

**business copy
virtual array
integration
guide**



i n v e n t

**data replication
and backup
for the
hp va 7000 series**

hp — white paper

for information about the va 7000 series
and periodic updates to this white paper
see the HP SureStore website at
<http://www.hp.com/go/storage>



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hp va 7000 series

Purpose

This paper, the Business Copy Virtual Array Integration Guide, provides an overview of information to support custom integration of Business Copy Virtual Array (VA) into backup and other data replication processes and environments. The emphasis of this guide is on integration with operating system and application software so that correct results are obtained when Business Copy VA is used in those software environments. In addition, examples are given for command line usage.

Overview

What is Business Copy VA and how is it used?

Business Copy VA is data replication software that makes nearly instant point-in-time copies of LUNs. Business Copy LUNs can be used immediately after they are created. Applications can read or write to Business Copy LUNs just like any normal LUN.

Business Copy VA creates nearly instant LUN copies.

A business copy LUN is created in milliseconds because it only points to the data logs of the parent LUN, using a meta data file. Therefore, data does not have to physically move from the parent LUN to the business copy LUN.

A business copy LUN is presented as a complete copy of the parent LUN at the time it was copied. Once the business copy LUN is created, new business copy data is added only to the business copy meta-file and new parent LUN data is added only to the parent LUN's data log file.

Note: Business copy LUNs are “point-in-time,” not mirrored, copies. Once a business copy LUN is created, it is an independent logical entity.

Each business copy requires the same amount of space as its parent LUN, just like a traditional split mirrored data replication environment. Even though Business Copy VA copies Meta data, it reserves the same physical space as the parent LUN, allowing the business copy LUN to change up to 100 percent of its data. The size of the parent LUN limits the growth of the business copy LUN.



HP Command View Storage Device Manager software is the management software for use with the VA 7000 series of disk arrays from HP. This management software supports two user interfaces for Business Copy Virtual Array:

- The Graphical User Interface (GUI):
The GUI provides a quick and simple way to create Business Copy LUNs for manual backup processes or application testing purposes.
- The Command Line User Interface (CLUI):
The CLUI is scriptable, making it easy to integrate into almost any backup application environment.

References

“HP SureStore Command View SDM Installation and User's Guide”

“HP SureStore Business Copy Virtual Array Installation and User's Guide”

“HP SureStore Secure Manager Virtual Array Installation and User's Guide”

Data consistency

Operating system and application software typically stores data in a structured format. This structure usually involves some kind of meta-data, or descriptive data about the data. The structure also implies a need for internal consistency of the stored data. If consistency is compromised, the application data is rendered useless until consistency can be restored.

Business Copy VA can be used to make copies of virtual array LUNs containing application data objects. The process for making the copies must be integrated with application software in such a way that the copies retain enough internal consistency to be useful by the application software.

Consistency using volume state management

From the point of view of the software, storage volumes can typically be in one of two states: mounted or dismantled.

To create a useful copy or backup of a data volume, the data in the volume generally must be consistent. Steps must be taken before making a backup to assure that the backup will be consistent. While a volume is mounted, it is subject to ongoing access and modification by the software. The consistency of the data on a mounted volume usually depends on the contents of the volume as well as the internal state of the software. A copy of a mounted volume is typically not guaranteed to have enough consistency to be useful.

Software often provides facilities to suspend usage of its storage volumes. These facilities often go by names such as “dismount” or “deactivate.” The result of this operation is that the volume has been placed into the dismantled state. Data objects on dismantled volumes are usually fully consistent. A copy of a dismantled volume will also have full consistency. Dismounting a storage volume usually requires that the software using the volume be terminated, suspended, or placed into a special operating state.

For the purpose of this document the following terms are defined:

Mounteda storage volume is in use by the software (a copy will not be consistent)

Dismounteda storage volume is not in use by the software (a copy will be consistent)

Mountthe act of transitioning a storage volume from the dismantled to the mounted state

Dismountthe act of transitioning a storage volume from the mounted to the dismantled state

These terms are used generically in this document and do not refer to any specific operation in any particular software application or operating system.

Consistency using online backup facilities

For data consistency, place application software into online backup mode.

Some software implementations include online backup facilities. These facilities allow the software to be placed into a mode such that a copy of the application data objects are consistent but the applications using the data need not be taken offline. This is sometimes referred to as “online” or “hot” backup mode. A Business Copy of data that has been placed into online backup mode will have the necessary consistency.

Consistency using post copy update procedures

It may be possible to create a consistent copy of application data without taking the application offline.

