



## IBM i™ on a Power Blade Read-me First

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This “read-me first” document provides detailed instructions on using IBM i on a Power blade. It covers prerequisites, supported configurations, preparation for install, hardware and software install, firmware updates and post-install tasks such as backups. The document also contains links to many additional information sources.

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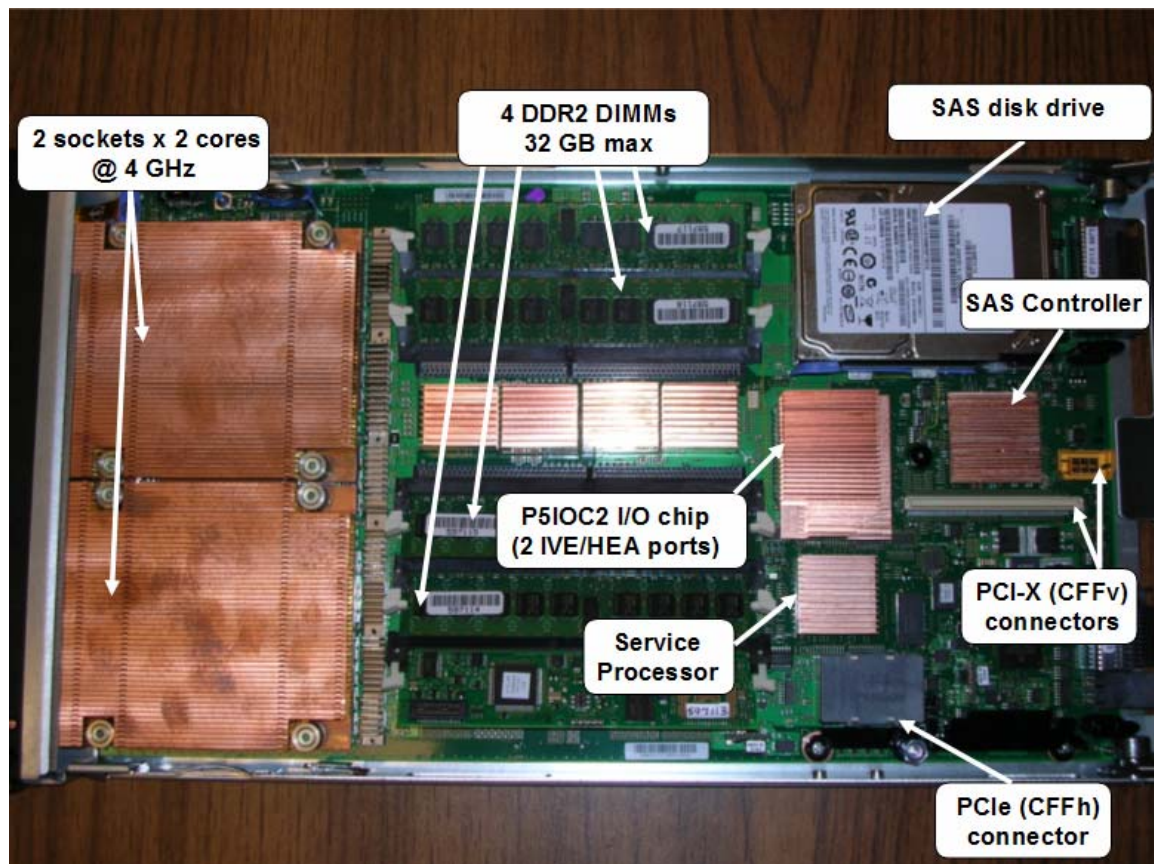
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## 1. Prerequisites

### 1.1. Review IBM i on Power blade concepts

#### 1.1.1. IBM BladeCenter JS22

The JS22 Power blade is a 4-core blade server based on the POWER6™ processor. The JS22 fits in a standard IBM BladeCenter chassis and has an integrated Service Processor (SP), two Gigabit Ethernet ports, SAS and USB controllers and a SAS disk drive. The embedded Ethernet ports are Integrated Virtual Ethernet (IVE) ports, also present on other POWER6-based servers. Additional I/O is provided by CFFh and CFFv expansion cards, which allow connections to external storage and tape via switches in the BladeCenter chassis. IBM i on the JS22 is supported in BladeCenter H and BladeCenter S. The following picture shows the JS22, identifying the major components:



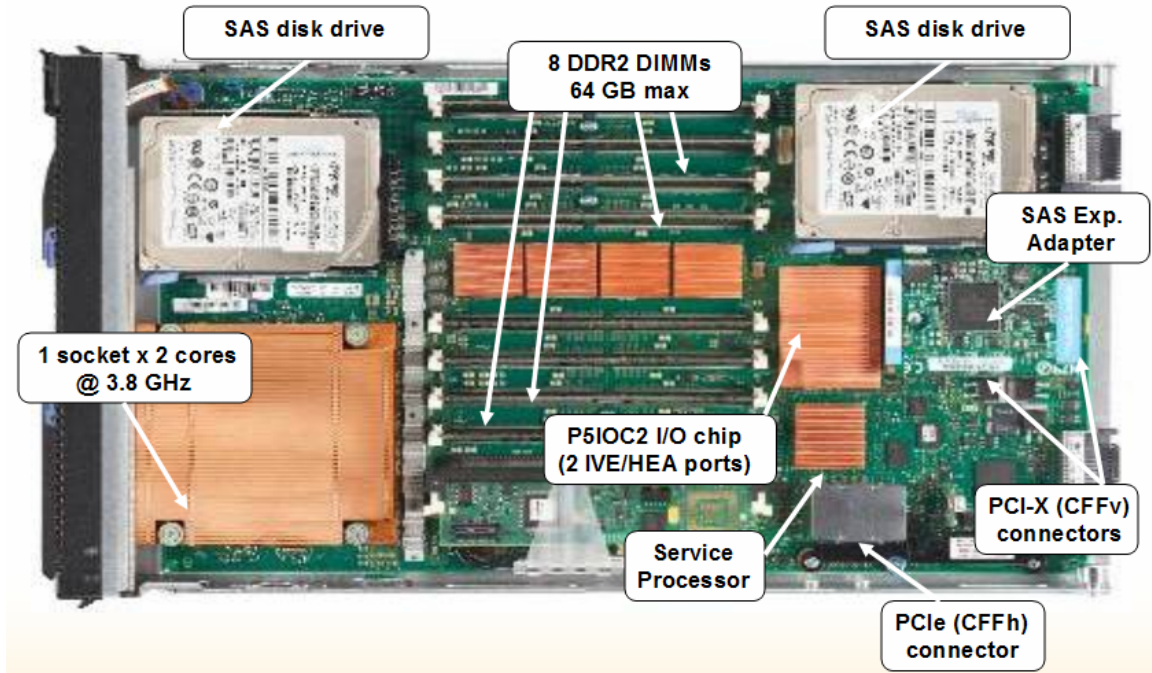
#### 1.1.2. IBM BladeCenter JS12

The JS12 Power blade is a 2-core blade server based on the POWER6™ processor. Its hardware is very similar to that of the JS22, with several important differences:

- There is a single POWER6 socket with 2 processor cores
- The processor cores operate at 3.8 GHz, instead of the JS22's 4 GHz
- Two integrated SAS drives are supported on the blade

- Four additional memory DIMM slots are supported, for a total of eight slots

The JS12 includes the same SP, embedded Gigabit Ethernet (IVE) ports, CFFv and CFFh I/O expansion slots, and embedded SAS and USB controllers. The JS12 is capable of supporting twice the number of memory DIMMs because of the new, shorter DIMM design, which allows the DIMMs to be plugged in vertically. IBM i on the JS12 is supported in BladeCenter H and BladeCenter S. The following picture shows the JS12, identifying the major components:



**Note that all implementation instructions in the rest of the document apply to both JS12 and JS22, unless explicitly stated otherwise.**

### 1.1.3. Logical Partitioning (LPAR)

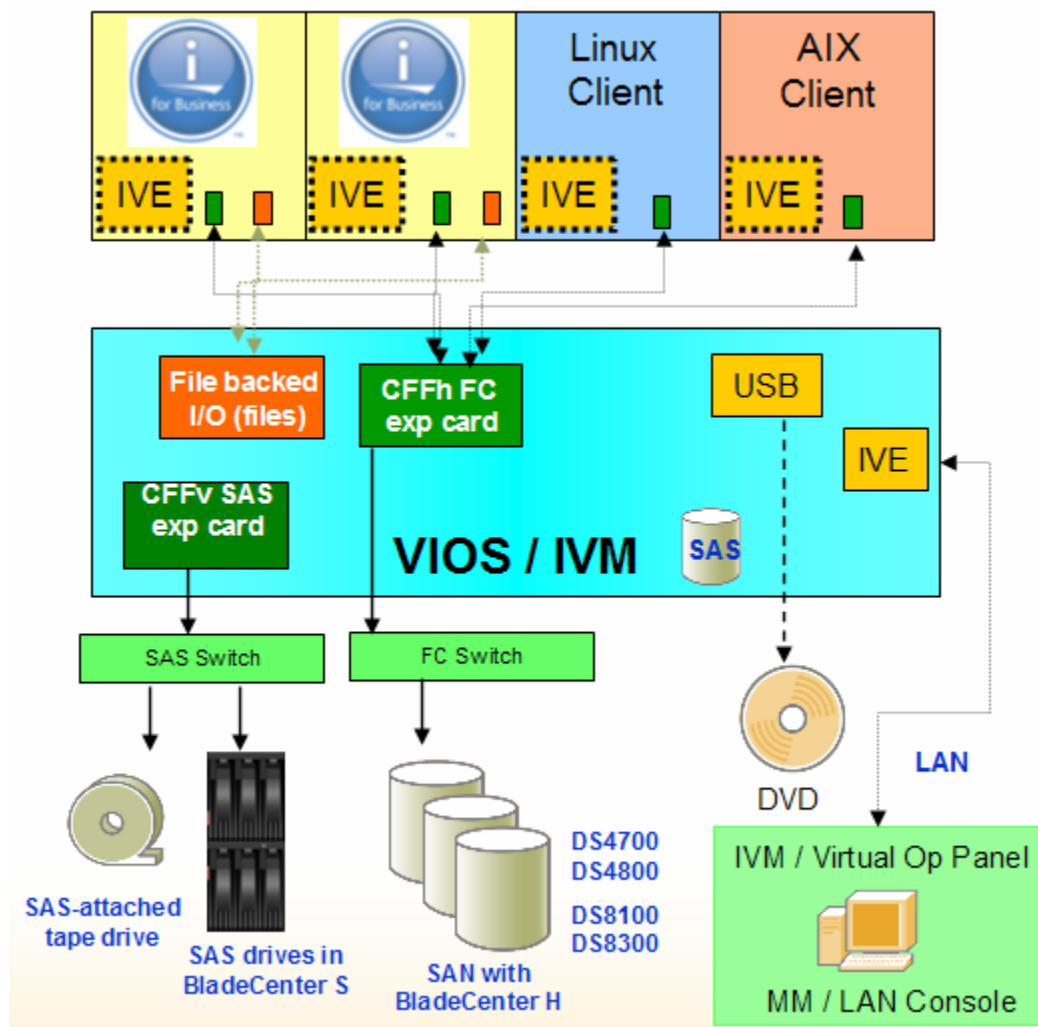
Like other Power systems, the JS12 and JS22 can be partitioned into separate environments, or logical partitions (LPARs). Both Power blades support IBM i, AIX and Linux partitions. Any physical hardware the blade has access to is owned by a Virtual I/O Server (VIOS) LPAR, which virtualizes storage, optical and network resources to the other LPARs. An IBM i LPAR on the blade does not have direct access to any physical hardware on the blade or outside the BladeCenter chassis. IBM i is a client to VIOS, using a Virtual SCSI (VSCSI) connection in the Hypervisor firmware residing on the SP.

VIOS is always the first LPAR installed on a partitioned Power blade. Once VIOS is installed, other LPARs can be created using the Integrated Virtualization Manager (IVM). IVM is part of VIOS and provides a browser interface to the blade for managing LPARs and I/O virtualization. The Power blade does not support a Hardware Management Console (HMC).

#### 1.1.4. Overview of I/O concepts on the Power blade

IBM i LPARs on the Power blade can use Fibre Channel SAN or SAS storage. **The type of storage used is determined by the BladeCenter chassis in which the Power blade resides, and not by the blade itself.** Both JS12 and JS22 support the same expansion adapters – the QLogic CFFh adapter for Fibre Channel storage and the LSI CFFv adapter for SAS storage. However, the BladeCenter H allows for high-speed Fibre Channel connectivity to a SAN outside of the chassis; whereas the BladeCenter S currently provides storage connectivity only to the SAS drives in the chassis. Therefore, presently a JS12 or a JS22 would use Fibre Channel storage if placed in a BladeCenter H and SAS storage in a BladeCenter S. As mentioned above, both blades are supported in both chassis.

The storage is physically connected to VIOS using either the CFFh expansion adapter (for Fibre Channel) or the CFFv adapter (for SAS) on the blade. Once the Fibre Channel LUNs or SAS drives in the BladeCenter S are recognized by VIOS, they are directly virtualized to IBM i, so that each LUN or SAS drive appears as one drive within IBM i. IBM i is installed using the DVD-ROM drive in the chassis (virtualized by VIOS) or a media image file in VIOS, and uses LAN console, which is the only option. VIOS also provides a backup capability to client partitions by using a SAS-attached external tape drive via the CFFv expansion card on the blade and a SAS switch in the chassis. The following diagram shows an example Power blade environment with 2 IBM i, 1 AIX and 1 Linux LPAR as clients of VIOS:



## 1.2. Review terminology

**BladeCenter:** The chassis containing the blade servers, I/O modules, AMM, DVD-ROM drive, Power and fan modules.

**Advanced Management Module (AMM):** A control module residing in a special I/O bay in the BladeCenter. The AMM provides browser and command-line interfaces into the BladeCenter and can also provide KVM (keyboard, video, mouse) functions to blade servers. The KVM functions are not used for Power blades.

**I/O bay:** A slot for an I/O module (switch) inside the BladeCenter. A BladeCenter can have a mix of standard and high-speed switch bays.

**I/O module (switch):** A switch residing in the BladeCenter which provides connectivity between the blade servers and external I/O device, using wiring in the BladeCenter midplane.

**Multi-switch Interconnect Module (MSIM):** A module which occupies both high-speed I/O bays 7 and 8 or 9 and 10. By placing a standard “vertical” module (normally residing in I/O bays 1-4) in an MSIM, the module can use the BladeCenter’s high-speed fabric. This allows a “horizontal” high-speed expansion card (CFFh) to connect through a “vertical” module.

**Blade server:** A standalone server residing in a blade slot in the BladeCenter.

**Service Processor (SP):** The SP on the Power blade is similar to the SP (sometimes called “FSP”) on other POWER6-based systems. It contains firmware to manage the hardware on the blade; the Power Hypervisor; and Partition Firmware (PFW).

**System firmware:** As with other POWER6-based systems, this is the firmware on the SP (see above).

**I/O expansion card:** Sometimes called “daughter card.” An I/O adapter that fits into a PCIe or PCI-X slot on the blade and allows connectivity to external I/O devices through the BladeCenter midplane and I/O modules.

**Adapter firmware:** The firmware on the I/O expansion cards on the blade.

**Integrated Virtual Ethernet (IVE) ports:** Like other POWER6-based systems, the POWER6 blade includes 2 embedded Gigabit Ethernet ports on the system I/O bridge chip.

**Host Ethernet Adapter (HEA) ports:** Another name for the IVE ports, more commonly used in technical documentation.

**Virtual I/O Server (VIOS):** The Virtual I/O Server is software that is located in a logical partition. This software facilitates the sharing of physical I/O resources between client logical partitions within the system.

**Integrated Virtualization Manager (IVM):** A browser interface installed with VIOS. It provides LPAR and virtualization management functions.

**Virtual Ethernet adapter:** A virtual network adapter created in the Power Hypervisor that is part of an LPAR’s hardware resources. On Power blade, IBM i cannot be assigned physical network adapters.

**Virtual SCSI adapter:** A virtual storage adapter created in the Power Hypervisor that is part of an LPAR’s hardware resources. On Power blade, a Virtual SCSI (VSCSI) client adapter is created in IBM i and a VSCSI server adapter in VIOS for storage virtualization.

**Virtual Ethernet bridge:** A VIOS function that allows Layer-2 bridging of a Virtual LAN to an outside physical LAN. It is a required on Power blade in order to provide both LAN console and standard networking to IBM i.

**Logical Unit (LUN):** A volume created on a SAN system that appears as a single disk device to a server.

**Disk Drive Module (DDM):** A physical disk unit in a SAN system.

**SDD-PCM (Subsystem Device Driver – Path Control Module):** A Multi-path I/O (MPIO) driver for DS8000 installed on top of VIOS.

**RDAC (Redundant Disk Array Controller):** A Multi-path I/O (MPIO) driver for DS4000, which is included with VIOS.

**SAS (Serial-attached SCSI):** A storage access protocol, which is the next generation of the [parallel] SCSI protocol.

**DSM (Disk Storage Module):** A disk bay in the BladeCenter S, currently capable of supporting six SAS or SATA drives. Two DSMs are supported in the BladeCenter S.

### 1.3. Supported environments

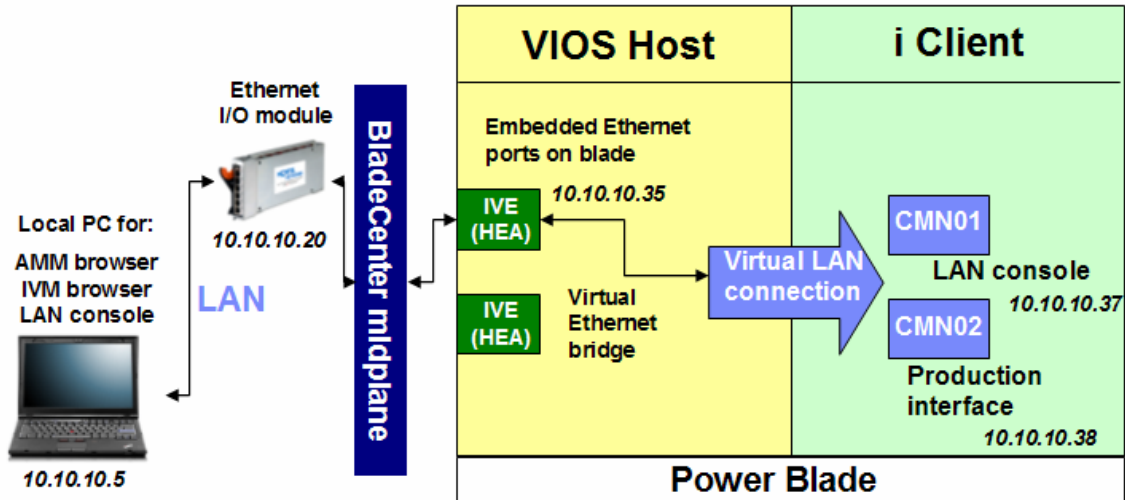
For a complete list of supported hardware, firmware and software for the IBM i on Power blade environment, see <http://www.ibm.com/systems/i/advantages/v6r1/blades/index.html>.

