

IBM Power Systems

PowerVM NovaLink



Note

Before using this information and the product it supports, read the information in [“Notices” on page 53.](#)

This edition applies to IBM® PowerVM® NovaLink Version 2.0.0.0, to IBM AIX® Version 7.2, to IBM AIX Version 7.1, to IBM AIX Version 6.1, to IBM i 7.5 (product number 5770-SS1), to IBM Virtual I/O Server Version 3.1.3, and to all subsequent releases and modifications until otherwise indicated in new editions.

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PowerVM NovaLink

PowerVM NovaLink is a software interface that is used for virtualization management. You can install PowerVM NovaLink on a PowerVM server. PowerVM NovaLink enables highly scalable modern cloud management and deployment of critical enterprise workloads. You can use PowerVM NovaLink to provision large numbers of virtual machines on PowerVM servers quickly and at a reduced cost.

PowerVM NovaLink runs on a Linux® logical partition on a POWER8 or POWER9 processor-based server that is virtualized by PowerVM. You can manage the server through a representational state transfer application programming interface (REST API) or through a command-line interface (CLI). You can also manage the server by using PowerVC or other OpenStack solutions. PowerVM NovaLink is available at no additional charge for servers that are virtualized by PowerVM.

PowerVM NovaLink can be installed only on POWER8 or POWER9 processor-based servers.

Benefits of PowerVM NovaLink

PowerVM NovaLink provides the following benefits:

- Rapidly provisions large numbers of virtual machines on PowerVM servers.
- Simplifies the deployment of new systems. The PowerVM NovaLink installer creates a PowerVM NovaLink partition and Virtual I/O Server (VIOS) partitions on the server and installs operating systems and the PowerVM NovaLink software. The PowerVM NovaLink installer reduces the installation time and facilitates repeatable deployments.
- Reduces the complexity and increases the security of your server management infrastructure. PowerVM NovaLink provides a server management interface on the server. The server management network between PowerVM NovaLink and its virtual machines is secure by design and is configured with minimal user intervention.
- Operates with PowerVC or other OpenStack solutions to manage your servers.
- PowerVM NovaLink 1.0.0.4 enables Software Defined Networking (SDN) technology on a PowerVM server to allow PowerVC or OpenStack cloud management software to virtualize the networks by using industry standard Open vSwitch (OVS).
- PowerVM NovaLink 2.0.0.0, or later does not support SDN.

PowerVM NovaLink architecture

The PowerVM NovaLink software runs on an Ubuntu Linux, or a Red Hat® Enterprise Linux version 7.3 logical partition. The PowerVM NovaLink partition uses I/O resources that are virtualized by the Virtual I/O Server. The PowerVM NovaLink software is delivered by using the *dpkg* package manager for Ubuntu versions of PowerVM NovaLink, and the standard RPM Packet Manager (RPM) for Red Hat versions of PowerVM NovaLink, similar to any other software in the Linux operating system.

PowerVM NovaLink includes an installer that configures the PowerVM NovaLink environment in one action. The PowerVM NovaLink installer creates the Linux and Virtual I/O Server logical partitions and installs the operating systems and PowerVM NovaLink software.

The PowerVM NovaLink stack consists of the following services:

- PowerVM NovaLink Core Services provide direct interfaces to the managed system.
 - REST API which is similar to that on the Hardware Management Console (HMC) and a python-based software development kit: <https://github.com/powervm/pypowervm>
 - Command-line interface (CLI) for shell interaction with PowerVM. This CLI differs from CLI of the HMC to provide a complete PowerVM CLI that encompasses both hypervisor and VIOS configurations.
- OpenStack Services provide drivers and plug-ins for use by OpenStack-based management solutions, including PowerVC:

- PowerVM virtualization driver for OpenStack Nova: <https://github.com/openstack/nova-powervm>
- PowerVM Shared Ethernet Adapter agent for OpenStack Neutron: <https://github.com/openstack/networking-powervm>
- PowerVM compute agent plug-ins for OpenStack Ceilometer: <https://github.com/openstack/ceilometer-powervm>

Managed system co-management

POWER8 and POWER9™ processor-based servers can be co-managed by PowerVM NovaLink and an HMC.

When a managed system is co-managed by the HMC and PowerVM NovaLink, you set either PowerVM NovaLink or the HMC to be in the controller mode. Certain system management, partition management, and Capacity on Demand (CoD) tasks can be performed only from the interface that is in controller mode. For example, if PowerVM NovaLink is in the controller mode, you can run partition change operations only by using PowerVM NovaLink. If you want to run partition change operations by using the HMC, you must set the HMC to controller mode.

Firmware updates for a co-managed system can be performed only from the HMC. The HMC must be set to the controller mode to update the firmware.

To set the HMC to the controller mode, run the following command from the HMC command line, where *managed_system* is the name of the managed system:

```
chcogmt -m managed_system -o setcontroller -t norm
```

After you have completed your tasks on the HMC, run the following command from the HMC command line to make PowerVM NovaLink the controller again.

```
chcogmt -m managed_system -o relcontroller
```

Note: When a server is co-managed by the HMC and PowerVM NovaLink, partition profiles and system plans are not supported, regardless of whether the HMC is set to the controller mode. Use the Enhanced UI on the HMC to modify the current configuration of a partition. Use PowerVC or another OpenStack solution to manage the *flavors* (resource profiles) for your PowerVM NovaLink servers.

The HMC retains its hardware and service management roles in a co-managed environment, even when the HMC is not in controller mode. However, you must set the HMC to controller mode to perform any operations that change the system state. Operations that change the system state include firmware update, repair and verify, power on, or power off.

For more information about OpenStack, see the OpenStack documentation (<http://docs.openstack.org/>).

For more information about PowerVC, see the PowerVC Standard Edition information in IBM Knowledge Center (<https://www.ibm.com/support/knowledgecenter/SSXK2N>).

What's new in PowerVM NovaLink

Read about new or significantly changed information in IBM PowerVM NovaLink since the previous update of this topic collection.

August 2023

The following topic was removed:

- Installing Ubuntu 18.04 LTS in a PowerVM NovaLink partition

The following topic was added:

- [“Installing Ubuntu 20.04 LTS on a PowerVM NovaLink partition” on page 26](#)

The following topics were updated:

- [“PowerVM NovaLink system requirements” on page 4](#)

- [“Setting up network installation of PowerVM NovaLink ” on page 8](#)
- [“Installing the PowerVM NovaLink environment on a new managed system” on page 10](#)
- [“Upgrading PowerVM NovaLink software to version 2.0.2” on page 37](#)

July 2022

The following topics were updated:

- [“Installing the PowerVM NovaLink environment on a new managed system” on page 10](#)

August 2021

The following topics were updated:

- [“PowerVM NovaLink” on page 1](#)
- [“PowerVM NovaLink system requirements” on page 4](#)
- [“Setting up network installation of PowerVM NovaLink ” on page 8](#)
- [“Installing the PowerVM NovaLink environment on a new managed system” on page 10](#)
- [“Installing the PowerVM NovaLink software on a Red Hat Enterprise Linux partition” on page 18](#)
- [“Installing the PowerVM NovaLink software by using the PowerVM NovaLink Installer 2.0” on page 25](#)
- [Installing Ubuntu 18.04 LTS in a PowerVM NovaLink partition](#)
- [“Updating PowerVM NovaLink from a cloned repository” on page 34](#)
- [“Upgrading PowerVM NovaLink software to version 2.0.2” on page 37](#)
- [“PowerVM NovaLink Access Control Framework ” on page 50](#)

March 2021

The following topics were updated:

- [“Installing the PowerVM NovaLink software on a Red Hat Enterprise Linux partition” on page 18](#)
- [“Installing the PowerVM NovaLink software by using the PowerVM NovaLink Installer 2.0” on page 25](#)
- [Installing Ubuntu 18.04 LTS in a PowerVM NovaLink partition](#)
- [“PowerVM NovaLink command-line interface” on page 41](#)

November 2020

The following topics were added:

- [“Installing the PowerVM NovaLink software by using the PowerVM NovaLink Installer 2.0” on page 25](#)
- [Installing Ubuntu 18.04 LTS in a PowerVM NovaLink partition](#)
- [“Upgrading PowerVM NovaLink software to version 2.0.2” on page 37](#)

The following topics were updated:

- [“Installing the PowerVM NovaLink software on a Red Hat Enterprise Linux partition” on page 18](#)
- [“PowerVM NovaLink command-line interface” on page 41](#)

May 2020

- A partition cannot be set as a Time Reference Partition (TRP) from PowerVM NovaLink. The command to set up as TRP is not supported in PowerVM NovaLink.
- For information on the latest update on PowerVM NovaLink Version 1.0.016, see [PowerVM Novalink Readme](#).

- A new warning message is displayed when the Virtual I/O Server partition is powered-off. For more information, see [“Updating the firmware on a system that is managed by PowerVM NovaLink” on page 36.](#)

December 2019

You can specify the license key of IBM i logical partitions by using the PowerVM NovaLink CLI. For more information, see [“PowerVM NovaLink command-line interface” on page 41.](#)

June 2018

PowerVM NovaLink supports storage redundancy in the PowerVM Open I/O mode as a Technology Preview.

PowerVM NovaLink system requirements

For successful operation, PowerVM NovaLink requires hardware and software to meet specific criteria.

Server requirements

PowerVM NovaLink can be installed on POWER8 processor-based servers with firmware level FW840, or later and POWER9 processor-based servers with firmware level FW910, or later. For systems that are co-managed by a Hardware Management Console (HMC), firmware level FW840.11, or later, is required for POWER8 servers and firmware level FW910, or later, is required for POWER9™ servers. If the server does not have the required firmware level you must update the server firmware before you install PowerVM NovaLink. If you are planning to use Software Defined Networking (SDN) Technology Preview with PowerVM NovaLink, firmware level FW860, or later is required for POWER8 servers and firmware level FW910, or later, is required for POWER9™ servers.

PowerVM NovaLink partition requirements

PowerVM NovaLink requires its own partition on its managed system. The table lists the additional system resources that are required by the PowerVM NovaLink partition.

Table 1. System requirements of the PowerVM NovaLink partition

System requirements	Standard VIOS-based environment	PowerVM Open I/O (SDN and SDE)
Processors	0.5 shared processors that are uncapped with a nonzero weight and two virtual processors	
Memory	6.5 GB adjusted to 2.5 GB after installation	8 GB - 64 GB, depending on the number of partitions that are hosted
Storage	>= 30 GB vSCSI storage (LV, PV, NPIV)	SDN Only: >= 30 GB vSCSI storage (LV, PV, NPIV) SDN + Storage: Local SAS disk
Physical I/O	None	Physical network adapters (SDN and SDE), SAS devices (SDE)
Network	Virtual Ethernet	

If you install the PowerVM NovaLink environment on a new managed system, the PowerVM NovaLink installer creates the PowerVM NovaLink partition automatically. When the PowerVM NovaLink installer creates the PowerVM NovaLink partition on a new managed system, the PowerVM NovaLink installer always uses virtualized storage that is provisioned from the Virtual I/O Server. The installer creates logical volumes from the VIOS rootvg for the PowerVM NovaLink partition. If you set the PowerVM NovaLink

installer to use I/O redundancy, the storage for the PowerVM NovaLink partition is automatically mirrored for redundancy by using RAID 1.

If you install the PowerVM NovaLink software on a system that is already managed by a HMC, use the HMC to create a Linux logical partition that has the required amount of resources. When you use the HMC to create the Linux logical partition, set the `powervm_mgmt_capable` flag to true.

Supported operating systems for hosted logical partitions

PowerVM NovaLink supports all operating systems that are supported on the machine type and model of the managed system.

Virtual I/O Server partition requirements

PowerVM NovaLink version 2.0.3.1 requires Virtual I/O Server version 3.1.3, or later.

If you install the PowerVM NovaLink environment on a new managed system, configure one disk with at least 60 GB of storage for each Virtual I/O Server instance that you plan to create on the system. You can configure the disks in your local serial-attached Small Computer System Interface (SAS) storage or on your storage area network (SAN). If you create two instances of Virtual I/O Server, create each disk on a separate SAS controller or Fibre Channel (FC) card for redundancy. Otherwise, the resource requirements for Virtual I/O Servers that are installed by the PowerVM NovaLink installer are the same as the resource requirements for Virtual I/O Servers that are not installed by the PowerVM NovaLink.

For more information about the requirements for Virtual I/O Server logical partitions, see [Planning for the Virtual I/O Server](#).

Reliable Scalable Cluster Technology (RSCT) for Resource Monitoring Control (RMC) connections

To enable IPv6 link-local address support for Resource Monitoring Control (RMC) connections, update the Reliable Scalable Cluster Technology (RSCT) packages on AIX and Linux logical partitions to be at version 3.2.1.0 or later.

For information about updating RSCT packages, see [“Updating RSCT packages for PowerVM NovaLink” on page 32](#).

Resource Monitoring Control (RMC) and PowerVM NovaLink

Resource Monitoring Control (RMC) is used by a management console to perform dynamic operations on a logical partition. RMC connections between PowerVM NovaLink and each logical partition are routed through a dedicated internal virtual network. Such a configuration simplifies the network architecture for RMC, which increases the resiliency of the network to security attacks.

The RMC internal virtual network is configured such that client logical partitions can communicate only with the PowerVM NovaLink partition and not with each other.

For easier configuration of the RMC internal virtual network, assign an IPv6 link-local address to the RMC virtual network interfaces. To assign IPv6 link-local addresses to the RMC virtual network interfaces on AIX and Linux logical partitions, the Reliable Scalable Cluster Technology (RSCT) packages must be at version 3.2.1.0 or later. For more information about how to update RSCT packages, see [“Updating RSCT packages for PowerVM NovaLink” on page 32](#).

A Hardware Management Console (HMC) cannot use the RMC internal virtual network, even if the HMC co-manages the system with PowerVM NovaLink. For an HMC to perform dynamic operations on a co-managed system, you must configure an RMC connection between the HMC and each logical partition.

Installing PowerVM NovaLink

Use the PowerVM NovaLink installer to install the entire PowerVM NovaLink environment on a new managed system (Greenfield Installation). Alternatively, for systems that are already running and

managed by a Hardware Management Console (HMC), create a Linux logical partition, and use the PowerVM NovaLink installer to prepare and install the Linux operating system and the PowerVM NovaLink (and related) software.

About this task

If you plan to use the PowerVM NovaLink installer to install the entire PowerVM NovaLink environment on a new managed system, add the Virtual I/O Server installation files to the PowerVM NovaLink image.

PowerVM NovaLink must be installed before adding the system to the Power Enterprise Pool 2.0. If PowerVM NovaLink is reinstalled by using the installer, the host must be removed from the Power Enterprise Pool 2.0 before the install procedure.

The PowerVM NovaLink software is supported by the PowerVM support contract. The support for the underlying operating system (Ubuntu or Red Hat Enterprise Linux) on which the PowerVM NovaLink software runs on can be obtained separately, either directly with the Linux vendor or through IBM.

For easier installation of PowerVM NovaLink on multiple servers, set up a netboot (bootp) server to install PowerVM NovaLink from a network.

For storage that are not supported by VIOS and require you to install additional drivers on VIOS, complete the following steps:

1. Remove the connection to the storage from the CEC.
2. Install the PowerVM NovaLink software along with the VIOS
3. Install on the VIOS the drivers that are specific to the storage that must be attached to the CEC.
4. Add the storage back to the CEC.

Adding the Virtual I/O Server installation files to the PowerVM NovaLink installer

The downloaded PowerVM NovaLink installer contains a copy of the Ubuntu Linux operating system and the PowerVM NovaLink software. To install the entire PowerVM NovaLink environment on new servers, add the Virtual I/O Server (VIOS) installation files to the PowerVM NovaLink installer.

Before you begin

Before you add VIOS installation files to the PowerVM NovaLink installer, complete the following tasks:

- If you do not already have the installer, download the PowerVM NovaLink installer. You can download the PowerVM NovaLink installer from the My Entitled Systems support site (<http://www.ibm.com/server/eserver/ess>) in the **My entitled software** area. Download the installer for the **5692-A6P 2324 NovaLink feature code**. Use the installer to create a bootable USB drive. Alternatively, you can add the installer to a netboot server for network installation.
- Obtain the Virtual I/O Server installation discs.
- Obtain a Linux PC or notebook. The Linux PC or notebook must have at least 60 GB of free space.

