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Dell EMC SC Series Storage with AIX Best Practices

Dell Storage Applications Engineering
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Dell EMC Best Practices

Revisions

Date	Revision	Description
Oct 2013	1.0	Initial release
Feb 2014	1.1	Updated with new ODM instructions, etc.
May 2014	1.2	Update to section 2.1.2 regarding use of fc_err_recov
Jan 2015	1.3	Update to reflect new version of ODM/PCM, functions with legacy/virtual port mode
September 2015	1.4	Dell Storage Software Suite for AIX introduced
August 2016	1.5	Dell Storage Software Suite for AIX v3.0.0.6
February 2017	1.6	Dell Storage Software Suite for AIX v3.0.1.6

Acknowledgements

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Executive summary

IBM® AIX® is an extremely robust and scalable enterprise-class operating system (OS). Correctly configured using the best practices presented in this paper, the IBM AIX OS provides an optimized experience for use with Dell EMC™ SC Series storage. These best practices include guidelines for configuring volume discovery, multipath, and file-system and queue-depth management.

This paper discusses AIX versions 6.1 through 7.2 with Dell EMC Storage Center OS (SCOS) version 6.6.x through 7.2.x. Because there are often various methods to accomplish the tasks discussed, this paper is only a starting point of reference for end users and system administrators.

This guide focuses almost exclusively on the Command Line Interface (CLI) because it is universally applicable across most UNIX and Linux® distributions.

Note: The formal validation and support of PowerHA v7 with Dell Storage Software Suite for AIX and SC Series storage has been deferred to a future release.

1 Introduction

IBM Power Systems™ servers include reduced instruction set computing (RISC) processors and the AIX OS, providing a robust and resilient server environment that is ideal for a wide variety of enterprise configurations.

AIX provides volume management and a range of utilities that can be used with SC Series volumes. The AIX logical volume manager can discover, manage, manipulate, and modify local SCSI or Fibre Channel (FC)-attached volumes presented from a variety of sources. SC Series provides AIX-compatible volumes which appear as familiar hdisk devices when viewed from within the AIX OS. These SC Series volumes are also SCSI-3 compliant, which removes much of the complexity of allocating and administering, using, and protecting the mission-critical data found on most AIX-based hosts. In addition, SC Series volumes can take advantage of AIX utilities such as mirroring, backup, multiple file system types, multipath, boot from SAN, and disaster recovery.

Using SC Series storage with AIX can simplify data management and protection. A properly configured SC Series array can remove the need for cumbersome physical disk configuration and management, along with complex RAID configuration exercises. It also removes the need to mirror volumes within the AIX OS layer because the SC Series storage is already providing native RAID 10 integrity and reliability.

The SC Series storage and AIX solution also helps simplify the configuration and use of mission-critical servers. The application or OS-specific procedures recommended or required by the server can be used without modification when used with SC Series volumes. These environment-specific requirements are configured using AIX utilities, which removes the need for SC Series-specific command sets on the server, thus reducing the complexity and chances of introducing error.

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2　Fibre Channel

IBM provides a feature-rich Fibre Channel (FC) architecture as part of the AIX OS. The strict regulation of hardware used in the IBM POWER® platform allow IBM to create, test, and distribute the host bus adapters (HBAs), drivers, multipath software, and disk migration utilities, which allow AIX administrators to manage SC Series volumes.

SC Series storage recommends using the hardware and software provided by AIX without modifications. The only addition to the AIX platform is the Dell Storage Software Suite for AIX. This install-compliant module enables the AIX OS and identifies SC Series volumes as MPIO-capable hdisk devices. The installation of this software suite is discussed in section 3.

2.1　Connectivity

This section discusses the configuration and operation of the SC Series storage for proper interoperability with the AIX platform.

2.1.1　SC Series modes

SC Series storage may be configured in either legacy or virtual port mode. These two modes are mutually exclusive and cannot be used concurrently on the same SC Series array.

SC Series storage supports provisioning both Fibre Channel and iSCSI volumes to the AIX platform.

2.1.2　Dynamic tracking with IBM FC cards

Dynamic tracking is a configurable attribute of AIX-based FC adapters. When dynamic tracking is enabled, the FC adapter driver detects when the FC N_Port ID of a fabric device changes. The FC adapter driver then reroutes I/O destined for that device to the new address while keeping the device in an online state. The dynamic tracking attribute has a hardcoded 15-second timeout which cannot be changed. Within this time period, it needs to be able to locate and reroute I/O to the new device path. If it is unable to do so, it will mark both paths as down and the fabric device will go offline.

Events which can cause an N_Port ID to change include moving a cable between a switch and storage device from one switch port to another, connecting two separate switches using an inter-switch link (ISL), rebooting a switch, experiencing a SC Series controller failover, or performing a planned maintenance event.

It is recommended to configure the dynamic tracking attribute to the **yes** (enabled) state when used with any vSCSI or vFC-based LPARs including VIOS.

The attribute is validated with the `lsattr` command.

```
# lsattr -El fscsi0 | grep dyntrk
dyntrk        yes              Dynamic Tracking of FC Devices       True
```

This attribute is configurable with the `chdev` command.

```
# chdev -l fscsiX -a dyntrk=yes [-P]
```

The optional -P parameter implements this attribute change upon the next reboot.

2.1.3 fc_err_recov

It is recommended to configure the fc_err_recov attribute of all fscsi-based devices to the **fast_fail** state when used with any vSCSI or vFC-based LPARs.

The state of this attribute is validated with the `lsattr` command.

```
# lsattr -El fscsi0 | grep err
fc_err_recov fast_fail FC Fabric Event Error RECOVERY Policy True
```

This attribute is configurable with the `chdev` command.

```
# chdev -l fscsiX -a fc_err_recov=fast_fail [-P]
```

Where the optional `-P` parameter implements this attribute change upon the next reboot.

2.2 Fabric configuration

The use of persistent FCID on fabric switch ports is no longer required with the implementation and installation of the Dell Storage Software Suite for AIX.

There is no further configuration or requirement of this attribute with either Cisco® or Brocade®-based switches and fabrics.

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3 Dell Storage Software Suite for AIX

The Dell Storage Software Suite for AIX is developed, validated and delivered in the form of a standard AIX backup bundle and is available for download from Dell.com/support.

The latest release of the Dell Storage Software Suite for AIX is v3.0.1.6.

3.1 Features

This release introduces the following features and improvements:

- The software suite supports AIX version 7.2.
- The software suite takes into account that rootvg may be mirrored and improves backup / recovery behavior.
- The uninstall procedures are streamlined and include error checking.
- There is an improved correlation to native IBM commands, such as `dellsc_bootlist`, returns the same console output as the native AIX bootlist command.
- This release introduces the `dellsc_tune` command and tuning profiles.

Additional minor changes include:

- The software suite has been renamed from Compellent_SC.* to DellSC_MPAIX.*.
- The default value of queue_depth of iSCSI-attached volumes set to 8.
- iSCSI support is added to the `ls_dellsc` and `ls_vpd` commands.

The installation of the Dell Storage Software Suite for AIX enables the AIX OS and MPIO stack and identifies SC Series volumes as **MPIO Compellent Fibre Channel Disk Drive** devices as shown:

```
# lsdev -Cc disk
hdisk0 Available 10-T1-01 MPIO Compellent Fibre Channel Disk Drive
hdisk1 Available 12-T1-01 MPIO Compellent Fibre Channel Disk Drive
hdisk2 Available 10-T1-01 MPIO Compellent Fibre Channel Disk Drive
hdisk3 Available 10-T1-01 MPIO Compellent Fibre Channel Disk Drive
```

The extended attributes of each hdisk device are shown:

```
# lsattr -El hdisk1
PCM            PCM/friend/compellent_sc      Path Control Module
True
PR_key_value   none                          Persistant reservation value
True
algorithm      round_robin                   Algorithm
True
clr_q          no                            Device CLEARS its Queue on error
True
dist_err_pcnt  0                             Distributed Error Sample Time
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            0x1000000000000                 Logical Unit Number ID
True
max_transfer      0x40000                         Maximum TRANSFER Size
True
node_name         0x5000d31000ed2302              FC Node Name
False
pvid              00f684260ddbd2aa0000000000000000            Physical
volume identifier      False
q_err             yes                             Use QERR bit
True
q_type            simple                          Queuing TYPE
False
queue_depth       16                              Queue DEPTH
True
reassign_to       120                             REASSIGN unit time out value
True
reserve_policy    no_reserve                      Reserve Policy
True
rw_timeout        60                              READ/WRITE time out value
True
scsi_id           0x1d0201                        SCSI ID
True
start_timeout     60                              START unit time out value
True
timeout_policy    fail_path                       Timeout Policy
True
unique_id         32110000ed23-0000009f0ECompellent Vol08COMPELNTfcp Unique device
identifier        False
ww_name           0x5000d31000ed2333              FC World Wide Name
False
```

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3.2 Prerequisites

The following minimum system requirements need to be met to install and use the Dell Storage Software Suite for AIX.

