IBM

IBM Power Virtualization Center

Installation and User's Guide

Version 1.1

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> **Note**
>
> Before using this information and the product it supports, read the information in "Notices" on page 63.

Contents

About this book

IBM® Power® Virtualization Center is designed to simplify the management of virtual resources in your Power Systems™ environment. This topic provides an overview of what you can do using IBM PowerVC.

This topic collection contains information about how to perform such tasks as monitoring utilization of resources, migrating a virtual machine, and creating and resizing volumes to virtual machines.

Highlighting

The following highlighting conventions are used in this document:

Bold	Identifies commands, subroutines, keywords, files, structures, directories, and other items whose names are predefined by the system. Also identifies graphical objects such as buttons, labels, and icons that the user selects.
Italics	Identifies parameters whose actual names or values are to be supplied by the user.
`Monospace`	Identifies examples of specific data values, examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, messages from the system, or information you should actually type.

Who should read this book

This book is for system administrators and operators using IBM Power Virtualization Center to manage virtual resources in aPower Systems environment.

Conventions and terminology

These notices are 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 appears before the instruction or situation in which damage can occur.

Related Information

You can find additional information about tools and resources that relate to IBM Power Virtualization Center. To view a PDF file, you need Adobe Acrobat Reader, which can be downloaded for free from the Adobe Web site at http://get.adobe.com/reader/.

A Practical Guide for Resource Monitoring and Control (RMC)

http://www.redbooks.ibm.com/abstracts/sg246615.html

IBM Power Virtualization Center Programmer's Guide
http://www.ibm.com/support/fixcentral

Integrated Virtualization Manager for IBM Power Systems Servers

http://www.redbooks.ibm.com/abstracts/redp4061.html

OpenStack
http://www.openstack.org/

Power Systems Hardware information center
http://pic.dhe.ibm.com/infocenter/powersys/v3r1m5/index.jsp?

Power Systems Hardware information center
http://pic.dhe.ibm.com/infocenter/powersys/v3r1m5/index.jsp?

Chapter 1. Introduction to IBM Power Virtualization Center

IBM Power Virtualization Center is designed to simplify the management of virtual resources in your Power Systems environment. This topic provides an overview of what you can do using IBM PowerVC.

Using IBM Power Virtualization Center, you can do the following:

- Register physical hosts, a storage system, and network resources and use them to create a virtual environment.
- Create, resize, and attach volumes to virtual machines.
- Monitor the utilization of the resources that are in your environment.
- Migrate virtual machines while they are running (hot migration).
- Capture a running virtual machine that is configured just the way you want it to be. When you capture the virtual machine, an image is created that can be deployed multiple times in your environment.
- Deploy images quickly to create new virtual machines that meet the demands of your ever-changing business needs.

Chapter 2. Setting up the IBM Power Virtualization Center environment

Before you can install and use IBM PowerVC, you must ensure that your environment is configured correctly. This includes using supported hardware and software as well as configuring storage, hosts, and network resources.

The following diagram shows an overview of a PowerVC environment:
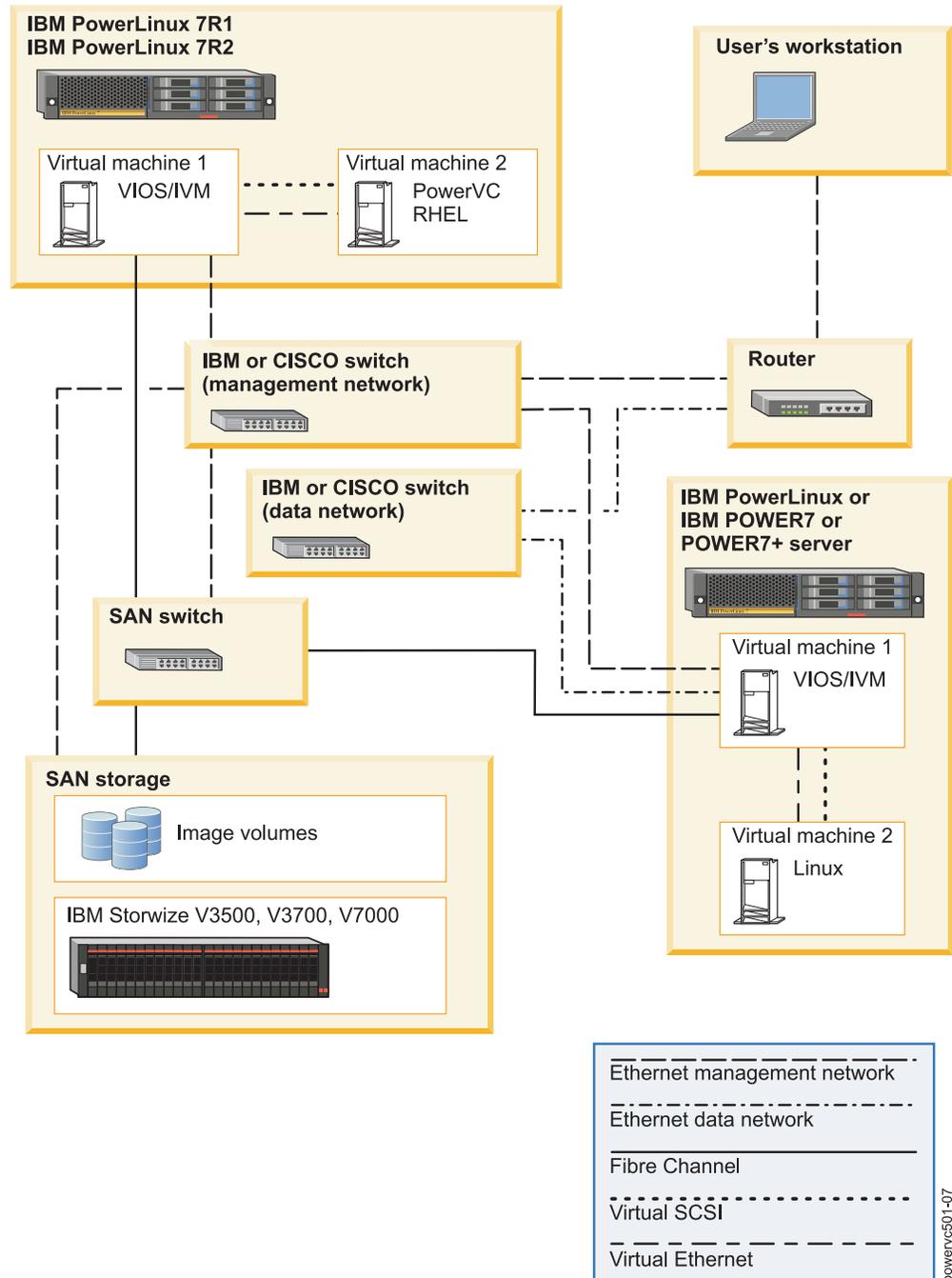
You may have some variation in your environment, such as the number or model of hosts that you have, but the steps for configuring the environment are the same as what is described here. Following are some of the high-level requirements for each of the components of the environment:

Storage

- Only a single storage system is supported.
- The storage system must be one of the supported models.
- At least one supported Fibre Channel SAN switch is required for interaction between your hosts and the storage area network. If possible, you should use two SAN switches and create redundant fabrics.

Hosts

- The hosts must be supported IBM PowerLinux or Power Systems models.

  Note: The hosts you manage should be either IBM PowerLinux or POWER7® and POWER7+™ models and not a mixture.
- A maximum of five hosts is supported, including the host on which PowerVC is installed.
- The hosts can have a maximum of 100 virtual machines on them (combined).
- Each host must have a Virtual I/O Server (VIOS) virtual machine that has the Integrated Virtualization Manager (IVM) enabled on it. The Integrated Virtualization Manager needs to be configured with some specific settings to support some PowerVC tasks.

In addition, the management host must meet the following requirements:

- Must have a virtual machine (logical partition) on it that meets the minimum requirements for PowerVC.
- The management virtual machine must have Red Hat Enterprise Linux version 6.4 installed on it.

  Important: The management virtual machine should be reserved for PowerVC and the operating system on which it runs. Do not install other software into it.

Network

- One supported network switch to enable network traffic among your hosts and storage. If possible, you should separate your data and management networks. To do so, you need two network switches.
- One Shared Ethernet Adapter must be configured on each host with a maximum of one virtual LAN (VLAN).
- To enable Resource Monitoring and Control (RMC) connections, each VLAN must be routable to the hosting IVM network
- The PowerVC virtual machine must be able to communicate with the SAN Volume Controller and all of the Virtual I/O Server virtual machines on the network.

The following table provides an overview of the steps you need to follow to set up your PowerVC environment and provides a link to information that helps you perform the steps.

Table 1. Steps for setting up a PowerVC environment.

Step	Task	Reference
1.	Unpack your IBM PowerLinux or Power Systems hardware and cable the systems according to the information provided for your model or models. Cabling includes the following: • Connect the power cable. • Connect the network cables. • Connect the Fibre Channel cables.	Refer to the information for your model or models in the IBM Power Systems Hardware information center at the following link: http://pic.dhe.ibm.com/ infocenter/powersys/ v3r1m5/topic/ipha8/ hwicwelcome.htm
2.	Configure the storage controller and SAN switch or switches.	Configuring the storage controller and SAN switch or switches
3.	Configure the network switch or switches.	Consult the documentation for your network switches for information on how to configure them. You must have at least one network switch for the server's data network. Optionally, the management network can be connected to a different switch.
4.	Configure the VLANs on the physical switches.	Configuring VLANs on the physical switches
5.	Configure the domain name server (optional).	If you are using a domain name server, ensure that it is properly configured on the system before installing IBM PowerVC. Consult the documentation for your domain name server for information on how to do that configuration. The domain name server must be able to resolve the host name of the system that IBM PowerVC is being installed on.

Table 1. Steps for setting up a PowerVC environment. (continued)

Step	Task	Reference
6.	Configure your hosts. This step includes the following sub-steps: 1. Installing the Virtual I/O Server and enabling the Integrated Virtualization Manager. 2. Accepting the Virtual I/O Server license agreement. 3. Configuring the Virtual I/O Server . 4. Configuring the gateway. 5. Activating the PowerVM® Enterprise Edition or the PowerVM for IBM PowerLinux hardware features. 6. Creating a Shared Ethernet Adapter that is backed by a single adapter or by a link aggregation. The Shared Ethernet Adapter must have a single primary virtual Ethernet adapter. 7. Changing the logical-memory block size. 8. Setting the maximum number of virtual resources. 9. Creating the virtual media repository (for deploying ISO images). 10. Making sure there is enough temporary storage space to store ISO images during a deploy operation.	Configuring the hosts
7.	Configure zoning on your SAN switch or switches.	Configuring zoning on your SAN switch or switches

Table 1. Steps for setting up a PowerVC environment. (continued)

Step	Task	Reference
8.	Ensure that all of your Integrated Virtualization Manager instances can communicate with your storage controller.	If your storage controller does not use VLAN tagging, configure the edge switch port that the storage controller connects to with the appropriate port VLAN ID. This lets the storage controller's management traffic pass through. For instructions, refer to the documentation that came with your edge switch.
9.	Prepare the management host for PowerVC. This step includes the following sub-steps: 1. Creating the management virtual machine that will host PowerVC. 2. Installing Red Hat Enterprise Linux 6.4 in the management virtual machine.	Preparing the management host

Related concepts:

"Capture requirements" on page 38

"Deploy requirements" on page 35

"Migration requirements" on page 43

Related tasks:

Chapter 4, "Getting started with IBM Power Virtualization Center," on page 27

Chapter 3, "Installing IBM Power Virtualization Center from media," on page 25

Related information:

➡ Power Systems Hardware information center (http://pic.dhe.ibm.com/ infocenter/powersys/v3r1m5/index.jsp?)

➡ Integrated Virtualization Manager for IBM Power Systems (http://www.redbooks.ibm.com/abstracts/redp4061.html)

Hardware and software requirements

The following information provides a consolidated view of the hardware and software requirements for your IBM Power Virtualization Center environment.

Hosts

Table 2. Hardware and software supported on PowerVC hosts

Item	Requirement
Hardware	IBM PowerLinux 7R1 and 7R2 servers, or IBM POWER7 and POWER7+ servers. **Note:** The hosts you manage should be either IBM PowerLinux or POWER7 and POWER7+ models and not a mixture.
Operating system that must be installed on the PowerVC management host	Red Hat Enterprise Linux (RHEL), version 6.4
Operating systems that can be managed by PowerVC	• Red Hat Enterprise Linux 5.9 and 6.4 • SUSE Linux Enterprise Server (SLES), version 11 SP2 • AIX®, version 6.1 TL8 and AIX 7.1 TL2
Virtual I/O Server (VIOS), which includes the Integrated Virtualization Manager (IVM)	Version 2.2.1.5 or later **Note:** Must use a single Shared Ethernet Adapter. Multiple Shared Ethernet Adapters are not supported.
Fibre Channel cards	Fibre Channel cards must be suitable for connecting to the SAN switches.

