

IBM Director 4.20



# Virtual Machine Manager 1.0 Installation and User's Guide

**Note**

Before using this information and the product it supports, read the general information in Appendix D, "Notices," on page 59.

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## About this book

This book describes IBM® Virtual Machine Manager 1.0 and how to use VMware VirtualCenter and Microsoft® Virtual Server in an IBM Director environment.

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## How this book is organized

Chapter 1, “Introducing Virtual Machine Manager,” on page 1 contains an overview of Virtual Machine Manager (VMM), including its components and features, and its integration with IBM Director. This chapter also describes the features of IBM Director that are relevant to VMM objects.

Chapter 2, “Installing Virtual Machine Manager,” on page 11 details the system requirements for VMM and how to install and uninstall VMM.

Chapter 3, “VMM objects and their discovery,” on page 15 describes the various objects in VMM, explains their state icons, and describes discovery of these objects.

Chapter 4, “Working with credentials and configuring hosts,” on page 23 provides information about entering and revoking credentials for coordinators and how to use IBM Director Console to configure hosts that define virtual machines. This chapter also explains how to delete VMM objects from IBM Director Console.

Chapter 5, “Running power operations on virtual machines,” on page 29 describes the power operations that you can perform on virtual machines.

Chapter 6, “Viewing VMM object attributes,” on page 33 describes the VMM object attributes that VMM displays for coordinators, farms, hosts, and virtual machines.

Chapter 7, “Solving Virtual Machine Manager problems,” on page 39 lists some of the problem symptoms and suggested solutions for VMM.

Appendix A, “Virtual Machine Manager event filters and actions,” on page 43 describes the event filters and actions that are provided by VMM that you can use with IBM Director event action plans. This chapter also describes the virtual machine task failures that can occur.

Appendix B, “Terminology summary and abbreviation list,” on page 55 contains a summary of VMM terminology and a list of abbreviations that are used in VMM documentation.

Appendix C, “Getting help and technical assistance,” on page 57 contains information about accessing IBM Support Web sites for help and technical assistance.

Appendix D, “Notices,” on page 59 contains product notices and trademarks.

The “Glossary” on page 61 provides definitions for terms that are used in VMM documentation.

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## Notices that are used in this document

This document contains the following notices designed to highlight key information:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or difficult situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.

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## VMM documentation

The Web site for VMM provides the following document in Adobe Acrobat Portable Document Format (PDF):

- *Virtual Machine Manager 1.0 Installation and User's Guide*

You can also obtain this document from the IBM Support Web site at <http://www.ibm.com/pc/support/>.

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## VMM resources on the World Wide Web

The following Web pages provide resources for understanding, using, and troubleshooting IBM Director and systems-management tools.

### IBM Support page

<http://www.ibm.com/pc/support/>

This is the IBM Support Web site for IBM hardware and systems-management software. For systems-management software support, click **Systems management**.

### IBM Systems Management Software: Download/Registration page

[http://www.ibm.com/pc/us/eserver/xseries/systems\\_management/dwnl.html](http://www.ibm.com/pc/us/eserver/xseries/systems_management/dwnl.html)

Use this Web page to download IBM systems-management software, including IBM Director.

### IBM xSeries® Systems Management page

[http://www.ibm.com/pc/ww/eserver/xseries/systems\\_management/index.html](http://www.ibm.com/pc/ww/eserver/xseries/systems_management/index.html)

This Web page presents an overview of IBM systems management and IBM Director. Click **IBM Director 4.2** for the latest information and documentation.

### IBM ServerProven® page

<http://www.ibm.com/pc/us/compat/index.html>

This Web page provides information about IBM hardware compatibility with IBM systems-management software.

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## Chapter 1. Introducing Virtual Machine Manager

IBM Virtual Machine Manager (VMM) enables the use of the following virtualization applications in an IBM Director environment:

- VMware VirtualCenter
- Microsoft Virtual Server

When VMM and these virtualization applications are installed, you can perform the following tasks from IBM Director Console:

- Correlate relationships between physical platforms and virtualization components
- Report status of physical platforms and their corresponding virtualization components
- Log in to the management interface of the virtualization application
- Discover virtualization components
- Perform migration and power operations on virtual machines
- Create event action plans that involve virtualization components

When VMM is installed, IBM Director can recognize systems that contain virtualization components. Next, VMM can create *VMM objects* to represent the virtualization components that were recognized.

VMM uses the application programming interface (API) of the virtualization application to perform VMM operations on the virtualization component itself. Both IBM Director Console and the virtualization application then are updated.

All VMM Console operations, such as powering on a virtual machine, are run as background processes. Therefore, IBM Director Console can be used for other operations while VMM performs its operations.

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### VMM environment and terminology

The hardware in a VMM environment is referred to in the following ways:

- A *management server* is a server on which both IBM Director Server and VMM Server are installed.
- A *management console* is a system on which both IBM Director Console and VMM Console are installed. In a VMware VirtualCenter environment, this system must also be installed with VMware VirtualCenter client, which provides a graphical user interface (GUI) to an instance of VMware VirtualCenter server.
- A *managed system* is a system on which IBM Director Agent and a virtualization application are installed.
- A *system* is a server, workstation, desktop computer, or mobile computer.

The software and its components in a VMM environment are referred to in the following ways:

- A *virtualization application* is one of the following applications:
  - VMware VirtualCenter server
  - VMware ESX Server
  - Microsoft Virtual Server
- A *virtualization component* is a software element that is created by a virtualization application.

- A *VMM object* is an IBM Director managed object that represents the virtualization components in a VMware VirtualCenter environment or in a Microsoft Virtual Server environment. VMM objects include coordinators, farms, hosts, virtual machines, and guest operating systems.

The following VMM objects are used by VMM:

- A *coordinator* is a managed object that represents a system on which all of the following software is running:
  - VMware VirtualCenter server
  - VMware VirtualCenter Web service
  - IBM Director Agent
  - VMM Agent
- A *farm* is a managed object that represents a collection of hosts and their associated virtual machines as defined by a farm configured on a VMware VirtualCenter server.
- A *host* is a managed object that represents a system on which one of the following combinations of software are running:
  - VMware ESX Server and IBM Director Agent
  - Microsoft Virtual Server, IBM Director Agent, and VMM Agent.
- A *virtual machine* is a managed object that represents a virtual machine that is associated with a system that is running VMware ESX Server or Microsoft Virtual Server.
- A *guest operating system* is a managed object that represents an operating system that is running in a virtual machine and on which IBM Director Agent is installed.

In a VMware VirtualCenter environment, VMM uses coordinators, farms, hosts, virtual machines, and guest operating systems.

In a Microsoft Virtual Server environment, VMM uses hosts, virtual machines, and guest operating systems.

For detailed explanations of VMM objects and how they are used, see Chapter 3, “VMM objects and their discovery,” on page 15.

## Overview of VMM integration with IBM Director

VMM includes the following software components:

- VMM Server
- VMM Console
- VMM Agent

Figure 1 shows how VMM is integrated with IBM Director, VMware VirtualCenter, and Microsoft Virtual Server.

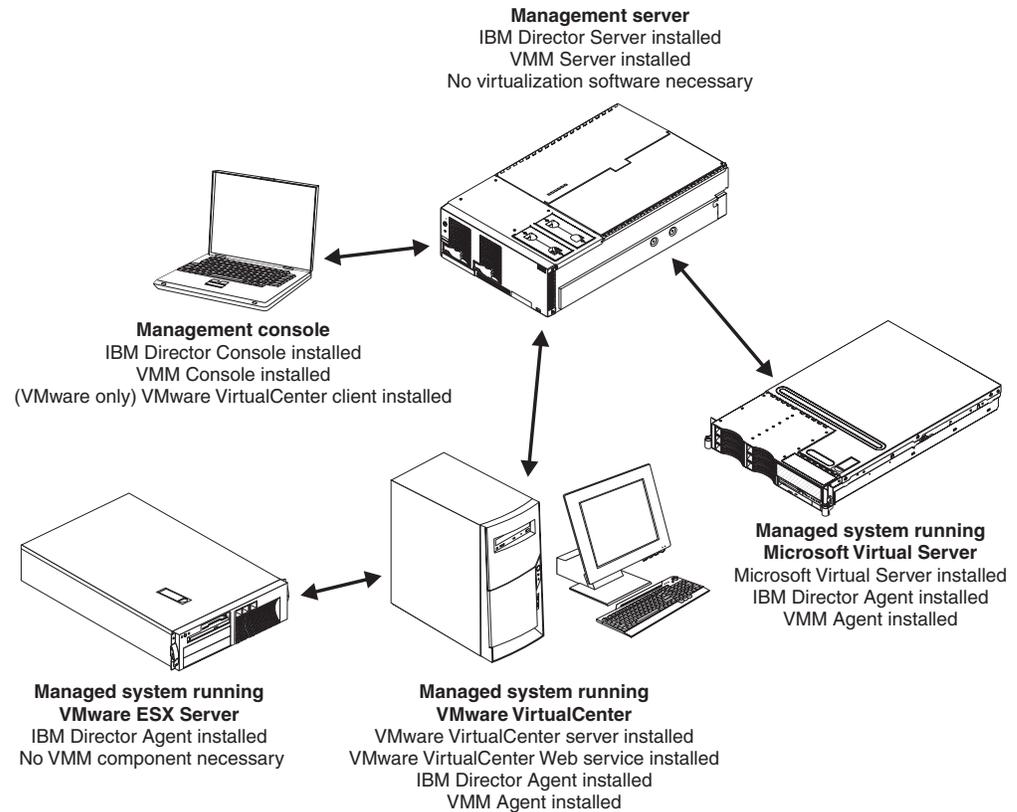


Figure 1. Overview of VMM environment

## VMM Server

VMM Server is the main component of Virtual Machine Manager because it maintains the VMM environment and manages all VMM operations. VMM Server communicates with VMM Agent and VMM Console to display status and perform operations for VMM objects. VMM Server communicates with IBM Director Server to provide event filtering and event actions that support IBM Director event action plans that involve VMM objects.

VMM Server must be installed on the management server. When you install VMM Server, VMM Console is installed automatically also.

## VMM Console

VMM Console is the graphical user interface (GUI) component of VMM. VMM Console must be installed on any management console from which a system administrator will remotely access the management server and perform VMM tasks.

**Note:** If you are using VMware VirtualCenter with IBM Director, the VMware VirtualCenter client must be installed on the system where IBM Director Console and VMM Console are installed. Otherwise, you cannot start the VMware VirtualCenter client with the Start Vendor Software subtask of VMM.

Microsoft Virtual Server does not have the same requirement, because it has a Web interface.

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## VMM Agent

VMM provides a different version of VMM Agent for each virtualization application that it supports. The installation program for VMM automatically detects which virtualization application is installed and displays the correct installation choice for the applicable version of VMM Agent.

**Note:** VMM Agent can provide support only for features that are provided by the virtualization application. For example, when VMM Agent is installed on a system that is running VMware VirtualCenter, you can migrate virtual machines from one host to another. When VMM Agent is installed on a system that is running Microsoft Virtual Server, this support is not provided.

VMM Agent performs the following functions:

- Discovers virtualization application and creates VMM objects
- Relays communication between VMM Server and the virtualization application
- Translates events that are provided by the virtualization application into events that can be used in IBM Director event action plans

### VMM Agent for VMware VirtualCenter

Install VMM Agent on a system that is running IBM Director Agent, VMware VirtualCenter server, and VMware VirtualCenter Web service. These software components enable VMM and IBM Director to recognize this managed system as a coordinator object, which you can view and manage from IBM Director Console. For more information, see “Coordinator objects” on page 15.

### VMM Agent for Microsoft Virtual Server

Install VMM Agent on the system that is running Microsoft Virtual Server. You also must install IBM Director Agent on this system. These software components enable VMM and IBM Director to recognize this managed system as a host object, which you can view and manage from IBM Director Console. For more information, see “Host objects” on page 17.

## Virtual Machine Manager task

When you add VMM Console to your IBM Director environment, the Virtual Machine Manager task is added to IBM Director Console. The Virtual Machine Manager task has the following two subtasks:

- Help
- Start Vendor Software

Figure 2 shows the “IBM Director Console” window with VMM and its tasks in the Tasks pane.

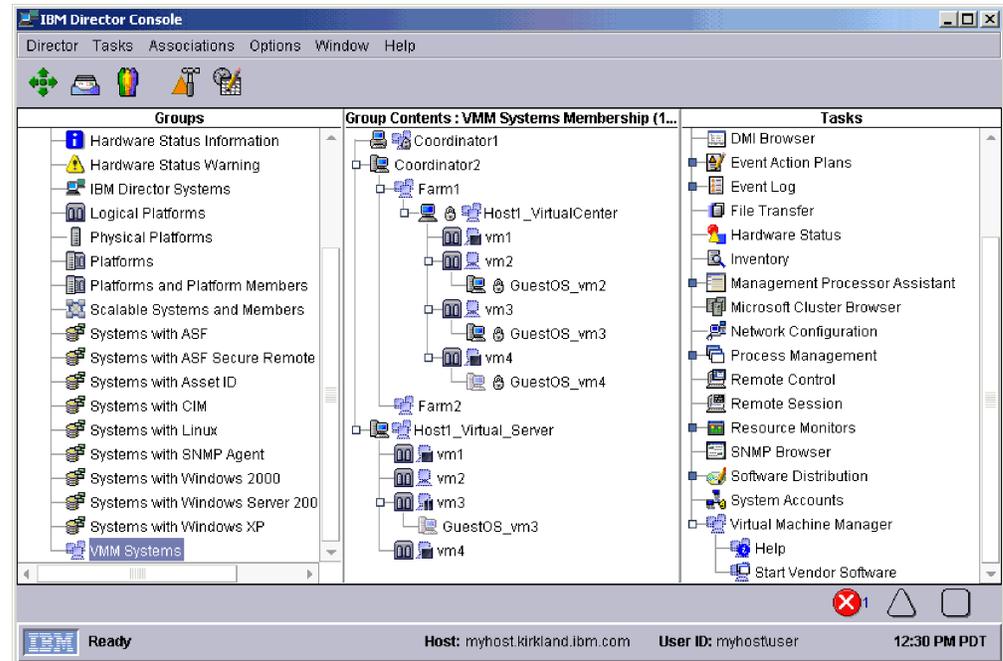


Figure 2. VMM tasks that are displayed in IBM Director Console

The  icon is used to identify the following VMM features:

- The Virtual Machine Manager task
- The VMM Systems group
- Windows, event actions, scheduler tasks, and help topics that are provided by VMM

Additionally, VMM adds various state icons to the VMM objects that are displayed in the Group Contents pane of IBM Director Console. For information, see the descriptions of the state icons for the various VMM object types in Chapter 3, “VMM objects and their discovery,” on page 15.