Description	Criteria
Host operating system	AIX 6.1 TL6 SP5 or later, including devices.common.IBM.mpio.rte v6.1.6.15 AIX 7.1 TL0 SP3 or later, including devices.common.IBM.mpio.rte v7.1.0.15 AIX 7.2 TL0 SP0 or later, including devices.common.IBM.mpio.rte v7.2.0.0
VIOS version	2.2.3.4 or later, including MPIO Disk PCM v6.1.7.0
Storage Center OS version	6.6.x or later thru 7.1.x, including either legacy or virtual port mode
Approximate disk capacity	Up to 15MB in /usr/sbin

3.3 Installation

SC Series storage recommends installing the Dell Storage Software Suite for AIX according to the guidelines in Table 1. The `oem_setup_env` command should be used to access the superuser shell when installing the software suite to VIOS.

The Dell Storage Software Suite for AIX should only be installed to the VIOS or LPAR after initial AIX OS installation has been complete. The initial AIX OS installation should be performed to an SC Series volume presented over a single FC path only as discussed in further detail in section 5, Boot from SAN.

Table 1   Dell Software Suite for AIX installation guidelines

VIOS environment	Software suite installation
Serves vSCSI LPARs	Install *only* to the VIOS (single or dual) partition
Uses a boot-from-SAN volume and serves vFC LPARs	Install to the VIOS (single or dual) partition, and to every hosted AIX-based LPAR connected by vFC
Uses a boot-from-local volume and serves vFC LPARs	Install *only* to every hosted, AIX-based LPAR connected by vFC
Serves both vSCSI and vFC LPARs	Install to the VIOS (single or dual) partition, and to every hosted AIX-based LPAR connected by vFC

Note: A VIOS environment (single or dual) can operate and service both vSCSI and vFC-based LPARs concurrently.

Download the **DellSC_MPAIX.* .bff** file and move it to the /tmp directory on the VIOS or LPAR environment with superuser privileges.

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Install the bundle:

```
# installp -ac -d /tmp/DellSC_MPAIX.3.0.1.63.0.1.6.bff all
# shutdown -r now
```

The install bundle can be applied on top of an existing and previous release (v2.2.0.17 or v1.2.0.1 or v1.0.0.5) without needing to uninstall the previous release.

The installation of this bundle will invoke a `bosboot -a` command. This will inject the ODM records and the protoext file into the IBM AIX boot record, thus making these changes persistent across reboots. It is recommended to back up your data prior to any software installation efforts; the reboot of the VIOS or LPAR environment is recommended to complete and commit these changes.

3.3.1 Verify

Verify the Dell Storage Software Suite for AIX with the following command:

```
# lslpp -l | grep DellSC
  DellSC_MPAIX.dellsc        3.0.1.63.0.1.6  COMMITTED  Dell Storage Center
Software
  DellSC_MPAIX.fcp           3.0.1.63.0.1.6  COMMITTED  Compellent FCP Disk
  DellSC_MPAIX.iscsi         3.0.1.6  COMMITTED  Compellent iSCSI Disk
  DellSC_MPAIX.pcm           3.0.1.6  COMMITTED  Compellent PCM module
  DellSC_MPAIX.dellsc        3.0.1.6  COMMITTED  Dell Storage Center Software
  DellSC_MPAIX.pcm           3.0.1.6  COMMITTED  Compellent PCM module
```

The installation of the Dell Storage Software Suite for AIX enables the AIX OS and MPIO stack and identifies SC Series volumes as **MPIO Compellent Fibre Channel Disk Drive** devices as shown:

```
# lsdev -Cc disk
hdisk0 Available 10-T1-01 MPIO Compellent Fibre Channel Disk Drive
hdisk1 Available 12-T1-01 MPIO Compellent Fibre Channel Disk Drive
hdisk2 Available 10-T1-01 MPIO Compellent Fibre Channel Disk Drive
hdisk3 Available 10-T1-01 MPIO Compellent Fibre Channel Disk Drive
```

3.4 Device management

The VPD information generated from the lscfg command has been updated to reflect multiple SC Series volume attributes. This simplifies and facilitates the correlation of AIX hdisk devices to SC Series volumes as shown:

```
# lscfg -vl hdisk1
  hdisk0          U8231.E2B.068426P-V24-C12-T1-W5000D31000ED2333-L1000000000000
MPIO Compellent Fibre Channel Disk Drive

    Manufacturer................COMPELNT
    Machine Type and Model......Compellent Vol
    ROS Level and ID............0701                    Storage Center OS version
```

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```
        Device Specific.(Z0)........00000532FA181002
        Device Specific.(Z1)........0000ed23-0000009f        Volume serial number
        Device Specific.(Z2)........SSN:60707                System serial number
        Device Specific.(Z3)........IND:157                  Volume index number
        Device Specific.(Z4)........CID:60708                Controller ID which this
                                                             volume is active on
        Device Specific.(Z5)........ETH0IP:ac10023c          Controller IP (HEX)
        Device Specific.(Z6)........MIP:ac10027d             Mgmt IP (HEX)
        Device Specific.(Z7)........SysName:SC 25            System name
        Device Specific.(Z8)........VolName: LivePM_dellstud_lpar4_Boot_200G_00
                                                             Volume name on SC
```

3.4.1   ls_vpd

The ls_vpd command provides similar hdisk console output as the lscfg command discussed above. This
command is provided as part of a suite of commands included with the Dell Storage Software Suite for AIX.

```
# ls_vpd -l hdisk1

    DELL tool query VPD for LUN: 1

        Manufacturer................COMPELNT
        Machine Type and Model......Compellent Vol
        ROS Level and ID............0701
        Device Specific.(Z0)........00000532FA181002
        Device Specific.(Z1)........0000ed23-0000009f
        Device Specific.(Z2)........SSN:60707
        Device Specific.(Z3)........IND:157
        Device Specific.(Z4)........CID:60708
        Device Specific.(Z5)........ETH0IP:ac10023c
        Device Specific.(Z6)........MIP:ac10027d
        Device Specific.(Z7)........SysName:SC 25
        Device Specific.(Z8)........VolName:LivePM_dellstud_lpar4_Boot_200G_00
```

3.5   Queue depth management

The queue depth for each existing SC Series enabled FC-attached volume is configured to a value of 16. This
queue depth value is inherited by all SC Series FC-attached (vFC) volumes subsequently presented to the
AIX OS where the software suite has been installed.

The queue depth value of the hdisk device is validated with the `lsattr` command.

```
# lsattr -El hdisk1 | grep queue
queue_depth      16                      Queue DEPTH                      True
```

The queue depth value of an hdisk device is modified with the `chdev` command.

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```
# chdev -l hdisk1 -a queue_depth=XX
```

Where XX represents the new, and intended value for the queue_depth attribute.

3.5.1 iSCSI queue depth

IBM recommends and supports only single-path iSCSI-attached volumes.

iSCSI-attached volumes attached to an AIX OS with the Dell Storage Software Suite for AIX installed will
have its queue depth configured to a value of 8.

Note: The guidelines in this subsection (3.5.1) should be adapted accordingly to the needs of the respective
environment and applications and applied in all VIOS environments (single or dual) when used with Dell SC
Series storage products.

3.6 Path management

The Dell Storage Software Suite for AIX introduces intermediary pseudo-path devices. These pseudo-path
devices are referenced as pdisk devices where each pdisk device represents a logical path of the parent
hdisk device.

The identification, management, and usage of these pdisk devices are performed with the introduction and
use of several new commands. The ls_dellsc command is provided with the Dell Storage Software Suite for
AIX while the lsmpio command was introduced with AIX 7.1 TL3 and AIX 6.1 TL9 or later. These two
commands are discussed in the following sections.

3.6.1 ls_dellsc

The ls_dellsc command presents a display of parent hdisk devices along with its respective and associated
pdisk devices, one per line as shown in the following:

```
# ls_dellsc -l hdisk1
hdisk1,vg name:rootvg
        pdisk0, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 0, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0201]
        pdisk1, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2337,  1, 1, Enabled, fcs0, fscsi0 [C0507603C385005C, 0x1e0201]
        pdisk2, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2338,  1, 2, Enabled, fcs0, fscsi0 [C0507603C385005C, 0x1e0301]
        pdisk3, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2337,  1, 3, Enabled, fcs1, fscsi1 [C0507603C385005E, 0x1e0201]
        pdisk4, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2338,  1, 4, Enabled, fcs1, fscsi1 [C0507603C385005E, 0x1e0301]
        pdisk5, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2334,  1, 5, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0301]
        pdisk6, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 6, Enabled, fcs3, fscsi3 [C0507603C3850062, 0x1d0201]
```

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```
        pdisk7, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2334,  1, 7, Enabled, fcs3, fscsi3 [C0507603C3850062, 0x1d0301]
```

Each pdisk pseudo-path device represents a path to the hdisk device and displays the configuration details for end-to-end path connectivity as shown in the following:

```
        pdisk0, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 0, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0201]
```

Configuration details are described as follows:

```
pdisk<int>            Name of path
SSN:<int>             System serial number
VolName:<string>      Volume name on SC (50 char limit)
5000d31000ed2333      WWPN of the controller path
1                     LUN number
0                     Path ID
Enabled               Path status
fcs2                  Adapter
fscsi2                Adapter driver
C0507603C3850060      WWPN of the vFC adapter on the LPAR/vSCSI device
0x1d0201              Fabric switch ID
```

3.6.2   lsmpio

The lsmpio command was introduced with AIX 7.1 TL3 and AIX 6.1 TL9 or later. This command works with the Dell Storage Software Suite for AIX and displays the following device and path details:

```
# lsmpio -l hdisk1 -S
Disk: hdisk1
    Path statistics since Thu Aug 11 09:31:51 CDT 2016
    Path 0: (pdisk0:5000d31000ed2333,1000000000000)
        Path Selections:                               4420
        Adapter Errors:                                   0
        Command Timeouts:                                 0
        Reservation Conflicts:                            0
        SCSI Queue Full:                                  0
        SCSI Busy:                                        0
        SCSI ACA Active:                                  0
        SCSI Task Aborted:                                0
        SCSI Aborted Command:                             0
        SCSI Check Condition:                             0
        Last Error:                                     N/A
        Last Error Time:                                N/A
        Path Failure Count:                               0
        Last Path Failure:                              N/A
```

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```
            Last Path Failure Time:                              N/A
Disk: hdisk1
    Path statistics since Thu Aug 11 09:31:51 CDT 2016
    Path 1: (pdisk1:5000d31000ed2337,1000000000000)
         Path Selections:                               4425
         Adapter Errors:                                   0
         Command Timeouts:                                 0
         Reservation Conflicts:                            0
         SCSI Queue Full:                                  0
         SCSI Busy:                                        0
         SCSI ACA Active:                                  0
         SCSI Task Aborted:                                0
         SCSI Aborted Command:                             0
         SCSI Check Condition:                            10
         Last Error:                         SCSI Check Condition
         Last Error Time:                    Thu Aug 11 09:31:52 CDT 2016
         Path Failure Count:                               0
         Last Path Failure:                              N/A
         Last Path Failure Time:                         N/A
[snip]
```

3.7   Performance management

The dellsc_tune command is newly introduced with this release. This command enables the system administrators to decide and define how the Dell Storage Software Suite for AIX should behave on the AIX OS.

Table 2   Two tuning profiles provided by this feature and command:

Profile	Behaviour
robust	This profile focuses on reliability over performance. This is the default profile upon installation of the software suite.
performance	This profile focuses on performance over reliability.

3.7.1   dellsc_tune

The dellsc_tune command installs to the /usr/lpp/DellSC_MPAIX directory and usage as shown:

```
# /usr/lpp/DellSC_MPAIX/dellsc_tune
Usage: /usr/lpp/DellSC_MPAIX/dellsc_tune list
       /usr/lpp/DellSC_MPAIX/dellsc_tune active
       /usr/lpp/DellSC_MPAIX/dellsc_tune profile profile_name
 list option: list all available profiles and identify the current active
profile
 active option: only display the currently active profile
 profile option: switch to one of the available profiles
```

```
                profile_name: robust, performance
```

The tuning profile defaults to **robust** profile during installation and is validated as shown:

```
# /usr/lpp/DellSC_MPAIX/dellsc_tune active
Current active profile is robust
```

The tuning profile can be changed to the **performance** profile as shown. A system reboot is required to effect this change to all SC Series FC- or iSCSI-attached volumes.

```
# /usr/lpp/DellSC_MPAIX/dellsc_tune profile performance
Current active profile is robust
WARNING: You are changing profile:
          from profile robust to profile performance
Do you really want to change profile (Y/N) ? Y
...
You must reboot the server now.
# shutdown -r now
```

The pdisk pseudo-path devices are removed upon successful system reboot. Device path designation is replace with fscsi device references instead as shown in the following. The Dell Storage Software Suite for AIX command set should continue to be used for SC Series volume management as discussed.

```
# ls_dellsc -l hdisk1
hdisk1,vg name:rootvg
        fscsi0, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 0, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0201]
        fscsi0, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2337,  1, 1, Enabled, fcs0, fscsi0 [C0507603C385005C, 0x1e0201]
        fscsi1, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2338,  1, 2, Enabled, fcs0, fscsi0 [C0507603C385005C, 0x1e0301]
        fscsi1, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2337,  1, 3, Enabled, fcs1, fscsi1 [C0507603C385005E, 0x1e0201]
        fscsi2, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2338,  1, 4, Enabled, fcs1, fscsi1 [C0507603C385005E, 0x1e0301]
        fscsi2, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2334,  1, 5, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0301]
        fscsi3, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 6, Enabled, fcs3, fscsi3 [C0507603C3850062, 0x1d0201]
        fscsi3, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2334,  1, 7, Enabled, fcs3, fscsi3 [C0507603C3850062, 0x1d0301]
```

3.8   Bootlist management

The pdisk pseudo-path devices and their use in bootlist management and configuration is performed with the dellsc_bootlist command. The native AIX bootlist command should not be used for bootlist management after the Dell Storage Software Suite for AIX has been installed.

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3.8.1 dellsc_bootlist

The command syntax and parameters of the dellsc_bootlist command mirror that of the native AIX bootlist command. The configuration of the bootlist sequence is performed with reference to the pseudo-path devices instead of the hdisk device names as shown:

```
# ls_dellsc -l hdisk1
hdisk1,vg name:rootvg
        pdisk0, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 0, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0201]
        pdisk1, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2337,  1, 1, Enabled, fcs0, fscsi0 [C0507603C385005C, 0x1e0201]
        pdisk2, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2338,  1, 2, Enabled, fcs0, fscsi0 [C0507603C385005C, 0x1e0301]
        pdisk3, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2337,  1, 3, Enabled, fcs1, fscsi1 [C0507603C385005E, 0x1e0201]
        pdisk4, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2338,  1, 4, Enabled, fcs1, fscsi1 [C0507603C385005E, 0x1e0301]
        pdisk5, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2334,  1, 5, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0301]
        pdisk6, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 6, Enabled, fcs3, fscsi3 [C0507603C3850062, 0x1d0201]
        pdisk7, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2334,  1, 7, Enabled, fcs3, fscsi3 [C0507603C3850062, 0x1d0301]
```

The bootlist is configured as shown, where the unique pdisk pseudo-path devices are used to define the preferred bootlist path order of the designated bootable hdisk device. The service management bootlist path order is configured in similar fashion.

```
# dellsc_bootlist –m normal pdisk1 pdisk3 pdisk5 pdisk7
```

Note: Interleaved pdisk pseudo-path devices are selected to ensure that one path from each pair of paths is designated for bootlist use, and thus ensure proper path redundancy for the boot volume.

The bootlist post-configuration is shown in the following:

```
# dellsc_bootlist -m normal -o
hdisk1 blv=hd5 pathid=1
hdisk1 blv=hd5 pathid=3
hdisk1 blv=hd5 pathid=5
hdisk1 blv=hd5 pathid=7
```

The dellsc_bootlist command can configure up to five bootable paths in the bootlist sequence. Four configured paths is sufficient for most use cases.

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3.9   Removal

The Dell Storage Software Suite for AIX is removed using the following command:

```
# /usr/lpp/DellSC_MPAIX/uninstall_dellsc
```

A system reboot is recommended after the complete removal of the software suite. The following sections outline procedures required to remove the software suite depending upon the type of volume in which the software suite is installed.

3.9.1   uninstall_dellsc

The uninstall_dellsc command is used to remove the software suite from the VIOS or LPAR host. This command is installed and located in the /usr/lpp/DellSC_MPAIX directory.

3.9.2   Removal from local volume

On local or vSCSI provisioned volumes, run the command as shown:

```
# /usr/lpp/DellSC_MPAIX/uninstall_dellsc
```

The console output from this command is shown in the following section.

It is recommended to review and verify the bootlist sequence at this time and reconfigure as deemed necessary. A final system reboot of the host is recommended to complete and conclude this procedure.

3.9.3   Removal from boot from SAN volume

On boot from SAN (vFC) provisioned volumes, execute the command as shown:

```
# /usr/lpp/DellSC_MPAIX/uninstall_dellsc
WARNING: YOU are executing DELL SC uninstall forced package
Do you really want to uninstall DELL SC package (Y/N) ? Y
  SAN boot with DELL SC device : delete boot attribute..... Ok

You must reboot with only ONE path active for rootvg.

Then, to finish uninstall procedure :
    relaunch uninstall_dellsc
            Or
    uninstall all DellSC_MPAIX filesets
    with standard procedures (smit or installp)
```

Remove any additional server HBA paths from the server object leaving only one active path through the Dell Storage Manager (DSM) interface, then perform a system reboot of the AIX host.

```
# shutdown -r now
```

