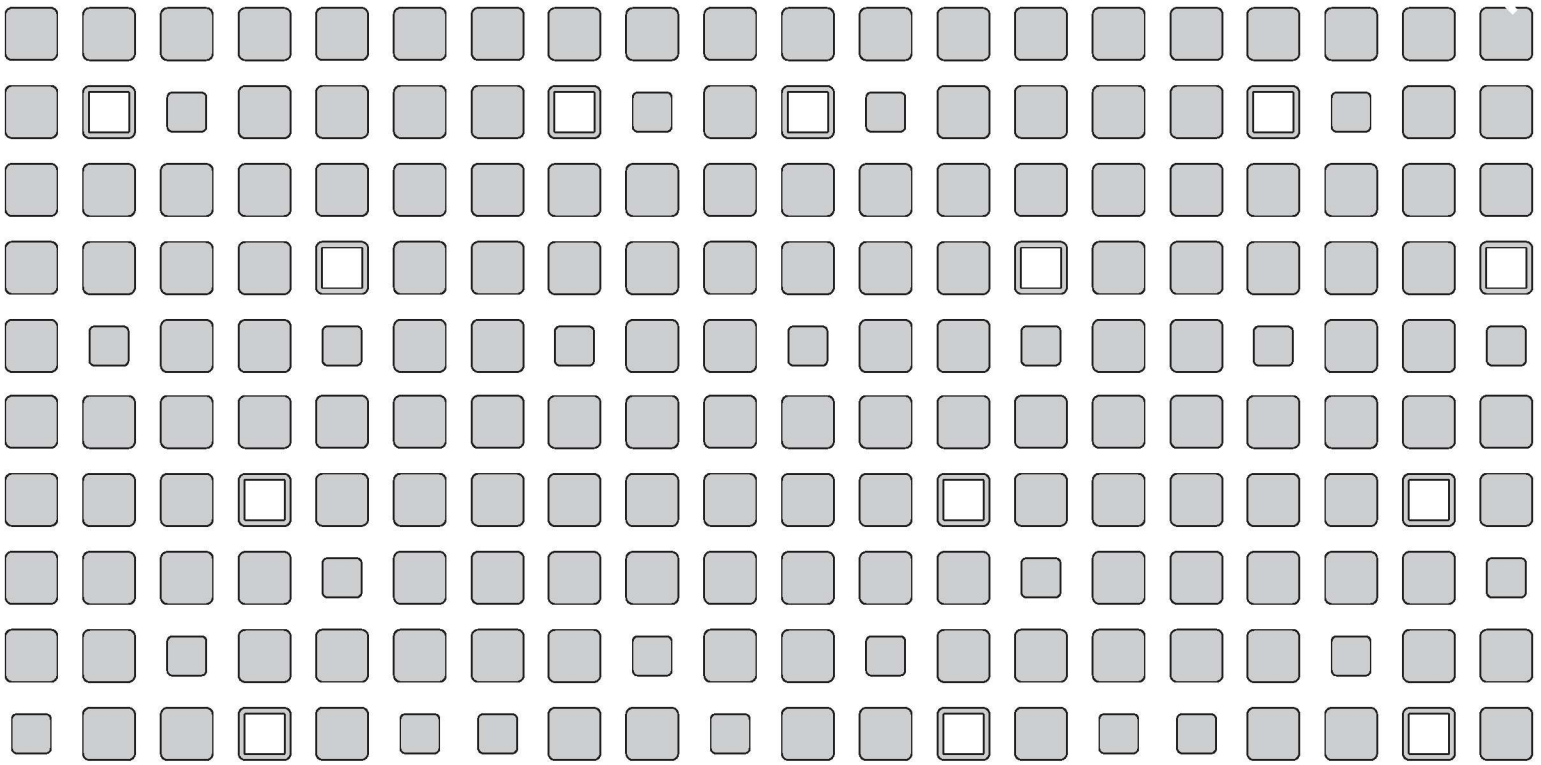
VERSION 1.4

VMware VirtualCenter

User's Manual



WIZ, Inc. EXHIBIT - 1052
WIZ, Inc. v. Orca Security LTD.

VMware, Inc.

3145 Porter Drive
Palo Alto, CA 94304
www.vmware.com

Please note that you can always find the most up-to-date technical documentation on our Web site at http://www.vmware.com/support/.

The VMware Web site also provides the latest product updates.

Copyright © 1998-2006 VMware, Inc. All rights reserved. Protected by one or more of U.S. Patent Nos. 6,397,242, 6,496,847, 6,704,925, 6,711,672, 6,725,289, 6,735,601, 6,785,886, 6,789,156, 6,795,966, 6,880,022 6,961,941, 6,961,806 and 6,944,699; patents pending. VMware, the VMware "boxes" logo and design, Virtual SMP and VMotion are registered trademarks or trademarks of VMware, Inc. in the United States and/or other jurisdictions. Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation. Linux is a registered trademark of Linus Torvalds. All other marks and names mentioned herein may be trademarks of their respective companies. Revision: 20060706 Version: 01 Item: VC-ENG-Q306-195

Table of Contents

Introducing VMware VirtualCenter 13
VirtualCenter Overview 14
About This Manual 15
Intended Audience 15
Document History 15
Conventions 16
Abbreviations 16
Understanding the Components 17
Managed Components 17
Software Components 18
Organizational Components 19
Functional Components 21
Access Privileges Components 22
Operations Overview 25
Understanding Virtual Machines and Hosts 27
Understanding Templates 27
Cloning Virtual Machines 31
Understanding Customization 32
Understanding Migration 33
Understanding New Virtual Machines 34
Understanding Scheduled Tasks 35
Understanding Events 35
Understanding Alarms 35
Understanding the User Interface 35
Performing Actions 36

VMware VirtualCenter Requirements and Resources 39
VMware VirtualCenter Requirements 40
VirtualCenter Server Requirements 40
VirtualCenter Client Requirements 41
VirtualCenter Database Requirements 41
VMware SDK Requirements 42
VirtualCenter Managed Host Requirements 43
GSX Server or VMware Server as Managed Host Requirements 43
VirtualCenter Managed Virtual Machine Requirements 44

VirtualCenter Networking Requirements 44
VirtualCenter Licensing Requirements 47
VirtualCenter VMotion Requirements 48
VirtualCenter Template Requirements 50
VirtualCenter Guest Operating System Customization Requirements 51
Technical Support Resources 54
Documentation on the Web 54
VMware Knowledge Base 54
VMware Newsgroups 54
VMware Community 54
Reporting Problems 55
Viewing System Logs 56
Collecting Log Files 58

Installing VMware VirtualCenter 65
Preparing for the VirtualCenter Database 67
Preparing to use a VirtualCenter Database 67
Configuring Oracle 8i, 9i, or 10g Connection to Work Locally 68
Configuring Oracle 8i, 9i, or 10g Connection to Work Remotely 68
Configuring a SQL Server ODBC Connection 69
Configuring the Microsoft Access Database 72
Maintaining Your VirtualCenter Database 73
Installing and Upgrading the VirtualCenter Product 75
Starting the VirtualCenter Installer for a First Time Installation 76
Starting the VirtualCenter Installer for an Upgrade Installation 77
Selecting the Components to Install 80
Installing the VirtualCenter Server 83
Installing the VMware Web Service 87
Completing the Installation 89
Finishing VirtualCenter Web Service Installation 91
Verifying VirtualCenter Web Service Installation 91
Changing VMware Web Service Options After Installation 95
Updating VMware SDK Digital Certificates 98
Configuring Communication Between VirtualCenter Components 100
Connecting to Your VirtualCenter Clients Through a Firewall 100
Connecting to Your VirtualCenter Hosts Through a Firewall 101
Uninstalling VirtualCenter 103
Uninstalling VirtualCenter Using the Windows Add/Remove Tool 103

Uninstalling VirtualCenter Using the VirtualCenter Installer 104
Uninstalling a VirtualCenter Component 106
Uninstalling a VirtualCenter Component Using the Windows Add/Remove Tool 106
Uninstalling a VirtualCenter Component Using the VirtualCenter Installer 107
Adding a VirtualCenter Component 109

Starting VMware VirtualCenter 117
Starting or Stopping VMware VirtualCenter 118
Getting Started with VirtualCenter Users 118
Verifying the VirtualCenter Server Has Started 119
Restarting the VirtualCenter Server 119
Stopping the VirtualCenter Server 120
Restarting the VirtualCenter Host Agent 121
Starting and Stopping the VirtualCenter Client 124
Starting the VirtualCenter Client and Logging On 124
Stopping the VirtualCenter Client and Logging Off 126
Adding Licenses 127
Configuring Communication Through a Firewall 129
Configuring the Port VirtualCenter Uses to Communicate with the VirtualCenter Client 129
Configuring VirtualCenter Communication Over a Web Connection 130
Navigating in the VirtualCenter Client 133
Selecting Objects 133
Monitoring Objects 135
Performing Actions on Objects 136

Working with the VirtualCenter Client 139
Introducing the VirtualCenter Client Window 140
Menu Bar 141
Popup Menus 142
Console Menu 142
Navigation Bar 144
Toolbar 145
Status Bar 147
Panel Sections 147
Understanding the Information Elements 150
Symbol Information Elements 150
Attribute Elements 151

List Elements 152
Chart Elements 153
Accessing Properties and Settings 156
VMware VirtualCenter Settings 156
VMware Management Interface 159
Host Properties 160
Virtual Machine Resources 161
Virtual Machine Properties 162
Schedule Task Properties 163
Template Properties 164
Alarm Properties 164

Working with Farms 165
Working with VirtualCenter Farms 166
Adding a Farm 166
Removing a Farm 167
Working with Farm Groups 168
Adding a Farm Group 168
Moving a Farm to a Farm Group 169
Removing a Farm Group 169

Working with Hosts 171
Hosts Overview 173
Understanding Host States 174
Preparing to Add a GSX Server or VMware Server Host 175
Adding a Host to a Farm 177
Configuring Network Labels for GSX Server or VMware Server Hosts 182
Connecting or Disconnecting a Host 185
Using Host Power Options 187
Moving Hosts Between Farms 189
Automatically Reconnecting a Host 190
Removing a Host 191
Allocating Host Resources 194
Configuring a Host 197

Interacting with Virtual Machines 199
Adding and Removing Virtual Machines 200
Adding Existing Virtual Machines to VirtualCenter 200
Removing Virtual Machines from VirtualCenter 200

Returning a Virtual Machine to VirtualCenter 201
Removing Virtual Machines from the Disk 201
Changing Virtual Machine Power States 203
Understanding Virtual Machine Power States 203
Understanding Transitional Power States 204
Understanding How a Virtual Machine on a GSX Server or VMware Server Windows Host Is Powered On 205
Manually Powering a Virtual Machine On and Off 205
Scheduling a Power State Change for a Virtual Machine 206
Answering a Pending Question 209
Working with Virtual Machine Groups 211
Adding a Virtual Machine Group 212
Adding Virtual Machines to a Virtual Machine Group 212
Moving Virtual Machines from a Virtual Machine Group 213
Removing a Virtual Machine Group 213

Migrating Virtual Machines 215
Understanding the Migration Options 217
Understanding Migration with VMotion 217
Understanding Migration 218
Migration Restrictions 220
Migrating Powered-Off Virtual Machines 221
Migrating a Powered-Off Virtual Machine Manually 221
Creating a Scheduled Task to Migrate a Virtual Machine 223
Enabling VMotion 226
Moving Powered-On Virtual Machines 228
Migrating with VMotion a Virtual Machine Manually 228
Creating a Scheduled Task to Migrate a Virtual Machine with VMotion 230

Creating New Virtual Machines 233
Changing the Default Virtual Machine Directory 235
Creating Typical Virtual Machines Using the New Virtual Machine Wizard 236
Creating Custom Virtual Machines Using the New Virtual Machine Wizard 243
Creating a New Virtual Disk on a GSX Server or VMware Server Host 248
Creating a New Virtual Disk on an ESX Server Host 250
Using an Existing Virtual Disk 252
Mapping a System LUN Disk on an ESX Server Host 253
Installing a Guest Operating System and VMware Tools 258
Installing a Guest Operating System in a Virtual Machine 258

Installing VMware Tools 260

Working with Templates 261
Understanding Templates 263
Template Restrictions 268
Preparing for Templates 269
Specifying an Upload Directory for Templates 269
Configuring ESX Server to Allow Concurrent Template Deploys 270
Configuring Datastores on GSX Server or VMware Server Hosts 271
Using a GSX Server or Workstation Virtual Machine as a Template 273
Using an ESX Server Golden Image as a Template 274
Using an Unmanaged Virtual Machine as a Template 274
Using a Managed Existing Host Virtual Machine as a Template 275
Creating Templates 276
Cloning a Template 283
Deleting a Template 285
Deleting a Template from VirtualCenter 285
Deleting a Template from Disk 285
Editing a Template 287
Reimporting a Template 289

Copying Virtual Machines 291
Cloning and Template Restrictions 293
Creating Virtual Machines from a Template 294
Manually Deploying Virtual Machine from a Template 296
Creating a Scheduled Task to Deploy a Template 302
Creating Virtual Machines by Cloning an Existing Virtual Machine 307
Manually Cloning a Virtual Machine 308
Creating a Scheduled Task to Clone a Virtual Machine 312