The virtual machine that you install IBM PowerVC into must have the following characteristics:

Table 3. Minimum resource requirements for the PowerVC virtual machine.

System resource	Amount
Processors	**Minimum:** An uncapped shared processor virtual machine with 1.0 processor unit of entitled processing capacity and 2 virtual processors. **Recommended (one of the following):** • An uncapped shared processor virtual machine with a minimum of 2.0 processor units of entitled processing capacity and 2 virtual processors. • A virtual machine with 2 dedicated processors.
Memory	10 Gigabytes
Hard disk	40 Gigabytes **Tip:** You must temporarily store ISO images before you import them into PowerVC. If you plan to store them temporarily on your PowerVC virtual machine, then you may need to create the virtual machine with more than the minimum 40 GB of hard disk space. Choose the size based on the number and size of the ISO images that you plan to import.

Network

Table 4. PowerVC-supported network hardware and software

Item	Requirement
Network switches that are supported by PowerVC	Any entry-level IBM or Cisco switch that supports VLAN tagging **Note:** PowerVC does not manage network switches.

Storage

Table 5. PowerVC-supported storage hardware

Item	Requirement
Storage systems that can be managed by PowerVC **Note:** PowerVC supports using only one storage system.	Version 6.4 or higher of IBM Storwize® V3500 (China only), V3700, and V7000
Storage area network (SAN) switches that are supported by PowerVC	IBM System Networking SAN24B-5 **Note:** PowerVC does not manage the SAN switch.

Web browsers

- Google Chrome, version 25
- Firefox ESR, version 17.0
- Microsoft Internet Explorer, version 10.0
- Microsoft Internet Explorer, version 9.0
- Microsoft Internet Explorer, version 8.0

Related concepts:

"Capture requirements" on page 38

"Deploy requirements" on page 35

Related tasks:

"Installing Red Hat Enterprise Linux in the management virtual machine" on page 21

Chapter 3, "Installing IBM Power Virtualization Center from media," on page 25

Configuring the storage controller and SAN switch

You must initially configure your storage controller and storage area network (SAN) switch before you install IBM Power Virtualization Center.

Before you begin, decide how you want to connect remotely to the storage controller. If you are using user authentication, make sure to retain the user name and password for the storage controller. Otherwise, plan on using key pairs to connect remotely to the storage controller. For instructions to generate key pairs, see the documentation for your device.

To configure the storage controller and SAN switch, follow these steps:

1. Configure the Fibre Channel fabric for your IBM PowerVC environment.

    a. Connect the required Fibre Channel ports that are owned by the Integrated Virtualization Managers (IVMs) and the storage controller to the SAN switch. Consider creating two redundant fabrics by connecting all IVMs and

storage controllers to two SAN switches. If one switch fails, the redundancy helps to ensure constant connectivity between IVMs and the storage controller.

   b. Perform initial configuration for the SAN switch. The initial configuration process requires a serial connection. For more information, go to the IBM Support Portal Documentation page and use Quick find to search for your switch model: http://www.ibm.com/support/entry/portal/documentation

     Note: Zoning is configured on the SAN switch as part of the host configuration. For more information, see "Configuring zoning."

2. Configure the storage controller. This configuration includes setting up user authentication and creating storage pools and volumes. For more information, follow the link for your controller.

Related tasks:

"Configuring zoning" on page 19

Related information:

➦ IBM Storwize V3500 SAN configuration and zoning rules summary (http://pic.dhe.ibm.com/infocenter/storwize/v3500_ic/topic/com.ibm.storwize.v3500.641.doc/svc_configrulessummary_02171530.html)

➦ IBM Storwize V3700 SAN configuration and zoning rules summary (http://pic.dhe.ibm.com/infocenter/storwize/v3700_ic/topic/com.ibm.storwize.v3700.641.doc/svc_configrulessummary_02171530.html)

➦ IBM Storwize V7000 SAN configuration and zoning rules summary (http://pic.dhe.ibm.com/infocenter/storwize/ic/index.jsp?topic=%2Fcom.ibm.storwize.v7000.doc%2Fsvc_configrulessummary_02171530.html)

Configuring the VLANs on the network switch

Set up your Virtual LAN (VLAN) to divide your network as required. On each VLAN, complete the following steps, as necessary.

Note: The VIOS is preconfigured with four virtual Ethernet adapters on VLANs 1 through 4. IBM Power Virtualization Center removes VLANs when they are no longer needed. However, IBM PowerVC does not modify any of the VLANs that preexist on the system or are assigned to the primary virtual Ethernet adapter. Therefore, if a VLAN should not be removed, add it to the primary virtual Ethernet adapter.

1. Optional: Configure the gateway. Only IPv4 gateways are supported.

2. Recommended: Route VLAN for a Resource Monitoring and Control (RMC) connection. Several advanced PowerVC features require an active RMC connection between the IVM and the virtual machine. For example, hot migration and dynamic partitioning require an active RMC connection.

   Many environments require an independent network (VLAN) between their IVM and virtual machines. In this situation, ensure that a router exists between the two independent networks. Doing this enables the virtual machines to establish an RMC connection with the IVM. An RMC connection enables the advanced PowerVC features.

   To set up an RMC connection, follow the instructions for your operating system:

    • For AIX, no additional setup is necessary. After the IP address is configured, an RMC connection is automatically created.

- For Linux, access the Service and productivity tools website and choose the **on HMC or IVM-managed servers** option under your Linux distribution. Next, download and install the "RSCT utilities" and "RSCT core" tools.

   Important: You might have to install other tools; tool packages must be installed in the order that is listed in the table. For example, if you do not have any other tools installed, you would install `librtas*rpm`, `src*rpm`, `rsct.core.utils*rpm`, and `rsct.core*rpm`, in that order.

If there are multiple IP addresses on the VIOS, follow these steps to set the preferred IP address:

   a. From the IVM user interface, select **View/Modify TCP/IP Settings**.

   b. On the General tabbed page, clear **Default** and specify the preferred IP address. Click **Apply**.

   c. The RMC connections are ready in 5-10 minutes. If they are not, refer to the IBM Redbooks® publication "A Practical Guide for Resource Monitoring and Control (RMC)".

   For more information about RMC connections, see the IBM Redbooks publication "A Practical Guide for Resource Monitoring and Control (RMC)".

3. Optional: Set up the DHCP server. If you want to set up dynamic networks, you must set up an external DHCP server. If you use DHCP, PowerVC is unaware of the IP address that is assigned to the virtual machine.

Related concepts:

"Migration requirements" on page 43

Related information:

➡ A Practical Guide for Resource Monitoring and Control (RMC) (http://www.redbooks.ibm.com/abstracts/sg246615.html)

➡ Service and productivity tools (http://www.ibm.com/support/customercare/sas/f/lopdiags/home.html)

Configuring hosts for IBM Power Virtualization Center tasks

There are several configuration tasks that you must perform on your hosts (including the host that will be your management host) to prepare for IBM PowerVC.

The following summarizes the specific configuration tasks and requirements for the hosts in your environment and links to information about how to fulfill the requirements:

Table 6. Configuration tasks for the hosts in your IBM PowerVC environment.

Step	Task	Reference or recommendation
1.	Install the Virtual I/O Server and enable the Integrated Virtualization Manager.	Installing the Virtual I/O Server and enabling the Integrated Virtualization Manager
2.	Accept the Virtual I/O Server license agreement.	Accepting the Virtual I/O Server license agreement

Table 6. Configuration tasks for the hosts in your IBM PowerVC environment. (continued)

Step	Task	Reference or recommendation
3.	Activate the PowerVM Enterprise Edition or the PowerVM for IBM PowerLinux hardware feature.	Entering the PowerVM Editions activation code
4.	Create a Shared Ethernet Adapter.	Creating a Shared Ethernet Adapter The Shared Ethernet Adapter must be backed by a single adapter or by a link aggregation. The Shared Ethernet Adapter must have a single primary virtual Ethernet adapter.
5.	Change the maximum number of virtual resources.	Changing the maximum number of virtual resources You should have at least 60 virtual resources available on the host for use by the Virtual I/O Server. This number enables you to have sufficient resources available on your hosts as you create and migrate virtual machines throughout your environment.
6.	Change the logical-memory block size.	Changing the logical-memory block size The logical-memory block size should be the same on all of the hosts in your environment.
7.	Change the maximum number of open sessions.	Changing the maximum number of open sessions The maximum number of open sessions that the SSHD daemon on your hosts listens for should be set to 20.

Table 6. Configuration tasks for the hosts in your IBM PowerVC environment. (continued)

Step	Task	Reference or recommendation
8.	Create a virtual media repository.	Creating a virtual media repository This task is important if you plan to deploy ISO images. The virtual media repository needs to be large enough to house all of the images that you plan to deploy to that host. For example, if you plan to deploy 3 images that are 4 Gigabytes each, then your virtual image repository must be at least 12 GB.
9.	Make sure that there is enough temporary storage space for ISO images.	If you plan to deploy ISO images, you must ensure that there is enough temporary space for storing the images during the deployment process. On the Virtual I/O Server virtual machine on the host you want to deploy to, the file system that contains the /home/padmin directory must have enough space to temporarily store the ISO image during the deployment.

Installing the Virtual I/O Server and enabling the Integrated Virtualization Manager

Each of the hosts in your IBM Power Virtualization Center environment must have the Virtual I/O Server installed on it and be managed by Integrated Virtualization Manager.

Before you start, ensure that you have completed the following tasks:

1. Verify that you have cabled the server. Specifically, ensure that you have connected a serial cable from a PC or ASCII terminal to a system port on the server.
2. Verify that you have access to the Advanced System Management Interface (ASMI) by using the Web interface.
3. Verify that you have administrator or authorized service provider authority in ASMI.
4. Using the Web-based ASMI, change the following settings as appropriate for the type of partition on which you are installing the Integrated Virtualization Manager:

   For an AIX or Linux partition, complete the following steps to change the partition boot mode:

   a. In the navigation area, expand **Power/Restart Control**.
   b. Click **Power On/Off System**.
   c. Select **Boot to SMS menu** in the **AIX or Linux partition mode** by boot field.

d. Click **Save settings and power on**.
5. Open a terminal session on the PC, using an application such as HyperTerminal, and wait for the SMS menu to appear. Be sure that the line speed is set to 19,200 bits per second to communicate with the system unit.
6. Using the Web-based ASMI, change the partition boot mode back so that the server loads the operating environment during startup:
   a. Expand **Power/Restart Control**.
   b. Click **Power On/Off System**.
   c. Select **Continue to operating system** in the **AIX or Linux partition mode** boot field.
   d. Click **Save settings**.

Follow these steps to install the Virtual I/O Server and enable the Integrated Virtualization Manager:
1. Insert the *Virtual I/O Server* CD or DVD into the optical drive.
2. In SMS, select the CD or DVD as the boot device:
   a. Select **Select Boot Options**, and press Enter.
   b. Select **Select Install/Boot Device**, and press Enter.
   c. Select **CD/DVD**, and press Enter.
   d. Select the media type that corresponds to the optical device, and press Enter.
   e. Select the device number that corresponds to the optical device, and press Enter.
   f. Select **Normal Boot**, and confirm that you want to exit SMS.
3. Install the Virtual I/O Server:
   a. Select the console, and press Enter.
   b. Select a language for the BOS menus, and press Enter.
   c. Select **Start Install Now with Default Settings**.
   d. Select **Continue with Install**. The managed system restarts after the installation is complete, and the login prompt is displayed on the ASCII terminal.

Related information:

➡ Accessing ASMI without an HMC (http://pic.dhe.ibm.com/infocenter/ powersys/v3r1m5/topic/iphby/connect_asmi.htm)

Accepting the Virtual I/O Server license agreement

Before you can use IBM Power Virtualization Center, you have to accept the Virtual I/O Server product licenses on all of the Power Systems or IBM PowerLinux hosts in your environment. You must complete this task for each host in your environment.

To accept the Virtual I/O Server license key, use the **license** command from the Virtual I/O Server command line.
1. Log in to the Virtual I/O Server using the **padmin** user ID.
2. Choose a new password. The software maintenance terms and conditions are displayed.
3. If Virtual I/O Server is at Version 1.5 or later, view and accept the software maintenance terms and conditions.

   a. To view the software maintenance terms and conditions, type `v` on the command line and press enter.

   b. To accept the software maintenance terms and conditions, type `a` on the command line and press enter.

4. View and accept the Virtual I/O Server product license.

Note: If you installed the Virtual I/O Server by deploying a system plan, then you already accepted the Virtual I/O Server product license and do not need to complete this step.

   a. To view the Virtual I/O Server product license, type `license -ls` on the command line. By default, the license is displayed in English. To change the language in which the license is displayed, follow these steps:

     1) View the list of available locales to display the license by typing the following command:

      `license -ls`

     2) View the license in another language by typing the following command:

      `license -view -lang `*`Name`*

      For example, to view the license in Japanese, type the following command:

      `license -view -lang ja_JP`

   b. To accept the Virtual I/O Server product license, type `license -accept` on the command line.

