Creating Virtual Machines

Module Lessons

Lesson 1: Virtual Machine Concepts

Lesson 2: Creating a Virtual Machine

Lesson 1: Virtual Machine Concepts

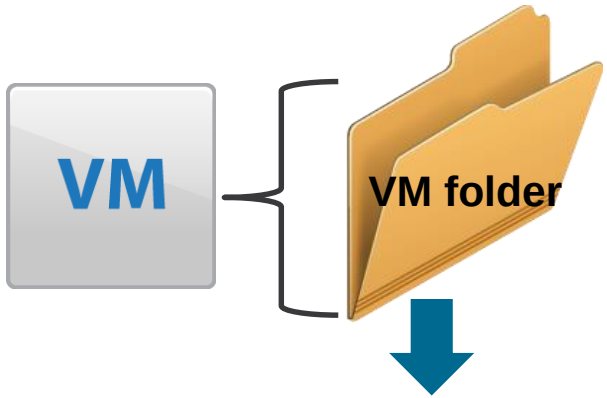
Learner Objectives

By the end of this lesson, you should be able to meet the following objectives:

- Identify virtual machine files and file extensions
- Compare virtual machine hardware version 13 to other versions
- Describe components of a virtual machine
- Identify the various methods to access a virtual machine console
- Identify the virtual network adapters and describe the enhanced VMXNET3 adapter
- Discuss the features of paravirtualized RDMA (PVRDMA) and virtual NVM Express (NVMe)
- Compare and contrast the types of virtual disk provisioning

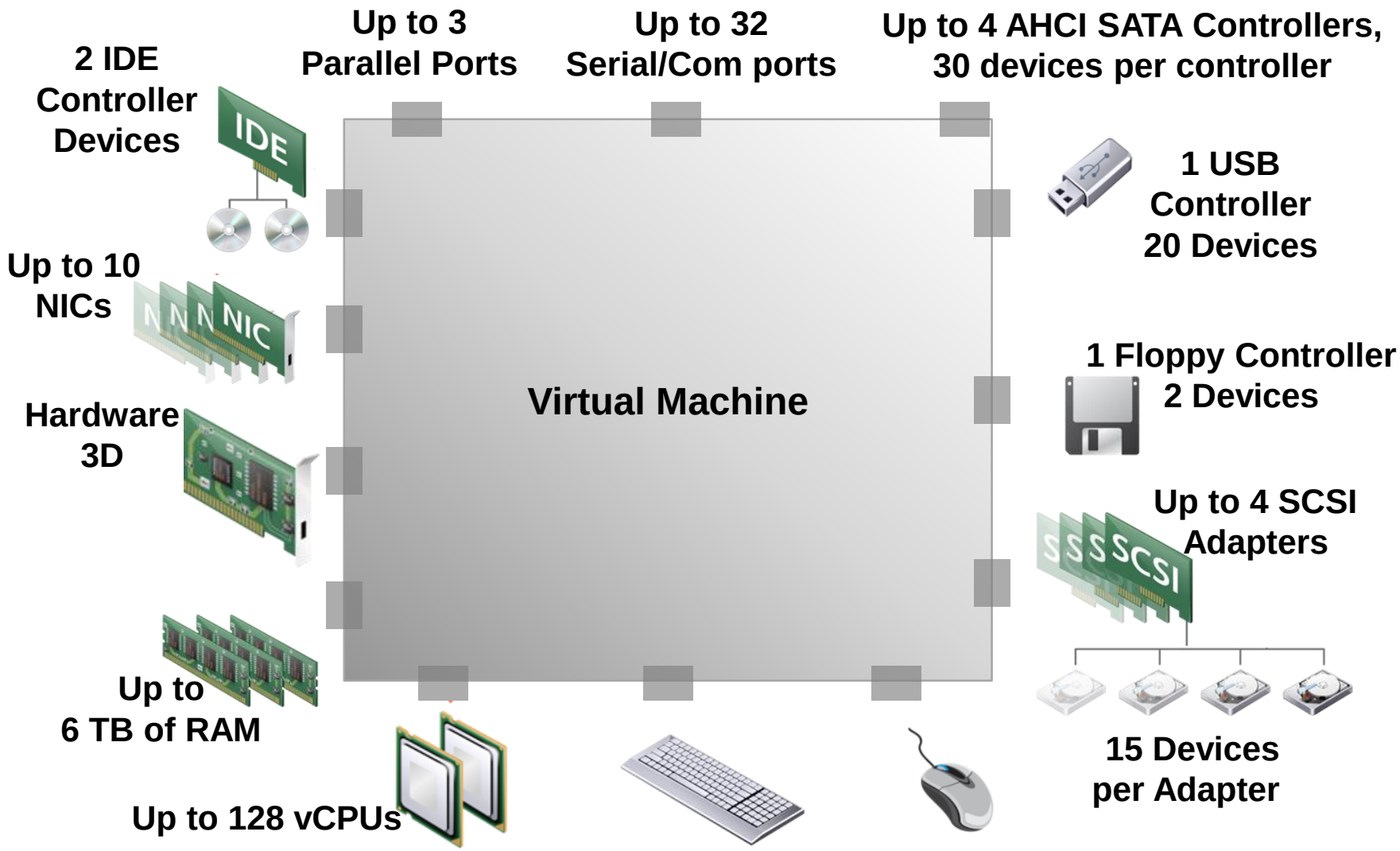
About Virtual Machine Files

A virtual machine includes a set of related files.



Configuration file	*VM_name*.vmx
Swap files	*VM_name*-*.vswp
	vmx-*VM_name*-*.vswp
BIOS file	*VM_name*.nvram
Log files	vmware.log
Template configuration file	*VM_name*.vmtx
Disk descriptor file	*VM_name*.vmdk
Disk data file	*VM_name*-flat.vmdk
Raw device map file	*VM_name*-rdm(p).vmdk
Snapshot disk file	*VM_name*-######-delta.vmdk
Snapshot data file	*VM_name*.vmsd
Snapshot state file	*VM_name*-*Snapshot#*.vmsn
Snapshot memory file	*VM_name*-*Snapshot#*.vmem
Suspend state file	*VM_name*-*.vmss
Suspended snapshot memory state	*VM_name*-*.vmem

About Virtual Machine Virtual Hardware



Virtual Hardware Versions

The virtual hardware version determines the operating system functions that a virtual machine supports. Do not use a later version that is not supported by the VMware product.

Compatibility	Hardware Version
ESXi 6.5 and later	13
ESXi 6.0 and later	11
ESXi 5.5 and later	10
ESXi 5.1 and later	9
ESXi 5.0 and later	8
ESX/ESXi 4.x and later	7

About CPU and Memory

You can add, change, or configure CPU and memory resources to improve virtual machine performance.

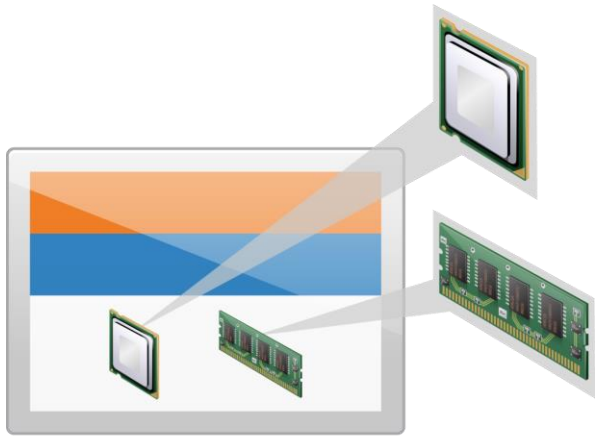
The maximum number of vCPUs that you can assign to a virtual machine depends on:

- The number of logical CPUs on the host
- The type of installed guest operating system

A virtual machine running on an ESXi 6 host can have up to 128 vCPUs.

