hp storage solutions

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invent

technical blueprint

hp StorageWorks rapid backup for mySAP Business Suite for Oracle on HSG80 on Tru64

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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 is put in backup mode for an extended period. Users may experience slow system response time 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 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 Rapid Backup Solution eliminates these challenges by using HSTK utility integrated with SAP/Oracle and the SAP tools BRBACKUP and BRRESTORE.

solutions overview

The SAP backup/restore functions are among the most important operations in the production environment. Downtime or application performance penalty can be detrimental and cannot be tolerated. The HSTK procedure split/mirror functions built into the HP solution enable customers to easily back up their production database, reducing the time the application needs to be in backup mode for online backup or minimizing downtime for offline. This solution integrates SAP application tools and HP StorageWorks technology. Backup operations are completed using streaming backup data from a mirror instead of an original disk. Because of this, the time that the database has to be in backup mode is minimized (online) or downtime is minimized (offline) and backup operation management is simplified. This solution also provides for the rapid restore and recovery of individual data volumes. Customers can restore damaged files or individual systems to their point of failure. By implementing this solution, the customer's mean-time-between-failures is drastically reduced.

The solution is based on the capability of the modular arrays to create a clone of the data residing on the disk subsystem by performing a split/mirror at the controller level. This solution uses HSTK utility, which directly communicates to HP HSG80 subsystems and does the split/mirror operations at the HSG80 controller level. Rapid Backup for mySAP Business Suite solutions deliver quantifiable business benefits.

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.

Businesses today know that even planned downtime costs money, and the process of backing up data in the traditional manner—directly from a primary volume to tape—can take hours to complete, slow application performance, or require the business application to be taken offline. This solution enables customers to back up data to tape without affecting application performance or availability. The HP SAP solution also simplifies individual volume recovery for a database administrator and saves hours of downtime compared to traditional tape-based restore.

solution design and design rules

The HSTK utility communicates to the HSG80 controller and performs split operation for the third member of the mirrorset and resynchronizes the mirror without affecting the production system. These operations are performed in a background process, which is executed on a separate backup system, leaving operations and access to the application available. Because of this, the database does not have to be in hot backup mode or down for a long period of time. In addition to this configuration, setting up remote HSG80 storage enables rapid recovery in a reasonable time for individual volumes in the production environment.

For a backup, the third mirror disk is detached from the original mirrorset and mounted on the backup system. The backup process—streaming data to tape—is started on the backup system without interfering with the disks on which the application is running. After backup, depending on the option, the mirror disk is reattached to the original disk. The integration does not create new mirrors to perform the backup. It uses the existing three-member mirror pairs. The pair of disks is already synchronized and in paired status at the beginning of the backup.

