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Virtualization Reference

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## Glossary

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# Preface

The Oracle® Enterprise Manager Ops Center Virtualize Reference describes virtualization and cloud management tasks.

## Audience

This document is intended for system administrators.

## Related Documents

For more information, see the following documents in the Oracle Enterprise Manager Ops Center 12c documentation set:

- *Oracle Enterprise Manager Ops Center Configure Reference*
- *Oracle Enterprise Manager Ops Center Operate Reference*
- *Oracle Enterprise Manager Ops Center Operations for Oracle SuperCluster Reference*
- *Oracle Enterprise Manager Ops Center Release Notes*
- *Oracle Enterprise Manager Ops Center Concepts Guide*
- *Oracle Enterprise Manager Ops Center Installation for Linux Operating Systems*
- *Oracle Enterprise Manager Ops Center Installation for Oracle Solaris Operating System*
- *Oracle Enterprise Manager Ops Center Command Line Interface Guide*
- *Oracle Enterprise Manager Ops Center Deploy How To Library*
- *Oracle Enterprise Manager Ops Center Operate How To Library*
- *Oracle Enterprise Manager System Monitoring Plug-in for Oracle Enterprise Manager Ops Center Guide*

For more information, see the other documents in the Oracle Enterprise Manager Ops Center 12c Release 3 documentation set, located at this site: [http://docs.oracle.com/cd/E59957\\_01/index.htm](http://docs.oracle.com/cd/E59957_01/index.htm)

## Conventions

The following text conventions are used in this document:

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<b>Convention</b>	<b>Meaning</b>
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
monospace	Monospace type indicates commands, file names, and directories within a paragraph, and code in examples.

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# Get Started With Virtualization

The following sections describe the virtualization and cloud management features in Oracle Enterprise Manager Ops Center:

- [Get Started With Virtualization](#)
- [Storage Libraries for Virtualization](#)
- [Networks for Virtualization](#)
- [Oracle Solaris Zones](#)
- [Oracle VM Server for SPARC](#)
- [Oracle VM Server for x86](#)
- [Server Pools](#)
- [Virtual Datacenters](#)

## 1.1 Introduction to Virtualization

Virtualization technologies are designed to extend your hardware, operating systems, storage and network resources. Oracle Enterprise Manager Ops Center provides centralized management and optimization features for the following Oracle virtualization technologies:

- **Oracle Solaris Zones (SPARC and x86):** Creates isolated, secure virtual operating systems, called zones, within an Oracle Solaris 10 or 11 operating system on either a SPARC or x86 platform. The default operating system controls the CPU, memory, and network resource allocation for the zones.
- **Oracle VM Server for SPARC:** Creates virtual machines, called logical domains or guests, within a single SPARC machine. Each logical domain has its own resources, such as a boot environment, CPU threads, memory, I/O devices, and its own operating system. Logical domains can run different operating systems. You can create zones within logical domains.
- **Oracle VM Server for x86:** Creates virtual machines within a single x86 platform. Virtual machines can run Linux, Oracle Solaris, and Windows guests.

You can use the virtualization management capabilities to create a comprehensive cloud management solution.

This chapter includes the following sections:

- [Concepts for Virtualization](#)
- [Preparing for Virtualization](#)

- [Virtualization Agent Controllers](#)
- [Agent Management Options](#)
- [Introduction to Virtualization Management](#)
- [Introduction to Cloud Management](#)
- [Related Resources for Getting Started with Virtualization](#)

## 1.2 Concepts for Virtualization

As a virtualization administrator, you can create virtual operating systems, virtual systems, or a virtual data center in the cloud. All of these options require access to storage and networks. Information about core network and storage functionality is in Part II of the document.

See [Storage Libraries for Virtualization](#) and [Networks for Virtualization](#) for more targeted information for virtualization technologies.

You should be aware of the following Oracle Enterprise Manager Ops Center concepts:

- [Connection Modes](#)
- [Agent Controllers and VC Agent Controllers](#)
- [User Permissions and Roles for Virtualization](#)
- [Groups](#)
- [Server Pools](#)

To take full advantage of the features in , run the application in connected mode use agent-managed assets, groups, and server pools.

### 1.2.1 Connection Modes

The connection mode determines whether your instance of Oracle Enterprise Manager Ops Center is connected to the Internet. Plans and profiles that rely on images and packages have access to the versions that are stored in the library in Oracle Enterprise Manager Ops Center.

In Connected mode, it is quick and easy to use the UI to add the latest images and packages from Oracle and vendor sites. If your site uses the product software in Disconnected mode, a manual process and scripts are available for you to update the images and packages in your local knowledge base. Alternatively, you can operate in Disconnected mode and then change to connected mode to update the images, then change back to Disconnected mode. As an administrator, you can easily and quickly change the connection mode. See the [Related Resources for Getting Started with Virtualization](#) section for more information.

### 1.2.2 Agent Controllers and VC Agent Controllers

Several types of agent controllers are available for you to manage your physical and virtual assets.

The actions that you can perform are determined by the type of agent installed. See [Virtualization Agent Controllers](#) for more information.

## 1.2.3 User Permissions and Roles for Virtualization

The required roles for using a feature are listed in each chapter:

- [Roles for Oracle Solaris Zones](#)
- [Roles for Oracle VM Server for SPARC](#)
- [Roles for Oracle VM Server for x86](#)
- [Roles for Server Pools](#)
- [Roles for Managing Virtual Datacenter](#)

See the [Related Resources for Getting Started with Virtualization](#) for more information about the different roles and the permissions they grant.

Contact your administrator to add roles to your user account. You must log out and then log in to see the actions for your revised role.

## 1.2.4 Groups

Oracle Enterprise Manager Ops Center uses groups to help organize and define a set of assets. An asset can belong to multiple groups. One of the main advantages of using groups is that you can apply profiles and plans to a group of like assets instead of individually.

When you discover an asset, the software automatically adds the asset in a system group based on the type of asset. For example, operating systems are automatically added to an Operating Systems group and to a group for that specific release, such as Oracle Linux, Solaris 11 or Solaris 10.

You can create your own user-defined groups and add assets to them. You can manually add assets to groups, or you can create rules that automatically add assets at discovery.

## 1.2.5 Server Pools

You can create a server pool for your virtualization hosts to share resources among all members of the pool. A server pool enables you to balance the load on the resources and provides high availability capabilities. To be a member of a server pool, one or more virtualization hosts must have the same processor architecture and have access to the same virtual and physical networks and storage resources.

See [Server Pools](#) for details on server pools.

## 1.3 Preparing for Virtualization

In preparing for virtualization, you need to know what types of virtualization you want to use and which features you want to use. You must create storage libraries to store the metadata and networks to assign to the zones or logical domains.

- [Storage for Zones and Logical Domains](#)
- [Networks for Zones and Logical Domains](#)

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**Note:**

If you want to update Oracle Solaris 11 operating systems or create Oracle Solaris 11 zones, the Enterprise Controller and Proxy Controllers must be running on a system that is running the Oracle Solaris 11 operating system.

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### 1.3.1 Storage for Zones and Logical Domains

For zones, you must provide storage for the zone and zone metadata.

Zone data is the data that results from its operations. You can store zone data in a local library or a SAN storage library. For zone migration, store the zone data in a SAN storage library.

Zone metadata is the configuration of the zone's operating system, CPU, memory, and network. You can store metadata in a local library or in a NAS library. For zone migration, store the metadata in a NAS storage library.

When you create a zone, you assign it to one of the storage libraries associated with its virtual host. See [Storage Libraries for Virtualization](#) for more details.

For Oracle VM Server for SPARC, you must provide storage for the logical domains. When you associate storage resources with Oracle VM Server for SPARC, the storage becomes available for the logical domains. A virtual disk server (vds), *primary-vds0*, is added to the Control Domain by default. The vds provides virtual disk service to the logical domains to access the storage disks that are not directly assigned to them.

Assigning a PCIe bus or PCIe HBA to a logical domain results in exclusive storage resource for the logical domain. A virtual disk server is also created in the logical domain so that it can provide virtual disk service to other domains.

### 1.3.2 Networks for Zones and Logical Domains

You can establish and manage different types of network infrastructure for Oracle Solaris Zones, Oracle VM Server for SPARC and Oracle VM Server for x86 virtualization technologies.

## 1.4 Virtualization Agent Controllers

A customized discovery profile identifies the assets and credentials needed to add assets to the user interface. Hardware assets are managed using a set of credentials. Operating systems and virtualization software are managed using an Agent Controller installed on the system or using only a set of credentials.

For an asset to be managed, it must be accessible on a network that is associated with a Proxy Controller. When you discover assets, you are given the option to manage them with or without an agent. Agent managed assets enables you to use Oracle Enterprise Manager Ops Center to monitor, update, and virtualize the assets. When an operating system is managed using only a set of credentials, it is considered agentlessly managed. Some features, such as analytics of your virtual environment, are not available when the operating system is managed agentlessly.

Agent Controllers run in two modes, basic and virtualization management. The basic Agent Controller provides support for monitoring and updating of the host operating system. The Virtualization Controller Agent, or VC Agent, supports basic and virtualization control for Oracle VM Server systems and Oracle Zones.

Two types of Virtualization Agent Controllers exist:

- **Zones Virtualization Controller Agent:** Manages the zones running on a global zone and manages zones that are running on the logical domains. Using this agent enables full zone monitoring and management actions. This is also known as the Zones VC agent.
- **Oracle VM Server Virtualization Controller Agent:** Manages the logical domains that are running on the Control Domain. The Oracle VM Server, Control Domain and operating system are reflected in the UI. Using this agent enables full monitoring and management actions for the Oracle VM Server system. This is also known as the Oracle VM Server for SPARC VC agent or LDom VC agent.

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**Note:**

Before Oracle Enterprise Manager Ops Center 12c Release 2, only the Zones Virtualization Controller Agent and the basic Agent Controller were available. If you managed an Oracle VM Server for SPARC in 12c Release 1 or earlier releases, it is managed with the Zones Virtualization Controller Agent. See [Agent Management Options](#) for how to change the controller to the Oracle VM Server VC Agent.

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When you use the **Add and manage various types of assets via discovery probes** option and select the option to agent manage a control domain or a global zone asset, the agent automatically discovers existing logical domains and non-global zones. Oracle Enterprise Manager Ops Center discovers the server and operating system of the control domain or global zone, then installs and configures the Virtualization Controller agent on the control domain or global zone. If the asset has logical domains or non-global zones, the agent discovers them and they appear in the list of assets.

In most cases, Oracle Enterprise Manager Ops Center deploys the Agent Controller needed. When there might be a conflict, you are prompted to choose which type of controller to install.

When you deploy the Agent Controller on an Oracle VM Server for SPARC system, either through OS discovery or by changing the management access, you are prompted to define which of the following types of Agent Controller to install:

- **Zone VC Agent:** The global zone is reflected in the UI. Using this agent enables full zone monitoring and management actions.
- **Oracle VM Server VC Agent:** The Oracle VM Server, control domain and operating system are reflected in the UI. Using this agent enables full monitoring and management actions for the Oracle VM Server system.

---

**Note:**

You cannot create zones on a global zone that is managed agentlessly. For an agentless managed zone, you can boot, shutdown, halt and delete the zone. An Agent Controller is required on the zone when you want to use the full range of OS update actions on the operating system.

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For robust management, use the Oracle VM Server VC Agent to manage the domains. When you have an Oracle VM Server VC Agent installed on a managed system, you can use Oracle Enterprise Manager Ops Center or the Oracle VM Server for SPARC command line to perform configuration operations.

Metadata for all managed logical domains is stored in the Oracle VM Server's default local library. The agent runs on the control domain and monitors the configuration and reflects any changes on the configuration in its copy of the metadata. The Oracle VM Server VC Agent synchronizes the logical domain configuration defined on the control domain with the domain model view in .

The following operations are synchronized:

- Configuration assignment of I/O resources
- Network configuration when adding, removing, or updating virtual switches
- Storage configuration when adding, removing, or updating some Virtual Disk Services and Virtual Disk Devices
- Logical domain configuration when adding, removing, or updating the following guest configurations: CPU, memory allocation and policies, networking, storage, and I/O resources definition.

The Logical Domain can be an I/O Domain with the following I/O resources allocated to it:

- one or more PCIe root complexes (using PCI bus split)
- one or more PCIe End Point (using Direct I/O)
- one or more Virtual Function (using SR-IOV)

## 1.5 Agent Management Options

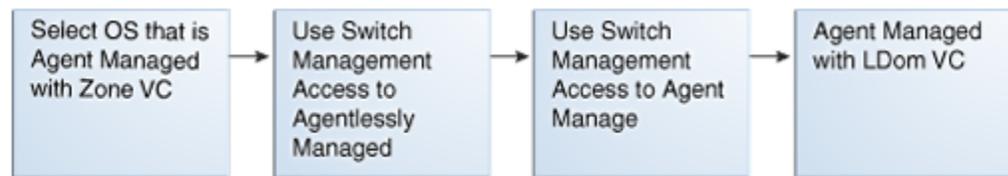
You can install the agent during discovery, or at any time after discovery.

You have the following agent management options:

- **Oracle VM Server for SPARC Virtualization Controller Agent:** Manages the logical domains that are running on the Control Domain. The Oracle VM Server, Control Domain and operating system are reflected in the UI. Using this agent enables full monitoring and management actions for the Oracle VM Server system.
- **Zones Virtualization Controller Agent:** Manages the zones that are running on the logical domains. The global zone is reflected in the UI. Using this agent enables full zone monitoring and management actions.
- **Agentlessly:** Limited management functionality is available with this method. Information is gathered by using SSH connection between the logical domains and the Proxy Controller.

### 1.5.1 Change the Type of Agent Controller

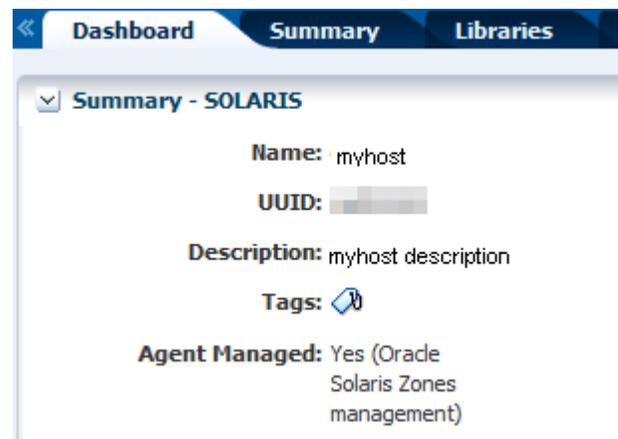
To switch between the different agent controllers, you must use the Management Access point, agentlessly manage the asset and then manage again. [Figure 1-1](#) is an example flow of selecting an operating system that is agent managed with a zone VC agent, switching to agentlessly managed, then switching back to agent managed and selecting the Oracle VM Server VC agent. Alternatively, you can also delete the asset and re-discover it.

**Figure 1-1 Flow to Change the Type of Agent Controller**

When you manage the asset, you are prompted to choose the type of Agent Controller when it is not obvious which type of agent you want to install.

1. Expand **Assets** in the Navigation pane.
2. Expand **Servers**, then select the operating system.

The current management status appears in the Dashboard tab.

**Figure 1-2 Agent Managed with an Oracle Solaris Zones Management Agent**

3. Click **Switch Management Access** in the Actions pane.
4. Add or select the credentials for the system, then click **Finish**.
  - (Optional) To create a new set of credentials, click **New** and complete the Create Credentials Wizard, then click **OK**.
  - (Optional) To select from a list of existing credentials, click **Select**, highlight the credentials from the list of available credentials, then click **OK**.

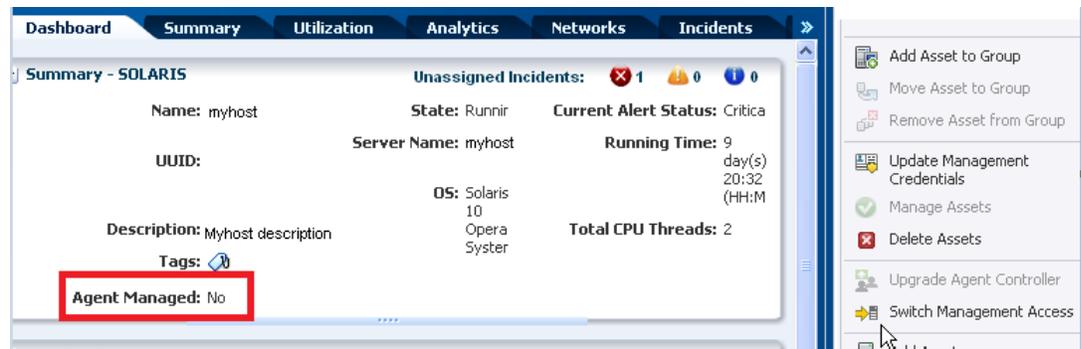
**Figure 1-3 Switch Management Access**



Wait for the job to finish. When the job finishes, the Asset is not agent managed.

- Expand **Assets**, then **Servers** in the Navigation pane. Select the same operating system. The operating system is not agent managed. Click **Switch Management Access** in the Actions pane.

**Figure 1-4 Switch Management Access**



- Select the check box to Enable Oracle VM Server for SPARC management to install that type of agent, then click **Finish**.

**Figure 1-5 Switch Management Access From Agentless to Agent**

Wait for the job to finish. When the job finishes, the Asset is agent managed for Oracle VM Server for SPARC.

## 1.6 Introduction to Virtualization Management

Oracle Enterprise Manager Ops Center enables you to manage the lifecycle of virtualized operating systems and hardware, and provides centralized management of the virtualization infrastructure.

The following technologies are supported:

- **Oracle Solaris Zones:** Operating system virtualization for SPARC and x86 platforms.
- **Oracle VM Server for SPARC:** Hardware virtualization on a SPARC platform.
- **Oracle VM Server for x86:** Hardware virtualization on an x86 platform.

**Operating system virtualization** uses Oracle Solaris Zone partitioning technology to virtualize operating system services, and provide an isolated and secure environment for running applications. When you create a non-global zone, you produce an application execution environment in which processes are isolated from all other zones. This isolation prevents processes that run in a zone from monitoring or affecting processes that run in any other zones. See also global zone and non-global zone.

**Hardware virtualization** is a technology that creates multiple virtual systems on a single piece of physical hardware. When you create a hardware virtualized (HVM) guest, you must supply an ISO file in a repository to create the virtual machine. You can also virtualize hardware with paravirtualized drivers, PVHVM. PVHVM is identical to HVM, but has additional paravirtualized drivers for improved performance of the virtual machine. PVHVM improves the performance level of Microsoft Windows running in guests.

**Oracle VM Server for SPARC** is hardware virtualization technology that enables the creation of multiple virtual systems by a hypervisor in the firmware layer, interposed between the operating system and the hardware platform. This is designed to abstract the hardware and can expose or hide various system resources, allowing for the

creation of resource partitions that can operate as discrete systems, complete with virtual CPU, memory and I/O devices.

**Oracle VM Server for x86** is hardware virtualization technology that runs on x86 platforms. It is a managed virtualization environment, or part of such an environment, that is designed to provide a lightweight, secure, server-based platform for running virtual machines. Oracle VM Server for x86 is based upon an updated version of the underlying Xen hypervisor technology, and includes Oracle VM Agent.

### 1.6.1 Roles for Oracle VM Server for SPARC Domains

All logical domains are the same and can be distinguished from one another based on the roles that you specify for them. The following are the roles that logical domains can perform:

- **Control domain:** The control domain is the first domain created when you install the Oracle VM Server for SPARC software. This is also called the primary domain and denoted as primary wherever applicable in the Oracle Enterprise Manager Ops Center UI. The Logical Domains Manager runs in this domain, which enables you to create and manage other logical domains, and to allocate virtual resources to other domains. You can have only one control domain per server.
- **Service domain:** A service domain has physical I/O devices and provides virtual device services to other domains. The following are examples of virtual device services: virtual switch, a virtual console concentrator, and a virtual disk server. In the Oracle Enterprise Manager Ops Center UI, the service domain list includes the primary domain, I/O domains, and root domains that can provide virtual device services. You can have more than one service domain, and any domain can be configured as a service domain. You should not run any applications in service domains.
- **I/O domain:** An I/O domain has direct access to a physical I/O device, such as a network card in a PCI EXPRESS (PCIe) controller. An I/O domain either uses the physical I/O devices to host its own applications or shares the physical I/O device with other domains in the form of virtual devices.

An I/O domain can share physical I/O devices with other domains in the form of virtual devices when the I/O domain is also used as a service domain.

- **Root domain:** A root domain has a PCIe root complex assigned to it. This domain owns the PCIe fabric and provides all fabric-related services, such as fabric error handling. A root domain is also an I/O domain, as it owns and has direct access to physical I/O devices.

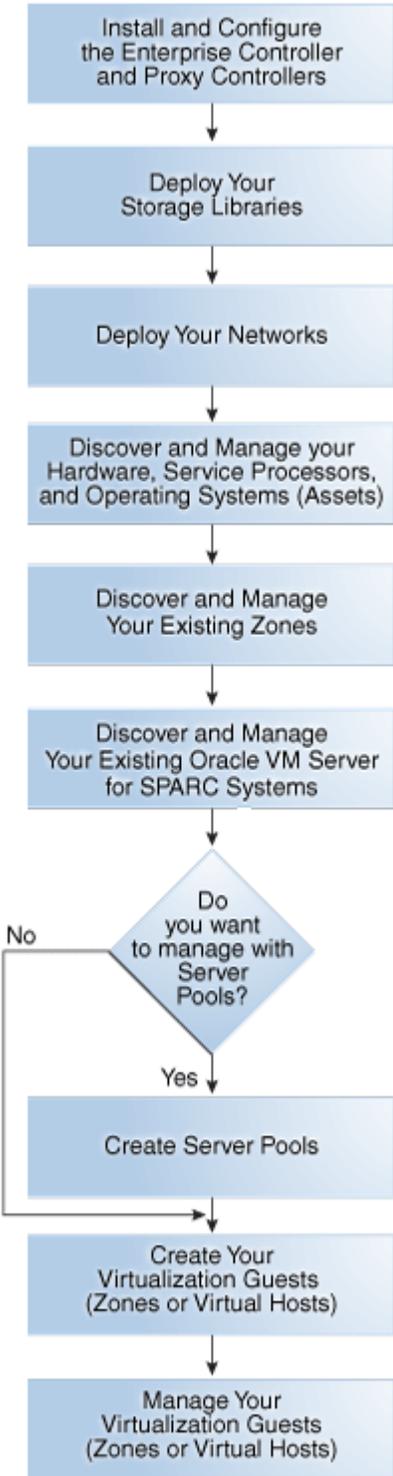
The number of root domains that you can have depends on your platform architecture. For example, if you are using an Oracle Sun SPARC Enterprise T5440 server, you can have up to four root domains.

- **Guest domain:** A guest domain is a non-I/O domain that uses virtual services that are provided by one or more service domains. A guest domain does not have any physical I/O devices, but only has virtual I/O devices, such as virtual disks and virtual network interfaces.

### 1.6.2 Deploy and Manage Virtual Assets

[Figure 1-6](#) is a high-level workflow of the tasks needed to deploy and manage Oracle Solaris Zones and virtual machines.

Figure 1-6 Workflow to Deploy and Manage Virtual Assets



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**Note:**  
When you have zones inside a logical domain, manage the Oracle VM Server for SPARC system *before* managing the zones.

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You can discover and fully manage an existing Oracle VM Server for SPARC, one that you created without using the Oracle Enterprise Manager Ops Center software to provision the Control Domain. See [Related Resources for Getting Started with Virtualization](#) for the procedure to add an existing Oracle VM Server system to the user interface to begin managing the environment.

The software provides appropriate components to keep the physical and virtual systems up-to-date, such as latest firmware, packages, and patches. Oracle Enterprise Manager Ops Center reduces the complexity of deploying and maintaining a virtualization stack.

The following are some of the software features:

- **Asset Discovery:** Use discovery to locate hardware, service processors, operating systems and virtual systems in your data center and add the assets to the user interface.
- **Provisioning:** Provision operating systems on bare-metal systems and virtual systems.
- **Patching:** Update and upgrade your firmware and operating systems with the help of a comprehensive knowledge base. Patching is available for all of the components in the virtualization stack, including physical and virtual systems.
- **Monitoring:** Monitor the physical and virtual systems of the virtualization stack, including individual and aggregate resource utilization for a system.
- **Server pools:** Aggregate virtual resources to cater to specific purposes. Set the server pool policies for optimal use of the physical resources and to migrate virtual systems to another pool to reduce downtime or balance resources.
- **Migration:** Move virtual systems to different physical systems based on the resource usage, hardware failure, and other application requirements.

## 1.7 Introduction to Cloud Management

Oracle Enterprise Manager Ops Center's broad range of virtualization management capabilities work together to provide a comprehensive cloud management solution.

You can use the vDCs feature to enable the deployment and management process for a cloud-based infrastructure. A **cloud** is a defined set of physical resources that includes server pools backed by a virtualization infrastructure, storage, and networks. Use the UI to create, manage, and setup the clouds. The interface also provides options for a cloud user to create, run, and manage their virtual resources in the cloud.

Oracle Enterprise Manager Ops Center provides a cloud web service interface for Infrastructure as a Service (IaaS) functionality. The software also provides a Java Client API and a CLI to manage the cloud web service, enabling you to design applications and run instances on the cloud. See the [Related Resources for Getting Started with Virtualization](#) section for information on the API and CLI.

### 1.7.1 Deploy and Manage a Virtual Data Center

A virtual datacenter (vDC) is a consolidation of your physical resources that share the network and storage resources. A virtual data center has the following physical resources:

- Storage

- Networks
- Server pools

Server pools aggregate virtual resources for specific types of resources. Server pools enable you to optimize the use of physical resources. You can migrate virtual systems to another pool to reduce downtime or balance resources.

Figure 1-7 is a high-level workflow of the tasks needed to deploy and manage a virtual datacenter.

**Figure 1-7 Workflow to Deploy and Manage a Virtual Datacenter**



## 1.8 Related Resources for Getting Started with Virtualization

For instructions in performing actions or to learn more about the role of this feature, go to one of the following resources:

- See the following chapters in the *Oracle Enterprise Manager Ops Center Configure Reference*:
  - See Asset Management for information about discovering and adding assets, and how to create and use groups.
  - See Networks for the requirements and how networks are connected or assigned to the virtualization hosts, virtual host, and the operating system.
- For end-to-end examples, see the workflows and how to documentation in the Deploy How To library at [http://docs.oracle.com/cd/E59957\\_01/nav/deploy.htm](http://docs.oracle.com/cd/E59957_01/nav/deploy.htm) and the Operate How To library at [http://docs.oracle.com/cd/E59957\\_01/nav/operate.htm](http://docs.oracle.com/cd/E59957_01/nav/operate.htm).
- See *Adding an Existing Oracle VM Server for SPARC* in the Deploy How To library at [http://docs.oracle.com/cd/E59957\\_01/nav/deploy.htm](http://docs.oracle.com/cd/E59957_01/nav/deploy.htm) for the procedure to add an existing Oracle VM Server system to the user interface to begin managing the environment.
- See the *Oracle Enterprise Manager Ops Center Administration Guide* for information about users and roles, switching connection modes, and other administrative tasks.
- See *Oracle Enterprise Manager Ops Center Using Disconnected Mode* for how to obtain updates while in disconnected mode.
- See the *Oracle Enterprise Manager Ops Center Cloud Infrastructure API and CLI Reference Guide* for information on the API and CLI.
- See *Oracle Enterprise Manager Ops Center Using Disconnected Mode* for how to obtain updates while in disconnected mode.
- For current discussions, see the product blog at <https://blogs.oracle.com/opscenter>.
- For a list of the Oracle Solaris 11 documentation available in HTML and PDF formats, visit the Oracle Solaris 11 Documentation website at <http://www.oracle.com/technetwork/documentation/solaris-11-192991.html>.
- For a list of the Oracle Solaris 10 documentation available in HTML and PDF formats, visit the Oracle Solaris 10 Documentation website at <http://www.oracle.com/technetwork/documentation/solaris-10-192992.html>.
- For Oracle VM Server for SPARC, see <http://www.oracle.com/technetwork/documentation/vm-sparc-194287.html>.
- See <http://docs.oracle.com/cd/E19044-01/sol.containers/817-1592/> for Oracle Solaris Resource Management and Oracle Solaris Zones documentation.

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# Storage Libraries for Virtualization

This chapter includes the following sections:

- [Introduction to Storage Libraries for Virtualization](#)
- [Discovering Storage Servers](#)
- [Storage Types](#)
- [Using the Storage Libraries](#)
- [Storage Library Setup](#)
- [Roles for Storage Libraries for Virtualization](#)
- [Actions for Storage Libraries for Virtualization](#)
- [Location of Storage Information in the User Interface](#)
- [Storage Libraries for Oracle Solaris Zones](#)
- [Storage Libraries for Oracle VM Server for SPARC](#)
- [Storage Libraries for Oracle VM Server for x86](#)
- [Storage Libraries for Virtual Datacenters](#)
- [Related Resources for Storage Libraries](#)

## 2.1 Introduction to Storage Libraries for Virtualization

Oracle Enterprise Manager Ops Center manages and monitors storage servers and appliances, discovers and provisions storage capacity on these appliances through Storage Connect plug-in software, and then makes them available for use as guests storage.

Storage libraries are the storage resources for Oracle Solaris Zones, Oracle VM Server for SPARC, Oracle VM Server for x86, their server pools, and virtual datacenters. The storage libraries are used for storing the virtual host metadata and for virtual disk storage usage. The storage libraries must be associated with the virtualization hosts for guest storage usage.

Oracle Enterprise Manager Ops Center provides the ability to utilize the two following main types of storage:

- **Filesystem Storage:** File system based storage such as Network Attached Storage (NAS) Libraries and Oracle VM Storage Repository.
- **Block Storage:** Block-based storage arrays that support the Storage Array Network (SAN) protocols like Fibre Channel and iSCSI.

This chapter provides a brief description about different storage types, how they are represented in the UI and supported actions, and how they are associated with the virtualization hosts and used by the guests.

## 2.2 Discovering Storage Servers

Oracle Enterprise Manager Ops Center provides discovery profiles to discover your storage servers. If the storage vendor provides Storage Connect Plug-in for the storage server, then Oracle Enterprise Manager Ops Center checks for the plug-in and exposes the storage device features and attributes. With the discovery of the storage server, the exported file systems, LUNs, clones, and snapshots are populated and displayed in the UI. There are also periodic update of the storage server for any creation or deletion of exported LUNs, file systems, clones and snapshots.

For Oracle VM Server for x86, you must discover the storage resources from the Oracle VM Manager. To add storage to Oracle VM Servers, discover the storage resources from the corresponding Oracle VM Manager. Oracle Enterprise Manager Ops Center provides the UI options from the Oracle VM Manager to discover the storage resources such as Discover File System Storage, Discover SAN Storage and Discover iSCSI Storage. The same options are available from the discovery profile options.

The discovered servers are displayed under Storage in the Assets tree. You can select the storage and the center pane displays the details about the server.

You can manage storage servers like Oracle ZFS Storage Appliance and Oracle Exadata Servers. For Oracle ZFS Storage Appliance, there are more options to launch the appliance UI from the Oracle Enterprise Manager Ops Center UI, and to manage the shares and services of the server.

Oracle Exadata Server are discovered as part of discovering the SuperCluster Engineered Systems.

See the [Related Resources for Storage Libraries](#) section for more information about discovering, managing, and setting up storage hardware in Oracle Enterprise Manager Ops Center.

## 2.3 Storage Types

Oracle Enterprise Manager Ops Center provides support for the following storage types:

- **File System Storage:** The NAS storage libraries are based on the NFS file systems. You can create the storage library by providing the NFS mount point on the discovered storage asset or any other hosts.

Oracle VM Storage Repository are based on NFS or OCFS (Oracle Cluster File System). The repository is especially for Oracle VM Server for x86 systems. Whereas, the NAS storage are used for all other systems. Create the repository by providing the Oracle VM Manager, Oracle VM Server, and the NFS file systems. For OCFS, you must select the LUNs from the list.

- **Block Storage:** Block storage libraries are the storage arrays that support the SAN protocols Fiber Channel and iSCSI. The block storage are also known as SAN libraries. The SAN libraries are groups of Logical Unit Numbers (LUNs). The LUNs supported by one or more storage arrays that are managed by Oracle Enterprise Manager Ops Center form the Dynamic Block Storage Library. In the dynamic block storage library, the user can create, edit or delete the LUNs.

The LUNs supported by one or more storage arrays that are not managed by Oracle Enterprise Manager Ops Center form the Static Block Storage Library. Also,

for storage servers that are discovered and managed with existing LUNs from the static block storage as the user cannot create, edit or delete the LUNs.

- **Local Library and Local Devices:** The file system in the virtualization host are termed as local library. Local library is the default library that is displayed in selecting the storage library. The storage devices that are attached to the virtualization host are defined as local devices. You cannot manage the local devices. You can use to store the data on the local devices.

## 2.4 Using the Storage Libraries

You associate the storage libraries to virtualization hosts like Oracle Solaris Zones, Oracle VM Server for SPARC, and Oracle VM Server for x86. Server pool is a group of homogenous virtualization hosts. Associating a storage library to a server pool results in associating the storage library to all the virtualization hosts in the server pool.

The storage libraries are provided to store ISO images, guest metadata and for disk storage for the guest requirements. The storage libraries store the metadata of the guest such as zones, logical domains, and virtual machines. The metadata storage in the File System storage such as NAS enables to migrate the guests between compatible servers. You cannot store the metadata in SAN storage libraries. You use the SAN libraries only for disk storage purposes of guests.

## 2.5 Storage Library Setup

Prepare your storage resources to be accessed and used by the systems managed in Oracle Enterprise Manager Ops Center. Create appropriate storage libraries depending on the type of storage which are exposed as file system or block storage disks. You can then associate the libraries to the virtualization hosts during provisioning or assign them later.

See the [Related Resources for Storage Libraries](#) section for procedures about creating storage libraries.

## 2.6 Roles for Storage Libraries for Virtualization

This table lists the tasks and the role required to complete the task. Contact your administrator if you do not have the necessary role or privilege to complete a task.

See the [Related Resources for Storage Libraries](#) section for information about the different roles and the permissions they grant.

**Table 2-1 Storage Tasks and Roles**

Task	Role
Create Storage Libraries	Storage Admin
Associate Storage Libraries to Virtualization Hosts	Virtualization Admin or Storage Admin
Add Storage to Virtual Hosts	Virtualization Admin

## 2.7 Actions for Storage Libraries for Virtualization

You can perform the following actions, depending on the requirements:

- Create Storage Libraries

- Edit Library Attributes
- Associate Libraries
- Disassociate Libraries
- Create Local Library
- Remove Storage
- Enable Sharing
- Disable Sharing

## 2.8 Location of Storage Information in the User Interface

This table shows where to find storage information.

**Table 2-2** *Location of Library Information in the BUI*

Object	Location
To see storage libraries	Expand Libraries in the Navigation pane, then scroll to the Storage Libraries. Select the type of library.
To associate storage libraries to virtualization hosts	Expand All Assets in the Navigation pane, then select the virtualization host and click Associate Libraries in the Actions pane.
To add storage to virtual hosts	Expand All Assets in the Navigation pane, select the virtualization host and then the virtual host. Click Add Storage in the Actions pane.
To associate storage libraries to server pools.	Expand Assets in the Navigation pane, then Server Pools in the Resource Management Views. Select the server pool and click Associate Library in the Actions pane.

## 2.9 Storage Libraries for Oracle Solaris Zones

The file systems of the zones are implemented as ZFS file systems and a dedicated zpool is created for each zone. The storage allocated to the zone are pooled in the zpool and used by all the file systems of the zone.

For Oracle Solaris Zones, you can use the following types of storage libraries:

- Local Library and Local Devices
- NAS Storage Libraries
- Static Block Storage Libraries
- Dynamic Block Storage Libraries

Apart from the local library and local devices, associate the other libraries to the global zone. The libraries associated with the global zone are automatically available for all the non-global zones under it. The local storage is always available by default to all the zones.

## 2.9.1 Unmanaged Storage

When you discover and manage existing zone environments, the underlying storage of the zone is considered to be unmanaged and not recognized by Oracle Enterprise Manager Ops Center. You can use the option Move Storage option to move the zone metadata and storage to managed storage.

See [Moving Zone Storage](#) for more information about the procedure.

## 2.9.2 Migration Capability

For migrating the zones, the non-global zone must have shared storage. It is required to store the non-global zone metadata in a shared storage such as NAS storage and the virtual disk storage on SAN libraries. Only then, the migration option is enabled for the zone.

For any unmanaged storage, you must use scripts for migrating the unmanaged storage from the source to the target global zone. See [Migrating Zones](#) for more information about using scripts and other requirements.

## 2.10 Storage Libraries for Oracle VM Server for SPARC

For Oracle VM Server for SPARC, you can assign the following storage libraries:

- NAS Storage Library
- Static Block Storage Library
- Dynamic Block Storage Library

The local storage libraries are available by default. The storage resources when associated with Oracle VM Server for SPARC becomes available for the logical domains. A virtual disk server (vds), *primary-vds0*, is created in the control domain by default. The vds provides virtual disk services to the logical domains to access the storage disks that are not directly assigned to them.

Assigning a PCIe bus or PCIe HBA to a root domain or I/O domain results in exclusive storage resource to the domains. A vds is created in the root domain and I/O domain so that it can provide virtual disk services to guest domains.

### 2.10.1 Virtual Disk Multipathing

You can provide redundant access to the logical domain storage. The alternate path to access the same back-end storage can be provided while creating logical domains or adding storage to logical domains. For each virtual disk of the logical domain, a multipathing group is created and you must specify a group of virtual disk servers (vds) of other domains as the alternate path to the back-end storage access.

A multipathing group is created only when there is more than alternate path to access the back-end storage. You must select an active alternate path when there is a failure in a service domain.

When there is only one alternate path to the back-end storage, then unless you specify a name for the group, the multipathing group is not created.

You can either enter a name for the multipathing or a name is created in the format of *logical domain name\_mpGroup\_devID*. The devID is the disk index. For example, if the name of the logical domain is *ldom*, then the multipathing group name is in the format of *ldom\_mpGroup\_1*.

When you want to migrate guest domains that have multipathing configured for the back-end storage, then the target server must also have the I/O domains or root domains that provide multipathing to the back-end storage. This is essential for live migration of the guest domains. To successfully migrate a guest domain, the target Oracle VM Server must have root or I/O domains that have the same virtual disk service name as that of the source Oracle VM Server.

For example, when *vds1* and *vds2* are the alternate paths for a guest domain virtual disk, then the target Oracle VM Server must also have the same virtual disk servers, *vds1* and *vds2*.

When you create guest domains, you can enable automatic recovery of the guest domains and authorize the recovery of the domains without I/O redundancy. This results in guest domains being recovered on servers when the server pool does not have any servers that do not have any I/O domains or root domains in them.

## 2.10.2 Opaque Storage

When you discover and manage logical domains created using CLI, the logical domain metadata is stored in the local storage library. The virtual disks of the logical domain are on the storage servers that are not managed by Oracle Enterprise Manager Ops Center, and they are defined as opaque storage. You must enable the storage disks as Shared to allow migration or automatically recover guests with opaque file systems.

## 2.10.3 Moving Metadata

When you have the logical domain metadata stored in local storage library, migration option is disabled. You must move the metadata storage from local storage to shared storage such as NAS storage library. Use the **Move Metadata** option to move the metadata of a logical domain to a shared storage.

## 2.10.4 Associating Storage Libraries

When you associate storage libraries with Oracle VM Server for SPARC, you have the option to select to which domain the library is associated. You can associate any storage library with the control domain, I/O domain or root domain provided the domains can access the library. The storage library that is associated with the domain adds to the virtual disk server (vds) of that domain.

For example, when a FC card is installed only in the primary or the control domain, then the FC SAN library must be associated with the control domain only as it is the only domain that can access it. The FC SAN library storage adds to the control domain vds and enables the guest disks to use the storage.

## 2.10.5 Moving Guest Storage

You can move a LUN from one storage library to another. This change can be made without interrupting the assets that are associated with storage library if the assets are able to access both the source and the target library.

## 2.10.6 Adding Storage to Logical Domains

You can add storage to the logical domains from the storage libraries associated with the server pool or the Oracle VM Server for SPARC.

The control domain, I/O domains, and the root domains provide the virtual disk service to the logical domains. Use the option **Add Storage** to add storage to the logical domains.

## 2.11 Storage Libraries for Oracle VM Server for x86

Oracle Enterprise Manager Ops Center provides option to create Oracle VM Storage Repositories. This type of storage library stores virtual machine metadata, templates, assemblies, ISO images, and virtual disks for the Oracle VM Server for x86.

When you create the storage repository on a LUN, it is a block-based repository. When you create the storage repository on a NFS file server, it is a NFS-based storage repository.

When you discover an Oracle VM Manager, Oracle Enterprise Manager Ops Center provides the option to discover the storage servers attached to it. Create discovery profiles for the storage servers and save them.

When you select to discover a storage server, existing discovery profiles are searched for the selected storage type. You can select from an available profile. When there are no profiles available, then the wizard to discover the corresponding storage server appears.

When you discover a storage resource, existing resources such as virtual disks, templates, ISO images, and virtual machine metadata are also discovered and displayed.

The following types of libraries setup are supported for storage of Oracle VM resources:

- **File system Storage:** Oracle Enterprise Manager Ops Center provides an option to create Oracle VM Storage Repositories. A storage repository is a logical disk space made available through a file system on top of physical storage hardware. The supported types of file system are NFS and OCFS. When the storage repository is created on an NFS file server, it is a NFS based storage repository. The NFS file server consists of NFS file systems. When the storage repository is created on a LUN, it is a LUN-based repository. The OCFS file system is created on the storage server. Create storage repositories on these file servers to be used by Oracle VM Servers to store resources. The resources include virtual machine metadata, templates, assemblies, ISO images and virtual disks.

To create Oracle VM storage repositories, you must have an Oracle VM Server discovered. Only NFS-based repositories can be shared by multiple server pools.

- **Static Block Storage Libraries:** The LUNs from the storage arrays that are not managed by Oracle Enterprise Manager Ops Center form the static storage libraries. The LUNs are addressed by iSCSI or Fibre Channel protocols. This forms the iSCSI and SAN static storage libraries. Also, add LUNs exported from managed storage arrays. The LUNs can belong to one library at a time.
- **Dynamic Block Storage Libraries:** The storage servers that are discovered and managed in Oracle Enterprise Manager Ops Center are presented under dynamic block storage libraries. The dynamic block storage libraries contains the exported LUNs from the storage array servers.

## 2.12 Storage Libraries for Virtual Datacenters

The virtual datacenter (vDC) inherits the storage resources allocated for the server pool. The virtualization type of the server pool defines all the possible types of storage resources available for the vDC.

When you create a vDC, you allocate the storage resources to be used for all the accounts created in the vDC. The allocated storage resources are used as root disks of

the virtual servers (vServers) and volumes. Volumes are additional storages that you can attach to the vServers. For volumes, the storage is allocated from the storage libraries that are associated with the server pools. A cloud user can also import external volumes into the account.

The following storage resource that can be designated as volumes for vDCs based on different virtualization types:

- Oracle VM Server for x86 based vDC
  - Oracle VM Storage Repositories
  - Dynamic Block Storage Libraries
- Oracle Solaris Zone based vDC
  - NAS Libraries
  - Block Storage Libraries that include both Dynamic and Static
- Oracle VM Server for SPARC based vDC
  - NAS Libraries
  - Block Storage Libraries that include both Dynamic and Static

## 2.13 Related Resources for Storage Libraries

For instructions on performing actions or to learn more about the role of this feature, go to one of the following resources.

- See the *Oracle Enterprise Manager Ops Center Configure Reference* for more information about moving LUNs from one storage library to another.
- See the Hardware chapter of the *Oracle Enterprise Manager Ops Center Operations Reference* for detailed information about discovering, managing, and setting up storage hardware in Oracle Enterprise Manager Ops Center.
- See the *Oracle Enterprise Manager Ops Center Administration Guide* for information about the different roles and the permissions they grant.
- See [Storage Libraries for Virtualization](#) and the *Deploy Storage Libraries Workflow* in the Deploy How To library at [http://docs.oracle.com/cd/E59957\\_01/nav/deploy.htm](http://docs.oracle.com/cd/E59957_01/nav/deploy.htm) for procedures about creating storage libraries.
- For end-to-end examples, see the *Deploy Storage Libraries Workflow* in the Deploy How To library at [http://docs.oracle.com/cd/E59957\\_01/nav/deploy.htm](http://docs.oracle.com/cd/E59957_01/nav/deploy.htm).
- For current discussions, see the product blog at <https://blogs.oracle.com/opscenter>.

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## Networks for Virtualization

This chapter includes the following sections:

- [Introduction to Networks for Virtualization](#)
- [Roles for Networks for Virtualization](#)
- [Actions for Networks for Virtualization](#)
- [Location of Network Information in the User Interface](#)
- [Manage Networks](#)
- [Physical Fabrics Management](#)
- [Networks and Network Domains](#)
- [Properties of a Network](#)
- [VLAN and VLAN Tags](#)
- [IP Multipathing Groups](#)
- [Link Aggregation](#)
- [Networking for Virtualization and Virtual Datacenter](#)
- [Related Resources for Networks](#)

### 3.1 Introduction to Networks for Virtualization

Oracle Enterprise Manager Ops Center provides extensive management support for your datacenter network infrastructure. It supports both Ethernet and InfiniBand network protocols.

Network management in Oracle Enterprise Manager Ops Center provides a full lifecycle management of network domains, networks, and fabrics. It provides the following services:

- Discover and manage switches
- Define Ethernet fabrics
- Create and define networks
- Create and manage network domains
- Automatic network discovery during asset discovery
- Provision to create private networks on demand

- IP address allocation that includes reserve and release a subnet member
- DHCP management for host interface configuration
- UI support for complex network configurations of virtualization deployments

This chapter provides a brief description about the network management in Oracle Enterprise Manager Ops Center, the different types of network infrastructure that can be setup and managed for virtualization technologies like Oracle Solaris Zones, Oracle VM Server for SPARC and Oracle VM Server for x86.

The prerequisites and how networks are connected to or assigned to the virtualization hosts, virtual host and the OS are described in this chapter.

See the [Related Resources for Networks](#) section for more information about networking.

## 3.2 Roles for Networks for Virtualization

This table lists the tasks and the role required to complete the task. Contact your administrator if you do not have the necessary role or privilege to complete a task.

See the [Related Resources for Networks](#) section for information about the different roles and the permissions they grant.

**Table 3-1 Network Tasks and Roles**

Task	Role
Create Networks	Network Admin
Create Network Domains	Network Admin
Create Private Networks	Network Admin
Define Networks	Network Admin
Assign Networks	Network Admin
Define Ethernet Fabric	Network Admin
Add Fabric	Network Admin
Assign Fabric	Network Admin
Assign Network	Network Admin
Delete Network Domain	Network Admin
Remove Network	Network Admin
Delete Network	Network Admin
Remove Fabric	Network Admin
Delete Managed Fabric	Network Admin
Assign VLAN ID Range	Network Admin
Edit Attributes	Network Admin
Attach Network	Virtualization Admin

**Table 3-1 (Cont.) Network Tasks and Roles**

Task	Role
Connect Guests	Virtualization Admin
Associate Network Domain	Virtualization Admin
Detach Networks	Virtualization Admin

### 3.3 Actions for Networks for Virtualization

You can perform the following actions from the virtualization hosts, server pools, and guests:

- Attach Network
- Connect Guests
- Associate Network Domain
- Detach Networks
- Disconnect Guests from Network
- Modify Physical Connectivity

### 3.4 Location of Network Information in the User Interface

This table shows where to find network information.

**Table 3-2 Location of Network Information in the BUI**

Object	Location
To see fabrics	Expand Networks in the Navigation pane, then select Fabrics in the filter.
To see all network domains	Expand Networks in the Navigation pane, then select Networks in the filter. Network Domains are listed.
To see all network	Expand Networks in the Navigation pane, then select Networks in the filter. Network Domains are listed. Expand a Network Domain to view all networks.
To attach networks to virtualization host	Expand Assets in the Navigation pane and select the Virtualization host. Click Attach Network in the Actions pane.
To connect guests to network	Expand Assets in the Navigation pane and select the guest. Click Connect Network in the Actions pane.
To associate network domains to server pool	Expand Assets in the Navigation pane, then Server Pools in the Resource Management Views. Select the server pool and click Associate Network Domain in the Actions pane.
To attach networks to server pool	Expand Assets in the Navigation pane, then Server Pools in the Resource Management Views. Select the server pool and click Attach Networks in the Actions pane.

## 3.5 Manage Networks

Networks are managed in the following way in Oracle Enterprise Manager Ops Center:

- Discovering an asset automatically discovers the network.
- Discovering and managing a switch automatically discovers all the fabrics in the switch.
- Defining the Ethernet fabrics and assigning VLAN IDs to the fabrics.
- Defining networks by providing network address, gateway, VLAN ID, fabrics, and network services.
- Creating networks by providing network address, gateway, fabric, and network services. Oracle Enterprise Manager Ops Center automatically allocates the VLAN IDs or P-Keys.
- Creating network domains that are administrative containers for networks. The network domains handle the relationship between the physical fabrics and networks constructed on the fabrics.

## 3.6 Physical Fabrics Management

Networks are built on the physical fabrics that provide network resources such as links and IP subnets. The physical fabrics can be fully managed, host managed, or unmanaged in Oracle Enterprise Manager Ops Center.

Depending on the network infrastructure in your datacenter, you can use Oracle Enterprise Manager Ops Center to manage the physical fabrics in the following way:

- **Fully managed fabrics**

When you discover a physical switch in Oracle Enterprise Manager Ops Center, all the fabrics that the switch supports are discovered and managed. A physical fabric can be partitioned to support many logical fabrics. Each port on an Ethernet switch can support 128 fabrics through its VLAN ID. Each partition on an InfiniBand switch can support 32000 partition keys. You can create VLANs or partitions as required. The fully managed fabrics facilitates to create dynamic private network for each VLAN ID or partition key.

- **Host managed fabrics**

The host of the switch is a managed asset in Oracle Enterprise Manager Ops Center. You must manually enable the VLAN IDs or the partition keys on the switch ports connected to the host.

The host managed fabrics facilitates to create dynamic private network for each VLAN ID or partition key.

- **Unmanaged fabrics**

The switches are not managed in Oracle Enterprise Manager Ops Center. The VLAN IDs or partition keys are not available to manage the fabrics through a host. The networks are defined or discovered while discovering an asset in Oracle Enterprise Manager Ops Center. You cannot create dynamic private networks on unmanaged fabrics. Instead, you can assign some of the managed networks on these fabrics as private, called as static private networks.

## 3.7 Networks and Network Domains

You can create, define, or discover the networks in Oracle Enterprise Manager Ops Center as follows:

- [Create and Define Public Networks](#)
- [Create Network Domains](#)
- [Create Private Networks](#)
- [Dynamic Private Network Creation](#)

### 3.7.1 Create and Define Public Networks

Use the **Create Network** or **Define Network** option in the UI to create public networks on the fully managed and host managed fabrics. When you use Create Network option, Oracle Enterprise Manager Ops Center automatically assigns the VLAN IDs or P-Keys.

When you use Define Network option, you must specify the VLAN IDs for host managed Ethernet fabrics. For InfiniBand networks, the P-Keys are automatically assigned. For unmanaged fabric, use Define Network option to create public networks on the fabrics. You do not require to specify any VLAN IDs for Ethernet fabrics.

### 3.7.2 Create Network Domains

A network domain is a container for managed networks that handles the relationship between the physical fabrics that support the networks and the virtualization hosts or server pools that use the networks.

The Oracle Enterprise Manager Ops Center software always has a **Default Network Domain** and all public networks are members of that domain. You can create a user-defined network domain. When you create a network domain, you assign the fabrics and associate the networks that are already known to the system.

### 3.7.3 Create Private Networks

Use the Create Private Network option to create private networks on fully managed and host managed fabrics.

The **Create Private Network** option is useful for environment where you want to isolate applications any services from the public network. Private networks are created within a specific user-defined network domain for a specific purpose.

### 3.7.4 Dynamic Private Network Creation

To facilitate dynamic private network creation from virtual datacenter, associate user-defined network domains with the server pools of the virtual datacenter.

Select fully managed and host managed fabrics in the network domain to dynamically create private networks on demand. When you use unmanaged fabrics, then you must assign some of the existing managed networks assigned to the fabric. You must choose the managed networks that are not in use and do not route to other networks.

## 3.8 Properties of a Network

[Figure 3-1](#) is an example of the network characteristics that appear in the **Details** tab.

**Figure 3-1 Network Details Tab**

Dashboard Details IP Address Allocations Network Services Incidents Monitoring

Network Name: 192.0.2.0/24.1 Network Type: Physical

Description: Max Bandwidth: 100%

Network IP: 192.0.2.0/24

Netmask: 255.255.255.0

Gateway:

MTU: 1500

Fabric Name: Eth Fab at GB\_1 at 192.0.2.1

Media Type: Ethernet

VLAN ID: -

VLAN Tagging: Disabled

Tag Name ▲	Value
No data	

You cannot change the network IP address or the network type. Use the **Edit Network Attributes** action to change the network name and description, default gateway, MTU size, and to change the static IP routes. To change the MTU size, see the instructions for the Maximum Transmission Unit (MTU).

For 15811770:

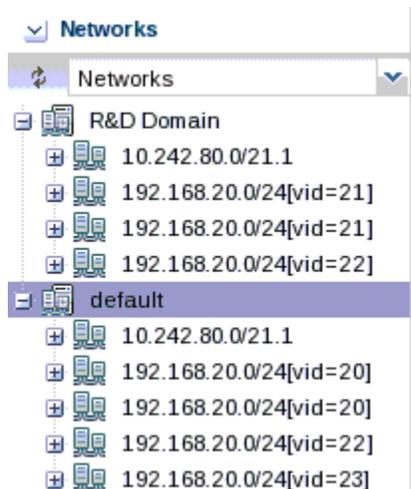
Use the **Edit Managed IP Ranges** action to change the range of IP addresses that are available from the selected network. You specify the range with the starting IP address and the ending IP address. You have the option to exclude a specific IP address from the range. When you attach the network to a virtualization host, server pool, or virtual datacenter, the IP address is not available. You cannot exclude an IP address that is in use, which can be difficult to determine. For example, in a virtual data center, an account is assigned a range of IP addresses for its exclusive use. While the account exists, the IP addresses are in use, regardless of whether there is network activity.

### 3.9 VLAN and VLAN Tags

For fabrics based on Ethernet protocol, the ability to use VLAN tags is an attribute of each network. Use the **Edit Network Attributes** action to add or change the VLAN capability only for networks on fully managed fabrics.

For Bug 16745166, 15811770

When one CIDR supports both tagged and untagged networks, you can distinguish them by the default User Friendly Name (UFN), as shown in [Figure 3-2](#). appends the VLAN ID or tag to the UFN. For an untagged network with no VLAN ID, the [UNTAG] string is appended.

**Figure 3-2 VLAN Tags**

### 3.10 IP Multipathing Groups

Using IP Multipathing (IPMP), two or more physical network interface cards (NIC) form a group that use one IP address. If one NIC fails, the other NIC in the group maintains network access.

A network interface can be a physical network interface card (NIC) or, for an Oracle Solaris OS asset, it can be an IPMP group or link aggregation. You can implement both methods on the same network because they work at different layers of the network stack.

For information about how IPMP groups work in Oracle Solaris 11, see the [Related Resources for Networks](#) section.

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**Note:**

IPMP groups are supported only for IPv4 protocol.

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IPMP provides increased reliability, availability, and network performance for systems with multiple physical interfaces because IPMP detects a physical interface failure and migrates network access to another member transparently.

Using IPMP, you can configure two or more physical interfaces into an IPMP group. If an interface in the group fails or is removed for maintenance, IPMP migrates the failed interface's IP addresses to another member of the group. The failover feature of IPMP preserves connectivity and prevents disruption of any existing connections.

The association between an IPMP group and a network must be unique. You can associate an IPMP group with only one network and you can associate a network with only one IPMP group or individual NICs.

In an IPMP group, you define whether each interface is a failover or a standby interface. The actions of each type differ if the current network interface fails, as follows:

- Network access changes from the failed interface to the failover interface in the IPMP group and uses the failover interface data address. You must provide the data address for an interface that is defined as failover.

- Network access changes from the failed interface to the standby interface in the IPMP group but does not change its data address. The data address of the failed interface migrates to the standby interface.

Link-based failure detection in an IPMP group is always enabled if your interface supports this type of failure detection. You can set up probe-based failure detection by providing a test address for each interface in the group.

You can create a single IPMP group while provisioning an operating system. If you create IPMP groups manually, Oracle Enterprise Manager Ops Center identifies and displays the groups on the UI. See [Creating IPMP Groups](#) for information and procedures for creating IPMP groups.

## 3.11 Link Aggregation

A network interface can be a physical network interface card (NIC) or, for an Oracle Solaris OS asset, it can be an IPMP group or link aggregation. You can implement both methods on the same network because they work at different layers of the network stack.

In an aggregated link, two or more NICs form a group and all members of the link aggregation provide network access at the same time. In addition to the high availability and load balancing that an IPMP group provides, an aggregated link can provide increased throughput when the network ports are also aggregated.

When interfaces have been aggregated, they are treated as a single network interface. Oracle Enterprise Manager Ops Center includes any link aggregations in the list of available NICs as if the link aggregation were an individual interface. To assign a network with a link aggregation to an Oracle VM Server or global zone, select the link aggregation from the NIC list. You can view the link aggregation details on the Oracle VM Server's or global zone's Network tab as described in [Link Aggregation](#).

Link aggregation is a standard defined in IEEE802.3ad. An aggregated link consists of several interfaces on a system configured as a single, logical unit. Link aggregation increases the speed and high availability of a connection between a server and a switch. The most common protocol used to manage link aggregation is LACP (Linked Aggregation Control Protocol).

For information about how link aggregation works in Oracle Solaris 11, see the [Related Resources for Networks](#) section.

In Oracle Solaris 10 and by default in Oracle Solaris 11, the type of link aggregation you create is a trunk aggregation, which has these requirements:

- All the members of the aggregated link are connected to the same switch.
- The members of the aggregated link are of the same type. For example, NICs with the `e1000g` interface cannot be mixed with NICs that use the `bge` interface.
- The required driver is `GLDv3`.

The following is for Bug 16398076

Oracle Solaris 11 supports an alternative to trunk aggregation called Datalink Multipathing Aggregations (DLMP). This type of aggregation overcomes the limitations of trunk aggregation for network virtualization because DLMP aggregation works with more than one switch and provides the benefits of the link layer of the network stack to the aggregation.

In trunk aggregation, every port is associated with every datalink in the link aggregation. In a DLMP aggregation, every port is associated with every datalink in

the link aggregation and every port is associated with the primary network interface and any of its VNICs that are configured to use the link aggregation.

For a link aggregation created in Oracle Solaris 11 OS, the MTU size for all of the members of the aggregation must be at least 9216 bytes to allow Oracle VM Servers and logical domains to use VLAN tagged networks. To change the MTU size, see the Maximum Transmission Unit (MTU) instructions.

## 3.12 Networking for Virtualization and Virtual Datacenter

Oracle Enterprise Manager Ops Center provides systems and users with efficient, controlled and secure sharing of the networking resources. The virtualization properties available in different Oracle Solaris OS version and the virtualization technology are implemented and available through the software UI.

The UI provides options to assign the network connection to the managed assets. You can also select the network interfaces through which the network connection is made to the virtualization host, virtual host and the OS. The attachment and connection varies, depending on the virtualization technology.

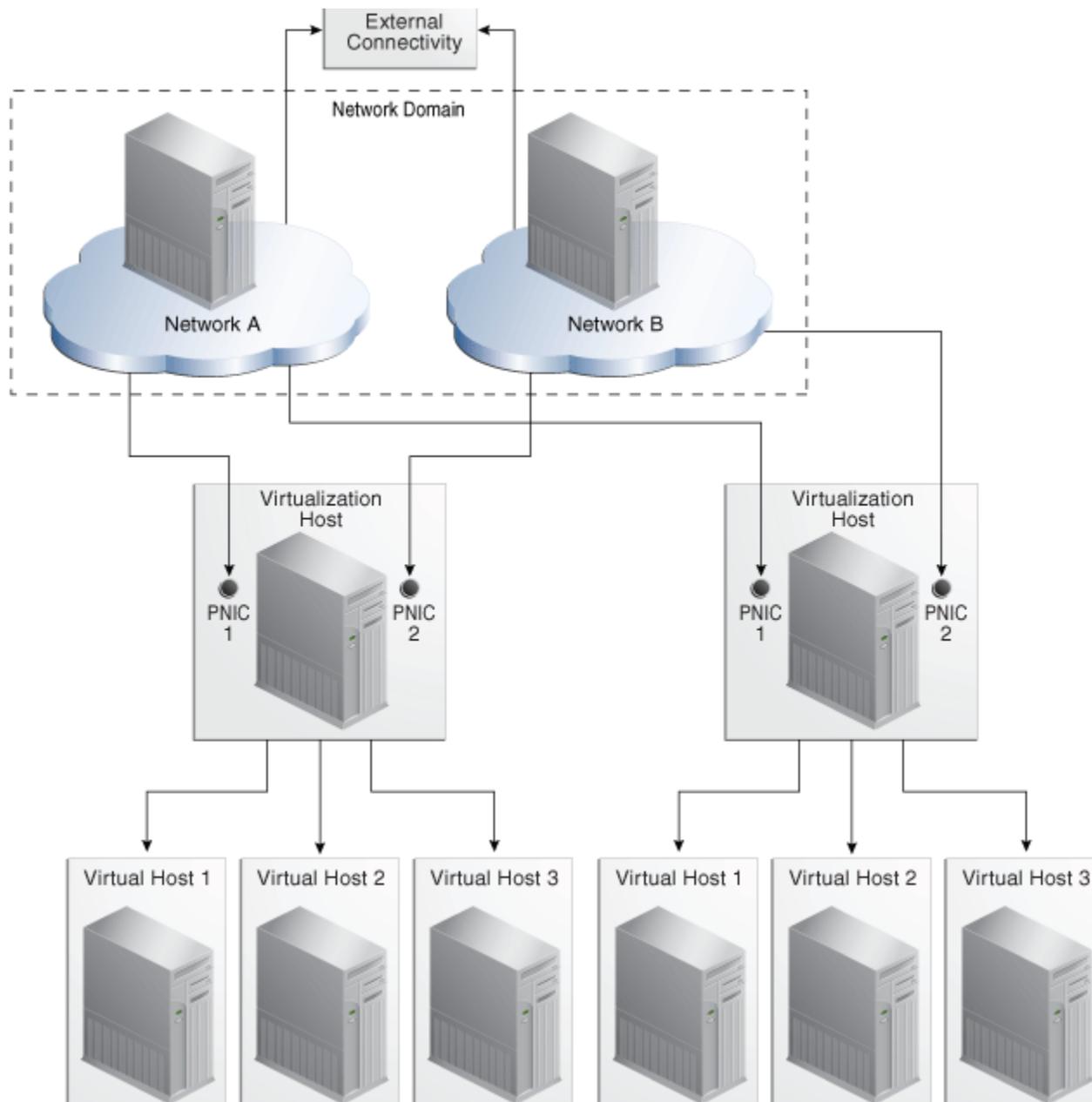
### 3.12.1 Networking for Server Pools

A server pool must have at least one network. When a server pool has more than one network, all virtualization hosts in the server pool are associated with the same set of networks.

When you add a virtualization host to a server pool, the virtualization host is provided access to all the networks defined for the pool. This ensures that all virtual hosts have network access, even when you migrate a virtual host from one virtualization host to another one within the pool.

For zones and Oracle VM Server for SPARC server pool, it is recommended to create server pool that has homogenous network connection. Refer to [Server Pools](#) for more detailed information.

[Figure 3-3](#) is an example of network connections to two virtualization hosts in a server pool. This server pool has two virtualization hosts and two network associations.

**Figure 3-3 Network Connections for a Server Pool**

### 3.12.2 Networking for Zones

When you attach networks to zones, VNICs are created. Virtual Network Interface Cards (VNICs) are pseudo interfaces created on top of datalinks. It has an automatically generated MAC address.

You can define the mode of the network to be attached as Shared IP or Exclusive IP. In Shared IP mode, the global zone shares its network interface with one or more zone. You must define the network interface when you assign the network to the global zone. In Exclusive IP mode, a dedicated network interface is allocated to the zone. You can choose the network interface when you assign the network to a zone.

When a network is assigned as shared on a global zone, you can assign the network as exclusive on another global zone. For a global zone, a network can be attached in

either shared or exclusive mode only. For non-global zones, a network that is used in a shared mode for one zone cannot be used in exclusive mode for another zone.

While you attach networks to a global zone, you can deploy IP Multipathing (IPMP) to obtain better network performance or link aggregation to provide increased reliability, availability, and network performance for systems with multiple physical interfaces.

[Table 3-3](#) identifies the differences in attaching the network for Oracle Solaris 10 OS and Oracle Solaris 11 OS global zone in Oracle Enterprise Manager Ops Center.

**Table 3-3 Differences in Network Connection for Global Zone**

Oracle Solaris 10 OS	Oracle Solaris 11 OS
You can attach network in Shared IP or Exclusive IP mode.	Networks are always attached in Exclusive IP mode.
You cannot make multiple connections to a network.	You can make multiple connections to a network.
You can deploy IPMP or Link Aggregation for better network performance.	You can deploy only Link Aggregation in Oracle Solaris 11 OS.

In Oracle Solaris 11 OS, the network is always attached in exclusive IP mode, this is because a VNIC is created when the zone boots, and deleted when the zone is halted.

When you connect networks to the global zones, you can also select the tagging mode for the networks configured with VLAN ID. You can select Tagged or Untagged mode for the network connection.

### 3.12.2.1 Zones Server Pool

Server pool for zones reflect the networking properties of the Oracle Solaris OS version of the global zones in the pool. You can connect to a network only once for Oracle Solaris 10 OS. Whereas, you can make multiple network connections for Oracle Solaris 11 OS.

For zones server pool that contains a mixture of Oracle Solaris 10 and Oracle Solaris 11 OS, you cannot make multiple connections to a network.

Also, create zones server pool that are homogenous in network tagging mode. It can prevent any network outages for the zones created on the members of the server pool.

Before you attach a network to a server pool, verify that each virtualization host in the server pool has a physical network interface to the network so that all members of the pool can continue to share the network resources of the server pool.

## 3.12.3 Networking for Oracle VM Server for SPARC

You can attach networks to the Oracle VM Server using the physical interfaces or etherstub device that can belong to the control domain, I/O domain, or root domain. When you attach networks to the Oracle VM Server, you can select the service domain and the physical network interfaces available from that domain.

You can also specify the tagging mode for attaching networks configured with VLAN ID. You can select Tagged or Untagged mode for the network connection.

Attaching networks to Oracle VM Server result in the creation of a virtual switch for each network connection. This is not applicable for SR-IOV enabled networks. See [SR-IOV Enabled Networks](#) for more information about attaching SR-IOV enabled networks.

You can make multiple connections to a network in the control domain. For each network connection, a virtual switch is required. If there is an already existing virtual switch for the physical interface or etherstub device, you can re-use the virtual switch. If there is no virtual switch for the physical interface or etherstub device, you can either provide a user-friendly name for the virtual switch or a virtual switch is automatically created with a default naming pattern. For an example network 1.1.1.0/24, the virtual switches take the name as 1.1.1.0\_24, 1.1.1.0\_24\_1, 1.1.1.0\_24\_2 and 1.1.1.0\_24\_3. This ensures that the switches have unique names.

When a network connection is made to the server, the virtual switch created is incremented. When you create and start a logical domain, you define the virtual switch that connects to the logical domain. Each virtual switch must be connected to a NIC.

When you connect to the physical interfaces from I/O domains and root domains, the virtual switch is created in the control domain. You cannot define the IP address allocation for the network connection. Instead, you can define the IP address in the OS of the guest domain as required. You can define the IP address only when you use the network interfaces from the control domain or primary.

You can create IPMP groups and aggregate links in the control domain.

### 3.12.3.1 SR-IOV Enabled Networks

An SR-IOV enabled network interface means that there are virtual functions created on the physical functions of the PCIe Endpoint device and you can assign the virtual functions to the logical domains. Oracle Enterprise Manager Ops Center does not create any virtual switch when you connect to a network using SR-IOV enabled network interface. When you select **SR-IOV** option while attaching networks to the Oracle VM Server, only the interfaces on which the virtual functions are created are available for network configuration.

Guest domains that are assigned with SR-IOV enabled networks cannot be migrated. SR-IOV enabled networks are available only from control domain and root domain.

SR-IOV enabled networks on root domain are available only in the following conditions:

- Oracle Solaris 11 Update 1 OS (SRU 4.5) is necessary for dynamic attach of networks.
- Available only from Oracle VM Server for SPARC 3.1 version.
- Refer to Oracle VM Server for SPARC Release Notes at [http://docs.oracle.com/cd/E38405\\_01/html/E38409/index.html](http://docs.oracle.com/cd/E38405_01/html/E38409/index.html) for hardware and firmware requirements for SR-IOV feature.

### 3.12.3.2 Attach Networks to Oracle VM Server for SPARC Server Pool

Before you attach a network to a server pool, verify that each virtualization host in the server pool has a physical network interface to the network so that all members of the pool can continue to share the network resources of the server pool.

The following options are available when you attach networks to the server pool:

- You can select the service domain which provides the network interface for the network connection.
- If the Oracle VM Server is already connected to the network, you can keep the existing connection or make a new connection.

- If there are any virtual switches available for the network interface, you can re-use the virtual switches.
- If there are no virtual switches, you can either provide a name for the virtual switch or a virtual switch is automatically created with a default naming pattern.
- You can select the tagging mode for the networks configured with VLAN ID.

It is recommended to maintain server pool networks attached either in tagged or untagged mode to the server pool members. You can maintain server pool with mixed configuration. There is likely occurrence of network outage in the logical domain OS when you try to migrate the logical domain between servers that have different tagging modes. To avoid such outage, maintain the server pool members with homogenous network condition. Refer to [Network Tagging Mode Conditions](#) for more information about selecting tagging modes for the network connection.

### 3.12.3.3 Connect Networks to Logical Domains

You can connect networks to logical domains in running state. You can make multiple connections to a network. For each connection, you require a virtual switch or virtual function of SR-IOV enabled networks to connect the logical domain to the network.

You can re-use a virtual switch to make multiple connections to a network from the logical domain or use the same virtual switch to connect to a network for different logical domains. A virtual network device or vnet is defined when you connect the logical domain to a network through a virtual switch. For each network connection, a vnet is created. Oracle Enterprise Manager Ops Center tries to re-use the vnets. This reduces the number of vnets created for the network connections.

You can connect network root domains and I/O domains only when their operating systems are managed in Oracle Enterprise Manager Ops Center.

When you connect networks to logical domains, you can define the following parameters for the connection:

- Select the service domain that will provide the network services.
- Select the network mode as Tagged or Untagged for an VLAN ID network.
- Select SR-IOV enabled network connection.
- Select the virtual switch or the virtual function for SR-IOV enabled network function through which the logical domain is connected to the network.

You need an untagged network connection for provisioning OS on the logical domain. If the network is already configured with an VLAN ID, then select Untagged option while connecting the logical domain to the network.

When the network is connected to logical domain using Oracle Enterprise Manager Ops Center, by default 10 alternate MAC addresses are created.

## 3.12.4 Networking for Oracle VM Server for x86

During the installation of Oracle VM Server, the network interface used for the management is configured as a bonded interface. The bond is created with one interface and named as bond0. You can create additional bonds to add redundancy and load balancing of your network environment.

Attach networks to the Oracle VM Server or to the server pool that consists of a group of Oracle VM Servers on an Oracle VM Manager. Configure the network interfaces or

the bonds to the network to be attached. You can assign different roles or functions to the networks attached to the Oracle VM Server.

The following are the network roles available for an Oracle VM Server:

- **Server Management:** Manages the Oracle VM Servers in a server pool. The Oracle VM Manager has one Server Management network.
- **Live Migrate:** Migrates the virtual machines from one Oracle VM Server to another in the server pool, without changing the state of the virtual machine.
- **Cluster Heartbeat:** Verifies that the Oracle VM Servers in the server pool are running.
- **Virtual Machine:** Monitors the network traffic between the virtual machines in a server pool.
- **Storage:** Transfers between virtual machines and virtual disks.

The management network created during the installation of Oracle VM Server has the following roles:

- Server Management
- Cluster Heartbeat
- Live Migrate

You can add and remove the roles of this management network, except for the Server Management role.

Depending on the available network interfaces on the Oracle VM Server, you can attach networks to Oracle VM Server and assign different roles to the networks. For example, you can attach the network in which your storage servers are placed and assign the Storage role to that network. You can assign a network with Live Migrate to be used only for migration.

### 3.12.5 Networking for Virtual Datacenters

Each virtual datacenter uses server, storage, and network resources in a dynamic way, allocating and releasing resources when necessary.

The virtual datacenter inherits its network resources from the network domain that supports the server pool. These networks form the public external networks for the virtual datacenter. These networks can then be assigned to the accounts in the virtual datacenter. When the user of an account creates a private vNet, either a dynamic private network is created or the static private network is made available for use in that account.

For a complete description of networks for virtual datacenters, see [Creating vNets](#) and [Setting Up Network Resources in Virtual Datacenters](#).

## 3.13 Related Resources for Networks

For instructions in performing actions or to learn more about the role of this feature, go to one of the following resources.

- For information about how IPMP groups and link aggregation work in Oracle Solaris 11, see the *Network Interfaces and Network Virtualization* at <http://www.oracle.com/technetwork/documentation/solaris-11-192991.html>. For Oracle Solaris 10, see *IP Services* at <http://>

[www.oracle.com/technetwork/documentation/solaris-10-192992.html](http://www.oracle.com/technetwork/documentation/solaris-10-192992.html).

- See the *Oracle Enterprise Manager Ops Center Administration Guide* for information about the different roles and the permissions they grant.
- For more detailed information and procedures about networking, refer to the Networking chapter in *Oracle Enterprise Manager Ops Center Configure Reference*.
- For current discussions, see the product blog at <https://blogs.oracle.com/opscenter>.



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# Oracle Solaris Zones

This chapter includes the following sections:

- [Introduction to Oracle Solaris Zones](#)
- [Roles for Oracle Solaris Zones](#)
- [Actions Available for Oracle Solaris Zones](#)
- [Location of Oracle Solaris Zones Information in the User Interface](#)
- [Preparing Your Global Zone](#)
- [Discovering and Managing Existing Zones](#)
- [Outline of Zone Creation](#)
- [Determining Zone Requirements](#)
- [Zone Configuration Parameters](#)
- [Creating a Zone Profile](#)
- [Creating a Kernel Zone Profile](#)
- [Creating and Deploying Zone Plans](#)
- [Creating and Deploying Zones on a Logical Domain](#)
- [Creating and Deploying Zones on a Kernel Zone](#)
- [Managing Zones](#)
- [Migrating Zones](#)
- [Recovering Zones](#)
- [Zones Server Pool](#)
- [Updating Zones](#)
- [Related Zone Operations](#)
- [Related Resources for Oracle Solaris Zones](#)

## 4.1 Introduction to Oracle Solaris Zones

Oracle Solaris Zones, also known as Oracle Solaris Containers, are used to virtualize operating systems and provide an isolated and secure environment for running

software applications. A zone is a virtualized operating system environment created within a single instance of the Oracle Solaris operating system.

Think of a zone as a box with flexible, software-defined walls. One or more applications can run in this box without interacting with the rest of the system. Because zones isolate software applications or services, applications that are running in the same instance of the Oracle Solaris OS are managed independently of each other. For example, you can run different versions of the same application in separate zones.

Zones require a machine that is running an Oracle Solaris 10 or later release.

### 4.1.1 Global and Non-global Zones

The global zone is the default operating system and has control over all of the processes and has system-wide administrative control. The global zone oversees the CPU, memory, and network resource allocation of all of the non-global zones. A global zone always exists, even when no other zones are configured.

Non-global zones, or simply zones, are configured inside the global zone. Zones are isolated from the physical hardware by the virtual platform layer. A zone cannot detect the existence of other zones.

### 4.1.2 Types of Non-Global Zones

You can create different types of non-global zones for different purposes. The zones can be broadly classified as native zones and kernel zones. The native zone can be a sparse, whole root, or branded zone.

Each of the zones is described as follows:

- **Sparse Root Zone:** Contains a read/write copy of a portion of the file system that exists on an Oracle Solaris 10 global zone. Other file systems are mounted read-only from the global zone as loop-back virtual file systems. As part of creating a sparse root zone, the global administrator selects which file systems to share with the sparse root zone and the default read-only file systems: `/usr`, `/lib`, `/sbin`, and `/platform`. All packages that are installed on the global zone are available to the sparse root zone; a package database is created and all files in the mounted file system are shared with the zone.

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**Note:**

Sparse root zones are not available beginning with Oracle Solaris 11. You can create sparse root zones only in Oracle Solaris 10.

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- **Whole Root Zone:** Contains a read/write copy of the entire file system that exists on the global zone. When a whole root zone is created, all packages that are installed on the global zone are available to the whole root zone; a package database is created and all files are copied onto the whole root zone for the dedicated and independent use of the zone.
- **Branded Zone:** The non-global zone runs the same operating system software on the global zone. The branded zone facility is used to create non-global branded zones that contain operating environments different from that of the global zone. For example, you can install Oracle Solaris 8, 9, or 10 in a branded zone.

- **Kernel Zone:** A kernel zone is a zone which runs its own dedicated kernel. A kernel zone's operating system can be at a different update level from the global zone. Kernel zones can also support nested zones, which can be discovered and managed.

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**Note:**

Oracle Solaris 11 Immutable Zones and Zones on Shared Storage (ZOSS) are not supported.

Oracle Solaris 11 shared IP zones support is limited to basic monitoring.

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### 4.1.3 Zones and Virtual Machines

Oracle Enterprise Manager Ops Center supports three types of virtualization:

- Oracle Solaris Zones: operating system virtualization
- Oracle VM Server for SPARC: hardware virtualization on a SPARC platform
- Oracle VM Server for x86: hardware virtualization on an x86 platform

You can create and manage zones within virtualized hardware on both SPARC and x86 platforms, including managed zones in Control Domains and I/O Domains.

## 4.2 Roles for Oracle Solaris Zones

The following table lists the tasks and the role required to complete the task. Contact your administrator if you do not have the necessary role or privilege to complete a task.

See the [Related Resources for Oracle Solaris Zones](#) section for information about the different roles and the permissions they grant.

**Table 4-1 Oracle Solaris Zones Tasks and Roles**

Task	Role
Create, manage, update, and delete zones	Virtualization admin
Provision and manage virtualization host	Virtualization admin
Discover and manage virtualization hosts	Asset admin
Create and manage zone profiles and plans	Profile and plan admin
Create and manage IPMP groups	Network admin
Create and manage Link Aggregation	Network admin
Set monitor thresholds	Asset admin

## 4.3 Actions Available for Oracle Solaris Zones

Oracle Enterprise Manager Ops Center provides the following solution for managing your zones environment in a data center:

- Create zones using profiles and deployment plan.

