Overview of SDDPCM migration methods with IBM AIX

Evaluation guide version 1.0

This white paper describes the Subsystem Device Driver Path Control Module (SDDPCM) migration methods on the IBM® AIX® OS. It explains the different migration methods that can be used to upgrade SDDPCM while upgrading AIX.

Introduction

Sometimes, administrators are unaware that they need to upgrade the SDDPCM driver while upgrading the AIX OS. In such an instance, the system might become unstable, hang, or result in an outage and this needs to be recovered. It is very important to migrate SDDPCM before OS migration to avoid such conditions.

About this white paper

The purpose of this paper is to provide a thorough understanding of different migration methods for SDDPCM. This paper provides a self-guided evaluation of SDDPCM migration for system administrators. It also guides them through the different scripts provided by IBM and explains how it can be used to avoid SDDPCM migration-related issues.

Assumptions

In this technical paper, it is assumed that:
- System administrators have access to the SDDPCM driver packages compatible with the AIX OS, which is planned for migration.
- System administrators have familiarity with the standard AIX migration methods such as Network Installation Management (NIM) server, NIMADM and so on.
- Customer environment has NIM master setup, which is running at a level greater than or equal to the AIX upgradable image.
- System administrators have the basic understanding and awareness of SDDPCM installation requirements, purpose, and usage.
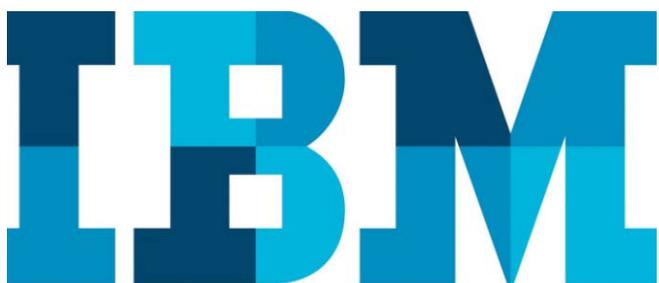
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Overview

Challenge

Customers are facing issues while migrating AIX with SDDPCM installed on it.

Solution

While upgrading the AIX OS to the next level with SDDPCM installed in it, it is recommended to follow the SDDPCM migration methods explained in this paper.

Note: System administrators unfamiliar with the prerequisites can refer to the "Resources" section at the end of this paper.

Terminology	Brief description
SDDPCM	Subsystem Device Driver Path Control Module
NIM	Network Installation Manager
NIMADM	Network Installation Manager Alternate Disk Migration
MPIO	Multipath I/O
IBM L1/L2	IBM support
SAN	Storage area network
SVC	Unless explicitly specified, a general term that is used to describe all applicable IBM System Storage® SAN Volume Controller (SVC) platforms – IBM SVC (CG8, CF8), IBM Storwize® V7000, Storwize V5000, Storwize V3700, Storwize V9000, and IBM PureFlex® System – storage nodes
VIOS	Virtual I/O Server
LVM	Logical Volume Manager
FCP	Fibre Channel Protocol
AIX PCM	AIX built-in multipathing driver
PowerHA	High availability cluster solution for AIX
SDD	Subsystem Device Driver (earlier variant of SDDPCM)
SPOT	Shared Product Object Tree
LPP	Licensed Program Product

Table 1: Terminology and description

Why SDDPCM needs migrating along with AIX migration

If AIX is migrated to a newer level and the system administrator overlooked the need to upgrade SDDPCM, it leads to incompatibility between the SDDPCM driver and the AIX kernel level. In such cases, the behavior of SDDPCM might be unpredictable and a system outage is possible and there comes the need for path failover and recovery.

IBM provides separate SDDPCM installation file sets for each AIX level (for example, *devices.sddpcm.61.rte* for AIX 6.1 and *devices.sddpcm.71.rte* for AIX 7.1). Whenever an AIX migration happens, a newer AIX base level is installed over the earlier AIX base level. This migration does not consider the SDDPCM migration, which results in incompatible SDDPCM binaries present on the newer AIX base level. After host reboots, SDDPCM automatically claims supported devices over other MPIO path-control modules (PCMs) that may be on the system. As current SDDPCM is not built for the OS level it is running, the presence of an unsupported SDDPCM driver can lead to critical issues. Therefore, system administrators must migrate SDDPCM as per SDDPCM migration methods discussed in this paper to avoid such situations.

Methods of migrating SDDPCM along with AIX

There are multiple methods to migrate SDDPCM during AIX migration. While some of the methods facilitate SDDPCM migration along with AIX migration, others provide methods to migrate SDDPCM before the AIX OS migration. It is up to the AIX system administrators to decide which method suites their environment and existing migration preferences.