### 1.4. Plan for necessary IP addresses

You should plan to assign IP addresses to the following components for a minimum IBM i on blade configuration. All the addresses below are typically configured on the same subnet.

- **AMM** (this IP address is already assigned on an existing BladeCenter)
  - The AMM IP address is a physical LAN IP address. It will be used to remotely manage the BladeCenter and blade servers
- **Ethernet I/O module** (this IP address is already assigned on an existing BladeCenter)
  - This IP address will be used to connect the Ethernet I/O module to the physical LAN, allowing any blades in the BladeCenter access to the LAN
- **VIOS/IVM**
  - An IP address on the external LAN that will be used to connect to both IVM and the VIOS command line
- **IBM i LAN console**
  - An IP address on the external LAN that will be used to provide 5250 console access to IBM i via a PC with the System i Access for Windows software. The address will be assigned to the IBM i partition when the LAN console connection is first established. See **PC for LAN console and IVM browser access** below
- **IBM i production interface**
  - An IP address on the external LAN that will be used for IBM i production network traffic. This address will be configured after IBM i is installed using LAN console. It is recommended that the IBM i LAN console and production network interface use two separate Virtual Ethernet adapters in the IBM i partition
- **PC for LAN console and IVM browser access**
  - When the IBM i LAN console connection is first established, the console PC *must be on the same subnet* as the IBM i partition. Once the console is established, this restriction is removed
- **SAS I/O module 1**
  - **This applies only to BladeCenter S.** An IP address on the external LAN that will be used to connect to the SAS I/O module. This IP address is required in order to manage the SAS module configuration and assign SAS drives in the chassis to blades.
- **SAS I/O module 2**
  - **This applies only to BladeCenter S.** An IP address on the external LAN that will be used to connect to the SAS I/O module. This IP address is required in order to manage the SAS module configuration and assign SAS drives in the chassis to blades. A second SAS I/O module is optional in the BladeCenter S.

From a network perspective, one significant difference between the BladeCenter H and BladeCenter S is that in the BladeCenter H, each embedded network port on the Power blade connects to the outside LAN through a separate Ethernet module in the chassis. The first embedded network port connects through I/O module bay 1 and the second embedded network port through I/O module bay 2. In the BladeCenter S, both embedded network ports on the blade connect through I/O module bay 1. The following diagram shows a sample network configuration for a basic IBM i on blade installation:



### 1.5. Install System i Access for Windows

IBM i on Power blade uses Operations Console (LAN) for a system console. This is the only option. LAN console necessitates having a PC (initially on the same subnet as IBM i) with the System i Access for Windows software. The same PC can be used for the browser connection to IVM and Telnet sessions to the AMM or VIOS.

Obtain the System i Access software by visiting this Web site:

<http://www.ibm.com/systems/i/software/access/caorder.html>. Make sure to obtain the latest version of the software.

Complete the PC preparations for LAN console and install the software as described in this section of the IBM i Information Center:

<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/topic/rzajr/rzajrlcnetworksu.htm>. Make sure to install the Operations Console component.

### 1.6. Install PuTTY

As mentioned above, IVM is used for both LPAR and virtual resource management in this environment. IVM requires networking to be configured in VIOS, which is discussed in section 5.3. To install and configure VIOS, and later to use the **backup** and **restore** VIOS commands, a Telnet session to the AMM or to VIOS is required. Use the PuTTY application any time a Telnet session is mentioned in this document. PuTTY provides better terminal functionality than the Telnet client included with Windows and can be downloaded at no cost from <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>. Install PuTTY on the same PC used for LAN console and the browser connection to IVM.

## 2. Prepare for the hardware installation

### 2.1. Verify or obtain BladeCenter hardware

If you have already purchased a BladeCenter chassis, verify it is supported for IBM i on Power blade by consulting the supported environments document:  
<http://www.ibm.com/systems/i/advantages/v6r1/blades/index.html>.

If you have not already obtained a BladeCenter chassis, work with your local sales channel or use the IBM BladeCenter chassis Web site at  
<http://www.ibm.com/systems/bladecenter/hardware/chassis/>.

### 2.2. Verify or obtain I/O switch modules

If you have already obtained the BladeCenter switch modules, verify that:

- They are supported for IBM i on Power blade
- They meet the requirements of the minimum configuration for IBM i on Power blade

Consult the supported environments document at  
<http://www.ibm.com/systems/i/advantages/v6r1/blades/index.html>.

**NOTE:** If the Power blade(s) is/are going to co-exist with another type of blade server, such as Intel-based blades, verify that the I/O switch module configuration of the chassis meets the I/O requirements of all blades.

## 3. Hardware installation and BladeCenter firmware updates

### 3.1. Assemble the BladeCenter and blade server hardware

The first step in preparing the BladeCenter is to install the BladeCenter and blade server hardware. This may include installing any management modules, Power modules, and I/O modules in the BladeCenter. The BladeCenter might have these components already installed if an additional blade server is being added to an already functioning BladeCenter. Before installing the blade servers in the BladeCenter, any blade server options must be installed. This may include additional processors (if x86 blades), additional memory and I/O expansion cards. For the JS22 and JS12 Power blade server, it requires the QLogic Ethernet and 4Gb Fibre Channel CFFh expansion card if the BladeCenter H is used. For both Power blades, the LSI SAS CFFv expansion adapter is required in order to use the SAS drives in the BladeCenter S. Refer to the blade server and expansion card documentation that came with the option for details on installing each one. Once the blade server options have been installed, the blade server can be installed in the BladeCenter. Refer to BladeCenter and blade server documentation for details on how to install the BladeCenter and blade server components. After installing all the blade server options, installing the blade servers into the BladeCenter, and installing the BladeCenter modules, the BladeCenter can be connected to the Power outlets.

## 3.2. Configure the Advanced Management Module (AMM)

### 3.2.1. Initial AMM configuration

At this time, the AMM must have an Ethernet cable plugged into its Ethernet port. Plug the other end of this cable into the Ethernet connector of a computer where you will open a browser session to the AMM. In some cases, a switch or hub may also be necessary to connect. The following steps are performed on the computer connected to the AMM and not on the BladeCenter console.

- Set the IP address to one in the same subnet as the AMM's default IP address of 192.168.70.125 such as 192.168.70.101 and set the subnet mask to 255.255.255.0.
- Ensure the BladeCenter's AC Power cords are plugged into an appropriate Power source to provide Power for the management module. Allow about 30 seconds after performing this step for the management module to boot
- Open a Web browser on the computer connected to the AMM. In the address or URL field, type the IP address (192.168.70.125 is the default) of the AMM to which you want to connect
- The Enter Password window will open. Type the user name and password on the Enter Password window. The management module has a default user name of USERID and password of PASSWORD (where 0 is a zero, not the letter O). It is recommended to change the password during this initial configuration
- Select a timeout value on the next screen and click continue

### 3.2.2. AMM user profiles

- To create additional user profiles on the AMM, click **Login Profiles** under **MM Control**
- Click a login ID currently marked as "not used"
- Enter the user profile and password (twice), select the user profile's desired role and click **Save**

### 3.2.3. AMM LAN configuration

- To configure the AMM so that it is accessible on the local network, click **Network Interfaces** under **MM Control**
- Enter a hostname for the AMM. If the AMM is going to use DHCP, choose the option **Enabled – Obtain IP Config from DHCP** server in the **DHCP** drop-down menu
- If the AMM is going to use a static IP address, choose the option **Disable – Use static IP configuration**, then enter the IP address, subnet mask and gateway IP address
- Click **Save**.

## 3.3. Download BladeCenter firmware

The procedures below are performed on a computer using a common web browser, while accessing the webpage: <http://www.ibm.com/systems/i/advantages/v6r1/blades/index.html> (the *IBM i on Power Blade Supported Environments* document).

- Start by locating the BladeCenter chassis model
- Click on the **Download firmware** link
- The **Support for BladeCenter - Downloads** page will then be displayed.

### 3.4. Download BladeCenter management module firmware

- From the **Support for BladeCenter - Downloads** page, in the Refine results field, select **Advanced Management Module** and click the **Go** button
- Note that both functional and maintenance releases of the AMM firmware are available for download. A functional release enables new functions in the BladeCenter; whereas a maintenance release fixes known problems since the last functional release
- Download both the latest functional and maintenance firmware releases. Verify that the Power blade(s) and x86 blade(s) you are installing are in the **Supported systems** list
- On the firmware update page, click on the link for the **README** text file and print a copy for use as a reference when actually performing the update
- Click on the browser's **Back** button to return to the previous page
- Click on the link for the .zip file containing the firmware updates to download the file. This file will be used to later update the firmware

### 3.5. Download the BladeCenter Fibre Channel I/O module firmware

- From the **Support for BladeCenter - Downloads** page, in the **Refine** results field, select **Networking** and click the **Go** button
- Find and select the appropriate link for the Fibre Channel I/O module installed in the BladeCenter chassis (most often Brocade or QLogic)
- On the firmware update page, click on the link for the **README** text file and print a copy for use as a reference when performing the update
- Click on the browser's Back button to return to the previous page
- Next, click on the link of the firmware update to download the file. This file will be used later to update the firmware. This link may lead to the I/O module vendor's Web site:
  - For Brocade, fill in the export compliance form and accept the user's license. Then download the file marked similar to **Fabric OS v5.3.0a for PC**
  - For Cisco, click on the latest available release, named similar to **Cisco MDS 9000 SAN-OS Software Release 3.2**, then click the **Download Software** link. A registration with Cisco is required to download the update file
  - For QLogic, find the table named **Fibre Channel Switch Module Firmware** and download the latest version of the firmware marked similar to **QLogic 4Gb 6-Port Fibre Channel Switch Module for IBM eServer BladeCenter Firmware**

### 3.6. Download the BladeCenter Ethernet I/O module firmware

- From the **Support for BladeCenter - Downloads** page, in the **Refine** results field, select **Networking** and **press** the **Go** button
- Find and select the appropriate link for the Ethernet I/O module installed in the BladeCenter chassis
- On the firmware update page, click on the link for the **README** text file and print a copy for use as a reference when performing the update
- Click on the browser's Back button to return to the previous page
- Next, click on the link of the firmware update to download the file. This file will be used later to update the firmware

### 3.7. Download the BladeCenter SAS I/O module firmware

- Start at <http://www.ibm.com/support>
- Choose **BladeCenter** under **Choose support type** and click the right arrow
- Select **BladeCenter S** under **Product family** and click **Go**

- Find the link to the most recent **SAS Connectivity Module firmware** and click it
- Download the .ZIP file containing the firmware update and the corresponding README file

### 3.8. Download the BladeCenter S DSM firmware

- Start at <http://www.ibm.com/support>
- Choose **BladeCenter** under **Choose support type** and click the right arrow
- Select **BladeCenter S** under **Product family** and click **Go**
- Find the link to the most recent **Disk Storage Module (DSM) Firmware** and click it
- Download the .ZIP file containing the firmware update and the corresponding README file

### 3.9. Update the BladeCenter management module firmware

- You can begin this procedure from any AMM Web browser window
- Click **Firmware Update** under **MM Control** on the navigation pane on the left
- On the **Update MM Firmware** window, select **Browse** and navigate to the location (usually on a local PC) where you downloaded the management module firmware update. The file or files will have an extension of .PKT
- Begin with the update file for the **functional AMM firmware release**. Highlight the file and click the Open button
- The README text may specify a particular order to select these files. If so, follow the README file instructions
- The full path of the selected file is displayed in the Browse field
- To start the update process, click **Update**
- A progress indicator opens as the file is transferred to temporary storage on the AMM. A confirmation window will be displayed when the file transfer is complete
- Verify that the file shown on the **Confirm Firmware Update** window is the one you want to update. If not, click **Cancel**
- To complete the update process, click **Continue**. A progress indicator opens as the firmware on the AMM is flashed. A confirmation window will be displayed when the update has successfully completed
- The README file text might direct you to restart the AMM after completing the .PKT file update. If so, click **Restart MM** on the navigation pane on the left side of the window
- Click **OK** to confirm the reset. The Web browser window will then close. A new Web browser window will have to be started and signed onto to continue
- Repeat this process using the update file for the latest maintenance firmware release

### 3.10. Update the firmware on the BladeCenter I/O modules

Each of the I/O module's software needs to be updated at this time. The procedure varies depending on the manufacturer of the I/O module. Refer to the README text printed earlier along with the I/O module documentation to complete this task. **Make sure you are using the instructions for VIOS or AIX in each README**; avoid instructions that refer to SANsurfer on Linux or Windows.

### 3.11. Update the firmware on the BladeCenter S DSM(s)

Use the instructions in the README file you downloaded in section 3.8. If the BladeCenter S contains two DSMs, make sure to update the firmware on both. Note that to update the DSM

firmware, you log into one of the SAS I/O modules. The default userid for a SAS I/O module is **USERID** and the default password is **PASSWORD** (note the number zero). To log into a SAS I/O module, start a browser session to the IP address assigned to it. If an IP address has not been assigned to a SAS I/O module yet, follow these instructions to do so:

- Start a browser session to the IP address of the AMM
- Log in with an administrator userid
- Under **I/O module Tasks**, click **Configuration**
- Locate the SAS I/O module and assign an IP address, subnet mask and gateway. Click **Save**
- Repeat for the second SAS module, if it is installed
- Continue by following the DSM firmware update instructions in the README file you downloaded in section 3.8

### 3.12. Update the BladeCenter SAS I/O module firmware

Use the instructions in the README file you downloaded in section 3.7. If the BladeCenter S contains two SAS I/O modules, make sure to update the firmware on both. If an IP address has not been assigned to a SAS I/O module yet, first follow the instructions in section 3.11 to do so.

### 3.13. Installing and configuring a Copper Pass-through Module (CPM)

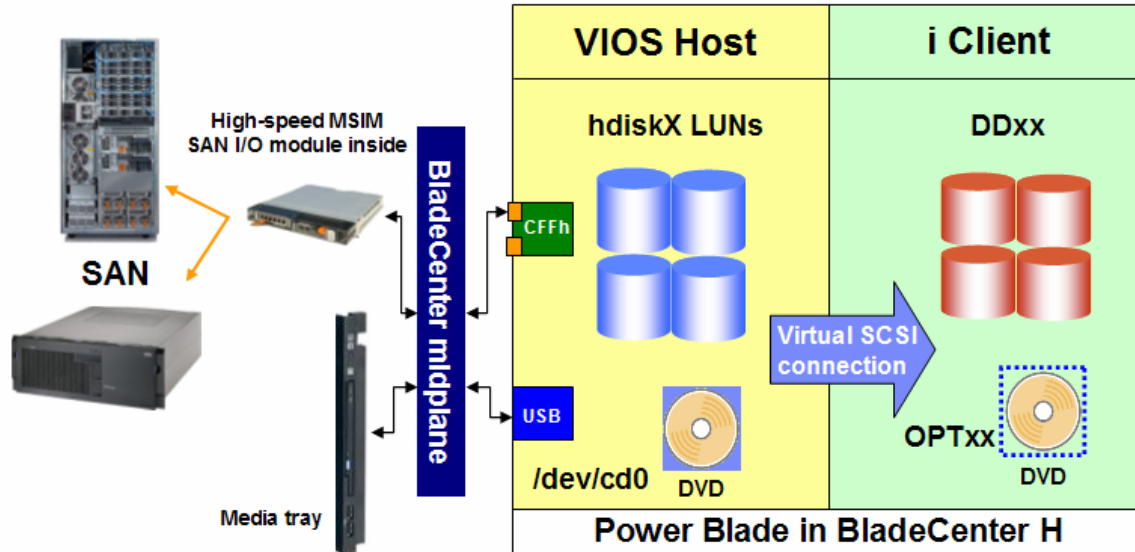
Use the instructions in the *CPM Installation Guide* (<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-59020&brandind=5000020>), as well as the *CPM Cable Installation Instructions* (<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-57332&brandind=5000020>). **Note** that the BladeCenter Serial-over-LAN (SOL) console function does not work with a CPM. The AMM Remote Control console function must be used, as described in section 5.2.2 of this document.

## 4. Storage management

As mentioned previously, the type of storage IBM i uses on a Power blade depends on the BladeCenter in which the blade is installed. **For both JS12 and JS22, Fibre Channel storage is used with BladeCenter H and SAS storage with BladeCenter S.** This section will first address the storage concepts, best practice and implementation for Fibre Channel and BladeCenter H, followed by SAS and BladeCenter S.

### 4.1. Storage concepts for IBM i on Power blade in BladeCenter H

In the Power blade environment, IBM i partitions do not have direct access to any physical I/O hardware on the blade or outside the BladeCenter chassis. On BladeCenter H, disk storage is provided by attaching LUNs on a SAN system to VIOS, then directly virtualizing them to IBM i by assigning them in IVM. DVD access for IBM i installation is provided by assigning the DVD-ROM drive in the BladeCenter to a blade, which makes the optical drive available to VIOS. The drive is then directly virtualized to IBM i by assigning it in IVM. The following diagram presents an overview of storage and optical virtualization for IBM i on Power blade in the BladeCenter H environment:



VIOS accesses LUNs configured on the SAN via the CFFh expansion card on the blade. Presently, the QLogic CFFh card has 2 x 4Gb Fibre Channel ports and 2 x 1Gb Ethernet ports. Before reaching the external SAN, disk I/O operations first travel through the BladeCenter midplane; then through a Multi-switch Interconnect Module (MSIM) and a SAN I/O module inside the MSIM. The MSIM resides in slots 7 and 8 or 9 and 10 in the BladeCenter H chassis. The MSIM allows the standard, or “vertical,” SAN module inside it to connect to a high-speed, or “horizontal,” CFFh card on the blade. With the 2-port CFFh card, 2 MSIMs with 1 SAN module in each are supported in the BladeCenter H for redundancy in the SAN connection.