After system reboot, rerun the uninstall_dellsc command again to display the following console output. The software suite is now removed from the AIX host. The lsdev command will display hdisk devices as **Other FC SCSI Disk Drive** as shown:

```
# /usr/lpp/DellSC_MPAIX/uninstall_dellsc
WARNING: YOU are executing DELL SC uninstall forced package
Do you really want to uninstall DELL SC package (Y/N) ? Y
hdisk0 deleted
hdisk1 deleted
hdisk2 deleted
hdisk3 deleted
+-----------------------------------------------------------------------+
                    Pre-deinstall Verification...
+-----------------------------------------------------------------------+
Verifying selections...done
Verifying requisites...done
Results...

SUCCESSES
---------
  Filesets listed in this section passed pre-deinstall verification
  and will be removed.

  Selected Filesets
  -----------------
  DellSC_MPAIX.dellsc 3.0.1.6                  # Dell Storage Center Software...
  DellSC_MPAIX.fcp 3.0.1.6                     # Compellent FCP Disk
  DellSC_MPAIX.iscsi 3.0.1.6                   # Compellent iSCSI Disk
  DellSC_MPAIX.pcm 3.0.1.6                     # Compellent PCM module

  << End of Success Section >>

FILESET STATISTICS
------------------
    4  Selected to be deinstalled, of which:
       4  Passed pre-deinstall verification
  ----
    4  Total to be deinstalled

installp:  bosboot verification starting...
installp:  bosboot verification completed.
+-----------------------------------------------------------------------+
                      Deinstalling Software...
+-----------------------------------------------------------------------+

installp: DEINSTALLING software for:
        DellSC_MPAIX.dellsc 3.0.1.6


installp: DEINSTALLING software for:
        DellSC_MPAIX.fcp 3.0.1.6
```

```
        DellSC_MPAIX.iscsi 3.0.1.6

0 entries added.
0 entries deleted.
1 entries updated.
Filesets processed:  3 of 4  (Total time:  10 secs).

installp: DEINSTALLING software for:
        DellSC_MPAIX.pcm 3.0.1.6

Finished processing all filesets.  (Total time:  11 secs).

installp:  bosboot verification starting...
installp:  bosboot verification completed.
installp:  bosboot process starting...

bosboot: Boot image is 51228 512 byte blocks.
0503-292 This update will not fully take effect until after a
        system reboot.

    * * *  A T T E N T I O N  * * *
    System boot image has been updated. You should reboot the
    system as soon as possible to properly integrate the changes
    and to avoid disruption of current functionality.

installp:  bosboot process completed.
+-----------------------------------------------------------------------------+
                           Summaries:
+-----------------------------------------------------------------------------+

Installation Summary
--------------------
Name                        Level           Part      Event       Result
-------------------------------------------------------------------------------
DellSC_MPAIX.dellsc         3.0.1.6         ROOT      DEINSTALL   SUCCESS
DellSC_MPAIX.dellsc         3.0.1.6         USR       DEINSTALL   SUCCESS
DellSC_MPAIX.fcp            3.0.1.6         USR       DEINSTALL   SUCCESS
DellSC_MPAIX.iscsi          3.0.1.6         USR       DEINSTALL   SUCCESS
DellSC_MPAIX.pcm            3.0.1.6         ROOT      DEINSTALL   SUCCESS
DellSC_MPAIX.pcm            3.0.1.6         USR       DEINSTALL   SUCCESS
..
to finish uninstall procedure ONLY if you are in SAN boot:
   You must reboot with only one path for each hdisk
-bash-4.3# lsdev -Cc disk
hdisk4  Available 10-T1-01 Other FC SCSI Disk Drive
hdisk5  Available 10-T1-01 Other FC SCSI Disk Drive
hdisk6  Available 11-T1-01 Other FC SCSI Disk Drive
```

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```
hdisk7  Available 11-T1-01 Other FC SCSI Disk Drive
hdisk8  Available 12-T1-01 Other FC SCSI Disk Drive
hdisk9  Available 12-T1-01 Other FC SCSI Disk Drive
hdisk10 Available 13-T1-01 Other FC SCSI Disk Drive
hdisk11 Available 13-T1-01 Other FC SCSI Disk Drive
```

It is recommended to review and verify the bootlist sequence at this time and reconfigure as deemed necessary. A final system reboot of the host is recommended to complete and conclude this procedure.

3.10 Additional commands

The Dell Storage Software Suite for AIX introduces a few additional commands as discussed in this section. These commands are installed and located in the /usr/sbin directory.

3.10.1 show_wwid

The show_wwid command displays a correlation of fcs devices to their respective vFC World Wide Port Name (WWPN) identifiers. This output can be used to correlate and define bootlist management and sequencing.

```
# /usr/sbin/show_wwid
fcs0: C0507603C3850054
fcs1: C0507603C3850056
fcs2: C0507603C3850058
fcs3: C0507603C385005A
```

3.10.2 show_timer_value

The Dell Storage Software Suite for AIX introduces a watchdog timer value which accommodates SC Series controller failover events and allows AIX to maintain path connectivity and visibility to its volumes for up to 65 seconds. The 65 seconds value is comprised of this watchdog timer value (50 seconds) and the IBM-defined dynamic tracking value (15 seconds). This command displays the watchdog timer value applied to all existing and newly presented FC-attached vFC volumes upon installation of the Dell Storage Software Suite for AIX. This value has been tested and validated for optimal performance with SC Series storage and should not be changed without recommendation from Dell Copilot support.

```
# /usr/sbin/show_timer_value
Timer value is 50 seconds
```

This value can also obtained by querying any of the pdisk pseudo-path devices and observing the watchdog_timer value as shown:

```
# lsattr -El pdisk1
location                          Location Label
True
lun_id          0x1000000000000   Logical Unit Number ID
True
node_name       0x5000d31000ed2302 FC Node Name
False
```

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```
scsi_id          0x1e0201            SCSI ID
True
watchdog_timer 50                    DELL SC watchdog timer
True
ww_lun_name      0000ed23-0000009f  World Wide LUN ID value in storage subsystem
False
ww_name          0x5000d31000ed2337 FC World Wide Name
False
```

3.10.3 change_timer_value

This change_timer_value command is used to change the value of this timer, and only upon recommendation from Dell CoPilot support. The acceptable value range is an integer from 5 to 60.

```
# /usr/sbin/change_timer_value 50
50
```

The installation default for this watchdog timer value is 50 seconds. If this timer is set to a value less than 15 seconds, it disables the timer and the failover buffer.

> **Note:** To change this timer value, perform a **bosboot -a** command followed by a system reboot to ensure that this change is applied to all FC-attached vFC SC Series volumes and is persistent across future reboots.

3.11 Use with NIM and mksysb

The Dell Storage Software Suite for AIX can be used with the NIM deployment framework, mkdvd and mksysb commands. In these use cases, the following guidelines should be followed.

3.11.1 NIM

The Dell Storage Software Suite for AIX should be configured into the NIM framework for installation with script- and fb_script-type resources. The script-type resource is executed upon completion of the AIX OS and should be used to locate the software suite onto the destination host. The fb_script-type resource is executed upon first reboot of the destination host and should be used to install the bundle with the installp command.

3.11.2 mkdvd and mksysb

The mkdvd command works with the Dell Storage Software Suite for AIX installed. The mkdvd image can be captured of an AIX host with single or multiple FC path mappings in place. The recovery of an AIX host from a mkdvd image should only be performed with a single FC path mapping in place. When used with the Dell SC Series storage operating in Virtual port mode, the procedures outlined in section 5.1.2, Virtual port mode, for SC Series volume mapping should be used to configure this single FC path mapping.

An example of the mkdvd command is shown in the following:

```
# mkdvd -V rootvg -R -S
```

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3.12 Troubleshooting

This section is meant to assist and offer resolution with any errors encountered during the installation, upgrade, or removal of the Dell Storage Software Suite for AIX.

3.12.1 Cannot open object class file_overlay

The following errors may be displayed during the installation or upgrade of the Dell Storage Software Suite for AIX:

```
0518-506 odmget: Cannot open object class file_overlay
        Check path name and permissions.
0518-506 odmget: Cannot open object class file_overlay
        Check path name and permissions.
Finished processing all filesets.  (Total time:  30 secs).
```

These errors are generated from known issues with the bos.wpars fileset and corrected with the application of SP 03 or later on AIX 7.1.

Additional details are referenced in the following IBM APAR:
http://www-01.ibm.com/support/docview.wss?uid=isg1IV52815.

3.12.2 Missing pdisk devices

There may be circumstances whereby pdisk pseudo-path devices do not show up in the ls_dellsc console output. In these circumstances, certain existing fscsi devices (and their respective dependencies) may already be bound to the system. The removal and recreation of these fscsi devices is recommended with the procedure shown in this section.

The problematic fscsi devices are usually discovered upon the use of the `cfgmgr` command. The typical errors may look like this:

```
# cfgmgr
Method error (/usr/lib/methods/cfgefscsi -l fscsi1 ):
        0514-061 Cannot find a child device.
```

To correct these errors, remove the respective fscsi device with the following command shown, then run the `cfgmgr` command again to rebuild the properly bound fscsi device and the respective pdisk pseudo-path devices.

```
# rmdev –Rdl fscsiX
# cfgmgr
```

3.12.3 Live Partition Mobility and SC Series controller failover

The Dell SC Series array in virtual port mode will remove from any server object all passively mapped (down) server FC paths during a controller failover event. It is recommended to validate and add any missing FC paths back to any LPM-designated AIX LPAR after a SC Series controller failover event.

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4 Volume management

AIX provides both a robust CLI and a System Management Interface Tool (SMIT) which provides a menu-based alternative to the CLI for managing and maintaining AIX.

SMIT can run in one of two modes: ASCII (non-graphical) or X Window (graphical). The ASCII mode of SMIT can run on either terminals or graphical displays. The graphical mode of SMIT (which supports a mouse and point-and-click operations) can be run only on a graphical display running an X Window manager. The ASCII mode is often the preferred method to run SMIT because it can be run from any machine.

4.1 hdisk device discovery

To install and boot AIX from an SC Series volume, the AIX host must be instructed to scan the FC bus and log in to the FC fabric. This would present the FC WWPN of the HBA in the Create Server or Select Server windows on the SC Series array or DSM GUI.

