Virtual Machine Management Guide

Novell®
ZENworks® Orchestrator

1.3
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About This Guide

This guide introduces Novell® ZENworks® Virtual Machine Management, including its basic administration environment, which is accessed through an Eclipse* rich client console. This guide provides an introductory overview of Virtual Machine Management, and explains how to install, monitor, and manage VMs and coordinate their management with applications running on Orchestrator. For additional information about ZENworks and other Novell products, visit www.novell.com (http://www.novell.com/products/zenworks).

The guide is organized as follows:

Audience

This book is for data center administrators, job managers, and job developers. It assumes that users of the product have the following background:

- General understanding of network operating environments and systems architecture
- Knowledge of basic UNIX* shell commands, the Windows* command prompt, and text editors
- General ZENworks Orchestrator Server knowledge

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with this product. Please use the User Comments feature at the bottom of each page of the online documentation, or go to www.novell.com/documentation/feedback.html (http://www.novell.com/documentation/feedback.html) and enter your comments there.

Documentation Updates

For the most recent version of this guide, visit the ZENworks Orchestrator 1.3 documentation Web site (http://www.novell.com/documentation/zen_orchestrator13/).

Documentation Conventions

In Novell documentation, a greater-than symbol (>) is used to separate actions within a step and items in a cross-reference path.

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When a single pathname can be written with a backslash for some platforms or a forward slash for other platforms, the pathname is presented with a backslash. Users of platforms that require a forward slash, such as Linux*, should use forward slashes as required by your software.

Overview

1

Novell® ZENworks® Virtual Machine Management (VM Management) adds increased functionality to Novell ZENworks Orchestrator. It helps administrators, IT operators, and job developers to improve and expand the performance and efficiency of the data center by automating provisioning and by using virtual machines (VMs) as resources in the data center computing environment. Better management of VMs assists in controlling associated data center costs by addressing several of the main data center issues, including cooling, space, power usage, and efficient hardware usage.

Review the following sections to get started with ZENworks VM Management:

1.1 How to Use This Guide

This *Overview* section provides basic concepts about VM Management. The other main sections of the guide provide the following information:

1.1.1 Setup Tasks and Tutorial

This section also provides a first-run tutorial to familiarize you with the VM life cycle processes.

1.1.2 VM Management Tasks

Review the following sections for information on the various Virtual Machine Management tasks:

Provides information how to create and configure VMs. For example:

- Launching the ZENworks VM Management Console
- Building a VM

- Discovering VMs
- Storing and versioning a VM

- Chapter 4, "Provisioning Virtual Machines," on page 57

  Provides some information on provisioning VMs. Provisioning is usually done when VM jobs are run.

  For more information on provisioning as it is related to VM jobs, see "Provisioning Virtual Machines" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

- Chapter 5, "Deploying Virtual Machines," on page 59

  Provides information you on how to deploy your VMs. You can deploy VMs to the following repositories:

  - Local
  - Datagrid
  - Warehouse
  - Network Attached Storage (NAS)
  - Storage Area Network (SAN)

- Chapter 6, "Ongoing Management of Virtual Machines," on page 65

  Provides ongoing management tasks, such as:

  - Managing a VM in runtime
  - Modifying a VM after checking it in to the Warehouse
  - Monitoring VMs
  - Using a VM that is not checked in to the Warehouse
  - Using the Orchestrator User Portal to run VM jobs
  - Destroying a VM

1.1.3 Appendixes

The appendixes provide other information that you might need:

- Appendix A, "Management Consoles for ZENworks VM Management," on page 79

  Provides information on the management consoles for doing your VM Management work.

- Appendix B, "VM Management Installation Sources," on page 97

  Provides two sources from which to obtain software when building VMs.

- Appendix C, "Virtual Machine Technologies and Actions," on page 99

  Provides information about the different ZENworks VM technologies, ZENworks Orchestrator provisioning adapters, and actions that you can perform to and with a VM.

- Appendix D, "Sample VM Management Jobs," on page 117

  Provides an example job that is designed to help you to install the Orchestrator Agent on all VMs running Apache*.

1.2 Virtual Machine Management

ZENworks Orchestrator enables you to manage and control data center jobs and processes through the application of rules, policies, scheduling, utilization, and billing data center resources. VM Management enhances the functionality of ZENworks Orchestrator Server, enabling it to control VMs in your data center.

The Orchestrator Server manages resources to perform work. It does this through automated jobs (written in Jython) that in turn are broken down into joblets that are distributed among multiple resources. For more information about ZENworks Orchestrator and Orchestrator Server operations, see "What You Should Know" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

With VM Management, the Orchestrator Server is able to control and maximize the use of VMs in your data center. This lets you have fewer physical machines while giving your data center many additional resources. As with your physical resources, you use the ZENworks Orchestrator Console to manage the physical VM host machines and their VMs in your data center.

In addition, as calls for resources lessen and resources are released, the Orchestrator Server evaluates the capabilities of the active resources (VM or physical machine) and keeps the best resource for the job. This might include any of the currently running VMs.

The following figure shows how VM Management plugs in to the Orchestrator Server:

Figure 1-1   *ZENworks VM Management Integration with ZENworks Orchestrator*

**ZENworks Orchestrator
(SLES 10 SP1)**

+ ZENworks Orchestrator Server
   • Rules Engine
   • Policy
   • Scheduling
   • Grid Services
   • Utilization & Billing
   • Load Balancer
   • Job/Definition/Deployment
   • Monitoring Server

**ZENworks Virtual
Machine Management**

+ VM Host Detection
+ VM Image Detection
   • Only detects Gold Master
+ VM Resource Utilization
   • Provisioning VMs (start, stop, pause)
   • Resourcing Provisioned VMs
   • Resourcing VM templates

**Virtual Machine
Builder**

+ Creation Wizard
   • Virtualization Type
   • Virtual Processor
   • Virtual RAM
   • Virtual Storage Size

CIM monitoring

+ Node Performance
   • Boot Time
   • Load Time
   • Memory Usage
   • CPU Usage
   • etc.

**Virtual Machine
Warehouse**

+ Version Control
   • Set Gold Master
+ Check-in
+ Check-out
   • Modify
+ Deploy

1.3 The Virtual Machine Life Cycle

Automating the management of VMs through all aspects of the VM life cycle provides the ability to use your physical resources in the most efficient and productive manner. You create VMs as needed, put them under version control, provision them as jobs require, and remove them from the system when they are no longer needed.

Figure 1-2 *The VM Life Cycle*
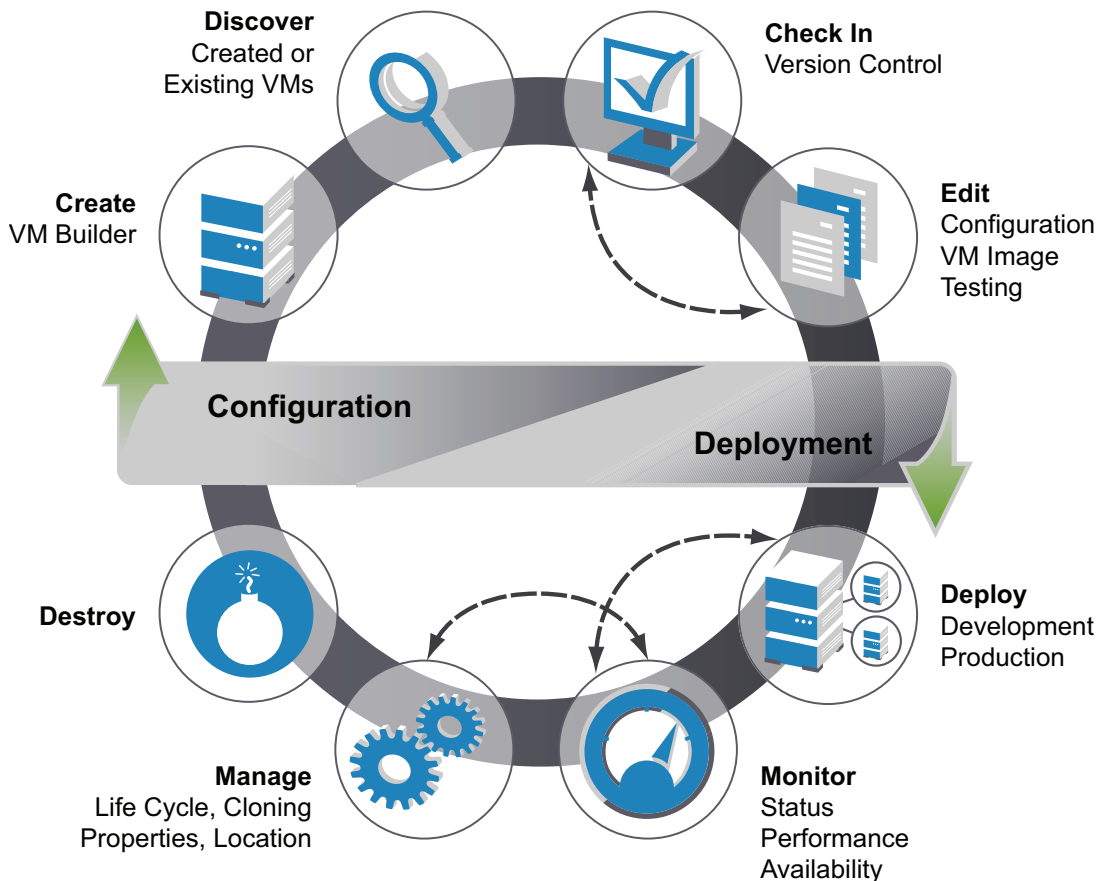
The VM life cycle is divided into two parts: configuration and deployment. Configuration is performed on a VM in the security of a development environment, which allows for creation, testing, and modification of the VM until you are ready to launch the VM into the production environment. Deployment is performed in the production environment and the changes take place in real time. As the administrator, you might do both the configuration and deployment tasks.

1.4 Creating and Deploying Virtual Machines

The following sections describe the functions involved in creating and deploying VMs:

- Section 1.4.1, "Creating Virtual Machines," on page 16
- Section 1.4.2, "Deploying Virtual Machines," on page 16

1.4.1 Creating Virtual Machines

Configuring VMs includes creating, storing, editing, and versioning. These configurations are done in an environment removed from your production environment. These VMs do not affect your data center operations. The configurations are done to prepare the VM for data center launch. Any changes made after data center launch are done during the deployment phase of the life cycle.

- **Create:** ZENworks Virtual Machine Builder (VM Builder) is used to create new Xen* VMs. You simply define the parameters of the VM you need and the VM is automatically created to your specifications. For more information on the VM Builder, see Section 1.6.2, "Virtual Machine Builder," on page 20.

- **Discover:** The Orchestrator Server discovers VMs that exist in your enterprise. In order to be available as a resource for jobs, the VM must have the ZENworks Orchestrator Agent installed on it. These can be VMs you have just created or VMs that you have already been using in your enterprise. For information on discovering VMs and VM host machines in ZENworks Orchestrator, see Section 1.6.5, "ZENworks Orchestrator Console Elements," on page 21. For information on installing the Orchestrator Agent on a VM, see "Installing the Orchestrator Agent on VMs" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

- **Check-in:** Both created and discovered VMs can be checked into the ZENworks Virtual Machine Warehouse. When VMs are checked in, version control is implemented. You can decide to not check VMs in so they do not receive version control. For more information on the VM Warehouse, see Section 1.6.3, "Virtual Machine Warehouse," on page 21.

- **Edit:** You can check VMs out from the VM Warehouse to edit their configuration or operating system image, then when you check an edited VM back into the VM Warehouse, it has its version number incremented. When you have two or more versions of a VM, the designation of Gold Master version is used to identify the approved version, which you can set to be any of its versions. The Gold Master version is the version of the VM that launches when deployed by the Orchestrator Server. There can be many Gold Master versions of VMs (but one per VM). These are listed in the ZENworks Orchestrator Console under the Repository and VM headings in the tree. For more information on editing VMs, see Section 6.3, "Modifying a Virtual Machine after Checking In," on page 71.

1.4.2 Deploying Virtual Machines

When deploying VMs, you designate management of the VMs that are under version control, tested, and ready for deployment. These include further developmental changes to the VM, changes made because of Q/A testing, or changes required after launching the VM into your data center's production environment.

- **Deploy:** Deployment operations are performed through ZENworks Orchestrator. When a VM is ready for your production environment, you can list either a started VM or a VM Template as a resource. These VMs, as stated before, must have the Orchestrator Agent installed on them before they become resources.

  The ZENworks Orchestrator deploys a VM when it is needed to run a job, in the same way as it uses physical machines to meet the resource needs of a job. When a VM template is deployed, the template is cloned into a VM and then deployed. The cloned VM is destroyed when the job releases it. For information on deploying VMs, see Chapter 5, "Deploying Virtual Machines," on page 59.

- **Monitor:** The ZENworks Monitoring Service, which is included as another perspective with VM Management, monitors every aspect of your VMs, including their performance, status, and availability. This service also monitors the host machines on which your VMs are deployed and can be extended to any physical machine in your network.

- **Manage:** While your VMs are deployed, you can manage any step of the life cycle of the VM according to your criteria. You can manage the process of cloning, the overall properties of the VM, and you can use provisioning adapters to manage the location of the VM within your VM Host environment. You can also patch deployed VMs or send them to a directory for image editing. If a VM Host fails or experiences performance issues, the Orchestrator Server transfers the active, running VM to another server with a barely perceptible pause in the speed and continuity of the transfer of data. For more information on managing your VMs in runtime, see Section 6.2, "Managing a Virtual Machine in Runtime," on page 65.

- **Destroy:** At the end of its usefulness, you can destroy the VM, which removes it from its listing in the ZENworks Orchestrator Console. To completely destroy the VM, you also need to delete its stored image in the VM Warehouse. For information on destroying VMs, see Section 6.1, "Destroying a Virtual Machine," on page 65.

1.5 Using Jobs for VM Management

While ZENworks Orchestrator enables you you manage many aspects of your virtual environment, your job developer can create custom jobs that do the following VM Management tasks:

- Create and clone VMs

  These jobs create virtual machine images to be stored or deployed. They also create templates for building images to be stored or deployed.

- Discover resources that can be used as VM hosts

- Provision, migrate, and move VMs

  Virtual machine images can be moved from one physical machine to another.

- Check in VMs that have the proper versions and system configurations

- Provide checkpoints, restoration, and resynchronization of VMs

  Snapshots of the virtual machine image can be taken and used to restore the environment if needed.

- Retire, delete, and destroy VMs

  Jobs can decommission and retire deployed images.

- Monitor VM operations

  Jobs can start, shut down, suspend and restart VMs.

- Manage on, off, suspend, and restart operations

For more information on creating VM Management jobs, see "Virtual Machine Job Development" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

1.6 Product Components

There are several new architectural components in VM Management that function with the ZENworks Orchestrator Server and the ZENworks Orchestrator Console. These elements give you additional functionality, including ZENworks Orchestrator Monitoring designed to function with the overall monitoring capabilities of the Orchestrator Server.

The list of architectural components includes the following:

 ◆ Section 1.6.1, "Component Introduction for ZENworks VM Management," on page 18
 ◆ Section 1.6.2, "Virtual Machine Builder," on page 20
 ◆ Section 1.6.3, "Virtual Machine Warehouse," on page 21
 ◆ Section 1.6.4, "ZENworks Orchestrator Monitoring," on page 21
 ◆ Section 1.6.5, "ZENworks Orchestrator Console Elements," on page 21

1.6.1 Component Introduction for ZENworks VM Management

The following are the additional components involved in making sure the managed VMs are able to function with the Orchestrator Server and help you in running your data center.

 ◆ "SUSE Linux Enterprise Server Xen Server" on page 18
 ◆ "The ZENworks Client and the ZENworks VM Management Console" on page 19
 ◆ "The Orchestrator User Portal" on page 20
 ◆ "Oracle Cluster File System 2" on page 20
 ◆ "ZENworks Orchestrator" on page 20
 ◆ "ZENworks Virtual Machine Builder" on page 20
 ◆ "ZENworks Virtual Machine Warehouse" on page 20

SUSE Linux Enterprise Server Xen Server

The SUSE® Linux Enterprise Server (SLES) Xen Server is a robust, production-proven virtualization layer run on physical servers, It abstracts processor, memory, storage, and networking resources into multiple VMs.

The basic components of a virtualization environment based on Xen are the Xen hypervisor, the VM host machine, any number of other guest operating system VMs based on Xen, and the tools, commands, and configuration files that let you manage virtualization. Collectively, the physical computer running all these components is referred to as a virtualization host server because these components form a platform for hosting VMs.

 ◆ "The Xen Hypervisor" on page 19
 ◆ "The VM Host Machine" on page 19
 ◆ "Virtual Machines Based on Xen" on page 19
 ◆ "Management Tools, Commands, and Configuration Files" on page 19

The Xen Hypervisor

The Xen hypervisor, sometimes referred to generically as the hypervisor or VM monitor, is an open source software program that coordinates the low-level interaction between VMs and physical hardware.

For further information on the Xen hypervisor that is shipped with SLES 10 SP1, see Introduction to Xen Virtualization (http://www.novell.com/documentation/vmserver/virtualization_basics/data/b9km2i6.html#b9km2i6) in the *Novell Virtualization Technology: Virtualization Technology Guide*.

The VM Host Machine

The management VM has the Xen hypervisor directly installed on the hardware and serves as the hardware abstraction layer. The host operating system runs in the Host Xen domain in the first layer of the hypervisor. VMs can only be installed and run in the Host. The host machine is comprised of several components, such as:

- The SUSE Linux operating system, which gives the administrator a graphical desktop and command line environment to manage the virtualization host server components and its VMs.
- The `xend` daemon, which stores configuration information about each VM and controls how VMs are created and managed.
- A modified version of QEMU, which is an open source software program that emulates a full computer system, including a processor and various peripherals. It provides the ability to host operating systems in full virtualization mode.

Virtual Machines Based on Xen

A VM based on Xen is a guest, and runs the guest operating system. Guests can only run on the Host and cannot run another VM. VMs based on Xen consist of the following components:

- At least one virtual disk that contains a bootable operating system
- VM configuration information, which is managed by the `xend` daemon and can be modified by modifying a text file

Management Tools, Commands, and Configuration Files

You use a combination of GUI tools, commands, and configuration files to help you manage and customize your virtualization environment.

The ZENworks Client and the ZENworks VM Management Console

These tools are consoles that allow users to connect to the Orchestrator Server or individual Xen VM host machines from a SUSE Linux Enterprise Desktop (SLED) 10 SP1 remote machine. The ZENworks VM Management Console is an Eclipse*-based rich-client environment that allows you to use the VM Builder, VM Warehouse, and ZENworks Orchestrator Monitoring. For more information on the ZENworks VM Management Console, see Section A.2, "The ZENworks VM Management Console," on page 84.

The Orchestrator User Portal

The ZENworks Orchestrator User Portal is used to connect to a Web location to allow the user to run a job. The jobs and available resources are assigned to the user by the Orchestrator administrator. For information about the Orchestrator User Portal, see "Using the ZENworks Orchestrator User Portal" in the *Novell ZENworks Orchestrator 1.3 Job Management Guide*.

Oracle Cluster File System 2

Oracle* Cluster File System 2 (OCFS2) is a high-performance cluster file system for Xen Server VMs. It is a general-purpose journaling file system that is fully integrated in the Linux kernel 2.6 and later. OCFS2 allows you to store application binary files, data files, and databases on devices in a SAN. All nodes in a cluster have concurrent read and write access to the file system. A distributed lock manager helps prevent file access conflicts. OCFS2 supports up to 32,000 subdirectories and millions of files in each directory. The O2CB cluster service (a driver) runs on each node to manage the cluster.

ZENworks Orchestrator

ZENworks Orchestrator dynamically allocates and balances computing across collections of resources. VM Management functions as an expansion of available services to ZENworks Orchestrator to allow ZENworks Orchestrator to manage physical and VMs. For more information on ZENworks Orchestrator, see the "Introduction" section in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

ZENworks Virtual Machine Builder

The ZENworks Virtual Machine Builder (VM Builder) provides the ability to create and build a VM on a variety of different servers as designated by the physical capabilities of the machines in your VM Builder group. For more information on the VM Builder, see Section 1.6.2, "Virtual Machine Builder," on page 20.

ZENworks Virtual Machine Warehouse

The ZENworks Virtual Machine Warehouse (VM Warehouse) stores and versions VMs as they are checked in. These VMs can be checked back out, edited and modified, and then be checked back in to increment the next version number.

1.6.2 Virtual Machine Builder

The ZENworks VM Builder is a service of VM Management that allows you to build a VM to precise specifications required for your data center. You designate the parameters required: processor, memory, hard drive space, operating system, virtualization type, if it's based of an auto-install file, and any additional parameters.

When you launch the build job, VM Builder sends the build request to a machine that meets the hardware requirements of the defined VM and builds the VM there.

These VMs are built using the Xen hypervisor through the VM Builder Wizard in the ZENworks VM Management Console.

ZENworks Orchestrator 1.3 Xen VMs can be fully virtualized or, for SLES 10 and Red Hat* Enterprise Linux (RHEL) 5, they can be paravirtualized. For details on building VMs and the functionality of the VM Builder, see Section 3.2, "Building a Virtual Machine," on page 42.

1.6.3 Virtual Machine Warehouse

The VM Warehouse contains the VMs you have created and discovered. When you check a VM into the VM Warehouse, it is brought under version control. Any time you make modifications to the VM, in a development, testing, or production environments, you can check these modified versions back into the VM Warehouse to have the VM assigned the next version number.

When you have built and tested sufficient VM versions, and a VM version has been certified for deployment in your production environment, you can designate that version as the Gold Master. From that point forward, any time you deploy an instance of that VM through the Orchestrator Server, the Gold Master deploys. You can change the Gold Master designation at any time inside the VM Warehouse. For more information on operating the VM Warehouse, see Section 3.3, "Storing and Versioning a Virtual Machine," on page 53.

1.6.4 ZENworks Orchestrator Monitoring

The ZENworks VM Management Console gives an additional Monitoring perspective for ZENworks Orchestrator Monitoring. This perspective gives you the ability to get a Web-based report on any of your VMs, VM hosts, and all other managed nodes (including physical machines). In order to be monitored, the ZENworks Monitoring Agent must be installed. For more details about what can be monitored and how to monitor with the Monitoring Server, see Section 6.4, "Monitoring Virtual Machines," on page 74.

1.6.5 ZENworks Orchestrator Console Elements

The ZENworks VM Management Console helps you make the best use of your VMs in the data center. VM Management works with the Orchestrator Server, and it contains many elements necessary to manage your VMs. You can use the ZENworks Orchestrator Console to tell the Orchestrator Server to detect and list your VM host machines, pre-existing VMs, and the Gold Master versions. The list of VMs appears in the Repository section of the ZENworks Orchestrator Console allows you to select specific VMs (Gold Master versions) to be deployed to host machines. For details on managing your VMs with the ZENworks Orchestrator Console, see Section A.1, "The ZENworks Orchestrator Console," on page 80.

- ◆ "Discovering Virtual Machine Hosts" on page 21
- ◆ "Discovering Virtual Machine Images" on page 22
- ◆ "Using the ZENworks Orchestrator Console to Deploy Virtual Machines" on page 22

Discovering Virtual Machine Hosts

When you first start the ZENworks Orchestrator Console, it lists no VMs and no VM hosts. When you click *Provision > Discover VM Hosts*, the ZENworks Orchestrator Console searches through all ZENworks Orchestrator Server provisioning adapters and finds all the VM hosts in your data center that you have chosen to register with the Orchestrator Server. These are listed under the *VM Hosts* section of your tree in ZENworks Orchestrator Console. For detailed instructions on discovering VM hosts, see Section 2.2.4, "Discovering Virtual Machine Hosts," on page 30.

Discovering Virtual Machine Images

In the ZENworks Orchestrator Console, click *Provision > Discover VM Images* to have the Orchestrator Server find any VMs in your data center and VMs with the Orchestrator Agent installed. This action also lists (in the Repository section) all VM Images available to the Orchestrator Server. For detailed instructions on discovering VM images, see Section 3.1, "Discovering Existing Virtual Machines," on page 39.

Using the ZENworks Orchestrator Console to Deploy Virtual Machines

In order for joblets and jobs to be deployed to the VMs, the Orchestrator Agent must be installed as an application on the VM. VMs that have been started and are running the Orchestrator Agent are listed as available resources for ZENworks Orchestrator to use in the *Repositories* and *Resources* sections in the ZENworks Orchestrator Console. These VMs are made available by moving them into the Resources list. You can move VM templates that haven't been started into the Resources list to make clones of the templates available as resources. As the Orchestrator Server requires a server meeting the requirements of the VM Template, it clones and launches a VM of that type. For more information on deploying VMs in the ZENworks Orchestrator Console, see Chapter 5, "Deploying Virtual Machines," on page 59.

VM Management Setup and Tutorial

2

The first time you run the Novell® ZENworks® Orchestrator Console and the ZENworks VM Management Console, there are actions you need to take to make sure your VMs are enabled for use in your data center. After these actions are taken, you can begin using the VM Builder and VM Warehouse features to create and deploy VMs.

Perform the following tasks to set up VM Management and do a first run to familiarize you with the VM life cycle:

2.1 Installing or Upgrading the VM Management Software

VM Management is installed separately from ZENworks Orchestrator. A VM Management installation consists of installing the ZENworks VM Management Console on your Linux or Windows administration devices.

For instructions on installing VM Management, see "Installing the VM Management Console" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

To upgrade VM Management, simply replace the previous version of the console by installing the newer version's ZENworks VM Management Console.

Continue with Section 2.2, "Setting Up VM Management with the ZENworks Orchestrator Console," on page 23.