Maximum memory size for a virtual machine depends on the virtual machine's compatibility setting

The maximum memory size of a virtual machine with ESXi 6.5 compatibility running on ESXi 6.5 is 6 TB.



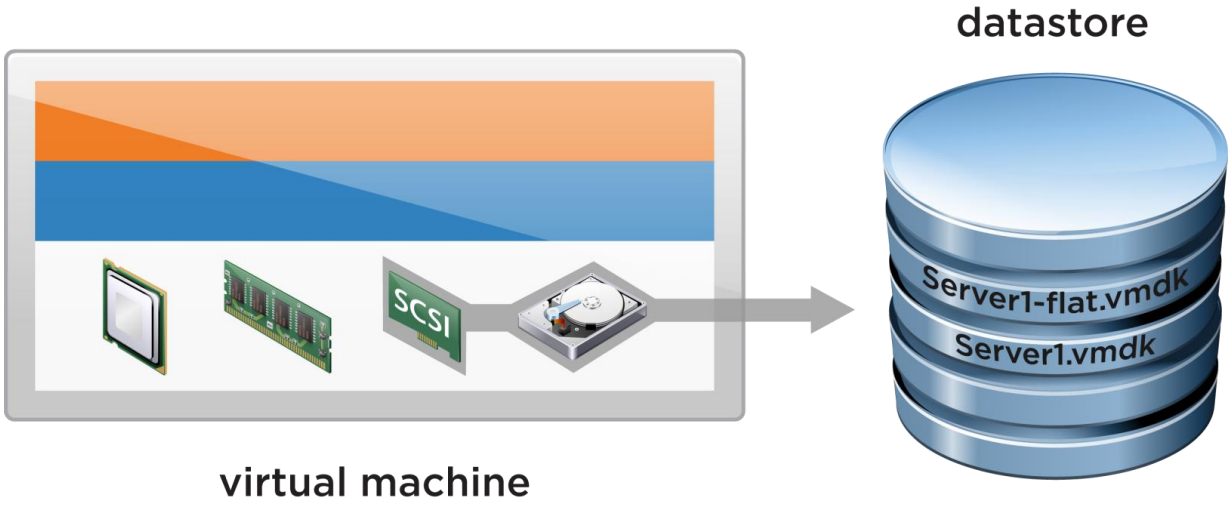
About Virtual Storage

Virtual disks are connected to virtual storage adapters. The ESXi host offers several choices in storage adapters to a virtual machine:

- BusLogic Parallel: The latest Mylex (BusLogic) BT/KT-958 compatible host bus adapter.
- LSI Logic Parallel: LSI Logic LSI53C10xx Ultra320 SCSI I/O controller is supported.
- LSI Logic SAS: LSI Logic SAS adapter has a serial interface.
- VMware Paravirtual SCSI: A high-performance storage adapter that can provide greater throughput and lower CPU use.
- AHCI SATA controller: Provides access to virtual disks and CD/DVD devices. The SATA virtual controller appears to a virtual machine as an AHCI SATA controller. AHCI SATA is available only for virtual machines with ESXi 5.5 and later compatibility.
- Virtual NVMe: NVMe is an Intel specification for attaching and accessing flash storage devices to the PCI Express bus. NVMe is an alternative to existing block-based server storage I/O access protocols.

About Virtual Disks

A virtual machine usually has at least one virtual disk.



Sample virtual disk definition:

Virtual disk size:	8 GB
Datastore:	MyVMFS
Virtual disk node:	0:0
Virtual storage adapter:	LSI Logic SAS
Virtual disk files:	`Server1.vmdk` and `Server1-flat.vmdk`
Default disk mode:	Snapshots allowed
Optional disk mode:	Independent: Persistent or nonpersistent
Disk provisioning policy:	Thick provision lazy zeroed, thick provision eager zeroed, or thin provision

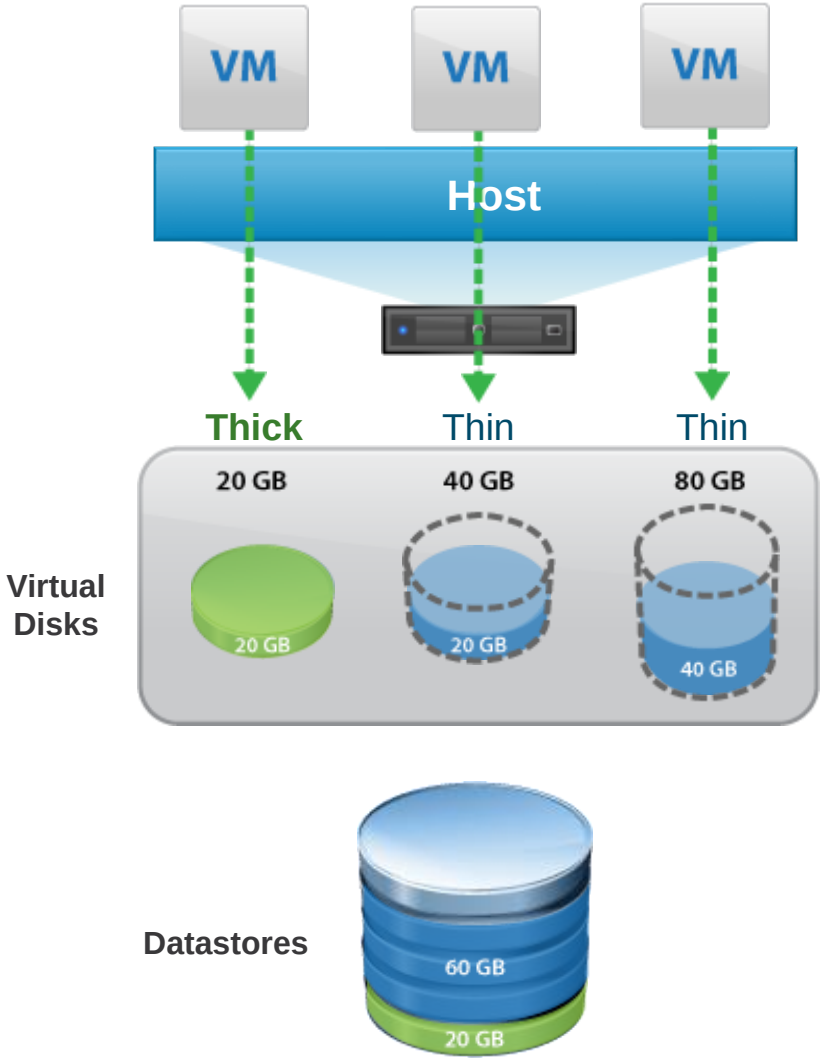
About Thick-Provisioned Virtual Disks

Thick provisioning uses all the defined disk space at the creation of the virtual disk:

- Virtual machine disks consume all the capacity, as defined at creation, regardless of the amount of data in the guest operating system file system.