5. In the installation program, English is the default language. To change the language setting for the system, follow these steps:

   a. View the available languages by typing the following command:

     `chlang -ls`

   b. Change the language by typing the following command, replacing Name with the name of the language you are switching to, as follows:

     `chlang -lang `*`Name`*

     Note: If the language file set is not installed, use the `-dev Media` flag to install it.
     For example, to install and change the language to Japanese, type the following command:

     `chlang -lang ja_JP -dev /dev/cd0`

Entering the PowerVM Editions activation code

To be able to use some of the features of IBM Power Virtualization Center, you have to first activate the PowerVM Enterprise Edition or PowerVM for IBM PowerLinux hardware feature, depending on the model of hardware that you are using.

1. From the IVM Management menu, click **Enter PowerVM Editions Key** or **Enter PowerVM for IBM PowerLinux Key**, depending on the model of hardware that you are using.

2. In the Enter Key window, enter your activation code and click **Apply**.

Related concepts:
"Migration requirements" on page 43

Configuring a Shared Ethernet Adapter

IBM PowerVC requires the Virtual I/O Server (VIOS) to be configured with a single shared Ethernet adapter. It can be backed by a single adapter or by a link aggregation.

Important: Before configuring the Shared Ethernet Adapter, read the information in "Shared Ethernet Adapter requirements".

Follow these steps to configure a Shared Ethernet Adapter. For detailed instructions, refer to "Ethernet bridging" in the IBM Redpaper publication "Integrated Virtualization Manager for IBM Power Systems"

1. If you are not using vLAN ID 1-4, use the command line to create a virtual Ethernet adapter with the appropriate vLAN.
2. Log on to the Integrated Virtualization Manager (IVM) console to assign the physical adapter or link aggregation to the virtual Ethernet adapter.
3. Use the command line to verify that the Shared Ethernet Adapter updated in step 2 is available.

Shared Ethernet Adapter requirements

You must configure a single Shared Ethernet Adapter on IBM PowerVC that meets these requirements. Multiple Shared Ethernet Adapters are not supported.

* If possible, you should separate the management network from the data network.

  In this scenario, IBM PowerVC can use the Shared Ethernet Adapter for data communication and a physical adapter for the management communication.

  – For instructions to configure you data network on a Shared Ethernet Adapter, see "Configuring a Shared Ethernet Adapter".

  – For instructions to configure your management network on a physical adapter with no attached Shared Ethernet Adapter, see "Changing the TCP/IP settings on the Virtual I/O Server" in the IBM Redpaper publication "Integrated Virtualization Manager for IBM Power Systems" (http://www.redbooks.ibm.com/abstracts/redp4061.html).

* The Shared Ethernet Adapter can be backed by a single adapter or by a link aggregation.

  Link aggregations increase throughput and redundancy within the environment. However, link aggregations also require that the physical switch is configured properly.

  – For instructions to back the Shared Ethernet Adapter with a single adapter, see "Configuring a Shared Ethernet Adapter".

  – For instructions to configure a link aggregation, see "Etherchannel with SEA" (https://www.ibm.com/developerworks/community/blogs/powermeup/entry/etherchannel_with_sea22?lang=en).

* The Shared Ethernet Adapter must have a single primary virtual Ethernet adapter configured.

  The primary adapter is typically used for management communication within the Integrated Virtualization Manager (IVM) and VIOS. The VIOS is preconfigured with four virtual Ethernet adapters on VLANs 1 through 4. These adapters might be assigned to the Shared Ethernet Adapter.

Related information:

➡ Etherchannel with SEA (https://www.ibm.com/developerworks/community/blogs/powermeup/entry/etherchannel_with_sea22?lang=en)

➡ Integrated Virtualization Manager for IBM Power Systems (http://www.redbooks.ibm.com/abstracts/redp4061.html)

Changing the maximum number of virtual resources

The maximum number of virtual resources determines the maximum number of logical partitions that you can create on your hosts. You can use the Integrated Virtualization Manager to change this setting.

The value for **Configured maximum virtual resources** is initially set by the firmware level of your host. This field displays the maximum number of virtual resources that the firmware currently supports and the corresponding maximum number of logical partitions that you can currently create based on this value. This number is an estimate that is based on the assumption that each client logical partition needs many virtual resources, for example, one virtual Serial adapter, two virtual SCSI adapters, and two virtual Fibre Channel adapters. However, if your client logical partitions use the minimum number of virtual resources (for example, one virtual Serial adapter and one virtual SCSI adapter), you can create more partitions than this number indicates.

When you use IBM PowerVC, it is recommended that you have at least **60** virtual resources available on the host or managed system for use by the Virtual I/O Server. This should enable you to have sufficient resources available on your hosts as you create and migrate virtual machines throughout your environment.

1. From the **Partition Management** menu, click **View/Modify System Properties**. The View/Modify System Properties page is displayed.

2. In the **Configured maximum virtual resources** field, verify whether this value is the maximum number of virtual resources that you want to allow on this managed system. If it is not, change it as follows:

   a. Specify the maximum number of virtual resources that you want the server to have available in the **Maximum virtual resources after restart** field, and click **OK**.

   b. Open a virtual terminal session to the management partition.

   c. Restart the system. It can take a few minutes for the managed system to restart. Be sure to complete all of the setup steps before you restart the system. Otherwise, it may be necessary to restart the system again.

Related concepts:

"Deploy requirements" on page 35

"Migration requirements" on page 43

Creating a virtual media repository

Before you can deploy an ISO image using IBM PowerVC, you have to create a virtual media repository on the Virtual I/O Server virtual machine on the host that you want to deploy the ISO image to. The virtual media repository provides a single container to store and manage file-backed virtual optical media files. This topic describes how to create the virtual media repository.

You can use the Integrated Virtualization Manager to create the virtual media repository on a Virtual I/O Server. Only one repository can be created within a

Virtual I/O Server. The virtual media repository needs to be large enough to house all of the images that you plan to deploy to that host. For example, if you plan to deploy 3 images that are 4 Gigabytes each, then your virtual image repository needs to be at least 12 GB in size. Once you have deployed the images, you may want to delete the images and adjust the size of the virtual media repository accordingly.

1. Log in to the Integrated Virtualization Manager on the host on which you want to deploy an ISO image.
2. Click **View/Modify Virtual Storage** under Virtual Storage Management. You see the View/Modify Virtual Storage page.
3. Select the Optical/Tape tab.
4. Click **Create Library**.

Related concepts:

"Deploy requirements" on page 35

Changing the logical-memory block size

You may have to change the logical-memory block size on your hosts to prepare them for hot migration and other tasks in IBM Power Virtualization Center.

The system kernel uses the memory block size to read and write files. By default, the logical-memory block size is set to *Automatic*. This setting allows the system to set the logical-memory block size based on the physical memory that is available. You can also manually change the logical-memory block size. For IBM PowerVC, the logical-memory block size should be the same on all of the hosts in your environment.

To change logical-memory block size, you must have one of the following authority levels:

- Administrator
- Authorized service provider

To configure logical-memory block size, follow these steps:

1. On the ASMI Welcome pane, specify your user ID and password, and click **Log In**.
2. In the navigation area, expand **Performance Setup**.
3. Select **Logical Memory Block Size**.
4. In the right pane, select the logical-memory block size and click **Save settings**.

Related concepts:

"Migration requirements" on page 43

Changing the maximum number of open sessions

You may have to change the `MaxSessions` parameter in the sshd_config file to prepare for hot migration and other tasks in IBM Power Virtualization Center.

The SSHD daemon listens for connections from clients. It reads configuration information from the sshd_config file, which contains the parameters and values that tell it how to operate. The `MaxSessions` parameter in that file specifies the maximum number of open sessions that are allowed per network connection. For IBM PowerVC, the recommended value of the `MaxSessions` parameter is 20.

1. Log in to the Virtual I/O Server virtual machine on your host as the padmin user.

2. Run the following command to switch to root: `oem_setup_env`

3. Run the following command to edit the sshd_config file: `vi /etc/ssh/sshd_config`

4. Look for the **MaxSessions** parameter. If that line of the file is commented out, remove the # at the beginning of the line.

5. Change the value of the **MaxSessions** parameter from 10 to 20.

6. Save your changes.

7. Stop and start the SSHD daemon so the change you just made takes effect. Run the following commands:

   a. `stopsrc -s sshd`

   b. `startsrc -s sshd`

8. On the IBM PowerVC host, restart PowerVC using the following command: `/opt/ibm/powervc/bin/powervc-services restart`

Configuring zoning

Use the following steps as an example of how to configure zoning on your storage area network (SAN) switch before you install IBM Power Virtualization Center. The storage controller in the example is an IBM Storwize V7000.

- For the storage controller, hosts, and switches, obtain the user name and password or use key pairs to connect remotely to the devices.

  Notes:
  - You will need the connection information for the storage controller and hosts when registering them with PowerVC.
  - For storage controllers, the user ID must be in the "Administrator" group.
  - For hosts, the user ID must be `padmin`.
  - For switches, the user ID must have sufficient credentials to perform zoning operations.

- IBM PowerVC supports using only one storage system.

1. On the Virtual I/O Server (VIOS), identify the WWPNs (worldwide port names) of the Fibre Channel cards for each host by using the **lsdev** command:

   lsdev -dev *$dev* **-vpd**

   where *$dev* is fcs0, fcs1, and so on, for each Fibre Channel card. The output of the command lists each WWPN as a "Network Address."

2. Use ssh to connect remotely to the SAN switch.

3. On the SAN switch, create an alias for every WWPN on a host by using the **alicreate** command. For example, if a host has two Fibre Channel cards, you might run the following commands:

   alicreate "host1_fcs0", "20:00:00:e0:69:41:54:02"
   alicreate "host1_fcs1", "20:00:00:e0:69:41:54:03"

4. On the storage controller, list the storage controller WWPNs by using the **lsportfc** command. Example results:

```
id fc_io_port_id port_id type port_speed node_id node_name WWPN              nportid status                attachment
0  1             1       fc   8Gb        5       node1     500507680215B741  010400  active                switch
1  2             2       fc   8Gb        5       node1     500507680225B741  010400  active                switch
2  3             3       fc   N/A        5       node1     500507680235B741  000000  inactive_unconfigured none
3  4             4       fc   N/A        5       node1     500507680245B741  000000  inactive_unconfigured none
6  1             1       fc   8Gb        4       node2     500507680215B742  010500  active                switch
7  2             2       fc   8Gb        4       node2     500507680225B742  010500  active                switch
8  3             3       fc   N/A        4       node2     500507680235B742  000000  inactive_unconfigured none
9  4             4       fc   N/A        4       node2     500507680245B742  000000  inactive_unconfigured none
```

5. On the SAN switch, create an alias for every attached WWPN on the storage controller by using the **alicreate** command. In the example results of the

previous step, four connected ports exist across the two controller canisters, and the canisters are represented by node_id. Example commands:

```
alicreate "v7000_canister1_port1", "50:05:07:68:02:15:B7:41"
alicreate "v7000_canister1_port2", "50:05:07:68:02:25:B7:41"
alicreate "v7000_canister2_port1", "50:05:07:68:02:15:B7:42"
alicreate "v7000_canister2_port2", "50:05:07:68:02:25:B7:42"
```

6. On the SAN switch, create a zone for every path that you want between the host and the storage controller by using the **zonecreate** command. For example, make a separate port on each canister visible to each of the two Fibre Channel cards on the host:

```
zonecreate "host1_fcs0_to_v7000_canister1_port1", "host1_fcs0;v7000_canister1_port1"
zonecreate "host1_fcs0_to_v7000_canister1_port2", "host1_fcs0;v7000_canister1_port2"
zonecreate "host1_fcs1_to_v7000_canister2_port1", "host1_fcs1;v7000_canister2_port1"
zonecreate "host1_fcs1_to_v7000_canister2_port2", "host1_fcs1;v7000_canister2_port2"
```

Note: Create at most four paths between a host and a storage controller.

7. On the SAN switch, add the zones to the current configuration by using the **cfgadd** command. Example commands:

```
cfgadd "powervc","host1_fcs0_to_v7000_canister1_port1"
cfgadd "powervc","host1_fcs0_to_v7000_canister1_port2"
cfgadd "powervc","host1_fcs1_to_v7000_canister2_port1"
cfgadd "powervc","host1_fcs1_to_v7000_canister2_port2"
```

8. On the SAN switch, save and enable the configuration by using the following commands:

```
cfgsave "powervc"
cfgenable "powervc"
```

After you install PowerVC, you can validate your environment by using the PowerVC GUI or the **powervc-validate** command.

Related concepts:

"Verifying your environment" on page 27

Related tasks:

"Configuring the storage controller and SAN switch" on page 9

Related reference:

"powervc-validate command" on page 48

Preparing the management host

Once you have done all of the initial configuration of your hosts for IBM Power Virtualization Center, then there are few additional tasks that you need to perform on the host that is going to be your management host. The management host is the host on which you plan to install PowerVC.

