# Oracle® VM

## User's Guide for Release 3.2

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# Oracle® VM: User's Guide for Release 3.2



### Abstract

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# Preface

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The preface contains information on how to use the Oracle VM User's Guide.

## 1 Audience

The Oracle VM User's Guide is intended for system administrators and end users who want to learn the fundamentals of virtualization, Oracle VM, and the provision and management of virtual machines.

## 2 Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc.

### Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info or visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing impaired.

## 3 Related Documents

For more information, see the following documents in the Oracle VM Release 3.2 documentation set:

- *Oracle VM Release Notes*
- *Oracle VM Installation and Upgrade Guide*
- *Oracle VM Getting Started Guide*
- *Oracle VM Windows Paravirtual Drivers Installation Guide*
- *Oracle VM Security Guide*
- *Oracle VM Utilities Guide*
- *Oracle VM Command Line Interface User's Guide*

You can also get the latest information on Oracle VM by going to the Oracle VM Web site:

http://www.oracle.com/us/technologies/virtualization/oraclevm

## 4 Command Syntax

Oracle Linux command syntax appears in `monospace` font. The dollar character ($), number sign (#), or percent character (%) are Oracle Linux command prompts. Do not enter them as part of the command. The following command syntax conventions are used in this guide:

| Convention | Description |
|---|---|
| backslash \ | A backslash is the Oracle Linux command continuation character. It is used in command examples that are too long to fit on a single line. Enter the command as displayed (with a backslash) or enter it on a single line without a backslash:<br>`dd if=/dev/rdsk/c0t1d0s6 of=/dev/rst0 bs=10b \`<br>`count=10000` |
| braces { } | Braces indicate required items:<br>`.DEFINE {macro1}` |
| brackets [ ] | Brackets indicate optional items:<br>`cvtcrt termname [outfile]` |
| ellipses ... | Ellipses indicate an arbitrary number of similar items:<br>`CHKVAL fieldname value1 value2 ... valueN` |
| *italics* | Italic type indicates a variable. Substitute a value for the variable:<br>`library_name` |
| vertical line \| | A vertical line indicates a choice within braces or brackets:<br>`FILE filesize [K\|M]` |

# 5 Conventions

The following text conventions are used in this document:

| Convention | Meaning |
|---|---|
| **boldface** | Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary. |
| *italic* | Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values. |
| `monospace` | Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter. |

# Chapter 1 Introduction to Virtualization

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This chapter provides introductory information on virtualization. It discusses why you would want to use virtualization, the technology provided, and a high level overview of Oracle VM.

## 1.1 Introduction to Virtualization

The IT industry's focus on virtualization technology has increased considerably in the past few years. However, the concept has been around much longer, as you can read in the brief history below. This section also provides a high level view of the virtualization technology and methods that exist today, and highlights a number of reasons why organizations are embracing virtualization more and more.

### 1.1.1 Brief History of Virtualization

The concept of virtualization is generally believed to have its origins in the mainframe days in the late 1960s and early 1970s, when IBM invested a lot of time and effort in developing robust time-sharing solutions. Time-sharing refers to the shared usage of computer resources among a large group of users, aiming to increase the efficiency of both the users and the expensive computer resources they share. This model represented a major breakthrough in computer technology: the cost of providing computing capability dropped considerably and it became possible for organizations, and even individuals, to use a computer without actually owning one. Similar reasons are driving virtualization for industry standard computing today: the capacity in a single server is so large that it is almost impossible for most workloads to effectively use it. The best way to improve resource utilization, and at the same time simplify data center management, is through virtualization.

Data centers today use virtualization techniques to provide abstraction from the physical hardware, create large aggregated pools of logical resources consisting of CPUs, memory, disks, file storage, applications, networking, and offer those resources to users or customers in the form of agile, scalable, consolidated virtual machines. Even though the technology and use cases have evolved, the core meaning of virtualization remains the same: to enable a computing environment to run multiple independent systems at the same time.

### 1.1.2 Hypervisor

If virtualization is defined as enabling multiple operating systems to run on a single host computer, then the essential component in the virtualization stack is the hypervisor. This hypervisor, also called Virtual Machine Monitor (VMM), creates a virtual platform on the host computer, on top of which multiple guest operating systems are executed and monitored. This way, multiple operating systems, which are either multiple instances of the same operating system, or different operating systems, can share the hardware resources offered by the host.

Hypervisors are commonly classified as one of these two types, as show in Table 1.1, “Hypervisor Types”.

**Table 1.1 Hypervisor Types**

| Classification | Characteristics and Description |
|---|---|
| Type 1: *native* or *bare metal* | Native hypervisors are software systems that run directly on the host's hardware to control the hardware, and to monitor the guest operating systems. Consequently, the guest operating system runs on a separate level above the hypervisor. Examples of this classic implementation of virtual machine architecture are Oracle VM, Microsoft Hyper-V, VMWare ESX and Xen. |
| Type 2: *hosted* | Hosted hypervisors are designed to run within a traditional operating system. In other words, a hosted hypervisor adds a distinct software layer on top of the host operating system, and the guest operating system becomes a third software level above the hardware. A well-known example of a hosted hypervisor is Oracle VM VirtualBox. Others include VMWare Server and Workstation, Microsoft Virtual PC, KVM, QEMU and Parallels. |

# 1.2 Reasons to Use Virtualization

There are many different good reasons for companies and organizations to invest in virtualization today, but it is probably safe to assume that financial motivation is number one on the list: virtualization can save a lot of money. Below is an overview of the key benefits of virtualization.

**Table 1.2 Reasons to Use Virtualization**

| Item | Description |
|---|---|
| Resource optimization | Today's enterprise level computer resources are so powerful that they often have excess capacity. By virtualizing the hardware and allocating parts of it based on the real needs of users and applications, the available computing power, storage space and network bandwidth can be used much more effectively. Computers no longer need to be idle or performing below their capabilities because there are fewer connected users, or because the hosted application happens to be less demanding than the server can handle.<br><br>Virtual machines offer software developers isolated, constrained, test environments. Rather than purchasing dedicated physical hardware, virtual machines can be created on the existing hardware. Because each virtual machine is independent and isolated from all the other servers, programmers can run software without having to worry about affecting other applications, or external components affecting the execution of their code. |
| Consolidation | It is common practice to dedicate individual computers to a single application. If several applications only use a small amount of processing power, the administrator can consolidate several computers into one server running multiple virtual environments. For organizations that own hundreds or thousands of servers, consolidation can dramatically reduce the need for floor space, HVAC, A/C power, and co-location resources. This means the cost of ownership is reduced significantly, since less physical servers and floor and rack space are required, which in turn leads to less heat and power consumption, and ultimately a smaller carbon footprint. |
| Maximizing Uptime | Agility is all about being able to respond to changing requirements as quickly and flexibly as possible. Virtualization brings new opportunities to data center administration, allowing users to enjoy:<br><br>• Guaranteed uptime of servers and applications; speedy disaster recovery if large scale failures do occur. |

| Item | Description |
| --- | --- |
| | • Instant deployment of new virtual machines or even aggregated pools of virtual machines via template images.<br>• Elasticity, that is, resource provisioning when and where required instead of keeping the entire data center in an *always-on* state.<br>• Reconfiguration of running computing environments without impacting the users. |
| Automatically Protect Applications from Server Failure | Server virtualization provides a way to implement redundancy without purchasing additional hardware. Redundancy, in the sense of running the same application on multiple servers, is a safety measure: if for any reason a server fails, another server running the same application takes over, thereby minimizing the interruption in service. This kind of redundancy works in two ways when applied to virtual machines:<br>• If one virtual system fails, another virtual system takes over.<br>• By running the redundant virtual machines on separate physical hardware you can also provide better protection against physical hardware failure. |
| Easily Migrate Workloads as Needs Change | Migration refers to moving a server environment from one place to another. With most virtualization solutions it is possible to move a virtual machine from one physical machine in the environment to another. With physical servers this was originally possible only if both physical machines ran on the same hardware, operating system and processor. In the virtual world, a server can be migrated between physical hosts with entirely different hardware configurations. Migration is typically used to improve reliability and availability: in case of hardware failure the guest system can be moved to a healthy server with limited downtime, if any. It is also useful if a virtual machine needs to scale beyond the physical capabilities of the current host and must be relocated to physical hardware with better performance. |
| Protect Investment in Existing, Legacy Systems | Server hardware will eventually become obsolete, and switching from one system to another can be difficult. In order to continue offering the services provided by these legacy systems, you can run it as a virtual machine on new, modern hardware, while the legacy system itself still behaves as if it were running on the same legacy hardware. From an application perspective, nothing has changed. In fact, its performance may well benefit from the newer underlying hardware. This gives the organization the time to transition to new processes without worrying about hardware issues, particularly in situations where the manufacturer of the legacy hardware no longer exists or cannot fix broken equipment. |

# Chapter 2 Introduction to Oracle VM

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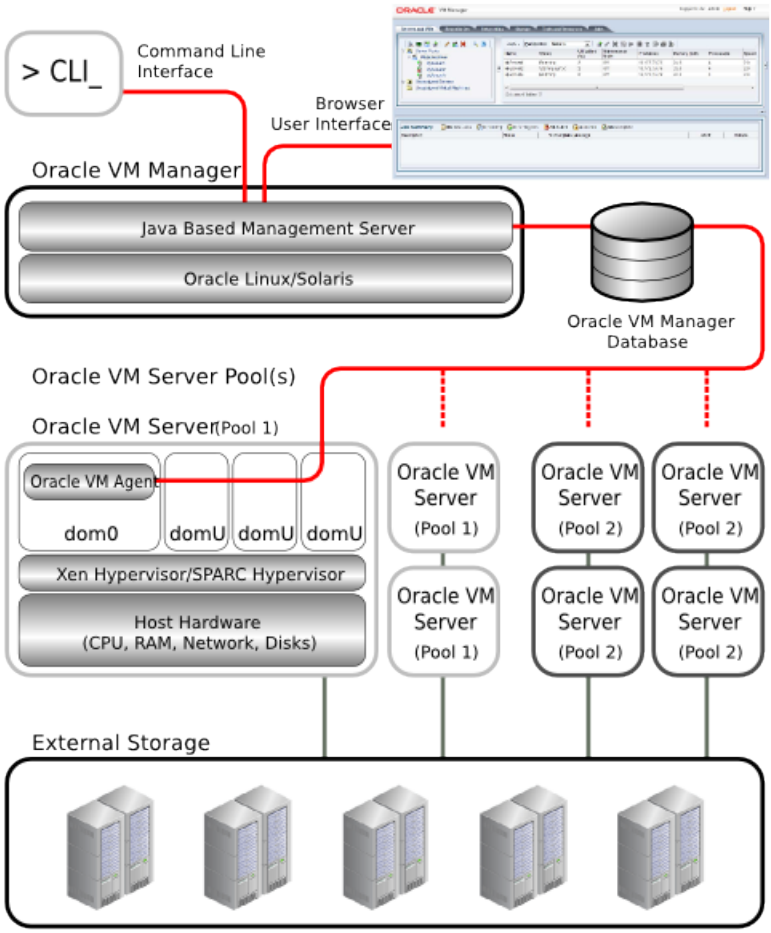
This chapter contains introductory information about Oracle VM, its components, architecture, and deployment options.

## 2.1 Introduction to Oracle VM

Oracle VM is a platform that provides a fully equipped environment with all the latest benefits of virtualization technology. Oracle VM enables you to deploy operating systems and application software within a supported virtualization environment. Oracle VM insulates users and administrators from the underlying virtualization technology and allows daily operations to be conducted using goal-oriented GUI interfaces. The components of Oracle VM are shown in Figure 2.1, “Oracle VM Architecture”.

**Figure 2.1 Oracle VM Architecture**




- **Oracle VM Manager**: Used to manage Oracle VM Servers, virtual machines, and resources. It is comprised of a number of subcomponents, including an Application Development Framework (ADF) application, providing a familiar web-based graphical user interface (GUI); and a command line interface (CLI) allowing you to manage your infrastructure directly from the command line either via external scripts or by running manual command sequences.

  Oracle VM Manager is an Oracle WebLogic Server application running on Oracle Linux. This can be a standalone computer, or part of a virtual machine running on an instance of Oracle VM Server.

  While Oracle VM Manager is a critical component for configuration actions within the Oracle VM infrastructure, the virtualized environment can continue to function properly even if Oracle VM Manager experiences downtime. This includes the ability to maintain high availability and to perform live migration of virtual machines.

- **Oracle VM Server**: A managed virtualization environment providing a lightweight, secure, server platform which runs virtual machines. At least one Oracle VM Server is required, but several are needed to take advantage of clustering.

  Oracle VM Server is installed on a bare metal computer, and contains the Oracle VM Agent to manage communication with Oracle VM Manager. Dom0 is an abbreviation for *domain zero*, the management or control domain with privileged access to the hardware and device drivers. DomU is an unprivileged

domain with no direct access to the hardware or device drivers. A user-domain (domU) is started and managed on an Oracle VM Server by dom0.

**Note**

Some of this terminology may vary depending on whether you are working with an x86 or SPARC based environment. Where possible, through this document, the alternate terminology is mentioned.

On x86-based systems, Oracle VM Server is based upon an updated version of the underlying Xen hypervisor technology, and includes Oracle VM Agent. It also includes a Linux kernel with support for a broad array of devices, file systems, and software RAID volume management. The Linux kernel is run as dom0 to manage one or more domU virtual machines, each of which could be Linux, Oracle Solaris, or Microsoft Windows™.

In contrast, Oracle VM Server for SPARC takes advantage of the hypervisor that is already included within the SPARC firmware, alongside the Oracle VM Agent for SPARC. The default Oracle Solaris operating system is usually promoted to act as the primary domain, which is equivalent to dom0 on x86 systems. Once the primary domain is in place, it can be used to create and manage further domains running different versions of the Oracle Solaris operating system.

### 2.1.1 Xen™ Technology

Oracle VM makes use of Xen technology, when running on x86 servers, taking advantage of the Xen hypervisor. The Xen hypervisor is a small, lightweight bare metal hypervisor for x86-compatible computers. The Xen hypervisor securely executes multiple virtual machines on one host computer. Each virtual machine has its own guest operating system with almost native performance. The Xen hypervisor was originally created by researchers at Cambridge University, and derived from work done on the Linux kernel.

### 2.1.2 Oracle VM Server for SPARC

On SPARC systems, the SPARC hypervisor is built into the SPARC firmware and is generally referred to as the Logical Domains Manager (LDOM). As with the Xen hypervisor, each virtual machine is securely executed on a single computer and runs its own guest Oracle Solaris operating system. The SPARC hypervisor provides a broader range of virtualization features than the Xen hypervisor, due to the nature and design of SPARC hardware.

## 2.2 Oracle VM Features

This section gives an overview of the Oracle VM Manager features used to manage Oracle VM Servers, virtual machines, storage repositories, networks, and resources. Oracle VM Manager provides the following main capabilities:

- Manages the physical Oracle VM Servers and can, for example, reboot or rediscover the physical hardware.
- Creates and configures server pools.
- Creates and manages Oracle VM Server logical networks, for example, NIC port bonding, and configuring VLAN networks.
- Creates and manages storage repositories.
- Manages resources, including ISO files, virtual machine templates, virtual machine images, and virtual machine assemblies.

- Manages the virtual machines. This includes creating virtual machines from either installation media or from templates, starting, logging in, shutting down, and deleting virtual machines.
- Imports, clones and migrates virtual machines.
- Performs load balancing of virtual machines in server pools.
- Manages jobs in the Oracle VM environment.
- Manages policies such as High Availability, Distributed Resource Scheduling, and Distributed Power Management.

## 2.3 Oracle VM Integrated Support

Oracle has a unique position in the virtualization market as an Enterprise application, operating system and hardware vendor that delivers technologies across the stack. Owning the entire stack has various advantages:

- integration and centralized management of all components
- the ability to pre-package and distribute Oracle technologies via Oracle VM templates
- integrated enterprise support across the entire technology stack, from application to hardware

Oracle VM support is an add-on component of Oracle's enterprise support package that offers an end-to-end single vendor support solution from the application to the disk. A single support call covers the entire Oracle stack which expedites problem resolution. Using Oracle support allows an Oracle support service request (SR) to transition between support teams with issues that require cross stack collaboration. For example, if you open a service request for an application issue and the root cause is at the virtualization layer then the service request will transition between the application and virtualization teams.

## 2.4 Terminology

This section contains definitions for the terms used throughout this Guide and terms used within Oracle VM.

### 2.4.1 Hypervisor

The hypervisor present on each Oracle VM Server is an extremely small-footprint virtual machine manager and scheduler. It is designed so that it is the only fully privileged entity in the system. It controls only the most basic resources of the system, including CPU and memory usage, privilege checks, and hardware interrupts.

**Note**

On SPARC-based systems, the hypervisor is already built into the firmware. If Oracle VM Server for SPARC has not been installed, the default operating system runs on top of the hypervisor transparently. When Oracle VM Server for SPARC is installed, the default operating system becomes the primary domain and tools are provided for the primary domain to manage how resources and hardware are allocated via the hypervisor to other domains. See Section 2.4.2, “Domains, Guests and Virtual Machines”.

### 2.4.2 Domains, Guests and Virtual Machines

The terms "domain", "guest" and "virtual machine" are often used interchangeably, but they have subtle differences. A *domain* is a configurable set of resources, including memory, virtual CPUs, network devices

and disk devices, in which virtual machines run. A domain is granted virtual resources and can be started, stopped and restarted independently of other domains or the host server itself. A *guest* is a virtualized operating system running within a domain. A guest operating system may be paravirtualized or hardware virtualized. Multiple guests can run on the same Oracle VM Server. A *virtual machine* is a guest operating system and its associated application software. See Section 7.2, “Virtualization Modes (Domain Types)” for information on virtualization modes.

## 2.4.3 Management Domain (dom0)

Most of the responsibility of hardware detection in an Oracle VM Server environment is passed to the management domain, referred to as domain zero (or dom0). On x86-based servers, the dom0 kernel is actually a small-footprint Linux kernel with support for a broad array of devices, file systems, and software RAID and volume management. In Oracle VM Server, the dom0 is tasked with providing access to much of the system hardware, creating, destroying and controlling guest operating systems, and presenting those guests with a set of common virtual hardware.

On SPARC-based servers, the management domain, usually referred to as the *primary* domain, is created when the logical domains manager is installed. If installed on an existing server that is not already configured for logical domains, the current Operating System automatically gets promoted to primary domain status. The primary domain runs an Oracle Solaris kernel and is responsible for the creation and management of all other domains. It is also responsible for providing access to virtualized hardware resources.

On systems running Oracle VM Server for SPARC, aside from the concepts of a "management domain" and of "guest domains", similar to the "user domains" described in Section 2.4.4, “Domains (domU)”, there are a variety of other domain-types that can run alongside the management domain. For instance, it is possible to set up "service domains" that can act as network switches and virtual disk servers. Not all of these domain types are configurable using the Oracle VM Manager.

## 2.4.4 Domains (domU)

Guest operating systems each have their own management domain called a "user domain", abbreviated to "domU". These domains are unprivileged domains with no direct access to the hardware or device drivers. Each domU is started alongside dom0 running on Oracle VM Server.

**Note**

Under Oracle VM Server for SPARC these domains are usually referred to as "guest domains".

## 2.4.5 Storage and Storage Repositories

A storage repository is a central location where various resources to build virtual machines are stored. These resources include templates, ISO files, VM files and so on. Oracle VM Servers have shared access to storage repositories for optimized usage of available disk space in the environment, as well as easy reallocation of virtual machines in case a physical server should malfunction.

However, storage in Oracle VM is more than repositories: it also encompasses server pool file systems for clustered server pools, physical disks, or LUNs, in storage arrays, and local physical disks on the Oracle VM Servers. All these storage elements are used in various ways and managed centrally through Oracle VM Manager.

## 2.4.6 Server Pools

A server pool is a required entity in Oracle VM, even if it contains a single Oracle VM Server. In practice, several Oracle VM Servers will form a server pool, and an Oracle VM environment may contain one or

several server pools. Server pools are typically clustered, although an unclustered server pool is also possible.

Server pools have shared access to storage repositories and exchange and store vital cluster information in the server pool file system. In a server pool, a Master server is elected, which is responsible for centralized communication with the Oracle VM Manager. If necessary, any other member of the server pool can take over the Master role. Even in case of server failure, the server pool remains accessible at its virtual IP address, which all servers in the pool share.

Within a clustered server pool, virtual machines can be live-migrated for load balancing purposes or for scheduled maintenance. If a pool member disappears for whatever reason, its virtual machines can be recovered and brought back up on another Oracle VM Server because all necessary resources are available on shared storage.

## 2.4.7 Networks

The networking infrastructure in the Oracle VM environment comprises connections between Oracle VM Servers, between Oracle VM Servers and Oracle VM Manager, between the Oracle VM Servers and their storage sub-systems, as well as communications among virtual machines deployed in the environment, and between virtual machines and external private or public networks. These networking connections can leverage features supported by Oracle VM, such as networked file systems, clustering, redundancy and load balancing, bridging, and support for Virtual LANs (VLANs).

The physical network is the collection of physical connections in Oracle VM Manager and all Oracle VM Servers, and the switches and routers that allow information to reach its destination. A logical network in Oracle VM is built on top of these physical connections. When you create an Oracle VM network, you map available network ports to a set of logical Ethernet networks. This ensures that the networking environment for each virtual machine is constant regardless of the actual server that it is running on. This allows a virtual machine to be easily migrated between servers within a server pool without affecting the networking for the virtual machine. You perform this mapping in Oracle VM Manager.

In Oracle VM a network can perform one or more network functions. Oracle VM has the following network functions: server management, live migrate, cluster heartbeat, virtual machine, and storage. Functions can be combined or spread over several different networks; this design decision depends on the available physical network infrastructure, such as the number of NICs in each server, network traffic and appliction behaviors within the system.

## 2.4.8 Jobs and Events

Jobs are a sequence of operations usually triggered by a user action. For example: discovering a server, presenting a repository, creating a VM, and so on. These jobs appear in the Jobs Summary pane at the bottom of the Oracle VM Manager user interface and their status is refreshed according to their progress. Some jobs are not the result of a specific user action but are a recurring system operation, such as checking the YUM repository for updates. A history of all jobs in the environment is available in the Jobs tab, where you can view and filter the job list and display details of each job: status, execution time stamps, operations executed as part of the job, etc.

Since jobs are sequential and sometimes take time to complete, tracking the status of a job within the Jobs tab allows you to understand what actions the system is currently performing, and which actions are queued to run in sequence after the current job has completed. Jobs also allow you to access system messages that may be useful to debug the failure of an operation.

Events are often also related to user actions, but their main function from a user perspective is to register status information of "objects" for future reference or to make problems easier to trace back. Events are displayed in the Servers and VMs, Repositories, and Storage tabs in the Oracle VM Manager user

interface and the list of events depends on the object selected in the tree view of the Navigation pane. For example, the events list of a VM shows you when it was created, at what point it was started and stopped, when it was migrated, and so on. If you select a server or server pool in the same tree view, different types of events appear, related to that particular object. Events have no status but a severity level: most events will be informational, but they can also be warnings, errors or other situations that require your attention. You must acknowledge an error event to clear the error. See Section B.1.11, “Acknowledging Events/ Errors” for information on acknowledging events.

Events represent changes in the state of a system that may not be associated with a job. For instance, events can be triggered through changes in the environment such as server crashes or storage disconnects. Therefore, events are used to alert you to potential problems that may need your attention.

## 2.5 Servers and Server Pools

An Oracle VM environment is built up out of an extensible set of Oracle VM Servers, which are controlled by a single Oracle VM Manager. The Oracle VM Manager runs the database that contains all information about both the physical and the virtual infrastructure. In addition, it hosts the web browser interface that is used to configure and manage the entire environment. Communication between the Oracle VM Manager and the Oracle VM Servers, in order to execute operations on and through the servers, is relayed via the Oracle VM Agent, which is present on all the servers in the environment.

Oracle VM Servers are discovered based on their IP address or host name through Oracle VM Manager. Additional servers can be installed and discovered at any time as the need for capacity grows. The Oracle VM Servers provide computing capacity to the virtual machines they host: CPU and RAM. They also host the storage plug-ins that are used to connect with shared, attached file-based and block-based storage offered by other hardware in the data center. For more details, see Section 2.6, “Storage” in this chapter, and Chapter 4, *Managing Storage*.

Oracle VM Servers are members of a server pool. Server pools use a virtual IP address and elect one master server that handles interactions with the Oracle VM Manager. If the master server goes down, another server in the pool immediately takes over the master function and the server pool remains reachable at the virtual IP address. Virtual machines running on a failing server can be restored on another server in the pool. This is possible because all members of the server pool have access to the same shared storage, where virtual machine configuration, disks, templates etc. are stored.

In a clustered server pool, which is the typical configuration, high availability is enabled for the virtual machines they host. In the case that a server in a clustered server pool becomes unavailable, the virtual machines that it was hosting are made available using one of the other servers within the pool. Clustered server pools use a shared ocfs2 pool file system for the cluster heartbeating function, configuration and other clustering information. Clustering and ocfs2 enable important advanced functionality such as shared block-based storage access, policies for fail over, load balancing and power management, etc. For details about server pools, clustering and ocfs2, see Chapter 6, *Managing Server Pools and Oracle VM Servers*.

An Oracle VM environment can consist of several server pools. This is a design decision: like in any data center it may be preferred to subdivide resources into groups, isolate these from each other, and assign them to different users (departments, teams, administrators, customers and so on).

## 2.6 Storage

To cover all aspects of Oracle VM storage we must discuss both the provisioning and the consumption side of the storage functionality. The following sections provide an answer to two major questions:

- How does Oracle VM connect to its storage?
- What storage elements are available within the Oracle VM environment?

## 2.6.1 How Oracle VM Connects to its Storage

Oracle VM connects to its storage via Oracle Storage Connect plug-ins. Storage Connect plug-ins are packaged and distributed as RPM packages and deployed on the Oracle VM Servers. They are divided in two major categories: storage array plug-ins for any block based storage, and file system plug-ins for any network file system based storage.

For both categories, generic plug-ins are included. They offer standard functionality to discover, register and use NFS storage, iSCSI or Fibre Channel SANs, and local storage For more information about the types of storage supported in Oracle VM, see Section 4.2, “Storage Types”. The standard operations allowed via generic plug-ins are "passive", in the sense that they can detect and use storage elements offered to the Oracle VM Servers. Interactive management operations on the storage hardware is not possible with generic plug-ins.

In addition, Oracle cooperates with storage partners and invites storage hardware vendors to develop Oracle Storage Connect plug-ins for their specific hardware. These vendor-specific plug-ins can only be used with a specific brand or product line of storage hardware but they offer additional operations from within Oracle VM Manager compared to generic plug-ins. For example, a generic storage array plug-in can only detect LUNs on the storage host and has only a single access group to define which servers can access the storage elements. In contrast, a vendor-specific storage array plug-in allows interactive operations such as creating and modifying LUNs, and can configure various access groups for finer-grained storage access management. For detailed information about Oracle Storage Connect plug-ins, see Section 4.3, “Storage Connect Plug-ins”.

The main benefits of the plug-in approach are:

- **Flexibility.** Use and integrate with your existing storage infrastructure, choose between file-based and block-based solutions, and use local storage for testing purposes or virtual machines of minor importance. Use generic or vendor-specific plug-ins depending on your available hardware or any new hardware you select.
- **Scalability.** Add more storage providers of your preferred type and present them to your server pools as your need for storage increases. Reduce the amount of storage again if the higher storage requirements are temporary. Provision your storage with redundancy and multipathing according to your requirements and preferences.
- **Extensibility.** If you upgrade your storage, consider the added functionality of vendor-specific plug-ins. If you select hardware for which Oracle Storage Connect plug-ins are available, ask the manufacturer for the RPM and install the plug-in on the Oracle VM Servers with access to this storage hardware.

## 2.6.2 Usage of Storage Elements

Oracle VM always requires a location to store environment resources that are essential to the creation and management of virtual machines. These resources include VM templates and assemblies, ISO files (virtual DVD images), VM configuration files and VM virtual disks. The location of such a group of resources is called a storage repository. You present a storage repository to the Oracle VM Servers that need access to those resources; typically all servers in a server pool.

Storage repositories can be configured on an NFS file system or on a physical disk (LUN) of a storage array. However, for storage repositories on physical disk, the servers with access to it must be members of a *clustered* server pool. For unclustered server pools only file server storage is available. For details about the use of storage repositories, see Section 4.8, “Managing Storage Repositories”.

Clustering adds another storage element to the environment: the server pool file system. During server pool creation, the server pool file system specified for the new server pool is accessed and formatted as an OCFS2 file system, whether the file system is accessed by the Oracle VM Servers as an NFS share, a

FC LUN or iSCSI LUN. This formatting creates several management areas on the file system including a region for the global disk heartbeat. The server pool file system plays a key role in clustering and therefore in the high-availability configuration of the Oracle VM environment. For details about server pool clustering, see Section 6.2, “Server Pool Clusters”.

The storage element that is most tangible and visible to all users of Oracle VM is the virtual machine disk. A VM disk is either a disk image file in a storage repository or a raw physical disk. If a physical disk (LUN) is used, it is attached directly to the VM in the same way it would be to a physical machine. For details about virtual machine operation, see Chapter 7, *Managing Virtual Machines*. Again, the availability of VM disks in a storage location with shared access from all Oracle VM Servers in the server pool is essential for VM high-availability.

## 2.7 Networking

The networking infrastructure in the Oracle VM environment comprises connections between Oracle VM Servers, between Oracle VM Servers and Oracle VM Manager, between the Oracle VM Servers and their storage sub-systems, as well as communications among virtual machines deployed in the environment, and between virtual machines and external private or public networks.

These networking connections can leverage features supported by Oracle VM, such as networked file systems, clustering, redundancy and load balancing, bridging, and support for Virtual LANs (VLANs).

In Oracle VM Manager, network configuration is the mapping of available network interfaces to a set of logical Ethernet networks. The physical network is the collection of physical connections in Oracle VM Manager and all Oracle VM Servers, and the switches and routers that allow information to reach its destination. A logical network in Oracle VM is built on top of these physical connections. Before you define the logical networks in Oracle VM Manager, you have to review the physical network configuration that you intend to use, such as VLAN and subnet usage. You also take into account the number of network interfaces available to your Oracle VM Servers. The minimum recommended number of ports required on a single Oracle VM Server is two, although one would suffice for test or demonstration purposes. If you have more than two ports on your Oracle VM Servers, you can design more redundancy or traffic isolation in your environment.

Oracle VM identifies different network functions: server management, live migrate, cluster heartbeat, virtual machine, and storage. All network functions can either be on dedicated or shared physical networks (except for the virtual machine intra-server network). For example, a physical network can be dedicated to Virtual Machine or Storage only, or can be dedicated for all network functions. For details about network functions, see Section 5.2, “Network Usage”.

After reviewing your physical network environment and deciding on the logical distribution and grouping of these physical objects, you create the logical constructs in Oracle VM Manager to implement your network design. These logical constructs include network bonds, VLAN groups, networks and bridges. If your network design includes interface bonding, or aggregations of two ports, you create these network bonds first. These bonds are often used in conjunction with VLANs, when traffic from several VLANs is allowed to use the same bond. If your network environment comprises VLANs, your next step is to create VLAN Groups, determining which port or bond on each Oracle VM Server will accept traffic from which VLANs.

After careful evaluation of the available network building blocks and required network functions, you create the necessary logical networks by choosing one of these types:

- network with bonds and ports
- network with VLANs only
- hybrid network connecting bonds and ports, as well as VLAN interfaces
- logical network on a single server (intra-server VM network)

For details, see Section 5.3, “Building a Network Environment”, and the subsequent sections in the chapter.

## 2.8 High Availability, Load Balancing and Power Management

Oracle VM has high-availability (HA) functionality built in. Even though there is only one Oracle VM Manager in the environment, it distributes vital information over the servers it manages, so that in case of failure the Oracle VM Manager and its infrastructure database can be rebuilt. For virtual machine HA, Oracle VM Servers can be clustered so that if one server fails, the virtual machines can be automatically migrated to another server as all virtual machine data is on shared storage and not directly on the Oracle VM Server. In case of predictable failures or scheduled maintenance, virtual machines can be moved to other members of the server pool using live migration.

In addition, Oracle VM supports HA networking and storage, but these are configurations the system administrator must implement outside Oracle VM Manager (RAID, multipathing, etc.).

Clustered server pools also support advanced management policies called Dynamic Power Management (DPM) and Dynamic Resource Scheduler (DRS). DPM is a policy that optimizes the use of the server pool members to conserve power. When DPM is enabled, the policy will periodically look for Oracle VM Servers that are under utilized and then live-migrate the virtual machines on that server to other servers in the pool. When live migration is complete, the server is shut down, conserving power. Conversely, if a server becomes overloaded, the policy will look for other servers to off load virtual machines from the busy server. If no other powered up Oracle VM Servers are available, then the policy will start up a powered-down server using its Wake-On-LAN capability, and begin live-migrating virtual machines to balance the overall load. It is a prerequisite that all the servers that participate in DPM have Wake-On-LAN enabled in the BIOS for the physical network interface that connects to the dedicated management network. Dynamic Resource Scheduler (DRS) uses the same underlying code as DPM. The difference is that DRS will only react to servers that exceed their thresholds for CPU and network usage, and take action to move virtual machines off servers. These thresholds are configurable in the DRS policy, which runs at a specified interval and monitors CPU and network usage over a sample time period. The calculated average load is compared to the threshold and determines if migrations need to be performed.

## 2.9 Virtual Machines

A virtual machine (VM) can be defined as a virtualized operating system with its associated software and applications. It runs in one of three virtualization modes, also named domain types:

- **Hardware virtualized (HVM).** An unmodified guest operating system executes in complete isolation. Instructions are trapped and emulated at the hardware level (Intel® VT-x/VT-i and AMD-V™), providing limited overhead for guest modifications.
- **Paravirtualized (PVM).** A software interface similar but not identical to the underlying hardware is presented to the guest operating system. Paravirtualization provides hooks for guest instructions so that hardware related tasks such as access to network resources, blocks and underlying files can be handled by the management domain instead of the virtual machine, significantly improving performance. As a result, PVM offers superior performance to its HVM counterpart. Paravirtualization requires that the guest kernel has support for and loads the PVM drivers to be made aware of the virtual environment.
- **Hardware virtualized with paravirtualized drivers (PVHVM).** Similar to HVM but with additional paravirtualized drivers that are capable of handling I/O related processes directly within the management domain to increase VM performance. This provides the advantages of paravirtualization to an otherwise hardware virtualized guest. This domain type is typically used to run Microsoft Windows™ guests with a limited performance penalty.

Virtual machines can be created from different types of resources: either from a template or assembly containing preconfigured virtual machines, or from scratch using an ISO file (image) of an installation DVD. Booting a VM via PXE, or network boot for a PVM guest, is also possible.

The creation of a VM from template is based on cloning: the template is imported as an archive, unpacked and stored as a VM configuration file with images of its disks, which are cloned to create a new instance in the form of a VM. In the same way, an existing VM can be cloned to create a new VM, and to a new template as well. Cloning is discussed in further detail in Section 7.9, “Cloning a Virtual Machine or Template”.

Assemblies can be described as a template of a group of virtual machines, or a collection of multiple VM templates. In the Oracle VM Manager user interface, templates and assemblies appear in different tabs of the storage repository, but their VM configuration files and disk images are stored in the same location as those of other virtual machines and templates.

Creating a VM from a virtual DVD (image file, ISO) is different depending on the virtualization mode. With HVM the standard installer provided in the image is used, so no allowance for PV drivers is given. To allow the installer to be modified on the fly the image must be expanded and then the Oracle VM Server can cause the PV drivers to be used. When creating an HVM guest, you can assign an ISO file located on a storage repository so that the new VM immediately boots from the virtual DVD. Conversely, a PVM guest cannot simply boot from DVD out of nothing, and uses an ISO file mounted remotely, accessing it via NFS, HTTP or FTP.

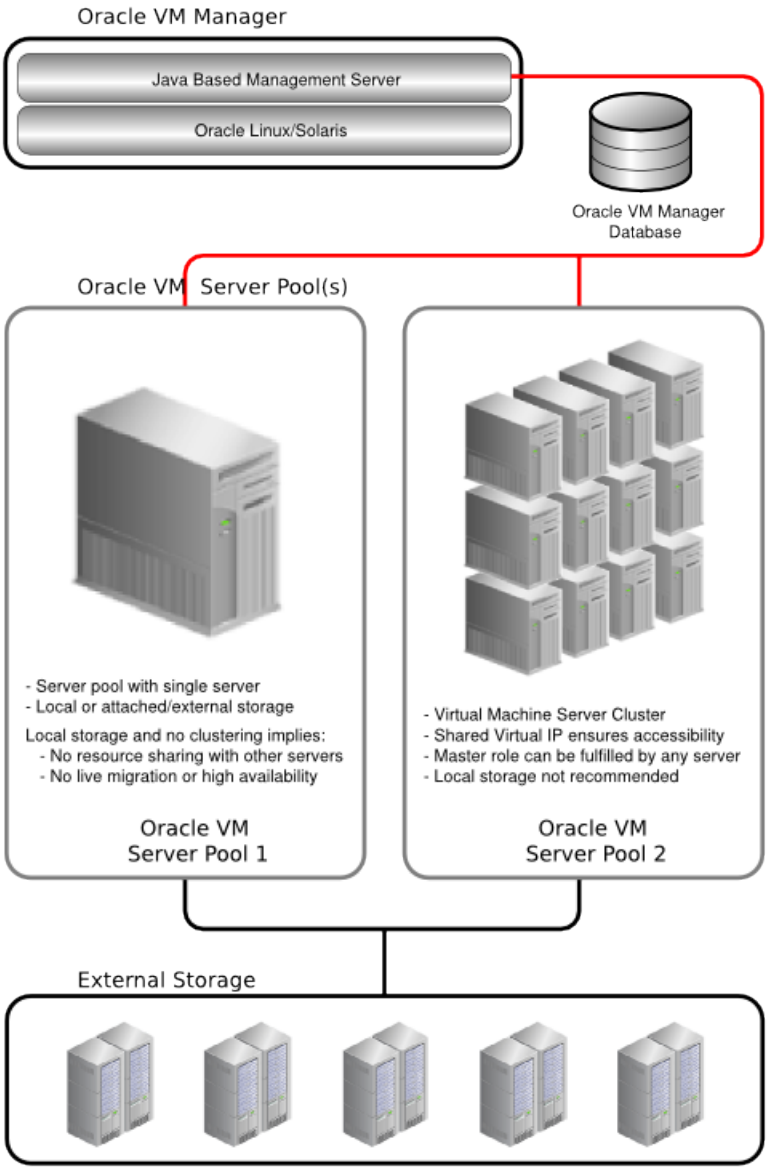
As mentioned in this section and in Section 2.6, “Storage”, virtual machine resources are stored in storage repositories. The contents and structure of storage repositories is described in detail in Section 7.5, “Virtual Machine Resources”.

Once a VM is running, it can be accessed through a VNC console, which allows it to be used as a regular pc. All operations on the VM are executed through Oracle VM Manager, as described in Section 7.10, “Managing Virtual Machines”.

## 2.10 Deployment Options

This section gives an overview of the deployment options for Oracle VM.

**Figure 2.2 Oracle VM Deployment**




As shown in Figure 2.2, “Oracle VM Deployment”, an Oracle VM deployment, involves these components:

- **Oracle VM Manager:** The host machine on which Oracle VM Manager is installed is known as the Oracle VM Manager host. It provides the interface where all virtual machine management tasks are performed. Operational commands are sent to the Oracle VM Servers through the Oracle VM Agent.
- **Oracle VM Server(s):** An Oracle VM Server must always belong to a server pool, even if it is the only member.

  The information needed to keep the server pool operational is kept in shared storage and is available to all cluster nodes.
- **Server Pools:** A server pool is an autonomous region that contains one or more Oracle VM Servers. A server pool presents a unified view of the storage in which the virtual machines reside.

- **Storage:** A shared storage resource is mounted on each Oracle VM Server in a server pool to store virtual machines, external resources, and other data files. In order to perform live migration of virtual machines, each Oracle VM Server involved must have shared access to storage.

  See Chapter 4, *Managing Storage* for more information on creating different types of shared storage.

## 2.11 Oracle VM Templates

Oracle VM templates are self-contained and pre-configured virtual machines with key Oracle technologies. Each Oracle VM template is packaged using Oracle best practices, which reduces installation and configuration costs, reduces risk and dramatically shortens deployment time lines.

Oracle VM templates of many key Oracle products are available for download, including Oracle Linux, Oracle Solaris, Oracle Database, Fusion Middleware, and many more.

Oracle VM template licensing includes a free download and free trial use with the option to purchase a product license. Oracle VM templates do not have time limits or feature limitations, that is, Oracle VM templates are full featured and do not have expiration dates. Oracle VM templates can be quickly transitioned from evaluation into production by purchasing Oracle technology licenses.

You can download Oracle VM templates from the Oracle Technology Network:

http://www.oracle.com/technetwork/server-storage/vm/templates-101937.html

The password for the *root* user of all Oracle VM templates is *ovsroot*. The password for the *oracle* account in the OVM_*os_version*_ORACLE_11G template is *oracle*.

Before using the downloaded templates, you must import them into Oracle VM Manager. See Section 7.5.3.2, “Importing a Virtual Machine Template” for information on importing templates.

For more information on these templates, see

http://download.oracle.com/otn_software/virtualization/README.templates

## 2.12 Managing Oracle VM using Oracle Enterprise Manager 12*c*

You can manage your Oracle VM environment using Oracle Enterprise Manager 12*c*. Oracle VM Manager plugs into Oracle Enterprise Manager 12*c* and exposes all the functionality of Oracle VM to Oracle Enterprise Manager, so you can manage the entire Oracle VM environment from within Oracle Enterprise Manager. Oracle Enterprise Manager offers extended functionality beyond that of Oracle VM, for example, monitoring and role based access control. For more information, see the Oracle Enterprise Manager 12*c* documentation at:

http://docs.oracle.com/cd/E24628_01/doc.121/e28814/cloud_setup.htm

# Chapter 3 Using Oracle VM Manager

## Table of Contents



Management for the Oracle VM environment is provided by Oracle VM Manager, a transaction-based framework that also includes an integrated database, a web-based management user interface and a command line interface.

This chapter discusses using the Oracle VM Manager user interface.

## 3.1 Logging into the User Interface

To open the Login page of the Oracle VM Manager user interface, enter the following address in a Web browser:

https://*hostname*:*port*/ovm/console

Where, *hostname* refers to the host name or IP address of the Oracle VM Manager host, and *port* refers to the port number on which the Oracle VM Manager user interface is listening (which is 7002 by default).

**Note**

In previous versions of Oracle VM Manager unencrypted HTTP traffic was permitted by default. HTTP access is now disabled by default and Oracle VM Manager uses Secure Sockets Layer (SSL) to encrypt all HTTP traffic. Therefore, you should always use *https* in the protocol section of your URI.

> **Important**
>
> You must ensure that if you are accessing Oracle VM Manager through a firewalled connection, the firewall is configured to allow TCP traffic on the port that Oracle VM Manager is using to listen for connections.

To connect to Oracle VM Manager on a host named example.com, use:

https://example.com:7002/ovm/console

Enter your Oracle VM Manager administration username in the **Username** field. This is the administration username you create during the Oracle VM Manager install. Enter the password for the Oracle VM Manager administration username in the **Password** field.

> **Important**
>
> The Oracle VM Manager user interface makes use of cookies in order to store session data. Therefore, to successfully login and use the Oracle VM Manager user interface your web browser must accept cookies from the Oracle VM Manager host.

Now you are logged in, you can add Oracle VM Servers, add storage, create storage repositories and import resources into them, create server pools, and create virtual machines.

The user interface displays context sensitive information, relevant to the selection in the navigator and content panes.

## 3.2 Oracle VM Manager user interface Accessibility Features

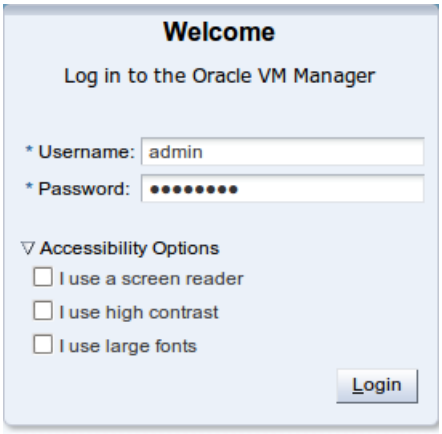
As part of the effort to make Oracle products, services, and supporting documentation accessible and usable to the disabled community, Oracle VM Manager user interface allows you to configure the following accessibility features:

- Support for Screen Reader
- Support for High Contrast
- Support for Large Fonts

You can enable these features when logging in to the Oracle VM Manager user interface or you can set or change the accessibility options once you have logged in.

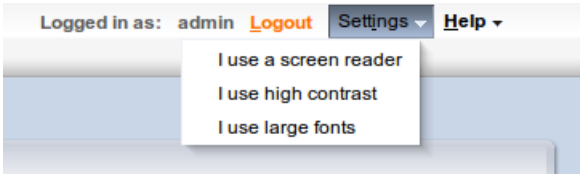
**To enable accessibility options when logging in:**

1. On the login page of the Oracle VM Manager user interface, click the arrow to expand **Accessibility Options**.
2. Select one or more check box from the following accessibility options:
   - I use a screen reader
   - I use high contrast
   - I use large fonts




**To set or change accessibility options once you have logged in:**

1. In the Global Links at the top of the right-hand-side of the Oracle VM Manager user interface, click **Settings**.
2. From the drop-down list, select from the following accessibility options:
   - I use a screen reader
   - I use high contrast
   - I use large fonts




## 3.3 HTML Access Keys

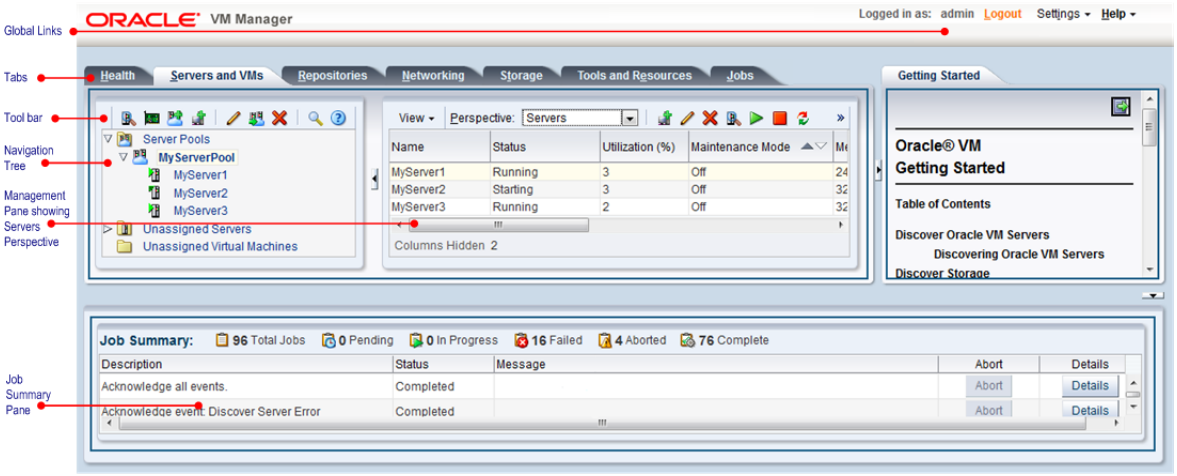
To access menus without using a mouse, you can use the HTML access keys. The shortcut key for a user interface item is shown as an underline of the shortcut key letter in the item name, for example, the shortcut key for the **Servers and VMs** tab is s, as that is the letter underlined in the tab text as shown below:


To access the shortcut key, enter the HTML access key for your browser, plus the access key letter. For example, to access a shortcut key on Microsoft Internet Explorer, press **Alt** + ***shortcut_key*** at the same time. See your web browser documentation to find the key combination to use for HTML access keys for your browser.

## 3.4 User Interface Overview

The Oracle VM Manager user interface provides a set of tabs, work areas (management panes), icons, and toolbars, for access to various functions and configuration screens. Figure 3.1, “The Oracle VM Manager user interface” shows the main components of the Oracle VM Manager user interface.

**Figure 3.1 The Oracle VM Manager user interface**




The components of the Oracle VM Manager user interface are described in more detail in Table 3.1, “Oracle VM Manager user interface components”.

**Table 3.1 Oracle VM Manager user interface components**

| User Interface Item | Description |
|---|---|
| Global Links | Contain navigation and resources which are relevant to the whole Oracle VM Manager user interface. See Section 3.5, “Using the Global Links” for information on each global link. |
| Tabs | The tabs available are **Health**, **Servers and VMs**, **Repositories**, **Networking**, **Storage**, **Tools and Resources**, **Jobs**,and **Getting Started**. See Section 3.6, “Using the Tabs” for information on each tab. |
| Toolbar | Allows quick access to a group of task icons. The icons in the toolbar change depending on the selected tab. See Section 3.7, “Using the Toolbar” for information on the toolbar. |
| Navigation Pane | Contains the navigation tree. |
| Navigation Tree | Shows hierarchy of physical and virtual components. Click on a component to open its default pane and related management panes. See Section 3.8, “Using the Navigation Tree” for more information on the navigation tree. |
| Management Pane | Contains the management panes for the selected tab. The management panes change depending on the selected subtab or **Perspective** in the drop-down list in the management pane toolbar. The management panes that can be displayed are described in each tab. See Section 3.6, “Using the Tabs” for a list of the panes that can be displayed in each tab. |
| Job Summary Pane | The **Job Summary** pane provides a summary of jobs; **Total Jobs**, **Pending**, **In Progress**, **Failed**, **Aborted** and **Complete**. Click an icon to open a dialog box showing the tasks. The dialog box lets you export a list of the jobs to a spreadsheet file, view details of a job, or abort a job. See Section 3.6.7, “Jobs Tab” for more information on jobs.<br><br>The **Job Summary** pane also includes a status icon that indicates the readiness of Oracle VM Manager:<br><br>• The icon is green when Oracle VM Manager is running normally and it is safe to perform any operations. |

| User Interface Item | Description |
|---|---|
| | • The icon is yellow when Oracle VM Manager is either in the process of starting up or shutting down. During these periods it is not recommended that any actions are performed within Oracle VM Manager. |

The sections that follow describe each set of controls and their relationship to one another, in more detail.

# 3.5 Using the Global Links

The global links are available on every page. The global links are as shown in Table 3.2, "Global Link Item Descriptions":

**Table 3.2 Global Link Item Descriptions**

| Global Link | Description |
|---|---|
| **Logged in as** *username* | Displays the username of the user currently logged in. |
| **Logout** | Logs out of the Oracle VM Manager user interface and displays the Oracle VM Manager log in screen. |
| **Settings** | The drop-down list contains configurable accessibility options. See Section 3.2, "Oracle VM Manager user interface Accessibility Features" for more information on the Settings menu. |
| **Help** | The drop-down list contains the **Oracle VM Help**, **Getting Started**, **Oracle.com** and **About** menu items. See Section 3.5.1, "Help Menu" for more information on the Help menu. |

## 3.5.1 Help Menu

Use the **Help** menu to display the Oracle VM Manager online help, the Getting Started chapter of the online help, the product release number, and to go to Oracle's home page. The **Help** menu options are as shown in Table 3.3, "Help Menu Options".

**Table 3.3 Help Menu Options**

| Help Menu Option | Icon | Description |
|---|---|---|
| **Oracle VM Manager Help** |  | Opens a new web browser window which contains the Oracle VM Manager online help system. |
| **Getting Started** |  | Opens a new web browser window which contains the Getting Started chapter of the online help system. Read this section to quickly get started using Oracle VM Manager. |
| **Oracle.com** |  | Opens a new web browser window which contains the Oracle home page. |
| **About** |  | Displays the **About Oracle VM** dialog box which contains the release number. |

# 3.6 Using the Tabs

Each tab defines different objects and functional areas of operations that can be performed in Oracle VM Manager. When you select a tab the default management pane for that tab is displayed. The management pane change depending on the selected object in the navigation tree and the **Perspective** selected in

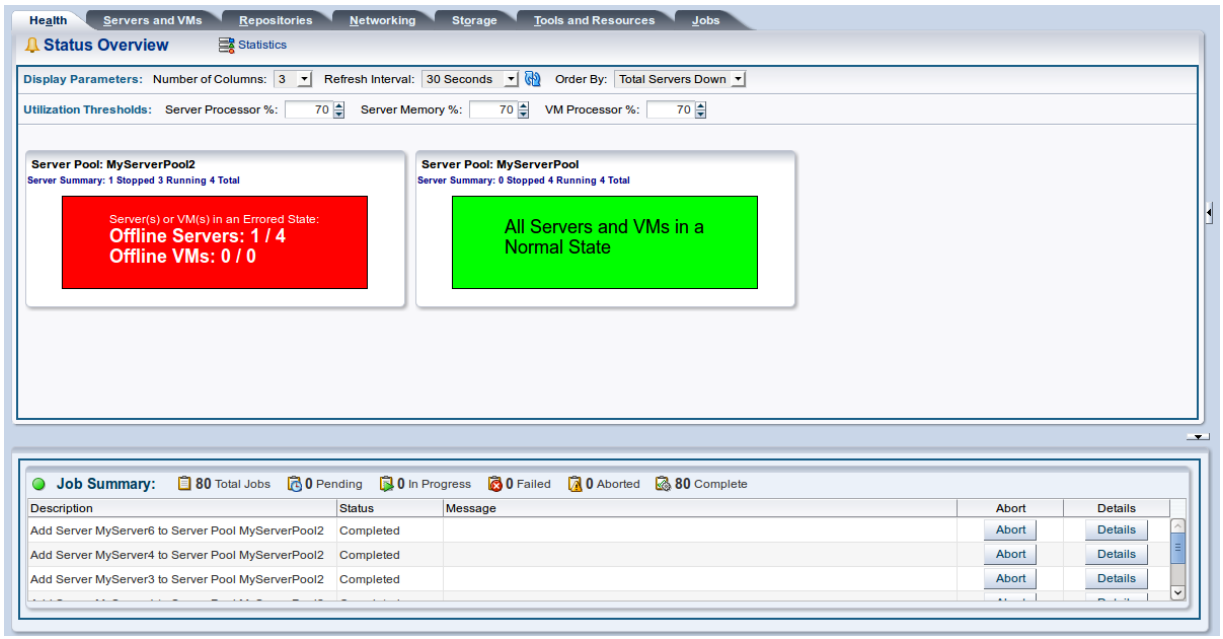
the drop-down list in the management pane toolbar. The tabs in the Oracle VM Manager user interface are **Health**, **Servers and VMs**, **Repositories**, **Networking**, **Storage**, **Tools and Resources**, **Jobs** and **Getting Started**.

## 3.6.1 Health Tab

Use the **Health** tab to monitor the overall health and status of your virtualization environment and to view historical statistics such as memory and CPU usage.

Figure 3.2, “Health tab” shows the Health tab.

**Figure 3.2 Health tab**




The **Health** tab contains the subtabs set out in Table 3.4, “Health Subtabs”.

**Table 3.4 Health Subtabs**

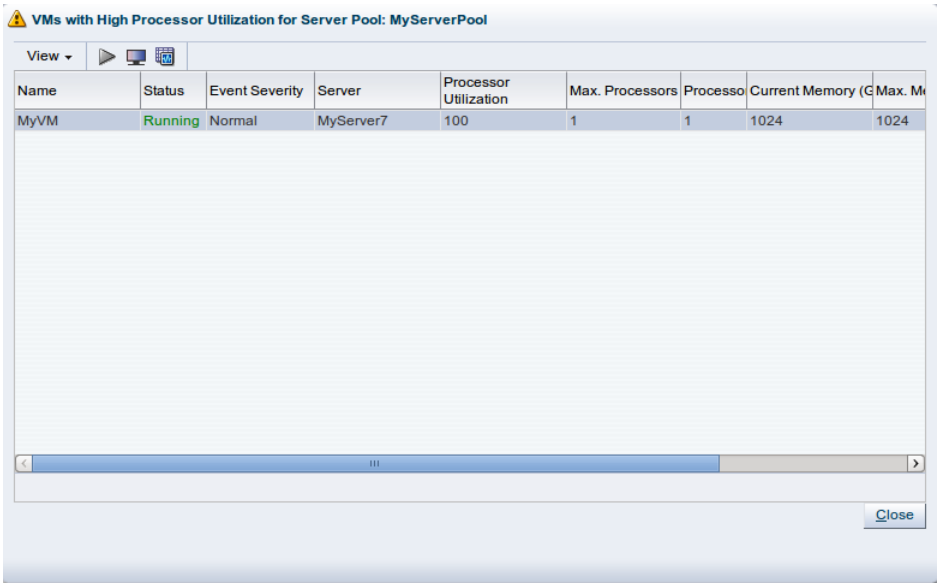
| Subtab | Description |
|---|---|
| **Status Overview** | The dashboard displays information about each server pool, Oracle VM Server summary, and the number of Oracle VM Servers that are running or stopped.<br><br>A green, yellow, or red status is displayed for each server pool:<br><br>**Green:** All Oracle VM Servers and virtual machines are in a normal state.<br><br>**Yellow:** One or more Oracle VM Server(s) has a CPU or memory utilization above the specified limit. One or more virtual machine(s) has a CPU utilization above the specified limit. Click the hyperlink to view detailed information. See Section 3.6.1.1, “Detailed Information Dialog” for more information on this dialog panel.<br><br>**Red:** One or more Oracle VM Server(s) has unacknowledged events indicating a down state that needs operator attention. Click the hyperlink to view detailed information. See Section 3.6.1.1, “Detailed Information Dialog” for more information on this dialog panel. |

| Subtab | Description |
|---|---|
| | The content can be reordered using the **Order By** drop-down list. Sort by Total Servers Down, Total VMs Down, or Alphabetically.<br><br>The refresh interval can be configured using the **Refresh Interval** drop-down list. Select 20, 30, 45, 60 or 120 seconds.<br><br>The number of columns can be selected using the **Number of Columns** drop-down list. Select 1 to 10 columns.<br><br>The **Utilization Thresholds** toolbar at the top of the panel allows you to set the parameters available to trigger different health warnings. The following options are available:<br><br>• *Server Processor %*: Set the percentage of processor utilization on the server that will trigger a warning.<br><br>• *Server Memory %*: Set the percentage of memory utilization on the server that will trigger a warning.<br><br>• *VM Processor %*: Set the percentage of processor utilization for a Virtual Machine that will trigger a warning. |
| **Statistics** | Oracle VM Manager periodically collects vital statistics such as memory and CPU usage. Select the **Statistics** subtab to view historical statistics for your Oracle VM Servers and virtual machines.<br><br>Click the **Line Graph** icon in the toolbar for a line graph view of the statistics. |

### 3.6.1.1 Detailed Information Dialog

When a **Yellow** or **Red** status is shown for a server pool, the message appears as a hyperlink that opens a dialog containing more detailed information to describe the incident that needs attention. This dialog provides facilities to drill down to discover events leading up to an incident.

**Figure 3.3 Health tab error details**



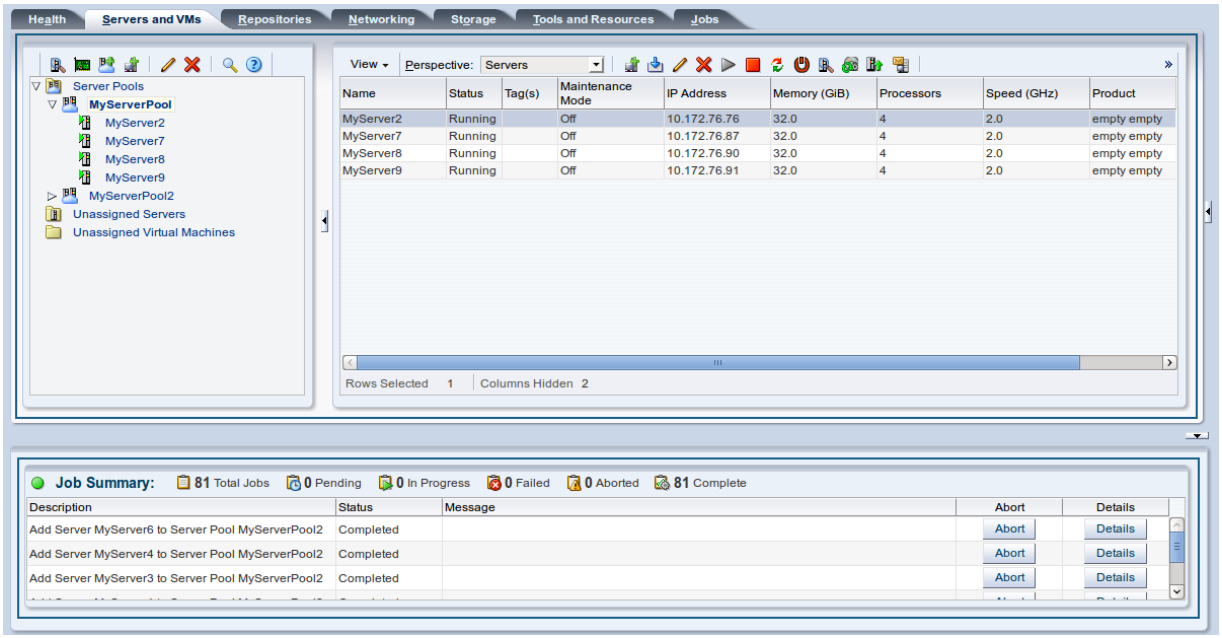
In the dialog a toolbar is present which includes various icons that can be clicked in order to help you resolve an issue. Select the item in the table that you wish to act on. Click on the **Events** icon to view more information about the events within the log related to the item that you are working with. You may need to acknowledge particular events in order to resolve an issue. See Section B.1.11, "Acknowledging Events/Errors" for information on acknowledging events.

## 3.6.2 Servers and VMs Tab

Use the **Servers and VMs** tab to discover Oracle VM Servers, create and manage server pools and virtual machines, assign Oracle VM Servers to server pools, and create and configure virtual machines in server pools.

Figure 3.4, "Servers and VMs tab" shows the **Servers and VMs** tab.

**Figure 3.4 Servers and VMs tab**




The **Servers and VMs** tab contains the **Perspectives** set out in Table 3.5, "Servers and VMs Tab Perspective".

**Table 3.5 Servers and VMs Tab Perspective**

| Management Pane Perspective | Description |
|---|---|
| **Server Pools** | Displays information about the server pools. Use this tab to edit server pool policies, add or remove Oracle VM Servers from a server pool, edit information about a server pool, and delete a server pool.<br><br>Select the **Server Pools** folder in the navigation tree and then select **Server Pool** in the **Perspective** drop-down list to display this pane.<br><br>For more information about managing server pools, see Section 6.9, "Managing Server Pools". |
| **Server Processor Compatibility** | Displays information about the server processor compatibility groups defined for selected Oracle VM Servers with compatible processors for virtual machine |

| Management Pane Perspective | Description |
|---|---|
| | migration. You can perform actions on the server processor compatibility groups using the tab's toolbar, such as create, edit and delete.<br><br>Select the **Server Pools** folder in the navigation tree and then select **Server Processor Compatibility** in the **Perspective** drop-down list to display this pane.<br><br>See Section 6.7, “Server Processor Compatibility Groups” for information on server processor compatibility groups. |
| **Servers** | Lists the Oracle VM Servers in the server pool. You can perform actions on the Oracle VM Servers using the tab's toolbar, such as start, stop, and edit. You can also use the tab's toolbar to discover an Oracle VM Server and create a virtual machine on a selected Oracle VM Server. When an Oracle VM Server is discovered, it is listed in the **Unassigned Servers** folder. When an Oracle VM Server is added to a server pool, it is listed in the **Server Pools** folder.<br><br>Select a server pool in the navigation tree and then select **Servers** in the **Perspective** drop-down list to display this pane.<br><br>See Section 6.10, “Managing Oracle VM Servers” for information on managing Oracle VM Servers. |
| **Virtual Machines** | Displays information about the virtual machines in the server pool, or on the Oracle VM Server. You can perform actions on the virtual machines using the tab's toolbar, such as start, stop, edit, migrate and clone.<br><br>Use the **Name Filter** input field to specify search criteria to filter the displayed results. See Section 3.14, “Name Filters” for more information.<br><br>Select a server pool or Oracle VM Server in the navigation tree and then select **Virtual Machines** in the **Perspective** drop-down list to display this pane.<br><br>The Virtual Machines pane is also displayed when you select the **Unassigned Virtual Machines** folder in the navigation tree.<br><br>See Section 7.10, “Managing Virtual Machines” for information on managing virtual machines. |
| **Anti-Affinity Group** | Displays information about the anti-affinity groups defined to keep selected virtual machines on separate Oracle VM Servers. You can perform actions on the anti-affinity groups using the tab's toolbar, such as create, edit and delete.<br><br>Select a server pool in the navigation tree and then select **Anti-Affinity Group** in the **Perspective** drop-down list to display this pane.<br><br>See Section 6.6, “Anti-Affinity Groups” for information on anti-affinity groups. |
| **Policies** | Displays information about server pool power and resource management policies; Distributed Resource Scheduler (DRS), or Distributed Power Management (DPM). You can define or edit a policy for the server pool using the tab's toolbar.<br><br>Select a server pool in the navigation tree and then select **Policies** in the **Perspective** drop-down list to display this pane. |

| Management Pane Perspective | Description |
|---|---|
| | See Section 6.5, “Server Pool Policies” for information on managing server pool policies. |
| **Ethernet Ports** | Lists the Ethernet ports on the selected Oracle VM Server that can be used for network bridges. Use this tab to edit the type of addressing (none, DHCP or static IP address) used for the Ethernet port.<br><br>Select an Oracle VM Server in the navigation tree and then select **Ethernet Ports** in the **Perspective** drop-down list to display this pane.<br><br>For more information on network bridges, see Section 5.6, “Network Bridges”. |
| **Bond Ports** | Lists the bonded Ethernet ports on the selected Oracle VM Server. Use this tab to create, edit and delete bonds on Ethernet ports.<br><br>  <br>**Note**<br><br>While Oracle VM Manager uses the Linux terminology, Oracle Solaris users should understand port bonding to be equivalent to data link aggregation.<br><br>Select an Oracle VM Server in the navigation tree and then select **Bond Ports** in the **Perspective** drop-down list to display this pane.<br><br>For more information on network bonding, see Section 5.5, “Network Bonding”. |
| **Physical Disks** | Lists the local storage available on the selected Oracle VM Server. Use this tab to edit, rescan, clone, refresh, delete, display servers using a physical disk, and display events for local storage. You can also use this tab to create or delete an OCFS2 file system on local storage.<br><br>Use the **Name Filter** input field to specify search criteria to filter the displayed results. See Section 3.14, “Name Filters” for more information.<br><br>Select an Oracle VM Server in the navigation tree and then select **Physical Disks** in the **Perspective** drop-down list to display this pane.<br><br>For more information on local storage, see Section 4.2.1, “Local Storage”. |
| **Storage Initiators** | Lists the storage initiators available on the Oracle VM Server in your environment. Use this tab to view access groups for selected storage initiators.<br><br>Select an Oracle VM Server in the navigation tree and then select **Storage Initiators** in the **Perspective** drop-down list to display this pane. |
| **Control Domains** | Displays information about the control domain, such as CPU, memory, operating system and Oracle VM Agent version. A control domain is an Oracle Solaris concept, and is also known as dom0 on an x86 host. You can also use this tab to view which version of Oracle VM Server the server is running before and after an upgrade using the server update management (YUM) repository.<br><br>Select an Oracle VM Server in the navigation tree and then select **Control Domains** in the **Perspective** drop-down list to display this pane.<br><br>See Section 6.10.11, “Updating and Upgrading Oracle VM Servers” for more information on Oracle VM Server update management. |

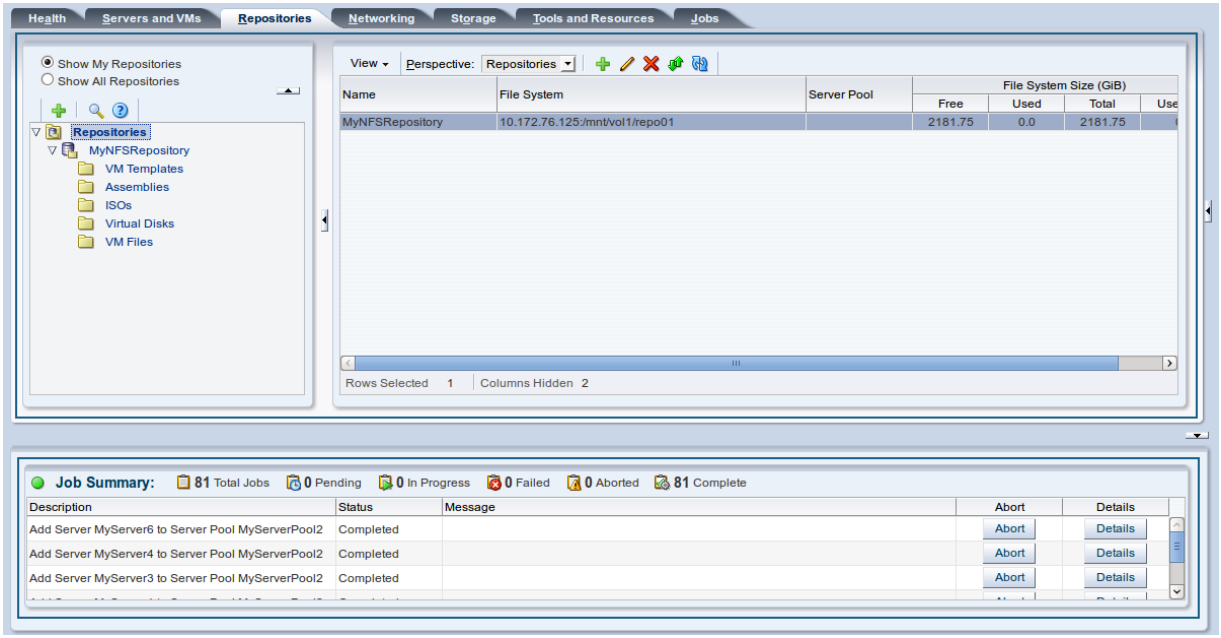
| Management Pane Perspective | Description |
|---|---|
| **Repository Exports** | List the export file servers used by backup and restore applications to access OCFS2 file systems. Use this tab to create, edit and delete repository export file servers.<br><br>Select an Oracle VM Server in the navigation tree and then select **Repository Exports** in the **Perspective** drop-down list to display this pane.<br><br>See Section 4.8.5, “Enabling Storage Repository Back Ups” for more information on setting up an Oracle VM Server as an export file server to back up storage repositories. |
| **Info** | Displays a high-level view of the selected object. The Info pane contents change to reflect information about the object selected in the navigation tree. You can use this pane to view information about repositories in your environment.<br><br>Select **Info** in the **Perspective** drop-down list to display the **Info** pane. |
| **Events** | Events are displayed for each object in the navigation tree and displays events related to that object.<br><br>Select **Events** in the **Perspective** drop-down list to display the **Events** pane. |

## 3.6.3 Repositories Tab

Use the **Repositories** tab to create and configure storage repositories and their content; assemblies, VM templates, ISO files, virtual disks and virtual machine configuration files.

Figure 3.5, “Repositories tab” shows the **Repositories** tab.

**Figure 3.5 Repositories tab**




The **Repositories** tab contains the **Perspectives** set out in Table 3.6, “Repositories Tab Perspective”.

**Table 3.6 Repositories Tab Perspective**

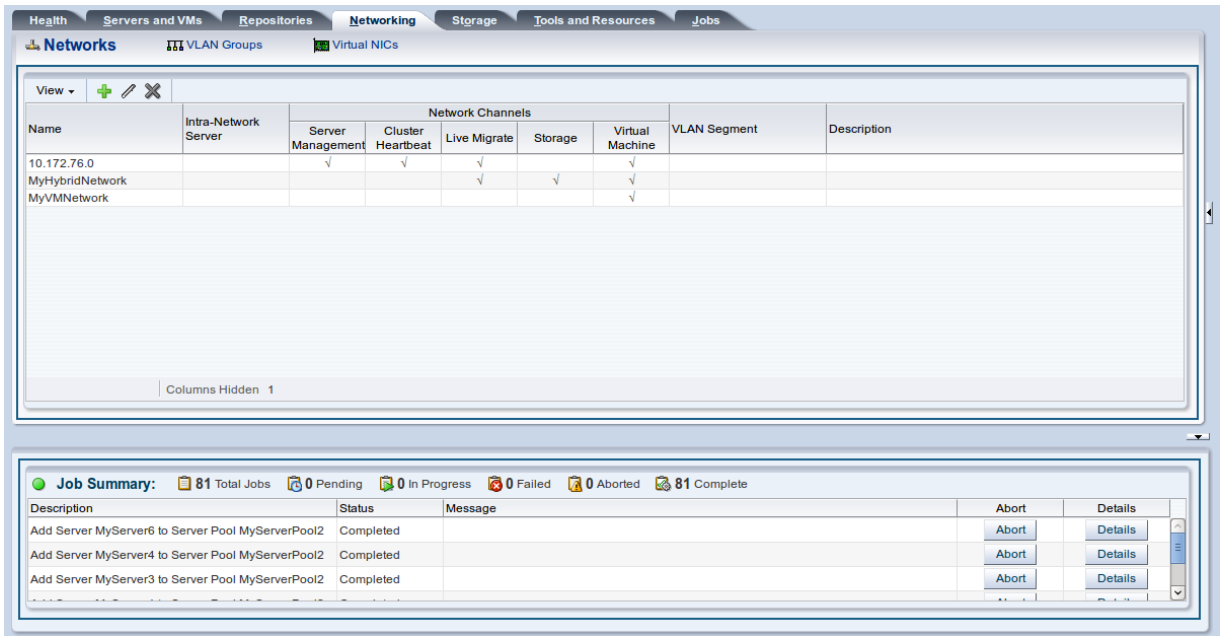
| Management Pane Perspective | Description |
|---|---|
| **Repositories** | Displays information about the storage repositories, and the resources in each repository. Use this tab to view, create, edit, present/unpresent, refresh and delete storage repositories.<br><br>You can also use this tab to create and manage the contents of storage repositories; assemblies, ISO files, template files, virtual disks and virtual machine configuration files. To view the contents of each storage repository, select it in the navigation tree, and then select **Repositories** in the **Perspective** drop-down list.<br><br>See Chapter 4, *Managing Storage* for more information on managing storage. |
| **Info** | Displays a high-level view of the selected object. The Info pane contents change to reflect information about the object selected in the navigation tree. You can use this pane to view information about repositories in your environment.<br><br>Select **Info** in the **Perspective** drop-down list to display the **Info** pane. |
| **Events** | Events are displayed for each object in the navigation tree and displays events related to that object. Select **Events** in the **Perspective** drop-down list to display the **Events** pane. |

## 3.6.4 Networking Tab

Use the **Networking** tab to manage networks and their functions in your environment, create, edit and delete networks and VLAN groups, and create virtual NICs which can be used by virtual machines.

Figure 3.6, “Networking tab” shows the Networking tab.

**Figure 3.6 Networking tab**



The **Networking** tab contains the subtabs set out in Table 3.7, “Networking Subtabs”.

**Table 3.7 Networking Subtabs**

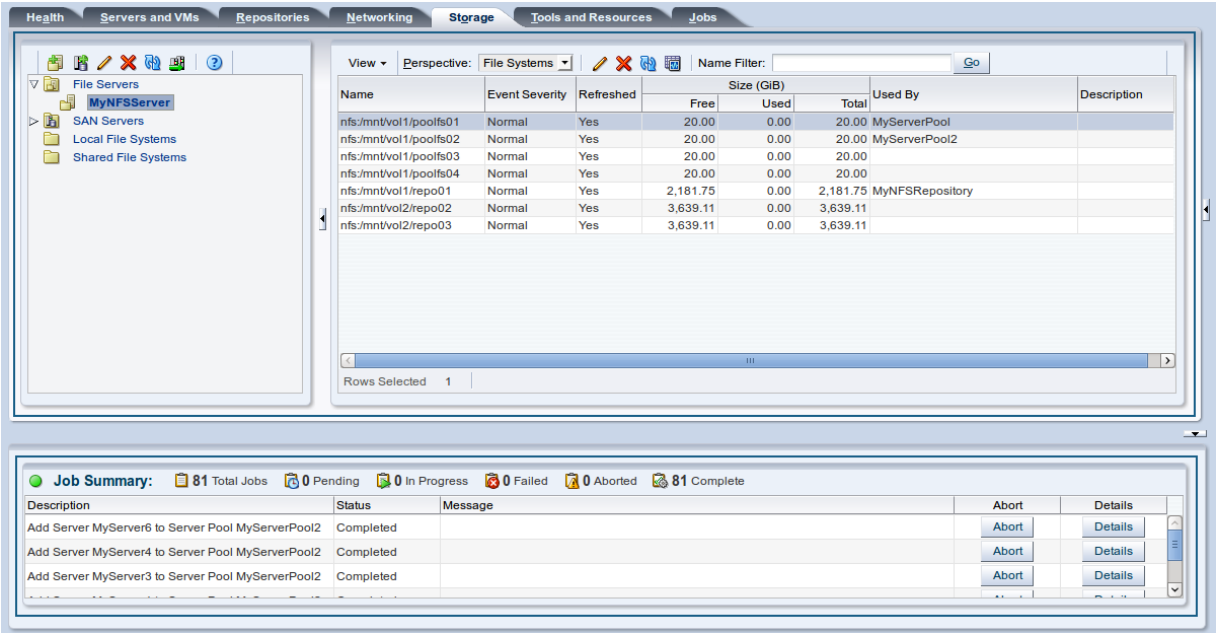
| Subtab | Description |
|---|---|
| **Networks** | Displays information about networks. Use this tab to create, edit, and delete networks.<br><br>Select the **Networks** subtab to display this pane. Select a network in the table to view and edit information about the network ports and VLAN segments used in a network.<br><br>See Chapter 5, *Managing Networks* for more information on managing networks. |
| **VLAN Groups** | Displays information about VLAN Groups. Use this tab to create, edit and delete VLAN Groups.<br><br>Select the **VLAN Groups** subtab to display this pane. Select a VLAN Group in the table to view and edit information about the ports and VLAN Segments used in a VLAN Group.<br><br>See Section 5.11, “Managing VLAN Groups” for more information on managing VLAN groups. |
| **Virtual NICs** | Displays information about virtual NICs. Use this tab to create and delete virtual NICs for virtual machines.<br><br>See Section 7.6, “Managing VNICs” for more information on managing virtual NICs. |

## 3.6.5 Storage Tab

Use the **Storage** tab to manage, discover and edit file servers and SAN servers (storage arrays), physical disks, access groups and volume groups.

Figure 3.7, “Storage tab” shows the **Storage** tab.

**Figure 3.7 Storage tab**




The **Storage** tab contains the **Perspectives** set out in Table 3.8, “Storage Tab Perspective”.

**Table 3.8 Storage Tab Perspective**

| Management Pane Perspective | Description |
|---|---|
| **File Servers** | Lists the file servers which contain file-based storage. Use this tab to register, edit, delete and discover file-based storage.<br><br>Select **File Servers** in the navigation tree to display this tab.<br><br>See Section 4.2, “Storage Types” for more information on file-based storage. |
| **File Systems** | Lists the file systems available on the file server. Use this tab to discover edit, refresh, delete and display events for file systems.<br><br>Use the **Name Filter** input field to specify search criteria to filter the displayed results.<br><br>See Section 3.14, “Name Filters” for more information.<br><br>Select a file server in the navigation tree and then select **File Systems** in the **Perspective** drop-down list to display this tab. |
| **Logical File Systems** | Lists the logical file systems available on the file server. Use this tab to refresh and delete logical file systems.<br><br>Select the **Logical File Systems** folder in the navigation tree to display this tab. |
| **SAN Servers** | Lists the SAN servers (storage arrays). Use this tab to register, edit, delete, refresh and discover SAN servers.<br><br>Select **SAN Servers** in the navigation tree to display this tab. |

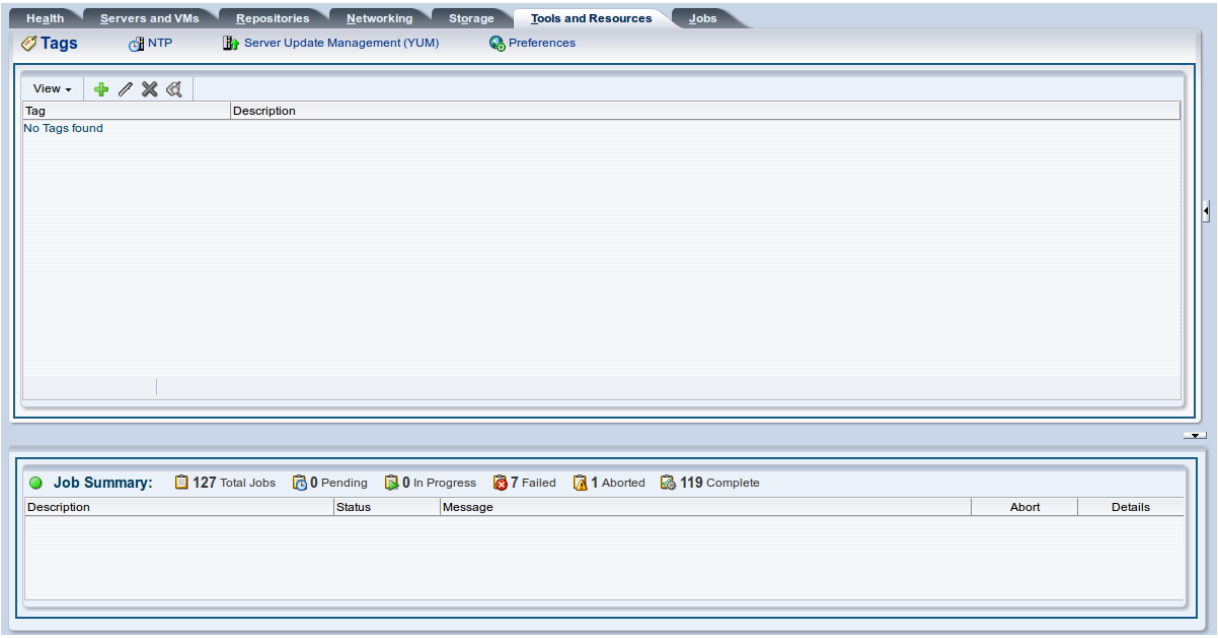
| Management Pane Perspective | Description |
|---|---|
| | See Section 4.2, “Storage Types” for more information on storage arrays. |
| **Physical Disks** | Lists the physical disks on the storage array. Use this tab to create, edit, clone, delete, refresh, display servers using a physical disk, and display events for physical disks.<br><br>Select a storage array in the navigation tree and then select **Physical Disks** in the **Perspective** drop-down list to display this tab. |
| **Access Groups** | Lists the access groups for the storage array. Use this tab to create, edit, delete, present/unpresent and display events for storage array access groups. Also use this tab to grant access to physical disks in the storage array to Oracle VM Servers using the access groups.<br><br>Select a storage array in the navigation tree and then select **Access Groups** in the **Perspective** drop-down list to display this tab.<br><br>See Section 4.6.4.2, “SAN Server Access Groups” for more information on access groups. |
| **Volume Groups** | Lists the volume groups for the storage array. Use this tab to create, edit and delete storage array volume groups. Also use this tab to grant access to physical disks in the storage array to Oracle VM Servers using the volume groups.<br><br>Select a storage array in the navigation tree and then select **Volume Groups** in the **Perspective** drop-down list to display this tab. |
| **Info** | Displays a high-level view of the selected object. The Info pane contents change to reflect information about the object selected in the navigation tree. You can use this pane to view information about repositories in your environment.<br><br>Select **Info** in the **Perspective** drop-down list to display the Info pane. |
| **Events** | Events are displayed for each object in the navigation tree and displays events related to that object. Select **Events** in the **Perspective** drop-down list to display the Events pane. |

## 3.6.6 Tools and Resources Tab

Use the **Tools and Resources** tab to manage tags which can be used to identify and group objects within Oracle VM Manager, and to configure server update management (YUM) repositories for automatic updates of the Oracle VM Servers being managed by Oracle VM Manager. This tab also contains preferences that control certain user interface behaviors.

Figure 3.8, “Tools and Resources tab” shows the **Tools and Resources** tab.

**Figure 3.8 Tools and Resources tab**




The **Tool and Resources** tab contains the subtabs set out in Table 3.9, “Tool and Resources Subtabs”.

**Table 3.9 Tool and Resources Subtabs**

| Subtab | Description |
|---|---|
| **Tags** | Use this tab to manage tags, which can be used within Oracle VM Manager to identify and group objects such as server pools, servers and virtual machines. The panel provides options to add, edit and remove tags within Oracle VM Manager. There is also an option to search for components that have been tagged with a particular tag.<br><br>See Section 3.15, “Tags” for more information on using tags. |
| **NTP** | Use this tab to manage and configure NTP on Oracle VM. NTP maintains time synchronization between Oracle VM Servers in a server pool. NTP is set up by default to use the Oracle VM Manager host computer as the NTP server. You can also use your own NTP servers.<br><br>See Section 6.10.17, “Managing NTP on Oracle VM Servers” for more information on configuring NTP. |
| **Server Update Management (YUM)** | Displays the **Server Update Management (YUM)** dialog box. Use this tab to configure YUM repositories for automatic updates of the Oracle VM Servers being managed by Oracle VM Manager.<br><br>See Section 6.10.11, “Updating and Upgrading Oracle VM Servers” for more information on Oracle VM Server update management. |
| **Preferences** | Displays the **Preferences** dialog box. Use this tab to configure user interface behavior such as whether or not to display the Oracle VM Manager server URI on the login page; and whether or not to timeout during a filesystem refresh. |

| Subtab | Description |
|---|---|
| | See Section 3.10, “Changing Default UI Behaviour” for more information on the Oracle VM Manager user interface preferences. |

## 3.6.7 Jobs Tab

Use the **Jobs** tab for information on current and past tasks, or *jobs*. A job is a set of one or more operations made in Oracle VM Manager. See Section B.1, “Working with the Jobs Framework” for more information on managing jobs.

The **Jobs** tab provides comprehensive information on all completed and in-progress jobs in the virtualization environment. The **Jobs** tab is used to get a global view on jobs, to evaluate information on jobs completed or aborted, or to cancel a job in progress.

