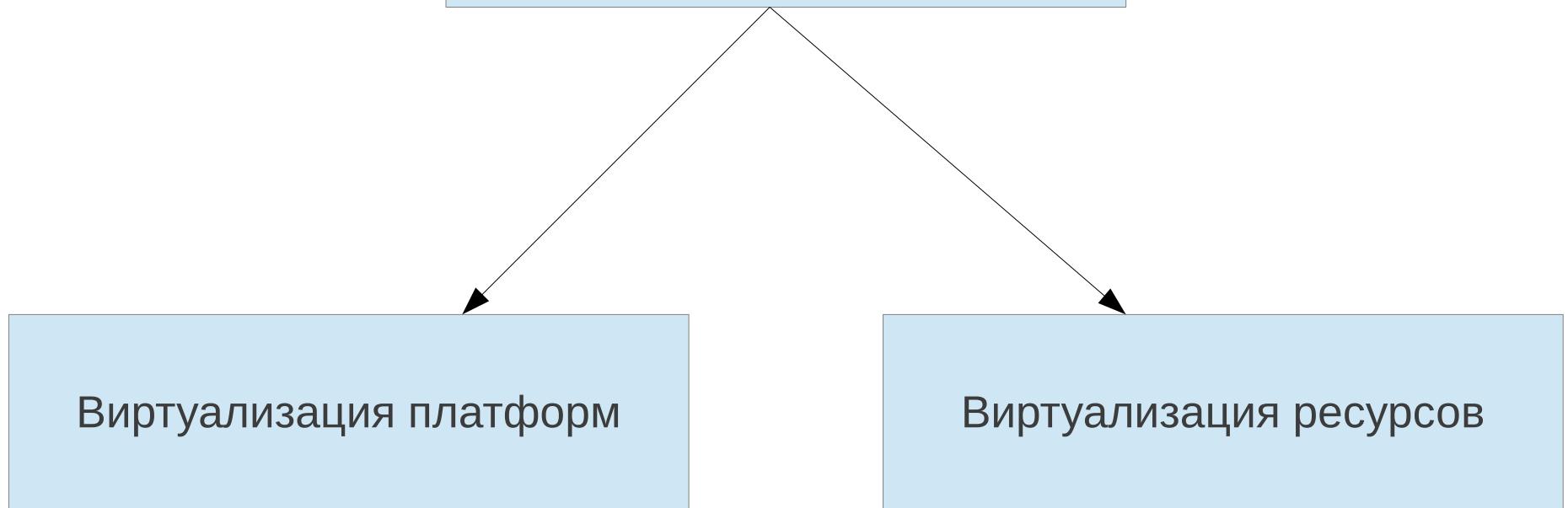
Основы виртуализации

Теория

Что такое виртуализация?

Виртуализация в вычислениях — процесс представления набора вычислительных ресурсов, или их логического объединения, который даёт какие-либо преимущества перед оригинальной конфигурацией. По-научному, виртуализация — это изоляция вычислительных процессов и ресурсов друг от друга.

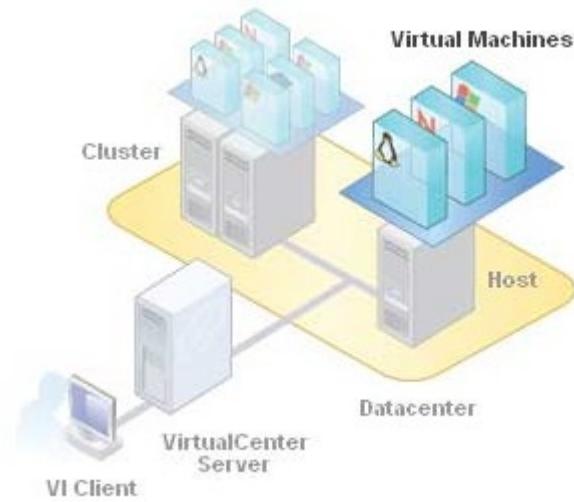
Виртуализация



Виртуализация платформ, продуктом этого вида виртуализации являются виртуальные машины - некие программные абстракции, запускаемые на платформе реальных аппаратно-программных систем.

Виртуализация ресурсов, данный вид виртуализации преследует своей целью комбинирование или упрощение представления аппаратных ресурсов для пользователя и получение некоторых пользовательских абстракций оборудования, пространств имен, сетей и т.п.

Виртуализация платформ



Виртуализация платформ

- Полная эмуляция (симуляция);
- Частичная эмуляция (нативная виртуализация);
- Частичная виртуализация;
- Паравиртуализация;
- Виртуализация уровня операционной системы;
- Виртуализация уровня приложений.

Полная Эмуляция

Виртуальная машина полностью виртуализует все аппаратное обеспечение при сохранении гостевой операционной системы в неизменном виде.

Примеры: Bochs, PearPC, QEMU, Hercules Emulator.

Частичная эмуляция

Виртуальная машина виртуализует лишь необходимое количество аппаратного обеспечения, чтобы она могла быть запущена изолированно.

Примеры: VMware Workstation, VMware Server, VMware ESX Server, Virtual PC, VirtualBox, Microsoft Hyper-V

Частичная виртуализация

Виртуальная машина симулирует несколько экземпляров аппаратного окружения в частности, пространства адресов, что позволяет совместно использовать ресурсы и изолировать процессы.

Пример: UML (User-mode Linux).

Паравиртуализация

Виртуальная машина подготавливаются для исполнения в виртуализированной среде, для чего ядро операционные системы незначительно модифицируется.

Пример: Citrix (xen).

Виртуализация уровня ОС

Виртуализация физического сервера на уровне операционной системы в целях создания нескольких защищенных виртуализованных серверов на одном физическом.

Примеры: Linux-VServer, Virtuozzo, OpenVZ, Solaris Containers и FreeBSD Jails..

Виртуализация уровня приложений

Приложение помещается в контейнер с необходимыми элементами для своей работы: файлами реестра, конфигурационными файлами, пользовательскими и системными объектами..

Пример: Thinstall, Altiris, Trigence, Softricity.

Надо быть проще

Два типа виртуализации:

- Гипервизор работает прямо на железе, а операционные системы – на гипервизоре (ESX, Hyper-V, XEN, KVM(Macro Kernel))
- Гипервизор работает на существующей операционной системе как приложение, а гостевые ОС на гипервизоре (VMWare Workstation, GSX, VMWare Player, VirtualBox, Parallels)

Основы виртуализации

Практика

VirtualBox

Oracle VM VirtualBox Manager

New Settings Start Discard Details Snapshots

Welcome to VirtualBox!

The left part of this window is a list of all virtual machines on your computer. The list is empty now because you haven't created any virtual machines yet.

In order to create a new virtual machine, press the **New** button in the main tool bar located at the top of the window.

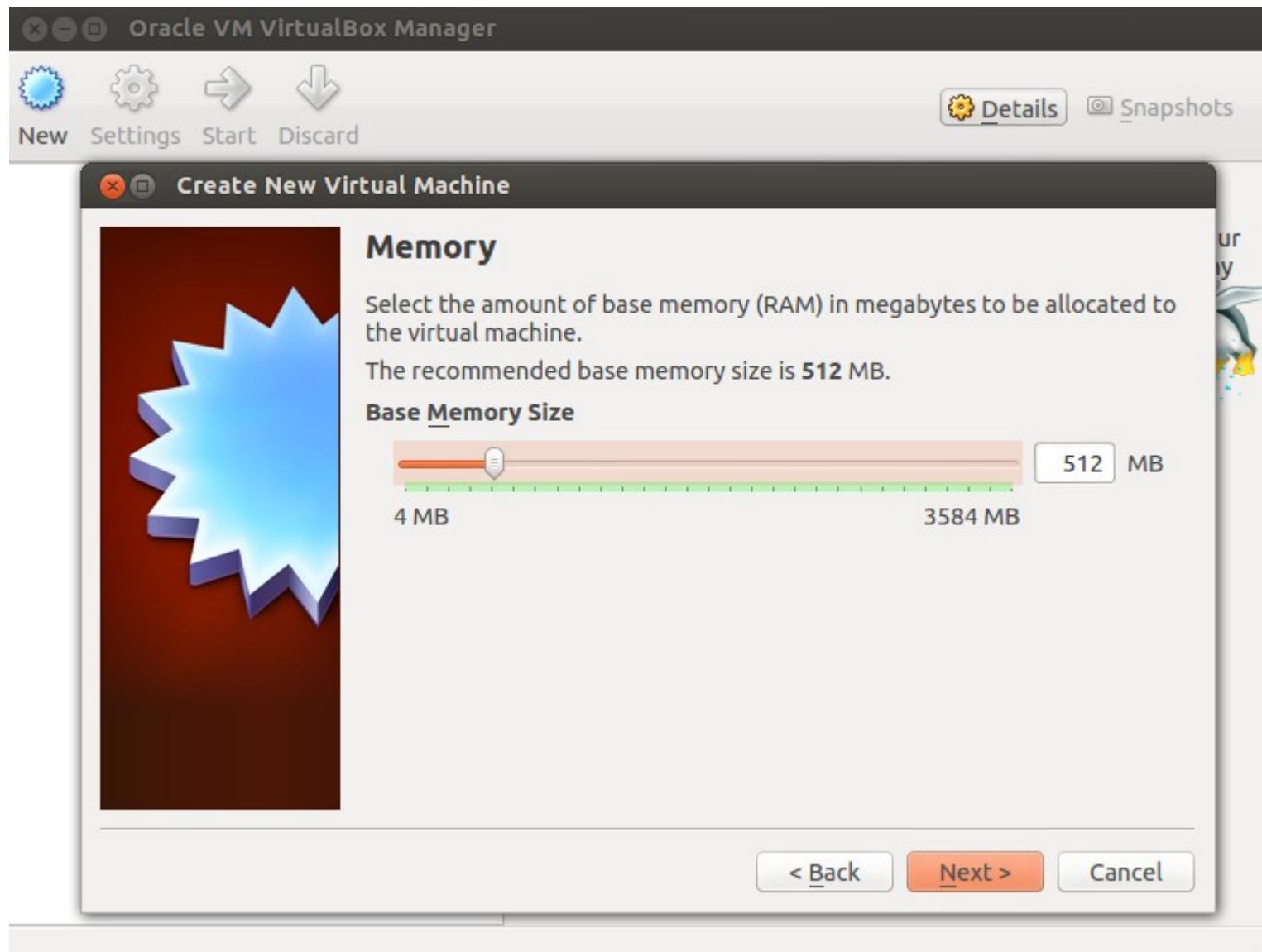
You can press the **F1** key to get instant help, or visit www.virtualbox.org for the latest information and news.



VirtualBox



VirtualBox



VirtualBox



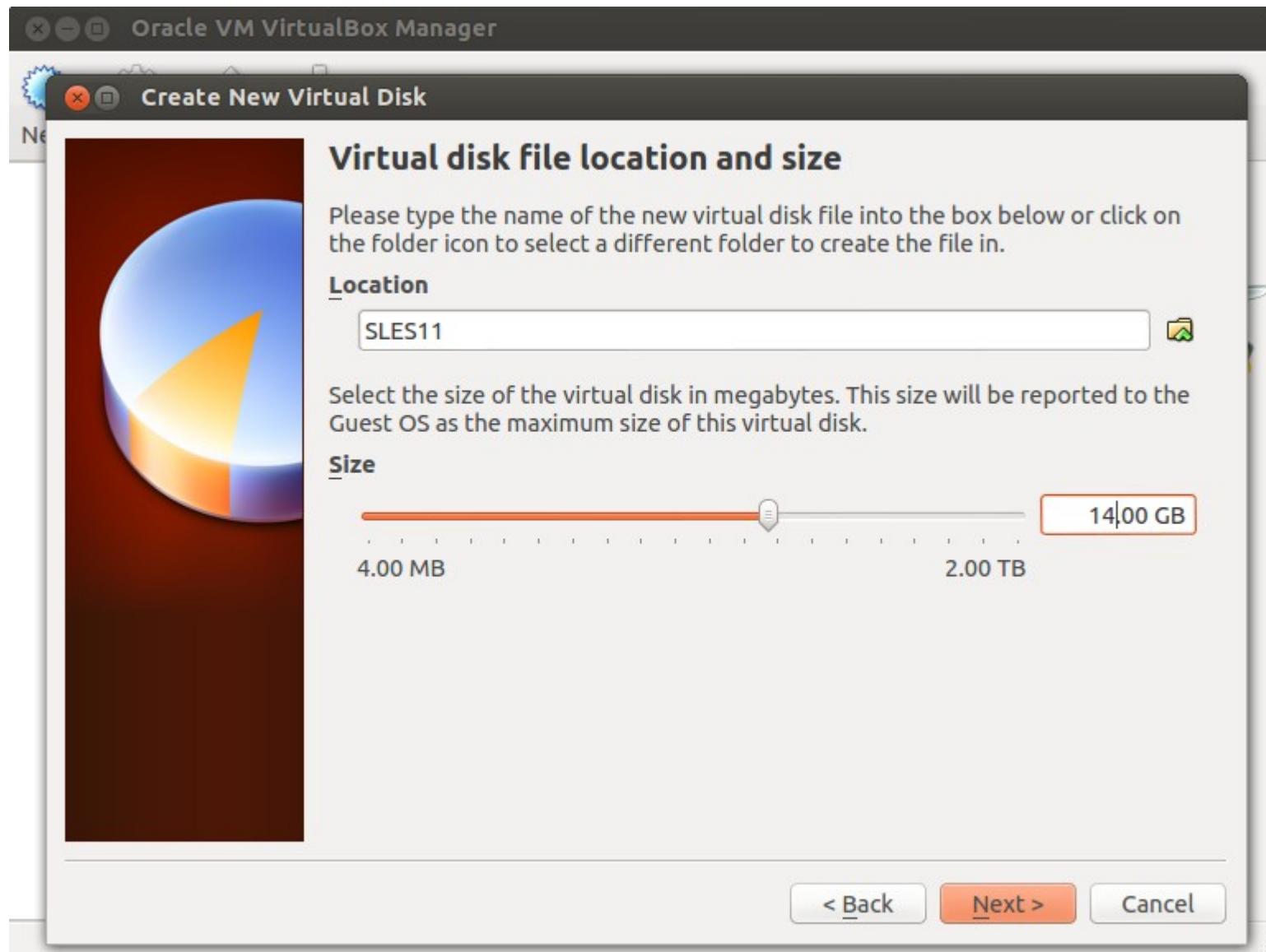
VirtualBox



VirtualBox



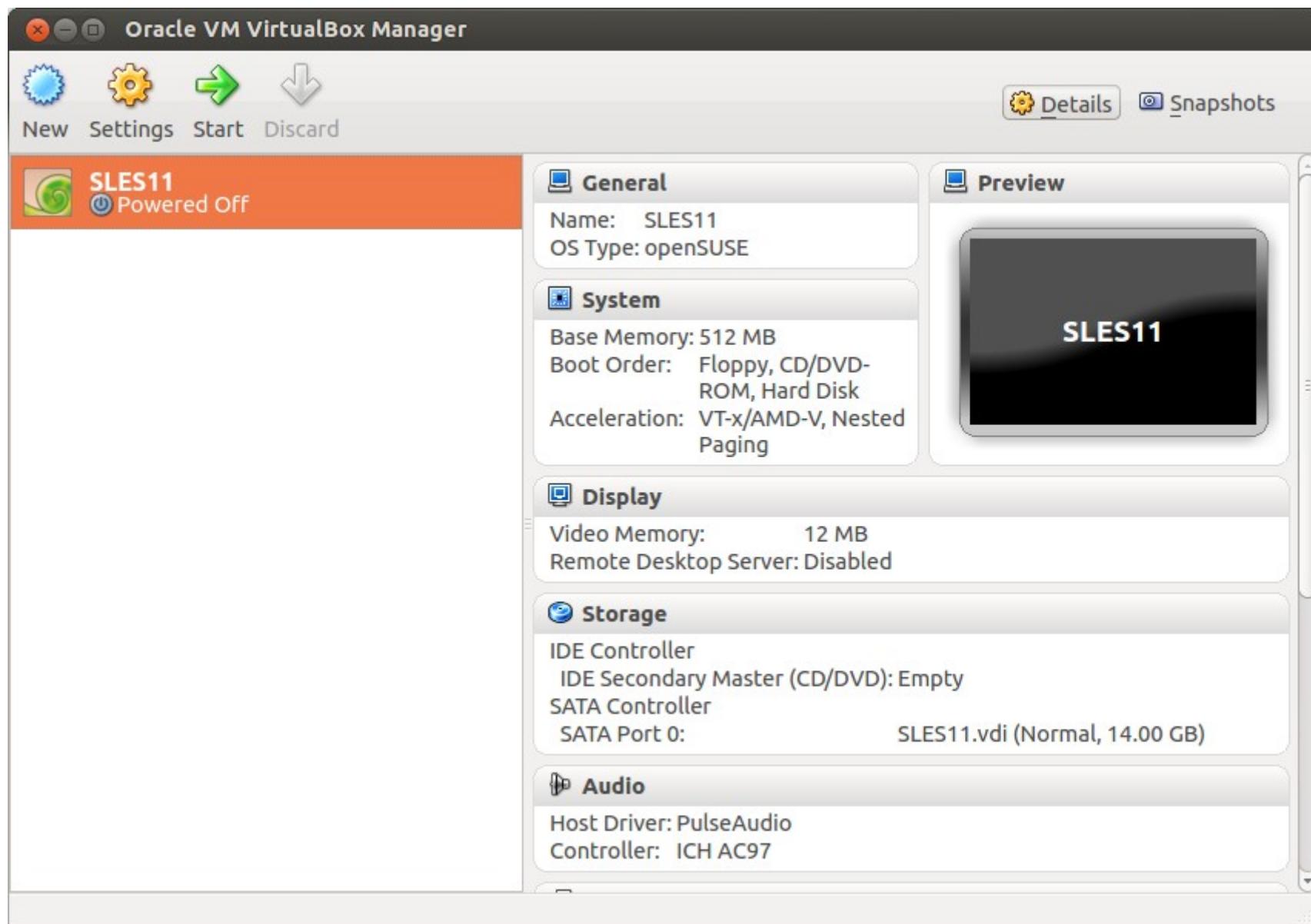
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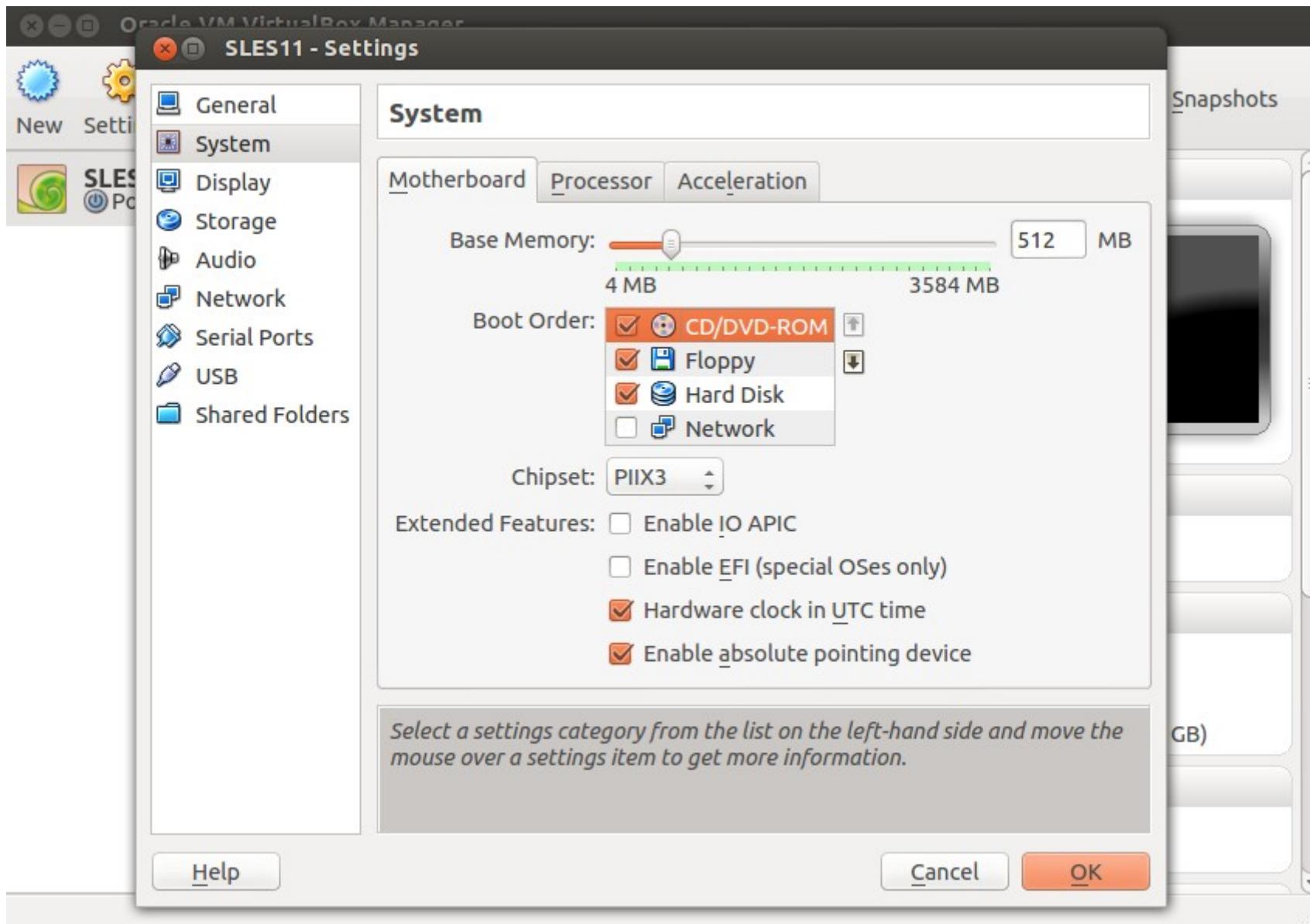
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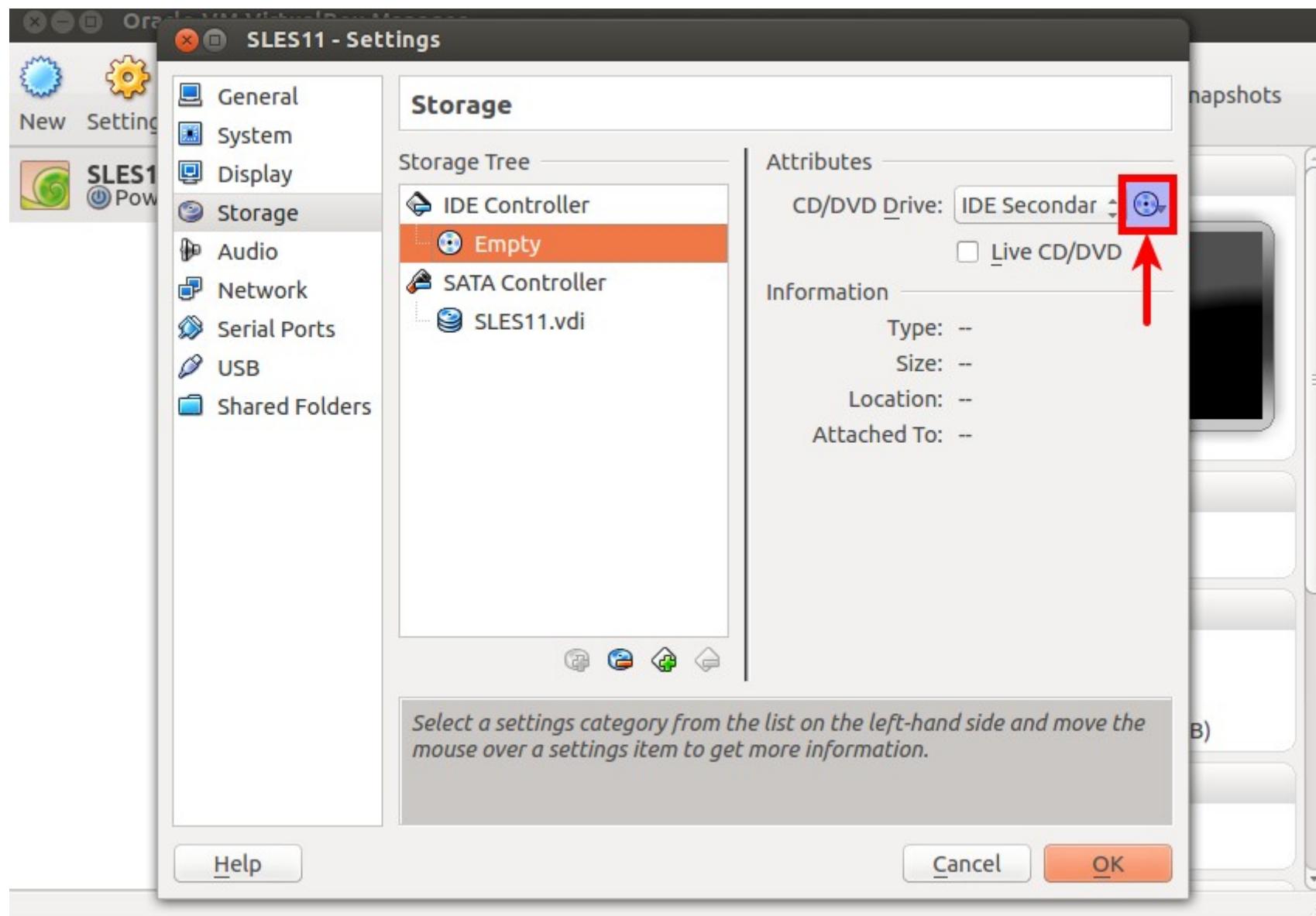
VirtualBox



VirtualBox



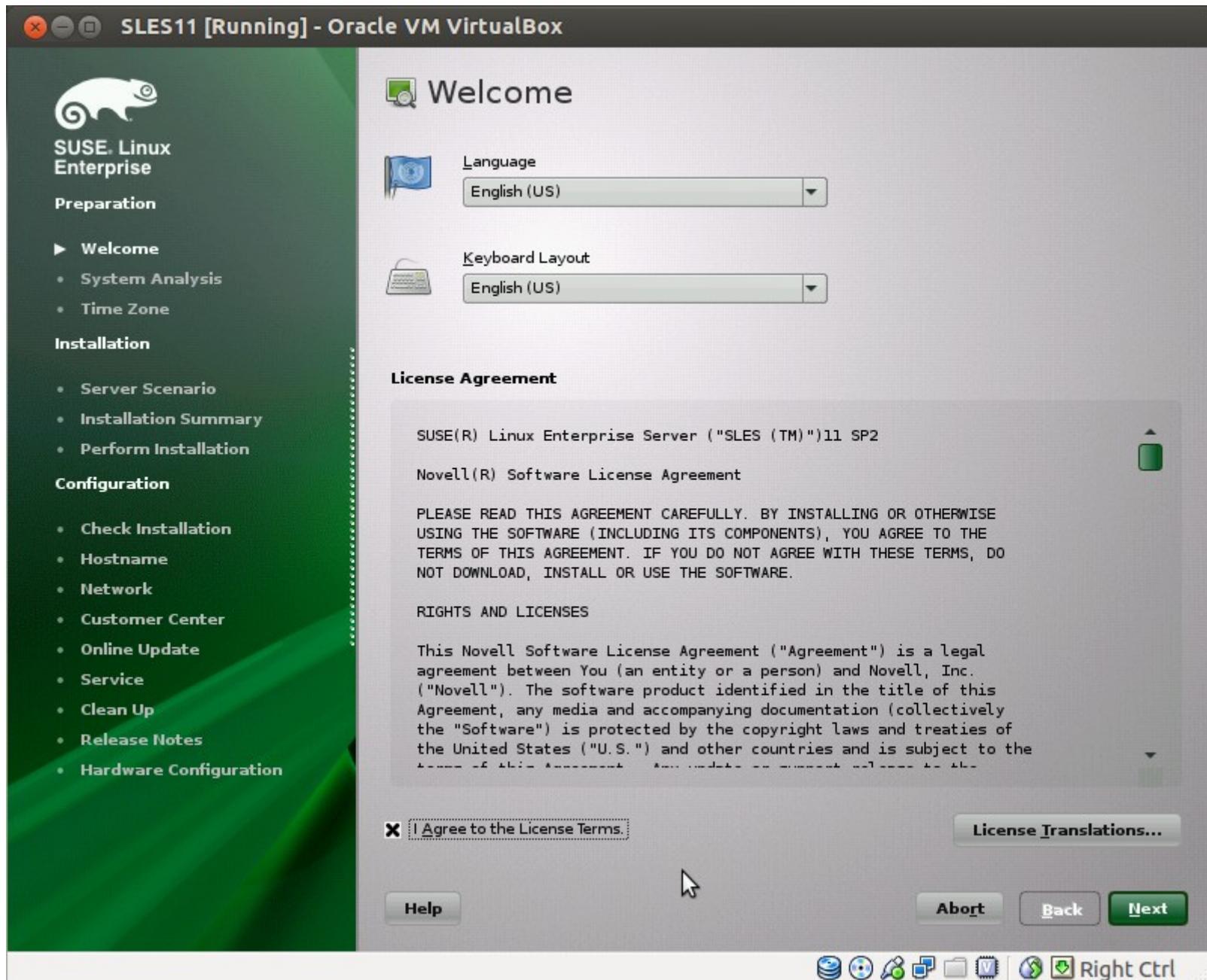
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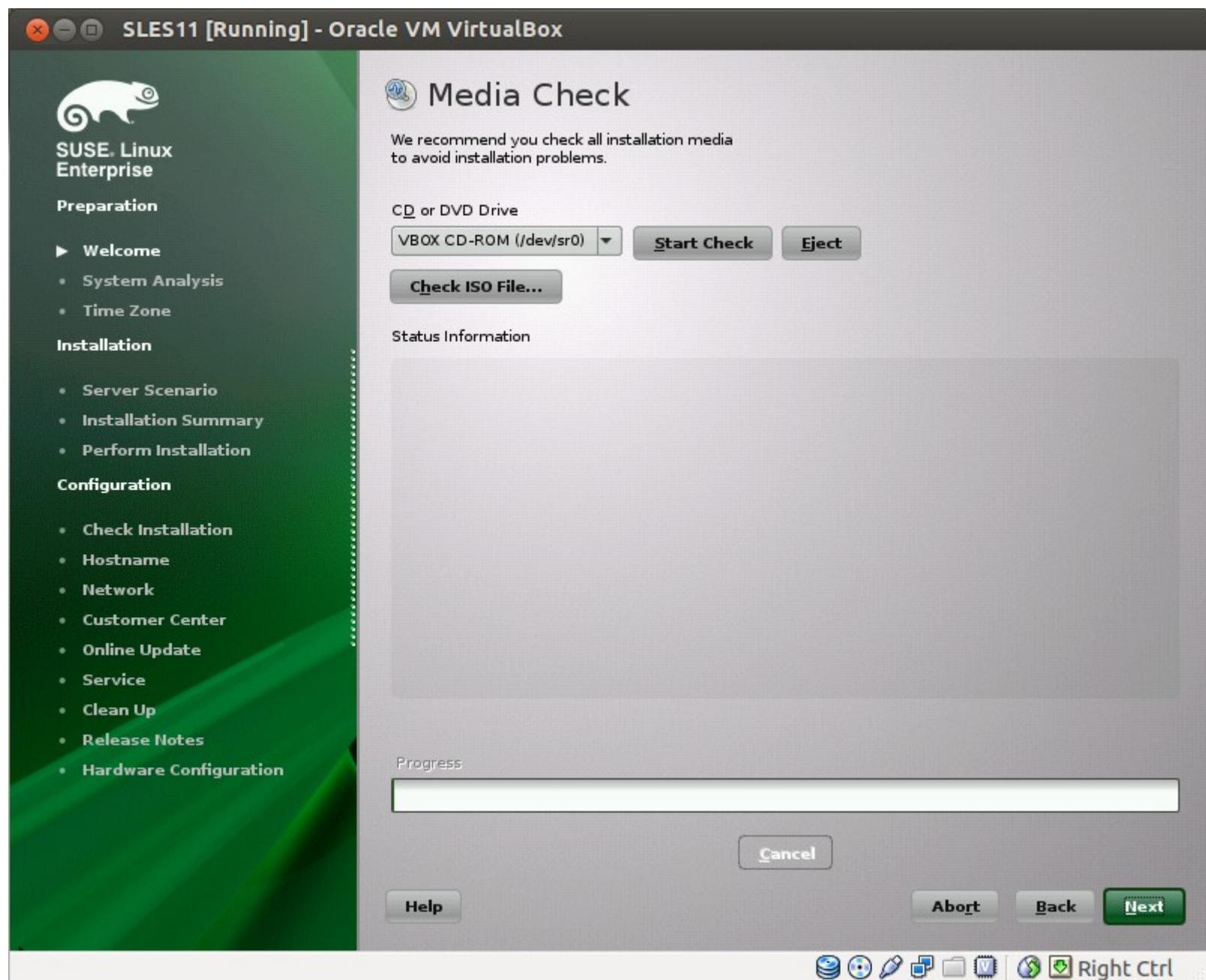
VirtualBox+SLES