Eager-zeroed or lazy-zeroed:

- Every block in an eager-zeroed thick-provisioned disk is prefilled with a zero.
- Every block in a lazy-zeroed thick-provisioned disk is filled with a zero when data is written to the block.



About Thin-Provisioned Virtual Disks

Thin provisioning enables virtual machines to use storage space as needed:

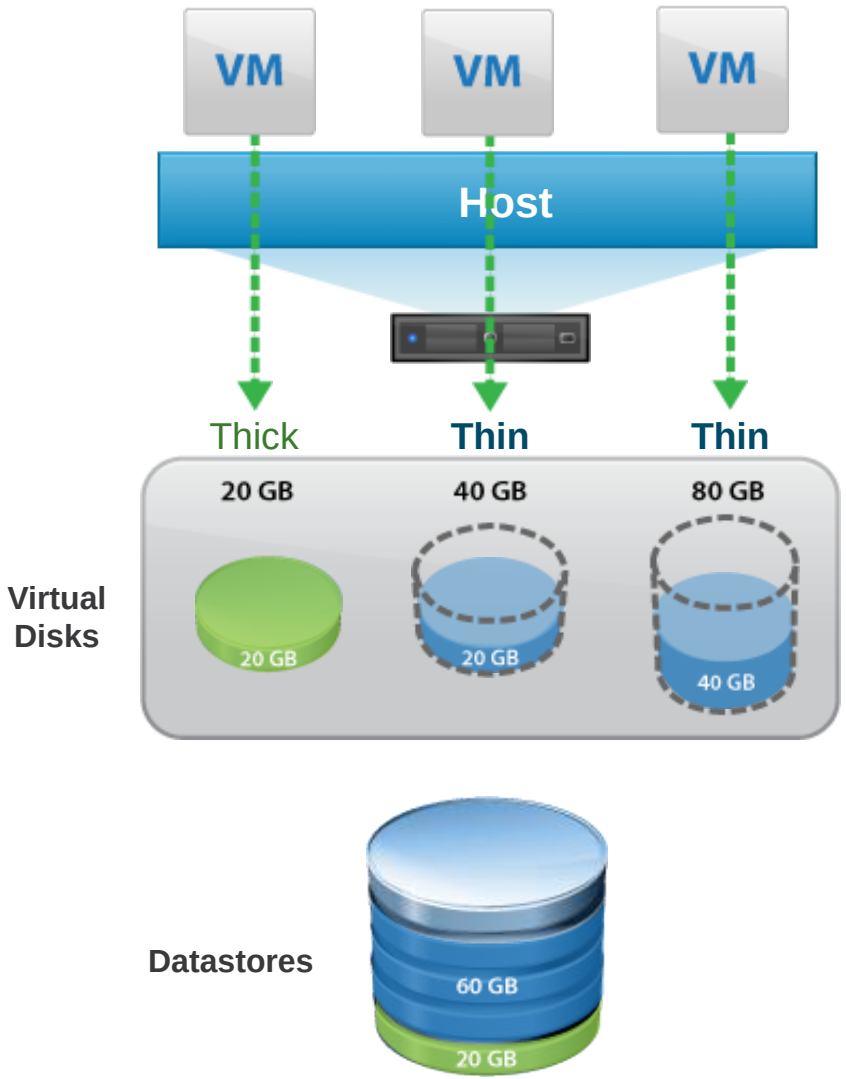
- Thin-provisioned virtual machine disks consume only the capacity needed to hold the current files.
- A virtual machine sees the full allocated disk size at all times.

You can mix thick and thin formats.

Full reporting and alerts help manage allocations and capacity.

More efficient use of storage:

- Virtual disk allocation: 140 GB
- Available datastore capacity: 100 GB
- Used storage capacity: 80 GB

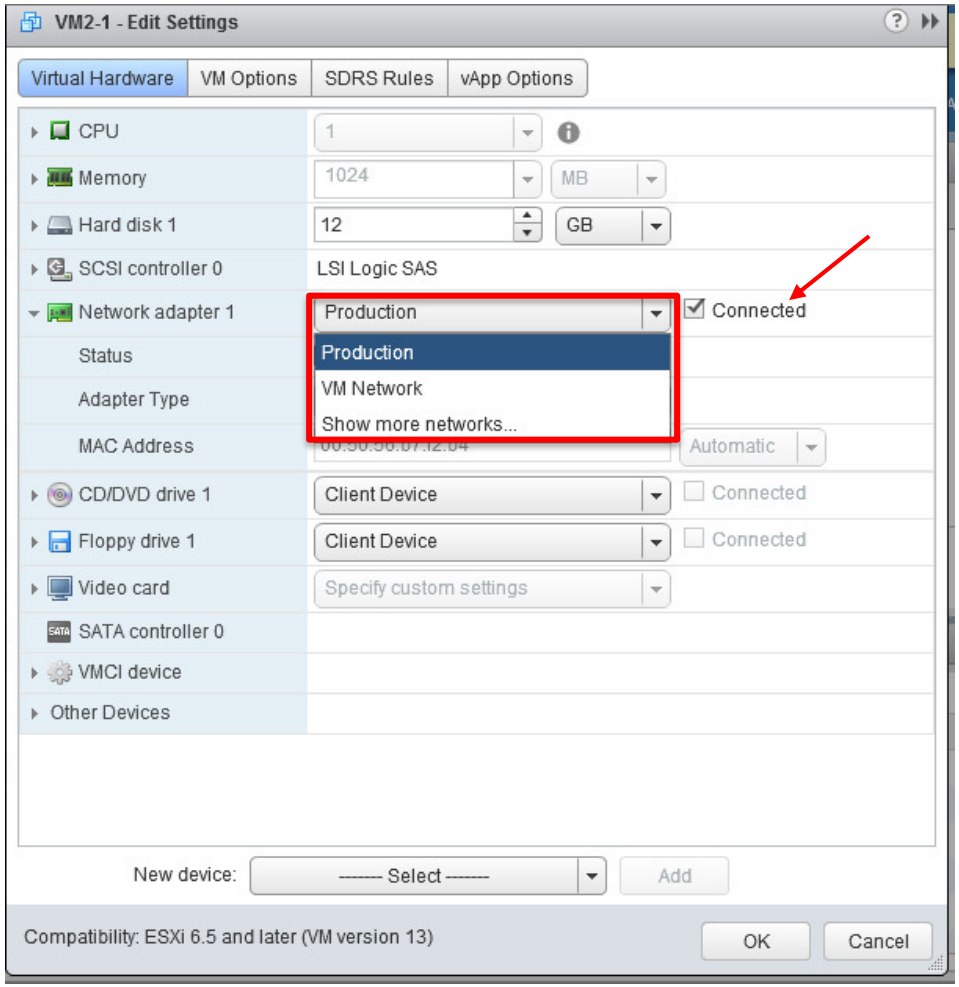


About Virtual Networks

A virtual network enables communication between virtual machines and physical machines.