Customizing Guest Operating Systems 317
Preparing for Guest Customization 319
Installing the Microsoft Sysprep Tools 319
Installing the VMware Open Source Components 321
Beginning the Guest Customization Process 324
Entering the Guest Customization Wizard from the Template Deployment Process 324
Entering the Guest Customization Wizard from the Cloning Process 325

Customizing New Guest Operating Systems 327
Customizing a Windows Guest Operating System 327
Customizing a Linux Guest Operating System 338
Completing a Guest Operating System Customization 342
Completing Linux Guest Operating System Customization 342
Completing Windows Guest Operating System Customization 342

Editing an Existing Virtual Machine Configuration 345
Beginning to Edit the Virtual Machine Configuration 346
Changing the Hardware Configuration of a Virtual Machine 348
Changing the DVD/CD-ROM Drive Configuration 348
Changing the Floppy Drive Configuration 350
Changing the Generic SCSI Device Configuration 351
Changing the Virtual Disk Configuration 351
Changing the Memory Configuration 354
Changing the Virtual Ethernet Adapter (NIC) Configuration 355
Changing the Parallel Port Configuration 358
Changing the SCSI Controller Configuration 358
Changing the Serial Port Configuration 360
Changing the Virtual Processor (or CPU) Configuration 362
Changing the Audio Configuration 363
Changing the Mouse Configuration 365
Changing the USB Configuration 366
Adding Hardware to a Virtual Machine 367
Adding a DVD/CD-ROM Drive 368
Adding a Floppy Drive 371
Adding a Generic SCSI Device 371
Adding a Hard Disk 372
Adding an Ethernet Adapter (NIC) 374
Adding a Parallel Port 375
Adding a Serial Port 377
Adding a USB Controller 381
Adding a Virtual Sound Adapter 382
Changing Virtual Machine Options 383
Changing General Settings 383
Changing Power State Options 384
Changing Advanced Settings 385

Changing Virtual Machine Resource Settings 387
Scheduling a Resource Settings Change 388
Changing Processor (or CPU) Settings 389
Changing Memory Settings 390
Changing Disk Settings 392
Changing Network Settings 393

Working with Scheduled Tasks 395
Understanding Scheduled Tasks 396
Creating a Scheduled Task 397
Rescheduling a Task 403
Removing a Scheduled Task 404
Cancelling a Scheduled Task 405

Working with Alarms and Events 407
Events and Alarms Overview 408
Working with Events 409
Viewing All VirtualCenter Events 410
Viewing Selected VirtualCenter Events 410
Sorting and Filtering Event Messages 411
Exporting Events 412
Working with Alarms 414
Preparing for Email Message SMTP Alarm Notification 415
Preparing for SNMP Alarm Notification 416
Creating Alarms 420
Editing Alarms 425
Removing Alarms 426

Working with the VirtualCenter Data 429
VirtualCenter Data Overview 431
Viewing Scheduled Tasks 434
Viewing Templates 436
Viewing VirtualCenter Events 437
Viewing the VirtualCenter Inventory 439
Understanding the Inventory Panel 439
Understanding the Information Panel 439
Understanding the Summary Tabs 441
Viewing the Farm Summary Tab 441
Viewing the Host Summary Tab 443

Viewing the Virtual Machine Summary Tab 445
Viewing the Farms Tab 447
Viewing the Hosts Tab 448
Viewing the Virtual Machines Tab 449
Viewing the Tasks Tab 451
Viewing the Events Tab 452
Viewing the Alarms Tab 453
Viewing the Permissions Tab 454
Viewing the Console Tab 455
Viewing the Performance Tab 457
Viewing Summary Performance Charts 457
Viewing Individual Performance Charts 459
Working with Performance Chart Data 460
Displaying the Performance Panel Legend 460
Changing the Performance Panel Range 460
Customizing Performance Charts 460
Viewing Performance Panel Resource Charts 462
Configuring Performance Measurement Intervals 464
Configuring the Number of Threads for Collecting Performance Statistics 465
Configuring the Statistics Detail for Performance Data 466
Exporting Performance and Host Summary Data 467

Setting Access and Permissions 469
Understanding Users and Groups 470
Using the Hierarchy to Apply Access Rights 473
Planning Access Permission 478
Preparing GSX Server or VMware Server Windows Host Virtual Machines 478
Setting Parameters for Identifying Users and Groups 480
Assigning Access Permissions 482
Changing Access Permissions 485
Removing Access Permissions 487

Glossary 489

Index 497

CHAPTER 8

Interacting with Virtual Machines

This chapter describes virtual machine and virtual machine group tasks, including adding and removing a virtual machine to and from VirtualCenter, and powering on and off virtual machines. Refer to the appropriate chapter for information on deploying from a template; creating a clone from an existing virtual machine; and creating, deleting, migrating, customizing, and editing the configuration of a virtual machine.

This chapter contains the following sections:

- Adding and Removing Virtual Machines on page 200
- Changing Virtual Machine Power States on page 203
- Answering a Pending Question on page 209
- Working with Virtual Machine Groups on page 211

You need to use a Virtual Machine Administrator role assigned to the virtual machine to perform the activities described in this chapter.

Adding and Removing Virtual Machines

Add virtual machines to VirtualCenter through their managed hosts. Remove virtual machines from VirtualCenter control, and optionally from their managed host's disk.

The following sections discuss adding and removing virtual machine:

- Adding Existing Virtual Machines to VirtualCenter
- Removing Virtual Machines from VirtualCenter
- Returning a Virtual Machine to VirtualCenter
- Removing Virtual Machines from the Disk

Adding Existing Virtual Machines to VirtualCenter

When you add a managed host to VirtualCenter, VirtualCenter automatically discovers all the virtual machines on that managed host and adds them to the VirtualCenter inventory. If a managed host is disconnected, the already discovered virtual machines continue to be listed as part of VirtualCenter.

If a managed host is disconnected and reconnected, any changes to the virtual machines on that managed host are identified and VirtualCenter updates the list of virtual machines. For example, if `virtualmachine3` is removed and `virtualmachine4` is added, the new list of virtual machines shows `virtualmachine4` and shows `virtualmachine3` as orphaned.

Refer to Adding a Host to a Farm on page 177 for information on adding a managed host and its associated virtual machines.

Removing Virtual Machines from VirtualCenter

If a virtual machine is removed from VirtualCenter control, the link between the managed host and the virtual machine is severed. The managed host and VirtualCenter no longer recognize the virtual machine. However, the virtual machine remains on the datastore connected to the managed host.

To remove a virtual machine:

1. From the VirtualCenter client, display the inventory panel.

   Click the **Inventory button** in the navigation bar. Expand the inventory as needed, and click the appropriate virtual machine.

2. Make sure that the virtual machine is powered down.
3. Remove the virtual machine from VirtualCenter but not from the datastore.

Select the virtual machine in the inventory panel. From the main or right-click popup menu, select **Remove**.

4. Confirm that you want to remove the virtual machine from VirtualCenter. Click **OK**.



VirtualCenter removes references to the virtual machine and no longer tracks its condition.

Note: The **Remove** option removes the virtual machine only from VirtualCenter. It does not remove the virtual machine from its datastore. Refer to Removing Virtual Machines from the Disk on page 201 for information about the **Remove From Disk** option.

Returning a Virtual Machine to VirtualCenter

If you have removed a virtual machine from a VirtualCenter server but did not remove it from the managed host's datastore, and you wish to return it to VirtualCenter, refer to your managed host virtualization platform documentation and follow the procedures for adding an existing virtual machine to an ESX Server, GSX Server, or VMware Server.

Removing Virtual Machines from the Disk

Through VirtualCenter, remove individual virtual machines from the datastore.

To remove a virtual machine from VirtualCenter and the datastore:

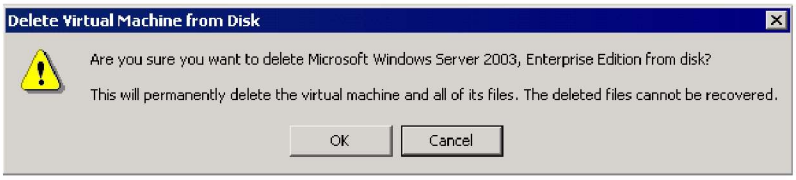
1. From the VirtualCenter client, display the inventory panel.

   Click the **Inventory button** in the navigation bar. Expand the inventory as needed, and click the appropriate virtual machine.

2. Ensure that the virtual machine is powered down.
3. Select **Remove From Disk** from the virtual machine main or right-click popup menu.

   Note: This removes all the files for the selected virtual machine, including the configuration file and the virtual disk files.

4. Confirm removing the virtual machine from VirtualCenter and the datastore. Click **OK**.



VirtualCenter removes the virtual machine from its datastore entirely.

Changing Virtual Machine Power States

There are several options for a virtual machine power state. Each virtual machine power state change has a different effect on the guest operating system in the virtual machine.

There are also several access points for making changes to these power states. Manually select a power state change by selecting the virtual machine then the power option from either the main menu or the right-click popup menu. Alternatively, you can schedule a power state change through the **Tasks** option in the navigation bar.

The power state topics are covered in the following sections:

- Understanding Virtual Machine Power States
- Understanding Transitional Power States
- Understanding How a Virtual Machine on a GSX Server or VMware Server Windows Host Is Powered On
- Manually Powering a Virtual Machine On and Off
- Scheduling a Power State Change for a Virtual Machine

Understanding Virtual Machine Power States

The basic power state options include:

- **Power on** – Powers up the virtual machine and boots the guest operating system if the guest operating system is installed.
- **Power off** – Powers down the virtual machine. The virtual machine does not attempt to shut down the guest operating system gracefully.
- **Suspend** – Pauses the virtual machine activity. All transactions are frozen until you issue a resume command.
- **Resume** – Allows virtual machine activity to continue, and releases the Suspended state.
- **Reset** – Shuts down the guest operating system and restarts it.

The following power options perform extra functions in addition to the basic virtual machine power operations. These operations require that VMware Tools is installed in the virtual machine.

- **Shut down guest** – Shuts down the guest operating system. If the guest operating system automatically powers off after shutting down, then the virtual machine also powers off.
- **Suspend after running script** – Executes a VMware Tools script, then suspends the virtual machine. Refer to VMware Tools for information on setting up scripts.
- **Resume and run script** – Resumes the virtual machine, and executes a VMware Tools script. Refer to VMware Tools for information on setting up scripts.
- **Power on and run script** – Starts the virtual machine and executes a VMware Tools script. Refer to VMware Tools for information on setting up scripts.
- **Restart guest** – Shuts down and restarts the guest operating system without powering off the virtual machine.

Toolbar power buttons perform as follows:

- **Power off** – Powers off the virtual machine when VMware Tools is not installed or unavailable, or shuts down the guest operating system when VMware Tools is installed and available. A power off operation displays a confirmation dialog box indicating that the guest operating system may not shut down properly.
- **Suspend** – Suspends the virtual machine without running a script when VMware Tools is not installed, or runs a scripts then suspends the virtual machine when VMware Tools is installed and available.
- **Power on** – Powers on a virtual machine when a virtual machine is stopped, or resumes the virtual machine and runs a script when it is suspended and VMware Tools is installed and available. Resumes the virtual machine and does not run a script when VMware Tools is not installed or unavailable.
- **Reset** – Resets the virtual machine when VMware Tools is not installed, and restarts the guest operating system when VMware Tools is installed and available. A reset operation displays a confirmation dialog box indicating that the guest operating system is not shut down properly.

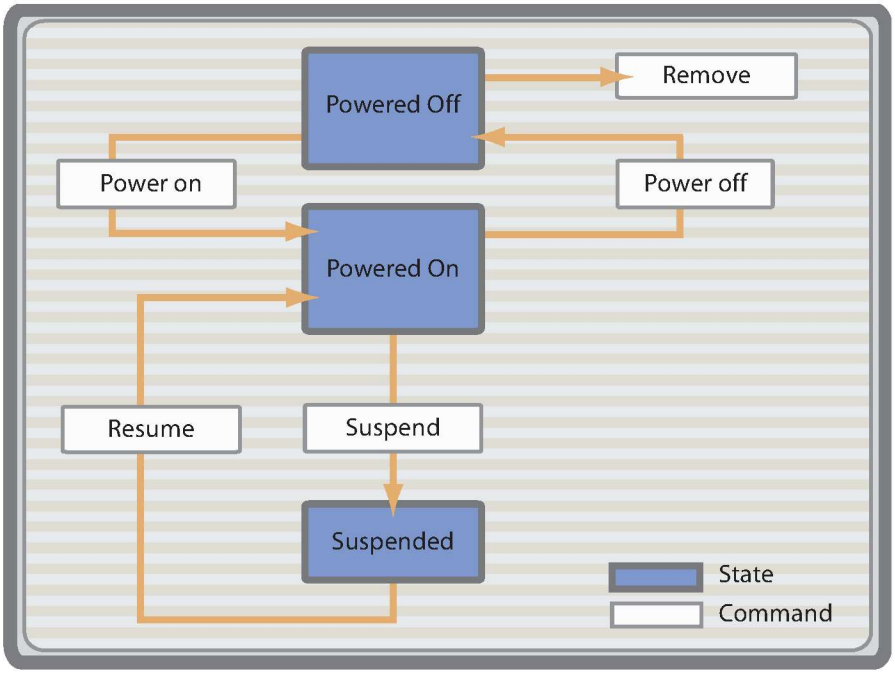
Note: The specific form of the power state action can be modified to include guest operating system shut downs or not, and to include running scripts or not. Refer to Changing Power State Options on page 384 for additional information.

