IBM

PowerVM Migration from Physical to Virtual Storage

- Moving to a Virtual I/O Server managed environment
- Ready-to-use scenarios included
- AIX operating system based examples

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PowerVM Migration from Physical to Virtual Storage

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Note: Before using this information and the product it supports, read the information in “Notices” on page vii.

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Preface

IT environments in organizations today face more challenges than ever before. Server rooms are crowded, infrastructure costs are climbing, and right-sizing systems is often problematic. In order to contain costs there is a push to use resources more wisely by minimizing waste and maximizing the return on investment. Virtualization technology was developed to answer these objectives.

More and more organizations will deploy (or are in the process of deploying) some form of virtualization. However, parts of an organization's systems may use earlier storage equipment. In these contexts, knowing how to migrate from physical, often direct-attached storage, to a virtual storage environment becomes valuable.

This IBM® Redbooks® publication introduces techniques to use for the migration of storage from physical to virtual environments and introduces several new features in POWER6® technology-based systems. These features include:

- The **chkdev** command, added in Virtual I/O Server 2.1.2 FP22 to assist in identifying physical-to-virtual candidates and to ensure that device identification is consistent
- Extensive use of NPIV technology for both disk and tape devices
- The use of file-backed optical technology to present virtual CD media as a means of restoration

This publication is organized into the following chapters:

- Chapter 1, “Introduction” on page 1, provides an introduction into the material that will be presented.
- Chapter 2, “Core procedures” on page 9, provides detailed core procedures that will be used throughout the remaining chapters. By examining and learning the core procedures, more experienced users can proceed directly to any of the fully documented migration cases without needing to read all the chapters. Newer users can learn the core procedures and then examine the different migration techniques and choose the appropriate ones that apply to their organizations.
- Chapter 3, “Standalone SCSI rootvg to virtual SCSI” on page 43, through Chapter 7, “Direct attached Fibre Channel devices partition to virtual Fibre Channel” on page 153, provide lab-tested migration examples that build on the core procedures learned in Chapter 2, “Core procedures” on page 9. Detailed figures and output listings take the users through the migrations

step-by-step and allow the reader to determine which migration techniques will work best for them based on their skills and available resources.

The procedures detailed cover migrations on AIX® operating-system-based hosts. Linux® operating-system-based migrations are not covered in this publication.

The team who wrote this book

This book was produced by a team of specialists from around the world working at the International Technical Support Organization, Poughkeepsie Center.

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Introduction

This publication provides instructions on how to transition from direct-attached storage on a standalone IBM server or IBM logical partition to an IBM logical partition with its storage virtualized through a Virtual I/O Server. This transition is referred to as a physical-to-virtual migration. Since the focus of this publication is on migrations, it only briefly covers the creation and configuration of logical partitions. Refer to the publications *PowerVM Virtualization on IBM System p: Introduction and Configuration Fourth Edition*, SG24-7940, and *IBM PowerVM Virtualization Managing and Monitoring*, SG24-7590, for a more thorough discussion of these topics. Furthermore, the tools and technologies used in the migrations are what you will find on standard AIX install media. The use of open source and other third-party tools is not covered.

Note: All examples in this publication were tested on lab systems. However, it is important that you validate these procedures on test systems before putting them into production.

1.1 Definitions

The following definitions will assist you in understanding the material located within this publication:

Standalone servers Standalone servers are typically systems that do not contain multiple logical partitions or any Virtual I/O Servers.

Client or logical partition This is a partition on POWER®-based hardware that has some level of virtualization. For example, CPU and memory and may have some direct-attached I/O hardware or I/O hardware virtualized by the Virtual I/O Server, or both.

Local disks These are direct-attached SCSI or SAN disks.

Storage This is categorized as local or storage area network (SAN) storage. The hardware disks comprising the storage are descibed as either rootvg.

rootvg, data, and datavg rootvg is used to describe content that is used as the base operating system necessary to boot the server. All other disk contents will be given the generic label of data disk and sometimes will also be referred to in this publication as datavg.

1.2 Audience

This publication targets architects and solution designers who may be required to design migration strategies that use physical-to-virtual migration techniques and system administrators who may be required to perform such migrations. Knowledge of the Virtual I/O Server and AIX is assumed, as well as intermediate to advanced skills in storage systems.

1.3 Test environment

The environment in which testing of the migration scenarios was performed is depicted in Figure 1-1.

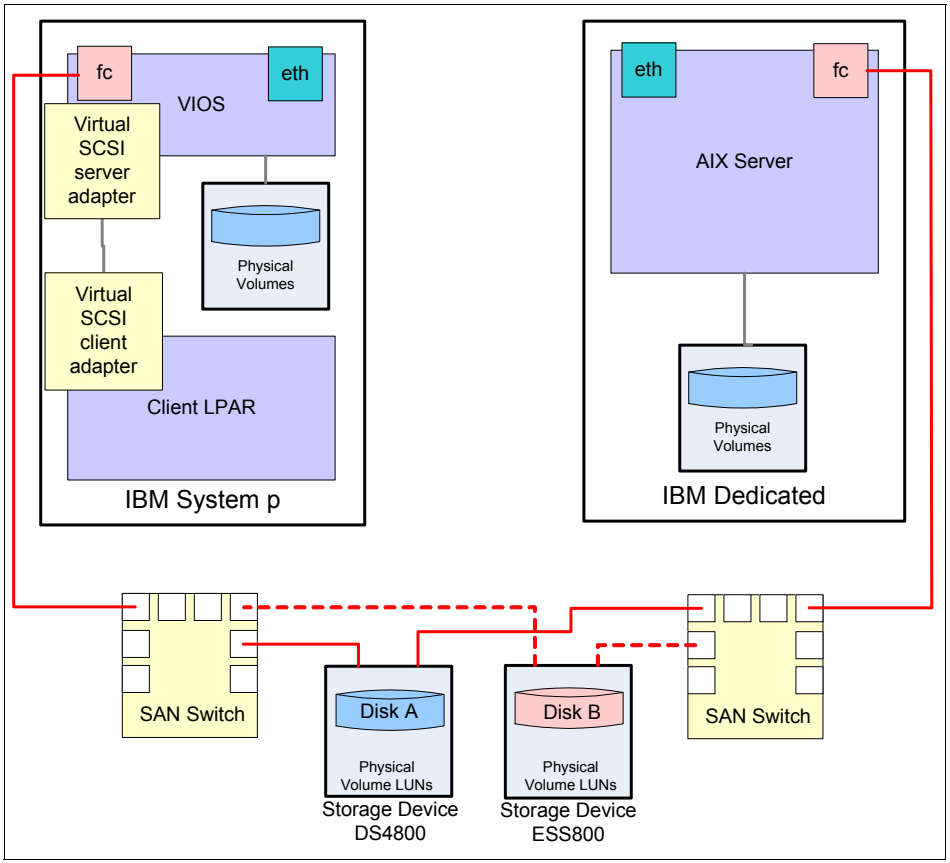

Figure 1-1 Test environment

The environment was run at the following software release levels:

- HMC: Version 7, Release 3.4.0, Service Pack 3
- VIOS: 2.1.2.10-FP-22
- Source and Target AIX: 6100-03
- DS4800 Storage System Firmware 7.36.17
- IBM B2005-B16 SAN Switches with v5.3.0 Fabric OS

1.4 Storage device compatibility in a Virtual I/O Server environment

Physical-to-virtual (p2v) device compatibility refers only to the data on the device, not necessarily to the capabilities of the device. A device is p2v compatible when the data retrieved from that device is identical regardless of whether it is accessed directly through a physical attachment or virtually (for example, through the Virtual I/O Server). That is, every logical block (for example, LBA 0 through LBA n-1) returns identical data for both physical and virtual devices. Device capacity must also be equal in order to claim p2v compliance. You can use the Virtual I/O Server **chkdev** command to determine whether a device is p2v compatible. The **chkdev** command is available in Virtual I/O Server Version 2.1.2 FP22 or later.

Virtual disk devices exported by the Virtual I/O Server are referred to as virtual SCSI disks. A virtual SCSI disk device may be backed by an entire physical volume, a logical volume, a multi-path device, or a file.

Data replication functions such as copy services and device movement between physical and virtual environments are common operations in today's data center. These operations, involving devices in a virtualized environment, often have a dependency on p2v compliance.

Copy services refer to various solutions that provide data replication functions including data migration, flashcopy, point-in-time copy, and remote mirror and copy solutions. These capabilities are commonly used for disaster recovery, cloning, backup/restore, and more.

Device migration from physical environments to client partitions refers to the ability to migrate a physical storage device to a Virtual I/O Server client partition without the need for a backup and restore operation. The storage device may be a direct-attached SCSI or SAN disk or tape device. This capability is very useful for server consolidation.

The operations above may work if the device is p2v compatible. However, not all device combinations and data replication solutions have been tested by IBM. See claims by your copy services vendor for support claims for devices managed by a Virtual I/O Server. See also *PowerVM and SAN Copy Services*, REDP-4610 (available 1Q, 2010).

A device is considered to be p2v compatible if it meets the following criteria:

- It is an entire physical volume (for example, a LUN).
- Device capacity is identical in both physical and virtual environments.
- The Virtual I/O Server is able to manage this physical volume using a UDID or IEEE ID. For more information about determining whether a physical volume has a UDID or IEEE identification field see 2.2, “Checking unique disk identification” on page 13.

Devices managed by the following multipathing solutions within the Virtual I/O Server are expected to be UDID devices:

- All multipath I/O (MPIO) versions, including Subsystem Device Driver Path Control Module (SDDPCM), EMC PCM, and Hitachi Dynamic Link Manager (HDLM) PCM
- EMC PowerPath 4.4.2.2 and later
- IBM Subsystem Device Driver (SDD) 1.6.2.3 and later
- Hitachi HDLM 5.6.1 and later

Virtual SCSI devices created with earlier versions of PowerPath, HDLM, and SDD are not managed by UDID format and are not expected to be p2v compliant. The operations mentioned previously (for example, data replication and movement between Virtual I/O Server and non-Virtual I/O Server environments) are not likely to work in these cases.

Note: If there is any doubt about device compatibility you should contact IBM and your storage vendor before attempting physical-to-virtual migration. For additional information refer to the InfoCenter POWER Systems Web site:

`http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/index.jsp?topic=/iphb1_vios_device_compat.htm`

1.5 Overview of the physical-to-virtual migration process

This section provides an overall set of instructions about how to transition the various storage configurations in order to utilize Virtual I/O Server storage functionality. These instructions point users to information that they should use for their particular situations.

In Table 1-1 a number of migrations are presented from a source host configuration through to the destination host configuration. The table is not exclusive of any other forms of migration. However, the procedures and thus the lab-tested methods detailed in subsequent chapters in this book are derived from this table. You may find methods that work better in your particular environments especially since this book exclusively discusses IBM-specific technologies. The Destination Host Configuration Column presents what has been tested as the primary target, with alternative targets in parentheses.

Table 1-1 Migration procedures table

Migration objective	Volume group to migrate	Migration procedure	Destination host configuration
Chapter 3, “Standalone SCSI rootvg to virtual SCSI” on page 43	rootvg	fbo, migratepv, alt_clone	Partition with virtual SCSI (virtual Fibre Channel also possible)
Chapter 4, “Standalone SCSI data to virtual SCSI” on page 77	datavg, raw datavg	dd	Partition with virtual SCSI (virtual Fibre Channel also possible)
5.1, “Direct-attached SCSI partition to virtual SCSI” on page 90	rootvg	Remap physical adapter	Partition with virtual SCSI
5.2, “Direct-attached SAN rootvg and data partition to SAN virtual SCSI” on page 100	rootvg, datavg	Remap physical adapter	Partition with virtual SCSI
5.3, “Direct-attached SAN rootvg and data partition to virtual Fibre Channel” on page 113	rootvg, datavg	Access same SAN disk with adapter on destination	Partition with virtual Fibre Channel (virtual SCSI also possible)
5.4, “Virtual SCSI rootvg and data to virtual Fibre Channel” on page 137	rootvg, datavg	Access same SAN disk with adapter on destination	Partition with virtual Fibre Channel (virtual SCSI also possible)

Migration objective	Volume group to migrate	Migration procedure	Destination host configuration
Chapter 6, “Standalone SAN rootvg to virtual Fibre Channel” on page 145	rootvg	Access same SAN disk with adapter on destination	Partition with virtual Fibre Channel (virtual SCSI also possible)
Chapter 7, “Direct attached Fibre Channel devices partition to virtual Fibre Channel” on page 153	N/A	Access same tape with adapter on destination	Partition with virtual Fibre Channel

The following is a suggested flow for using Table 1-1 on page 6:

1. Learn how to use the virtual SCSI and virtual Fibre Channel methods as described in Chapter 2, “Core procedures” on page 9.
2. Choose from what configuration you are migrating (Migration Objective column). The cells in this column are linked to the actual procedures. Thus, clicking the cells is another way to quickly move through this publication.
3. Choose what you are migrating (Volume Group to Migrate column).
4. Choose which procedure (Migration Procedure column) suits your environment and your administrator skills.

As with any data migration, we first recommend:

1. Back up the client system. Prior to making any changes, we recommend that the source standalone and dedicated partition be backed up. Some of the migration procedures can be used to perform this backup. All backups require validation to ensure that they are restorable.
2. Back up the configuration of the Virtual I/O Server that you will be modifying. The **`viosbr`** command has been introduced to the Virtual I/O Server commands for this purpose.
3. It is *always* a best practice to perform the migration procedure on *test systems and data* before applying to a production environment.

2

Core procedures

There are a number of core procedures that are used in multiple scenarios of the accompanying chapters. These procedures are documented fully in this chapter and additional notes are provided about the procedures that will not be found in the fully worked-through examples in subsequent chapters. Some of the additional notes are about issues such as best practices, and some are additional diagnostic methods that may be used.

Some of the procedures in this book rely on being able to reconfigure a Virtual I/O Server's devices and mappings and the procedures could become complex if many migrations resulting in many changes to the configuration occur. For this reason, you may consider backing up the Virtual I/O Server configuration using the Virtual I/O Server **`viosbr`** command, which creates compressed files from the Virtual I/O Server configuration without having to perform a full Virtual I/O Server backup. For further information, use the Virtual I/O Server **`man viosbr`** command or refer to InfoCenter documentation.

The core procedures are:

- Using file-backed optical devices to perform a restoration
- Checking unique disk identification: IEEE, PVID, and UDID
- Creating a virtual SCSI device
- Using virtual Fibre Channel and NPIV

Each of these procedures is detailed in the sections that follow.

2.1 File-backed optical for restoration

File-backed optical devices provide a clean, easy-to-use mechanism to take a backup of either a root or data volume group and restore it to a target device. The target device could be a LUN presented as virtual SCSI or virtual Fibre Channel.

In this example the terms source system and target system are used:

Source system May be a standalone system or a logical partition

Target system A logical partition

The **mkcd** command produces a set of ISO files that were used to migrate data. Ensure that there is sufficient space in the chosen file system to store files that will add up to the size of the volume group being migrated.

On the source system

To make image files, there are two methods that will be detailed:

- Using the AIX **smitty mkcd** command
- The **mkcd** command line from an AIX shell

Choose whichever method is appropriate for your environment.

Using smitty to make the required images

The following steps detail the use of smitty to create the required images:

1. Run the **smitty mkcd** command as follows:

   ```
   # smitty mkcd
   ```

2. Select **No** from the Use an existing mksysb image menu. Selecting **No** allows you to create a new system backup that reflects your current running environment.
3. Select the options that are appropriate to your environment from the Back Up This System to CD menu. you can also leave the default options as they are.
4. For the File system to store final CD images question, you can leave it blank or chose to use an option such as an NFS file system.
5. Select **Yes** for the Do you want the CD to be bootable option.
6. Select **No** for the Remove final images after creating CD option.
7. Select **No** for the Create the CD now option.
8. Press Enter to begin the system backup creation.
9. Exit **smitty** when the OF status appears.

Using the AIX mkcd command-line method

To use the AIX **mkcd** command-line method, use the following procedures:

1. Run the **mkcd** command with the flags shown below. If you would like to use a non-default location to store the images, such as an NFS file share, you can include a -I /<*location flag*> at the end of the options, where <*location*> is the path for the final images. If you require a bootable copy of the volume group (for example, rootvg), omit the `-v rootvg` that is shown in the example command below:

```
# mkcd -v rootvg -V rootvg -R -S -A
Initializing mkcd log: /var/adm/ras/mkcd.log...
Verifying command parameters...
Creating information file for volume group datasrcvg.
Creating temporary file system: /mkcd/mksysb_image...
Creating savevg image...

Creating list of files to back up.

Backing up 9 files

9 of 9 files (100%)0512-038 savevg: Backup Completed Successfully.
Creating temporary file system: /mkcd/cd_fs...
Copying backup to the CD or DVD file system...

Creating Rock Ridge format image: /mkcd/cd_images/cd_image_401446
Running mkisofs ...

mkrr_fs was successful.



Removing temporary file system: /mkcd/cd_fs...
Removing temporary file system: /mkcd/mksysb_image...
```

2. To check which files where created, change the directory to the `/mkcd/cd_images` directory or the directory that you specified.
3. Issue the **ls** command. In this example, the default location to store the files was accepted.

```
$ cd /mkcd/cd_images
$ ls
$ cd_image_15364.vol1 cd_image_15364.vol2
```

4. Transfer the files from the images directory to the target Virtual I/O Server using a file transfer technology that best suits your environment.

On the Virtual I/O Server

A media repository and a virtual optical device must now be created. The media repository does not have to be on the rootvg. Any volume group accessible to the Virtual I/O Server will be acceptable, but there can only be one repository per Virtual I/O Server.

5. Make a media repository on the Virtual I/O Server rootvg as in the following command:

   ```
   $ mkrep -sp rootvg -size 10G
   ```

   A repository should be large enough to hold any and all images that you may have created for this migration. If additional space is required, you may resize the repository using the Virtual I/O Server **chrep** command with the size flag.

6. Create virtual optical media using the first volume of the files that you copied from the source dedicated system:

   ```
   $ mkvopt -name cd_image_15364.vol1 -file
   /home/padmin/cd_image_15364.vol1 -ro
   ```

   If your repository is large enough, you may load the rest of the media images into it at this stage by repeating the **mkvopt** command.

   In the previous **mkvopt** command, the -name parameter represents a logical unique name for you to refer to the object referenced with the -file parameter. cd_image_15364.vol1 could have been shortened to cd15364.1.

   If you have limited space available for the media repository, you can delete the image after you have used it with the **rmvopt** command, and then load the next image with the **mkvop**t command, as shown previously.

7. Create a file-backed virtual optical device that uses a virtual adapter on your target logical partition using the **mkvdev** command. You can assign a name using the -dev option. In this example the host already has a SCSI vhost adapter called vhost1 in use. There is no need to create a separate vhost for use by file-backed optical devices.

   ```
   $ mkvdev -fbo -vadapter vhost1 -dev vcd1
   vcd1 Available
   $
   ```

8. Load the virtual optical media file that was created earlier using the **mkvopt** command against the virtual optical device that you created in step 7 (vcd1 in this example):

   ```
   $ loadopt -disk cd_image_15364.vol1 -vtd vcd1
   ```

9. Use the **lsmap** command to ensure that the correct media is loaded as the backing device:

   ```
   lsmap -vadpater vhost1
   ```

10. If you have multiple media created and the procedure that you are running asks for the next CD in the sequence, use the Virtual I/O Server **unloadopt** command to unload the current virtual media and repeat step 8 on page 12 to load the next image.

```
$ unloadopt -vtd vcd1

$ loadopt -disk cd_image_15364.vol2 -vtd vcd1
```

If your repository size was not able to store all the images, repeat step 6 on page 12 to remove unneeded images with the **rmvopt** command and add the next image with the **mkvopt** command before using the **unloadopt** command in this step.

11. Run a final Virtual I/O Server **unloadopt** command at the end of the procedure to ensure that the virtual media is cleaned up.

12. Depending on your requirements, you may keep the current media repository or remove the virtual media objects using the Virtual I/O Server **rmvopt** command:

```
rmvopt cd_image_15364.vol1
```

On the target system

13. On the target system, look for a CD drive in the list of devices and use it as any other CD drive. The restore/recovery will read your virtual media image rather than physical media to complete the task.

2.2 Checking unique disk identification

Recognition of the correct disks is paramount in the physical-to-virtual migration processes regardless of the type of disk. SAN volumes and SCSI/SAS disks will be referred to with the generic term *disk* in this section.

There are three signatures that a disk may have written to it in the AIX/VIOS environment, which allow identification of that disk when it is migrated:

- Physical volume identifier (PVID)
- IEEE volume identifier
- Unique device identifier (UDID)

2.2.1 The physical volume identifier (PVID)

The PVID is written to a disk when the disk has been made a member of an AIX volume group and may be retained on the disk when the disk is removed from a volume group.

The quickest way of determining whether a disk has a PVID is to use the AIX/VIOS **lspv** command:

```
# lspv
hdisk0          000fe4012a8f0920                    rootvg
active
hdisk1          none                                None
hdisk2          000fe4012913f4bd                    None
hdisk3          none                                None
hdisk4          000fe401106cfc0c                    None
hdisk5          000fe4012b5361f2                    None
hdisk6          none                                None
hdisk7          none                                None
```

From the previous example of **lspv** command output:

- hdisk0 is a current member of the root volume group (rootvg).
- hdisk1 has never been in a volume group.
- hdisk2 has been in a volume group but is no longer a member.

Some of the commands used in this publication display a PVID as 32 digits, while many of the other commands only display 16 digits. At the time of writing, only the left-most 16 digits of a PVID are significant. Thus, for our purposes both of the following PVIDs displayed are equivalent:

```
002631cd31ad04f5
002631cd31ad04f50000000000000000
```

2.2.2 The IEEE volume identifier

A disk may have an IEEE volume identifier assigned.

On a Virtual I/O Server, the **lsdev** command may be used to display the IEEE ID (or ieee_volname, as it will be shown):

```
$ lsdev -dev hdisk2 -attr
attribute       value                             description
user_settable
PR_key_value    none                            Persistant Reserve Key Value
True
cache_method    fast_write                       Write Caching method
False
```

```
ieee_volname    600A0B8000110D0E0000000E47436859   IEEE Unique volume name
False
lun_id          0x0003000000000000                 Logical Unit Number
False
max_transfer    0x100000                           Maximum TRANSFER Size
True
prefetch_mult   1                                      Multiple of blocks to prefetch
on read False
pvid            none                               Physical volume identifier
False
q_type          simple                             Queuing Type
False
queue_depth     10                                 Queue Depth
True
raid_level      5                                  RAID Level
False
reassign_to     120                                Reassign Timeout value
True
reserve_policy  no_reserve                         Reserve Policy
True
rw_timeout      30                                 Read/Write Timeout value
True
scsi_id         0x660a00                           SCSI ID
False
size            20480                              Size in Mbytes
False
write_cache     yes Write Caching enabled False
```

From an AIX system, the **`lsattr -El diskX`** command will display the same information as shown in the preceding example.

2.2.3 The unique device identifier (UDID)

The UDID may be assigned to a disk if the disk is being managed by a multi path I/O (MPIO) driver.

On a Virtual I/O Server, the **`lsdev`** command can be used to display the UDID value, which appears in the command output as `unique_id`:

```
$ lsdev -dev hdisk6 -attr
attribute       value
description                     user_settable

PCM             PCM/friend/otherapdisk                                      Path
Control Module              False
PR_key_value    none
Persistant Reserve Key Value     True
algorithm     fail_over                                     Algorithm
True
autorecovery    no
Path/Ownership Autorecovery      True
```

```
clr_q           no                                                  Device
CLEARS its Queue on error True
cntl_delay_time 0
Controller Delay Time            True
cntl_hcheck_int 0
Controller Health Check Interval True
dist_err_pcnt   0
Distributed Error Percentage     True
dist_tw_width   50
Distributed Error Sample Time    True
hcheck_cmd      inquiry
Health Check Command             True
hcheck_interval 60                                                  Health
Check Interval            True
hcheck_mode     nonactive                                           Health
Check Mode                True
location                                                            Location
Label                    True
lun_id          0x0                                                 Logical
Unit Number ID           False
lun_reset_spt   yes                                                 LUN Reset
Supported               True
max_retry_delay 60                                                  Maximum
Quiesce Time             True
max_transfer    0x40000                                             Maximum
TRANSFER Size            True
node_name       0x200200a0b811a662                                  FC Node
Name                     False
pvid            000fe4017e0037d70000000000000000                    Physical
volume identifier       False
q_err           yes                                                 Use QERR
bit                      True
q_type          simple                                              Queuing
TYPE                      True
queue_depth     10                                                  Queue
DEPTH                       True
reassign_to     120                                                 REASSIGN
time out value           True
reserve_policy  single_path                                         Reserve
Policy                    True
rw_timeout      30
READ/WRITE time out value        True
scsi_id       0x11000                                   SCSI ID
False
start_timeout   60                                                  START
unit time out value         True
unique_id       3E213600A0B8000291B0800009D760401BBB80F1815      FAStT03IBMfcp Unique
device identifier         False
ww_name         0x201300a0b811a662                                  FC World
Wide Name               False
$
```

2.2.4 The chkdev command

As of Virtual I/O Server Fix Pack 22, a new command has been introduced to assist with the identification of disks and their capabilities. The Virtual I/O Server **chkdev** command is capable of displaying the same values as mentioned previously (IEEE, UDID, and PVID), but provides some additional information:

```
$ chkdev -dev hdisk6 -verbose
NAME:                hdisk6
IDENTIFIER:          3E213600A0B8000291B0800009D760401BBB80F1815      FAStT03IBMfcp
PHYS2VIRT_CAPABLE:   YES
VIRT2NPIV_CAPABLE:   NA
VIRT2PHYS_CAPABLE:   NA
PVID:                000fe4017e0037d70000000000000000
UDID:                3E213600A0B8000291B0800009D760401BBB80F1815      FAStT03IBMfcp
IEEE:
VTD:

$
```

In the command output you can see the PVID and UDID of the volume that the Virtual I/O Server will identify as the IDENTIFIER field. In addition, there are three capability fields:

PHYS2VIRT_CAPABLE This disk may be virtualized to a logical partition. Once this is performed, this field will change to a value of NA if the mapping is successful. A value of NO indicates that this volume may not be virtualized.

VIRT2NPIV_CAPABLE If the disk is capable of moving from a virtual SCSI environment to an N_Port ID Virtualization (NPIV) environment, this field will be set to YES. Otherwise, it will be set to NO. A value of NA means that this disk has already been moved and the Virtual Target Device (or VTD as it is abbreviated in the command output) will indicate the mapping.

VIRT2PHYS_CAPABLE If the device is capable of moving from a virtual environment to a physical environment and is currently mapped to a VTD then the value here will be YES. A value of NA means the disk is not in use by a VTD, while a value of NO means the disk is not capable of such a move.

For further information refer to the Virtual I/O Server **chkdev** manual page.

2.3 Creating a virtual SCSI device

In a virtual SCSI storage environment, the Virtual I/O Server owns the physical SCSI cards and disks. The disks are then configured as backing devices on the Virtual I/O Server so that client partitions can access these backing storage devices. Physical disks owned by the Virtual I/O Server can be assigned to client partitions in several different ways:

- The entire disk may be presented to the client partition.
- The disk may be carved up into multiple logical volumes and each logical volume can be presented to the client partition.
- Files can be created on the disks on the Virtual I/O Server and these files can be presented to the client partition as file-backed storage.

Thus, virtual SCSI enables the sharing of both SCSI adapters and disks.

To make a physical disk, logical volume, or file-backed storage device available to a client partition:

1. Create one or more virtual SCSI server adapters on the Virtual I/O Server. Assign server adapter IDs and also specify the adapter IDs that will be used on the client partition. For additional information see also:
   - *PowerVM Virtualization on IBM System p: Introduction and Configuration Fourth Edition*, SG24-7940
   - *IBM PowerVM Virtualization Managing and Monitoring*, SG24-7590
2. Create virtual SCSI client adapters on the client partition. Specify the same adapter IDs selected on the Virtual I/O Server.
3. Create the virtual target mappings on the Virtual I/O Server such that the client is connected to the correct server-side resources.

Virtual SCSI server adapters appear as vhost virtual devices on the Virtual I/O Server, as shown in the following command output:

```
$ lsdev -dev vhost*
name             status      description
vhost0           Available   Virtual SCSI Server Adapter
```

In the same way that a physical SCSI adapter allows access to multiple disks, a virtual SCSI host adapter allows many disks to be mapped to it. The following command is an example of how to map a disk—hdisk6 to a virtual SCSI host adapter vhost5:

```
$ mkvdev -vdev hdisk6 -vadapter vhost5
vtscsi2 Available
```

Figure 2-1 shows the relationship between physical SCSI disk and the target SCSI device on the Virtual I/O Server.

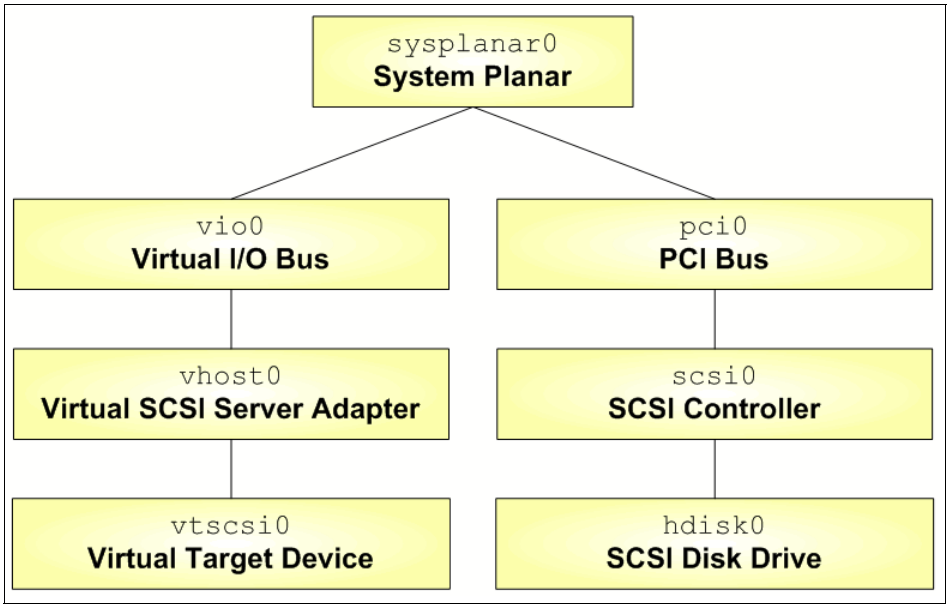

Figure 2-1 Relationship between physical and virtual SCSI on Virtual I/O Server

As mentioned earlier, client partitions access their assigned storage through a virtual SCSI client adapter. While the Virtual I/O Server may be presenting entire disks, logical volumes, or file-backed devices from physical SCSI or Fibre Channel adapters to a client through the vhost adapters, the client sees them all as virtual SCSI disk devices. The following command shows how a client partition sees the virtual SCSI device:

```
# lsdev -c disk -s vscsi
hdisk0 Available  Virtual SCSI Disk Drive
```

Figure 2-2 shows the relationship between physical SCSI disk and the virtual SCSI devices on a client partition.

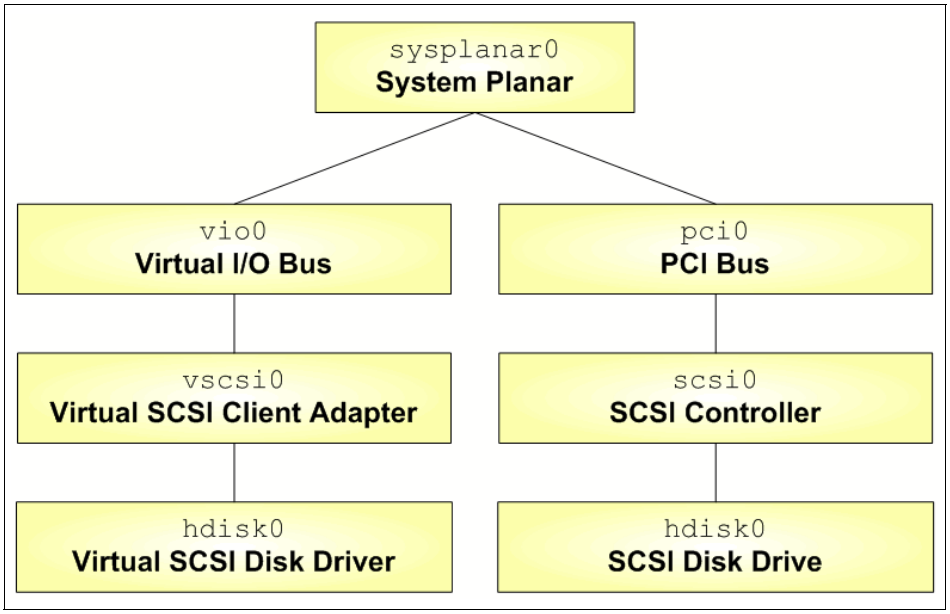

Figure 2-2 Relationship between physical and Virtual SCSI on client partition

Detailing the actual procedure of creating virtual SCSI devices follows. It is assumed that you have:

- A running Virtual I/O Server
- A physical SCSI or a Fibre Channel adapter that is presenting disk to the Virtual I/O Server, or both

On the HMC

The objective is to create the server and client adapters that will allow the disks being presented from a physical Fibre Channel adapter to be visible to a client partition.

1. On the HMC, you will see a panel similar to Figure 2-3 if you display the physical adapters attached to the Virtual I/O Server. In our example, the highlighted Fibre Channel adapter in slot C1 will be used.

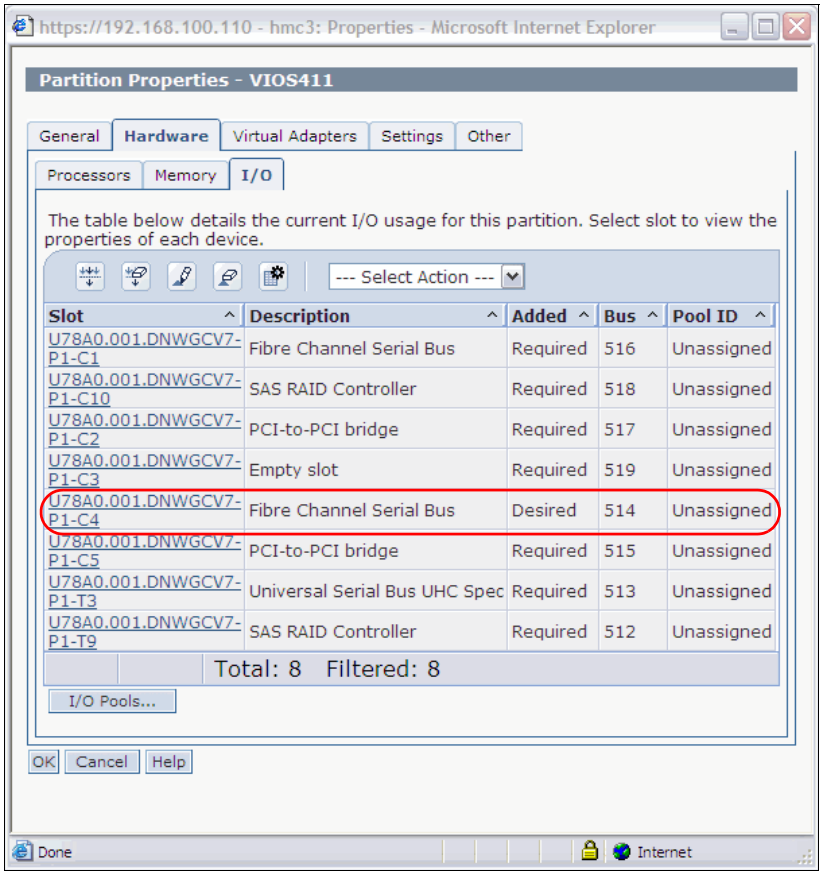

Figure 2-3 HMC Virtual I/O Server Physical Adapters panel

2. Select the client partition and display the Virtual Adapters panel. Make a note of a free slot number. This slot number will be needed in the following step.
3. Select the Virtual I/O Server and add a virtual SCSI server adapter. You will choose a free slot number on the Virtual I/O Server and map it to the slot number that you made a note of in the previous step. In our case, the server slot number is 17 and the client slot number is 9. In our example, the adapter

will be available to only a single partition since a specific partition was specified. This is the best practice, as we do not recommend making the adapter available to all clients. Figure 2-4 shows the panel to create the server adapter.

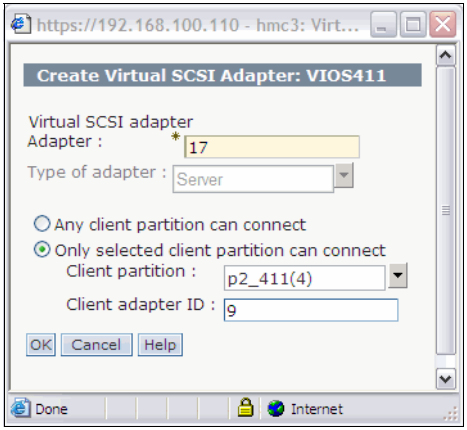

Figure 2-4 Create Virtual SCSI Server Adapter panel

For this example, the adapter was dynamically added. If you want your configuration to be permanent, add the adapter to the Virtual I/O Server profile in addition to dynamically adding it. Your display of the Virtual I/O Server virtual adapters panel will look similar to Figure 2-5 when this step is complete. The server adapter that was created is highlighted.

