HP storage solutions

June 2003

Technical blueprint

HP Rapid Backup for mySAP Business Suite on EVA for Oracle on Windows 2000

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Executive summary

In a mission-critical SAP/Oracle application 24 x 7 production environment, customers choose online or offline backup. During online backup, customers may experience severe impacts to their production system since the database remains in backup mode for an extended period of time. Users may experience slow system response and inability to access the database in a timely manner. In addition, the amount of Oracle log file information generated during the time the database is in backup mode increases significantly. With offline backup, the application is shut down for long durations. Using either option, the production system is either slowed down or disrupted, so customers cannot achieve high availability or high performance as they require. The HP Rapid Backup Solution eliminates these challenges by using Business Continuance Volumes (BCVs) streamed to tape by a dedicated backup server.

Solutions overview

The SAP backup/restore functions are among the most critical operations in the production environment. Downtime or application performance penalty can be detrimental and cannot be tolerated. The BCVs generated by the HP solution enable customers to back up their production database with minimum impact on database service levels. This solution integrates SAP application tools and proven HP methodologies. Backup operations are completed using streaming backup data from a virtual snapshot instead of an original disk. Because of this, the time that the database must be in backup mode is minimized (online) or downtime is minimized (offline) and backup operation management is simplified. By implementing this solution, the customer's mean-time-between-failures (MTBF) is drastically reduced.

The solution is based on the capability of HP Enterprise Virtual Arrays to create a virtual snapshot of a LUN within the disk freespace of the disk subsystem.

Business needs

To meet business needs, customers must:
- Have accessible global business protection
- Leverage information to maximize operations

Companies are becoming bigger and more complex, and they cover multiple geographies in a variety of time zones.

To SAP users, it is not only having access to the data in a reliable manner—it is also having access to the information that allows better decision making at a faster pace.

To achieve business velocity, an organization needs a sound business continuity strategy that allows it to reduce planned and unplanned downtime.

While a traditional backup typically implies hours of costly Oracle downtime or backup mode time, the HP rapid backup methodology for Enterprise Virtual Arrays returns Oracle to unimpaired availability within minutes.

Solution design and design rules

The HP Rapid Backup solution offloads the backup process from the production database server to a dedicated backup server. This can be a scaled-down sibling of the production server.

- The backup server must run the same Windows 2000 Advanced Server operating system as the production server, plus SAP and Oracle.
- A Modular Data Router (MDR) is required for connecting the tape devices to the Storage Area Network (SAN).

Since the backup is performed by the backup server and data is to be restored to the production database server, both servers must share the same tape devices.

Example

Figure 1 shows an example of an EVA that contains two disk groups. Disk group 1 (shown on the left) is fairly small. It is used for mirrored and archived log files. Disk group 2 comprises two virtual disks (Vdisk1 and Vdisk2) plus available disk space.

- At the beginning of the backup process, a snapshot of LUN1 (Vdisk1) and LUN2 (Vdisk2) is initiated. This snapshot is created as Vsnap1 (which serves as LUN1') and Vsnap2 (which serves as LUN2') outside of Vdisk1 and Vdisk2 in the freespace of disk group 2. These two Vsnaps make up two BCVs.
- The backup server shares both switches with the production server. The tape devices are connected to the backup server by one of the switches. The Vsnaps are streamed to tape by way of an MDR. When the backup to tape is completed, the Vsnaps are automatically removed from the disk group.
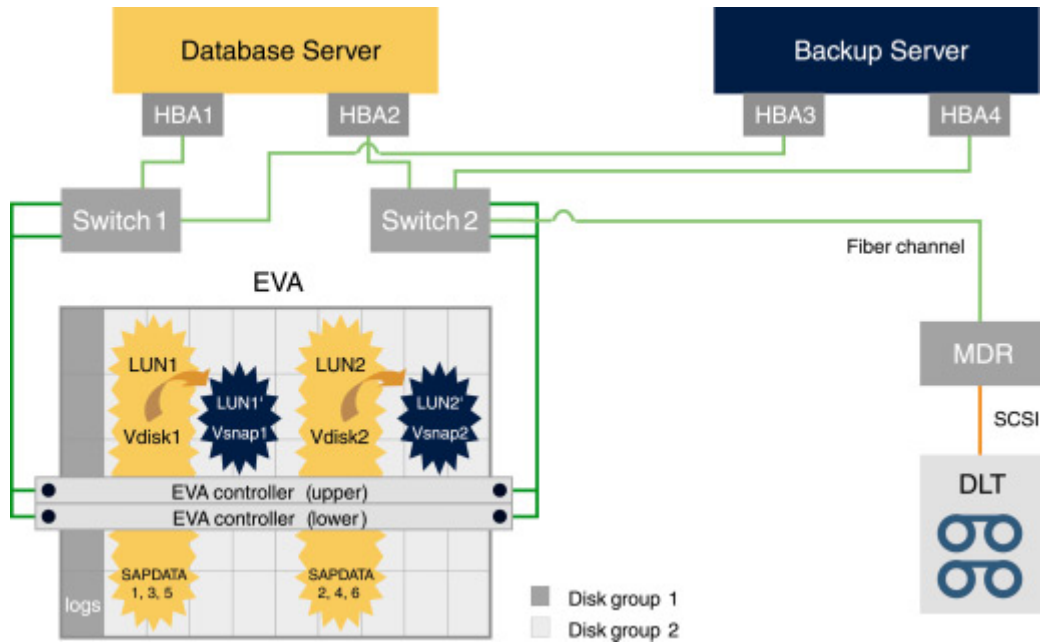