To use PowerVC, the management host needs to have two virtual machines (logical partitions) installed on it:

• The Virtual I/O Server virtual machine that was created when you installed the Virtual I/O Server in a previous step.

• The management virtual machine, which is a Red Hat Enterprise Linux virtual machine into which you will install PowerVC.

Important: The management virtual machine should be reserved for PowerVC and the operating system on which it runs. Do not install other software into it.

Creating the management virtual machine

To prepare your management host for IBM Power Virtualization Center, you first have to create a virtual machine (logical partition) on it. This is the virtual machine into which you will install PowerVC.

The virtual machine you create for PowerVC should have the following resources, at a minimum:

Table 7. Minimum resource requirements for the PowerVC virtual machine.

System resource	Amount
Processors	**Minimum:** An uncapped shared processor virtual machine with 1.0 processor unit of entitled processing capacity and 2 virtual processors. **Recommended (one of the following):** • An uncapped shared processor virtual machine with a minimum of 2.0 processor units of entitled processing capacity and 2 virtual processors. • A virtual machine with 2 dedicated processors.
Memory	10 Gigabytes
Hard disk	40 Gigabytes **Tip:** You must temporarily store ISO images before you import them into PowerVC. If you plan to store them temporarily on your PowerVC virtual machine, then you may need to create the virtual machine with more than the minimum 40 GB of hard disk space. Choose the size based on the number and size of the ISO images that you plan to import.

Important: The management virtual machine should be reserved for PowerVC and the operating system on which it runs. Do not install other software into it.

1. From the navigation area, select **View/Modify Partitions** under **Partition Management**. The View/Modify Partitions page is displayed.
2. Click ***Create Partition...** The Create Partition wizard is displayed.
   a. Follow the instructions for each step of the wizard, and click **Next** when you complete each step.
   b. When the Summary step is displayed, confirm that the information displayed in this step is correct, and click **Finish**.
3. From the navigation area, select **View/Modify Partitions** under **Partition Management**. The View/Modify Partitions page is displayed and lists the new partition.

Installing Red Hat Enterprise Linux in the management virtual machine

Before you install IBM Power Virtualization Center, you must install Red Hat Enterprise Linux into the management virtual machine. For supported Red Hat Enterprise Linux versions, see "Hardware and software requirements".

PowerVC requires certain packages to be installed. If the Red Hat Enterprise Linux "yum" repository is configured and enabled on the host, then during PowerVC installation, it finds and installs the required packages. Otherwise, you must

manually install the required packaged. For instructions to set up the "yum" repository, see "Configuring Yum and Yum Repositories".

Some packages cannot be on the system when PowerVC is installed. These packages will cause the PowerVC installation to fail and must be manually removed.

Table 8. Red Hat Enterprise Linux packages relevant to PowerVC

Required packages Note: Only manually install these packages if the "yum" repository is not configured and enabled.	Packages that must not be installed Note: If any of these packages are installed on the system, they must be removed before PowerVC is installed.
bridge-utils cmake gcc-c++ gedit genisoimage libaio libicu libstdc++.so.5 libvirt libvirt-python mod_ssl PyPAM python-decorator python-ldap python-libguestfs python-lxml python-mako python-markdown python-memcached python-netaddr python-paste python-pygments python-rtslib python-simplejson python-suds python-tempita radvd scsi-target-utils vconfig	boost-1.47.0-7.ibm.ppc64 boost-chrono-1.47.0-7.ibm.ppc64 boost-date-time-1.47.0-7.ibm.ppc64 boost-devel-1.47.0-7.ibm.ppc64 boost-filesystem-1.47.0-7.ibm.ppc64 boost-graph-1.47.0-7.ibm.ppc64 boost-iostreams-1.47.0-7.ibm.ppc64 boost-math-1.47.0-7.ibm.ppc64 boost-program-options-1.47.0-7.ibm.ppc64 boost-python-1.47.0-7.ibm.ppc64 boost-random-1.47.0-7.ibm.ppc64 boost-regex-1.47.0-7.ibm.ppc64 boost-serialization-1.47.0-7.ibm.ppc64 boost-signals-1.47.0-7.ibm.ppc64 boost-system-1.47.0-7.ibm.ppc64 boost-test-1.47.0-7.ibm.ppc64 boost-thread-1.47.0-7.ibm.ppc64 boost-wave-1.47.0-7.ibm.ppc64

You can have Red Hat Enterprise Linux available for installation in one of these ways. See "How to Download Red Hat Installation Files" for details.
- Red Hat Enterprise Linux ISO image is available to be mounted.
- Red Hat Enterprise Linux is downloaded to your system.

For detailed Red Hat Enterprise Linux installation instructions, see the documentation in the Red Hat Customer Portal.

Important: When you run the Red Hat Enterprise Linux installation wizard, you must select these values:
- On the Installation Types window, choose **Basic Server** and **Customize Now**.
- On the Select Package groups and packages window, make these selections:

Table 9. Groups and packages to choose when installing Red Hat Enterprise Linux

Group	Selections to make
Base System > Base	PyPAM genisoimage libaio
Base System > Select Performance tools	sg3_utils
Servers > System administration tools	expect
Web Services > Web Server	mod_ssl python-memcached
System Managment > Messaging Client Support	Do not select any packages.
Desktops	Desktop
Desktops > General Purpose Desktop	Clear gnote.
Applications	Internet Browser
Development	Additional Development
Development	Clear boost-devel and mysql-devel.
Development > Development tools	cmake

Related tasks:

Chapter 3, "Installing IBM Power Virtualization Center from media," on page 25

Related reference:

"Hardware and software requirements" on page 7

Related information:

Red Hat Customer Portal documentation(https://access.redhat.com/site/documentation/)

Configuring Yum and Yum Repositories (https://access.redhat.com/site/documentation/en-US/Red_Hat_Enterprise_Linux/6/html/Deployment_Guide/sec-Configuring_Yum_and_Yum_Repositories.html)

How to Download Red Hat Installation Files (http://www.redhat.com/download/howto_download.html)

Chapter 3. Installing IBM Power Virtualization Center from media

This topic describes how to install IBM PowerVC on your management host using install media.

Before you install IBM PowerVC, ensure that all of the hardware and software prerequisites are met and that your environment is configured correctly. The management host must be prepared and have Red Hat Enterprise Linux version 6.4 installed before you continue with this task.

Important: The management virtual machine should be reserved for PowerVC and the operating system on which it runs. Do not install other software into it.

1. Configure the yum repo repository for the IBM PowerVC install. The following steps are an example illustrating how to configure the yum repo repository using Red Hat Enterprise Linux installation media so that the IBM PowerVC installation finds the required packages.

   a. Create the directory where the iso image will be mounted.

      ```
      mkdir -p /media/iso
      ```

   b. Mount the Red Hat Enterprise Linux 6.4 iso image

      ```
      mount -o loop /path/to/rhel.iso /media/iso
      ```

   c. Create a repo file that points to the Red Hat Enterprise Linux repo file on the iso image

      Example repo file /etc/yum.repos.d/rhel64-media.repo

      ```
      [rhel64media]
      name=RHEL 6.4 media
      baseurl=file:///media/iso
      enabled=1
      gpgcheck=0
      ```

   d. Verify that yum is seeing the new repo file.

      ```
      yum repolist
      ```

2. Change the directory to the location of the installation script:
   dvd_mount_point/powervc-1.1.0.0/

3. Run the following command to start the installation

   ```
   ./install
   ```

Related concepts:

Chapter 2, "Setting up the IBM Power Virtualization Center environment," on page 3

Related tasks:

"Preparing the management host" on page 20

"Installing Red Hat Enterprise Linux in the management virtual machine" on page 21

Related reference:

"Hardware and software requirements" on page 7

Uninstalling IBM PowerVC

This topic describes how to uninstall IBM PowerVC from your management host.

The following procedure removes IBM PowerVC from the management host. It does not remove or change anything in your environment that you created while you were using IBM PowerVC. Any Red Hat Enterprise Linux prerequisite packages that are installed during the IBM PowerVC installation remain.

Run the following command to uninstall IBM PowerVC.
```
/opt/ibm/powervc/bin/powervc-uninstall
```

Chapter 4. Getting started with IBM Power Virtualization Center

Before you can start performing tasks in IBM PowerVC, you have to register the resources that you want to manage. You can register a storage system and hosts, and create network templates that you use when you deploy images.

When you register resources with IBM PowerVC, you make them available for use in performing tasks within PowerVC, such as hosting virtual machines or storing images of captured virtual machines. It is very important that your environment meets all of the hardware and software requirements and is configured correctly before you register your resources.

When you register your resources, you should register your storage first and then your hosts after that. When removing resources, you should remove the hosts first and then the storage.

1. Access IBM PowerVC by opening your browser and typing `https://ipaddress/powervc`, where *ipaddress* is the IP address of your PowerVC management host.

2. Log in to IBM PowerVC.

   Note: To register resources, you must sign in with the credentials of a user in the admin group.

3. On the Home page, click **Add Storage** to register your storage system. You must specify a user ID from the storage system's "Administrator" group. You can add only one supported storage system to PowerVC.

4. Click **Add Host** to register a host with PowerVC. You must specify the `padmin` user ID and password. You can register up to five hosts.

5. Click **Add Network Template** to create a network template. A network template includes information about how your network is subdivided using VLANs as well as information about the subnet mask, gateway, and other characteristics. When you deploy an image in PowerVC, you choose an existing network template and the network settings are applied to the new virtual machine. Network templates make it easy for you to correctly deploy images. You may need to talk to your network administrator to gather the information you need to create your network templates.

Related concepts:

Chapter 2, "Setting up the IBM Power Virtualization Center environment," on page 3

Verifying your environment

IBM PowerVC includes a tool that enables you to check certain aspects of your environment to make sure that your resources are configured correctly. This topic describes how and when to use this tool and what elements of your environment are checked.

The Home page of IBM PowerVC includes a button that you can click to verify your environment. You can run this tool at any time, but it is recommended that you wait until you have registered storage, hosts, and network templates before you run the tool for the first time. The tool is only aware of the resources that you

have registered with the product at the time that it is run; if you run the tool before you have registered the resources you plan to use you will receive a lot of messages.

It can take several minutes to verify your environment. If you have errors in your environment, you can click on links to see additional information about how to resolve the issues.

The following are some examples of the items that are checked by the tool:
- Verify that your hosts and storage are of the correct machine type and model
- Verify that you do not exceed the allowed number of storage systems and hosts
- Verify that you have the correct level of Virtual I/O Server installed on your hosts
- Verify that the Virtual I/O Server is configured correctly on all of your hosts
- Verify that storage and SAN switches are configured correctly

You can also run the tool from the command line using the `powervc-validate` command.

Related reference:

"powervc-validate command" on page 48

Configuring security

You can use the security features of the IBM Power Virtualization Center environment to manage user groups.

When you install IBM PowerVC, by default it is configured to use the security features of the operating system on the management host. IBM PowerVC includes three user groups that have the following privileges:

admin   Users in this group can perform all tasks and have access to all resources.

deployer
Users in this group can perform all tasks except the following:
- Adding, updating, or deleting storage systems
- Adding, updating, or deleting hosts
- Adding, updating, and deleting network templates
- Viewing users and groups

viewer
Users in this group can view resources and the properties of resources, but can perform no tasks. They cannot view users and groups.

The members of these groups are determined by the users who are in these groups in the operating system on the management host. To add or remove users from these groups, you must add or remove them on the operating system. Any changes to the group are reflected in IBM PowerVC.

IBM PowerVC stores data in IBM DB2®. When you install IBM PowerVC, an operating system user account is created for the main DB2 process to run under. This user account is *pwrvcdb*. Do not remove or modify this user.

After installation, you can configure IBM PowerVC to work with an existing Lightweight Directory Access Protocol (LDAP) server for security. All versions of OpenLDAP are supported.

Related concepts:

"Avoiding LDAP user group conflicts" on page 31

Related tasks:

"Configuring LDAP for PowerVC" on page 30

Related information:

➦ OpenLDAP (http://www.openldap.org/)

Installing IBM Power Virtualization Center from media

This topic describes how to install IBM PowerVC on your management host using install media.

Before you install IBM PowerVC, ensure that all of the hardware and software prerequisites are met and that your environment is configured correctly. The management host must be prepared and have Red Hat Enterprise Linux version 6.4 installed before you continue with this task.

Important: The management virtual machine should be reserved for PowerVC and the operating system on which it runs. Do not install other software into it.

1. Configure the yum repo repository for the IBM PowerVC install. The following steps are an example illustrating how to configure the yum repo repository using Red Hat Enterprise Linux installation media so that the IBM PowerVC installation finds the required packages.

   a. Create the directory where the iso image will be mounted.