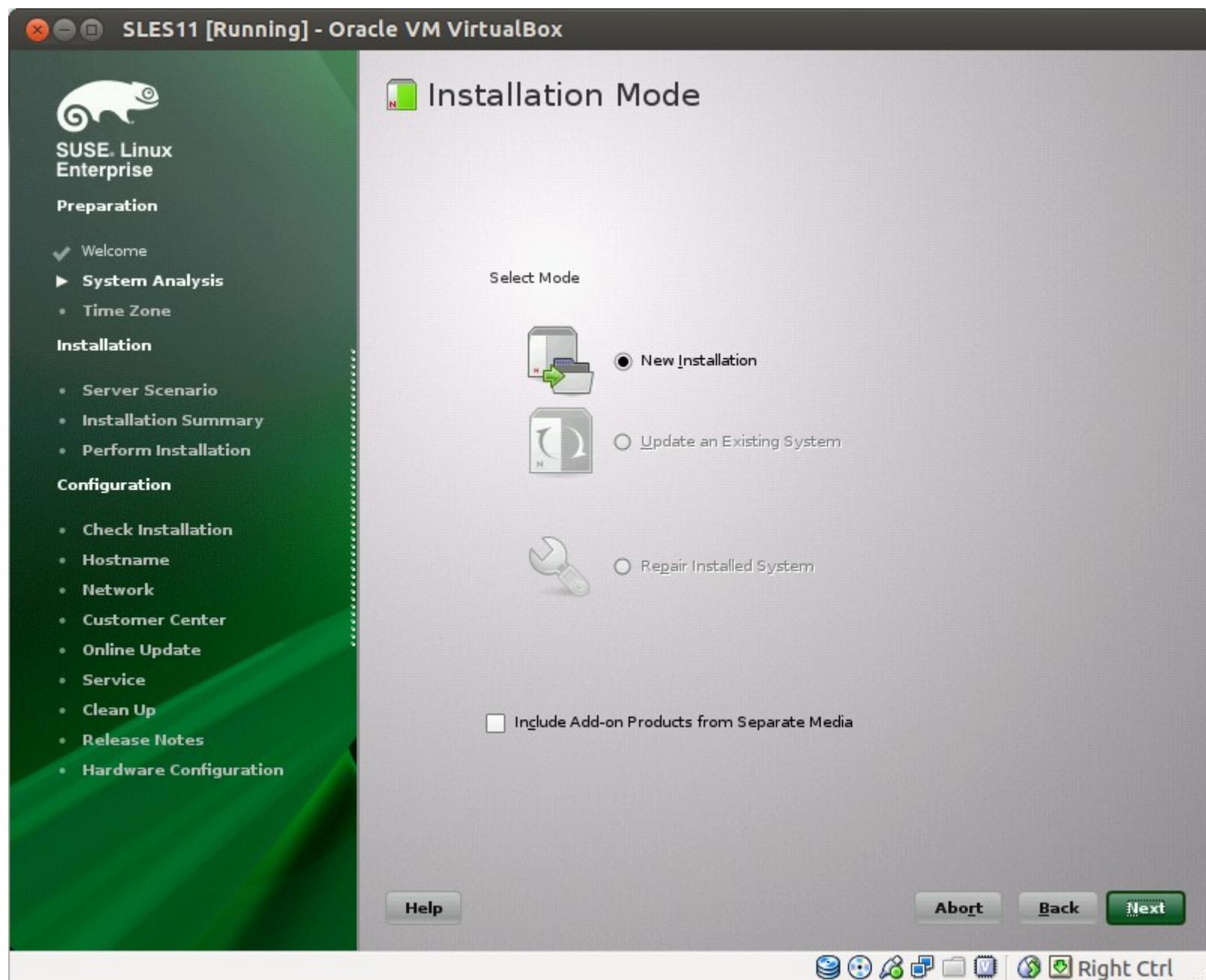
VirtualBox+SLES



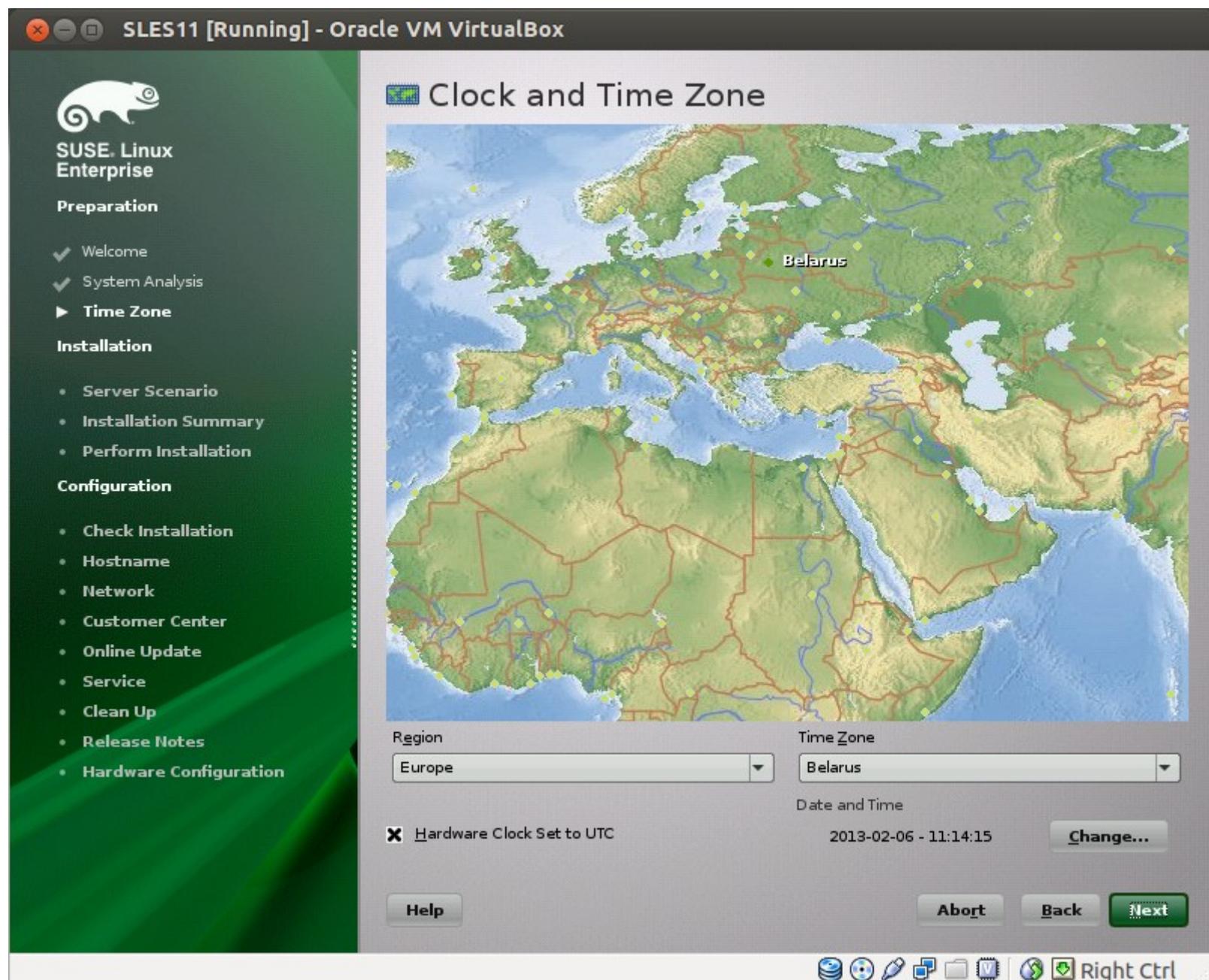
VirtualBox+SLES



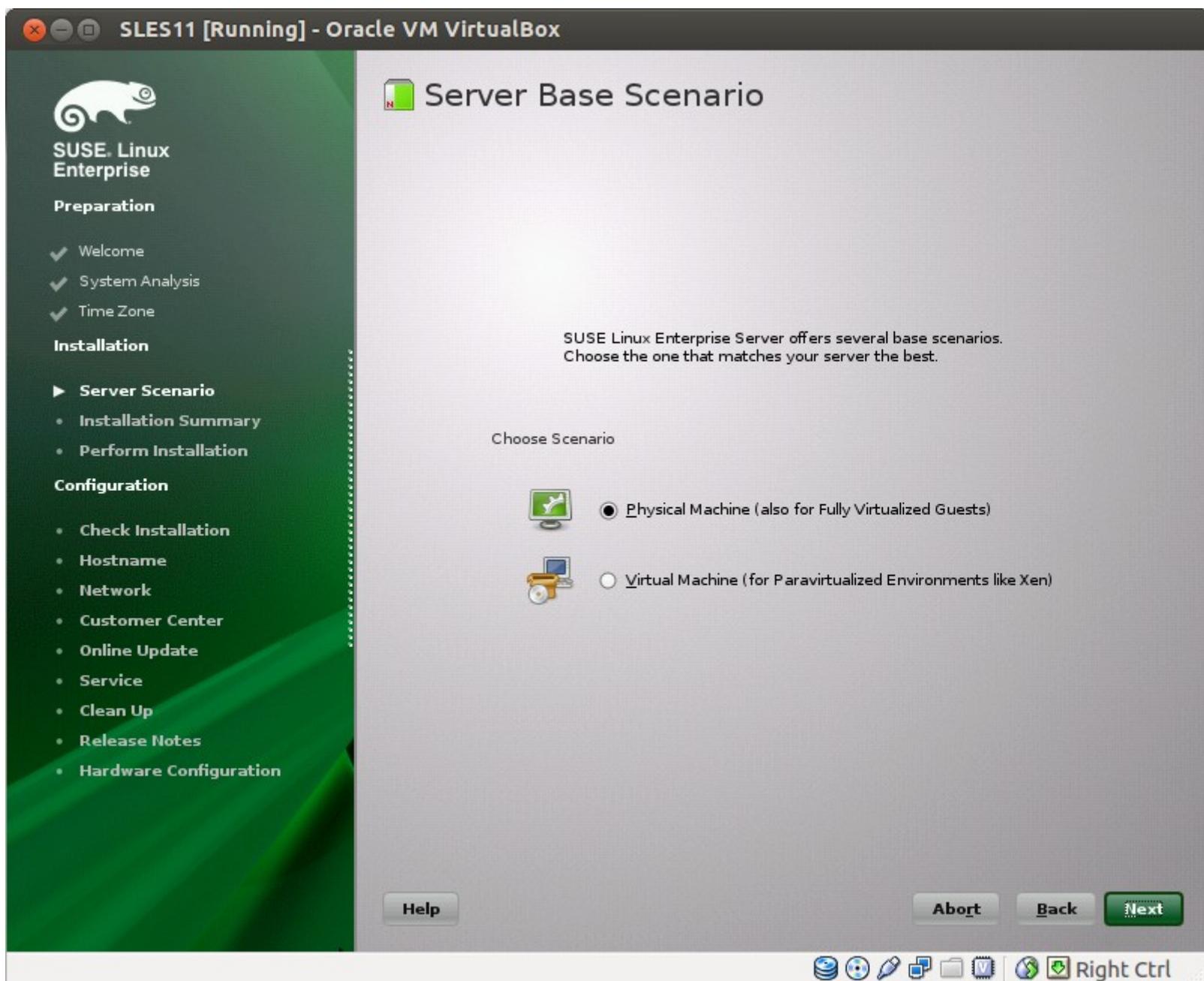
VirtualBox+SLES



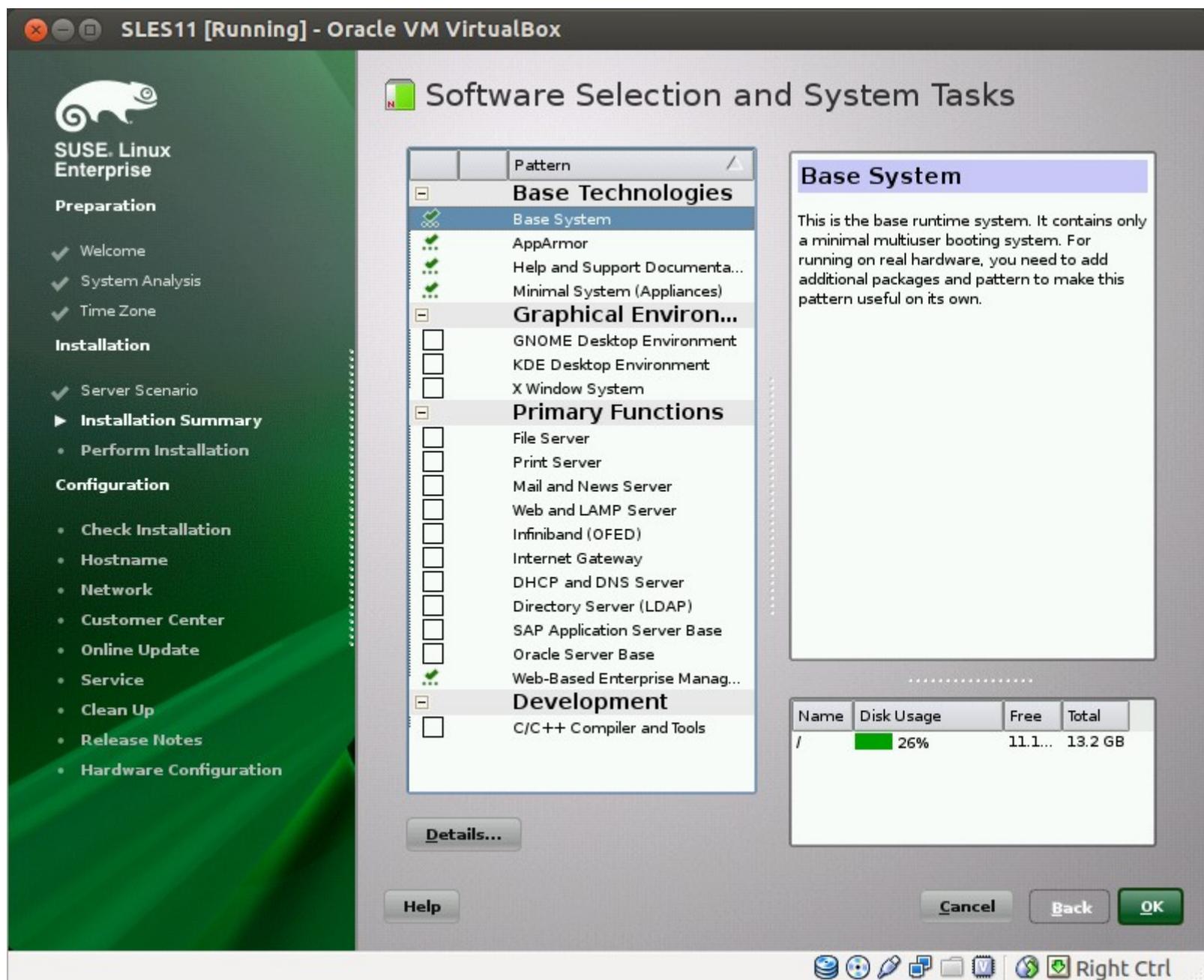
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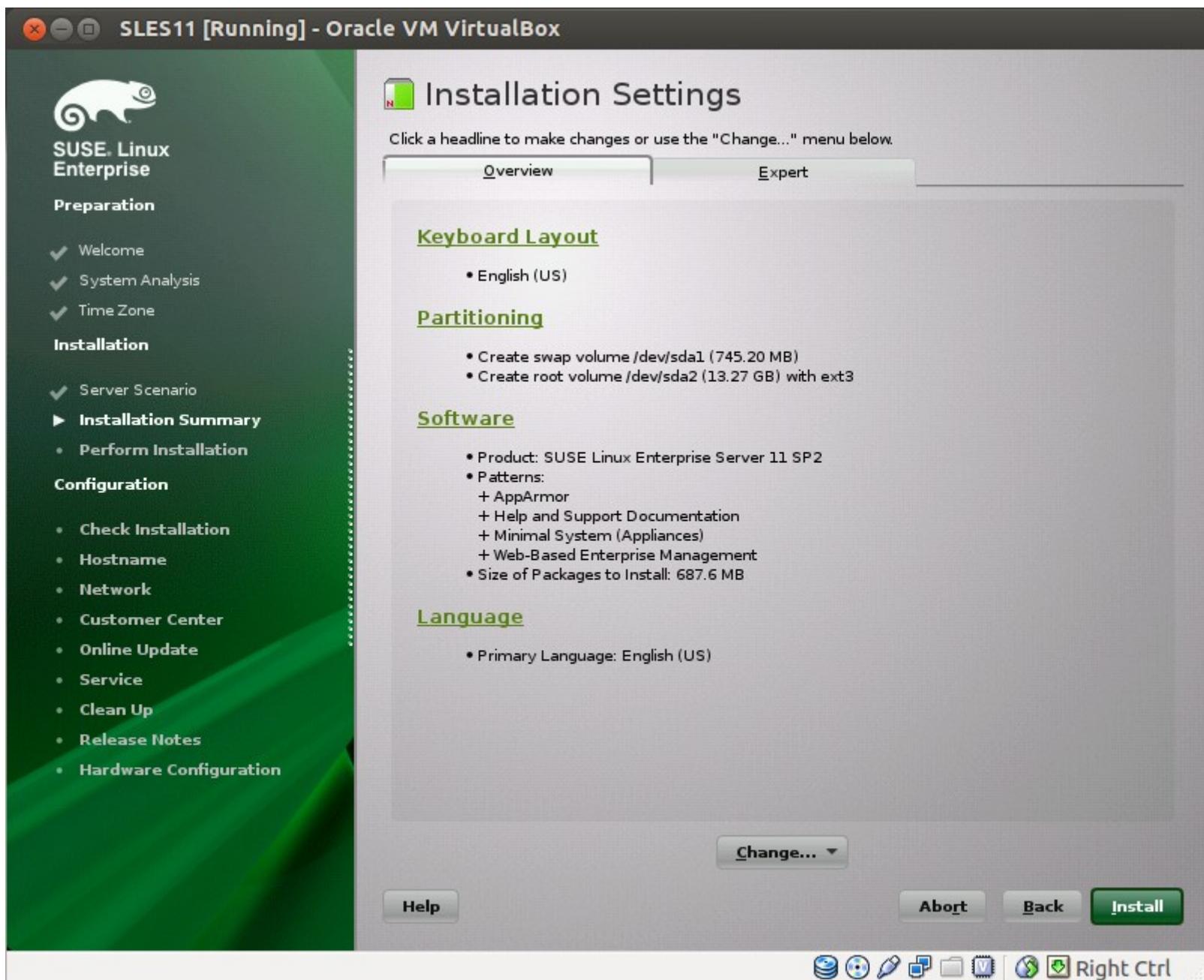
VirtualBox+SLES