Even if a software implementation does not include an online backup facility, it may still be possible to create a consistent copy of application data without taking the application offline. In this approach a copy is made that does not have consistency. Then updates are applied to the copy to make it consistent. One possible source of the updates is a recovery log being maintained by the software. Another possible source is a data consistency check and restoration tool (such as the Unix “fsck” command). With this approach, the application need not go offline but the software may still need to be brought into a particular state so that the copy can be made consistent by the update (for example, a database checkpoint).

Procedures

Following are procedures for creating a copy using Business Copy and for restoring a copy from backup using Business Copy that account for the need to maintain data consistency. In these procedures, the term “parent LUN” refers to a virtual array LUN that contains the data to be copied. The term “Business Copy LUN” or just “Business Copy” refers to a virtual array LUN containing the copied data

Copy procedure

Depending on the operating system and application software, each step in the Business Copy usage processes have corresponding details with which Business Copy is used.

To ensure data consistency, prepare the parent LUNS before making the Business Copy.

The corresponding details of the Business Copy usage process are described here for some common usage environments. We assume that the user is familiar with storage device configuration tools and processes for the applicable environments and with any logical volume management software to be used in those environments.

An assumption at the beginning of the copy procedure is that the parent LUNs have been created and configured for normal use by software and are currently in use. Given this assumption the process is as follows:

1c. Prepare parent LUNs for data consistency

For consistency, using volume state management, the parent LUNs are dismounted. Parent LUNs are dismounted differently depending on the type of volume and file system.

Raw logical volume

- Suspend or terminate any applications using the logical volume.
- Use volume manager software to deactivate the corresponding volume group.

File system residing on a logical volume

- Suspend or terminate any applications using the file system.
- Use the operating system facility to dismount the file system.
- Use volume manager software to deactivate the corresponding volume group.

Raw virtual array LUN

- Suspend or terminate any applications using the LUN.

File system residing on a virtual array LUN

- Suspend or terminate any applications using the file system.
- Use operating system facility to dismount the file system.

For consistency, when using application software with an online backup capability, the software is placed into online backup mode.

For consistency, when using software that supports post copy updates, the application software is placed into the necessary state so that updates can be applied to the copy.

2c. Capture software configuration information if needed

The volume manager produces configuration information useful for accessing a copy made with Business Copy.

Software may require configuration information to make use of the Business Copy LUNs after the data has been copied. This information is extracted from the instance of the software being used to access the parent LUNs. In particular, some logical volume managers support an “export” operation. The purpose of the export operation is to provide the means to access a volume group on a different host system for clustering or for physical movement of storage between host systems. The configuration information produced by a volume manager export is useful to access a copy that has been made with Business Copy.

Logical volume manager volume group

- Use the export operation to save configuration information for use with the Business Copy LUNs.

3c. Prepare Business Copy LUNs for data consistency

It is not necessary to prepare the Business Copy LUNs the first time a copy is made.

The Business Copy LUNs are dismounted as described in *1c* for consistency using volume state management. It is not necessary to prepare the Business Copy LUNs the first time a copy is made since the Business Copy LUNs will not have been created or configured with the software yet. Preparation is needed only when the Business Copy LUNs are in existence and configured with the software when a copy is made. Some of the details of *1c* may be slightly different or unnecessary since the use of the Business Copy may be different from the use of the parent.

4c. Make the copy from parent LUNs to Business Copy LUNs

Three methods are available for making a copy of the parent LUNs.

There are a few different ways to use Business Copy to make a copy of the parent LUNs.

1. If the Business Copy LUNs are to be created whenever the copy is made and then deleted to discard the copy, use the “create attached” operation to make the Business Copy and the “delete” operation is used to discard the Business Copy.
2. If the Business Copy LUNs remain in existence and remain accessible between uses after being created for the first time, use the “attach” operation to both make the Business Copy and to discard the Business Copy.



3. If the Business Copy LUNs retain their original LUN number after having been first created, but are not accessible after the copy is discarded, use the “attach” operation to make the Business Copy and the “detach” operation to discard the Business Copy.

In all three cases, the “create” operation must be used first to define the relationship between the parent LUNs and the Business Copy LUNs.

A Business Copy LUN can be created in either the attached or detached state.

If created in the attached state, a copy is made when the Business Copy LUN is created. This *create in attached state* process would typically be used to support cases 1 and 2 above.

If *created in the detached state*, a copy is not made and an attach operation will be required to make a copy. This create in a detached state process would typically be used to support case 3 above.

The method of defining the Business Copy LUNs with a create operation may only apply to an initial configuration process. The other methods may be most useful for repetitive operations. The *create, delete, attach, and detach* operations are all available for use in Command View SDM. These operations may be integrated with user written scripts or programs for automation.

The table below contains the details for these operations.