      ```
      mkdir -p /media/iso
      ```

   b. Mount the Red Hat Enterprise Linux 6.4 iso image

      ```
      mount -o loop /path/to/rhel.iso /media/iso
      ```

   c. Create a repo file that points to the Red Hat Enterprise Linux repo file on the iso image

      Example repo file /etc/yum.repos.d/rhel64-media.repo

      ```
      [rhel64media]
      name=RHEL 6.4 media
      baseurl=file:///media/iso
      enabled=1
      gpgcheck=0
      ```

   d. Verify that yum is seeing the new repo file.

      ```
      yum repolist
      ```

2. Change the directory to the location of the installation script:
   dvd_mount_point/powervc-1.1.0.0/

3. Run the following command to start the installation
   ```
   ./install
   ```

Providing a certificate

Self-signed certificates are certificates that you create yourself for private use. After you create a self-signed certificate, you can use it immediately. Because anyone can create self-signed certificates, they are not considered publicly trusted certificates. You can replace default, expired, or corrupted certificates with a self-signed certificate. You must delete the default certificate before you complete this procedure.

IBM Power Virtualization Center is installed with a default certificate that is signed by IBM and a key. The certificates are installed in the following locations:

- `/etc/pki/tls/certs/localhost.crt`
- `/etc/pki/tls/private/localhost.key`

After you install IBM PowerVC, you must replace the default self-signed certificate with a certificate of your own. You must restart PowerVC after you replace the default certificate. This new certificate can be requested from a certificate authority (CA). The certificate request can include the following information:

- **Key size**: determines strength of cryptographic keys for certificate.
- **Certificate label**: the certificate with a unique string of characters.
- **Common name**: the fully qualified host name of the server for which the certificate is being created.
- **Organization name**: the company that uses this certificate.
- **Locality or city**: the city or a locality designation for your organization.
- **State or province**: the state or province in which you use this certificate.
- **Country or region**: identifies, with a two-letter designation, the country, or region in which you use this certificate.

Configuring LDAP for PowerVC

After you install IBM PowerVC, you can configure it to work with an existing Lightweight Director Access Protocol (LDAP) server. This task is optional.

You must have an LDAP server that is installed and running in your environment. IBM PowerVC supports all versions of OpenLDAP.

To switch from having the operating system manage users and groups to using LDAP server, you must run a command on the operating system command line. When you run this command, you must provide information about your LDAP configuration.

Table 10. Configure IBM PowerVC to use an LDAP server.

Attribute name	Description	Example
URL	Specifies a Uniform Resource Locator (URL) on the World Wide web.	ldap://129.32.200.252
Username	Specifies the user profile on the LDAP server	cn=Administrator,dc=raleigh,dc=ibm,dc=com
Password	LDAP server password	passw0rd
User tree DN	The name that uniquely identifies the entry in the directory.	ou=people,dc=raleigh,dc=ibm,dc=com
User filter	Used to search the registry for users. It can also be used to authenticate	
User object class	Specifies the object classes that are supported by the LDAP server	inetOrgPerson
User ID attribute	Specifies the name of the attribute on the LDAP server that specifies the user ID. This attribute is often named uid. The characters a-z, A-Z, DBCS, period (.), dash (-), and underscore (_)	uid
User name attribute	Specifies the user profile on the LDAP server	uid
User mail attribute	Specifies the user's primary email address	email
User password attribute	Password for the LDAP user. The characters a-z, A-Z, period (.), dash (-), and underscore (_)	userPassw0rd

Table 10. Configure IBM PowerVC to use an LDAP server. (continued)

Attribute name	Description	Example
Group tree DN	The name that uniquely identifies an entry in the directory.	ou=group,dc=raleigh,dc=ibm,dc=com
Group filter	Specifies the property that is used to look up groups in the directory service	
Group object class	Specifies the object class of the group that uses the member attribute.	groupOfNames
Group ID attribute	The name that is used to identify a group in the LDAP server. The characters a-z, A-Z, DBCS, period (.), dash (-), and underscore (_)	gidNumber
Group name attribute	Specifies the name of the attribute on the LDAP server that specifies the group name for a group entry. This attribute is often named cn.	cn
Group member attribute	Specifies the name of the attribute on the LDAP server that specifies the names of group members for a group entry. This attribute is often named member.	member
Group description attribute	Specifies the name of the attribute on the LDAP server that contains a text description of the group.	

1. Open a command line to the operating system on the virtual machine in which IBM PowerVC is installed.
2. Run the command `/usr/bin/powervc-ldap-config`.
3. Respond with the information used in the table as the command prompts you.

The security service restarts and starts using your LDAP server. To add or remove users from groups, you must add or remove them the groups on the LDAP server.

Related concepts:

"Configuring security" on page 28

Related information:

➥ OpenLDAP (http://www.openldap.org/)

Avoiding LDAP user group conflicts

IBM Power Virtualization Center uses three user groups that exist on the LDAP server.

Admin, deployer, and viewer are the three LDAP user groups used in IBM PowerVC. You need at least one user as a member of the admin group. These groups should not have a large number of users. Large numbers of users in the group can impact performance of IBM PowerVC.

If the admin, deployer, or viewer groups exist in your LDAP server for a different application, you can modify the user groups IBM PowerVC uses by editing this file: /etc/opt/ibm/powervc/identity/identity-defs.json

```
    "grants": [
        {
            "group": "admin",
            "role": "admin",
            "project": "ibm-default"
```

```
        },
        {
            "group": "**deployer**",
            "role": "deployer",
            "project": "ibm-default"
        },
        {
            "group": "**viewer**",
            "role": "viewer",
            "project": "ibm-default"
        },
```

The group names in bold above can be modified to better interoperate with the customer's LDAP server.

Related concepts:

"Configuring security" on page 28

Operating system managing groups

Use the command line on the virtual machine to manage users and groups on IBM PowerVC.

To revert to using the operating system to manage users and groups, complete the following steps:

1. Open a command line to the operating system on the virtual machine in which IBM PowerVC is installed.

2. Run the following command: a.`/usr/bin/powervc-ldap-config` –s off.

The complete syntax for the `/usr/bin/powervc-ldap-config` command is `powervc-ldap-config` [–s on|off] -h Where:

- *-s*: indicates whether users and groups are to be managed by LDAP (on) or the operating system (off). The long form of the operand is *--set*. If the operand is not specified, the default is to use LDAP.

- *-h*: displays command usage. The long form of the operand is *--help*.

Chapter 5. Working with images

IBM Power Virtualization Center enables you import or capture images that you can deploy as instances across your environment. This topic provides an overview of images and the tasks you can do related to images in your environment.

Importing images

This topic describes how to import ISO images into IBM Power Virtualization Center. An ISO image is a file that is an exact copy of an existing file system.

1. Open a command line to the operating system on the virtual machine in which IBM PowerVC is installed.
2. Navigate to the /usr/bin directory.
3. Type `powervc-iso-import [--name name] [--os-distro os] [--location location] [--user user]`, using the following information to guide you:

   name The name of the ISO image that you want to import.

   os The operating system of the ISO image.

   location
   The path to where the ISO image resides in the file system of the PowerVC virtual machine.

   user The user name with which to run the command, if different from the current user (optional).

   For example, the command `powervc-iso-import --name aiximagea --os-distro aix  --location /tmp/aix.iso --user admin2` imports an AIX ISO image named *aiximagea* from the */tmp/aix.iso* directory and the command is run using the credentials of user *admin2*.
4. Enter your password or the password of the user name with which you opted to run the command when you are prompted to do so.

PowerVC is now aware of the image and is able to deploy it.

Once you import an image into PowerVC, you can delete the image in the location you specified on the powervc-iso-import command.

Deploying images

You can use IBM Power Virtualization Center to deploy ISO images that you have imported or images that are created when you capture a virtual machine.

Before you deploy an image you should be aware of the following:

- If you recently removed a host from PowerVC, you should wait a few minutes before deploying an image. This allows PowerVC to fully remove the host and can help to prevent problems during the deploy task.
- You can set a default domain for the resulting virtual image by editing the nova.conf file. If you do not set a default domain name in the nova.conf file, PowerVC uses the domain that is set for the Virtual I/O Server on the host you are deploying to. If it is unable to retrieve that value, it will use the domain

name of the PowerVC management host. If it is unable to retrieve that value, no domain name is set and you will have to set it manually after you deploy the image.

- PowerVC has the following limits on deploys:
  - PowerVC supports a maximum of 5 concurrent deploys.
  - PowerVC supports a maximum of 10 deploys per minute. If you exceed this limit, you receive an error with an error code of 413.

The following step applies to all images.

1. Select the image in the graphical user interface and select **Deploy**. When you deploy an ISO image, you specify the size of the resulting virtual machine during the deploy using the specification preconfigurations. When you deploy an image of a captured virtual machine, the resulting virtual machine has the same characteristics as the original virtual machine.

The rest of this topic only applies if you are deploying an ISO image. When you deploy an ISO image, the following happens:

- The image is first copied from the IBM PowerVC managing host to the virtual media repository on the host on which you want to deploy the image. This may take some time depending on the speed of your network and the location of the hosts.

  Note: This only happens the first time you deploy an image to a particular host.

- A new virtual machine is created on the host that has the properties that you specified when you deployed the image. The virtual machine will be in the stopped state.

2. Before you start the new virtual machine, connect to it using the `powervc-console-term` command that is provided with IBM PowerVC. This command enables you to interact with the installation of the operating system as it happens.

3. Start the new virtual machine in the graphical user interface. When you start the virtual machine, you can interact with the install program for the operating system in the window in which you opened the connection to the virtual machine.

4. At the end of the operating system installation, restart the virtual machine.

   Note: If you are installing a Red Hat Enterprise Linux distribution, you have to use system management services (SMS) to manually change the boot list so that the next time you restart the virtual machine it will restart from the SAN volume you specified for it, not from the install program for the operating system.

5. When the virtual machine has restarted, configure networking for the virtual machine. Be sure to use the same network settings that you specified when you deployed the image. Refer to the documentation for your operating system for information on how to configure the network settings.

When you finish, there is a new virtual machine on the host you selected that has the characteristics of the image you deployed. You may have to manually set the domain for the virtual machine if the domain is not what you want it to be.

Related concepts:
"Capture requirements" on page 38

Deploy requirements

This topic describes the support and requirements for deploying an image in your IBM Power Virtualization Center environment.

Type of images that you can deploy

You can use IBM PowerVC to deploy the following types of images:
- ISO images that you import into PowerVC.
- Images that are created when you capture a virtual machine in your PowerVC environment.

Requirements

Before you deploy an image, you should ensure that the following requirements are met:
- Your IBM PowerVC environment is configured as described in setting up the IBM PowerVC environment.
- Each Virtual I/O Server on the target host must have the same number of virtual resources available as the number of virtual appliances that you plan to deploy. If any one of these VIOS virtual servers does not have enough virtual resources available, you need to increase the maximum number of virtual resources on the VIOS before deploying the image.
- The memory allocations (minimum, maximum, and desired) for the image you want to deploy must be a multiple of the memory region size of the target host. For example, if the target host has a memory region size of 256 MB, then the virtual appliance can have a memory allocation of 1024 MB, because 1024 can be divided evenly by 256.
- To deploy ISO images, there are some additional space requirements both on the PowerVC management host and on the host you are deploying the image to, as follows:
  - On the PowerVC management host, the file system containing the /var/lib/glance/images directory must have enough free space to store all of the ISO images that you want to import.
  - On the PowerVC management host, the file system containing the /var/lib/nova/images directory needs to have enough free space to store the ISO images temporarily while they are being deployed.
  - On the Virtual I/O Server virtual machine on the host you want to deploy to, the file system containing the /home/padmin directory needs to have enough space to temporarily store the ISO image during the deploy. You can change the size of this file system by using the chfs command.
  - On the Virtual I/O Server virtual machine on the host you want to deploy to, there is a virtual media repository that is large enough to hold all of the ISO images you want to deploy to that host.

Related concepts:

Chapter 2, "Setting up the IBM Power Virtualization Center environment," on page
3

Related tasks:

"Creating a virtual media repository" on page 17

"Changing the maximum number of virtual resources" on page 17

Related reference:

"Hardware and software requirements" on page 7

Related information:

chfs Command (http://pic.dhe.ibm.com/infocenter/aix/v7r1/topic/
com.ibm.aix.cmds/doc/aixcmds1/chfs.htm)

Opening a terminal session to your virtual machine

The `powervc-console-term` command enables you to open a terminal session to a
virtual machine. This session enables you to interact with the installation of the
operating system on that virtual machine as it happens. This topic describes how
to use this command.

1. Type `powervc-console-term` **vmname**, where **vmname** is the name of the virtual
   machine that you want to connect to. This command has the following options:

   - - f   Enables you to disconnect any other terminal session that is attached to
   this virtual machine.

   - - h   Enables you to view help for this command.

   - - user
   Enables you to specify a user name with which to run the command. If
   you don't specify a user name, the user name used is the one that is
   used to run the command.

   - - v   Enables you to see more verbose output from the command.

2. Enter the Linux password for the specified user name.

3. To disconnect from the terminal session, press the Enter key, type a tilde (~)
   and then type a period (.), in succession.