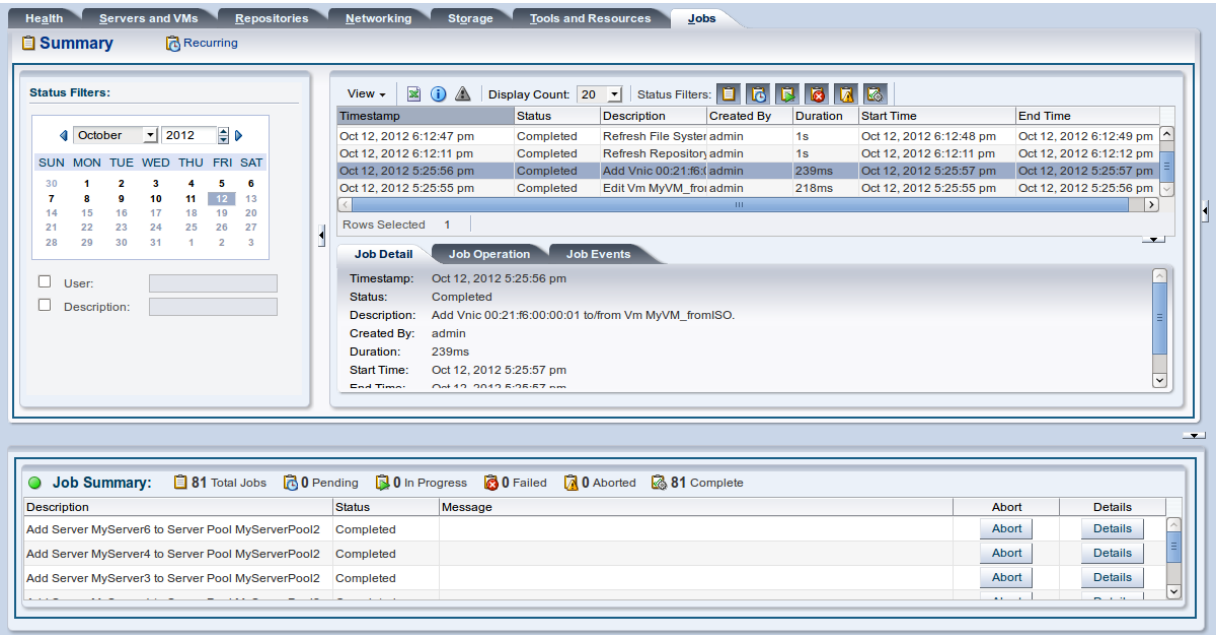
The default view on the **Jobs** tab is the **Summary** view.

Jobs can be displayed for all users, or just for the administrator.

The Jobs calendar enables you to display the jobs for a particular date. Select a date in the Jobs calendar and the jobs for that date are displayed in the Jobs table.

Figure 3.9, “Jobs tab” shows the Jobs tab.

**Figure 3.9 Jobs tab**




The **Summary** view on the **Jobs** tab contains the subtabs set out in Table 3.10, “Jobs Subtabs”.

**Table 3.10 Jobs Subtabs**

| Management Pane Tab | Subtab | Description |
|---|---|---|
| **Jobs** | | Displays information on all jobs in a time-stamped list in the Jobs table. Jobs can be sorted and viewed by any column |

| Management Pane Tab | Subtab | Description |
|---|---|---|
| | | in the Jobs table. Click a column heading to resort the table content. The table contents can be reordered using **View** > **Reorder Columns** in the Jobs tab toolbar. The columns listed in the Jobs table can be selected using **View** > **Columns** in the Jobs tab toolbar.<br><br>You can select which columns to view, and order the columns in the Jobs table using the **View** drop-down list.<br><br>Click **Export to Excel** to save a list of the jobs to a spreadsheet file.<br><br>Select a job in the table and click **Details...** to see the details of the job.<br><br>To abort a job, select the job in the table and click **Abort Job**.<br><br>Use the **Status Filters** icons to view **Total Jobs**, **Pending**, **In Progress**, **Failed**, **Aborted** and **Complete Jobs**. Click the icons to open a dialog box showing the tasks. The dialog box lets you export a list of the jobs to a spreadsheet file, view details of a job, or abort a job.<br><br>See Section B.1, “Working with the Jobs Framework” for more information on jobs. |
| | **Job Detail** | This tab is displayed on the Jobs tab. The Job detail tab displays all the available information about the job selected in the Jobs table.<br><br>If a message is associated with the job detail, it is displayed in the message pane. |
| | **Job Operation** | This tab is displayed on the Jobs tab. The Job operations tab displays the operations performed as part of the job. |
| | **Job Events** | This tab is displayed on the Jobs tab. The Job events tab displays a list of the events performed during the job. |

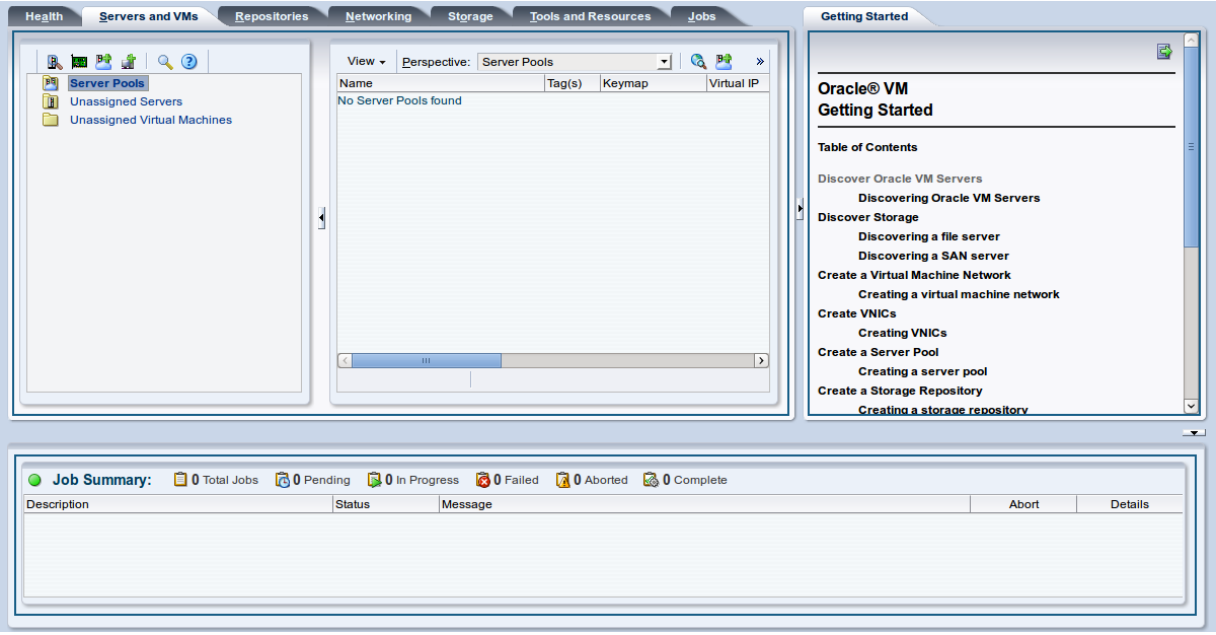
The **Jobs** tab includes a link to manage **Recurring** jobs. See Section B.1.7, “Managing Recurring Jobs” for more information on recurring jobs.

## 3.6.8 Getting Started Tab

When you first log in to the Oracle VM Manager user interface the **Getting Started** tab is displayed on the right side of the management pane. The **Getting Started** tab contains a tutorial that describes how to get started with Oracle VM Manager, and walks you through discovering Oracle VM Servers, registering storage, setting up networking, setting up a storage repository and importing resources into it, creating a server pool and creating virtual machines. To show or hide the tutorial, click the arrow to the right of the management pane.

Figure 3.10, “Getting Started tab” shows the **Getting Started** tab.

**Figure 3.10 Getting Started tab**




# 3.7 Using the Toolbar

The toolbar is positioned just below the tabs. The icons in the toolbar are arranged to support the work-flow required to perform tasks associated with the object selected in the navigation pane.

The toolbar is used to perform specific actions. Depending on the selected tab, the icons in the toolbar change. For example, if you select an Oracle VM Server in the **Servers and VMs** tab, the toolbar icons to manage Oracle VM Servers are displayed.

## 3.7.1 Toolbar Options

The toolbar options are context-sensitive, and change to display actions related to the object selected in the navigator. The toolbar in the management pane change depending on the object selected in the navigation tree and the selected **Perspective** in the drop-down list in the management pane. Many of the toolbar options are also available as right-click menu options.

The toolbar icon options are discussed in Table 3.11, “Toolbar Icon Options”.

**Table 3.11 Toolbar Icon Options**

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| **Discover Servers...** |  | Displays the **Discover Servers** dialog box. Use this option to discover Oracle VM Servers.<br><br>Select the **Servers and VMs** tab to enable this option. |
| **Create VNICs...** |  | Displays the **Create Virtual NICs** dialog box. Use this option to create virtual NICs for virtual machines.<br><br>Select the **Servers and VMs** tab to enable this option. |
| **Create Server Pool...** |  | Displays the **Create a Server Pool** wizard. Use this option to create a server pool for Oracle VM Servers. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| | | Select the **Servers and VMs** tab to enable this option. |
| **Create Virtual Machine...** |  | Displays the **Create Virtual Machine** wizard. Use this option to create a virtual machine in the selected server pool.<br><br>Select the **Servers and VMs** tab to enable this option. |
| **Find** |  | Displays the **Find** dialog box. Use this option to search for server pools, Oracle VM Servers, and virtual machines. You can use wildcards such as “*” and “?”. For example, if you search for a virtual machine, it is displayed and selected in the first row in the Virtual Machines table when it is found. The Oracle VM Server it belongs to is also selected in the navigation tree.<br><br>Select the **Servers and VMs** tab to enable this option. |
| **Refresh All** |  | Rediscovers all Oracle VM Server instances, file servers, and SAN servers. Use this to refresh information about all Oracle VM Server instances<br><br>Select the **Server Pools** folder on the **Servers and VMs** tab to enable this option.<br><br>Use this option after rebuilding your database, to ensure that all information stored within the database is up to date. |
| **Import Virtual Machine...** |  | Displays the **Import Virtual Machine** dialog box. Use this option to import a virtual machine into Oracle VM Manager and optionally deploy it to an Oracle VM Server or server pools.<br><br>Select a server pool or Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Edit Server Pool...** |  | Displays the **Edit Server Pool** wizard. Use this option to edit a server pool.<br><br>Select a server pool in the **Servers and VMs** tab to enable this option. |
| **Delete Server Pool** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected server pool.<br><br>Select a server pool in the **Servers and VMs** tab to enable this option. |
| **Change Servers Agent Password** |  | Displays the **Change Agent Password for All Servers within the Server Pool** dialog box. Use this option to set a new Oracle VM Agent password for all Oracle VM Servers in a server pool.<br><br>Select a server pool in the **Servers and VMs** tab to enable this option. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| **Define Policy for Server Pool...** |  | Displays the **Configure DRS/DPM** wizard. Use this option to set or edit resource policies for the server pool.<br><br>Select a server pool in the **Servers and VMs** tab to enable this option. |
| **Edit Server** |  | Displays the **Edit Server** dialog box. Use this option to edit the name and description for an Oracle VM Server. This is also used to put the Oracle VM Server into maintenance mode, take ownership of it, and to configure remote management of the Oracle VM Server using IPMI (Intel®ligent Platform Management Interface).<br><br>Select an Oracle VM Server in the **Servers and VMs** tab to enable this option.<br><br>Note that placing an Oracle VM Server in maintenance mode is indicated in the navigation pane with this icon:  |
| **Delete Server** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected Oracle VM Server.<br><br>Select an Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Start Server** |  | Starts a stopped Oracle VM Server.<br><br>Select an Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Stop Server** |  | Stops a running Oracle VM Server.<br><br>Select an Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Restart Server** |  | Restarts a running Oracle VM Server.<br><br>Select an Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Kill Server** |  | Powers off an Oracle VM Server. This is the equivalent of physically pushing the Off button on the hardware.<br><br>Select an Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Rediscover Server** |  | Rediscovers the Oracle VM Server. Use this to refresh information about the Oracle VM Server.<br><br>Select an Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Rescan Physical Disks** |  | Rescans the local storage on an Oracle VM Server. Use this option to rescan the storage presented to an Oracle VM Server when the storage configuration is changed, for example, a new storage array is added. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| | | Select an Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Update Server** |  | Updates or upgrades the Oracle VM Server if an update is available in the YUM repository.<br><br>Select an Oracle VM Server in the **Servers and VMs** tab to enable this option. |
| **Edit Virtual Machine** |  | Displays the **Edit Virtual Machine** wizard. Use this option to edit a virtual machine.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree and then select **Virtual Machines** in the **Perspective** drop-down list to enable this option. |
| **Delete Virtual Machine** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected virtual machines.<br><br>Select one or more virtual machines in the **Servers and VMs** tab to enable this option. |
| **Start Virtual Machine** |  | Starts up a stopped virtual machine.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree, and then select **Virtual Machines** in the **Perspective** drop-down list. Select a stopped virtual machine in the table to use this option. |
| **Stop Virtual Machine** |  | Shuts down a virtual machine.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree, and then select **Virtual Machines** in the **Perspective** drop-down list. Select a running virtual machine in the table to use this option. |
| **Launch Console** |  | Launches the virtual machine VNC console in an x86-based server pool, which enables access to the virtual machine. Use this option to connect to a virtual machine's console and access the virtual machine directly.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree and then select **Virtual Machines** in the **Perspective** drop-down list to enable this option. |
| **Launch Serial Console** |  | Launches the virtual machine serial console, which enables access to the virtual machine. Use this option to connect to a virtual machine's serial console and access the virtual machine directly.<br><br>This service is commonly used for virtual machines running in a SPARC-based server pool, but is also |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| | | available for virtual machines running on x86-based server pools.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree and then select **Virtual Machines** in the **Perspective** drop-down list to enable this option. |
| **Restart Virtual Machine** |  | Restarts a running virtual machine.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree, and then select **Virtual Machines** in the **Perspective** drop-down list. Select a running virtual machine in the table to use this option. |
| **Kill Virtual Machine** |  | Shuts down a running virtual machine.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree, and then select **Virtual Machines** in the **Perspective** drop-down list. Select a running virtual machine in the table to use this option. |
| **Suspend Virtual Machine** |  | Suspends (pauses) a running virtual machine.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree, and then select **Virtual Machines** in the **Perspective** drop-down list. Select a running virtual machine in the table to use this option. |
| **Resume Virtual Machine** |  | Resumes (unpauses) a suspended virtual machine.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree, and then select **Virtual Machines** in the **Perspective** drop-down list. Select a suspended virtual machine in the table to use this option. |
| **Migrate Virtual Machine** |  | Migrates a virtual machine to another Oracle VM Server.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree and then select **Virtual Machines** in the **Perspective** drop-down list to use this option. |
| **Clone or Move Virtual Machine** |  | Displays the **Clone or Move Virtual Machine** dialog box. Use this option to clone a virtual machine to create another virtual machine.<br><br>In the **Servers and VMs** tab, select a server pool or Oracle VM Server in the navigation tree and then select **Virtual Machines** in the **Perspective** drop-down list to use this option. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| **Create New Repository...** |  | Displays the **Create a Data Repository** wizard. Use this option to create a new repository and make it available to Oracle VM Servers.<br><br>Select the **Repositories** tab to enable this option. |
| **Find** |  | Displays the **Find** dialog box. Use this option to search for repositories, VM templates, assemblies, ISOs, virtual disks, and VM files. You can use wildcards such as “*” and “?”. For example, if you search for a virtual machine template, it is displayed and selected in the first row in the VM Templates table when it is found. The VM Templates folder is also selected in the navigation tree.<br><br>Select the **Repositories** tab to enable this option. |
| **Edit Selected Repository...** |  | Displays the **Edit Repository** dialog box. Use this option to edit a repository.<br><br>Select the **Repositories** tab and then select a repository in the table to enable this option. |
| **Delete Selected Repository...** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected repository.<br><br>Select the **Repositories** tab and then select a repository in the table to enable this option. |
| **Present-Unpresent Selected Repository...** |  | Displays the **Present this Repository to Servers** dialog box. Use this option to select which Oracle VM Servers the selected repository should be presented or not presented to.<br><br>Select the **Repositories** tab and then select a repository in the table to enable this option. |
| **Refresh Selected Repository...** |  | Refreshes the selected repository. Use this option to detect changes to the disk content of the selected repository.<br><br>Select the **Repositories** tab and then select a repository in the table to enable this option. |
| **Import VM Template...** |  | Displays the **Import VM Template** dialog box. Use this option to import a virtual machine template into Oracle VM Manager and make it available to server pools.<br><br>Select the **Repositories** tab and then select the **VM Templates** folder to enable this option. |
| **Create VM Template...** |  | Displays the **Create VM Template** wizard. Use this option to create a new virtual machine template or clone from an existing virtual machine template.<br><br>Select the **Repositories** tab and then select the **VM Templates** folder to enable this option. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| **Edit Selected VM Template...** |  | Displays the **Edit VM Template** dialog box. Use this option to change the configuration, networking, disks and boot order for a virtual machine template.<br><br>In the **Repositories** tab, select the **VM Templates** folder and then select a template in the table to enable this option. |
| **Delete Selected VM Template** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected virtual machine template.<br><br>In the **Repositories** tab, select the **VM Templates** folder and then select a template in the table to enable this option. |
| **Clone or Move VM Template...** |  | Displays the **Clone or Move Template** dialog box. Use this option to create a clone of the virtual machine template or move a template, including repository and disk locations.<br><br>In the **Repositories** tab, select the **VM Templates** folder and then select a template in the table to enable this option. |
| **Manage Clone Customizers...** |  | Displays the **Manage Clone Customizer** dialog box. The clone customizer lets you set up clone parameters, such as networking, disks and ISO resources. Use this option to create, edit or delete a clone customizer.<br><br>In the **Repositories** tab, select the **VM Templates** folder and then select a template in the table to enable this option. |
| **Import VM Assembly...** |  | Displays the **Import VM Assembly** dialog box. Use this option to import a virtual machine assembly into Oracle VM Manager and make it available to server pools.<br><br>In the **Repositories** tab, select the **VM Assemblies** folder to enable this option. |
| **Create VM Assembly...** |  | Displays the **Create VM Assembly** wizard. Use this option to create a new virtual machine assembly.<br><br>Select the **Repositories** tab and then select the **Assemblies** folder to enable this option. |
| **Edit Selected VM Assembly...** |  | Displays the **Edit VM Assembly** dialog box. Use this option to edit the selected virtual machine assembly.<br><br>In the **Repositories** tab, select the **Assemblies** folder and then select a virtual machine assembly in the table to enable this option. |
| **Delete Selected VM Assembly** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected virtual machine assembly. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| | | In the **Repositories** tab, select the **Assemblies** folder and then select a virtual machine assembly in the table to enable this option. |
| **Refresh Selected VM Assembly** |  | Refreshes the selected VM assembly. Use this option refresh the selected virtual machine assembly.<br><br>In the **Repositories** tab, select the **Assemblies** folder and then select an assembly in the table to enable this option. |
| **Import ISO...** |  | Displays the **Import ISO** dialog box. Use this option to import a virtual machine ISO file into Oracle VM Manager and make it available to server pools.<br><br>In the **Repositories** tab, select the **ISOs** folder to enable this option. |
| **Edit Selected ISO...** |  | Displays the **Edit ISO** dialog box. Use this option to edit the selected ISO file.<br><br>In the **Repositories** tab, select the **ISOs** folder and then select an ISO file in the table to enable this option. |
| **Delete Selected ISO** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected ISO file.<br><br>In the **Repositories** tab, select the **ISOs** folder and then select an ISO file in the table to enable this option. |
| **Clone ISO** |  | Displays the **Clone ISO** dialog box. Use this option to clone the selected ISO file.<br><br>In the **Repositories** tab, select the **ISOs** folder and then select an ISO file in the table to enable this option. |
| **Import Virtual Disk** |  | Displays the **Import Virtual Disk** dialog box. Use this option to import a virtual disk into Oracle VM Manager and make it available to server pools.<br><br>In the **Repositories** tab, select the **ISOs** folder to enable this option. |
| **Create Virtual Disk...** |  | Displays the **Create Virtual Disk** wizard. Use this option to create a new virtual disk.<br><br>Select the **Repositories** tab and then select the **Virtual Disks** folder to enable this option. |
| **Edit Selected Virtual Disk...** |  | Displays the **Edit Virtual Disk** dialog box. Use this option to edit the selected virtual disk.<br><br>In the **Repositories** tab, select the **Virtual Disks** folder and then select a virtual disk in the table to enable this option. |
| **Delete Selected Virtual Disk** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected virtual disk. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| | | In the **Repositories** tab, select the **Virtual Disks** folder and then select a virtual disk in the table to enable this option. |
| **Clone Virtual Disk** |  | Displays the **Clone Virtual Disk** dialog box. Use this option to clone the selected virtual disk.<br><br>In the **Repositories** tab, select the **Virtual Disks** folder and then select a virtual disk in the table to enable this option. |
| **Create New Network...** |  | Displays the **Create New Network** dialog box. Use this option to create a new network.<br><br>Select the **Networking** tab and then select the **Networks** subtab to enable this option. |
| **Edit Selected Network...** |  | Displays the **Edit Network** dialog box. Use this option to edit the selected network.<br><br>Select the **Networking** tab, select the **Networks** subtab and then select a network in the table to enable this option. |
| **Delete Selected Network...** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected network.<br><br>Select the **Networking** tab, select the **Networks** subtab and then select a network in the table to enable this option. |
| **Create New VLAN Group...** |  | Displays the **Create New VLAN Group** wizard. Use this option to create a new VLAN group.<br><br>Select the **Networking** tab and then select the **VLAN Groups** subtab to enable this option. |
| **Edit Selected VLAN Group...** |  | Displays the **Edit VLAN Group** wizard. Use this option to edit a VLAN group.<br><br>Select the **Networking** tab, select the **VLAN Groups** subtab and then select a VLAN group in the table to enable this option. |
| **Delete Selected VLAN Group...** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected VLAN group.<br><br>Select the **Networking** tab, select the **VLAN Groups** subtab and then select a VLAN group in the table to enable this option. |
| **Virtual NICs** |  | Displays the **Create Virtual NICs** dialog box. Use this option to create virtual NICs for virtual machines.<br><br>Select the **Networking** tab and then select the **Virtual NICs** subtab to enable this option. |
| **Discover File Server...** |  | Displays the **Discover File Server** wizard. Use this option to discover a new file server. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| | | Select the **Storage** tab to enable this option. |
| **Edit File Server...** |  | Displays the **Edit File Server** dialog box.<br><br>In the **Storage** tab, select the **File Servers** folder and then select a file server in the table to enable this option. |
| **Delete File Server** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected file server.<br><br>Select the **Storage** tab, select the **File Servers** folder and then select a file server in the table to enable this option. |
| **Refresh File Server** |  | Refreshes the list of storage elements made available by the selected file server. Use this option to rescan a file server after making changes to its configuration. This updates the storage information known to Oracle VM Manager. Since refreshing storage may be time consuming, a confirmation dialog box is displayed before the operation is launched.<br><br>In the **Storage** tab, select the **File Servers** folder and then select a file server in the table to enable this option. |
| **Refresh File System** |  | Refreshes the file system presented by a file server. Use this option to rescan the configuration of a file system.<br><br>In the **Storage** tab, select a file server in the **File Servers** folder, select **File Systems** in the **Perspective** drop-down, and then select a file system in the table to enable this option. |
| **Add/Remove Admin Servers...** |  | Displays the **Add/Remove Admin Servers** dialog box. Use this option to select the admin servers for each of your file servers.<br><br>In the **Storage** tab, select the **SAN Servers** folder and then select a file server in the table to enable this option. |
| **Discover SAN Server...** |  | Displays the **Discover SAN Server** wizard. Use this option to discover a new SAN server.<br><br>Select the **Storage** tab to enable this option. |
| **Edit SAN Server...** |  | Displays the **Edit SAN Server** dialog box.<br><br>In the **Storage** tab, select the **SAN Servers** folder and then select a SAN server in the table to enable this option. |
| **Delete SAN Server** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected SAN server.<br><br>Select the **Storage** tab, select the **SAN Servers** folder and then select a SAN server in the table to enable this option. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| **Refresh SAN Server** |  | Refreshes the list of storage elements made available by the selected SAN server. Use this option to rescan a SAN server after making changes to its configuration. This updates the storage information known to Oracle VM Manager. Since refreshing storage may be time consuming, a confirmation dialog box is displayed before the operation is launched.<br><br>In the **Storage** tab, select the **SAN Servers** folder and then select a SAN server in the table to enable this option. |
| **Add/Remove Admin Servers...** |  | Displays the **Add/Remove Admin Servers** dialog box. Use this option to select the admin servers for each of your SAN servers.<br><br>In the **Storage** tab, select the **SAN Servers** folder and then select a SAN server in the table to enable this option. |
| **Create Physical Disk** |  | Displays the **Create Physical Disk** dialog box. Use this option to create a new physical disk in the selected volume group of the storage array of your choice.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, then select **Physical Disks** in the **Perspective** drop-down list, and the select a volume group of a SAN server in the table to enable this option. |
| **Edit Physical Disk...** |  | Displays the **Edit Physical Disk** dialog box. Use this option to change the name, size, provisioning and share ability of the selected physical disk.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Physical Disks** in the **Perspective** drop-down list to enable this option. |
| **Clone Physical Disk** |  | Displays the **Clone Physical Disk** dialog box. Use this option to clone a physical disk to another physical disk or to a disk image on a file server.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Physical Disks** in the **Perspective** drop-down list to enable this option. |
| **Refresh Physical Disk** |  | Refreshes the physical disk presented by a SAN server. Use this option to rescan the configuration of a physical disk.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Physical Disks** in the **Perspective** drop-down list to enable this option. |
| **Display Servers using Physical Disk...** |  | Displays the **Servers using Physical Disk** dialog box. Use this option to view which servers are using a selected physical disk. |

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| | | In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Physical Disks** in the **Perspective** drop-down list, and then select a physical disk in the table to enable this option. |
| **Edit Volume Group** |  | Displays the **Edit Volume Group** dialog box.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Volume Groups** in the **Perspective** drop-down list, and the select a volume group of a SAN server in the table to enable this option. |
| **Create Access Group** |  | Displays the **Create Access Group** dialog box. Use this option to create a new access group.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Access Groups** in the **Perspective** drop-down list to enable this option. |
| **Edit Access Group** |  | Displays the **Edit Access Group** dialog box. Use this option to edit access group settings such as name, description, selected storage initiators and physical disks.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Access Groups** in the **Perspective** drop-down list to enable this option. |
| **Delete Access Group** |  | Displays the **Delete Confirmation** dialog box. Use this option to delete the selected access group.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Access Groups** in the **Perspective** drop-down list to enable this option. |
| **Present/Unpresent Physical Disk** |  | Displays the **Present/Unpresent Physical Disk** dialog box. Use this option to change the selection of physical disks to which an access group has access.<br><br>In the **Storage** tab, select a SAN server in the **SAN Servers** folder, and then select **Access Groups** in the **Perspective** drop-down list to enable this option. |
| **Abort Job** |  | Aborts and cancels a job.<br><br>Select a running job in the **Job Summary** pane or in the **Jobs** tab to enable this option. |
| **Find** |  | Displays the Find dialog box. Use this option to search for server pools, Oracle VM Servers, and virtual machines. For example, if you search for a virtual machine, it is displayed and selected in the first row in the Virtual Machines table when it is found. The Oracle VM Server it belongs to is also selected in the navigation tree. |
| **Help** |  | Opens a new web browser window which contains the Oracle VM Manager online help system. |

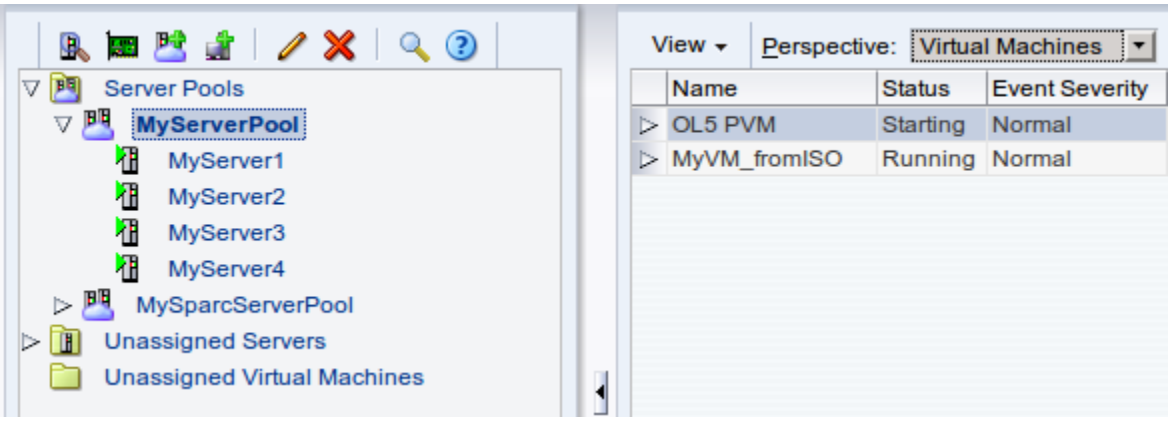
## 3.8 Using the Navigation Tree

The navigation tree shows the relationship between managed objects. These objects are both physical and virtual, and include Oracle VM Servers, server pools, virtual machines and so on, created using Oracle VM Manager. For example, the relationships between server pools, Oracle VM Servers, and the virtual machines hosted on those Oracle VM Servers. If you select a server pool in the navigation tree, the Oracle VM Servers in that server pool are displayed in the navigation tree. Any virtual machines hosted on the Oracle VM Server are listed in the virtual machines perspective in the management pane.

The content of the navigation tree changes, depending on the object you select in the navigation tree.

A sample of the navigation tree is shown in figure Figure 3.11, “Navigation tree”.

**Figure 3.11 Navigation tree**




## 3.9 Object Icon Colors

The icon for an object may be one of three colors: gray, yellow or red. These colors represent the status of the object and the color meanings are listed in table Table 3.12, “Object Icon Colors”.

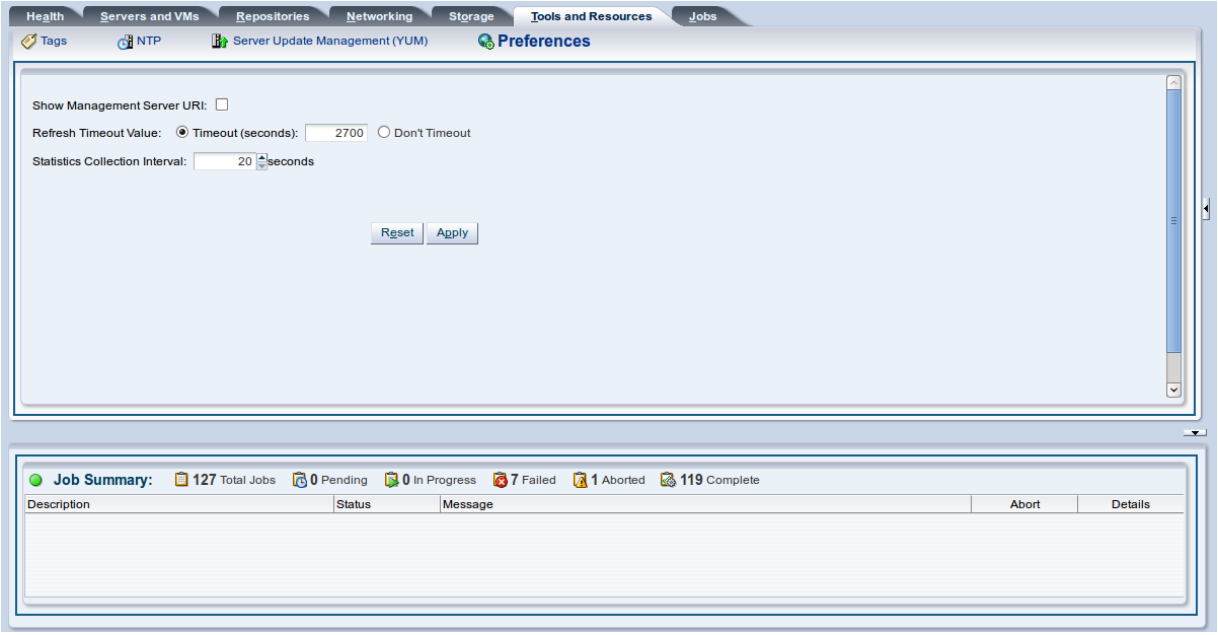
**Table 3.12 Object Icon Colors**

| Icon Color | Icon Example | Status |
|---|---|---|
| Gray |  | Normal. No warning or error events. |
| Yellow |  | The object has a warning event associated with it. |
| Red |  | The object has an error event associated with it. |

To see the events associated with an object, select the object in the navigation tree. Select **Events** in the management pane's **Perspective** drop-down list. All the events for that object is listed in the table.

## 3.10 Changing Default UI Behaviour

Oracle VM Manager makes use of certain default values while performing particular operations or while presenting particular screens within the UI. The default values should be sufficient for the majority of environments, however there are particular cases where changing these default values may improve usability. Default values used by Oracle VM Manager can be changed within the Oracle VM Manager UI under the **Tools and Resources** tab.




The options listed here apply to different functionalities within Oracle VM Manager. These are described below:

- **Show Management Server URI**: This checkbox controls whether or not the Oracle VM Manager server URI is displayed on the login page. By default, the URI option is not displayed. This can be useful when the Oracle VM Manager user interface is also used to manage remote instances of Oracle VM Manager. See Enabling Remote Log Ins for more information on this.
- **Refresh Timeout Value**: This radio button controls whether or not a timeout value is applied when refreshing the list of file systems that are available. If a timeout value is set, you will need to specify the number of seconds to wait before timing out in the field provided.
- **Statistics Collection Interval**: This field allows you to specify how frequently statistics are collected for servers. The statistics are used within Oracle VM Manager on the Health tab. The value for this field can be between 20 seconds and 86,400 seconds (one day). For more information on server statistics see Section 3.6.1, “Health Tab”.

Default Oracle VM Manager parameters can be easily edited from within Oracle VM Manager user interface by clicking on the **Tools and Resources** tab and then clicking on the **Preferences** link in the toolbar.

The configuration parameters can be changed with instant effect. No restart of Oracle VM Manager is required.

See Section B.3.1, “Changing Default UI Behaviour” for more information on when these UI preferences should be changed.

# 3.11 Drag and Drop

You can drag and drop one or more Oracle VM Servers (either from the table in the management pane, or from the navigation tree) to another server pool, or the **Unassigned Servers** folder in the navigation tree. Any virtual machines on an Oracle VM Server must be migrated or moved before moving an Oracle VM Server.

You can also drag and drop one or more virtual machines from the table in the management pane to a server pool, an Oracle VM Server or to the **Unassigned Virtual Machines** folder in the navigation tree. When you drag and drop multiple virtual machines to a server pool, the placement strategies for the virtual machines depend on the Oracle VM Server roles, and server pool policies such as Distributed Resource Scheduler (DRS) and Distributed Power Management (DPM). See Section 6.9.1, “Oracle VM Server Roles” for information on Oracle VM Server roles, and Section 6.5, “Server Pool Policies” for information on server pool policies. See Section 7.10.12, “Migrating Virtual Machines” for more information on migrating virtual machines.

All drag and drop operations are performed serially, and not concurrently, so one job is submitted and performed at a a time. For example, when migrating multiple virtual machines, one virtual machine is migrated, then the next, and so on.

## 3.12 Right-Click Action Menus

You can right-click on many elements within in a tab's management pane and within the navigation tree to bring up the action menu. The right-click action menu options are context-sensitive, and change to display actions related to the selected element. For example, if you click the **Servers and VMs** tab and select a server pool in the navigation tree and then right-click on an Oracle VM Server in the management pane table, the action menu for the Oracle VM Server is displayed.

Many of the toolbar options are also available as right-click menu options. See Section 3.7, “Using the Toolbar” for more information on the toolbar.

## 3.13 Multi-Select Functionality

The Oracle VM Manager user interface allows you to select multiple objects from the management pane tables and perform actions on all selected objects at one time. Multi-select functionality supports all commonly used selection options and shortcuts. For instance, selecting the first object in the table, holding down the **Shift** key and selecting the last object in the table can be used to select all objects. Alternately, once you have selected any object within the table, you can use the **Ctrl**+**A** keyboard shortcut to select all remaining objects. To select individual objects, you can hold down the **Ctrl** key while clicking on the objects upon which you want to perform an action.

You can use the toolbar options or the right-click action menu options to perform an action on multiple selected objects. When an action affects multiple objects, the confirmation dialog for the action lists all of the objects that are affected.

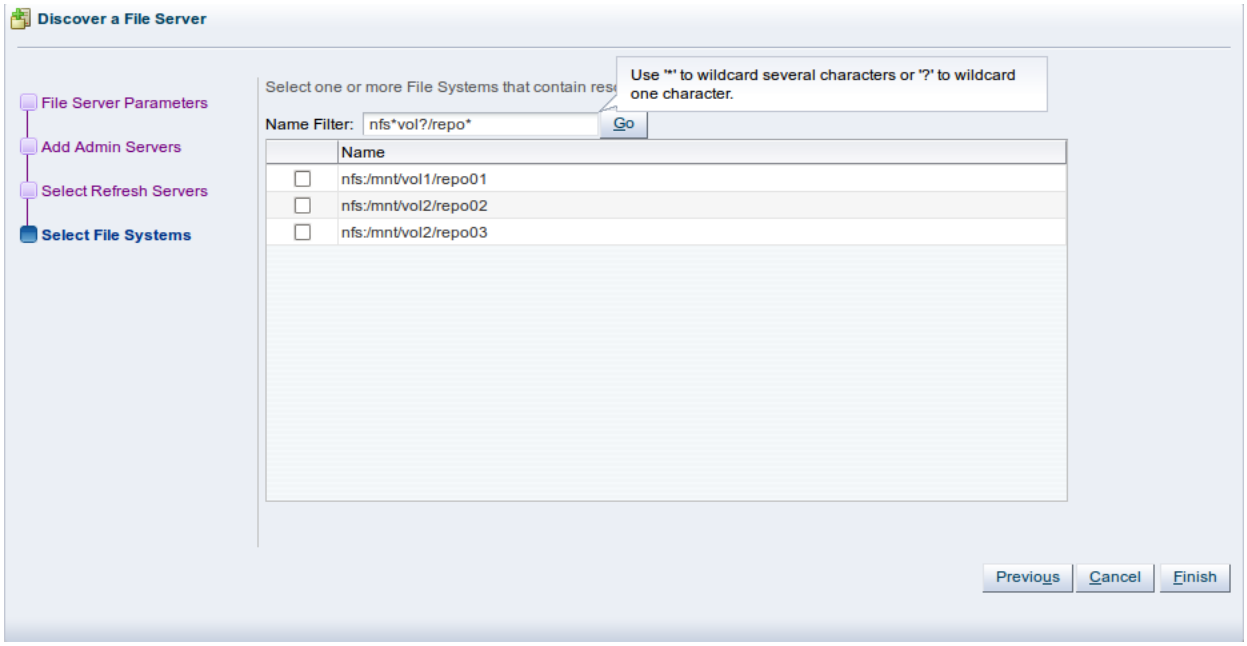
All multi-select operations are performed serially, and not concurrently, so one job is submitted and performed at a time. For example, when starting multiple virtual machines, one virtual machine is started, then the next, and so on.

## 3.14 Name Filters

In many of the tab management panes and in some of the dialog boxes within the Oracle VM Manager user interface there is an option to provide a **Name Filter**. For large deployments where many items pertaining to the current view may be listed, it can be difficult to find and select the objects that you want to run an action against. The **Name Filter** field is designed to make this process easier by allowing you to specify search criteria to filter the displayed results.

In tab management panes, the **Name Filter** field is positioned just below the tabs alongside the Toolbar.

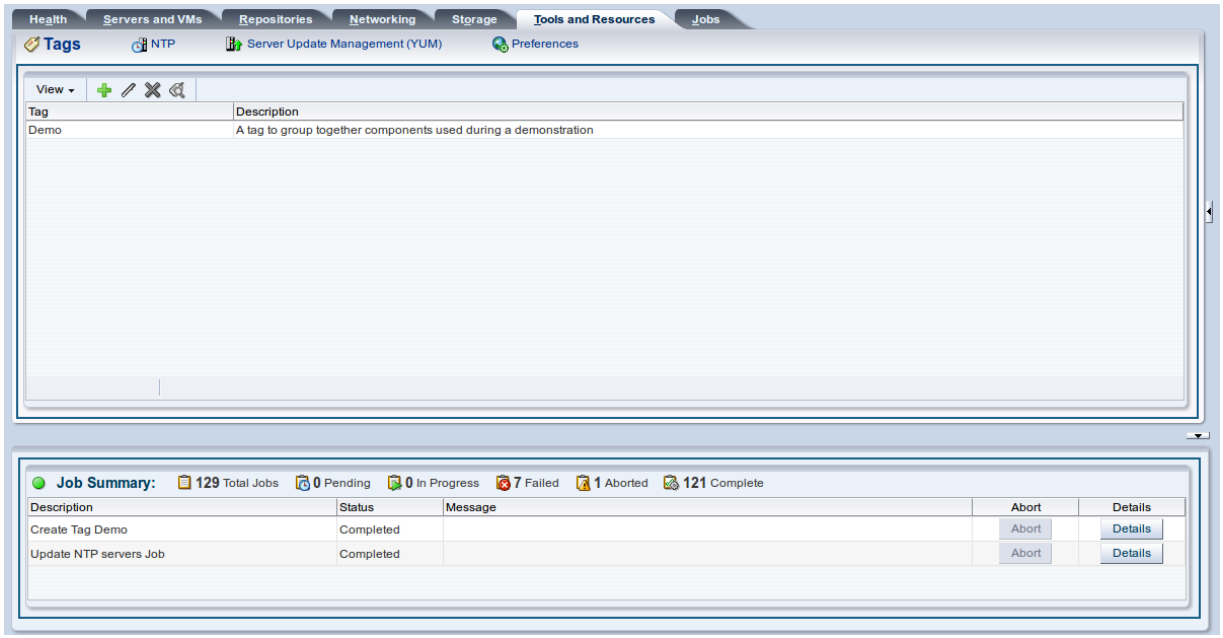
The input field is case-insensitive and accepts wildcard characters such as * (multiple character variations) and ? (single character variation). For example, a typical filter used in the **Select File Systems** dialog may look like this: *nfs*vol?/repo**.




# 3.15 Tags

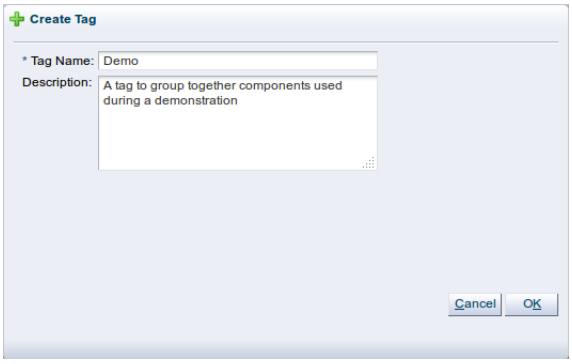
Oracle VM Manager provides the ability to create tags which can be used to identify and group together objects. This functionality makes it easier to quickly limit views of objects and to perform batch operations against objects sharing a common tag. Tags are managed within the **Tags** subtab on the **Tools and Resources** tab within the Oracle VM Manager user interface.

**Figure 3.12 Tag management subtab**




The **Tags** tab provides facilities to add , edit and delete tags. There is also an option to Find Components that share a common tag. These options can be accessed either using the toolbar at the top of the tab, or by using the context menu that appears when you right-click on an item within the panel.

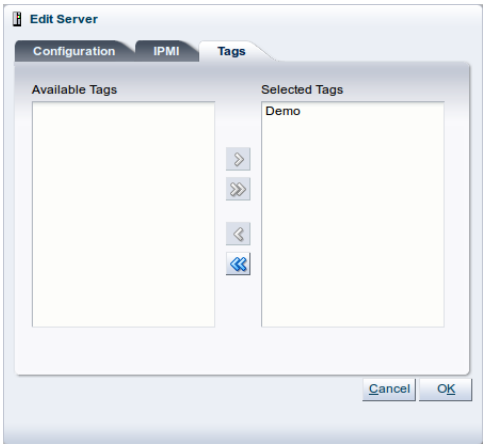
Clicking on the Create New Tag icon, or clicking on the Edit Tag icon, will bring up a dialog box that allows you to enter the Tag name and a description for the Tag.



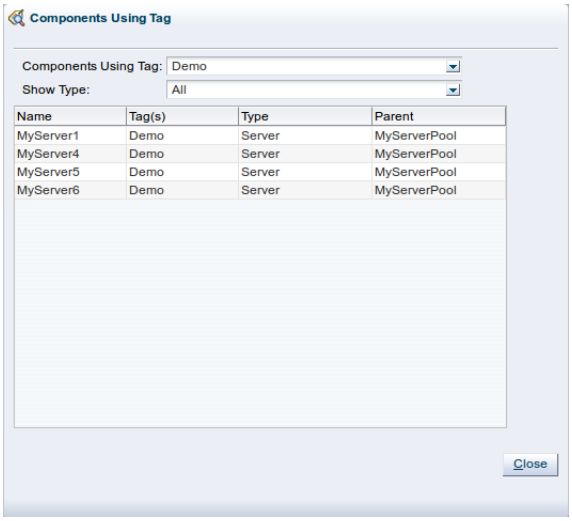

**Note**

Tag names are case-sensitive. Tag names are unique and cannot be duplicated.

Once tags have been created within Oracle VM Manager it is possible to assign them to various components or objects. This can be done by either editing existing objects and adding tags within the dialog that appears, or during the creation of a new object. For instance, to add a tag to an existing server you should locate the server on the **Servers and VMs** tab and select the option to edit the server. In the dialog that appears, click on the **Tags** tab and assign the tags that you wish to use to identify the server in future.




Tags can be reused across objects of different types. For instance, the same tag used to identify a particular set of servers can also be used to group a set of virtual machines together. To see all objects that share the same tag, you can click on the **Find Components** icon on the **Tags** subtab on the **Tools and Resources** tab.




The **Find Components** feature supports multi-select functionality, allowing you to search for components that are tagged by a number of separate tag names. Furthermore, the **Find Components** dialog allows you to filter results by object type, by selecting a particular object type from the **Show Types** drop-down selector.

Many screens within the Oracle VM Manager user interface provide the option to use a **Tag Filter**. This feature takes the form of a drop-down box listing the available tags that can be used to form a filter. Selecting a tag limits the view in the current screen to objects sharing the same tag. On a screen that also provides the **Name Filter** option, it is possible to switch between the filter types by selecting the appropriate filter type from the drop-down menu.


Once a view has been limited using the **Tag Filter** function, batch operations can be performed on all items listed by using shortcut keys such as Ctrl-a to select all items before selecting the operation that you wish to execute.

# Chapter 4 Managing Storage

## Table of Contents



To set up and configure the storage providers for your Oracle VM environment you need to be aware of the concepts and design ideas behind the entire storage architecture. That is precisely the information provided in the first topics of this chapter. Next, you will find the necessary instructions to prepare, configure and start using storage elements with Oracle VM.

For information on managing and working with the contents of a storage repository, such as virtual machine templates, ISO files, assemblies, and so on, see Section 7.5, “Virtual Machine Resources”.

## 4.1 Storage Overview

The particular way in which Oracle VM approaches storage is through plug-ins: Oracle has made storage configuration and integration as flexible and modular as possible by creating a Storage Connect plug-in for each different category and type of storage. These plug-ins are discussed in further detail in Section 4.3, “Storage Connect Plug-ins”.

Storage in Oracle VM refers to two different types of disk storage: the space available for environment resources such as templates and ISO files, and the logical or physical disks used by virtual machines.

**Note**

In addition there is also disk space used for the pool file systems of clustered server pools, but that is not the focus of this section.

For virtual machine disks Oracle VM offers you two choices:

- **Virtual disks**: disk image files on a file system.
- **Raw physical disks**: LUNs accessed directly by the virtual machine.

The design decision of virtual versus physical storage access depends on your server virtualization use cases as well as the existing storage hardware at your disposal. Virtual storage enables quick and easy on-the-fly configuration but introduces a higher level of abstraction, since multiple filesystems are nested within each other. Therefore, when using virtual storage it is important to balance ease of use against the lower performance compared to physical storage. Physical storage access implies that virtual machine disk storage is mapped directly onto the LUNs configured in the physical storage hardware, which is exactly like the way physical servers access their storage. The advantage here is that existing procedures and storage management practices can be maintained.

Storage can be configured locally, specifically using an OCFS2 file system on a local disk of the Oracle VM Server. OCFS2 is used because the file system is accessed simultaneously by multiple VMs, something which most file systems cannot handle, but which OCFS2 is explicitly designed to handle. In general, it is far more reliable to use a separate location for a storage repository, so that it can be addressed by and attached to all Oracle VM Servers in the server pool. This is essential for live migration and HA configurations. Storage is configured with any of the following technologies:

- Local disks
- Shared Network Attached Storage - NFS
- Shared iSCSI SANs: abstracted LUNs or raw disks accessible over existing network infrastructure
- Fibre Channel SANs connected to one or more host bus adapters (HBAs)

**Note**

OCFS2 (Oracle Cluster File System) is used in the storage configurations that are not based on NFS.

To enable HA or live migration, you must make sure all Oracle VM Servers have access to the same storage resources. Specifically for live migration the Oracle VM Servers also must be part of the same server pool. Also note that clustered server pools require access to a shared file system where server pool information is stored and retrieved, for example in case of failure and subsequent server role changes. The server pool file system can either be on an NFS share or on a LUN of a SAN server. For more information about setting up file servers and SAN servers, see Section 4.6, “Managing Storage”.

## 4.2 Storage Types

Oracle VM was designed to allow you to use a wide variety of storage types so you can adapt your configuration to your needs. Whether you have a limited hardware setup or a full rack of servers, whether you perform an installation for testing and temporary internal use or design a production environment that requires high availability in every area, Oracle VM offers support for a suitable storage solution.

Making use of both generic and vendor-specific Storage Connect plug-ins, Oracle VM allows you to use the following types of storage:

- Local Storage
- Shared Network Attached Storage (NFS)
- iSCSI Storage Attached Network

- Fibre Channel Storage Attached Network

## 4.2.1 Local Storage

Local storage consists of hard disks installed locally in your Oracle VM Server. In a default installation, Oracle VM Server will only use the first disk (*/dev/sda*), leaving other disks available for storage.

As long as no partition and data are present the device will be detected as a raw disk. The choice is yours to use the local disks either to provision logical storage volumes as disks for virtual machines or to install a storage repository. If you place a storage repository on the local disk, an OCFS2 file system is installed. If you intend to create a storage repository on a local disk, the disk must not contain any data or meta-data. In this case, it is necessary to clean the disk manually before attempting to create a storage repository on it. This can be used by using the `dd` command:

```
# dd if=/dev/zero of=/dev/disk bs=1M
```

Where `disk` is the device name of the disk where you wish to create the repository. Note that this action is destructive and that data on the device where you perform this action may be rendered irretrievable. Also note that the installation process does not clean disks that are not specified for the actual installation. Therefore, if you have installed Oracle VM Server on a system that contains other disks with pre-existing data, you may choose to clean these disks manually for use as local storage repositories.

**Note**

Local storage can never be used for a server pool file system.

Local storage is fairly easy to set up because no special hardware for the disk subsystem is required. Since the virtualization overhead in this setup is limited, and disk access is internal within one physical server, local storage offers reasonably high performance.

However, the downsides are quickly revealed when you think about configurations with multiple Oracle VM Servers. Local storage by definition remains local and cannot be shared between different servers. Therefore, even if you set up a pool of multiple servers and use the advantages of clustering, virtual machines using local storage can never benefit from high availability: they cannot be migrated from one server to another.

**Note**

In Oracle VM, sharing a local physical disk between VMs is possible but not recommended.

## 4.2.2 Shared Network Attached Storage (NFS)

Network Attached Storage – typically NFS – is a commonly used file-based storage system that is very suitable for the installation of Oracle VM storage repositories. Storage repositories contain various categories of resources such as templates, virtual disk images, DVD ISO files and virtual machine configuration files, which are all stored as files in the directory structure on the remotely located, attached file system. Since most of these resources are rarely written to but are read frequently, NFS is ideal for storing these types of resources.

With Oracle VM you discover NFS storage via the server IP or host name and typically present storage to all the servers in a server pool to allow them to share the same resources. This, along with clustering, helps to enable high availability of your environment: virtual machines can be easily migrated between host servers for the purpose of load balancing or protecting important virtual machines from going off-line due to hardware failure.

NFS storage is exposed to Oracle VM Servers in the form of shares on the NFS server which are mounted onto the Oracle VM Server's file system. Since mounting an NFS share can be done on any server in the network segment to which NFS is exposed, it is possible not only to share NFS storage between servers of the same pool but also across different server pools.

In terms of performance, NFS is slower for virtual disk I/O compared to a logical volume or a raw disk. This is due mostly to its file-based nature. For better disk performance you should consider using block-based storage, which is supported in Oracle VM in the form of iSCSI or Fibre Channel SANs.

### 4.2.3 iSCSI Storage Attached Network

With Internet SCSI, or iSCSI, you can connect storage entities to client machines, making the disks behave as if they are locally attached disks. iSCSI enables this connectivity by transferring SCSI commands over existing IP networks between what is called an initiator (the client) and a target (the storage provider).

To establish a link with iSCSI SANs, all Oracle VM Servers can use configured network interfaces as iSCSI initiators. It is the user's responsibility to:

- configure the disk volumes (iSCSI LUNs) offered by the storage servers
- discover the iSCSI storage through Oracle VM Manager
- set up access groups, which are groups of iSCSI initiators, through Oracle VM Manager, in order to determine which LUNs are available to which Oracle VM Servers

Performance-wise an iSCSI SAN is better than file-based storage like NFS and it is often comparable to direct local disk access. Because iSCSI storage is attached from a remote server it is perfectly suited for a clustered server pool configuration where high availability of storage and the possibility to live migrate virtual machines are important factors.

Provisioning of iSCSI storage can be done through open source target creation software at no additional cost, with dedicated high-end hardware or with anything in between. The generic iSCSI Storage Connect plug-in allows Oracle VM to use virtually all iSCSI storage providers. In addition, vendor-specific Storage Connect plug-ins exist for certain types of dedicated iSCSI storage hardware, allowing Oracle VM Manager to access additional interactive functionality otherwise only available through the management software of the storage provider. Examples are creating and deleting LUNs, extending existing LUNs and so on. Check with your storage hardware supplier if a Storage Connect plug-in is available. For installation and usage instructions, consult your supplier's plug-in documentation.

### 4.2.4 Fibre Channel Storage Attached Network

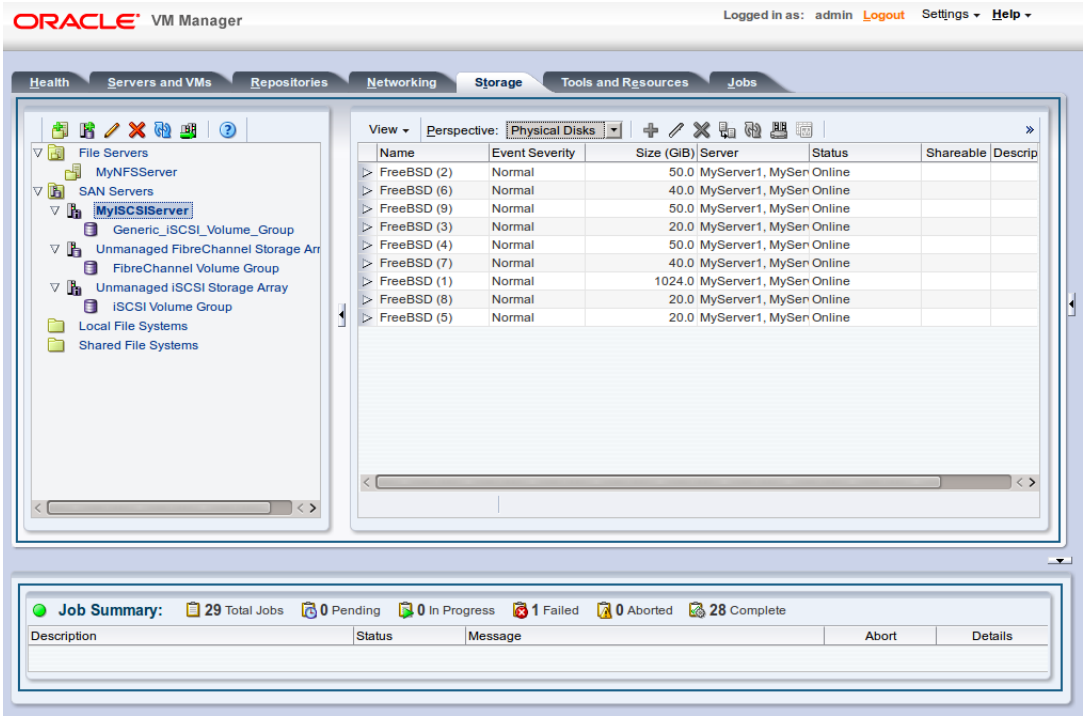
Functionally, a fibre channel SAN is hardly different from an iSCSI SAN. Fibre channel is actually older technology and uses dedicated hardware instead: special controllers on the SAN hardware, host bus adapters or HBAs on the client machines, and special fibre channel cables and switches to interconnect the components.

Like iSCSI, a Fibre Channel SAN transfers SCSI commands between initiators and targets establishing a connectivity that is almost identical to direct disk access. However, whereas iSCSI uses TCP/IP, a Fibre Channel SAN uses Fibre Channel Protocol (FCP). The same concepts from the iSCSI SAN, as described above, apply equally to the Fibre Channel SAN. Again, generic and vendor-specific Storage Connect plug-ins exist. Your storage hardware supplier will provide proper documentation with the Storage Connect plug-in.

## 4.3 Storage Connect Plug-ins

Oracle VM Manager communicates with all storage through a set of plug-ins, which are part of the Storage Connect framework. These plug-ins are not actually run from the Oracle VM Manager but rather live on some or all of the Oracle VM Servers. You can see these plug-in files in the local file system of an Oracle VM Server in the */opt/storage-connect/* directory. In the Oracle VM Manager user interface you select an available plug-in when creating and configuring storage elements for use in your environment.

**Figure 4.1 Storage tab in the Oracle VM Manager user interface**




As you can see in the **Storage** tab in Figure 4.1, “Storage tab in the Oracle VM Manager user interface”, storage elements are logically divided in File Servers and SAN Servers. This distinction refers to the difference between file-based storage and block-based storage, or raw disks. Both types of storage are supported and Storage Connect plug-ins are available for each category described in Section 4.2, “Storage Types”.

Furthermore, Storage Connect plug-ins are split up according to the functionality they offer: there are generic plug-ins and non-generic plug-ins, also referred to as vendor-specific plug-ins. Generic plug-ins offer a limited set of standard storage operations on virtually all storage hardware, such as discovering and operating on existing storage resources. We categorize these operations as 'passive' in the sense that they do not interact with the storage management but simply detect the available storage architecture and allow it to be used in the Oracle VM environment.

Vendor-specific plug-ins include a much larger set of operations, which also includes direct, active interventions on the storage hardware: snapshot, clone, create LUNs, resize, and so on. To execute generic storage plug-in operations, only an access host or fibre channel connectivity is required (for iSCSI: typically a host name or IP address with a port number). The non-generic plug-in operations require an additional admin host, with optional administrative user name and password, granting Oracle VM Servers, with the appropriate plugin installed, direct access to the configuration of the storage hardware.

The following plug-ins are included with Oracle VM Server and will work with Oracle VM Manager:

- Oracle Generic NFS Plug-in.
- Oracle Generic SCSI Plug-in.

To install vendor-specific plug-ins, see Section 4.3.1, “Installing Storage Connect Plug-ins”.

### 4.3.1 Installing Storage Connect Plug-ins

Vendor-specific (non-generic) storage connect plug-ins are available directly from your storage vendor.

A complete list of vendor-specific plug-ins is available here:https://wikis.oracle.com/display/oraclevm/Oracle+VM+Storage+Connect+Plugins.

Storage connect plug-ins are delivered as an RPM, usually a single RPM, but your storage vendor may provide multiple RPMs. When you have the storage connect plug-in RPM from your storage vendor, install the RPM on your Oracle VM Servers.

**Note**

You must install the RPM on all the Oracle VM Servers that will use the particular storage.

To install the storage plug-in RPM, on the command line of the Oracle VM Server, enter

```
# rpm -ivh filename.rpm
```

If you are upgrading an existing storage connect plug, use the RPM upgrade parameter:

```
# rpm -Uvh filename.rpm
```

If you are installing or upgrading a storage connect plug-in on an Oracle VM Server already managed by Oracle VM Manager, rediscover the Oracle VM Server to update the database repository with the latest configuration information about the Oracle VM Server.

Read the install and configuration documentation for the storage connect plug-in from your storage vendor before you install and use it. There may be extra configuration required that is not documented here.

## 4.4 Storage Repositories

A storage repository is essentially logical disk space made available through a file system on top of physical storage hardware. If the storage repository is created on a file server, for example an NFS share, then a file system is already present; if the repository is created on a LUN, an OCFS2 file system is created first.

A storage repository defines where Oracle VM resources may reside. Resources include virtual machine configuration files, templates for virtual machine creation, virtual machine assemblies, ISO files (DVD image files), shared and unshared virtual disks, and so on.

**Warning**

Never manually copy Oracle VM resources such as virtual machine configuration files from one repository to another, as this can cause duplication of UUIDs within the Oracle VM environment and can cause Oracle VM to malfunction. Always use the tools provided by Oracle VM Manager to move resources. For instance, to move a virtual machine configuration from one storage repository to another use the Move Virtual Machine wizard described in Section 7.10.9, “Moving Virtual Machines Between Repositories”.

Before you begin configuring a storage repository, make sure that these requirements are met:

- **NFS-based repository:** At least one Oracle VM Server must be discovered. The NFS server must be accessible to all of the Oracle VM Servers that are to use it. The NFS server directory must be writeable.

- **LUN-based repository:** The iSCSI server must be accessible to all of the Oracle VM Servers that are to use it. The iSCSI server directory must be writeable. A server pool must exist with clustering enabled, and at least one server must be present in the clustered pool. By design, a storage repository on a LUN is linked to a clustered server pool, because of the nature of the OCFS2 file system it uses.

  A repository on a local server storage also belongs in this category, since local disks are always discovered as LUNs. For more information about local storage and repositories, see Section 4.6.5, “Using Local Storage”.

**Note**

Only NFS storage repositories can be shared by multiple server pools.

For detailed instructions about the configuration and management of storage repositories, see Section 4.8, “Managing Storage Repositories”.

## 4.5 Storage Configuration Guidelines

It is important to plan your storage configuration in advance of deploying virtual infrastructure. Here are some guidelines to keep in mind:

- Take care when adding, removing, and resizing LUNs as it may require a physical server reboot. Do not resize LUNs that are used as part of Logical disks; instead, create a new LUN and add it to the disk group.
- Avoid remapping LUNs as this can cause data corruption since the targets have been switched outside of the server. The Linux SCSI layer does not support dynamic remapping of LUNs from the storage array.
- Test your configuration, especially fail over, in a test environment before rolling into production. If your (SAN) array firmware is at a different release number than we have tested, confirm whether there are any differences. You may need to make changes to the multipath configuration files of Oracle VM Server.
- Plan the size and type of storage that you are using by workload. For example:
  - Boot volumes can typically be on higher capacity drives as most operating systems have minimal I/O activity on the boot disk, but some of that I/O is memory paging, which is sensitive to response times.
  - Applications can be on larger, slower drives (e.g. RAID 5) unless they perform a lot of I/O. Write-intensive workloads should use RAID 10 on medium to fast drives. Ensure that log files are on different physical drives than the data they are protecting.
  - Infrastructure servers such as DNS tend to have low I/O needs. These servers can have larger, slower drives.
- If using storage server features such as cloning and snapshots, use raw disks.
- While it may be tempting to create a very large LUN when using logical disks, this can be detrimental to performance as each virtual machine queues I/Os to the same disks. Oracle recommend that storage repositories do not exceed 2TB.
- Be sure to leave some disk space available to create smaller storage entities of, at least, 12GB each to use as server pool file systems. The server pool file system is used to hold the server pool and cluster data, and is also used for cluster heartbeating. You create space for server pool file systems the same way as you create storage entities for storage repositories. For more information about the use and

management of clusters and server pools, see Chapter 6, *Managing Server Pools and Oracle VM Servers*.

- Place server pool file systems on a separate NFS server or use a small LUN, if possible. The OCFS2 heartbeating function can be disturbed by I/O-intensive operations on the same physical storage. For example: importing a template or cloning a VM in a storage repository on the same NFS server where the server pool file system resides may cause a time-out in the heartbeat communication, which in turn leads to server fencing and reboot. To avoid unwanted rebooting, it is recommended that you choose a server pool file system location with sufficient and stable I/O bandwidth.
- Disable read and write caching on the underlying disk systems to guarantee I/O synchronization. Caching may result in data loss if the Oracle VM Server or a virtual machine fails abruptly. To disable write caching, change the applicable settings in the RAID controller BIOS. Alternatively, use the `sg_wr_mode` command or use the SCSI disk class directly: `echo "write through" > /sys/class/scsi_disk/scsi-device-id/cache_type`.

**Warning**

When creating exports on a fileserver, if you choose to restrict access to a particular set of hosts, then all exports on the fileserver must have an identical list of permitted hosts in the export list. In Oracle VM Manager all of the hosts that have been permitted access must be added to the file server's list of Admin Servers. See Section 4.6.1, “Discovering File Servers” for more information on adding Admin Servers to your file server in Oracle VM Manager.

## 4.6 Managing Storage

As described in Section 4.1, “Storage Overview”, Oracle VM Manager distinguishes between File Servers and SAN Servers in the **Storage** tab. Depending on your hardware and networking configuration, external storage may be detected during discovery of the Oracle VM Servers or a rescan of their physical disks. Local storage is always detected during this discovery operation.

An external storage element is created on storage hardware: a server configured for NAS offering NFS shares, generic iSCSI targets and LUNs, or SAN devices from your preferred storage vendors. The server or disk subsystem offering the storage simply needs to be reachable by the Oracle VM Servers in the Oracle VM environment through a Fibre Channel or Ethernet network. The external storage is offered as a mount point (NFS share) or LUN (iSCSI and fibre channel) which can be discovered through Oracle VM Manager as a potential location for a repository, or a raw disk for use with a VM.

The typical way to attach external storage to the Oracle VM environment is to create a new storage entity in Oracle VM Manager and point to the location of the external storage provider while selecting the appropriate Storage Connect plug-in.

Subsequently, you may choose to configure a storage repository on one or more of the discovered storage entities in order to make storage resources available to servers and server pools in the Oracle VM environment.

These preparation and configuration steps are covered in the following topics. Storage repository configuration is covered in Section 4.8, “Managing Storage Repositories”.

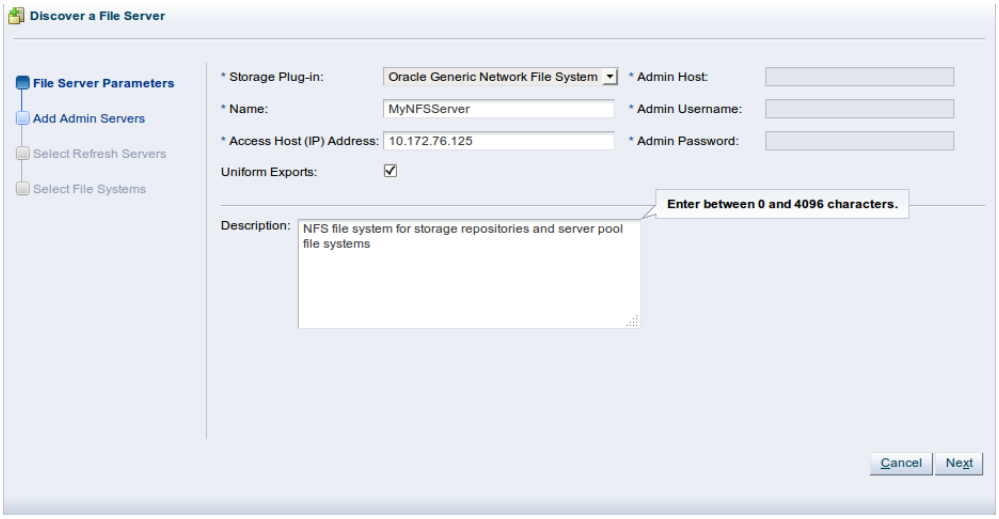
### 4.6.1 Discovering File Servers

In Oracle VM, the term *file server* is used to indicated file-based storage made available to the environment from another physical server, as opposed to local storage. Describing the technology used to expose file systems, NFS shares and so on, is beyond the scope of this guide. The procedure below explains how

you can bring the exposed file-based storage into Oracle VM, prepare it for the installation of a storage repository, and configure the file server and discovered file systems.

**To discover a file server:**

1. Make sure that your storage server exposes a writable file system to the storage network of your server pool.
2. Select the **Storage** tab.
3. In the toolbar above the navigation pane, click **Discover File Servers** . The **Discover a File Server** dialog box is displayed, where you enter the information necessary for Oracle VM Manager to discover the external storage mount points.




4. Always enter the following information:
   - **Storage Plug-in:** The storage plug-in corresponding to the type of file server (generic NFS or vendor-specific).
   - **Name:** The name you wish to use to identify the file server.
   - **Access Host:** The host name or IP address of the server offering the file system.
   - **Uniform Exports:** If all Oracle VM Servers in all server pools have access to the same exports on the file server, leave this as the default (checked). If the file server is configured to offer different exports to different server pools, this box should be unchecked and, once you have completed the steps in the wizard, you need to configure NFS Access Groups so that Oracle VM Manager can be made aware of export permissions. See Section 4.6.1.1, “NFS Access Groups for Non-uniform Exports” for more information.

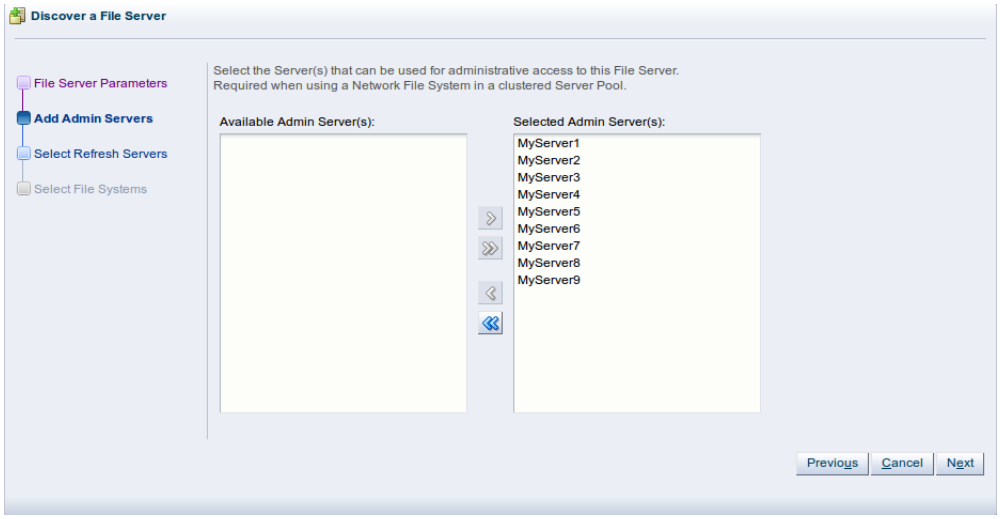
     > **Important**
     >
     > Non-uniform exports are not intended for servers within the same server pool. Your NFS server should be configured to, at least, provide the same exports to all of the servers that belong to a particular clustered server pool.

   - **Description:** Optional information you would like to add about this file server.
5. If you are adding a non-generic file server, for example a Sun ZFS Storage Appliance, also enter the additional plug-in options to enable Oracle VM Manager to access the file server's configuration management functions:

- **Admin Host:** The host name or IP address where administrative access to the file server is allowed with appropriate credentials.
- **Admin User Name:** A user name with administrator access to the file server.
- **Admin Password:** The administrator password for the user name you entered.

6. Click **Next** to proceed to the admin server selection screen. If you are working with a non-clustered server pool, you may skip this screen. Admin servers are designated Oracle VM Servers that are capable of logging into a storage array or file server to perform administrative functions such as extending a file system or creating a new LUN. In the case of an NFS file server, admin servers are only used to validate the file server. For backward compatibility reasons, admin servers are also capable of being used to perform file server refreshes in much the same way as refresh servers.

   Use the arrow buttons to move the required Oracle VM Servers to the **Selected Servers** box.



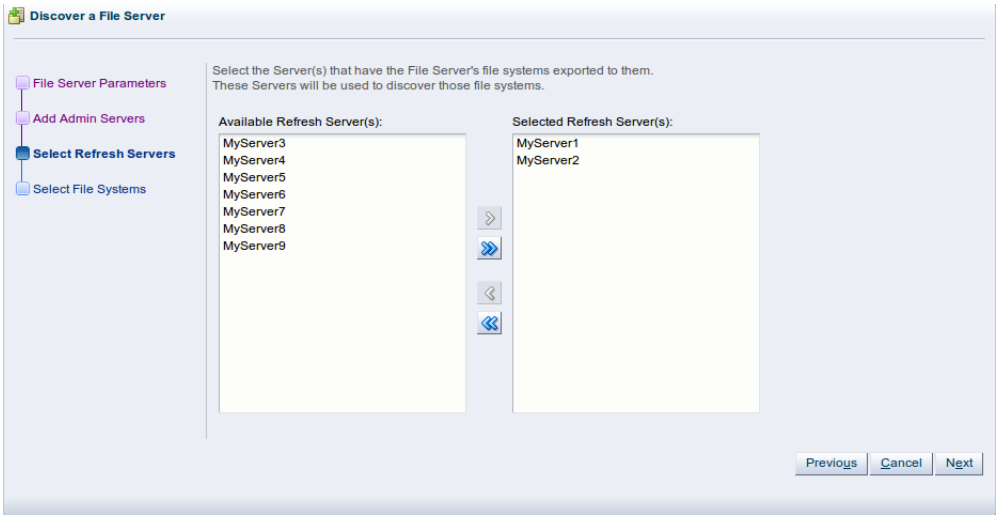

7. Click **Next** to proceed to the refresh servers selection screen. Refresh servers are designated Oracle VM Servers that have visibility of one or more file systems on an NFS file server. These servers are used for file system refreshing across server pools.

   Each file system must be assigned at least one refresh server to allow for file system refreshing. During the refresh of a file server, the refresh servers are used to refresh all file systems used across all pools. For this reason it is critical that your refresh server list contains at least one server from each server pool.

> **Important**
>
> In some environments, it is plausible to expect that the file server is configured to provide different file system exports to different server pools. Therefore, it is possible that no single server has access to all of the exports provided by a file server. By assigning a server from each server pool to handle file system refreshes, Oracle VM can ensure that all file systems are refreshed across all server pools. If your environment is set up in such a way, you need to configure NFS Access Groups so that the manager can be made aware of export permissions. See Section 4.6.1.1, “NFS Access Groups for Non-uniform Exports” for more information.

If you select the Refresh All [153] option available in the context menu for Server Pools on the Servers and VMs tab, the configured refresh servers specified for each filesystem are used to perform a comprehensive file system refresh and you are not provided with an option to use one or more alternate refresh servers.

In this screen, you must include at least one server from each server pool that you intend to create. You may select more than one server from each server pool in order to ensure high availability, but adding more than two servers is superfluous.



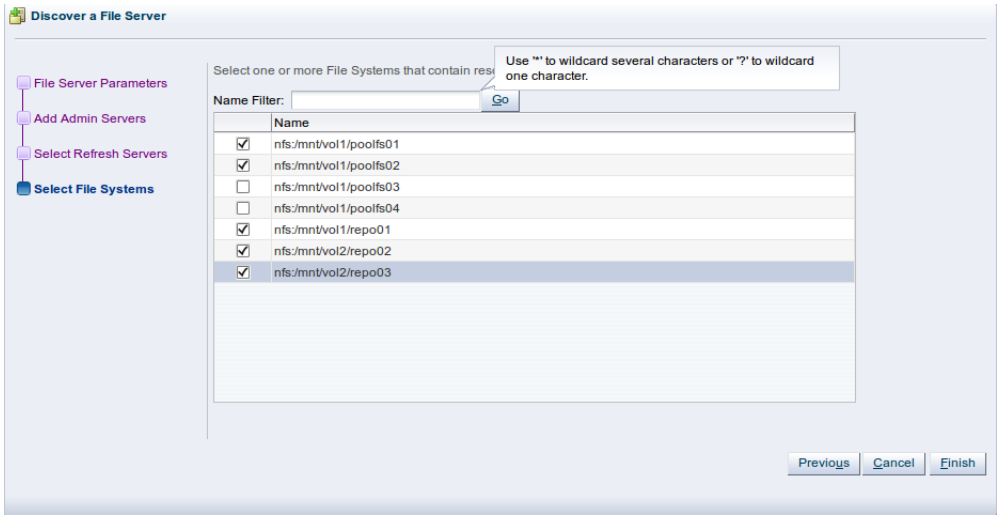

**Note**

If you defined a group of admin servers in the previous step, for backward compatibility reasons, these servers are added to the refresh server list, and can be used to perform file server refreshes as well. This is not apparent in the Oracle VM Manager user interface.

8. If you are using non-uniform file system exports (as selected on the first screen of this wizard), click **Finish** to complete the wizard. A message is displayed to inform you that you should now create access groups for the file server. See Section 4.6.1.1, “NFS Access Groups for Non-uniform Exports” for information on creating an NFS access group. When at least one access group is configured, you should then refresh the file systems on the file server to make them available for use in Oracle VM Manager. See Section 4.6.2, “Managing File Server Configuration” for information on refreshing a file server.

   If you are using uniform file system exports, click **Next** to proceed to the file systems selection screen. If any file systems contain existing virtual machine resources, select the corresponding check boxes to have Oracle VM Manager add the existing resources to the environment.

   At the top of the screen you can see that there is an option to provide a **Name Filter**. You can use this filter to specify search criteria to limit the objects displayed. See Section 3.14, “Name Filters” for more information.



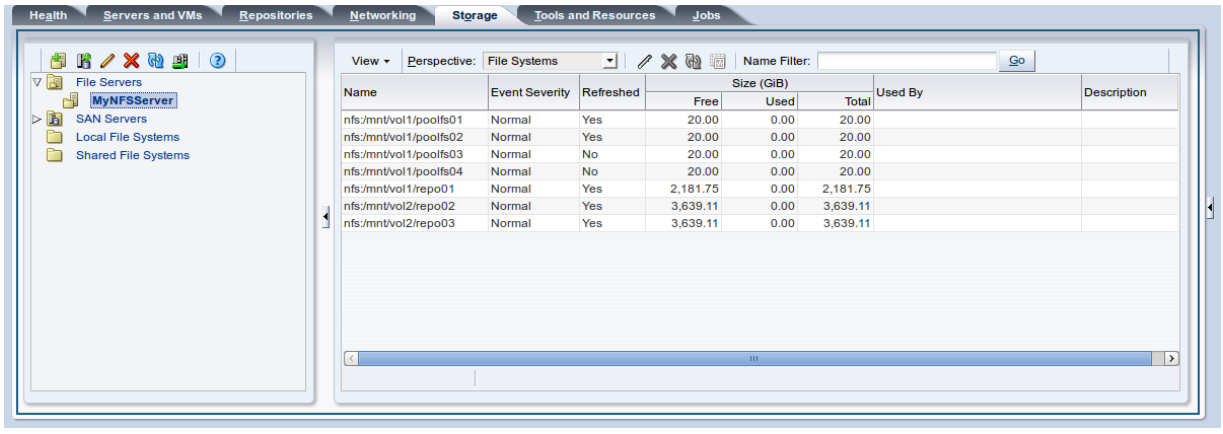

Click **Finish** to complete the file server registration.

9. The new file server appears in the navigation pane, under **File Servers**.

**Note**

If you created shares to be used as server pool file systems, these are discovered in the same process. Since these file systems are relatively small, be sure to keep those available for the server pools and create storage repositories on the higher capacity file systems.

At the end of the file server discovery a refresh operation is triggered to make sure all file systems available on the file server appear in Oracle VM Manager. When the operation is complete, and if you select the file server in the navigation pane, the available file systems appear in the **File Systems** overview table in the management pane.




Your file server and file systems are now ready to be used either for storage repositories or as server pool file systems. A server pool file system is selected during the creation of the server pool; to create storage repositories on your file systems, see Section 4.8, “Managing Storage Repositories”.

**Warning**

If a server is unable to mount the file system for some reason, such as a permissions related issue, Oracle VM Manager does not report the failure as this

would stop any further mounting. If a server is unable to access a file system the reason is reported in the `/var/log/ovs-agent.log` log file on the server.

#### 4.6.1.1 NFS Access Groups for Non-uniform Exports

Usually an NFS server is configured to export the same file systems to different server pools. This setup is described as having *uniform exports*. If, however, your NFS server is configured to export *different* file systems to *different* server pools, no single server in any server pool has full access to all of the exports available on the NFS server. This setup is described as having *non-uniform exports*. In these cases, in order for Oracle VM Manager to properly handle file system refreshes, you need to configure NFS Access Groups to define the permissions available to each server pool. If your exports are uniform across all server pools, you do not need to perform this operation.

It is important to understand that when describing uniform and non-uniform exports, we are describing how the NFS server is configured to present exports to all of the servers belonging to a particular server pool. Within any clustered server pool, all of the servers must have access to the same exports on the NFS server.

**To configure NFS Access Groups for non-uniform exports**

1. In the Storage tab, expand the **File Servers** folder in the navigation pane and select a file server listed here. In the management pane, select the **NFS Access Groups** perspective from the drop down.

2. To add a new NFS Access Group, click on the **Create NFS Access Group** icon .

   a. The Create NFS Access Group wizard appears. Enter a meaningful name and description for the NFS Access Group that you are creating. The group defines the set of file systems that are available to a particular set of servers. Click **Next**.

   b. In the Select File Systems dialog, identify the file systems that are accessible via the set of servers that you are going to assign to the NFS Access Group. Use the arrow buttons to move them into the Selected File System(s) panel. Click **Next**.

   c. In the Select Servers dialog, select either the individual servers or the server pools that have access to the file system exports that you selected in the previous step. Use the arrow buttons to move them into the Selected Server(s)/Selected Server Pool(s) panel. Click **Finish** to complete the process of defining a new NFS Access Group.

3. To edit an existing NFS Access Group, click on the **Update NFS Access Group** icon . This will open the Edit NFS Access Group dialog. Tabs are provided to allow you to change the NFS Access Group details, File Systems and Servers.

4. To delete an existing NFS Access Group, click on the **Delete NFS Access Group** icon . A confirmation dialog is displayed before the action can be completed.

5. To view events pertaining to an existing NFS Access Group, click on the **NFS Access Group Events** icon . The Events dialog is displayed showing a listing of events specific to the NFS Access Group. You may need to acknowledge particular events in order to resolve an issue. See Section B.1.11, “Acknowledging Events/Errors” for information on acknowledging events.

### 4.6.2 Managing File Server Configuration

It is possible to edit the configuration for an existing file server. The steps and options to do so are described below.

**To change the registered file server configuration:**

1. If you need to modify a file server, select the **File Servers** folder in the navigation pane, select one or more file servers in the management pane table, and use the applicable buttons in the management pane toolbar. Alternatively, right-click the file server and choose one of these corresponding options:

   - **Edit File Server:** Change file server settings such as name, access host, description and plug-in options; change admin server settings in the second section of the wizard.
   - **Delete File Server:** Remove the selected file server from your Oracle VM environment.
   - **Discover File Systems:** Discover all file systems for one or more file servers.
   - **Refresh File Server:** Request an update of the configuration for one or more file servers in case changes have been made to the disks and file systems.
   - **Add/Remove Admin Server:** Determine which Oracle VM Servers are responsible for information exchange with this file server.

2. If you need to modify a file system, select the file server it belongs to, and make sure the perspective of the management pane is set to **File Systems**. Select one or more file systems in the overview table and click the appropriate button in the toolbar above to choose one of these options:

   - **Edit File System:** Change the name and description of the file system.
   - **Delete File System:** Stop using the selected file systems in your Oracle VM environment.
   - **Refresh File System:** Request an update of the file system information for one or more file systems to see if changes have been made to the size and contents. When selecting one or more file systems to be refreshed the **Refresh Servers** selected for this purpose during the initial discovery of the file server are used to temporarily mount the selected file systems during the file system refresh.
   - **Display Selected File System Events:** Display the **Events** dialog box to see events for the file system.

## 4.6.3 Handling Unmanaged Storage Arrays

The purpose of listing unmanaged storage arrays is that Oracle VM warns you when it detects storage in the environment for which no particular management mechanism is available or in case the appropriate management mechanism cannot be determined. In other words, the unmanaged storage arrays, for iSCSI and for fibre channel, are placeholders for physical disks of which the appropriate location in the storage management tree is unclear.

It should be noted that the unmanaged arrays behave differently for iSCSI and fibre channel. For iSCSI the use of the unmanaged array in practice is temporary, but for fibre channel the situation is different. Because generic fibre channel arrays are simply detected when they are connected to the storage network, there is no mechanism to place them under a separate storage array based on a specific access host. Consequently, generic fibre channel LUNs will remain in the unmanaged fibre channel storage array, which has no access group.

**Warning**

You must always configure an admin server when using generic fibre channel storage with Oracle VM. The admin server is required for discovery and administrative operations. For example, rescanning the physical disks of an array will not produce any results if no admin server is set. Configure the admin server(s) as described in Section 4.6.4.3, “Editing a SAN Server”.

You may choose to delete the unmanaged storage elements from the Oracle VM environment in case you do not intend to use it. In the case of generic iSCSI storage arrays, it is preferable to register them in the correct way by following the procedures in Section 4.6.4.1, “Discovering a SAN Server”. To properly register the storage entries, you should remove them from the unmanaged array. After registration these entries are displayed under a managed storage array of the appropriate type.