2.2 Setting Up VM Management with the ZENworks Orchestrator Console

Before you can use the ZENworks VM Management Console, you need to:

* Install and configure the Orchestrator Server and its components

  For instructions, see "Installing and Configuring ZENworks Orchestrator Components" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.
* Make sure that your VM host machines and your VM Builder machines are recognized
* Make sure that your main physical resources are registered

To accomplish the latter two points, complete the following tasks in order:

2.2.1 Discovering Physical Resources

After you have configured and set up your Orchestrator Server:

1 Open the ZENworks Orchestrator Console.

The console is displayed with the available grids displayed:
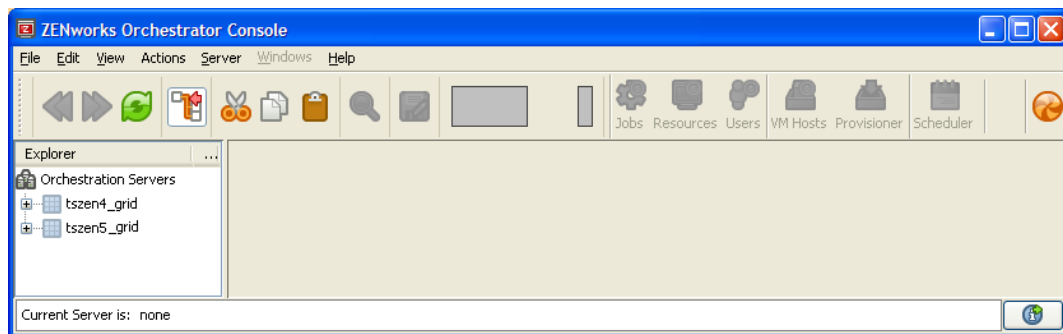
2 Click your grid in the tree view.

The Login dialog box is displayed:
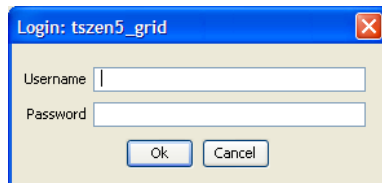
3 Enter your administrator username and password.

The console is displayed with the information expanded for the selected grid:
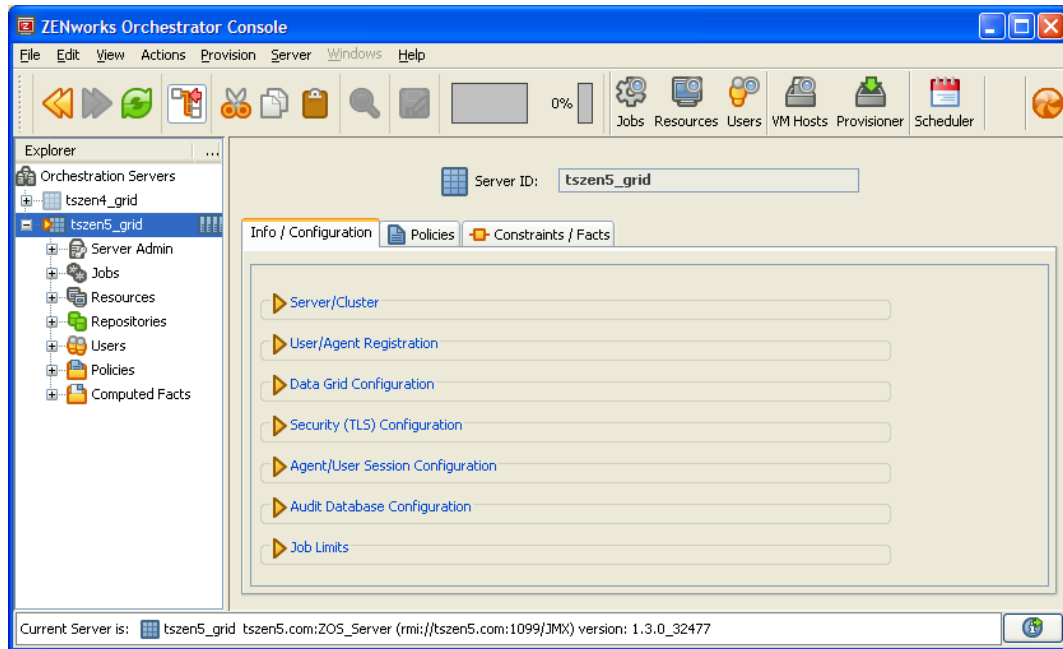
4 Click the *Resources* button to display the *Resources* tab:
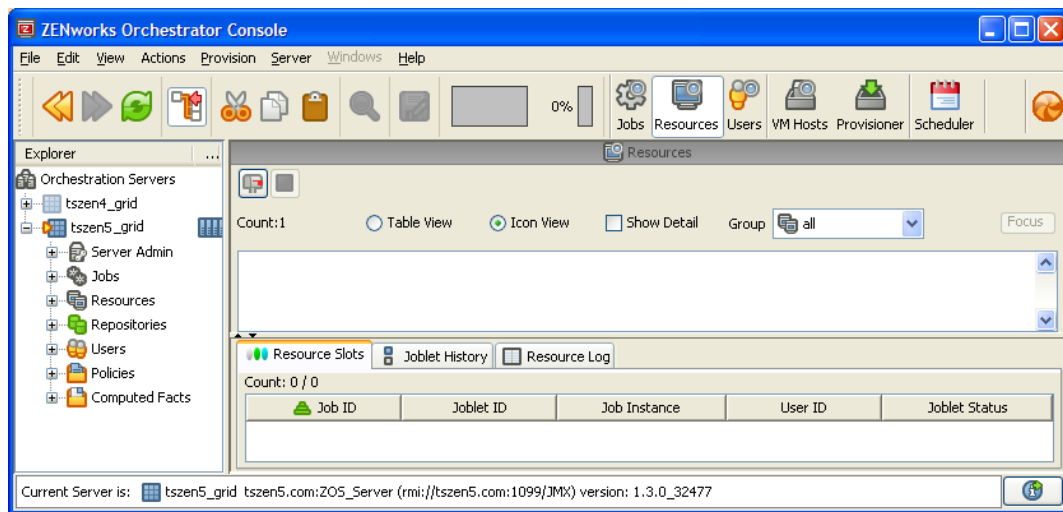
5 Click the mailbox () in the upper left of the Resources view to open the following dialog box:
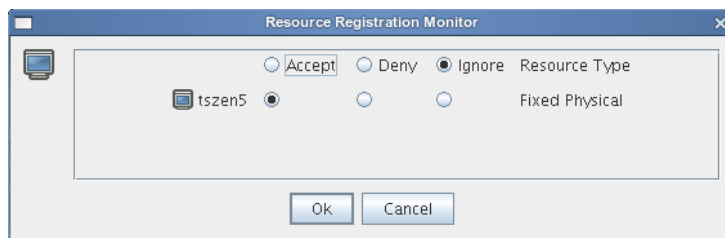
6 Select *Accept* to register the physical resources available, then click *OK* to display the available resources:
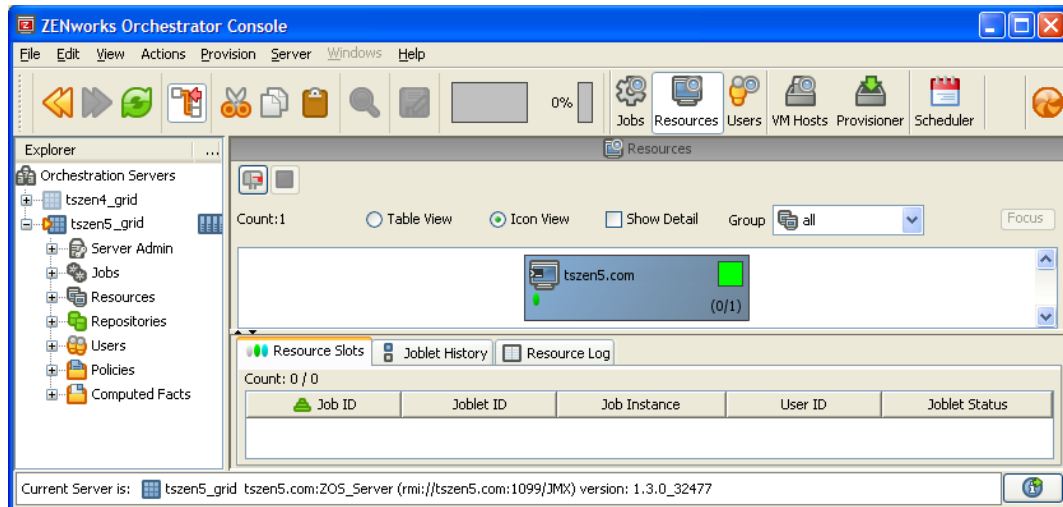
After your physical resources are registered, you can begin to build and discover the VM hosts and VMs in your data center, which brings the VMs into the control of the Orchestrator Server and allows you to install the Orchestrator Agent on any VMs that are already installed on your system. After the VM host machines have been discovered, you can also begin the process of creating VMs.

For information on creating VMs, see Section 3.2, "Building a Virtual Machine," on page 42 and for information on discovering VMs, see Section 3.1, "Discovering Existing Virtual Machines," on page 39.

7 Continue with Section 2.2.2, "Resuming the VNC Password Job," on page 26.

2.2.2 Resuming the VNC Password Job

The VNC password was set when you ran the configuration script. The *vmHostVncConfig* job must be activated because it is shipped in a paused state. This job opens up the VNC port on the VM host machines that are part of the VM Builder group in the Orchestrator Server and sets the previously specified password.

When this job is running it allows you to open a VNC session to the ZENworks VM Management Console or any other VNC client.

To resume the VNC job:

1 In the ZENworks Orchestrator Console, click the *Scheduler* button.

The applicable portion of the console is illustrated here:
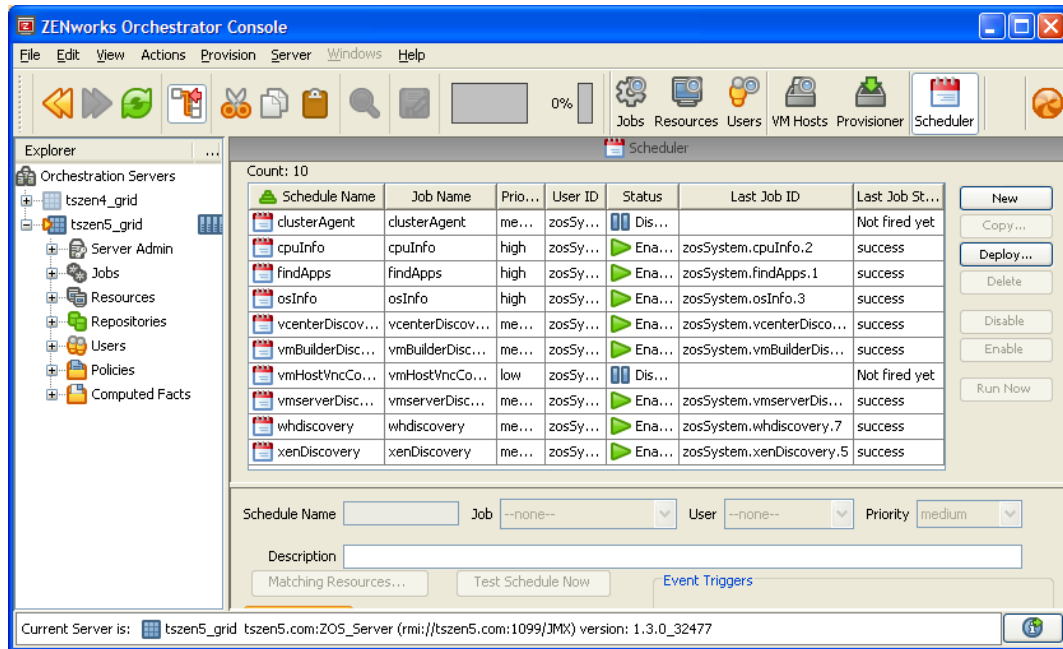
2 Select the *vmHostVncConfig* job (indicated in blue):
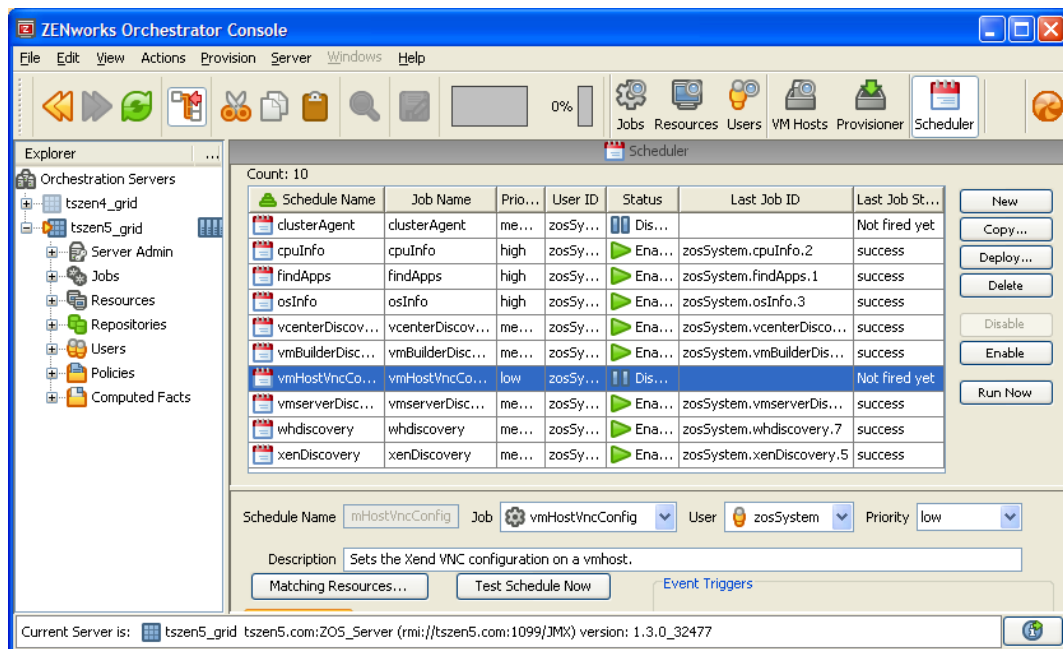
3 Click *Enable*, then click *Run Now*:
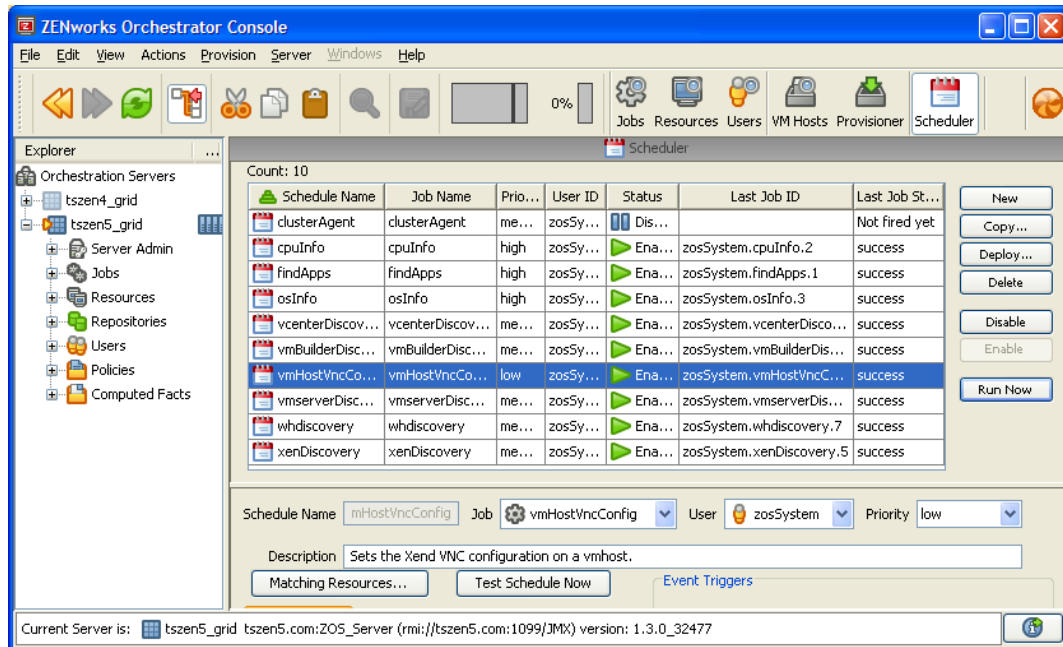
4 Continue with one of the following:

- ◆ (Optional) Section 2.2.3, "Setting Joblet Slots on Physical Machines," on page 28
- ◆ Section 2.2.4, "Discovering Virtual Machine Hosts," on page 30

2.2.3 Setting Joblet Slots on Physical Machines

If your physical machine is going to be part of the group of Xen hypervisor-enabled machines that you want to use as VM Builder agent machines, you might want to increase the number of joblet slots on that particular physical machine.

To set joblet slot values:

1 In the ZENworks Orchestrator Console, select a physical resource in the left pane, then in the right pane, click the *Info/Groups* tab:
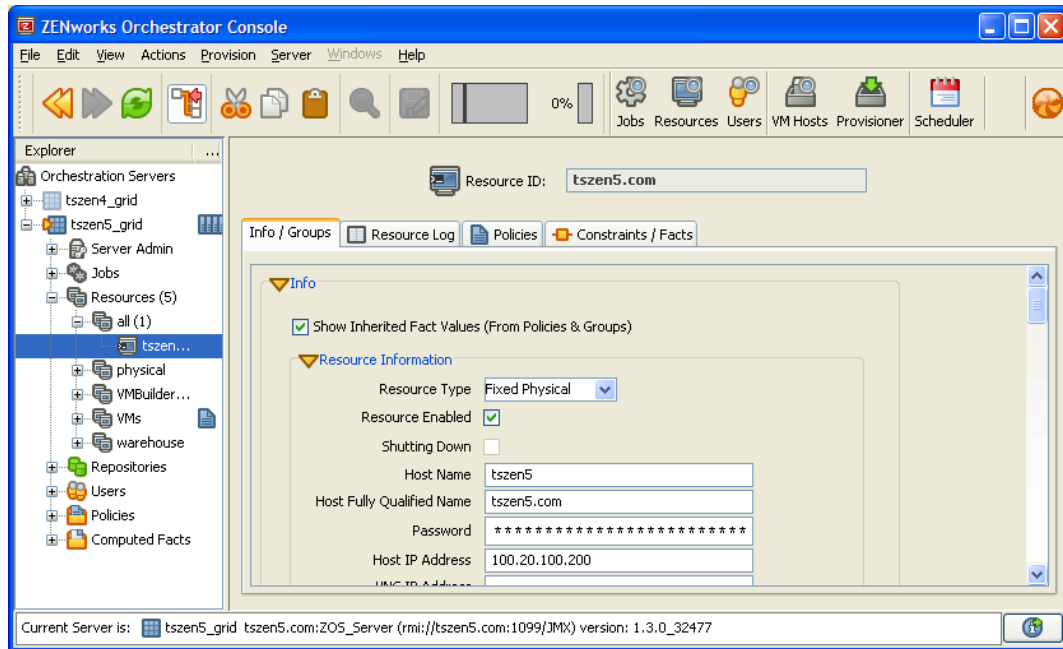
If necessary, click the ▷ icon to open the *Info* section.

2 Scroll down to view the *Joblets Slot* field:
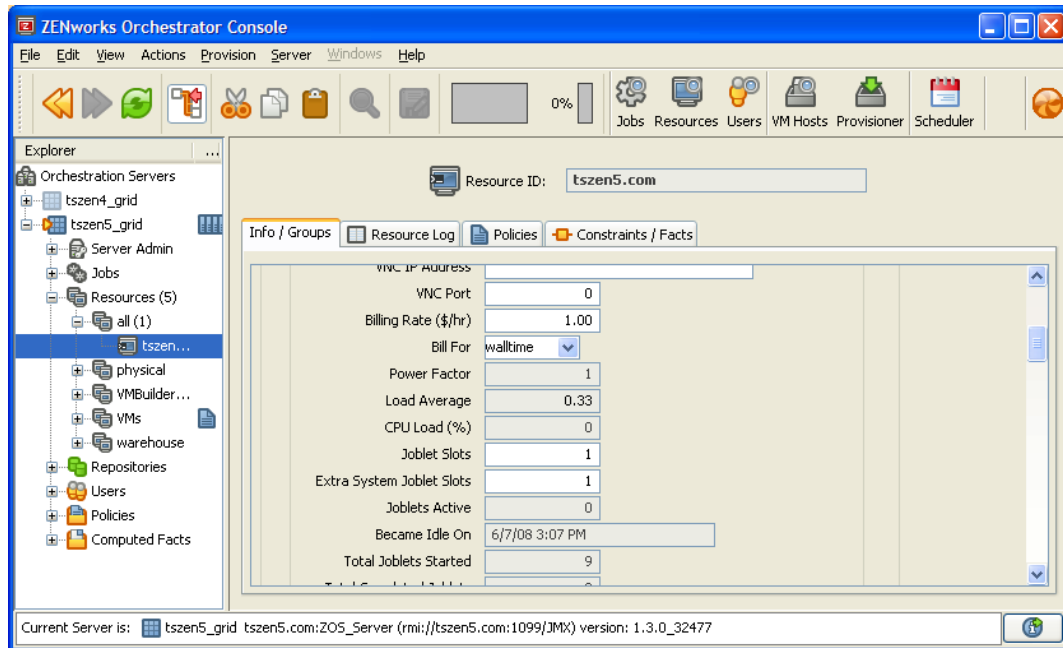
3 In the *Joblet Slots* field, change the default of 1 to a higher value (depending on the capacity of the machine), then click *File > Save* to make the change effective.

Two or three slots is the recommended number of joblet slots for most machines.

Additional joblet slots allows you to run multiple joblets on the machine, or build more than one VM at a time.

You can also make this change on non-VM Builder servers.

4 Continue with Section 2.2.4, "Discovering Virtual Machine Hosts," on page 30.

2.2.4 Discovering Virtual Machine Hosts

After you have discovered your physical resources, resumed the VNC job, and have set the correct number of joblet slots for the VM Builder host and other VM host machines, you can begin to discover and build VMs in your data center. For information on using the VM Builder to build your new VMs, see Section 3.2, "Building a Virtual Machine," on page 42. For information on discovering VMs in your data center, see Section 3.1, "Discovering Existing Virtual Machines," on page 39.

When you load ZENworks Orchestrator Console with active VM Management, you can use the console to manage VMs as resources in your data center. Before you can use your VMs, you need to discover the machines on which they reside and on which they will run.

1 In the ZENworks Orchestrator Console, click *Provision > Discover VM Hosts* to display the Discover VM Hosts dialog box.
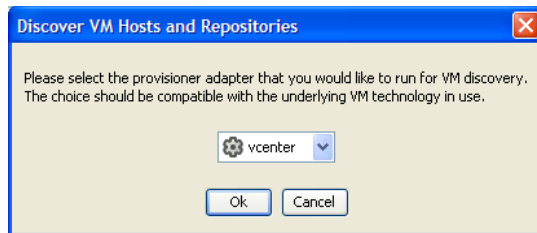
2 Select your provisioning adapter (*vcenter*, *vmserver*, or *xen30*) from the drop-down menu.

> **IMPORTANT:** In order to use Xen 3.0 virtual machines, select *xen30*.

For information on provisioning adapters, see Chapter 4, "Provisioning Virtual Machines," on page 57.

3 Click *OK*.

The following dialog box is displayed:
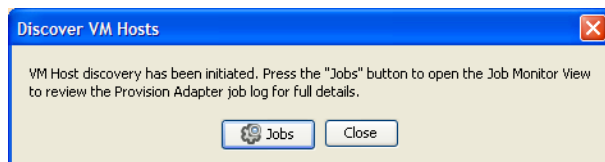
4 Click *Jobs* to view the Jobs section in the ZENworks Orchestrator Console and verify that the job has started.
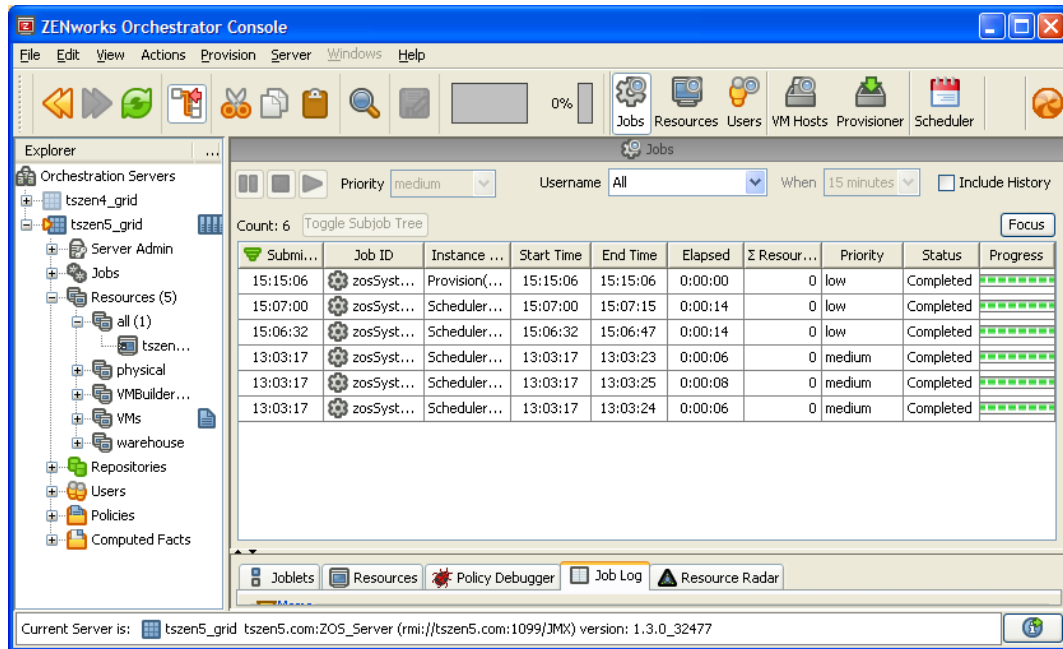
After your VM host machines are discovered, you can refresh your tree view or wait for the automatic tree refresh to see the VM host machine listed under the provisioning adapter, although no VMs are listed.