Examples:

- The command `powervc-console-term` `testaix3` enables you to connect to virtual
  machine `testaix3` under the user name used to run the command.

- The command `powervc-console-term` `vmabc` `-- user` `admin1` enables you to
  connect to virtual machine `vmabc` with the credentials of user `admin 1`.

- The command `powervc-console-term` `vm123` `-- f` enables you to disconnect any
  other terminal connections to virtual machine `vm123`.

Changing the boot list (Red Hat Enterprise Linux)

When you install a Red Hat Enterprise Linux distribution, you have to use system
management services (SMS) to manually change the boot list. Doing so ensures
that the next time you restart the virtual machine it will restart from the SAN
volume you specified for it, not from the install program for the operating system.

Perform these steps when you restart a virtual machine after you install the
operating system on it.

Follow these steps to check the current boot order:

1. To access the SMS menu, press 1 when you see the IBM banner during the restart.

   Note: The menu goes by quickly and looks like this:

   ```
   IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
   IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
           1 = SMS Menu                          5 = Default Boot List
           8 = Open Firmware Prompt              6 = Stored Boot List

       Memory      Keyboard      Network      SCSI      Speaker
   ```
2. On the Main Menu in SMS, select `Select Boot Options`.
3. On the Multiboot menu, select `Configure Boot Device Order`.
4. On the Configure Boot Device Order menu, select `Display Current Setting`. Review the current boot order. If the CD-ROM device is listed first in the order, then you need to reorder the list.
5. Press Escape until you are back on the SMS Main Menu.

Follow these steps to change the boot order:

6. On the SMS Main Menu, select `Select Boot Options`.
7. On the Multiboot menu, select `Configure Boot Device Order`.
8. On the Configure Boot Device Order menu, select `Select 1st Boot Device`.
9. On the Select Device Type menu, select `List All Devices`.
10. On the Select Device page, select the option that lists the *harddisk*.

    Note: In this step, the term *harddisk* corresponds to the storage volume.
11. On the Select Task menu, select `Set Boot Sequence: Configure as 1st Boot Device`.
12. After you configure the first boot device, go back through these steps and set the second boot device to `None`.
13. When finished, press `x` to exit System Management Services.
14. When asked if you want to leave SMS, answer `Yes`.

When you complete these steps, the virtual machine restarts using the boot list you configured.

Setting a default domain name for deployed virtual machines

When you deploy an image, the domain name of the resulting virtual machine is assigned by IBM Power Virtualization Center. You can set a default domain that PowerVC can use for all virtual machines, or you can change the domain after you deploy the image.

To set a default domain, follow these steps:

1. To set a default domain before you register a host with PowerVC, open the nova.conf file that is located in the /etc/nova/ directory. To set a default domain for a host you have already registered, open the nova-`hostname`.conf file, where `hostname` is the name of the host for which you want to set the domain.
2. In the [DEFAULT] section, add a `dhcp_domain` key and make it equal to the domain you want to use as the default for your deployed virtual machines. For example, if your domain is austin.century.com, then you would specify `dhcp_domain=austin.century.com` in the nova.conf file.

If you do not set a default domain name in the nova.conf file, PowerVC uses the domain that is set for the Virtual I/O Server on the host you are deploying to. If it is unable to retrieve that value, it will use the domain name of the PowerVC management host. If it is unable to retrieve that value, no domain name is set and you will have to set it manually after you deploy the image. Consult the documentation for the operating system on the deployed virtual machine for information on how to set the domain name.

Capturing a virtual machine

You can capture a virtual machine that you created or deployed. Follow these steps to enable a virtual machine to be captured and then to capture the virtual machine.

There are requirements that the virtual machine must meet before it can be captured. If you do not prepare the virtual machine before you capture it, you can experience problems when you deploy the resulting image. For example, you may not be able to ping the virtual machine that is created when the image is deployed.

1. Install the activation engine on the virtual machine that you want to capture.

   Note: Do this step only the first time you capture a virtual machine. You do not have to install the activation engine again when you capture virtual machines that are created from this image.

2. Perform any pre-capture preparation that you want to do on the virtual machine, such as deleting or cleaning up log files.

3. Enable the activation engine on the virtual machine that you want to capture.

   Note: Do this step each time you want to capture a virtual machine, even if you are capturing a virtual machine that was captured before.

4. Select the virtual machine that you just prepared and click **Capture**.

The virtual machine is captured as an image and is stored in a storage volume. Each image you capture is stored in its own storage volume. An image is created even if the capture operation fails or hangs in Queued state. To see why the capture failed, you can view the details of the resulting image.

Capture requirements

This topic describes the support and requirements for capturing a virtual machine in your IBM Power Virtualization Center environment.

Sources that you can capture

You can create an image by capturing a virtual machine that is running any of the operating systems that are supported by IBM PowerVC, as described in the hardware and software requirements.

Requirements

Before you can capture a virtual machine, you should ensure that the following requirements are met:

- Your IBM PowerVC environment is configured as described in setting up the IBM PowerVC environment.
- The host that the virtual machine resides on is registered in IBM PowerVC.
- The virtual server uses virtual I/O and virtual storage.

- The virtual machine is powered off. When you power off a virtual machine, the status will appear as `Active` until the virtual machine has completely shut down. You can select the virtual machine for capture while the status is still displayed as `Active`.

- For SUSE Linux 11 virtual servers, devices names should be literal names rather than symbolic links. By default, devices are mounted by **-id**, which means that they are represented by symbolic links. You need to change the devices so they are mounted by device name or UUID, not by **-id**. The following steps describe how to do this using device name.

  - Search the file system table `/etc/fstab` for the presence of symbolic links. They will look like this: `/dev/disk/by-*`

  - Store the mapping of `/dev/disk/by-*` `symlinks` to their target devices in a scratch file. For example:

    ```
    ls -l /dev/disk/by-* > /tmp/scratchpad.txt
    ```

    The contents of the scratchpad.txt file may look something like this:

    ```
    /dev/disk/by-id:
    total 0
    lrwxrwxrwx 1 root root  9 Apr 10 12:07 scsi-360050768028180ee380000000000603c -> ../../sda
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 scsi-360050768028180ee380000000000603c-part1 -> ../../sda1
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 scsi-360050768028180ee380000000000603c-part2 -> ../../sda2
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 scsi-360050768028180ee380000000000603c-part3 -> ../../sda3
    lrwxrwxrwx 1 root root  9 Apr 10 12:07 wwn-0x60050768028180ee380000000000603c -> ../../sda
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 wwn-0x60050768028180ee380000000000603c-part1 -> ../../sda1
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 wwn-0x60050768028180ee380000000000603c-part2 -> ../../sda2
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 wwn-0x60050768028180ee380000000000603c-part3 -> ../../sda3

    /dev/disk/by-path:
    total 0
    lrwxrwxrwx 1 root root  9 Apr 10 12:07 scsi-0:0:1:0 -> ../../sda
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 scsi-0:0:1:0-part1 -> ../../sda1
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 scsi-0:0:1:0-part2 -> ../../sda2
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 scsi-0:0:1:0-part3 -> ../../sda3

    /dev/disk/by-uuid:
    total 0
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 3cb4e486-10a4-44a9-8273-9051f607435e -> ../../sda2
    lrwxrwxrwx 1 root root 10 Apr 10 12:07 c6a9f4e8-4e87-49c9-b211-89086c2d1064 -> ../../sda3
    /
    ```

  - Edit `/etc/fstab`, replacing the `/dev/disk/by-*` entries with the device names that the `symlinks` point to, as laid out in your scratchpad.txt file.

    The following example shows what these lines may look like before you edit them:

    ```
    /dev/disk/by-id/scsi-360050768028180ee380000000000603c-part2 swap    swap      defaults      0 0
    /dev/disk/by-id/scsi-360050768028180ee380000000000603c-part3 /       ext3      acl,user_xattr  1 1
    ```

    In this example, you would change those lines so they refer to the specific device names, as shown here:

    ```
    /dev/sda2 swap                swap      defaults      0 0
    /dev/sda3 /                   ext3      acl,user_xattr  1 1
    ```

  - Edit `/etc/lilo.conf`, making the boot and root lines correspond to the device names.

    The following example shows what the lines may look like before you edit them:

    ```
    boot = /dev/disk/by-id/scsi-360050768028180ee380000000000603c-part1
    root = /dev/disk/by-id/scsi-360050768028180ee380000000000603c-part3
    ```

    In this example, you would change those lines so they refer to the specific device names, as shown here:

    ```
    boot = /dev/sda1
    root = /dev/sda3
    ```

  - Run `lilo`

– Run `mkinitrd`

> **Note:** You have to do this step each time you deploy the SUSE Linux ISO image. After that, you can capture and deploy an image of the resulting virtual machine as many times as you'd like without having to perform this step.

Related concepts:

Chapter 2, "Setting up the IBM Power Virtualization Center environment," on page 3

Related tasks:

"Deploying images" on page 33

Related reference:

"Hardware and software requirements" on page 7

Installing the activation engine

Before you capture a virtual machine for the first time, you must install the activation engine that is shipped with IBM Power Virtualization Center on the virtual machine.

Follow these steps to Install and enable the activation engine:

1. Get the activation engine package `vmc.vsae.tar` from the IBM PowerVC management host on `/opt/ibm/powervc/activation-engine` .

2. Transfer the `vmc.vsae.tar` file to the virtual machine that you are going to capture.

3. On the virtual machine that you are going to capture, extract the contents of the .tar file.

4. For AIX, ensure that the `JAVA_HOME` environment variable is set and points at a Java™ runtime environment (JRE), for example:

   `# export JAVA_HOME=/usr/java5/jre`

   Then run the following command, which is included in the .tar file:

   `aix-install.sh`

5. For Linux, run the following command, which was included in the `.tar` file:

   `linux-install.sh`

   When you run this command, you are asked if the operating system is running on a KVM hypervisor. Answer no to this question.

Enabling the activation engine

Before you capture a virtual machine, you must enable the activation engine that is installed on it. This topic describes how to enable the activation engine.

1. If you previously captured the virtual machine and want to capture it again, run the following commands:

   ```
   rm /opt/ibm/ae/AP/*
   cp /opt/ibm/ae/AS/vmc-network-restore/resetenv /opt/ibm/ae/AP/ovf-env.xml
   ```

2. Prepare the virtual machine to be captured by running the following command:

   `/opt/ibm/ae/AE.sh -R`

   > **Attention:** This command finishes preparing the virtual machine for capture and then powers off the virtual server. Run this command only when you are sure that you no longer need to be logged into the virtual server before capturing it.

When you complete this task, the virtual machine is powered off and ready to be captured.

Uninstalling the activation engine

If you need to uninstall the activation engine from a virtual machine, follow the steps in this topic.

To uninstall the activation engine, run one of the following commands:

- For AIX:

```
aix-install.sh -u
```

- For Linux:

```
linux-install.sh -u
```

Chapter 6. Migrating a virtual machine

This task describes how to migrate a virtual machine from one host to another using IBM Power Virtualization Center. This migration is *hot*, which means that the virtual machine is migrated while it is running.

Before you attempt to migrate a virtual machine, you should ensure that both the source and destination hosts and the virtual machine meet the requirements for the type of migration that you want to do.

Select the virtual machine that you want to migrate and click **Migrate**.

Migration requirements

To successfully migrate virtual machines using IBM Power Virtualization Center, you have to make sure that the source and destination host and the virtual machine are configured properly.

To migrate a virtual machine, the following requirements must be met:

- The virtual machine must be in `Active` status in IBM PowerVC.
- The PowerVM Enterprise Edition or PowerVM for IBM PowerLinux hardware feature is activated on your hosts, depending on the model of hardware you are using. This enables you to use the Live Partition Mobility feature.
- The maximum number of virtual resources must be set to at least 60 on all of the hosts in your environment. This ensures that you are able to create a sufficient number of virtual machines on your hosts.
- The logical-memory block size on the source host and the destination host must be the same.
- The virtual machine must have a Resource Monitoring and Control (RMC) connection enabled. For instructions on how to set up the RMC connection, see Configuring VLANs on the network switch.

Related concepts:

Chapter 2, "Setting up the IBM Power Virtualization Center environment," on page 3

Related tasks:

"Changing the maximum number of virtual resources" on page 17

"Configuring the VLANs on the network switch" on page 10

"Entering the PowerVM Editions activation code" on page 15

"Changing the logical-memory block size" on page 18

Chapter 7. Troubleshooting and support for IBM Power Virtualization Center

To isolate and resolve problems with your IBM products, you can use the troubleshooting and support information. This information contains instructions for using the problem-determination resources that are provided with your IBM products, including IBM Power Virtualization Center.

Techniques for troubleshooting problems

Troubleshooting is a systematic approach to solving a problem. The goal of troubleshooting is to determine why something does not work as expected and how to resolve the problem. Certain common techniques can help with the task of troubleshooting.