## Help

You can use the Help subtask to access and view the help pages that are provided with VMM.

To start the **Help** subtask, double-click the subtask.

Use the links at the bottom of each help page to navigate the help that is provided for VMM and its subtasks.

## Start Vendor Software

You can use the Start Vendor Software subtask to start the virtualization application for the targeted VMM object.

To start the **Start Vendor Software** subtask, drag it onto any VMM object in the Group Contents Pane.

You must run this subtask on a VMM object. When you start this subtask, VMM determines whether the VMM object exists in VMware VirtualCenter or Microsoft Virtual Server. Then, the applicable virtualization application is started.

### **VMware VirtualCenter**

When you drag the Start Vendor Software subtask onto a VMM object that is in a VMware VirtualCenter environment, VMM starts the VMware VirtualCenter client interface. Log in to the VMware VirtualCenter server for the VMM object that you want to manage. After you have successfully logged in, you can access and use the features of VMware VirtualCenter client, which enables administration of multiple virtual machines and VMware ESX Server instances that are associated with one VMware VirtualCenter server.

Use the VMware VirtualCenter client only when VMM does not provide equivalent functionality, for example, creation of virtual machines. Otherwise, use the features that are provided by VMM. For information about VMware VirtualCenter and its client interface, see the documentation that comes with that product.

### **Microsoft Virtual Server**

When you drag the Start Vendor Software subtask onto a VMM object that is in a Microsoft Virtual Server environment, VMM starts the Administration Web site, which is the user interface to Microsoft Virtual Server. Log in to the Microsoft Virtual Server that you want to manage. After you have successfully logged in, you can access and use the features of Microsoft Virtual Server, which enables administration of multiple virtual machines that are hosted on a single system.

Use the Microsoft Virtual Server user interface only when VMM does not provide equivalent functionality, for example, creation of virtual machines. Otherwise, use the features that are provided by VMM. For information about Microsoft Virtual Server and its Administration Web site, see the documentation that comes with that product.

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## IBM Director features that are relevant to VMM objects

IBM Director includes several features that are relevant to VMM objects.

### Groups for use with VMM objects

IBM Director provides several default groups of managed objects in the Groups pane for easier management of objects. Some of these groups, like the Logical Platforms group and the Platforms group, will display some VMM objects.

VMM has additional groups just for VMM objects. Table 1 lists the groups that apply only to VMM objects.

Table 1. IBM Director groups that are used only with VMM objects

Group name	Includes these VMM objects
Farms	Only farms
VMM Systems	Only VMM objects, which includes coordinators, farms, hosts, virtual machines, and guest operating systems

### Associations for use with VMM objects

You can use IBM Director associations to display the VMM objects of a group in the Group Contents pane in a logical ordering, and if applicable, in a tree structure. Both IBM Director and VMM provide associations that are relevant to VMM objects. Use the VMM Systems group with these associations to list just the VMM objects on IBM Director Server.

VMM provides one association, the VMM Systems Membership association, that applies only to VMM objects. This association alphabetically orders the objects in a group by coordinator and then all remaining hosts. For coordinators, each object is shown in a tree structure that lists the farms, hosts, virtual machines, and guest operating systems that are associated with the coordinator. For each remaining host, each object is shown with a tree structure that lists the virtual machines and guest operating systems that are associated with that host.

### Scheduler tasks for use with VMM objects

You can use IBM Director Scheduler to create jobs that perform tasks on a single host or on a single virtual machine. For detailed procedures for creating and monitoring scheduled jobs, see the *IBM Director 4.20 Systems Management Guide*.

**Note:** The execution history provides details only about the start and completion of the job. It does not provide details about the success or failure of the VMM operations that are performed by the job. For that information, use the IBM Director Event Log task to view details about all operations that have been received and logged by IBM Director Server.

For information about virtual machine operations that fail, see “Virtual machine task failures” on page 51. For information about the Event Log task, see the *IBM Director 4.20 Systems Management Guide*.

## Tasks for a single host

You can use the Scheduler in IBM Director Console to create scheduled jobs that perform operations on a specific host. You can perform operations that affect a host directly or affect all virtual machines on a host. These Scheduler tasks for use with hosts are under **Host Management** on the “Tasks” page of the “New Scheduled Job” window.

### Notes:

1. The “Targets” page of the “New Scheduled Job” window lists all managed objects that are shown in the Group Contents pane of IBM Director Console. However, you must target host tasks to only host managed objects; otherwise, the task will fail.
2. Status icons for VMM objects are not shown on the “Targets” page of the “New Scheduled Job” window.

Figure 3 shows the “New Scheduled Job” window with the host management operations that you can schedule.

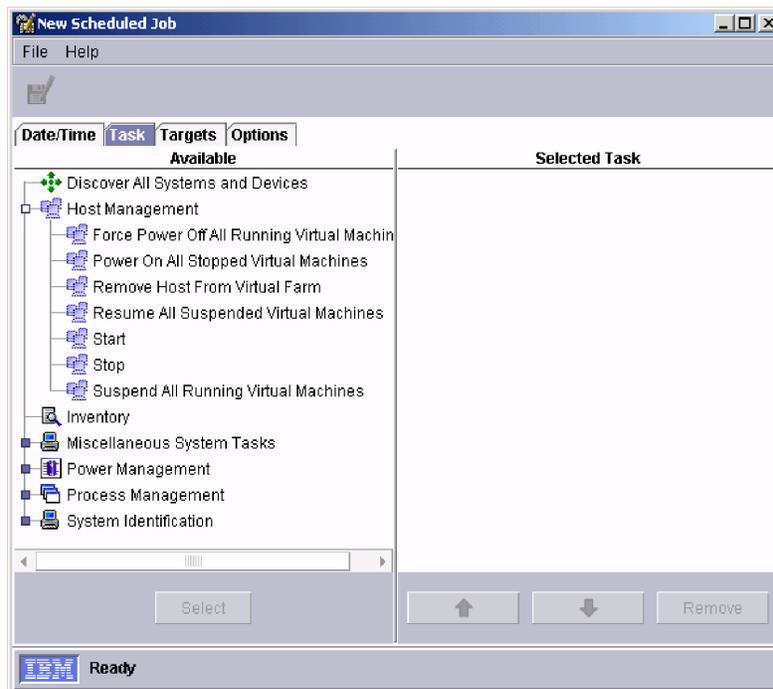


Figure 3. Scheduler tasks for host management

Table 2 describes each of these host management tasks.

**Important:** The power operations for the virtual machines on a single host apply to all virtual machines that are associated with a single VMware ESX Server or a single Microsoft Virtual Server, even those virtual machines that are not represented in IBM Director Console.

Table 2. Scheduler tasks for host objects

Scheduler task	Description
Force Power Off All Running Virtual Machines	Powers-off all running virtual machines that are associated with a host without an orderly shut down of any guest operating systems.

Table 2. Scheduler tasks for host objects (continued)

Scheduler task	Description
Power On All Stopped Virtual Machines	Powers-on all stopped virtual machines that are associated with a host.
Remove Host From Farm	(Hosts that are running VMware ESX Server only) Removes the managed object for the host from the farm managed object in IBM Director Console.
Resume All Suspended Virtual Machines	Resumes all suspended virtual machines that are associated with a host.
Start	(Hosts that are running Microsoft Virtual Server only) Starts the host that is represented by the managed object. You can only create scheduled jobs that use this task for hosts that are currently stopped.
Stop	(Hosts that are running Microsoft Virtual Server only) Stops the host that is represented by the managed object. You can create scheduled jobs that use this task only for hosts that are currently started.
Suspend All Running Virtual Machines	Suspends all running virtual machines that are associated with a host.

If you use a task that applies to all virtual machines on a host, VMM generates a “Virtual Machine, Task Failed” event for each virtual machine that cannot perform the task. For example, if you use Power On All Stopped Virtual Machines and two virtual machines are already powered-on, VMM will generate two “Virtual Machine, Task Failed” events because those two virtual machines could not be powered-on. For more information about virtual machine operations that fail, see “Virtual machine task failures” on page 51.

### Tasks for a single virtual machine

You can use the Scheduler in IBM Director Console to create scheduled jobs that perform operations on a specific virtual machine. These Scheduler tasks for use with virtual machines are under **Power Management** on the “Tasks” page of the “New Scheduled Job” window.

#### Notes:

1. You only can use some of these power management operations with virtual machine objects. For information about which ones are supported, see Table 7 on page 31 in the section Power operations for a single virtual machine.
2. The “Targets” page of the “New Scheduled Job” window lists all managed objects that are shown in the Group Contents pane of IBM Director Console. However, you must target power operation tasks to only virtual machine objects; otherwise, the task will fail.
3. Status icons for VMM objects are not shown on the “Targets page” of the “New Scheduled Job” window.

Figure 4 shows the “New Scheduled Job” window with the power management operations that you can schedule.

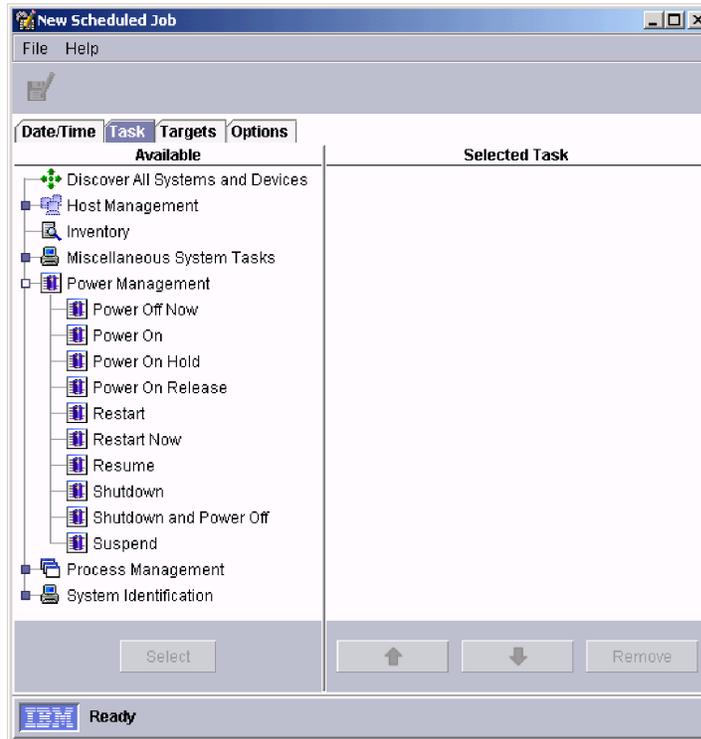


Figure 4. Scheduler tasks for power management

## Event filters and actions for use with VMM objects

VMM provides several events and event actions for use with VMM objects. For more information about using events and event actions with VMM objects, see Appendix A, “Virtual Machine Manager event filters and actions,” on page 43.

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## Chapter 2. Installing Virtual Machine Manager

This chapter provides information about system requirements, supported systems, and instructions for installing and uninstalling VMM 1.0

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### System requirements

In addition to the requirements that are applicable to IBM Director 4.20, VMM has further requirements regarding the hardware and software with which it can be used.

### Supported virtualization applications

VMM 1.0 supports the following virtualization applications:

- VMware VirtualCenter 1.1.x
- Microsoft Virtual Server 2005

#### (VMware environment only) Notes:

1. Only VMware ESX Server hosts are supported with VMware VirtualCenter in IBM Director.
2. The VMware VirtualCenter client must be installed on the system where IBM Director Console and VMM Console are installed.

### Hardware requirements

This section describes the hardware requirements for VMM.

#### Management servers and management consoles

VMM has these additional hardware requirements beyond those of IBM Director 4.20:

- VMM Server needs 10 MB of additional disk space
- VMM Console needs 10 MB of additional disk space

#### Managed systems

You can install VMM Agent on any platform that supports IBM Director 4.20 Agent and the virtualization application that you plan to use. However, depending on the virtualization application that you are using, VMM has these additional hardware requirements beyond those of IBM Director 4.20:

- Managed systems running VMware VirtualCenter need 10 MB of additional disk space
- Managed systems running Microsoft Virtual Server need 10 MB of additional disk space.

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### Supported operating systems

This section lists the operating systems upon which the components of VMM 1.0 are supported.

#### VMM Server

VMM Server is supported for use with IBM Director 4.20 management servers that are running any supported Windows® operating system.

## VMM Console

VMM Console is supported for use with IBM Director 4.20 management consoles that are running any supported Windows operating system.

## VMM Agent

VMM Agent is supported for use on Windows operating systems that are supported by both IBM Director 4.20 managed systems and virtualization applications on that managed system.

---

## Downloading VMM

Complete the following steps to download VMM from the IBM Web site:

1. Go to <http://www.ibm.com>.
2. Click **Support & Downloads**.
3. Click **Downloads & drivers**.
4. In the **Enter search terms** field, type *Virtual Machine Manager 1.0* and click **Submit**.
5. Click **Systems Management - Virtual Machine Manager 1.0**.
6. Click the file link for the executable file to download the file.  
You also can download the VMM readme text file and the *Virtual Machine Manager 1.0 Installation and User's Guide* from this Web page.
7. Copy the downloaded file to a local drive on each management server, management console, and managed system on which you want to install VMM.