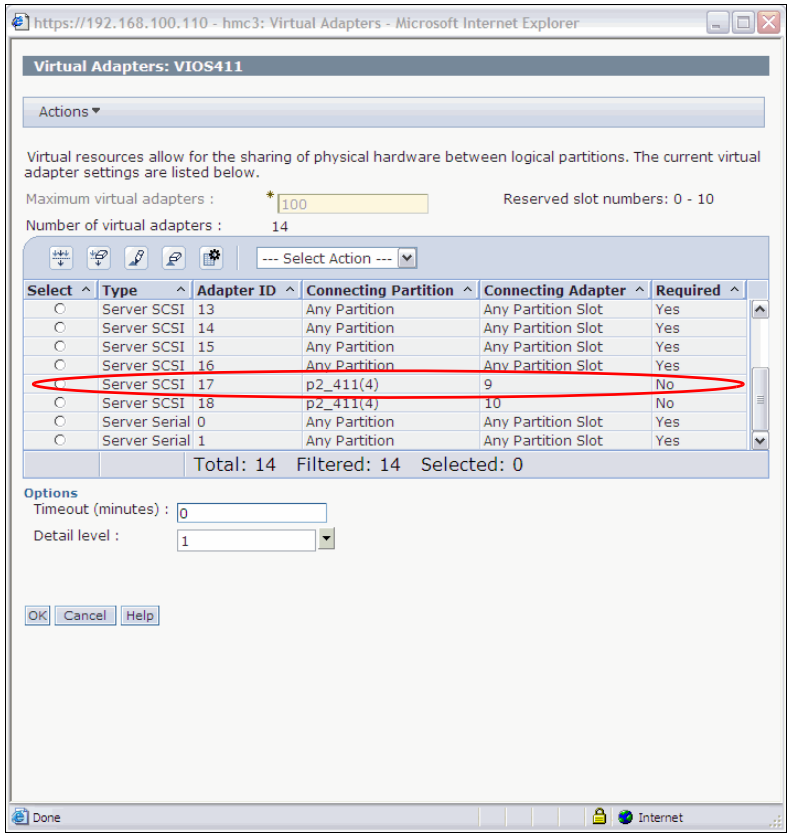

Figure 2-5 Virtual SCSI server adapter created on Virtual I/O Server

4. Create the virtual client adapter. You must use the same slot numbers that you selected in the previous step. In addition, select the check box **This adapter is required for partition activation** check box. Your display of the Client Virtual Adapters Properties panel should yield something similar to Figure 2-6 when this step is complete. Note from the figure that the adapter was added to the client partition profile and not dynamically added. This is required in our case because our client is not activated and will use the virtual SCSI device as its boot disk.

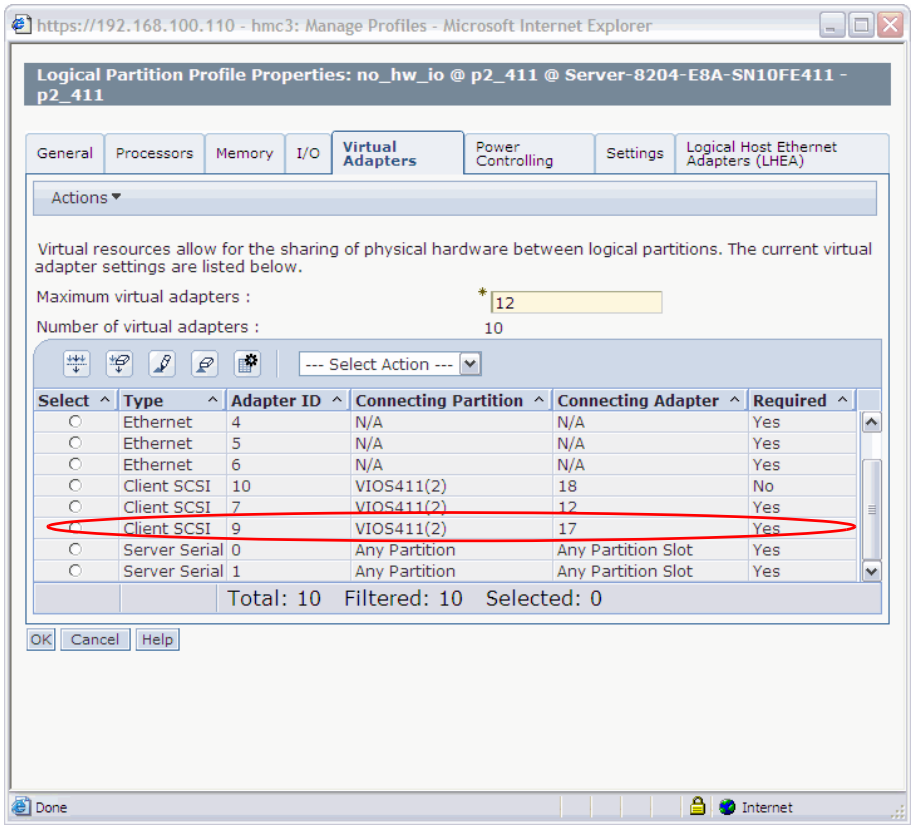

Figure 2-6 Matching virtual SCSI client adapter created in client profile

On the Virtual I/O Server

With the server and client adapters created on the HMC, mapping the storage to the adapters on the Virtual I/O Server must be completed.

5. Within the padmin restricted shell, run the **`cfgdev`** command to create the virtual SCSI server adapter defined in the previous steps on the HMC. In our case, this will create a new vhost6 virtual SCSI server adapter.

The first **lsmap** command in the following command output shows us that vhost6 is mapped to server slot C17 (as previously defined on the HMC) and currently has no virtual target device mapped to it. Noting the slot number is a good way to verify that you have selected the correct server adapter before proceeding. For the purpose of this example, the physical hdisk6 is the disk that the client partition should eventually use. To achieve this, run the **mkvdev** command, as shown below, to map hdisk6 to the client partition. The second **lsmap** command shows us that vhost6 now has hdisk6 as its backing device.

```
$ lsmap -vadapter vhost6
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost6          U8204.E8A.10FE411-V2-C17                    0x00000000

VTD                   NO VIRTUAL TARGET DEVICE FOUND

$ mkvdev -vdev hdisk6 -vadapter vhost6
vtscsi2 Available
$
$ lsmap -vadapter vhost6
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost6          U8204.E8A.10FE411-V2-C17                    0x00000004

VTD                   vtscsi2
Status                Available
LUN                   0x8100000000000000
Backing device        hdisk6
Physloc               U78A0.001.DNWGCV7-P1-C4-T1-W201300A0B811A662-L0
```

On the client partition

6. Once activated, the client partition will now have available to it a virtual boot disk. (Note that in certain situations, a SCSI reserve will prevent the destination client partition from using the migrated disk. In this case, the SCSI reserve must be released before attempting to use the SCSI device on the destination client partition.) Once the partition has booted up, the **lscfg** command may be used if required for final validation as in the command output below.

```
# lscfg -vl hdisk1
  hdisk1           U8204.E8A.10FE401-V2-C9-T1-L8100000000000000  Virtual
SCSI Disk Drive
#
```

In the previous output, C9 is our client slot number and 8100000000000000 matches the value of the LUN field in the **lsmap** command performed on the Virtual I/O Server. This serves as additional confirmation that the mapping of physical disk to virtual disk on the client was successful.

2.4 Virtual Fibre Channel and N_Port ID virtualization

N_Port ID virtualization (NPIV) is a technology that allows multiple logical partitions to access independent physical storage through the same physical Fibre Channel adapter. Each partition is identified by a pair of unique worldwide port names, enabling you to connect each partition to independent physical storage on a SAN. Unlike virtual SCSI, only the client partitions see the disk. The Virtual I/O Server acts only as a pass-through managing the data transfer through the POWER Hypervisor™.

NPIV is supported at certain minimum hardware configurations and software levels. Refer to the requirements that follow; the publication *IBM PowerVM Virtualization Managing and Monitoring*, SG24-7590; and the latest Virtual I/O Server documentation for more information.

NPIV is supported in PowerVM Express, Standard, and Enterprise Editions.

POWER6 processor-based servers require a minimum of one of the following items:

- 8 GB Fibre Channel adapter Feature Code 5735
- An NPIV capable SAN switch:
  - A Brocade SAN switch at firmware level 5.3.0 or later
  - A CISCO MDS 9000 SAN with the optional NPIV licensed feature installed

POWER6 Blade systems require a minimum of one of the following I/O cards:

- Emulex 8 Gigabit Fibre Card Feature Code 8240
- QLogic 8 Gigabit Fibre Card Feature Code 8271
- QLogic 8 Gigabit Fibre Card + 1 Gigabit Ethernet Feature Code 8242

  JS12 and JS22 Blades support only the CFFh adapter, and JS23 and JS43 support the CIOv adapters.

In addition, there are some restrictions on SAN switches and firmware levels. Check with your IBM support representative for the currently supported levels.

To enable NPIV, assign the physical NPIV-capable Fibre Channel adapter to a Virtual I/O Server and connect virtual Fibre Channel adapters on the client partition to virtual Fibre Channel adapters on the Virtual I/O Server.

Detailing the procedure to use NPIV follows. In the scenario described, it is assumed that you have:

- A running standalone source host with rootvg on a SAN LUN
- A Virtual I/O Server with a physical NPIV-capable Fibre Channel adapter allocated to it
- A destination client partition that is currently running with rootvg on virtual SCSI disk

The client partition will be reconfigured such that it boots using the migrated SAN LUN using virtual Fibre Channel.

Note: Be sure to have the virtual Fibre Channel client file set installed on the standalone SAN rootvg before shutting down your standalone host for migration. This is required for virtual Fibre Channel when rootvg is started on the client partition.

On the HMC

Create the virtual Fibre Channel mappings that will allow the destination client partition to see what was previously the source standalone server's rootvg SAN LUN.

1. Create the virtual Fibre Channel server adapter on the Virtual I/O Server. Something similar to the highlighted portion in Figure 2-7 is what you should see when this step is complete.

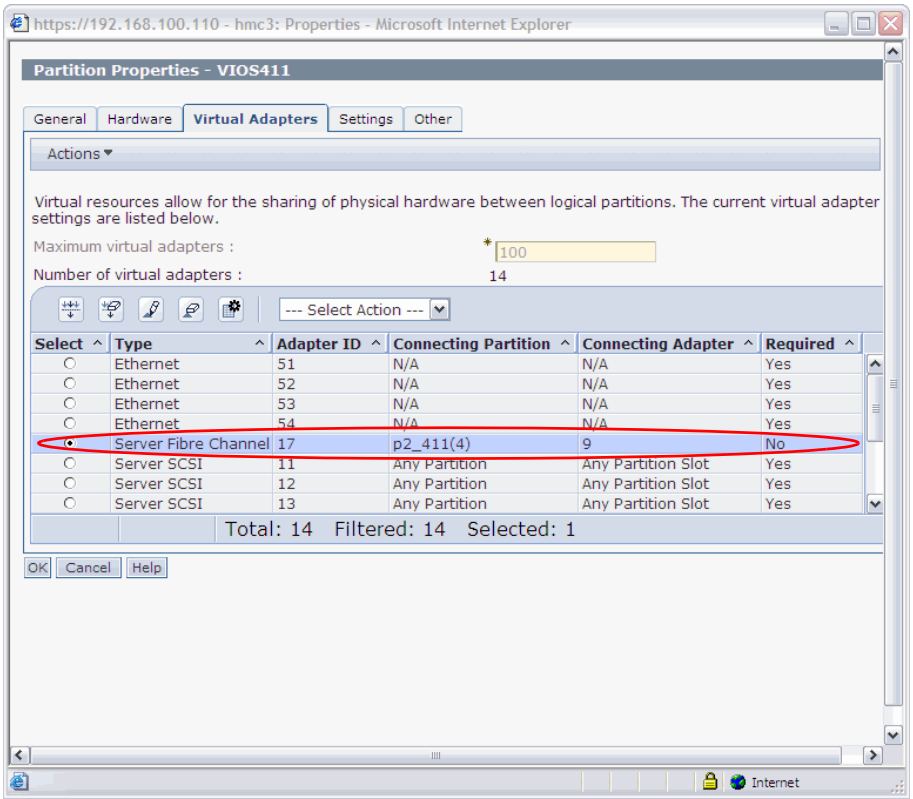

Figure 2-7 Virtual Fibre Channel server adapter created on Virtual I/O Server

2. Create the virtual Fibre Channel client adapter in the client partition profile. If you want the adapter and storage to be visible after a partition shutdown, save the configuration to a new profile and use the new profile when starting up the partition. You should see something similar to the highlighted portion in Figure 2-8 when this step is complete.

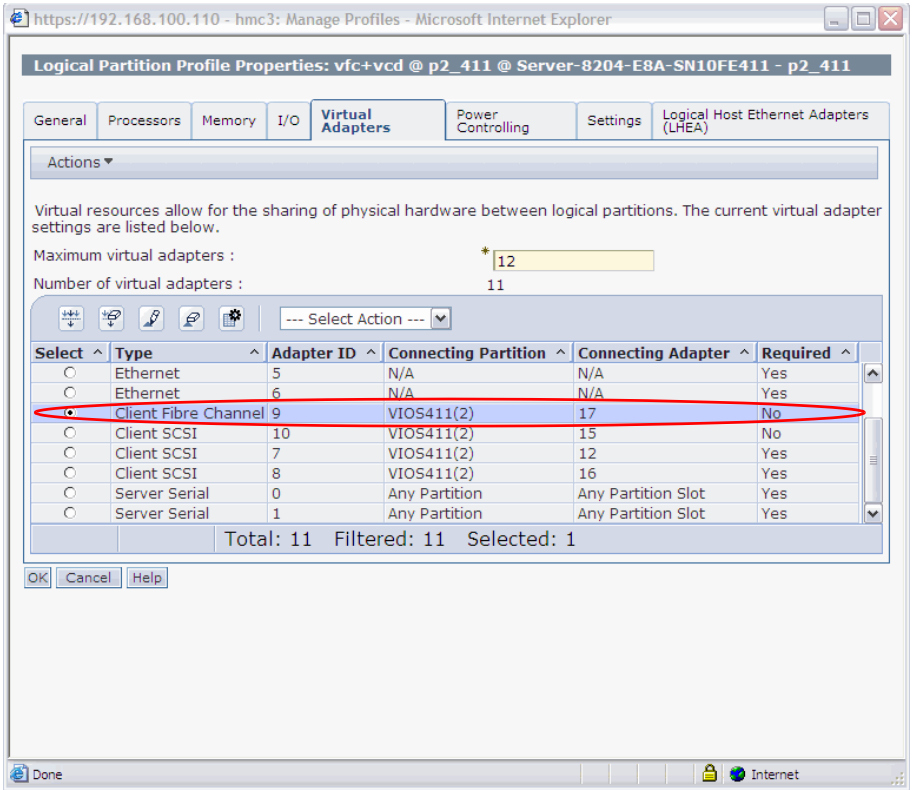

Figure 2-8 Virtual Fibre Channel client adapter created in client partition profile

Note: A POWER Hypervisor has a limit of 32,000 pairs of WWPNs. If you run out of WWPNs, you must obtain an activation code for an additional set of 32,000 pairs.

Note: Each time that you configure a virtual Fibre Channel adapter, whether dynamically or by adding to a partition profile, the HMC obtains a new, non-reusable, pair of WWPNs from the POWER Hypervisor. Therefore, the correct procedure for dynamically allocating a virtual Fibre Channel adapter to an active partition that must keep the configuration across a partition shutdown is to first dynamically allocate the adapter to the partition and then use the HMC Save Current Configuration feature to save the configuration to a new profile. This new profile then must be used to start the partition after a shutdown. This ensures that the WWPNs that were allocated during the dynamic operation will be the same ones in the profile. If instead you dynamically add an adapter and then add an adapter to the partition profile, the partition will come up with a different pair of WWPNs after a partition shutdown and access to the storage will be lost.

On the standalone source host

3. Shut down the standalone host and remap the SAN rootvg LUN on the Fibre Channel switches from the standalone host's physical Fibre Channel adapter to the client partition virtual Fibre Channel adapter. The WWPNs will be found in the client virtual Fibre Channel adapter properties and will look similar to Figure 2-9.

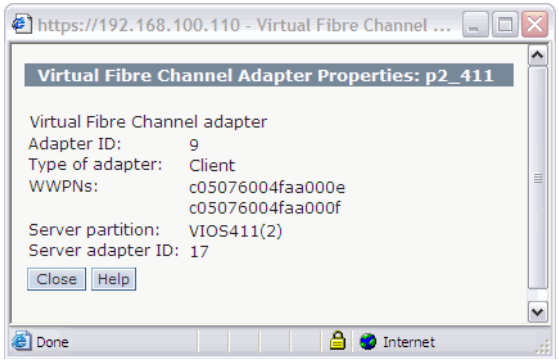

Figure 2-9 Virtual Fibre Channel Adapter Properties

To get to the above panel, on the HMC select the client partition, click **Properties** from the Tasks menu. Select the **Virtual Adapters** tab on the panel that appears. Select the Client Fibre Channel adapter line. From Actions, select **Properties**.

On the Virtual I/O Server

You will now activate the virtual adapters defined in the previous step and map the virtual adapter to the physical Fibre Channel adapter.

4. Log in to the Virtual I/O Server as the padmin user and run the **cfgdev** command to get the virtual Fibre Channel adapter configured.
5. Get the list of all available virtual Fibre Channel server adapters using the **lsdev** command:

```
$ lsdev -dev vfchost*
name             status      description
vfchost0         Available   Virtual FC Server Adapter
```

6. Get the list of all available physical Fibre Channel server adapters. As you can see from the **lsdev** command output, our NPIV-supported dual-port Fibre Channel card is at fcs0 and fcs1. Since only the second port is cabled on the card in this test environment, fcs1 must be selected.

```
$ lsdev -dev fcs*
name             status      description
fcs0             Available   8Gb PCI Express Dual Port FC Adapter (df1000f114108a03)
fcs1             Available   8Gb PCI Express Dual Port FC Adapter (df1000f114108a03)
fcs2             Defined     4Gb FC PCI Express Adapter (df1000fe)
fcs3             Defined     4Gb FC PCI Express Adapter (df1000fe)
fcs4             Available   FC Adapter
fcs5             Available   FC Adapter
```

7. Run the **lsnports** command to check the Fibre Channel adapter NPIV readiness of the adapter and the SAN switch. Since the fabric attribute is set to 1, the configuration is NPIV ready so the migration can proceed. If you see a state of 0, check the configuration of your adapter or SAN switch, or both.

```
$ lsnports
name             physloc                        fabric tports aports swwpns  awwpns
fcs1             U78A0.001.DNWGCV7-P1-C1-T2          1     64     64   2048    2048
```

8. Use the **vfcmap** command to map the virtual adapter to the physical adapter. The **lsmap** command lists out the mapping created by the **vfcmap** command:

```
$ vfcmap -vadapter vfchost0 -fcp fcs1
$
$ lsmap -npiv -vadapter vfchost0
Name          Physloc                            ClntID ClntName       ClntOS
------------- ---------------------------------- ------ -------------- -------
vfchost0      U8204.E8A.10FE411-V2-C17                4 p2_411         AIX

Status:LOGGED_IN
FC name:fcs1                    FC loc code:U78A0.001.DNWGCV7-P1-C1-T2
```

```
Ports logged in:7
Flags:a<LOGGED_IN,STRIP_MERGE>
VFC client name:fcs0            VFC client DRC:U8204.E8A.10FE411-V4-C9-T1
```

In your **lsmap** output, you may not see the Status as LOGGED_IN if you had not already mapped the SAN LUN to the Virtual I/O Server.

On the SAN and storage devices

You can do the SAN mapping now by proceeding with the following steps:

9. There are two scenarios that you should be aware of: dynamically creating a virtual Fibre Channel and non-dynamic mode, that is, when you configure the profile of a logical partition that is not currently running.
   a. If you dynamically configure the virtual Fibre Channel client adapter into the logical partition, the world wide port names (WWPNs) that get created are immediately presented to the SAN fabric.

      This has the benefit of allowing you to immediately change the SAN zoning and storage mapping to the new WWPNs.

   b. if you do not use the dynamic partition tools, and edit the profile of the logical partition, you must use a slightly longer process to perform the mapping if your target storage does not allow you to directly type in the new WWPNs. Boot the logical partition using the SMS mode, then use the following steps to force the vfc-client device to log in to the SAN fabric:
      i. Type 5 and press Enter to access the Select Boot Options panel.
      ii. Type 1 and press Enter to access the Select Device Type panel.
      iii. Type 5 and press Enter to access the Hard Drive Panel.
      iv. Type 3 and press Enter to use SAN media.

At this point, the following SMS panel is displayed:

```
--------------------------------------------------------------------------------
 Select Media Adapter
 1.          U8204.E8A.10FE411-V2-C9-T1   /vdevice/vfc-client@30000008
 2.   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:
```

c. Type 1 and press Enter. At this stage the WWPNs are presented to the SAN Fabric.

> **Tip:** You do not have to leave this screen. Leave it open so that you can complete the procedure.

d. Now have your SAN team perform the zone changes and any storage device mapping.

   If you think that your system has not shut down cleanly or you are performing a live migration, you may be required to break any SCSI 2 reserves using the SAN GUI or CLI appropriate to your storage subsystem.

> **Note:** If your SAN or storage people cannot see the WWPNs on the storage device, you may be required to complete another scan by following steps b and c again.

In Figure 2-10, the relationship between the virtual Fibre Channel components and what the SAN switch sees is shown.

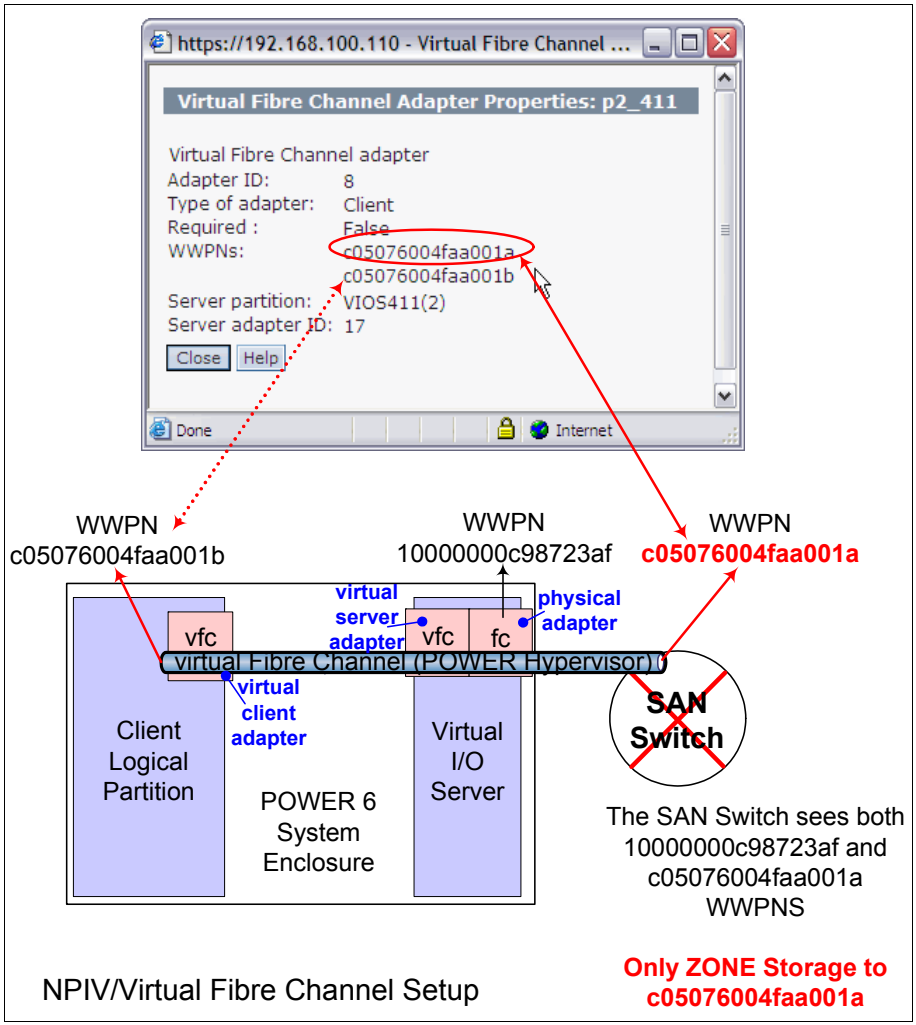

Figure 2-10 Virtual Fibre Channel concepts

10. In some cases you may be required to verify that WWPNs can be seen on the SAN. In the examples used here, we use an IBM 2005-B16 SAN switch. The commands will work on any IBM B Series or Brocade switch with firmware equal to or greater than FOS 5.3.0. Two methods are presented:
    - Using the Web-based SwitchExplorer interface
    - Using **`telnet`**

Method 1: the SwitchExplorer Web Interface

a. Use your Web browser to point to the URL of your SAN switches' IP address, then log in to the SAN switch with a user login with at least read access. You should see a panel similar to the one shown in Figure 2-11.

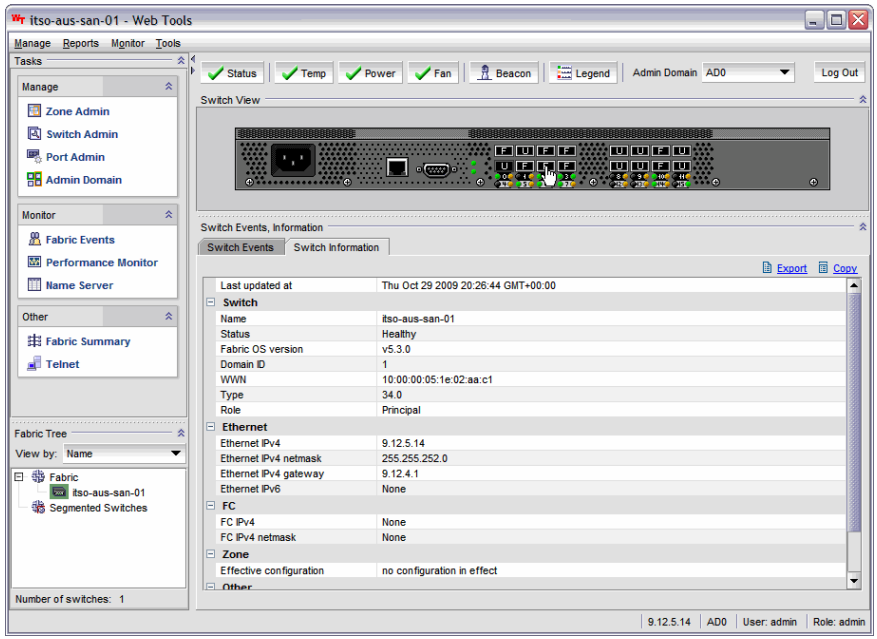

Figure 2-11 SAN Switch panel

b. In Figure 2-11 on page 35, port 6 has been highlighted since this is our physical port from our cabling diagram. Click the port to bring up the port details. You will see a panel similar to that shown in Figure 2-12.

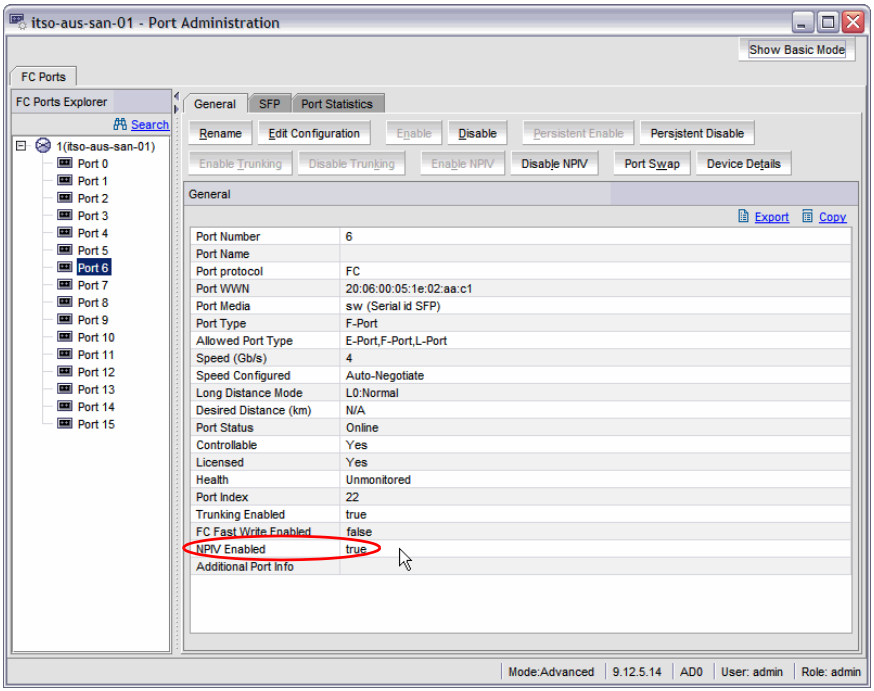

Figure 2-12 SAN port details

c. Note that the port selected has the entry NPIV Enabled set to a value of True. This is highlighted in Figure 2-12. If the value is set to false then this should be rectified before continuing this procedure.

Next select the **Device Details** tab, which is in the upper right-most area of the panel.

d. The panel shown in Figure 2-13 is displayed.

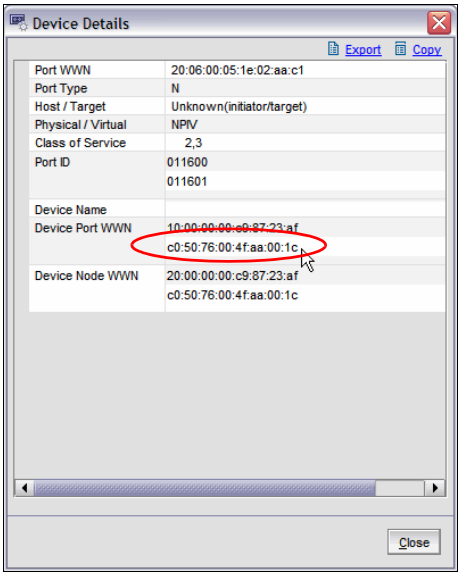

Figure 2-13 SAN port device details

The highlighted device port WWN is one that would be expected to be seen. This means our virtual Fibre Channel connection has correctly presented the virtual Fibre Channel to the SAN Switch. Some disk storage devices may take a few seconds before the WWPN is presented to them.

Method 2: using telnet

a. **`telnet`** to the SAN switches' management IP address and log in to the SAN switch with a user login with at least read access. You should see a prompt similar to the following:

```
itso-aus-san-01:admin>
```

In the prompt, itso-aus-san-01 is the name of the example SAN switch and admin is the login user account. Your switch name and possibly your user ID will be different.

b. Use the **`portcfgshow`** command to determine whether the port that you are using has the NPIV capability value set to ON:

```
itso-aus-san-01:admin> portcfgshow
Ports of Slot 0    0  1  2  3    4  5  6  7    8  9 10 11   12 13 14 15
-----------------+--+--+--+--+----+--+--+--+----+--+--+--+----+--+--+--
Speed             AN AN AN AN   AN AN AN AN   AN AN AN AN   AN AN AN AN
Trunk Port        ON ON ON ON   ON ON ON ON   ON ON ON ON   ON ON ON ON
Long Distance     .. .. .. ..   .. .. .. ..   .. .. .. ..   .. .. .. ..
```

```
VC Link Init      .. .. .. ..   .. .. .. ..   .. .. .. ..   .. .. .. ..
Locked L_Port     .. .. .. ..   .. .. .. ..   .. .. .. ..   .. .. .. ..
Locked G_Port     .. .. .. ..   .. .. .. ..   .. .. .. ..   .. .. .. ..
Disabled E_Port   .. .. .. ..   .. .. .. ..   .. .. .. ..   .. .. .. ..
ISL R_RDY Mode    .. .. .. ..   .. .. .. ..   .. .. .. ..   .. .. .. ..
RSCN Suppressed   .. .. .. ..   .. .. .. ..   .. .. .. ..   .. .. .. ..
Persistent Disable.. .. .. ..   .. .. .. ..   .. .. .. ..   .. .. .. ..
NPIV capability   ON ON ON ON   ON ON ON ON   ON ON ON ON   ON ON ON ON

                  where AN:AutoNegotiate, ..:OFF, ??:INVALID,
                  SN:Software controlled AutoNegotiation.
itso-aus-san-01:admin>
```

c. Issue a **portshow** command against the number of the port that you are interested in (port 6 in our case). The output is long, but you must look for two pieces of information:

   i. The portFlags field should show a keyword of NPIV in the output.

   ii. The lines that start with portWwn should show that your client virtual Fibre Adapter WWPN is listed. This has been highlighted for clarity in the following example:

```
itso-aus-san-01:admin> portshow 6
portName:
portHealth: No Fabric Watch License

Authentication: None
portDisableReason: None
portCFlags: 0x1
portFlags: 0x1024b03     PRESENT ACTIVE F_PORT G_PORT U_PORT NPIV
LOGICAL_ONLINE

LOGIN NOELP LED ACCEPT FLOGI
portType:  11.0
POD Port: Port is licensed
portState: 1    Online
portPhys:  6    In_Sync
portScn:   32   F_Port
port generation number:    64
portId:    011600
portIfId:    43020006
portWwn:   20:06:00:05:1e:02:aa:c1
portWwn of device(s) connected:
        c0:50:76:00:4f:aa:00:1c
        10:00:00:00:c9:87:23:af
Distance:  normal
portSpeed: N4Gbps

LE domain: 0
FC Fastwrite: OFF
Interrupts:        121       Link_failure: 1          Frjt:         0
Unknown:           23        Loss_of_sync: 7          Fbsy:         0
```

```
   Lli:               109        Loss_of_sig:  7
   Proc_rqrd:         2422       Protocol_err: 0
   Timed_out:         0          Invalid_word: 0
   Rx_flushed:        0          Invalid_crc:  0
   Tx_unavail:        0          Delim_err:    0
   Free_buffer:       0          Address_err:  0
   Overrun:           0          Lr_in:        5
   Suspended:         0          Lr_out:       2
   Parity_err:        0          Ols_in:       1
   2_parity_err:      0          Ols_out:      5
   CMI_bus_err:       0

   Port part of other ADs: No
   itso-aus-san-01:admin>
```

d. From the **portshow** command output, note that the WWPN has been presented to the SAN switch. You can also check to see whether the virtual WWPN has a valid login status using the **portLoginShow** command. The presence of the WWPN with a PID value greater than 0 indicates a valid login state:

```
itso-aus-san-01:admin> portloginshow 6
Type  PID     World Wide Name        credit df_sz cos
=====================================================
  fe  011601  c0:50:76:00:4f:aa:00:1c    40  2048   c  scr=3
  fe  011600  10:00:00:00:c9:87:23:af    40  2048   c  scr=3
  ff  011601  c0:50:76:00:4f:aa:00:1c    12  2048   c  d_id=FFFFFC
  ff  011600  10:00:00:00:c9:87:23:af    12  2048   c  d_id=FFFFFC
itso-aus-san-01:admin>
```

The command output indicates that the virtual Fibre Channel WWPNs are correctly registered with the SAN switch.

Note: If your output does not show your expected WWPNs as detailed in either the SwitchExplorer or **telnet** sections above, you should consult with your SAN specialist before proceeding.

On the destination client partition

Boot the client partition using the virtual Fibre Channel drive that was mapped in the previous steps. Keep in mind that since you are coming from a standalone server with physical Ethernet interfaces, you may have to reconfigure the Ethernet on the destination client partition to get network access.

11. If not already in the SMS menu, shut down the client partition and reactivate the partition into SMS.

12. Select option number 5 from the menu (Select Boot Options), find the Fibre Channel drive, and initiate a boot from this device. The device should look like the one shown in the following SMS example:

```
--------------------------------------------------------------------------------
```

```
Select Device
Device  Current  Device
Number  Position  Name
1.        -      SCSI 14 GB FC Harddisk, part=2 (AIX 6.1.0)
       ( loc=U8204.E8A.10FE411-V4-C9-T1-W201300a0b811a662-L0 )

--------------------------------------------------------------------------------

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
```

13. Type 1 and press Enter in the SMS menu, then perform a Normal Mode Boot, as shown here:

```
--------------------------------------------------------------------------------
Select Task

SCSI 14 GB FC Harddisk, part=2 (AIX 6.1.0)
    ( loc=U8204.E8A.10FE411-V4-C9-T1-W201300a0b811a662-L0 )

 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
```

14. Enter option 1 to exit the SMS menu, as shown here:

```
--------------------------------------------------------------------------------
 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
```

15. Verify that the client has booted with the same LUN that was on the standalone machine via the virtual Fibre Channel adapter. The **getconf** command is another way to discover the boot device. The **lspv** command gives us added confirmation that rootvg is on hdisk8, and the **lsdev** and **lscfg** commands show us that hdisk8 is a SAN disk.

```
# getconf BOOT_DEVICE
hdisk8
# lspv | grep hdisk8
hdisk8          000fe401727b47c5                    rootvg          active
#
# lsdev -c disk | grep hdisk8
hdisk8 Available C9-T1-01 MPIO Other DS4K Array Disk
#
# lscfg -vl hdisk8
  hdisk8           U8204.E8A.10FE411-V4-C9-T1-W201300A0B811A662-L0  MPIO
Other DS4K Array Disk

        Manufacturer.................IBM
        Machine Type and Model......1815      FAStT
        ROS Level and ID............30393134
        Serial Number...............
        Device Specific.(Z0).........0000053245005032
        Device Specific.(Z1).........
```

The remaining **lsdev** commands list out all Fibre Channel adapters and show how hdisk8 maps back to the virtual Fibre Channel adapter fcs2:

```
# lsdev|grep fcs
fcs0       Defined   07-00         4Gb FC PCI Express Adapter (df1000fe)
fcs1       Defined   07-01         4Gb FC PCI Express Adapter (df1000fe)
fcs2       Available C9-T1         Virtual Fibre Channel Client Adapter
#
# lsdev -l hdisk8 -F parent
fscsi2
# lsdev -l fscsi2 -F parent
fcs2
```

The migration is now complete.

3

Standalone SCSI rootvg to virtual SCSI

This chapter details the migration of a standalone client with a rootvg on local disk to a logical partition with a disk presented via a Virtual I/O Server using virtual SCSI.

Figure 3-1 shows an overview of the process.