Figure 1. Backup server streams Vsnaps to tape

Typical backup chronology

Online backup

Table1 provides an example of the chronological "sequence of events" during a rapid online backup procedure, illustrating that the impact of the backup procedure on production operations is minimized.

Table 1: Example of an online rapid backup chronology

Time	Event
10:25	BRBACKUP starts
10:26	**Switch Oracle to backup mode**
10:28	Oracle changes to backup mode
10:29	Virtual snapshot is initiated
10:31	Virtual snapshot completed
10:32 – 10:37	Mount BCV to backup
10:38	Take Oracle out of backup mode
10:40	**Oracle out of backup mode**
10:41	Start backup to tape (by dedicated backup server, detached from production server)
16:15	BRBACKUP completed

Offline backup

An example of the chronological "sequence of events" during a rapid offline backup procedure is provided in Table 2.

Table 2: Example of an offline rapid backup chronology

Time	Event
10:25	BRBACKUP starts
10:26	**Stop Oracle**
10:32	Oracle stops
10:33	Virtual snapshot is initiated
10:35	Virtual snapshot completed
10:36 – 10:41	Mount BCV to backup
10:42	Start Oracle
10:47	**Oracle up and running**
10:48	Start backup to tape (by dedicated backup server, detached from production server)
14:55	BRBACKUP completed

Test environment

The HP Rapid Backup Solution has been simulated in a business-critical environment using specific test configurations to simulate actual SAP working environments. SAP R/3 is one of the most disk I/O-intensive applications in the industry. In tests, HP used Vraid1 mirror volume sets for performance and reliability. To reach our goals and best throughput, HP distributed the data evenly on many disks to balance the I/O of different groups of files.

I/O performance considerations

As the disk subsystem is the slowest part of an SAP system, it is extremely important to design it for optimal performance. For an SAP server, the disk subsystem for the SAP/Oracle databases is commonly designed using RAID fault-tolerant settings, which delivers optimal performance.

The overall performance of the disk subsystem depends heavily on the number of disk drives installed. The more drives are installed in a volume (Vraid1 or Vraid5), the more I/Os per second and the higher the transfer rate the volume can provide.

In a typical mySAP Business Suite environment using Oracle as the database, access to data can be random—even in sequential table scans through the primary index.

Operators may compute the total number of required I/Os for a given RAID level and subsequently determine the number of drives necessary to provide the required number of I/Os.

Storage subsystems can have disk drives used in the production volumes and other disk drives may be used for cloning and snapshot purposes. In other words, a pool of disk drives must be present so that the scripts can perform snapshots, generate clones, and so on.

Component review

Table 3 provides a sample bill of materials used in SAP/Oracle rapid backup solutions.

Table 3: Bill of materials for SAP/Oracle Rapid Restore-Backup Solution

Item	Item description
1	Business Copy 2.1
2	VCS 3.0 (Controller Firmware)
3	Operating System Platform Software Kit for Windows 2000
4	Enterprise Virtual Array 110
5	Hard Disk Drives, 36.4 GB, 10K UWSE
6	Two DL580 (production system and backup system)
7	Fibre Channel HBA (switched fabric), KGPSA-CA
8	Fibre Channel Storage 2 SAN Switches, 16 port
9	Fibre Channel Optical Short Wave GBIC
10	Fibre Channel Optical Cable
11	Modular Data Router
12	Super DLT 110/220 Tape Library
13	HP StorageWorks Secure Path 4.1
14	Data Protector version 5.1

