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Migrating from an HP Smart Array 5304 controller to an HP Smart Array 6404 controller

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Abstract

This paper compares the HP Smart Array 5304 Controller and the HP Smart Array 6404 Controller. It describes the utilities for manual configuration of arrays and then describes the SA-5304 and SA-6404 in more detail. This paper explains the advantages of using the SA-6404 over the SA-5304 and also explains, in general terms, how to migrate from the SA-5304 to the SA-6404.

WARNING: This information is intended for experienced IT professionals. Because of the potential risk of damage to the servers, a clear understanding of these utilities is critical. Always back up your data. Be sure that all mission-critical systems will remain active in the event of a system failure before using the utilities.

NOTE: While this information explains how to migrate from an SA-5304 to an SA-6404, this information also pertains to the HP Smart Array 4200 Controller. Any discrepancies between the SA-4200 and the SA-5304 are noted for clarity.

Hardware comparison

A controller enables you to combine the capacity of several physical drives into one or more virtual units called **logical drives** (also called **logical volumes**).

HP has designed several Smart Array controllers with different speeds and throughputs.

- **HP Smart Array 5304 Controller**—A single-processor, single RAID XOR engine 64-bit 66 MHz PCI Wide Ultra3 SCSI controller that transfers data at 160 MB/sec per SCSI bus. The controller supports up to 56 drives (4 channels, 14 drives per channel) per controller.
- **HP Smart Array 6404 Controller**—A dual-processor, dual RAID XOR engine 64-bit 133 MHz PCI-X Wide Ultra 320 SCSI controller that transfers data at 320 MB/sec per SCSI bus. The controller supports up to 56 drives (4 channels, 14 drives per channel) per controller.

HP controller software displays controller names in the firmware, Array Configuration Utility (ACU), and drivers, while HP uses marketing names for those controllers. Table 1 lists the controller name as it displays in the firmware, ACU, and drivers and the marketing name by which the controller is known.

Table 1. Controller names

Firmware, ACU, and drivers	Marketing
SA-6400	SA-6402
SA-6400-EM	Ultra-320 Expansion Module for SA-6402
SA-6400+SA-6400 EM	SA-6404 → SA-6402 with Ultra-320 Expansion Module
SA-5300	SA-5302 or SA-5304

For more information about Smart Array controller features, specifications, and system requirements, visit the HP website at <http://www.hp.com/products/smartarray>.

HP Smart Array 5304 controller

The HP Smart Array 5304 Controller has four Wide Ultra3 SCSI channels and 256 MB of cache. The controller is comprised of a two-channel HP Smart Array 5302 Controller plus a two-channel HP Smart Array 5304 Expansion Module. Figure 1 shows the SA-5304, and Table 2 lists its components.