About this task

To add Virtual I/O Server installation files to the PowerVM NovaLink installer, complete the following steps:

Procedure

1. Access the command-line interface on the Linux PC or notebook.
2. Insert the first Virtual I/O Server installation disc and extract the disc image to your home directory by entering the following command. Replace `/dev/sr x` with the device name (for example, `/dev/sr0`).

```
sudo cat /dev/sr $x$  > $HOME/dvdimage.v1.iso
```

3. Insert the second Virtual I/O Server installation disc and extract the disc image to your home directory by entering the following command. Replace srx with the device name (for example, $sr0$).

```
sudo cat /dev/sr $x$  > $HOME/dvdimage.v2.iso
```

4. Copy the PowerVM NovaLink installer to the home directory on the Linux PC or notebook.
5. Copy the installation files from the Virtual I/O Server installation images by entering the following commands.

```
sudo mkdir -p /tmp/mount_point
sudo mkdir /vios_files
sudo mount -o loop $HOME/dvdimage.v1.iso /tmp/mount_point
sudo cp /tmp/mount_point/nimol/ioserver_res/booti.chrp.mp.ent.Z /vios_files/
sudo cp /tmp/mount_point/nimol/ioserver_res/ispot.tar.Z /vios_files/
sudo cp /tmp/mount_point/nimol/ioserver_res/bosinst.data /vios_files/
sudo cp /tmp/mount_point/usr/sys/inst.images/mksysb_image /vios_files/
sudo cp /tmp/mount_point/usr/sys/inst.images/mksysb_image2 /vios_files/
sudo umount /tmp/mount_point
sudo mount -o loop $HOME/dvdimage.v2.iso /tmp/mount_point
sudo cp /tmp/mount_point/usr/sys/inst.images/mksysb_image /vios_files/mksysb_image3
sudo umount /tmp/mount_point
```

6. Open the `/vios_files/bosinst.data` file in a text editor and set the `SIZE_MB` entry in the `target_disk_data` section to be `SIZE_MB=61140`.
7. Copy the files from the PowerVM NovaLink installer by entering the following commands. Ensure that the hidden `.disk` directory is copied to the new directory.

```
sudo mkdir /novalink
sudo mount -o loop $HOME/novalink_ppc64e1.v1.iso /tmp/mount_point
cd /novalink
sudo cp -pR /tmp/mount_point/* .
sudo cp -pR /tmp/mount_point/.disk .
```

8. Copy the Virtual I/O Server installation files to the `vios/inst.images` directory by entering the following command.

```
sudo cp /vios_files/* /novalink/vios/inst.images/
```

9. Regenerate the PowerVM NovaLink installer with the Virtual I/O Server installation files by entering the following command on one line.

```
genisoimage -r -T -udf --allow-limited-size --netatalk -chrp-boot
-iso-level 4 -part -no-desktop -o $HOME/novalink-ubuntu-ppc64e1.iso /novalink
```

10. To create a bootable USB drive by using the PowerVM NovaLink image, complete the following steps. If you plan to install PowerVM NovaLink from a netboot server, you do not need to complete this step.
 - a) Insert a USB drive into the PC or notebook. The USB drive must have at least 6 GB of free space.
 - b) Use the `dmesg` command to show the device name of the USB drive (for example, `sd c`).
 - c) Enter the `mount` command to check for partitions on the USB drive. If partitions exist, enter the `umount` command as a root user to unmount all partitions from the USB drive. For example, if the device name is `/dev/sdc`, run the `mount` command and check for any mount points with `/dev/sdc x` (for example, `/dev/sdc1`). Enter the `umount /dev/sdc x` command for all such mount points that you find.
 - d) Copy the image to the USB drive by entering the following command. Replace `/dev/sd x` with the device name.

```
dd if=novalink-ubuntu-ppc64e1.iso of=/dev/sd $x$  bs=1M
```

Related information

[Customizing and using the bosinst.data file](#)

Setting up network installation of PowerVM NovaLink

For easier installation of PowerVM NovaLink to multiple servers, you can choose to install PowerVM NovaLink from a network by using netboot.

About this task

Complete the following tasks to set up network installation of PowerVM NovaLink:

- Set up a bootp server for network boot requests.
- Set up a tftp server for downloads of the initial files.
- Set up an http server for downloads of the remaining files.

To set up a netboot (bootp) server for PowerVM NovaLink installation on an Ubuntu Linux logical partition on a POWER8 or x86 system:

Procedure

1. Access the command line of an Ubuntu Linux logical partition.
2. Install the *bootp* protocol on the Ubuntu Linux logical partition by entering the following command.

```
sudo apt-get install bootp
```

3. Create the netboot (bootp) server database file `/etc/bootptab` by entering the command `sudo vi /etc/bootptab`. Enter the following text in the `/etc/bootptab` file. Replace `HOST_IP_ADDRESS`, `SUBNET MASK`, `GATEWAY_IP_ADDRESS`, `DOMAIN_NAME`, `NAME_SERVER_IP_ADDRESS`, and `BOOT_SERVER_IP_ADDRESS` with the values for your network.

```
neo-dev-19:\
    bf=core.elf:\
    ip=HOST_IP_ADDRESS:\
    sm=SUBNET_MASK:\
    gw=GATEWAY_IP_ADDRESS:\
    dn=DOMAIN_NAME:\
    ns=NAME_SERVER_IP_ADDRESS:\
    sa=BOOT_SERVER_IP_ADDRESS:
```

4. Install the *tftpd-hpa* and *tftp-hpa* packages on the Linux logical partition. After installation of the packages, the tftp server starts in a secure mode and uses `/var/lib/tftpboot` as the root directory.
5. Create a grub `/var/lib/tftpboot/core.elf` file that supports network booting by entering the following command in one line: `grub-mkimage --output=/var/lib/tftpboot/core.elf --format=powerpc-ieee1275 boot configfile echo elf http ieee1275_fb linux loadenv ls net normal ofnet reboot regexp serial sleep tftp time true date -p /`
6. Create a `/var/lib/tftpboot/grub.cfg` file.

Alternatively, you can create a `/var/lib/tftpboot/grub.cfg` file by entering the command `sudo vi /var/lib/tftpboot/grub.cfg` and by entering the following text in the `/var/lib/tftpboot/grub.cfg` file. Replace `GATEWAY_ADDRESS`, `SUBNET MASK`, `GATEWAY_IP_ADDRESS`, and `HOST_NAME` with the values for your network.

```
# Sample GRUB configuration for NovaLink network installation
set default=0
set timeout=-1

menuentry 'PowerVM NovaLink Install/Repair' {
    insmod http
    insmod tftp
    regexp -s 1:mac_pos1 -s 2:mac_pos2 -s 3:mac_pos3 -s 4:mac_pos4 -s 5:mac_pos5 -s 6:mac_pos6
    '(..):(..):(..):(..):(..):(..)' ${net_default_mac}
    set bootif=01-${mac_pos1}-${mac_pos2}-${mac_pos3}-${mac_pos4}-${mac_pos5}-${mac_pos6}
    regexp -s 1:prefix '(.*)\.(.*)' ${net_default_ip}
    # Setup variables with values from Grub's default variables
    set ip=${net_default_ip}
    set serveraddress=${net_default_server}
```

```

set domain=${net_ofnet_network_domain}
# If tftp is desired, replace http with tftp in the following line
set root=http,${serveraddress}
set gateway=GATEWAY_ADDRESS
set netmask=SUBNET_MASK
set nameserver=NAME_SERVER_IP_ADDRESS
set hostname=HOST_NAME
# In this sample file, the directory novalink is assumed to exist on the
# BOOTP server and has the Novalink ISO content
linux //novalink/ppc/ppc64/vmlinuz ro inst.text ip=${ipaddr}:::${gateway}:${netmask}:$
{hostname}::none nameserver=${domainnameserver} inst.repo=http://${net_default_server}/
novalink BOOTIF=${net_default_mac}
pkgset/language-pack-patterns= \
pkgset/install-language-support=false \
netcfg/disable_dhcp=true \
netcfg/choose_interface=auto \
netcfg/get_ipaddress=${ip} \
netcfg/get_netmask=${netmask} \
netcfg/get_gateway=${gateway} \
netcfg/get_nameservers=${nameserver} \
netcfg/get_hostname=${hostname} \
netcfg/get_domain=${domain} \
debian-installer/locale=en_US.UTF-8 \
debian-installer/country=US \
# The directory novalink-repo on the BOOTP server contains novalink content
# and dependent packages.
# The directory novalink-repo can be from a public IP or local IP address if the user had
# cloned the repo to a
# local machine. This folder will contain
# the public key of novalink novalink-gpg-pub.key
pvm-repo=http://${serveraddress}/novalink-repo \
# The directory novalink-vios on the BOOTP server contains the files
# needed to perform a NIM install of Virtual I/O Servers
pvm-viosdir=http://${serveraddress}/novalink-vios \
BOOTIF=${bootif} -- quiet
initrd //novalink/install/netboot_initrd.gz
}

```

To get the exact GRand Unified Bootloader (GRUB) file for Ubuntu 2004, refer to the Green Field Installation (GFI) procedure of Ubuntu ([Installing Ubuntu 20.04 LTS on a PowerVM NovaLink partition by using the autoinstall config](#)).

7. Create a `/tftpboot/grub.cfg/var/www/html/novalink-vios` directory and then copy the Virtual I/O Server installation files to this directory. Complete the following steps:

- a) Insert the first Virtual I/O Server installation disc and extract the disc image to your home directory by entering the following command. Replace `/dev/sr x` with the device name (for example, `/dev/sr0`).

```
sudo cat /dev/sr $x$  > $HOME/dvdimage.v1.iso
```

- b) Insert the second Virtual I/O Server installation disc and extract the disc image to your home directory by entering the following command. Replace `sr x` with the device name (for example, `sr0`).

```
sudo cat /dev/sr $x$  > $HOME/dvdimage.v2.iso
```

- c) Copy the installation files from the Virtual I/O Server installation images by entering the following commands.

```

sudo mkdir -p /tmp/mount_point
sudo mkdir novalink-vios
sudo mount -o loop $HOME/dvdimage.v1.iso /tmp/mount_point
sudo cp /tmp/mount_point/nimol/ioserver_res/booti.chrp.mp.ent.Z $HOME/novalink-vios
sudo cp /tmp/mount_point/nimol/ioserver_res/ispot.tar.Z $HOME/novalink-vios
sudo cp /tmp/mount_point/nimol/ioserver_res/bosinst.data $HOME/novalink-vios
sudo cp /tmp/mount_point/usr/sys/inst.images/mksysb_image $HOME/novalink-vios
sudo cp /tmp/mount_point/usr/sys/inst.images/mksysb_image2 $HOME/novalink-vios
sudo umount /tmp/mount_point
sudo mount -o loop $HOME/dvdimage.v2.iso /tmp/mount_point
sudo cp /tmp/mount_point/usr/sys/inst.images/mksysb_image $HOME/novalink-vios/
mksysb_image3
sudo umount /tmp/mount_point

```

- d) Open the `/var/www/html/novalink-vios/bosinst.data` file in a text editor and set the `SIZE_MB` entry in the `target_disk_data` section to be `SIZE_MB=61140`.
- e) Concatenate the `mksysb` files into a single file by entering the following commands.

```
sudo mkdir -p /var/www/html/novalink-vios
sudo cp $HOME/novalink-vios/booti.chrp.mp.ent.Z /var/www/html/novalink-vios/
sudo cp $HOME/novalink-vios/ispot.tar.Z /var/www/html/novalink-vios/
sudo cp $HOME/novalink-vios/bosinst.data /var/www/html/novalink-vios/
sudo cp $HOME/novalink-vios/mksysb_image /var/www/html/novalink-vios/mksysb
sudo cat $HOME/novalink-vios/mksysb_image2 >> /var/www/html/novalink-vios/mksysb
sudo cat $HOME/novalink-vios/mksysb_image3 >> /var/www/html/novalink-vios/mksysb
```

8. Copy the PowerVM NovaLink installer ISO file to your netboot (bootp) server at the following location: `$HOME/novalink.iso`.
9. Create a `/var/www/html/novalink` and `/var/lib/tftpboot/novalink` directory. Mount the PowerVM NovaLink image over it by entering the following commands.

```
sudo mkdir -p /var/www/html/novalink
sudo mount -o ro $HOME/novalink.iso /var/www/html/novalink
sudo mkdir -p /var/lib/tftpboot/novalink
sudo mount -o ro $HOME/novalink.iso /var/lib/tftpboot/novalink
```

10. Create a `/var/www/html/novalink-repo` directory. If public access is restricted for your environment, create a local repository. For more information, see [Updating PowerVM NovaLink from a cloned repository](#).

Installing the PowerVM NovaLink environment on a new managed system

Use the PowerVM NovaLink installer to install the PowerVM NovaLink environment on a new managed system.

Before you begin

This information can be used for managed systems that are in factory configuration and that are not managed by a Hardware Management Console (HMC). For information about how to install the PowerVM NovaLink software on a system that is managed by an HMC, see [“Installing the PowerVM NovaLink software on a system that is managed by an HMC”](#) on page 15.

Before you install the PowerVM NovaLink environment on a new managed system, complete the following tasks:

1. Install the hardware as needed and connect all cables except for the power cables. Install the hardware as required and connect all the cables. Note down the location code associated to each network adapter and their ports to be used. This information will be used during the installation. To understand the location codes for POWER9 systems, see [Part locations and location codes](#).
2. Update the system firmware to the latest version. For information on how to update the system firmware, see [Installing firmware using the USB port on the service processor on a system that is not managed by a management console](#).
3. Locate a Linux PC or notebook with the `ipmitool` installed to use as a console for initial configuration. If you have not configured the IP address of the Flexible Service Processor (FSP) of the managed system, then you also need an Ethernet cable to connect the PC or notebook to an FSP port of the managed system.
4. If you do not already have the installation image, download the PowerVM NovaLink install image. You can download the PowerVM NovaLink installation image from the My Entitled Systems support site (<http://www.ibm.com/server/eserver/ess>) from the **My entitled software** section. Download the image for the **5692-A6P 2324 NovaLink** feature code. Use the installation image to create a bootable USB drive. Alternatively, you can set up a netboot (bootp) server that has the PowerVM NovaLink image to install PowerVM NovaLink from a network.

5. Add the Virtual I/O Server installation files to the PowerVM NovaLink image. For information about how to add the Virtual I/O Server installation files to the PowerVM NovaLink image, see [“Adding the Virtual I/O Server installation files to the PowerVM NovaLink installer”](#) on page 6.
6. If you plan to use Red Hat Enterprise Linux (RHEL) instead of Ubuntu on the PowerVM NovaLink logical partition, ensure that you have the RHEL media and use a kickstart file. For more information on the contents of the sample kickstart file, see [“Installing the PowerVM NovaLink software on a Red Hat Enterprise Linux partition”](#) on page 18. When the installation completes, you can select **Install other Operating System** on the **Confirm Installation** panel. The PowerVM NovaLink installer reboots to the SMS menu after creating and installing the Virtual I/O Server logical partitions.
 - If you plan to use Ubuntu 20.04 instead of RHEL on the PowerVM NovaLink logical partition, ensure that you have the Ubuntu 20.04 media and use a preseed file. For more information on the contents of the sample preseed file, see [“Installing Ubuntu 20.04 LTS on a PowerVM NovaLink partition”](#) on page 26. When the installation completes, you can select **Install other Operating System** on the **Confirm Installation** panel. The PowerVM NovaLink installer reboots to the SMS menu after creating and installing the Virtual I/O Server logical partitions.
7. To install PowerVM NovaLink by using a netboot (bootp) server, you must set up the netboot server that has the PowerVM NovaLink image. For information about how to set up a netboot server, see [“Setting up network installation of PowerVM NovaLink ”](#) on page 8. If you are planning to use Software Defined Networking (SDN) Technology Preview, add the following line to the `grub.cfg` file: `pvm-installmode=SDN`
8. Configure one disk with at least 60 GB of storage for each Virtual I/O Server instance that you plan to create on the server. You can configure the disks in the local serial-attached Small Computer System Interface (SAS) of the server storage, or on a storage area network (SAN) storage. If you create two instances of Virtual I/O Server, create each disk on a separate SAS controller or Fibre Channel (FC) card for redundancy.
9. Obtain a static IP address (including gateway, DNS, and netmask) for the PowerVM NovaLink logical partition and for each of the VIOS logical partitions. Configure them appropriately during the PowerVM NovaLink install.