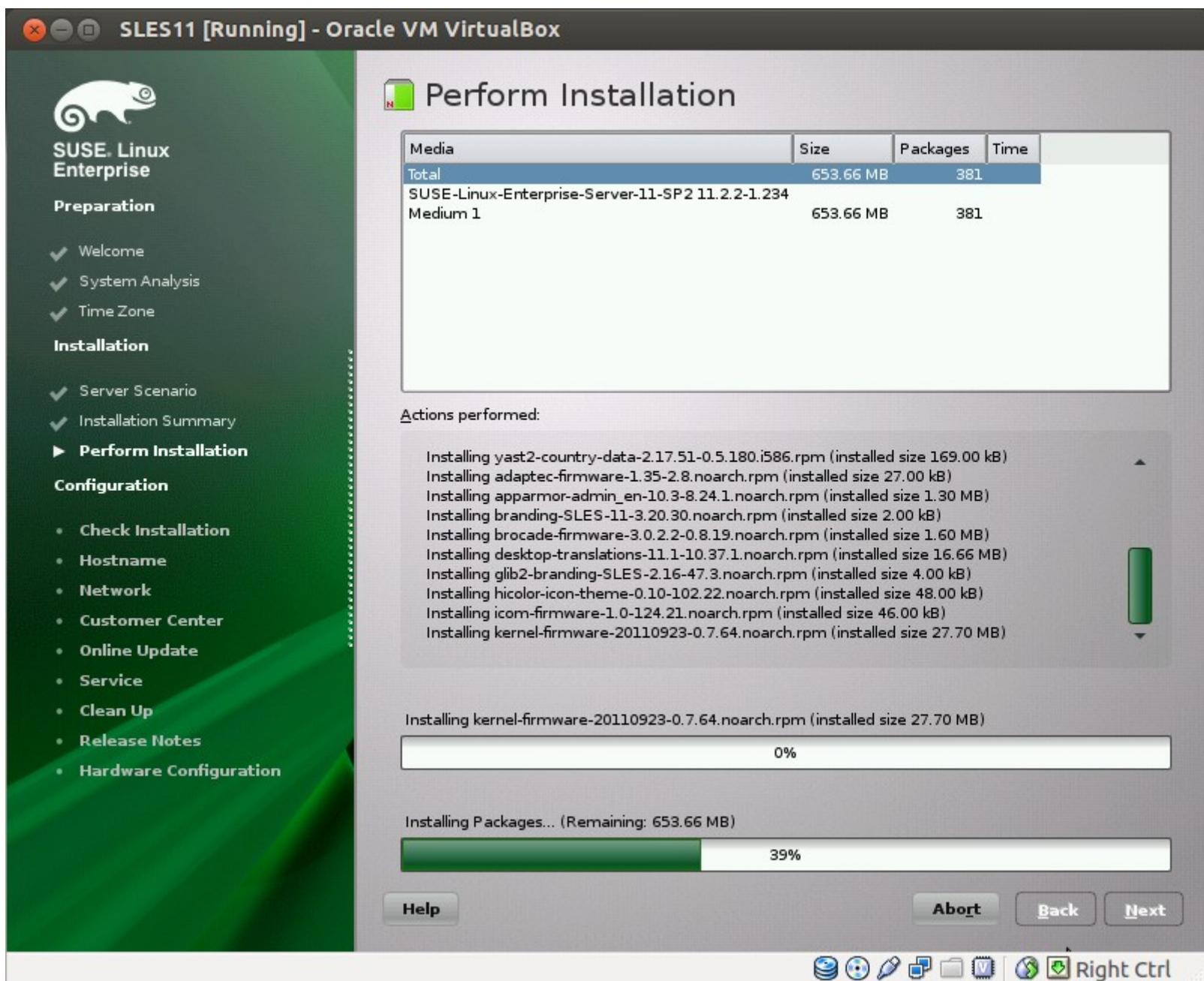
VirtualBox+SLES



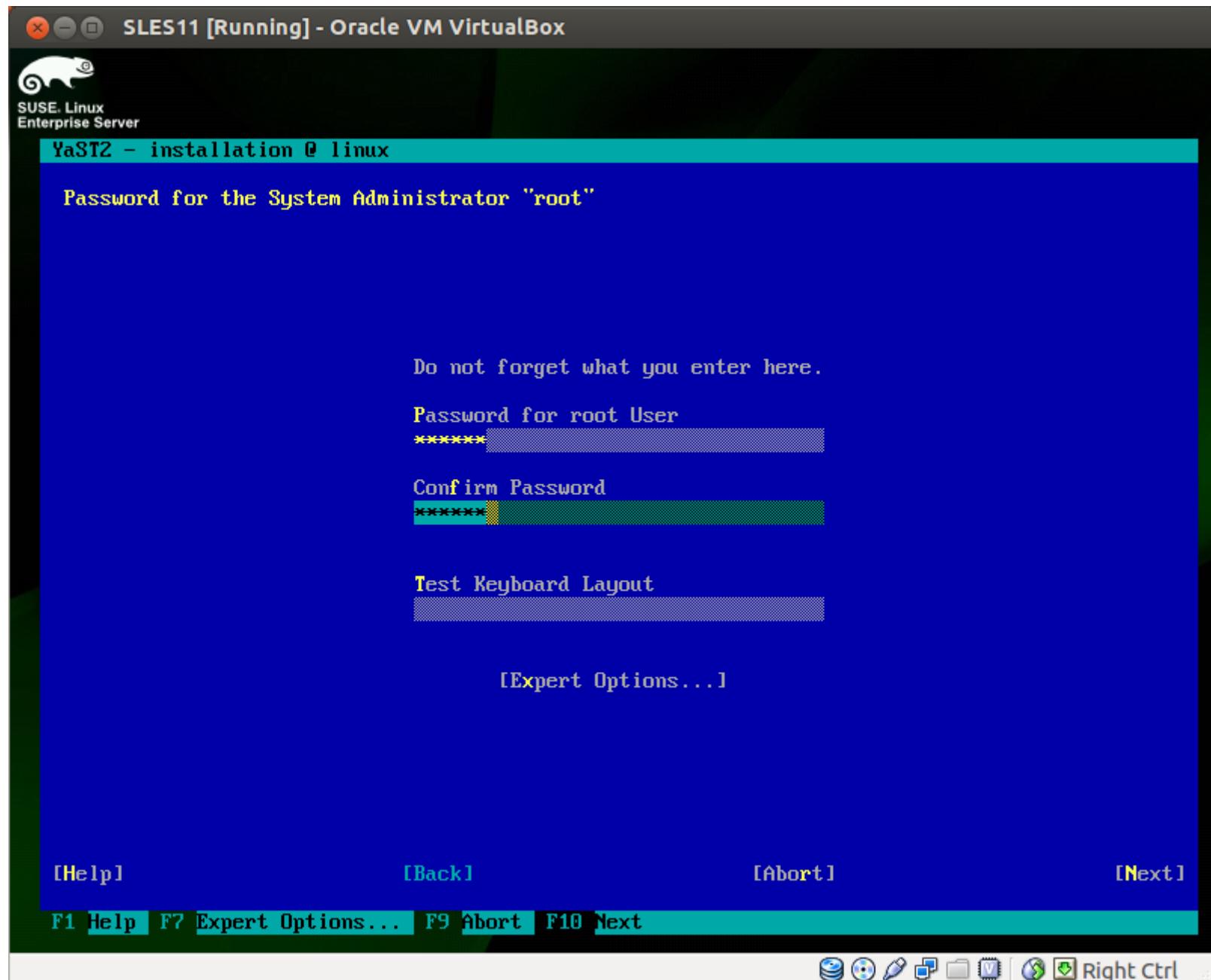
VirtualBox+SLES

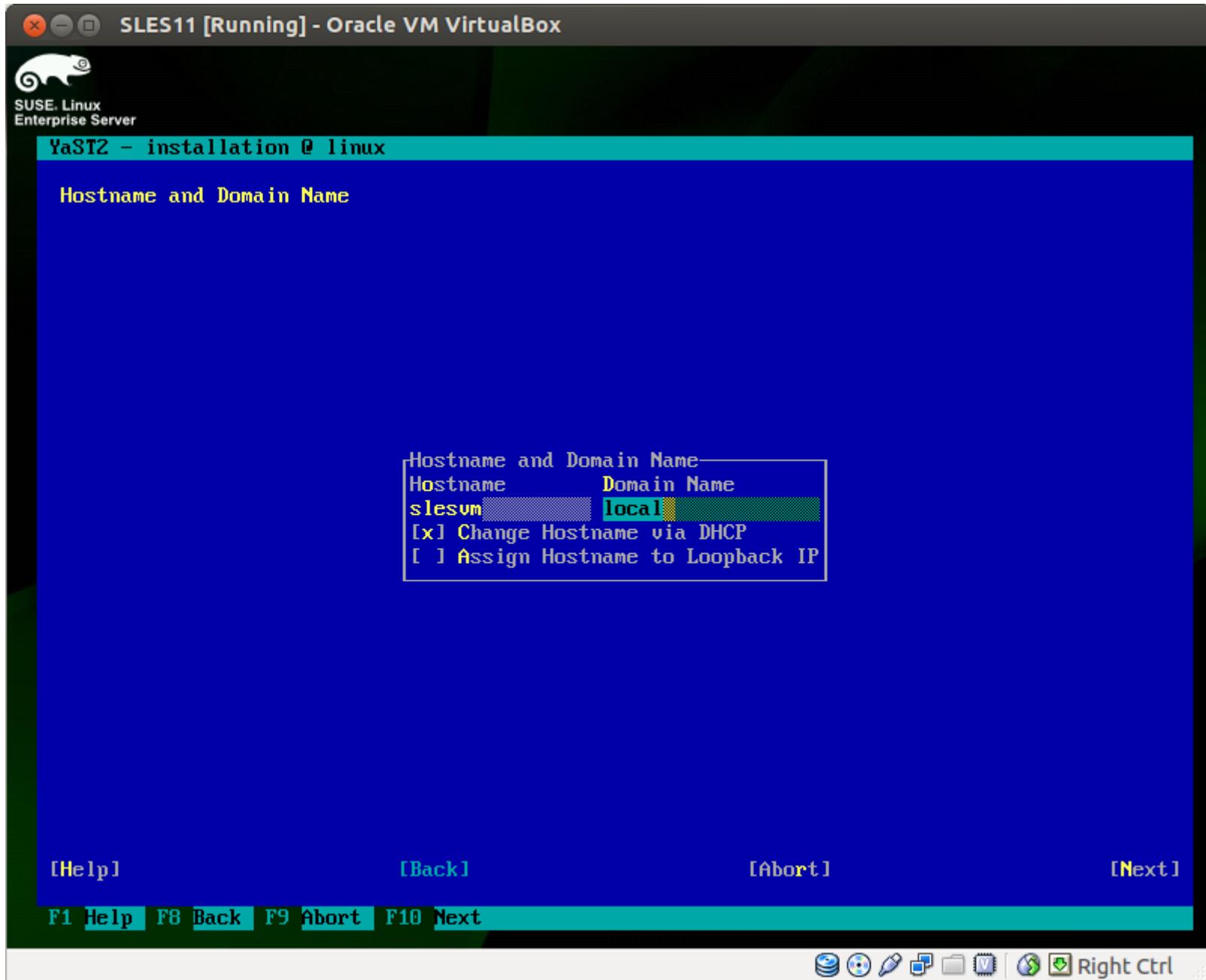


VirtualBox+SLES

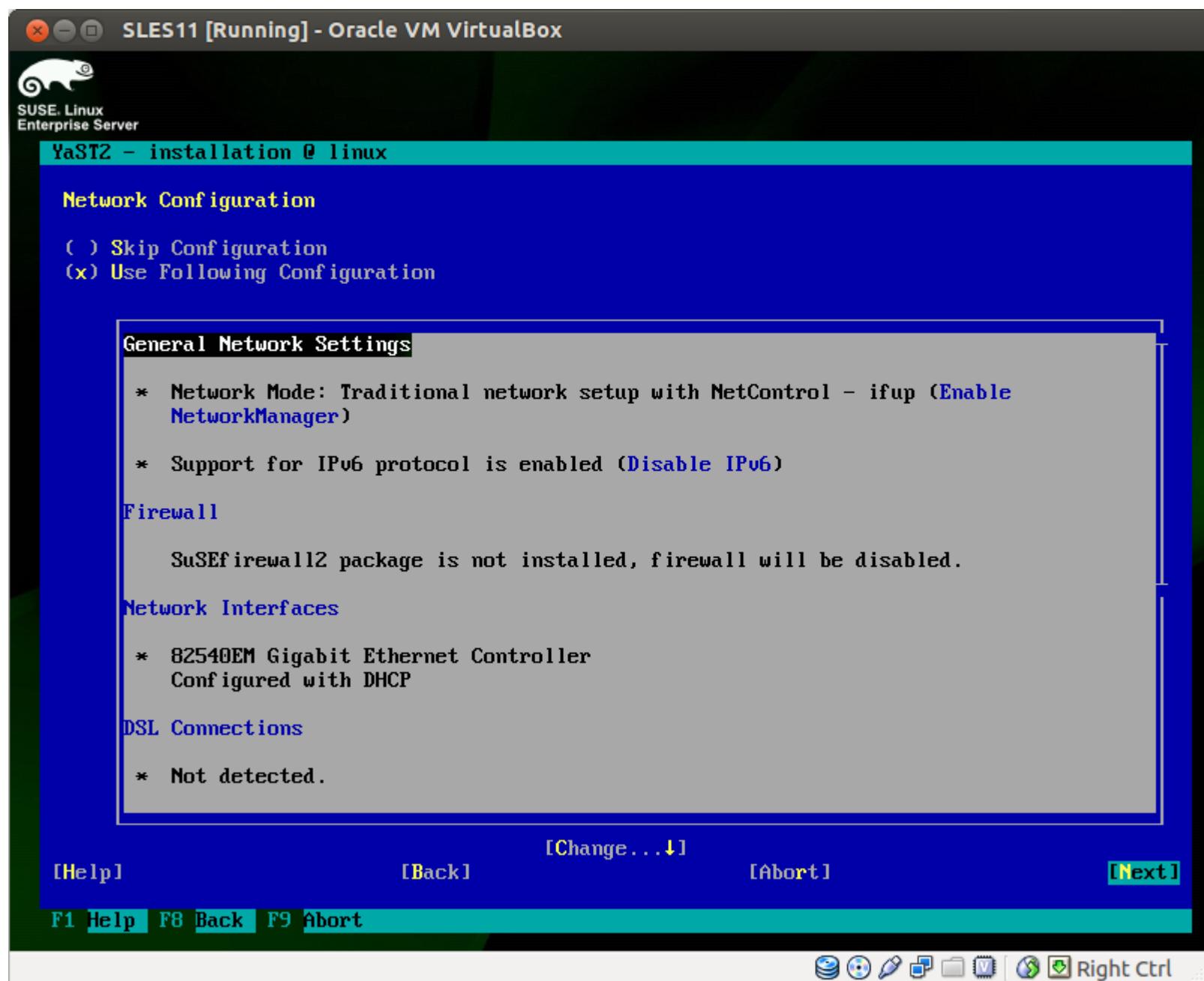


VirtualBox+SLES

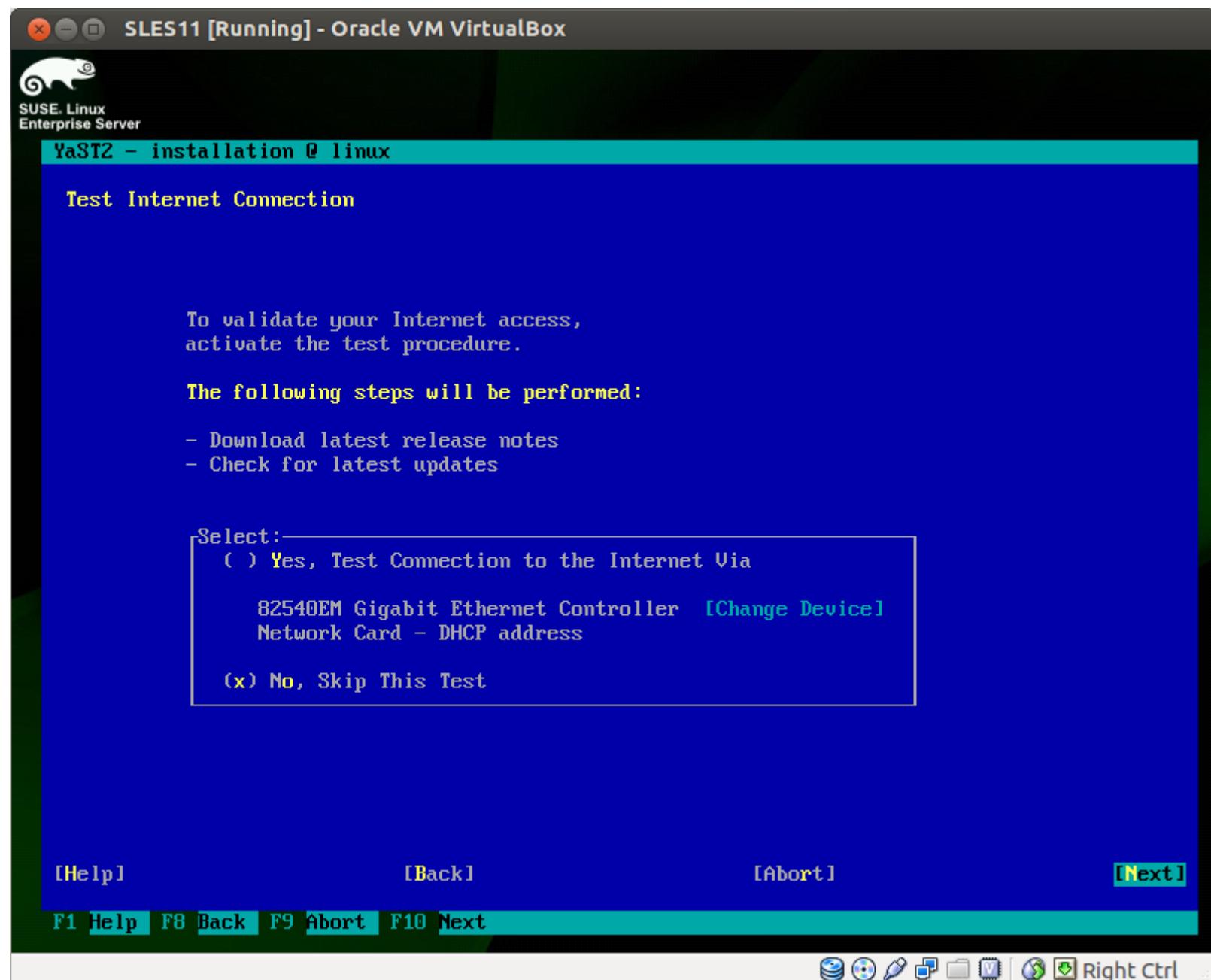




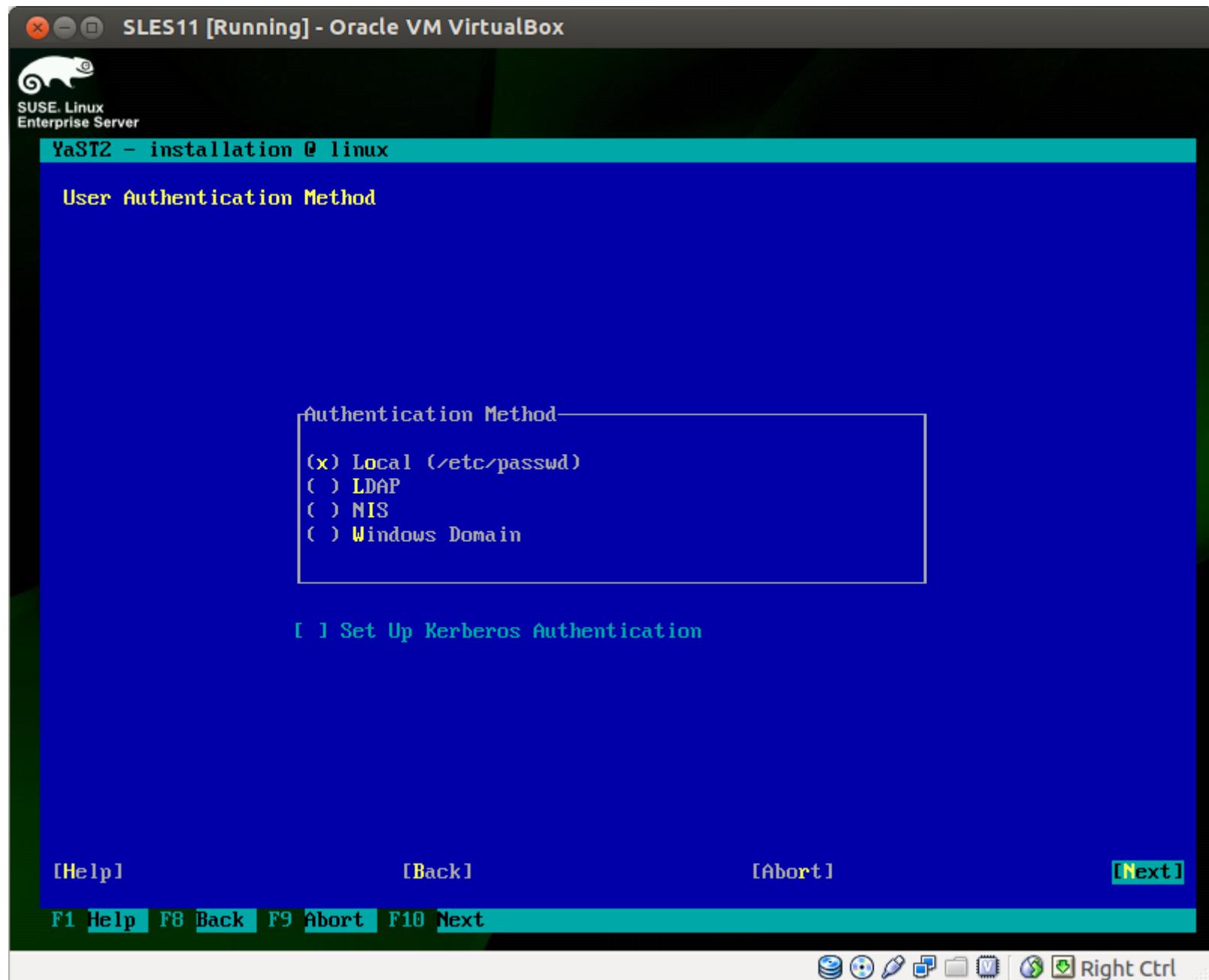
VirtualBox+SLES



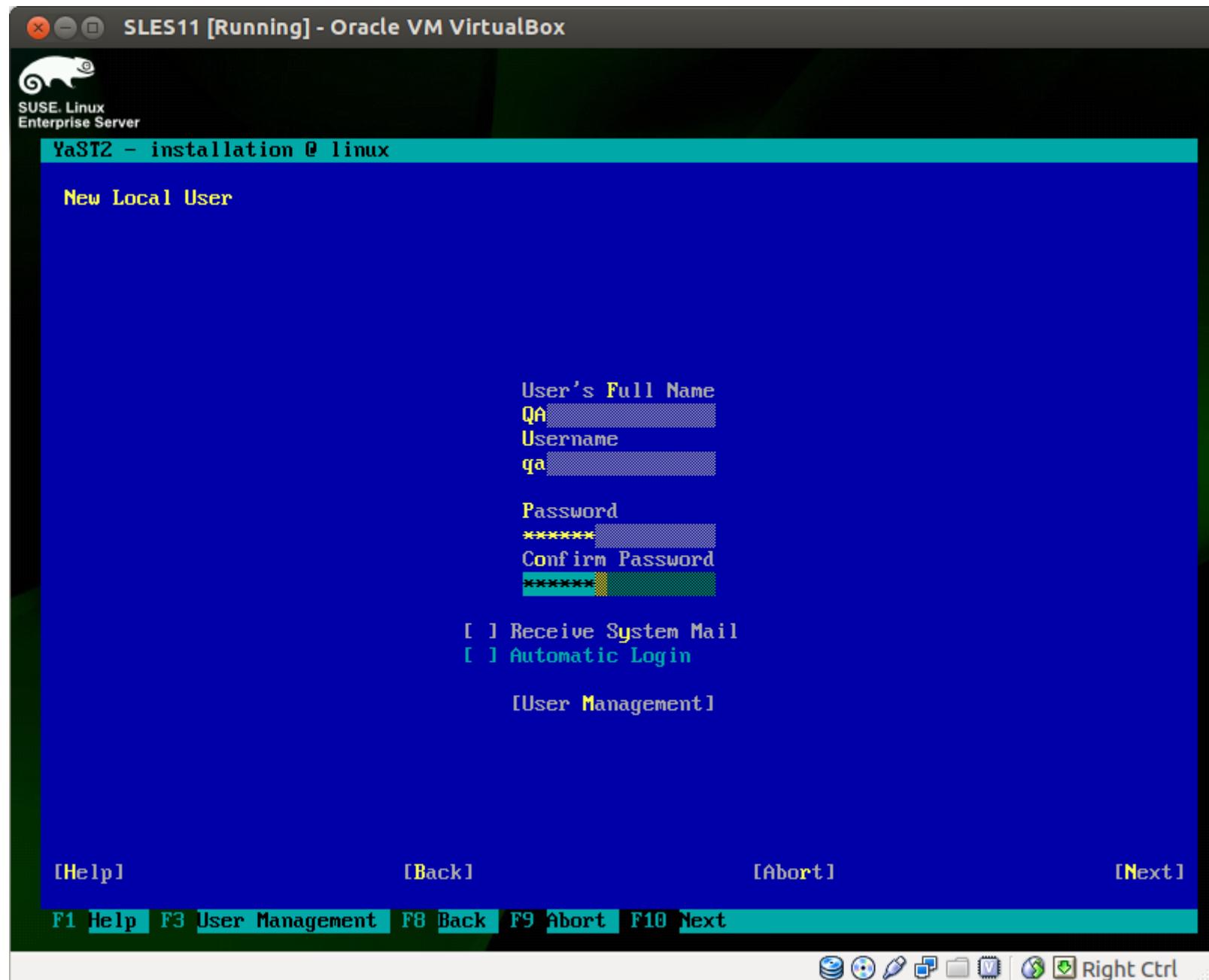
VirtualBox+SLES



VirtualBox+SLES



VirtualBox+SLES



VirtualBox+SLES

SLES11 [Running] - Oracle VM VirtualBox

SUSE Linux Enterprise Server

```
Loading keymap assuming iso-8859-15 euro                                done
Loading /usr/share/kbd/keymaps/i386/qwerty/us.map.gz                      done
Loading compose table latin1.add                                         done
Start Unicode mode                                                       unused
Starting irqbalance
Setting up (remotefs) network interfaces:                                 done
Setting up service (remotefs) network . . . . .                           done
Starting mail service (Postfix)                                         done
Starting CRON daemon                                                 done
Master Resource Control: runlevel 3 has been reached
Skipped services in runlevel 3:                                         nfs irq_balancer

Welcome to SUSE Linux Enterprise Server 11 SP2 (i586) - Kernel 3.0.13-0.27-default (tty1).

slesvm login: qa
Password:
qa@slesvm:~> ls
bin
qa@slesvm:~> ls -la
total 36
drwxr-xr-x 5 qa    users 4096 Feb  6 12:31 .
drwxr-xr-x 3 root  root 4096 Feb  6 12:31 ..
-rw----- 1 qa    users     0 Feb  6 12:31 .bash_history
-rw-r--r-- 1 qa    users 1177 Feb  6 12:31 .bashrc
drwxr-xr-x 2 qa    users 4096 Feb  6 12:31 bin
-rw-r--r-- 1 qa    users 1637 Feb  6 12:31 .emacs
drwxr-xr-x 2 qa    users 4096 Feb  6 12:31 fonts
-rw-r--r-- 1 qa    users  861 Feb  6 12:31 .inputrc
drwxr-xr-x 2 qa    users 4096 Feb  6 12:31 mozilla
-rw-r--r-- 1 qa    users 1028 Feb  6 12:31 .profile
qa@slesvm:~> _
```

Right Ctrl

VirtualBox

- VirtualBox extension pack
- vboxheadless
- vboxmanage

ESX (webUI)

The screenshot shows the VMware ESX 4.1 web interface. At the top, it says "VMware ESX 4.1 Welcome". Below that, there's a "Getting Started" section with instructions on how to access the host remotely using vSphere Client or vCenter. It also lists links for "Download vSphere Client" and "Download VMware vCenter". There's a "For Administrators" sidebar with sections for "vSphere Web Access" (describing its purpose and linking to "Log in to Web Access") and "Web-Based Datastore Browser" (describing its purpose and linking to "Browse datastores in this host's inventory"). A "For Developers" sidebar has a section for "vSphere Web Services SDK" with links to "Learn more about the Web Services SDK" and "Browse objects managed by this host". The bottom of the page contains copyright and trademark information.

VMware ESX 4.1
Welcome

Getting Started

If you need to access this host remotely, use the following program to install vSphere Client software. After running the installer, start the client and log in to this host.

- [Download vSphere Client](#)

To streamline your IT operations with vSphere, use the following program to install vCenter. vCenter will help you consolidate and optimize workload distribution across ESX hosts, reduce new system deployment time from weeks to seconds, monitor your virtual computing environment around the clock, avoid service disruptions due to planned hardware maintenance or unexpected failure, centralize access control, and automate system administration tasks.

- [Download VMware vCenter](#)

If you need more help, please refer to our documentation library:

- [vSphere 4.1 Documentation](#)

For Administrators

vSphere Web Access

vSphere Web Access streamlines remote desktop deployment by allowing you to organize and share virtual machines using ordinary web browser URLs.

Web Access must be enabled before use. For details, please refer to the vSphere documentation library.

- [Log in to Web Access](#)

Web-Based Datastore Browser

Use your web browser to find and download files (for example, virtual machine and virtual disk files).

- [Browse datastores in this host's inventory](#)

For Developers

vSphere Web Services SDK

Learn about our latest SDKs, Toolkits, and APIs for managing VMware ESX, ESXi, and VMware vCenter. Get sample code, reference documentation, participate in our Forum Discussions, and view our latest Sessions and Webinars.

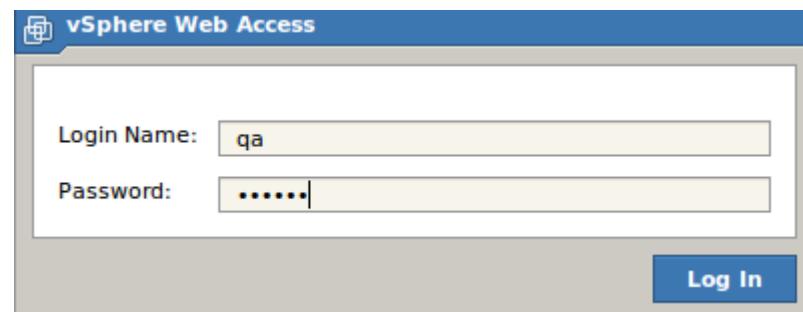
- [Learn more about the Web Services SDK](#)
- [Browse objects managed by this host](#)

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ESX (webUI)



ESX (webUI)

The screenshot shows the VMware ESXi web interface under the 'Inventory' tab. The main content area displays system summary information, datastores, and networks. A red arrow points to the 'Create Virtual Machine' button in the 'Commands' sidebar.

General

- Hostname: [REDACTED]
- Manufacturer: [REDACTED]
- Model: [REDACTED]

Processors
Intel(R) Xeon(R) CPU E5430 @ 2.66GHz
2 CPUs x 4 Cores

Usage: 5952.00 MHz

Memory
12 GB
Usage: 9703 MB

Datastores

Name	Capacity	Free Space	Location
[REDACTED]	464 GB	82.12 GB	/vmfs/volumes/4d6fbdc8-d84550f8-ce6d-00
[REDACTED]	899.75 GB	193.37 GB	/vmfs/volumes/50a25717-d62b1418-4683-0
[REDACTED]	7317.36 GB	3097.33 GB	/vmfs/volumes/846c39bc-d835a4f4
[REDACTED]	465 GB	249.62 GB	/vmfs/volumes/4d6fd4ee-17b021d0-85f0-00
[REDACTED]	7317.36 GB	3097.16 GB	/vmfs/volumes/07b0bc50-5be8aab8

Networks

Name	VMnet	Type
[REDACTED]	vSwitch1	hostonly
[REDACTED]	vSwitch2	hostonly
[REDACTED]	vSwitch0	bridged
[REDACTED]	vSwitch0	bridged
[REDACTED]	vSwitch0	bridged

Commands

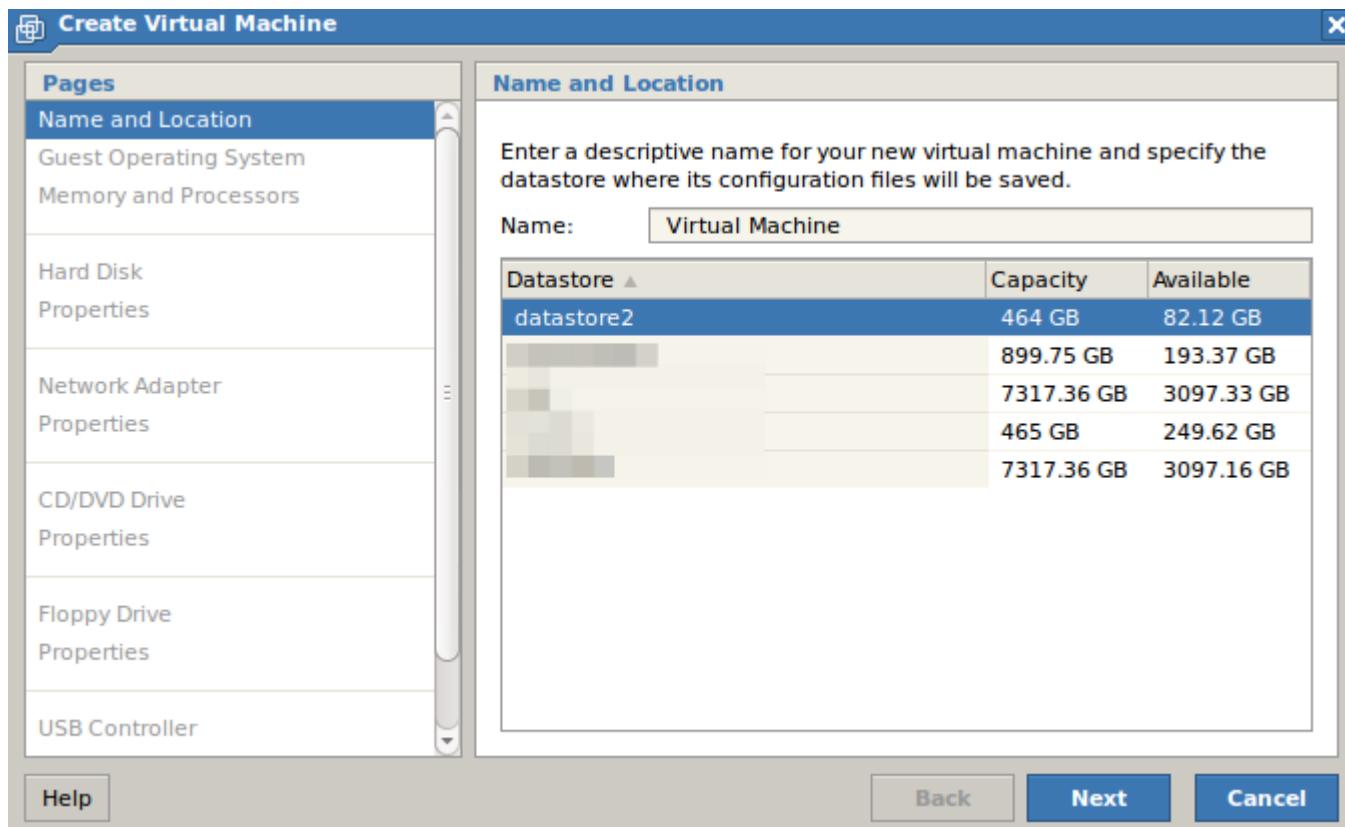
- Create Virtual Machine (highlighted with a red box and arrow)
- Add Virtual Machine to Inventory
- Edit Virtual Machine Startup/Shutdown Settings
- Refresh Network List