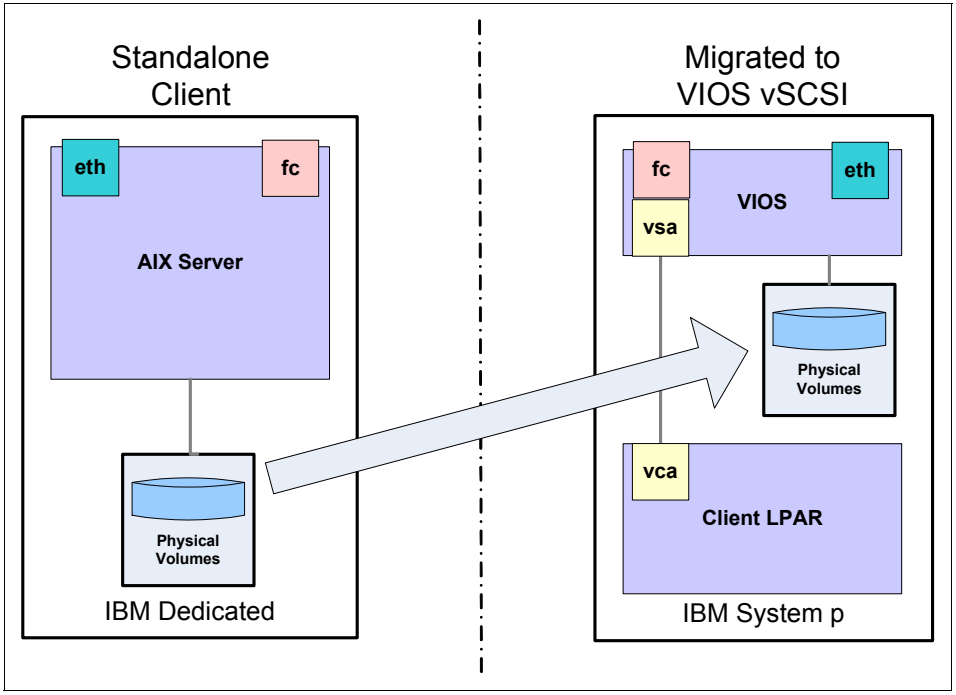

Figure 3-1 Migration from standalone rootvg on local disk to a logical partition

Local disks on standalone machines are not accessible to a Virtual I/O Server. Therefore, the data on the disks comprising rootvg must be transferred to disks accessible by the target Virtual I/O Server or the physical standalone disk must be moved to a location that the Virtual I/O Server can access.

Note that instructions to physically move a standalone hard disk to a Virtual I/O Server are not covered by this guide since the required instructions are hardware specific. If you have the capability to move the standalone disk to the virtualized system enclosure/CEC containing the target Virtual I/O Server then you can:

- Physically move the disks to the new location.
- Follow the instructions in 2.3, “Creating a virtual SCSI device” on page 18, to map your disks to the logical partition.

As with any migration, planning is essential. Our instructions generally refer to a single disk rootvg environment. If you have multiple disks in your rootvg then:

- If the rootvg is mirrored across the disks, you may want to break the mirror first. This gives you a recovery point if any problem occurs.
- If the rootvg is striped across a number of disks then our recommendation is that you use the method in 3.1, “Back up to CD and restore” on page 46.

There are four methods provided in this chapter to migrate the data from a standalone disk to a Virtual I/O Server virtual SCSI-managed disk. Different methods will appeal to each systems administrator depending on the skill level and availability of other team personnel such as SAN administrators and backup operators. Our suggestion is to choose the method that gives you the best flexibility with as little risk as possible based on your service-level requirements. The methods are listed below in no significant order:

- Back up to CD/Tape and restore on Virtual I/O Server managed disk.
- Mirror rootvg disks to SAN disks.
- Clone rootvg to an external disk.
- Other methods such as NIM.

Each method is discussed in the following sections in detail.

3.1 Back up to CD and restore

This migration uses the file backed optical feature of the Virtual I/O Server to present a number of previously made ISO images to the target logical partition as though these images where physical CD media. The advantage of this method is that it could be used to provision logical partitions very quickly from a master image copy, for example, in a development environment or if performing any form of diagnostics.

The steps for the migration follow.

On the standalone server: part 1

The first step is to determine how big the destination disk must be.

1. Determine the required size of a destination disk for the migration by using the AIX **lsvg** command on the rootvg:

```
# lsvg rootvg
VOLUME GROUP:       rootvg                  VG IDENTIFIER:
000fe4010000d9000000012478906561
VG STATE:           active                  PP SIZE:        256 megabyte(s)
VG PERMISSION:      read/write              TOTAL PPs:      546 (139776 megabytes)
MAX LVs:            256                     FREE PPs:       508 (130048 megabytes)
LVs:                13                      USED PPs:       38 (9728 megabytes)
OPEN LVs:           11                      QUORUM:         2 (Enabled)
TOTAL PVs:          1                       VG DESCRIPTORS: 2
STALE PVs:          0                       STALE PPs:      0
ACTIVE PVs:         1                       AUTO ON:        yes
MAX PPs per VG:     32512
MAX PPs per PV:     1016                    MAX PVs:        32
LTG size (Dynamic): 1024 kilobyte(s)        AUTO SYNC:      no
HOT SPARE:          no                      BB POLICY:      relocatable
```

2. Calculate the size from the number of physical partitions and the physical partition size. You only need the USED PPs and a small margin and do not have to allocate a full disk if the rootvg is not required to grow.
3. Back up the rootvg to CD images using the **mkcd** command:
   a. Run the **smitty mkcd** command as follows:

      ```
      # smitty mkcd
      ```

   b. Select **No** from the Use an existing mksysb image menu. Selecting **No** allows you to create a new system backup that reflects your currently running environment.
   c. Select the options that are appropriate to your environment from the Back Up This System to CD menu. You can also leave the default options as they are.

d. For the File system to store final CD images question, you can leave it blank or chose to use options such as an NFS file system. An NFS file system was used in this example (the /mnt/cdiso NFS file system that was previously created).

e. Select **Yes** for the Do you want the CD to be bootable option.

f. Select **No** for the Remove final images after creating CD option.

g. Select **No** for the Create the CD now option.

h. Press Enter to begin the system backup creation. When the operation completes successfully, there is a file or files located in the default `/mkcd/cd_images` directory or the location that you specified if you modified the input in step 3 on page 46d.

i. To check which files where created, exit **`smitty`** and change the directory to the directory that you provided at step d above. Issue the **`ls`** command.

In this example an NFS file system was used to store the files:

```
# ls /mnt/cdiso/cd_*
/mnt/cdiso/cd_image_82472.vol1  /mnt/cdiso/cd_image_82472.vol3
/mnt/cdiso/cd_image_82472.vol2  /mnt/cdiso/cd_image_82472.vol4
#
```

On the Virtual I/O Server: part 1

On the Virtual I/O Server, create the disk and map to the required logical partition:

4. Allocate a destination disk and verify that it meets the allocated size of the standalone client's rootvg as determined from the previous steps. The disk may be a LUN presented by a virtual SCSI, or from a storage pool on the Virtual I/O Server.

5. Create a mapping using the allocated disk from the Virtual I/O Server to the client logical partition using the Virtual I/O Server **`mkvdev`** command:

```
$ mkvdev -vdev vp1rootvg -vadapter vhost0
```

6. Ensure that you have already created at least one virtual SCSI adapter between the target Virtual I/O Server and the logical partition. Use the **`lsdev -virtual`** command for verification:

```
$ lsdev -virtual
name             status      description
ent4             Available   Virtual I/O Ethernet Adapter (l-lan)
ent5             Available   Virtual I/O Ethernet Adapter (l-lan)
ent6             Available   Virtual I/O Ethernet Adapter (l-lan)
ent7             Available   Virtual I/O Ethernet Adapter (l-lan)
```

```
vasi0           Available   Virtual Asynchronous Services Interface
(VASI)
vbsd0           Available   Virtual Block Storage Device (VBSD)
vhost0          Available   Virtual SCSI Server Adapter
vhost1          Available   Virtual SCSI Server Adapter
vhost2          Available   Virtual SCSI Server Adapter
vhost3          Available   Virtual SCSI Server Adapter
vhost4          Available   Virtual SCSI Server Adapter
vhost5          Available   Virtual SCSI Server Adapter
vhost6          Available   Virtual SCSI Server Adapter
vsa0            Available   LPAR Virtual Serial Adapter
vcd1            Available   Virtual Target Device - File-backed
Optical
vp1rootvg       Available   Virtual Target Device - Logical Volume
vp2rootvg       Available   Virtual Target Device - Logical Volume
vp3rootvg       Available   Virtual Target Device - Logical Volume
vp4rootvg       Available   Virtual Target Device - Logical Volume
vtopt0          Available   Virtual Target Device - File-backed
Optical
vtscsi0         Available   Virtual Target Device - Logical Volume
vtscsi1         Available   Virtual Target Device - Disk
vtscsi2         Available   Virtual Target Device - Disk
name            status      description
ent8            Available   Shared Ethernet Adapter
```

7. The Virtual I/O Server **lsmap** command can be used to check that the correct disk is mapped to the client logical partition. For clarity only the required entry has been shown below:

```
$ lsmap -all | more
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost0          U8204.E8A.10FE411-V2-C11                    0x00000003

VTD                   vtscsi0
Status                Available
LUN                   0x8100000000000000
Backing device        p1rootvg
Physloc
```

8. Create the virtual optical device using the **mkvdev** command. In this example the same vhost that is assigned to the disk volume is used. There is no need to create a separate vhost for use by file-backed optical devices:

```
$ mkvdev -fbo -vadapter vhost0
vtopt1 Available
$
```

9. Use the Virtual I/O Server **lsmap** command to verify that the device has been created:

```
$ lsmap -all | more
SVSA            Physloc                                      Client Partition ID
--------------- -------------------------------------------- ------------------
vhost0          U8204.E8A.10FE411-V2-C11                     0x00000003

VTD                   vtopt1
Status                Available
LUN                   0x8200000000000000
Backing device
Physloc

VTD                   vtscsi0
Status                Available
LUN                   0x8100000000000000
Backing device        p1rootvg
Physloc
<output truncated>
```

10. Make a media repository on the Virtual I/O Server rootvg. It must be big enough to hold any and all images that you may have created for this migration. However, you may resize the repository using the Virtual I/O Server **chrep** command with the size flag if you run out of space.

    a. Use the **mkrep** command to create the repository:

    ```
    $ mkrep -sp rootvg -size 10G
    ```

    b. The **lsrep** command confirms that the repository has been created:

    ```
    $ lsrep
    Size(mb) Free(mb) Parent Pool         Parent Size      Parent Free
       10198    10198 rootvg                  139776            81920
    $
    ```

    c. You now load the first of the required images into the repository using the **mkvopt** command:

    ```
    $ mkvopt -name cd_image_82472.1 -file /updates/cd_image_82472.vol1 -ro
    ```

d. The **lsrep** command can be used to show which images you have loaded into the repository:

```
$ lsrep
Size(mb) Free(mb) Parent Pool         Parent Size      Parent Free
   10198     9595 rootvg                   139776            81920

Name                                  File Size Optical         Access
cd_image_82472.1                            603 None            ro
```

11. Load the virtual optical media file that was created earlier using the **mkvopt** command against the virtual optical device that you created in step 6 on page 47 above (vtopt1 in this example) using the **loadopt** command:

```
$ loadopt -disk cd_image_82472.1 -vtd vtopt1
```

12. A final Virtual I/O Server l**smap** command can be used to ensure that you have the correct media loaded:

```
$ lsmap -all | more
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost0          U8204.E8A.10FE411-V2-C11                    0x00000003

VTD                   vtopt1
Status                Available
LUN                   0x8200000000000000
Backing device        /var/vio/VMLibrary/cd_image_82472.1
Physloc

VTD                   vtscsi0
Status                Available
LUN                   0x8100000000000000
Backing device        p1rootvg
Physloc
<output truncated>
```

On the HMC

Using the HMC, activate the client logical partition and restore the backup. The method is the same as though you were using a CD-ROM from the Virtual I/O Server with the CD media, except that there is a copy of the media on disk:

13. Activate the client partition using the HMC.
14. Open a terminal window or console session.
15. Click **Advanced** to open the Advanced options menu.
16. Click **SMS** for the boot mode.
17. Click **OK** to close the Advanced options menu.
18. Click **OK** again. A vterm window opens for the partition. The client logical partition should now boot to the SMS menu.

19. Type the 5, as shown in Example 3-1.

Example 3-1 Main SMS Entry Panel

```
--------------------------------------------------------------------------------
 Main Menu
 1.   Select Language
 2.   Setup Remote IPL (Initial Program Load)
 3.   Change SCSI Settings
 4.   Select Console
 5.   Select Boot Options




 --------------------------------------------------------------------------------

 Navigation Keys:

                                                          X = eXit System Management
Services

 --------------------------------------------------------------------------------

Type menu item number and press Enter or select Navigation key:
```

20. Type the 2 key and press Enter to enter the Configure Boot Device Order panel.
21. Type the 1 key and press Enter to access the Select the 1st Boot Device panel.
22. Type the number that corresponds to the CD/DVD device and press Enter.
23. You can type 1 for the SCSI panel and press Enter or type 10 for the List All Devices and press Enter.

24. In response to the Select Media Adapter panel, type the number that represents the virtual SCSI device that is mapped to the CD/ROM. In Example 3-2 there is only a single device.

Example 3-2 Select Media Adapter

```
--------------------------------------------------------------------------------
 Select Media Adapter
 1.          U8204.E8A.10FE411-V3-C7-T1   /vdevice/v-scsi@30000007
 2.    None
 3.   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:
```

Navigate through the menus to exit from SMS mode, which now starts a normal install from the virtual media device that was loaded (cd_image_82472.1).

Tip: When the first volume starts to restore, you may get an error on the screen to the effect that the hard disk device is different from what was recorded when the CD image was created. This is to be expected and you can enter 1 to continue the install.

During the install you may be prompted for other volumes. This example has four in total. Each time that this happens eject/unload the current volume and load the new media.

The next three steps show this cycle which you will repeat for each requested volume:

25. Unload the current volume using the **unloadopt** command:

```
$ unloadopt -vtd vtopt1
```

26. Create virtual optical media using the next volume of the files that you copied from the source dedicated system. If you have enough space in your

repository you can also create all the media up front and not revisit this step again:

```
$ mkvopt -name cd_image_82472.vol2 -file
/updates/cd_image_82572.vol2 -ro
```

27. Load the next virtual optical media file that was created earlier using the Virtual I/O Server **loadopt** command:

```
$ loadopt -disk cd_image_82472.vol2 -vtd vtopt1
```

On the target partition

28. From the logical partition terminal session or console, you can now press Enter to continue the restore process.

    Once all your media files have been processed, you will be presented with the AIX login panel. You should now be able to log into the logical partition and correct any issues such as IP addresses.

On the Virtual I/O Server: cleanup stage

29. Once the restore is finished you can unload the last of your virtual media files using the Virtual I/O Server **unloadopt** command:

```
$ unloadopt -vtd vtopt1
```

    Cleanup any images not required in the repository using the **rmvopt** command.

Your migration is now complete.

3.2 Moving rootvg disks to SAN

This method uses the AIX **migratepv** command to move the rootvg onto a SAN-attached disk. The local SCSI disk is then removed from the root volume group and the volume group now containing the SAN disk is presented to the Virtual I/O Server where it is mapped to the target logical partition.

Note: No instructions are provided in this book for SAN functions such as modifying zones or mapping storage to hosts from SAN disk platforms. Users should be familiar with these operations before starting the migration task or have appropriately trained people who can perform those tasks.

In this example, both the standalone client and the Virtual I/O Server require access to a Fibre Channel adapter. You may therefore be required to relocate the Fibre Channel adapter from the standalone client to the Virtual I/O Server once

the mirroring procedure is complete to allow the target client logical partition to access the SAN.

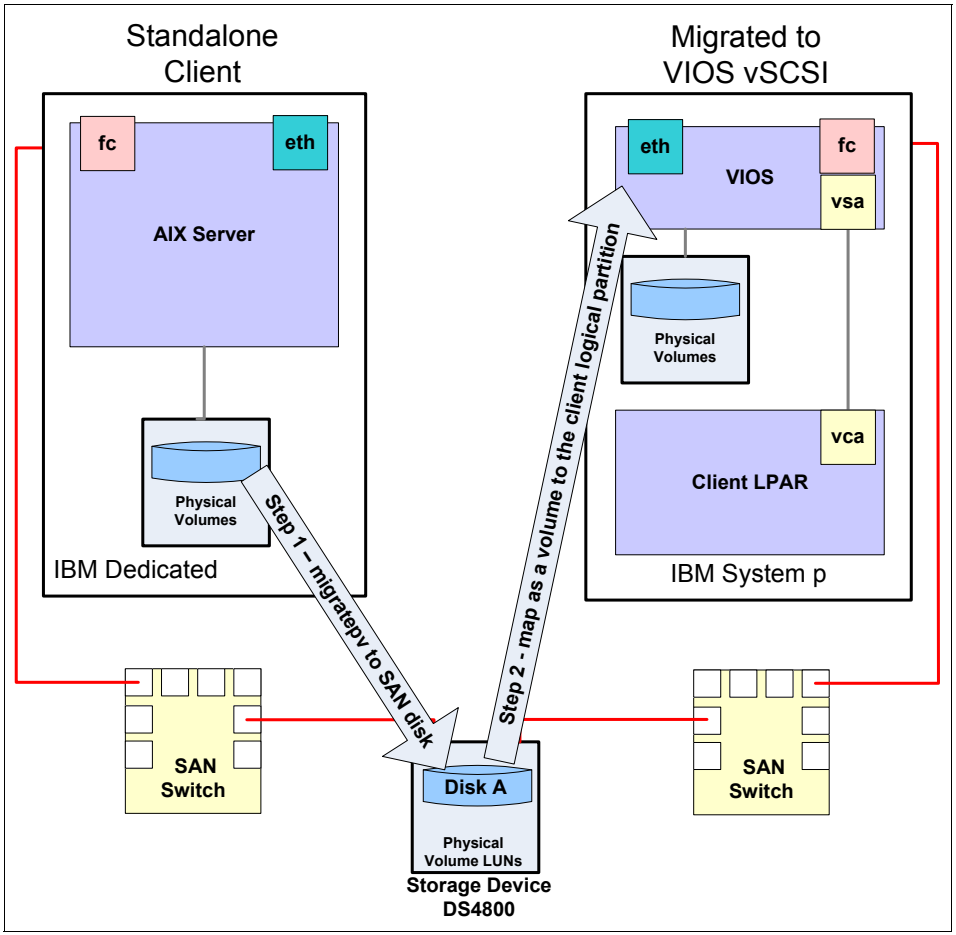

Figure 3-2 Cloning using mirrorvg to a SAN disk

The steps for the migration follow.

On the standalone server

Start by determining the size of the root volume group, then use the **migratepv** command to move to a new disk.

1. Obtain the size of the rootvg using the AIX **lsvg rootvg** command if the rootvg spans several volumes.

```
# lsvg rootvg
VOLUME GROUP:       rootvg                  VG IDENTIFIER:
000fe4010000d9000000012459f83d51
VG STATE:           active                  PP SIZE:        256 megabyte(s)
VG PERMISSION:      read/write              TOTAL PPs:      546 (139776 megabytes)
MAX LVs:            256                     FREE PPs:       509 (130304 megabytes)
LVs:                12                      USED PPs:       37 (9472 megabytes)
OPEN LVs:           11                      QUORUM:         2 (Enabled)
TOTAL PVs:          1                       VG DESCRIPTORS: 2
STALE PVs:          0                       STALE PPs:      0
ACTIVE PVs:         1                       AUTO ON:        yes
MAX PPs per VG:     32512
MAX PPs per PV:     1016                    MAX PVs:        32
LTG size (Dynamic): 1024 kilobyte(s)        AUTO SYNC:      no
HOT SPARE:          no                      BB POLICY:      relocatable
#
```

2. Using the size of the rootvg, create a SAN volume on SAN storage that can be made accessible to both the standalone client and to the target Virtual I/O Server. Remember that you only have to use the actual amount of used space and not the entire allocated amount, which may allow you to reduce the amount of SAN disk that you provision. Thin Provisioning technologies may also be beneficial for this purpose.

3. Perform a discovery using the AIX **cfgmgr** command to ensure that the target SAN disk becomes available. If you know which fiber port the SAN disk device is plugged into you can limit the discovery time using the -vl options of the AIX **cfgmgr** command:

```
# cfgmgr -vl fcs0
---------------
attempting to configure device 'fcs0'
Time: 0 LEDS: 0x2603
invoking /usr/lib/methods/cfgefc -l fcs0
Number of running methods: 1
---------------
Completed method for: fcs0, Elapsed time = 0
return code = 0
****************** stdout ***********
fscsi0
****************** no stderr ***********
---------------
Time: 0 LEDS: 0x539
```

```
Number of running methods: 0
----------------
attempting to configure device 'fscsi0'
Time: 0 LEDS: 0x569
invoking /usr/lib/methods/cfgefscsi -l fscsi0
Number of running methods: 1
----------------
Completed method for: fscsi0, Elapsed time = 1
return code = 0
****************** stdout ***********
hdisk8
****************** no stderr ***********
----------------
Time: 1 LEDS: 0x539
Number of running methods: 0
----------------
attempting to configure device 'hdisk8'
Time: 1 LEDS: 0x626
invoking /usr/lib/methods/cfgscsidisk -l hdisk8
Number of running methods: 1
----------------
Completed method for: hdisk8, Elapsed time = 0
return code = 0
****************** no stdout ***********
****************** no stderr ***********
----------------
Time: 1 LEDS: 0x539
Number of running methods: 0
----------------
calling savebase
return code = 0
****************** no stdout ***********
****************** no stderr ***********
Configuration time: 1 seconds
```

4. List the disks using the AIX **lsdev** command to ensure that the SAN disk is presented correctly to AIX:

```
# lsdev -Cc disk
hdisk0 Available 00-08-00 SAS Disk Drive
hdisk1 Available 00-08-00 SAS Disk Drive
hdisk2 Available 00-08-00 SAS Disk Drive
hdisk3 Available 00-08-00 SAS Disk Drive
hdisk4 Available 00-08-00 SAS Disk Drive
hdisk5 Available 00-08-00 SAS Disk Drive
hdisk6 Available 00-08-00 SAS Disk Drive
hdisk7 Available 00-08-00 SAS Disk Drive
hdisk8 Available 06-00-02 MPIO Other DS4K Array Disk
#
```

5. Now is a good time to ensure that you can correctly identify a unique ID on the SAN disk so that you can track it through the migration. Use the AIX **lsattr** command:

```
# lsattr -El hdisk8
PCM             PCM/friend/otherapdisk                                  Path
Control Module              False
PR_key_value    none
Persistant Reserve Key Value     True
algorithm       fail_over
Algorithm                        True
autorecovery    no
Path/Ownership Autorecovery      True
clr_q           no                                                      Device
CLEARS its Queue on error True
cntl_delay_time 0
Controller Delay Time            True
cntl_hcheck_int 0
Controller Health Check Interval True
dist_err_pcnt   0
Distributed Error Percentage     True
dist_tw_width   50
Distributed Error Sample Time    True
hcheck_cmd      inquiry                                                 Health
Check Command             True
hcheck_interval 60                                                      Health
Check Interval            True
hcheck_mode     nonactive                                               Health
Check Mode                True
location
Location Label                   True
lun_id          0x0
Logical Unit Number ID           False
lun_reset_spt   yes                                                     LUN
Reset Supported             True
max_retry_delay 60
Maximum Quiesce Time             True
```

```
max_transfer    0x40000
Maximum TRANSFER Size           True
node_name       0x200200a0b811a662                                      FC
Node Name                       False
pvid            none
Physical volume identifier      False
q_err           yes                                                     Use
QERR bit                        True
q_type          simple
Queuing TYPE                    True
queue_depth     10                                                      Queue
DEPTH                           True
reassign_to     120
REASSIGN time out value         True
reserve_policy  single_path
Reserve Policy                  True
rw_timeout      30
READ/WRITE time out value       True
scsi_id         0x11000                                                 SCSI
ID                              False
start_timeout   60                                                      START
unit time out value             True
unique_id       3E213600A0B8000291B0800009AE303FEFAE10F1815      FAStT03IBMfcp Unique
device identifier               False
ww_name         0x201300a0b811a662                                      FC
World Wide Name                 False
#
```

Note the unique_id as highled in the previous output. For additional information refer to 2.2, “Checking unique disk identification” on page 13.

6. Use the AIX **extendvg** command to add the SAN disk to the root volume group:

```
$ extendvg rootvg hdisk8
```

Note: Do not proceed if the extendvg returns an error. The IBM InfoCenter has detailed instructions for the most common scenarios. Use the following URL to look for suggestions:

http://publib.boulder.ibm.com/infocenter/aix/v6r1/index.jsp?topic=/com.ibm.aix.baseadmn/doc/baseadmndita/mirrorootvg.htm

7. Use the AIX **migratepv** command to move the contents of the local SAS/SCSI disk to the SAN disk. If you are migrating disks on a one-for-one basis, the command shown below works well. If you have multiple local hard disks in use then it is best to use the **migratepv** command with the -l option and migrate each logical volume in turn:

```
# migratepv hdisk0 hdisk8
0516-1011 migratepv: Logical volume hd5 is labeled as a boot logical
volume.
0516-1246 migratepv: If hd5 is the boot logical volume, please run 'chpv -c
hdisk0'
        as root user to clear the boot record and avoid a potential boot
        off an old boot image that may reside on the disk from which this
        logical volume is moved/removed.
migratepv: boot logical volume hd5 migrated. Please remember to run
        bosboot, specifying /dev/hdisk8 as the target physical boot device.
        Also, run bootlist command to modify bootlist to include
/dev/hdisk8.
```

8. You can use the AIX **lspv** command to ensure that every logical volume has moved off the source disk and is now located on the SAN disk:

```
# lspv -l hdisk0
#
# lspv -l hdisk8
hdisk8:
LV NAME               LPs     PPs     DISTRIBUTION          MOUNT POINT
lg_dumplv             16      16      00..16..00..00..00    N/A
livedump              1       1       00..01..00..00..00    /var/adm/ras/livedump
hd11admin             1       1       00..00..01..00..00    /admin
hd8                   1       1       00..00..01..00..00    N/A
hd6                   2       2       00..02..00..00..00    N/A
hd2                   8       8       00..00..08..00..00    /usr
hd4                   1       1       00..00..01..00..00    /
hd3                   1       1       00..00..01..00..00    /tmp
hd9var                2       2       00..00..02..00..00    /var
hd10opt               2       2       00..00..02..00..00    /opt
hd1                   1       1       00..00..01..00..00    /home
hd5                   1       1       01..00..00..00..00    N/A
#
```

Note: At this stage in the migration the original hdisk is no longer bootable. If you decide to cancel the migration you can perform the **migratepv** command with the original hdisk as the target disk and your SAN disk as the source.

9. Update the boot partition and reset the bootlist on the source standalone system using the AIX **bosboot** and **bootlist** commands:

```
# bosboot -a -d hdisk8

bosboot: Boot image is 40810 512 byte blocks.
# bootlist -m normal hdisk8
#
```

10. Shut down the standalone client using the AIX **shutdown** command.

On the SAN disk storage controller

11. Using your SAN disk management software, you should now un-map the SAN disk from the standalone server and present it to the Virtual I/O Server which hosts the connections for your client logical partition.

    It is important even while you are testing this procedure that an un-map and re-map is performed. If there is a SCSI reserve on the rootvg in the SAN disk at the SAN disk controller level then the Virtual I/O Server may not be able to present the SAN disk correctly to the client logical partition. Any SCSI 2 reservation can be removed by using the appropriate SAN GUI or CLI.

On the Virtual I/O Server

Use the Virtual I/O Server to discover the correct disk:

12. Using the Virtual I/O Server, log in as the padmin user and use the **cfgdev** command to ensure that the Virtual I/O Server re-scans for the newly attached SAN disk.

13. Using the Virtual I/O Server **chkdev** command will also display the pvid and unique ID that should match what you wrote down from a previous step:

```
$ chkdev -dev hdisk6 -verbose
NAME:                 hdisk6
IDENTIFIER:          3E213600A0B8000291B0800009AE303FEFAE10F1815
FAStT03IBMfcp
PHYS2VIRT_CAPABLE:    NA
VIRT2NPIV_CAPABLE:    YES
VIRT2PHYS_CAPABLE:    YES
PVID:                 000fe4016e0bb6e90000000000000000
UDID:                3E213600A0B8000291B0800009AE303FEFAE10F1815
FAStT03IBMfcp
IEEE:
VTD:                  vtscsi0

$
```

Ensure that the UUID in this step matches that from step 5. This will confirm the same disk is mapped.

14. Map the SAN disk device to the client logical partition.

    In this instance the **Virtual Resource ∅ Virtual Storage Management** task was used from the HMC rather than typing commands on the Virtual I/O Server.

    Figure 3-3 shows the HMC panel from which this task is accessed.

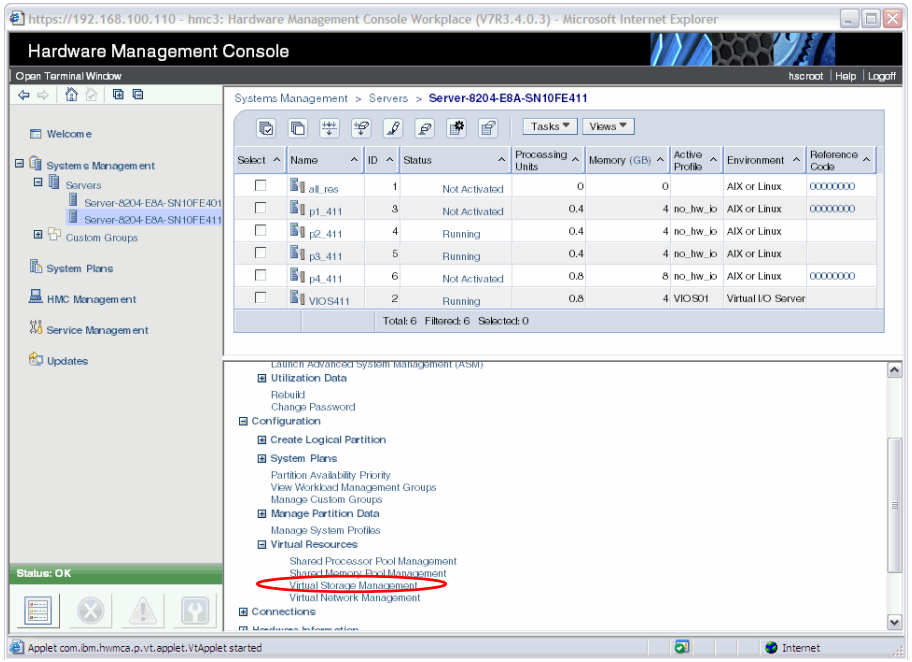

Figure 3-3 Virtual Storage Management functions

15. Because there is a physical disk in use here, you must navigate to the Physical Volumes tab, as shown in to Figure 3-4.

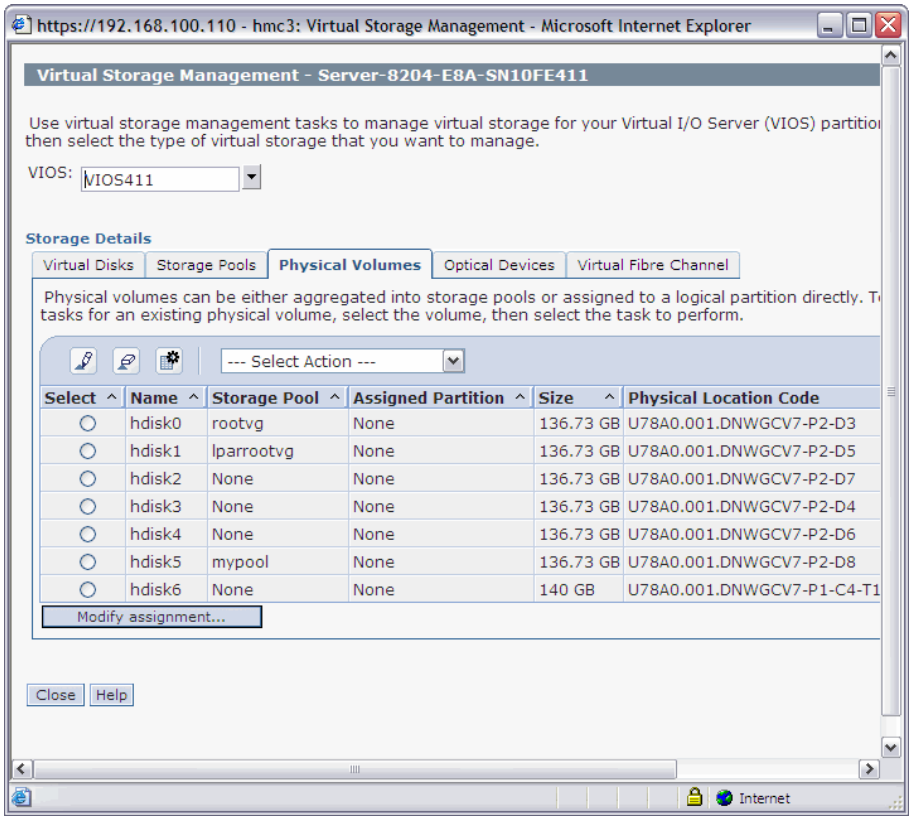

Figure 3-4 Physical Volumes

16. Select the required hard disk, such as hdisk6, to map to the client partition and click **Modify Assignment**, as shown in Figure 3-5.

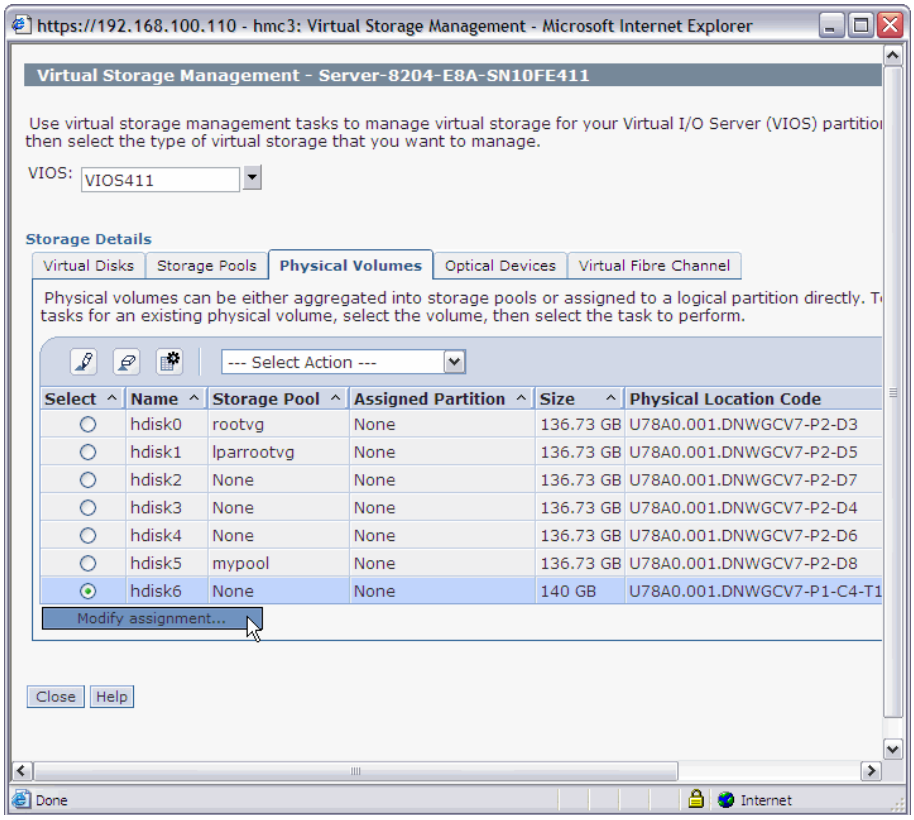

Figure 3-5 Hard Disk Selection

17. Select the new partition assignment and click **OK** to accept that you are assigning this volume, as shown in Figure 3-6.

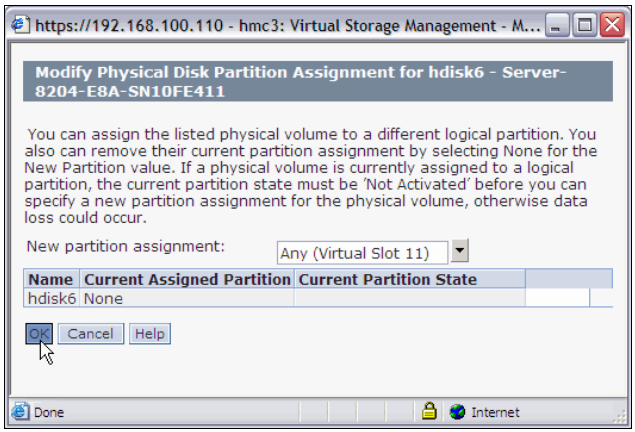

Figure 3-6 Selection of the client virtual slot

The last screen after a number of updating panels shows that the assignment was correct. Click **Close** to exit the Virtual Storage Assignment function, as shown in Figure 3-7.

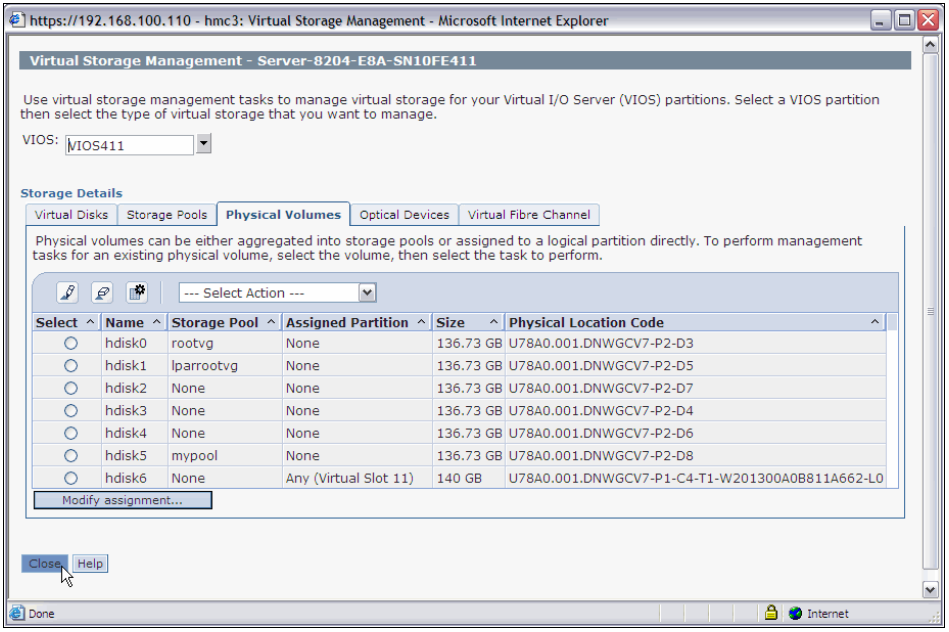

Figure 3-7 Virtual Storage Management

On the client partition

18. You can now boot the client logical partition using the SMS option and discover the newly presented virtual SCSI disk that maps to your SAN disk. The migration is almost complete.