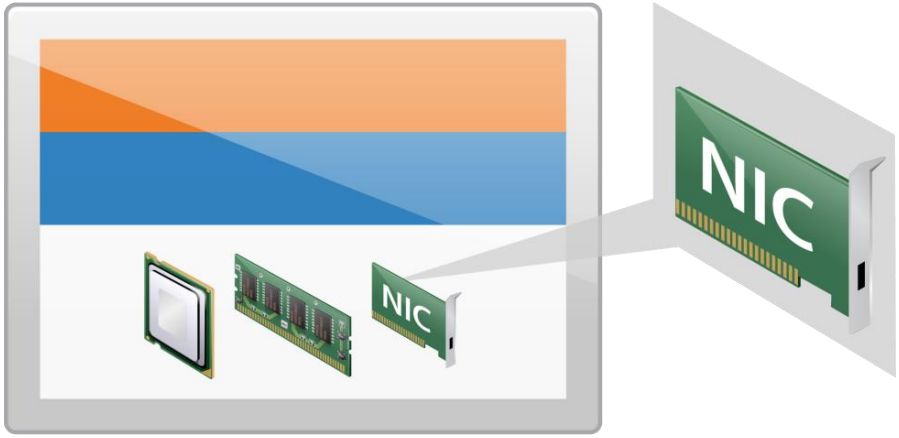
When you configure networking for a virtual machine, you select or change the following items:

- The network adapter type
- The network connection
- Whether to connect to the network when the virtual machine powers on



About Virtual Network Adapters (1)

When you configure a virtual machine, you can add network adapters (NICs) and specify the adapter type. Whenever possible, select VMXNET3.



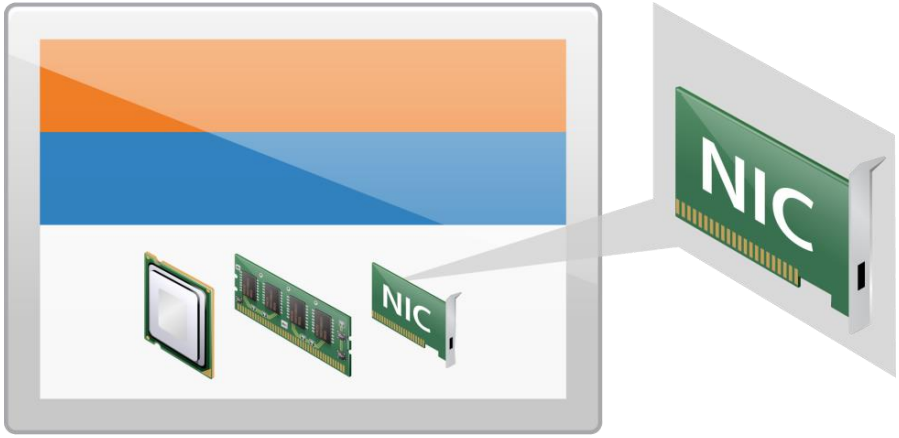
Supported network adapter types:

- Flexible: Can function as either a Vlance or VMXNET adapter.
- E1000-E1000E: High-performance adapter available for only some guest operating systems.
- VMXNET, VMXNET2, and VMXNET3 are VMware drivers that are available only with VMware Tools.

About Virtual Network Adapters (2)

Supported network adapter types:

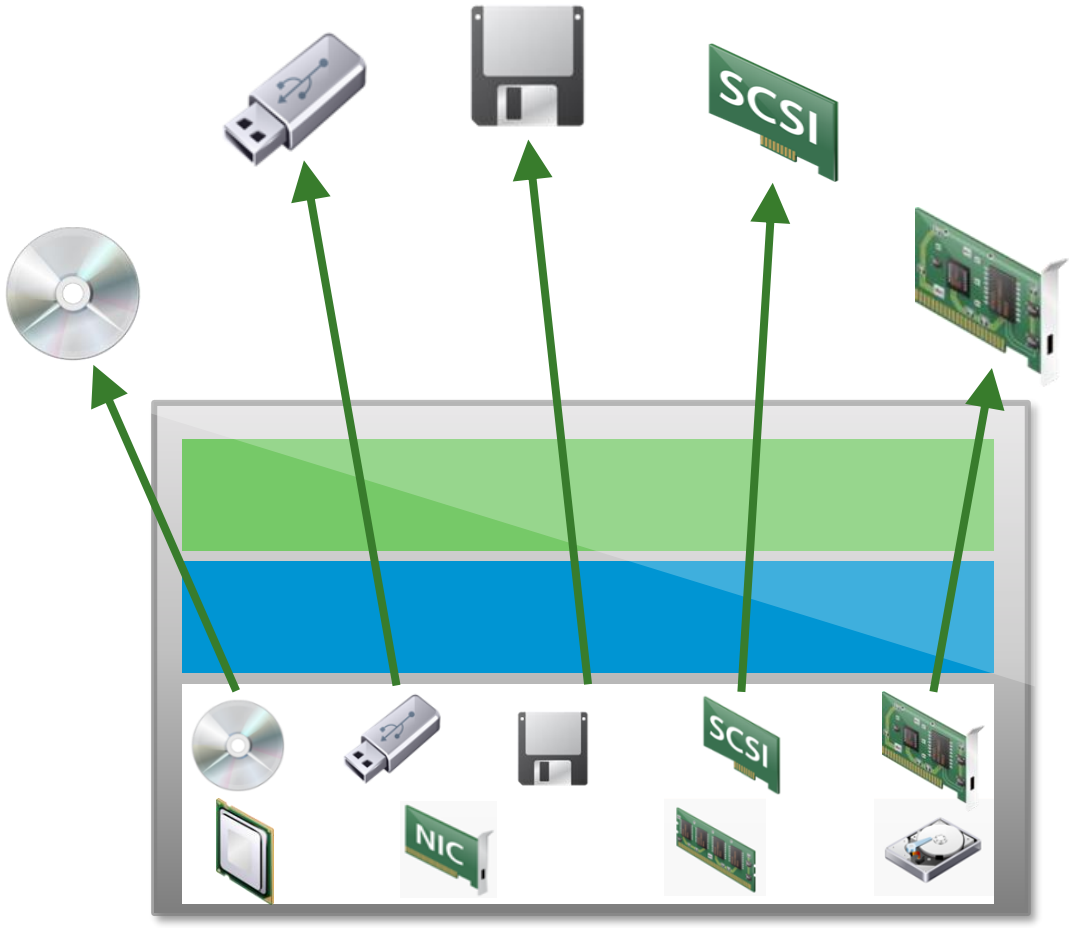
- SR-IOV passthrough: The virtual machine and the physical adapter exchange data without using the VMkernel as an intermediary:
  - Limited guest operating system support
- VMware vSphere® DirectPath I/O™: vSphere DirectPath I/O allows virtual machine access to physical PCI network functions on platforms with an I/O memory management unit.
- PVRDMA: PVRDMA is a paravirtualized device that provides improved virtual device performance. It provides an RDMA-like interface for vSphere guests.