The AIX host can be made to scan the FC bus by either booting the host with the installation media or by scanning the FC bus from the AIX SMS menu. If the WWPNs of the HBA do not appear in the SC Series server object windows, uncheck the **Show Only Active Connections** check box and allow the DSM interface to refresh and display all HBA WWPNs that the SC Series array has seen regardless of their state (active or disabled).

Once the HBA WWPNs have been mapped and the server object created, SC Series volumes can be presented to the AIX host. Any SC Series volumes should be presented to the AIX host at this time by only one of the multiple paths available. The AIX installation media will list the SC Series volume as a valid installation target.

> **Note:** At this point, the SC Series volume is perceived as a basic third-party storage device. Do not map a second path from the SC Series array to the AIX host until the AIX OS installation has completed successfully and the Dell Storage Software Suite for AIX is installed successfully on the AIX OS primary boot disk.

4.1.1 MPIO module

Dell uses the native AIX MPIO module for multipath connectivity to SC Series volumes. Additionally, Dell provides the Dell Storage Software Suite for AIX which leverages this underlying MPIO layer. MPIO uses a round_robin algorithm by default in a direct fabric-attached configuration, which writes data down one path and then switches to the other path of the same volume. The path management algorithm for LPARs will vary as determined by the presentation layer of the SC Series volumes (vSCSI or vFC). Virtual SCSI (vSCSI) volumes will always be represented on LPARs with a fail_over algorithm.

4.1.2 Making SC Series volumes visible to AIX

Once the initial SC Series server object is configured and the initial volume is mapped, there is no need to reboot the AIX host to query subsequent SC Series-attached volumes. Create new volumes on the SC Series array and instruct the AIX host to query the FC bus to discover and identify any new hdisk devices.

The commands most commonly used to discover and identify new devices on AIX are as follows:

```
# cfgmgr
# lsdev -Cc disk
# ls_dellsc
```

4.2 Snapshots and mapping snapshot view volumes

The SC Series array provides the ability to capture snapshots (replays) of its volumes. Snapshot view volumes (created from snapshots) can be used as incremental backups, presented to other hosts as read-only or read-write volumes for other uses.

Certain procedures need to be followed to ensure data integrity because the snapshot view volumes can be presented to the same host or a different host. These procedures are outlined in the following subsections.

4.2.1 Same host

1. Capture a snapshot of the desired volume on the SC Series array.
2. Cut a snapshot view volume from this snapshot.
3. Map this snapshot view volume to the AIX host or VIOS.
4. Run the `cfgmgr` and `lsdev -Cc disk` commands to discover and identify this new hdisk device/volume.
5. Run the `lspv -p hdiskX` command to display the PVID of this new volume (the PVID of this new volume will be the same as that of the original volume, from which the snapshot was captured).
6. Run the `chdev -l hdiskX -a pv=clear` command to clear the PVID.
7. Run the `chdev -l hdiskX -a pv=yes` command to assign a new PVID to this new volume.
8. Run the `recreatevg -y <new name> hdiskX` command to create a new volume group on this hdisk device, naming it *<new name>*, and thereafter importing the volume group and varying-on the device.

Note: If the host is an LPAR, appropriate provisions should be made on the VIOS to map and reestablish vhost mappings of the hdisk device through the VIOS to the LPAR accordingly.

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4.2.2   Different host

1. Capture a snapshot of the desired volume on the SC Series array.
2. Cut a snapshot view volume from this snapshot.
3. Map this snapshot view volume to the AIX host or VIOS.
4. Run the `cfgmgr` and `lsdev -Cc disk` commands to discover and identify this new hdisk device/volume.
5. Run the `lspv -p hdiskX` command to display the PVID of this new volume (the PVID of this new volume will be the same as that of the original volume, from which the snapshot was captured). There is no need to change the PVID in this scenario because the hdisk device has been presented to a different host.
6. Run the `varyon <volume group name>` command to enable the volume group.
7. Run the `importvg -y <volume group name> hdiskX` command to import the volume group for use.
8. Make the directory to mount any logical volumes inside this volume group.
9. Mount the logical volumes to the desired directory structure.

Note: If the host is an LPAR, appropriate provisions should be made on the VIOS to map and reestablish vhost mappings of the hdisk device through the VIOS to the LPAR accordingly.

4.3   Online filesystem expansion

After AIX discovers a new hdisk device, the administrator can choose to allocate all the space in the new volume to the new file system created within the LVM filesystem structure or only a portion of the space. This choice allows the administrator to limit the amount of space available to the end user.

This provides flexibility and control for space allocation. This is the default behavior for the AIX installation media, which then allows for the online growth of the critical OS file systems when future events either unexpectedly fill up a critical file system or normal growth occurs over time.

AIX provides the `chfs` command which offers a wide variety of control features for use with file systems. This section highlights the size command option of the `chfs` command.

- Grow filesystem to a specific size:

  ```
  # chfs -a size=<new size>
  ```

- Grow filesystem by a specific size:

  ```
  # chfs -a size=+<new size>
  ```

- Reduce filesystem by a specific size:

  ```
  # chfs -a size=-<new size>
  ```

An example is shown as follows:

```
# chfs –a size=+1G /tmp
Filesystem size changed to 2621440
```

> **Note:** The `<new size>` variable can be represented in various units by post-fixing the value with M (Megabytes), G (Gigabytes), T (Terabytes), or other units accordingly.

4.3.1   Discovering new capacity on a SAN volume

After an SC Series volume has been expanded in capacity, instruct the AIX OS to be made aware of this change. This is accomplished by using the `chvg` command shown as follows:

```
# chvg -g <volume group name>
```

All hdisk devices inside the volume group will be scanned and resized to its new capacity.

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5 Boot from SAN

All AIX OS installations to an SC Series boot volume need to be performed with a single mapped HBA path from the SC Series array to the AIX host (or LPAR), prior to the installation of the Dell Storage Software Suite for AIX.

This section assumes there is no local disk available to the AIX host or LPAR. If there is an existing local disk which the host (or LPAR) is currently using to operate the AIX OS, there are multiple options to relocate the AIX OS to an SC Series volume as the boot volume, to migrate from an existing internal hdisk device, or to mirror the existing boot disk to a SC Series volume.

5.1 Mapping the boot from SAN volume

The following subsections discuss the recommendations towards mapping the initial SC Series boot volume to the AIX host (or LPAR) and outlines the requirements if the SC Series array is operating in legacy or virtual port mode.

5.1.1 Legacy port mode

In legacy port mode, the SC Series server object should initially be mapped to the AIX host (or LPAR) using a single server HBA path as shown in the following screenshot. The additional HBA paths should be added to the server object after the AIX OS has been installed.
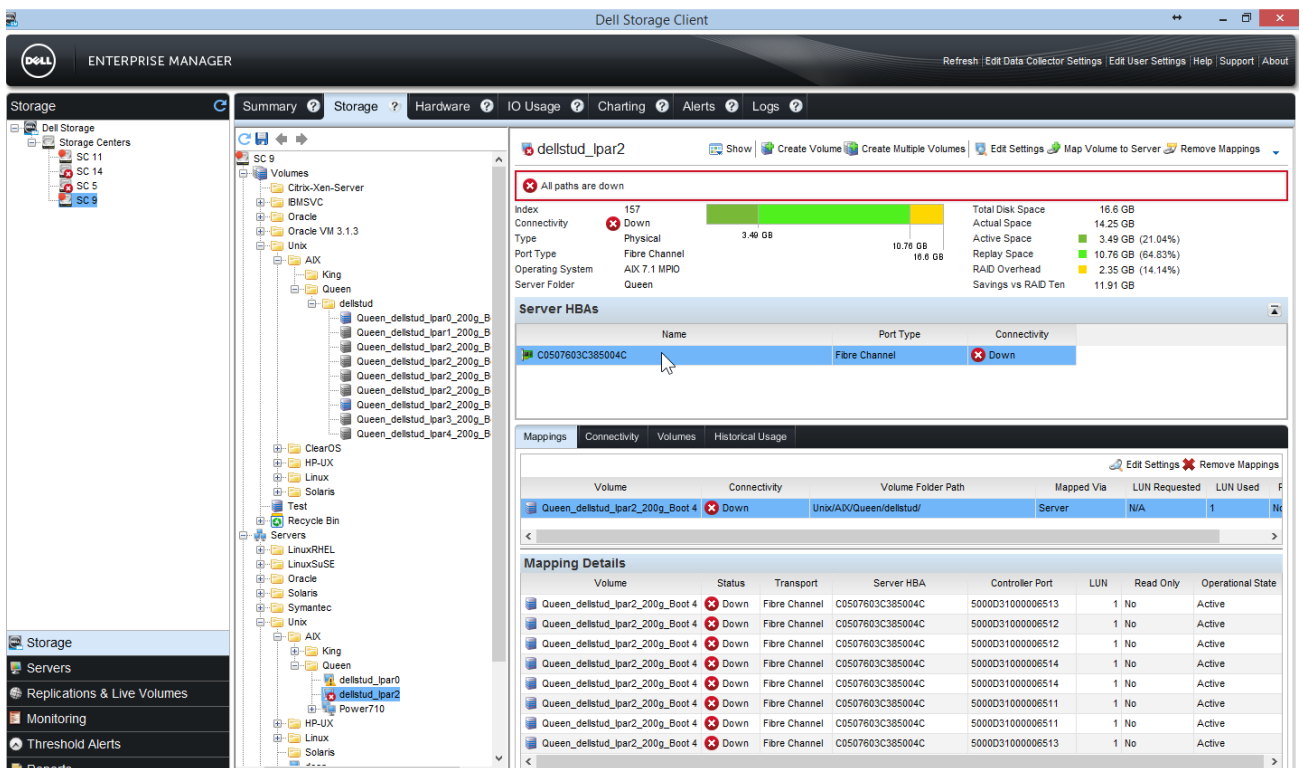

Figure 1   SC Series server object presented over single HBA path

Additionally, the SC Series boot volume should be presented to the SC Series server object. In the **Advanced** mapping menu, check the **Create maps to down server ports** option as shown in the following screenshot.

