

HP StorageWorks Rapid Backup for mySAP Business Suite on EVA for Oracle

Solution Family Guide
4th Edition



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Executive summary

For the majority of enterprises relying on mySAP Business Suite applications for their mission-critical processes, Oracle® is the relational database management system of choice. To ensure the ongoing availability of these applications plus associated data to users across the organization, enterprises strive to minimize or even eliminate any impairment of Oracle availability during backup.

While a traditional backup typically implies hours of Oracle downtime or backup mode time, the HP StorageWorks Rapid Backup methodology for Enterprise Virtual Arrays (EVAs) returns Oracle to unimpaired availability within minutes.

Overview

HP StorageWorks Rapid Backup Solutions for mySAP Business Suite on EVA for Oracle provide reliable, scalable and cost-effective solutions that minimize service impairment during backup.

This is achieved by offloading the backup process from the database server. HP StorageWorks Rapid Backup Solutions use Business Continuance Volumes (BCVs) by creating a virtual copy of the Oracle data residing on the EVA. The physical backup to tape is performed by a dedicated backup server that reads the data from the newly created BCVs and writes them to the tape, thereby relieving the database server of backup tasks and allowing Oracle to return to production mode while the backup is in progress.

HP StorageWorks Rapid Backup Solutions are developed by HP StorageWorks Engineering, Global SAP Solutions, to complement SAP business applications designed for businesses that must run 24 x 7 Oracle databases. Minimizing the impact of backup procedures on the database server and simplifying backup management, HP StorageWorks Rapid Backup Solutions deliver measurable business benefits. These integrated storage solutions address the major business issues associated with large-scale data backup:

- Shrinking backup window
- Ever-growing database size
- Growing complexity of backup
- Production environment service level requirements during backup

Scope

This paper applies to mySAP Business Suite using Oracle databases in combination with HP StorageWorks EVA for data storage. The concepts, methodologies and recommendations presented in this paper apply across a number of leading platforms.

Business issues of backup-related service level impairment

In a mission-critical SAP/Oracle 24 x 7 production environment, the IT organization must perform regular backups to protect mission-critical data. Backups are performed either in online or offline mode.

- During online backup, users might experience performance impairment on the database system because the database must be kept in backup mode for a prolonged period of time (typically a number of hours). This performance impairment is due to Oracle generating up to 60% more log information and may require up to 250% more time for inserts while the database is in backup mode.
- During offline backup, the Oracle database must be shut down for a prolonged period of time (typically a number of hours), disrupting mySAP Business Suite system services.

Delivering on service level expectations

To consistently provide the service levels required by business organizations—particularly the service level qualities laid down in Service Level Agreements (SLAs)—IT organizations strive to dramatically reduce the period of time during which Oracle availability and/or performance is impaired for backup reasons.

HP StorageWorks Rapid Backup Solutions enable IT organizations to deliver on SLAs by leveraging BCVs to minimize any backup-related impact on the database server.

These solutions help customers to achieve fast return on investment (ROI) in several ways:

- Point-in-time backup with only minimal performance impact on business applications.
- Reduced time during which the database is in backup mode during online backup or reduced time during which the database is unavailable during offline backup.
- Less time required to get the SAP system up and running after a failure that requires data to be restored.
- In the event of a disaster affecting the production environment, faster recovery initiated with minimum lead time can be achieved.

Offline backup considerations

SAP recommends the offline backup method. During an offline backup, the Oracle database is shut down. Ensuring consistency, an offline backup allows the restored database to be started immediately by Oracle without any Oracle recovery.

However, as the database size grows, so does the time it takes to back up the database. Depending on the availability needs businesses place on mySAP Business Suite, offline backup might not always be feasible.

When the database size becomes so big that a full online backup cannot be performed within a reasonable period of time, IT organizations tend to do partial online backups, and it might take several days to back up all tablespaces.

In the event of a full restore, large numbers of archived redo log files must be applied. The total size of the log files to be applied depends on the age of the oldest partial backup. For huge databases with partial backups spanning several days, the restore of the database and its associated log files plus Oracle recovery can be a rather time-consuming process that may take days to complete.

HP StorageWorks Rapid Backup Solutions overview

HP StorageWorks Rapid Backup Solutions for mySAP Business Suite on EVA for Oracle leverages the ability of storage subsystems to create a BCV of a given Vdisk/LUN in a disk group. This BCV is created in the available freespace.

The creation of BCVs on the disk subsystem has been integrated with the SAP BRBACKUP utility. The BRBACKUP utility controls the entire backup procedure of Oracle databases. The execution time of BRBACKUP is critical to the availability of the Oracle databases to an organization's users.

Dedicated backup server

HP Rapid Backup Solutions use a dedicated backup server that relieves the database server of backup tasks, thereby minimizing the impact on the database server. The database backup can be performed using backup methods supported by BRBACKUP (with local tape, BACKINT and so on). To reduce the load on the database server, the BRBACKUP command must be scheduled to run on the backup server. The backup server uses dedicated commands for communicating with the EVA controller (HSV) to:

- Create the BCV.
- Mount the BCV on the backup server.
- Unmount the BCV from the backup server upon completion of the backup to tape.
- Delete the BCV.

Refer to **Figure 1** for a flowchart of the rapid backup process. The use of a dedicated backup server means that these operations are performed without any impact on the database server; in other words, BRBACKUP executes on the backup server, not on the production database server.

Role of BCVs

For both offline and online backups, the HP StorageWorks Rapid Backup Solutions use BCVs to minimize any impact on the database server during backup.

Note: BCV is a generic name for "clone," "snapshot," "snapclone," "Vsnap," "Vsnapshot" and "Vsnapclone," irrespective of the method (clone, snapshot, split mirror and so on) by which it was created.