Vendor-specific storage, which does not use a generic Storage Connect plug-in, must always be registered with its dedicated plug-in and appears under its own storage array entry in the storage management tree.

## 4.6.4 Managing SAN Servers

In Oracle VM, the term *SAN server* is used to indicate block-based storage made available to the environment from another physical server. The storage entities are also referred to as *storage arrays* and include external as well as local storage volumes. Describing the technology used to expose raw disk space in the form of iSCSI targets and LUNs or the configuration of a SAN (storage attached network), is beyond the scope of this guide. The procedure below explains how you can bring the exposed block-based storage into Oracle VM and configure the storage array and physical disks either for the installation of a storage repository or direct attachment as physical disk to a virtual machine.

**Note**

Oracle VM has a default *Unmanaged Fibre Channel Storage Array*. Since only a single generic fibre channel storage array can exist, no additional arrays of this type can be created. Consequently, the instructions below apply to SAN servers and storage arrays using the following types of Storage Connect plug-ins:

- Generic iSCSI.
- Vendor-specific iSCSI.
- Vendor-specific fibre channel.

The end-to-end procedure is broken down into three phases, discussed in the following sections.

### 4.6.4.1 Discovering a SAN Server

This first phase covers the discovery and registration part, meaning how you discover the container of the storage elements you intend to use in your environment.

Depending on the selected storage type and plug-in, you may be required to enter additional information than shown in this example (which uses an ISCSI SAN server) when registering your storage array, as shown in the following table.

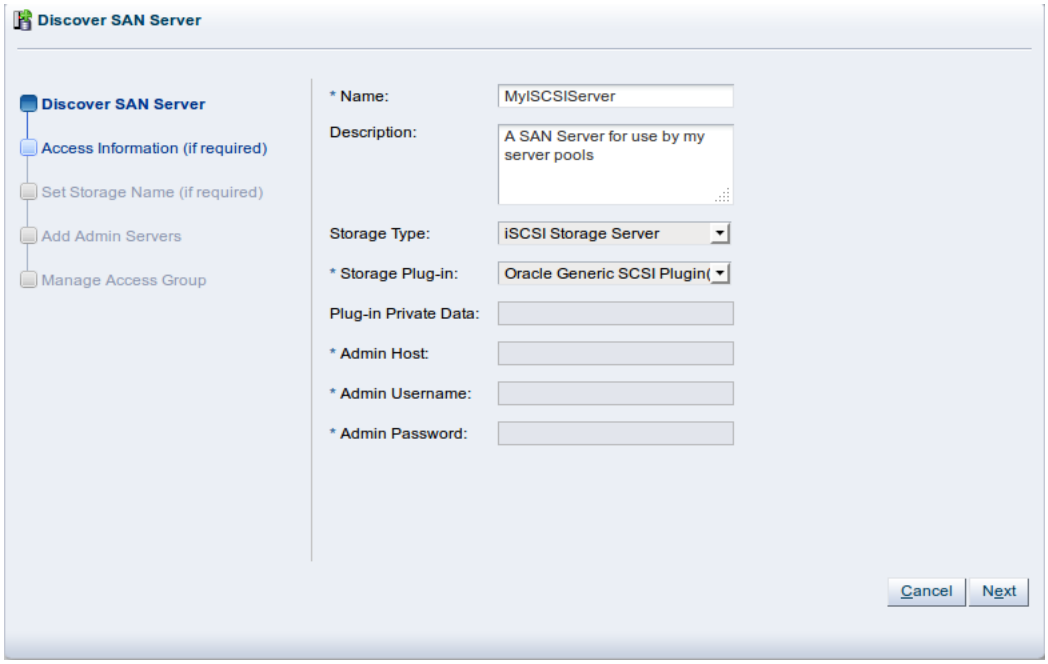
**Table 4.1 Required Information for Registering Different Storage Types**

| Information Field Required | Generic iSCSI | Vendor-specific iSCSI | Generic Fibre Channel | Vendor-specific Fibre Channel |
|---|---|---|---|---|
| Access host and port | Yes | Yes | No | No |
| Access credentials/Chap | No | Optional | No | No |
| Administration information | No | Yes | No | Yes |
| Plug-in private data | No | Optional | No | Optional |

**To discover a storage array:**

1. Make sure that your storage server exposes raw disks (Fibre Channel SAN volumes, iSCSI targets and LUNs) to the storage network of your server pool.

2. Select the **Storage** tab.
3. In the toolbar above the navigation pane, click **Discover SAN Server** .
4. The **Discover SAN Server** wizard is displayed, where you enter the information necessary for Oracle VM Manager to discover the external storage elements.




In the **Discover SAN Server** step enter the following information:

- **Name:** The name you wish to use to identify the SAN server.
- **Description:** Optional information you would like to add about this SAN server.
- **Storage Type:** The array is either a SAN or an iSCSI storage server.
- **Storage Plug-in:** The storage plug-in corresponding to the type of storage array, which is either generic iSCSI, or a vendor-specific iSCSI or fibre channel plug-in.
- **Plugin Private Data:** Any vendor-specific storage plug-in data that may be required. This is not available to generic storage.

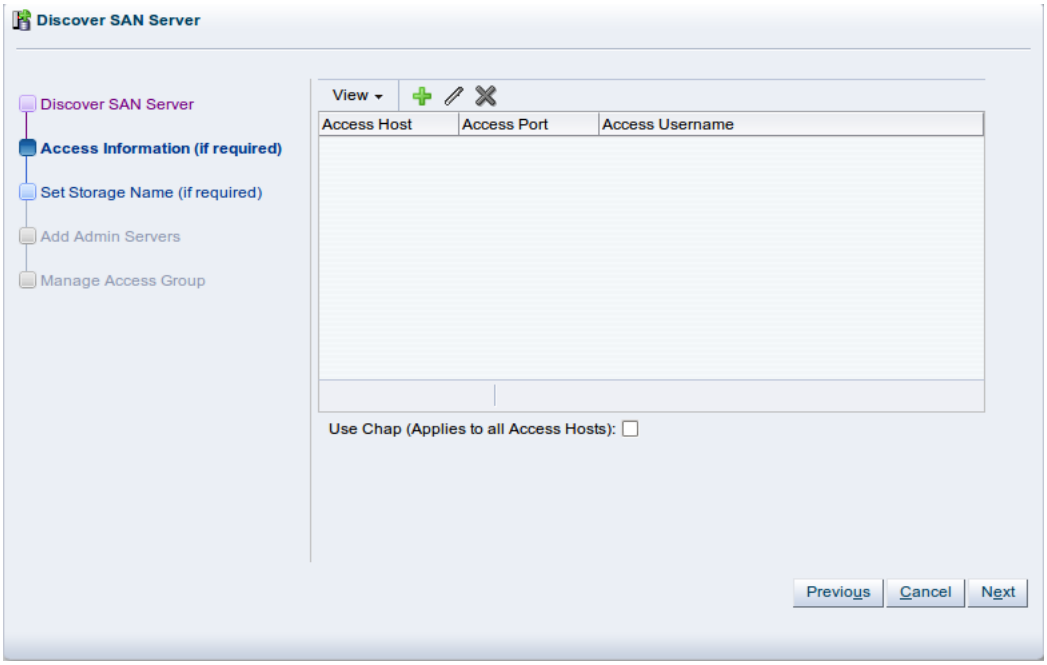
**Note**

When registering a vendor-specific storage array, be sure to double-check the information you entered in the plug-in private data field. Once the storage array is registered, this field can no longer be modified. If you need to update the plug-in private data, you must unregister and re-register the storage array.

- **Admin Host:** The host name or IP address of the administration host. This is not available to generic storage.
- **Admin Username:** The admin host username. This is not available to generic storage.
- **Admin Password:** The password for the admin user. This is not available to generic storage.

Click **Next**.

5. The **Access Information** step is displayed. This is not applicable to fibre channel storage arrays.

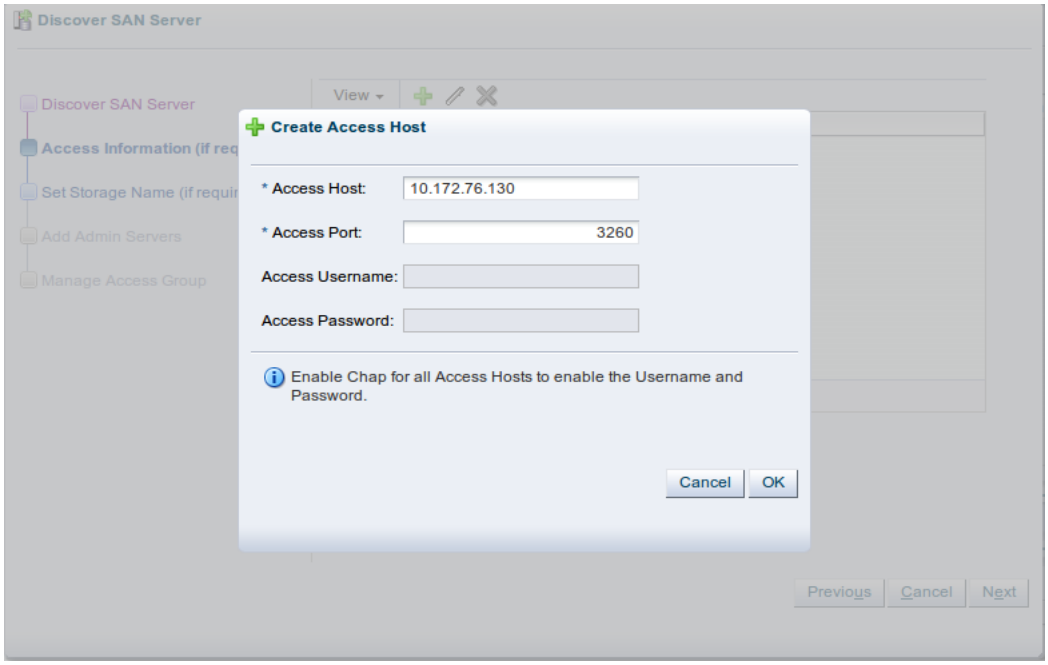



An access host is the IP address of the network interface that has access to the SAN server and creates a network path to the storage. On this screen enter one or more access hosts to create network paths to the storage. To add multiple paths (for multipathing), add multiple access hosts. You must have at least one access host to the storage. On some ISCSI servers, only one access host is supported, so your screen may differ from the example in this step. If so, enter the access host IP address, access port and optionally the Chap authentication details on the screen that you see, and the remaining parts of this step are not required to performed.

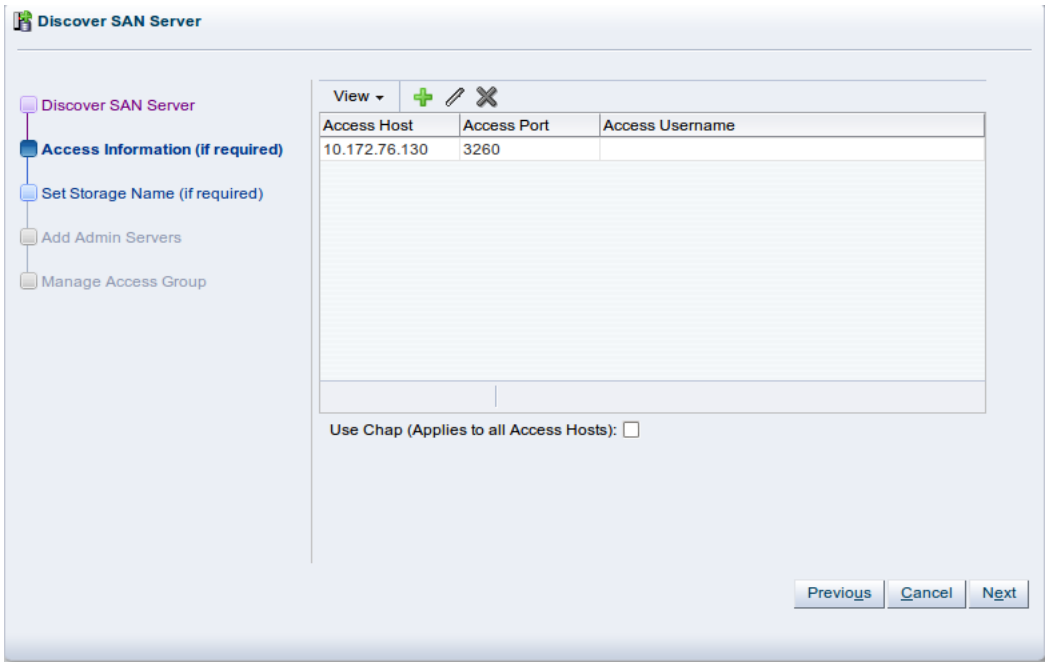
If you want to use Chap authentication to connect to the SAN server, check the **Use Chap** check box.

Click **Create New Access Host** to add access hosts for the SAN server.

The **Create Access Host** dialog box is displayed.




Enter the IP address and access port of the host that has access to the SAN server. The default access port for iSCSI is 3260. If you checked Chap authentication on the previous screen, enter the username and password to access the storage. Click **OK**.



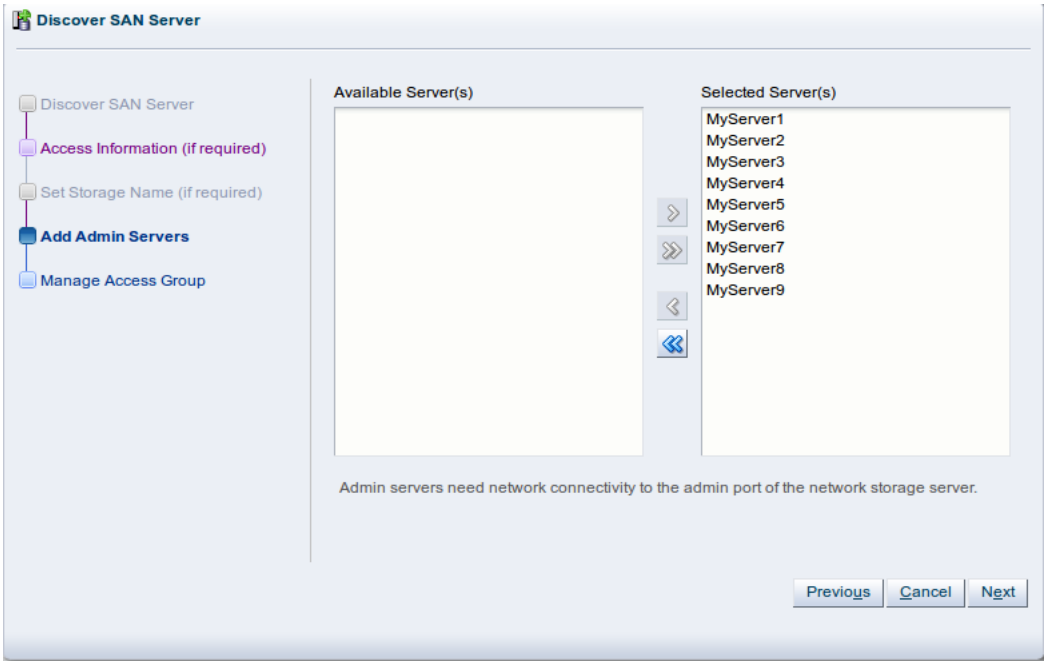

Repeat this step for each access host, for example, you may have access hosts such as 10.172.76.130, 10.172.76.131, 10.172.77.130, and 10.172.77.131 to enable multipathing.

When you have entered all access hosts, click **Next**.

6. For most SAN servers the wizard moves straight to the **Add Admin Servers** step. However, if you have vendor-specific storage hardware with an admin host handling more than one storage array, such as certain HP EVAs and EMC arrays, you must enter the name of the array to be used for the new

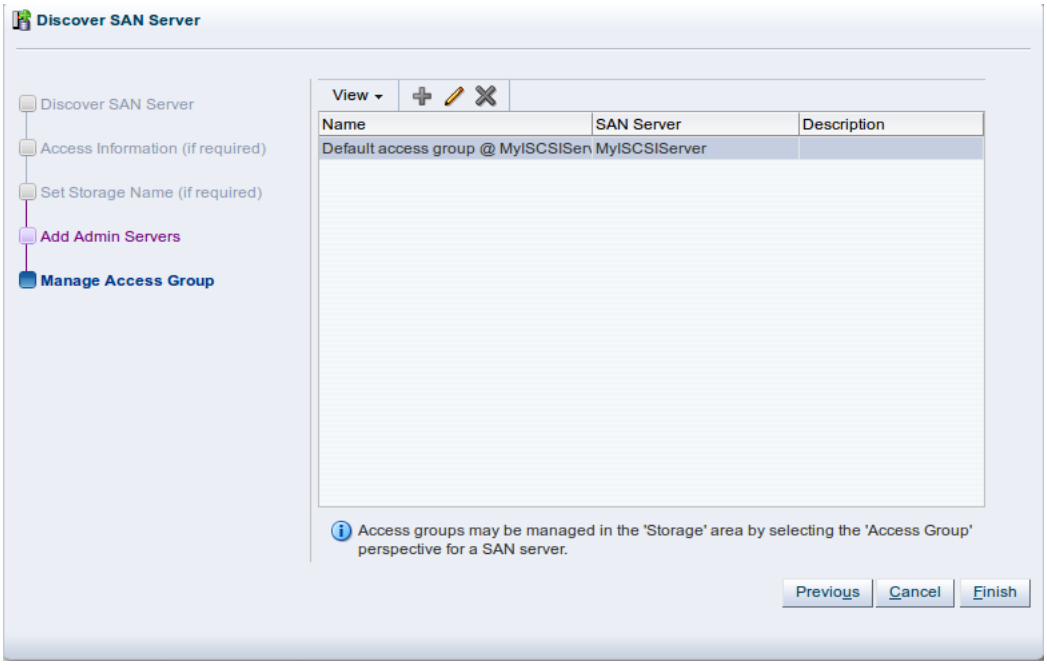
SAN server. The wizard recognizes this type of storage and displays the **Set Storage Name** step when applicable. Enter the storage name and click **Next**.

7. The **Add Admin Servers** step is displayed. If you are working with a non-clustered server pool, you may skip this step.




Use the arrow buttons to move the required Oracle VM Servers to the **Selected Servers** box. This selects which Oracle VM Servers are to be made available to perform Oracle VM related admin operations on the SAN server. Click **Next**.

8. The **Manage Access Group** step is displayed.



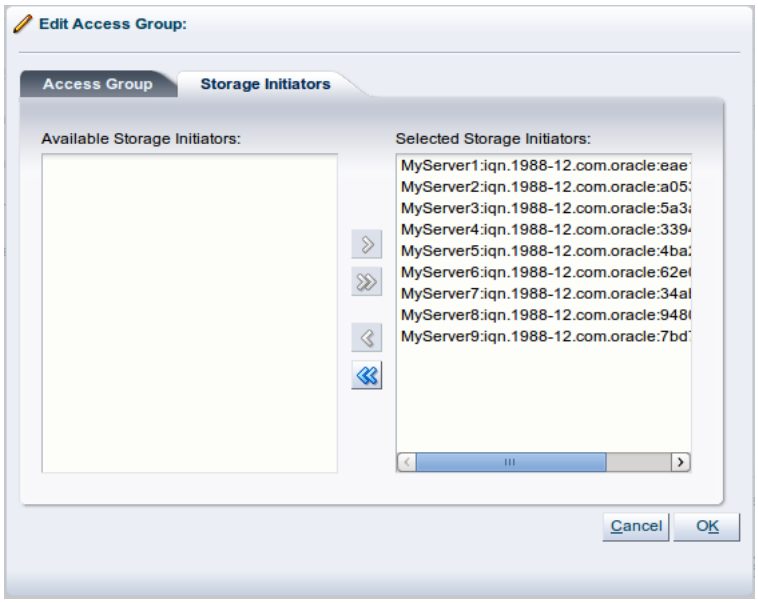
This final phase of the wizard offers you the access group configuration functionality. Within an access group you add the storage initiators to Oracle VM Servers to complete the storage configuration.

> **Important**
>
> You must add a storage initiator to an access group for each Oracle VM Server that you want to access the SAN server. If you do not add any storage initiators, Oracle VM cannot log in to the storage array and no LUNs can be accessed.

A default access group may be created during the discovery process.

- If no access group exists, you can create one from this screen by clicking **Create Access Group** .
- If you want to modify an existing access group for use with this SAN server, select it from the list and click **Edit Access Group** .
- If necessary, you can delete an access group by clicking **Delete Access Group**

This example uses a generic ISCSI SAN server, so a default access group is created. Select the default access group in the table and click **Edit Access Group** , then select the **Storage Initiators** tab in the **Edit Access Group** dialog box.




Select and move the Oracle VM Servers into the **Selected Storage Initiators** box to add storage initiators to each Oracle VM Server. Click **OK**.

The access group management functionality is also available outside this wizard. To access it, you must go to the **Storage** tab, select a SAN server in the navigation pane, and change the **Perspective** field in the management pane to **Access Groups**, as described in Section 4.6.4.2, “SAN Server Access Groups”. Access group management for an individual Oracle VM Server is also described in Section 6.10.13, “Managing Access Groups and Storage Initiators on an Oracle VM Server”.

9. Click **Finish** to complete the SAN server discovery operation.

   The new storage array appears in the navigation pane, under SAN Servers. Prior to the access group configuration, the Storage Connect plug-in established a link to the storage location. By configuring the access group(s), you grant one or more Oracle VM Servers access to the storage array, so that the

storage elements or physical disks offered by the SAN server appear in Oracle VM Manager. Access group configuration and management is described in detail in the next section. The exception to the rule is again the unmanaged fibre channel storage array, which does not use the concept of access groups but offers its LUNs to all Oracle VM Servers connected to the fibre channel storage network.

### 4.6.4.2 SAN Server Access Groups

During discovery of a storage array you are given the option of configuring access groups which enable Oracle VM Servers to access the storage. This section explains the configuration of storage array access groups.

Except for generic storage arrays, it is possible to create multiple access groups in order to arrange and restrict physical disk access according to your requirements. The generic iSCSI storage arrays have a single access group available by default, where you can simply add or remove storage initiators from your Oracle VM Servers.

Generic fibre channel storage has no access groups and is always listed under the **Unmanaged Fibre Channel Storage Array** folder.

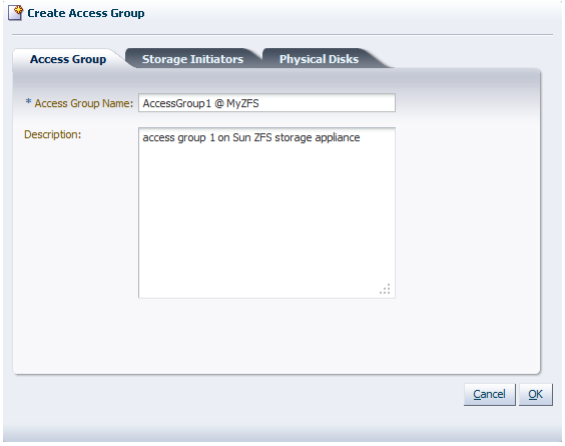
Select the appropriate procedure for your type of storage array.

**To configure an access group for a non-generic iSCSI storage array:**

1. In the navigation pane, select your SAN server. In the management pane, select the Perspective **Access Groups**.

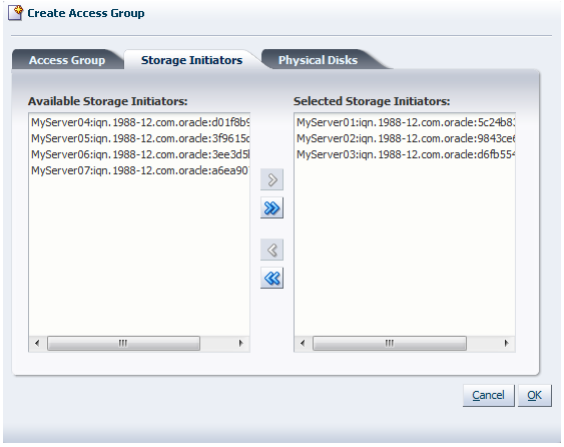
2. Click **Create Access Group** ✚ . The **Create Access Group** dialog box appears.

3. In the **Access Group** tab, enter a name for your new access group and optionally provide a description.




4. Select the **Storage Initiators** tab. It contains the available storage initiators for this type of storage on the Oracle VM Servers in your environment.

5. Use the arrow buttons to move the required initiators to the **Selected Storage Initiators** box.




**Note**

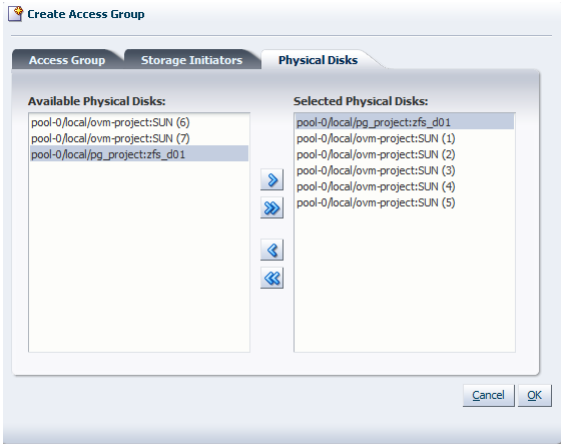
You can also use the **Storage Initiators** perspective in the **Servers and VMs** tab to view and configure storage initiators on an individual Oracle VM Server. See Section 6.10.13, “Managing Access Groups and Storage Initiators on an Oracle VM Server” for more information on using this method.

6. Select the **Physical Disks** tab. It contains the available storage elements on the storage array you are registering.

**Note**

If this is the first time you are configuring access to this storage array, the list of available physical disks may be empty. You may have to edit the access group afterwards to select physical disks. See Section 4.8.4, “Deleting a Storage Repository” for details.

7. Use the arrow buttons to move the required disks to the **Selected Physical Disks** box. These disks will be presented to the Oracle VM Servers of which the iSCSI initiator is part of the access group.




8. Click **OK** to create the new access group with the selected initiators and physical disks. The new access group now appears in the **Access Groups** table. If you change the **Perspective** of the management pane to **Physical Disks**, the list of presented physical disks appear in the table.

9. After configuring the access group it is advisable to refresh the SAN server to make sure that the current storage layout and access rules are in effect.

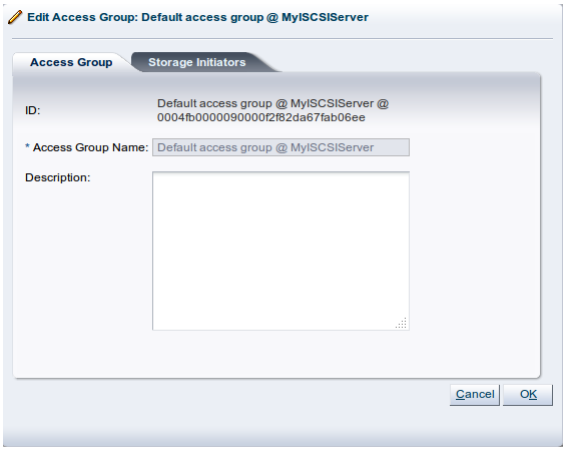
The selected physical disks in your non-generic storage array are now available to the Oracle VM Servers in this access group. The access group configuration of a generic iSCSI storage array is simpler, as you can see below.

**To configure the access group for a generic iSCSI storage array:**

1. In the navigation pane, select your SAN server. In the management pane, select the Perspective **Access Groups**. The default access group for this storage array is already present.

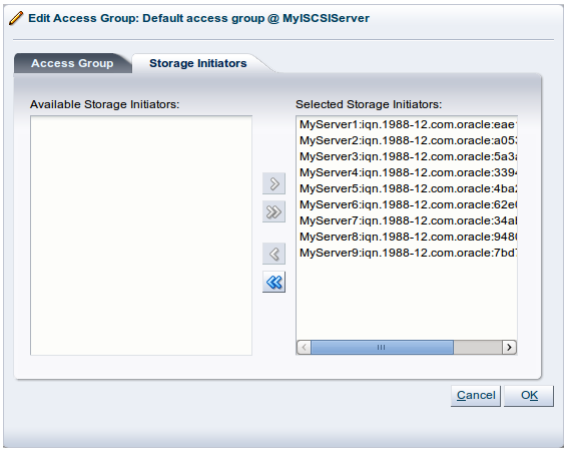
2. Select the default access group and click **Edit Access Group** . The **Edit Access Group** dialog box appears.

3. In the **Access Group** tab, you cannot modify the name of the default access group, but if required, you can provide a description for the access group.




4. Select the **Storage Initiators** tab. It contains the available storage initiators for this type of storage on the Oracle VM Servers in your environment.

5. Use the arrow buttons to move the required initiators to the **Selected Storage Initiators** box.

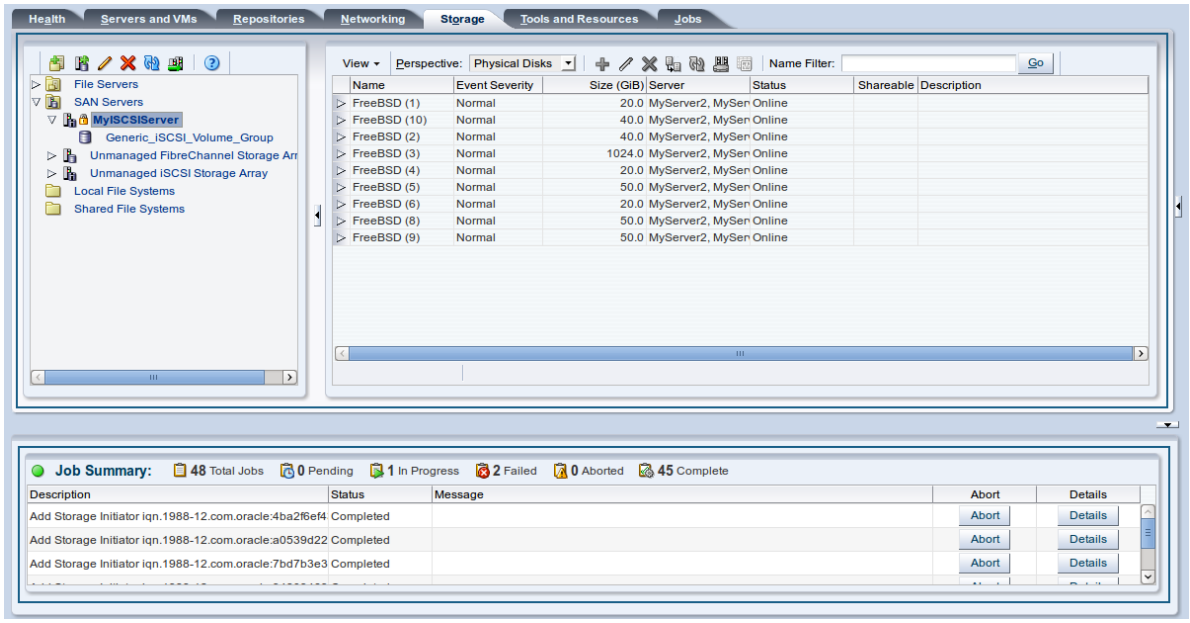



**Note**

You can also use the **Storage Initiators** perspective in the **Servers and VMs** tab to view and configure storage initiators on an individual Oracle VM Server. See Section 6.10.13, “Managing Access Groups and Storage Initiators on an Oracle VM Server” for more information on using this method.

For a generic storage array you cannot select which physical disks are added; all disks are automatically presented to the selected Oracle VM Servers.

6. Click **OK** to save your changes to the default access group. If you change the **Perspective** of the management pane to **Physical Disks**, the list of presented physical disks appears in the table.




7. After configuring the access group it is advisable to refresh the storage array to make sure that the current storage layout and access rules are in effect.

The Oracle VM Servers in this access group now have the necessary permissions to use the physical disks of the storage array; they can be deployed either as disks for virtual machines (VMs) or for storage repositories. To create storage repositories on your physical disks, see Section 4.8, “Managing Storage Repositories”.

Of course, you can always make changes to the storage configuration you just registered. The steps and options to do so are described below.

### 4.6.4.3 Editing a SAN Server

This section discusses the update options available after a storage array has been discovered through Oracle VM Manager.

**To change the registered storage array configuration:**

1. If you need to modify the registered SAN servers, select the **SAN Servers** folder in the navigation tree, select the **SAN Servers** option in the **Perspective** drop-down list, select one or more SAN servers in the table and click the appropriate button in the toolbar above to select one of these options:

   - **Edit SAN Server:** Change SAN server settings such as name, description, add/edit/remove access hosts; and change admin server settings.

**Note**

When editing access hosts, you are unable to change the IP address or hostname for an existing access host. If you need to change this parameter, you should remove the access host that is no longer accessible at the

specified IP address or hostname, and then add a new access host with the corrected information.

- **Delete SAN Server:** Remove one or more selected SAN servers from your Oracle VM environment.
- **Refresh SAN Server:** Request an update of storage array configuration for one or more SAN servers in case changes have been made to the available physical disk configuration on the servers.
- **Add/Remove Admin Server:** Determine which Oracle VM Servers are responsible for information exchange with this SAN server.

2. If you need to modify a physical disk on a storage array, select the SAN server in the navigation pane, and make sure that the **Perspective** of the management pane is set to **Physical Disks.** Select one or more physical disks in the overview table, and click the appropriate button in the toolbar above to select one of these options:

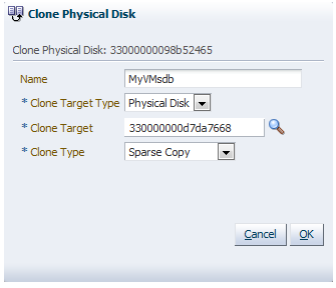
   - **Edit Physical Disk:** Change the name, description and extra information of the physical disk or make it shareable.
   - **Delete Physical Disk:** Stop using one or more selected physical disks in your Oracle VM environment.

     **Warning**

     If you delete a LUN from a registered storage array, make sure that you delete it in Oracle VM Manager first, before you physically delete it from the storage server. If you do not respect this order of operations, the system will go into an unknown state, which can only be resolved by rebooting the Oracle VM Servers the deleted LUN is connected to.

   - **Clone Physical Disk:** Create a thin clone, sparse copy or non-sparse copy of the physical disk on the selected target. The options are explained in the table below:

| Clone Target | Thin Clone | Sparse Copy | Non-sparse Copy |
|---|---|---|---|
| Physical Disk | | | Yes |
| Storage Array | Yes | | |
| Storage Repository | | Yes | Yes |




This applies specifically to a physical disk; for more information about VM cloning, see Section 7.9, “Cloning a Virtual Machine or Template”.

For a definition of these clone target types, see Glossary.

- **Refresh Physical Disk:** Request an update of one or more physical disks to see if changes have been made to the size and configuration. It is important to do this if you have made changes to any of your physical disks, so that Oracle VM Manager is capable of correctly determining available disk space when performing operations like creating a repository.

**Caution**

A critical event is generated and the repository is put into an error state if the disk has all three of the following properties:

- The disk has been shrunk
- The disk is NOT an extended physical disk
- The disk has an OCFS2 file system present

This is not a typical action for most users, but is worth keeping in mind when changing disk sizes.

To put the repository back to a normal state you need to extend the physical disk to a size equal or larger than the OCFS2 file system size and then acknowledge the event in repository events table. See Section B.1.11, “Acknowledging Events/Errors” for information on acknowledging events.

- **Display Servers using Physical Disk...:** Displays which servers are using the selected physical disk.
- **Display Selected Physical Disk Events...:** Display the **Events** dialog box to see events for the physical disk.

3. If you need to modify the way Oracle VM Servers access the physical disks in your storage array, select the SAN server in the tree structure in the navigation pane, set the management pane **Perspective** to **Access Groups**, and select the access group you wish to modify. Using the toolbar buttons near the top of the tab, choose one of these options:

   - **Edit Access Group:** Change access group settings such as name, description, selected storage initiators and physical disks.
   - **Delete Access Group:** Remove one or more selected access groups.
   - **Present/Unpresent Physical Disk:** Change the selection of physical disks to which this access group has access.
   - **Display Selected Access Group Events...:** Display the **Events** dialog box to see events for the access groups.

**Note**

For generic iSCSI storage arrays, only the selected storage initiators can be modified. Other properties cannot be changed.

### 4.6.4.4 Removing File Systems from Physical Disks

When discovering the physical disks or LUNs of a SAN storage array, you may find some that contain unwanted file systems. Oracle VM expects physical disks and LUNs to be entirely clean, without any file

system information on them, and Oracle VM Manager offers the functionality to remove a file system from a physical disk.

**To remove file system from physical disks via the Servers and VMs tab:**

1. Select the **Servers and VMs** tab.
2. In the navigation pane, select an Oracle VM Server to which the physical disk with the unwanted file system is presented.
3. Change the **Perspective** of the management pane to **Physical Disks**.
4. In the table, select one or more physical disks from which you want to remove the file systems and click **Delete File System**
5. Click **OK** to confirm the deletion of the file system and destroy the data stored on the physical disk.

**To remove file systems from a physical disk via the Storage tab:**

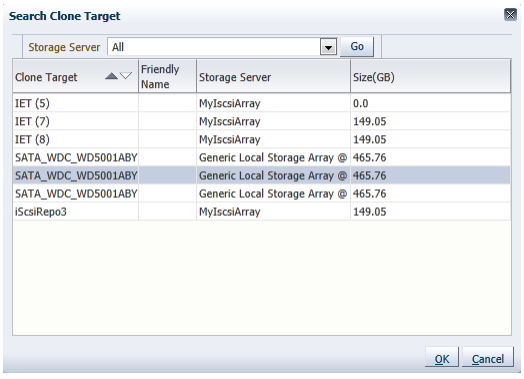
1. Select the **Storage** tab.
2. In the navigation pane, select the **Shared File Systems** folder.
3. In the table in the management pane, select one or more file systems that correspond with the storage devices you need to clean.
4. Click **Delete File System**
5. Click **OK** to confirm the deletion of the file systems and destroy the data stored on the physical disks.

When the file system is removed from the physical disk, it can be used to create a storage repository or as a raw physical disk for a virtual machine.

## 4.6.5 Using Local Storage

If an Oracle VM Server has unused hard disks, they can be used as local storage for your environment. On condition that these spare disks are completely empty, meaning they have no partitions or file systems, they are included automatically in the local storage array of the Oracle VM Server.

Note that local storage arrays are not listed under the **Storage** tab. You can, however, see the local storage entities in locations where you can use them; for example when you create a storage repository, select a physical disk for a VM, list the physical disks accessible to an Oracle VM Server, or select a physical clone target.




Local storage has the advantage that it is fast and easy to use, but users must be aware that there is no possibility to share this type of storage and that it cannot be used in a high-availability configuration.

Consequently, if you need to store important data and run important virtual machines that require virtually uninterrupted uptime with a high degree of data loss prevention, it is recommended not to use local storage but to invest in attached storage with proper redundancy instead.

In addition, local storage lacks flexibility in a clustered setup with multiple Oracle VM Servers in a server pool. Resources and VM disks that live on local storage cannot be shared with other servers, even if they are within the same server pool. This means that you cannot use a template, ISO or VM disk stored on a local repository on another Oracle VM Server, and that live migration of VMs with locally stored disks is impossible. We strongly advise you to take this into account when designing your Oracle VM environment.

The configuration where local storage is most useful is where you have an unclustered server pool that contains only one Oracle VM Server. By configuring a storage repository (see Section 4.8, “Managing Storage Repositories”) on local storage you can set up an Oracle VM virtualized environment quickly and easily on a single server: all your resources, virtual machines and their disks are stored locally. Since there is only one Oracle VM Server, access to resources is guaranteed.

**Note**

Some properties of local storage elements may be edited through the Oracle VM Server management pane: go to the **Servers and VMs** tab, select the appropriate server in the navigation pane and set the management pane **Perspective** to **Physical Disks**. Disks available to this server are displayed, and available operations can be executed via the toolbar buttons above.

### 4.6.6 Removing Storage

Before you can remove a storage server, you must delete any storage repositories and server pool file systems on it.

If there is a storage repository on the storage server, all virtual machine resources such as virtual machine templates, virtual disks, assemblies and ISO files must be removed from the repository. If the storage repository is on a file server (NFS server), you should also release ownership of the storage repository before you delete the repository. Deleting an unowned storage repository only removes it from the Oracle VM Manager database; it does not delete any files in the repository. If the storage repository is on a storage array (physical disk), all of the contents of the storage repository must be deleted. Then the file system on which the storage repository resides must also be deleted.

If there is a server pool file system on the storage server, the server pool must be deleted to delete the server pool file system.

The storage server may now be shut down and decommissioned.

For more information on working with virtual machine resources, see Section 7.5, “Virtual Machine Resources”. For more information on deleting a server pool, see Section 6.9.8, “Deleting Server Pools”. For more information on releasing ownership of a storage repository, see Section 4.8.3, “Editing a Storage Repository”. For more information on deleting a storage repository, see Section 4.8.4, “Deleting a Storage Repository”.

## 4.7 Enabling Multipath I/O Support

Multipathing is the technique of creating more than one physical path between the server CPU and its storage devices. It results in better fault tolerance and performance enhancement. Oracle VM supports multipath I/O out of the box. Oracle VM Servers are installed with multipathing enabled because it is a requirement for SAN disks to be discovered by Oracle VM Manager.

**Note**

Any system disks (disks that contain / or /boot) are blacklisted by Oracle VM Manager and are not available for use in an Oracle VM environment.

Multipath configuration information is stored in `/etc/multipath.conf` and contains specific settings for Oracle VM along with an extensive set of configuration details for commonly used SAN hardware. In most cases the user should not need to modify this file and is advised not to. Examining the contents of the file may be useful to better understand how it works in Oracle VM and what may need to be configured if your SAN is not using multipathing and your LUNs are not appearing.

In case user action is required to enable multipathing, this sections explains how to do so. The required steps depend on the storage hardware implemented. Consequently, the steps below are intended as a guideline and priority should be given to the SAN hardware documentation.

**Note**

Not all steps apply to your environment. Consult the SAN hardware vendor's documentation for a complete list of steps, the order in which to execute them, and their relevance to your specific environment.

**General steps to configure multipathing:**

1. Design and document the multipathing configuration you intend to apply to the SAN hardware used in your Oracle VM environment.
2. Ensure that the drivers for your Host Bus Adapters (HBAs) are present. If not, install the drivers.
3. Configure the appropriate zoning on the fibre channel switches.
4. Configure LUN masking on the storage arrays.
5. Configure path optimization features (ALUA or similar) on your disk subsystem, if so instructed by your vendor's documentation.
6. Check the fabric information on each Oracle VM Server that has access to the SAN hardware. Use `multipath -ll` and related commands.
7. Make the necessary changes to the file `/etc/multipath.conf` on the Oracle VM Servers.

   **Note**

   You must make the exact same changes to the multipath configuration file on all Oracle VM Servers in your environment.

   **Important**

   It is critical that the configuration parameter `user_friendly_names` remain set to **no** within the `/etc/multipath.conf` configuration file.
8. Restart the multipath daemon (multipathd).
9. Check the fabric information again to verify the configuration.
10. If so instructed by the vendor's documentation, rebuild initrd.
11. Reboot the Oracle VM Servers to verify that the SAN and multipathing configuration come up properly after a restart.

For detailed information and instructions, consult the SAN hardware vendor's documentation.

**Note**

Booting from a multipath SAN is supported.

## 4.8 Managing Storage Repositories

You use Oracle VM Manager to create and configure storage repositories, and to present one or more storage repositories to Oracle VM Servers in a server pool. During the creation and configuration of the storage repository the Oracle VM Agent on the Oracle VM Server will act as the worker component performing the instructions given through Oracle VM Manager. This chapter discusses the flow of the operations you perform after the discovery of your physical storage hardware, LUNs, file systems and so on, in order to make a storage repository available to the Oracle VM Servers in your server pool. Once the storage repository is accessible, you can start adding storage resources and building VMs with those resources.

Depending on the configuration of Oracle VM Servers in your environment, some restrictions may apply to the creation of storage repositories due to the nature of the storage. Keep in mind the following guidelines when working with storage repositories:

- When using server pools without clustering functionality, two storage options are available: file servers (NFS) and local physical disks in a local storage array. Remember that local storage imposes severe restrictions, as described in Section 4.6.5, “Using Local Storage”.
- Local storage, or unused disks in your Oracle VM Servers, are discovered as LUNs in a local storage array. If you want to use a single-server setup with local storage, be sure to deactivate clustering in your server pool. This eliminates the need for a server pool file system, which cannot be on a local disk by definition.
- Only a server pool with multiple servers, active clustering and attached storage (NFS, iSCSI, fibre channel) can offer high availability, load balancing and similar advanced functionality.

Oracle VM Manager allows you to perform a number of management operations on the storage repositories under its control. Table 4.2, “Storage Repository Management Operations” describes the possible operations at the level of a storage repository. To access these functions in Oracle VM Manager, open the **Repositories** tab, use the tree view in the navigation pane to select repositories, then choose the appropriate button from the toolbar above.

**Note**

Storage repositories are presented to individual servers, and not necessarily to all servers within a server pool. This means that it is possible that a repository may not be available for use on a particular server. You should keep this in mind when you deploy a VM on a specific Oracle VM Server. To see which servers have access to a storage repository, select the repository in the navigation pane and verify the access status in the management pane with the **Perspective** set to **Info**.

**Table 4.2 Storage Repository Management Operations**

| Operation | Description |
|---|---|
| Create repository | See Section 4.8.1, “Creating a Storage Repository”. |
| Present repository | 1. Select a repository in the tree view and click **Present/Unpresent** in the toolbar above.<br>2. In the **Present Repository** dialog box, there is an option to either present the repository to an entire server pool or to individual servers. Use the |

| Operation | Description |
|---|---|
| | arrow buttons to determine to which server pool or Oracle VM Servers the current repository should be presented (or not presented).<br>  **Note**<br>If you present a repository to a server pool, this has the same effect as selecting all of the sOracle VM Servers within the server pool and presenting the repository to them individually.<br>3. Click **OK** to save your changes.<br>See Section 4.8.2, “Presenting or Unpresenting a Storage Repository”. |
| Edit repository | 1. Select a repository in the tree view and click **Edit Selected Repository** in the toolbar above.<br>2. In the **Edit Repository** dialog box there are two tabs:<br>On the **Repository** tab you can make the following changes:<br>• **Name:** Edit the name of the selected repository.<br>• **Description:** Optionally enter a more elaborate description of the selected repository.<br>• **Release Ownership:** Select this check box to allow the repository to be used by another Oracle VM Manager.<br>On the **Present Repository** tab there is an option to either present the repository to an entire server pool or to present the repository to individual servers. Use the arrow buttons to determine to which server pool or Oracle VM Servers the current repository should be presented (or not presented).<br>  **Note**<br>If you present a repository to a server pool, this has the same effect as selecting all of the sOracle VM Servers within the server pool and presenting the repository to them individually.<br>3. Click **OK** to save the changes to the storage repository.<br>See Section 4.8.3, “Editing a Storage Repository”. |
| Delete repository | 1. Select one or more repositories in the table and click **Delete Selected Repository** in the toolbar above.<br>2. Click **OK** to execute the delete operation.<br>See Section 4.8.4, “Deleting a Storage Repository”. |
| Refresh and resync repository | Select one or more repositories in the table and click **Refresh and Resync Selected Repository** in the toolbar above. |

| Operation | Description |
| --- | --- |
| | Oracle VM Manager re-checks the disk contents of the selected repositories. Any detected changes will be reflected in the various content tabs (Assemblies, ISO files, ...) of the storage repository. |

## 4.8.1 Creating a Storage Repository

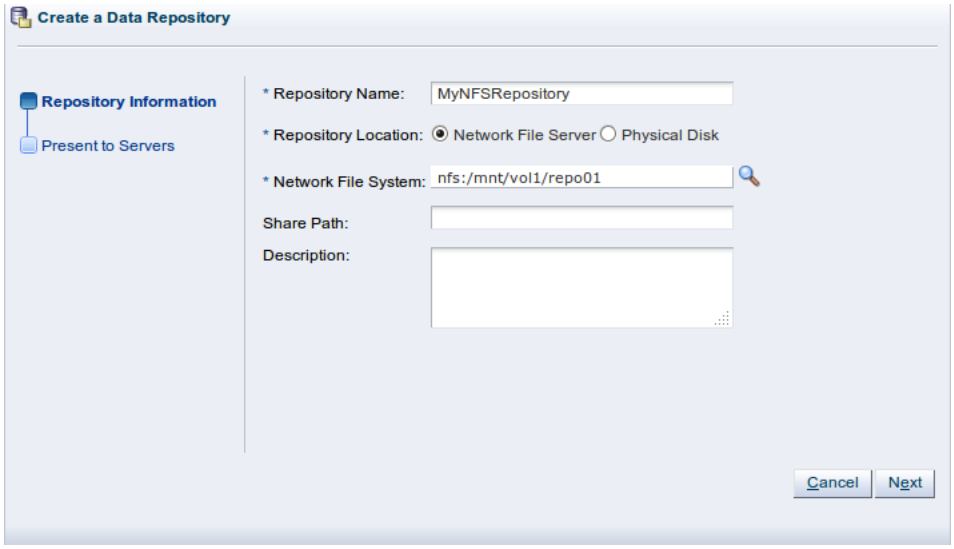
After you complete the preparation phase described above in Section 4.6.1, “Discovering File Servers” and Section 4.6.4.1, “Discovering a SAN Server”, Oracle VM Manager is fully aware of the underlying physical storage providers available for use as a storage repository.

> **Important**
>
> A storage repository should be at least 10GB in size. In addition to this minimum size requirement, you should include enough storage space for virtual machines, templates, ISO files and other virtual machine resources.

**To create a storage repository for your server pool:**

1. Select the **Repositories** tab.
2. In the toolbar above the navigation pane, click **Create New Repository** .
3. In the **Create a Data Repository** dialog box, enter the following information:
   - **Repository Name:** The name you wish to use to identify the repository.
   - **Repository Location:** Either a network file server or a physical disk.
4. If you selected **Physical Disk** as location, proceed to Physical Disk as the Repository Location [87].
   If you selected **Network File Server** as location, click **Search** to select a location in the **Select Network File System** dialog box:
   - Select a **Network File Server** from the list. The available file systems appear. Note that only a refreshed file system can be used.
   - Select the file system you wish to install the storage repository on. Click **OK**.

> **Note**
>
> When searching for a file system, there is an option to provide a **Name Filter**. You can use this filter to specify search criteria to limit the objects displayed. See Section 3.14, “Name Filters” for more information.




5. Optionally provide this additional information:

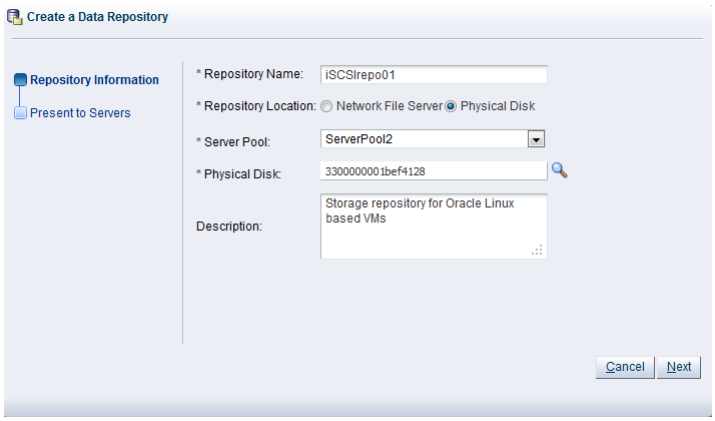
   - **Share Path:** Path to a subdirectory on the selected file system.
   - **Description:** Information you would like to add about this storage repository.
   - Proceed to Present the storage repository to servers [88].

6. If you selected **Physical Disk** as the **Repository Location**, click **Search** to select a location in the **Select Physical Disk** dialog box:

   - Select a **Storage Array** and, if applicable, a **Volume Group** from the respective lists. The available disks appear.
   - Select the physical disk you wish to install the storage repository on. Click **OK**.

**Note**

When searching for a physical disk, there is an option to provide a **Name Filter**. You can use this filter to specify search criteria to limit the objects displayed. See Section 3.14, “Name Filters” for more information.



7. Select from the list to which **Server Pool** this storage repository should be provided. Optionally enter additional information about this storage repository in the **Description** field.

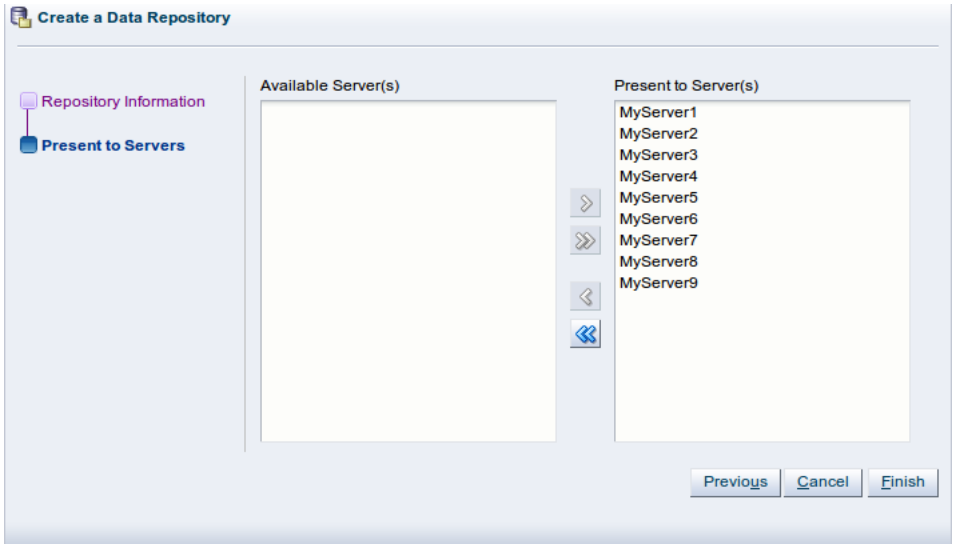
**Note**

When you create a storage repository on a LUN, only clustered server pools can be selected.

8. Click **Next** to proceed to the second section of the wizard: **Present to Servers**.

   When the storage repository is prepared and created, it must also be made available for use by your Oracle VM Servers before it can be populated. Typically you present the storage repository to all the Oracle VM Servers in the server pool. However, should you wish to set up storage differently, Oracle VM Manager allows you to present a repository to a selection of Oracle VM Servers instead of the entire server pool. See also Section 4.8.2, “Presenting or Unpresenting a Storage Repository”

9. In the **Present to Servers** dialog box, use the arrow buttons to move the required Oracle VM Servers from the left to the right pane.




10. Click **Finish** to create the new storage repository and present it to the selected Oracle VM Servers. The new storage repository is displayed in the **Repositories** table in the management pane.

At this point, the storage repository has been created, Oracle VM Manager has taken ownership, and the selected Oracle VM Servers have access in order to store virtual machines, ISO files, templates and so on. To modify the configuration of servers with access to the storage repository, see Section 4.8.2, “Presenting or Unpresenting a Storage Repository”.

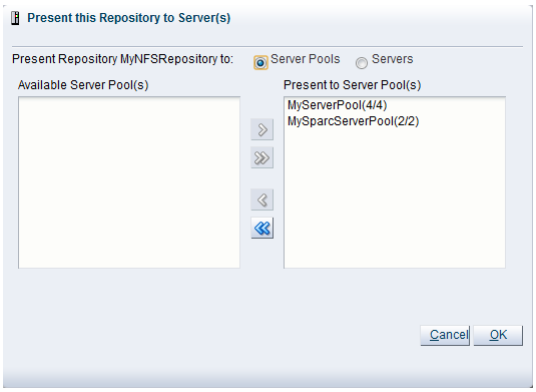
## 4.8.2 Presenting or Unpresenting a Storage Repository

As part of the storage repository creation you can select the Oracle VM Servers to which the repository must be made available. However, you can modify this selection afterwards and present the repository to new servers or unpresent it from servers already selected earlier.

Presenting the storage repository to an Oracle VM Server is the equivalent of mounting a file system. Essentially, when you present the repository to the Oracle VM Servers in your server pool, the repository file system is mounted by the *root* user on each Oracle VM Server. This is an essential factor in the HA configuration of the Oracle VM setup.

**To present a storage repository to your Oracle VM Servers:**

1. Select the **Repositories** tab and select the repository of your choice in the navigation pane.
2. Click **Present/Unpresent** in the toolbar above to change the list of servers the repository is presented to.
3. In the **Present this Repository to Server(s)** dialog box, use the check box to select whether to present individual Oracle VM Servers, or all Oracle VM Servers in one or more server pools. Then use the arrow buttons to move the required Oracle VM Servers or server pools between the panes.




4. Click **OK** to present the storage repository to the selected Oracle VM Servers.

**Note**

NFS-based storage repositories can be shared by multiple server pools controlled by the same Oracle VM Manager. OCFS2-based storage repositories always belong to a single clustered server pool. Therefore only members of that server pool appear in either pane.

Your external storage setup is now complete. The storage repository is made available to your Oracle VM Servers. When the server pool is ready you can start creating virtual machines. For more information, see Chapter 6, *Managing Server Pools and Oracle VM Servers*.

## 4.8.3 Editing a Storage Repository

**To edit a storage repository:**

1. Select the repository in the tree view in the navigation pane and click **Edit Selected Repository** in the toolbar above.
2. In the **Edit Repository** dialog box you can make the following changes:

   **Name:** Edit the name of the selected repository.

   **Server Pool:** This option is available if your repository location is a **Physical Disk**. It allows you to change the server pool that the repository is associated with. This option makes it simple to move OCFS2 repositories from one server pool to another. Usually after changing server pool association, you should change the servers or server pool where the repository is presented. See Section 4.8.2, “Presenting or Unpresenting a Storage Repository” for more information on this.

   **Description:** Optionally enter a more elaborate description of the selected repository.

   **Release Ownership:** Select this check box to allow the repository to be used by another Oracle VM Manager.

By clicking on the **Present Repository** tab, you can easily change the servers or server pools on which the repository is presented. See Section 4.8.2, “Presenting or Unpresenting a Storage Repository” for more information on this.

3. Click **OK** to save the changes to the storage repository.

## 4.8.4 Deleting a Storage Repository

**To delete an owned storage repository:**

1. Make sure that all content has been removed from the storage repository you wish to delete.
2. Select one or more repositories in the table in the management pane and click **Delete Selected Repository** in the toolbar above.
3. Confirm that you wish to delete this storage repositories: click **OK** to continue.

**To delete a storage repository without removing the contents:**

1. Select the repository in the table in the management pane and click **Present/Unpresent** in the toolbar above.
2. In the **Present Repository** dialog box, unpresent the storage repository from all Oracle VM Servers. Click **OK**.
3. Select the repository in the tree view in the navigation pane and click **Edit Selected Repository** in the toolbar above. Select the **Release Ownership** check box and click **OK**.
4. Select the now unowned repository in the table and click **Delete**.
5. Confirm that you wish to delete this storage repository: click **OK** to continue.

When your server pool is fully configured with Oracle VM Servers, network and storage, you use Oracle VM Manager for all management and maintenance operations on the storage repository. The storage resources residing in the repository (ISO files, templates, and so on) are also managed through Oracle VM Manager. Management operations on the storage resources inside a storage repository are discussed in detail in a separate chapter: Section 7.5, “Virtual Machine Resources”. Detailed instructions for the use of different types of storage entities with virtual machines are discussed in Chapter 7, *Managing Virtual Machines*.

## 4.8.5 Enabling Storage Repository Back Ups

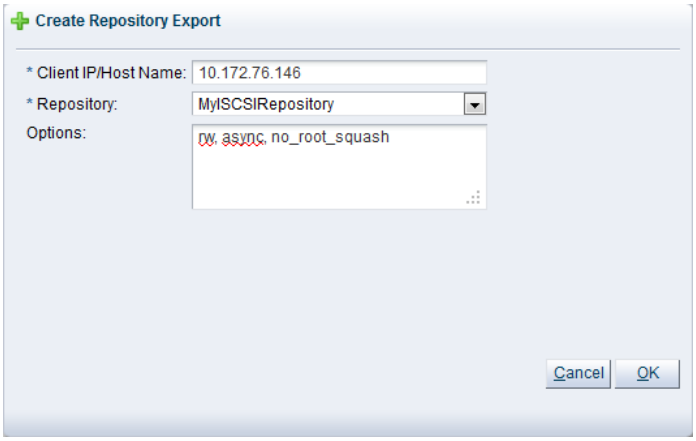
An Oracle VM Server can be configured to enable third party applications to perform a back up of the contents of a storage repository. To enable this, an Oracle VM Server is configured to provide an NFS share that a third party back up tool can use to access the contents of the repository. The Oracle VM Server must be in a clustered server pool and have the OCFS2-based storage repository presented to it.

When you have created a repository export, use the **Repository Path** (displayed in the management pane table) and the Oracle VM Server hostname or IP address to connect to the NFS mount point from the third party back up software.

**To create a repository export:**

1. Click the **Servers and VMs** tab.
2. In the navigation pane, select the Oracle VM Server on which you want to create the repository export location.

3. Select **Repository Exports** from the **Perspective** drop-down list in the management pane.
4. Click **Create Repository Export..** in the toolbar.
5. The **Create Repository Export** dialog box is displayed.




Enter or select the following:

- **Client IP/Host Name:** The IP address or hostname of the computer for which to grant access to the repository contents. This is likely to be the machine on which the third party back up and restore software is running.
- **Repository:** An OCFS2-based storage repository presented to the Oracle VM Server. This is the repository you want to back up.
- **Options:** The parameters to include in the NFS mount configuration, for example:

```
rw, async, no_root_squash
```

Click **OK**.

6. To edit a repository export, select the entry in the table in the management pane and click **Edit Repository Export..** in the toolbar.
7. To delete a repository export, select the entry in the table in the management pane and click **Delete Repository Export** in the toolbar.

# Chapter 5 Managing Networks

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Networking is a very broad concept with many different interpretations. Data center administrators typically have their own idea about what the best network configuration is in terms of performance, security and cost-effectiveness. In some cases physical network connections are readily available so bonding or data link aggregation is preferred for fail over or higher bandwidth, while other configurations use VLANs for network segregation or to compensate for the lack of free NICs. Some will use Ethernet connections for storage while others have dedicated fibre channel hardware at their disposal.

Generally speaking, data center operators tend to think essentially in terms of hardware: switches, routers, firewalls, cables, NICs (Network Interface Cards), and so on. The only widespread network virtualization concept to date is VLAN (Virtual LAN) technology. VLANs are also very frequently used in Oracle VM networking.

The networking infrastructure in the Oracle VM environment comprises connections between various components:

- between Oracle VM Servers themselves;
- between Oracle VM Servers and Oracle VM Manager;
- between Oracle VM Servers and their storage sub-systems;
- between virtual machines deployed in the environment;
- and between virtual machines and external private or public networks.

These networking connections can leverage features supported by Oracle VM, such as networked file systems, clustering, redundancy and load balancing, bridging, and support for Virtual LANs (VLANs).

This chapter discusses creating and using Oracle VM networks.

# 5.1 Oracle VM Networking Overview

When you create an Oracle VM network, you map available network ports to a set of logical Ethernet networks. You perform this mapping in Oracle VM Manager.

The physical network is the collection of physical connections in Oracle VM Manager and all Oracle VM Servers, and the switches and routers that allow information to reach its destination.

A logical network in Oracle VM is built on top of these physical connections. Each physical connection is called a network port. Other names for this physical connection include network interface card, or NIC, or network interface.

You define a name or alias for each logical network that you create. When you have created your networks, you connect the physical network ports to the logical networks.

Before you define the logical networks in Oracle VM Manager, you have to review the physical network configuration that you intend to use, such as VLAN and subnet usage. You also take into account the number of network ports, or NICs, available to your Oracle VM Servers. The minimum recommended number of ports required on a single Oracle VM Server is two, although one would suffice for test or demonstration purposes. If you have more than two ports on your Oracle VM Servers, you can design more redundancy or traffic isolation in your environment.

Oracle VM supports both 1Gbit and 10Gbit NICs. All network functions can either be on dedicated or shared physical networks, except for the virtual machine intra-server. For example, a physical network can be dedicated to Virtual Machine or Storage only, or can be used for all network functions.

You may also want to review additional *Oracle VM 3 Networking* whitepapers available on OTN at:

http://www.oracle.com/technetwork/server-storage/vm/overview/index.html

# 5.2 Network Usage

In Oracle VM a network can perform one or more network functions:

- **Server Management**: is used to manage the physical Oracle VM Servers in a server pool, for example, to update the Oracle VM Agent on the different Oracle VM Servers.

**Note**

In Oracle VM the management network interface and the public interface (i.e. default route) are expected to be the same on each Oracle VM Server. Other types of network usage are allowed on the same interface, for example through the use of VLANs and/or network bridges.

- **Cluster Heartbeat**: is used to verify if the Oracle VM Servers in a clustered server pool are up and running. The heartbeat function has a network component, where a TCP/IP communication channel is created with each Oracle VM Server. Each Oracle VM Server sends regular keep-alive packets and these packets are used to determine if each Oracle VM Server is alive.

**Important**

It is recommended to separate the Cluster Heatbeat function from networks with high load, such as Storage and Live Migrate networks. If bandwidth drops too

low, heartbeating connectivity might be interrupted, which could lead to rebooting of virtual machines and Oracle VM Servers. See Section 5.9, “Desiging Cluster Heartbeat Networks” for more information on designing a network for the Cluster Heartbeat role.

- **Live Migrate**: is used to migrate virtual machines from one Oracle VM Server to another in a server pool, without changing the status of the virtual machine.
- **Storage**: is used for all storage transport in a server pool. It is used by the Oracle VM Servers to connect to Ethernet-based storage repositories and server pool file systems. As with the Virtual Machine role, it is possible to have multiple networks with the Storage role.
- **Virtual Machine**: is used for the network traffic between the different virtual machines in a server pool. The virtual machine role can be either standard Inter-Server (routable through standard switches), or Intra-Server (without a route to an external physical network and dedicated to the selected Oracle VM Server).

  Note that it is possible, and very likely, to have multiple networks with the Virtual Machine role in one Oracle VM Manager.

The first step in configuring your Oracle VM environment is to discover your Oracle VM Servers. This step assumes that the Oracle VM Manager host and all of the Oracle VM Servers can communicate over the same network, though the Oracle VM Servers and Oracle VM Manager can reside in different subnets. When you discover the first Oracle VM Server, the management network is created automatically and takes its name from the subnet to which the Oracle VM Server is connected. Each additional Oracle VM Server discovered is either on a previously known subnet, or a new subnet. If the Oracle VM Server is on a new subnet then a new management network is constructed; if the Oracle VM Server is on a known subnet then it is simply added to that subnet. Each server in your Oracle VM environment can only have one interface designated for management, belonging to a single management network object in the Oracle VM Manager's database.

**Warning**

Although the Oracle VM Manager and its discovered and owned Oracle VM Servers may be on different subnets as long as they can reach each other, Network Address Translation (NAT) is not supported in this configuration. NAT would lead to a discrepancy between the actual management IP of the Oracle VM Server and the IP provided during discovery.

A network port on every Oracle VM Server is designated as the management interface during the installation of the Oracle VM Server and is configured as a bonded interface. Ports can be added to this bond or removed from it. Once a management network is created, it can only be deleted if no servers have ports in the management network anymore.

After your management networks are in place, you plan for the creation of other types of network. Note that once a port is selected for a particular network, it cannot be selected again when creating additional networks. You can use a combination of network bonding and VLAN Groups to create all the networks needed for your environment using your existing ports. Network bonding is covered in Section 5.3, “Building a Network Environment”; VLAN Groups are covered in Section 5.7, “VLAN Groups and VLAN Segments”.

**Figure 5.1 Oracle VM Networking Example**

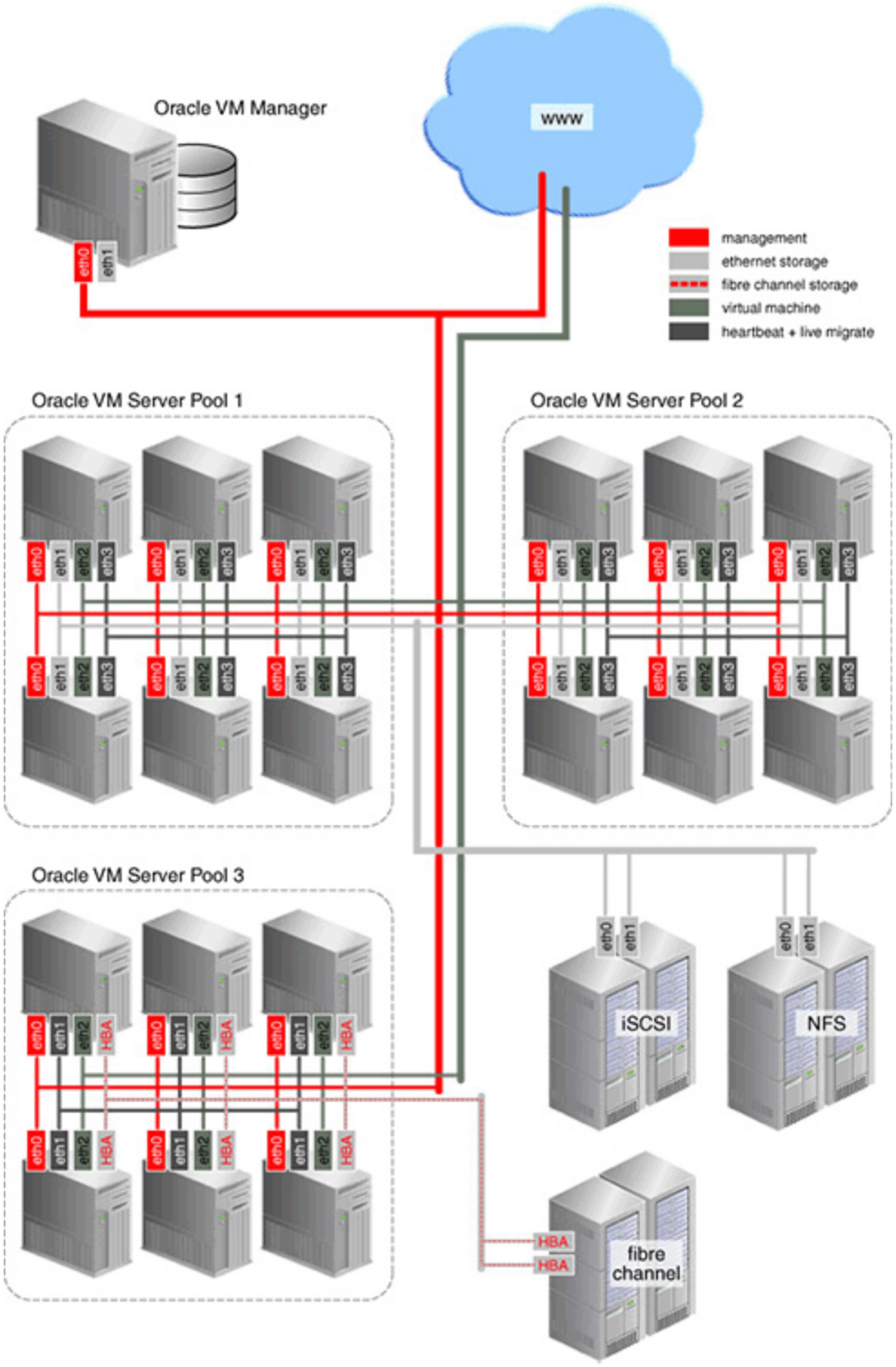



Figure 5.1, “Oracle VM Networking Example” shows an example of an Oracle VM environment with split network functions. Each Oracle VM Server is connected to the management network, regardless of which server pool they belong to.

It is best practice to define separate networks for heartbeating functionality and for live migration. This is because functions like live migration can generate peaks in network traffic. Since heartbeat functionality is sensitive to peak loads, it is better that this function is not affected by a loaded network [1] . Since these types of network traffic occur at the level of an individual server pool, the networks do not need a gateway. It is important to understand that when creating different networks to handle separate functions, it is not possible for a server to belong to more than one network that has been assigned the same function.

Virtual machine (VM) traffic is often routed over a dedicated network, although it can be combined with the other network functions. In this example the dedicated VM network has a route to the internet (or corporate wide area network). You can create as many virtual machine networks as permitted by your network infrastructure.

The first two server pools are connected to a storage network with Ethernet based storage providers. Ethernet based storage is provided as either NFS file servers or iSCSI LUNs. Server Pool 3 has dedicated fibre channel storage, which requires a fibre channel switch and host bus adapters (HBAs) in all connected hardware components. Similar to networks for virtual machines, you create as many storage networks as needed to implement your storage strategy.

## 5.3 Building a Network Environment

When you create a new network, you choose a network function and network elements to build this network. These network elements include network ports, bonds, or VLAN segments if VLANs are used in your environment. These network elements as well as the networks you create are stored as networking objects in the Oracle VM Manager database. Your Oracle VM Servers are unaware of these Oracle VM Manager network objects. Creating and managing network objects in Oracle VM Manager results in the configuration or deletion of the network devices (for example: ports, VLAN devices, bridges) present on Oracle VM Servers.

After reviewing your physical network environment and deciding on the logical distribution and grouping of these physical objects, you create the logical constructs in Oracle VM Manager to implement your network design. These logical constructs include:

- Network bonds
- VLAN groups
- Networks
- Bridges

**Important**

While Oracle VM Manager uses the Linux terminology for network bonds, Oracle Solaris users should understand this to be equivalent to data link aggregation.

**Note**

Bridges are associated with networks. Network bridges are automatically created when creating networks for virtual machines.

A short description of these objects and their usage is given below in the following sections.

If your network design includes interface bonding (or data link aggregation), you create these network bonds first. A bond is the aggregation of network ports to provide redundancy and depending on the

[1] Temporarily high network load could cause the heartbeat to fail for a server, resulting in the server being fenced out of a cluster unnecessarily.

bonding mode, to increase performance. These bonds are often used in conjunction with VLANs, when traffic from several VLANs is allowed to use the same bond.

If your network environment comprises VLANs, your next step is to create VLAN Groups. With VLAN Groups, you determine which port or bond, on each Oracle VM Server, will accept traffic from more than one VLAN. Next, you specify the VLAN segments, as VLAN IDs, that are part of the VLAN Group.

Once these network building blocks are in place, you are ready to create networks using Oracle VM Manager. For each network, you must answer two questions:

- What is the expected network function for your new network?

  Network functions are discussed in Section 5.2, “Network Usage”.

- What are the building blocks for your new network?

These building blocks determine the network type in Oracle VM Manager. The choices when creating a network are:

- Create a network with ports and bonds
- Create a network with VLANs only
- Create a network with ports and bonds, and VLANs
- Create a logical network on a single server

If you create a network with ports, these ports, located on the Oracle VM Servers that will participate in the network, cannot be part of an already existing network. If you intend to use port bonding, create the bond(s) before creating your network. If you intend to allow traffic from several VLANs on a single port or bond, create the VLAN Groups before creating the network.

When creating a VLAN Group, you provide the following information:

- The port or bond for each server participating in the network
- The VLAN ID for each VLAN allowed to use the network
- IP addressing is desired, the IP address to assign to each port or VLAN interface specified respectively in the bullet points above.

You can also create a network using a combination of VLAN interfaces, ports and bonds. If you choose this type of network, the bonds must be created first and the VLAN interfaces must already be part of an existing VLAN Group.

In addition, you can create a network which is intended for a single server. This type of network allows communication between the virtual machines running on a single Oracle VM Server, and does not allow external network traffic. A computing environment made up of several virtual machines, where the virtual machines provide services to each other over the network, could benefit from this type of network, without requiring additional network ports on the Oracle VM Server. As the network traffic can never leave the server, it can be a high speed network. Virtual machines using this type of network cannot be moved or migrated to another Oracle VM Server unless the network configuration is removed from the virtual machine. This is known as an Intra-Server network.

The next topics provide more information about IP addressing, network bonding, network bridges, VLAN Groups and VLAN segments. To create VLAN Groups, see Section 5.11, “Managing VLAN Groups”. To create networks, see Section 5.12, “Managing Networks”.

## 5.4 IP Addressing and DHCP

When setting up a network within Oracle VM Manager you have the option to configure the IP addressing mechanism that should be used for each Oracle VM Server and also for each virtual machine. There are two options, `DHCP`, and `Static IP Address`. If you choose to make use of DHCP to automatically assign IP addresses to servers or virtual machines within a network, you must ensure that a DHCP server is set up and available within your Oracle VM environment. Oracle VM Manager does not function as a DHCP server by itself. In order for DHCP to function properly, the DHCP server must be connected to the physical network ports that you have specified for each Oracle VM Server within the network.

If using static IP addresses for your Oracle VM Servers or virtual machines, Oracle VM Manager will automatically configure the network parameters for each Oracle VM Server or virtual machine, via the Oracle VM Agent, according to the IP address, netmask and gateway that you specify for each server or virtual machine within Oracle VM Manager.

When configuring network bridges, or networks that solely function as virtual machine networks, it is possible to not specify an IP addressing mechanism for the bridge. In this case, the bridge functions as a Layer 2 switch for the virtual machines making use of it. See Section 5.6, “Network Bridges” for more information on this.

## 5.5 Network Bonding

Network bonding refers to the combination of network interfaces on one host for redundancy and/or increased throughput. Redundancy is the key factor: we want to protect our virtualized environment from loss of service due to failure of a single physical link. This network bonding is the same as the Linux network bonding or Oracle Solaris data link aggregation. Using network bonding in Oracle VM may require some switch configuration.

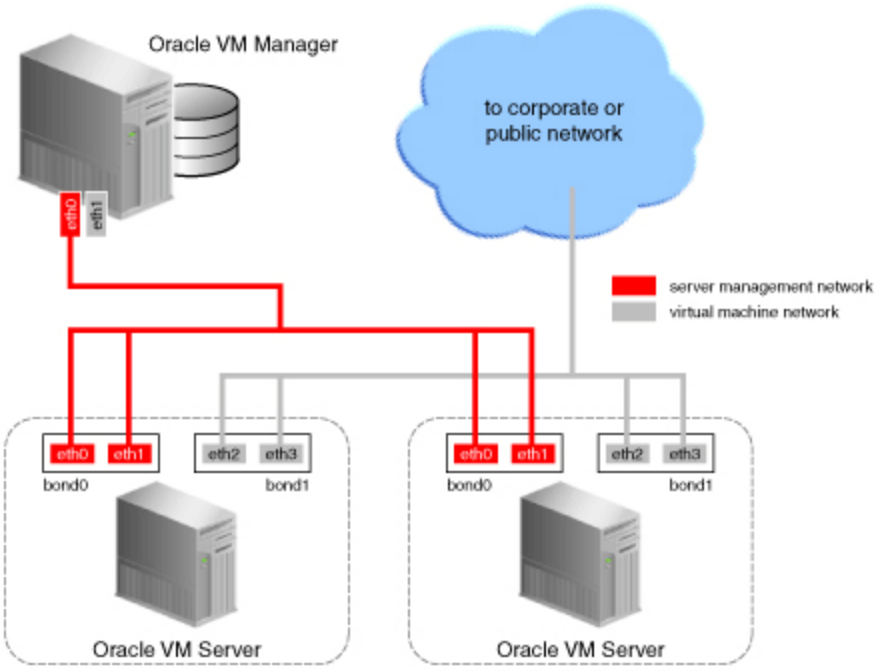
In Oracle VM, there are three modes of network bonding:

- **Active Backup**: there is one NIC active while another NIC is asleep. If the active NIC goes down, another NIC becomes active. While this mode does not increase throughput, it provides redundancy in case of failure. Active Backup is only supported in x86 environments.
- **Dynamic Link Aggregation**: aggregated NICs act as one NIC which results in a higher throughput, but also provides failover in the case that a NIC fails. Dynamic Link Aggregation requires a switch that supports IEEE 802.3ad.
- **Adaptive Load Balancing**: the network traffic is equally balanced over the NICs of the machine and failover is also supported to provide redundancy. Unlike Dynamic Link Aggregation, Adaptive Load Balancing does not require any particular switch configuration. Adaptive Load Balancing is only supported in x86 environments.

**Note**

Only Dynamic Link Aggregation is currently supported for SPARC servers.

**Figure 5.2 Network bonding**




During installation of Oracle VM Server, the network interface (selected when prompted for the management port) is configured as a bonded interface. The bond is created with only one interface. This is done because the reconfiguration of the management interface on the Oracle VM Servers is not supported. You can add a second interface to the already existing bond device without affecting the configuration of the original interface. This is illustrated in Figure 5.2, “Network bonding”, where a second network interface is added to bond0, the network bond created during installation. By default, the bond mode is set to Active Backup for the management network.

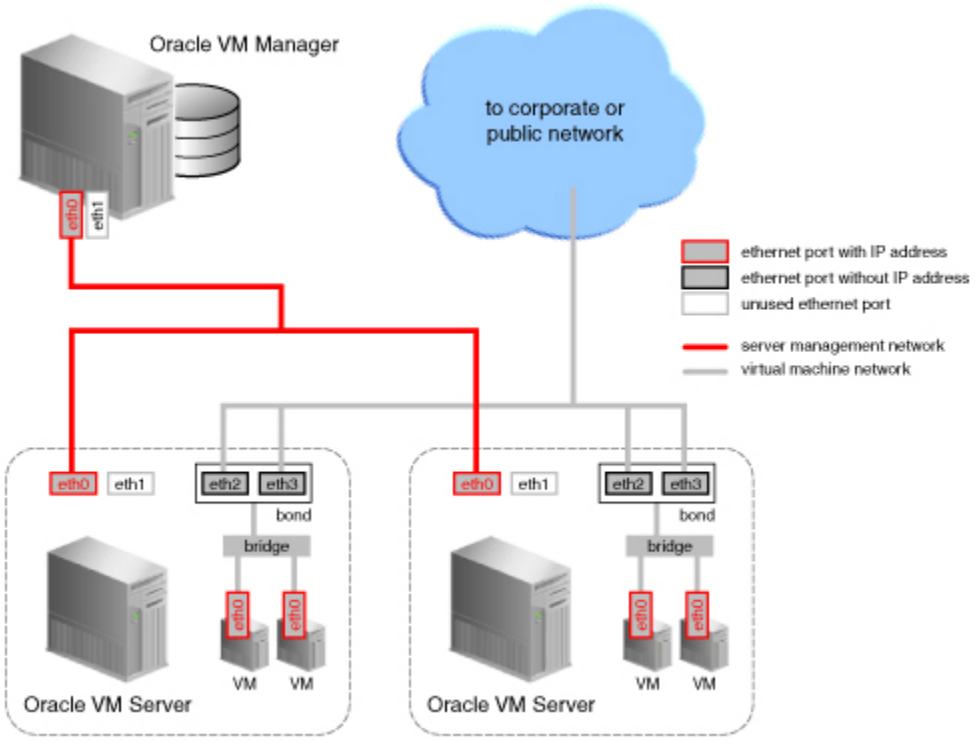
Figure 5.2, “Network bonding” also illustrates the configuration of a second bonded interface, bond1, which can be used for other network usage, such as the virtual machine function.

# 5.6 Network Bridges

When creating a network with the virtual machine role, a bridge is created automatically on the port or bond added to the network for each Oracle VM Server participating in this network. All network packets generated by the virtual machines are sent to the bridge configured for the virtual machines' network. The bridge acts as a Layer 2 switch, and directs packets to other virtual machines running on the Oracle VM Server, or to the port or bond, if the packets' destination is outside of the Oracle VM Server.

Though each virtual machine deployed within a network is usually assigned an IP address, either static or assigned using DHCP, there is no need to configure an IP address for the bridge on the Oracle VM Servers. When configuring your Virtual Machine network, if you specify an IP address for the port or bond you selected for this network, it is assigned to the bridge. You can choose not to assign an IP address to the selected port or bond. In this case, the bridge does not acquire an address but still functions as a Layer 2 switch.

**Figure 5.3 Network bridge**




In Figure 5.3, “Network bridge”, two network ports are specified for the network with the virtual machine role. Therefore, these ports should be configured as a bonded interface. Since this network is configured with the virtual machine role, a bridge is automatically created on each Oracle VM Server in the network. Neither the bridge nor the ports in the virtual machine network, have IP addresses assigned to them, though you may assign IP addresses if you wish during network creation.

Bridges are only created for networks with the virtual machine role.

# 5.7 VLAN Groups and VLAN Segments

Oracle VM supports multiple virtual LANs, or VLANs, on the same network port or bond. Each VLAN is essentially an independent logical network operating with other VLANs over the same physical connection. This means that virtual machines deployed on different networks, connected through the same Oracle VM Server port (or bond), can have traffic directed to different VLANs. This feature is implemented using VLAN groups.

Configuring VLANs involves creating one or more VLAN Groups, each of which can house multiple VLANs. Each VLAN is assigned a distinct VLAN identification. The VLAN ID is used by an attached VLAN switch to segregate traffic among the different VLANs operating on the same link. When a VLAN is configured, it functions exactly like a separate physical connection.

## 5.7.1 Configuring VLANs

You must configure the VLANs needed to support your network before you can use them. This is usually accomplished using switch trunking. Trunking involves configuring ports on the switch to allow multiple VLAN traffic on these ports, to ensure that packets are correctly transmitted to their final destination. Consult your switch vendor's documentation for information regarding trunking.