Figure 2   Create server object mappings to down server ports

5.1.2   Virtual port mode

In virtual port mode, the SC Series server object should initially be mapped to the AIX LPAR using a single server HBA path as shown in the following screenshot. The additional HBA paths should be added to the server object after the AIX OS has been installed.

Figure 3   SC Series server object presented over single HBA path

Additionally, the SC Series boot volume should be presented to the SC Series server object. In the **Advanced** mapping window, check the **Create maps to down server ports** option as shown in the following screenshot.

Additionally, with volumes presented from an SC Series array in virtual port mode, configure the **Maximum number of paths per Server** option to show **Single Path** instead of the default value of **Unlimited**.

Figure 4   Volume presented over single HBA path/mapped to down server ports

After the OS installation has been complete, it is recommended to install the Dell Storage Software Suite for AIX to the AIX OS.

Finally, the SC Series HBA path option should be revisited and set back to its default value of **Unlimited**. This configuration can be applied on demand without impact to the volume or data integrity. Run the **cfgmgr** command on the AIX OS to discover all additional mapped HBA paths from the SC Series array and verify that the boot volume and paths are accurately managed by the Dell Storage Software Suite for AIX as shown:

```
# ls_dellsc -l hdisk1
hdisk1,vg name:rootvg
        pdisk0, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 0, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0201]
        pdisk1, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2337,  1, 1, Enabled, fcs0, fscsi0 [C0507603C385005C, 0x1e0201]
        pdisk2, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2338,  1, 2, Enabled, fcs0, fscsi0 [C0507603C385005C, 0x1e0301]
        pdisk3, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2337,  1, 3, Enabled, fcs1, fscsi1 [C0507603C385005E, 0x1e0201]
        pdisk4, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2338,  1, 4, Enabled, fcs1, fscsi1 [C0507603C385005E, 0x1e0301]
        pdisk5, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2334,  1, 5, Enabled, fcs2, fscsi2 [C0507603C3850060, 0x1d0301]
        pdisk6, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2333,  1, 6, Enabled, fcs3, fscsi3 [C0507603C3850062, 0x1d0201]
        pdisk7, SSN:60707, VolName:LivePM_dellstud_lpar4_Boot_200G_00,
5000d31000ed2334,  1, 7, Enabled, fcs3, fscsi3 [C0507603C3850062, 0x1d0301]
```

5.2   Boot volume migration

The following subsections discuss the commands and methods to migrate a boot volume from a local disk device to an SC Series boot volume.

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5.2.1   migratepv command

The `migratepv` command can be used to migrate the boot image from an existing local hdisk device (in this example, hdisk0) to an SC Series boot volume (in this example, hdisk2). In this example, the Dell Storage Software Suite for AIX has not been installed. The procedure is similar in either use case.

1. Create, map, discover (cfgmgr), and identify (lsdev -Cc disk) the new SC Series volume on the AIX host:

```
hdisk0 Available 10-60-00-4,0 16 Bit SCSI Disk Drive
hdisk1 Available 10-60-00-5,0 16 Bit SCSI Disk Drive
hdisk2 Available 20-58-01 Other FC SCSI Disk Drive
```

9. Display the rootvg with the following command:

```
# lsvg -l rootvg
LV NAME TYPE LPs PPs PVs LV STATE MOUNT POINT
hd5 boot 1 1 1 closed/syncd N/A
```

10. Apply the following command to check the status of the hd5 partition:

```
# migratepv –l hd5 hdisk0 hdisk2
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.
```

11. Apply the `migratepv` command then make the new hdisk2 device bootable with the `bosboot` command:

```
# migratepv hdisk0 hdisk2
# bosboot -ad /dev/hdisk2
bosboot: Boot image is 29924 512 byte blocks.
```

12. Apply the following commands to remove rootvg from hdisk0 and make hdisk2 the primary boot device and finally reboot the host using the new hdisk2 device:

```
# chpv -c hdisk0
# reducevg -d rootvg hdisk0
# dellsc_bootlist -m normal pdiskX [ pdiskX | pdiskX | pdiskX ]
# shutdown –Fr now
```

5.2.2   mirrorvg and mklvcopy command

The `mirrorvg` command mirrors all the logical volumes inside a volume group from one hdisk device to another hdisk device. Both hdisk devices need to be active members of this volume group.

The `mklvcopy` command also provides the same functionality, though this command will need to be applied individually to each logical volume of the discussed volume group.

> **Note:** Additional hdisk devices may be added to a volume group with the extendvg command.

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The `mirrorvg` command, by default, attempts to mirror the logical volumes to any of the alternate hdisk device members of the volume group; this can be controlled by specifying a destination target hdisk device as a parameter in the CLI.

Additionally, the `mirrorvg` command, by default, mirrors all the logical volumes using the default settings of the source logical volume. In some cases where mirror-strict policies are inherited from the source logical volumes, the `mklvcopy` command can be used to mirror each logical volume individually.

Note: Other command line parameters may be issued to the `mirrorvg` command, such as the `-S` or `-s` parameter, which can be used to run this command as a background process; the `-c` option can be used to specify more than two (default) mirror copies.

The procedure outlined as follows represents one of many ways to accomplish this process with datavg:

1. Create, map, discover (cfgmgr), and identify (lsdev -Cc disk) the new SC Series volume on the AIX host:

   ```
   hdisk0 Available 10-60-00-4,0 16 Bit SCSI Disk Drive
   hdisk1 Available 10-60-00-5,0 16 Bit SCSI Disk Drive
   hdisk2 Available 20-58-01 Other FC SCSI Disk Drive
   ```

13. Extend datavg volume group with hdisk2:

    ```
    # extendvg datavg hdisk2
    ```

14. Mirror the primary datavg hdisk device to hdisk2 and wait for it to synchronize:

    ```
    # mirrorvg datavg hdisk2
    ```

15. Finally, unmirror and separate the original hdisk device from datavg.

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5.2.3 alt_disk_copy command

The `alt_disk_copy` command replaces the `alt_disk_install` command in AIX 5.3 and later versions of AIX. This command provides the ability to clone the current running system to an alternate target hdisk device.

In the default usage, the command may be issued as shown in the following. The full details of this command can be found in the IBM Knowledge Center article, alt_disk_copy Command.

```
# alt_disk_copy -d hdisk3
```

The following assumptions are made:

- rootvg is the current, active and default boot device (internal device)
- hdisk3 is the SC Series volume (or similar capacity)

The following commands are then applied to make hdisk3 the default boot device on the next reboot;

```
# dellsc_bootlist -m normal pdiskX [ pdiskX | pdiskX | pdiskX ]
# shutdown -Fr now
```

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6 Live Partition Mobility

Live Partition Mobility on AIX with SC Series is achieved with the methods and considerations detailed in this section. These methods apply to both vFC and vSCSI provisioned LPARs.

It is recommended to always quiesce any I/O on the LPAR before any Live Partition Mobility event is attempted.

Additional prerequisites to achieve Live Partition Mobility are outlined in the following IBM Redbook documents:

- *IBM PowerVM Virtualization Introduction and Configuration*
- *IBM PowerVM Virtualization Managing and Monitoring*
- *IBM PowerVM Enhancements What is New in 2013*

The default profile for LPAR dellstud_lpar3 is shown in the following screen. Click each of the Client Fibre Channel Adapter IDs to display the WWPNs for each adapter.