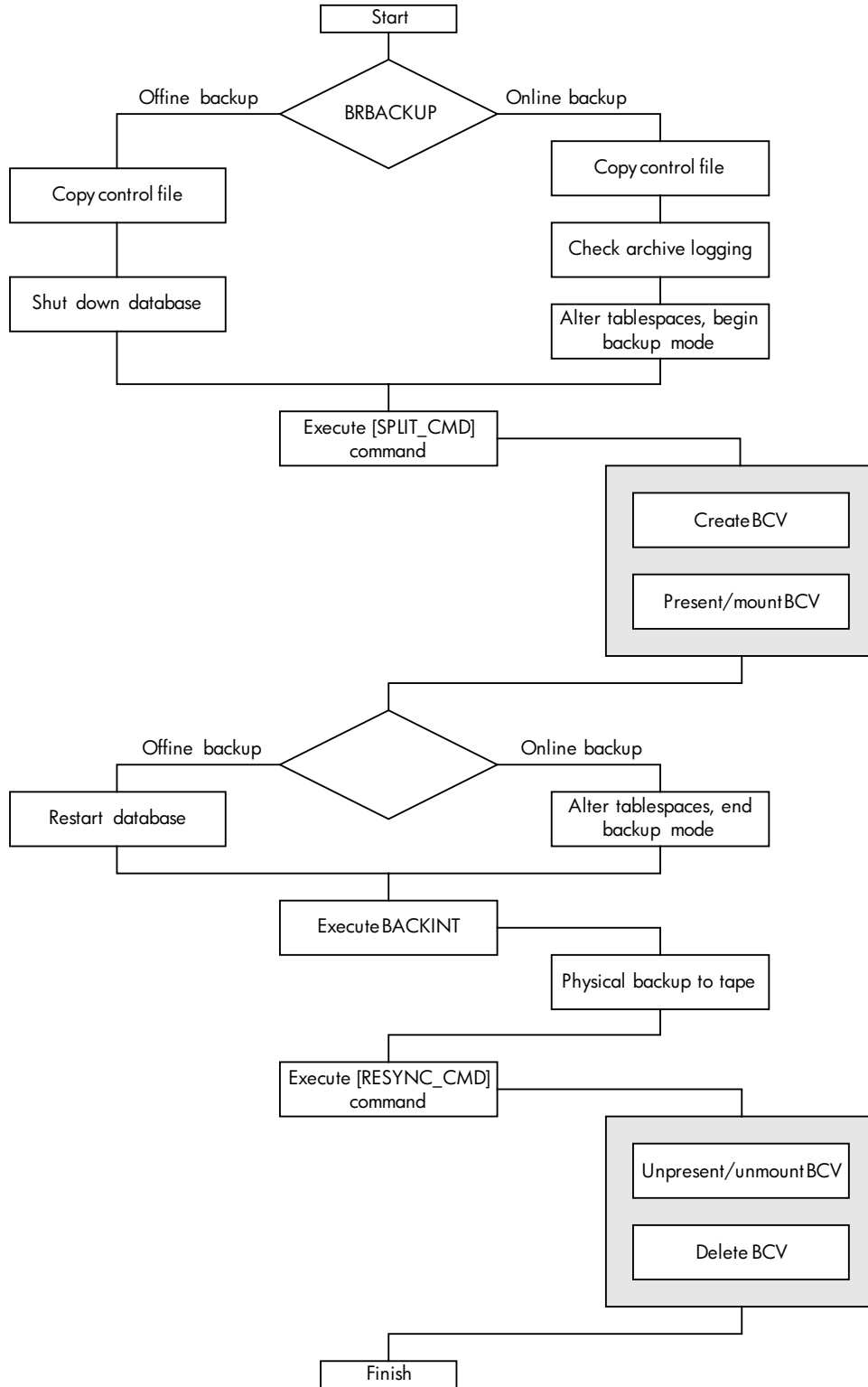
The general procedure comprises the following stages:

1. Creating a BCV of a LUN in the disk freespace
2. Streaming the BCV to tape

Rapid backup process flow

Figure 1 illustrates the general procedure for both online and offline backup using BCVs. Note that SPLIT_CMD (a parameter value of the BRBACKUP command) creates the BCV and RESYNC_CMD deletes it.

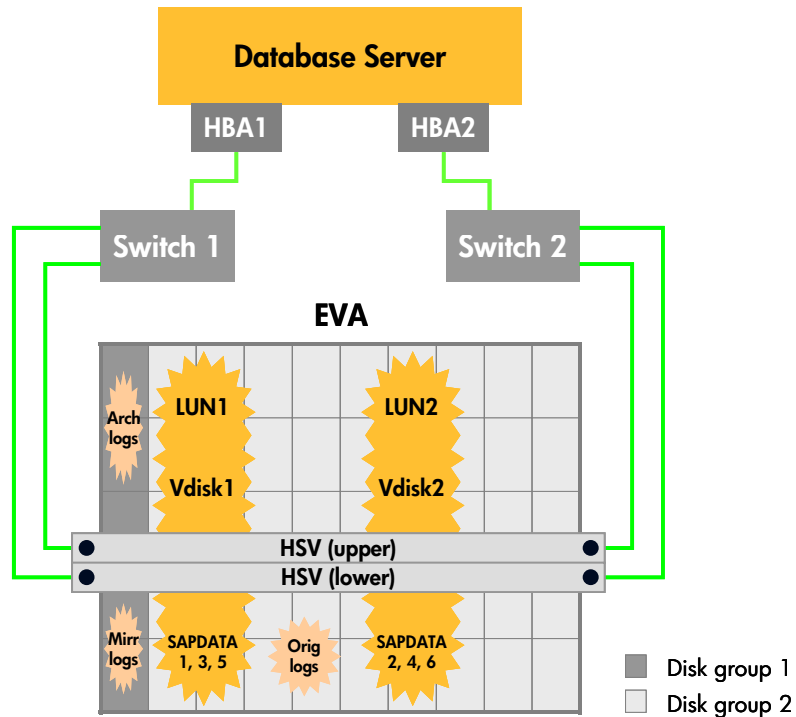
Figure 1. Rapid backup process flowchart



Example: Small EVA

Figure 2 shows an example of a small EVA.

Figure 2. General layout of a small EVA



Connections

- The database server of this small EVA is equipped with two host bus adapters (HBAs). Each of these HBAs is connected to the EVA by way of a separate switch to avoid a single point of failure.
- The EVA is equipped with two controllers (HSVs). Each of these HSVs has two 2-G/s ports.
- Each HBA of the database server is physically connected to both HSVs to avoid a single point of failure.

Internal structure

The EVA contains two disk groups. Disk group 1 (shown on the left) is fairly small. It is used for mirrored and archived redo log files. Disk group 2 comprises three virtual disks: Vdisk1 and Vdisk2 for SAPDATA plus a Vdisk for the Oracle online redo logs (Orig Log).

- Vdisk1 is defined as LUN1 (served by HBA1). Vdisk1 holds SAPDATA 1, 3 and 5.
- Vdisk2 is defined as LUN2 (served by HBA2). Vdisk2 holds SAPDATA 2, 4 and 6.
- Vdisk3 is defined as LUN3, which holds the original redo logs.

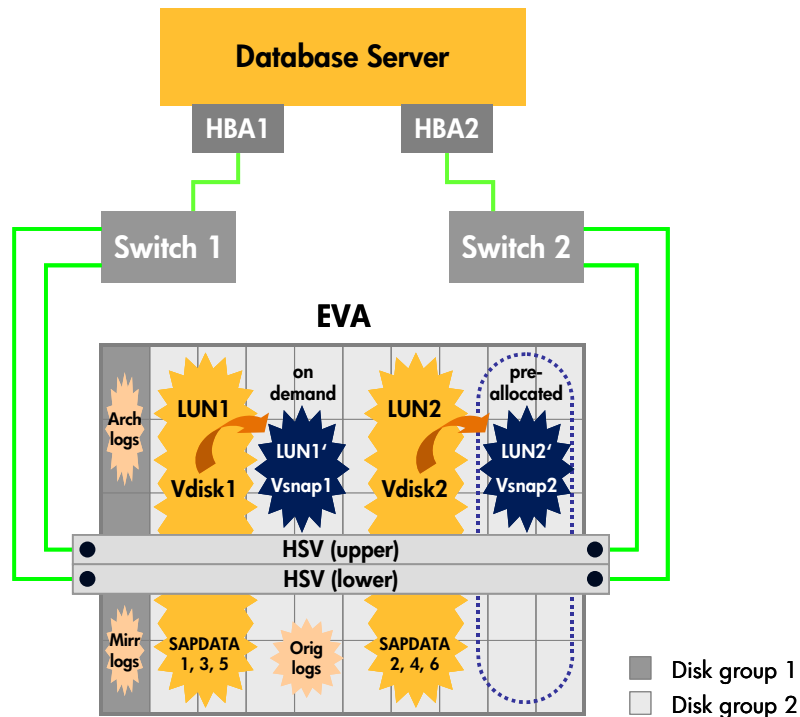
Rapid backup procedure

Figure 3 illustrates the typical sequence of events during an Oracle backup using BCVs.