When configuring LUNs for IBM i (via VIOS) in this environment, the host connection on the SAN system must include the World-wide Port Name (WWPN) of one or both ports on the CFFh card. If the Power blade is inserted in the chassis, the WWPNs can be observed in the AMM under **Hardware VPD**. Once on the **Hardware VPD** screen, scroll down to **Unique IDs of Blades and Expansion Cards**. Here is an example (the **HS Exp Card** is the Fibre Channel CFFh card):

Bay(s)	Name	ID Type	ID 1	ID 2	ID 3	ID 4
3	JS22-BC3B3E	n/a	n/a	n/a	n/a	n/a
	Exp Card	SAS ID	50:00:62:b0:00:09:42:ec	50:00:62:b0:00:09:42:ed	n/a	n/a
	HS Exp Card	WWN	n/a	21:00:00:1b:32:18:b3:0a	n/a	21:01:00:1b:32:38:b3:0a

**When configuring LUNs for IBM i (virtualized by VIOS), they should be created as 512-byte, “AIX” LUNs, not as 520-byte “IBM i” LUNs.** VIOS accesses the 512-byte LUNs as described above and then virtualizes them to IBM i via a Virtual SCSI connection between the 2 partitions. The Virtual SCSI server adapter in VIOS and Virtual SCSI client adapter in IBM i are created automatically when the LUNs are assigned to IBM i in IVM. The Virtual SCSI client adapter driver allows IBM i to access 512-byte virtual disks. For each 4-kilobyte memory page, nine 512-byte sectors are used, instead of eight; the ninth sector is used to store the 8-byte headers from the preceding eight sectors.

There is at least one Virtual SCSI connection between VIOS and each IBM i partition, which is also used for IBM i access to the USB DVD-ROM drive in the chassis. The IVM Web interface creates a single Virtual SCSI client adapter for each IBM i partition. The Virtual SCSI connection allows a maximum of 16 disk and 16 optical devices in IBM i. This means that by default, a maximum of 16 LUNs can be virtualized by VIOS *per IBM i partition* using only the IVM Web

interface. Additional Virtual SCSI client adapters can be created in an IBM i partition using the VIOS command line. Note that even if only 16 LUNs are assigned to an IBM i partition, each LUN does not represent a single physical disk arm. IBM i (via VIOS) takes advantage of the SAN system's ability to create a LUN using a RAID rank with multiple physical drives (DDMs).

#### 4.1.1. Creating multiple Virtual SCSI adapters per IBM i partition

With the availability of VIOS 2.1 in November 2008, it is possible to create multiple Virtual SCSI client adapters per IBM i partition on a Power blade. Power blades are always IVM-managed. This allows for increased flexibility in configuring storage and optical devices for IBM i in the blade environment:

- More than 16 disk and 16 optical devices can be virtualized by VIOS per IBM i partition
- Disk and optical devices can be configured on separate Virtual SCSI adapters

As mentioned above, the IVM Web browser interface creates a single Virtual SCSI client adapter per client partition and a corresponding Virtual SCSI server adapter in VIOS. (Except when tape devices are virtualized by VIOS, which is currently not supported for IBM i.) To create additional Virtual SCSI client adapters, you must use the VIOS command line:

- Log into VIOS with **padmin** or another administrator userid
- If the IBM i partition is not activated, follow the example below, which adds a new Virtual SCSI client adapter in **slot 5** of IBM i partition "**test**," connecting to a server adapter in the next available slot (chosen automatically by IVM) in partition "**VIOS**:"
  - **chsyscfg -r prof -i "name=test,virtual\_scsi\_adapters+=5/client/1/VIOS/1"**
  - The corresponding server adapter in VIOS is created automatically by IVM
- If the IBM i partition is running, follow the example below, which creates a new Virtual SCSI client adapter in **slot 5** of IBM i partition "**test**," connecting to a server adapter in the next available slot (chosen automatically by IVM) in partition "**VIOS**:"
  - **chhwres -r virtualio --subtype scsi -p test -o a -s 5 -a "adapter\_type=client"**
  - The corresponding server adapter in VIOS is created automatically by IVM

Notice that there are three variables in the commands above – the name of the IBM i partition, the new slot for the Virtual SCSI client adapter and the name of the VIOS partition. VIOS always has partition ID 1 when IVM is used, and by default carries the serial number of the blade as a name. To display the current names and IDs of all existing partitions, use:

- **lssyscfg -r lpar -F "name,lpar\_id"**

To display which virtual slots have been already been used, by partition and adapter, use:

- **lshwres -r virtualio --subtype slot --level slot** (notice the double dashes)

#### 4.1.2. Mapping storage to new Virtual SCSI adapters

Once the new Virtual SCSI client adapter for IBM i and the server adapter for VIOS are created, you can assign additional LUNs to IBM i by mapping them to the new server adapter in VIOS. Alternatively, you can map an optical drive to a separate Virtual SCSI connection. **Note** that even if you create a new Virtual SCSI adapter on the command line as described above, the IVM Web interface will not use it to map LUNs or optical devices to IBM i (with the exception of tape

devices, which are not supported for IBM i). **Assignment of disk and optical devices to IBM i using a new Virtual SCSI adapter must be done explicitly, using the VIOS command line.**

To display LUNs (or other physical volumes, such as SAS disks) that are available to be assigned to IBM i on the blade, use the following command:

- **lspv -avail**

To display all existing virtual resource mappings by Virtual SCSI server adapter in VIOS (vhostX) and client partition, as well as any newly created Virtual SCSI server adapters, use:

- **lsmmap -all**

Any new Virtual SCSI server adapters will appear as having no resources mapped to them. Assuming that “**hdisk7**” is an available LUN and “**vhost1**” is a newly created Virtual SCSI server adapter, use the following command to make hdisk7 available to IBM i:

- **mkvdev -vdev hdisk7 -vadapter vhost1**

The **lsmmap** command above will also show whether the physical DVD drive in the BladeCenter (typically **cd0**) is already assigned to a client other partition. If so, a **vtoptX** device will exist under a Virtual SCSI server adapter (**vhostX**). To map the DVD drive to a different Virtual SCSI adapter, first delete the correct existing **vtoptX** device (such as “**vtopt0**”):

- **rmdev -dev vtopt0**

Skip the above step if the DVD drive is not already assigned to a client partition. Next, assign the physical optical device (such as **cd0**) to the IBM i partition using the correct separate Virtual SCSI adapter (such as “**vhost 1**”):

- **mkvdev -vdev cd0 -vadapter vhost1**

To map a file-backed optical device to a new Virtual SCSI adapter (such as “**vhost 1**”), use:

- **mkvdev -fbo -vadapter vhost1**

#### 4.1.3. Removing Virtual SCSI adapters

The VIOS command line is also used to remove Virtual SCSI client adapters from an IBM i partition. **Note** that removing a Virtual SCSI client adapter from IBM i will make any devices it provides access to unavailable. As mentioned above, to check which devices in VIOS are mapped to which Virtual SCSI server adapter, and therefore which client partition, use the following command on the VIOS command line:

- **lsmmap -all**

To remove a Virtual SCSI client adapter when the IBM i partition is not activated, follow the example below, which removes the client adapter in **slot 5** of IBM i partition “**test:**”

- **chsyscfg -r prof -i "name=test,virtual\_scsi\_adapters=-5////" (note the minus sign before the equal sign)**

To remove a Virtual SCSI client adapter when the IBM i partition is running, follow the example below, which removes the client adapter in **slot 5** of IBM i partition “**test:**”

- **chhwres -r virtualio --subtype scsi -p test -o r -s 5**

## 4.2. Best practices for BladeCenter H and Fibre Channel storage

When configuring LUNs for IBM i (virtualized by VIOS), follow the best practices outlined in chapter 14.5 of the latest *Performance Capabilities Reference* manual, available here: <http://www.ibm.com/systems/i/solutions/perfmgmt/resource.html>. Note that some of its recommendations apply only to IBM i using virtual storage outside of the blade environment.

In addition to the guidelines in the *Performance Capabilities Reference* manual, follow these additional recommendations:

- Use Fibre Channel (FC) drives (and not SATA or FATA) to create the RAID ranks for production IBM i workloads
- Use 15K RPM FC drives for medium and heavy I/O IBM i workloads, and 10K RPM FC drives for low I/O workloads
- Do not create more LUNs per RAID rank than the number of physical drives in the rank
- When creating a host connection to the WWPN of the QLogic card on the blade, specify at most 2 specific host ports. Do not create the connection so that the QLogic card can connect to any host port on the SAN system, which is the default.
- Once the LUNs that will be virtualized to IBM i have reported in VIOS, change their queue depth to improve performance. Start a Telnet session to VIOS and log as **padmin**. Use the following command for each LUN (hdisk1 in this example):
  - **chdev -dev hdisk1 -perm -attr queue\_depth=32**
- Another parameter that can improve performance is the number of I/O commands to send to the QLogic CFFh Fibre Channel adapter. The recommended value is 512. Be sure to change the value for both ports of the CFFh adapter:
  - **chdev -dev fcs0 -attr num\_cmd\_elems=512**
  - **chdev -dev fcs1 -attr num\_cmd\_elems=512**
- To improve reliability, enable dynamic tracking for the LUNs virtualized to IBM i. Do so for both ports of the CFFh adapter:
  - **chdev -dev fcs0 -attr dyntrk=yes**
  - **chdev -dev fcs1 -attr dyntrk=yes**

## 4.3. Create LUNs for the IBM i partition(s) in BladeCenter H

To create LUNs for IBM i (virtualized by VIOS) on DS3400, follow the instructions in chapter 8 of the Redbook *IBM System Storage DS3000: Introduction and Implementation Guide (SG247065)*, available here: <http://www.redbooks.ibm.com/redpieces/abstracts/sg247065.html?Open>.

To create LUNs for IBM i (virtualized by VIOS) on DS4700 or DS4800, follow the instructions in chapter 5 of the Redbook *IBM System Storage DS4000 and Storage Manager V10.10 (SG247010)*, available here: <http://www.redbooks.ibm.com/redpieces/abstracts/sg247010.html?Open>.

To create LUNs for IBM i (virtualized by VIOS) on DS8000, follow the instructions in section 3 of the Redbook *IBM System Storage DS8000 Series: Architecture and Implementation (SG246786)*, available here: <http://www.redbooks.ibm.com/redpieces/abstracts/sg246786.html?Open>.

#### 4.4. Multi-path I/O (MPIO) for IBM i in BladeCenter H

MPIO refers to the capability of an operating system to use two separate I/O paths to access storage, typically SAN. For IBM i on blade, that capability resides with VIOS, because IBM i is not directly accessing the SAN. Additionally, IBM i does not currently support having two paths to the virtual disk units (LUNs) in VIOS from a virtual client/server perspective.

As shown in the picture in section 4.1, VIOS accesses the SAN via a two-port QLogic CFFh card. Currently, VIOS does not support using a second Fibre Channel card on the Power blade. Therefore, only a certain level of redundancy can be achieved by using MPIO between the two different ports on the CFFh card. As explained in section 4.1, each port has a separate I/O path through and out of the BladeCenter chassis. Those separate paths can be extended by connecting to separate external Fibre Channel switches or directly to separate ports on the SAN system. The MPIO configuration for a given VIOS (and blade) is performed on the SAN system:

- For DS8100 and DS8300:
  - The SDD-PCM MPIO driver is included with VIOS and it is the default MPIO driver starting with VIOS 2.1 in November 2008
  - Then configure MPIO as described in section 16.3 of the Redbook *IBM System Storage DS8000 Series: Architecture and Implementation (SG246786)*, available here: <http://www.redbooks.ibm.com/redpieces/abstracts/sg246786.html?Open>
- For DS4700 and DS4800:
  - The SDD-PCM MPIO driver is included with VIOS and it is the default MPIO driver starting with VIOS 2.1 in November 2008
  - Configure MPIO as described in section 5.1.2 of the Redbook *IBM System Storage DS4000 and Storage Manager V10.10 (SG247010)*, available here: <http://www.redbooks.ibm.com/redpieces/abstracts/sg247010.html?Open>
- For DS3400:
  - The SDD-PCM MPIO driver is included with VIOS and it is the default MPIO driver starting with VIOS 2.1 in November 2008
  - Configure MPIO as described in section 5.1.2 of the Redbook *IBM System Storage DS3000: Introduction and Implementation Guide (SG247065)*, available here: <http://www.redbooks.ibm.com/redpieces/abstracts/sg247065.html?Open>

#### 4.5. Storage concepts for IBM i on Power blade in BladeCenter S

As with the BladeCenter H, IBM i does not have physical access to storage when running in the BladeCenter S. In this case, storage is provided in the chassis itself in the form of one or two Disk Storage Modules (DSMs), each containing up to 6 SAS drives. While SATA drives can also be placed in the DSMs, they are not supported for IBM i. The minimum SAS configuration in the BladeCenter S is one DSM with one SAS drive.

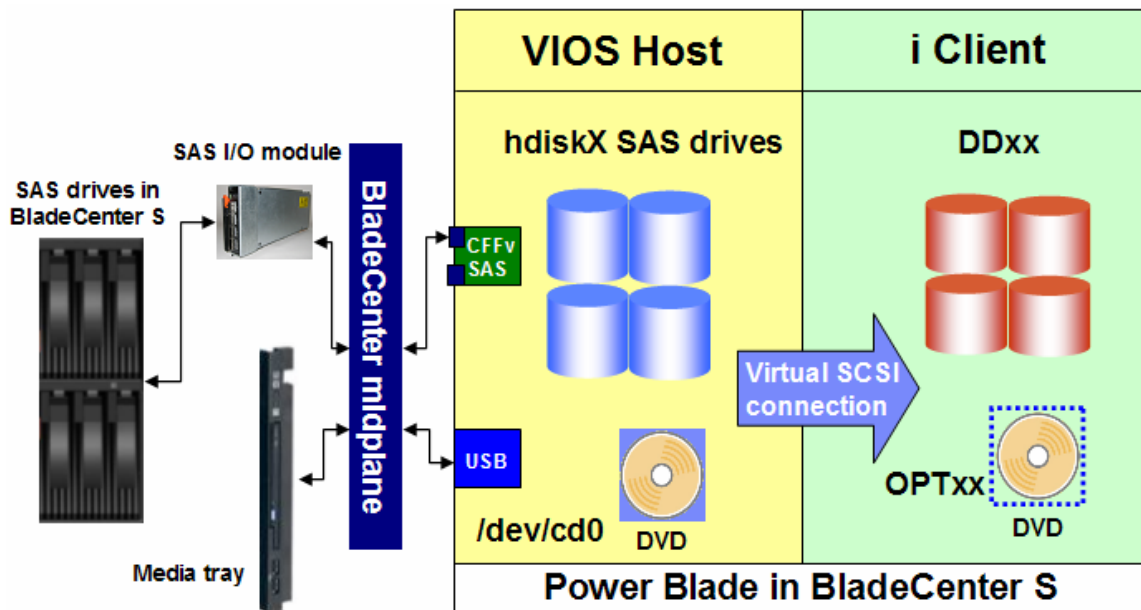
To get access to the SAS drives in the chassis, a Power blade must have the LSI CFFv SAS expansion adapter installed. The same adapter can also provide access to a SAS-attached tape drive on both BladeCenter S and BladeCenter H. To connect the SAS adapter on the blade to the drives in the chassis, at least one SAS I/O module must be present in the BladeCenter S. A single SAS I/O module can provide access to both DSMs and all 12 drive slots. However, it is

recommended to install two SAS I/O modules in order to avoid a single point of failure. If two SAS I/O modules are available, the first one resides in I/O bay 3 and the second one in I/O bay 4. Each module has 6 internal ports wired to the six blade slots via the BladeCenter midplane and 4 external ports. Currently, the external ports can be used only to attach a SAS tape drive.

It is important to understand that presently **the SAS I/O modules provide only switch functionality: they allow an individual SAS drive in either DSM to be assigned to any of the 6 blades.** RAID functionality is not available: **it is not possible to create a RAID array from the SAS drives in a DSM, create LUNs and assign them to blades.** Each SAS drive is assigned to a blade as a separate disk unit. IBM is investigating two different solutions to address the issues of RAID functionality and additional physical disks:

- A RAID SAS I/O module to provide the type of LUN functionality described above
- Providing support for attaching a SAS-connected external storage system to the SAS I/O module(s) in the BladeCenter S

Once SAS drives have been assigned to a Power blade, they become available in VIOS as hdiskX SAS devices. VIOS then virtualizes each SAS drive directly to the IBM i client partition(s), exactly as with LUNs in the BladeCenter H. Each virtualized SAS drive is recognized and used in IBM i as a DDxx physical drive. If both internal drives are ordered on the JS12, they will be recognized by VIOS as hdisk0 and hdisk1. The internal drives on the blade are used for VIOS and are not virtualized to IBM i client LPARs. Access to the DVD-ROM drive in the BladeCenter S is also provided by VIOS, as with the BladeCenter H. The following diagram presents an overview of storage and optical virtualization for IBM i on a Power blade in the BladeCenter S environment:



#### 4.6. Best practices for BladeCenter S and SAS storage

Note that presently the SAS I/O modules do not provide disk protection for any SAS drives virtualized to IBM i. There are two possibilities for disk protection once SAS drives have been assigned to the Power blade and are available in VIOS:

- Use Logical Volume Manager (LVM) mirroring in VIOS, create a volume group from the available SAS drives, then create logical volumes and present those to IBM i
- Directly virtualize each SAS drive to IBM i and use mirroring in IBM i

**The recommendation is to use mirroring in IBM i.** Using logical volumes extends the path of each I/O request in VIOS by involving the LVM layer. Mirroring in IBM i allows the use of existing IBM i disk management skills. Because all SAS drives for an IBM i partition are virtualized by VIOS through a single virtual SCSI connection, disk-level mirroring will be used in IBM i.

For a higher level of redundancy, it is strongly recommended to assign the same number of SAS drives in each DSM and mirror between them in IBM i. SAS drives in the BladeCenter S are assigned to blades by changing the configuration of the SAS I/O module.

For performance information on IBM i on JS12 in BladeCenter S, see section 14.5.1.3.2 of the latest *Performance Capabilities Reference* manual, available here: <http://www.ibm.com/systems/i/solutions/perfmgmt/resource.html>.

#### 4.7. Assign drives in the BladeCenter S to a Power blade

##### 4.7.1. SAS I/O modules configurations

The configuration of the SAS I/O module(s) in the BladeCenter S determines which SAS drives in the DSM(s) are assigned to which blades. This configuration is kept on non-volatile storage in the module(s). If two modules are present, it is necessary to change the SAS drive assignment in only one of them; the changes will be replicated to the second one.