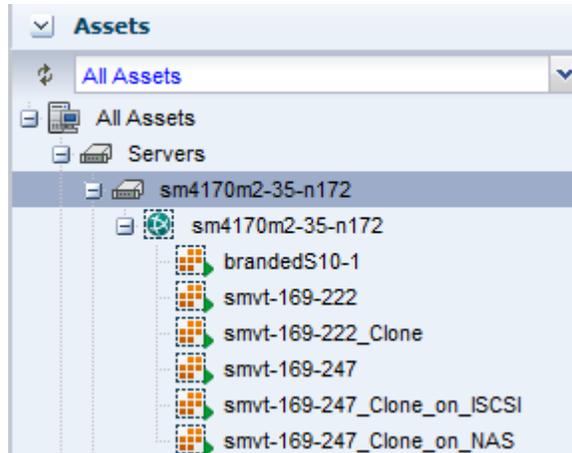
- Discover and manage existing zone environments.
- Perform zones functions such as booting, rebooting, shutting down, cloning, migrating and delete zones from the software UI.
- Manage zone configuration such as file systems, storage, and networks from the UI.
- Aggregate your NICs or create IP Multipathing (IPMP) groups.
- Create zones server pool for balancing available resources and provide the infrastructure support for virtual datacenter creation.
- Use UI and native CLI interchangeably to create and manage zones.
- Complete support for managing Oracle Solaris 11 zones.
- Options to upload scripts to manage the unmanaged file system and zone dependencies.

## 4.4 Location of Oracle Solaris Zones Information in the User Interface

This figure shows how zones appear beneath the global zone in the Assets section of the user interface.

The zones appear with a different icon. Badges on the icon indicate the status of the zone. The green triangle badge indicates that the zone is running. The black circle with a white vertical line indicates that the zone is shut down.

**Figure 4-1 Zone Display in the UI**



This table lists where to find the different information about zone in the UI.

**Table 4-2 Location of Zone Information in the UI**

To See	Location
Zones	Expand Assets in the Navigation pane. The operating system under which the zones are created are listed with the icons representing it.

**Table 4-2 (Cont.) Location of Zone Information in the UI**

To See	Location
Zone resources	Expand Assets in the Navigation pane, then select Oracle Solaris OS. Select a zone listed under it. The center pane lists the zone information such as Storage, Networks, Analytics, and Summary.
Zone actions	Expand Assets in the Navigation pane, then select Oracle Solaris OS. Select a zone listed under it. The Actions pane lists the various zone actions such as Add Storage, Migrate Zone, Replicate Zone, Connect Network, Add File System, Move Storage, Boot, Halt, Shutdown, and Reboot Zone.
Kernel zone resources	Expand Assets in the Navigation pane, then select Servers. Select a kernel zone listed under it. The center pane lists the zone information such as Storage, Incidents, Configuration, and Summary.

## 4.5 Preparing Your Global Zone

The global zone is the default Oracle Solaris 10 or 11 operating system installed on a system. When you provision systems, you can use the **Add Assets** or **Find Assets** option in Oracle Enterprise Manager Ops Center to discover the global zone.

See the [Related Resources for Oracle Solaris Zones](#) section for information on provisioning a system with an Oracle Solaris operating system.

Each global zone has an `/etc/patch/pdo.conf` file that specifies the number of processes that are forked to execute the patch utilities in parallel on a zoned system. The file contains a `num_proc=` entry indicating the number of processes to be forked. Oracle Enterprise Manager Ops Center requires the number of CPUs on the system to be `*1.5`.

Beginning with Oracle Enterprise Manager Ops Center 12.2.2.0.0, the software checks this file every 12 hours, during an agent refresh, and makes the following adjustments:

- If the file does not exist, the software creates the file with the following entry:  
`num_proc=Number of CPUs on the system*1.5`.
- If the file exists, but the value in the entry is incorrect, where `num_proc=Value is not equal to Number of CPUs on the system*1.5`, the software removes this entry and appends to the contents of the file an entry: `num_proc=Number of CPUs on the system*1.5`.

If the file exists with a correct entry: `num_proc=Number of CPUs on the system*1.5`, the file is not changed or updated. For more information about this file, see the Oracle Solaris Zones `pdo.conf` man page.

You must prepare your global zone with the network and storage resources that the non-global zones will use, including associating the required storage libraries with the global zone and attaching networks to the global zone. You can also aggregate the interfaces or create IPMP groups in the global zone before you connect them to the zones. The use of IPMP and link aggregated interfaces results in enhanced network availability for the zones.

This section covers the following topics:

- [Associating a Storage Library with a Global Zone](#)
- [Managing Global Zone Networks](#)
- [Creating IPMP Groups](#)
- [Creating Link Aggregation](#)
- [Modifying and Detaching a Network from the Global Zone](#)

## 4.5.1 Associating a Storage Library with a Global Zone

Global and non-global zone metadata and the data that is the output of operations is saved in a SAN or NAS storage library.

You can associate the following types of storage libraries to a global zone:

- Filesystem storage: NAS libraries
- Block storage: SAN and Dynamic storage libraries

Libraries associated with the global zone are available to all of the zones in the hierarchy of the global zone. A list of available LUNs appears when you create a new zone. When you associate a storage library with the global zone, discovers the available LUNs. A list of available LUNs appears in the wizard when you create a new zone in the global zone. When you select the LUN for the zone, the LUN is reserved for that zone and is not available for other zones. When the SAN storage library is associated with a zones server pool, the LUNs are available to all global zones in the pool.

When using a SAN storage library, the metadata and data are stored on LUNs that are managed by the SAN storage library that is associated with the global zone. The number of LUNs determines the number of zones that the library can support. SAN LUNs are associated with Fibre Channel or iSCSI target groups. Fibre Channel targets use a dedicated optical network and iSCSI targets use the IP network. In both cases, the targets in the target group expose the LUNs as a storage resource for the zones.

When you use LUNs backed by Fibre Channel disks, the block storage is static. You cannot change the size of the LUNs, create LUNs, or delete LUNs in the UI. When the LUNs are not in use, you can add LUNs to the library or remove LUNs.

For information about how to create SAN and NAS storage libraries, see the [Related Resources for Oracle Solaris Zones](#) section.

### 4.5.1.1 To Associate a Library With the Global Zone

You can associate a library with a global zone.

1. Select the global zone in the Assets section.
2. Click **Associate Libraries** in the Actions pane.

The Associate Library window lists the libraries that are not associated with the global zone.

3. Select one or more libraries to add.
4. Click **Associate Libraries**.

A job is submitted to associate the libraries with the global zone.

### 4.5.1.2 To Disassociate Libraries From the Global Zone

When you disassociate a library from the global zone:

- The libraries are not available to new zones.
- The libraries remain associated to existing non-global zones in that global zone.

1. Select the global zone in the Assets section.
2. Click the **Libraries** tab in the center pane.

The associated libraries with the global zone are listed.

3. Select a library from the list.

The Disassociate Library icon is enabled.

4. Click the **Disassociate Library** icon to display the Disassociate Library window.
5. Click **Disassociate Library** to confirm unmounting the library.

## 4.5.2 Managing Global Zone Networks

You can attach one or more networks to global zone using the Attach Networks option. When your networks are grouped as network domains in Oracle Enterprise Manager Ops Center, select the domain and choose the corresponding networks to be attached.

When you assign a network to a stand-alone global zone, you must define the mode of the network, either Shared IP or Exclusive IP:

- In Shared IP mode, the global zone shares its network interface with one or more zone. You must define the network interface when you assign the network to the global zone.
- In Exclusive IP mode, a dedicated network interface is allocated to the zone. You can choose the network interface when you assign the network to a zone.

Beginning with Oracle Enterprise Manager Ops Center 12.2.2.0.0, the type of IP (Shared or Exclusive) that is assigned appears in the non-global zone's Summary tab.

A network that is assigned as shared on a global zone can be assigned as exclusive on another global zone. For a global zone, a network has only one mode. For non-global zones, a network that is used in a shared mode for one zone cannot be used in exclusive mode for another zone.

You can attach networks that are configured with VLAN ID or P-key. When you use networks with VLAN ID, you can select to attach the network in tagged or untagged mode.

While you attach networks to a global zone, you can deploy IP Multipathing (IPMP) to obtain better network performance or link aggregation to provide increased reliability, availability, and network performance for systems with multiple physical interfaces.

For stand-alone global zones with Oracle Solaris 10 OS, network can be attached in shared or exclusive IP mode. Whereas with Oracle Solaris 11 OS, the network is always attached in exclusive IP mode. This is because a virtual NIC or VNIC is created when the zone boots and deleted when the zone is halted.

This scenario is different for attaching networks to global zones that are in a server pool. See [Attaching Networks](#) for more information about attaching networks in a zones server pool.

Some of the networking conditions that must be followed while attaching the network in tagged or untagged mode:

- You can select networks without VLAN ID. The UI does not provide the option to select Tagged or Untagged mode.
- You can select to associate and configure the networks with VLAN ID in Tagged mode.
- You can select to associate and configure the networks with VLAN ID in Untagged mode.
- You can select to configure the networks in mixed tagging mode in the server pool. For example, you can attach the network N1 with VLAN ID = 100 in tagged mode with the server S1 and in untagged mode for server S2. Refer to [Mixed Network Tagging Mode Configuration](#) for more detailed information.
- You can attach networks whose VLAN ID is similar to another network already connected to the servers. For example, a server S1 is already connected to network N1 with VLAN ID = 100, then while creating the server pool with S1 as the member of the pool, you can attach a network N2 with VLAN ID =100.
- You can edit the VLAN ID of a network when you are attaching the network in Tagged mode for the first time.
- When you can edit the VLAN ID of the network, you cannot enter -1 as the value for the VLAN ID.
- If the selected network with a VLAN ID is already connected to the selected assets in Tagged mode, then you cannot edit the VLAN ID and make another connection.
- You cannot make multiple network connections to the global zone over the same network in both tagged and untagged modes. The mode can be either in tagged or untagged mode only. For example, if you attach network N1 with VLAN ID =100 for the first time to server S1 in Tagged mode, then you cannot make another connection to the same network N1 in Untagged mode. Every other connection with network N1 must always be in Tagged mode for server S1.
- If the selected members of the pool are already connected to network N1 with VLAN ID =100, then you cannot select the same network with different VLAN ID to be connected for the server pool.

#### 4.5.2.1 IPMP Groups

IPMP groups provide network failover for your global and non-global zones. You can configure one or more physical interfaces into an IPMP group in the global zone and extend that functionality to the non-global zones.

After configuring the IPMP group, the system monitors the interfaces in the IPMP group for failure. If an interface in the group fails or is removed for maintenance, IPMP migrates, or fails over, the failed interface's IP addresses. The failover feature of IPMP preserves connectivity and prevents disruption of any existing connections. The network access changes from the failed interface to the standby interface in the IPMP group and the data address of the failed interface migrates to the standby interface.

See [IP Multipathing Groups](#) and [Creating IPMP Groups](#) for more information about IPMP groups.

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**Note:**

You can create IPMP groups when you attach network in exclusive IP mode on Oracle Solaris 10 and 11 operating systems or you can create an IPMP group without using the attach network option. IPMP groups are not available for shared IP mode networks.

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When you attach networks to a global zone in a shared IP mode, you can create an IPMP group and configure the following characteristics:

- Define the number of members for the IPMP group.
- Select the NICs that are part of the IPMP group. The NICs selected are placed in the IPMP group.
- Select the type of interface:
  - Active interface enables you to provide the data address and choose whether failover must be enabled for the interface for uninterrupted access to the network. This is applicable for Oracle Solaris 10 OS and is inherent in Oracle Solaris 11 OS.
  - Standby interface enables you to provide a test address when you want probe-based detection.
- Select the data addresses for each NIC.

Multiple shared IP zones can use the IPMP group. When you create a zone or connect a network to a zone, the IPMP group appears in the NIC list. Select the IPMP group from the list to connect to the selected network.

#### 4.5.2.2 Link Aggregation

Several interfaces in a system can be aggregated into a single logical link. The aggregation is done as per the standard defined in IEEE802.3ad. When interfaces have been aggregated, they are treated as a single network interface.

Oracle Enterprise Manager Ops Center displays the link aggregation in the list of available NICs as if it were an individual interface. You can assign a network with a link aggregation to a non-global zone, and select the link aggregation from the NIC list.

When you attach a network to a global zone, you can aggregate the physical interfaces and attach to the network. Link aggregation is available for both shared and exclusive IP network stack.

#### 4.5.2.3 To Attach a Network to a Global Zone

When you attach a network to a global zone, you can choose to create an IPMP group or aggregate link.

See [Creating IPMP Groups](#) to create IPMP groups on the global zone without using the attach network option.

The following network options are available:

- **Exclusive network:** For zones that use an exclusive IP network, each zone has a dedicated network interface. You can configure the interfaces when you connect a zone to the exclusive network. An IPMP group requires an exclusive network.
- **Shared network:** The global zone shares the network interface with the zones that use a shared IP network. You must configure the network interfaces of the global zone.

Perform the following steps to attach a network to a stand-alone global zone:

1. Select the global zone in the Assets section.
2. Click **Attach Network** in the Actions pane.

The Attach Network Wizard is displayed.

3. Select the network domain and the corresponding networks that are not yet connected to the asset are displayed in the network list. Select a network from the list.

You can attach one or more networks to the global zone. Click **Next** to configure the networks.

4. For each selected network, select the following information:
  - Select the IP stack as **shared** or **exclusive**.
  - Select the Mode as Tagged or Untagged for networks configured with VLAN ID. If you are attaching the network in Tagged mode for the first time, then you can edit the VLAN ID of the network, provided the VLAN ID is not used by any of the networks attached to the asset.
  - Select the network configuration as **IPMP**, **Link Aggregation**, or **None**. For an exclusive IP stack, only the Link Aggregation network configuration is available.
    - When you select **IPMP** network configuration, you are taken to Step 6 for IPMP configuration.
    - When you select **Link Aggregation** configuration, you are taken to Step 5 to configure the aggregation.
    - When you select **None**, you are taken to Step 7 to configure the network interfaces for shared IP stack or to the Summary step.
  - Enter the number of connections for each network.

The number of connections depends on the Oracle Solaris OS version. For Oracle Solaris 10 OS, you cannot make multiple connections. For Oracle Solaris 11 OS, you can make multiple network connections.

Click **Next**.

5. Provide the following information for link aggregation:
  - The link aggregation name.
  - Select the load balancing policy.

Click **Next** to configure the link aggregation. Specify the following information for link aggregation:

- LACP mode and timer
- MAC address policy and the MAC address if required.

Click **Next** to go to the Step 7 to configure the interfaces.

6. Specify the IPMP group details.

- IPMP group name
- Number of members of the IPMP group
- Select whether the probe-based failure detection must be enabled.

Click **Next** to configure the interfaces.

7. Configure the interfaces for networks that do not have network configuration:

- Specify the NIC and the IP address for the network connection.
- If required, modify the network tagging mode specified for the network connection.
- You can select **System Allocated for the NIC** and **Assign by DHCP** for the system to take care of the NIC and IP address allocation.
- Select **Do Not Allocate IP** for the IP address, when you do not want to allocate IP address for the network connection.

For IPMP group, select the interface that will act as Standby interface. You must have at least one active interface.

Click **Next** to specify the data addresses for IPMP group, otherwise go to Step 9.

8. Enter the data addresses that must be used for the active network interfaces. Also, specify whether failover must be enabled for the interface. You must have more than one interface to enable failover.

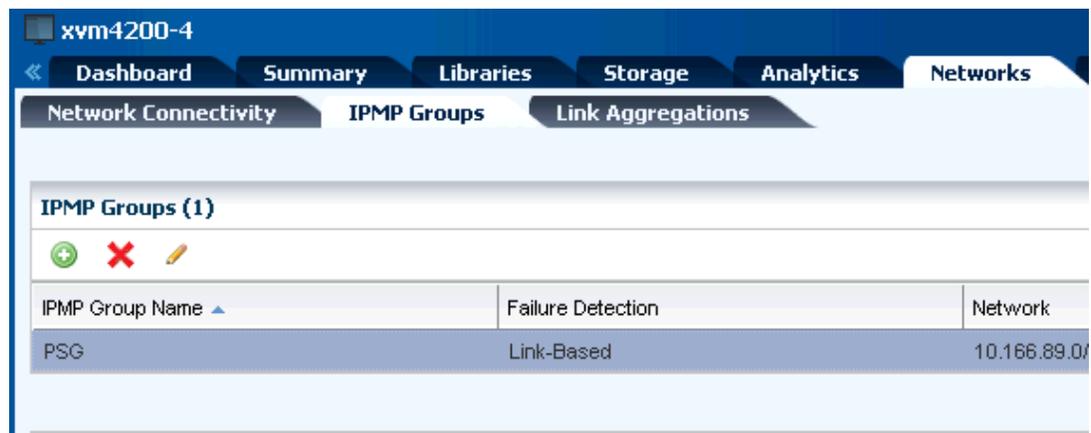
9. Review the information provided for attaching a network to the global zone and click **Finish** to attach the network.

To prevent a failure of the attach network job, ensure that you enter the correct information for different versions of Oracle Solaris OS.

### 4.5.3 Creating IPMP Groups

You can directly create IPMP groups on the global zone without using the attach network option. From the network tabs, you have the option to create and manage the IPMP groups in the selected Oracle Solaris OS.

[Figure 4-2](#) shows the options that are available to create and manage IPMP groups.

**Figure 4-2 IPMP Group Option**

IPMP provides physical interface failure detection, transparent network access failover, and packet load spreading for systems with multiple interfaces. Oracle Enterprise Manager Ops Center provides option to create IPMP groups. You can configure one or more interfaces into an IPMP group. The group functions like an IP interface with data addresses to send and receive network traffic. When an underlying interface in the group fails, the data addresses are redistributed among the remaining underlying active interfaces in the group. Thus, the group maintains network connectivity despite an interface failure. With IPMP, network connectivity is always available, provided that a minimum of one interface is usable for the group. IPMP also provides load spreading for the outbound network traffic across the network interfaces in the group.

To create an IPMP group, you must define the following parameters for the group:

- The active and the standby interfaces of the group. By default, an interface added to an IPMP group is active. You can configure as many standby interfaces as you want for the group.
- The gateway. You can specify a default route for the gateway.
- The link-based failure detection is enabled by default. You must select whether you want to enable Probe-Based failure detection. For probe-based failure detection, you must provide the test address to track the interface status.
- You must assign the data addresses for the physical interfaces in the IPMP group. Data traffic flow use the data addresses that are hosted on the IPMP interface and flow through the active interfaces of that group.

See the [Related Resources for Oracle Solaris Zones](#) section for information about using the tagged and untagged mode for the networks that are configured using different media type. The tagging mode also varies for different Oracle Solaris OS versions.

#### 4.5.4 Creating Link Aggregation

You can also create link aggregation directly on the Oracle Solaris OS. To create link aggregation, you must define the following details:

- Load balancing policy
- LACP mode and timer
- MAC address policy and if required, the MAC address

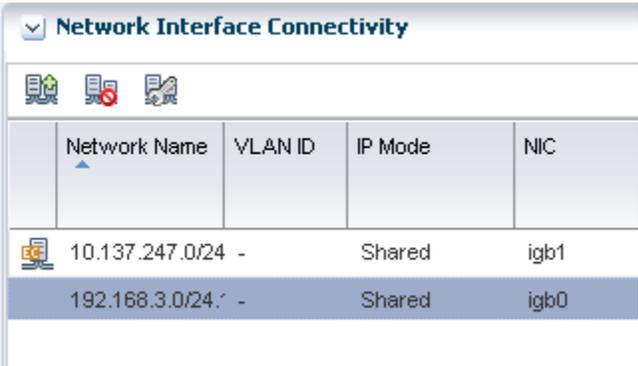
See the [Related Resources for Oracle Solaris Zones](#) section for more information about creating a link aggregation.

## 4.5.5 Modifying and Detaching a Network from the Global Zone

You can modify the network connection that are attached to the network except for the management network. The modify and unbind network options are available in the Network tab.

[Figure 4-3](#) shows the icons that represent the following options that are available to manage networks of a global zone: Connect Networks, Disconnect Networks, and Modify Physical Connectivity.

**Figure 4-3 Network Options**



The screenshot shows a window titled "Network Interface Connectivity" with a dropdown arrow on the left. Below the title bar are three icons: a green plus sign, a red minus sign, and a blue refresh icon. Below the icons is a table with the following data:

	Network Name	VLAN ID	IP Mode	NIC
	10.137.247.0/24	-	Shared	igb1
	192.168.3.0/24	-	Shared	igb0

### 4.5.5.1 To Modify Physical Connectivity

You can modify the physical connectivity for a global zone.

1. Click the **Network** tab of the selected global zone in the Assets section.
2. Click the **Modify Physical Connectivity** icon.

[Figure 4-4](#) shows the Modify Physical Connectivity window that displays the network details that can be modified.

**Figure 4-4 Modify Physical Connectivity**

The screenshot shows a dialog box titled "Oracle Enterprise Manager Ops Center - Change Virtual Host Network/NIC Connection". Inside the dialog, there is a section titled "Change Network-NIC Connection on". Below this section are several input fields:

- Network Name: 10.100.200.0/24.1
- Physical NIC: igb0 (selected from a dropdown menu)
- IP Address Allocation Method: Use Static IP (selected from a dropdown menu)
- IP Address: 192.0.2.1
- DHCP ID: (empty field)

At the bottom right of the dialog, there are two buttons: "Submit" and "Cancel".

You can change the permanent IP address or change the allocation method.

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**Note:**

When the network interface is an IPMP group, you cannot modify the network interface.

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#### 4.5.5.2 Unbind Network Connection

When you unbind a network from a global zone, the global zone's non-global zones are also disconnected from the network. Select the global zone and click the **Unbind Network** icon to remove the network.

## 4.6 Discovering and Managing Existing Zones

When you discover a global zone that has existing zones, these zones are also automatically discovered and displayed on the UI. The option to deploy the agent on the global zone is inherited to the zones.

The following steps provide an outline of the procedure to discover and manage existing zones:

1. Use the option **Add Assets** to discover a global zone.
2. In the Add Assets Wizard, select whether you want to deploy the agent on the global zone or you want agentless management.
3. All the non-global zones in the selected global zone are automatically discovered. The virtualization portion of a kernel zone is also discovered when its global zone is discovered, but the kernel zone operating system and any nested zones can only be discovered if the discovery includes the kernel zone IP address as a target.
4. Agents are installed based on your selections in the discovery wizard and the system being discovered:

- If you choose agentless management, the global zone and all non-global zones are managed agentlessly.
- If you choose a Zone VC agent, an agent is deployed on the global zone and the non-global zones are managed using this agent. The OS of a kernel zone must be managed separately.
- If you check the Deploy Agent Controller on Oracle Solaris 10 Zones option, an agent is deployed on the global zone and Oracle Solaris 10 non-global zones.
- If you check the Enable Oracle VM for SPARC management option, the global zone is managed with an Oracle VM Server for SPARC agent and the non-global zones are managed agentlessly.

When you want to deploy the agent for the zones in shutdown state, boot them and use the option **Switch Management Access**. Using this option you can change the state from agentless management to managed by agent mode.

5. You can always use the option **Switch Management Access** to switch between managed by agent and agentless management mode.

You cannot create zones on a global zone that is managed agentlessly. For an agentless managed zone, you can boot, shutdown, halt and delete the zone. The Zones Virtualization Controller Agent is required on the zone when you want to use the full range of OS update actions on the OS. See the [Related Resources for Oracle Solaris Zones](#) section for information about what functions are supported for agent and agentlessly managed zones and operating systems. See [Virtualization Agent Controllers](#) and [Agent Management Options](#) for more information about agents.

When you use the native Oracle Solaris CLI to create a zone, select the global zone in the UI and then click the **Refresh** icon to display the new zone in the UI. You can interchangeably use the CLI and the UI to perform zone functions. To display the changes in the zone configuration and state, select the zone in the UI and click the **Refresh** icon. If you do not refresh, the software will refresh the state in 12 hours.

As shown in [Figure 4-5](#), the discovered zones appear in the UI and the following actions are enabled for the zone: Shutdown Zone, Halt Zone, Reboot, Edit Attributes, Edit Tags, Edit Configuration, Replicate Zone, Move Storage, and Delete Zone.

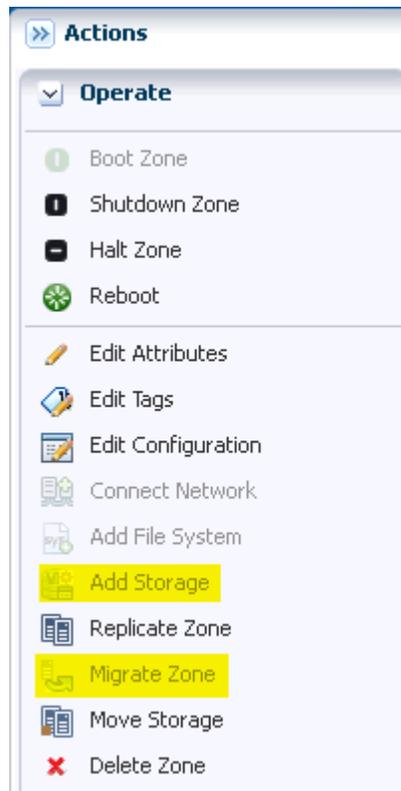
The Oracle Enterprise Manager Ops Center UI fully supports Oracle Solaris 11 zones configured with an exclusive IP mode for the network. You can discover and monitor Oracle Solaris 11 zones that are configured with shared IP, but zone support is similar to a zone without an agent. The zones appear in the UI, but active management is not supported and advanced network configurations are not monitored.

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**Note:**

For Oracle Solaris 11 zones that are configured with shared IP, you cannot perform migration, connect networks or add storage resources to the zone and this zone should not be part of a server pool.

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**Figure 4-5 Enabled Actions**

In [Figure 4-5](#) the Migrate Zone and Add Storage options are not enabled because the zone storage source is unmanaged. To enable these actions, you must move the storage source to managed using the option Move Storage.

See [Actions Available for Oracle Solaris Zones](#) for more information about performing zone management operations.

### 4.6.1 Deleting or Unmanaging a Global Zone

When you delete or unmanage the global zone, all the non-global zones under it are also automatically unmanaged.

You do not need to unmanage the non-global zones before unmanaging the global zone. See the [Related Resources for Oracle Solaris Zones](#) section for more information about deleting an asset.

### 4.6.2 Unmanaged Zone Storage Information

When you discover and manage existing zones, Oracle Enterprise Manager Ops Center handles the zone metadata and networks except for the zone storage. The metadata of the existing zones is stored in the local storage of the global zone. Whereas, the zone's storage is considered to be unmanaged storage source.

Even for the zones that are created using Oracle Enterprise Manager Ops Center, when you add a storage or file system manually using the native CLI, the storage becomes an unmanaged storage or file system.

See [Moving Zone Storage](#) for more information about how to move the unmanaged storage to managed storage.

## 4.7 Outline of Zone Creation

Using Oracle Enterprise Manager Ops Center, you create a zone profile that captures the zone configuration. Use the profile in a deployment plan to create one or more zones simultaneously. The benefit of using a profile is that you can create multiple zones with consistent configuration.

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**Note:**

When you create or migrate a zone using Oracle Enterprise Manager Ops Center, you cannot use Oracle Solaris Live Upgrade and an alternate boot environment (ABE) to update the zone.

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**Note:**

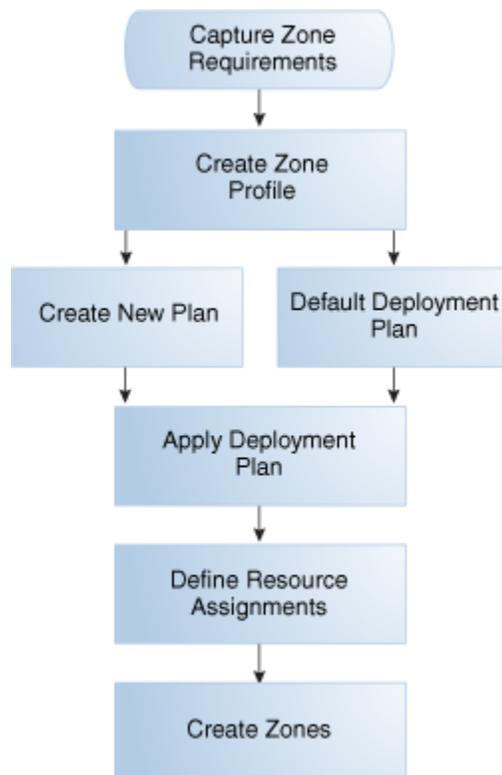
When you use OpenStack software to create a zone, do not use Oracle Enterprise Manager Ops Center to modify the zone. OpenStack cannot handle the modifications. A warning is displayed in the center pane if OpenStack services are running on the selected zone.

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Create a zone profile that captures all the zone configurations. Then, create a deployment plan with the zone profile. The deployment plan is a single step plan which covers only the zone profile. During the application of the deployment plan, select the number of zones to create. In the plan deployment, you can correct the storage and network details as required.

**Figure 4-6 Zone Creation Process**



## 4.8 Determining Zone Requirements

Before you create a zone profile, determine the requirements for the zone.

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**Note:**

When you use MAC addresses, you must have free alternate MAC addresses on available on the global zone before you can create zones. The addresses must be available before you apply the deployment plan to create the zones.

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The requirements vary according to the Oracle Solaris OS version and the type of zone. See the following sections for os-specific zone requirements:

- [Requirements for Zones on Oracle Solaris 10 OS](#)
- [Requirements for Zones on Oracle Solaris 11 OS](#)

### 4.8.1 Requirements for Zones on Oracle Solaris 10 OS

You can create sparse root, whole root, and branded zones on Oracle Solaris 10 OS. While creating the zone profile, select the appropriate options and provide the required resources for a successful zone creation.

#### 4.8.1.1 Requirements for a Whole Root Zone

A whole root zone contains a read/write copy of the global zone's file system and has the following requirements:

- Minimum size of the file system is 5 GB.
- Minimum size of the virtual disk for the storage library is 6 GB.

#### 4.8.1.2 Requirements for a Sparse Root Zone

A sparse root zone contains a read/write copy of a portion of the global zone's file system and shares the global zone's `/usr`, `/lib`, `/sbin`, and `/platform` directories in read-only mode.

A sparse root zone has the following requirements:

- Minimum size of the file system is 1 GB.
- Minimum size of the virtual disk for the storage library is 1 GB.

#### 4.8.1.3 Requirements for a Branded Zone

A branded zone emulates the user environment of earlier versions of Oracle Solaris. For example, you can create a branded zone to run Oracle Solaris 8 applications on your Oracle Solaris 10 system.

Use the following procedure to prepare to create a branded zone:

1. Download the images for the operating system, as shown in [Table 4-3](#).
2. Import the images into one of the software libraries associated with the global zone.

During the process of creating a branded zone, you install the images in the global zone. For instructions, see the README files in the Oracle Solaris 8 or 9 Containers bundle.

**Table 4-3 Packages for Branded Zones**

Global Zone OS	Branded Non-Global Zone
Oracle Solaris 10 10/08 OS or later	<p>For Oracle Solaris 8, install SUNWs8brandk from Oracle Solaris 8 Containers 1.0.1.</p> <p>For Oracle Solaris 9, install SUNWs9brandk from Oracle Solaris 9 Containers 1.0.1.</p> <p>The Oracle Solaris 10 installation automatically installs the following required packages for branded zones:</p> <ul style="list-style-type: none"> <li>• Oracle Solaris 9 branded zones: SUNWs9brandr and SUNWsbrandu packages</li> <li>• Oracle Solaris 8 branded zones: SUNWs8brandr and SUNWs8brandu packages</li> </ul>
Releases prior to Oracle Solaris 10 10/08 OS	<p>For Oracle Solaris 8, install SUNWs8brandr and SUNWs8brandu from Oracle Solaris 8 Containers 1.0.1.</p> <p>For Oracle Solaris 9, install SUNWs9brandr, SUNWs9brandu, and SUNWs9brandk from Oracle Solaris 9 Containers 1.0.1.</p>

## 4.8.2 Requirements for Zones on Oracle Solaris 11 OS

You can install zones in Oracle Solaris 11 OS either using the IPS packages in the default Oracle Solaris 11 Package Repository or using an image of an installed system running the Oracle Solaris release.

To install zones using images, you must have an Oracle Solaris 10 image in flash archive format or from an existing Oracle Solaris 11 OS image in gzip format. See <http://www.oracle.com/technetwork/documentation/solaris-11-192991.html> for how to prepare your installed Oracle Solaris 10 or 11 systems, and create the `flar` or `gzip` image. Upload these images to the storage libraries and install branded zones in Oracle Solaris 11 OS.

### 4.8.2.1 Requirements for Installing Zones Using the Repository

To install zones from the repository, configure your Oracle Solaris 11 Software Update Library in the Enterprise Controller to synchronize with the Oracle Solaris 11 Package Repository.

When you install from repository, the default software group, `solaris-small-server` group is used. This occupies less space. The zones are whole root type only.

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**Note:**

To provision Oracle Solaris 11 and Oracle Solaris 11 zones, the Enterprise Controller and Proxy Controller must be installed on an Oracle Solaris 11 operating system.

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### 4.8.2.2 Requirements for Oracle Solaris 10 Branded Zone

You can migrate an Oracle Solaris 10 OS into an Oracle Solaris 11 environment. Create an archive of the Oracle Solaris 10 instance that you would like to migrate. In the

Enterprise Controller software library, import an ISO image of Oracle Solaris 10 OS that has the same architecture (SPARC or x86) of the instance to be migrated. Then, import the `flar` archive with the parent as the ISO image imported previously.

You can migrate only systems that have Oracle Solaris 10 10/09 or later versions. To migrate earlier versions, install the kernel patch 141444-09 (SPARC) or 141445-09 (x86/x64), or later version, on the original system.

Since branded zones do not nest, existing zones in the original system are detected and a warning is issued that nested zones are not usable and that the disk space can be recovered.

To use the Oracle Solaris 10 package and patch tools in your Oracle Solaris 10 Container, install patches 119254-75 (SPARC) and 119255-75 (x86/x64) on your source system before the image is created. The P2V process works without the patches, but the package and patch tools do not work properly within the `solaris10` branded zone.

To use Oracle Solaris 10 zones on your system, the `system/zones/brand/brand-solaris10` package must be installed on the system running Oracle Solaris 11 OS.

## 4.9 Zone Configuration Parameters

When you create a zone profile, you can provide zone configuration details such as CPU model, memory caps, priority value, network mode, and storage resources for the zone.

- **Zone name:** Specify a unique name for the zone. Do not use names that start with `global` or `SUNW`.
- **Autoboot:** Specify whether the zone must boot immediately after you create it and whenever the global zone boots.
- **Shared CPU:** A zone with a shared CPU gets its CPU resources by the number of shares you allocate to it from the resource pool, which is also used by other zones. The new zone is added to the Fair Share Scheduling automatically. You have the option to set a maximum value for the CPU resources. The CPU cap limits the amount of CPU resources that can be used by one zone. For example, a CPU cap value of 1 means 100% of a CPU.
- **Dedicated CPU:** A zone with a dedicated CPU gets exclusive use of the available CPU resources. You specify the minimum and maximum number of CPUs available to the new zone. A temporary resource pool is created and dedicated to the zone.

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**Note:**

This parameter is available when you select dedicated CPU. Set the priority of the zone. Assign an importance value for the zone so that when there are not enough CPU resources to satisfy all zones, the zone with the greater importance value receives a larger share of the available CPU resources.

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- **Priority of recovery:** When you enable automatic recovery for the zone, the priority of recovery value decides which zone must be migrated first during a global zone failure in a server pool. Set the priority of recovery between 0 to 100.
- **Memory Caps:** Set the maximum value for physical, swap and lock memory resources.

- **Naming Service:** Specify the name service that the zone uses to communicate with network objects. You can select the DNS, NIS, NIS+ or LDAP naming service. To specify the name service, you require the domain name and the IP address of the name server.
- **Shared IP Address or Exclusive IP Address**
  - A zone with a shared IP address uses its global zone's IP layer configuration and state. The zone has a logical network interface to the IP address.
  - A zone with an exclusive IP has its own dedicated IP layer configuration and state. The zone has its own set of network interfaces. You must configure the network interfaces using the same network configuration methods applied to all Oracle Solaris OS configurations.

For Oracle Solaris 11 OS, only exclusive IP mode is supported for the network in the Oracle Enterprise Manager Ops Center UI.

## 4.10 Creating a Zone Profile

Oracle Enterprise Manager Ops Center provides option to create profile that captures the zone configuration. Use the zone profile in a deployment plan and apply to create one or more zones simultaneously.

1. Expand the **Plan Management** section in the Navigation pane.
2. Expand Profiles and Policies and click **Oracle Solaris Zone**.
3. Click **Create Profile** in the Actions pane.

The Create Profile – Oracle Solaris Zone Wizard is displayed.

4. Enter a name and description for the profile identification.

Select whether you want to create a deployment plan automatically using this profile.

5. Select the OS version of the zone.

Ensure that you apply the plan on correct target to create the zone. See [Table 4-4](#) for more information.

**Table 4-4 Oracle Solaris Zones Targets**

Zone OS Version	As	On Target
Oracle Solaris 10	Whole root zone Sparse root zone	Oracle Solaris 10
Oracle Solaris 10	Branded zone	Oracle Solaris 11
Oracle Solaris 11	Whole root zone	Oracle Solaris 11
Oracle Solaris 8	Branded zone	Oracle Solaris 10
Oracle Solaris 9	Branded zone	Oracle Solaris 10

Click **Next** to specify the zone identity.

6. You can create one or more zones using the profile. To identify the zones, provide a zone prefix name and a number to start the series.

Each zone created uses the prefix name appended with the number that is incremented. For example, if the prefix name is Myzone and the number to start from is 1, then the zones are created with names Myzone1, Myzone2, and Myzone3.

Enter the description and tags for the zones. This is common for all the zones created using this profile.

Click **Next** to specify the zone installation source.

7. According to the OS version selected, the page displays the following information:

- Oracle Solaris 10

Select whether you want to create whole root, sparse root, or branded zone. For branded zone, provide the following information:

- Select the architecture as x86 or SPARC
- Select the branded zone image. You must have created a flash archive image of an installed Oracle Solaris 10 OS and uploaded to the software library in Oracle Enterprise Manager Ops Center. These images are listed in the Branded Zone Image list.
- Enter the prefix for the Host ID and the starting number.
- Select the machine type as sun4u or sun4v.

- Oracle Solaris 11

You must select the installation source for installing Oracle Solaris 11 zones. You have the following options to select:

- Install from repository. You must have configured your Oracle Solaris 11 Software Update Library in Oracle Enterprise Manager Ops Center in synchronization with the Oracle Solaris 11 Package Repository. This option installs the `solaris-small-server` software group by default. This is also referred to as the whole root zone for Oracle Solaris 11 OS.
- Install from selected image. You must have created `gzip` archive image of an installed Oracle Solaris 11 OS and uploaded to software libraries in Oracle Enterprise Manager Ops Center. Select an image from the list. You can create the `gzip` archive formats using `cpio` or `zfs` command options.

- Oracle Solaris 8 and 9

You can install Oracle Solaris 8 and 9 as branded zones on Oracle Solaris 10 OS only.

Download the images of Oracle Solaris 8 or 9 and upload them to a software library. Refer to [Requirements for Zones on Oracle Solaris 10 OS](#) for more information about requirements for branded zones.

Click **Next** to specify the zone configuration details.

8. Specify the CPU type, either Shared or Dedicated. Set the memory thresholds and verify that the locked memory threshold value is less than or equal to the physical memory threshold.

You can enable automatic recovery option for the zone. Set the priority of recovery value between 0 to 100. This value decides which zone is recovered first when the global zone fails.

Click **Next** to specify the zone file system.

9. The zone is created with a default root file system which is the zone path. You cannot delete this file system or change its read and write access. You can add more file systems from original zone's list of file systems. Set the size and access to the file system.

For each file system added, specify whether it is managed or unmanaged. When it is unmanaged, enter the mount point for the file system.

The Reserved size is the size of the file system that the user can reserve. The Quota size is the maximum size that the file system can utilize.

Click **Next** to configure the zone's storage.

10. Select the storage library for the zone and its metadata.

You can store the zone metadata in the local or NAS library only. To migrate a zone, you must store the zone metadata in a NAS storage library.

All the libraries that are available in the Oracle Enterprise Manager Ops Center are listed. Select the library type and the corresponding libraries are listed. Select the library and the virtual disk for the zone. You can select library types such as NAS, SAN, Local, Local Devices, and Dynamic Storage.

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**Note:**

When you specify a local storage library, you cannot migrate the zone in the future.

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**Caution:**

An Oracle Solaris Zone running with a zone path on a NFS share is not a supported configuration. When you specify this type of storage, do not use the zone for production or non-experimental workload.

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11. When the library is local or NAS storage, specify the virtual disk name and size of the disk. For SAN library, select a LUN from the available list. You cannot change the size of the LUN and the size of the local devices.

For Dynamic Storage, select the Dynamic library that is available for the discovered storage servers in Oracle Enterprise Manager Ops Center. You can select the existing LUNs or create new LUN. Select Create LUN in the drop-down list of the column LUN/Virtual Disk Name and select the volume group. The size of the volume group is automatically displayed.

Click **Next** to specify the zone networks.

12. Select the networks that you want to connect to the zone. Also, specify the number of connections to the zone for each network. The actual binding of the networks takes place during deployment of a plan with this profile.

You can create an Oracle Solaris 11 zone with no networks, but an Oracle Solaris 10 zone must have at least one network.

Click **Next**.

13. Specify the following setup parameters:

- Language, time zone, terminal-type and root password for the zone.
- Provide a domain name for the NFSv4 Domain Name or accept the default value dynamic to allow the naming service that you specify in Step 14 to determine the NFSv4 domain at run time.
- Set the boot properties for the zone. You can set the zone to boot after it is created or whenever the global zone boots.
- For Oracle Solaris 10 version, you can select whether to install the agent on the zone or not. When the agent is not installed, the global zone access the zone through zlogin.

Click **Next** to specify the naming services.

14. Specify the naming service for the zone: DNS, NIS, NIS+ or LDAP naming service. You can also choose not to specify a naming service.

- **DNS:** Enter the domain name of the DNS server and the IP address of the DNS server. You can enter up to three IP addresses in the Name Server field. To specify additional domains to search, enter up to six domain names for the Domain Name Search List. The total length of each entry cannot exceed 250 characters.
- **NIS and NIS+:** Enter the domain name of the NIS or NIS+ server. When you know the NIS server details, choose the Specify an NIS Server option to provide the NIS server host name and its IP address. When you do not have the NIS server information, select the Find an NIS Server option.
- **LDAP:** Enter the domain name of the LDAP server. Specify the name of the LDAP Profile. Enter the IP address of the LDAP Profile Server. You can also provide the Proxy Bind Distinguished Name and Password.
- **NONE:** Select this option so that no name server is configured.

Click **Next** to view the summary of the selected parameters for creating a zone profile.

15. Review the information and click **Finish** to create the zone profile.

The zone profile is created with version 1 and a corresponding deployment plan also with version 1. Apply the deployment plan to create one or more zones of consistent configuration.

## 4.11 Creating a Kernel Zone Profile

Oracle Enterprise Manager Ops Center provides the option to create a profile that captures the kernel zone configuration. Use the zone profile in a deployment plan and apply to create one or more kernel zones simultaneously.

1. Expand the **Plan Management** section in the Navigation pane.

2. Expand Profiles and Policies and click **Oracle Solaris Kernel Zone**.

3. Click **Create Profile** in the Actions pane.

The Create Profile – Oracle Solaris Kernel Zone wizard is displayed.

4. Enter a name and description for the profile identification.

Select whether you want to create a deployment plan automatically using this profile.

Click **Next** to specify the zone identity.

5. You can create one or more zones using the profile. To identify the zones, provide a zone prefix name and a number to start the series.

Each zone created uses the prefix name appended with the number that is incremented. For example, if the prefix name is Myzone and the number to start from is 1, then the zones are created with names Myzone1, Myzone2, and Myzone3.

Enter the description and tags for the zones. This is common for all the zones created using this profile.

Click **Next** to specify the zone installation source.

6. You must select the installation source for installing Oracle Solaris 11 zones. You have the following options to select:

- Install from repository. You must have configured your Oracle Solaris 11 Software Update Library in Oracle Enterprise Manager Ops Center in synchronization with the Oracle Solaris 11 Package Repository. This option installs the `solaris-small-server` software group by default. This is also referred to as the whole root zone for Oracle Solaris 11 OS.
- Install from selected image. You must have created a `gzip` archive image of an installed Oracle Solaris 11 OS and uploaded to software libraries in Oracle Enterprise Manager Ops Center. Select an image from the list. You can create the `gzip` archive formats using `cpio` or `zfs` command options.

Click **Next** to specify the zone configuration details.

7. Specify the CPU model, either Shared or Dedicated, and a number of CPU shares.

Specify whether the CPU should be capped, and if so, at what value.

Set the physical memory threshold. The minimum allowed value is 2 GB, and the minimum recommended value is 8 GB.

Click **Next** to configure the zone's storage.

8. Select the storage library for the zone and its metadata.

You can store the zone metadata in the local or NAS library only. To migrate a zone, you must store the zone metadata in a NAS storage library.

Check the **Force the re-use of Zpool** checkbox to release the kernel zone's storage if it is deleted.

All the libraries that are available in the Oracle Enterprise Manager Ops Center are listed. Select the library type and the corresponding libraries are listed. Select the

library and the virtual disk for the zone. You can select library types such as NAS, SAN, Local, Local Devices, and Dynamic Storage.

One storage disk is listed by default. You can add or delete storage disks using the add and delete icons. For each storage disk, provide the following information:

- **Library Type:** Select a library type.
- **Library Name:** Select a library name from the available libraries.
- **Virtual Disk Name:** Specify the virtual disk name. You can specify the virtual disk name for local and NAS libraries only.
- **Volume Group:** Specify the volume group.
- **Required Size (GB):** Specify the disk size in GB.

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**Note:**

When you specify a local storage library, you cannot migrate the zone in the future.

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**Caution:**

An Oracle Solaris Zone running with a zone path on a NFS share is not a supported configuration. When you specify this type of storage, do not use the zone for production or non-experimental workload.

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Click **Next** to specify the zone networks.

9. Select the networks that you want to connect to the zone. Also, specify the network domain and number of connections to the zone for each network. The actual binding of the networks takes place during deployment of a plan with this profile.

Click **Next** to specify the zone setup parameters.

10. Specify the following setup parameters:

- Language, time zone, terminal-type and root password for the zone.
- Provide a domain name for the NFSv4 Domain Name or accept the default value dynamic to allow the naming service that you specify in Step 14 to determine the NFSv4 domain at run time.
- Set the boot properties for the zone. You can set the zone to boot after it is created or whenever the global zone boots.

Click **Next** to specify the zone user account.

11. Create a user account for the zone. Enter a name, username, and password.

Click **Next** to specify the naming services.

12. Specify the naming service for the zone: DNS, NIS, NIS+ or LDAP naming service. You can also choose not to specify a naming service.

- **DNS:** Enter the domain name of the DNS server and the IP address of the DNS server. You can enter up to three IP addresses in the Name Server field. To specify additional domains to search, enter up to six domain names for the Domain Name Search List. The total length of each entry cannot exceed 250 characters.
- **NIS and NIS+:** Enter the domain name of the NIS or NIS+ server. When you know the NIS server details, choose the Specify an NIS Server option to provide the NIS server host name and its IP address. When you do not have the NIS server information, select the Find an NIS Server option.
- **LDAP:** Enter the domain name of the LDAP server. Specify the name of the LDAP Profile. Enter the IP address of the LDAP Profile Server. You can also provide the Proxy Bind Distinguished Name and Password.
- **NONE:** Select this option so that no name server is configured.

Click **Next** to view the summary of the selected parameters for creating a zone profile.

13. Review the information and click **Finish** to create the zone profile.

The zone profile is created with version 1 and a corresponding deployment plan also with version 1. Apply the deployment plan to create one or more zones of consistent configuration.

## 4.12 Creating and Deploying Zone Plans

Apply the zone deployment plans on the required number of targets. When you apply the deployment plan, you must provide the resource assignments for storage and network. When there are resources that are provided from the profile are not available or not accessible, it is flagged in red and you must re-assign the resources to continue further.

Use zone deployment plans to modify the parameters such as storage, networks, and zone name. The zone deployment plan is a single step plan which collects details of the number of zones to be created. You can also create your own zone deployment plans.

### 4.12.1 To Create a Zone Deployment Plan

You can create a deployment plan to deploy zones.

1. In the Plan Management section, expand **Deployment Plans** and click **Create Oracle Solaris Zones**.
2. Click **Create Plan from Template** in the Actions pane.
3. Enter a name and description for the plan.
4. Select the failure policy.
5. In the Deployment Plan Steps, select the **Oracle Solaris Zone** profile.
6. Enter the number of zones to create.
7. Click **Save** to save the deployment plan.

When you modify the zone profile, you can choose to update the deployment plan with the correct version of the zone profile.

Zone deployment allows you modify the parameters such as storage, networks, and zone name. When you apply the zone deployment plan, resource assignments that are not available is marked in red and it must be corrected.

## 4.12.2 To Apply a Zone Deployment Plan

1. Select the zone deployment plan and click **Apply Deployment Plan** in the Actions pane.

2. Select the target asset from the list and click **Add to Target List**.

You can add more than one asset to the list.

3. Select how to apply the plan.

You can either apply the plan with minimal interaction or override the profile values. When you select to override the profile values, you are taken through each step of the profile. Otherwise, you are directed to provide only the required resource assignments. In this procedure the minimal interaction is taken into consideration. Click **Next**.

4. In the Specify Storage Step, correct the storage resources defined in the profile if required.

For example, when the selected storage libraries in the profile are not associated with the target global zone., then you must modify the storage resources accordingly.

Click **Next** to specify the zone networks.

5. Designate the IP stack for the zone as Shared or Exclusive. Select the IP stack and the network list is updated accordingly.

For Shared IP network:

- Select a network from the list.
- The address allocation method is Use Static IP only. This is fixed for shared IP networks.
- Enter the IP address. When you create more than one zone, enter the IP addresses either in the form of range, separated by comma or both. For example, 192.0.2.1 - 192.0.2.3, or 192.0.2.1,192.0.2.2, 192.0.2.3.

For Exclusive IP network:

- Select a network from the list.
- Enter the number of times the zone connects to the network. This is applicable only for exclusive IP networks.

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**Note:**

For Oracle Solaris 11 OS, you can connect to networks configured as exclusive IP stack only.

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- Select the type of address allocation as Use static IP, DHCP allocated, or Do Not Plumb.

- When the allocation is static, then the IP range for the zones is proposed. The range depends on the number of zone and number of connections for each zone. You can modify the IP range as required.

Click **Next** to define the network resource assignment.

6. Modify zone host name and network assignment as required. You can also add or remove the network assignment to a zone.

For each network connection of the zone, the P-Key or VLAN ID, the NIC, the address allocation method, and the individual IP address are displayed. Each zone's host name is also editable. Modify the zone resource assignment as required.

You can create an Oracle Solaris 11 zone with no networks, but an Oracle Solaris 10 zone must have at least one network.

Click **Next** to schedule the job.

7. Select to run the zone creation job now or schedule to a later time.

Click **Next** to view the summary.

8. Review the information provided for creating zones. Click **Apply** to start the zone creation tasks.

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**Note:** If a zone creation job successfully creates a zone but the zone fails to boot, the zone is not deleted by the job rollback to enable manual troubleshooting.

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### 4.12.3 Zpool and File System of Zones

Creating zones with Oracle Enterprise Manager Ops Center results in the following operations which run automatically in the background:

- The file systems of the zones are implemented as ZFS file systems.
- A zpool is created for each zone with the name of the zone metadata.
- The storage that is allocated to the zone is pooled in a zpool and used by all the file systems.

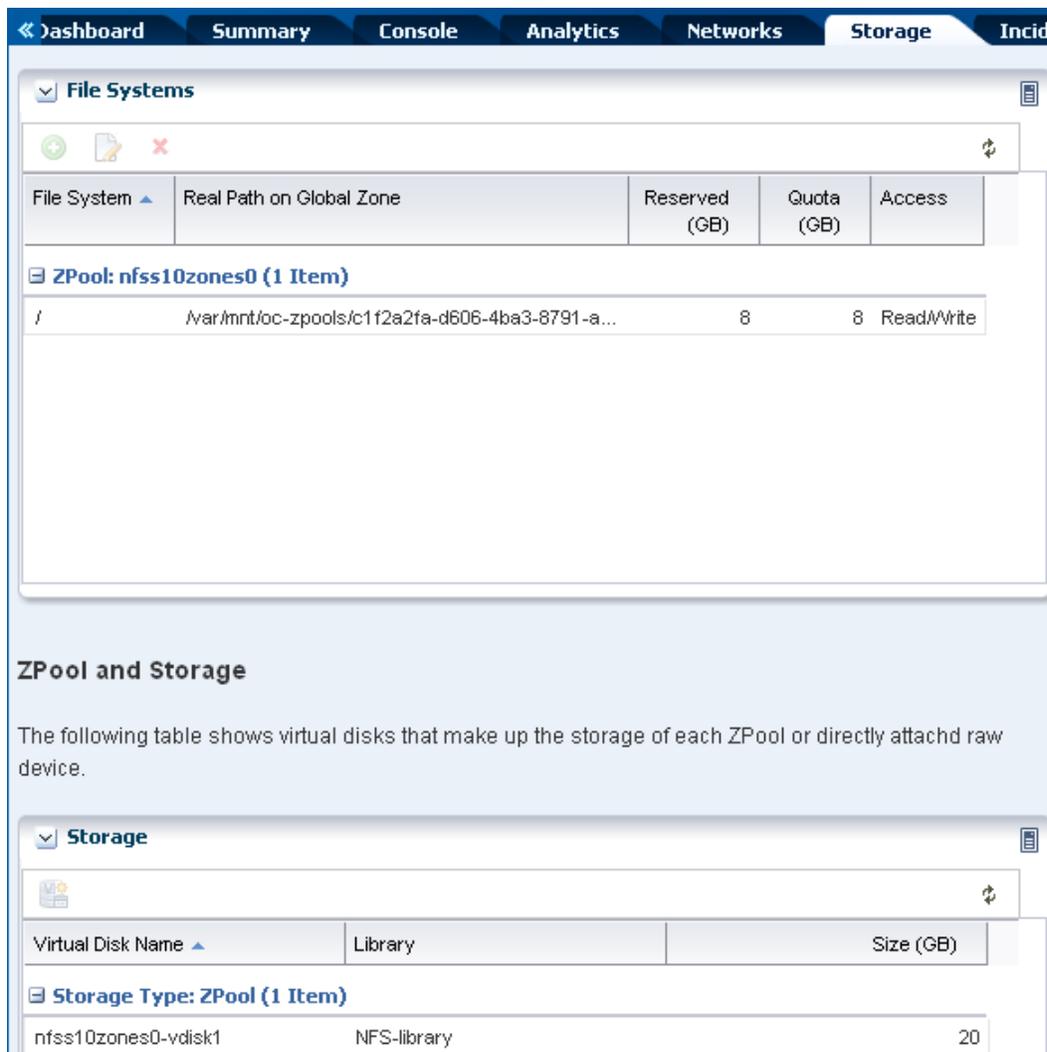
For each deployed zone you can view the following information: file systems, zpools with reservations and quotas, the storage library used, and the file system usage. The Storage tab for a zone shows the zpools with reservations and quotas. The Analytics tab for a zone contains information on file system usage. Use the **Move Storage** action to change the reservation and quotas.

#### 4.12.3.1 To View the File System and Storage Added to a Zone

1. Select the zone in the Navigation pane.
2. Click the **Storage** tab.

As shown in [Figure 4-7](#), the Storage tab has two tables: a File Systems table and a ZPool and Storage table. The file system table displays the file system, the real path of the file system on the global zone, the amount of Reserved GB, the quota in GB, and the Access permissions for the zone.

**Figure 4-7 Storage Tab for a Zone**



### 4.12.3.2 To Change the Default Reservation and Quota

You can change the default reservation and quota for zones.

1. Select the zone in the Navigation pane.
2. Click the **Storage** tab.
3. Click **Move Storage** in the Actions pane.

### 4.12.3.3 To View the File System Usage for a Zone

You can view the file system usage for a zone.

1. Select the zone in the Navigation pane.
2. Click the **Analytics** tab, then click the **Metrics** subtab.
3. Click **File Systems** in the Navigation pane.

Figure 4-8 Zone File System Metrics

Name	Type	Total Space	Free Space	Free Space %	reachable
/	zfs	8388608	7916219	94.36868	true

#### 4.12.4 Modify Zone Configuration

You can modify the configuration of a zone to change the CPU or memory resources, scheduler, and the identity of the zone. When you modify the CPU model, you must reboot the zone for the changes to take effect unless the zone is using Oracle Solaris 11.2 or later.

Use the **Edit Attributes** option to modify the description and tags of the zone. You can also add new tags to the zone.

You can modify the following properties of a zone using the **Edit Configuration** option:

- **Host ID Prefix:** You can define or modify the host ID for the zone.
- **CPU Model:** The CPU model can be shared or dedicated. For a shared CPU, you can modify the number of CPU shares allocated to the zone. For a dedicated CPU, you can edit the minimum and maximum dedicated CPU numbers. You can also set the relative importance of the zone compared to other zones when contending for CPUs.
- **Memory Caps:** You can specify caps on various aspects of memory used by the zone. You can modify the caps set for physical, swap, locked, and virtual memory.
- **Scheduler:** For shared CPU model, the scheduler is assigned to Fair Share Scheduler (FSS). For a dedicated CPU model, you can set the following scheduler attributes:
  - Fair Share Scheduler (FSS)
  - Fixed Priority (FX)
  - Interactive (IA)
  - Real-time (RT)
  - Timer Sharing (TS)
- **LightWeight Processes (LWP):** You can set the maximum number of LWPs simultaneously available to a zone.
  - **Message IDs:** Set the maximum number of message queue IDs.
  - **Semaphore IDs:** Set the maximum number of semaphore IDs.
  - **Shared Memory IDs:** Set the maximum number of shared memory IDs.

- **Shared Memory:** Set the maximum amount of shared memory.
- **Automatic Recovery:** Set the value of priority of recovery. When the server fails, the zone with highest priority is recovered first. See [Automatic Recovery](#) for more information on how automatic recovery works.
- **Lofi Devices:** Set the maximum number of lofi devices.
- **Processes:** Set the maximum number of processes.

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**Note:** For Oracle Solaris 11 kernel zones, only a subset of applicable configuration properties can be edited.

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## 4.13 Creating and Deploying Zones on a Logical Domain

Oracle Enterprise Manager Ops Center has a consolidated view of a managed Oracle VM Server for SPARC Control Domain and associated logical domains and I/O resources. You can create zones on the domain using the domain's I/O resources that are not already in use by other assets. You can use the Oracle Enterprise Manager Ops Center UI to manage, update, and delete the zones.

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**Note:**

When you create a zone on a logical domain, the logical domain cannot be a root domain that is dedicated to provide I/O resources exclusively to an Oracle VM Server for SPARC Server Pool.

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To manage zones on an Oracle VM Server for SPARC logical domain, you must deploy the Zone VC Agent on the logical domain and the Oracle VM Server for SPARC VC Agent on the associated Control Domain. See [Virtualization Agent Controllers](#) in [Get Started With Virtualization](#) for information about Zone VC and Oracle VM Server VC Agents.

When you create a zone on logical domain, storage resources are assigned to the zone and are no longer available to use. The storage resource is not available to create other zones or to create a virtual server in exclusive mode. The zone's alternate MAC address cannot be assigned to a new VNIC or used to create a new zone.

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**Note:** A logical domain with a kernel zone installed on it cannot be migrated.

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When you delete the zone, the storage resources that are assigned to the zone are put back into the available storage resources and the alternate MAC address is available.

## 4.14 Creating and Deploying Zones on a Kernel Zone

You can create nested zones on an existing kernel zone. You can use the Oracle Enterprise Manager Ops Center UI to manage, update, and delete these zones.

To create and manage zones on a kernel zone, you must deploy an Agent on the kernel zone operating system. In addition, to create nested zones on a kernel zone, there must be free MAC addresses in the kernel zone.

## 4.15 Managing Zones

After creating the zones, you can perform various operations such as boot, reboot, shut down, and halt on the zone. Oracle Enterprise Manager Ops Center provides all these options to be performed from the UI. The UI updates the status of the zone when you perform these operations from the CLI.

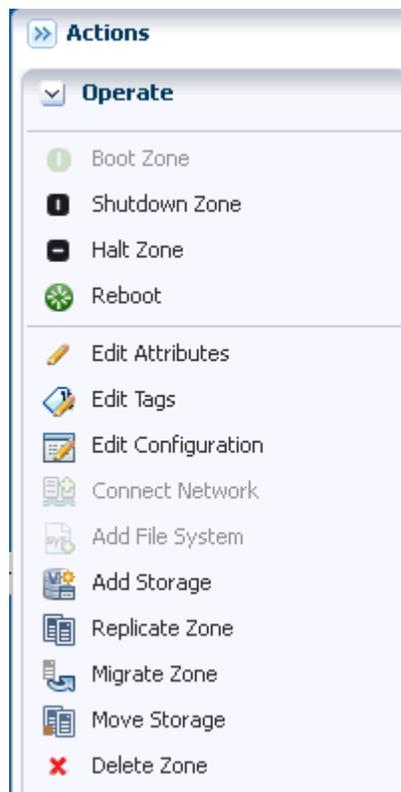
Select the global zone Summary tab in the center pane. The actions available for the zone are displayed as in [Figure 4-9](#).

**Figure 4-9 Zone Management Functions**

State	Zone Name	Description
	brandedS10-1	
	smvt-169-222	
	smvt-169-222_Clone	
	smvt-169-247	
	smvt-169-247_Clone_on_ISCSI	
	smvt-169-247_Clone_on_NAS	

The same actions are available in the Actions pane when you select the zone.

Figure 4-10 Zone Actions Pane View



Simple zone operations that can be performed from the UI are as follows:

- **Boot Zone** – Booting a zone places the zone in the running state, using the current configuration. This option is enabled only when the zone is in the ready or installed state. The zone boots whenever the global zone boots depending on the autoboot properties set during zone creation.
- **Shutdown Zone** – Shut a zone down in a graceful manner so that it is in a state that can be restarted.
- **Halt Zone** – When you halt a zone, it removes both the application environment and the virtual platform of the zone. Halting a zone changes the zone's state to Installed, all processes are killed, devices are unconfigured, network interfaces are unplumbed, file systems are unmounted, and the kernel data structures are destroyed.
- **Reboot Zone** – You can reboot a zone that is in the running state. The zone is shut down and then booted. This is different from the `zoneadm reboot` command in which the zone is first halted and then booted.
- **Delete Zone** – When you delete a running zone, the zone is halted, uninstalled, then deleted from the global zone. The following changes are also made:
  - Zone root file system is deleted.
  - Other file systems that were added to the zone are deleted.
  - Zone metadata is deleted from the storage library.
  - The `zpool` for the zone is deleted and the storage is made available.

- Exclusive IPs that were assigned to the zone are available for re-use.

You can delete multiple zones by selecting them in a user-defined group, in the global zone summary tab, or in a server pool summary tab.

### 4.15.1 Replicating Zones

Use this option to copy an existing zone so that you can provision a new zone on the same system efficiently. The process of cloning a zone is similar to the process of creating a zone because you can accept each of the original zone's specification or change it before you create the copied zone.

1. Select the zone that you want to clone in the Assets section.
2. Click **Replicate Zone** in the Actions pane.  
The Replicate Zone Wizard is displayed.
3. Enter a different zone name and description for the zone.
4. Select a library from the list of libraries that are associated with the global zone to store the cloned zone's image and metadata. Click **Next**.
5. The CPU shares that are allocated in the original zone are displayed. You can edit the changes for the cloned zone. Click **Next**.
6. Accept or change the attributes of the original zone: language, time zone, terminal type, host name and root password. Click **Next**.
7. Set the boot properties for the cloned zone. You can set the properties so that the new zone boots after it is created and whenever the global zone boots. Click **Next**.
8. Configure the file systems for the cloned zone. The new zone has a default root file system which is the zone path. You cannot delete this file system or change its read and write access. You can add more file systems from original zone's list of file systems. Accept or change the size and access to the file system. The Reserved size is the size of the file system that the user can reserve. The Quota size is the maximum size that the file system can utilize. Click **Next**.

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#### Note:

Make sure that the cloned zone has the same or more size for its file system than the size of the original zone's file system. When the cloned zone's file system is smaller than the original zone's file system, the clone operation cannot complete and the job fails. Do not modify the root file system of the new zone to a size less than the source zone root file system. Do not modify the system file system if it is defined in the source zone.

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9. Accept or change the storage library. The library can be either a NAS storage or Fibre Channel library. When the library is NAS storage, specify the virtual disk name and size of the disk. For SAN library, select a LUN from the available list of LUNs in the library. The size of the selected LUN is displayed. You cannot change the size of the LUN.
10. The accumulated size of the storage is displayed as Currently Accumulated Storage. The required storage is displayed as Recommended Storage Size. Click the **Add** icon to configure more storage resources to the zone if the Currently

Accumulated Storage is less than the Recommended Storage Size. When you have defined the Currently Accumulated Storage size as at least equal to the Recommended Storage size, click **Next**.

11. Assign at least one network to the zone. Select the zone IP type as Shared or Exclusive.
  - For Shared IP networks:
    - a. Select a network from the list of networks that use the Shared IP mode and are assigned to the global zone.
    - b. Select a NIC from the list of shared Network Interface Cards (NIC).
    - c. Specify the management interface for the NIC. When the network has a defined IP range, the Auto Allocate IP option is displayed with the zone's IP address from the range. When the network does not have a defined IP range, the Use Static IP option is displayed. Enter an IP address for the zone in the Zone IP field.
    - d. Click **Next**.
  - For Exclusive IP networks
    - a. Select a network from the list of networks that are assigned to the global zone and are not used by other zones.
    - b. Select a NIC from the list of the selected network's NICs that are not bound or assigned to other networks.
    - c. Specify the management interface for the NIC. When the selected network has a defined IP range, the Auto Allocate IP option is displayed in the Management Interface and the zone's IP address is populated with an IP address from the defined range.

When the network does not have a defined IP range, you must either provide the IP address or specify a DHCP server to provide one. To provide an IP address, select the **Static IP** option and enter the IP address in the Zone IP field. To designate a DHCP server, select the **Assigned by ext. DHCP** option. The Zone IP field contains the Automatically Allocated value.
  - Click **Next**.
12. Click **Finish** to launch the job for replicating a zone.

### 4.15.2 Adding Storage to Zones

You can add storage to zones dynamically. The storage is added to the zpool that is created for the zone. You cannot delete the storage from the zpool.

The storage libraries that are associated with the global zone are available for the zone. You can assign the following types of libraries to a zone:

- File system storage: Use NAS libraries
- Block storage: Use SAN or Dynamic storage libraries
- Local storage: Add the local storage on the global zone and local devices that are attached to the system

See [Storage Libraries for Virtualization](#) and the [Related Resources for Oracle Solaris Zones](#) section for more information about setting up your storage servers and software libraries.

1. Select the zone in the Assets section.
2. Click **Add Storage** in the Actions pane. As an alternative, click the **Storage** tab and click the **Add Storage to Zone** icon under Zpool and Storage.

The Add Storage to the Zone window is displayed.

3. Click the **Add** icon to add storage.

The storage libraries associated with the global zone are displayed in the Library list. The library can be a local storage, NAS, local device, Dynamic Storage, or SAN library.

4. Select a library from the list.
5. The selection of virtual disks varies according to the library selected.

- Local and NAS library: Enter a virtual disk name and specify the size of the disk.
- For SAN and iSCSI libraries: Select a LUN from the list. The size of the LUN displays automatically.
- For Dynamic Storage Library: Either select a LUN from the list or create new LUN. When you create a new LUN, select the volume group from the list and specify the size of the new LUN.

The Additional Storage Specified shows the additional storage added to the zone.

6. Click **Add Storage** to add the specified storage to the zone.

### 4.15.3 Moving Zone Storage

Some management and monitoring functions of the zone might be disabled depending on the managed resources of the zone. For example, the zone migration option is disabled when the zone file system is not on a shared storage library in .

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**Note:**

A shared storage library in is one that is accessible by the server and operating system. It is not related to Zones on Shared Storage in Oracle Solaris 11.1.

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To enable the storage management and monitoring functions of the zone, you must move the zone's existing storage to a shared storage library. This provides the following options to you to manage the storage and zpools:

- Convert the local storage to a shared storage library so that you can migrate zones.
- Convert the experimental NFS file systems into a local or a shared storage library.
- Combine small ZFS pools per zone into a single ZFS pool.
- Split a single ZFS pool hosting zones into ZFS pools dedicated to each zone.

provides the Move Storage option to convert the storage of the zones. You can use this option to manage your unmanaged storage resources of the zone.

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**Note:**

You cannot move managed storage to unmanaged storage and you cannot alter the root file system of the zone.

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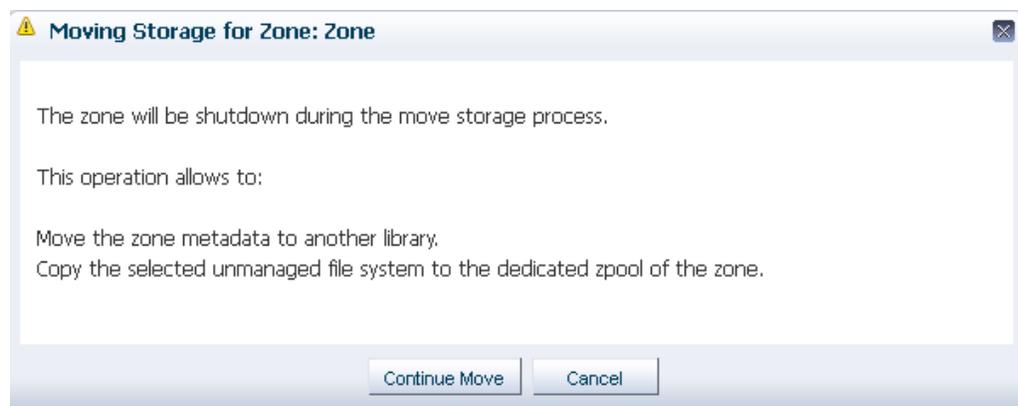
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When you discover and manage existing zone environments in Oracle Enterprise Manager Ops Center, the storage is considered to be unmanaged. You can move this storage from unmanaged state to managed using this option.

1. Select the zone for which you want to move the storage.
2. Click **Move Storage** in the Actions pane.

A warning message is displayed that the zone is shutdown during this process. You can use this option to relocate the zone metadata to a shared storage library and copy the selected unmanaged file system to the dedicated zpool of the zone.

**Figure 4-11 Warning Message for Move Storage**



3. Click **Continue Move** to proceed with the continue the process.
 

The Move Storage Wizard is displayed. The zone details are displayed.
4. You can edit the description and tags of the zone.
5. If required, you can change the library in which you have stored the zone metadata. All the libraries associated with the global zone are listed. Select the library from the list. Click **Next**.
6. Select the file systems that you want to be managed.
  - When there are unmanaged file systems in the zone, you can select the option Managed and provide the Reserved and Quota size of the file system. These are added as new ZFS file systems on the existing zpool for the zone.
  - When you want to relocate the root file system to a managed storage, a dedicated zpool is created for the zone and you must configure the virtual disks for the file systems.
  - You can also modify the size of the file systems except for the root file system.

- You can keep some unmanaged file systems and relocate only those you require.
- You cannot relocate managed storage to unmanaged storage.

Click **Next** to configure the virtual disk storage when you move the root file system from unmanaged to managed state.

7. Select the library and the virtual disk for the zone's storage.

The libraries associated with the global zone are listed. Select NAS, SAN or Dynamic Storage library from the list.

For NAS library, provide a virtual disk name and enter the size of the disk.

For SAN library, select a LUN from the list.

For Dynamic Storage library, either select a LUN or create new LUN from the list. When you create a new LUN, select the volume group and enter the size of the LUN.

Click **Next** to view the summary.

8. Review the information and click **Finish** to change the zone storage from unmanaged to managed.

#### 4.15.4 Managing Kernel Zone Storage

The storage tab for a kernel zone displays all of the current storage disks. You can view this storage and enable or disable sharing.

To view the storage for a kernel zone, select the Storage tab. A table is displayed, showing the storage disks. You can use the Enable Sharing and Disable Sharing actions to enable or disable sharing for the selected disk. The On Shared Storage column indicates whether the disk is shared.

#### 4.15.5 Moving Kernel Zone Metadata to Another Library

Metadata for a kernel zone is saved in either a local library or a shared library. When you install a kernel zone on a system without using Oracle Enterprise Manager Ops Center, the metadata is saved in a default local library. When you install a kernel zone with Oracle Enterprise Manager Ops Center, you define either a local library or a shared storage location for metadata.

Before you can move the kernel zone metadata to another library, the zone that hosts the kernel zone must be managed with a zone virtualization controller.

##### 4.15.5.1 To Move Kernel Zone Metadata to Another Library

You can move a kernel zone's metadata to another library.

1. Expand **Assets**, then select the kernel zone in the Assets tree.
2. Click **Move Metadata** in the Actions pane.
3. Select the new library from the list of available libraries to store the logical domain metadata. Optionally, add a description and add tags. Click **Next**.
4. Review the Summary, then click **Submit**.

When the job completes, the kernel zone's metadata is located on the new library.

### 4.15.6 Adding File Systems to Zones

You can add file systems to zones. You can add file systems dynamically if the global zone is using Oracle Solaris 11.2 or later.

The storage source for the file system can be managed or unmanaged storage source. For unmanaged storage source, you must provide the mount point of the storage.

Provide the Reserved and Quota size for the file system. The file system is added to the existing zpool of the zone.

1. Shut down the zone if it is using Oracle Solaris 11.1 or earlier.
2. Select the zone in the Assets section.
3. Click **Add File Systems** in the Actions pane.

The Add File Systems window is displayed.

4. Click the **Add** icon to add file system.
5. Enter the file system.
6. Select whether the storage is managed or unmanaged.

When it is not managed, enter the mount point of the storage source.

7. Enter the Reserved and Quota size for the new file system.
8. Click **Add File Systems**.
9. Boot the zone for the changes to take effect if the zone is using Oracle Solaris 11.1 or earlier.

### 4.15.7 Connect and Disconnect Networks

You can connect and disconnect networks from non-global zones and kernel zones. You can connect and disconnect networks dynamically if the global zone is using Oracle Solaris 11.2 or later, or Oracle Solaris 11.3 for kernel zones. If the global zone is using Oracle Solaris 11.1 or earlier, or Oracle Solaris 11.2 or earlier for kernel zones, you must shut down the zone before you can connect or disconnect a network.

The networks attached to the corresponding global zone are available for the zones. The shared IP zones can connect to only networks that are specified for shared IP mode. The exclusive IP zones can connect to only exclusive IP networks.

Select the network and click the connect or disconnect icon, or select the zone and click **Connect Network**, as required.

You can select an IP address allocation method for the zone. The following options are available:

- **Use Static IP:** Uses an IP address that you provide.
- **Do Not Plumb:** Does not set an IP address.
- **Assigned by External DHCP:** Uses an IP address assigned by external DHCP.

### 4.15.8 Enabling Automatic Recovery for Zones

Use the options Enable Automatic Recovery and Disable Automatic Recovery to set the recovery option of created zones.

To set automatic recovery for the zone, select the option Enable Automatic Recover. Edit the zone configuration to set the priority of recovery. The zone with highest value is recovered first. See [Recovering Zones](#) to manually recover the zones. See [Automatic Recovery](#) for more information about how automatic recovery works.

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**Note:** Automatic recovery is not supported for kernel zones.

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### 4.15.9 Connect to Zone Console

You can attach to the zone console within the Oracle Enterprise Manager Ops Center UI. You enable the console connection and then you connect to the console.

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**Note:**

When the logical domain is not in view in the Assets tree, the console is logged out automatically but the connection exists until the connection time expires. You must log in again.

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### 4.15.10 View the Console Logs

You can view the console logs for a zone through the Oracle Enterprise Manager Ops Center UI. Select the **Console** tab for the guest, then select the **Console Logs** tab. You can export these logs as a zip file.

By default, the maximum log size is 400 KB.

A system must meet these prerequisites for the console logs to be visible through the UI:

- The global zone must be managed with an Oracle Solaris Zones agent.
- The global zone must be running Oracle Solaris 11.2 or later.

## 4.16 Migrating Zones

In Oracle Enterprise Manager Ops Center, zone migration is a cold migration because the zone is shut down, all applications are stopped, the migration occurs, and then the zone is restarted.

To enable migration action for a zone, the zone storage must be on a shared storage library in Oracle Enterprise Manager Ops Center that is accessible by the server and operating system. When a zone uses local storage, use the [Moving Zone Storage](#) option to change the storage from local to shared.

Beginning with Oracle Solaris 10 10/08, the `zoneadm attach` command updates the zone to match the destination global zone during migration. This option is not available for branded zones. To migrate branded zones, both the source and destination global zones must have the same patch level.

When you migrate a non-global zone with a network attached to the global zone, the software adds a router entry for the network on the destination zone. If the non-global

zone has several different types of networks (such as management, public, and private) attached to the global zone, the software adds a router entry on the destination zone for each network. You can edit a system property to disable this feature. When you disable the feature, a default router is not configured when creating or migrating a zone.

You must have Ops Center Admin permissions to disable the property. To disable the system property, go Administration->Configuration->Virtualization' in the UI. Set the property 'ZoneDefaultAddRouter' to false.

This section describes the procedure for the following types of migration:

- Migrating an Oracle Solaris system into a new non-global zone. This is referred to as physical to virtual (P2V) conversion. See [Migrating a Physical Oracle Solaris System into a Zone](#).
- Migrating a non-global zone from one global zone to another global zone, when all components are managed by Oracle Enterprise Manager Ops Center. See [Migrating Zones to a Different Machine](#).
- Migrating a non-global zone that has dependencies that are not managed by Oracle Enterprise Manager Ops Center. This process uses a script to perform the migration. To migrate unmanaged file systems, see [Script to Migrate a Zone With Dependencies](#).

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**Note:**

When you migrate a zone, the Alternate Boot Environment (ABE) is not supported.

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**Note:**

Kernel zones cannot be migrated through Oracle Enterprise Manager Ops Center.

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### 4.16.1 Disabling the Automatic Router Assignment

When you migrate a non-global zone with a network attached to the global zone, the software adds a router entry for the network on the destination zone. If the non-global zone has several different types of networks (such as management, public, and private) attached to the global zone, the software adds a router entry on the destination zone for each network. You can edit a system property to disable this feature. When you disable the feature, a default router is not configured when creating or migrating a zone.