About this task

To install the PowerVM NovaLink environment on a new managed system, complete the following steps:

Procedure

1. If you are installing PowerVM NovaLink from a bootable USB drive, plug the drive into a USB port on the managed system. If you want to network install PowerVM NovaLink, connect an Ethernet port (other than the service processor ports) to the network in which the netboot server resides. Also, you must use a grub file for the network install. An example grub file follows:

```
set default=0
set timeout=10

menuentry 'PowerVM NovaLink Install/Repair' {
  insmod http
  insmod tftp
  regexp -s 1:mac_pos1 -s 2:mac_pos2 -s 3:mac_pos3 -s 4:mac_pos4 -s 5:mac_pos5 -s 6:mac_pos6
  '(.):(:):(:):(:):(:):(:)' ${net_default_mac}
  set bootif=01-${mac_pos1}-${mac_pos2}-${mac_pos3}-${mac_pos4}-${mac_pos5}-${mac_pos6}
  regexp -s 1:prefix '(*)\.(.*)' ${net_default_ip}

  # USER CAN CONFIGURE THESE
  set ipaddr=${net_default_ip}
  set hostname=ip9-47-71-90
  set gateway=9.47.79.254
  set netmask=255.255.240.0
  set nameserver=9.12.16.2
  set root=tftp,${net_default_server}
  set serveraddress=${net_default_server}
  set domain=${net_ofnet_network_domain}
  # END CONFIGURE
  linux //novacentos8/ppc/ppc64/vmlinuz ro inst.text ip=${ipaddr}::${gateway}:${netmask}:
```

```

{hostname}::none nameserver=${domainnameserver} inst.repo=http://${net_default_server}/
novacentos8 BOOTIF=${net_default_mac} \
pkgsel/language-pack-patterns= \
pkgsel/install-language-support=false \
netcfg/disable_dhcp=true \
netcfg/choose_interface=auto \
netcfg/get_ipaddress=${ipaddr} \
netcfg/get_netmask=${netmask} \
netcfg/get_gateway=${gateway} \
netcfg/get_nameservers=${nameserver} \
netcfg/get_hostname=${hostname} \
netcfg/get_domain=${domain} \
debian-installer/locale=en_US.UTF-8 \
debian-installer/country=US \
pvm-repo=http://${serveraddress}/novalink_dev_test/repo \
pvm-viosdir=http://9.114.254.135/vios/31314/2211A_72X/ \
pvm-install-other-os=RHEL \
pvm-os-install-source=http://9.47.68.254/rhel84_new/ \
pvm-ks-file=http://9.47.68.254/novalink_install_cfgs/rhel8/novalink-arch-finalRHEL84-ks.cfg

initrd //novacentos8/ppc/ppc64/initrd.img
}

```

2. Prepare the system for PowerVM NovaLink installation by using the Advanced System Management Interface (ASMI) by completing the following steps.

- a) If you have already configured the IP address of the FSP of the managed system, access the ASMI by using the administrator account by using a browser on another system. Otherwise, access the ASMI by using the PC or notebook.

For information about how to connect to ASMI by using the PC or notebook, see [Accessing the ASMI using a PC or notebook and web browser](#).

- b) If the system is powered on, power off the system from the ASMI by clicking **Power/Restart Control > Power On/Off System**.
- c) If the system was used earlier, you must clear the system firmware configuration by clicking **System Service Aids > Factory Configuration**.
- d) If the system is found connected to an Hardware Management Console HMC, disconnect the system by clicking **System Configuration > Hardware Management Consoles**, then click **Reset the server to a non-HMC-managed configuration**.

To disconnect a Central Electronics Complex (CEC) from an Hardware Management Console HMC, log in to the HMC. Select the CEC on which the PowerVM NovaLink installation is done. Click **Action > Reset or Remove System Connection**. On the window that is displayed, select the **Remove connection** and click **OK**.

- e) Enable Intelligent Platform Management Interface (IPMI) in the managed system by clicking **System Configuration > Console Type > IPMI**.
- f) Set the IPMI password by clicking **Login Profile > Change Password > User ID IPMI** and entering a password.
- g) From ASMI, power on the system to boot to the SMS menu by clicking **Power/Restart Control > Power On/Off System** and change **AIX/Linux partition mode boot** to **Boot to SMS menu**. If **Boot to SMS menu** is not an available option, click **System Configuration > Firmware Configuration**, select **PowerVM**, and click **Save**. Set **Server Firmware Start Policy** to **Running**. Click **Save settings and power on**.
- h) Use the IPMI console on a running Linux instance in another system to access the SMS menu. This Linux instance must have the **ipmitool** command installed. Enter the following command, and then enter the IPMI password (as set in step “2.f” on page 12) when prompted to check the power status of the system:

```
ipmitool -I lanplus -H FSP-ip-addr chassis power status
```

where *FSP-ip-addr* is IP address of the FSP that is used in a browser to access ASMI.

Connect the IPMI console to the system by running the following command:


```
ipmitool -I lanplus -H FSP-ip-addr sol activate
```

On successful completion of the **ipmitool** command, a prompt as shown below is displayed on the IPMI console:

```
[SOL Session operational. Use ~? for help]
```

3. If you are installing PowerVM NovaLink from the network, open an SSH terminal session to the netboot server and add the managed system to the `/etc/bootptab` file on the netboot server.

Choose an IP address, subnet mask, and gateway IP address for the managed system, and note the IP address of the netboot server.

4. Select the boot device by using the SMS menu.

You can select either a USB drive or a netboot server as the boot device. For your chosen boot device, complete the steps listed in the following table.

Boot device type	Steps
USB drive	<ol style="list-style-type: none">a. From the SMS menu, enter 5 to select boot options.b. Enter 1 to select the install/boot device.c. Enter 7 to view a list of all boot devices, and then enter the number that corresponds to the USB drive.d. Enter 2 to perform a normal mode boot, and then enter 1 to exit the SMS menu and to start the boot process.
Netboot server	<ol style="list-style-type: none">a. From the main menu, enter 2 to set up the remote IPL.b. Enter the number that corresponds to the Ethernet adapter that you want to use.c. Enter the number for IPv4 IP addresses.d. Enter the number for BOOTP as your network service.e. Enter 1 for IP parameters.f. Set the IP parameters:<ul style="list-style-type: none">• Client IP Address is the IP address that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server.• Server IP Address is the IP address of the netboot server.• Gateway IP Address is the gateway IP address that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server.• Subnet Mask is the subnet mask that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server.g. Press ESC, enter 3 for ping test, enter 1 for execute ping test, and verify that the netboot server is reachable.h. Enter M to return to the main menu.i. From the main menu, enter 5 to select boot options.j. Enter 1 to select the install/boot device.k. Select Network, BOOTP and then select the network card that you configured.l. Enter 2 to perform a normal mode boot, and then enter 1 to exit the SMS menu and to start the boot process.

5. At the GNU GRand Unified Bootloader (GRUB) screen, select the **PowerVM NovaLink Install/Repair** option.
6. Complete the PowerVM NovaLink installation wizard.

- a) Select **Choose to perform installation** and press **Next**. Use the **Tab** key to move the cursor to the **Next** button and press the **Enter** or **Space** key.
- b) Select **Choose to provide custom values** and press **Next**.
- c) Press **I Accept** for the license agreement and press **Next**.
- d) Enter the user name and password of the administrators of PowerVM NovaLink and the Virtual I/O Servers and press **Next**.
- e) Enter the network configuration settings for the PowerVM NovaLink logical partition and press **Next**.
- f) If you configured GRUB to enable SDN Technology Preview mode, complete the following steps:
 - Select **Choose to enable SDN** and press **Next**.
 - Specify the processor and memory settings for the PowerVM NovaLink logical partition and press **Next**.
- g) Select whether you want I/O redundancy and press **Next**. If you select **Choose to create I/O redundancy**, the installation creates 2 VIOS logical partitions that collectively provide redundancy for the disk data of the VIOS-client logical partition.
- h) Specify the processor and memory settings for VIOS logical partitions and press **Next**.
- i) Verify the physical I/O settings.

This screen assigns physical I/O (disk and network) adapters on the server to the VIOS logical partitions. If you are using the SDN Technology Preview mode, you can also allocate network adapters to the PowerVM NovaLink logical partition. The network adapters assigned to the PowerVM NovaLink logical partition will be assigned to Open vSwitch-client logical partitions in the managed system.

By default, the installer automatically divides all physical I/O adapters between the two VIOS instances if VIOS redundancy was selected and the following conditions apply:

 - Each VIOS must be assigned at least one adapter that serves disk I/O
 - Each VIOS must be assigned at least one Ethernet adapter that is cabled.
 - If using SDN Technology Preview mode, the PowerVM NovaLink logical partition must be assigned at least one cabled Ethernet adapter

Note that this screen may consist of multiple sub-screens for a server with many adapters. Use the **View More** and **View Previous** buttons to navigate among the sub-screens. To assign an adapter to an owner-logical partition, use the **Tab** key to skip to the correct radio button, press the **Enter** or **Space** key to select the radio button. Press **Next** to go to the next wizard task. To understand the location codes for POWER9 systems, see [Part locations and location codes](#).
- j) If you are using SDN Technology Preview mode, complete the following steps:
 - Select the ports to be used for SDN Virtual Network Bridge and press **Next**. This screen lists all the network ports from the previously assigned network adapters. Select two or more ports to create a link aggregation device.
 - Select the Link Aggregation parameters for the SDN Virtual Network Bridge and press **Next**.
- k) Select the ports to be used for VIOS-SEA Network Bridges and press **Next**.

This screen lists all the network ports from the previously assigned network adapters. This step will be repeated for each VIOS instance.
- l) If you selected two or more ports to be used for VIOS-SEA Network Bridges, select the Link-aggregation type and press **Next**.
- m) Enter the Network configuration settings for Virtual I/O Servers and press **Next**.
- n) Review the settings in the summary screen and press **Finish**.

In the Summary screen, you can review the configured installation options, and optionally manually edit the options. To change specific configuration settings, move the cursor to the specific field and select the **Edit Settings** button.

- Changing the Time zone: By default the PowerVM NovaLink installer sets the default timezone value to `America/New_York`. You can change the time-zone to a different value from the **Summary** screen by performing the following actions:

- Select **Edit Settings**.
- In another window, on a Linux system, run the following command:

```
timedatectl list-timezones
```

and find the line for your time zone location. For example: “America/Indiana/Indianapolis”.

- Move the cursor to the line containing `timezone =`, and replace it with the desired timezone value. For example: “America/Indiana/Indianapolis”.
 - Press `Ctrl+X` to save and exit to the **Summary** screen.
- To use your own Network Installation Manager (NIM) server for installation of Virtual I/O Server, complete the following actions:
 - Select **Edit Settings**.
 - Set **VIOSNIMServerConfig** > **viosinstallprompt** to `True` and exit.

Results

After you specify installation parameters, the PowerVM NovaLink installer creates one or two Virtual I/O Server logical partitions. PowerVM NovaLink installer then creates a Linux logical partition and installs the Ubuntu Linux operating system and the PowerVM NovaLink software on the partition.

For faster installation of PowerVM NovaLink on a system with more than 100 GB of memory, press `Ctrl+C` when prompted to at the end of the Installer wizard and choose the reboot option. Choosing to reboot allows you to avoid waiting for the memory and I/O slots to be reallocated dynamically. Dynamic reallocation of memory can take a long time to complete on a system with a large amount of memory. However, you must complete the wizard again after the reboot operation completes.

During the installation of the Virtual I/O Server partitions, you can open a virtual terminal session for the partitions to change the partition configuration if necessary. To open a virtual terminal session for a Virtual I/O Server partition, press `Ctrl+Z` to access a shell prompt and enter `mkvtterm --id 2` or `mkvtterm --id 3`. To exit the virtual terminal session enter `CTRL]`, then type `exit` to go back to the PowerVM NovaLink installer status screen.

What to do next

When the installation of PowerVM NovaLink is complete, update the Ubuntu Linux operating system and the PowerVM NovaLink software if needed.

Installing the PowerVM NovaLink software on a system that is managed by an HMC

You can install PowerVM NovaLink on a system that is managed by a Hardware Management Console (HMC). For a system that is managed by an HMC, the PowerVM NovaLink installer installs the Ubuntu Linux operating system and the PowerVM NovaLink software on a Linux partition.

Before you begin

Before you install the PowerVM NovaLink software on a system that has logical partitions, complete the following tasks:

- Install the hardware as needed, connect all cables, and set up the system so that it is managed by an HMC.
- If you do not already have the PowerVM NovaLink installation image, download the image. You can download the PowerVM NovaLink installation image from the My Entitled Systems support site (<http://www.ibm.com/server/eserver/ess>) in the **My entitled software** section. Download the image for the

5692-A6P 2324 NovaLink feature code. Use the installation image to create a bootable USB drive. Alternatively, you can set up a netboot (bootp) server that has the PowerVM NovaLink image to install PowerVM NovaLink from a network. You can also mount the PowerVM NovaLink image as a virtual optical drive in a Virtual I/O Server partition.

- To install PowerVM NovaLink by using a netboot (bootp) server, you must set up the netboot (bootp) server that has the PowerVM NovaLink image. For information about how to set up a netboot (bootp) server, see “[Setting up network installation of PowerVM NovaLink](#)” on page 8.
- Update the system firmware to the latest version. Download the latest system firmware from IBM Fix Central (<http://www.ibm.com/support/fixcentral/>). You can update the system firmware by using the HMC.

About this task

To install the PowerVM NovaLink software on a system that has logical partitions, complete the following steps:

Procedure

1. If you are installing PowerVM NovaLink from a bootable USB drive, plug the drive into a USB port on the managed system. If you are installing PowerVM NovaLink from the network, connect an Ethernet port other than the service processor ports to the network on which the netboot server resides.
2. Create a Linux logical partition on the managed system by using the HMC.

When you create the Linux logical partition, assign the following resources to the partition:

- 0.5 shared processors that are uncapped with a non-zero weight and 2 virtual processors
- 6.5 GB of memory, which you can adjust to 2.5 GB after installation
- At least 30 GB of storage
- A virtualized network that is bridged through the shared Ethernet adapter (SEA)
- Maximum virtual slots that are set to 200 or higher

For more information about how to create a Linux partition by using the HMC, see [Creating a logical partition by using a template](#).

From the HMC command line, enter the following command to apply the profile for the Linux partition. In this command, *sys_name* is the name of the managed system, *lpar_id* is the partition ID of the Linux partition, and *profile_name* is the name of the profile.

```
chsyscfg -m sys_name -r lpar -o apply --id lpar_id -n profile_name
```

3. From the HMC command line, enter the following command to enable co-management. In this command, *sys_name* is the name of the managed system.

```
chcomgmt -m sys_name -o setcontroller -t norm
```

4. From the HMC command line, enter the following command to enable PowerVM NovaLink support for the logical partition.

In this command, *sys_name* is the name of the managed system and *lpar_id* is the ID of the PowerVM NovaLink partition.

```
chsyscfg -m sys_name -r lpar -i lpar_id=lpar_id,powervm_mgmt_capable=1
```

5. Activate the logical partition by using the HMC.

When you activate the logical partition, ensure that the HMC is set to open a terminal window for the logical partition when the logical partition is activated.

For information about how to activate the logical partition by using the HMC, see [Activating AIX or Linux partitions](#).

The SMS menu is displayed in the terminal window.

6. From the HMC command line, enter the following command to release controller authority for the managed system.

In this command, *managed_system* is the name of the managed system.

```
chcomgmt -o relcontroller -m managed_system
```

7. Return to the terminal window for the logical partition and select the boot device by using the SMS menu.

You can select either a USB drive or a netboot server as the boot device. To select the boot device, complete the steps for the type of boot device that you are using.

Boot device type	Steps
USB drive	<ol style="list-style-type: none"> a. From the main menu, enter 5 to select boot options. b. Enter 1 to select the install/boot device. c. Enter 7 to view a list of all boot devices, and then enter the number that corresponds to the USB drive. d. Enter 2 to perform a normal mode boot, and then enter 1 to exit the SMS menu and to start the boot process.
Netboot server	<ol style="list-style-type: none"> a. From the main menu, enter 2 to set up the remote IPL. b. Enter the number that corresponds to the Ethernet adapter that you want to use. c. Enter the number for IPv4 IP addresses. d. Enter the number for BOOTP as your network service. e. Enter 1 for IP parameters. f. Set the IP parameters: <ul style="list-style-type: none"> • Client IP Address is the IP address that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server. • Server IP Address is the IP address of the netboot server. • Gateway IP Address is the gateway IP address that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server. • Subnet Mask is the subnet mask that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server. g. Press ESC, enter 3 for ping test, enter 1 for execute ping test, and verify that the netboot server is reachable. h. Enter M to return to the main menu. i. From the main menu, enter 5 to select boot options. j. Enter 1 to select the install/boot device. k. Select Network, and then select the configured network card. l. Enter 2 to perform a normal mode boot, and then enter 1 to exit the SMS menu and to start the boot process.

8. At the GNU GRand Unified Bootloader (GRUB) screen, select the **PowerVM NovaLink Install/Repair** option.
9. Complete the PowerVM NovaLink installation wizard.
 - a) Select **Choose to perform installation** and click **Next**.
 - b) Select **I Accept** for the license agreement and click **Next**.
 - c) Enter the user name and password of the PowerVM NovaLink administrator and click **Next**.
 - d) Enter or verify the network configuration settings and click **Next**.

- e) Review the settings and click **Finish**.

Results

After you specify installation parameters, the PowerVM NovaLink installer installs the Ubuntu Linux operating system and the PowerVM NovaLink software on the Linux partition.

What to do next

After the installation is complete, update the Ubuntu Linux operating system and the PowerVM NovaLink software if needed.