TABLE 1. Command View SDM Operations

Operation	Command Line
Create attached	<code>armcopy -p <parent> -s <business copy> -a true <array-id></code>
Create detached	<code>armcopy -p <parent> -s <business> -a false <array-id></code>
Delete	<code>armcfg -L <business copy> -d <array-id></code>
Attach	<code>armcopy -s <business copy> -a true <array-id></code>
Detach	<code>armcopy -s <business copy> -a false <array-id></code>

5c. Set permissions on the Business Copy LUNs (required for Windows)

See the “*HP SureStore Secure Manager Virtual Array Installation and User's Guide*” for details. Permissions can be set using the **armsecure** command line or with the Command View SDM graphical user interface.

6c. Release parent LUNs for ongoing use

This reverses the effect of 1c. *Prepare parent LUNs for data consistency* on page 5, putting software and parent LUNs back into the normal operating state.

Using volume state management tools, the parent LUNs are again mounted to enable their use by the application software.

Raw logical volume

- Use volume manager software to activate the corresponding volume group.
- Resume or restart any applications using the logical volume.

File system residing on a logical volume

- Use volume manager software to activate the corresponding volume group.
- Use operating system facility to mount the file system.
- Resume or restart any applications using the file system.
- Raw virtual array LUN.
- Resume or restart any applications using the LUN.

File system residing on a virtual array LUN.

- Use operating system facility to mount the file system.
- Resume or restart any applications using the file system.

For consistency, using online backup the software is taken out of online backup mode.

For consistency, using post copy updates the software taken out of the necessary copy state and placed back into the normal operating state.

7c. Configure Business Copy LUNs for use with software

Using the configuration information captured in 2c Capture software configuration.

Using the configuration information captured in 2c. *Capture software configuration information if needed* on page 6, configure the Business Copy LUNs for use with the application software with the designated host system.

Business Copy LUNs may be configured for access on the same host system as the parent LUNs or on a different host system in a multi-host system configuration. Some uses of Business Copy may require the Business Copy LUNs to exist in exactly the same environment as the parent LUNs, including host volume labels, volume group names, and file system mount points. If the Business Copy LUNs must be configured exactly the same to work with the application software, then the Business Copy LUNs must be configured on another host system since both the parent LUNs and Business Copy LUNs can not be in exactly the same environment on the same host system at the same time.



Logical volume manager volume group

- Import the volume group using exported volume group definition information from *2c. Capture software configuration information if needed* on page 6.
- Change the name of the volume group as it is being imported if configured on the same host system.

8c. Update the Business Copy LUNs for data consistency, if needed

Use the software to apply updates to the Business Copy LUNs.

9c. Use the Business Copy

To use the Business Copy, follow the steps outlined in *6c. Release parent LUNs for ongoing use* on page 7. The step is the same as *6c*, except the actions are performed on the Business Copy LUNs rather than the parent LUNs. Some of the details of *6c* may be slightly different or unnecessary since the use of the Business Copy LUNs may be different from the use of the parent LUNs. For example, in a backup scenario the data is copied from the Business Copy LUNs to backup media using backup software rather than resuming operations on the Business Copy LUNs with the normal application software.

10c. Discard the Business Copy when no longer needed

To avoid consuming excess storage space, discard the Business Copy when no longer needed.

Discarding a Business Copy that is no longer needed is useful because a Business Copy does consume some amount of storage space and array controller performance resources. The space consumed by a Business Copy will tend to grow as the copy ages, therefore it is beneficial to discard a Business Copy soon after it is no longer needed.

Prior to discarding a Business Copy the actions of *3c. Prepare Business Copy LUNs for data consistency* on page 6 should be used to prepare the Business Copy LUNs. Below are listed the three options described in *4c. Make the copy from parent LUNs to Business Copy LUNs* on page 6 for making/discarding Business Copies.

1. create/delete
2. attach/attach
3. attach/detach.

Discarding a Business Copy with delete or detach (options 1 or 3) prevents the copy from consuming resources until the copy is made again with create or attach. Discarding a Business Copy with attach (option 2) is essentially the same as making a copy again. This does not prevent the copy from consuming resources as it ages, however it does start the resource consumption cycle over. It may be useful when using option 2 to discard the copy on a regular basis

whenever it is not being used. Although, option 2 is the most difficult way to create and discard copies it is required in any environment that requires continuous access to the Business Copy LUNs as a part of basic system operation.

Restore procedure

When a parent LUN is lost or damaged, you have to restore the parent LUN using data captured using Business Copy as described above. There are a few assumptions at the beginning of the restore procedure.