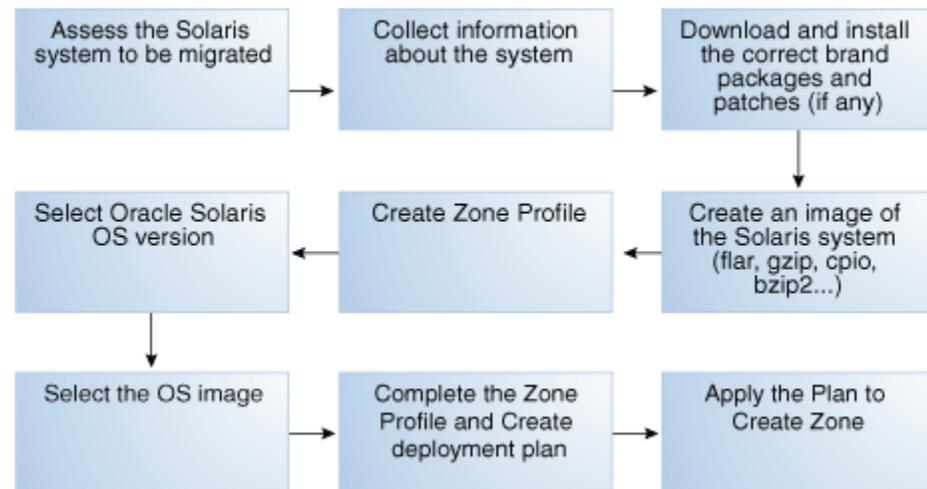
1. Log in to the software as an Ops Center Admin.
2. Expand **Administration** in the left navigation.
3. Click the **Configuration** tab.
4. Select **Virtualization** from the Subsystem menu.
5. Set the `ZoneDefaultAddRouter` property to **false**.

## 4.16.2 Migrating a Physical Oracle Solaris System into a Zone

A physical to virtual (P2V) conversion moves an existing Oracle Solaris system into a new non-global zone on the target system's global zone.

Figure 4-12 shows the steps for a P2V conversion.

**Figure 4-12 Workflow for Migrating an Existing Oracle Solaris System Into a Zone**



Ensure the following before migrating the zone:

- Assess the system to be migrated and collect information.  
See <http://docs.oracle.com/cd/E19683-01/817-1592/> for information about collecting information about the source system.
- The system image to be installed in the non-global zone must not be newer than the target global zones's operating system release or the installation fails.
- The destination global zone must be running at least Oracle Solaris 10 8/07 OS.
- The supported branded zones are Oracle Solaris 8 and 9. For the branded zones to be supported on the destination global zone, remove the following brand packages from the global zone:
  - SUNWs8brandu
  - SUNWs8brandr
  - SUNWs9brandu
  - SUNWs9brandr
- For branded zone migration, the target and source global zones must have the same patch levels. The `zoneadm attach` option to update the branded zone to match the target global zone patches and packages is not available.
- When migrating a branded zone, you must provide an Address Allocation Method when you specify the network interface.

For instructions to download and install the correct brand packages, see the [Related Resources for Oracle Solaris Zones](#) section.

### 4.16.3 Migrating Zones to a Different Machine

Using Oracle Enterprise Manager Ops Center you can migrate one or more zones simultaneously. You can either migrate the zone to an individual global zone or to a zones server pool. When you migrate zones to a server pool, the target global zone depends on the server pool placement policy.

When you migrate a zone, perform a trial run before submitting the migration job to verify that the target global zone has the correct configuration to host the non-global zones.

The target global zone must have same or later versions of the following operating system packages and patches that are installed on the non-global zone.

- Packages that deliver files under an `inherit-pkg-dir` resource
- Packages where `SUNW_PKG_ALLZONES=true`

Other packages and patches, such as those for third-party products, can be different.

When the source and target global zone do not have the same patches and packages during migration, either update the zones patches and packages to match the target global zone or migrate without updating the zone patches and packages.

---

---

**Note:**

You cannot migrate branded zones if the source and target global zones have different patch levels. The option to update on attach capability is also not available for branded zones migration.

---

---

When the target global zone has later versions of the zone-dependent packages or patches, update those packages in the non-global zone before the migration to match the target global zone. When the target global zone supports the update on attach capability, it checks the non-global zone for packages that must be updated and only those packages are updated. The rest of the packages, and their associated patches, can vary from zone to zone.

You cannot downgrade the patches and packages of the zones to a lower version. In such cases, the update option fails.

The patches that must be backed out of the zone before the update are also listed. You must remove the patches manually and run the migration job again.

You can change the Name, Description, Tags, and NIC details of the non-global zone but, when you change other configuration, a warning message indicating that to change the zone configuration you must execute the `sys-unconfigure` command on the zone.

After you migrate a zone, you cannot use an alternate boot environment (ABE) to upgrade the zone.

#### 4.16.3.1 Compatible Global Zones for Migration

When you click the Migrate Zone option in the Actions pane, Oracle Enterprise Manager Ops Center checks all global zones for compatibility with the source global zone. When there are compatible global zones, the Migrate Zone Wizard is displayed.

Otherwise, the following pop-up window is displayed.

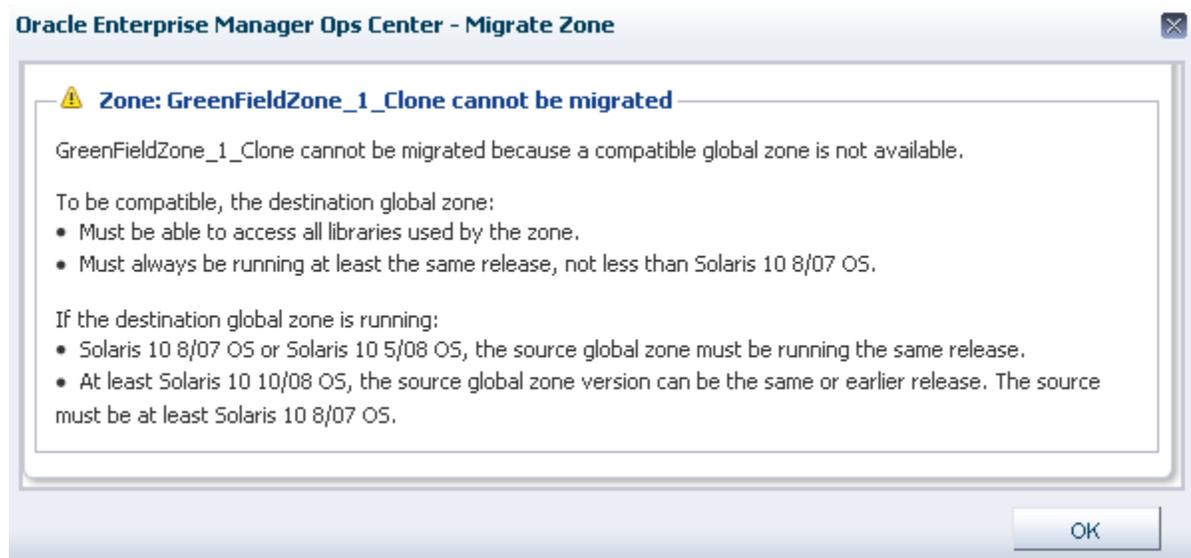
**Figure 4-13 Message Displayed When No Global Zones are Compatible**

Table 4-5 shows the compatible global zones, depending on the operating system release.

**Table 4-5 Compatible Global Zones**

Source Global Zone	Compatible Target Global Zone
Oracle Solaris 10 8/07	Oracle Solaris 10 8/07
	Oracle Solaris 10 10/08
	Oracle Solaris 10 5/09
	Oracle Solaris 10 10/09
	Oracle Solaris 10 9/10
	Oracle Solaris 10 8/11
Oracle Solaris 10 5/08	Oracle Solaris 10 5/08
	Oracle Solaris 10 10/08
	Oracle Solaris 10 5/09
	Oracle Solaris 10 10/09
	Oracle Solaris 10 9/10
	Oracle Solaris 10 8/11
Oracle Solaris 10 10/08	Oracle Solaris 10 10/08
	Oracle Solaris 10 5/09
	Oracle Solaris 10 10/09
	Oracle Solaris 10 9/10
	Oracle Solaris 10 8/11
Oracle Solaris 10 5/09	Oracle Solaris 10 5/09
	Oracle Solaris 10 10/09
	Oracle Solaris 10 9/10
	Oracle Solaris 10 8/11

**Table 4-5 (Cont.) Compatible Global Zones**

Source Global Zone	Compatible Target Global Zone
Oracle Solaris 10 10/09	Oracle Solaris 10 10/09 Oracle Solaris 10 9/10 Oracle Solaris 10 8/11
Oracle Solaris 10 9/10	Oracle Solaris 10 9/10 Oracle Solaris 10 8/11
Oracle Solaris 10 8/11	Oracle Solaris 10 8/11
Oracle Solaris 11	Oracle Solaris 11 Oracle Solaris 11 Update 1
Oracle Solaris 11 Update 1	Oracle Solaris 11 Update 1
Oracle Solaris 11 Update 2	Oracle Solaris 11 Update 2

Verify the following conditions:

- The source and target global zones are compatible.
- The source and target global zones have access to all the libraries associated with the non-global zone.
- The non-global zone's metadata is not stored in the source global zone's local library.
- The non-global zone's data is not stored in the source global zone's local library. The zone must use a shared storage library.
- The non-global zone is in the running state.
- For a server pool, it must have at least one compatible global zone for migration.
- When you migrate the zone, a warning message indicates that when you change the zone configuration except for Name, Description, Tags, and NIC details, you must execute the `sys-unconfigure` command on the zone. Also, when the NIC names are changed for a zone that uses exclusive IP mode, the `/etc/hostname.itf` and `/etc/dhcp.itf` file are renamed accordingly.

When the target global zone does not support backout on attach capability, you must remove or downgrade the patches and packages manually before continuing with the migration. Create an update profile that includes the patches that must be removed. Run an update job with this update profile. Repeat the migration job on the zone after the removal of the patches and packages.

#### 4.16.3.2 To Migrate a Zone

You can migrate a zone to a new global zone.

1. Select the zone in the Assets section.
2. Click **Migrate Zone** in the Actions pane.

A warning message indicating that when you change the zone configuration except for Name, Description, Tags, and NIC details, you must execute the `sys-unconfigure` command on the zone. Also, when the NIC names are changed for a zone that uses exclusive IP mode, the `/etc/hostname.iff` and `/etc/dhcfp.iff` file are renamed accordingly.

**3. Click **Continue Migration**.**

The Migrate Zone Wizard is displayed.

**4. Select an individual global zone or server pool as the target.**

The compatible global zones list the number of zones that are running, total CPUs, and available dedicated CPUs. The server pools list the average usage of CPU and memory.

Click **Next**. The zone migration test starts.

**5. Review the migration test result. Select an update option to continue the migration on the target global zone or server pool:**

- Update the patches and packages of the zone to match the target and then migrate the zone.
- Migrate the zone without updating its patches and packages.

Click **Save Test Result As** to save the migration test result. When you want to change the target, click Previous and select another target to run the migration test.

Click **Next** to review the zone identification.

**6. If the zone name exists in the target global zone, you must change the zone name.**

Click **Next** to specify the zone setup.

**7. Select the language, time zone, and terminal type for the zone. The host name is the zone name as defined.**

The dynamic value for NFSv4 domain name enables the domain name to be derived dynamically from the naming service configuration. To hard code the value for NFSv4 domain, provide a domain name.

Leave the password fields empty to use the existing password. Click **Next** to define the network interfaces.

**8. You must have at least one network interface for the migration to continue. The network interfaces that are not accessible to the target global zone are displayed in yellow. Specify a new network interface for the inaccessible networks or click **Do Not Connect** to that network.**

- a. Select the network which is marked in yellow color. The network interface details are displayed under Network Interface.
- b. Select a new network interface from the Network list or click **Do Not Connect**. The selected network can be either shared or dedicated. Enter the required network interface information for the selected network.

Click **Next** to specify the naming service.

**9. Specify the naming service for the zone: DNS, NIS, NIS+ or LDAP naming service, or choose to not specify a naming service. Click **Next**.**

- **DNS:** Enter the domain name of the DNS server and the IP address of the DNS server. You can enter up to three IP addresses in the Name Server field. To specify additional domains to search, enter up to six domain names for the Domain Name Search List. The total length of each entry cannot exceed 250 characters.
  - **NIS and NIS+:** Enter the domain name of the NIS or NIS+ server. When you know the NIS server details, choose the Specify an NIS Server option to provide the NIS server host name and its IP address. When you do not have the NIS server information, click **Find an NIS Server**.
  - **LDAP:** Enter the domain name of the LDAP server. Specify the name of the LDAP Profile. Enter the IP address of the LDAP Profile Server. You can also provide the Proxy Bind Distinguished Name and Password.
  - **NONE:** Select this option when you do not want to configure a naming service.
10. Review the summary of the migration job. When there are no patches and packages to be backed out, continue with the migration. When there are patches or patches that must be removed, a warning is displayed.
- When the target global zone supports backout on attach capability, a warning is displayed that the list of patches have been removed or downgraded.
  - When the target global zone does not support backout on attach, the patches and packages on the zone must be removed or downgraded manually so that the source zone matches the destination global zone. Cancel the migration or select a new target global zone.
11. Click **Finish** to submit the migration job.

#### 4.16.3.3 To Migrate Multiple Zones

You can migrate multiple zones to a new global zone.

1. Select the global zone from which you want to migrate the zones.
2. Click **Migrate Zones** in the Actions pane.

The Migrate Zones Wizard appears. The migratable zones running in the global zone are listed. If there are no migratable zones, an error message appears.

3. Select one or more zones from the list. Click **Next**.
4. Select an individual global zone or server pool to be the destination for the zone migration.

The table displays the list of eligible global zones and server pool to which you can migrate the zones. The target global zone in the server pool depends on the server pool placement policy.

5. Select an update option to continue with migration.

The source and the target global zones might not be in the same patch level. Either select to update the patches and packages of zone to match the target global zone or continue migration without updating the zone.

6. Review the details and click **Finish** to migrate the zones.

## 4.16.4 Script to Migrate a Zone With Dependencies

You can migrate zones even when the zone has dependencies that are not managed by Oracle Enterprise Manager Ops Center, such as when the zone uses storage that is not part of the zpool.

Scripts enable you to extend the zone migration feature to include the migration of dependencies, such as storage or other resources that are not managed by Oracle Enterprise Manager Ops Center. For example, unmanaged file systems are lost when you migrate a zone. To avoid this, use a script to migrate the file systems. See [Example 4-1](#) for a sample script.

Develop your own scripts to migrate the dependencies and place them on the source and target global zone before migration.

The script for migrating the dependencies is executed in the following way:

- The migration job checks for a script placed on both the source and target global zones. The migration job is aborted when the script is found only on one of the global zones.
- When you create zones server pool, ensure that you upload the script to handle the unmanaged storage. The script is placed in all the global zones in the server pool and thus the migration of zone dependencies are taken care.
- The job checks whether the script has zero on exit. A non-zero exit is a failure and the migration job fails.
- The script is called on the global zone eight times when the migration job is executed.

---



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### Note:

You can use the OEMOC\_AUTOMATIC\_RECOVERY variable to determine if a script runs in the context of a migration or automatic recovery. Set the variable as follows:

- For migration, set the variable to false.
  - For automatic recovery, set the variable to true.
- 
- 

**Table 4-6 Script Call to Environment Variables**

Call to the Script	Environment Variables
On the source global zone, to verify the script existence and user dependencies	OEMOC_ZONENAME=source zonename OEMOC_PHASE=VERIFY OEMOC_OPERATION=MIGRATION OEMOC_JOBID=ID of the job running the script OEMOC_TARGET=SOURCE

**Table 4-6 (Cont.) Script Call to Environment Variables**

Call to the Script	Environment Variables
On the target global zone, to verify the script existence and user dependencies	OEMOC_ZONENAME=destination zonename OEMOC_PHASE=VERIFY OEMOC_OPERATION=MIGRATION OEMOC_JOBID=ID of the job running the script OEMOC_TARGET=DESTINATION
On the source global zone, before the zone is shutdown	OEMOC_ZONENAME=source zonename OEMOC_PHASE=PREOPERATION_RUNNING OEMOC_OPERATION=MIGRATION OEMOC_JOBID=ID of the job running the script OEMOC_TARGET=SOURCE
On the source global zone, after the zone is shutdown.	OEMOC_ZONENAME=source zonename OEMOC_PHASE=PREOPERATION_NOTRUNNING OEMOC_OPERATION=MIGRATION OEMOC_JOBID=ID of the job running the script OEMOC_TARGET=SOURCE
On the source global zone, after the zone is detached	OEMOC_ZONENAME=source zonename OEMOC_PHASE=PREOPERATION_SHUTDOWN_DETACHED OEMOC_OPERATION=MIGRATION OEMOC_JOBID=ID of the job running the script OEMOC_TARGET=SOURCE
On the target global zone, before the zone is attached	OEMOC_ZONENAME=destination zonename OEMOC_PHASE=POSTOPERATION_SHUTDOWN_DETACHED OEMOC_OPERATION=MIGRATION OEMOC_JOBID=ID of the job running the script OEMOC_TARGET=DESTINATION
On the target global zone, before the zone is started.	OEMOC_ZONENAME=destination zonename OEMOC_PHASE=POSTOPERATION_NOTRUNNING OEMOC_OPERATION=MIGRATION OEMOC_JOBID=ID of the job running the script OEMOC_TARGET=DESTINATION
On the target global zone, after the zone is started	OEMOC_ZONENAME=destination zonename OEMOC_PHASE=POSTOPERATION_RUNNING OEMOC_OPERATION=MIGRATION OEMOC_JOBID=ID of the job running the script OEMOC_TARGET=DESTINATION

During rollback phase, the same sequence is executed in reverse order. The environment variables values change accordingly:

- PREOPERATION becomes POSTROLLBACK

- POSTOPERATION becomes PREROLLBACK

## 4.16.5 Script Requirements

The script must be executable and follow these conventions:

- Good error checking and clean-up within the script
- Standard exit code conventions
- Non-zero exit indicates that an error has occurred
- Informational messages are in stdout
- Error messages are in stderr
- The script must be named as `guest-operations` and placed in the `/var/opt/sun/oc/public` directory on both the source and target global zone.

See the [Example 4-1](#) for migrating the additional inherited file systems of an adopted zone. The sample script is based on the assumption that `/opt/` file system is the additional inherited file system. The script re-configures `/opt/` file system on the target global zone before rebooting the zone. The script reconfigures the user-inherited file systems during `POSTOPERATION_NOTRUNNING` phase

### Example 4-1 Sample Script

```
#!/bin/sh

do_migration_action() {

    echo "executing migration action for zone ${OEMOC_ZONENAME}"

    if [ ${OEMOC_PHASE} != "POSTOPERATION_NOTRUNNING" ]; then
        exit 0
    fi

    #
    # for migration action, before starting the zone on the target GZ
    # add to /opt inherited filesystem.

    /usr/sbin/zoneadm -z ${OEMOC_ZONENAME} detach >/dev/null 2>&1
    if [ $? -ne 0 ] ;then
        echo "unable to detach ${OEMOC_ZONENAME}"
        exit 1
    fi

    echo "add inherit-pkg-dir" >/tmp/tmp-$$ .txt
    echo "set dir=/opt" >>/tmp/tmp-$$ .txt
    echo "end" >>/tmp/tmp-$$ .txt

    /usr/sbin/zonecfg -z ${OEMOC_ZONENAME} -f /tmp/tmp-$$ .txt >/dev/null 2>&1
    if [ $? -ne 0 ] ;then
        echo "unable to add inherit filesystem for ${OEMOC_ZONENAME}"
        exit 1
    fi

    /usr/sbin/zoneadm -z ${OEMOC_ZONENAME} attach -u >/dev/null 2>&1
    if [ $? -ne 0 ] ;then
        echo "unable to attach ${OEMOC_ZONENAME}"
```

```
        exit 1
    fi
}

echo ${OEMOC_ZONENAME}
echo ${OEMOC_PHASE}
echo ${OEMOC_OPERATION}

if [ ${OEMOC_OPERATION} = "MIGRATION" ] ;then
    do_migration_action
fi
exit 0
```

## 4.17 Recovering Zones

When the global zone crashes or must be halted, its non-global zones can be migrated to another global zone. However, this zone recovery procedure is not the same as zone migration because Oracle Enterprise Manager Ops Center cannot get access to the information in the global zone and therefore cannot perform compatibility checks. The procedure to relocate non-global zones from the source global zone to the target global zone is a forced attachment of the non-global zone.

The zone recovery procedure uses the command-line interface for the Oracle Enterprise Manager Ops Center.

See the [Related Resources for Oracle Solaris Zones](#) section for instructions on getting access to the CLI and the available CLI commands.

### 4.17.1 Before You Begin Recovering Zones

- Verify that the zone metadata is on the NAS storage library.
- Verify that both the source and target global zones have the same network connectivity.
- Verify that the source and the target global zones have the shared storage library.
- Verify that the target global zone has access to the same libraries associated with the non-global zone.
- Verify that the non-global zone's metadata and operational data is not stored in a local library.
- Verify that JDK version 6 or 7 is used. In the Enterprise Controller command prompt, enter the following command:

```
export JAVA_HOME=/usr/jdk/latest
```

### 4.17.2 To Recover Zones

You can recover a zone using the command line interface.

1. Connect to the Oracle Enterprise Manager Ops Center CLI using the following command:

```
/opt/SUNWoccli/bin/oc
```

2. Connect to the local Enterprise Controller.

```
xvmSh > connect
```

```
localhost >
```

3. Enter the virtualization mode.

```
localhost > virtualization
localhost [virtualization] >
```

4. List the available global zones.

```
localhost [virtualization] > list_hosts
```

Name	Type	Health	Reachable
	UUID	ObjectName	
gzhost36	zone	OK	False
com.sun.hss.domain:type=xVMServer,name=NORM-NORM-localhost 2b7c71ac-70ab-48a2-a2f2-ac291e580c39			
gzhost44	zone	OK	True
com.sun.hss.domain:type=xVMServer,name=NORM-NORM-localhost-4 3b6c61ab-50ab-34a1-b2d2-bd253e632c45			

5. List the zones that are running in the source global zone. For example, when the source global zone is gzhost36, then enter the following command.

---

**Note:**

Do not use the user-friendly name of the zone in the commands.

---

```
localhost [virtualization] > list_guests -C
com.sun.hss.domain:type=xVMServer,name=NORM-NORM-localhost
```

Name	Type	State	Migratable
	ObjectName		
test	ZONE	RUNNING	True
com.sun.hss.domain:type=Server,name=NORM-07e91405-8313-43ec-9671-dc320989866e			

6. Select the destination global zone and start the zone on it. For example, when the destination global zone is gzhost44, execute then execute the following command to start the test zone on it.

```
localhost [virtualization] > startup -Z <source global zone ObjecName> -D <target
global zone ObjecName>
```

```
localhost [virtualization] > startup -Z
com.sun.hss.domain:type=Server,name=NORM-07e91405-8313-43ec-9671-dc320989866e -D
com.sun.hss.domain:type=xVMServer,name=NORM-NORM-localhost-4
```

```
submitted job : <Ecname>-1.17
```

A job is submitted. You can view the status of the job in the Jobs pane.

After the zone is migrated to the target global zone, the zone is a managed zone of the target global zone. The zone might continue to be displayed under source global zone. This is because the status of the source global zone is not updated. After the source global zone is rebooted, the zone does not appear as one of its managed zones.

## 4.18 Zones Server Pool

You can create server pools for zones in Oracle Enterprise Manager Ops Center. Pooling your virtualization hosts provides the capability for load balancing the virtualization servers, high availability and minimize power consumption.

See [Server Pools](#) for information about creating and managing zones server pools.

## 4.19 Updating Zones

Oracle Enterprise Manager Ops Center enables you to update the global and non-global zones. You can also patch zones that are running on a supported configuration. The installation of the patches on the zones depend on the package parameters and the attribute set for the patch commands.

This section describes the parameters for installation of the packages and patches. The concepts involved in updating global and non-global zones, and the procedures to update the zones are described in this section.

---

---

**Note:**

When you use Oracle Solaris Live Upgrade to update the OS in a zone, you cannot use Oracle Enterprise Manager Ops Center to manage the zone. Alternate Boot Environment (ABE) is not supported for zones that were created using Oracle Enterprise Manager Ops Center.

---

---

### 4.19.1 Install Packages and Patches on Zones

A patch is a collection of files and directories that replace existing files and directories that are preventing proper execution of the software.

You can install packages and patches on a zone. The `patchadd` and `pkgadd` commands operate in the background to install a patch and package respectively. However, the installation of packages on zones also depends on the parameters `SUNW_PKG_ALLZONES`, `SUNW_PKG_HOLLOW`, and `SUNW_PKG_THISZONE`. These parameters control whether a package can be installed on global zones or non-global zones. The actions for the parameters are as follows:

- **SUNW\_PKG\_ALLZONES:** If the value is true, the package is installed on all zones, both global and non-global.
- **SUNW\_PKG\_HOLLOW:** If the value is true, the package information is propagated to the non-global zones, but the package is not installed.
- **SUNW\_PKG\_THISZONE:** If the value is true, the package is installed only in that zone.

### 4.19.2 Configure `patchadd` and `pkgadd` Commands

In Oracle Enterprise Manager Ops Center, the `patchadd`, `pkgadd`, `patchrm`, and `pkgrm` commands are implemented without the `-G` switch by default. To install

updates or packages only on the current zone, enable the `-G` switch by editing the `.uce.rc` file.

---



---

**Note:**

Two files in the `/SUNWuce/agent/bin` directory have similar names. Verify that you are editing the `.uce.rc` file. Do *not* edit the `uce.rc` file.

---



---

1. Open the `.uce.rc` file in the `/SUNWuce/agent/bin` directory in the managed system.

2. Add the following lines to the `.uce.rc` file:

```
( all ) (invisible.__is_patchadd_g_specified, false)
( all ) (invisible.__is_patchremove_g_specified, false)
( all ) ( invisible.__is_pkgadd_g_specified, false)
```

3. Set the `-G` parameter to true for the action that you want to perform.

4. Save and close the file.

5. For this change to take effect, restart the services using the following commands:

```
svcadm disable -s update-agent
svcadm enable -s update-agent
```

### 4.19.3 Updating a Global Zone

In Oracle Enterprise Manager Ops Center, when a package or patch is installed, the `patchadd` and `pkgadd` commands are implemented in the background as shown in the following example:

```
patchadd <patchid>
pkgadd <pkgname>
```

Change the way that these commands are implemented by enabling the `-G` switch. You can enable the `-G` switch to cause the patch or package to be installed to the target zone only if the package parameter `SUNW_PKG_THISZONE` is set to true. See [Install Packages and Patches on Zones](#) for information about configuring the `patchadd` and `pkgadd` commands on the managed systems.

See the following scenarios when you are updating a global zone. The result for each scenario determines whether the update job is successful, depending on the package information.

**Table 4-7 Updating a Global Zone Scenarios**

<b>SUNW_PKG_ ALLZONES</b>	<b>SUNW_PKG_ _THISZONE</b>	<b>SUNW_PKG_ HOLLOW</b>	<b>Impact</b>	<b>Impact with -G Configuration</b>
False	False	False	The package is installed on the global zone, and all the non-global zones	The package is installed only on the global zone.

**Table 4-7 (Cont.) Updating a Global Zone Scenarios**

<b>SUNW_PKG_ ALLZONES</b>	<b>SUNW_PKG_ _THISZONE</b>	<b>SUNW_PKG_ HOLLOW</b>	<b>Impact</b>	<b>Impact with -G Configuration</b>
True	False	False	The package is installed on the global zone and all the non-global zones.	The -G switch cannot override the SUNW_PKG_ALLZONES parameter, and the package is installed on all the zones.
True	False	True	The package is installed on the global zone and the package information is made available on all the non-global zones.	The -G switch cannot override the SUNW_PKG_ALLZONES parameter, and the package is installed on all the zones.
False	True	False	The package is installed only on the global zone.	The package is installed only on the global zone.

Patches are sets of updates to packages. When you install a patch, the patch is installed on the global zone and the non-global zones, depending on the package parameters as shown in the previous table.

---



---

**Note:**

Use caution while enabling the -G option on a host with sparse zones. Packages that are inherited from the global zone that are not SUNW\_ALL\_ZONES cannot be patched within a sparse zone.

---



---

#### 4.19.4 Updating a Non-Global Zone

A user with the virtualization administrator role can install packages and patches on non-global zones. The `patchadd` and `pkgadd` command must be used without options. Do not configure the -G switch to the commands while updating the non-global zones.

See the following scenarios when you are updating a non-global zone. The results of each scenario determine whether the update job is successful, depending on the package information.

---



---

**Note:**

The -G switch does not have an effect on installing packages or patches in a non-global zone.

---



---

**Table 4-8 Updating Non-Global Zones Scenarios**

**Table 4-8 (Cont.) Updating Non-Global Zones Scenarios**

<b>SUNW_PKG _ALLZONES</b>	<b>SUNW_PKG_THI SZONE</b>	<b>SUNW_PKG_HOLLO W</b>	<b>Impact</b>
False	False	False	The package is installed only on the target non-global zone.
True	False	False	The package installation fails.
True	False	True	The package installation fails.
False	True	False	The package is installed only on the target non-global zone.

**Note:**

When the patch is installed only on the non-global zone, ensure that autoboot property is set to true for the zone. Otherwise, single user mode patches fail to apply as the zone does not come up after the reboot.

Patches are sets of packages that must be installed. When one of the packages has the SUNW\_PKG\_ALLZONES parameter set to true, then the patch installation fails. For a successful patch installation, ensure that none of the packages have SUNW\_PKG\_ALLZONES parameter set to true.

**Note:**

Packages that deliver to read-only inherit directories do not install on sparse root zones. These packages must be installed from the global zone with the -G switch disabled. When a package has the parameter SUNW\_PKG\_THISZONE=true, it does not appear as installed from the sparse zone and the software might not function correctly. In this case, a whole root zone must be used. Packages with SUNW\_PKG\_THISZONE=true must not deliver to read-only inherit directories.

### 4.19.5 Zone Parallel Patching

To view the number of zones that you can patch in parallel when you update the global zone, go to the global zone's Summary page.

When the agent is installed on the Oracle Solaris OS, the number of zones that you can patch in parallel is calculated as 1.5 times the number of CPU cores in the server. For example, if you have a 2 CPU core machine, then you can patch three (3) zones in parallel. This is set and displayed on the UI.

Oracle Solaris 10 and 11 OS version displays this information in the Summary page. When the update capability is not enabled on the OS, then the zone parallel patching is also not enabled.

## 4.20 Related Zone Operations

Refer to the following chapters in this guide for operations that are common for many resources:

- See [Storage Libraries for Virtualization](#) for setting up your storage resources.
- See [Networks for Virtualization](#) for setting up your network infrastructure.
- See the Plans and Profiles chapter of the *Oracle Enterprise Manager Ops Center Configure Reference* for information about managing your zone profiles and deployment plans.
- See [Server Pools](#) for information about creating and managing zones server pools.
- See the Operating System Management chapter of the *Oracle Enterprise Manager Ops Center Operations Guide* for information about monitoring your resources, setting up boot environments, and Agent Controllers.
- See the Asset Management chapter of the *Oracle Enterprise Manager Ops Center Configuration Guide* for discovering and registering your assets.

## 4.21 Related Resources for Oracle Solaris Zones

For instructions in performing actions or to learn more about the role of this feature, go to one of the following resources:

- For end-to-end examples, see the workflows and how to documentation in the Deploy How To library at [http://docs.oracle.com/cd/E59957\\_01/nav/deploy.htm](http://docs.oracle.com/cd/E59957_01/nav/deploy.htm) and the Operate How To library at [http://docs.oracle.com/cd/E59957\\_01/nav/operate.htm](http://docs.oracle.com/cd/E59957_01/nav/operate.htm).

See the following example workflows for preparing for, deploying, and using zones:

- *Deploy Software Libraries Workflow*
- *Deploy Storage Libraries Workflow*
- *Deploy Networks Workflow*
- *Deploy Hardware Workflow*
- *Deploy Operating System Workflow*
- *Deploy Oracle Solaris 10 Zones Workflow*
- *Deploy Oracle Solaris 11 Zones Workflow*
- *Operate Zones Workflow*
- See the following chapters in the *Oracle Enterprise Manager Ops Center Configure Reference* for more information:
  - See the Configure Networks chapter for information about using the tagged and untagged mode for the networks, and for information about link aggregation.

- See the Manage Assets chapter for information about discovering, managing, and deleting assets.
- See the Configure Software Libraries chapter for more information about configuring software libraries.
- See the *Oracle Enterprise Manager Ops Center Administration Guide* for information about how to manage the software, including user and role management.
- See the following chapters in the *Oracle Enterprise Manager Ops Center Operations Reference* for more information:
  - See the Operating System Provisioning chapter for information on provisioning a system with an Oracle Solaris operating system.
  - See the Operating System Management chapter for information about what functions are supported for agent and agentlessly managed zones and operating systems.
- See the *Oracle Enterprise Manager Ops Center Command Line Interface Guide* for instructions on getting access to the CLI and the available CLI commands.
- For instructions to download and install the correct brand packages to migrate a physical system onto a zone, see [http://docs.oracle.com/cd/E22645\\_01/index.html](http://docs.oracle.com/cd/E22645_01/index.html).
- For current discussions, see the product blog at <https://blogs.oracle.com/opscenter>.
- For a list of the Oracle Solaris 11 documentation available in HTML and PDF formats, including the *Oracle Solaris 11.1 Administration: Oracle Solaris Zones, Oracle Solaris 10 Zones, and Resource Management* and *Oracle Solaris Administration: Oracle Solaris Zones, Oracle Solaris 10 Zones, and Resource Management* documentation, visit the Oracle Solaris 11 Documentation website at <http://www.oracle.com/technetwork/documentation/solaris-11-192991.html>.
- For a list of the Oracle Solaris 10 documentation available in HTML and PDF formats, visit the Oracle Solaris 10 Documentation website at <http://www.oracle.com/technetwork/documentation/solaris-10-192992.html>.
- The complete Oracle Solaris 10 documentation set is located at <http://docs.oracle.com/cd/E19253-01/index.html>.
- See [http://docs.oracle.com/cd/E23824\\_01/html/E24456/transzone-1.html](http://docs.oracle.com/cd/E23824_01/html/E24456/transzone-1.html) for information about creating Solaris Flash archive images of an Oracle Solaris 10 operating system.
- See <http://docs.oracle.com/cd/E19082-01/819-6990/index.html> for information about network interfaces and virtualization, and administration of your network interfaces.
- For a list of the Oracle Solaris 8 and 9 documentation, visit the Legacy Solaris Documentation website at <http://www.oracle.com/technetwork/documentation/legacy-solaris-192993.html>.



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# Oracle VM Server for SPARC

This chapter includes the following sections:

- [Introduction to Oracle VM Server for SPARC](#)
- [Domain Types and Representation on the UI](#)
- [Roles for Oracle VM Server for SPARC](#)
- [Actions for Oracle VM Server for SPARC](#)
- [Location of Oracle VM Server for SPARC Information in the User Interface](#)
- [Discovering Existing Oracle VM Server for SPARC Environments](#)
- [Provisioning Oracle VM Server for SPARC](#)
- [Manage Oracle VM Server for SPARC](#)
- [Managing Storage Resources in Oracle VM Server for SPARC](#)
- [Managing Network Resources in Oracle VM Server for SPARC](#)
- [About Logical Domains](#)
- [Create Logical Domains](#)
- [Logical Domains Created Using CLI](#)
- [Provisioning OS on Logical Domains](#)
- [Manage Logical Domains](#)
- [Managing Logical Domain Networks](#)
- [Migrate Logical Domains](#)
- [Automatic Recovery of Logical Domains](#)
- [Layered Virtualization](#)
- [Server Pools](#)
- [Related Resources for Oracle VM Server for SPARC](#)

## 5.1 Introduction to Oracle VM Server for SPARC

Oracle VM Server for SPARC technology enables server virtualization on SPARC platforms. You can create and manage multiple virtual machine instances

simultaneously on a single SPARC machine. Each virtual machine, or guest, can run a different operating system.

Oracle VM Server for SPARC technology is virtualization of SPARC servers. This technology is part of a suite of methodologies for consolidation and resource management for SPARC Chip Multi Threading (CMT) systems. Using this technology, you can allocate the various resources of the system such as memory, CPU threads, and devices, into logical groupings and create multiple discrete systems. These discrete systems have their own operating system, resources, and identity within a single system. By careful architecture, an Oracle VM Server for SPARC environment can help you achieve greater resource usage, better scaling, and increased security and isolation.

When Oracle VM Server for SPARC software is installed, a domain called the control domain is created. From this control domain, you create virtual machines called logical domains that each run an independent OS. A logical domain is a virtual machine with resources, such as CPU threads, memory, I/O devices, and its own operating system. The control domain manages the logical domains. Each logical domain can be created, destroyed, reconfigured, and rebooted independently of other logical domains.

Logical domains that are created manually for an Oracle VM Server for SPARC provisioned through the UI are also automatically discovered and managed on the UI.

You can also provision the OS on the manually created logical domains using the OS provisioning profile and plans in Oracle Enterprise Manager Ops Center.

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**Note:**

When the Enterprise Controller and Proxy Controller are installed on an Oracle Solaris 11 operating system, you can perform more tasks than with other operating systems. For example, the Enterprise Controller must be installed on Oracle Solaris 11 to provision Oracle Solaris 11, Oracle Solaris 11 zones, and newer versions of Oracle VM Server for SPARC. In some cases, the Proxy Controller must also be installed on Oracle Solaris 11. See the [Related Resources for Oracle VM Server for SPARC](#) section for more information on operating system requirements for Oracle Solaris 11 actions.

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## 5.2 Domain Types and Representation on the UI

You can create different types of logical domains. Depending on how the physical resources are assigned to the logical domain, distinguishes a logical domain from another domain. The different types are:

- **Control Domain:** The control domain is the first domain created when you install the Oracle VM Server for SPARC software. This is also called the primary domain and denoted as `primary` wherever applicable in the Oracle Enterprise Manager Ops Center UI. Only from the control domain, you can create logical domains.
- **I/O Domain:** An I/O domain has direct access to a physical I/O device, such as the PCIe Controller. An I/O domain either uses the physical I/O devices to host its own applications or shares the physical I/O device with other domains in the form of virtual devices.
- **Root Domain:** A root domain is also an I/O domain which has PCIe root complex assigned to it.

- **Guest Domain:** A guest domain is a non-I/O domain that uses virtual devices, such as virtual disks and virtual network interfaces, provided by one or more service domains.
- **HA Guest Domain:** A guest domain with redundant network and storage resources.
- **Service Domain:** A service domain provides virtual device services to other domains. This means that the domain has physical I/O devices. In the Oracle Enterprise Manager Ops Center UI, the service domain list includes the primary domain, I/O domains, and root domains that can provide virtual device services. It is generally recommended to not run any applications in service domains.

When you create logical domains using Oracle Enterprise Manager Ops Center, ensure to select the appropriate domain subtype. The selection of the domain subtype defines the step for selection of PCIe Endpoints for the I/O domain and PCIe buses for the root domain.

In Oracle VM Server for SPARC, an I/O domain can be created either by assigning PCIe Endpoints or SR-IOV Virtual Functions.

In Oracle Enterprise Manager Ops Center, an I/O domain is defined as Physical I/O domain, and created by assigning PCIe Endpoints only.

The subtype for the I/O domains is defined as Physical IO Domain in the UI. The I/O domain in this documentation refers to the Physical I/O Domain hereafter.

In the Oracle Enterprise Manager Ops Center UI, for I/O domains, the center pane displays the **I/O Resources** tab. The I/O Resources tab displays the details of the PCIe Endpoints assigned to the domain.

For root domains, the **I/O Resources** tab displays the PCIe buses assigned to the domain and the corresponding Endpoint devices in the bus.

Refer to [View I/O Resources](#) section for more detailed information.

## 5.3 Roles for Oracle VM Server for SPARC

The following table lists the tasks and the role required to complete the task. Contact your administrator if you do not have the necessary role or privilege to complete a task.

See the [Related Resources for Oracle VM Server for SPARC](#) section for information about the different roles and the permissions they grant.

**Table 5-1 Oracle VM Server for SPARC Tasks and Roles**

Task	Role
Provision and manage virtualization host	Virtualization admin
Create, manage, update, and delete guests	Virtualization admin
Create, manage, and delete I/O domains and root domains	Virtualization admin
Discover and manage virtualization hosts	Asset admin
Create and manage profiles and plans	Profile and plan admin
Create and manage IPMP groups	Network admin

**Table 5-1 (Cont.) Oracle VM Server for SPARC Tasks and Roles**

<b>Task</b>	<b>Role</b>
Create and manage Link Aggregation	Network admin
Set monitor threshold	Asset admin
Create credentials	Security admin

## 5.4 Actions for Oracle VM Server for SPARC

Using Oracle Enterprise Manager Ops Center, you can perform the following tasks:

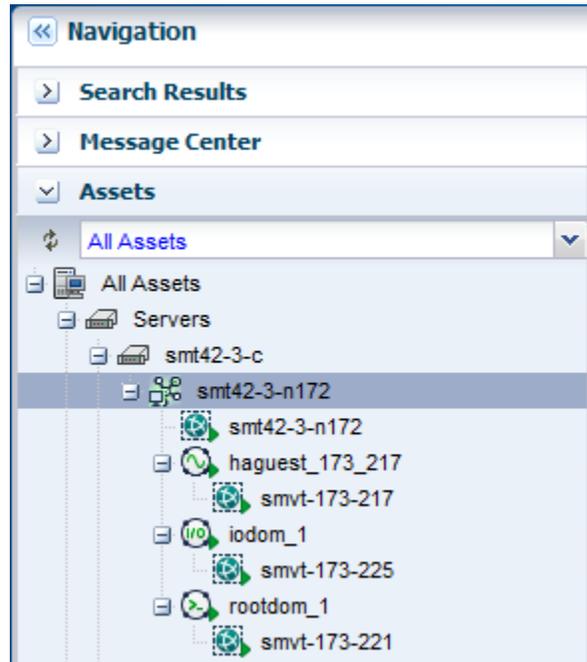
- Provision Oracle VM Server for SPARC.
- Manage Oracle VM Server, including, rebooting, shutting down, changing name servers and NFS4 domains.
- Monitor the performance of Oracle VM Server.
- Create and provision logical domains, that includes I/O domains, root domains and guest domains.
- Manage logical domains, including editing, migrating, starting, rebooting, and shutting down domains.
- Monitor the performance of logical domains.
- Discover and manage existing Oracle VM Server for SPARC systems and logical domains.
- Create server pools to maximize capacity and for automatic load balancing.
- Migrate guest domains.
- Manage automatic recovery of guest domains in a server pool.

Oracle Enterprise Manager Ops Center uses special Agent Controllers, called virtualization controller agents, or VC Agents, to manage Oracle VM Server systems and Oracle Solaris Zones. See [Virtualization Agent Controllers](#) for more information about VC Agents.

## 5.5 Location of Oracle VM Server for SPARC Information in the User Interface

Oracle VM Server for SPARC assets are visible from the All Assets section in the user interface (UI). The server hardware, control domain, the control domain OS, the logical domains and its OS are displayed as shown in this figure:

**Figure 5-1 Oracle VM Server for SPARC System in the UI**



This table lists where to find different information for Oracle VM Server for SPARC in the UI.

**Table 5-2 Location of Oracle VM Server for SPARC Information in the UI**

To See	Location
Control Domain	Expand <b>Assets</b> in the Navigation pane. The Oracle VM Server for SPARC asset is represented by the SPARC icon which is the control domain.
Logical Domains	Expand <b>Assets</b> in the Navigation pane. Select the control domain and all the logical domains created in that server are listed.
Virtual Services	Expand <b>Assets</b> in the Navigation pane and select the control domain. The center pane displays the <b>Virtual Services</b> tab that displays the Virtual Disks, Virtual Network Switches, and Virtual Console Concentrators details.
I/O Resources	Expand <b>Assets</b> in the Navigation pane and select the control domain. The center pane displays the <b>I/O Resources</b> tab that displays the Buses/Endpoint Devices and SR-IOV Services.

**Table 5-2 (Cont.) Location of Oracle VM Server for SPARC Information in the UI**

To See	Location
Other options	Expand <b>Assets</b> in the Navigation pane and select the control domain. The Actions pane lists the different options available for managing Oracle VM Server for SPARC. The options are Associate Libraries, Attach Network, Reboot and Edit Attributes.

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## 5.6 Discovering Existing Oracle VM Server for SPARC Environments

The following information is covered in this section:

- [Supported Logical Domain Configurations](#)
- [Limitations of Discovering an Existing Oracle VM Server for SPARC System with Logical Domains](#)
- [Discover and Manage Existing Oracle VM Server for SPARC Servers](#)

You can use Oracle Enterprise Manager Ops Center to manage Oracle VM Server for SPARC systems created outside of Oracle Enterprise Manager Ops Center. There is no difference between the logical domains created using Oracle Enterprise Manager Ops Center and the domains created outside of Oracle Enterprise Manager Ops Center except for some limitations that are described in [Limitations of Discovering an Existing Oracle VM Server for SPARC System with Logical Domains](#).

You can manage the following types of existing Oracle VM Server for SPARC servers:

- Oracle Solaris 11 running Oracle VM Server for SPARC server. The control domain can have non-global zones.
- Oracle Solaris 10 running Oracle VM Server for SPARC server. The control domain can have non-global zones.

To manage an existing Oracle VM Server for SPARC environment, use the Oracle Enterprise Manager Ops Center discovery feature to display the domains (control, root, I/O, and guest domains) in the user interface. The information about the I/O resources, and SR-IOV configurations appear in the UI.

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**Note:**

If you manually configured an Oracle VM Server for SPARC environment that you managed with an earlier version of Oracle Enterprise Manager Ops Center, the Zones VC Agent is installed. See [Virtualization Agent Controllers](#) for information about VC Agents and [Agent Management Options](#) for how to change the Agent Controller to the Oracle VM Server VC Agent.

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## 5.6.1 Supported Logical Domain Configurations

You can discover and agent manage an existing fully configured Oracle VM Server for SPARC system that has logical domains and associated network and storage resources that are configured on the control domain.

The logical domain configuration might be one of the following types with I/O resources or virtual resources:

- A root domain with one or more PCIe root complexes
- A physical I/O domain with one or more PCIe Endpoint devices
- A guest domain with virtual resources

## 5.6.2 Limitations of Discovering an Existing Oracle VM Server for SPARC System with Logical Domains

When you discover and deploy an agent on an existing Oracle VM Server for SPARC system that has associated logical domains, the system and logical domains appear in the Assets section of the UI. Some actions are disabled when the agent is not able to manage a resource.

### 5.6.2.1 Disabled Migration Action

The following are some reasons why the migration management action is disabled:

- Migration is disabled for all discovered guest domains because the metadata of the domain is in the default local library. To resolve, move the metadata to a shared library for all guest domains that you want to migrate. See [Moving Metadata to Another Library](#) for how to move the metadata.
- Migration is disabled for all guest domains that use storage on local devices or local files. To resolve, use shared FC or iSCSI LUNs for the guest domain's storage. Or enable shared action for the local file system storage

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**Note:**

You cannot migrate a guest domain until you move all of its virtual disks to shared storage and move the domain's metadata to a shared library. See [Migration Requirements](#) for more details.

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### 5.6.2.2 Monitoring Information

The monitoring information might be incomplete due to missing managed resources. The following are examples of situations of missing resources:

- The networking view of logical domains shows only the networks that you discover with the control domain Virtualization Agent Controller.
- The networking view of a logical domain is incomplete when the domain is provisioned without an Agent Controller running on it.
- For a control domain with no guests and VLAN tagged networks, the Networks tab displays VLAN IDs but not a network name. The network name field is populated when a guest operating system is discovered or created using an IP address over

the VLAN tagged network, or when you manually attach the network to the control domain with the Do Not Allocate option for the same VLAN ID.

- The storage view of a logical domain might be incomplete if its backing storage is not part of a library that is managed by Oracle Enterprise Manager Ops Center.

### 5.6.2.3 Agentless Management

Agentless management does not deploy the Agent Controller on the control domain, which restricts the management capabilities to the following:

- Perform basic state change command such as shutdown, start, reboot, and destroy.
- Edit the number of vCPUs, the number of Crypto units, and the memory size.
- Provision the Oracle Solaris operating system.
- Access the guest's serial console.
- View the network configuration and storage configuration for each guest.

With an agentlessly managed domain, you are unable to change the network and storage configurations, and therefore, unable to migrate the guests to another managed Oracle VM Server.

## 5.6.3 Discover and Manage Existing Oracle VM Server for SPARC Servers

You can discover and manage an Oracle VM Server for SPARC system that you manually provisioned. The underlying logical domains are automatically discovered and managed in Oracle Enterprise Manager Ops Center. In the Assets section, the discovered logical domains are displayed in order and grouped under the control domain.

You can manage the versions of Oracle VM Server for SPARC listed in the *Oracle Enterprise Manager Ops Center Certified Systems Matrix*.

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**Note:**

To discover the server, the Logical Domains Manager must be running in the Oracle VM Server for SPARC system.

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The following tasks are covered:

- [To Agent Manage an Existing Oracle VM Server for SPARC System](#)
- [To Agentlessly Manage an Existing Oracle VM Server for SPARC System](#)

See [Get Started With Virtualization](#) for information about agent controllers.

### 5.6.3.1 To Agent Manage an Existing Oracle VM Server for SPARC System

1. (Optional) Create SSH or SNMPv3 credentials. If you have not created the credentials, you can create them before creating an OS Discovery profile, or you can create them as part of the OS Discovery profile.
2. Create an OS Discovery profile.
  - a. Expand **Plan Management** in the Navigation pane.

- b. Click **Discovery** in Profiles and Policies.
- c. Click **Create Profile** in the Actions pane.
- d. Enter a name and description for the discovery profile. Expand Operating Systems and select **Solaris, Linux OS**. Click **Next**.
- e. (Optional) Click **Next** to skip tags.
- f. (Optional) Click **Next** to skip adding IP Ranges. You are prompted to provide IP addresses and host names during discovery.
- g. Click **Select**, select the SSH or SNMPv3 credentials that you previously created, then click **OK**. To create new credentials, click **New** and create the credentials.

Select the **Enable Oracle VM for SPARC management** check box to deploy the Agent Controller during discovery. Click **Next**.

**Figure 5-2** *Discovery Credentials for Oracle VM for SPARC Management*

**Discovery Credentials**

Optionally specify the discovery and/or management credential sets for each protocol. These credentials are used to probe the assets.

**Discovery**

SSH : New Select Clear

SNMPV3 : New Select Clear

**Management**

After discovery, an asset must be managed for full data to be reported and actions to be available. Specify whether to manage the assets using Agent Deployment or Agentless.

Deploy Agent Controller. Required for software update and virtualization support.

Enable Oracle VM for SPARC management.

Deploy Agent Controller on Oracle Solaris 10 Zones.

Manage without Agent Controller. A Proxy Controller periodically probes the asset using SSH.

- h. Review the Summary page, then click **Finish**.
3. Add the assets using the OS discovery profile.
    - a. Expand **Assets** in the Navigation pane, then click **Add Assets** in the Actions pane.
    - b. Select **Add and manage various types of assets via discovery probes**, then click **Next**.
    - c. Select the Discovery profile you created in the previous step. You are prompted to complete the host names or IP addresses and network.
    - d. Enter a comma-separated list of host names or IP addresses. Select a managed network with which the host is associated, or select Automatic to route the job to the most appropriate Proxy Controller.

The IP address of a target must resolve to only one known network for automatic routing to succeed.

- e. (Optional) The Discovery credentials and management option are completed based on the profile. You can edit these fields.
- f. Click **Add Now**.

The control domain appears in the Asset tree under its server hardware. The control domain operating system appears under its control domain. The non-global zones, if any, appears under the control domain operating system with a limited set of capabilities.

When an Agent Controller is installed on the control domain, all the networks that are connected to the control domain and configured with an IP address are discovered in Oracle Enterprise Manager Ops Center.

Also, when the Agent Controller is installed on the logical domains of the control domain, the extra networks that are connected to the logical domains and configured with an IP address are discovered in Oracle Enterprise Manager Ops Center.

### 5.6.3.2 To Agentlessly Manage an Existing Oracle VM Server for SPARC System

Agentlessly managed discovery locates the logical domains through the proxy management point.

1. (Optional) Create SSH credentials. If you have not created SSH credentials, you can create them before creating an OS Discovery profile, or you can create them as part of the OS Discovery profile.
2. Create an agentless OS Discovery profile.
  - a. Expand **Plan Management** in the Navigation pane.
  - b. Click **Discovery** in Profiles and Policies.
  - c. Click **Create Profile** in the Actions pane.
  - d. Enter a name and description for the discovery profile. Expand Operating Systems and select **Solaris, Linux OS**. Click **Next**.
  - e. (Optional) Click **Next** to skip tags.
  - f. (Optional) Click **Next** to skip adding IP Ranges. You are prompted to provide IP addresses and host names during discovery.
  - g. Select **Manage without Agent Controller**. Click **Replace** and choose the SSH management credentials. Click **Next**.

**Figure 5-3 Discovery Credentials for Oracle VM for SPARC Management**

**Discovery Credentials**

Optionally specify the discovery and/or management credential sets for each protocol. These credentials are used to probe the assets.

**Discovery**

SSH: New Select Clear

**Management**

After discovery, an asset must be managed for full data to be reported and actions to be available. Specify whether to manage the assets using Agent Deployment or Agentless.

Deploy Agent Controller. Required for software update and virtualization support.

Manage without Agent Controller. A Proxy Controller periodically probes the asset using SSH.

SSH: ssh\_credentials New Replace Clear

- h. Review the Summary page, then click **Finish**.
3. Use the OS Discovery profile to add the Oracle VM Server for SPARC:
    - a. Expand **Assets** in the Navigation pane, then click **Add Assets** in the Actions pane.
    - b. Select **Add and manage various types of assets via discovery probes**, then click **Next**.
    - c. Select the Discovery profile you created in the previous step. You are prompted to complete the host names or IP addresses and network.
    - d. Enter a comma-separated list of host names or IP addresses. Select a managed network with which the host is associated, or select Automatic to route the job to the most appropriate Proxy Controller.
 

The IP address of a target must resolve to only one known network for automatic routing to succeed.
    - e. (Optional) The Discovery credentials and management option are completed based on the profile. You can edit these fields.
    - f. Click **Add Now**.

The control domain appears in the Asset tree under its server hardware. The control domain operating system appears under the control domain. The logical domains appear under the control domain operating system.

Because it is agentlessly-managed, the control domain has a limited level of monitoring and management actions.

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**Note:**

To change the server to agent managed, use **Switch Management Access**. To monitor and manage the Oracle VM Server for SPARC server, control domain, and operating system, select the LDom Virtualization Controller agent. To monitor and manage the global zone, select the Zone Virtualization Controller Agent.

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## 5.7 Provisioning Oracle VM Server for SPARC

The following information is covered in this section:

- [Prerequisites for Provisioning Oracle VM Server for SPARC](#)
- [Recommended Minimum Configuration](#)
- [Profiles for Provisioning and Configuring Oracle VM Server for SPARC](#)
- [Creating an OS Provisioning Profile for Oracle VM Server for SPARC](#)
- [Creating an OS Configuration Profile for Oracle VM Server for SPARC](#)
- [Creating a Link Aggregation in Oracle VM Server for SPARC](#)
- [Creating IPMP Group in Oracle VM Server for SPARC](#)
- [Deployment Plans for Oracle VM Server for SPARC](#)
- [Overview of Oracle VM Server for SPARC Installation](#)

### 5.7.1 Prerequisites for Provisioning Oracle VM Server for SPARC

The specific hardware, OS, and firmware requirements must be met for provisioning Oracle VM Server for SPARC.

#### 5.7.1.1 Operating System

Configure your Oracle Solaris 11 Software Update Library in the Enterprise Controller. The library is a local copy of the parent repository of Oracle Solaris 11 Image Packaging System (IPS). When you create OS provisioning profile, the supported Oracle VM Server for SPARC version, Oracle Solaris 11 OS and the Support Repository Update (SRU) are populated and listed.

When you want to use Oracle Solaris 10 OS, import or upload the required update versions of Oracle Solaris 10 OS in the Initial EC Library or in a software library created using a local file system on the Enterprise Controller or on a shared file system on a NFS server. Refer to the [Related Resources for Oracle VM Server for SPARC](#) for the required update versions of Oracle Solaris 10 OS.

Upload the required Oracle Solaris OS image to the software library in Oracle Enterprise Manager Ops Center. See the [Related Resources for Oracle VM Server for SPARC](#) section for more information about uploading or importing OS images.

#### 5.7.1.2 Hardware and Firmware

Refer to the [Related Resources for Oracle VM Server for SPARC](#) section for the supported platforms to install different versions of Oracle VM Server for SPARC.

Ensure that you install the correct system firmware. You can update the firmware using Oracle Enterprise Manager Ops Center. See the [Related Resources for Oracle VM Server for SPARC](#) section for information about downloading and updating the required firmware version.

When you use Oracle Enterprise Manager Ops Center to provision the Oracle VM Server for SPARC software, it installs the Oracle Solaris OS, the control domain, and an agent on the target system. The provisioning action removes existing virtualization software, including any previous logical domains installed on the service processor.

To install Oracle VM Server for SPARC software, apply a profile that specifies the values for resources such as CPU threads, Crypto units, and memory as described in [Profiles for Provisioning and Configuring Oracle VM Server for SPARC](#).

When you have existing Oracle VM Server for SPARC environment that you want to discover and manage in Oracle Enterprise Manager, refer to the section [Discovering Existing Oracle VM Server for SPARC Environments](#) for more information.

## 5.7.2 Recommended Minimum Configuration

The recommended minimum configurations for the control domain are described in the following sections:

- [CPU Resource Allocation](#)
- [Crypto Units](#)
- [RAM](#)
- [NVRAMRC Value](#)

### 5.7.2.1 CPU Resource Allocation

You can allocate CPU threads or cores to the control domain.

The number of system CPUs determines the number of control domain CPU threads:

- For less than 16 system CPUs, set the control domain CPU Threads to 2.
- For between 16 and 64 system CPUs, set the control domain CPU Threads to 4.
- For more than 64 system CPUs, set the control domain CPU Threads to 8.

You can select to allocate CPU resources either as CPU Threads or Whole-core. Whole-core is the default value in Oracle Enterprise Manager Ops Center. When you allocate as Whole-core, all the CPU Threads in the core are allocated to the control domain. For example, when you allocate two cores in UltraSPARC T2 servers, the control domain is allocated with all the 16 CPU Threads in the core. You can also set the maximum cores constraint when you select Whole-core allocation type. The maximum number of cores constraint specifies the number of cores that must be assigned to the domain.

### 5.7.2.2 Crypto Units

Crypto units are the resources on the supported platforms that provide high-performance, dedicated cryptographic engines. These can be used for tasks such as encrypting and decrypting network traffic between a Secure Socket Layer (SSL) web server and an application server.

Each CPU core has one Crypto unit and four or eight CPU threads. Because the Crypto unit is part of a core, the Crypto unit is bound only to domains that contain at least one thread from the parent core. Crypto units cannot be split as CPU threads are split.

For example, you have assigned the Crypto unit for the first CPU core to the control domain. When a new logical domain is assigned a thread from the first CPU core and the Crypto unit for that core is already assigned, the control domain cannot assign that Crypto unit to the new logical domain. Allocation of Crypto units might not succeed, especially when a core is split between domains. An Oracle VM Server might allocate fewer Crypto units or none at all.

You must assign at least one Crypto unit to the control domain because the Crypto unit enables domain migration.

The use of Crypto Units is not mandatory although it might speed the logical domain migration. Allocation of Crypto Units might not be available in all the hardware supported. See the corresponding hardware data sheet and documentation for more information before planning for Crypto Units.

#### **Example 5-1 Example of Crypto Unit Assignments**

In UltraSPARC T1 based servers, one core is four CPU threads. Therefore, assign one Crypto unit and four CPU threads to the control domain. These values are set in the OS profile for Oracle VM Server for SPARC.

In UltraSPARC T2 and T2 Plus based servers, one core is eight CPU threads. Therefore, assign one Crypto unit and eight CPU threads to the control domain.

### **5.7.2.3 RAM**

The amount of RAM for the control domain depends on the size of the system RAM and the load of the system.

- For system RAM less than 8 GB, set the control domain's RAM to 1 GB.
- For system RAM between 8 GB to 16 GB, set the control domain's RAM to 2 GB.
- For system RAM greater than 64 GB, set the control domain's RAM to 8 GB.

In Oracle Enterprise Manager Ops Center the default value is 4 GB as a recommended starting point for logical domains, and the minimum value is 1GB.

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**Note:**

See the [Related Resources for Oracle VM Server for SPARC](#) section for more information about allocating memory size.

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### **5.7.2.4 NVRAMRC Value**

Automatic booting on a SPARC system uses the default boot device that is defined in the non-volatile RAM (NVRAM).

User-defined commands that are executed during start-up are stored in the NVRAMRC file in the NVRAM. When you run an OS provisioning job on a SPARC machine, Oracle Enterprise Manager Ops Center resets the configuration to the factory default configuration and removes the information that is stored in the NVRAMRC file. The control domain OS configuration profile gives you the option to preserve the information in the NVRAMRC file before resetting the server to the factory defaults, and then restore the information after the reset.

### 5.7.3 Profiles for Provisioning and Configuring Oracle VM Server for SPARC

Oracle Enterprise Manager Ops Center provides two profiles for defining the parameters required for provisioning Oracle VM Server for SPARC:

- **OS Provisioning Profile:** The profile collects information required for provisioning the OS.
- **OS Configuration Profile:** The profile collects information about control domain parameters and network configuration.

Create an OS provisioning plan that encapsulates the OS provisioning and configuration profile for installing Oracle VM Server for SPARC software, the OS, and to set the parameters of the control domain.

The OS provisioning profile collects the following details:

- OS provisioning parameters such as OS image, and Oracle VM Server for SPARC version.
- OS setup details such as time zone, language, root and console serial port and baud rate, root password, and options to enable manual net boot and save NVRAMRC values.
- File system layout.
- Naming services that includes, DNS, NIS, and LDAP.

The OS configuration profile collects the following information:

- Control domain configuration such as CPU Threads or Whole-cores, memory, and Crypto Units.
- Options such as enabling SR-IOV, and detaching the unused buses.
- OS management option to install the Agent Controller.
- Enabling multiplexed I/O to connect to block storage libraries.
- Networking options to use IPMP or Link Aggregation.

### 5.7.4 Creating an OS Provisioning Profile for Oracle VM Server for SPARC

You can create an OS Provisioning profile to provision Oracle VM Server for SPARC.

1. Select the **Plan Management** section and expand **Profiles and Policies**.
2. Select **OS Provisioning** and click **Create Profile** in the Actions pane.
3. Specify the profile details in the **Create Profile - OS Provisioning** wizard:
  - a. Enter the name and description of the profile.
  - b. Select Oracle VM Server for SPARC as the Subtype.

Click **Next** to select the OS image and distribution.
4. Select the following parameters in the Specify OSP Parameters step:

- Oracle VM Server for SPARC Version

- Software Group

Refer to [Operating System](#) for selecting Oracle Solaris 10 OS. You have option to include custom scripts when you use Oracle Solaris 10. For Oracle Solaris 11 OS, the SRU and the supported Oracle VM Server for SPARC version are listed.

Click **Next** to specify the OS setup.

5. Specify the following OS setup parameters:

- Select a language from the list.
- Specify the time zone.
- Specify a terminal type.
- To monitor the installation using a serial connection, select the console serial port device and the baud rate.
- Enter the NFS4 domain name for the target system to use. A dynamic NFSv4 domain name enables the name to be derived at run time, based on the naming service configuration. You can also enter a static domain name.
- Enter the root password for the root user on systems provisioned using this profile. Re-enter the password for confirmation.
- Select the **Manual Net Boot** option to enable manual control of network boot operations for the target system. You must select this option for a target system that does not have a service processor because Oracle Enterprise Manager Ops Center cannot control the network boot process remotely on these systems.
- Select the option **Save NVRAMRC** values to preserve your user-defined commands that were executed during start-up.

Click **Next**.

6. If it is Oracle Solaris 11 OS, then you are directed to [Step 7](#) to create a user account to log in.

Otherwise, to [Step 8](#) for Oracle Solaris 10 OS.

7. For Oracle Solaris 11 OS, root login to the system is not enabled. Create a user account through which you can SSH to the OS after provisioning. Enter the user name and password for the user account.

Click **Next** to specify whether you want to install the OS on an iSCSI disk.

8. Select the option **Use iSCSI Disk** to use iSCSI disks for provisioning Oracle VM Server for SPARC. The storage server is identified in the network and select the volume group that must be used to create a new iSCSI disk. A new iSCSI disk is created in the storage server for each target when necessary.

A Dynamic Block Storage Library is automatically created for each storage server.

If you want to enter the details of the storage server, select **Manually Specify iSCSI Disk** to enter the storage server IP address and the LU Number while deploying the plan.

Click **Next** to specify the file system layout.

9. Specify the disk partitions and file systems that you want to create on the target system. The root (/) and a swap file system are defined by default. You can

modify the size of the file system. Click the **Add** icon to define a new partition. For each partition that you define, provide the following information:

- **File System Type:** Select a file system type: ufs, unnamed, zfs, or swap.
- **Mount Point:** Enter a directory to use as a mount point for partitions.
- **Device:** Enter the `rootdisk` keyword and a slice value to describe a partition on the target system's boot disk, for example, `rootdisk.s0`, or enter the logical device name, for example, `c1t0d0s0`, of the partition that you want to create.
- **Size:** Enter the size that you want to assign to the partition, expressed in MB. Do not enter any value for the size when you want to allocate the remaining unused disk space to a file system.

Click **Next** to specify the name service.

10. Specify the name service, domain name and the corresponding name server. Select one of the following name services:

- **DNS:** Enter the domain name of the DNS server and enter the IP address of the DNS server in the **Name Server** field. You can enter up to three IP addresses as the value for the Name Server. Provide the additional domains to search for name service information in the Domain Name Search List. You can specify up to six domain names to search. The maximum length of each search entry is 250 characters.
- **NIS or NIS+:** Enter the domain name of the NIS or NIS+ server. When you know the NIS server details, select the option **Specify an NIS Server** and enter the NIS server host name and the IP address.
- **LDAP:** Enter the domain name of the LDAP server. Specify the name of the LDAP Profile you want to use to configure the system. Enter the IP address of the LDAP Profile Server. You can also provide the Proxy Bind Distinguished Name and Password.
- **None:** Select **None** when there is no naming service configured.

Click **Next** to review the properties of the profile.

11. Review the summary of your selections. Click **Finish** to create the profile.

## 5.7.5 Creating an OS Configuration Profile for Oracle VM Server for SPARC

1. Select the **Plan Management** section and expand **Profiles and Policies**.
2. Select **OS Configuration** and click **Create Profile** in the Actions pane.
3. Specify the profile details:
  - a. Enter the name and description of the profile.
  - b. Select Oracle VM Server for SPARC as the Subtype.

Click **Next** to specify the setup for configuring control domain.

4. Specify the resources that you want to assign to the control domain. The remaining resources are available for the logical domains.

- **Oracle VM Server Version:** Select the Oracle VM Server for SPARC version to be configured.
- **CPU Model:** Select how you want to allocate the CPU resources, Virtual CPU or Whole-Core. The default value is Whole-Core.
- **CPU Threads:** This field is displayed when you select the CPU Model as Virtual CPU. Specify the number of CPU threads that you want to assign to the control domain.
- **CPU Cores:** This field is displayed when you select the CPU Model as Whole-Core. Specify the number of cores to be allocated to the control domain.
- **Max CPU Cores:** This field is displayed when you select the CPU Model as Whole-core. Specify the maximum number of cores that must be assigned to the domain.
- **Memory:** Specify the amount of memory that you want to assign to the control domain. The default value is 4 GB and the minimum value is 1 GB.
- **Requested Crypto Units:** Specify the number of Crypto units that you want to assign to the control domain.
- **Virtual Console Port Range:** Specify the minimum port and maximum port of the virtual console of the control domain. The default port range for virtual console is 5000 to 6000.
- **Virtual Disk Server:** A virtual disk server (vds), `primary-vds0`, is added to the control domain by default. The virtual disk services allow you to export virtual disks to logical domains. You can modify the default name of the virtual disk server.
- **Enable Single Root I/O Virtualization (SR-IOV):** The supported PCIe buses are SR-IOV enabled and maximum number of virtual functions (VFs) are created on them. The type of network card decides the number of VFs. The option to enable SR-IOV is available from Oracle VM Server for SPARC 2.2 version.
- **Detach unused buses:** The PCIe buses that are not in use by the control domain are released. All the unused PCIe buses are detached so that it is available for creating root domains.

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**Note:**

For Oracle VM Server for SPARC 1.2 version, you can select **Enable JASS** to install SUNWJass package to harden the system.

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Click **Next** to specify the OS management for installing Agent Controller.

5. The option to install the Agent Controller is by default and cannot be changed. Select **Enable Multiplexed I/O** option to enable multiple path for SAN library connectivity to the control domain. The action enables LUNs to be accessed through multiple host controller interfaces from a single instance of the I/O device.

Click **Next** to specify the networking details for provisioning.

6. Select one of the network options for the target system:
  - When you select **Use Link Aggregation**, refer to the section [Creating a Link Aggregation in Oracle VM Server for SPARC](#) to define the parameters for Link Aggregation.
  - When you select **Use IPMP**, refer to the section [Creating IPMP Group in Oracle VM Server for SPARC](#) for IP Multipathing.
  - When you select **None**, you are forwarded to the next step to define the network interfaces and IP address allocation for the selected networks.

Select an option and click **Next** to continue.

7. Select the following details for network configuration:
  - **Controller:** The network interfaces built in with the server hardware are displayed as **default** in the **Controller** column. For bare-metal OS provisioning, only the in-built network interfaces of the server are displayed.
  - **Interface:** Select the network interface which you want to configure on the OS. The network interfaces are represented as *net\_x*. x ranges from 0 to 31. The number of interfaces for each controller available is 32. For bare-metal ILOM servers, the device map are not available. For such instances, you can specify the MAC address instead of interface while deploying the provisioning plan.
  - **Address Allocation Method:** The address allocation for the network is to use static IP. You have to provide the static IP address while deploying the OS provisioning plan.
  - **Virtual Switch:** Select **Auto** to create virtual switch automatically for the network connection. Or select **None** if you do not want to create virtual switch. You can also enter a name for the virtual switch. Enter a switch name directly in the virtual switch list.

Click the **Add** icon to add more networks and define the interfaces.

Click **Next** to go to the Summary step.

8. Review the Summary of your selections. Click **Finish** to create the profile.

### 5.7.6 Creating a Link Aggregation in Oracle VM Server for SPARC

While creating the profile for installing Oracle VM Server for SPARC, follow the procedure to create link aggregation:

1. Select **Use Link Aggregation** in the Specify Networks step of the profile.
2. Specify and configure the IEEE 802.3ad Link Aggregation details:
  - **Link Aggregation Name:** Select the name of the Link Aggregation. The names are set to *aggr<x>*.
  - **Load Balancing Policy:** Define the policy for outgoing traffic.
  - **Aggregation Mode and Switches:** When the aggregation topology connects through a switch, determine whether the switch supports the Link Aggregation Control Protocol (LACP). When the switch supports LACP, you must configure LACP for the switch and the aggregation. Define one of the modes in which LACP must operate.

- **LACP Timer:** Indicates the LACP timer value, either short or long.
- **MAC Address Policy:** Define whether the MAC address of the NICs are fixed.
- **Virtual Switch:** Select **Auto** to create virtual switch automatically for the network connection. Or select **None** if you do not want to create virtual switch. You can also enter a name for the virtual switch. Enter a switch name directly in the virtual switch list.
- **Number of Interfaces:** By default, two interfaces are defined in the aggregation. You can modify the number of interfaces for the aggregation.

You can add multiple link aggregation and define the configuration parameters for each aggregation.

Click **Next** to specify the link aggregation interfaces.

3. Select the interfaces for each link aggregation defined in the previous step. Choose the **Controller** from which the interfaces are used in the link aggregation.

You must define the number of interfaces in the previous step. You cannot add or delete the required interfaces in this step.

Click **Next** to continue.

### 5.7.7 Creating IPMP Group in Oracle VM Server for SPARC

While creating the profile for installing Oracle VM Server for SPARC, follow the procedure to create IPMP groups.

1. Select **Use IPMP** in the Specify Networks step of the profile.
2. Specify and configure the IPMP groups:
  - **IPMP Group Name:** The name of the IPMP group is automatically displayed in the format of *ipmp<x>*. You can also modify the default name of the IPMP group.
  - **Failure Detection:** The detection can be Link-Based or Link-Based and Probe-Based.
  - **Number of Interfaces:** By default, two interfaces are defined in the group. You can modify the number of interfaces for the IPMP group.

You can add multiple IPMP groups and select the failure detection for each group.

Click **Next** to specify the IPMP interfaces.

3. Select the **Controller** from which the interfaces are used in the IPMP group. Select the interfaces for each IPMP group and choose whether they are **Failover** or **Standby** interface. You can add multiple interfaces to each IPMP group.

Select whether to assign IP address to the specified NIC during configuration. The data and test addresses are assigned during profile execution.

Select **Auto** to create virtual switch automatically for the network connection. Or select **None** if you do not want to create virtual switch. You can also enter a name for the virtual switch. Enter a switch name directly in the virtual switch list.

Click **Next** to continue the profile.

## 5.7.8 Deployment Plans for Oracle VM Server for SPARC

The Provision OS deployment plan provides the steps to provision and configure Oracle VM Server for SPARC. The Provision OS plan consists of the following profiles:

- OS Provisioning Profile
- OS Configuration Profile

Create a Provision OS deployment plan with the two profiles defined in the steps of the plan and apply the plan on the target server.

See the [Related Resources for Oracle VM Server for SPARC](#) section for more information about creating and managing the profiles and plans.

### 5.7.8.1 Applying a Deployment Plan for Oracle VM Server for SPARC

When you apply a deployment plan to provision Oracle VM Server for SPARC, you must have the following information to complete the installation:

- In the server hardware, obtain the network interface that is physically connected to the network that is managed by Oracle Enterprise Manager Ops Center.
- Both tagged and untagged networks are listed for network configuration. When OpenBoot PROM (OBP) is used, only untagged networks can be used for OS provisioning as you cannot boot from a tagged network.
- The IP address for the boot interface.
- If you want to identify the network interface using the MAC address, you can select to enter the MAC address instead of the boot interface.
- The details of network connection that you want to use to configure the OS after booting. For multiple network configuration, the first interface is always overwritten by the boot interface that is defined during the OS provisioning step. For single network configuration, it is same as the boot interface network.
- Select to place the Oracle VM Server for SPARC in a server pool or not.

1. Select the **Provision OS** plan in the **Deployment Plans** list.
2. Select **Apply Deployment Plan** in the Actions pane.
3. Select one or more assets and add to the target list.
4. Select the plan to be applied with minimal interaction. If required to change the profile parameters, then select **Allow me to override any profile values**.
5. Select not to review the steps that are not included in the plan and click **Next**.
6. The wizard collects information for provisioning Oracle VM Server for SPARC. Click **Next**.
7. In the Boot Interface Resource Assignments step, provide the following information:
  - **Network:** The network for the boot interface.

- **Controller:** Select the controller that provides the network interface for OS provisioning. It is always default for the Oracle VM Server for SPARC provisioning.
- **Interface:** Select the interface from the list. The network interface that is physically connected to the selected network.
- **IP Address:** Enter the IP address for the boot interface.
- (Optional) **Primary Hostname:** Enter the host name for Oracle VM Server for SPARC.

If you want to identify the network interface by its MAC address, then select the option **Identify Network Interface by MAC Address** and enter the MAC address instead of selecting the Controller and the Interface.

Click **Next** to view the OS provisioning summary.

8. Review the parameter of OS provisioning and click **Next**.
9. The following steps in the wizard collects information about OS configuration.

Click **Next**.

10. Specify the network resources that were defined in the profile. Select the network and for each network, select the network interface and enter the IP address.

The first network interface listed is the boot interface. For multiple network configuration, the first network interface is always overwritten by the boot interface network. You can select which is the primary network interface after the provisioning of the OS.

For single network, the boot interface network will be the defined as the primary network during OS configuration.

Click **Next**.

11. Select whether you want to add the Oracle VM Server for SPARC to a server pool. You also have option to create a new server pool with default server pool settings. For creating a new server pool, you must provide a NAS storage library for the server pool.

Click **Next**.

12. Review the summary of the OS configuration parameters and click **Next** to schedule the job.

13. Schedule the provisioning job to run immediately, or at a later time.

Click **Apply** to apply the deployment plan on the selected targets.

## 5.7.9 Overview of Oracle VM Server for SPARC Installation

You can install the software on bare-metal or on systems already configured with logical domains. When you provision Oracle VM Server through Oracle Enterprise Manager Ops Center, any previous configuration is removed and the service processor is reset to its factory defaults.

When you provision Oracle VM Server for SPARC, the instance of the Oracle Solaris OS becomes the control domain which is the first domain to be created. The virtualization host on which this instance of Oracle Solaris OS runs is called the Oracle

VM Server Host or simply, Oracle VM Server. The Logical Domains Manager runs in the control domain and provides the functions to create and manage logical domains. You can have only one control domain per server. You cannot change the name or destroy the control domain.

This section describes how to install the Oracle VM Server for SPARC software on a service processor:

1. The Oracle VM Server for SPARC software depends on particular Oracle Solaris OS versions, required software patches, and particular versions of system firmware. See [Selection of Oracle VM Server Version](#).
2. Discover the target system on which you want to install Oracle VM Server for SPARC software.
3. Refer to the [Related Resources for Oracle VM Server for SPARC](#) section for information about configuring DHCP services on Proxy Controllers, if required.
4. Create an OS provisioning and OS Configuration profiles for provisioning Oracle VM Server for SPARC. See [Profiles for Provisioning and Configuring Oracle VM Server for SPARC](#).
5. Create a deployment plan with the profiles created for provisioning and configuring Oracle VM Server for SPARC.
6. (Optional) Adjust the amount of time allowed for the provisioning job. The default time is three hours or 180 minutes. You can edit the `default_timeout` value for OS provisioning in the Enterprise Controller Configuration in the Administration section, as shown in [Figure 5-4](#).

**Figure 5-4** Default Timeout Settings

The screenshot shows the Enterprise Controller Configuration interface. The 'Configuration Management' section is active, and the 'Subsystem' is set to 'OS Provisioning'. A table lists various properties and their values. The 'default\_timeout' property is highlighted, showing a value of 180.

Property	Value
default_timeout	180
id.satellite_base_dir	/var/opt/sun/xvm
ldom.pis_key.1.2	LDOM_VERSION_12_FW
ldom.pis_key.1.3	LDOM_VERSION_13_FW
ldom.pis_key.2.0	LDOM_VERSION_20_FW_REC
ldom.pis_key.2.1	LDOM_VERSION_21_FW_REC
ldom.pis_key.2.2	LDOM_VERSION_22_FW_REC
ldom.update_version.1.2	7
ldom.update_version.1.3	7

The Oracle VM Server for SPARC provisioning job performs the following major tasks:

- Downloads the appropriate OS image.
- Initiates a net boot action on the service processor.
- Installs the Oracle VM Server Host.
- Configures Oracle VM Server Host according to the values set in the profile such as memory, CPU threads, Crypto units, and virtual console port range.
- When selected, installs the SUNWJass package to harden the system. For example, you can install the SUNWJass package for version 1.2.
- Enables the Fibre Channel ports on the storage system.
- Installs and configures the Agent Controller. Do not install the Agent Controller manually on the Oracle VM Server host.
- Detaches unused buses and enables SR-IOV feature on PCIe buses as defined in the profile.

#### 5.7.9.1 Selection of Oracle VM Server Version

Verify that the target system has the correct hardware and firmware configuration to support the installation of selected version of Oracle VM Server for SPARC.