8 pre-defined configurations and 4 user-defined configurations are stored on a SAS I/O module. To use a pre-defined configuration, it has to be activated by interacting with the module. User-defined configurations are blank until explicitly created. The following tables summarize the pre-defined configurations.

Pre-defined configurations for a single SAS I/O module:

Pre-defined Config #	Disks per Blade	Blades Involved	Details
03	2	All 6 blade slots	B1 gets D1 in each DSM; B2-D2 and so on
05	12	Blade slot 1	Blade 1 gets all 12 drives
07	4	Blade slots 1, 3, 5	B1-D1,D4; B3-D2,D5; B3-D3,D6 in both DSMs
09	6	Blade slots 1 and 4	B1-D1,D3,D5; B4-D2,D4,D6 in both DSMs

Pre-defined configurations for two SAS I/O modules:

Pre-defined Config #	Disks per Blade	Blades Involved	Details
02	2	All 6 blade slots	B1 gets D1 in each DSM; B2-D2 and so on
04	12	Blade slot 1	Blade 1 gets all 12 drives
06	4	Blade slots 1, 3, 5	B1-D1,D4; B3-D2,D5; B3-D3,D6 in both DSMs
08	6	Blade slots 1 and 4	B1-D1,D3,D5; B4-D2,D4,D6 in both DSMs

Notice that the same four configurations of drives and blades are used for both a single SAS I/O module and two modules. Any of the four configurations can be used for IBM i in BladeCenter S. However, keep in mind the further mirroring required in IBM i. Therefore, pre-defined configuration #02/#03 will likely not be applicable to the majority of IBM i in BladeCenter S implementations, because it provides for only one mirrored pair of drives in IBM i.

The choice among the remaining configurations depends on the number of blades (Power and x86) in the chassis. For example, configuration #04/#05 provides the greatest number of arms for a single IBM i partition on the blade (12); however, it does not leave any drives in the chassis for other blades. One approach to addressing the disk requirement for x86 blades in this case is to use the two supported embedded drives on the x86 blade, provided they allow for sufficient disk performance for the x86 application. If ordered, the two embedded SAS drive on the Power blade are used to install and mirror VIOS.

#### 4.7.2. Activate a pre-defined SAS I/O module configuration

If one of the pre-defined drive configurations fits the storage requirements of the IBM i in BladeCenter S implementation, the only required action to assign drives to the blade is to activate that configuration. The simplest method is to use an already familiar interface – a browser session to the AMM:

- Start a browser session to the AMM of the BladeCenter S and sign on with USERID or another administrator ID
- Click **Configuration** under **Storage Tasks**
- Click the SAS I/O module you want to configure. If two modules are present, it is necessary to activate the selected configuration on only one
- Click the radio button next to the pre-defined configuration you wish to activate
- Click the **Activate Selected Configuration** button at the bottom of the right screen pane

The selected number of SAS drives is now available to VIOS on the Power blade to virtualize to IBM i. There are three other methods to activate a pre-defined configuration:

- A Telnet command-line interface to the SAS I/O module
- A browser session directly to the module
- The Storage Configuration Manager GUI from a PC

However, using the AMM is the most straightforward way to just activate a pre-defined configuration. The AMM does not have the capability to create a custom user configuration for the SAS drives in the chassis.

### 4.7.3. Create a custom SAS I/O module configuration

If none of the pre-defined configurations meets the storage requirements of the IBM i in BladeCenter S implementation, a custom drive configuration must be created by changing one of the four available user-defined configuration templates on the SAS I/O module(s). Two interfaces are available for creating a custom configuration:

- A Telnet command-line interface to the SAS I/O module
- The Storage Configuration Manager GUI from a PC

It is recommended to use the Storage Configuration Manager (SCM), unless you are already familiar with the SAS I/O module command line. SCM can be downloaded here: <https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5502070&brandind=5000008>.

To install SCM and create a custom SAS I/O module configuration, follow the instructions in chapter 4.4 of the Redpiece *Implementing the IBM BladeCenter S Chassis* (REDP-4357), available here: <http://www.redbooks.ibm.com/abstracts/redp4357.html?Open>. When installing SCM, choose to install only the **SAS Module in BCS** option.

Note that if the SAS I/O module configuration is changed after VIOS has been installed on a Power blade, the **cfgdev** command must be run on the VIOS command line to detect any changes in the drive configuration.

### 4.8. Using the DVD drive in the BladeCenter with VIOS and IBM i

As mentioned above, VIOS virtualizes the DVD drive in the media tray (MT) of the BladeCenter to IBM i. When the MT is assigned to the blade using the steps described in section 5.2.1, the DVD drive becomes physically available only to VIOS. It is then assigned to an IBM partition using the IVM GUI as described in section 7.3.2 (cd0 is the name of the physical DVD drive).

When the DVD drive must be reassigned to another IBM i LPAR on the same blade, the OPTxx device in IBM should first be varied off. Then the cd0 device would be assigned to the second LPAR using the same method described in section 7.3.2.

When the DVD drive must be reassigned to another IBM i LPAR on a different blade, or after it has been used by a different blade and must be assigned back to the same LPAR, use the following process:

- Vary off the OPTxx device in IBM i (if it was assigned to a Power blade and an IBM i LPAR)
- Use the AMM browser interface to assign the MT to the correct blade, as described in section 5.2.1
- Telnet to VIOS on the correct blade and sign in with **padmin**
- Enter **cfgdev** and press Enter
- Assign the DVD drive in the MT (cd0) to the correct IBM i partition on the blade, as described in section 7.3.2.
- Vary on the OPTxx device in IBM i

Note that **you must run the cfgdev command** every time the DVD drive is assigned to a Power blade, in order for VIOS to recognize that the device is present again.

## 5. Software installation

### 5.1. Obtain the VIOS and IBM i installation media and fixes

VIOS is part of IBM PowerVM Editions (formerly Advanced Power Virtualization) and is required in the IBM i on Power blade environment. Work with your local sales channel to ensure that PowerVM (Standard or Enterprise Edition) and the latest fix pack are part of the Power blade order. Consult the supported environments page to verify you have the minimum supported release of VIOS: <http://www-03.ibm.com/systems/i/advantages/v6r1/blades/index.html>.

Work with your local sales channel to obtain the IBM i install media and the latest PTF package. Consult the supported environments page to verify you have the minimum supported release of IBM i: <http://www.ibm.com/systems/i/advantages/v6r1/blades/index.html>. IBM i PTFs can also be obtained from IBM Fix Central: <http://www-912.ibm.com/eserver/support/fixes/>.

### 5.2. Install VIOS

The instructions in this section explain how to install VIOS on the Power blade. VIOS may be pre-installed on the internal SAS drive of your blade. In that case, you can skip to section 5.3. However, you should use the instructions in sub-sections 5.2.1, 5.2.2 and 5.2.3 to open a VIOS console and Power on the blade. After approximately 5 minutes, if a VIOS login prompt appears on the console, the install was performed by IBM. If VIOS was not pre-installed, proceed with the instructions immediately below.

The recommended location for VIOS install differs by blade. The JS12 provides the option for two integrated SAS drives on the blade. It is recommended to order both integrated drives on the JS12, install VIOS on the first SAS drive and mirror the entire install to the second drive. In the case of using the JS12 in the BladeCenter S, this approach allows more of the drives in the chassis to be assigned to IBM i. The JS22 supports only a single SAS drive. If using the JS22 in the BladeCenter H, it is recommended to install VIOS on LUNs on the SAN and use two MSIMs and two Fibre Channel I/O modules for redundancy.

After the Power blade is installed in the BladeCenter (see section 3), only its Service Processor (SP) is powered on. It communicates with the AMM over an internal management network in the BladeCenter. The AMM also provides an ASCII console to the first partition on the Power blade (VIOS) using a Serial-over-LAN (SOL) connection. **Note** that an Ethernet switch module is required in I/O bay 1 or 2 for SOL functionality. If the BladeCenter is using a Copper Pass-through Module (CPM) instead, SOL would not work.

#### 5.2.1. Prerequisites in the AMM

- Log into the AMM browser interface with a user profile with supervisor authority, then click on **Serial Over LAN** under **Blade Tasks**
- Verify SOL is enabled for the blade you are going to install VIOS on, or enable it

VIOS can be installed from a DVD image or from a Network Installation Manager (NIM) server. Installing from NIM requires that a supported VIOS image is configured for this blade client on the NIM server; that configuration is beyond the scope of this document.

If you are going to install VIOS from DVD, you must assign the media tray in the BladeCenter to the new Power blade. You can either press the **MT** button on the front of the blade itself or use the AMM browser interface:

- Click on **Remote Control** under **Blade Tasks**
- Click the **Start Remote Control** button
- Select the Power blade you want to install in the drop-down menu labeled **Media Tray**
- Close the **Remote Control** web interface.
- Place the VIOS DVD in the media tray

### 5.2.2. Opening a console for VIOS

- To open a console for the VIOS install, start a Telnet session to the AMM
- Log in with the same user profile as for the browser interface
- Type **env -T blade[x]** and press **Enter**, where x is your blade slot number in the BladeCenter. Note that the brackets are part of the command
- Then type **console**. The console will appear inactive until the blade is Powered on and Partition Firmware (PFW) on it starts

Note that the SOL console for VIOS does not need to be restarted if the VIOS partition is rebooted. However, the console will time out and disconnect after 5 minutes of inactivity.

In addition to the Serial-over-LAN (SOL) console option for VIOS, the Remote Control function of the AMM discussed in the previous section can also provide a console for VIOS. **The Remote Control console must be used if the BladeCenter is using a Copper Pass-through Module (CPM)**. To open a console to the blade through Remote Control on the AMM:

- Connect to the AMM with the browser interface and sign in with an administrator ID
- Click **Remote Control** under **Blade Tasks**
- Click the **Start Remote Control** button
- In the KVM drop-down menu, select the correct Power blade

To type into the Remote Control console, click anywhere in the actual console window. To exit the data-entry mode, hit the **left Alt** key.

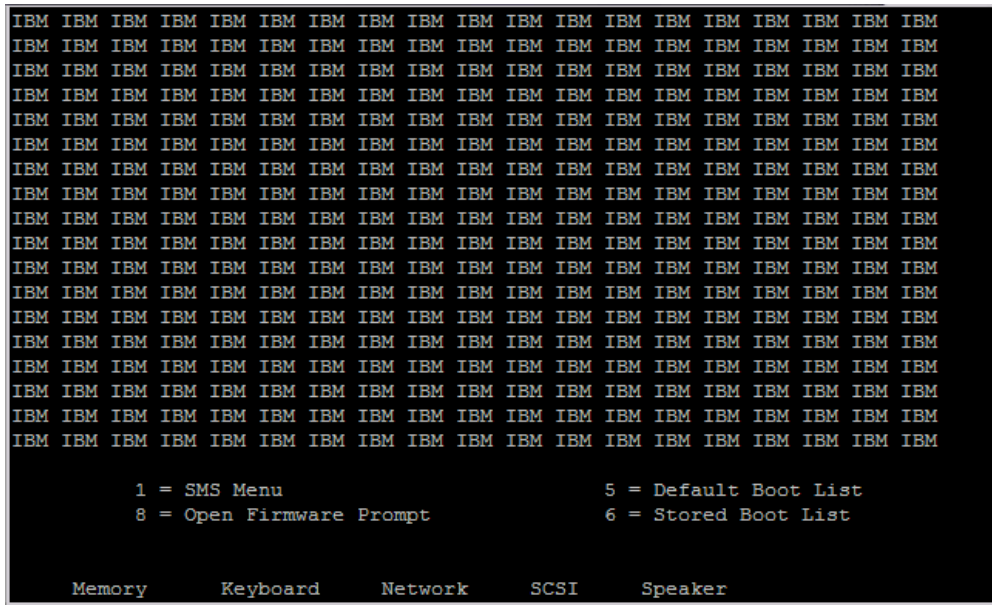
### 5.2.3. Powering on the blade

- In your browser session to the AMM, click on **Power/Restart** under **Blade Tasks** on the left-hand side menu
- Click on the checkbox next to the blade you want to Power on, then click on the **Power On Blade** link below
- You can monitor the SP and VIOS reference codes by clicking on **Blade Service Data** under **Service Tools**
- Click on the blade you are installing, then use the **Refresh** button to updates the reference codes shown

### 5.2.4. Accessing the SMS menus

- On the console for VIOS, once the PFW screen starts to load (see screenshot below), press **1** quickly to enter the System Management Services (SMS) menu
- If you miss the opportunity to press 1, PFW will attempt to boot the partition from the default boot device. If VIOS is not yet installed, the boot will fail and the SMS menu will eventually be displayed

The following screenshot shows the initial PFW screen:



### 5.2.5. Installing VIOS from DVD

- On the main SMS menu, choose **5.Select Boot Options**
- Select **1.Select Install/Boot Device**
- Select **3.CD/DVD**
- Select **6.USB**
- Select Option 1 to choose the **USB CD-ROM**
- Select **2.Normal mode**
- Select **1.Yes** to exit the SMS menus and start the VIOS install. Allow approximately 5 minutes for the install program to load from the media

### 5.2.6. Installing VIOS from NIM

- On the main SMS menu, select the menu option **2.Setup Remote IPL (Initial Program Load)**
- Select the port to use (for most scenarios, port 1)
- Select **1.BOOTP** as the Network Service
- Select **1.IP Parameters** to fill in the necessary data. Fill in the following information for the IP Parameters by selecting the item number and typing in the data:
  - **Client IP Address:** The IP address you have chosen for this VIOS partition.
  - **Server IP Address:** The NIM server's IP address.
  - **Gateway IP Address:** The gateway IP for this VIOS partition.
  - **Subnet Mask:** The correct subnet mask for the network segment of which VIOS is going to be a part.
- Once everything is filled in correctly, hit the ESC key to go back a page and select **3.Ping Test**
- Select **1.Execute Ping Test** to test the connection. If the ping test was successful, hit the **M** key to go back to the SMS Main Menu and continue the install. (If the ping test was not successful, check the network settings on the BladeCenter)
- At the SMS Main Menu, select the menu option **5.Select Boot Options**
- Select **1.Select Install/Boot Device**

- Select **6.Network** for the Device Type
- Select **1.BOOTP** as the Network Service
- Select the port you configured above (for most scenarios, port 1)
- Select **2.Normal Mode Boot**
- Select **1.Yes** to start the install (this will exit the SMS menus and the install image will start downloading from the NIM server)

### 5.2.7. Completing the install

This section applies to installing from DVD or NIM:

- Once the first "Welcome to the Virtual I/O Server" screen has disappeared, enter **2** on the following one to confirm this terminal as the console and press Enter (the number will not appear on the screen)
- Enter the correct number option for the language you want to use during install
- On the **Welcome to BOS** menu, choose **Change/Show Installation Settings and Install**
- Choose **option 2** to verify the correct disk unit is selected for installation. The SAS drive internal to the blade will be detected as hdisk0, whereas any LUNs attached to VIOS will be detected as hdisk1, hdisk2 and so on
- Choose **option 0** twice to start installing
- After the install has completed and VIOS has rebooted, log in with the default administrator user profile, **padmin**. A password is not required for this first login
- When prompted, enter a password for **padmin** twice
- Enter **license –accept** to accept the VIOS license agreement

### 5.2.8. Mirroring of VIOS

Because VIOS provides storage, optical and networking I/O resources to IBM i, any IBM i LPAR on the blade depends on VIOS to be operational. Therefore, it is strongly recommended to employ disk protection for the VIOS installation.

When IBM i is implemented on JS22, there is a single internal SAS drive on the blade itself that can be used for the VIOS installation. With JS22 in a BladeCenter H, the VIOS installation can then be mirrored to a LUN on the SAN. Alternatively, you can forgo the internal drive on the blade, and install VIOS entirely on the SAN, leveraging its RAID disk protection. If VIOS is installed entirely on the SAN, it is strongly recommended to use MPIO to access the LUNs, as discussed in section 4.4. With JS22 in a BladeCenter S, VIOS can again be installed on the internal drive on the blade and mirrored to a SAS drive in the chassis; or installed on a SAS drive in one DSM and mirrored to a drive in the second DSM. In this case, it is recommended to install VIOS on the drive on the blade and mirror to a drive in the chassis, in order to use as few drives in the chassis as possible just for VIOS.

When IBM i is implemented on JS12, there are two drives available on the blade for VIOS installation. In a BladeCenter H, VIOS can be installed on one drive on the blade and mirrored to the second; or installed entirely on the SAN. As with JS22, if VIOS is installed entirely on the SAN, MPIO should be used. In a BladeCenter S, it is recommended to install VIOS on one drive on the blade and mirror to the second. This allows the drives in the chassis to be used for IBM i.

Note that if mirroring is used, the correct method to achieve a redundant VIOS installation, regardless of the type and location of disks used, is to install VIOS on one drive and then mirror to the second. The incorrect method is to install VIOS on both drives at the same time. This latter method would not result in two copies of all VIOS files and two bootable drives. Note also

that mirroring VIOS does not protect any IBM i or other client partition data; it protects only the system volume group, or storage pool, *rootvg*.

Once VIOS is installed, use the following steps to configure mirroring:

- Use the SOL console to VIOS and log in with **padmin**
- Identify a second available hdisk for the mirrored pair, such as *hdisk1*
- Add that hdisk to the *rootvg* with **chsp -add hdisk1**. The command assumes *rootvg* if a storage pool is not specified
- Enable mirroring with **mirrorios -f -defer hdisk1**. When possible, reboot VIOS to complete the mirroring. For an immediate reboot, omit the *-defer* option

The **mirrorios** command accomplishes three tasks: it creates a copy of all logical volumes (except for the system dump volume) in *rootvg* on the second hdisk, makes the second hdisk bootable and changes the VIOS bootlist to include it. Once mirroring is complete, you can verify that all logical volumes in *rootvg* have a copy on both hdisks with:

- **lsvg -lv rootvg**. Check for the number 2 in the **PVs** column

You can verify that the VIOS bootlist now includes the second hdisk with:

- **bootlist -mode normal -ls**. The output should include both hdisks

### 5.3. Configure networking in VIOS (if necessary)

If you installed VIOS from a NIM server, basic networking is already configured.