Figure 5   Virtual adapter devices for dellstud_lpar3 partition

Observe and note both WWPNs listed in the following screen, in which the first WWPN represents the active path to vFC adapter ID 10 provisioned from vio1 and the second WWPN represents the passive path.
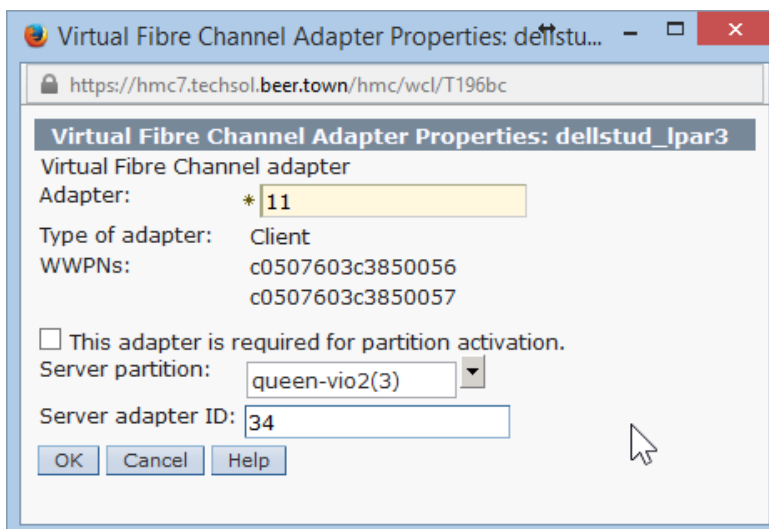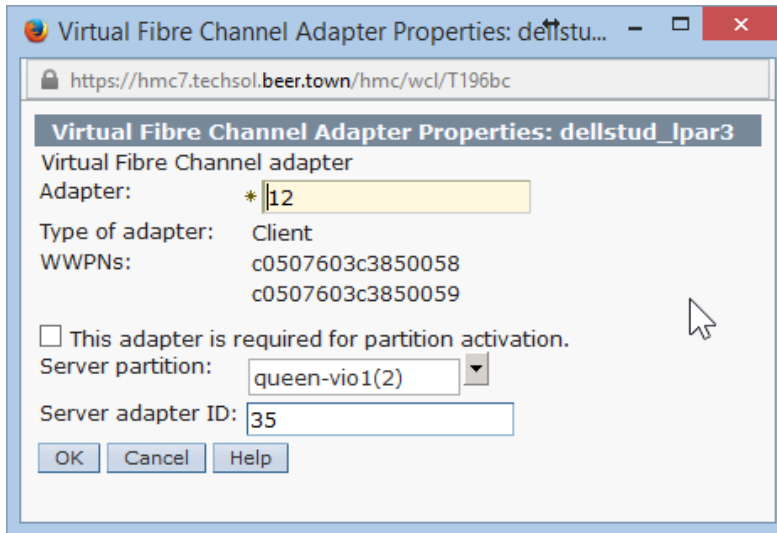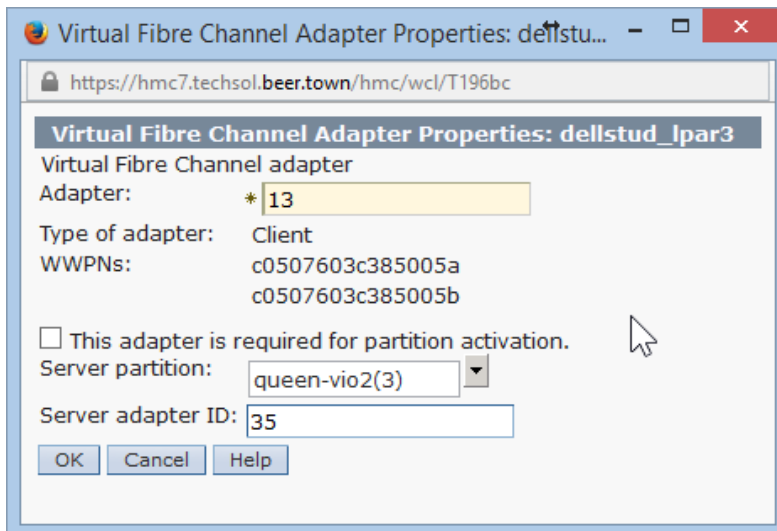

Figure 6   Observe active / passive WWPNs for adapter 10

Observe and note both WWPNs listed in the following screen, in which the first WWPN represents the active path to vFC adapter ID 11 provisioned from vio2 and the second WWPN represents the passive path.

Figure 7   Observe active / passive WWPNs for adapter 11

Observe and note both WWPNs listed in the following screen, in which the first WWPN represents the active path to vFC adapter ID 12 provisioned from vio1 and the second WWPN represents the passive path.

Figure 8   Observe active / passive WWPNs for adapter 12

Observe and note both WWPNs listed in the following screen, in which the first WWPN represents the active path to vFC adapter ID 13 provisioned from vio2 and the second WWPN represents the passive path.

Figure 9   Observe active / passive WWPNs for adapter 13

Add the WWPNs (both active and passive paths) for the first VIOS pair of vFC adapters to the same fabric zoneset (VSAN1 in a dual VSAN fabric) as shown in the following screen, mapping the WWPNs to the WWPNs of the SC Series array.
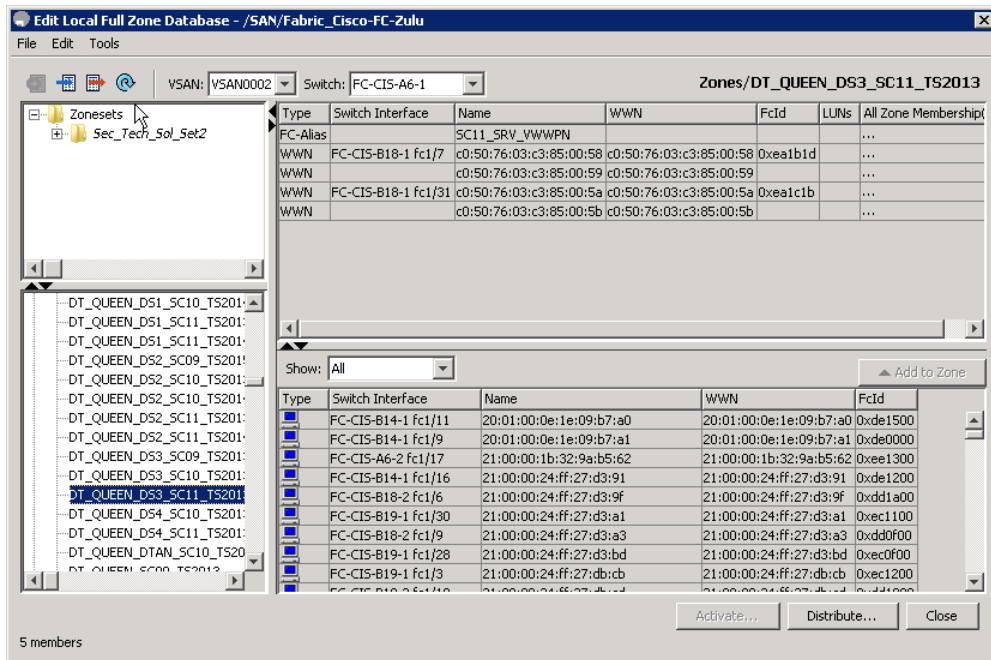

Figure 10   Adding first set of WWPNs to zoneset in VSAN01

Add the WWPNs (both active and passive paths) for the second VIOS pair of vFC adapters to the same fabric zoneset (VSAN2 in a dual VSAN fabric) as shown in the following screen, mapping the WWPNs to the WWPNs of the SC Series array.

Figure 11   Adding second set of WWPNs to zoneset in VSAN02

The following screen displays the dellstud_lpar3 server object created on a SC Series array. In the right pane under **Server HBAs,** the server object is presently mapped to the four active WWPN paths (*54, *56, *58, and *5A), one per vFC adapter. This is the basic configuration for a vFC-provisioned LPAR mapped across a dual-VSAN fabric and a dual-VIOS-based environment.
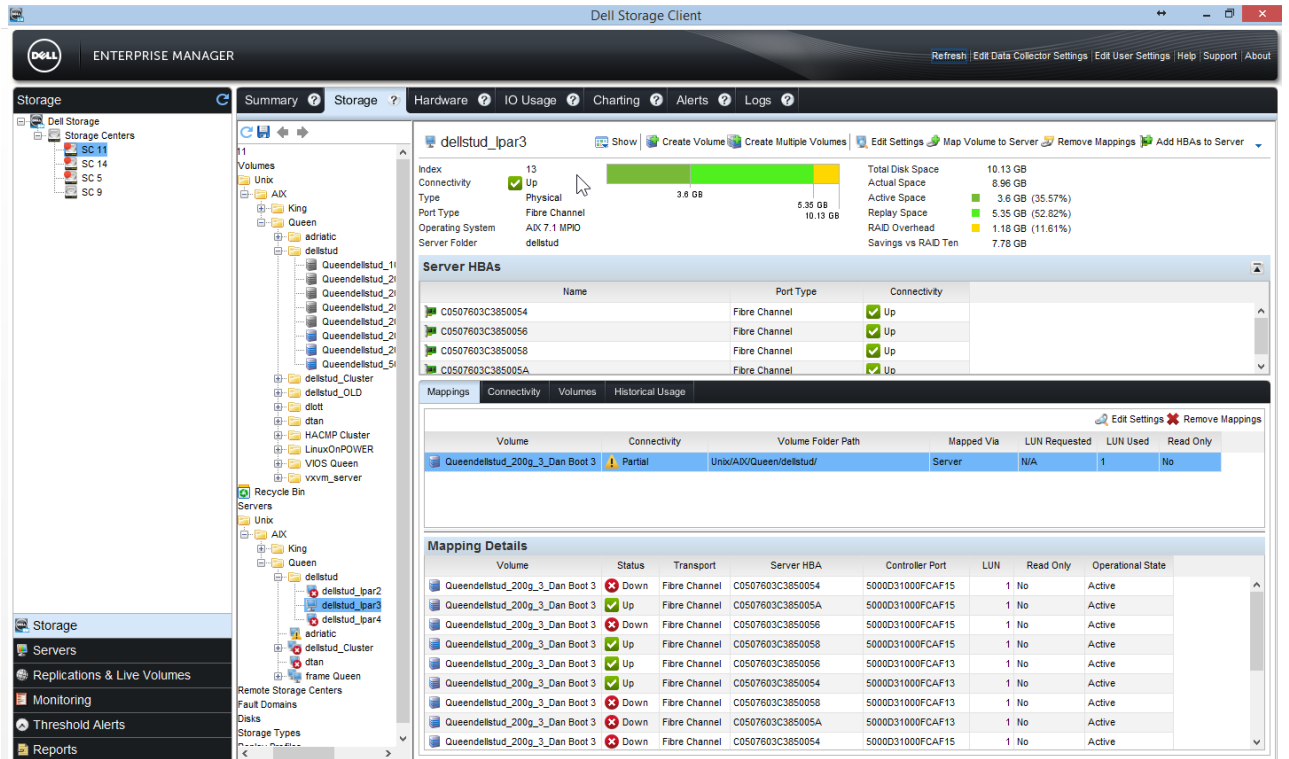
Figure 12   SC Series server object mapped to all active HBA paths