For a listing of the VM technologies and supported host and guest operating systems, see Section C.1, "Virtual Machine Technologies," on page 99.

5 Continue with Section 2.3, "First Run Tutorial," on page 31.

2.3 First Run Tutorial

The following provides a tutorial to familiarize you with the VM life cycle processes:

- Section 2.3.1, "Starting the ZENworks Orchestrator Management Environment," on page 32
- Section 2.3.2, "Providing an Installation Source for installing a New Virtual Machine," on page 32
- Section 2.3.3, "Creating a New Virtual Machine," on page 32
- Section 2.3.4, "Installing the Orchestrator Agent on the Virtual Machine," on page 33
- Section 2.3.5, "Installing Applications on the Virtual Machine," on page 34
- Section 2.3.6, "Checking the Virtual Machine in to the VM Warehouse," on page 34
- Section 2.3.7, "Provisioning the Virtual Machine," on page 34
- Section 2.3.8, "Deploying the Virtual Machine," on page 34
- Section 2.3.9, "Cloning the Virtual Machine," on page 35
- Section 2.3.10, "Monitoring Your Virtual Machines," on page 36
- Section 2.3.11, "Destroying the Virtual Machine," on page 36

2.3.1 Starting the ZENworks Orchestrator Management Environment

1 Make sure that the ZENworks Orchestrator Server is running.

   For information, see "Installation and Configuration" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

2 (Conditional) Install both management consoles on your management workstation, if they have not yet been installed:

   ◆ ZENworks Orchestrator Console: "Independent Installation of the Agent and Clients"

   ◆ ZENworks VM Management Console: "Installing the VM Management Console"

   Your management workstation can be running either Windows or Linux. Both consoles are available on these operating systems.

3 On your management workstation, open the ZENworks Orchestrator Console by using the instructions contained in Section A.1.1, "Launching the ZENworks Orchestrator Console," on page 80.

4 Right-click the grid that you created during installation of ZENworks Orchestrator, select *Login*, then provide your username and password for the grid.

5 On your management workstation, open the ZENworks VM Management Console using the instructions contained in Section A.2.1, "Launching the ZENworks VM Management Console," on page 84.

6 Continue with Section 2.3.2, "Providing an Installation Source for installing a New Virtual Machine," on page 32.

2.3.2 Providing an Installation Source for installing a New Virtual Machine

To create a new VM, you'll need an installation source for the VM's operating system installation.

1 To select a VM installation source, see Appendix B, "VM Management Installation Sources," on page 97.

2 Select a source that contains the necessary software for installing an operating system to the VM.

   You might need to provide the software in your selected source. Select an operating system that you'll likely use in your production environment, perferably one that won't require a lot of configuration, which is done in the next section when you create the VM.

3 Continue with Section 2.3.3, "Creating a New Virtual Machine," on page 32.

2.3.3 Creating a New Virtual Machine

1 In the ZENworks VM Management Console, do one of the following actions to open the VM Builder Wizard:

   ◆ Click the *Create New* button (⊕) on the toolbar.

   ◆ Click *File > Create New*.

   ◆ Right-click in the Workspace panel and select *Create New*:
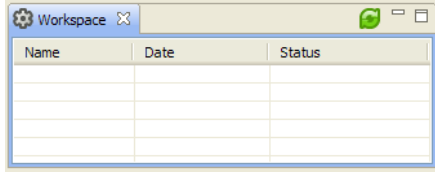
- ◆ Double-click a blank space in the Workspace panel.

2 In the VM Build Wizard, fill in the necessary information on the wizard pages to define your VM, then click *Install* on any wizard page when finished configuring the VM.

For details on the wizard pages, see:

- ◆ Description page: "Description" on page 44
- ◆ Hardware page: "Hardware" on page 45
- ◆ Storage Devices page: "Storage Devices" on page 46
- ◆ Network page: "Network" on page 47

If you click *Apply*, the wizard exits without starting the installation of the VM. Instead, the VM is listed in the Workspace panel as *Defined*. To start the installation from there, simply right-click the VM name and select *Install*.

For other ways to start a defined VM's installation, see Section 3.2.3, "Installing a Defined Virtual Machine," on page 49.

You can also edit an installed VM, but cannot edit as many fields as you can before the VM is installed. The *Edit* option allows you to edit a defined VM, and the *Edit Image* option allows you to create a copy of the VM that is put elsewhere on the drive, so you can open the VM Image and change its inherent metadata, processor architecture, initial hard disk properties, memory properties, and so forth. For more information, see Section 6.3.2, "Modifying Virtual Machine Properties," on page 71.

3 To monitor the installation process, do both of the following:

- ◆ In the ZENworks VM Management Console, click *Window > Show View > Progress* to display the Progress panel.
- ◆ In the ZENworks Orchestrator Console, click the *Jobs* tab.

4 To interact with the VM where the software is being installed, click the Show VNC icon () and provide your VNC password.

5 After the VM has been installed, continue with one of the following:

- ◆ Section 2.3.4, "Installing the Orchestrator Agent on the Virtual Machine," on page 33
- ◆ Section 2.3.5, "Installing Applications on the Virtual Machine," on page 34

2.3.4 Installing the Orchestrator Agent on the Virtual Machine

If you want a VM to be used by the Orchestrator Server as a resource for high performance computing (HPC), you must install the Orchestrator Agent.

1 Follow the instructions contained in "Installing the Orchestrator Agent on VMs" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

2 Continue with Section 2.3.5, "Installing Applications on the Virtual Machine," on page 34.

2.3.5 Installing Applications on the Virtual Machine

To understand how to enhance the functionality of a VM that might be a basic operating system installation, install some applications on the VM. Choose the applications for a simple purpose so you can see whether the VM is behaving as desired after it has been deployed.

Do the following:

1 Start the VM on a VM Host outside of your production environment.

The VM can be left running after its installation if it is installed on a VM Host outside of your production environment.

2 Install a few selected applications on the running VM.

Do this by installing the software just as you would on a physical machine.

3 After you have installed the applications, stop the VM.

The applications remain installed the next time you start the VM.

4 Continue with Section 2.3.3, "Creating a New Virtual Machine," on page 32.

2.3.6 Checking the Virtual Machine in to the VM Warehouse

In order for the VM to be used, it must be checked in to the VM Warehouse.

1 In the ZENworks VM Management Console, do one of the following:

- Right-click the VM and select *Check In*.
- Select the VM, then click *File > Check In*.
- Select the VM and click the *Check In* button.

2 To view the VM in the VM Warehouse, double-click a warehoused VM, or right-click the VM in the warehouse and select *Show Versions*.

This displays a list of all the versions of that VM in an edit window on the right.

3 Continue with Section 2.3.7, "Provisioning the Virtual Machine," on page 34.

2.3.7 Provisioning the Virtual Machine

Provisioning is used to get a VM ready to start in a running state when deployed. For more information, see Chapter 4, "Provisioning Virtual Machines," on page 57.

For procedures and more information on provisioning of VMs, see "Virtual Machine Job Development" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

Continue with Section 2.3.8, "Deploying the Virtual Machine," on page 34.

2.3.8 Deploying the Virtual Machine

By default, the Xen and VMware server adapters create a local type Repository object for local VM images when ZENworks Orchestrator accomplishes the *Discover VM Hosts* action.

For information on other deployment resources, see Chapter 5, "Deploying Virtual Machines," on page 59.

To deploy the VM:

1 In the ZENworks Orchestrator Console, create a job that deploys the VM to a VM Host where the VM can be used for a particular purpose of your choosing.

For information on creating deployment jobs, see *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

2 To deploy the job, go to the ZENworks Orchestrator Console, click *Actions > Deploy Job*, then select the VM job that you created in Step 1.

3 Monitor the VM to see whether it is deployed and is working as designed.

4 Continue with Section 2.3.9, "Cloning the Virtual Machine," on page 35.

2.3.9 Cloning the Virtual Machine

A VM template is a special kind of VM that is not deployed separately. When the Orchestrator Server needs a VM of the template's type to be used as a resource, it automatically clones a version of the VM and uses that clone as the VM. You can change cloned VMs into instances of VMs instead of clones.

1 To make a VM instance into a template, go to the ZENworks Orchestrator Console, right-click the VM, then select *Create Template*.

2 Do the following:

- ◆ Name the template.
- ◆ Specify a repository.
- ◆ Specify a visible VM host.
- ◆ Select a recommended host for the VMs to be launched on, if any are present.

3 Click OK when finished defining the template.

When the clone of the template VM is provisioned, it appears as a sub-branch of the template's location in the resources tree, as in the following Linux and Windows examples:

This clone functions as an instance of a VM and runs as though it were its own version with its own MAC address and other unique identifiers. The UUID is the only new information that is automatically generated for the clone. All the rest of the new information comes from autoprep, including the MAC address if an asterisk (*) is placed in the *Mac Address* field in the *Autoprep Network Adapter* section of the *Info/Groups* tab for the template (the default is a blank field, meaning no MAC address is created), and if the *Use Autoprep* check box is enabled on the Create VM from *Template* dialog box.

When the Orchestrator Server no longer needs the clone, it deprovisions it and automatically deletes it from the data center.

4 If you decide to keep a clone VM, go to the ZENworks Orchestrator Console, right-click the clone and select *Remove Template Dependency*.

This brings up the Remove Template Dependency dialog box, shown in the following figure:
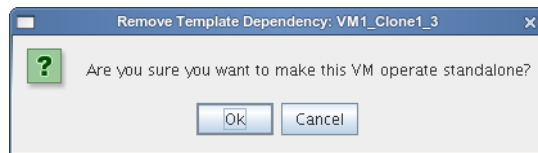
5 Click *OK* to retain the clone VM.

6 Continue with Section 2.3.10, "Monitoring Your Virtual Machines," on page 36.

2.3.10 Monitoring Your Virtual Machines

You can monitor your virtual machines from both management consoles.

1 Use the ZENworks VM Management Console to view your VMs.

This console can be used to influence decisions about machines to constrain to use specific joblets and be hosts to specific VMs. You can view the VM information in a text or graphical view.

For information, see Section 6.4.1, "Using the ZENworks VM Management Console Monitoring View," on page 75.

2 Use the ZENworks Orchestrator Console to view your VMs.

This console allows you to view the information by looking at the *Jobs* section, which provides feedback for jobs being executed by the Orchestrator Server.

For information on monitoring from the ZENworks Orchestrator Console, see Section 6.4.2, "Monitoring Orchestrator Server Jobs," on page 77.

3 Continue with Section 2.3.11, "Destroying the Virtual Machine," on page 36.

2.3.11 Destroying the Virtual Machine

When you want ZENworks Orchestrator to no longer use a VM, you can "destroy" it.

1 In the ZENworks Orchestrator Console, right-click the VM in the tree and select *Delete/ Destroy Resource*.

This action removes the VM from your resource list. However, the actual image of the VM is still stored in its directory. If the VM was stored in the VM Warehouse, it is retained there.

2 (Optional) If you deleted a VM from your resource tree, rediscover it by running a discovery job. Click *Provision > Discover VM Images* to rediscover any VMs in your data center with unique UUIDs.

3 To delete a VM from the VM Warehouse, right-click the VM in the ZENworks VM Management Console and select *Delete*.

This completely deletes the VM and all its versions from your data center. You cannot restore any version of the VM after you delete it from the Warehouse. However, if you do have a checked-out instance of the VM, you can check that back into the Warehouse.

4 Continue with .

2.4 What's Next?

After you have logged in to the ZENworks VM Management Console, you can begin to build VMs by using the VM Builder, check those VMs into the warehouse, check out and modify the VMs, and use the ZENworks VM Management Console to its full capacity as an efficient resource in managing your VMs.

To perform VM Management tasks, continue with:

For more information on the ZENworks VM Management Console, see .

Creating Virtual Machines

<div align="right">3</div>

In creating virtual machines (VMs), you design, build, and test your VMs before deploying them to your data center. The Novell® ZENworks® VM Management Console aids you in developing and testing your VMs before listing them as deployable resources in your ZENworks Orchestrator Console. These actions do not directly impact your production environment.

Review the following sections to discover, design, build, install, configure with applications, store, and version your VMs:

3.1 Discovering Existing Virtual Machines

You can use VMs you have previously created or VMs you have built by using other hypervisors in your data center. To make use of these VMs, you need to run a discover job. You use the ZENworks Orchestrator Console to detect the VMware Server, VMware Virtual Center, and Xen VM host machines.

After you have detected the host machines, you can detect the VMs contained on the host machines and in other VM storage repositories. This search seeks VMs stored already on the host machines and any Gold Master versions of the VMs stored in the VM Warehouse. This discovery process applies to Xen, VMware Server, and VMware Virtual Center VMs.

NOTE: The following steps assume that you have already discovered and incorporated all physical resources of the data center, including the host machine (which lists as a physical resource). If you have not done this, see Section 2.2.1, "Discovering Physical Resources," on page 24. For information on discovering VM host machines, see Section 2.2.4, "Discovering Virtual Machine Hosts," on page 30.

To discover VMs in the entire data center:

1 In the ZENworks Orchestrator Console, click *Provision > Discover VM Images*.
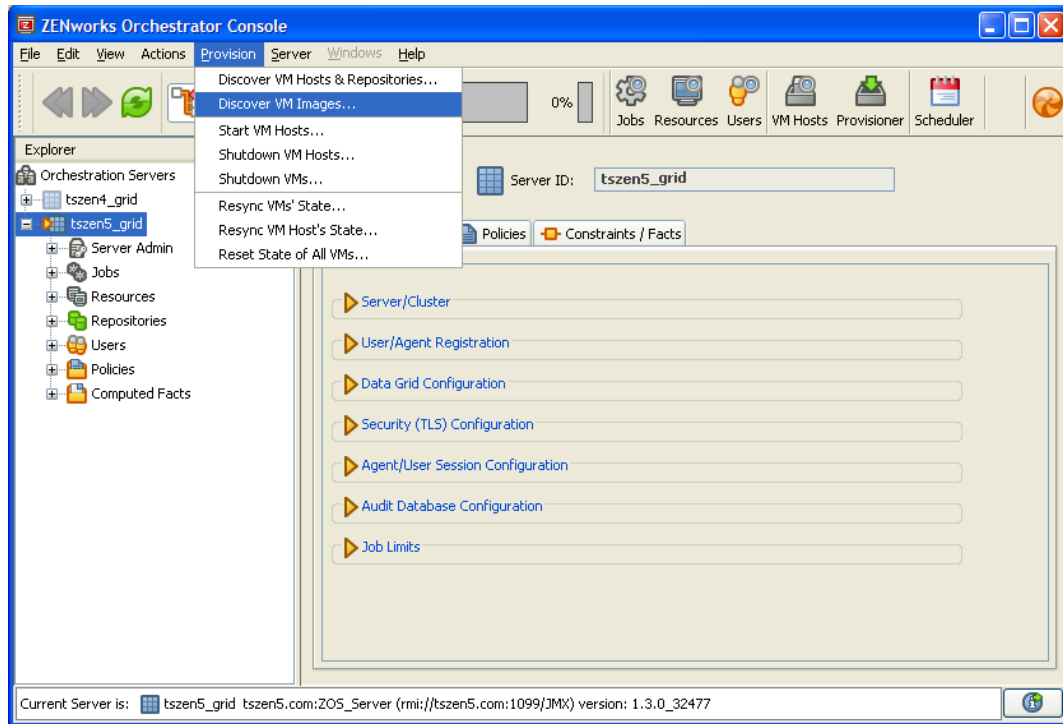
2 Select the provisioning adapter.
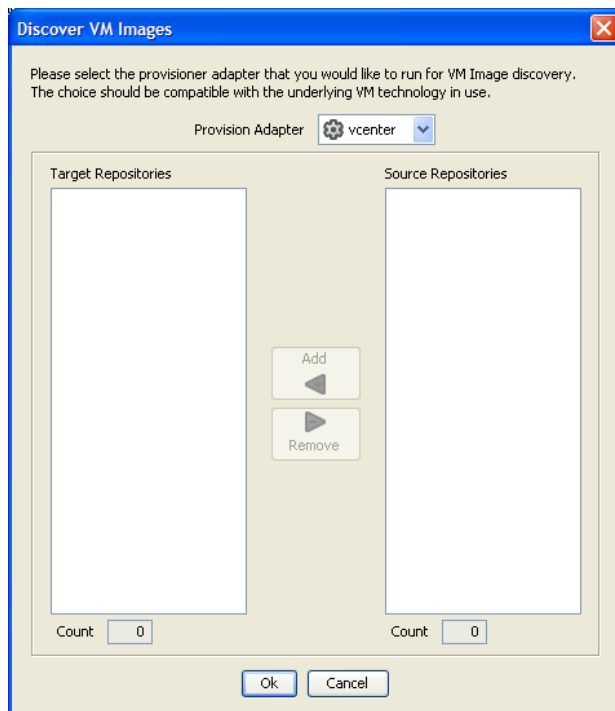
For information on provisioning adapters, see Chapter 4, "Provisioning Virtual Machines," on page 57.

3 Select the source repository or repositories.

4 Click *Add* to add the source repository to the target repository list.

5 Click *OK* when you are finished adding source repositories.

6 Look at the Jobs view in the ZENworks Orchestrator Console to verify that the job to add source repositories has started.
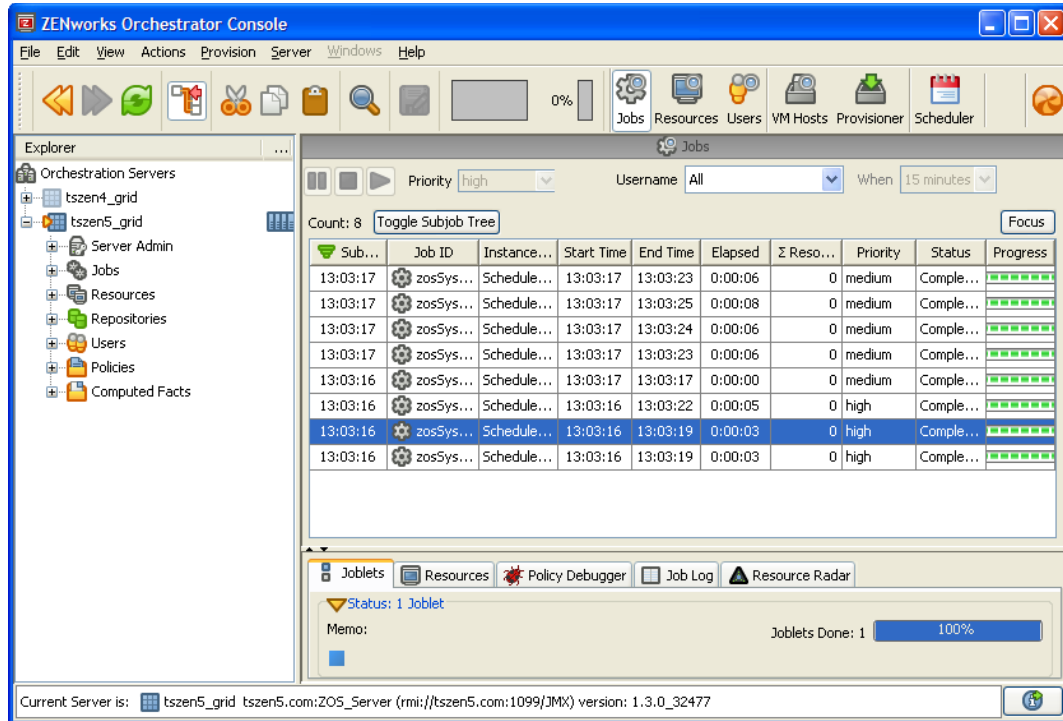
When you discover VMs, they are listed both under their specific VM technology and under the VMs section in the ZENworks VM Management Console, as shown in the following figure:

Figure 3-1   *Resource Tree with VMs in Explorer Window of the ZENworks Orchestrator Console*
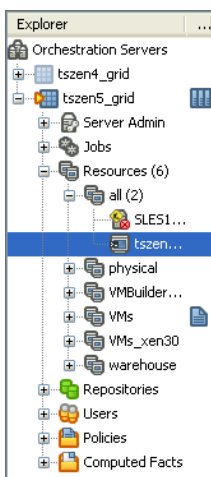
3.2 Building a Virtual Machine

VM Builder is used to define the components required in a VM. When these components are defined, a request is sent to the Orchestrator Server which in turn sends the request to a VM host machine that is part of the VM Builder group.

When a VM Builder installation request is made, it is sent to the Orchestrator Server, which sends the request to a build machine. If a machine that meets the build requirements of the VM is found, then the Orchestrator Server launches the build job on that machine. You should not build a machine that exceeds the capability of the build machines in your VM Builder group.

For more information on the Orchestrator Server and its installed components, see "Software Architecture" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

Do the following tasks in order:

3.2.1 Launching the Virtual Machine Builder

One of the functions provided by the ZENworks VM Management Console is the Virtual Machine Builder (VM Builder) Wizard. To launch the VM Builder Wizard:

1 In the ZENworks VM Management Console, do one of the following actions to open the VM Builder Wizard:

   - Click the *Create New* button (⊕) on the toolbar.
   - Click *File > Create New*.
   - Right-click in the Workspace panel and select *Create New*:
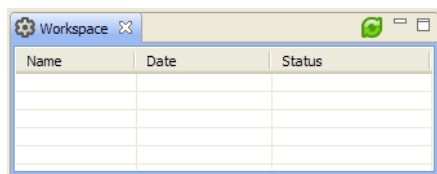
   - Double-click a blank space in the Workspace panel.

2 Continue with Section 3.2.2, "Defining the Virtual Machine," on page 42.

3.2.2 Defining the Virtual Machine

The VM Builder Wizard has four pages. As you progress through the pages, you can refer to this documentation or you can use the dynamic help displayed in the white bar at the top of the Wizard.

To define a VM:

1 In the VM Build Wizard, fill in the necessary information on the wizard pages to define your VM.

Review the following sections for information on the wizard pages:

- "Description" on page 44
- "Hardware" on page 45
- "Storage Devices" on page 46
- "Network" on page 47

Click *Back* to make changes on any wizard page.

2 When you have completed defining the VM in the VM Builder Wizard, do one of the following to exit the wizard:

- Click *Apply* on any wizard page, which saves your changes.

  The defined VM is listed in the Workspace panel as *Defined*, which means it is not yet installed. To install the VM at a later time, review Section 3.2.3, "Installing a Defined Virtual Machine," on page 49.

- To install immediately, click *Install* on any wizard page, then continue with Section 3.2.3, "Installing a Defined Virtual Machine," on page 49.

Description

The following figure shows the VM Builder Wizard window when you first launch VM Builder:

Figure 3-2 *VM Builder Wizard*

The Description page is used to define the VM's descriptive parameters and operating system:

- ◆ **VM Name:** (Required) Give the VM a unique name. This name applies to all versions of the VM.

- ◆ **Description:** Note the purpose and any other specifics you might require of the VM. These notes apply to all versions of this VM.

- ◆ **Guest Operating System:** The operating system you want to install on your VM.

- ◆ **Virtualization Mode:** *Full Virtualization* means that all the hardware components are emulated by the hypervisor. *Paravirtualization* means that the operating system directly accesses elements of the hardware, including processor, display, memory, network interface card, and hard drive, and uses the hypervisor to emulate other hardware interactions. Paravirtualization performs much faster and with better hardware efficiency than full virtualization.

  NOTE: Please refer to the SLES and RHEL documentation to verify supported platforms in each virtualization mode.

- **Architecture:** The type of processor you want to have as the virtual processor for the VM.

- **Install Source:** (Required) The path to the installation media for your guest operating system. For a fully virtualized VM, the install source must be an ISO. For a paravirtualized VM, an ISO or network install source is required. For more information, see Appendix B, "VM Management Installation Sources," on page 97.

- **Auto Install File:** This field applies only to paravirtual installations. The file listed here is used to populate the answers needed during the installation of the guest operating system (some examples include time zone, language, firewall, and other settings given in response to the user interactive areas of the installation). An AutoYaST file listed here can contain network settings that are applied during the VM Builder job. For RHEL the file would be a kickstart file.

- **Additional Arguments:** This field applies only to paravirtual installations. These are Linux install arguments, which are operating system parameters similar to the information entered in a GRUB boot loader when running on bare hardware in SLES and SLED. Additional network installation information can be added here, which will be used during the build process to find the installation source for the VM Build process.

Hardware

The hardware section defines the kind of actual hardware to be virtualized for the VM. The following graphic displays the Hardware page.