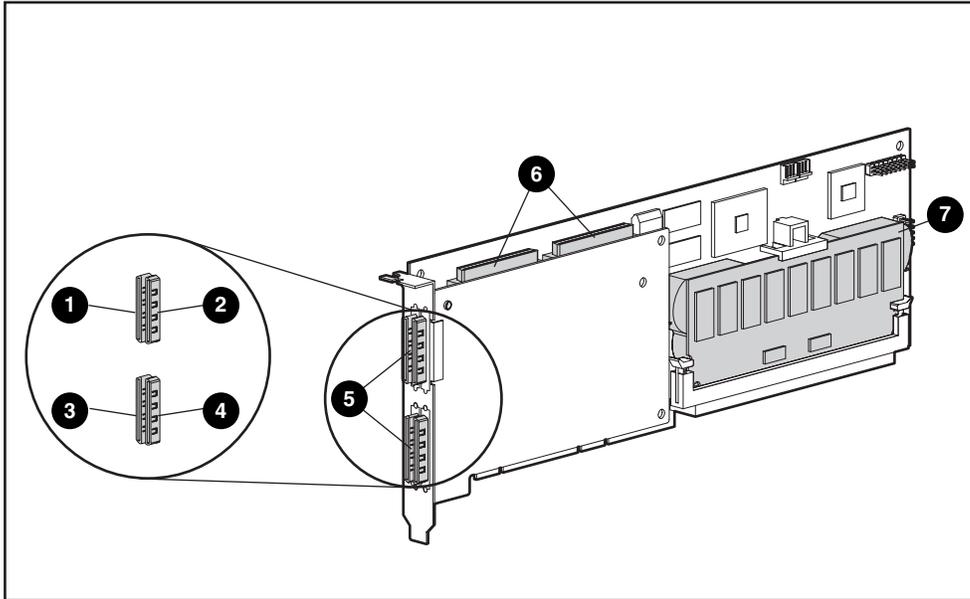


Figure 1. HP Smart Array 5304 controller

Table 2. HP Smart Array 5304 controller components

Item ID	Description
1	Port 1
2	Port 2
3	Port 3
4	Port 4
5	Four external (VHDCI) connectors (ports 1 and 3 nearer the main board)
6	Two internal 68-pin Wide SCSI connectors (port 1 nearer the bracket, port 2 nearer the board center)
7	Array accelerator cache

NOTE: Ports 1 and 2 each have two connectors (one internal and one external). However, only one connector can be used per port at any given time. Ports 3 and 4 (available on the 5304) can be used only for external drives.

NOTE: Volumes can span across all four channels.

Figure 2 shows the standard array configuration for the SA-5304.

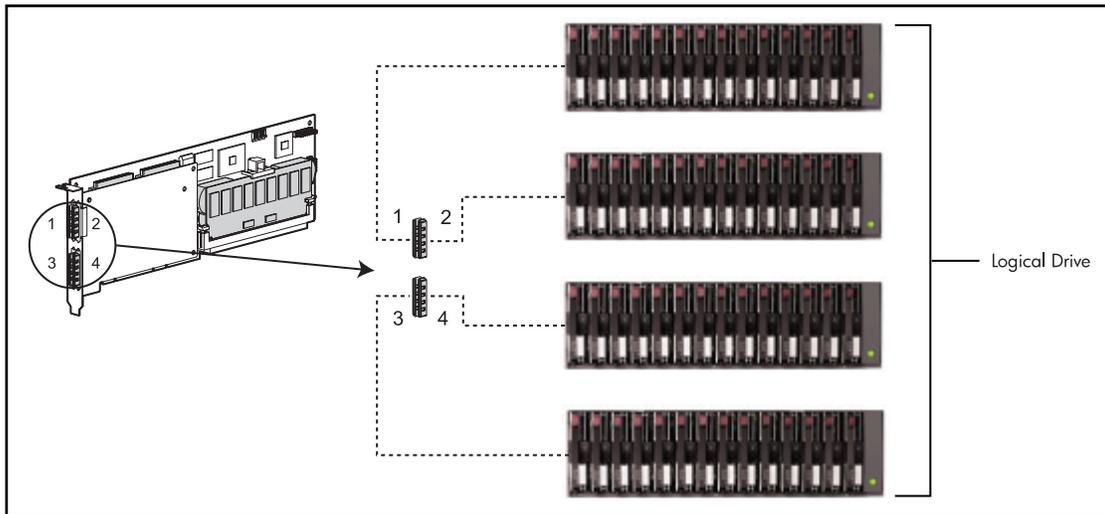


Figure 2. HP Smart Array 5304 standard array configuration

HP Smart Array 6404 controller

The HP Smart Array 6402 Controller, combined with the HP Smart Array 6404 Expansion Module, increases controller performance significantly. The SA-6404 expansion module is a controller in its own right. Thus, the SA-6404 is actually two two-channel controllers that share one PCI-X connector. Figure 3 shows the SA-6404, and Table 3 lists its components.

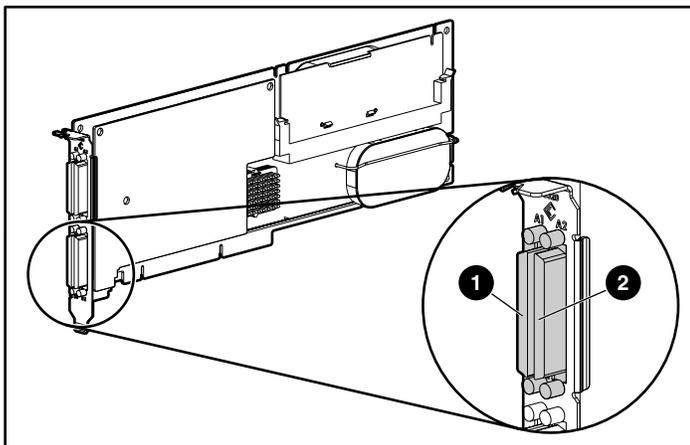


Figure 3. HP Smart Array 6404 controller

Table 3. HP Smart Array 6404 controller components

Item ID	Description
1	VHDCI connector, port B1
2	VHDCI connector, port B2

NOTE: The volume cannot span across more than two channels. Also, you must arrange the two-channel volume by port letters, not port numbers. For instance, port A1 with A2 or B1 with B2 is acceptable, but port A2 with B2 is not.