VMware Tips

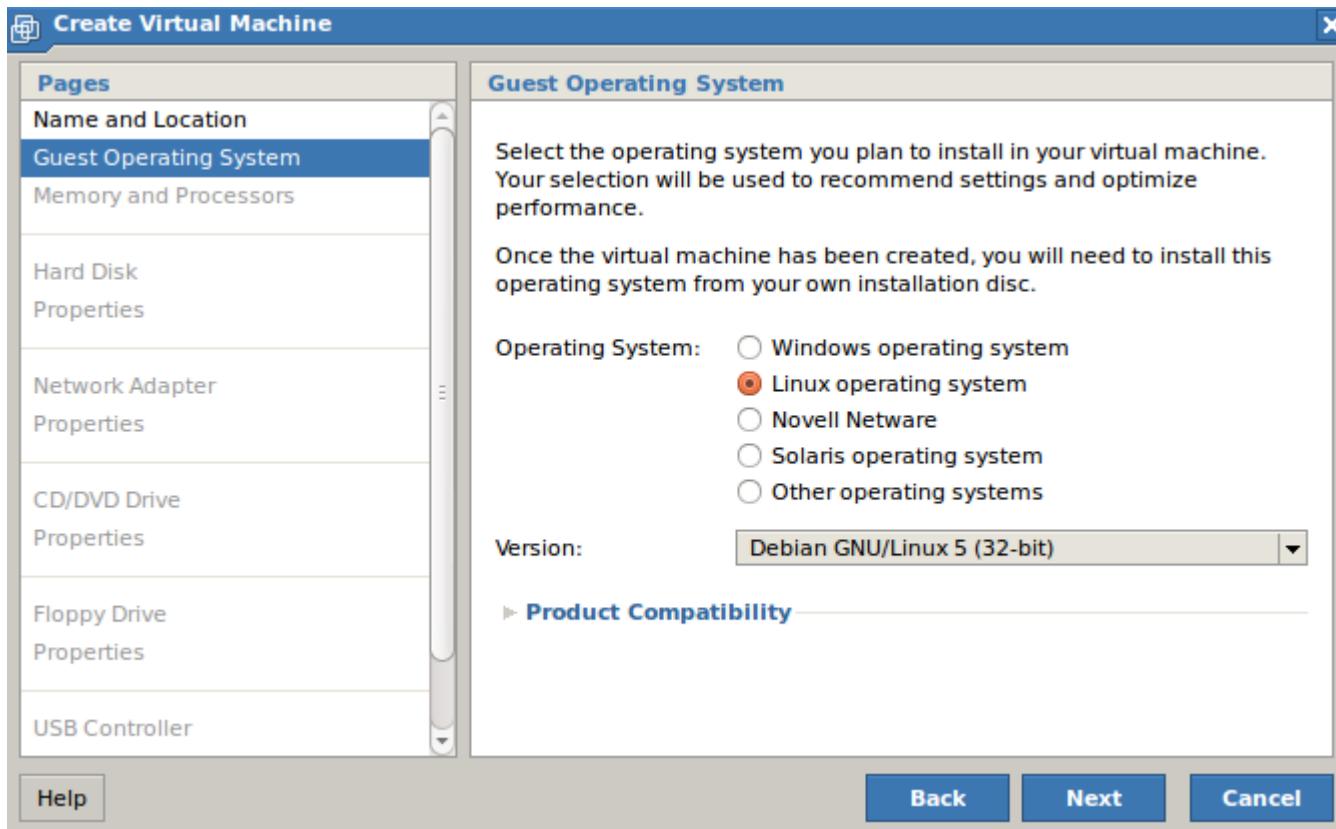
Want a superior consolidation ratio, unparalleled security and higher performance? Learn more about VMware ESXi! [Learn more...](#)

Physical Server → VMware ESXi → Virtual Machines

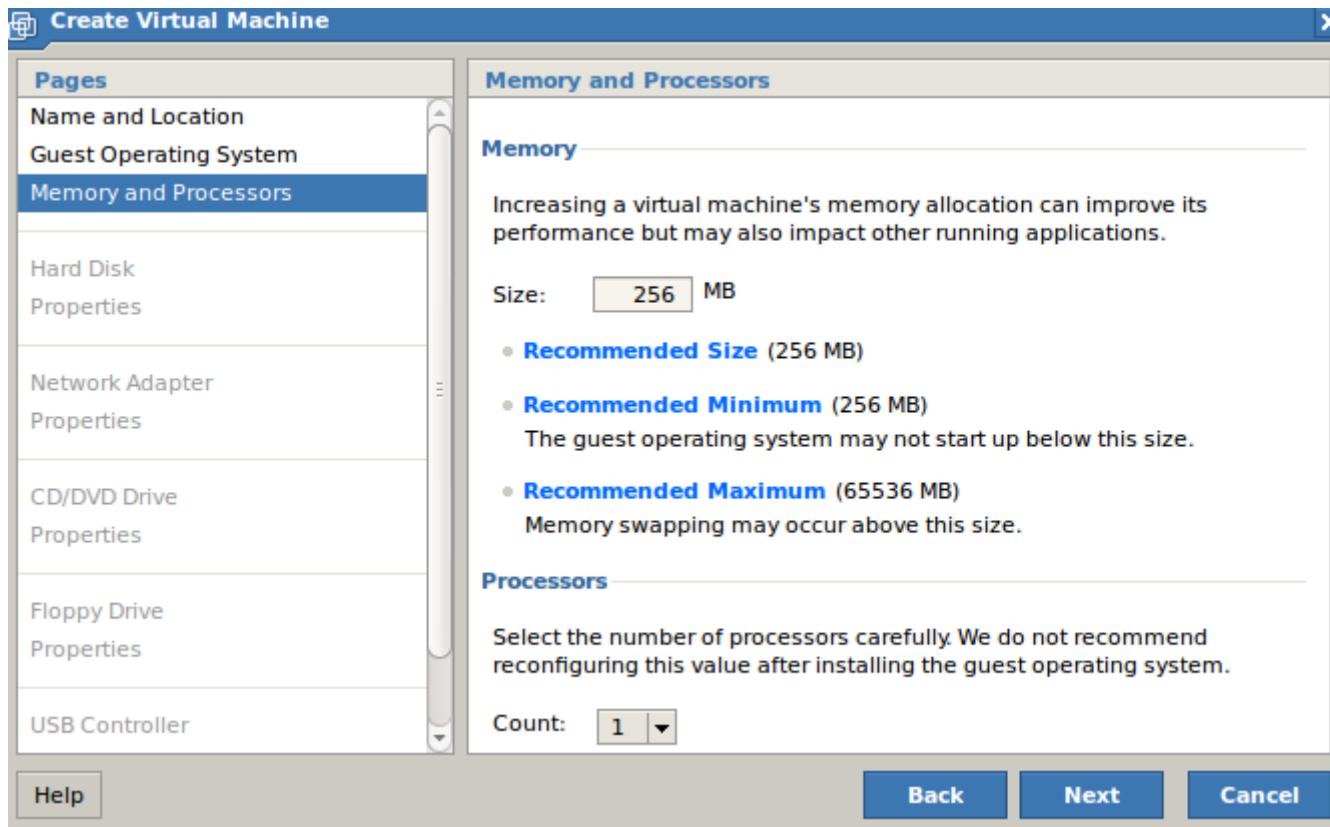
ESX (webUI)



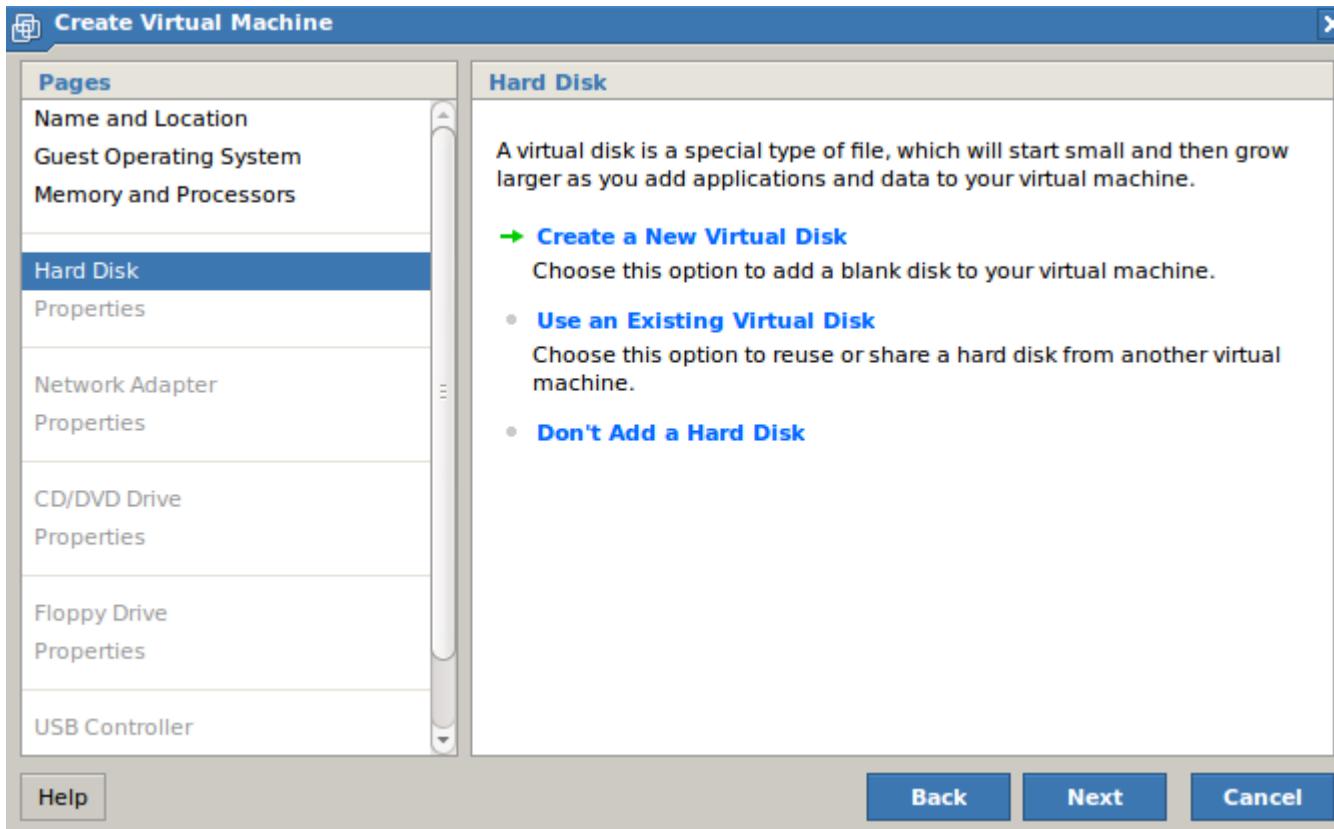
ESX (webUI)



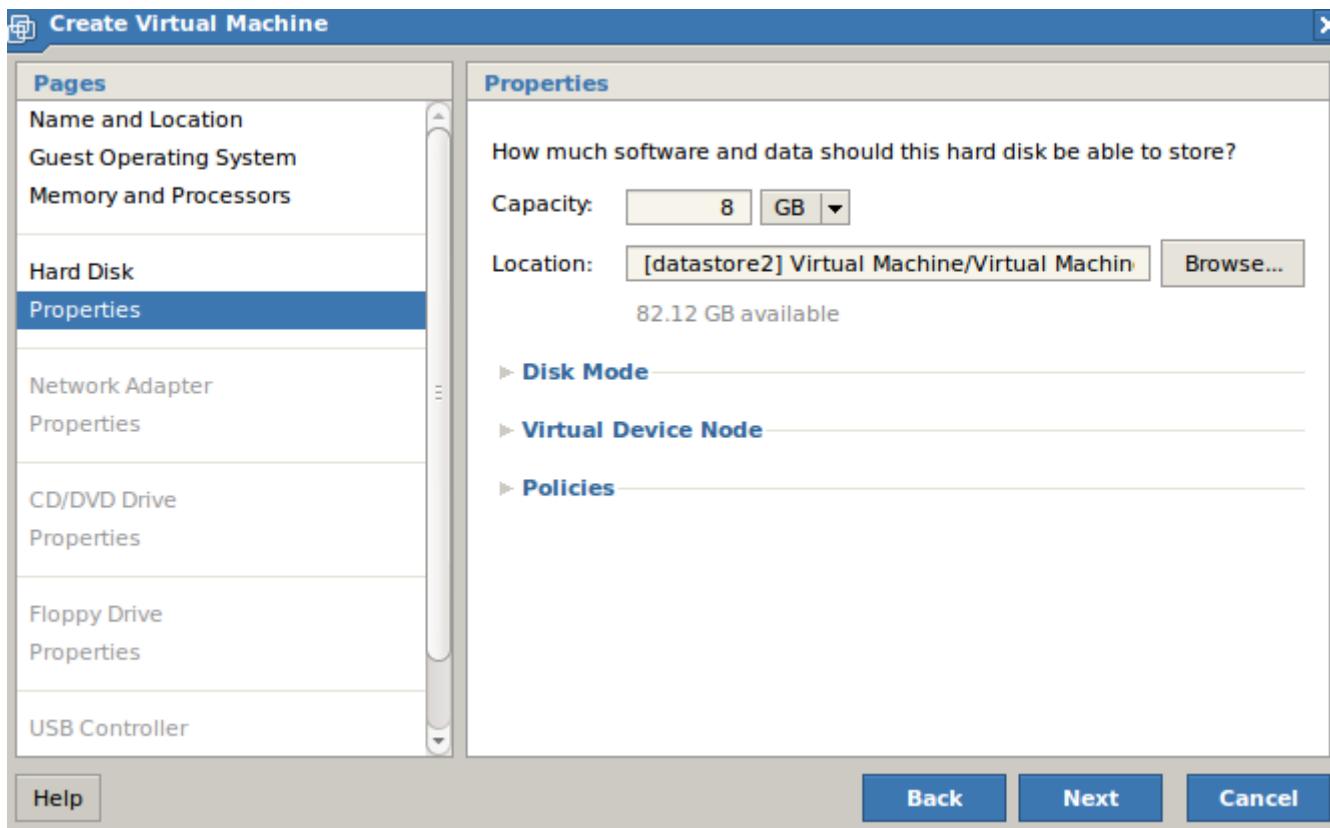
ESX (webUI)



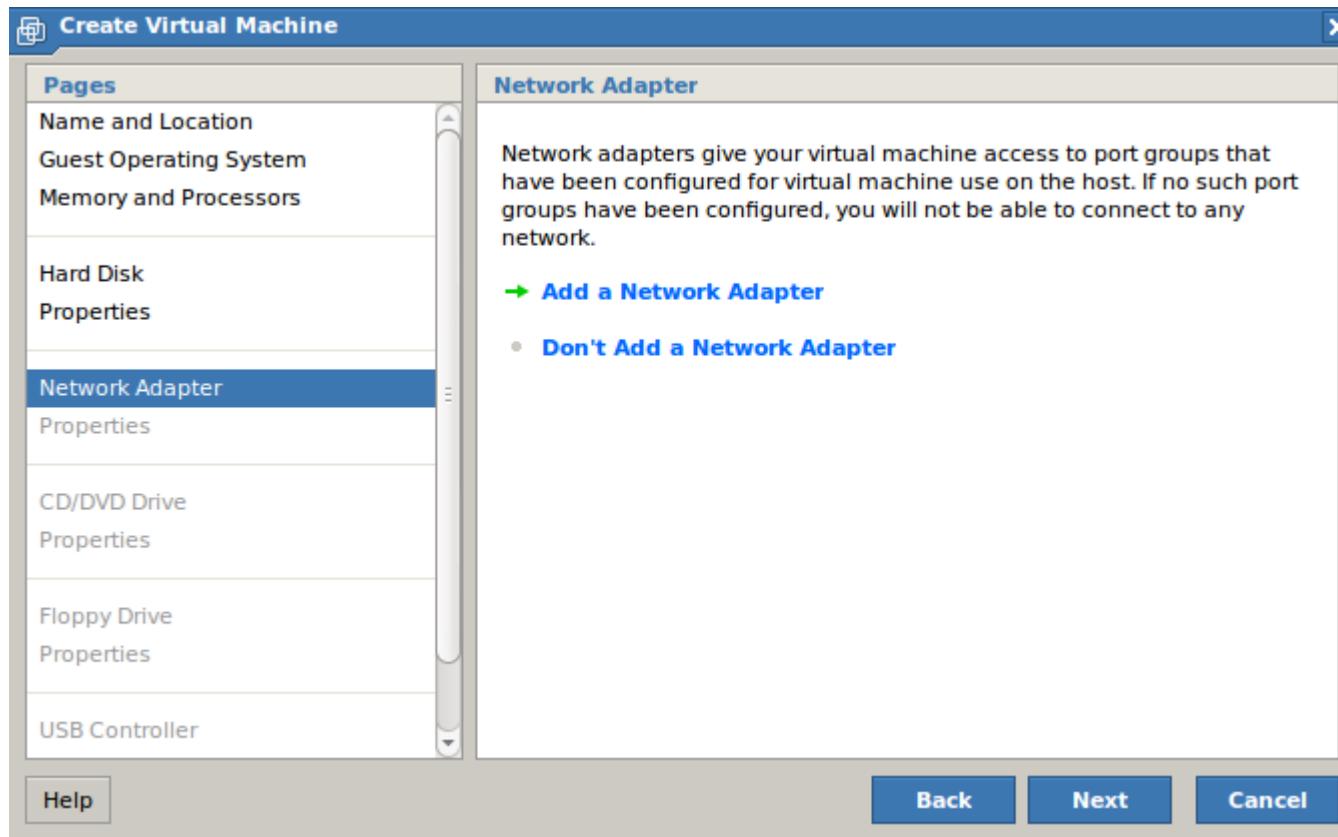
ESX (webUI)



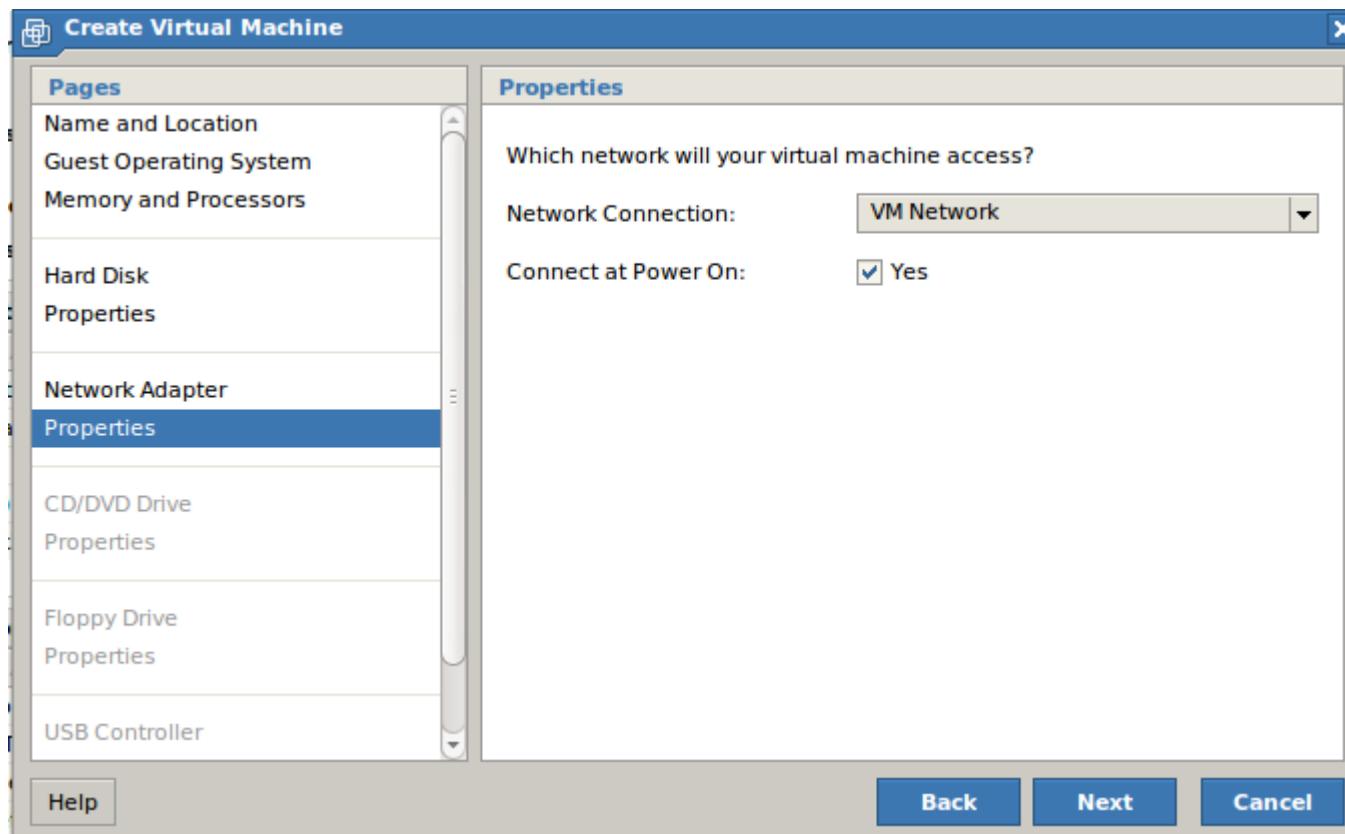
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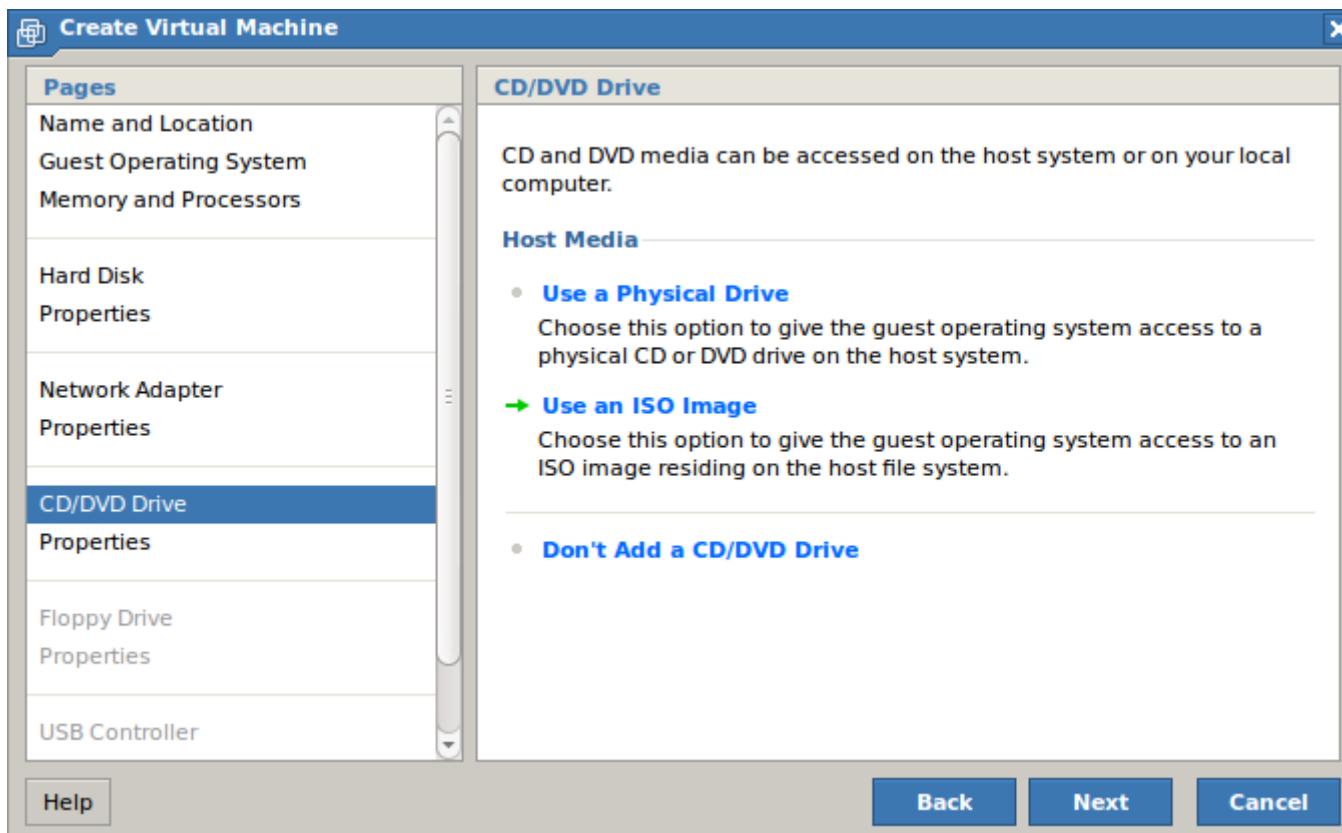
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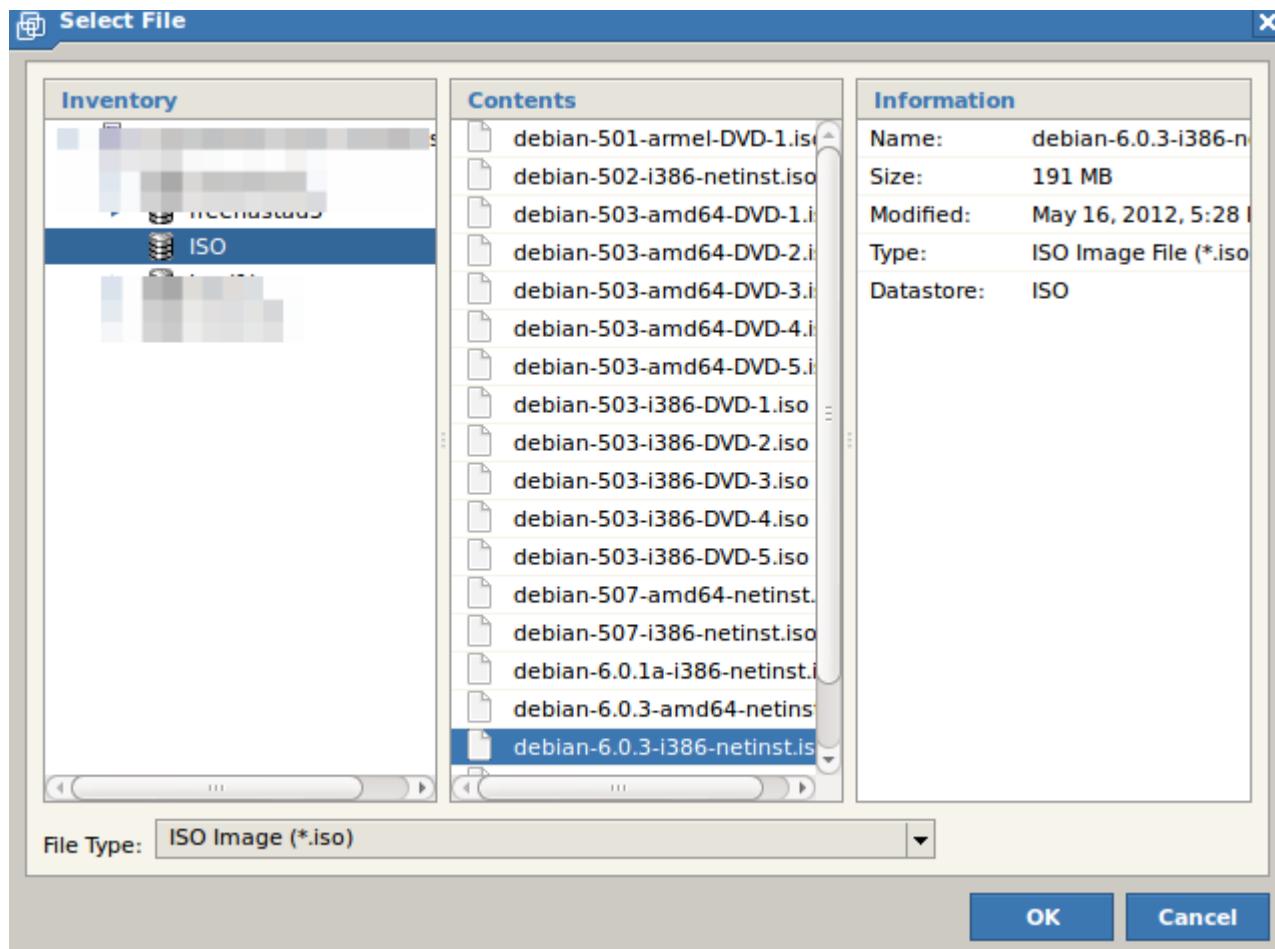
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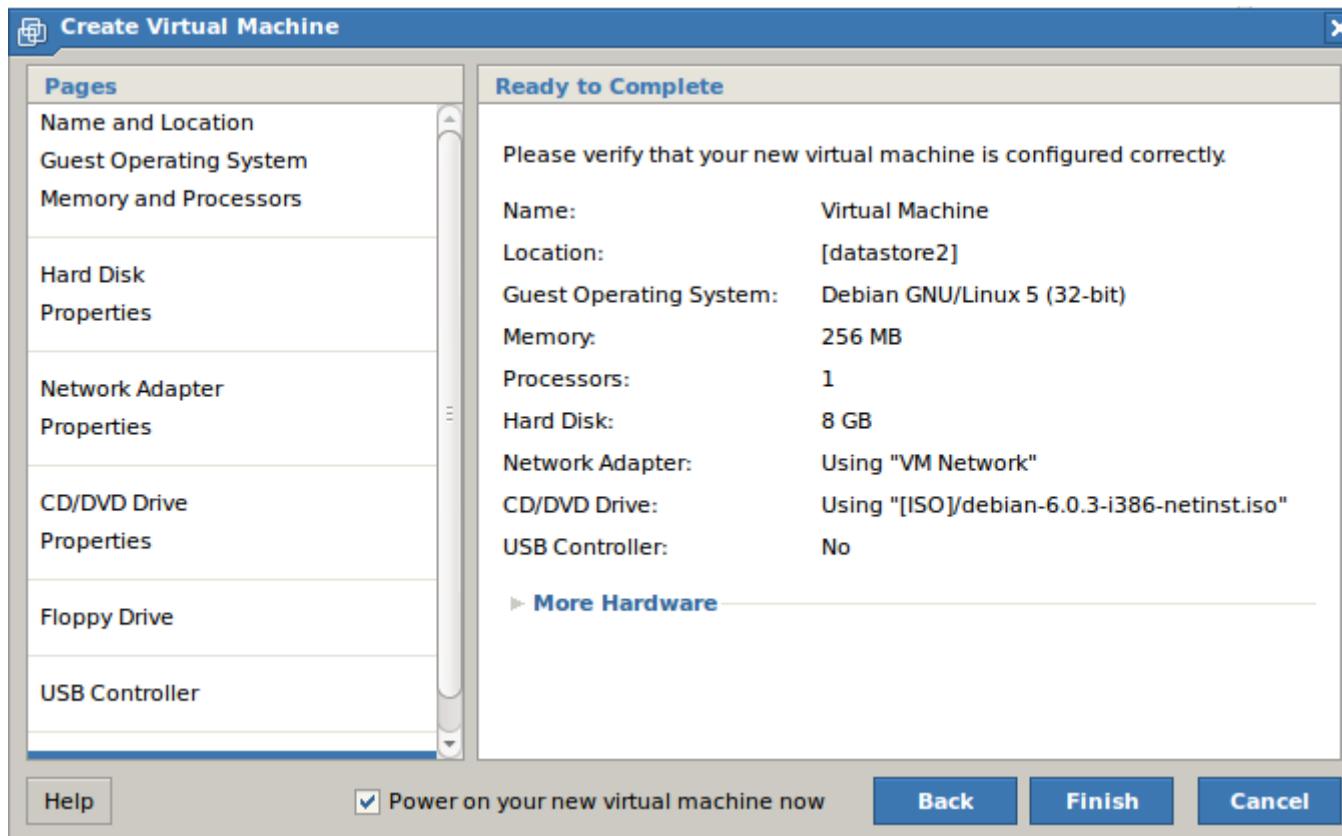
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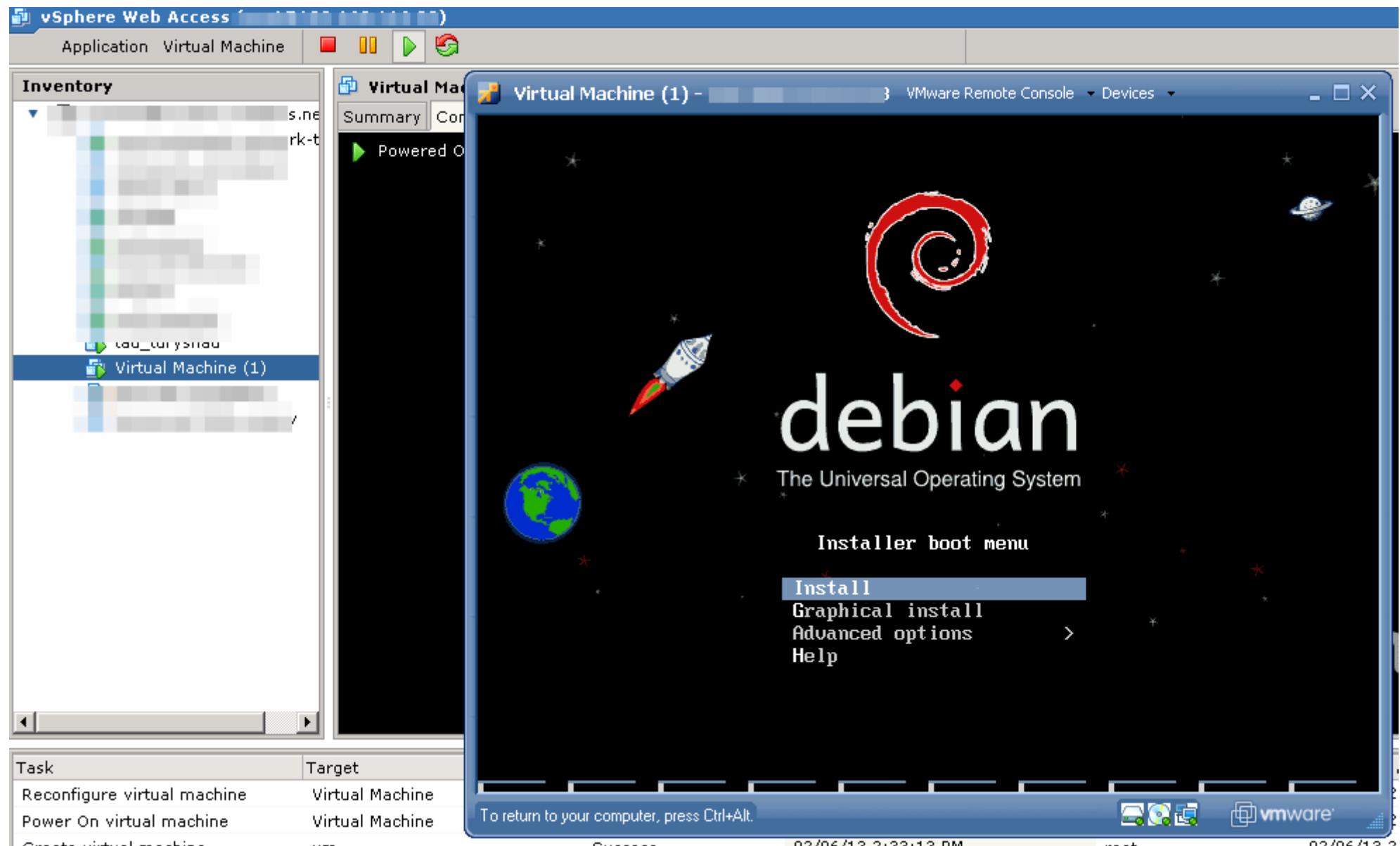
ESX (webUI)



ESX (webUI)



ESX (webUI)



ESXi (vSphere Client)



ESXi (vSphere Client)

- vSphere Client

File Edit View Inventory Administration Plug-ins Help

Home Inventory Inventory

Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Local Users & Groups Events Permissions close tab

What is a Host?