Figure 3-3 *VM Builder Hardware Properties*
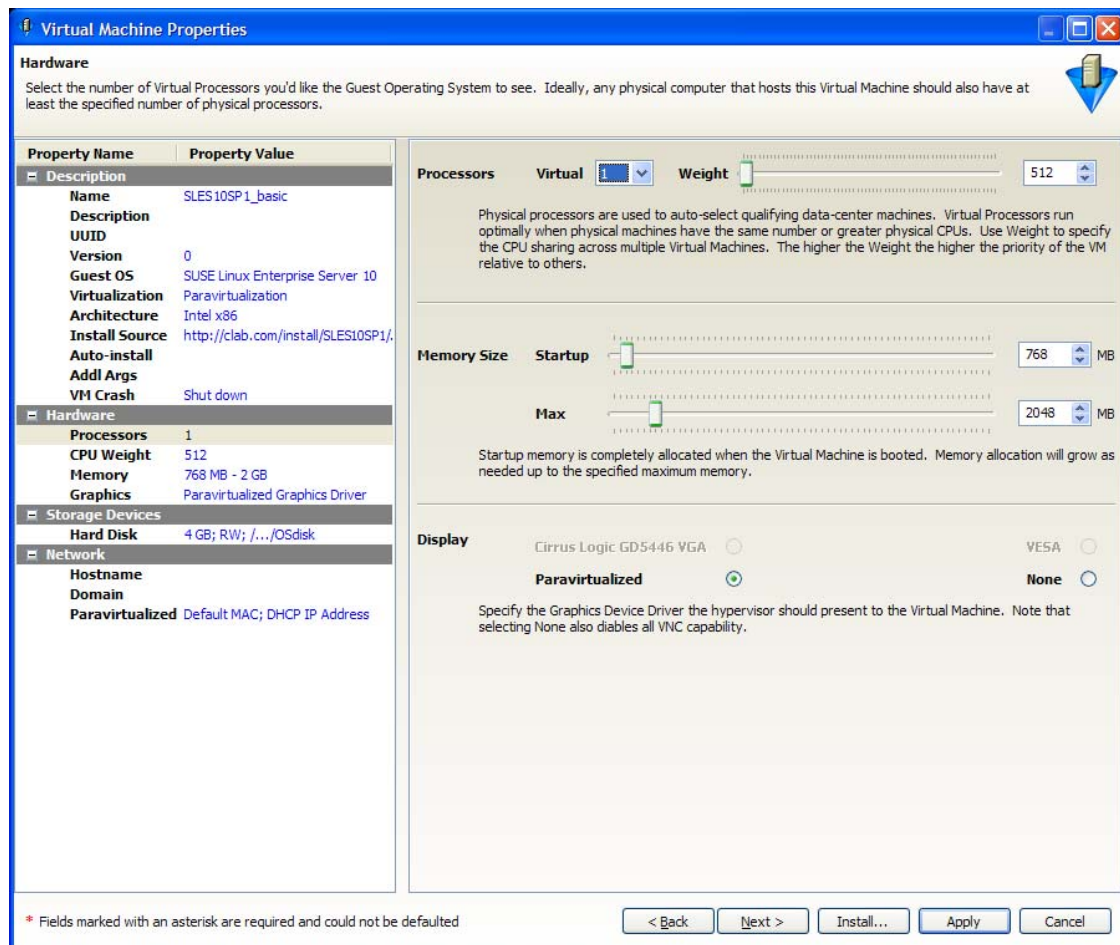
These hardware constraints are:

- **Virtual Processors:** The number of virtual processors the VM has.
- **Processor Weight:** The priority of the selected virtual processor over other virtual processors on the same VM host.
- **Memory Size:** The amount of virtual RAM the VM has, or paravirtualized memory that can be used by the VM if it is paravirtualized.
- **Display:** The properties of the VM's display. If you have chosen paravirtualization for this VM, your only option is *Paravirtualized*. If you have chosen full virtualization, you can select between *VESA* or the on-board VGA. If you do not need a display, you can turn off the display on a fully virtualized machine.

Storage Devices

The storage devices are the hard drives and CD or DVD drives you want to include in the VM profile. The first device must always be a hard disk that cannot be removed unless another hard disk has been put into the first slot. This is the only disk (Disk 0) that is stored and version controlled. All other disks added are virtual and are created upon the launch of the VM. You can add any other storage devices you want to the VM and move them according to priority in the list. The following figure shows the Storage Devices page.

Figure 3-4   VM Builder Storage Device Definition
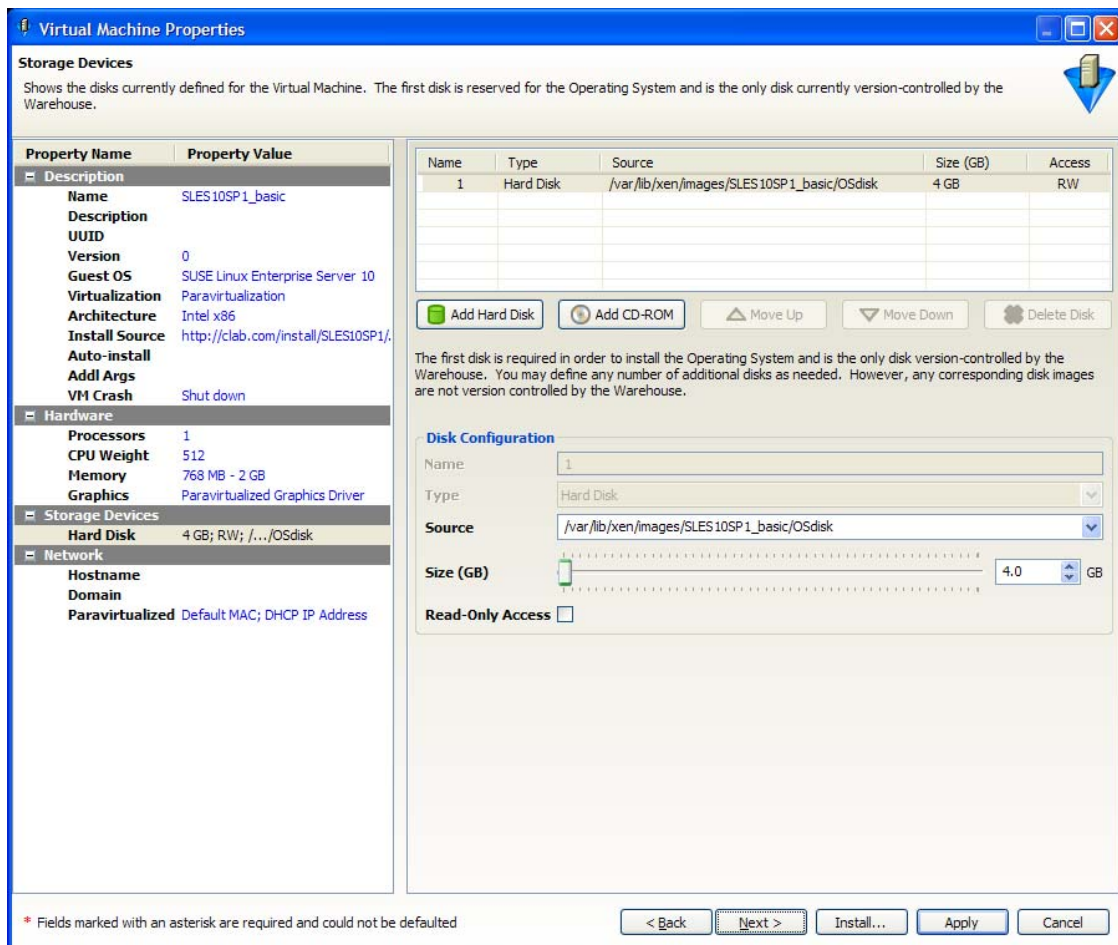
The elements of the Storage Device Definition page are:

- **Add, Move, and Delete Control Buttons:** These buttons control disk order beyond the initial required hard disk in the VM. The first disk must be a hard disk and is the only one that is actually stored in the VM image.

- **Name:** The name is the number in the order the drive appears in its VM image listing.

- **Type:** Select either *Add CD-ROM* or *Add Hard Disk*. Selecting *Add CD-ROM* allows you to add a CD-ROM or DVD ROM to your VM. Selecting *Add Hard Disk* allows you to add an additional hard disk to your VM.

- **Source:** The storage location of the hard disk of the VM.

- **Size (GB):** The VM size, ranging from 0.25 GB (250 MB) to 4 TB. This is the maximum allowable size of the VM.

- **Sparse Image File:** Select this option to make the file sparse. This makes the whole image file capable of taking up its maximum size, but the actual size is only the size of the guest operating system and any installed files.

- **Read Only Access:** Select this option to give the drive Read-Only access.

Network

The Network page contains network settings that are stored as VM Personality Data when VM is checked into the warehouse. When the VM is provisioned through ZENworks Orchestrator, these Network settings are used. If this data does not exist, the provisioned VM uses the existing VM for

network settings. The network devices are added, deleted, and defined on the Network page, where you add specific information about your network connections or intended network connections for your VM. The following graphic represents the Network Devices page.

Figure 3-5 *VM Builder Network Interface Definition*
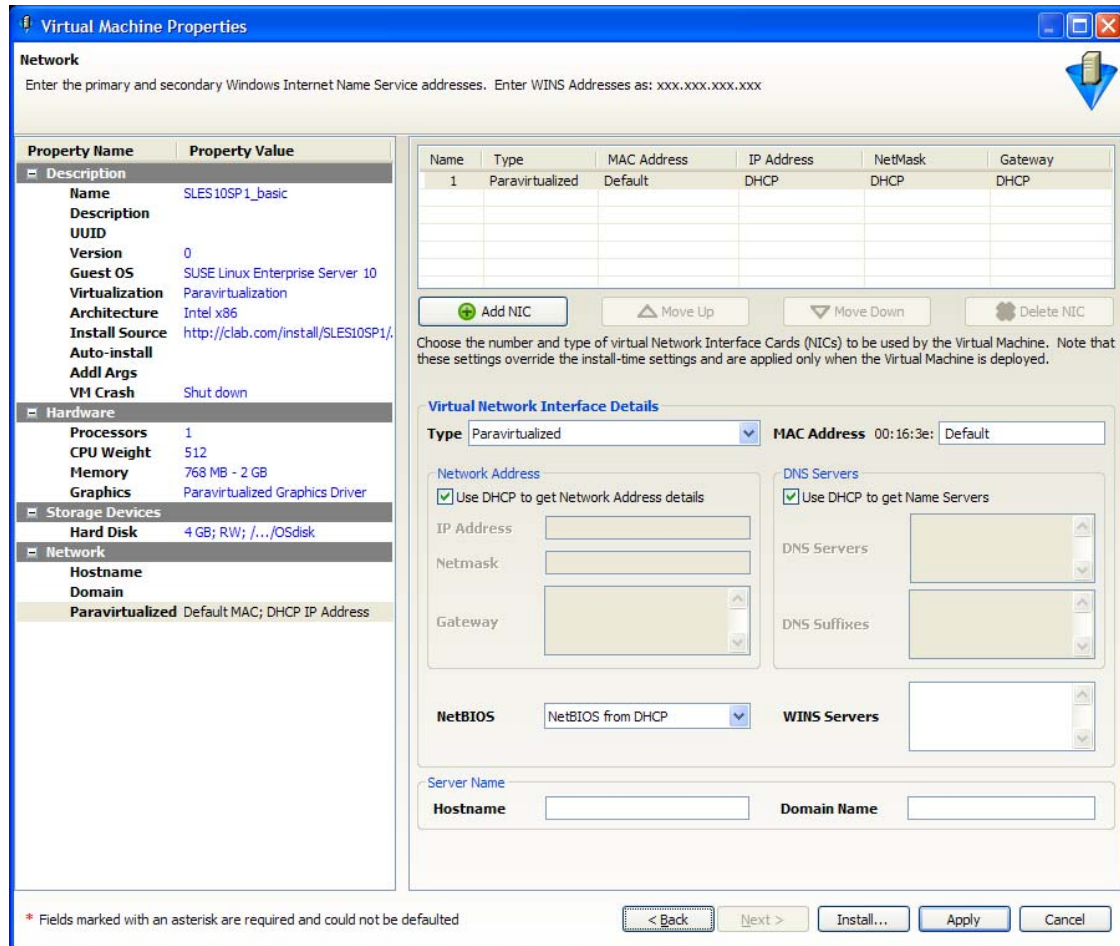
The Network Device definition sections are:

- **Add, Move, and Delete Control Buttons:** These buttons control the list order and number of virtual NICs in your VM.

- **Type of Virtual Network:** Indicates whether the VM has direct access to the NIC. If the NIC should only interface with the hypervisor, you can select the specific type of full virtualization. You should have a paravirtualized NIC with a paravirtualized VM.

- **MAC Address:** Unless you have a specific MAC address you want to assign to this VM, leave this set to *Default*, and Xen assigns it a MAC address when you launch the VM.

- **Network Address:** The default selection allows DHCP to get a network address for your VM when it starts. You can designate a static IP address in the *IP Address* field, a network mask in the *Netmask* field, and the gateway in the *Gateway* field by deselecting the DHCP check box.

- **DNS Servers:** The default selection allows DHCP to get name servers for your VM when it starts. You can deselect the DHCP check box, then designate DNS servers in the *DNS Servers* field and DNS suffixes in the *DNS Suffixes* field.

- **NetBIOS:** The default setting gets NetBIOS information from the DHCP, or you can use this drop-down menu to completely enable or disable NetBIOS.

- **WINS Servers:** Designate any WINS servers your VM needs.

- **Server Hostname:** The default is the name you gave to the VM. You can change this to anything you want the hostname to be.

- **Server Domain Name:** Designate the domain to which the VM will belong.

3.2.3 Installing a Defined Virtual Machine

The Xen hypervisor is used to build all VMs built with the VM Builder. The following illustrates a defined VM:
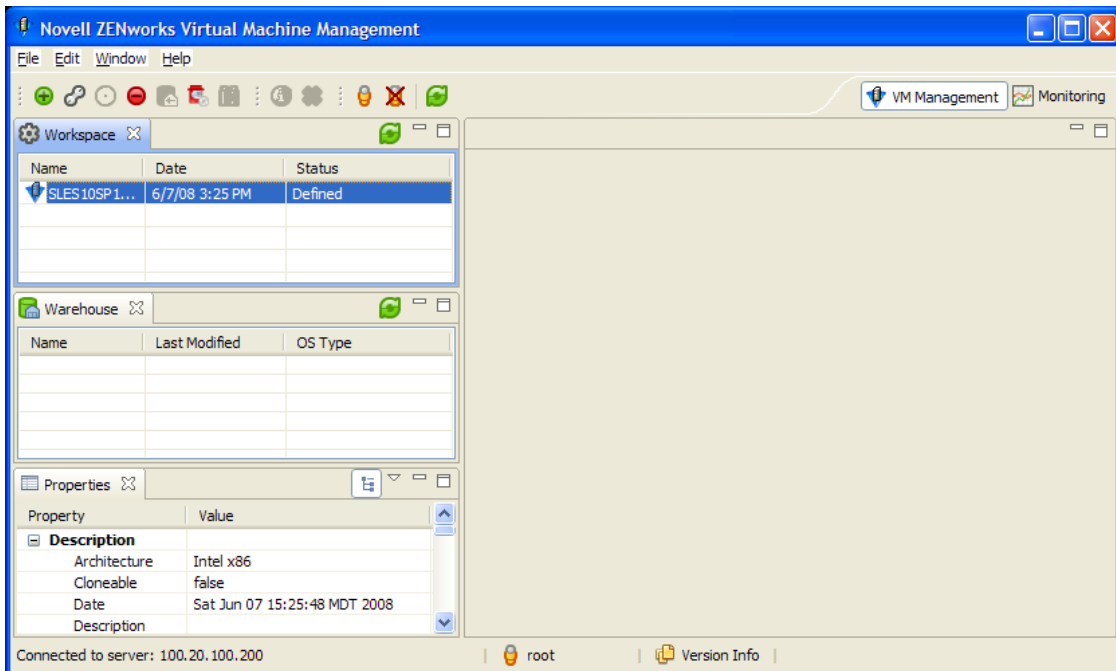
The VM installation can also be automated using a response file. For more information, see .

To manually install a defined VM:

1 In the ZENworks VM Management Console, do one of the following:

- Install directly by clicking *Install*.

- Select the VM, then select *File > Install*.

- Select the VM, then click the *Install* button in the toolbar.

- Right-click in the Workspace window and select *Install* from the menu.

- Double-click the VM to open the VM Builder Wizard, then click *Install*.

- Select the VM, select *File > Edit*, then click *Install*.

- Select the VM, click the *Edit* button in the toolbar, then click *Install*.

- Right-click the VM, select *Edit*, then click *Install*.

2 To monitor the progress of the VM installation, open the Virtual Network Console (VNC) by clicking the icon (🖼).

For information on opening a VNC, see "Viewing and Interacting with the Installing Virtual Machine" on page 51.

For information on monitoring the installation progress in the VNC, see "Monitoring Installation Progress" on page 50.

For information on viewing and interacting with the VM as it's being installed, see "Viewing and Interacting with the Installing Virtual Machine" on page 51.

To cancel a VM installation that is in progress, open the Progress view and click the red square at the end of the moving progress bar.

3 After the VM has been installed, continue with one of the following:

◆ Section 3.2.4, "Installing the Orchestrator Agent on a Virtual Machine," on page 52

◆ Section 3.2.5, "Installing Applications on a Virtual Machine," on page 53

◆ Section 3.2.6, "Checking a Virtual Machine into the VM Warehouse," on page 53

Monitoring Installation Progress

When you click *Install*, you see a progress indicator on the lower right side of the ZENworks VM Management Console, and you see areas that indicate activity in the build and what is being built. In the ZENworks VM Management Console, click *Window > Show View > Progress* to display the Progress panel.

You can also monitor the Orchestrator Server interaction with Xen during the build process. If you look at the Resources view, select the *Resource* button to see the resource chosen to be used for the VM Builder job as displayed in the following figure.

Figure 3-6 *ZENworks Orchestrator Console Resource View in a VM Build Job*
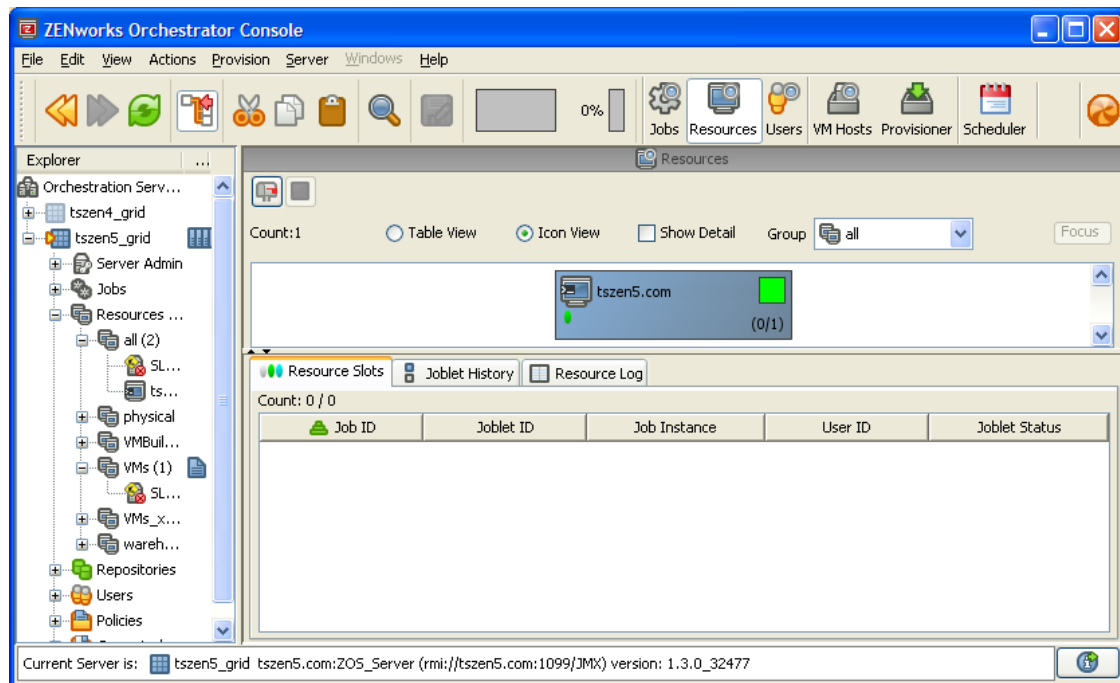
You can also select the Jobs view to see the job, and all of its job-related monitored data as displayed in the following figure.

Figure 3-7 *ZENworks Orchestrator Console Job View in a VM Build*
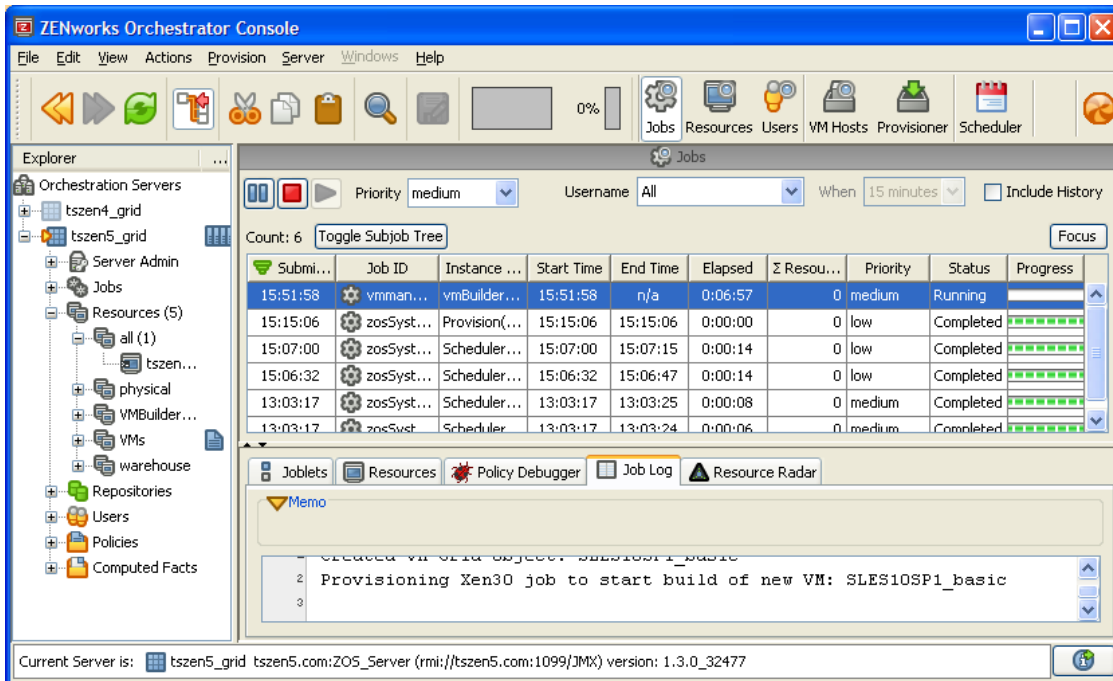
Viewing and Interacting with the Installing Virtual Machine

While you are installing, if you have not designated an AutoYaST file to serve as the automated response file for the installation (see "Automating the Installation Responses" on page 52) you are required by the operating system installation to give responses to certain configuration questions. You can use a VNC to display the console just as if you were installing the product on a physical machine.

Respond to all the questions as if you were setting up the guest operating system on a physical machine. You can even create an AutoYaST file as part of the responses, which you can use to automate future VM builds.

Figure 3-8 *VNC Authentication Screen*
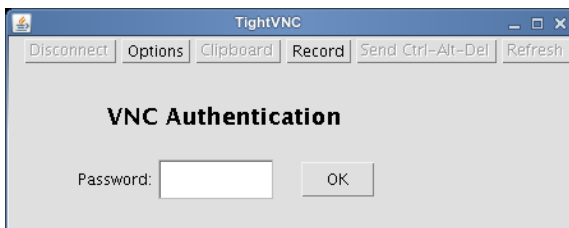
When you have logged in and given all the parameters for the actual guest operating system installation, you see a window similar to the following, displaying the install progress. This is the same as installing on a physical machine.

Figure 3-9 *VNC Console During a SLES 10 SP 1 Installation*
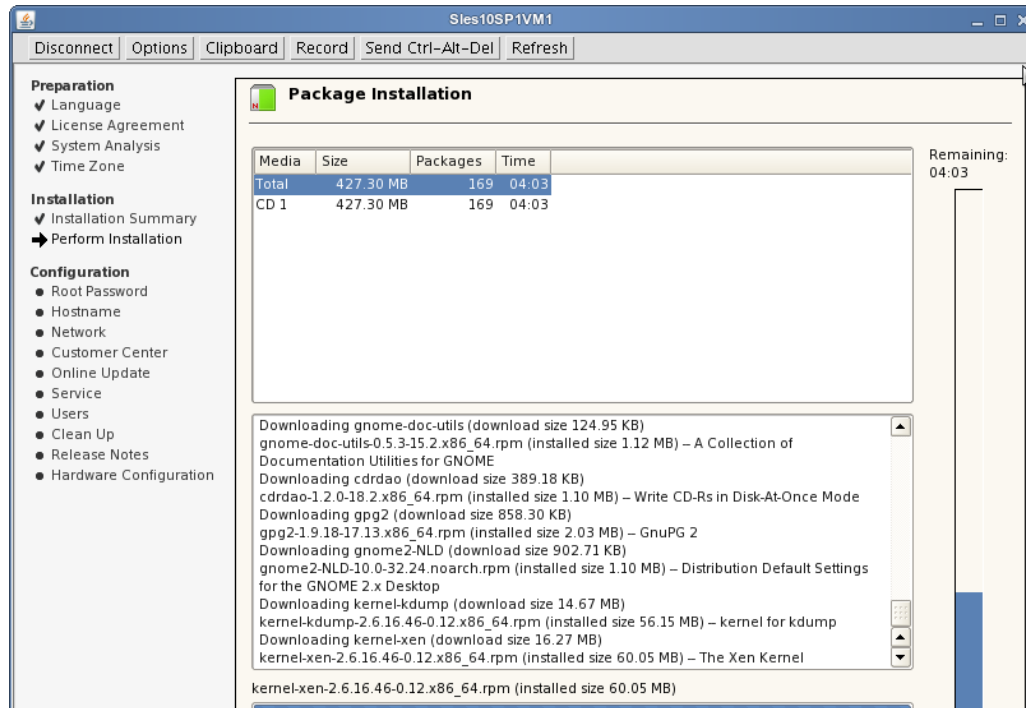
Automating the Installation Responses

To automate the responses to your VM guest operating system installation, you can use an AutoYaST response file that automatically fills in all information, such as the root password, that you are normally required to provide during an operating system installation.

If you choose to use a response file, all responses are precisely like the previous operating system. The speed by which the operating system is installed is dramatically increased.

The AutoYaST file can be designated on the Definitions page of the VM Builder Wizard. If you choose to use an AutoYaST file, you can browse to it by clicking on the button on the right of the space provided.

3.2.4 Installing the Orchestrator Agent on a Virtual Machine

For a VM to be used by the Orchestrator Server as a resource for high performance computing (HPC), it needs to have the Orchestrator Agent installed. For instructions on installing the Orchestrator Agent on a VM, see "Installing the Orchestrator Agent on VMs" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

You can also run a job to install the Orchestrator Agent on a VM. You need to set the constraints in the job to find the type of VM you want, then it automatically installs, similar to the example found at Section D.1, "Installing the ZENworks Orchestrator Agent on an Apache Virtual Machine," on page 117.