Figure 4 shows the standard array configuration for the SA-6404.

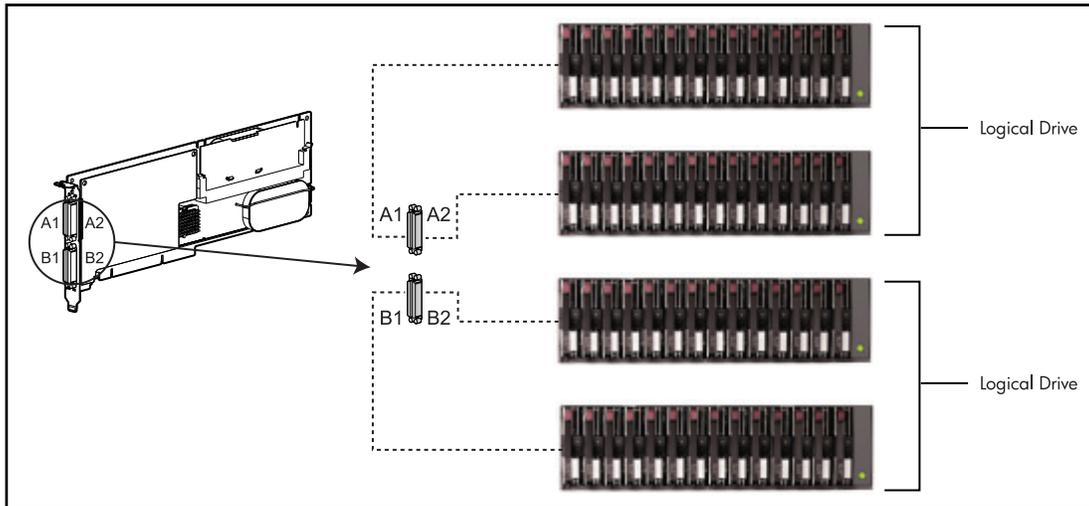


Figure 4. HP Smart Array 6404 standard array configuration

Software comparison

Configuring controllers requires the use of certain utilities and the installation of drivers as necessary. This section describes the utilities for manual configuration of arrays.

- **Power On Self Test (POST)**—POST is used for initial powering up of the controller in the server. POST will provide basic information on the controller as well as an option to invoke the ORCA utility.
- **Option ROM Configuration for Arrays (ORCA)**—The ORCA utility is a hardware-level configuration program that is embedded in the option ROM of the controller.
- **Array Configuration Utility (ACU)**—The ACU is an easy-to-use graphical configuration utility to help set up and change drive array configurations. Figure 5 shows a screen shot of the SA-6400 ACU.