    Remember to set up the Ethernet addresses on the virtual Ethernet interfaces since they were last used on physical Ethernet cards and may not be correct in this virtual environment.

3.3 Cloning rootvg to external disk

This method uses the AIX **`alt_disk_copy`** command to clone the operating system to a separate disk that has been presented from a SAN. The SAN disk is then used as a virtual SCSI device from the Virtual I/O Server and presented to a logical partition.

In this example, both the standalone client and the Virtual I/O Server require access to a Fibre Channel adapter. You may be required to relocate the Fibre Channel adapter from the standalone client to the Virtual I/O Server once the alt_disk_copy procedure is complete to allow the target client logical partition to access the SAN.

Figure 3-8 provides an overview of this process.

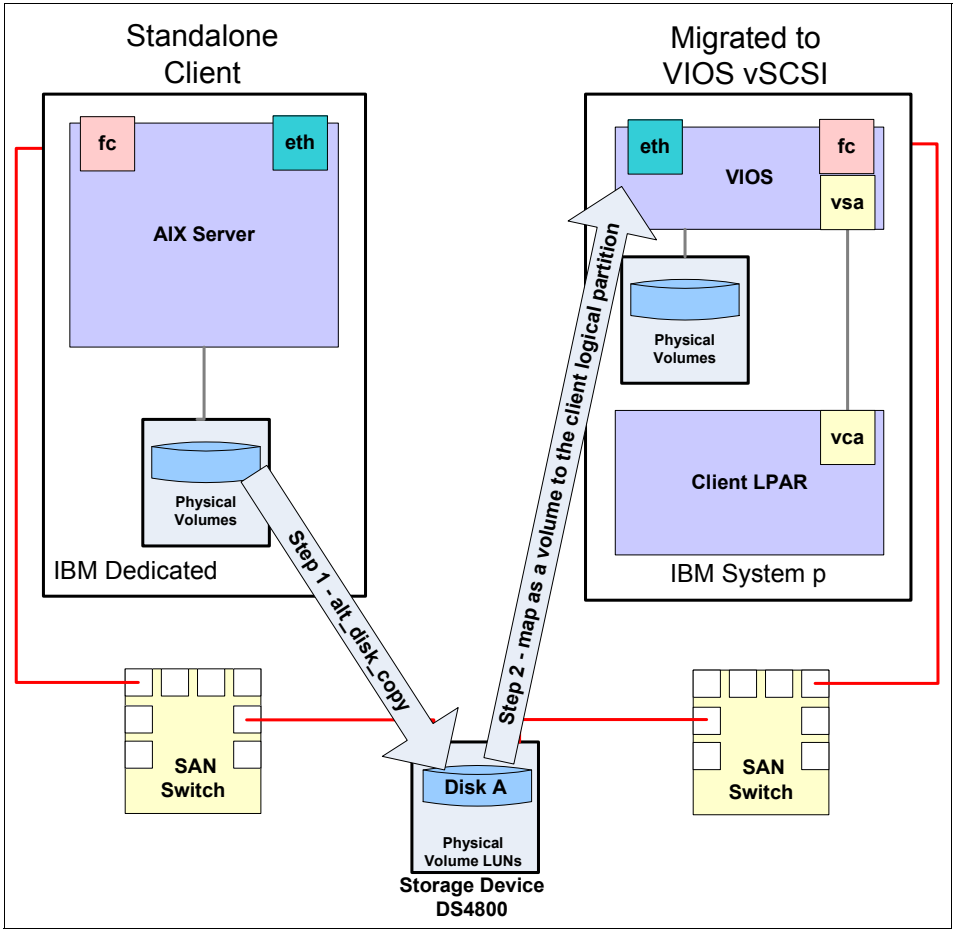

Figure 3-8 alt_disk_copy using SAN disk

The steps for the migration follow.

On the standalone server

The first part of the method requires a SAN disk and then use of the AIX **alt_disk_copy** command to clone the root volume group:

1. First obtain the size of the root volume group - this can be done using the AIX **lsvg** command:

```
# lsvg rootvg
VOLUME GROUP:       rootvg                  VG IDENTIFIER:
000fe4010000d9000000012478906561
VG STATE:           active                  PP SIZE:        256 megabyte(s)
```

```
VG PERMISSION:      read/write              TOTAL PPs:      546 (139776 megabytes)
MAX LVs:            256                     FREE PPs:       509 (130304 megabytes)
LVs:                12                      USED PPs:       37 (9472 megabytes)
OPEN LVs:           11                      QUORUM:         2 (Enabled)
TOTAL PVs:          1                       VG DESCRIPTORS: 2
STALE PVs:          0                       STALE PPs:      0
ACTIVE PVs:         1                       AUTO ON:        yes
MAX PPs per VG:     32512
MAX PPs per PV:     1016                    MAX PVs:        32
LTG size (Dynamic): 1024 kilobyte(s)        AUTO SYNC:      no
HOT SPARE:          no                      BB POLICY:      relocatable
```

2. Ensure that the disk that you are going to clone the rootvg to has:

   a. Enough space available using the size of the rootvg obtained from step 1 on page 66. You can see that a disk of about 140 GB has been allocated but 9472 MBs (9.5 GB) has been used. A SAN volume of about 10 or 15 GB is adequate in this case.

   b. The target disk for the alt_clone operation should not be a member of the rootvg that you are cloning. If it is a member, you must remove it from the volume group (**reducevg**). Use the AIX **lspv** command to check the disks' volume group membership:

```
# lspv
hdisk0          000fe4012a8f0920                    rootvg          active
hdisk8          none                                None
#
```

3. It is useful to make a note of the unique disk identification using the AIX **lsattr** command. At this stage record the unique_id attribute:

```
# lsattr -El hdisk8
PCM             PCM/friend/otherapdisk                                          Path
Control Module              False
PR_key_value    none
Persistant Reserve Key Value     True
algorithm       fail_over
Algorithm                        True
autorecovery    no
Path/Ownership Autorecovery      True
clr_q           no                                                              Device
CLEARS its Queue on error True
cntl_delay_time 0
Controller Delay Time            True
cntl_hcheck_int 0
Controller Health Check Interval True
dist_err_pcnt   0
Distributed Error Percentage     True
dist_tw_width   50
Distributed Error Sample Time    True
hcheck_cmd      inquiry                                                         Health
Check Command             True
hcheck_interval 60                                                              Health
Check Interval            True
```

```
hcheck_mode     nonactive                                                    Health
Check Mode               True
location
Location Label                   True
lun_id          0x0
Logical Unit Number ID           False
lun_reset_spt   yes                                                          LUN
Reset Supported              True
max_retry_delay 60
Maximum Quiesce Time             True
max_transfer    0x40000
Maximum TRANSFER Size            True
node_name       0x200200a0b811a662                                           FC
Node Name                     False
pvid            none
Physical volume identifier       False
q_err           yes                                                          Use
QERR bit                      True
q_type          simple
Queuing TYPE                     True
queue_depth     10                                                           Queue
DEPTH                         True
reassign_to     120
REASSIGN time out value          True
reserve_policy  single_path
Reserve Policy                   True
rw_timeout      30
READ/WRITE time out value        True
scsi_id         0x11000                                                      SCSI
ID                             False
start_timeout   60                                                           START
unit time out value        True
unique_id       3E213600A0B8000291B0800009D760401BBB80F1815      FAStT03IBMfcp Unique
device identifier         False
ww_name         0x201300a0b811a662                                           FC
World Wide Name               False
#
```

Note in the above command output that there is no pvid assigned at this point since hdisk8 is not a member of a volume group.

4. Use the AIX **alt_disk_copy** command to copy the rootvg to the external SAN disk, hdisk8 in this example:

```
# alt_disk_copy -O -d hdisk8
Calling mkszfile to create new /image.data file.
Checking disk sizes.
Creating cloned rootvg volume group and associated logical volumes.
Creating logical volume alt_hd5
Creating logical volume alt_hd6
Creating logical volume alt_hd8
Creating logical volume alt_hd4
Creating logical volume alt_hd2
```

```
Creating logical volume alt_hd9var
Creating logical volume alt_hd3
Creating logical volume alt_hd1
Creating logical volume alt_hd10opt
Creating logical volume alt_hd11admin
Creating logical volume alt_lg_dumplv
Creating logical volume alt_livedump
Creating logical volume alt_loglv00
Creating /alt_inst/ file system.
/alt_inst filesystem not converted.
        Small inode extents are already enabled.
Creating /alt_inst/admin file system.
/alt_inst/admin filesystem not converted.
        Small inode extents are already enabled.
Creating /alt_inst/home file system.
/alt_inst/home filesystem not converted.
        Small inode extents are already enabled.
Creating /alt_inst/opt file system.
/alt_inst/opt filesystem not converted.
        Small inode extents are already enabled.
Creating /alt_inst/tmp file system.
/alt_inst/tmp filesystem not converted.
        Small inode extents are already enabled.
Creating /alt_inst/usr file system.
/alt_inst/usr filesystem not converted.
        Small inode extents are already enabled.
Creating /alt_inst/var file system.
/alt_inst/var filesystem not converted.
        Small inode extents are already enabled.
Creating /alt_inst/var/adm/ras/livedump file system.
/alt_inst/var/adm/ras/livedump filesystem not converted.
        Small inode extents are already enabled.
Generating a list of files
for backup and restore into the alternate file system...
Backing-up the rootvg files and restoring them to the
alternate file system...
Modifying ODM on cloned disk.
Building boot image on cloned disk.
Resetting all device attributes.
NOTE: The first boot from altinst_rootvg will prompt to define the
new
system console.
Resetting all device attributes.
NOTE: The first boot from altinst_rootvg will prompt to define the
new
```

```
system console.
forced unmount of /alt_inst/var/adm/ras/livedump
forced unmount of /alt_inst/var/adm/ras/livedump
forced unmount of /alt_inst/var
forced unmount of /alt_inst/var
forced unmount of /alt_inst/usr
forced unmount of /alt_inst/usr
forced unmount of /alt_inst/tmp
forced unmount of /alt_inst/tmp
forced unmount of /alt_inst/opt
forced unmount of /alt_inst/opt
forced unmount of /alt_inst/home
forced unmount of /alt_inst/home
forced unmount of /alt_inst/admin
forced unmount of /alt_inst/admin
forced unmount of /alt_inst
forced unmount of /alt_inst
Changing logical volume names in volume group descriptor area.
Fixing LV control blocks...
Fixing file system superblocks...
Bootlist is set to the boot disk: hdisk8 blv=hd5
```

5. The output from the AIX **lspv** command shows that the disk volume now has a pvid and is a member of the altinst_rootvg volume group:

```
# lspv
hdisk0          000fe4012a8f0920                    rootvg
active
hdisk1          none                                None
hdisk2          000fe4012913f4bd                    None
hdisk3          none                                None
hdisk4          000fe401106cfc0c                    None
hdisk5          000fe4012b5361f2                    None
hdisk6          none                                None
hdisk7          none                                None
hdisk8          000fe4017e0037d7                    altinst_rootvg
```

6. Remove the SAN volume hdisk8 from the standalone system using the AIX **rmdev** command:

```
# rmdev -dl hdisk8
hdisk8 deleted
```

Note: At this point you must re-zone and present the SAN disk that was the target of the clone to the client logical partition. Instructions are not provided here for this task.

7. One of the final actions of the **alt_disk_copy** command is to set the bootlist to the newly created altinst_rootvg. Since the aim is to preserve the rootvg, ensure that the bootlist is set back to the correct volume. Reset the bootlist on the source standalone system using the AIX **bosboot** and **bootlist** commands:

```
# bosboot -a -d hdisk0

bosboot: Boot image is 40810 512 byte blocks.
# bootlist -m normal hdisk0
#
# bootlist -m normal -o
hdisk0 blv=hd5
#
```

On the Virtual I/O Server

Now discover, verify, and map the SAN disk to the correct client logical partition:

8. Perform a discovery using **oem_setup_env** and the AIX **cfgmgr** command to make the target SAN disk available:

```
# cfgmgr -vl fcs4
```

9. You can identify the disk using the Virtual I/O Server **chkdev** command:

```
$ chkdev -dev hdisk6 -verbose
NAME:                 hdisk6
IDENTIFIER:          3E213600A0B8000291B0800009D760401BBB80F1815
FAStT03IBMfcp
PHYS2VIRT_CAPABLE:    YES
VIRT2NPIV_CAPABLE:    NA
VIRT2PHYS_CAPABLE:    NA
PVID:                 000fe4017e0037d70000000000000000
UDID:                3E213600A0B8000291B0800009D760401BBB80F1815
FAStT03IBMfcp
IEEE:
VTD:

$
```

In this case the PVID and UDID match the values from the previous steps where you noted down the unique identification values.

Note: If the values do not match then you should stop at this step and ensure that you have presented the correct SAN disk to the partition. Failure to do so may result in you overwriting data.

The other important output from the **chkdev** command is the PHYS2VIRT_CAPABLE field. In this example it has YES as a value. A value of YES means that at this point in time, this disk volume can be mapped to a virtual device and presented to a logical partition. A value of NO would mean that the disk cannot be mapped. A value of NA means that the disk has already been mapped as a virtual target device (VTD).

More information about the **chkdev** command can be found by reading its man page.

10. Create a mapping from the Virtual I/O Server to the client logical partition for the SAN disk that has been discovered. This can be done using the Virtual I/O Server command-line tools or by using the **Configuration** ∅ **Virtual Resource** ∅ **Virtual Storage Management** panels as shown in Figure 3-9.

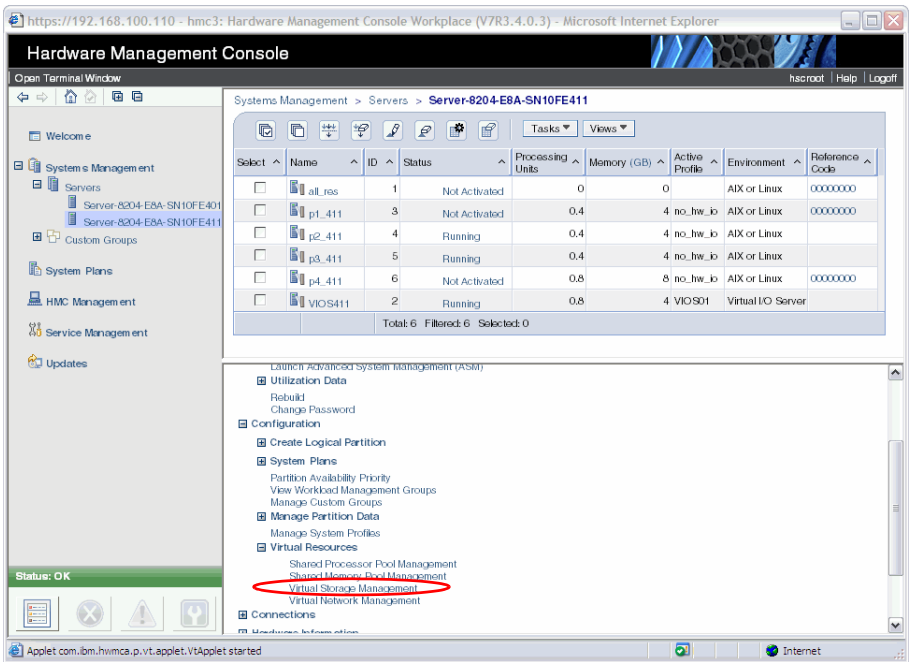

Figure 3-9 Virtual Storage Management Functions

11. Once you have made the mapping, you can verify the status by again using the Virtual I/O Server **chkdev** command:

```
$ chkdev -dev hdisk6 -verbose
NAME:                 hdisk6
IDENTIFIER:          3E213600A0B8000291B0800009D760401BBB80F1815
FAStT03IBMfcp
PHYS2VIRT_CAPABLE:    NA
```

```
VIRT2NPIV_CAPABLE:   YES
VIRT2PHYS_CAPABLE:   YES
PVID:                000fe4017e0037d70000000000000000
UDID:               3E213600A0B8000291B0800009D760401BBB80F1815
FAStT03IBMfcp
IEEE:
VTD:                 vtscsi0

$
```

Note that the PHYS2VIRT_CAPABLE field in the above command output is now set to a value of NA, which indicates that this disk is now mapped to a VTD, vtscsi0 in this example.

On the client partition

Using the SMS menu, now boot the client partition and perform cleanup tasks:

12. Boot the client using the HMC and verify that the cloned disk boots successfully.

13. Using the AIX **lspv**, **lsvg**, and **lsattr** commands you can verify that the correct disk has been used:

```
# lspv
hdisk0          000fe4017e0037d7                    rootvg          active
#
# lsvg rootvg -p
rootvg:
PV_NAME           PV STATE          TOTAL PPs   FREE PPs    FREE DISTRIBUTION
hdisk0            active            559         521         111..92..94..112..112
# lsattr -El hdisk0
PCM             PCM/friend/vscsi                 Path Control Module        False
algorithm       fail_over                        Algorithm                  True
hcheck_cmd      test_unit_rdy                    Health Check Command       True
hcheck_interval 0                                Health Check Interval      True
hcheck_mode     nonactive                        Health Check Mode          True
max_transfer    0x40000                          Maximum TRANSFER Size      True
pvid            000fe4017e0037d70000000000000000 Physical volume identifier False
queue_depth     3                                Queue DEPTH                True
reserve_policy  no_reserve                       Reserve Policy             True
#
```

14. You must verify that the IP connections are set up correctly on the correct Ethernet interfaces.

On the standalone system

You have now migrated this system to a logical partition. If you wish to revert the current disk configuration back to a pre alt_disk_copy scenario:

15. On the local system an AIX **lsvg** command shows that the ODM is unaware that you have removed the SAN disk that was the target of the alt_disk_copy:

```
# lsvg
rootvg
altinst_rootvg
#
```

16. To clean up the system, use the AIX **alt_rootvg_op** command with the -X flag:

```
# alt_rootvg_op -X
Bootlist is set to the boot disk: hdisk0 blv=hd5
```

17. An AIX l**svg** command confirms that the clean up is successful:

```
# lsvg
rootvg
#
```

3.4 Other methods

There are a number of accepted methods that can also be used to perform the migration. These methods include:

- NIM
- Backup and restore
- SAS-attached tape devices

An overview of these methods follows.

3.4.1 NIM

If you are familiar with the AIX Network Installation Manager (NIM) subsystem then it is feasible to make a mksysb to a NIM storage area (normally an NFS mount) and perform a NIM install in much the same way that 3.1, “Back up to CD and restore” on page 46, performs an SMS boot from media. The difference is that you load from the source through the network using the Ethernet card, and not from virtual CD media.

NIM also allows you to perform functions such as:

- Installation of system patch bundles
- Installation of user-defined software packages
- Upgrades of the operating system on the fly

While you generally must install NIM on a separate server or logical partition (and it could reside on the Tivoli® Storage Manager Server if required), the benefits of NIM outweigh the expense:

- Multiple restorations can be performed simultaneously in a NIM environment.
- Provisioning of on demand resources or major projects is simplified through the ability to easily manage the required bundles of chosen operating system level, patches, and additional software during a deployment.

3.4.2 Backup and restore

IBM markets the Tivoli Storage Manager (TSM) software, which allows backups of the AIX file systems, including both the root and data volume groups. In addition, there are various additions to TSM that allow databases and data from a wide variety of third-party vendors to be backed up and more importantly restored.

When it comes to the root volume group of AIX, extra care is needed. Simply backing up the volume group and restoring it once a fresh install of AIX has been performed can be problematic. The Tivoli Storage Manager for System Backup and Recovery (SYSBACK) or Cristie Bare Metal packages resolve the issues and provide a full bare metal recovery of the AIX root volume group. Once either of these packages has been used to recover the bootable section of AIX, data in other volume groups can be restored using either TSM file-based or agent-based recovery of databases.

3.4.3 SAS-attached tape devices

If you have a Power System server with a SAS tape drive attached to your Virtual I/O Server you can use the tape device to back up from one client logical partition, then re-map or present the new disk storage and restore using the tape drive. The tape is also transportable to another system with an SAS-connected tape drive. The Virtual I/O Server command **mkvdev** is used to map a tape drive to a virtual host adapter.

The following notes apply to the use of a SAS-connected tape drive:

- At the time of writing, only an IBM SAS-attached tape drive is supported.
- It is preferable to create a separate virtual SCSI host adapter than to use one already in service for disks or optical storage. This is because of the different block sizes used to transfer data for tape operations and a separate virtual SCSI adapter is more portable.
- The tape drive is not a shared device. It can only be in use by one partition at a time.
- The Virtual I/O Server does not support functions to move media, even if the backup tape device supports them. You must manually load the media.

To use a SAS configured tape drive:

1. Create a separate virtual SCSI server adapter. This example shows vhost4 as a server SCSI adapter that has no other mappings.
2. Use the Virtual I/O Server **mkvdev** command to map the tape drive:

   ```
   mkvdev -vdev rmt0 -vadapter vhost4
   ```

   The system displays a message similar to the following:

   ```
   vttape0 available
   ```

Further information can be found at the following IBM InfoCenter links:

http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/iphb2/iphatvirtualadapters.htm

http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/index.jsp?topic=/iphb1/iphb1_vios_tape.htm

4

Standalone SCSI data to virtual SCSI

This chapter provides instructions for migrating a client's data on direct-attached disk to a logical partition with the data disks being virtualized by a Virtual I/O Server using virtual SCSI. The instructions outlined assume that both the source and destination hosts already exist.

Data disks can be in two forms:

- Disks that belong to a volume group other than rootvg, referred to as user volume groups
- Disks with raw data in which case they are not part of any volume group

The instructions that follow are for both types of data disks.

Since direct-attached disks on standalone machines are not accessible to a Virtual I/O Server, the data on the disks must be transferred to disks accessible by the targeted Virtual I/O Server or the disk must be physically moved to a location that is accessible by the targeted Virtual I/O Server. The instructions to physically move the disks are not covered by this guide since those instructions are hardware specific.

The source server comprises a standalone machine with multiple direct-attached SCSI and SAN disks. The first of those disks (hdisk0) contains rootvg, while the

remaining disks are used as data disks. The SAN storage is provided by a DS4800. The destination server is a client logical partition that has no physical disk of its own. The physical disks are attached to the Virtual I/O Server. See Figure 4-1 for a graphical representation.

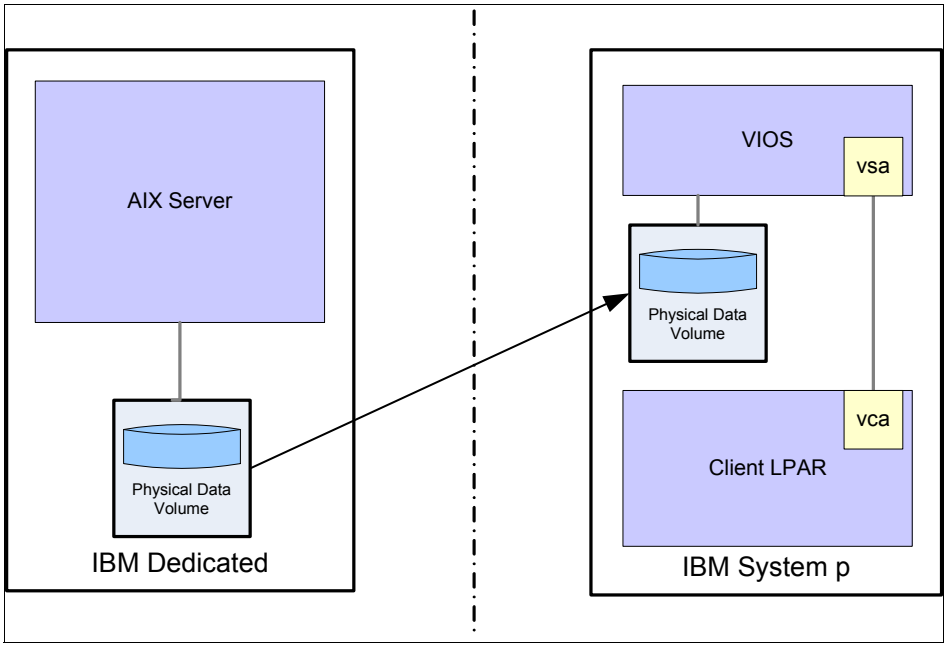

Figure 4-1 Transition direct-attached storage to Virtual I/O Server managed storage

4.1 Migration using a virtual media repository

The goal of this section is to make a backup of a user volume group to a file, create a media repository on the Virtual I/O Server, and give the client logical partition virtualized access to the media repository. Keep in mind that applications should be shut down prior to performing the backup since files that are open cannot be backed up.

On the standalone source host

Begin by backing up the user volume data:

1. Ensure that the destination disk will be large enough to hold the user volume data that you will be backing up.
2. Save the user volume group to a file. In the example below, a text file named `datafile` will be transitioned and the file system containing `datafile` is in the `datasrcvg` volume group. The **`ls`** and **`cat`** commands show the data file and its contents before the migration so that a recheck of the contents of the file post-migration will confirm success.

```
# ls -l
total 8
-rw-r--r--    1 root     staff            21 Oct 12 09:58 datafile
drwxr-xr-x    2 root     system          256 Oct 12 09:57 lost+found
# cat datafile
This is a test file.
#
# mkcd -v datasrcvg -V rootvg -R -S -A
Initializing mkcd log: /var/adm/ras/mkcd.log...
Verifying command parameters...
Creating information file for volume group datasrcvg.
Creating temporary file system: /mkcd/mksysb_image...
Creating savevg image...

Creating list of files to back up.

Backing up 9 files

9 of 9 files (100%)0512-038 savevg: Backup Completed Successfully.
Creating temporary file system: /mkcd/cd_fs...
Copying backup to the CD or DVD file system...

Creating Rock Ridge format image: /mkcd/cd_images/cd_image_401446
Running mkisofs ...
```

```
mkrr_fs was successful.



Removing temporary file system: /mkcd/cd_fs...
Removing temporary file system: /mkcd/mksysb_image...
```

The **mkcd** command creates the backup file in `/mkcd/cd_images` by default. In this case, the file created is `cd_image_401446`. Transfer the file to the Virtual I/O Server using the file transfer program of your choice.

On the Virtual I/O Server

Create the media repository and make it ready for access by the client partition:

3. Check to see whether a media repository already exists using the **lsrep** command. You will see the following if it does not exist:

```
$ lsrep
The DVD repository has not been created yet.
```

4. Create the media repository in the volume group and size of your choice if it does not already exist using the Virtual I/O Server **mkrep** command. For the purposes of this example, it will be created in rootvg.

```
$ mkrep -sp rootvg -size 100M
Virtual Media Repository Created
Repository created within "VMLibrary_LV" logical volume
```

5. Create the virtual optical media using the **mkvopt** command. The following command assumes that the backup file that was transferred to the Virtual I/O Server is in the current directory:

```
$ pwd
/home/padmin
$ ls -l cd_image_401446
-rw-r--r--    1 padmin   staff        258048 Oct 12 10:10
cd_image_401446
$ mkvopt -name cd_image_401446 -file cd_image_401446 -ro
$
```

6. Use **mkvdev** to create the file-backed virtual optical device if it does not exist. You must find a free vhost adapter to bind to or allocate one using the HMC if there are none free. A free adapter can be identified as below:

```
$ lsmap -vadapter vhost4
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost4          U8204.E8A.10FE411-V2-C15                    0x00000000

VTD                   NO VIRTUAL TARGET DEVICE FOUND
```

```
$ mkvdev -fbo -vadapter vhost4 -dev vcd1
vcd1 Available
```

The virtual optical device will appear as `Virtual Target Device - File-backed Optical` in a virtual device listing.

7. Load the virtual optical media file that you created earlier with the **`loadopt`** command. Once loaded, the image file will be copied into the repository (/var/vio/VMLibrary) and you will see a backing device for vhost4.

```
$ loadopt -disk cd_image_401446 -vtd vcd1
$ lsmap -vadapter vhost4
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost4          U8204.E8A.10FE411-V2-C15                    0x00000000

VTD                   vcd1
Status                Available
LUN                   0x8100000000000000
Backing device        /var/vio/VMLibrary/cd_image_401446
Physloc
```

On the HMC

8. Map the vhost adapter from the previous step to a SCSI adapter on the client logical partition if the mapping does not already exist. Something similar to the highlighted line in Figure 4-2 is what you should see.

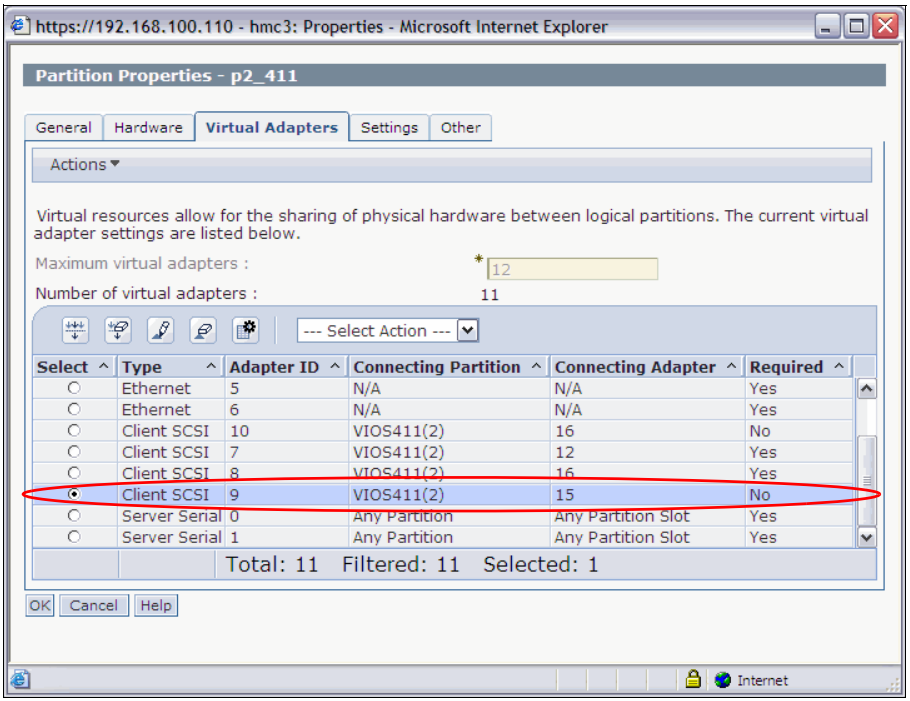

Figure 4-2 Client logical partition virtual adapter mapping in WebSM

This will map vcd1, which has vhost4 as its backing device, on the Virtual I/O Server to a virtual SCSI optical device in slot 9 on the client logical partition.

On the destination partition

On the destination partition:

9. Select an unused logical disk device and restore the user volume group. The AIX **restvg** command will restore the volume group, mount points, and all data just as they were on the source system.

```
# restvg -f /dev/cd1 hdisk2

Will create the Volume Group:   datasrcvg
Target Disks:   hdisk2
Allocation Policy:
        Shrink Filesystems:     no
```

```
        Preserve Physical Partitions for each Logical Volume:   no

Enter y to continue: y
0516-1254 /usr/sbin/mkvg: Changing the PVID in the ODM.
datasrcvg
datasrclv
/dev/datadestlv: A file or directory in the path name does not
exist.
New volume on
/tmp/vgdata.249948/cdmount/usr/sys/inst.images/savevg_image:
Cluster size is 51200 bytes (100 blocks).
The volume number is 1.
The backup date is: Mon Oct 12 11:10:23 EDT 2009
Files are backed up by name.
The user is root.
x           14 ./tmp/vgdata/datasrcvg/image.info
x          142 ./tmp/vgdata/vgdata.files372862
x          142 ./tmp/vgdata/vgdata.files
x         2746 ./tmp/vgdata/datasrcvg/filesystems
x         1803 ./tmp/vgdata/datasrcvg/datasrcvg.data
x          282 ./tmp/vgdata/datasrcvg/backup.data
x            0 ./mnt
x            0 ./mnt/lost+found
x           21 ./mnt/datafile
The total size is 5150 bytes.
The number of restored files is 9.
```

Note that there was a warning message generated in the previous command output regarding a nonexistent `/dev/datadestlv`. This warning was generated because a logical volume with that specific name did not exist on the target host. This warning can be ignored. The restore will complete successfully, as will be shown next.

10. Verify the restore once completed. The following **`lsvg`** commands show us the new volume group and mount point. The **`cat`** command lists out the contents of the data file that was originally created, which confirms that the migration was successful.

```
# lsvg
rootvg
datasrcvg
# lsvg -l datasrcvg
datasrcvg:
LV NAME             TYPE       LPs     PPs     PVs  LV STATE
MOUNT POINT
```

```
datasrclv           jfs2       1       1       1    open/syncd
/mnt
# cd /mnt
# ls -l
total 8
-rw-r--r--    1 root     staff            21 Oct 12 10:58 datafile
drwxr-xr-x    2 root     system          256 Oct 12 17:06 lost+found
# cat datafile
This is a test file.
```

4.2 Migrating data using savevg

If it is not required to have a media repository, **savevg** may be used instead.

1. On the standalone source host, specify to **savevg** the name of the backup file to save the data to and the volume group to be backed up:

```
# savevg -f /tmp/dataimage datasrcvg

Creating list of files to back up.

Backing up 9 files             yes

9 of 9 files (100%)0512-038 savevg: Backup Completed Successfully.
```

2. After you have a running destination partition with virtual SCSI drives, transfer the backup file to a temporary area on one of the drives.
3. Select an unused virtual disk and restore the backup. As above, the output of **cat** shows us that the datafile was migrated successfully.

```
# restvg -f /tmp/dataimage hdisk2

Will create the Volume Group:   datasrcvg
Target Disks:   hdisk2
Allocation Policy:
        Shrink Filesystems:     no
        Preserve Physical Partitions for each Logical Volume:   no

Enter y to continue: y
datasrcvg
datasrclv
New volume on /tmp/dataimage:
Cluster size is 51200 bytes (100 blocks).
The volume number is 1.
The backup date is: Mon Oct 12 17:53:35 EDT 2009
```

```
Files are backed up by name.
The user is root.
x           14 ./tmp/vgdata/datasrcvg/image.info
x          142 ./tmp/vgdata/vgdata.files405658
x          142 ./tmp/vgdata/vgdata.files
x         2746 ./tmp/vgdata/datasrcvg/filesystems
x         1803 ./tmp/vgdata/datasrcvg/datasrcvg.data
x          272 ./tmp/vgdata/datasrcvg/backup.data
x            0 ./mnt
x           21 ./mnt/datafile
x            0 ./mnt/lost+found
The total size is 5140 bytes.
The number of restored files is 9.
# cd /mnt
# ls -l
total 8
-rw-r--r--    1 root     system           21 Oct 12 17:53 datafile
drwxr-xr-x    2 root     system          256 Oct 12 17:59 lost+found
# cat datafile
This is a test file.
```

4.3 Transition raw data disk

In this section a migration of raw disk attached to a standalone AIX server to a Virtual I/O Server managed partition is described. The migrated disk must be a SAN disk since as was stated earlier. A physical move of a SCSI disk is hardware specific. As per this procedure, you must map one or more (depending on how much data there is and how it is organized on the source storage) of the same SAN LUNs to both the standalone machine and the Virtual I/O Server.

On the standalone source host

On the standalone source host:

1. Select the raw SAN disk that will be migrated. The **lscfg** command output below shows us that hdisk8 is a SAN disk. The file `pattern.txt` was then created as test data and was written to the raw disk using the **dd** command:

```
# lscfg -vl hdisk8
  hdisk8           U78A0.001.DNWG9AD-P1-C3-T1-W201300A0B811A662-L0
MPIO Other DS4K Array Disk

        Manufacturer.............IBM
        Machine Type and Model......1815      FAStT
        ROS Level and ID............30393134
```

```
        Serial Number...............
        Device Specific.(Z0)........0000053245005032
        Device Specific.(Z1)........
# ls -l pattern.txt
-rw-r--r--    1 root     system           30 Oct 16 12:24
pattern.txt
# cat pattern.txt
This is a raw disk test file.
# dd if=./pattern.txt of=/dev/hdisk8 seek=20 count=1
0+1 records in.
0+1 records out.
```

2. Get the `unique_id` of the SAN LUN. While the **`odmget`** command has been used below, the **`lsattr`** command is also useful for this task.

```
# odmget CuAt | grep -p unique_id | grep -p hdisk8
CuAt:
        name = "hdisk8"
        attribute = "unique_id"
        value = "3E213600A0B8000291B0800009A8103FAF5B50F1815
FAStT03IBMfcp"
        type = "R"
        generic = "D"
        rep = "nl"
        nls_index = 79
```

On the Virtual I/O Server

3. Set up zoning on the SAN switch such that the LUN from the previous step is visible to the Virtual I/O Server. Verify that the disk that you are seeing on the Virtual I/O Server is the same as the standalone machine disk. If they are the same disk, the values of the `unique_id` will match:

```
# odmget CuAt|grep -p unique_id|grep -p hdisk6
CuAt:
        name = "hdisk6"
        attribute = "unique_id"
        value = "3E213600A0B8000291B0800009A8103FAF5B50F1815
FAStT03IBMfcp"
        type = "R"
        generic = "D"
        rep = "nl"
        nls_index = 79
```

On the HMC

4. Map a virtual SCSI adapter from the Virtual I/O Server to the client logical partition if the mapping does not already exist. You should see something similar to the highlighted line in Figure 4-3.