Stage 1: Creating a BCV of LUNs

A BCV of LUN1 (Vdisk1) and LUN2 (Vdisk2) is initiated. This BCV is logically read to create Vsnap1 (which serves as LUN1') and Vsnap2 (which serves as LUN2') outside of Vdisk1 and Vdisk2 in the disk freespace. These two Vsnaps make up two BCVs.

Figure 3. Creating Vsnaps that serve as BCVs



Note the following:

- In this example, Vsnap1 is defined as a BCV on demand. This is done by specifying an option in the configuration of rapid backup. This option implies that the Vsnap can grow dynamically. The maximum size of this Vsnap is the size of the original Vdisk. While this method makes economic use of the available disk freespace, the Vsnap might become invalid if the storage system runs out of space.
- Vsnap2 is defined as a pre-allocated BCV. Vsnap2 can grow within this predefined space only.
- Before the first change to a block, the Copy on First Write (COFW) process copies the original block to the BCV to ensure consistency. The point-in-time status of each block is thus preserved in the BCV.
- Any blocks that remain unchanged after this point in time will be read from the original Vdisk. Blocks that change will be read from the corresponding Vsnap for consistency.

The Vsnap is a “container” that provides a different view to its associated Vdisk. On the operating system level, the scenario shown in **Figure 3** is represented as follows:

LUN1 = \HOSTS\DBSERVER\1

LUN1' = \HOSTS\BACKUPSRVR\1

LUN2 = \HOSTS\DBSERVER\2

LUN2' = \HOSTS\BACKUPSRVR\2

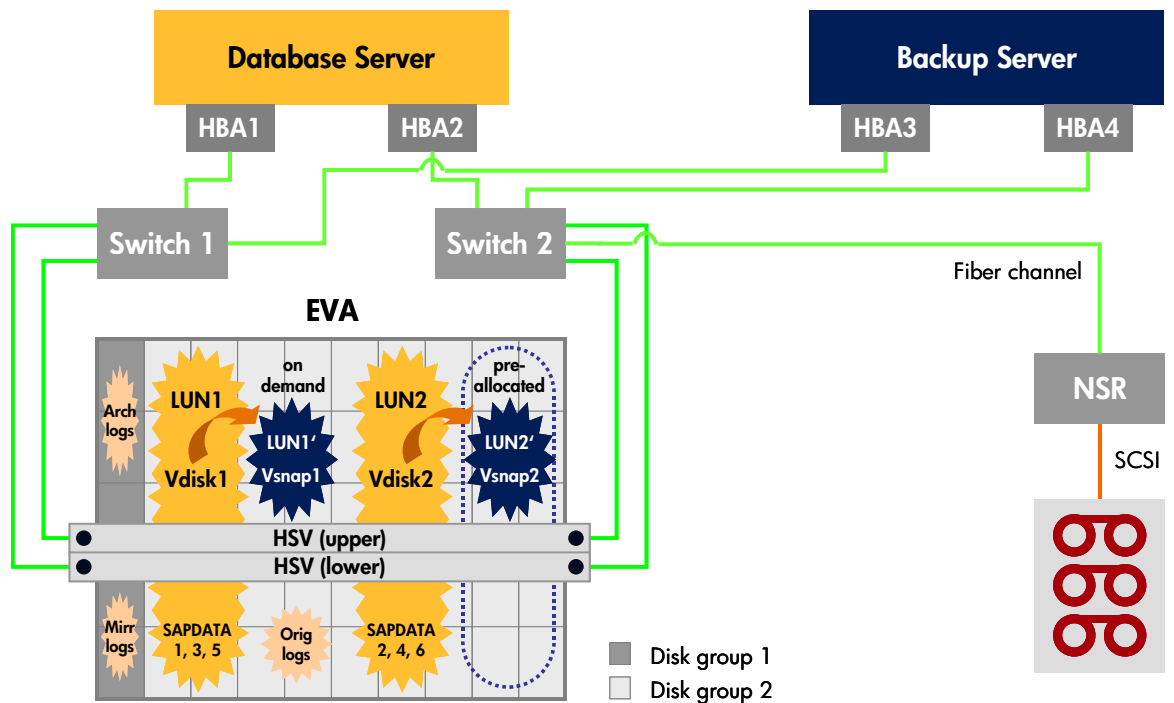
Note: **Figure 3** shows a mixed dynamic/pre-allocated setup only to illustrate the two ways of allocating space for BCVs. In a typical installation, all Vsnaps would be defined either as dynamic or as pre-allocated.

Stage 2: Streaming BCVs to tape

At this stage, the dedicated backup server becomes relevant. This backup server shares both switches with the database server. The tape devices (one or multiple drives) are connected to the backup server by an HBA, a switch and a Network Storage Router (NSR) that converts the data stream from SCSI to Fibre Channel.

Note: When the backup to tape is completed, the Vsnaps will automatically be removed from the disk group.

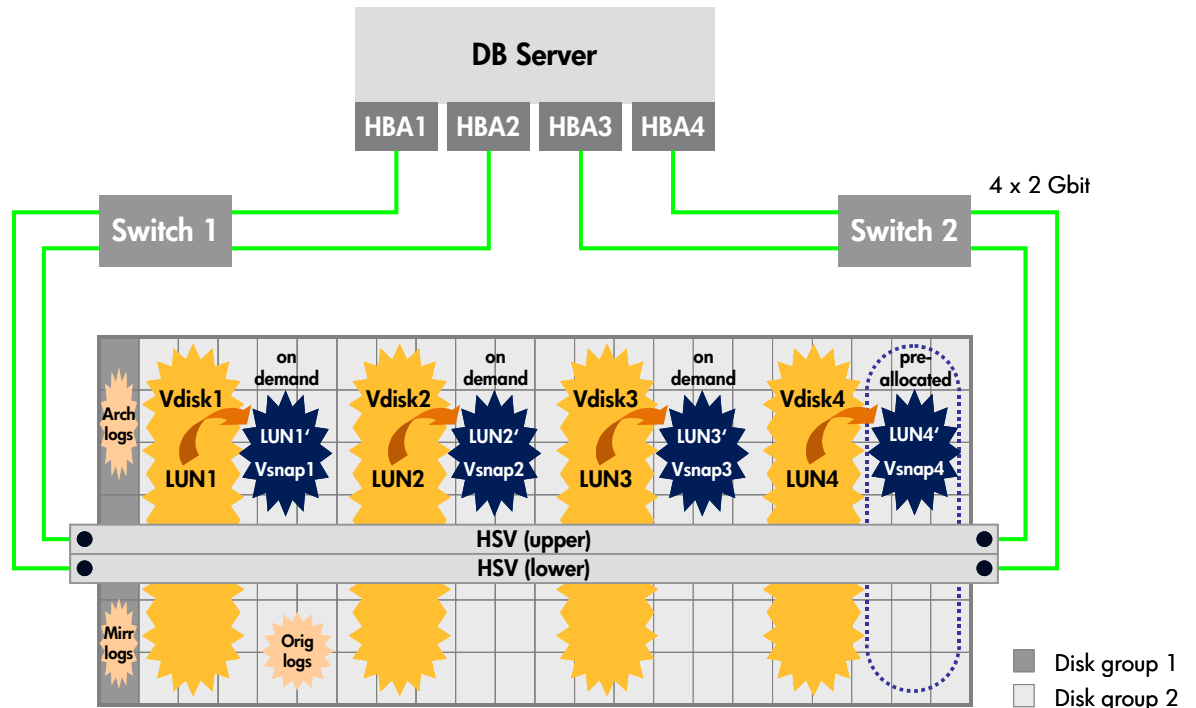
Figure 4. Backup server streams Vsnaps to tape



Example: large EVA

Figure 5 shows an example that illustrates the use of BCVs in a production environment equipped with a large EVA. While the small EVA shown in **Figure 4** uses two LUNs for SAPDATA, the large EVA shown in **Figure 5** uses four LUNs for SAPDATA.