1. Business Copy software is necessary on the management appliance and backup system that communicates or coordinates communication with hosts and storage subsystems.
2. Controller firmware — One instance of VCS is necessary for each EVA controller.
3. Operating System Platform kit CDROM — In the test, HP StorageWorks Solutions Software Fibre Channel Solutions for Windows 2000 was used.
4. Disk array — For these tests, EVA storage was used.
5. Disks — The choice of disk type does not affect the functionality; however, rpm and the number of spindles should be considered. For applications such as SAP/Oracle, the access pattern is random. Also, as many spindles as possible should be used to increase parallel access to the volume as opposed to fewer disks. In this test, six LUNs were created with Vraid1.
6. Backup system — In this test, an HP DL580 server was used for the production system and another HP DL580 was used as the backup server. Both servers run Windows 2000 Advanced Server with Service Pack 3. The Windows 2000 Resource Kit was used.
7. Fibre Channel Host Bus Adapter (HBA) — The HP DLT580 backup system running Windows 2000 supports KGPSA-CA Fibre Channel HBAs. For further information on HBA drivers, visit the HP storage Web site at: www.hp.com/go/storage
8. Fibre Channel Interconnect — SAN interconnect switches allow for significantly better performance, whereas loops (hubs) present significantly limited performance and connectivity options. However, since they are newer, switches currently have limited configuration support where loops are maintained by a variety of components. Storage arrays and tape can reside on the same switched fabric, making a simpler, more extensible installation possible. Disk and tape cannot exist on the same loop; dual loops are required in this case.

9. Fibre Channel Optical Short Wave GBIC — Gigabit Interconnects (GBIC) are not available with the hubs or switches and must be ordered separately. SAN switches require the GBIC 380561-B21.

10. Fibre Channel Optical Cable — Order the length needed.

11. Modular Data Router — HP StorageWorks Modular Data Router (Fibre Channel Tape Controller) is required with the following: SCSI-attached tape libraries require special HBAs (do not use standard server HBA adapters), Fibre Channel-attached tape libraries (SCSI devices) require a special Fibre Channel to SCSI bridge (FCTC). The following cables are also needed: VHDCI Cables for SCSI connection.

12. MSL5026 Super DLT 110/220 Tape Library is a needed solution component— HP SDLT 110/220, HP5/70 GB DLT tape drives were used in tests.

13. Secure Path 4.0 – This storage software is needed by Windows 2000 in order to present the disk infrastructure in the SAN to the server.

14. Third-Party Backup Software — Data Protector version 5.1 can be used with this solution.

Synergy of components

Online backup

An online backup is a sophisticated backup that allows users access to the database during the backup process. Specifically, the BRBACKUP tool in the SAP tool suite alters the mode of the database tablespaces to backup mode. At that time, a copy (BCV) of the database is created by means of the DO_SPLIT parameter of the BRBACKUP command. After the BCV has been completed, BRBACKUP alters the tablespaces to end the backup mode. Then the physical backup is performed on the backup system.

Offline backup

During SAP offline backup, the database is shut down to create the BCV. When the BCV has been created, BRBACKUP restarts the production database, thereby making the system available to users again. The physical backup is then performed on the backup system. This is the simplest backup strategy and results in a consistent point-in-time database backup.