Understanding Transitional Power States

Actions taken upon a virtual machine require that the virtual machine be in specific power states. Whenever a power operation is performed on a virtual machine, the

virtual machine power state changes and all other commands are locked out until the first command is completed.

The figure below illustrates states, transitions, and state changing commands for virtual machines.



Virtual Machine Power State Changes

Understanding How a Virtual Machine on a GSX Server or VMware Server Windows Host Is Powered On

Virtual machines on a GSX Server or VMware Server Windows host are powered on and run as specific user accounts.

For more information, see Preparing GSX Server or VMware Server Windows Host Virtual Machines on page 478.

Manually Powering a Virtual Machine On and Off

Prior to performing any power state changing activity on a virtual machine, you must have added the virtual machine to your VirtualCenter environment. Refer to Adding and Removing Virtual Machines on page 200.

To manually change the power state of a virtual machine:

1. From the VirtualCenter client, display the inventory panel.

   Click the **Inventory button** in the navigation bar. Expand the inventory as needed, and click the appropriate virtual machine.

2. Choose the **power** option.

   Through either the main or right-click popup menu, display the available options. Or select the power options from the toolbar. If an option is not currently available, it is grey and unselectable.

   The following options include the basic virtual machine power operations:

   - Power on
   - Power off
   - Suspend
   - Resume
   - Reset

   Two options affect the guest operating system only:

   - Shut down guest
   - Restart guest

   Note: The specific form of the power state action can be modified to include guest operating system shutdowns or not, and to include running scripts or not. Refer to Changing Power State Options on page 384 for additional information.

   After the power option is selected, VirtualCenter displays messages in the Summary tab indicating the transition modes.

Scheduling a Power State Change for a Virtual Machine

To make a scheduled task to change the power state of a virtual machine:

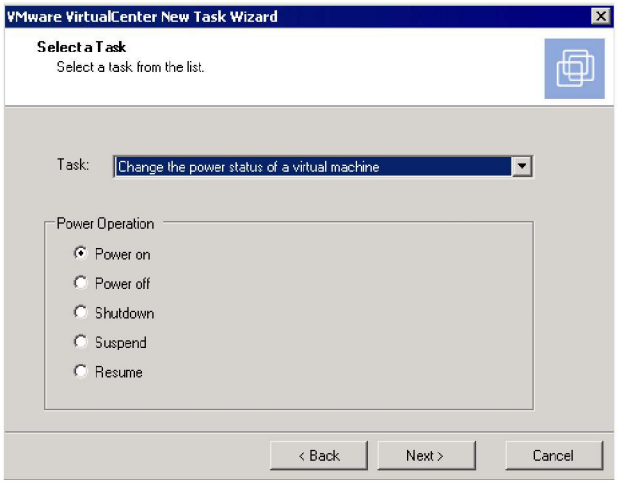
1. Display the Tasks panel.

   Click the **Tasks** option in the navigation bar. The list of scheduled tasks appears.

2. Start the New Task Wizard. Click **New** in the toolbar.
3. Confirm continuing with the New Task Wizard. Click **Next**.
4. Select the task to create.

   Select **Change the power status of a virtual machine** from the list. Click **Next**.

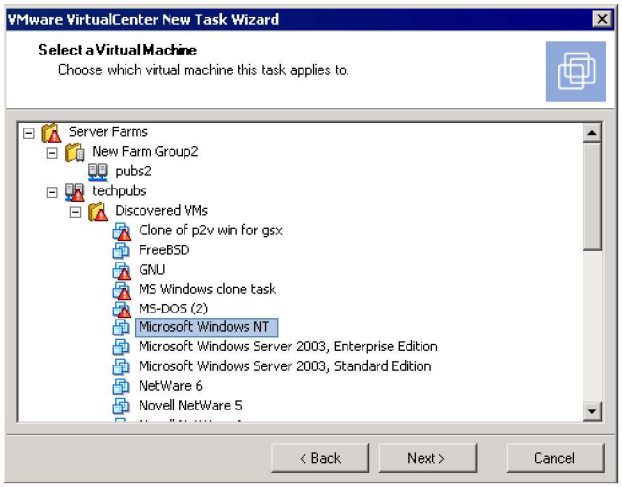
5. Select the power state to which to change the virtual machine.



Select the appropriate power operation. Click **Next**.

Note: The specific form of the power state action can be modified to include guest operating system shutdowns or not, and to include running scripts or not. Refer to Changing Power State Options on page 384 for additional information.

6. Select the virtual machine whose power state changes.



Select the virtual machine, then click **Next**.

7. Specify the timing of the task. Click **Next**.

   To see the calendar, click Later, then click the drop-down arrow to select a date from the displayed calendar. A red circle indicates today's date and a dark circle indicates the scheduled date. Refer to Creating a Scheduled Task on page 397 for additional information.

8. Confirm creating the task.

   Optionally, specify an email address for notification when the task is performed. Click **Finish**.

   VirtualCenter adds the new task to the scheduled task list and completes it at the designated time. When it is time to perform the task, VirtualCenter first verifies that the user who created the task still has permission to complete the task. If the permission levels are not acceptable, a message is generated and the task is not performed.

Answering a Pending Question

When VirtualCenter is performing a task that requires input from you, the Inventory Summary tab for the selected virtual machine displays **Question Pending** as the status.

To answer a pending question for a virtual machine:

1. From the VirtualCenter client, display the inventory panel.

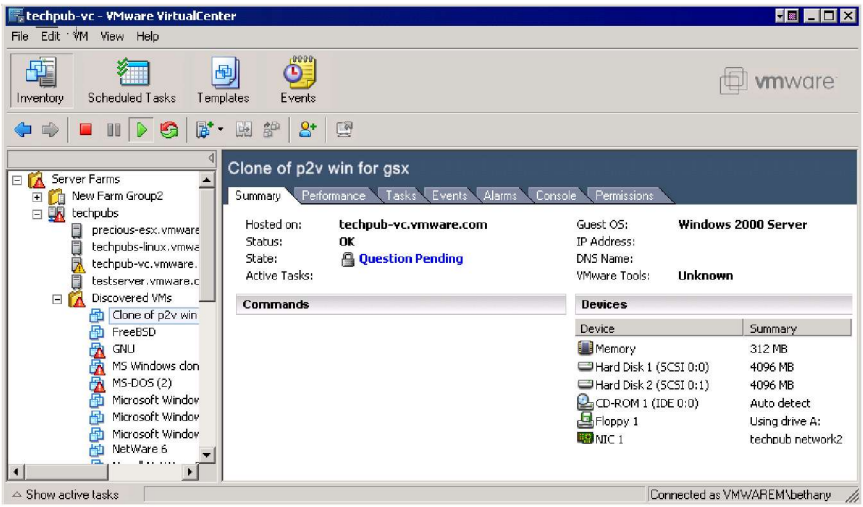
   Click the **Inventory button** in the navigation bar. Expand the inventory as needed.

2. Identify a question pending.

   Check the virtual machine in the inventory panel. If the virtual machine is flashing a question mark over its icon symbol, proceed.

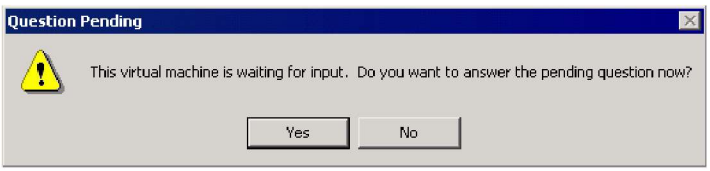
3. Select the virtual machine **Summary** tab.

   The **State**: status displays a **Question pending link**.

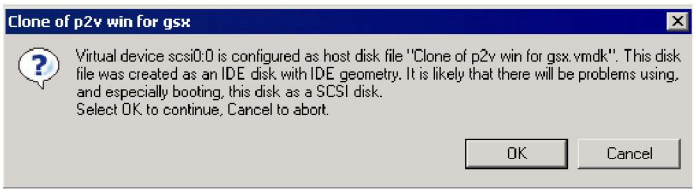


4. Open the **Answer Question** dialog. Confirm the prompt.

   Click the **Question Pending** link. Or alternatively, with the virtual machine highlighted, choose **VM** > **Answer Question**.



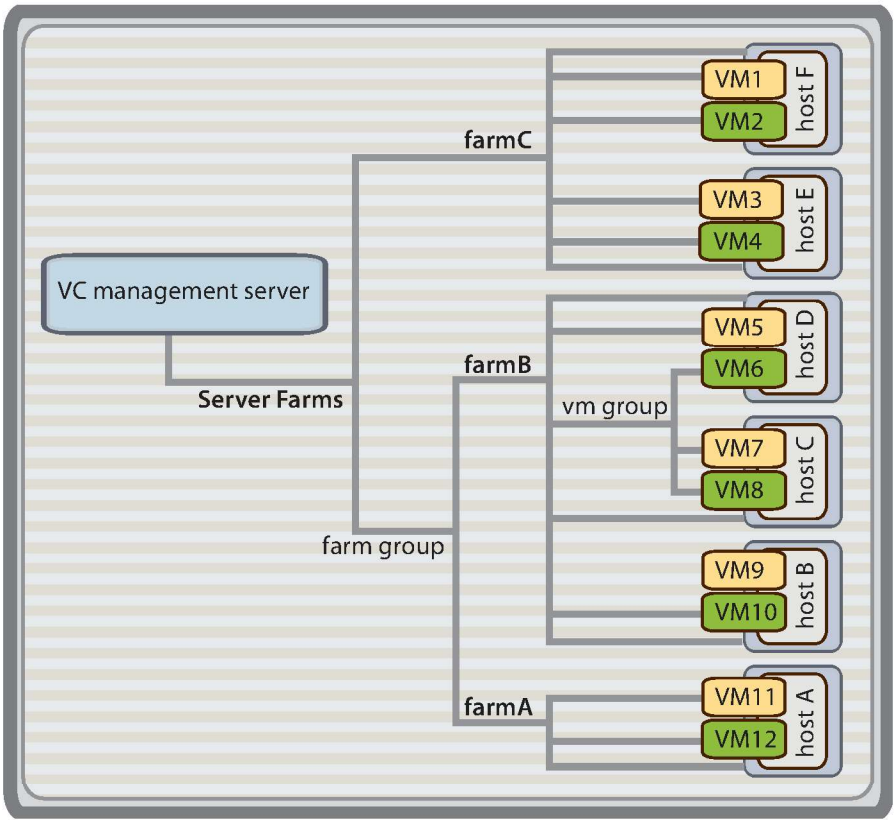
5. Answer the question dialog that appears. For example:



Working with Virtual Machine Groups

Virtual machine groups are organizational structures. They can be added only to the virtual machine's farm. Hierarchically, virtual machine groups contain virtual machines or additional virtual machine groups.

The figure below illustrates the VirtualCenter organizational components. Refer to Abbreviations on page 16 for a description of abbreviations.



Hierarchical Virtual Machine Groups

The virtual machine group topics are covered in the following sections:

- Adding a Virtual Machine Group
- Adding Virtual Machines to a Virtual Machine Group
- Moving Virtual Machines from a Virtual Machine Group
- Removing a Virtual Machine Group

Adding a Virtual Machine Group

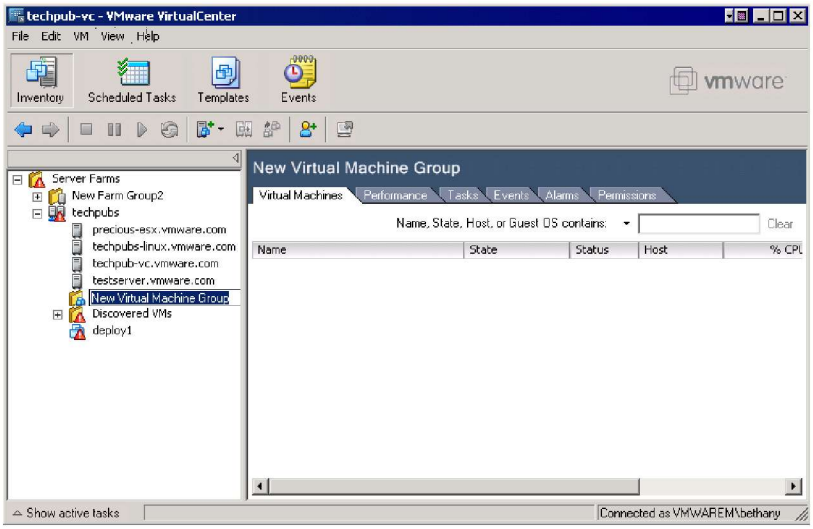
To add a virtual machine group:

1. From the VirtualCenter client, display the inventory panel.

   Click the **Inventory button** in the navigation bar. Select the appropriate farm.

2. Add a new virtual machine group.

   With the farm highlighted, from the main or right-click popup menu, select **New VM Group**. VirtualCenter adds a new group to the inventory panel.



Adding Virtual Machines to a Virtual Machine Group

When you create a virtual machine group, it is empty. Drag and drop the virtual machines as needed to the new virtual machine group.

To add virtual machines to the virtual machine group:

1. From the VirtualCenter client, display the inventory panel.

   Click the **Inventory button** in the navigation bar.

2. If needed, add the virtual machine group to the farm that contains the virtual machines you wish to group.

3. Move the virtual machine to the virtual machine group.

   Select the appropriate virtual machine and drag it to the virtual machine group.