Figure 5. Large EVA



Connections

- The database server of this large EVA is equipped with four HBAs. Two switches are shared by these HBAs.
- The EVA is equipped with two HSV controllers. Each of these HSV controllers has two 2-Gb/s ports.
- By way of the two switches, each HBA of the database server is physically connected to both HSV controllers to avoid a single point of failure.

Internal structure

The large EVA contains two disk groups. Disk group 1 (shown on the left) is fairly small. It is used for mirrored and archived redo log files. Disk group 2 comprises a total of four virtual disks for SAPDATA plus one for the online logs.

- Vdisk1 is defined as LUN1 (served by HBA1). The associated Vsnap1 is defined as dynamic.
- Vdisk2 is defined as LUN2 (served by HBA2). The associated Vsnap2 is defined as dynamic.
- Vdisk3 is defined as LUN3 (served by HBA3). The associated Vsnap3 is defined as dynamic.
- Vdisk4 is defined as LUN4 (served by HBA4). The space for the associated Vsnap4 is pre-allocated.

Each switch can handle multiple 2-Gb/s logical cross connections internally. Two switches are sufficient in this configuration. Additional switches would not yield any extra performance.

Note: **Figure 5** shows a mixed dynamic/pre-allocated setup only to illustrate the two ways of allocating space for BCVs. In a typical installation, all Vsnapshots would be defined either as dynamic or as pre-allocated.

Rapid backup procedure

The backup procedure for the large EVA is similar to that of the small EVA, except that four Vdisks (LUNs) and thus four Vsnapshots are involved.

Typical backup chronology

Offline backup

An example of the chronological “sequence of events” during a rapid offline backup procedure is provided in the following table.

Time	Event
00:00:00	BRBACKUP starts
00:01:42	Stop Oracle
00:02:15	Oracle stops
00:02:19	BCV creation is initiated
00:02:41	BCV creation has completed
00:02:41 – 00:04:15	Mount BCV to backup server
00:04:15	Start Oracle
00:07:02	Oracle up and running
00:07:03	Start backup to tape (by dedicated backup server, detached from database server)
04:30:00	BRBACKUP completed

Online backup

An example of the chronological “sequence of events” during a rapid online backup procedure is provided in the following table, illustrating that the impact of the backup procedure on production operations is minimized.

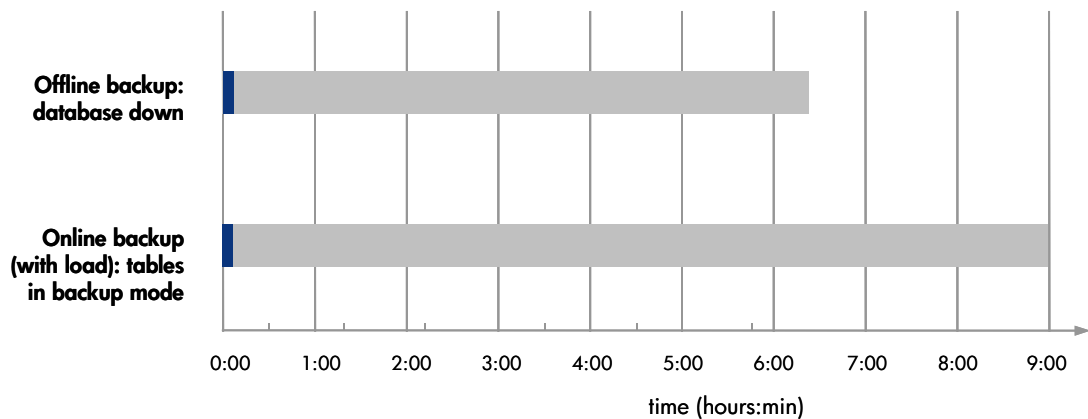
Time	Event
00:00:00	BRBACKUP starts
00:01:42	Switch Oracle to backup mode
00:01:44	Oracle changes to backup mode
00:01:44	BCV creation is initiated
00:02:19	BCV creation has completed
00:02:19	Take Oracle out of backup mode
00:02:20	Oracle out of backup mode
00:02:20 – 00:02:41	Mount BCV to backup server
00:02:43	Start backup to tape (by dedicated backup server, detached from database server)
04:50:01	BRBACKUP completed

Business case—reducing backup time from hours to minutes

The BCV methodology used by HP StorageWorks Rapid Backup Solutions dramatically shortens, by orders of magnitude, the backup-related time span during which Oracle service levels are impaired. **Figure 6** illustrates this dramatic improvement by way of an example involving a 2 x 750 GB database.

- In an offline backup scenario, the database downtime is reduced from more than 6 hours to less than 7 minutes.
- In an online backup scenario, the backup mode time is reduced from nearly 9 hours to less than 7 minutes.

Figure 6. Reducing backup time from hours to minutes



The following diagrams give a general impression of the improvements experienced by organizations that deploy these solutions.

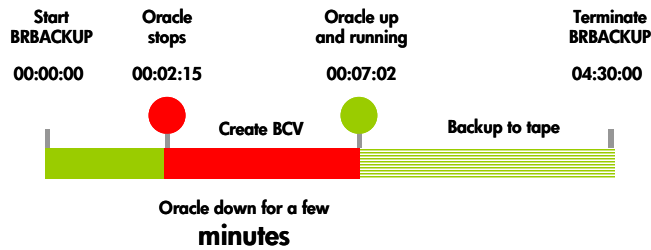
Oracle offline rapid backup using BCV vs. conventional Oracle offline backup

Using HP StorageWorks Rapid Backup, the backup to tape involves BCVs streamed to tape by way of a dedicated server. The backup procedure is thus detached from the database server. Oracle downtime is reduced to a few minutes.

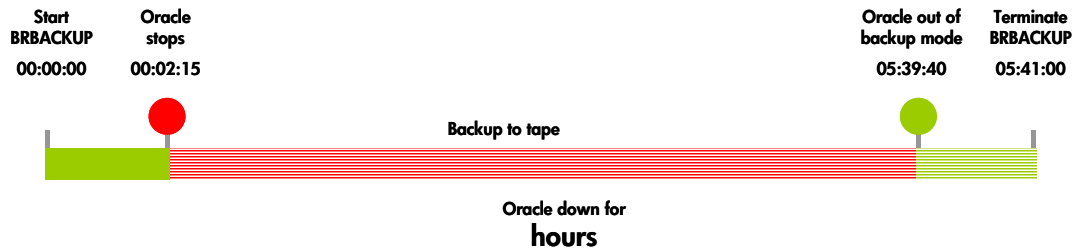
During conventional offline backup, Oracle remains down until the entire backup to tape procedure has been completed.