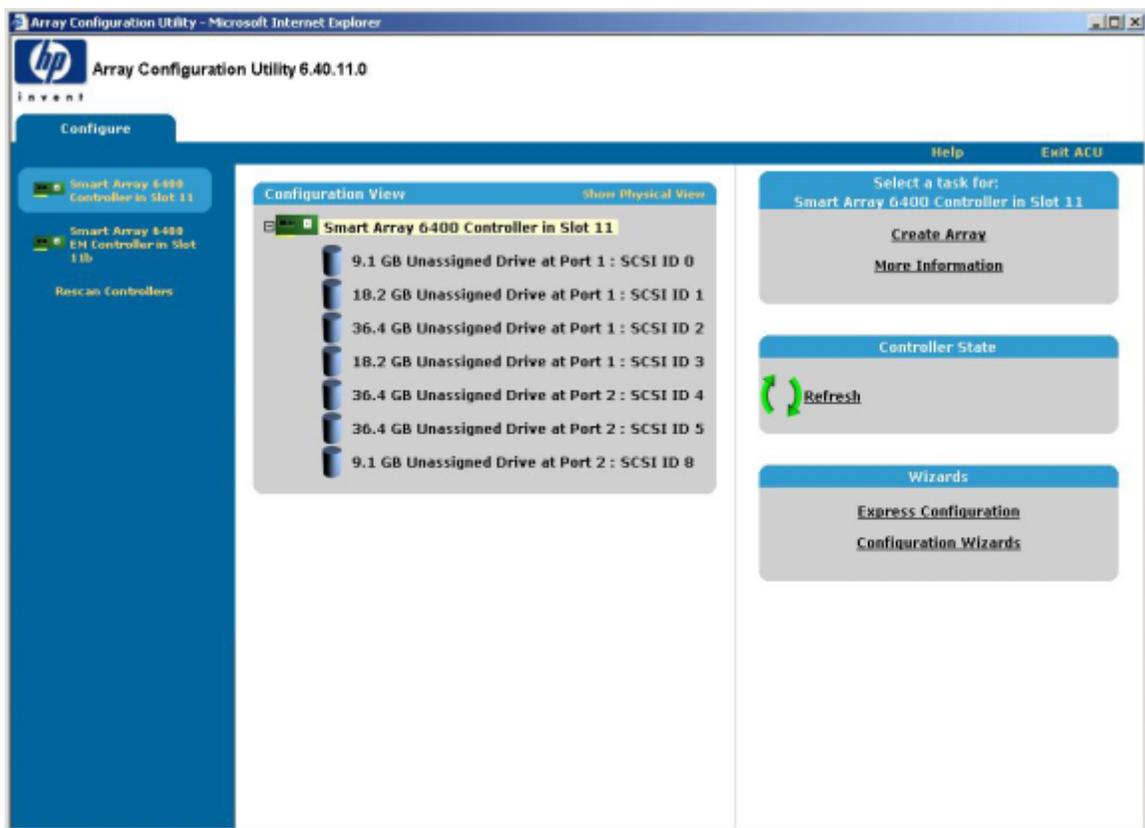


Figure 5. SA-6400 ACU screen shot

Figure 6 shows a screen shot of the SA-6400 EM ACU.