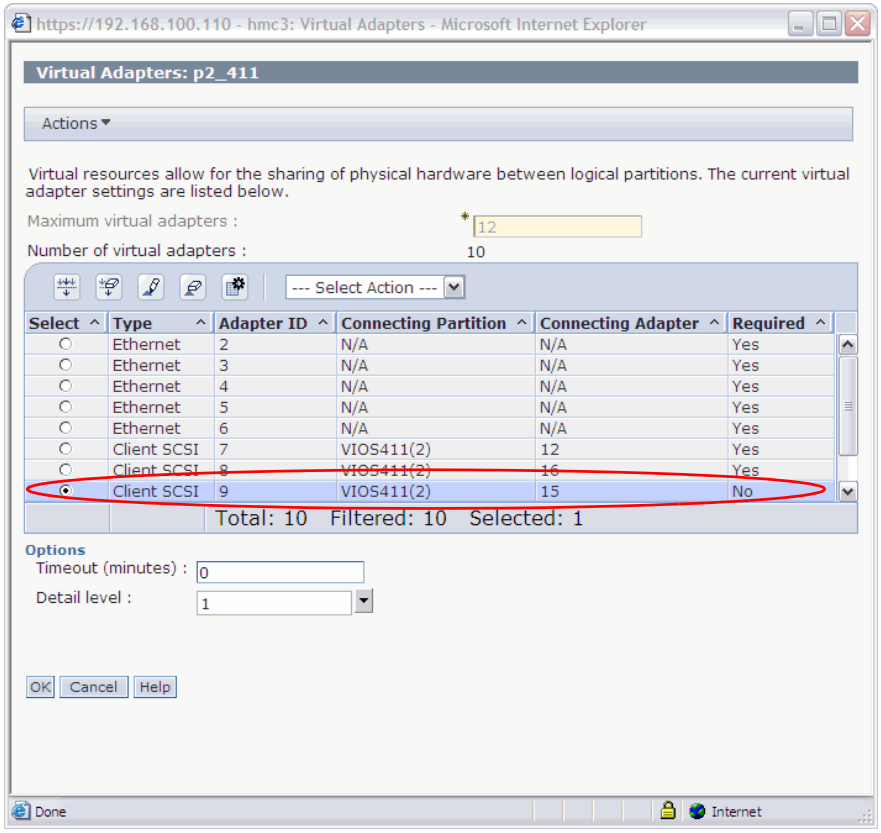

Figure 4-3 Client logical partition mapping for access to SAN disk

On the Virtual I/O Server

5. Map the vhost created from the step above to the SAN disk and present it to the client partition using the **mkvdev** command:

```
$ mkvdev -vdev hdisk6 -vadapter vhost4
vtscsi0 Available
```

On the client partition

The SAN LUN will be visible to the client as a SCSI disk.

6. Verify that the data is available to the client. Running the **lspv** command after the **cfgmgr** command makes the new disk visible on the client. Our test data was extracted from the raw disk using the **dd** command as a confirmation that the migration was successful:

```
   # lspv
hdisk0          000fe41120532faf                    rootvg
active
# cfgmgr
# lspv
hdisk0          000fe41120532faf                    rootvg
active
hdisk1          none                                None
#
# dd if=/dev/hdisk1 count=21
This is a raw disk test file.
2814+0 records in.
2814+0 records out.
```

This migration is now complete.

5

Logical partition migrations

In this chapter we describe the methods for moving data from a logical partition with direct-attached disk to a logical partition using disk presented through a Virtual I/O Server.

5.1 Direct-attached SCSI partition to virtual SCSI

This migration method describes a scenario where a logical partition with local direct-attached disk is migrated to a Virtual I/O Server in the same systems enclosure or CEC, as shown in Figure 5-1.

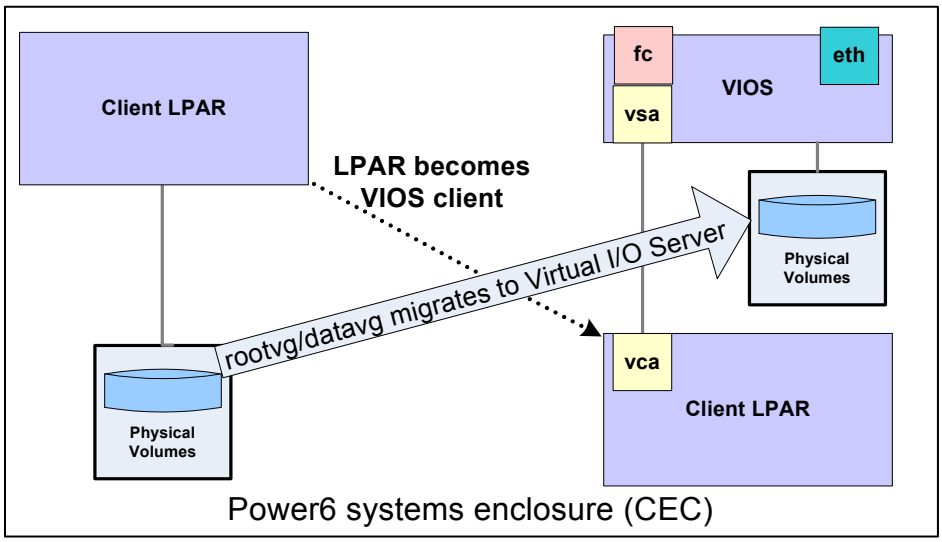

Figure 5-1 Local disk to Virtual I/O Server migration

On the client partition: part 1

The client tasks to be performed involve the identification of the resources to be migrated. While not mentioned as a step in this example, your local procedures may also require that a valid backup is taken before performing the migration.

1. The first step is to perform identification tasks to ensure that the correct disks are migrated. In this example a single disk root volume group is migrated. These same procedures apply regardless of how many disks and volume groups one is required to migrate:

   a. List the physical disks using the **lspv** command:

   ```
   # lspv
   hdisk0          002631cd31ad04f5                    rootvg
   active
   #
   ```

   b. Identify the disks that will be migrated using the **lsdev** command:

   ```
   # lsdev -Cc disk
   hdisk0  Available 00-08-01-1,0  16 Bit LVD SCSI Disk Drive
   ```

c. Check whether the disks to be migrated have a unique ID using the **lsattr** command:

```
# lsattr -El hdisk0
PCM             PCM/friend/scsiscsd                Path Control Module

False
algorithm       fail_over                          Algorithm

True
dist_err_pcnt   0                                  Distributed Error Percentage

True
dist_tw_width   50                                 Distributed Error Sample Time

True
hcheck_interval 0                                  Health Check Interval

True
hcheck_mode     nonactive                          Health Check Mode

True
max_transfer    0x40000                            Maximum TRANSFER Size

True
pvid            002631cd31ad04f50000000000000000   Physical volume identifier

False
queue_depth     3                                  Queue DEPTH

False
reserve_policy  single_path                        Reserve Policy

True
size_in_mb      146800                             Size in Megabytes

False
unique_id       22080004B9710BST3146807LC03IBMscsi Unique device identifier

False
#
```

In the previous output, both the `pvid` and `unique_id` values have been highlighted for clarity. These values will be required at later stages to verify that the migration is proceeding correctly.

2. Identify the parent device to which hdisk0 is connected. This is done using the **lsdev** command in two steps:

```
# lsdev -l hdisk0 -F parent
scsi1
# lsdev -l scsi1 -F parent
sisscsia0
#
```

3. The output from step 2 shows us that in this example, hdisk0 is attached to the SCSI device scsi1, which has a parent device of sisscsia0. Determine what the sisscsia0 device is using the **lsdev** command:

```
# lsdev -C | grep sisscsia0
sisscsia0  Available 00-08         PCI-X Dual Channel Ultra320 SCSI Adapter
#
```

4. The next step is to identify any other resources attached to the SCSI controller sisscsia0. Use the **lsdev** command with the location code 00-08, which is given from the output:

```
# lsdev -C | grep 00-08
hdisk0     Available 00-08-01-1,0  16 Bit LVD SCSI Disk Drive
scsi0      Available 00-08-00      PCI-X Dual Channel Ultra320 SCSI Adapter bus
scsi1      Available 00-08-01      PCI-X Dual Channel Ultra320 SCSI Adapter bus
ses0       Available 00-08-00-14,0 SCSI Enclosure Services Device
ses1       Available 00-08-00-15,0 SCSI Enclosure Services Device
ses2       Available 00-08-01-14,0 SCSI Enclosure Services Device
ses3       Available 00-08-01-15,0 SCSI Enclosure Services Device
sisscsia0  Available 00-08         PCI-X Dual Channel Ultra320 SCSI Adapter
```

   The previous output shows that:

   – There is only one hdisk device attached to the SCSI controller.

   – There are two scsi devices, scsi0 and scsi1, one for each port on the sisscsia0 SCSI controller.

   – There are four ses units, ses0 through ses3, which belong to the SCSI enclosure that our hdisk is located in.

   Since there are no other hard disks or devices such as CD-ROM drives attached, migrating the sisscsia0 SCSI controller card can now be performed.

5. Obtain the physical location code for the SCSI adapter card using the **lscfg** command:

```
# lscfg -vl sisscsia0
  sisscsia0        U78A0.001.0000000-P1-C4  PCI-X Dual Channel Ultra320 SCSI

Adapter

      PCI-X Dual Channel Ultra320 SCSI Adapter:
        Part Number.................97P3359
        FRU Number.................97P3359
```

```
Serial Number...............YL10C4061142
Manufacture ID..............000C
EC Level....................0
ROM Level.(alterable).......05080092
Product Specific.(ZO).......5702
Hardware Location Code......U78A0.001.0000000-P1-C4

#
```

In the previous output the hardware location code is highlighted and provides the physical location code of slot C4 for the sisscsia0 SCSI adapter. Write down the location code for use in future steps.

6. Shut down the client logical partition with the **shutdown** command and ensure that it is fully shutdown before continuing the migration.

On the HMC

The HMC is now used to create client and server virtual SCSI adapters and migrate the SCSI Storage controller to the correct profile.

7. Modify the client logical partition profile by removing the SCSI adapter with the local attached disks. The physical location code that was noted from the previous step 6 on page 93 was slot C4. Figure 5-2 shows the logical partition profile properties.

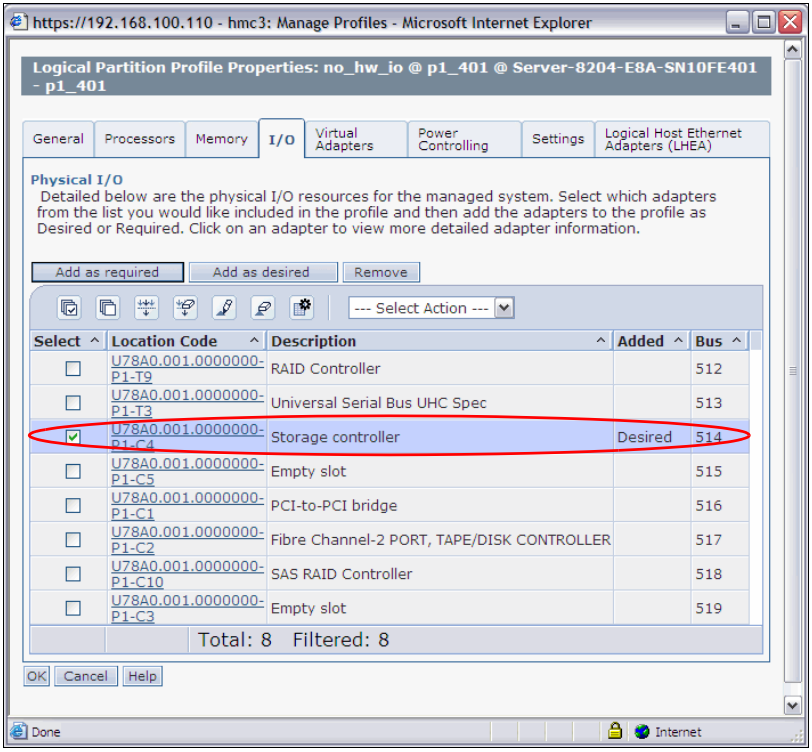

Figure 5-2 Logical Partition Profile Properties panel

Select the correct storage controller, as shown in Figure 5-2, using slot C4. Click the **Remove** tab, click **OK**, then click **Close** to remove the adapter from the profile.

8. Select the client partition and display the virtual adapters list. Make a note of a free slot number. This slot number will be required in a future step.
9. Select the Virtual I/O Server and add a virtual SCSI server adapter. You will choose a free slot number on the Virtual I/O Server and map it to the slot number that you made a note of in the previous step. In our case, the server

slot number is 15 and the free client slot number is 5. Figure 5-3 shows the required properties to create the server adapter.

If you perform this task using the **Dynamic Logical Partition** → **Virtual Adapters** function to add the virtual SCSI server adapter, be sure that you save the current profile using the **Configuration** → **Save Current Configuration** function. You can rename this newly created profile later if required.

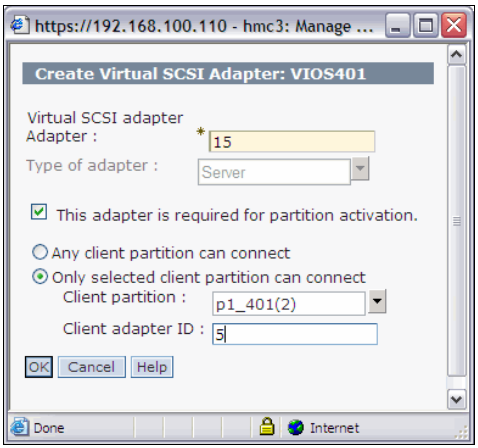

Figure 5-3 Create Virtual SCSI Server Adapter panel

10. Modify the Virtual I/O Server to add the SCSI adapter to the profile.

    Figure 5-4 shows the storage controller in slot C4, which has been highlighted, for addition to the profile.

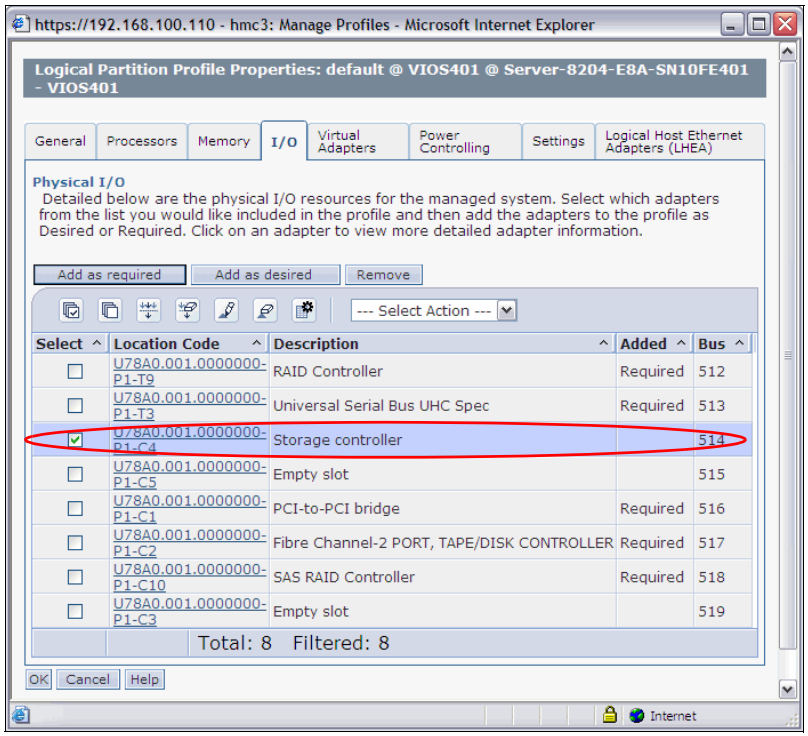

Figure 5-4 Logical Partition Profile Properties panel

Click the **Add as required** tab, click **OK**, then click **Close** and return to the HMC management server panel.

11. Now you must make the Virtual I/O Server use the newly added SCSI Storage controller. There are two choices to make the Virtual I/O Server see the SCSI Storage controller, which depend on the environment that are running in:

    a. Use the **Dynamic Logical Partition** → **Physical adapters** → **Add** function on the HMC Server Tasks panel to add the SCSI Storage controller to the operating Virtual I/O Server.

       If you use the dynamic method, once the HMC panel returns with no errors, you must log in to the Virtual I/O Server as the padmin user and issue the **`cfgdev`** command to configure the devices.

    b. Reboot the Virtual I/O Server if it is practical to do so.

12. Create a client virtual SCSI adapter. Select your client partition and navigate through, selecting your profile for the **Create** → **Virtual Adapters** task. You can fill the panel in with the required information, similar to the panel shown in Figure 5-5.

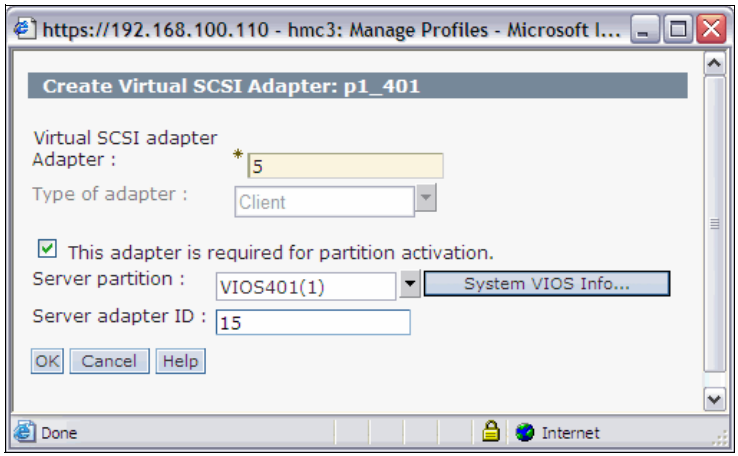

Figure 5-5 Create Virtual SCSI Adapter Panel

Ensure that the Virtual SCSI adapter number is the same as the free client slot number that you identified previously and that the server adapter ID matches the slot number used when you created the virtual SCSI server adapter.

On the Virtual I/O Server

Verify that the correct devices have been created and perform the mapping of the physical disk to the client logical partition.

13. Log in to the Virtual I/O Server as the padmin user ID.

    a. To check that the creation of the new virtual SCSI server adapter has been successful, use the **lsdev** command and notice that a new vhost has been created, vhost4 in the example:

```
$ lsdev | grep vhost
vhost0          Available   Virtual SCSI Server Adapter
vhost1          Available   Virtual SCSI Server Adapter
vhost2          Available   Virtual SCSI Server Adapter
vhost3          Available   Virtual SCSI Server Adapter
vhost4          Available   Virtual SCSI Server Adapter
```

b. Use the **lsmap** command to ensure that vhost4 is the correct virtual adapter:

```
$ lsmap -all | grep vhost4
vhost4          U8204.E8A.10FE401-V1-C15
0x00000000
$
```

The previous output confirms that vhost4 is our required virtual SCSI server adapter. The location code of C15 matches the slot that was used when it was created.

14. Now look for new disks that have been defined.

a. Use the **lsdev** command to look at the hard drives:

```
$ lsdev -type disk
name             status      description
hdisk0           Available   SAS Disk Drive
hdisk1           Available   SAS Disk Drive
hdisk2           Available   SAS Disk Drive
hdisk3           Available   SAS Disk Drive
hdisk4           Available   SAS Disk Drive
hdisk5           Available   SAS Disk Drive
hdisk6           Available   SAS Disk Drive
hdisk7           Available   SAS Disk Drive
hdisk8           Available   16 Bit LVD SCSI Disk Drive
$
```

In the previous output, hdisk8 has been added and is a SCSI disk.

b. Confirm that this disk is correct using the **chkdev** command:

```
$ chkdev -dev hdisk8 -verbose
NAME:                hdisk8
IDENTIFIER:          22080004B9710BST3146807LC03IBMscsi
PHYS2VIRT_CAPABLE:   YES
VIRT2NPIV_CAPABLE:   NA
VIRT2PHYS_CAPABLE:   NA
PVID:                002631cd31ad04f50000000000000000
UDID:                22080004B9710BST3146807LC03IBMscsi
IEEE:
VTD:

$
```

In the previous output, the PVID and UDID fields match the values noted from the client logical partitions PVID and unique_id, respectively.

The PHYS2VIRT_CAPABLE field is also set to YES, an indication that this disk is acceptable to virtualize to a client partition.

15. Create a mapping from the physical disk and verify that the mapping is correct:

    a. Use the **mkvdev** command to map hdisk8 to the new virtual Server SCSI adapter, which is vhost4:

    ```
    $ mkvdev -vdev hdisk8 -vadapter vhost4
    vtscsi0 Available
    $
    ```

    b. Use the **lsmap** command to verify that the correct disk is now mapped to vhost4:

    ```
    $ lsmap -vadapter vhost4
    SVSA            Physloc                                     Client Partition ID
    --------------- ------------------------------------------- ------------------
    vhost4          U8204.E8A.10FE401-V1-C15                    0x00000000

    VTD                   vtscsi0
    Status                Available
    LUN                   0x8100000000000000
    Backing device        hdisk8
    Physloc               U78A0.001.0000000-P1-C4-T2-L1-L0

    $
    ```

On the client partition: part 2

Now boot the client partition and perform the post-migration steps:

1. Re-verify that the disks that are now presented are correct:

    a. Use the **lspv** command and check the PVID:

    ```
    # lspv
    hdisk1          002631cd31ad04f5                    rootvg
    active
    #
    ```

    b. Use the **lsdev** command. Notice in the output below that the disk is now a Virtual SCSI Disk Drive.

    ```
    # lsdev -Cc disk
    hdisk0  Defined   00-08-01-1,0  16 Bit LVD SCSI Disk Drive
    hdisk1  Available               Virtual SCSI Disk Drive
    ```

    c. Use the **lscfg** command if required for final validation:

    ```
    # lscfg -vl hdisk1
      hdisk1           U8204.E8A.10FE401-V2-C5-T1-L8100000000000000
    Virtual SCSI Disk Drive
    #
    ```

In the previous output the C5 is the client slot number and 8100000000000000 matches the value of the LUN field in the output from the **lsmap** command that was performed on the Virtual I/O Server. These values are all correct.

2. If the disks that you migrated contain a boot volume, check and update the boot information if required.

   a. Use the **bosboot** command to set up the disk correctly for the next boot:

   ```
   # bosboot -ad /dev/hdisk1

   bosboot: Boot image is 40810 512 byte blocks.
   ```

   Ensure that the /dev/ipldevice is linked to the correct hard disk.

   b. Use the **bootlist** command to first set the hdisk and the correct media:

   ```
   # bootlist -m normal hdisk1
   ```

   c. Use the **bootlist** command to verify that the disk is set correctly to boot:

   ```
   # bootlist -m normal -o
   hdisk1  blv=hd5
   #
   ```

Your migration is now complete.

5.2 Direct-attached SAN rootvg and data partition to SAN virtual SCSI

In this section a logical partition's direct-attached SAN rootvg and data volumes will be migrated to another partition that will have the same volumes available as a virtual SCSI disk. The migration method used will be to remap the physical Fibre Channel adapter from the source partition to the Virtual I/O Server. If you

already have a physical Fibre Channel adapter on the Virtual I/O Server, you may do the migration by mapping the SAN storage to the Virtual I/O Server instead of remapping the adapter. Figure 1-2 provides a graphical representation of the procedure that you are about to follow.

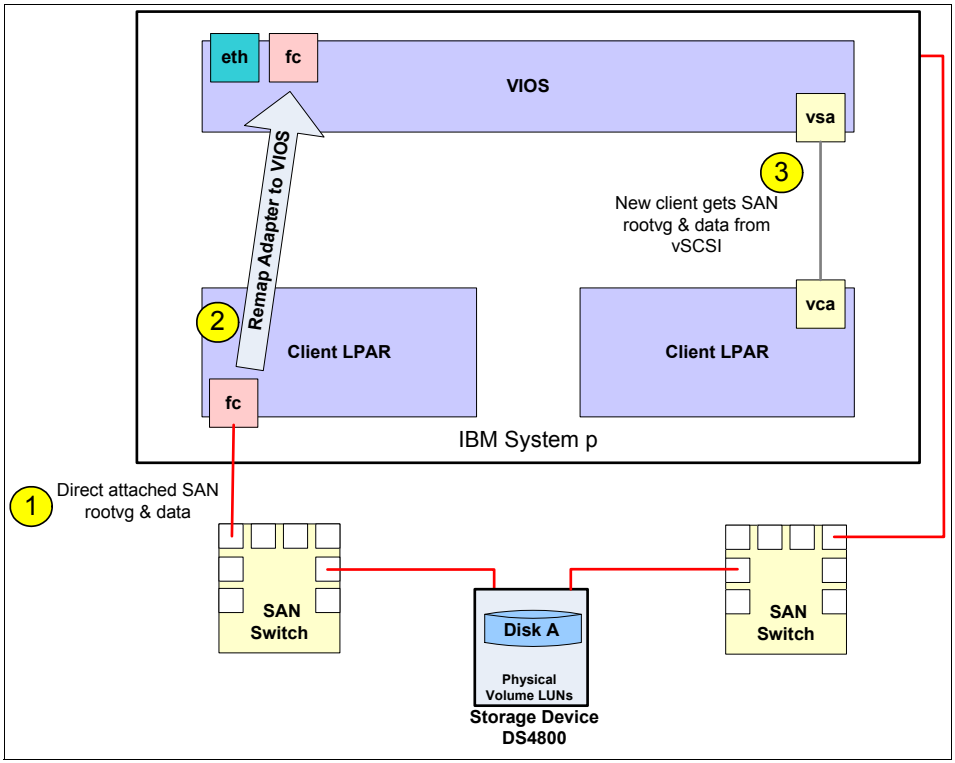

Figure 5-6 SAN direct attach rootvg and data partition migration to SAN vSCSI

In the scenario described below, it is assumed that you have:

- A running source client partition with direct-attached rootvg and a data volume on SAN LUNs
- A Virtual I/O Server that has access to the same SAN as the direct-attached source client
- A destination client partition that is currently shut down

On the source partition

The following series of commands show us the pre-migration state of the source partition and allow us to collect the information that will be needed later on in the migration.

The first **lspv** command displays only the disks that are relevant for this exercise and shows us that the partition was booted from rootvg on hdisk4 and the data volume group is datasrcvg on hdisk5. The remaining **lsattr** commands retrieve the unique_id for each disk. These IDs will be needed when the Fibre Channel adapter has been remapped to the Virtual I/O Server.

Use the **lsdev** command with the parent flag to verify the type of disk as done in the example 2 on page 92. For additional information about the type of disk, use the **lsattr** command, as shown below. Since the command lists the string FASt in its output, this must be IBM DS4000® Fibre Channel storage. You will see different identification strings unique to the type of storage that you are using.

```
# lspv | grep active
hdisk4          000fe4117e88efc0                    rootvg
active
hdisk5          000fe41181e1734c                    datasrcvg
active
# lsattr -El hdisk4 | grep unique_id
unique_id       3E213600A0B8000291B0800009DCB0402FC540F1815
FAStT03IBMfcp Unique device identifier         False
# lsattr -El hdisk5 | grep unique_id
unique_id       3E213600A0B8000291B0800009DCC0402FC6C0F1815
FAStT03IBMfcp Unique device identifier         False
```

The first two **lsdev** commands that follow provide further confirmation that hdisk4 and hdisk5 are SAN disks. The next **lsdev** command shows us all devices that are on the 00-08 logical location code. This tells us that since our rootvg and data disks are at logical location 00-08, the Fibre Channel adapter that is mapped to the same logical location code will be the Fibre Channel adapter that is serving hdisk4 and hdisk5. As is shown in the output, the Fibre Channel adapter is fcs0. The **lscfg** command gives us the hardware location code of fcs0 that must be moved to the destination partition.

```
# lsdev -l hdisk4
hdisk4 Available 00-08-02 MPIO Other DS4K Array Disk
# lsdev -l hdisk5
hdisk5 Available 00-08-02 MPIO Other DS4K Array Disk
# lsdev | grep 00-08
fcnet0     Defined   00-08-01 Fibre Channel Network Protocol Device
fcs0       Available 00-08    FC Adapter
fscsi0     Available 00-08-02 FC SCSI I/O Controller Protocol Device
```

```
hdisk1     Available 00-08-02 MPIO Other FC SCSI Disk Drive
hdisk2     Available 00-08-02 MPIO Other FC SCSI Disk Drive
hdisk4     Available 00-08-02 MPIO Other DS4K Array Disk
hdisk5     Available 00-08-02 MPIO Other DS4K Array Disk
hdisk6     Available 00-08-02 MPIO Other FC SCSI Disk Drive
hdisk7     Available 00-08-02 MPIO Other FC SCSI Disk Drive
# lscfg -vl fcs0
  fcs0             U78A0.001.DNWGCV7-P1-C4-T1  FC Adapter

        Part Number.................10N8620
        Serial Number...............1B80904DC3
        Manufacturer................001B
        EC Level....................A
        Customer Card ID Number.....5759
        FRU Number.................. 10N8620
        Device Specific.(ZM)........3
        Network Address.............10000000C9738E84
        ROS Level and ID............02C82774
        Device Specific.(Z0)........1036406D
        Device Specific.(Z1)........00000000
        Device Specific.(Z2)........00000000
        Device Specific.(Z3)........03000909
        Device Specific.(Z4)........FFC01231
        Device Specific.(Z5)........02C82774
        Device Specific.(Z6)........06C12715
        Device Specific.(Z7)........07C12774
        Device Specific.(Z8)........20000000C9738E84
        Device Specific.(Z9)........BS2.71X4
        Device Specific.(ZA)........B1F2.70A5
        Device Specific.(ZB)........B2F2.71X4
        Device Specific.(ZC)........00000000
        Hardware Location Code......U78A0.001.DNWGCV7-P1-C4-T1
```

The remaining commands gather data that will be compared with the post-migration state to validate that the disks on the source system are in fact the same disks as on the destination partition.

The **tail** command lists out the last two lines of the `/etc/hosts` file and the **df** command shows us that the partition has a `/data` file system mounted. Finally, the **ls** command shows us a data file that was created for this exercise to validate the post-migration data disk.

```
# tail -2 /etc/hosts
192.168.100.92  p2_411
192.168.100.91  p1_411
# df -k
```

```
Filesystem    1024-blocks      Free %Used    Iused %Iused Mounted on
/dev/hd4           196608     31000   85%    13317    62% /
/dev/hd2          1966080    128204   94%    38267    54% /usr
/dev/hd9var        376832    128428   66%     7128    20% /var
/dev/hd3           147456    130732   12%       40     1% /tmp
/dev/hd1            16384     16032    3%        5     1% /home
/dev/hd11admin      131072    130708    1%        5     1% /admin
/proc                  -         -    -         -     -  /proc
/dev/hd10opt       409600    122912   70%     8450    24% /opt
/dev/livedump      262144    261776    1%        4     1%
/var/adm/ras/livedump
/dev/fslv00       2097152   2096504    1%        5     1% /data
# cd /data
# ls -l
total 0
drwxr-xr-x    2 root     system          256 Oct 23 09:53 lost+found
-rw-r--r--    1 root     system            0 Nov 28 2010
migrate_FC_to_vSCSI.sig
```

The required data collection from the source partition is now complete. Shut down the source partition.

On the HMC

The Fibre Channel adapter must now be remapped from the source partition to the Virtual I/O Server so that the LUNs may be made available to the destination partition as virtual SCSI disk.

1. Using the hardware location code for fcs0 from the previous step, open the source partition's profile panel and locate the physical Fibre Channel adapter. In Figure 5-7, the correct Fibre Channel adapter in slot C4 has been highlighted. Remove this Fibre Channel adapter from the partition profile.

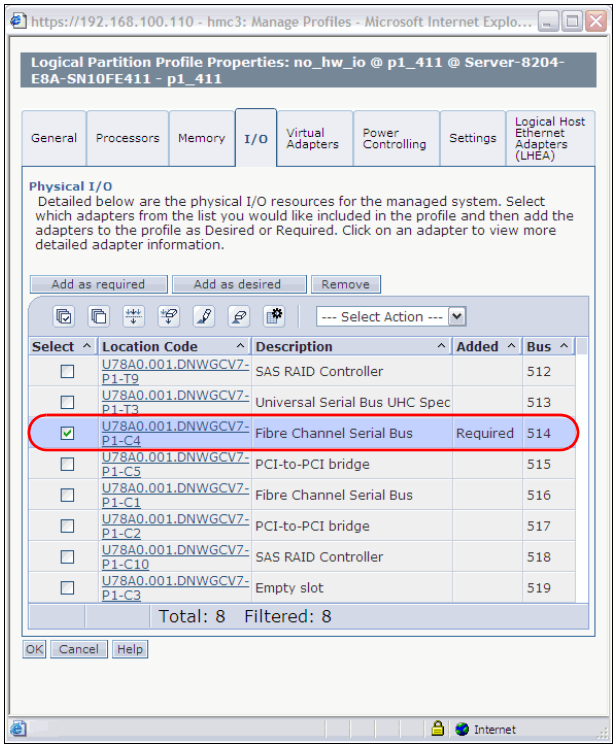

Figure 5-7 Physical Fibre Channel Adapter to remove from source partition

2. Dynamically add the physical Fibre Channel adapter removed from the source partition profile in the previous step to the Virtual I/O Server. The partition Properties Panel will show something similar to the highlighted portion in Figure 5-8 when this step is complete.

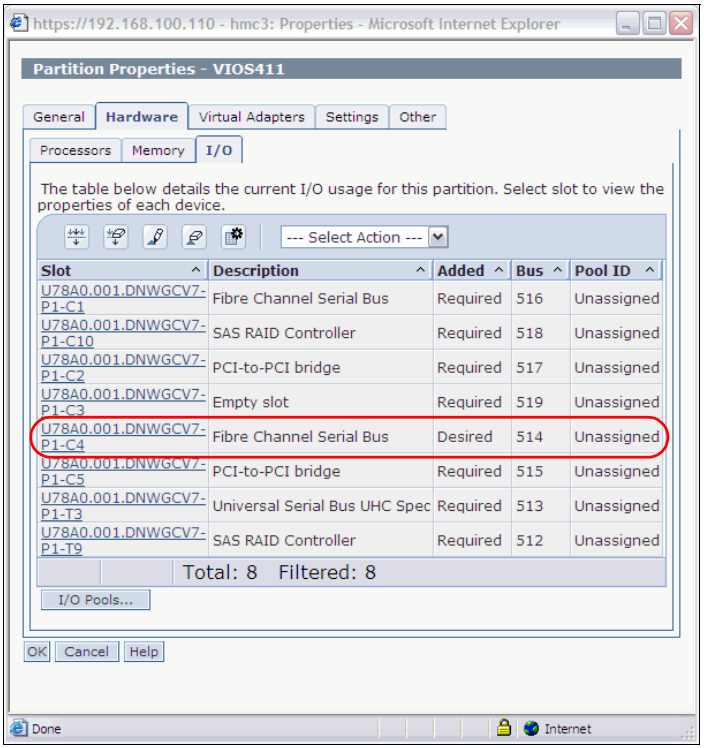

Figure 5-8 Fibre Channel adapter added to Virtual I/O Server

3. Dynamically add two virtual SCSI server adapters to the Virtual I/O Server, one for rootvg and the other for the data disk. An example of the panel in which you create a virtual adapter is displayed in Figure 5-9.

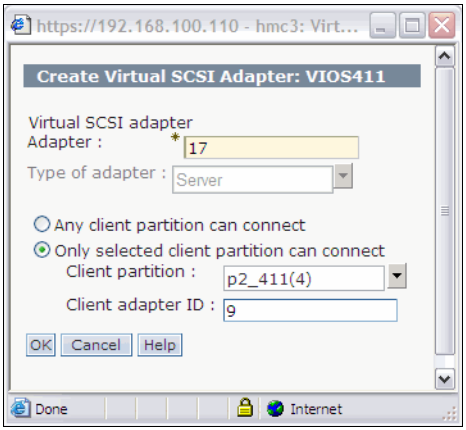

Figure 5-9 Virtual SCSI Server Adapter Add Panel

Figure 5-10 shows the Virtual Adapters panel with our two server SCSI adapters added.

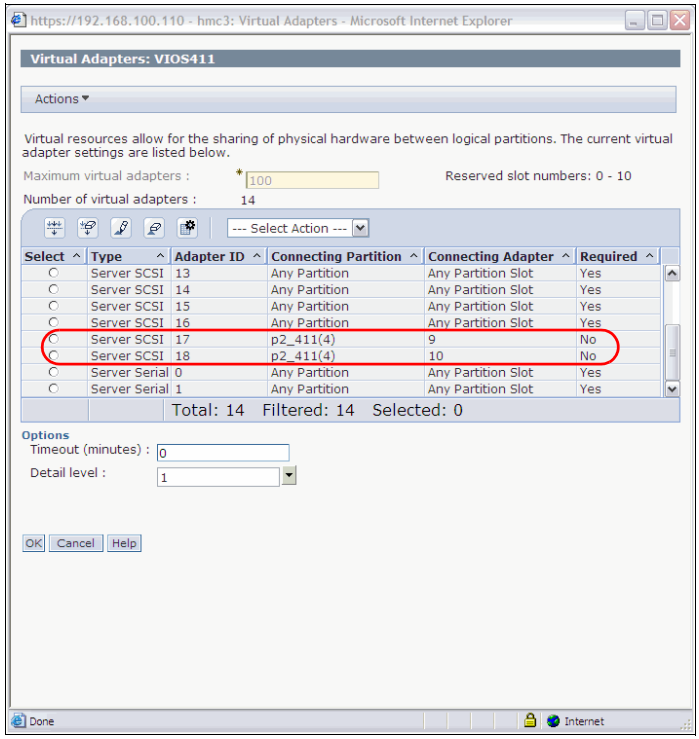

Figure 5-10 Virtual SCSI server adapters added

4. Since our destination partition is currently shut down, add two virtual SCSI client adapters to the destination partition's profile. The client partition's Profile Properties panel is displayed in Figure 5-11 with the added client adapters highlighted.