Moving Virtual Machines from a Virtual Machine Group

Moving a virtual machine from a virtual machine group moves it from the organizational structure of the virtual machine group but does not remove it from the managed host, the farm, or VirtualCenter.

To move a virtual machine from the virtual machine group:

1. From the VirtualCenter client, display the inventory panel.

   Click the **Inventory button** in the navigation bar.

2. Move the virtual machines.

   Select the appropriate virtual machines and drag them out to the farm or another virtual machine group.

   Moving virtual machines between virtual machine groups on the same farm does not move them between managed hosts.

Removing a Virtual Machine Group

Removing a virtual machine group removes all its hierarchical contents from the VirtualCenter environment. These contents includes any virtual machines contained within the group. This process removes control of the virtual machines from VirtualCenter and the managed host.

To remove a virtual machine group:

1. From the VirtualCenter client, display the inventory panel.

   Click the **Inventory button** in the navigation bar.

2. Power down all virtual machines in the virtual machine group to be removed.

3. If needed, remove any virtual machines from the virtual machine group.

   Select the virtual machine and drag it to the farm icon or another group.

   Note: Removing a virtual machine group removes the virtual machines contained within the virtual machine group from VirtualCenter.

4. Remove the virtual machine group.

   Select the appropriate virtual machine group, and from either the main or right-click popup menu, select **Remove**.

5. Select whether or not to remove the virtual machines in the virtual machine group.

If there are no virtual machines in the virtual machine group, VirtualCenter removes the virtual machine group without a confirmation message.



a. Select the **Remove VM Files** check box.

   If this box is selected the virtual machines are removed from the datastore.

   If this box is not selected the virtual machines remain on the datastore.

b. Confirm that you want to remove the virtual machine group. Click **Yes**.

VirtualCenter removes the selected virtual machine group and all items contained within it from the hierarchy and the VirtualCenter environment. Any assigned processor and migration licenses return to available status.

CHAPTER 17

Working with the VirtualCenter Data

This chapter describes the scope of the VirtualCenter data presented in the VirtualCenter client. This chapter describes the display of current data. This chapter contains the following topics:

- VirtualCenter Data Overview on page 431
- Viewing Scheduled Tasks on page 434
- Viewing Templates on page 436
- Viewing VirtualCenter Events on page 437
- Viewing the VirtualCenter Inventory on page 439
- Understanding the Summary Tabs on page 441
- Viewing the Farms Tab on page 447
- Viewing the Hosts Tab on page 448
- Viewing the Virtual Machines Tab on page 449
- Viewing the Tasks Tab on page 451
- Viewing the Events Tab on page 452

- Viewing the Alarms Tab on page 453
- Viewing the Permissions Tab on page 454
- Viewing the Console Tab on page 455
- Viewing the Performance Tab on page 457
- Working with Performance Chart Data on page 460

VirtualCenter Data Overview

You can access the general display of data and activity through the information panel of the VirtualCenter client window. The information panel is the visual center of your VirtualCenter monitoring activities. Through the information panel, view status, resource usage, and performance information about your hosts, virtual machines, and farms. View scheduled tasks, available templates, and a list of events.

When an object is removed from the VirtualCenter inventory, its log and event history remains until purged through the normal processes.

This information is in one of the following two sets of panels:

- **Navigation bar** – Provides shortcuts to generalized areas of related activities. The options are: **Inventory**, **Scheduled Tasks**, **Templates**, and **Events**.

  The Scheduled Tasks, Templates, and Events options display a single information panel. The Inventory button displays an inventory panel or an information panel. The Inventory information panel displays a set of tabs. The displayed tabs depend upon the object you select in the inventory panel.

  When you select any other navigation bar, the information panel appears.

- **Inventory tabs** – A subset of the Inventory button. The Inventory tabs are a set of panels that display task oriented information pertaining to the selected VirtualCenter object. Each VirtualCenter object has its own set of tabs. The tab options are: Summary, Farms, Hosts, Virtual Machines, Performance, Tasks, Events, Alarms, Console, and Permissions.

  When you select the Inventory button in the navigation bar, an information panel appears on the right side of the screen. When you select an object (host, virtual machine, group, or farm) from the inventory panel, the information panel displays tabs corresponding to the selected object. This data appears until you select another Inventory button.

The following table shows the available panels and their source mapping.

Note: You can use either the navigation bar or the information panel tabs to view events information.

Panel	Source	Description
Alarms	inventory panel	Lists the configured alarms for the selected object.

Panel	Source	Description
Console	inventory panel	Displays a remote console to interact directly with the virtual machine. Through the remote console you can take selected actions upon the virtual machine.
Events	navigation bar	Lists the recent event messages for all objects managed by VirtualCenter. Keeps all event messages.
Events	inventory panel	Lists the recent event messages that report on the status of the selected object.
Farms	inventory panel	Lists the farms assigned to the selected farm group.
Hosts	inventory panel	Lists the hosts assigned to the selected farm.
Inventory	navigation bar	Provides access for managing all the Server Farms entities.
Performance	inventory panel	Displays the performance charts for the selected host or virtual machine resources. The charts for farms and hosts display combined charts that show the usage of each resource.
Permissions	inventory panel	Lists the users and groups that have permissions on the selected object and at what level the permission was assigned.
Summary	inventory panel	Displays a collection of data for the selected object.
Scheduled Tasks	navigation bar	Provides access for creating and managing scheduled tasks.
Tasks	inventory panel	Lists the all tasks for the selected object.
Templates	navigation bar	Provides access for managing templates.
Virtual Machines	inventory panel	Lists the virtual machines assigned to the selected farm or host and group. To access, select Virtual Machines and the virtual machines in the group are displayed.

Each navigation bar has a primary information panel and associated tab. The Inventory button has an inventory panel from which you can select objects. Each

selected object has its own set of associated information panel tabs. The following table lists the possible tab views for each VirtualCenter object.

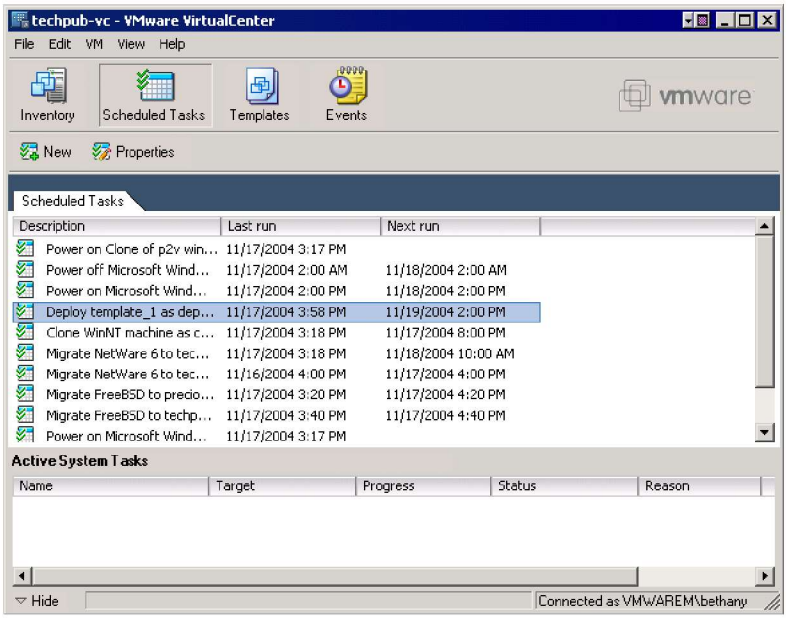
Inventory Object	Summary	Farms	Virtual Machines	Hosts	Performance	Tasks	Events	Alarms	Console	Permissions
Server Farms		Farms	Virtual Machines	Hosts		Tasks	Events	Alarms		Permissions
Farm Group		Farms	Virtual Machines	Hosts		Tasks	Events	Alarms		Permissions
Farm	Summary		Virtual Machines	Hosts	Performance	Tasks	Events	Alarms		Permissions
Host	Summary		Virtual Machines		Performance	Tasks	Events	Alarms		
Virtual Machine Group			Virtual Machines		Performance	Tasks	Events	Alarms		Permissions
Virtual Machine	Summary				Performance	Tasks	Events	Alarms	Console	Permissions

Viewing Scheduled Tasks

You can view a list of VirtualCenter tasks that are scheduled to be performed, and you can create and edit scheduled tasks.

To view scheduled tasks:

Click **Scheduled Tasks** in the VirtualCenter client navigation bar.



Navigation Bar > Scheduled Tasks Button

The scheduled task activities include:

- Create a new task
- Edit the task properties

The type of scheduled tasks that can be created through the New Task Wizard include:

- Deploying a virtual machine from a template
- Cloning an existing virtual machine
- Changing the power status of a virtual machine
- Migrating a virtual machine
- Migrating a virtual machine with VMotion
- Changing resource settings of a virtual machine

For more information on scheduled tasks, refer to Working with Scheduled Tasks on page 395. The table below lists the possible attributes that appear in a Scheduled Tasks panel list.

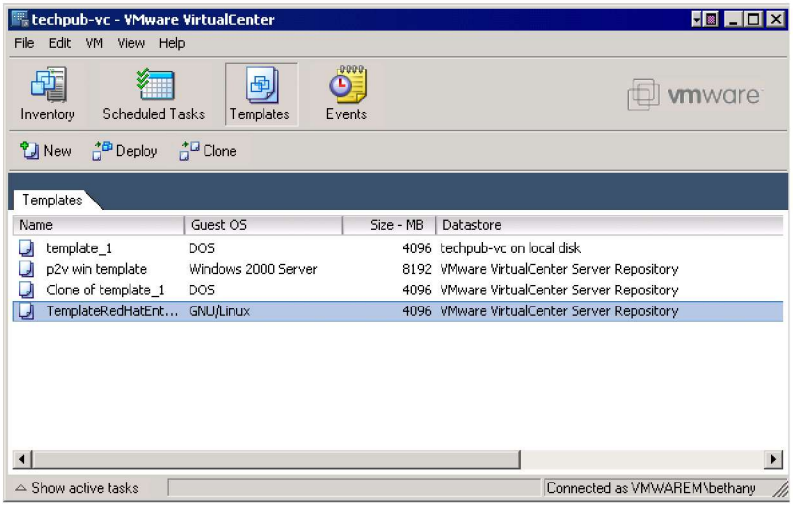
List Attribute	Description
Description	Details of the task, such as the task, the name of the VirtualCenter object where the setting was made, the expected name of the object, and the location
Last Run	Date and time the task was last performed
Next Run	Date and time the task is to be performed next

Viewing Templates

The Templates option in the navigation bar displays the list of available templates and provides the means to create, deploy, and clone templates.

To view the templates:

Click **Templates** in the VirtualCenter client's navigation bar.



Navigation Bar > Templates Button

The template activities include:

- Create a new template
- Deploy a template (create new virtual machine)
- Clone a template

For more information on template, refer to Working with Templates on page 261. The table below lists the possible attributes that appear in the Template panel list.

List Attribute	Description
Name	Name of template
Guest OS	Guest operating system in the virtual machine
Size	Size of the template, in MB
Datastore	Indicates if the template is on a shared datastore
Description	Text entered for reference

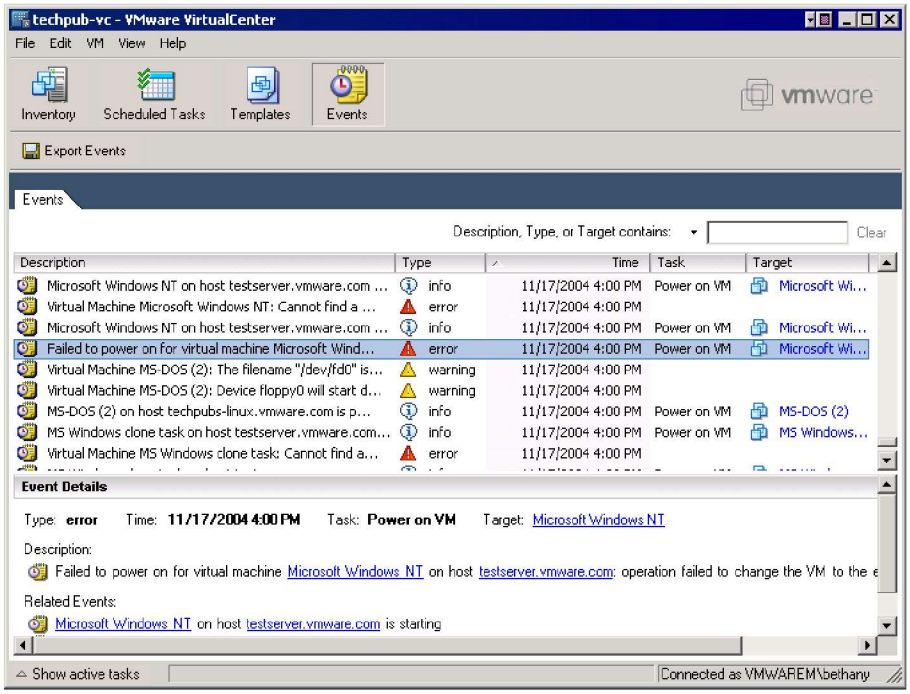
Viewing VirtualCenter Events

An event is any action that is of interest to VirtualCenter. Each event triggers an event message. All event messages are archived in the VirtualCenter database. Event messages appear in two locations:

- **Events option in the navigation bar** – Displays all events that have occurred on the VirtualCenter server.
- **Events tab for an object under the Inventory button** – List the events that occurred on or to the selected object.