About Miscellaneous Devices

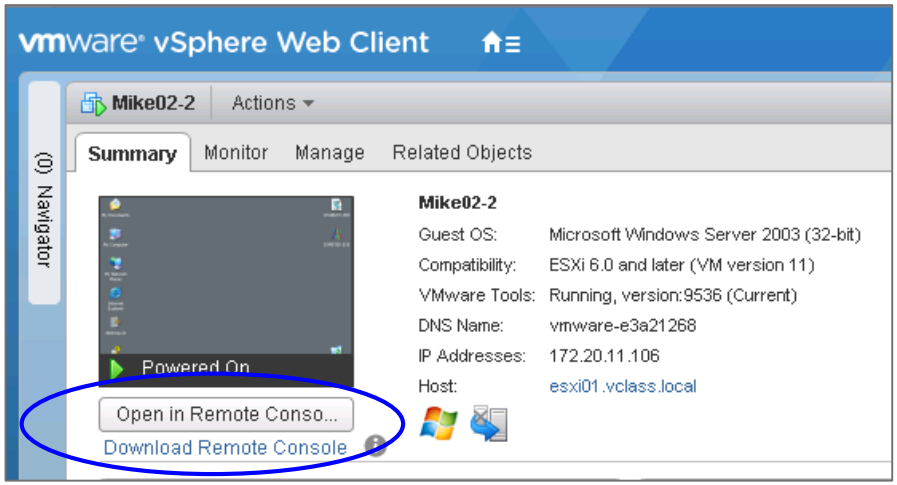
A virtual machine must have a vCPU and virtual memory. The addition of other virtual devices makes the virtual machine more useful:

- CD/DVD drive: Connect to a CD, a DVD, or an ISO image.
- USB 3.0: Supported with host-connected and client-connected devices on Linux or Windows 8/Server 2012.
- Floppy drive: Connect a virtual machine to a floppy drive or a floppy image.
- Generic SCSI devices: A virtual machine can be connected to additional SCSI adapters.
- vGPUs: Enable a virtual machine to use GPUs on the physical host for high-computation activities.

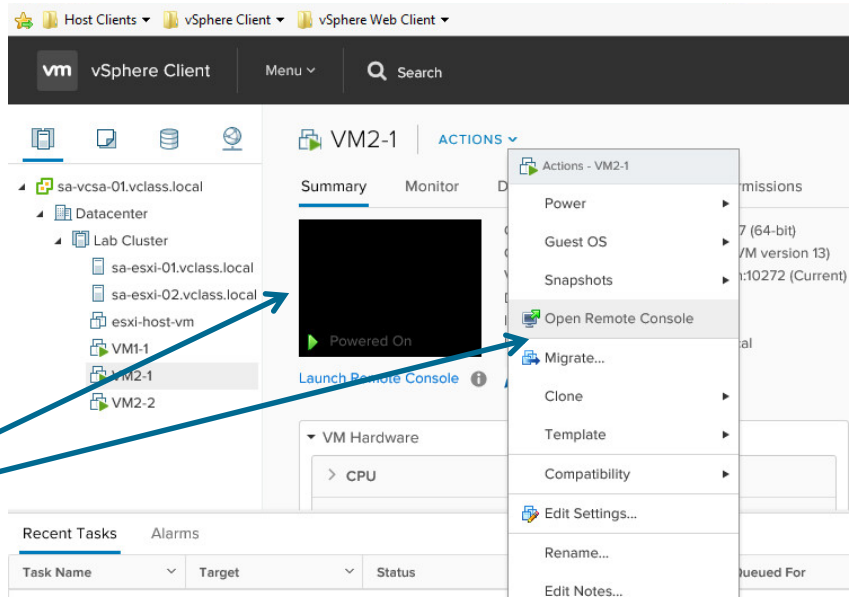


About the Virtual Machine Console

The virtual machine console provides the mouse, keyboard, and screen features to control the virtual machine.



vSphere Web Client



vSphere Client

Review of Learner Objectives

You should be able to meet the following objectives:

- Identify virtual machine files and file extensions
- Compare virtual machine hardware version 13 to other versions
- Describe components of a virtual machine
- Identify the various methods to access a virtual machine console
- Identify the virtual network adapters and describe the enhanced VMXNET3 adapter
- Discuss the features of paravirtualized RDMA (PVRDMA) and virtual NVM Express (NVMe)
- Compare and contrast the types of virtual disk provisioning

Lesson 2: Creating a Virtual Machine

Learner Objectives

By the end of this lesson, you should be able to meet the following objectives:

- Create, provision, and remove a virtual machine
- Explain the importance of VMware Tools
- Describe how to import a virtual appliance Open Virtual Machine Format (OVF) template
- Manage VMware Tools
- Explain troubleshooting OS installation and VMware Tools problems

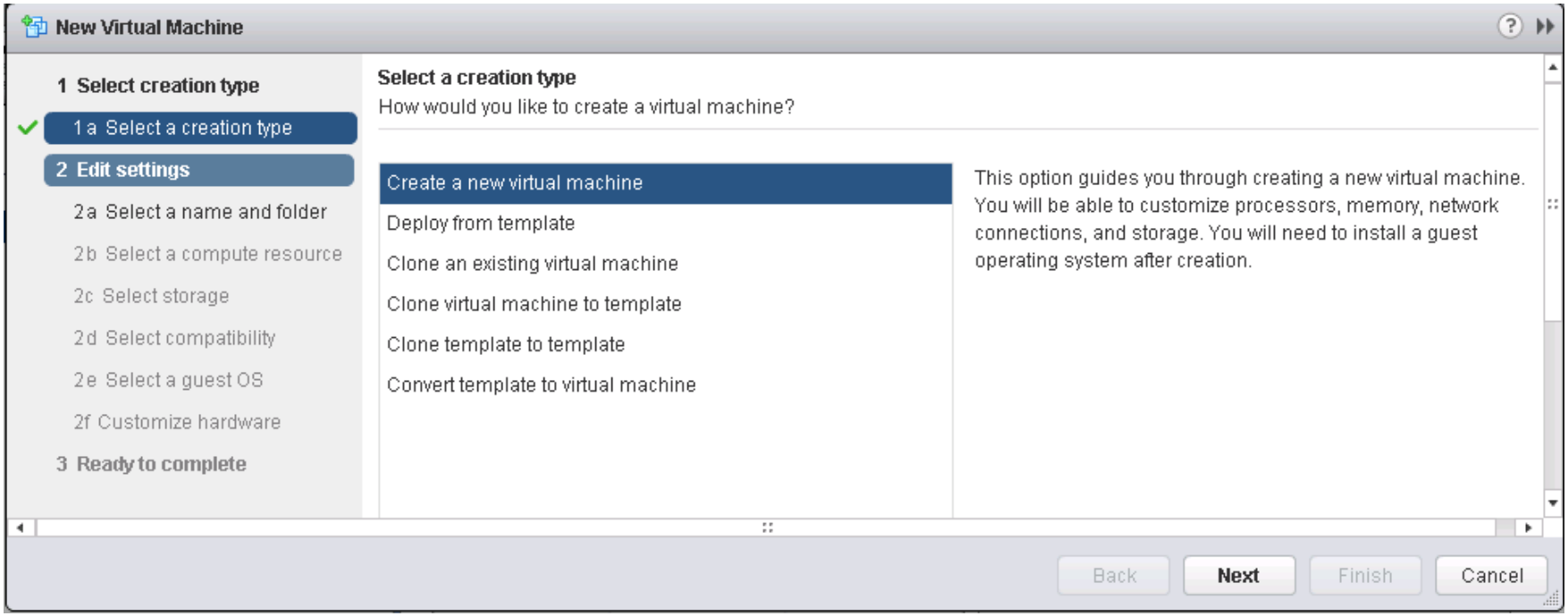
About Provisioning Virtual Machines

You can create virtual machines in several ways:

- Use the New Virtual Machine wizard to create virtual machines.
- Deploy virtual machines, virtual appliances, and vApps stored in OVF.
- Use a CentOS, Linux, or Windows template in a VMware vCloud® Air™ catalog to create virtual machines.