A host is a computer that uses virtualization software, such as ESX or ESXi, to run virtual machines. Hosts provide the CPU and memory resources that virtual machines use and give virtual machines access to storage and network connectivity.

You can add a virtual machine to a host by creating a new one or by deploying a virtual appliance.

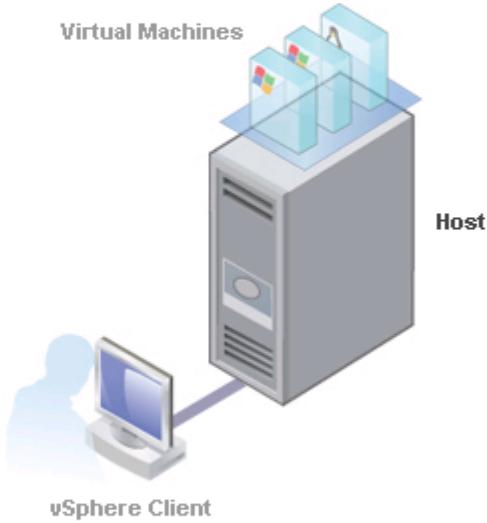
The easiest way to add a virtual machine is to deploy a virtual appliance. A virtual appliance is a pre-built virtual machine with an operating system and software already installed. A new virtual machine will need an operating system installed on it, such as Windows or Linux.

Basic Tasks

[Manage this host from vCenter Server](#)

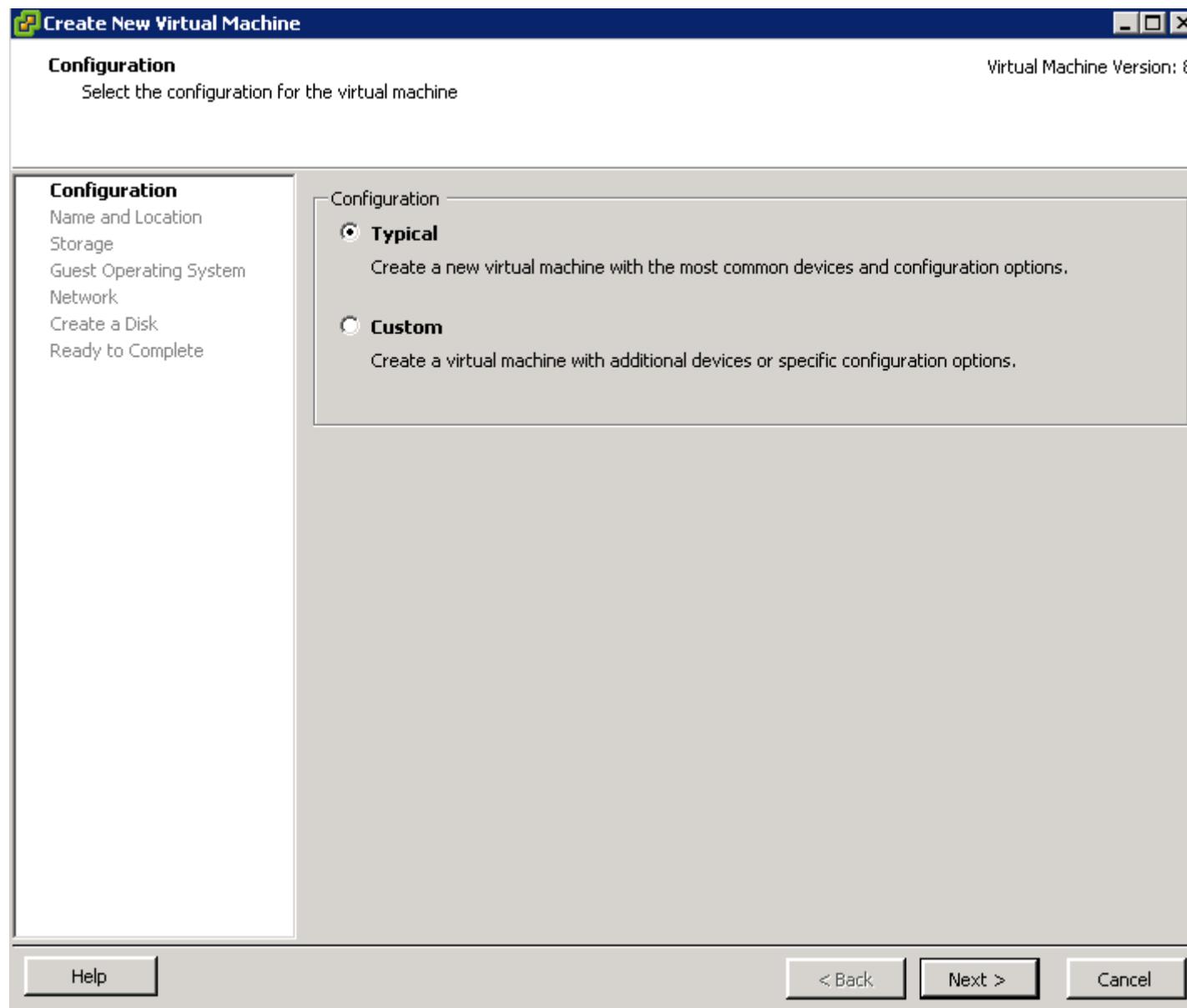
[Deploy from VA Marketplace](#)

[Create a new virtual machine](#)

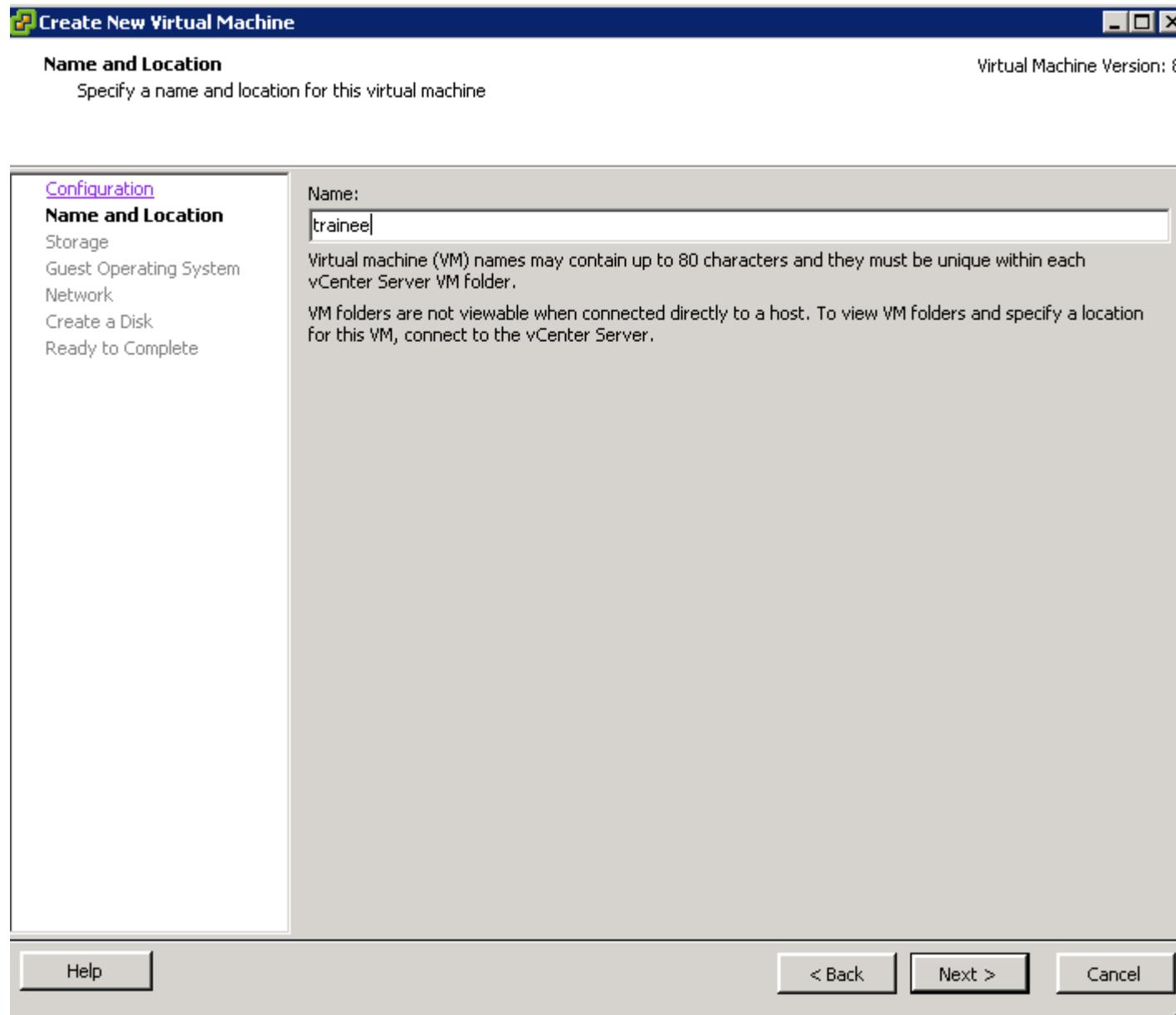

Virtual Machines
Host
vSphere Client

A red arrow points to the "Create a new virtual machine" button at the bottom of the basic tasks list.

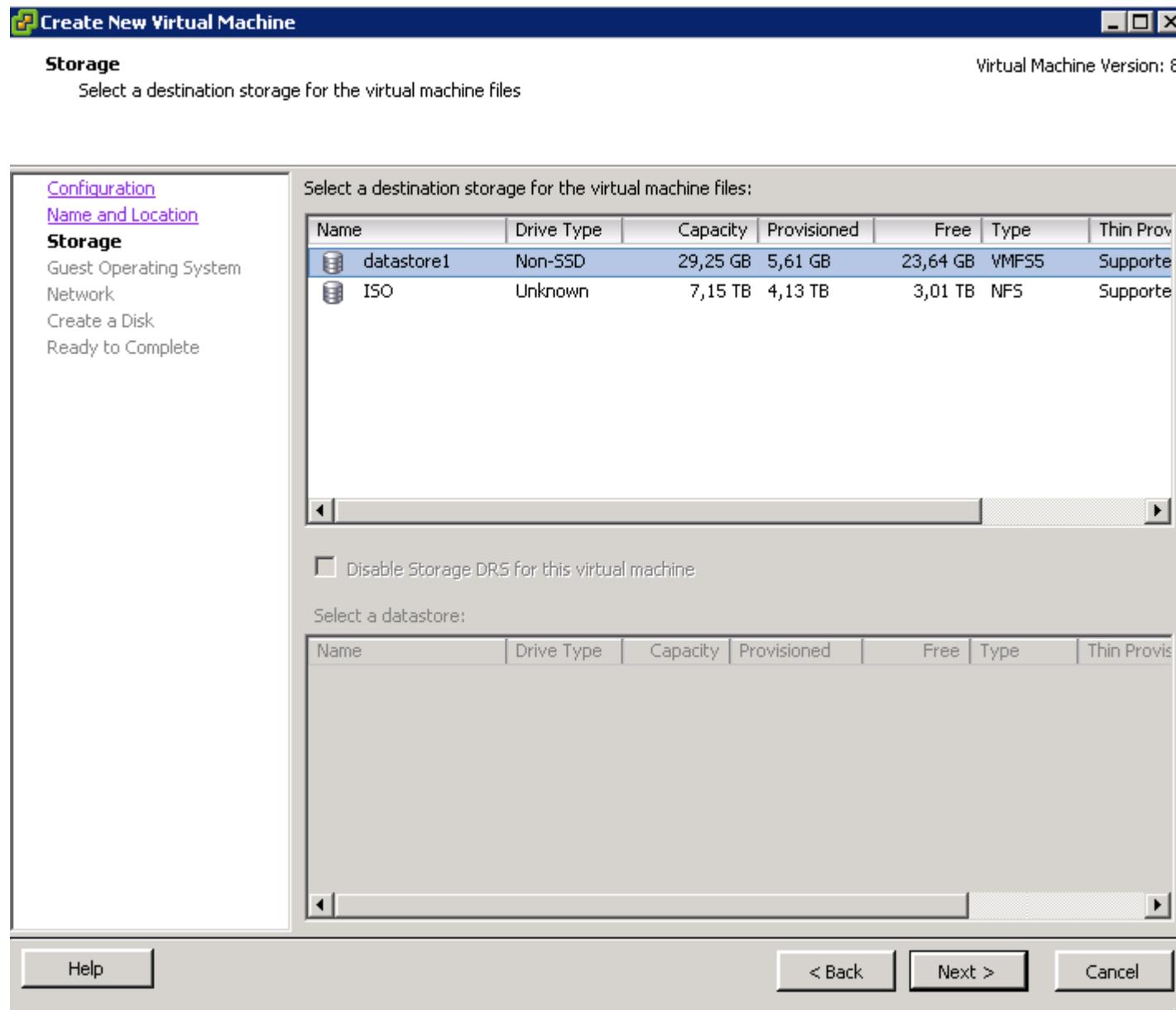
ESXi (vSphere Client)



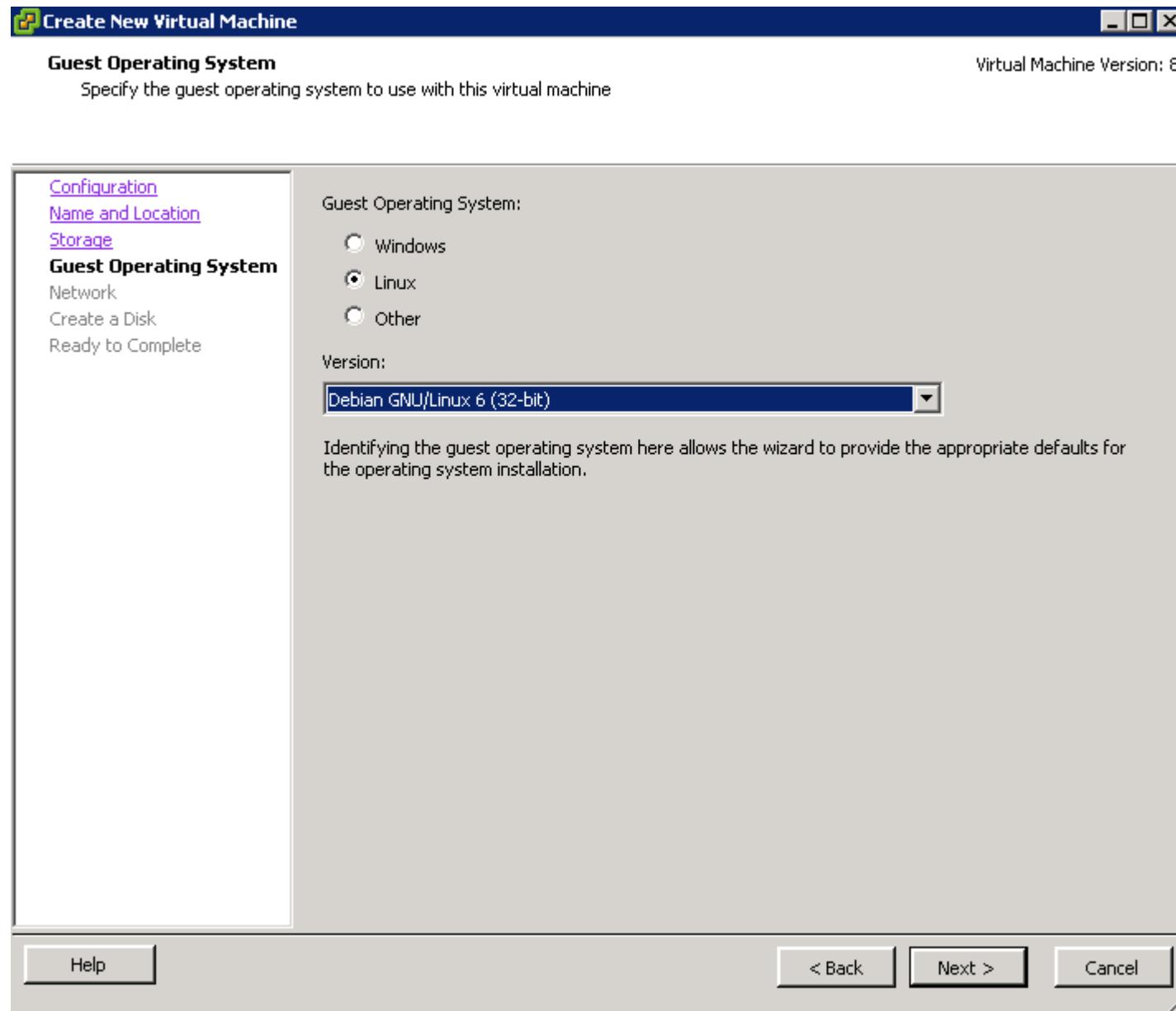
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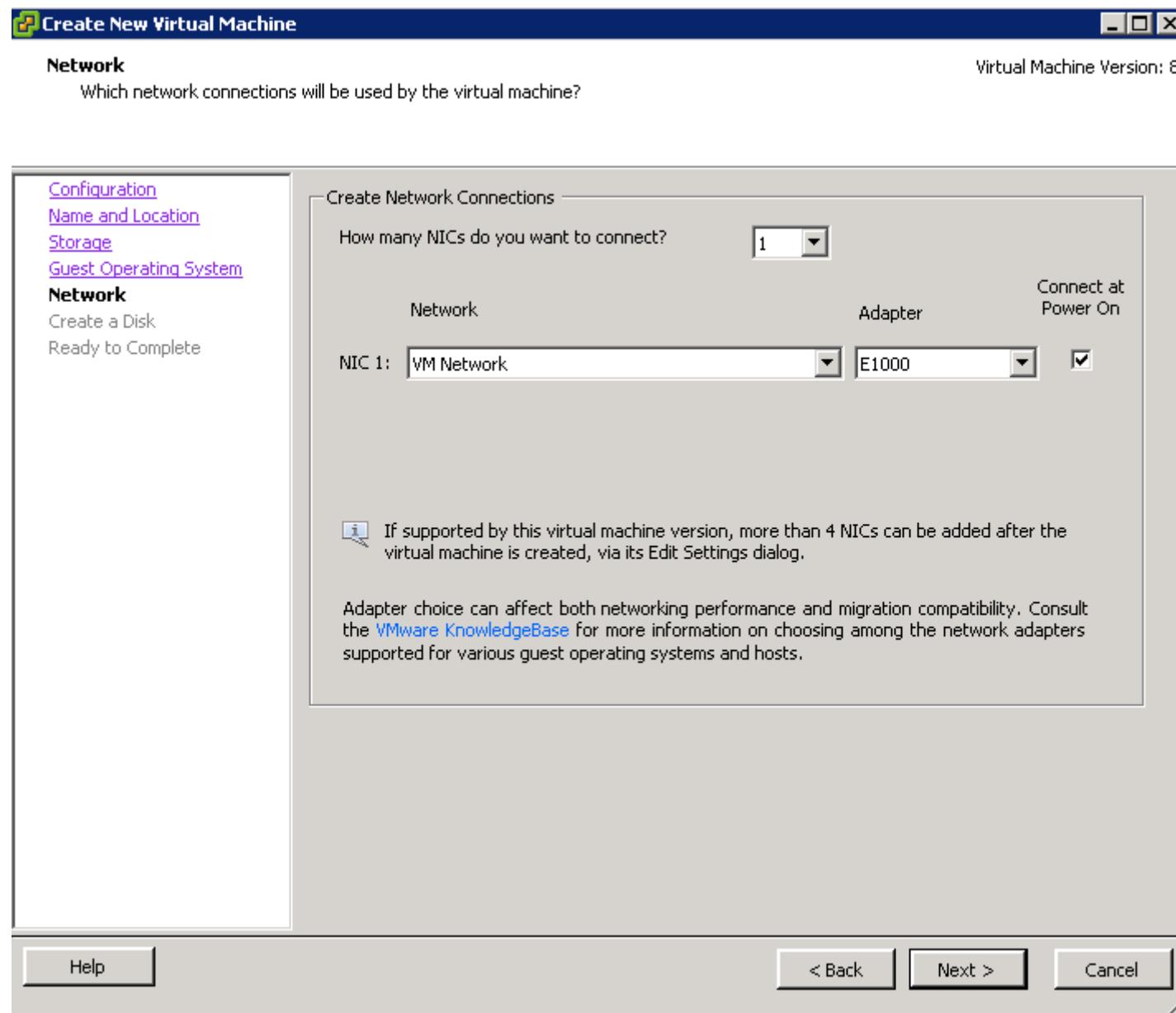
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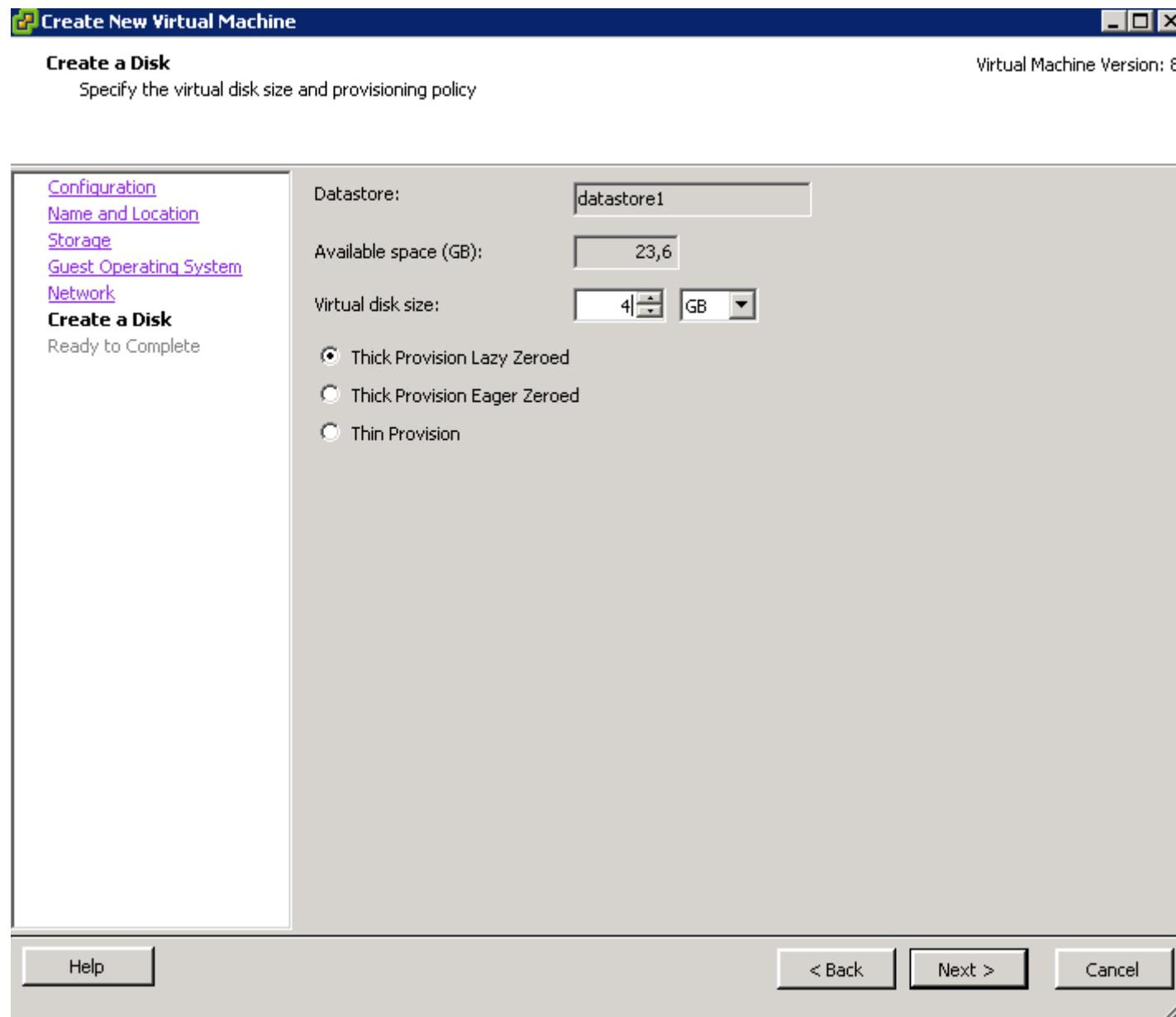
ESXi (vSphere Client)