When the supported hardware and firmware versions are not there, the provisioning job might fail. You cannot force set the version of the software to be installed. For the complete list of supported hardware, firmware version, and the supported Oracle VM Server for SPARC version, refer to the [Related Resources for Oracle VM Server for SPARC](#) section for more information.

#### 5.7.9.2 Important Notes for Installation

Some important notes for installing Oracle VM Server for SPARC in Oracle Enterprise Manager Ops Center:

- The OS in the control domain must have the default locale set to C. The control domain provisioning is supported on Oracle Solaris SPARC or x86 Proxy Controllers, but not on Linux Proxy Controllers.
- To provision the Oracle VM Server for SPARC software, the proper system model name must be populated on the service processor. The model name is not available on the service processor of the Sun Blade T6320 hardware.
- Oracle Enterprise Manager Ops Center does not support use of the LDoms configuration manager in LDoms 1.2.

#### 5.7.9.3 Manual Net Boot Initiation

A target system requires a manual net boot operation when Oracle Enterprise Manager Ops Center cannot perform a remote network boot process. Profiles that provision this type of system contain the Manual Net Boot option enabled. You must initiate the net boot operation when the Oracle VM Server provisioning job completes on the UI.

1. Log in to the service processor of the target system.
2. When the target system is running, enter `halt`.
3. Enter the following command

```
boot net:dhcp - install
```

#### 5.7.9.4 Additional Configurations

A virtual console concentrator named *primary-ucc0* is created during the installation of Oracle VM Server for SPARC and is not required to be included or defined in the profiles.

The virtual disk server is created by the default name *primary-vds0*. You can modify the name of the virtual disk server in the OS configuration profile.

## 5.8 Manage Oracle VM Server for SPARC

The following actions and information are available for managing the Oracle VM Server:

- [Virtual Services in Control Domain](#)
- [View I/O Resources](#)
- [Modify Configuration and Tags](#)
- [Reboot Oracle VM Server](#)
- [Performance Management](#)

After you have provisioned or discovered the Oracle VM Server for SPARC, you can dynamically manage the Oracle VM Server control domain resource configurations such as CPU Threads, Crypto Units, and memory. You can associate storage libraries and attach networks with Oracle VM Server for SPARC, create logical domains, and monitor the performance of logical domains.

You can also create server pools for Oracle VM Server for SPARC for an efficient management of your resources. For creating server pools, see [Server Pools](#).

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**Note:** If the Enterprise Controller is installed in a logical domain, do not take any action that would power down or restart the corresponding control domain.

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### 5.8.1 Virtual Services in Control Domain

In Oracle Enterprise Manager, the control domain is also a service domain and the following virtual device services are created:

- **Virtual disk server:** A virtual disk server (vds), *primary-vds0*, is added to the control domain by default. The virtual disk services allow you to export virtual disks to logical domains. The virtual storage infrastructure enables logical domains to access the storage disks that are not directly assigned to them. The virtual disk service processes the requests from the logical domains and submits them to the back end storage.
- **Virtual network switches:** The virtual network switch enables networking between virtual network devices in logical domains. When you connect a network to control domain, a virtual switch is created for each network connection. You can also define the switch name. You use virtual switch to connect a logical domain to the external network for communication. A virtual network (vnet) device is defined in the logical domain when connected to a virtual switch. There is no virtual switch creation for SR-IOV enabled networks and you do not require virtual switch for

connecting to SR-IOV enabled network. You can also edit the virtual switch attributes such as Oracle Solaris Cluster Mode, Physical Link State, Inter-vnet Link, Maximum Bandwidth, and Private VLAN. Note that Private VLAN settings can only be edited for a vnet if the primary VLAN ID is in untagged mode.

- **Virtual console concentrator:** This functions as a concentrator for all logical domains console and for use by the virtual network terminal server daemon. The console I/O from all other domains is redirected to the control domain that is running the virtual console concentrator (vcc).

### 5.8.1.1 Editing Virtual Switch Attributes

You can edit the virtual switch attributes such as Oracle Solaris Cluster Mode, Physical Link State, and Inter-vnet Link.

#### Inter-Vnet Links

The inter-vnet LDC channels are configured so that virtual network devices can communicate directly to achieve high guest-to-guest communications performance. However, as the number of virtual network devices in a virtual switch device increases, the number of required LDC channels for inter-vnet communications increases exponentially. You can choose to enable or disable inter-vnet LDC channel allocation for all virtual network devices attached to a given virtual switch device. By disabling this allocation, you can reduce the consumption of LDC channels, which are limited in number. You can switch off or on the inter-vnet link. From Oracle VM Server for SPARC 3.4 version, an additional option Auto is available to manage the inter-vnet links.

To edit the virtual switch attributes:

1. Select the Oracle VM Server or the control domain in the Assets section.
2. Select the Virtual Services tab in the center pane.
3. Select Virtual Network Switches in the sub tab.
4. Select the virtual switch that you want to edit and click the **Edit** icon.

The Edit Logical Domain Virtual Switch Attributes window appears.

5. You can modify the following properties:
  - Physical Link State
  - Solaris Cluster Mode
  - Inter-vnet Link
6. Click **Finish** to save the changes.

## 5.8.2 View I/O Resources

The I/O Resources tab in the Center pane displays the PCIe root complexes, PCIe Endpoint devices, Network Interface Units (NIU), and Single Root I/O virtualization (SR-IOV) functions.

### 5.8.2.1 Buses and End Point Devices

The PCIe root complexes and the NIUs that are available in the servers are listed here.

The number of PCIe root complexes and NIUs depend on the type of server hardware. Initially, when you provision Oracle VM Server for SPARC, all the PCIe root complexes and NIUs are assigned to the control domain. When you use the option **Detach Unused Buses** option in the OS configuration profile, the PCIe buses are released from the control domain.

You allocate PCIe buses to create root domains. You allocate PCIe Endpoint devices to create Physical I/O domains.

To assign PCIe Endpoint devices to Physical I/O domains, you must first release the devices from the corresponding PCIe bus that is allocated to the control domain or root domain. You must manually release the PCIe Endpoint devices using the CLI.

The PCIe Endpoint devices displays whether the PCIe card slot is occupied or empty. If occupied, the domain to which it is allocated is displayed. The devices to which the PCIe bus is attached to are also grouped and displayed.

### 5.8.2.2 SR-IOV Services

Single Root I/O Virtualization is a PCI-SIG standard specification that enables efficient use of PCIe devices. In this, a single PCIe card owned by a PCIe root complex is made to physically appear in multiple domains simultaneously. A single I/O resource also know as physical function is shared by many virtual machines. A physical function is a PCIe device that is SR-IOV enabled with appropriate hardware and OS support can appear as multiple, separate physical devices, each with its own configuration space.

A virtual function is a lightweight PCIe function that shares one or more physical resources with the physical function and with virtual functions that are associated with that physical function. The number of virtual functions that are supported on a physical function depends on the hardware.

The physical functions and their corresponding virtual functions are listed in the SR-IOV services tab. The number of virtual functions supported for the physical function and the logical domains to which the virtual functions are assigned are displayed.

Currently, the SR-IOV feature is enabled only for the SR-IOV cards that are installed on the control domain. SR-IOV feature are not enabled when you assign the SR-IOV card to a physical I/O domain.

With the release of Oracle VM Server for SPARC 3.1 version, the SR-IOV feature is enabled when the SR-IOV cards are assigned to a root domain.

## 5.8.3 Modify Configuration and Tags

You can modify the control domain configuration that includes CPU Model, CPU Threads or cores, and memory. You can select to switch between the CPU Models. When you select Whole-core option, you can edit the number of whole-cores and the maximum number of cores to be allocated to the Oracle VM Server.

You can also modify the name and description of the control domain.

Use the **Edit Attributes** option to modify the configuration. The Oracle VM Server must have Oracle Solaris 10 10/09 OS or higher version to edit the attributes.

When you modify the memory size, Oracle VM Server is rebooted unless it is running Oracle VM Server for SPARC 2.0 or higher version. You can choose to cancel the reboot option after editing the changes.

If you have any physical bindings constraint for the memory, CPU cores, or both, then you cannot edit CPU and memory configuration of the control domain in the UI. You can edit the CPU Model even if you have any physical bindings constraint, but the change of CPU Model will undo the physical binding as well.

Oracle Enterprise Manager Ops Center also does not provide options to explicitly assign physical resources such as CPU and memory. Whereas, you can use the CLI to assign physical resources to the logical domains. These are displayed in the Summary tab of the control domain as Physical Bindings.

Use **Edit Tags** option to modify the existing tags and add new tags.

### 5.8.3.1 Delayed Reconfiguration Mode

Some resources of a domain can be configured dynamically on a running logical domain, while others must be configured on a stopped domain. If a resource cannot be dynamically configured, the logical domain can be set in delayed reconfiguration state to postpone the configuration activities until after rebooting the domain.

Delayed reconfiguration is restricted to the control domain or a PCIe root domain (if supported). For all other logical domains, you must stop the domain to modify the configuration unless the resource can be dynamically reconfigured.

You cannot initiate a delayed reconfiguration using Oracle Enterprise Manager Ops Center UI, but Oracle Enterprise Manager Ops Center detects when a logical domain is in delayed reconfiguration state. When a domain is in delayed reconfiguration state, a message in the center pane is visible to all logical domains attached to the affected control domain. When a delayed reconfiguration is in progress, trying to perform actions such as start, shutdown, reboot, or change attributes in any domain attached to the affected control domain will fail.

You can either reboot the domain in delayed reconfiguration to apply changes and exit the delayed configuration mode, or use the **Cancel Delayed Reconfiguration** action to cancel the delayed reconfiguration in the logical domain.

## 5.8.4 Reboot Oracle VM Server

You can reboot the control domain regardless of the state of the logical domains in it. During the reboot, the logical domains might suspend temporarily but keep their current states.

## 5.8.5 Performance Management

You can view the following information about Oracle VM Server performance:

- The **Summary** tab displays the Oracle VM Server for SPARC configuration information, and its health status.
- The **Dashboard** tab displays the general information about the selected Oracle VM Server for SPARC. A graphical representation of the group members and its relationship are displayed. The unassigned incidents and the list of recent incidents are also displayed.

- The **Analytics** tab displays the CPU, memory and network utilization by the logical domains in the Oracle VM Server. The consumption is represented in the form of charts.
- The **Incidents** tab lists the incidents that are reported for the Oracle VM Server. The tab provides the list of unresolved incidents and a graphical representation of the problem composition.
- The **Monitoring** tab, as shown in [Figure 5-5](#), shows the monitoring values and boundaries that are set for Oracle VM Server activity. You can review the rules, monitoring attributes, specific time period for monitoring, and the level of severity for monitoring the activity of Oracle VM Server. For more information, see the [Related Resources for Oracle VM Server for SPARC](#) section.

**Figure 5-5 Oracle VM Server for SPARC Monitoring Options**

- The **Configuration** tab displays information such as remote logging, routing, NFS domain name, and name service information for the Oracle VM Server.
- The **Charts** tab displays the CPU, memory and network utilization of the Oracle VM Server. The data are collected in five-minute intervals and displayed graphically. The utilization data are provided for different time intervals.

## 5.9 Managing Storage Resources in Oracle VM Server for SPARC

The following information is covered in this section:

- [Associating Storage Library with the Domains](#)

- [Disassociating Storage Libraries](#)

Storage libraries are required for storing logical domain metadata, ISO images and to provide virtual disks for logical domain storage. You must first associate the storage library to the Oracle VM Server and then it is made available for all the logical domains under it.

You can associate the following libraries for Oracle VM Server:

- **Filesystem storage:** This includes the NAS storage libraries.
- **Block storage:** This includes the Static and Dynamic Block Storage libraries.
  - **Static Block Storage:** The Static Storage library includes the LUNs of Fibre Channel (FC) and iSCSI disks of storage servers. Oracle Enterprise Manager Ops Center manages the storage device on which the LUNs are already created. The existing LUNs are assigned to the library. You cannot create, modify or delete the LUNs in Static Storage Library.
  - **Dynamic Block Storage:** The Dynamic Storage Library is automatically created when the storage server is discovered and managed in Oracle Enterprise Manager Ops Center. It includes the LUNs of iSCSI disks of storage servers. You can create LUNs as you attach the library to an Oracle VM Server. You can create, modify and delete the LUNs as required and it is defined as Dynamic Storage Library.

When you are associating the libraries with the control domain, I/O domain and root domains, the storage resources are applicable at the domain level. You can associate the libraries with the control domain, I/O domain, or root domain. You must select at least one domain per server to be associated with the library. You must not attempt to associate the storage libraries from the OS of the domain.

The storage resource that is to be used for a guest domain might not be exclusively provided by the control domain but also by the I/O domains and the root domains configured on the Oracle VM Server. The same storage resource can be accessed through multiple I/O domains which results in redundancy for the access to the storage resource.

When you associate the storage library with Oracle VM Server that are configured with I/O domains and root domains, you can select the domain to which you want to associate the storage library.

Select the option **Associate Library** to associate the libraries with the selected Oracle VM Server.

### 5.9.1 Associating Storage Library with the Domains

An Oracle VM Server can be configured with I/O domains, root domains, and guest domains. When you associate storage library with Oracle VM Server, you can select to associate the library with the preferred domains.

**Associate Libraries** wizard provides with options to select the appropriate domains to which you want to associate the storage library.

1. Select the Oracle VM Server or the control domain in the Assets section.
2. Click **Associate Libraries** in the Actions pane.

The Associate Library Wizard is displayed.

3. Select the libraries that you want to associate with the domains.

Click **Next**.

4. Select the **Associate** action for the control domain, I/O domain, or both. You must select at least one domain per server.

When the storage library is already associated with any of the domains, the **Associate** action is selected. You can deselect the option to disassociate the storage library from the domain.

This action is repeated for each selected storage library. Click **Next**.

5. Review the summary of the association and click **Finish** to associate the library with the selected domains.

The domains for which the association was removed are disassociated from the storage library.

## 5.9.2 Disassociating Storage Libraries

1. Select the Oracle VM Server or the control domain in the Assets section.
2. Select the **Libraries** tab in the Center pane.

All the storage libraries that are associated with the system are displayed.

3. Select the storage library that you want to disassociate from the domain, then click the Disassociate Library icon.

The Disassociate Library window is displayed.

4. The domains that are associated with the storage library are displayed with the **Disassociate** option selected. You can deselect the **Disassociate** action if you do not want to remove the association.
5. Click **Finish** to disassociate the storage library from the selected domains.

## 5.10 Managing Network Resources in Oracle VM Server for SPARC

The following information is covered in this section:

- [Network Tagging Mode Conditions](#)
- [Attaching Networks to Oracle VM Server for SPARC](#)
- [Attaching SR-IOV Enabled Networks to Oracle VM Server](#)
- [Network Options](#)
- [Unbinding Networks from Oracle VM Server for SPARC](#)
- [Maximum Transmission Unit \(MTU\) Size](#)

Attach networks to Oracle VM Server to provide networking facilities for the logical domains.

With the support for advanced I/O domain configurations in Oracle Enterprise Manager Ops Center UI, the network configuration for Oracle VM Server is also enhanced to support the access to the available network interfaces from the I/O domains and root domains.

You can attach networks to the Oracle VM Server that involves the physical interfaces or `etherstub` device belonging to the control domain, root domain or the I/O domains. When you attach networks to the Oracle VM Server, you can select the domain and the physical network interfaces or the `etherstub` devices that belong to the domain.

`etherstub` is an Oracle Solaris 11 network virtualization feature. `etherstub` is a pseudo network device which provides functionality similar to physical network devices but only for private communications with its clients. This pseudo device can be used as a network back-end device for a virtual switch that provides the private communications between virtual networks.

When you discover and manage existing Oracle VM Server for SPARC environments, you must have the Agent Controller installed on the control domain to discover all the networks that are attached and configured with an IP address in the control domain.

Also, when the Agent Controller is installed on the logical domains of the control domain, the extra networks that are connected to the logical domains and configured with an IP address are discovered in Oracle Enterprise Manager Ops Center.

### 5.10.1 Virtual Switches

Virtual switches are created or re-used when you attach networks to Oracle VM Server.

This is not applicable when you select SR-IOV enabled network interface. See [Attaching SR-IOV Enabled Networks to Oracle VM Server](#) for more information about attaching SR-IOV enabled networks.

You can make multiple connections to a network in the Oracle VM Server. For each network connection, a virtual switch is required. If there is an already existing virtual switch for the physical interface or `etherstub` device, you can re-use the virtual switch. If there is no virtual switch for the physical interface or `etherstub` device, you can either provide a user-friendly name for the virtual switch or a virtual switch is automatically created with a default naming pattern. For example, the network 1.1.1.0/24, the virtual switches take the name as 1.1.1.0\_24, 1.1.1.0\_24\_1, and 1.1.1.0\_24\_2. The virtual switches have a unique name. When you create and start a logical domain, you define the virtual switch that connects the logical domain to the network. Each virtual switch is connected to a NIC.

### 5.10.2 Service Domains

When you connect to the network interfaces from physical I/O domains and root domains, the virtual switch is created in the control domain. You cannot define the IP address allocation for the network connection. Instead, you can later define the IP address in the OS of the logical domain as required. You can define the IP address only when the network interfaces are used from the control domain.

### 5.10.3 Tagged and Untagged Mode

You can attach the network to Oracle VM Server for SPARC in tagged or untagged mode. This option is available for networks configured with VLAN IDs.

You can set the tagging mode while attaching the network to Oracle VM Server. When you make multiple connections to the same network, the connection must be either in tagged or untagged mode. You cannot mix the tagging mode for the multiple connection networks.

Refer to the section [Mixed Network Tagging Mode Configurations in Server Pool](#) for the limitations of having Oracle VM Servers in different tagging mode in a server pool.

### 5.10.4 IPMP and Link Aggregation

You can create IPMP groups and aggregate links in the control domain. Navigate to the Oracle Solaris OS of the control domain and create IPMP groups or Link Aggregation.

Refer to [Networks for Virtualization](#) for more information about creating IPMP groups and Link Aggregations in an Oracle Solaris OS.

### 5.10.5 Network Tagging Mode Conditions

There are certain scenarios in which the network configuration must be applied to avoid any networking issues. The scenarios that are explained here are for Oracle VM Server for SPARC in stand-alone mode:

- You can select networks without VLAN ID. The UI does not provide the option to select Tagged or Untagged mode.
- You can select to associate and configure the networks with VLAN ID in Tagged mode.
- You can select to associate and configure the networks with VLAN ID in Untagged mode.
- You can select to configure the networks in mixed tagging mode in the server pool. For example, you can attach the network N1 with VLAN ID = 100 in tagged mode with the server S1 and in untagged mode for server S2. Refer to [Mixed Network Tagging Mode Configurations in Server Pool](#) for more detailed information.
- You can attach networks whose VLAN ID is similar to another network already connected to the servers. For example, a server S1 is already connected to network N1 with VLAN ID = 100, then while creating the server pool with S1 as the member of the pool, you can also attach another network N2 with VLAN ID =100.
- You can edit the VLAN ID of a network when you are attaching the network in Tagged mode for the first time.
- When you can edit the VLAN ID of the network, you cannot enter -1 as the value for the VLAN ID.
- If the selected network with a VLAN ID is already connected to the selected assets in Tagged mode, then you cannot edit the VLAN ID and make another connection.
- You cannot make multiple network connections to the Oracle VM Server over the same network in both tagged and untagged modes. The mode can be either in tagged or untagged mode only. For example, if you attach network N1 with VLAN ID =100 for the first time to server S1 in Tagged mode, then you cannot make another connection to the same network N1 in Untagged mode. Every other connection with network N1 must always be in Tagged mode for server S1.
- If the selected members of the pool are already connected to network N1 with VLAN ID =100, then you cannot select the same network with different VLAN ID to be connected for the server pool.

## 5.10.6 Attaching Networks to Oracle VM Server for SPARC

The procedure to attach networks is applicable for Oracle VM Server for SPARC in stand-alone mode. The procedure varies if the Oracle VM Server is placed in a server pool.

Refer to [Server Pools](#) for more information.

1. Select the Oracle VM Server in the Assets section.
2. Click **Attach Networks** in the Actions pane.

The list of available networks in Oracle Enterprise Manager Ops Center are displayed. The list also displays the existing number of connections with the server.

3. Select one or more networks from the list. You can make multiple connections to a network.

Click **Next**.

4. Specify the Mode for networks configured with VLAN ID and the number of connections for each selected networks. Increase the total number of connections.

If required, the VLAN ID of the network can be modified based on the condition that the network is being attached to the server for the first time in tagged mode. The VLAN ID can be already in use by the network attached to the server.

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**Note:**

The number of connections does not limit the number of logical domains that can be connected to this network.

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Click **Next**.

5. Select the domain in the Service Domain list from which the network interfaces are selected. The service domain can be the control domain, I/O domains, or root domains. Root domains and I/O domains OS must be managed by Oracle Enterprise Manager Ops Center.

For control domain, it is listed as `primary` in the Service Domain list. Whereas for I/O domains and root domains, the names of the domains are listed.

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**Note:**

When you select an network interface from an I/O domain or root domain, the virtual switch is created in the control domain.

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6. Specify the NIC and IP address for each network connection.

For each network connection, you must provide a NIC. The virtual switch requires a physical interface to allow communication between the logical domains and external network. Follow these rules while assigning the NIC and IP address:

- Specify the network interface or NIC. Specify the same NIC to different network when the network has different VLAN ID and every connection is in tagged mode. Otherwise, you cannot assign the same NIC to different networks.
- If required, you can modify the network tagging mode specified in the previous step.
- If there is a virtual switch available for the network, the virtual switch is displayed. Otherwise, enter a name for the virtual switch or leave it blank for the software to automatically create a name for the virtual switch using the default naming pattern.
- Select an IP address allocation method according to your requirements:
  - When supported by the network, select **Assign by DHCP** to enable the system to automatically allocate the IP address.
  - Select **Use Static IP** to provide an IP address for the network connection.
  - Select **Do Not Allocate IP** for the IP address when you do not want to assign IP address to the selected network interface.
  - Select **Do not Plumb Interface** for the IP address when you do not want to assign IP address and plumb the selected network interface. This option is available for non SR-IOV enabled networks.

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**Note:**

For network interfaces from I/O domains or root domains, the Address Allocation Method is automatically set to Do Not Allocate IP.

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Click **Next**.

7. Review the summary and click **Finish** to attach the selected network to the Oracle VM Server.

### 5.10.7 Attaching SR-IOV Enabled Networks to Oracle VM Server

When you connect to network using SR-IOV enabled network interface, there is no virtual switch creation. An SR-IOV enabled network interface means that there are virtual functions created on the physical function of PCIe Endpoint device and you can assign the virtual functions to the logical domains. When you select SR-IOV option while attaching networks to the Oracle VM Server, only the interfaces on which the virtual functions are created are available for network configuration.

When you assign SR-IOV enabled networks to logical domains, you cannot migrate the domains. SR-IOV enabled networks are available only from control domain and root domain.

SR-IOV enabled networks on root domain are available only in the following conditions:

- Oracle Solaris 11.1.4.5.0 or higher version is necessary for dynamic attach of networks.
- Oracle VM Server for SPARC 3.1 version to support SR-IOV networks on root domain.

- See the [Related Resources for Oracle VM Server for SPARC](#) section for hardware and firmware requirements for SR-IOV feature.

1. Select the Oracle VM Server in the Assets section.

2. Click **Attach Networks** in the Actions pane.

The list of available networks in Oracle Enterprise Manager Ops Center are displayed. The list also displays the existing number of connections with the server.

3. Select one or more networks from the list. You can make multiple connections to a network.

Click **Next**.

4. Specify the number of connections for the selected networks. Increase the total number of connections.

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**Note:**

The number of connections does not limit the number of logical domains that can be connected to this network.

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5. Select the domain in the Domain list from which the network interfaces are selected. If the network interface is from the control domain, then it displays as `primary`. For network interfaces from the root domain is listed with the name of the domain.

6. Select the option SR-IOV and the NIC list is populated with the NICs that are SR-IOV enabled in the selected domain. The NICs that are defined as a physical function are listed.

7. Skip the option to define the IP address for the network interface. You can define the IP address in the logical domain OS later.

Click **Next**.

8. Review the summary and click **Finish** to attach the selected network to the Oracle VM Server.

## 5.10.8 Network Options

To manage the attached networks, use the icons available in the **Network** tab of the Oracle VM Server for SPARC, as shown in [Figure 5-6](#).

**Figure 5-6 Network Options**

	Network Name ▲	V... ID	Service Domain	Switch name	Link
	192.0.2.0/22.1	-	primary	192.0.2.0_24	net1
	192.0.2.0/22.1	-	rdom1	-	net1
	192.0.2.0/22.1	-	primary	-	net1
	198.51.100.0/22.1	-	primary	198.51.100_24	net0

- **Refresh DHCP connectivity:** Reconnects to the DHCP server.
- **Unbind networks:** Disconnects the selected network from Oracle VM Server.
- **Modify physical connectivity:** Changes the connectivity attributes of the selected network, as shown in [Figure 5-7](#).

**Figure 5-7 Modify Physical connectivity**

**Change Network-NIC Connection on 192.0.2.0/24.1**

Network Name: 192.0.2.0/24.1

Physical NIC:

IP Address Allocation Method:

IP Address:

DHCP ID:

### 5.10.9 Unbinding Networks from Oracle VM Server for SPARC

You can remove the network connection from Oracle VM Server for SPARC. The removal of a network connection does not remove the virtual switch. You must select the appropriate virtual switch or the physical function to remove the network connection.

1. Select the Oracle VM Server or control domain in the **Assets** section.
2. Select the **Networks** tab in the center pane.

The list of networks that are connected to Oracle VM Server are displayed.

3. Select the network that you want to unbind from Oracle VM Server. You can unbind only one network at a time.
4. Click the **Unbind Network** icon.

The Unbind Network Wizard is displayed.

5. In the Remove Network Connection step, the number of **New Connections Count** is automatically reduced by one and displayed. If you want to remove more than one network connection, enter the number of New Connections Count after the removal of the required network connections.

Click **Next**.

6. Select the virtual switch or the physical function that connects the network to the physical interface.

Ensure to select the correct virtual switch on the interface and click **Next**.

7. Review the summary of the network connection to be removed and click **Unbind** to remove the network connection.

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**Note:**

You cannot detach a network from Oracle VM Server if the network is connected to a virtual switch that is already in use.

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### 5.10.10 Maximum Transmission Unit (MTU) Size

The default size of the network's MTU is 1500 bytes. A network can be created with MTU size that varies between 576 and 9216. Oracle Enterprise Manager Ops Center configures the IP configuration of Oracle VM Server for SPARC with the MTU value set at the network level.

When a network's MTU is modified and the network is attached a control domain and its logical domains, you must reboot the control domain for changes to take effect. You must also shut down and start the running logical domains attached to the network.

For a logical domain, the network to be attached must have minimum MTU size as 1500 bytes. The network interface cards driver configuration must be updated to support MTU size greater than or equal to 9216 in the following scenario:

- You have VLAN tagged networks created over the virtual switches with Link Aggregation as the uplink.
- You are using Oracle Solaris 11 OS.

Otherwise, the tagged networks become unreachable, and Oracle VM Server and logical domains cannot connect to these networks.

## 5.11 About Logical Domains

A logical domain is a virtual machine that has its own operating system and identity within a single SPARC server. Each logical domain can be created, destroyed, reconfigured, and rebooted independently, without requiring the server to be powered off. You can run a variety of applications in different logical domains to keep them independent for performance and security purposes.

Using Oracle Enterprise Manager Ops Center, you can create logical domains and provision Oracle Solaris OS on them. Using profiles and deployment plans, you can create more than one logical domain simultaneously and then save the configuration for future use.

You can use one of the following methods to create logical domains:

- **Create Logical Domain Profile and Plan**

1. Create a profile which defines the configuration of the logical domain.
2. Using the profile, create a deployment plan.
3. Apply the plan on an Oracle VM Server to create logical domains.
4. The logical domains do not have the OS installed. You must select each logical domain and apply an OS provisioning plan to install the OS. See [Provisioning OS on Logical Domains](#) for provisioning OS on the logical domains.

- **Configure and Install Logical Domains**

This is a complex plan which contains deployment plans that create logical domains and install Oracle Solaris OS on them. You must have the required profiles and deployment plans available to create the complex plan. The outline to create a plan is as follows:

1. Create a logical domain profile.
2. Create an OS provisioning profile to install the OS.
3. Create a deployment plan to install the OS and other updates if any.
4. Create the Configure and Install Logical Domains plan.

You can now manage logical domains that were created manually using the native CLI in Oracle Enterprise Manager Ops Center. See [Discovering Existing Oracle VM Server for SPARC Environments](#) for more information.

### 5.11.1 Selection of Domains Types

Oracle Enterprise Manager Ops Center provides options to select the type of logical domain in the logical domain profile creation.

You can select the following subtypes:

- Physical I/O domain
- Root domain
- Guest domain
- HA Guest domain

Select the appropriate subtype in the profile for creating logical domains.

## 5.12 Create Logical Domains

You can create logical domains with the following roles in Oracle Enterprise Manager Ops Center:

- Root domain: See [Creating a Root Domain Profile](#)

- Physical I/O domain: See [Creating a Physical I/O Domain Profile](#)
- Guest domain: See [Creating a Guest Domain Profile](#)
- HA Guest domain: See [Creating HA Guest Domain Profile](#)

### 5.12.1 Plan Your Domain Configuration

A logical domain profile captures the requirements and configuration of a logical domain, that includes the CPU Threads or whole-cores, memory, storage, and network details. You must provision Oracle Solaris OS on each domain separately. As an alternative, you can also use the complex plan Configuring and Installing Logical Domains that includes the OS provisioning profile.

Ensure that you have the following information before you create a profile:

- **System Requirements:** For creating I/O domains and root domains, the hardware and firmware requirements must be met. See the [Related Resources for Oracle VM Server for SPARC](#) section for more information about the hardware, firmware and software requirements for different versions of Oracle VM Server for SPARC and hardware.

- **CPU Resource Allocation: Virtual or Whole-Core**

Each SPARC processor has multiple cores and each core has multiple CPU threads (virtual CPUs). The CPU threads are grouped into cores. For example, there are 4 Threads per core in the Oracle Sun Fire and SPARC Enterprise T1000 CMT processors.

To a logical domain, you can either select to allocate the CPU resource as virtual CPU or as Whole-core, the default value is Whole-core. When you select to allocate as whole core, the specified number of cores and all their CPU threads are allocated to the logical domain.

- **Virtual CPU Allocation**

The physical CPUs of the Oracle VM Server for SPARC are shared among the CPU threads of all the logical domains. Each logical domain requires:

- At least one GB of memory, the default value is 4 GB.
- At least one CPU thread.

Each CPU thread can be allocated independently to logical domain. Some hardware resources are provided on a per-core basis and therefore, shared between the threads in the core. When the threads in a core are allocated to two or more separate logical domains, it can lead to suboptimal performance of those threads. To get the best performance, it is best to avoid allocating the threads of a core to many logical domains. The best approach would be create large logical domains first, the logical domains with complete cores, and then the smaller logical domains.

- **Whole-Core CPU Allocation**

The CPU cores are allocated to a logical domain rather than virtual CPUs. You can also limit the maximum number of CPU cores that must be allocated to a logical domain. By default all logical domains are created for maximum throughput by tuning CPU cores to use a maximum number of CPU Threads.

- **CPU Architecture**

The CPU architecture is of importance when you want to migrate the guest domains between systems that have different CPU processor type. The following are the supported types for CPU architecture:

- `native`: This is the default value which enables the logical domains to be migrated only between systems that have the same CPU architecture type.
- `generic`: Use this type when you want to enable the logical domain migration to take place independent of the CPU type of the systems. Though this might result in reduced performance, it provides an increased flexibility to migrate the domains between systems that have different CPU types.

- **Crypto Units**

Crypto units are assigned based on CPU thread assignments. You can request the number of Crypto units to be assigned to the logical domain. However, the number of Crypto units assigned might be different than the amount requested because we can only allocate a Crypto unit for every given number of CPU thread allocation, depending on the server hardware. After the creation of logical domain, view the job notification to see the actual number of Crypto Units assigned to the logical domain. You can also edit the logical domain configuration, storage, and network resource configuration later.

- **PCIe Buses**

You must release the PCIe buses from the control domain. Only, then you can assign the PCIe buses to the root domain. When you configure and deploy Oracle VM Server for SPARC, you can select the option **Detach Unused Buses** from the control domain. Refer to [Creating an OS Configuration Profile for Oracle VM Server for SPARC](#) for more information. Otherwise, you must manually detach the buses to be used to create root domains.

- **Storage resources**

The libraries for virtual disk can be local, local device, NAS, SAN, or Dynamic Storage libraries. The default value for storage size of a logical domain is 20 GB. If Oracle Solaris 11.2 is later installed, the OS provisioning job might fail if the storage size is less than 20GB.

Oracle Enterprise Manager Ops Center provides multipathing configuration for logical domains. For each virtual disks that have more than one path to access the back-end storage, a multipathing group is created.

Oracle Enterprise Manager Ops Center provides storage redundant access for logical domains. You can enable virtual disk multipathing to access the back-end storage of the domain by more than one path. Provide the name of the multipathing group and select the alternate path to access the virtual disk.

The virtual disk of a logical domain remains accessible even if one of the service domains go down. For each virtual disks of the logical domain that has more than one alternate path, a new multipathing group is created. You must always specify the virtual disk of another service domain for the alternate path to access the back-end storage. You can select to enter the name of the multipathing group or a group is created automatically in the format of *logical domain name\_mpGroup\_devID*. The devID is the disk index. For example, if the name of the logical domain is *ldom*, then the multipathing group name is in the format of *ldom\_mpGroup\_1*.

When you select more than one alternate path to the virtual disk, you must select which is the active path during the failure of the main storage path.

When the virtual disk has only one alternate path to access the back-end storage, multipathing group is not created automatically unless you enter the name of the group.

- **Network resources and number of connections for a network**

You can connect a network multiple times to the logical domain. When you create a logical domain, the number of connections for a network translate to the number of virtual network devices created for the logical domain. A vnet is created for each connection of the guest to the network. Vnets are re-used when the underlying virtual switch is used for networks with different VLAN IDs.

When you start a logical domain, you must define the virtual switches or the virtual functions through which you connect the logical domain to the external network. If the root domain or I/O domain has connection to the physical network interfaces, you can use the direct physical network connection.

- **Automatic Recovery**

Select the automatic recovery option to recover the guest domains when the server hardware fails. This option is helpful when the Oracle VM Server is placed in a server pool and the guest domains can be recovered on the other Oracle VM Servers in the pool. If selected, enter the value for Priority of Recovery. The value must be between 0 and 100. A guest domain with a higher value is recovered first.

The guest domains are created with virtual disk multipathing configuration by providing the alternate path to access the back-end storage. During server hardware failure in a server pool, Oracle Enterprise Manager Ops Center tries to recover the guest domains on server that provides redundant access to the storage. You can select the option **Authorize Recovery without Redundant I/O** to authorize the recovery of the logical domains on other servers without redundant storage access in the server pool. The configuration of the guest domain is changed to lose the redundant storage access. If you do not select this option and there are no servers with redundant storage access, the automatic recovery is not performed.

## 5.12.2 About Root Domains

Root domain is the domain which has the entire PCIe bus also known as root complex assigned to it.

The entire PCIe bus consists of the PCIe bus and all its switches and devices. When you assign a PCIe bus to the root domain, all the devices on that bus are owned by the domain. You cannot directly assign the PCIe Endpoint devices on that bus to any other domains. You must release the PCIe Endpoint devices so that it can be allocated to other I/O domains.

The root domain is non-migratable domain and the domain metadata is stored in the local file system.

The root domain can provide virtual I/O services to guest domains. When you create a root domain, you can define the name of the virtual disk storage server that provide virtual disk storage to guest domains. The names are checked for uniqueness during creation.

## 5.12.3 Creating a Root Domain Profile

1. Select the **Plan Management** section in the Navigation pane.
2. Expand **Profiles and Policies** and select **Logical Domain** from the list.

3. Click **Create Profile** from the Actions pane.

The Create Logical Domain Profile Wizard is displayed.

4. Provide a name and description to identify the profile and select Root Domain as the role for the logical domain.

The option **Create a deployment plan for this profile** is already selected and creates a plan using this profile. If required, you can deselect this option.

Click **Next** to specify the domain identity.

5. Provide a name and the starting number for the logical domain.

Using this profile, you can create more than one logical domain. To identify each new logical domain, provide a prefix start name and starting number. For example, for a Start Name defined as TestDomain and a starting number of 10, three new logical domains have the name TestDomain10, TestDomain11, and TestDomain12.

To avoid number in the suffix, you can add the number in between the name using the wild card '%?d', where '?' is the number of digits displayed.

Click **Next** to configure the CPU and memory allocation for the domain.

6. Select one of the following options for CPU resource allocation:

- **Virtual CPU:** You allocate CPU Threads to the root domain. Enter the number of **CPU Threads** that must be allocated to the root domain.
- **Whole-core:** You allocate whole cores to the root domain. Provide the following data for whole-core allocation:
  - **CPU Cores:** Enter the number of CPU cores that you want to allocate to the root domain.
  - **Max CPU Cores:** The maximum number of cores that you can assign to an active domain.

7. (Optional) Enter the number of **Crypto Units** to be assigned to the root domain.

The number of allocated Crypto Units might be different depending on the CPU Threads allocated and the server hardware. Check the job details for viewing the actual number of Crypto Units assigned to the logical domain.

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**Note:**

The Crypto Units are not applicable from SPARC T4 server onwards and the values are ignored.

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8. Enter the size of the memory to be allocated to the logical domain. The root domain requires at least four GB of memory per I/O device.

Click **Next** to specify the I/O buses.

9. Enter the number of PCIe buses to be assigned to this domain. The number depends on the number of PCIe root complexes available on the hardware platform.

Click **Next** to specify the library for virtual storage disks of the root domain.

10. The root domains are non-migratable as it is an I/O domain that has direct access to physical I/O devices. Therefore, the root domain metadata is stored in the local filesystem.
11. (Optional) Select one or more libraries that form the logical domain virtual disks. The libraries for virtual disk can be local, local device, NAS, SAN, or Dynamic Storage libraries.

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**Note:**

It is recommended not to allocate virtual devices to root domain.

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Any physical storage or network devices attached to the root domain are made available and presented during OS provisioning.

Click **Next** to specify the networks for the domains.

12. (Optional) Select the network from the list of networks identified by Oracle Enterprise Manager Ops Center. You can associate a root domain with more than one network.

You can use this step to attach networks using vnets. Skip this step if you want to connect to the networks available through the physical I/O devices. The physical connectivity is presented during OS provisioning.

13. (Optional) Enter the number of connections for each network.

You can connect to a network multiple times to the logical domain. When you create a logical domain, the number of connections for a network translate to the number of virtual network devices (vnet) created for the logical domain. Oracle Enterprise Manager Ops Center re-uses the vnets and reduces the necessity to create vnets for each network connection.

When you start a logical domain, you must define the virtual switches or the virtual function of SR-IOV enabled network interface through which you connect the logical domain to the external network.

Click **Next** to view the summary of the details selected for creating a logical domain.

14. Review the information and click **Finish** to save the profile.

When you want to create a deployment plan with this profile in the first step, then a corresponding logical domain plan is also created.

## 5.12.4 Applying Deployment Plan for Creating a Root Domain

You can create root domains on Oracle VM Servers that are stand-alone or placed in a server pool. When you want to select Oracle VM Servers placed in a server pool, remove the filter option in the Select Target Assets window and then select the Oracle VM Server which can be placed in a server pool.

When the root domain has access to storage devices, then it can provide storage services to other guest domains. For providing storage services to other domains, a virtual disk server (vds) must be configured on the root domain. vds is required to export virtual disk devices to other domains. During root domain creation, a single vds is created by default with the default name `<domain name>-vds0`. You can change the name of the vds or retain the default name. You can also configure as many vds on

the root domain. When you migrate guest domains that are utilizing the storage services from the root domain, the vds must be available to the target server.

1. Select the deployment plan created for root domain creation.

2. Click **Apply Deployment Plan** in the Actions pane.

The Select Target Assets window is displayed.

3. The Oracle VM Server for SPARC servers are listed. To list the Oracle VM Servers placed in server pools, deselect the filter option.

Select the targets and click **Add Targets to List**.

4. Select **Apply with minimum interaction** to apply the plan with the selected profile values. Otherwise, select **Allow me to override any profile values** to change the profile values.

Click **Next** to specify the resource assignments for root domain.

5. If required, modify the name of the logical domains starting name and the number appended to it.

Click **Next** to configure the CPU Threads and memory.

6. Edit the CPU model, and memory as required.

Click **Next** to specify the I/O buses to the domain.

7. Select the PCIe buses that have been released from the control domain.

Click **Next** to specify the storage resource assignments and virtual disk server name.

8. (Optional) A default virtual disk server name is automatically set in the Name of the Virtual Disk Server to be created in the format of *<domain name>-vds0*. You can select to modify the name. The vds is to provide storage services to other domains.

9. (Optional) If required, you can add virtual disks to the root domain.

The root domain is not migratable and therefore, the root domain metadata is automatically stored in the local library of the control domain.

When the storage resources from the profile are not available for the selected target, it is flagged in red color. Modify the storage resources accordingly. Provide the name of the multipathing group and select the virtual disk server of the service domains and the active path. When a group name is not provided, a multipathing group is automatically created with the default naming procedure.

Click **Next** to specify the network resource assignments.

10. (Optional) If you want to attach networks using vnets, use this step to provide the network connection. Select the networks and define the network resource assignment.

When the network resource assignments from the profile are not available for the selected target, then it is flagged in red color. Modify the network resources accordingly in the profile or apply the plan in override any profile values mode.

Click **Next** to schedule the job.

11. Schedule the job to run now or at a later time. Click **Next**.
12. Review the summary and click **Apply** to execute the deployment plan on the selected targets.

When you provision OS on the root domain, virtual functions are automatically created on the SR-IOV enabled PCIe buses that are allocated to the root domain.

### 5.12.5 Creating a Physical I/O Domain Profile

An I/O domain has direct access to and ownership of physical I/O devices. In Oracle Enterprise Manager Ops Center, you can create I/O domains by assigning PCIe Endpoint devices.

In the Logical Domain profile, select Physical I/O Domain subtype. In this guide, the I/O domains refer to the domains assigned with PCIe Endpoint devices only.

A domain that is assigned with a virtual function from SR-IOV enabled network interfaces is also defined as an I/O domain in Oracle VM Server for SPARC.

In Oracle Enterprise Manager Ops Center, to create domains assigned with virtual functions, you must use the Guest Domain subtype in the Logical Domain profile.

The number of I/O domains that you can create is limited by the number of PCIe Endpoint devices.

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**Note:**

You cannot migrate I/O domains as they are assigned with PCIe Endpoint devices.

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This section describes about creating I/O domains that are assigned with PCIe Endpoint devices.

1. Select the **Plan Management** section in the Navigation pane.
2. Expand **Profiles and Policies** and select **Logical Domain** from the list.
3. Click **Create Profile** from the Actions pane.

The Create Logical Domain Profile Wizard is displayed.

4. Provide a name and description to identify the profile. The option **Create a deployment plan** is already selected for this profile and creates a plan using this profile. If required, you can deselect this option.
5. Select Physical I/O Domain from the Subtype.

Click **Next** to specify the domain identity.

6. Provide a name and the starting number for the logical domain.

Using this profile, you can create more than one logical domain. To identify each new logical domain, provide a prefix start name and starting number. For example, for a Start Name defined as TestDomain and a starting number of 10, three new logical domains have the name TestDomain10, TestDomain11, and TestDomain12.

To avoid number in the suffix, you can add the number in between the name using the wild card '%?d', where '?' is the number of digit displayed.

Click **Next** to configure the CPU and memory allocation for the I/O domain.

7. Select one of the following options for CPU resource allocation:

- **Virtual CPU:** You define the CPU resource allocation in CPU Threads to the I/O domain. Enter the number of **CPU Threads** that must be allocated to the I/O domain.
- **Whole-core:** You allocate whole cores to the I/O domain. Provide the following data for whole-core allocation:
  - **CPU Cores:** Enter the number of CPU cores that you want to allocate to the I/O domain.
  - **Max CPU Cores:** The maximum number of cores that can be assigned to an active domain.

8. Provide the values for Crypto units and memory allocation:

- **Memory:** Enter the size of the memory to be allocated to the I/O domain. The size of the memory must be set according to the system size and load. The default is 4 GB and the minimum value is 1 GB.
- **Requested Crypto Units:** Though you can enter the number of Crypto Units to be assigned to the logical domain, the number might be different depending on the CPU threads allocated and the server hardware. Check the job details for viewing the actual number of Crypto Units assigned to the logical domain.

Click **Next** to specify the PCIe Endpoint devices for the I/O domain.

9. Select the type of PCIe Endpoint device and the number of devices. Select the type of device to filter only those I/O resources attached to it during resource assignment:

- Ethernet Device
- InfiniBand Device
- Fibre Channel Device
- SCSI Device

Select Any type when you do not want to filter the I/O resources attached to the PCIe Endpoint.

Click **Next** to specify the library for the storage disks for the logical domain.

10. (Optional) Select one or more libraries that form the I/O domain storage disks.

The libraries for virtual disk can be local, local device, NAS, SAN, or Dynamic Storage libraries. You can skip this step when you want to provide the storage disks from the directly attached storage resources from the device.

Click **Next** to specify the networks for the domains.

11. (Optional) Select at least one network from the list of networks identified by Oracle Enterprise Manager Ops Center. You can associate a logical domain with more than one network.

Enter the number of connections for each network. You can connect to a network multiple times to the logical domain. When you create a logical domain, the

number of connections for a network translate to the number of virtual network devices created for the logical domain. When you start a logical domain, you must define the virtual switches or the virtual functions of SR-IOV enabled networks through which you connect the logical domain to the external network.

Skip this step when you want to use the networks available from the physical devices attached to the I/O domain. You can define the physical connectivity during OS provisioning.

Click **Next** to view the summary of the details selected for creating an I/O domain.

12. Review the information and click **Finish** to save the profile.

When you want to create a deployment plan with this profile in the first step, then a corresponding logical domain plan is also created.

### 5.12.6 Applying Deployment Plan for Creating an I/O Domain

When the I/O domain has access to storage devices, then it can provide storage services to other guest domains. For providing storage services to other domains, a virtual disk server (vds) must be configured on the I/O domain. vds is required to export virtual disk devices to other domains.

During I/O domain creation, a single vds is created by default with the default name `<domain name>-vds0`. You can change the name of the vds or retain the default name. You can also configure as many vds on the I/O domain. When you migrate guest domains that are utilizing the storage services from the I/O domain, the vds must be available to the target server.

1. Select the deployment plan created for I/O domain creation.
2. Click **Apply Deployment Plan** in the Actions pane.  
The Select Target Assets window is displayed.
3. The Oracle VM Server for SPARC servers that are available and eligible are listed. Select the targets and click **Add Targets to List**.
4. Select **Apply with minimum interaction** to apply the plan with the selected profile values. Otherwise, select **Allow me to override any profile values** to change the profile values.

Click **Next** to specify the resource assignments for root domain.

5. If required, modify the name of the logical domains starting name and the number appended to it.

Click **Next** to configure the CPU Threads and memory.

6. Edit the CPU model, and memory as required.

Click **Next** to specify the PCIe Endpoint devices to be assigned to the domain.

7. The selected PCIe Endpoint Type and the corresponding PCIe Endpoint devices that have been released from the control domain or the root domain are listed.

Select the PCIe Endpoint devices that you want to assign to the I/O domain.

Click **Next** to specify the storage resource assignments and virtual disk server name.

8. (Optional) A default virtual disk server name is set in the format of `<domain name>-vds0` for the Name of the Virtual Disk Server to be created. You can select to modify the name. The vds is for providing virtual disk services to other domains.

You can also edit the assignment of your storage resources.

9. (Optional) If required, you can add virtual disks to the I/O domain.

The I/O domains are not migratable as they are attached to physical I/O devices and therefore, the domain metadata is automatically stored in the local library of the control domain.

When the storage resources from the profile are not available for the selected target, it is flagged in red color. Modify the storage resources accordingly. Provide the name of the multipathing group and select the virtual disk server of the service domains and the active path. When you do not provide the group name and there is more than one alternate path to the virtual disk, a multipathing group is automatically created with the default naming procedure.

Click **Next** to specify the network connection settings.

10. (Optional) All network connection require a virtual switch or virtual function to connect the network to the logical domain. Select the following options for each network connection:

- **SR-IOV**: Select this option if you want to connect to the networks using the virtual function.
- **Mode**: This option is applicable for networks that are configured with a VLAN ID. Select **Untagged** or **Tagged** mode from the list.

Click **Next** to specify the network resource assignments.

11. In the network resource assignment, specify the domain that provides the network interface, and the virtual switch or the virtual function for the network connection.

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**Note:**

You cannot edit the SR-IOV option in this step. Click **Back** to edit the SR-IOV option.

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Click **Next** to schedule the job.

12. Schedule the job to run now or at a later time. Click **Next**.
13. Review the summary and click **Apply** to execute the deployment plan on the selected targets.

### 5.12.7 Creating a Guest Domain Profile

1. Select the **Plan Management** section in the Navigation pane.
2. Expand **Profiles and Policies** and select **Logical Domain** from the list.
3. Click **Create Profile** from the Actions pane.

The Create Logical Domain Profile Wizard is displayed.

4. Provide a name and description to identify the profile. The option **Create a deployment plan** is already selected and creates a plan using this profile. If required, you can deselect this option.
5. Select Guest Domain from the Subtype.

Click **Next** to specify the domain identity.

6. Provide a name and the starting number for the logical domain.

Using this profile, you can create more than one logical domain. To identify each new logical domain, provide a prefix start name and starting number. For example, for a Start Name defined as TestDomain and a starting number of 10, three new logical domains have the name TestDomain10, TestDomain11, and TestDomain12.

To avoid number in the suffix, you can add the number in between the name using the wild card '%?d', where '?' is the number of digit displayed.

Click **Next** to configure the CPU and memory allocation for the domain.

7. Select one of the following options for CPU resource allocation:

- **Virtual CPU:** You allocate CPU Threads to the logical domain. Enter the number of **CPU Threads** that must be allocated to the logical domain.
- **Whole-core:** You allocate whole cores to the logical domain. Provide the following data for whole-core allocation:
  - **CPU Cores:** Enter the number of CPU cores that you want to allocate to the logical domain.
  - **Max CPU Cores:** The maximum number of cores that can be assigned to an active domain.

8. Select the CPU architecture, Crypto units, memory allocation, and automatic recovery options:

- **CPU architecture:** Select the architecture as `native` or `generic` according to your requirement to migrate the logical domains.
- **Memory:** Enter the size of the memory allocated to the logical domain. The size of the memory must be set according to the system size and load. The default is 4 GB and the minimum value is one GB.
- **Requested Crypto Units:** Though you can enter the number of Crypto Units to be assigned to the logical domain, the number might be different depending on the CPU threads allocated and the server hardware. Check the job details for viewing the actual number of Crypto Units assigned to the logical domain.
- **Automatic Recovery:** Select whether you want the logical domain to be recovered automatically when the server hardware fails. If selected, enter the value for **Priority of Recovery**. The value must be between 0 and 100. A logical domain with a higher value is recovered first.

Click **Next** to specify the library for storing the domain metadata and storage disks for the logical domain.

9. Select a library to store the logical domain metadata.

Select local storage library or NAS library to store the domain metadata.

10. Select one or more libraries that form the logical domain storage disks.

The libraries for virtual disk can be local storage, local device, NAS, SAN, or Dynamic Storage libraries. Click **Next** to specify the networks for the domains.

11. Select at least one network from the list of networks identified by Oracle Enterprise Manager Ops Center. You can associate a logical domain with more than one network.

12. Enter the number of connections for each network.

You can connect to a network multiple times to the logical domain. When you create a logical domain, the number of connections for a network translate to the number of virtual network devices created for the logical domain.

When you start a logical domain, you must define the virtual switches or the virtual functions through which you connect the logical domain to the external network.

13. Click **Next** to view the summary of the details selected for creating a logical domain.

14. Review the information and click **Finish** to save the profile.

When you want to create a deployment plan with this profile in the first step, then a corresponding logical domain plan is also created.

### 5.12.8 Applying Deployment Plan for Creating a Guest Domain

Apply the created logical domain deployment plan on the target server and create the logical domains.

1. Expand **Deployment Plans** in the **Plan Management** section.

and select the created logical domain deployment plan.

2. Select **Create Logical Domain** in the deployment plans.

3. Click **Apply Deployment Plan** in the Actions pane.

The Select Target Assets window is displayed.

4. Select the target server from the list.

Select one or more targets to apply the plan.

5. Click **Add to Target List** option to add the selected targets on which you want to apply the plan.

6. Select whether you want to run the plan with minimal interaction or you want to override the profile values.

7. Click **Next** to specify the resource assignments in the profile.

8. If required, modify the name of the logical domains starting name and the number appended to it.

Click **Next** to configure the CPU Threads and memory.

9. Edit the CPU Threads, memory, and automatic recovery as required.

Click **Next** to specify the storage resource assignments.

10. When the storage resources from the profile are not available for the selected target, it is flagged in red color. Modify the storage resources accordingly. Provide the name of the multipathing group and select the virtual disk server of the service domains and the active path. When you do not provide the group name and the virtual disk has more than one alternate path, a multipathing group is automatically created with the default naming procedure.

Click **Next** to specify the network connection settings.

11. You can assign a virtual function or a vnet to the guest domain for the network connection.

Select the following options for each network connection:

- **SR-IOV**: Select this option when you want to assign a virtual function to connect to the network.
- **VLAN ID / P-KEY**: Specify the VLAN ID or P-KEY for the network.
- **Mode**: If the network is assigned a VLAN ID, you can select the network to be connected in tagged or untagged mode.

Click **Next** to specify the network resource assignments.

12. You can select the domain which provides the network interface for the network connection. Select the following details for each network connection:

- **SR-IOV**: Select this option when you want to assign a virtual function to connect to the network.
- **Service domain**: Select the service domain that provides the network interface for the network connection. The domain can be primary, I/O domains or the root domains.
- **Map Connection**: Select the virtual switch through which you want to connect the guest domain to the network. For SR-IOV enabled network connection, select the physical function through which you want to connect to the network.
- **VLAN ID / P-KEY**: Specify the VLAN ID or P-KEY for the network.
- **Mode**: If the network is assigned a VLAN ID, you can select the network to be connected in tagged or untagged mode.
- **Link Mode**: Select the link mode for the network connection. In Automatic link mode, the data link is automatically generated by Ops Center. In Manual link mode, you specify the data link resource information.

Click **Next** .

13. If you selected manual link mode for at least one network, the data link resource assignments are displayed. Select the following details for each network connection:

- **Lower Link Name**: Specify the lower link name for the network connection.
- **Link Name**: Specify the VNet name for the network connection.

- **Nb Alt Mac Addrs:** Specify a number of alternate MAC addresses for the network connection.
- **Max Bandwidth (Mbps):** Specify the maximum bandwidth for the network connection in megabits per second.
- **Private VLAN ID:** If the network connection is in untagged mode, you can specify a private VLAN ID for the network connection.
- **Private VLAN Type:** If you provided a private VLAN ID, select a private VLAN type, isolated or community.

Click **Next** .

14. Schedule the job to run now or at a later time. Click **Next**.
15. Review the summary and click **Apply** to execute the deployment plan on the selected targets.

### 5.12.9 Creating HA Guest Domain Profile

The guest domain has the following high available features defined in the profile:

- Two network connections for each networks
- Redundant storage access to the virtual disks
- Automatic recovery of the guests during server failure in a server pool

The HA guest domain profile requires that you provide at least two connections for each selected network.

1. Select the **Plan Management** section in the Navigation pane.
2. Expand **Profiles and Policies** and select **Logical Domain** from the list.
3. Click **Create Profile** from the Actions pane.

The Create Logical Domain Profile Wizard is displayed.

4. Provide a name and description to identify the profile. The option **Create a deployment plan for this profile** automatically creates a plan using this profile. If required, you can deselect this option.
5. Select Guest Domain from the Subtype.

Click **Next** to specify the domain identity.

6. Provide a name and the starting number for the logical domain.

Using this profile, you can create more than one logical domain. To identify each new logical domain, provide a prefix start name and starting number. For example, for a Start Name defined as TestDomain and a starting number of 10, three new logical domains have the name TestDomain10, TestDomain11, and TestDomain12.

To avoid number in the suffix, you can add the number in between the name using the wild card '%?d', where '?' is the number of digit displayed.

Click **Next** to configure the CPU and memory allocation for the domain.

7. Select one of the following options for CPU resource allocation:

- **Virtual CPU:** You allocate CPU Threads to the logical domain. Enter the number of **CPU Threads** that must be allocated to the logical domain.
  - **Whole-core:** You allocate whole cores to the logical domain. Provide the following data for whole-core allocation:
    - **CPU Cores:** Enter the number of CPU cores that you want to allocate to the logical domain.
    - **Max CPU Cores:** The maximum number of cores that can be assigned to an active domain.
8. Select the CPU architecture, Crypto units, memory allocation, and recovery options:
- **CPU architecture:** Select the architecture as `native` or `generic` according to your requirement to migrate the logical domains.
  - **Memory:** Enter the size of the memory allocated to the logical domain. The size of the memory must be set according to the system size and load. The default is 4 GB and the minimum value is one GB.
  - **Requested Crypto Units:** Though you can enter the number of Crypto Units to be assigned to the logical domain, the number might be different depending on the CPU threads allocated and the server hardware. Check the job details for viewing the actual number of Crypto Units assigned to the logical domain.
  - **Automatic Recovery:** Select whether you want the logical domain to be recovered automatically when the server hardware fails. When you select this option, provide the following details: If selected, enter the value for **Priority of Recovery**. The value must be between 0 and 100. A logical domain with a higher value is recovered first.
    - **Priority of Recovery:** The value for priority of recovery must be between 0 and 100. A guest domain with a higher value is recovered first.
    - **Authorize recovery without redundant I/O:** Select this option when you want to recover the guest domain in a server pool even when there is no redundant storage access in the other servers in the pool.

Click **Next** to specify the library for storing the domain metadata and storage disks for the logical domain.

9. Select a library to store the logical domain metadata.

Select only the local storage or NAS library to store the domain metadata.

10. Select one or more libraries that form the logical domain storage disks.

The libraries for virtual disk can be local storage, local device, NAS, SAN, or Dynamic Storage libraries. Click **Next** to specify the networks for the domains.

11. Select at least one network from the list of networks identified by Oracle Enterprise Manager Ops Center. You can associate a logical domain with more than one network.

12. Enter the number of connections for each network. You must enter at least two connections for each network.

You can connect to a network multiple times to the logical domain. When you create a logical domain, the number of connections for a network translate to the number of virtual network devices created for the logical domain.

When you start a logical domain, you must define the virtual switches or the virtual functions through which you connect the logical domain to the external network.

13. Click **Next** to view the summary of the details selected for creating a logical domain.
14. Review the information and click **Finish** to save the profile.

When you want to create a deployment plan with this profile in the first step, then a corresponding logical domain plan is also created.

### 5.12.10 Applying Deployment Plan for Creating a HA Guest Domain

Apply the created logical domain deployment plan on the target server and create the logical domains.

1. Expand **Deployment Plans** in the **Plan Management** section and select the created logical domain deployment plan.
2. Click **Apply Deployment Plan** in the Actions pane.  
The Select Target Assets window is displayed.
3. Select the target server from the list.  
Select one or more targets to apply the plan.
4. Click **Add to Target List** option to add the selected targets on which you want to apply the plan.
5. Select whether you want to run the plan with minimal interaction or you want to override the profile values.
6. Click **Next** to specify the resource assignments in the profile.
7. If required, modify the name of the logical domains starting name and the number appended to it.  
Click **Next** to configure the CPU Threads and memory.
8. Edit the CPU Threads, memory, and automatic recovery as required.  
Click **Next** to specify the storage resource assignments.
9. When the storage resources from the profile are not available for the selected target, it is flagged in red color. Modify the storage resources accordingly. Provide the name of the multipathing group and select the virtual disk server of the service domains and the active path. When you do not provide the group name and the virtual disk has more than one alternate paths, a multipathing group is automatically created with the default naming procedure.  
Click **Next** to specify the network connection settings.
10. You can assign a virtual function or a vnet to the guest domain for the network connection.

Select the following options for each network connection:

- **SR-IOV:** Select this option when you want to assign a virtual function to connect to the network.
- **Mode:** If the network is assigned a VLAN ID, you can select the network to be connected in tagged or untagged mode.

Click **Next** to specify the network resource assignments.

11. You can select the domain which provides the network interface for the network connection. Select the following details for each network connection:

- **Service domain:** Select the service domain that provides the network interface for the network connection. The domain can be primary, I/O domains or the root domains.
- **Map Connection:** Select the virtual switch through which you want to connect the guest domain to the network. For SR-IOV enabled network connection, select the physical function through which you want to connect to the network.

Click **Next** to schedule the job.

12. Schedule the job to run now or at a later time. Click **Next**.

13. Review the summary and click **Apply** to execute the deployment plan on the selected targets.

### 5.12.11 Selection of CPU Architecture

Newer platforms have a new class for the CPU architecture, named `migration-class1` and `sparc64-class1`. The `class1` architecture enables you to migrate the guest domains across systems while maintaining the full capabilities of the domains.

When you have a guest domain with the CPU architecture as `generic` in Oracle Enterprise Manager Ops Center and you start the guest in the following servers:

- Oracle SPARC T3 and T2 Servers: Oracle Enterprise Manager Ops Center sets the CPU architecture to `generic`.
- Oracle SPARC T4, T5, M5, and M6 servers: Oracle Enterprise Manager Ops Center sets the CPU architecture to `generic (migration-class1)`. `migration-class1` is a cross-CPU migration family for SPARC platforms starting with the SPARC T4 servers.
- Fujitsu M10 Systems: Oracle Enterprise Manager Ops Center sets the CPU architecture to `generic (sparc64-class1)`. `sparc64-class1` is a cross-CPU migration family for SPARC 64 platforms. `sparc64-class1` value has more instructions than `generic` value. This value is compatible only with Fujitsu M10 systems.

### 5.12.12 Creating a Deployment Plan for Installing Logical Domain

When you create a logical domain profile, you can select to create a deployment plan with that profile. You can also create logical domain plans. You can either create a

simple plan to install only the logical domains or a complex plan to create the logical domains and provision OS on it.

The following procedure describes how to create a simple plan to install the logical domains only. You require to have created a logical domain profile to select in the plan.

1. Expand **Deployment Plans** in the **Plan Management** section and select **Create Logical Domains** plan.

2. Click **Create Plan from Template** in the Actions pane.

The Create a Deployment Plan window is displayed.

3. Enter a name and description for the plan.

4. Select the failure policy.

5. Select the logical domain profile in the Create Logical Domain step.

This is a simple single step plan to select the logical domain profile. The logical domain profiles that are available are listed in the list of **Associated Profile/Deployment Plan**.

6. Enter the number of logical domains to be created.

7. Click **Save** to create the deployment plan.

The deployment plan is created with the associated profile. Now, apply the plan on a suitable target to create the logical domains.

## 5.13 Logical Domains Created Using CLI

You can also create logical domains using the native CLI. The new logical domain created is automatically discovered and displayed under the corresponding Oracle VM Server for SPARC in the UI. The discovered logical domain metadata is stored in the local library of the control domain and the virtual disk storage is defined as Opaque.

The logical domains cannot be migrated as such and it requires the following actions to enable the migrate option:

- Move the metadata of logical domain to shared storage like NFS storage. See [Moving Metadata to Another Library](#) for complete procedure.
- Enable sharing of the virtual disk storage of the logical domain.

## 5.14 Provisioning OS on Logical Domains

The following information is covered in this section:

- [Plan Your Network and Storage Resources](#)
- [Profiles and Deployment Plans for OS Provisioning](#)
- [Creating an OS Provisioning Profile](#)
- [Creating an OS Configuration Profile](#)
- [Creating Link Aggregation in Logical Domains](#)

- [Creating IPMP Groups in Logical Domains](#)
- [Apply the OS Deployment Plan for Logical Domains](#)

The Oracle OS version that is provisioned on the logical domains is independent of the OS version on the Oracle VM Server for SPARC control domain. You can provision Oracle Solaris 10 or Oracle Solaris 11 OS on the logical domains irrespective of the Oracle Solaris OS version of the control domain.

After you create a logical domain, you must provision an OS on the domain.

- Ensure that you have imported the appropriate ISO image into the library. If it is Oracle Solaris 10, then it must be at least Oracle Solaris 10 8/07.
- Create or identify an OS provisioning profile for SPARC. See the [Related Resources for Oracle VM Server for SPARC](#) section for more information.
- Create or identify a deployment plan with the OS provisioning and configuration profile and apply the deployment plan.

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**Note:**

When you want to monitor the OS provisioning on the logical domains, you must first enable the logical domain console. See [Connect to Logical Domain Console](#) for enabling the console.

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Oracle Enterprise Manager Ops Center provides OS provisioning and OS configuration profiles that capture the required parameters for provisioning OS. The profiles provide Logical Domain subtype that collects the parameters required for logical domain OS provisioning. You cannot use the Oracle Solaris OS provisioning profiles created for bare-metal provisioning.

The procedures to create the OS provisioning and configuration profiles especially for logical domains are described in this section.

### 5.14.1 Plan Your Network and Storage Resources

When you provision OS on the root domains and I/O domains, you can plan to provide the physical resources to the domains that are available from the PCIe Endpoint devices assigned to them. The physical network or the storage resources are presented while deploying the OS provisioning plan on the domains.

The storage resource can be either used by the domain or provide virtual disk server services to other guest domains. Whether the I/O domains are attached to a physical storage device or not, a virtual disk server service is created for the virtual disks added to it. You can modify the name of the Virtual Disk Server name during the deployment of OS provisioning plan.

For network resources, the OS provisioning deployment displays the network controllers that provides the Ethernet connection and the available network ports in the controller. The PCIe Endpoint devices that are provided with Ethernet devices and the network ports that are connected must be known before deploying the OS provisioning plan on the I/O domain or root domain. Check with your administrator for the network connection details in the server hardware.

## 5.14.2 Profiles and Deployment Plans for OS Provisioning

Oracle Enterprise Manager Ops Center provides the following profiles and deployment plans for OS provisioning on logical domains:

- Profiles
  - OS Provisioning
  - OS Configuration
- Deployment Plans
  - Provision OS
  - Install Server
  - Configure and Install Logical Domains

The Provision OS deployment plan is a simple deployment plan that consists of two steps to provision and configure OS. You use this plan to do OS provisioning on the already created logical domains.

Install Server deployment plan is a multi-step deployment plan that includes step to update the OS, and install any software apart from OS provisioning. You use this plan on the already created logical domains.

Configure and Install Logical Domains is a complex plan that includes the step to create logical domains and provision OS on them.

Depending on the requirement in your environment, choose the appropriate method to create logical domains and provision OS on them. Using the complex plan Configure and Install Logical Domains might show some differences in the boot interface assignment and network resource assignment steps. For example, when you apply a provisioning plan on already created root domain, the OS provisioning deployment plan filters the network controllers that provides the network device and the network ports that are available from that device. Whereas, when you use a complex plan such as Configure and Install Logical Domains, the network resources are not filtered for the network devices. Instead, all the PCIe Endpoint devices assigned to the domain are listed. You must enter the correct network port for the OS provisioning job.

Oracle Enterprise Manager Ops Center also provides the option to identify the network interface by providing the MAC address.

## 5.14.3 Creating an OS Provisioning Profile

The OS provisioning profile collects the following details:

- OS image and version.
- OS setup parameters such as time zone, language, console, terminal type, and root password for the OS.
- File system layout.
- Name services.
- User account for Oracle Solaris 11

1. Select the **Plan Management** section in the Navigation pane.
2. Expand **Profiles and Policies** and select **OS Provisioning** profile.
3. Click **Create Profile** in the Actions pane.

The Create Profile - OS Provisioning Wizard is displayed.
4. Provide the following details for the profile identification:
  - Provide a name and description for the profile identification.
  - Select **Logical Domain** as the Subtype.Click **Next** to specify the provisioning parameters.
5. Select the OSP parameters:
  - Select the Oracle Solaris OS image from the list of available images. For Oracle Solaris 11 OS, select the SRU from the list.
  - Select the Software Group from the list.Click **Next** to specify the OS Setup.
6. Specify the OS setup parameters:
  - Enter the time zone, language, terminal type, console serial port, and console baud rate.
  - Enter the root password.
  - The NFS4 domain is set to dynamic in this example. If a naming service is configured in your environment, enter the NFS4 domain value.Click **Next** to provide a user account for Oracle Solaris 11. Otherwise, skip to Step 8.
7. Root login is not enabled in Oracle Solaris 11 OS. Create a user account to SSH to the OS after provisioning. Provide a user name and password for the account.

Click **Next** to specify whether you want to use iSCSI disks for OS provisioning.
8. Select the option **Use iSCSI Disks** if you want to use iSCSI for OS provisioning.

You must provide the storage server IP address and the volume group during deployment.

Click **Next** to specify the file system.
9. The root (/) and a swap file system are defined by default. Click the **Add** icon to add more file systems. You can also change the file system type to UFS, or ZFS.

Click **Next** to specify the name service.
10. If you have a naming service in place, select the appropriate one and provide the setup details. Otherwise, select **None** and proceed further.
  - **DNS:** Enter the domain name of the DNS server and enter the IP address of the DNS server in the Name Server field. You can enter up to three IP addresses as the value for the Name Server. Provide the additional domains to search for name service information in the Domain Name Search List. You can specify up

to six domain names to search. The maximum length of each search entry is 250 characters.

- **NIS or NIS+:** Enter the domain name of the NIS or NIS+ server. When you know the NIS server details, choose the option **Specify an NIS Server** and enter the NIS server host name and the IP address.
- **LDAP:** Enter the domain name of the LDAP server. Specify the name of the LDAP Profile you want to use to configure the system. Enter the IP address of the LDAP Profile Server. You can also provide the Proxy Bind Distinguished Name and Password.

Click **Next** to view the summary of the parameters selected for the profile.

11. Review the parameters selected for the profile and click **Finish** to create the OS provisioning profile.

### 5.14.4 Creating an OS Configuration Profile

The OS configuration profile collects the information related to networking details for the OS. You can specify the number of interfaces that you want to specify for the OS.

Depending on the number of interfaces that you want to configure for the OS, the network connections are constructed for the OS during the deployment. The

1. Select the **Plan Management** section and expand **Profiles and Policies**.
2. Select **OS Configuration** and click **Create Profile** in the Actions pane.
3. Enter the following details to identify the profile:
  - Name and description of the profile.

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**Note:**

Ensure that the name of the profile is not same as the OS provisioning profile.

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- Select **Logical Domain** as the Subtype and **Virtual Machine** as the Target Type.

Click **Next** to set the OS Management properties

4. Select to manage the OS automatically and deploy the Agent Controller to manage the asset. Select the option **Enable Multiplexed I/O** so that you can associate block storage libraries such as SAN and iSCSI libraries for storage with the OS. If required, deselect the option **Enable Single Root I/O Virtualization (SR-IOV)** to disable SR-IOV on root domains.

Click **Next** to specify the networking details.

5. Select one of the network options for the target system:
  - When you select **Use Link Aggregation**, refer to the section [Creating Link Aggregation in Logical Domains](#) to define the parameters for Link Aggregation.
  - When you select **Use IPMP**, refer to the section [Creating IPMP Groups in Logical Domains](#) for IP Multipathing.
  - When you select **None**, you are forwarded to the next step to define the network interfaces and IP address allocation for the selected networks.

Click **Next** to specify the number of network interfaces that must be used on the OS.

6. Enter the number of network interfaces that must be used on the OS. The details of the interfaces are collected while deploying the plan.

Click **Next** to view the summary of the parameters selected for OS configuration.

7. Review the parameters and click **Finish** to create the OS configuration profile.

### 5.14.5 Creating Link Aggregation in Logical Domains

While creating the profile for OS configuration, follow the procedure to create link aggregation:

1. Select **Use Link Aggregation** in the Specify Networks step of the profile.
2. Specify and configure the IEEE 802.3ad Link Aggregation details:
  - **Link Aggregation Name:** Select the name of the Link Aggregation. The names are set to *aggr<x>*.
  - **Load Balancing Policy:** Define the policy for outgoing traffic.
  - **Aggregation Mode and Switches:** When the aggregation topology connects through a switch, determine whether the switch supports the Link Aggregation Control Protocol (LACP). When the switch supports LACP, you must configure LACP for the switch and the aggregation. Define one of the modes in which LACP must operate.
  - **LACP Timer:** Indicates the LACP timer value, either short or long.
  - **MAC Address Policy:** The MAC address policy is always defined to Auto.
  - **Number of Interfaces:** By default, two interfaces are defined in the aggregation. You can modify the number of interfaces for the aggregation.

You can add multiple link aggregation and define the configuration parameters for each aggregation.

You can define the interfaces during deployment. Click **Next** to continue the profile.

### 5.14.6 Creating IPMP Groups in Logical Domains

While creating the profile for OS configuration, follow the procedure to create IPMP groups.

1. Select **Use IPMP** in the Specify Networks step of the profile.
2. Specify and configure the IPMP groups:
  - **IPMP Name:** The name of the IPMP group is automatically displayed in the format of *ipmp<x>*. You can also modify the default name of the IPMP group.
  - **Failure Detection:** The detection can be Link-Based or Link-Based and Probe-Based.
  - **Number of Interfaces:** By default, two interfaces are defined in the group. You can modify the number of interfaces for the IPMP group.

You can add multiple IPMP groups and select the failure detection for each group. Click **Next** to specify the IPMP interfaces.

3. The interfaces are defined during the deployment of the profile. Specify the following information for each interface:
  - Select whether the interface is Failover or Standby Interface.
  - Select to Assign IP address or not during deployment to the specified NICs. The data and test addresses are defined during deployment.

Click **Next** to continue the profile.

### 5.14.7 Apply the OS Deployment Plan for Logical Domains

When you apply the plan for provisioning the OS on logical domains, you must provide resource information in the following steps:

- Boot Interface Resource Assignments
- Storage Resource Assignments
- Specify Network Resource Assignments

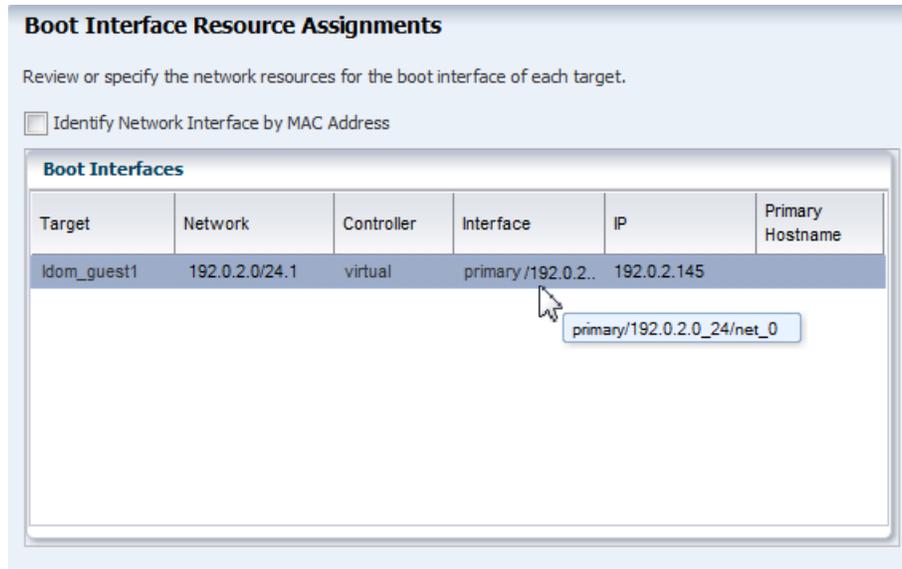
When assigning a boot interface, if OpenBoot PROM (OBP) is used, only untagged networks are listed for selection. Only untagged networks can be used for OS provisioning as you cannot boot from a tagged network.

When assigning a boot interface, if you are applying a combined Logical Domain creation and OS Provisioning plan, select the first network connected to the LDom guest during the LDom creation wizard to minimize the job's runtime. Selecting another network causes the OS provisioning job to take additional time.

Other than these steps, the deployment plan in minimal interaction mode takes you through the confirmation of the OS provisioning and configuration profile information.

For logical domains that use vnets for network resource, the network resource step is displayed as shown in [Figure 5-8](#).

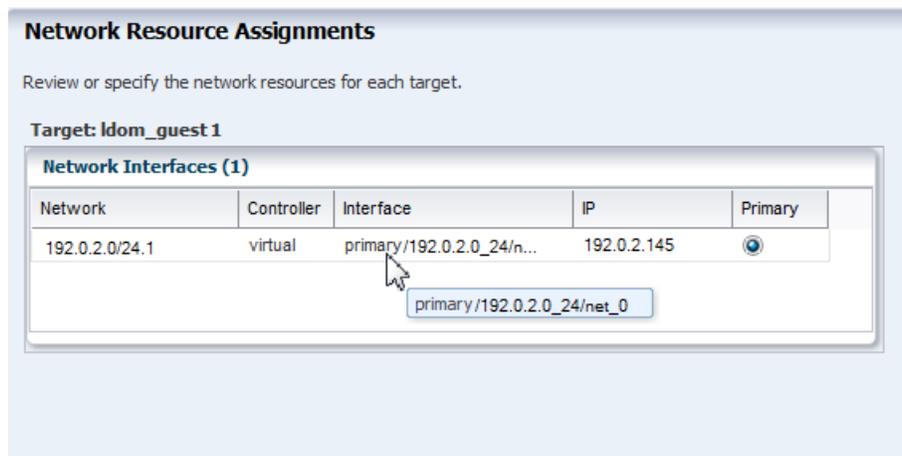
**Figure 5-8 Boot Interface Step for Virtual Controller**



The Controller is displayed as virtual and the interface is the network interface that provides the virtual switch for the network connection of the logical domain.

For the other vnet network connections that must be configured with the OS are displayed as shown in the [Figure 5-9](#).

**Figure 5-9 Network Resource Assignments**



For every network connection that must be configured with the OS, requires a virtual switch.

### 5.14.7.1 Root Domains and I/O Domains

The physical network resources for root domains and I/O domains are displayed as shown in the [Figure 5-10](#)

**Figure 5-10 Boot Interface Resource for Root Domain**

**Boot Interface Resource Assignments**

Review or specify the network resources for the boot interface of each target.

Identify Network Interface by MAC Address

**Boot Interfaces**

Target	Network	Controller	Interface	IP	Primary Hostname
root_dom1	192.0.2.0/24.1	PCIE7(pci_1)	net_0	192.0.2.100	

The network devices are filtered in the Controller list and displayed for selection. The Interface lists the network interfaces or the ports that are available in the selected network device.

If you know the MAC address of the network interface that must be used for the booting, you can use the option **Identify Network Interface by MAC Address**.

**Figure 5-11 Boot Interface by Using MAC Address**

**Boot Interface Resource Assignments**

Review or specify the network resources for the boot interface of each target.

Identify Network Interface by MAC Address

**Boot Interfaces**

Target	Network	MAC Address	IP	Primary Hostname
rootdom_1	10.166.168.0/24.1	00:01:3F	10.166.168.100	

While configuring network on the OS, the first interface is always overwritten by the boot interface resource assignment. You can select the network resource that will be the primary network resource for the OS.