The first step in the troubleshooting process is to describe the problem completely. Problem descriptions help you and the IBM technical-support representative know where to start to find the cause of the problem. This step includes asking yourself basic questions:

- What are the symptoms of the problem?
- Where does the problem occur?
- When does the problem occur?
- Under which conditions does the problem occur?
- Can the problem be reproduced?

The answers to these questions typically lead to a good description of the problem, which can then lead you to a problem resolution.

What are the symptoms of the problem?

When you begin to describe a problem, the most obvious question is "What is the problem?" This question might seem straightforward; however, you can break it down into several more-focused questions that create a more descriptive picture of the problem. These questions can include:

- Who, or what, is reporting the problem?
- What are the error codes and messages?
- How does the system fail? For example, is it a loop, hang, crash, performance degradation, or incorrect result?

Where does the problem occur?

Determining where the problem originates is not always easy, but it is one of the most important steps in resolving a problem. Many layers of technology can exist between the reporting and failing components. Networks, disks, and drivers are only a few of the components to consider when you are investigating problems.

The following questions help you to focus on where the problem occurs to isolate the problem layer:

- Is the problem specific to one platform or operating system, or is it common across multiple platforms or operating systems?

- Is the current environment and configuration supported?
- Do all users have the problem?
- (For multi-site installations.) Do all sites have the problem?

If one layer reports the problem, the problem does not necessarily originate in that layer. Part of identifying where a problem originates is understanding the environment in which it exists. Take some time to completely describe the problem environment, including the operating system and version, all corresponding software and versions, and hardware information. Confirm that you are running within an environment that is a supported configuration; many problems can be traced back to incompatible levels of software that are not intended to run together or were not fully tested together.

When does the problem occur?

Develop a detailed timeline of events that lead up to a failure, especially for those cases that are one-time occurrences. You can most easily develop a timeline by working backward: Start at the time an error was reported (as precisely as possible, even down to the millisecond), and work backward through the available logs and information. Typically, you need to look only as far as the first suspicious event that you find in a diagnostic log.

To develop a detailed timeline of events, answer these questions:
- Does the problem happen only at a certain time of day or night?
- How often does the problem happen?
- What sequence of events leads up to the time that the problem is reported?
- Does the problem happen after an environment change, such as upgrading or installing software or hardware?

Responding to these types of questions can give you a frame of reference in which to investigate the problem.

Under which conditions does the problem occur?

Knowing which systems and applications are running at the time that a problem occurs is an important part of troubleshooting. These questions about your environment can help you to identify the root cause of the problem:
- Does the problem always occur when the same task is being performed?
- Does a certain sequence of events need to happen for the problem to occur?
- Do any other applications fail at the same time?

Answering these types of questions can help you explain the environment in which the problem occurs and correlate any dependencies. Just because multiple problems occur around the same time does not mean necessarily that the problems are related.

Can the problem be reproduced?

From a troubleshooting standpoint, the ideal problem is one that can be reproduced. Typically, when a problem can be reproduced you have a larger set of tools or procedures at your disposal to help you investigate. Problems that you can reproduce are often easier to debug and solve.

However, problems that you can reproduce can have a disadvantage: If the problem is of significant business impact, you do not want it to recur. If possible, re-create the problem in a test or development environment, which typically offers you more flexibility and control during your investigation.

- Can the problem be re-created on a test system?
- Are multiple users or applications encountering the same type of problem?
- Can the problem be re-created by running a single command, a set of commands, or a particular application?

Interpreting messages in IBM Power Virtualization Center

You can use IBM PowerVC messages to help you troubleshoot problems. This topic describes how to interpret the message information you see in order to help understand the source of problems you may be seeing in the product.

Message numbers

Messages have unique message identifiers that are a minimum of seven characters and a maximum of ten characters in length. The format of the message identifiers is AEVXXX######Z, and is structured as follows:

- The characters AEV indicate that the message is a PowerVC message.
- The next 0-3 alphabetic characters (XXX) identify the area of the product where the error originated, as follows:

Table 11. Message identifiers for the different areas of PowerVC.

Area of the product	Message identifier
Verify environment tool	TTV
User interface	WEB
Storage	STG
Image	IMG
Hosts	COM
Security	SEC
Network	NET
Scheduler	SCH

- The next 3 to 6 digits (######) identify the unique message number.

  Note: Zero padded numbers in message identifiers are not unique. For example, numbers 029, 0029, and 00029 all represent the same message.
- The last character (Z) identifies the severity code, as follows:

  E   Indicates that the message is an error message.

  I   Indicates that the message is an information message.

  S   Indicates that a process completed successfully.

  W   Indicates that the message is a warning message.

Message content

Most messages include a description of the problem that has occurred as well as information on what you can do to resolve the problem. In some cases, additional information may be provided that refers to what is happening within the program

itself. This information is intended to give you a better idea of what is causing the problem in order to assist with troubleshooting. You may see some of this internal information as the Explanation in an error message; you may also see some of this information in the Health field if you look at the properties of a resource.

powervc-services script

Use the **powervc-services** shell script to manage IBM Power Virtualization Center services. Actions include starting, stopping, restarting, and viewing status for the specified service.

The script includes parameters for managing the following IBM PowerVC and OpenStack services:

- PowerVC
  - ego: Enterprise Grid Orchestrator, which is used for scheduling
  - ras: Reliability, Availability, and Serviceability, which is used for logging
  - ttv: Time To Value, which is used to validate the PowerVC environment
- OpenStack
  - cinder: volume block service that includes creating, deleting, attaching, and detaching volumes
  - glance: image service that includes creating, deleting, and updating images
  - keystone: identity service that is used for authentication, including token-based and user-service authorization
  - nova: compute service that is responsible for all PowerVM hypervisor communication
  - quantum: networking service that includes creating, editing, and deleting user-defined networks

Note: Some services might not support all the actions that the script offers.

To find out more about the **powervc-services** script, navigate to the /opt/ibm/powervc/bin directory, then run ./powervc-services.

powervc-validate command

Use the **powervc-validate** command to validate your IBM Power Virtualization Center environment. The command includes parameters to output results in JSON format and to retrieve current and previous validation results.

You can run the **powervc-validate** command at any time, but it is recommended that you wait until after you register storage, hosts, and network templates before you run the command for the first time.

To find out more about the **powervc-validate** command, navigate to the /opt/ibm/powervc/ttv/bin directory, then run ./powervc-validate -h.

For information about how to validate your environment by using the IBM PowerVC GUI, see "Verifying your environment."

Related concepts:
"Verifying your environment" on page 27

Searching knowledge bases

You can often find solutions to problems by searching IBM knowledge bases. You can optimize your results by using available resources, support tools, and search methods.

You can find useful information by searching the IBM Power Virtualization Center PDF. However, sometimes you need to look beyond the PDF to answer your questions or resolve problems.

To search knowledge bases for information that you need, use one or more of the following approaches:

- Find the content that you need by using the IBM Support Portal: http://www.ibm.com/support/us/en/.

  The IBM Support Portal is a unified, centralized view of all technical support tools and information for all IBM systems, software, and services. The IBM Support Portal provides access to the IBM electronic support portfolio from one place. You can tailor the pages to focus on the information and resources that you need for problem prevention and faster problem resolution. Familiarize yourself with the IBM Support Portal by viewing the demo videos about this tool: https://www.ibm.com/blogs/SPNA/entry/ the_ibm_support_portal_videos. The demo videos introduce you to the IBM Support Portal, explore troubleshooting and other resources, and demonstrate how you can tailor the page by moving, adding, and deleting portlets.
- Search for IBM PowerVC Technotes and tips by using the IBM Techdoc website: http://www.ibm.com/support/techdocs/atsmastr.nsf/Web/TechDocs.
- Search for content by using the IBM masthead search. You can use the IBM masthead search by typing your search string into the Search field at the top of any ibm.com® page.
- Search for content by using any external search engine, such as Google, Yahoo, or Bing. If you use an external search engine, your results are more likely to include information that is outside the ibm.com domain. However, sometimes you can find useful problem-solving information about IBM products in newsgroups, forums, and blogs that are not on ibm.com.

  Tip: Include "IBM" and the name of the product in your search if you are looking for information about an IBM product.

Getting fixes from Fix Central

You can use Fix Central to find the fixes that are recommended by IBM Support for various products, including IBM Power Virtualization Center. With Fix Central, you can search, select, order, and download fixes for your system with a choice of delivery options. A PowerVC product fix might be available to resolve your problem.

To find and install fixes:

1. Obtain the tools that are required to get the fix. If it is not installed, obtain your product update installer. You can download the installer from Fix Central: http://www.ibm.com/support/fixcentral. This site provides download, installation, and configuration instructions for the update installer.

Note: For more information about how to obtain software fixes, from the Fix Central page, click **Getting started with Fix Central**, then click the Software tab.

2. Click **Find product**.
3. Begin typing PowerVC in the **Product selector** field.
4. Select PowerVC from the list. For **Installed version**, select **All**.
5. Identify and select the fix that is required.
6. Download the fix.

   a. Open the download document and follow the link in the "Download Package" section.

   b. When you download the file, ensure that the name of the maintenance file is not changed. This change might be intentional, or it might be an inadvertent change that is caused by certain web browsers or download utilities.

7. Apply the fix.

   a. Copy the PowerVC 1.1.0.1 tar update package to your PowerVC system.

   b. Extract the tar update package with the following command:

   ```
   tar -zxvf package_name
   ```

   c. In the directory where you extracted the file, run the following command to apply the update:

   ```
   powervc-1.1.0.1/update
   ```

Contacting IBM Support

IBM Support provides assistance with product defects, answers FAQs, and helps users resolve problems with the product.

After you try to find your answer or solution by using other self-help options such as technotes, you can contact IBM Support.

Note: For IBM Power Virtualization Center, IBM Support is available only in China.

Before you contact IBM Support, your company or organization must have an active IBM software maintenance agreement (SWMA), and you must be authorized to submit problems to IBM. For information about the types of available support, see the "Support portfolio" topic in the "*Software Support Handbook*": http://www14.software.ibm.com/webapp/set2/sas/f/handbook/offerings.html.

To contact IBM Support about a problem:

1. Define the problem, gather background information, and determine the severity of the problem. For more information, see the "Getting IBM support" topic in the *Software Support Handbook*: http://www14.software.ibm.com/webapp/set2/sas/f/handbook/getsupport.html.

2. Gather diagnostic information. For more information about collecting and compressing diagnostic data, see "Exchanging information with IBM."

3. Submit the problem to IBM Support in one of the following ways:

   • Online through the IBM Support Portal: http://www.ibm.com/software/support/: You can open, update, and view all of your service requests from the Service Request portlet on the Service Request web page.

   • By phone: For the phone number to call in your region, see the Directory of worldwide contacts web page: http://www.ibm.com/planetwide/

If the problem that you submit is for a software defect or for missing or inaccurate documentation, IBM Support creates an Authorized Program Analysis Report (APAR). The APAR describes the problem in detail. Whenever possible, IBM Support provides a workaround that you can implement until the APAR is resolved and a fix is delivered. IBM publishes resolved APARs on the IBM Support website daily so that other users who experience the same problem can benefit from the same resolution.

Be prepared to work with the IBM technical-support representative by using IBM Assist On-site, which is a remote-assistance plug-in that you can download to your computer. The IBM technical-support representative can use IBM Assist On-site to view your desktop and share control of your mouse and keyboard. This tool can shorten the time that it takes to identify the problem, collect the necessary data, and solve the problem. For more information, see IBM Assist On-site: http://www.ibm.com/support/assistonsite/.

Related tasks:

"Exchanging information with IBM"

"Collecting data for IBM PowerVC problems" on page 52

Exchanging information with IBM

To diagnose or identify a problem, you might need to provide IBM Support with data and information from your system. In other cases, IBM Support might provide you with tools or utilities to use for problem determination.

Related tasks:

"Contacting IBM Support" on page 50

"Collecting data for IBM PowerVC problems" on page 52

Sending information to IBM Support

To reduce the time that is required to resolve your problem, you can send trace and diagnostic information to IBM Support.

To submit diagnostic information to IBM Support:

1. Open a problem management record (PMR). You can use the Service Request Tool to create a PMR: http://www.ibm.com/support/servicerequest

2. Collect the diagnostic data that you need. Diagnostic data helps reduce the time that it takes to resolve your PMR. Manually collect and compress the required diagnostic information by following the directions that you receive from IBM Support.

   Note: The IBM Power Virtualization Center diagnostic data collection tool collects and compresses diagnostic data that is needed for problem determination and resolution. The powervc-diag tool is in the /opt/ibm/powervc/bin directory on the IBM PowerVC managing system. Based on the nature of the issue, an IBM technical-support representative provides the exact syntax to use to run the command.

3. Transfer the required files to IBM. You can use one of the following methods to transfer the files to IBM:

   - The Service Request Tool at the following URL: http://www.ibm.com/support/servicerequest
   - Standard data upload methods: FTP, HTTP
   - Secure data upload methods: FTPS, SFTP, HTTPS

- Email

All of these data exchange methods are explained on the IBM Enhanced Customer Data Repository (ECuRep) websitehttp://www.ibm.com/software/support/exchangeinfo.html.