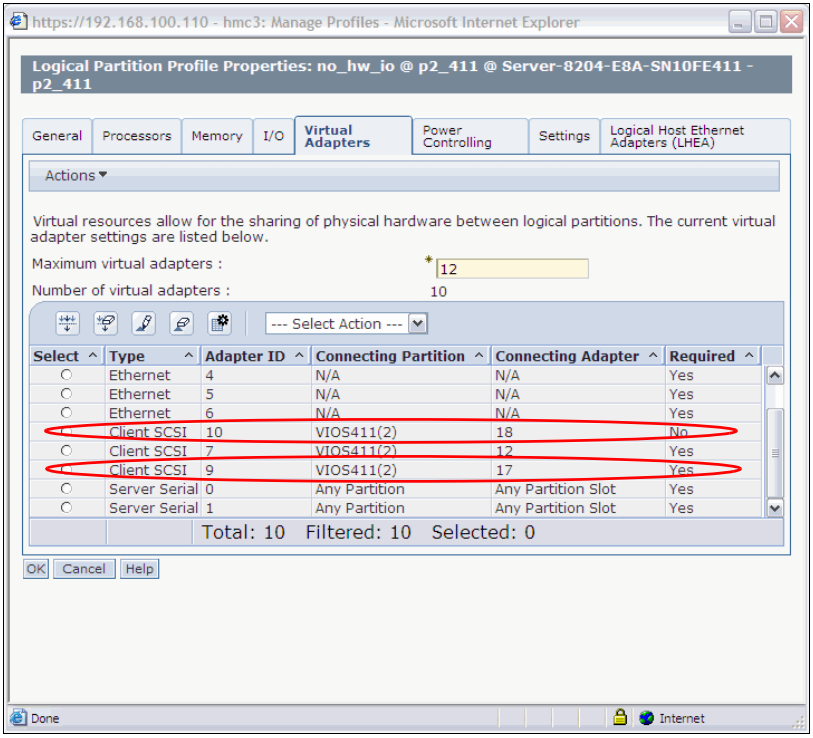

Figure 5-11 Virtual SCSI Client Adapters Added

On the Virtual I/O Server

In the following steps, the adapters defined in the previous steps will be configured and the mappings of the disk from the Virtual I/O Server to the destination client partition created.

5. Run the **cfgdev** command to get the virtual SCSI server adapters configured.
6. Locate the disks that were previously on the source partition that are now visible to the Virtual I/O Server. In the command output below, the **chkdev** command is used to validate that the correct disk from the available disks on the Virtual I/O Server was selected. Match the unique IDs noted for the disks on the source partition in an earlier step to the UDIDs from the **chkdev** command. If they are the same, you have chosen the correct disk. The **chkdev** command is also used to validate whether mapping hdisk6 and hdisk7 to the destination client partition will destroy any data on those disks. In the example

below, the PHYS2VIRT_CAPABLE field for both disks show a state of YES. This tells us that it is safe to use these disks for our physical-to-virtual migration.

```
$ chkdev -dev hdisk6 -verbose
NAME:                 hdisk6
IDENTIFIER:          3E213600A0B8000291B0800009DCB0402FC540F1815
FAStT03IBMfcp
PHYS2VIRT_CAPABLE:   YES
VIRT2NPIV_CAPABLE:   NA
VIRT2PHYS_CAPABLE:   NA
PVID:                 000fe4117e88efc00000000000000000
UDID:                3E213600A0B8000291B0800009DCB0402FC540F1815
FAStT03IBMfcp
IEEE:
VTD:

$ chkdev -dev hdisk7 -verbose
NAME:                 hdisk7
IDENTIFIER:          3E213600A0B8000291B0800009DCC0402FC6C0F1815
FAStT03IBMfcp
PHYS2VIRT_CAPABLE:   YES
VIRT2NPIV_CAPABLE:   NA
VIRT2PHYS_CAPABLE:   NA
PVID:                 000fe41181e1734c0000000000000000
UDID:                3E213600A0B8000291B0800009DCC0402FC6C0F1815
FAStT03IBMfcp
IEEE:
VTD:
```

7. Locate the vhost server adapters and map the disks to the destination client partition using the **mkvdev** command, as in the example that follows. To validate that you have chosen the correct vhost adapters, look at the slot numbers from the **lsmap** command. As you can see from the **lsmap** output below, the slot number for vhost6 is C17 and the slot number for vhost7 is C18. These slot numbers match the IDs that were used when creating the adapters on the HMC.

```
$ lsmap -vadapter vhost6
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost6          U8204.E8A.10FE411-V2-C17                    0x00000000

VTD                   NO VIRTUAL TARGET DEVICE FOUND

$ lsmap -vadapter vhost7
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
```

```
vhost7          U8204.E8A.10FE411-V2-C18                    0x00000000

VTD                   NO VIRTUAL TARGET DEVICE FOUND

$ mkvdev -vdev hdisk6 -vadapter vhost6
vtscsi2 Available
$ mkvdev -vdev hdisk7 -vadapter vhost7
vtscsi3 Available
```

As shown in the following command output, running **chkdev** again after running the **mkvdev** command will show you the mapped VTDs. In addition, the PHYS2VIRT_CAPABLE field now has a state of NA and the VIRT2NPIV_CAPABLE and VIRT2PHYS_CAPABLE fields have a state of YES. This tells us that hdisk6 and hdisk7 are no longer available for a physical-to-virtual mapping operation, since with the **mkvdev** commands that were just run, physical-to-virtual mapping has already been performed. But both disks are available to be mapped to virtual Fibre Channel or to be remapped back to physical disk.

```
$ chkdev -dev hdisk6 -verbose
NAME:                hdisk6
IDENTIFIER:          3E213600A0B8000291B0800009DCB0402FC540F1815      FAStT03IBMfcp
PHYS2VIRT_CAPABLE:   NA
VIRT2NPIV_CAPABLE:   YES
VIRT2PHYS_CAPABLE:   YES
PVID:                000fe4117e88efc00000000000000000
UDID:                3E213600A0B8000291B0800009DCB0402FC540F1815      FAStT03IBMfcp
IEEE:
VTD:                 vtscsi2

$ chkdev -dev hdisk7 -verbose
NAME:                hdisk7
IDENTIFIER:          3E213600A0B8000291B0800009DCC0402FC6C0F1815      FAStT03IBMfcp
PHYS2VIRT_CAPABLE:   NA
VIRT2NPIV_CAPABLE:   YES
VIRT2PHYS_CAPABLE:   YES
PVID:                000fe41181e1734c0000000000000000
UDID:                3E213600A0B8000291B0800009DCC0402FC6C0F1815      FAStT03IBMfcp
IEEE:
VTD:                 vtscsi3
```

8. Activate the destination client partition in SMS mode and select the disk to boot from that was originally on the source partition. The output below shows the available SCSI devices from SMS from our example. The disk in slot C9 is our original rootvg disk.

```
--------------------------------------------------------------------------------
 Select Media Adapter
 1.          U8204.E8A.10FE411-V4-C7-T1   /vdevice/v-scsi@30000007
 2.          U8204.E8A.10FE411-V4-C9-T1   /vdevice/v-scsi@30000009
 3.          U8204.E8A.10FE411-V4-C10-T1   /vdevice/v-scsi@3000000a
 4.   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
```

9. When the destination partition has completed its boot, verify that the disks that are visible are in fact the original disks from the source partition and that the data is intact. In our example below, our destination client sees the original disks as hdisk8 and hdisk9 as is seen from the following **lspv** command output. The remaining **lsdev** commands show that they appear as virtual SCSI disks and they map to the virtual SCSI adapters vscsi2 and vscsi3.

```
# lspv | grep active
hdisk8          000fe4117e88efc0                    rootvg          active
hdisk9          000fe41181e1734c                    datasrcvg       active
# lsdev -l hdisk8
hdisk8 Available  Virtual SCSI Disk Drive
# lsdev -l hdisk9
hdisk9 Available  Virtual SCSI Disk Drive
# lsdev -l hdisk8 -F parent
vscsi2
# lsdev -l hdisk9 -F parent
vscsi3
```

The remaining commands provide additional evidence that hdisk8 and hdisk9 are in fact the same disks that were visible on the original client partition.

Compare the output below to the output gathered from the pre-migration source partition.

The **tail** command lists out the last two lines of the /etc/hosts file, which looks the same as on the original host, and the **df** command shows us that the partition booted with /data already mounted just as on the original host. Finally, the **ls** command shows us that the data on the data disk is intact and that it is the same data disk that was on the original host.

```
# tail -2 /etc/hosts
192.168.100.92  p2_411
192.168.100.91  p1_411
# df -k
Filesystem    1024-blocks      Free %Used    Iused %Iused Mounted on
/dev/hd4           196608     31000   85%    13317    62% /
/dev/hd2          1966080    128204   94%    38267    54% /usr
/dev/hd9var        376832    128428   66%     7128    20% /var
/dev/hd3           147456    130732   12%       40     1% /tmp
/dev/hd1            16384     16032    3%        5     1% /home
/dev/hd11admin      131072    130708    1%        5     1% /admin
/proc                  -         -    -         -     -  /proc
/dev/hd10opt       409600    122912   70%     8450    24% /opt
/dev/livedump      262144    261776    1%        4     1% /var/adm/ras/livedump
/dev/fslv00       2097152   2096504    1%        5     1% /data
# cd /data
# ls -l
total 0
drwxr-xr-x    2 root     system          256 Oct 23 09:53 lost+found
-rw-r--r--    1 root     system            0 Nov 28 2010  migrate_FC_to_vSCSI.sig
```

The migration is now complete.

5.3 Direct-attached SAN rootvg and data partition to virtual Fibre Channel

This method describes a scenario where a logical partition with SAN-attached disks are migrated to a Virtual I/O Server in the same systems enclosure and uses the virtual Fibre Channel function to present the disks.

In Figure 5-12, a direct-attached Fibre Channel adapter is shown with SAN disks for the client logical partition, which is then migrated to the Virtual I/O Server with virtual Fibre Channel installed.

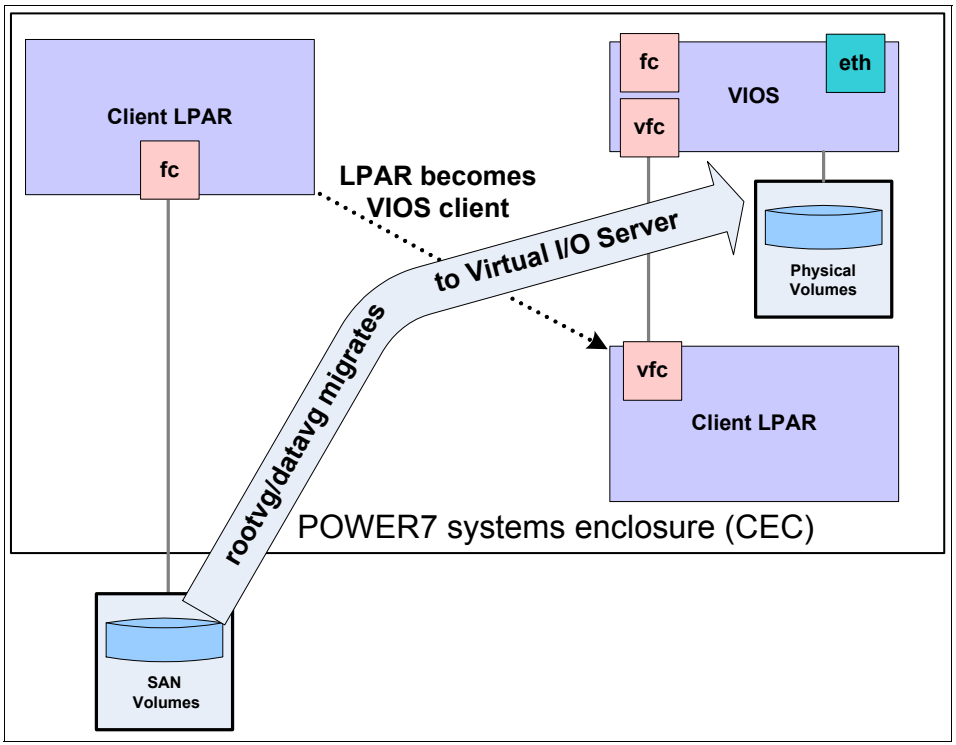

Figure 5-12 Migration from direct-attached SAN to Virtual Fibre Channel

In this example the source client logical partition will be migrated such that the Fibre Channel will be managed by the Virtual I/O Server. For your migration, you may prefer to pre-commission a new logical partition and establish the virtual Fibre Channel connection prior to any change window and then perform the re-mapping phase of the migration at the appropriate time. While the pre-allocation of a new logical partition method depends on having CPU and memory resources available, it saves time because you do not need to be concerned with the direct-attached Fibre Channel adapter until it is required elsewhere.

In addition, the client logical partition's direct-attached Fibre Channel card may not be a supported model for the NPIV function (required for virtual Fibre Channel), requiring you to migrate to a virtual Fibre Channel capable adapter, which may already be installed in a Virtual I/O Server.

On the client partition

On the client logical partition first capture details of the resources that are going to migrate. These may include the details of the root volume group (rootvg), any data volume groups, and the details of the Fibre Channel card if you are going to migrate the Fibre Channel card from the client partition to the Virtual I/O Server:

1. List the physical hard disks available using the **lspv** command:

   ```
   # lspv
   hdisk3          000fe411201305c3                    None
   hdisk4          000fe4117e88efc0                    rootvg          active
   hdisk5          000fe41181e1734c                    datasrcvg       active
   ```

   The output from the **lspv** command shows that there are three disks installed and the physical volume identifiers (PVIDs), as well as the disks volume group membership. For this migration, both the rootvg and datasrcvg will be migrated.

2. At this stage, identify which disk the system is using as a boot disk using either of two AIX commands, **bootlist** or **getconf**:

   ```
   # bootlist -m normal -o
   hdisk4 blv=hd5
   ```

   or

   ```
   # getconf BOOT_DEVICE
   hdisk4
   ```

   The previous output confirms that hdisk4 in rootvg is the boot disk.

3. Now capture information about where the disk is sourced from, which could be local SCSI, virtual SCSI, or SAN-attached disks.

   a. List the physical volume information using the AIX **lsdev** command with the list disk subtype option. This provides us with:

      ```
      # lsdev -Cc disk
      hdisk3 Available          Virtual SCSI Disk Drive
      hdisk4 Available 00-08-02 MPIO Other DS4K Array Disk
      hdisk5 Available 00-08-02 MPIO Other DS4K Array Disk
      ```

      The previous output shows that there are three disks, of which hdisk3 is presented from a virtual SCSI mapping, and disks hdisk4 and hdisk5 are presented from a multi path IO driver (MPIO).

   b. In addition, the MPIO type from the above output is from a DS4000 device which allows us to query the MPIO characteristics using the AIX **mpio_get_config** command:

      ```
      # mpio_get_config -A
          Storage Subsystem worldwide name: 60ab800114632000048ed17e
          Storage Subsystem Name = 'ITSO_DS4800'
      ```

```
hdisk      LUN #   Ownership          User Label
hdisk4         1   B (preferred)      PW9405-17-1
hdisk5         2   B (preferred)      PW9405-17-2
```

The previous output describes where the hard disks that are SAN connected are sourced from (in this case the Storage Subsystem ITSO_DS4800) and how the disks are named in the storage array (PW9405-17-1 and PW9405-17-2, respectively). If you are using EMC storage then the **powermt display** command may be used or the **lspath** command for other MPIO-capable storage to display details.

4. Gather information for any data volume groups that are going to migrate. This includes:

   a. The physical volumes contained in the volume group. Use the **lsvg** command with the -p flag:

   ```
   # lsvg datasrcvg -p
   datasrcvg:
   PV_NAME           PV STATE          TOTAL PPs   FREE PPs    FREE
   DISTRIBUTION
   hdisk5 active            119         102         24..07..23..24..24
   #
   ```

   b. The logical volumes in the data volume groups. Use the **lsvg** command with the -l flag:

   ```
   # lsvg datasrcvg -l
   datasrcvg:
   LV NAME             TYPE       LPs     PPs     PVs  LV STATE      MOUNT
   POINT
   loglv00             jfs2log    1       1       1    open/syncd    N/A
   fslv00              jfs2       16      16      1    open/syncd    /data
   ```

   From the previous output you have determined that the datasrcvg has a single jfs2 file system that is mounted at the /data mount point. To assist in the context of performing migration tests, we wrote a signature to the /data directory using the AIX **touch** command and verified that the file was created using the AIX **ls** command:

   ```
   # ls /data
   lost+found
   # touch /data/migrate_FC_to_VFC.sig
   # ls /data
   lost+found              migrate_FC_to_VFC.sig
   #
   ```

5. The last piece of disk identification information required is the unique identification string for each disk that will migrate. Use the AIX **lsattr** command to obtain this information. For further information about disk

identification refer to 2.2, “Checking unique disk identification” on page 13. The key values to record from the **lsattr** command are:

– The PVID

– The unique_id or ieee_volname, which depends on the type of disk and MPIO driver that you have installed

Example command output for both hdisk4 and hdisk5 follows:

```
# lsattr -El hdisk4
PCM             PCM/friend/otherapdisk

Path Control Module              False
PR_key_value    none

<output truncated>

node_name       0x200200a0b811a662

FC Node Name                     False
pvid            000fe4117e88efc00000000000000000

<output truncated>

unique_id       3E213600A0B8000291B0800009DCB0402FC540F1815      FAStT03IBMfcp

Unique device identifier         False
ww_name         0x201300a0b811a662

FC World Wide Name               False
#
```

and for hdisk5

```
# lsattr -El hdisk5
PCM             PCM/friend/otherapdisk

Path Control Module              False
PR_key_value    none

<output truncated>

node_name       0x200200a0b811a662

FC Node Name                     False
pvid            000fe41181e1734c0000000000000000

<output truncated>

unique_id       3E213600A0B8000291B0800009DCC0402FC6C0F1815      FAStT03IBMfcp

Unique device identifier         False
ww_name         0x201300a0b811a662
```

```
FC World Wide Name              False
#
```

6. Now capture details about the Fibre Channel card if you are going to migrate it. If you are not migrating the Fibre Channel cards then you can omit this step. At the time of writing, only the 8 GB Fibre Channel adapter Feature Code 5735 supports the virtual Fibre Channel (or NPIV) function on a POWER6-technology-based system.

   a. Determine which fiber card would be the candidate for migration by listing the installed adapters and then tracing the SAN-connected hard disks to the source Fibre Channel. List the installed Fibre Channel adapters using the AIX **lsdev** command:

   ```
   # lsdev -C | grep ^fc
   fcnet0     Defined   00-08-01 Fibre Channel Network Protocol Device
   fcnet1     Defined   00-09-01 Fibre Channel Network Protocol Device
   fcs0       Available 00-08    FC Adapter
   fcs1       Available 00-09    FC Adapter
   ```

   b. Use the AIX **lsdev** command to trace back from one of the hard disks and find the owner:

   ```
   # lsdev -l hdisk4 -F parent
   fscsi0
   # lsdev -l fscsi0 -F parent
   fcs0
   ```

   You can now be sure that the Fibre Channel card fcs0 is the correct card if you were going to migrate it to the Virtual I/O Server partition.

   Note: In the example above the Fibre Channel card fcs0 is *not* capable of supporting the virtual Fibre Channel (NPIV) function. The steps provided here are still the correct steps for identification of the Fibre Channel card.

   c. Use the AIX **lscfg** command to obtain the Fibre Channel details. The WWPN will be shown as the network address of the Fibre Channel adapter.

   ```
   # lscfg -vl fcs0
     fcs0             U78A0.001.DNWGCV7-P1-C4-T1  FC Adapter

           Part Number.................10N8620
           Serial Number...............1B80904DC3
           Manufacturer................001B
           EC Level....................A
           Customer Card ID Number.....5759
           FRU Number.................. 10N8620
   ```

```
Device Specific.(ZM)........3
Network Address.............10000000C9738E84
ROS Level and ID............02C82774
Device Specific.(Z0)........1036406D
Device Specific.(Z1)........00000000
Device Specific.(Z2)........00000000
Device Specific.(Z3)........03000909
Device Specific.(Z4)........FFC01231
Device Specific.(Z5)........02C82774
Device Specific.(Z6)........06C12715
Device Specific.(Z7)........07C12774
Device Specific.(Z8)........20000000C9738E84
Device Specific.(Z9)........BS2.71X4
Device Specific.(ZA)........B1F2.70A5
Device Specific.(ZB)........B2F2.71X4
Device Specific.(ZC)........00000000
Hardware Location Code......U78A0.001.DNWGCV7-P1-C4-T1
```

Ensure that you make a note of the network address of the card to verify that it is the correct card if you relocate the card to the Virtual I/O Server.

7. Shut down the client logical partition using the **shutdown** command.

On the HMC: part 1

Use the HMC to dynamically reassign the Fibre Channel card to the Virtual I/O Server and create the virtual Fibre Channel adapter in the client logical partition and Virtual I/O Server's profiles. Finally, use SAN tools to map the required SAN volumes to the newly created virtual Fibre Channel resource.

8. If your Fibre Channel card in the client logical partition is NPIV capable, now is the time to use the HMC to move the card from the client logical partition to the Virtual I/O Server.

   The Fibre Channel card to move is identified by the slot number. Using the Fibre Channel card from the client partition from step 6 on page 118 above, the location of the card is presented as part of the **lscfg** output:

   ```
   fcs0             U78A0.001.DNWGCV7-P1-C4-T1  FC Adapter
   ```

   The above output show us that the fcs0 adapter is located in slot C4.

9. Because you have shut down the client logical partition you can dynamically move the card to the Virtual I/O Server. First edit the client logical partition and remove the Fibre Channel card from the profile.

   You now dynamically assign the card in slot C4 to the Virtual I/O Server using the dynamic logical partitioning tools from the HMC Server Tasks menu. Once the Fibre Channel adapter is configured into the profile remember to save the

profile of the running Virtual I/O Server immediately so that on a restart, the Fibre Channel resource is available for use.

10. Use the HMC to determine a free slot number on the client logical partition. Performing this action now reduces switching between the client logical partition and Virtual I/O Server configurations a number of times.

11. Now create the virtual Fibre Channel resource on the Virtual I/O Server and then the client logical partition. Edit the Virtual I/O Server's running client logical partitions profile by adding a virtual Fibre Channel client adapter.

    From the HMC Systems Management panel, select the server, then the **Configuration** → **Manage Profiles** option. Select the profile by clicking in the check box, then click **OK**. Now use the **Create** → **Fibre Channel** option from the Actions menu, as in Figure 5-13.

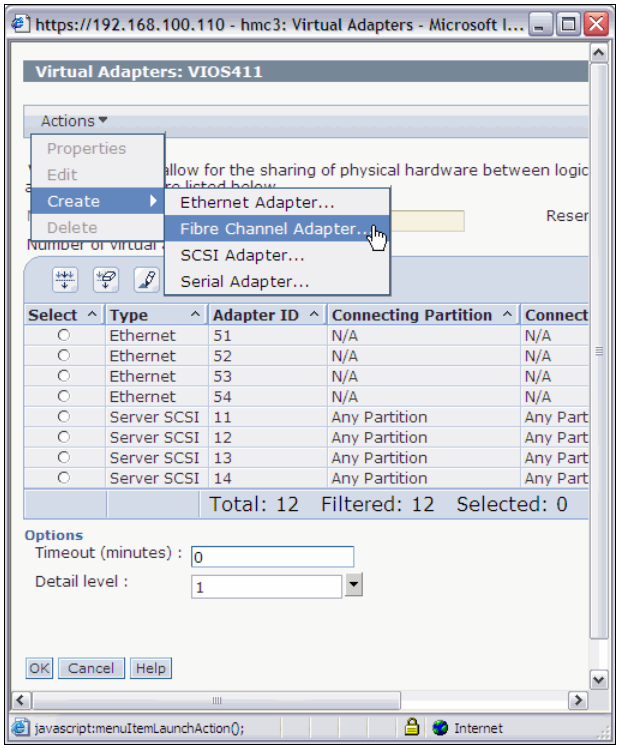

Figure 5-13 Add a Fibre Channel adapter to the Virtual I/O Server

a. Enter the required slot numbers into the Create Virtual Fibre Channel Adapter panel, as in Figure 5-14.

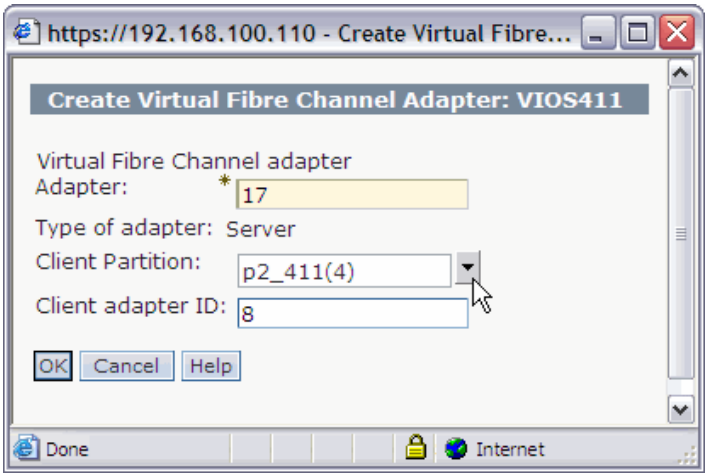

Figure 5-14 Create Virtual Fibre Channel Adapter panel

On the page shown in Figure 5-14 it is also possible to select the client partition, p2_411. Click **OK** once the slot number is entered that was recorded in step 10 on page 120.

b. The HMC panel that is displayed is to the panel in Figure 5-15 and shows that the virtual Fibre Channel is defined for creation. You must exit this panel by clicking the **OK** button for the definition to be saved.

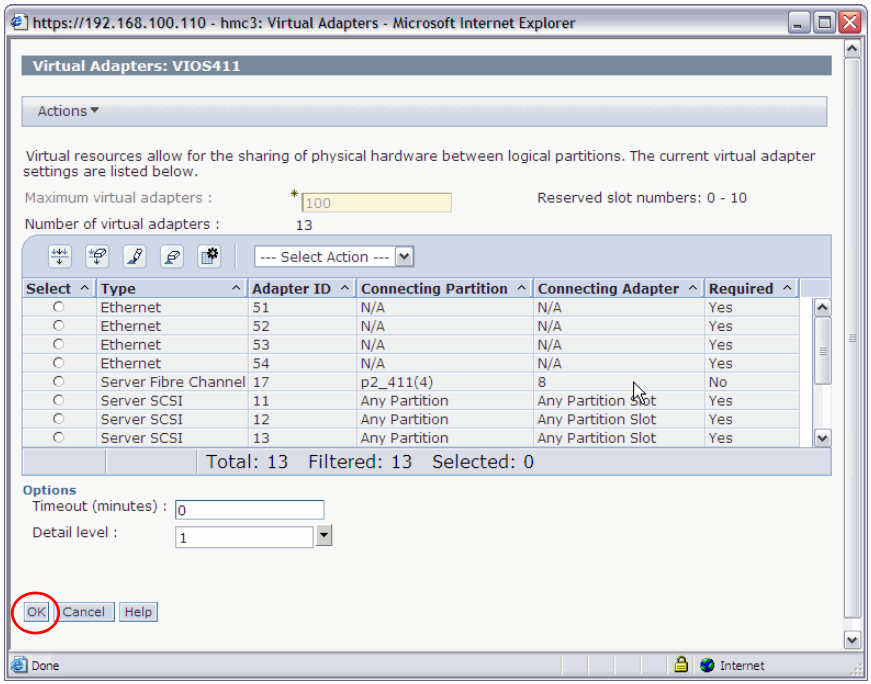

Figure 5-15 Virtual Adapters panel

12. Modify the profile of the client logical partition and create a virtual Fibre Channel client adapter. Select the required client partition, and then edit the profile by using the **Action** → **Edit** function, as in Figure 5-16.

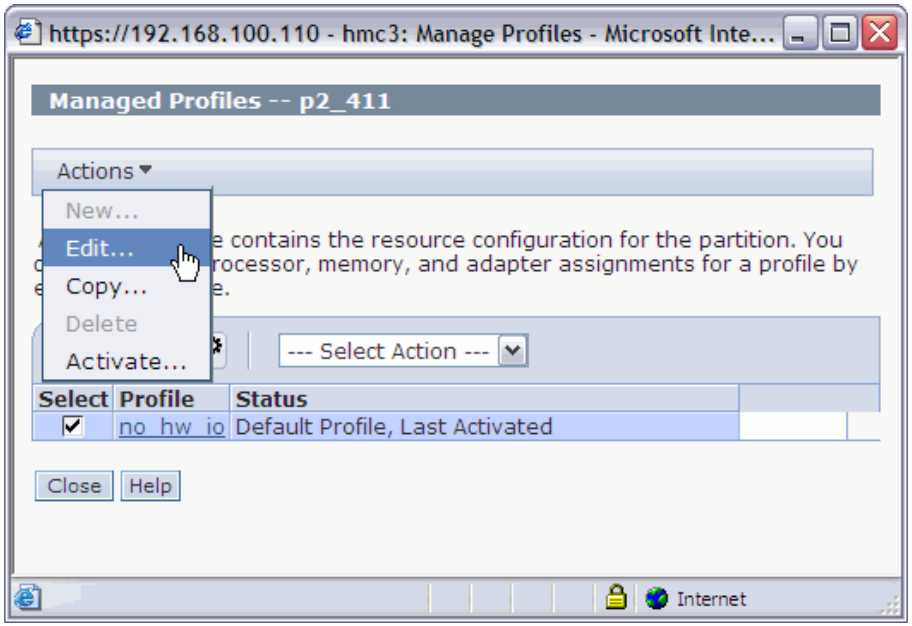

Figure 5-16 Edit a managed profile

a. Select the **Virtual Adapters** tab, as in Figure 5-17.

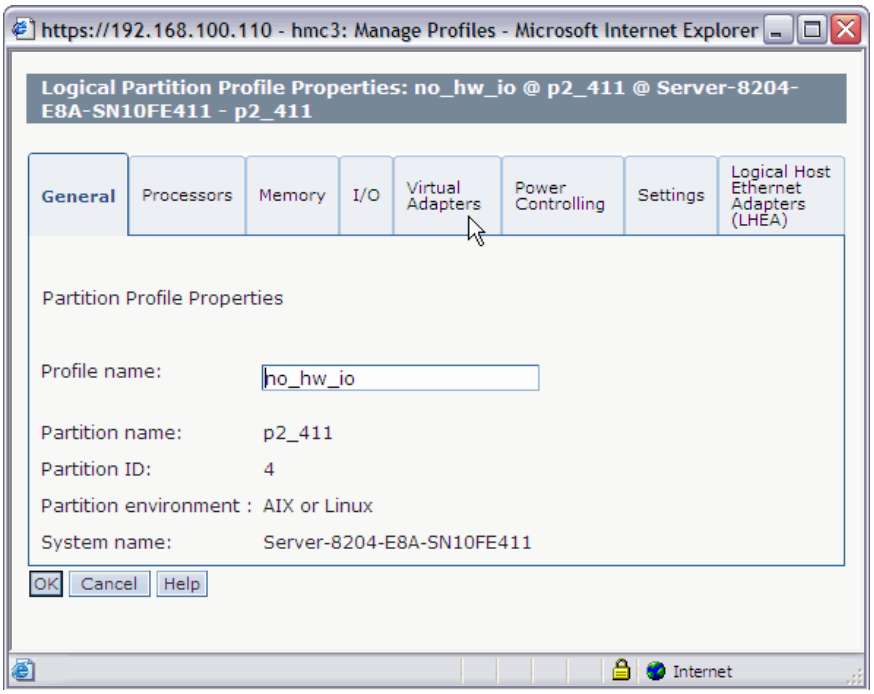

Figure 5-17 Virtual Adapters tab

b. Using the **Actions** drop-down box, as in Figure 5-18, select **Create** → **Fibre Channel Adapter**.

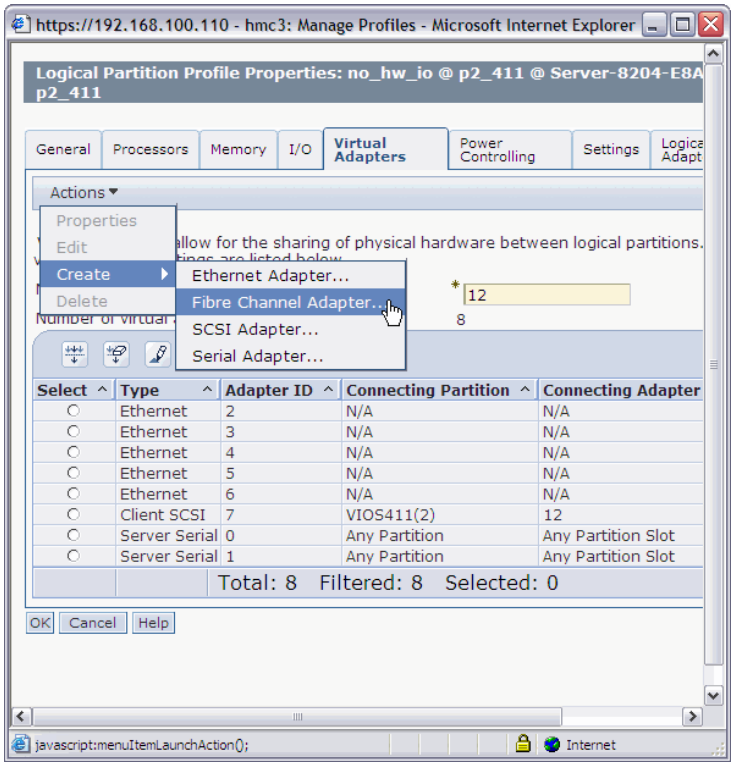

Figure 5-18 Resource Creation panel

c. In the Fibre Channel resource panel (Figure 5-19) enter the slot numbers that match the numbers that you used when you defined the Fibre Channel Adapter on the Virtual I/O Server endpoint in step 12a on page 124. Click **OK** when complete.

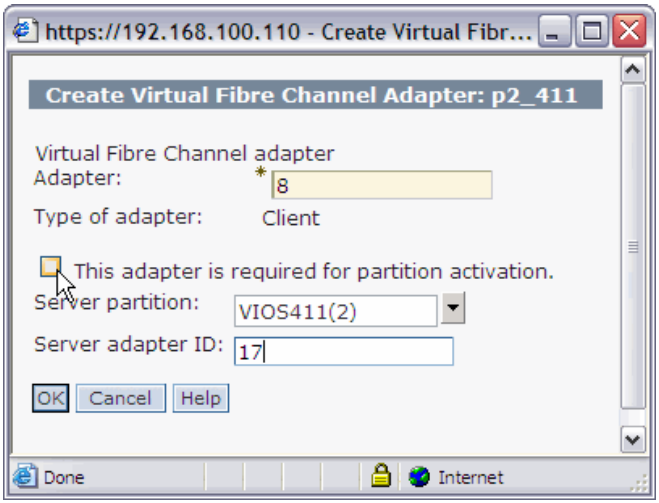

Figure 5-19 Fibre Channel Adapter resources

Note: On the panel shown in Figure 5-19, the “This adapter is required for partition activation” check box was not selected during the test migration. In production this option should be selected.

As shown in Figure 5-20, you can now see that a Client Fibre Channel Adapter has been created.

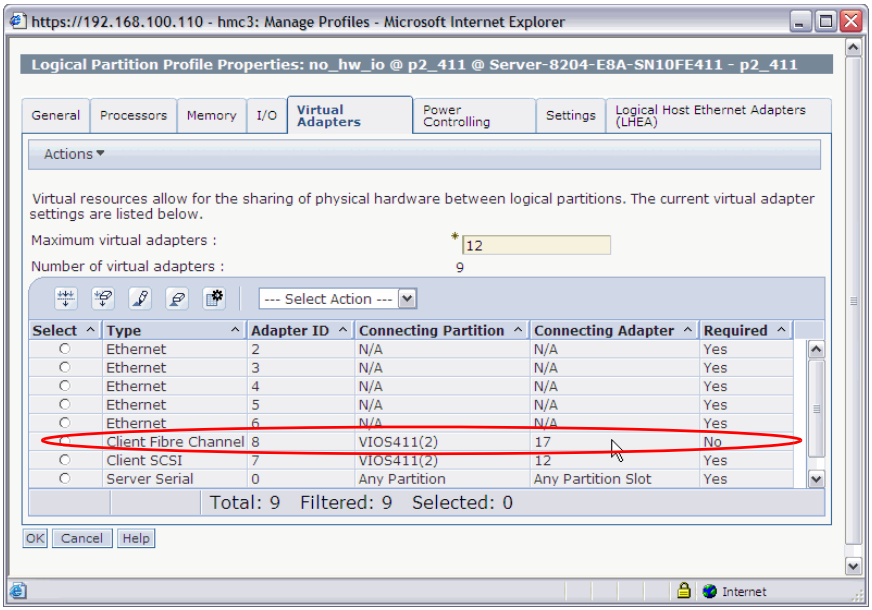

Figure 5-20 Client Fibre Channel Adapter

Note: You must exit the previous panel (Figure 5-20 on page 127) by clicking **OK** for the resource to be saved correctly in the profile.

Exiting without clicking OK means that the POWER Hypervisor will not assign world wide port names (WWPNs) to the client Fibre Channel adapter and you will not be able to continue this migration. For further details refer to 2.4, “Virtual Fibre Channel and N_Port ID virtualization” on page 26.

d. Once you have clicked **OK** on the above panel, reselect the **Virtual Adapters** tab and select the newly created client Fibre Channel adapter. Use the **Actions** → **Properties** selection in the drop-down box (Figure 5-21) to display the WWPNs of the client Fibre Channel adapter.