Installing the PowerVM NovaLink software on a Red Hat Enterprise Linux partition

You can install the PowerVM NovaLink software on a Red Hat Enterprise Linux (RHEL) partition. To install the PowerVM NovaLink software on a RHEL partition, the PowerVM NovaLink software requires RHEL version 7.6, or later, for IBM Power Systems (little endian).

Before you begin

To install PowerVM NovaLink on your managed system, complete the following tasks:

- When your managed system is in the manufacturing default configuration and is not managed by a Hardware Management Console (HMC), see [“Installing the PowerVM NovaLink environment on a new managed system” on page 10](#) for more information on installing PowerVM NovaLink.
- When your managed system is managed by a Hardware Management Console (HMC), see [“Installing the PowerVM NovaLink software on a system that is managed by an HMC” on page 15](#) for more information on installing PowerVM NovaLink.

When the PowerVM NovaLink installation wizard completes, perform the following actions:

- After the Virtual I/O Servers are created and installed, the system reboots to the SMS menu.
- You can now point to a network boot server that has RHEL images, and reinstall RHEL on the PowerVM NovaLink partition by using the sample kickstart file. Ensure RHEL operating system is installed and the SELinux environment variable is disabled.

About this task

To install PowerVM NovaLink software on RHEL partition, complete the following tasks:

1. Set up the YUM repository. For instructions, see [Setting up the YUM repository](#).
2. Install PowerVM NovaLink software on RHEL partition. For instructions, see [Installing PowerVM NovaLink on a running RHEL partition](#). Alternatively, if you are using PowerVM NovaLink Installer, you can use the installer to select the installation of another Linux distribution such as RHEL. For instructions, see [Installing RHEL by using PowerVM NovaLink Installer](#).

Setting up the YUM repository

The YUM repository is set up for PowerVM NovaLink binary Red Hat Package Manager (RPM) and the dependencies of the RPMs.

Choose one of the following options depending on the version of RHEL on which you want the YUM repository:

- To install the YUM repository on RHEL 7, complete the following steps:
 1. Sign in to the RHEL partition as a root user.
 2. Run the following command:

```
rpm -ivh http://public.dhe.ibm.com/systems/virtualization/Novalink/rhel/ibm-novalink-repo-latest.noarch.rpm
```

This command installs the YUM repository configuration file along with script that will be used to import the GPG key into the RPM database. This enables checking of subsequent installation of PowerVM NovaLink packages to ensure they have not been corrupted or altered. The latest RPMs might not be signed and if you want to use the latest RPM, you must use the value `gpgcheck=0` in your repository files. For more details about the configuration, see the [sample kickstart file](#).

3. Run the following command to import the key into the RPM database:

```
/opt/ibm/novalink/bin/import-ibm-novalink-repo-key.sh
```

4. Run the following commands to obtain RPM files from RSCT:

- a. `wget ftp://public.dhe.ibm.com/software/server/POWER/Linux/yum/download/ibm-power-repo-latest.noarch.rpm`

- b. `rpm -vih --nodeps ibm-power-repo-latest.noarch.rpm`

5. Run the `/opt/ibm/lop/configure` command and accept the license statement to set up the repository.

6. For information about how to enable Extra Packages for Enterprise Linux (EPEL) repository for the partition, see <https://fedoraproject.org/wiki/EPEL>.

- To install the YUM repository on RHEL 8, complete the following steps:

1. Sign in to the RHEL partition as root user and complete the registration of RHEL.

2. Enable the following repositories:

- AppStream
- Supplementary
- BaseOS

3. To install the Extra Packages for Enterprise Linux (EPEL) repository for the partition, run the following commands:

- a. `yum --assumeyes install https://dl.fedoraproject.org/pub/epel/epel-release-latest-8.noarch.rpm`

- b. `yum install kernel-modules-extra`

- c. `yum update`

- d. `reboot`

4. Configure a YUM repository (`/etc/yum.repos.d/pvm.repo`).

Note: The value for the `baseurl` variable can be a public repository or a local repository.

If the `baseurl` variable is a public repository, an example `pvm.repo` file is as follows:

```
[novalink]
name=Novalink
baseurl=http://public.dhe.ibm.com/systems/virtualization/Novalink/rhel/82/
novalink_2.0.3
enabled=1
gpgcheck=0
```

If the `baseurl` variable is a CD or an ISO repository, an example `pvm.repo` file is as follows:

```
[novalink]
name=Novalink
baseurl=file://<CD Mount Point>/repo/rhel8/
enabled=1
gpgcheck=0
```

5. Run the following commands to obtain RPM files from RSCT and the `ibm-power-repo` package:

- a.

```
wget ftp://public.dhe.ibm.com/software/server/POWER/Linux/yum/download/ibm-power-repo-latest.noarch.rpm
```
- b.

```
rpm -vih --nodeps ibm-power-repo-latest.noarch.rpm
```

6. After you install the RPM package, run the following command:

```
/opt/ibm/lop/configure
```

7. Accept the license to set up the repository.

Installing PowerVM NovaLink on a running RHEL partition

Choose one of the following options depending on the version of RHEL on which you want to install PowerVM NovaLink:

- To install the PowerVM NovaLink environment on an RHEL 7 partition, complete the following steps:
 1. Before installing PowerVM NovaLink, run the following command to install the `kernel-devel` package:

```
yum install kernel-devel
```

Note: You must not combine this command with step “6” on page 20.

2. Sign in to the RHEL partition as root user.
3. To check if the SELinux variable is in disabled mode or permissive mode, run the following command:

```
getenforce
```

The SELinux variable is set to **Disabled** mode.

4. If SELinux variable is not in either disabled mode or permissive mode, you must run the following command to set the SELinux variable in disabled mode or permissive mode and reboot the PowerVM NovaLink partition:

```
setenforce disabled
```

Alternatively, run the following command to disable the SELinux variable and reboot the PowerVM NovaLink partition:

```
vi /etc/sysconfig/selinux  
Change the variable as SELINUX=disabled
```

5. To stop and disable the firewall service, run the following commands:

```
systemctl stop firewalld  
systemctl disable firewalld
```

6. To install the PowerVM NovaLink stack, run the following command:

```
yum install pvm-novalink python-positional
```

7. After the installation is complete, you can add the `admin` user to the `pvm_admin` group by running the following command:

```
usermod -G pvm_admin <admin_user_id>
```

- To install the PowerVM NovaLink environment on a RHEL 8.2, or later partition complete the following steps:

1. Sign in to the RHEL partition as root user.
2. To install the PowerVM NovaLink stack, run the following command:

```
yum --assumeyes install python3 pvm-novalink xerces-c
```


3. After the installation is complete, you can add the *neo* user and assign the *sudo* user privilege by running the following command:

```
useradd -G pvm_admin -m -p `openssl passwd -1 neo123` neo
sed -i "s/(root)\(.*ALL\)$/\1\2\nneo\2/" /etc/sudoers
```

4. To create a soft link for **Python 3** as **Python**, choose either [Method 1](#) or [Method 2](#):

- Method 1

- a. Run the following command:

```
sudo alternatives --config python
sudo] password for neo:
There are 2 programs which provide 'python'.
  Selection      Command
-----
** 1             /usr/libexec/no-python
   2             /usr/bin/python3
Enter to keep the current selection[+], or type selection number: 2
```

- b. Choose option **2** to use **Python 3**.

- Method 2

Run the following command:

```
ln -s /usr/bin/python3 /usr/bin/python
```

Installing RHEL by using PowerVM NovaLink installer

The PowerVM NovaLink installer has a new option to select the installation of another Linux distribution such as RHEL. If you select this option, the PowerVM NovaLink partition is rebooted into the SMS menu after the Virtual I/O Servers are created and installed. You can setup an installation of RHEL 7.3 or RHEL 8 along with the PowerVM NovaLink packages by using a kickstart file.

An example kickstart file of RHEL 7.3 is as follows:

```
#platform=Power VM
#version=DEVEL

# Firewall configuration
firewall --disabled

# Install OS instead of upgrade
install
repo --name=epel --baseurl=http://download.fedoraproject.org/pub/epel/7/ppc64le

# Root password encrypted using python one liner
# python -c 'import crypt,base64,os; print(crypt.crypt("passwd", "$6$" +
base64.b64encode(os.urandom(6))))'

rootpw --iscrypted $6$F5jDDW3B$Vf3th7JxE2nfwoz0nbrl6moBeEanQbRqRjvWeC03nJIumI3
intY0m4JUnl9Hg0uEncViM.sn05Dkq.zC3yo70

# System authorization information
auth --passalgo=sha512

# Use text mode install
text

# System keyboard
keyboard us

# System language
lang en_US

# SELinux configuration
selinux --disabled
```

```

# Do not configure the X Window System
skipx
services --enabled=sshd

# Installation logging level
# logging --level=info

logging --level=debug

# System timezone

timezone America/Chicago

# Clear the controller Boot Record
zerombr

# Partition clearing information
clearpart --drives=sda,sdb --all --initlabel

# reqpart will take care of PreP partition on first disk reqpart
# It will be safer to use /dev/disk/by-id/<device id> if known
# instead of /dev/sda or /dev/sdb
# Uncomment if configuring single disk no redundant VIOS
# part /boot --size 300 --fstype ext4 --ondisk /dev/sda
# part pv.01 --size 1 --grow --ondisk /dev/sda
# volgroup pvmvg pv.01
# logvol / --vgname=pvmvg --name=root --size=9216
# logvol /var --vgname=pvmvg --name=var --size=10240
# logvol /tmp --vgname=pvmvg --name=tmp --size=1024
# logvol swap --vgname=pvmvg --name=swap --fstype swap --size=4096
# logvol /home --vgname=pvmvg --name=home --size=1 --grow

bootloader --driveorder=sda,sdb

# RAID1 2 disk partition recipe using LVM over RAID
# Second disk needs to have PreP partition created

part None --fstype prepboot --ondrive=sdb --size 8
part raid.00 --size 256 --asprimary --ondrive=sda
part raid.10 --size 256 --asprimary --ondrive=sdb
part raid.01 --size 29696 --asprimary --ondrive=sda
part raid.11 --size 29696 --asprimary --ondrive=sdb
raid /boot --fstype ext4 --device raid1-boot --level=RAID1 raid.00 raid.10
raid pv.01 --device raid1-pv --level=RAID1 raid.01 raid.11

volgroup pvmvg pv.01

# Adjust size accordingly if you want to have different values

logvol / --vgname=pvmvg --name=root --size=9216
logvol /var --vgname=pvmvg --name=var --size=10240
logvol /tmp --vgname=pvmvg --name=tmp --size=1024
logvol swap --vgname=pvmvg --name=swap --fstype swap --size=4096
logvol /home --vgname=pvmvg --name=home --size=1 --grow

# Reboot the lpar after install completes

reboot

%packages
kernel-headers
kernel-devel
openssh*
parted*
net-tools*
@base
epel-release
telnet
%end

%post --log=/var/log/novalink-post.log

exec < /dev/console > /dev/console
echo "Running post configuration"
# Create the configuration file for the NovaLink repo
# at your location

cat > /etc/yum.repos.d/pvm.repo <<EOF
[novalink] name=NovaLink
baseurl=http://<FILL IN YOUR LOCATION>
failovermethod=priority
enabled =1

```

```

gpgcheck=0
EOF

# Create the configuration file for the optional or extra packages
# at your location as needed

cat > /etc/yum.repos.d/optional-yum.repo <<EOF
[optional]
name=Optional yum repository
baseurl=ftp://<FILL IN YOUR LOCATION>
gpgkey=file://<FILL IN YOUR GPG KEY LOCATION>
EOF

# Create the configuration file for the IBM RSCT repo

cat > /etc/yum.repos.d/ibm-power.repo <<EOF
[IBM_Power_Tools]
name=IBM Power Tools baseurl=
http://public.dhe.ibm.com/software/server/POWER/Linux/yum/OSS/RHEL/7/ppc64le
enabled=1
gpgcheck= 0

[IBM_Power_SDK_Tools]
name=IBM Power SDK Tools
baseurl=http://public.dhe.ibm.com/software/server/POWER/Linux/yum/SDK/RHEL/7/ppc64le
enabled=1
gpgcheck=0

[Advance_Toolchain]
name=Advance Toolchain
baseurl=ftp://ftp.unicamp.br/pub/linuxpatch/toolchain/at/redhat/RHEL7
enabled=1
gpgcheck=0
EOF

yum --assumeyes install pvm-novalink python-positional

# Create firewall configuration file to open port 657 for RSCT

cat > /etc/firewalld/services/rmc.xml <<EOF
<?xml version="1.0" encoding="utf-8"?>
<service>
  <short>RMC</short>
  <description>
Reliable Scalable Cluster Technology (RSCT) is a set of software components that together
provide a comprehensive clustering environment for AIX®, Linux, Solaris, and Windows
operating systems. RSCT is the infrastructure used by a variety of IBM® products to provide
clusters with improved system availability, scalability, and ease of use.</description>
<port protocol="tcp" port="657"/>
<port protocol="udp" port="657"/>
</service>
EOF

systemctl enable firewalld.service firewall-offline-cmd --add-service=rmc

# Make sure PreP partition are mirrored

dd if=/dev/sda1 of=/dev/sdb1
parted /dev/sda set 1 boot on
parted /dev/sdb set 1 boot on
%end

```

An example kickstart file of RHEL 8 is as follows:

```

#platform=Power VM
#version=DEVEL

# Firewall configuration
firewall --disabled

# Root password encrypted using python one liner
# python -c 'import crypt,base64,os; print(crypt.crypt("passwd", "$6$" +
base64.b64encode(os.urandom(6))))'
rootpw --iscrypted
$6$F5jDDW3B$Vf3th7JxE2nfwoz0nbrl6moBeEanQbRqZRjvWeC03nJIumI3intY0m4JUUnl9Hg0uEncViM.sn05Dkq.zC3yo
70

# System authorization information

```

```

authselect --passalgo=sha512

# Use text mode install
text

# System keyboard
keyboard us

# System language
lang en_US

# SELinux configuration
selinux --disabled

# Do not configure the X Window System
skipx
services --enabled=sshd

# Installation logging level
#logging --level=info
logging --level=debug

# System timezone
timezone America/New_York

# Clear the controller Boot Record
zerombr

# Storage data and setup below. By default, this kickstart file
# assumes 2 disks: sda and sdb, to be on a RAID. A sample single
# disk setup is also provided. Set this up to properly reflect your
# environment.

# 1 DISK SETUP START
# Uncomment everything until "1 DISK SETUP END"
# if configuring single disk with no redundant VIOS
# Also, you must edit the PreP partition setting in
# the post install at the end of this file if using
# a single drive environment.

# bootloader --driveorder=sda
# part None --fstype prepboot --ondrive=sda --size 8
# part /boot --size 300 --fstype ext4 --ondisk /dev/sda
# part pv.01 --size 1 --grow --ondisk /dev/sda
# volgroup pvmvg pv.01
# logvol / --vgname=pvmvg --name=root --size=9216
# logvol /var --vgname=pvmvg --name=var --size=10240
# logvol /tmp --vgname=pvmvg --name=tmp --size=1024
# logvol swap --vgname=pvmvg --name=swap --fstype swap --size=4096
# logvol /home --vgname=pvmvg --name=home --size=1 --grow
# clearpart --drives=sda --all --initlabel

# 1 DISK SETUP END

# 2 DISK WITH RAID SETUP START
# Comment everything until "2 DISK WITH RAID SETUP END"
# if configuring single disk with no redundant VIOS

# Set drive boot order
bootloader --driveorder=sda,sdb

# RAID1 2 disk partition recipe using LVM over RAID
# Second disk needs to have PreP partition created
part None --fstype prepboot --ondrive=sdb --size 8

# Setup RAID
part raid.00 --size 256 --asprimary --ondrive=sda
part raid.10 --size 256 --asprimary --ondrive=sdb
part raid.01 --size 29696 --asprimary --ondrive=sda
part raid.11 --size 29696 --asprimary --ondrive=sdb

raid /boot --fstype ext4 --device raid1-boot --level=RAID1 raid.00 raid.10
raid pv.01 --device raid1-pv --level=RAID1 raid.01 raid.11

# Build out volume group and logical volumes.
volgroup pvmvg pv.01

logvol / --vgname=pvmvg --name=root --size=9216
logvol /var --vgname=pvmvg --name=var --size=10240
logvol /tmp --vgname=pvmvg --name=tmp --size=1024
logvol swap --vgname=pvmvg --name=swap --fstype swap --size=4096

```

```

logvol /home --vgname=pvmvg --name=home --size=1 --grow

# Partition clearing information
clearpart --drives=sda,sdb --all --initlabel

# 2 DISK WITH RAID SETUP END

# reqpart will take care of PreP partition on first disk
reqpart

# Reboot the lpar after install completes
reboot

%packages
kernel-headers
kernel-devel
openssh*
parted*
net-tools*
@base
telnet
%end

#%pre
#echo "Cleaning the partitions"
#dd if=/dev/zero of=/dev/sda bs=512 count=1
#dd if=/dev/zero of=/dev/sdb bs=512 count=1
#%end

```

What to do next

When the installation completes, update the PowerVM NovaLink software if required.