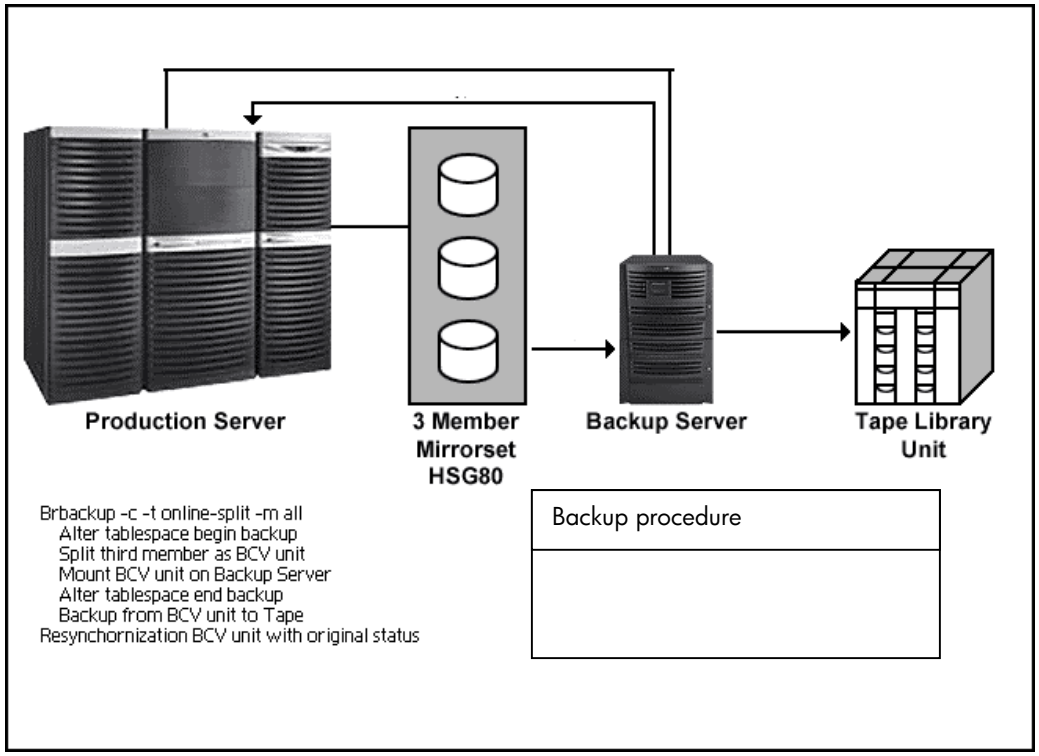

figure 1

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. As the disk subsystem is the slowest part of an R/3 system, it is extremely important to design it for optimal performance. For an SAP R/3 server, the disk subsystem for the SAP/Oracle databases is commonly designed using RAID fault-tolerant settings, which delivers optimal performance.

In tests, HP used RAID 1+0 striped 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.

A three-member striped mirror set—a striped set whose members are mirrorsets—is created. The split-off third member is known as a business continuance volume (BCV). After the BCV has been backed up to tape, it can be resynchronized immediately or it can be retained for a day depending on the customer's business needs. This way, data can be restored rapidly.

For best security and performance results, the database data files and the database online redo log files should reside on different disks. Because the online redo logs are written synchronously, they produce the most I/O activity of all database files.

The overall performance of the disk subsystem depends heavily on the number of disk drives installed. The more drives that are installed in a volume (RAID 1+0, RAID 5), the more I/Os per second and the higher the transfer rate the volume can provide.

In a typical mySAP Business Suite environment that uses Oracle as the database, access to data can be random, even sequential table scan through primary index.

Users can 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.

During a merge operation, a disk out of the pool is brought into each of the mirrorsets of the production volume. After the merge operation, the mirrorsets contain the production disks as well as the disk brought in during the merge. Because the configuration file describes which disks in the mirrorset are the production disks, the scripts know which disk to remove again during the split operation.

The Oracle Fail Safe product is responsible for failing over and restarting the SAP database on a surviving node in the solution configuration. The SAP database in an Oracle active-passive configuration with a single instance runs on one of the cluster members.

component review

Table 1 provides a sample bill of materials used in the SAP/Oracle non-disruptive backup/restore solutions.

table 1: bill of materials for SAP/Oracle Rapid Restore-Backup Solution

Item	Item Description
1	HSG Tool Kit (HSTK)
2	ACS 8.6P Controller Firmware
3	Operating System Platform Software kit for Tru64 UNIX 5.1A
4	ema 12000 with 2 Chassis Four HSG80 Controllers
5	Hard Disk Drives, 18.2 GB, 10K UWSE
6	Two Alpha Server DS20 (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	VERITAS NetBackup/Computer Associates ARCserve 2000/Legato Networker

1. HSTK software — HSTK software is necessary on the backup system that communicates or coordinates communication with hosts and storage subsystems for splitting and resynchronization of the mirrors.
2. Controller firmware — One instance of ACS is necessary for each HSG80 controller. ACS firmware is a PCMCIA card inserted into the front panel of the controller. ACS 8.6P supports cloning and snapshots as well.
3. Operating System Platform kit CDROM — HP StorageWorks Solutions Software ra8000/ma8000 Fibre Channel Solutions for Tru64 UNIX installation files are required for the specific operating system and host involved.
4. Disk array — For these tests, two ema12000/4214 and one ma8000/4254 were used. The subsystem configured in multi-bus failover.
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 mirrorsets were created, each with three members, and were then striped together to form one logical unit.
6. Backup system — In this test, one HP Alpha DS20 server was used as the production system and the other HP Alpha DS20 server as the backup system. The backup system must maintain performance levels during a backup/restore operation.
7. Fibre Channel Host Bus Adapter (HBA) — The Tru64 UNIX backup system supports the following Fibre Channel HBAs: KGPSA-CA. Refer to the HBAs driver information from the HP storage Web site at www.hp.com/go/storage
8. Fibre Channel Interconnect — Storage Area Network (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. The basic part number is 234457 and the suffix B2x denotes the length in meters. Suffix B21 is 2, B22 is 5, B23 is 15, B24 is 30, and B25 denotes a 50-m cable. Each controller comes with one 5-m cable. All other cables must be ordered separately.
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. #341176.B21 for 6-foot cable or #341177-B21 for 12-foot cable.
12. MSL5026 Super DLT 110/220 Tape Library is a needed solution component— HP SDLT 110/220, HP 5/70 GB DLT tape drives.
13. Third-Party Backup Software — Computer Associates ARCserve 2000 or VERITAS NetBackup or Legato Networker can be used with this solution.