When you apply the combined plan of configuring and installing guest domain on a server pool, then in the OS deployment steps, the Interface column does not display the service domain, and the virtual switch. Only the network interface is listed as *net\_x*. You must wait for the job to complete to see in which Oracle VM Server for

SPARC system, the guest domain is created. The service domain and the virtual switch are auto assigned. See for the actual assignment after the job is completed.

For detailed information about creating plans and applying the deployment plan for OS provisioning, see the [Related Resources for Oracle VM Server for SPARC](#) section.

#### 5.14.7.2 Creation of Virtual Functions

When you provision OS on the root domain, virtual functions are automatically created on SR-IOV enabled PCIe buses that are allocated to the domain. When you want to delete the root domain, it is required to delete all the virtual functions before proceeding to delete the root domain.

## 5.15 Manage Logical Domains

Oracle Enterprise Manager Ops Center provides options from the UI to manage the logical domain state, add resources, migrate and recover them. You can interchangeably use the CLI or the UI to manage the logical domains. The UI reflects the current state of the logical domains.

The logical domains that are discovered and managed in the UI does not have any difference in the management options in the UI except for the logical domain metadata.

You can manage logical domains with Oracle Enterprise Manager Ops Center or from the control domain. See [Discovering Existing Oracle VM Server for SPARC Environments](#) for information about managing from the control domain.

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**Note:** If the Enterprise Controller is installed in a logical domain, do not take any action that would power down or restart the corresponding control domain.

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The following operations are available for managing the logical domains that are created using Oracle Enterprise Manager Ops Center or that are discovered and managed with an LDom VC Agent in Oracle Enterprise Manager Ops Center:

- [View I/O Resources](#)
- [View Virtual Services](#)
- [Edit Logical Domain Configuration](#)
- [Shut Down a Logical Domain](#)
- [Starting a Logical Domain](#)
- [Add Storage to Logical Domain](#)
- [Moving Metadata to Another Library](#)
- [Enabling Shared Access for Opaque Storage Disks](#)
- [Connect to Logical Domain Console](#)
- [View the Console Logs](#)
- [Delete a Logical Domain](#)
- [Cancel Delayed Reconfiguration](#)

### 5.15.1 View I/O Resources

The logical domain that has I/O resources assigned to it displays the PCIe buses and the corresponding endpoints in the **I/O Resources** tab in the center pane.

The I/O resources tab also displays the network interfaces that are SR-IOV enabled. The physical functions and their corresponding virtual functions are listed in the **SR-IOV Services** sub tab. The guest domains to which the virtual functions are assigned are displayed.

### 5.15.2 View Virtual Resources

You can view all the resources of a logical domain, including the virtual services bindings and the SR-IOV Virtual Functions of a logical domain, in the **Virtual Resources** tab in the center pane.

The Virtual Resources tab contains several subtabs. The **Virtual Devices** subtab displays all virtual devices attached to the logical domain, including the virtual console, virtual network, virtual disks, and virtual HBAs. The **SR-IOV Devices** subtab displays all virtual functions.

### 5.15.3 View Virtual Services

Depending on the type of PCIe bus or the PCIe Endpoint assigned to the logical domain, it can provide services to other domains.

If the PCIe Endpoint is attached to storage device, then the logical domain can provide virtual disk services to other domains. The type of device attached to the PCIe Endpoint or the bus, the I/O domains provide virtual services to other domains. These details are listed in the **Virtual Services** tab in the center pane of the selected logical domain.

- **Virtual disk server:** The virtual disk services allow you to export virtual disks to other logical domains. The virtual storage infrastructure enables other logical domains to access the storage disks that are not directly assigned to them. The virtual disk service processes the requests from the logical domains and submits them to the back end storage.
- **Virtual network switches:** The virtual network switch enables networking between virtual network devices in logical domains. The virtual switches that are created for the network interfaces in the I/O domain are listed. You can use the virtual switches to start or create logical domains. There is no virtual switch creation for SR-IOV enabled networks. See [View I/O Resources](#) for the SR-IOV enabled network interfaces and virtual functions.
- **Virtual console concentrator:** The virtual console concentrator that has been created in the logical domain is listed. You can use this console to redirect the console I/O from other domains.
- **Virtual SANs:** The virtual SANs on the guest are displayed. Virtual SANs are available prior to Oracle VM for SPARC 3.3.

## 5.15.4 Edit Logical Domain Configuration

Use the option **Edit Attributes** in the Actions pane of a selected logical domain. You can edit the name, description, CPU Model, Crypto Units, memory, and automatic recovery priority value.

You can modify the CPU model of a logical domain between Virtual CPU and Whole-Core.

You can modify the CPU architecture between `generic` and `native`. To modify the CPU architecture, the Oracle VM Server for SPARC must be at least running 2.2 version.

When you edit the CPU model, CPU architecture, or memory, the guest must be rebooted unless the Control Domain is running Logical Domains Manager 2.0 or later and the guest OS is Oracle Solaris 10 9/10 or later.

You cannot edit the CPU or memory settings for a guest if an OS is not installed and running on the guest.

If you have any physical bindings constraint for the memory, CPU cores, or both, then you cannot edit CPU and memory configuration of the logical domain in the UI. Oracle Enterprise Manager Ops Center also does not provide options to explicitly assign physical resources such as CPU and memory. Whereas, you can use the CLI to assign physical resources to the logical domains. These are displayed in the Summary tab of the logical domains as Physical Bindings.

Also, you cannot switch the CPU Model for logical domains that are assigned with physical CPU and memory resources.

Use the option **Edit Tags** to modify the tag values or to add new tags.

## 5.15.5 Shut Down a Logical Domain

You can either shutdown or shutdown and detach the domain from its running state. Shutting down a logical domain means that the domain is still associated with the control domain, and connected to its network and storage resources. The domain is said to be in the state of shutdown. When you start a shutdown domain, you are not required to define the server and the resources.

When you shutdown and detach the domain from its running state, the domain is detached from the control domain, and disconnected from its network and storage resources. To start the domain, you have to define and select the server, network and storage resources. The option to detach the domain is not available in the following conditions of the domain:

- The domain is root or I/O domain.
- The domain is managed agentlessly.
- The domain metadata is on unmanaged storage. The scenario can occur when you discover and manage logical domains that are created using the CLI and storage of the logical domain is not moved to a managed storage.

When you shut down and detach a logical domain, the guest constraints are saved in an xml file in the `/var/opt/sun/xvm/guests/` directory. You can use this file to manually reconstruct the guest if necessary. The xml file is named according to the guest name. For example, if you shut down and detach a guest named `guest_1`, the guest constraints are saved in the `/var/opt/sun/xvm/guests/guest_1.xml` file.

A logical domain might be attached to virtual I/O devices on multiple I/O domains. You can still shut down the logical domain unless it does not provide any network, storage and console services to other domains.

Table 5-3 lists the logical domain configuration and shows the state, either shutdown or shutdown and detached.

**Table 5-3 Shutdown or Shutdown and Detached State**

Logical Domain	Shutdown	Shutdown and Detached
Created using Oracle Enterprise Manager Ops Center and Agent Managed	Yes	Yes
Discovered and LDom VC Agent Managed	Yes	Yes
Metadata on unmanaged storage	Yes	No
Agentlessly Managed	Yes	No
I/O Domain	Yes	No
Root Domain	Yes	No

### 5.15.6 Starting a Logical Domain

You can start a logical domain from a shutdown or shutdown and detached state.

The logical domain in shutdown state is not detached from the server, and network resources and therefore, starting the logical domain immediately starts the logical domain in the Oracle VM Server. The Start action does not initiate the Start Logical Domain Wizard.

When the logical domain is in shutdown and detached state, it is disconnected from its network resources. To start a logical domain that is in a shutdown and detached state, you must define the network resources.

For logical domains placed in a server pool, in shutdown and detached state, the logical domain is detached from its control domain and disconnected from its network and storage resources. Starting this logical domain requires you to select the Oracle VM Server in which you want to run the logical domain, storage and network resources.

You must select the virtual switch or the virtual functions of SR-IOV enabled networks that connects to the logical domain MAC address. A virtual switch can be connected to only one MAC address. You can select not to connect to network for a virtual switch.

When a shutdown and detached guest is started, then Oracle Enterprise Manager Ops Center selects the appropriate and best option for the guest domain with generic CPU architecture.

When you have a guest with the CPU architecture as `generic` in Oracle Enterprise Manager Ops Center and you start the guest in the following servers:

- Oracle SPARC T3 and T2 Servers: Oracle Enterprise Manager Ops Center sets the CPU architecture to generic.

- Oracle SPARC T4, T5, M5, and M6 servers: Oracle Enterprise Manager Ops Center sets the CPU architecture to `generic (migration-class1)`. `migration-class1` is a cross-CPU migration family for SPARC platforms starting with the SPARC T4 servers.
- Fujitsu M10 Systems: Oracle Enterprise Manager Ops Center sets the CPU architecture to `generic (sparc64-class1)`. `sparc64-class1` is a cross-CPU migration family for SPARC 64 platforms. `sparc64-class1` value has more instructions than `generic` value. This value is compatible only with Fujitsu M10 systems.

1. Select the logical domain in shutdown and detached state.
2. Click **Start** in the Actions pane.

The Start Logical Domain Wizard is displayed.

3. Select the server pool in which you want to start the logical domain.

When you shutdown a logical domain, the logical domain is disassociated from the control domain and it can be started on a server.

When you have networks attached to a logical domain and is not available in the selected server pool, then that network is not available when the logical domain starts.

4. Select the Oracle VM Server for SPARC in which you want to start the logical domain. You can select the same Oracle VM Server in which the logical domain is running already. Otherwise, select an Oracle VM Server for SPARC from the list.

The current load for all the Oracle VM Server for SPARC are displayed. Use this information to place your logical domain.

Click **Next** to specify the network interfaces.

5. Select the virtual switch or the virtual function that must be associated with the logical domain MAC address.

The number of virtual switches displayed depends on the number of network connections for the server pool. For each network connection, you have a virtual switch created. You can associate a virtual switch with only one MAC address.

6. Select **Do Not Connect** when you do not want the virtual switch to connect to MAC address.

Click **Next** to schedule the job.

7. Schedule the job to run now or at a later time.
8. Review the properties and click **Start** to run the logical domain.

### 5.15.7 Add Storage to Logical Domain

You can add virtual disks to a logical domain. The associated libraries to the Oracle VM Server for SPARC are available to be added as additional storage to logical domains.

Use the option **Add Storage** in the Actions pane to add virtual disks to the logical domain. The logical domain can be in running state for adding storage.

You can add virtual disks from the following type of storage libraries:

- **File system storage:** These are NAS libraries. Specify a virtual disk name and size of the disk.
- **Static block storage:** Select LUNs from SAN or iSCSI storage servers. The LUNs sizes are fixed.
- **Dynamic block storage:** Add LUNs from SAN or iSCSI storage servers discovered and managed in Oracle Enterprise Manager Ops Center. You can also create LUNs by selecting a volume group and specifying the size of the LUN.

Starting in the 12.2.2.0.0 release, you can add multiple SAN LUNs to a logical domain from different libraries using the **Add Multiple SAN LUNs** option of the **Add Storage** wizard. See the [Related Resources for Oracle VM Server for SPARC](#) section for more details about using this option.

### 5.15.7.1 Virtual Disk Multipathing

Virtual disk multipathing enables you to configure a virtual disk on a logical domain to access its back-end storage by more than one path. The paths lead through different service domains that provide access to the same back-end storage. The virtual disk of a logical domain remains accessible even if one of the service domains go down.

For each virtual disks of the logical domain that have more than one alternate path to the backend storage, a new multipathing group is created automatically. You must always specify the virtual disk of another service domain for the alternate path to access the back-end storage. You can select to enter the name of the multipathing group or a group is created automatically in the format of *logical domain name\_mpGroup\_devID*. The devID is the disk index. For example, if the name of the logical domain is *ldom*, then the multipathing group name is in the format of *ldom\_mpGroup\_1*.

When you have more than one alternate path for the virtual disks, you can select the active path which serves during a failure in one of the service domains.

Unless you enter the name of the multipathing group, the group is not created when there is only one alternate path to access the back-end storage.

## 5.15.8 Moving Metadata to Another Library

Metadata for a logical domain is saved in either a local library or a shared library. When you install Oracle VM Server for SPARC on a system without using Oracle Enterprise Manager Ops Center, the metadata is saved in a default local library. When you install Oracle VM Server for SPARC with Oracle Enterprise Manager Ops Center, you define a shared storage location for metadata.

To migrate a logical domain to another system, both systems must use the same virtual disks for shared storage and the same shared library for the logical domain metadata.

The following conditions must be met before you can move the logical domain metadata to another library:

- The control domain must be managed with an LDom VC Agent.
- The Logical Domain must be known to Oracle Enterprise Manager Ops Center.
  - The Logical Domain and its associated resources are created with Oracle Enterprise Manager Ops Center

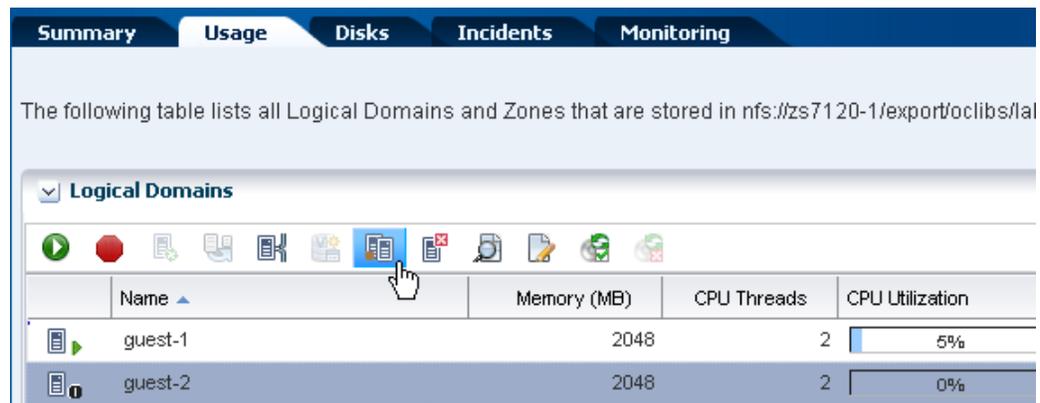
- A manually created logical domain is agent managed with Oracle Enterprise Manager Ops Center

### 5.15.8.1 To Move Metadata to Another Library From the Control Domain View

You can move a guest's metadata to another library from the control domain view.

1. Expand **Libraries**, expand **Storage Libraries**, then select the source library in the Navigation pane.
2. Click the **Usage** tab. Select the guest in the Logical Domains table, then click the **Move Metadata** icon.

**Figure 5-12 Move Metadata Icon**



3. Select the new library from the list of available libraries to store the logical domain metadata. Optionally, add a description and add tags. Click **Next**.
4. Review the Summary, then click **Submit**.

When the job completes, the logical domain's metadata is located on the new library.

### 5.15.8.2 To Move Metadata to Another Library From the Logical Domain View

You can move a logical domain's metadata to another library.

1. Expand **Assets**, then select the shutdown guest in the Assets tree.
2. Click **Move Metadata** in the Actions pane.
3. Select the new library from the list of available libraries to store the logical domain metadata. Optionally, add a description and add tags. Click **Next**.
4. Review the Summary, then click **Submit**.

When the job completes, the logical domain's metadata is located on the new library.

## 5.15.9 Enabling Shared Access for Opaque Storage Disks

When you create logical domains using the native CLI, it is automatically discovered and displayed under the corresponding Oracle VM Server for SPARC in the UI.

The metadata of the logical domain is stored in the local library of the control domain. If the logical domain storage disks are on storage servers that are not managed by Oracle Enterprise Manager Ops Center, then they are tagged as Opaque and displayed in the UI. Oracle Enterprise Manager Ops Center does not identify whether the storage

is local or shared. The migration action is disabled for the logical domain that has the metadata on local library and the storage disks tagged as opaque. Use **Move Metadata** option to move the logical domain metadata to a shared storage.

Mark the logical domain storage disks as shared to indicate that the storage is available to other managed Oracle VM Servers using the same backend name.

The storage that is marked as shared must be available for all the members in a server pool.

1. Select the logical domain that has been created using CLI.
2. Select the **Storage** tab in the center pane.
3. Select the disks tagged as Opaque in the Disk Type.
4. Click the **Enable Sharing** icon.

The selected disks are marked as sharing in the UI.

### 5.15.10 Connect to Logical Domain Console

You can attach to the logical domain console within the Oracle Enterprise Manager Ops Center UI. You enable the console connection and then you connect to the console.

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**Note:**

When the logical domain is not in view in the Assets tree, the console is logged out automatically but the connection exists until the connection time expires. You must log in again.

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You can view detailed information about the console. Select the Virtual Resources tab for the guest, then select the Virtual Devices tab. The Virtual Console information is displayed, including the port, console service name, and service domain. The service domain indicates the domain providing the virtual console services. The operating system of a domain must be discovered to provide virtual console services to another domain.

### 5.15.11 View the Console Logs

You can view the console logs for a logical domain through the Oracle Enterprise Manager Ops Center UI. Select the **Console** tab for the guest, then select the **Console Logs** tab. You can export these logs as a zip file.

By default, the maximum log size is 400 KB.

The virtual console for a domain can be provided by another domain. The domain providing the virtual console must be agent managed and must be running Oracle Solaris 11 or later.

A system must meet these prerequisites for the console logs to be visible through the UI:

- The control domain must be managed.

- The service domain providing the virtual console concentrator service must be running Oracle Solaris 11.0 or later. The guest domain being logged can run older versions of Oracle Solaris.
- The system runs Oracle VM Server for SPARC 3.0 or later.

### 5.15.12 Delete a Logical Domain

When you delete a logical domain, it is disconnected from the associated networks and is disassociated from the Oracle VM Server. All of the associated resources are released and the domain configuration is removed from the library. All references to the logical domain, including its disk image and snapshots are removed from the system. However, the logical domain profile and plan remain unaffected.

When you delete a logical domain manually, that is, using the native CLI, the UI reflects the removal of the logical domain.

You can delete one or more logical domains simultaneously by selecting them in the Control Domain summary.

You can use the **Delete** action to delete root domains that have virtual functions on SR-IOV enabled PCIe devices if other domains are not using a virtual function from that root domain.

If you want to delete guest domains assigned with virtual functions, you must first remove the virtual functions from the domain and then delete the guest domains.

### 5.15.13 Cancel Delayed Reconfiguration

The action **Cancel Delayed Reconfiguration** is restricted to the control domain or a PCIe root domain, if supported. This action is disabled for all other logical domains.

See [Delayed Reconfiguration Mode](#), for more information about the delayed reconfiguration.

## 5.16 Managing Logical Domain Networks

The following information is covered in this section:

- [VLAN Tagging Support](#)
- [Alternate MAC Addresses](#)
- [Connecting to Network](#)
- [Port Connectivity](#)

You can connect or disconnect a network from a logical domain in running state. You can connect to a network multiple times. Use the **Connect Network** and **Disconnect Network** icons, shown in [Figure 5-6](#), in the Networks tab.

You can also connect to SR-IOV enabled networks and thereby assign virtual functions to the logical domain. The SR-IOV enabled networks are available only on control domain as the SR-IOV feature is enabled only on the SR-IOV cards on the primary domain. From Oracle VM Server for SPARC 3.1 version, SR-IOV enabled networks are also available from root domains.

Each connection requires a virtual switch or the virtual function of SR-IOV enabled networks to connect the logical domain to the network.

Virtual network device (vnet) is a virtual device that is defined in the logical domain when it is connected to a virtual switch. You can create several vnets over a virtual switch. Creating too many vnets also decrease the performance. Therefore, the creation of vnets are reduced and Oracle Enterprise Manager Ops Center ensures to re-use when possible. For example, when there is an existing vnet that has the connectivity to the required network and there is no VLAN ID incompatibility then the vnet is re-used.

You can re-use a virtual switch to make multiple connections to a network from the logical domain or use the same virtual switch to connect to a network for different logical domains.

For SR-IOV enabled networks, you can use a virtual function to connect to a network multiple times for a logical domain or connect to a network for multiple logical domains.

Migration is disabled for domains that has one or more virtual functions assigned to it. For virtual switches, the virtual switch name must be identical in the source and target machine to migrate the guest domain.

#### **Example 5-2 Re-using Vnets**

Consider a virtual switch *vsw0* connected to networks N1 and N2. Network N1 is a regular LAN without a VLAN ID and Network N2 is a VLAN ID with VID = 11. When you connect a guest G1 to network N1 through *vsw0*, a virtual network device *vnet0* is created. The *vnet0* is created with PVID = 1 and VID = <null>.

When you connect the guest G1 to network N2 through *vsw0*, then the vnet, *vnet0*, is re-used by setting the VID = 11 which is the VLAN ID of the network N2.

### **5.16.1 VLAN Tagging Support**

Oracle VM Server for SPARC software supports 802.1Q VLAN-Tagging in the network infrastructure. The option to define the VLAN tagging mode is available from the Oracle Enterprise Manager Ops Center UI when you connect networks configured with a VLAN ID to the guest domains.

Configure the VLAN interfaces over the physical network devices in Oracle VM Server for SPARC. When you connect these networks to the guest domains, define the tagging mode as tagged or untagged.

In untagged mode, the Port VLAN ID (PVID) is set to the VLAN ID of the network. The outbound frames from the virtual network that are untagged are tagged with this PVID by the virtual switch. You can have only one PVID for a vnet or a virtual function (VF). If the PVID option is selected for a virtual function, you cannot use the VID option; if the VID option is selected, you cannot use the PVID option.

In tagged mode, the network's VLAN ID is added to the VID of the vnet or virtual function. The vnet sends and receives tagged frames over the VLANs specified by its VLAN IDs (VIDs).

You must have at least one untagged network connection to be used for provisioning OS on the logical domain. If the network to be used for OS provisioning is already VLAN tagged, then select the untagged mode while connecting the network. The network is assigned the PVID with the VID of the network.

When the tagging mode for a network configured with VLAN ID is set to tagged at the Oracle VM Server, then you have the option to select tagged or untagged option when you connect the logical domain to the network. If the tagging mode is set to untagged, then you cannot the change the tagging mode and it is set to untagged.

## 5.16.2 Alternate MAC Addresses

When you connect network to a logical domains, alternate MAC addresses are created automatically for the vnets or the virtual functions assigned to the logical domain. These alternate MAC addresses can be used to create zones in the logical domains.

The number of MAC addresses to create is set to `virtualization/ldom.auto.alt.mac.addr`s property value by default. This value is 20 but can be changed. If required, you can change the number of MAC addresses to create through the Administration section of the UI.

Select the Configuration tab, then select the Virtualization subsystem. The `ldom.auto.alt.mac.addr`s property specifies the number of MAC addresses to create:

```
ldom.auto.alt.mac.addr.count=20
```

If you do not want any MAC address to be created, you can change the value to:

```
ldom.auto.alt.mac.addr.count=0
```

The property is set globally for each Oracle VM Server for SPARC managed in Oracle Enterprise Manager Ops Center. Restart the Enterprise Controller after you change the property. Only after the restart, the number of alternate MAC address change is applied when you connect a network to the logical domain. The number is not altered for any existing connection.

The alternate MAC address are not created in the following scenarios or conditions:

- When you connect to a network dynamically, that is when the logical domain is in running state.
- The network connection is not done using Oracle Enterprise Manager Ops Center.

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**Note:**

You need alternate MAC addresses to create zones on logical domains. Refer to Oracle VM Server for SPARC documentation at [http://docs.oracle.com/cd/E38405\\_01/html/E38406/assignmacaddressesautomaticallyormanually.html#scrolltoc](http://docs.oracle.com/cd/E38405_01/html/E38406/assignmacaddressesautomaticallyormanually.html#scrolltoc) to create alternate MAC address manually.

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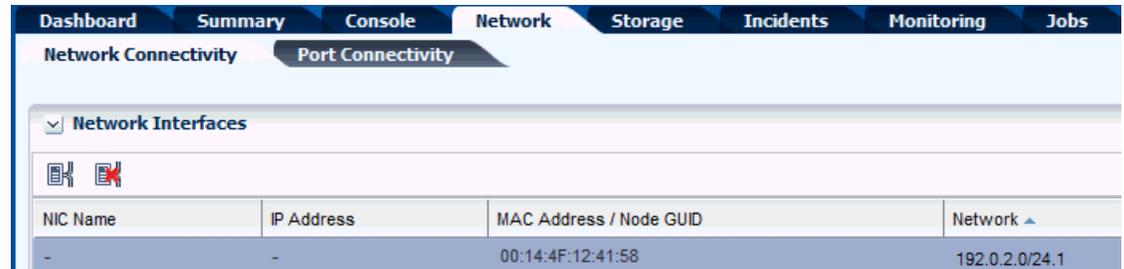
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- When you use InfiniBand virtual functions.
- The Oracle VM Server for SPARC is lower than 3.0.0.2 version.

### 5.16.3 Connecting to Network

You can connect or disconnect a network from a logical domain in running state.

**Figure 5-13 Logical Domain Network Options**



1. Click the **Connect Network** icon to display the Connect Guests to Network window. Select the network.
2. Select the networks from the list. For each selected network, choose the following details:
  - **VLAN ID / P-KEY:** Specify the VLAN ID or P-KEY for the network.
  - **Mode:** If the network is assigned a VLAN ID, you can select the network to be connected in tagged or untagged mode.
  - **Service domain:** Select the service domain that provides the network interface for the network connection. The domain can be primary, I/O domains or the root domains.
  - **SR-IOV:** Select this option when you want to assign a virtual function to connect to the network.
  - **Map Connection:** Select the virtual switch through which you want to connect the guest domain to the network. For SR-IOV enabled network connection, select the physical function through which you want to connect to the network.

An existing vnet is re-used to connect to the same virtual switch or virtual function rather than creating a new vnet for each connection.

- **Link Mode:** Select the link mode for the network connection. In Manual link mode, you specify the data link resource information. In Automatic link mode, the data link is automatically generated and configured using the following rules:
  - If an existing compatible vnet already is found, it will be used to connect the network. Vnets are re-used. Whereas, it is not applicable for SR-IOV enabled networks. A vnet supports one untagged network and one or more tagged network connections.
  - The number of alternate MAC addresses is set according to the `virtualization/ldom.auto.alt.mac.addr` property value. This value is ten by default but can be edited.

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**Note:**

- When you assign an Ethernet virtual function to connect to the guest, only the number of alternate MAC addresses can be specified.
  - When you assign an InfiniBand virtual function to connect to the guest, the **Link Mode** is automatically set to **Automatic** and cannot be changed to **Manual** mode.
- 
- 

Click **Next** to continue.

3. If you selected manual link mode for at least one network, the data link resource assignments are displayed. Select the following details for each network connection:
  - **Lower Link Name:** Specify the lower link name for the network connection.
  - **Link Name:** Specify the VNet name for the network connection.
  - **Nb Alt Mac Addr:** Specify a number of alternate MAC addresses for the network connection.
  - **Max Bandwidth (Mbps):** Specify the maximum bandwidth for the network connection in megabits per second.
  - **Private VLAN ID:** If the network connection is in untagged mode, you can specify a private VLAN ID for the network connection.
  - **Private VLAN Type:** If you provided a private VLAN ID, select a private VLAN type, isolated or community.

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**Note:** When you assign an Ethernet virtual function to connect to the guest, only the number of alternate MAC addresses can be specified.

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Click **Next** to continue.

4. View the summary, then click **Finish** to connect the networks to the logical domains.

When you connect networks to a guest domain that is in shutdown/detached state, then the service domain and Map Connection options are not available in the Connect Networks window.

You cannot connect networks to a guest domain that does not have an installed operating system.

You can create IPMP groups or aggregate the NICs allocated to the logical domain. See [Networks for Virtualization](#) for more information about creating IPMP groups and link aggregation.

When you disconnect networks from logical domains, the vnets are destroyed. If the vnets are re-used with another network connection, then it cannot be removed. To remove the vnet completely, you must remove the network connections in the following order:

- You must detach the network in the order of highest to lowest for netx. For example, a network connection with net5 as the highest must be removed first.

- The network connection for a network with a VLAN ID must be the last network connection to be removed.

To disconnect a network:

1. Select the networks that you want to disconnect from the logical domain in the Network tab of the selected logical domain.

2. Click **Disconnect Network** icon.

Unbind a Network window is displayed.

3. Click **Disconnect From Network** to confirm the delete action.

## 5.16.4 Port Connectivity

The Port Connectivity sub tab in the Network tab provides the details of the logical domain network connection.

The port connectivity tab displays the following information:

- Port Type
- Media Type
- VLAN ID and Port VLAN ID
- Alternate MAC Address
- MAC Address
- Port Name

**Figure 5-14 Port Connectivity**

Port	Port Name	MAC Address / Node GUID	Media Type	Port Type	Port VLAN ID	VLAN IDs	Alternate MAC addresses
0	SYS/PCI-EM7//OVIB.PF0.VF1,1	001405000000...	InfiniBand	Physical Interfa...	-	-	-
1	SYS/PCI-EM7//OVIB.PF0.VF1,2	001405000000...	InfiniBand	Physical Interfa...	-	-	-
2	SYS/PCI-EM7//OVIB.PF0.VF3,1	-	Ethernet	Physical Interfa...	-	-	-
3	SYS/PCI-EM7//OVIB.PF0.VF3,2	-	Ethernet	Physical Interfa...	-	-	-
4	SYS/PCI-EM7//OVIB.PF0.VF4,1	-	Ethernet	Physical Interfa...	-	-	-
5	SYS/PCI-EM7//OVIB.PF0.VF4,2	-	Ethernet	Physical Interfa...	-	-	-
6	SYS/PCI-EM7//OVIB.PF0.VF5,1	-	Ethernet	Physical Interfa...	-	-	-
7	SYS/PCI-EM7//OVIB.PF0.VF5,2	-	Ethernet	Physical Interfa...	-	-	-
8	SYS/PCI-EM7//OVIB.PF0.VF6,1	-	Ethernet	Physical Interfa...	-	-	-
9	SYS/PCI-EM7//OVIB.PF0.VF6,2	-	Ethernet	Physical Interfa...	-	-	-
10	SYS/PCI-EM7//OVIB.PF0.VF7,1	-	Ethernet	Physical Interfa...	-	-	-
11	SYS/PCI-EM7//OVIB.PF0.VF7,2	-	Ethernet	Physical Interfa...	-	-	-
12	SYS/PCLEM7//OVIB.PF0.VF8,1	-	Ethernet	Physical Interfa...	-	-	-

The Port Name displays the name of the vnet created. When the name of the vnet is of the format *unicxxxx*, it indicates that the vnet is created by Oracle Enterprise Manager Ops Center. Whereas, all other formats indicate that the network was not connected to the logical domain using Oracle Enterprise Manager Ops Center.

Also, when the network is connected to logical domain using Oracle Enterprise Manager Ops Center, then the alternate MAC address shows the list of created address provided the properties is set to create MAC address.

The Port Type indicates whether the type of underlying network connection for the logical domain. The type can be Physical Interface, SR-IOV Virtual Function, or Ldom vnet. The Media Type indicates whether the network media is Ethernet or InfiniBand.

## 5.17 Migrate Logical Domains

The following information is covered in this section:

- [Setting User Accounts for Migration](#)
- [Migration Requirements](#)
- [Migrating a Logical Domain](#)
- [Migrating Multiple Logical Domains](#)

Migrating a logical domain means moving the logical domain from one server (source) to another server (target). When a domain is migrated from the source to the target server in its running state without any impact to its availability is called live migration.

When the logical domain is stopped and then migrated to the target server, it is called as cold migration. You can migrate the logical domains when the requirements are met for successful migration.

Apart from these, Oracle Enterprise Manager Ops Center also migrate domains to other servers in the following scenarios:

- Balancing the load of the servers in a server pool
- Recovery of logical domains when the server on which it is running fails

Live migration, logical domain recovery and load balancing are available and supported only in the context of a server pool.

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**Note:**

From Oracle VM Server for SPARC 2.1 and higher versions, you can migrate the logical domains only when the source and target machines are running at least Oracle VM Server for SPARC 2.1 version.

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**Note:**

A logical domain with a kernel zone installed on it cannot be migrated.

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Oracle Enterprise Manager Ops Center UI provides the Migrate option to migrate the logical domains. The Migrate Logical Domain Wizard provides a list of available compatible target machines to migrate the logical domain. Select a target and migrate the logical domain.

### 5.17.1 Setting User Accounts for Migration

Temporary user accounts are created dynamically when a logical domain migration is initiated. The user account is deleted after the migration. If your datacenter environment does not support dynamic creation of user accounts, then you can set the logical domain migration to use an existing user account instead of creating a temporary one.

You must have the Security Admin role to create the credentials. If not, contact the Ops Center Administrator for creating a user account for logical domain migration.

To create a user account, follow the procedure:

1. Select the **Administration** section in the Navigation pane.
2. Select **Credentials** in the Administration section.
3. Click **Create Credentials** in the Actions pane.  
The Create Credentials window is displayed.
4. Select the protocol as OVM For SPARC Migration and enter the following details:
  - Name of the credential
  - User name for the account
  - Password for the user account
5. Click **Create** to create the user account.

Set the following system property in the configuration management of the Enterprise Controller:

1. Select the **Administration** section in the Navigation pane.
2. Select the **Configuration** tab in the center pane.
3. Select **Virtualization** in the Subsystem.  
The property `Virtualization.Ldoms.Migration.Username` is displayed.
4. Enter the user name of OVM For SPARC Migration user account created previously to be used for all logical domain migration.
5. Click **Save**.

The migration job proceeds to use the user account as defined in the system property, that user account must exist on the source and target systems. If the system property is set default to null, then the migration job dynamically creates a temporary user account. Ensure to set this property before initiating any logical domain migration, if required.

### 5.17.2 Migration Requirements

When you migrate logical domains, there are certain requirements and restrictions that must be noted for successful migration. Otherwise, there can be loss in the configuration of the logical domains or unsuccessful migration job.

The requirements and restrictions that affect the migration of the logical domains are:

- **Shared Storage:** The source and the target servers must have access to common storage resource. The logical domain metadata must be stored on NFS storage that must be associated with the server pool or the stand-alone Oracle VM Servers. The virtual disks must be shared. If the virtual disks are on shared storage that are not managed by Oracle Enterprise Manager Ops Center (other than FC or iSCSI LUNs, or NFS shares), enable shared access for the storage disks. Otherwise, use shared FC or iSCSI LUNs, NFS shares for domain's storage.
- **CPU Architecture:** The CPU architecture is of importance when you want to migrate the logical domains between systems that have different CPU processor type.

The following are the supported types for CPU architecture:

- **native:** The logical domains that are created with this CPU type enable them to be migrated only between systems that have the same CPU architecture type.
- **generic:** The logical domains that are created with this CPU type enable them to migrate to systems independent of the CPU type. Though this might result in reduced performance, it provides an increased flexibility to migrate the domains between systems that have different CPU types.

From Oracle VM Server for SPARC 3.1 and higher versions, the value of generic varies according to the platform. For example, if generic is set for a guest CPU architecture on an Oracle SPARC T2 server, then the CPU architecture is set to generic. Whereas for servers starting from Oracle SPARC T4, when the CPU architecture is set to generic in the UI, Oracle Enterprise Manager Ops Center sets the CPU architecture to migration-class1. In the UI, the CPU architecture is displayed as `generic (migration-class1)`. For Oracle M5 and M6 servers also, `generic (migration-class1)` is displayed. For Fujitsu M10 systems, the guests that are set to generic CPU architecture, are automatically set to `sparc64-class1` CPU architecture. In the UI, the CPU architecture is displayed as `generic (sparc64-class1)`.

Depending on the server platform onto which the guest is started after shutdown-detach, the best option for the CPU architecture is selected when the guest has generic as the CPU architecture.

You can edit the CPU architecture of the logical domain as required to facilitate the cross CPU live migration. You must shut down and detach the guest to edit the CPU architecture.

- **Logical Domains Created Using CLI:** For logical domains that are not created using the Oracle Enterprise Manager Ops Center UI, you must move the metadata of the discovered logical domains to a shared NFS storage. The virtual disks of the discovered logical domains are marked as opaque and it must be shared to enable migration.
- **Whole-core:** When you migrate the logical domains from latest versions of Oracle VM Server for SPARC to earlier versions results in losing the whole core configuration. For example, the logical domains configured with whole cores on Oracle VM Server for SPARC 3.0 version loses its whole-core configuration when migrated to Oracle VM Server for SPARC 2.2 version. Depending on the original number of cores allocated, it is translated to the number of CPU Threads and allocated to the logical domain.
- **Power Management Policy:** The power management policy for Oracle Integrated Lights Out Manager (ILOM) firmware can be set to Disabled, Elastic or

Performance. For Oracle VM Server for SPARC 2.2 and earlier versions, the migration of logical domains are not supported when the source and target machines are set with elastic power management policy. You must change to Performance policy to migrate the logical domains.

From Oracle VM Server for SPARC 3.0 version onwards, the Elastic policy does not affect the migration of the logical domains. The power management policy Performance and Elastic are fully compatible with the whole-core constraint.

- **Physical I/O devices:** The logical domains that are attached to physical I/O devices, namely the I/O domains and root domains, cannot be migrated.
- **Virtual Switch:** When you migrate logical domains, the virtual switch name must be identical in the source and the target Oracle VM Server for SPARC.
- **Virtual Functions:** You cannot migrate logical domains that are connected to virtual functions.
- **Virtual I/O Devices:** The logical domains can be attached to virtual I/O devices from multiple I/O domains. You can still migrate the logical domains provided all the virtual I/O services are available on the target machine.
- **Virtual Disk Server:** The target and the source Oracle VM Server must have the same names for the virtual disk server to migrate the guest domain. When the guest domains uses I/O resources from I/O domains or root domains, then the target Oracle VM Server must have domains that use the same name for the virtual disk server as the source Oracle VM Server.
- **Virtual HBAs:** The logical domains with virtual HBAs attached can be migrated only if the source and destination servers are running Oracle VM Server for SPARC 3.4 or higher version.
- **MAU:** For Oracle VM Server for SPARC 1.2 version, you can migrate with only one MAU. For Oracle VM Server for SPARC 1.3 and later versions, you can migrate with any number of MAUs.
- **Tagged and Untagged Networks:** When you migrate logical domains between servers that have different tagging mode, then the network configuration of the logical domain OS can be lost. You can avoid this issue by migrating domains between servers that have similar network configuration mode. When a guest domain is connected to a network configured with a VLAN ID, migration is not allowed between servers with the same VLAN network connected using different tagging mode.

### 5.17.3 Migrating a Logical Domain

1. Select the logical domain to be migrated from the Assets section.
2. Click **Migrate** in the Actions pane.

The Migrate Logical Domain Wizard is displayed.

3. The eligible Oracle VM Servers appear in decreasing order of preference. Select an Oracle VM Server from the list.

Click **Next**.

4. Review the information and click **Finish** to migrate the logical domain.

This migration is initiated from the logical domain and it results in migration of single logical domain. When the Oracle VM Server is placed in a server pool and there are more than one logical domain in the host, you can use Migrate Logical Domains to migrate more than one logical domain from the host.

### 5.17.4 Migrating Multiple Logical Domains

You can migrate multiple logical domains to a new Oracle VM Server in the same server pool.

1. Select an Oracle VM Server that is placed in a server pool.
2. Click **Migrate Logical Domains** in the Actions pane.

The Migrate Logical Domains Wizard is displayed.

3. The list of logical domains running in the Oracle VM Server are listed. Select one or more logical domains from the list.

Click **Next**.

4. The eligible Oracle VM Servers in the same server pool that have the required resources to host all the logical domains are listed in the decreasing order of preference. Select an Oracle VM Server from the list.

Click **Next**.

5. Review the summary and click **Finish** to migrate logical domains.

## 5.18 Automatic Recovery of Logical Domains

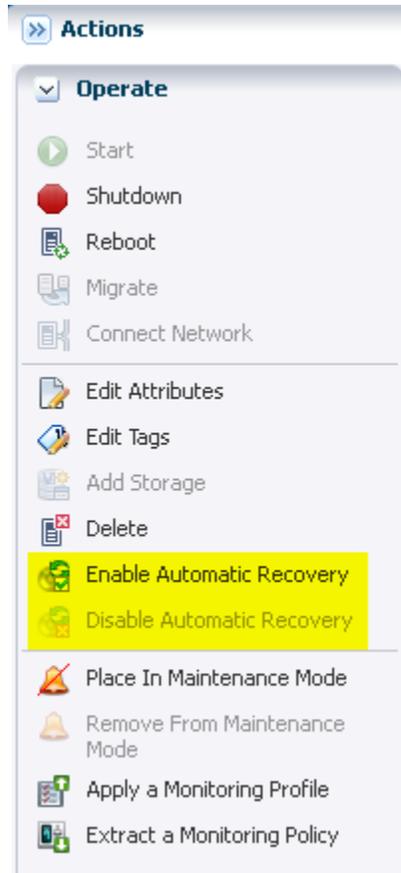
You can enable automatic recovery of logical domains. This ensures that when the Oracle VM Server for SPARC placed in a server pool fails, the logical domains are recovered and restarted on another server in the server pool.

The following information is covered in this section:

- [Virtual Disk Multipathing and Automatic Recovery Process](#)
- [Recovering Logical Domains](#)
- [Re-introducing the Failed Server](#)

You can set the priority of recovery value for the logical domain that decides the order of recovery of the logical domains in the Oracle VM Server for SPARC. The priority of recovery value can be set between 0 to 100. For example, if the priority of recovery value set for logical domain A is 12 and logical domain B is 15, then the logical domain B is recovered first.

Use the **Enable Automatic Recovery** and **Disable Automatic Recovery** actions, shown in [Figure 5-15](#), to set the automatic recovery for a logical domain. If you have disabled the automatic recovery of a logical domain, then it is not migrated to other servers in the pool when the underlying virtualization host fails. Instead, it is listed under Shutdown Guests in the Server Pool. You can restart them on other servers as required.

**Figure 5-15 Enable and Disable Automatic Recovery**

When you edit the attributes of a logical domain, you can edit the priority of recovery value.

If there are no resources available to recover the logical domains in the server pool, Oracle Enterprise Manager Ops Center checks periodically for every minute for free resources to retry the automatic recovery mechanism.

You can also follow the procedure described in [Recovering Logical Domains](#) to recover the attached logical domains.

When a logical domain is configured for automatic recovery, the auto boot value for the logical domain is set to false. The auto boot value is controlled by Oracle Enterprise Manager Ops Center. This is because, when the failed server is repaired and restarted, the logical domains are not started automatically. Oracle Enterprise Manager Ops Center checks whether the logical domains are recovered and running on other servers. If the logical domains are not recovered, then the logical domains are started. If the logical domains are recovered on other servers, then Oracle Enterprise Manager Ops Center cleans up those logical domains on the server.

When you perform shut down and start operations using the UI for a logical domain that is configured to automatically recover, the operating system is also booted automatically by Oracle Enterprise Manager Ops Center.

When you perform the shut down and start operations using the CLI for a logical domain that is configured to automatically recover, you must boot the OS separately. This is not automatically done by Oracle Enterprise Manager Ops Center.

See [Server Pools](#) and [Automatic Recovery](#) of Oracle VM Server for SPARC in a server pool for more information.

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**Note:** If the Enterprise Controller is installed in a logical domain, do not enable automatic recovery for that logical domain.

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### 5.18.1 Virtual Disk Multipathing and Automatic Recovery Process

When you have I/O domains and root domains, it is possible to have several paths to access the LUNs allocated for virtual disk storage. The redundant storage access requires the automatic recovery options of the logical domains to be set or modified accordingly to recover the logical domains with or without the redundant storage.

For example, if an Oracle VM Server for SPARC has two HBA cards that have access to the Fiber Channel LUNs. One HBA card is assigned to the control domain or the primary domain. Other HBA card is made available to an I/O domain by assigning the PCIe bus to it. Now, the LUN from the storage array is accessible from the primary domain and the I/O domain. When you create a guest domain, select that the virtual disk is created from the virtual disk server of the primary domain and the alternate path to the storage is the virtual disk server on the I/O domain. A multipathing group is created for the virtual disk of the guest domain with both the paths to the storage. Also, while creating the guest domain select the option to automatic recovery and authorize recovery without Redundant I/O.

If the PCIe card on the primary domain fails, then the guest domain is still up and running as it has access to its virtual disk through the alternate path on the I/O domain.

The Oracle VM Server for SPARC system is placed in a server pool with other servers in the pool that do not have an I/O domain or root domain. The primary domain is the only access to the LUN.

If the server fails, then Oracle Enterprise Manager Ops Center tries to recover the guest domain on other servers in the server pool only when the option Authorize Recovery without Redundant I/O is selected. Otherwise, the recovery is not done as there is no target server that provides redundant access to the storage.

### 5.18.2 Recovering Logical Domains

The following procedure describes the actions that must be performed to recover the attached logical domains when an Oracle VM Server for SPARC server in a server pool has failed.

1. Isolate the failed server.  

Log in to the ALOM or ILOM of the physical server and shut down the server.
2. Power-off the failed server.
3. In the Oracle Enterprise Manager Ops Center UI, select the server pool in which the failed server is the member. Check whether the server is flagged as unavailable. This status is updated within 5 minutes approximately.
4. Select the control domain of the server in the UI and click **Delete Asset** in the Actions pane.
5. Select the server pool in which the failed server was a member and expand the **Shutdown Guests** list.

6. The attached logical domains of the failed server are listed. Select the logical domains and click **Start** to start the logical domains in the desired server in the server pool.
7. To bring back the failed server to the server pool, the server must be repaired and provisioned again with Oracle VM Server for SPARC using Oracle Enterprise Manager Ops Center.

To avoid provisioning the server again with Oracle VM Server for SPARC, follow the steps as defined in the section [Re-introducing the Failed Server](#).

### 5.18.3 Re-introducing the Failed Server

You can bring in the repaired server back into Oracle Enterprise Manager Ops Center without the need of provisioning Oracle VM Server for SPARC again.

You must do the following when you want to re-introduce the repaired Oracle VM Server back into Oracle Enterprise Manager Ops Center:

1. Start the server and login to the console of the server and check whether the logical domains that have been recovered on other servers are still present on the server without the OS being booted. The logical domain OS not being booted prevents data corruption.
2. During the startup of the Oracle Enterprise Manager Ops Center Agent Controller on the server, the logical domain that were recovered on other servers without their OS being booted are removed.
3. Wait until the agent starts up on the control domain. When the agent is starting up, the following message is displayed on executing the command `/usr/bin/svcs -xv`:
 

```
svc:/application/management/common-agent-container-1:scn-agent is starting
```

This message stops when the agent is started.
4. Discover the control domain from the Oracle Enterprise Manager Ops Center UI using the discovery procedure as explained in the section [Discovering Existing Oracle VM Server for SPARC Environments](#).

## 5.19 Layered Virtualization

Oracle Enterprise Manager Ops Center supports non-global zones within the logical domains.

The consolidated view of the control domain, and its service domains helps Oracle Enterprise Manager Ops Center to understand the network and storage resources that can be used to create zones within a logical domain OS. When you provision OS on logical domains, it will automatically install the Zone Virtualization Controller Agent. The Zone Virtualization Controller Agent enables you to create non-global zones on the logical domain OS.

Creating zones on a logical domain requires alternate MAC addresses which can be allocated to the zones. See the [Alternate MAC Addresses](#) section for information about the limitations of alternate MAC ID creation.

The virtual disks storage that are free and available for use in the logical domains are available for zone storage. The storage that are in use by other zones, and those

exported by the logical domains and used as a virtual disk to other domains, are not available for zone creation.

When you need to migrate the zones on the logical domains placed in a server pool, then the zone must not be using the logical domains virtual disk for storage. To enable migration of zones created on logical domains, the following conditions must be satisfied:

- The zone must be directly attached to NFS, FC LUNs or iSCSI LUNs.
- For zones on I/O domains or root domains and to use FC LUNs, the domains must have the FC card to enable creation and migration of zones.

Refer to the [Oracle Solaris Zones](#), for more information about creating zones.

## 5.20 Server Pools

You can create server pools of your Oracle VM Server for SPARC systems in Oracle Enterprise Manager Ops Center. The Oracle VM Server for SPARC can have logical domains running in it.

When you want to create logical domains for the Oracle VM Servers placed in the server pool, the designation of the domains and the virtual switches or virtual functions to provide network connection are auto assigned. You cannot specify the network connection resource assignments.

The detailed description and procedure for creating server pools are described in [Server Pools](#).

## 5.21 Related Resources for Oracle VM Server for SPARC

For instructions in performing actions or to learn more about the role of this feature, go to one of the following resources.

- For Oracle VM Server for SPARC documentation, see <http://www.oracle.com/technetwork/documentation/vm-sparc-194287.html>  
See the **PCIe SR-IOV Hardware and Software Requirements** and **Non-primary Root Domain Hardware and Software Requirements** sections in the Release Notes of Oracle VM Server for SPARC documentation for hardware and software requirements.  
See the Release Notes for the complete list of supported hardware, firmware version, and the supported Oracle VM Server for SPARC version.  
See the Oracle VM Server for SPARC Administration Guide for more information about allocating memory size.
- See the following chapters of the *Oracle Enterprise Manager Ops Center Operations Reference* for more information:
  - See the Operating System Management chapter for more information on operating system requirements for Oracle Solaris 11 actions.
  - Refer to the Operating System Provisioning chapter for information about OS provisioning and configuring DHCP services on Proxy Controllers.
  - See the Hardware chapter for information about downloading and updating firmware.
  - See the Incidents chapter for more information about incidents and alerts.

- See the following chapters of the *Oracle Enterprise Manager Ops Center Configure Reference* for more information:
  - See the Manage Assets chapter for information about discovering and managing assets.
  - See the Configure Software Libraries chapter for more information about uploading or importing OS images.
  - See the Create Plans and Profiles chapter for more information about creating and managing the profiles and plans.
  - See the Set Up Monitoring Rules and Policies chapter for information about monitoring rules and attributes.
- See the *Oracle Enterprise Manager Ops Center Certified Systems Matrix* for information about supported OS and Oracle VM Server for SPARC versions.
- [Server Pools](#)
- [Networks for Virtualization](#)
- [Storage Libraries for Virtualization](#)
- See the *Oracle Enterprise Manager Ops Center Administration Guide* for information about users and roles.
- For an end-to-end example of how to discover and manage an existing Oracle VM Server for SPARC system, see *Oracle Enterprise Manager Ops Center Add an Existing Oracle VM Server for SPARC*.
- See *Oracle Enterprise Manager Ops Center Adding Volumes to SAN Storage Libraries* for more details about adding multiple SAN LUNs to a logical domain from different libraries using the **Add Multiple SAN LUNs** option of the **Add Storage** wizard.
- *Oracle Enterprise Manager Ops Center Configure and Deploy Oracle VM Server for SPARC*
- For current discussions, see the product blog at <https://blogs.oracle.com/opscenter>.



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## Oracle VM Server for x86

This chapter includes the following sections:

- [Introduction to Oracle VM Server for x86](#)
- [Roles for Oracle VM Server for x86](#)
- [Integration of Oracle VM Server for x86 with Oracle Enterprise Manager Ops Center](#)
- [Location of Oracle VM Server for x86 Information in the User Interface](#)
- [Installing Oracle VM Manager](#)
- [Discovering Oracle VM Manager](#)
- [Discover Oracle VM Servers](#)
- [Installing Oracle VM Servers](#)
- [Administration of Oracle VM Manager](#)
- [Manage Oracle VM Servers](#)
- [Create Server Pool](#)
- [Create Virtual Machines](#)
- [Manage Virtual Machines](#)
- [Related Resources for Oracle VM Server for x86](#)

### 6.1 Introduction to Oracle VM Server for x86

Oracle VM Server for x86 is a platform that provides a fully equipped environment to leverage the benefits of x86 virtualization technology. Oracle VM Server enables you to deploy operating systems and application software within a supported virtualization environment.

Oracle VM Server for x86 is a Xen-based server virtualization technology which supports Linux, Oracle Solaris, and Windows guests, and provide features to manage guests lifecycle operations, allocate and monitor guest resource consumption. The components of Oracle VM are:

- **Oracle VM Manager:** Provides the user interface to manage Oracle VM Servers, virtual machines, and resources.
- **Oracle VM Server:** A self-contained environment that is designed to produce a lightweight, secure server-based platform for running virtual machines. The Oracle VM Server can perform one or more of the following functions:

- **Server Pool Master:** The master is the core of the server pool operations and it acts as the contact point for the server pool to Oracle VM Manager, and also as the dispatcher to other Oracle VM Servers in the server pool.
- **Utility Server:** Its function focuses on the creation and removal operations of virtual machines, Oracle VM Servers, and server pools.
- **Virtual Machine Server:** The primary function of virtual machine server is to run virtual machines.

## 6.2 Roles for Oracle VM Server for x86

This table lists the tasks and the role required to complete the task. Contact your administrator if you do not have the necessary role or privilege to complete a task.

See the [Related Resources for Oracle VM Server for x86](#) section for information about the different roles and the permissions they grant.

**Table 6-1 Oracle VM Server for x86 Tasks and Roles**

Task	Role
Discover Oracle VM Manager and Oracle VM Server	Virtualization admin
Provision Oracle VM Manager	Ops Center admin
Manage Oracle VM Manager	Virtualization admin
Create Link Aggregation	Network admin
Create, manage, update, and delete virtual machines	Virtualization admin
Set monitor threshold	Asset admin
Manage storage resources	Storage admin
Create and manage profiles and plans	Profile and plan admin

## 6.3 Integration of Oracle VM Server for x86 with Oracle Enterprise Manager Ops Center

The integration of Oracle VM Server for x86 with Oracle Enterprise Manager Ops Center provides the platform to manage Oracle VM Manager, Oracle VM Servers, server pools, and the virtual machines through Oracle Enterprise Manager Ops Center UI.

The following operations can be done through Oracle Enterprise Manager Ops Center to manage Oracle VM Server for x86 deployments:

- Discover deployed Oracle VM Managers
- Provision Oracle VM Servers
- Discover existing Oracle VM Servers
- Launch Oracle VM Manager UI
- Create virtual machines

- Provision OS on virtual machines
- Create server pools
- Connect to Oracle VM Manager console
- Manage storage repositories of Oracle VM Server for x86
- Perform management operations on Oracle VM Servers and virtual machines

## 6.4 Location of Oracle VM Server for x86 Information in the User Interface

This table lists where to find different information for Oracle VM Server for x86 in the UI.

**Table 6-2 Location of Oracle VM Server for x86 Information**

To See	Location
Discovered Oracle VM Manager	Expand Administration in the Navigation pane. All the discovered Oracle VM Managers are displayed under Oracle VM Manager.
Discovered Oracle VM Server	Expand Assets in the Navigation pane. All the discovered Oracle VM Servers are displayed in the All Assets tree.
Server Pools	Expand Assets in the Navigation pane and select Server Pools in the Resource Management Views
Virtual Machine	Expand Assets in the Navigation pane and select Server Pools in the Resource Management Views. The virtual machines are listed under corresponding Oracle VM Servers.
Options for managing Oracle VM Servers from Oracle VM Manager	Expand Administration in the Navigation pane and select the Oracle VM Manager. All options to manage Oracle VM Servers are listed in the Actions pane.

## 6.5 Installing Oracle VM Manager

Installation of Oracle VM Manager is outside the scope of this document.

For detailed instructions about how to install the Oracle VM Manager, see *Oracle VM Installation and Upgrade Guide for x86* at <http://www.oracle.com/technetwork/documentation/vm-096300.html>.

By default, the Enterprise Controller, Proxy Controller, and Agent Controller use the most recent version of JDK available on the system. However, Oracle VM Server for x86 code will not work when the JDK version on the Proxy Controller is higher than JDK version 6. If the Proxy Controller has a higher version, you must manually set the JDK to version 6 on the Proxy Controller by editing the JAVA\_HOME variable to force the use of JDK 6.

Discover the Oracle VM Manager in Oracle Enterprise Manager Ops Center and launch the console to access it.

## 6.6 Discovering Oracle VM Manager

When you discover the Oracle VM Manager in Oracle Enterprise Manager Ops Center, the following Oracle VM resources are automatically discovered and populated in the UI:

- Oracle VM Servers
- Server pools
- Virtual machines
- Storage servers
- Storage repositories
- Networks

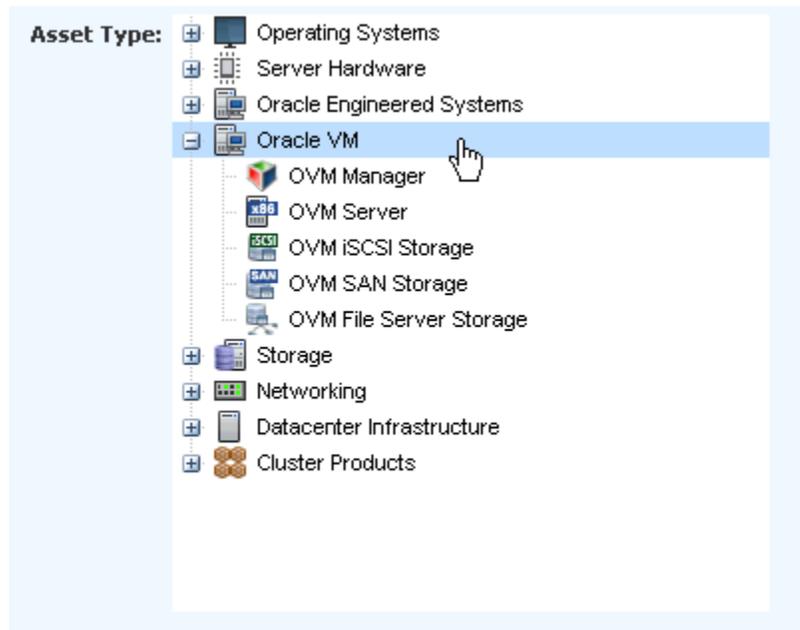
To discover an existing Oracle VM Manager, you must have the following information:

- Discovery profile for Oracle VM Manager
- Credentials for Oracle VM Manager access

You must create a discovery profile for discovering the installed Oracle VM Manager. The discovery profile provides options to create the discovery profiles for all the components related to Oracle VM Server for x86.

Figure 6-1 shows the different assets that are available under Oracle VM in the Discovery Profile Wizard.

**Figure 6-1** Discovery Asset Type



The following procedure outlines the steps to create a discovery profile for Oracle VM Manager:

1. Select Discovery from the Plan Management section.

2. Click **Create Profile** in the Actions pane.  
The Create Profile-Discovery Wizard is displayed.
3. Enter a name and description for the discovery profile.
4. Select the Asset Type as Oracle VM Manager from the list.  
Click **Next** to define the tags.
5. (Optional) Define the tags for the asset to be discovered. Tags help to group the assets.  
Click **Next** to enter the IP range.
6. (Optional) Enter the IP address of the Oracle VM Manager to be discovered. Enter the host name or IP Address when you execute the profile.  
Click **Next** to select the credentials of the Oracle VM Manager.
7. When you have the credentials of the Oracle VM Manager, click **Select** and the list of saved credentials are displayed. Select the appropriate credential from the list.  
Click **New** to display the Create Credentials window. Enter the following information:
  - Name and description for the credential.
  - Enter the username and password of the Oracle VM Manager. Re-enter the password to confirm.
  - Select the protocol and enter the port number.Click **Ok** to create the credential and click **Next** to review the summary of the Oracle VM Manager discovery parameters.
8. Click **Finish** to create the profile.

After creating the profile, execute the profile to discover the Oracle VM Manager. The following procedure describes how to execute the profile:

1. Select the discovery profile created for Oracle VM Manager.
2. Click the **Add Assets Using Profile** icon to launch the Add Assets Wizard.
3. When you have not provided the details of the IP address or host name in the profile, you must enter the details of the IP address or host name of the Oracle VM Manager.
4. Click **Add Now** to initiate the discovery job.

The Oracle VM Manager is considered an independent entity with which Oracle Enterprise Manager Ops Center integrates. The Oracle VM Manager appears in the Administration section of the UI, not as an asset in the Assets tree.

[Figure 6-2](#) shows the Oracle VM Managers displayed in the Administration section of the UI.

**Figure 6-2 Oracle VM Manager**

When you discover an Oracle VM Manager, all of the Oracle VM Servers managed in it are also discovered and displayed in the Assets section. Existing server pools in the Oracle VM Manager are also displayed in the Server Pools view of the UI.

## 6.7 Discover Oracle VM Servers

When you discover and manage an Oracle VM Manager, all of the known Oracle VM Servers to the manager are also discovered and displayed in the software UI. When you have manually installed Oracle VM Servers and not discovered in the Oracle VM Manager, you can still discover the Oracle VM Server in the Oracle Enterprise Manager Ops Center UI.

When you create a discovery profile for Oracle VM Server, you must define the Oracle VM Manager to which it can be associated. This makes the Oracle VM Server known to the Oracle VM Manager.

You must use SSH discovery of the Oracle VM Server when you want access to the serial console and perform advanced configuration in the Control Domain.

### 6.7.1 Discovery Profile for Oracle VM Server

The creation of discovery profiles is similar to Oracle VM Manager except for selecting the Discovery Type as Oracle VM Server. When you provide the Oracle VM Server

host name or IP address, select the Oracle VM Manager with which you want to associate the Oracle VM Server.

Figure 6-3 shows the IP Ranges step of the Discovery Profile Wizard in which the user must select the Oracle VM Manager to discover the Oracle VM Server.

**Figure 6-3 Select Oracle VM Manager**

Execute the profile and discover the Oracle VM Server. This is a very basic discovery of the server. The storage and network configuration of the server are not populated in the UI and only basic information is displayed in the UI.

## 6.7.2 Discovering Oracle VM Servers Using SSH

Use this method when you want to access the serial console of the Oracle VM Server and perform advanced configuration.

To use SSH for discovery, define the credentials for the Oracle VM Server as explained in this procedure:

1. Select Credentials from the Plan Management section.
2. Click **Create Credentials** in the Actions pane.  
The Create Credentials window displays.
3. Select the protocol SSH from the list.
4. Provide a name and description for the credential.
5. Select **Password** for Authentication Type.
6. Enter the root user and the password.
7. Click **Ok** to save the credential.

Create a discovery profile for the Oracle VM Server and select the credential created for ssh discovery. Discover the Oracle VM Server using the profile. Since the discovery of the Oracle VM Server is through the SSH discovery, the network and storage configuration of the server is populated in the UI.

## 6.8 Installing Oracle VM Servers

You can provision Oracle VM Servers using Oracle Enterprise Manager Ops Center. You can download an Oracle VM Server image into the storage libraries, create OS provisioning profiles and then deploy a plan with the profile on the selected target. When you import an image into Oracle Enterprise Manager Ops Center, a default profile and plan are created automatically.

See the [Related Resources for Oracle VM Server for x86](#) section for more information.

### 6.8.1 Hardware and Software Requirements

Oracle VM Server is a managed virtualization environment based upon the Xen hypervisor technology and includes a small Linux-based management operating system.

For hardware and software requirements for installing Oracle VM Server, see *Oracle VM Installation and Upgrade Guide for x86* at <http://www.oracle.com/technetwork/documentation/vm-096300.html>.

### 6.8.2 Oracle VM Agent Installation

When you install Oracle VM Server through Oracle Enterprise Manager Ops Center, the Oracle VM Server is installed without Agent Controller. The Oracle VM Agent is installed automatically when you install Oracle VM Server. The Oracle VM Agent enables communication between the Oracle VM Manager and Oracle VM Server for all management tasks.

### 6.8.3 Oracle VM Server Password Management

The provisioning profile of installing Oracle VM Server is similar to installing a Linux OS profile with additional steps to provide the Oracle VM Server password and the management interface. The Oracle VM Server password is different from the root password. This password is used by the Oracle VM Manager to manage and monitor the Oracle VM Server and the virtual machines running in it. You must use this password while discovering the Oracle VM Server from Oracle VM Manager.

### 6.8.4 Creating OS Provisioning Profile for Oracle VM Server

You can create OS provisioning profile for provisioning Oracle VM Servers.

1. Select OS Provisioning profile in the Plan Management section.
2. Click **Create Profile** to create a new profile.
3. Provide a name and description for the profile.
4. Select **Oracle VM Server for x86** in the subtype.

Click **Next** to specify the OSP parameters.

5. Select the Oracle VM Server from the list.

Oracle VM Server does not have any specific software groups. Click **Next** to specify the OS setup.

(Optional) Select Include Custom Scripts to add some scripts to the installation. Select the scripts in the subsequent steps to execute.

6. Specify the time zone, language, terminal type and the root password for the OS. Also, specify the console baud rate and the serial port.

Click **Next** to specify the installation parameters.

7. Specify the following parameters for the Linux OS:

- **Installation number:** Enter the installation number that is used to allow installation of all of the software that is included in your subscription.
- **Partition action:** Select whether you want to change the disk partition of the system.
- **Install protocol:** Specify HTTP or NFS as the install protocol.
- **Kernel parameters:** If necessary, enter kernel parameters for the GRUB menu of the target system.
- **Linux packages:** Specify the Linux packages to include or exclude during provisioning. To include a package, enter the package name in a line. To exclude a package, enter the package name preceded by a dash (-).

The options MD5 Checksum, Reboot action, Initialize Disk label, Use Shadow passwords, and Clear master boot record are enabled by default.

Click **Next** to specify the volume groups when you are using Logical Volume Manager.

8. Select **Use Logical Volume Manager** when you want to specify the volume groups in the Logical Volume Manager for the hard disk drives.

Click **Next** to specify the disk partitions and file systems.

9. Specify the disk partitions and file systems that you want to create on the target system. For the file system device, you can also select the logical device name.

Click **Next** to specify the naming service.

10. Specify the name service, domain name and the corresponding name server. Select one of the following name services:

- **DNS:** Enter the domain name of the DNS server. Provide the IP address of the DNS server in the Name Server field. You can enter up to three IP addresses as the value for the Name Server. Provide the additional domains to search for name service information in the Domain Name Search List. You can specify up to six domain names to search. The total length of each search entry cannot exceed 250 characters.
- **NIS or NIS+:** Enter the domain name of the NIS or NIS+ server. When you know the NIS server details, choose the option Specify an NIS Server and provide the NIS server host name and the IP address.
- **LDAP:** Enter the domain name of the LDAP server. Specify the name of the LDAP Profile you want to use to configure the system. Enter the IP address of the LDAP Profile Server. You can also optionally provide the Proxy Bind Distinguished Name and Password.
- **None:** Select None when there is no naming service configured.

Click **Next** to specify the network.

11. Select **None** to continue to specify the networks.

You can bond the interfaces after provisioning the Oracle VM Server. Select the Linux OS and aggregate the links.

12. Click the Add icon to add multiple networks.

All of the networks that are defined in Oracle Enterprise Manager Ops Center are displayed in the Network list. Enter the following information for each selected network:

- Select a NIC from the list of available logical interfaces for each network.
- Select the Address Allocation Method for the selected networks except the boot interface.

When you have selected Use Static IP for Address Allocation Method, then you must provide the IP address when you apply a plan with this profile. The specific IP address is assigned to the target system after provisioning.

Click **Next** to specify the Oracle VM Server parameters.

13. Enter the password to be used by the Oracle VM Agent. This password is used by the Oracle VM Manager to manage and monitor the Oracle VM Server. Re-enter the password to confirm it.

Figure 6-4 shows the step to enter the Oracle VM Server password.

**Figure 6-4 Oracle VM Server Password**

**Specify Oracle VM Server Parameters** \* Indicates Required Field

Specify the setup configuration for the Oracle VM Server.

\* Oracle VM Server Password:

\* Oracle VM Server Password Confirm:

Oracle VM Server Management Interface:

14. Specify the management interface, then click **Next**.
15. Review the information in the Summary, then click **Finish** to create the profile.

### 6.8.5 Applying Deployment Plan for Oracle VM Server

When you create a profile for provisioning Oracle VM Server, select the option to create a deployment plan with the profile. Either apply the created plan or create your own deployment plan.

1. Select the plan created for provisioning Oracle VM Server in the Plan Management section.
2. Click **Apply Deployment Plan** in the Actions pane.

3. Specify the network resources defined in the profile. Provide the IP address for the boot interface.
4. (Optional) Provide a host name for the Oracle VM Server.

Click **Next** to select the Oracle VM Manager.

5. (Optional) Select an Oracle VM Manager from the list to discover and manage the Oracle VM Server. Select **None** when you do not want to associate with an Oracle VM Manager.

Place the Oracle VM Server in one of the server pools of the selected Oracle VM Manager. After provisioning, a separate job is initiated to add the Oracle VM Server to the server pool.

Click **Next** to schedule the job.

6. Schedule the provisioning job to run now or at a later time.
7. Review the summary and click **Apply** to launch the provisioning job.

## 6.9 Administration of Oracle VM Manager

The list of Oracle VM Managers discovered and managed in Oracle Enterprise Manager Ops Center are displayed in the Administration section.

Select an Oracle VM Manager and the following information is displayed as shown in [Figure 6-5](#).

**Figure 6-5 Oracle VM Manager View**

The screenshot displays the 'Summary' page for an Oracle VM Manager. The page is titled 'xvm-vhost18.fr.oracle.com' and has tabs for 'Summary', 'Storage', 'Networks', and 'Incidents'. The main content area shows the following information:

- Oracle VM Manager Name:** xvm-vhost18
- Oracle VM Manager UUID:** 0004fb00000100002224378d24d7bc8a
- Description:**
- Oracle VM Manager Version:** 3.0.3.126
- Server Pools:** 1
- Servers:** 2
- Virtual Machines:** 3
- Storage Servers:** 2
- Storage Repositories:** 1
- Networks:** 1
- Reachable:** Yes
- YUM Repository Name:** -
- YUM Repository URL:** -
- YUM GPG Key:** -

There is a 'Tags' section with a table that is currently empty. Below this, there is a 'Server Pools (1)' section with a table:

Server Pool Name	Description	Oracle VM Servers	Virtual Machines
OvmPool	0		

The Summary page displays information about the Oracle VM Manager, the list of server pools, the discovered Oracle VM Servers, and the virtual machines that are created in the corresponding Oracle VM Servers.

## 6.9.1 Manage Ownership of Oracle VM Servers

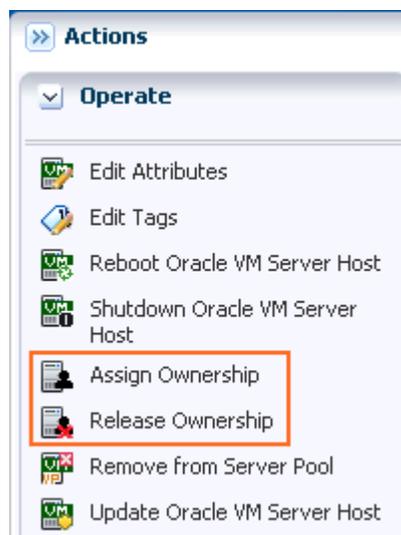
To use the Oracle VM Servers in the server pool and create virtual machines, it is required that you take ownership of the Oracle VM Server from the Oracle VM Manager.

Oracle VM Manager must take ownership of the Oracle VM Servers. Either assign ownership from the Oracle VM Server or take ownership through the Oracle VM Manager.

When you select an Oracle VM Server in the Assets section, the **Assign Ownership** and **Release Ownership** actions are available in the Actions pane.

Figure 6-6 shows the options Assign Ownership and Release Ownership displayed in the Actions pane.

**Figure 6-6 Assign and Release Ownership From Oracle VM Server**



When you select the Oracle VM Manager from the **Administration** section, the **Take Ownership** and **Release Ownership** options are available in the Actions pane.

When you take ownership of the Oracle VM Servers, add them to server pools and create virtual machines in them.

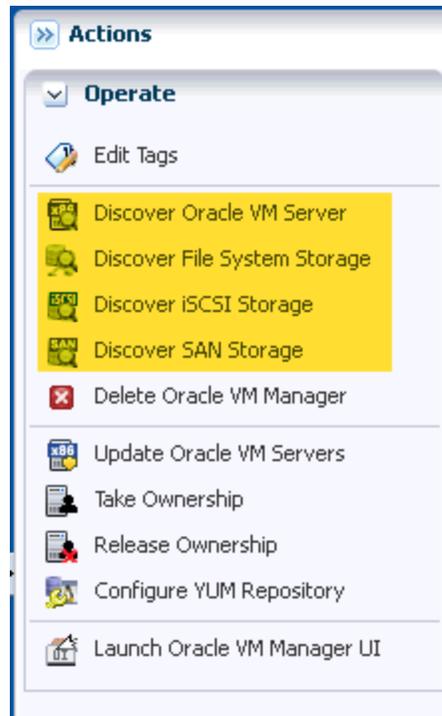
## 6.9.2 Discover Storage Resources

When you discover an Oracle VM Manager, Oracle Enterprise Manager Ops Center provides the option to discover the storage servers attached to it.

The following discovery options are available from the Oracle VM Manager:

- File system storage
- iSCSI storage
- SAN storage

Figure 6-7 shows the options to discover the storage resources from Oracle VM Manager.

**Figure 6-7 Discover Storage Resources from Oracle VM Manager**

Create discovery profiles for the storage servers and save them.

When you select to discover a storage server, existing discovery profiles are searched for the selected storage type. You can select from an available profile. When there are no profiles available, then the wizard to discover the corresponding storage server appears.

When you discover a storage resource, existing resources such as virtual disks, templates, ISO images, and virtual machine metadata are also discovered and displayed.

See [Storage Libraries for Virtualization](#) for more information about the storage servers and the discovering them in Oracle Enterprise Manager Ops Center.

### 6.9.3 Manage Storage Resources

The following type of libraries setup are supported for storage of Oracle VM resources:

- **Filesystem Storage Libraries**

Oracle Enterprise Manager Ops Center provides an option to create Oracle VM Storage Repositories. A storage repository is a logical disk space made available through a file system on top of physical storage hardware. The supported types of file system are NFS and OCFS. When the storage repository is created on an NFS file server, it is a NFS based storage repository. The NFS file server consists of NFS file systems. When the storage repository is created on a LUN, it is a LUN-based repository. The OCFS file system is created on the storage server. Create storage repositories on these file servers to be used by Oracle VM Servers to store resources. The resources include virtual machine metadata, templates, assemblies, ISO images and virtual disks.

To create Oracle VM storage repositories, you must have an Oracle VM Server discovered. Only NFS-based repositories can be shared by multiple server pools.

- **Static Block Storage Libraries**

The LUNs from the storage arrays that are not managed by Oracle Enterprise Manager Ops Center form the static storage libraries. The LUNs are addressed by iSCSI or Fibre Channel protocols. This forms the iSCSI and SAN static storage libraries. Also, add LUNs exported from managed storage arrays. The LUNs can belong to one library at a time.

- **Dynamic Block Storage Libraries**

The storage servers that are discovered and managed in Oracle Enterprise Manager Ops Center are presented under dynamic block storage libraries. The dynamic block storage libraries contains the exported LUNs from the storage array servers.

See [Storage Libraries for Virtualization](#) for more information about discovering your storage servers, storage connect plug-ins, creating storage libraries and managing the libraries.

## 6.9.4 Manage Networks

During the installation of Oracle VM Server, the network interface used for the management is configured as a bonded interface. The bond is created with one interface and named as bond0. You can create additional bonds to add redundancy and load balancing of your network environment.

Attach networks to the Oracle VM Server or to the server pool that consists of a group of Oracle VM Servers on an Oracle VM Manager. Configure the network interfaces or the bonds to the network to be attached. You can assign different roles or functions to the networks attached to the Oracle VM Server.

The following are the network roles available for an Oracle VM Server:

- **Server Management:** Manages the Oracle VM Servers in a server pool. The Oracle VM Manager has one Server Management network.
- **Live Migrate:** Migrates the virtual machines from one Oracle VM Server to another in the server pool, without changing the state of the virtual machine.
- **Cluster Heartbeat:** Verifies that the Oracle VM Servers in the server pool are running.
- **Virtual Machine:** Monitors the network traffic between the virtual machines in a server pool.
- **Storage:** Transfers between virtual machines and virtual disks.

The management network created during the installation of Oracle VM Server has the following roles:

- Server Management
- Cluster Heartbeat
- Live Migrate

You can add and remove the roles of this management network, except for the Server Management role.

Depending on the available network interfaces on the Oracle VM Server, you can attach networks to Oracle VM Server and assign different roles to the networks. For example, you can attach the network in which your storage servers are placed and assign the Storage role to that network. You can assign a network with Live Migrate to be used only for migration.

For more information about setting different roles for network, refer to the *Oracle VM User's Guide*.

## 6.9.5 Attaching Networks

You can attach networks to the Oracle VM Server using the option **Attach Network**. When the Oracle VM Server is placed in a server pool and the server pool is associated with an user-defined network domain, you must add the network to the network domain.

1. Select the Oracle VM Server or the server pool.
2. Select **Attach Networks** from the Actions pane.

The Attach Network Wizard is displayed. The list of available networks in the network domain are displayed with the current connection to the Oracle VM Server.

3. Select one or more networks that you want to attach to the Oracle VM Server or the server pool.

---



---

**Note:**

You cannot make multiple connections to the same network. You can connect to a network only once.

---



---

Click **Next** to configure the networks.

4. You cannot make more than one connection to the network. Do not increment the number of connections.

Click **Next** to configure the interfaces to the network.

5. For each selected network, select the NIC and the IP address.
  - **NIC:** Select an available NIC from the list. When the networks have different VLAN IDs, then you can assign the same NIC to another network. Otherwise, you cannot assign the same NIC to different network connection. When supported by the network, you can also select System Allocated for the system to take care of the NIC allocation.
  - **IP Address:** Select Use Static IP to provide the IP address manually or select Use System Allocated IP Address for the system to take care of the IP address allocation.

Click **Next** to view the summary of the selected information.

6. Review the information provided and click **Finish** to attach the networks to the Oracle VM Server or the server pool.

## 6.10 Manage Oracle VM Servers

When you install or discover the Oracle VM Server through the Oracle Enterprise Manager Ops Center UI, take ownership of the server from the Oracle VM Manager. This helps to place the Oracle VM Servers in the server pool. The following are some functions available for managing Oracle VM Servers:

- Edit Oracle VM Server information
- Reboot the server
- Shutdown the server
- Update the server
- Edit IPMI configuration

### 6.10.1 Edit Oracle VM Server Information

Select the Oracle VM Server and click **Edit Attributes** in the Actions pane. You can edit the following Oracle VM Server information:

- Name
- Description
- Tags

### 6.10.2 Editing IPMI Configuration

Intelligent Platform Management Interface (IPMI) allows you to remotely power off an Oracle VM Server, and to send a Wake-on-LAN message to power on an Oracle VM Server without having to physically press the power button. You can edit the IPMI configuration using the following procedure:

1. Select the Oracle VM Server and click **Edit IPMI Configuration** in the Actions pane.

The Edit IPMI Configuration window is displayed as shown in [Figure 6-8](#).

**Figure 6-8 IPMI Configuration**

Oracle Enterprise Manager Ops Center - Edit IPMI Configuration

Edit IPMI Configuration ? ORACLE

\* Indicates Required Field

\* Username:

\* Password:

\* Confirm Password:

\* IP Address:

OK Cancel

2. Enter the following information for IPMI configuration:
  - Username for the IPMI
  - Password for the IPMI
  - IP address of the IPMI
3. Click **Ok** to enter the IPMI configuration.