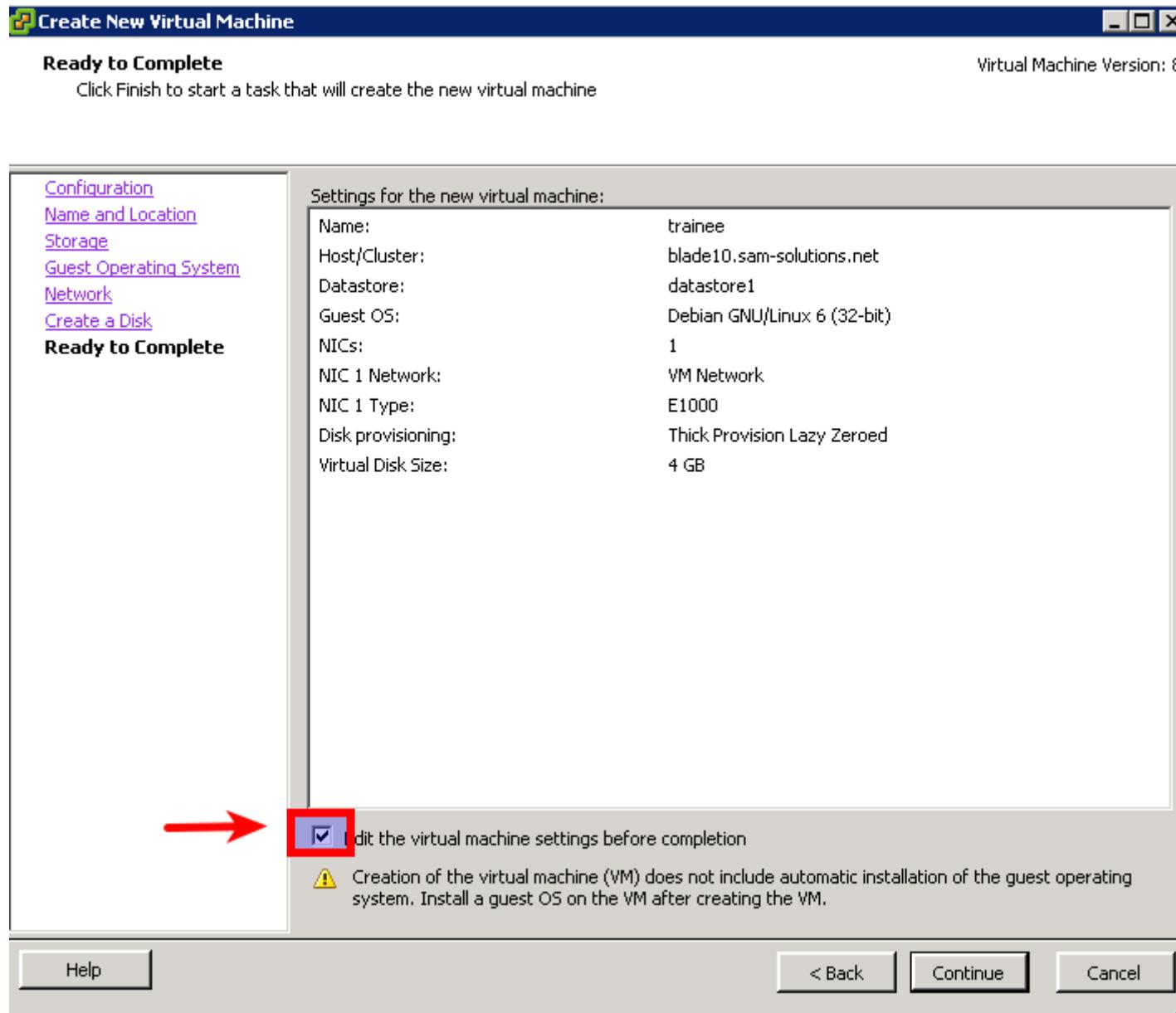
ESXi (vSphere Client)



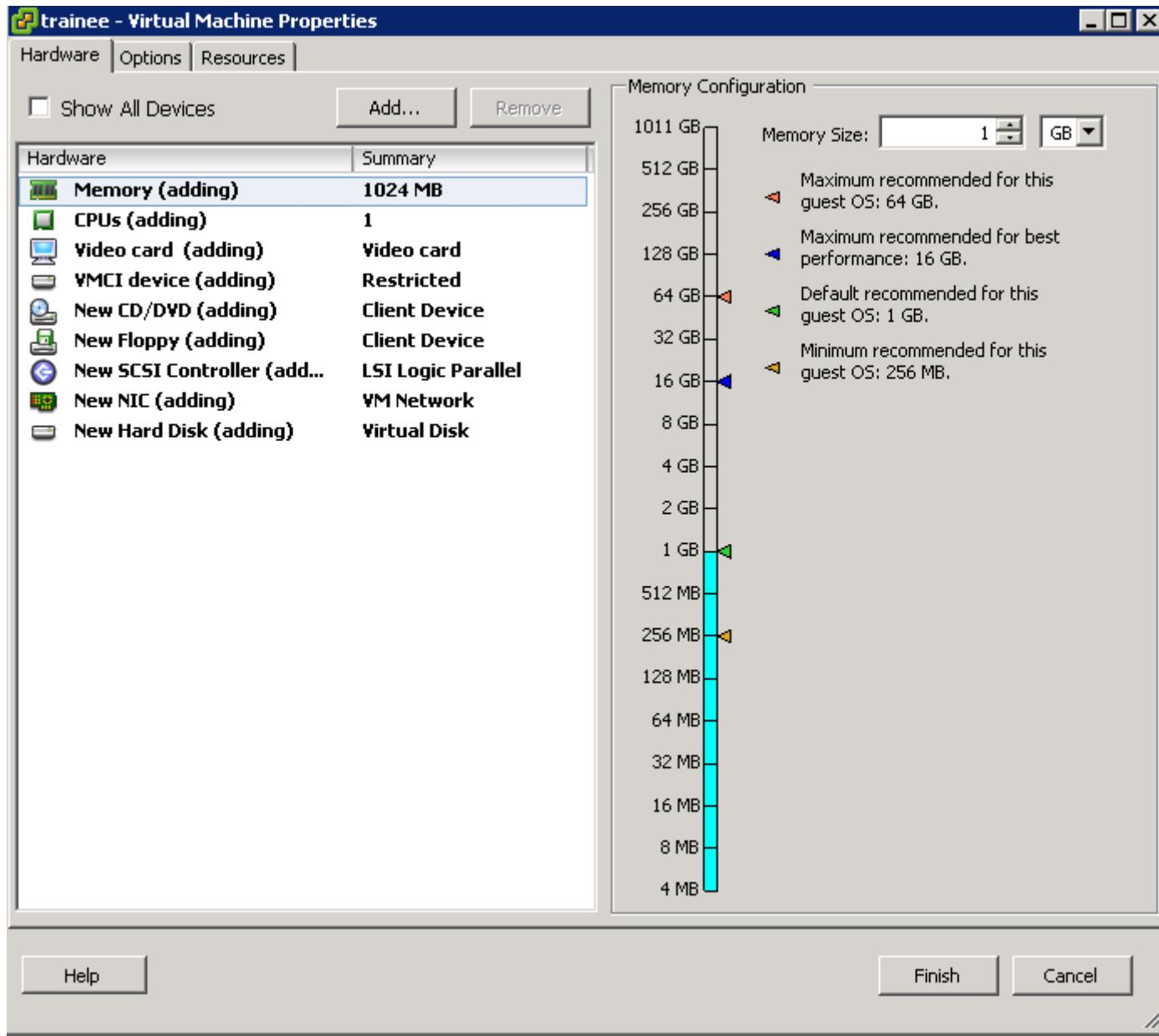
ESXi (vSphere Client)



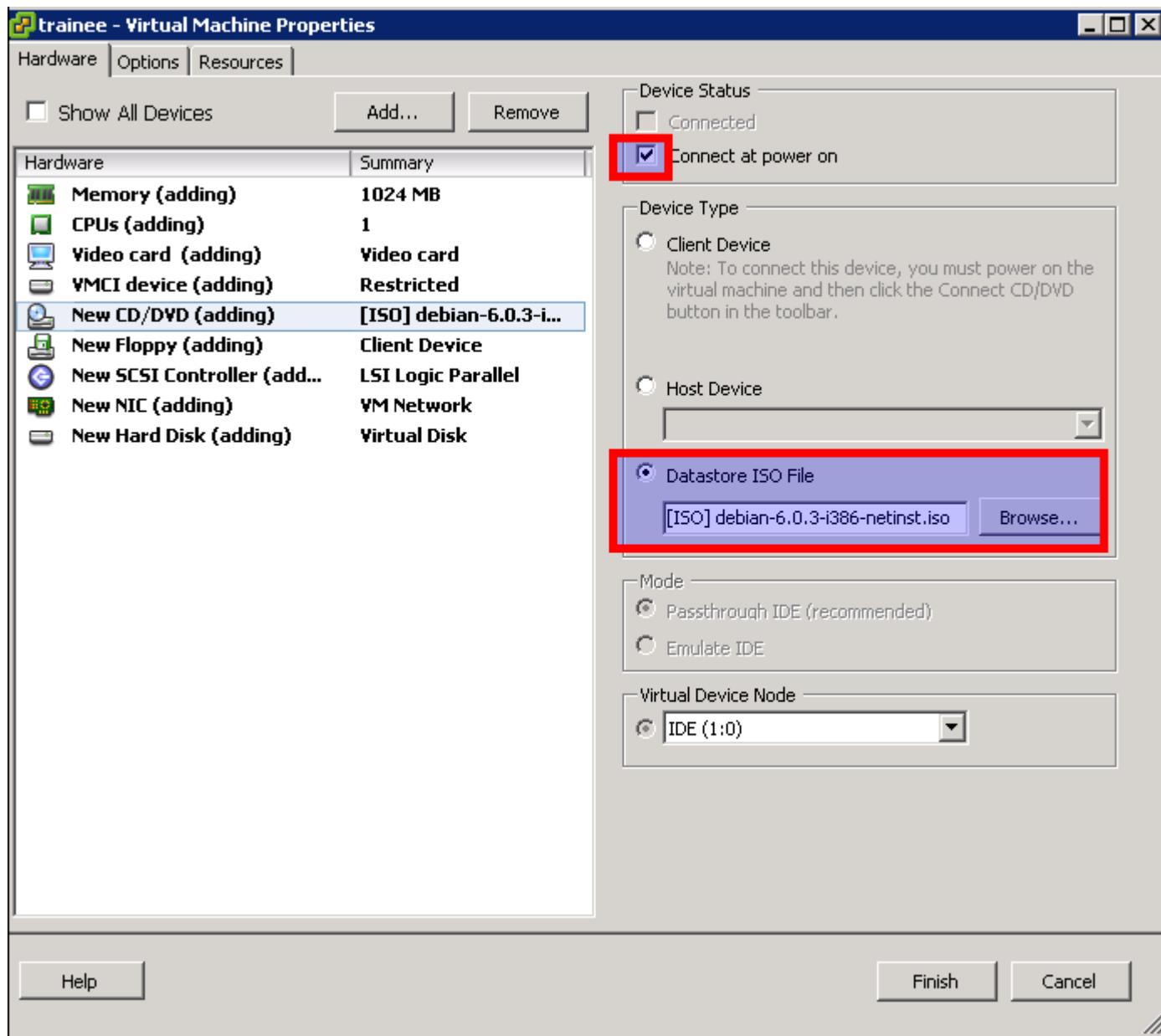
ESXi (vSphere Client)



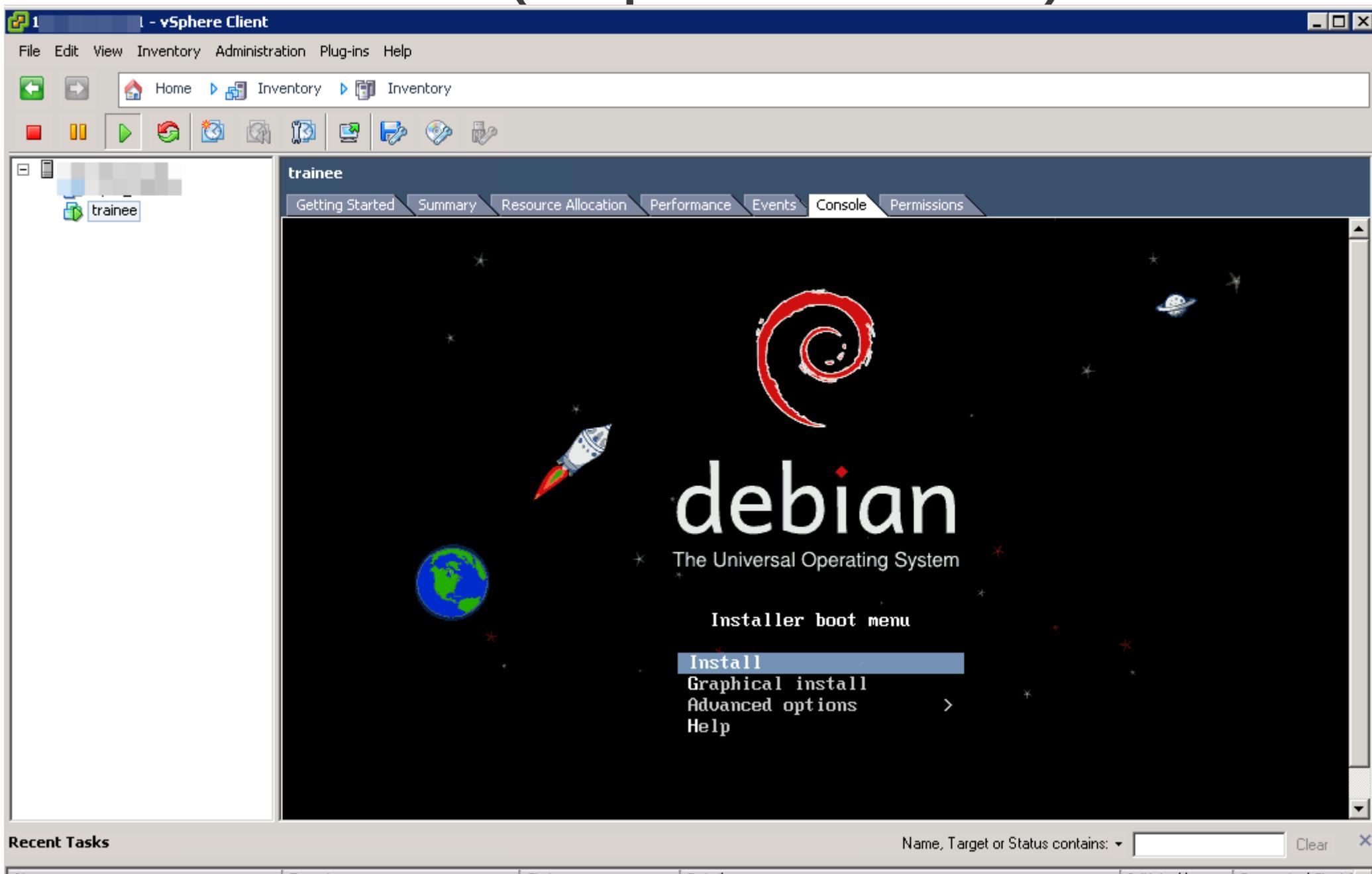
ESXi (vSphere Client)



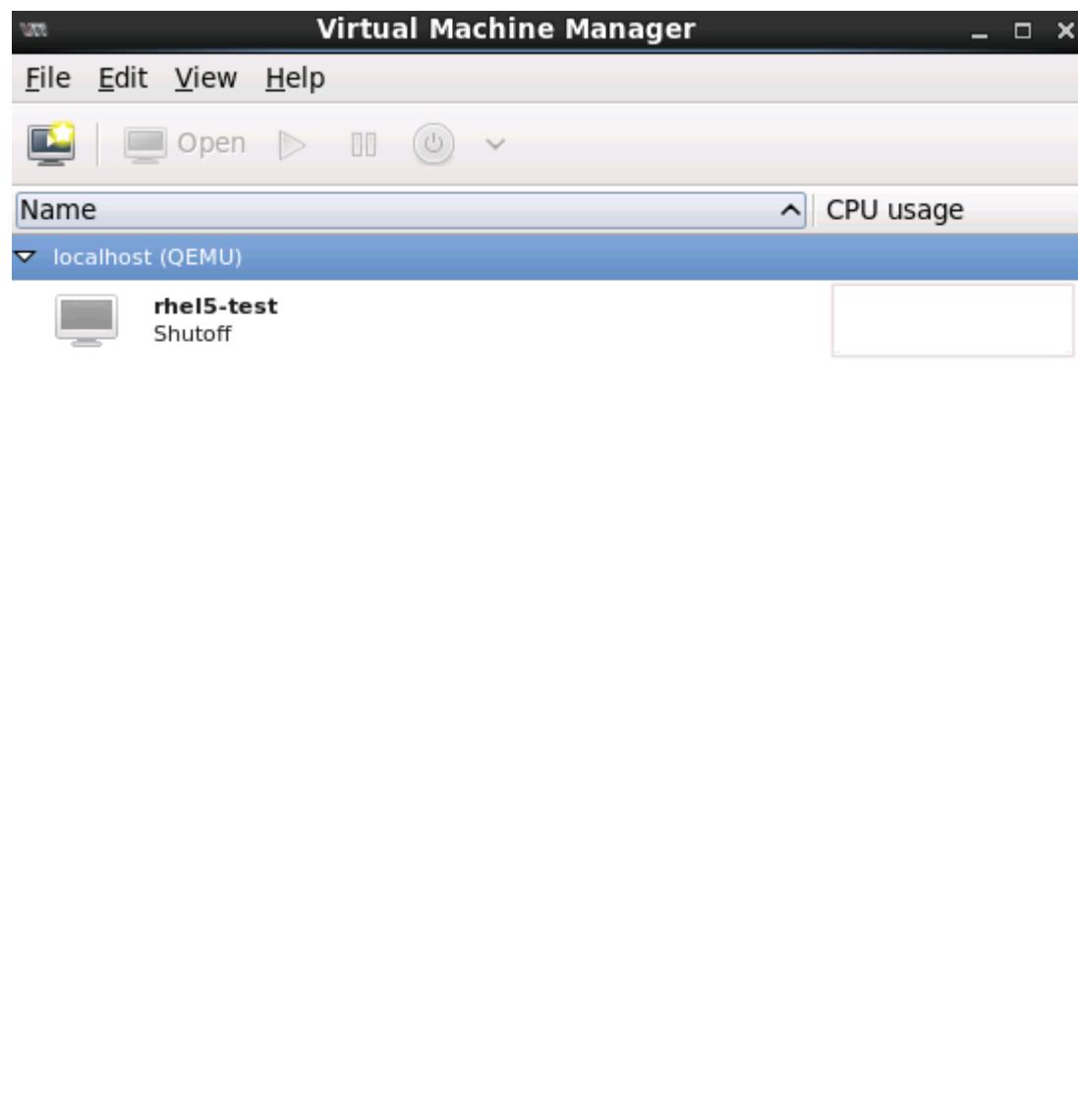
ESXi (vSphere Client)



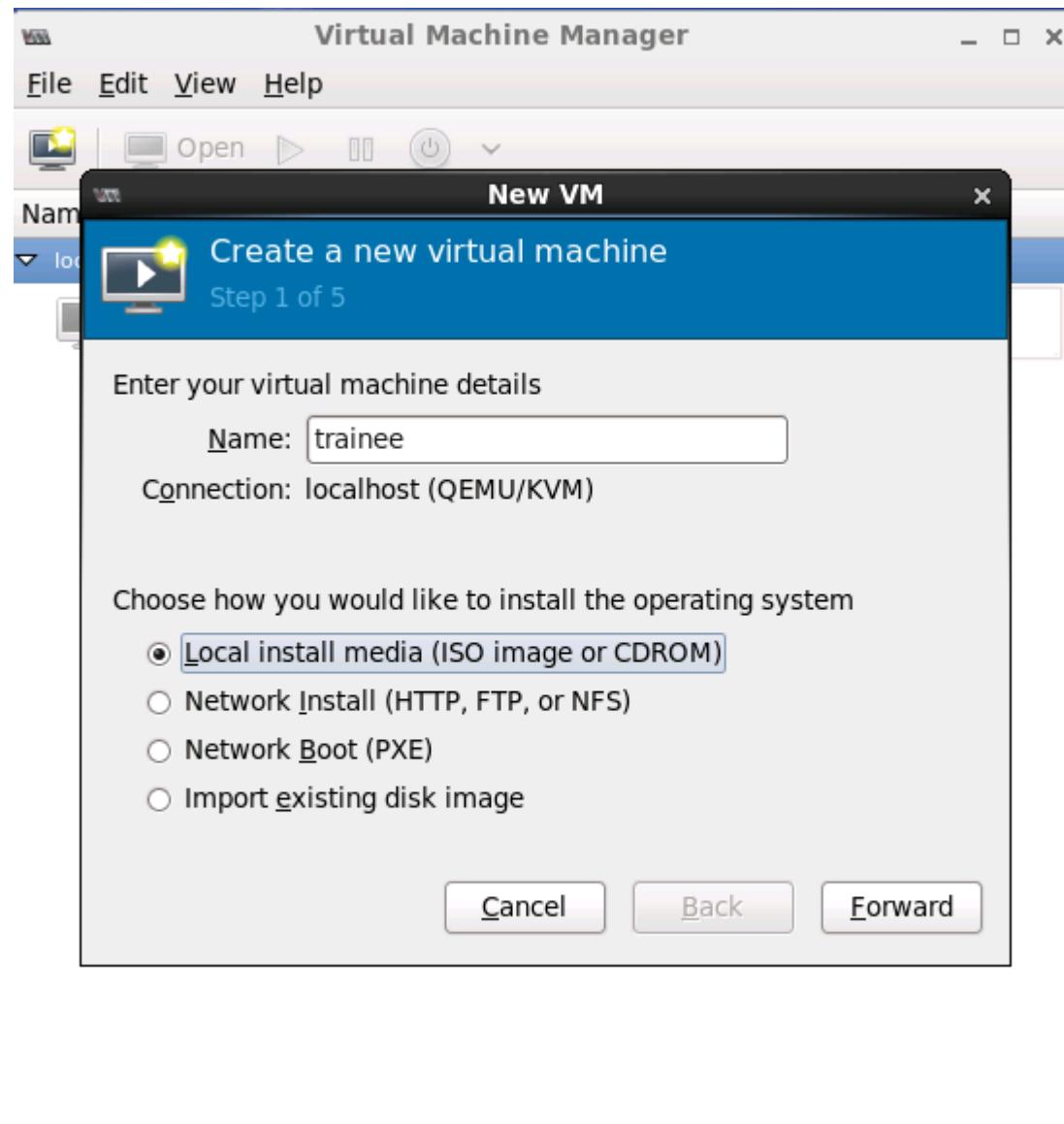
ESXi (vSphere Client)