Figure 2 illustrates the general procedure for both online and offline backup using BCVs.
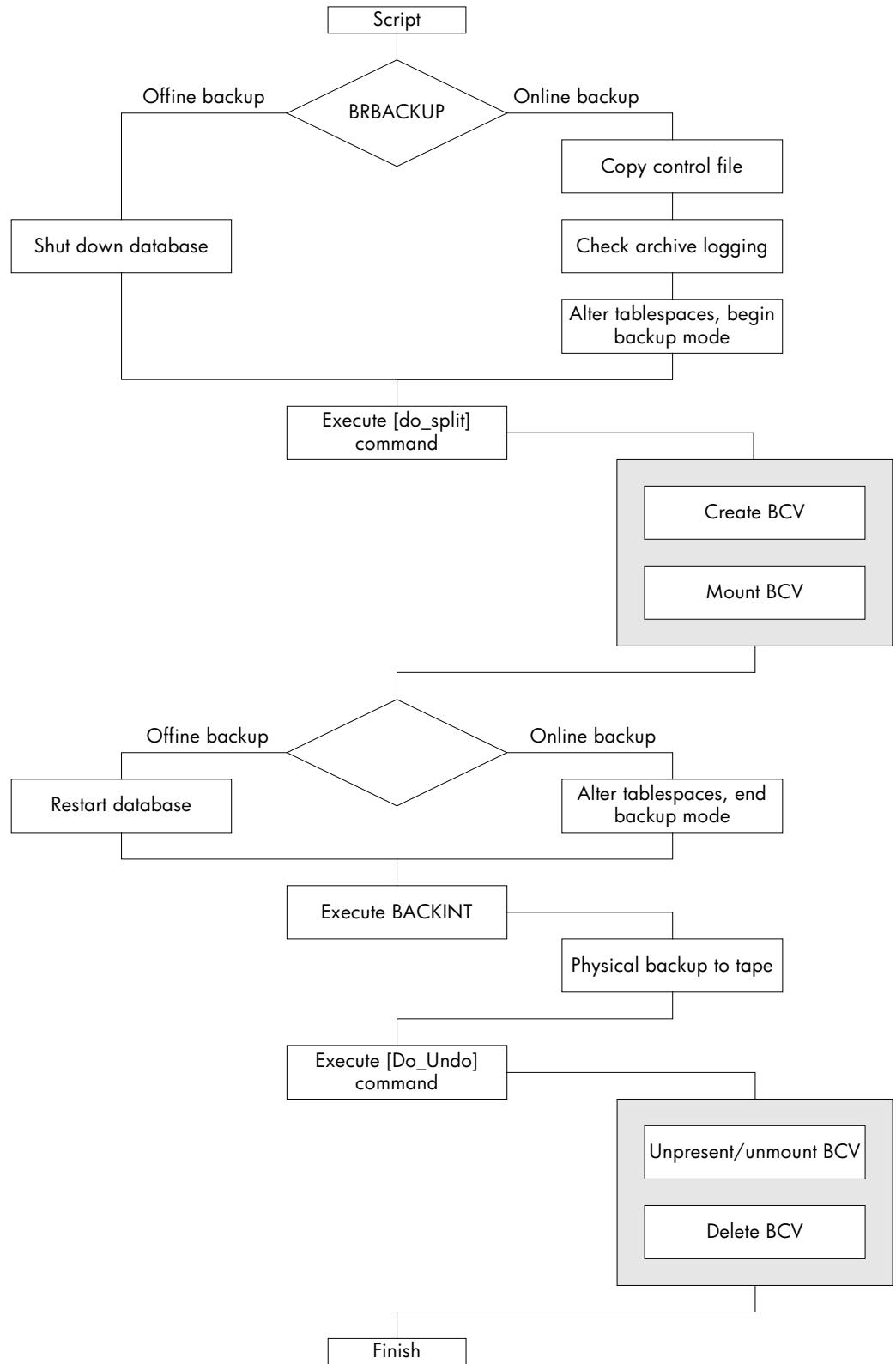
```
                              ┌──────────┐
                              │  Script  │
                              └──────────┘
                                    │
                ┌───────────────────◇───────────────────┐
   Offine backup │              BRBACKUP              │ Online backup
                 │                                     │
        ┌────────────────┐                    ┌─────────────────┐
        │ Shut down      │                    │ Copy control file│
        │ database       │                    └─────────────────┘
        └────────────────┘                             │
                                              ┌─────────────────┐
                                              │ Check archive    │
                                              │ logging          │
                                              └─────────────────┘
                                                       │
                                              ┌─────────────────┐
                                              │ Alter tablespaces,│
                                              │ begin backup mode │
                                              └─────────────────┘
                 │                                     │
              ┌──────────────────┐
              │ Execute [do_split]│
              │ command          │
              └──────────────────┘
                                   ┌──────────────┐
                                   │  Create BCV   │
                                   └──────────────┘
                                   ┌──────────────┐
                                   │  Mount BCV    │
                                   └──────────────┘

   Offine backup ◇ Online backup
        ┌────────────────┐        ┌─────────────────┐
        │ Restart database│       │ Alter tablespaces,│
        └────────────────┘        │ end backup mode  │
                                   └─────────────────┘
              ┌──────────────────┐
              │ Execute BACKINT  │
              └──────────────────┘
                                   ┌─────────────────┐
                                   │ Physical backup  │
                                   │ to tape          │
                                   └─────────────────┘
              ┌──────────────────┐
              │ Execute [Do_Undo]│
              │ command          │
              └──────────────────┘
                                   ┌──────────────────┐
                                   │Unpresent/unmount  │
                                   │BCV               │
                                   └──────────────────┘
                                   ┌──────────────────┐
                                   │  Delete BCV       │
                                   └──────────────────┘
                              ┌──────────┐
                              │  Finish  │
                              └──────────┘
```

Figure 2. Rapid backup process flowchart

Resilient, extensible, controllable

- Resilient — Simplifies management and implementation of your mySAP Business Suite ENSAextended—the HP strategy for an adaptive infrastructure for storage—creates a storage environment that is built from a redundant infrastructure and component capabilities that enable automatic failover. It can monitor and automatically heal itself. The resilience of this storage environment provides a basis from which storage delivers data to applications based on policy-driven Quality of Service attributes.