---

## Installing VMM

The VMM installation program detects whether IBM Director Server or IBM Director Console are installed on a system and automatically displays installation choices for the corresponding VMM components.

If IBM Director Agent is installed on a system that contains a supported virtualization application, the VMM installation program detects which virtualization application is installed and automatically displays an installation choice for the applicable version of VMM Agent.

### Notes:

1. (VMware environment only) Before you use VMM, you must also install the VMware VirtualCenter Web service on the managed system that is running VMware VirtualCenter.
2. Do not install VMM Agent on any managed system that is running VMware ESX Server.

Complete the following steps to install VMM:

1. If IBM Director Console is running, close it.
2. From the system on which you want to install VMM, run the executable file that you downloaded.

**Note:** The operating-system account that is used to install VMM has at least local Administrator authority.

The VMM Setup program starts, and the “Welcome to the InstallShield Wizard for IBM Virtual Machine Manager” window opens.

3. Click **Next**. The “License Agreement” window opens.

4. Click **I accept the terms in the license agreement** and click **Next**. The “Setup Type” window opens.

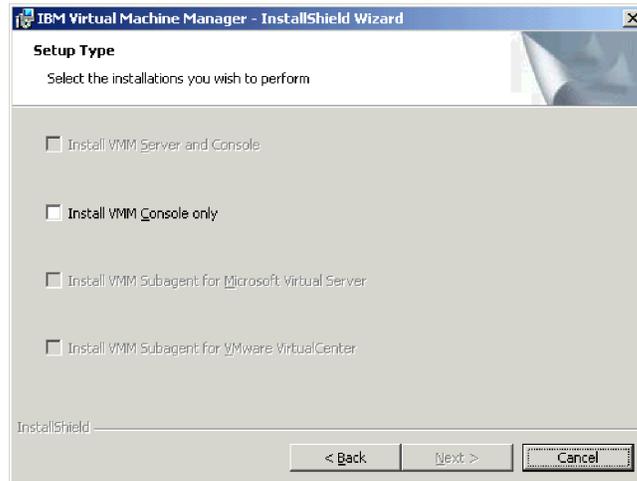


Figure 5. “Setup Type” window

5. Select the check box for the type of installation that you want and click **Next**. The “Destination Folder” window opens.

**Note:** You can select only those installation types that are applicable for the system on which you are installing VMM. For example, you cannot install VMM subagent for VMware VirtualCenter unless VMware VirtualCenter is installed on the system.

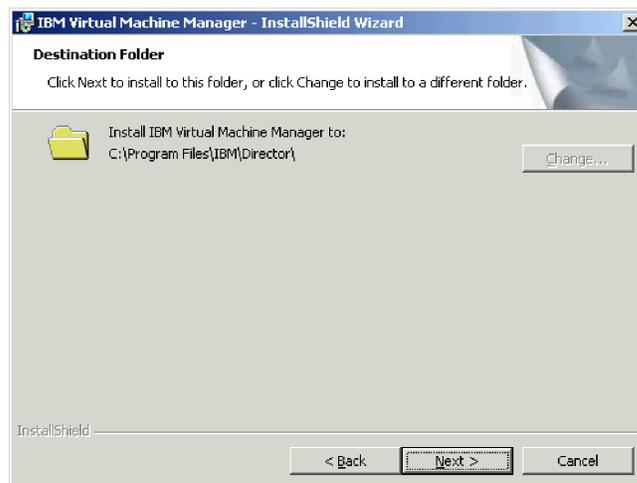


Figure 6. “Destination Folder” window

6. Click **Next**. The “Ready to Install the Program” window opens.
7. Click **Install**. If you are installing VMM Server or VMM Agent, the “Question” window opens.

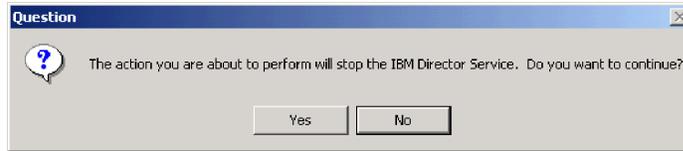


Figure 7. “Question” window

8. Click **Yes**. The “Installing IBM Virtual Machine Manager” window opens. The progress of the installation is displayed.  
When the installation is completed, the “InstallShield Wizard Completed” window opens.
9. Click **Finish**.

---

## Installing IBM Director Agent on guest operating systems

You also must install IBM Director Agent on all guest operating systems that you want to view through IBM Director Console. When IBM Director Agent is installed on guest operating systems, VMM can recognize these objects as guest operating systems and correlates them to their virtual machines within IBM Director.

For information about installing IBM Director Agent and the operating systems that it supports, see the *IBM Director 4.20 Installation and Configuration Guide*.

---

## Uninstalling VMM

You must uninstall VMM 1.0 before you uninstall IBM Director 4.20. The IBM Director 4.20 setup program does not uninstall VMM 1.0.

Complete the following steps to uninstall VMM:

1. If necessary, close IBM Director Console.
2. Click **Start** → **Settings** → **Control Panel**. The “Control Panel” window opens.
3. Double-click **Add/Remove Programs**. The “Add/Remove Programs” window opens.
4. Click **IBM Virtual Machine Manager**.
5. Click **Remove**.
6. When prompted Are you sure you want to remove IBM Virtual Machine Manager from your computer, click **Yes**.
7. (VMM Server and VMM Agent only) When you are prompted The action you are about to perform will stop the IBM Director Service. Do you want to continue?, click **Yes**.

---

## Chapter 3. VMM objects and their discovery

This chapter describes VMM objects and how they are discovered

**Note:** You cannot create any virtualization components in IBM Director. Instead, you must create virtualization components in the virtualization application that you are using. Then, Virtual Machine Manager and IBM Director can discover these virtualization components and create VMM objects that are based on the information that they discover about a specific installation of a virtualization application.

VMM assigns various attributes to VMM objects. For information, see Chapter 6, “Viewing VMM object attributes,” on page 33.

---

### Coordinator objects

This information applies only to systems that are running VMware VirtualCenter server.

A coordinator object is a managed object that represents a physical system on which all of the following software is installed:

- VMware VirtualCenter server
- VMware VirtualCenter Web service
- IBM Director Agent
- VMM Agent

A coordinator object is a particular type of managed system.

When IBM Director Server discovers that VMM Agent is running on a managed system, it registers services for VMM Agent. When VMM Server detects that VMM Agent has been registered with IBM Director Server, it recognizes the managed system as a coordinator object.

IBM Director does not recognize a managed system as a coordinator until the managed system has been unlocked from IBM Director Console. (The padlock icon beside a managed system indicates that the object is secured.) To request access to the object, right-click the managed system and click **Request Access**. By providing a valid user name that has local administrative rights to that managed system and its password, you can unlock and access the system.

A coordinator object can manage multiple farms, the hosts that they contain, and their virtual machines and guest operating systems.

### Operations for coordinator objects

You can perform the following operations on coordinator objects:

- Discover farms
- Enter credentials
- Revoke credentials

**Note:** Before you can manage a coordinator object, you must enter credentials to login to VMware VirtualCenter server. For information, see “Credentials for coordinators” on page 23.

## Icons for coordinator objects

IBM Director Console displays a system icon for a managed system object. When VMM recognizes the managed system as a coordinator, it adds a second icon to depict status information about VMware VirtualCenter server. VMM obtains status information from the virtualization application. For example, a system that is running VMware VirtualCenter server and that has not yet granted permission to IBM Director to perform operations on VMM objects is represented in IBM Director Console as  .

**Note:** VMM does not add a status icon to a coordinator object when VMware VirtualCenter server is available for use and authenticated with IBM Director.

Table 3 describes the status icons that are used for coordinator objects.

Table 3. Status icons for coordinator objects

Icon	Description
	The VMware VirtualCenter server has not granted permission to IBM Director to perform operations on VMM objects.
	The server is no longer running one of the required services, VMware VirtualCenter server or VMware VirtualCenter Web service. VMM requires both of these services.
	The server is powered-on but has an error condition. Generally this problem has two causes: <ul style="list-style-type: none"><li>• VMM Agent or IBM Director Agent is not running.</li><li>• VMware VirtualCenter server or VMware VirtualCenter Web service is not installed.</li></ul>

---

## Farm objects

This information applies only to systems that are running VMware VirtualCenter server.

A farm object is a managed object that represents a farm configured on an instance of VMware VirtualCenter server. A farm is a logical grouping of hosts and their virtual machines; it does not represent a physical system. A farm object is a new managed object that is created specifically by VMM.

After IBM Director creates a coordinator object for a system that is running VMware VirtualCenter server, VMM Agent continues the discovery process to identify farms that are in a VMware VirtualCenter environment and create farm objects for these farms. If necessary, you can request the creation of farm objects after IBM Director has discovered a coordinator object. For information, see “Manually discovering farms” on page 22.

A farm object can manage multiple hosts and their associated virtual machines.

Farm objects in VMM are not identical to farm objects in VMware VirtualCenter because VMM does not use the hierarchical model that VMware uses. VMware VirtualCenter supports collections of farms, which are referred to as *farm groups*. This concept enables VMware VirtualCenter to present farms in hierarchical groups within the VMware VirtualCenter client. However, VMM does not have a farm group concept and does not support this type of farm hierarchy. When VMM Agent creates a farm object for a VMware VirtualCenter farm that is a member of one or more

farm groups, the name of the farm object is a concatenation of the names of its farm groups and the farm itself, for example, FarmGroup1/FarmSubGroup1/Farm.

**Note:** If a farm that is contained within a farm group is discovered and later that farm group is renamed in VMware VirtualCenter, unexpected behavior can occur with the farm object in the VMM environment. This unexpected behavior for the farm object occurs for all instances of IBM Director Server that are tracking activity on that farm object. After a farm group is renamed, you should revoke and enter credentials for the coordinator object that contains the farm object.

## Operations for farm objects

You can perform the following operations for farm objects:

- Add a host to a farm
- Remove a host from a farm

For information about these operations, see “Configuring hosts that are running VMware ESX Server” on page 24.

## Icons for farm objects

IBM Director Console displays a farm icon for a farm object. VMM uses a second icon to depict status information about the farm. VMM obtains status information from the virtualization application.

**Note:** VMM does not add a status icon to a farm object when VMware VirtualCenter server is available for use and authenticated with IBM Director. For example, a farm that is available for use in VMware VirtualCenter is represented in IBM Director Console as .

Table 4 describes the status icons that are used for farm objects.

Table 4. Status icons for farm objects

Icon	Description
	<p>A farm whose coordinator has not authenticated with VMware VirtualCenter server. For more information, see “Credentials for coordinators” on page 23.</p> <p>VMM also displays this icon for a farm when the VMware VirtualCenter Web service on the coordinator has been stopped.</p> <p>This icon is displayed when the coordinator of the farm has an error condition.</p>

---

## Host objects

A host object is a managed object that represents a physical system on which one of the following sets of software are installed:

- VMware ESX Server and IBM Director Agent
- Microsoft Virtual Server, IBM Director Agent, and VMM Agent

A host object is a particular type of managed system.

After IBM Director creates a farm object for a farm that is in a VMware VirtualCenter environment, VMM queries the virtualization application for the hosts that the farm contains. For each host that is identified, VMM matches it with an

existing IBM Director managed system. If a managed object does not already exist for the physical system, VMM will not create a managed object for it.

A host object can manage multiple virtual machines and their guest operating systems.

The following sections describe the icons that are used for host objects and how VMM supports hosts that are running VMware ESX Server or running Microsoft Virtual Server.

## Icons for host objects

IBM Director Console displays a system icon for a managed system object. When VMM recognizes a managed system as a host, it adds a second icon to depict status information about the host. VMM obtains status information from the virtualization application. For example, a system that is running VMware ESX Server and IBM Director Agent is represented in IBM Director Console as   .

Table 5 describes the status icons that are used for host objects.

Table 5. Status icons for host objects

Icon	Description
	(VMware VirtualCenter) The host is powered-on and VMware ESX Server is running.  (Microsoft Virtual Server) The host is powered-on and Microsoft Virtual Server is started.
	(Microsoft Virtual Server) Microsoft Virtual Server is stopped on the host.
	A host whose status cannot be determined. This icon can occur when VMM Agent cannot communicate with either the coordinator (VMware environment) or the host (Microsoft environment).
	(Microsoft Virtual Server only) A host that is powered-on but has an error condition. Generally this problem has two causes: <ul style="list-style-type: none"> <li>• VMM Agent or IBM Director Agent is not running.</li> <li>• Microsoft Virtual Server is not installed on the server.</li> </ul>

## Hosts that are running VMware ESX Server

When a host object represents a system that is running VMware ESX Server, you can perform VMM operations on that host whether it is locked or unlocked. VMM communicates out-of-band with this system.

You can perform the following operations for host objects that represent systems that are running VMware ESX Server:

- Add a host to and remove a host from a farm.
- Discover virtual machines associated with a host
- Perform power operations for virtual machines associated with a host
- Migrate a virtual machine from one host to another

For information about these operations, see “Configuring hosts that are running VMware ESX Server” on page 24, “Manually discovering virtual machines” on page 22, and “Power operations for all virtual machines on a host” on page 30.

VMM supports only those hosts that are connected to a system that is running VMware VirtualCenter server. If a VMware host is disconnected, VMM removes the host object for that system and generates a "Farm, Host Removed" event. VMM does not discover hosts that are connecting to or are disconnected from a system that is running VMware VirtualCenter server.

## Hosts that are running Microsoft Virtual Server

A managed system that is running Microsoft Virtual Server is not recognized as a host object until the managed system has been unlocked. To request access to the object, right-click the managed system and click **Request Access**. By providing a valid user name that has local administrative rights to that managed system and its password, you can access the system.

You can perform the following operations on hosts that are running Microsoft Virtual Server:

- Start a host
- Stop a host
- Discover virtual machines associated with a host
- Perform power operations for virtual machines associated with a host

For information about these operations, see "Configuring hosts that are running Microsoft Virtual Server" on page 26, "Manually discovering virtual machines" on page 22, and "Power operations for all virtual machines on a host" on page 30.