Installing the PowerVM NovaLink software by using the PowerVM NovaLink Installer 2.0

The PowerVM NovaLink Installer 2.0 creates and installs Virtual I/O Server (VIOS) and PowerVM NovaLink partitions on IBM Power Systems server. Also, the PowerVM NovaLink installer installs the Ubuntu or RHEL operating system, and the PowerVM NovaLink software.

Before you begin

The PowerVM NovaLink installer version 2.0 uses the HMC for the installation process.

To install PowerVM NovaLink on your managed system, consider the following prerequisites:

- IBM PowerVC version 2.0.0, or later must be installed on the logical partition.
- IBM PowerVC must be used to run the command-line interface for the PowerVM NovaLink Installer.
- The VIOS must be at a version 3.1.3, or later and the HMC must be at a version 9.2.950.0, or later.
- The operating system of the managed system must be Red Hat Enterprise Linux (RHEL) 8.2, or later.
- A minimum of 100 GB disk space.
- A single HMC must not be used for the installing more than one PowerVM NovaLink instance at the same time.
- The central electronics process (CEC) or frame must be connected to a single HMC during the installation process.

About this task

To install PowerVM NovaLink, complete the following steps:

Note: [Step 1](#) and [Step 2](#) are a one-time process. To install PowerVM NovaLink on each managed system, you must go to [Step 3](#) to [Step 8](#).

1. To install PowerVM NovaLink Installer on IBM PowerVC, complete the following steps:

- a. Use the `novalinkautoinstaller.repo` file that is available at the `/etc/yum.repos.d/` `novalinkautoinstaller.repo` repository. A sample `novalinkautoinstaller.repo` file follows:

Note: You must change the `baseurl` variable to either a public repository or a local repository.

```
[root@os4p112 ~]# cat /etc/yum.repos.d/novalinkautoinstaller.repo
[novalinkautoinstaller]
name=novalinkAutoInstaller yum repository
baseurl=http://public.dhe.ibm.com/systems/virtualization/Novalink/rhel/82/
novalink_2.0.0.0
gpgcheck = 0
```

- b. At the command line, run the following command:

```
yum install novalinkAutoInstaller
```

2. Download the Virtual I/O Server (VIOS) ISO image on the HMC.
3. Reset the server firmware settings and power on the managed system.
4. Connect the CEC or frame to the HMC. You must ensure that the CEC or the frame must be in an **Operating** state.
5. Log in to IBM PowerVC and run the following command to generate the `NovalinkInstallerTemplate.xls` file.

Note: You must specify the value for the `installation_mode` as normal.

```
novalinkAutoInstaller -i <hmc_ip> -u <hmc_username> -r <installation_mode> -m <host_name> -n <number_of_vios> --generate
```

6. Enter the required details in the columns that are highlighted in yellow color in the `NovalinkInstallerTemplate.xls` excel file for the RHEL partition.

On the **VIOS** tab of the excel sheet, enter the following details:

- ISO path of the VIOS image in the HMC. For example, `/dump/vios3.1.2.0/dvdimage.v1.iso`.
- IP address details of the VIOS partition and the port VLAN ID.
- Select the adapters that are marked as **Required**. You must select one network adapter and one storage adapter for each VIOS.

On the **Novalink** tab of the excel sheet, enter the following details:

- IP address details of the PowerVM Novalink partition and the bootP server.
- Use the same Port VLAN ID that you entered in the VIOS tab.
- Hostname of the PowerVM Novalink partition.

7. To install the VIOS and the PowerVM Novalink software in the partition, at the remote terminal session (such as PuTTY), run the following command:

Note: You must specify the value for the `installation mode` as normal.

```
novalinkAutoInstaller -i <hmc_ip> -u <hmc_username> -r <installation_mode> --install --accept-license
```

8. The PowerVM Novalink software is installed successfully in the partition. After the installation completes, a message is displayed and PowerVM Novalink software is configured successfully. Press **Enter** or press **Return** to go to the login prompt.

Installing Ubuntu 20.04 LTS on a PowerVM Novalink partition

You can install the Ubuntu operating system version 20.04 LTS and the PowerVM Novalink software version 2.1.0, or later on your PowerVM Novalink logical partition.

Before you begin

The process of installing the Ubuntu 20.04 LTS operating system and the PowerVM NovaLink software version 2.1.0 or later is different from installing the Ubuntu 16.04 LTS operating system and the PowerVM NovaLink software version 1.0.0.16.

The ISO image of the PowerVM NovaLink Installer 2.0 is not bundled with Ubuntu 20.04 LTS. To install PowerVM NovaLink software version 2.1.0, or later by using the PowerVM NovaLink installer 2.0, complete the following steps:

1. Download the 20.04 LTS ISO image (`live_server_ubuntu-20.04.5-live-server-ppc64el.iso`) and mount the ISO image on the PowerVM NovaLink partition.

Note: The PowerVM NovaLink package and dependent packages can be downloaded from the internet.

2. If there is no internet connectivity on servers where PowerVM NovaLink software is installed, you must locally replicate or mirror the repositories. For more information, see [Updating PowerVM NovaLink from a cloned repository](#).

Note: Ensure that you replicate the following repositories:

- [PowerVM NovaLink repository](#)
- Repository for the *focal* package.

Procedure

To install the Ubuntu 20.04 LTS operating system on to the PowerVM NovaLink partition by using the autoinstall config, complete the following steps:

Note: PowerVM NovaLink software version 2.1.0, or later is supported only with Ubuntu 20.04 LTS and RHEL 8.2, or later operating systems. PowerVM NovaLink version 1.x.x.x is not supported if you have Ubuntu 20.04 LTS and RHEL 8.2 operating systems.

1. Select a GNU GRand Unified Bootloader (GRUB) file. An example GRUB file follows:

Notes:

- Use the URL as specified in the netboot (bootp) server for the `pvm-viosdir` variable.
- The location of the `novarhel8 test` file system varies based on the mount point of the bootp server.
- The location of the `ubuntu 2004` file system varies based on the mount point of the bootp server.

```
set default=0
set timeout=-1

menuentry 'NovaLink install To install VIOS & set for Other OS' {
    insmod http
    insmod tftp
    regexp -s 1:mac_pos1 -s 2:mac_pos2 -s 3:mac_pos3 -s 4:mac_pos4 -s 5:mac_pos5 -s 6:mac_pos6
    '(..):(..):(..):(..):(..):(..)' ${net_default_mac}
    set bootif=${mac_pos1}:${mac_pos2}:${mac_pos3}:${mac_pos4}:${mac_pos5}:${mac_pos6}
    set root=http,${net_default_server}
    set domain=${net_ofnet_network_domain}
    set ipaddr=${net_default_ip}

# USER CAN CONFIGURE THESE
set hostname=neo46
set gateway=9.47.79.254
set netmask=255.255.240.0
set nameserver=9.0.128.50
# END CONFIGURE
linux //novacentos8/ppc/ppc64/vmlinuz ro inst.text ip=${ipaddr}::${gateway}:${netmask}:$
{hostname}::none nameserver=${domain}nameserver} inst.repo=http://${net_default_server}/
novacentos8 BOOTIF=${net_default_mac} \
live-installer/net-image=http://${net_default_server}/novacentos8/images/install.img \
pkgset/language-pack-patterns= \
pkgset/install-language-support=false \
netcfg/disable_dhcp=true \
netcfg/choose_interface=auto \
netcfg/get_ipaddress=${ipaddr} \
netcfg/get_netmask=${netmask} \
```

```

netcfg/get_gateway=${gateway} \
netcfg/get_nameservers=${nameserver} \
netcfg/get_hostname=${hostname} \
netcfg/get_domain=${domain} \
debian-installer/locale=en_US.UTF-8 \
debian-installer/country=US \
pvm-repo=http://${net_default_server}/novalink_dev/repo \
pvm-viosdir=http://9.114.254.135/vios/31314/2205A_72X/

initrd //novacentos8/ppc/ppc64/initrd.img
}
menuentry 'Novalink Automated Install for UBUNTU2004' {
insmod http
insmod tftp
regexp -s 1:mac_pos1 -s 2:mac_pos2 -s 3:mac_pos3 -s 4:mac_pos4 -s 5:mac_pos5 -s 6:mac_pos6
'(..):(..):(..):(..):(..):' ${net_default_mac}
set bootif=${mac_pos1}:${mac_pos2}:${mac_pos3}:${mac_pos4}:${mac_pos5}:${mac_pos6}
regexp -s 1:prefix '(.*).\.(.*)' ${net_default_ip}

# USER CAN CONFIGURE THESE
set hostname=neo46
set ip=${net_default_ip}
set gateway=9.47.79.254
set netmask=255.255.240.0
set nameserver=9.0.128.50
set root=tftp,${net_default_server}
set serveraddress=${net_default_server}
set domain=${net_ofnet_network_domain}
# END CONFIGURE
linux //ubuntu2004/casper/vmlinuz \
autoinstall ip=${net_default_ip}:${serveraddress}:${gateway}:${netmask}:${hostname}::none \
'ds=nocloud-net;seedfrom=http://9.47.68.254/novalink_install_cfgs/ubuntu/ubuntu2004/' \
live-installer/net-image=http://${serveraddress}/ubuntu2004/casper/filesystem.squashfs \
url=http://${serveraddress}/ubuntu-20.04.5-live-server-ppc64el.iso \
pkgsel/language-pack-patterns= \
pkgsel/install-language-support=false \
netcfg/disable_dhcp=true \
netcfg/choose_interface=auto \
netcfg/get_ipaddress=${ip} \
netcfg/get_netmask=${netmask} \
netcfg/get_gateway=${gateway} \
netcfg/get_nameservers=${nameserver} \
netcfg/get_hostname=${hostname} \
netcfg/get_domain=${domain} \
debian-installer/locale=en_US.UTF-8 \
debian-installer/country=US \
BOOTIF=${bootif} -- quiet

initrd //ubuntu2004/casper/initrd.gz
}

```

Note: In the GRUB file, the following command-line is hardcoded with the IP address and URL. It is enclosed within single quotation marks:

```
'ds=nocloud-net;seedfrom=http://9.47.68.254/novalink_install_cfgs/ubuntu/ubuntu2004/'
```

2. To perform a scratch installation by using the PowerVM Novalink installer ISO file, complete the following steps:
 - a. Reset the server firmware by using the Intelligent Platform Management Interface (IPMI) tool.
 - b. Follow the instructions on the **Complete Novalink** wizard and include information such as whether it is a single or dual Virtual I/O Server (VIOS), adapter attachments, and the IP addresses for VIOS and PowerVM Novalink.
 - c. Install VIOS from the PowerVM Novalink ISO file.
 - d. Create a PowerVM Novalink logical partition.
 - e. Install the PowerVM Novalink-specific operating system (Ubuntu or Red Hat Enterprise Linux)
3. In the GNU GRand Unified Bootloader (GRUB) screen, select the **Novalink install To install VIOS and set for Other OS** option and continue with the next step.

```
GNU GRUB version 2.02~beta2-29
```

```
+-----+
```



```
|*NovaLink install To install VIOS & set for Other OS
| Novalink Automated Install for UBUNTU2004
```

```
+-----+
|
| Use the ^ and v keys to select which entry is highlighted.
| Press enter to boot the selected OS, `e` to edit the commands
| before booting or `c` for a command-line.
| The highlighted entry will be executed automatically in 0s.
|
+-----+
```

4. Follow the instructions on the **Complete Novalink** wizard.
5. On the **Confirm Installation** window, select the **Install VIOS(s) and NovaLink with other OS –Manual** option. The Virtual I/O Server is installed and the system reboots to the system management services (SMS) menu.

```
+-----+ Confirm Installation +-----+
|
| Select one of the installation options.
|
| ( ) Install VIOS(s) and NovaLink with RHEL - Automatic
| Kickstart File http://-----
| Installation Source http://-----
|
| (*) Install VIOS(s) and NovaLink with other OS - Manual
| This will reboot to SMS after the VIOS(s) are installed to allow
| for manual install of the OS and NovaLink.
|
| <Back> <Finish> <Cancel>
|
+-----+
-+
|
| <Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen
```

Note: If you want to reinstall the operating system on the PowerVM Novalink logical partition, restart the PowerVM Novalink logical partition and navigate to the SMS menu.

6. From the SMS menu, select the logical adapter that is connected to the public VLAN, typically the first adapter in the list. By default, all IP addresses for the selected adapter are automatically configured. The following SMS menu is displayed:

```
PowerPC Firmware
Version FW860.20 (SV860_082)
SMS (c) Copyright IBM Corp. 2000,2016 All rights reserved.
-----
NIC Adapters                Location Code                Hardware
                             Address
1. Interpartition Logical LAN U8247.22L.211D9FA-V1-C3-T1  caaa5a1633a2
2. Interpartition Logical LAN U8247.22L.211D9FA-V1-C6-T1  e230fd71a7ce
-----
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen      X = eXit System Management Services
-----
Type menu item number and press Enter or select Navigation key:1
```

```
PowerPC Firmware
Version FW860.20 (SV860_082)
SMS (c) Copyright IBM Corp. 2000,2016 All rights reserved.
-----
IP Parameters
Interpartition Logical LAN: U8247.22L.211D9FA-V1-C3-T1
1. Client IP Address          [xxx.xxx.xxx.xxx]
2. Server IP Address          [xxx.xxx.xxx.xxx]
3. Gateway IP Address         [xxx.xxx.xxx.xxx]
4. Subnet Mask                 [xxx.xxx.xxx.xxx]
-----
Navigation keys:
M = return to Main Menu
```

```
ESC key = return to previous screen      X = eXit System Management Services
-----
Type menu item number and press Enter or select Navigation key:
```

7. In the GRUB screen, select **NovaLink Automated Install for UBUNTU2004**. The following GRUB screen is displayed:

```
GNU GRUB  version 2.02~beta2-29

+-----+
| NovaLink install To install VIOS & set for Other OS          |
| *Novalink Automated Install for UBUNTU2004                    |
|                                                                 |
+-----+

Use the ^ and v keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the commands
before booting or 'c' for a command-line.
```

8. To autoinstall Ubuntu 20.04 LTS on a PowerVM NovaLink partition, include the following files in the **seed URL** that is specified in the [GRUB file](#):

- *meta-data*
- *vendor-data*
- *user-data*

An example *user-data* yaml file follows:

```
#cloud-config
autoinstall:
  apt:
    disable_components: []
    geoip: true
    preserve_sources_list: false
    primary:
      - arches:
        - amd64
        - i386
        uri: http://archive.ubuntu.com/ubuntu
      - arches:
        - default
        uri: http://ports.ubuntu.com/ubuntu-ports
  drivers:
    install: false
  identity:
    hostname: 'tmp'
    password: $6$ZnzKGIzuQsQDBwS4$Pn5.721D276dG319pCz5deM3fbYm/
    lsh5UBcuA5s9Sqr8QT1FXFXPu5Y.oDF.pGeGQiEd.P.cFsqgMr069v21/
    realname: neo
    username: neo
  kernel:
    package: linux-generic
  keyboard:
    layout: us
    toggle: null
    variant: ''
  locale: en_US.UTF-8
  ssh:
    allow-pw: true
    authorized-keys: []
    install-server: true

  storage:
    layout:
      name: lvm

  updates: security
  version: 1
  late-commands:
    - echo 'ubuntu ALL=(ALL) NOPASSWD:ALL' > /target/etc/sudoers.d/sysuser # allow sudo
    without password
    - cat /proc/cmdline > /target/etc/proc/cmdlineRam
    - sudo head -n -1 /target/etc/netplan/00-installer-config.yaml > temp && mv temp /
    target/etc/netplan/00-installer-config.yaml
    - |
      cat -<<EOF>> /target/etc/netplan/00-installer-config.yaml
      nameservers:
```

```

        addresses: [9.0.128.50, 9.12.16.2]
    version: 2
EOF
user-data: # Commands here run during first boot (cannot be interactive)
runcmd:
- wget http://9.47.68.254/ovalink_install_cfgs/ubuntu/ubuntu2004/SetPrivIPHostname.sh
- chmod +x SetPrivIPHostname.sh
- ./SetPrivIPHostname.sh

```

An example *SetPrivIPHostname.sh* file follows:

```

#!/bin/bash

# Generic /proc/cmdline value retrieval function
getproccmdlinevalue()
{
    pclvalue=""
    CMDLINE=$(cat /etc/proccmdlineRam)
    for i in $CMDLINE; do
        case "$i" in
            $1=*)
                pclvalue=${i#*=}
                break ;;
            *) ;;
        esac
    done
    echo $pclvalue
}

SetHostnamenPrivIP()
{
    Serverhostname=$(getproccmdlinevalue 'netcfg/get_hostname')
    sudo hostnamectl set-hostname $Serverhostname
}

sudo head -n -1 /etc/netplan/00-installer-config.yaml > temp && mv temp /etc/netplan/00-
installer-config.yaml
ip a | grep "^[0-9]" | awk '{print $2}' | sed 's:/:/' | while read interface
do
    if [[ -z $(ip -f inet addr show $interface 2>/dev/null | grep -v "^\s*inet6" | grep
"inet") ]]; then
        cat -<<EOF>> /etc/netplan/00-installer-config.yaml
        $interface:
            addresses: [ 192.168.128.1/17 ]
        version: 2
    EOF
    fi
done

SetHostnamenPrivIP
netplan -v apply

```

9. To check whether a public or private network is selected, complete the following steps:

a. Run the *installer-config.yaml* file.

```

~# cat /etc/netplan/00-installer-config.yaml
# This is the network config written by 'subiquity'
network:
  ethernets:
    ibmveth2:
      addresses:
        - 9.47.66.13/20
      gateway4: 9.47.79.254
      nameservers:
        addresses: [9.0.128.50, 9.12.16.2]
    ibmveth3:
      addresses: [ 192.168.128.1/17 ]
  version: 2
~#

```

Note: To edit this *yaml* file, run the following command:

```
netplan --verbose apply.
```

b. Set the hostname in the following format:

```
sudo hostnamectl set-hostname <hostname>.
```

- c. Restart the PowerVM NovaLink partition.