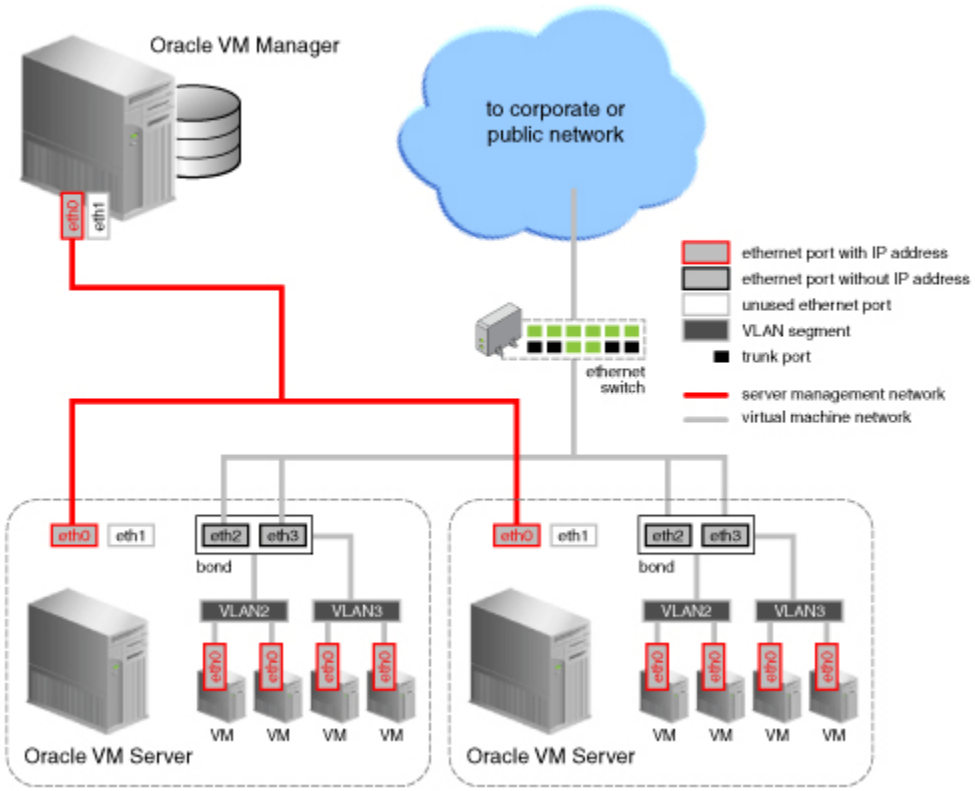
## 5.7.2 Configuring VLAN Groups

A VLAN Group is a logical grouping of VLANs, either tagged or untagged. If a VLAN is tagged, each packet transmitted to and from this VLAN contains a VLAN ID. Network traffic can contain a mix of tagged and untagged packets. If a packet does not contain a VLAN tag, the packet is destined to an untagged VLAN.

You create a VLAN group to direct the traffic from several VLANs onto a single port or bond on each Oracle VM Server in the server pool. For example, if a port or bond is expected to carry traffic for VLAN with ID 2 and for VLAN with ID 3, you create a VLAN Group and specify the two VLANs, VLAN 2 and VLAN 3. These VLANs appear as VLAN segments in the VLAN Group. After creating the VLAN Group, you create a network and specify one of the VLAN segments present in the VLAN Group. Each packet transmitted from virtual machines on this network is tagged with the VLAN Id for the VLAN segment specified during network creation. If you specify untagged during network creation, the packets can still flow through the port or bond defined in the VLAN groups, but the packets are untagged. The Ethernet switch, to which the Oracle VM Servers are connected, is responsible to transmit the packets to the appropriate VLAN, tagged or untagged.

Figure 5.4, “Networks with VLANs and VLAN Group” illustrates the case of two virtual machine networks, whose network traffic flows through the same bonded interface.

**Figure 5.4 Networks with VLANs and VLAN Group**




The VLAN Group needed to support the configuration shown in Figure 5.4, “Networks with VLANs and VLAN Group” contains two VLANs, with ID 2 and 3. The VLAN Group also contains two ports for each Oracle VM Server in the network. On each server, the ports are configured as a bond device. Once the VLAN Group is created, two virtual machine networks are added: the first network specifies the VLAN segment with ID 2 and the second network specifies the VLAN segment with ID 3, where both segments are defined in the VLAN Group. For each network, a bridge is defined for the specified VLAN segment,

without an IP address since none is specified during configuration. Network packets from virtual machines deployed on VLAN segment 2 travel through the bridge and acquire a tag which identifies the packets as belonging to VLAN 2. Similarly, the packets issued from the virtual machines deployed on the network for VLAN segment 3 are tagged for VLAN3 with ID 3. The packets from both networks use either path to the switch if the bond is configured for Dynamic Link Aggregation or for Adaptive Load Balancing. The receiving ports on the Ethernet switch are configured using trunking or similar program to recognize network traffic for the two VLANs in the configuration. As such, the trunk ports will direct the packets to the correct VLAN on the switch, or other connected switches.

# 5.8 Creating Additional Networks

Depending on the number of available network ports on your Oracle VM Servers, and whether or not you use VLANs, you can create additional networks and assign network functions to them. The exception would be the Management function, which is already assigned, and cannot be removed from the management network(s) created when the Oracle VM Servers were discovered. For example, if your Oracle VM Servers have two NICs, you create a second network with the Virtual Machine role. If your storage is connected to the Management network, you can add the Storage role to your Management network if your storage is connected to the same network as defined by the Management network.

If you have more than two ports on your Oracle VM Servers, or if you are using VLANs, you can create additional networks with the Storage role. These networks connect your Oracle VM Servers to either iSCSI or NFS-based storage. Generally, all Oracle VM Servers that belong to the same pool access the same storage. For each network created, you select a port, bond or VLAN interface on each Oracle VM Server to participate in this network.

You can also create a separate network for the Live Migrate function. After the initial server discovery, the Live Migrate role is assigned to the Management network. Oracle VM encrypts migration traffic using SSL, to protect sensitive data from exploitation and to eliminate the requirement for a dedicated network. Nonetheless, if you have sufficient network resources on your Oracle VM Servers within a server pool, you can choose to create a separate network for live migration.

Similarly, the Cluster Heartbeat network function is assigned to the Management network upon discovering the first Oracle VM Server. The heartbeat communication does not generate a lot of traffic on the network, and therefore does not have much impact on the Management network. It is however susceptible to latency. For this reason, you can choose to create a separate network for the cluster heartbeat function.

**Note**

Though you can create several networks for the heartbeat and live migration functions, each Oracle VM Server can only participate in one heartbeat and live migration network.

Network configuration is independent of your server pool configuration, but both entities must be taken into account when designing your overall networking infrastructure. Oracle VM Manager communicates with all Oracle VM Servers in the environment, using the management port, independent of how Oracle VM Servers are grouped to form server pools. Some network configuration in your environment might be dependent on the storage available to specific server pools. Virtual machines deployed from separate server pools might use the same external network. For this reason, it is best to plan your network design based on current network and storage setup as well as anticipated growth.

The next sections of this chapter describe how to use Oracle VM Manager to translate the network structure of your Oracle VM environment into VLAN Groups and networks. If you expect to use bonding of network ports in your environment, create those first. If your environment contains VLANs, create the VLAN Groups to support your VLAN setup. You can then specify the VLAN segments contained in these VLAN Groups when creating your networks.

## 5.9 Desiging Cluster Heartbeat Networks

Oracle VM uses OCFS2 as its underlying clustering file system to manage its storage repositories and provide access to shared storage.

A cluster *heartbeat* is an essential component in any OCFS2 cluster. It is charged with accurately designating *nodes* (in this case, nodes are Oracle VM Servers) as dead or alive. There are two types of heartbeats used in OCFS2:

- The disk heartbeat where all the Oracle VM Servers in the cluster write a time stamp to the server pool file system device.
- The network heartbeat which is where the Oracle VM Servers communicate through the network to signal to each other that every cluster member is alive.

The *quorum* is the group of Oracle VM Servers in a cluster that is allowed to operate on the shared storage. When there is a failure in the cluster, Oracle VM Servers may be split into groups that can communicate within their groups and with the shared storage, but not between groups. In this case, OCFS2 determines which group is allowed to continue and initiates *fencing* of the other group(s). Fencing is the act of forcefully removing an Oracle VM Server from a cluster. An Oracle VM Server with OCFS2 mounted will fence itself when it realizes that it does not have quorum in a degraded cluster. It does this so that other Oracle VM Servers are not stuck trying to access the cluster's resources. When an Oracle VM Server is fenced, it is rebooted and rejoins the cluster. If an Oracle VM Server is fenced, the virtual machines running on the fenced Oracle VM Server are migrated and restarted on other Oracle VM Servers if the virtual machines are HA enabled (virtual machines that are not HA enabled are not migrated).

The cluster heartbeat is sensitive to network interruptions and therefore the Cluster Heartbeat network should be given special attention and be treated separately to make sure that:

- It is not sharing the same links with high traffic networks like the Storage or Live Migrate networks. See Section 5.12.1, “Creating a Network” for information on creating a network.
- It has redundancy using a bond which ensures continued operation if one network path fails. See Section 5.5, “Network Bonding” and Section 5.10, “Managing Bonded Interfaces” for information bonds.

For more information on the implementation of OCFS2 in Oracle VM, see Section 6.2, “Server Pool Clusters”.

## 5.10 Managing Bonded Interfaces

The management port on each Oracle VM Server is specified at installation time and is automatically configured as a bonded interface. You create additional bonds to add redundancy and if desired, load-balancing to your network environment. Once created, these bonds can be used as building blocks when building VLAN Groups or networks. This section discusses managing bonded interfaces.

**To create a bond port:**

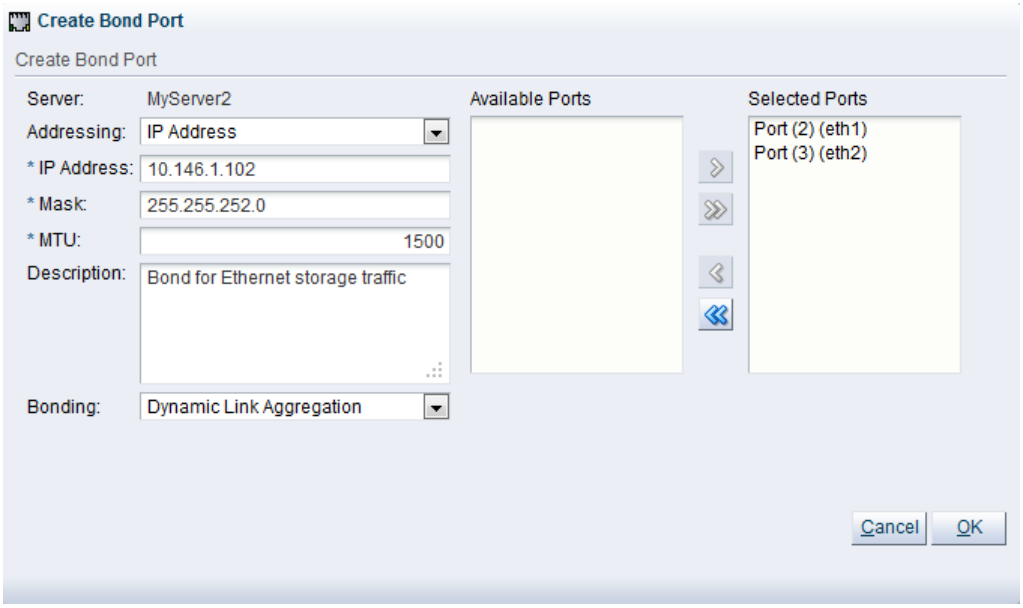
1. In the Oracle VM Manager user interface, select the **Servers and VMs** tab.
2. In the navigation pane, select the Oracle VM Server on which the bond port is to be created. If the Oracle VM Server is already part of a server pool, it is listed under **Server Pools**. Otherwise, find and select the Oracle VM Server in the **Unassigned Servers** folder.
3. In the management pane, set the **Perspective** to **Ethernet Ports**. Make sure that the selected Oracle VM Server's ports to be used for the bond port are not part of an existing bond, network or VLAN group. Verify that the ports are available.

4. In the management pane, set the Perspective to **Bond Ports**. In the toolbar above, click **Create Bond Port** ✚ to start the Bond Port Creation wizard.

5. In the right part of the **Create Bond Port** window, select the ports to be part of the new bond. Do this by moving ports from the **Available Ports** pane to the **Selected Ports** pane by means of the arrow buttons.

   **Note:** You cannot add a port to a bond if the port has an IP address.

   You can also assign an IP address to this bond now, or wait to assign an IP address later, when using the bond to create VLAN Groups or networks. If you choose to assign an IP address now, select the **Addressing** type, and if applicable, the IP address and netmask.




6. If necessary, set a Maximum Transfer Unit size in the **MTU** field. If your network supports jumbo frames, increase the MTU value to the required size. The MTU is set to 1500 by default, and can be between 1500 and 9000 for a 1GbE NIC, and 1500 and 64000 for a 10GbE NIC. Setting the MTU field sets the maximum transmission rate, so a packet size of 5000 can be sent and received if the MTU is set to 9000 for a 1GbE NIC.

   **Note**

   Support for jumbo frames on SPARC systems is currently unavailable. If configuring a port on SPARC system, do not attempt to change the MTU value.

7. Optionally, add a description for this bond.

8. Specify the bonding mode from the **Bonding** list. See Section 5.5, “Network Bonding”, for more information regarding network bonding modes.

9. Click **OK** to complete the operation.

When you have created the bond port, you can make changes to its configuration. You can update its bonding mode, and add or remove ports as well as changing its description and IP addressing.

**To edit a bond port:**

1. In the Oracle VM Manager user interface, select the **Servers and VMs** tab.

2. In the navigation pane, select the Oracle VM Server on which the bond port is to be created. If the Oracle VM Server is already part of a server pool, it is listed under **Server Pools**. Otherwise, find and select the Oracle VM Server in the **Unassigned Servers** folder.

3. In the management pane, set the **Perspective** to **Bond Ports** and select the bond you wish to update. In the toolbar above, click **Edit Selected Port** . The **Edit Port** dialog box appears.

4. You can set or change the IP addressing, the bonding mode, the MTU, the description, or the ports that are part of the bond.

5. Click **OK** to save and apply your changes.

If the bond port is no longer in use in any VLAN Group or network, it can be deleted.

**To delete a bond port:**

1. In the Oracle VM Manager user interface, select the **Servers and VMs** tab.

2. In the navigation pane, select the Oracle VM Server on which the bond port is to be created. If the Oracle VM Server is already part of a server pool, it is listed under **Server Pools**. Otherwise, find and select the Oracle VM Server in the **Unassigned Servers** folder.

3. In the management pane, set the **Perspective** to **Bond Ports** and select the bond you wish to delete. In the toolbar above, click **Delete Selected Port** .

4. In the **Delete Confirmation** dialog box, click **OK** to delete the bond port.

# 5.11 Managing VLAN Groups

Oracle VM supports multiple virtual LANs (VLANs) on the same NIC port. Each VLAN is essentially an independent logical network operating with other VLANs over the same physical connection. Using VLANs in an ideal way to minimize the number of required physical connections and NICs while concurrently separating traffic. Configuring networks to support VLAN traffic involves creating one or more VLAN Groups, each of which can house multiple VLANs. Each VLAN is assigned a distinct VLAN identification. The VLAN ID is used by an attached VLAN switch to segregate traffic among the different VLANs operating on the same link. When a VLAN is configured, it functions exactly like a separate physical connection.

VLANs need to be configured in the physical switches before you can use them. See Section 5.7, “VLAN Groups and VLAN Segments” for more information about using VLANs in your networking environment.

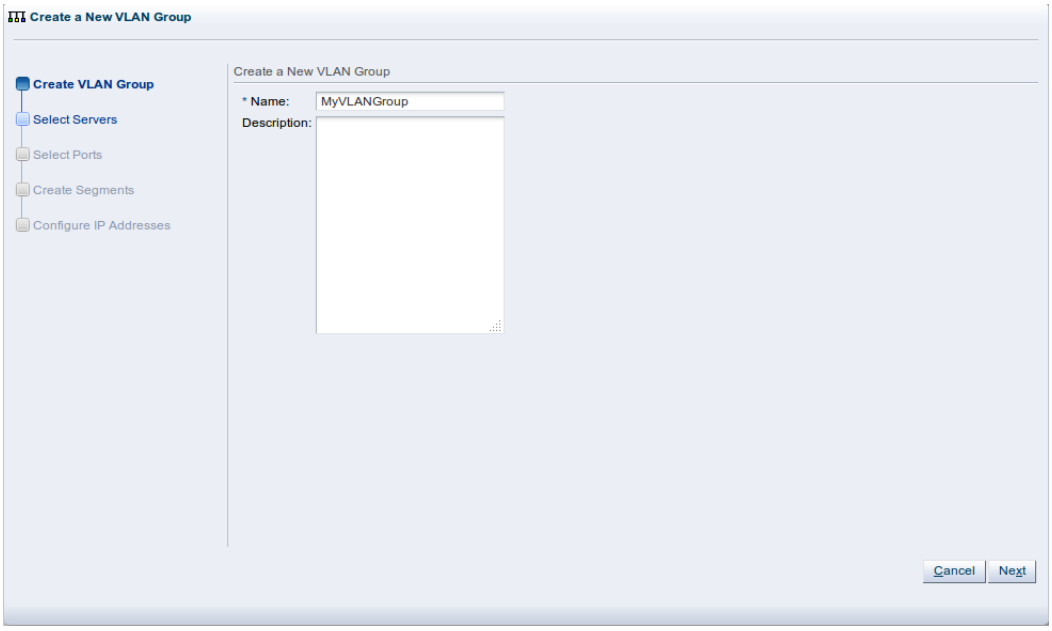
## 5.11.1 Creating a VLAN Group

**To create a VLAN Group:**

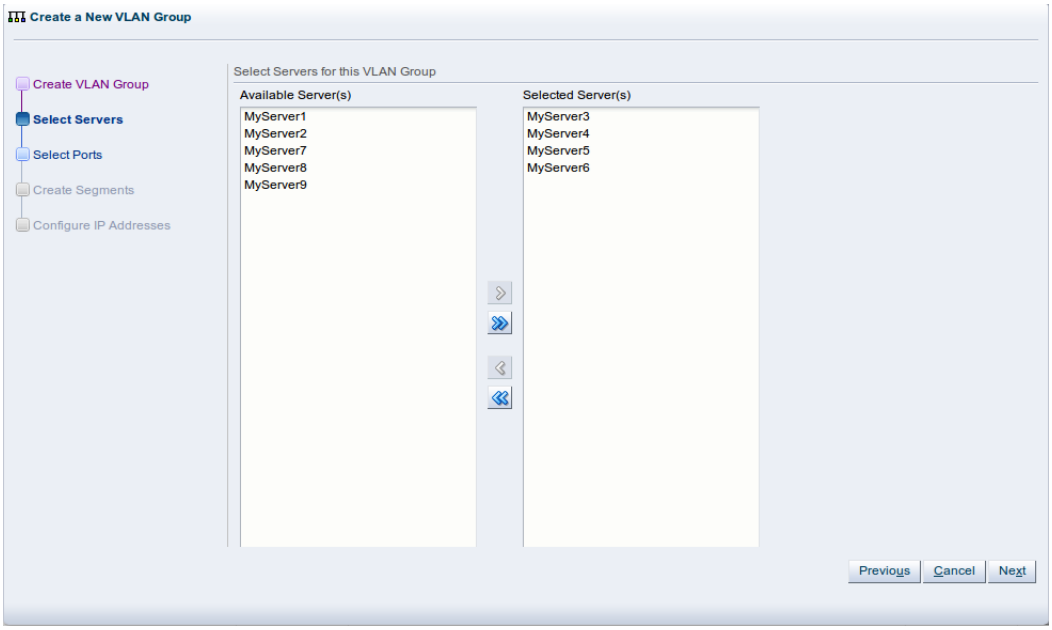
1. In the Oracle VM Manager user interface, select the **Networking** tab. Click **VLAN Groups** to display the VLAN Groups screen.

2. In the VLAN Groups toolbar, click **Create New VLAN Group** to start the VLAN Group Creation wizard.

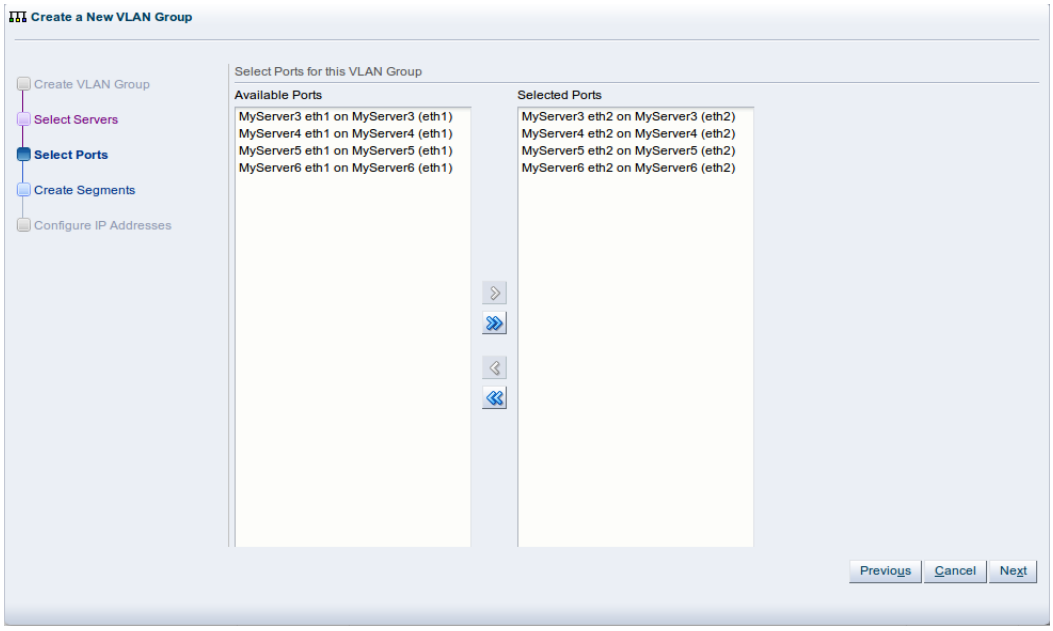
3. Enter a name in the **Name** field, and optionally a description in the **Description** field for the VLAN group and click **Next**.



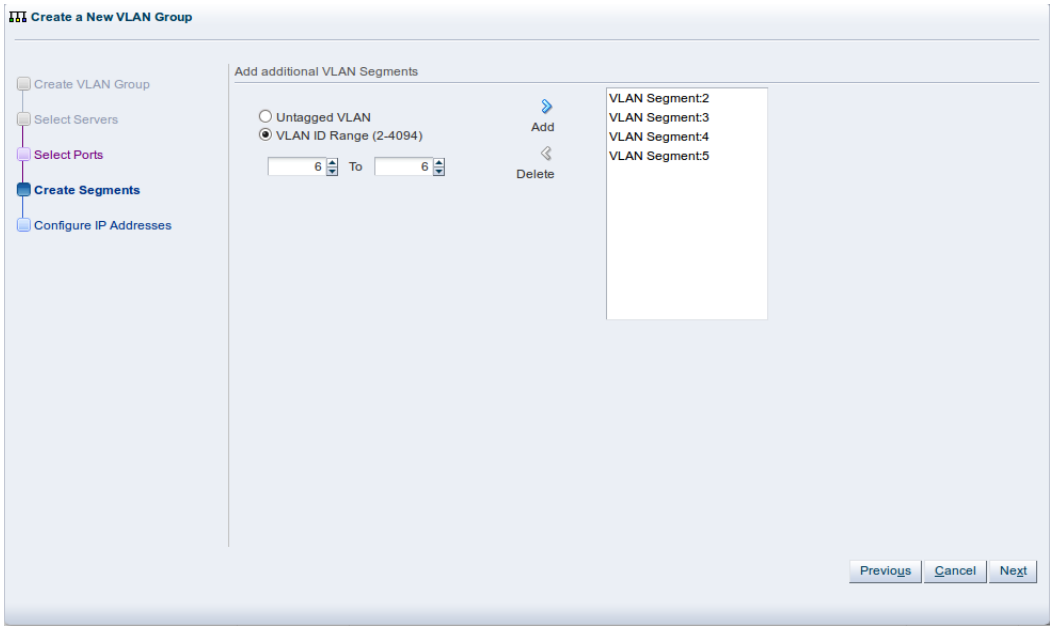

4. Select the Oracle VM Servers that have ports or bonds for this VLAN group and click **Next**.



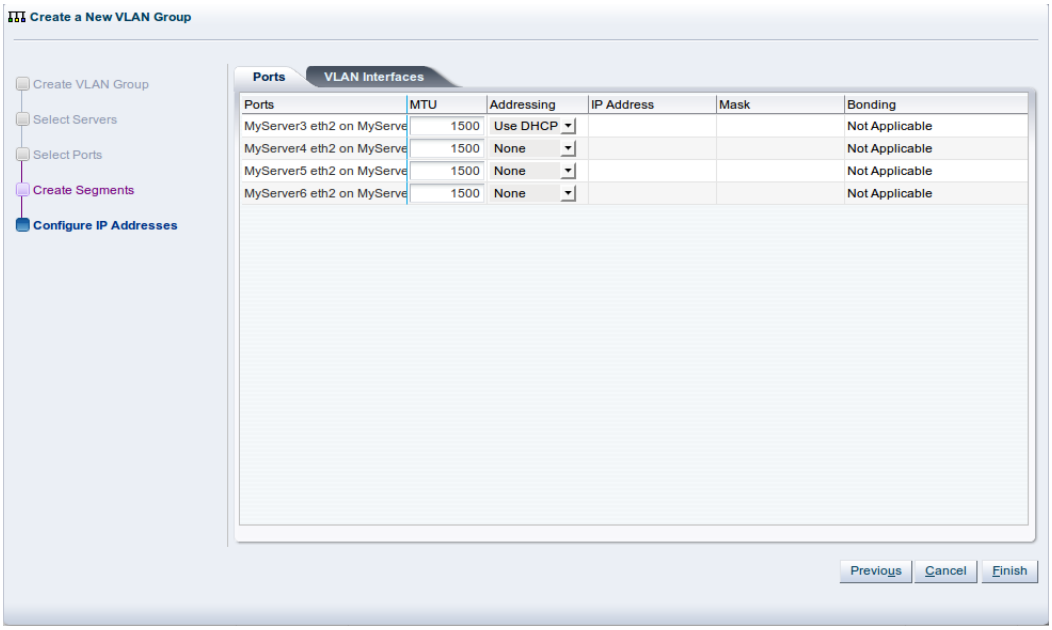

5. Select the port or bond of each Oracle VM Server that belongs to the network and click **Next**. The number between brackets next to the name of the Oracle VM Server corresponds with the NIC of the Oracle VM Server.




6. Add all VLAN IDs which belong to the VLAN group, and optionally select **Untagged VLAN**. Each selected VLAN ID appears as a separate VLAN segment in the VLAN Group.




7. In the next screen, you can set IP addressing to either the ports and bonds or to the VLAN interfaces that are part of this new VLAN Group. Generally, you do not specify IP addresses to VLAN interfaces that are part of a network for virtual machines.




8. Click **Finish** to complete the operation.

## 5.11.2 Editing a VLAN Group

**To edit a VLAN Group:**

1. In the Oracle VM Manager user interface, select the **Networking** tab. Click **VLAN Groups** to display the VLAN Groups screen.

2. In the VLAN Groups table, select the VLAN group you wish to edit, and in the toolbar above, click **Edit Selected VLAN Group** . The Edit VLAN Group dialog box appears. The screens in the wizard are identical to the ones displayed in Section 5.11.1, “Creating a VLAN Group”.

3. In the **Edit VLAN Group** screen you can change the name in the **Name** field, and the description in the **Description** field. Click **Next**.

4. In the **Select Servers** screen, you can add or remove Oracle VM Servers participating in this VLAN group. Click **Next**.

5. In the **Select Ports** screen, you can add or remove ports or bonds for the Oracle VM Servers in this VLAN Group. The number between brackets next to the name of the Oracle VM Server corresponds with the port of the Oracle VM Server. Click **Next**.

6. In the **Edit Segments** screen, you can add or remove VLAN IDs from the VLAN Group and optionally select **Untagged VLAN**. Each selected VLAN ID appears as a separate VLAN segment in the VLAN Group. It is possible to combine VLAN IDs with Untagged VLANs, so, first select the proper **VLAN IDs**, and then select **Untagged VLAN**.

7. In the **Configure IP Address** screen, you can update information for the ports or bond ports and for the VLAN interfaces that are currently part of the VLAN Group.

   Select the **Ports** tab to modify the IP addressing of ports or bond ports that are part of the VLAN Group. You can update the IP addressing type, the IP address if selecting a static address, and the netmask. If the VLAN Group contains bond ports, you can also modify the bonding mode for the bond ports.

Select the **VLAN Interfaces** tab to modify the IP addressing of the VLAN interfaces that are part of the VLAN Group. You can update the IP addressing type, the IP address if selecting a static address, and the netmask.

8. Click **Finish** to complete the update.

### 5.11.3 Deleting VLAN Groups

You can only delete a VLAN Group if none of the VLAN segments in the VLAN Group are currently being used by a network.

**To delete VLAN Groups:**

1. Select the **Networking** tab. Click **VLAN Groups** to display the VLAN Groups screen.
2. Select one or more VLAN groups in the table, and in the toolbar above, click **Delete Selected VLAN Group** ✖ .
3. In the **Delete Confirmation** dialog box, click **OK** to delete the VLAN groups. The VLAN groups are deleted.

## 5.12 Managing Networks

The initial Oracle VM Server installation configures the bare minimum network configuration. This allows Oracle VM Servers to set up their networking sufficiently to establish communication with Oracle VM Manager.

User created network devices (VLAN or a bond) on an Oracle VM Server are discovered by Oracle VM Manager, but these network devices are not associated with logical networks.

The management network, created during the Oracle VM installation, has the following network functions:

- Server Management
- Live Migrate
- Cluster Heartbeat

When an Oracle VM Server is discovered, the port on which the Oracle VM Manager discovers the Oracle VM Server is added to this management network, and the port is configured as a bonded interface. See Section 5.5, “Network Bonding” for details about network bonding. You can add a port to this bond, and you can add or remove network functions for this network other than the management role. You can also remove the Oracle VM Server management interfaces from the management network temporarily if you wish to add them to a VLAN group and configure VLAN interfaces for management traffic and other network functions separately. You can make the allowed changes to the configuration of the management network at any time using Oracle VM Manager. See Section 5.13, “Editing Network Data” for details about changing a network configuration in Oracle VM Manager.

**Note**

In Oracle VM the management network interface must be configured on the the public interface (i.e. the interface that provides the default route) for each Oracle VM Server. Other types of network usage are allowed to share the same interface, for example through the use of VLANs and/or network bridges.

Additional Oracle VM network configuration beyond what is done through the discovery process must be done using Oracle VM Manager. Do not edit the network configuration files on Oracle VM Servers manually, instead, use Oracle VM Manager.

All network configurations are persistent on the Oracle VM Servers to allow HA to work without requiring Oracle VM Manager. This includes enough logical information to allow the configuration to be recreated on Oracle VM Manager in the event that the Oracle VM Manager database is lost. All network configuration is also persistent on Oracle VM Manager.

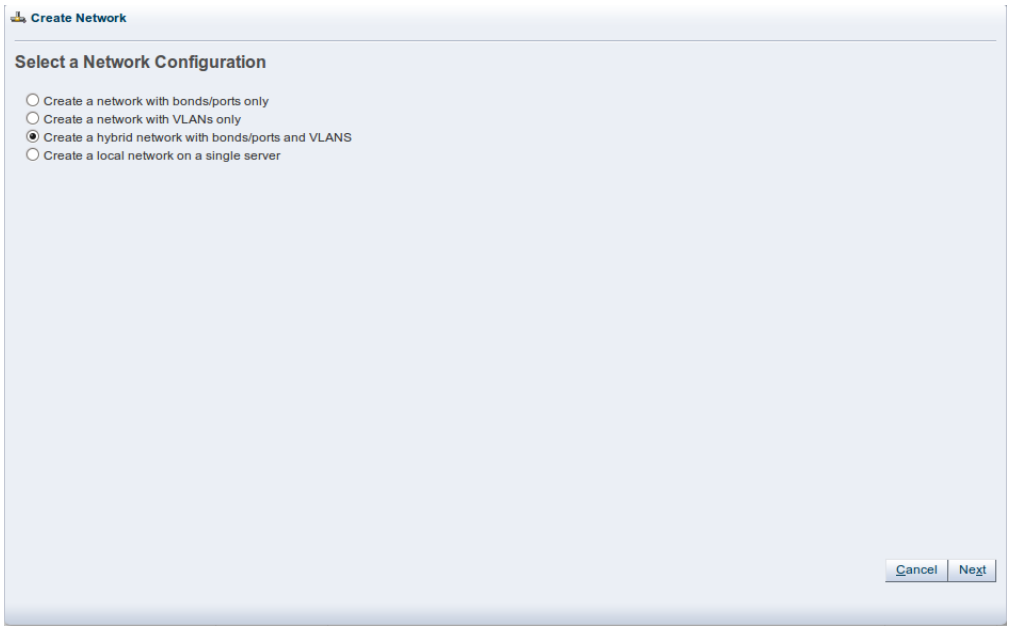
When you build a new network, you use ports, bond ports or VLAN interfaces as building blocks for the network. For more information on network building blocks, see Section 5.3, “Building a Network Environment”. You must also select the network usage for your new network. For a discussion of network functions and rules associated with them, consult Section 5.8, “Creating Additional Networks”.

This section discusses managing networks.

## 5.12.1 Creating a Network

**To create a network:**

1. Select the **Networking** tab.
2. Click **Create New Network** ✚ to start the **Create Network** wizard. The wizard offers the following choices:
   - Create a network with bonds/ports only
   - Create a network with VLANs only
   - Create a hybrid network with bonds/ports and VLANs
   - Create a local network on a single server

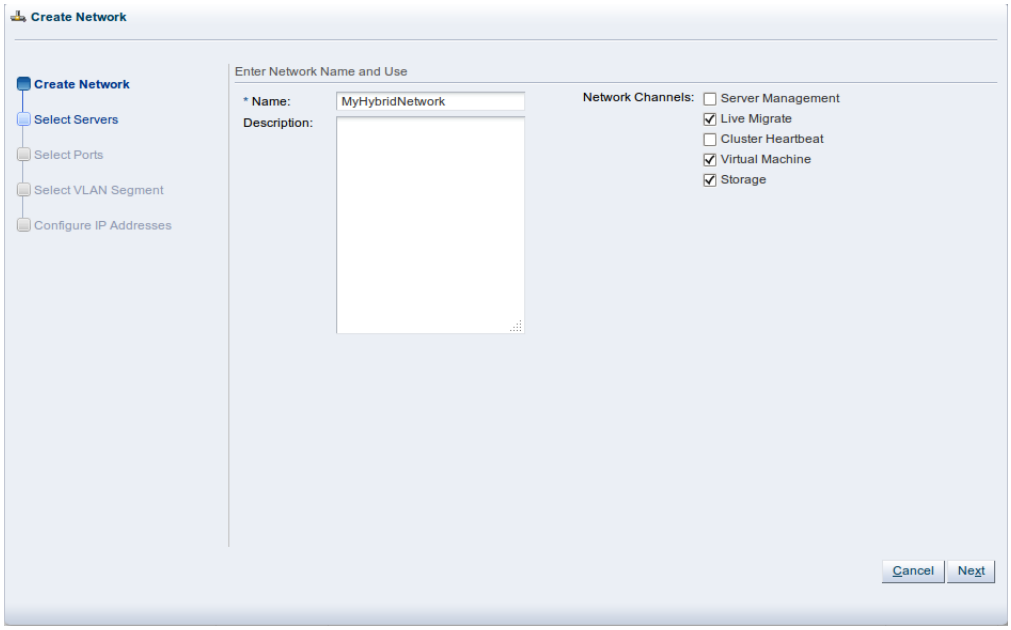



3. Select the type of network to create, based on your network infrastructure.
   - If you have created bonds previously, you can now use them to create a network.
   - If you select to create a network with VLANs only, you must have created a VLAN Group previously. See Section 5.11.1, “Creating a VLAN Group” for details on how to create a VLAN Group.
   - You can also choose to create a network with a combination of bonds and ports, and VLANs.

- The last selection, to create a local network on a single server, creates an intra-server network on a single Oracle VM Server. See Section 5.3, “Building a Network Environment” for information about intra-server networks. To create an intra-server network on a single server, proceed with creating a local network for a single Oracle VM Server [116]. For all other network types, continue with entering network information [112].

4. Enter the following network information:

   - **Name:** A name for the network.
   - **Description:** A description of the network. This is an optional field.
   - **Network Channels:** Select one or more network functions:
     - Server Management
     - Live Migrate
     - Cluster Heartbeat
     - Virtual Machine
     - Storage




See Section 5.2, “Network Usage” for more information regarding network functions.

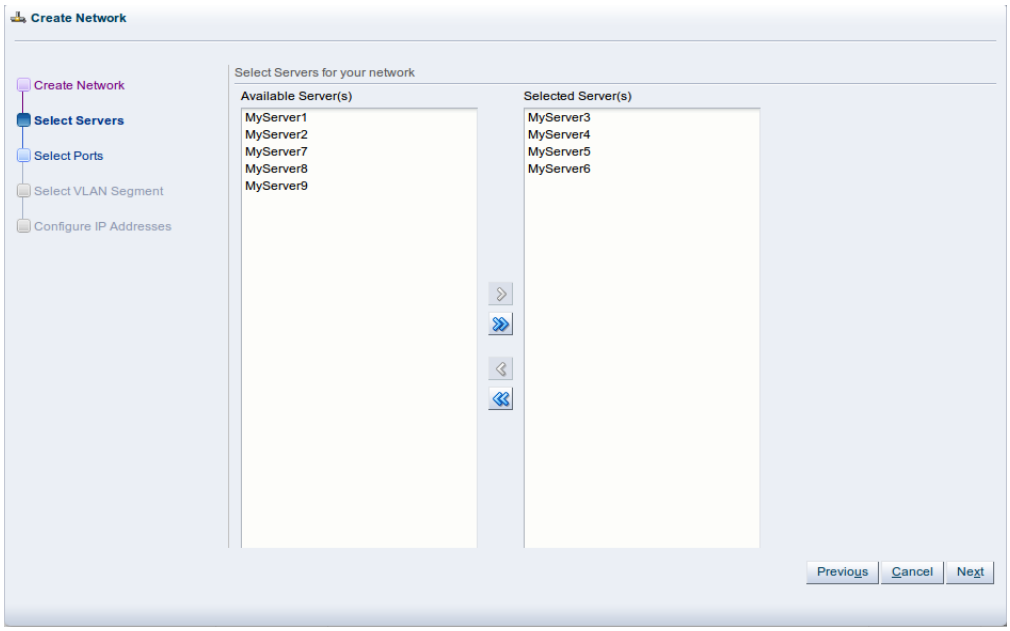
> **Important**
>
> It is recommended to separate the Cluster Heatbeat function from networks with high load, such as Storage and Live Migrate networks. If bandwidth drops too low, heartbeating connectivity might be interrupted, which could lead to rebooting of virtual machines and Oracle VM Servers. See Section 5.9, “Desiging Cluster Heartbeat Networks” for more information on designing a network for the Cluster Heartbeat role.

5. Depending on the network type you selected to create, fill out the applicable screens in the wizard as described below:

   - **Select Servers** screen

     *(applies to network type: bonds/ports, hybrid – skip for type VLAN only)*

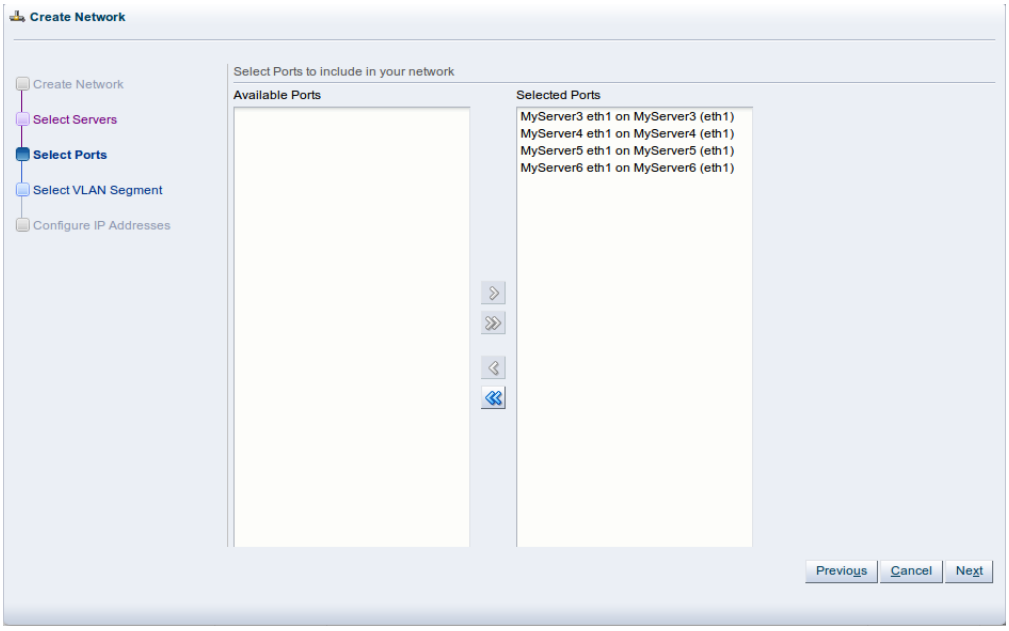
     Add the servers participating in this network. Click **Next**.




   - **Select Ports** screen

     *(applies to network type: bonds/ports, hybrid – skip for type VLAN only)*

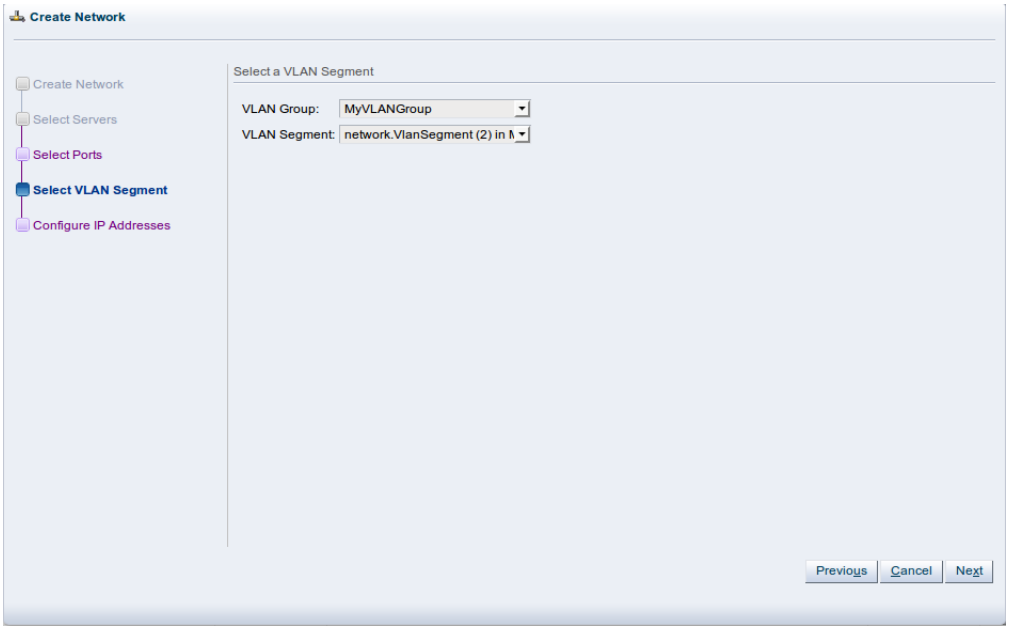
     Select the ports or bonds of each Oracle VM Server that participates in this network. The number between brackets next to the name of the Oracle VM Server corresponds with the NIC of the Oracle VM Server. Click **Next**.




- **Select VLAN Segment** screen

  *(applies to network type: VLAN only, hybrid – skip for type bonds/ports)*

  Select the VLAN Group from the list, then select the VLAN segment from the list. All VLAN Groups are available for selection, but VLAN segments already in use do not appear in the drop-down list. Click **Next**.




- **Configure IP Addresses** screen – **Ports** tab

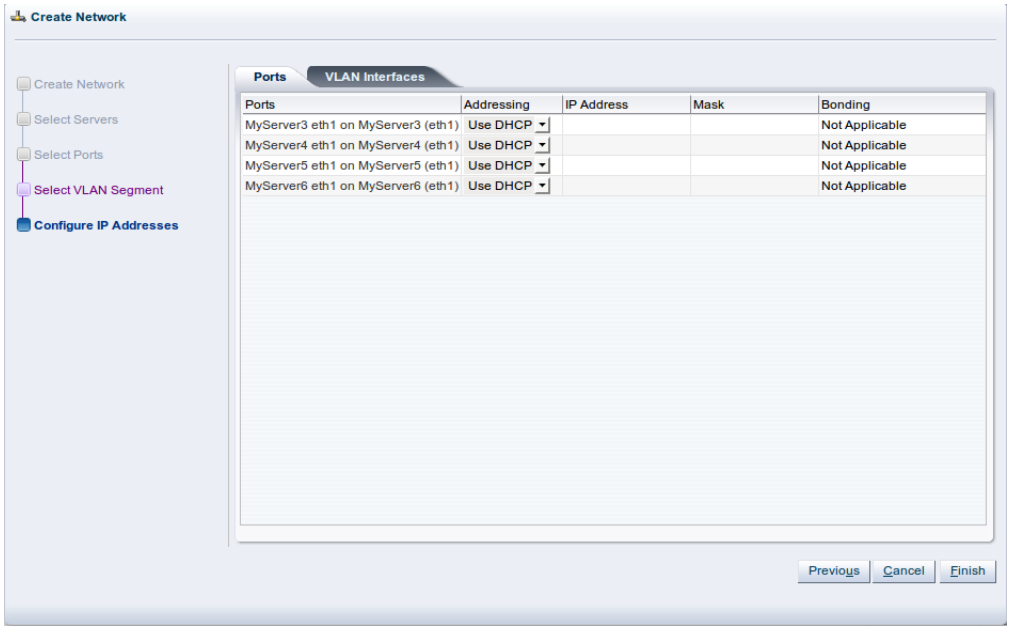
  *(applies to network type: bonds/ports, hybrid – select other tab for VLAN only)*

  Set the IP configuration for each port or bond. See Section 5.4, “IP Addressing and DHCP” for more information.

If your network is only being configured for the virtual machine function, you do not have to define the IP data. See Section 5.6, “Network Bridges” for details on creating bridges for virtual machine networks.

If bonding is active, select the Bonding mode. See Section 5.5, “Network Bonding” for a description of the bonding modes.

If you are creating a hybrid type network, select the VLAN Interfaces tab. If you are creating a network with bonds and ports only, click **Finish** to close the wizard and complete the network creation.



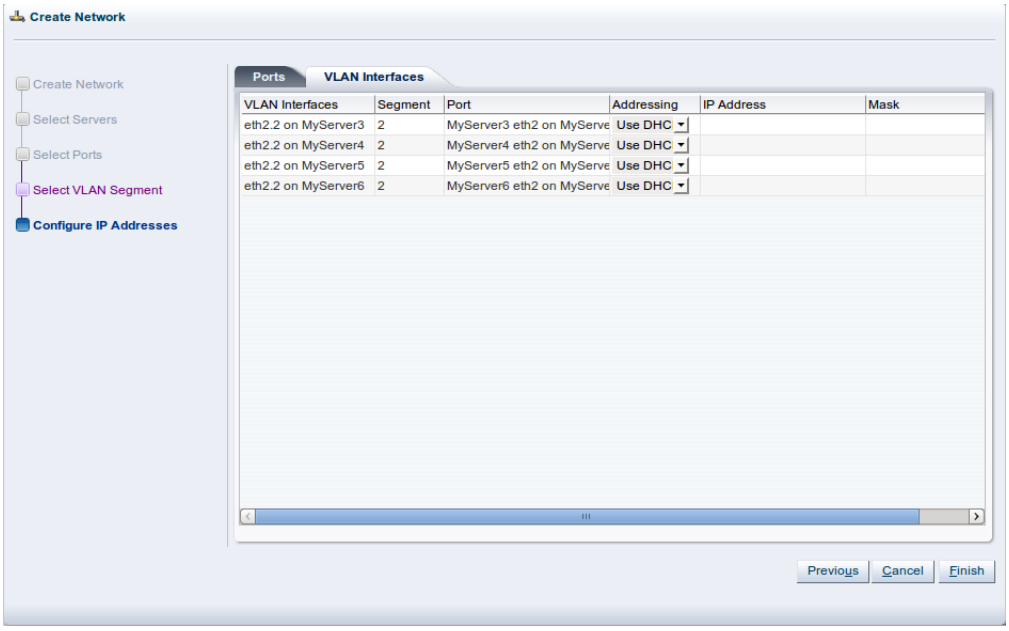

- **Configure IP Addresses** screen – **VLAN Interfaces** tab

  *(applies to network type: VLAN only, hybrid – skip for type bonds/ports)*

  The VLAN interface selected for each port is listed, along with the IP addressing information. If IP information was supplied when creating the VLAN Group, this IP information is displayed. If no IP information was supplied when creating the VLAN Group, none is displayed.

  If the network you are creating contains the virtual machine network function only, you *cannot* change the IP information from the VLAN Interfaces tab. If the network you are creating contains any other network function, alone, or combined with the virtual machine network function, you *can* edit the IP information from the VLAN Interfaces tab.

  Click **Finish** to close the wizard and complete the network creation.




6. If you are creating an intra-server network for a single Oracle VM Server:
   - In the **Create Network** screen, enter a name and optional description for the new network.
   - In the **Select Server** screen, choose the server from the drop-down list.

   **Note**

   If the only network configured into a VM is an intra-server network then the only access available is through the VM's console. If remote access is required other than through a console then the VM must be configured another network other than an intra-server network
7. Click **Finish** to complete the network creation.

## 5.12.2 Editing a Network

The following applies to all types of network except intra-server networks on a single server.

**To edit a network:**

1. In the Oracle VM Manager user interface, select the **Networking** tab.
2. Select the network you wish to edit and click **Edit Selected Network** to start the **Edit Network** wizard.
3. Edit the network information and configuration as follows:
   - **Name:** Change the name of the network.
   - **Description:** Add or change a description for the network. This is an optional field.
   - **Network Usage:** Select or deselect one or more network functions:
     - Server Management
     - Live Migrate

- Cluster Heartbeat
- Virtual Machine
- Storage

See Section 5.2, “Network Usage” for more information regarding network functions.

4. Depending on the network type you selected to edit, make changes in the applicable screens as described below. The screens in the wizard are identical to the ones displayed in Section 5.12.1, “Creating a Network”.

   - **Select Servers** screen

     *(applies to network type: bonds/ports, hybrid – skip for type VLAN only)*

     Select or deselect the servers participating in this network. Click **Next**.

   - **Select Ports** screen

     *(applies to network type: bonds/ports, hybrid – skip for type VLAN only)*

     Select or deselect the ports or bonds of each Oracle VM Server that participates in this network. The number between brackets next to the name of the Oracle VM Server corresponds with the NIC of the Oracle VM Server. Click **Next**.

   - **Select VLAN Segment** screen

     *(applies to network type: VLAN only, hybrid – skip for type bonds/ports)*

     Select the VLAN Group from the list, then select the VLAN segment from the list. All VLAN Groups are available for selection, but VLAN segments already in use do not appear in the drop-down list. Click **Next**.

   - **Configure IP Addresses** screen – **Ports** tab

     *(applies to network type: bonds/ports, hybrid – select other tab for VLAN only)*

     Set or update the IP configuration for each port or bond. See Section 5.4, “IP Addressing and DHCP” for more information.

     If your network only has the virtual machine function, you do not have to define the IP data. See Section 5.6, “Network Bridges” for details on creating bridges for virtual machine networks.

     If bonding is active, select the Bonding mode. See Section 5.5, “Network Bonding” for a description of the bonding modes.

     If you are editing a hybrid type network, select the VLAN Interfaces tab. If you are editing a network with bonds and ports only, skip the second tab and proceed completing the network updates [118].

   - **Configure IP Addresses** screen – **VLAN Interfaces** tab

     *(applies to network type: VLAN only, hybrid – skip for type bonds/ports)*

     The VLAN interface selected for each port is listed, along with the IP addressing information. If IP information was supplied when creating the VLAN Group, this IP information is displayed. If no IP information was supplied when creating the VLAN Group, none is displayed.

If the network you are creating contains the virtual machine network function only, you *cannot* change the IP information from the VLAN Interfaces tab. If the network you are creating contains any other network function, alone, or combined with the virtual machine network function, you *can* edit the IP information from the VLAN Interfaces tab.

5. After verifying or making the necessary changes to the network, click **Finish** to complete the network updates.

**Note**

For logical networks on a single Oracle VM Server, you can only edit the **Description** field. If you want to change servers, delete the network and re-create it with a different server.

## 5.12.3 Deleting Networks

It may occur that a logical network becomes obsolete in Oracle VM. To keep your Oracle VM environment clean, it is recommended to remove all obsolete data, such as obsolete networks.

**Note**

You cannot remove a virtual machine network if there are running virtual machines using the network.

**To delete networks:**

1. Select the **Networking** tab.
2. Select one or more networks to be deleted and click **Delete Selected Network** ✖ .
3. In the **Delete Confirmation** dialog box, click **OK** to delete the network. The network is deleted.

## 5.12.4 Configuring the Management Network on a VLAN

During the installation of the Oracle VM Servers you configure a management interface on each server. These interfaces are added to the default management network when the servers are discovered by Oracle VM Manager. During server installation you have two configuration options for the management network interface: standard or as part of a tagged VLAN.

**Caution**

The only supported method to obtain a management network on a tagged VLAN is to specify the VLAN tag during the installation. For more information, see Installing Oracle VM Server on x86 in the Oracle VM Installation and Upgrade Guide.

In case you installed the Oracle VM Servers with a management interface on a standard network, not on a VLAN, discovering the servers leads to the creation of a default management network with management IP addresses assigned to a bond0 port containing one Ethernet network interface per server. You can use Oracle VM Manager to change this configuration and use the untagged VLAN for the management network. The procedure is described below.

**Warning**

Once the VLAN is associated with the management network, this association cannot be broken. The original state of the management network and interfaces cannot be restored. Plan this reconfiguration carefully.

**To reconfigure the management network from physical to untagged VLAN:**

1. In the Oracle VM Manager user interface, select the **Networking** tab.
2. Select the management network and click **Edit Selected Network** to start the **Edit Network** wizard.
3. Remove the management interfaces of the Oracle VM Servers from the management network.
4. Click **VLAN Groups** to display the VLAN Groups screen. In the VLAN Groups toolbar, click **Create New VLAN Group** to start the VLAN Group Creation wizard.
5. In the new VLAN group, add the network ports you removed from the management network earlier. Create the untagged VLAN segment you need for the management network. Include any additional VLAN segments for other networks for which you want to use a VLAN over the same network interface. Click **Next**.
6. With the untagged VLAN the IP addresses must be assigned to the underlying network ports. The management IP address cannot be changed, so you may skip this wizard step and Click **Finish**.
7. Return to the **Networking** screen and edit the management network again. Select the VLAN segment you wish to associate with the management network, which is the untagged VLAN segment.

   The restriction for the untagged VLAN still applies: the IP address must be on the underlying port, so it cannot be assigned to the VLAN interface. The physical network interface is now available to add other tagged VLAN interfaces to include in other networks.

In case you installed the Oracle VM Servers with a management interface on a tagged VLAN, the bond0 ports are included in a VLAN group during server discovery. The VLAN group is then associated with the management network via the appropriate VLAN tag or segment. Changing this configuration, for example to use the untagged VLAN or a physical network for the management network, is not supported in Oracle VMRelease 3.2.

## 5.12.5 Dealing with Failed Network Operations

Network configuration is a complex operation involving many different elements in the physical and logical environment. Many instructions are sent to the Oracle VM Servers in the process, and if a single instruction in a whole sequence goes wrong, the resulting state of the network configuration is unpredictable. To avoid badly or partly configured network objects, which become unusable, Oracle VM Manager has a mechanism in place that is triggered when a network operation fails: a network discovery is launched for each Oracle VM Server that participated in the operation, and the commands that completed successfully are reflected in the network model displayed in the Oracle VM Manager user interface.

The moment a network operation fails, an event is displayed in the **Events** tab of each affected Oracle VM Server. When the subsequent automatic network discovery completes, the event is also automatically acknowledged. Note that if you acknowledge the event manually, the discovery operation is not cancelled.

**Note**

The automatic network discovery is not instantaneous. The operations start as soon as the job fails, but could take some time to finish: from a few seconds to a couple of minutes. This will depend on how complicated the network configuration is and how many Oracle VM Servers are involved.

During network discovery, resources may be locked or may change to reflect the new state of the Oracle VM Servers. To avoid resource locking issues and further failing operations, it is recommended that you wait for the discovery operation to complete before you resume the reconfiguration of the network. Check the Events tab of the Oracle VM Server to know the status of the operation.

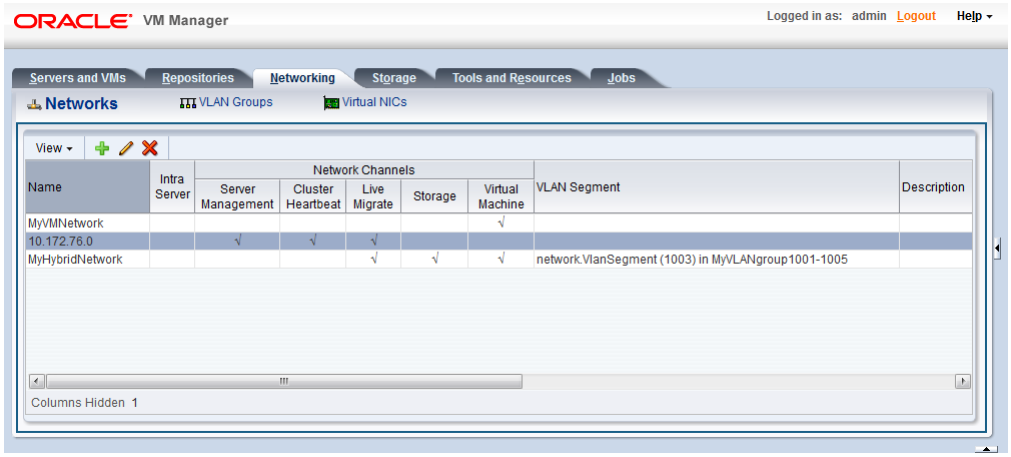
In case your network configuration returns a failed job, you have to manually go through all the physical and logical network elements involved and make the necessary changes one by one in Oracle VM Manager. Typical network elements include: network interfaces, Ethernet ports, bond ports, VLAN groups, VLAN segments and IP addresses. The amount of manual reconfiguration depends on the complexity of your network configuration and the number of Oracle VM Servers involved.

## 5.13 Editing Network Data

To edit networking data, for example adding or removing network functions or updating port definitions, VLAN IDs, and so on, you use the **Edit** button in the respective screens of the **Networking** tab of the Oracle VM Manager user interface.

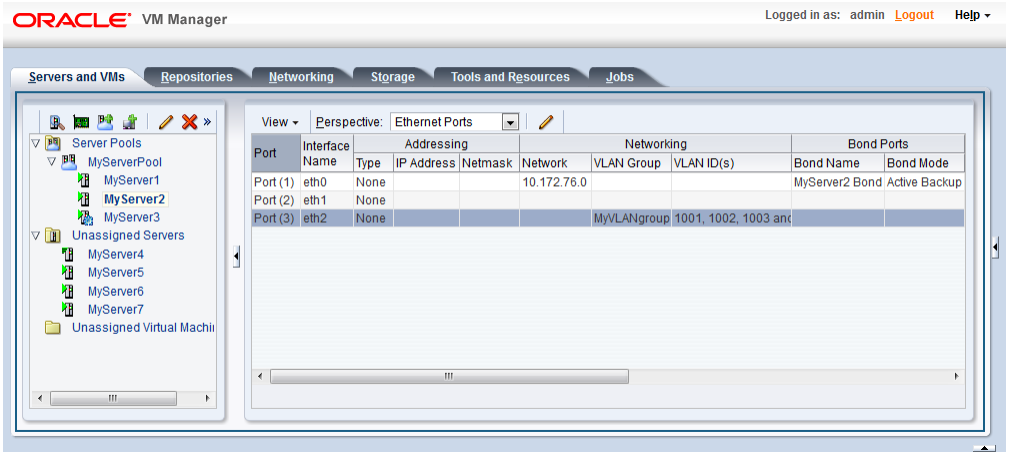
**To go to the Network Configuration and VLAN Groups wizards:**

1. Select the **Networking** tab in the Oracle VM Manager user interface.
2. Select the **Networks** or **VLAN Groups** screen in the **Networking** tab to view the respective management panes.




Editing a network or VLAN group via **Edit** ( ✎ ) in the toolbar launches the same wizard as creating networks or VLAN Groups. Update the data in the respective steps of the wizards. They are described in detail in the previous sections: Section 5.11, “Managing VLAN Groups” and Section 5.12, “Managing Networks”.

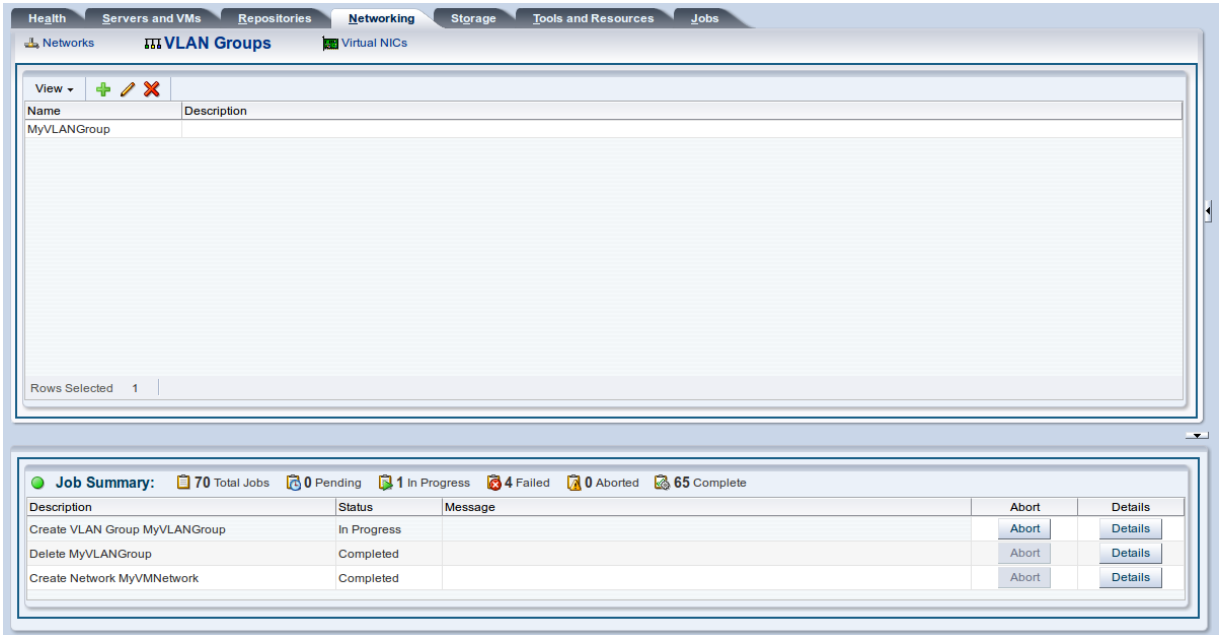
In addition, you can modify the networking configuration data for bonds and ports outside these wizards by going into the detailed perspectives of the **Servers and VMs** tab instead of editing the top level network resources step by step.



The table below describes some specific actions to take when editing network ports and bonds. You can update the IP address of ports, and add, remove, and delete bond ports in a network. The following table describes the methods to use for each type of network update.

| Function | Method |
|---|---|
| Update IP information for ports | In the **Servers and VMs** tab, select the server which owns the port under **Server Pools** or under **Unassigned Servers**. In the management pane, set the **Perspective** to **Ethernet Ports** and select the port you wish to update. Click **Edit Selected Port** to update the IP information. |
| Update bond information | In the **Servers and VMs** tab, select the server which owns the bond under **Server Pools** or under **Unassigned Servers**. In the management pane, set the **Perspective** to **Bond Ports** and select the bond you wish to update. Click **Edit Selected Port** to update the bond. You can update the IP information for the bond, the ports which are part of the bond and the bonding mode. |
| Add a bond | In the **Servers and VMs** tab, select the server for which you wish to add a bond. In the management pane, set the **Perspective** to **Bond Ports** and click **Create Bond Port** to create the bond. You provide the IP information for the bond, the ports which are part of the bond and the bonding mode. |
| Delete a bond | In the **Servers and VMs** tab, select the server for which you want to delete a bond. In the management pane, set the **Perspective** to **Bond Ports** and click **Delete Selected Port** to remove the bond. |

The VLAN configuration, in contrast, can only be edited via the wizard, which is accessible through the **VLAN Groups** screen of the **Networking** tab.




In the **Servers and VMs** tab you can see the VLAN group and associated VLAN IDs for a given Ethernet port. However, to make changes, for example edit the address information, you must edit the VLAN group and set a static IP or DHCP in the last step of the wizard.

# Chapter 6 Managing Server Pools and Oracle VM Servers

## Table of Contents



A server pool is a domain of physical and virtual resources to host virtual machines, perform virtual machine migration, HA, and so on.

This chapter describes how to create and manage server pools and Oracle VM Servers.

# 6.1 Server Pool Overview

A server pool consists of one or more Oracle VM Servers, and represents a logical view of the storage where the virtual machines reside.

A server pool is scalable. If you find a server pool does not have sufficient resources, such as CPU or memory, to run the virtual machines, you can expand the server pool by adding more Oracle VM Servers. See Section 6.9.2, “Adding an Oracle VM Server to a Server Pool”.

Oracle VM's deployment architecture utilizes server pools, with shared access to storage across Oracle VM Servers in the server pool. Virtual machines are stored on the shared storage and placed on one of the Oracle VM Servers to balance the workloads of the server pool.

Since the virtual machines are not bound to any specific Oracle VM Server in the server pool, virtual machines are not prevented from starting up simply because an individual Oracle VM Server happens to be down for maintenance or otherwise unavailable at the time. Further, options are provided to specify the start policy for the virtual machines in the server pool. The start policy can implement a load-balancing algorithm that assures that a virtual machine is only started on the Oracle VM Server with the most resources available. Load balancing is achieved using the same algorithms used for Dynamic Power Management (DPM) and for the Distributed Resource Scheduler (DRS). Load-balancing further helps assure the maximum aggregate performance from the server pool.

# 6.2 Server Pool Clusters

Oracle VM works in concert with Oracle OCFS2 to provide shared access to server pool resources residing in an OCFS2 file system. This shared access feature is crucial in the implementation of high availability (HA) for virtual machines running on the Oracle VM Servers that belong to a server pool with clustering enabled.

OCFS2 is a cluster file system developed by Oracle for Linux, which allows multiple nodes (Oracle VM Servers) to access the same disk at the same time. OCFS2, which provides both performance and HA, is used in many applications that are cluster-aware or that have a need for shared file system facilities. With Oracle VM, OCFS2 ensures that Oracle VM Servers belonging to the same server pool access and modify resources in the shared repositories in a controlled manner.

The OCFS2 software includes the core file system, which offers the standard file system interfaces and behavioral semantics and also includes a component which supports the shared disk cluster feature. The shared disk component resides mostly in the kernel and is referred to as the O2CB cluster stack. It includes:

- A disk heartbeat to detect live servers
- A network heartbeat for communication between the nodes
- A Distributed Lock Manager (DLM) which allows shared disk resources to be locked and released by the servers in the cluster

OCFS2 also offers several tools to examine and troubleshoot the OCFS2 components. For detailed information on OCFS2, see the OCFS2 documentation at:

http://oss.oracle.com/projects/ocfs2/documentation/

Oracle VM decouples storage repositories and clusters so that if a storage repository is taken off-line, the cluster is still available. A loss of one heartbeat device does not force an Oracle VM Server to self fence.

When you create a server pool, you have a choice to activate the cluster function which offers these benefits:

- Shared access to the resources in the repositories accessible by all Oracle VM Servers in the cluster.
- Protection of virtual machines in the event of a failure of any Oracle VM Server in the server pool.

To configure the server pool cluster and enable HA in a server pool, select the **Clustered Server Pool** check box when you create or edit a server pool. See Section 6.8, “Creating a Server Pool” and Section 6.9.4, “Editing a Server Pool” for more information on creating and editing a server pool.

When you create a server pool, you specify:

- Server pool name and description
- A virtual IP address
- Whether or not to activate the cluster
- A server pool file system for the global heartbeat and other cluster information

During server pool creation, the server pool file system specified for the new server pool is accessed and formatted as an OCFS2 file system. This formatting creates several management areas on the file system including a region for the global disk heartbeat. Oracle VM formats the server pool file system as an OCFS2 file system whether the file system is accessed by the Oracle VM Servers as an NFS share, a FC LUN or iSCSI LUN.

The virtual IP address is used by Oracle VM Manager to communicate with the server that is designated as the Master in the server pool. If the master changes, the virtual IP address is transferred to the new Master, ensuring that Oracle VM Manager continues to communicate with the Master.

The next step is to add Oracle VM Servers to the newly created server pool. When Oracle VM Servers are added, Oracle VM:

1. Selects a Master Oracle VM Server.
2. Configures the Virtual IP address selected during pool creation as a virtual network interface on top of the management interface for the Master Oracle VM Server.
3. Creates the cluster configuration file and the cluster time-out file.
4. Pushes the configuration files to all Oracle VM Servers in the server pool.
5. Starts the cluster.

On each Oracle VM Server in the cluster, the cluster configuration file is located at /etc/ocfs2/cluster.conf, and the cluster time-out file is located at /etc/sysconfig/o2cb. Cluster timeout can be configured during server pool creation. The recommended approach to setting timeout values is to use the functionality provided within the Oracle VM Manager when creating or editing a server pool. See Section 6.8, “Creating a Server Pool” and Section 6.9.4, “Editing a Server Pool” for more information on setting the timeout value.

Starting the cluster activates several services and processes on each of the Oracle VM Servers in the cluster. The most important processes and services are discussed in Table 6.1, “Cluster services ”.

**Table 6.1 Cluster services**

| Service | Description |
|---|---|
| 02net | The o2net process creates TCP/IP intra-cluster node communication channels on port 7777 and sends regular keep-alive packages to each node in the |

| Service | Description |
|---|---|
| | cluster to validate if the nodes are alive. The intra-cluster node communication uses the network with the Cluster Heartbeat role. By default, this is the Server Management network. You can however create a separate network for this function. See Section 5.2, “Network Usage” for information about the Cluster Heartbeat role. Make sure the firewall on each Oracle VM Server in the cluster allows network traffic on the heartbeat network. By default, the firewall is disabled on Oracle VM Servers after installation. |
| o2hb-*diskid* | The server pool cluster also employs a disk heartbeat check. The o2hb process is responsible for the global disk heartbeat component of cluster. The heartbeat feature uses a file in the hidden region of the server pool file system. Each pool member writes to its own block of this region every two seconds, indicating it is alive. It also reads the region to maintain a map of live nodes. If a server pool member's block is no longer updated, the Oracle VM Server is considered dead. If an Oracle VM Server dies, the Oracle VM Server is fenced. Fencing forcefully removes dead members from the server pool to make sure active pool members are not obstructed from accessing the fenced Oracle VM Server's resources. |
| o2cb | The o2cb service is central to cluster operations. When an Oracle VM Server boots, the o2cb service starts automatically. This service must be up for the mount of shared repositories to succeed. |
| ocfs2 | The ocfs2 service is responsible for the file system operations. This service also starts automatically. |
| ocfs2_dlm and ocfs2_dlmfs | The DLM modules (ocfs2_dlm, ocfs2_dlmfs) and processes (user_dlm, dlm_thread, dlm_wq, dlm_reco_thread, and so on) are part of the Distributed Lock Manager.<br><br>OCFS2 uses a DLM to track and manage locks on resources across the cluster. It is called distributed because each Oracle VM Server in the cluster only maintains lock information for the resources it is interested in. If an Oracle VM Server dies while holding locks for resources in the cluster, for example, a lock on a virtual machine, the remaining Oracle VM Servers in the server pool gather information to reconstruct the lock state maintained by the dead Oracle VM Server. |

**Warning**

Do not manually modify the cluster configuration files, or start and stop the cluster services. Oracle VM Manager automatically starts the cluster on Oracle VM Servers that belong to a server pool. Manually configuring or operating the cluster may lead to cluster failure.

When you create a repository on a physical disk, an OCFS2 file system is created on the physical disk. This occurs for local repositories as well. The resources in the repositories, for example, virtual machine configuration files, virtual disks, ISO files, templates and assemblies, can then be shared safely across the server pool. When a server pool member stops or dies, the resources owned by the departing server are recovered, and the change in status of the server pool members is propagated to all the remaining Oracle VM Servers in the server pool.

Figure 6.1, “Server Pool clustering with OCFS2 features” illustrates server pool clustering, the disk and network heartbeats, and the use of the DLM feature to lock resources across the cluster.

**Figure 6.1 Server Pool clustering with OCFS2 features**

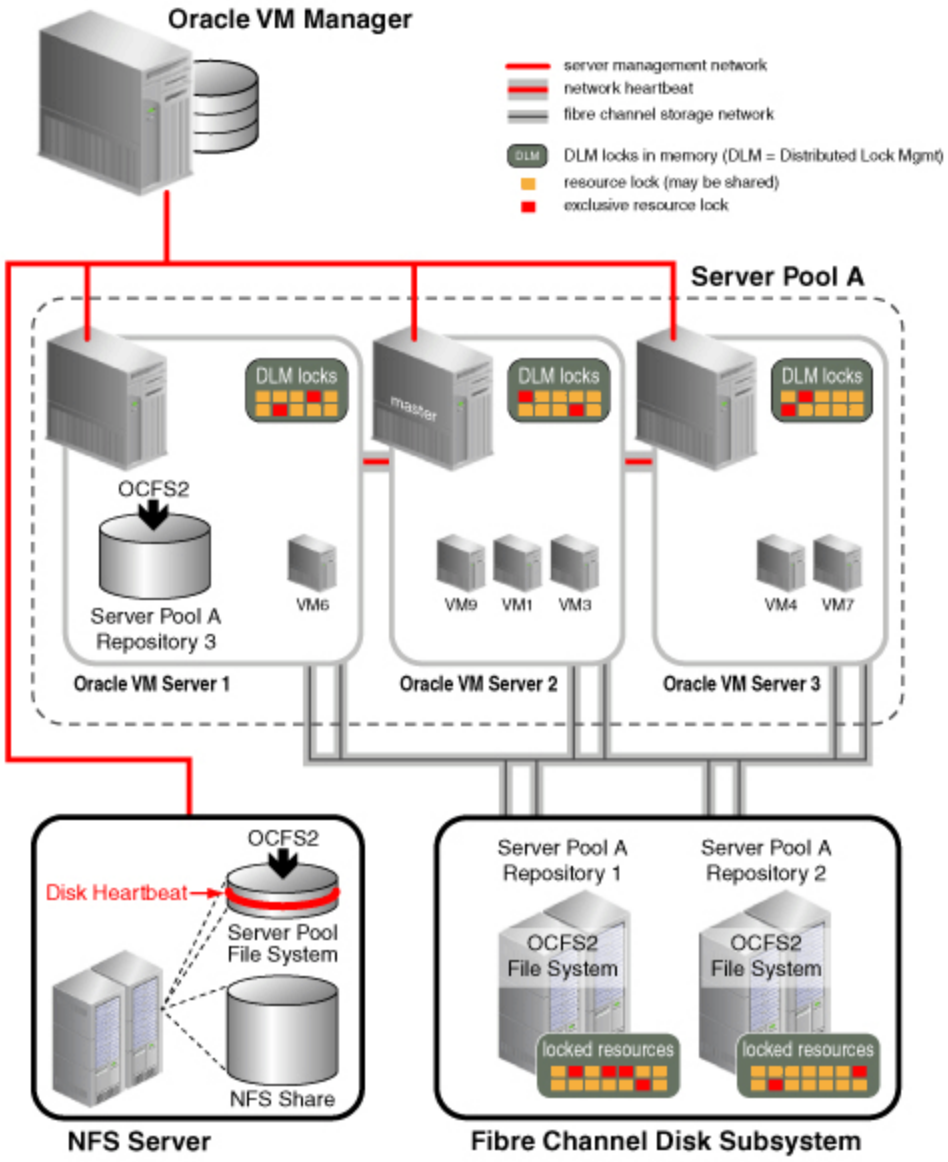



Figure 6.1, “Server Pool clustering with OCFS2 features” represents a server pool with three Oracle VM Servers. The server pool file system associated with this server pool resides on an NFS share. During server pool creation, the NFS share is accessed, a disk image is created on the NFS share and the disk image is formatted as an OCFS2 file system. This technique allows all Oracle VM Server pool file systems to be accessed in the same manner, using OCFS2, whether the underlying storage element is an NFS share, an iSCSI LUN or a Fibre Channel LUN.

The network heartbeat, which is illustrated as a private network connection between the Oracle VM Servers, is configured before creating the first server pool in your Oracle VM environment. After the server pool is created, the Oracle VM Servers are added to the server pool. At that time, the cluster configuration is created, and the cluster state changes from *off-line* to *heartbeating*. Finally, the server pool file system is mounted on all Oracle VM Servers in the cluster and the cluster state changes from *heartbeating* to *DLM ready*. As seen in Figure 6.1, “Server Pool clustering with OCFS2 features”, the heartbeat region is global to all Oracle VM Servers in the cluster, and resides on the server pool file system. Using the network

heartbeat, the Oracle VM Servers establish communication channels with other Oracle VM Servers in the cluster, and send keep-alive packets to detect any interruption on the channels.

For each newly added repository on a physical storage element, an OCFS2 file system is created on the repository, and the repository is usually presented to all Oracle VM Servers in the pool. Figure 6.1, “Server Pool clustering with OCFS2 features” shows that Repository 1 and Repository 2 are accessible by all of the Oracle VM Servers in the pool. While this is the usual configuration, it is also feasible that a repository is accessible by only one Oracle VM Server in the pool. This is indicated in the figure by Repository 3, which is accessible by Oracle VM Server 1 only. Any virtual machine whose resources reside on this repository cannot take advantage of the high availability feature afforded by the server pool.

Note that repositories built on NFS shares are not formatted as OCFS2 file systems. See Section 4.8, “Managing Storage Repositories” for more information on repositories.

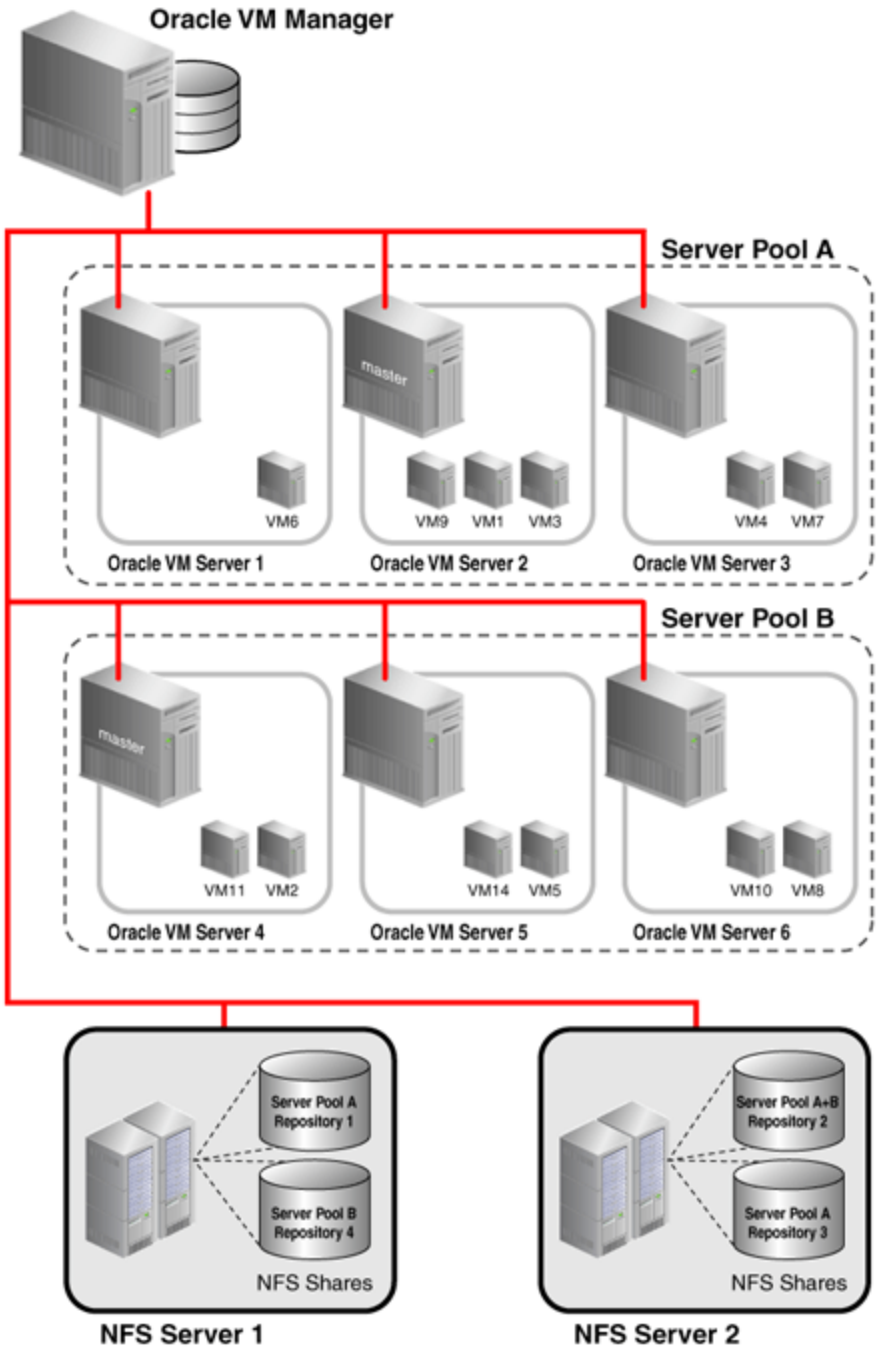
Figure 6.1, “Server Pool clustering with OCFS2 features” shows several virtual machines with resources in shared Repositories 1 and 2. As virtual machines are created, started, stopped, or migrated, the resources for these virtual machines are locked by the Oracle VM Servers needing these resources. Each Oracle VM Server ends up managing a subset of all the locked resources in the server pool. A resource may have several locks against it. An exclusive lock is requested when anticipating a write to the resource while several read-only locks can exist at the same time on the same resource. Lock state is kept in memory on each Oracle VM Server as shown in the diagram. The distributed lock manager (DLM) information kept in memory is exposed to user space in the synthetic file system called dlmfs, mounted under /dlm. If an Oracle VM Server fails, its locks are recovered by the other Oracle VM Servers in the cluster and virtual machines running on the failed Oracle VM Server are restarted on another Oracle VM Server in the cluster. If an Oracle VM Server is no longer communicating with the cluster via the heartbeat, it can be forcibly removed from the cluster. This is called fencing. An Oracle VM Server can also fence itself if it realizes that it is no longer part of the cluster. The Oracle VM Server uses a machine reset to fence. This is the quickest way for the Oracle VM Server to rejoin the cluster.

## 6.3 Unclustered Server Pools

When creating a server pool, you specify whether the servers in the pool will be part of a cluster or not. In most cases, you create a clustered server pool. You can create a non-clustered pool when all servers in the pool are expected to use only NFS shares as repositories. If your Oracle VM Servers are also expected to access repositories on physical disks, then these servers must be part of a clustered server pool.

Figure 6.2, “Unclustered Server Pools Using Only NFS Storage” illustrates server pools in an unclustered configuration, with shared access to resources on NFS storage but no HA features for the servers.

**Figure 6.2 Unclustered Server Pools Using Only NFS Storage**




Non-clustered server pools do not require a server pool file system, though a Virtual IP is still required and the Master function is also assigned to one of the server pool members.

A non-clustered server pool does not support HA for virtual machines deployed on its servers. If a server fails, the virtual machines on this server have to be restarted manually on a server in this server pool, or possibly on a server in another server pool, if that server pool also has access to the repositories needed for deploying the virtual machines on the failed server. Live Migration is supported between servers in a non-clustered pool if the servers have the same CPU affinity (same family and type of CPU).

**Note**

Converting non-clustered server pools to clustered server pools is not supported in Release 3.2 of Oracle VM.

## 6.4 High Availability (HA)

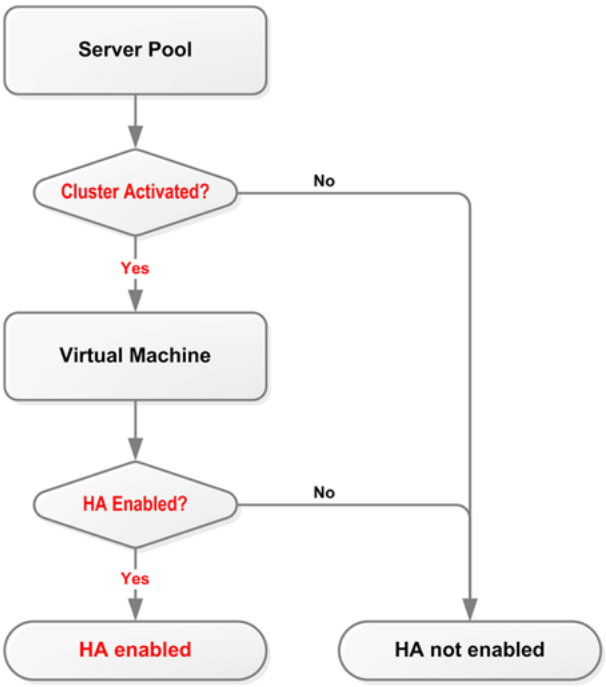
You can set up HA to help ensure the uninterrupted availability of a virtual machine. If HA is configured and a Oracle VM Server is restarted or shut down, the virtual machines running on it are either restarted on, or migrated to, another Oracle VM Server.

The following prerequisites are requirement to implement HA:

- The server pool must contain multiple Oracle VM Servers. HA cannot be implemented with a stand-alone Oracle VM Server.
- The server pool must be clustered.
- All Oracle VM Servers must be Oracle VM Server Release 3.0 or above.

To use HA, you must first enable HA on the server pool, then on all virtual machines, as shown in Figure 6.3, “Enabling HA”. If you enable HA on the server pool and then for virtual machines, when an Oracle VM Server is shut down or fails, the virtual machines are migrated or restarted on another available Oracle VM Server. HA must be enabled for **both** the server pool **and** for virtual machines.

**Figure 6.3 Enabling HA**




To automatically configure the server pool cluster and enable HA in a server pool, select the **Clustered Server Pool** check box when you create a server pool. See Section 6.8, “Creating a Server Pool” for more information on creating a server pool.