### 6.10.3 Placing Oracle VM Server in Maintenance Mode

To perform hardware or software maintenance, an Oracle VM Server can be placed in maintenance mode. When an Oracle VM Server is placed in maintenance mode, all of the virtual machines running on the Oracle VM Server are automatically migrated to other Oracle VM Servers in the server pool, if they are available, otherwise they are stopped. When 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.

1. Select the Oracle VM Server and click **Place in Maintenance Mode** in the Actions pane.
2. Click **Place** to confirm the action.

The Oracle VM Server is placed in maintenance mode.

When you have finished with the maintenance on the Oracle VM Server and you are ready for it to rejoin the server pool, select the option **Remove From Maintenance Mode**.

### 6.10.4 Updating Oracle VM Server

Using a YUM repository, update or upgrade Oracle VM Servers. To access patch updates for Oracle VM, contact Oracle to purchase an Oracle VM Support contract and gain access to the Unbreakable Linux Network (ULN) which contains updates for Oracle VM. When you have access to ULN, you can use this to set up your own Yum repository to use when updating your Oracle VM Servers.

### 6.10.4.1 Configure YUM Repository

A YUM repository is required to update or upgrade Oracle VM Servers that are attached to an Oracle VM Manager. Set up a YUM repository and configure for automatic updates of the Oracle VM Servers managed by an Oracle VM Manager. Setting up a YUM repository is beyond the scope of this document.

After you set up a YUM repository, select the Oracle VM Manager and click **Configure YUM Repository** in the Actions pane. Enter the following details of the repository to configure it.

- **Yum Repository Name:** A name for the Yum repository.
- **YUM Base URL:** The URL to access the Yum repository, for example, the Oracle public YUM repository is at:

<http://public-yum.oracle.com/>

- **Enable GPG Key:** Select whether to use the GPG Key for the Yum repository. The GPG key or GnuPG key is the GNU project's implementation of the OpenPGP key management standard.
- **Yum GPG Key:** This field is enabled when you select **Enable GPG Key**. Enter the GPG key for the Yum repository, for example:

<http://public-yum.oracle.com/RPM-GPG-KEY-oracle-e15>

The GPG key must be available through HTTP, FTP, or HTTPS protocols. The GPG key for Oracle-signed updates from ULN is pre-installed on the Oracle VM Server at `/etc/pki/rpm-gpg/RPM-GPG-KEY-oracle`. When you want to use this GPG key, enter as:

`file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle`

### 6.10.4.2 To Update Oracle VM Server

You can update an Oracle VM Server for x86.

1. Configure the Yum repository.
2. Select the Oracle VM Server and click **Update Oracle VM Server Host** in the Actions pane.

When you update the Oracle VM Server, the server is placed into maintenance mode and then the update is performed. When there are virtual machines in the Oracle VM Server, they are migrated to other Oracle VM Servers in the server pool, if they are available, otherwise they are stopped. After the update, the Oracle VM Server remains in maintenance mode. Select the option **Remove From Maintenance Mode**.

## 6.11 Create Server Pool

You can group one or more Oracle VM Servers in an Oracle VM Manager and create server pools.

You must create server pools before you start creating virtual machines. You can apply the virtual machines plans only on Oracle VM Servers that are in a server pool.

This section describes only how to create server pools using Oracle Enterprise Manager Ops Center. For more information about server pool policies, and managing server pools, see [Server Pools](#).

When you create a server pool for Oracle VM Server for x86 systems, you must have the following information defined:

- Cluster file system
- Server pool master
- Virtual IP address for the server pool master

### 6.11.1 Cluster File System

Shared access to the server pool resources is a must for providing for high availability for the virtual machines running in the Oracle VM Servers of the server pool. This is achieved by cluster file system OCFS2 which allows multiple Oracle VM Servers to access the same disk at the same time. OCFS2 ensures that the Oracle VM Servers in a server pool can access and modify resources in the shared repositories in a controlled manner.

When you create a server pool, you must specify the server pool file system for the cluster heartbeat and other cluster information. The file system can be NFS shares or LUNs of iSCSI or SAN-based storage servers. Oracle VM formats the server pool file system as OCFS2 file system.

In Oracle Enterprise Manager Ops Center, the cluster is always enabled by default. The cluster configuration is pushed out to all the Oracle VM Servers in the server pool and the cluster heartbeat starts when the server pool is created. You can set a separate network for this cluster heartbeat. See [Manage Networks](#) for more information about setting up the networks and its role for an Oracle VM Server.

### 6.11.2 Server Pool Master

An Oracle VM Server is internally elected as Server Pool Master.

You cannot set the role for an Oracle VM Server. When the elected Oracle VM Server fails, the role is set for another Oracle VM Server in the server pool. The virtual IP address provided while creating the server pool is assigned to the Oracle VM Server that has been elected as server pool master.

### 6.11.3 Server Pool Policies

The server pool policies that are applicable for Oracle VM Server for x86 are as follows:

- Set the CPU utilization threshold. Places the virtual machines on the Oracle VM Server that has the lowest relative load.
- Set the CPU utilization threshold. Places the virtual machines on minimum number of Oracle VM servers to minimize the power consumption.
- You can select the automatic load balancing so that the virtual machines can be migrated automatically in the server pool whenever the thresholds are exceeded.

When you enable automatic load balancing for Oracle VM Server for x86 server pool, the server pool is checked continuously for the selected placement policy. When the threshold exceeds, the virtual machines are migrated from one Oracle VM Server to another.

When you have selected power minimization and automatic load balancing policy, and the servers in the server pool are not overloaded, some Oracle VM Server host

servers are freed from the logical domains and powered off to minimize power consumption.

When the servers are overloaded and there are no other servers in the pool to host the virtual machines, then the policy decides to start a powered-off server using its Wake-on-LAN capability and live migrate the virtual machines to take up the load. The Wake-on-LAN capability must be enabled on the BIOS of the Oracle VM Server.

- When an Oracle VM Server fails, the virtual machines are migrated to another Oracle VM Server in the server pool, when you have selected Enable High Availability while creating the virtual machine.

### 6.11.4 Creating Oracle VM Server for x86 Server Pools

The following procedure describes the steps in the wizard to create an Oracle VM Server for x86 server pool.

1. Select Server Pool in the Systems Group list on the Navigation pane.
2. Click **Create Server Pool** in the Actions pane.

The Create Server Pool Wizard is displayed.

3. In the Identify Server Pool step, enter the following information:

- Name and description of the server pool.
- Enter tags for categorizing your server pool.
- Select Oracle VM Server for x86 from the Virtualization Technology.

Click **Next** to define the server pool configuration.

4. Define the following configuration details:

- Select the Oracle VM Manager in which the Oracle VM Servers are discovered and owned.
- Select the network domain.
- Select a network from the list of networks available in the network domain.
- Enter the virtual IP address that is assigned to the server pool master. When the server pool master changes, the IP address is assigned to the new Oracle VM Server.
- Select the server pool file system to store cluster heartbeat and other cluster information. The file system can be either NFS shares on a NFS file servers or LUNs of SAN and iSCSI based storages. The NFS file servers and the storage servers are known and reachable to the selected Oracle VM Manager.

Click **Next** to select the members of the pool.

5. Select one or more Oracle VM Servers to add to the server pool.

The list of Oracle VM Servers displayed have the following characteristics:

- Owned by the Oracle VM Manager. Refer to [Manage Ownership of Oracle VM Servers](#) to own an Oracle VM Server.

- Not associated with server pool.
- In a healthy state.
- Not placed in maintenance mode.
- Do not have virtual machines in running, shutdown or suspended state.

Select Oracle VM Servers that are compatible for migration of virtual machines. To migrate virtual machines within a server pool, the Oracle VM Servers systems must be identical in model.

Click **Next** to associate the network domain.

**6.** Select the network domain to associate with the server pool.

- When you have selected default network domain, then go to Step 7.
- For a user-defined network domain, select the physical interfaces of each selected servers to connect to each fabric in the network domain. You cannot bond the interfaces in Oracle VM Server for x86. Bonding can be done in only individual OS of the Oracle VM Server.

Click **Next** to select the networks and associate with the server pool.

**7.** For default network domain, all the networks that are declared and managed in Oracle Enterprise Manager Ops Center are listed. For an user-defined network domain, only the networks assigned to it are listed.

Select the networks that you want to associate with all the servers in the server pool. You cannot make multiple connections to a network. Limit the number of connections to 1.

Click **Next** to configure the interfaces of the servers.

**8.** For each network connection, specify the following details:

- Specify the NIC and IP address for each network connection. When a selected server is connected to the network, then no rows are displayed for that server.
- You can assign the same NIC to different network connection when the networks have different VLAN IDs.
- When supported by the network, you can select System Allocated for the NIC and IP address to be automatically allocated by the system.

Click **Next** to associate the storage libraries.

**9.** The storage libraries that are reachable from the selected members of the pool are displayed. The storage libraries are required to store virtual machine metadata, ISO images, and for virtual disks of virtual machine.

You can select the following type of storage libraries:

- **Filesystem Storage Libraries:** This includes the Oracle VM storage repositories. You must have at least one Oracle VM storage repository associated with the server pool.
- **Block Storage Libraries:** This includes the Static Block Storage and Dynamic Block Storage. Static block storage libraries comprises the exported LUNs of storage arrays that are not managed by Oracle Enterprise Manager Ops Center.

Dynamic block storage libraries comprises the exported LUNs of storage array servers that are discovered and managed in Oracle Enterprise Manager Ops Center.

Select the storage libraries from the list that you want to associate with all the virtualization hosts in the server pool.

Click **Next** to select the server pool policies.

**10.** You must select the following policies in the server pool to manage the underutilized and overutilized servers in the pool:

- **Placement Policy:** This policy decides the preferred virtualization host in the server pool to place the logical domains.
- **Auto Balancing Policy:** This policy performs load balancing of the server pool automatically at set intervals.

**11.** Select one of the following placement policies:

- **Lowest relative load:** The recent lowest memory and CPU utilization for the Oracle VM Servers in the server pool are calculated. Based on this, the server with the lowest relative load is considered to place a virtual machine. Provide the threshold for CPU utilization above which the server is considered to be over-utilized and virtual machines are migrated to server with lowest relative load.
- **Minimize power consumption:** The virtual machines running in a server pool are placed on the minimum number of Oracle VM Servers so that the unused Oracle VM Servers can be powered off. The threshold value set for the server over-utilization ensures that the servers are not over-loaded. Otherwise, the powered off Oracle VM Servers can be powered on to host the virtual machines.

**12.** Select the automatic load balancing policies:

- Select automatic load balancing and set the interval in which the server pool must be checked for resource balancing. You can set the approval to migrate the virtual machines automatically. Or send notifications about the approval.
- You cannot manually balance the resources.

Click **Next** to view the summary of the server pool details.

**13.** Review the information to create a server pool for Oracle VM Server for x86. Click **Finish** to create the server pool.

## 6.12 Create Virtual Machines

A virtual machine comprises configurable set of resources and its own operating system. The resources include virtual CPU, memory, network, and virtual disk. You can start, stop, and restart each virtual machine independently.

You can create virtual machines using one of the following installation sources:

- Templates
- Existing virtual machines
- ISO images in storage libraries

- Mounted ISO images on NFS, HTTP or FTP server
- Netboot

The operating system provisioned on the virtual machines can be hardware virtualized, paravirtualized and, hardware virtualized with paravirtualized drivers. Based on these virtualization types, you select the appropriate option to create the virtual machines.

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**Note:**

You can create virtual machines only in an Oracle VM Server for x86 server pools.

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### 6.12.1 Virtualization Types

The following virtualization types are available for a virtual machine:

- **HVM**

Hardware virtualization or fully virtualized. For HVM, select an ISO image from the storage library and create a virtual machine. You must activate the hardware virtualization in the BIOS of the Oracle VM Server in which you want to create the virtual machine. The OS might be completely unmodified.

- **PVM**

Paravirtualized. You must use an ISO file mounted from an NFS share, HTTP, or FTP server. The OS is modified and recompiled to be made aware of the virtual environment. The paravirtualized guests run at near native speed, since most memory, disk and network accesses are optimized for maximum performance.

- **PVHVM or HVM with PV Drivers**

Hardware assisted virtualization with a paravirtualized driver. Install paravirtualized drivers on the hardware virtualized machines for optimized performance. This is mainly used for running Microsoft Windows guest operating systems.

### 6.12.2 Creating Virtual Machine Profile

Capture the virtual machine requirements in the form of profile in Oracle Enterprise Manager Ops Center. Create a deployment plan with this profile and apply it on the selected targets. Use these profiles and plans to create more than one virtual machine at a time.

1. In the Plan Management section, expand Profiles and Policies and select Virtual Machine from the list.
2. Click **Create Profile** in the Actions pane.

The Create Profile - Virtual Machine Wizard is displayed.

3. Enter the name and description of the profile.

Select Create a deployment plan for this profile to automatically create a plan using this profile. Click **Next** to specify the installation source of the virtual machine.

4. Select an installation source for creating the virtual machine. You have the following options to select from:
  - **Templates:** Templates are pre-configured, pre-installed virtual machine. You must upload the templates into Oracle VM Storage Repositories. In the profile, the available storage repositories and the corresponding available templates are listed. Select a storage library and template.
  - **Existing Virtual Machine:** When there are existing virtual machines, select the storage repository and the virtual machine image stored in it.
  - **Install from ISO image (HVM):** You must have imported ISO images into the storage repository. Select the library and an ISO image from the list.
  - **Install from mounted ISO image (PVM):** Mount the required ISO files to a NFS share, HTTP or FTP server and it must be accessible from the Enterprise Controller. Provide the network path of the mounted ISO file. For example, an ISO image accessed through HTTP server is represented like this.  
  
`http://example.com/Enterprise-R5-U6-Server-x86_64-dvd.iso/`
  - **Install from Network (Netboot):** Use this option only to create the virtual machine with Network as the boot order. You must provision the OS separately on it.

Select an option for the installation source and click **Next** to identify the virtual machines created.

5. Provide a name for the virtual machine and the number to be appended to the name. You can create one or more virtual machines simultaneously using this profile. To provide unique name for the virtual machines, enter the prefix name and the number to start the series.

For example, if the prefix name is VMachine, the number to start from is 10 and the number of virtual machines to be created is 3, then the virtual machines are created with the name VMachine10, VMachine11, and VMachine12.

6. Provide the description and tags for the virtual machine. All the virtual machines created with this profile carry the same description and tags. Use the tags to group the virtual machines based on the role.

Click **Next** to specify the configuration of the virtual machine.

7. When you have the installation source selected as templates or existing virtual machine, the values for all the parameters are set from the template. Otherwise, you must provide the following parameters:
  - **VM Type:** Based on the installation source, select the type as HVM, PVM or HVM with PV Drivers. For HVM, you must have the ISO image in the storage library. For PVM, you must use mounted ISO images.
  - **OS:** Select the OS from the list to be installed on the virtual machine.
  - **Enable High Availability:** High availability is to ensure the uninterrupted availability of a virtual machine. When an Oracle VM Server shuts down or fails in a server pool, all the virtual machines are migrated to other Oracle VM Servers in the server pool. High availability is implemented only in server pool.
  - **CPU Threads:** The number of CPU threads to be used by the virtual machine.

- **CPU Priority:** The CPU priority of the virtual machine. You can select a high (100), intermediate (50), or low (1) priority for the virtual CPUs. The higher the priority more number of physical CPU cycles are allocated to the virtual machine.
- **CPU Cap:** This parameter defines the maximum percentage to which the virtual CPUs can receive scheduled time. Set this option to keep the low priority virtual machines from using too many CPU cycles.
- **Memory:** The size of the memory the virtual machine is allocated to use when starting it.
- **Boot Property:** Select whether you want to start the virtual machine after creation.

Set these parameters and click **Next** to specify the boot configuration.

8. Select the boot media and order for the virtual machine. The boot options are set according to the installation source.

The default boot order for different installation source are:

- Templates: Disk
- Existing Virtual Machines: Disk
- HVM using ISO image: CDRROM and Disk
- PVM using mounted ISO image: Network and Disk
- Netboot: Network

Select the correct order when you want to modify the boot order. Click **Next** to select the storage resources for virtual machine.

9. Select the storage resources to store the virtual machine configuration, also known as virtual machine metadata, and the virtual disks.

Use the following libraries for the virtual machine:

- **Oracle VM Storage Repositories:** The Oracle VM storage repositories are NFS file servers that are used to store virtual machine metadata, ISO images and virtual disk images. You can store the virtual machine metadata only in Oracle VM storage repositories. When you use the storage repository for virtual disk storage, you can either create a virtual disk or select existing virtual disks that are unshared and unused. You can also select ISO images to a virtual machine for HVM and PVHVM types.
- **Static Block Storage Libraries:** These are the storage array servers that are not managed by Oracle Enterprise Manager Ops Center but reachable to the Oracle VM Servers in the Oracle VM Manager. Select the LUNs that are exported as iSCSI and SAN storage types.
- **Dynamic Block Storage Libraries:** The exported LUNs that are available from the storage servers that are managed by Oracle Enterprise Manager Ops Center. Select the existing LUNs that are available from the storage servers. You can also create LUNs by specifying the volume group and the size of the LUN.

**10.** When you select to create virtual machines from existing virtual machines or templates, you are required to select the clone type for the virtual disks. You can select the following clone types:

- **Sparse type:** This clone type 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.
- **Non-sparse type:** This clone type is a disk image file of a physical disk, taking up the space equivalent to the full specified disk size, including empty blocks.

Select the appropriate storage library, specify the virtual disks, disk size, and click **Next** to select the networks.

**11.** Select the network domain, and the networks that must be attached to the virtual machine.

You can connect to one or more networks. The number of connection to a network is limited to 1.

Click **Next** to view the summary.

**12.** Review the information provided to create a virtual machine profile. Click **Finish** to create the profile.

Create a deployment plan with this profile and apply the plan to create virtual machines. Except for the installation source Netboot, all the other source types results in creating a virtual machine with the OS installed. For virtual machine created with Netboot installation source, you must provision the OS on it separately using an OS provisioning plan.

The next section describes the different methods of deployment of virtual machine plans to create virtual machines.

### 6.12.3 Deploying Virtual Machine Plan

This section describes how to create virtual machines and provision OS in an Oracle VM Server using Oracle Enterprise Manager Ops Center.

The two new deployments plans for provisioning and creating multiple virtual machines are:

- Single step deployment plan to create only virtual machines
- Multi-step deployment plan to create virtual machine, provision OS, and install other applications.

In the single step deployment plan, the virtual machine can be created using Oracle VM templates or ISO images stored in Oracle VM repositories. Or only a virtual machine is created with ready to be booted using a separate OS provision plan.

In the complex deployment plan, you can configure and install the virtual machine, provision the OS, install software applications, apply monitoring profiles, and operational plans.

This is a single step virtual machine plan that creates a virtual machine and the OS is installed depending on the installation source selection. When you create HVM or PVHVM type virtual machines, select the ISO image to be used to create the virtual machine. You can select only one ISO image and multiple ISO files are not supported. While selecting the virtual disks, you have the option to select the ISO image. The following procedure describes how to apply the plan for creating a virtual machine:

1. Select the Virtual Machine plan in the Plan Management section.
2. Click **Apply Deployment Plan** in the Actions pane.
3. Select the targets on which you want to apply the plan. Click **Add Targets to List**.

You can apply the plan only on the Oracle VM Server for x86 server pools. You cannot create virtual machines on Oracle VM Servers that are not part of a server pool.

4. Select to apply the plan with minimal interaction when you do not want to modify the parameters in the profile.

Click **Next**.

5. You can modify the virtual machine identification, if required.

Click **Next** to specify the storage resource assignments.

6. The storage resources from the profile are populated. When the storage libraries are not available for a selected target, it is flagged in red. Modify the storage resources accordingly.

7. For the selected storage library, define the virtual disks.

- For Oracle VM Storage repositories, you can create new virtual disks, select existing disks, or select ISO images. Select ISO image option is available only for HVM and PVHVM type virtual machines. Provide a disk name, select an existing disk or an ISO image.
- For Static Block Storage, select an available LUN from the list.
- For Dynamic Block Storage, either select an available LUN from the list or create a new LUN. When you create a new LUN, select the volume group and enter the size of the LUN.

Click **Next** to provide the network resources.

8. The network selected in the profile is populated. When the network is not available for a selected target, it is flagged in red. Modify the network resource.

9. Specify the network resource and the IP address for the virtual machine.

Click **Next** to view the summary.

10. Review the information provided and click **Apply** to apply the plan on the selected targets.

Except for the virtual machine created with Netboot as the installation source, all the other virtual machines are installed and provisioned with the OS.

Use the complex plan **Configure and Install Virtual Machines** to install the virtual machine and provision the OS on it. See the [Related Resources for Oracle VM Server for x86](#) section for more information about complex plans.

### 6.12.4 Provisioning OS on Virtual Machines

You can install an OS on virtual machines created on the Oracle VM Server. Use OS provisioning profiles to install the OS.

See the [Related Resources for Oracle VM Server for x86](#) section for more information about creating provisioning profiles and plans to install an OS.

## 6.13 Manage Virtual Machines

Oracle Enterprise Manager Ops Center provides options to manage the lifecycle operations of virtual machines. You can start, suspend, resume, shut down, and delete virtual machines on the UI.

When you select the Oracle VM Server in the Assets section, the Summary tab in the center pane lists all the virtual machines that are currently running. All the options required to manage a virtual machine is available on the UI.

[Figure 6-9](#) shows the actions available for a virtual machine from Oracle VM Server.

**Figure 6-9 Action Icons for Virtual Machines**

State	Virtual Machine Name	Memory (MB)	Memory Used %	CPI
	Anicka_0	1024 of 1024	100	1
	LubosP_ovm_do_not_touch	4096 of 4096	100	2
	oidsjfojffVM_1	1024 of 1024	100	1
	rys_0	1024 of 1024	100	1
	srTemp_1	1024 of 1024	100	1
	ttVM_1	1024 of 1024	100	1
	vServer_1	1024 of 1024	100	1

### 6.13.1 Starting a Virtual Machine

Select the virtual machine and click the **Start Selected Guest** icon. The job is initiated to start the virtual machine.

### 6.13.2 Suspending a Virtual Machine

Select the virtual machine and click the **Suspend Selected Guest** icon. When you suspend a virtual machine, you cannot use the virtual machine. Click **Ok** to confirm the suspend action.

### 6.13.3 Rebooting a Virtual Machine

Select the virtual machine in the running state and click the **Reboot Selected Guest** icon. Click **Reboot Guest** to confirm the action.

### 6.13.4 Shutting Down a Virtual Machine

Select the virtual machine and click the **Shut Down Guest** icon. When you shut down a virtual machine, it is disconnected from its network. Click **Ok** to shut down the virtual machine.

### 6.13.5 Deleting a Virtual Machine

Select the virtual machine and click the **Delete Selected Guest** icon. Click **Ok** to confirm deleting the virtual machine. When you delete a virtual machine, all the references to the virtual machine such as the metadata and disk images are deleted from the system.

All these options are also available in the Actions pane when you select the virtual machine in the Assets section.

### 6.13.6 Edit Boot Order

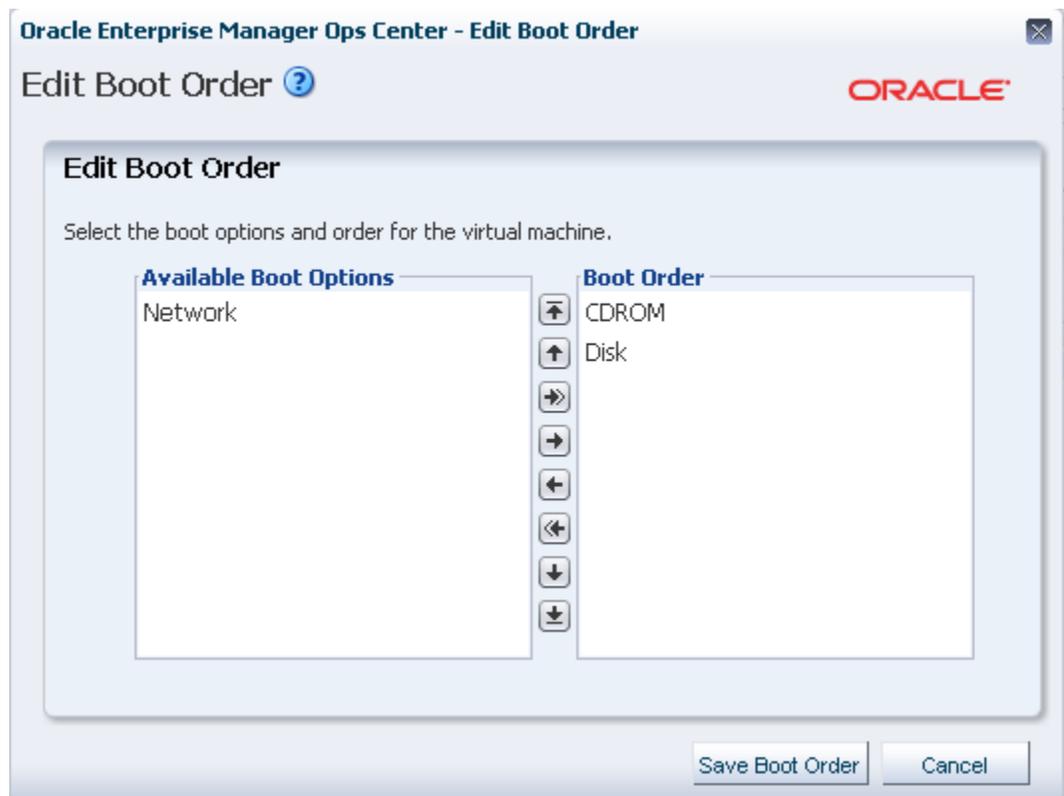
The boot order that you have set during virtual machine installation is displayed. You can modify the boot order. You must specify the appropriate boot order depending on the installation source of the virtual machine.

The following list shows the preferred boot options for different installation source:

- Hardware Virtualized Machine (HVM): CDROM and Disk
- Paravirtualized Virtual Machine (PVM): Network and Disk
- Templates and existing virtual machines: Disk
- Netboot: Network

If the virtual machine is in running state, then the modified boot order takes effect on the next reboot. Ensure to select the correct boot order for the virtual machine.

The **Edit Boot Order** option is available in the Actions pane of a selected virtual machine. [Figure 6-10](#) shows the Edit Boot Order window that is displayed to edit the boot order of the virtual machine.

**Figure 6-10 Edit Boot Order Window**

Modify the boot order and click Save Boot Order to save the changes.

### 6.13.7 Automatic Recovery

You can enable high availability for a virtual machine while creating a virtual machine profile. When the virtual machines are selected to be highly available and the Oracle VM Server shuts down or fails, the virtual machine is restarted on another available Oracle VM Server in the server pool.

You can also use the options **Enable Automatic Discovery** and **Disable Automatic Discovery** for a virtual machine to manage the high availability.

## 6.14 Related Resources for Oracle VM Server for x86

For instructions in performing actions or to learn more about the role of this feature, go to one of the following resources:

- See the following chapters of the *Oracle Enterprise Manager Ops Center Configure Reference*:
  - See the Manage Assets chapter for information about discovering and managing assets.
  - See the Create Plans and Profiles chapter for information about complex plans for installing virtual machines and provisioning operating systems.
- See the Operating System Management chapter of the *Oracle Enterprise Manager Ops Center Operate Reference* for more information about creating provisioning profiles and plans to install an OS.

- See the Software Libraries chapter of the *Oracle Enterprise Manager Ops Center Configure Reference* to upload or import images into the software library.
- [Server Pools](#)
- [Networks for Virtualization](#)
- [Storage Libraries for Virtualization](#)
- See the *Oracle Enterprise Manager Ops Center Administration Guide* for information about users and roles.
- For current discussions, see the product blog at <https://blogs.oracle.com/opscenter>.



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# Server Pools

This chapter includes the following sections:

- [Introduction to Server Pools](#)
- [Roles for Server Pools](#)
- [Actions for Server Pools](#)
- [Location of Server Pool Information in the User Interface](#)
- [Server Pool Capabilities](#)
- [Server Pool Policies](#)
- [Automatic Recovery](#)
- [Managing Guest Affinity and Disaffinity](#)
- [Server Pool Libraries](#)
- [Server Pool Networks](#)
- [Oracle VM Server for SPARC Server Pool](#)
- [Oracle Solaris Zones Server Pool](#)
- [Oracle VM Server for x86 Server Pool](#)
- [Manage Server Pools](#)
- [Related Resources for Server Pools](#)

## 7.1 Introduction to Server Pools

A server pool is a group of one or more virtualization hosts with the same processor architecture that have access to the same virtual and physical networks, and storage resources. Server pools provide load balancing, high availability capabilities, and sharing of some resources for all members of the pool.

You can create server pools for the following types of virtualization servers:

- Oracle VM Server for SPARC
- Oracle VM Server for x86
- Oracle Solaris Zones x86
- Oracle Solaris Zones SPARC

A virtualization host can refer to Oracle VM Server for SPARC, Oracle Solaris Zones, or Oracle VM Server for x86 that are managed through Oracle Enterprise Manager Ops Center. A virtual host or guest in a server pool refers to a non-global zone, logical domain or virtual machine running on the virtualization host.

Server pools are resource pools of homogeneous virtualization hosts that allow actions such as balancing load between servers and moving guests between hosts. You can also apply resource configurations and policies to them. The policies that you establish for a server pool manage many of the CPU utilization and resource balancing functions. Operations to the server pool are delegated to the individual virtualization hosts in the server pool.

To manage the guests within a server pool, you can perform warm and live guest migration and you can balance all of the guests' load among the members of the server pool. You can configure a policy to balance the load automatically, based on a schedule that you determine, or you can balance the load manually. When a virtualization host system shuts down, such as a hardware failure, you can start the guests on another host in the same pool.

Virtualization hosts in a server pool share network and storage libraries and several server pools can share the same networks and storage resources.

Server pools form a key concept for virtual datacenter management. Pooling your virtualization supported systems plays an important role and requires proper understanding of your requirements in your environment.

All the requirements, procedures, and different functions available for a server pool depend on the type of virtualization technology selected. See the appropriate sections to create a server pool for different virtualization technology.

- [Oracle VM Server for SPARC Server Pool](#)
- [Oracle Solaris Zones Server Pool](#)
- [Oracle VM Server for x86 Server Pool](#)

When you create a server pool, you must plan the storage and network resources such that they are accessible for all the members of the server pool.

You must set the policies to place the guests on the virtualization hosts and choose how you want to do the load balancing of the server pool. To understand more on this, refer to [Server Pool Policies](#).

## 7.2 Roles for Server Pools

The following table lists the tasks and the role required to complete the task. Contact your administrator if you do not have the necessary role or privilege to complete a task.

See the [Related Resources for Server Pools](#) section for information about the different roles and the permissions they grant.

**Table 7-1 Server Pool Tasks and Roles**

Task	Role
Create, manage, update, and delete server pools	Virtualization Admin
Provision and manage virtualization host	Virtualization Admin
Create, manage, update, and delete guests	Virtualization Admin

## 7.3 Actions for Server Pools

Using Oracle Enterprise Manager Ops Center, you can perform the following tasks:

- Create server pools for different types of virtualization technologies.
- Balance load on the resources in the server pool.
- Manage storage and network resources for the server pool.
- Set placement policies for automatic load balancing.
- Perform automatic recovery of the guests during server failure.
- Edit the attributes of an existing server pool.

## 7.4 Location of Server Pool Information in the User Interface

This table lists where to find different information for server pools in the UI.

**Table 7-2 Location of Server Pool Information in the UI**

To See	Location
Server pools	Expand Assets in the Navigation pane and select Server Pools in the Resource Management Views.
Server pool resources	Expand Assets in the Navigation pane and select Server Pools in the Resource Management Views. Select the server pool and the center pane displays all the details of the server pool resources such as network, libraries, and fabrics.
Server pool actions	Expand Assets in the Navigation pane and select Server Pools in the Resource Management Views. Select the server pool and the Actions pane list the various options such as Associate Libraries, Attach Networks, Create Guests, Associate Network Domains and Edit Attributes for managing the server pool.

## 7.5 Server Pool Capabilities

You can create server pools for different types of virtualization technology. See the appropriate sections to create a server pool for different virtualization technology.

Each time Oracle Enterprise Manager Ops Center adds a new system to the pool, it checks the network connections on all the members of the pool. You will not be allowed to continue if something is wrong.

The following are some server pool capabilities and limitations:

- [Mixing Virtualization Technology in a Server Pool](#)
- [Performing Maintenance When Using a Server Pool](#)

### 7.5.1 Mixing Virtualization Technology in a Server Pool

You can create a zones server pool and use the logical domains as the global zones. However, those logical domains should not be part of an Oracle VM Server server pool. The user interface does not prevent you from creating these server pools, but the configuration is not supported and it can cause problems; particularly when automatic recovery is enabled on both server pools.

## 7.5.2 Performing Maintenance When Using a Server Pool

Before performing maintenance in your datacenter, it is a good idea to place the systems affected in maintenance mode to suppress the creation of alerts and incidents. When the system is part of a server pool, you can decide whether you want to migrate the guests to a different host in the pool before placing the system in maintenance mode. Maintenance mode does not stop monitoring, it only stops the alerts and incidents.

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**Note:**

If you do not relocate the guests before putting the system in maintenance mode, consider disabling the server pool monitoring and disabling automatic recovery for each guest. Beginning with 12.2.2, you can disable automatic recovery at the server pool level instead of disabling it for each guest. See [Editing Server Pool Parameters](#) for how to disable automatic recovery for the server pool.

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## 7.6 Server Pool Policies

The following information is covered in this section:

- [Placement Policy](#)
- [Minimize Power Consumption Policy](#)
- [Automatic Load Balancing Policy](#)

When you create a server pool, you define guest placement, and automatic load balancing policies. When you create guests, you define the guest resource consumption, including physical and virtual CPUs.

You can edit the server pool policies in the server pool's Summary tab. See [Editing Server Pool Parameters](#) for how to edit the pool attributes.

### 7.6.1 Placement Policy

The placement policy determines the preferred virtualization host for new guests within the server pool, the type of load balancing (automatic or manual) of the server pool, and balances the server pool during any server failure or maintenance. You define the placement policy when you create the server pool; however, you can modify the policy at any time.

The following are the server pool placement policy options:

- Place the guest on the virtualization host with the lowest relative load, based on the lowest CPU resource utilization. The calculation is based on a combination of the average load for the time period defined by the user. The default value is the last 10 minutes. The default threshold value for CPU utilization is 75%.
- Place the guest on the virtualization host with the lowest allocated CPU and memory, that is, the total static resource allocation across all guests on the host. The resource allocation is the sum of the number of vCPUs and virtual memory specified for each guest. This policy first verifies whether the resource allocation is possible and then ranks the server with available resources. The relative weight of CPU and memory resource is 1:1 while calculating the load on the host.

- Place the guest on minimum number of virtualization host and thereby consume less power.

The following is an example of how the placement policy works in a server pool.

**Example 7-1 Example of Least Allocated Virtualization Host**

A server pool has two virtualization hosts with different CPU and memory allocations. Host A has 8 available CPUs and 16 GB of memory. Host B has 4 available CPUs and 8 GB of memory.

Host A has three guests:

- Guest X has one vCPU and 1024 MB of memory.
- Guest Y has two vCPUs and 2048 MB of memory.
- Guest Z has one vCPU and 1024 MB of memory.

Host A's total static allocation is 4 vCPUs and 4 GB of memory.

Host B has one guest:

- Guest W has 3 vCPU and 4096 MB of memory.

Host B's total static allocation is 3 vCPUs and 4 GB of memory.

The allocation percentage for Host A is: CPU allocation is 4 vCPUs/8 physical CPUs, or 50%. Memory allocation is 4 GB/16 GB or 25%.

The allocation percentage for Host B is: CPU allocation is 3 vCPUs/4 physical CPUs or 75%. Memory allocation is 4 GB/8 GB or 50%

Therefore, Host A is the least allocated of the virtualization hosts.

## 7.6.2 Minimize Power Consumption Policy

The policy to minimize power consumption places the guests on the minimum number of virtualization hosts and powers off the idle servers. The idle virtualization hosts are powered off or set to low-power mode on explicit approval.

For Oracle VM Server for x86, Oracle Enterprise Manager Ops Center will power off unused servers in the pool.

Beginning with Oracle Enterprise Manager Ops Center 12.2.2, you can enable power management for Oracle VM Server for SPARC server pools. When you enable power management, Oracle Enterprise Manager Ops Center will load as much work as it can onto a physical server before adding a virtual machine to a different server in the pool.

When power management is enabled, the software performs the following tasks:

- Places unassigned resources into a lower power state
- Identifies the members with the highest load and determines if those members have enough unallocated resources to support a new virtual machine placement request
- Checks the number of logical domains for each server in the pool and sets the appropriate placement policy
- Adjusts the placement policy every time you create, migrate, or delete a logical domain.

You can enable the policy and time interval to check for resource changes in Administration. The default check.delay time interval checks for resource changes every 5 minutes (300 seconds). See the [Related Resources for Server Pools](#) section for how to set the power consumption policy and edit the property values.

### 7.6.3 Automatic Load Balancing Policy

Use the Automatic Load Balancing Policy to schedule load balancing within a server pool. You can schedule the automatic balancing to occur weekly, daily, or hourly on a specific day and time of the week. The default is to balance the load on the servers in the server pool every Saturday at midnight according to the defined placement policy.

Scheduling automatic load balancing is applicable only for Oracle VM Server for SPARC and Oracle Solaris Zones server pool.

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**Note:**

The day and time are in the Enterprise Controller's time zone.

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When you do not want to balance the server pool's load automatically, schedule a reminder to balance the server pool's load manually.

#### **Maintenance Mode**

Automatic load balancing policy does not consider the virtualization hosts that are placed in maintenance mode as a target in the server pool for migrating the guests. When you place a virtualization host in maintenance mode, all of the migratable guests in it are migrated to other servers in the server pool. This action is triggered automatically.

#### **Resource Balancing Enhancements**

You can define the resource usage threshold for the servers in the server pool. The servers are considered to be loaded heavily depending on the threshold set for the resources. Depending on the placement policy selected, the CPU or total CPU and memory resource usage is calculated.

When the virtualization host utilization exceeds the threshold, the software identifies the servers with sufficient resources and the guests that can be migrated from the server to balance the load.

When the virtualization hosts are well within the threshold and power minimization policy is selected, the automatic balancing policy attempts to free a virtualization host from its guest so that the administrator can power off the server.

## 7.7 Automatic Recovery

The automatic recovery feature provides the option to recover the guests that are attached to a failed server. The recovered guests are restarted on other servers in the server pool.

This feature is available for all types of supported virtualization technology. You can enable or disable the automatic recovery of zones, logical domains, and the virtual machines. The automatic recovery for virtual machines is managed by Oracle VM Manager. For logical domains and zones, the automatic recovery is managed by Oracle Enterprise Manager Ops Center.

Oracle Enterprise Manager Ops Center follows the recovery process described in this section, and is applicable for zones and logical domains.

By default, automatic recovery is enabled at the server pool level. When enabled at the server pool level, the recovery options selected for zones and logical domains determines whether automatic recovery is attempted.

Oracle Enterprise Manager Ops Center monitors the managed assets by checking the connection between the agent deployed on the assets and the Proxy Controller. You can set the interval of periodic check of the assets reachability while creating the server pool. The default value is 180 seconds. If any of the Oracle Enterprise Manager Ops Center Agent Controllers installed on the server do not respond within the fixed timeout interval, then the server is considered to be a failed server. The timeout interval is a minimum of 20 seconds and a maximum of 60 seconds.

For example, if the interval is set at 180 seconds, the server pool checks the status of the members of the pool every 180 seconds and if there is no response from the Agent Controller in 60 seconds, then the automatic recovery of the zones or the logical domains in the server are started approximately four (4) minutes after the server failure.

If the interval is set at 20 seconds, the server pool checks the status of the members of the pool every 20 seconds and if there is no response from the Agent Controller in 20 seconds, then the automatic recovery of the zones or the logical domains in the server are started approximately 40 seconds after the server failure.

An automatic recovery job can be initiated when the global zone, kernel zone, or Oracle VM Server for SPARC is:

- Placed in a server pool.
- Has at least one zone or logical domain that is configured to recover automatically.
- Is not in maintenance mode.

The job initiated first performs the preliminary check of pinging all the known IP address of the failed server from another member in the server pool and the heartbeat in the metadata that is refreshed by the servers. The recovery job continues if the asset is seen as unreachable from Oracle Enterprise Manager Ops Center.

The recovery job fails if the assets are reachable and only the Agent Controller is down on the server. The attempt to recover the logical domains or zones are stopped as they are reachable.

If an automatic recovery failed or cannot be performed because of non availability of free resources in the server pool, Oracle Enterprise Manager Ops Center periodically checks if there are enough free resources and retries the automatic recovery. Hosts in maintenance mode cannot be targets for automatic recovery.

The software checks every 60 seconds until it can perform the automatic recovery. A retry counter is available to control how many times the auto-recovery manager will attempt to perform an automatic recovery. Setting the counter to zero (0) results in an unlimited number of times that the automatic recovery is attempted.

You can disable the automatic recovery feature for a server pool or for an individual asset. To disable the automatic recovery feature for a server pool, and all assets in the server pool, select the check box when you create the server pool. You can edit an existing pool to disable or enable the feature. When you disable automatic recover at the server pool level, the software will not check for resources or attempt to recover a guest, regardless of what option is selected at the zone or guest level.

You can enable to policy and time interval to check for resource changes in Administration. The default check.delay time interval checks for resource changes

every 5 minutes (300 seconds). See the Administration guide for how to set the power consumption policy and edit the property values.

You can also manually recover the zones and logical domains. See [Recovering Zones](#) for more information about manual recovery.

See the sections [Oracle Solaris Zones Server Pool](#), [Oracle VM Server for SPARC Server Pool](#), and [Oracle VM Server for x86 Server Pool](#) for more information about automatic recovery options.

## 7.8 Managing Guest Affinity and Disaffinity

You can use tags to assign affinities and disaffinities to guests. When a guest is initially placed, when it is recovered, during a live migration, or during a server pool rebalance, a guest is placed on a host with other guests sharing its affinities and lacking its disaffinities wherever possible. If guests sharing an affinity cannot be placed on the same host, an alarm is raised.

Affinities and disaffinities are useful when placing certain guests on the same hosts, or on different hosts, is counterproductive. For example, if three guests contain parts of a three-tiered application, it is beneficial to keep them together, whereas two guests that are nodes of an HA cluster should not be placed on the same host.

In a case where a guest's affinities and disaffinities cannot both be satisfied, preference is given to satisfying the disaffinities.

Guest affinities and disaffinities are managed by tags. You can use the **Edit Tags** action to add and edit tags, then save the changes to apply them to the asset.

You can edit the following tags on a guest to provide affinity and disaffinity information:

- **affinityTags:** This tag identifies this guest for other guest's affinities and disaffinities.
- **affinities:** This tag identifies the guest's affinities. A guest's affinities must include all of its affinity tags.
- **disaffinities:** This tag identifies the guest's disaffinities.

You can provide more than one entry for a tag using a comma-separated list. Affinity and disaffinity tags are not case-sensitive. Enclosing quotation marks are ignored.

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**Note:** Do not give a guest an affinity and a disaffinity for the same affinity tag.

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### **Example 7-2 Example of Affinity and Disaffinity**

For example, a guest with the following tags is a member of Group A. It should be recovered onto a host with other Group A guests, and not recovered onto a host with Group B guests or Group C guests.

- **affinityTags:** Group A
- **affinities:** Group A
- **disaffinities:** Group B, Group C

## 7.9 Server Pool Libraries

Oracle Enterprise Manager Ops Center uses software libraries to store ISO images and guest metadata. Storage libraries are also used to provide storage disks for the guest operating systems and for guests' data.

The virtualization hosts in a server pool share the libraries associated with the server pool. The type of library you can associate with the server pool depends on the type of virtualization hosts in the server pool and on whether all members of the server pool can access the storage resource.

See [Storage Libraries for Virtualization](#) and the Software Libraries chapter of the *Oracle Enterprise Manager Ops Center Configuration Guide* for more information about setting up these libraries.

## 7.10 Server Pool Networks

Oracle Enterprise Manager Ops Center provides group related networking components, such as fabrics, and networks, such as network domains. By default, all managed and declared networks in Oracle Enterprise Manager Ops Center are placed in the default network domain. Associating a virtualization host or a server pool with the default network domain does not require a fabric connection. All of the networks in the default network domain are available to be attached to the server pool.

You can create network domains. Associating a server pool with a user-defined network domain requires connection between the physical interface of each server in the pool and each fabric in the network domain. Only networks assigned to the user-defined network domain are available to be attached to the server pool.

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**Note:**

Before attaching one or more private ethernet networks to a server pool, verify that all members of the pool have access to the private networks. When all members do not have access, you might encounter inconsistent guest creation and network information.

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You can use server pools with Oracle SuperCluster systems:

- When you attach public networks to a server pool, the server pool members can belong to different Oracle SuperCluster systems.
- When you attach private (internal) networks to an Oracle SuperCluster server pool, the members must all belong to the same Oracle SuperCluster system.

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**Note:**

Do not create server pools using members from more than one Oracle SuperCluster systems and attach private, or internal, networks to the systems.

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Before creating a server pool, plan your networks and network domains that you must attach to the server pool. See [Networks for Virtualization](#) for more information about creating network domains and managed networks.

## 7.11 Oracle VM Server for SPARC Server Pool

The following information is covered in this section:

- [Enhancements in Oracle VM Server for SPARC Server Pool](#)
- [Server Pool Policies](#)
- [Automatic Recovery](#)
- [Creating an Oracle VM Server for SPARC Server Pool](#)

You can pool the Oracle VM Server for SPARC resources and manage your logical domains. The Oracle VM Server for SPARC can be configured and running with I/O domains and root domains.

Oracle VM Servers for SPARC must meet the following requirements to be added to a server pool:

- You are able to place Oracle VM Servers of different CPU types in the server pool; however, you might lose the ability to migrate the logical domains between virtualization hosts with different CPU architectures. When you want to live migrate the logical domains, ensure that you create server pools of compatible CPU types. Cold migration and automatic guest recovery are available by using the shutdown/detach operation of the logical domain. Plan your servers that must be pooled.
- Must be running a supported version of Oracle VM Server for SPARC. The minimum supported version for server pools is Oracle VM Server for SPARC version 1.2.
- Must be running a supported version of Oracle Solaris operating system. The minimum supported version for server pools is Oracle Solaris 10 10/09 OS and must meet specific patch and firmware requirements.
- Plan the network that must be attached to the server pool. Either place those networks in the user-defined network domain or use the default network domain. You can connect to a network multiple times. The multiple network connection allows you to create IPMP or aggregate the links in the logical domain.
- The storage libraries must be associated with the server pool to store logical domain metadata, ISO images, and for virtual disk storage of logical domains. You can associate file system and block storage libraries with the server pool. Filesystem storage includes the NAS storage libraries. Block storage includes the SAN, iSCSI, and Dynamic Storage libraries. Ensure that you have at least one NAS storage library assigned to the server pool. For using migration capabilities, the server pool must be on shared storage facility.

### 7.11.1 Enhancements in Oracle VM Server for SPARC Server Pool

The following enhancements are available for supporting Oracle VM Server environments created outside Oracle Enterprise Manager Ops Center and advanced I/O domain configurations. Some of the enhancements are available from 3.0 or higher version:

- You can add Oracle VM Servers to the server pool even if they have logical domains configured and running.

- You can select the servers in the server pool to create I/O domains and root domains. The server pool will not be available as a target.
- Discover and manage user-configured Oracle VM Server for SPARC environments. The metadata of logical domains are stored in the local library of the Control Domain. To enable logical domain migration, you must move the metadata to a NFS storage.
- Oracle VM Servers of different CPU type can be pooled together. The migration is not possible for logical domains between incompatible servers. Still, you can perform cold migration, that is shutting down the domain and starting on other servers in the server pool. Also, the guest recovery can be performed as it is often possible to start the domain on another server even though live migration is not possible.
- You can configure exclusive access of I/O domain and root domain resources to other logical domains. The exclusive access prevents creation of zones in the I/O domain or root domain OS and the global zone is not available to be placed in a zones server pool.
- You can delete a server pool even if the logical domains are attached to the Oracle VM Servers.
- Placing an Oracle VM Server in the server pool does not remove any existing network and storage resource that are already attached to it.
- Deleting a server pool also does not unconfigure all the Oracle VM Servers of the attached network and storage resources. All the attached resources are retained and only the server pool is deleted.

### 7.11.2 Server Pool Policies

The server pool policies that are applicable for Oracle VM Server for SPARC are as follows:

- **Placement Policy**

Set the CPU utilization threshold. Place the logical domains on the Oracle VM Server for SPARC that has the lowest relative load.

Set the CPU and memory allocation threshold. Place the logical domains on the Oracle VM Server for SPARC allocated with lowest CPU and memory resources.

Set the CPU utilization threshold. Place the logical domains on the minimum number of Oracle VM Servers to minimize the power consumption.

- **Automatic Balancing**

Set the automatic load balancing. Logical domains are migrated automatically in the server pool whenever the thresholds are exceeded. Schedule the automatic load balancing to take place at definite time interval.

When you have selected power minimization and automatic load balancing policy, and the servers in the server pool are not overloaded, some Oracle VM Server host servers are freed up from the logical domains and powered off to minimize power consumption.

Set whether administrator approval is required for migrating the logical domains.

### 7.11.3 Automatic Recovery

You can enable automatic recovery for a logical domain in the following scenarios:

- During logical domain creation, you can enable automatic recovery option and set the value for priority of recovery. See [Creating a Guest Domain Profile](#) for more information about setting the priority of recovery while creating a logical domain profile.
- For an existing logical domain, use the options Enable Automatic Recovery and Disable Automatic Recovery to set the automatic recovery. Also, you can edit the attributes of a logical domain to set the value for priority of recovery. See [Automatic Recovery of Logical Domains](#) for more information.
- See [Automatic Recovery](#) for the recovery process of the logical domains when a server fails in the server pool.

In an Oracle VM Server for SPARC server pool, the option to power-off the failed server and recover the logical domains is enabled by default. When a server fails, Oracle Enterprise Manager Ops Center tries to power-off the failed server, ensure that it is stopped and then initiates the automatic recovery of the logical domains. The logical domains that are configured for automatic recovery are recovered and restarted on other servers in the server pool.

When the option to power-off the failed server is enabled and Oracle Enterprise Manager Ops Center cannot power-off the failed server, that is the Service Processor is also unreachable, the automatic recovery of the logical domains does not take place. This is to avoid any potential data corruption during the recovery process of the logical domains.

When Oracle Enterprise Manager Ops Center detects that the failed server is unreachable, the logical domains that were running in the server disappear from the Navigation pane in the UI until they are recovered to other servers in the server pool.

The metadata of disappeared logical domains is still available in the storage libraries. The logical domains that are not configured for automatic recovery or the logical domains that cannot be recovered re-appear in the UI in the following scenario:

- When the failed server is restarted, the logical domains are booted and attached to the server again.
- When you have followed the manual recovery procedure and deleted the failed server from Oracle Enterprise Manager Ops Center, the logical domains re-appear in the list of Shutdown Guests in the Server Pool. You can start them on other server in the server pool. See [Recovering Logical Domains](#) for the logical domains recovery.

[Table 7-3](#) provides a quick view of different conditions that exist for recovering a logical domain.

**Table 7-3 Recovery of Logical Domains**

**Table 7-3 (Cont.) Recovery of Logical Domains**

	Conditions	Result
Logical domains	<ul style="list-style-type: none"> <li>Failed Oracle VM Server for SPARC</li> <li>The server pool option to power-off the failed server on automatic recovery is enabled</li> <li>Oracle Enterprise Manager Ops Center can power-off the failed server</li> <li>Automatic recovery is enabled for the logical domain</li> </ul>	<p>The logical domain is restarted and placed in another server in the server pool.</p> <p>If there are no server available in the server pool, then you must manually recover the logical domains.</p> <p>See <a href="#">Recovering Logical Domains</a> for more information.</p>
Logical domains	<ul style="list-style-type: none"> <li>Failed Oracle VM Server for SPARC</li> <li>The server pool option to power-off the failed server on automatic recovery is enabled</li> <li>Oracle Enterprise Manager Ops Center cannot power-off the failed server</li> <li>Automatic recovery is enabled for the logical domain</li> </ul>	<p>The automatic recovery of the logical domain does not take place.</p> <p>This is to avoid any data corruption during the recovery procedure.</p> <p>You must manually recover the logical domains.</p>
Logical domains	<ul style="list-style-type: none"> <li>Failed Oracle VM Server for SPARC</li> <li>The server pool option to power-off the failed server on automatic recovery is not enabled</li> </ul>	<p>Oracle Enterprise Manager Ops Center proceeds to recover the logical domains configured to automatically recover without trying to power-off the failed server from its processor.</p> <p>This can lead to data corruption if the failed server is just isolated from the network point of view, and has still logical domains writing to disks.</p>
Logical domains	<ul style="list-style-type: none"> <li>Failed Oracle VM Server for SPARC</li> <li>Automatic recovery is not enabled for the logical domain</li> </ul>	<p>Follow the procedure in <a href="#">Recovering Logical Domains</a> to recover the logical domains. Only after this the logical domains appear in the Shutdown Guests list in the UI. You can restart them on the available server in the server pool.</p>

### 7.11.4 Network Tagging Mode Conditions

There are certain conditions in which the network tagging mode must be selected while creating a server pool. Review the following conditions and scenarios before deciding on the network tagging mode when you create an Oracle VM Server for SPARC server pool:

- You can select networks without VLAN ID. The UI does not provide the option to select Tagged or Untagged mode.

- You can select to associate and configure the networks with VLAN ID in Tagged mode.
- You can select to associate and configure the networks with VLAN ID in Untagged mode.
- You can select to configure the networks in mixed tagging mode in the server pool. For example, you can attach the network N1 with VLAN ID = 100 in tagged mode with the server S1 and in untagged mode for server S2. Refer to [Mixed Network Tagging Mode Configurations in Server Pool](#) for more detailed information.
- You can attach networks whose VLAN ID is similar to another network already connected to the servers. For example, a server S1 is already connected to network N1 with VLAN ID = 100, then while creating the server pool with S1 as the member of the pool, you can also attach a network N2 with VLAN ID =100.
- You can edit the VLAN ID of a network when you are attaching the network in Tagged mode for the first time.
- When you can edit the VLAN ID of the network, you cannot enter -1 as the value for the VLAN ID.
- If the selected network with a VLAN ID is already connected to the selected assets in Tagged mode, then you cannot edit the VLAN ID and make another connection.
- You cannot make multiple network connections to a member of the server pool over the same network in both tagged and untagged modes. The mode can be either in tagged or untagged mode only. For example, if you attach network N1 with VLAN ID =100 for the first time to server S1 in Tagged mode, then you cannot make another connection to the same network N1 in Untagged mode. Every other connection with network N1 must always be in Tagged mode for server S1.
- If the selected members of the pool are already connected to network N1 with VLAN ID =100, then you cannot select the same network with different VLAN ID to be connected for the server pool.

### 7.11.5 Mixed Network Tagging Mode Configurations in Server Pool

In an Oracle VM Server for SPARC server pool, you must group the servers that are homogenous in the network VLAN tagging mode to avoid any network outage. When you create a server pool, you can select the network tagging mode for the networks configured with VLAN ID to be attached to the Oracle VM Servers. You must group the servers in a way that all the Oracle VM Servers in the pool are either untagged or tagged mode for each network connection.

If the server pool is mixed with servers attached to networks in untagged and tagged mode, then there is a possibility that you will lose the network configuration of the logical domain OS.

When a logical domain is using an untagged VLAN, you cannot migrate the guest to a server that uses a tagged VLAN.

For example, in the following scenario, there is a server pool with two Oracle VM Servers CD1 and CD2. CD1 has a logical domain LD1. A network 192.0.2.0/24 with VID=100 is attached to CD1 in tagged mode. When you attach the network on the CD1, a VNIC is created with VID=100 and configured with an IP address to reach the network 192.0.2.0/24. The same network is attached to CD2 in untagged mode. LD1 is also connected to the network 192.0.2.0/24. When you migrate the LD1 from CD1 to CD2 or when you start the shutdown-detached LD1 on CD2, the LD1 will successfully

start on the CD2. However, the OS of the LD1 is not able to reach the network 192.0.2.0.24 with VID=100 because, the VNIC is created with VID=100. To re-establish the network connection, you must change the configuration of the VNIC in the OS of the Oracle VM Server CD2.

To avoid such issues, create server pools with homogenous network tagging mode. Or to maintain mixed network configurations, check with your administrator for maintaining the network connection of the logical domain operating system.

### 7.11.6 Creating an Oracle VM Server for SPARC Server Pool

Oracle Enterprise Manager Ops Center launches a wizard that collects information about the servers, storage and network resources, and placement policies to create a server pool.

With the support of I/O domains in Oracle VM Server for SPARC, you can assign network interfaces from I/O domains or root domains to connect to the network. The Create Server Pool wizard provides the option to select the network interfaces from other domains.

The wizard provides the option to select the SR-IOV enabled network interfaces to connect to the network.

1. Select Server Pools in the Systems Group list on the Navigation pane.
2. Click **Create Server Pool** in the Actions pane.

The Create Server Pool Wizard is displayed.

3. In the Identify Server Pool step, enter the following information:

- Name and description of the server pool.
- Enter tags for categorizing your server pool.
- Select Oracle VM Server for SPARC from the Virtualization Technology.

Click **Next** to select the members of the server pool.

4. Select one or more Oracle VM Servers to add to the server pool.

The list of Oracle VM Servers displayed have the following characteristics:

- Not associated with a server pool
- In a healthy state
- Not placed in maintenance mode

The list displays the details of CPU frequency, type, and architecture of Oracle VM Servers. You can add Oracle VM Servers of different CPU type. If you want to live migrate the logical domains, then select Oracle VM Servers that are compatible for migration.

Click **Next** for configuring the I/O domains and root domains I/O resources for exclusive access.

5. When Oracle VM Servers have I/O domains or root domains, you can select to use the I/O resources exclusively for logical domains only. The exclusive access does not allow to create zones on them.

Click **Next** to select the network domain.

6. Select the network domain to associate with the server pool.
  - When you have selected default network domain, then go to Step 9.
  - For a user-defined network domain, select the physical interfaces of each server to connect to each fabric in the network domain. When you do not want to bond the interfaces, go to Step 9.
7. You can bond the interfaces of the servers into a single logical link. The aggregation is done according to the standard IEEE 802.3ad Link Aggregation. Select Bond Interface in the Physical Interface column. A Bond ID is provided. Select the physical interfaces for the aggregation.

Click **Next** to configure the bonding parameters.

8. In the Configure Bonding step, specify the following parameters for Link Aggregation:
  - Load balancing policy.
  - LACP mode. If the Ethernet switch to which the physical interface connects to supports aggregation, then specify the LACP mode.
  - LACP timer.
  - MAC address policy and provide the MAC address.

Click **Next** to select the networks and associate with the server pool.

9. For default network domain, all the networks that are declared and managed in Oracle Enterprise Manager Ops Center are listed. For an user-defined network domain, only the networks assigned to it are listed. Select the following details:
  - Select the networks that you want to associate with all the servers in the server pool.
  - Select the network tagging mode as Tagged or Untagged for networks configured with VLAN ID.
  - You can edit the VLAN ID if you are attaching the network for the first time in Tagged mode with the selected server.
  - Enter the number of connections for each network. You can make multiple connections to a network.
  - Select the network that you want to use for migration of logical domains.

Click **Next** to configure the interfaces of the servers.

10. For each network connection, provide the connection details:
  - **Service Domain:** Select the domain that provides the network interface. The domain can be primary, I/O domain or the root domain.
  - **SR-IOV:** Select this option if you want to assign SR-IOV enabled network interface for the network connection.
  - **Mode:** For networks configured with VLAN ID, you can modify the option to select the network to be attached in Tagged or Untagged mode.

- **NIC:** The network interfaces that are available in the selected domain are listed. If you have selected SR-IOV, the network interfaces that are SR-IOV enabled are listed.

You can assign the same NIC to different network connection when the networks have different VLAN IDs and every connection is in tagged mode.

- **Switch Name:** For SR-IOV enabled networks, there is no virtual switch creation. Instead, select the physical functions listed in the column.

For non SR-IOV enabled networks, a virtual switch is created. Enter a name for the virtual switch for a new network connection. You can also leave it blank for Oracle Enterprise Manager Ops Center to create a name using the default naming pattern.

When any of the selected members for the server pool is already connected to the selected network, then the existing connection details is displayed. The Connected option is selected and the virtual switch name is displayed. You can either keep the existing connection or modify the network connection to make an additional connection to the same network. To modify the network connection, you can change the service domain that provides the NIC or select another NIC from the list.

- **Address Allocation Method:** You can select the following options:
  - **Assign by DHCP:** Select this option to automatically allocate the IP address by the system.
  - **Use Static IP:** Select this option and provide the IP address for the network connection.
  - **Do not Plumb Interface:** Select this option when you do not want to plumb an interface. This option allows you to avoid creating a virtual NIC in the control domain for networks used by logical domains. This option is available for non SR-IOV Ethernet connections beginning with Oracle Enterprise Manager Ops Center 12.2.2.
  - **Do not Allocate:** Select this option when you do not want to allocate any IP address for the network connection. You can allocate the IP address later in the logical domain OS. When you select the network interfaces from domains other than primary, then the Address Allocation Method is set to this option automatically and you cannot change it.

Click **Next** to associate the storage libraries.

11. The storage libraries that are reachable from the selected members of the pool are displayed. The storage libraries are required to store logical domain metadata, ISO images, and for virtual disks of logical domain.

You can select the following types of storage libraries:

- **Filesystem Storage Libraries:** This includes the NAS storage libraries. Associate at least one NAS storage library with the server pool to store the logical domain metadata.
- **Block Storage Libraries:** This includes the Static Block Storage and Dynamic Block Storage. Static block storage libraries consists of the exported LUNs of storage arrays that are not managed by Oracle Enterprise Manager Ops Center. Dynamic block storage libraries consists of the exported LUNs of storage array

servers that are discovered and managed in Oracle Enterprise Manager Ops Center.

Select the storage libraries from the list that you want to associate with all the virtualization hosts in the server pool.

Click **Next**. If there are I/O domains and root domains in the selected Oracle VM Server for SPARC, then you are directed to define the association details for the libraries in the next step. Otherwise, you are directed to select the server pool policies in Step 13.

12. For each selected member of the server pool, you must select at least one domain to be associated with the storage library. The domains that are already associated with the library are displayed with the **Associate** option selected. You can deselect to remove the association and select another domain in the server.

The action to associate the Control Domain or the I/O domains is repeated for all the selected storage libraries in the previous step.

Click **Next** to select the server pool policies.

13. Select the following policies in the server pool to manage the under utilized and overutilized servers in the pool:

- **Placement Policy:** This policy decides the preferred virtualization host in the server pool to place the logical domains.
- **Auto Balancing Policy:** This policy performs load balancing of the server pool automatically at set intervals.

14. Select one of the following placement policies:

- **Lowest relative load:** The recent lowest memory and CPU utilization for the Oracle VM Servers in the server pool are calculated. The server with the lowest relative load is considered to place a logical domain. Provide the threshold for CPU utilization above which the server is considered to be over-utilized and logical domains are migrated to server with lowest relative load.
- **Lowest allocated CPU and memory resources:** The total number of virtual CPU and memory resources allocated for all the logical domains in an Oracle VM Server are calculated. The server with the lowest allocated resources is considered to place a logical domain in the pool. Provide the threshold values for CPU and memory allocation. When the allocation is exceeded, the server is considered to be over-allocated and logical domains are migrated to server with lowest allocated CPU and memory resources.
- **Minimize power consumption:** The logical domains running in a server pool are placed on the minimum number of Oracle VM Servers and the unused Oracle VM Servers are powered off. The threshold value set for the server over-utilization ensures that the servers are not overloaded.

15. Select the automatic load balancing policies:

- Select automatic load balancing and set the interval in which the server pool must be checked for resource balancing. You can set the approval to migrate the logical domains automatically. Or send notifications about the approval.
- You can also select to manually balance the resources. See [Balancing Resources](#) for more information.

16. For Automatic Recovery, you can specify whether an attempt to power-off the failed server must be performed before initiating the automatic recovery of the logical domains.

When Oracle Enterprise Manager Ops Center has the capability to power-off the Service Processor of a failed server and you have selected the automatic recovery option, the failed server is powered off and then the logical domain recovery is started. If Oracle Enterprise Manager Ops Center cannot power-off the failed server, the recovery of the attached logical domains does not take place. This is to avoid any data corruption during the recovery process.

Enter the time interval to check the state of the server pool members reachability. The time value is entered in seconds. The minimum interval for checking the status must be 20 seconds and the default value is 180 seconds.

Click **Next** to view the summary of the server pool details.

17. Review the information to create a server pool for Oracle VM Server for SPARC. Click **Finish** to create the server pool.

## 7.12 Oracle Solaris Zones Server Pool

The following information is covered in this section:

- [IP Stack in Server Pool](#)
- [Network Tagging Mode Conditions](#)
- [Mixed Network Tagging Mode Configuration](#)
- [Server Pool Policies](#)
- [Changing the Post-Recovery Zone Deletion Property](#)
- [Creating a Zones Server Pool](#)

You can now pool Oracle Solaris Zones resources and manage your zones. Oracle Solaris Zones must meet the following requirements to be added to a server pool:

- All the assets in the pool must have compatible architecture for supporting guest migration. For a global zone to be added to the server pool, it must have the same release or must be at least Oracle Solaris 10 10/08 version. This ensures that the zones can be migrated to a global zone in the server pool.
- The global zones must be in healthy state.
- The global zones must not be associated with a server pool.
- The global zones must not be placed in maintenance mode.

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**Note:**

Oracle Solaris 11 shared IP zones should not be part of a server pool. You cannot perform migration, connect networks or add storage resources to shared IP zones.

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## 7.12.1 IP Stack in Server Pool

The network deployment for zones server pool vary depending on the Oracle Solaris OS version.

For a stand-alone Oracle Solaris 10 OS, you can attach the network in either shared IP or exclusive IP mode. Whereas, in a server pool, you can attach a network only in shared IP mode for Oracle Solaris 10 OS. You cannot make multiple connections to a network.

For Oracle Solaris 11 OS, the network is always attached in exclusive IP mode. In a server pool, the network for Oracle Solaris 11 OS is always deployed in exclusive IP mode. You can make multiple connections to a network.

When you want to have a server pool with mixture of Oracle Solaris 10 and 11 OS, then you cannot make multiple connections to a network. So, plan your server pools with compatible Oracle Solaris OS versions.

## 7.12.2 Network Tagging Mode Conditions

There are certain conditions in which the networking configuration that must be selected while creating a server pool. Refer to the following scenarios for deciding on the networking configuration when you create an Oracle Solaris Zones server pool:

- You can select networks without VLAN ID. The UI does not provide the option to select Tagged or Untagged mode.
- You can select to associate and configure the networks with VLAN ID in Tagged mode.
- You can select to associate and configure the networks with VLAN ID in Untagged mode.
- You can select to configure the networks in mixed tagging mode in the server pool. For example, you can attach the network N1 with VLAN ID = 100 in tagged mode with the server S1 and in untagged mode for server S2. Refer to [Mixed Network Tagging Mode Configuration](#) for more detailed information.
- You can attach networks whose VLAN ID is similar to another network already connected to the servers. For example, a server S1 is already connected to network N1 with VLAN ID = 100, then while creating the server pool with S1 as the member of the pool, you can attach a network N2 with VLAN ID =100.
- You can edit the VLAN ID of a network when you are attaching the network in Tagged mode for the first time.
- When you can edit the VLAN ID of the network, you cannot enter -1 as the value for the VLAN ID.
- If the selected network with a VLAN ID is already connected to the selected assets in Tagged mode, then you cannot edit the VLAN ID and make another connection.
- You cannot make multiple network connections to a member of the server pool over the same network in both tagged and untagged modes. The mode can be either in tagged or untagged mode only. For example, if you attach network N1 with VLAN ID =100 for the first time to server S1 in Tagged mode, then you cannot make another connection to the same network N1 in Untagged mode. Every other connection with network N1 must always be in Tagged mode for server S1.

- If the selected members of the pool are already connected to network N1 with VLAN ID =100, then you cannot select the same network with different VLAN ID to be connected for the server pool.

### 7.12.3 Mixed Network Tagging Mode Configuration

When you attach network to zones server pool, you can specify the network tagging mode for the networks configured with VLAN ID. You must ensure that the server pools have global zones either in tagged or untagged mode. If the server pool has mixed network tagging modes for the global zones, there might be any network outage issues for the zones depending on the action performed upon them.

If you want to maintain mixed network tagging configuration in your server pool, check with your administrator for re-establishing the network connection of the zones when the network outage occurs.

### 7.12.4 Server Pool Policies

The server pool policies that are applicable for Oracle Solaris Zones are as follows:

- **Placement Policy**

Place the zones on the global zone that has the lowest relative load. Set the CPU utilization threshold.

Place the zones on the global zone allocated with lowest CPU and memory resources. Set the CPU and memory allocation threshold.

Place zones on minimum number of global zones to minimize the power consumption. Set the CPU utilization threshold.

- **Automatic Balancing**

You can select the automatic load balancing so that the zones can be migrated automatically in the server pool whenever the thresholds are exceeded. You can schedule the automatic load balancing to take place at definite time interval.

When you have selected power minimization and automatic load balancing policy, and the servers in the server pool are not overloaded, some servers are freed from the zones and powered off to minimize power consumption.

You can set whether the approval is required from the administrator for migrating the zones.

- **Automatic Recovery**

You can set the automatic recovery for the zones in the following scenarios:

- During zone creation, you can enable automatic recovery of the zones. You can set the value for priority of recovery. Zone with a highest priority is migrated first.
- For existing zones, use the option **Enable Automatic Recovery** and **Disable Automatic Recovery** to set the automatic recovery. You can edit the zone configuration to modify the value for priority of recovery.

In an Oracle Solaris Zones server pool, you can specify that the automatic recovery of a failed server must start first with an attempt to power off the failed server, ensure that it is stopped and then initiate the automatic recovery of the zones.

## 7.12.5 Changing the Post-Recovery Zone Deletion Property

When a non-global zone is recovered from a failed global zone onto another global zone in the server pool, ownership of the non-global zone is transferred to the new global zone. If the failed global zone is restarted, its VC agent checks the ownership of its non-global zones, and deletes any non-global zone for which it no longer has ownership. You can change this default behavior to preserve the non-global zone on the original global zone.

1. Log on to the global zone system.
2. Open the `/opt/sun/n1gc/lib/XVM_SERVER.properties` file and set the `zone.delete.after.recovery` property to `false`.
3. Restart the VC agent using the `agentadm stop` and `agentadm start` commands.

Non-global zones on the global zone are not deleted, even if the global zone does not have ownership of them.

## 7.12.6 Creating a Zones Server Pool

Oracle Enterprise Manager Ops Center takes you through a series of steps to collect information for creating a zones server pool.

1. Select **Server Pools** in the Systems Group list on the Navigation pane.
2. Click **Create Server Pool** in the Actions pane.

The Create Server Pool Wizard is displayed.

3. In the Identify Server Pool step, enter the following information:
  - Enter a descriptive name for the server pool.
  - (Optional) Enter a description for the server pool.
  - (Optional) Enter tags for categorizing your server pool.
  - Select **Oracle Solaris Zones – SPARC** or **Oracle Solaris Zones –x86** from the Virtualization Technology menu.

You cannot have a zones server pool with a mixture of SPARC and x86 architectures.

Click **Next** to select the members of the server pool.

4. Select one or more global zones to add to the server pool.

The list of global zones displayed have the following characteristics:

- The same architecture – SPARC or x86
- Oracle Solaris 10 10/08 OS or higher version
- Not associated with a server pool
- In a healthy state
- Not placed in maintenance mode

- Not running in an I/O domain or root domain that is configured to provide its resources exclusively to other logical domains

The list includes the CPU architecture and OS version of the global zone. Select global zones that are compatible for migration of zones within the pool.

Click **Next** to associate the network domain.

5. Select the network domain to associate with the server pool from the available network domains in the list, then click **Next**.
  - Default network domain: If you select the default network domain, go to Step 8.
  - User defined network domain: If you select a user-defined network domain, select the physical interfaces of each selected servers to connect to each fabric in the network domain. When you do not want to bond the interfaces, go to Step 8.
6. You can bond the interfaces of the servers into a single logical link. The aggregation is done according to the standard IEEE 802.3ad Link Aggregation. Select Bond Interface in the Physical Interface column. A Bond ID is provided. Select the physical interfaces for the aggregation.

Click **Next** to configure the bonding parameters.

7. In the Configure Bonding step, specify the following parameters for Link Aggregation:
  - Load balancing policy.
  - LACP mode. If the Ethernet switch to which the physical interface connects to supports aggregation, then specify the LACP mode.
  - LACP timer.
  - MAC address policy and provide the MAC address.

Click **Next** to select the networks and associate with the server pool.

8. For a default network domain, all of the networks that are declared and managed in Oracle Enterprise Manager Ops Center are listed. For a user-defined network domain, only the networks assigned to it are listed.

Select the networks that you want to associate with all the global zones in the server pool. Depending on the Oracle Solaris OS versions selected for the server pool, you can make multiple connections to a network. See [IP Stack in Server Pool](#) for more information about IP stack mode for networks in the zones server pool.

For networks configured with VLAN ID, you can specify whether the network must be attached in Tagged or Untagged mode. If you are attaching the network in Tagged mode for the first time, then you can edit the VLAN ID of the network, provided the VLAN ID is not used by any of the networks attached to the asset.

Enter the total number of connections and click **Next** to configure the interfaces of the servers.

9. For each network connection, provide the connection details:
  - Specify the NIC and IP address for each network connection. When a selected server is connected to the network, no rows are displayed for that server.

If required, you can modify the network tagging mode specified in the previous step.

You can assign the same NIC to different network connection when the networks have different VLAN IDs and every connection is in tagged mode.

- When supported by the network, you can select System Allocated for the NIC and IP address to be automatically allocated by the system.
- You can select **Do Not Allocate IP** to skip the option of providing the IP address for the network connection.

Click **Next** to associate the storage libraries.

10. The storage libraries that are reachable from the selected members of the pool are displayed. The storage libraries are required to store zone metadata, ISO images, and for virtual disks of zones.

You can select the following type of storage libraries:

- **Filesystem Storage Libraries:** This includes the NAS storage libraries. Associate at least one NAS storage library with the server pool to store the zone metadata.
- **Block Storage Libraries:** This includes the Static Block Storage and Dynamic Block Storage. Static block storage libraries consists of the exported LUNs of storage arrays that are not managed by Oracle Enterprise Manager Ops Center. Dynamic block storage libraries consists of the exported LUNs of storage array servers that are discovered and managed in Oracle Enterprise Manager Ops Center.

Select the storage libraries from the list that you want to associate with all the virtualization hosts in the server pool.

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**Note:**

When you have unmanaged storage attached to the non-global zones, then upload the script to be placed in all the global zones in the server pool. See [Script to Migrate a Zone With Dependencies](#) for more information about migrating zone with unmanaged storage.

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Click **Next** to select the server pool policies.

11. You must select the following policies in the server pool to manage the under utilized and overutilized servers in the pool:

- **Placement Policy:** This policy decides the preferred virtualization host in the server pool to place the zones.
- **Auto Balancing Policy:** This policy performs load balancing of the server pool automatically at set intervals.

12. Select one of the following placement policies:

- **Lowest relative load:** The recent lowest memory and CPU utilization for the global zones in the server pool are calculated. The server with the lowest relative load is considered to place the zone. Provide the threshold for CPU utilization above which the server is considered to be over-utilized and zones are migrated to server with lowest relative load.

- **Lowest allocated CPU and memory resources:** The total number of virtual CPU and memory resources allocated for all the zones in an Oracle VM Server are calculated. The server with the lowest allocated resources is considered to place a zone in the pool. Provide the threshold values for CPU and memory allocation. When the allocation is exceeded, the server is considered to be over-allocated and zones are migrated to server with lowest allocated CPU and memory resources.
- **Minimize power consumption:** The zones running in the server pool are placed on the minimum number of global zone and the unused servers are powered off. The threshold value set for the server over-utilization ensures that the servers are not overloaded. Otherwise, the powered off servers can be powered on to host the zones.

**13.** Select the automatic load balancing policies:

- Select automatic load balancing and set the interval in which the server pool must be checked for resource balancing. You can set the approval to migrate the zones automatically. Or send notifications for the approval.
- You can also select to manually balance the resources. See [Balancing Resources](#) for more information.

**14.** For Automatic Recovery, you can specify whether an attempt to power-off the failed server must be performed before initiating the automatic recovery of the zones.

When Oracle Enterprise Manager Ops Center has the capability to power-off the Service Processor of a failed server and you have selected the automatic recovery option, the failed server is powered off and then the zone recovery is started.

Enter the time interval to check the state of the server pool members reachability. The time value is entered in seconds. The minimum interval for checking the status must be 20 seconds and the default value is 180 seconds.

Click **Next** to view the summary of the server pool details.

**15.** Review the information to create a server pool for Oracle Solaris Zones. Click **Finish** to create the server pool.

## 7.13 Oracle VM Server for x86 Server Pool

You can group one or more Oracle VM Servers in an Oracle VM Manager and create server pools. When you create a server pool for Oracle VM Server for x86 systems, you must have the following information defined:

- Cluster file system
- Server pool master
- Virtual IP address for the server pool master

### 7.13.1 Cluster File System

Shared access to the server pool resources is a must for providing for high availability for the virtual machines running in the Oracle VM Servers of the server pool. This is achieved by cluster file system OCFS2 which allows multiple Oracle VM Servers to access the same disk at the same time. OCFS2 ensures that the Oracle VM Servers in a

server pool can access and modify resources in the shared repositories in a controlled manner.

When you create a server pool, you must specify the server pool file system for the cluster heartbeat and other cluster information. The file system can be NFS shares or LUNs of iSCSI or SAN based storage servers. Oracle VM formats the server pool file system as OCFS2 file system.

In Oracle Enterprise Manager Ops Center, the cluster is always enabled by default. The cluster configuration is pushed out to all the Oracle VM Servers in the server pool and the cluster heartbeat starts when the server pool is created. You can set a separate network for this cluster heartbeat. See [Manage Networks](#) for more information about setting up the networks and their role for an Oracle VM Server.

### 7.13.2 Server Pool Master

An Oracle VM Server is internally elected as server pool master.

You cannot set the role for an Oracle VM Server. When the elected Oracle VM Server fails, the role is set for another Oracle VM Server in the server pool. The virtual IP address provided while creating the server pool is assigned to the Oracle VM Server that has been elected as server pool master.

### 7.13.3 Server Pool Policies

The server pool policies that are applicable for Oracle VM Server for x86 are as follows:

- **Placement Policy**

Places the virtual machines on the Oracle VM Server that has the lowest relative load. Set the CPU utilization threshold.

Places the virtual machines on minimum number of Oracle VM servers to minimize the power consumption. Set the CPU utilization threshold.

- **Automatic Balancing**

You can select the automatic load balancing so that the virtual machines can be migrated automatically in the server pool whenever the thresholds are exceeded.

When you enable automatic load balancing for Oracle VM Server for x86 server pool, the server pool is checked continuously for the selected placement policy. When the threshold exceeds, the virtual machines are migrated from one Oracle VM Server to another.