Continue with one of the following:

- Section 3.2.5, "Installing Applications on a Virtual Machine," on page 53
- Section 3.2.6, "Checking a Virtual Machine into the VM Warehouse," on page 53

3.2.5 Installing Applications on a Virtual Machine

To install an application on an installed VM:

1 Start the VM on a VM Host outside of your production environment.

The VM can be left running after its installation if it is installed on a VM Host outside of your production environment.

2 Install whatever applications you need on the running VM.

Do this by installing the software just as you would on a physical machine.

3 After you have installed all of the applications that you need, stop the VM.

The applications remain installed the next time you start the VM.

4 Continue with Section 3.2.6, "Checking a Virtual Machine into the VM Warehouse," on page 53.

3.2.6 Checking a Virtual Machine into the VM Warehouse

After you have built or discovered a VM, and installed all the software you need the VM to run, the VM is ready to be checked into the VM Warehouse. This can only be performed on a VM that is shut down or stopped.

Make sure the VM is shut down before checking it into the VM Warehouse. You must have already discovered your VM host machines for the xen30 provisioning adapter.

For instructions on checking an installed VM into the VM Warehouse, see Section 3.3, "Storing and Versioning a Virtual Machine," on page 53.

For information on discovering VM hosts, see Section 2.2.4, "Discovering Virtual Machine Hosts," on page 30.

3.3 Storing and Versioning a Virtual Machine

When you have built or discovered your VMs, and have installed all of the software you need that VM to be running, you can check the VMs into the VM Warehouse. The VM Warehouse stores VM images and the data about the first disk attached to the VM. The VM Warehouse also controls the versioning process.

To store and version a VM, do the following tasks:

- Section 3.3.1, "Checking In a Virtual Machine," on page 54
- Section 3.3.2, "Getting Information about Warehoused Virtual Machines," on page 54
- Section 3.3.3, "Moving Other Virtual Machines into the Warehouse," on page 54
- Section 3.3.4, "Using Virtual Machines that Are Not in the Warehouse," on page 55

3.3.1 Checking In a Virtual Machine

The action of checking the VM into the warehouse begins the versioning process. The first version checked into the warehouse is designated as Gold Master and is Version 1 of the VM. If you use ZENworks Orchestrator Server to deploy the VM from the VM Warehouse, you deploy this version. For information on changing the Gold Master designation, see Section 6.3.7, "Changing the Gold Master Designation," on page 74.

Any subsequent versions you check in to the warehouse are given the next sequential version number. The data on the versions also indicates the parent version of all succeeding versions after the first.

IMPORTANT: Only the first hard disk is stored with the VM image in the warehouse. All other disks and CD-ROM or DVD drives are ignored during check-in, but the configuration is saved to be redeployed with the VM when it is provisioned.

To check VMs into the VM Warehouse:

1 In the ZENworks VM Management Console, do one of the following:

 * Right-click the VM and select *Check In*.
 * Select the VM, then click *File > Check In*.
 * Select the VM and click the *Check In* button.

 For VMs discovered in the ZENworks Orchestrator Console, see Section 3.3.3, "Moving Other Virtual Machines into the Warehouse," on page 54.

2 To deploy your VMs, continue with Chapter 5, "Deploying Virtual Machines," on page 59.

3.3.2 Getting Information about Warehoused Virtual Machines

To get information about VMs in the VM Warehouse, double-click a warehoused VM, or right-click the VM in the warehouse and select *Show Versions*.

This provides a list of all the versions of that VM in an edit window on the right. For more information about the edit view window, see "Displaying Versions" on page 93.

3.3.3 Moving Other Virtual Machines into the Warehouse

If you have preexisting Xen VMs in your data center environment, you can check them into the VM Warehouse for version control:

1 In the ZENworks Orchestrator Console, right-click the VM in the Resource Tree.

2 Select *Move Disk Images*.

The following dialog box is displayed:

Figure 3-10 *Move VM Disks Dialog Box*
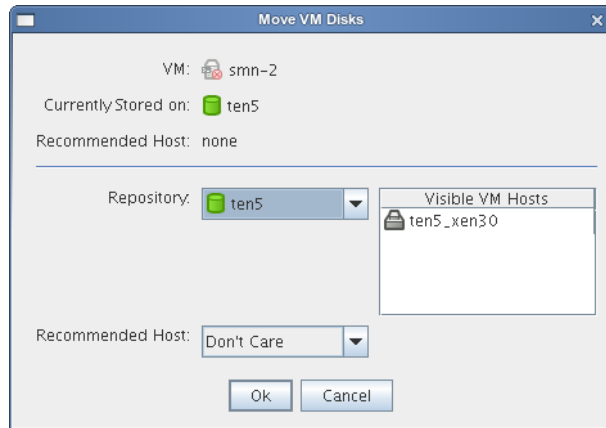
3 In the *Move VM Disks* dialog box, click the drop-down *Repository* menu.

4 Select *Warehouse*.

5 Click *OK*.

This launches a move job to move the VM into the VM Warehouse listing and implement version control.

3.3.4 Using Virtual Machines that Are Not in the Warehouse

You can also choose to not move a VM into the VM Warehouse. If you choose to do this, just create and use your VMs as needed and delete the VM when you are finished.

You can use any VM in the system without checking it in to the VM Warehouse, but you do need to check it in if you want version control applied.

Provisioning Virtual Machines

4

Provisioning is used to get a Novell® ZENworks® VM ready to start in a running state. The Orchestrator Server automatically looks for the best VM host machine to run the VM on, unless you have specifically designated another server to run the VM.

Provisioning adapters on the Orchestrator Server abstract the VM. These adapters are special provisioning jobs that perform operations for each integration with different VM technologies.

The ZENworks Orchestrator Server uses provisioning adapters to perform life cycle functions for the VMs and allow the Orchestrator Server to control them. Provisioning adapters are programs that provision (start, stop, snapshot, migrate, or pause) a VM. They run just like regular jobs on the Orchestrator Server.

The system can detect a local store on each VM host and detect if a local disk might contain VM images. The provisioner puts in a request for a VM host. However, before a VM is used, the system pre-reserves that VM for exclusive use. That reservation prevents a VM from being "stolen" by any other job that's waiting for a resource that might match this particular VM.

The constraints specified to find a suitable host evaluate machine architectures, CPA, bit width, available virtual memory, or other administrator-configured constraints, such as the number of virtual machine slots. This process provides heterogeneous virtual machine management.

For procedures and more information on provisioning of VMs, see "Virtual Machine Job Development" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

Deploying Virtual Machines

5

When you are finished modifying and versioning your Novell® ZENworks® virtual machines (VMs), you can deploy them in your production environment and manage them. The version you want launched into your production environment must be designated as the Gold Master version in the Virtual Machine Warehouse (VM Warehouse).

In order to be able to use a VM as a resource to which you can deploy joblets from your Orchestrator Server, you must deploy or provision a VM. The VM can be deployed to any appropriate VM host machine. If the VM has the Orchestrator Agent installed on it, it can have joblets deployed to it. If you have not yet installed the Orchestrator Agent on the VM, you can give the job to the Orchestrator Server to install the Orchestrator Agent on the next startup of the machine.

Template VMs do not need to be provisioned to be used. Instead, if the template VM has the Orchestrator Agent installed on it and a call is made to use a VM template clone, then ZENworks Orchestrator automatically clones a version of the template VM and deploys it.

The Orchestrator Server automatically deploys VMs with the Orchestrator Agent installed on them as it would physical machines, according to one of the default jobs programmed into the Orchestrator Server. As it is needed, the Orchestrator Server takes one of the provisioned VMs and deploys a joblet to it as the job needs the additional resources.

ZENworks Orchestrator uses the Repository object to represent where VMs are stored. VMs can be stored on local disks, the Orchestrator Datagrid, the VM Warehouse, a network area storage (NAS), a storage area network (SAN), or by using a separate VM technology.

Before VMs can be used by ZENworks Orchestrator, you must create Repository objects and then discover the VM Images within the Repository:

5.1 Deploying a VM to the Local Repository

By default, the Xen and VMware* server adapters create a local Repository object for local VM images when ZENworks Orchestrator accomplishes the *Discover VM Hosts* action.

A Local Repository represents VMs residing in a VM Host's local storage where the VMs are only visible to the VM Host. VMs are thus searched for in the default paths for each adapter.

IMPORTANT: Do not use Local Repositories for shared directories visible to more than one VM Host. Instead, create a new NAS/SAN Repository.

For information on NAS storage, see "Deploying a VM to the NAS Repository" on page 60. For information on SAN storage, see "Deploying a VM to the SAN Repository" on page 61.

When discovering VM Images, the adapters use the `location`, `searchpath` and `preferredpath` facts for searching. The `repository.location` is usually the root path, such as `/`. For Xen, the adapter creates a Local Repository with search paths of `/etc/xen/vm` and a preferred search path of `/var/lib/xen/images`.

When the *Discover VM Images* is run, the provisioning adapter follows these steps:

- Concatenates the `repository.location` and every element of `repository.searchpath` and searches for VMs in those directories.
- Concatenates the `repository.location` and `repository.preferredpath` and searches for VMs in that directory.

These steps are also followed when searching in NAS and SAN repositories when representing automounted file systems, and when the location, search path, and preferred path are set.

For more information on facts, see "Defining Values for Grid Objects" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

5.2 Deploying a VM to the Datagrid Repository

By default, a Datagrid Repository named `zos` is automatically created. The Datagrid Repository represents VMs residing in the ZENworks Orchestrator Datagrid, which is a storage area on the Orchestrator Server.

The `zos` Datagrid Repository has a location of `grid:///vms`, which points to an area in the Datagrid reserved for VM archival storage.

You can store VMs to the Datagrid and deploy to a VM host as necessary.

The Datagrid Repository storage is archival because VMs cannot be run from the Datagrid Repository. You must move VMs out of the DataGrid to a VM Host in order to run them.

5.3 Deploying a VM to the Warehouse Repository

The Warehouse Repository represents the VMs stored in the VM Warehouse Server. The Warehouse Repository is supported only by the Xen adapter.

If you have installed the VM Warehouse Server, then run *Discover VM Hosts*. The Xen adapter creates a Warehouse Repository named Warehouse.

If you run *Discover VM Images* on the Warehouse Repository, it displays the inventory of Gold Master VMs in ZENworks Orchestrator. These are the Gold Master versions stored in the VM Warehouse. The discovered Gold Master VMs can then be provisioned to VM Hosts.

VMs cannot run from the Warehouse Repository, so any provisioning actions must first export a VM from the warehouse.

5.4 Deploying a VM to the NAS Repository

The Network Attached Storage (NAS) Repository represents VMs stored in a NAS. This is a storage where VMs are visible to multiple VM Hosts, so they can be run by any one of the available hosts.

The following procedure shows an example of setting up a NAS Repository. For the example, assume you have a Xen setup where the directory /vms is auto-mounted on multiple VM hosts as the shared storage location for your VMs.

To deploy a VM to the NAS Repository:

1 To create a new Repository object, go to the ZENworks Orchestrator Console, then click *Actions > Create Repository*.

2 Specify a new name and choose which adapter group this Repository is used for.

The example is for Xen VMs, so choose the xen30 adapter.

3 Close the dialog box to display the *Info/Groups* tab for the new repository.

4 Set the location path.

This is the root path for the repository. It is usually /.

5 Set the search path and preferred path.

In this example, the vms are all in /vms, so leave `searchpath` empty and set the `preferredpath == "vms"`.

6 Select the VM Host objects that have visibility to the shared directory and add the new repository to the VM hosts list of available Repositories.

To find a VM host, either go the *VM Hosts* view or open the *Physical* tree under *Resources* and open the physical host representing the VM host.

7 Run *Provision > Discover VM Images* on the new Repository.

5.5 Deploying a VM to the SAN Repository

The Storage Area Network (SAN) Repository is a single storage server that can be accessed by multiple machines.

NOTE: This section refers to an iSCSI SAN, not a Fibre Channel SAN.

There are two ways to access VMs on a SAN:

◆ The SAN is auto-mounted.

For an auto-mounted SAN, follow the setup steps noted in "Deploying a VM to the NAS Repository" on page 60 in setting the facts for identifying the paths.

For more information on facts, see "Defining Values for Grid Objects" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

◆ The Orchestrator Server managing the connection requires additional information to have the SAN as an available repository for VM images.

For example, the physical disks are on the SAN, but the configuration file is on local storage. The additional information is necessary for ZENworks Orchestrator to know how to bind or connect the SAN disk on the VM host.

Perform the tasks in the following sections, as applicable:

◆ Section 5.5.1, "Setting Up the SAN," on page 62

5.5.1 Setting Up the SAN

For information on setting up an iSCSI target, see *Setting Up an iSCSI Target* (http://www.novell.com/documentation/sles10/sles_admin/index.html?page=/documentation/sles10/sles_admin/data/sec_inst_system_iscsi_target.html) in the *SUSE Linux Enterprise Server 10 Installation and Administration Guide*.

For information on setting up an iSCSI Initiator, see *Configuring iSCSI Initiator (http://www.novell.com/documentation/sles10/sles_admin/index.html?page=/documentation/sles10/sles_admin/data/sec_inst_system_iscsi_initiator.html)* in the SUSE Linux Enterprise Server 10 Installation and Administration Guide.

You need to have one of the following for the setup:

◆ On the server, create a file or partition that has sufficient size for a VM image.

◆ Have or select a VM disk image.

You can set up the iSCSI target according to the linked directions above, or you can use a VM image as your target. With the addition of the optional instructions on installing on a VM Image are included here.

NOTE: If the iSCSI Target is not installed, you are prompted to install the `iscsitarget` package.

To install the target (iSCSI Server) and complete setting up the SAN:

1 On the ZENworks Orchestrator Server, open YaST2.

2 Click *iSCSI Target* in the *Miscellaneous* section.

3 Select the *When Booting* option in the *Service Start* section. Select the *Global* tab and set up global authentication if needed. If you are not using authentication, select *No Authentication*. Select the *Targets* tab.

4 There should be a default iSCSI target in the *Targets* list. Delete this example target.

5 Click *Add*.

6 Click *Add* again.

7 Select *Type=fileio*.

8 Specify the path to the created partition, file, or VM Image.

9 Click *OK*.

10 Click *Next*.

11 Specify any authentication information for incoming or outgoing stored VMs, or select *No Authentication*.

12 Select *Finish*. A dialog box appears, asking you to restart the service.

13 Click *Yes*.

14 After you have installed and configured your iSCSI Target and Initiator, run `$hwinfo -disk` to see something similar to the following:

```
Model: "IET VIRTUAL-DISK" Vendor: "IET" Device: "VIRTUAL-DISK" Revision: "0"
Driver: "sd"  Device File: /dev/sdb (/dev/sg2)
```

NOTE: Notice the virtual disk and the new device file that appear. This shows that the iSCSI initiator has established a connection and is able to attach to the file, partition, or VM image. If this information does not appear, troubleshoot the iSCSI connection and setup.

15 To create a Xen configuration file and start the VM:

15a Enter `$virt-manager` at a command line prompt.

15b Either create a new VM or select *I have a disk or disk image*.

15c Select *Disks*.

15d Enter the new device file location as found in the `hwinfo -disk` command output.

5.5.2 Configuring the iSCSI SAN in ZENworks Orchestrator

After you have set the SAN up outside of ZENworks Orchestrator, launch the ZENworks Orchestrator Console.

Perform the following steps if your iSCSI SAN is a VM Image:

1 Click *Provision > Discover VM Images.*

2 Ensure that the new VM appears on the tree.

3 Right-click *Repositories* and select *New Repository.*

4 Name the new repository.

5 Add the `xen30` provisioning adapter.

For information on provisioning adapters, see Chapter 4, "Provisioning Virtual Machines," on page 57.

6 Click *Create*.

7 Select the new repository from the list.

8 In the large window on the right, fill in the following information:

 ◆ Type = SAN

In the *SAN Specific Configuration* section, fill in the following information:

 ◆ SAN Type = iSCSI

 ◆ SAN Vendor = "iqn"

9 Select *Save* from the toolbar icon or the file menu.

10 Click the Resources selection in the tree.

11 Select the new VM.

12 On the right select *Info/Groups* and select the Browse button *(...)*. find the Virtual Disks Layout

13 Click the drop-down menu to change the information.

For example:

```
iqn: iqn.2007-05.lab.cimlocation: phy:/dev/sdbmoveable: left
uncheckedrepository: iscsisize: 0 (untouched)
```

14 Test the new setup by provisioning a VM.

For information, see "Provisioning Virtual Machines" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

15 Check the Job Log for bind/unbind operations similar to this:

```
iscsi unbind(iqn=iqn.2007-05.lab.cim,u=None,pw=None,auth=None) Running
'iscsiadm -m node' rslt= 0 Found record for iqn: e375f3 Run cmd: iscsiadm -m
node -r e375f3 -urslt= 0unbind was successful
```

5.5.3 Virtual Repository

A Virtual Repository is where ZENworks Orchestrator assumes the VM store is handled by the underlying VM technology. For example, the Virtual Repository is used by the Virtual Center adapter because Virtual Center is managing the VM storage.

Ongoing Management of Virtual Machines

6

Review the following sections for ongoing tasks in Novell® ZENworks® VM Management:

6.1 Destroying a Virtual Machine

1 In the ZENworks Orchestrator Console, right-click the VM in the tree and select *Delete/Destroy Resource*.

This action removes the VM from your resource list. However, the actual image of the VM is still stored in its directory. If the VM was stored in the VM Warehouse, it is retained there.

2 If you deleted a VM from your resource tree, rediscover the VM by running a discovery job. Click *Provision > Discover VM Images* to rediscover any VMs in your data center with unique UUIDs.

3 To delete a VM from the VM Warehouse, right-click the VM in the ZENworks VM Management Console and select *Delete*.

This completely deletes the VM and all its versions from your data center. You cannot restore any version of the VM after you delete it from the warehouse. However, if you do have a checked-out instance of the VM, you can check that back into the warehouse.

6.2 Managing a Virtual Machine in Runtime

There are many ways you can control the VM after it has been deployed from the warehouse. All actions from provisioning to shutting down the VM can be managed directly from the ZENworks Orchestrator Console and through the jobs written and executed by the Orchestrator Server.

Review the following sections for ways to manage VMs in runtime:

6.2.1 Provisioning Actions from the Right-Click Menu

You can perform provisioning actions by right-clicking a VM in the tree of the ZENworks Orchestrator Console. You start VMs by provisioning them under the *VMs* list according to the appropriate provisioning adapter.

For information on provisioning adapters, see Chapter 4, "Provisioning Virtual Machines," on page 57.

For information on provisioning a VM and on the usable provisioning adapters, see Section 6.2.4, "Managed Virtual Machine Actions," on page 70.

The provisioning actions available from the right-click menu are as follows:

Table 6-1 *Right-Click VM Commands*

Action	Description
Provision	Starts a VM to a running state. The Orchestrator Server automatically looks for the best VM host machine to run the VM on, unless you have specifically designated another server to run the VM.
Pause	Prevents the VM from gaining access to the processor of the host machine, although it is still resident in the memory of the host machine.
Resume	Allows a paused VM to access the processor of the host machine again.
Suspend	Pauses the VM and takes a snapshot of its disk and memory status. In the suspended state, a VM can be moved or migrated to another host machine.
Shutdown	Stops a VM from running, just like shutting down a physical machine. The operating system stops and acts as if it is shut down.
Restart	Shuts down and restarts a running VM.
Migrate	Moves a VM that is shut down from one host machine to another. This action is a "live migration" as opposed to moving the disk image with a "cold" VM.
Resync State	Assures that the state of the VM displayed in the ZENworks Orchestrator Console is accurate.
Save Config	Commits runtime modifications of VM properties (such as adding more virtual memory or a new application during runtime) to the VM Warehouse.
Apply Config	Updates the VM's transient configuration. The VM must be running. This action is not supported in ZENworks Orchestrator 1.3.
Create Template	Makes a VM instance into a template from which other versions can be cloned. This menu item is replaced by the Clone menu item when you right-click a template VM.
Clone	Launches a cloned instance of the template VM.
Delete/Destroy Resource	Removes a VM from the *Resources* list in the ZENworks Orchestrator Console.

Action	Description
Move Disk Images	Migrates a disk image from one storage location to another. Select the storage location from the drop-down menu. You can also move a VM from one VM host machine to another. This is a "cold" migration. VMware Server VMs must be migrated in this manner.
Checkpoint	Creates a named snapshot of a VM image. This image is stored on the disk of the repository machine. Xen VMs cannot have a checkpoint applied to them.
Restore	Starts a Checkpoint VM (that is, resumes the operations of a VM made into a stored checkpoint from the moment of storage).
Remove Template Dependency	Changes a cloned instance of a VM into a VM instance.
Install Agent	Launches a job that automatically installs the Orchestrator Agent on a VM the next time you provision the VM.
Personalize	Allows you to customize the VM. This includes changing elements like the DNS server. The changes are made to a VM that is shut down.
Shutdown Agent	Shuts down the Orchestrator Agent and makes the VM unavailable as a resource.
Cancel Action	Stops an action that has been requested.
Check Host Assignment	Opens a window so you can compare the VM hosts capable of hosting the VM.
Launch Remote Desktop	Launches a VNC terminal in which you can view and control the VM.

6.2.2 Releasing a Virtual Machine from Usage

When the demand and load on your data center decreases, the Orchestrator Server analyzes the remaining resources and releases the most appropriate resource. If a VM meets the requirements of the remaining job demands better than a physical machine, then the physical machine is released before the VM is released. This dynamic analysis allows you to make sure that the needs of your data center are met.

6.2.3 Managing Virtual Machine Templates

A VM template is a special kind of VM that is not deployed separately. When the Orchestrator Server needs a VM of the template's type to be used as a resource, it automatically clones a version of the VM and uses that clone as the VM. You can change cloned VMs into instances of VMs instead of clones.

Review the following tasks to manage VM templates:

Making a Virtual Machine Instance into a Template

1 In the ZENworks Orchestrator Console, right-click the VM.

2 Select *Create Template*.

In Linux:
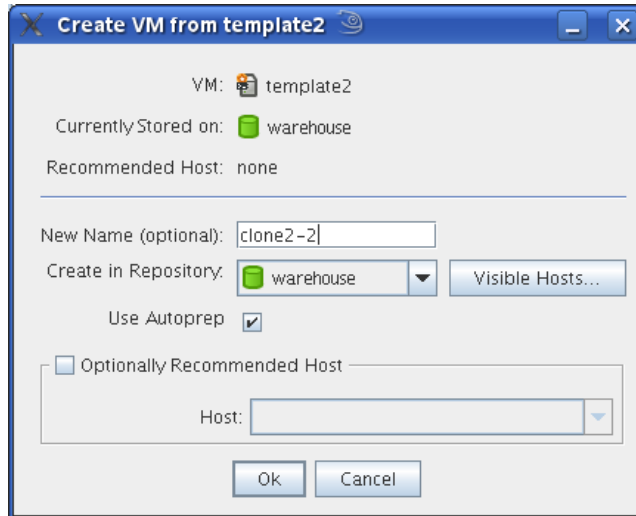
In Windows:
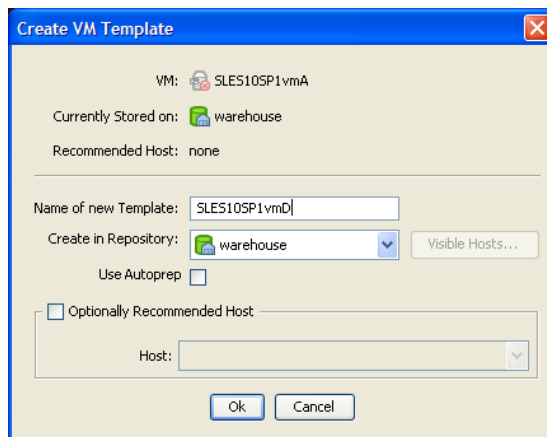
3 Name the template.

4 Specify a repository.

5 Specify a visible VM host.

6 Select a recommended host for the VMs to be launched on, if any are present.

7 Click *OK*.

When the clone of the template VM is provisioned, it appears as a sub-branch of the template's location in the resources tree, as in the following Linux and Windows examples:

Figure 6-1 *VM Template with Daughter Clone*
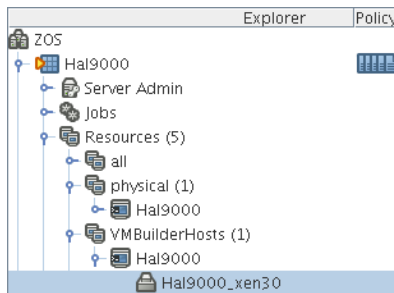
Figure 6-2 *VM Template with Daughter Clone*
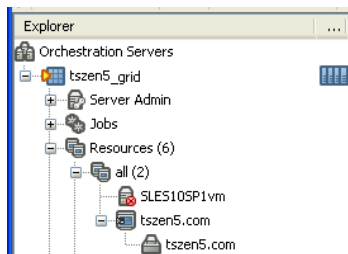
This clone functions as an instance of a VM and runs as though it were its own version with its own MAC address and other unique identifiers. The UUID is the only new information that is automatically generated for the clone. All the rest of the new information comes from autoprep, including the MAC address if an asterisk (*) is placed in the *Mac Address* field in the *Autoprep Network Adapter* section of the *Info/Groups* tab for the template (the default is a blank field, meaning no MAC address is created), and if the *Use Autoprep* check box is enabled on the Create VM from *Template* dialog box.

Ending the Clone

When the Orchestrator Server no longer needs the clone, it deprovisions it and automatically deletes it from the data center.

Changing a Virtual Machine Template Clone to an Instance

1 If you decide to keep a clone VM, go to the ZENworks Orchestrator Console, right-click it, and select *Remove Template Dependency*.