To enable HA on a virtual machine, select the **Enable High Availability** check box when you create or edit a virtual machine. See Section 7.7, “Creating a Virtual Machine” and Section 7.10.2, “Editing a Virtual Machine” for more information on creating and editing a virtual machine.

If HA is enabled and you want to restart, shut down, or delete an Oracle VM Server, you must first migrate the running HA-enabled virtual machines to another available Oracle VM Server. For information on migrating virtual machines, see Section 7.10.12, “Migrating Virtual Machines”.

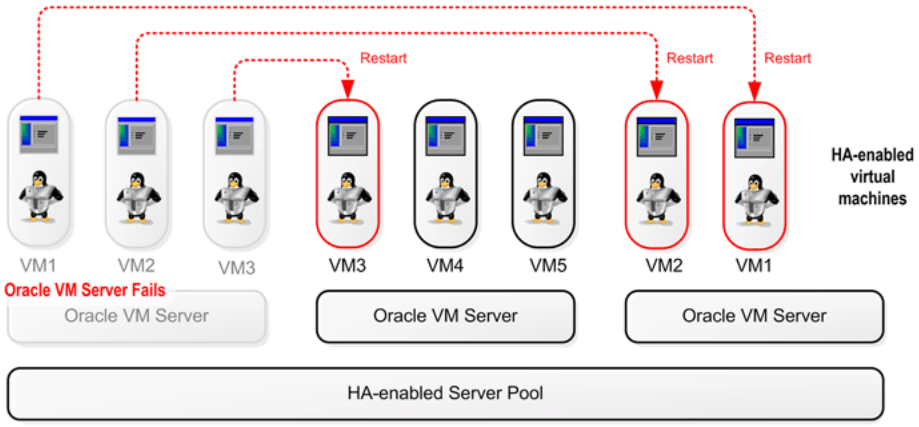
If there are no Oracle VM Servers available, the virtual machines are shut down (Powered Off) and are restarted when an Oracle VM Server becomes available.

The possible HA scenarios are:

- If you want to shut down or restart an Oracle VM Server, you must first migrate the HA-enabled virtual machines to another Oracle VM Server. For information on migrating virtual machines, see Section 7.10.12, “Migrating Virtual Machines”.
- If an Oracle VM Server fails, all running virtual machines are restarted automatically on another available Oracle VM Server.
- If an Oracle VM Server fails and no other Oracle VM Servers are available, all running virtual machines are restarted when an Oracle VM Server becomes available.

Figure 6.4, “HA in effect for an Oracle VM Server failure” shows an Oracle VM Server failing and the virtual machines restarting on other Oracle VM Servers in the server pool.

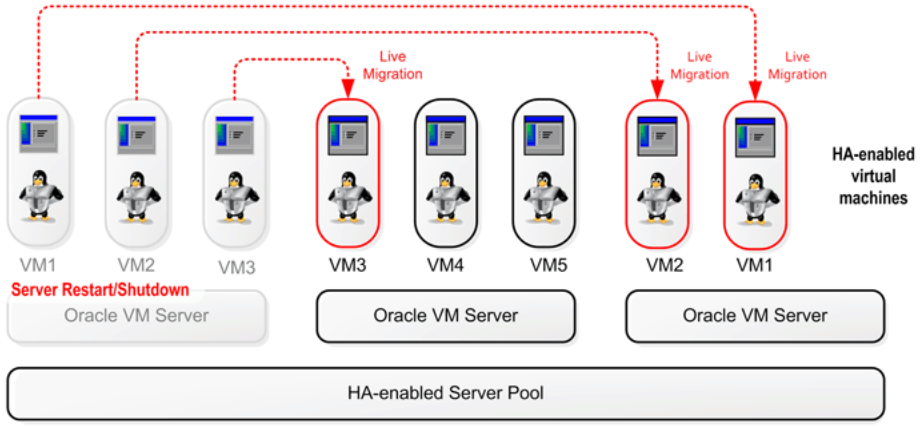
**Figure 6.4 HA in effect for an Oracle VM Server failure**




You should test your HA configuration to ensure it is properly configured in the event of a real failure.

Figure 6.5, “HA in effect for an Oracle VM Server restart or shut down” shows an Oracle VM Server restarting or shutting down and the virtual machines migrating to other Oracle VM Servers in the server pool. In this example, the virtual machines are running and so live migration can be performed and the virtual machines continue to run, uninterrupted. Live migration is not a feature of HA, but can be used in conjunction with, or independently of, HA. For more information on live migration, see Section 7.10.12, “Migrating Virtual Machines”.

**Figure 6.5 HA in effect for an Oracle VM Server restart or shut down**




If you do not have HA enabled, before you shut down an Oracle VM Server, you should migrate all virtual machines to another Oracle VM Server (either using standard virtual machine migration or live migration), or have them automatically migrated by placing the server into maintenance mode.

# 6.5 Server Pool Policies

This section discusses the policies you can set to manage server pools, the Oracle VM Servers and virtual machines in server pools, and the networks used in a server pool.

## 6.5.1 Distributed Resource Scheduler (DRS)

The Distributed Resource Scheduler (DRS) optimizes virtual machine resource utilization in a server pool. DRS automatically moves running virtual machines to another Oracle VM Server in a server pool if any of the Oracle VM Servers exceed a specified CPU threshold for a specified period of time. DRS continuously samples performance data from every Oracle VM Server and every virtual machine.

The movement of virtual machines is policy-driven. When a threshold is reached, Oracle VM Manager live migrates the running virtual machine from one Oracle VM Server to another, without down time. Oracle VM Manager allows you to specify a DRS threshold for each server pool, and to choose which Oracle VM Servers participate in the policy.

See Section 6.9.7, “Editing Server Pool Policies” for information on enabling and configuring the DRS in a server pool.

## 6.5.2 Distributed Power Management (DPM)

Distributed Power Management (DPM) is used when there are periods of relative low resource utilization to increase the consolidation ratio on fewer Oracle VM Servers. DPM dynamically migrates virtual machines from under-utilized Oracle VM Servers. When there are Oracle VM Servers without virtual machines running the Oracle VM Server can be powered off, conserving power until the Oracle VM Server is needed again.

DPM aims to keep only the minimum necessary number of Oracle VM Servers running. If a periodic check reveals that a Oracle VM Server's CPU utilization is operating at below a user-set level, virtual machines are live migrated to other Oracle VM Servers in the same server pool.

When all virtual machines are migrated, the Oracle VM Server is shut down.

If an Oracle VM Server exceeds the DPM policy CPU threshold, Oracle VM Manager looks for other Oracle VM Servers to migrate virtual machines to from the busy Oracle VM Server. If no powered Oracle VM Servers are available, Oracle VM Manager finds and starts a powered-off Oracle VM Server to power on. When that Oracle VM Server is running, Oracle VM Manager off-loads the virtual machines from the busy Oracle VM Server to the newly started Oracle VM Server.

Oracle VM Manager allows you to specify a DPM threshold for each server pool, and to choose which Oracle VM Servers participate in the policy.

See Section 6.9.7, “Editing Server Pool Policies” for information on enabling and configuring DPM in a server pool.

### 6.5.3 DRS/DPM Network Policies

Both the DRS and DPM policies can also be set for the networks used by Oracle VM Servers in a server pool. When a network used by an Oracle VM Server exceeds its threshold, virtual machines are migrated to other Oracle VM Servers to either balance the resources used (DRS), or reduce the power used (DPM). Each network on an Oracle VM Server can have a threshold set. The threshold applies to either the received data or the transmitted data. If the threshold is set to say 50%, when an Oracle VM Server's receive or transmit traffic on that network exceeds 50% of the theoretical capacity of the network, the Oracle VM Server is deemed to be over the threshold. The theoretical capacity of a network on an Oracle VM Server is equal to the port speed of the physical Ethernet adapter on the Oracle VM Server. If the network is bonded in a fail-over configuration, then the port capacity is equal to the port speed of one of the Ethernet adapters. If the network is bonded on a Oracle VM Server with link aggregation, then the network capacity is equal to the sum of the speed of the bonded Ethernet adapters.

You set the network policies for DRS and DPM when you set up the server pool policy. See Section 6.9.7, “Editing Server Pool Policies” for information on enabling and configuring network DRS and DPM policies in a server pool.

## 6.6 Anti-Affinity Groups

Anti-affinity groups specify that specific virtual machines should never run on the same Oracle VM Server. An anti-affinity group applies to all the Oracle VM Servers in a server pool. You may want to set up anti-affinity groups when you want to build-in redundancy or load balancing of specific applications in your environment.

If you add a virtual machine to an anti-affinity group that already has a virtual machine in the group running on the same Oracle VM Server, the job is aborted and the virtual machine is not added to the group. To add the virtual machine to the anti-affinity group, migrate it to another Oracle VM Server, then add it to the group.

### 6.6.1 Creating an Anti-Affinity Group

**To create an anti-affinity group:**

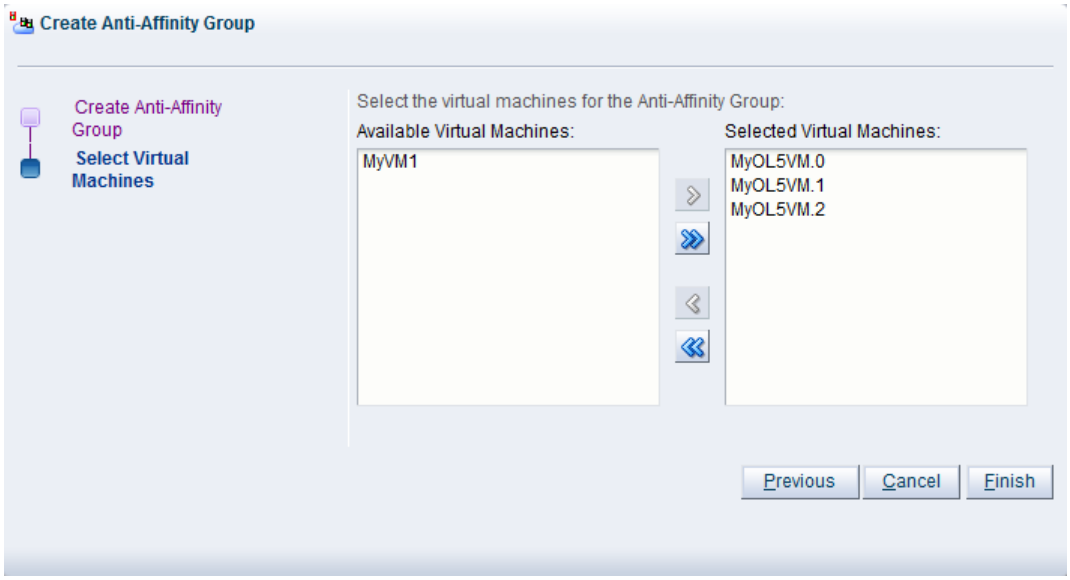
1. Click the **Servers and VMs** tab. Select a server pool in the navigation pane.
2. From the **Perspective** field in the management pane, select **Anti-Affinity Group** from the drop-down list. Click **Create New Anti-Affinity Group...** + in the management pane toolbar.
3. The **Create Anti-Affinity Group** wizard is displayed.


Enter the anti-affinity group information:

- **Anti-Affinity Group Name:** Enter the name of the anti-affinity group.
- **Description:** A description of the anti-affinity group.

Click **Next**.

4. The **Select Virtual Machines** step of the **Create Anti-Affinity Group** wizard is displayed.




Select the virtual machines to include in the anti-affinity group and move them from the **Available Virtual Machines** column to the **Selected Virtual Machines** column.

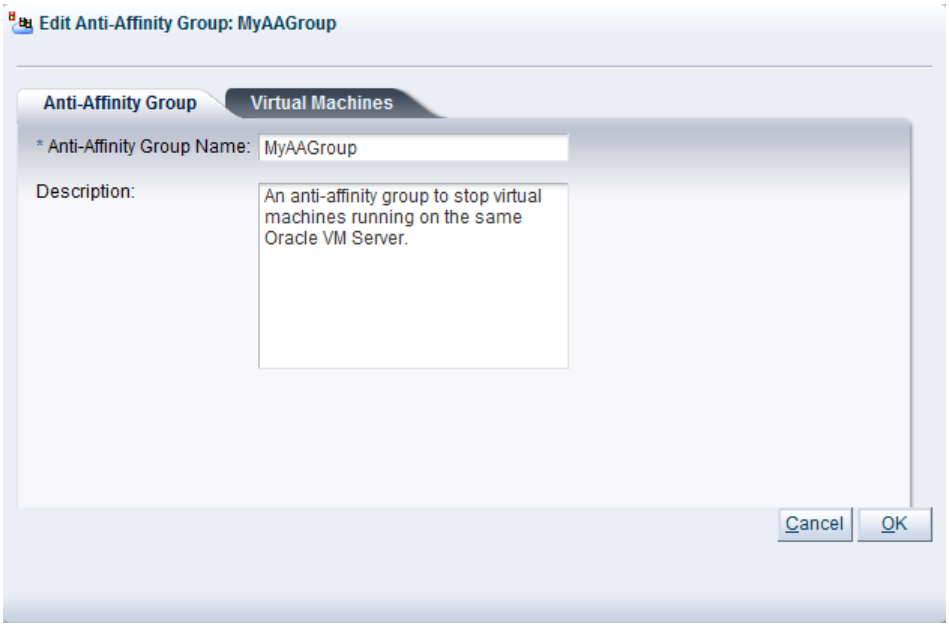
Click **Finish**.

The anti-affinity group is created and listed in the **Anti-Affinity Group** table in the management pane.

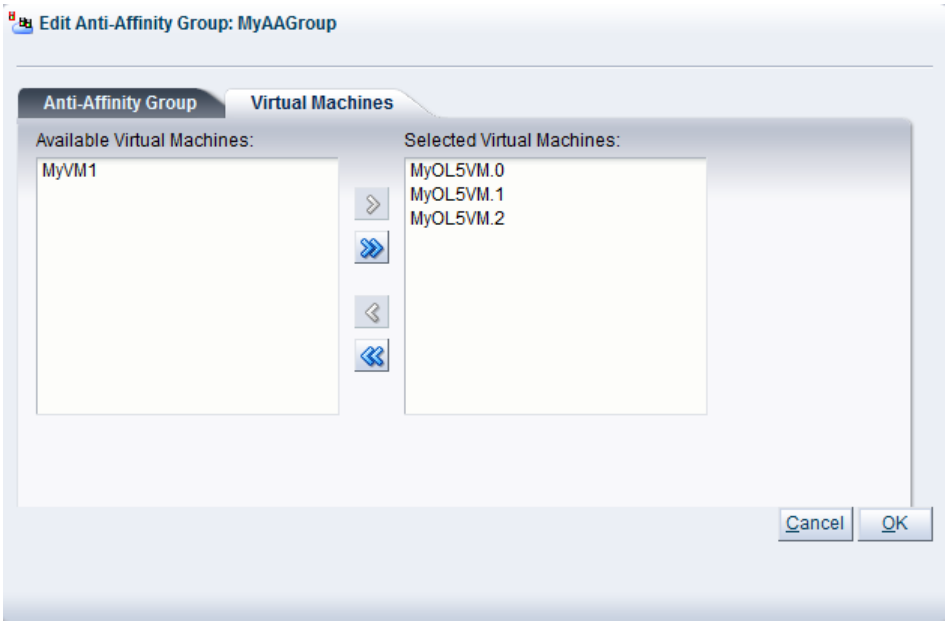
## 6.6.2 Editing an Anti-Affinity Group

**To edit an anti-affinity group:**

1. In the **Servers and VMs** tab, select the server pool to which the anti-affinity group belongs in the navigation pane.
2. From the **Perspective** field in the management pane, select **Anti-Affinity Group** from the drop-down list. Select the anti-affinity group in the **Anti-Affinity Group** table and click **Edit Anti-Affinity Group...** in the management pane toolbar.
3. The **Edit Anti-Affinity Group:** ***group_name*** dialog box is displayed.




Edit the anti-affinity group as required. To edit the virtual machines in the anti-affinity group, click the **Virtual Machines** tab.



For more information on the tabs in this wizard, see Section 6.6.1, “Creating an Anti-Affinity Group”.

Click **OK**.

The anti-affinity group is edited and displayed in the **Anti-Affinity Group** table in the management pane.

### 6.6.3 Deleting an Anti-Affinity Group

**To delete an anti-affinity group:**

1. In the **Servers and VMs** tab, select the server pool to which the anti-affinity group belongs in the navigation pane.
2. From the **Perspective** field in the management pane, select **Anti-Affinity Group** from the drop-down list. Select the anti-affinity group in the **Anti-Affinity Group** table and click **Delete Anti-Affinity Group...** ✖ in the management pane toolbar.
3. A confirmation dialog box is displayed. Click **OK** to delete the anti-affinity group.

The anti-affinity group is deleted.

## 6.7 Server Processor Compatibility Groups

To ensure successful virtual machine live migration, Oracle VM Manager requires the processor family and model number of the source and destination computer to be the same. A server processor compatibility group is a group of Oracle VM Servers with compatible processors, where a running virtual machine on one Oracle VM Server can safely be migrated and continue to run on another Oracle VM Server. Although Oracle VM Manager contains rules for server processor compatibility, you can create custom compatibility groups to ensure the ability to do smooth migrations is improved. If live migration is attempted between incompatible processors, an error message is displayed.

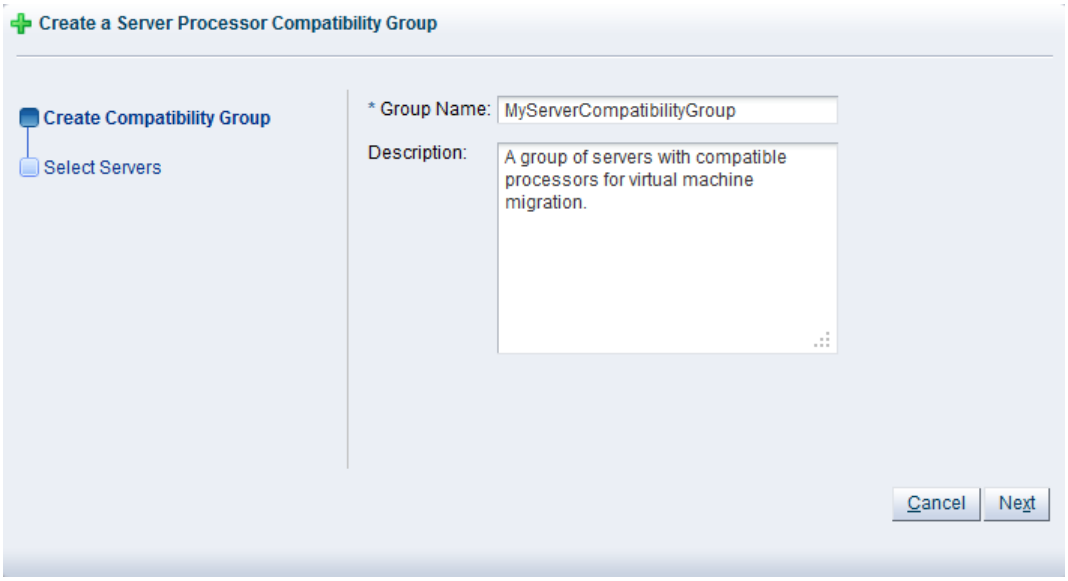
All Oracle VM Servers are added to a default server processor compatibility group as they are discovered. A default server processor compatibility group is created when an Oracle VM Server is discovered if that Oracle VM Server has a processor that is new and unique to Oracle VM Manager.

Each server processor compatibility group may include Oracle VM Servers that are members of one or more server pools. An Oracle VM Server may be included in multiple server processor compatibility groups. You can create server processor compatibility groups and select which Oracle VM Servers to include according to your needs. There is no limit to the number of server processor compatibility groups you may have.

### 6.7.1 Creating a Server Processor Compatibility Group

**To create a server processor compatibility group:**

1. Click the **Servers and VMs** tab. Select **Server Pools** in the navigation pane.
2. From the **Perspective** field in the management pane, select **Server Processor Compatibility** from the drop-down list. Click **Create New Server Processor Compatibility...** + in the management pane toolbar.
3. The **Create a Server Processor Compatibility Group** wizard is displayed.

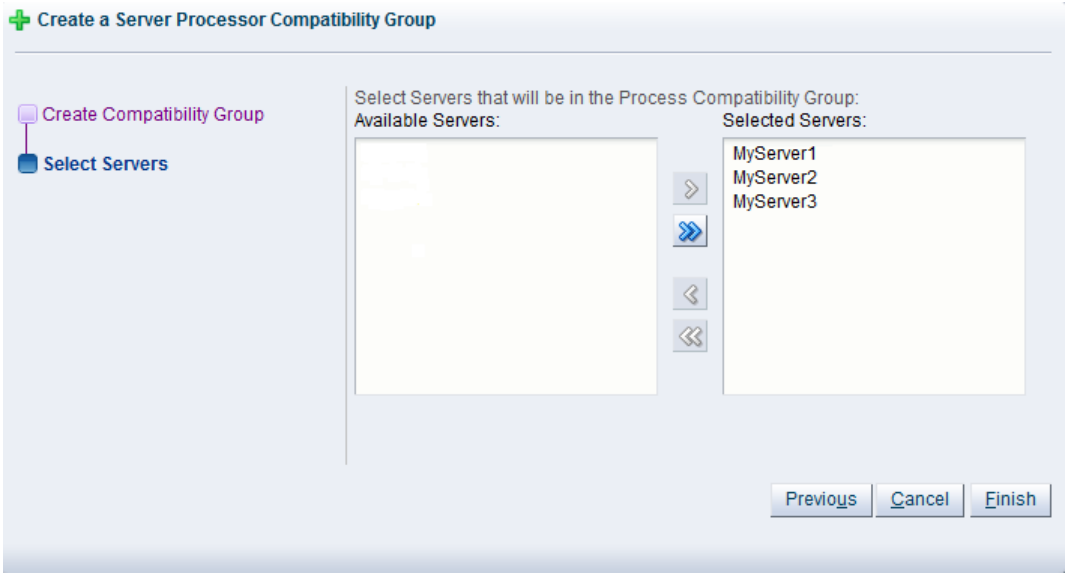



Enter the server processor compatibility group information:

- **Group Name:** Enter the name of the server processor compatibility group.
- **Description:** A description of the server processor compatibility group.

Click **Next**.

4. The **Select Servers** step of the **Create a Server Processor Compatibility Group** wizard is displayed.




Select the servers to include in the server processor compatibility group and move them from the **Available Servers** column to the **Selected Servers** column.

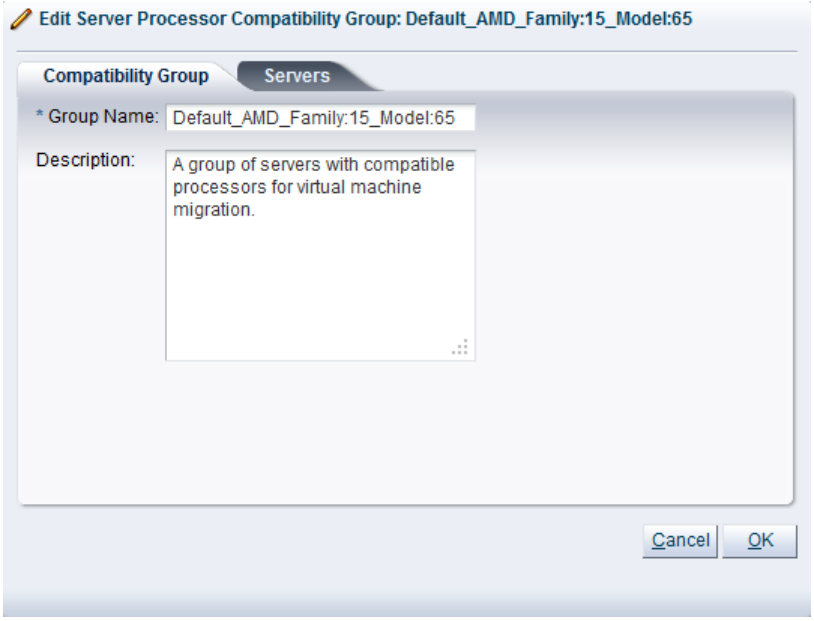
Click **Finish**.

The server processor compatibility group is created and listed in the **Server Processor Compatibility Group** table in the management pane.

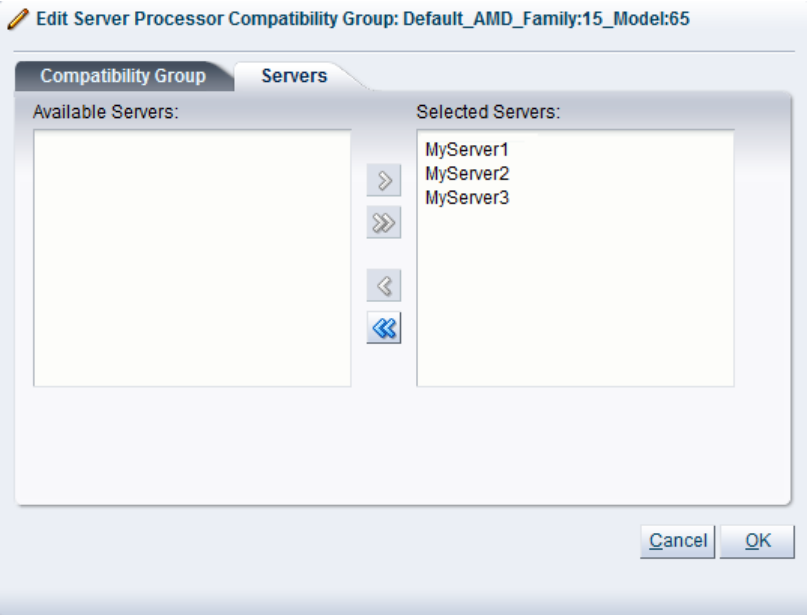
## 6.7.2 Editing a Server Processor Compatibility Group

**To edit a server processor compatibility group:**

1. In the **Servers and VMs** tab, select **Server Pools** in the navigation pane.
2. From the **Perspective** field in the management pane, select **Server Processor Compatibility** from the drop-down list. Select the server processor compatibility group in the **Server Processor Compatibility** table and click **Edit Server Processor Compatibility...** in the management pane toolbar.
3. The **Edit Server Processor Compatibility Group: *group_name*** dialog box is displayed.




Edit the server processor compatibility group as required. To edit the servers in the server processor compatibility group, click the **Servers** tab.




Click **OK**.

The server processor compatibility group is edited and displayed in the **Server Processor Compatibility Group** table in the management pane.

### 6.7.3 Deleting a Server Processor Compatibility Group

**To delete a server processor compatibility group:**

1. In the **Servers and VMs** tab, select **Server Pools** in the navigation pane.
2. From the **Perspective** field in the management pane, select **Server Processor Compatibility** from the drop-down list. Select the server processor compatibility group in the **Server Processor Compatibility** table and click **Delete Server Processor Compatibility** in the management pane toolbar.
3. A confirmation dialog box is displayed. Click **OK** to delete the server processor compatibility group.

The server processor compatibility group is deleted.

## 6.8 Creating a Server Pool

A server pool consists of at least one, but usually multiple Oracle VM Servers. All Oracle VM Servers in a server pool should have CPUs in the same CPU family and of the same type. If they are not in the same CPU family and type, some operations such as live migration may fail. Though the CPUs should be in the same CPU family, they may have differing configurations, such as different number of cores. Other hardware components on the host computer may also differ, such as the amount of RAM, the number and size of disk drives, and so on.

Although the host computers may have differing configurations, Oracle recommends that all Oracle VM Servers in a server pool are identical. Oracle VM Manager contains rules for processor compatibility groups. If live migration is attempted between incompatible processors, an error message is displayed.

Before creating a server pool, you must have:

- IP addresses for the Oracle VM Servers.
- IP address to use as the virtual IP address.
- Password to access the Oracle VM Agent installed on the Oracle VM Server(s).

**Note**

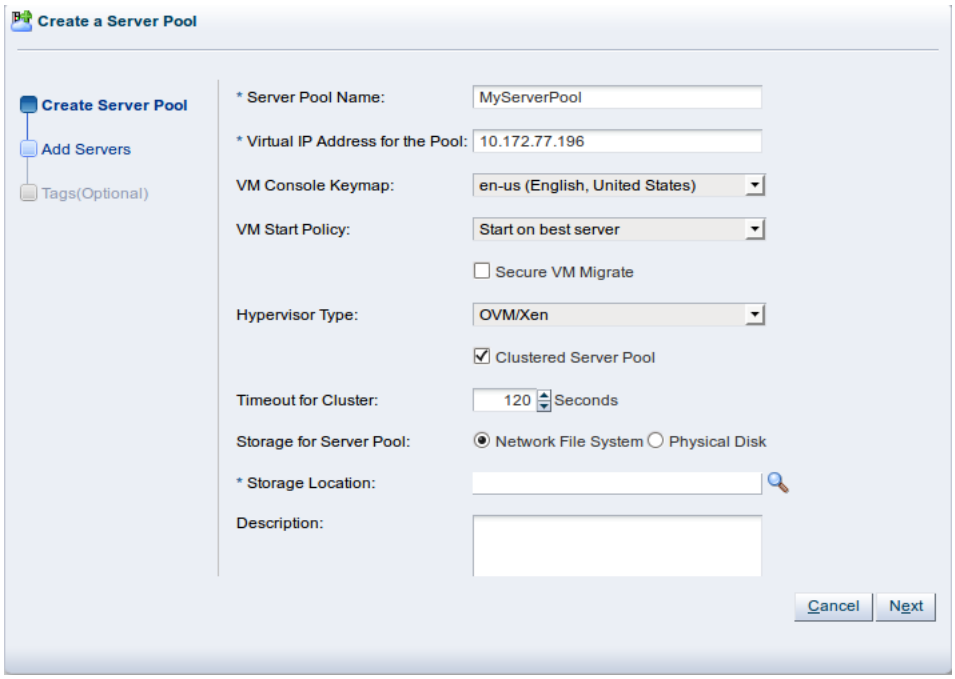
The Oracle VM Agent password should be the same on each Oracle VM Server in a server pool. For information on changing the Oracle VM Agent password on your Oracle VM Servers, see Section 6.9.6, “Changing Oracle VM Agent Passwords on Oracle VM Servers”.

A clustered server pool must have a dedicated file system (either a NAS export, or a LUN) to use as the server pool's file system. Oracle recommends that you create this storage with a size of at least 10 GB.

If any errors are encountered when you create a server pool, the Oracle VM Servers are returned to the unconfigured state.

**To create a server pool:**

1. Click the **Servers and VMs** tab.
2. Click **Create Server Pool** in the toolbar to start the **Create Server Pool** wizard.
3. The **Create Server Pool** step is displayed in the wizard.




Enter the server pool information:

- **Server Pool Name:** The name of the server pool. The maximum length of a server pool name is 256 characters and may contain any character.
- **Virtual IP Address for the Pool:** An IP address used to identify the master Oracle VM Server, which controls the other Oracle VM Server in the server pool. In the event that the master Oracle VM Server fails or is placed into maintenance mode, another Oracle VM Server is selected to perform the master role, and this IP address is then assigned to the new host.
- **VM Console Keymap:** The key mapping to be used when connecting to a virtual machine's console.
- **VM Start Policy**: For each server pool you can define the default startup policy for all of your virtual machines. Options include the ability to start the virtual machine on the current server (the server to which the virtual machine has been assigned) and the ability to start the virtual machine on the best available server (determined using the same algorithms as DRS and DPM). It is possible to override the default policy within the configuration of each virtual machine. See Section 7.7, “Creating a Virtual Machine” for information on setting the start policy for an individual virtual machine.
- **Secure VM Migrate:** Select whether to enable encrypted migration of virtual machines. When Secure VM Migrate is checked, virtual machines are migrated using SSL to protect the data during the migration process. Secure migration of a virtual machine may effect the time taken to perform the migration as the encryption and decryption of data requires more system resources and time.
- **Hypervisor Type:** Select the hypervisor type to use for the server pool.
- **Clustered Server Pool:** Select whether to enable clustering of the Oracle VM Servers in the server pool to enable HA. See Section 6.4, “High Availability (HA)” for more information on HA policies and configuration.

**Note**

This option is greyed out if the Hypervisor Type is set to `OVM/SPARC`.

- **Timeout for cluster:** If clustering is enabled for the server pool, this option allows you to set the timeout parameter. The maximum cluster timeout setting is 300 seconds. The minimum cluster timeout is 12 seconds. The default cluster timeout is 120 seconds. The Disk heartbeat and network heartbeat are automatically derived from the cluster timeout value.

  The cluster timeout can only be changed when there are no servers in the server pool, therefore it is usually good to set this during the creation of your server pool. See Section 6.4, “High Availability (HA)” for more information on HA policies and configuration.

**Note**

This option is greyed out if the Hypervisor Type is set to `OVM/SPARC`.

- **Storage for Server Pool:** Select the file system type to use for the server pool, either a **Network File System**, or a **Physical Disk**. The server pool file system is used to hold the server pool and cluster data, and is also used for cluster heartbeating. Oracle recommends that you create this storage with a size of at least 12 GB, as a NAS export or LUN.

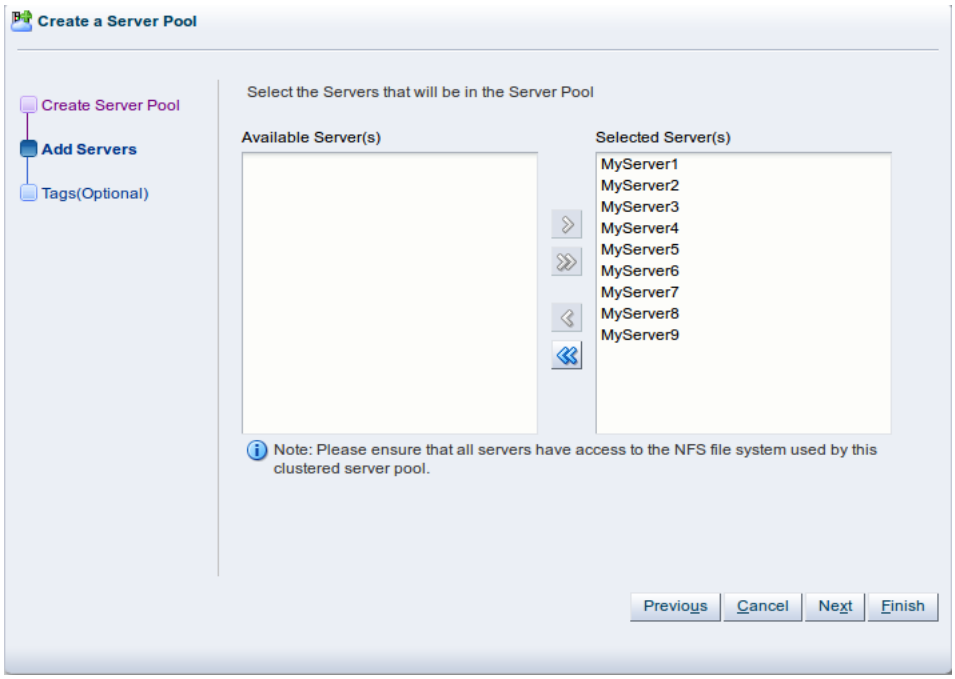
  A server pool file system is exclusive, just like other storage. That is, in the same way that you cannot create two storage repositories on the same export path, the server pool file system cannot be shared with other server pools, or with storage repositories. Each fully qualified export path (for example, /export/myexport/one, /export/myexport/two) must be used for one, and only one, purpose, that is, for a storage repository, or a server pool file system.

  For information on creating storage, see Chapter 4, *Managing Storage*.

- **Network File System:** The file system to use as the pool file system. Click **Search** in the **Storage Location** field to search for a network file system. This field is displayed if you select Network File System in the previous field.
- **Physical Disk:** The file system to use as the pool file system. Click **Search** in the **Storage Location** field to search for a physical disk. This field is displayed if you select Physical Disk in the previous field.
- **Description:** A description of the server pool. This field is optional.

  Click **Next**.

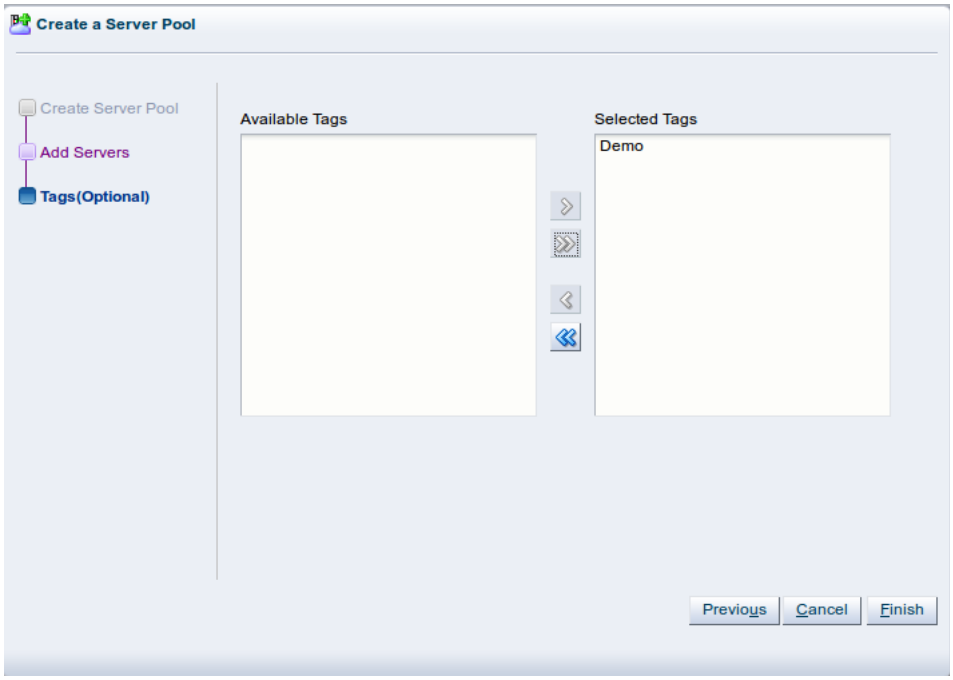
4. The **Add Servers** step is displayed in the wizard.




Select the Oracle VM Servers to add to the server pool from the **Available Servers** column and move them to the **Selected Servers** column.

If you have defined tags and wish to add any to the server pool, click **Next**. Otherwise, click **Finish**.

5. The **Tags** step is optional and displays in the wizard if you clicked **Next** in the previous step.




If you have defined tags previously they will appear in the **Available Tags** column. You can select the tags that you wish to apply to the server pool and move them to the **Selected Tags** column.

See Section 3.15, “Tags” for more information on creating and managing tags.

Click **Finish**.

The server pool is created.

# 6.9 Managing Server Pools

When you have created a server pool, you can perform a number of actions on it, like adding and removing Oracle VM Servers, and editing server pool policies. This section discusses the actions you can perform on a server pool.

## 6.9.1 Oracle VM Server Roles

Oracle VM Server roles allow you to fine tune how your Oracle VM Servers are used in your environment. Roles allow you to designate Oracle VM Servers to perform utility functions and/or to run virtual machines. Oracle VM Manager supports the following server roles:

- **VM Server role:** The VM Server role enables an Oracle VM Server to run virtual machines.
- **Utility Server role:** A Utility Server will be favored to do operations other than hosting virtual machines, for example, importing virtual machine templates and assemblies, creating virtual machine templates from assemblies, and creating repositories. If no Utility Servers are available, a non-utility server is chosen to do the work.

When you add an Oracle VM Server to a server pool it has both the Utility Server role and the VM Server role automatically selected by default. The VM Server role is required to run virtual machines. The Utility Server role is not required, it is advisory only.

You can select certain Oracle VM Servers to have the Utility Server role and others to have the VM Server role. This reduces the likelihood of impeding virtual machine performance due to utility operations. To edit an Oracle VM Server role, see Section 6.10.5, “Editing Oracle VM Server Information”.

You cannot update the VM Server role for an Oracle VM Server if the server is not in a server pool or if the Oracle VM Server has any virtual machines, running or not running. You must own the Oracle VM Server to change the VM Server role. To take ownership of an Oracle VM Server, see Section 6.10.3, “Taking Ownership of an Oracle VM Server”.

**Warning**

Turning off the VM Server role on all Oracle VM Servers within a server pool prevents any virtual machines from running.

You can change the Utility Server role anytime as long as you own the Oracle VM Server. To take ownership of an Oracle VM Server, see Section 6.10.3, “Taking Ownership of an Oracle VM Server”.

## 6.9.2 Adding an Oracle VM Server to a Server Pool

When you need more resources in a server pool (such as the number of CPUs and the size of memory), you can add more Oracle VM Servers. For example, when you want to run more virtual machines and the resources in the server pool are reaching capacity, you can add more Oracle VM Servers which increases the available resources.

Adding Oracle VM Servers to a server pool requires the modification of both the cluster configuration information and the server pool information, on all Oracle VM Servers. This is performed automatically.

Adding Oracle VM Servers to a server pool may trigger pending HA operations if there were previously insufficient resources to run all HA virtual machines.

**Note**

It is advisable that the password is the same on all Oracle VM Servers to avoid authentication issues for the Oracle VM Manager.

To add servers to a server pool, you can edit the server pool and click on the **Servers** tab to add available servers. See Section 6.9.4, “Editing a Server Pool” for more information.

You can also drag and drop Oracle VM Servers into and out of server pools, and to the **Unassigned Servers** folder. See Section 3.11, “Drag and Drop” for information on using the drag and drop feature.

## 6.9.3 Removing an Oracle VM Server from a Server Pool

When you want to remove resources in a server pool, perhaps to be used elsewhere, you can remove an Oracle VM Server from a server pool. Removing an Oracle VM Server from a server pool does not delete it, but places it in the unconfigured state.

Before you can remove an Oracle VM Server from a server pool, all virtual machines must be stopped or migrated. To automatically migrate the running virtual machines, place the Oracle VM Server in maintenance mode. See Section 6.10.10, “Placing an Oracle VM Server into Maintenance Mode” for information on putting an Oracle VM Server into maintenance mode.

Removing an Oracle VM Server from a server pool requires modification of both cluster configuration information and server pool information on all Oracle VM Servers in the server pool. This is performed automatically.

To remove servers to a server pool, you can edit the server pool and click on the **Servers** tab to remove servers that are already assigned to the server pool. See Section 6.9.4, “Editing a Server Pool” for more information.

You can also drag and drop Oracle VM Servers into and out of server pools, and to the **Unassigned Servers** folder. See Section 3.11, “Drag and Drop” for information on using the drag and drop feature.

## 6.9.4 Editing a Server Pool

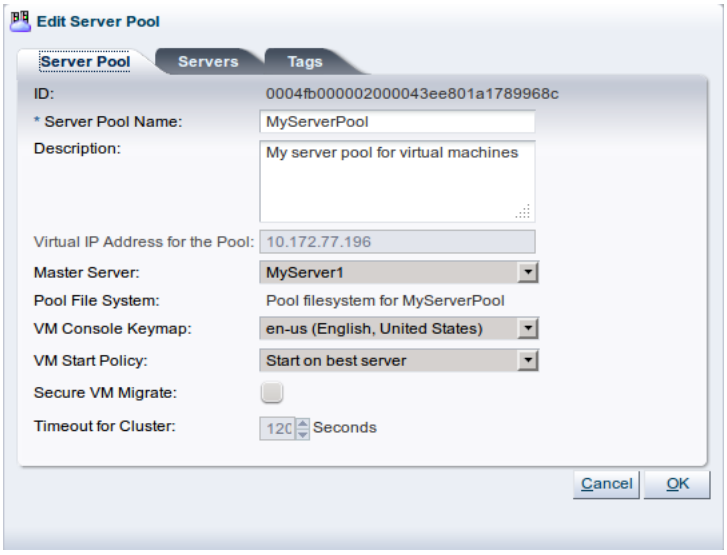
You can edit the configuration information of a server pool, including the server pool name, description, and key mapping. You can also change the master server, which controls the cluster, as well as whether the virtual machines are migrated securely. You cannot change the virtual IP address or the file system used for the server pool.

To add or remove Oracle VM Servers from a server pool, see Section 6.9.2, “Adding an Oracle VM Server to a Server Pool” and Section 6.9.3, “Removing an Oracle VM Server from a Server Pool”.

**To edit a server pool:**

1. Click the **Servers and VMs** tab.

2. Select the server pool in the **Server Pools** folder in the navigation pane. Click **Edit Selected Server Pool...** in the toolbar. The **Edit Server Pool** dialog box is displayed.

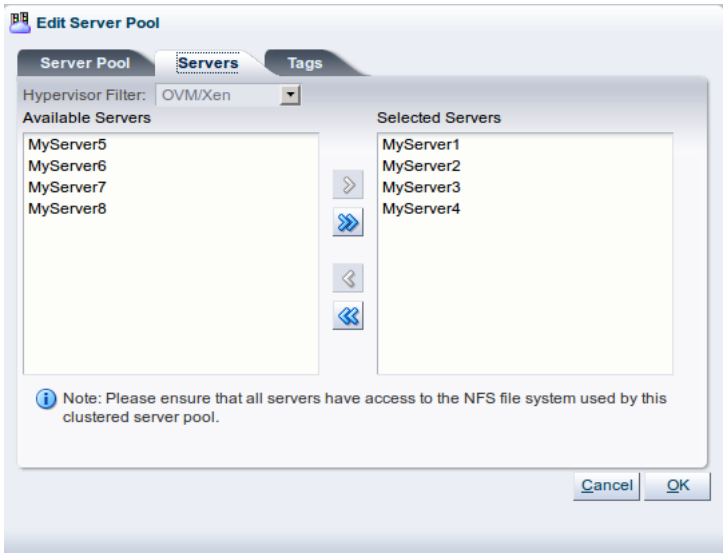



3. Edit the server pool information:

   - **Server Pool Name:** The name of the server pool. The maximum length of a server pool name is 256 characters and may contain any character.
   - **Description:** A description of the server pool.
   - **Virtual IP Address for the Pool**: This field cannot be modified.
   - **Master Server:** The master server that handles interactions with Oracle VM Manager.
   - **Pool File System:** This field cannot be modified.
   - **VM Console Keymap**: The key mapping to use in the consoles for all virtual machines in the server pool.
   - **VM Start Policy:** Define the default startup policy for all of your virtual machines handled by this server pool. It is possible to override the default policy within the configuration of each virtual machine. See Section 7.7, “Creating a Virtual Machine” for information on setting the start policy for an individual virtual machine.
   - **Secure VM Migrate:** Select whether to enable encrypted migration of virtual machines.
   - **Timeout for cluster:** If clustering is enabled for the server pool, this option allows you to set the timeout parameter. The maximum cluster timeout setting is 300 seconds. The minimum cluster timeout is 12 seconds. The default cluster timeout is 120 seconds. The Disk heartbeat and network heartbeat are automatically derived from the cluster timeout value.

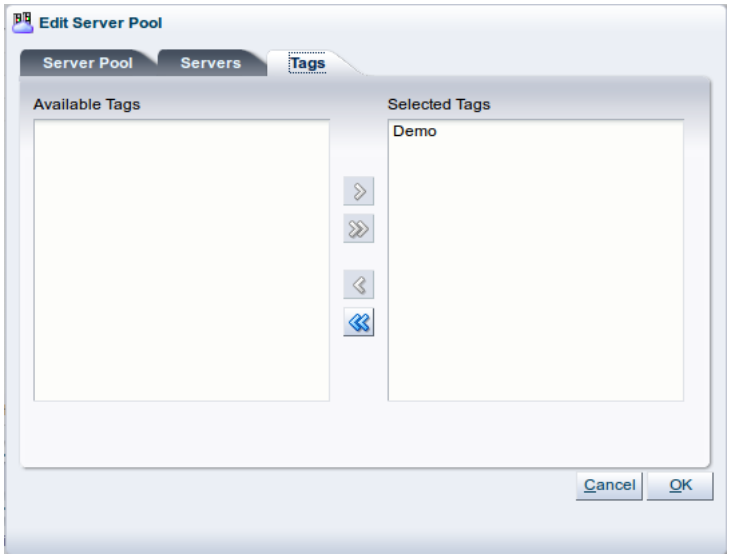
     The cluster timeout can only be changed when there are no servers in the server pool, therefore it is usually good to set this during the creation of your server pool. See Section 6.4, “High Availability (HA)” for more information on HA policies and configuration.

4. To edit the servers in the server pool, click the **Servers** tab.




Using the controls provided, you can add or remove servers that comprise the server pool.

5. To edit the tags associated with the server pool, click the **Tags** tab.




Using the controls provided, you can add or remove tags that can be used to identify the server pool and to group it with other objects within Oracle VM Manager.

See Section 3.15, “Tags” for more information on creating and managing tags.

6. Click **OK** to apply your changes.

The server pool changes are automatically propagated to all Oracle VM Servers in the server pool by the master server.

## 6.9.5 Selecting the Master Oracle VM Server

You can select any Oracle VM Server in a server pool to perform the master Oracle VM Server role.

**To change the master Oracle VM Server in a server pool:**

1. In the **Servers and VMs** tab, select **Server Pools** in the navigation tree, then select the server pool in the table in the management pane. Click **Change Master Server** in the management pane toolbar.
2. The **Change Master Server for Server Pool** dialog box is displayed. Select the Oracle VM Server from the **Master Server** drop-down list. Click **OK**.

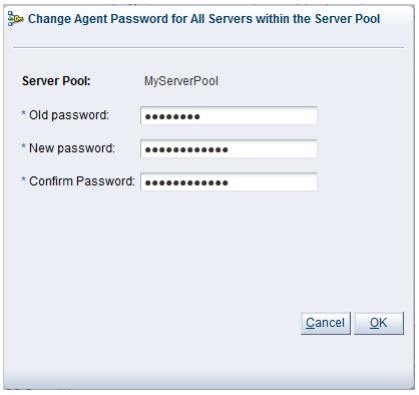
You can also select which Oracle VM Server performs the master Oracle VM Server role in a server pool with the **Edit the Server Pool** dialog box. See Section 6.9.4, “Editing a Server Pool” for information on using the **Edit the Server Pool** dialog box.

## 6.9.6 Changing Oracle VM Agent Passwords on Oracle VM Servers

Oracle VM Manager allows you to change the password for the Oracle VM Agent running on each Oracle VM Server. However, you must change the Oracle VM Agent password for all Oracle VM Servers in a server pool. This is why the password change can only be executed at the server pool level and is applied to all Oracle VM Servers in the server pool at the same time.

**To change the Oracle VM Agent password for all Oracle VM Servers in a server pool:**

1. Click the **Servers and VMs** tab.
2. In the navigation pane, select the server pool for which you want to change the Oracle VM Agent password. Click **Change Servers Agent Password** in the toolbar. The **Change Agent Password for All Servers within the Server Pool** dialog box is displayed.




3. Enter the current password first. Then enter a new password and confirm it in the respective fields.
4. Click **OK** to complete the operation. Oracle VM Manager logs into each Oracle VM Server in the server pool and changes the Oracle VM Agent password.

## 6.9.7 Editing Server Pool Policies

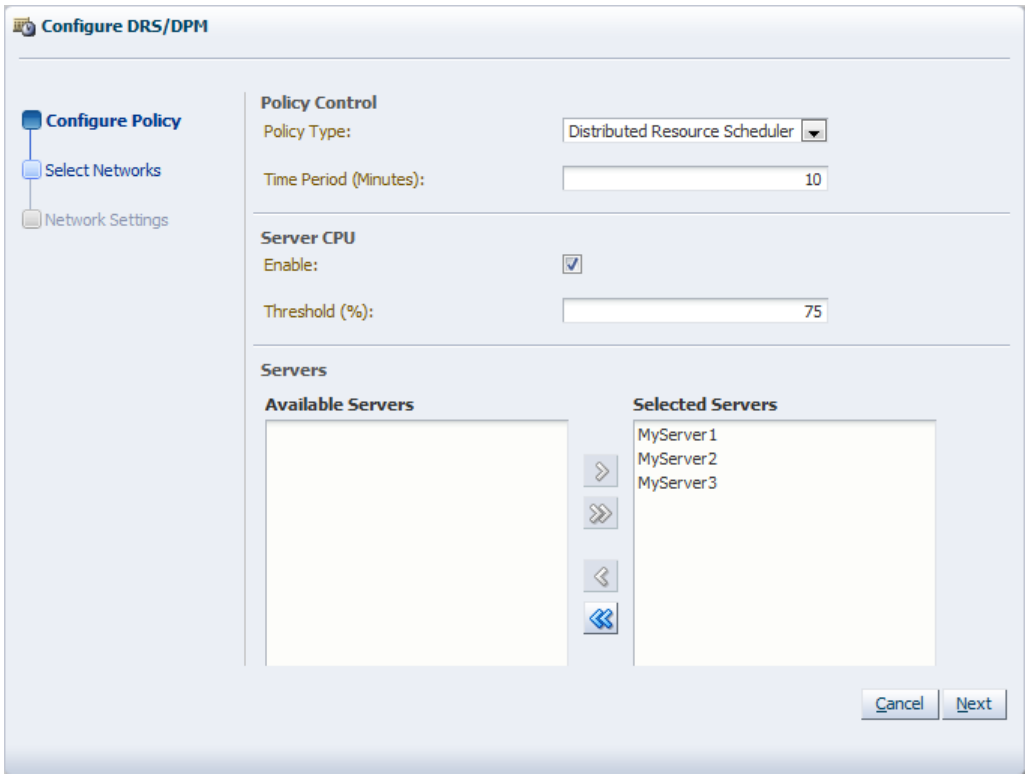
When you select a server pool in the navigation pane, the **Policies** view is available in the **Perspective** field in the management pane showing the power and resource utilization policy settings for the server pool. The two policies you can set are for:

- Distributed Resource Scheduler (DRS): Optimizes virtual machine resource utilization in a server pool.
- Distributed Power Management (DPM): Increases the consolidation ratio to use fewer Oracle VM Servers during periods of relative low resource utilization.

The policy is also able to be set for networks used in a server pool. You can set the server pool to use either DRS, or DPM, but not both at the same time.

See Section 6.5, “Server Pool Policies” for more information on these server pool policies.

**To set or edit a server pool policy:**

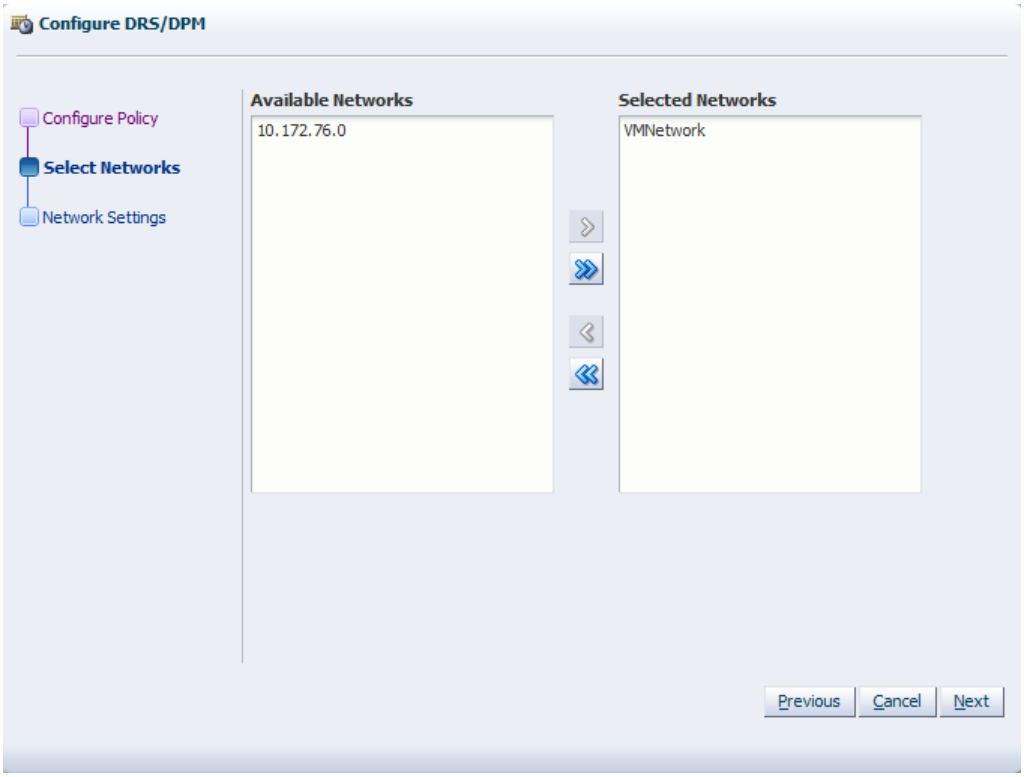
1. Click the **Servers and VMs** tab.
2. Select the server pool in the **Server Pools** folder in the navigation pane.
3. From the **Perspective** field in the management pane, select **Policies** from the drop-down list. Click **Edit** in the toolbar. The **Configure Policy** step of the **Configure DRS/DPM** wizard is displayed.
4. 


   Enter the server pool policy information:

   - **Policy Control:**
     - **Policy Type:** You can choose from either DRS, DPM, or none. You cannot set both DRS and DPM to be active at the same time.
     - **Time Period (Minutes):** The time period for the policy job to run. This sets the policy job to run every *n* minutes, for example, 10 sets the policy job to run every 10 minutes. You can enter a number between 1 and 60.
   - **Server CPU:**
     - **Enable:** Set whether to enable or disable logging of CPU performance and utilization.
     - **Threshold (%):** The maximum amount of CPU percentage usage allowed before the policy must be enacted. You can enter between 0 and 99.
   - **Servers:** Select the Oracle VM Servers for which the policy is to be enabled by moving the selected Oracle VM Servers from the **Available Servers** to the **Selected Servers** shuttle box.

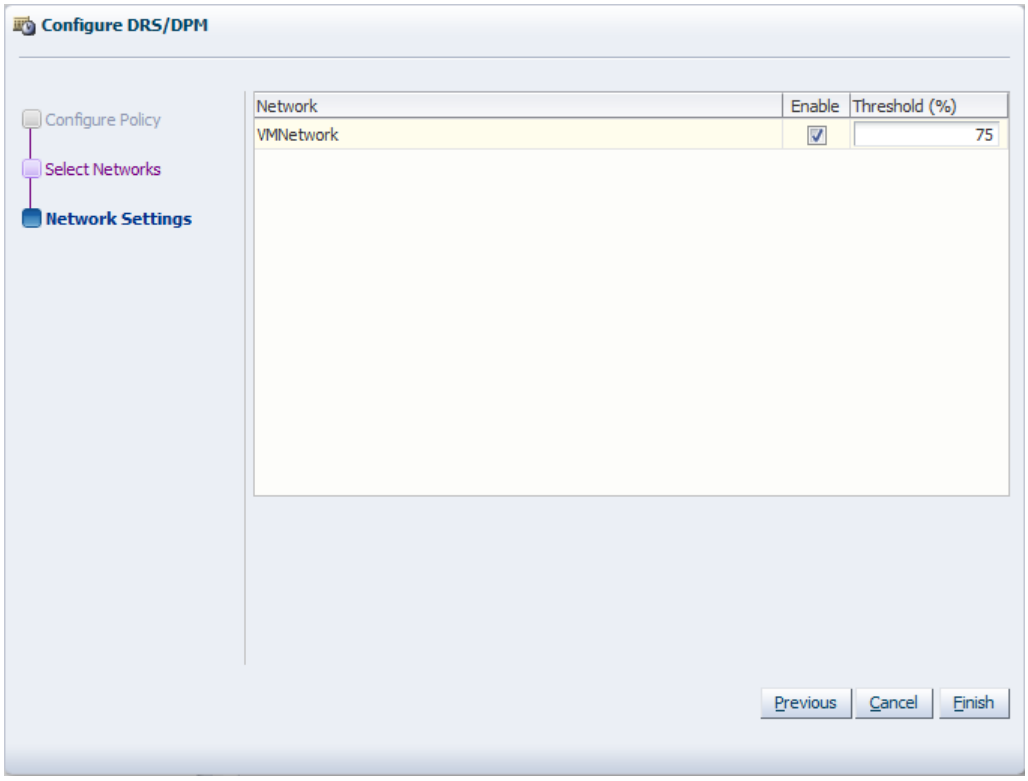
Click **Next**.

5. The **Select Networks** step of the **Configure DRS/DPM** wizard is displayed.




Select the networks to be included in the policy. Click **Next**.

6. The **Network Settings** step of the **Configure DRS/DPM** wizard is displayed.




Select whether to enable the policy on the network, and select the threshold at which the policy is to be enacted for the network. Click **Finish**.

The policy is set for the server pool.

## 6.9.8 Deleting Server Pools

Before you can delete a server pool, you must delete or remove all virtual machines and remove all Oracle VM Servers from the server pool.

To delete a virtual machine, see Section 7.10.13, “Deleting Virtual Machines”, to move a virtual machine, see Section 7.10.10, “Moving Virtual Machines Between Oracle VM Servers”, and to move a virtual machine to the **Unassigned Virtual Machines** folder, see Section 7.10.11, “Moving Virtual Machines To/From Unassigned Virtual Machines Folder”. To remove an Oracle VM Server from a server pool, see Section 6.9.3, “Removing an Oracle VM Server from a Server Pool”.

**To delete server pools:**

1. Click the **Servers and VMs** tab.
2. Select the **Server Pools** folder in the navigation tree.
3. Select **Server Pools** from the **Perspective** drop-down list.
4. Select one or more server pools in the table in the management pane. Click **Delete** ✖ in the toolbar.
5. The **Delete Confirmation** dialog box is displayed. Click **OK** to delete the server pools.

The server pools are deleted.

**Tip**

To delete a server pool which is HA-enabled, you must have an Admin server assigned to any NFS file server-based storage. See Section 4.6.1, "Discovering File Servers" for information on editing a file server to add an Admin server.

# 6.10 Managing Oracle VM Servers

Use Oracle VM Manager to manage Oracle VM Servers. Do not manage Oracle VM Servers directly using the Oracle VM Server command line unless directed to do so by a My Oracle Support document, or by Oracle Support.

A server pool must contain at least one Oracle VM Server. After installing an Oracle VM Server, you must discover it in Oracle VM Manager before it can be added to a server pool.

Before you discover Oracle VM Servers and add them to a server pool, you must:

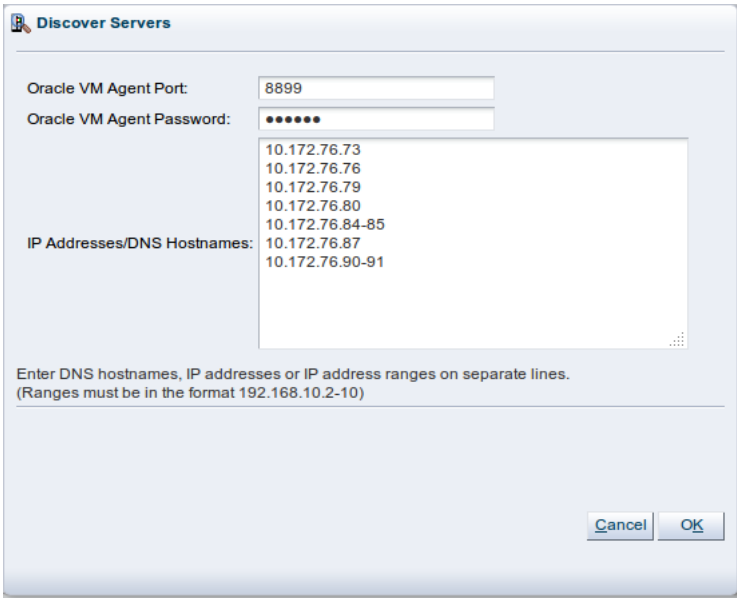
- Identify the IP address of the Oracle VM Server(s). If you installed Oracle VM Server with a static IP address (recommended), this is the IP address you use. If you installed Oracle VM Server with a dynamic IP address, log onto the Oracle VM Server and determine the IP address.
- Identify the password to access the Oracle VM Agent installed on the Oracle VM Server.

## 6.10.1 Discovering Oracle VM Servers

When an Oracle VM Server is installed and starts up, it listens for Oracle VM Manager server pool discovery events. Before you can add an Oracle VM Server to a server pool, it must first be discovered.

**To discover an Oracle VM Server:**

1. Click the **Servers and VMs** tab.
2. Click **Discover Servers** in the toolbar. The **Discover Servers** dialog box is displayed.




3. Enter information about the Oracle VM Server(s) to be discovered:
   - **Oracle VM Agent Port**: The port on which the Oracle VM Agent is listening. This is most likely the default port **8899**.

- **Oracle VM Agent Password**: The password to connect to the Oracle VM Agent. It is advisable that the password is the same on all Oracle VM Servers to avoid authentication issues for the Oracle VM Manager.

  An incorrect password results in an error message, notifying you of an 'Unauthorized access attempt'.

- **IP Addresses/DNS Hostnames**: Enter the IP address(es), IP ranges or DNS hostnames of the Oracle VM Server(s) to be discovered. You can paste a list of multiple IP addresses or multiple DNS hostnames. If you enter an IP range it must be in the format 192.168.10.2-10. For example, if you enter 192.168.10.2-4 Oracle VM Manager will discover 192.168.10.2, 192.168.10.3 and 192.168.10.4. IP addresses, IP ranges and DNS host names must be entered on separate lines.

**Note**

Invalid entries may result in a job that will fail to complete and may need to be aborted. See Section B.1.9, “Aborting Jobs” for information on aborting a job.

Click **OK**.

The Oracle VM Servers are discovered and added to the **Unassigned Servers** folder. The newly discovered Oracle VM Server contains some basic information about itself, and about any immediate connectivity to a shared SAN, but it is considered to be in an unconfigured state. The Oracle VM Server cannot be used to perform any virtual machine, or active cluster operations. Physical network and storage configuration can be performed, and any subsequent storage discovery operations may also be performed.

The **Utilization %** column in the **Servers** perspective in the management pane does not report the utilization statistics of an Oracle VM Server that is in the **Unassigned Servers** folder. This field does not report utilization statistics unless an Oracle VM Server is included in a server pool.

**Note**

Discovered Oracle VM Servers do not use a Virtual IP address until they are properly configured by being included in a server pool.

When an Oracle VM Server has been discovered, it can be added to a server pool. See Section 6.9.2, “Adding an Oracle VM Server to a Server Pool” for information on adding an Oracle VM Server to a server pool.

## 6.10.2 Rediscovering Oracle VM Servers

If there are either changes to the physical state of an Oracle VM Server or its attached storage, you should discover it again to update the configuration information in Oracle VM Manager.

**To rediscover Oracle VM Servers:**

1. Click the **Servers and VMs** tab.
2. Select the server pool in which the Oracle VM Servers reside in the navigation tree.
3. Select **Servers** from the **Perspective** drop-down list. Select one or more Oracle VM Servers in the management pane, and click **Rediscover Server** in the management pane toolbar.

The configuration and storage information about the Oracle VM Servers is updated in Oracle VM Manager.

In order to cut load time within Oracle VM Manager, Oracle VM Server rediscovery is not performed at start-up, therefore there may be cases where you want to update the configuration information for *all*

Oracle VM Server instances within the Oracle VM Manager. Note that in larger deployments this may be a resource consuming action.

**To rediscover all Oracle VM Servers, file servers and SAN servers:**

1. Click the **Servers and VMs** tab.

2. Right click on the **Server Pools** folder in the navigation pane, and select the **Refresh All** option in the context menu that appears. This icon also appears in the management pane toolbar.

The configuration information about all Oracle VM Server instances is updated in Oracle VM Manager.

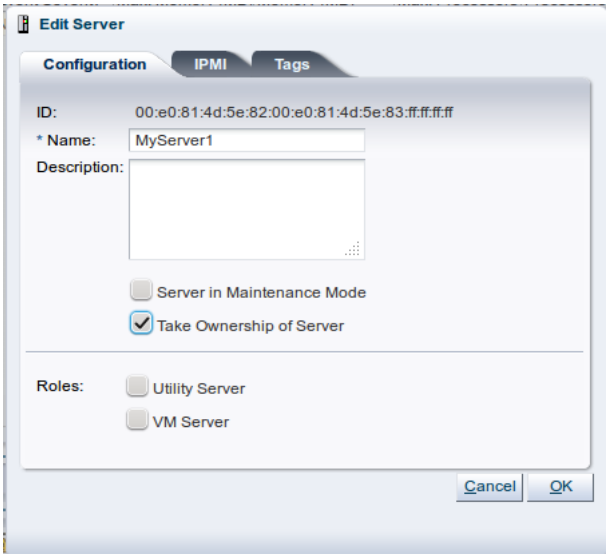
## 6.10.3 Taking Ownership of an Oracle VM Server

By default, the the instance of Oracle VM Manager that first adds the Oracle VM Server has ownership of that Oracle VM Server. If an Oracle VM Server is in the Unassigned Servers folder and does not have ownership by your user, you need perform the following steps to take ownership and use the Oracle VM Server in a server pool.

**To take ownership of an Oracle VM Server:**

1. Click the **Servers and VMs** tab.

2. Select the Oracle VM Server in the **Unassigned Servers** folder in the navigation pane. Click **Edit Server** in the toolbar. The **Edit Server** dialog box is displayed.




3. Select the **Take Ownership** check box to take ownership of the Oracle VM Server. Click **OK**.

To relinquish ownership of the Oracle VM Server, repeat the same procedure and uncheck the **Take Ownership** check box.

You cannot relinquish ownership of an Oracle VM Server while it is in a server pool, you must first remove it from the server pool. See Section 6.9.3, “Removing an Oracle VM Server from a Server Pool” for information on removing an Oracle VM Server from a server pool. You also cannot relinquish ownership of an Oracle VM Server if a repository is presented to it. However, it is possible to take ownership of an Oracle VM Server regardless of whether it is in a server pool or not.

## 6.10.4 Viewing Oracle VM Server Information and Events

You can view basic information about an Oracle VM Server, or drill down for more detailed information. The basic Oracle VM Server information is what you are likely to want to see on a regular basis for system monitoring, for example, the status (running, starting, stopped), utilization, IP address, memory, CPUs, and whether a software update is available. If this information is not enough, you can drill down to the more detailed information.

**To view basic Oracle VM Server information:**

1. Click the **Servers and VMs** tab, and select the server pool on which the Oracle VM Server resides in the navigation tree.
2. Select **Servers** in the **Perspective** drop-down list in the management pane. General information about the Oracle VM Servers in the server pool is displayed in the management pane.

**To view detailed Oracle VM Server information:**

1. Click the **Servers and VMs** tab, and select the Oracle VM Server in the navigation tree.
2. Select **Info** in the **Perspective** drop-down list in the management pane. Detailed information about the Oracle VM Server is displayed in the management pane. Expand any arrows for more information.

**To view Oracle VM Server events:**

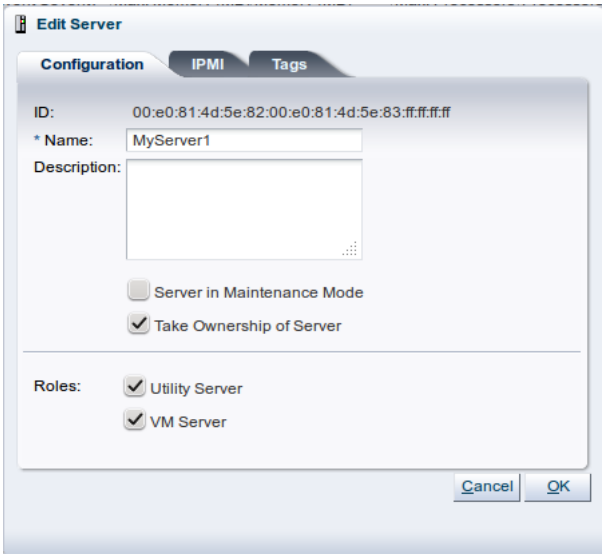
1. Click the **Servers and VMs** tab, and select the Oracle VM Server in the navigation tree.
2. Select **Events** from the **Perspective** drop-down list. A list of the events associated with the Oracle VM Server are displayed in the management pane table. Select an event in the table, and expand the arrow for more information about the event.
3. If an Oracle VM Server has error event associated with it you must acknowledge the event to clear the error. See Section B.1.11, “Acknowledging Events/Errors” for information on acknowledging events.

## 6.10.5 Editing Oracle VM Server Information

You can edit the configuration information for an Oracle VM Server to change the name, description, any server pool roles, and to take it off-line to perform system maintenance.

**To edit the configuration information of an Oracle VM Server:**

1. Click the **Servers and VMs** tab.
2. Select the Oracle VM Server in the navigation pane. Click **Edit Server** in the toolbar. The **Edit Server** dialog box is displayed.




3. In the Configuration tab, edit the information about the Oracle VM Server:

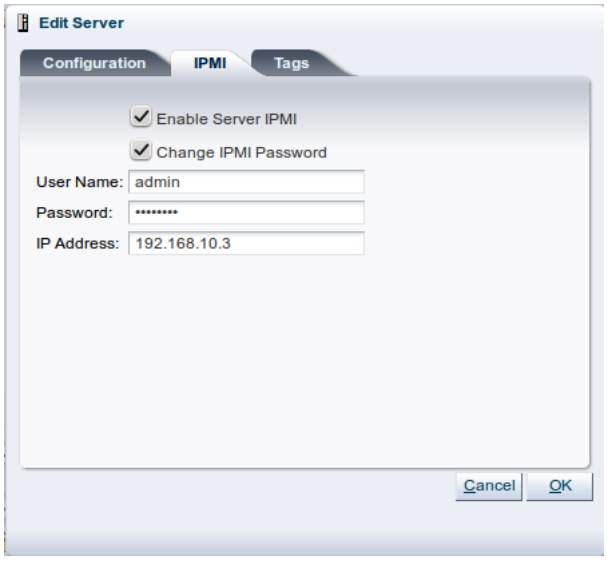
   - **Name:** The name of the Oracle VM Server.
   - **Description:** A description of the Oracle VM Server.
   - **Maintenance Mode:** Select whether to place the Oracle VM Server in maintenance mode. See Section 6.10.10, “Placing an Oracle VM Server into Maintenance Mode” for more information about Oracle VM Server maintenance mode.
   - **Take Ownership:** Select to take ownership of the Oracle VM Server. See Section 6.10.3, “Taking Ownership of an Oracle VM Server” for information on ownership of an Oracle VM Server.

     **Tip**

     You cannot edit the ownership of an Oracle VM Server if it is included in a server pool or if a repository is presented to it. .

   - **Utility Server:** Select to designate the Oracle VM Server to perform utility functions such as importing, cloning and storage refresh. See Section 6.9.1, “Oracle VM Server Roles” for information on Oracle VM Server roles.
   - **VM Server:** The virtual machine role is required to run virtual machines. See Section 6.9.1, “Oracle VM Server Roles” for information on Oracle VM Server roles.

4. In the IPMI tab, select the **Enable Server IPMI** check box to enable the Intel®ligent Platform Management Interface (IPMI). IPMI allows you to remotely power on or power off an Oracle VM Server. If IPMI is either not available or not enabled on the Oracle VM Server, Oracle VM Manager may still be able to remotely power on an Oracle VM Server using a *Wake on LAN* message without having to physically press the power button, and it may be able to send a system power off message to shut it down.

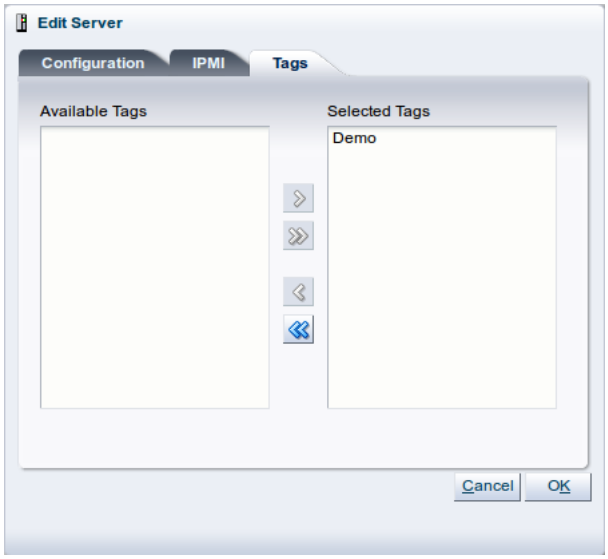



To configure IPMI enter the following information in the fields:

- **User Name:** The user name for the IPMI.
- **Password:** The password for the IPMI.

  To set or modify the IPMI password, you must also select the **Change Password** check box.
- **IP Address:** The IP address of the IPMI.

5. To edit the tags associated with the server, click the **Tags** tab.




Using the controls provided, you can add or remove tags that can be used to identify the server and to group it with other objects within Oracle VM Manager.

See Section 3.15, “Tags” for more information on creating and managing tags.

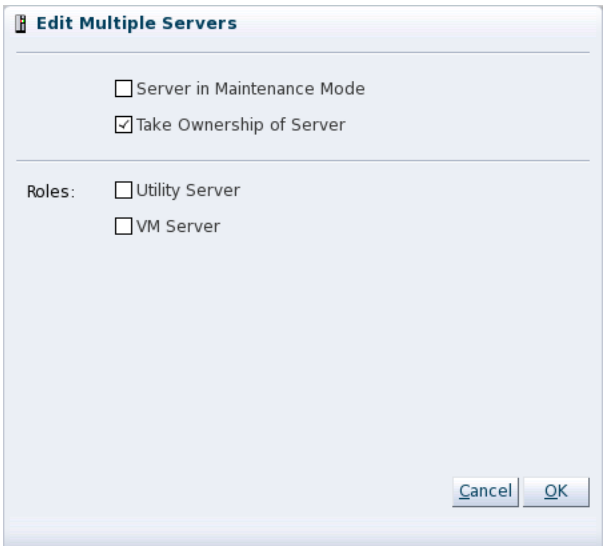
Click **OK**. The Oracle VM Server is updated.

### 6.10.5.1 Batch Editing Oracle VM Servers

You can edit the information for more than one Oracle VM Server at a time by using the multi-select functionality provided within the Oracle VM Manager interface to select multiple items before clicking on the **Edit Server** icon in the toolbar.

When editing a group of Oracle VM Servers in batch mode the options available to you are limited to actions that can be applied to all selected items. The following options are available:

- **Server in Maintenance Mode**: Checking this checkbox sets all selected items into Maintenance Mode
- **Take Ownership of Server**: Checking this checkbox allows Oracle VM Manager to take ownership of all of the selected items
- **Utility Server**: Checking this checkbox changes the role of all selected items to Utility Servers
- **VM Server**: Checking this checkbox changes the role of all selected items to Virtual Machine Servers




**Note**

If the values set for the options provided vary across the selected servers, the dialog will display the values for the first server in the selection. Clicking OK will update all of the selected servers to have the same status.

## 6.10.6 Starting Oracle VM Servers

When you start an Oracle VM Server, it is started using the Intel®ligent Platform Management Interface (IPMI), or Wake-on-LAN (WOL). If neither IPMI nor WOL have been configured, the job to start the Oracle VM Server cannot be completed. The Oracle VM Server must then be powered on manually. See Section 6.10.5, “Editing Oracle VM Server Information” for information on configuring IPMI.

**To start Oracle VM Servers:**

1. Click the **Servers and VMs** tab.
2. Select the server pool in which the Oracle VM Server resides in the navigation tree.
3. Select **Servers** from the **Perspective** drop-down list. Select one or more Oracle VM Servers in the management pane, and click **Start Server** in the management pane toolbar.

The Oracle VM Servers are started.

## 6.10.7 Stopping Oracle VM Servers

When you stop an Oracle VM Server, it is stopped using the Intel®ligent Platform Management Interface (IPMI), or a system power off command. Before you can stop an Oracle VM Server, you must stop any running virtual machines, or place the Oracle VM Server into maintenance mode to automatically migrate the running virtual machines.

**Warning**

Make sure that the IPMI is properly configured on the Oracle VM Server, otherwise it cannot be started again remotely. See Section 6.10.5, “Editing Oracle VM Server Information” for IPMI configuration. Alternatively, make sure that you activate the Wake-on-LAN (WOL) feature in the Oracle VM Server BIOS and that you have tested that it is properly working. If an Oracle VM Server cannot start through IPMI or WOL, it must be power-cycled manually.

**To stop Oracle VM Servers:**

1. Stop or migrate any running virtual machines. To stop the virtual machines see Section 7.10.4, “Stopping (Shutting Down) Virtual Machines”. To automatically migrate the virtual machines to other Oracle VM Servers in the server pool, place the Oracle VM Servers into maintenance mode , see Section 6.10.10, “Placing an Oracle VM Server into Maintenance Mode” .
2. Click the **Servers and VMs** tab.
3. Select the server pool in which the Oracle VM Server resides in the navigation tree.
4. Select **Servers** from the **Perspective** drop-down list. Select one or more Oracle VM Servers in the management pane, and click **Stop Server** in the management pane toolbar.

The Oracle VM Servers are powered off.

## 6.10.8 Killing Oracle VM Servers

To kill an Oracle VM Server is equivalent to performing a power off of an Oracle VM Server, similar to unplugging the power cable from the physical machine. This is not the recommended method of shutting down an Oracle VM Server, but may be used if the shut down command fails to shut down the Oracle VM Server.

**To kill Oracle VM Servers:**

1. Click the **Servers and VMs** tab.
2. Select the server pool in which the Oracle VM Server resides in the navigation tree.
3. Select **Servers** from the **Perspective** drop-down list. Select one or more Oracle VM Servers in the management pane, and click **Kill** in the management pane toolbar. Click **OK** in the Confirmation dialog.

The Oracle VM Servers are powered off.

## 6.10.9 Restarting Oracle VM Servers

When you restart an Oracle VM Server, an operating system restart command is sent and the Oracle VM Server is restarted. Before you can restart an Oracle VM Server, you must stop any running virtual

machines, or place the Oracle VM Server into maintenance mode to automatically migrate the running virtual machines.

When the Oracle VM Server is restarted and rejoins the server pool, the master Oracle VM Server initiates any pending HA operations in the server pool. When Oracle VM Manager is notified that the Oracle VM Server is online and available, any pending state changes are reconciled before any policy actions are resumed.

**To restart Oracle VM Servers:**

1. Stop or migrate any running virtual machines. To stop the virtual machines see Section 7.10.4, “Stopping (Shutting Down) Virtual Machines”. To automatically migrate the virtual machines to other Oracle VM Servers in the server pool, place the Oracle VM Servers into maintenance mode , see Section 6.10.10, “Placing an Oracle VM Server into Maintenance Mode” .

2. Click the **Servers and VMs** tab.

3. Select the server pool in which the Oracle VM Server resides in the navigation tree.

4. Select **Servers** from the **Perspective** drop-down list. Select one or more Oracle VM Servers in the management pane, and click **Restart** in the management pane toolbar.

The Oracle VM Servers are restarted.

## 6.10.10 Placing an Oracle VM Server into Maintenance Mode

An Oracle VM Server can be placed into *maintenance mode* to perform hardware or software maintenance. When an Oracle VM Server is placed in maintenance mode, any virtual machines running on the Oracle VM Server are automatically migrated to other Oracle VM Servers in the server pool, if they are available. If the Oracle VM Server is the master Oracle VM Server in the server pool, this role is moved to another Oracle VM Server in the server pool, if available, after the server is shutdown. If any of these automatic processes fail, check the Oracle VM Server event log (Section 6.10.4, “Viewing Oracle VM Server Information and Events”) for reasons why the failure occurred.

**To place an Oracle VM Server into maintenance mode:**

1. In the **Servers and VMs** tab, select the Oracle VM Server in the navigation pane. Click **Edit Server** in the management pane toolbar.

2. The **Edit Server** dialog box is displayed. Select the **Maintenance Mode** check box to place the Oracle VM Server into maintenance mode. Click **OK**.

The Oracle VM Server is placed into maintenance mode. In the navigation pane, you can recognize a server in maintenance mode by its different icon: .

When you have finished performing maintenance on the Oracle VM Server and you are ready for it to rejoin the server pool, perform the same procedure and uncheck the **Maintenance Mode** check box.

## 6.10.11 Updating and Upgrading Oracle VM Servers

Updates and upgrades to Oracle VM Servers can be automatically performed using a Yum repository. To access patch updates for Oracle VM, you should contact Oracle to purchase an Oracle VM Support contract and gain access to the Unbreakable Linux Network (ULN) which contains updates for Oracle VM. If you have access to ULN you can use this to set up your own Yum repository to use when updating your Oracle VM Servers. Setting up a Yum repository is beyond the scope of this documentation, however you can read about setting one up in an OTN article "*Yum Repository Setup*" at:

http://www.oracle.com/technetwork/articles/servers-storage-admin/yum-repo-setup-1659167.html

Make sure you subscribe to the Oracle VM Release 3.2 channel on ULN when you set up your Yum repository.

If you have a Yum repository configured for Oracle VM Server updates, you add this to Oracle VM Manager and perform updates using Oracle VM Manager.

To see which version the Oracle VM Server is running before and after an upgrade, click the **Servers and VMs** tab, select the Oracle VM Server in the navigation tree and then select **Control Domains** in the **Perspective** drop-down list.