To view VirtualCenter events:

Click **Events** in the VirtualCenter client's navigation bar.



Navigation Bar > Events Button

Events activities include:

- Sorting the list of event messages.
- Viewing the event details for a selected message.
- Following the links in an Event Detail message.
- Exporting events to a text file. The exported data can be a set of messages selected by time, date, and type.

For more information on events, refer to the chapter, Working with Alarms and Events on page 407. The table below lists the possible attributes that can be displayed in an Events panel list.

List Attribute	Description
Description	Text explanation of action
Type	Type of event that occurred
Time	Date and time event occurred
Task	Task that triggered the event, if there is one
Target	Object the event occurred on

Viewing the VirtualCenter Inventory

The Inventory button in the navigation bar displays an inventory panel and an information panel. Each object in the inventory panel displays a particular set of tabs in the information panel. The remainder of this chapter describes each of the Inventory tab panels.

To view the inventory, click **Inventory** in the VirtualCenter client's navigation bar.

The navigation bar topics are covered in the following sections:

- Understanding the Inventory Panel
- Understanding the Information Panel

Understanding the Inventory Panel

The inventory panel is located on the left side of the screen when you select the Inventory button in the navigation bar. The inventory panel elements include:

- Hierarchical listing of VirtualCenter server objects.
- Status icons associated with each object.
- Toggle to close or open the inventory panel.
- Popup menu bar for close, dock, and float options.

The root of the inventory panel is a top-level group labeled Server Farms. All farms, groups, hosts, and virtual machines fall within the Server Farms group. All of these items are added to the VirtualCenter server through the VirtualCenter client.

Depending upon your user permissions, you may be able to see but not expand a farm or group. You must be assigned the appropriate permissions levels before you can view and take action upon objects managed by VirtualCenter.

Understanding the Information Panel

The information panel is the visual center of your VirtualCenter monitoring activities. Through the information panel you:

- View status, resource usage, and performance information about your hosts, virtual machines, and farms.
- View scheduled tasks, available templates, and a list of events for the object selected.

Select any button in the navigation bar or any object in the inventory panel and the corresponding information panel appears. Select the Inventory button in the navigation bar and the information panel appears to the right side of the inventory panel. Use the docking option in the inventory panel menu, to place the information panel on the left side of the screen.

The information panel elements are:

- Toolbar – specific to each navigation button
- Tabbed panel – for all but the Inventory button, lists in column form, all the objects that apply to the navigation button. For the Inventory button, there are multiple tabbed panels that vary depending upon the object selected in the inventory panel.
- Identification line – displayed with the Inventory button only, it lists the name and, if relevant, the version level of the object selected in the inventory panel.

Understanding the Summary Tabs

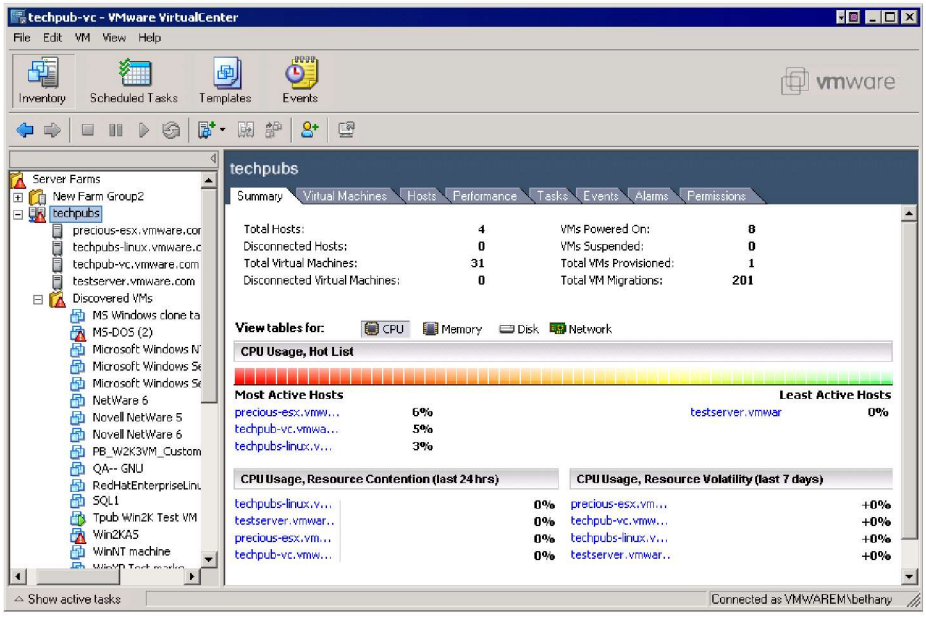
The **Summary** tab is available when you select a farm, host, or virtual machine object from the inventory panel. The Summary tab information panel is grouped into sections, depending upon the object type selected.

The Summary tab topics are covered in the following sections:

- Viewing the Farm Summary Tab
- Viewing the Host Summary Tab
- Viewing the Virtual Machine Summary Tab

Viewing the Farm Summary Tab

The farm **Summary** tab displays information that applies to the hosts and virtual machines within the farm.



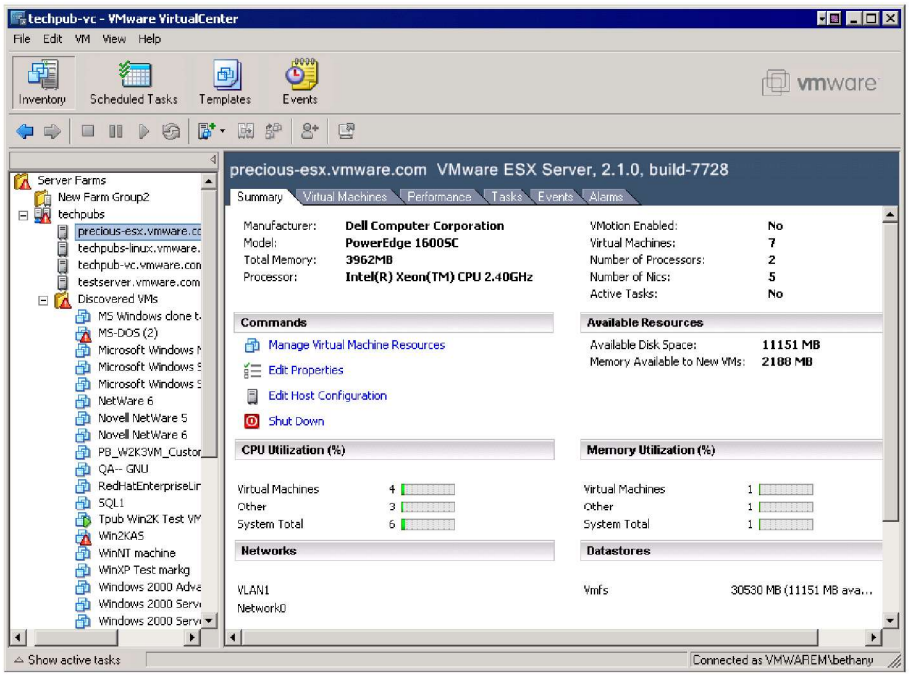
Inventory > Farm > Summary Tab

The farm **Summary** tab content is described in the following table.

Section	Field	Description
Identification	Total Hosts	Number of hosts on the farm.
	Disconnected Hosts	Number of disconnected hosts on the farm.
	Total Virtual Machines	Number of virtual machines on the farm.
	Disconnected Virtual Machines	Number of disconnected virtual machines on the farm.
	VMs Powered On	Number of virtual machines in a powered on state.
	VMs Suspended	Number of virtual machine in a suspended state.
	Total VMs Provisioned	Number of virtual machines that have been created by either cloning or deploying a template.
	Total VM Migrations	Number of times virtual machines have been migrated between host machines.
View tables for	Processor (or CPU), Memory, Disk, Network	The resource whose data you wish to see.
Processor (or CPU) Usage, Hot List	Most active hosts — Least active hosts	Where the hosts fit, relative to the critical ends of the range.
Processor (or CPU) Usage, Resource Contention (last 24 hrs)	All hosts	Percentage of time any host was in contention for the past 24 hours.
Processor (or CPU) Usage, Resource Volatility (last 7 days)	All hosts	Percentage change in host utilization in the past seven days.

Viewing the Host Summary Tab

The host **Summary** tab displays information that applies to the host machine and its resources.



Inventory > Host > Summary Tab

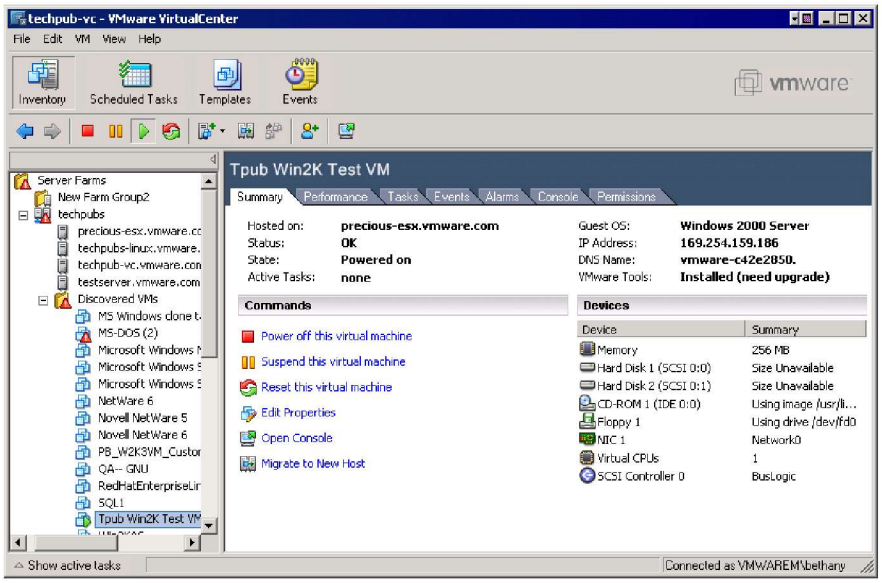
The host **Summary** tab content is described in the following table.

Section	Field	Description
Identification	Manufacturer	Manufacturer of the host machine.
	Model	Model type of the host machine.
	Total Memory	Memory installed in the host machine.
	Processor (or CPU)	Manufacturer, type, and speed of processor.
	VMotion Enabled	Whether or not the host machine is licensed for VMotion.
	Virtual Machines	Number of virtual machines currently located on the host machine.
	Number of Processors	Number of processors installed in the host machine.
	Number of NICs	Number of NICs installed in the host machine.

Section	Field	Description
	Active Tasks	Indicates if at least one task is occurring on object currently.
Commands	Manage Virtual Machine Resources	The Virtual Machine Resources panel for adjusting the resource allocation for virtual machines on the host. Available for ESX Server hosts only.
	Edit Properties	The virtual machine Properties panel.
	Edit Host Configuration	Opens a Web browser to connect to the VMware Management Interface. Requires that you log on.
	Shut Down	Displays a menu to shut down or restart the host. Starting the host is not available.
Available Resources	Available Disk Space	Free disk space on all datastores available to the host machine.
	Memory Available to New VMs	Unreserved memory on the host machine.
Processor (or CPU) Utilization	Virtual Machines	Percentage of processor used by running virtual machines.
	Other	Percentage of processor used for other purposes.
	System Total	Total percentage of processor used on the host machine.
Memory Utilization	Virtual Machines	Percentage of memory used by running virtual machines.
	Other	Percentage of memory used for other purposes.
	System Total	Total percentage of memory used on the host machine.
Networks		List of networks accessible by the host machine.
Datastores		List of datastores accessible by the host machine.

Viewing the Virtual Machine Summary Tab

The virtual machine **Summary** tab displays information that applies to a virtual machine and its resources.



Inventory > Virtual Machine > Summary Tab

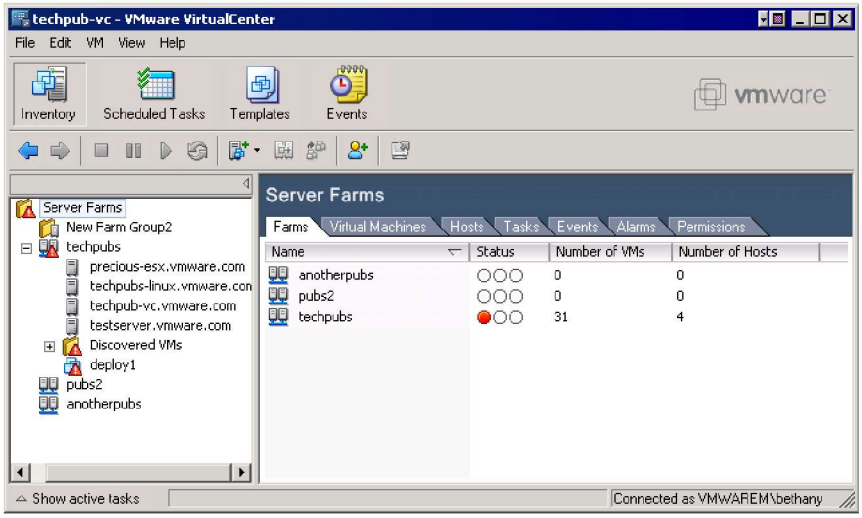
The virtual machine **Summary** tab content is described in the following table.