If you installed VIOS from DVD, use the following steps to configure basic networking in VIOS:

- Log into the VIOS console via the AMM using the **padmin** user profile
- Use the **lsdev** command to identify the correct network device. In most cases, the first embedded Integrated Virtual Ethernet (or, Host Ethernet Adapter, HEA) port will be used
- In that case, you can use a more specific command to find just the IVE/HEA ports: **lsdev | grep hea**. You should see a result similar to:

```
ent0           Available Logical Host Ethernet Port (lp-hea)
ent1           Available Logical Host Ethernet Port (lp-hea)
lhea0          Available Logical Host Ethernet Adapter (l-hea)
```

- In this example, the first IVE/HEA network port is **ent0**. The network interface that corresponds to **ent0** is **en0**. The first IVE/HEA port on your blade may have a different **entX** device name
- Use a command similar to the one below to configure the correct **enX** interface:
- **mktcpip -hostname <VIOS hostname> -inetaddr <VIOS IP address> -interface enX -netmask <subnet mask> -gateway <gateway IP address> -nsrvaddr <DNS server IP address> -nsrvdomain <domain name> -start**
- Write down the name of the physical adapter (such as *ent0*), as you will need it later to configure the virtual Ethernet bridge (section 5.8).

Several VIOS commands are available to check, remove or change the networking configuration. For example, to list the current VIOS network configuration, use:

- **lstcpip -stored**

To check that routing is configured correctly, use:

- **lstcpip –routtable**

To remove the VIOS network configuration and start again (this command should be executed on the SOL console for VIOS that the AMM provides), use:

- **rmtcpip –f –all**

To learn about all available options for these commands and the rest of the VIOS network configuration commands, see the **Network commands** section of the VIOS command reference in the IBM Systems Information Center:

[http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphb1/iphb1\\_vios\\_commandslist.htm](http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphb1/iphb1_vios_commandslist.htm).

#### 5.4. Update the system firmware on the SP of the Power blade (if necessary)

- To display the current level of the system firmware, start a browser session to the AMM
- Click on **Firmware VPD**. The system firmware level is displayed under **Blade Firmware Vital Product Data** (EA320\_030 in this example):

Bay(s)	Name	Firmware Type	Build ID	Released	Revision
3	SN#YL10W734404G	BIOS	EA320_030	11/20/07	0745
		Blade sys. mgmt. proc.	BOBT001	n/a	1.00

- To check or download the latest available level of the system firmware, start with <http://www.ibm.com/support>, and choose **BladeCenter** under **Choose support type**
- Then select **BladeCenter JS22** under **Product family** and click **Go**
- The system firmware download link will be named similar to **Firmware release - IBM BladeCenter JS22**. Download the **.IMG** firmware file and the README file.
- FTP the firmware update file to VIOS, logging in with the **padmin** user profile. Do not change the default FTP upload location (**/home/padmin** in this case)
- Telnet directly to VIOS and log in with the **padmin** user profile
- Use the following command to update the system firmware: **ldfware –file /home/padmin/<update file>**
- The update process will shut down VIOS, update the SP and reboot both the SP and VIOS

Note that it may take up to 10 minutes for the AMM to correctly display the new version of the SP firmware.

#### 5.5. Update VIOS (if necessary)

Updates to the VIOS software are released as *Fix Packs*, or rarely for important individual fixes, interim fixes (ifixes). A Fix Pack is cumulative and contains all fixes from previous Fix Packs. Each Fix Pack also includes information on the level of VIOS to which it will update the system. To find your current VIOS level, use the following command in a VIOS Telnet session:

- **ioslevel**

Then compare your current level with the level documented in the latest Fix Pack. To find the latest VIOS Fix Pack, visit

<http://www14.software.ibm.com/webapp/set2/sas/f/vios/download/home.html>. To install a Fix

Pack or ifix, click on it on the VIOS **Downloads** page above and follow the instructions for that update..

## 5.6 Update the microcode on the I/O expansion cards on the blade (if necessary)

### 5.6.1. Displaying the current microcode level of the expansion adapters on the blade:

- Start a Telnet session to VIOS
- **Isfware –dev <device name>**
  - To find the device name for the CFFh Fibre Channel card, use the **Isdev** command and look for a device similar to **fcs0**
  - **mptsas0** or similar will be the device name for the CFFv SAS card
- You should see a result similar to: **77103224.0125040024** (for the QLogic CFFh Fibre Channel card) or **00105000.1004712301** (for the LSI CFFv SAS card)

### 5.6.2. Downloading the latest available level of expansion adapter microcode:

- Start at <http://www.ibm.com/support>
- Choose **BladeCenter** under **Choose support type**
- Select **BladeCenter JS22** or **BladeCenter JS12** under **Product family** and click **Go**.
- The adapter microcode download link will be named similar to **QLogic 4Gb Fibre Channel Multiboot flash image - IBM BladeCenter** (for the QLogic CFFh Fibre Channel card), or
- Click the **QLogic Web site** link
- Scroll down on the page and find the table **4Gb Fibre Channel Expansion Card Drivers & ROM Image**
- Click the **Download** link in the row starting with **4Gb Expansion Card ROM Image in AIX naming convention for JS blades (QLogic GbE/4Gb FC combo card)**
- The update file will be named similar to **77103224.0125040027**. Compare this level with the current level of microcode on the adapter you determined with the **Isfware** command above

### 5.6.3. Updating the adapter microcode:

- Telnet directly to VIOS and log in with the **padmin** user profile
- **mkdir microcode** (do not close the Telnet session yet)
- Start an FTP session to VIOS and log in with **padmin**
- **cd microcode** (by default, you will start in /home/padmin)
- Upload the microcode update file using binary mode
- Close the FTP session and return to the Telnet session
- **mount microcode /etc/microcode**
- **diagmenu**, then press **Enter**
- Use the arrow keys to select **Task Selection** and press **Enter**
- Use the arrow keys to find and select **Microcode Tasks** and press **Enter**
- Use the arrow keys to select **Download Microcode** and press **Enter**
- Use the arrow keys to select **fcs0**, press **Enter**, then **F7** to commit
- The screen should display a warning about updating a dual-port adapter. Press **Enter**
- The screen should display the current microcode level on the adapter and the level found in the update file. Press **Enter** to continue, then **Enter** again to confirm and begin the microcode update
- Once the update is complete, press **Enter** again and then **F10** to exit
- Updating the first port on the QLogic CFFh Fibre Channel card will update both ports

- **umount microcode**
- If the update fails, use **errpt -a | more** to take note of the error for IBM Support

### 5.7. Verify disks for IBM i are reporting in VIOS

- With VIOS networking configured, you can **start using IVM by opening a browser connection to the IP address of the VIOS partition**
- Log in with the **padmin** user profile. Your goal is to verify that the correct number of LUNs or SAS drives for IBM i are reporting in VIOS
- In IVM, click on **View/Modify Virtual Storage**
- Click the **Physical Volumes** tab. Any LUNs (if using a BladeCenter H) or SAS drives (if using a BladeCenter S) will report in as disk units hdisk1, hdisk2 and so on. If no LUNs or SAS drives are reporting in and you are using a BladeCenter H, check the configuration of the SAN I/O module in the BladeCenter, any external SAN switches and the SAN system, as well as all physical Fibre Channel connections. If you are using a BladeCenter S, check the configuration of the SAS module(s), as discussed in section 4.7.

### 5.8. Configure the Virtual Ethernet bridge for IBM i LAN console

As discussed previously, IBM i does not have direct access to any physical network adapters on the Power blade. Instead, it uses a Virtual Ethernet adapter to connect to VIOS and any other partitions on the same blade over a Virtual LAN (VLAN). VIOS in turn connects to the external LAN by using either the embedded IVE/HEA ports on the blade or the 1Gb Ethernet ports on the CFFh card and an Ethernet I/O module in the BladeCenter. The VLAN is bridged over to the external physical LAN using a Virtual Ethernet bridge in VIOS. The Virtual Ethernet bridge associates a VLAN with a physical network port in VIOS. This Layer-2 bridge allows externally routable IP addresses to be assigned to the IBM i partition for both LAN console and regular network communications. Separate Virtual Ethernet adapters can be created in the IBM i partition for LAN console and production traffic. This would require bridging a second Virtual LAN to either the second IVE/HEA port on the blade or an Ethernet port on the CFFh card.

- To configure the Virtual Ethernet bridge, start an IVM session and log in with **padmin**
- Click on **View/Modify Host Ethernet Adapters**
- Select the first IVE/HEA port (its physical location ends in **-P1-T6**), then click on **Properties**
- Check **Allow virtual Ethernet bridging**, then click **OK**
- Click **View/Modify Virtual Ethernet**
- Select the **Virtual Ethernet Bridge** tab
- Select **Virtual Ethernet 1** and change its **Physical Adapter** to the IVE/HEA port you modified above
- Click **Apply**.

### 5.9. Memory recommendations for VIOS and the Power Hypervisor

A minimum of 1 GB of memory is recommended for VIOS with an IBM i client. If you are running two or more IBM i partitions on the same Power blade, consider increasing the VIOS memory to 2 GB. To change the amount of memory VIOS is using:

- Log into IVM with **padmin**
- Click on the **VIOS** partition
- Click on the **Memory** tab

- Change the assigned memory and click **OK**

Note that if the new assigned value is higher than the maximum memory value, a restart of VIOS is required to activate the change. Before restarting VIOS, gracefully shut down any client partitions on the blade.

You should also plan on leaving 512 MB of memory unassigned for use by the system firmware (the Power Hypervisor). To observe the amount of memory the Hypervisor is currently using, click on **View/Modify Partitions** in IVM and check the **Reserved firmware memory** value.

### 5.10. Create the IBM i partition(s) using IVM

Using IVM to create an IBM i partition is similar to using the HMC; however, fewer steps are necessary. IVM uses a number of defaults that simplify partition creation. For example, because IBM i partitions cannot own physical hardware on an IVM-managed system (such as a Power blade), those screens are omitted from the creation wizard.

IVM defaults the load source and alternate IPL adapters to the Virtual SCSI client adapter in the IBM i partition, and the console adapter to the first Virtual Ethernet adapter. If you plan to use separate Virtual Ethernet adapters for LAN console and production traffic and wish to use the second Virtual Ethernet adapter for LAN console, you can make the change in the partition properties.

If you choose to use shared processors for IBM i, IVM defaults to assigning 0.1 times the number of processors you select as shared processor units and the whole number of processors you select as virtual processors. For example: if you select 4 shared processors, IVM initially assigns 0.4 processing units and 4 virtual processors to the partition. Note also that by default shared processor partitions are configured as uncapped. When assigning memory during partition creation, you are selecting the “assigned” or “desired” amount for the partition. IVM automatically assigns minimum and maximum values. The default processor and memory configuration can be changed by working with the partition properties after creation.

The minimum recommended amount of memory for an IBM i client partition on the Power blade is 1 GB. The actual memory and CPU values should be sized individually for each IBM i workload using the Workload Estimator, available at <http://www-304.ibm.com/systems/support/tools/estimator/index.html>.

- To create an IBM i partition, click **View/Modify Partitions**
- Click **Create Partition**. Partition ID will default to the next available partition number
- Enter a name for the partition
- Select **Environment: IBM i**
- Click **Next**
- Set the assigned (desired) memory value
- Click **Next**
- Set the desired processor configuration
- Click **Next**
- Set the first Virtual Ethernet adapter to VLAN1, which you previously configured for bridging
- Click **Next**
- Select **Assign existing virtual disks and physical volumes**
- Click **Next**
- Choose the LUNs or SAS disks you configured for IBM i from the list of **Available Physical Volumes**. If you are using a BladeCenter S and need to configure IBM i disk mirroring after installation, see also section 5.13

- Click **Next**
- Select the USB physical optical drive in the top portion of the screen to virtualize the DVD-ROM drive in the BladeCenter to IBM i (this assumes the media tray is assigned to this blade)
- Click **Next**. Review the summary
- Click **Finish**.

### 5.11. Create the LAN console connection on the console PC

Following section 1.5 of this document, you should have System i Access installed on a PC that is on the same subnet as the IP address you are going to assign to the new IBM i partition for LAN console. To configure the Operations Console (LAN) connection, follow the process described in this section of the IBM i Information Center:

<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/index.jsp?topic=/rzajr/rzajrcfglanconsole.htm>. Keep in mind the following tips:

- IBM i partitions on Power blade have partition IDs of 2 or higher (VIOS always has partition ID 1)
- You can look up the serial number of the blade in IVM by clicking on **View/Modify System Properties**.

Note that the LAN console uses an IP address separate from the ones for VIOS and, later, the IBM i LPAR production interface. See section 1.4 for a full list of the IP addresses required for implementing IBM i on blade. Once the LAN console connection is configured, start it in preparation for installing IBM i.

### 5.12. Install IBM i

Once the prerequisites for installation above have been completed, installing IBM i on Power blade is essentially the same as on any other supported system.

- Place the IBM i installation media in the DVD-ROM drive in the BladeCenter (which at this point should be assigned to your blade and selected in the IBM i partition's properties)
- In IVM, click on **View/Modify Partitions**
- Select the IBM i partition and click **Activate** (IVM defaults a new IBM i partition's IPL source and type to D, manual)
- Use the LAN console connection and the installation topic in the IBM i Information Center to perform the install:  
[http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/index.jsp?topic=/rzahc/rzahc1.htm&tocNode=int\\_216451](http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/index.jsp?topic=/rzahc/rzahc1.htm&tocNode=int_216451). When first authenticating the LAN console connection, use the 11111111 ID and password

Note that during installation, the load source and other disk units will be initialized before they are included in the System or other ASPs by IBM i. This initialization time will vary depending on the type of storage used: LUNs on a SAN with the BladeCenter H will provide for a faster install than individual SAS drives in the BladeCenter S.

### 5.13. Configure mirroring in IBM i (if necessary)

#### 5.13.1 Disk protection for IBM i in BladeCenter H

When IBM i is implemented in a BladeCenter H, it is not necessary to configure disk protection within the operating system. Data integrity is provided by the SAN, where each LUN made available to IBM i through VIOS is created from multiple physical drives in a RAID array. However, unlike LUNs physically attached to IBM i, LUNs virtualized by VIOS will not appear in IBM i as parity-protected. Instead, both LUNs from a SAN and physical SAS drives in a BladeCenter S will be recognized in IBM i as unprotected DDxxx devices.

#### 5.13.2. IBM i mirroring in BladeCenter S

Presently, when IBM i is implemented in a BladeCenter S, IBM i disk-level mirroring must be used for disk protection. For an overview of mirroring in IBM i, consult the Planning for Mirrored Protection topic in the IBM i Information Center to create the mirroring configuration:  
<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/topic/rzaly/rzalymirroredplanning.htm>.

For maximum redundancy, one SAS disk unit from each DSM should be used in every mirrored pair in IBM i. However, if multiple SAS drives – the same number from each DSM – are assigned to IBM i at the same time and mirroring is started using all of them, there is no guarantee that every mirrored pair will contain drives from both DSMs. The only way to ensure that each disk unit in a mirrored pair resides in a separate DSM is to use the following method:

- Assign the same number of SAS drives from both DSMs to the Power blade. Consult section 4.7
- Once the SAS drives are available in VIOS, identify which drives reside in which DSM. Consult section 5.13.3
- Assign one drive from each DSM when creating the IBM i LPAR, as discussed in section 5.10
- Install the IBM i Licensed Internal Code (LIC), as discussed in section 5.12
- Start mirroring using only the two available SAS drives. Consult section 5.13.4
- In VIOS, assign any additional SAS drives to IBM i, using only two drives each time. Consult section 5.13.4
- In IBM i, add the newly available drives to the mirrored ASP, two at a time. Consult section 5.13.4
- Install the operating system, as discussed in section 5.12

#### 5.13.3. Identifying SAS disk units in different DSMs

The two DSMs in a BladeCenter S can be distinguished by their serial numbers. Each SAS drive, or hdisk in VIOS, carries a portion of its DSM serial number in its physical location code. To locate the serial numbers of the DSMs:

- Start a browser session to the AMM and sign in with an administrator ID
- Click **Hardware VPD** in the menu options on the left
- Scroll down to the **Storage** section and check the **FRU Serial No.** column for each **Storage Module**. The serial number will be similar to **YK12907CM0Z9**

The last 7 characters of the DSM serial number (07CM0Z9, in this case) will be reflected in the physical location code of the SAS drives in VIOS. To locate the location code for a SAS drive, or hdisk, in VIOS and identify in which DSM it is located:

- Start an IVM browser session to VIOS and sign in with **padmin**

- Click **View/Modify Virtual Storage**
- Click **Physical Volumes** and check the **Physical Location Code** column for each hdisk. The location code will be similar to **U4545.001.07CM0Z9-P1-D2**

The location code for the hdisk in VIOS also identifies the position of the SAS drive in the DSM. **D2** is the second drive, left to right, in the top row in the DSM.

#### 5.13.4. Configuring mirroring

When assigning hdisks to the IBM i partition during creation (see section 5.10), select only two hdisks with locations signifying they are from different DSMs. For example, U4545.001.07CM0Z9-P1-D2 and U4545.001.07CM0YT-P2-D2. Mirroring does not have to be configured between drives in the same position in each DSM.

Once IBM i LIC is installed on one of these hdisks (see section 5.10), add the second one to the System ASP:

- Sign into Dedicated Service Tools (DST) with QSECOFR
- Choose option 4 to work with disk units
- Choose option 1 to work with the disk unit configuration
- Choose option 3 to work with the ASP configuration
- Choose option 3 to add units to ASPs
- Choose option 3 to add units to existing ASPs
- Specify ASP 1 for the new disk unit and press **Enter**
- Confirm with **Enter**, or with **F10** and then **Enter**

To start mirroring:

- Sign into Dedicated Service Tools (DST) with QSECOFR
- Choose option 4 to work with disk units
- Choose option 1 to work with the disk unit configuration
- Choose option 2 to start mirrored protection
- Select the System ASP and press **Enter**
- Confirm with **Enter** and **F10**

To include additional SAS drives in the mirrored configuration:

- In IVM, identify two additional disk units from different DSMs, as described in section 5.13.3
- On the same **Physical Volumes** screen in IVM, place a checkmark next to them and click **Modify partition assignment**
- Select the correct IBM i LPAR in the drop-down menu and click **OK**
- In IBM i, add the two new disk units to the mirrored System ASP, as described earlier in this section

#### 5.14. Install IBM i PTFs (if necessary)

Use the “Fixes concepts and terms” topic in the IBM i Information Center for the steps to install any required PTFs:

<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/index.jsp?topic=/rzam8/rzam8fixconcepts1.htm>.

Use the IBM i Recommended Fixes Web site to get a list of the latest recommended PTFs:

[http://www-912.ibm.com/s\\_dir/slkbase.nsf/recommendedfixes](http://www-912.ibm.com/s_dir/slkbase.nsf/recommendedfixes).