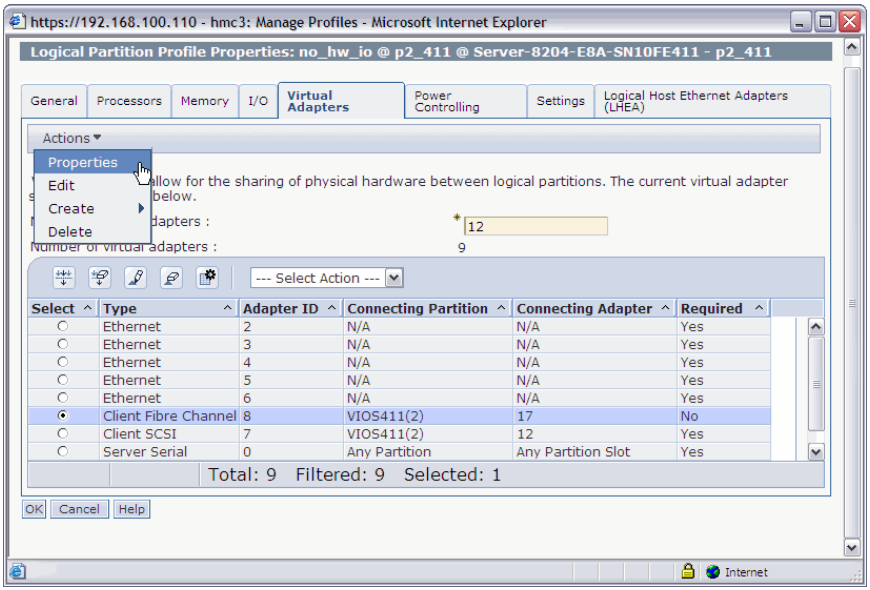

Figure 5-21 Adapter properties

The resulting panel displays the assigned WWPNs, as shown in Figure 5-22.

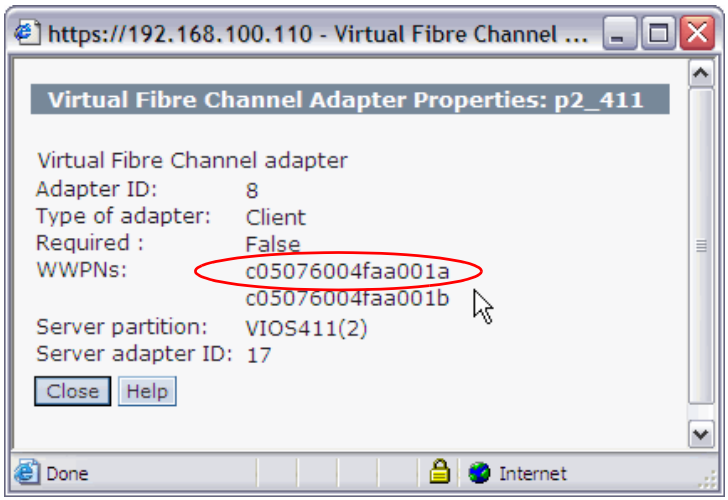

Figure 5-22 Virtual Fibre Channel Adapter Properties

e. Make a note of the WWPNs that are displayed (Figure 5-22), as they will be needed shortly. If you want the adapter and storage to be visible after the partition shutdown, save the configuration to a new profile and use the new profile when starting up the partition.

On the Virtual I/O Server

Now log in to the Virtual I/O Server and map the Fibre Channel card to the virtual Fibre Channel adapter.

13. Log in to the Virtual I/O Server and use the **cfgdev** command to configure the virtual Fibre Channel server adapter. Use the **lsdev** command to ensure that a vfchost device has been created:

```
$ lsdev -type adapter -virtual
name             status      description
ent4             Available   Virtual I/O Ethernet Adapter (l-lan)
ent5             Available   Virtual I/O Ethernet Adapter (l-lan)
ent6             Available   Virtual I/O Ethernet Adapter (l-lan)
ent7             Available   Virtual I/O Ethernet Adapter (l-lan)
vasi0            Available   Virtual Asynchronous Services Interface (VASI)
vbsd0            Available   Virtual Block Storage Device (VBSD)
vfchost0         Available   Virtual FC Server Adapter
vhost0           Available   Virtual SCSI Server Adapter
vhost1           Available   Virtual SCSI Server Adapter
vhost2           Available   Virtual SCSI Server Adapter
```

```
vhost3          Available   Virtual SCSI Server Adapter
vhost4          Available   Virtual SCSI Server Adapter
vhost5          Available   Virtual SCSI Server Adapter
vhost6          Available   Virtual SCSI Server Adapter
vhost7          Available   Virtual SCSI Server Adapter
vsa0            Available   LPAR Virtual Serial Adapter
name            status      description
ent8            Available   Shared Ethernet Adapter
$
```

Or use the shorter form of the **lsdev** command if you prefer:

```
$ lsdev -dev vfchost*
name             status      description
vfchost0         Available   Virtual FC Server Adapter
```

14. Use the Virtual I/O Server **lsdev** command to display the Fibre Channel cards in the Virtual I/O Server partition:

```
$ lsdev -type adapter | grep ^fc
fcs0            Available   8Gb PCI Express Dual Port FC Adapter (df1000f114108a03)
fcs1            Available   8Gb PCI Express Dual Port FC Adapter (df1000f114108a03)
fcs2            Available   FC Adapter
fcs3            Available   FC Adapter
$
```

15. If you relocated a virtual Fibre Channel compliant (NPIV) Fibre Channel card to the Virtual I/O Server, use the **lsdev** command as the padmin user against the Fibre Channel (fcs) devices to locate the corresponding WWPN that you noted from the client logical partition:

```
$ lsdev -dev fcs0 -vpd | grep 'Network Address'
Network Address.............10000000C98723AE

$ lsdev -dev fcs1 -vpd | grep 'Network Address'
Network Address.............10000000C98723AF
```

In the previous example output the highlighted network address matches the address that is expected to be visible.

16. It has now been established that:
    - There is a Virtual Fibre Channel Server adapter.
    - The physical Fibre Channel card is presented correctly to the Virtual I/O Server.
    - The correct WWPN/Network Address can be identified.

Create the mapping between the resources:

a. Use the **lsmap** command to view the newly added virtual Fibre Channel server adapter. Note that the physical location code of the virtual Fibre Channel server adapter will display the slot number:

```
$ lsmap -all -npiv
Name          Physloc                          ClntID ClntName       ClntOS
------------- -------------------------------- ------ -------------- -------
vfchost0      U8204.E8A.10FE411-V2-C17               4

Status:NOT_LOGGED_IN
FC name:                      FC loc code:
Ports logged in:0
Flags:1<NOT_MAPPED,NOT_CONNECTED>
VFC client name:              VFC client DRC:

$
```

b. Now use the Virtual I/O Server **vfcmap** command to establish the relationship between your virtual Fibre Channel server adapter and the physical fcs Fibre Channel card:

```
$ vfcmap -vadapter vfchost0 -fcp fcs1
```

c. The **lsmap** command should now show the correct mapping from physical Fibre Channel card fcs1 to virtual Fibre Channel server adapter vfchost0:

```
$ lsmap -all -npiv
Name          Physloc                          ClntID ClntName       ClntOS
------------- -------------------------------- ------ -------------- -------
vfchost0      U8204.E8A.10FE411-V2-C17               4

Status:NOT_LOGGED_IN
FC name:fcs1                  FC loc code:U78A0.001.DNWGCV7-P1-C1-T2
Ports logged in:0
Flags:4<NOT_LOGGED>
VFC client name:              VFC client DRC:

$
```

The above output from the **lsmap** command is correct for this stage of the migration. For further details see 2.4, “Virtual Fibre Channel and N_Port ID virtualization” on page 26.

On the client partition: part 1

If you did not shut down the client partition cleanly, you may have a SCSI 2 reservation on the disks. This can be removed using the SAN GUI or CLI appropriate to the storage platform. Now force the client logical partition to present the WWPNs to the SAN fabric. This is required because the WWPNs are not presented until the client logical partition is activated (so the SAN fabric

cannot see them at this stage). For further information refer to 2.4, “Virtual Fibre Channel and N_Port ID virtualization” on page 26.

17. Boot to the SMS menu:
    a. Type 5 and press Enter to access the Select Boot Options panel.
    b. Type 1 and press Enter to access the Select Device Type panel.
    c. Type 5 and press Enter to access the Hard Drive Panel.
    d. Type 3 and press Enter to use SAN media.
18. At this point, the following screen is displayed:

```
--------------------------------------------------------------------------------
 Select Media Adapter
 1.          U8204.E8A.10FE411-V4-C8-T1   /vdevice/vfc-client@30000008
 2.   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:
```

19. Type 1 and press Enter. At this stage the world wide port numbers are presented to the SAN Fabric.

Tip: You do not have to leave this screen. Leave it open so that you can complete the procedure.

On the SAN switch and storage device

You have now:

- Created a client virtual Fibre Channel adapter
- Created a Virtual I/O Server Fibre Channel Adapter

- Mapped a physical Fibre Channel port to the virtual Fibre Channel host with the **vfcmap** command
- Started the client logical partition that should present the WWPNs to the SAN fabric

20. Correct the SAN zoning in the SAN switch and the storage device mapping/masking to the new WWPNs.
21. Break the reserve if required. If you did not shut down the client partition cleanly, you may have a SCSI 2 reservation on the disks. This can be removed using the SAN GUI or CLI appropriate to the storage platform.
22. Obtain the WWPNs to be used from the Client Properties panel (Figure 5-22 on page 129). The lowest numbered port name is usually the WWPN that is presented to the SAN devices. Figure 5-23 highlights this number.

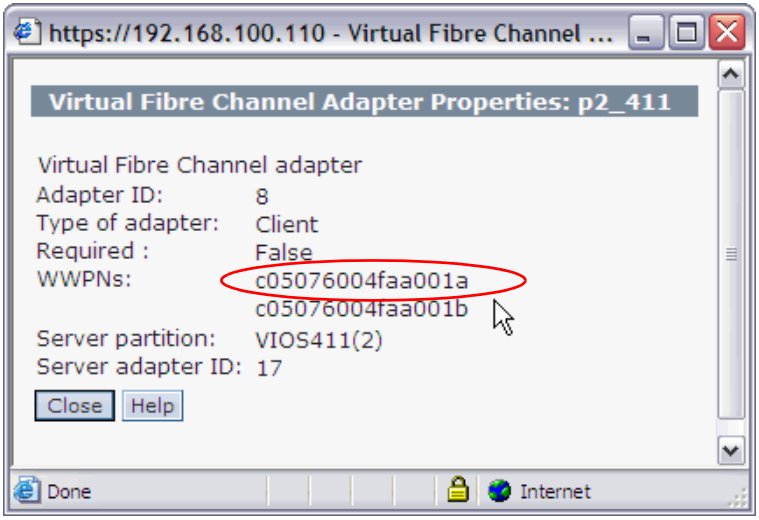

Figure 5-23 World wide port names

On the client partition: part 2

Complete the process of SAN disk discovery using the SMS menu and boot the logical partition:

23. Return to the entry SMS menu by typing `M` and pressing Enter to return to the Main menu and then re-scan for the SAN disk volumes by taking the following steps:
    a. Type `5` and press Enter to access the Select Boot Options panel.
    b. Type `1` and press Enter to access the Select Device Type panel.
    c. Type `5` and press Enter to access the Hard Drive Panel.

d. Type 3 and press Enter to use SAN media.

At this point, the following screen is displayed:

```
--------------------------------------------------------------------------------
 Select Media Adapter
 1.          U8204.E8A.10FE411-V4-C8-T1   /vdevice/vfc-client@30000008
 2.   List all devices
```

24. At the Select Media Adapter panel, type 1 and press Enter, which should correspond to a vfc-client device. The slot number will be the client slot number that was used when the client Virtual Fibre Channel adapter was created:

    U8204.E8A.10FE411-V4-**C8**-T1 /vdevice/**vfc-client**@30000008

    a. You should now see a disk device presented. Select this device by typing the number next to it. In this case type 1 and press Enter.

```
--------------------------------------------------------------------------------
 Select Device
 Device  Current  Device
 Number  Position  Name
 1.        -      SCSI 14 GB FC Harddisk, part=2 (AIX 6.1.0)
        ( loc=U8204.E8A.10FE411-V4-C8-T1-W201300a0b811a662-L0 )




 --------------------------------------------------------------------------------

 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
```

    b. Select the Normal Mode Boot task by typing 2, pressing Enter, typing 1, and then pressing Enter again to exit the SMS menus.

    The system has now booted the Virtual Fibre Channel disk.

25. There are a few last tasks to perform, which are orientated around proving that the correct disks mapped:

    a. Use the AIX **lspv** command to ensure that the disks have the correct PVIDs on them:

```
# lspv
hdisk4          000fe4117e88efc0                    rootvg          active
hdisk5          000fe41181e1734c                    datasrcvg       active
```

These PVIDs match the values that were recorded prior to the migration.

b. The AIX **lsvg** command also shows that the two volume groups are present as expected:

```
# lsvg
rootvg
datasrcvg
```

c. Now list the Fibre Channel devices. Note that there are no physical Fibre Channel cards, but there is a virtual Fibre Channel Client adapter:

```
# lsdev -C | grep ^f
fcnet0     Defined   00-08-01 Fibre Channel Network Protocol
Device
fcnet1     Defined   00-09-01 Fibre Channel Network Protocol
Device
fcs0       Defined   00-08    FC Adapter
fcs1       Defined   00-09    FC Adapter
fcs2       Available C8-T1    Virtual Fibre Channel Client
Adapter
fscsi0     Defined   00-08-02 FC SCSI I/O Controller Protocol
Device
fscsi1     Defined   00-09-02 FC SCSI I/O Controller Protocol
Device
fscsi2     Available C8-T1-01 FC SCSI I/O Controller Protocol
Device
fslv00     Defined            Logical volume
```

d. Trace hdisk4 back to find the parent device:

```
# lsdev -l hdisk4 -F parent
fscsi2
# lsdev -l fscsi2 -F parent
fcs2
```

This proves that the disks are presented using the correct type of Fibre Channel attachment.

e. Also check that the disks are correct with the AIX **mpio_get_config** command:

```
# mpio_get_config -A
    Storage Subsystem worldwide name: 60ab800114632000048ed17e
    Storage Subsystem Name = 'ITSO_DS4800'
        hdisk      LUN #   Ownership          User Label
        hdisk4         0   B (preferred)      PW9405-17-1
        hdisk5         1   B (preferred)      PW9405-17-2
```

The previous steps prove conclusively that the migration from a logical partition with a direct-attached Fibre Channel card to a logical partition with a Virtual Fibre Channel card has been successful.

26. The last steps are to:

    a. Ensure that the bootlist still correctly points to the correct hard disk.

    b. Clean up un-needed references to Fibre Channel cards that have been removed from the operating system.

This migration is now complete.

5.4 Virtual SCSI rootvg and data to virtual Fibre Channel

In this section a logical partition's virtual SCSI rootvg and data volumes will be migrated to another partition that will have the same volumes presented as the virtual Fibre Channel disk. Figure 5-24 provides a graphical representation of the procedure that we detail.

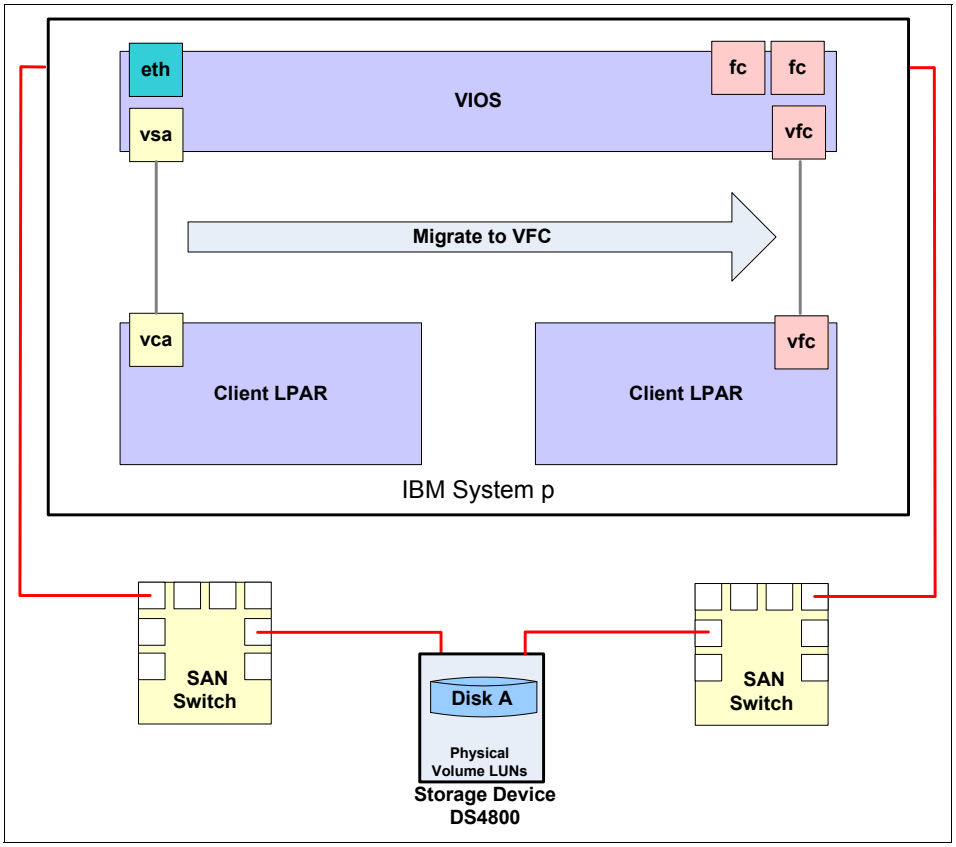

Figure 5-24 Virtual SCSI migration to virtual Fibre Channel

In the scenario described below, it is assumed that you have:

- A running source client partition with virtual SCSI rootvg and data that will become the destination client partition
- A Virtual I/O Server that is serving the source partition with SAN LUNs and has allocated to it a NPIV-capable Fibre Channel adapter

On the source partition

The following series of commands show us the pre-migration state of the source virtual SCSI partition.

1. The first **lspv** command displays only the disks that are relevant for this exercise and shows us that the partition was booted from rootvg on hdisk8 and the data volume group is datasrcvg on hdisk9.

```
# lspv | grep active
hdisk8          000fe4117e88efc0                    rootvg          active
hdisk9          000fe41181e1734c                    datasrcvg       active
```

2. The **lsdev** commands show us that the parent adapter for our two disks are both virtual SCSI adapters and that our disks are virtual SCSI disks:

```
# lsdev -l hdisk8 -F parent
vscsi2
# lsdev -l hdisk9 -F parent
vscsi3
# lsdev -l hdisk8
hdisk8 Available  Virtual SCSI Disk Drive
# lsdev -l hdisk9
hdisk9 Available  Virtual SCSI Disk Drive
```

   The commands that follow are used to gather information about the source partition's disks that will be needed when the migration is complete for validation of the migration.

3. The **df** command shows us that /data should be mounted on this host and the **ls** command shows us a data file on this source host. Finally, the **tail** command shows us the last two lines of the `/etc/hosts` file.

```
# df -k
Filesystem    1024-blocks      Free %Used    Iused %Iused Mounted on
/dev/hd4           196608     29468   86%    13315    63% /
/dev/hd2          1966080    128204   94%    38267    54% /usr
/dev/hd9var        376832    128272   66%     7128    20% /var
/dev/hd3           147456    130732   12%       40     1% /tmp
/dev/hd1            16384     16032    3%        5     1% /home
/dev/hd11admin      131072    130708    1%        5     1% /admin
/proc                  -         -    -         -     -  /proc
/dev/hd10opt       409600    122912   70%     8450    24% /opt
/dev/livedump      262144    261776    1%        4     1%
/var/adm/ras/livedump
/dev/fslv00       2097152   2096504    1%        5     1% /data
# cd /data
# ls -l
total 0
drwxr-xr-x    2 root     system          256 Oct 23 09:53 lost+found
-rw-r--r--    1 root     system            0 Nov 28 2010
migrate_vSCSI_to_vFC.sig
```

```
# tail -2 /etc/hosts
192.168.100.92  p2_411
192.168.100.91  p1_411
```

Having gathered the configuration and validation data from the source partition, shut down the source partition.

On the Virtual I/O Server

On the Virtual I/O Server:

4. Find the virtual SCSI server mappings for the source partition and remove them. The **lsmap** commands in the following example show us the mappings of the virtual SCSI server adapters and the following **rmvdev** commands remove these mappings.

```
$ lsmap -vadapter vhost6
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost6          U8204.E8A.10FE411-V2-C17                    0x00000004

VTD                   vtscsi2
Status                Available
LUN                   0x8100000000000000
Backing device        hdisk6
Physloc               U78A0.001.DNWGCV7-P1-C4-T1-W201300A0B811A662-L0

$ lsmap -vadapter vhost7
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost7          U8204.E8A.10FE411-V2-C18                    0x00000004

VTD                   vtscsi3
Status                Available
LUN                   0x8100000000000000
Backing device        hdisk7
Physloc               U78A0.001.DNWGCV7-P1-C4-T1-W201300A0B811A662-L1000000000000

$ rmvdev -vtd vtscsi2
$ rmvdev -vtd vtscsi3
```

The **lsmap** commands are run again to confirm that the mappings were deleted:

```
$ lsmap -vadapter vhost6
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
vhost6          U8204.E8A.10FE411-V2-C17                    0x00000004

VTD                   NO VIRTUAL TARGET DEVICE FOUND

$ lsmap -vadapter vhost7
SVSA            Physloc                                     Client Partition ID
--------------- ------------------------------------------- ------------------
```

```
vhost7          U8204.E8A.10FE411-V2-C18                    0x00000004

VTD                   NO VIRTUAL TARGET DEVICE FOUND
```

Finally, the vhost server adapters are deleted using **rmdev** commands. Use the -recursive option for the **rmdev** command to remove both the vhost adapter and vtscsi targets with a single command:

```
$ rmdev -dev vhost6
vhost6 deleted
$ rmdev -dev vhost7
vhost7 deleted
```

On the HMC

The virtual SCSI adapters will be removed from the source partition and the Virtual I/O Server and the source partition will be reconfigured to receive its disk through the virtual Fibre Channel.

5. In the profile of the source partition that was shut down previously, remove the virtual SCSI client adapters from the partition profile and add a virtual Fibre Channel adapter. You will see something similar to the highlighted line in Figure 5-25 on page 141 when this step is complete.

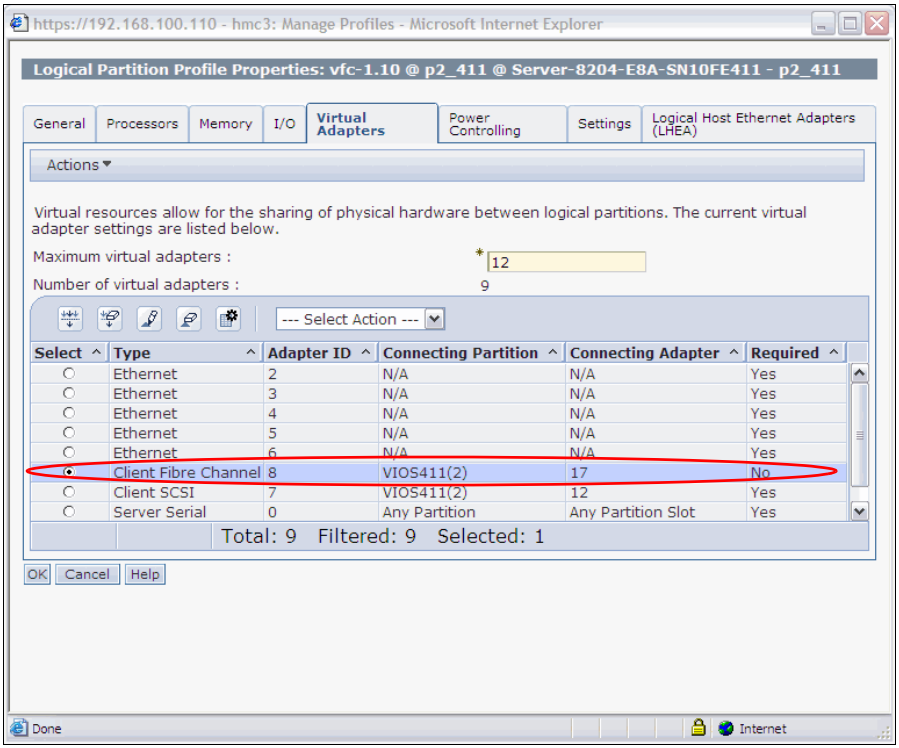

Figure 5-25 Virtual Fibre Channel adapter added to client profile

6. Dynamically remove the virtual SCSI server adapters from the Virtual I/O Server and add a virtual Fibre Channel adapter.

On the Virtual I/O Server

In the following steps, the adapters defined in the previous steps will be configured and the mappings to the disk from the Virtual I/O Server to the client partition created:

7. Run the **cfgdev** command to remove the virtual SCSI server vhost adapters removed earlier and to configure the virtual Fibre Channel adapter. The following **lsdev** command shows us the virtual Fibre Channel adapter that was configured.

```
$ lsdev -virtual | grep vfc
vfchost0         Available   Virtual FC Server Adapter
```

8. Map the physical Fibre Channel adapter to the virtual Fibre Channel adapter. The **lsdev** command that follows shows us all the Fibre Channel adapters on the Virtual I/O Server. The dual-ported 8 GB Fibre Channel adapter shown is our NPIV capable adapter. Thus, this is the one that must be used. Our cables

are ported to the second port on the adapter, so fcs1 is the correct adapter to use.

```
$ lsdev | grep fcs
fcs0             Available   8Gb PCI Express Dual Port FC Adapter (df1000f114108a03)
fcs1             Available   8Gb PCI Express Dual Port FC Adapter (df1000f114108a03)
fcs2             Available   FC Adapter
fcs3             Available   FC Adapter
```

The **vfcmap** command is used to create the virtual Fibre Channel mappings. The **lsmap** command shows a NOT_LOGGED_IN state because our client is currently shut down.

```
$ vfcmap -vadapter vfchost0 -fcp fcs1
$ lsmap -all -npiv
Name          Physloc                            ClntID ClntName       ClntOS
------------- ---------------------------------- ------ -------------- -------
vfchost0      U8204.E8A.10FE411-V2-C17                4

Status:NOT_LOGGED_IN
FC name:fcs1                    FC loc code:U78A0.001.DNWGCV7-P1-C1-T2
Ports logged in:0
Flags:4<NOT_LOGGED>
VFC client name:                VFC client DRC:
```

On the SAN

9. Locate the WWPNs for the destination client Fibre Channel adapter from the HMC and remap the SAN storage that was originally being mapped for the source partition to the WWPNs for the destination partition.

On the destination partition

The client partition that was the source partition with virtual SCSI storage, which now is the destination partition with virtual Fibre Channel storage, will now be started in SMS mode so that the correct boot disk may be selected and the migration verified.

10. When the destination partition has completed its boot, verify that the disks that are visible are in fact the original disks from the source partition and that the data is intact. In our example below, our destination client sees the disks as hdisk1 and hdisk2, as seen in the following **lspv** command output. The remaining **lsdev** commands show that they appear as Fibre Channel disks.

```
# lspv | grep active
hdisk1          000fe4117e88efc0                    rootvg          active
hdisk2          000fe41181e1734c                    datasrcvg       active
# lsdev -l hdisk1 -F parent
fscsi0
# lsdev -l hdisk2 -F parent
fscsi0
# lsdev -l hdisk1
```

```
hdisk1 Available C8-T1-01 MPIO Other DS4K Array Disk
# lsdev -l hdisk2
hdisk2 Available C8-T1-01 MPIO Other DS4K Array Disk
```

The remaining commands provide additional evidence that hdisk1 and hdisk2 are in fact the same disks that were visible on the original client partition. Compare the output below to the output gathered from the pre-migration source partition.

The **tail** command lists out the last two lines of the /etc/hosts file, which looks the same as on the original host, and the **df** command shows us that the partition booted with /data already mounted, just as on the original host. Finally, the **ls** command shows us that the data on the data disk is intact and that it is the same data disk that was on the original host.

```
# tail -2 /etc/hosts
192.168.100.92  p2_411
192.168.100.91  p1_411
# df -k
Filesystem    1024-blocks      Free %Used    Iused %Iused Mounted on
/dev/hd4           196608     29400   86%    13322    63% /
/dev/hd2          1966080    128204   94%    38267    54% /usr
/dev/hd9var        376832    128236   66%     7131    20% /var
/dev/hd3           147456    130732   12%       40     1% /tmp
/dev/hd1            16384     16032    3%        5     1% /home
/dev/hd11admin      131072    130708    1%        5     1% /admin
/proc                  -         -    -         -     -  /proc
/dev/hd10opt       409600    122908   70%     8450    24% /opt
/dev/livedump      262144    261776    1%        4     1% /var/adm/ras/livedump
/dev/fslv00       2097152   2096504    1%        5     1% /data
# cd /data
# ls -l
total 0
drwxr-xr-x    2 root     system          256 Oct 23 09:53 lost+found
-rw-r--r--    1 root     system            0 Nov 28 2010  migrate_vSCSI_to_vFC.sig
```

This migration is now complete.

6

Standalone SAN rootvg to virtual Fibre Channel

In this chapter we show you how to migrate a standalone machine's rootvg on storage area network (SAN) LUNs to a Virtual I/O Server client partition that will have its rootvg on SAN LUNs mapped using virtual Fibre Channel (using NPIV). Figure 6-1 on page 146 provides a graphical representation of the procedure to perform.

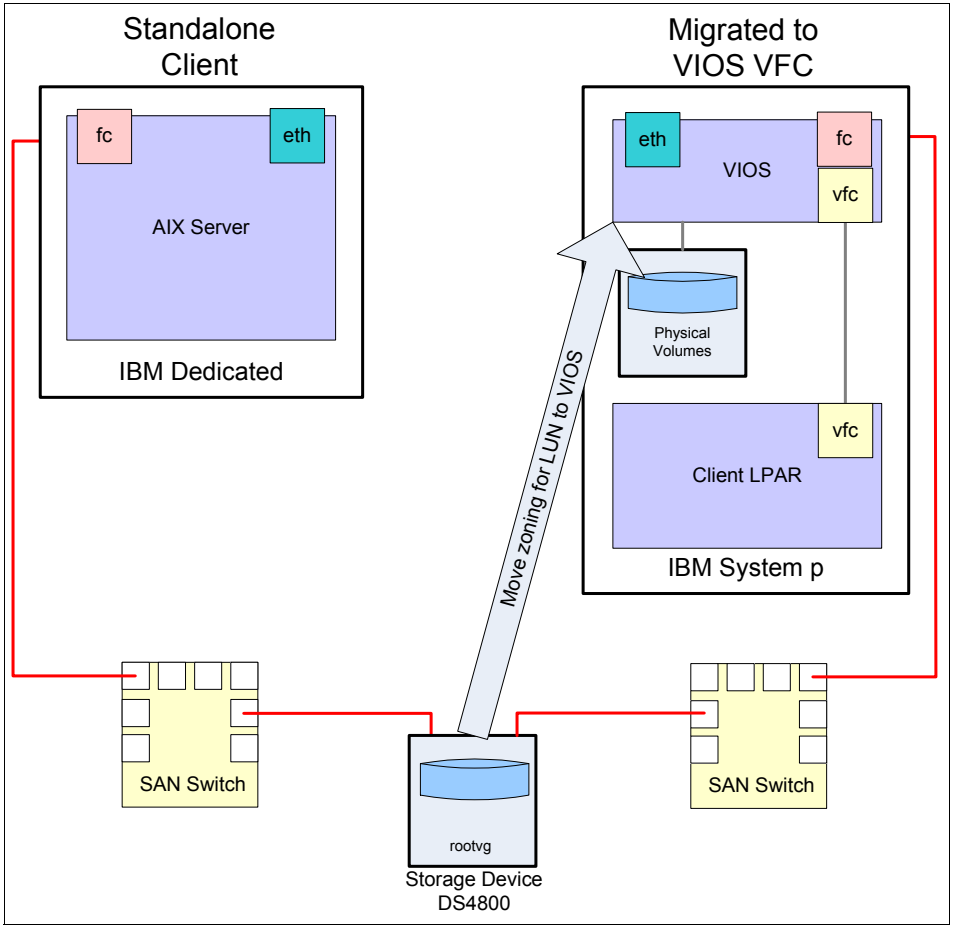

Figure 6-1 Migrate standalone SAN rootvg to client partition SAN rootvg over Virtual Fibre Channel

In the scenario described below, it is assumed that you already have:

- A running standalone host with rootvg on a SAN LUN
- A Virtual I/O Server with a physical NPIV-capable Fibre Channel adapter allocated to it
- A destination client partition that is currently running with rootvg on virtual SCSI disk

The client partition will be reconfigured so that it boots using the migrated SAN LUN. NPIV is supported at certain minimum hardware configurations and software levels. Refer to *IBM PowerVM Virtualization Managing and Monitoring*, SG24-7590, for more information before proceeding.

On the standalone source host

The **lspv** command below shows us that rootvg is on hdisk8. Thus, our machine was booted from hdisk8.

```
# lspv
hdisk0          000fe4012a8f0920                    None
hdisk1          none                                None
hdisk2          000fe4012913f4bd                    None
hdisk3          none                                None
hdisk4          000fe401106cfc0c                    None
hdisk5          000fe4012b5361f2                    None
hdisk6          none                                None
hdisk7          none                                None
hdisk8          000fe401727b47c5                    rootvg
active
```

The following **lsdev** commands confirm that hdisk8 is a LUN on a storage array that is mapped to the client through a Fibre Channel adapter. The **tail** command output will be used at the end of the migration as additional evidence that the client partition has in fact booted off the standalone host's original disk.

```
# lsdev -c disk
hdisk0 Available 00-08-00 SAS Disk Drive
hdisk1 Available 00-08-00 SAS Disk Drive
hdisk2 Available 00-08-00 SAS Disk Drive
hdisk3 Available 00-08-00 SAS Disk Drive
hdisk4 Available 00-08-00 SAS Disk Drive
hdisk5 Available 00-08-00 SAS Disk Drive
hdisk6 Available 00-08-00 SAS Disk Drive
hdisk7 Available 00-08-00 SAS Disk Drive
hdisk8 Available 07-00-01 MPIO Other DS4K Array Disk
# lsdev | grep 07-00
fcnet0     Defined   07-00-02      Fibre Channel Network Protocol
Device
fcs0       Available 07-00         4Gb Fibre Channel PCI Express
Adapter (df1000fe)
fscsi0     Available 07-00-01      Fibre Channel SCSI I/O Controller
Protocol Device
hdisk8     Available 07-00-01      MPIO Other DS4K Array Disk
# tail -1 /etc/hosts
192.168.100.50  standalone
```

1. Shut down the standalone machine and remap the SAN rootvg LUN on the Fibre Channel switches to the NPIV-supported Fibre Channel card on the Virtual I/O Server.

Note: Be sure to have the virtual Fibre Channel client file set installed on the standalone SAN rootvg before shutting down your standalone machine for migration. This will be required for the virtual Fibre Channel when rootvg is started on the client partition.

On the HMC

Create the virtual Fibre Channel mappings that will allow the client partition to see what was previously the standalone server's rootvg SAN LUN.

2. Create the virtual Fibre Channel server adapter on the Virtual I/O Server. Something similar to the highlighted portion of Figure 6-2 is what you should see when this step is complete.

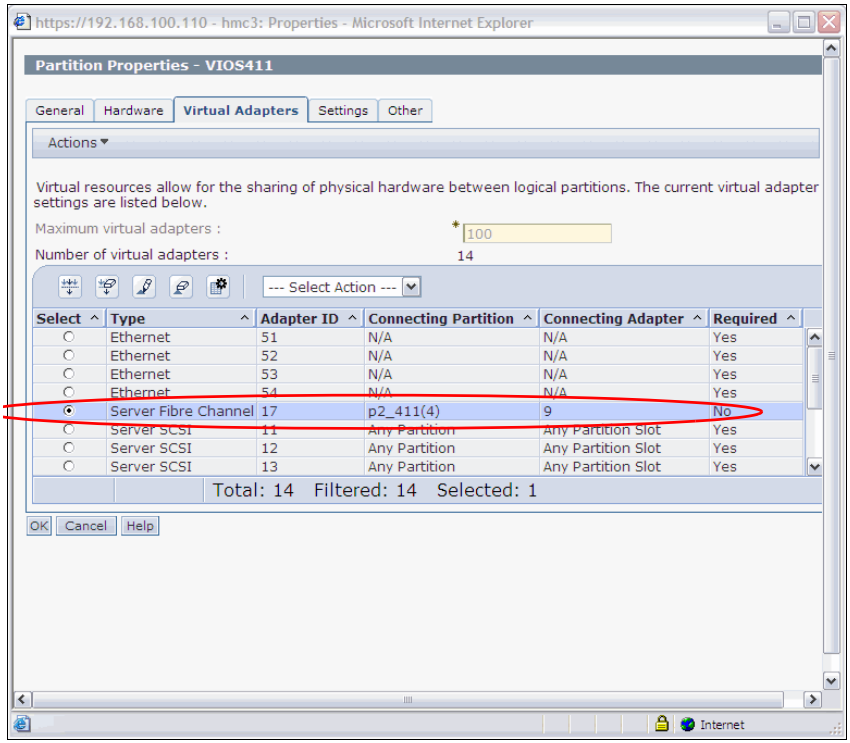

Figure 6-2 Virtual Fibre Channel Server Adapter on Virtual I/O Server

3. Create the virtual Fibre Channel client adapter on the client partition. If you want the adapter and storage to be visible after the partition shutdown, save the configuration to a new profile and use the new profile when starting up the

partition. Something similar to the highlighted portion in Figure 6-3 is what you should see when this step is complete.