Running the postinstallation script to install PowerVM NovaLink packages

After the installation process completes, the following script (*postinstallation.sh*) that is referenced in the preseed configuration file is automatically run on the PowerVM NovaLink partition.

Note: Ensure that you enter the public link for the `pmv.list` file.

```
# This is a sample postinstallation file for installing NovaLink and its
# dependent packages on Ubuntu1804
# Modify this file as needed to match your site's configuration.
#In case user has not installed these packages
sudo apt-get -y update
sudo apt-get install --yes openssh-server net-tools gnupg

# install Python 3.9
sudo apt-get -y install software-properties-common
sudo add-apt-repository ppa:deadsnakes/ppa -y

sudo apt-get -y update
sudo apt-get -y upgrade

sudo apt-get -y install python3.9

sudo apt-get -y update
sudo rm /usr/bin/python
sudo ln -s /usr/bin/python3.9 /usr/bin/python

# install novalink
sudo cat > /etc/apt/sources.list.d/pmv.list <<EOF
deb https://public.dhe.ibm.com/systems/virtualization/Novalink/debian/ novalink_2.1.1 non-free
optional
EOF
wget https://public.dhe.ibm.com/systems/virtualization/Novalink/debian/novalink-gpg-pub.key
sudo apt-key add novalink-gpg-pub.key

sudo apt-get -y update

sudo mkdir /etc/bash_completion.d
sudo apt-get install python3-pyasn1-modules
sudo apt-get -y install --yes pmv-novalink

sudo usermod -G pmv_admin neo
sudo sed -i "s/\(wlp\)\(.*ALL\)\$/\1\2\neo\2/" /etc/sudoers
```

Troubleshooting the autoinstallation process

During the installation process, you might receive a failure message or the following error when the **python3** module is not installed:

```
/tmp/apt-dpkg-install-n9v8WD/113-python39-pyasn1-modules_0.2.8-3_all.deb
E: Sub-process /usr/bin/dpkg returned an error code (1)
```

To fix this error, complete the following steps:

1. To uninstall the **python3** packages, run the following command:
sudo dpkg -r --force-depends python3-pyasn1-modules
2. To install the **python39** packages, run the following command:
sudo apt-get install python39-pyasn1-modules
3. To fix the installation error, run the following command:
sudo apt --fix-broken install

Updating RSCT packages for PowerVM NovaLink

Resource Monitoring Control (RMC) connections between PowerVM NovaLink and each logical partition are routed through a dedicated internal virtual network. For easier configuration of the internal virtual

network, assign an IPv6 link-local address to the RMC virtual network interfaces. To assign IPv6 link-local addresses to the RMC virtual network interfaces on AIX and Linux logical partitions, the Reliable Scalable Cluster Technology (RSCT) packages must be at version 3.2.6.2 or later.

About this task

RSCT packages at version 3.2.6.2 support an IPv6 Link Local addressed virtual Ethernet adapter on each AIX and Linux logical partition. The AIX or Linux logical partition uses the virtual Ethernet adapter to connect to the PowerVM NovaLink partition through a virtual switch. The virtual switch is configured to communicate only with the trunk port. An AIX or Linux logical partition can use this virtual network only to connect with the PowerVM NovaLink partition. AIX or Linux logical partitions can connect with partitions other than the PowerVM NovaLink partition only if you configure a separate network for this purpose.

- For information about how to verify the version of RSCT packages on AIX logical partitions and how to update RSCT packages from the AIX installation media, see [Verifying RSCT installation on AIX nodes](#).
- For information about how to verify the version of RSCT packages on Linux logical partitions and how to update RSCT packages, see [Verifying RSCT installation on Linux nodes](#). RSCT packages for Linux can be downloaded from Service and productivity tools for Linux on Power servers in the IBM Support portal (<https://www-304.ibm.com/support/customer/sas/f/lopdiags/home.html>).

What to do next

If you have updated RSCT packages manually on PowerVM NovaLink, the `pvm-rest` service must be restarted. Enter the following command to restart the service:

```
systemctl restart pvm-rest.service
```

After you update RSCT packages on a logical partition, capture an image of the operating system along with the updated RSCT package. You can then deploy the image that has the updated RSCT package, which eliminates the need to update RSCT for new logical partitions. For information about how to use PowerVC to capture an image, see [Capturing a virtual machine](#).

Updating PowerVM NovaLink

The PowerVM NovaLink software uses standard Linux operating system tools to update itself. Use the Ubuntu **apt** function to update the Ubuntu Linux operating system, and the PowerVM NovaLink and related software. Similarly, you can use the *yum* function to update the software in a Red Hat Enterprise Linux environment.

About this task

The Ubuntu Linux operating system is maintained by Canonical Ltd. Fixes for operating system components can be retrieved from the Canonical repositories.

The PowerVM NovaLink software is provided by IBM. Updates to the PowerVM NovaLink can be obtained from the PowerVM NovaLink repository that is hosted by IBM.

If the PowerVM NovaLink partition can connect to online repositories, you can update the Ubuntu Linux operating system and the PowerVM NovaLink software from the online repositories. Otherwise, you must clone the online repositories and update the Ubuntu Linux operating system and the PowerVM NovaLink software from the cloned repositories.

Updating PowerVM NovaLink from an online repository

You can update the Ubuntu Linux operating system and the PowerVM NovaLink software on your PowerVM NovaLink logical partition by using an online repository.

Before you begin

If the PowerVM NovaLink logical partition cannot access the online repository, update the PowerVM NovaLink logical partition from a repository that is cloned from the online repository.

Before you update PowerVM NovaLink from an online repository, complete the following steps for an Ubuntu logical partition:

- Verify that the following line exists in the source list file on the PowerVM NovaLink partition (`/etc/apt/sources.list.d/pvm.list`), and if required, add the following line:

```
deb http://public.dhe.ibm.com/systems/virtualization/Novalink/debian novalink_<version> non-free
```

In this line, *version* is the version number of the PowerVM NovaLink software (for example, 1.0.0).

If the PowerVM NovaLink update fails, verify that your PowerVM NovaLink repository is the latest version, or is pointing to the public PowerVM NovaLink repository. Also ensure that the PowerVM NovaLink key is available on the system before you install or update PowerVM NovaLink on Ubuntu.

Before you update PowerVM NovaLink from an online repository, complete the following steps for an RHEL logical partition:

- Verify that the following line exists in the source list file on the PowerVM NovaLink partition (`/etc/yum.repos.d/pvm.repo`), and if required, add the following line:

```
baseurl=http://public.dhe.ibm.com/systems/virtualization/Novalink/rhel/86/<Novalink Version>
```

You must have `sudo` access on the PowerVM NovaLink partition to complete this task.

About this task

To update PowerVM NovaLink from an online repository, complete the following steps:

Procedure

1. On an Ubuntu logical partition, access the Ubuntu Linux command-line interface on the PowerVM NovaLink partition.

- a) To update the Debian Advanced Packaging Tool (APT) with the latest information about Ubuntu Linux operating system updates, enter the following command:

```
sudo apt-get update
```

- b) To update APT with the latest information about updates for the PowerVM NovaLink software, enter the following command:

```
sudo apt-get install pvm-novalink
```

2. On a Red Hat Enterprise Linux logical partition, enter the following command:

```
sudo yum update pvm-novalink
```

Updating PowerVM NovaLink from a cloned repository

You can update the Ubuntu or Red Hat Enterprise Linux (RHEL) operating system, and the PowerVM NovaLink software on your PowerVM NovaLink logical partition by using a cloned repository. Use a cloned

repository to update the PowerVM NovaLink software if the PowerVM NovaLink partition does not have direct access to the online repository.

Before you begin

This information describes how to use a File Transfer Protocol (FTP) server to store your cloned repository. The PowerVM NovaLink partition must be able to access the FTP server. Alternatively, you can use a Hypertext Transfer Protocol (HTTP) server to store your cloned repository.

For an Ubuntu logical partition, before you update PowerVM NovaLink from a cloned repository, open the source list file on the PowerVM NovaLink partition (`/etc/apt/sources.list.d/pvm.list`), remove each line that references an online repository, and add the following line to the file. In this line, `server_ip` is the IP address or host name of the FTP server, `repo_path` is the repository path in the FTP server, and `version` is the version number of the PowerVM NovaLink software (for example, `1.0.0`).

```
http://server_ip/repo_path novalink_version non-free
```

For RHEL, before you update PowerVM NovaLink from a cloned repository, edit the YUM repository configuration file (`/etc/yum.repos.d/pvm.repo`) on the PowerVM NovaLink partition, to change the line that contains the `baseurl` variable that references the online YUM repository. Add the address of the server where the clone repository resides (`baseurl=http://server_ip/repopath`).

You must have `sudo` access on the PowerVM NovaLink partition to complete this task.

About this task

To update PowerVM NovaLink from a cloned repository, complete the following steps:

Procedure

1. On your server, clone the PowerVM NovaLink repository by entering the following commands, where `repo_path` is the repository path in the FTP server:

```
cd repo_path
```

For an Ubuntu logical partition:

```
wget -m -e robots=off --no-parent -R "index.html" https://public.dhe.ibm.com/systems/virtualization/Novalink/debian/
```

For a RHEL logical partition:

```
wget -m -e robots=off --no-parent -R "index.html" https://public.dhe.ibm.com/systems/virtualization/Novalink/rhel/
```

2. Connect to the Ubuntu or RHEL Linux command-line interface on the PowerVM NovaLink partition.
3. For an Ubuntu logical partition, to update the Debian Advanced Packaging Tool (APT) with the latest information about Ubuntu Linux operating system updates, enter the following command:

```
sudo apt-get update
```

4. For RHEL, to update the YUM repository with the latest information for the PowerVM NovaLink software, enter the following command:

```
sudo yum update pvm-novalink
```

5. To update APT with the latest information about updates for the PowerVM NovaLink software, enter the following command:

```
sudo apt-get install pvm-novalink
```

Updating the firmware on a system that is managed by PowerVM NovaLink

To update the firmware on a system that is managed by only PowerVM NovaLink, use the **ldfware** command on the service partition. If the system is co-managed by PowerVM NovaLink and a Hardware Management Console (HMC), you must use the HMC to update the firmware. The HMC must be set to the controller mode to update the firmware.

Before you begin

To set the HMC to the controller mode for a system that is co-managed by the PowerVM NovaLink, run the following command from the HMC command line. In this command, *managed_system* is the name of the managed system.

```
chcmmgmt -m managed_system -o setcontroller -t norm
```

After you set the HMC to the controller mode, you can update the firmware by using the standard HMC procedure. For information about how to update the firmware by using the HMC, see [Updates](#).

The information that is provided here applies to a managed system that is already managed by PowerVM NovaLink. For information about how to update the firmware on a system on which you plan to install PowerVM NovaLink, see [Installing firmware using the USB port on the service processor on a system that is not managed by a management console](#).

Download the latest system firmware from IBM Fix Central (<http://www.ibm.com/support/fixcentral/>).

About this task

To update the firmware on a system that is managed by PowerVM NovaLink, choose one of the following options depending on how you are running the PowerVM NovaLink software:

- For the PowerVM NovaLink software running in the PowerVM Open I/O mode, complete the following steps:

1. Power off all client partitions by entering the following command for each client partition, where *partition_id* is the partition ID.

```
pvmctl lpar power-off -i id=partition_id
```

2. In the PowerVM Open I/O mode, the PowerVM NovaLink partition is designated as the service partition. Copy the firmware to a temporary location in the PowerVM NovaLink partition.
3. Run the following command on the service partition, where *firmware_path* is the location of the firmware in the service partition.

```
/usr/sbin/update_flash -f firmware_path
```

- For the PowerVM NovaLink software running the Virtual I/O Server, complete the following steps:

1. Power off all client partitions by entering the following command for each client partition, where *partition_id* is the partition ID.

```
pvmctl lpar power-off -i id=partition_id
```

2. Power off all Virtual I/O Server partitions except for the service partition by entering the following command for each Virtual I/O Server partition, where *partition_id* is the partition ID.

Note: A warning message is displayed that states that when the Virtual I/O Server partition is powered-off and if the redundant VIOS is not running, then all the running logical partitions might lose access to their storage and network, and confirms whether to proceed with the operation.

```
pvmctl vios power-off -i id=partition_id
```

By default, the service partition is the partition with partition ID 2. To determine which partition is the service partition, enter the following command:


```
pvmctl vios list -d id name service
```

The `is_service_partition` property of the service partition is `True`.

3. Power off the PowerVM NovaLink partition by entering the following command, where `novalink_id` is the partition ID of the PowerVM NovaLink partition. The partition ID of the PowerVM NovaLink partition is typically 1.

```
pvmctl lpar power-off -i id=novalink_id
```

4. Copy the firmware to a temporary location in the service partition.
5. Run the following command on the service partition, where `firmware_path` is the location of the firmware in the service partition.

```
ldfware -file firmware_path
```

6. If the managed system does not completely power off automatically, power off the managed system by using the Advanced System Management Interface (ASMI). Complete the following steps:
 - a. Access the ASMI by using the PC or notebook. For information about how to connect to ASMI, see [Accessing the ASMI using a PC or notebook and web browser](#).
 - b. Power off the system by clicking **Power/Restart Control > Power On/Off System**.
7. Power on the system.

Upgrading PowerVM NovaLink software to version 2.0.2

You can upgrade the PowerVM NovaLink software to version 2.0.2 only when the PowerVM NovaLink is at a version 1.0.0.x. Additionally, the operating system must be RHEL 7.x or Ubuntu 16.04. While upgrading, it is mandatory to reinstall the operating system on PowerVM NovaLink logical partition to Ubuntu 20.04 LTS or RHEL 8.2, or later if current Novalink version is 1.0.0.x.

Before you begin

To reinstall PowerVM NovaLink on your managed system, complete the following tasks:

- Create a [grub file](#) and a [kickstart file](#) for installation of the RHEL 8.2, or later the Ubuntu 20.04 operating system.
- Create a preseed file for the installation of the Ubuntu 20.04 LTS operating system. For more information about the reseed file, see [Installing Ubuntu 20.04 LTS on a PowerVM NovaLink partition by using the autoinstall config](#).