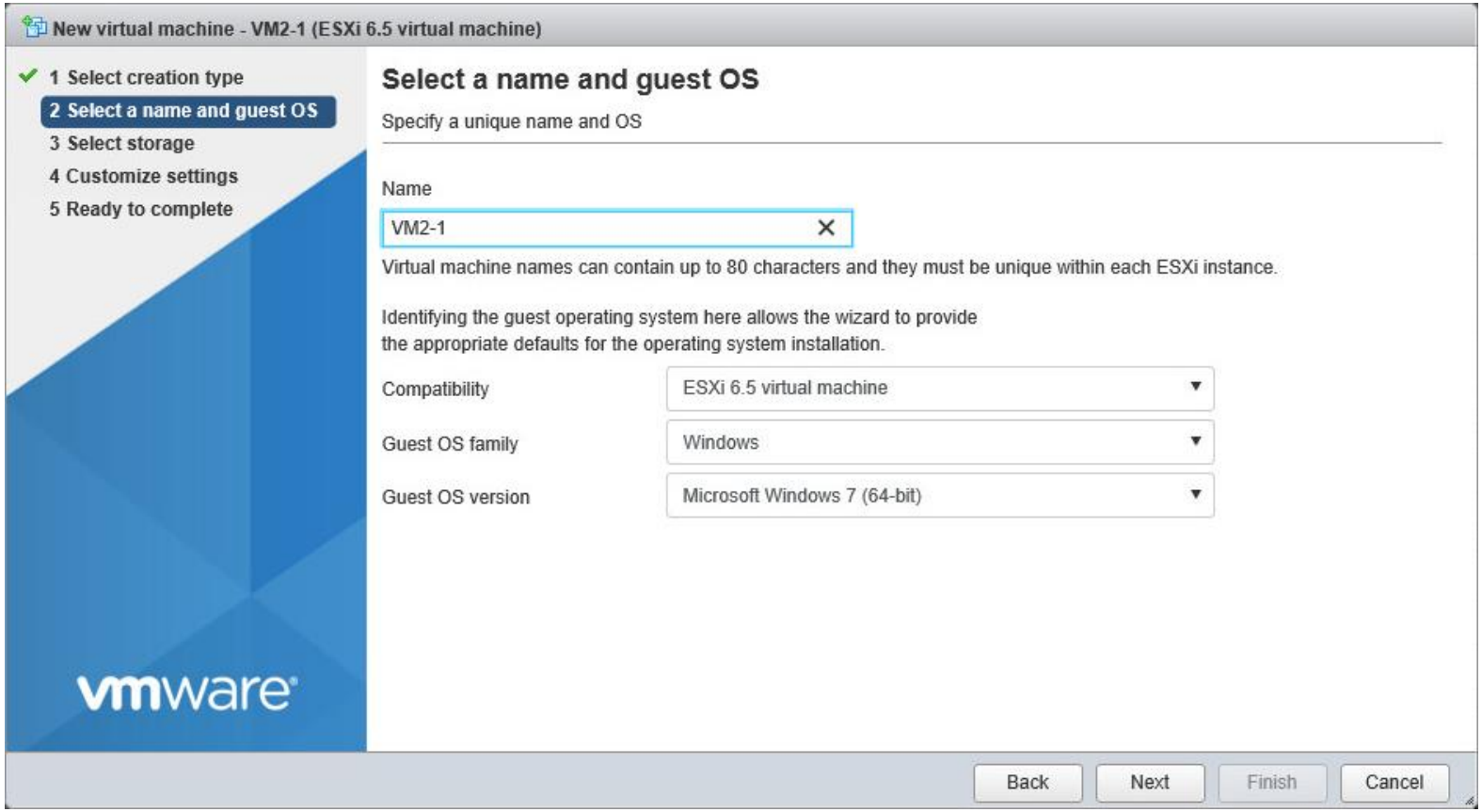
Creating Virtual Machines with the New Virtual Machine Wizard (1)

You can use the New Virtual Machine wizard in vSphere Web Client to create a virtual machine.

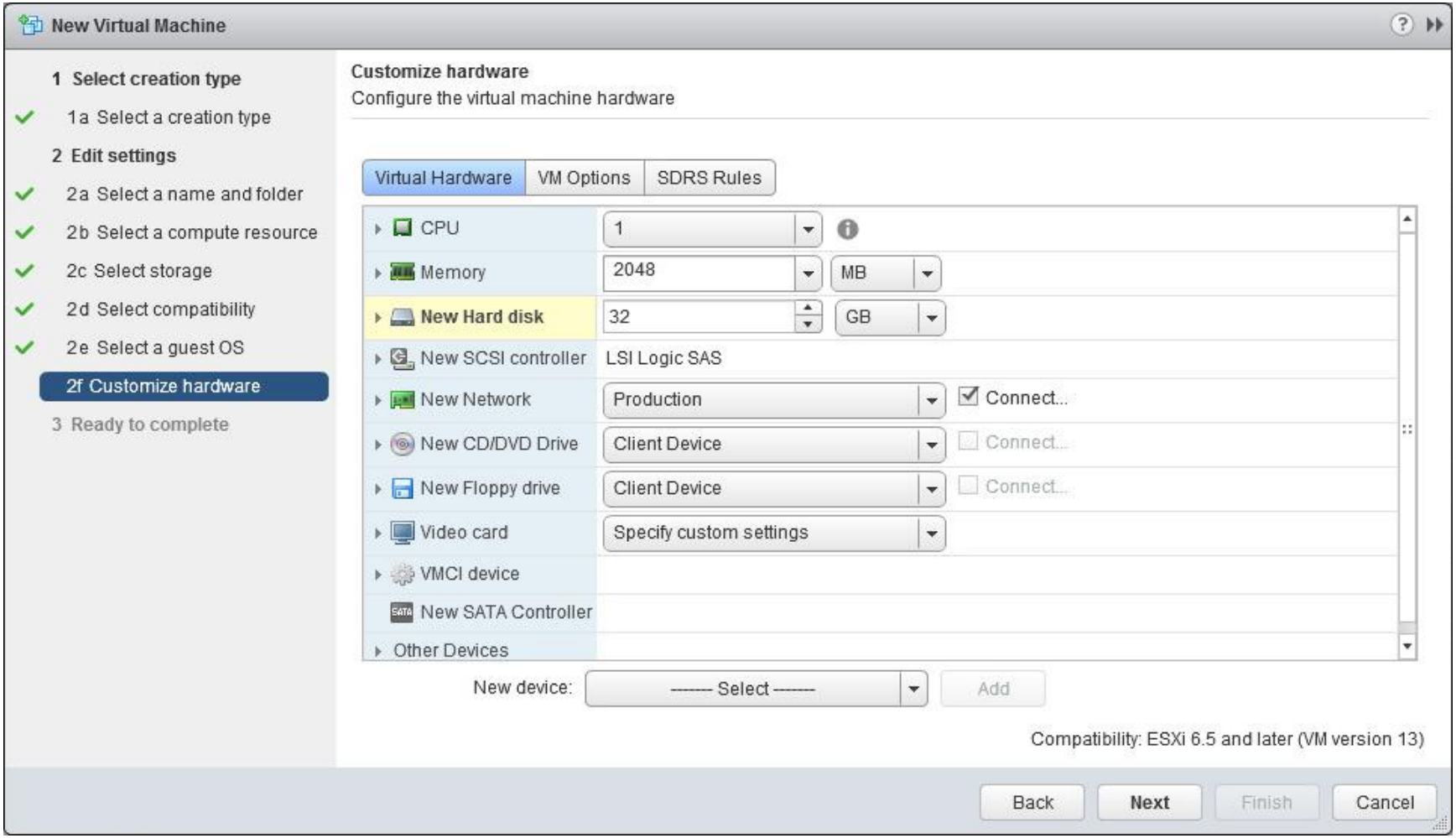


Creating Virtual Machines with the New Virtual Machine Wizard (2)

You can use the New Virtual Machine wizard in VMware Host Client to create a virtual machine.