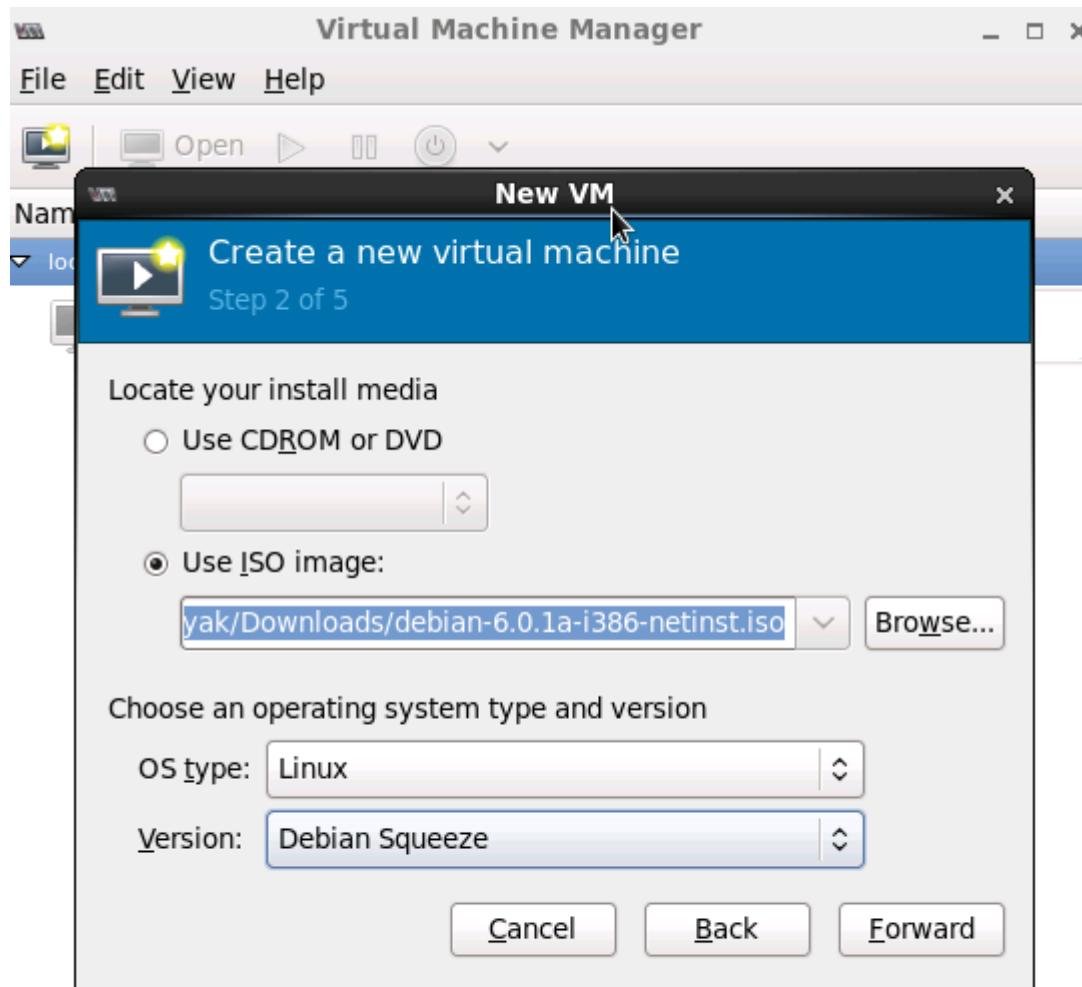
KVM



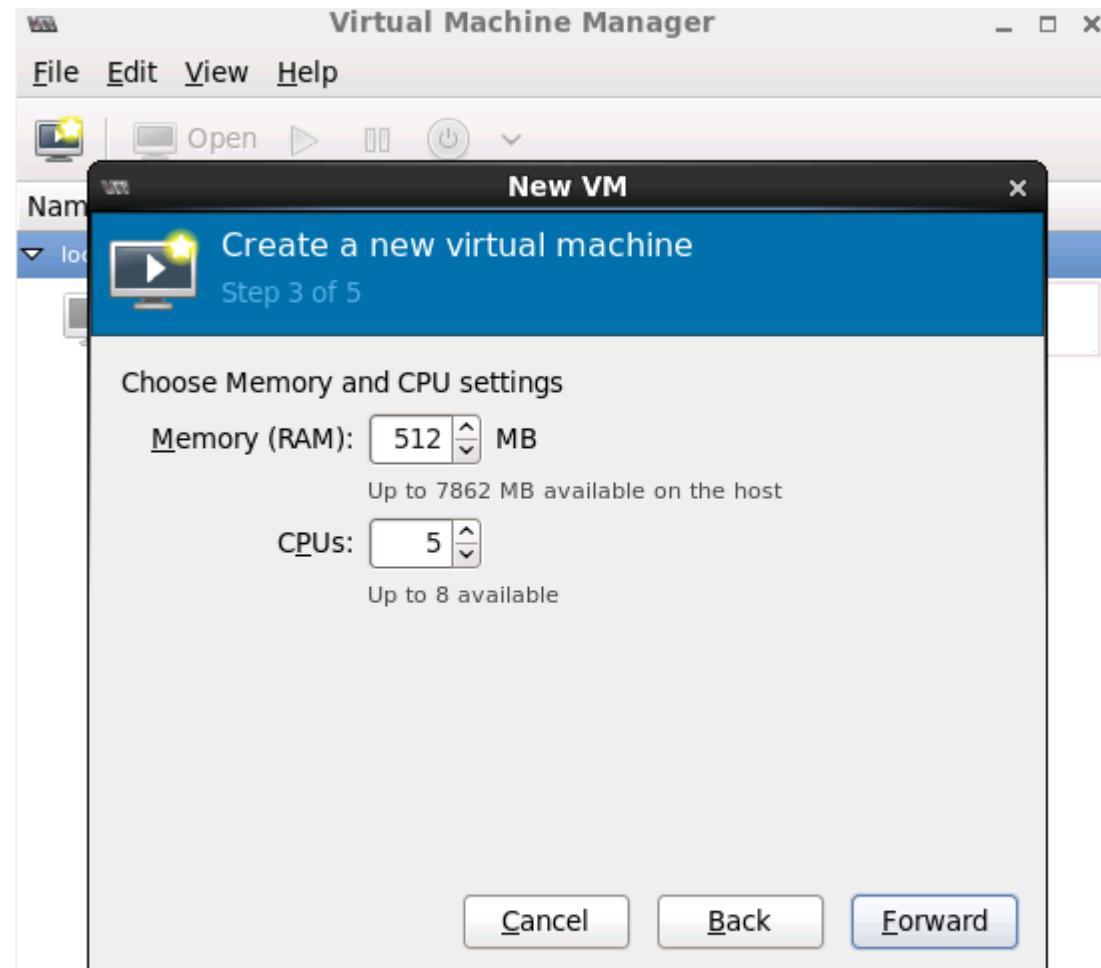
KVM



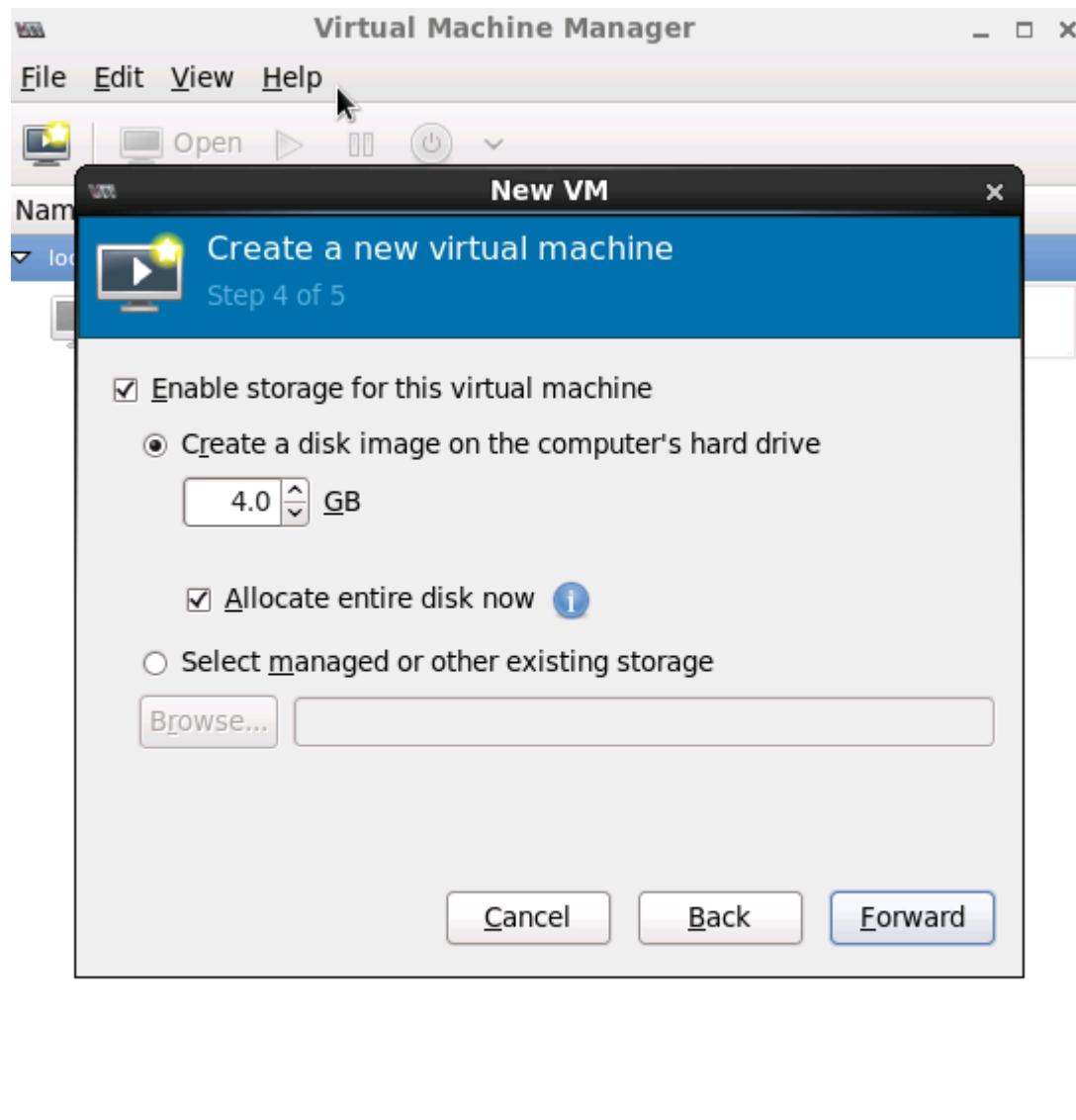
KVM



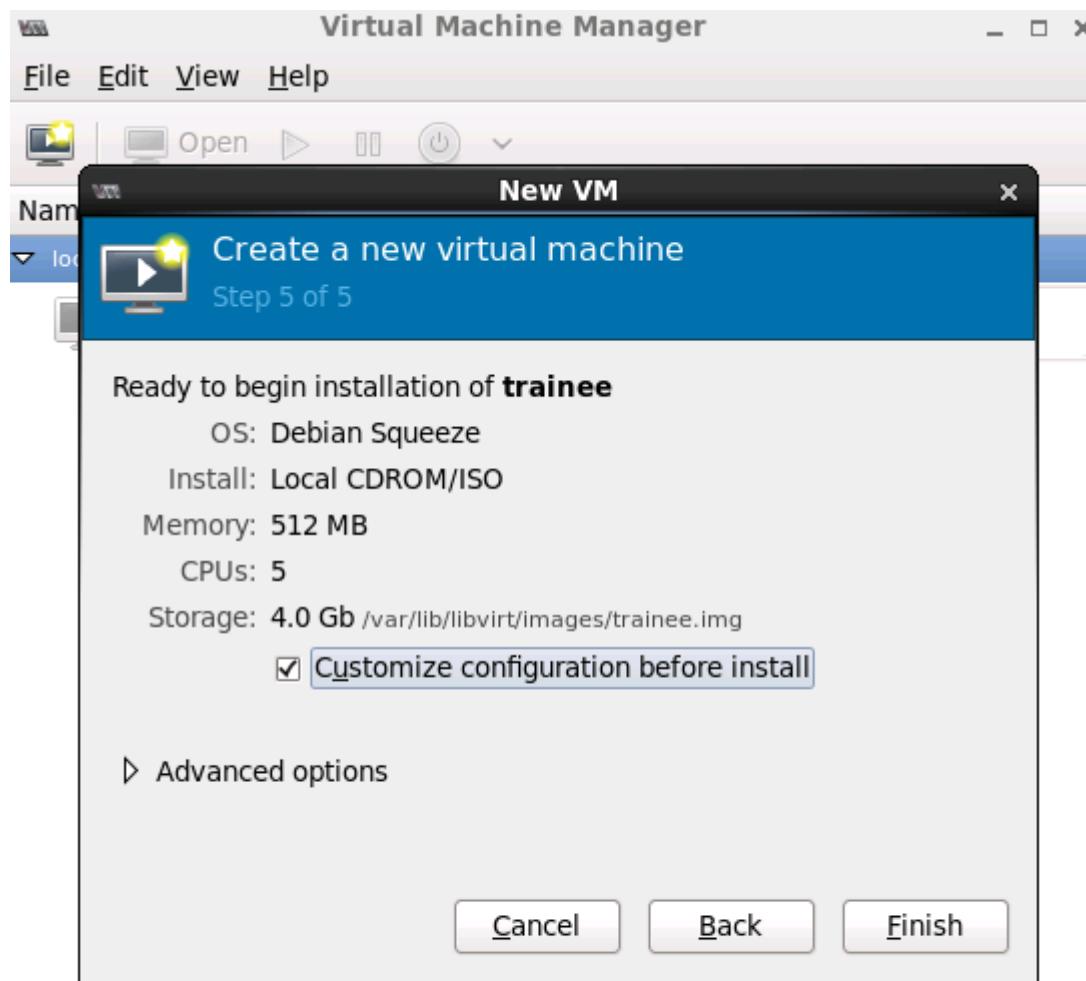
KVM



KVM



KVM



KVM

trainee Virtual Machine

Begin Installation Cancel

Overview

- Processor
- Memory
- Boot Options
- Disk 1
- NIC :f2:b5:bc
- Input
- Display VNC
- Sound: default
- Console
- Video

Basic Details

Name: trainee

UUID: 8ecb04b0-ed11-ef2c-1ea6-0eefc2ef84b2

Status: Shutoff

Description:

Hypervisor Details

Hypervisor: kvm

Architecture: x86_64

Emulator: /usr/libexec/qemu-kvm

Operating System

Hostname: unknown

Product name: unknown

▷ Applications

▷ Machine Settings

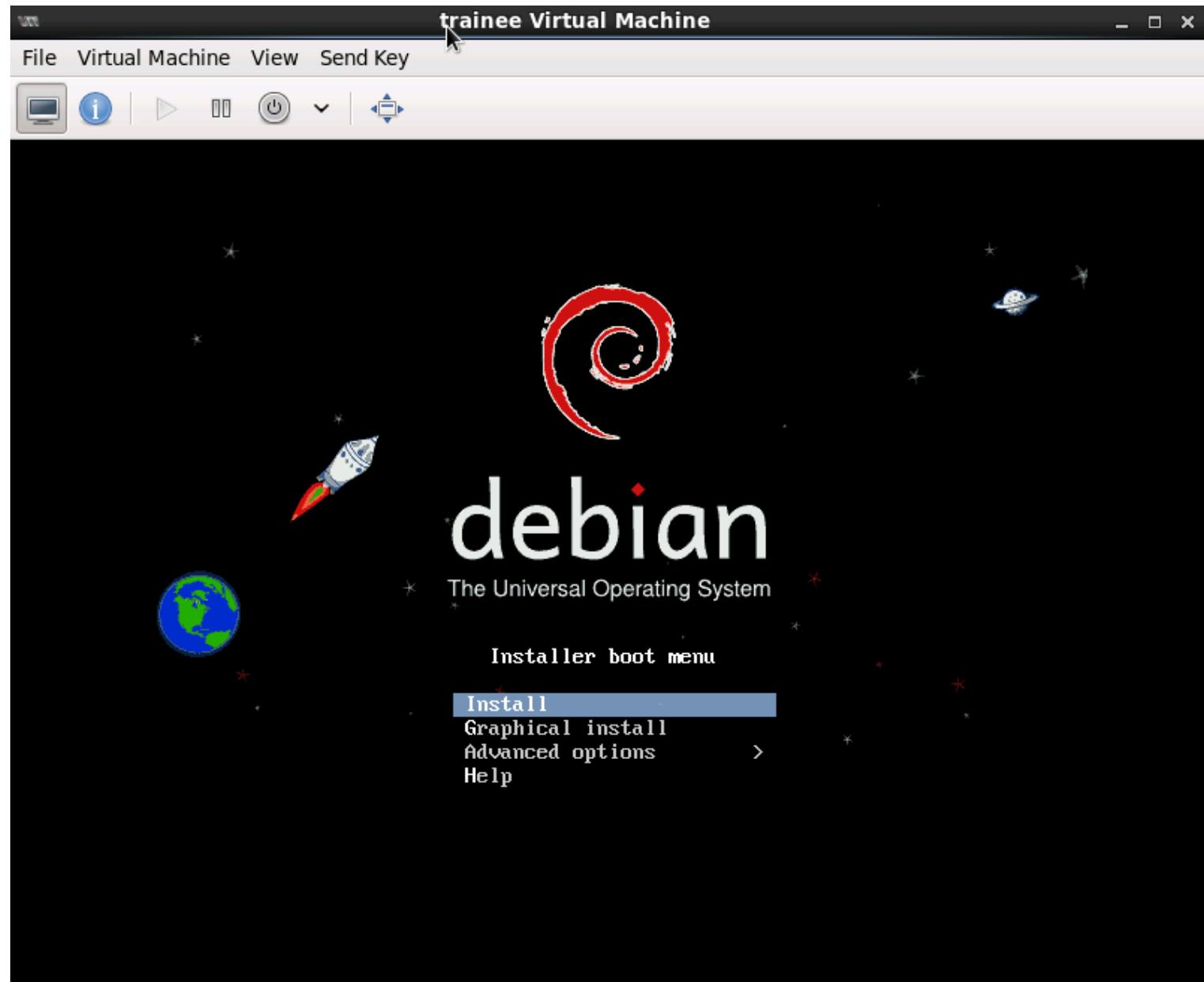
▷ Security

Add Hardware

Cancel

Apply

KVM

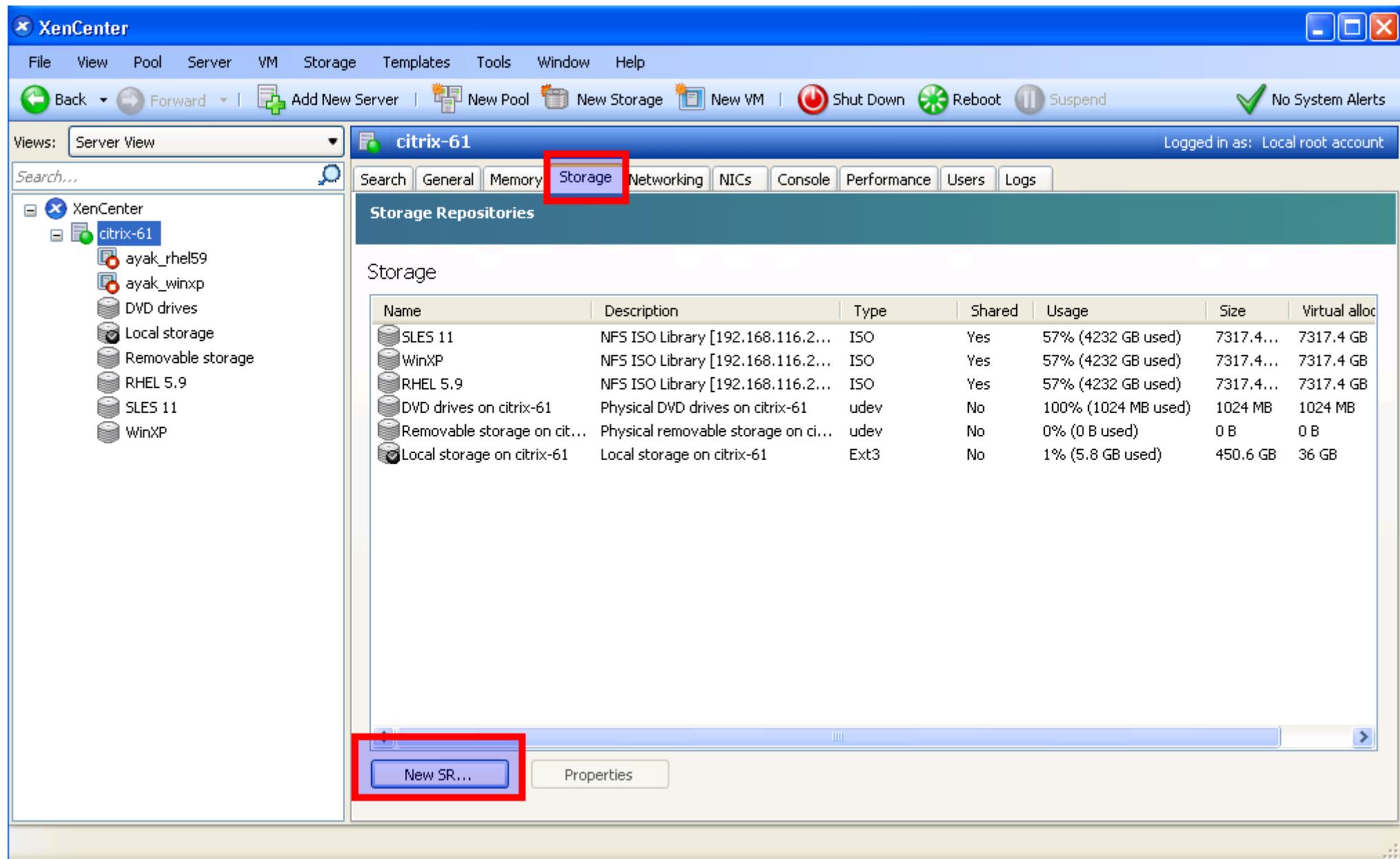


Citrix XenCenter

The screenshot shows the Citrix XenCenter interface. The title bar reads "XenCenter". The menu bar includes File, View, Pool, Server, VM, Storage, Templates, Tools, Window, and Help. The toolbar contains Back, Forward, Add New Server, New Pool, New Storage, New VM, Shut Down, Reboot, Suspend, and a "No System Alerts" indicator. The left sidebar shows a tree view of "XenCenter" and "citrix-61", listing various virtual machines and storage devices. The main pane is titled "citrix-61 Overview" and displays a table of system metrics. The table has columns for Name, CPU Usage, Used Memory, Disks (avg / max KBs), and Network (avg / max KBs). The data shows:

Name	CPU Usage	Used Memory	Disks (avg / max KBs)	Network (avg / max KBs)
citrix-61 Default install of XenServer	1% of 2 CPUs	911 of 8192 MB	-	3/3
ayak_rhel59	-	-	-	-
ayak_winxp	-	-	-	-
DVD drives	-	-	-	-
Local storage	-	-	-	-
Removable storage	-	-	-	-
RHEL 5.9	-	-	-	-
SLES 11	-	-	-	-
WinXP	-	-	-	-

Citrix XenCenter



Citrix XenCenter

New Storage Repository - citrix-61

Choose the type of new storage

Type

Name

Location

Virtual disk storage

NFS VHD

Software iSCSI

Hardware HBA

StorageLink technology

ISO library

Windows File Sharing (CIFS)

NFS ISO

Select this option if you have a library of VM installation ISO images available as a NFS share that you wish to attach to your host or pool.

CITRIX

< Previous

Next >

Cancel

Citrix XenCenter

 New Storage Repository - citrix-61 [Minimize] [Maximize] [Close]

 What do you want to call this Storage Repository? ?

Type: Provide a name and a description (optional) for your SR.

Name	Name: RHEL 5.9
Location	<input checked="" type="checkbox"/> Autogenerate description based on SR settings (e.g., IP address, LUN etc.) <input type="text" value="Description:"/>

CITRIX

[< Previous](#) [Next >](#) [Cancel](#)

Citrix XenCenter

New Storage Repository - citrix-61 Minimize Maximize Close

Enter a path for your NFS ISO storage ?

Type	Provide the name of the share where your NFS ISO storage is located.
Name	
Location	Share Name: <input type="text" value="server:/iso/redhat5.9"/> ▼ Example: server:/path

CITRIX

[< Previous](#) [Finish](#) [Cancel](#)

Citrix XenCenter

The screenshot shows the Citrix XenCenter interface. The top menu bar includes File, View, Pool, Server, VM, Storage, Templates, Tools, Window, and Help. The toolbar features Back, Forward, Add New Server, New Pool, New Storage, New VM, Shut Down, Reboot, Suspend, and a green checkmark icon for No System Alerts. The Views dropdown is set to Server View, and the status bar indicates "Logged in as: Local root account".

The left sidebar displays a tree view of storage resources:

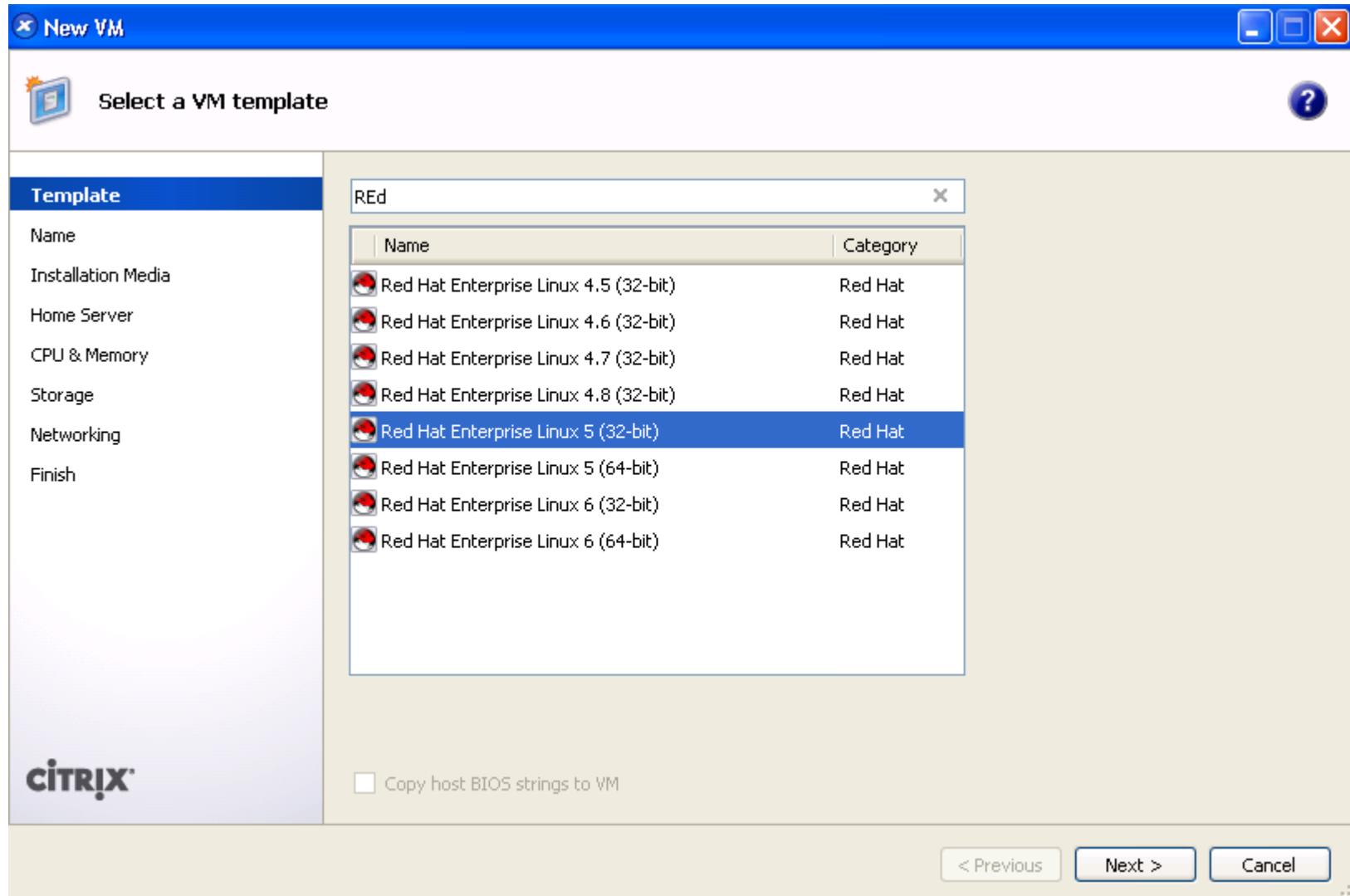
- XenCenter
- citrix-61
 - ayak_rhel59
 - ayak_winxp
 - Debian
 - DVD drives
 - Local storage
 - Removable storage
 - RHEL 5.9 (selected)
 - SLES 11
 - WinXP

The main pane is titled "RHEL 5.9" and shows the "Storage" tab selected. It displays "Virtual Disks" and a "Disks" table:

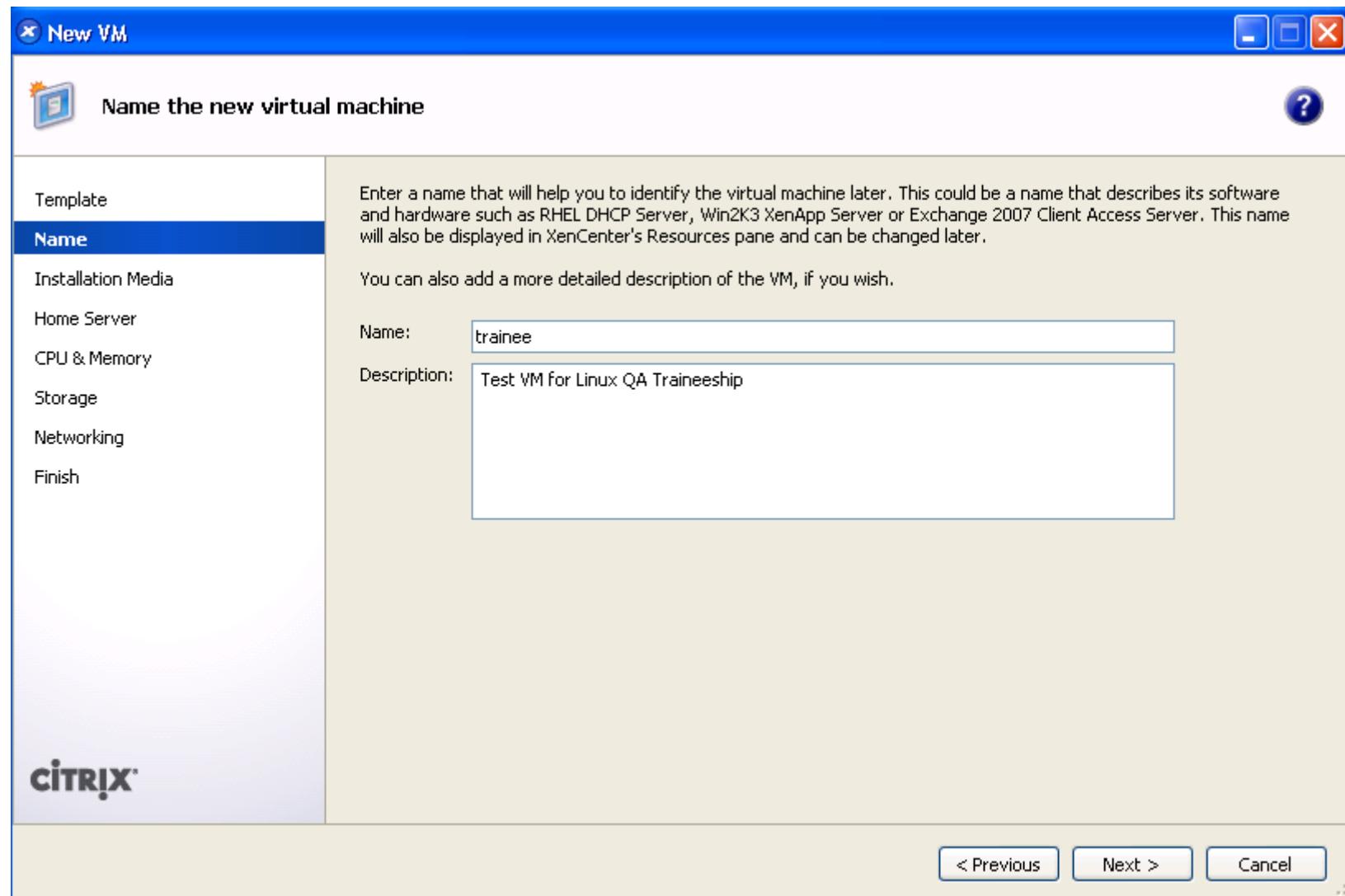
Name	Description	Size	Virtual Machine
rhel-server-5.9-x86_64-dvd.iso		4 GB	
rhel-server-5.9-i386-dvd.iso		3.4 GB	

At the bottom of the main pane are buttons for Rescan, Properties, Move..., and Delete.

Citrix XenCenter



Citrix XenCenter



Citrix XenCenter

 New VM

 Locate the operating system installation media

Template
Name
Installation Media
Home Server
CPU & Memory
Storage
Networking
Finish

Select the installation method for the operating system software you want to install on the new VM.

Install from ISO library or DVD drive:
rhel-server-5.9-i386-dvd.iso

Install from URL:

Advanced OS boot parameters
Enter any advanced boot parameters here. Leave this box blank if you do not wish to supply any parameters.
graphical utf8

< Previous Next > Cancel

CITRIX

Citrix XenCenter

 New VM

 Select a home server 

Template
Name
Installation Media
Home Server
CPU & Memory
Storage
Networking
Finish

When you nominate a home server for a virtual machine, the virtual machine will always be started up on that server if it is available. If this is not possible, then an alternate server within the same pool will be selected automatically.

Don't assign this VM a home server. The VM will be started on any server with the necessary resources.
(Shared storage required)

Place the VM on this server:

 citrix-61 7263 MB available (8192 MB total)

< Previous Next > Cancel

Citrix XenCenter

 New VM - X

 Allocate processor and memory resources ?

Template	Specify the number of virtual CPUs and the amount of memory that will be initially allocated to the new virtual machine.
Name	
Installation Media	
Home Server	
CPU & Memory	
Storage	
Networking	
Finish	

CPU & Memory

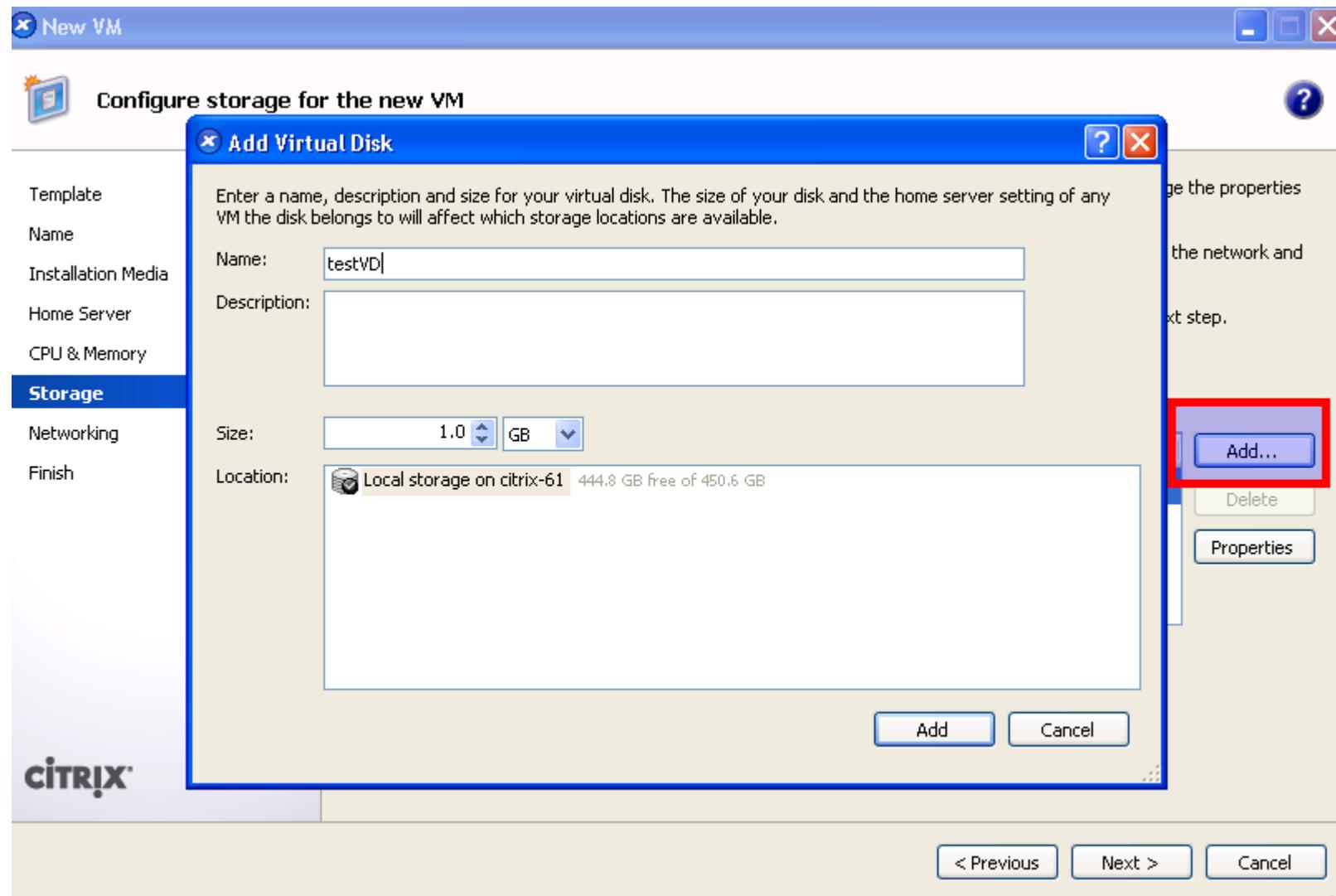
Number of vCPUs:

Memory: MB

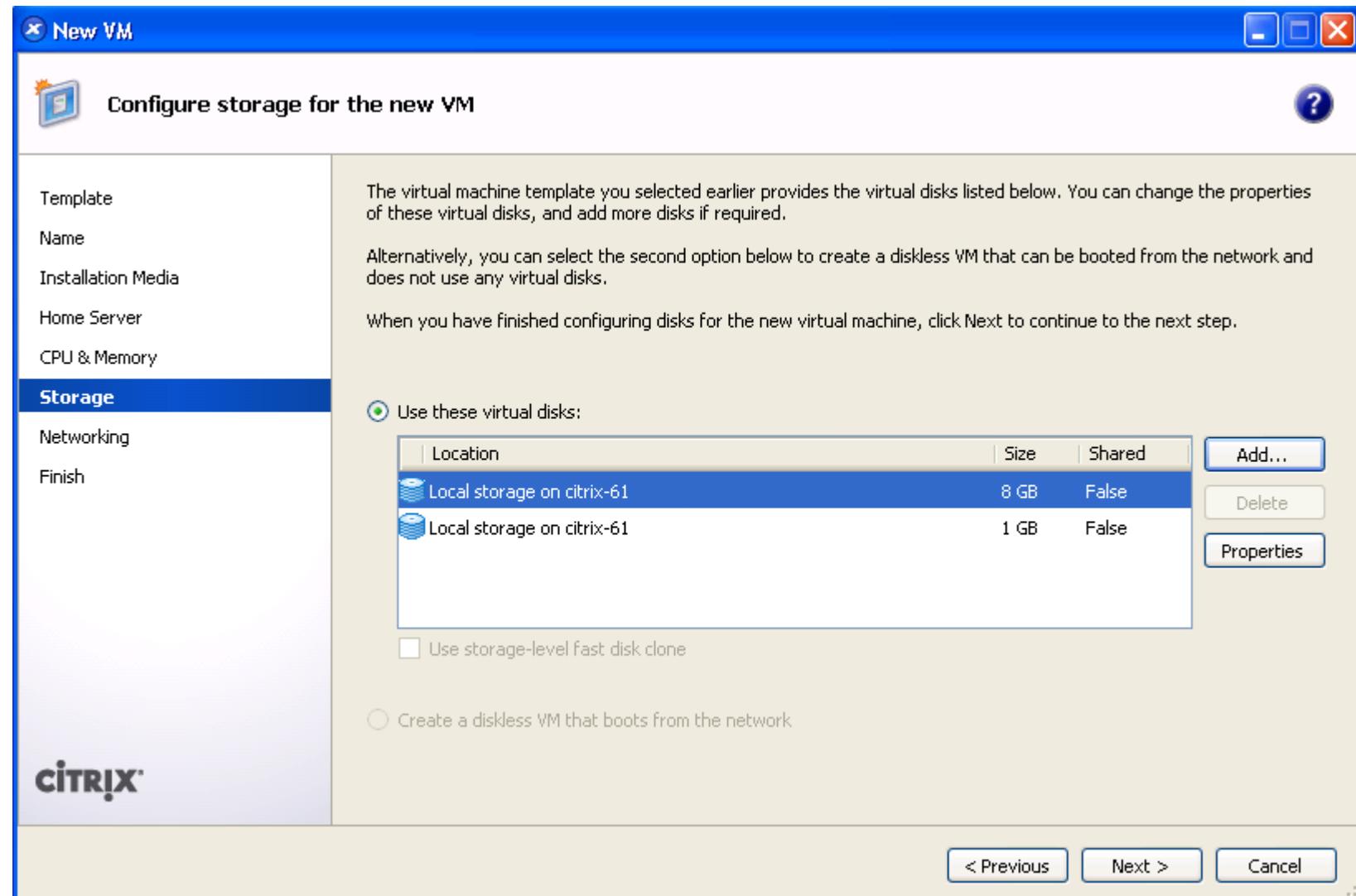


< Previous Next > Cancel

Citrix XenCenter



Citrix XenCenter



Citrix XenCenter

 New VM

 Configure networking on the new VM 

Template
Name
Installation Media
Home Server
CPU & Memory
Storage
Networking
Finish

The virtual machine template you have selected provides the virtual network interfaces listed below. You can configure or delete the default virtual network interfaces here, and add more if required.