To upgrade the operating system of the PowerVM NovaLink partition to Ubuntu 20.04 LTS or to RHEL 8.x, and the PowerVM NovaLink software to version 2.0.0.0, complete the following steps:

1. Log in to the PowerVM NovaLink console and increase the memory of the PowerVM NovaLink partition. Set the desired memory to 10 gigabyte (GB) and the minimum memory to 8 GB by running the following command. By default, the maximum memory is set to 16 GB.
 - To set the desired memory for the PowerVM NovaLink partition, on the command line run the following command:

```
sudo pvmctl lpar update -i id=1 -s PartitionMemoryConfiguration.desired=10240
```

- To set the minimum memory for the PowerVM NovaLink partition, on the command line run the following command:

```
sudo pvmctl lpar update -i id=1 -s PartitionMemoryConfiguration.min=8192
```

2. Use the **ipmitool** command or the Hardware Management Console (HMC) virtual terminal window to access the PowerVM NovaLink partition.


```

insmod tftp
regexp -s 1:mac_pos1 -s 2:mac_pos2 -s 3:mac_pos3 -s 4:mac_pos4 -s 5:mac_pos5 -s 6:mac_pos6
'(..):(..):(..):(..):(..):(..)' ${net_default_mac}
set bootif=${mac_pos1}:${mac_pos2}:${mac_pos3}:${mac_pos4}:${mac_pos5}:${mac_pos6}
set root=http,${net_default_server}
set domain=${net_ofnet_network_domain}
set ipaddr=${net_default_ip}

# USER CAN CONFIGURE THESE
set hostname=neo46
set gateway=9.47.79.254
set netmask=255.255.240.0
set nameserver=9.0.128.50
# END CONFIGURE
linux //novacentos8/ppc/ppc64/vmlinuz ro inst.text ip=${ipaddr}::${gateway}:${netmask}::${hostname}::none nameserver=${domainnameserver} inst.repo=http://${net_default_server}/
novacentos8 BOOTIF=${net_default_mac} \
live-installer/net-image=http://${net_default_server}/novacentos8/images/install.img \
pkgsel/language-pack-patterns= \
pkgsel/install-language-support=false \
netcfg/disable_dhcp=true \
netcfg/choose_interface=auto \
netcfg/get_ipaddress=${ipaddr} \
netcfg/get_netmask=${netmask} \
netcfg/get_gateway=${gateway} \
netcfg/get_nameservers=${nameserver} \
netcfg/get_hostname=${hostname} \
netcfg/get_domain=${domain} \
debian-installer/locale=en_US.UTF-8 \
debian-installer/country=US \
pvm-repo=http://${net_default_server}/novalink_dev/repo \
pvm-viosdir=http://9.114.254.135/vios/31314/2205A_72X/

initrd //novacentos8/ppc/ppc64/initrd.img
}
menuentry 'Novalink Automated Install for UBUNTU2004' {
insmod http
insmod tftp
regexp -s 1:mac_pos1 -s 2:mac_pos2 -s 3:mac_pos3 -s 4:mac_pos4 -s 5:mac_pos5 -s 6:mac_pos6
'(..):(..):(..):(..):(..):(..)' ${net_default_mac}
set bootif=${mac_pos1}:${mac_pos2}:${mac_pos3}:${mac_pos4}:${mac_pos5}:${mac_pos6}
regexp -s 1:prefix '(*)\.(.*)' ${net_default_ip}

# USER CAN CONFIGURE THESE
set hostname=neo46
set ip=${net_default_ip}
set gateway=9.47.79.254
set netmask=255.255.240.0
set nameserver=9.0.128.50
set root=tftp,${net_default_server}
set serveraddress=${net_default_server}
set domain=${net_ofnet_network_domain}
# END CONFIGURE
linux //ubuntu2004/casper/vmlinuz \
autoinstall ip=${net_default_ip}:${serveraddress}:${gateway}:${netmask}:${hostname}::none \
'ds=nocloud-net;seedfrom=http://9.47.68.254/novalink_install_cfgs/ubuntu/ubuntu2004/' \
live-installer/net-image=http://${serveraddress}/ubuntu2004/casper/filesystem.squashfs \
url=http://${serveraddress}/ubuntu-20.04.5-live-server-ppc64el.iso \
pkgsel/language-pack-patterns= \
pkgsel/install-language-support=false \
netcfg/disable_dhcp=true \
netcfg/choose_interface=auto \
netcfg/get_ipaddress=${ip} \
netcfg/get_netmask=${netmask} \
netcfg/get_gateway=${gateway} \
netcfg/get_nameservers=${nameserver} \
netcfg/get_hostname=${hostname} \
netcfg/get_domain=${domain} \
debian-installer/locale=en_US.UTF-8 \
debian-installer/country=US \
BOOTIF=${bootif} -- quiet

initrd //ubuntu2004/casper/initrd.gz
}

```

Upgrading PowerVM NovaLink software from version 2.0.3.1 to version 2.1.1 on an Ubuntu partition

You can upgrade the PowerVM NovaLink software to version 2.1.1 only when PowerVM NovaLink is at a version 2.0.3.1. Additionally, the operating system must be Ubuntu 20.04, or later.

To upgrade the PowerVM NovaLink software to version 2.1.0, or later, complete the following steps:

1. Uninstall the earlier version of the PowerVM NovaLink software by running the following command:

```
sudo apt-get -y purge pvm-novalink
sudo apt-get -y purge $(apt-cache depends pvm-novalink | awk '{ print $2 }' | tr '\n' ' ')
sudo apt-get -y purge lvm2
sudo apt-get -y autoremove
sudo apt-get -y update
sudo apt-get -y check
sudo apt-get -f -y install
sudo apt-get -y autoclean
sudo apt install lvm2
```

2. Set up the PowerVM NovaLink repository and import the public key by running the following command:

```
cat > /etc/apt/sources.list.d/pvm.list <<EOF
deb http://public.dhe.ibm.com/systems/virtualization/Novalink/debian/ novalink_2.1.1 non-
free optional
EOF
wget http://public.dhe.ibm.com/systems/virtualization/Novalink/debian/Novalink-gpg-pub.key
sudo apt-key add novalink-gpg-pub.key
sudo apt-get -y update
```

3. Install Python3.9 software and set the file path of python to python3 as follows:

```
sudo apt-get -y update
sudo apt-get -y install software-properties-common
sudo add-apt-repository ppa:deadsnakes/ppa -y
sudo apt-get -y update
sudo apt-get -y upgrade
sudo apt-get -y install python3.9
sudo rm /usr/bin/python
sudo ln -s /usr/bin/python3.9 /usr/bin/python
```

4. Install the PowerVM NovaLink software by running the following command:

```
sudo apt-get -y install --yes pvm-novalink
sudo apt-get -y upgrade
sudo usermod -G pvm_admin neo
```

PowerVM NovaLink API

Use the PowerVM NovaLink application programming interface (API) to programmatically control the management of virtualization functions on a managed system. The PowerVM NovaLink API is based on the API that is used by the Hardware Management Console (HMC).

Differences from the Hardware Management Console (HMC) API

The PowerVM NovaLink API differs from the Hardware Management Console (HMC) API in the following ways.

- The PowerVM NovaLink API does not allow you to use PUT or POST methods on virtual networks.
- The PowerVM NovaLink API does not include Atom links for elements that are otherwise discoverable by using a specific Atom feed. For example, a managed system object does not include a list of logical partition Atom links.
- The PowerVM NovaLink API does not include all optional schema elements from the Hardware Management Console (HMC) API.

For more information about the pypowervm open source library, see the pypowervm website (<https://github.com/pypowervm/pypowervm>).

PowerVM NovaLink command-line interface

The PowerVM NovaLink command-line interface (CLI) is a Python-based CLI for administrative functions on a system that is managed through PowerVM NovaLink.

chlickey command

When PowerVM NovaLink is at version 1.0.0.16 or later, you can specify the license key of IBM i logical partitions by entering the following command:

```
/usr/bin/chlickey -p <system name> -o a --lickey "<license key>"
```

Comma-separated list of license keys and input file (*--lickey* file) options are available for PowerVM NovaLink version 1.0.0.16, or later.

```
chlickey -p lpar | --id id -o a (--lickey <comma separated list of licensekey.> | --lickeyfile <input file> )
```

Where

- *-p* <system name> indicates the logical partition or the server.
- *-o* indicates the type of the operation to be performed.
- *a* indicates that the license information must be added to the license repository.
- *--lickey* <license key> specifies a single key or comma-separated list of license keys that are 101 bytes long, which is applicable for an IBM i virtual machine.
- *--lickey* <inputfile> specifies the file that contains the license keys for an IBM i virtual machine. The license keys are listed as comma-separated list of keys, which are 101 bytes long.

Format for building the 101 byte long license key

The following example shows the format of a 101 byte long license key and an example license key:

```
Format for 101 byte key:
keyFileTimeStamp(13) + systemName(8) + productId + licenseTerm + feature + serial +
processorGroup + usagelimit + expirationDate + vendorData + licenseKey + keyGenTimeStamp(13)
If any value unknown, default must be used as :
keyFileTimeStamp = "00000000000000";
systemName = " ";
serial = " *LOCAL";
processorGroup = "999";
expirationDate = "99999999";
vendorData = " ";
keyGenTimeStamp = "00000000000000";
More details on default and fillers as below:
Valid attribute names:( From HMC usage)
prdid
lictrm
Specify in Vx, VxRy, or VxRyMz format, where x and y can be a number from 0 through 9, and z
can be a
number from 0 through 9 or a letter from A through Z
feature
[serial]
Defaults to *LOCAL
[prcgrp]
Specify in Pxx format where xx is a number from 00 to
99
Defaults to 999
usglmt
Specify *NOMAX for no limit
[expdate]
Specify in 1YYMMDD format
Defaults to 9999999 which correlates to *NONE
[vnndtta]
```

```
Defaults to blank which correlates to *NONE
lickey
```

An example license key is as follows:

```
1210222210611RCHASC025770SS1V7R4M05117 7800050999 -11220223 DD0829B7E5E2A6B5011210222210611
```

Pvmctl command

The command-line interface uses the **pvmctl** command for most operations. The command can be entered at the command line of the PowerVM NovaLink partition.

The **pvmctl** command can be run only by users who are in the `pvm_admin` group. To add a user to the `pvm_admin` group, enter the following command:

```
sudo adduser user_id pvm_admin
```

The `admin` user for the PowerVM NovaLink partition is added to the `pvm_admin` group automatically when PowerVM NovaLink is installed.

Displaying version information

To display version information for the PowerVM NovaLink software, enter the command `pvmctl --version`.

Command help

The **pvmctl** command includes help information that lists the operations that are used by the command. To view the help information, enter one of the following commands.

To view a list of objects on which you can perform actions, enter the command `pvmctl help` or `pvmctl --help`.

To view a list of operations for a specific object type, enter the command `pvmctl object_type help` or `pvmctl object_type --help`.

To view information about the arguments for a specific object type and operation, enter the command `pvmctl object_type operation help` or `pvmctl object_type operation --help`.

Supported object types

The following object types are supported by the PowerVM NovaLink CLI. You can use either the full object type or the indicated short names for each object type.

- Cluster
- IOSlot (`io`)
- LogicalPartition (`lpar` or `vm`)
- LogicalUnit (`lu`)
- LogicalVolume (`lv`)
- ManagedSystem (`sys`)
- LogicalPartition (`lpar` or `vm`)
- NetworkBridge (`nbr`, `bridge`, `sea`, `sharedethernetadapter`)
- PhysicalVolume (`pv`)
- SharedProcessorPool (`sharedprocpool`, `spp`)
- VirtualIOServer (`vios`)
- SharedStoragePool (`ssp`)
- SRIOVadapter (`sriov`)

- sriovethernetlogicalport (ethlogicalport, ethlp)
- SharedEthernetAdapter (sea)
- VirtualEthernetAdapter (vea or eth)
- VirtualFibreChannelMapping (vfc or vfcmapping)
- VirtualMediaRepository (vmr or repo)
- VirtualNICdedicated (vnic)
- VirtualNetwork (vnet or net)
- VirtualOpticalMedia (vom or media)
- VirtualSCSIMapping (scsi or scsimapping)
- VirtualSwitch (vswitch or vsw)
- Volumegroup (vg)
- virtualserialnumber (vsn)

For PowerVM NovaLink Version 2.0, or later, the following object types are supported by the PowerVM NovaLink CLI.

- persistentmemorydevice (pmemd)
- persistentmemoryvolume (pmemv)

Command structure

The CLI uses the following command structure.

```
pvmctl [--version] [object] [operation] [arguments...] [help | --help]
```

For example, to list the logical partitions on the managed system, enter the following command:

```
pvmctl LogicalPartition list
```

To list all Virtual I/O Server names, IDs, states, and their associated I/O Adapter device names, use the `--display-fields` (or `-d`) argument:

```
pvmctl vios list -d name id state IOAdapter.dev_name
```

To list the names, IDs, states, and associated I/O Adapter device names of all Virtual I/O Servers that are not running, use the `--where` argument to add the condition to the command:

```
pvmctl vios list -d name id state IOAdapter.dev_name --where VirtualIOServer.state!=running
```

To list a network bridge with a port VLAN ID of 10, use the `--object-id` (or `-i`) argument:

```
pvmctl bridge list --object-id pvid=10
```

To update the desired memory of a logical partition with name `mylpar` to 512 MB, use the `--set-fields` argument:

```
pvmctl lpar update -i name=mylpar --set-fields PartitionMemoryConfiguration.desired=512
```

To delete a virtual Ethernet adapter, specify its parent identifier with the `--parent-id` (or `-p`) argument:

```
pvmctl vea delete -i pvid=1 --parent-id name=lpar_name
```

To create a new logical partition, view the required arguments by using the command `pvmctl lpar create help`.

The following command creates an AIX/Linux logical partition named `new_lpar` with one dedicated processor and 512 MB of memory:

```
pvmctl lpar create --name new_lpar --proc 1 --proc-type dedicated
--sharing-mode normal --type AIX/Linux --mem 512
```

Virtual serial number

When you are using IBM Power servers at firmware level FW950, or later and PowerVM NovaLink software version 2.1.0, or later, you can assign a virtual serial number (VSN) to the logical partition. The virtual serial number has seven digits and it is a unique string. When the logical partition is in the **Running** state, you cannot change the virtual serial number.

A list of virtual serial numbers is activated in the POWER® Hypervisor by using a Capacity on Demand (CoD) code that is provided by IBM. The virtual serial number is used to license and track the usage of the logical partition.

In PowerVM NovaLink software version 2.1.0, or later, the PowerVM NovaLink CLI supports `virtualserialnumber` (`vsn`) object type.

To display the help menu of the VSN, enter the following command:

```
[neo@MyCec ~]$ pvmctl vsn
usage: pvmctl virtualserialnumber [help] <operation> [help] [<args>]
Supported operations:
list      List information about Virtual Serial Numbers.
delete    Delete VSN from the system.
transfer  Transfer VSN to other managed system.
Object type aliases:
virtualserialnumber
vsn
```

To list the virtual serial number on the managed system, enter the following command:

```
[neo@MyCec ~]$ pvmctl vsn list
Virtual Serial Numbers
+-----+-----+-----+
| VSN   | LPAR ID | AUTO ASSIGN |
+-----+-----+-----+
| VSHJKSZ | -       | True        |
| VSHJKZY | 22      | False       |
+-----+-----+-----+
```

To delete the VSN from managed systems, enter the following command:

```
pvmctl vsn delete -i name=<virtual serial number>
```

To transfer the VSN to other managed systems, enter the following command:

```
pvmctl vsn transfer --mgmt-svr <server ip> -i id=<virtual serial number> --mgmt-usr <userid>
--sys <target sys name>
```

Platform keystore

When you are using IBM Power servers at firmware level FW950, or later and the PowerVM NovaLink software is at version 2.1.1, or later, the Platform keystore (PKS) feature in PowerVM NovaLink creates an encrypted non-volatile store. This keystore provides logical partitions with additional capabilities to store and protect sensitive information. PowerVM provides an isolated PKS storage allocation for each partition with individually managed access controls. The total partition size that can be allocated to a logical partition by the PKS feature is in the range 4 KB - 64 KB.

To list the trusted system key information for a managed system, enter the following command:

```
# lstskey
key_length=32,key_status=default_key
#
```


To view the help information for changing the trusted system key information for a managed system, enter the following command:

```
# chtskey
Usage: chtskey -m <managed system>
        -o change | restore
        --newkey <key file>
        [--oldkey <key file>]
        [--force]
        [--help]
Changes the trusted system key for a managed system.
-m <managed system> - the managed system's name
-o                  - the operation to perform:
                    change - set the key and re-encrypt virtual
                        Trusted Platform Module (vTPM) data
                    restore - set the key without re-encrypting vTPM
                        data
--newkey <key file> - binary file that contains the new key
--oldkey <key file> - binary file that contains the current key
--force            - force a change when previous change operation is
                    still re-encrypting vTPM data
--help            - prints this help.
#
```

Managing the persistent memory volume

When the firmware is at level FW940, or later and PowerVM NovaLink is at a Version 2.0.0.0, or later, you can view and manage the persistent memory volume that is assigned to a logical partition. You can manage the persistent memory volume only when the logical partition is in the **Not activated** state. You cannot add virtual Persistent Memory (PMEM) volumes to a logical partition in which the Simplified Remote Restart (SRR) capability is enabled.

You can perform the following operations on your logical partition:

To list the persistent memory devices that are associated with a logical partition, enter the following command:

```
pvmctl pmemd list
```

To list the persistent memory volumes that are assigned to a logical partition, enter the following command:

```
pvmctl pmemv list
```

To create a persistent memory volume, enter the following command:

Note: The volume size of the persistent memory volume must be a multiple of the device block size, which can be queried by listing the device.

```
pvmctl pmemv create --name volume_name --size volume_size --lpar_id associated_lpar_id
```

To delete a persistent memory volume, enter the following command:

```
pvmctl pmemv delete -i name=volume_name
```

Virtual terminal command

Enter the **mkvterm** command to open a virtual terminal connection to an AIX or Linux logical partition.