**To add a Yum repository:**

1. Click the **Tools and Resources** tab.
2. Click the **Server Update Management (YUM)** sub-tab.
3. Click **Update** to display the **Server Update Management (YUM)** dialog box. Enter the following information about the Yum repository:

   - **YUM Base URL:** The URL to access the Yum repository, for example:

     ```
     http://example.com/OVM3/Server/
     ```

     **Note**

     The YUM Base URL should contain the RPMs and the repodata directory created by the createrepo tool. If you are copying the RPMs from the Oracle VM Server ISO media, or loop mounting the ISO file, make sure to include the `Server` directory (which includes the `repodata` directory), for example:

     http://example.com/OVM3/Server/

   - **Enable GPG Key:** Whether to use a GPG key for the Yum repository. The GPG key (or GnuPG key) is the key used in the GNU project's implementation of the OpenPGP key management standard. The GPG key is used to check the validity of the Yum repository, and any packages (RPMs) downloaded from the repository.
   - **YUM GPG Key:** The GPG key for the Yum repository, for example:

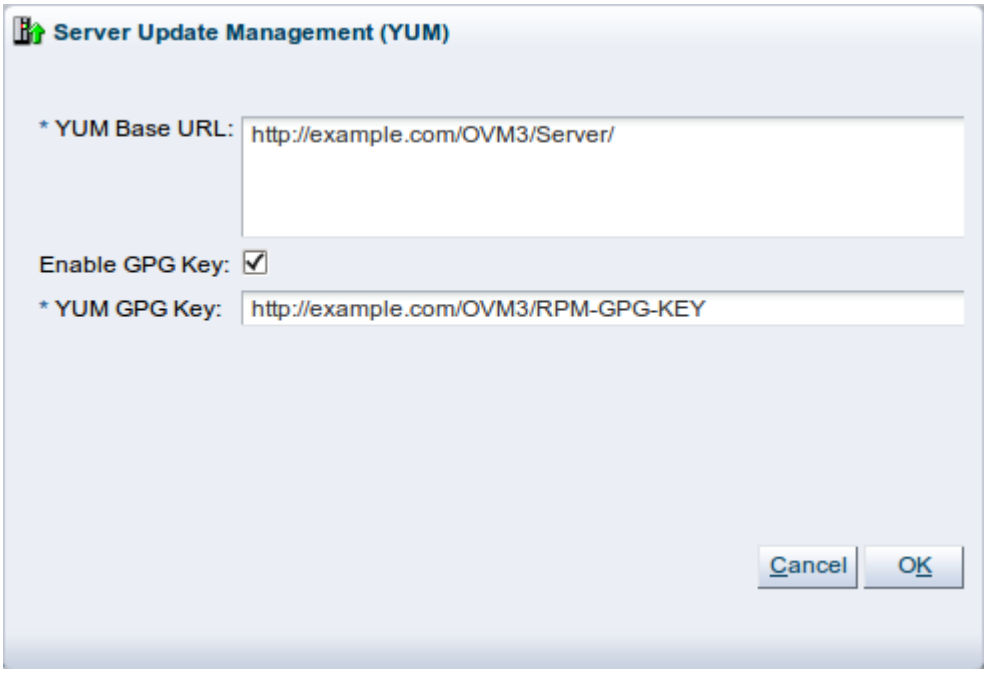
     ```
     http://example.com/OVM3/RPM-GPG-KEY
     ```

     The GPG key must be available via one of HTTP, FTP, FILE or HTTPS protocols.

     The GPG key for Oracle-signed updates from ULN is pre-installed on Oracle VM Server at /etc/pki/rpm-gpg/RPM-GPG-KEY-oracle. If you want to use this GPG key, enter:

     ```
     file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
     ```

     This field is only enabled when you select **Enable GPG Key**.

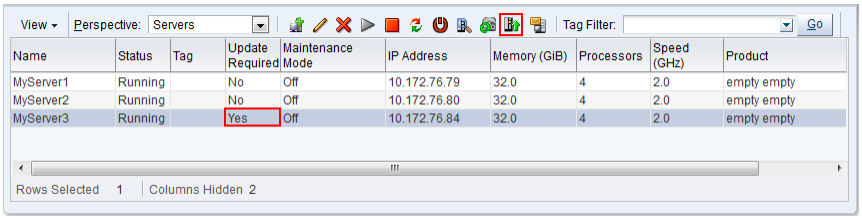



Click **Apply**.

The YUM repository is added and ready to use to update Oracle VM Servers.

The YUM repository is checked for updates every 6 hours, so there may be a delay between the YUM repository being updated and the notification being displayed in Oracle VM Manager. To change the frequency of this recurring job, see Section B.1.7, “Managing Recurring Jobs”.

When an Oracle VM Server update is available, an event is posted to the Oracle VM Server and displayed in the **Update Required** column in the **Servers** perspective in the management pane.




To update an Oracle VM Server, the virtual machines on the Oracle VM Server must first be stopped or migrated to another Oracle VM Server. You can manually stop or migrate the virtual machines, or, if you prefer, have the upgrade server job perform the virtual machine migration automatically.

**To update Oracle VM Servers:**

1. Click the **Servers and VMs** tab, and select the server pool in which the Oracle VM Servers reside in the navigation tree.

2. Select **Servers** in the **Perspective** drop-down list in the management pane.

3. Select the Oracle VM Servers in the management pane table and click **Update Server** from the management pane toolbar.

   A confirmation dialog is displayed. Click **OK**. Each Oracle VM Server is placed into maintenance mode, and the update performed. Any virtual machines on the Oracle VM Servers are automatically migrated

to another Oracle VM Server when it is put into maintenance mode. If the Oracle VM Server is a master Oracle VM Server, the master role is transferred to another Oracle VM Server in the server pool. When the update is complete the Oracle VM Server is restarted and remains in maintenance mode.

4. To have the Oracle VM Servers rejoin the server pool as a fully functioning member, edit each the Oracle VM Server and take it out of maintenance mode.

For information on manually migrating virtual machines, see Section 7.10.12, “Migrating Virtual Machines”. For information on taking an Oracle VM Server out of maintenance mode, see Section 6.10.10, “Placing an Oracle VM Server into Maintenance Mode”.

## 6.10.12 Managing Ethernet Ports and Network Bonding on an Oracle VM Server

**Important**

While Oracle VM Manager uses the Linux terminology for network bonds, Oracle Solaris users should understand this to be equivalent to IP MultiPathing (IPMP).

To view and edit the Ethernet ports and network bonding on an Oracle VM Server, select the **Servers and VMs** tab, the Oracle VM Server in the navigation tree, then the **Ethernet Ports** and **Bond Ports** options in the **Perspective** drop-down list. You can view which ports are bonded to which networks and VLAN groups, and set network addressing and the MTU (Maximum Transmission Unit) on a port. You can also configure the network bonding of each Ethernet port. For information on managing Ethernet ports and bonding on an Oracle VM Server see Section 5.10, “Managing Bonded Interfaces”.

**Note**

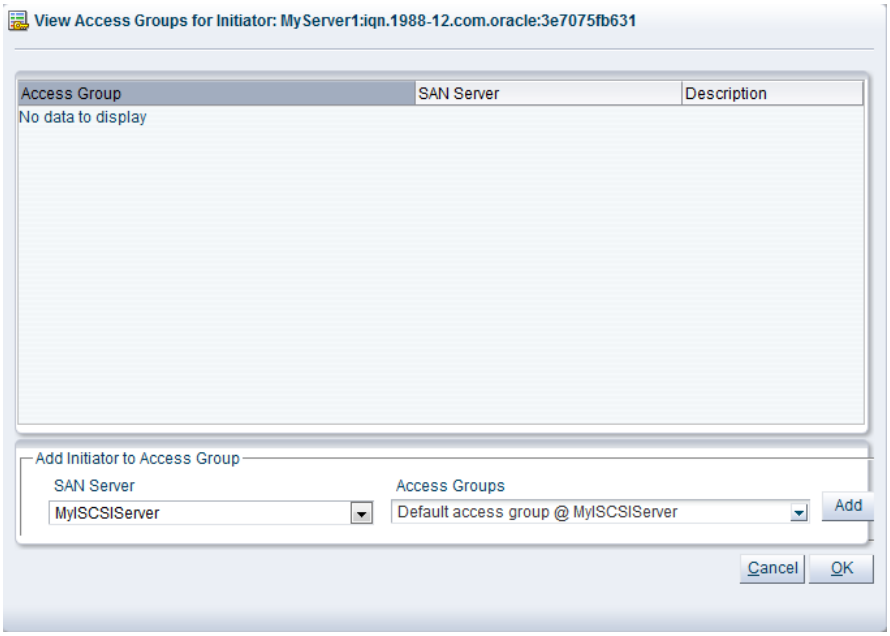
You cannot edit the MTU setting of an Ethernet port which is part of a bond configuration. Change the MTU setting for the bond port instead of the individual Ethernet port. For more information on the MTU setting, or if your network supports jumbo frames, please see Section 5.10, “Managing Bonded Interfaces”.

## 6.10.13 Managing Access Groups and Storage Initiators on an Oracle VM Server

In order to access SAN server storage, an access group must be created, and a storage initiator configured on the Oracle VM Server. Storage initiators are added to an Oracle VM Server during discovery, based on your storage configuration. You configure access groups to bind storage initiators to physical disks. For information on creating access groups, see Section 4.6.4.2, “SAN Server Access Groups”. You can also view and configure existing storage initiators for a particular Oracle VM Server.

**To view storage initiators on an Oracle VM Server:**

1. Click the **Servers and VMs** tab, and select the Oracle VM Server in the navigation tree.
2. Select **Storage Initiators** in the **Perspective** drop-down list in the management pane. The storage initiators configured on the Oracle VM Server are listed in the management pane table.
3. Select a storage initiator in the table, and click **View access groups for selected initiator** .
4. The **View Access Groups for Initiator** dialog box is displayed.




Select the **SAN Server** and **Access Groups** from the drop-down lists and click **Add**. Click **OK**.

See Section 4.6.4.2, “SAN Server Access Groups” for more information on managing SAN server access groups.

## 6.10.14 Managing Physical Disks on an Oracle VM Server

You can view and manage the physical disks on an Oracle VM Server, as well as those available to it from a SAN server. You can also refresh the physical disks on an Oracle VM Server when SAN server disks have been added or removed.

**To refresh the physical disks on Oracle VM Servers:**

1. Click the **Servers and VMs** tab, and select the server pool in which the Oracle VM Servers reside in the navigation tree.
2. Select **Servers** in the **Perspective** drop-down list in the management pane.
3. Select the Oracle VM Servers in the management pane table and click **Rescan Physical Disks** in the management pane toolbar.
4. A confirmation dialog box is displayed. Click **OK**.

**To view and manage the physical disks on an Oracle VM Server:**

1. Click the **Servers and VMs** tab, and select the Oracle VM Server in the navigation tree.
2. Select **Physical Disks** in the **Perspective** drop-down list in the management pane.
3. A list of the physical disks accessible by the Oracle VM Server is displayed in the table in the management pane and the management functions you can perform on the disk are available as icons in the management pane toolbar. Some management options are only available to SAN server disks that use a non-generic storage connect plug-in. The physical disk management options available are listed in Table 6.2, “Oracle VM Server Physical Disks Toolbar Icon Options”.

**Table 6.2 Oracle VM Server Physical Disks Toolbar Icon Options**

| Toolbar Icon Option | Icon | Description |
|---|---|---|
| **Rescan Physical Disks** | | Request an update of the all the physical disks available to the Oracle VM Server to see if changes have been made. |
| **Edit Physical Disk** | | Change the name, description and extra information of the physical disk, or make it shareable. |
| **Delete Physical Disk** | | Stop using the selected physical disk in your Oracle VM environment.<br>**Warning**<br>If you effectively delete a LUN from a registered storage array, make sure that you delete it in Oracle VM Manager first, before you physically delete it from the storage server. If you do not respect this order of operations, the system will go into an unknown state, which can only be resolved by rebooting the Oracle VM Servers the deleted LUN is connected to. |
| **Clone Physical Disk** | | Create a thin clone, sparse copy or non-sparse copy of the physical disk on the selected target. |
| **Delete File System** | | Delete one or more file systems and contents of the physical disks. |
| **Refresh Physical Disk** | | Request an update of one or more physical disks to see if changes have been made to the size and configuration. |
| **Display Servers using Physical Disk...** | | Display the **Servers using Physical Disk...** dialog box which shows the servers that are using the selected physical disk. |
| **Display Selected Storage Element Events...** | | Display the **Events** dialog box which contains the job events associated with the physical disk. |

For more information on managing SAN servers and their contents, see Section 4.6.4.1, “Discovering a SAN Server”. For more information on using storage, see Chapter 4, *Managing Storage*.

## 6.10.15 Viewing Oracle VM Server Operating System Information and Control Domains

You can view information about the underlying operating system and hardware on an Oracle VM Server using the Control Domains perspective when you select an Oracle VM Server. This perspective lists each control domain and information about it. Xen has only one control domain, whereas other hypervisors may have multiple control domains. This information may be useful when talking to Oracle Support Services, as you can find out the exact version of Oracle VM Server, Oracle VM Agent, and the hypervisor kernel installed on the machine.

**To view control domain information:**

1. Click the **Servers and VMs** tab, and select the Oracle VM Server in the navigation tree.

2. Select **Control Domains** in the **Perspective** drop-down list in the management pane. The control domain is listed in the management pane table. Expand the table row for more information about the control domain.

## 6.10.16 Deleting Oracle VM Servers from Oracle VM Manager

When you delete an Oracle VM Server, it is removed from the Oracle VM Manager repository and becomes unmanaged. The Oracle VM Server is not stopped, nor is anything physically done to the Oracle VM Server.

Before you can delete an Oracle VM Server, you must stop any running virtual machines, or place the Oracle VM Server into maintenance mode to automatically migrate the running virtual machines.

**To delete Oracle VM Servers from Oracle VM Manager:**

1. Stop or migrate any running virtual machines. To stop the virtual machines see Section 7.10.4, “Stopping (Shutting Down) Virtual Machines”. To automatically migrate the virtual machines to other Oracle VM Servers in the server pool, place the Oracle VM Server into maintenance mode, see Section 6.10.10, “Placing an Oracle VM Server into Maintenance Mode”.

2. Click the **Servers and VMs** tab.

3. Select the **Unassigned Servers** folder in the navigation tree. Select **Servers** from the **Perspective** drop-down list.

4. Select one or more Oracle VM Servers in the management pane. Click **Delete** in the management pane toolbar.

5. The **Delete Confirmation** dialog box is displayed. Click **OK** to delete the Oracle VM Servers.

The Oracle VM Servers are deleted from Oracle VM Manager.

## 6.10.17 Managing NTP on Oracle VM Servers

Network Time Protocol (NTP) time source servers enable time synchronization between all Oracle VM Servers managed by Oracle VM Manager. By default, the Oracle VM Manager host computer is set as the NTP time source. To use the default option you should make sure the Oracle VM Manager host computer is set up properly. For information on setting up the Oracle VM Manager host computer as an NTP server, see Configuring the NTP Service in the *Oracle VM Installation and Upgrade Guide*. You can also set your own list of NTP servers.

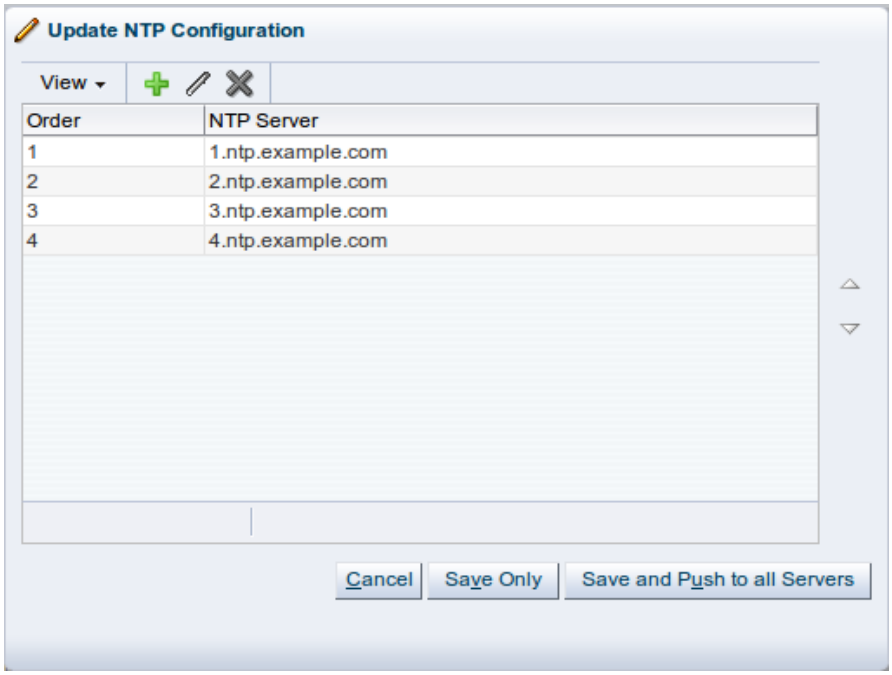
By default, when an Oracle VM Server is (re)discovered, it is configured to use the Oracle VM Manager host computer as the NTP time source. If you configure your own list of NTP servers, each time an Oracle VM Server is (re)discovered, your custom list is instead used to configure the NTP time sources.

A list of the NTP servers configured for an Oracle VM Server is available on the server's information page, which is available by selecting **Info** from the **Perspective** dropdown when an Oracle VM Server is selected in the **Servers and VMs** tab.

**To configure NTP servers:**

1. Click the **Tools and Resources** tab, and click the **NTP** subtab.

2. Click **Edit** to display the **Update NTP Configuration** dialog box.




3. To add an NTP server, click **Create New NTP...** in the dialog box toolbar to display the **Add NTP Server** dialog box. Enter the IP address or hostname of the NTP server in the **IP Address/DNS Hostname** field and click **OK** to return to the **Update NTP Configuration** dialog box.

4. To edit an NTP server, select the server in the table and click **Edit NTP...** in the dialog box toolbar. To delete a server, select it and click **Delete NTP...** in the dialog box toolbar.

   As the order of the NTP servers may be important, you can change the order of the servers using the arrows on the right of the dialog box.

5. To push the NTP server configuration to each Oracle VM Server managed by Oracle VM Manager, click **Save and Push to all Servers**. Any previous NTP configuration is overwritten. Alternatively, you can save the NTP server configuration and push it to the Oracle VM Servers at another time by clicking **Save Only**. Click **Cancel** to exit the dialog box.

# Chapter 7 Managing Virtual Machines

## Table of Contents



In this chapter we describe in detail all types of virtual machine activities. A virtual machine is a guest operating system, for example, Linux, Microsoft Windows™, or Oracle Solaris, and its associated application software. A virtual machine runs on an Oracle VM Server in a server pool. Oracle VM Manager provides full management of virtual machines.

This chapter describes how to create and use virtual machines.

# 7.1 Virtual Machines Overview

The terms domain, guest and virtual machine are often used interchangeably, but they have subtle differences. A *domain* is a configurable set of resources, including memory, virtual CPUs, network devices and disk devices, in which virtual machines run. A domain is granted virtual resources and can be started, stopped and restarted independently of other domains and of the host server itself. A *guest* is a virtualized operating system running within a domain. A guest operating system may be paravirtualized, hardware virtualized, or hardware virtualized with paravirtualized drivers. Multiple guests can run on the same Oracle VM Server. A *virtual machine* is a guest operating system and its associated application software. For the sake of simplicity, we use the term *virtual machine* to encompass domain, guest and virtual machine. They are synonymous with each other and may be used interchangeably.

You can use Oracle VM Manager to create virtual machines using:

- ISO files in a repository (hardware virtualized only)
- Mounted ISO files on an NFS, HTTP or FTP server (paravirtualized only)
- Virtual machine templates (by cloning a template)
- Existing virtual machine (by cloning the virtual machine)
- Virtual machine assemblies

Virtual machines require most installation resources to be in a storage repository, managed by Oracle VM Manager, with the exception of mounted ISO files for paravirtualized guests. See Section 7.5, “Virtual Machine Resources” for information on importing and managing virtual machine resources.

Before you create a virtual machine that requires network connectivity, or a paravirtualized machine which requires network connectivity to perform the operating system install, you must generate some virtual network interfaces using the VNIC Manager. See Section 7.6, “Managing VNICs” for information on using the VNIC Manager.

# 7.2 Virtualization Modes (Domain Types)

Virtual machines may run in one of two main modes, paravirtualized (PVM) or hardware virtualized (HVM). In paravirtualized mode, the kernel of the guest operating system is recompiled to be made aware of the virtual environment. This allows the paravirtualized guest to run at near native speed, since most memory, disk and network accesses are optimized for maximum performance.

If support for hardware virtualization is available (either Intel® VT or AMD-V™), the guest operating system may run completely unmodified. This hardware virtualized guest is carefully monitored and trapped by Oracle VM Server when any instruction is executed which would violate the isolation with other guests or dom0. In the current implementation, there may be performance penalty for certain types of guests and access types, but hardware virtualization also allows many Microsoft Windows™ operating systems and legacy operating systems to run unmodified.

The third virtualization mode is hardware virtualized, with paravirtualized drivers (PVHVM). This mode is identical to hardware virtualized, but with additional paravirtualized drivers installed in the guest's operating system to improve virtual machine performance.

Oracle recommends you create paravirtualized virtual machines if possible, as the performance of a paravirtualized virtual machine is superior to that of a hardware virtualized guest.

There are a number of virtual machine virtualization modes, or domain types, as shown in Table 7.1, “Domain Types”. When you create a virtual machine using the Virtual Machine wizard you must select which mode to use.

**Table 7.1 Domain Types**

| Domain Type | Description |
|---|---|
| Hardware virtualized (HVM) | Hardware virtualization, or fully virtualized. When you create an HVM guest, you must supply an ISO file in a repository from which to create the virtual machine. See Section 7.5.5, “ISO Files (CD/DVD Images)” for information on importing an ISO file into a repository.<br><br>To create HVM guests, you may need to activate the hardware virtualization in the BIOS of the server on which you install the Oracle VM Server. |
| Hardware virtualized, with paravirtualized drivers (PVHVM) | Identical to HVM, but with additional paravirtualized drivers for improved performance of the virtual machine. See Section 7.13, “Converting to Paravirtualized Guests or Installing Paravirtualized Drivers” for more information about using paravirtualized drivers. This Domain Type is used to run Microsoft Windows™ guest operating systems with an acceptable performance level. |
| Paravirtualized (PVM) | Paravirtualized. Enables you to select a location for the mounted ISO file from which to create the virtual machine. Before you create the virtual machine using the paravirtualized method, mount the ISO file on an NFS share, or HTTP or FTP server. You supply the location of the mounted ISO file in the Boot Options step of the wizard.<br><br>For information on creating a mounted ISO file, see Section 7.4, “Virtual Machine Installation Media”. |
| Oracle VM Server for SPARC (OVM/SPARC) | This mode should be selected if the server pool and hypervisors use Oracle VM Server for SPARC as the hypervisor instead of Oracle VM Server for x86. |

**Note**

If you opt to create a PVHVM or PVM, you must ensure that all disks that the virtual machine is configured to use are configured as paravirtual devices, or they may not be recognized by the virtual machine. If you discover that a disk or virtual cdrom device is not being recognized by your virtual machine, you may need to edit the `vm.cfg` file for the virtual machine directly. To do this, determine the UUID of the virtual machine, and then locate the configuration file in the repository, for example on an Oracle VM Server:

```
# vi /OVS/Repositories/UUID/vm.cfg
```

Locate each `disk` entry that contains a hardware device such as `hda`, `hdb`, or `hdc` and replace with an `xvd` mapping, such as `xvda`, `xvdb`, `xvdc` etc.

Restart the virtual machine with the new configuration, to check that it is able to discover the disk or virtual cdrom device.

## 7.3 Supported Guest Operating Systems

An operating system installed in a virtual machine is known as a guest operating system. Oracle VM supports a variety of guest operating systems including Linux, Oracle Solaris and Microsoft Windows™. For a list of the supported guest operating systems, see the *Oracle VM Release Notes*.

# 7.4 Virtual Machine Installation Media

Virtual machines require some form of installation media, whether it be a template, assembly, ISO file, or mounted ISO file. Different domain types may require slightly different installation source files. Table 7.2, “Virtual machine installation sources” lists the installation sources available for HVM and PVM guests.

**Table 7.2 Virtual machine installation sources**

| Installation Source | HVM | PVM |
|---|---|---|
| Template (clone) | Yes | Yes |
| ISO file in repository | Yes | No |
| Mounted ISO file on NFS, HTTP or FTP server | No | Yes |
| Assembly | Yes | Yes |

When you create an HVM guest from an ISO file, you must supply an ISO file which has been preloaded into a storage repository that is presented to the Oracle VM Server on which the virtual machine is to be deployed. See Section 7.5.5, “ISO Files (CD/DVD Images)” for information on importing ISO files.

When you create a PVM guest from an ISO file, you cannot use an ISO file from a repository to install the operating system. Oracle VM requires that the ISO file is mounted so that its internal filesystem contents are available during the installation of the operating system for a PVM guest. The mounted ISO file can be made available via an NFS, HTTP or FTP server. When you specify the location of the installation media in the **Network Boot Path** field in the **Create Virtual Machine** wizard, you enter the NFS, HTTP or FTP path to the mounted ISO file. The following examples show how to create and use mounted ISO files on an NFS share, and on an HTTP server.

**Example 7.1 Creating an installation tree on an NFS share**

This example creates an installation tree for paravirtualized guests by mounting an ISO file. The installation tree is made available via an NFS share. On the NFS server, enter

```
# mkdir -p /isos/EL5u6-x86_64
# mount -o ro,loop /path/Enterprise-R5-U6-Server-x86_64-dvd.iso /isos/EL5u6-x86_64
# exportfs *:/isos/EL5u6-x86_64/
```

When you create the virtual machine, enter the installation location in the **Network Boot Path** field in the **Create Virtual Machine** wizard as:

```
nfs:example.com:/isos/EL5u6-x86_64
```

**Example 7.2 Creating an installation tree on an HTTP server**

This example creates an installation tree from an ISO file that can be accessed via HTTP. On the HTTP server, enter

```
# cd /var/www/html
# mkdir EL5u6-x86_64
# mount -o ro,loop /path/Enterprise-R5-U6-Server-x86_64-dvd.iso EL5u6-x86_64
```

When you create the virtual machine, enter the installation location in the **Network Boot Path** field in the **Create Virtual Machine** wizard as:

```
http://example.com/Enterprise-R5-U6-Server-x86_64-dvd.iso/
```

**Tip**

If you have multiple ISO files, you can mount each ISO file and copy the contents into a single directory. All the ISO files are then available from the same location.

# 7.5 Virtual Machine Resources

The resources required to create virtual machines are stored in a storage repository. This section provides information on the structure of storage repositories, and describes how you manage virtual machine resources in storage repositories. See Section 4.8, “Managing Storage Repositories” for information on creating and managing storage repositories.

## 7.5.1 Overview of Virtual Machine Resources in a Storage Repository

A storage repository is used to store virtual machine resources, so that these resources can be made available to Oracle VM Servers in a server pool, without having to copy the resources to each Oracle VM Server. The Oracle VM Servers in a server pool gain access to these virtual machine resources by having the storage repository *presented* to them. If your storage is file-based storage, you can present a storage repository to multiple server pools. Alternatively, if your storage is physical disk-based, you can only present the storage repository to a single server pool.

The types of virtual machine resources can be categorized as:

- **Virtual machine templates:** Reusable virtual machine templates used to create multiple virtual machines.
- **Assemblies:** Template containing a configuration of multiple virtual machines with their virtual disks and the inter connectivity between them.
- **ISO files:** DVD/CD image files used to create virtual machines from scratch using the installation media.
- **Virtual disks:** Virtual disks used by virtual machines to perform boot operations, to run the operating system, and to extend the storage capability of virtual machines.
- **Virtual machine files:** Configuration files of your virtual machines.

You access and manage virtual machine resources in a storage repository using the **Repositories** tab.

To enable third party backup tools to access the contents of a storage repository, see Section 4.8.5, “Enabling Storage Repository Back Ups”.

The following sections describe the structure of a storage repository, and how to manage its contents.

## 7.5.2 Storage Repository Contents and Structure

Each storage repository has a predefined structure, which is visible in Oracle VM Manager, and maps to the directory structure of the underlying physical storage. Figure 7.1, “Graphical User Interface view of storage repository contents” shows the repository as seen through the Oracle VM Manager user interface. The directory structure is listed in Table 7.3, “Storage Repository Directory Structure”.

**Figure 7.1 Graphical User Interface view of storage repository contents**


The directories listed in Table 7.3, “Storage Repository Directory Structure” are subdirectories of a storage repository file system. On disk they are, in fact, located under the path:

/OVS/Repositories/*repository_id*/...

**Table 7.3 Storage Repository Directory Structure**

| Directory Name | Description |
|---|---|
| Templates | This is the directory that contains guest virtual machine templates. See Section 7.5.3, “Virtual Machine Templates” for information on working with virtual machine templates. |
| Assemblies | Contains preconfigured sets of virtual machines, typically created with Oracle Assembly Builder. See Section 7.5.4, “Assemblies” for information on working with assemblies. |
| ISO files | Contains ISO files that can be mounted as virtual CD/DVD drives on virtual machines. See Section 7.5.5, “ISO Files (CD/DVD Images)” for information on working with ISO files. |
| VirtualDisks | Contains virtual disks, which can be either dedicated to a virtual machine or shared by multiple virtual machines. See Section 7.5.6, “Virtual Disks” for information on working with virtual disks. |
| VirtualMachines | Contains virtual machine configuration files. See Section 7.5.7, “Virtual Machine Configuration Files” for information on working with virtual machine configuration files. |

## 7.5.3 Virtual Machine Templates

A virtual machine template is a fully pre-installed, pre-configured virtual machine that can be repeatedly used to create new virtual machines. A typical virtual machine template contains:

- An operating system.
- A file which contains the basic configuration information, such as the number of virtual CPUs, the amount of memory, the size of disk, and so on.
- Pre installed applications.

Virtual machine templates can contain the configuration of one or more virtual machines. In most cases, a template will only contain a single virtual machine. Virtual machine templates are shared among users to

create new virtual machines. New virtual machines inherit the same contents and configuration from the template.

You can obtain or create a virtual machine template by:

- Downloading an Oracle VM template from the Oracle Technology Network, and importing it into Oracle VM Manager. See Section 2.11, “Oracle VM Templates” for more information on downloading a template. See Section 7.5.3.2, “Importing a Virtual Machine Template” for information on importing a template.
- Downloading an Oracle VM template that contains an assembly file (.ovf file) from the Oracle Technology Network, and importing it into Oracle VM Manager as an assembly, then creating a template from the assembly. See Section 7.5.4, “Assemblies” for more information on importing an assembly.
- Cloning an existing virtual machine or template as a template in Oracle VM Manager. For information on cloning virtual machine templates, see Section 7.9, “Cloning a Virtual Machine or Template”.
- Creating a template from scratch. See Section 7.5.3.3, “Creating a Virtual Machine Template” for information on creating a template.

### 7.5.3.1 Using a Virtual Machine Template

A virtual machine template can be used to create virtual machines, and to create new templates based on the original. To create a virtual machine from a template, see Section 7.7, “Creating a Virtual Machine”.

### 7.5.3.2 Importing a Virtual Machine Template

A virtual machine template contains various components such as the virtual machine configuration information, virtual disks that contain the operating system and any application software. These components are packaged together as an Oracle VM template file. An assembly is similar to a virtual machine template, but in the open standard Open Virtualization Format (OVF) format. Older Oracle VM template files were packaged as Oracle VM template files, and the more recent templates are packaged in OVF format as assemblies. If the template you are importing uses the OVF format, see Section 7.5.4, “Assemblies” for information on importing an assembly and creating a template from the assembly.

Before you can use a virtual machine template, you must import it into Oracle VM Manager and make it available to your server pool(s). Virtual machine templates are stored in the server pool's storage repository by importing them from a web server into Oracle VM Manager.

In a storage repository, templates are typically imported as an archive (.tgz, .tar or other). The archive contains a virtual machine configuration file (.cfg) file, and at least one virtual disk image (.img file).

On disk, a template archive is unpacked after import. The .cfg file of the virtual machine is always referenced from the Templates folder, but the virtual disk image files (.img) are placed in the VirtualDisks folder. This makes the creation of virtual machines from template a lot faster, which also applies to cloning of virtual machines.

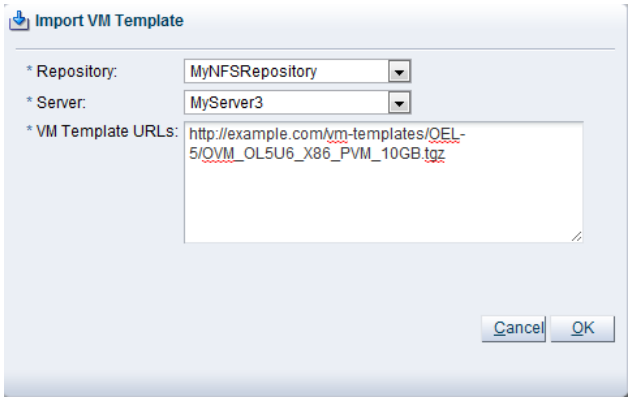
If you downloaded an Oracle VM template from the Oracle Software Delivery Cloud which contains an *template*.tgz file, you should use this procedure to import the template. This format of a template is the older format used by Oracle to publish Oracle VM templates.

**To import a virtual machine template:**

1. The Oracle VM template should be accessible to your Oracle VM environment from a location that can be reached using HTTP, HTTPS or FTP.
2. Click the **Repositories** tab. Select the repository in which to store the template. Select **VM Templates** in the navigation tree.

3. Select **Import VM Template...** in the toolbar in the management pane.

4. The **Import VM Template** dialog box is displayed.




Select or edit the following:

- **Repository:** The storage repository in which to import the template.
- **Server:** The Oracle VM Server to use the perform the template import.
- **VM Template URLs:** The URLs for the templates. The URL schemes supported are HTTP, HTTPS, and FTP. To import a template using FTP, use the standard FTP syntax, for example:

  ftp://*user*:*password*@*server*/*path*/*filename*.tgz

  Each template component should be listed on a new line. Each URL must be a reference to a complete file. If your template files are split into multiple compressed files [1] , concatenate those files and enter the URL for the concatenated file, for example to concatenate a number of compressed files to one compressed file, enter

  ```
  $ cat template.tgz.1of3 template.tgz.2of3 template.tgz.3of3 > template.tgz
  ```

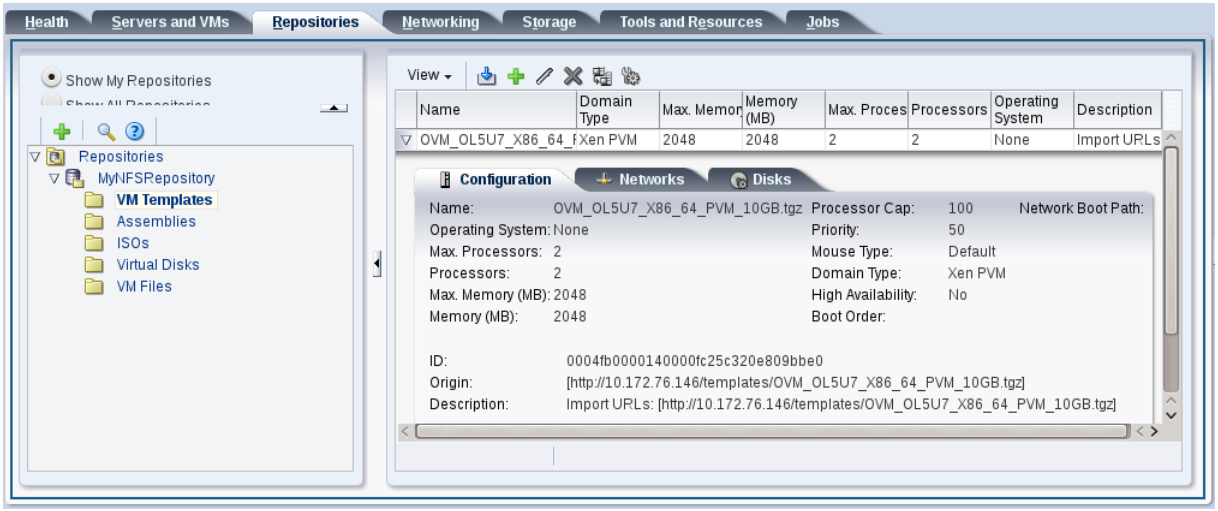
  Then enter the URL to the single compressed template file, in this case, template.tgz.

  To import a template that is not compressed as a single file, each component must be a complete file (if not, concatenate them to one file), for example to enter a virtual disk image and a virtual machine configuration file that together make up a complete template, you could enter:

  ```
  http://myexample.com/System-sda.img
  http://myexample.com/vm.cfg
  ```

Click **OK** to import the template. When the import job is complete, the new template is displayed in the table in the management pane. Expand the table row to see more information about the template.

[1] Templates can get very large, therefore it is not unusual that they're split into manageable chunks. This splitting is done without any attempt at preserving the structure, so the structure must be reconstructed by amalgamating the various files together again before import.




For information about creating a virtual machine from a template, see Section 7.9, “Cloning a Virtual Machine or Template”.

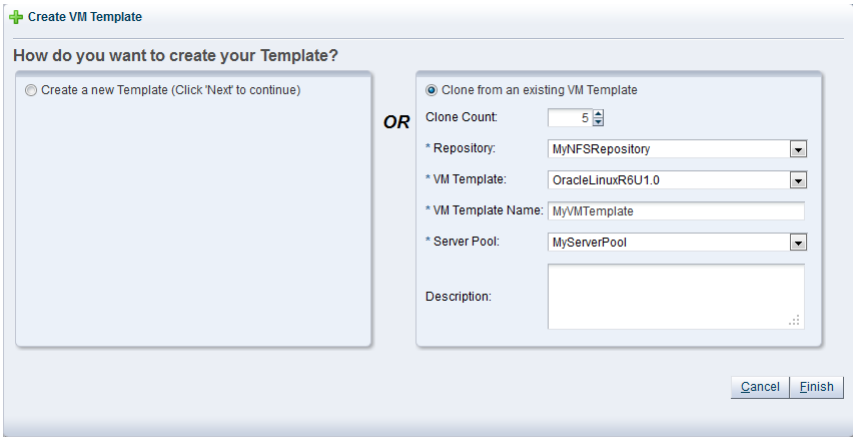
### 7.5.3.3 Creating a Virtual Machine Template

To create a virtual machine template, you can specify all the parameters in the same way you would to create a virtual machine, or you can clone an existing template. This section discusses these two methods of creating a virtual machine template.

It is also possible to create a template directly from an existing virtual machine by cloning it as a template. For information on creating a template from an existing virtual machine, see Section 7.9, “Cloning a Virtual Machine or Template” .

**To create a template using a template:**

1. Click the **Repositories** tab. Select the repository in which the template is to be created. Click **VM Templates** in the navigation tree.
2. Click **Create VM Template...** .
3. The **Create VM Template** wizard is displayed.




Select the **Clone from an existing VM Template** option.

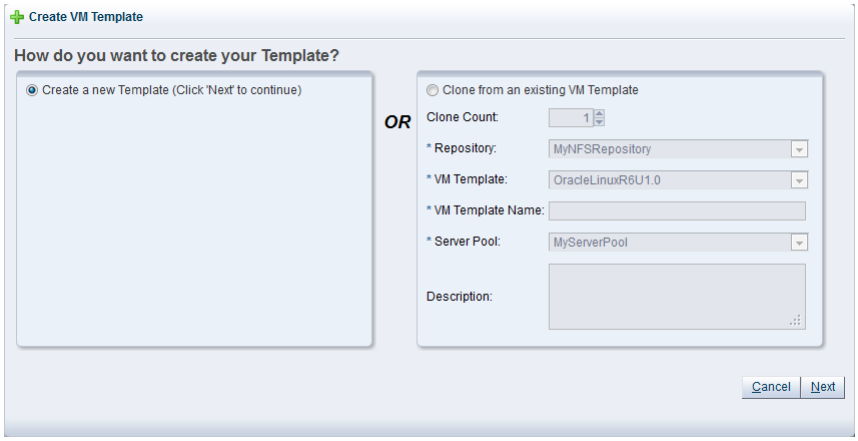
Enter or select the following:

- **Clone Count:** The number of templates to create from the template.
- **Repository:** Select the repository in which to create the virtual machine configuration files.
- **VM Template:** The template to use to create the templates.
- **VM Name:** A name for the template. The maximum name length is 256 characters and may contain any character. The name need not be unique. Each clone is suffixed with a dot and the clone number, starting with 0, for example MyVMTemplate.0, MyVMTemplate.1 and so on.
- **Server Pool:** The server pool in which to deploy the virtual machines.
- **Description:** A description of the templates.

Click **Finish**. The templates are created and saved in the repository.

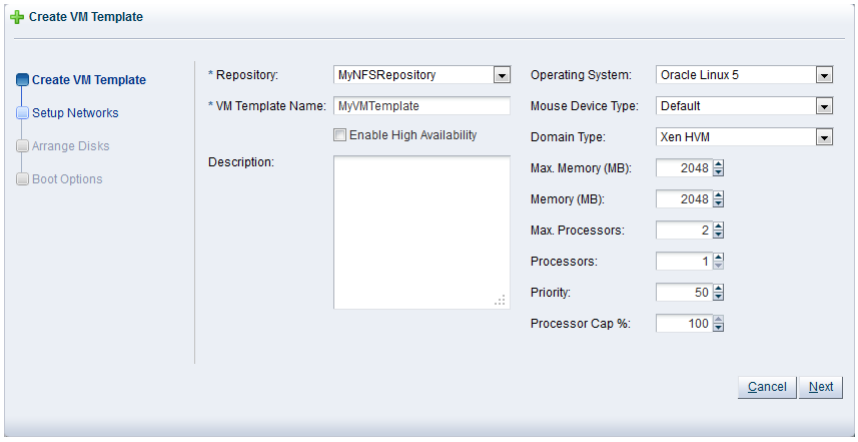
**To create a new template:**

1. Click the **Repositories** tab. Select the repository in which the template is to be created. Click **VM Templates** in the navigation tree.
2. Click **Create VM Template...** .
3. The **Create VM Template** wizard is displayed.




Select the **Create a new Template** option. Click **Next**.

4. The **Create VM Template** step of the wizard is displayed.



Enter or select the following:

- **Repository:** Select the repository in which to create the virtual machine configuration file.
- **VM Template Name:** A name for the template. The maximum name length is 256 characters and may contain any character. The name need not be unique.
- **Enable High Availability:** Select to enable HA. See Section 6.4, “High Availability (HA)” for more information on HA.
- **Description:** A description of the template.
- **Operating System**: The operating system of the template. This setting enables or disables certain virtual machine settings that your guest operating system may require.
- **Mouse Device Type**: The mouse type to use for the template. Select one of:
  - Default
  - PS2 Mouse
  - USB Mouse
  - USB Tablet

  This option is ignored if using a SPARC hypervisor.
- **Domain Type**: The domain type of the template. Oracle recommends you create paravirtualized virtual machines if possible, as the performance of a paravirtualized virtual machine is superior to that of a hardware virtualized guest.
  - **Xen HVM:** Hardware virtualization, or fully virtualized. When you select this option you must supply an ISO file in a repository (in the Create Storage step of the wizard) from which to create the virtual machine. See Section 7.5.5, “ISO Files (CD/DVD Images)” for information on importing an ISO file into a repository.
  - **Xen HVM, PV Drivers:** Identical to Xen HVM, but with additional paravirtualized drivers for improved performance of the virtual machine. See Section 7.13, “Converting to Paravirtualized Guests or Installing Paravirtualized Drivers” for more information about using paravirtualized drivers. This Domain Type is used to run Microsoft Windows™ guest operating systems with an acceptable performance level.
  - **Xen PVM:** Paravirtualized. Enables you to select a location for the mounted ISO file from which to create the virtual machine. Before you create the virtual machine using the paravirtualized method, mount the ISO file on an NFS share, or HTTP or FTP server. You supply the location of the mounted ISO file in the **Network Boot Path** field in the **Boot Options** step of the wizard. For information on creating a mounted ISO file, see Section 7.4, “Virtual Machine Installation Media”.
  - **OVM/SPARC:** This domain type should be selected if the server pool and hypervisors use Oracle VM Server for SPARC as the hypervisor instead of Oracle VM Server for x86.
  - **Unknown:** This hypervisor should be selected if the domain type is unknown.
- **Max. Memory (MB):** The maximum size of the memory the virtual machine is to be allocated. When you edit a running virtual machine, this is the maximum amount of memory that can be allocated.

- **Memory (MB):** The size of the memory the virtual machine is to be allocated. This is the memory allocation to use when starting the virtual machine. You can change this when editing a running virtual machine, up to the value of the maximum memory set in the previous field. For HVM guests, increasing or decreasing the memory requires a restart of the virtual machine. For PVM guests, no restart is required.
- **Max Processors:** The maximum number of processors to be used by the virtual machine. The number of processors is expressed in number of physical CPU cores, and is limited to 128.
- **Processors:** The number of processors to be used by the virtual machine. The number of processors is expressed in number of physical CPU cores, and is limited to 128.
- **Priority**: The CPU priority of the virtual machine. You can select a high (100), intermediate (50), or low (1) priority for the virtual CPUs, or a self-defined priority, by moving the slider. The higher the priority, the more physical CPU cycles are given to the virtual machine.

  This option is ignored if using a SPARC hypervisor.
- **Processor Cap %**: Increase or decrease the percentage to which the virtual CPUs can receive scheduled time. This parameter defines the maximum percentage to which the virtual CPUs can receive scheduled time. You can select a high (100), intermediate (50), or low (1) percentage of scheduled time for the virtual CPUs, or a custom percentage, by moving the slider. Use this parameter to keep low priority virtual machines from consuming too many CPU cycles on a Virtual Machine Server.

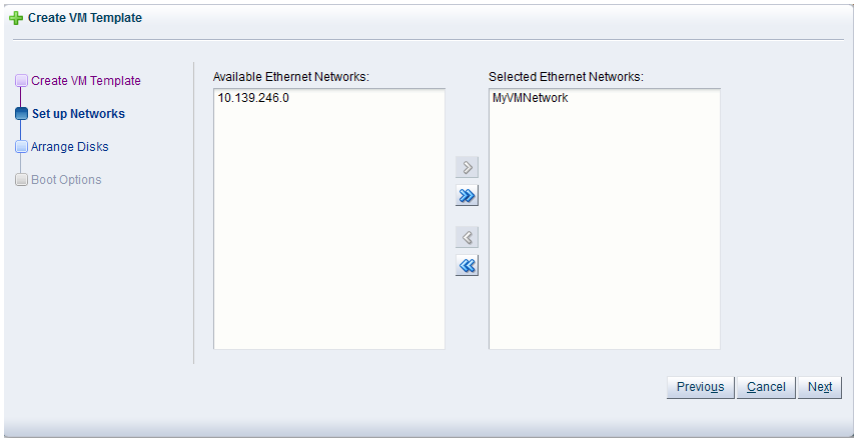
  This option is ignored if using a SPARC hypervisor.

The **Priority** and **Processor Cap%** parameters are passed to the Xen hypervisor for use by the credit scheduler, which automatically load balances guest VCPUs across all available physical CPUs using an algorithm that combines these two parameters. Therefore, these parameters are a key factor for the performance of the virtual machine on x86 hardware.

On SPARC, each virtual machine uses dedicated physical CPU threads and CPUs are not shared between virtual machines, being exclusively assigned to a single virtual machine.

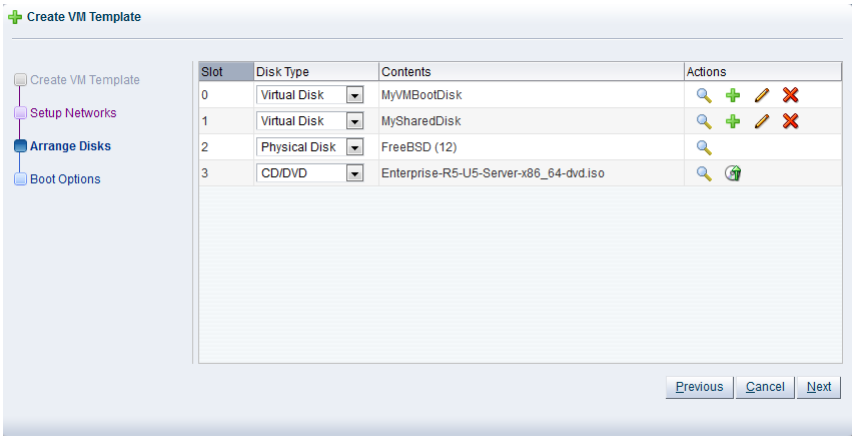
Click **Next**.

5. The **Setup Networks** step is displayed in the wizard.




Select the network to use from the **Available Ethernet Networks** field and add it to the **Selected Ethernet Networks** field. Click **Next**.

6. The **Arrange Disks** step of the wizard is displayed.




Select the desired storage configuration of your template, such as virtual disks, physical disks, and ISO files. On a separate slot, add one or more of the following disk types:

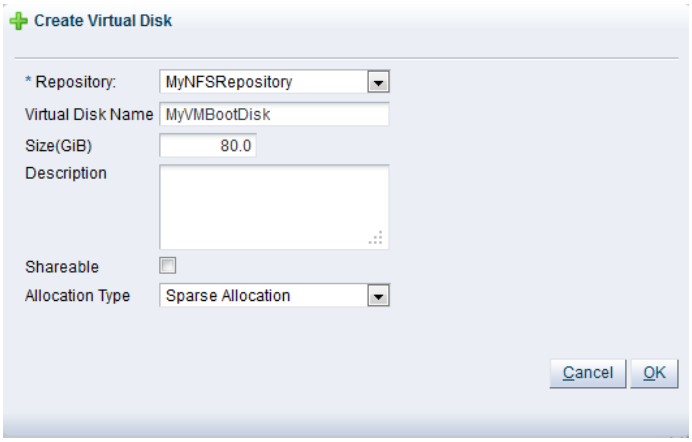
- **Empty** A empty slot.
- **Virtual Disk:** This allows you to add or create a virtual disk. Virtual disks can be shared by virtual machines.
- **Physical Disk** The physical disks are the disks in a storage array. Physical disks can be shared by virtual machines.
- **CD/DVD:** This adds an ISO file in a storage repository and can be used to create HVM and PVHVM virtual machines. When creating a virtual machine from an ISO file, you must use a single file. Installations that span multiple ISO files are not supported. ISO files cannot be used to create PVM virtual machines.

Add or create any virtual disks to use as the virtual machine's hard disk, select any physical disks to add, and select any ISO files to use to create the virtual machine. Add the disks in the order they should appear in the virtual machine. The disk with the boot partition or installation media should be the first disk listed. An HVM guest can have up to four disks, including empty CD/DVD drives. A PVM or PVHVM guest can have up to 52 disks. Only one slot can contain an empty CD/DVD.

**To create or add a virtual disk:**

a. To create a virtual disk, select **Virtual Disk** from the **Disk Type** drop-down list and click **Create a Virtual Disk** ✚ .

b. The **Create Virtual Disk** dialog box is displayed.

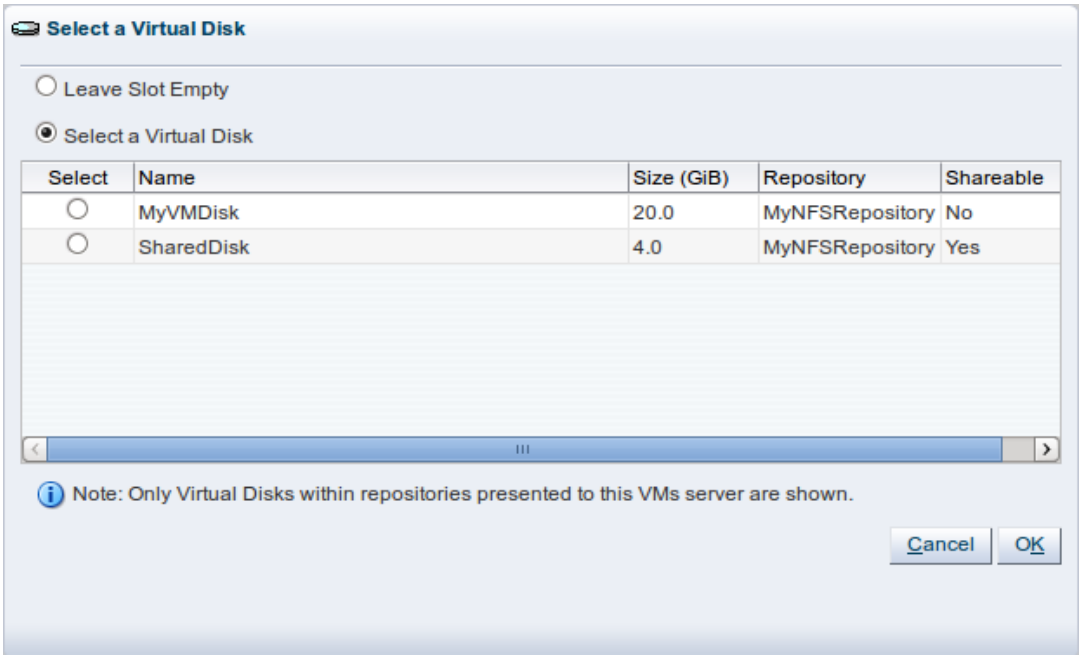



Enter or select the following to create a virtual disk:

- **Repository:** The repository in which the virtual disk is to be created.
- **Virtual Disk Name:** The name of the virtual disk to be created and made available to the virtual machine. See Section 7.5.6, “Virtual Disks” for more information about using virtual disks.
- **Size (GiB):** The disk size in GiB of the virtual disk.
- **Description:** A description of the virtual disk.
- **Shareable:** Whether the virtual disk should be shareable (read/write) with other virtual machines.
- **Allocation Type:** Whether to use a **Sparse Allocation** or **Non-sparse Allocation**. Sparse Allocation creates a sparse disk, so the size of the disk is initially small and increases as it is used. Sparse allocation is faster than using Non-Sparse Allocation when creating a virtual machine. Non-Sparse Allocation creates the entire disk when the virtual machine is created, and so is slower than creating a sparse disk.

Click **OK**.

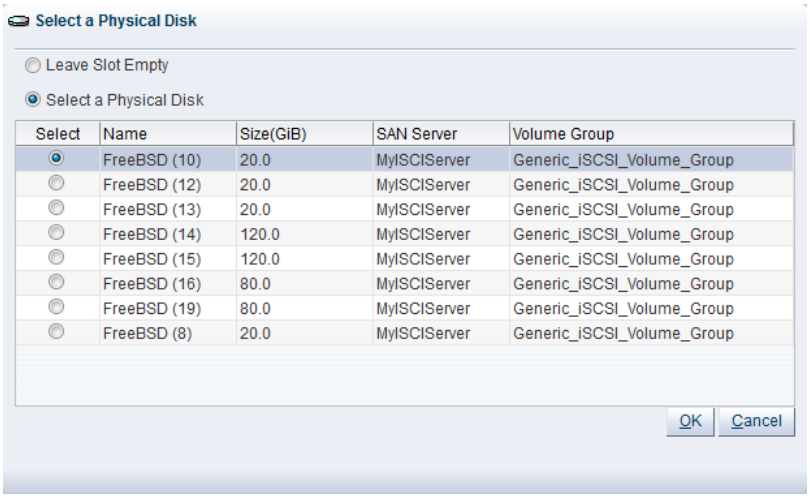
c. To search for an existing virtual disk to add to the virtual machine, click **Select a Virtual Machine Disk** . The **Select a Virtual Machine Disk** dialog box is displayed.




Select the virtual disk to use and Click **OK**.

**To add a physical disk:**

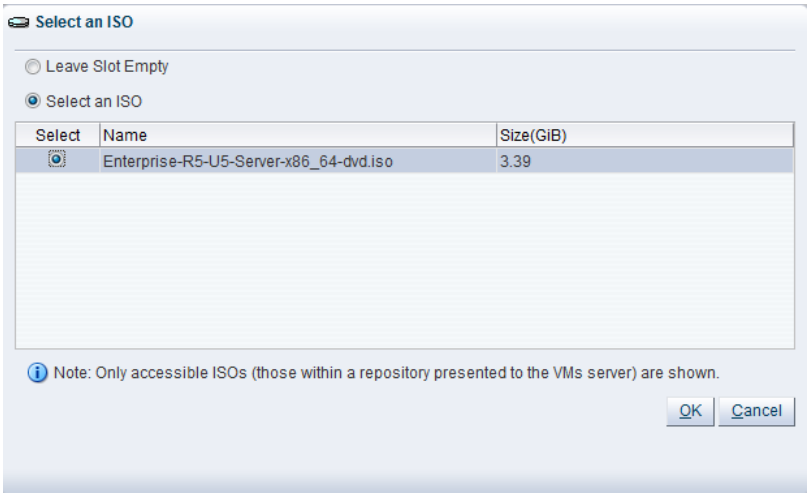
a. To add a physical disk to the virtual machine, select **Physical Disk** from the **Disk Type** drop-down list. Click **Select a Virtual Machine Disk** . The **Select a Physical Disk** dialog box is displayed.




Select a physical disk and click **OK**.

**To add an ISO file:**

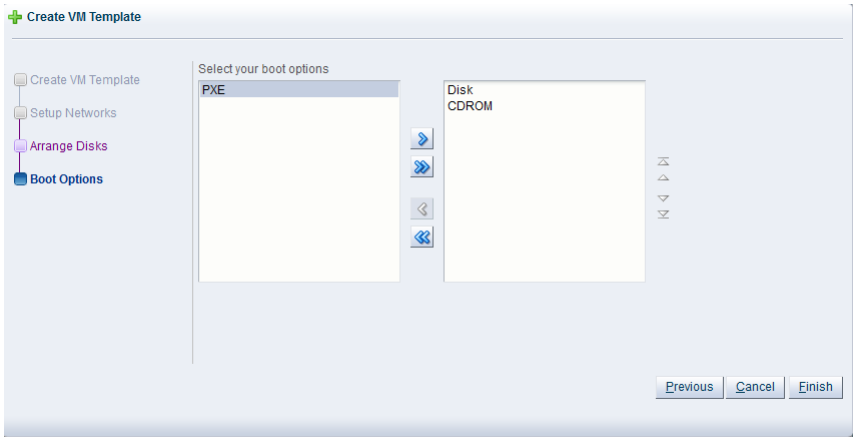
a. To add an ISO file to the virtual machine, select **CD/DVD** from the **Disk Type** drop-down list. Click **Select a Virtual Machine Disk** . The **Select an ISO** dialog box is displayed.




Select an ISO file and click **OK**.

When you have set up the virtual machine's disks, click **Next**.

7. The **Boot Options** step is displayed in the wizard.




Select the boot media order for your virtual machine.

If you are creating a hardware virtualized virtual machine (HVM), you can choose the **PXE** boot option. If so, remember to put PXE first in the **Select your boot options** field, and change the boot order again after installation and before rebooting the virtual machine. To use PXE, you must configure a PXE/tftp environment to offer the necessary boot media and instructions to the virtual machine.

If you are creating a paravirtualized virtual machine (PVM), you also have the **Network** option available (not shown in here). If so, specify **Network** to be at the top of the right-hand-side column, and enter the location of the mounted ISO file from which to perform the operating system installation in the **Network Boot Path** field (also not shown in here), for example

```
http://example.com/Enterprise-R6-U1-Server-x86_64-dvd.iso/
```

For information on creating a mounted ISO file, see Section 7.4, “Virtual Machine Installation Media”.

You cannot use the **Network Boot Path** field to boot a virtual machine using PXE. This field can only be used to specify the path to a mounted ISO file to use when installing a PVM guest.

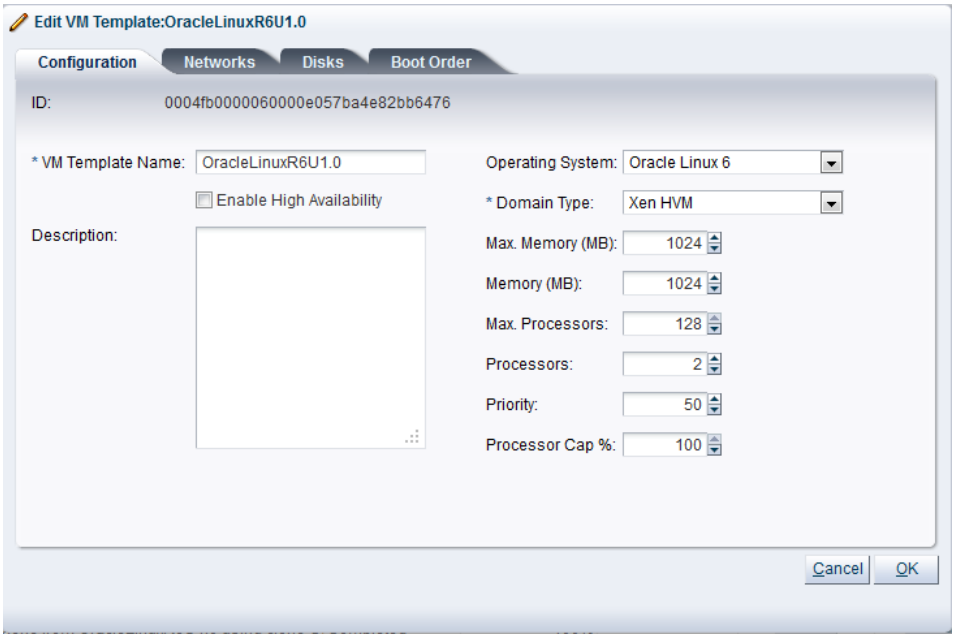
Click **Finish**. The template is created and saved in the repository.

### 7.5.3.4 Editing a Virtual Machine Template

You can edit a virtual machine template to change the configuration, networking, disks and boot order.

**To edit a virtual machine template:**

1. Click the **Repositories** tab. Select the repository in which the template is saved. Click **VM Templates** in the navigation tree.
2. Select the template to edit in the table in the management pane and click **Edit Selected VM Template...** .
3. The **Edit VM Template** dialog box is displayed.




Make any required changes to the template and click **OK** to save the template. For detailed information on each field in this dialog box, see Section 7.5.3.3, “Creating a Virtual Machine Template” .

### 7.5.3.5 Deleting Virtual Machine Templates

You can delete a virtual machine template, and the virtual disks associated with it.

**To delete a virtual machine template:**

1. Click the **Repositories** tab. Select the repository in which the template is saved. Click **VM Templates** in the navigation tree.
2. Select one or more templates in the table in the management pane and click **Delete Selected VM Template...** .
3. The **Delete Confirmation** dialog box is displayed. Select the virtual disks associated with the templates you want to delete, if any. Click **OK** to delete the templates.

### 7.5.3.6 Cloning a Virtual Machine Template

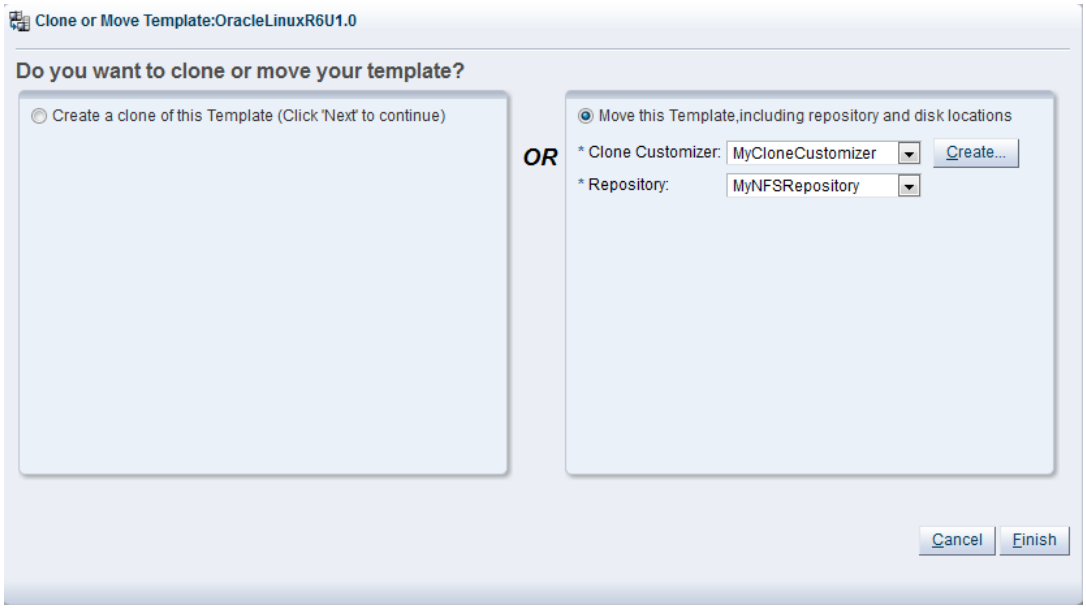
You can clone a virtual machine template to create new templates or virtual machines from the original template. See Section 7.9, “Cloning a Virtual Machine or Template” for information on cloning a template.

### 7.5.3.7 Moving a Virtual Machine Template

You can move a virtual machine template's resources (virtual disks, virtual machine configuration files) to a different storage repository, or change the location of the disks and network used in the template. You can change the location of disks and the network to use when you move a virtual machine template using a clone customizer.

**To move a virtual machine template:**

1. Click the **Repositories** tab. Select the repository in which the template is saved. Click **VM Templates** in the navigation tree.
2. Select the template to move in the table in the management pane and click **Clone or Move** .
3. The **Clone or Move Template** dialog box is displayed.




Select **Move this Template**.

Select a clone customizer from the **Clone Customizer** drop-down list. If no clone customizers are displayed or you want to create a new one, click **Create**. See Section 7.9.1.1, “Creating a Clone Customizer” for information on creating a clone customizer.

Select a repository from the **Repository** drop-down list. The repository is where the template's virtual machine configuration file is moved to.

Click **Finish** to move the template.

### 7.5.3.8 Managing Virtual Machine Template Clone Customizers

To create, edit or delete clone customizers, see Section 7.9.1, “Managing Clone Customizers”.

## 7.5.4 Assemblies

An assembly is a kind of infrastructure template containing a configuration of one or more virtual machines with their virtual disks and even the inter connectivity between them. Assemblies can be created as a set of .ovf (Open Virtualization Format) and .img (disk image) files, or may all be contained in a single .ova

(Open Virtualization Format Archive) file. Disk image files can be different formats such as VMDK, VHD, VDI in addition to raw disk images. After the assemblies are imported, the disk images are converted into raw disk images used by Oracle VM Templates and virtual machines.

To use an assembly, you must first import it into a repository, then create one or more templates from the assembly. You create one virtual machine template for each virtual machine in the assembly. You can then use the template(s) to deploy the virtual machines that originated from the assembly. You cannot deploy all virtual machines in an assembly in one step; you must deploy each virtual machine individually. To perform deployment of all virtual machines, including the associated networking configuration, you should use Oracle Enterprise Manager.

For ease of use, you should use a single .ova file when working with assemblies in Oracle VM. You can also use the .ovf format with the associated disk image files, but you must import all the disk files individually as virtual disks, then import the .ovf file as an assembly before you can use the assembly to create a template.

An assembly can contain a virtual machine from another virtualization software vendor, such as VMWare. This enables you to import virtual machines from other virtualization software providers. Just make sure the virtual machine to be imported is correctly saved or created using the OVF standards and all files are saved in an assembly file using the OVF archive file format, then import the .ova file into Oracle VM Manager as you would any other assembly file.

To display the virtual machines which use an assembly, select the assembly in the management pane and expand the table row.

**To import an assembly:**

1. Create or locate an assembly file. This should be a single .ova file, which contains the .ovf descriptive file(s), and disk image file(s) for the assembly. If you do not have the assembly in the archive (.ova) format, but instead have a series of virtual disk images and the .ovf file, you must first import all the virtual disk files, then continue with this procedure to import the .ovf file.

   **Note**

   OVF files in the version 0.9 format (as used by ESX 3.5) are not supported. If the assembly that you wish to import uses an unsupported format, you can try to use VMware's Converter or OVF Tool to convert to a newer version or you can use qemu-img to convert the vmdk files to raw disk files and recreate the VM manually.

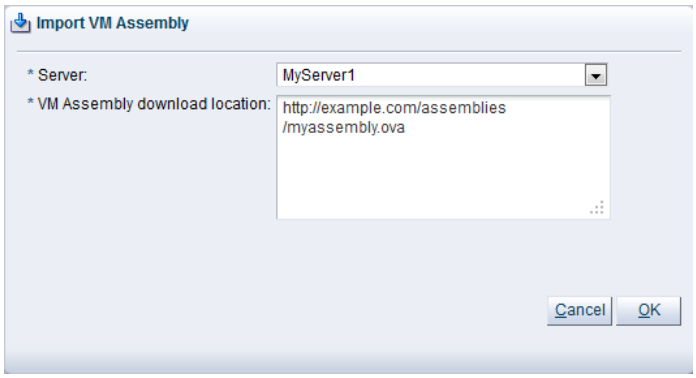
   See Section 7.5.6, “Virtual Disks” for information on importing virtual disk files.

2. Place the assembly file in a location accessible from your Oracle VM Manager host computer using either of these protocols: HTTP, HTTPS or FTP.

3. Click the **Repositories** tab. Select the repository in which to store the assembly file. Select **Assemblies** in the navigation tree.

4. Select **Import VM Assembly...** in the toolbar in the management pane.

5. The **Import VM Assembly** dialog box is displayed.




Select or edit the following:

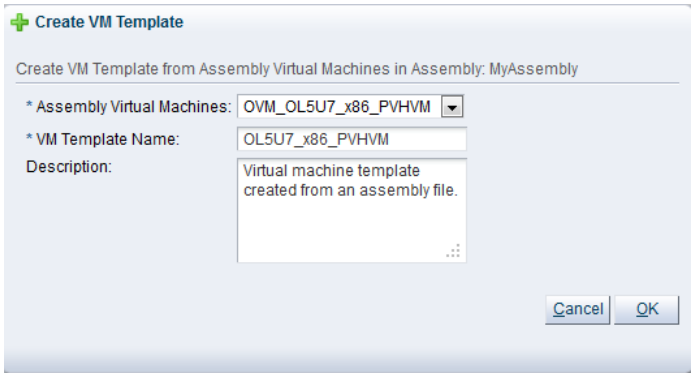
- **Server:** The Oracle VM Server to use the perform the assembly file import.
- **VM Assembly download location:** The URL for the assembly file. The URL schemes supported are HTTP, HTTPS, and FTP. For example:

  http://example.com/assemblies/myassembly.ova

Click **OK** to import the assembly file. When the import job is complete, the new assembly is displayed in the table in the management pane.

**To create a virtual machine template from an assembly:**

1. Click the **Repositories** tab. Select the repository in which the assembly file is located. Select **Assemblies** in the navigation tree.
2. Select **Create VM Template...** in the toolbar in the management pane.
3. The **Create VM Template** dialog box is displayed.




Select or edit the following:

- **Assembly Virtual Machines:** The virtual machine in the assembly from which to create a template.
- **VM Template Name:** A name for the template.
- **Description:** An option text description of the template.

Click **OK** to create the template. The template is created in the same repository as the original assembly is located. When you have created a template from the assembly, you can use the template

to create and deploy virtual machines. See Section 7.5.3.1, “Using a Virtual Machine Template” for information on using a template to create virtual machines.

**To edit an assembly file:**

1. Click the **Repositories** tab. Select the repository in which the assembly file is located. Select **Assemblies** in the navigation tree.
2. Select the assembly in the table in the management pane. Click **Edit Selected VM Assembly...** in the management pane toolbar.
3. Edit the **Name** or **Description**. Click **OK**.

**To delete assembly files:**

1. Click the **Repositories** tab. Select the repository in which the assembly files are located. Select **Assemblies** in the navigation tree.
2. Select one or more assembly files in the table in the management pane. Click **Delete Selected VM Assembly** in the management pane toolbar.
3. The **Delete Confirmation** dialog box is displayed. Click **OK**.

**To refresh assembly files:**

1. Click the **Repositories** tab. Select the repository in which the assembly files are located. Select **Assemblies** in the navigation tree.
2. Select one or more assembly files in the table in the management pane. Click **Refresh Selected VM Assembly** in the management pane toolbar.
3. The contents of the assembly files are refreshed from the storage repository.

## 7.5.5 ISO Files (CD/DVD Images)

Virtual machines have no access to the physical DVD or CD-ROM drive. You can assign virtual drives to virtual machines by offering ISO files containing the image of a DVD or CD-ROM. These image files can be found in the ISOs folder in a storage repository.

You import ISO files from a web server into Oracle VM Manager. You can then select the installation media as an ISO file when you create a virtual machine. To create a virtual machine using an ISO file, see Section 7.7, “Creating a Virtual Machine”.

To be able to use an ISO file with your virtual machine you must first import the file into an appropriate storage repository, namely one that can be accessed by the server pool where the virtual machine is to be created. If your storage repository uses file-based storage, you can the make the repository available to multiple server pools, therefore making an ISO file available to multiple server pools. If you are using storage array-based storage, you can only make a repository available to a single server pool. Virtual machines can only access ISO files on repositories that have been assigned to the server pool to which they belong.

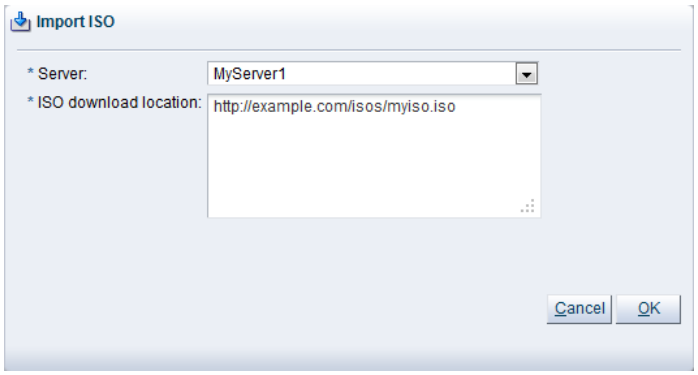
To copy an ISO file to the same repository, another repository, a file system, or a storage array, you *clone* the ISO file. To clone an ISO file, it must not be in use by any running virtual machines or other clone job.

To display the virtual machines which use an ISO file, select the ISO file in the management pane and expand the table row.

To delete an ISO file, it must not be in use by any virtual machines.

**To import an ISO file:**

1. Click the **Repositories** tab. Select the repository in which to store the ISO file. Select **ISOs** in the navigation tree.
2. Select **Import ISO...** in the toolbar in the management pane.
3. The **Import ISO** dialog box is displayed.




Select or edit the following:

- **Server:** The Oracle VM Server to use the perform the ISO file import.
- **ISO download location:** The URL for the ISO file. The URL schemes supported are HTTP, HTTPS, and FTP. For example:

  http://example.com/isos/myiso.iso

Click **OK** to import the ISO file. When the import job is complete, the new ISO is displayed in the table in the management pane.

**To edit an ISO file:**

1. Click the **Repositories** tab. Select the repository in which the ISO file is located. Select **ISOs** in the navigation tree.
2. Select the ISO in the table in the management pane. Click **Edit Selected ISO** in the management pane toolbar.
3. The **Edit ISO** dialog box is displayed. Edit the **ISO Name** or **Description**. Click **OK**.

**To delete ISO files:**

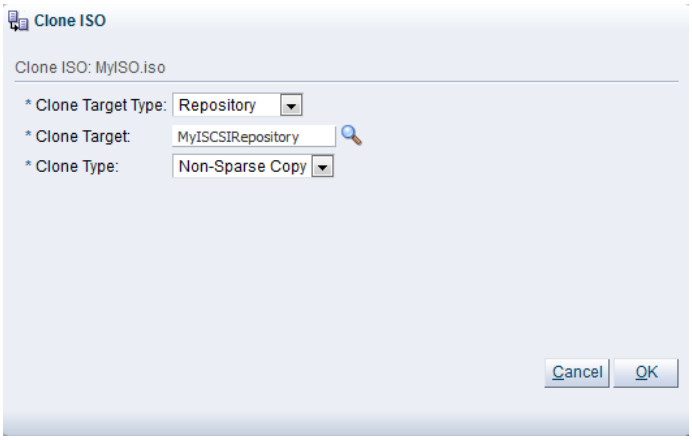
1. Click the **Repositories** tab. Select the repository in which the ISO files are located. Select **ISOs** in the navigation tree.
2. Select one or more ISO files in the table in the management pane. Click **Delete Selected ISO** in the management pane toolbar.
3. The **Delete Confirmation** dialog box is displayed. Click **OK**.

**To clone an ISO file:**

1. Click the **Repositories** tab. Select the repository in which the ISO is located. Select **ISOs** in the navigation tree.

2. Select the ISO in the table in the management pane. Click **Clone ISO** in the management pane toolbar.

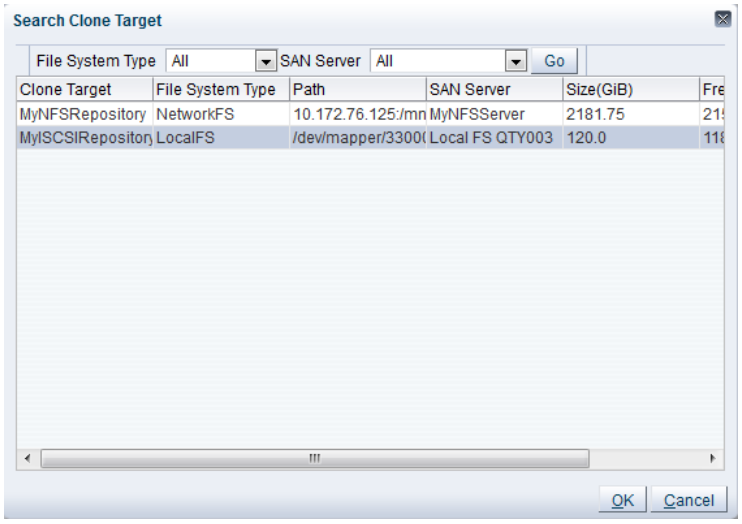
3. The **Clone ISO** dialog box is displayed.




Select or edit the following:

- **Clone Target Type:** The destination storage type for the cloned ISO, either:
  - Repository
  - Physical Disk
  - Storage Array
- **Clone Target:** The destination location for the cloned ISO. Click **Search Clone Target** to select the destination.

  The **Search Clone Target** dialog box is displayed.




  Select the location on which to clone the ISO and click **OK**.

- **Clone Type:** Whether to use a **Sparse Copy** or **Non-sparse Copy**. Sparse Copy creates a sparse disk, so the size of the disk is smaller than the original. Sparse copy is faster than using Non-Sparse Copy. Non-Sparse Copy copies the entire ISO, and so is slower than creating a sparse disk.

Click **OK** to clone the ISO file.

## 7.5.6 Virtual Disks

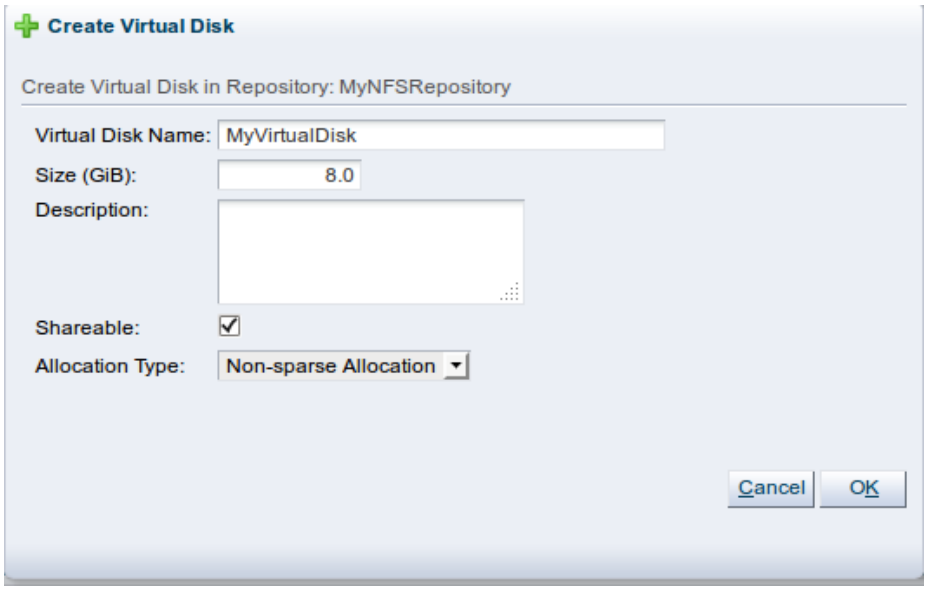
A virtual machine needs at least one disk – that is, a disk to boot from and to run the operating system. Virtual disks can be part of a template, assembly, can be created as part of the virtual machine creation process, or can be created independently inside the storage repository. Virtual disks can be shared across virtual machines, or dedicated to one virtual machine. All virtual disks available in the storage repository appear in **Virtual Disks** in the navigation tree when you select a storage repository, regardless of how they are created.

When you create a virtual machine from scratch, you are given the opportunity to either create a new virtual disk or use an existing one. This section lists how to create, import, edit, delete and clone virtual disks. For more information about creating a virtual machine from scratch, see Section 7.7, “Creating a Virtual Machine”.

To display the virtual machines which use a virtual disk, select the virtual disk in the management pane and expand the table row.

**To create a new virtual disk:**

1. Click the **Repositories** tab. Select the repository in which to store the virtual disk. Select **Virtual Disks** in the navigation tree.
2. Click **Create Virtual Disk...** in the management pane toolbar.
3. The **Create Virtual Disk** dialog box is displayed.




Enter or select the following:

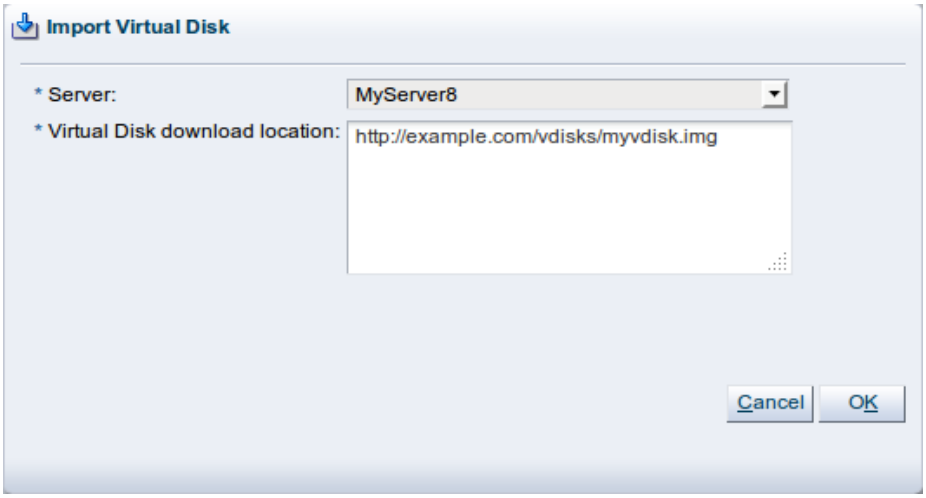
- **Virtual Disk Name:** A name for the virtual disk.
- **Size (GiB):** The size of the disk, in GiB.
- **Description:** A description of the virtual disk.
- **Shareable:** Whether the virtual disk is shareable. Shareable disks have read/write privileges in multiple virtual machines and should be used with caution.

- **Allocation Type:** Whether to create a sparse or non-sparse virtual disk.

Click **OK** to create the new disk. To display which virtual machines use a disk, expand the table row in the management pane.

**To import a virtual disk:**

1. Click the **Repositories** tab. Select the repository in which to store the virtual disk. Select **Virtual Disks** in the navigation tree.
2. Click **Import Virtual Disk...** in the management pane toolbar.
3. The **Import Virtual Disk** dialog box is displayed.




Select or edit the following:

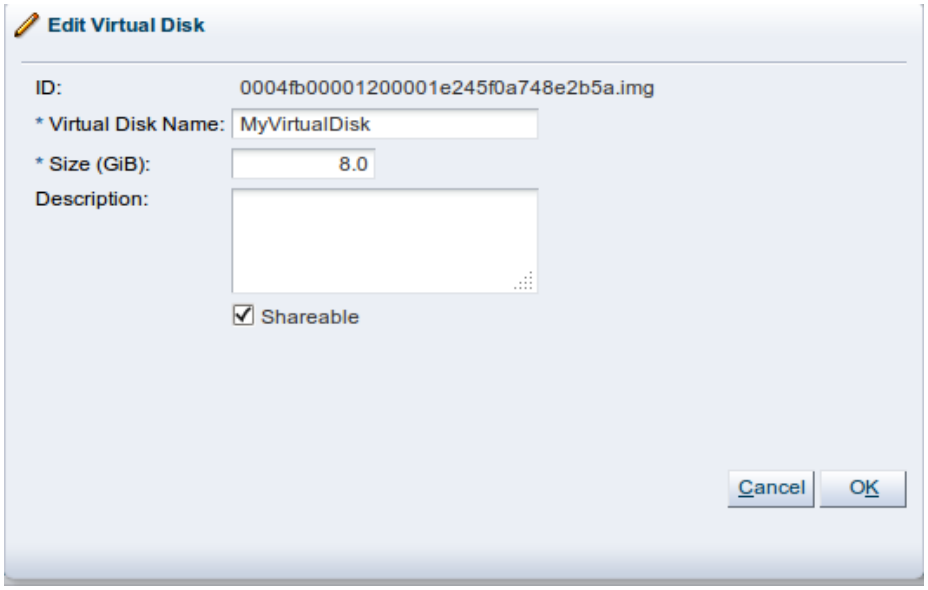
- **Server:** The Oracle VM Server to use the perform the virtual disk file import.
- **Virtual Disk download location:** The URL for the virtual disk file. The URL schemes supported are HTTP, HTTPS, and FTP. For example:

  http://example.com/vdisks/myvdisk.img

Click **OK** to import the virtual disk file. When the import job is complete, the new virtual disk is displayed in the table in the management pane.

**To edit a virtual disk:**

1. Click the **Repositories** tab. Select the repository in which the virtual disk is located. Select **Virtual Disks** in the navigation tree.
2. Select the virtual disk in the table in the management pane. Click **Edit Virtual Disk...** in the management pane toolbar.
3. The **Edit Virtual Disk** dialog box is displayed.




Enter or select the following:

- **Virtual Disk Name:** A name for the virtual disk.
- **Size (GiB):** The size of the disk, in GiB.
- **Description:** A description of the virtual disk.
- **Shareable:** Whether the virtual disk is shareable. Shareable disks have read/write privileges in multiple virtual machines and should be used with caution.

Click **OK** to save the changes.

**Warning**

When resizing a disk there is always a risk of data corruption. Also, the file system on the virtual disk may not be aware of the resize operation, so you may have to perform operating specific procedures to make the guest virtual machine aware of the change in disk size.