Note:
- It is expected from the system administrator to contact the IBM (SDDPCM) L1/L2 (support) team and request the specific SDDPCM migration method to be used. These methods contain scripts and *readme* files for SDDPCM migration.
- *Readme* files contain all the required instructions to perform SDDPCM migration.

SDDPCM supports following migration methods along with AIX migration.

Method 1: SDDPCM migration before AIX OS migration

In this method, you need to perform the following steps:

1. Uninstall the older SDDPCM driver.
2. Install the new SDDPCM file sets that are compatible with the newer AIX OS level.
3. Immediately migrate the AIX OS, without rebooting the host.
4. Reboot the host.

This method makes use of the fact that SDDPCM installation does not claim supported devices until the host reboots.

Therefore, the SDDPCM driver is first upgraded, immediately afterwards AIX OS is migrated, then the host is rebooted. After this reboot, SDDPCM configures and begins handling supported SAN devices.

The AIX host can be booted either from the internal disks or from the SAN boot disk.

Note:
- It is of utmost importance that the system administrator migrates the AIX OS immediately after SDDPCM migration.
- Do **not** reboot the AIX host until migration is complete. Rebooting the AIX host in between will result in unpredictable behavior of SDDPCM and outage.

Scripts used:
- *migratePCMbeforeOSmigrate.sh*:
  This script can put all supported target devices (including the virtual ones if any) to the defined state, unmount file systems, and deactivate (varyoff) the volume groups that are created with SDDPCM devices.

It also removes all the SDDPCM devices and removes the SDDPCM package for the current operating system or Virtual I/O Server (VIOS) version and installs the SDDPCM for the next OS or VIOS version. During this process, this script also saves the LVM configuration, which can later be restored using the *restorelvm.sh* script.

- *b. restorelvm.sh*:
  This script recovers the original LVM configuration which was on the host system just before running *migratePCMbeforeOSmigrate.sh*. Volume groups that were varied on before will be varied back on, and file systems that were mounted before will be re-mounted. It only needs to be run if the volume groups or file systems are not set to *auto on*.

Merits:
- There is no need to take care of SDDPCM handled devices manually.
- It enables smooth and simple migration.
- As it is not tightly coupled with AIX migration, AIX migration does not get affected by this method.

Demerits:
- Immediate AIX OS migration after SDDPCM migration is mandatory. Rebooting the host without the AIX OS migration can cause issues in customer environment because the SDDPCM driver and the AIX kernel (if not migrated) might be incompatible.
- Outage time required for maintenance (AIX migration) is more in this method.

Method 2. Migration using a conventional NIM server

To migrate SDDPCM along with AIX, this method can be used. It uses the conventional NIM server based migration. The AIX host can be booted either from internal disks or SAN boot disk. In this method, you need to perform the following steps:

1. Create the licensed program products (LPP) and Shared Product Object Tree (SPOT) resources and the *bosinst* data resource.
2. Add the compatible SDDPCM packages to the SPOT resource.
3. Migrate the AIX host.

Scripts used:
- *migrateSDDPCMwithOSmigration.sh*
  This script removes the SDDPCM package for the current operating system or the VIOS version and installs SDDPCM for the next OS or VIOS version.
- b. *savelvm.sh*
  This script records the LVM state.

- c. *restorelvm.sh*
  This script restores the LVM state with the contents of LVM
  configuration file that is created by the *savelvm.sh* script.

Merits:
- Since this is a network based installation, it can be performed on
  remote AIX hosts as well.
- Unlike the NIMADM method, the NIM client does not need
  additional disks for migration.

Demerit:
- The outage caused by this method equals the time needed for
  complete upgrade.
- If AIX upgrade is not successful due to any reason, it needs
  immediate attention as AIX host will not be alive unless fixed. This
  adds up time to outage. This is due to the flow of conventional NIM
  server migration.

Method 3. Migration using NIMADM (Alternate Disk Manager)
This method migrates SDDPCM along with AIX OS migration using the
NIMADM method for all SDDPCM supported FCP storage devices. It uses
NIMADM-based migration. The AIX host can be booted either from the
internal disks or the SAN boot disk.
In this method, you need to perform the following steps:
1. Add SDDPCM to LPP and SPOT resources of NIM.
2. Create a duplicate copy of the root volume group (rootvg).
3. Upgrade a copy of rootvg using the same LPP and SPOT resources
   mentioned in step 1.
4. After successful upgrade, reboot the AIX host.

Scripts used:
- *savelvm.sh*
  This script records the LVM state.
- *preSDDPCMOSmigration.sh*:
  This script removes the SDDPCM package for the current OS or
  VIOS version.
- *postSDDPCMOSmigration.sh*
  This script runs the `manage_disk_drivers` command to enable
  all devices to be managed by SDDPCM.
- *restorelvm.sh*
  This script restores the LVM state with contents of the LVM
  configuration file that is created by the *savelvm* script.