When you have selected power minimization and automatic load balancing policy, and the servers in the server pool are not overloaded, some Oracle VM Server host servers are freed from the logical domains and powered off to minimize power consumption.

When the servers are overloaded and there are no other servers in the pool to host the virtual machines, then the policy starts a powered-off server using its Wake-on-LAN capability and live migrate the virtual machines to take up the load. The Wake-on-LAN capability must be enabled on the BIOS of the Oracle VM Server.

- **Automatic Recovery**

When an Oracle VM Server fails, the virtual machines are migrated to another Oracle VM Server in the server pool. The automatic recovery for a virtual machine is set in the following scenarios:

- During virtual machine creation, select the option Enable High Availability. This ensures that the virtual machines are migrated when an Oracle VM Server fails.
- For an existing virtual machine, use the option Enable or Disable Automatic Recovery to set the automatic recovery.

### 7.13.4 Creating an Oracle VM Server for x86 Server Pool

The following procedure describes the steps in the wizard that is launched to create an Oracle VM Server for x86 server pool.

1. Select Server Pool in the Systems Group list on the Navigation pane.

2. Click **Create Server Pool** in the Actions pane.

The Create Server Pool Wizard is displayed.

3. In the Identify Server Pool step, enter the following information:

- Name and description of the server pool.
- Enter tags for categorizing your server pool.
- Select Oracle VM Server for x86 from the Virtualization Technology.

Click **Next** to define the server pool configuration.

4. Define the following configuration details:

- Select the Oracle VM Manager in which the Oracle VM Servers are discovered and owned.
- Select the network domain.
- Select a network from the list of networks available in the network domain.
- Enter the virtual IP address that is assigned to the server pool master. When the server pool master changes, the IP address is assigned to the new Oracle VM Server.
- Select the server pool file system to store cluster heartbeat and other cluster information. The file system can be either NFS shares on a NFS file servers or LUNs of SAN and iSCSI based storages. The NFS file servers and the storage servers are known and reachable to the selected Oracle VM Manager.

Click **Next** to select the members of the pool.

5. Select one or more Oracle VM Servers to add to the server pool.

The list of Oracle VM Servers displayed have the following characteristics:

- Owned by the Oracle VM Manager. Refer to [Manage Ownership of Oracle VM Servers](#) to own an Oracle VM Server.
- Not associated with a server pool
- In a healthy state
- Not placed in maintenance mode

- Have no virtual machines in the running, shutdown or suspended state

Select Oracle VM Servers that are compatible for migration of virtual machines. To migrate virtual machines within a server pool, the Oracle VM Servers systems must be identical in model.

Click **Next** to associate the network domain.

6. Select the network domain to associate with the server pool.

- When you have selected default network domain, go to Step 7.
- For a user-defined network domain, select the physical interfaces of each selected servers to connect to each fabric in the network domain. You cannot bond the interfaces in Oracle VM Server for x86. Bonding can be done in only individual OS of the Oracle VM Server.

Click **Next** to select the networks and associate with the server pool.

7. For default network domain, all the networks that are declared and managed in Oracle Enterprise Manager Ops Center are listed. For a user-defined network domain, only the networks assigned to it are listed.

Select the networks that you want to associate with all the servers in the server pool. You cannot make multiple connections to a network. Limit the number of connections to 1.

Click **Next** to configure the interfaces of the servers.

8. For each network connection, specify the following details:

- Specify the NIC and IP address for each network connection. When a selected server is connected to the network, no rows are displayed for that server.
- You can assign the same NIC to different network connection when the networks have different VLAN IDs.
- You can select System Allocated for the NIC and IP address to be automatically allocated by the system.

Click **Next** to associate the storage libraries.

9. The storage libraries that are reachable from the selected members of the pool are displayed. The storage libraries are required to store virtual machine metadata, ISO images, and for virtual disks of virtual machine.

You can select the following type of storage libraries:

- **Filesystem Storage Libraries:** This includes the Oracle VM storage repositories. At least one Oracle VM storage repository must be associated with the server pool.
- **Block Storage Libraries:** This includes the Static Block Storage and Dynamic Block Storage. Static block storage libraries comprises the exported LUNs of storage arrays that are not managed by Oracle Enterprise Manager Ops Center. Dynamic block storage libraries comprises the exported LUNs of storage array servers that are discovered and managed in Oracle Enterprise Manager Ops Center.

Select the storage libraries from the list that you want to associate with all the virtualization hosts in the server pool.

Click **Next** to select the server pool policies.

10. You must select the following policies in the server pool to manage the underutilized and overutilized servers in the pool:

- **Placement Policy:** This policy decides the preferred virtualization host in the server pool to place the logical domains.
- **Auto Balancing Policy:** This policy performs load balancing of the server pool automatically at set intervals.

11. Select one of the following placement policies:

- **Lowest relative load:** The recent lowest memory and CPU utilization for the Oracle VM Servers in the server pool are calculated. The server with the lowest relative load is considered to place a virtual machine. Provide the threshold for CPU utilization above which the server is considered to be over-utilized and virtual machines are migrated to server with lowest relative load.
- **Minimize power consumption:** The virtual machines running in a server pool are placed on the minimum number of Oracle VM Servers and the unused Oracle VM Servers are powered off. The threshold value set for the server over-utilization ensures that the servers are not overloaded. Otherwise, the powered off Oracle VM Servers can be powered on to host the virtual machines.

12. Select the automatic load balancing policies:

- Select automatic load balancing and set the interval in which the server pool must be checked for resource balancing. You can set the approval to migrate the virtual machines automatically. Or send notifications about the approval.
- You can also select to manually balance the resources. See [Balancing Resources](#) for more information.

Click **Next** to view the summary of the server pool details.

13. Review the information to create a server pool for Oracle VM Server for x86. Click **Finish** to create the server pool.

## 7.14 Manage Server Pools

You must monitor the requirements of the server pool so that there are resources to host the guests and run them efficiently. You might need to add more storage and network resources to run the guests. Also, the server pools gives the infrastructure support for the virtual datacenters.

Oracle Enterprise Manager Ops Center provides the following management functions to manage the resources in the server pool:

- [Editing Server Pool Parameters](#)
- [Adding Virtualization Hosts](#)
- [Associating Network Domains](#)
- [Attaching Networks](#)
- [Associating Libraries](#)
- [Creating Guests](#)

- [Migrating Multiple Guests](#)
- [Migrating Zones](#)
- [Migrating Logical Domains](#)
- [Migrating Virtual Machines](#)
- [Balancing Resources](#)
- [Monitoring Server Pool Resources](#)
- [Monitoring Server Pool Incidents](#)
- [Deleting Server Pool](#)

### 7.14.1 Editing Server Pool Parameters

You can edit the following parameters and attributes of a server pool:

- Name
- Description
- Placement policy, including CPU Utilization
- Auto balancing policy
- Enable or disable automatic recovery option.
- Automatic Recovery Authorization.
- Automatic Recovery Number of Retries.

For Oracle Solaris Zones server pool, you can edit the following additional parameters:

- Check server reachability interval.
- Upload scripts to manage the file systems on unmanaged storage. See [Step 10 in Oracle Solaris Zones Server Pool](#) for more information.

For Oracle VM Server for SPARC server pool, you can edit the following additional parameters:

- Migration networks.
- Enable or disable automatic recovery to power off a failed server from Service Processor, given capabilities, before automatic recovery of attached logical domains.
- Check servers reachability.

Perform the following to modify the parameters of a server pool:

1. Expand **Assets** in the Navigation pane.
2. Select **Server Pools** in the Resource Management view.
3. Select the server pool in the Navigation pane, then click the **Summary** tab.

4. To edit the parameters, click **Edit Attributes** in the Actions pane. To add, remove or modify the tags added to the server pool, click **Edit Tags** in the Actions pane.
5. Click the **Save** icon.

## 7.14.2 Adding Virtualization Hosts

You can add more virtualization hosts to a server pool when you require more CPU and memory resources to take up the load in the server pool.

Depending on the virtualization type, you can add global zones, and Oracle VM Servers of x86 and SPARC architecture.

### 7.14.2.1 Oracle Solaris Zones

The list of global zones that are displayed to be added to the server pool has the following characteristics:

- Same release as the existing global zones in the pool or at least Oracle Solaris 10 10/08 OS or higher version
- Not associated with a server pool
- In a healthy state and not placed in maintenance mode

When the server pool has Oracle Solaris 11 OS and multiple network connections, then the list of available global zones is limited to only Oracle Solaris 11 OS. You cannot add Oracle Solaris 10 OS as you cannot make multiple network connections to it.

Load balancing in the server pool requires the zones to be migrated within the pool. Therefore, ensure compatibility for migration within the pool when you select the members.

Refer to [Network Tagging Mode Conditions](#) for more information about the network tagging conditions while adding an asset to the server pool.

### 7.14.2.2 To Add Global Zones to the Server Pool

1. Select the server pool and click **Add Global Zones** in the Actions pane.

The Add Global Zones to Server Pool Wizard is displayed.

2. Select one or more global zones to be added to the server pool.

When the server pool is associated with the default network domain, you must proceed to configure the interfaces. Otherwise, you must associate the network domain with the selected assets.

3. For a user-defined network domain, select the physical interfaces of each selected servers to connect to each fabric in the network domain. When you do not want to bond the interfaces for global zones, go to Step 4.
4. You can bond the interfaces of the servers into a single logical link. The aggregation is done according to the standard IEEE 802.3ad Link Aggregation. Select **Bond Interface** in the Physical Interface column. A Bond ID is provided. Select the physical interfaces for the aggregation.

Click **Next** to configure the bonding parameters.

5. In the Configure Bonding step, specify the following parameters for Link Aggregation:

- Load balancing policy.
- LACP mode. If the Ethernet switch to which the physical interface connects supports aggregation, then specify the LACP mode.
- LACP timer.
- MAC address policy and provide the MAC address.

Click **Next** to define the network connection.

6. For each network connection of the global zones, specify the following details:

- Specify the NIC and IP address for each network connection. When a selected server is connected to the network, no rows are displayed for that server.  
You can assign the same NIC to different network connection when the networks have different VLAN IDs and every connection is in tagged mode.
- For networks configured with VLAN ID, you can select the network to be attached in Tagged or Untagged mode. If you are attaching the network in Tagged mode for the first time, then you can edit the VLAN ID of the network, provided the VLAN ID is not used by any of the networks attached to the asset.
- You can select System Allocated for the NIC and IP address to be automatically allocated by the system.

Click **Next** to view the summary.

7. Review the information provided and click **Finish** to add the selected global zones to the server pool.

### 7.14.2.3 Oracle VM Server for SPARC

The list of Oracle VM Servers displayed to be added to the server pool have the following characteristics:

- Not associated with a server pool
- In a healthy state and not placed in maintenance mode

Refer to [Network Tagging Mode Conditions](#) for more information about the networking configurations when you add Oracle VM Server to the server pool.

### 7.14.2.4 To Add Oracle VM Servers to the Server Pool

You can add Oracle VM Servers to a server pool.

1. Select the server pool and click **Add Oracle VM Servers** in the Actions pane.

The Add Oracle VM Servers to Server Pool Wizard is displayed.

2. Select one or more Oracle VM Servers to be added to the server pool.

When the server pool is associated with the default network domain, you must proceed to configure the interfaces. Otherwise, you must associate the network domain with the selected assets.

3. For a user-defined network domain, select the physical interfaces of each selected servers to connect to each fabric in the network domain. When you do not want to bond the interfaces for Oracle VM Server for SPARC server pool, go to Step 4.

4. You can bond the interfaces of the servers into a single logical link. The aggregation is done according to the standard IEEE 802.3ad Link Aggregation. Select Bond Interface in the Physical Interface column. A Bond ID is provided. Select the physical interfaces for the aggregation.

Click **Next** to configure the bonding parameters.

5. In the Configure Bonding step, specify the following parameters for Link Aggregation:

- Load balancing policy.
- LACP mode. If the Ethernet switch to which the physical interface connects supports aggregation, then specify the LACP mode.
- LACP timer.
- MAC address policy and provide the MAC address.

Click **Next** to define the network connection.

6. For Oracle VM Server for SPARC, you can select the network interfaces from I/O domains and root domains to connect to the network. You can also select SR-IOV enabled network interfaces that are available from primary and root domains. Select the following information for the network connection:

- **Service Domain:** Select the domain that provides the network interface. The domain can be primary, I/O domain, or the root domain.
- **SR-IOV:** Select this option if you want to assign SR-IOV enabled network interfaces for the network connection. SR-IOV enabled network interfaces are available only from primary and root domain.
- **Mode:** For networks configured with VLAN ID, you can select the network to be attached in Tagged or Untagged mode. If you are attaching the network in Tagged mode for the first time, then you can edit the VLAN ID of the network, provided the VLAN ID is not used by any of the networks attached to the asset.

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**Note:**

It is recommended to attach the network in the same tagging mode as the other Oracle VM Servers of the server pool to avoid any network outage.

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- **NIC:** The network interfaces that are available in the selected domain are listed. If you have selected SR-IOV, the network interfaces that are SR-IOV enabled are listed.

You can assign the same NIC to different network connection when the networks have different VLAN IDs and every connection is in tagged mode.

- **Switch Name:** For SR-IOV enabled networks, there is no virtual switch creation. Instead, select the physical functions listed in the column.

For non SR-IOV enabled networks, a virtual switch is created. Enter a name for the virtual switch for a new network connection. You can also leave it blank for Oracle Enterprise Manager Ops Center to create a name using the default naming pattern.

When any of the selected members for the server pool is already connected to the selected network, then the existing connection details is displayed. The Connected option is selected and the virtual switch name is displayed. You can either keep the existing connection or modify the network connection to make an additional connection to the same network.

- **Address Allocation:** Select **Do not Allocate** to skip the option of providing the IP address. Select **Use Static IP** to provide the IP address, or select **System Allocated** to have the system automatically allocate an IP address.

**Do Not Plumb Interface:** Select this option when you want to avoid creating a virtual NIC in the control domain for networks used by logical domains. This option is available for non SR-IOV Ethernet connections.

Click **Next** to view the summary.

7. Review the information provided and click **Finish** to add the selected assets to the server pool.

#### 7.14.2.5 Oracle VM Server for x86

The list of Oracle VM Servers displayed to be added to the server pool have the following characteristics:

- Owned by the Oracle VM Manager
- Not associated with a server pool
- In a healthy state and not placed in maintenance mode
- Have no virtual machines in the running, shutdown or suspended states

#### 7.14.2.6 To Add Virtualization Hosts to the Server Pool

1. Select the server pool and click **Add Oracle VM Servers** in the Actions pane.

The Add Oracle VM Servers to Server Pool Wizard is displayed.

2. Select one or more virtualization hosts to be added to the server pool.

When the server pool is associated with the default network domain, you must proceed to configure the interfaces. Otherwise, you must associate the network domain with the selected assets.

3. For a user-defined network domain, select the physical interfaces of each selected servers to connect to each fabric in the network domain. For Oracle VM Server for x86, you cannot bond the interfaces and click **Next**.

4. For each network connection of Oracle VM Server for x86 server pool, specify the following details:

- Specify the NIC and IP address for each network connection. When a selected server is connected to the network, no rows are displayed for that server.

You can assign the same NIC to different network connection when the networks have different VLAN IDs.

- You can select System Allocated for the NIC and IP address to be automatically allocated by the system.

Click **Next** to view the summary.

5. Review the information provided and click **Finish** to add the selected assets to the server pool.

### 7.14.2.7 Removing Virtualization Hosts from Server Pool

You can remove the virtualization hosts from the server pool. For zones and Oracle VM Server for SPARC, you can remove them from the server pool even when there are zones and logical domains running on them. All the network and storage resources are not unconfigured. Instead, the resources are retained as it is in the virtualization hosts.

To remove Oracle VM Server for x86 from a server pool, you must stop or migrate the virtual machines that are running in it.

## 7.14.3 Associating Network Domains

All networks in a network domain that is associated with a server pool are available to the members of the server pool. To associate a user-defined network domain with a server pool, there must be a connection between the virtualization servers and the fabrics in the network domain. The fabric connection is not required for the default network domain.

The default network domain includes all the networks in Oracle Enterprise Manager Ops Center. When you associate a server pool with the default network domain, all the networks in Oracle Enterprise Manager Ops Center are available for attaching with the server pool.

For a user-defined network domain, you must define the physical interfaces of each virtualization server in the server pool to connect to each fabric in the network domain. You can also bond the interfaces of the virtualization servers.

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**Note:**

You cannot bond the interfaces of Oracle VM Server for x86 servers.

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1. Select the server pool.
2. Click **Associate Network Domain** in the Actions pane.  
The Associate Network Domain Wizard is displayed.
3. Select the network domain from the list.
4. For a user-defined network domain, select the physical interfaces of each selected servers to connect to each fabric in the network domain. When you do not want to bond the interfaces, go to Step 7. For Oracle VM Server for x86, you cannot bond the interfaces and go to Step 7.

For default network domain, you are taken to the Summary step.

5. You can bond the interfaces of the servers into a single logical link. The aggregation is done according to the standard IEEE 802.3ad Link Aggregation. Select Bond Interface in the Physical Interface column. A Bond ID is provided. Select the physical interfaces for the aggregation.

Click **Next** to configure the bonding.

6. In the Configure Bonding step, specify the following parameters for Link Aggregation:
  - Load balancing policy.
  - LACP mode. If the Ethernet switch to which the physical interface connects to supports aggregation, then specify the LACP mode.
  - LACP timer.
  - MAC address policy and provide the MAC address.

Click **Next** to view the summary.

7. Review the information and click **Finish** to associate the network domain with the server pool.

When you associate with a user-defined network domain, only the assigned networks in the network domain are available for attaching with the server pool. Therefore, ensure that you assign the required networks to the domain to attach to the server pool.

### 7.14.4 Attaching Networks

After the network domain is associated with a server pool, you can attach the networks in the network domain. Depending on the type of virtualization, the multiple connection to a network is allowed.

For Oracle VM Server for SPARC, you can make multiple connections to a network. Refer to the [Oracle VM Server for SPARC](#) for more information.

For Oracle Solaris Zones, you can make multiple connections to a network when the server pool contains only Oracle Solaris 11 OS. For Oracle Solaris 10 OS, you can make only one connection. Also, when the server pool has mixture of Oracle Solaris 10 and 11 OS, then also you can make only single connection.

Refer to [Network Tagging Mode Conditions](#) for more information about selecting the correct tagging modes when you attach the network to Oracle Solaris Zones and Oracle VM Server for SPARC.

1. Select the server pool.
2. Click **Attach Networks** in the Action pane.

The Attach Network Wizard is displayed. All the networks assigned to the network domains are listed. For default network domain, all the networks are listed. The table also displays existing number of connections to the server pool.

3. Select one or more networks to attach to the server pool.

Click **Next** to specify the number of connections.

4. Enter the total number of connections required as per the virtualization type:
  - For Oracle VM Server for SPARC, you can enter multiple connections. For each network connection, a virtual switch is created. Virtual switch creation is not applicable for SR-IOV enabled networks. For each network connection, you can assign the network interfaces from the I/O domains and root domains. Specify the tagging mode as Untagged or Tagged for the networks configured with VLAN ID.

- For Oracle VM Server for x86, you can enter only one connection per network. You cannot make multiple connections.
- For Oracle Solaris Zones, the Oracle Solaris OS version plays an important role. For Oracle Solaris 10 OS, the network is always deployed in shared IP mode. You cannot make multiple connections. For Oracle Solaris 11 OS, the network is always deployed in exclusive IP mode. You can make multiple connections to the network. For each network connection, a VNIC is created when you boot the zone. For a server pool of mixture of Oracle Solaris 10 and 11 OS, the network connection is limited to single connection.

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**Note:**

The number of connections do not limit the number of guests to be connected to be network.

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Click **Next** to configure the interfaces.

5. When one of the virtualization hosts are connected to the network, the corresponding row for network configuration for that host is not displayed. If not, specify the information for each connection:

- Specify the NIC and IP address for each connection.  
You can assign the same NIC to different network connection when the VLAN IDs are different for the networks and every connection is in tagged mode.
- Select **Do Not Allocate IP** to connect to the network without specifying the IP address. This option is available for zones and Oracle VM Server for SPARC systems.
- Select **System Allocated** for the system to take care of the NIC and IP address allocation.

For Oracle VM Server for SPARC and zones, you can select the network interfaces from I/O domains and root domains to connect to the network. You can also select SR-IOV enabled network interfaces that are available from primary and root domains. Select the following information for the network connection:

- **Service Domain:** Select the domain that provides the network interface. The domain can be primary, I/O domain or the root domain.
- **SR-IOV:** Select this option if you want to assign SR-IOV enabled network interfaces for the network connection. SR-IOV enabled network interfaces are available only from primary and root domain.
- **Mode:** For networks configured with VLAN ID, you can modify the option to select the network to be attached in Tagged or Untagged mode.
- **NIC:** The network interfaces that are available in the selected domain are listed. If you have selected SR-IOV, the network interfaces that are SR-IOV enabled are listed.

You can assign the same NIC to different network connection when the networks have different VLAN IDs and every connection is in tagged mode.

- **Switch Name:** For SR-IOV enabled networks, there is no virtual switch creation. Instead, select the physical functions listed in the column.

For non SR-IOV enabled networks, a virtual switch is created. Enter a name for the virtual switch for a new network connection. You can also leave it blank for Oracle Enterprise Manager Ops Center to create a name using the default naming pattern.

When any of the selected members for the server pool is already connected to the selected network, then the existing connection details is displayed. The Connected option is selected and the virtual switch name is displayed. You can either keep the existing connection or modify the network connection to make an additional connection to the same network.

- **Address Allocation:** Select **Do not Allocate** to skip the option of providing the IP address. Select **Use Static IP** to provide the IP address, or select **System Allocated** to have the system automatically allocate an IP address.
- Select **Do Not Plumb Interface** when you do not want to plumb the interface.

Click **Next** to view the summary of the information.

6. Review the information provided and click **Finish** to attach the networks to the server pool.

#### 7.14.4.1 Detaching Networks from Server Pool

You can detach the networks that have been attached to the server pool. Detaching the networks results in unplumbing the network connection to the host's NIC from all the virtualization hosts in the server pool.

1. Select the server pool.
2. Select the **Network** tab in the center pane.
3. Select the network that you want to remove.
4. Click the icon **Unbind Network** from Server Pool.

The Unbind Network from a Server Pool window is displayed.

5. Click **Unbind** to confirm the network removal.

#### 7.14.5 Associating Libraries

This section lists the types of storage libraries that you can associate with the server pool.

**Table 7-4 Supported Libraries**

	Oracle VM Storage Repositories	NAS Libraries	SAN Fibre Channel Libraries	SAN iSCSI Libraries
Oracle VM Server for SPARC	No	Yes	Yes	Yes
Oracle VM Server for x86	Yes	Yes	Yes	Yes

**Table 7-4 (Cont.) Supported Libraries**

	Oracle VM Storage Repositories	NAS Libraries	SAN Fibre Channel Libraries	SAN iSCSI Libraries
Oracle Solaris Zones	No	Yes	Yes	Yes

When you associate libraries with the server pool, only the libraries that are reachable from the virtualization hosts in the server pool are listed. Depending on the type of library, you either provide virtual disks or LUNs to the guests' storage.

Except for Oracle VM Server for SPARC server pool, the Associate Libraries action for zones and Oracle VM Server for x86 server pool displays the available libraries. Select the libraries and click Associate to associate the libraries with the zones or Oracle VM Server for x86 server pool.

For Oracle VM Server for SPARC server pool, the procedure to associate and disassociate the storage libraries are described as follows.

1. Select the Oracle VM Server for SPARC or server pool from the Server Pools list.
2. Click **Associate Libraries** in the Actions pane.  
The Associate Library Wizard is displayed.
3. Select the libraries that you want to associate with the server pool, then click **Next**.
4. Select **Associate** action for the Control Domain, I/O domain, or both. You must select at least one domain per server.

When the storage library is already associated with domains, then the Associate option is selected. You can deselect to disassociate the storage library from the domain.

This action is repeated for each selected storage library. Click **Next**.

5. Review the summary of the association and click **Finish** to associate the library with the selected domains in the server pool.

#### 7.14.5.1 To Disassociate Storage Libraries from Oracle VM Server for SPARC Server Pool

You can disassociate storage libraries from an Oracle VM Server for SPARC server pool.

1. Select the Oracle VM Server for SPARC server pool in the Server Pools list.
2. Select the **Libraries** tab in the Center pane.

All the storage libraries that are associated with the server pool are displayed.

3. Select the storage library that you want to disassociate from the server pool.

The Disassociate Library window is displayed.

4. When the storage library is associated with the domains are displayed with the **Disassociate** option selected. You can deselect the Disassociate action if you do not want to remove the association.
5. Click **Finish** to disassociate the storage library from the selected domains in the Oracle VM Server for SPARC server pool.

### 7.14.6 Creating Guests

The guests refer to the logical domains, zones or the virtual machines that can be created in the virtualization hosts. According to the virtualization type of the server pool, you have the following options:

- Oracle VM Server for SPARC: Create Logical Domains
- Oracle Solaris Zones: Create Zones
- Oracle VM Server for x86: Create Virtual Machines

These options trigger the deployment plans for the corresponding guests. Refer to the following chapters to refer to the profile and plan creation for the guests:

- [Oracle Solaris Zones](#)
- [Oracle VM Server for SPARC](#)
- [Oracle VM Server for x86](#)

### 7.14.7 Migrating Multiple Guests

When you place a virtualization host in a server pool, the option to migrate one or more guests is enabled.

The following options become available for the virtualization hosts:

- Oracle Solaris Zones: [Migrating Zones](#)
- Oracle VM Server for SPARC: [Migrating Logical Domains](#)
- Oracle VM Server for x86: [Migrating Virtual Machines](#)

### 7.14.8 Migrating Zones

You can migrate multiple zones from a global zone which is in a server pool. Migrate the zones to an individual global zone or other zones server pool.

When you migrate zones, the source and the target global zone must be compatible. The target global zones must have the following characteristics:

- Running at least Oracle Solaris 10 8/07 OS.
- Can access all the storage libraries associated with the zone.

Apart from compatibility, the target and the source global zone might have differences in the patches and packages installed on them. Choose to update the zone to match the patches and packages of the target global zone.

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**Note:**

You cannot downgrade the patches and packages of the zone. The migration fails in such scenario.

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You can also force the migration of the zone without updating the patches and packages. Select the update options while migrating the zone.

1. Select the global zone from which you want to migrate the zones.

2. Click **Migrate Zones** in the Actions pane.

The Migrate Zones Wizard is displayed.

3. The list includes the zones running in the global zone. Select one or more zones from the list.

Click **Next**.

4. Select an individual global zone or server pool to which you can migrate the zones.

The table displays the list of eligible global zones and server pool to which you can migrate the zones. The target global zone in the server pool depends on the server pool placement policy.

5. Select an update option to continue with migration.

The source and the target global zones might not be in the same patch level. Either you can select to update the patches and packages of zone to match the target global zone or continue migration without updating the zone.

6. Review the details and click **Finish** to migrate the zones.

### 7.14.9 Migrating Logical Domains

Migrate multiple logical domains from an Oracle VM Server to another Oracle VM Server in the same server pool. You cannot do cross server pool migration.

Only from Oracle VM Server for SPARC 2.1 version, live migration of logical domains is supported. For earlier releases, it is cold migration. The logical domains are shut down and then restarted on the target server.

See [Migrate Logical Domains](#) in [Oracle VM Server for SPARC](#) for more conditions in migrating a logical domain.

1. Select the Oracle VM Server in a server pool.

2. Click **Migrate Logical Domains** in the Actions pane.

3. The list of logical domains running in the Oracle VM Server are listed. Select one or more logical domains from the list.

4. Select an Oracle VM Server from the list.

The table lists the Oracle VM Servers that have enough resources to host the logical domains in the same server pool. The Oracle VM Server are listed in the decreasing order of preference.

5. Review the information and click **Finish** to migrate the logical domains.

### 7.14.10 Migrating Virtual Machines

For Oracle VM Server for x86 systems, you can migrate virtual machines only within a server pool. Live migration of virtual machines is supported.

The eligible Oracle VM Servers have the following characteristics:

- Owned by the Oracle VM Manager.
  - Placed in the same server pool as the source Oracle VM Server.
  - Have required resources to host the virtual machines.
  - Identical in machine make and model of the source Oracle VM Server.
1. Select the Oracle VM Server in the server pool.
  2. Click **Migrate Virtual Machines** in the Actions pane.
  3. Select the virtual machines that you want to migrate.
  4. Select the Oracle VM Server to which you want to migrate the virtual machines.

The table lists the Oracle VM Servers that are eligible to host the virtual machines.

5. Review the summary and click **Finish** to migrate the virtual machines.

### 7.14.11 Balancing Resources

When you have selected to balance server pool resource manually, use the Balance Resources action to check for the under-utilization or over-utilization of resources.

Select a server pool and click **Balance Resources** in the Actions pane to display the current utilization of the virtualization hosts in the server pool. When balancing is required according to the placement policy, Oracle Enterprise Manager Ops Center displays a list of target server that can accept migrated guests. Click **Balance Resources** to start the migration job.

### 7.14.12 Monitoring Server Pool Resources

A comprehensive view and analysis of the server pool resource usage are displayed in the Analytics tab of the selected server pool.

The Analytics tab displays the following information about a server pool:

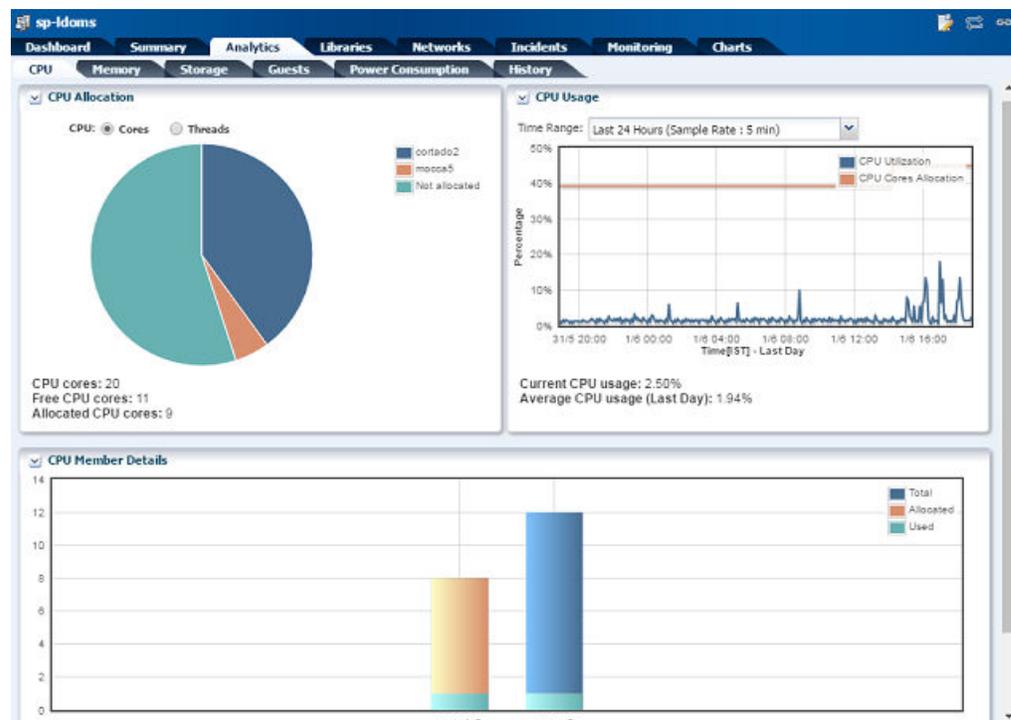
- CPU
- Memory
- Storage
- Guests
- Power Consumption
- History

## CPU

The CPU sub tab displays information related to CPU resources allocated to the server pool and the percentage of usage:

- **CPU Allocation:** You can select to view the CPU allocation as number of threads or cores for an Oracle Server for SPARC server pool. Whereas, for a zones pool, the CPU allocation is represented only as threads.
- **CPU Usage:** The CPU usage for a varied time range is available. The graph displays the CPU usage in percentage for a selected time range. It also provides the current CPU usage and average CPU usage for the selected time range.
- **CPU Member Details:** The allocated CPU resource and the usage by each member of the server pool are displayed.

**Figure 7-1 CPU Resource Usage**

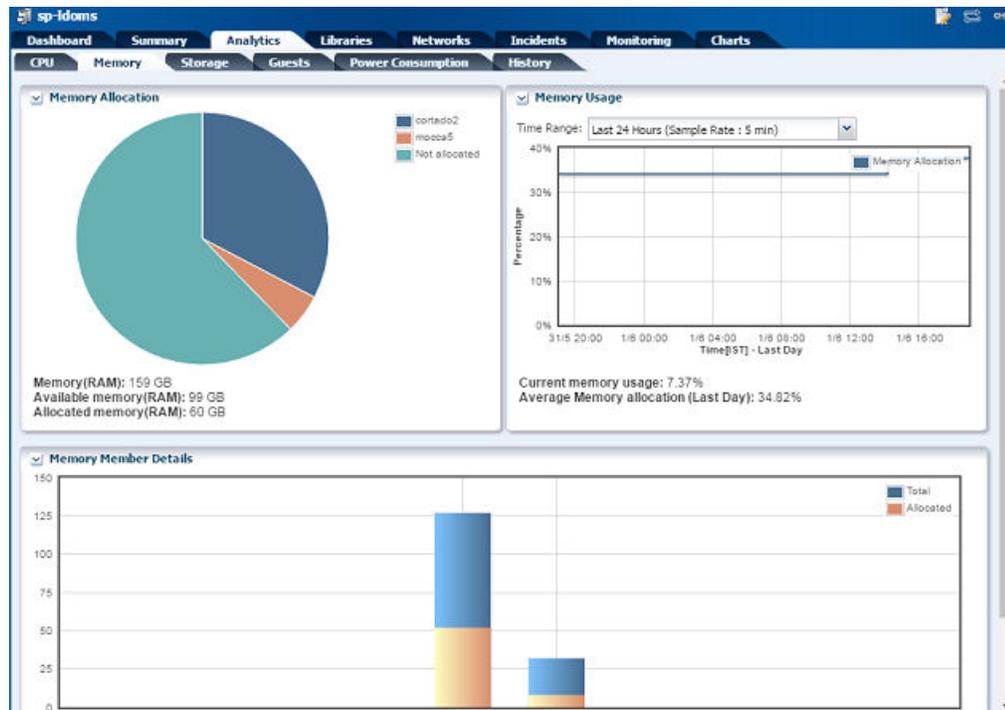


## Memory

The Memory sub tab displays the memory resources allocated to the server pool and its usage by the servers in the pool.

- **Memory Allocation:** The memory resource allocated to the server pool and the available memory for use are displayed.
- **Memory Usage:** The memory usage in the server pool for a selected time range is displayed in a graph.
- **Memory Member Details:** The memory resource used by each server in the server pool is displayed.

**Figure 7-2 Memory Resource Usage**

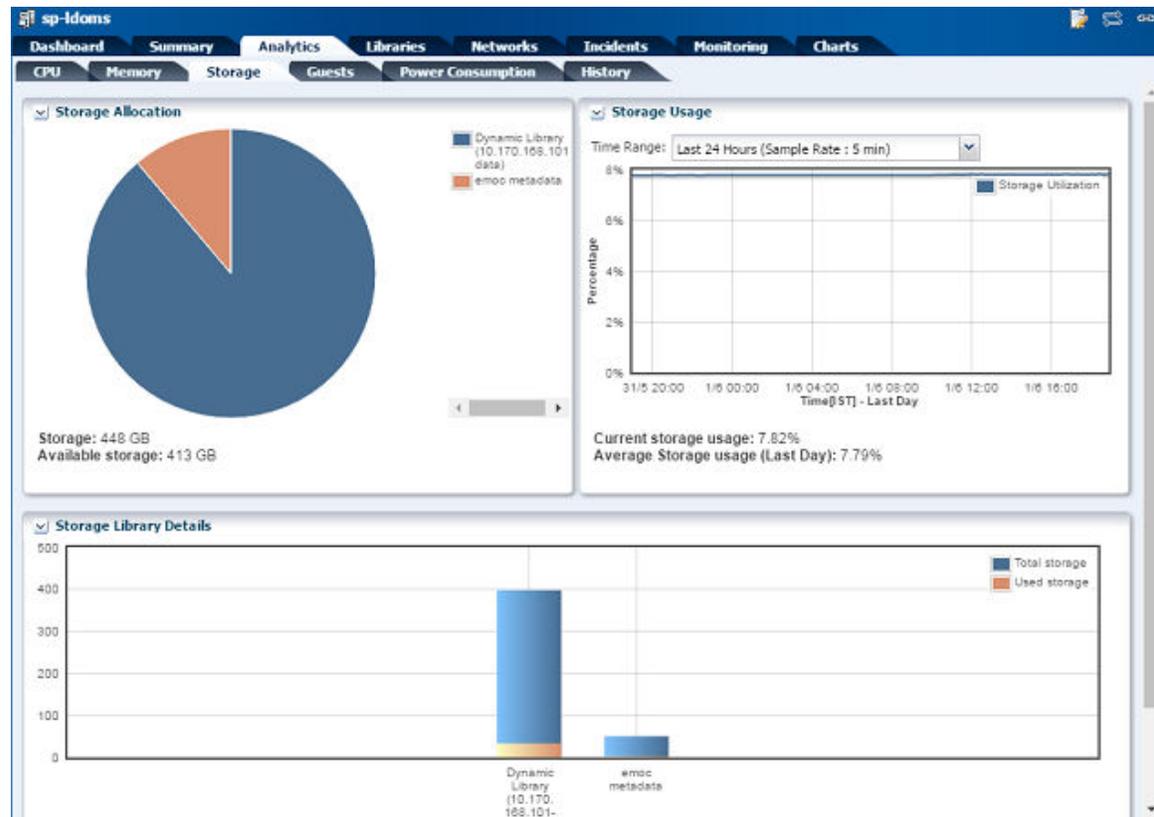


### Storage

The Storage sub tab displays the allocated storage resource and the available storage resource in the storage pool.

- Storage Allocation: The storage resources available in the server pool from different types of library are displayed.
- Storage Usage: The storage usage for a selected time range is displayed as a graph.
- Storage Library Details: The storage resource available through different storage libraries is displayed.

Figure 7-3 Storage Resource Usage

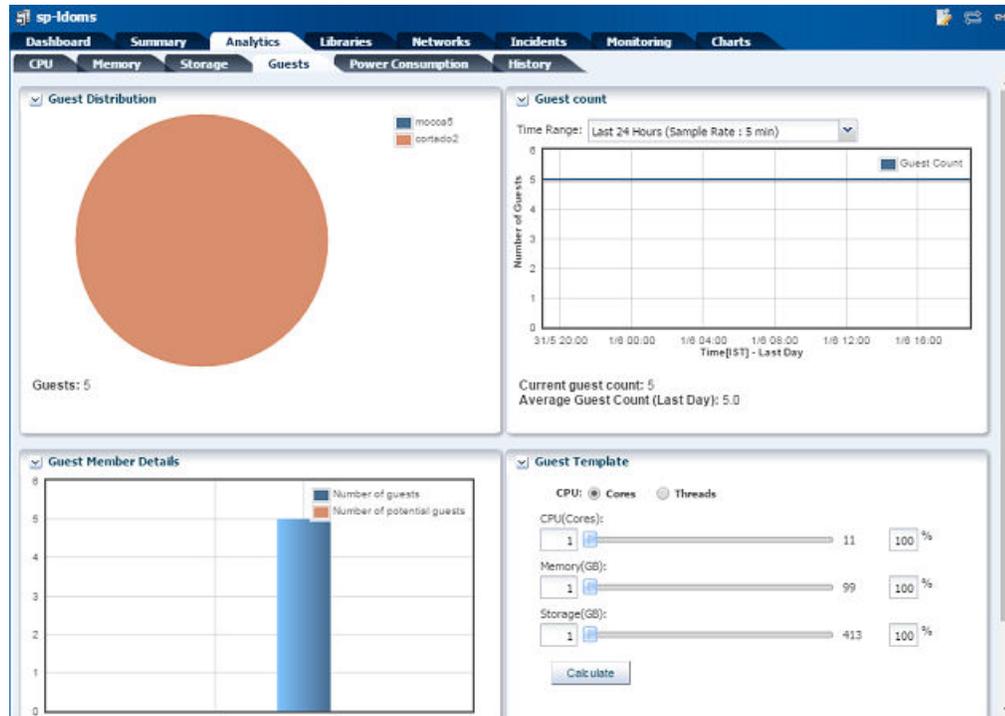


### Guests

The Guests sub tab provides information about the number of guests running in the server pool and the details of the guest location. It also provides the option to calculate the number of guests that can be created in the server pool for a given guest parameters.

- **Guest Distribution:** The number of guests running in the server pool and the servers on which it is distributed are displayed.
- **Guest Count:** The number of guests running in a specified time range is displayed in a graphical format.
- **Guest Member Details:** The number of guests running in each server of the server pool and the potential number of guests that the server can support are displayed.
- **Guest Template:** You can specify a guest parameters such as CPU, memory and storage resource. Click **Calculate** to find the potential number of guests that can be created in the server pool with the defined configuration.

**Figure 7-4** Guests Resource Usage

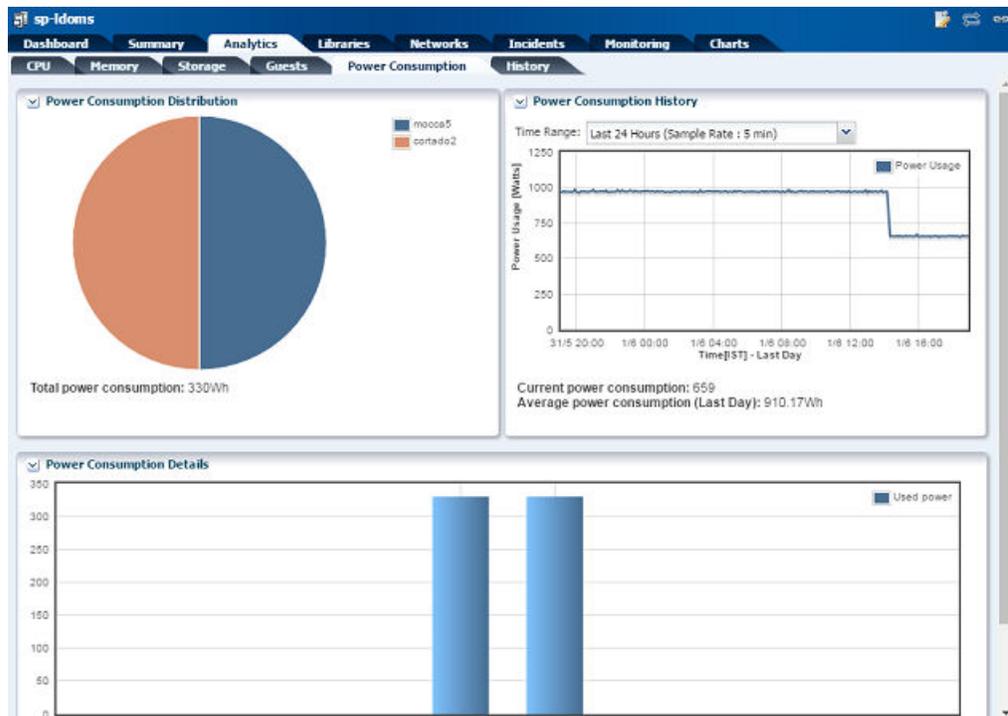


**Power Consumption**

The Power Consumption sub tab displays the power consumption details of the server pool. It displays information about the total power consumed and power consumed by each server of the server pool.

- Power Consumption Distribution: The total power consumed by the servers in the server pool and the power consumption by each server are displayed.
- Power Consumption History: The power consumption history for a specified time range is displayed.
- Power Consumption Details: The power consumed by each server in the server pool is displayed.

Figure 7-5 Power Consumption

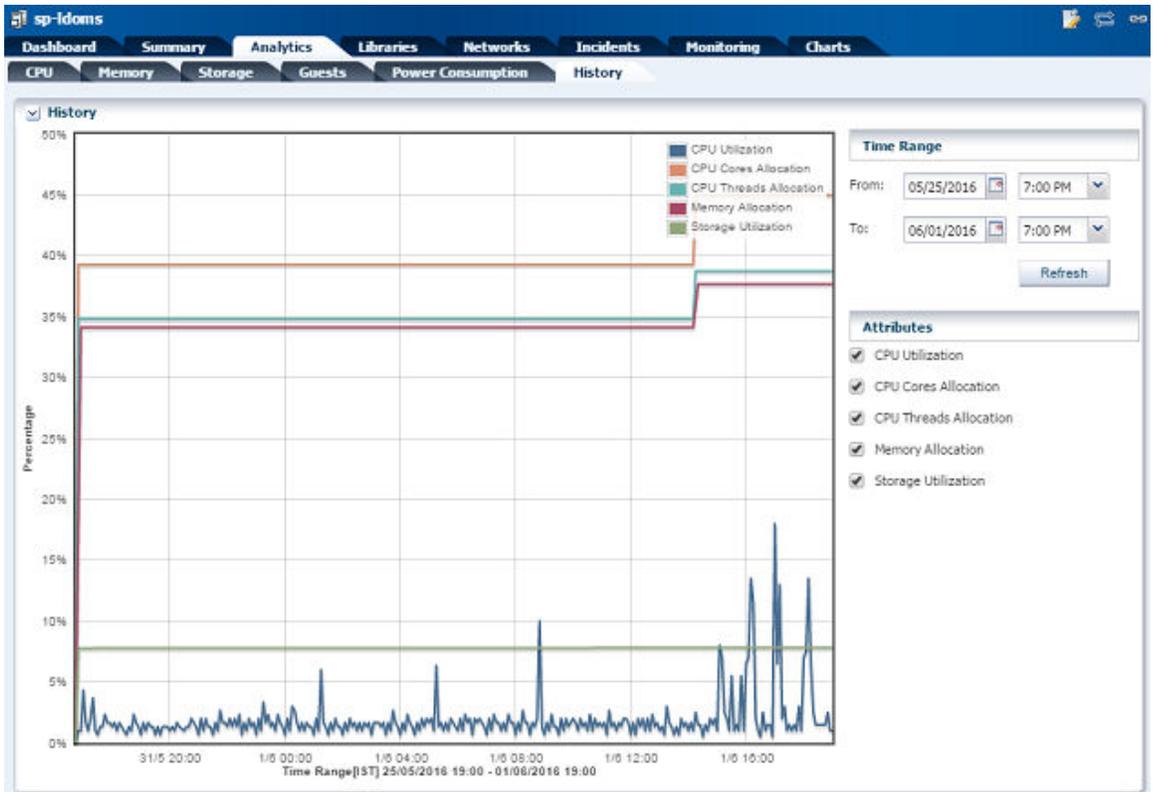


### History

The History sub tab displays the graphical representation of the following resource utilization in the server pool:

- CPU utilization
- CPU cores allocation
- CPU threads allocation
- Memory allocation
- Storage allocation

**Figure 7-6 History Graph**



### 7.14.13 Monitoring Server Pool Incidents

When the server pool does not meet the policies and rules set, warning or critical incidents are raised accordingly. For example, when the servers in the pool are overloaded and need to migrate a guest to another server.

Incidents also provide information about the result of a server pool status on automatic load balancing.

The guests are recovered according to the policy set in the server pool for automatic recovery. The incidents are raised that describes the guests that are recovered and in which servers they are recovered in the server pool.

Incidents are also raised when there are no resources or servers available in the server pool for recovering the guests. Incidents provide more information about the scenario.

Refer to the [Related Resources for Server Pools](#) section for more information about handling and viewing incident messages.

### 7.14.14 Deleting Server Pool

Use the option **Delete Server Pool** to release the virtualization hosts back to stand-alone state. The type of server pool imposes some limitations to delete a server pool.

#### 7.14.14.1 Oracle VM Server for SPARC

You can delete the Oracle VM Server for SPARC server pool even when the logical domains are attached to it and running. There is no restriction for deleting an Oracle VM Server for SPARC server pool to shut down the logical domains. All the network

and storage resources are not unconfigured from the Oracle VM Servers in the server pool. The network and storage resources are retained by the servers.

#### 7.14.14.2 Oracle Solaris Zones

For a zones server pool, you can delete the server pool and the zones continue to be attached to the global zone. Oracle Enterprise Manager Ops Center does not provide any restrictions to shut down the zones before deleting a zones server pool.

#### 7.14.14.3 Oracle VM Server for x86

Shut down all the virtual machines and remove all Oracle VM Servers except for the Master Oracle VM Server before deleting the server pool. The virtual machine metadata and virtual disks are stored in the storage library. The virtual machine details are not lost and you can start the virtual machine.

## 7.15 Related Resources for Server Pools

For instructions in performing actions or to learn more about the role of this feature, go to one of the following resources:

- [Storage Libraries for Virtualization](#)
- [Networks for Virtualization](#)
- [Oracle Solaris Zones](#)
- [Oracle VM Server for SPARC](#)
- [Oracle VM Server for x86](#)
- [Virtual Datacenters](#)
- See the Asset Management chapter of the *Oracle Enterprise Manager Ops Center Configure Reference* for information about discovering and managing assets.
- See the Incidents chapter of the *Oracle Enterprise Manager Ops Center Operations Reference* for more information about handling and viewing incident messages.
- See the *Oracle Enterprise Manager Ops Center Administration Guide* for information about users, roles, and the power consumption policy.

See the following how to documentation in the Deploy How To tab in the library at [http://docs.oracle.com/cd/E59957\\_01/nav/deploy.htm](http://docs.oracle.com/cd/E59957_01/nav/deploy.htm) for end-to-end examples.

- *Oracle Enterprise Manager Ops Center Create a Server Pool for Zones*
- *Oracle Enterprise Manager Ops Center Create a Server Pool for Oracle VM Server for SPARC*

See the *Oracle Enterprise Manager Ops Center Explore Your Server Pools* how to documentation in the library at [http://docs.oracle.com/cd/E59957\\_01/nav/operate.htm](http://docs.oracle.com/cd/E59957_01/nav/operate.htm) for an end-to-end example of how to manage server pools.

For current discussions, see the product blog at <https://blogs.oracle.com/opscenter>.



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# Virtual Datacenters

This chapter includes the following sections:

- [Introduction to Cloud Management](#)
- [Oracle Engineered Systems](#)
- [Roles for Managing Virtual Datacenter](#)
- [Actions Available in vDC Management](#)
- [Location of Virtual Datacenter Information in the User Interface](#)
- [Overview of Virtual Datacenter](#)
- [Creating Virtual Datacenters](#)
- [Managing a Virtual Datacenter](#)
- [Creating and Managing Cloud Users](#)
- [Creating Accounts](#)
- [Managing Accounts](#)
- [Creating and Managing vServer Types](#)
- [Overview of Cloud Users](#)
- [Roles for Cloud User Tasks](#)
- [Actions Available for a Cloud User](#)
- [Location of Account Quotas and Virtual Resources in the User Interface](#)
- [Creating vServers](#)
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- [Creating Server Templates](#)
- [Managing Server Templates](#)
- [Creating vNets](#)
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- [Creating Volumes](#)
- [Managing Volumes](#)
- [Creating Snapshots](#)

- [Managing Snapshots](#)
- [Creating Distribution Groups](#)
- [Managing Distribution Groups](#)
- [Related Resources for Virtual Datacenters](#)

## 8.1 Introduction to Cloud Management

Oracle Enterprise Manager Ops Center provides the platform to consolidate the physical resources in your data center, and to build and operate your cloud services. The physical resources such as virtualization servers, storage, and network are pooled which are accessed by users to build their applications.

Oracle Enterprise Manager Ops Center provides comprehensive management solution to deploy, configure, and manage the virtualization servers, storage resources, and network fabrics. Also, pool the virtualization resources that share the storage and network resources. All these features are leveraged and can be deployed as Infrastructure-as-a-Service (IaaS) cloud platform service model in Oracle Enterprise Manager Ops Center.

In Oracle Enterprise Manager Ops Center, the provision to setup the IaaS cloud platform service is available as vDC Management. Virtual Datacenter, or vDC, is a collection of the server pools that share the common storage and network resources. A cloud administrator sets up the infrastructure and provide access to cloud users. Cloud users use the allocated resources to create guests with an OS installed, deploy applications, monitor, and manage the applications. The cloud user is provided the access to Oracle Enterprise Manager Ops Center UI to view and manage their applications.

Oracle Enterprise Manager exposes APIs and command-line interface (CLI) to enable the access to a subset of the Virtual Datacenter functionality. The cloud user can also manage the allocated resources programmatically by calling the IaaS web services directly.

The features accessible through the Cloud Infrastructure API and CLI are available for a Cloud User. The features that are restricted to the Cloud Administrator, such as infrastructure configuration and setup are not available through the Cloud Infrastructure API and CLI except for listing the accessible accounts and to create key based access to cloud users who have access to the accounts already. All the functions that are available for a Cloud User are also available for the Cloud Administrator.

When you log in to Oracle Enterprise Manager Ops Center, the views and access for different sections of the UI are different for a cloud administrator and a cloud user.

If you are a cloud user looking for more information about creating and managing virtual servers, then go to the section [Overview of Cloud Users](#).

If you are a cloud administrator, continue with the following sections that describe how to create and manage the virtual datacenters in Oracle Enterprise Manager Ops Center.

## 8.2 Oracle Engineered Systems

If you want to manage virtual datacenters on engineered systems such as Oracle SuperCluster, then refer to the [Related Resources for Virtual Datacenters](#) for more information.

## 8.3 Roles for Managing Virtual Datacenter

The following table lists the tasks and the role required to complete the task. Contact your administrator if you do not have the necessary role or privilege to complete a task.

**Table 8-1 Virtual Datacenter Tasks and Roles**

Task	Role
Create and Manage Virtual Datacenters	Cloud Admin
Create and Manage Accounts	Cloud Admin
Create and Manage vServer Types	Cloud Admin
Add and Manage Cloud Users	Cloud Admin

A cloud administrator requires the Cloud Admin role to create and manage the virtual datacenters, accounts, and cloud users. The Cloud Admin role has the necessary permissions of Asset Admin and Network Admin roles to setup and manage the virtual datacenter infrastructure.

By default, the addition of the Cloud admin role to a user does not give full vDC privileges. To access an existing vDC as a cloud administrator, you must have the proper privileges set to view and manage it. Adding only the cloud admin role is not enough; you must have the privileges for the vDCs to be managed.

Contact your Ops Center administrator to manage your user's role to specify proper vDC privileges.

## 8.4 Actions Available in vDC Management

The virtual datacenter configuration involves the setup of the infrastructure, managing the resource workloads, and understanding cloud user requirements. The user with the cloud administrator role has the following actions:

- Create and manage virtual datacenters
- Create and manage accounts
- Manage access to accounts
- Manage physical resources of virtual datacenter
- Create and manage vServer types

## 8.5 Location of Virtual Datacenter Information in the User Interface

This table lists where to find different information for virtual datacenter in the UI.

**Table 8-2 Location of Virtual Datacenter Information in the UI**

To See	Location
Virtual Datacenter	Expand <b>vDC Management</b> in the Navigation pane.

**Table 8-2 (Cont.) Location of Virtual Datacenter Information in the UI**

To See	Location
Network resources for a vDC	Expand <b>vDC Management</b> in the Navigation pane and select the vDC. Expand the selected vDC and select <b>Network</b> . The center pane displays information about network resources in the vDC.
Storage resources for a vDC	Expand <b>vDC Management</b> in the Navigation pane and select the vDC. Expand the selected vDC and select <b>Storage</b> . The center pane displays information about storage resources in the vDC.
Server Pools for a vDC	Expand <b>vDC Management</b> in the Navigation pane and select the vDC. Expand the selected vDC and select <b>Server Pools</b> . The center pane displays information about server pools in the vDC.
Accounts in a vDC	Expand <b>vDC Management</b> in the Navigation pane and select the vDC. Expand the selected vDC and select <b>Accounts</b> . All the accounts created in the vDC are listed.
Options for managing vDCs	Expand <b>vDC Management</b> in the Navigation pane and select the vDC. The Actions pane list the options for managing the vDCs and its accounts.

## 8.6 Overview of Virtual Datacenter

In Oracle Enterprise Manager Ops Center, consolidate the virtualization servers, storage, and network resources, and enable those resources to be utilized optimally and securely for mixed and dynamic workloads. This optimization of your resources is done by creating a Virtual Datacenter (vDC) in Oracle Enterprise Manager Ops Center.

The physical resources allocated of a vDC are entitled to accounts as virtual resources under quotas set by the cloud administrator. Accounts provide the required capabilities to manage the allocated resources. An account entitles designated cloud users the right to use its virtual computing, network, and storage resources.

A cloud user with access to different accounts can create virtual servers, known as vServers, and host or access applications.

A cloud administrator is involved in setting up the infrastructure for the vDC, creating and managing vDCs, creating and managing accounts, and managing access to cloud users.

## 8.7 Creating Virtual Datacenters

Virtual datacenter (vDC) is a consolidation of your physical resources that share the network and storage resources.

The physical resources that form a virtual datacenter are:

- **Homogenous server pools**

The server pools are groups of virtualization supported servers that share compatible chip architecture. The supported virtualization types are:

- Oracle Solaris Zones

A vDC based on Oracle Solaris Zones can not use a server pool with virtualization host with a mix of operating systems. For creating a vDC using server pools based on Oracle Solaris Zones, all virtualization hosts of the server pool must have the same configuration and only one from the following:

- ◆ Oracle Solaris 10 Zones for x86
- ◆ Oracle Solaris 11 Zones for x86
- ◆ Oracle Solaris 10 Zones for SPARC
- ◆ Oracle Solaris 11 Zone for SPARC
- Oracle VM Server for x86
- Oracle VM Server for SPARC

Server pools are of single virtualization technology. For example, you can have a server pool of Oracle VM Server for SPARC servers only and not a mixture of Oracle VM Server for x86 and Oracle VM Server for SPARC servers. You cannot have server pools that have mixture of different virtualization technology. A vDC is based on any one of the supported virtualization technology. This infrastructure difference brings in some major differences in using the vDC. The cloud user might not be aware of the background infrastructure but the cloud administrator ensures that the vDC resources are always highly available to a cloud user. See [Setting Up the Server Pool](#) for more information about the server pool setup required for virtual datacenter.

- **Storage**

The storage is inherited from the server pools. The storage is used for storing root disk of the virtual server created in the accounts, virtual server configuration data, templates, ISO images, FLAR images, and also used as volumes. While creating a vDC, you can allocate some storage resources that are used for volumes and root disks. Volumes are used to attach to the vServers. See [Setting Up Storage Resources](#) for more information about the storage resources required for virtual datacenter.

- **Networks**

Plan the network requirements and attach the network to the server pools. vDC inherits the network resources from the server pools. Server pools in a vDC are associated with the same user-defined network domain. See [Setting Up the Server Pool](#) and [Setting Up Network Resources](#) for more information about setting up your network resources for virtual datacenter.

## 8.7.1 Setting Up the Server Pool

You can create vDC with server pools based on the following types of virtualization technology:

- Oracle VM Server for x86
- Oracle Solaris Zones
- Oracle VM Server for SPARC

Ensure all the required networks are assigned to the user-defined network domain that is associated with the server pool. The vDC creation wizard displays the list of

available server pools in Oracle Enterprise Manager Ops Center. The list includes the server pools that conform to the following characteristics:

- The server pool is not empty and there are virtualization servers placed in the server pool.
- The server pool is associated with a user-defined network domain. Each network in the user-defined network domain must be connected to every server in the server pool.
- Server pools of a single supported virtualization technology.

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**Note:**

For Oracle Solaris Zones server pools, the pool members must not be a mixture of Oracle Solaris 10 and Oracle Solaris 11. Such server pools are not supported.

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- Server pools have compatible storage resources to be used as root disk and volumes.
- Compatible storage resources for saving vServer metadata.

To add a server pool to a vDC, you must verify that each network in the network domain is connected to every server in the server pool when creating a server pool. See [Server Pools](#) for more information about how to create server pools.

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**Note:**

For Oracle VM Server for SPARC based server pools, the option to select the SR-IOV enabled network interfaces to connect to the network is not supported for vDCs. VLAN tagging support for networks configured with VLAN ID is not used in the vDC context.

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## 8.7.2 Setting Up Storage Resources

The vDC inherits the storage resources allocated for the server pool. The virtualization type of the server pool defines all the possible types of storage resources available for the vDC.

Oracle VM Server for x86 based server pools can have the following type of storage resources:

- Oracle VM Storage Repositories
- LUNs allocated from Static Block Storage libraries
- LUNs from Dynamic Block Storage libraries

For Oracle VM Server for x86 server pools, the Oracle VM Storage repositories must be associated with the server pool.

The Oracle Solaris Zones server pools can have the following types of storage resources:

- NAS libraries

- LUNs allocated from Static Block Storage libraries
- LUNs from Dynamic Block Storage libraries

The Oracle VM Server for SPARC server pools can have the following types of storage:

- NAS libraries
- LUNs allocated from Static Block Storage libraries
- LUNs from Dynamic Block Storage libraries

You require the Oracle Solaris Zones and Oracle VM Server for SPARC server pool to be associated with NAS libraries if they are associated only with Block Storage libraries. NAS libraries are required for storing guest metadata details.

When you create a vDC, you allocate the storage resources to be used for all the accounts created in the vDC. You can select storage resources to be used for root disks of the virtual servers (vServers) and for volumes. Volumes are additional storages that you can attach to the vServers. For volumes, the storage is allocated from the storage libraries that are associated with the server pools. A cloud user might also import external volumes into the account.

### 8.7.3 Setting Up Network Resources

Oracle Enterprise Manager Ops Center provides comprehensive network management options that enables secure management of the virtual datacenter.

The server pools must be associated with the same user-defined network domain to be added to the vDC. Each network in the user-defined network domain must be connected to every server in the server pool.

#### 8.7.3.1 Understanding Network Domain Implementation

The network domain is a logical grouping of related networking components in Oracle Enterprise Manager Ops Center. The networks are built on the following type of fabrics:

- **Fully-managed switched fabrics**

The switches and the fabrics they support are discovered and managed in Oracle Enterprise Manager Ops Center and you can create VLANs or InfiniBand partitions. The network domain created from fully-managed fabrics provides the option to create dynamic private networks.

- **Host-managed fabrics**

Set VLAN IDs to unmanaged Ethernet fabrics and make it host-managed fabrics. Though the switches are not managed in Oracle Enterprise Manager Ops Center, you can assign VLAN IDs to the Ethernet fabrics. You must enable the VLAN IDs manually on the switch ports connected to the hosts in that fabric. Host-managed fabrics allow you to create dynamic private networks.

Oracle Enterprise Manager Ops Center uses the VLAN IDs set for the creation of dynamic private networks.

- **Unmanaged fabrics**

Neither the switches are managed nor the VLAN IDs are available in Oracle Enterprise Manager Ops Center to create the network. The networks are declared or discovered while discovering an asset in Oracle Enterprise Manager Ops Center.

The network domain created out of these networks does not provide the option to create dynamic private networks. You can set aside the networks created on the unmanaged fabrics as private while creating a network domain.

You must ensure that these networks assigned as private are not in use and there is no routing between the selected networks and other networks. These private networks are defined as static private networks. For vDC, a network domain with unmanaged fabrics can be assigned to a server pool only if there are static private networks available in it.

### 8.7.3.2 Dynamic Private Networks

Each dynamic private network created is allocated a subnet address according to the standards specified in IETF RFC1918. While creating network domains, you can select the option to select the fabric on which you want to create the network, limit the number of networks to be created on the fabric, and the network addresses to be excluded from use.

The number of private networks that you can create on a fully-managed fabric depends on the type of physical fabric. Each port on an Ethernet switch can support 128 logical fabrics. Each partition on an InfiniBand switch can support 32000 logical fabrics. The number of logical fabrics determines how many private networks you can create. For an InfiniBand fabric, each P-key can support a private network. For an Ethernet fabric, each VLAN ID can support a private network.

When you create a network domain, you can set the network creation limit for each selected fabric. This determines how many private vNets that can be created in an account. You can spread the number of private networks across all of the accounts in the vDC.

### 8.7.3.3 Plan Your Network Domains

The network setup must be implemented in such a way that the cloud user has the required network resources available to allocate to the virtual servers created in the accounts. The cloud user must be able to create private networks. The networks must be created upon either fully-managed switched fabrics, host-managed fabrics or unmanaged fabrics.

Create a network domain, assign the managed networks, and associate it with the server pool which must be added to the vDC. The vDC inherits the network domain from the server pool. From the available networks in the network domain, attach the required networks to the server pool. These managed networks form the public external networks for the vDC. You can assign these networks to the accounts created in vDC.

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**Note:**

All the server pools in the vDC must be associated with the same user-defined network domain.

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The vDC enables cloud users to create virtual machines and run applications. The cloud user provides networking to its virtual machines from the public networks that are allocated to each account or by creating private networks. The cloud user can use the public networks, or create a private vNet for use in the account. When the cloud users create a private vNet, either a dynamic private network is created or the static private network is available for use in that account.

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**Note:**

You must allocate the IP addresses in the public networks and static private network so that cloud users can use the IP addresses.

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When the cloud user creates a private vNet, it is listed under the network domain of the vDC.

Avoid to delete any EoIB network resource when a cloud user has just deleted a vServer. When you delete a EoIB network resource, wait for approximately 5 minutes for the VLAN maps to be refreshed automatically.

See [Networks for Virtualization](#) for more information about managing fabrics, creating network domains, and private networks.

### 8.7.4 CPU Oversubscription

You can oversubscribe the CPU resources allocated to a vDC for an increased utilization of the resource.

CPU oversubscription is applicable only for vDCs based on Oracle Solaris Zones and Oracle VM Server for x86 virtualization technologies. For Oracle VM Server for SPARC, this is not applicable as there is a one to one relationship between vCPU and physical CPU thread.

You define two parameters that define the CPU oversubscription:

- The ratio of number of virtual CPUs (vCPUs) to physical CPU Threads.

For example, if the vCPU to physical CPU threads is set to 2, each virtual CPU receives at least 50% of the cycles of a physical CPU thread.

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**Note:**

As the CPU oversubscription ration increases, the performance might be affected, but the utilization of the CPU resources improve. The CPU oversubscription ratio that you might want to use is at most 3:1. At extremely high ratios, the risk of instability of the system increases.

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- CPU cap that defines the maximum share of the physical CPU thread's cycle that can be allocated to a vCPU. This parameter is only applicable for vDCs based on Oracle VM Server for x86 virtualization technology.

For example, if the CPU Cap is set to 50, a vCPU can use up to 50% of the cycles of a physical CPU thread.

Provide appropriate CPU cap for the ratio of vCPU to physical CPU thread to get accountable vServer performance and balanced system.

### 8.7.5 Creating a Virtual Datacenter

Before you create the vDC, you must have your server pools, network, and storage set up. When they are set up properly, you can select the required resources for the vDC.

1. Select vDC Management in the Navigation pane.
2. Click **Create Virtual Datacenter** in the Actions pane.

The Create Virtual Datacenter Wizard is displayed.

3. The first step provides a introduction to the vDC and the prerequisites for creating a vDC.

You can select to skip this step in the future when you create a vDC again. Click **Next** to specify identification details for the vDC.

4. In the Specify Virtual Datacenter Details, enter the following information:

- Provide a name and description for the vDC.
- Enter tags for better identification and classification of the vDC in Oracle Enterprise Manager Ops Center.
- Select Password Required to force setting vServer credentials when creating vServers in the vDC.

When this option is enabled, cloud users must specify a root password, with or without an SSH key. Additionally to the root password, cloud users must specify either an SSH key or a remote user credentials when creating vServers using Oracle Solaris 11 OS in a vDC based on Oracle Solaris Zones or Oracle VM Server for SPARC.

Click **Next** to select the server pools.

5. Select a server pool from the list.
6. Select the Add more compatible server pools option to add other compatible server pools to the vDC. Then, use the Left and Right arrow keys to select the server pools that must be assigned to the vDC.
7. Select Oracle SuperCluster Support if the vDC is in an Oracle SuperCluster.

When selecting the Oracle SuperCluster Support option, specific actions for Oracle SuperCluster are enabled or disabled in the vDC.

Click **Next** to continue.

8. For Oracle VM Server for SPARC based vDCs, select one or more boot networks from the list. The list contains the available public networks, you must select at least one network.

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**Note:**

Boot networks are required for vServer OS deployment. You must also add at least one boot network to each account in the vDC for creating vServers in the account. You can also assign a boot network to an account and use it as a regular public network for that account.

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Click **Next** to specify the vCPU sizing.

9. Define the following values for vCPU sizing:

- Enter the ratio of number of vCPUs to a physical CPU thread. The value must be greater or equal to 1.0. Decimal values are also supported. The total number of vCPUs can be higher than the number of physical CPU threads. You can run

more vCPUs than the existing physical CPU threads through timesharing of the CPU cycles.

- Specify the CPU cap which is the maximum share of the physical CPU thread's cycle that can be allocated to a vCPU. The CPU cap parameter is only applicable for vDCs based on Oracle VM Server for x86 virtualization technology.

The following information is displayed in the vCPU sizing screen:

- **Total number of vCPUs:** The total number of vCPU in the vDC for the updated vCPU to physical CPU Threads ratio.
- **Avg memory per vCPU:** The average memory per vCPU in GB. The total memory available for the vDC by the total number of vCPUs. When you want to use the CPU and memory resources to the full extent, then the vServers must be using this amount of resources.

When vServers are created in a zone based vDC, the Fair Share Scheduler is the default scheduler. The physical CPU allocation for each vServer is provided by the Fair Share Scheduler.

This is not applicable for vDCs based on Oracle VM Server for SPARC virtualization technology.

Click **Next** to configure the storage resources.

**10.** Select the root disk storage type from the list. Designate one of the following storage types for root disks:

- Oracle VM Server for x86 based vDC
  - Oracle VM Storage Repositories
  - Dynamic Block Storage Libraries
- Oracle Solaris Zone based vDC
  - NAS Libraries
  - Block Storage Libraries that include both Dynamic and Static
- Oracle VM Server for SPARC based vDC
  - NAS Libraries
  - Block Storage Libraries that include both Dynamic and Static

**11.** Select the storage resources to be used for root disk from the list. The list contains the storage resources associated to the selected server pools and storage type.

**12.** Select the volume and template storage type from the list. Designate the following storage types for volumes and templates:

- Oracle VM Server for x86 based vDC
  - Oracle VM Storage Repositories
  - Dynamic Block Storage Libraries
- Oracle Solaris Zone based vDC

- NAS Libraries
  - Block Storage Libraries that include both Dynamic and Static
  - Oracle VM Server for SPARC based vDC
    - NAS Libraries
    - Block Storage Libraries that include both Dynamic and Static
13. Select the storage resources to be used for volumes and templates from the list. The list contains the storage resources associated to the selected server pools and storage type.

Click **Next** to view the summary.

14. The summary lists the total resources that are allocated for the vDC. The summary lists the following:
- **vDC Name:** The name given to the vDC.
  - **Virtualization type:** The virtualization technology of the server pool.
  - **Oracle SuperCluster Support:** Flag indicating if the vDC must behave as part of an Oracle SuperCluster.
  - **Total Physical CPU Threads:** The physical CPU threads available from all the virtualization servers in the selected server pools for the vDC.
  - **Required Password:** Flag to indicate if the cloud user must specify vServer credentials when creating vServers in the vDC.
  - **Total Memory (GB):** The total RAM allocated to the management domains of the selected server pool. For example, Oracle Solaris Zones based vDC, it is the total memory of the global zones in the server pool. For Oracle VM Server for x86 based server pools, it is the total memory of the Oracle VM Servers in which the virtual machines run.
  - **Total Disk Space (GB):** The sum of all the disk spaces allocated from the storage libraries associated with the selected server pools.
  - **vCPU to Physical CPU Threads ratio:** The number of vCPUs to physical CPU Threads.
  - **vCPU cap:** The maximum share of the physical CPU Thread's cycle that can be allocated to a vCPU. This parameter is only available for vDCs based on Oracle VM Server for x86 virtualization technology.

Confirm the vDC configuration and click **Finish** to create the vDC.

## 8.8 Managing a Virtual Datacenter

Perform the following actions for managing a vDC:

- [Updating the Configuration](#)
- [Managing Resources](#)
- [Deleting a Virtual Datacenter](#)

## 8.8.1 Updating the Configuration

Update the following details of vDC:

- vDC identification and tags.
- Assign more server pools.
- Assign more storage for volume or root disks. You cannot remove the storage that is currently used by the vDC.
- Modify the vCPU sizing.
- Disable or enable the Password Required option.
- Disable or enable the Oracle SuperCluster Support option.
- Add public networks to be used as boot networks. This option is only available for Oracle VM Server for SPARC virtual datacenters.

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**Note:**

After upgrading from Oracle Enterprise Manager Ops Center version 12.1 to version 12.2, cloud administrators must update the configuration of all Oracle VM Server for SPARC vDCs created in a 12.1 version to select a public network as a boot network. Cloud administrator might also need to update the account configuration to add at least a boot network to the account. If a boot network is not added to the account, cloud users won't be able to create new vServers.

Server templates created in a 12.1 version are not usable after upgrading to 12.2, cloud users need to create new server templates for creating new vServers in the vDC.

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Select a vDC and click the **Edit Virtual Datacenter** option in the Actions pane. Modify the required attributes and complete the wizard.

To add storage, networks, or servers to the vDC, you must first assign the resources to the server pool of the vDC. When adding networks or servers to a server pool, you must verify that each network in the network domain is connected to every server in the server pool. See [Attaching Networks](#) and [Adding Virtualization Hosts](#) sections of the Server Pools chapter for more information.

## 8.8.2 Managing Resources

Oracle Enterprise Manager provides a complete view of the resources in the vDC and monitors the utilization of the virtualization servers, network, and storage. The cloud administrator gets a good picture of the utilization of the resources which helps to manage the under-utilized and over-utilized resources.

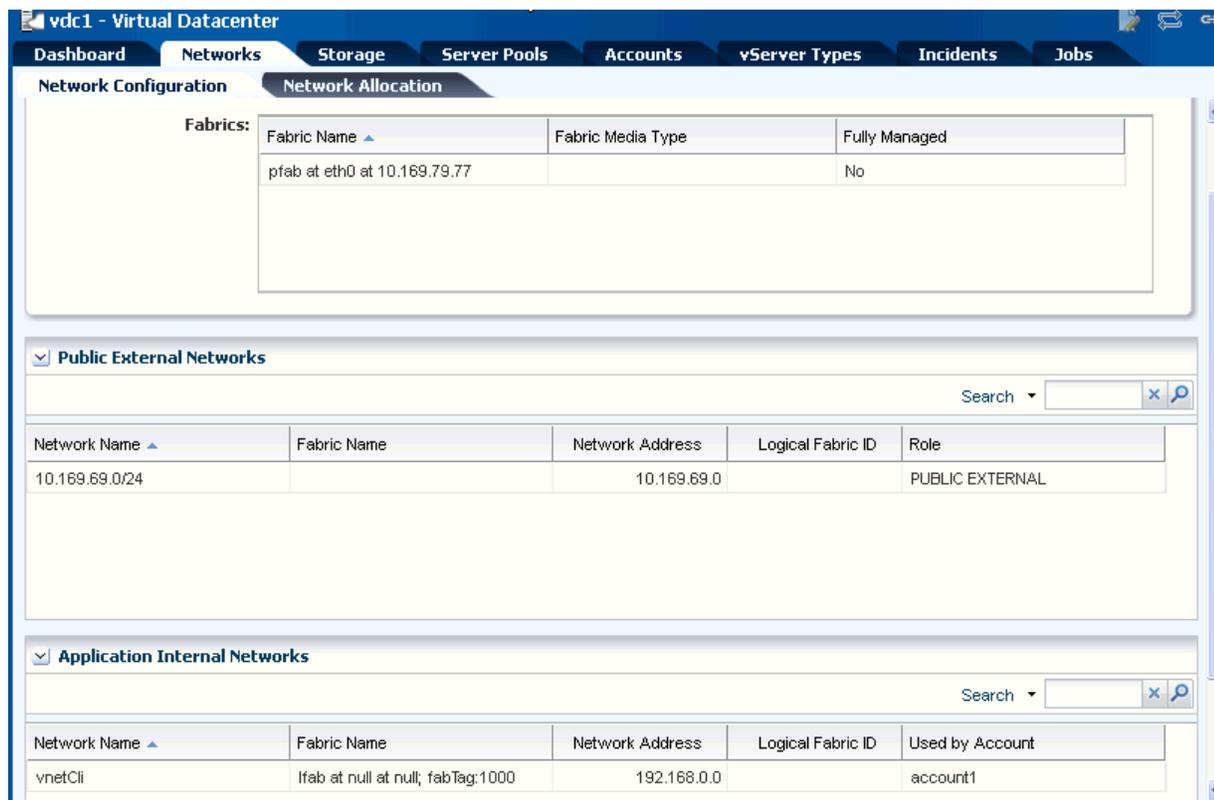
The Dashboard shows the total resources available for a vDC and the amount allocated for different accounts. The committed resources indicate the total resources entitled to all the accounts in the vDC.

For example, if you have 4 physical threads in the vDC and set the vCPU to physical CPU threads ratio to 2, then you have 8 virtual CPUs. You can oversubscribe the

vCPUs and allocate 5 vCPUs to one account and another 5 vCPUs to another account. The total committed resources to all the accounts in the vDC is 10 vCPUs.

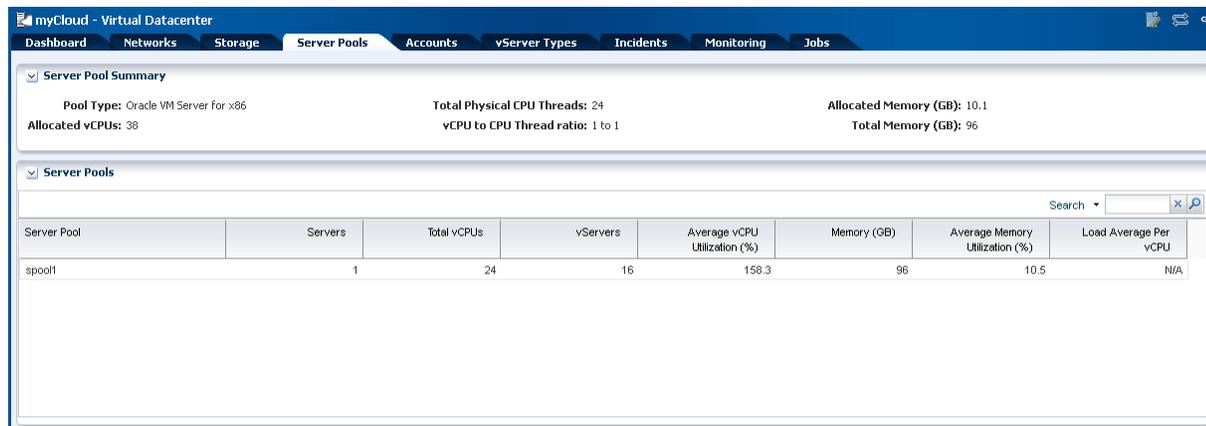
The Network tab displays detailed network usage in the vDC. The page lists the fabric and public networks of the vDC, and all of the private networks created by the cloud user. The fabric on which the private vNets are created are also displayed in this page.