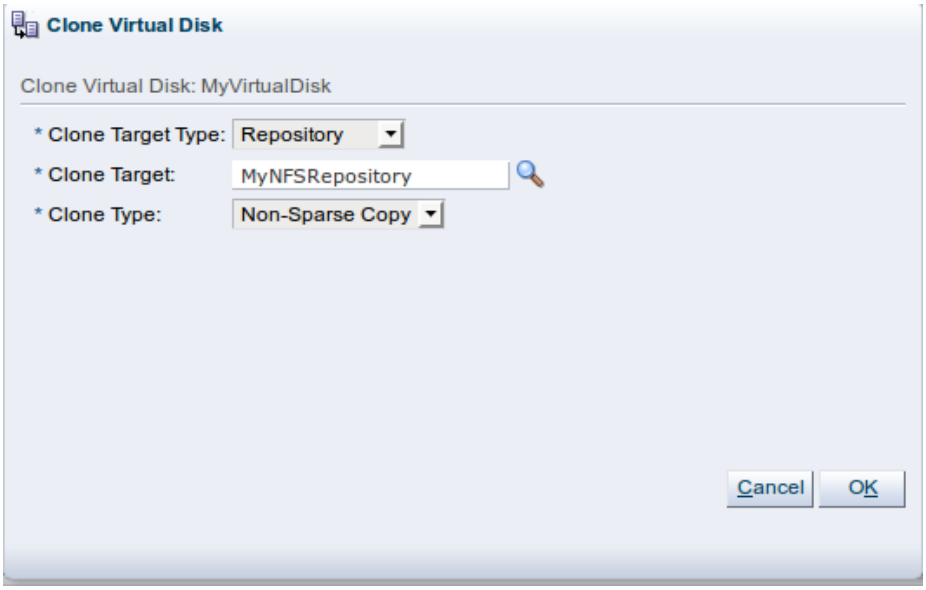
**To delete virtual disks:**

1. Click the **Repositories** tab. Select the repository in which the virtual disks are located. Select **Virtual Disks** in the navigation tree.
2. Select one or more virtual disks in the table in the management pane. Click **Delete Selected Virtual Disk** in the management pane toolbar.
3. The **Delete Confirmation** dialog box is displayed. Click **OK**.

**To clone a virtual disk:**

1. Click the **Repositories** tab. Select the repository in which the virtual disk is located. Select **Virtual Disks** in the navigation tree.
2. Select the virtual disk in the table in the management pane. Click **Clone Virtual Disk** in the management pane toolbar.

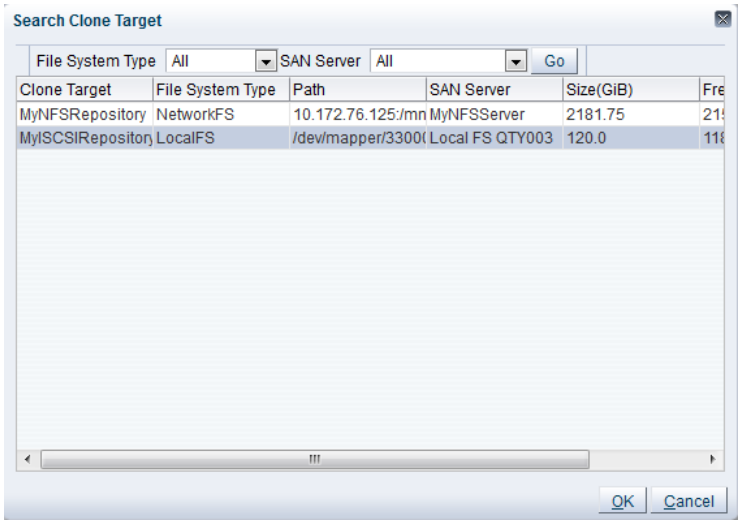
3. The **Clone Virtual Disk** dialog box is displayed.




Select or edit the following:

- **Clone Target Type:** The destination storage type for the cloned virtual disk, either:
  - Repository
  - Physical Disk
  - Storage Array
- **Clone Target:** The destination location for the cloned virtual disk. Click **Search Clone Target** to select the destination.

  The **Search Clone Target** dialog box is displayed.




  Select the location on which to clone the virtual disk and click **OK**.

- **Clone Type:** Whether to use a **Sparse Copy** or **Non-sparse Copy**. Sparse Copy creates a sparse disk, so the size of the disk is smaller than the original. Sparse copy is faster than using Non-Sparse Copy. Non-Sparse Copy copies the entire virtual disk, and so is slower than creating a sparse disk.

Click **OK** to clone the virtual disk.

### 7.5.7 Virtual Machine Configuration Files

The final folder in a storage repository navigation tree is **VM Files**. This folder lists all the virtual machine configuration files in the storage repository. In the **Create Virtual Machine** wizard you specify which storage repository to use to store the configuration file of your virtual machine. Consider the **VM Files** folder to be the home location of all the virtual machines that have been created in the selected storage repository. You cannot perform any actions to the virtual machine configuration files. If you want to rename, move or delete any of these files, you should perform those operations on the virtual machine, not just the virtual machine configuration file.

See Section 7.10.2, “Editing a Virtual Machine” for information on editing a virtual machine, and Section 7.10.13, “Deleting Virtual Machines” for information on deleting a virtual machine.

## 7.6 Managing VNICs

A VNIC is a virtualized Network Interface Card, used by a Virtual Machine as its network interface. A VNIC is assigned a MAC address. Each MAC address corresponds with a single virtual NIC, which is used by a virtual machine. You can create a VNIC when you create a virtual machine, or you can create VNICS at any time using the **Virtual NICs** subtab of the **Networking** tab.

**To create VNICs:**

1. Click the **Networking** tab. Click the **Virtual NICs** subtab.

**Note**

You can also click **Create VNICs...** in the toolbar in the **Servers and VMs** tab to create VNICs.

2. In the **Create Virtual NICs** area, enter a MAC address in the **Initial Address** field, or click **Auto Fill** to randomly select the first MAC address to use.

3. Select the number of addresses that you want to create in the **Create** list, and click **Create**. The VNICs are created and listed in the Virtual NIC table.

4. To delete VNICs, select one or more in the table and click **Delete Selected VNICs** in the toolbar. Click **OK** in the **Delete Confirmation** dialog box. The VNICs are deleted.

After the creation of the VNICs you are able to use them when you create virtual machines. For more information on creating virtual machines, see Section 7.7, “Creating a Virtual Machine”.

**Caution**

It is important that you do not have overlapping MAC address ranges as this can lead to issues tracing network issues. Oracle VM Manager attempts to prevent the likelihood of this happening by generating unique MAC addresses. However, if you run more than one Oracle VM Manager instance, it is possible that an overlapping MAC address could be generated. If you create a MAC address that is already in the Oracle VM Manager database, an error message is displayed.

# 7.7 Creating a Virtual Machine

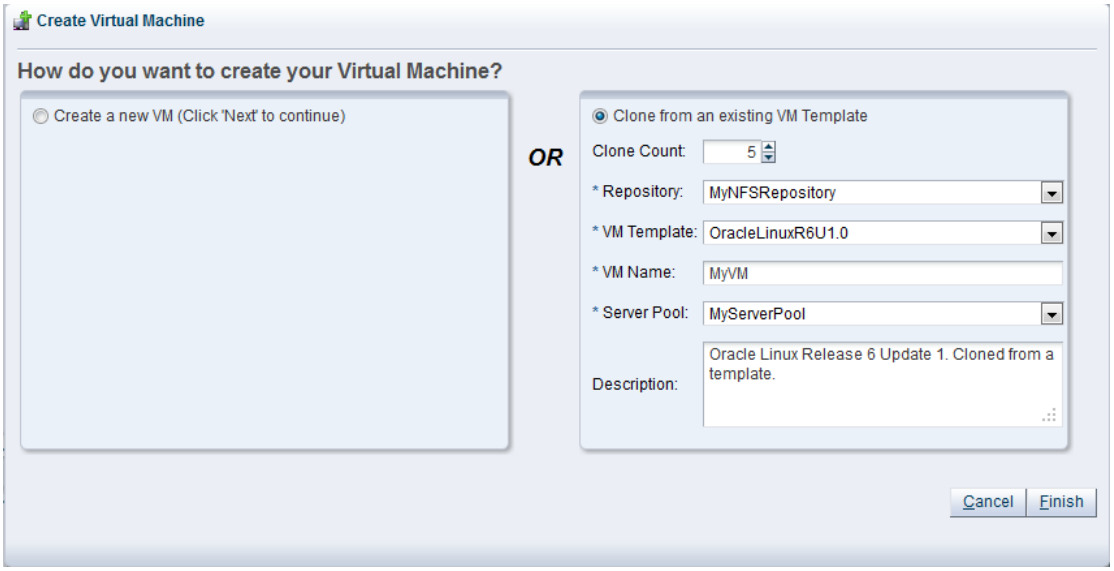
Before you create a new virtual machine, make sure that the following resources are available:

- A server pool. See Section 6.8, “Creating a Server Pool” for information on creating server pools.
- An Oracle VM Server as part of the server pool.
- Source file(s) in a repository from which to create the virtual machine. The source files can be any of the following:
  - Imported ISO file. See Section 7.5.5, “ISO Files (CD/DVD Images)” for more information on how to import ISO files.
  - Virtual machine template. See Section 7.5.3, “Virtual Machine Templates” for more information on how to import a virtual machine template.
  - Virtual machine assembly. See Section 7.5.4, “Assemblies” for more information on how to import an assembly.

This section discusses creating a virtual machine using a template, and creating a virtual machine from an ISO file, or from physical or virtual disks.

**To create a virtual machine using a template:**

1. Click the **Servers and VMs** tab.
2. Click **Create Virtual Machine** in the toolbar.
3. The **Create Virtual Machine** wizard is displayed.




Select the **Clone from an existing VM Template** option.

Enter or select the following:

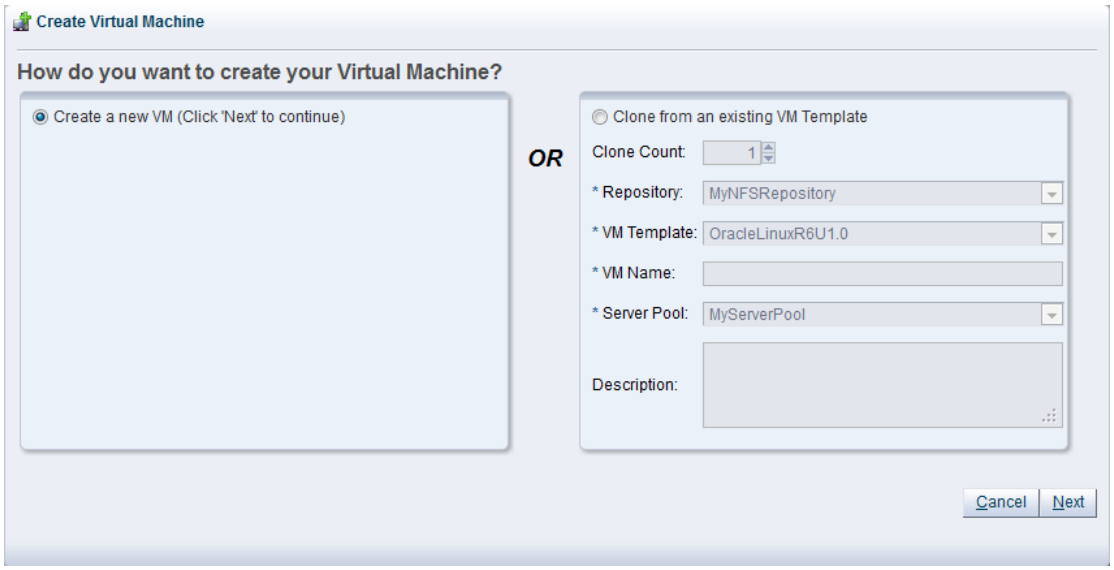
- **Clone Count:** The number of virtual machines to create from the template.
- **Repository:** Select the repository in which to create the virtual machine configuration files.

- **VM Template:** The template to use to create the virtual machines.
- **VM Name:** A name for the virtual machines. The maximum name length is 256 characters and may contain any character. The name need not be unique. Each clone is suffixed with a dot and the clone number, starting with 0, for example MyVM.0, MyVM.1 and so on.
- **Server Pool:** The server pool in which to deploy the virtual machines.
- **Description:** A description of the virtual machines.

Click **Finish**. The virtual machines are created and deployed to the server pool.

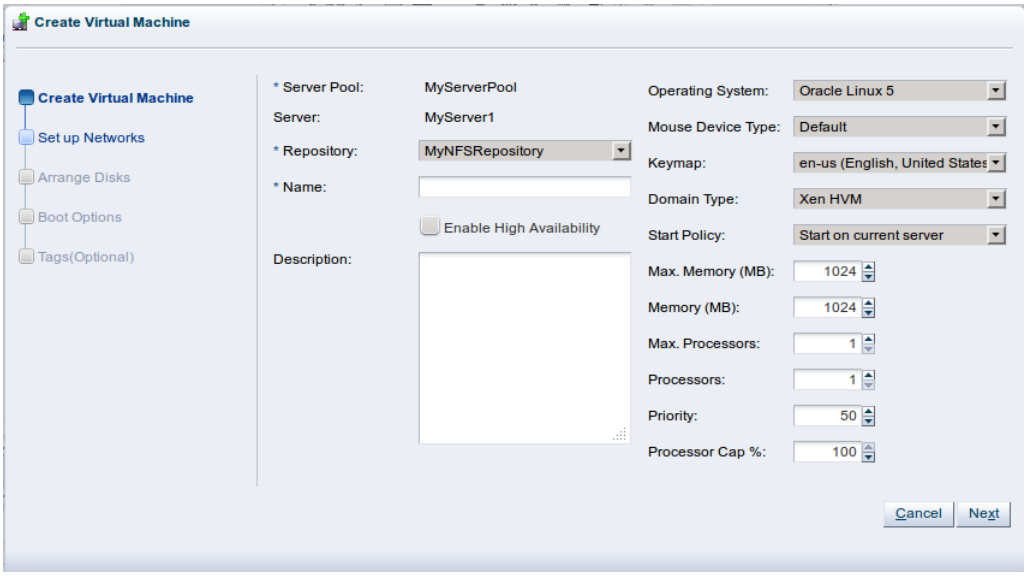
**To create a virtual machine using all other media:**

1. Click the **Servers and VMs** tab.
2. Click **Create Virtual Machine** in the toolbar.
3. The **Create Virtual Machine** wizard is displayed.




Select the **Create a new VM** option. Click **Next**.

4. The **Create Virtual Machine** step is displayed in the wizard.




Enter or select the following:

- **Server Pool:** The server pool on which to create the virtual machine.
- **Server:** A Oracle VM Server on which to run the virtual machine. If you do not have a preference as to which Oracle VM Server to use, select **Any** and the Oracle VM Server with the most available resources is selected to host the virtual machine.
- **Repository:** Select the repository in which to create the virtual machine configuration file.
- **Name:** A name for the virtual machine. The maximum name length is 256 characters and may contain any character. The name need not be unique.
- **Enable High Availability:** Select to enable HA. See Section 6.4, “High Availability (HA)” for more information on HA.
- **Description:** A description of your virtual machine.
- **Operating System**: The operating system of your virtual machine. This setting enables or disables certain virtual machine settings that your guest operating system may require.
- **Mouse Device Type**: The mouse type to use for the template. Select one of:
  - Default
  - PS2 Mouse
  - USB Mouse
  - USB Tablet

  This option is ignored if using a SPARC hypervisor.
- **Keymap**: The keyboard mapping to use for the virtual machine.

- **Domain Type**: The domain type of the virtual machine. Oracle recommends you create paravirtualized virtual machines if possible, as the performance of a paravirtualized virtual machine is superior to that of a hardware virtualized guest.
  - **Xen HVM:** Hardware virtualization, or fully virtualized. When you select this option you must supply an ISO file in a repository (in the Create Storage step of the wizard) from which to create the virtual machine. See Section 7.5.5, “ISO Files (CD/DVD Images)” for information on importing an ISO file into a repository.
  - **Xen HVM, PV Drivers:** Identical to Xen HVM, but with additional paravirtualized drivers for improved performance of the virtual machine. See Section 7.13, “Converting to Paravirtualized Guests or Installing Paravirtualized Drivers” for more information about using paravirtualized drivers. This Domain Type is used to run Microsoft Windows guest operating systems with an acceptable performance level.
  - **Xen PVM:** Paravirtualized. Enables you to select a location for the mounted ISO file from which to create the virtual machine. Before you create the virtual machine using the paravirtualized method, mount the ISO file on an NFS share, or HTTP or FTP server. You supply the location of the mounted ISO file in the **Network Boot Path** field in the **Boot Options** step of the wizard. For information on creating a mounted ISO file, see Section 7.4, “Virtual Machine Installation Media”.
  - **OVM/SPARC:** This domain type should be selected if the server pool and hypervisors use Oracle VM Server for SPARC as the hypervisor instead of Oracle VM Server for x86.
  - **Unknown:** This hypervisor should be selected if the domain type is unknown.
- **Start Policy**: The policy that should be used to start the virtual machine. Select one of:
  - **Start on best server**: The virtual machine is started on the best available server as determined by the algorithm used for DRS and DPM.
  - **Start on current server**: The virtual machine is started on the current server to which it is assigned.
  - **Use server pools VM start policy**: The virtual machine is started using the Start Policy defined for the entire server pool. See Section 6.8, “Creating a Server Pool” for more information on setting the Start Policy for a server pool.
- **Max. Memory (MB):** The maximum memory size the virtual machine can be allocated.
- **Memory (MB):** The memory size the virtual machine is allocated. When creating a virtual machine, this is the memory allocation used when starting the virtual machine. You can change this when editing a running PVM and no virtual machine restart is required. For HVM guests, increasing or decreasing the memory requires the virtual machine to be stopped.
- **Max. Processors:** The maximum number of processors the virtual machine can be allocated. The number of processors is expressed in number of physical CPU cores, and is limited to 128. This cannot be changed when editing a running virtual machine. To edit this value, you must first stop the virtual machine.
- **Processors:** The number of processors the virtual machine is allocated. The number of processors is expressed in number of physical CPU cores, and is limited to 128. You can change this when editing a running virtual machine, up to the value of Max. Processors.

- **Priority**: The CPU priority of the virtual machine. The higher the priority, the more physical CPU cycles are given to the virtual machine.

  This option is ignored if using a SPARC hypervisor.

- **Processor Cap %**: Increase or decrease the percentage to which the virtual CPUs can receive scheduled time. This parameter defines the maximum percentage to which the virtual CPUs can receive scheduled time. Use this parameter to keep low priority virtual machines from consuming too many CPU cycles on a Virtual Machine Server.

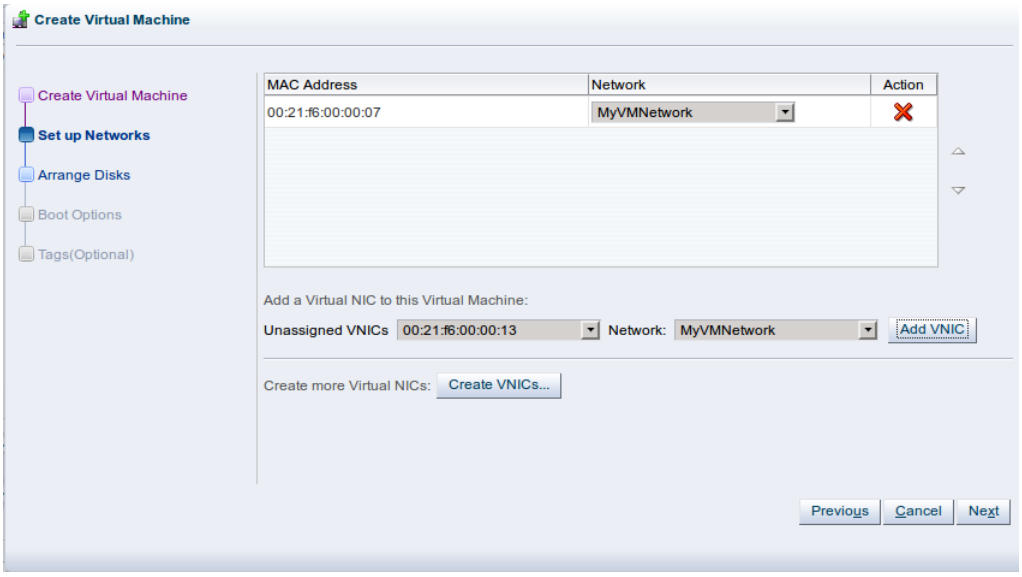
  This option is ignored if using a SPARC hypervisor.

The **Priority** and **Processor Cap%** parameters are passed to the Xen hypervisor for use by the credit scheduler, which automatically load balances guest VCPUs across all available physical CPUs using an algorithm that combines these two parameters. Therefore, these parameters are a key factor for the performance of the virtual machine on x86 hardware.

On SPARC, each virtual machine uses dedicated physical CPU threads and CPUs are not shared between virtual machines, being exclusively assigned to a single virtual machine.

Click **Next**.

5. The **Setup Networks** step is displayed in the wizard.

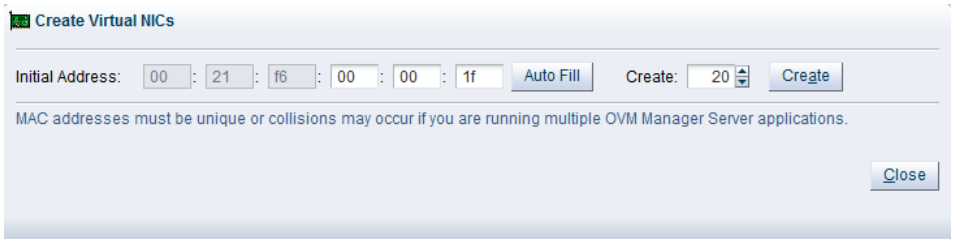



For each VNIC you want to add to the virtual machine, select a VNIC from the **Unassigned VNICs** drop-down list. Select the network to use from the **Network** drop-down list, and click **Add VNIC**. The VNIC order specified here is important, as it determines the order in which they are presented to the virtual machine. You can control the ordering of the VNICs using the up and down arrows on the right of the panel.

If you are editing the networking of an existing stopped virtual machine, you can change the network to which the VNIC belongs using the **Network** drop-down list. It is important that the VNIC belongs to a network already associated with the servers on which it can run, or you will not be able to start the virtual machine. See Section 5.12.1, “Creating a Network” and Section 5.12.2, “Editing a Network” for more information on associating servers with networks. You can also change the ordering of the VNICs for your virtual machines by using the Up and Down arrow buttons on the right of the panel.

If you are editing an existing running virtual machine, you are able to add VNICs to the virtual machine, but you are not able to remove VNICs that are already in use. You will also not be able to reorder VNICs on a running virtual machine. If you choose to add a VNIC to a running machine you must ensure that the VNIC belongs to a VM Network already associated with the servers on which it can run, by selecting the appropriate network from the **Network** drop-down list. See Section 5.12.1, “Creating a Network” and Section 5.12.2, “Editing a Network” for more information on associating servers with networks.

If no VNICs are available in the **Unassigned VNICs** drop-down list, click **Create VNICs** to display the **Create Virtual NICs** dialog box.

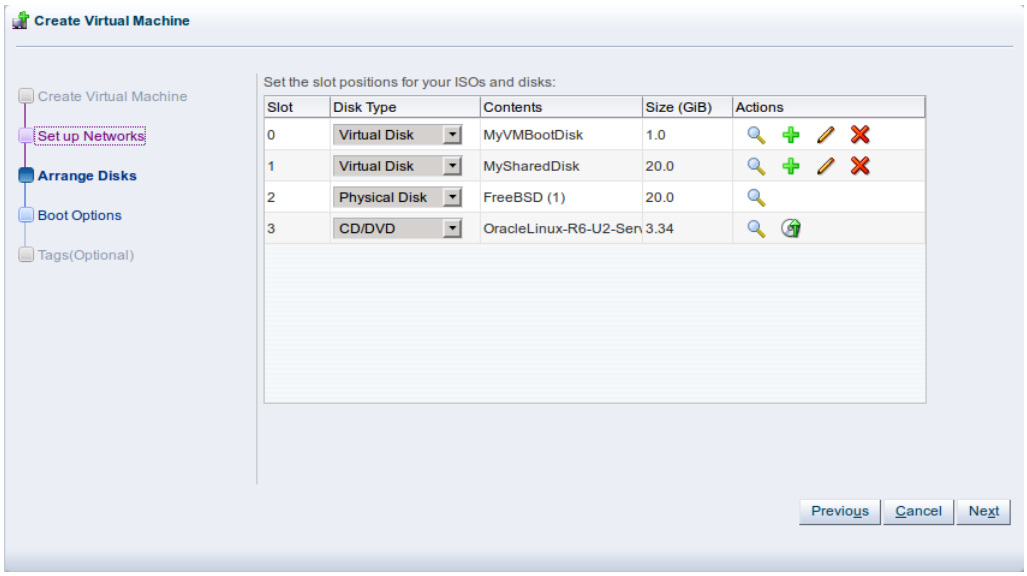



Click **Auto Fill**, then **Create** to create VNICs. Click **Close**.

A virtual machine can have up to eight virtual network interfaces for emulated guests and up to 31 for PVM guests. A PVM guest requires network connectivity to perform the operating system install and must have a VNIC.

Click **Next**.

6. The **Arrange Disks** step of the wizard is displayed.




Select the desired storage configuration of your virtual machine, such as virtual disks, physical disks, and ISO files. On a separate slot, add one or more of the following disk types:

- **Empty** A empty slot.
- **Virtual Disk:** This allows you to add or create a virtual disk. Virtual disks can be shared by virtual machines.

- **Physical Disk** The physical disks are the disks in a storage array. Physical disks can be shared by virtual machines.
- **CD/DVD:** This adds an ISO file in a storage repository and can be used to create HVM and PVHVM virtual machines. When creating a virtual machine from an ISO file, you must use a single file. Installations that span multiple ISO files are not supported. ISO files cannot be used to create PVM virtual machines.

Add or create any virtual disks to use as the virtual machine's hard disk, select any physical disks to add, and select any ISO files to use to create the virtual machine. Add the disks in the order they should appear in the virtual machine. The disk with the boot partition or installation media should be the first disk listed. An HVM guest can have up to four disks, including empty CD/DVD drives. A PVM guest can have up to 104 disks. A PVHVM guest can have up to 107 disks. Only one slot can contain an empty CD/DVD.

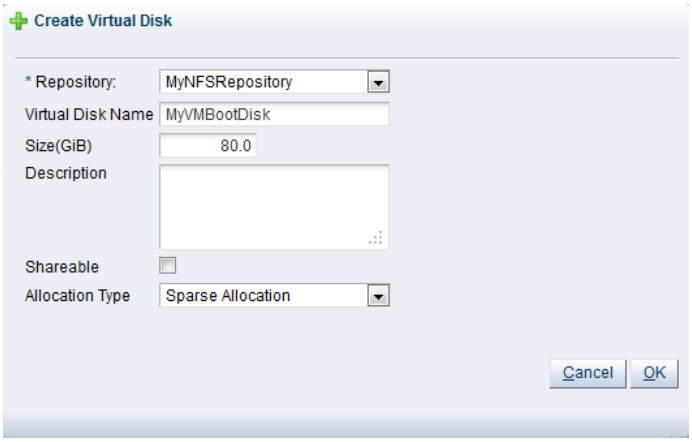
**Tip**

When editing a running virtual machine, you can change the CD/DVD using this dialog box and the CD/DVD is mounted in the operating system.

**To create or add a virtual disk:**

a. To create a virtual disk, select **Virtual Disk** from the **Disk Type** drop-down list and click **Create a Virtual Disk** ✚ .

b. The **Create Virtual Disk** dialog box is displayed.



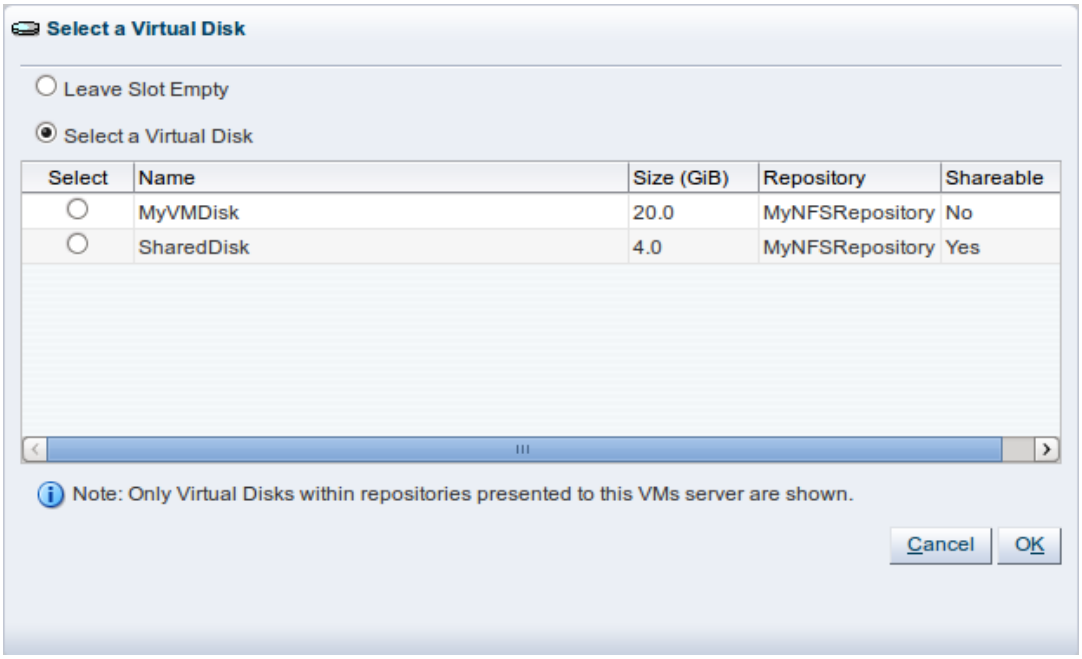

Enter or select the following to create a virtual disk:

- **Repository:** The repository in which the virtual disk is to be created.
- **Virtual Disk Name:** The name of the virtual disk to be created and made available to the virtual machine. See Section 7.5.6, “Virtual Disks” for more information about using virtual disks.
- **Size (GiB):** The disk size in GiB of the virtual disk.
- **Description:** A description of the virtual disk.
- **Shareable:** Whether the virtual disk should be shareable (read/write) with other virtual machines.

- **Allocation Type:** Whether to use a **Sparse Allocation** or **Non-sparse Allocation**. Sparse Allocation creates a sparse disk, so the size of the disk is initially small and increases as it is used. Sparse allocation is faster than using Non-Sparse Allocation when creating a virtual machine. Non-Sparse Allocation creates the entire disk when the virtual machine is created, and so is slower than creating a sparse disk.

Click **OK**.

c. To search for an existing virtual disk to add to the virtual machine, click **Select a Virtual Machine Disk** . The **Select a Virtual Machine Disk** dialog box is displayed.



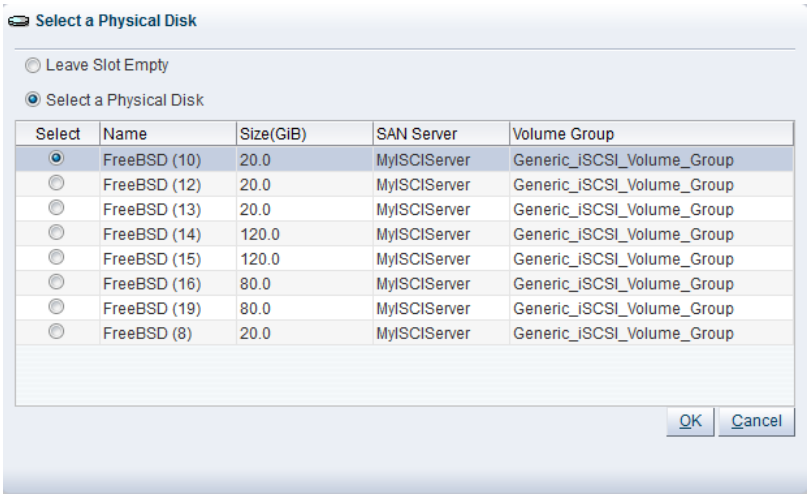

Select the virtual disk to use and Click **OK**.

**Note**

If your virtual machine needs more than one disk, you can create the disk(s) afterwards in the repository, and add them to the virtual machine. See Section 7.5.6, “Virtual Disks” for more information.

**To add a physical disk:**

a. To add a physical disk to the virtual machine, select **Physical Disk** from the **Disk Type** drop-down list. Click **Select a Virtual Machine Disk** . The **Select a Physical Disk** dialog box is displayed.



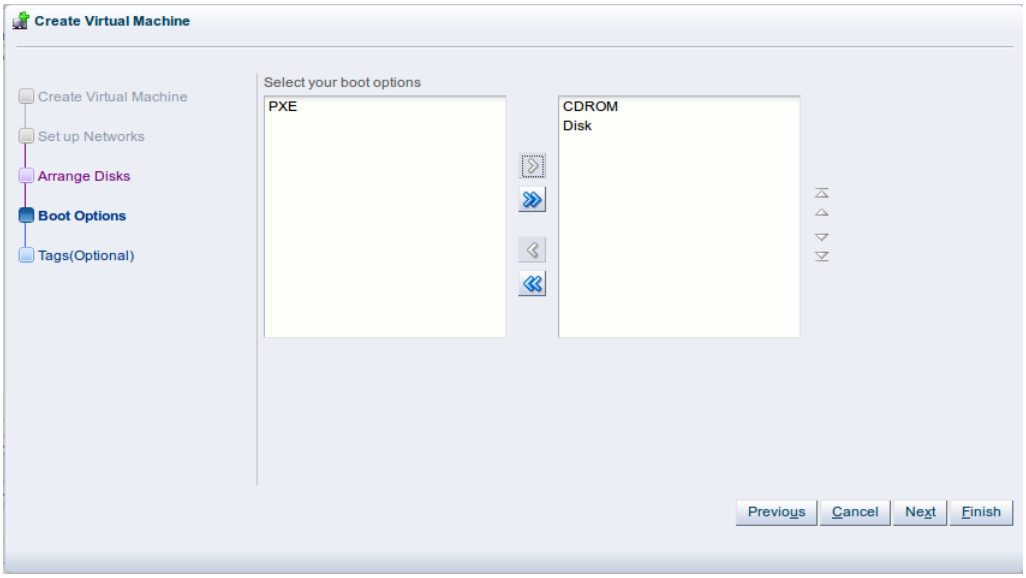

Select a physical disk and click **OK**.

**To add an ISO file:**

a.

When you have set up the virtual machine's disks, click **Next**.

7. The **Boot Options** step is displayed in the wizard.




Select the boot media order for your virtual machine.

If you are creating a hardware virtualized virtual machine (HVM), you can choose the **PXE** boot option. If so, remember to put PXE first in the **Select your boot options** field, and change the boot order again after installation and before rebooting the virtual machine. To use PXE, you must configure a PXE/tftp environment to offer the necessary boot media and instructions to the virtual machine.

If you are creating a paravirtualized virtual machine (PVM), you also have the **Network** option available (not shown in here). If so, specify **Network** to be at the top of the right-hand-side column, and enter the location of the mounted ISO file from which to perform the operating system installation in the **Network Boot Path** field (also not shown in here), for example

```
http://example.com/Enterprise-R6-U1-Server-x86_64-dvd.iso/
```

For information on creating a mounted ISO file, see Section 7.4, “Virtual Machine Installation Media”.

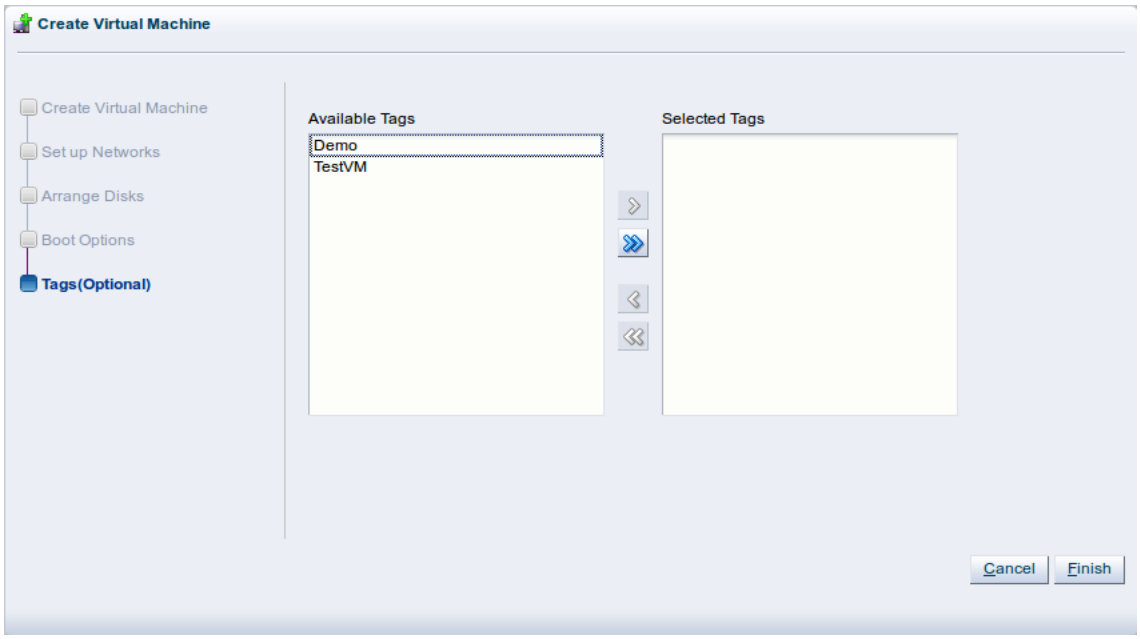
You cannot use the **Network Boot Path** field to boot a virtual machine using PXE. This field can only be used to specify the path to a mounted ISO file to use when installing a PVM guest.

If you have defined tags and wish to add any to this virtual machine, click **Next**. Otherwise, click **Finish** to create and deploy the virtual machine to the server pool.

8. The **Tags** step is optional and displays in the wizard if you clicked **Next** in the previous step.

**Note**

The Virtual Machine has already been created and deployed to the server pool at this point. This step is entirely optional. Cancelling the operation within this screen does not prevent the virtual machine from being created.

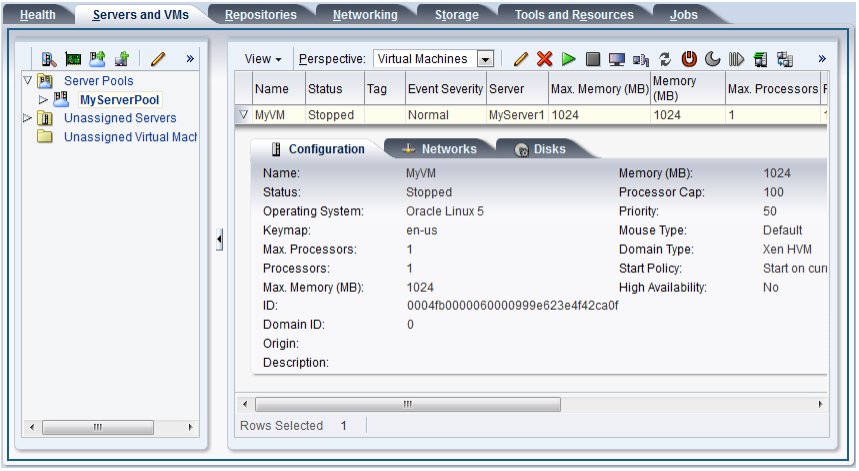



If you have defined tags previously they will appear in the **Available Tags** column. You can select the tags that you wish to apply to the virtual machine and move them to the **Selected Tags** column.

See Section 3.15, “Tags” for more information on creating and managing tags.

Click **Finish**.

To access the virtual machine, select the server pool on which the virtual machine was created in the navigation tree, and select **Virtual Machines** in the **Perspective** drop-down list in the management pane. Select the virtual machine in the table to perform operations on it. Expand the virtual machine in the table to see more detailed configuration information.




If you created a PVM, there are some steps you should take after the operating system installation is completed:

1. Stop the virtual machine.

2. Edit the virtual machine and remove **PXE** from the **Boot Order** column in the **Boot Options** step of the **Edit Virtual Machine** wizard.

3. Start the virtual machine and complete the installation if necessary.

To edit the virtual machine configuration information, see Section 7.10.2, “Editing a Virtual Machine”.

# 7.8 Importing a Virtual Machine

You can import a virtual machine into Oracle VM Manager and have it deployed to a server pool, or placed in the **Unassigned Virtual Machines** folder if you do not want to deploy it. The virtual machine must be located on an FTP or web server, either as separate files, or compressed into a single archive file (for example, a .tgz or .zip file). As an archive of a virtual machine is also known as a virtual machine template, you can also use this process to import older style Oracle VM virtual machine templates. This process does not work for the newer OVF/OVA style templates.

When you import a virtual machine into a server pool, you have the option of saving it to any storage repository that is presented to at least one Oracle VM Server in the server pool. When you import a virtual machine to the **Unassigned Virtual Machines** folder, you can save it into any storage repository.

**To import a virtual machine:**

1. Place the files that make up a virtual machine, or an archive of those files, in a location accessible by Oracle VM Manager using any of these protocols: HTTP, HTTPS or FTP.

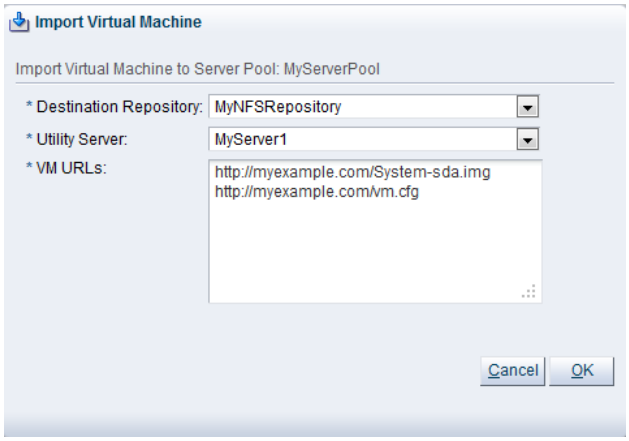
2. Click the **Servers and VMs** tab.

3. If you want to import and deploy the virtual machine to a server pool, select **Server Pools** in the navigation tree, then select the server pool in the management pane table.

   If you do not want to deploy the virtual machine, select the **Unassigned Virtual Machines** folder.

4. Select **Import Virtual Machine...** in the toolbar in the management pane.

5. The **Import Virtual Machine** dialog box is displayed.




Select or edit the following:

- **Destination Repository:** The storage repository in which to save the virtual machine.
- **Utility Server:** The Oracle VM Server to use to perform the virtual machine import job. This field is populated from the list of administration servers assigned to the storage repository chosen in the **Destination Repository** field.
- **VM URLs:** The URLs for the virtual machine. The URL schemes supported are HTTP, HTTPS, and FTP. To import a virtual machine using FTP, use the standard FTP syntax, for example:

  ftp://*user*:*password*@*server*/*path*/*filename*.tgz

  Each virtual machine component should be listed on a new line. Each URL must be a reference to a complete file. If your virtual machine files are split into multiple compressed files, concatenate those files and enter the URL for the concatenated file, for example to concatenate a number of compressed files to one compressed file, enter

  ```
  $ cat vm.tgz.1of3 vm.tgz.2of3 vm.tgz.3of3 > vm.tgz
  ```

  Then enter the URL to the single compressed virtual machine file, in this case, vm.tgz.

  To import a virtual machine that is not compressed as a single file, each component must be a complete file (if not, concatenate them to one file), for example to enter a virtual disk image and a virtual machine configuration file that together make up a complete virtual machine, you could enter:

  ```
  http://myexample.com/System-sda.img
  http://myexample.com/vm.cfg
  ```

Click **OK** to import the virtual machine. The virtual machine is deployed to the server pool in the stopped state. Alternatively, the virtual machine is imported to the **Unassigned Virtual Machines** folder.

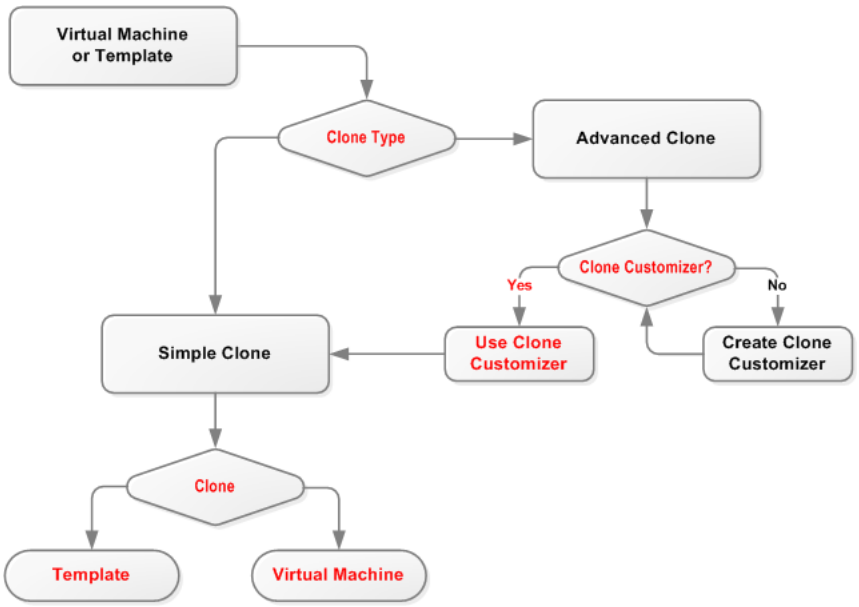
See Section 7.10.3, “Starting Virtual Machines” for information on starting a virtual machine, and Section 7.10.2, “Editing a Virtual Machine” for information on editing a virtual machine.

# 7.9 Cloning a Virtual Machine or Template

Cloning a virtual machine or template enables you to create multiple virtual machines or templates based on the original. There are two methods of cloning; a simple clone, and an advanced clone. A simple clone sets up the clone with the same configuration information as the original. An advanced clone enables you

to create and use a clone customizer with differing configuration from the original. For example, you can use a clone customizer to have the clone deploy to a different server pool or repository, with changed memory, virtual CPU number, network settings, and so on. Figure Figure 7.2, “Cloning a virtual machine or template” shows the process of creating a clone of a virtual machine or template.

**Figure 7.2 Cloning a virtual machine or template**




To modify the clone parameters, such as virtual disks, network, memory, and so on, you should use a clone customizer, and use that clone customizer to perform cloning. See Section 7.9.1, “Managing Clone Customizers” to create a clone customizer to use during cloning.

A *cold* clone is a clone created from a *stopped* virtual machine. A cold clone performs a clone of the virtual machine, with safe and consistent virtual disk status. This is useful for creating a virtual machine or template from the original virtual machine. A *hot* clone is created from a *running* virtual machine. A hot clone is only available on OCFS2-based file systems, so you must use either iSCSI- or fibre channel-based storage for the source and target repositories. A hot clone creates a clone with inconsistent disk status, and should only be used as a *snapshot* or back up of a virtual machine, perhaps on a virtual machine that requires 100% uptime and cannot be shut down. If you want to use the hot-cloned virtual machine, you should first repair any virtual disks, using a disk repair utility such as `fsck`. Do not use hot cloning for virtual machines running an Oracle Database. Instead, you should use an Oracle Database backup strategy, such as the `rman` utility.

A *thin clone* copies the virtual machine files and only takes up the amount of disk space actually used, not the full specified disk size. Thin cloning can only be used when cloning from and to the same OCFS2-based repository, and when the storage used for the storage repository is non-generic (for example, a Sun 7000 or NetApp Storage Connect plug in). Thin cloning is the fastest and most efficient cloning method.

**Note**

Thin provisioning of physical disks on generic storage is not supported.

A clone can also be performed using two other file copy methods: *sparse* copy, and *non-sparse* copy. These two cloning methods can be used when cloning from and to different repositories, and when the

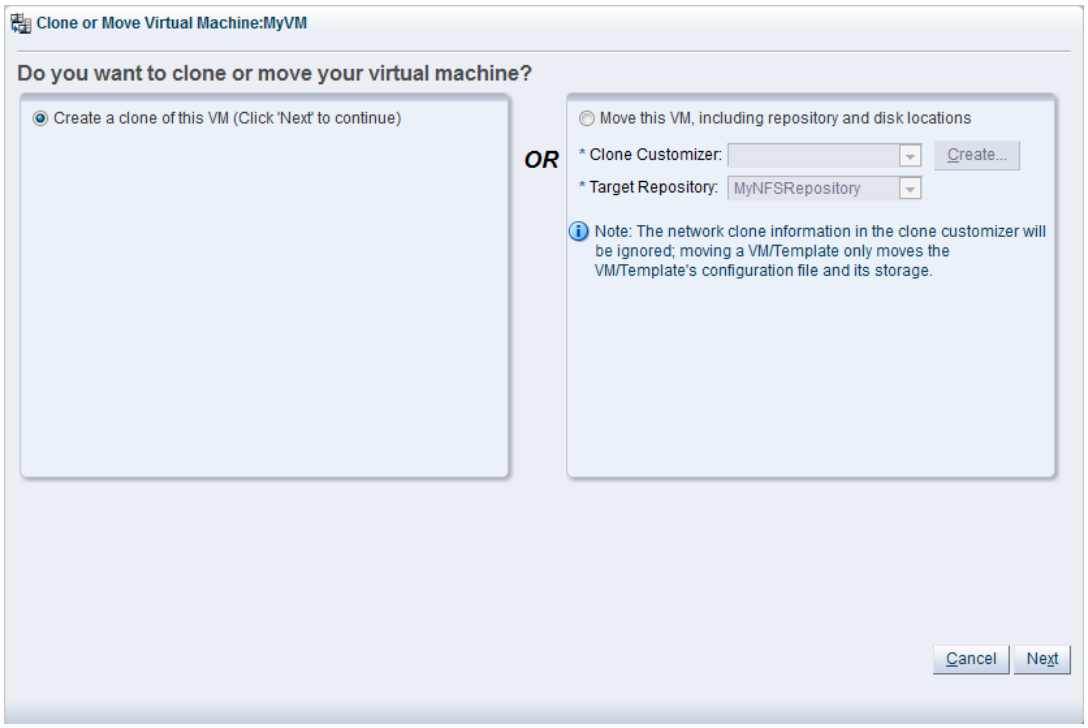
storage used for the storage repository uses a generic Storage Connect plug in. These cloning methods are slower than thin cloning, but more versatile.

**To create a clone of a virtual machine or template:**

1. Select the virtual machine or template to clone and display the **Clone or Move** dialog box. You display this dialog box from different locations, depending on whether you are cloning a virtual machine or a template.

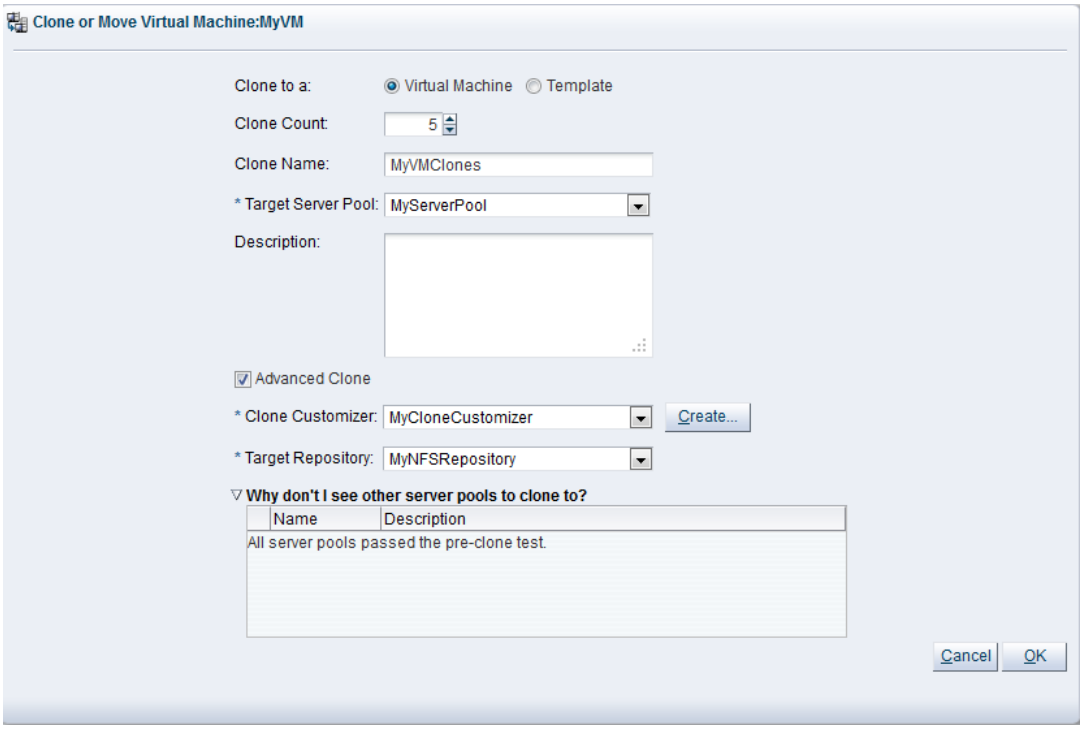
   - **Virtual Machine:** Click the **Servers and VMs** tab. Select the server pool on which the virtual machine resides in the navigation tree. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine to clone in the management pane, and click **Clone or Move** .
   - **Virtual Machine Template:** Click the **Repositories** tab. In the navigation tree, select the repository in which the template resides, then **VM Templates**. Select the template in the management pane and click **Clone or Move Template...** .

2. The **Clone or Move** dialog box is displayed.




   Select the **Create a clone of this (VM or Template)** option. Click **Next**.

3. The **Clone or Move (Virtual Machine or Template)** dialog box is displayed.




Select or enter the following:

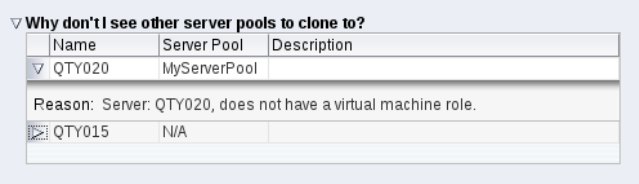
- **Clone to a:** Select the clone type, either **Virtual Machine** or **Template**, to specify the objects to create from the clone.
- **Clone Count:** The number of clones to create.
- **Clone Name:** A name for the virtual machines or templates.
- **Target Server Pool:** The server pool on which the clone is to be deployed.

**Note**

The list of server pools that are available in the dropdown is limited to valid server pools that are capable of handling the cloning process correctly. This helps you to prevent cloning to a server pool that may fail to process the request. If this list is empty, you should refer to the table presented under the **Why don't I see other server pools to clone to?** element on this dialog screen.

- **Description:** A description for the virtual machines or templates.
- **Advanced Clone:** Whether to use a clone customizer to set preferences for the clone operation.
- **Clone Customizer:** The clone customizer to use to create the clones. Click **Create...** to create a new clone customizer. See Section 7.9.1, “Managing Clone Customizers” for information on creating a clone customizer. Only enabled if **Advanced Clone** is checked.
- **Target Repository:** The repository to store the cloned files, such as virtual disks. Only enabled if **Advanced Clone** is checked.

- **Why don't I see other server pools to clone to?** A collapsed window element, providing a table of server pools that do not meet the requirements to accept a clone request. Expanding any of the entries in this table will provide the reason that the server pool does not qualify.




**Tip**

If you clone a virtual machine or template without using a clone customizer, the storage repository is locked for the duration of the cloning job; this may be some time in some circumstances. To quickly create clones and not lock the storage repository, use a clone customizer.

Click **OK**.

The virtual machines are created and deployed to the server pool. The templates are created in the storage repository.

## 7.9.1 Managing Clone Customizers

Cloning a virtual machine or template means making a copy of it, so that you can create multiple virtual machines or templates from the original. You can create a clone customizer to set up the clone parameters, such as networking, and the virtual disk, and ISO resources. A clone customizer is also used when moving a virtual machine or template.

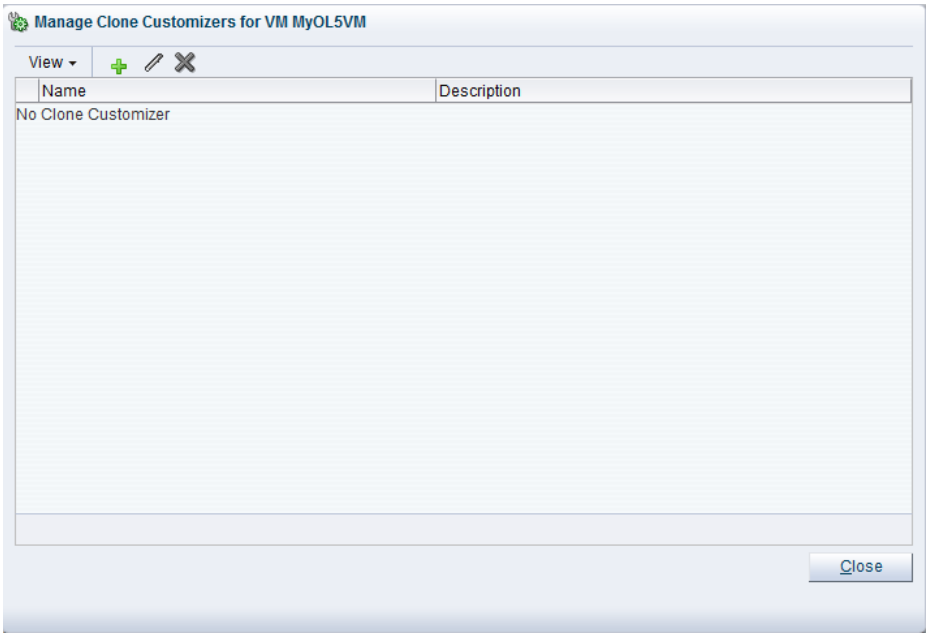
### 7.9.1.1 Creating a Clone Customizer

**To create a clone customizer:**

1. Select the virtual machine or template and display the **Manage Clone Customizers for (Virtual Machine or Template)** dialog box by:

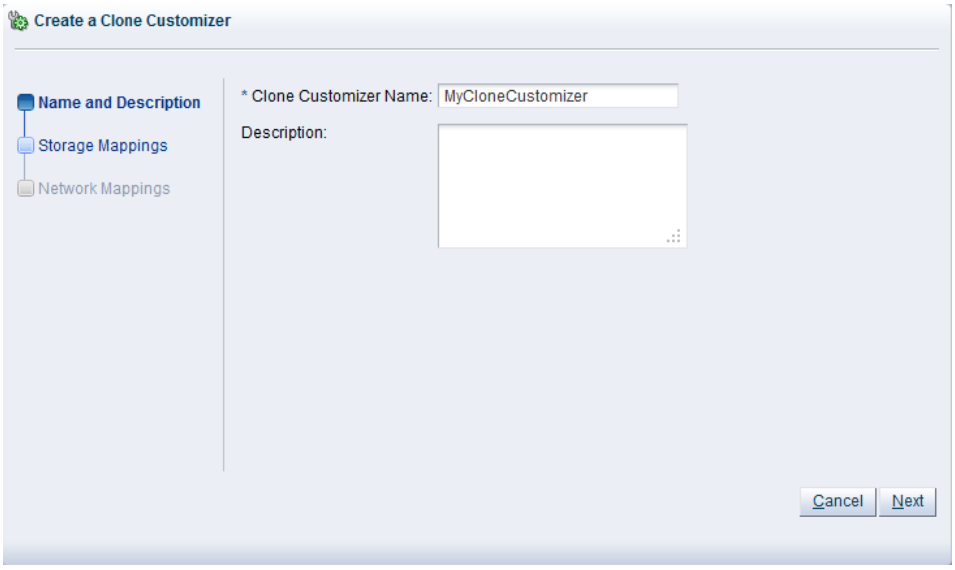
   - **Virtual Machine:** Click the **Servers and VMs** tab. Select the server pool on which the virtual machine resides in the navigation tree. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine to clone in the management pane, and click **Manage Clone Customizers...** .

   - **Virtual Machine Template:** Click the **Repositories** tab. In the navigation tree, select the repository in which the template resides, then **VM Templates**. Select the template in the management pane and click **Manage Clone Customizers** .



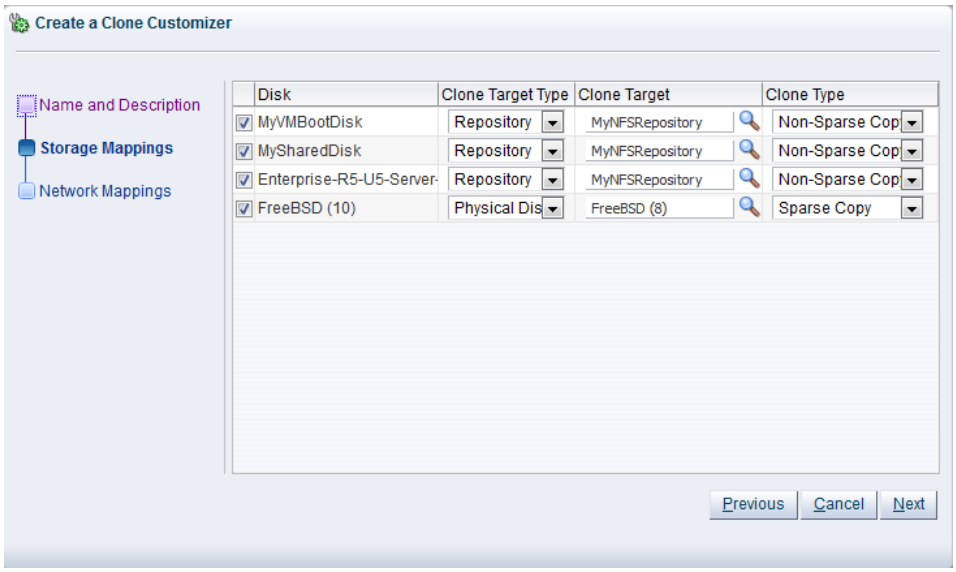

2. Select **Create Clone Customizer...** .

3. The **Create a Clone Customizer** wizard is displayed.




   In the **Name and Description** step of the wizard, enter a **Name** and **Description** for the clone customizer, and click **Next**.

4. The **Storage Mappings** step of the wizard is displayed.

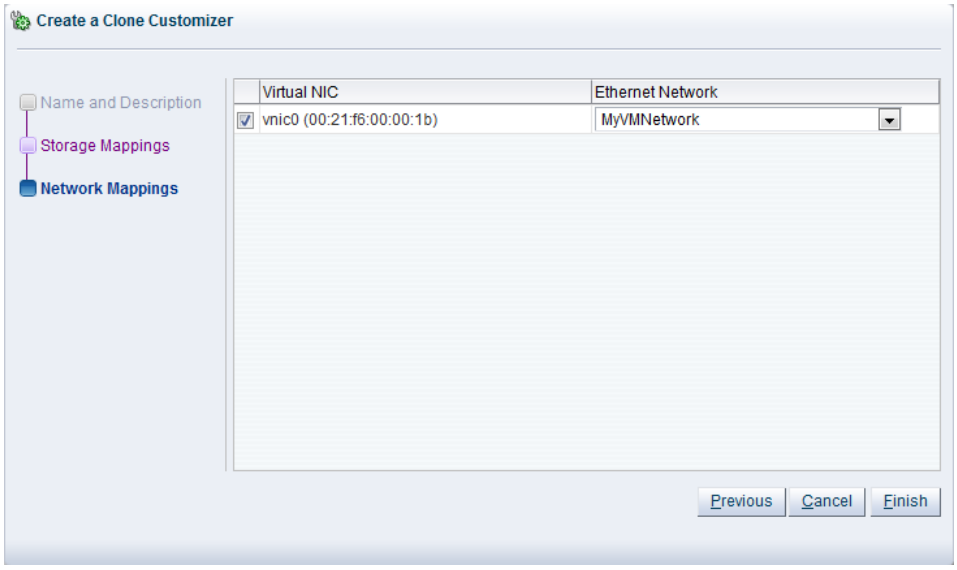



Select the following storage mappings:

- **Disk:** The disks to include in the clone.
- **Clone Target Type:** The type of storage location where the disk is to be created, either a **Repository** or a **Physical Disk**.
- **Clone Target:** The location on the storage type where the disk is to be created.
- **Clone Type:** Whether to use a sparse or non-sparse files for the disk.

Click **Next**.

5. The **Network Mappings** step of the wizard is displayed.




Select the **Virtual NICs** to include in the clone customizer, and the **Ethernet Network** to which they should belong.

**Note**

The network configuration is not changed when moving a virtual machine or template. It is only used when cloning a virtual machine or template.

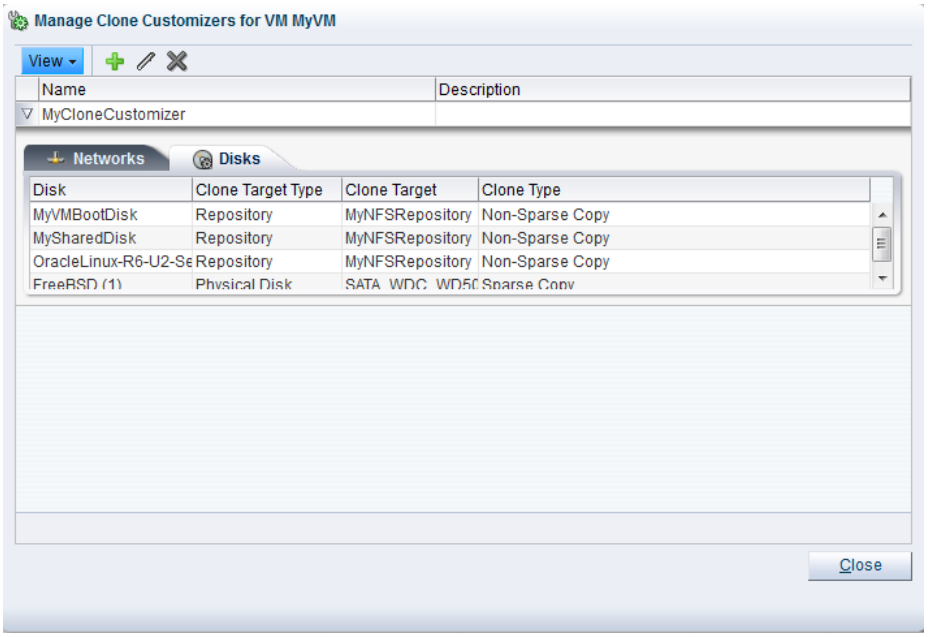
Click **Finish**.

The clone customizer is now available to use to create a virtual machine, or template. See Section 7.9, “Cloning a Virtual Machine or Template” for information on using the clone customizer to create a virtual machine or template.

### 7.9.1.2 Editing a Clone Customizer

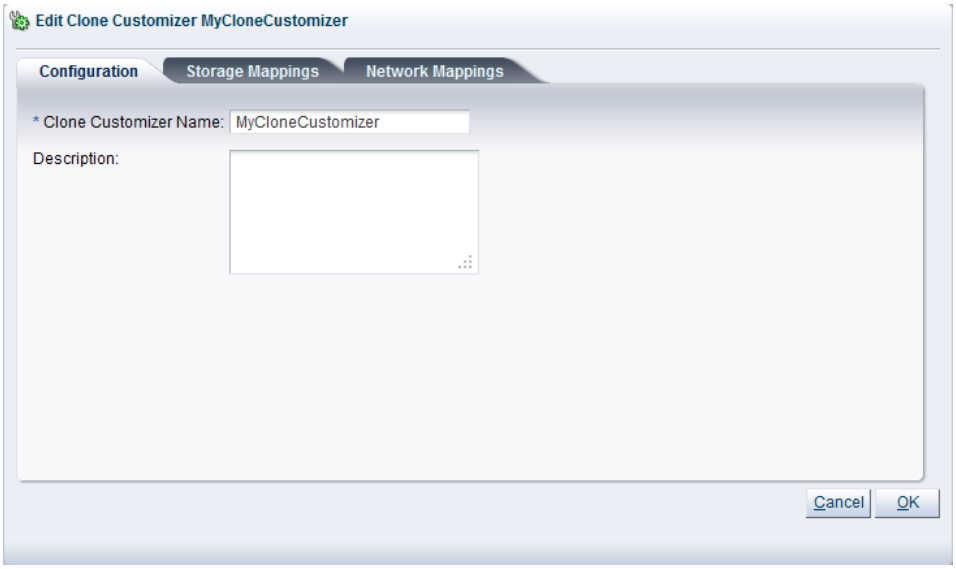
To edit a clone customizer:

1. Select the object to which the clone customizer belongs, either a virtual machine, or a virtual machine template. Click **Manage Clone Customizers...** .
2. The **Manage Clone Customizers for (VM or Template)** dialog box is displayed.




Select the clone customizer to edit and click **Edit Clone Customizer...** .

3. The **Edit Clone Customizer** dialog box is displayed.



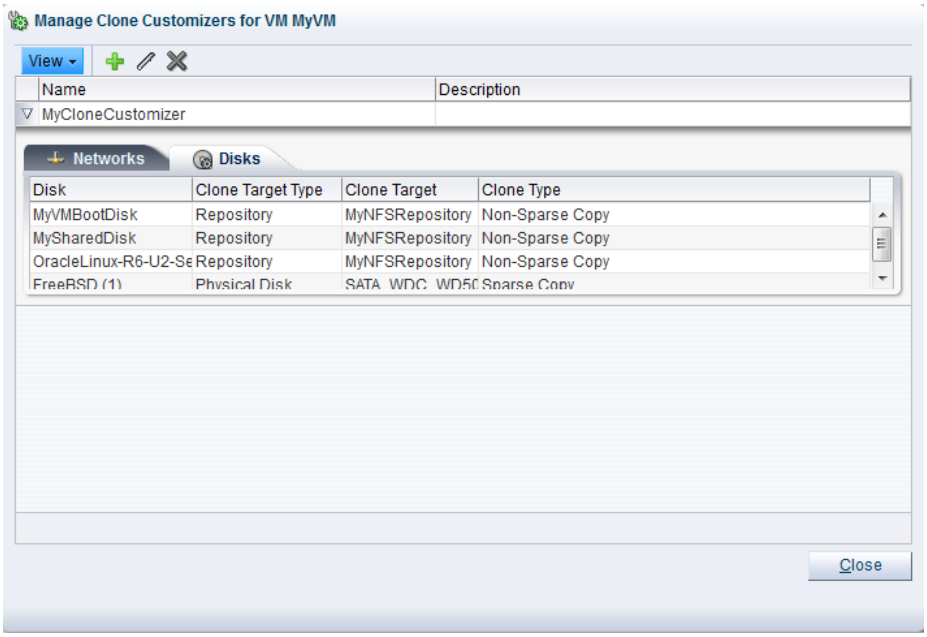

Edit the clone customizer. For details on each clone customizer option, see Section 7.9.1.1, “Creating a Clone Customizer”.

Click **OK**. The changes to the clone customizer are saved.

### 7.9.1.3 Deleting a Clone Customizer

**To delete a clone customizer:**

1. Select the object to which the clone customizer belongs, either a virtual machine, or a virtual machine template. Click **Manage Clone Customizers...** .
2. The **Manage Clone Customizers for (VM or Template)** dialog box is displayed.




Select the clone customizer to delete and click **Delete Clone Customizer** .

3. A dialog box is displayed to confirm you want to delete the clone customizer. Confirm you want to delete the clone customizer and click **OK**. The clone customizer is deleted.

# 7.10 Managing Virtual Machines

When you have created a virtual machine, there are a number of actions you can perform on them in Oracle VM Manager. This section describes the actions you can perform on virtual machines.

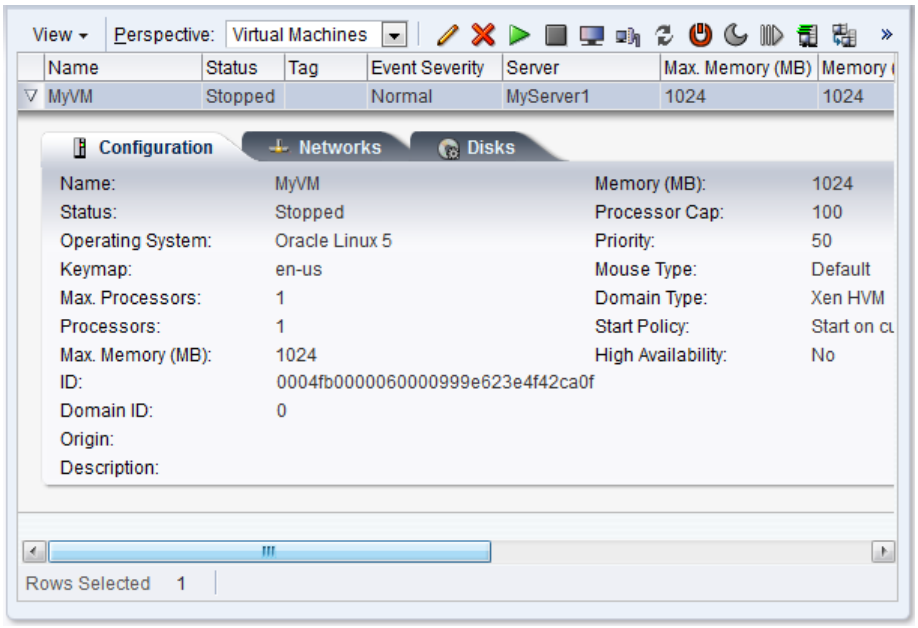
## 7.10.1 Viewing Virtual Machine Information and Events

You can view information about the configuration, networks, disks, and jobs associated with the virtual machine.

To edit the virtual machine details, see Section 7.10.2, “Editing a Virtual Machine”.

**To view virtual machine details:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine in the management pane.
4. Click the expand arrow to the left of the virtual machine name in the table.




Three tabs displaying information about the virtual machine are displayed. Click each tab to view the following information about the virtual machine:

- **Configuration:** General information about the virtual machine, such as the minimum and maximum memory and processors, operating system, domain type, high availability status, and so on.
- **Networks:** Networks and vNICs used.

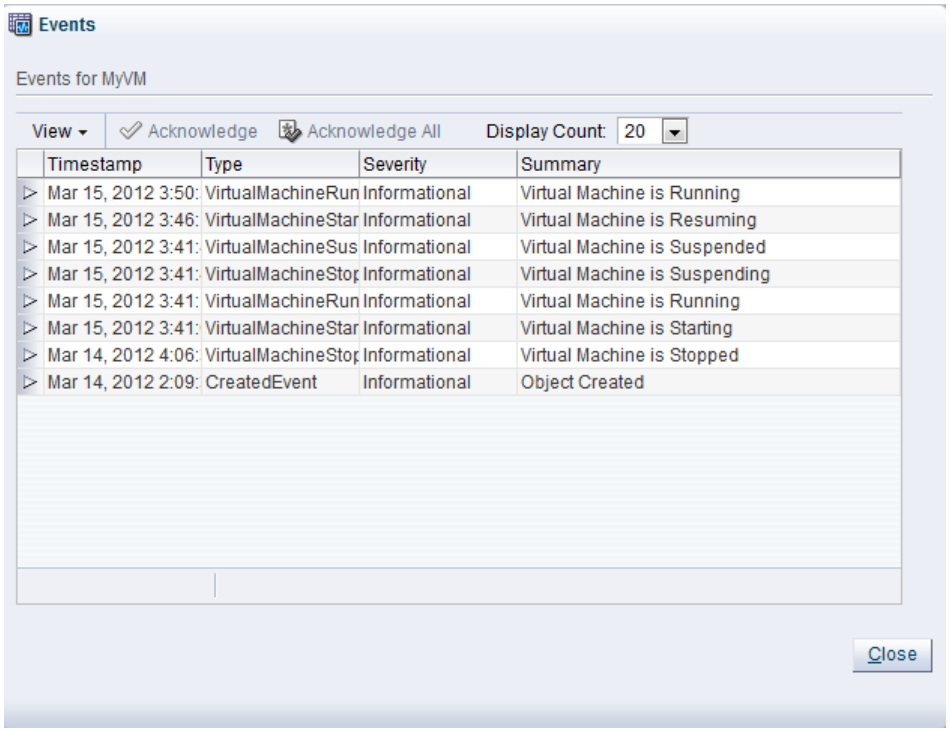
**Note**

The IP addresses for a virtual machine are only displayed if the paravirtual drivers are installed. See Section 7.13, “Converting to Paravirtualized Guests or Installing Paravirtualized Drivers” for information on installing the paravirtual drivers.

- **Disks:** Virtual and physical disks and ISOs attached to the virtual machine.

**To view virtual machine events:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine in the management pane, and click **Display Selected VM Events** in the management pane toolbar
4. The **Events** dialog box is displayed.




If a virtual machine has error event associated with it you must acknowledge the event to clear the error. See Section B.1.11, “Acknowledging Events/Errors” for information on acknowledging events. Click **Close** to close the dialog box.

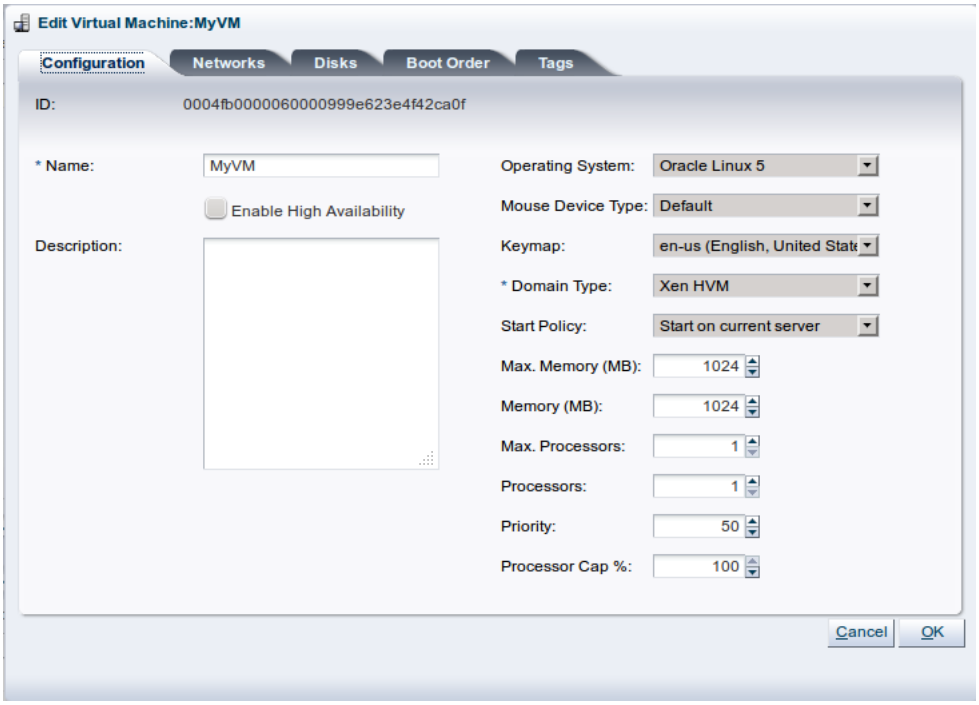
## 7.10.2 Editing a Virtual Machine

**To edit a virtual machine:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.

3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine in the management pane, and click **Edit...** in the management pane toolbar

4. The **Edit Virtual Machine** dialog box is displayed.




Select each tab to edit the virtual machine configuration. See Section 7.7, “Creating a Virtual Machine” for the details of each tab. Click **OK** to save the changes.

**Note**

It is not possible to dynamically change resources such as the number or processors or allocated memory for an Oracle Solaris VM without first enabling the `drd` service on the VM itself. To allow for these changes, connect to the VM and make sure that the drd service is enabled:

```
# svcadm enable -s drd
# svcs drd
```

These commands should notify you that the service is online. Once you have performed these actions, you will be able to use Oracle VM Manager to dynamically change the allocation of resources.

## 7.10.3 Starting Virtual Machines

After a virtual machine is created, you can start it. Starting a virtual machine is analogous to starting a computer by pressing the **Power On** button.

**To start virtual machines:**

1. Click the **Servers and VMs** tab.

2. Select the server pool on which the virtual machines reside in the navigation tree.

3. Select **Virtual Machines** from the **Perspective** drop-down list. Select one or more virtual machines in the management pane, and click **Start** .

The virtual machines are started.

## 7.10.4 Stopping (Shutting Down) Virtual Machines

When a virtual machine is not in use, you should shut it down to release system resources. Stopping a virtual machine is analogous to a normal shutdown of a physical computer.

If you want to save the state of the virtual machine, you should suspend it. See Section 7.10.7, “Suspending Virtual Machines” for information on suspending virtual machines.

In some situations you may not be able to stop a virtual machine, for example, if you have tried to stop it while another job is in progress on the virtual machine such as a start virtual machine job. To resolve this type of situation, you should abort the job that is in progress, then kill the virtual machine. See Section B.1.9, “Aborting Jobs” for information on aborting jobs, and Section 7.10.5, “Killing Virtual Machines” for information on killing a virtual machine.

**To stop virtual machines:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machines reside in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select one or more virtual machines in the management pane, and click **Stop** .

**Note**

You can also shut down a virtual machine from within the virtual machine, the same way you shut down a physical computer.

After issuing the stop command, the status of the virtual machine is changed to *Stopped*. However, this only indicates that the command was acknowledged. There is no guarantee that the virtual machine is effectively shut down correctly. This is expected behavior since an operating system running on a physical PC may also *hang* during the shutdown sequence.

If the virtual machine fails to shut down, you can power it off using the kill virtual machine option, which is similar to unplugging the power cable from a physical machine. To perform a power off (kill) of virtual machines, see Section 7.10.5, “Killing Virtual Machines”.

## 7.10.5 Killing Virtual Machines

Killing a virtual machine is equivalent to performing a power off of a virtual machine, similar to unplugging the power cable from a physical machine. This is not the recommended method of shutting down a virtual machine, but may be used if the shut down command fails to shut down the virtual machine.

**To kill virtual machines:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select one or more virtual machines in the management pane, and click **Kill** .

The virtual machines are powered off.

## 7.10.6 Restarting Virtual Machines

Restarting a virtual machine is analogous to rebooting a computer. You may need to restart a virtual machine if an operating system update requires you to restart the virtual machine, for example Microsoft Windows™ updates.

**To restart virtual machines:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machines reside in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select one or more virtual machines in the management pane, and click **Restart** .

The virtual machines are restarted.

**Note**

If a virtual machine has not fully started, a restart request may not succeed as the virtual machine may not be ready to initiate the request. In this case, you may need to abort the restart job and try again later. Alternately, kill the virtual machine and start it again.

## 7.10.7 Suspending Virtual Machines

Suspending a virtual machine is analogous to putting a computer into sleep mode. When a virtual machine is suspended, the current state of the operating system, and applications is saved, and the virtual machine put into a suspended mode. When you resume the virtual machine, the operating system and applications continue from the same point you suspended the virtual machine.

**To suspend virtual machines:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select one or more virtual machines in the management pane, and click **Suspend** .

The virtual machine state is saved and the virtual machines suspended.

To resume the virtual machine, see Section 7.10.8, “Resuming a Virtual Machine”.

## 7.10.8 Resuming a Virtual Machine

Resuming a suspended virtual machine is analogous to waking up a computer that has been in sleep mode. When you resume a suspended virtual machine, the operating system and applications continue from the same point you suspended the virtual machine.

**To resume a virtual machine:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine to start in the management pane, and click **Resume** .

The virtual machine state is retrieved and the virtual machine started.

## 7.10.9 Moving Virtual Machines Between Repositories

**Important**

You should never manually move the files for a virtual machine from one repository to another. This can result in duplicate UUIDs for a virtual machine which can cause problems within your Oracle VM environment. If you need to move a virtual machine to another storage repository, alway use the tools provided within Oracle VM Manager.

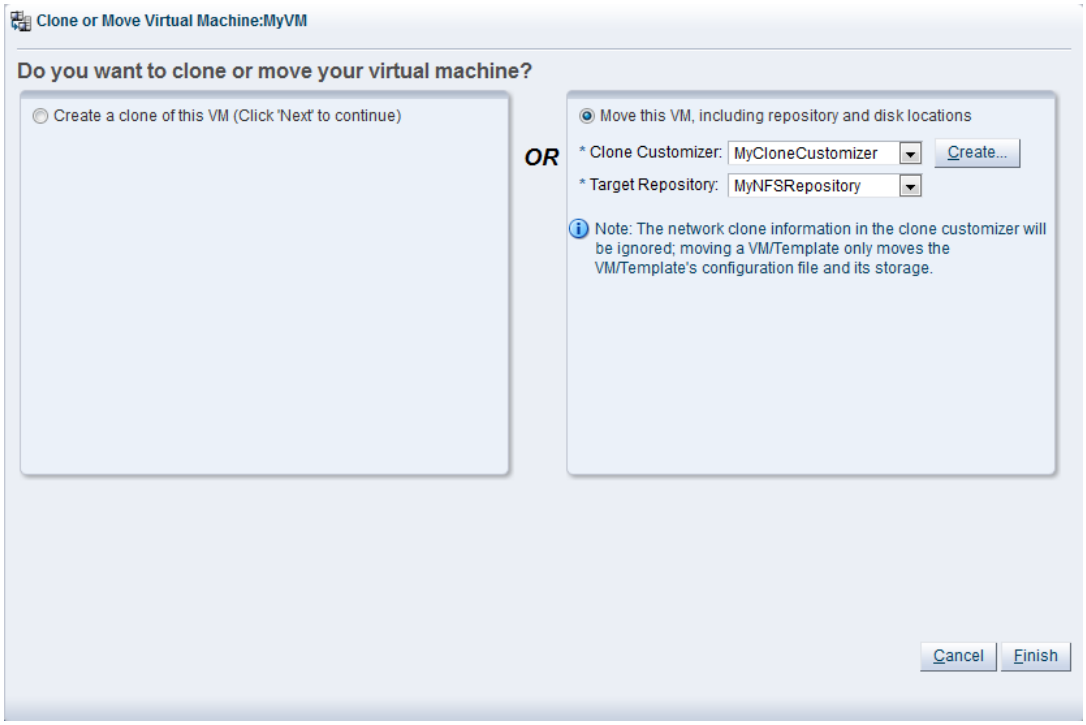
You can move a non-running virtual machine from one repository to another. During the move you can specify where the disks should be moved to using a clone customizer. If you keep the clone customizers to the default settings (the same as the original virtual machine), a move is essentially the same as migrating the virtual machine to another Oracle VM Server. You can change the location of disks and the virtual machine configuration file to another storage repository when you move a virtual machine using a clone customizer.

**Note**

The network information is not changed when moving a virtual machine, so you cannot move VNICs between networks. Any network changes you make in a clone customizer are ignored when moving a virtual machine. This allows you to preserve the virtual machine in its original state, while moving the configuration file and storage to a different repository.

**To move a virtual machine:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine in the management pane, and click **Clone or Move** .
4. The **Clone or Move** dialog box is displayed.



Select **Move this VM**.

Select a clone customizer from the **Clone Customizer** drop-down list. If no clone customizers are displayed or you want to create a new one, click **Create**. See Section 7.9.1.1, “Creating a Clone Customizer” for information on creating a clone customizer.

Select a repository from the **Target Repository** drop-down list. This is the location of the new virtual machine configuration file.