The HP StorageWorks Rapid Backup Solution for mySAP Business Suite enhances high availability with consistent additional data protection capabilities from HP. A dedicated backup server offloads the backup process from the production environment. An online backup that creates and mounts BCVs while Oracle is in backup mode is a best practice for high-availability, mission-critical applications like SAP. During the HP rapid online backup, the database performance is minimally affected while the data remains accessible to users and the application. An offline backup that creates and mounts BCVs while Oracle is down minimizes database downtime.

- Extensible — Enables you to do business the way you choose
ENSAextended uses open, modular, networked storage. The architecture's networked storage approach encourages extremely flexible deployment of any capabilities required.

The SAP application-aware solution offers SAP users scalability and interoperability and provides end-to-end solutions, which ultimately translate into both cost-saving and revenue-enhancement opportunities. This solution offers the following capabilities:

  – Integrated point-in-time backup with minimal performance impact on business applications.
  – Restore made possible in a reasonable time in case of lost files in the production environment or in case of a disaster in the production environment.

- Controllable — Puts you in control
ENSAextended enables the implementation of storage policies in the context of business rules, thus linking storage behavior and capabilities with the policies and practices that govern the business entity they serve. This means that policy-based automation such as Rapid Backup for mySAP Business Suite can adjust data delivery to business and application requirements.

An important consideration in SAP customers' data protection plans is maintaining the required quality of service while making their infrastructure manageable in the time needed to be in full operation following planned or unplanned downtime. Test results show that downtime for backup is significantly shortened or eliminated. Details are available from HP or an authorized reseller sale representative in a solution implementation blueprint.

Why HP

- **Ensures continuous uptime** by systematically eliminating single points of failure across the board—from the hardware to the SAP application level; HP solutions for SAP provide instant, automated switchover for hardware, operating system, database, and SAP components, ensuring service continuity in the event of a failure
- **Delivers security** with solutions that perform both encryption for secure transactions and instant authorization and authentication checks
- **Prepares you for sudden load peaks** by keeping extra processor and storage capacity on standby for instant activation whenever needed
- **Enables rapid deployment of mySAP Business Suite solutions** because HP consultants, cooperating closely with SAP, use a structured approach based on SAP best practices to help customers design and implement the IT infrastructure their enterprise needs to ensure a smooth, speedy rollout of mySAP Business Suite solutions
- **Provides end-to-end control** of the entire mySAP Business Suite environment with management tools and support services that manage every component, from hardware to application—even in distributed, Internet-based system environments
- **Enables faster recovery time** to ensure the customer's SAP environment is restored with minimal impact to their business
- **Provides the highest level of storage performance in the industry,** which contributes to higher productivity of the customer's SAP resources

Glossary

BCV — Business Continuance Volume.

cache — A fast, temporary storage buffer in a controller or computer.

command line interface (CLI) — The configuration interface operating the controller software.

clone — A utility physically duplicating data on any unpartitioned single-disk unit, stripeset, mirrorset, or striped mirrorset.

EVA — Enterprise Virtual Array.

fabric — A network of Fibre Channel switches or hubs and other devices.

FCA — Fibre Channel Adapter. Newer HBA has FCA in their name.

Fibre Channel — An ANSI standard name given to a low-level protocol for a type of serial transmission. The Fibre Channel specifications define the physical link, the low-level protocol, and all other pertinent characteristics.

HBA — Hos Bus Adapter. The Fiber adapter installed in a server connecting the server to the SAN.

HSV — Hierarchical Storage Virtualization. The controller of the EVA. On EVA500 the controller is called HSV110, on EVA300 the name is HAV100.

SAN — Storage Area Network.

Vraid-1 — Virtual RAID-1 implemented in the HSV controller. Vraid-1 is a technology mirroring the data on two separate disk spindles.

Vraid-5 — Virtual RAID-5 implemented by the HSV controller.

Vsnap — Virtual Snapshot. A point-in-time view of the data residing on an EVA. The Vsnap is created by the HSV controller.

Vsnapclone — A point-in-time view of data on a EVA. A Vsnapclone starts as a Vsnap and over time migrates to a clone.

Virtual Controller Software (VCS) — Software installed on the EVA HSV controller that provides the operating environment for the Enterprise Virtual Array.

For more information

To learn more about HP storage solutions for SAP, contact your local HP sales representative or visit our Web site at: www.hp.com/go/storage

To learn more about the HP SAP Global Alliance, contact your local HP sales representative or visit our Web site at: **HP SAP global alliance,** www.hp.com/go/sap