---

## Virtual machine objects

A virtual machine object is a managed object that represents a virtual machine that is associated with a system (host) that is running VMware ESX Server or Microsoft Virtual Server. A virtual machine object is a logical platform managed object. It is the logical equivalent of a physical platform: it can be powered-on and powered-off through IBM Director Console. For information, see Chapter 5, "Running power operations on virtual machines," on page 29.

After VMM discovers a host, it continues the discovery process to create virtual machine objects for all the virtual machines that are associated with the host. If necessary, you can request discovery of virtual machines after a host has been discovered. For information, see "Manually discovering virtual machines" on page 22.

You can use VMM with virtual machines that are configured with one or more virtual disks.

## Icons for virtual machine objects

IBM Director Console displays the logical platform icon for a virtual machine object. VMM adds a second icon to the virtual machine object to depict status information about the virtual machine. VMM obtains the status information from the virtualization application. For example, a virtual machine that is powered-on is represented in IBM Director Console as  .

IBM Director updates the virtual machine icons whenever you perform power operations on a virtual machine. IBM Director also updates the virtual machine icons for power operations initiated by the virtualization application.

Table 6 describes the status icons that are used for virtual machine objects.

Table 6. Status icons for virtual machine objects

Icon	Description
	A virtual machine that is powered-on.
	A virtual machine that is powered-off.
	A virtual machine that is undergoing a transition, for example, powering-on, suspending, resuming, powering-off, resetting, or migrating. <b>Note:</b> This icon is displayed when the virtual machine state change is initiated through VMM. This icon is not displayed when the virtualization application initiates a state change.
	A virtual machine that is powered-on but suspended. When a virtual machine is suspended, all activity on the virtual machine is stopped until you explicitly resume operations on the virtual machine.
	A virtual machine that has not established communication. This icon means different things:  <b>VMware environment</b> <ul style="list-style-type: none"> <li>• The coordinator does not have credentials to log in to the VMware VirtualCenter server. For more information, see “Credentials for coordinators” on page 23.</li> <li>• VMware VirtualCenter Web service on the coordinator has been stopped.</li> <li>• The coordinator has some other error condition.</li> </ul> <b>Microsoft environment</b> <ul style="list-style-type: none"> <li>• Microsoft Virtual Server has been stopped.</li> <li>• VMM Agent has been stopped</li> </ul>

## Virtual machines in VMware VirtualCenter

In addition to power operations, you can also migrate a virtual machine on a host that is running VMware ESX Server to another host that is running VMware ESX server. For information, see “Migrating a virtual machine to a different host” on page 26.

VMM does not support or display virtual machine groups, which are collections of virtual machines supported by VMware VirtualCenter. When VMM Agent creates a virtual machine object for a virtual machine that is a member of one or more virtual machine groups, the name of the virtual machine group is ignored and not included in the name of the virtual machine object.

## Virtual machines in Microsoft Virtual Server

Microsoft Virtual Server has a virtual machine status called *save state*; VMM refers to this feature as *suspending* a virtual machine. For information about the save state, see the documentation that comes with Microsoft Virtual Server.

## Undoable disks

An *undoable disk* is a type of virtual disk that saves changes to a temporary file instead of to the virtual disk itself. Changes can be committed when the virtual machine is powered-off.

VMM displays virtual machine objects for virtual machines that contain undoable disks. You can view these objects in IBM Director Console, and VMM object attributes are displayed for them. However, VMM does not support power operations or migration for virtual machines that contain undoable disks.

For detailed information about the undoable disk implementation for a virtualization application, see the documentation that comes with it.

---

## Guest-operating-system objects

A guest-operating-system object is a managed system that represents an operating system that is running on a virtual machine and that is running IBM Director Agent. A guest-operating-system object is a particular type of managed system.

The standard IBM Director discovery process for managed systems can discover guest operating systems. However, if a guest operating system is not running IBM Director Agent, it is not recognized as a guest-operating-system object in IBM Director.

IBM Director Console displays a system icon for a guest-operating-system object. VMM does not display any status icons for guest-operating-system objects.

---

## Manually discovering VMM objects

All the virtualization components on a system that is running VMware VirtualCenter server or Microsoft Virtual Server are automatically discovered when the systems are discovered. However, you might want to force the discovery of virtualization components if they have been newly created on those systems since other virtualization components were initially discovered by IBM Director, or if the objects for some virtualization components were deleted from IBM Director. Once the new virtualization components are discovered, IBM Director can create VMM objects for them.

Because VMM objects, such as coordinators, hosts, and guest operating systems, are extensions of IBM Director managed systems, you can manually request discovery of these objects through the standard IBM Director discovery process for physical platforms. To do so, from IBM Director Console, click **Tasks** → **Discover Systems** → **Physical Platforms**. For more information about discovering managed systems, see the *IBM Director 4.20 Installation and Configuration Guide*.

**Note:** You cannot use the **Discover All Systems** icon in the toolbar of IBM Director Console or **Tasks** → **Discover Systems** → **All Systems and Devices** to discover VMM objects.

However, because other VMM objects, such as those that represent farms and virtual machines, are not extensions of IBM Director managed systems, you cannot use this method. Use VMM menu options to manually discover farms and virtual machines and create VMM objects for them.

The remainder of this section describes the VMM menus that you can use to discover farms and virtual machines.

## Manually discovering farms

This procedure applies only to systems that are running VMware VirtualCenter server.

Complete the following steps to discover all farms that are defined on a system that is running VMware VirtualCenter server and create farm objects as necessary:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the coordinator.
2. Click **Coordinator Management** → **Discover Farms**.

## Manually discovering virtual machines

Complete the following steps to discover all virtual machines that are associated with a system that is running VMware ESX Server or Microsoft Virtual Server and create virtual machine objects as necessary:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the host.
2. Click **Host Management** → **Discover Virtual Machines**.

---

## Chapter 4. Working with credentials and configuring hosts

This chapter provides information about entering and revoking credentials for coordinators, how to use IBM Director Console to configure hosts that are associated with virtual machines, and how to delete VMM objects from IBM Director Console.

---

### Credentials for coordinators

This information applies only to systems that are running VMware VirtualCenter server.

Before you can perform operations on VMM objects, you must enter credentials for the coordinator object that represents the system on which VMware VirtualCenter server is installed. For example, you must enter credentials before you can power on a virtual machine through IBM Director Console. *Entering credentials* logs you into the VMware management interface for that system. Logging off of the VMware management interface is referred to as *revoking credentials*.

After you have entered credentials, any instance of IBM Director Server in the environment can access that instance of VMware VirtualCenter server. You can continue to enter credentials from any instance of IBM Director Server in the environment. You can revoke credentials only from those instances of IBM Director that originally entered credentials. After credentials are revoked from the last instance of IBM Director server that previously entered credentials, no instance of IBM Director Server can access that instance of VMware VirtualCenter server.

### Entering credentials for a coordinator

Complete the following steps to enter credentials for a coordinator:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the coordinator.
2. Click **Coordinator Management** → **Enter Credentials**. The “Enter Credentials” window opens.



The screenshot shows a standard Windows-style dialog box titled "Enter Credentials". It features a title bar with a small gear icon on the left and standard window control buttons (minimize, maximize, close) on the right. The main area of the dialog contains three labeled text input fields: "User ID" (empty), "Password" (empty), and "Port" (containing the text "8443"). At the bottom of the dialog, there is a grey bar containing three buttons: "OK", "Cancel", and "Help".

Figure 8. “Enter Credentials” window

3. In the **User ID** field, type the user name for the VMware VirtualCenter server. (This user name was designated when VMware VirtualCenter Server was installed.)
4. In the **Password** field, type the password for the user name that you used.
5. If necessary, in the **Port** field, type the address of the port that VMM uses for communication with the VMware VirtualCenter Web service. By default, VMM uses port 8443, which is the default port number used for VMware VirtualCenter Web service.
6. Click **OK**. VMM Agent logs on to the management interface that is provided by VMware VirtualCenter. If the login is successful, VMM displays a confirmation message that the credentials were accepted.
7. Click **OK** to close the message window.

VMM saves the entered credentials for the coordinator to IBM Director Server. VMM Agent does not save any credentials.

## Revoking credentials for a coordinator

Complete the following steps to revoke credentials for a coordinator:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the coordinator.
2. Click **Coordinator Management** → **Revoke Credentials**.

**Note:** The **Revoke Credentials** menu option appears only when you are using an instance of IBM Director Server that previously entered credentials. This menu option is not available when using any other instance of IBM Director Server.

VMM deletes the saved credentials for the coordinator from IBM Director Server. Also, VMM Agent logs off from the management interface that is provided by VMware VirtualCenter.

---

## Configuring hosts in IBM Director

VMM provides limited configuration of hosts to which virtual machines are associated. Configuration tasks differ according to the virtualization application that you are running on the host.

### Configuring hosts that are running VMware ESX Server

You can use VMM to perform the following configuration tasks on a host that is running VMware ESX Server:

- Add a host to a farm
- Remove a host from a farm
- Migrate a virtual machine from one host to a different host

#### Adding a host to a farm

Complete the following steps to add a host to a farm:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the farm.
2. Click **Farm Management** → **Add a Host to a Farm**. The “Add Host” window opens.

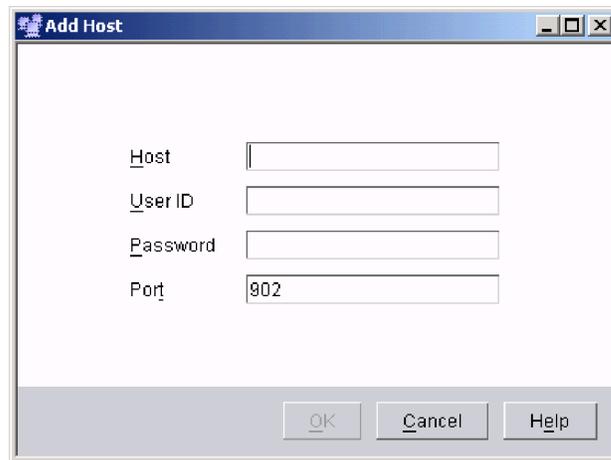


Figure 9. "Add Host" window

3. In the **Host** field, type the IP address or name of the host that is to be added to the farm.

**Note:** Before you type a host name, make sure that the network environment is able to determine the IP address from the host name. Otherwise, the operation to add a host will fail. If you cannot determine the IP address of a host by using the **ping** command, type the IP address instead of the host name.

4. In the **User ID** field, type the user name for the administrator of the system. Generally, this is root. This user name is used by VMware VirtualCenter server to communicate with the host that is running VMware ESX Server.
5. In the **Password** field, type the password for the user name that you used.
6. If necessary, in the **Port** field, type the address of the port that VMware VirtualCenter server will use for communication with VMware ESX Server. By default, VMM uses port 902 for this communication. If the system that is running VMware ESX Server is configured to use a port address other than 902, type that port address in this field.
7. Click **OK**.

**Notes:**

1. VMM Agent does not enable VMware VirtualCenter VMotion for the newly added host. If you want to migrate virtual machines to or from this host, you must use VMware VirtualCenter to enable VMotion for the host. For information about VMware VirtualCenter VMotion requirements, see the documentation that comes with VMware VirtualCenter.
2. This procedure will add a system that is running VMware GSX Server to VMware VirtualCenter, but it does not result in a host object for the system that is running VMware GSX Server. VMM does not support systems that are running VMware GSX Server.

### Removing a host from a farm

Complete the following steps to remove a host from a farm:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the host.
2. Click **Host Management** → **Remove Host From Farm**.
3. Click **Execute Now** to perform the operation immediately or click **Schedule** to create a new scheduled job.

## Migrating a virtual machine to a different host

### Notes:

1. VMware VirtualCenter VMotion must be enabled on both the source host and destination host between which you want to migrate virtual machines. Use VMware VirtualCenter client to enable VMotion for the applicable hosts. For information about VMware VirtualCenter VMotion requirements, see the documentation that comes with VMware VirtualCenter.
2. A virtual machine must be powered-on or powered-off before you can migrate it. You cannot migrate a virtual machine that is in the suspended state.
3. VMM does not support migration of a virtual machine that contains one or more undoable disks. For more information about undoable disks, see “Undoable disks” on page 21.

Complete the following steps to migrate a virtual machine to a different host:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the virtual machine that you want to migrate.
2. Click **Virtual Machine Management** → **Migrate**. The “Migrate” window opens.

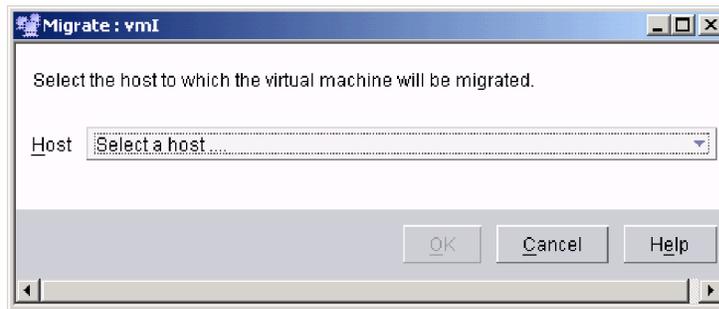


Figure 10. “Migrate” window

3. In the **Host** field, select the host to which you want to migrate the virtual machine.
4. Click **OK**.

## Configuring hosts that are running Microsoft Virtual Server

You can use VMM to start or stop Microsoft Virtual Server services. These features can be useful when you want to use Microsoft Virtual Server to preconfigure individual virtual machines. VMM does not provide these configuration features. For information about Microsoft Virtual Server services, see the documentation.

### Starting Microsoft Virtual Server services

Complete the following steps to start Microsoft Virtual Server services on a host:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the host where you want to start Microsoft Virtual Server services.
2. Click **Host Management** → **Start Host**.

## Stopping Microsoft Virtual Server services

Complete the following steps to stop Microsoft Virtual Server services on a host:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the host where you want to stop Microsoft Virtual Server services.
2. Click **Host Management** → **Stop Host**.