Click **Finish** to move the virtual machine.

## 7.10.10 Moving Virtual Machines Between Oracle VM Servers

You can drag and drop one or more virtual machines to other Oracle VM Servers to change the Oracle VM Server that the virtual machine is running on. See Section 3.11, “Drag and Drop” for information on using the drag and drop feature.

This facility is also known as migration. See Section 7.10.12, “Migrating Virtual Machines” for more information.

You can also drag and drop one or more virtual machines to the **Unassigned Virtual Machines** folder to prevent the virtual machine from running on any Oracle VM Servers. See Section 7.10.11, “Moving Virtual Machines To/From Unassigned Virtual Machines Folder” for more information.

## 7.10.11 Moving Virtual Machines To/From Unassigned Virtual Machines Folder

You can move one or more non-running virtual machines from an Oracle VM Server or server pool to the **Unassigned Virtual Machines Folder**, and vice versa. Placing a virtual machine in the **Unassigned Virtual Machines** folder means it cannot be started, but it is available to move to another server pool. You do not need to specify clone customizers when moving virtual machines to the **Unassigned Virtual Machines** folder, and you can move multiple virtual machines at one time. The same is true when moving virtual machines from the **Unassigned Virtual Machines** folder to a server pool or Oracle VM Server.

**To move virtual machines to/from the Unassigned Virtual Machines folder:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select one or more virtual machines in the management pane, and drag and drop them to the **Unassigned Virtual Machines** folder.
4. To move one or more virtual machines from the **Unassigned Virtual Machines** folder, select the folder, then select one or more virtual machines in the management pane, and drag and drop them on an Oracle VM Server or server pool in the navigation tree. See Section 3.11, “Drag and Drop” for information on using the drag and drop feature.

## 7.10.12 Migrating Virtual Machines

Migrating a virtual machine is a process to move a virtual machine from one Oracle VM Server, or server pool, to another. If the virtual machine is running during the migration, the applications continue to run, uninterrupted and this is called *live* migration. This feature is important, and useful, when the existing Oracle VM Server may be out of commission (if HA is enabled), or on a planned shutdown for maintenance purposes. Live migration can only be performed within the same server pool, so a running virtual machine cannot be moved out of its server pool. Live migration does not require HA to be enabled; it can occur in a

server pool simply by selecting a running virtual machine and migrating it, independently of whether or not the server pool is clustered and/or whether the virtual machine has its HA flag set.

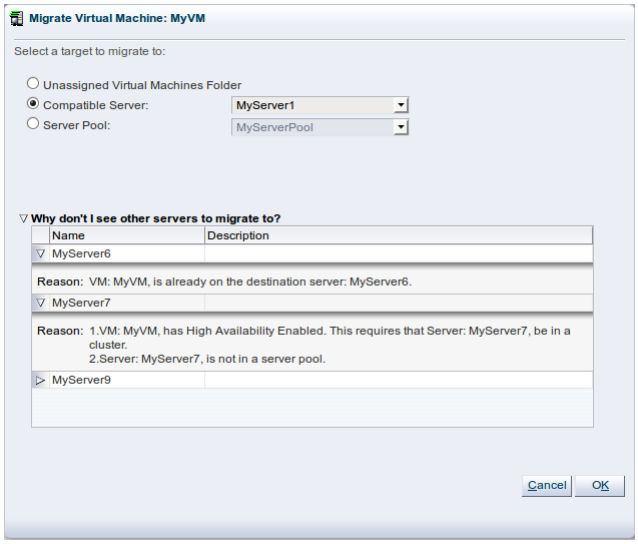
You can migrate one or more virtual machines at a time. When migrating multiple virtual machines, the migrations are performed serially and not concurrently, so one migration is performed, then the next, until all the migrations are completed. Cross-server pool migration is allowed, though the virtual machines must first be stopped. A virtual machine must also be in a stopped state before migrating it to the **Unassigned Virtual Machines** folder. When you migrate a virtual machine to another server pool, the virtual machine is not deployed to a particular Oracle VM Server until you start the virtual machine, then the placement strategies for the virtual machine depends on the Oracle VM Server roles, and destination server pool policies such as Distributed Resource Scheduler (DRS) and Distributed Power Management (DPM). See Section 6.9.1, “Oracle VM Server Roles” for information on Oracle VM Server roles, and Section 6.5, “Server Pool Policies” for information on server pool policies.

The CPU family and model number of the source and destination computers must be compatible in order to perform live migration. This means, for instance, that you cannot migrate a virtual machine from an x86-based server pool to a SPARC-based server pool, or vice versa. Equally, you cannot perform a live-migration within the same x86-server pool, if the servers have different CPU families or model numbers. For more information on CPU compatibility, please see Section 6.7, “Server Processor Compatibility Groups”.

The steps below assume the virtual machine is deployed to an Oracle VM Server. If the virtual machine is located in the **Unassigned Virtual Machines** folder, select it in that folder to perform the migration.

**To migrate a virtual machine:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine to migrate in the management pane, and click **Migrate** .
4. The **Migrate Virtual Machine** dialog box is displayed.




Select the virtual machine destination:

- **Unassigned Virtual Machines Folder:** Removes the virtual machine from the server pool and moves it to the **Unassigned Virtual Machines** folder. The virtual machine must be in a stopped state for this option to be available. When migrating a running virtual machine, this option is not enabled.

- **Compatible Server:** Moves the virtual machine to the selected Oracle VM Server. Stopped virtual machines can be migrated to Oracle VM Servers in other server pools sharing the same repository, so Oracle VM Servers from other server pools may be listed here.
- **Server Pool:** Moves the virtual machine to the selected server pool. Stopped virtual machines can be migrated to other server pools. The virtual machine is not deployed to a particular Oracle VM Server within the destination pool; you need to start the virtual machine in the destination server pool for it to be deployed to an Oracle VM Server. When migrating a running virtual machine, this option is not enabled.

If the Oracle VM Server you want is not listed, click the arrow next to **Why don't I see other servers to migrate to?**. A list of all Oracle VM Servers registered with Oracle VM Manager is displayed. Click the arrow next to the Oracle VM Server you want for an explanation as to why it is not available as a migration target.

Click **OK**.

The virtual machine is migrated.

**To migrate multiple virtual machines:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machines reside in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machines to migrate in the management pane and drag and drop them to the Oracle VM Server, server pool or the **Unassigned Virtual Machines** folder in the navigation tree to which you want to migrate the virtual machines. See Section 3.11, “Drag and Drop” for information on using the drag and drop feature.
4. The virtual machines are migrated.

### 7.10.13 Deleting Virtual Machines

When you delete a virtual machine, all the files and data associated with this virtual machine are removed from Oracle VM Manager. Before deleting a virtual machine, make sure you do not need it any longer. You can only delete a virtual machine when the virtual machine status is **Stopped** or **Error**.

**To delete virtual machines:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machines reside in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select one or more virtual machines in the management pane, and click **Delete** ✖ in the management pane toolbar.
4. The **Delete Confirmation** dialog box is displayed. Select any virtual disks associated with the virtual machines that you want to delete. Click **OK** to delete the virtual machines and the selected virtual disks.

## 7.11 Sending Messages to Virtual Machines

Sending a message to a virtual machine may be useful during certain situations, like developing or starting a virtual machine template. Messages are passed to the virtual machine operating system, and can be of any key/value pair that the operating system or template understands. For example, to set up a virtual machine template to use DHCP, you may want to send the following key/pairs to a virtual machine:

```
com.oracle.linux.network.device.0       eth0
com.oracle.linux.network.onboot.0       yes
com.oracle.linux.network.bootproto.0    dhcp
com.oracle.linux.root-password          password
```

**Note**

The root-password is always required as a parameter and should be sent as the final parameter for any message.

Any messages that are not understood are discarded and ignored by the operating system. You can hide the message for sensitive information such as passwords, so a series of asterisks are displayed in the user interface instead of the sensitive information.

You can optionally keep a log of the message. This feature is especially useful to template or application developers that want to send messages to virtual machines. Message logs are stored in the Oracle VM Manager API and are not available through any log file or database query. To gain access to these messages, you must use the API. Messages are limited to 1024 bytes when message logging is selected, or 8192 bytes when logging is not selected. They key is limited to 256 bytes.

Each message sent to a virtual machine is contained within its own job. If you send multiple messages to multiple virtual machines, each one has its own job, so 10 messages to 100 virtual machines produces 1,000 jobs.

When messages have been sent or you cancel out of the messaging dialog box, any messages you entered are not retained and are discarded.

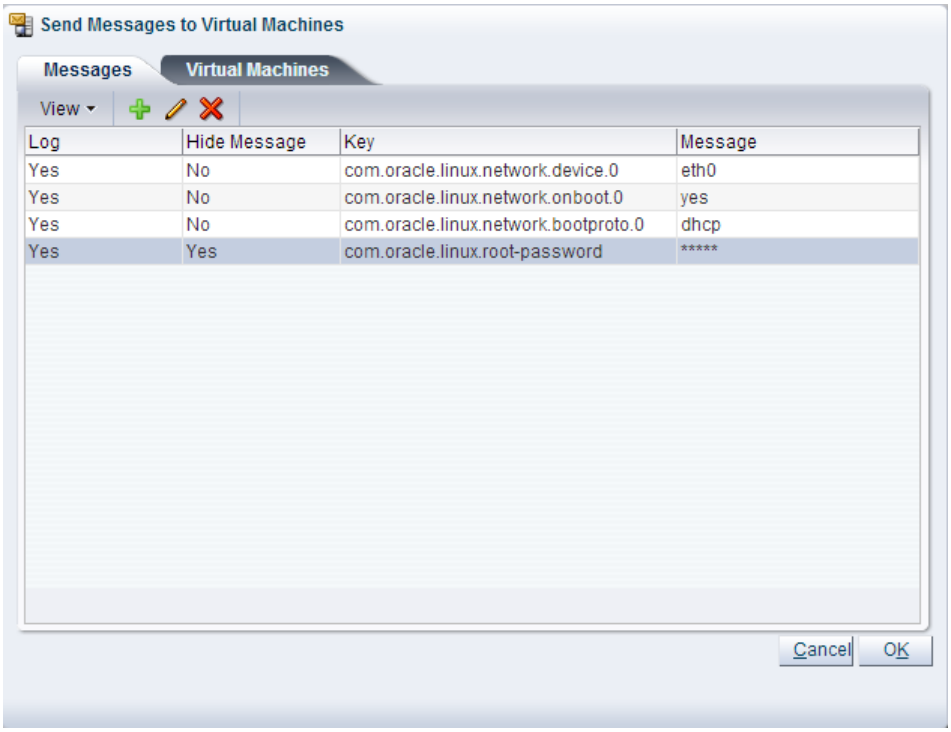
You can select one or more virtual machines, an Oracle VM Server, or a server pool, to select which running virtual machines are populated in the dialog box used to send messages to virtual machines.

To send a virtual machine a message you must have first installed the Oracle VM Guest Additions in the virtual machine. For information on installing the Guest Additions, and a more detailed description of the virtual machine messaging mechanism and its uses, see the *Oracle VM Utilities Guide*.

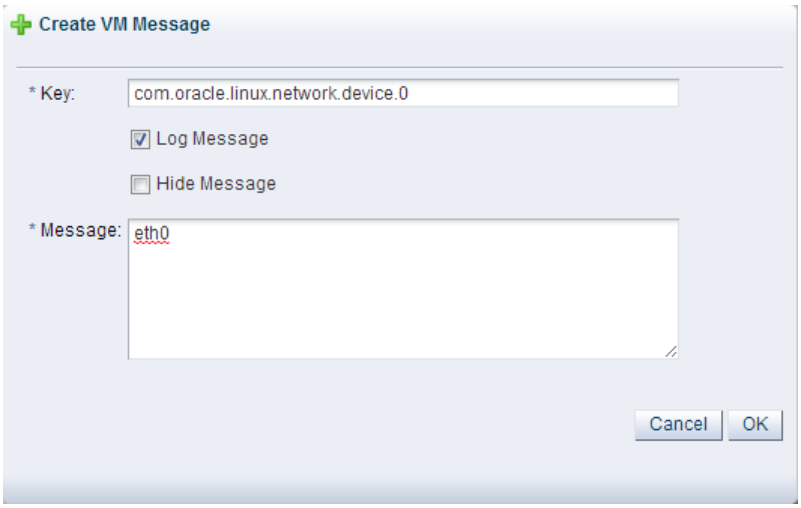
**To send messages to virtual machines:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machines reside in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select one or more virtual machines in the management pane, and click **Send VM Messages...** in the management pane toolbar.

   The **Send Messages to Virtual Machines** dialog box is displayed.



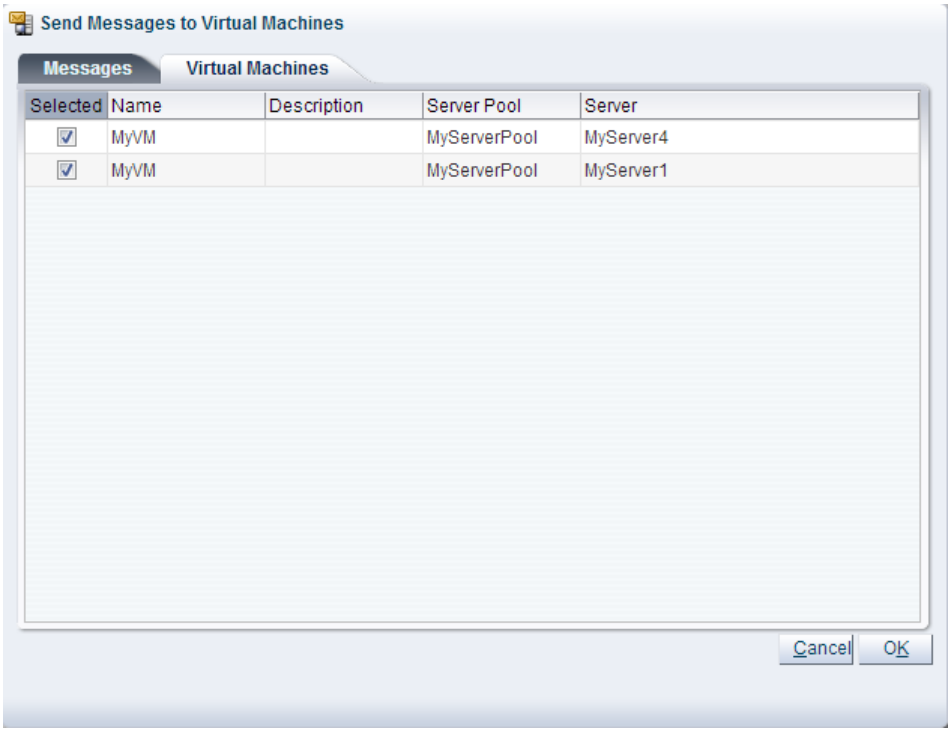

4. To create a message, click **Create Message...** in the management pane toolbar to display the **Create VM Message** dialog box.




   Enter the message key value pair in the **Key** and **Message** fields. Check the **Log Message** field to retain a log of the message. Check the **Hide Message** field to hide the message of the key/value pair in the user interface. Click **OK** to save the message and return to the **Send Messages to Virtual Machines** dialog box.

5. To edit a message, select the message and click **Edit...** in the dialog box toolbar. To delete a message, select it and click **Delete** in the dialog box toolbar.

6. Select the **Virtual Machines** tab to select which running virtual machines are to receive the messages.




Click **OK** to send the messages to the virtual machines.

# 7.12 Connecting to a Virtual Machine

You can connect to a virtual machine using its *console*. The console is the remote control system of Oracle VM, and enables you to work and interact with your virtual machines.

There are two types of virtual machine consoles in Oracle VM Manager: the console used to connect virtual machines in x86-based server pools, and the *serial* console used to connect to virtual machines in SPARC-based server pools. This section discusses both console types.

**Note**

You can use the serial console to connect to a Linux guest virtual machine in an x86-based server pool, but the console is in read-only mode, and you cannot interact with the virtual machine.

## 7.12.1 Web Browser Requirements for Oracle VM Manager Console Applets

Since the console applets included in Oracle VM Manager make use of Java, there are some requirements that you need to meet in order for the console applets to load properly within your browser. You may need to edit various browser settings in order to make use of these applets.

In order for the console applets to work properly, it is essential that a Java Runtime Environment is installed on the client system. Oracle recommends that you install the Oracle Java SE6 Update 35 for the most consistent and reliable behavior. For users accessing Oracle VM Manager from Mac OS X systems, Java SE7 Update 9 is recommended. You can download either of these Java Runtime Environments from http://www.oracle.com/technetwork/java/javase/downloads/index.html.

Some browsers allow you to disable Java applets and Javascript within the browser preferences. It is important that the use of these commonly used web features is permitted in order for the Oracle VM Manager and its console applets to function.

Some browsers include a built-in 'Popup Blocker'. When you first attempt to open a console, the browser may notify you that a popup window has been blocked. In order to allow the console to open successfully in future, you should add the IP address or URL of the Oracle VM Manager host to the allowed list in the popup blocker management dialog.

**Note**

On Mac OS X systems using the Safari web browser, you are not provided with any notification that a popup window has been blocked. Ensure that you configure the browser to allow popups.

For users of Microsoft Internet Explorer versions 7 and up, it is important that you adjust your security settings to include the URL for your Oracle VM Manager instance within your Trusted Sites, and to ensure that the security level for Trusted Sites is set to Low. Some of Internet Explorer's default security settings prevent the application from opening the Java applet.

## 7.12.2 Oracle VM Server for x86 Console

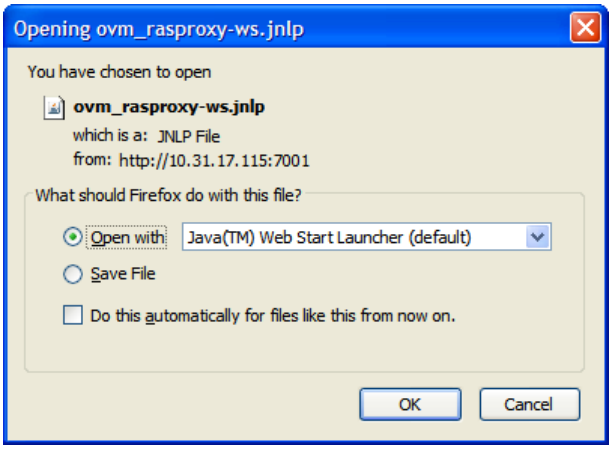
If you have VNC Viewer (from RealVNC), or TightVNC Viewer installed on your client computer, the Oracle VM Manager user interface finds the installation and uses it to create the connection with the virtual machine. Oracle recommends you install RealVNC on the client computer as it renders more quickly, has better keyboard support, and has less mouse control issues than Tight VNC.

If no client viewer is available, the Oracle VM Manager user interface looks for TightVNC on the Oracle VM Manager host computer and uses this to create the connection with the virtual machine. See the *Oracle VM Installation and Upgrade Guide* for information on installing TightVNC on the Oracle VM Manager host computer.

The key mapping for each VNC session is set when you create or edit a virtual machine, in the Keymap field. See Section 7.7, “Creating a Virtual Machine” and Section 7.10.2, “Editing a Virtual Machine” for information on creating and editing a virtual machine.

**To connect to a virtual machine's console:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine in the management pane, and click **Launch Console** in the management pane toolbar
4. A dialog box may be displayed requesting to start a Java proxy to connect to the virtual machine. Click **OK**.



5. If a VNC viewer is found, it is started.

   You can configure which VNC viewer to use with the **Options** > **Configuration** menu item of the Java RAS proxy window. Enter the path to the VNC client on the host computer; use quotes around the path if it contains spaces. You can additionaly specify the parameters `$host` and `$port` if the VNC client requires these parameters in a different format than the default `host:port`, for example, `-host=$host -port=$port`. Click **OK**.

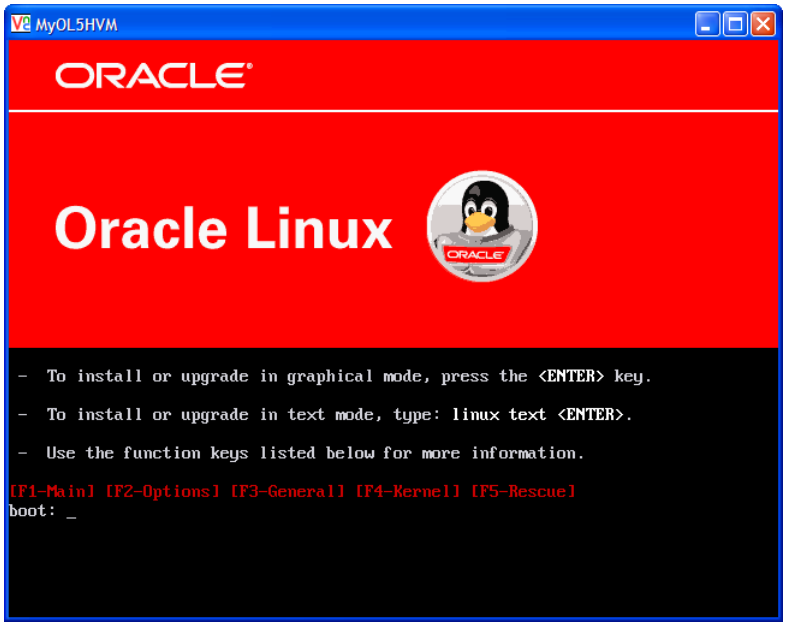
   

   **Tip**

   If the console does not start, check that your web browser allows pop-ups to be displayed. If you are using Microsoft Internet Explorer, add the base URL of Oracle VM Manager (for example, `http://example.com`) to the list of trusted sites in the security settings. You may also need to downgrade the security level from medium to medium-low for the Trusted sites zone.

   If the virtual machine's console is in use by another user, a message is displayed asking if you want to take over the connection. If you take over the connection, the other user's session is disconnected and the VNC session is started on your client computer.

   The virtual machine console is displayed. Log in and interact with the virtual machine as you would through any other VNC session. This example shows the initial installation screen for a virtual machine created with an Oracle Linux operating system ISO file.

   If required, enter the user name and password of the guest operating system to log in to the operating system.

Depending on the method by which you created the virtual machine, you may need to continue with some further tasks before you can use the virtual machine.

- If you created the virtual machine based on a template, you can directly use the guest operating system and applications installed in advance, without any further configuration.
- If you created the virtual machine using the fully virtualized method, the installation of the guest operating system is triggered after your first login. Follow the installation wizard to install the guest

operating system. For more information on creating virtual machines using the fully virtualized method, see Section 7.7, “Creating a Virtual Machine”.

**Note**

You must install the guest operating system using a single ISO file. If your operating system installer consists of multiple ISO files, you cannot install it.

For information on the supported guest operating systems, see the *Oracle VM Release Notes*.

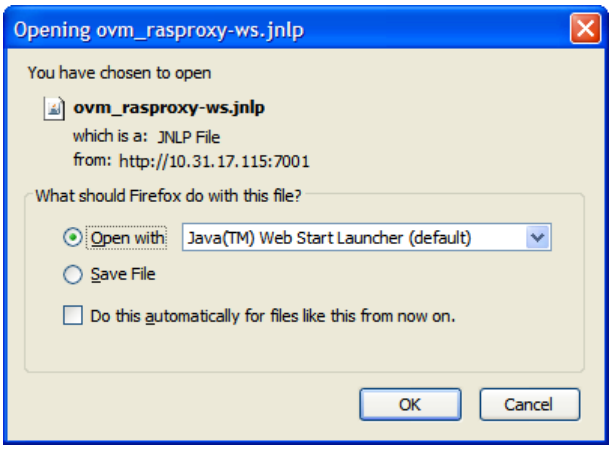
### 7.12.3 Oracle VM Server for SPARC Serial Console

You cannot use the standard VNC-based console to connect to virtual machines on a SPARC-based server pool. Instead, use the Telnet-based *serial* console. The serial console behaves differently to the x86 console, and the console must be displayed using the Java Telnet Application (JTA2) package installed on the Oracle VM Manager host computer. See the *Oracle VM Installation and Upgrade Guide* for information on installing JTA2 on the Oracle VM Manager host computer.

The key mapping for each VNC session is set when you create or edit a virtual machine, in the Keymap field. See Section 7.7, “Creating a Virtual Machine” and Section 7.10.2, “Editing a Virtual Machine” for information on creating and editing a virtual machine.

**To connect to a virtual machine's serial console:**

1. Click the **Servers and VMs** tab.
2. Select the server pool on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list. Select the virtual machine in the management pane, and click **Launch Serial Console** in the management pane toolbar
4. A dialog box may be displayed requesting to start a Java proxy to connect to the virtual machine. Click **OK**.




5. The virtual machine console is displayed. Log in and interact with the virtual machine as you would through any other Telnet console session. If required, enter the user name and password of the guest operating system to log in to the operating system.

## 7.13 Converting to Paravirtualized Guests or Installing Paravirtualized Drivers

For optimized performance, you can install paravirtualized drivers on hardware virtualized machines. Paravirtual drivers are optimized and improve the performance of the operating system in a virtual machine. These drivers enable high performance throughput of I/O operations in guest operating systems on top of the Oracle VM Server hosts.

Creating hardware virtualized machines may require that you install paravirtual drivers for your hardware on the guest operating system.

The Oracle Solaris 10 and Oracle Solaris 11 operating system runs as a hardware virtual machine (HVM), which requires HVM support (Intel® VT or AMD-V™) on the underlying hardware platform. By default, Oracle Solaris 10 or Oracle Solaris 11 operating system already has the required paravirtualized drivers installed as part of the operating system.

You can continue using HVM guest, but leverage the paravirtualized I/O drivers. For more information, see Comparison of Guest Virtualization Modes; HVM, PVM and PVHVM. Configuration, Mode Validation and Conversion to PVHVM.

To install the paravirtual drivers for Microsoft Windows™ operating systems, see the *Oracle VM Windows Paravirtual Drivers Installation Guide* .

**To install paravirtual drivers on an Oracle Linux guest operating system:**

1. Download the paravirtualized kernel on the virtual machine, for example for an Oracle Enterprise Linux 5.5 64-bit guest, download:

   http://public-yum.oracle.com/repo/EnterpriseLinux/EL5/5/base/x86_64/kernel-xen-2.6.18-194.el5.x86_64.rpm

2. Install the paravirtualized kernel on the virtual machine:

```
# rpm -ivh kernel-xen-version.type.rpm
 Preparing...                ########################################### [100%]
    1:kernel-xen             ########################################### [100%]
```

3. Back up the old initrd file, and make the new one with xennet, xenblk driver:

```
# mv initrd-oldversion.el5xen.img initrd-oldversion.el5xen.img.old
# mkinitrd initrd-newversion.el5xen.img newversion.el5xen --with=xenblk --with=xennet \
  --preload=xenblk --preload=xennet
```

**Note**

If you get an error similar to the following:

```
No module xen_vbd found for kernel version.el5xen, aborting
```

substitute the `mkinitrd` command above with the following:

```
# mkinitrd -f --allow-missing initrd-newversion.el5xen.img \
newversion.el5xen --with=xenblk --with=xennet --preload=xenblk \
--preload=xennet
```

4. Edit the /boot/grub/grub.conf file to be:

```
default=0
timeout=5
splashimage=(hd0,0)/grub/splash.xpm.gz
hiddenmenu
title Enterprise Linux Enterprise Linux Server (version.el5xen)
        root (hd0,0)
        kernel /vmlinuz-version.el5xen ro root=LABEL=/
```

```
        initrd /initrd-version.el5xen.img
```

**Note**

If you had trouble with the previous step and had to change the parameters for the `mkinitrd` command, specify the actual path to the root kernel image. For example, you might change the `root=LABEL=/` parameter to something like `root=/dev/VolGroup00/LogVol00`.

5. Modify the /etc/modprobe.conf file to include:

```
alias scsi_hostadapter xenblk
alias eth0 xennet
```

6. Shut down the virtual machine. See Section 7.10.4, “Stopping (Shutting Down) Virtual Machines” for information on shutting down a virtual machine.

7. Edit the virtual machine and change the **Domain Type** to **Xen PVM**. See Section 7.10.2, “Editing a Virtual Machine” for information on editing a virtual machine.

8. Start the virtual machine. See Section 7.10.3, “Starting Virtual Machines” for information on starting a virtual machine.

# 7.14 Setting Hard Partitioning for Virtual Machine CPUs

Oracle VM offers an advanced feature for hard partitioning, also known as CPU pinning. Hard partitioning means binding a virtual machine CPU to a physical CPU or core, and preventing it from running on other physical cores than the ones specified. This is done for Oracle CPU licensing purposes, since Oracle VM is licensed on a per-CPU basis.

For more information about special Oracle licensing policies, see the Oracle Technology Network and open the PDF document on the subject of *Partitioning* located at:

http://www.oracle.com/us/corporate/pricing/specialty-topics/index.html

As a specialist topic, hard partitioning is described in its own whitepaper. For more information about hard partitioning, see the PDF document titled Hard Partitioning With Oracle VM Server for x86 located at:

http://www.oracle.com/technetwork/server-storage/vm/ovm-hardpart-168217.pdf

**Warning**

Live-migration of CPU pinned virtual machines to another Oracle VM Server is not permitted under the terms of the license. Consequently, DRS and DPM policies should not be enabled for server pools containing CPU pinned guests.

**Note**

If your Oracle VM Servers support NUMA (non-uniform memory access), make sure that the systems are running correctly in NUMA mode. In a clustered setup, a CPU can access its local memory faster than non-local and shared memory. To make full use of the performance advantages of NUMA, be sure to pin the virtual VCPUs to the same physical CPU on an Oracle VM Server. For more information about NUMA, consult your server hardware documentation.

# Chapter 8 Converting Hosts

## Table of Contents



This chapter discusses creating hardware virtualized guest images from existing physical computers running any of the operating systems supported by Oracle VM.

## 8.1 Converting a Host

You can convert the operating system and application software on a computer to an Oracle VM hardware virtualized guest image using the Physical to Virtual (P2V) conversion utility. The P2V utility is included on the Oracle VM Server CD. The operating system must be one of the Oracle VM supported guest operating systems. See the *Oracle VM Release Notes* for a list of the supported guest operating systems. To perform a P2V conversion, the host computer must have a CPU that supports PAE (Physical Address Extension).

The P2V conversion process creates a virtual machine configuration file (vm.cfg), allows you to make some modifications in terms of sizing of the virtual machine hardware, and then replicates the physical image and transfers it over the network to a storage repository using Oracle VM Manager. The image on your physical computer is not changed in any way.

The P2V utility converts disks on the computer to virtual disk images. The first four virtual disk images are created as IDE disks (hda, hdb, hdc, and hdd) on the guest, using the original disk names. Up to seven additional disks are created as SCSI devices (sda, sdb, sdc, and so on). The disk entries in the vm.cfg file look similar to:

```
disk = ['file:System-sda.img,hda,w',
'file:System-sdb.img,hdb,w',
'file:System-sdc.img,hdc,w',
'file:System-sdd.img,hdd,w',
'file:System-sde.img,sda,w',
'file:System-sdf.img,sdb,w',
'file:System-sdg.img,sdc,w',
'file:System-sdh.img,sdd,w',
'file:System-sdi.img,sde,w',
'file:System-sdj.img,sdf,w',
'file:System-sdk.img,sdg,w',
]
```

The hardware virtualized guest created by the P2V utility must have it's own network configuration. If you use the same network configuration as the original computer, a network clash may occur as two computers on the network may have the same IP and MAC address. When the guest is started, make sure the network device is detected and a new network device is configured.

You can run the P2V utility interactively, or as an automated process using a kickstart configuration file. When you use the P2V utility with a kickstart file, no user intervention is required.

### 8.1.1 Using the P2V Utility

When you use the P2V utility, you are prompted for all required information.

**To create a virtual machine image of a computer:**

1. Insert the Oracle VM Server CDROM into the CDROM drive of the computer you want to image.

**Note**

This procedure is for 64-bit computers. If you want to convert a 32-bit host computer to a virtual machine template, you must use the Oracle VM 2.*x* CD.

2. Start the computer with the Oracle VM Server CDROM.

3. The **Oracle VM Server** screen is displayed.


At the `boot:` prompt, enter:

```
p2v
```

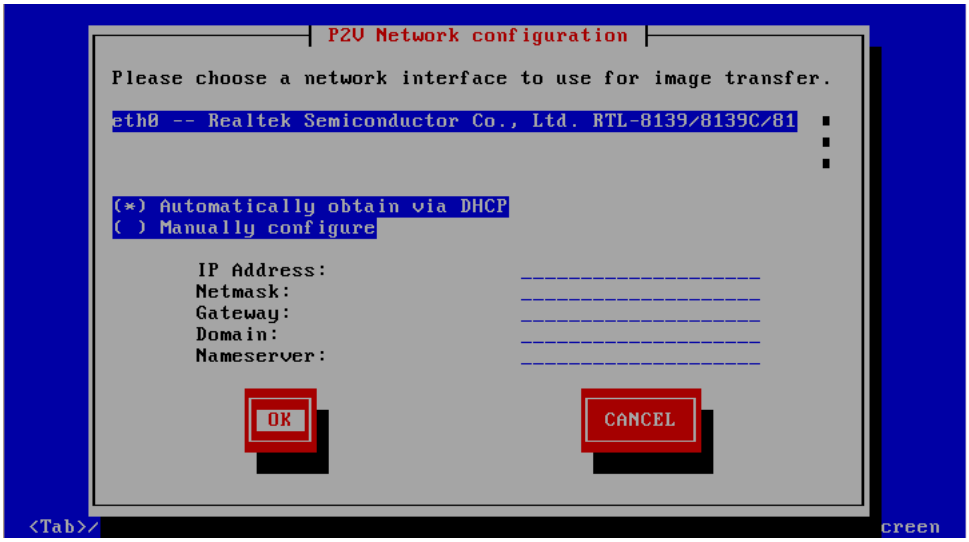
Press **Enter**.

4. The **CD Found** screen is displayed.


If you want to make sure the CDROM is error free, you can have the installer test it for errors. To test the CDROM, select **OK** and press **Enter**. The CDROM is tested and any errors are reported.

To skip media testing and continue with the installation, select **Skip** and press **Enter**.

5. The **P2V Network Configuration** screen is displayed.



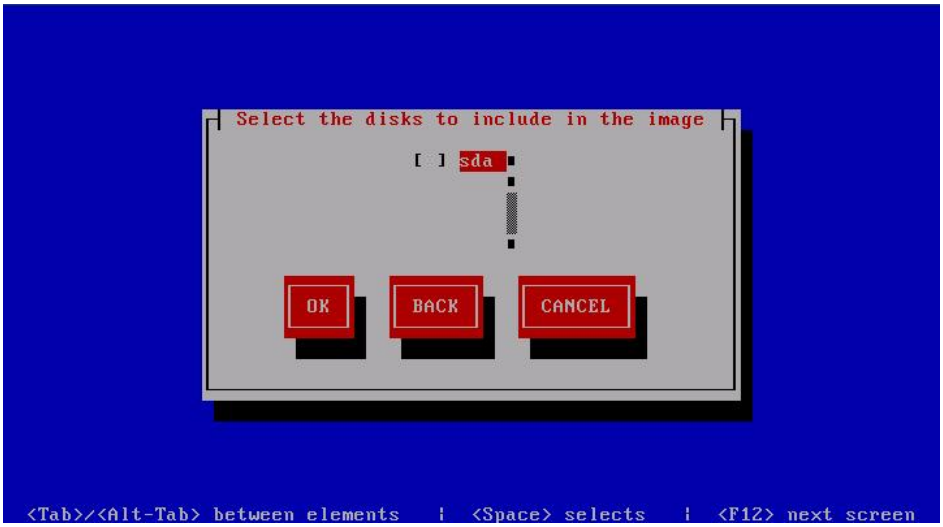

Select your Ethernet driver from the list displayed.

If your computer uses DHCP to assign its IP address, select **Automatically obtain via DHCP**.

If your computer uses a static IP address, select **Manually configure**, and enter the IP address and netmask, gateway, domain and name server for your computer.

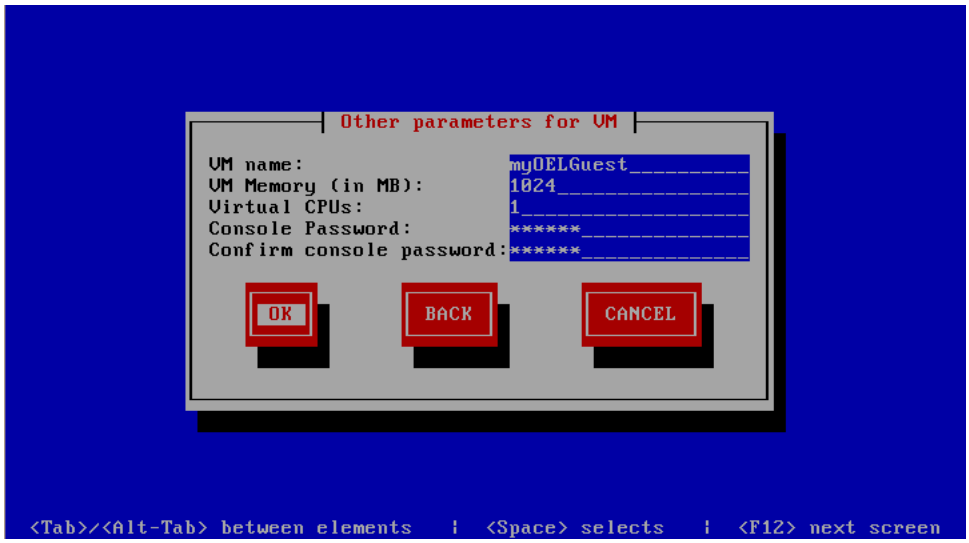
Select **OK** and press **Enter**.

6. The disk selection screen is displayed.




Select the disk partition(s) on the computer to include in the guest image. Select **OK** and press **Enter**.

7. The **Other parameters for VM** screen is displayed.

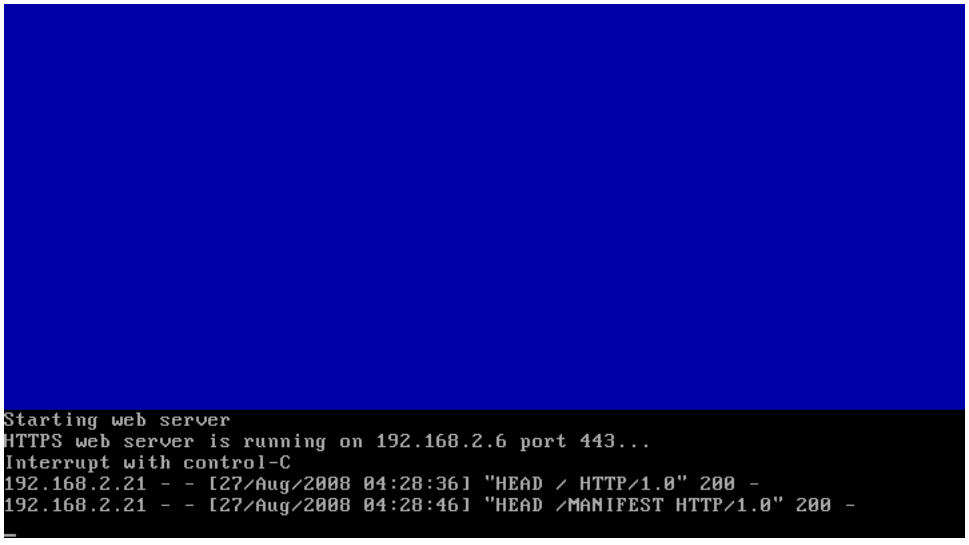



Enter information about the guest image for:

- VM (guest) name
- VM (guest) memory
- Number of virtual CPUs
- Console password. This is no longer required, but you must enter a value.

Select **OK** and press **Enter**.

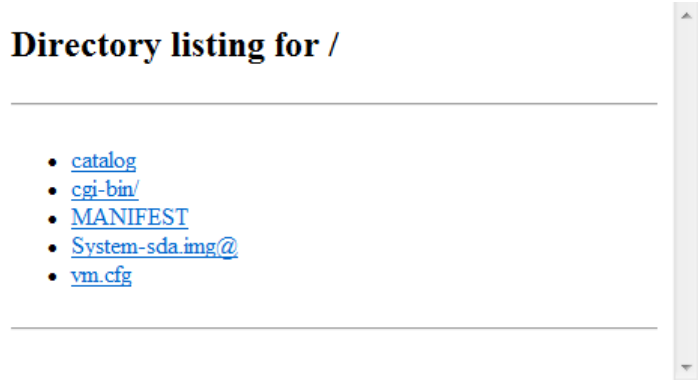
8. A secure web server (HTTPS) is started. The IP address of the computer, and port number the web server is available on is displayed.




Open a web browser on another computer and enter the URL created using the information displayed on the computer running the P2V utility, for example

https://192.168.2.6/

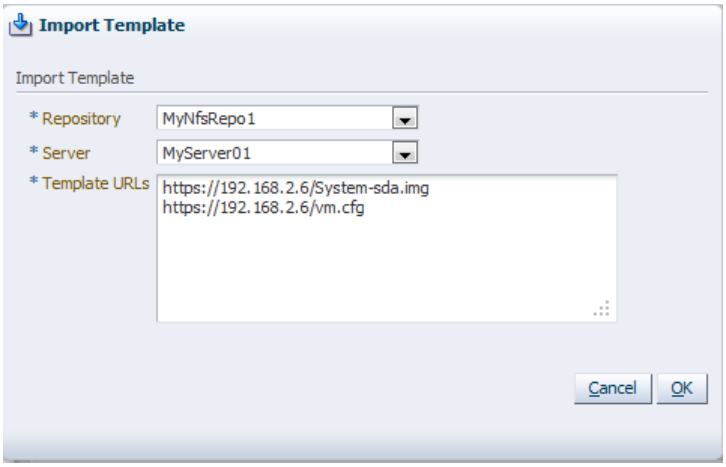
You do not need to enter the port number as this is the default port number for HTTPs connections. A directory listing is displayed which contains the files created by the P2V utility. Take a note of the URLs for the vm.cfg and *.img files as you use them in the next step when importing the virtual machine into Oracle VM Manager.




Log in to Oracle VM Manager and import the guest using the import template feature. When you import the guest, you should add the URLs for each virtual disk image and the virtual machine configuration file on a new line in the **Template URLs** field in the **Import Template** dialog, for example:

```
https://192.168.2.6/System-sda.img
```

```
https://192.168.2.6/vm.cfg
```




See Section 7.5.3.2, “Importing a Virtual Machine Template” for information on importing templates.

9. When the virtual machine template is added to the repository, you should terminate the P2V utility on the host computer. Press **Control**+**C** to terminate the P2V utility on the computer. Remove the Oracle VM Server CDROM from your CDROM drive. Restart the computer.

The guest image is created and available in the repository as a hardware virtualized virtual machine template.

## 8.1.2 Using the P2V Utility with a Kickstart File

You can use a kickstart file to automate the creation of a guest image of a physical computer using the P2V utility. When you use the P2V utility with a kickstart file, no user intervention is required. If there are any missing parameters in the kickstart file, you are prompted to enter them.

To use a P2V kickstart file, you must create a file with the P2V configuration options and parameters and place it on a kickstart server. The kickstart server can be made available using NFS, FTP, or HTTP. The kickstart server is set up in the same way as a standard Oracle Linux or Red Hat kickstart server and is beyond the scope of this book.

The following example P2V kickstart file starts sends the guest image to an instance of Oracle VM Manager via network device eth0, which obtained an IP address via DHCP:

```
p2v
cdrom
lang en_US.UTF-8
keyboard us
target --ovmmanager
network --device eth0 --bootproto dhcp
diskimage --device /dev/sda --type IDE
vm_options --name myGuest --mem 1024 --vcpus 1 --consolepasswd mypassword
```

See Appendix A, *P2V Parameters* for detailed information on the P2V kickstart file options and parameters.

**To create an Oracle VM virtual machine image of a computer using the P2V utility with a kickstart file:**

1. Create a P2V kickstart file and copy it to your kickstart server.
2. Insert the Oracle VM Server CDROM into your CDROM drive of the computer you want to image.
3. Restart the computer with the Oracle VM Server CDROM.
4. The **Oracle VM Server** screen is displayed. At the `boot:` prompt, enter `p2v` and the protocol and location for the kickstart file. For example, to use a kickstart file called *ks.cfg* on an HTTP server named *http://example.com*, enter:

   ```
   p2v ks=http://example.com/mypath/ks.cfg
   ```

   Press **Enter**.
5. If there are any missing parameters in the kickstart file, you are prompted to enter them.
6. If the kickstart file includes the directive to import the guest image to Oracle VM Manager, a secure web server (HTTPS) is started. A screen is displayed giving the IP address of the computer, and port number the web server is available on. Log in to Oracle VM Manager and import the guest using the import template feature as described in Section 8.1.1, “Using the P2V Utility”.
7. When the virtual machine template is added to the repository, you should terminate the P2V utility on the host computer. Press **Control**+**C** to terminate the P2V utility on the computer. Remove the Oracle VM Server CDROM from your CDROM drive. Restart the computer.

The guest image is created and available in the repository as a hardware virtualized virtual machine template.

# Appendix A P2V Parameters

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This appendix contains information about the Physical to Virtual (P2V) conversion utility and details the usage, syntax and parameters.

## A.1 P2V

The P2V conversion utility enables you to convert a computer's operating system (Linux and Microsoft Windows™) and applications to an Oracle VM hardware virtualized guest image. The P2V utility is included on the Oracle VM Server CD. You can access the P2V utility by restarting a computer with the Oracle VM Server CD. The Oracle VM Server startup screen is displayed. At the `boot:` prompt, enter:

```
p2v
```

You can use a P2V kickstart file to automate creation of hardware virtualized guest images from physical computers. This section discusses the options and parameters of the P2V kickstart file.

The P2V utility converts disks on the computer to virtual disk images. The virtual disk images are created as IDE disks (hda, hdb, hdc, hdd, and so on) on the guest, using the original disk names. When you use a P2V kickstart file, up to four disks are automatically deployed in the guest. Any extra disks are converted and added to the guest configuration file (vm.cfg), although they are not deployed. To deploy the additional disks in the guest, edit the guest configuration file, remove the comments from the disk entries, and map the additional disks to SCSI device names, for example, sda, sdb, and sdc. The boot disk must always be mapped to device hda. Any files on the guest which contain references to these devices must also be changed, for example, the /etc/fstab file may contain references to /dev/hda1, /dev/sda1, and so on.

When you use a P2V kickstart file, at least one network interface must use DHCP. This is required for the computer running the P2V utility to read the kickstart file over the network. The network configuration for this network interface cannot be modified from the kickstart file.

If you want the P2V utility's web server to listen using a network interface other than the one used to initiate the kickstart session, the network configuration (DHCP or static IP address) for that network interface can be specified in the kickstart file.

A number of screens may be displayed prior to the P2V utility starting with a kickstart file. You can suppress these screens to fully automate the P2V utility. Prior to the P2V utility starting, you may see up to four screens:

- P2V Network Configuration screen
- Language selection screen
- Keyboard selection screen
- Installation source screen

The following examples show how to suppress these screens.

**Example A.1 Suppressing the P2V Network Configuration Screen**

To suppress the P2V Network Configuration screen, supply the Ethernet device on the command line, for example:

```
p2v ks=http://example.com/ks.cfg ksdevice=eth0
```

**Example A.2 Suppressing the Language Selection Screen**

To suppress the Language selection screen, supply the language kickstart parameter, for example:

```
lang en_US.UTF-8
```

**Example A.3 Suppressing the Keyboard Selection Screen**

To suppress the Keyboard selection screen, supply the keyboard kickstart parameter, for example:

```
keyboard us
```

**Example A.4 Suppressing the Installation Source Screen**

To suppress the Installation source screen, supply the source kickstart parameter, for example:

```
cdrom
```

**Example A.5 P2V Kickstart File**

An example P2V kickstart file follows:

```
p2v
cdrom
lang en_US.UTF-8
keyboard us
target --ovmmanager
network --device eth0 --bootproto dhcp
diskimage --device /dev/sda --type IDE
vm_options --name myGuest --mem 1024 --vcpus 1 --consolepasswd mypassword
```

## A.1.1 Options

The following parameters are accepted in a P2V kickstart file.

`p2v`

Indicates the kickstart file is intended to automate a P2V conversion. This parameter is required in order to perform an automated P2V conversion and should be supplied at the Oracle VM Server `boot:` prompt instead of `install`, `update`, or `rescue`. It accepts no parameters.

`target [option]`

Sets the end destination for the guest image.

The *`option`* parameter can only contain the following:

```
--ovmmanager
```

Sets the P2V utility to operate in HTTPS server mode to transfer the guest image to a running instance of Oracle VM Manager.

`diskimage [option...]`

Denotes a disk to be included in the guest image. The P2V utility uses device mapper-based snapshotting to copy the disk as a `system-*.img` file on the target computer. There may be multiple `diskimage` directives in a P2V kickstart file, each resulting in a disk image in the guest image. The `--device` parameter must always be used with the `diskimage` directive to indicate which device should be imaged.

The *`option`* parameter is one or more of the following:

```
--device path
```

The device to image. `path` must be the full path to the device. For example:

```
diskimage --device /dev/sda
```

```
--type [IDE | SCSI | LVM | MDRAID]
```

Sets the type of disk. Must be one of `IDE`, `SCSI`, `LVM`, or `MDRAID`. Devices /dev/hda, /dev/hdb, /dev/hdc, and /dev/hdd should be `IDE`. Devices /dev/sd[a-zz] should be `SCSI`. A logical volume should be `LVM`. Devices /dev/md[a-zz] should be `MDRAID`. For example:

```
diskimage --device /dev/hda --type IDE
```

`network [option...]` Configures network information for the computer.

The *`option`* parameter is one or more of the following:

```
--bootproto [dhcp | bootp | static]
```

Sets the method by which the network configuration is determined. Must be `dhcp`, `bootp`, or `static`. The default is `dhcp`. `bootp` and `dhcp` are treated as the same.

`dhcp` uses a DHCP server to obtain the networking configuration, for example:

```
network --bootproto dhcp
```

`static` requires all the necessary networking information. As the name implies, this information is static and is used during and after the installation. The entry for static networking is more complex, as you must include all network configuration information on one line. You must specify the IP address, netmask, gateway, and nameserver, for example:

```
network --bootproto static --ip 10.0.2.15 --netmask 255.255.255.0
--gateway 10.0.2.254 --nameserver 10.0.2.1
```

The `static` method has the following restrictions:

- All static networking configuration information must be specified on one line; you cannot wrap lines using a backslash.
- You can only specify one nameserver.

```
--ip ipaddress
```

The IP address for the computer.

```
--gateway ipaddress
```

The IP address for the default gateway.



```
--nameserver ipaddress
```

The IP address for the primary nameserver.

```
--netmask netmask
```

The netmask for the computer.

`vm_options [option...]` Sets the configuration options for the guest.

```
--name name
```

The name of the guest.

```
--mem size
```

The memory allocation for the guest in Mb.

```
--vcpus number
```

The number of VCPUs for the guest.

```
--consolepasswd password
```

The console password for the guest. For example:

```
vm_options --name myGuest --mem 1024 --vcpus 1
--consolepasswd mypassword
```

# Appendix B Troubleshooting

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This chapter contains information on using the jobs framework, and troubleshooting Oracle VM.

For additional information, see the Oracle support-oriented Web sites:

- My Oracle Support, http://support.oracle.com
- Oracle Virtualization Forum, http://forums.oracle.com/forums/forum.jspa?forumID=823

## B.1 Working with the Jobs Framework

Oracle VM Manager uses a job operations framework that supports a flexible approach to the configuration of physical and virtual objects. Oracle VM Manager maintains an accurate and consistent view of the virtualization environment while users perform separate and simultaneous jobs. Each configuration change (a transaction performed by a single user) is considered a *job.*

The following sections describe jobs, and how resources are locked and released at the start and conclusion of each job, and how to manage jobs.

## B.1.1 Jobs Overview

A job is a configuration change that affects one or more physical or virtual objects. Examples of user operations that can be included in a job are:

- Adding or deleting a server pool
- Adding a VNIC to a virtual machine

A single job can contain one or many individual operations. When a job is in progress, a yellow lock appears to the left of the resources included in the job.

## B.1.2 Jobs and Resource Locking

A single job can contain one or many individual operations. When a job is in progress, a yellow lock appears to the left of the resources included in the job.

Objects involved in a job are locked to all other Oracle VM Manager users until the job is completed or aborted. Only a user with the same permission level on the object can unlock it. This assures that a consistent and accurate view is maintained for all users.

The state of locked objects cannot be known until the locks are cleared. The state of Oracle VM Manager is always accurately reflected by the state of objects that are not locked.

## B.1.3 Locks and Multiple Users

A number of different users may perform jobs simultaneously, provided they are performed on different objects. For example, suppose User A has created a Finance-One server pool and begins a job by moving Oracle VM Servers into another server pool. At the same time, User B modifies the resources of the Commodities server pool. Each user has a separate job pane for jobs, and would see each other's objects as locked. The objects remain locked until the jobs are completed.

Prior to completing a job, a lock can be cleared in two ways:

- By logging out the user who initiated the lock. This action can be performed by the user, or by an Oracle VM Manager administrator.
- By direct action of an Oracle VM Manager administrator.

As a job completes, its progress is shown in the Jobs tab. All locks are cleared when a job completes.

## B.1.4 Job Failure and Rollback

Job operations are validated by Oracle VM Manager as they are added to the Job tab. The failure of any operation causes the following to happen:

- The job is cancelled.
- All operations specified by the job are cancelled.
- The state of Oracle VM Manager is rolled back to the state it was prior to the start of the job.
- All locks in the operation are released.

## B.1.5 Jobs and Events

When a job operation fails, one or more events may be generated and displayed in Oracle VM Manager. Events are flagged with yellow or red icons in the navigation tree. To clear the errors you need to acknowledge the event. To acknowledge events, see Section B.1.11, “Acknowledging Events/Errors”.

To get information on failed events, click **Failed** in the **Jobs** tab or in the **Job Summary** pane.

## B.1.6 Job States

A job listed in the Job tab can have any of the states defined in Table B.1, “Job states”.

**Table B.1 Job states**

| Job State | Definition |
|---|---|
| Completed | The job has completed. |
| In Progress | The job is in progress. |
| Aborted | The job has been aborted. Oracle VM Manager has rolled-back to its previous state and all locks have been released. |
| Failed | The job has failed. Oracle VM Manager has rolled-back to its previous state and all locks have been released. |

## B.1.7 Managing Recurring Jobs

Oracle VM Manager periodically performs recurring jobs, such as repositories and file systems refresh, and Yum updates for Oracle VM Servers. Select the Jobs tab and then select the Recurring sub-tab to view and edit the settings for these jobs.

Recurring jobs are listed in Table B.2, “Recurring Jobs”.

**Table B.2 Recurring Jobs**

| Recurring Job | Definition |
|---|---|
| Refresh Repositories' File System Task | Oracle VM Manager performs refresh operations for all file systems containing repositories owned by Oracle VM Manager to help keep in synch with file system changes. The Refresh Repositories' File System Task minimizes the amount of time that the file system is locked. If the file system size or free size changes, the change is reflected in the repository and the file system size is displayed in the Oracle VM Manager user interface. The default setting for this job is disabled with an interval of one hour. |
| Yum Update Checker Task | The Yum Update Checker Task periodically checks that all owned Oracle VM Servers known to Oracle VM Manager have the latest versions available in the Yum repository. The default setting for this job is enabled with an interval of six hours. |

**To edit a recurring job**

1. Select the **Jobs** tab and then select the **Recurring** sub-tab.
2. Select a job in the **Recurring Jobs** table.
3. Click **Edit...** in the toolbar.
4. The **Edit Recurring Job:** ***job_name*** dialog box is displayed. Edit the recurring job as required and click **OK**.

## B.1.8 Starting A Job

A job begins when you make any change in Oracle VM Manager. Each change you make appears in the Job Summary pane as a discrete operation. Job operations can be comparatively minor actions, such as renaming a virtual machine. Operations may also have a wider scope, such as the creation of a new network or storage device. Performing any of these actions changes the configuration of Oracle VM Manager. When a new job is started, information about the job is displayed in the Job Summary pane at the bottom of the management pane to show the job's progress.

## B.1.9 Aborting Jobs

If a job is running or fails to complete, you can abort the job to cancel it. For example, a virtual machine or Oracle VM Server may be in an unresponsive state and fail to respond to a start or stop request. The appropriate action is to abort the job. Administrators can abort the jobs of all users.

If you abort a job, all queued operations roll back to the pre-job state. Some job operations, such as renaming an object, complete quickly. Others, such as adjusting the memory used by a virtual machine, take longer.

There are two ways to abort a job:

- Using the Jobs tab
- Using the Job Summary pane.

Both procedures for aborting jobs are listed below.

**To abort jobs using the Jobs tab:**

1. Select the **Jobs** tab.
2. Select one or more jobs in the **Jobs** table.
3. Click **Abort Job** in the toolbar.
4. In the **Abort Job Confirmation** dialog box, click **OK** to abort the jobs.

**To abort jobs using the Job Summary pane:**

1. Select a jobs in the **Job Summary** pane.
2. Click **Abort** in the **Abort** column.
3. In the **Abort Job Confirmation** dialog box, click **OK** to abort the job.

## B.1.10 Determining the Cause of a Job Failure

If a job succeeds, all operations associated with it performed in Oracle VM Manager. A **Job Succeeded** message appears in the **Job Progress** area.

If a job fails, the state of Oracle VM Manager returns to its pre-job state. Click **Details** to see high-level information on all operations in the job.

Jobs may *hang* or remain *in progress* every time a virtual machine is started or stopped. A virtual machine may be in an unresponsive state for a variety of reasons and consequently fail to respond to a start or stop request. The appropriate action in this case is to abort the job. For example, when starting a PVM virtual machine using PXE type boot with an invalid network URL, this causes the virtual machine status to be *in progress* indefinitely. To resolve this, abort the virtual machine start job. Edit the virtual machine and provide the correct URL.

### B.1.11 Acknowledging Events/Errors

If an object has an error event associated with it you must acknowledge the event to clear the error and return the object to normal operations. For example, this can occur if an Oracle VM Server or virtual machine appear as Stopped (Error) in the status. The object in error is flagged with a red icon in the navigation tree. Oracle VM Servers, virtual machines, repositories and storage objects can have error events associated with them. The following procedures show you how to clear errors and return the object to normal operations.

**To acknowledge Oracle VM Server error events:**

1. Click the **Servers and VMs** tab.
2. Select the Oracle VM Server in the navigation tree.
3. Select **Events** from the **Perspective** drop-down list in the management pane.
4. Select the error event and click **Acknowledge** , or click **Acknowledge All** to clear all errors.

**To acknowledge virtual machine error events:**

1. Click the **Servers and VMs** tab.
2. Select the server pool, or Oracle VM Server on which the virtual machine resides in the navigation tree.
3. Select **Virtual Machines** from the **Perspective** drop-down list in the management pane.
4. Select the virtual machine in the management pane table. Click **Display Selected VM Events...** .
5. The **Events** dialog box is displayed. Select the error event and click **Acknowledge** , or click **Acknowledge All** to clear all errors. Click **Close**.

**To acknowledge storage repository error events:**

1. Click the **Repositories** tab.
2. Select the repository in the navigation tree.
3. Select **Events** from the **Perspective** drop-down list in the management pane.
4. Select the error event and click **Acknowledge** , or click **Acknowledge All** to clear all errors.

**To acknowledge storage error events:**

1. Click the **Storage** tab.
2. Select **File Servers**, **SAN Servers**, or a storage server in the navigation tree.
3. Select **Events** from the **Perspective** drop-down list in the management pane.
4. Select the error event and click **Acknowledge** , or click **Acknowledge All** to clear all errors.

## B.2 Troubleshooting Oracle VM Server

This section describes some problems you may encounter when using Oracle VM Server, and explains how to resolve them.

If you need to contact Oracle Support Services, you will be asked to supply the log files mentioned in this section. You may also be required to provide the exact version of each Oracle VM component. To find the

version of Oracle VM Manager, click the **Help** menu, then **About**. To find the version of Oracle VM Server and Oracle VM Agent, see Section 6.10.15, “Viewing Oracle VM Server Operating System Information and Control Domains”.

## B.2.1 Debugging Tools

If virtual machine creation fails, check the Oracle VM Server log files and use the command-line tools to help you find the cause of a problem. There are a number of useful command-line tools, important directories, and log files that you should check when troubleshooting problems with Oracle VM Server. This section discusses:

- Oracle VM Server directories
- Oracle VM Server log files
- Oracle VM Server command-line tools

### B.2.1.1 Oracle VM Server Directories

The important Oracle VM Server directories you should check when troubleshooting problems with Oracle VM Server are listed in Table B.3, “Oracle VM Server directories”

**Table B.3 Oracle VM Server directories**

| Directory | Purpose |
|---|---|
| /etc/xen | Contains Oracle VM Server configuration files for the Oracle VM Server daemon and virtualized guests. |
| /etc/xen/scripts | Contains networking related scripts. |
| /var/log | Contains the Oracle VM Agent log file, ovs-agent.log.<br><br>Contains the ovmwatch.log, which logs virtual machine life cycle events.<br><br>Contains the ovm-consoled.log, which logs remote VNC console access, and all communication with Oracle VM Manager. |
| /var/log/xen | Contains Oracle VM Server log files. |
| /var/log/messages | Contains Oracle VM Server messages. |

### B.2.1.2 Oracle VM Server Log Files

The Oracle VM Server log files you should check when troubleshooting problems with Oracle VM Server are listed in Table B.4, “Oracle VM Server log files”

**Table B.4 Oracle VM Server log files**

| Log File | Purpose |
|---|---|
| xend.log | Contains a log of all the actions of the Oracle VM Server daemon. Actions are normal or error conditions. This log contains the same information as output using the `xm log` command. This file is located in the /var/log/xen directory. |
| xend-debug.log | Contains more detailed logs of the actions of the Oracle VM Server daemon. This file is located in the /var/log/xen directory. |
| xen-hotplug.log | Contains a log of hotplug events. Hotplug events are logged if a device or network script does not start up or become available. This file is located in the /var/log/xen directory. |

| Log File | Purpose |
|---|---|
| qemu-dm.*pid*.log | Contains a log for each hardware virtualized guest. This log is created by the quemu-dm process. Use the ps command to find the *pid* (process identifier) and replace this in the file name. This file is located in the /var/log/xen directory. |
| ovs-agent.log | Contains a log for Oracle VM Agent. This file is located in the /var/log/ directory. |
| osc.log | Contains a log for Oracle VM Storage Connect Plug-ins. This file is located in the /var/log/ directory. |
| ovm-consoled.log | Contains a log for the Oracle VM virtual machine console. This file is located in the /var/log/ directory. |
| ovmwatch.log | Contains a log for the Oracle VM watch daemon. This file is located in the /var/log/ directory. |

### B.2.1.3 Oracle VM Server Command-Line Tools

The Oracle VM Server command-line tools you should use when troubleshooting problems with Oracle VM Server are listed in Table B.5, “Oracle VM Server command-line tools”.

**Table B.5 Oracle VM Server command-line tools**

| Command-Line Tool | Purpose |
|---|---|
| xentop | Displays real-time information about Oracle VM Server and domains. |
| xm dmesg | Displays log information on the hypervisor. |
| xm log | Displays log information of the Oracle VM Server daemon. |

A further set of Oracle VM command line utilities are available for download, separate to the Oracle VM Server in-built utilities. These Oracle VM utilities are a collection of command line scripts that allow you to perform a set of basic management tasks on Oracle VM Servers and virtual machines in an Oracle VM environment. These utilities are particularly useful to administrators who need to execute certain operations quickly and/or repeatedly. Using the command line scripts makes these tasks quicker and easier to perform. See the *Oracle VM Utilities Guide* for more information on these utilities.

## B.2.2 Using DHCP

It is recommended that you install Oracle VM Server on a computer with a static IP address. If your computers uses DHCP you should configure your DHCP server to assign static DHCP addresses. This makes sure your host always receives the same IP address. The behavior of the Oracle VM Server host is undefined if used in an environment where your IP address may change due to DHCP lease expiry.

## B.2.3 Setting the Guest's Clock

Paravirtualized guests may perform their own system clock management, for example, using the NTPD (Network Time Protocol daemon), or the hypervisor may perform system clock management for all guests.

You can set paravirtualized guests to manage their own system clocks by setting the `xen.independent_wallclock` parameter to `1` in the /etc/sysctl.conf file. For example

```
"xen.independent_wallclock = 1"
```

If you want to set the hypervisor to manage paravirtualized guest system clocks, set `xen.independent_wallclock` to `0`. Any attempts to set or modify the time in a guest will fail.

You can temporarily override the setting in the /proc file. For example

```
"echo 1 > /proc/sys/xen/independent_wallclock"
```

**Note**

This setting does not apply to hardware virtualized guests.

## B.2.4 Wallclock Time Skew Problems

Additional parameters may be needed in the boot loader (grub.conf) configuration file for certain operating system variants after the guest is installed. Specifically, for optimal clock accuracy, Linux guest boot parameters should be specified to ensure that the *pit* clock source is utilized. Adding `clock=pit nohpet nopmtimer` for most guests will result in the selection of *pit* as the clock source for the guest. Published templates for Oracle VM include these additional parameters.

Proper maintenance of virtual time can be tricky. The various parameters provide tuning for virtual time management and supplement, but do not replace, the need for an *ntp* time service running within guest. Ensure that the `ntpd` service is running and that the /etc/ntpd.conf configuration file is pointing to valid time servers.

## B.2.5 Mouse Pointer Tracking Problems

If your mouse pointer fails to track your cursor in a VNC Viewer session in a hardware virtualized guest, add the following to the Oracle VM Server configuration file located at /etc/xen/xend-config.sxp to force the device model to use absolute (tablet) coordinates:

```
usbdevice='tablet'
```

Restart the Oracle VM Server for the changes to take effect. You may need to do this for each Oracle VM Server in the server pool.

## B.2.6 Hardware Virtualized Guest Stops

When running hardware virtualized guests, the QEMU process (qemu-dm) may have its memory usage grow substantially, especially under heavy I/O loads. This may cause the hardware virtualized guest to stop as it runs out of memory. If the guest is stopped, increase the memory allocation for dom0, for example from 512MB to 768MB.

## B.2.7 Migration of Large Hardware Virtualized Guest Results in CPU Soft Lock

On some hardware, such as the SUN FIRE X4170 M2 Server, migration of very large virtual machines using hardware virtualization can result in a soft lockup causing the virtual machine to become unresponsive. This lock is caused when the migration causes the virtual machine kernel to lose the clock source. Access to the console for the virtual machine shows a series of error messages similar to the following:

```
BUG: soft lockup - CPU#0 stuck for 315s! [kstop/0:2131]
```

To resolve this, the virtual machine must be restarted and the `clocksource=jiffies` option should be added to the HVM guest kernel command line, before rebooting the virtual machine again.

**Important**

This option should only be used on HVM guest systems that have actually resulted in a CPU soft lock.

## B.2.8 Hardware Virtualized Guest Devices Not Working as Expected

Some devices, such as sound cards, may not work as expected in hardware virtualized guests. In a hardware virtualized guest, a device that requires physical memory addresses instead uses virtualized memory addresses, so incorrect memory location values may be set. This is because DMA (Direct Memory Access) is virtualized in hardware virtualized guests.

Hardware virtualized guest operating systems expect to be loaded in memory starting somewhere around address 0 and upwards. This is only possible for the first hardware virtualized guest loaded. Oracle VM Server virtualizes the memory address to be 0 to the size of allocated memory, but the guest operating system is actually loaded at another memory location. The difference is fixed up in the shadow page table, but the operating system is unaware of this.

For example, a sound is loaded into memory in a hardware virtualized guest running Microsoft Windows™ at an address of 100MB may produce garbage through the sound card, instead of the intended audio. This is because the sound is actually loaded at 100MB *plus* 256MB. The sound card receives the address of 100MB, but it is actually at 256MB.

An IOMMU (Input/Output Memory Management Unit) in the computer's memory management unit would remove this problem as it would take care of mapping virtual addresses to physical addresses, and enable hardware virtualized guests direct access to the hardware.

## B.2.9 Firewall Blocks NFS Access

Oracle VM Server blocks NFS access from any external computer (or guest) by default. This may cause problems when trying to create a guest using an NFS connection. To resolve this, disable the firewall with the following command:

```
# service iptables stop
```

## B.2.10 Migrating Virtual Machines

You cannot migrate virtual machines on computers with hardware that is not identical. To migrate a virtual machines, you must have hardware that is the same make and model and the CPU must be in the same CPU family. You must also have the same Oracle VM Server release number.

# B.3 Troubleshooting Oracle VM Manager

This section describes some problems you may encounter when using Oracle VM Manager, and explains how to resolve them.

## B.3.1 Changing Default UI Behaviour

This section discusses changes you can make to configure the behavior of the Oracle VM Manager user interface.

### B.3.1.1 Cannot See the Oracle VM Manager Server URI on the Login Screen

It is likely that the default value for **showLoginCoreServerUri** is set to false. Check the **Show Management Server URI** checkbox in the **Preferences Pane** on the **Tools and Resources** tab in Oracle VM Manager.

See Section 3.10, “Changing Default UI Behaviour” for more information on Oracle VM Manager UI preferences.

### B.3.1.2 No File Systems Found When Searching a Storage Server Due to Timeout

On Storage Servers that have a very large number of file systems available, the UI may timeout while refreshing the list of available file systems, resulting in a 'No File Systems Available' message. This usually means that the timeout value is set too low for the number of file systems that the UI needs to refresh. Change the settings for the **Refresh Timeout Value** in the **Preferences Pane** on the **Tools and Resources** tab in the Oracle VM Manager user interface.

See Section 3.10, “Changing Default UI Behaviour” for more information on Oracle VM Manager UI preferences.

## B.3.2 Log Files

Oracle VM Manager error messages are displayed in the User Interface, in the Jobs tab, in the object's Events list and are also available in log files. Log files are stored in the following directory on the Oracle VM Manager host computer:

**/u01/app/oracle/ovm-manager-3/machine1/base_adf_domain/servers/AdminServer/logs**

There a few files of interest here:

- **access.log**: Used to track HTTP access to the Web interface of the Oracle VM Manager and to the underlying WebLogic HTTP interface. This log can be used to track access and HTTP operations within Oracle VM Manager to help debug access issues and to audit access to the Oracle VM Manager
- **AdminServer.log**: Used to track events within the underlying WebLogic framework, including events triggered by Oracle VM Manager. This log can be used to track a variety of issues within Oracle VM Manager including TLS/SSL certificate issues, server availability issues, and any actions performed within Oracle VM Manager which are usually identifiable by searching for items containing the string '*com.oracle.ovm.mgr*'. Login failures resulting from locked accounts (as opposed to incorrect credentials) are also in this file.
- **AdminServer-diagnostic.log**: Used to track exceptions within the underlying WebLogic framework, including particular events triggered by Oracle VM Manager such as login failures due to incorrect credentials. This log can be used to track Oracle VM Manager behavior that results in an exception or for login failure, which can be tracked by searching for the string '*An incorrect username or password was specified*'.

Since log file format is determined by WebLogic, many of these files may be difficult to read. A log parsing tool is included with Oracle VM Manager to help extract useful information from the actual log files. The log parsing tool is named **OvmLogTool.py** and is located here:

**/u01/app/oracle/ovm-manager-3/ovm_shell/tools**

**OvmLogTool.py** can do 3 useful things:

- convert and combine all the AdminServer log files into one easier-to-read file
- create a filtered summary log file that only lists errors
- tail the AdminServer log, applying the filtering on the fly

Usually analysis of the logs starts by generating an error summary log. The summary file can act as an index into the filtered file to investigate and analyze errors, providing you with timestamps an a shortened summary of each error that may need further investigation. To generate a summary log file, do the following:

```
# python OvmLogTool.py -s -o summary
processing input file: /u01/app/oracle/ovm-manager-3/machine1/base_adf_domain/servers/AdminServer/
  logs/AdminServer.log00001
processing input file: /u01/app/oracle/ovm-manager-3/machine1/base_adf_domain/servers/AdminServer/
  logs/AdminServer.log
```

This generates a file named `summary` in the local directory. You can use this to look for *errors* that occurred within Oracle VM Manager.

To get a full log of all events and errors within Oracle VM Manager you can do the following:

```
# python OvmLogTool.py -o filteredlog
processing input file: /u01/app/oracle/ovm-manager-3/machine1/base_adf_domain/servers/AdminServer/
  logs/AdminServer.log00001
processing input file: /u01/app/oracle/ovm-manager-3/machine1/base_adf_domain/servers/AdminServer/
  logs/AdminServer.log
```

This generates a file named `filteredlog` in the local directory. You can use this to look for all *events* that occurred within Oracle VM Manager.

Finally, you can use **OvmLogTool.py** to filter results on the fly while tailing the log:

```
# python OvmLogTool.py -t
tailing log file: /u01/app/oracle/ovm-manager-3/machine1/base_adf_domain/servers/AdminServer/
  logs/AdminServer.log
```

Use **Ctrl**+**C** to exit the program when you have finished tailing the log file.

## B.3.3 Command Line Tools

A set of Oracle VM command line utilities are available for download. These Oracle VM utilities are a collection of command line scripts that allow you to perform a set of basic management tasks on Oracle VM Servers and virtual machines in an Oracle VM environment. These utilities are particularly useful to administrators who need to execute certain operations quickly and/or repeatedly. Using the command line scripts makes these tasks quicker and easier to perform. See the *Oracle VM Utilities Guide* for more information on these utilities.

A command line interface to Oracle VM Manager is also available which mirrors the user interface in functionality to enable ad hoc, scripted, and programmatic access to the Oracle VM environment. See the *Oracle VM Command Line Interface User's Guide* for more information on the command line interface.

## B.3.4 Cannot Start Virtual Machine Console

If you launch the console of a virtual machine in Oracle VM Manager, and an error is displayed, you may not have installed the VNC viewer on the Oracle VM Manager host computer. To resolve this problem, install a VNC viewer on the Oracle VM Manager host. See Installing and Configuring Virtual Machine Console Utilities for more information.

You can also install a VNC viewer on the client accessing the Oracle VM Manager user interface. Oracle recommends you also install a VNC viewer on the Oracle VM Manager host computer so that if a client does not have a VNC viewer, this problem does not occur.

## B.3.5 Cannot Create a Virtual Machine from Installation Media

The following message is displayed: "Error: There is no server supporting hardware virtualization in the selected server pool."

To solve this problem, make sure the Oracle VM Server supports hardware virtualization.

Follow these steps to check:

a. Run the following command to check if hardware virtualization is supported by the CPU:

```
# cat /proc/cpuinfo |grep -E 'vmx|smx'
```

If any information that contains `vmx` or `smx` is displayed, it means that the CPU supports hardware virtualization. Here is an example of the returned message:

```
flags : fpu tsc msr pae mce cx8 apic mtrr mca cmov pat pse36 clflush dts acpi mmx fxsr
sse sse2 ss ht tm pbe nx lm constant_tsc pni monitor ds_cpl vmx est tm2 cx16 xtpr lahf_lm
```

**Note**

The **/proc/cpuinfo** command only shows virtualization capabilities starting with Linux 2.6.15 (Intel®) and Linux 2.6.16 (AMD). Use the **uname -r** command to query your kernel version.

b. Make sure you have enabled hardware virtualization in the BIOS.

c. Run the following command to check if the operating system supports hardware virtualization:

```
# xm info |grep hvm
```

The following is an example of the returned message:

```
xen_caps : xen-3.0-x86_64 xen-3.0-x86_32p hvm-3.0-x86_32 hvm-3.0-x
```

If the CPU does not support hardware virtualization, use the paravirtualized method to create the virtual machine. See Section 7.7, “Creating a Virtual Machine”.

## B.3.6 Cannot Change CD in the Virtual Machine

To change the CD in a virtual machine:

a. Unmount the first CD:

```
# umount mount-point
```

b. Select the second ISO file, and click **Change CD**.

c. Mount the second CD:

```
# mount /dev/cdrom mount-point
```

## B.3.7 Cloning Virtual Machine from Oracle VM 2.*x* Template Stuck in Pending

When creating a virtual machine from an Oracle VM 2.*x* template, the clone job fails with the error:

```
OVMAPI_9039E Cannot place clone VM: template_name.tgz, in Server Pool: server-pool-uuid.
That server pool has no servers that can run the VM.
```

This is caused by a network configuration inconsistency with the `vif = ['bridge=xenbr0']` entry in the virtual machine's configuration file.

To resolve this issue, remove any existing networks in the virtual machine template, and replace them with valid networks which have the Virtual Machine role. Start the clone job again and the virtual machine clone is created. Alternatively, remove any existing networks in the template, restart the clone job, and add in any networks *after* the clone job is complete.

# Appendix C Third Party Licenses

## Table of Contents



This Appendix includes the software licenses for third party software products included as part of Oracle VM.

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Apache MINA SSHD is included with Oracle VM Manager.

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Oracle has modified the following files:

setup.py
py/ovf/__init__.py
py/ovf/Ovf.py
py/ovf/OvfCertificate.py
py/ovf/OvfPlatform.py
py/ovf/OvfFile.py
py/ovf/OvfManifest.py
py/ovf/OvfReferencedFile.py
py/ovf/OvfSet.py
py/ovf/OvfLibvirt.py
py/ovf/OvfTransport.py
py/ovf/env/EnvironmentSection.py

py/ovfapi/__init__.py
py/ovfapi/ovfapi.py
py/ovfapi/ovfova.py
py/scripts/chovf
py/scripts/lsovf
py/scripts/mkovf
py/scripts/rmovf
py/scripts/ova
schemas/README.ORACLE
schemas/ovf-envelope.xsd
schemas/ovf-environment.xsd
schemas/CIM_ResourceAllocationSettingData.xsd
schemas/CIM_VirtualSystemSettingData.xsd
schemas/ovf-envelope-ovm.xsd

The modifications made to the files are:

- Update version and schemas to OVF spec 1.1.0
- Support OVM extensions
- Add XML namespace to elements in envelope and environment files
- Support chunksize/compression attribute of File element
- Support certificate file creation with user supplied X509 certificate and private key
- Verify certificate as part of ova package validation
- Extract the contents of the appliance to a specified location after validating the appliance
- Add Oracle VM specific VirtualSystemTypes
  - 'DMTF:Oracle:OracleVM:PVM' for xenpv
  - 'DMTF:Oracle:OracleVM:HVM' for xenfv
- Remove libvirt dependency
- Other minor fixes

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Also add information on how to contact you by electronic and paper mail.

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The hypothetical commands `show w' and `show c' should show the appropriate
parts of the General Public License.  Of course, the commands you use may
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consider it more useful to permit linking proprietary applications with the
library.  If this is what you want to do, use the GNU Lesser General
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```

# Glossary

## A

admin server
: An Oracle VM Server dedicated to performing administrative functions on storage servers such as creating a new LUN or extending a file system. The server must be capable of logging into a storage array or file server as an admin user. The administrative functions available to the server are defined by the storage connect plugin.

affinity
: Specify that specific virtual machines should always run on the same host.

anti-affinity
: Specify that specific virtual machines should never run on the same host.

assembly
: An infrastructure template containing a configuration of multiple virtual machines with their virtual disks, and the inter-connectivity between them. Assemblies can be created as a set of .ovf (Open Virtualization Format) and .img (disk image) files, or may all be contained in a single .ova (Open Virtualization Format Archive) file.

## C

clone
: The action or result of making an exact copy of an object. The object may be a virtual machine, virtual machine template, ISO file, or virtual disk. Cloning is analogous to copying and maintains the integrity of the original object, while creating a new object based on the original. A clone customizer may be used to define cloning options to specify details of where the object components may reside when cloned, such as in a different storage repository.

control domain
: A privileged domain that creates and manages other logical domains and services.

## D

dom0
: An abbreviation for *domain zero*. The management domain with privileged access to the hardware and device drivers. Dom0 is the first domain started at boot time. Dom0 has more privileges than domU. It can access the hardware directly and can manage the device drivers for other domains. It can also start new domains.

domain
: A configurable set of resources, including memory, virtual CPUs, network devices and disk devices, in which virtual machines run. A domain is granted virtual resources and can be started, stopped and rebooted independently.
See Also dom0, domU.

domU
: An unprivileged domain with no direct access to the hardware or device drivers. Each domU is started by dom0.

## G

guest guest operating system
: A guest operating system that runs within a domain in Oracle VM Server. A guest may be paravirtualized or hardware virtualized. Multiple guests can run on the same Oracle VM Server.

# H

hardware virtualized machine (HVM)
: A virtual machine with an unmodified guest operating system. It is not recompiled for the virtual environment. There may be substantial performance penalties running as a hardware virtualized guest. Enables Microsoft Windows™™ operating system to be run, as well as legacy operating systems. Hardware virtualization is only available on Intel® VT or AMD SVM CPUs.

host computer
: The physical computer on which Oracle VM Server is installed.

hypervisor
: A hypervisor, also called a monitor or Virtual Machine Manager (VMM), is a layer which abstracts the virtual hardware from the real hardware. As such it is the only privileged entity in the system which has full access to real hardware resources. It controls only the most basic resources of the system, including CPU and memory usage, privilege checks, and hardware interrupts.

# L

logical domain
: A virtual machine comprised of a discrete logical grouping of resources, which has its own operating system and identity within a single computer system. Also called a domain.
See Also domain.

# M

management domain
: See dom0.

master Oracle VM Server
: A component of Oracle VM Agent. An application that acts as the contact point to Oracle VM Manager, and to other Oracle VM Agents. Provides virtual machine host load-balancing, and local persistence for Oracle VM Server.

  There is only one master Oracle VM Server in a server pool. A physical server can perform as the master Oracle VM Server, Utility Server and Virtual Machine Server simultaneously.

migrate
: The act of moving a virtual machine from one Oracle VM Server to another, or to the Unassigned Virtual Machines folder. Migration can be performed on either a running or a stopped virtual machine.

move
: The act of moving an object from one location to another. This may be moving a stopped virtual machine from one Oracle VM Server to another, moving a virtual machine template from one storage repository to another, or moving an ISO file or virtual disk to another storage location.

# N

non-sparse copy
: A clone of the type "non-sparse copy" is a disk image file of a physical disk, taking up the space equivalent to the full specified disk size, including empty blocks.
See Also sparse copy.

# O

Oracle VM Agent
: An application installed with Oracle VM Server. It communicates with Oracle VM Manager for management of virtual machines. Oracle VM Manager manages the virtual machines running on Oracle VM Server by communicating with Oracle VM Agent. It contains three components: master Oracle VM Server, Utility Server, and Virtual Machine Server.

Oracle VM Manager
: Provides the user interface, which is an Application Development Framework (ADF) web application, to manage Oracle VM Server pools. Manages virtual machine life cycle, including creating virtual machines from templates or from installation media, deleting, powering off, uploading, deployment and live migration of virtual machines. Manages resources including ISO files, templates and shared virtual disks.

Oracle VM Server
: A self-contained virtualization environment designed to provide a lightweight, secure, server-based platform for running virtual machines. Oracle VM Server is based upon an updated version of the Xen hypervisor technology. Includes Oracle VM Agent to enable communication with Oracle VM Manager.

# P

paravirtualized machine (PVM)
: A virtual machine with a kernel that is recompiled to be made aware of the virtual environment. Runs at near native speed, with memory, disk and network access optimized for maximum performance.

# Q

QEMU
: Also referred to as qemu-dm, which is the process name. The virtualization process which allows full virtualization of a PC system within another PC system.

# R

refresh server
: An Oracle VM Server dedicated to handling filesystem refreshes on behalf of a server pool. A refresh server temporarily mounts file systems on an NFS file server during the refresh operation. The server must be granted full data access in order to perform the refresh. For each NFS file server, at least one Oracle VM Server from each server pool accessing the file server must be assigned as a refresh server.

# S

server pool
: Logically an autonomous region that contains one or more physical Oracle VM Servers. Presents a unified view of the storage where the virtual machines reside, and groups the users of these virtual machines into a single community called a *group*, in which each user is a server pool member.

service domain
: Logical domain that provides devices, such as virtual switches, virtual console connectors, and virtual disk servers, to other logical domains.

sparse copy
: A clone of the type "sparse copy" is a disk image file of a physical disk, taking up only the amount of space actually in use; not the full specified disk size.

See Also non-sparse copy.

# T

thin clone
: A thin clone is a clone of a virtual disk that takes up only the amount of disk space actually in use; not the full specified disk size.

  Thin cloning of virtual disks on OCFS2-based repositories is supported. Thin provisioning of physical disks on generic storage is not supported.

# U

Utility Server
: A component of Oracle VM Agent. An application that handles I/O intensive operations for virtual machines, server pools and servers, for example, copying, moving and renaming files.

  There can be more than one Utility Server in a server pool. A physical server can perform as the master Oracle VM Server, Utility Server and Virtual Machine Server simultaneously.

# V

vif
: A virtual network interface for bridging network interfaces between domUs and dom0. When a domU is started it is assigned a number. This number is used to bridge the network interface from eth*n* to vif*n.0*.

virtual disk
: A file or set of files, usually on the host file system although it may also be a remote file system, that appears as a physical disk drive to the guest operating system.

virtual machine (VM)
: A guest operating system and the associated application software that runs within Oracle VM Server. May be paravirtualized or hardware virtualized machines. Multiple virtual machines can run on the same Oracle VM Server.

Virtual Machine Manager (VMM)
: See hypervisor.

Virtual Machine Server
: A component of Oracle VM Agent. An application which runs Oracle VM Server virtual machines. It can start and stop virtual machines, and collect performance data for the host and guest operating systems. Enables communication between the master Oracle VM Server, Utility Server and Virtual Machine Servers.

  There can be more than one Virtual Machine Server in a server pool. A physical server can perform as the master Oracle VM Server, Utility Server and Virtual Machine Server simultaneously.

virtual machine template
: A template of a virtual machine. Contains basic configuration information such as the number of CPUs, memory size, hard disk size, and network interface card (NIC). Create virtual machines based on a virtual machine template using Oracle VM Manager.

VMM
: See Virtual Machine Manager (VMM).

# X

Xen™

The  Xen hypervisor is a small, lightweight, software virtual machine monitor, for x86-compatible computers. The Xen hypervisor securely executes multiple virtual machines on one physical system. Each virtual machine has its own guest operating system with almost native performance. The Xen hypervisor was originally created by researchers at Cambridge University, and derived from work done on the Linux kernel.

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