## 6. Post-install tasks and considerations

### 6.1. Configure IBM i networking

Refer to the Ethernet topic in the IBM i Information Center to configure IBM i networking for production:  
<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/topic/rzajy/rzajyoverview.htm>. Keep in mind that while any Virtual Ethernet adapter available in IBM i (as a CMNxx device) can be configured, only those on VLANs bridged with a Virtual Ethernet bridge can communicate with the external LAN.

### 6.2. Configure Electronic Customer Support (ECS) over LAN

There is no physical modem available to IBM i on Power blade, so ECS over LAN should be configured. Consult the topic “Setting up a connection to IBM i” in the IBM i Information Center:  
[http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/topic/rzaji/rzaji\\_setup.htm](http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/topic/rzaji/rzaji_setup.htm).

### 6.3. How to perform IBM i operator panel functions

- In IVM, click **View/Modify Partitions**
- Select the IBM i partition
- Use the **More Tasks** drop-down menu and select **Operator panel service functions**
- Select the function you wish to perform and click **OK**

### 6.4. How to display the IBM i partition System Reference Code (SRC) history

- In IVM, click **View/Modify Partitions**
- Select the IBM i partition
- Use the **More Tasks** drop-down menu and select **Reference Codes**
- Click an SRC to display all words.

### 6.5. IBM i on Power blade considerations and limitations

Consult the topic “Considerations and limitations for IBM i client partitions on systems managed by the Integrated Virtualization Manager” in the IBM i Information Center:  
<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/topic/rzahc/rzahcbladei5limits.htm>. See also the topic “Limitations and restrictions for IBM i client partitions on systems managed by the Integrated Virtualization Manager” in the *PowerVM Editions Operations Guide*, available at [http://publib.boulder.ibm.com/infocenter/systems/index.jsp?topic=/iphdx/abstract\\_pvme\\_guide.htm](http://publib.boulder.ibm.com/infocenter/systems/index.jsp?topic=/iphdx/abstract_pvme_guide.htm).

### 6.6. Moving the BladeCenter DVD drive to another Power blade

Section 5.2.1 explained how to initially assign the DVD-ROM drive in the BladeCenter to a Power blade. When the blade is later powered on, the DVD drive device in VIOS (/dev/cd0) attains “available” status and can be used. The status of the DVD drive in VIOS can be verified in IVM:

- Start a browser session to VIOS and log into IVM with **padmin** or another administrator userid
- Click **View/Modify Virtual Storage**
- Click **Optical Devices**. If **cd0** appears under Physical Optical Devices, the status of the device is “available”

However, when moving the BladeCenter DVD drive from one Power blade to another, its status is not properly updated in VIOS and IVM on both blades. After performing the steps to re-assign the DVD drive to the second Power blade per section 5.2.1, the cd0 device will still appear in IVM on the first blade and its status in VIOS will remain “available.” Meanwhile, the status of cd0 on the second blade will be “defined” in VIOS and the device will not appear in IVM. To correct the status of the DVD drive on both blades, perform the following steps:

- Start a Telnet session to VIOS on the first blade and log in with **padmin**
- Run the command **rmdev –dev cd0**
- Start a Telnet session to VIOS on the second blade and log in with **padmin**
- Run the command **cfgdev**

The DVD drive will now appear in IVM on the second blade and no longer appear on the first blade.

## 7. Backup and restore

### 7.1. Overview of backup and restore for IBM i on Power blade

As discussed previously in this document, IBM i does not have direct access to a physical tape drive for backup and restore. This changes the save/restore process as a whole, although the steps performed within IBM i remain the same for the most part.

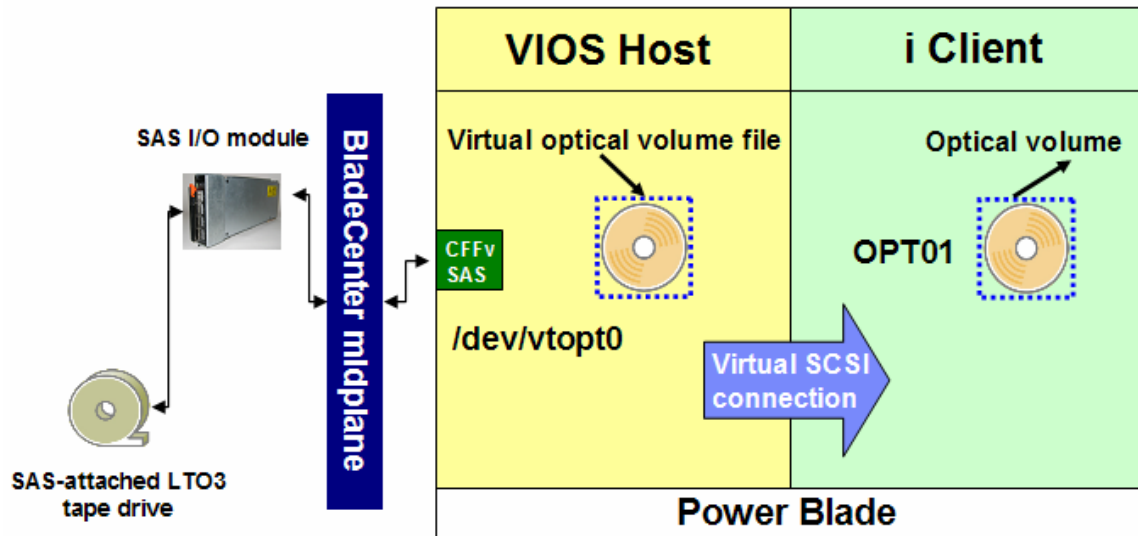
Performing an IBM i backup is a *2-stage process* on the Power blade:

- First, a standard IBM i save command or BRMS is used to perform a save on a writeable optical device which contains an optical volume. The writeable optical device is a file-backed virtual optical drive created in VIOS and the optical volume is a virtual media image, which is a file on disk in VIOS
- Second, the virtual media image, containing the IBM i save, is written out to a SAS-attached tape drive using a VIOS command

Performing a restore follows the same 2-stage process in reverse:

- First, the virtual media image file is restored from the SAS tape drive onto VIOS disk using a VIOS command. The image file is then mounted on the correct virtual optical drive assigned to the IBM i partition and becomes available as a volume from which to restore
- Second, a standard IBM i restore is performed from the volume using an IBM i restore command or BRMS. A full system restore can be executed by first performing a D-mode IPL from the virtual optical image, provided the image contains a full system save performed previously

VIOS has access to an LTO SAS tape drive external to the BladeCenter via the SAS CFFv card on the blade and a SAS switch in the chassis. The following diagram illustrates the backup and restore environment for IBM i on Power blade:



Note that the virtual optical device in VIOS used for backups (e.g., /dev/vtopt0) is different from the USB DVD-ROM drive in the chassis (e.g. /dev/cd0), which is also a “virtual optical device” from an IBM i perspective. The same Virtual SCSI connection between the 2 partitions is used for both types of optical devices. However, the virtualized DVD-ROM drive in the chassis *cannot* be used for IBM i backups, because it is not writeable.

Backing up IBM i to the file-backed virtual optical device is a transfer from disk in IBM i (using a save command or BRMS) to disk in VIOS via a writeable virtual optical device. The virtual optical device contains an optical volume (the image file), which is created in a *virtual media library* in VIOS. This media library is similar to an image catalog in IBM i and exists on a separate set of LUNs attached to VIOS. Only one virtual media library exists per VIOS server and it contains the virtual optical volumes for all IBM i partitions on the blade. A virtual optical volume is made available to an IBM i partition by mounting it on the correct virtual optical device (/dev/vtoptX) assigned to the IBM i partition.

The above discussion leads to an important planning rule: **there must be sufficient space in VIOS to create a large enough virtual media library containing the optical volume files with the backup from the largest IBM i partition on the blade.**

The file-backed virtual optical drive receives a standard OPTxx device name in IBM i, as does the virtualized DVD-ROM drive in the BladeCenter. Typically, the virtual optical device representing the DVD-ROM drive is OPT01, whereas the file-backed virtual optical device is OPT02. To verify which OPTxx device name is which virtual optical device, use WRKOPTVOL to display the volume in the device.

IVM provides another method to offload the virtual media image file containing the IBM i save from VIOS. Once the save is complete, the image file can be downstreamed using the browser connection to IVM to a system that has a tape drive attached. That system must have sufficient disk space to accommodate the image file. A physical save to tape can then be performed on that system. For a restore, the image file can be uploaded to VIOS through IVM if it is at most 2GB in size, or through the VIOS command line if it is larger. This method is mentioned for information only. **Using the VIOS command line to save and restore the virtual optical volume files to and from the SAS tape drive is the preferred method to offload the data to physical tape.**

## 7.2. Planning considerations and limitations for backup and restore

The first planning consideration is the additional storage required in VIOS to create the virtual media library and optical volume files. Because the file-backed virtual optical device will be used for both partial and full-system (Go Save option 21 or BRMS \*SYSTEM) backups, the virtual media library and volumes must be large enough to accommodate both types of saves. A different virtual optical volume or set of volumes should be created and mounted on the correct virtual optical device for daily vs. full-system backups. Currently, the maximum virtual optical volume size for IBM i is 2TB. Multiple volumes should be used for the same backup if the save size is larger than 2TB. Each volume would be mounted in turn on the virtual optical device (/dev/vtoptx) after IBM i prompts for the next volume. If there are multiple IBM i partitions on the blade, the virtual media library must be large enough to accommodate backups from all the partitions, unless optical volumes are removed after saving them to tape.

The next major planning consideration deals with the creation, naming and handling of the virtual optical volumes. When a virtual optical volume is created in IVM, it must be given a name, which will also be the name of the image file on disk in VIOS. The image files for virtual optical volumes are stored in the */var/vio/VMLibrary* directory in VIOS. It is recommended that virtual optical volumes be given meaningful (non-generic) names in IVM, so that it is easier to identify which IBM i partition they belong to and for what type of backup they were used. After the virtual optical volume is mounted on the correct virtual optical device, it will become available in IBM i and it will be identified with a timestamp volume ID. *IBM i will not retain the volume name given in IVM.* Therefore, it is recommended that **when the new volume is initialized with INZOPT, the same name as in IVM should be used.**

BRMS will support saving to the virtual optical device and spanning over multiple virtual optical volumes. However, BRMS does not have control over the physical tape drive; only VIOS does. Therefore, *BRMS can keep track of an optical volume and objects on it only after the volume is available to IBM i*; that is, after the correct virtual media image file has been mounted on the file-backed virtual optical device in the correct IBM i partition. Performing the physical save of the image file containing the IBM i backup and later restoring it back into VIOS is out of BRMS or IBM i control. Therefore, *it is the operator's responsibility to keep a record of which VIOS image file contains which IBM i backup and on which physical tape that image file was saved.* Naming each volume the same in IVM and IBM i should prove helpful in that task.

The VIOS **backup** and **restore** commands are used to write a virtual media image file to the SAS tape drive. When the backup command is used to save an image file to tape, *it will overwrite any existing data on the tape.* Therefore, it is important that different tapes are used for saving image files containing different IBM i backups and that the tapes are promptly ejected and stored. Currently, the backup command does not have an option to unload the tape after the save is complete. Before a save to the SAS tape drive is initiated with the backup command, the restore command with the **-T** option should be used to display any existing saves on the tape.

The virtual media library in VIOS is similar to an image catalog in IBM i. However, keep in mind that image catalogs in IBM i are not used for backup and restore in this environment. An IBM i virtual tape image catalog can be created and a save can be performed to an IBM i virtual tape image. However, this approach has 2 significant disadvantages:

- The IBM i virtual tape image containing the save would still reside in IBM i. To save the data to physical tape, the VIOS file-backed virtual optical device must be used. This would result in a “double save” process and higher disk requirements for IBM i.
- The IBM i virtual tape image, if saved to a VIOS virtual optical volume and then to SAS tape from VIOS, cannot later be used for a D-mode IPL and a full system restore. It requires an already running IBM i partition.

Creating a virtual tape image catalog in IBM i and performing a save to it might have a limited application in using FTP to send those IBM i image files to a running IBM i partition on a different Power blade or system. However, **the recommended backup and restore method for IBM i on blade is using the VIOS file-backed virtual optical device from IBM i and the SAS-attached tape drive from VIOS.**

### 7.3. Preparing for backup and restore

- To create a new storage pool for the virtual media library, log into IVM with padmin or another administrator user profile
- Click on **View/Modify Virtual Storage**
- Click on the **Storage Pools** tab
- Click on **Create Storage Pool**
- Enter a name for the storage pool, then select the LUNs you planned for the virtual media library
- Click **OK**.

#### 7.3.1. Creating the Media Library and adding optical volumes

- To create the virtual media library, click on the **Optical Devices** tab
- Under **Virtual Optical Media**, click on **Create Library**
- Select the name of the new storage pool you created
- Enter a size for your media library, then click **OK**
- To add a new virtual optical volume, click on the **Optical Devices** tab
- Click on **Add Media...**
- Select **Create blank media**
- Select **Read/Write Media** type
- Enter a meaningful name and a size for the new volume
- Click **OK**.

Note that in addition to creating empty virtual optical volumes, the following options exist to create a volume from existing media:

- An existing .ISO image can be uploaded to VIOS with FTP and used to create a virtual optical volume in the media library.
- An existing .ISO image can be uploaded directly via the browser in IVM
- An image can be imported from physical media placed in the DVD-ROM drive in the chassis

NOTE: the second option (uploading directly in IVM) has a 2GB limit on the image size and tends to have a slower transfer rate. It is recommended to use the first option (upload with FTP and use the image as an existing file to create a volume). Alternatively, you can upload the image with FTP and use the **mkvopt** command:

- **mkvopt -name <volume name> -file <location of image file in VIOS> -ro**

#### 7.3.2. Assigning a virtual optical volume to IBM i

- If you followed the instructions in section 5.10, you created a virtual optical device when you created the IBM i partition
- To mount the new virtual optical volume to a virtual optical device and assign it to IBM i, select the volume under **Virtual Optical Media**
- Click **Modify partition assignment**

- Select the correct IBM i partition and click **OK**

## 7.4. Performing a save

### 7.4.1. Performing a save in IBM i

The virtual optical volume is now available in IBM i. Remember to give it the same volume name as that in IVM when you initialize it, then use your standard IBM i save procedure to perform a partial or full system save to the correct OPTxx device. Keep in mind you can verify if that is the correct device by examining the optical volume with WRKOPTVOL.

- If prompted by IBM i to load the next volume, connect to IVM and click on **View/Modify Virtual Storage**
- Click on the **Optical Devices** tab
- Use the **Modify partition assignment** procedure as described above to unassign the current volume from the IBM i partition and then assign the next volume
- You can also click on **View/Modify Partitions**, then on the IBM i partition and on the **Optical Devices** tab
- Click on **Modify** under **Current Media** to mount a different optical volume, then click **OK**
- Note that the next volume is not mounted yet until **OK** is clicked

### 7.4.2. Configuring the tape drive

Once the IBM i save is complete, the next stage is to save the virtual optical image file(s) containing the save to physical tape using a VIOS command. To get the best performance during the physical save operation, the size of the data blocks VIOS uses when writing to the tape drive should be increased from the default value. By default, VIOS uses **512-byte** blocks when writing to tape devices. The recommended physical block size value for the SAS tape drive is **262144 bytes**.

To list the current physical block size for the tape drive, Telnet to VIOS and use:

- **lsdev -dev rmt0 -attr**

**rmt0** is the SAS tape drive. Note that **multiple LTO SAS tape drives can be attached to the same SAS I/O module and made available to the same or different Power blades**. In that case, the second SAS tape drive would be **rmt1**. In the output, note the value after **block\_size**. If the block size is smaller than 262144 bytes, use the following command to change it to that value:

- **chdev -dev rmt0 -attr block\_size=262144**

**You must use the same physical block size for both saves and restores.** Therefore, always use the **lsdev** command before performing a save or a restore to verify the block size is 262144 bytes. Use the **chdev** command to change it before performing the save or restore, if necessary. Note also that the tape physical block size **must be adjusted within VIOS on each blade** accessing the tape drive.

### 7.4.3. Performing a backup in VIOS

Once the tape device is configured correctly, use the backup command to save the optical volume image file(s) to the SAS tape drive. To save a single image file, use:

- **find /var/vio/VMLibrary/<image file> -print | backup -ivqf /dev/rmt0 -b 512**

The **-i** option to the **backup** command specifies that the files to be saved are read from standard input, via the **-print** option to the **find** command in this case, and are saved by name. The **-v** option displays additional information about the image file being saved. The **-q** option specifies that the tape media is ready and does not need to be loaded. The **-f** option specifies which tape drive to use (rmt0 in this case). The **-b** option with a value of 512 specifies how many 512-byte blocks the backup command should write with a single I/O operation. Notice that this parameter matches the value for the physical block size of the tape drive you set above: 512 blocks X 512 bytes per block = 262144 bytes, the physical block size of the tape drive. The **| (pipe)** operand signifies that the output of the **find** command (the optical image file) should be used as input of the **backup** command.

There are two methods to save multiple optical image files with a single backup command. If all the image file names start the same way (e.g., vol1, vol2, vol3), you can use a command similar to the following :

- **find /var/vio/VMLibrary/vol\* -print | backup -ivqf /dev/rmt0 -b 512**

If the image files you want to save have dissimilar names, you can use the **vi** editor to create a text file listing the full path of the image files to be saved:

```
/var/vio/VMLibrary/vol1  
/var/vio/VMLibrary/backup2  
/var/vio/VMLibrary/save3
```

A single command can then be used to read the list of image files from the text file and save them:

- **cat <text file> | backup -ivqf /dev/rmt0 -b 512**

You can verify that the backup was successful by displaying the contents of the tape with the following command:

- **restore -T -vf /dev/rmt0 -b 512**

Note that if the tape volume contains a large number of files, this command can take a long time to execute. You can use **Ctrl-Z** on the VIOS command line to suspend it.

## 7.5. Ejecting the tape media

The **backup** command currently does not have an option to eject the tape media after performing a save. It is possible to overwrite an existing save on the tape, whether from VIOS on the same Power blade or another blade in the same BladeCenter chassis. To avoid overwriting backup data, follow these steps when performing a save:

- Perform the save using the backup command as described above
- Enter the command **oem\_setup\_env**
- Enter the command **tctl -f /dev/rmt0 offline**
- Enter the command **exit**

The **tctl** (for “tape control”) command with the **offline** option will rewind and eject the tape media. It is also recommended to use different tapes for backing up IBM i partitions on different blades within the same chassis.