Merits:
- This method works on the copy of rootvg to upgrade it. After
  migration, the upgraded copy is used in booting the AIX host. As the
  copy of rootvg is used in migration, any issue with migration does not

affect the original rootvg disk. This allows system administrators to use the old image of rootvg in case any issue is faced.
- No practical outage. Downtime is just the time taken to reboot.
- This method can support several clients' migration at the same time.

Note:
When an incompatible SDDPCM driver package is present on the AIX OS, the system administrator can use the *rmSDDPCMandHA.sh* script to remove SDDPCM and the SDDPCM host attachment packages.

This script supports the AIX system or VIOS booting from internal disk or SAN boot disk for all SDDPCM supported storage types.
It covers the following scenarios:

- To recover the AIX OS or VIOS after OS migration without migrating SDDPCM for the new OS level.
- To downgrade or reinstall SDDPCM driver packages.
- To uninstall SDDPCM driver packages to switch to the native AIX PCM

Refer to **ibm.com**/developerworks/aix/library/au-aix-nimadm/ for more details.

Case studies

This section explains some of the SDDPCM migration issues faced by customers.

- In one of the scenarios, the AIX host was migrated from version 6.1 to 7.1. However, the AIX administrator did not take care of SDDPCM migration. Due to incompatible version of SDDPCM, system went into inconsistent state. Later while troubleshooting, the AIX host system with the OS got corrupted (LED 0554).

    Resolution:
    The system administrator had to go back and use the old backed up image (AIX 6.1). Later, the conventional NIM migration method was used for SDDPCM migration along with AIX migration.

- The system administrator upgraded AIX in an IBM PowerHA® setup and neglected to migrate SDDPCM. In this case, the customer asked help from the IBM support team to migrate SDDPCM.

    Resolution:
    The IBM support team provided the SDDPCM removal script to the customer, and this enabled the customer to uninstall the incompatible SDDPCM driver package.

Troubleshooting for PowerHA setup:
In a PowerHA setup, as cluster management system is still running, SDDPCM removal script might not be able to unmount the *caavg_private* file system. System administrators need to take care of this scenario by performing the following steps:

1. Take a cluster snapshot.
2. Shut down the HA cluster.
3. Varyoff and export the CAA volume group.
4. Run the *rmSDDPCMandHA.sh* script
5. After the SDDPCM removal process is complete, restore the cluster using the snapshot.
6. Import the caavg (quorum disk)

- An AIX system administrator is performing AIX upgrade using the NIMADM method. System administrator was aware of the SDDPCM migration scripts but used a wrong script which was intended for conventional NIM migration. After reboot, the system hung with LED 0554.

  Resolution:
  IBM support team has suggested to use the recommended script which is intended for the NIMADM method.

- A system administrator planned to migrate from Subsystem Device Driver (SDD) to SDDPCM on the AIX host and ran the *rmSDDPCMandHA.sh* script to remove SDD. However, instead of SDD removal, this script supports SDDPCM removal only.

  Later, the system administrator managed to remove SDD and installed SDDPCM over it. Because it was not a recommended migration method, after the reboot, the system hung with LED 0554.

  Resolution:
  IBM support team suggested to restore the AIX image from the available backup and contact L2 for the appropriate migration script.

Summary

You can use SDDPCM migration methods for smooth upgrade of SDDPCM driver along with AIX OS migration. It can prevent system administrators from facing multiple issues when they miss to upgrade the SDDPCM driver during AIX OS migration. IBM highly recommends contacting L2 support to provide the appropriate scripts for the recommended migration methods whenever an administrator plans to migrate the AIX OS with SDDPCM driver installed in it.

Resources

The following websites provide useful references to supplement the information contained in this paper:

- IBM SDDPCM
  ibm.com/support/docview.wss?uid=ssg1S4001363

- IBM SDDPCM user guide
  ibm.com/support/docview.wss?uid=ssg1S7000303

- IBM SDDPCM white paper
  ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=TSW03483USEN

- IBM AIX multipathing
  ibm.com/developerworks/aix/library/au-multipathing/

- IBM AIX migration methods
  ibm.com/developerworks/aix/library/au-aix-system-migration-installation/

- IBM Systems on PartnerWorld
  ibm.com/partnerworld/systems

- IBM Power Development Platform
  ibm.com/partnerworld/pdp

- IBM Power Systems Knowledge Center
  ibm.com/support/knowledgecenter/POWER8/p8hdx/POWER8welcome.htm

- IBM Redbooks®
  ibm.com/redbooks

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