Section	Field	Description
Identification	Hosted on	Host where virtual machine is currently located.
	Status	Condition status of the virtual machine. options: Alert, Warning, or OK.
	State	Power state of the virtual machine. Options: Powered on, Powered Off, or Suspended.
	Active Tasks	Transition status of any running task.
	Guest OS	Operating system installed in the virtual machine.
	IP Address	Primary IP address assigned to this virtual machine displayed in powered-on state.
	DNS Name	DNS name assigned to this virtual machine, if any.
	VMware Tools	Indicates if VMware Tools is installed and/or current. Unknown indicates that the virtual machine is in a suspended state.

Section	Field	Description
Commands	Power Off/Suspend/Resume/ Reset/Power On this virtual machine	Powers Off/On, Resets, or Suspends/Resumes the virtual machine now.
	Edit Properties	Opens the Virtual Machine Properties dialog box for editing the configuration.
	Open Console	Opens the virtual machine console. Screen is black if the virtual machine is not powered on.
	Migrate to New Host	Opens the Migration Wizard.
	Create Template	Opens the New Template Wizard. Available when virtual machine is powered off.
	Clone this Virtual Machine	Opens the Clone Virtual Machine Wizard. Available when virtual machine is powered off.
Devices		Installed or configured devices. For example: Memory, Hard Disk, Processor, or NIC.

Viewing the Farms Tab

The **Farms** tab is available when you select a server farm or farm group object from the inventory panel of the navigation bar. The **Farms** tab displays information about the farms in the group.



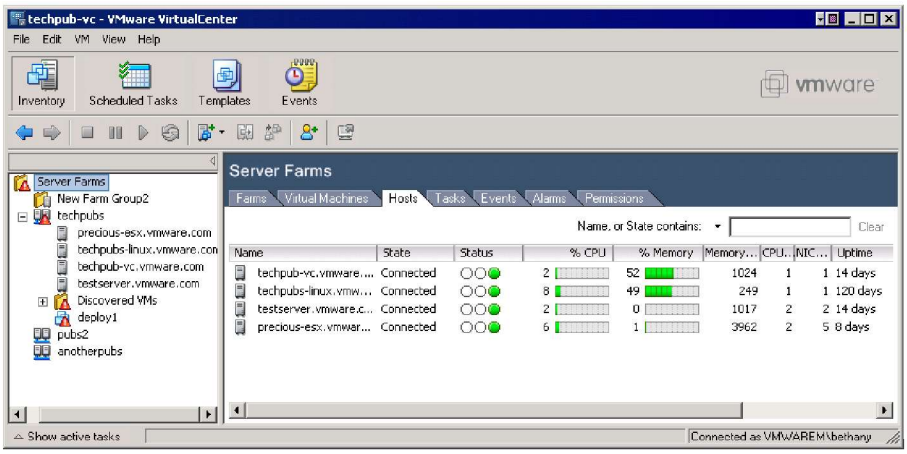
Inventory > Server Farms > Farms Tab

The **Farms** tab content is described in the following table.

List Attribute	Description
Name	Name of farm in the farm group or Server Farms.
Status	Condition of the farm.
Number of VMs	Number of virtual machines in the farm group or Server Farms.
Number of Hosts	Number of hosts in the farm group.

Viewing the Hosts Tab

The **Hosts** tab is available when you select a server farm, farm group, or farm object from the inventory panel of the navigation bar. The **Hosts** tab displays information about the hosts in the farm.



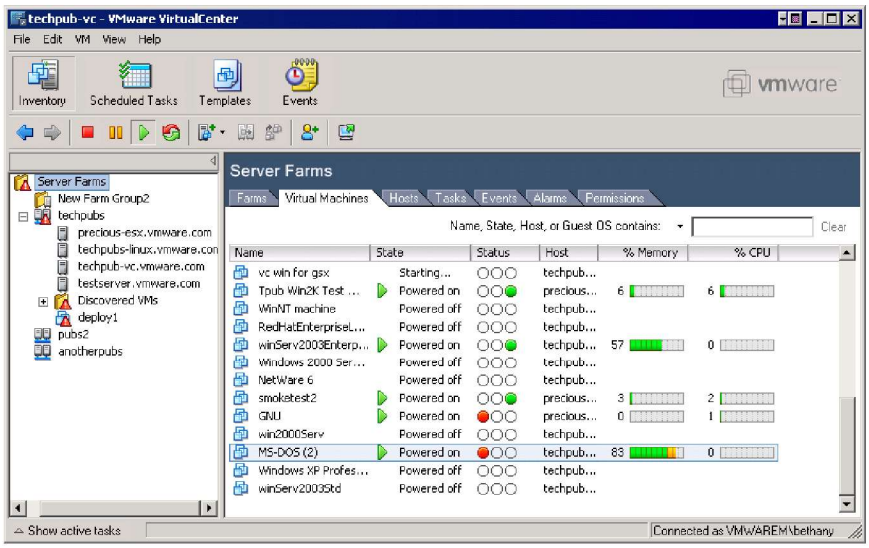
Inventory > Farm > Hosts Tab

The **Hosts** tab content is described in the following table.

List Attribute	Description
Name	Name of host.
State	State of host, for example, powered on or connected. **Note:** Different options are displayed depending upon whether the virtual machine is connected or disconnected and powered on or off.
Status	Condition of the host.
% Processor (or CPU)	Percentage of the processor being used.
% Memory	Percentage of the memory being used.
Memory Size - MB	System memory.
Processor (or CPU) Count	System processor Count.
NIC Count	Number of NICs.
Uptime	Uptime of system.

Viewing the Virtual Machines Tab

The **Virtual Machines** tab is available when you select a server farm, farm, farm group, host, or virtual machine group object from the inventory panel of the navigation bar. The **Virtual Machines** tab displays information about the status of virtual machines within the farm, host, or virtual machine group selected. The **Virtual Machines** tab's panel provides filtering capabilities to view only selected virtual machines.



Inventory > Farm > Virtual Machines Tab

The **Virtual Machines** tab content is described in the following table.

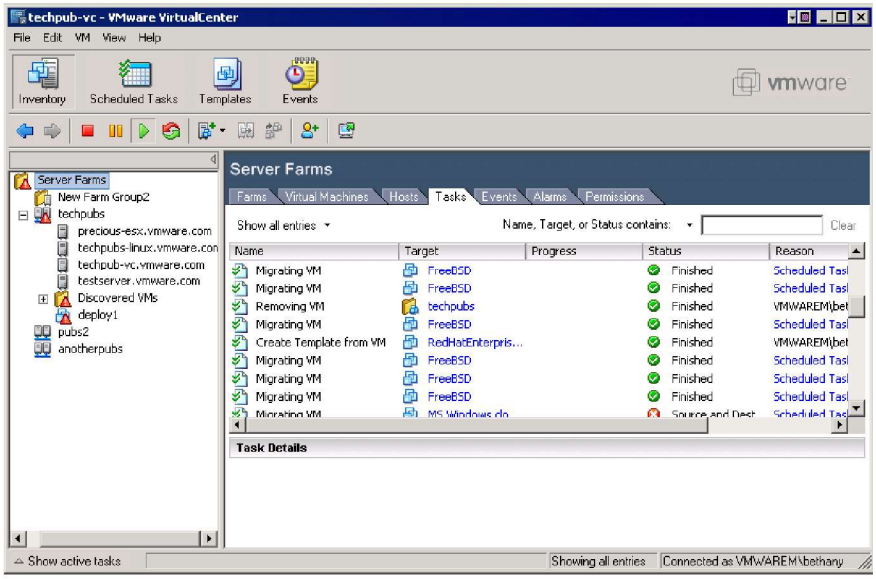
List Attribute	Description
Name	Name of virtual machine.
State	State of virtual machine, such as, powered on or connected.
Status	Condition of the virtual machine.
Host	Host where virtual machine is currently resident.
% Processor (or CPU)	Percentage of the processor being used.
% Memory	Percentage of the memory being used.
Guest OS	Guest operating system in the virtual machine.
Memory Size - MB	System memory.
Processor (or CPU) Count	System processor Count.
NIC Count	Number of NICs.

List Attribute	Description
Uptime	Uptime of system.
IP Address	IP address of the virtual machine.
Tools Status	whether or not VMware Tools is available. **Note:** The status is unknown if the virtual machine is powered off.
Path	Location of the virtual machine in the inventory.
DNS Name	DNS name used on the network.
UUID	UUID used on the network to uniquely identify this virtual machine.

Viewing the Tasks Tab

The **Tasks** tab is available when you select any object from the inventory panel. Selecting a task displays to its details in the **Task Details** field. Click the link in the **Task Details** field to shift the display to the linked object.

The Tasks tab displays a filtered view of the **Tasks**. It displays either all tasks in the VirtualCenter server or only those tasks that occurred on the selected object through a toggle. The toggle option state, Show all entries or Show <object> entries, displays in the bottom right status bar of the VirtualCenter client.



Inventory > Virtual Machine > Tasks Tab

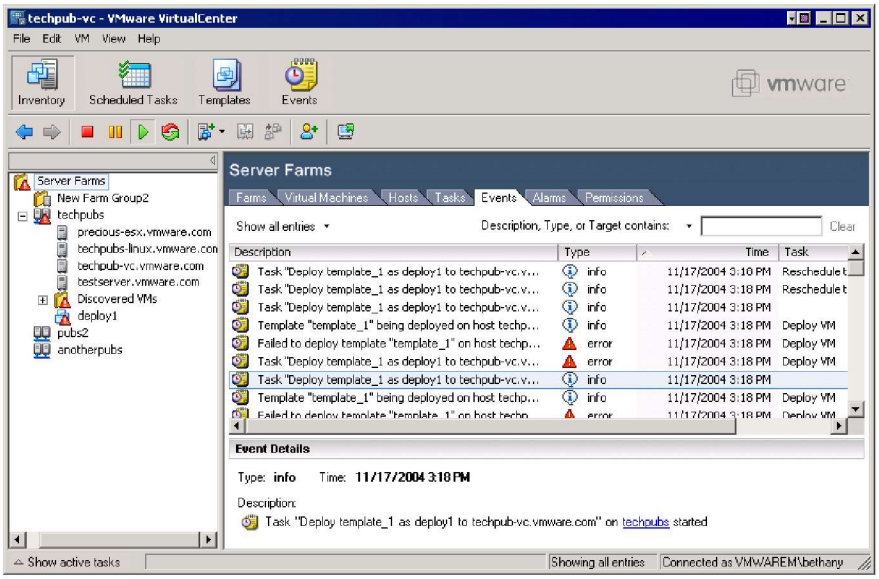
The **Task** tab content is described in the following table.

List Attribute	Description
Name	Name of the task.
Target	Object task performed on.
Progress	Progress state of the task, if it is in progress.
Status	State of complete of the task.
Reason	Name of user initiated the task or whether or not the task was a scheduled task.
Time	Time task started.

Viewing the Events Tab

The **Events** tab is available when you select any object from the Inventory panel. Selecting an event displays its details in the **Event Details** field. Click the link in the **Event Details** field to shift the display to the linked object.

The Events tab displays a filtered view of the **Events**. It displays either all events in the VirtualCenter server or only those events that occurred on the selected object through a toggle. The toggle option state **Show all entries** or **Show <object> entries** displays in the bottom right status bar of the VirtualCenter client.



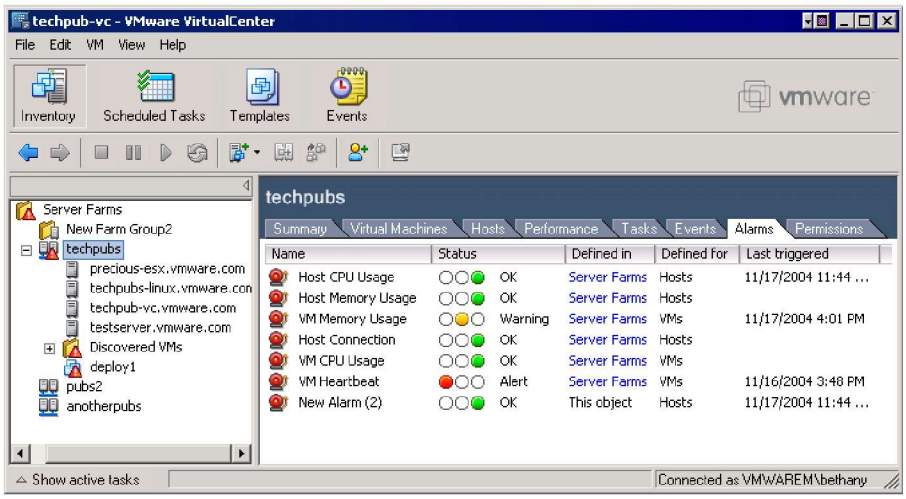
Inventory > Virtual Machine > Events Tab

The **Events** tab content is described in the following table.

List Attribute	Description
Description	Text explanation of action.
Type	Type of event that occurred.
Time	Time event occurred.
Task	Task that caused event.
Target	Object on which the event occurred.

Viewing the Alarms Tab

The **Alarms** tab is available when you select any object from the inventory panel of the navigation bar. The **Alarms** tab displays the alarms that have been created for the selected object and the status of the alarm.