---

## Deleting a VMM object from IBM Director

If you no longer require a VMM object, you can delete the managed object. VMM does not delete the virtualization component from VMware VirtualCenter or Microsoft Virtual Server. Later, if you decide that you want a managed object for a virtualization component, you can rediscover virtualization components. For more information, see “Manually discovering VMM objects” on page 21.

**Important:** Do not delete managed objects for coordinators, hosts, and guest operating systems. These managed objects represent real hardware on your network. After you uninstall VMM, these VMM objects are displayed as managed systems.

Complete the following steps to delete a VMM object:

1. From IBM Director Console, in the Group Contents pane, right-click a VMM object
2. Click **Delete**.



---

## Chapter 5. Running power operations on virtual machines

Virtual Machine Manager supports a subset of the power operations that you can perform on virtual machines by using VMware VirtualCenter or Microsoft Virtual Server. VMM does not provide any operations that specifically target guest operating systems or that run scripts. VMM cannot create or delete virtual machines that are created by VMware VirtualCenter or Microsoft Virtual Server. See the documentation that comes with the virtualization application for information about these types of operations.

**Note:** You cannot perform VMM power operations on virtual machines that contain undoable disks (VMware VirtualCenter) or that use the Undo Disks feature (Microsoft Virtual Server). For more information, see “Undoable disks” on page 21.

You can perform power operations in several different ways:

- Use the **Host Management** menu to perform a power operation for all virtual machines that are associated with a selected host.
- Use the **Power Management** menu to perform a power operation for a single virtual machine.

When you use either of these methods, IBM Director Console prompts you to run the operation immediately or to create a scheduled job for the operation. For information about the Scheduler, see the *IBM Director 4.20 Systems Management Guide*. Alternatively, you can use the Scheduler to create scheduled jobs for these power operations. For more information, see “Scheduler tasks for use with VMM objects” on page 7.

When you run a power operation immediately, the “Execution History” window is displayed and shows that the job is in progress.

**Note:** The execution history provides details only about start and completion of the job. It does not provide details about the success or failure of the VMM operations that are performed by the job. For that information, use the IBM Director Event Log task to view details about all operations that have been received and logged by IBM Director Server.

For information about the Event Log task, see the *IBM Director 4.20 Systems Management Guide*. For information about virtual machine operations that fail, see “Virtual machine task failures” on page 51.

Because VMM performs its operations in the background, IBM Director Console remains available for use when you perform power operations for virtual machines. You can determine that the power operation is completed by checking the job history or by watching the icons for the virtual machines.

When a virtual machine is undergoing a state transition that is initiated from IBM Director Console, the  icon is displayed for the virtual machine. After the state transition is completed, the applicable state icon is displayed for the virtual machine; for example, the  icon is displayed for the virtual machine when the virtual machine is powered-on. For more information about the icons that are used for a virtual machine object in IBM Director Console, see “Icons for virtual machine objects” on page 19.

---

## Power operations for all virtual machines on a host

Use the **Host Management** menu to perform power operations for all virtual machines that are associated with a single host. The **Host Management** menu is available when you right-click a host object in the Group Contents pane of IBM Director Console.

You can use the **Host Management** menu to perform the following power operations:

- Power-on all stopped virtual machines
- Suspend all running virtual machines
- Resume all suspended virtual machines
- Power-off all running virtual machines

**Important:** The power operations on the **Host Management** menu apply to all virtual machines that are associated with a system that is running VMware ESX Server or Microsoft Virtual Server, even those virtual machines that are not represented in IBM Director Console.

The selected power operation applies only to the virtual machines in the specified state. For example, a power-on operation applies only to virtual machines that are powered-off. It does not affect virtual machines that are already powered-on or suspended. This aspect is important to consider when you create IBM Director scheduled jobs for host management power operations that involve virtual machines.

Further, these power operations do not affect virtual machines that contain undoable disks (VMware VirtualCenter) or that use the Undo Disks feature (Microsoft Virtual Server).

### Powering-on all stopped virtual machines

Complete the following steps to power-on all stopped virtual machines that are associated with a single host:

1. From IBM Director Console, in the Group Contents pane, right-click the host.
2. Click **Host Management** → **Power On All Stopped Virtual Machines**.
3. Click **Execute Now** to perform the operation immediately or click **Schedule** to create a new scheduled job.

### Suspending all running virtual machines

Complete the following steps to suspend all running virtual machines that are associated with a single host:

1. From IBM Director Console, in the Group Contents pane, right-click the host.
2. Click **Host Management** → **Suspend All Running Virtual Machines**.
3. Click **Execute Now** to perform the operation immediately or click **Schedule** to create a new scheduled job.

## Resuming all suspended virtual machines

Complete the following steps to resume all suspended virtual machines that are associated with a single host:

1. From IBM Director Console, in the Group Contents pane, right-click the host.
2. Click **Host Management** → **Resume All Suspended Virtual Machines**.
3. Click **Execute Now** to perform the operation immediately or click **Schedule** to create a new scheduled job.

## Powering-off all running virtual machines

Complete the following steps to power-off all running virtual machines that are associated with a single host:

**Important:** This operation forces a virtual machine to power-off without an orderly shut down of its guest operating system. This immediately stops all applications that are in use on that guest operating system.

1. From IBM Director Console, in the Group Contents pane, right-click the host.
2. Click **Host Management** → **Force Power Off All Running Virtual Machines**.
3. Click **Execute Now** to perform the operation immediately or click **Schedule** to create a new scheduled job.

---

## Power operations for a single virtual machine

Use the **Power Management** menu to perform a power operation on a single virtual machine. The **Power Management** menu is available when you right-click a virtual machine object in the Group Contents pane of IBM Director Console. For more information about the **Power Management** task, see the *IBM Director 4.20 Systems Management Guide*.

You can use the **Power Management** menu to perform the power operations that are listed in Table 7.

Table 7. Power Management menu options for virtual machines

Menu option	Description
Power Off Now	The virtual machine is powered-off without an orderly shut down of its guest operating system. This immediately stops all applications that are in use on that guest operating system.
Power On	The virtual machine is powered-on.
Restart Now	The virtual machine is restarted immediately, which means that it is restarted without an orderly shut down of its guest operating system. This immediately stops all applications that are in use on that guest operating system.
Resume	The virtual machine resumes operation and is no longer suspended.
Shutdown and Power Off	(VMware VirtualCenter only) The guest operating system on the virtual machine is shut down in an orderly way, and then the virtual machine is powered-off.  (Microsoft Virtual Server only) If the guest operating system is a Windows operating system and if Microsoft Virtual Machine Additions is installed on the guest operating system, this menu option performs an orderly shut down of the guest operating system and then powers-off the virtual machine.
Suspend	The virtual machine remains powered-on but is suspended from use.

Only those operations that are applicable to the selected virtual machine are available on the **Power Management** menu. For example, if a virtual machine is suspended, the **Power Management menu** contains only the **Resume** menu option. Further, none of the available power operations can be used with virtual machines that contain undoable disks (VMware VirtualCenter) or that use the Undo Disks feature (Microsoft Virtual Server).

Complete the following steps to perform a power-management operation for a virtual machine:

1. From IBM Director Console, in the Group Contents pane, right-click the virtual machine.
2. Click **Power Management**; then, click the power operation that you want to perform. For example, click **Power Management → Power On**.
3. Click **Execute Now** to perform the operation immediately or click **Schedule** to create a new scheduled job.

## Chapter 6. Viewing VMM object attributes

Virtual Machine Manager creates attributes for the following VMM objects:

- Coordinators
- Farms
- Hosts
- Virtual machines

VMM does not create attributes for guest-operating-system objects.

### Displaying coordinator object attributes

Complete the following steps to display VMM object attributes for a coordinator:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the coordinator.
2. Click **Coordinator Management** → **VMM Object Attributes**. The “VMM Object Attributes” window opens.

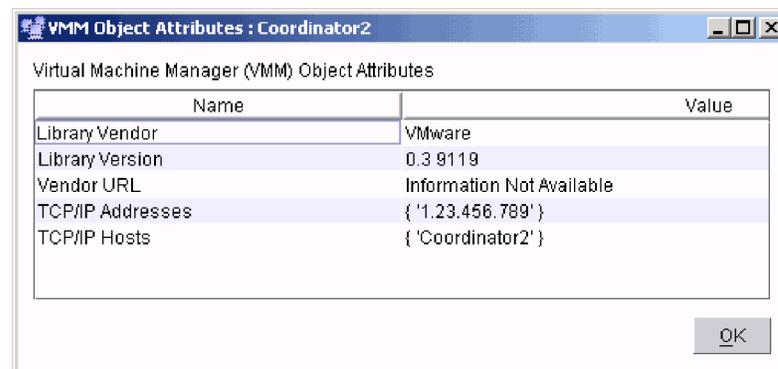


Figure 11. VMM object attributes for a coordinator

Table 8 describes the VMM object attributes for a coordinator.

Table 8. VMM object attributes for a coordinator

Attribute name	Description
Library Vendor	The name of the virtualization vendor that provides the API for the VMM object. For this release, the value is always VMware.
Library Version	The version of the vendor library that VMM is using.
Vendor URL	The Web address of the management interface for the coordinator as provided by the virtualization application. VMware VirtualCenter does not have a Web address of the management interface so this field has the value Information Not Available.
TCP/IP Addresses	The IP address of the server.
TCP/IP Hosts	The name of the server.

---

## Displaying farm object attributes

Complete the following steps to display VMM object attributes for a farm:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the farm.
2. Click **Farm Management** → **VMM Object Attributes**. The “VMM Object Attributes” window opens.

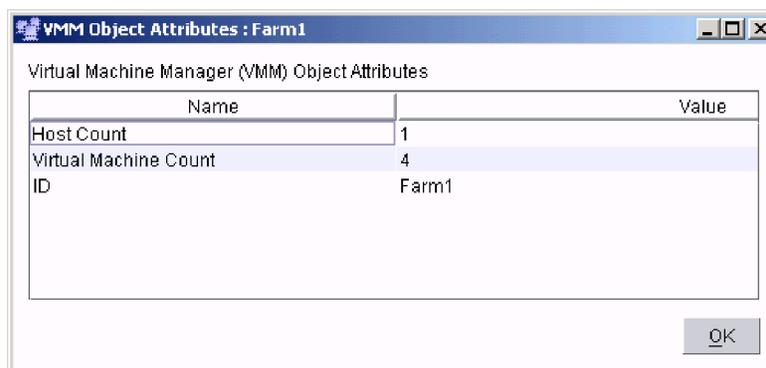


Figure 12. VMM object attributes for a farm

Table 9 describes the VMM object attributes for a farm.

Table 9. VMM object attributes for a farm

Attribute name	Description
Host Count	The number of hosts that are in the farm.
Virtual Machine Count	The number of virtual machines that are associated with the hosts in the farm.
ID	The name of the farm as it is known by the virtualization application. This name can be the same as, or different from, the name that is shown for the farm object in IBM Director Console.

---

## Displaying host object attributes

Complete the following steps to display VMM object attributes for a host:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the host.
2. Click **Host Management** → **VMM Object Attributes**. The “VMM Object Attributes” window opens.

This window displays different attributes depending on whether the host object represents a server that is running VMware ESX Server or Microsoft Virtual Server.

## Hosts in VMware VirtualCenter

Figure 13 shows the “VMM Object Attributes” window when the host object represents a server that is running VMware ESX Server in a VMware VirtualCenter environment.

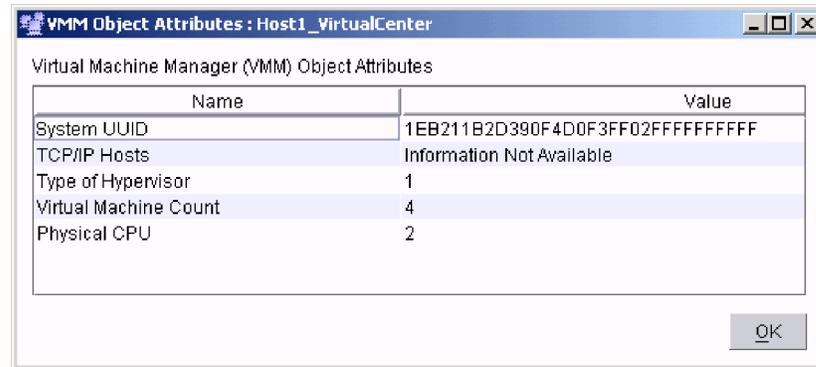


Figure 13. VMM object attributes for a host in a VMware VirtualCenter environment

Table 10 describes the VMM object attributes for a host object that represents a server that is running VMware ESX Server in a VMware VirtualCenter environment.

Table 10. VMM object attributes for a host in a VMware VirtualCenter environment

Attribute name	Description
System UUID	The UUID of the server. This attribute is the same as the IBM Director system attribute of the same name.
TCP/IP Hosts	The name of the server.
Type of Hypervisor	The type of hypervisor that is used by the server. For servers that are running VMware ESX Server, the type is always 1, which specifies that the hypervisor runs directly on the server.
Virtual Machine Count	The number of virtual machines that are associated with the host.
Physical CPU	The number of microprocessors (CPUs) that are in the server.

## Hosts in Microsoft Virtual Server

Figure 14 shows the “VMM Object Attributes” window when the host object represents a server that is running Microsoft Virtual Server.

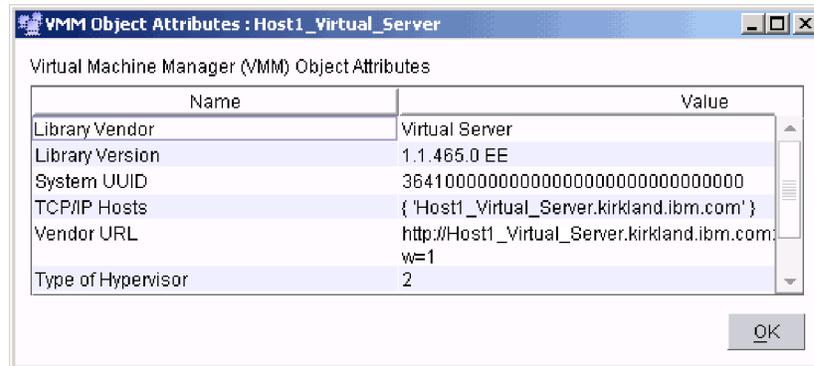


Figure 14. VMM object attributes for a host in a Microsoft Virtual Server environment

Table 11 describes the VMM object attributes for a host object that represents a server that is running Microsoft Virtual Server.