This brings up the Remove Template Dependency dialog box, shown in the following figure:

Figure 6-3 *Remove Template Dependency Dialog Box*
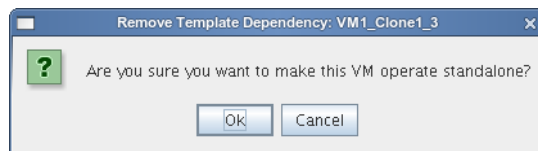
2 Click *OK*.

6.2.4 Managed Virtual Machine Actions

You can perform many actions on the VM through the ZENworks Orchestrator Console and
ZENworks VM Management Console or you can write jobs to have actions performed on the VMs
in your data center. The following table lists the managed VM actions that you can perform or use in
a written job.

Table 6-2 *Managed VM Actions*

Action	Description
Provision	Starts a VM. This action clones and start a cloned VM template.
Clone	Creates a new, unique instance of a VM template.
Cold Migrate	Moves the storage location of the configuration and first disk files to another physical storage host. This might allow the VM to start faster.
Shutdown	Stops an active VM instance (including a started template VM).
Destroy	Restarts (reprovisions) an active VM.
Suspend	Takes a snapshot of an active VM and pauses it in order to move it to another VM host.
Pause	Prevents the VM from obtaining CPU cycles, but it stays resident.
Resume	Allows a paused VM to access the CPU again.
Create Template	Creates a VM template from a VM instance.
Hot Migrate	Moves the storage location of an active VM, its disks and configuration, to another VM host machine.
Checkpoint	Create a named snapshot of a moment that can later be accessed to restart from the same point
Restore	Resumes a VM at a previously stored checkpoint.
Install Orchestrator Agent	Opens a VM image and installs the Orchestrator Agent.
Make Standalone	Removes the association of a template and makes the active VM into its own instance.
Check Status	Checks the current state of the VM to verify if the VM is provisioned or shut down.
Personalize	Modifies the Orchestrator Agent properties and disk image that are currently part of a clone.
Save Config	Transfers changes made to a VM to its permanent image storage.

6.2.5 Virtual Machine Technology-Specific Actions

For a detailed breakdown of the actions you can perform to and with a VM, see the appropriate VM
technology and configuration section in Appendix C, "Virtual Machine Technologies and Actions,"
on page 99.

6.3 Modifying a Virtual Machine after Checking In

After a VM has been checked in to the warehouse, you can check it out again to make changes to the properties and storage data. You can then check the VM back in to the warehouse to create the next version of the VM.

6.3.1 Checking Out a Virtual Machine

To check a VM out of the warehouse, go to the ZENworks VM Management Console, right-click the VM, and select *Check Out*. Checking out a VM moves a copy of the VM into the Workspace section of the ZENworks VM Management Console. When it is there, you can modify the VM. For information on the ZENworks VM Management Console, see "Workspace View" on page 89.

6.3.2 Modifying Virtual Machine Properties

When a VM is in a *Checked Out* status, it can be modified and edited. There are two different types of edit you can perform on the VM in the ZENworks VM Management Console:

- **Edit:** Allows you to change elements of the metadata on the VM.
- **Edit Image:** Allows you to create a copy of the VM that is put elsewhere on the drive, so you can open the VM image and change its inherent metadata, processor architecture, initial hard disk properties, memory properties, and so forth.

To start the edit process:

1 In the ZENworks VM Management Console, select the VM you want to edit.
2 Do one of the following:

- Select the *Edit* or *Edit Image* options in the *File* menu.
- Click the *Edit* or *Edit Image* icons in the toolbar.
- Right-click the VM and select *Edit* or *Edit Image*

When you click *Edit*, the VM Builder Wizard opens again, allowing you to change elements of the metadata of the VM. When you click *Edit Image*, a version of the VM is saved to a selected directory, where you can open it and make changes to the image itself.

- "Using the Edit Tool to Edit Virtual Machine Metadata" on page 72
- "Editing the Virtual Machine Image" on page 72

Using the Edit Tool to Edit Virtual Machine Metadata

When you right-click a VM in the Workspace panel, you can choose *Edit* to open the VM Builder Wizard. If the VM has the status of *Defining,* you can edit any of the initial VM Builder fields. The VM has not yet been built, so you can still add things to the overall metadata for the VM. However, if the VM has been installed or checked out, you can change only the following:

* The VM description
* Any additional arguments
* VM crash instructions
* Number and priority weight of processors
* Startup and maximum memory allocations
* Graphic mode (if you have fully virtualized the VM)
* Additional hard disks and CD or DVD disk drives
* Additional NICs
* Virtual network interface details
* Server name information

Editing the Virtual Machine Image

Click *Edit Image* to actually edit elements beyond the VM metadata. A dialog box is displayed that tells you where the image is located so that you can open the VM image and modify it:

Figure 6-4 *VM Image Location Dialog Box*
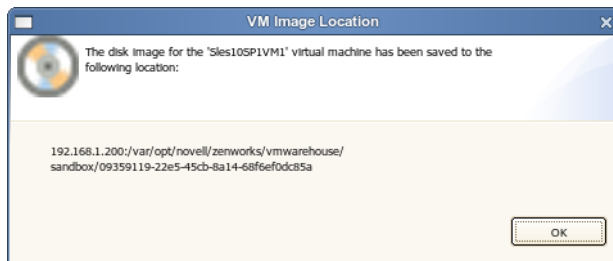
6.3.3 Modifying and Adding Applications to a Checked-Out Virtual Machine

A VM behaves as if it is a single, physical machine. While it is running, you can add any application to the VM that you need. If these applications are made on the first hard disk, the applications are saved as part of the VM image and are called upon when the VM is started again.

One of the specific modifications you might want to make to a VM is to install the Orchestrator VM Agent Pattern in YaST, so the VM is available to ZENworks Orchestrator. For instructions on installing the Orchestrator Agent on a VM, see "Installing the Orchestrator Agent on VMs" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

6.3.4 Assuring Sufficient Loopback Devices to Allow for Virtual Machines

The Linux kernel allows for a set number of loopback devices. The default is 64 for the version of Linux supported by ZENworks Virtual Machine Management.

The available loopback devices are for all VMs in the grid. The default setting for the allowed number of loopback devices can be changed in the kernel.

When you run a VM, the Orchestrator Server requires one of those loopback devices for the VM Prep job. The VM Prep job is a shared part of the provisioning adapters. It is used to personalize a VM (that is change identity and network configuration—the so-called autoprep facts). It works by mounting the VM disk over loopback and then modifying configuration files in the VM disk image (via the mount). For more information on the provisioning adapters and their function, see Section 6.2.1, "Provisioning Actions from the Right-Click Menu," on page 66.

When you use the Orchestrator Server to launch a VM, you need to make sure that there are enough loopback devices remaining to support that VM. For example, if the VM has seven mounted loopback devices, a VM host machine must have at least eight available loopback devices to allow for the seven for the VM and one more for the VM Prep job.

If the VM host machine is using a loopback device, this device also counts against the total. You can create a VM without a loopback device, which does not count against the total.

To manage loopback devices:

- ◆ "Setting Up Loopback Devices in the Virtual Machine" on page 73
- ◆ "Changing the Number of Allowed Virtual Machines" on page 73

Setting Up Loopback Devices in the Virtual Machine

You can designate loopback devices by running the VM and mounting the ISO or software you want to have as a mounted loopback device by using `mount -o loop` command, just as you would on a physical machine. The number of loopback devices in the VM do not count against the total allowable loopback devices of the host machine.

Changing the Number of Allowed Virtual Machines

In order to change the VM hosts in your data center grid, be sure that you have already discovered your VM hosts and your VMs. For information on discovering VM hosts and VMs, see Section 2.2.4, "Discovering Virtual Machine Hosts," on page 30.

To change the number of allowed VMs on a VM host machine:

1 In the ZENworks Orchestrator Console, open the grid containing the VM host you want to change.

2 Select *Resources* in the tree menu.

3 Select *All*.

4 Select the VM host machine.

5 On the Info page change the *Max Hosted VMs* to a number equal to one less than your Linux kernel's allowed number of loopback devices, or as many as the VM host machine's hardware allows.

6.3.5 Testing a Virtual Machine Modification

One of the benefits of modifying a VM before checking it into the VM Warehouse is the opportunity to test the VM configuration.

You can continue to make changes throughout the test process until the VM meets your organization's standards for VMs.

Test the VM by keeping it active until you have finished your testing. When you are finished, shut the VM down and check it into the warehouse.

6.3.6 Checking In an Edited Virtual Machine

When you have made a modification, and at any point during your testing cycle, you can check a VM back in to the VM Warehouse. Check it back in as you did the first time you checked the VM in to the warehouse. For more information, see Section 3.3.1, "Checking In a Virtual Machine," on page 54.

The newly checked-in VM receives the next version number for that VM.

Any version can be checked back out, modified, and checked back in to increment to the next version number.

6.3.7 Changing the Gold Master Designation

The first time you check a VM into the VM Warehouse, it is designated as Version 1, which is also the Gold Master version. After you have moved one or more modified versions of the VM back into the VM Warehouse, they are listed in the edit view in the order they were checked in, along with their parent versions.

When a version you have created has passed necessary testing, you can designate it as Gold Master by doing any of the following:

- Right-click the version, then select *Make Gold Master*.
- Click *File > Make Gold Master*.
- Click the *Make Gold Master* icon on the toolbar.

The Gold Master is the version of the VM discovered by the Orchestrator Server. It is launched when the VM is used as a resource to receive joblets.

6.4 Monitoring Virtual Machines

There are two different types of monitoring provided by ZENworks Orchestrator with the VM Management functionality:

- Direct monitoring in the ZENworks VM Management Console
- Monitoring in the Orchestrator Server

The monitored data in the ZENworks VM Management Console can be used to influence decisions about machines to constrain to use specific joblets and be hosts to specific VMs. For the monitored data on the Orchestrator Server, you can view the information by looking at the Jobs section of the ZENworks Orchestrator Console. This information is used as feedback for jobs being executed by the Orchestrator Server.

Review the following sections for how to monitor VMs:

6.4.1 Using the ZENworks VM Management Console Monitoring View

When you are in the ZENworks VM Management Console, you can access information about your grid environment. To see the monitoring perspective:

1 In the ZENworks VM Management Console, click the *Monitoring* button on the upper right side of the console.

2 Open the *Grid-Node* folder in the Monitored Servers view.

3 Provide your login name and password:

4 Select the node for which you want information.

5 Double-click the node icon to display an edit view on the right.

The following illustrates the Graphical Host View:
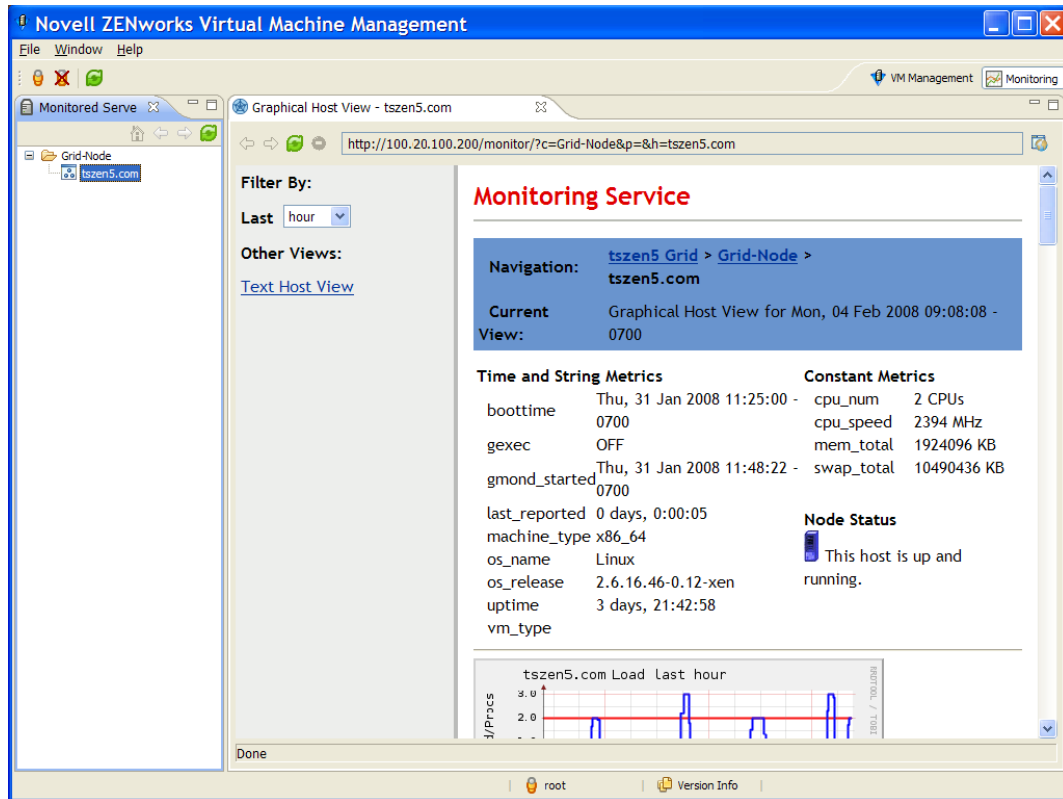
6 To change the time frame for observing the server performance, click in the *Last* field.

7 If you want to see the information in a text-based layout instead of a graphical layout, click *Text Host View* to display the following:
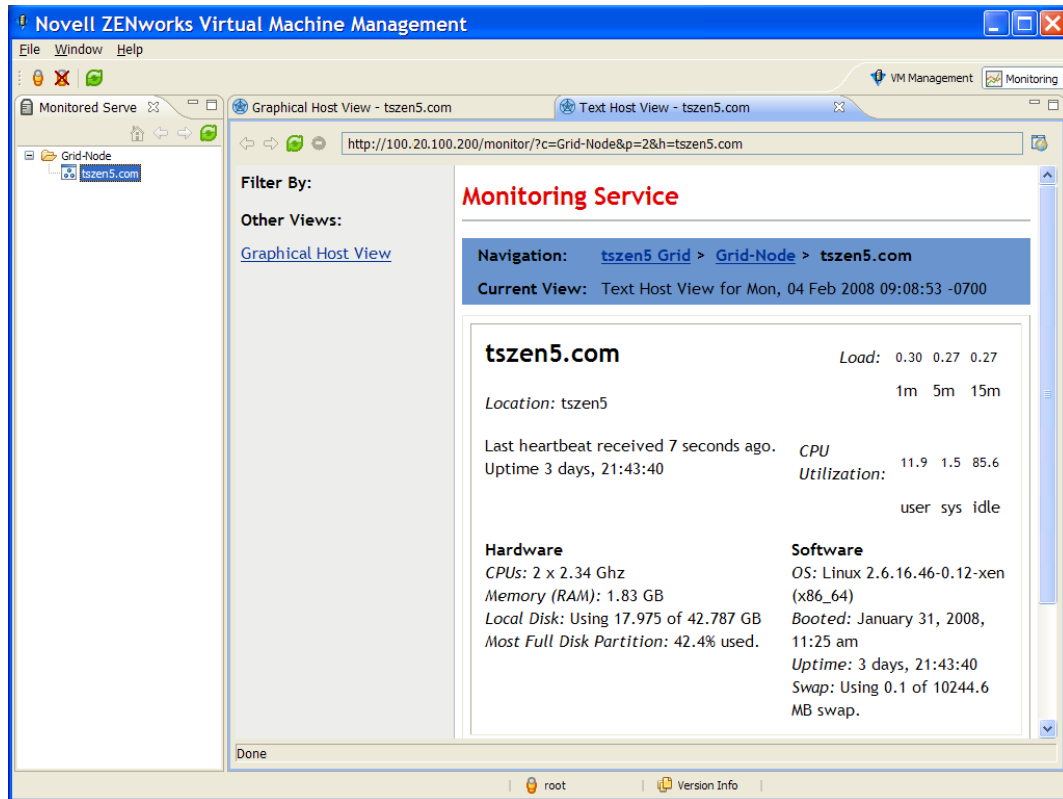
6.4.2 Monitoring Orchestrator Server Jobs

The Orchestrator Server monitors each job it deploys. It does this through multiple means, including the Orchestrator Agent installed on each of the nodes in the data center. The Agent reports processor load, memory usage, and basic operating system and processor information. This data is constantly used by the Orchestrator Server in making decisions about where to deploy joblets for a running job. The Orchestrator Server also sends out "discovery jobs" periodically (such as when an agent on a managed resource starts) to assess capabilities of the machine to run a joblet. ZENworks Orchestrator keeps a state or model of the VM location, basic health, and action facts. These facts and information are used to monitor the progress of a joblet and can be used to automatically reassign joblets based on policies, node failure, or operator intervention. For more information about the actual monitoring elements of the Orchestrator Server, see "What Is ZENworks Orchestrator?" in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

6.5 Using a Virtual Machine Not Checked in to the Warehouse

If you create a VM to be used in your data center and you do not want to store it in the VM Warehouse, you can use the VM Builder to create it. However, when you are finished building the VM and it is listed in its *Installed* state, do not check it in. This allows you to save information on any additional hard disk drives you have designated during the build process of the VM.

After the VM is listed as *Installed*, you can go to the ZENworks Orchestrator Console and click *Provision > Discover VM Images* to discover the newly created VM. After you have discovered it, you can provision it and use all the provisioning menu actions on it.

When you are finished using the VM, you can remove it from its listing in the ZENworks Orchestrator Console and delete it from the Workspace in the ZENworks VM Management Console. However, to completely remove the image from the computer, you must delete its image and the configuration files found in `/etc/xen/vm/` and `/var/lib/xen/images/`.

6.6 Using the Orchestrator User Portal to Run VM Jobs

To use the User Portal, see "Using the ZENworks Orchestrator User Portal" in the *Novell ZENworks Orchestrator 1.3 Job Management Guide*.

Management Consoles for ZENworks VM Management

A

Novell® ZENworks® Virtual Machine Management (VM Management) uses two different management consoles: ZENworks Orchestrator and ZENworks VM Management. They are used in the following ways:

- **ZENworks Orchestrator Console:** This console is used to manage and use existing VMs in your data center. It resides on the ZENworks Orchestrator Server, but it can be accessed from an administration device.

  In its tree view, the ZENworks Orchestrator Console shows all available physical machines, VM host machines, VMs, and VM Builder host machines that are available in your managed data center. It provides the following administrative functions for VM Management:

  - Discover VM hosts
  - Discover existing VMs
  - Deploy VMs to various repositories
  - Provision VMs
  - Migrate or move VMs
  - Destroy VMs (remove them from the resource tree)
  - Restore and resynchronize VMs
  - Clone VMs
  - Create VM templates
  - Stop, start, suspend, and restart VM operations
  - Create a job that installs the Orchestrator Agent on the VMs
  - Create jobs for managing VMs
  - Use VMs not checked into the warehouse
  - Connect to a VMware Virtual Center

- **ZENworks VM Management Console:** This console is used to create, edit, and store VMs. It is installed on administration devices. It provides the following administrative functions for VM Management:

  - General management of VM Management from the Home page
  - Build (define and install) VMs
  - Install applications on VMs
  - Review the properties of VMs
  - Edit VMs
  - Test VMs
  - Check VMs in and out of the warehouse (includes versioning of the VMs)
  - Monitor the status of the VMs
  - Change a VM's Gold Master designation

- ◆ Retire or delete VMs
- ◆ Run jobs created for managing VMs

The following sections provide details on the two consoles, including some tips and tricks in using the ZENworks VM Management Console:

A.1 The ZENworks Orchestrator Console

The ZENworks Orchestrator Console is the main operations center for the Orchestrator Server. It is installed with the ZENworks Orchestrator Client and the Orchestrator Server when you install in YaST. To launch the ZENworks Orchestrator Console, go to the `/opt/novell/zenworks/ zos/server/bin` and run the `./zoc` command. Log into the server. For information on general ZENworks Orchestrator Console operations, see " Walkthrough: Launch the ZENworks Orchestrator Console " in the *Novell ZENworks Orchestrator 1.3 Installation and Getting Started Guide*.

A.1.1 Launching the ZENworks Orchestrator Console

You can do this from either the VM Warehouse/Builder server, or from a workstation:

From the VM Warehouse/Builder server

1 Open a command terminal.

2 Change to the `/opt/novell/zenworks/zos/server/bin/` directory.

3 Enter `$./zoc` to open the ZENworks Orchestrator Console:
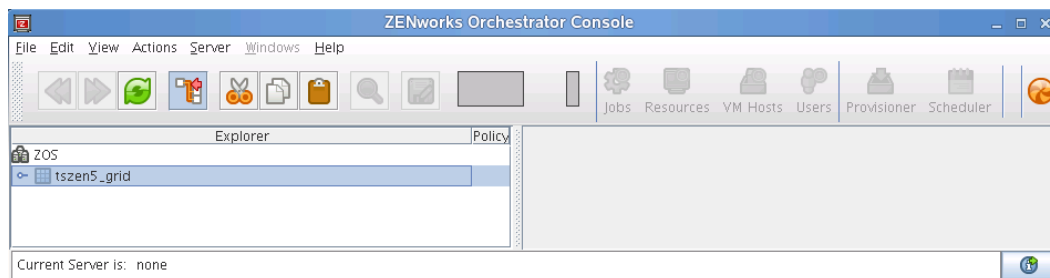
4 Click your grid in the tree view to open the login dialog box:
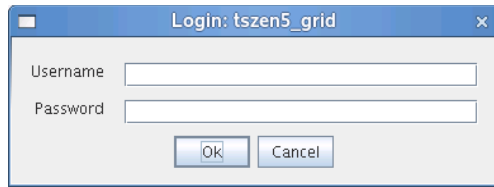
5 Enter your ZENworks Orchestrator Console administrator username and password.

The tree is expanded for your grid, as shown in this illustration:
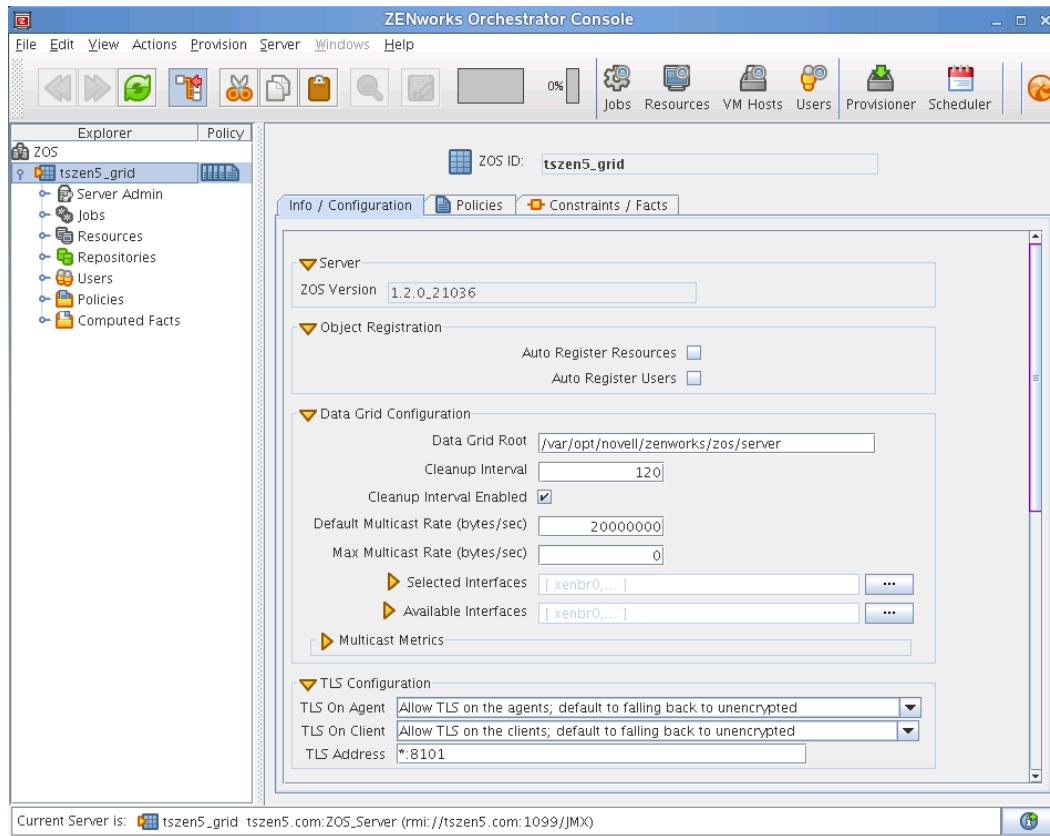
From Your Linux Workstation

1 Open a command terminal.

2 To connect to the VM Warehouse/Builder server, enter the following command:

```
ssh -X root@URL
```

where *URL* is the URL of the server.

3 Log in with root privileges.

4 Change to the `/opt/novell/zenworks/zos/server/bin/` directory and enter the following command:

```
./zoc
```

This opens the ZENworks Orchestrator Console:
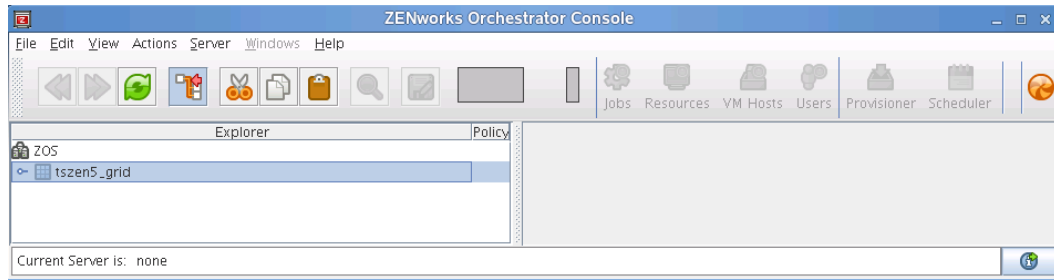
NOTE: You can also use this command terminal to open the ZENworks VM Management Console by entering `./zoc &` instead.