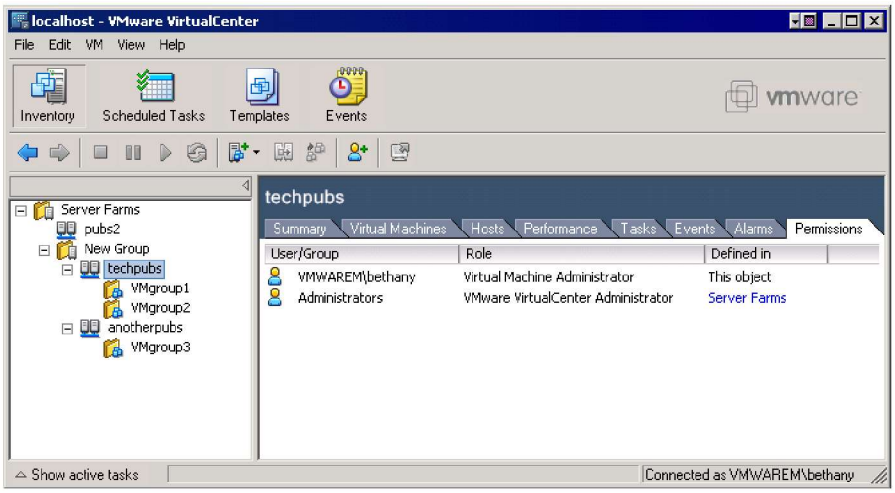
Inventory > Host > Alarms Tab

The **Alarms** tab content is described in the following table.

List Attribute	Description
Name	Name of object.
Status	Condition of the alarm.
Defined in	VirtualCenter object where the setting was made.
Defined for	VirtualCenter to which the setting applies.
Last triggered	Date and time the alarm was most recently triggered.

Viewing the Permissions Tab

The **Permissions** tab is available when you select any object from the inventory panel except a host. The **Permissions** tab displays the users and groups with their associated permission roles assigned to the selected object.



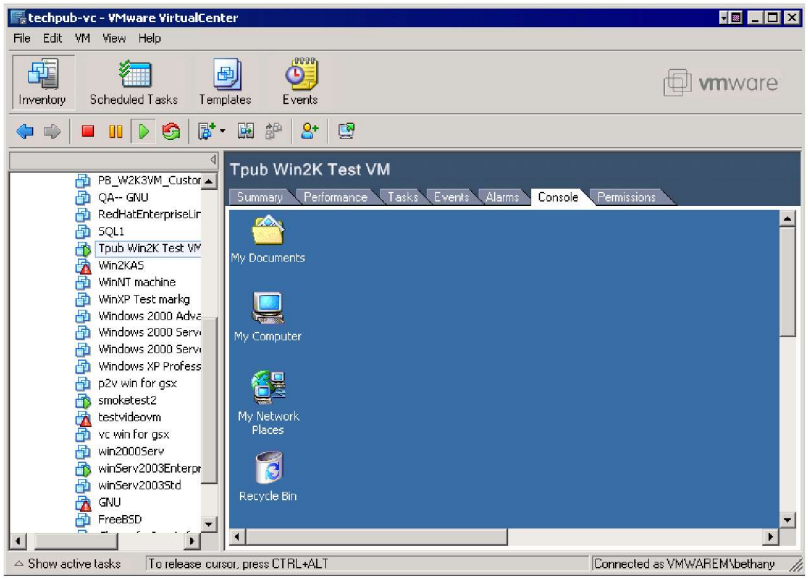
Inventory > Virtual Machines > Permissions Tab

The **Permissions** tab content is described in the following table.

List Attribute	Description
User/Group	Name of user or group assigned the role.
Role	The role assigned to the user or group. options: Read Only User, Virtual Machine User, Virtual Machine Administrator, and VirtualCenter Administrator.
Defined In	The VirtualCenter object where the permission user+role pair is assigned. If it is not the current object, a link to the defined in object appears.

Viewing the Console Tab

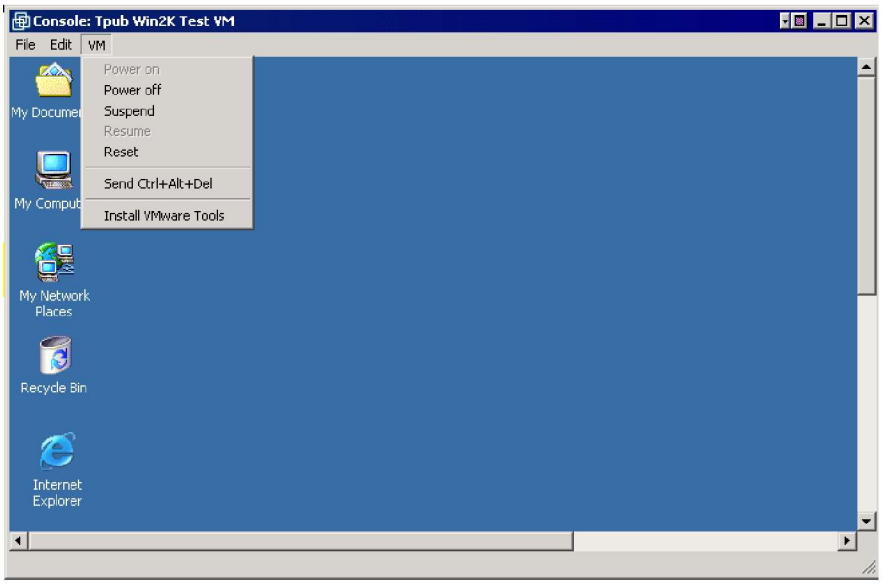
The **Console** tab is available when you select a virtual machine object from the inventory panel of the navigation bar. The **Console** tab displays a blank screen when the virtual machine selected is not powered on. When the virtual machine is powered on, the **Console** tab displays the running console of the virtual machine. When you select the Console tab, a popout version of the console is also available by clicking on the Console toolbar button.



Inventory > Virtual Machine > Console Tab

The Console tab provides live access to the virtual machine console from within the VirtualCenter client and allows you to interact with the operations of the virtual machine. A detachable virtual machine console window can be operated independently from the VirtualCenter client by selecting the appropriate virtual machine from the inventory panel and clicking the Console option in the Inventory

toolbar. This separate console operates in addition to, not to the exclusion of, the embedded console.



Detachable Console Window

The behavior of the VirtualCenter client console is similar to, but not an exact duplicate of, the VMware Remote Console provided with VMware ESX Server or the VMware Virtual Machine Console provided with VMware GSX Server or VMware Server. For example, quick switch mode (for switching between console windows), snapshots, and full screen mode are not included in VirtualCenter. The VirtualCenter client console does not provide access to selected functions (such as power or configuration operations) of the virtual machine. These tasks are handled on the VirtualCenter client toolbar.

Viewing the Performance Tab

The **Performance** tab is available when you select a farm, host, virtual machine group, or virtual machine from the inventory panel of the navigation bar.

The **Performance** tab displays the selected object's information in graph form. Performance views show graphs for four primary attributes: **Processor (or CPU) Usage**, **Memory Usage**, **Disk I/O Usage**, and **Network I/O Usage**.

Performance charts for hosts and virtual machines display in two forms:

- **Summary charts** – For farms and virtual machine groups, VirtualCenter displays thumbnail charts of processor, memory, disk and network utilization for each host in the farm or virtual machine in the group.
- **Individual charts** – For hosts and virtual machines, VirtualCenter displays thumbnail charts of processor, memory, disk and network utilization along with a detailed chart of a selected resource.

Performance charts for farms and virtual machine groups display the summary charts for each host or virtual machine in their group, respectively.

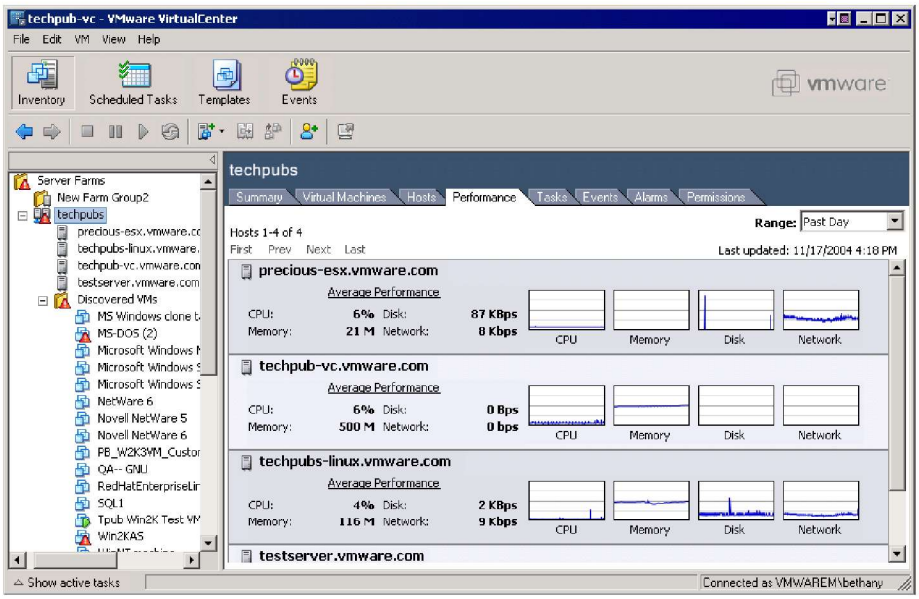
The Performance tab topics are covered in the following sections:

- Viewing Summary Performance Charts
- Viewing Individual Performance Charts

Viewing Summary Performance Charts

The Performance tab of a farm or a virtual machine group displays summary charts for each host in the farm or each virtual machine in a virtual machine group. These summary charts include the total processor, memory, disk, and network utilization over a selected time range, along with the average utilization over that same time range. Clicking on the chart links displays the charts.

If there are more than four hosts or virtual machines in the farm or virtual machine group, then the **First**, **Prev**, **Next**, and **Last** buttons are available to shift the view to additional hosts or virtual machines.



Inventory > Farm > Performance Tab

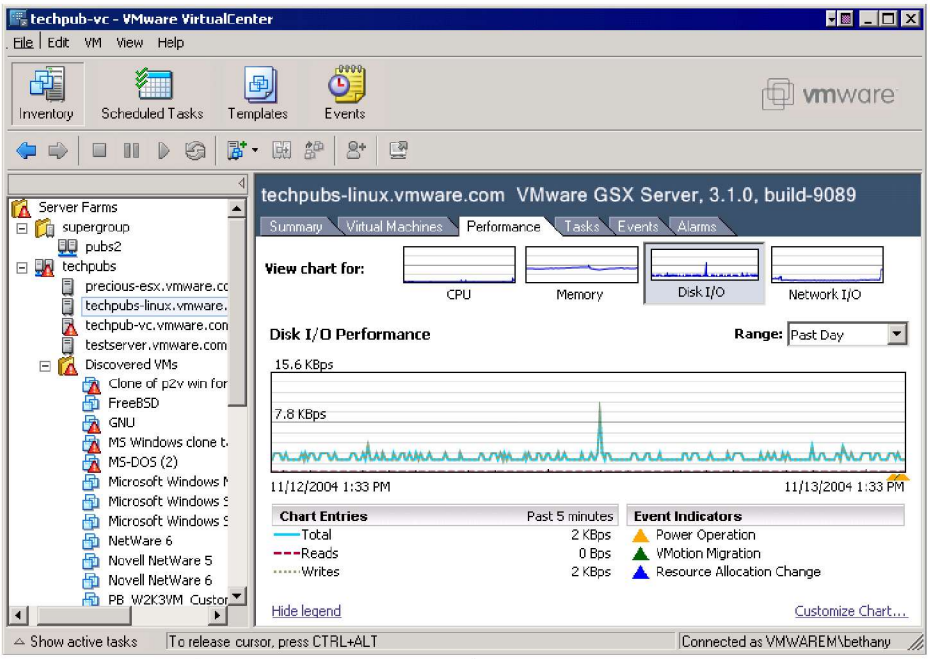
The **Performance** tab content is described in the following table.

List Attribute	Description
Name	Host or virtual machine name.
Processor (or CPU)	Reports the percentage of processor being used.
Memory	Reports the memory usage in MBytes.
Disks	Reports the number of bytes per second of read and write activity to and from the disk.
Network	Reports the number of bits per second of input and output to each and all network interface (NIC) cards.
Range	Selectable range of time to display in the charts. Options include: day, week, month, year.

Viewing Individual Performance Charts

The Performance tab displays four thumbnail charts and one expanded chart of the monitored resource for each selected host or virtual machine.

The thumbnail charts at the top of the panel are the same as the summary charts. Clicking a summary chart displays an expanded version of that chart in the body of the panel.



Inventory > Host > Performance > Processor (or CPU) Chart

Working with Performance Chart Data

There are several things you can do to alter the view, the data collected, and the range of information stored to the VirtualCenter database. The following sections describe these activities:

- Displaying the Performance Panel Legend on page 460
- Changing the Performance Panel Range on page 460
- Customizing Performance Charts on page 460
- Viewing Performance Panel Resource Charts on page 462
- Configuring Performance Measurement Intervals on page 464
- Configuring the Number of Threads for Collecting Performance Statistics on page 465
- Configuring the Statistics Detail for Performance Data on page 466
- Exporting Performance and Host Summary Data on page 467

Displaying the Performance Panel Legend

Click the **Show legend/Hide legend** link to view or hide the legend for the charts. The legend at the bottom of the panel displays a key for:

- **Chart Entries** – These map the line styles to the item they are representing.
- **Event Indicators** – These triangular icons on the expanded chart indicate when significant events occurred for the host or virtual machine. Click the **Events** tab to locate the nature and condition of the event.

Changing the Performance Panel Range

In the **Range** list, you can adjust the time increment for the charts. The charts can display data from the past day, week, month or year.