Table 11. VMM object attributes for a host in a Microsoft Virtual Server environment

Attribute name	Description
Library Vendor	The name of the virtualization vendor that provides the API for the VMM object. For this release, the value is always Virtual Server.
Library Version	The version of the vendor library that VMM is using.
System UUID	The UUID of the server. This attribute is the same as the IBM Director system attribute of the same name.
TCP/IP Hosts	The name of the server.
Vendor URL	The Web address of the management interface for the host as provided by the virtualization application.
Type of Hypervisor	The type of hypervisor that is used by the host object. For hosts in Microsoft Virtual Server, the type is always 2, which means that the hypervisor runs under control of the operating system.

## Displaying virtual machine object attributes

Complete the following steps to display VMM object attributes for a virtual machine:

1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the virtual machine.
2. Click **Virtual Machine Management** → **VMM Object Attributes**. The “VMM Object Attributes” window opens.

This window displays different attributes depending on whether the virtual machine object represents a virtual machine in a VMware VirtualCenter environment or a Microsoft Virtual Server environment.

## Virtual machines in VMware VirtualCenter

Figure 15 shows the “VMM Object Attributes” window when the virtual machine object represents a virtual machine that is associated with a host in a VMware VirtualCenter environment.

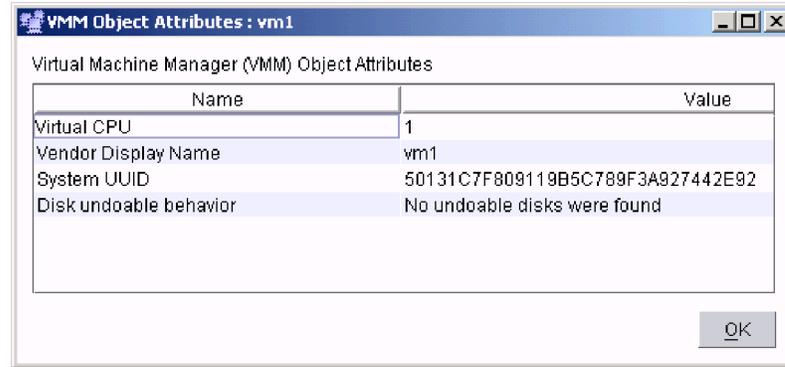


Figure 15. VMM object attributes for a virtual machine in a VMware VirtualCenter environment

Table 12 describes the VMM object attributes for a virtual machine that is associated with a host in a VMware VirtualCenter environment.

Table 12. VMM object attributes for a virtual machine in a VMware VirtualCenter environment

Attribute name	Description
Virtual CPU	The number of CPUs that are assigned to the virtual machine.
Vendor Display Name	The name of the virtual machine as it is known by the virtualization application. This name can be the same as, or different from, the name that is shown for the virtual machine object in IBM Director Console.
System UUID	The UUID of the virtual machine. This attribute is the same as the IBM Director system attribute of the same name.
Disk undoable behavior	The existence of undoable disks on the virtual machine. VMM indicates either that no undoable disks were found or that one or more undoable disks were found. For more information, see “Undoable disks” on page 21

## Virtual machines in Microsoft Virtual Server

Figure 16 shows the “VMM Object Attributes” window when the virtual machine object represents a virtual machine that is associated with a host in a Microsoft Virtual Server environment.

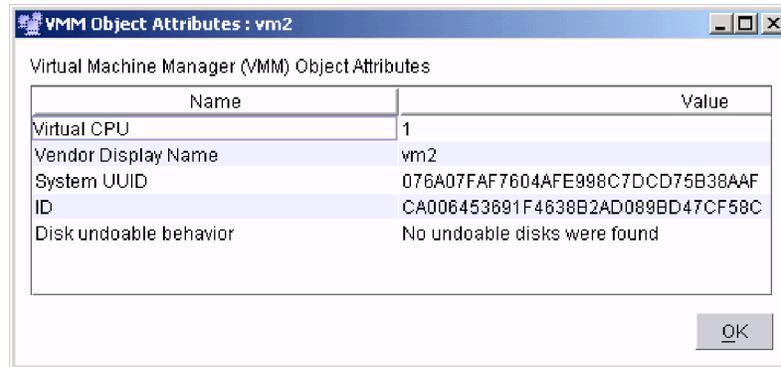


Figure 16. VMM object attributes for a virtual machine in a Microsoft Virtual Server environment

Table 13 describes the VMM object attributes for a virtual machine that is associated with a host in a Microsoft Virtual Server environment.

Table 13. VMM object attributes for a virtual machine in a Microsoft Virtual Server environment

Attribute name	Description
Virtual CPU	The number of CPUs that are assigned to the virtual machine.
Vendor Display Name	The name of the virtual machine as it is known by the virtualization application. This name can be the same as, or different from, the name that is shown for the virtual machine object in IBM Director Console.
System UUID	The UUID of the virtual machine. This attribute is the same as the IBM Director system attribute of the same name.
ID	The unique ID that identifies the virtual machine to Microsoft Virtual Server. This ID is assigned by Microsoft Virtual Server. You can use this ID to identify the virtual machine when you create scripts that use the Microsoft Virtual Server COM interface.
Disk undoable behavior	The existence of undoable disks on the virtual machine. VMM indicates either that no undoable disks were found or that one or more undoable disks were found. For more information, see “Undoable disks” on page 21.

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## Chapter 7. Solving Virtual Machine Manager problems

This chapter describes some of the problem symptoms and suggested solutions for Virtual Machine Manager. Multiple sections are used to list the problem symptoms depending on whether the symptom occurs with any supported virtualization environment, occurs only in a VMware VirtualCenter environment, or occurs only in a Microsoft Virtual Server environment.

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### Any supported virtualization environment

Table 14 describes some of the problem symptoms and suggested solutions for VMM when used in any supported virtualization environment.

*Table 14. VMM problems in any supported virtualization environment*

Symptom	Suggested action
<b>Event action plans</b>	
An event action in an event action plan does not occur when an event occurs.	Make sure that the event action plan is targeting the correct managed object; for example, if an event is for a virtual machine, the event action plan must be applied to a virtual machine and not any other VMM objects.

---

### VMware VirtualCenter environment

Table 15 describes some of the problem symptoms and suggested solutions for VMM when used in a VMware VirtualCenter environment.

*Table 15. VMM problems in a VMware VirtualCenter environment*

Symptom	Suggested action
<b>Communication with VMware VirtualCenter</b>	
An application exception error, an insufficient permission error, or a connection error occurs when you use the Start Vendor Software task to run the VMware VirtualCenter client from IBM Director.	Make sure that VMware VirtualCenter server is installed by a user that has administrator privileges on the installing system. If it was installed by a user that does not have administrator privileges, you either must assign administrator privileges to that user or reinstall VMware VirtualCenter server with a user that does have administrator privileges.
A login failure occurs when you try to enter credentials for a coordinator.	Make sure that the user that is running VMware VirtualCenter server has administrator privileges in VMware VirtualCenter. If it does not, log in to the VMware VirtualCenter client as a user with administrator privileges. Then, add administrator privileges to the user that does not have administrator privileges.

Symptom	Suggested action
<b>Unlocking coordinator objects</b>	
A coordinator object is locked, but Enter Credentials is not available in the right-click menu for the coordinator.	<p>This problem occurs when VMware VirtualCenter server has granted permission to IBM Director to perform operations on VMM objects, but later, someone changes the user ID and password of the VMware VirtualCenter server so access to the coordinator is no longer available.</p> <p>Complete the following steps to resolve this problem:</p> <ol style="list-style-type: none"> <li>1. From IBM Director Console, in the Group Contents pane, right-click the managed object for the coordinator; then, click <b>Coordinator Management</b> → <b>Revoke Credentials</b>.</li> <li>2. From IBM Director Console, in the Group Contents pane, right-click the managed object for the coordinator; then, click <b>Coordinator Management</b> → <b>Enter Credentials</b>.</li> <li>3. Type the new credentials for the coordinator in the “Enter Credentials” window. For information, see “Entering credentials for a coordinator” on page 23.</li> <li>4. Click <b>OK</b>.</li> </ol>
<b>Renaming farm groups</b>	
Unexpected behavior occurs for a farm object in any instance of IBM Director Server that is tracking activity on that farm object.	<p>This symptom can occur when a farm that is contained within a farm group is discovered in IBM Director and later that farm group is renamed in VMware VirtualCenter. After a farm group is renamed, you should revoke and enter credentials for the coordinator object that contains the farm object. For information, see “Credentials for coordinators” on page 23.</p>
<b>Virtual machine power operations</b>	
(Windows NT <sup>®</sup> 4.0 only) Virtual machines do not shut down and power-off as expected; instead, they power off without an orderly shut down of their operating system or they remain in a transition state.	<p>Install VMware Tools in the virtual machine so that shut down and power-off operations do not immediately power off virtual machine without an orderly shut down. For information about installing VMware Tools, see the VMware VirtualCenter documentation.</p> <p>However, even when VMware Tools are installed, shut down and power-off operations are not completed as expected from VMM. The guest operating system is shut down in an orderly way, but the virtual machine is not powered off. You must perform an additional operation to power off the virtual machine.</p> <p>Complete the following steps to perform a shut down and power-off of a virtual machine running Windows NT 4.0:</p> <ol style="list-style-type: none"> <li>1. Perform a shut down and power off operation for the virtual machine. For information, see “Power operations for a single virtual machine” on page 31. This action shuts down the operating system in an orderly way, but does not power off the virtual machine.</li> <li>2. Perform a second operation to power off the virtual machine. This second operation can be either another shut down and power off operation or a power off now operation.</li> </ol> <p><b>Note:</b> Before performing a power off now operation, make sure that the operating system has completely shut down on the virtual machine. One way to check this from IBM Director is to use the Remote Session task on the virtual machine.</p>

Symptom	Suggested action
<b>Virtual machine migration</b>	
<p>Failure codes 66 and 67 are returned even though migration is enabled on the system that is running VMware ESX Server.</p> <p>Failure code 84 is returned even though the virtual machine does not contain any undoable disks.</p> <p>Migration menu options are available for virtual machine objects even though VMotion is not enabled in VMware VirtualCenter.</p>	<p>These failure codes can be returned and the migration menu options can be available when VMM does not have the most up-to-date information about migration or undoable disk properties from the virtualization application.</p> <p>This situation occurs more frequently when multiple users are making changes to the properties. For example, migration failure codes can be returned when migration properties have been modified in VMware VirtualCenter while IBM Director Server is running.</p> <p>Use one of the following methods to refresh these properties in VMM Server:</p> <ul style="list-style-type: none"> <li>• From the Group Contents pane of IBM Director Console, right-click the host object for the virtual machine and click <b>Host Management</b> → <b>Discover Virtual Machines</b>.</li> <li>• From the Group Contents pane of IBM Director console, right-click the virtual machine object and click <b>Virtual Machine Management</b> → <b>VMM Object Attributes</b>.</li> </ul>

---

## Microsoft Virtual Server environment

Table 16 describes some of the problem symptoms and suggested solutions for VMM when used in a Microsoft Virtual Server environment.

*Table 16. VMM problems in a Microsoft Virtual Server environment*

Symptom	Suggested action
<b>Creation of virtual machine objects</b>	
<p>A virtual machine is created in a Microsoft Virtual Server environment, but a corresponding virtual machine object is not created in IBM Director.</p>	<p>Use Microsoft Virtual Server to power-on the newly-created virtual machine. Then, IBM Director and VMM will create a corresponding virtual machine object.</p>



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## Appendix A. Virtual Machine Manager event filters and actions

Virtual Machine Manager provides several events and event actions for use with VMM objects.

For more general information about event filters, event actions, and the Event Filter Builder, see the IBM Director help, the *IBM Director 4.20 Systems Management Guide*, and the *IBM Director 4.1 Events Reference*.

---

### Events provided by VMM

The events that are provided by VMM are for VMM objects. These events are in the **VMM** event type in the Event Filter Builder.

**Note:** Make sure that any event action plans that use these events are actually targeted to the applicable VMM object; otherwise, the intended actions will not occur.

Use the IBM Director Event Log task to view details about all VMM event types that have been received and logged by IBM Director Server.

Simple event filters can be created with or without specifying extended attributes for the event filter. The target object for an event filter is different depending on which method was used to create the event filter.

- If an event filter is created without specifying any extended attributes, the event action plan that contains this event filter should be applied directly to the VMM object identified as the target object in the tables that follow.
- If an event filter is created and it specifies values for extended attributes, the event action plan that contains this event filter can be applied directly to the VMM object identified as the target object or to any higher-level VMM objects that are associated with the target object.

For example, if you create an event filter with extended attributes that identifies a specific virtual machine, you can apply the event action plan that contains this event filter directly to the virtual machine itself or to its associated host, farm, or coordinator.

In this scenario, all VMM objects that are associated with the target object listed in the following tables will receive the event notification, which means that the IBM Director Event Log will contain one event for each associated VMM object, each with the same detail. To continue the example, there would be four log entries, one each for the coordinator, farm, host, and virtual machine.

## Virtual machine events

The virtual machine events are in the **Virtual Machine** subcategory of the **VMM** event type category.

Figure 17 shows the events for a virtual machine in the “Simple Event Filter Builder” window.