1. The data to be restored has been copied from backup media to on-line disks in form of the Business Copy LUNs.
2. The Business Copy LUNs are no longer subject to access by backup software.
3. The parent LUNs have been created and configured for normal use by software. They may or may not be currently in use depending on the state of the application.

Given these assumptions the process is as follows:

1r. Prepare Business Copy LUNs for data consistency

The details are the same as *3c. Prepare Business Copy LUNs for data consistency* on page 6.

2r. Prepare parent LUNs for data consistency

The details are the same as *1c. Prepare parent LUNs for data consistency* on page 5.

3r. Make the copy from Business Copy LUNs to parent LUNs

The “copy to parent” operation is used to copy data from the Business Copy LUNs back to the parent LUNs.

Command line

```
armcopy -r <parent> <array-id>
```

4r. Release parent LUNs for ongoing use

The details are the same as 6c. *Release parent LUNs for ongoing use* on page 7. The software is now operating with restored data.

Example:

Process partitioning

Configure the system to automatically perform “backup” and “restore” using Business Copy after a manual set up procedure then manually execute “maintenance” as needed.

The Business Copy usage processes can be partitioned into more than one executable process. In particular, it may be useful to break them into an initial configuration process that is executed only once and a repetitive process that is used each time a copy needs to be made. This would allow some process steps to be avoided in the ongoing use case once the configuration is initially set up and would result in a simplification of the repetitive process. This is an example of how the process could be partitioned for a backup and restore usage scenario.

Configuration process use steps: 1c, 2c, 4c, 5c, 6c, 7c, 8c

Backup process use steps: 1c, 3c, 4c, 6c, 7c, 9c

Restore process use steps: 1r, 2r, 3r, 4r

Maintenance process use step: 10c

In this example,

- The **configuration** process is executed manually when first configuring the system to perform backup using Business Copy.
- The **backup** process is executed automatically by time or demand scheduling.
- The **restore** process is executed automatically on demand.
- The **maintenance** process is executed manually as needed.

Integration in Microsoft Windows® environments

This section provides details about integrating Business Copy VA in Microsoft Windows NT® 4.x and Microsoft Windows 2000® environments that may not be readily apparent to users of those systems.

Business Copy LUN discovery

Discovery can be achieved without a reboot.

Newly created Business Copy LUNs (or any newly attached disks) are normally discovered by Windows during a system boot. However, discovery can also be achieved without a reboot. In Windows 2000 discovery without reboot is accomplished by use of the disk administrator tool “rescan” function. In Windows NT 4.x discovery without reboot is accomplished by starting and then exiting the disk administrator tool after making the Windows registry entry described in the following web document:

<http://support.microsoft.com/support/kb/articles/Q162/4/71.ASP>

Making Business Copy LUNs accessible to Windows.

Discovery of Business Copy LUNs is relevant to 4c (page 6) and 7c (page 8). After being discovered by Windows, Business Copy LUNs can be made accessible to Windows using the disk administrator tool. Once they have been made accessible to Windows they are subject to access by Windows as long as Windows remains booted. If the Business Copy LUNs do not remain accessible (in the attached state) while Windows is up, attempts to access them may result in placement into a failed state by Windows and a reboot may be required to recover. Therefore, in 4c. *Make the copy from parent LUNs to Business Copy LUNs* on page 6, the use model in which the Business Copy LUNs remain in the attached state between uses (case 2) is most useful for Windows.

Discovery and LUN security

Use Secure Manager Virtual Array to prevent discovery and access of a Business Copy LUN by the wrong host system.

Once a newly created Business Copy LUN has been discovered by Windows there is a potential that it can be made accessible by use of the disk administrator tool. When a LUN is made accessible to Windows, a signature is written on the LUN that would otherwise prevent it from being used on a different Windows system in a multi-host configuration. Secure Manager VA, the LUN security management tool available from HP for the VA series of disk arrays, can be used to prevent discovery and access of a Business Copy LUN by the wrong host system in a multi-host Windows environment (and in SAN configurations). Security is set on the Business Copy LUN after it has been created but before it is put to use on the host system as described in 5c. *Set permissions on the Business Copy LUNs (required for Windows)* on page 7.



Dismounting and remounting Windows volumes

The ability to dismount a volume in Windows is not supported in the disk administrator tool. The capability is provided in an operating system API. A command line utility that uses the API is provided with Business Copy VA.

The following command line can be used to dismount a Windows volume after all usage of the volume has been terminated:

```
BCopyUtil -dismount <volume path>
```

The following command line can be used to remount a dismounted Windows volume:

```
BCopyUtil -mount <volume path>
```

Dismounting and remounting Windows volumes is relevant to 1c, 3c, 6c, 9c, 1r, 2r, and 4r.



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Integration in Microsoft Windows® environments