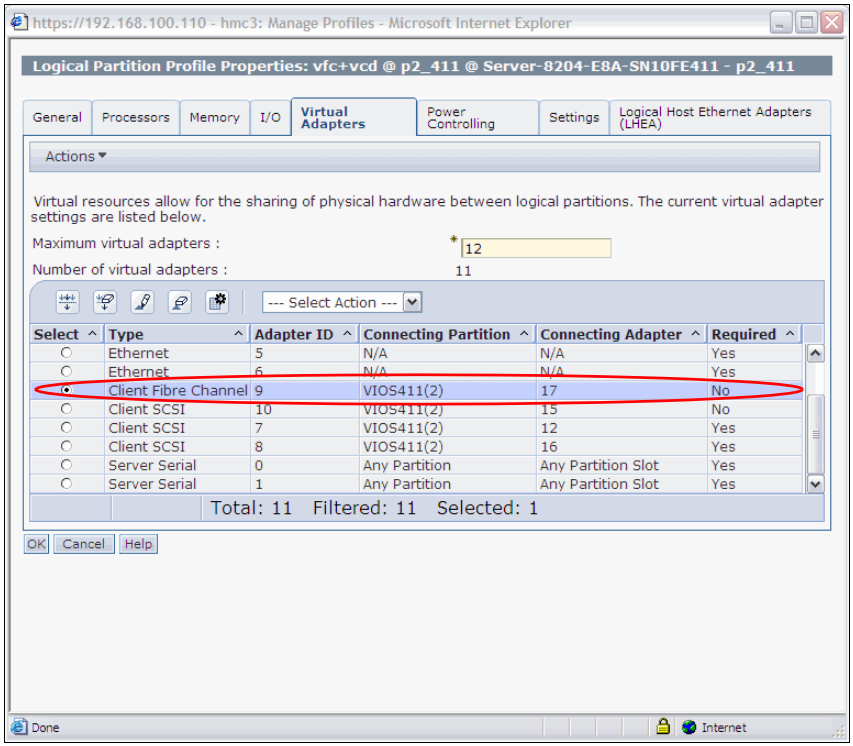

Figure 6-3 Virtual Fibre Channel client adapter defined in client logical partition profile

On the Virtual I/O Server

You will now activate the virtual adapters defined in the previous step and map the virtual adapter to the physical Fibre Channel adapter.

4. Run the **cfgdev** command to configure the virtual Fibre Channel adapter.
5. Get the list of all available virtual Fibre Channel server adapters using the **lsdev** command:

```
$ lsdev -dev vfchost*
name             status      description
vfchost0         Available   Virtual FC Server Adapter
```

6. Get the list of all available physical Fibre Channel server adapters. As you can see from the **lsdev** command output, our NPIV-supported dual-port Fibre Channel card is at fcs0 and fcs1. Since only the second port is cabled on the card in this test environment, fcs1 must be selected.

```
$ lsdev -dev fcs*
name             status      description
fcs0             Available   8Gb PCI Express Dual Port FC Adapter (df1000f114108a03)
fcs1             Available   8Gb PCI Express Dual Port FC Adapter (df1000f114108a03)
fcs2             Defined     4Gb FC PCI Express Adapter (df1000fe)
fcs3             Defined     4Gb FC PCI Express Adapter (df1000fe)
fcs4             Available   FC Adapter
fcs5             Available   FC Adapter
```

7. Run the **lsnports** command to check the Fibre Channel adapter NPIV readiness of the adapter and the SAN switch. Since the `fabric` attribute is set to 1, the configuration is NPIV ready, so the migration can proceed. If you see a state of 0, check the configuration of your adapter and SAN switch.

```
$ lsnports
name             physloc                        fabric tports aports swwpns  awwpns
fcs1             U78A0.001.DNWGCV7-P1-C1-T2          1     64     64   2048    2048
```

8. Use the **vfcmap** command to map the virtual adapter to the physical adapter. The **lsmap** command lists the mapping created by the **vfcmap** command:

```
$ vfcmap -vadapter vfchost0 -fcp fcs1
$ lsmap -npiv -vadapter vfchost0
Name          Physloc                            ClntID ClntName       ClntOS
------------- ---------------------------------- ------ -------------- -------
vfchost0      U8204.E8A.10FE411-V2-C17                4 p2_411         AIX

Status:LOGGED_IN
FC name:fcs1                    FC loc code:U78A0.001.DNWGCV7-P1-C1-T2
Ports logged in:7
Flags:a<LOGGED_IN,STRIP_MERGE>
VFC client name:fcs0            VFC client DRC:U8204.E8A.10FE411-V4-C9-T1
```

In your **lsmap** output, you may not see the Status as `LOGGED_IN` if you had not already mapped the SAN LUN to the Virtual I/O Server. You can do the SAN mapping now if that is the case and proceed with the following steps.

On the destination client partition

You will now boot the client partition using the virtual Fibre Channel drive that was mapped in the previous steps. Keep in mind that since you are coming from a standalone server with physical Ethernet interfaces, you may have to reconfigure the Ethernet on the destination client partition to get network access.

9. Shut down the client partition and reactivate the partition into SMS.
10. Select option number 5 from the menu (Select Boot Options), find the Fibre Channel drive, and initiate a boot from this device.

11. Verify that the client has booted with the same LUN that was on the standalone machine via the virtual Fibre Channel adapter. The **getconf** command is another way to discover the boot device. The **lspv** command gives us added confirmation that rootvg is on hdisk8 and the **lsdev** and **lscfg** commands show us that hdisk8 is a SAN disk.

```
# getconf BOOT_DEVICE
hdisk8
# lspv | grep hdisk8
hdisk8          000fe401727b47c5                    rootvg          active
# lsdev -c disk | grep hdisk8
hdisk8 Available C9-T1-01 MPIO Other DS4K Array Disk
# lscfg -vl hdisk8
  hdisk8           U8204.E8A.10FE411-V4-C9-T1-W201300A0B811A662-L0  MPIO Other DS4K
Array Disk

        Manufacturer................IBM
        Machine Type and Model......1815      FAStT
        ROS Level and ID............30393134
        Serial Number...............
        Device Specific.(Z0)........0000053245005032
        Device Specific.(Z1)........
```

The remaining **lsdev** commands list all Fibre Channel adapters and show how hdisk8 maps back to the virtual Fibre Channel adapter fcs2. Finally, the **tail** command shows us the last line of the /etc/hosts file, which is the same as was on the standalone host.

```
# lsdev|grep fcs
fcs0       Defined   07-00         4Gb FC PCI Express Adapter (df1000fe)
fcs1       Defined   07-01         4Gb FC PCI Express Adapter (df1000fe)
fcs2       Available C9-T1         Virtual Fibre Channel Client Adapter
# lsdev -l hdisk8 -F parent
fscsi2
# lsdev -l fscsi2 -F parent
fcs2
# tail -1 /etc/hosts
192.168.100.50  standalone
```

The migration is now complete.

7

Direct attached Fibre Channel devices partition to virtual Fibre Channel

This section provides instructions for the migration of a logical partition that uses direct-attached Fibre Channel resources (such as a tape drive) to a logical partition with the Fibre Channel devices being virtualized using the Virtual I/O Server and a virtual Fibre Channel capable Fibre Channel card.

Using Virtual Fibre Channel allows much more practical use of Fibre-Channel-attached devices and releases dependencies on having dedicated cards for functions such as tape access.

In Figure 7-1, LPAR1 and the Virtual I/O Server can both access the LTO4 tape drive since both have a dedicated adapter with SAN zoning in place. The migration process removes the dedicated tape access from LPAR1 and re-presents the tape drive using the virtual Fibre Channel capability of the VIOS.

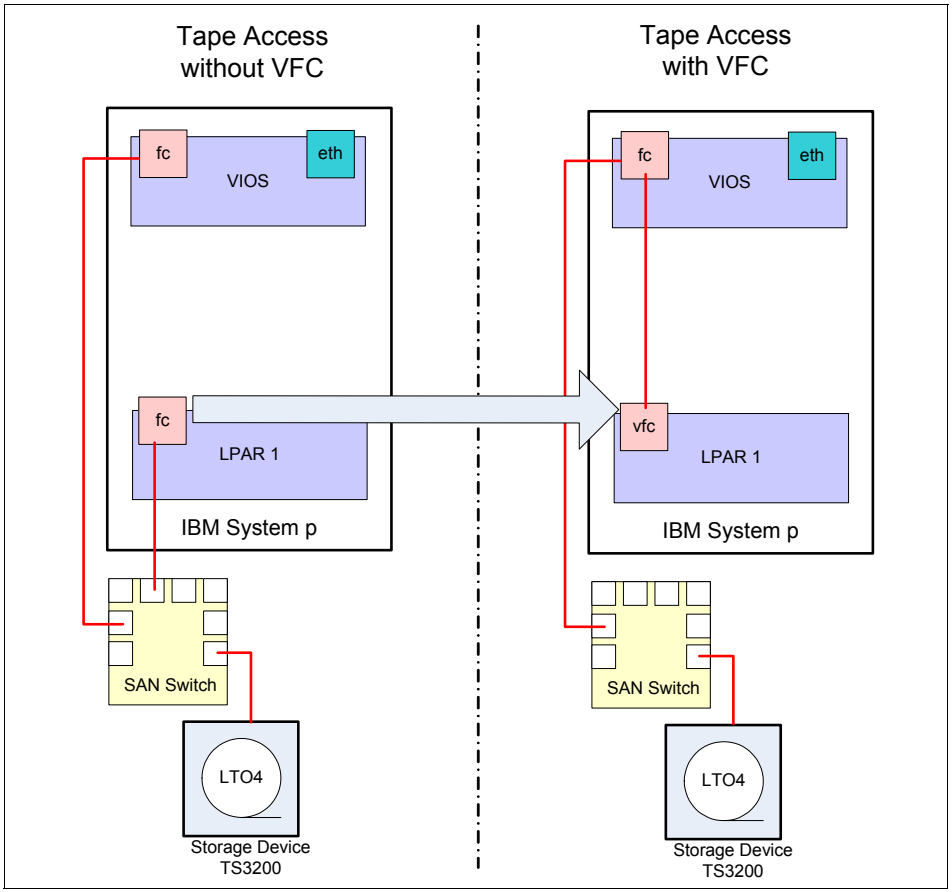

Figure 7-1 Migration of direct-attached tape to virtualized tape

Note: *IBM PowerVM Virtualization Managing and Monitoring*, SG24-7590, details the requirements for SAN switches, AIX levels, and Virtual I/O Server levels to support NPIV (virtual Fibre Channel). Ensure that these requirements are met before attempting the migration.

In addition, the AIX file set devices.vdevice.IBM.vfc-client.rte *must* be installed on the client logical partition for the VFC function to work.

The steps required to accomplish this are covered in the following section.

On the client partition: part 1

On the client logical partition, perform the following steps:

1. Identify which Fibre Channel card and port is being used by the tape device. The following AIX commands show how to trace from the rmt0 device back to the parent adapter using the **lsdev** command:

```
# lsdev -C | grep fcs
fcs0       Available 00-08    FC Adapter
fcs1       Available 00-09    FC Adapter

# lsdev -l rmt0 -F parent
fscsi1
# lsdev -l fscsi1 -F parent
fcs1
#
```

2. On the client logical partition, ensure that no processes are using the tape drive. Stop applications such as Tivoli Storage Manager since they will prevent removal of the devices.

3. Make a note of the tape drives and possibly the tape library's serial numbers. This can be accomplished using the AIX **tapeutil** utility (which is installed when the AIX Atape device driver is installed and is available for download from the IBM Storage support Web site www.storage.ibm.com. Select **Enterprise** or **Midrange tape category** ∅ **Product Details** ∅ **Product Support** ∅ **Download** ∅ **Device Drivers**).

   After opening the tape device using **tapeutil**, issue an inquiry and select inquiry page 83 as follows:

```
Enter Selection for /dev/rmt0: 5


Enter page code in hex or <enter> for standard inquiry: 83
Issuing inquiry for page 0x83...

Inquiry Page 0x83,  Length 74

           0 1  2 3  4 5  6 7  8 9  A B  C D  E F   0123456789ABCDEF
    0000 - 0183 0046 0201 0022 4942 4D20 2020 2020  [..F..."IBM     ]
    0010 - 554C 5433 3538 302D 5444 3420 2020 2020  [ULT3580-TD4     ]
    0020 - 3133 3130 3032 3535 3138 0183 0008 2001  [1310025518... .]
    0030 - 000E 1110 E588 0194 0004 0000 0001 0193  [....å.........]
    0040 - 0008 2002 000E 1110 E588                 [.. .....å      ]
```

4. Remove the tape devices and library device, if present, from the system. The AIX **rmdev** command can be used for this purpose:

```
rmdev -dl rmt0
rmdev -dl smc0
```

5. Remove the Fibre Channel device from AIX. The -R flag used with the **rmdev** command removes the fcnet and fscsi devices at the same time. Be careful if you are using a dual-ported Fibre Channel card. You must migrate the devices attached to both ports:

```
rmdev -Rdl fcs0
rmdev -Rdl fcs1
```

On the HMC: part 1

On the HMC, use the following steps to create the Virtual Fibre Channel attachment:

6. Remove the assigned Fibre Channel card from the client logical partition. Ensure that any profiles are updated if you perform this operation as a dynamic logical partitioning process.
7. Create a virtual Fibre Channel server adapter in the Virtual I/O Server partition.
   a. Select the Virtual I/O partition to be configured using **Systems Management** ∅ **Servers** ∅ **<*servername*>**.

b. Select the Virtual I/O Server partition on which the virtual Fibre Channel is to be configured. Then select **Tasks** ∅ **Dynamic Logical Partitioning** ∅ **Virtual Adapters**, as in Figure 7-2.

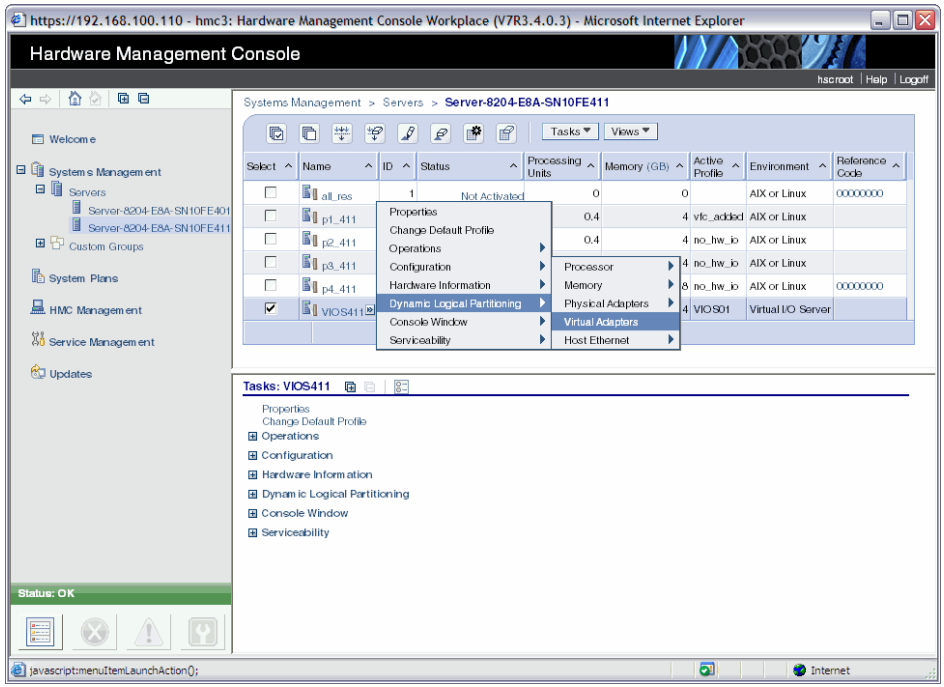

Figure 7-2 Dynamically add virtual adapter

c. Create a virtual Fibre Channel server adapter. Select **Actions** ∅ **Create** ∅ **Fibre Channel Adapter**, as in Figure 7-3.

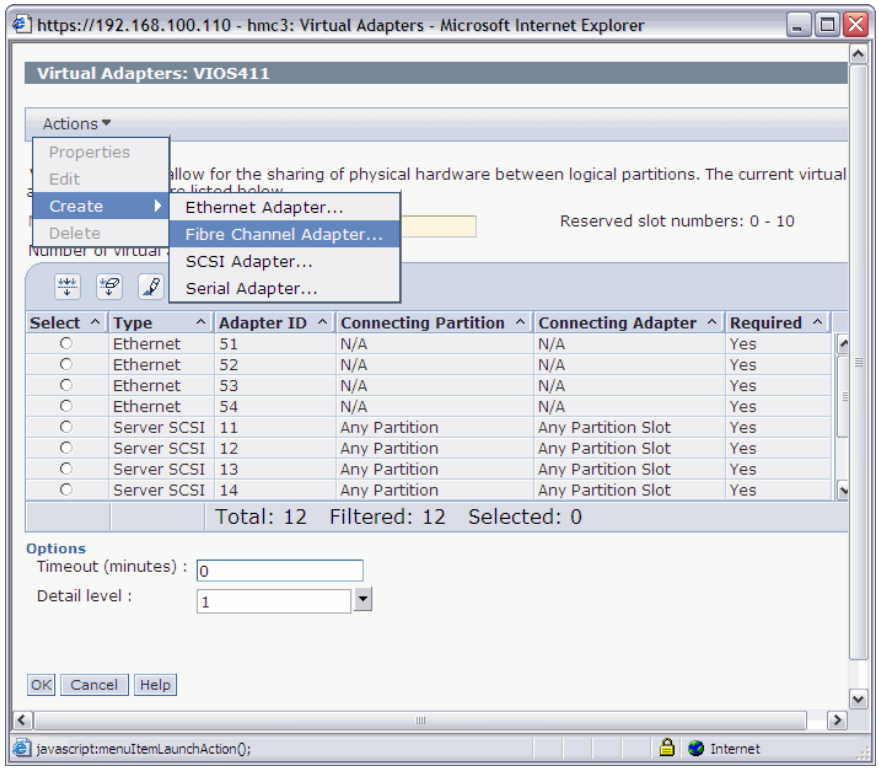

Figure 7-3 Create Fibre Channel server adapter

d. Enter the virtual slot number for the Virtual Fibre Channel server adapter, then select the client partition to which the adapter may be assigned and enter the client adapter ID, as in Figure 7-4. Click **OK**.

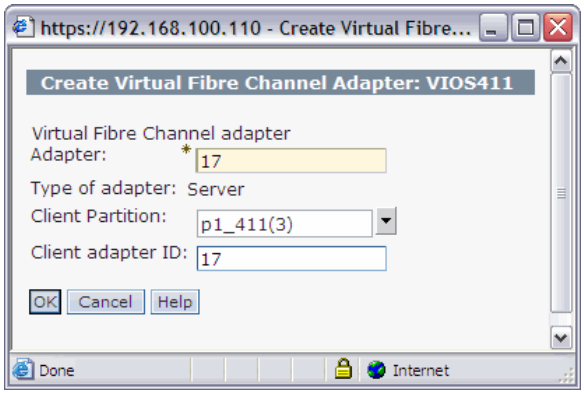

Figure 7-4 Set virtual adapter ID

Click **OK**.

e. Remember to update the profile of the Virtual I/O Server partition so that the change is reflected across restarts of the partitions. As an alternative, you may use the **Configuration** ∅ **Save Current Configuration** option to save the changes to the new profile. See Figure 7-5, which shows the location of the panel similar to what your HMC will present.

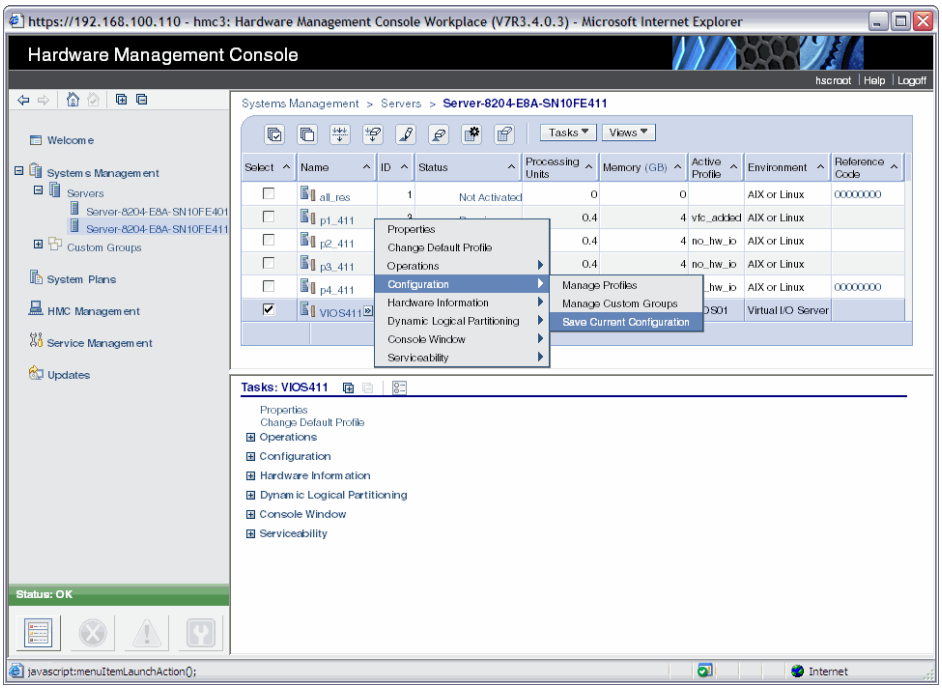

Figure 7-5 Save the Virtual I/O Server partition configuration

f. Change the name of the profile if required and click **OK**.

8. To create the virtual Fibre Channel client adapter in the client partition:

   a. Select the client partition on which the virtual Fibre Channel adapter is to be configured. Then select **Tasks** ∅ **Configuration** ∅ **Manage Profiles**, as in Figure 7-6.

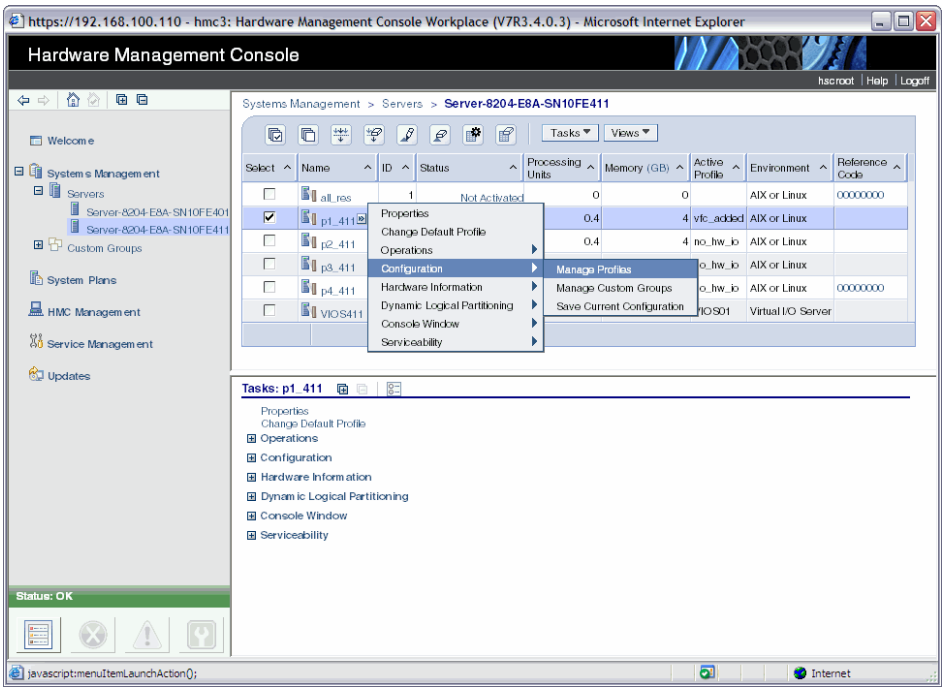

Figure 7-6 Change profile to add virtual Fibre Channel client adapter

b. To create the virtual Fibre Channel client adapter select the profile, then select **Actions** ∅ **Edit**. Expand the **Virtual Adapters** tab and select **Actions** ∅ **Create** ∅ **Fibre Channel Adapter**, as in Figure 7-7.

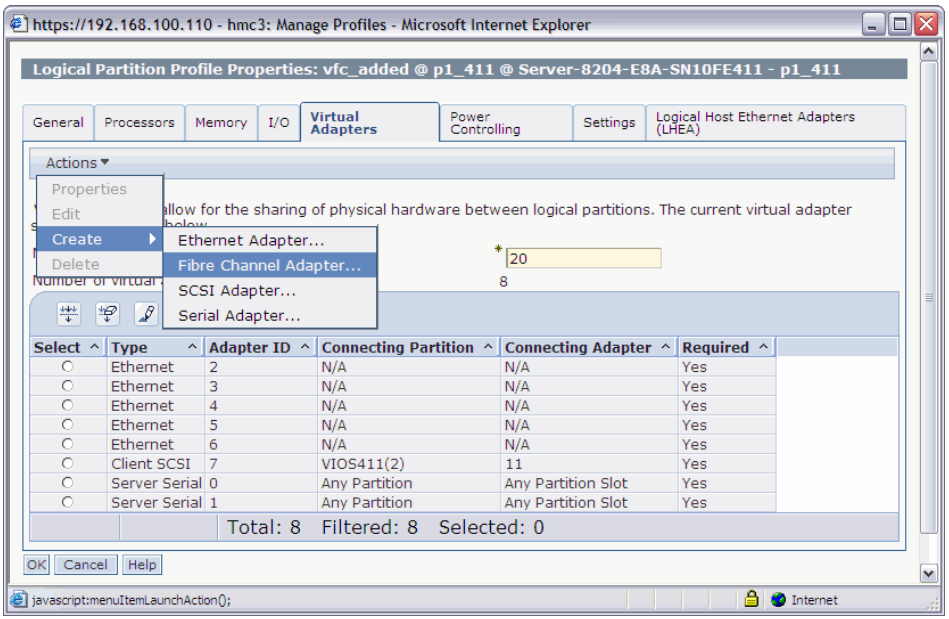

Figure 7-7 Create Fibre Channel client adapter

c. Enter the virtual slot number for the Virtual Fibre Channel client adapter. Then select the Virtual I/O Server partition to which the adapter may be assigned and enter the server adapter ID, as in Figure 7-8. Click **OK**.

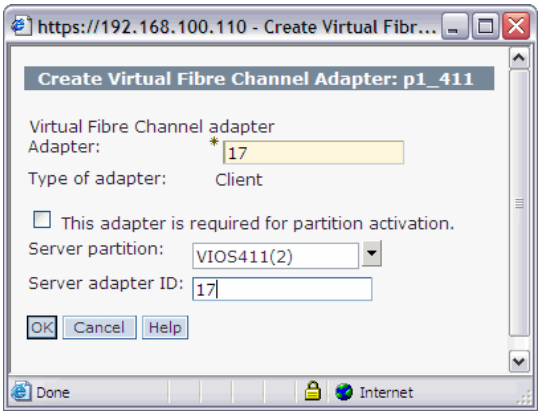

Figure 7-8 Define virtual adapter ID Values

d. Click **OK** ∅ **OK** ∅ **Close**.

On the Virtual I/O Server

On the Virtual I/O Server, ensure the correct setup for virtual Fibre Channel:

9. Log in to the Virtual I/O Server partition as user padmin.
10. Run the **cfgdev** command to configure the virtual Fibre Channel server adapter.
11. The command **lsdev -dev vfchost*** lists all available virtual Fibre Channel server adapters in the Virtual I/O Server partition:

```
$ lsdev -dev vfchost*
name             status      description
vfchost0         Available   Virtual FC Server Adapter
$
```

12. Run the **lsnports** command to check the Fibre Channel adapter NPIV readiness of the adapter and the SAN switch. In the example below, the fabric attribute is set to a value of 1, which confirms that the adapter and the SAN switch are NPIV enabled. If the fabric attribute is equal to 0, then the adapter or the SAN switch (or both) are not NPIV ready and you must check the configuration:

```
$ lsnports
name             physloc                        fabric tports aports
swwpns  awwpns
fcs1             U78A0.001.DNWGCV7-P1-C1-T2          1     64     64
2048    2048
```

13. To map the virtual adapter's vfchost to the physical Fibre Channel Adapter, the **vfcmap** command is used as shown:

```
$ vfcmap -vadapter vfchost0 -fcp fcs1
vfchost0 changed
```

14. It is then a good idea to list the mappings using the **lsmap** command. In the example below you will see that `FC name` is set to `fcs1`, which is the desired result:

```
$ lsmap -npiv -vadapter vfchost0
Name          Physloc                            ClntID ClntName       ClntOS
------------- ---------------------------------- ------ -------------- -------
vfchost0      U8204.E8A.10FE411-V2-C17                3

Status:NOT_LOGGED_IN
FC name:fcs1                    FC loc code:U78A0.001.DNWGCV7-P1-C1-T2
Ports logged in:0
Flags:4<NOT_LOGGED>
VFC client name:                VFC client DRC:
```

On the HMC: part 2

Now you have created the virtual Fibre Channel adapters for both the server on the Virtual I/O Server and on the client partition. You must correct the SAN zoning in the SAN switch. Use the HMC to get the correct port details:

15. To determine the world wide port numbers to be used in the new SAN zoning, perform the following steps:

    a. On the HMC select the appropriate virtual I/O client partition, then click **Task** ∅ **Properties**. Expand the **Virtual Adapters** tab, select the **Client Fibre Channel** client adapter, then select **Actions** ∅ **Properties** to list the properties of the virtual Client Fibre Channel client adapter, as in Figure 7-9.

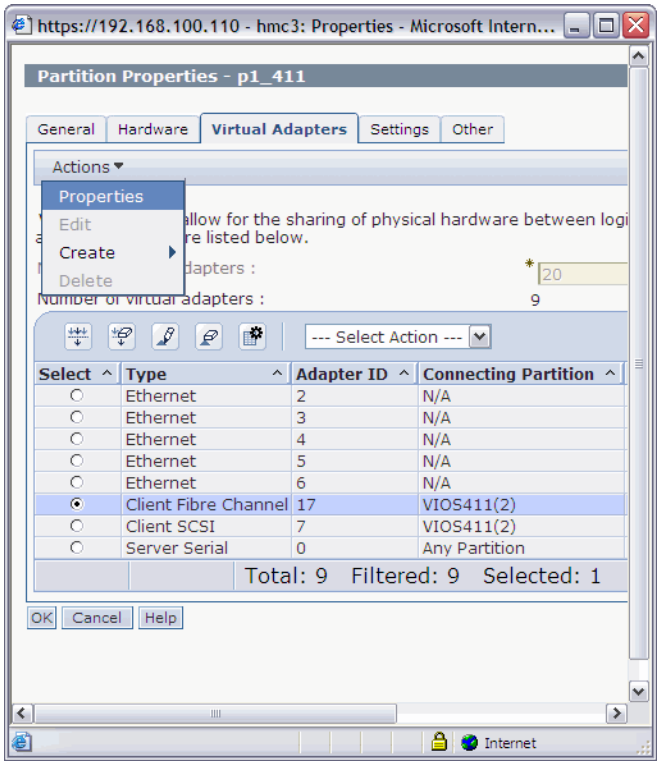

Figure 7-9 Select virtual Fibre Channel client adapter properties

b. Figure 7-10 shows the properties of the virtual Fibre Channel client adapter. Here you can get the WWPN that is required for the SAN zoning.

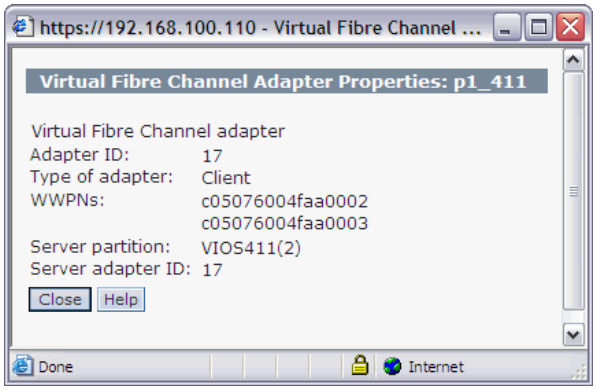

Figure 7-10 Virtual Fibre Channel client adapter properties

c. You can now log on to the SAN switch and use these values to fix the zone members.

> **Note:** The steps to perform SAN zoning are not shown. Refer to other IBM Redbooks publications and SAN Implementation manuals for guidelines and advice.

On the client partition: part 2

Log in to the client partition and verify the accessibility of the tape devices:

16. Log in to the AIX client partition. Use the AIX **`cfgmgr`** command to have AIX scan for new devices. You can then check that the newly created virtual Fibre Channel Client and the tape drive appears using the **`lsdev`** command:

```
# lsdev -C | grep fcs
fcs0       Available 17-T1    Virtual Fibre Channel Client Adapter
#
# lsdev -l rmt0 -F parent
fscsi0
# lsdev -l fscsi0 -F parent
fcs0
```

> **Note:** In the above example the device type is now *Virtual Fibre Channel Client Adapter*, where previously it was listed as *FC Adapter*.

17. Confirm that the tape device matches what was previously presented using the direct Fibre Channel connection. The **`tapeutil`** command with the inquiry

sub-command can be shortened from the prior example and typed on one line:

```
# tapeutil -f /dev/rmt0 inquiry 83
Issuing inquiry for page 0x83...

Inquiry Page 0x83,  Length 74

           0 1  2 3  4 5  6 7  8 9  A B  C D  E F   0123456789ABCDEF
    0000 - 0183 0046 0201 0022 4942 4D20 2020 2020  [..F..."IBM     ]
    0010 - 554C 5433 3538 302D 5444 3420 2020 2020  [ULT3580-TD4     ]
    0020 - 3133 3130 3032 3535 3138 0183 0008 2001  [1310025518... .]
    0030 - 000E 1110 E588 0194 0004 0000 0001 0193  [....å........]
    0040 - 0008 2002 000E 1110 E588                 [.. .....å      ]

#
```

As one would expect in a successful migration, the tape device serial number matches what was previously recorded. There are other methods to obtain the serial numbers such as using the Web-based management panel for the Tape Library.

18. Additionally, an inventory of the attached library using the AIX **tapeutil** command confirms that the media is what we expected to see. In this abbreviated listing, the tape volume 569AAAL4 in the tape drive in element position 256 is just as it was before the migration began.

```
# tapeutil -f /dev/smc0 inventory
Reading element status...

Robot Address 1
  Robot State ..................... Normal
  ASC/ASCQ ........................ 0000
  Media Present ................... No
  Source Element Address Valid ... No
  Media Inverted .................. No
  Volume Tag .....................

Import/Export Station Address 16
  Import/Export State ............. Normal
  ASC/ASCQ ........................ 0000
  Media Present ................... No
  Import Enabled .................. Yes
  Export Enabled .................. Yes
  Robot Access Allowed ............ Yes
  Source Element Address Valid ... No
  Media Inverted .................. No
  Volume Tag .....................
```

```
Drive Address 256
  Drive State ..................... Normal
  ASC/ASCQ ........................ 0000
  Media Present ................... Yes
  Robot Access Allowed ............ No
  Source Element Address ......... 4096
  Media Inverted .................. No
  Same Bus as Medium Changer ..... Yes
  SCSI Bus Address Vaild ......... No
  Logical Unit Number Valid ...... No
  Volume Tag ..................... 569AAAL4

Drive Address 257
  Drive State ..................... Normal
  ASC/ASCQ ........................ 0000
  Media Present ................... No
  Robot Access Allowed ............ Yes
  Source Element Address Valid ... No
  Media Inverted .................. No
  Same Bus as Medium Changer ..... Yes
  SCSI Bus Address Vaild ......... No
  Logical Unit Number Valid ...... No
  Volume Tag .....................

#<output truncated>
```

This migration is now complete.

Abbreviations and acronyms

AIX	Advanced Interactive Executive
APAR	Authorized Program Analysis Report
API	Application Programming Interface
BLV	Boot Logical Volume
CD	Compact Disk
CD-R	CD Recordable
CD-ROM	Compact Disk-Read Only Memory
CEC	Central Electronics Complex
CLI	Command Line Interface
CLVM	Concurrent LVM
CPU	Central Processing Unit
DLPAR	Dynamic LPAR
DVD	Digital Versatile Disk
EC	EtherChannel
F/C	Feature Code
FC	Fibre Channel
FTP	File Transfer Protocol
HACMP™	High Availability Cluster Multiprocessing
HBA	Host Bus Adapters
HMC	Hardware Management Console
HTML	Hypertext Markup Language
IBM	International Business Machines
ID	Identification
IDE	Integrated Device Electronics
IEEE	Institute of Electrical and Electronic Engineers
ISO	International Organization for Standards
ITSO	International Technical Support Organization
LAN	Local Area Network
LPAR	Logical Partition
LPP	Licensed Program Product
LUN	Logical Unit Number
LV	Logical Volume
LVCB	Logical Volume Control Block
LVM	Logical Volume Manager
Mbps	Megabits Per Second
MBps	Megabytes Per Second
MPIO	Multipath I/O
NFS	Network File System
NIM	Network Installation Management
NIMOL	NIM on Linux
NPIV	N_Port ID Virtualization
ODM	Object Data Manager
P2V	Physical to Virtual
PCI	Peripheral Component Interconnect
POWER	Performance Optimization with Enhanced Risc (Architecture)
PV	Physical Volume
PVID	Physical Volume Identifier
QoS	Quality of Service
RAID	Redundant Array of Independent Disks
SAN	Storage Area Network
SCSI	Small Computer System Interface

SDD	Subsystem Device Driver
SMIT	System Management Interface Tool
SMS	System Management Services
SP	Service Processor
SPOT	Shared Product Object Tree
SRC	System Resource Controller
SRN	Service Request Number
SSA	Serial Storage Architecture
SSH	Secure Shell
SSL	Secure Socket Layer
SUID	Set User ID
SVC	SAN Virtualization Controller
TCP/IP	Transmission Control Protocol/Internet Protocol
TSM	Tivoli Storage Manager
UDF	Universal Disk Format
UDID	Universal Disk Identification
VG	Volume Group
VGDA	Volume Group Descriptor Area
VGSA	Volume Group Status Area
VP	Virtual Processor
VPD	Vital Product Data

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this book.

IBM Redbooks

For information about ordering these publications, see “How to get Redbooks” on page 171. Note that some of the documents referenced here may be available in softcopy only.

- *IBM PowerVM Virtualization Managing and Monitoring*, SG24-7590
- *PowerVM Virtualization on IBM System p: Introduction and Configuration Fourth Edition*, SG24-7940

Online resources

These Web sites are also relevant as further information sources:

- IBM System p and AIX Information Center

  http://publib16.boulder.ibm.com/pseries/index.htm
- IBM System p Tape Device Drivers

  http://www.storage.ibm.com/

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