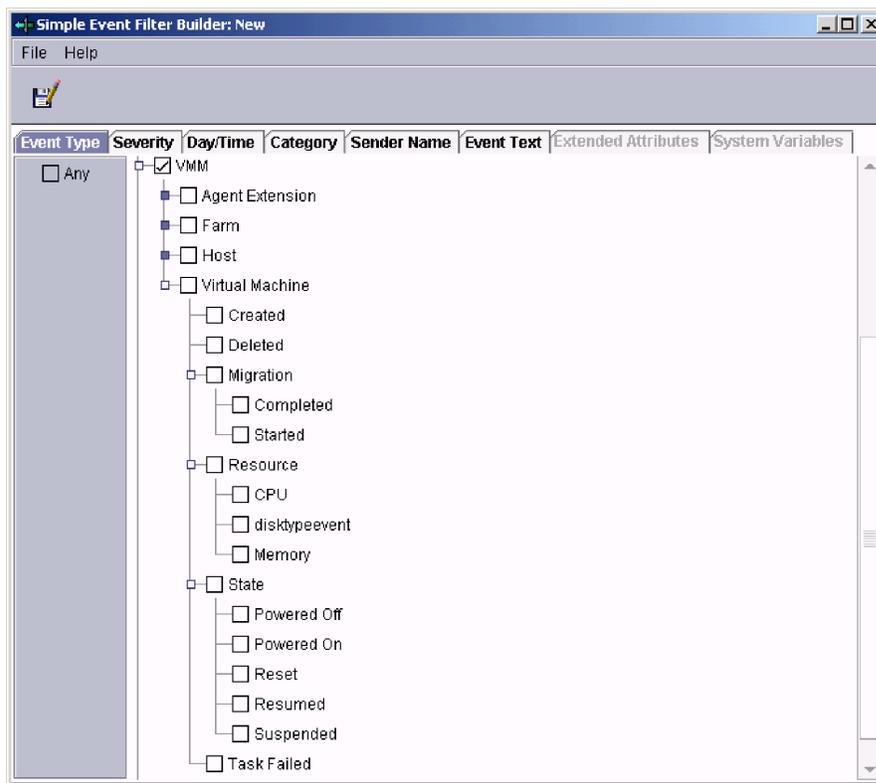


Figure 17. Virtual machine events in the “Simple Event Filter Builder” window

Table 17 defines the virtual machine events that are provided by VMM.

Table 17. Virtual machine events

Event subcategory	Additional event subcategory	Target object for event action plan	Event trigger	Description
Created		Virtual machine	A virtual machine object is created.	IBM Director Console displays a virtual machine object for a virtual machine.
Deleted		Virtual machine	A virtual machine object is deleted.	IBM Director Console no longer displays a virtual machine object for a virtual machine.
Migration	Started	Virtual machine	A virtual machine has started migration from one host to another.	VMM has started the migration of a virtual machine from one host to another.

Table 17. Virtual machine events (continued)

Event subcategory	Additional event subcategory	Target object for event action plan	Event trigger	Description
	Completed	Virtual machine	A virtual machine has completed migration from one host to another.	VMM has completed the migration of a virtual machine from one host to another.
Resource	CPU	Virtual machine	The values for the CPU resource for a virtual machine have changed.	(VMware VirtualCenter) One of the following events occur: <ul style="list-style-type: none"> <li>• The CPU count changes.</li> <li>• The CPU shares priority changes.</li> <li>• The CPU scheduling affinity changes.</li> </ul> (Microsoft Virtual Server) One of the following events occur: <ul style="list-style-type: none"> <li>• The reserved (minimum) or maximum capacity of CPU utilization changes.</li> <li>• The relative weight of the CPU changes.</li> </ul>
	Memory	Virtual machine	The values for the memory resource for a virtual machine have changed.	(VMware VirtualCenter) One of the following events occur: <ul style="list-style-type: none"> <li>• The memory size changes.</li> <li>• The minimum or maximum amount of memory changes.</li> <li>• The memory shares priority changes.</li> </ul> (Microsoft Virtual Server) One of the following events occur: <ul style="list-style-type: none"> <li>• The memory size changes.</li> </ul>
State	Powered off	Virtual machine	The state of a virtual machine has changed to powered-off.	A virtual machine is powered-off.
	Powered on	Virtual machine	The state of a virtual machine has changed to powered-on.	A virtual machine is powered-on.
	Reset	Virtual machine	The state of a virtual machine has changed to restarted.	A virtual machine is restarted.
	Resumed	Virtual machine	The state of a virtual machine has changed from suspended to powered-on.	A virtual machine resumes operations after being in the suspended state.

Table 17. Virtual machine events (continued)

Event subcategory	Additional event subcategory	Target object for event action plan	Event trigger	Description
	Suspended	Virtual machine	The state of a virtual machine has changed to suspended.	A virtual machine is suspended.
Task Failed		Virtual machine	An operation on a virtual machine has failed to be completed successfully.	A power or migration operation failed for a virtual machine. For more information, see “Virtual machine task failures” on page 51.

## Coordinator, farm, and host events

VMM also provides events for coordinators, farms and hosts. These events are in the **VMM** event type category.

Figure 18 shows the coordinator, farm, and host events for VMM objects in the “Simple Event Filter Builder” window.

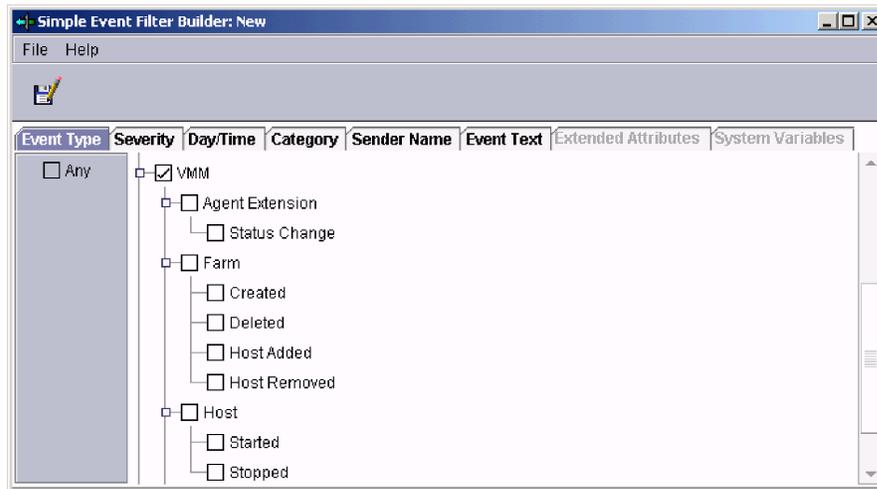


Figure 18. Coordinator, farm, and host events in the “Simple Event Filter Builder” window

Table 18 on page 47 defines the coordinator, farm, and host events that are provided by VMM.

Table 18. Coordinator, farm, and host events

Event subcategory	Additional event subcategory	Target object for event action plan	Event trigger	Description
Agent Extension	Status Change	Depends on the virtualization application: <ul style="list-style-type: none"> <li>Coordinator (VMware VirtualCenter)</li> <li>Host (Microsoft Virtual Server)</li> </ul>	VMM Agent detects a status change for the coordinator or the host.	The following are examples of such events: <ul style="list-style-type: none"> <li>VMM Agent is not running or the virtualization application is not installed.</li> <li>VMM Agent and the virtualization application are installed, but they are not communicating properly with each other.</li> <li>The coordinator or host is ready for use. For coordinators, this means that IBM Director has authenticated with VMware VirtualCenter server. For hosts, this means that Microsoft Virtual Server services are started.</li> <li>(VMware VirtualCenter only) The coordinator requires credentials. For more information, see “Credentials for coordinators” on page 23.</li> </ul>
Farm	Created	Farm	VMM Agent detects that a farm is created in a VMware VirtualCenter environment.	(VMware VirtualCenter only) IBM Director Console displays a farm object.
	Deleted	Farm	VMM Agent detects that a farm is deleted from a VMware VirtualCenter environment.	(VMware VirtualCenter only) IBM Director Console no longer displays a farm object.
	Host Added	Farm	VMM Agent detects that a host is added to a farm in a VMware VirtualCenter environment.	(VMware VirtualCenter only) IBM Director Console displays a host object under a farm object. <b>Note:</b> When this event occurs, a host object is displayed only when the managed system that represents the host has already been discovered by IBM Director.
	Host Removed	Farm	VMM Agent detects that a host is removed from a farm in a VMware VirtualCenter environment.	(VMware VirtualCenter only) IBM Director Console no longer displays a host object under a farm object.
Host	Started	Host	VMM Agent detects that Microsoft Virtual Server has started on a host.	(Microsoft Virtual Server only) Microsoft Virtual Server services are started on a host.

Table 18. Coordinator, farm, and host events (continued)

Event subcategory	Additional event subcategory	Target object for event action plan	Event trigger	Description
	Stopped	Host	VMM Agent detects that Microsoft Virtual Server has been stopped on a host.	(Microsoft Virtual Server only) Microsoft Virtual Server services are stopped on a host.

## Event actions provided by VMM

VMM adds several event action templates to IBM Director Event Action Plan Builder. To use these templates, from the “Event Action Plan Builder” window, right-click the template name; then, click **Customize** to create a custom event action.

By creating custom event actions, you can specify which action you want IBM Director to take as a result of the occurrence of an event that is triggered by an event filter. To create event filters for VMM objects, you can use VMM events. After you have created custom event actions and event filters, you can create an event action plan that contains specific filters and their associated actions. For example, you can create an event action plan that migrates a virtual machine after it has powered-on.

Each event action plan must target the applicable VMM object; otherwise the action that is defined in the plan will not occur. For example, if you have an event filter for the “Virtual Machine, Task Failed” event, it must be included in an event action plan that targets a virtual machine for it to trigger an action.

To use a custom event action, you must add it to an event filter that is already in an event action plan.

## Event actions for adding hosts to or removing hosts from farms

VMM provides the following event actions for adding hosts to or removing hosts from farms:

- Add a Host to a Farm
- Remove a Host from a Farm

### Add a Host to a Farm event action

The Add a Host to a Farm event action template has the following fields:

**Host** Designates the IP address or the name of the host that is to be added to the farm.

**Note:** Before you type a host name, make sure that the network environment is able to determine the IP address from the host name. Otherwise, the operation to add a host will fail. If you cannot determine the IP address of a host by using the **ping** command, type the IP address instead of the host name.

### User ID

Designates the user name for the administrator of the system. Generally,

this is root. This user name is used by VMware VirtualCenter server to communicate with the host that is running VMware ESX Server.

**Password**

Designates the password for the user name that you used.

**Port**

Designates the address of the port that VMware VirtualCenter server will use for communication with VMware ESX Server. By default, VMM uses port 902 for this communication. If the system that is running VMware ESX Server is configured to use a port address other than 902, type that port address in this field.

**Farm**

Identifies the farm to which the host is added.

**Notes:**

1. VMM Agent does not enable VMware VirtualCenter VMotion for the newly added host. If you want to migrate virtual machines to or from this host, you must use VMware VirtualCenter to enable VMotion for the host. For information about VMware VirtualCenter VMotion requirements, see the documentation that comes with VMware VirtualCenter.
2. This procedure will add a system that is running VMware GSX Server to VMware VirtualCenter, but it does not result in a host object for the system that is running VMware GSX Server. VMM does not support systems that are running VMware GSX Server.

**Remove a Host from a Farm event action**

The Remove a Host from a Farm event action template has the following fields:

**Farm**

Identifies the farm from which you want to remove a host.

**Host**

Identifies the host to remove from the farm.

## Event actions for performing power operations on virtual machines

VMM provides the following event actions for performing power operations on virtual machines:

- Manage a Host
- Manage a Virtual Machine

**Note:** VMM power operations do not apply to virtual machines that contain undoable disks (VMware VirtualCenter) or that use the Undo Disks feature (Microsoft Virtual Server). For more information, see “Undoable disks” on page 21.

**Manage a Host event action**

The Manage a Host event action template has the following fields:

**Host**

Identifies the host that you want to manage.

**Action**

Identifies the function that you want to perform on the host.

Table 19 describes the available functions.

*Table 19. Actions available for Manage a Host event action*

Action	Description
Start (Virtual Server only)	(Microsoft Virtual Server only) Starts Microsoft Virtual Server services on the host. You can use this event action only for hosts that are currently stopped.

Table 19. Actions available for Manage a Host event action (continued)

Action	Description
Stop (Virtual Server only)	(Microsoft Virtual Server only) Stops Microsoft Virtual Server services on the host. You can use this event action only for hosts that are currently started.
Power off all virtual machines	Powers-off all running virtual machines that are associated with a single host without an orderly shut down of any guest operating systems.
Power on all virtual machines	Powers-on all stopped virtual machines that are associated with a single host.
Resume all virtual machines	Resumes all suspended virtual machines that are associated with a single host.
Suspend all virtual machines	Suspends all running virtual machines that are associated with a single host.

## Manage a Virtual Machine event action

The Manage a Virtual Machine event action template has the following fields:

### Virtual Machine

Identifies the virtual machine that you want to manage.

### Action

Identifies the function that you want to perform on the virtual machine. Table 20 describes the available functions.

Table 20. Actions available for Manage a Virtual Machine event action

Action	Description
Power on	The virtual machine is powered-on.
Shut down and power off	(VMware VirtualCenter only) The guest operating system on the virtual machine is shut down in an orderly way, and then the virtual machine is powered-off.  (Microsoft Virtual Server only) If the guest operating system is a Windows operating system and if Microsoft Virtual Machine Additions is installed on the guest operating system, this menu option performs an orderly shut down of the guest operating system and then powers-off the virtual machine.
Power off now	The virtual machine is powered-off without an orderly shut down of its guest operating system. This will immediately stop all applications that are in use on that guest operating system.
Suspend	The virtual machine remains powered-on but is suspended from use.
Resume	The virtual machine resumes operation and is no longer suspended.
Restart now	The virtual machine is restarted immediately, which means that it is restarted without an orderly shut down of its guest operating system. This will immediately stop all applications that are in use on that guest operating system.

## Event actions for migrating virtual machines

Event actions for migration of virtual machines apply only to virtual machines that are associated with hosts that are running VMware ESX Server.