Figure 7. Offline rapid backup vs. conventional offline backup

HP Rapid Backup



Conventional Backup



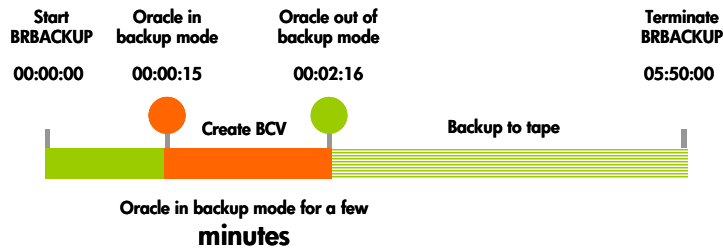
Oracle online rapid backup using BCV vs. conventional Oracle online backup

Using HP StorageWorks Rapid Backup, the backup to tape involves BCVs streamed to tape by way of a dedicated server. The backup procedure is thus detached from the database server. Oracle downtime is reduced to a few minutes.

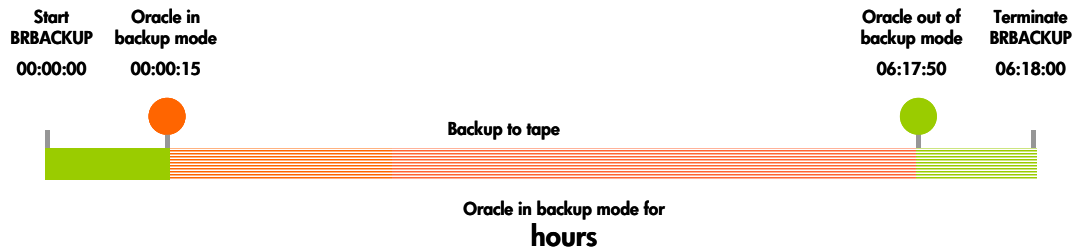
During conventional online backup (with or without load), Oracle remains in backup mode until the entire backup to tape procedure has been completed.

Figure 8. Online rapid backup vs. conventional online backup

HP Rapid Backup



Conventional Backup



Laboratory proof points—conventional backup vs. HP StorageWorks Rapid Backup

The BCV methodology used with the HP StorageWorks Rapid Backup Solutions dramatically reduces Oracle downtime or backup mode time during offline and online backup. The larger the database, the more significant the time advantage over conventional backup methods. HP StorageWorks Rapid Backup Solutions thus provide a major contribution to business continuity in 24 x 7 production environments.

Offline backup vs. online backup

Most customers prefer to back up Oracle databases in offline mode because an offline backup provides a consistent point-in-time database backup. Online backup without load tends to be marginally faster than offline backup because online backup does not require Oracle to be shut down. During online backup with load (that is, users accessing the database while Oracle is in backup mode), Oracle adds 60% more information to the log files than during production because the tablespaces are kept in backup mode. Up to 250% more time is required for database updates while the database is in backup mode.

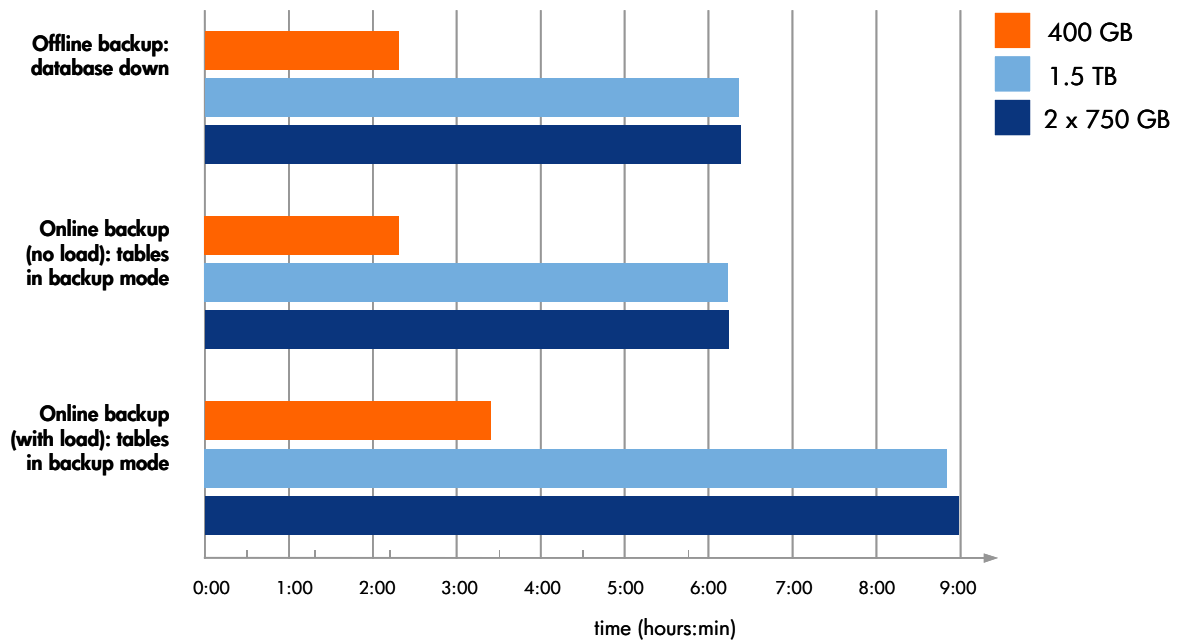
Conventional backup methods

Figure 9 reflects empirical data on the backup-related impact on the service levels of three different database sizes: 400 GB, 1.5 TB, and 2 x 750 GB (the 1.5-TB database split across two EVAs).

- During offline file backup from the database server, the 400-GB database is unavailable to users for 2 hours and 18 minutes. For a 1.5-TB database, the downtime is 6 hours and 21 minutes. For a 2 x 750-GB database using two EVAs, the downtime amounts to 6 hours and 22 minutes. In an order entry system, for example, if users cannot place orders during this period, the customer may lose a considerable amount of business.
- During online backup (without database load) from the database server, the 400-GB database is in backup mode for 2 hours and 19 minutes. The 1.5-TB database remains in backup mode for approximately 6 hours and 13 minutes. In the case of a 2 x 750-TB database using two EVAs, the database remains in backup mode for around 6 hours and 14 minutes.
- During online backup with moderate database load (that is, the database remains available while in backup mode), the 400-GB database remains in backup mode for around 3 hours and 24 minutes. For the 1.5-TB database, the backup mode duration is around 8 hours and 50 minutes. The 2 x 750-GB database using two EVAs remains in backup mode for 8 hours and 59 minutes. Although users can access the system during this period, the impact on database performance is considerable.

The results shown with database load largely depend on the type and amount of load on the database during the time of backup. Customer experience will differ from system to system.