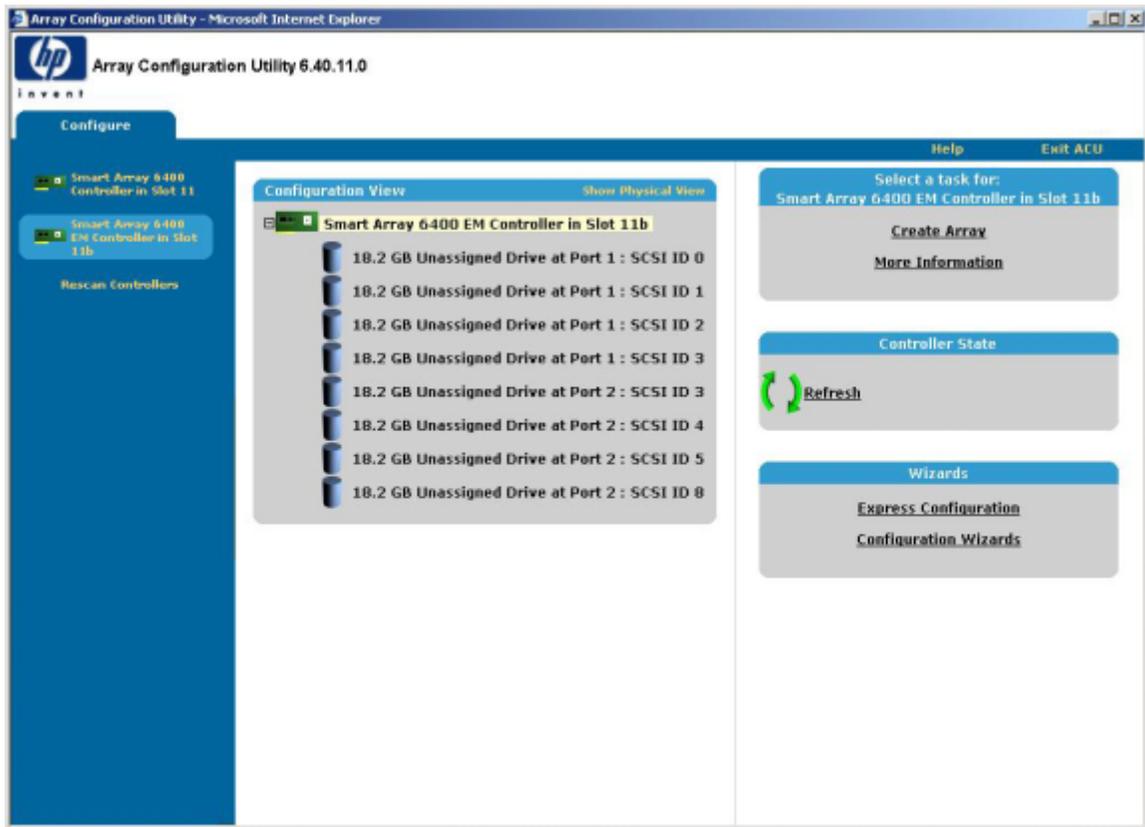


Figure 6. SA-6400 EM ACU screen shot

NOTE: To copy a particular array configuration to several other servers on the same network, use the Array Configuration Replicator (ACR) or the scripting capability of ACU. ACR is provided in the SmartStart Scripting Toolkit, which is available on the HP website (<http://www.hp.com/servers/sstoolkit>).

For HP ProLiant servers, the drivers for the controller are located on the Support Software CD or the SmartStart CD that is provided in the controller kit.

Advantages of an SA-6404

The dual two-channel controller provides advantages over the four-channel controller:

- **Dual processor**—The SA-6404 has dual processors that provide more power than the single processor in the SA-5304. This increased power reduces transaction time by increasing the speed at which transactions take place.
- **Dual XOR engine for RAID 5 and RAID ADG**—An XOR engine is a hardware component used to calculate the parity content stored in RAID 5 and RAID ADG disk arrays. The dual two-channel controller has a dual XOR engine as well as a dual DDR266 memory bus that provides the ability for improved average write performance, array rebuild time, regenerative read performance, and array expansion time for RAID 5 and RAID ADG.
- **Improved scalability**—The two-channel expansion module provides improvements in scalability. Because the two-channel expansion module located on the SA-6404 contains its own processor and XOR engine, the added performance, in many cases, increases significantly when upgrading from an SA-6402 to an SA-6404.
- **Slot consolidation**—The SA-6404 provides for slot consolidation by occupying only one PCI slot compared to using two separate two-channel controllers that would occupy two PCI slots. This consolidation frees the remaining available PCI slots for either more controllers or other server products.
- **Cost savings**—The SA-6404 provides the lowest priced solution for ProLiant customers who want performance direct attached storage for single servers requiring more than 4 TB of data or 28 hard disk drives. The SA-6404 features double the channels and cache of the SA-6402 for less than double the price.

Migrating logical drives

When migrating logical drives from an SA-5304 to an SA-6404, certain important considerations must be understood.

Migration overview

The SA-6404 cannot span a logical drive across more than two channels. If a logical drive spans across two channels, you must attach the two-channel volume by port letters on the SA-6404, not port numbers. For instance, port A1 with A2 or B1 with B2 is acceptable, but port A2 with B2 is not.

The SA-6404 recognizes logical drives that are grouped according to port letters. For instance, the SA-6404 expansion module only recognizes logical drives that exist on ports B1 and B2. Therefore, when migrating logical drives from an SA-5304 that contains drives on more than two channels, you must follow the migration process (Scenario 2, Case A) described later in this document. This process prevents the configuration information inside the logical drive from reporting missing drives when attached to an SA-6404.

Logical drive information loss can occur when migrating from an SA-5304 with a logical drive configured on ports 3 or 4 and ports 1 or 2. If you migrate the logical drives on ports 3 or 4 to an SA-6404 without first deleting the missing volumes that appear on ports 1 or 2, the SA-6404 will have a conflict between the logical drives missing from ports 1 or 2 and the new logical drives being migrated to the same port numbers, resulting in automatic logical drive deletion. To properly prepare the drives before migrating from SA-5304 ports 3 or 4, follow the procedure described in the migration process (Scenario 2, Case B).

Migration process

The following two scenarios describe the basic process for migrating from an SA-5304 to an SA-6404.

The first scenario describes when a logical drive is migrated from an HP Smart Array controller that has no more than 28 drives.

The second scenario describes two cases in which a controller has more than 28 drives. The first case describes a scenario in which no single logical drive has more than 28 drives. The second case describes a scenario in which a controller has more than 28 drives in its logical drive.

NOTE: These scenarios assume that your HP Storage Works enclosure has a single SCSI bus I/O module. If your enclosure has a dual SCSI bus I/O module, the scenarios must be modified to 14 drives instead of 28. You can purchase single SCSI bus I/O modules at the HP website, <http://www.hp.com>.