Receiving information from IBM Support

Occasionally an IBM technical-support representative might ask you to download diagnostic tools or other files. You can use FTP to download these files.

Ensure that your IBM technical-support representative provided you with the preferred server to use for downloading the files and the exact directory and file names to access.

To download files from IBM Support:

1. Use FTP to connect to the site that your IBM technical-support representative provided and log in as `anonymous`. Use your email address as the password.
2. Change to the appropriate directory:
   a. Change to the `/fromibm` directory.
      ```
      cd fromibm
      ```
   b. Change to the directory that your IBM technical-support representative provided.
      ```
      cd nameofdirectory
      ```
3. Enable binary mode for your session.
   ```
   binary
   ```
4. Use the **get** command to download the file that your IBM technical-support representative specified.
   ```
   get filename.extension
   ```
5. End your FTP session.
   ```
   quit
   ```

Collecting data for IBM PowerVC problems

Sometimes you cannot solve a problem by troubleshooting the symptoms. In such cases, you must collect diagnostic data.

Collecting and inspecting data before you open a problem management record (PMR) can help you to answer the following questions:

- Do the symptoms match any known problems? If so, has a fix or workaround been published?
- Can the problem be identified and resolved without a code fix?
- When does the problem occur?

The diagnostic data that you collect, and the sources from which you collect that data, are dependent on the type of problem that you are investigating. A base set of information is typically required for diagnosing and resolving a product-level or component-level problem. For specific symptoms, you must collect more problem-specific data.

When you submit a problem to IBM Support, you must provide a base set of information. The IBM PowerVC diagnostic data collection tool, also called the powervc-diag tool, can be used to collect information. The tool is in the `/opt/ibm/powervc/bin` directory of your IBM PowerVC installation. The

powervc-diag tool collects a variety of information into a single archive. Inspecting log files is a typical first step in problem determination. The OpenStack service log files can be found in the following locations within the archive.

OpenStack service log files

> /var/log/nova
>
> /var/log/cinder
>
> /var/log/quantum
>
> /var/log/keystone
>
> /var/log/glance

After you collect the appropriate diagnostic data, you can complete the following tasks:

- Contacting IBM Support
- Exchanging information with IBM Support

Related tasks:

"Exchanging information with IBM" on page 51

"Contacting IBM Support" on page 50

Subscribing to Support updates

To stay informed of important information about the IBM products that you use, you can subscribe to updates.

By subscribing to receive updates about IBM Power Virtualization Center, you can receive important technical information and updates for specific IBM Support tools and resources. You can subscribe to updates by using My Notifications:

My Notifications

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2. In the **Notifications** portlet, click **Manage all my subscriptions**, then click the **Subscribe** tab.
3. Click **Other Software**.
4. Select **IBM PowerVC**, then click **Continue**.

   a. Select your preferences for how to receive updates, whether by email or online in a designated folder. PowerVC subscriptions are not available by using an RSS or Atom feed.

   b. Select the types of documentation updates that you want to receive, for example, new information about product downloads and discussion group comments.

c. Click **Submit**.

Until you modify your My Notifications preferences, you receive notifications of updates that you requested. You can modify your preferences when needed.

Related information:

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➥ My Notifications for IBM technical support

➥ My Notifications for IBM technical support (http://www.ibm.com/support/mynotifications)

➥ My Notifications for IBM technical support overview (http://www.ibm.com/software/support/viewlet/my_notifications_viewlet_swf.html)

Known problems and solutions

This section provides troubleshooting information about various common problems with or limitations of IBM Power Virtualization Center, along with their solutions or workarounds.

If you experience a problem with any aspect of IBM PowerVC, review the following problem-solution topics to determine if a solution or workaround is already available. If your particular problem is not represented, see Searching knowledge bases for a list of other references, particularly the IBM Techdoc website, where the solution or workaround might instead be found.

Failed uninstall of IBM Power Virtualization Center

When you uninstall PowerVC, you get an error saying that you must try the uninstall using the force option.

Explanation

Uninstall fails because some of the RPMs that were installed with PowerVC could not be uninstalled.

Resolution

To resolve this issue, you can force an uninstall of PowerVC from the management host. Use the following command:

```
/opt/ibm/powervc/bin/powervc-uninstall -f
```

Note: This procedure removes IBM PowerVC from the management host. It does not remove or change anything in your environment that you created while you are using IBM PowerVC. Any Red Hat Enterprise Linux prerequisite packages that were installed during the IBM PowerVC installation remain.

PowerVC identity service fails to start

You can use the keystone logging command to restart IBM Power Virtualization Center.

Problem

When you attempt to start IBM PowerVC, the application fails to start.

Explanation

PowerVC does not start if you provided an invalid parameter or attribute necessary for keystone to make an LDAP client search.

Resolution

To correct this problem, complete the following steps:

1. Turn on the keystone logging `powervc-config --set /etc/keystone/keystone.conf DEFAULT debug True`.
2. Restart PowerVC by using the command `/opt/ibm/powervc/bin/powervc-services`.
3. Check the log file `/var/log/keystone/keystone.log` for errors.

Recovering an incomplete migration

If an IBM Power Virtualization Center migration task is interrupted, it might be necessary to recover the migration manually using the two Integrated Virtualization Managers, the source and the destination (target) hosts.

Explanation

During the migration of a virtual machine between two hosts, there are some events that can interfere with the migration. Examples of what could interfere with migration include the following:

- There may be trouble with the Resource Monitoring and Control (RMC) connection between the hosts.
- Some resources on the destination host may be unavailable.

In some cases, IBM PowerVC can stop the migration and restore the hosts to the condition they were in before the migration started. However, in some cases, PowerVC may not be able to detect and recover from the problem.

Resolution

If PowerVC is unable to detect a migration problem and recover, an administrator may need to manually manage the hosts using the Integrated Virtualization Manager. Follow these steps to manually recover an incomplete migration:

1. Identify the source host and the migrating virtual machine by logging on to the Integrated Virtualization Manager on one of the hosts, preferably the source if it is known, and access the command line.

   a. Get the current host's name using the following command: `lssyscfg -r sys -F name`. Make a note of the name of this host.

   b. List all of the virtual machines on this host to see if the virtual machine that was migrating indicates that this is the source host. Use the following command to do this: `lslparmigr -r lpar -m `*hostname*, where *hostname* is the name of the host from the previous step.

   c. Identify the migrating virtual machine and its source host.

      - For the migrating virtual machine, check for the following property: `source_msp_name`. This is the name of the Virtual I/O Server (VIOS)

virtual machine of the source host. If this does not correspond to the current host, log into the host of this VIOS, which will be the source.

- Note the names of both the source host and the migrating virtual machine.

2. Recover the migration on the source host by logging on to the Integrated Virtualization Manager for the source host and accessing the command line.

   a. Recover the migration by using the following command: `migrlpar -o r -p` *vmname* `-m` *hostname*, where *vmname* is the name of the migrating virtual machine and *hostname* is the name of the source host.

      Note: There are two possible outcomes for the migration recovery:
      - `outcome-1-src`: The migration reverts, leaving the virtual machine on the original source host.
      - `outcome-2-dest`: The migration completes, leaving the virtual machine on the destination (target) host.

   b. Determine the recovery status of the virtual machine on the source host.

      - List all of the virtual machines on the host to identify the source host. Use the following command to do this: `lslparmigr -r lpar -m` *hostname*.

         Note: Determine which outcome occurred:
         – `outcome-1-src`: The virtual machine migration state is *Not Migrating*.
         – `outcome-1-dest`: The virtual machine is no longer listed on the source host.

3. Recover the virtual machine's migration on the destination host by logging into the destination host and accessing the command line.

   a. If necessary, obtain the current host's name using the command `lssyscfg -r sys -F name`.

   b. List the virtual machines on this host to find the one that was migrating. Use the command `lsplparmigr -r lpar -m` *hostname* where *hostname* is the name of the host from the previous step.

      - If the migrating virtual machine is not listed and the outcome determined in step 2 is `outsome-1-src`, you can stop. The recovery is complete.
      - If the migrating virtual machine is listed and the migration state is *Not Migrating* and the outcome in step 2 is *outcome-2-dest*, you can stop. The recovery is complete.
      - If the migrating virtual machine is listed and it is still showing a migration state, then proceed.

   c. Recover the migrating virtual machine migration using the command `migrlpar -o r -p` *vmname* `-m` *hostname* `--force`, where *vnname* is the name of the migrating virtual machine and *hostname* is the name of the destination host.

      Note: The destination host adds the `--force` parameter.

   d. Verify that the recovery status of the virtual machine on the destination host is the reverse of the status on the source host.

      - List all of the virtual machines on the destination host using the command `lslparmigr -r lpar -m` *hostname*.
      - Verify that the correct outcome occurred:

         Note: This is reversed from the source host.

– `outcome-1-src`: The virtual machine is no longer listed on the destination host.
– `outcome-1-dest`: The virtual machine migration state is *Not Migrating*.

Task fails with error AEVWEB002E

This error can result when you are working with images.

Problem

The IBM Power Virtualization Center image service (called *glance* in OpenStack) stops running.

Explanation

When PowerVC is running, there are normally two image API processes and two image registry processes running. What causes this error is that the openstack-glance-api service stops running and only one of the two image processes is removed instead of both of them being removed. If you try to restart the openstack-glance-api service, it cannot run correctly because there is still one image API process running.

Resolution

To resolve this issue, you have to stop all of the running image processes and restart PowerVC.

1. View the running processes on the system by running the following command:
   `ps -ef | grep glance`
2. End the glance processes that are running by running the following command:
   `kill -9 process`, where *process* is the name of the process you want to end.
3. Restart PowerVC services by running the following command:
   `/opt/ibm/powervc/bin/powervc-services restart`

Tasks remain in the Scheduling state

You may encounter a problem where an IBM Power Virtualization Center task stays in the Scheduling state.

Problem

A task remains in the Scheduling state for longer than five minutes.

Explanation

There are two reasons why you may see this type of problem:

• The scheduler or one of its related components was stopped by an administrator.
• You performed a task on a host that was deleted before the host was completely removed from PowerVC. For example, you may have deployed an image to a host that was recently deleted. It takes a few minutes for hosts to be completely removed from PowerVC. If you try to perform a task on a host that has been deleted from PowerVC before it is completely removed, the task will remain in the Scheduling state because PowerVC is attempting to complete the task and is unable to do so.

Resolution

Run the following commands to stop and restart the PowerVC scheduler and its related components:

1. `service ego stop`
2. `service ego start`
3. `service openstack-nova-scheduler restart`
4. `service openstack-nova-ibm-notification restart`
5. `service openstack-nova-ibm-resource-optimization restart`

If running these commands does not resolve the problem, you need to delete the virtual machine that you were attempting to deploy and redeploy the image.

RHEL 5.9 virtual machines hang during initial start

A Red Hat Enterprise Linux (RHEL) 5.9 virtual machine might hang when you try to start it after deploying it from IBM Power Virtualization Center. If this happens, there might be a problem with the DHCP server configuration.

Problem

After you deploy a RHEL 5.9 virtual machine from IBM Power Virtualization Center, the virtual machine hangs during this step: "Determining IP information for eth0...".

Explanation

This problem is caused by a configuration problem with the DHCP server. The kudzu service automatically generates an `ifcfg-eth0` file with the line `"onboot=dhcp"` before the PowerVC activation engine assigns a static IP address to the virtual machine.

Resolution

Try one of these options to solve the problem.

Important: Complete these steps within one hour after creating the virtual machine. The initial network configuration is available to virtual machines for one hour after their deployment.

If the time between deployment and initial startup is longer than one hour, network configuration fails. In that case, you must delete the virtual machine and deploy another one, then follow these steps to configure the network.

- Run the command `dhclient` to determine whether the DHCP server is assigning addresses from an incorrect subnet. Look for DHCP offer messages (`DHCPOFFER`) that specify a subnet that the virtual machine does not use.

  If the DHCP server is assigning incorrect addresses, correct the issue or disable the DHCP server, then restart the RHEL 5.9 virtual machine.

- If the DHCP configuration cannot be changed, bypass the network service:
  1. When prompted with `Press "I" to enter interactive setup.`, type I.
  2. At the network service prompt, type N, then C to start the remaining services, as shown:
     ```
     Start service network (Y)es/(N)o/(C)ontinue? [Y] N
     Start service auditd (Y)es/(N)o/(C)ontinue? [Y] C
     ```

The PowerVC activation engine creates an `ifcfg-eth0` file with the correct IP address at the end of the startup process.

Accessibility

IBM Power Virtualization Center does not interfere with the accessibility features for supported browsers. For a comprehensive list of accessibility features please visit the accessibility support page for the supported browser that you are using. For a list of supported browsers, see the IBM Power Virtualization Center Administrator Guide.

The publications for this product are in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties using the PDF files and want to request a web-based format for a publication, email a request to the following address:

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