Figure 9. Impact of conventional backup on database availability



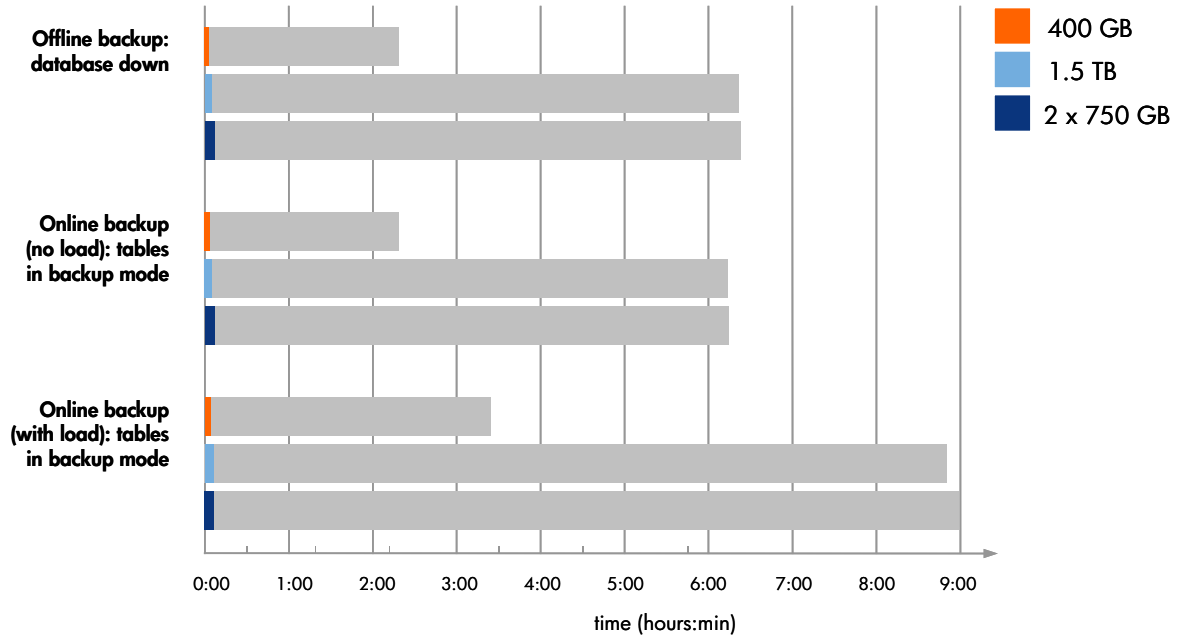
HP StorageWorks Rapid Backup methodology

Minimizing any load on the database server during backup, the BCV methodology used by the HP StorageWorks Rapid Backup Solutions helps IT organizations to deliver on the database service level expectations of their enterprise.

- During offline backup from the backup server, the 400-GB database is unavailable for merely 4 minutes. At 5 minutes, the downtime for the 1.5-TB database is only marginally higher. Even for the 2 x 750-GB database using two EVAs, the database is down for slightly less than 7 minutes.
- During online backup from the dedicated backup server without load on the database server, the 400-GB database remains in backup mode for less than 4 minutes. The 1.5-TB database remains in backup mode for around 6 minutes. For the 2 x 750-GB database using two EVAs, the backup mode duration is slightly longer than 6 minutes.
- During online backup from the backup server with load on the database server, database performance is slightly affected but users can still use the system during backup—implying “business as usual” for database users. For the 400-GB database, the backup mode time is just under 4 minutes. The 1.5-TB database remains in backup mode for 6 minutes. For the 2 x 750-GB database using two EVAs, the backup mode duration remains less than 7 minutes.

For comparison, the shaded “original” bars in **Figure 10** indicate the impact of conventional backup.

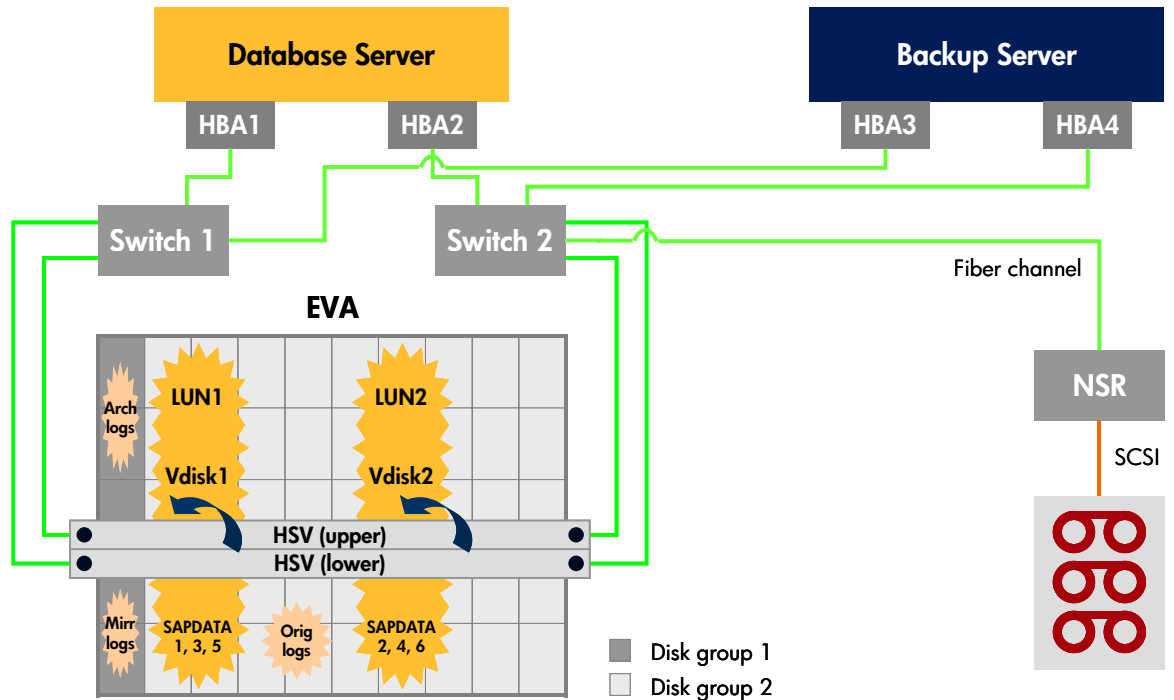
Figure 10. BCV methodology minimizes impact on database availability



Restore

The data on the backup media can be restored to the database server by the storage area network (SAN).

Figure 11. Restore by SAN



Full restore

Restoring data from tape to LUNs in the production environment requires skill and experience. The following descriptions provide a general overview of a number of methodologies. For specific instructions, refer to the documentation supplied with the backup software. Also, the pertinent SAP recommendations and guidelines should be observed.

Rapid backup facilitates restore and recovery

IT organizations that manage huge databases tend to do partial backups, backing up different tablespaces each day. In some organizations, databases tend to be so large that it takes an entire week to back up all tablespaces. This is problematic from a restore and recovery point of view, as to restore a system, IT operators must restore all datafiles plus archived redo log files spanning the time period from the oldest tablespace to the point in time when the problem necessitating a restore occurred.

Partial online backup results in large numbers of tape media from which tablespaces and log files must be restored. Obviously, the larger the number of tape media required for a restore becomes, the more likely it is for a defective tape medium to force the restore of an older backup.

Applying the log files during an Oracle recovery tends to be time consuming; such a restore and recovery could take up to several days to complete.

HP StorageWorks Rapid Backup creates BCVs of the tablespaces virtually instantaneously, so that only a few minutes of log files must be applied for a restore. The HP Rapid Backup methodology thus helps to minimize the time it takes to get a database up and running.

General recommendations

In terms of storage subsystem I/O performance, mySAP Business Suite using Oracle poses one of the toughest challenges in the industry. To ensure that the EVA delivers on mySAP Business Suite/Oracle service level expectation, the following recommendations should be followed.