For example, to open a virtual terminal connection to a partition with partition ID 3, enter the following command:

```
mkvterm --id 3
```

To exit the virtual terminal, press Control +].

Partition configuration backup and restore commands

Enter the **bkprofdata** and **rstprofdata** commands to back up and restore the partition configuration data of a managed system. These commands back up and restore only the partition configuration data in the hypervisor.

For example, to backup the partition configuration to the `/tmp/mybackup.bak` file, enter the following command:

```
bkprofdata -o backup -f /tmp/mybackup.bak
```

To restore the partition configuration data from the `/tmp/mybackup.bak` file by using phase 2 restoration, enter the following command:

```
rstprofdata -l 2 -f /tmp/mybackup.bak
```

Virtual I/O Server command

Use the **viosvrcmd** command to run commands on an instance of the Virtual I/O Server.

For example, to run the **lsmap -all** command on the Virtual I/O Server with partition ID 2, enter the following command:

```
viosvrcmd --id 2 -c "lsmap -all"
```

Related information

[PowerVM NovaLink Access Control Framework](#)

Recovering the PowerVM NovaLink partition

The PowerVM NovaLink installer contains recovery tools that you can use to recover from a hardware failure. To access recovery tools, boot the PowerVM NovaLink installer.

Checking service status

The PowerVM NovaLink partition contains the following system services that must always be running: `pvm-core` and `pvm-rest`. If you are not able to complete tasks on the PowerVM NovaLink partition, verify whether these services are running. Use the **systemctl** command to view the status of these services and to stop, start, and restart these services.

To view the status of a service, enter the following command, where *service_name* is `pvm-core` or `pvm-rest`.

```
sudo systemctl status service_name
```

To start a service, enter the following command.

```
sudo systemctl start service_name
```

To restart a service, enter the following command.

```
sudo systemctl restart service_name
```

To stop a service, enter the following command.

```
sudo systemctl stop service_name
```

Rebuilding the PowerVM NovaLink RAID array

By default, the PowerVM NovaLink partition uses two 30 GB logical volumes, each of which is hosted by an instance of Virtual I/O Server. The logical volumes are mirrored by using RAID 1. Each time you

reboot one of the instances of Virtual I/O Server, the RAID array puts one of the disks into failure mode. The RAID array is rebuilt automatically every 15 minutes. However, if you want to rebuild the RAID array immediately after a Virtual I/O Server reboot, enter the following command at the PowerVM NovaLink command line.

```
sudo /usr/sbin/pvm-rebuild-raid
```

Shutting down the PowerVM NovaLink partition

The PowerVM NovaLink partition always restarts itself if you use normal operating system commands to shut down. To shut down the PowerVM NovaLink partition, enter the following command, where *novalink_id* is the partition ID of the PowerVM NovaLink partition.

```
pvmctl lpar power-off -i id=novalink_id
```

Log file location

Log files for PowerVM NovaLink are located in the `/var/log/pvm` directory on the PowerVM NovaLink partition. Use the `/usr/sbin/pedbg` command on the PowerVM NovaLink partition to gather the log files for service and support.

Accessing recovery tools from the PowerVM NovaLink installer

The PowerVM NovaLink installer contains tools that you can use to recover from a part failure or from a managed system failure. To access the tools, start the PowerVM NovaLink installer.

Before you begin

To access recovery tools from the PowerVM NovaLink installer, you must locate a Linux PC or notebook to use as a console. You also need an Ethernet cable to connect the PC or notebook to the managed system.

About this task

To access recovery tools from the PowerVM NovaLink installer, complete the following steps:

Procedure

1. Access the ASMI by using the PC or notebook.
For information about how to connect to ASMI, see [Accessing the ASMI using a PC or notebook and web browser](#).
2. Power off the system by clicking **Power/Restart Control > Power On/Off System**.
3. Click **Power/Restart Control > Power On/Off System**, change **AIX/Linux partition mode boot** to **Boot to SMS menu**, and click **Save settings**.
4. Enter the following commands on the command line of the Linux PC or notebook, where *ip_add* is the IP address that you used to connect to the ASMI and *password* is your ASMI password:

```
ipmitool -I lanplus -H ip_add -P password chassis power on  
ipmitool -I lanplus -H ip_add -P password sol activate
```

5. Select the boot device by using the SMS menu.

You can select either a USB drive or a netboot server as the boot device. To select the boot device, complete the steps for the type of boot device that you are using.

Boot device type	Steps
USB drive	a. At the Boot selection window, enter 1 to select the SMS Menu.

Boot device type	Steps
	b. Enter 2 to continue with password entry. Enter admin. c. From the main menu, enter 5 to select boot options. d. Enter 1 to select the install/boot device. e. Enter 7 to view a list of all boot devices, and then enter the number that corresponds to the USB drive. f. Enter 2 to perform a normal mode boot, and then enter 1 to exit the SMS menu and to start the boot process.
Netboot server	a. At the Boot selection window, enter 1 to select the SMS Menu. b. Enter 2 to continue with password entry. Enter admin. c. From the main menu, enter 2 to set up the remote IPL. d. Enter the number that corresponds to the Ethernet adapter that you want to use. e. Enter the number for IPv4 IP addresses. f. Enter the number for BOOTP as your network service. g. Enter 1 for IP parameters. h. Set the IP parameters: <ul style="list-style-type: none"> • Client IP Address is the IP address that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server. • Server IP Address is the IP address of the netboot server. • Gateway IP Address is the gateway IP address that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server. • Subnet Mask is the subnet mask that you set for the managed system in the <code>/etc/bootptab</code> file on the netboot server. i. Press ESC, enter 3 for ping test, enter 1 for execute ping test, and verify that the netboot server is reachable. j. Enter M to return to the main menu. k. From the main menu, enter 5 to select boot options. l. Enter 1 to select the install/boot device. m. Select Network , and then select the network card you configured. n. Enter 2 to perform a normal mode boot, and then enter 1 to exit the SMS menu and to start the boot process.

6. At the GNU GRand Unified Bootloader (GRUB) screen, select the **PowerVM NovaLink Install/Repair** option, and then select the rescue mode option.

Results

After you are in rescue mode, you can use the `pvmct1` command to manage virtualization on the managed system.

PowerVM NovaLink system backup and restoration

PowerVM NovaLink automatically backs up hypervisor and Virtual I/O Server configuration data by using cron jobs. After failure of the managed system, access rescue mode by booting the PowerVM NovaLink

image. Use rescue mode to restore the system with the backed up hypervisor and Virtual I/O Server configuration data.

Backup file location

Backup files are stored in the `/var/backups/pvm/SYSTEM_MTMS/` directory on the PowerVM NovaLink partition. Virtual I/O Server configuration backups are stored in the default Virtual I/O Server locations for user `padmin` (`~padmin/cfgbackups`), and then copied to the `novalink` directory for consolidation. The backup cron jobs create and copy the backups automatically.

Up to 23 hourly backups and 31 daily backups are stored at a time.

Storing backup files at a remote location

For secure storage of backup files at a remote location, mount a Network File System (NFS) remote file system to the `/var/backups/pvm/` directory. Alternatively, you can use the backup software of your choice to back up the contents of the `/var/backups/pvm/` directory.

Partition IDs in backup files

For simpler recovery, the PowerVM NovaLink partition ID is always set to 1 in backup files. If some other logical partition has partition ID 1, the partition ID of that partition is swapped with the PowerVM NovaLink partition ID. For example, if PowerVM NovaLink partition ID is 2 and partition ID 1 belongs to a Virtual I/O Server partition, when PowerVM NovaLink backs up hypervisor and Virtual I/O Server configuration data, the PowerVM NovaLink partition ID becomes 1 and the Virtual I/O Server partition ID becomes 2.

System restoration by using the rescue mode

Use rescue mode to restore your managed system after system failure.

System restoration includes the following phases.

- The first phase restores the hypervisor configuration, the PowerVM NovaLink partition, and the Virtual I/O Server partitions. During this phase, you can choose to reinstall Virtual I/O Server manually on the Virtual I/O Server partitions. You can also manually restore the `viosbx` data to the Virtual I/O Server logical partitions during this phase, if necessary. At the end of this phase, the system performs a full system reboot to apply the hypervisor configuration. Run this phase only if the system is already reset to factory settings. For information about how to reset a system to factory settings, see [Restoring your server to factory settings](#).
- The second phase restores the client logical partitions. The client logical partitions are restored in partition ID order. If the managed system runs out of memory or processor resources, the remaining partitions are created with no resources.

To reinstall your PowerVM NovaLink environment instead of restoring it, you can use only the second phase. To reinstall your PowerVM NovaLink environment, complete the following steps:

1. Install PowerVM NovaLink by using automated installation.
2. Use rescue mode to restore the client logical partitions.
3. Restore the `viosbx` data to the Virtual I/O Server partitions manually.

Resetting a PowerVM NovaLink-managed system to an HMC-managed system

You can co-manage a managed system by using both PowerVM NovaLink and the Hardware Management Console (HMC). To use partition profiles and system plans on a managed system, you must remove PowerVM NovaLink from the managed system.

Before you begin

Before you reset the PowerVM NovaLink-managed system to an HMC-managed system, cable the server to an HMC if you have not already done so. For information about how to cable the server to the HMC, see the system installation documentation.

About this task

To reset a PowerVM NovaLink-managed system to an HMC-managed system, complete the following steps:

Procedure

1. Set the HMC to controller mode by entering the following command at the HMC command line, where *managed_system* is the name of the managed system.

```
chcomgmt -o setcontroller -t norm -m managed_system
```

2. Power off the PowerVM NovaLink partition by entering the following command at the HMC command line. In this command, *managed_system* is the name of the managed system and *partition_id* is the partition ID of the PowerVM NovaLink partition.

```
chsysstate -m managed_system -r lpar -o shutdown --id partition_id --immed
```

3. Remove the PowerVM NovaLink partition by entering the following command at the HMC command line. In this command, *managed_system* is the name of the managed system and *partition_id* is the partition ID of the PowerVM NovaLink partition.

```
rmsyscfg -r lpar -m managed_system --id partition_id
```

4. Release controller authority for the managed system by entering the following command at the HMC command line, where *managed_system* is the name of the managed system.

```
chcomgmt -o relcontroller -m managed_system
```

PowerVM NovaLink Access Control Framework

PowerVM NovaLink Access Control Framework is used to provide access for non-root users to access (read, write, and execute) the privileged files or commands for various types of tasks such as viewing the configuration of PowerVM NovaLink logical partition. It uses the *sudo* and *acl* facility on an operating system instance. The *sudo* facility is generally used to provide permissions to run privileged commands with specific arguments.

About this task

You can set up the access control framework by completing the following steps:

Procedure

1. Install the framework.

The following files are installed when the *pvm-core* package of PowerVM NovaLink software is installed in the PowerVM NovaLink logical partition:

- `/etc/security/pvm_access.conf`: This file contains the default access rules for the group **pvm_viewer**. The rules allow the members of the **pvm_viewer** group to view configuration information of various resources such as hardware, firmware, logical partitions, CPU, memory, networks, Open vSwitch, and storage of the system managed by using PowerVM NovaLink. The group **pvm_viewer** is also created when this configuration file is installed.
 - `/usr/bin/pvm_access`: This command is used to apply or enable the access rules defined in the `/etc/security/pvm_access.conf` file. It also provides options to check, get and disable the rules defined in the `/etc/security/pvm_access.conf` file.
2. Enabling the framework and adding authorized users. This configuration is performed by the PowerVM NovaLink administrator user.

- a) Enter the `sudo pvm_access -h` command to list the optional flags of the **pvm_access** command.

Syntax: `pvm_access [-c | -s | -g | -d | -h | --help`

Where

- `-c` is used to verify the correctness of the access rules
- `-s` is used to set the access rules
- `-g` is used to get your access rules
- `-d` is used to disable the access rules
- `-h | --help` is used to print this help

- b) Enter `sudo cat /etc/security/pvm_access.conf` to view the access rules. You can also add or modify rules if required. The `pvm_access.conf` file contains sufficient information for understanding or updating the rules in this file.

- c) Enter `sudo pvm_access -c` to verify whether the rules defined in the `pvm_access.conf` file are correct. The command returns an error if any rule is incorrect. The command also verifies the requirements for using this framework.

- d) Enter `sudo pvm_access -s` to set, apply, or enable the access rules defined in the `pvm_access.conf` file.

Running the command generates the following files:

- `/etc/sudoers.d/pvm_access_sudoer`
- `/etc/profile.d/pvm_access_profile.sh`
- `/etc/profile.d/pvm_access_aliases`
- `/etc/profile.d/pvm_access_aliases_unset`

Running the command also logs the list of rules applied, together with some other information in the `/var/log/pvm/pvm_access.log` file.

- e) To create a user called **pviewer**, belonging to the group **pvm_viewer**, enter the following commands:

```
sudo adduser pviewer
```

```
sudo usermod -aG pvm_viewer pviewer
```

3. Using the framework as a user. For example, a user called **pviewer**, who is privileged by this framework.

- a) Enter `pvm_access -g` to list the files you are allowed to read or write, and the commands (with arguments) that you are allowed to execute. You can also redirect the output and search for commands or files that you want to view. For example `pvm_access -g | grep pvmctl`

- b) The following commands are enabled for the users, for example **pviewer** belonging to the group **pvm_viewer**.

```
pvmctl lpar list
```

```
pvmctl -help
```

```
lshw
```

```
lsmcode
```

Note: If your shell type is not **bash**, you need to switch to the **bash** shell and then source the `/etc/profile.d/pvm_access_aliases` file by typing the following command:

```
bash ./etc/profile.d/pvm_access_aliases
```

To avoid switching to the **bash** shell and sourcing the `/etc/profile.d/pvm_access_aliases` file, you can modify the login shell of the user by using the `sudo usermod -s /bin/bash <userName>` command. To unset the aliases that are created by `/etc/profile.d/pvm_access_aliases`, you can source the `/etc/profile.d/pvm_access_aliases_unset` file.

4. Disabling the access rules. This task is performed by the PowerVM NovaLink administrator user. Enter `sudo pvm_access -d` to disable the rules. It removes all the files generated when the rules were enabled. It also unsets the ACLs modified by the script.

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Accessibility features for IBM Power Systems servers

Accessibility features assist users who have a disability, such as restricted mobility or limited vision, to use information technology content successfully.

Overview

The IBM Power Systems servers include the following major accessibility features:

- Keyboard-only operation
- Operations that use a screen reader

The IBM Power Systems servers use the latest W3C Standard, [WAI-ARIA 1.0 \(www.w3.org/TR/wai-aria/\)](http://www.w3.org/TR/wai-aria/), to ensure compliance with US Section 508 (www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-section-508-standards/section-508-standards) and [Web Content](#)

[Accessibility Guidelines \(WCAG\) 2.0 \(www.w3.org/TR/WCAG20/\)](http://www.w3.org/TR/WCAG20/). To take advantage of accessibility features, use the latest release of your screen reader and the latest web browser that is supported by the IBM Power Systems servers.

The IBM Power Systems servers online product documentation in IBM Knowledge Center is enabled for accessibility. The accessibility features of IBM Knowledge Center are described in the [Accessibility section of the IBM Knowledge Center help \(www.ibm.com/support/knowledgecenter/doc/kc_help.html#accessibility\)](http://www.ibm.com/support/knowledgecenter/doc/kc_help.html#accessibility).

Keyboard navigation

This product uses standard navigation keys.

Interface information

The IBM Power Systems servers user interfaces do not have content that flashes 2 - 55 times per second.

The IBM Power Systems servers web user interface relies on cascading style sheets to render content properly and to provide a usable experience. The application provides an equivalent way for low-vision users to use system display settings, including high-contrast mode. You can control font size by using the device or web browser settings.

The IBM Power Systems servers web user interface includes WAI-ARIA navigational landmarks that you can use to quickly navigate to functional areas in the application.

Vendor software

The IBM Power Systems servers include certain vendor software that is not covered under the IBM license agreement. IBM makes no representation about the accessibility features of these products. Contact the vendor for accessibility information about its products.

Related accessibility information

In addition to standard IBM help desk and support websites, IBM has a TTY telephone service for use by deaf or hard of hearing customers to access sales and support services:

TTY service
800-IBM-3383 (800-426-3383)
(within North America)

For more information about the commitment that IBM has to accessibility, see [IBM Accessibility \(www.ibm.com/able\)](http://www.ibm.com/able).

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Programming interface information

This PowerVM NovaLink publication documents intended Programming Interfaces that allow the customer to write programs to obtain the services of IBM PowerVM NovaLink Version 2.0.0.0, IBM AIX Version 7.2, IBM AIX Version 7.1, IBM AIX Version 6.1, IBM i 7.5, and IBM Virtual I/O Server Version 3.1.3.

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