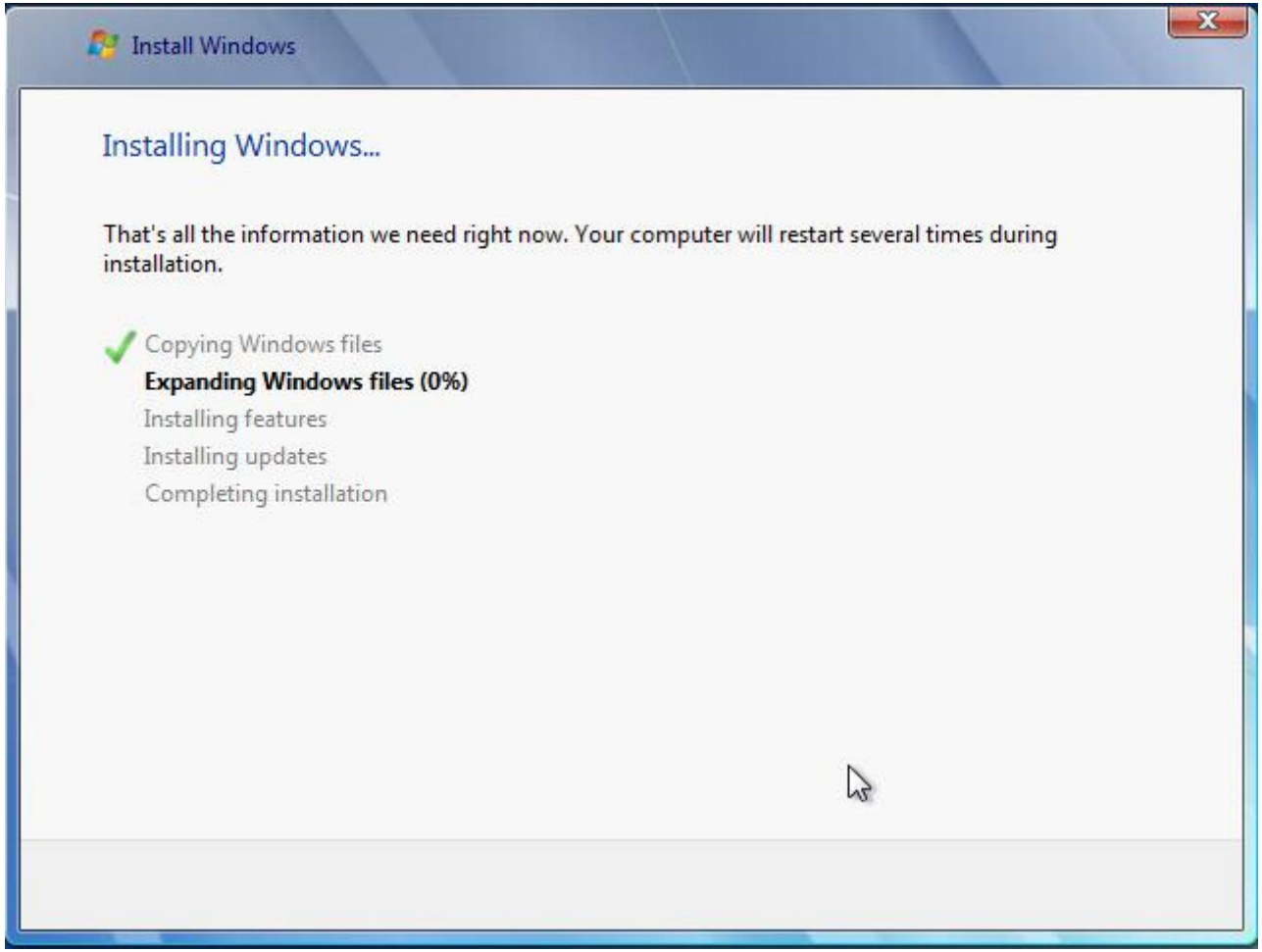


New Virtual Machine Wizard Settings



Installing the Guest Operating System

Installing a guest operating system in your virtual machine is like installing it on a physical computer.

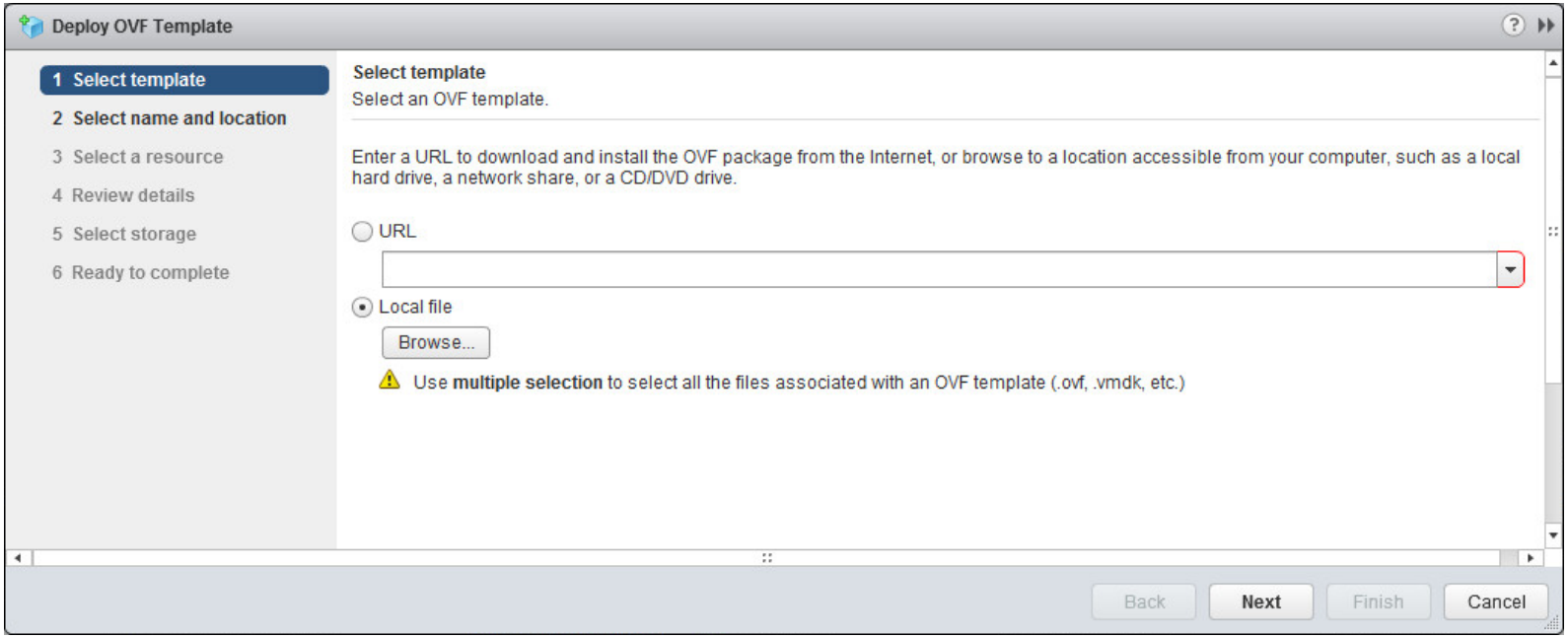


Deploying OVF Templates

You can deploy any virtual machine or a virtual appliance stored in OVF.