## 7.6. Performing a restore

Before performing a restore, consider the storage requirements discussed in section 7.2. Also, ensure that the physical block size of the tape drive is set to 262144 bytes with the **lsdev** command:

- **lsdev -dev rmt0 -attr**

As mentioned above, **you must perform a restore using the same physical block size as the save**. If the block size is different, the **restore** command will fail to read the save file(s). If the physical block size is not 262144 bytes, use the **chdev** command to change it:

- **chdev -dev rmt0 -attr block\_size=262144**

To restore a virtual media image file from the SAS tape drive, use the **restore** command:

- **restore -xvqf /dev/rmt0 -b 512 /var/vio/VMLibrary/vol1**

If multiple SAS tape drives are available to the Power blade, verify you are using the correct **rmtX** device with the **restore -T** command as described in section 7.4. Following this restore operations, a virtual optical volume named **vol1** will be available in the Media Library. Next, mount the restored volume on the virtual optical device in the correct IBM i partition as described in section 7.3.2. The volume can then be used to perform a D-mode IPL and full system restore (if it contains a full system save), or a restore of specific libraries and objects in a running IBM i partition. As mentioned in section 7.2, at this point BRMS can also use the virtual optical volume to perform a restore. Be sure to verify that there is no bootable DVD-ROM media in the physical DVD drive in the BladeCenter, if that DVD drive is assigned to the blade and the IBM i partition.

## 7.7. Backup and restore of VIOS and IVM

For a “bare metal” type of restore of the entire Power blade, backups of VIOS (which will contain IVM) and the LPAR configuration are also required. Saving VIOS, the LPAR configuration and IBM i on the blade can be performed in any order. During a restore, VIOS and the LPAR configuration are restored first, followed by IBM i as described previously in this section.

### 7.7.1. Backing up VIOS to tape

The Virtual I/O Server (which includes IVM) can be backed up to tape using the following steps. Ensure a blank tape is loaded in the tape device you will be using for the backup.

- Telnet into VIOS. Log in using the **padmin** profile.
- Backup the partition profile data by typing the following command:  
**bkprofdata -o backup -f profile.bak.**

This results in a profile backup file location of */home/padmin/profile.bak*.

Alternatively, the partition profile can be backed up through IVM using the following steps:

- Log into the Integrated Virtualization Manager using the **padmin** profile
- On the **Service Management** menu, click **Backup/Restore**.
- On the **Partition Configuration Backup/Restore** tab, click the **Generate Backup** button.
- Once the operation is complete, the backup file location will be displayed (default location is */home/padmin/profile.bak*) You can restore the partition profile by clicking **Restore Partition Configuration**,

- Note that the instructions on the **Management Partition Backup/Restore** tab will not work for a Power blade. The steps that follow are the proper method.
- Get the tape device name by typing the following command: **lsdev -type tape**  
If the device has a status of *Defined*, type the following command, with *name* as the tape device name: **cfgdev -dev name**
- Check the current physical block size for the tape device using the following command, with *name* as the tape device name: **lsdev -dev name -attr**
- Change the block size to 262144 if it is smaller than that using the command: **chgdev -dev name -attr block\_size=262144**
- Enter the OEM software installation environment using the command: **oem\_setup\_env**
- Bring up the **System Management** menu by typing the following command: **smit**

```

                                System Management
Move cursor to desired item and press Enter.
Software Installation and Maintenance
Software License Management
Devices
System Storage Management (Physical & Logical Storage)
Security & Users
Communications Applications and Services
Print Spooling
Advanced Accounting
Problem Determination
Performance & Resource Scheduling
System Environments
Processes & Subsystems
Applications
Installation Assistant
Cluster Systems Management
Using SMIT (information only)

F1=Help           F2=Refresh       F3=Cancel       F8=Image
F9=Shell         F10=Exit        Enter=Do

```

- On the **System Management** menu, move the cursor to **Software Installation and Maintenance** and press enter.

```
Software Installation and Maintenance
Move cursor to desired item and press Enter.

Install and Update Software
List Software and Related Information
Software Maintenance and Utilities
Software Service Management
Network Installation Management
EZ NIM (Easy NIM Tool)
System Backup Manager
Alternate Disk Installation
EFIX Management
Thin Server Maintenance

F1=Help      F2=Refresh   F3=Cancel   F8=Image
F9=Shell     F10=Exit    Enter=Do
```

- On the **Software Installation and Maintenance** menu, move the cursor to **System Backup Manager** and press enter.

```
System Backup Manager
Move cursor to desired item and press Enter.

Back Up the System
Preview Information about a Backup
Verify the Readability of a Backup (Tape only)
View the Backup Log
List Information about Filesets in a System Image
List Files in a System Image
Restore Files in a System Image

F1=Help      F2=Refresh   F3=Cancel   F8=Image
F9=Shell     F10=Exit    Enter=Do
```

- On the **System Backup Manager** menu, move the cursor to **Back Up the System** and press enter.

```

Back Up the System
Move cursor to desired item and press Enter.
Back Up This System to Tape/File
Back Up This System to CD
Back Up This System to DVD

F1=Help      F2=Refresh   F3=Cancel   F8=Image
F9=Shell     F10=Exit    Enter=Do

```

- On the **Back Up the System** menu, move the cursor to **Back Up this System to Tape/File**.

```

Back Up the System
Type or select values in entry fields.
Press Enter AFTER making all desired changes.

WARNING: Execution of the mksysb command will
         result in the loss of all material
         previously stored on the selected
         output medium. This command backs
         up only rootvg volume group.

[Entry Fields]

* Backup DEVICE or FILE
Create MAP files?      [/dev/rmt0]      +/
EXCLUDE files?        yes                +
List files as they are backed up?  no                +
Verify readability if tape device? no                +
Generate new /image.data file?     yes               +
EXPAND /tmp if needed? yes                +
Disable software packing of backup? no                +
Backup extended attributes?        yes                +
Number of BLOCKS to write in a single output [512]            #
(Leave blank to use a system default)

F1=Help      F2=Refresh   F3=Cancel   F4=List
F5=Reset     F6=Command  F7=Edit     F8=Image
F9=Shell     F10=Exit    Enter=Do

```

- On the subsequent **Back Up the System** menu, do the following:
  - Move the cursor to the **Backup DEVICE or FILE** field and press **F4** to list choices. A **Backup DEVICE or FILE** pane will appear. Move the cursor to the correct tape device and press enter.
  - Move the cursor to the **Create MAP files?** field and press **F4** to list choices. A **Create MAP files?** pane will appear, Move the cursor to **yes** and press enter.
  - Move the cursor to the **EXPAND /tmp if needed?** field and press **F4** to list choices. A **EXPAND /tmp if needed?** pane will appear. Move the cursor to **yes** and press enter.

- o Move the cursor to the **Number of BLOCKS to write in a single output** field and type a value of **512**,
- o Press enter.

```

                                COMMAND STATUS
Command: OK                stdout: yes                stderr: no
Before command completion, additional instructions may appear below.

Creating information file (/image.data) for rootvg.
Creating tape boot image...
bosboot: Boot image is 37660 512 byte blocks.
..
Creating list of files to back up.
Backing up 100986 files.....
20 of 100986 files (0%).....
22 of 100986 files (0%).....
25 of 100986 files (0%).....
11871 of 100986 files (11%).....
100985 of 100986 files (99%)....
100986 of 100986 files (100%)
0512-038 mksysb: Backup Completed successfully.

bosboot: Boot image is 37660 512 byte blocks.

F1=Help          F2=Refresh      F3=Cancel      F6=Command
F8=Image        F9=Shell       F10=Exit      /=Find
n=Find Next

```

- The backup will now begin. The **COMMAND STATUS** screen will be displayed. It will take several minutes for the backup to complete. A message indicating completion will appear when the backup has completed. Press **F10** to exit from the menus.
- Type **exit** and press enter to exit from the OEM software installation environment.

The resulting tape will be a bootable VIOS backup.

### 7.7.2. Restoring VIOS from tape

The steps to restore the Virtual I/O Server (including IVM) from a tape backup are described below. Ensure the backup tape media is loaded in the tape device before proceeding.

VIOS can be restored as follows:

- Open a console for VIOS:
  - o Telnet to the BladeCenter's AMM and log in with a valid AMM userid/password.
  - o Type the following command and press enter, where **x** is the slot number of the Power blade: **env -T blade[x]**.
  - o Type **console** and press enter to assign the VIOS console.
- Power on or restart the Power blade. This can be done in a number of ways, including using the white power button on the front of the blade or using the power on or restart option from the AMM web browser interface.
- Once the Partition Firmware displays its initial screen, press **1** to enter the SMS menu. If you miss the prompt to press 1, the partition will attempt to boot from the default device, which may boot back into VIOS, if there is still a bootable image installed on the default device (probably the internal hard drive). Otherwise, the boot will fail and the SMS menu will eventually be displayed.

```
Version EA330_031
SMS 1.7 (c) Copyright IBM Corp. 2000,2008 All rights reserved.
-----
Main Menu
1.  Select Language
2.  Setup Remote IPL (Initial Program Load)
3.  Change SCSI Settings
4.  Select Console
5.  Select Boot Options
6.  Firmware Boot Side options

-----
Navigation Keys:
                                     X = exit System Management Services
-----
Type menu item number and press Enter or select Navigation key:5
```

- On the SMS **Main Menu**, type **5** and press enter to **Select Boot Options**.

```
Version EA330_031
SMS 1.7 (c) Copyright IBM Corp. 2000,2008 All rights reserved.
-----
Multiboot
1.  Select Install/Boot Device
2.  Configure Boot Device Order
3.  Multiboot Startup <OFF>

-----
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
```

- On the **Multiboot** menu, type **1** and press enter to **Select Install/Boot Device**.

```
Version EA330_031
SMS 1.7 (c) Copyright IBM Corp. 2000,2008 All rights reserved.
-----
Select Device Type
1.  Diskette
2.  Tape
3.  CD/DVD
4.  IDE
5.  Hard Drive
6.  Network
7.  List all Devices

-----
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:2
```

- On the **Select Device Type** menu, type **2** and press enter to select **Tape**.

```
Version EA330_031
SMS 1.7 (c) Copyright IBM Corp. 2000,2008 All rights reserved.
-----
Select Media Type
1.  SCSI
2.  SSA
3.  SAN
4.  SAS
5.  SATA
6.  USB
7.  IDE
8.  ISA
9.  List All Devices

-----
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: 4
```

- On the **Select Media Type** menu, type **4** and press enter to select **SAS**.

```
Version EA330_031
SMS 1.7 (c) Copyright IBM Corp. 2000,2008 All rights reserved.
-----
Select Device
Device Current Device
Number Position Name
1.      -      SAS Tape
          ( loc=U78A5.001.WIH1128-P1-C10-T1-L0-L22 )

-----
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
```

- On the **Select Device** menu, type the device number for the tape device with the backup media loaded and press enter.

```
SMS 1.7 (c) Copyright IBM Corp. 2000,2008 All rights reserved.
-----
select Task
SAS Tape
( loc=U78A5.001.WIH1128-P1-C10-T1-L0-L22 )

1. Information
2. Normal Mode Boot
3. Service Mode Boot

-----
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:2
```

- On the **Select Task** menu, type **2** and press enter for **Normal Boot Mode**.

```
Version EA330_031
SMS 1.7 (c) Copyright IBM Corp. 2000,2008 All rights reserved.
-----
Are you sure you want to exit System Management Services?
1. Yes
2. No

-----
Navigation Keys:
-----
X = exit System Management Services
-----
Type menu item number and press Enter or select Navigation key:1
```

- Type **1** and press enter to confirm you want to exit the SMS menus. It will take several minutes to boot from the tape.

```
***** Please define the System Console. *****

Type a 2 and press Enter to use this terminal as the
system console.
Pour definir ce terminal comme console systeme, appuyez
sur 2 puis sur Entree.
Taste 2 und anschliessend die Eingabetaste druecken, um
diese Datenstation als systemkonsole zu verwenden.
Premere il tasto 2 ed Invio per usare questo terminal
come console.
Escriba 2 y pulse Intro para utilizar esta terminal como
consola del sistema.
Escribiu 1 2 i premeu Intro per utilitzar aquest
terminal com a consola del sistema.
Digite um 2 e pressione Enter para utilizar este terminal
como console do sistema.
```

- Once you are past the **Welcome to the Virtual I/O Server** screen, a screen prompting you to **Please define the System Console** will appear. Type **2** and press enter as the screen directs. Note that these keystrokes will not appear on the screen.

```

                                Error warning

The data file indicated that all logical volumes should
be created exactly as they were before, but the disks
are not the same as they were on the source system.

To reboot the system, press reset.
>>> 1  Continue with Install

88  Help ?

>>> Choice [1]: 1

```

- You may see a warning screen indicating the disks on the system do not match the disks on the source (of the backup) system. Type **1** and press enter to **Continue with Install**.

```

                                welcome to Base Operating System
                                Installation and Maintenance

Type the number of your choice and press Enter.  Choice is indicated by >>>.
>>> 1 start Install Now with Default Settings
    2 Change/Show Installation Settings and Install
    3 Start Maintenance Mode for System Recovery
    4 Configure Network Disks (iSCSI)

88  Help ?
99  Previous Menu

>>> Choice [1]: 3

```

- On the **Welcome to Base Operating System – Installation and Maintenance** menu, type **3** and press enter to select **Start Maintenance Mode for System Recovery**.

```

Maintenance
Type the number of your choice and press Enter.
>>> 1 Access a Root Volume Group
      2 Copy a System Dump to Removable Media
      3 Access Advanced Maintenance Functions
      4 Erase Disks
      5 Configure Network Disks (iSCSI)
      6 Install from a System Backup

      88 Help ?
      99 Previous Menu
>>> choice [1]: 6

```

- On the **Maintenance** menu, type **6** and press enter to **Install from a System Backup**.

```

Choose mkysyb Device
Type the number of the device containing the system backup to be
installed and press Enter.

      Device Name                Path Name
>>>  1 tape/sas/ost              /dev/rmt0

      88 Help ?
      99 Previous Menu
>>> choice [1]: 1

```

- On the **Choose mkysyb Device** menu, type the number of the device with the backup tape mounted and press enter. The restore will now begin. A progress screen will be displayed until the restore is complete.

Once the restore is complete, the VIOS will reboot from the just completed restore image.

After restoring VIOS, restore the partition data. The partition data can be restored by using the following command on the VIOS console (assuming you used the **bkprofdata** command as described above):

**rstprofdata -l 1 -f profile.bak -ignoremtms.**

The partition data can also be restored through IVM using the following steps:

- Log into the Integrated Virtualization Manager using the **padmin** profile
- On the **Service Management** menu, click **Backup/Restore**.
- On the **Partition Configuration Backup/Restore** tab, the Partition Configuration Backup file should be listed. Click the **Restore Partition Configuration** button to restore the listed configuration.

## 7.8. Tivoli Storage Manager

Tivoli Storage Manager (TSM) provides an alternative to saving the optical volume image files containing the IBM i backup to physical tape in VIOS. This option requires that a TSM environment already exists, with a central TSM server receiving backups from individual Unix or Windows systems and performing the physical saves to a tape library. In this case, VIOS can join the TSM environment as another client and send the optical volume image files to the TSM server for backup. The TSM client software is included in a default VIOS install.

Note that using a TSM server does not eliminate the IBM i save to a writeable virtual optical device in VIOS, described in section 7.4.1. However, it does remove the requirement to obtain an LTO SAS tape drive in order to save IBM i data to physical tape. In the case of running IBM i on JS22 in the BladeCenter H, it also removes the requirement to obtain a CFFv SAS expansion adapter for the blade. Using the TSM client software in VIOS to save to a central TSM server would take the place of the setup, save and restore procedures described in sections 7.4.2 through 7.6.

Configuring the TSM server is beyond the scope of this document. To configure VIOS on the Power blade as a TSM client, consult the **IBM Tivoli Storage Manager agent commands** section of the VIOS command reference:  
[http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphb1/iphb1\\_vios\\_commandslist.htm](http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphb1/iphb1_vios_commandslist.htm).

## 8. i Edition Express for BladeCenter S

### 8.1. Overview

The i Edition Express for BladeCenter S is a packaged solution that includes a BladeCenter S chassis with SAS disk drives, a JS12 Power blade server, IBM PowerVM and IBM i for 10 users. It is an integrated offering priced similarly to a Power 520 Express i Edition that makes it easier for clients to consolidate their existing IBM i and Windows workloads in a BladeCenter environment. For the minimum i Edition Express for BladeCenter S hardware configuration and further details, consult <http://www.ibm.com/systems/power/hardware/blades/iedition.html>.

With the October 2008 IBM i and BladeCenter enhancements, every i Edition Express for BladeCenter S will automatically get VIOS and IBM i preloaded on the JS12. See the next section in this document for an overview of the IBM i preinstall on BladeCenter S and the post-ship configuration actions that must be performed by the implementing party.

## 9. IBM i preinstall on BladeCenter S

### 9.1. IBM i preinstall overview

In October 2008, IBM announced the capability to preinstall IBM i in a BladeCenter S configuration with BladeCenter JS12 or JS22. This greatly simplifies the implementation of IBM i in a BladeCenter S environment and provides the client with a “white-button ready” server, similar to an IBM Power 520. If the correct feature codes are selected on the order, IBM manufacturing will perform the following tasks:

- Activate the correct SAS zone configuration on the BladeCenter S to assign drives to the BladeCenter JS12 or JS22
- Create the VIOS partition on the JS12 or JS22
- Install VIOS
- Mirror the VIOS installation
- Create the IBM i partition and assign two drives in the BladeCenter S to it
- Install the Licensed Internal Code (LIC)
- Start mirroring in IBM i
- Install the IBM i operating environment and Licensed Program Products (LPPs) specified on the order

The VIOS partition will always be installed on the drive(s) on the JS12 or JS22. In the case of JS12, VIOS will be mirrored to the second drive on the blade. In the case of JS22, VIOS will be mirrored to a separate drive in the BladeCenter S. IBM i will always be installed and mirrored on two drives in the BladeCenter S. Additional drives can be added to the IBM i installation later by the implementing party, depending on the SAS zone configuration selected. Any additional drives will already be available to the IBM i partition; they would have to be added to a storage pool in IBM i.