Infrastructure requirements

- Database server with an even number (a minimum of two) of HBAs.
- A dedicated backup server. This can be a scaled-down sibling of the database server. The backup server must run the same operating system as the database server, plus SAP and Oracle. The backup server must have a sufficient (preferably even) number of HBAs for connecting to the storage system.
- One or more additional HBAs can be installed for communication with the tape devices.
- The backup utility must conform to the HP Enterprise Backup Solution. Refer to *HP StorageWorks Enterprise Backup Solution—overview & features*:
<http://www.hp.com/go/ebs>
- The backup server must be able to read off the BCVs fast enough to keep the backup devices in streaming mode.
- The hard disk of the backup server must be dimensioned such that it provides adequate space for the backup log and the backup tape index. Note that a backup of the backup server index files must be scheduled.
- Sufficient space on the storage subsystem for BCVs, particularly for dynamic Vsnap.
- One or more NSRs for connecting the tape devices to the SAN. Since the backup is performed by the backup server and data is to be restored to the database server, both servers must share the same tape devices. For this reason, an NSR is needed to link the tape library or tape drives to the SAN. The NSR converts from SCSI to Fibre Channel.
- Adequate number of tape drives.
- Backup and database servers connected to 2-G/s SAN switches.

Storage layout

For in-depth information and recommendations on the layout of EVAs, refer to the *HP StorageWorks Enterprise Virtual Array Configuration Guide for mySAP Business Suite*.

Backing up the archived redo log files

During an online backup, the data files still being accessed become inconsistent with those being backed up. In the event of a restore, the database can only be made consistent through a recovery, provided that redo log files from the period between BEGIN BACKUP and END BACKUP exist on the disk or on tape from where these can be restored. Consequently, for online backups, BRARCHIVE must be used for backing up the archived redo log files to ensure database consistency, and archived redo log files should be backed up as frequently as possible.

BRARCHIVE must run on the database server. If the backup device is connected to the backup server, the BACKINT interface can be used. Be sure that a BRARCHIVE session can be started immediately after the BCVs are being created and not just at the end of the online BRBACKUP session.

Configuration of the backup server

The backup server must be included in a high-availability (HA) configuration:

- Set up redundancy and backup of the backup server itself to ensure HA.
- Keep the database for the backup server on an external storage system (other than the EVA to which the backup server is assigned).
- Be sure to schedule a regular (ideally daily) backup of the internal database of the backup server.

Backup software on the backup server

The backup software uses an internal database that keeps the information about the location of media, drives configured, when backup is been taken, which tape has been used, which media contains which logs and so on. The location where this information is kept on the system differs from vendor to vendor. This information is very valuable when the database files are restored from tape; hence, it must be secured by backing up the internal database regularly.

When the backup software is installed on the backup server, a disk (other than operating system disk) should be chosen that provides sufficient space for the growing internal database of the backup software. Also, be sure to provide the disk with a high protection level by configuring RAID 1 on a Smart Array or VRAID 1, depending on the storage technology in use.

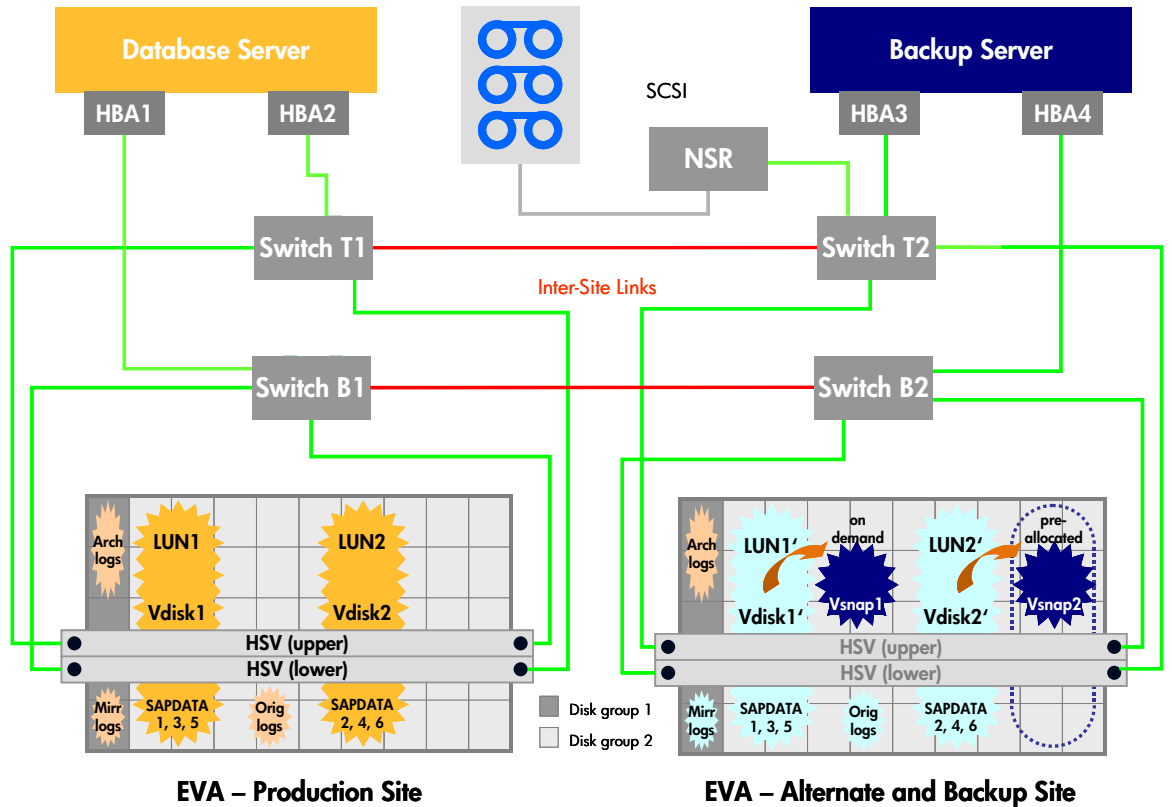
If the information is lost, it can be retrieved by scanning the tapes. This process is very slow and tedious; therefore, regular backups of this information are highly recommended.

The HP StorageWorks Rapid Backup solution in an HP StorageWorks Continuous Access EVA configuration

The EVA has the capability to mirror storage devices over distances with the Continuous Access EVA extension. Taking a snapshot or a snapclone on either the source or the destination site of Continuous Access EVA configuration is a supported operation when combining a disaster tolerance and a backup strategy. The paper on [Disaster Tolerant Solution for mySAP Business Suite on EVA](#) describes the configuration of Continuous Access EVA in a SAP environment with Oracle. The idea behind the combination of Continuous Access EVA and Rapid Backup is to centralize backup in large distributed environments and to off-load a primary production site storage array from a backup workload besides the benefit of protecting the SAP production data from disasters.

Figure 12 shows a Continuous Access EVA in a verification configuration.