Customizing Performance Charts

When you select the **Customize Chart** link, the Customize Performance Chart dialog box appears and provides options that affect the display of the chart. The chart options differ between hosts and virtual machines.

Host customize chart options:

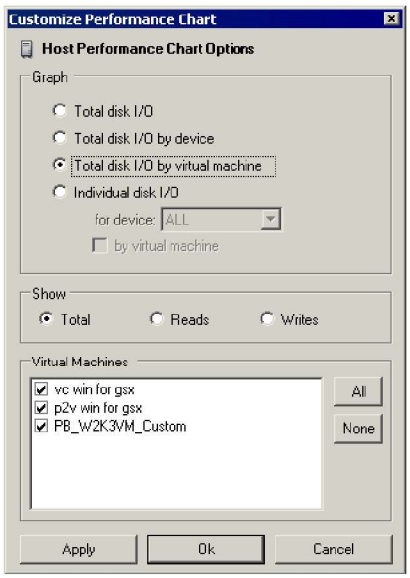
- Processor (or CPU):
  - Total processor (or CPU) utilization [line chart]

  - Total processor (or CPU) utilization by virtual machine [stacked chart]
- Memory:
  - Total memory utilization [line chart]
  - Total memory utilization by virtual machine [stacked chart]

    This also provides an option for selecting which metric to display and a selectable list of virtual machines to include in the chart data.
- Disk I/O and network I/O only:
  - Total disk/network I/O
  - Total disk/network I/O by device
  - Total disk/network I/O by virtual machine [stacked chart]

    This provides an option for selecting which metric to display and a selectable list of virtual machines to include in the chart data.
  - Individual disk/network I/O

    This provides an option to specify a device and list the performance data by virtual machine.



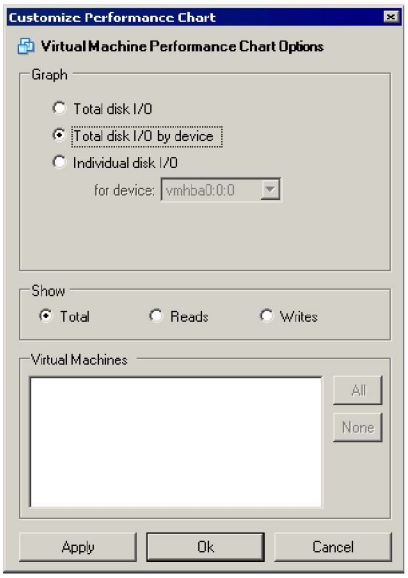
Virtual machine chart options:

- Total utilization (line chart) – All devices
- Total disk/network by device (stacked chart) – Disk and network only

This option provides an option for **Total/Reads/Writes** and a selectable list of virtual machines to include in the chart data.

- Individual disk I/O – Disk only

  This provides an option to specify a device in the virtual machine.



Viewing Performance Panel Resource Charts

To view the following information, select the corresponding chart.

The Performance panel displays the usage of the following resources:

- **Processor (or CPU)** – Chart reports the percentage of processor being used.

  To display the Chart Entries legend, click the Show/Hide legend link.

  The host machine processor chart has one usage line while the virtual machine processor chart has two lines on it: a usage line and a guarantee line.

  - Usage: Percentage of processor time used by the virtual machine (or by all virtual machines on the host)
  - Guarantee: Percentage of processor time guaranteed to be available to the virtual machine (not available on the host chart); value is determined by the min/max/shares settings of this virtual machine and all virtual machines currently running on the host

  The processor chart displays the percentage of combined processor usage. If there is more than one processor, the chart distributes the data based on the

combined usage at 100%. The legend lists the values as a portion of the 100% total.

- **Memory** – Chart reports the memory usage. This is calculated as a percentage of shares of the entire physical plus swap memory on the host assigned to the virtual machine. Virtual machine memory maximum and minimum usage is configurable.

  The display is one chart per host. This does not include NUMA systems. To display the Chart Entries legend, click the Show/Hide legend link.

  The memory chart has two lines on it: an active line and a granted line.

  - Active: Memory recently used by the virtual machine (or by all virtual machines on the host)
  - Granted: Memory allocated to the virtual machine (or to all virtual machines on the host)

  If several virtual machines are sharing the same processor or memory, the usage line steps down or up as additional virtual machines are powered on or off. If there is no contention for the processor or memory, usage is reported as a flat line.

- **Disk** – Chart reports the amount of read and write activity to and from the disk.

  The data is defined by shares of the disk resource per volume. There is no line to show the percentage of the disk space read/write usage assigned to the virtual machine.

  To display the Chart Entries legend, click the Show/Hide legend link.

  Data is collected on each disk connected to the ESX Server and GSX Server or VMware Server host. This tracks the VMFS traffic and access to the network share. For any disk, the reported data is relative to the host selected in the inventory panel. Traffic with a disk that is due to additional hosts attached to the disk is not included in the chart.

  Host data appears in two aggregate charts: one for read activity and one for write activity. With VMFS systems, separate charts display volume inbound read traffic and volume outbound write traffic. Note logical volumes span partitions.

  - Total: Total I/O
  - Reads: Disk reads, network traffic received
  - Writes: Disk writes, network traffic transmitted

- **Network** – Chart reports the number of bits per second of input and output to each and all network interface cards (NIC).

  The virtual machine aggregate chart shows all the input and output activity per virtual machine. The detail charts show the activity for each NIC for the virtual machine.

  To display the Chart Entries legend, click the Show/Hide legend link.

  Host aggregate chart reports all the network input and output per host. Network input and network output usage are given separate charts reporting the usage of the physical NIC based on the configuration of the virtual machines on that host.

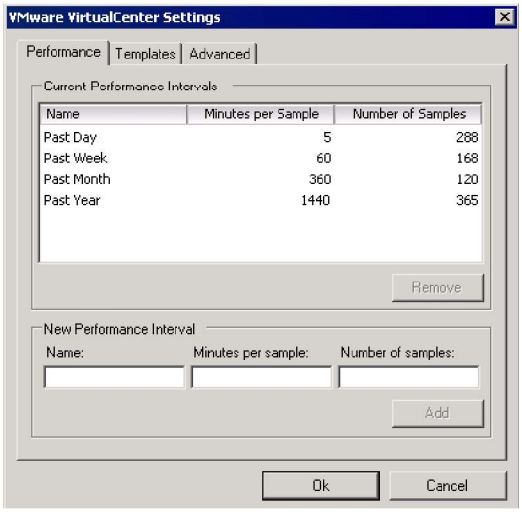
  - Total: Total I/O
  - Reads: Disk reads, network traffic received
  - Writes: Disk writes, network traffic transmitted

Configuring Performance Measurement Intervals

Note: Existing performance data is reset (lost) when you change the interval configuration. However, only the data for that interval is reset. For example, if you change only the weekly time interval, the daily and monthly data are maintained.

To configure performance intervals:

1. Start the VirtualCenter client.
2. Choose **File** > **VMware VirtualCenter Settings**. The VirtualCenter Settings dialog box appears.



3. On the **Performance** tab, modify intervals and sampling values as needed.

   Under **Current Performance Intervals**, you can remove an existing interval. Select the interval in the list and click **Remove**.

   To add a new interval:

   a. In the **Name** field, enter name of the interval. This name appears in the **Range** list on the Performance tab.

   b. In the **Minutes per sample** field, enter the length of time in minutes between each sample taken.

   c. In the **Number of samples** field, enter the maximum number of samples that are displayed on the Performance tab. As new samples are collected, old samples beyond the maximum number are purged.

   d. Click **Add**. The new interval appears in the list under **Current Performance Intervals**.

4. Click **OK**. The charts on the **Performance** tab reflect the adjusted values.

Configuring the Number of Threads for Collecting Performance Statistics

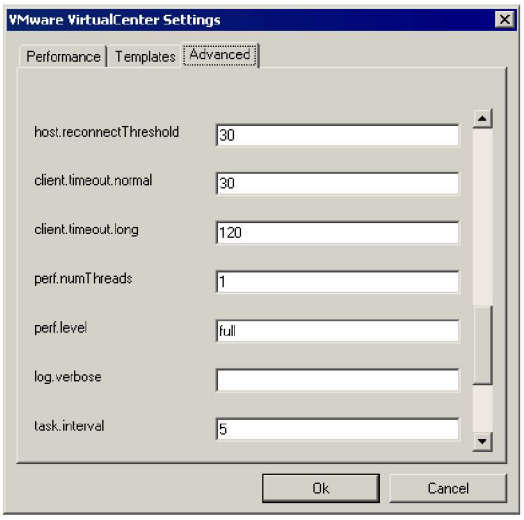
You can configure multiple statistical refresh threads and distribute their updates over time. On an SMP VirtualCenter host, you can use multiple threads to increase the number of managed hosts and take advantage of the additional processor. On a uniprocessor host, you can adjust this value to smooth out processor usage.

The number of threads is used for collecting performance statistics from managed hosts. The default value is 1, and the maximum setting is 8.

To configure the number of threads:

1. Start the VirtualCenter client.
2. Choose **File** > **VMware VirtualCenter Settings**. The VirtualCenter Settings dialog box appears.

3. Click **Advanced**.



4. Modify the **perf.numThreads** value as needed.

   On SMP hosts, using multiple threads increases the number of managed hosts possible by taking advantage of the additional processors. On UP hosts, it improves the processor utilization.

5. Click **OK** to save your change.

6. Restart the VirtualCenter server to apply the changes. For information, see Restarting the VirtualCenter Server on page 119.

Configuring the Statistics Detail for Performance Data

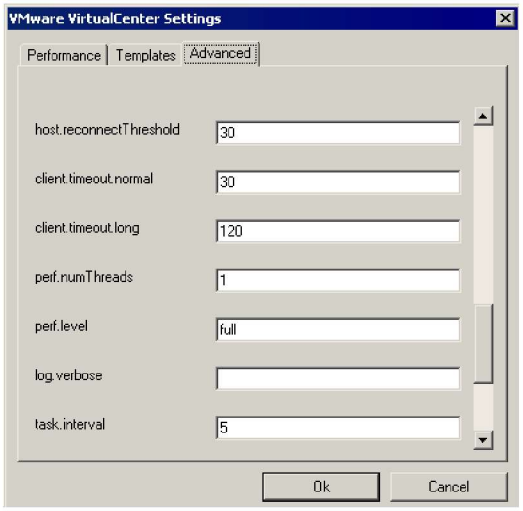
You can configure the amount of detailed information that is collected for the statistics. A minimum amount of information is always displayed in the VirtualCenter client. This setting applies to the amount of information collected and stored in the VirtualCenter database, which can viewed through the VirtualCenter database views. Refer to the technical note, Using VirtualCenter Database Views for additional information on the statistics collected and the database views.

The acceptable values for collecting detailed performance statistics are minimal, typical, and full. The minimal and typical values match the information displayed in the VirtualCenter client. The full value stores all the possible detail.

To configure the statistics data collected:

1. Start the VirtualCenter client.

2. Choose **File** > **VMware VirtualCenter Settings**. The VirtualCenter Settings dialog box appears.
3. Click **Advanced**.



4. Modify the **perf.level** value as needed.

   The choices are: **minimal**, **typical**, and **full**.

   Note: Selecting full does not alter the performance statistics viewed in the VirtualCenter client.
5. Click **OK** to save your change.

Exporting Performance and Host Summary Data

You can export performance data for a specific virtual machine or for a specific host. You can export host summary data.

Performance data includes processor Usage, Memory Utilization, Disk I/O, and Network I/O. The performance data is exported in a combination of XML and Microsoft Excel files.

The host summary data contains information about the host hardware, VirtualCenter settings, and resource and performance data. The host summary data is exported in HTML or Excel format.

To export host summary data:

1. Select a host in the VirtualCenter client inventory.
2. Choose **File** > **Report** > **Host Summary**.

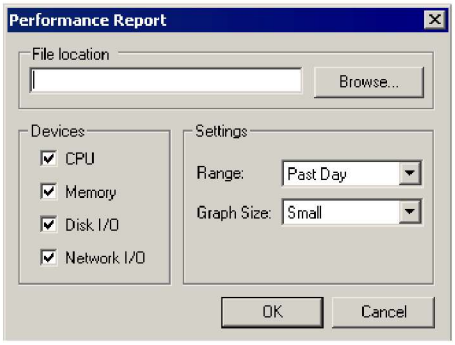
3. Provide a file name and location and select a file format for exporting the data. Choose between HTML and Microsoft Excel.
4. Click **OK** to create the report.

   If you have only one file, for example, if you select one statistic, such as virtual machine processor usage, then only one file is produced. If more than one file is created, then a folder is also created for each sheet. The main file contains no data at all; it contains links to the files in the folders.

To export performance data:

Note: Performance data is only exported in Excel format.

1. Select a host or a virtual machine in the VirtualCenter client inventory.
2. Choose **File** > **Report** > **Performance**. The Performance Report dialog appears.



3. In the **File location** field, type a location for the report or click **Browse** and navigate to a location and enter a file name.
4. Under **Devices**, deselect any data you do not want included in the report. By default, processor, memory, disk I/O, and network I/O data are included in the report.
5. Under **Settings**, select the range of the report and the size of the graph

   In the **Range** list, select from the past day, week, month, or year.

   In the **Graph Size** list, select a small, medium, or large graph.
6. Click **OK** to create the report.

   The output is in Excel format.