Scenario 1: migrating from a controller that has no more than 28 drives

To migrate the controller, ensure that all drives are combined into two HP Storage Works enclosures. Next, attach the two HP Storage Works enclosures to ports 1 and 2 on the older SA-5304 (or equivalent controller). Power up the system to allow the controller to migrate the rearranged drives to the new port numbers. The SA-5304 will perform this operation during its POST routine. The new logical drive positions can be verified using the ORCA utility or ACU. Finally, power down the system and cable both enclosures to an SA-6404. If a logical drive spans across the two HP Storage Works enclosures, you must attach the cables by port letters on the SA-6404, not port numbers. If a logical drive does not span across the two HP Storage Works enclosures, you can attach the cables to any port on the SA-6404.

Scenario 2: migrating from a controller that has more than 28 drives

The cases described here provide examples in which a controller has more than 28 drives. Case A describes a scenario in which a single logical drive has no more than 28 drives. Case B describes a scenario in which a single logical drive has more than 28 drives.

Case A: a single logical drive has no more than 28 drives

Figure 5 shows a sample migration from an SA-5304 to an SA-6404.

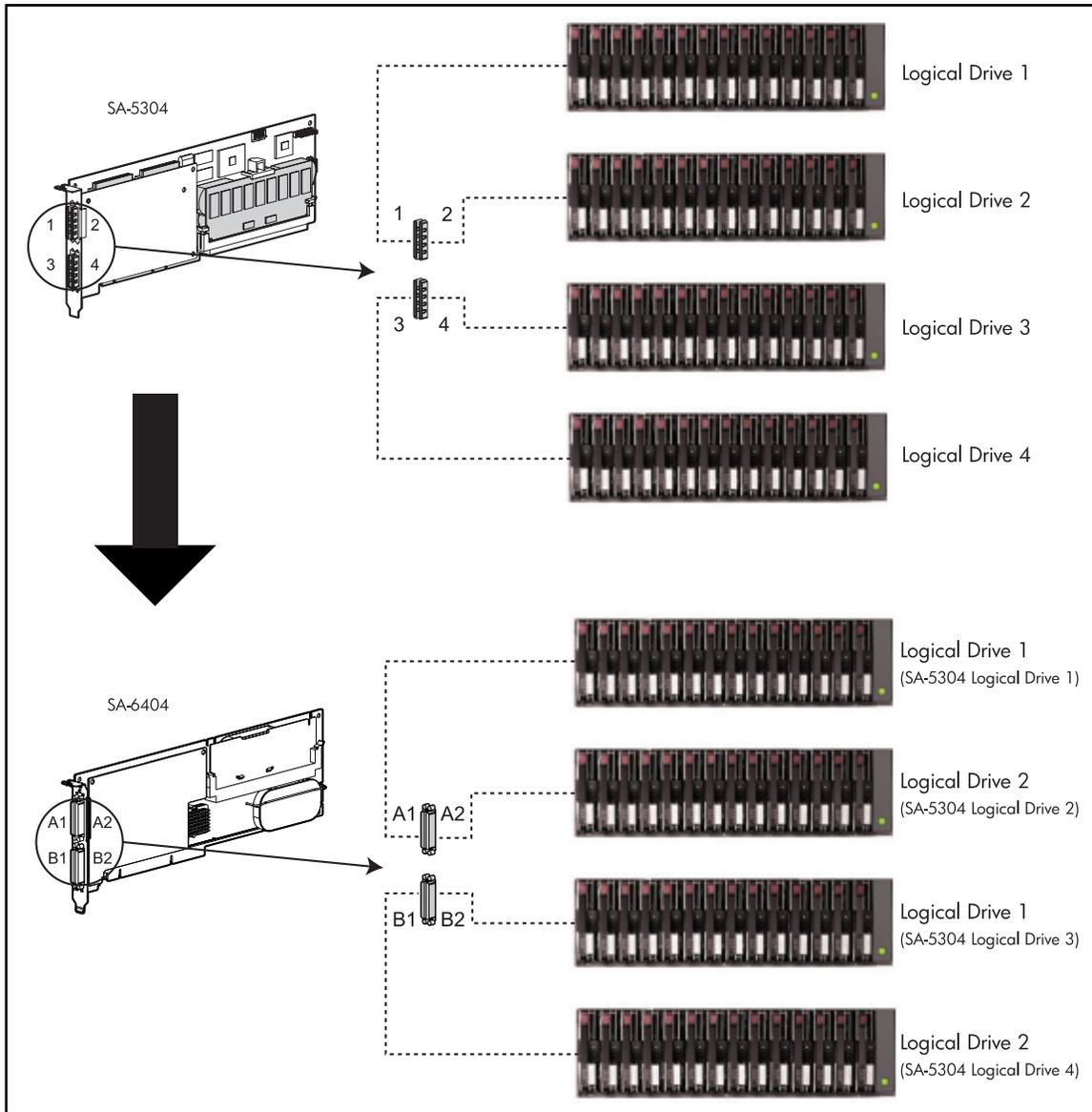


Figure 5. Migrating from an SA-5304 to an SA-6404

For this example, migrate by following these steps:

1. Power down the system.
2. Disconnect cables 3 and 4 from the SA-5304.

3. Power up the system.
4. When prompted, press the **F2** key to fail the missing logical drives.
5. When prompted, press the **F8** key to launch the ORCA utility.
6. Within ORCA, select **Delete Logical Drive** from the main menu.
7. The screen displays a list of the failed logical drives, which, in this case, should be logical drives 3 and 4. Select and delete the failed logical drives.

NOTE: Logical drives 3 and 4 display as “failed” because they are no longer connected to the SA-5304.

8. Press the **Esc** key to exit the ORCA utility.
9. Power down the system.
10. Reconnect cables 3 and 4 to the SA-5304.
11. Disconnect cables 1 and 2 from the SA-5304.
12. Power up the system.
13. When prompted, press the **F2** key to fail the missing logical drives.
14. When prompted, press the **F8** key to launch the ORCA utility.
15. Within ORCA, select **Delete Logical Drive** from the main menu.
16. The screen displays a list of the failed logical drives, which, in this case, should be logical drives 1 and 2. Select and delete the failed logical drives.

NOTE: Logical drives 1 and 2 display as “failed” because they are no longer connected to the SA-5304.