Virtual network interfaces on trainee

MAC	Network
 < autogenerated MAC >	Network 0

Add... Delete Properties

 Using a Default template, you can configure up to 4 virtual network interfaces during VM creation. To configure more than 4, create a Custom template or add extra virtual network interfaces from the Network tab after creating the new VM.

< Previous Next > Cancel

Citrix XenCenter

 New VM

 Ready to create the new virtual machine

Template
Name
Installation Media
Home Server
CPU & Memory
Storage
Networking
Finish

All the necessary information has been collected and the wizard is ready to provision the new virtual machine using the settings shown below.

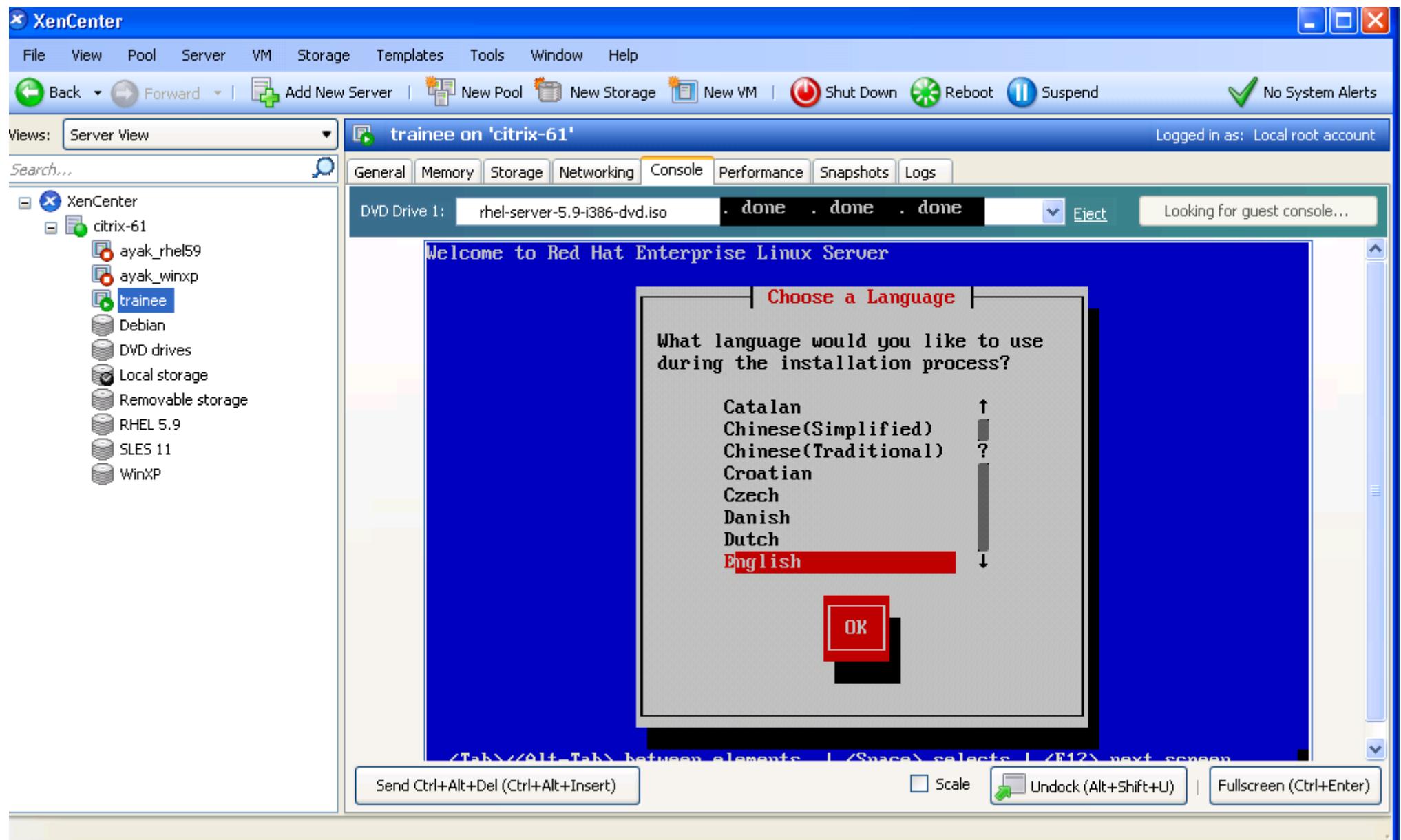
Review these settings, then click Previous if you need to change anything. Otherwise, click Create Now to create the new VM. It may take several minutes to create the new VM.

Template	Debian Squeeze 6.0 (32-bit)
Name	trainee
Install Method	CD
Installation Source	debian-6.0.3-i386-netinst.iso
Home Server	citrix-61
vCPUs	1
Memory	256 MB
Disk 0	8 GB
Disk 1	1 GB

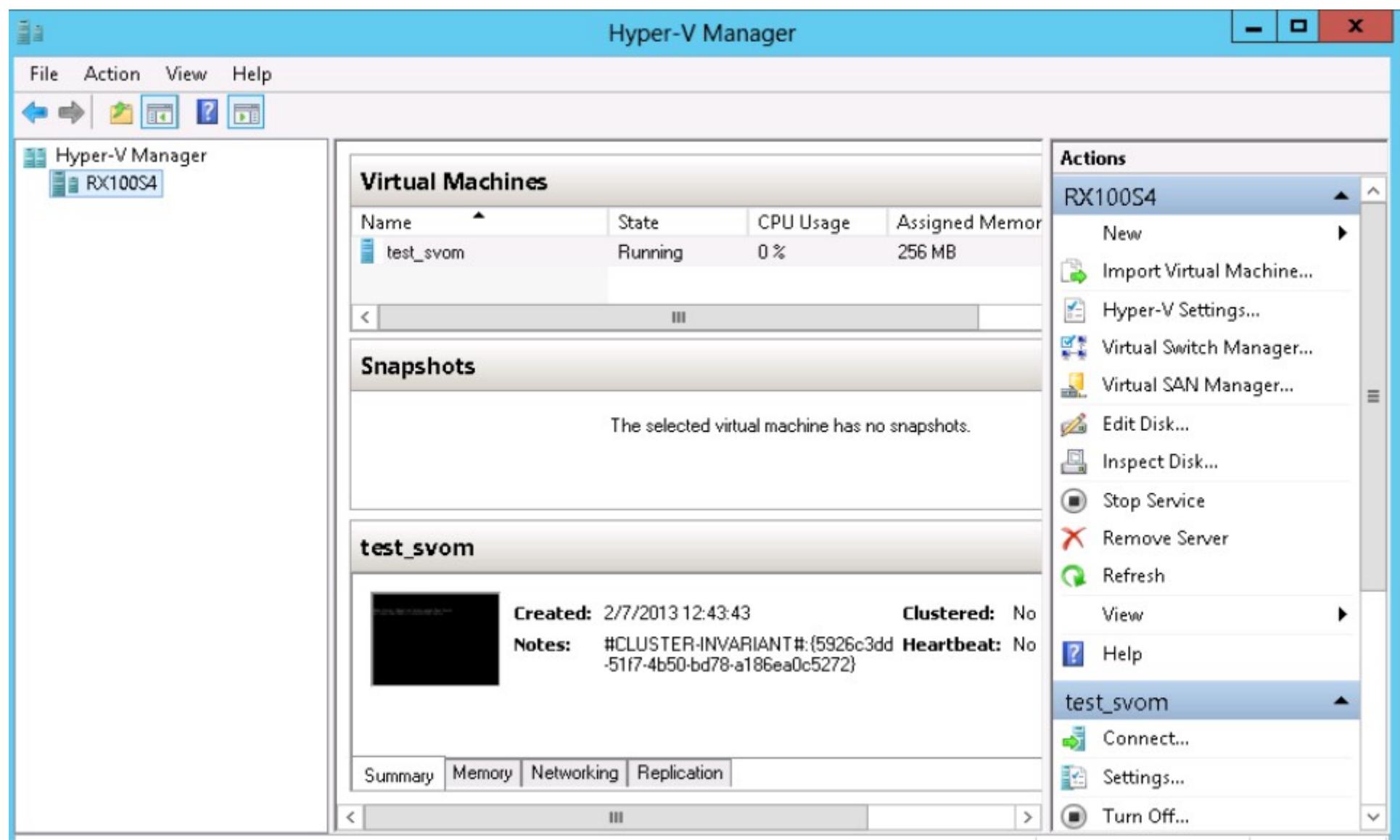
Start the new VM automatically

< Previous Create Now Cancel

Citrix XenCenter



Microsoft Hyper-V



Microsoft Hyper-V

 New Virtual Machine Wizard X

 **Before You Begin**

This wizard helps you create a virtual machine. You can use virtual machines in place of physical computers for a variety of uses. You can use this wizard to configure the virtual machine now, and you can change the configuration later using Hyper-V Manager.

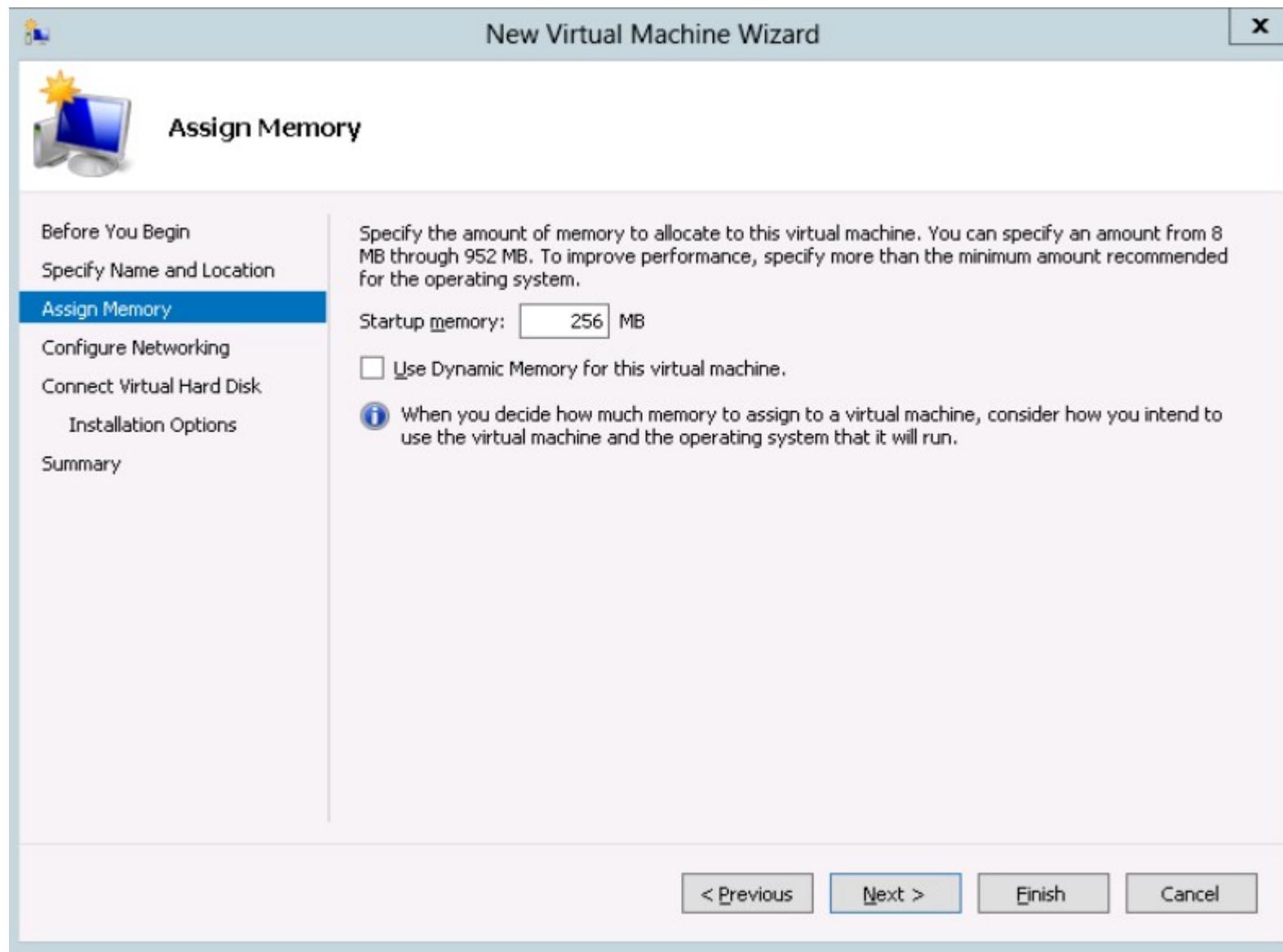
To create a virtual machine, do one of the following:

- Click **Finish** to create a virtual machine that is configured with default values.
- Click **Next >** to create a virtual machine with a custom configuration.

Do not show this page again

[**< Previous**](#) [**Next >**](#) [**Finish**](#) [**Cancel**](#)

Microsoft Hyper-V



Microsoft Hyper-V

New Virtual Machine Wizard X



Configure Networking

Before You Begin
Specify Name and Location
Assign Memory
Configure Networking
Connect Virtual Hard Disk
Installation Options
Summary

Each new virtual machine includes a network adapter. You can configure the network adapter to use a virtual switch, or it can remain disconnected.

Connection: Not Connected

< Previous Next > Finish Cancel

Microsoft Hyper-V

New Virtual Machine Wizard X



Connect Virtual Hard Disk

Before You Begin
Specify Name and Location
Assign Memory
Configure Networking
Connect Virtual Hard Disk
Installation Options
Summary

A virtual machine requires storage so that you can install an operating system. You can specify the storage now or configure it later by modifying the virtual machine's properties.

Create a virtual hard disk

Use this option to create a dynamically expanding virtual hard disk with the default format (VHDX).

Name:

Location:

Size: GB (Maximum: 64 TB)

Use an existing virtual hard disk

Use this option to attach an existing virtual hard disk, either VHD or VHDX format.

Location:

Attach a virtual hard disk later

Use this option to skip this step now and attach an existing virtual hard disk later.

Microsoft Hyper-V

New Virtual Machine Wizard X



Installation Options

Before You Begin
Specify Name and Location
Assign Memory
Configure Networking
Connect Virtual Hard Disk
Installation Options
Summary

You can install an operating system now if you have access to the setup media, or you can install it later.

Install an operating system later
 Install an operating system from a boot CD/DVD-ROM

Media

Physical CD/DVD drive: D:

Image file (.iso):

Install an operating system from a boot floppy disk

Media

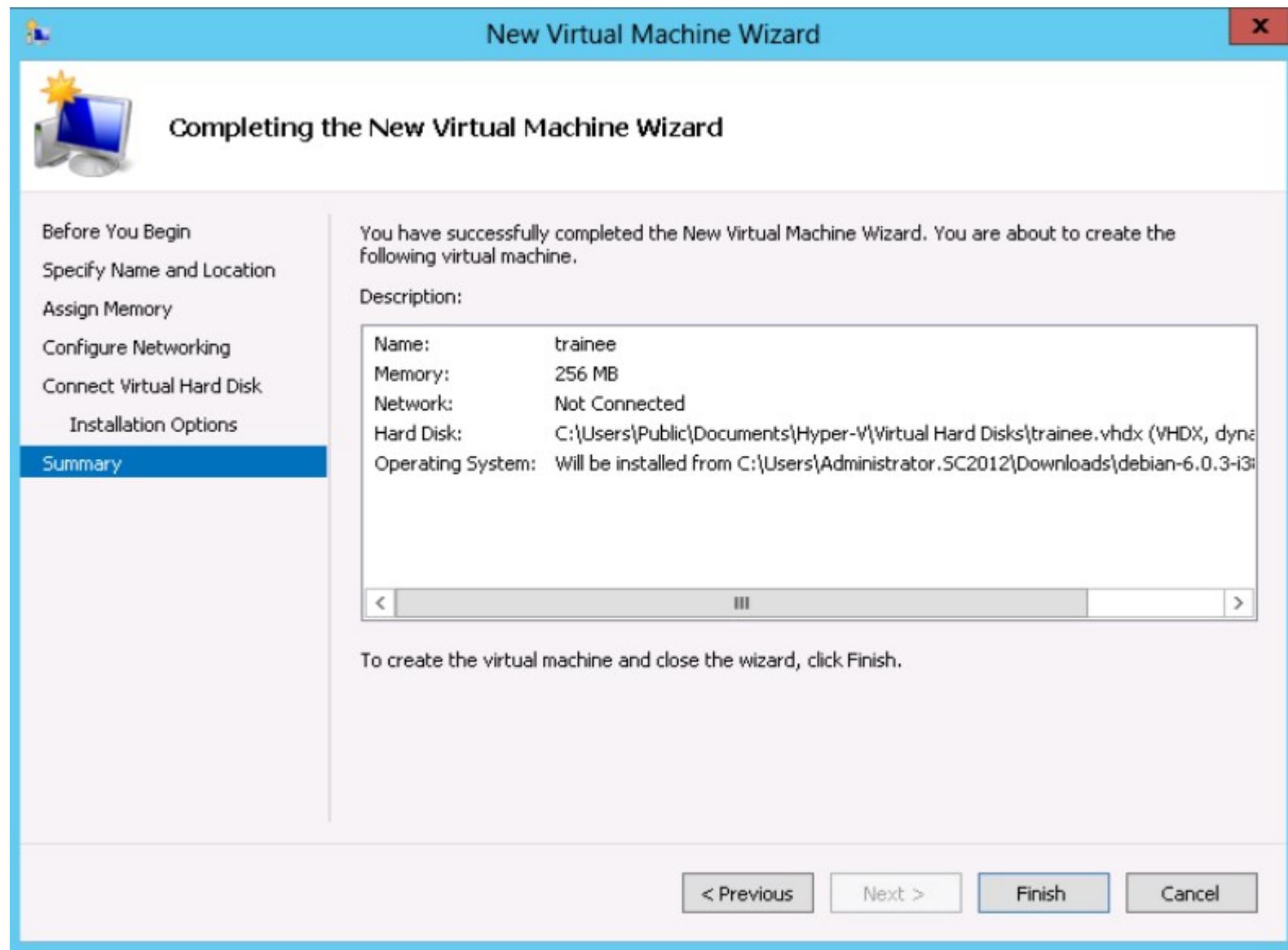
Virtual floppy disk (.vfd):

Install an operating system from a network-based installation server

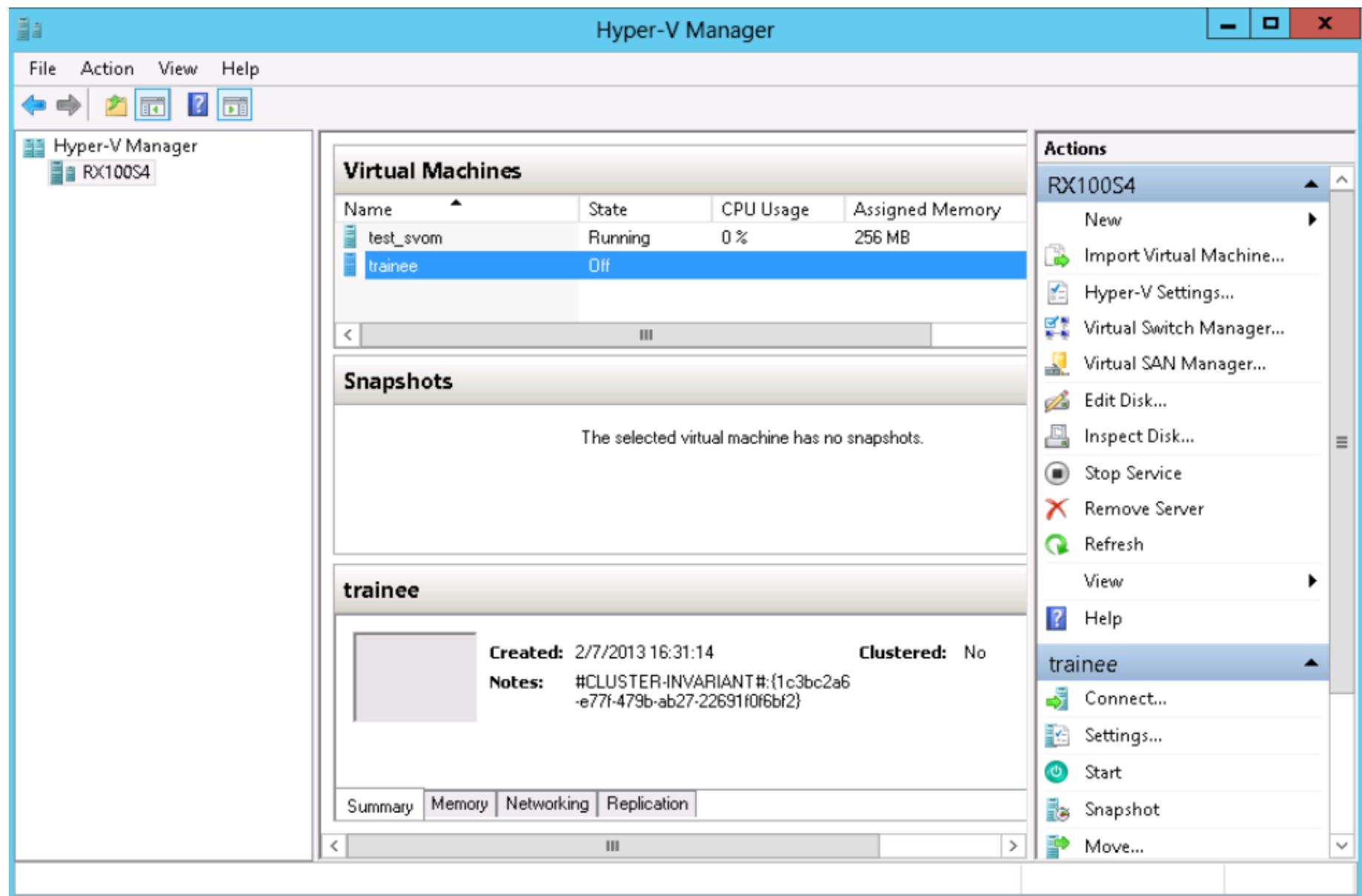
⚠ Your network adapter is disconnected. To perform a network-based installation, return to the Configure Networking page and connect the network adapter.

< Previous

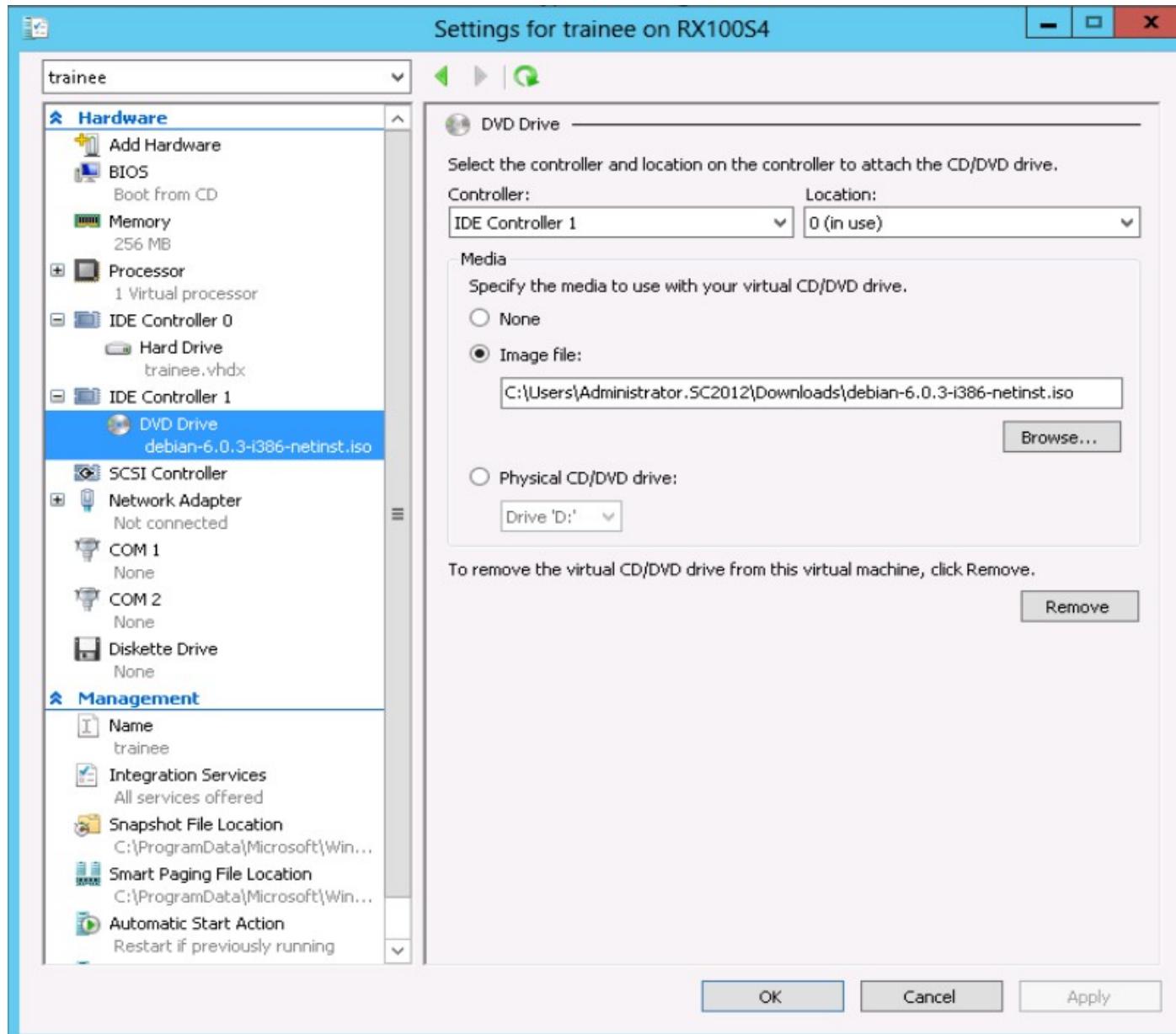
Microsoft Hyper-V



Microsoft Hyper-V



Microsoft Hyper-V



Microsoft Hyper-V