5 Click your grid in the tree view to open the login dialog box:
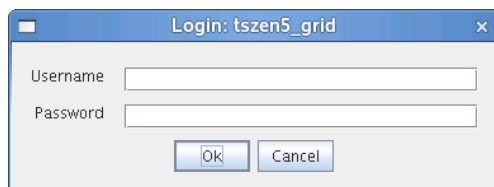
6 Enter your ZENworks Orchestrator Console administrator username and password.

The tree is expanded for your grid, as shown in this illustration:
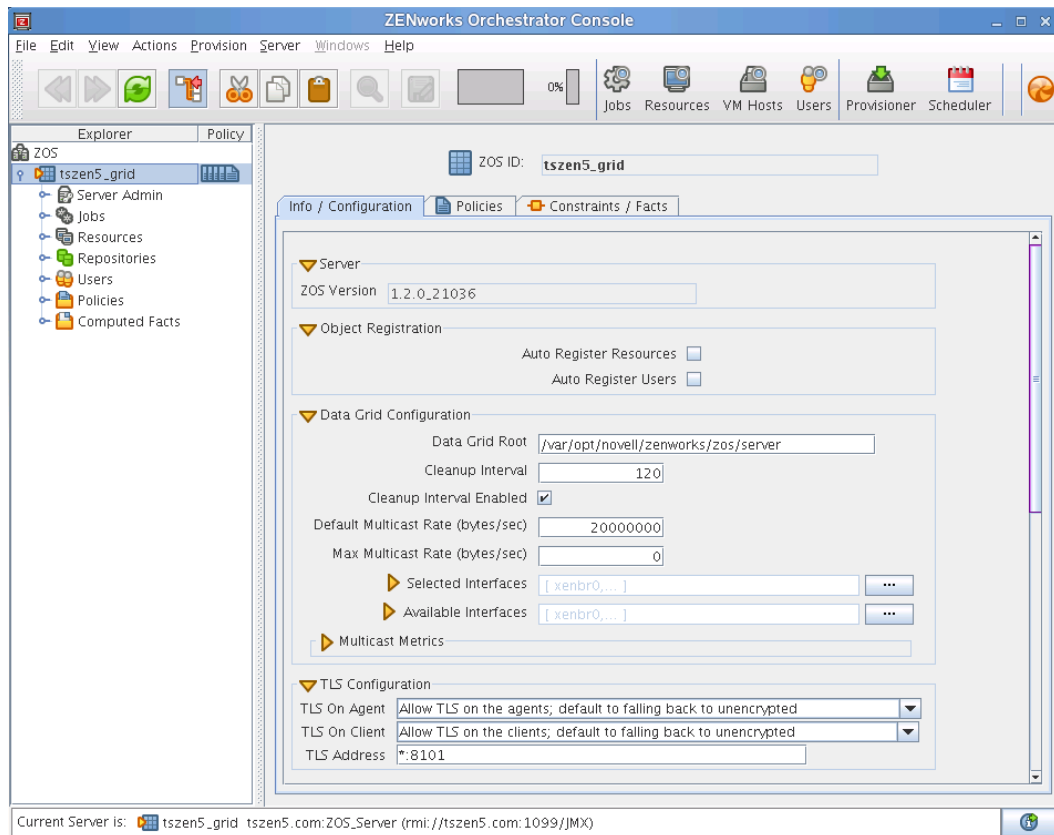
From Your Windows Workstation

1 Double-click the ZENworks Orchestrator Console icon () on your desktop to open the ZENworks Orchestrator Console:
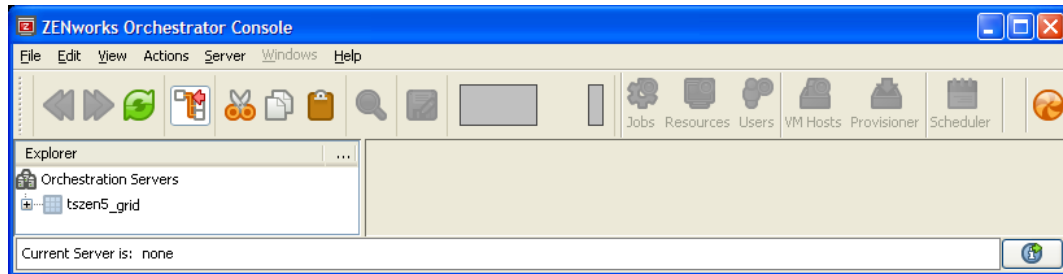
2 Click your grid in the tree view to open the login dialog box:
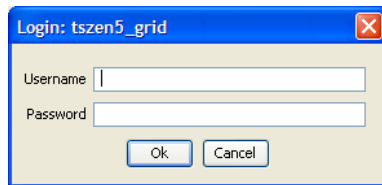
3 Enter your ZENworks Orchestrator Console administrator username and password.

The tree is expanded for your grid, as shown in this illustration:
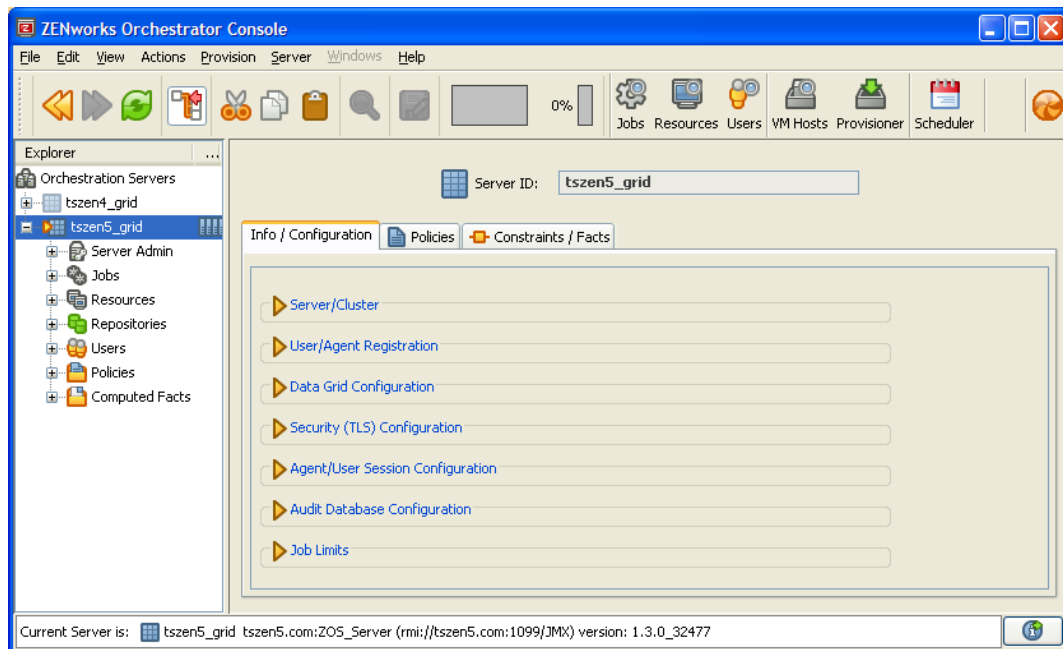
A.1.2 ZENworks Orchestrator Console VM Management Actions

There are several important actions to do with your VMs in the ZENworks Orchestrator Console. These include finding the VMs from the *Provision* menu and operating the VMs from the right-click menu. These actions include the following:

- ◆ **Discover VM Hosts:** Use the *Provision > Discover VM Hosts* menu to discover all VM host machines with the Orchestrator Agent installed on them. For more information on discovering VM hosts, see Section 2.2.4, "Discovering Virtual Machine Hosts," on page 30.

- ◆ **Discover VMs:** Use the *Provision > Discover VM Images* menu to discover all the VMs available in the VM Warehouse that are deployable to your VM hosts. You can also choose the Repository in the *Repositories* menu in the tree, right-click it and select *Discover VM Images* to discover the VM images stored on that specific storage location. These are sorted according to the provisioning adapter. For more information on discovering VMs, see Section 3.1, "Discovering Existing Virtual Machines," on page 39.

  For further information on the actions to take after you have discovered your VMs, see Section 6.2, "Managing a Virtual Machine in Runtime," on page 65.

A.1.3 Using Virtual Machines as Resources

After you have discovered all the VMs in your data center and provisioned them, you can write jobs and create constraints to use VMs just as the Orchestrator Server uses physical machines. For more information on using VMs in your data center, see Chapter 5, "Deploying Virtual Machines," on page 59.

A.2 The ZENworks VM Management Console

The Novell ZENworks Virtual Machine Management (VM Management) Console, built on an Eclipse-based rich client platform, uses a graphical user interface (GUI) to help you build and manage the VMs in your data center. This GUI provides management and access to the VM Builder and the VM Warehouse.

- ◆ Section A.2.1, "Launching the ZENworks VM Management Console," on page 84
- ◆ Section A.2.2, "Introduction to the ZENworks VM Management Console," on page 86
- ◆ Section A.2.3, "The Monitoring Perspective," on page 93

A.2.1 Launching the ZENworks VM Management Console

You can run the ZENworks VM Management Console on both Linux and Windows workstations:

Using a Linux Workstation

1 On your Linux workstation, open a command terminal, change to the `/opt/novell/zenworks/vmmanagement/bin/` directory, and enter the following command:

   `./run_nvmm.sh`

2 Close the Welcome pages to display the login window.

3 Specify the IP address of the server running the VM Warehouse and VM Builder.

4 Enter a username and password with root privileges on the VM Warehouse/Builder server, then click *Login*.

The console sections are filled in.

Using a Windows Workstation

1 On your Windows workstation, double-click the Virtual Machine Management Console icon (⊡) to open the console.

The first time you log in, the following Welcome page is displayed:

2 Close the Welcome page to display the following login window:
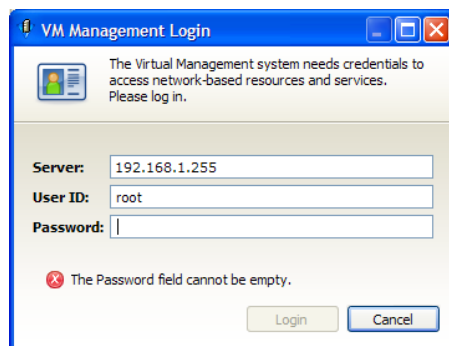
In subsequent logins, an empty console is displayed with the login dialog box:
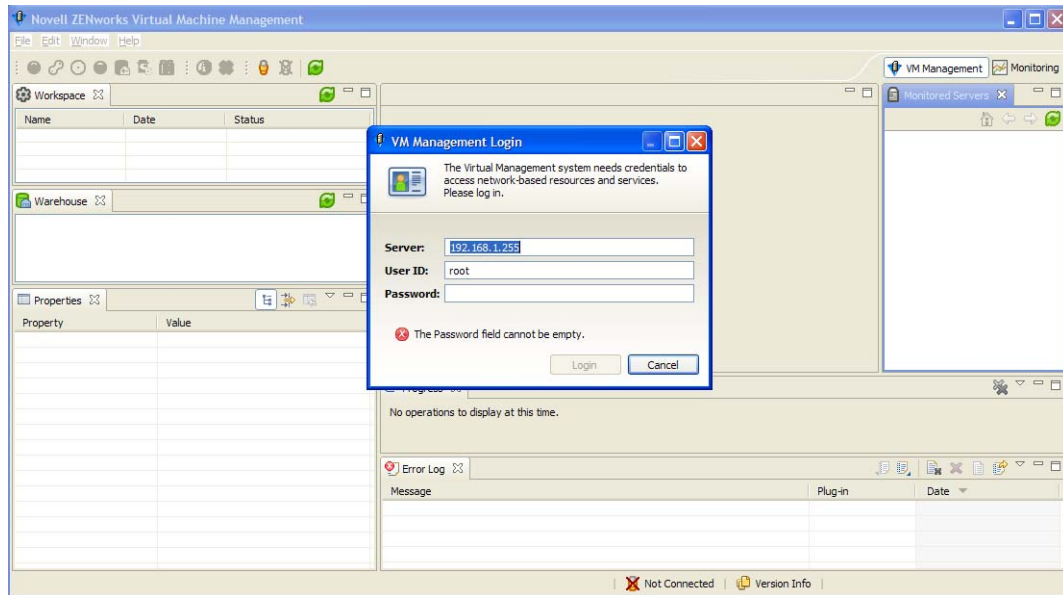
3 Specify the IP address of the server running the VM Warehouse and VM Builder.

4 Enter a username and password with root privileges on the VM Warehouse/Builder server, then click *Login*.

The console sections are filled in. For example:
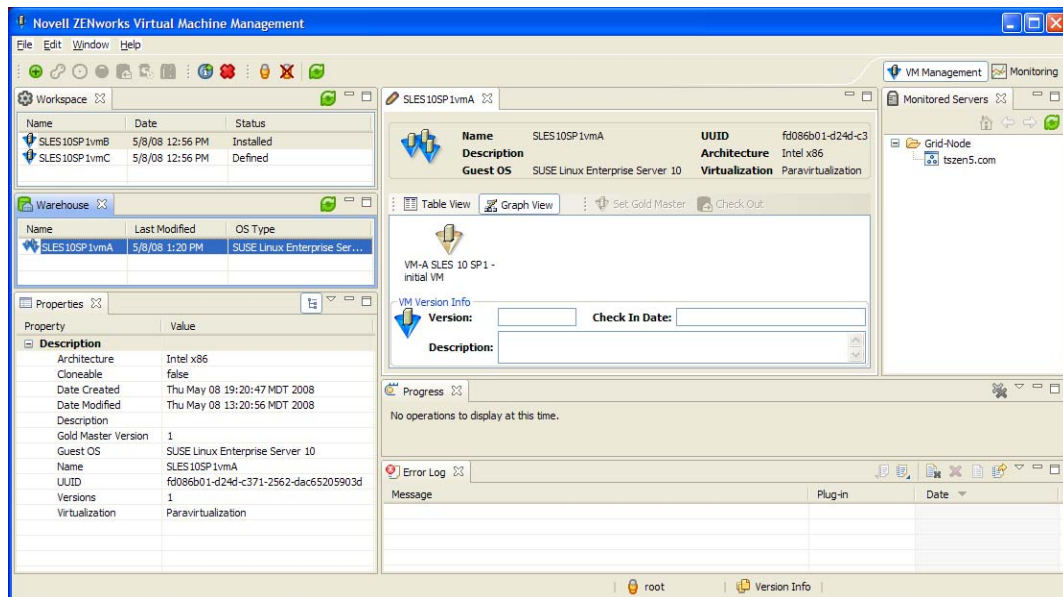
A.2.2 Introduction to the ZENworks VM Management Console

This section introduces you to the components of the GUI and gets you started managing your VMs in your data center. The GUI consists of the Welcome pages and two collections of Views called Perspectives.

- "VM Management Welcome Page" on page 87

VM Management Welcome Page

The first time you start ZENworks VM Management, the Welcome page displays. This page shows several buttons that take you to other pages containing more detailed information about the product.

Figure A-1   *ZENworks VM Management Console Welcome Page*

This home page of VM Management gives you quick access to answers for your questions concerning VM Management.

The Overview page contains links to a basic overview of VM Management, ZENworks Orchestrator Server, and the VM life cycle.

The Latest Features page gives you links to new features and information about the product. Latest Features also highlights any improvements since the previous release of the software.

The Web Resources page gives you many different Web links to access various associated Web sites including product pages, information about BrainShare®, press releases, online documentation for VM Management and ZENworks Orchestrator Support, and other useful information.

Manage Your VMs launches the ZENworks VM Management Console, where you can begin managing the VMs in your data center.

The welcome pages can be accessed again at any time by clicking *Help > Welcome*.

Basic VM Management Functionality

The ZENworks VM Management Console is designed to let you customize the overall look and feel of your console. If you want to return to the initial perspective view, click *Window > Reset Perspective*.

Moving and Resizing Views

To move a view, just drag it to a new location. As you drag, a black outline indicates the position that it will have when you release the mouse button. Use the window's sizing handles to resize the view.

Combining Views

To combine (stack) any view window with another, drag the view to another view. A black box appears around the view you want to combine with. When you drop the view you are dragging, the views stack together, allowing you to switch between the two by clicking their titles.

Refreshing, Minimizing, and Maximizing Views

Click the two green arrows in a circle to refresh the view. Click the *Minimize* button to minimize the window. Click the *Maximize* button to expand the view to fill the entire console window.

Popping Out a View

Drag a view outside the frame of the actual console to have the view available in its own, separate window. In the Monitoring perspective, you can also click the *Load in external browser* icon to have the Monitoring editor window loaded in your default Internet browser.

Tips and Tricks

For further tips and tricks for operating the ZENworks VM Management Console, see Section A.3, "Tips and Tricks with the ZENworks VM Management Console," on page 94.

Virtual Machine Builder and Warehouse Perspective

After you close the Welcome pages, the VM Management perspective displays, as shown in the following figure. Click the *Monitoring* button in the upper right corner of the console to display the Monitoring perspective.

Figure A-2   *VM Management Perspective*
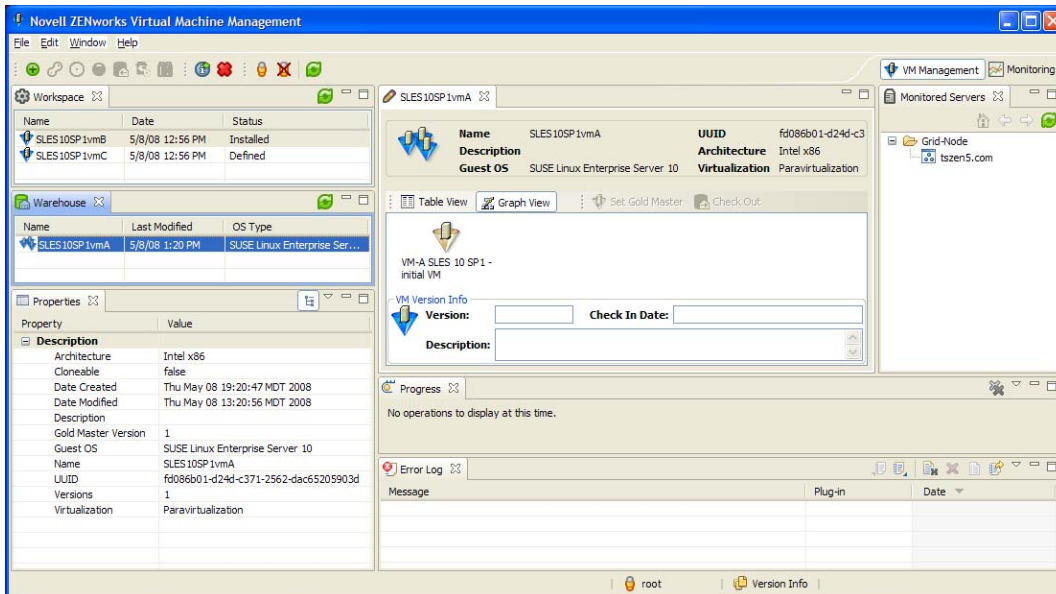
The VM Management perspective contains the Workspace view, VM Warehouse view, and the Properties view on the left side of the default perspective setup. The editor view space is the large section to the right.

- "Workspace View" on page 89
- "Warehouse View" on page 90
- "Properties View" on page 91
- "Displaying Versions" on page 93

Workspace View

The Workspace view is used to display VMs that can be edited. You can edit the VMs in the Workspace. The following figure represents an example of the Workspace view.

Figure A-3   *VM Management Workspace*
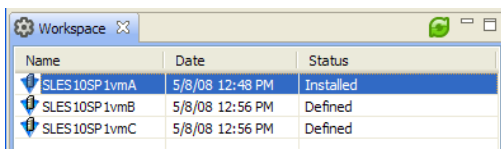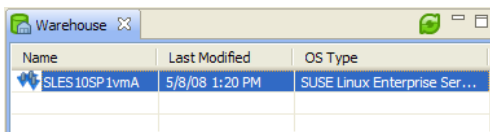
The Workspace provides access to the VM Builder and also lists VMs that have not been checked in or are in a checked-out state copied from the warehouse. You can build a new VM, edit the metadata attached to the VM, edit the VM image, and check in the VM to the VM Warehouse. The VMs are listed with the VM name and the creation or check-out date. These different states are:

- **Defining:** Defining a VM is process of setting its parameters and constraints by adding the information in the VM Builder Wizard. For details on defining a VM, see Section 3.2.2, "Defining the Virtual Machine," on page 42.

- **Defined:** A defined VM has had sufficient information added in the VM Builder Wizard but has not been created. The VM can be defined and closed, or you can keep the wizard open to begin installing the VM. You can also install a defined VM by right-clicking the defined VM, then clicking *Edit*. Clicking *Edit* opens the VM Builder Wizard again, allowing you to click the *Install* button. For details on installing a Defined VM, see Section 3.2.3, "Installing a Defined Virtual Machine," on page 49.

- **Installing:** A VM is installing when it is in the process of being built by the VM Builder. A VM in the process of being built requires that you be able to see it, with the initial installation. You can bring up a Virtual Network Computing (VNC) console icon to view and interact with its installation. You do not need a VNC connection to the VM if you are installing from an AutoYaST file. For details about the build process, see Section A.3, "Tips and Tricks with the ZENworks VM Management Console," on page 94.

- **Installed:** An installed VM has its build process complete and is ready to be launched to install any applications you need on the VM, including the Orchestrator Agent and the Monitoring Agent. When you are finished adding applications, you close the VM, and it is ready to be checked into the VM Warehouse. For details on adding applications to a newly built VM, see Section 3.2.5, "Installing Applications on a Virtual Machine," on page 53.

- **Checked Out:** When a VM is checked out of the warehouse for editing, modification, and application installation it is listed as *Checked Out*. For information on checking out and modifying a VM, see Section 6.3, "Modifying a Virtual Machine after Checking In," on page 71.

- **Checking in:** A VM is checking in when it is in the process of being returned the VM Warehouse for the next version iteration.

- **Check in Failed:** The check-in failed.

Warehouse View

The Warehouse view shows all checked-in VMs, their names, most recent modification, and operating system type. The following figure represents the VM Warehouse with some checked-in VMs.

Figure A-4   *VM Management Warehouse View*

The Warehouse gives you information on:
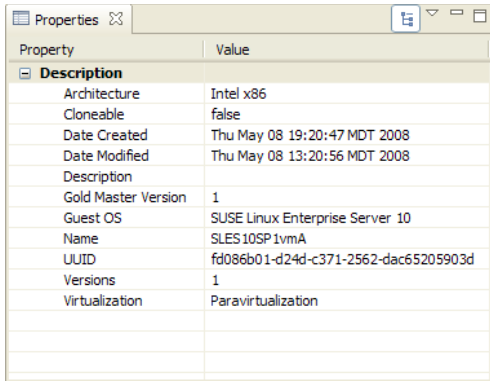
- **Name:** The name of the collected group of VMs. This is the name that you gave in the VM Builder Wizard and is the name that shows up in the VM list in the ZENworks Orchestrator Console.

- **Last Modified:** Lists when the last version was modified and checked into the warehouse.
- **OS Type:** Indicates the type of operating system that was installed when the VM was created.

Properties View

The Properties view displays specific information and properties of a selected VM, whether selected from the Workspace or Warehouse view. The property is named and its description is given in the *Value* column. The following figure represents the Properties view.

Figure A-5 *ZENworks VM Management Console Properties View*

Property	Value
☐ Description	
Architecture	Intel x86
Cloneable	false
Date Created	Thu May 08 19:20:47 MDT 2008
Date Modified	Thu May 08 13:20:56 MDT 2008
Description	
Gold Master Version	1
Guest OS	SUSE Linux Enterprise Server 10
Name	SLES10SP1vmA
UUID	fd086b01-d24d-c371-2562-dac65205903d
Versions	1
Virtualization	Paravirtualization

The available information for the Properties view changes depending on whether you select a VM in the Workspace or in the Warehouse. The properties of a VM in the Workspace section are:

- **Description:** Contains the information about the VM that make it unique or the initial parent of subsequent versions. This gets much of its information from user inputs and responses in the VM Builder Wizard.

  - **Architecture:** The type of virtual processor selected when the VM was built.

  - **Cloneable:** Indicates whether or not the VM can be cloned, if it is a template or a single version.

  - **Date:** Lists the date and time of the creation of, or last edit to, the VM.

  - **Description:** Notes the purpose and any other specifics you want to list for the VM. These notes apply to all versions of this VM.

  - **Gold Master:** Indicates if the VM is the Gold Master version that will be deployed by the Orchestrator Server for VM provisioning.

  - **Location:** Indicates whether it is stored in the warehouse.

  - **Name:** The name of the VM.

  - **OS Type:** Indicates the type of operating system that was installed when the VM was created.

  - **Parent Version:** Indicates which version was used to make the currently selected version of the VM.

  - **Status:** Displays the status or state of the VM. See "Workspace View" on page 89 for a list of the types.

  - **UUID:** The unique identification of this specific instance and version of the VM. The VM is not given a UUID until it is launched for the first time.

- **Version:** This indicates the current assigned version number of the VM, or the number it will be assigned when it is checked into the VM Warehouse.
- **VM Crash:** This is the setting for what to do if the VM crashes. It defaults to Shutdown which means that if the VM crashes, it shuts down immediately.
- **VM Type:** The virtualization type applied to the VM: paravirtualization or full virtualization. For more information on the virtualization type, see "Virtualization Mode:" on page 44.

- **Disks:** The disks saved as part of the initial VM configuration are stored here. This section changes according to what kind and how many disks are saved as part of the VM metadata. The following are the types of disks that your VM can have:
  - **Hard Disk:** The non-saved hard disks used as normal hard disks after the VM launches. Any data on these disks is lost when you shut down the VM. However, the disk size is maintained as part of the VM image.
  - **CD-ROM/DVD:** Gives access to any physical CD-ROM or DVD-ROM that is present on the VM host.
  - **OS Disk:** Lists the size of the first (and only) saved hard disk of the VM. This hard disk contains the installed guest operating system.