VMM provides the following event actions for migrating virtual machines:

- Migrate All Virtual Machines
- Migrate a Virtual Machine

Before using these event actions to migrate virtual machines, read the following information:

- VMware VirtualCenter VMotion must be enabled on both the source host and destination host between which you want to migrate virtual machines. Use VMware VirtualCenter client to enable VMotion for the applicable hosts. For information about VMware VirtualCenter VMotion requirements, see the documentation that comes with VMware VirtualCenter.
- A virtual machine must be powered-on or powered-off before you can migrate it. You cannot migrate a virtual machine that is in the suspended state.
- VMM does not support migration of a virtual machine that contains one or more undoable disks. For more information about undoable disks, see “Undoable disks” on page 21.

### Migrate all Virtual Machines event action

The Migrate all Virtual Machines event action template has the following fields:

#### Source Host

Identifies the host that is associated with the virtual machines that you want to migrate.

#### Destination Host

Identifies the host to become associated with the migrated virtual machines.

### Migrate a Virtual Machine event action

The Migrate a Virtual Machine event action template has the following fields:

#### Virtual Machine

Identifies the virtual machine that you want to migrate.

#### Host

Identifies the host to become associated with the migrated virtual machine.

---

## Virtual machine task failures

When an operation on a virtual machine fails, the “Virtual Machine, Task Failed” event occurs. Use the IBM Director Event Log task to view details about this failed event. Click the **VMM.Virtual Machine.TaskFailed** event type; then, in the Extended Attributes pane of the “Event Log” window, locate the command code and the failure code for this event. These extended attributes are defined in the following way:

#### Command codes

The virtual machine task that failed.

#### Failure codes

The cause of the failure.

## Command codes for virtual machine task failures

Table 21 lists the command codes and describes their meanings.

*Table 21. Command codes that are returned by Virtual Machine, Task Failed events*

Command code	Task description
131	Power-on all virtual machines that are associated with a host
132	Force power-off for all virtual machines that are associated with a host
137	Suspend all virtual machines that are associated with a host
138	Migrate all virtual machines that are associated with a host
139	Resume all virtual machines that are associated with a host
151	Power-on a single virtual machine
152	Force power-off to a single virtual machine
153	Orderly shut down and power-off a single virtual machine
154	Force a reset on a single virtual machine
157	Suspend a single virtual machine
159	Resume a single virtual machine
161	Migrate a single virtual machine

## Failure codes for virtual machine task failures

Table 22 lists the failure codes and describes their meanings.

*Table 22. Failure codes that are returned by Virtual Machine, Task Failed events*

Failure code	Failure description
15	An error occurred with the operation, but VMM Agent cannot determine the cause of the error.
60	A power operation timed out because it was not completed in the time that was expected by the virtualization application.
61	The host that is associated with this virtual machine is out of memory to perform the operation. This failure code generally occurs when you try to power-on or resume a virtual machine, which indicates that the host might need more memory to run the virtual machine.
62	The host that is associated with this virtual machine received a disk-related error. This failure code generally occurs when a power operation tries to write to or read from a disk.
63	(Microsoft Virtual Server only) The operation was cancelled by a script that was run from Microsoft Virtual Server.
64	(VMware VirtualCenter only) The host to which you are migrating a virtual machine could not be found. This failure code generally occurs when an event action plan is created to migrate virtual machines. Make sure that the host will be online when the event action plan is applied.
65	(VMware VirtualCenter only) The host from which you are migrating a virtual machine could not be found. This failure code generally occurs when an event action plan is created to migrate virtual machines. Make sure that the host will be online when the event action plan is applied.

Table 22. Failure codes that are returned by Virtual Machine, Task Failed events (continued)

Failure code	Failure description
66	(VMware VirtualCenter only) The host from which you are migrating a virtual machine is not enabled for virtual machine migration. Use VMware VirtualCenter to enable VMware VirtualCenter VMotion for the applicable VMware ESX Server host.
67	(VMware VirtualCenter only) The host to which you are migrating a virtual machine is not enabled for virtual machine migration. Use VMware VirtualCenter to enable VMware VirtualCenter VMotion for the applicable VMware ESX Server host.
68	(VMware VirtualCenter only) A virtual machine was not migrated as it was not in the correct state for a migration operation. Virtual machines must be powered-on or powered-off to be migrated. This failure code generally occurs when an event action plan is created to migrate virtual machines. Make sure that the virtual machine will be powered-on or powered-off when the event action plan is applied.
69	(VMware VirtualCenter only) A virtual machine is not found. This failure code generally occurs when an event action plan is created to migrate virtual machines. Make sure that the virtual machine will be available when the event action plan is applied.
84	(VMware VirtualCenter only) A virtual machine is not migrated because it contained undoable disks. For information, see “Undoable disks” on page 21.

**Note:** Failure codes 66, 67, and 84 can be returned when VMM does not have the most up-to-date information about migration or undoable disk properties from the virtualization application. This situation occurs more frequently when multiple users are making changes to the properties. For example, migration failure codes can be returned when migration properties have been modified in VMware VirtualCenter while IBM Director Server is running. For details, see Chapter 7, “Solving Virtual Machine Manager problems,” on page 39.



---

## Appendix B. Terminology summary and abbreviation list

This appendix provides a summary of Virtual Machine Manager terminology and a list of abbreviations that are used in this document.

---

### VMM terminology summary

The hardware in a VMM environment is referred to in the following ways:

- A *system* is a server, workstation, desktop computer, or mobile computer.
- A *management server* is a server on which IBM Director Server and VMM Server are installed.
- A *management console* is a system on which IBM Director Console and VMM Console are installed. In a VMware VirtualCenter environment, this system must also be installed with VMware VirtualCenter client.
- A *managed system* is a system on which IBM Director Agent and a virtualization application are installed.

The software and its components in a VMM environment are referred to in the following ways:

- A *virtualization application* is one of the following applications:
  - VMware VirtualCenter server
  - VMware ESX Server
  - Microsoft Virtual Server
- A *virtualization component* is a software element that is created by a virtualization application.
- A *VMM object* is an IBM Director managed object that represents the virtualization components in a VMware VirtualCenter environment or in a Microsoft Virtual Server environment. VMM objects include coordinators, farms, hosts, virtual machines, and guest operating systems.

The following VMM objects are used by VMM:

- A *coordinator* is a managed object that represents a system on which all of the following software is running:
  - VMware VirtualCenter server
  - VMware VirtualCenter Web service
  - IBM Director Agent
  - VMM Agent
- A *farm* is a managed object that represents a collection of hosts and their associated virtual machines as defined by a farm configured on a VMware VirtualCenter server.
- A *host* is a managed object that represents a system on which one of the following combinations of software are running:
  - VMware ESX Server and IBM Director Agent
  - Microsoft Virtual Server, IBM Director Agent, and VMM Agent.
- A *virtual machine* is a managed object that represents a virtual machine that is associated with a system that is running VMware ESX Server or Microsoft Virtual Server.

- A *guest operating system* is a managed object that represents an operating system that is running in a virtual machine and on which IBM Director Agent is installed.

---

## Abbreviation list

The following table lists abbreviations that are used in the VMM document.

Abbreviation	Definition
API	application programming interface
CPU	microprocessor
GUI	graphical user interface
HTTP	Hypertext Transfer Protocol
IP	Internet Protocol
MB	megabyte
PDF	Portable Document Format
TCP/IP	Transmission Control Protocol/Internet Protocol
UUID	universal unique identifier
VMM	IBM Virtual Machine Manager

---

## Appendix C. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM® products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your xSeries or IntelliStation® system, and whom to call for service, if it is necessary.

---

### Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your VMM documentation (see Chapter 7, “Solving Virtual Machine Manager problems,” on page 39) and other system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD or in the *IntelliStation Hardware Maintenance Manual* at the IBM Support Web site.
- Go to the IBM Support Web site at <http://www.ibm.com/pc/support/> to check for technical information, hints, tips, and new device drivers.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

---

### Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/pc/support/> and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at <http://www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi>.

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## Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/intellistation/>.

You can find service information for your IBM products, including supported options, at <http://www.ibm.com/pc/support/>.

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## Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to <http://www.ibm.com/services/sl/products/>.

For more information about Support Line and other IBM services, go to <http://www.ibm.com/services/>, or go to <http://www.ibm.com/planetwide/> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

---

## Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to <http://www.ibm.com/planetwide/> for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

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# Glossary

## A

**association.** (1) A way of displaying the members of a group in a logical ordering. For example, the Object Type association displays the managed objects in a group in folders based on their type. (2) A way to display additional information about the members of the group. For example, the Event Action Plans association displays any event action plans applied to the managed objects in the group in an Event Action Plan folder.

## C

**coordinator.** A managed object that represents a physical system on which all of the following software is running: VMware VirtualCenter server, VMware VirtualCenter Web service, IBM Director Agent, and VMM Agent.

**credentials.** A security feature of Virtual Machine Manager that enables you to log in to and log off from the VMware management interface for a system that is running VMware VirtualCenter server (coordinator).

## E

**event.** An occurrence of a predefined (in IBM Director) condition relating to a specific managed object that identifies a change in a system process or a device. The notification of that change can be generated and tracked, for example, notification that a managed system is offline.

**event action.** The action that IBM Director takes in response to a specific event or events. In the Event Action Plan Builder, you can customize an event action type by specifying certain parameters and saving the event action. You must assign the customized event action (and an event filter) to an event action plan before IBM Director can execute the event action.

**event action plan.** A user-defined plan that determines how IBM Director will manage certain events. An event action plan comprises one or more event filters and one or more customized event actions. The event filters specify which events are managed, and the event actions specify what happens when the events occur.

**Event Action Plan wizard.** An IBM Director Console wizard that can be used to create simple event action plans.

**event filter.** A filter that specifies the event criteria for an event action plan. Events must meet the criteria specified in the event filter in order to be processed by the event action plan that the filter is assigned to.

**extension.** See IBM Director extension.

## F

**farm.** A managed object that represents a collection of hosts and their associated virtual machines as defined by a farm configured on a VMware VirtualCenter server.

## G

**group.** A logical set of managed objects. Groups can be dynamic, static, or task-based.

**guest operating system.** An managed object that represents an operating system that is running on a virtual machine and on which IBM Director Agent is installed.

## H

**host.** A managed object that represents a system that contains one of the following sets of software:

- VMware ESX Server and IBM Director Agent
- Microsoft Virtual Server, IBM Director Agent, and VMM Agent

**hypervisor.** The portion of the virtualization application that provides scheduling and management of essential system resources among the virtual machines that are running under one hypervisor. These system resources include memory, processors, and I/O.

VMM recognizes two types of hypervisor. VMware ESX Server is an example of a type 1 hypervisor; this type of hypervisor runs directly on the server itself. Microsoft Virtual Server is an example of a type 2 hypervisor; this type of hypervisor is layered above and running under control of the operating system on that server.

## I

**IBM Director Agent.** A component of IBM Director software. When IBM Director Agent is installed on a system, the system can be managed by IBM Director. IBM Director Agent transfers data to the management server using several network protocols, including TCP/IP, NetBIOS, IPX, and SNA.

**IBM Director Console.** A component of IBM Director software. When installed on a system, it provides a graphical user interface (GUI) that you can use to access IBM Director Server. IBM Director Console transfers data to and from the management server using TCP/IP.

**IBM Director extension.** A tool that extends the functionality of IBM Director. IBM Director extensions include the IBM Server Plus Pack, Remote Deployment Manager, Software Distribution, VMM, and others.

**IBM Director Server.** The main component of IBM Director software. When installed on the management server, it provides basic functions such as discovery of the managed systems, persistent storage of configuration and management data, an inventory database, event listening, security and authentication, management console support, and administrative tasks.

## M

**managed group.** A group of systems or objects managed by IBM Director.

**managed object.** An item managed by IBM Director. Managed objects include managed systems, Windows NT® clusters, BladeCenter™ chassis, management processors, SNMP devices, multi-node servers (scalable systems), scalable partitions, physical platforms, scalable nodes, and remote I/O enclosures. In IBM Director Console, a managed object is represented by an icon that shows its type (such as chassis, cluster, system, or scalable system, for example represents a managed object).

**managed system.** A system (server, desktop computer, workstation, or mobile computer) on which IBM Director Agent is installed. Such a system is managed by IBM Director. In VMM, a managed system is installed with IBM Director Agent and one of the following virtualization applications:

- VMware VirtualCenter server
- VMware ESX Server
- Microsoft Virtual Server

**management console.** A system (server, desktop computer, workstation, or mobile computer) on which IBM Director Console and VMM Console is installed. In a VMware VirtualCenter environment, this system must also be installed with VMware VirtualCenter client.

**management server.** The server on which IBM Director Server and VMM Server is installed.

## P

**pause.** See suspend.

## R

**resume.** A power operation on a suspended virtual machine that returns the virtual machine to normal operation.

## S

**suspend.** A virtual machine state where the virtual machine remains powered-on but all activity is stopped and the virtual machine does not consume microprocessor resources. Applications that were active when the virtual machine was suspended remain suspended until operations are resumed on the virtual machine.

## U

**undoable disk.** A type of virtual disk on a virtual machine that saves changes to a temporary file instead of to the virtual disk itself. Changes can be committed when the virtual machine is powered-off. VMM does not support power operations or migration for virtual machines that contain any undoable disks.

**universal unique identifier (UUID).** A 128-bit character string guaranteed to be globally unique and used to identify components under management. The UUID enables inventory-level functionality and event tracking of VMM objects.

**UUID.** See universal unique identifier.

## V

**virtual machine.** A managed object that represents a virtual machine that is associated with a system that is running VMware ESX Server or Microsoft Virtual Server.

**virtualization application.** One of the following applications:

- VMware VirtualCenter server
- VMware ESX Server
- Microsoft Virtual Server

**virtualization component.** A software element that is created by a virtualization application.

**VMM object.** A managed object that represents the virtualization components in a VMware VirtualCenter environment or in a Microsoft Virtual Server environment. VMM objects include coordinators, farms, hosts, virtual machines, and guest operating systems.

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