**Figure 8-1 Network Usage in a vDC**



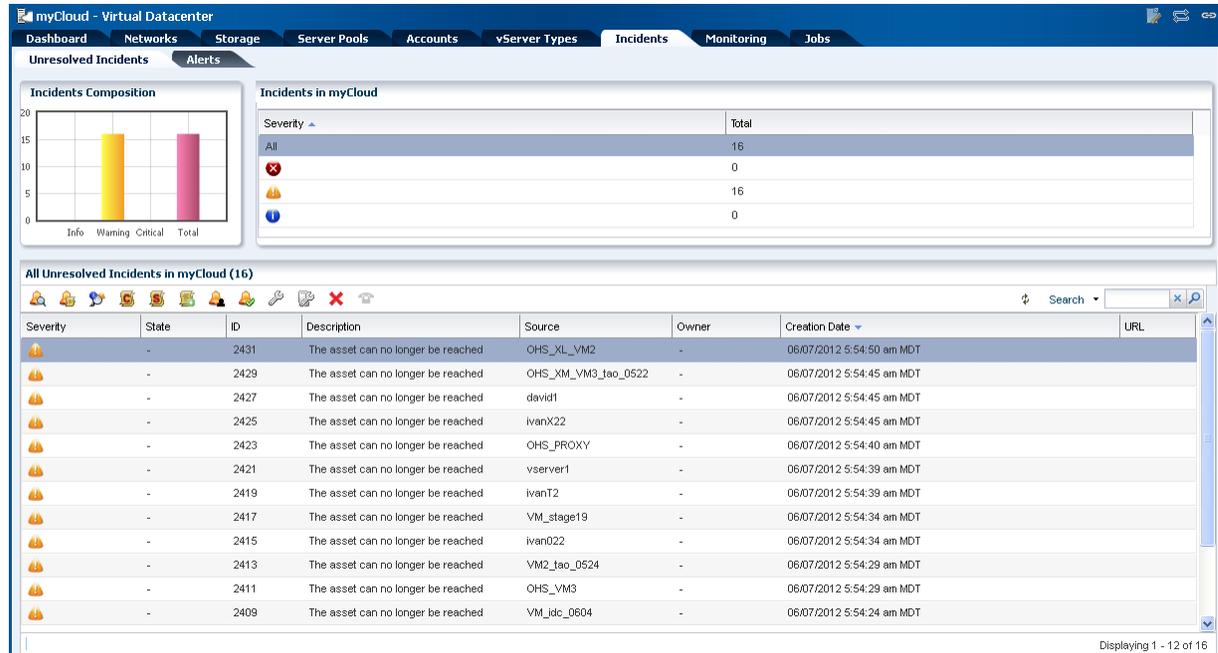
The Server Pools tab shows the usage of the server pool resources. This lists the server pools that are in the vDC. The total and committed resources of vCPU, memory and storage are displayed. This helps you to plan whether you must add more resources to the vDC.

**Figure 8-2 vDC Server Pool Usage**



The Incident tab lists all the incidents reported from all the infrastructure components in the vDC. For each incident, view the source of the incident which helps you to identify the component and the source of the problem. The incidents also covers the warnings issued when the vDC resources are over-utilized.

**Figure 8-3 vDC Incidents Tab**



### 8.8.3 Deleting a Virtual Datacenter

You can use the **Delete Virtual Datacenter** action to delete a virtual datacenter and release all of the resources attached to it. Before deleting a virtual datacenter, you must delete all the accounts in the vDC.

When you delete an account, ensure that you do not have running virtual servers or running jobs creating resources in the account. Once the account is deleted, all of the suspended or shut down vServers are deleted and the resources are released back to the vDC.

## 8.9 Creating and Managing Cloud Users

You can create cloud users and provide access to the accounts so that they can utilize the computing resources allocated to them. The cloud user is associated with an existing user on the OS under the Enterprise Controller. The ways to create this operating system user varies by the type of OS and type of name services, for example, file based, NIS, or LDAP.

Use the following Oracle Solaris OS command for a simple local file based user account.

```
useradd <cloud user name>
passwd <cloud user name>
```

## 8.9.1 Adding and Removing Cloud Users to an Account

You can add cloud users to the account and give them the right to use the resources allocated to an account.

You can add the cloud users when you create an account or using the option **Add Users**.

### 8.9.1.1 Adding a Cloud User

1. Select the account and click **Add Users** in the Actions pane.

The Add Users Wizard is displayed.

2. The lists of available cloud users and cloud users assigned to the account are displayed. Select users you want to assign to the account and move them to the Assigned Users.

Click **Next** to view the summary.

3. View the summary and click **Finish** to add the user to the account.

### 8.9.1.2 Removing a Cloud User

1. Select the account.
2. Select the **Users** tab in the center pane.

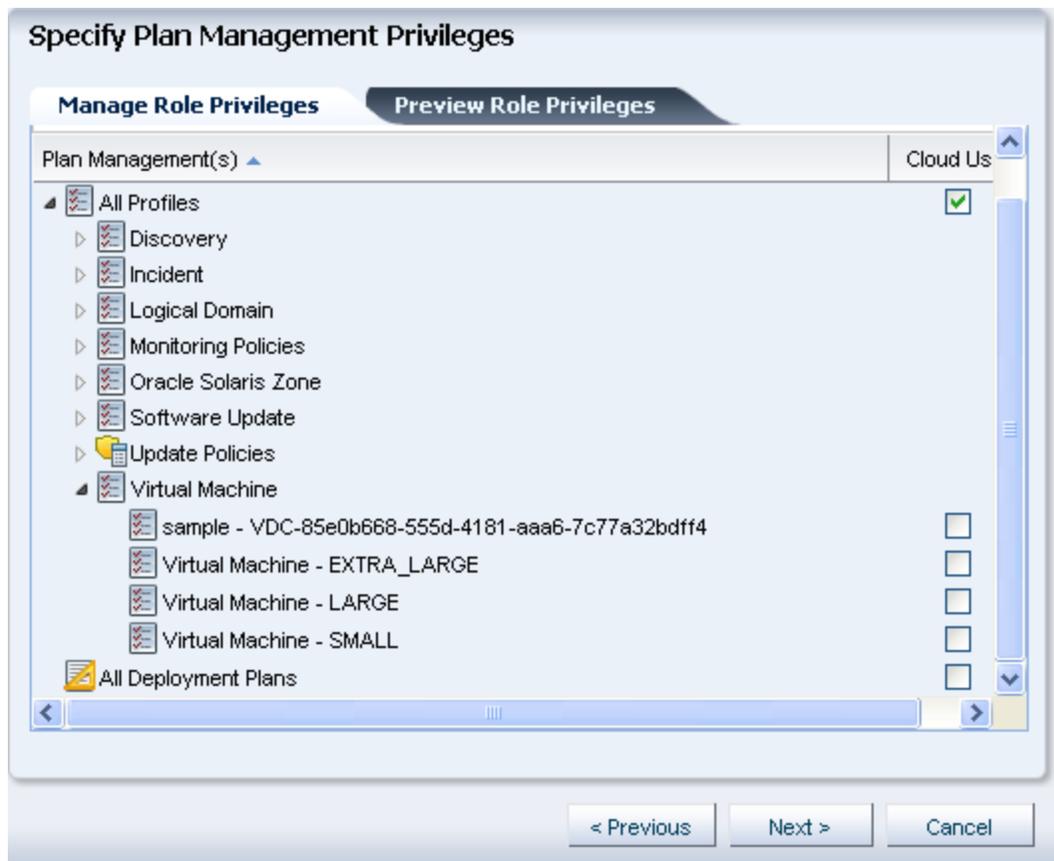
The list of users assigned to the account are displayed.

3. Select the cloud user whom you want to remove.
4. Click the **Delete** icon.
5. Click **Remove** to confirm the action.

## 8.9.2 Managing Roles for Cloud User

By default, the cloud user is provided with default privileges to use all the profiles, plans, and vServer Types available in the selected vDC. Ensure that the cloud user has appropriate privileges to the vServer types. Otherwise, the users cannot create vServers in their environment.

[Figure 8-4](#) shows the step to set the privileges for a cloud user.

**Figure 8-4 Specify Privileges**

## 8.10 Creating Accounts

An account entitles designated cloud users the right to use computing, network, and storage resources of vDC. The account provides the required capabilities to manage these resources.

The prerequisites for creating an account are:

- Estimate the resource quotas to be allocated for the account
- Identify the cloud users to be assigned to the account

The quota for vCPU, memory and storage resources are defined during account creation. The Resource Quota Information display in the account wizard creation indicates how much of the corresponding vDC resources are subscribed. The resource usage indicates whether the vDC resources are oversubscribed or undersubscribed.

You can create a maximum of 4096 private vNets in an account. You can set the limit of number of private vNets that can be created in an account.

During account creation, the public networks that are available in the vDC are listed. You can set the number of public IP addresses allocated to the account from the resource. A cloud user can assign the public IP address to a vServer, as needed.

Assign the cloud users to the account during account creation or separately. Cloud users have access to only specific accounts. As a cloud administrator, you can manage the access of the cloud users to all the accounts.

You provide an entitlement to the virtual resources for an account. You allocate the resources from the vDC to an account. The resource allocation for all the accounts in a vDC can be more than the actual resources in a vDC. This oversubscription of the resources must be identified and planned for a vDC. You must configure the virtual resources for an account properly and update the resource configuration when the requirement increases.

As a cloud administrator watch the resource usage and properly configure the resources for an account.

To create an account:

1. Select the vDC in which you want to create the account.

2. Click **Create Accounts** in the Actions pane.

The Create Account Wizard displays.

3. The first step provides a introduction to accounts and the prerequisites for creating an account.

You can skip this step in the future when you create an account again. Click **Next** to specify identification details for the account.

4. Enter the name and description for the account.

Add tags for categorizing and identifying the account. Click **Next**.

5. Specify the resource quotas for vCPU, memory, and storage for the account.

The available resources from vDC are allocated to the vDC. You can oversubscribe the resources. The Resource Quota Information displays whether the vDC resources are undersubscribed or oversubscribed. This gives a complete picture of the vDC resource usage.

6. Select the number of private vNets a cloud user can create in an account.

The maximum number of private vNets that you can create in an account is 4096.

7. Select the public networks from the list. The list contains all available public networks from the vDC that you can allocate to the account.

For each network, the available number of IP addresses is displayed. Enter the number of IP addresses to be allocated to the account. Click **Next**.

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**Note:**

For vDCs using Oracle VM Server for SPARC as virtualization technology, the list includes the boot networks of the vDC. A boot network must be added to the account for vServer OS deployment.

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8. Select the cloud users who can access the account. You must assign a cloud user while creating the account. Thereafter, use **Add Users** option to add more users.

9. Review the account information and click **Finish** to create the account.

---

## 8.11 Managing Accounts

You have the following options to manage the account configuration in a vDC:

- Update account resource configuration
- Assign cloud users to accounts
- Delete an account

### 8.11.1 Updating Accounts

As a cloud administrator, you can modify the identification, and resources allocated to an account. When you want to allocate more resources to an account, you can modify by selecting an account and click **Update Account** in the Actions pane. Modify the resources and complete the wizard.

You can remove the resources allocated to an account if they are not used by the vServers. Similarly, you can remove unused public networks from an account or reduce the limit of public IP addresses if they are unused by vServers.

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**Note:**

For accounts in vDCs using Oracle VM Server for SPARC as virtualization technology, a boot network must be added to each account. If a boot network is not added to the account, cloud users won't be able to create new vServers.

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### 8.11.2 Managing Account Resources

When an account does not have enough resources, the cloud user receives notifications that they cannot create vServers due to unavailability of resources. Also, when there are no physical resources available from the corresponding vDC, the cloud user cannot create vServers even if the account resources show that they are not fully used up.

For example, assuming that you have 100 GB physical storage allocated to a vDC and an account with 125 GB storage. The vDC storage is oversubscribed. The cloud users create vServers in the account and use the storage. When the storage usage exceeds 100 GB, the cloud user cannot create vServer as the vServer job fails with the message that enough space is not available.

Therefore, the cloud administrator must watch the resource usage and add more resources to the vDC.

### 8.11.3 Maintaining OS Images

For vDCs based on Oracle VM Server for SPARC virtualization technology, you must manage OS provisioning profiles and OS configuration profiles that the cloud user can use for creating server templates to deploy vServers in their environment.

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**Note:**

For handling IPS package dependencies properly, when a server template for Oracle Solaris 11 uses an OS provisioning profile that contains a Solaris 11 update profile for a package, the latest version of the package gets installed regardless of the version selected in the Solaris 11 update profile.

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The Oracle Solaris 10 ISO or FLAR images must be imported in the NAS libraries associated with the server pools placed in the vDCs.

Configure your Oracle Solaris 11 Software Update Library in the Enterprise Controller to synchronize with the Oracle Solaris 11 Package Repository. The cloud user can use all the profiles for Oracle Solaris 11 OS.

Ensure to configure DHCP in your environment so that the cloud user can install Oracle Solaris 10 ISO image.

OS provisioning profiles that are based on Oracle Solaris 10 FLAR images and Oracle Solaris 11 OS, use WAN boot and do not require DHCP configuration.

### 8.11.4 Deleting an Account

Ensure that you do not have running virtual servers or running jobs creating resources in the account. Use the option Delete Account to remove the account. Once the account is deleted, all of the suspended or shut down vServers are deleted and the resources are released back to the vDC.

When there are vServers in running state, the following message is displayed:

**Figure 8-5 Delete Account**



## 8.12 Creating and Managing vServer Types

vServer Type are profiles of virtual machines that defines the computing resources such as virtual CPU, memory, and storage size. A cloud user can use this to implement and create vServers.

**Note:**

For vDCs based on Oracle VM Server for x86, the storage size is not defined in the vServer type. The storage size is defined from the server template of the vServer.

A vServer type created is available for all the accounts in a virtual datacenter.

As a cloud administrator, you can capture the user requirements and create different vServer Types. Cloud users can use this to create vServers. By default, there are three system-defined vServer types that define the computing resources. You can edit or delete these system-defined vServer types.

The three system-defined vServer types provided for all vDCs are:

- Extra Large
- Large
- Small

The vServer type configuration varies depending on the virtualization technology on which the vDC is constructed.

**Figure 8-6 vServer Types**

Name	Description	Memory Size (GB)	Storage Size (GB)	Number of vCPUs	User Defined
EXTRA_LARGE	Solaris Zone extra-large instance ty...	16	24	4	No
LARGE	Solaris Zone large instance type for...	8	16	2	No
SMALL	Solaris Zone small instance type for...	4	12	1	No

For Oracle VM Server for x86 based vDCs, the vServer Type is displayed as shown in [Figure 8-7](#).

**Figure 8-7 vServer Type for Oracle VM Server for x86 based vDCs**

Name	Description	Memory Size (GB)	Number of vCPUs	User Defined
EXTRA_LARGE	Virtual Machine extra-large instanc...	16	4	No
LARGE	Virtual Machine large instance type...	8	2	No
SMALL	Virtual Machine small instance type...	4	1	No

## 8.12.1 Creating a vServer Type

When you create a vServer type, the VM hosting details display the following information in the wizard based on the resources defined:

- The number of virtualization servers in the vDC that have sufficient physical resources to host a vServer with the selected resources.
- An estimation of number of vServers that can be hosted with the total number of physical resources of the vDC.
- A warning when the current value of the memory size exceeds the selected storage size.

1. Select the vDC and click **Create vServer Type** in the Actions pane.

The Create vServer Type Wizard is displayed.

2. Enter the name and description for the vServer type.

Add tags for identification and classification of the vServer type. Click **Next**.

3. Specify the vCPU, memory and storage resources for the vServer type.

As you enter the values, the VM Hosting displays the following information:

- The number of virtualization servers that have sufficient resources in the vDC to host a vServer of this type.
- The number of vServers that the vDC can host with the total number of physical resources of the vDC.

A warning message is displayed when the current memory size is more than the storage size. The existing vServer types are displayed with the configuration details. This helps to avoid creating duplicate vServer types.

For vDCs based on Oracle VM Server for x86, the storage size is not defined in the vServer Type.

Provide the values for the resources and click **Next**.

4. Review the information provided and click **Finish** to create the vServer type.

## 8.12.2 Updating vServer Types

Modify the following details of a vServer type:

- Name and description
- Modify, or add new tags
- Modify the resource configuration

Use the option **Update vServer Type** to launch the Update vServer Type Wizard. Modify the configuration and complete the wizard.

### 8.12.3 Deleting vServer Type

You cannot delete the system-defined vServer types. You can delete only the vServer types that you have created.

## 8.13 Overview of Cloud Users

A cloud user with access to an account is entitled to manage and use computing, network, and storage resources allocated in a vDC within the limits of the account quotas.

Cloud users can create and manage the life cycle of vServers for their applications. Creation and management of vServers involve the setup of virtual resources, the management of virtual resource workloads, and understanding application requirements.

Cloud Users can manage the following virtual resources:

- **Virtual Networks (vNets):** Used to connect and restrict network access of vServers.
- **Server Templates:** Designates the operating system and how it is installed while creating a vServer.
- **Virtual Storage:** Includes volumes that you can attach to vServers, and snapshots to capture the current state of a volume for different purposes.
- **vServers:** An entity that provides the outward interface of a stand-alone operating system. A vServer has its own identity, local storage, interfaces, and configuration that exist for the full lifetime of the vServer.

Availability and management of some virtual resources vary depending on the virtualization technology of the vDC or resource type supported by the vDC.

Oracle Enterprise Manager Ops Center offers to cloud users the option to perform their tasks using its browser interface or through:

- **APIs:** A Web service API and a Java API to programmatically manage the allocated resources in a vDC account for automation or integration purposes.
- **CLI:** To manage allocated resources in a vDC account from a text-based console that can be also used for automation or integration purposes.

The following sections in this guide describe the tasks a cloud user can perform in Oracle Enterprise Manager Ops Center using the UI. For more information about the use of APIs and CLI, refer to the [Related Resources for Virtual Datacenters](#) section.

## 8.14 Roles for Cloud User Tasks

This table lists the tasks and the role required to complete the task. Contact your administrator if you do not have the necessary role or privilege to complete a task.

**Table 8-3 Cloud User Tasks and Roles**

Task	Role
View Account Quotas and Virtual Resources	Cloud User
Create and Manage vServers	Cloud User

**Table 8-3 (Cont.) Cloud User Tasks and Roles**

Task	Role
Create and Manage Virtual Networks	Cloud User
Create and Manage Volumes	Cloud User
Create and Manage Snapshots	Cloud User
Create and Manage Server Templates	Cloud User

## 8.15 Actions Available for a Cloud User

A cloud user can perform different actions to use and manage the allocated resources in a vDC account. This section lists the actions a cloud user can perform for each type of resource and also provides information about the actions that are available for the different vDC account types.

- View account quotas and virtual resources
- Create and manage vServers
- Create and manage virtual networks
- Create and manage volumes
- Create and manage snapshots
- Create and manage server templates

Based on the virtualization technology on which the vDC and its accounts are created, there might be differences in the availability of the options in the cloud user view. The following tables provide a detailed list of options that are available for a cloud user when the vDC is based on different virtualization technology.

### 8.15.1 Account

**Table 8-4 Account Options Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
View account quotas and resources	Yes	Yes	Yes
View account Incidents	Yes	Yes	Yes
View Account Jobs	Yes	Yes	Yes

### 8.15.2 vServers

**Table 8-5 vServers Options Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
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**Table 8-5 (Cont.) vServers Options Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
Create vServer	Yes	Yes	Yes
Stop and start vServer	Yes	Yes	Yes
Pause and Resume vServer	Yes	No	No
Update vServer	Yes	Yes	Yes
Launch Virtual Console	Yes	No	No
Shutdown and Start All vServers	Yes	Yes	Yes
Attach and Detach Volume	Yes	Yes	Yes
Enable and Disable HA	Yes	Yes	Yes
Delete vServer	Yes	Yes	Yes

### 8.15.3 Networks

**Table 8-6 Networks Options Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
Create private vNet	Yes	Yes	Yes
Update private vNet	Yes	Yes	Yes
Delete private vNet	Yes	Yes	Yes
Allocate vIP	Yes	Yes	Yes
Deallocate vIP	Yes	Yes	Yes
View vIPs	Yes	Yes	Yes

### 8.15.4 Volumes and Snapshots

**Table 8-7 Volumes and Snapshot Options Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
Create Volume	Yes	Yes	Yes

**Table 8-7 (Cont.) Volumes and Snapshot Options Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
Create Volume from Snapshot	Yes	No	No
Import Volume	Yes	No	No
Update Volume	Yes	Yes	Yes
Delete Volume	Yes	Yes	Yes
Create Snapshot	Yes	No	No

### 8.15.5 Server Templates

**Table 8-8 Server Templates Option Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
Upload Server Template	Yes	No	No
Create Server Template	No	Yes	No
Update Server Template	Yes	Yes	No
Delete Server Template	Yes	Yes	No
Register and Unregister Server Template	Yes	Yes	No
Save vServer as Template	Yes	No	No

### 8.15.6 Distribution Groups

**Table 8-9 Distribution Groups Options Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
Create Distribution Group	Yes	Yes	No
Update Distribution Group	Yes	Yes	No

**Table 8-9 (Cont.) Distribution Groups Options Availability**

Action	Oracle VM Server for x86 Based vDC	Oracle VM Server for SPARC Based vDC	Oracle Solaris Zones Based vDC
Delete Distribution Group	Yes	Yes	No

## 8.16 Location of Account Quotas and Virtual Resources in the User Interface

Account quotas limit the creation of new virtual resources in the account. A cloud user must be aware of the account quotas and manage the workloads of the virtual resources.

To see the quotas and virtual resources of an account, expand vDC Management in the Navigation pane.

This lists all the accounts to which a cloud user has access under vDC Accounts.

**Figure 8-8 vDC Management**

You can select a listed account to display general account information and quotas in the Dashboard tab of the center pane. The Dashboard tab displays general information about the selected account and a summary of the virtual resources status and usage.

Account resources details appear in the other tabs across the center pane:

- **Networks:** Shows the vNets quotas. Lists and displays information for each private vNet and public network available for the account. Also displays the actions bar for the actions that you can perform for a vNet.
- **Storage:** Shows the storage quotas. Lists and displays information for each vServer root disk, volume, and snapshot available for the account. Also displays the actions bar for the actions that you can perform for a storage resource.
- **vServers:** Shows the CPU quotas. Lists and displays information for each vServer available for the account. Also displays the actions bar for the actions that you can perform for a vServer.

- **Server Templates:** Lists and displays information for each server template available for the account. Also displays the actions bar for the actions that you can perform for a server template.

## 8.17 Creating vServers

A vServer is an entity that provides the outward interface of a stand-alone operating system that consumes CPU, storage, and memory resources. A vServer has its own identity, local storage, interfaces, and configuration that exist for the full lifetime of the vServer.

You determine the creation of new vServers according to the account quota limits and applications requirements.

### 8.17.1 Before You Begin

When creating a vServer, the following account resources are required:

- **A vServer type:** vServer Types are vServer profiles that defines the computing resources such as virtual CPU, memory, and storage size. After memory, storage, and number of vCPUs are defined for the vServer, you can select the best suitable vServer type from those available for the account. vServer types are visible to cloud users during the vServer creation process. Contact your cloud administrator when you require a vServer type.
- **A server template:** Server templates designate the OS and how it is installed while creating a vServer. You can either select a server template from those that exist for the account or create a new server template. Actions to use or create server templates vary based on the virtualization technology used in the vDC. For more information about server templates, see [Creating Server Templates](#).
- **One or more virtual networks:** For the vServer network connectivity you must choose one or more vNets from the available vNets or create new ones before creating a vServer. vServers are only assigned to virtual networks at vServer creation time. For more information about vNets, see [Creating vNets](#).

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**Note:**

For accounts in vDCs using Oracle VM Server for SPARC as virtualization technology, at least a boot network must be assigned to the account. If a boot network is not added to the account, cloud users won't be able to create vServers. Contact your cloud administrator if you receive an error message when creating new vServers.

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Depending on the needs of the user and the virtualization type of the vDC, a cloud user can also specify the following resources:

- **One or more volumes:** Volumes provide additional storage for vServers. You might be requested to attach volumes to vServers at vServers creation time, in that case, volumes must exist before creating the vServers. You can also attach volumes after creating the vServer. For more information about creating volumes, see [Creating Volumes](#).
- **A distribution group:** Distribution groups are only available for vDCs based on Oracle VM Server for SPARC virtualization technology. Distribution group enforces that two vServers are not running in the same Oracle VM Server. If you choose to assign a vServer to a distribution group, the distribution group must

exist before creating the vServer. For more information about distribution group, see [Creating Distribution Groups](#).

Additionally to the resources listed, a cloud user specifies the following values when creating a vServer:

- **IP address assignment method:** You can select from two different methods for IP address assignment to vServers:
  - **Static method:** Used to assign a specific IP address to a vServer. When using this method you must allocate in advance an IP address from the selected virtual networks. You must consider using this method when creating a single vServer at a time.
  - **Automatic method:** This method dynamically assigns an IP address from each selected virtual network. When creating a multiple vServer at a time, only the use of the automatic IP address assignment method is allowed.
- **Number of vServer:** You can create single or multiple vServers at a time. When creating multiple vServers at a time, vServers are created with the same configuration and a suffix is added to each vServer's name. You must also consider the IP address assignment method when defining the number of vServers.
- **High Availability:** When a high availability is enabled, the vServer is available uninterruptedly. The vServer is not shutdown when the backend infrastructure fails and it is migrated to another server and started. When high availability is not enabled, the vServer starts only after the backend infrastructure is available. Cloud administrator takes care of server pool settings to provide high availability feature in a vDC.
- **vServer control mechanism:** You can supply credentials for remote SSH root access to the vServer. An option available as an alternative secure method is to use a public key to authenticate SSH root access to the vServer without the use of a password. This option is available to all cloud users, other options to create local user account or provide password for remote SSH access are also available.

## 8.17.2 Creating a vServer

Oracle Enterprise Manager Ops Center provides a wizard that walks you through a series of steps to collect information and resources to create vServers.

To create a vServer:

1. Expand vDC Management in the Navigation pane.
2. Select the account from the vDC Accounts list.
3. Click **Create vServer** in the Actions pane.

The Create vServer Wizard is displayed.

4. Enter the following information in the **vServer Details** step:
  - Name and description for the vServer.
  - Tags for better identification and classification of the vServer.
  - Number of vServers to create.

- Select the High Availability Support option to enable it for the vServer.

Click **Next** to select a server template.

5. Select a server template from the list.

Click **Next** to select a vServer type.

6. Select a vServer type from the list and click **Next**.

7. (Optional) When the step to select volumes is present, select one or more volumes from the Available Volumes list. Use the arrow keys to move the selected volumes to the Attached Volumes list.

If not required, skip this step as the volumes can also be attached after creating a vServer. Click **Next** to continue.

8. Select one or more vNets from the list.

Click **Next** to select the IP address assignment method.

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**Note:**

For accounts in vDCs using Oracle VM Server for SPARC as virtualization technology, at least a boot network must be assigned to the account. If a boot network is not added to the account, cloud users won't be able to create vServers. Contact your cloud administrator if you receive an error message when creating new vServers.

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9. Select the IP address assignment method for each vNet and click **Next**.

When the static method is selected, choose an IP address from the list.

10. (Optional) When the Distribution Group Selection step is present, select a distribution group from the list if required.

If a distribution group is not required, skip this step. Click **Next** to provide a public key.

11. (Optional) In the vServer Access Control step, you can supply a public key as an alternative to authenticate remote SSH root access to the vServer. By supplying a public key, root user will not be able get remote SSH access without the corresponding private key.

You can choose one of the following options:

- Paste the public key directly into the Public Key text area.
- Click **Browse** to select a local file containing the public key, and then click **Upload Public Key**. The size of the file containing the public key is limited to 2GB.

If not required, skip this step and click **Next**.

12. In the Login Credentials step, provide the following information to authenticate the remote SSH access to the vServer:

- Enter the root password and confirm it.

- For vDCs based on Oracle Solaris Zones or Oracle OVM for SPARC, you can enter a local user name.
- For vDCs based on Oracle Solaris Zones or Oracle OVM for SPARC, you can enter a local user name password and confirm it.

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**Note:**

If the Password Required option is enabled for the vDC, you must specify a root password, with or without an SSH key. Additionally to the root password, you might require to specify either an SSH key or a remote user credentials when creating vServers using Oracle Solaris 11 OS.

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You can also skip this step and click **Next** to view the summary if the vDC is configured to allow the creation of vServer without setting credentials.

13. Confirm the vServer information provided in the Summary and click **Finish** to launch the job to create the vServer.

After the job completes, the vServer is created and listed in the Navigation pane. By default, the DNS and other naming information is taken from the selected vNet or server template and added in the `/etc/resolv.conf` file of the vServer.

If the job fails, you can look at the job details to identify the issue. Once the issue is solved, open the Create vServer wizard to try again. Re-running an existing job for creating vServers is not supported.

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**Note:** If a zone vServer creation job fails, the non-global zones created by the job are deleted.

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## 8.18 Managing vServers

After creating a vServer, you can manage the vServer life cycle by executing the available actions for vServer management.

To locate all the actions available for managing a vServer:

1. Expand vDC Management in the Navigation pane.
2. Select the account from the vDC Accounts list.
3. Select the vServer tab in the center pane.
4. You can then select a vServer from the vServers list displayed in the center pane and then choose one of the actions displayed.

**Figure 8-9 vServer Management Options**

Name	Description	OS	Memory Size (GB)	Storage Size (GB)	v...	Created by	Creation Date	St...
diskTestOC	Type: wls CatalogId: ...		4.0	5.3	1	rachidovab	Mon Oct 08 20...	

Cloud users can perform the following actions to manage a vServer life cycle. The availability of some actions depends on the cloud infrastructure. See [Actions Available for a Cloud User](#) for available actions under different cloud infrastructure:

- **Update a vServer:** To modify the current name, description, memory size, or number of vCPUs of a vServer. The Update vServer action also allows the creation or deletion of vServer tags.
- **Stop a vServer:** To stop a running vServer. When a vServer is stopped, the guest operating system is shutdown. A stopped vServer can be started later.
- **Start a vServer:** To start a stopped or shutdown vServer. The restarted vServer might not get the same IP address as the original vServer.
- **Pause a vServer:** To suspend a running vServer. This action is only available for vDCs based on Oracle VM Server for x86.
- **Resume vServer:** To start a suspended vServer. This action is only available for vDCs based on Oracle VM Server for x86.
- **Shutdown all vServers:** To shutdown all vServers listed for an account. This action is only available in the Actions pane.
- **Start all vServers:** To start all vServers listed for an account. This action is only available in the Actions pane.
- **Attach vServer volumes:** To attach one or more new volumes to a vServer. You do not need to stop the vServer to attach volumes.
- **Detach vServer volumes:** To detach one or more volumes from a vServer. You do not need to stop the vServer to detach volumes.
- **Enable HA:** To enable high availability of the vServer. This ensures that the vServer is migrated and restarted on another Oracle VM Server when the current Oracle VM Server fails.
- **Disable HA:** To disable high availability of the vServer. If the Oracle VM Server fails, the vServer is shut down and restarted when the Oracle VM Server becomes available.
- **Save vServer as Template:** To save the vServer as a server template and use for new vServer creation. This action is only available for vDCs based on Oracle VM Server for x86.
- **Delete a vServer:** To delete a vServer from a vDC account. Deleting a vServer results in shutting down the vServer followed by the deletion of the vServer.

## 8.19 Creating Server Templates

Server templates designate the operating system and how it is installed while creating a vServer. Server templates are specific to processor architecture of the server pool and virtualization type and can be pre-built images or identifies the OS distribution.

Server templates are loaded into the storage libraries associated with the vDC and cannot be changed later. By default, a server template is bound to a specific account.

The proper server template must exist before creating vServers. Depending on the virtualization type of the vDC account, cloud users can have the following options:

- Use a default server template provided by the system for creating vServers. This is available only for Zones based cloud infrastructure.
- Upload a new server template to be used for creating vServers. This is available only for Oracle VM Server for x86 based cloud infrastructure.
- Create a new server template for installing vServers. This is available only for Oracle VM Server for SPARC based cloud infrastructure.
- Save a server template from an existing vServer to be used for creating vServers, see [Managing vServers](#).

### 8.19.1 Uploading Server Templates

To upload a server template, you can choose from two different server templates subtypes:

- **Template:** Single virtual machine template that is ready to be deployed into virtualized platforms. Templates can be of format `.tar` or other file types. This option allows you to upload a multi-file template that is stored as a single server template for the account.
- **Assembly:** Collection of interrelated software appliances that can include a configuration of multiple virtual machines with their virtual disks and their inter connectivity. An assembly is contained in a single `.ova` (Open Virtualization Format Archive) file. When uploading an assembly, you can also create snapshots when registering an `.ova` file with shared virtual disks. Those snapshots are tagged with the template ID and the assembly ID.

Either select the server templates stored in the local host machines or from other locations that you can access. Use FTP, HTTP, or HTTPS protocols to upload the server templates from other locations.

Before uploading a server template, you must:

- Decide on a suitable server template subtype.
- Make sure the file for the server template is of the correct format.
- Check whether the file is accessible when uploading the server template from a file in other location.

1. Expand vDC Management in the Navigation pane.
2. Select the account from the vDC Accounts list.
3. Click **Upload Server Template** in the Actions pane.

The Upload Server Template Wizard is displayed.

4. Enter the following information in the Identify Server Template step:
  - Name and description for the server template.
  - Tags for better identification and classification of the server template.  
Click **Next** to specify server template details.
5. Choose a server template subtype.

6. Choose an option to upload the server template file.

When the URL option is selected, enter the complete URL. When using the subtype template, you can also specify multiple URLs when uploading a multi-file template.

Click **Next** to view the summary.

7. Confirm the server template information and click **Finish** to create the server template.

## 8.19.2 Creating a Server Template

The option to create a server template is available only when the vDC is built on Oracle VM Server for SPARC virtualization technology. The server templates define the OS installation media and version to be used during vServer creation.

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**Note:**

Server templates created in version 12.1 are not usable in 12.2. After upgrading from Oracle Enterprise Manager Ops Center version 12.1 to 12.2, you must create new server templates to create new vServers in Oracle VM Server for SPARC vDCs created in a 12.1 version.

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You can create server templates from existing OS provisioning profiles and OS configuration profiles. The list of profiles is filtered to display only the distribution which are available to vDC. If a required profile is not available, contact your cloud administrator for required OS provisioning profiles to install your vServers. The OS provisioning and configuration profiles are created when importing an Oracle Solaris OS image or when configuring the Oracle Solaris 11 Software Update Library in Oracle Enterprise Manager Ops Center.

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**Note:**

For handling IPS package dependencies properly, when a server template for Oracle Solaris 11 uses an OS provisioning profile that contains a Solaris 11 update profile for a package, the latest version of the package gets installed regardless of the version selected in the Solaris 11 update profile.

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1. Select the account in the vDC Management section.
2. Click **Create Server Template** in the Actions pane.

The Create Server Template Wizard is displayed.

3. Skip the introduction and click **Next**.
4. Enter the name and description for the server template.  
If required, enter tags for easy classification and categorization.  
Click **Next**.
5. Select a profile that provisions Oracle Solaris OS, then click **Next**.

You can install Oracle Solaris 10 or Oracle Solaris 11 OS on the vServer.

6. Select an OS configuration profile from the list, then click **Next**.

The OS configuration profile collects information about control domain parameters and network configuration.

7. Review the information and click **Finish** to create the server template.

The new template is created and available to create vServers.

## 8.20 Managing Server Templates

Perform the following actions for server templates management:

- **Update Server Template:** To modify the name or description of a server template. This action also allows the creation or deletion of server template tags.
- **Register Server Template:** To register a server template for public use. Registering a server template make the server template available to other accounts in the vDC.
- **Unregister Server Template:** To unregister a server template is accessible for public use. Unregistering a server template make the server template available to only to the vDC account from which the server template was created.
- **Delete Server Template:** To delete a registered or unregistered server template. You can only delete a registered server template from the account where the server template was originally created. Deletion of a server template does not influence a vServer that was created based on the server template. Deleting a server template that was created based on an assembly causes the deletion of all snapshots associated with that template.

These options are disabled when the vDC is built on Zones virtualization technology.

## 8.21 Creating vNets

vServers are bound to one or more vNets to restrict network connectivity. The different types of vNets that a cloud user can use are:

- **Public networks:** Created by cloud administrators. Cloud users cannot create, update, or delete this type of vNet. Cloud administrators can also share this type of vNet among a number of accounts in a vDC. vServers that are members of public vNets have also external communication beyond vDCs. You can also use the vServer to host public services.
- **Private vNets:** Created by cloud users according to their requirements and within the limits of the account quota. A private vNet is created based on the private network from the network domain of the vDC. Private vNets are only accessible within an account. All vServers that have membership to a private vNet in common can communicate freely through that subnet.

Cloud users define which vNets are associated with a vServer. You can specify the membership of a vServer to one or more vNets when you create a vServer. Once a vNet is associated with a vServer, the association persists until the vServer is deleted.

A cloud user can release a reserved IP address that is not allocated to a vServer. Allocated IP addresses are only released when the vServer is deleted.

Cloud users can create private vNets. To create a private vNet, you must:

- Plan vServers connectivity.

- Define the number of vServer that can be part of a private vNet.

Private vNet is a private virtual network set up exclusively for an account. The vServers associated with this vNet have private virtual IP address for internal communication.

To create a private vNet:

1. Expand vDC Management in the Navigation pane.
2. Select the account from the vDC Accounts list.
3. Click **Create Private vNet** in the Actions pane.

The Create Private vNet Wizard is displayed.

4. Enter the following information in the Private vNet Details step:

- Name and description for the private vNet.
- Tags for better identification and classification of the private vNet.

Click **Next** to configure the private vNet.

5. Select the number of elements for the private vNet.

This is the maximum number of vServers that can be part of this vNet. Use the slide bar to set the value. The values entered are rounded to the next value of 1, 5, 13, 29, 61, 125, 253, 509, 1021, 2045, 4093, and 8189.

Click **Next** to view the summary.

6. Confirm the private vNet information and click **Finish** to create the private vNet.

## 8.22 Managing vNets

Virtual network management involves the necessary actions to connect and restrict network access to vServers. After a vNet is created, cloud users can perform the following actions for virtual networks management:

- **Allocate vIP:** To allocate one or more IP addresses from a private or public vNet. IP addresses are dynamically allocated from those available IP addresses that have not been assigned to a vServer or allocated previously. You can use allocated vIP addresses for static assignment to vServers.
- **Deallocate vIP:** To release an IP address that was previously allocated from a public or private vNet. IP addresses assigned to a vServer are not listed and they cannot be deallocated. Once an IP address is deallocated, the IP address is available to the account.
- **Update a Private vNet:** To modify the name or description of a private vNet. This action also allows the creation or deletion of vNet tags.
- **Delete Private vNets:** To delete a private vNet. You cannot delete vNets associated with a vServer.
- **Connect vNet:** To connect a vNet to a server pool.
- **View Reserved IP Addresses:** To see a complete list of the reserved IP addresses for a public or private vNet. Lists all IP addresses of the vNet, the list includes allocated and not allocated IP addresses.

- **View Allocated IP Addresses:** To see a complete list of the allocated IP addresses from a public or private vNet. This option lists all allocated IP addresses, regardless of whether they are assigned to a vServer.
- **View Used IP Addresses:** To see the list of IP addresses that are in use in the public or private vNet. The list includes the IP addresses that are used by the vServers in that account.
- **View Blacklisted IP Addresses:** To see the list of IP addresses that have been blacklisted. You can add one or more IP addresses to the blacklist to save them for a specific purpose, or remove them from the blacklist to make them available.
- **Blacklist vIP:** To add one or more vIP addresses to the blacklist.
- **Clear Blacklisted vIP:** To remove one or more vIP addresses from the blacklist.

## 8.23 Creating Volumes

A volume is a virtual block storage device that you can attach or detach from vServers. Volumes are bound to an account. Storage space for volumes is limited by the account's quota.

You can attach one or more volumes to a vServer at vServer creation time or at a later time.

To create a volume, you can:

- Create a new empty volume specifying only the size.
- Create a volume from a snapshot. A volume created from a snapshot can be empty or not. The size of the volume is defined by the snapshot. Availability of this action depends of the virtualization type of the vDC account. The action might be disabled for some cloud users.
- Import volume from another location. Volumes must be contained in a file of the format `.img`. Volume files must be accessible by the Enterprise Controller, using HTTP, HTTPS or FTP protocols. The action is available only when the vDC is built on Oracle VM Server for x86 based virtualization technology.

Volumes can be shared at volume's creation time. When a volume is shared, the volume is available for all the cloud users of the account.

### 8.23.1 Before You Begin

Before creating a volume a cloud user must:

- Verify the storage space available for the account and plan accordingly.
- Decide for a suitable option to create the volume.

When importing a volume, check for file accessibility and format.

- Define whether the volume must be shared.

You can create or import volumes. The procedures to create and import volumes are described in this section.

### 8.23.2 Creating an Empty Volume

1. Expand **vDC Management** in the Navigation pane.

2. Select the account from the vDC Accounts list.
3. Click **Create Volume** in the Actions pane.  
The Create Volume Wizard is displayed.
4. Enter the following information in the Volume Details step:
  - Name and description for the volume.
  - Tags for better identification and classification of the volume.Click **Next** to configure the volume.
5. Check the **Shared** option if required.
6. Enter the size of the volume.  
Click **Next** to view the summary.
7. Confirm the volume information and click **Finish** to create the volume.

### 8.23.3 Creating a Volume from a Snapshot

Creating a volume from a snapshot is only available for vDCs based on Oracle VM Server for x86. To create a volume from a snapshot:

1. Expand **vDC Management** in the Navigation pane.
2. Select the account from the vDC Accounts list.
3. Select the **Storage** tab in the center pane.
4. Select the **Snapshot** sub tab in the center pane.
5. Select a snapshot for the Snapshots list.
6. Click the **Create Volume from Snapshot** action.  
The Create Volume From Snapshot Wizard is displayed.
7. Enter the following information in the Volume Details step:
  - Name and description for the volume.
  - Tags for better identification and classification of the volume.
8. Check the **Shared** option if required.
9. Click **Create** to create the volume.

### 8.23.4 Importing a Volume

Importing a volume is only available for vDCs based on Oracle VM Server for x86. To import a volume:

1. Expand vDC Management in the Navigation pane.
2. Select the account from the vDC Accounts list.
3. Click **Import Volume** in the Action action.

The Import Volume Wizard is displayed.

4. Enter the following information in the Volume Details step:
  - Name and description for the volume.
  - Tags for better identification and classification of the volume.
5. Enter the URL in which the external volume resides.
6. Check the **Shared** option if required.
7. Click **Import** to import the volume.

## 8.24 Managing Volumes

After a volume is created, perform the following actions for volume management.

- **Update Volume:** To modify the name or description of a volume. The action also allows the creation or deletion of volume tags.
- **Delete Volume:** To delete a volume from a vDC account. Only volumes that are not currently attached to a vServer can be deleted. Deleting a volume results in releasing storage space. The process of deletion of a volume does not influence a snapshot that has been created previously based on that volume.

## 8.25 Creating Snapshots

A snapshot is an image of a volume at a given time. A snapshot captures the current state of the volume and is immutable.

You can create snapshots for the following purposes:

- Backup of data stored on a volume
- Creation of new volumes based on a snapshot.

Snapshots availability and management are possible only when supported by the storage of the vDC and for vDCs based on Oracle VM Server for x86. Contact a cloud administrator for verification.

You can create a snapshot from:

- An existing volume.
- Uploading an assembly. See [Creating Server Templates](#).

In an assembly's template, there are four types of exposed disks. Three of them are presented to cloud users as snapshots, this allows cloud users to optionally create a shared volume from the snapshot. The types of disk created as snapshots are:

- **Public Populated:** Extra disk with present data
- **Private Raw:** Dynamically created as empty disk, no disk data, just a size
- **Shared Raw:** Dynamically created as empty disk, no disk data, just a size

You can create a volume from a snapshot and attach those volumes to vServers.

### 8.25.1 Before You Begin

Before creating a volume, you must:

- Verify the storage space available for the account and plan accordingly.
- Decide for a suitable option to create the snapshot: from a volume or from an assembly.

### 8.25.2 To Create a Snapshot from Volume

You can create a snapshot from a volume.

1. Expand vDC Management in the Navigation pane.
2. Select the account from the vDC Accounts list.
3. Click **Create Snapshot** in the Actions pane.

The Create Snapshot Wizard is displayed.

4. Enter the following information in the Snapshot Details step:
  - Name and description for the snapshot.
  - Tags for better identification and classification of the snapshot.

Click **Next** to select a volume.

5. Select a volume from the list.

Click **Next** to view the summary.

6. Confirm the snapshot information and click **Finish**.

## 8.26 Managing Snapshots

Perform the following actions for storage management:

- **Update Snapshot:** To modify the name or description of a snapshot. The action also allows the creation or deletion of snapshot tags.
- **Create Volume from a Snapshot:** To create a volume base on a snapshot, see [Creating Volumes](#)
- **Delete Snapshot:** To delete a snapshot from a vDC account. Deleting a snapshot does not affect volumes, snapshots exist independently of the volume.

## 8.27 Creating Distribution Groups

Distribution groups are necessary for properties similar to anti-affinity scaling. Distribution groups are available for vDCs based on Oracle VM Server for SPARC virtualization technology. The action to create a distribution group might be disabled to some cloud users.

A distribution group is bound to a specific account. You can assign a vServer to a distribution group only when you create the vServer.

You can create a distribution group and define its size. The size of the distribution group represents the minimum amount of anti-affinity desired for running vServers in the distribution group.

Distribution group rules are applied every time a vServer assigned to a distribution group is created or started. Distribution group rules enforce the following behavior for vServers assigned to a specific distribution group:

- When the number of running vServers in the distribution group does not exceed the size of the distribution group, then all running vServers are distributed in a separate server of the vDC. If a spare server is not available in the vDC, then the create or start task fails.
- When the number of running vServers in the distribution group exceeds the size of the distribution group, then running vServers are distributed in the servers of the vDC according to the normal account resources capacities.

At all times, distribution rules satisfy one of the following conditions for vServers assigned to a specific distribution group:

- If the number of running vServers in the distribution group exceeds the size of the distribution group, then the total number of servers in the vDC hosting running vServers is greater or equal to the distribution group size.
- If the number of running vServers in the distribution group does not exceed the size of the distribution group, then the number of servers in the vDC hosting running vServers is greater or equal to the total of vServers of the distribution group in running status.

If the distribution group rules are broken, then an alert is generated and it is displayed on the account and vDC level incidents report. Events that can break the distribution group rules are stopping, deleting, or migrating a vServer.

Before creating a distribution group, you must:

- Be aware of the size limit for creating a distribution groups. Contact a cloud administrator to verify it.
- Plan the creation and vServers distribution for the distribution groups.

### 8.27.1 Creating a Distribution Group

1. Expand **vDC Management** in the Navigation pane.
2. Select the account from the vDC Accounts list.
3. Click **Create Distribution Group** in the Actions pane.

The Create Distribution Group Wizard is displayed.

4. Enter the following information in the Distribution Group Details step:

- Name and description for the distribution group.
- Tags for better identification and classification of the distribution group.

Click **Next** to configure the distribution group.

5. Define the size of the distribution group.

Click **Next** to view the summary.

6. Confirm the distribution group information and click **Finish**.

## 8.28 Managing Distribution Groups

Perform the following actions for distribution groups management:

- **Update a distribution group:** To modify the name or description of a distribution group. The action also allows the creation or deletion of distribution group tags.
- Delete a distribution group.

If the distribution group rule is broken, then an alert is generated and displayed on the account and vDC level incidents report. The vServer that has violated the distribution group rule must be restarted. When a vServer is started, the accounts resources and distribution group rules are checked to place the vServer.

## 8.29 Related Resources for Virtual Datacenters

For instructions in performing actions or to learn more about the role of this feature, go to one of the following resources:

- [Storage Libraries for Virtualization](#)
- [Networks for Virtualization](#)
- [Oracle Solaris Zones](#)
- [Oracle VM Server for x86](#)
- [Server Pools](#)

See the *Oracle Enterprise Manager Ops Center Administration Guide* for more information about managing users and roles.

See the Software Libraries chapter of the *Oracle Enterprise Manager Ops Center Configure Reference* for more information about maintaining OS images.

See the *Oracle Enterprise Manager Ops Center Cloud Infrastructure API and CLI Reference Guide* for more information about using Cloud Web Service and Cloud Infrastructure API and CLI.

If you want to manage virtual datacenters on engineered systems such as Oracle SuperCluster, see the *Oracle Enterprise Manager Ops Center Operations for Oracle SuperCluster Reference*.

For end-to-end examples, see the workflows and how to documentation in the library. For deployment tasks, go to [http://docs.oracle.com/cd/E59957\\_01/nav/deploy.htm](http://docs.oracle.com/cd/E59957_01/nav/deploy.htm) and for operate tasks go to [http://docs.oracle.com/cd/E59957\\_01/nav/operate.htm](http://docs.oracle.com/cd/E59957_01/nav/operate.htm).

For current discussions, see the product blog at <https://blogs.oracle.com/opscenter>.

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# Glossary

## account

An account entitles designated cloud users the right to use computing, network, and storage resources of vDC. The account provides the required capabilities to manage these resources. Account defines the amount of vCPU, memory and storage resources that can be used from the available vDC resources.

## actions pane

The Actions pane is used to start jobs based on the current selection in the Navigation pane. Selections in the Navigation pane or center pane change the display of operations in the Actions pane. The Actions pane is subdivided into four sections – Operate, Organize, Deploy, and Update.

## active

Reflects the state of system and indicates whether monitoring is actually being performed. The active state is not editable. When a rule is not enabled, monitoring is not active. The status is displayed on the Alert Monitoring Rules page, which is accessed from the Monitoring tab. Text in the Active field indicates whether the parameter is active.

## activate

Changes an inactive Oracle Solaris boot environment to the new default boot environment on reboot.

## Agent Controller

The Agent Controller software communicates with the Enterprise Controller and is installed automatically when an asset is discovered to make the asset a managed asset. You can choose to manage resources remotely with proxy resources without putting an agent on the system. Some features of the product don't work without the agent, but discovery manages the assets without putting an agent on them.

## agentless

A system that is managed with Oracle Enterprise Manager Ops Center without the Agent Controller software being installed.

## alert monitor

Monitors the state of managed resources and their attributes and raise an alert when the state is outside the pre-defined thresholds.

## Alternate Boot Environment

An alternate boot environment, or ABE, is an inactive Oracle Solaris boot environment.

## annotations

Annotations are scripts or comments that you can associate with a incident. Annotations can be automated operations to solve a incident, a suggested action, or a comment. You can associate an annotation with a specific incident. Annotations can be added to the Incidents Knowledge Base.

## assemblies

Assemblies are kind of infrastructure templates that contain 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.

## assets

Assets are physical or virtual piece of hardware, storage device, or operating system that you can manage with Oracle Enterprise Manager Ops Center.

## audit log

An audit log file stores details about user log ins, changes to user accounts, and job details. It shows the activity on the Enterprise Controller and the Proxy Controller.

## Auto-Balancing Policy

An auto-balancing policy determines if, and how, a server pool is automatically load balanced. By default, automatic balancing is not selected. When you designate the server pool for automatic balancing, the software reviews the load on the virtualization hosts for the interval and day that you request. The software then migrates the guests, as needed, to balance the load. You can require administrator approval before the guests are moved. Also see placement policy and policy.

## bandwidth flow

Bandwidth flow is the speed of a connection, or the amount of data that flows from a site's server out to the viewer at any given time.

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## Baseline

A dated collection of Oracle Solaris patches, patch metadata, and tools. Oracle releases Solaris baselines on a monthly basis. You can use the black lists and the white lists to modify a baseline and create a custom patch set.

## baseline check

Baseline check is a feature of Oracle Enterprise Manager Ops Center Engineered Systems where the factory setup of eighth, quarter, half, and full rack configurations are considered as a normal or ideal setup. When the assets are discovered and associated with the rack, this setup is compared with the normal factory setup.

## black list

A list of Oracle Solaris operating system patch IDs that you never want to apply to an asset. The black list is used when you are using a baseline to update an Oracle Solaris operating system.

See also [white list](#).

## block storage

A block storage library consists of LUNs (Logical Unit Number). Each LUN is a slice of a storage volume, which is storage space provided by a collection of disks.

## Boolean Control Parameter

A monitoring rule that uses a true-false check.

## Boot Environment

A collection of mandatory file systems (disk slices and mount points) that are critical to the operation of the Oracle Solaris operating system. These disk slices can be on the same disk or distributed across multiple disks.

## branded zone

Zones that are capable of emulating user environments from operating systems other than Oracle Solaris 10. Zones supports different versions of Oracle Solaris operating system in the zones for running applications.

## category

For Oracle Enterprise Manager Ops Center's Local Content, a category is the type of software that is uploaded to Oracle Enterprise Manager Ops Center for use at a site. The parent category is one of the types defined in Oracle Enterprise Manager Ops Center. The local category is a category defined for the site, for example a script for a quarterly inventory.

## channel

An operating system distribution, such as Oracle Solaris 10 5/09 on x86 platform or Oracle Linux 5.5. A channel is also called a distribution.

## Cloud

A cloud is a set of physical resources that can be divided and allocated to multiple users who can in turn create and use virtual resources as needed without impact to or awareness of the other users' resources. A cloud is implemented as a pool of servers sharing the same virtualization type, storage, networks and fabrics.

## cluster heartbeat

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-active packets and these packets are used to determine if each Oracle VM Server is active.

## connected mode

This is the default connection mode for Oracle Enterprise Manager Ops Center. With this mode, patch data is regularly downloaded from Knowledge Base through an Internet connection.

## Control Domain

A domain that is created when Oracle VM Server for SPARC software is installed. The control domain contains the software packages for Oracle VM Server, including the domains manager application and the domains manager daemon (ldmd) process required for managing the logical domains. The interface to the hypervisor is through the domains manager. The control domain enables you to create, and manage logical domains and allocate virtual resources to the domains.

## critical file system

File systems that are required by the Oracle Solaris operating system. When you use Solaris Live Upgrade, these file systems are separate mount points in the `vfstab` file of the active and inactive boot environments. Example file systems are `root`, `/usr`, `/var`, and `/opt`. These file systems are copied from the source to the inactive boot environment.

## Dashboard

Displays a high-level overview of an asset or a group of assets on the user interface. The information of the selected asset or group is displayed in the Center Pane.

## Deployment Plans

Defines the sequence of steps that must be carried out on an asset to deploy. Deployment plans also include the specification or profile that each step should apply, and the resources that are required to apply it such as network addresses, host names and so on. Customized deployment plan enables you to perform hardware, firmware and operating system provisioning activities in a repeatable fashion.

## disconnected mode

This is the alternate connection mode for Oracle Enterprise Manager Ops Center. Instead of relying on an Internet connection for updates, patch data is acquired using the harvester script and moved to the Enterprise Controller.

## discovery

This is the method for adding assets to Oracle Enterprise Manager Ops Center. Assets can be discovered using a variety of protocols, by their service tags, or by declaring hardware so that it can be configured and provisioned with an operating system.

## distribution

For an operating system, a distribution is a specialized version of the operating system.

## Domain Name Service (DNS)

DNS is a network protocol that issues IP addresses within a specified range to devices on the network.

## Dynamic System Domains

In M-Series servers, you can partition the available hardware resources into smaller logical systems called as dynamic system domains. Dynamic System Domains run their own copies of the operating system and offer a very high level of isolation from other domains in the system because the partitioning occurs at the hardware level.

## Dynamic Storage Library

When the block storage library uses LUNs constructed from a storage array that is a managed asset, the block storage library is dynamic. You can add storage capacity as needed by adding LUNs supplied by the storage array.

When the block storage library relies on a storage array that is not a managed asset, the block storage library is static. Because Oracle Enterprise Manager Ops Center has less information about the storage array, you cannot increase the number of LUNs in the storage library.

## enabled

A monitoring rule that is enabled is actively monitoring a parameter. By default, all rules are enabled. Users can disable and enable parameters on a per asset or group basis. The status is displayed on the Alert Monitoring Rules page, which is accessed from the Monitoring tab. Text in the Enabled field indicates whether the parameter is enabled.

## Enterprise Controller

This is the central server for Oracle Enterprise Manager Ops Center software. The Enterprise Controller hosts the user interface and communicates with the Knowledge Base. Enterprise Controller stores management information, such as firmware and operating system images, plans, profiles, and policies and also stores the asset data

and site customizations. All operations, or jobs, are initiated from the Enterprise Controller.

## Enumerated Control Parameter

A monitoring rule that uses a series of values.

## Exclusive IP Mode

A dedicated network interface is allocated to the zone. You can choose the network interface when you assign the network to a zone.

## Expression Parameter

A monitoring rule that uses an instruction to execute something that returns a value.

## /etc Directory

The directory that contains critical system configuration files and maintenance commands.

## /etc/netboot Directory

The directory on a WANboot server that contains the client configuration information and security data that are required for a WANboot installation.

## /export File System

A file system on an operating system server that is shared with other systems on a network. For example, the /export file system can contain the root ( / ) file system and swap space for diskless clients and the home directories for users on the network. Diskless clients rely on the /export file system on an operating system server to boot and run.

## Fabrics

Fabrics are network topologies where network nodes connect with each other through one or more network switches. A true fabric provides a direct connection between any two ports, and supports single step/lookup-based processing. Regardless of its various components, a fabric appears on the outside as a single, logical device with a single, consistent state.

The term is popular in telecommunication, Fibre Channel storage area networks, and other high-speed networks, including InfiniBand.

## Filesystem Storage

A software or storage library that relies on a file system on the Enterprise Controller's system or a shared file system on an NFS server that the Enterprise Controller mounts.

## global zone

In Oracle Solaris Zones, the global zone is both the default zone for the system and the zone used for system-wide administrative control. The global zone is the only zone from which a non-global zone can be configured, installed, managed, or uninstalled.

Administration of the system infrastructure, such as physical devices, routing, or dynamic reconfiguration (DR), is only possible in the global zone. Appropriately privileged processes running in the global zone can access objects associated with other zones.

## **group**

A group is a user-defined set of assets. Assets can be added to groups based on asset attributes such as type or location. A group can include other groups. Assets can be manually added in addition to the rules based addition using attributes. Any type of asset that can be in a group can be added manually to any user-defined asset group.

## **guest**

Guest refers to a virtual machine that is configured and installed in a virtualization host. For example, the logical domains in an Oracle VM Server host are referred to as guests in a server pool.

## **Guest Domain**

A guest domain is a non-I/O domain that consumes virtual device services that are provided by one or more service domains. A guest domain does not have any physical I/O devices, but only has virtual I/O devices, such as virtual disks and virtual network interfaces.

## **GUID**

Globally Unique Identifier. A pseudo-random 128-bit number that is computed by Windows to identify any component in the computer that requires a unique number. In Oracle Enterprise Manager Ops Center, GUIDs are used to identify LUNs.

## **Hardware Virtualization (HVM)**

Hardware virtualization is a technology that is used to create multiple virtual systems on a single piece of physical hardware. When you create a hardware virtualized (HVM) guest, you must supply an ISO file in a repository to create the virtual machine.

## **Hardware Virtualized with Paravirtualized Drivers (PVHVM)**

PVHVM is identical to HVM, but has additional paravirtualized drivers for improved performance of the virtual machine. PVHVM improves the performance level of Microsoft Windows running in guests.

## **host name**

The name by which a system is known to other systems on a network. This name must be unique among all the systems within a particular domain (usually, this means within any single organization). A host name can be any combination of letters, numbers, and dashes ( - ), but it cannot begin or end with a dash.

## hypervisor

A hypervisor is the software that enables multiple virtual machines to be multiplexed on a single physical machine. The hypervisor code runs at a higher privilege level than the supervisor code of its guest operating systems to manage use of the underlying hardware resources by multiple supervisor kernels.

## Image Packaging System (IPS)

Image Packaging System is an Oracle Solaris 11 package that contains operating system components and a manifest that provides basic metadata.

## incident

An event that triggers an alert when a monitored attribute does not meet the monitoring parameters. A new incident is displayed in the Unassigned Incidents queue in the Message Center. From the Message Center you can view and act on incidents.

## Incident Knowledge Base

A custom database of annotations that are associated with known incidents.

## InfiniBand

InfiniBand is a switched fabric communications link primarily used in high-performance computing. Its features include quality of service and failover, and it is designed to be scalable. The InfiniBand architecture specification defines a connection between processor nodes and high performance I/O nodes such as storage devices.

InfiniBand transmission rates begin at 2.5 GBps.

## I/O Domain

An I/O domain has direct access to a physical I/O device, such as a network card in a PCI EXPRESS (PCIe) controller. An I/O domain can own a PCIe root complex, or it can own a PCIe slot or on-board PCIe device by using the direct I/O (DIO) feature. An I/O domain can share physical I/O devices with other domains in the form of virtual devices when the I/O domain is also used as a service domain.

## IPMP

IPMP (IP network multipathing) provides physical interface failure detection and transparent network access failover. You can configure one or more physical interfaces into an IP multipathing group, or IPMP group. After configuring IPMP, the system automatically monitors the interfaces in the IPMP group for failure.

## JET Templates

JumpStart Enterprise Toolkit provides a framework to simplify and extend the JumpStart functionality provided within the Oracle Solaris operating system. You can use JET to install Oracle Solaris on the SPARC and x86/64 platforms. You create JET templates to customize the operating system configuration options as required.

## JMX

Java Management Extensions (JMX) technology provides the tools for building distributed, modular, and dynamic solutions for managing and monitoring devices, applications, and networks. The JMX API defines the notion of MBeans, or manageable objects, which expose attributes and operations in a way that enables remote management applications to access them. The public API in Oracle Enterprise Manager Ops Center can be accessed through JMX-Remoting.

## kernel zone

An Oracle Solaris 11 zone with its own kernel. Kernel zones can be updated independently from the global zone operating system.

## Knowledge Base

The Knowledge Base is the repository for metadata about Oracle Solaris and Linux operating system components. Knowledge base stores information about patch dependencies, patch compatibilities, withdrawn patches, downloads, and deployment rules and also stores URL of operating system vendor download sites and downloads the components at set intervals. The Enterprise Controller must have Internet connection to connect to the Knowledge Base.

## LDom

Abbreviation for logical domain or Oracle VM Server for SPARC.

## least allocated

Least allocated is a parameter in the server pool placement policy. The lowest allocated CPU and memory is the total static resource allocation across all guests on the virtualization host. The other placement policy parameter is relative load.

## libraries

A collection of virtual machine images and disk images that are located under the same file system. When a server pool is created, one or more libraries are assigned to the server pool. Server pools can share the same libraries.

## link aggregation

Link aggregation is a standard defined in IEEE802.3ad. An aggregated link consists of several interfaces on a system configured as a single, logical unit. Link aggregation increases the speed and high availability of a connection between a server and a switch.

## logical domain

A virtual machine that has its own operating system and identity within a single SPARC server. Logical Domains are also known as Oracle VM Servers for SPARC.

## LUN

LUN stands for Logical Unit Number. In storage, a LUN is the number assigned to a SCSI protocol entity, that handles (I/O) operations. A SCSI target provides a LUN for each storage volume.

## management

An asset is managed when Oracle Enterprise Manager Ops Center can monitor it and target it with jobs. Operating systems can be managed with or without an Agent Controller, but operating system update functions are only available with an Agent Controller.

## manifest

Each Oracle Solaris 11 package has an associated manifest that describes how the package is put together. The package manifest provides basic metadata about the package (such as name, description, version, and category), what files and directories are included, and the package dependencies.

## maintenance mode

Disables incidents from displaying in the UI, but does not disable monitoring. This mode is useful when you do not want incidents generated during system maintenance.

## membership graph

Shows a graphical relationship between assets and status of the connection. A blue line shows the working connection and a red line represents the faulted or disconnected status. The membership graph is displayed in the Center Pane.

## message center

Displays all incidents, alerts, and notifications. Message Center helps you to view and manage incidents, notifications, and service request, and display warranty information.

## MTU

MTU stands for Maximum Transmission Unit. MTU is the largest packet size, in bytes, that can be sent over a network.

## monitoring policy

A set of monitoring rules that defines alert conditions. Policies are either system-defined, user-defined, or generic. Each monitoring policy contains one or more alert monitors for a specific type of resource. An alert is raised when the state is outside the pre-defined condition.

## monitoring rule

Contains monitoring parameters that state the values and boundaries for an asset's activity. The set of rules is called a monitoring policy.

## MPxIO

MPxIO provides a multipathing solution for storage devices accessible through multiple physical paths. MPxIO is included as a part of the distribution in Solaris 10 onwards.

## NAT

NAT stands for Network Address Translation. NAT is a protocol that enables a network to use many internal-only IP addresses and a few Internet-facing IP addresses.

## navigation pane

Navigation pane is an important part of the user interface of Oracle Enterprise Manager Ops Center. navigation pane contains Message Center, Assets, Plan Management, Networks, Libraries, Reports, vDC Management, and Administration. The Assets section of the Navigation pane lists all the asset that are managed by Oracle Enterprise Manager Ops Center, grouped by its type and the required criteria.

## network

A network enables guests to communicate with each other or with the external world (that is, the Internet). When a server pool is created, one or more networks is assigned to the server pool. Server pools can share the same networks.

## 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 you use to protect your virtualized environment from loss of service due to failure of a single physical link. This network bonding equals as the Linux network bonding. Using network bonding in Oracle VM might require some switch configuration.

## network domain

A system of centralized network administration, in which the permissions that grant access to resources in the network are maintained in one or more servers. Network Domains use a hierarchical structure that enables you to assign permissions to collaborate with different departments in an organization.

A large network may have several domains based on the needs of each set of users.

## NIS

NIS stands for Network Information System. NIS is a network naming and administration system for smaller networks. NIS is similar to the Internet's domain name system (DNS) but designed for a smaller network.

## **non-global zone**

A virtualized operating system environment created within a single instance of the Oracle Solaris operating system. One or more applications can run in a non-global zone without interacting with the rest of the system. Non-global zones are also called zones.

## **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.

## **notifications**

An email, pager, or user interface message that is automatically sent by Oracle Enterprise Manager Ops Center when specified conditions are met. You can configure separate notification profiles for different assets and different users. You can configure the software to send notification for specific incidents, or when a critical or warning incident is detected.

## **Opaque Data**

An opaque data is a data type that is incompletely defined in an interface, so that its values can only be manipulated by calling subroutines that have access to the missing information.

## **/opt**

A file system that contains the mount points for third-party and unbundled software.

## **Oracle Enterprise Manager Cloud Control**

Oracle Enterprise Manager Cloud Control is a single, integrated solution for managing all aspects of the Oracle Cloud and the applications running on it. Oracle Enterprise Manager Cloud Control couples a potent, top-down monitoring approach to delivering the highest quality of service for applications with a cost-effective automated configuration management, provisioning, and administration solution.

## **Oracle Engineered System**

Oracle Engineered Systems are hardware and software integrated systems that are designed for a specific enterprise purpose. Oracle Engineered System helps in reducing the cost and complexity of the IT infrastructures, and increases the productivity and performance.

## **Oracle Services**

Provides integrated methods of maintaining and displaying current contracts, warranty information, contract dates, and service requests in Oracle Enterprise Manager Ops Center.

## Oracle Solaris Clusters

Oracle Solaris Clusters is a high availability software product for Solaris operating system. Oracle Solaris Clusters are used to improve the availability of software services such as databases, file sharing on a network, electronic commerce websites, or other applications. You can now manage Oracle Solaris Clusters as any other asset using Oracle Enterprise Manager Ops Center.

## Oracle Solaris Zones

Oracle Solaris Zones is a software partitioning technology used to virtualize operating system services, and provide an isolated and secure environment for running applications. When you create a non-global zone, you produce an application execution environment in which processes are isolated from all other zones. This isolation prevents processes that run in a zone from monitoring or affecting processes that run in any other zones. See also global zone and non-global zone.

## Oracle Solaris 11 Software Update Library

Oracle Solaris 11 Software Update Library repository is located on the Enterprise Controller. This contains the Oracle Solaris 11 packages that you need to install, provision, and update your Oracle Solaris 11 operating system.

## Oracle VM Server for SPARC

Oracle VM Server is a virtualization technology that enables the creation of multiple virtual systems by a hypervisor in the firmware layer, interposed between the operating system and the hardware platform. This is designed to abstract the hardware and can expose or hide various system resources, allowing for the creation of resource partitions that can operate as discrete systems, complete with virtual CPU, memory and I/O devices.

Oracle VM Server for SPARC is a virtualization technology designed to run on CMT based servers.

## Oracle VM Server for x86

Oracle VM Server for x86 is a managed virtualization environment or part of such an environment, that is designed to provide a lightweight, secure, server-based platform for running virtual machines. Oracle VM Server for x86 is based upon an updated version of the underlying Xen hypervisor technology, and includes Oracle VM Agent.

## Oracle Solaris ZFS

An Oracle Solaris operating system file system that uses storage pools to manage physical storage.

## OS Provisioning Profile

Defines the image, provisioning, and installation requirements.

## OS Configuration Profile

Defines the OS and network configuration.

## Paravirtualization

Paravirtualization enables you to select a location for the mounted ISO file from which you create the virtual machine. Before you create the virtual machine using the paravirtualized method, you must mount the ISO file on an NFS share, or HTTP or FTP server.

## parent repositories

Any hosted Oracle repository that Oracle Solaris 11 Software Update Library can use to upload, or sync, content.

## photorealistic view

Photorealistic view displays the front and rear views of the rack. All slots and the respective assets are displayed. Positions within the rack are displayed in a 2-dimensional view. All assets in the rack have a specific image. The health status of assets such as OK, Warning, and Critical are displayed in the form of colored buttons.

## placement policy

Determines whether the guest is placed on a virtualization host with the lowest relative load or the least allocated. By default, new guests are placed on the server with the lowest load and are automatically started. The placement policy is defined when a server pool is created. Server pools can have different placement policies.

## policy

Defines how a job is performed and sets the automation level of the job. A policy file is similar to a response file. If there is a conflict between a profile and policy, the profile overrides the policy.

## Private vNet

vNet that is unique to a given account is called Private vNet.

## profile

Defines the configuration of components for a specific type of system. By using a profile, you can define what is enabled, and not enabled, to be installed on a system. If there is a conflict between a profile and policy, the profile overrides the policy.

## Proxy Controller

Proxy Controllers link the managed assets to the Enterprise Controller and act as proxies for operations that must be located close to the managed assets, such as operating system provisioning. Proxy Controllers distribute the network load and provide for fan-out capabilities to minimize network load. Proxy Controllers perform management operations on assets and report the results to the Enterprise Controller. An Oracle Enterprise Manager Ops Center installation must have at least one functioning Proxy Controller.

## relative load

Relative load is a parameter in the server pool placement policy. Lowest relative load is based on the lowest memory and CPU utilization for the virtualization host over the past three weeks. The other placement policy parameter is least allocated.

## repository

A repository is a central place that stores an aggregation of data in an organized way, usually in a computer storage. Depending on how the term is used, a repository may be directly accessible to users or may be a place from which specific databases, files, or documents are obtained for further relocation or distribution in a network.

## root

The top level of a hierarchy of items. `root` is the one item from which all other items are descended. See `root` directory or `root ( / )` file system.

## root directory

The top-level directory from which all other directories stem.

## Root Domain

A root domain has a PCIe root complex assigned to it. This domain owns the PCIe fabric and provides all fabric-related services, such as fabric error handling. A root domain is also an I/O domain, as it owns and has direct access to physical I/O devices.

## root file system

The top-level file system from which all other file systems stem. The `root ( / )` file system is the base on which all other file systems are mounted, and is never unmounted. The `root ( / )` file system contains the directories and files critical for system operation, such as the kernel, device drivers, and the programs that are used to boot a system.

## RPM

A package manager used by many versions of the Linux operating system.

## rule parameters

Define the monitoring parameters. The following types of rule parameters are available: Threshold, Boolean Control, Enumerated Control, and Expression. Some parameters are editable. All active parameters can be disabled.

## SAN Storage Library

Storage Attached Network (SAN) storage which is used for providing storage spaces for managed assets in Oracle Enterprise Manager Ops Center. The SAN storage library consists of groups of LUNs.

## script

A command file that is associated with one of Oracle Enterprise Manager Ops Center's actions, either before the action occurs (pre-action script), or after the action completes (post-action script).

## security group

The organization of users and other domain objects into groups for easy administration of access permissions is known as a security group. A Security Group enables you to specify certain security settings on an instance specific basis. You have the ability to filter traffic based on IP's (a specific address or a subnet), packet types (TCP, UDP or ICMP), and ports (or a range of ports). You can also grant access to an entire security group so that your trusted computers can get access to each other without having to open ports to the public.

## server management

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.

## server pool

A server pool is a resource pool of virtualization hosts that share compatible chip architecture, which facilitates actions such as moving guests between virtualization host instances. Members of the server pool have access to the same network and storage library resources. Guests can access the images contained in the server pool's library. Several server pools can share the same network and library storage resources.

## server templates

Server templates provide pre-built images for creating vServers. They can be uploaded individually or as part of an Assembly. Server templates can be created from an existing vServer.

## service tag

Service tags are XML files that identify assets uniquely. Assets with service tags can be discovered using the Find Assets wizard.

## Service Domain

A service domain provides virtual device services to other domains, such as a virtual switch, a virtual console concentrator, and a virtual disk server. You can have more than one service domain, and any domain can be configured as a service domain.

## Shared IP Mode

The global zone shares its network interface with one or more zone. You must define the network interface when you assign the network to the global zone.

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## shared storage

A shared storage library in Oracle Enterprise Manager Ops Center is one that is accessible by the server and operating system. It is not related to Zones on Shared Storage in Oracle Solaris 11.1.

## snapshot

Snapshot, a point in time image of a volume is a non-bootable copy of a boot environment that uses much less disk space than a boot environment. You can create a boot environment from a snapshot.

## software libraries

A software library can be a local file system on the Enterprise Controller or a mount point on an NFS server. The software library is used to store the operating system images for provisioning, branded images, flars, firmwares, profiles, operating system updates, custom programs and scripts.

## 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.

## static route

Specifies the route taken by the network for external access. You define a default gateway for the network; however, this default gateway may not be reachable to a given subnet. In this case, you must add a static route for this specific subnet.

## status pane

The Status pane in the Jobs section describes about the state of the incidents like jobs in progress, jobs failed, jobs partially successful, jobs stopped, jobs schedules, jobs successful and so on.

## Support Repository Update (SRU)

Support Repository Update (SRU) is a package of Oracle Solaris 11 operating system updates that releases on a regular basis.

## SCCM

Microsoft System Center Configuration Manager (SCCM), is used to update Windows operating systems.

## syncing

Syncing is the process of reconfiguring or updating the Oracle Solaris 11 Software Update Library with the Oracle Solaris 11 Image Packaging System (IPS).

## synchronizing

Updates an inactive boot environment to match an active boot environment.

## system groups

Default asset groups that automatically organize your assets by type in the user interface.

## System-defined Rules

Attribute specific monitoring rules that are hard-coded into drivers. You can disable a system-defined rule, but cannot edit, move, or reconfigure these types of rules.

## Thin Clone

A thin clone is a clone of a physical disk that takes up only the amount of disk space actually in use; not the full specified disk size.

## threshold parameters

A monitoring rule that uses a numeric value above or below a defined level.

## time server

The network device that provides accurate time for synchronizing network activity.

## unmanaged storage

Unmanaged storage is the storage resource that is unknown to Oracle Enterprise Manager Ops Center. When you add storage to zones using the native CLI or manage existing zone environments, the zone's storage is not identified and termed as unmanaged.

## User-defined Network Domain

A network domain provides custom network resources from an Ethernet or InfiniBand fabric to virtualization hosts, server pools, or virtual datacenters so that new networks can be created as needed. A user-defined network domain supplements the Default Network Domain that is always available and cannot be deleted.

## User-defined Rules

Monitoring rules that are associated with, and determined by, the type of managed resource. You can apply a user-defined rule to many different attributes.

## /usr File System

A file system on a standalone system or server that contains many of the standard UNIX programs.

Sharing the large /usr file system with a server rather than maintaining a local copy minimizes the overall disk space that is required to install and run the Solaris software on a system.

## **/var File System**

A file system or directory (on standalone systems) that contains system files that are likely to change or grow over the life of the system. These files include system logs, vi files, mail files, and UUCP files.

## **vDC**

vDC is a collection of physical servers and storage that are placed on a common network. These physical resources are organized into a pool that are accessed by self-service users. This offers an access point through which you can allocate and control the resources inside. This is created during the set up phase.

## **vNets**

vNets are managed networks and their associated logical (L2) fabrics that can be associated with a vDC and its Accounts.

## **vServer**

vServer is an entity that provides the outward interface of a standalone operating system. This may be a Virtual Machine (VM) or a Solaris Container or a similar construct. This consumes CPU and memory resources. This can be a member of one or multiple vNets.

## **vServer Type**

vServer type is a profile for vServer creation that defines size of memory, size of disk and number of vCPUs to be used when creating a new vServer instance, that is used in combination with a Server Template.

## **VID**

VLAN Identifier. Part of the VLAN tag inserted into Ethernet frame that specifies its VLAN.

## **virtual disk image**

A virtual disk image is a representation of a virtual storage device that is associated with a virtual machine. Such storage can represent a virtual hard disk or a virtual CD/DVD.

## **virtualization host**

Oracle VM Server that are managed by Oracle Enterprise Manager Ops Center is referred to as virtualization host. The virtualization host contains a hypervisor and its local resources and network connections.

## **virtual machine**

A virtual machine is a software implementation of a computing environment in which an operating system or program is installed and run.

A virtual machine typically emulates a physical computing environment, requests for CPU, memory, hard disk, network, and other hardware resources that are managed by a virtualization layer which translates these requests to the underlying physical hardware.

## virtual machine template

A Virtual Machine Template provides a standardized group of hardware, and software settings that is used repeatedly to create virtual machines configured with those settings.

## virtual server image

A virtual server image is the persisted specification and state of a virtual machine. A virtual server is created when you create a guest. The virtual server image contains the general specification of the guest such as CPU, network, memory, and the type of physical storage that is backing the guest. A virtual server image is also referred to as a guest image.

## Virtual Local Area Network (VLAN)

VLAN is a group of network resources connected to different network segments that behave as if they were connected to a single network segment. All transmissions from the VLAN are identified by a unique VLAN tag.

## volume

A volume is an identifiable unit of data storage that is sometimes physically removable from the computer or storage system. In tape storage systems, a volume may be a tape cartridge. In mainframe storage systems, a volume may be a removable hard disk. Each volume has a system-unique name or number that enables it to be specified by a user.

## white list

A list of Oracle Solaris operating system patch IDs that you always want to be applied to a host. The white list is used when you are using a baseline to update an Oracle Solaris operating system.

See also [black list](#).

## WINS

WINS stands for Windows Internet Naming Service. The WINS server converts NetBIOS names to IP addresses.

## WS-Man

Web Services for Management (WS-MAN) is a specification for managing servers, devices, and applications using web services standards. WS - Man provides a common way for systems to access and exchange management information across the entire IT infrastructure. The public API in Oracle Enterprise Manager Ops Center can be accessed through WS-Management.

## **World Wide Name (WWN)**

WWN is a unique identifier in a Fibre Channel or Serial Attached SCSI storage network. Each WWN is an 8-byte number derived from an IEEE OUI and vendor information.

## **zone**

Also called non-global zones, are a virtualized operating system environment created within a single instance of the Oracle Solaris operating system. One or more applications can run in a non-global zone without interacting with the rest of the system.



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