17. Press the **Esc** key to exit the ORCA utility.
18. Power down the system.
19. Disconnect all cables from the SA-5304.
20. Install the SA-6404 controller.
21. Connect cables 1 and 2 to ports A1 and A2, respectively, on the SA-6404. Connect cables 3 and 4 to ports B1 and B2, respectively, on the SA-6404.

Case B: a single logical drive has more than 28 drives

To migrate the controller, back up and restore the information on to a new logical drive. The existing logical drive would have required spanning across more than two channels on the SA-6404.

Database migration

The following migration scenarios describe the basic process for migrating database storage from an SA-5304 to an SA-6404.

This case describes a scenario in which a database file group spans more than 28 drives or more than two SCSI buses. If this not the case, follow the Case B scenario described in the preceding section to migrate the database storage.

SQL Server 7.0 or SQL Server 2000: SA-5304 is configured with a logical volume of more than 28 drives

To migrate, first perform a complete backup of the data and log devices as described in the Microsoft® SQL Server manuals. Save this backup on media (tape or other disk storage) separate from the media on which the database data files currently reside.

For this example, migrate by following these steps:

1. Perform a full backup of the database data and log files onto separate media as described in the Microsoft SQL Server Administrator manual.
2. Reboot the system.
3. Press the **F2** key. When prompted, press the **F8** key to launch the ORCA utility.
4. Select **Delete Logical Drive**. A list of the drives displays. Select and delete all the logical drives by pressing the **F8** key.
5. Repeat this action for each logical drive.
6. When all logical drives have been deleted, press the **Esc** key to exit the ORCA utility.
7. Power down the system.
8. Disconnect SCSI cables 1, 2, 3, and 4, as appropriate, from the SA-5304.
9. Install the SA-6404 in place of the SA-5304.
10. Reconnect SCSI cables 1, 2, 3, and 4 to the SA-6404.
11. Power up the system.
12. Press the **F2** key. When prompted, press the **F8** key to launch the ORCA utility.
13. Select **Create Logical Drive**. A list of the drives displays. Select and recreate all the logical drives as required for the database restore.
14. Repeat this action for each logical drive.
15. When all logical drives have been created, press the **Esc** key to exit the ORCA utility.
16. Reboot the system.
17. After the Microsoft Windows® operating system is booted, run the SQL Server Administration tools to restore the database data and log files.