- **Hardware:** Describes the virtualized hardware and architecture you earlier designated. Memory and graphics information is also included.
  - **CPUs:** The number of virtual processors you have assigned the VM.
  - **CPU Weight:** A numerical representation of the priority to access the VM host's CPU.
  - **Graphics:** Lists the virtualized graphics card. If you have a paravirtualized guest operating system, this lists the card as paravirtualized, which means that the VM can directly access the graphics card of the host.
  - **Memory:** The range of allowable RAM the system can use while running.
  - **VNC:** Indicates if you can create a virtual network connection to the VM, allowing you to see and operate the VM at a graphical level.

- **Installation:** Information about how the VM was installed, its source, and any other installation data.
  - **Additional Args:** Any listed additional arguments you made for the VM when you created it.
  - **Auto Install File:** The location of the AutoYaST file used for the installation of the VM.
  - **Install Source:** The location of the source files used to install the VM.

- **Misc:** Any miscellaneous information about the VM, including usernames applied to the VM.
  - **User:** List the `root` user and any other users with access to the VM.

- **Network:** Lists the network connection properties and virtualized network card properties.
  - **Domain Name:** This is the name of the domain to which the VM is assigned.
  - **Host Name:** This will usually be the name of your VM or it can be a host name you have designated during VM creation.

- ◆ **Paravirtualized:** This section lists the parameters of the VM's network card. If paravirtualized it is listed in this state. It defaults to Default MAC; DHCP IP Address; however, if a DHCP, DNS, or WINS specific property has been assigned, that information is displayed here.
- ◆ **Fully Virtualized:** Lists the parameters of the network card attached to the VM, including whether it is fully virtualized. For more information on the statuses assigned to the network settings, see "Network" on page 47.

Displaying Versions

Information about the VM and its history is available by:

- ◆ Double-clicking the checked-in VM.
- ◆ Right-clicking the checked-in VM and selecting *Show Versions*.
- ◆ Clicking the *Show Versions* button at the top of the window.

This opens an edit window on the right of the initial structure, with the following information:

- ◆ **Name:** The name of the VM and its versions.
- ◆ **UUID:** The unique identification of this instance of the VM.
- ◆ **Description:** Any information you entered when you created this VM.
- ◆ **Architecture:** The architecture of the virtualized processor.
- ◆ **OS Type:** The type of operating system installed on the VM.
- ◆ **VM Type:** Indicates whether the VM is fully virtualized or paravirtualized.

Figure A-6   *VM Information and Version Information in the GUI Display*
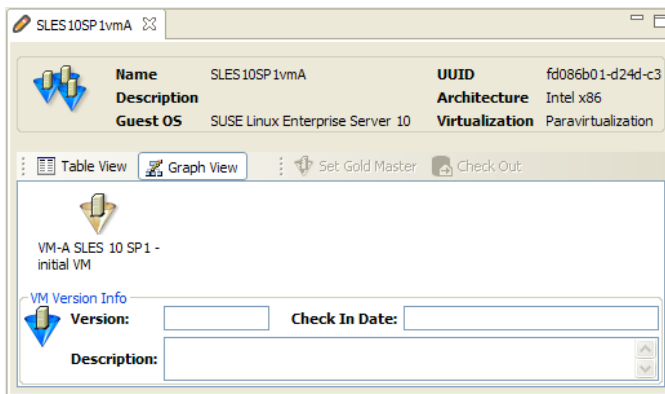
A.2.3 The Monitoring Perspective

Click the *Monitoring* button at the top right corner of the console to access the ZENworks Orchestrator Monitoring Service. The Monitoring Service to allows you to monitor many elements of the data center in both virtual and physical machines (including the VM host machines), aiding

you in the overall management of your data center. You can view this information in a text or graphical mode. The following figure represents a sample Monitoring Service page in a graphical view.

Figure A-7 *ZENworks Monitoring Service Graphical View*
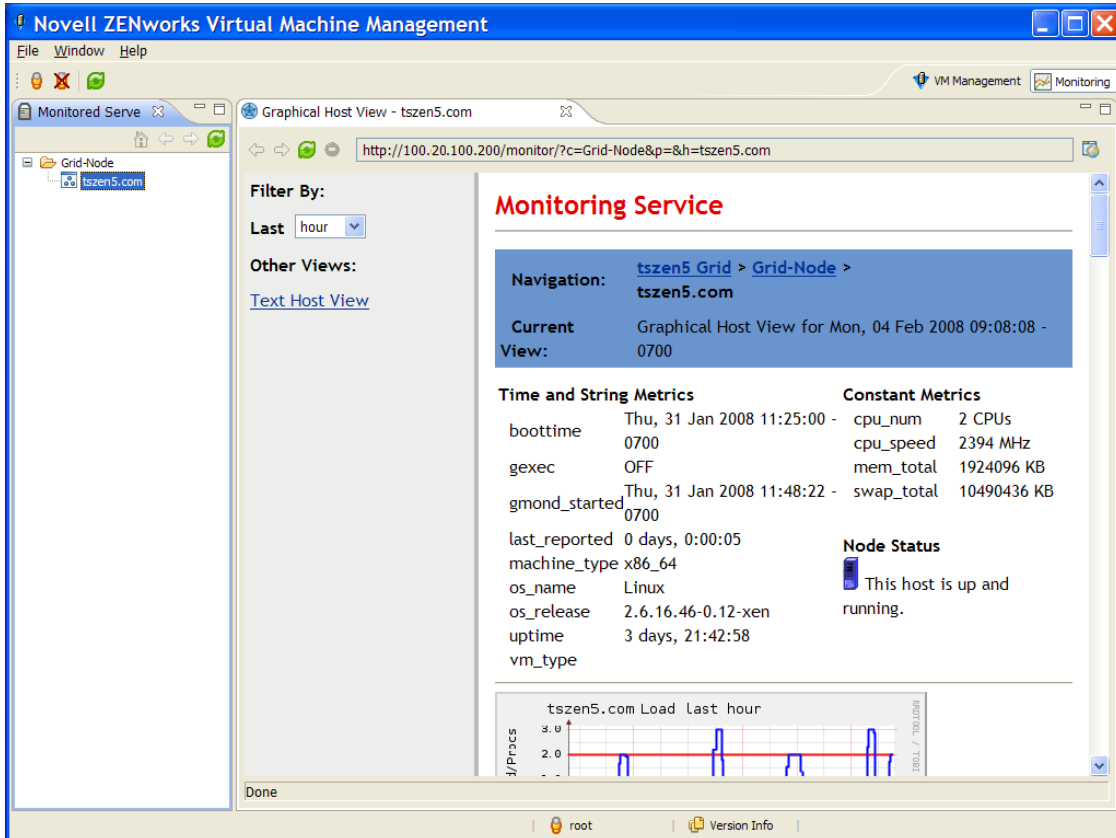
The left pane displays the groups or clusters of physical machines and VMs you can monitor. In the editing pane, you see a Web page where you define the parameters of how you want to monitor the selected machine. You can set the metric, time constraint, and how you want the data sorted in the display from the drop-down boxes on the left of the edit view.

For details about the monitoring service and how to access it, see Section 6.4, "Monitoring Virtual Machines," on page 74.

A.3 Tips and Tricks with the ZENworks VM Management Console

The following is a list of tips and tricks for the ZENworks VM Management Console. They can help you to maximize your work effort with the VMs in your data center:

Browser/Window Tips

- Click *Window > Preferences* and select *VM Management Server* to change your VM Management Server URL as well the username associated with that server.

- If you want to only work with one window and not have multiple windows open when you switch perspectives, click *Window > Preferences > General* menu, then select to have the new perspectives open *In the same window*.
- Click the *Load in external browser* button in the top right corner of the edit window to open an external browser to display the information in a full-sized browser window.
- Click the *Refresh All* button at the top of the console to refresh the views and any open editor views. Click the individual refresh buttons to refresh the specific view or editor view.
- Double-click a View or an editor tab to maximize it to a full window; double-click it to restore it to its previous size and layout position.

Editor Tips

- Editors can be dragged within the main window to re-dock anywhere you want. They can stack or tile but cannot be dragged outside of the main window.
- Edit views do not close automatically when switching between views. In order to avoid having VM Management Show Version edit views cluttering your Monitoring perspective or to avoid having Monitoring edit views cluttering your VM Management perspective, click *Window > Preferences* in the *General* menu, then select to open a new perspective *In a new window*. Any time you select one of the perspectives at the top of the console, this option allows you to open a new window so you can keep the VM Management and Monitoring edit views separate while working.
- Double-click any device name in the monitored servers view to load as many Monitoring editor views as you want. The editor windows stack with the other editor windows that you have open.

Views Tips

- Click *Window > Show View > Progress* to show the Progress view at the bottom of the VM Management window.
- Double-click the right portion of the status bar to quickly bring up the Progress view.
- Click *Window > Show View > Error Log* to view the Error Log view at the bottom of the VM Management window.
- Double-click the status bar to quickly bring up the Error Log view.
- Double-click a VM collection to bring up the Warehouse Editor view.
- Double-click a VM in the Workspace view to bring up the wizard in edit mode.
- Double-click the blank area in the Workspace view to bring up the wizard in creation mode.

Wizard Tips

- To quickly move around the VM Creation Wizard, click any of the blue items in the *VM Properties Table* at the left side of the wizard.

VM Management Installation Sources

<div style="text-align: right">

B

</div>

You have two sources from which to install Novell® ZENworks® VM Management VMs:

B.1 Disk Installation Sources

To install a fully virtualized machine, you need to specify an installation source that must be mounted in such a way that the VM recognizes it as a mounted installation source. For example, FTP, HTTP, and NFS.

For other installation sources to use for paravirtualized installs, the following installation sources can be designated to serve as virtual mount points:

- A disk image, such as an ISO file accessible from the local file system of the machine performing the installation. For example: `/install_ISOs/sles10sp2.iso`
- A remote storage device specified by using the Internet SCSI (iSCSI) protocol. For example: `iscsi:iqn.2001-04.com.acme@0ac47ee2-216e-452a-a341-a12624cd0225`
- A remote storage device specified by using a Fibre Channel (NPIV) protocol. For example: `npiv:210400e08b80c40f`

B.2 Guest Operating System Installation Sources

You need to designate an installation source for a paravirtualized machine. The following is a list of guest operating systems and the installation sources to use for a paravirtualized installation. The listed sources are suggestions and examples.

B.2.1 SUSE

- A remote directory containing the install files, specified by using the HTTP protocol: The HTTPS protocol is not supported.

  `http://www.domain.com/install_sources/sles10sp2/`
- A remote directory containing the install files, specified by using the FTP protocol:

  `ftp://www.domain.com/install_sources/sles10sp2/`
- A remote directory containing the install files, specified by using the NFS protocol:

```
nfs://www.domain.com/install_sources/sles10sp2/
```

B.2.2 Red Hat

- ◆ The NFS protocol is specified slightly differently:

```
nfs:www.domain.com:/install_sources/sles10sp2/
```

- ◆ The SMB protocol is not available.

B.2.3 NetWare

A paravirtualized NetWare® operating system can be installed by using the same installation sources as fully virtualized VMs.

NOTE: Only Open Enterprise Server (OES) 2 and OES 2 Linux can be paravirtualized. Either can be fully virtualized. NetWare 6.5 and earlier must be fully virtualized. See Section B.1, "Disk Installation Sources," on page 97 for instructions on fully virtualizing the guest operating system.

B.2.4 Other Linux Installation Sources

All other paravirtualized operating systems can be installed by using the same installation sources as fully virtualized VMs.

Virtual Machine Technologies and Actions

C

The following tables contain information about the different Novell® ZENworks® VM Management technologies, ZENworks Orchestrator provisioning adapters, and actions you can perform to and with a VM.

This section contains the following:

C.1 Virtual Machine Technologies

The following table represents the available actions using VMs with ZENworks Orchestrator.

Table C-1 *VM Technologies with Host Operating System, Guest Operating System, and Provisioning Adapter*

Hypervisor	Host Operating System	Guest Operating System	ZENworks Orchestrator Provisioning Adapter
Xen	SUSE® Linux Enterprise Server (SLES) 10	◆ SUSE 9 ◆ SUSE 10 ◆ RHEL 4 ◆ RHEL 5 ◆ Other Linux	xen30
	SLES 10 SP 1	◆ SUSE 9 ◆ SUSE 10 ◆ RHEL 4 ◆ RHEL 5 ◆ Other Linux ◆ Windows Server 2003 Windows XP	

Hypervisor	Host Operating System	Guest Operating System	ZENworks Orchestrator Provisioning Adapter
	RHEL 4	◆ SUSE 9 ◆ SUSE 10 ◆ RHEL 4 ◆ RHEL 5 ◆ Other Linux ◆ Windows Server 2003 Windows XP	
	RHEL 5	◆ SUSE 9 ◆ SUSE 10 ◆ RHEL 4 ◆ RHEL 5 ◆ Other Linux ◆ Windows Server 2003 Windows XP	
VMware Server	SLES 10	◆ SUSE 9 ◆ SUSE 10 ◆ RHEL 4 ◆ RHEL 5 ◆ Other Linux ◆ Windows Server 2003 Windows XP	vmserver
	SLES 10 SP 1	◆ SUSE 9 ◆ SUSE 10 ◆ RHEL 4 ◆ RHEL 5 ◆ Other Linux ◆ Windows Server 2003 Windows XP	
	RHEL 4	◆ SUSE 9 ◆ SUSE 10 ◆ RHEL 4 ◆ RHEL 5 ◆ Other Linux ◆ Windows Server 2003 Windows XP	

Hypervisor	Host Operating System	Guest Operating System	ZENworks Orchestrator Provisioning Adapter
	RHEL 5	◆ SUSE 9	
		◆ SUSE 10	
		◆ RHEL 4	
		◆ RHEL 5	
		◆ Other Linux	
		◆ Windows Server 2003 Windows XP	
	Windows Server 2003	◆ SUSE 9	
		◆ SUSE 10	
		◆ RHEL 4	
		◆ RHEL 5	
		◆ Other Linux	
		◆ Windows Server 2003 Windows XP	
VMware Virtual Center	Subject to the VMware support matrix	◆ SUSE 8	vcenter
		◆ SUSE 9	
		◆ SUSE 10	
		◆ RHEL 4	
		◆ RHEL 5	
		◆ Other Linux	
		◆ Windows Server 2003 Windows XP	

C.2 Xen Hypervisor

The Xen hypervisor runs on SLES 10, SLES 10 SP 1, RHEL 4, and RHEL 5 host machines. The following tables represent the ZENworks Orchestrator VM actions and whether or not ZENworks Orchestrator can perform that action on the guest operating system. The tables are listed according to host operating system.

C.2.1 SLES 10

Table C-2 *ZENworks Orchestrator VM Actions Supported for SLES 10 Using Xen*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux
Provision	X	X	X	X	X
Clone	X	X	X	X	X
Cold Migrate	X	X	X	X	X
Shutdown	X	X	X	X	X
Destroy	X	X	X	X	X
Suspend	X	X	X	X	X
Pause					
Resume					
Create Template	X	X	X	X	X
Hot Migrate					
Checkpoint	X	X	X	X	X
Restore	X	X	X	X	X
Install Orchestrator Agent	X	X			
Make Standalone	X	X	X	X	X
Check Status	X	X	X	X	X
Personalize					
Save Config					

C.2.2 SLES 10 SP 1

Table C-3 *ZENworks Orchestrator VM Actions Supported for SLES 10 SP 1 Using Xen*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause	X	X	X	X	X	X
Resume	X	X	X	X	X	X
Create Template	X	X	X	X	X	X
Hot Migrate	X	X	X	X	X	X
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.2.3 RHEL 4

Table C-4 *ZENworks Orchestrator VM Actions Supported for RHEL 4 Using Xen*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause	X	X	X	X	X	X

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Resume	X	X	X	X	X	X
Create Template	X	X	X	X	X	X
Hot Migrate						
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.2.4 RHEL 5

Table C-5 *ZENworks Orchestrator VM Actions Supported for RHEL 5 Using Xen*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause	X	X	X	X	X	X
Resume	X	X	X	X	X	X
Create Template	X	X	X	X	X	X
Hot Migrate						
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.3 VMware Server Technology

The VMware Server hypervisor runs on SLES 10, SLES 10 SP 1, RHEL 4, RHEL 5, and Windows Server 2003 host machines. The following tables represent the ZENworks Orchestrator VM actions and whether or not ZENworks Orchestrator can perform that action on the guest operating system. The tables are listed according to host operating system.

C.3.1 SLES 10

Table C-6 *ZENworks Orchestrator VM Actions Supported for SLES 10 Using VMware Server*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux
Provision	X	X	X	X	X
Clone	X	X	X	X	X
Cold Migrate	X	X	X	X	X
Shutdown	X	X	X	X	X
Destroy	X	X	X	X	X
Suspend	X	X	X	X	X
Pause					
Resume					

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux
Create Template	X	X	X	X	X
Hot Migrate					
Checkpoint	X	X	X	X	X
Restore	X	X	X	X	X
Install Orchestrator Agent	X	X			
Make Standalone	X	X	X	X	X
Check Status	X	X	X	X	X
Personalize					
Save Config					

C.3.2 SLES 10 SP 1

Table C-7 *ZENworks Orchestrator VM Actions Supported for SLES 10 SP 1 Using VMware Server*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause						
Resume						
Create Template	X	X	X	X	X	X
Hot Migrate						
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.3.3 RHEL 4

Table C-8 *ZENworks Orchestrator VM Actions Supported for RHEL 4 Using VMware Server*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause						
Resume						
Create Template	X	X	X	X	X	X
Hot Migrate						
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.3.4 RHEL 5

Table C-9 *ZENworks Orchestrator VM Actions Supported for RHEL 5 Using VMware Server*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause						
Resume						
Create Template	X	X	X	X	X	X
Hot Migrate						
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.3.5 Windows

Table C-10   *ZENworks Orchestrator VM Actions Supported for Windows Using VMware Server*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause						
Resume						
Create Template	X	X	X	X	X	X
Hot Migrate						
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X
Install Orchestrator Agent	X	X	X	X	X	X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.4 VMware Virtual Center

The VMware Virtual Center hypervisor runs on SLES 10, SLES 10 SP 1, RHEL 4, RHEL 5, and Windows Server 2003 host machines. The following tables represent the ZENworks Orchestrator VM actions and whether or not ZENworks Orchestrator can perform that action on the guest operating system. The tables are listed according to host operating system.

NOTE: Host operating systems are dependant on the VMware Virtual Center support matrix.

Table C-11 *ZENworks Orchestrator VM Actions Supported Guest Operating Systems Using VMware Server*

ZENworks Orchestrator Managed VM Action	SUSE 8	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X	X
Clone	X	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X	X
Destroy	X	X	X	X	X	X	X
Suspend	X	X	X	X	X	X	X
Pause							
Resume							
Create Template	X	X	X	X	X	X	X
Hot Migrate	X	X	X	X	X	X	X
Checkpoint	X	X	X	X	X	X	X
Restore	X	X	X	X	X	X	X
Install Orchestrator Agent	X	X	X	X	X	X	X
Make Standalone	X	X	X	X	X	X	X
Check Status	X	X	X	X	X	X	X
Personalize	X	X	X	X	X		X
Save Config	X	X	X	X	X	X	X

C.5 Xen VM Technology

The following sections represent Xen VM technologies.

C.5.1 SLES 10

Table C-12 *ZENworks Orchestrator VM Actions Supported for SLES 10 Using Xen*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux
Provision	X	X	X	X	X
Clone	X	X	X	X	X
Cold Migrate	X	X	X	X	X
Shutdown	X	X	X	X	X
Destroy	X	X	X	X	X
Suspend	X	X	X	X	X
Pause					
Resume					
Create Template	X	X	X	X	X
Hot Migrate					
Checkpoint	X	X	X	X	X
Restore	X	X	X	X	X
Install Orchestrator Agent	X	X			
Make Standalone	X	X	X	X	X
Check Status	X	X	X	X	X
Personalize					
Save Config					

C.5.2 SLES 10 SP 1

Table C-13 *ZENworks Orchestrator VM Actions Supported for SLES 10 SP 1 Using Xen*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause	X	X	X	X	X	X
Resume	X	X	X	X	X	X
Create Template	X	X	X	X	X	X
Hot Migrate	X	X	X	X	X	X
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.5.3 RHEL 4

Table C-14   *ZENworks Orchestrator VM Actions Supported for RHEL 4 Using Xen*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause	X	X	X	X	X	X

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Resume	X	X	X	X	X	X
Create Template	X	X	X	X	X	X
Hot Migrate						
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.5.4 RHEL 5

Table C-15 *ZENworks Orchestrator VM Actions Supported for RHEL 5 Using Xen*

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Provision	X	X	X	X	X	X
Clone	X	X	X	X	X	X
Cold Migrate	X	X	X	X	X	X
Shutdown	X	X	X	X	X	X
Destroy	X	X	X	X	X	X
Suspend	X	X	X	X	X	X
Pause	X	X	X	X	X	X
Resume	X	X	X	X	X	X
Create Template	X	X	X	X	X	X
Hot Migrate						
Checkpoint	X	X	X	X	X	X
Restore	X	X	X	X	X	X

ZENworks Orchestrator Managed VM Action	SUSE 9	SUSE 10	RHEL 4	RHEL 5	Other Linux	Windows
Install Orchestrator Agent	X	X	X	X		X
Make Standalone	X	X	X	X	X	X
Check Status	X	X	X	X	X	X
Personalize	X	X	X	X		X
Save Config	X	X	X	X	X	X

C.6 Virtual Machine Crash Responses

When you design a VM with the VM Builder, the VM crash direction is by default set to shut down the VM. However, after you have built and installed the VM, you can change its crash directions to any of the following options:

Table C-16 *VM Crash Directions*

Direction	Explanation
Shut down	If the VM crashes, the host operating system alerts the administrator and shuts down the VM. It remains in its shut-down state until it is restarted by the administrator.
Save core dump; then shut down	If the VM crashes, the host operating system saves the core dump, alerts the administrator, and shuts down the VM. It remains in its shut-down state until it is restarted by the administrator.
Restart	If the VM crashes, the host operating system alerts the administrator and the VM automatically restarts.
Save core dump; then restart	If the VM crashes, the host operating system alerts the administrator, saves the core dump, and the VM automatically restarts.
Preserve the image as is	If the VM crashes, the host operating system alerts the administrator and preserves the image in its crashed state until the administrator decides the next course of action.
Rename; then restart	If the VM crashes, the host operating system alerts the administrator, renames the image, then restarts the renamed image.

C.7 Connecting to VMware Virtual Center

1 Make sure that the Windows Orchestrator Agent is installed and started on the Windows host running Virtual Center.

2 Make sure that J2RE with version 1.4.2 for VCenter 1.x or version 1.5 for VCenter 2.x is installed on the Windows system running Virtual Center.

The JREs that ship with Virtual Center and with the Novell Agent are version 1.5. Version 1.4.2_15 can be downloaded from the Sun* Download Center (https://sdlc4a.sun.com/ECom/EComActionServlet;jsessionid=88B0E4E7E868F2F6C671427ACC9C0D13).

3 On the server where Virtual Center is installed, find the `rui.crt` certificate.

On Windows, the default location is: `C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\SSL\rui.crt`.

4 Create a `VCenter_Certs` directory at the top level by entering `mkdir C:\VCenter_Certs\`.

5 Copy `rui.crt` to `C:\VCenter_Certs\`.

6 Run `keytool`.

The default location is `C:\Program Files\VMware\VMware VirtualCenter 2.0\jre\bin\keytool.exe`.

7 Enter:

```
cd C:\VCenter_Certs

[path]keytool -import -keystore keystore -file rui.crt
```

8 Enter a password when prompted.

9 In ZENworks Orchestrator Console, edit the vcenter policy by entering the URL, username, and password.

10 In the ZENworks Orchestrator Console, edit the vcenter_client policy to do the following:

* Set `keystore` to point to `C:\VCenter_Certs\keystore`.
* Set the Java JRE path.

11 Save the changes.

12 Drag and drop the vcenter and vcenter_client policies to the server where Virtual Center is running.

13 Discover VM hosts.

14 Discover VM images.

15 If the VM images are not listed in the tree, restart the ZENworks Orchestrator Console.

NOTE: VM host discovery on the vcenter adapter can fail because VM host discovery with Virtual Center requires JRE 1.4.2 for VCenter 1.x and JRE 1.5 for VCenter 2.x to be installed on the Windows-based Virtual Center host. The JRE that ships with the Orchestrator Agent and with VMware Virtual Center is JRE 1.5.

Sample VM Management Jobs

D

This section provides a sample job that can be run in the Novell® ZENworks® Orchestrator Console to aid you in managing your VMs in your data center:

- Section D.1, "Installing the ZENworks Orchestrator Agent on an Apache Virtual Machine," on page 117

To develop your own jobs to manage, provision, and control your VMs in your data center, see the sample job or refer to "Virtual Machine Job Development" in the *Novell ZENworks Orchestrator 1.3 Developer Guide and Reference*.

D.1 Installing the ZENworks Orchestrator Agent on an Apache Virtual Machine

This job is designed to help you to install the Orchestrator Agent on all VMs running Apache. You can cut and paste this job into your ZENworks Orchestrator Console or you can use this job as a template from which to make new jobs.

```
"""

Search for a VM Grid objects using Constraints and
run a VM operation on them.

"""

class test(Job):

    def job_started_event(self):

        # collect all VM Instances whose resource ID
        # starts with the string "apache"

        a = AndConstraint()

        e1 = EqConstraint()
        e1.setFact("resource.type")
        e1.setValue("VM")
        a.add(e1)

        e2 = EqConstraint()
        e2.setValue("apache*")
        e2.setMatchMode(EqConstraint.MATCH_MODE_REGEXP)
        e2.setFact("resource.id")
        a.add(e2)

        vms = getMatrix().getGridObjects(TYPE_RESOURCE,a,None)
        for vm in vms:
            vm.installAgent()
```