In the following screen, the additional WWPN paths are added to the server object mapping using the **Manually Add HBA** window. Repeat this process four times in total, adding the four passive WWPN paths (*55, *57, *59, and *5B), one per vFC adapter.
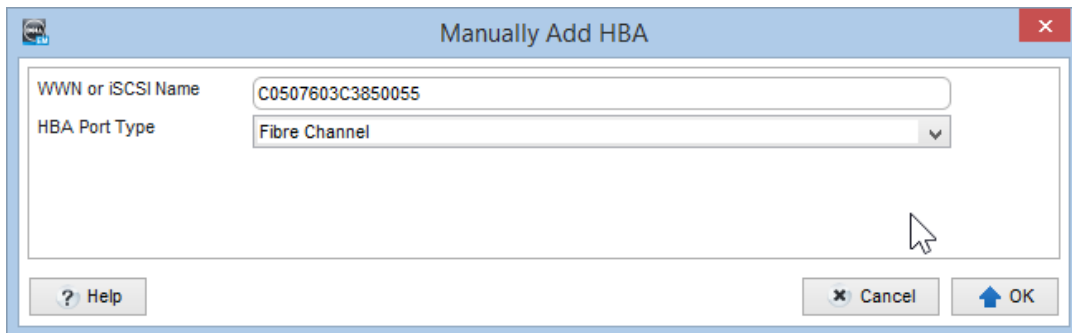

Figure 13   Adding an additional passive WWPN paths

The resulting server object mapping will look like the following screen, in which the active WWPN paths are denoted in green (Up) and the passive WWPN paths are denoted in red (Down). This is normal behavior for this server object mapping scenario.
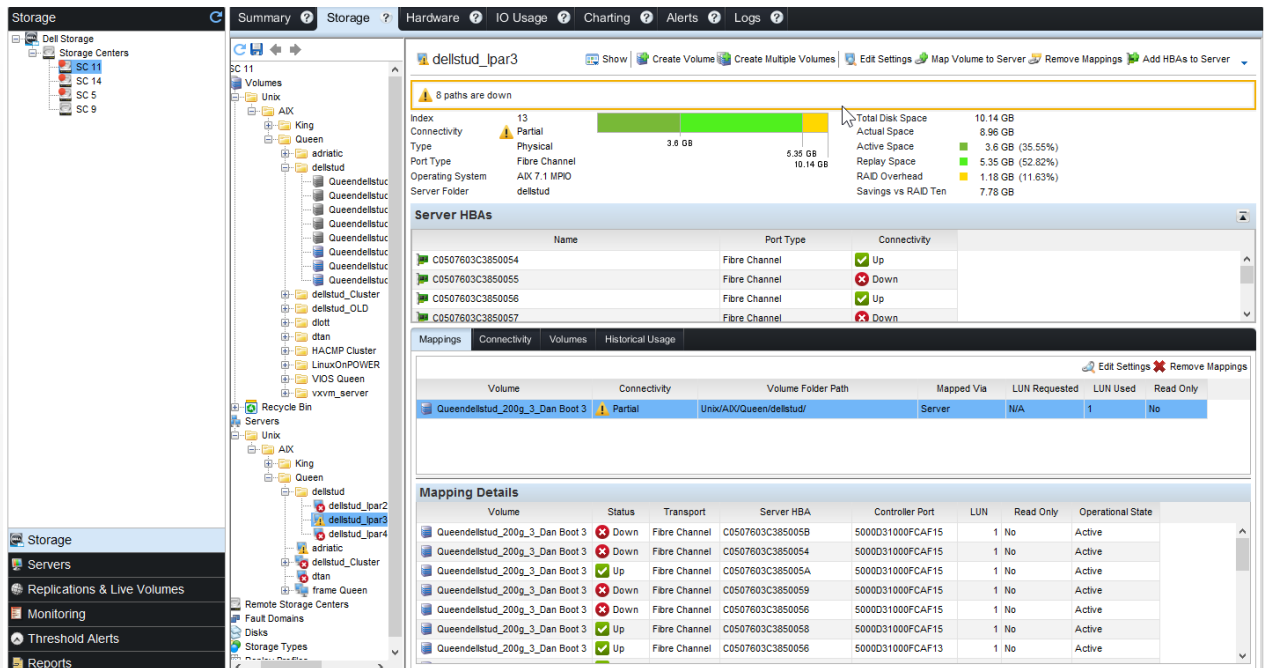
Figure 14   SC Series server object mapped to all active / passive HBA paths

After all the server object mappings have been created on the SC Series array, it is recommended to shut down the AIX LPAR, unmap all volumes from the AIX LPAR, and present all volumes again to the respective server object. It is recommended at this time to enable the **Create maps to down server ports** option in the advanced mapping window as shown in the following screenshot. Finally, reboot the AIX LPAR and run a cfgmgr command to discover all additional device paths.
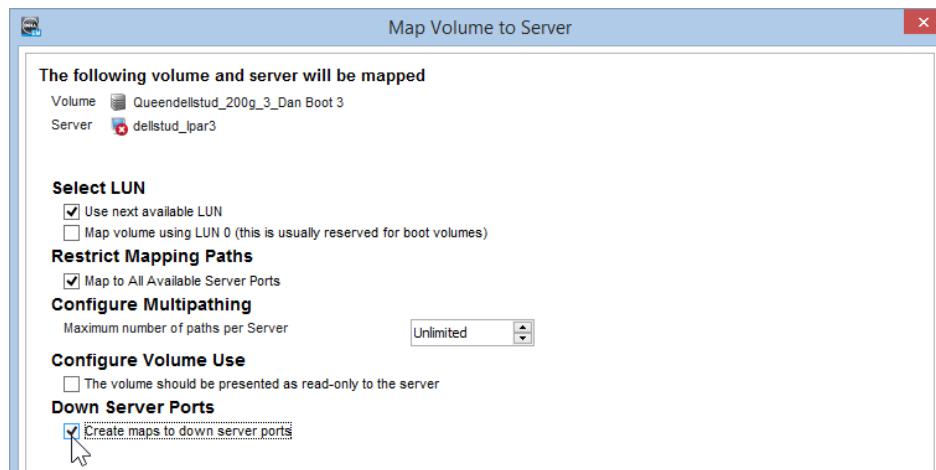

Figure 15   Map server object to all down server ports

The AIX LPAR is now ready for use with PowerVM Live Partition Mobility. It is recommended that the **Mobility > Validate** option is used with the AIX HMC to validate for any further and potential errors which may be encounted during a LPM event.

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7 Dell Storage REST API

The Dell Storage REST API interface is available with the installation of Dell Storage Manager 2015 R3 or newer. The REST API is recommended when intending to interact with Dell SC Series storage managed by the DSM installation, either programmatically or in a CLI. Refer to the Dell Storage Representational State Transfer (REST) API Cookbook.

The use of the Compellent Command Utility (CompCU) has been deprecated.

A Configuration details

Table 3 Component table

Component	Description
OS	IBM AIX 6.x and 7.x
Driver version	NA
Firmware version	NA
Application	NA
Cabling	Fibre Channel
Server	IBM Power 710 x 2
Storage	Dell Storage Center OS (SCOS) 7.1.x in legacy and virtual port mode
Switch	Brocade® 300

B Technical support and resources

Dell.com/support is focused on meeting customer needs with proven services and support.

Dell TechCenter is an online technical community where IT professionals have access to numerous resources for Dell software, hardware and services.

Storage Solutions Technical Documents on Dell TechCenter provide expertise that helps to ensure customer success on Dell Storage platforms.

B.1 Related documentation

Table 4 lists the referenced or recommended resources related to this document.

Table 4   Referenced or recommended resources

Vendor	Resource
Dell	*Dell Storage Center System Manager Administrator's Guide* available on the Knowledge Center at the SC Series Portal (login required)
Dell	*Dell Storage Center Connectivity Guide* available on the Knowledge Center at the SC Series Portal (login required)
Dell	*Dell Storage REST API Cookbook*
IBM	*IBM AIX Enterprise Edition System Admin Guide*
IBM	*IBM Certification Study Guide pSeries System Administration*

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