The IBM i preinstall option is available only when the BladeCenter S and JS12 or JS22 are ordered together. The preinstall is not available when a JS12 or JS22 is ordered separately or as part of a BladeCenter H configuration, because IBM manufacturing does not have access to the storage that will be used for IBM i in that case.

All i Express Edition for BladeCenter S orders will now automatically get VIOS and IBM i preloaded on the JS12. This is a change for the offering, which previously included a preinstall only of VIOS.

## 9.2. Requirements

The following features are required in an IBM i preinstall configuration on BladeCenter S:

- FC 8250 (SAS Expansion Card (CFFv) for IBM BladeCenter) on the JS12 or JS22
- When configuring a JS12, both drives on the blade are required
- When configuring a JS 22, one drive on the blade is required
- **All drives in the BladeCenter S must be the same size as part of an IBM i preinstall order**
- When configuring a JS12, at least two drives are required in the BladeCenter S for each JS12 with the IBM i preinstall, using one of the predefined SAS zone configuration feature codes
- When configuring a JS22, at least three drives are required in the BladeCenter S for each JS22 with the IBM i preinstall, using one of the predefined SAS zone configuration feature codes
  - The drives in the BladeCenter S must be the same size or bigger than the drives on the JS22
  - One of the drives in the BladeCenter S will be used to mirror the VIOS install from the drive on the JS22
- FC 5005 (Software Preinstall), FC 8146 (Software Preinstall) and FC 8141 (IBM i Preinstall) must be ordered
  - In the case of i Express Edition for BladeCenter S, FC 8141 is not required. All i Express Edition orders with FC 0775 will now get IBM i preinstalled

The following table shows the available feature codes for predefined SAS zone configurations for BladeCenter S:

Predefined Storage Config FC	Up to # of Blades	Up to # of drives	Up to # drives per blade	Up to # of DSS	# of SAS I/O Modules	Valid for IBM i preload	
						JS12 (requires 2 BCS drives per blade)	JS22 (requires 3 BCS drives per blade)
5059	6	12	2	2	2	Yes	No
5067	6	12	2	2	1	Yes	No
5068	1	12	12	2	2	Yes	Yes
5069	1	12	12	2	1	Yes	Yes
5084	3	12	4	2	2	Yes	Yes
5085	3	12	4	2	1	Yes	Yes
5086	2	12	6	2	2	Yes	Yes
5087	2	12	6	2	1	Yes	Yes

### 9.3. Installation steps that must be performed by the implementing party

While the IBM i preinstall capability greatly simplifies the installation of IBM i in a BladeCenter S environment, **some manual steps must be performed** by the party implementing this solution:

- Install the BladeCenter S hardware, as discussed in section 3.1 of this document
- Configure and update the AMM, as discussed in sections 3.2, 3.3, 3.4 and 3.9
- Configure and update any I/O modules and DSMs, as discussed in sections 3.6 – 3.12
- Create a physical network connection to I/O module bay 1 of the BladeCenter S, to allow connection of the LAN console connection for the IBM i partition created and installed by IBM manufacturing.
- Install the Operations Console (LAN) component of the System i Access for Windows software on a PC connected to the network on which the BladeCenter S resides. See section 1.5.
- Configure the LAN console connection on the PC, as discussed in section 5.11.
- Power on the blade by pressing the white button on its front (it is hidden behind a protective screen)
- Start the LAN console connection on the PC

The VIOS and IBM i partitions on the blade are configured to start automatically. However, because this is the first time the blade starts outside of IBM manufacturing, the system firmware and VIOS licenses must be accepted before the boot can continue.

- Open a console to VIOS on the blade, as described in section 5.2.2
- After several minutes, you will be presented with the system firmware language screen:

```
CA Telnet 192.168.70.125
PowerPC Firmware
Version EA330_031
LKM 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
Language Selection Menu
Current Language : IS08859-1 English (United States)
1. Change Language
2. Continue Boot
-----
Type menu item number and press Enter:2_
```

- Type 2 and press **Enter** to continue booting, or 1 and **Enter** to change the firmware screen language
- You will be presented with the firmware license screen:

```
CA Telnet 192.168.70.125
PowerPC Firmware
Version EA330_031
LKM 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-----
License Agreement
This system contains Licensed Internal Code and or Machine Code,
the terms of which are provided in a printed document
that has been shipped with the hardware.
By accepting here, you agree to be bounded by those printed terms.
1. Accept
2. Decline
-----
Type menu item number and press Enter:1_
```

- Type 1 and press **Enter** to accept the license
- Once VIOS boots, it will ask you to confirm the console screen:

```
C:\> Telnet 192.168.70.125

-----
Welcome to the Virtual I/O Server.
boot image timestamp: 21:13 07/31
The current time and date: 14:31:03 08/01/2008
number of processors: 2    size of memory: 512MB
boot device: /pci0800000020000200/pci1014,02BDC1/sas/disk030000:2
kernel size: 15063830; 64 bit kernel
-----

***** Please define the System Console. *****

Type a 2 and press Enter to use this terminal as the
system console.
```

- Type 2 and press **Enter**
- Sign in with padmin and set a password
- Accept the VIOS license as described in section 5.2.7
- Configure networking in VIOS as described in section 5.3
- Configure the virtual Ethernet bridge for IBM LAN Console as described in section 5.8
- Connect LAN Console to the IBM i partition as described in section 5.11

The IBM i partition is now started and accessible through LAN Console. Further setup tasks may involve adding disk units to the System ASP, configuring networking in IBM i, installing additional LPPs, PTFs and applications, migrating data from an existing system, or creating users, similar to those on an IBM Power 520 server.

## 10. DS4000 Copy Services and IBM i

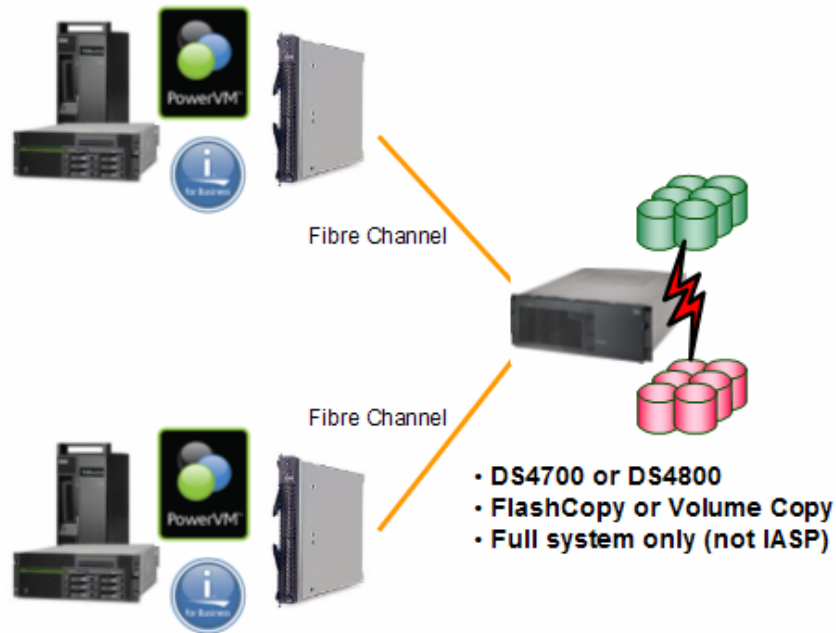
IBM has conducted some basic functional testing of DS4000 Copy Services with IBM i as client of VIOS. Below, you will find information on the scenarios tested and the resulting statements of support for using DS4000 Copy Services with IBM i.

### 10.1. FlashCopy and VolumeCopy

#### 10.1.1. Test scenario

The following diagram shows the test environment used for FlashCopy and VolumeCopy:

- Production LPAR on IBM Power server or IBM BladeCenter JS12/JS22
- IBM i as client of VIOS



- Backup LPAR on IBM Power server or IBM BladeCenter JS12/JS22
- IBM i as client of VIOS

### 10.1.2. FlashCopy and VolumeCopy support statements

The use of DS4000 FlashCopy and VolumeCopy with IBM i as a client of VIOS is supported as outlined below. **Please note** that to implement and use this solution, **multiple manual steps on the DS4000 storage subsystem, in VIOS and in IBM i are required**. Currently, no toolkit exists that automates this solution and it is not part of IBM PowerHA for IBM i. The components of the solution – DS4000 FlashCopy/VolumeCopy, VIOS and IBM i – must be managed separately and require the corresponding skill set. Note also that support for this solution will be provided by multiple IBM support organizations and not solely by the IBM i Support Center.

Support statements:

- DS4000 FlashCopy and VolumeCopy are supported by IBM as a client of VIOS on both IBM Power servers and IBM Power blades
- Full-system FlashCopy and VolumeCopy when the production IBM i logical partition (LPAR) is powered off are supported
- Full-system FlashCopy and VolumeCopy when the production IBM i LPAR is in restricted state are supported
- The DS4000 'disable' and 're-create' functions with full-system FlashCopy and VolumeCopy when the production IBM i LPAR is powered off or is in restricted state are supported
- Full-system FlashCopy and VolumeCopy of the production IBM i logical partition (LPAR) after only using the IBM i 6.1 memory flush to disk (quiesce) function are **not supported**

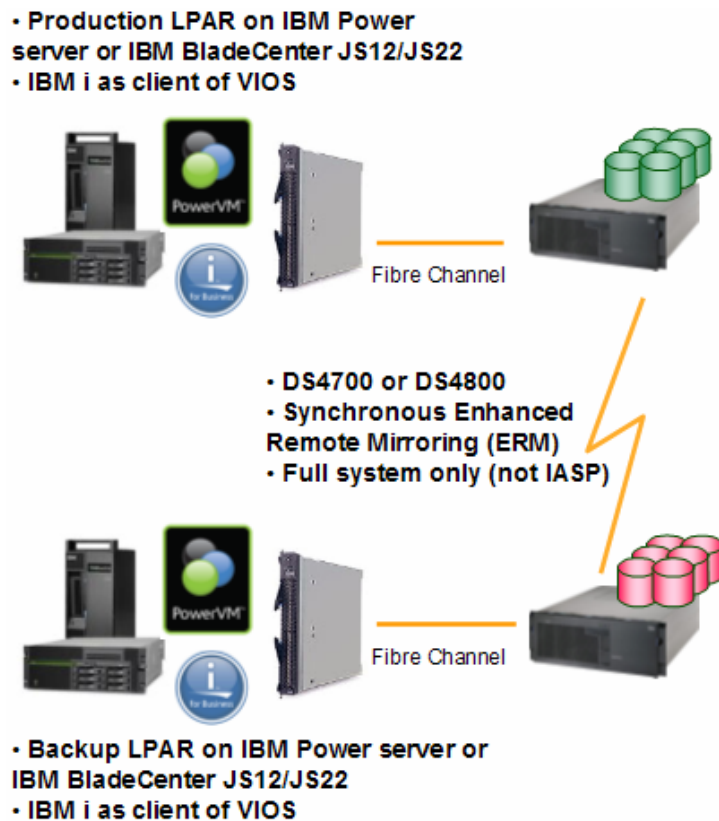
- Full-system FlashCopy and VolumeCopy when the production IBM i LPAR is running are **not supported**
- FlashCopy and VolumeCopy of Independent Auxiliary Storage Pools (IASPs) are **not supported**
- Having the production and backup IBM i LPAR under the same VIOS is **not supported**

For assistance with using DS4000 FlashCopy and VolumeCopy with IBM i, contact IBM Lab Services using this Web site: <http://www.ibm.com/systems/services/labservices/contact.html>.

## 10.2 Enhanced Remote Mirroring (ERM)

### 10.2.1. Test scenario

The following diagram shows the test environment used for ERM:



### 10.2.2 ERM support statements

The use of DS4000 Enhanced Remote Mirroring with IBM i as a client of VIOS is supported as outlined below. **Please note** that to implement and use this solution, **multiple manual steps on the DS4000 storage subsystem, in VIOS and in IBM i are required**. Currently, no toolkit exists that automates this solution and it is not part of IBM PowerHA for IBM i. The components of the solution – DS4000 FlashCopy/VolumeCopy, VIOS and IBM i – must be managed separately and require the corresponding skill set. Note also that support for this solution will be provided by multiple IBM support organization and not solely by the IBM i Support Center.

IBM PowerHA for IBM i is also supported for IBM i as a client of VIOS. PowerHA for IBM i provides an automated, IBM i-driven replication solution that allows clients to leverage their existing IBM i skills. PowerHA for IBM i is supported by the IBM i Support Center. For more information on IBM PowerHA for IBM i, consult: <http://www-304.ibm.com/jct03001c/systems/power/software/availability/i5os.html>.

Support statements for ERM:

- DS4000 ERM is supported by IBM as a client of VIOS on both IBM Power servers and IBM Power blades
- Only Synchronous ERM (DS4000 Metro Mirror) is supported
- Asynchronous ERM (DS4000 Global Copy) or Asynchronous ERM with Write Consistency Group (DS4000 Global Mirror) are **not supported**
- Full-system Synchronous ERM for a planned switchover (IBM i production LPAR is powered off) is supported
- Full-system Synchronous ERM for an unplanned failover (IBM i production LPAR is running) is supported
- Replication of IASPs is **not supported**
- Suspending replication and accessing the replicated LUNs on backup site is **not supported**

For assistance with using DS4000 Enhanced Remote Mirroring with IBM i, contact IBM Lab Services using this Web site: <http://www.ibm.com/systems/services/labservices/contact.html>.

## 11. Additional resources

### 11.1. BladeCenter and blade servers

- Supported environments for IBM i on a Power blade:  
<http://www.ibm.com/systems/i/advantages/v6r1/blades/index.html>.
- i Edition Express for BladeCenter S information:  
<http://www.ibm.com/systems/power/hardware/blades/iedition.html>.
- BladeCenter Information Center:  
[http://publib.boulder.ibm.com/infocenter/systems/index.jsp?topic=/com.ibm.bladecenter.common.nav.doc/bladecenter\\_converged\\_welcome\\_page.html&tocNode=int\\_12](http://publib.boulder.ibm.com/infocenter/systems/index.jsp?topic=/com.ibm.bladecenter.common.nav.doc/bladecenter_converged_welcome_page.html&tocNode=int_12)
- *IBM BladeCenter Products and Technology* (Redbook):  
<http://www.redbooks.ibm.com/redpieces/abstracts/sg247523.html?Open>
- IBM BladeCenter H Web site:  
<http://www.ibm.com/systems/bladecenter/hardware/chassis/bladeh/index.html>
- IBM BladeCenter S Web site:  
<http://www.ibm.com/systems/bladecenter/hardware/chassis/blades/index.html>
- BladeCenter S implementation (Redpiece):  
<http://www.redbooks.ibm.com/abstracts/redp4357.html?Open>.
- *CPM Installation Guide* (<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-59020&brandind=5000020>).
- *CPM Cable Installation Instructions* (<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-57332&brandind=5000020>)

### 11.2. Storage

- DS8000 Information Center:  
<http://publib.boulder.ibm.com/infocenter/dsichelp/ds8000ic/index.jsp>
- *IBM System Storage DS8000 Series: Architecture and Implementation* (Redbook):  
<http://www.redbooks.ibm.com/redpieces/abstracts/sg246786.html?Open>
- DS8000 Web site: <http://www.ibm.com/systems/storage/disk/ds8000/index.html>
- *IBM System Storage DS4000 and Storage Manager V10.10* (Redbook):  
<http://www.redbooks.ibm.com/redpieces/abstracts/sg247010.html?Open>
- DS4000 Web site: <http://www.ibm.com/systems/storage/disk/ds4000/index.html>
- *Performance Capabilities Reference* manual (chapter 14.5 for best practices for IBM i and VIOS): <http://www.ibm.com/systems/i/solutions/perfmgmt/resource.html>
- SDD-PCM driver:  
[http://www.ibm.com/support/docview.wss?rs=540&context=ST52G7&dc=D430&uid=ssg1S4000201&loc=en\\_US&cs=utf-8&lang=en](http://www.ibm.com/support/docview.wss?rs=540&context=ST52G7&dc=D430&uid=ssg1S4000201&loc=en_US&cs=utf-8&lang=en)
- Storage Configuration Manager download page: <https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5502070&brandind=5000008>.
- *IBM System Storage DS3000: Introduction and Implementation Guide* (Redbook):  
<http://www.redbooks.ibm.com/redpieces/abstracts/sg247065.html?Open>

### 11.3. VIOS and IVM

- VIOS/IVM Web site: <http://www14.software.ibm.com/webapp/set2/sas/f/vios/home.html>
- *PowerVM Editions Operations Guide*:  
[http://publib.boulder.ibm.com/infocenter/systems/index.jsp?topic=/iphdx/abstract\\_pvme\\_guide.htm](http://publib.boulder.ibm.com/infocenter/systems/index.jsp?topic=/iphdx/abstract_pvme_guide.htm).
- *Advanced Power Virtualization on IBM System p5: Introduction and Configuration* (Redbook): <http://www.redbooks.ibm.com/abstracts/sg247940.html?Open>

- *Integrated Virtualization Manager on IBM System p5* (Redbook):  
<http://www.redbooks.ibm.com/abstracts/redp4061.html?Open>
- VIOS command reference:  
[http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphb1/iphb1\\_vios\\_commandslist.htm](http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphb1/iphb1_vios_commandslist.htm)
- VIOS Datasheet:  
<http://www14.software.ibm.com/webapp/set2/sas/f/vios/documentation/datasheet.html>
- IVM white paper: <http://www.ibm.com/systems/p/hardware/whitepapers/ivm.html>

#### 11.4. IBM i

- System i Access software Web site:  
<http://www.ibm.com/systems/i/software/access/caorder.html>
- LAN console preparation and configuration instructions:  
<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/topic/rzajr/rzajrlcnetworksu.htm> and  
<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/index.jsp?topic=/rzajr/rzajrinstalopscon.htm>
- IBM i installation:  
[http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/index.jsp?topic=/rzahc/rzahc1.htm&tocNode=int\\_216451](http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/index.jsp?topic=/rzahc/rzahc1.htm&tocNode=int_216451)
- IBM i PTF installation:  
<http://publib.boulder.ibm.com/infocenter/systems/scope/i5os/index.jsp?topic=/rzam8/rzam8fixconcepts1.htm>
- Latest recommended IBM i PTFs: [http://www-912.ibm.com/s\\_dir/slkbases.nsf/recommendedfixes](http://www-912.ibm.com/s_dir/slkbases.nsf/recommendedfixes)
- IBM Fix Central: <http://www-912.ibm.com/eserver/support/fixes/>
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- IBM i virtual client partitions topics in the IBM i Information Center:  
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