Figure 12. Rapid Backup in a Continuous Access EVA configuration

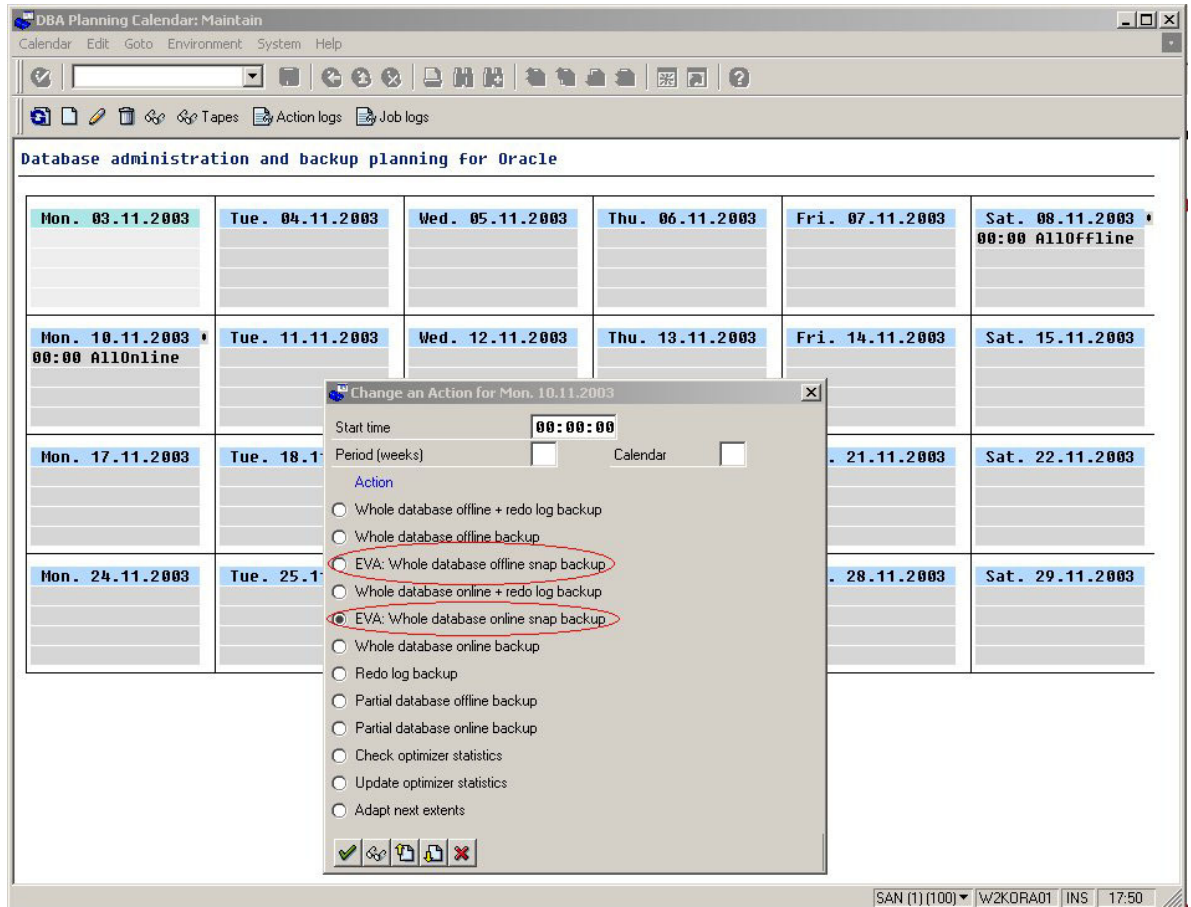


Integration with CCMS

The HP StorageWorks Rapid Backup solution is fully integrated with CCMS.

To simplify job planning and scheduling, external commands that use the HP StorageWorks Rapid Backup functionality for online and/or offline backup can be added to the SAP executable directory. CCMS can then be used to schedule and call these external commands instead of the native BRBACKUP command. **Figure 13** shows examples of an online and an offline backup command included in the DBA Planning Calendar for ease of use.

Figure 13. Example: DB13 Planning Calendar



Support matrix

The following table indicates the support matrix (status: February 2004) of HP StorageWorks Rapid Backup for mySAP Business Suite on EVA for Oracle.

Operating System	Oracle		HP OpenView Storage Data Protector	VERITAS NetBackup	VERITAS Backup Exec	Legato Networker	SAP version	
	8.1	9.2					4.6C/D	4.7
Microsoft® Windows® 2000	x	x	x	(x)			x	x
Windows 2003 32-bit	x	x	(x)	x			x	x
HPUX PA-RISC	x	x		x			x	(x)
Tru64 UNIX®	x	x				x	x	(x)

Note: Cells marked "x" indicate tested configurations. Cells marked "(x)" indicate other configurations that will be supported but have not yet been fully tested.

Required products

HP StorageWorks Rapid Backup for mySAP Business Suite on EVA for Oracle builds on HP StorageWorks Business Copy EVA. The following products are required:

- Business Copy Replicated TB
- Business Copy EVA3000 License or Business Copy EVA5000 License
- For Windows-based system:
 - HP StorageWorks Secure Path v4.0B for Windows or later
 - Windows 2000 Professional Resource Kit

Glossary

BCV — Business Continuance Volume

EVA — Enterprise Virtual Array

HBA — Host bus adapter

NSR — Network Storage Router

SAN — Storage area network

SLA — Service Level Agreement

For more information

HP SAP alliance

<http://www.hp.com/go/sap>

HP network storage solutions

<http://www.hp.com/go/storage>

HP StorageWorks Enterprise Backup Solution—overview & features

<http://www.hp.com/go/ebs>

HP white papers

<http://www.compaq.com/storage/whitepapers.html> - soft

<http://h18006.www1.hp.com/storage/arraywhitepapers.html>

Procedures for booting Windows from a SAN

http://www.compaq.com/support/storage/open_vendor/support/RAIDarray/boot_support_external_web.html

HP support—reference library—customer advisories for the EVA

http://h71025.www7.hp.com/support/reference_library/viewreferencelibrary.asp?countrycode=1000&catid=2058&famid=2184&prodid=2185|Enterprise+Virtual+Array

Storage virtualization and the EVA

ftp://ftp.compaq.com/pub/products/storageworks/whitepapers/Storage_VirtualizationWP.pdf

Wwidmgr, firmware user manuals

<ftp://ftp.digital.com/pub/Digital/Alpha/firmware>

HP SAN product support, design reference guides

<ftp://ftp.compaq.com/pub/products/storageworks/techdoc/san>

Connecting single HBA servers to the EVA without multi-path software

ftp://ftp.compaq.com/pub/products/storageworks/whitepapers/SingleHBAforEVA_F.pdf

SPC benchmark 1 executive summary

http://www.storageperformance.org/Results/SPC-1/HP-EVA2C12D_2002-12-06/hp_EVA2C12D_ExecSummary_2002-12-06A.pdf

Oracle links

Oracle Technology Network

<http://otn.oracle.com/index.html>

Microsoft links

<http://www.microsoft.com/>

SAP links

<http://www.hp.com/go/sap>

SAP documentation library

<http://help.sap.com/>

SAP OSS note 515014 "mySAP Business Suite on the Enterprise Virtual Array"

<http://service.sap.com/notes>

HP StorageWorks Continuous Access EVA specifications

<http://h18006.www1.hp.com/products/storage/software/conaccesseva/specifications.html>

Continuous Access EVA

<http://h18006.www1.hp.com/products/storage/software/conaccesseva/index.html>

HP StorageWorks Continuous Access EVA design reference guide

http://h20000.www2.hp.com/bizsupport/TechSupport/DocumentIndex.jsp?contentType=SupportManual&docIndexId=3124&locale=en_US&prodTypeId=12169&prodSeriesId=316118

HP StorageWorks Enterprise Virtual Array configuration guide for mySAP Business Suite

<http://h18006.www1.hp.com/storage/solutionwhitepapers.html>

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