**Oracle 8.x or 9i database on Microsoft Windows 2000 or Windows 2003:
SA-5304 is configured with a logical volume of more than 28 drives**

Oracle typically uses many smaller database files for TableSpace. When these files are in directories or on Raw Devices that span more than 28 drives, you must perform a backup and restore of these files.

To migrate the Oracle data files, perform a complete backup of the data and log devices as described in the Oracle Administration manuals. Save this backup on media (tape or other disk storage) separate from the media on which the database data files currently reside.

For this example, migrate by following these steps:

1. Perform a full backup of the database data and log files onto separate media as described in the Oracle Administrator manual.
2. Reboot the system.
3. Press the **F2** key. When prompted, press the **F8** key to launch the ORCA utility.
4. Select **Delete Logical Drive**. A list of drives displays. Select and delete all the logical drives by pressing the **F8** key.
5. Repeat this action for each logical drive.
6. When all logical drives have been deleted, press the **Esc** key to exit the ORCA utility.
7. Power down the system.
8. Disconnect SCSI cables 1, 2, 3, and 4, as appropriate, from the SA-5304.
9. Install the SA-6404 in place of the SA-5304.
10. Reconnect SCSI cables 1, 2, 3, and 4 to the SA-6404.
11. Power up the system.
12. Press the **F2** key. When prompted, press the **F8** key to launch the ORCA utility.
13. Select **Create Logical Drive**. A list of drives displays. Select and recreate all the logical drives as required for the database restore.
14. Repeat this action for each logical drive.
15. When all logical drives have been created, press the **Esc** key to exit the ORCA utility.
16. Reboot the system.
17. After the Windows operating system is booted, recreate the file systems using the same drive letters.
18. If additional drive letters are required because of the changes in the logical drive layout, the Oracle control file must be modified to reflect the changes for the restoration of the files. For instructions, refer to the *Oracle Database Restoration Manual*.
19. After recreating the file systems, run the Oracle Administration tools to restore the database data and log files.

Oracle 9i database on Linux: SA-5304 is configured with a logical volume of more than 28 drives

Oracle typically uses many smaller database files for each TableSpace. When these files are in directories or on Raw Devices that span more than 28 drives, you must perform a backup and restore of these files.

To migrate the Oracle data files, perform a complete backup of the data and log devices as described in the Oracle Administration manuals. Save this backup on media (tape or other disk storage) separate from the media on which the database data files currently reside.

For this example, migrate by following these steps:

1. Perform a full backup of the database data and log files onto separate media as detailed in the Oracle Administrator manual.
2. Modify the `/etc/fstab` file by removing the mount points for any directories used by the Oracle database.
3. Reboot the system.
4. Press the **F2** key. When prompted, press the **F8** key to launch the ORCA utility.
5. Select **Delete Logical Drive**. A list of the drives displays. Select and delete all the logical drives by pressing the **F8** key.
6. Repeat this action for each logical drive.
7. When all logical drives have been deleted, press the **Esc** key to exit the ORCA utility.
8. Power down the system.
9. Disconnect SCSI cables 1, 2, 3, and 4, as appropriate, from the SA-5304.
10. Install the SA-6404 in place of the SA-5304.
11. Reconnect SCSI cables 1, 2, 3, and 4 to the SA-6404.
12. Power up the system.
13. Press the **F2** key. When prompted, press the **F8** key to launch the ORCA utility.
14. Select **Create Logical Drive**. A list of drives displays. Select and recreate all the logical drives as required for the database restore.
15. Repeat this action for each logical drive.
16. When all logical drives have been created, press the **Esc** key to exit the ORCA utility.
17. Reboot the system.
18. After the Linux operating system is booted, recreate the file systems.
19. Modify the `/etc/fstab` file, using the same mount points as before.
20. If additional logical drives are required because of the changes in the logical drive layout, the Oracle control file must be modified to reflect the changes for the restoration of the files and additional mount points added to the `fstab` file. For instructions, refer to the *Oracle Database Restoration Manual*.
21. After recreating the file systems, run the Oracle Administration tools to restore the database data and log files.

For more information

For more information on controllers, refer to the following sources:

- *HP Smart Array 5300 Controller User Guide*
- *HP Smart Array 6400 Series Controllers User Guide*

For information on configuring your controller, refer to the following sources:

- *HP Array Configuration Utility 6.0 User Guide* (on the software CD provided with the utility or downloadable from the HP website)
- *HP ROM-Based Setup Utility User Guide* (on the Documentation CD provided with the utility or downloadable from the HP website)

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