Virtual appliances are preconfigured virtual machines:

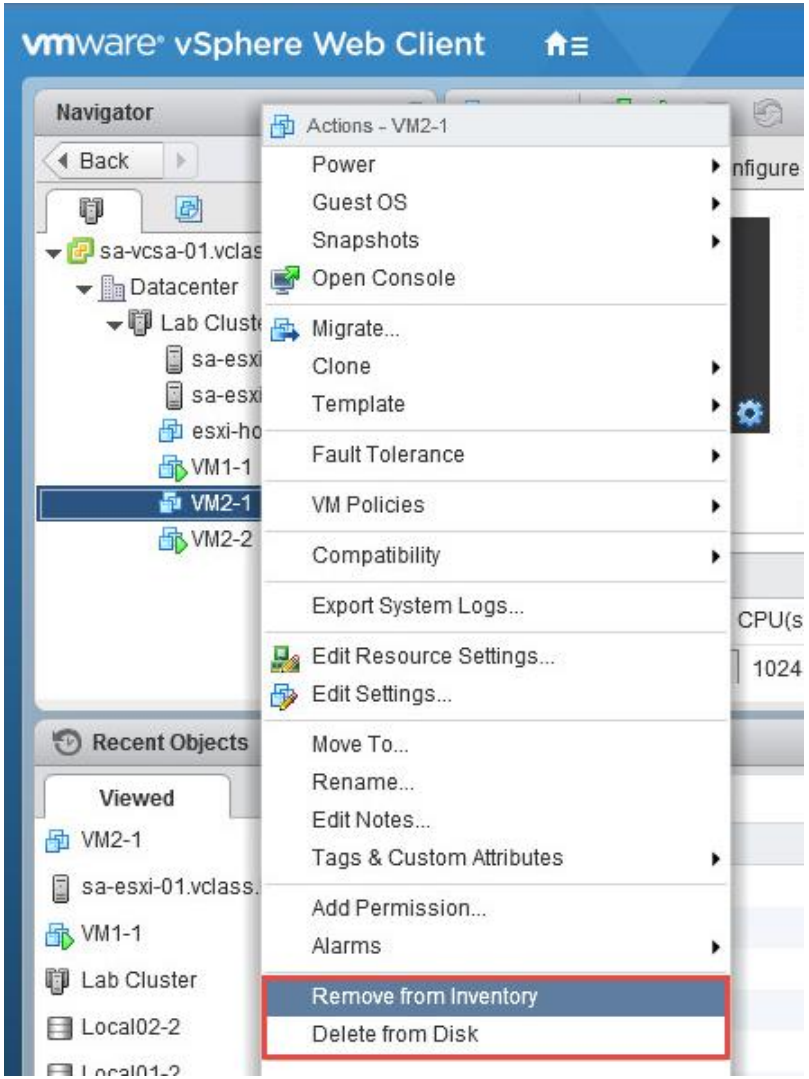
- They are usually designed for a single purpose, for example, a safe browser or firewall.
- They are available from VMware Solution Exchange.



Removing a Virtual Machine

You can remove a virtual machine in the following ways:

- Remove from the inventory:
  - This type of removal unregisters the virtual machine.
  - The virtual machine's files remain on the disk.
  - The virtual machine can later be registered (added) to the inventory.
- Delete from disk:
  - All virtual machine files are permanently deleted from the virtual machine datastore.



About VMware Tools

VMware Tools is a suite of utilities that enhance the performance of the virtual machine's guest operating system.

VMware Tools benefits:

- Device drivers:
  - SVGA display
  - VMXNET/VMXNET3
  - Balloon driver for memory management
  - Sync driver for quiescing I/O
- Increased graphics performance
- Improved mouse performance

VMware Tools features:

- Copying and pasting text, graphics, and files between the virtual machine and the client desktop
- Time synchronization
- Ability to shut down the virtual machine
- Guest authentication (vCenter Single Sign-On)

Managing VMware Tools

The version of VMware Tools distributed with vSphere 6.5 is 10.1.

VMware Tools 10.1 provides the following features:

- Digital signature verification
- Three supported guest operating system ISO images
- Product locker for storing ISOs

Additional ISO images for other operating systems can be downloaded from VMware.

VMware Tools: Supported ISO Images

The following ISO files are included with vSphere 6.5:

- `windows.iso`: For Vista and later guests
- `winPreVista.iso`: For Windows 2000, XP, and Server 2003 guests
- `linux.iso`: For Linux OS with glibc 2.5 or higher (for example, RHEL 5 or later, SLES 11 or later, Ubuntu 10.04 or later)
- VMware Tools for other guest operating systems, such as FreeBSD, Solaris, and Mac OS X, can be downloaded from My VMware at https://download.vmware.com.

Troubleshooting OS Installation Failures in Virtual Machines

Problems:

- The installation of a 64-bit operating system cannot start.
- The installation of a 64-bit guest operating system stops responding at the Setup is starting the Windows screen.
- The installation of a 64-bit operating system cannot complete.

Resolutions:

1. Verify that the guest operating system that you are attempting to install is fully certified by VMware.
2. Verify that your ESX/ESXi host meets the hardware and firmware requirements for running 64-bit virtual machines.
3. If your ESX/ESXi host uses Intel processors, verify that virtualization technology is enabled in the BIOS.
4. Verify that the correct guest operating system is selected.

Troubleshooting a Failed VMware Tools Installation on a Guest Operating System

Problems:

- VMware Tools installation errors before completion.
- VMware Tools installation fails to complete.
- Unable to complete VMware Tools for Windows or Linux installation.
- VMware Tools hangs when installing or reinstalling.

Solutions:

1. Verify that that the guest operating system that you are trying to install is fully certified by VMware.
2. Verify that the correct operating system is selected.
3. Verify that the ISO image is not corrupted.
4. If installing on a Windows operating system, ensure that you are not experiencing problems with your Windows registry.
5. If installing on a 64-bit Linux guest operating system, verify that no dependencies are missing.

Lab : Deploying and Configuring a Virtual Machine

Create and prepare a virtual machine for use

1. Create a Virtual Machine
2. Install a Guest Operating System and Disable Windows Updates
3. Install VMware Tools
4. Install Files

Key Points

- Virtual machines can be provisioned by using various methods:
  - You can use the New Virtual Machine wizard in vSphere Client, vSphere Web Client, and VMware Host Client to create and clone virtual machines.
  - You can create a virtual machine by deploying an OVF template.
- VMware Tools increases the performance of the virtual machine's guest operating system.

Questions?