HSTK-PERL SCRIPTS delivered through HP Professional Services

The scripts are driven by (1) the application action list, describing the application actions to be taken, (2) the configuration file, describing the contents of the production volumes, unit characteristics and so on, and (3) the output from CLI commands, issued by the scripts to the controller. To implement this solution, this service is required.

synergy of components

online backup

An online split 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 database tablespaces to begin backup mode. This mode prepares the data files for backup by forcing all committed transactions to be recorded in the archive logs thereby reducing I/O to the tablespaces. At that time, a copy (BCV) of the database is split off. After the split has been completed, BRBACKUP alters the tablespaces to end the backup mode. Then the physical backup is performed on the backup system. Refer to figure 2.

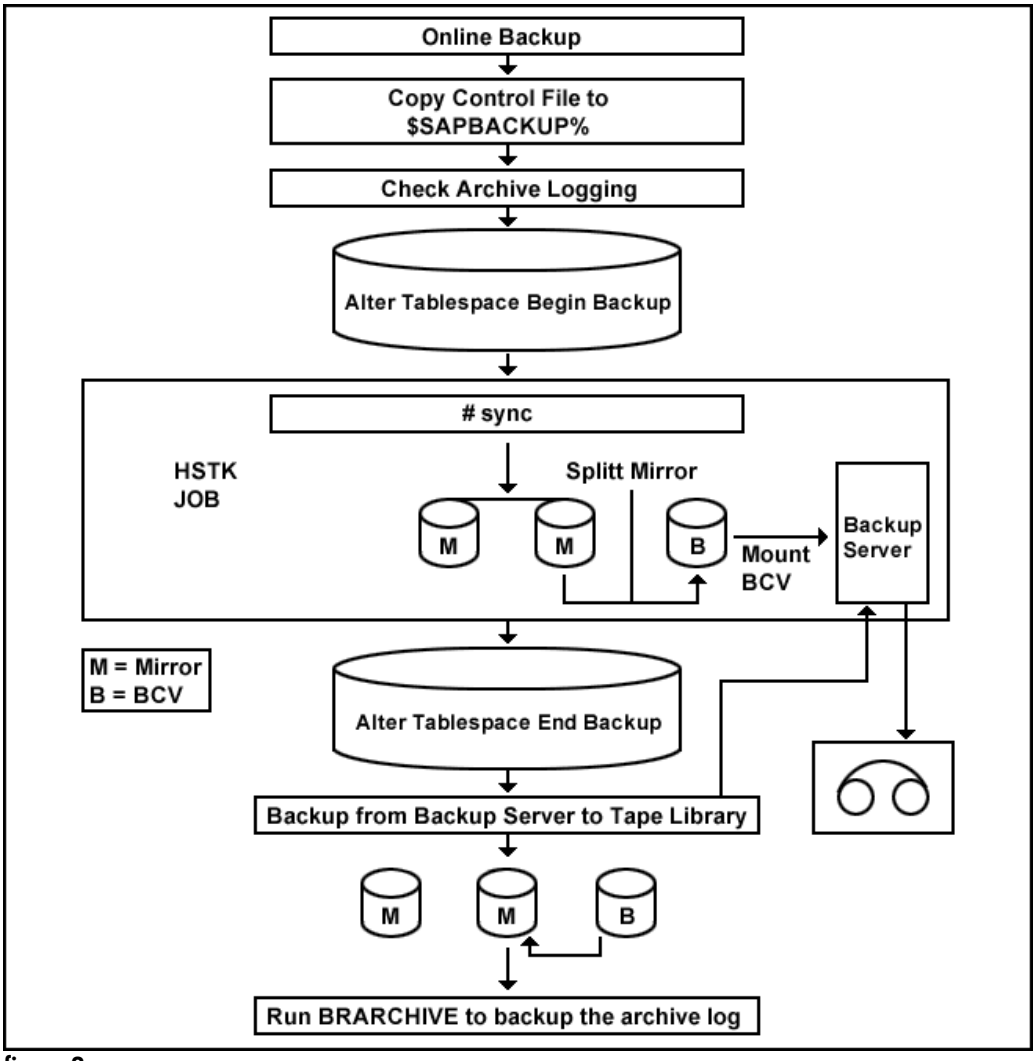

figure 2.

offline split mirror backup

During SAP offline split backup, the database is shut down to perform the BCV split. After the split has been completed, 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.

rapid-restore strategies (rapid recovery from remote HSG80 subsystem)

Data, which has been backed up to disk, can be restored from disk, which is ultimately faster than restoring from tape. Files that are readily available on disk (in a BCV) are not required to be restored from offline storage media in the event of a database crash, reducing mean time to repair (MTTR). Most of the delay occurs during recovery or restoring the necessary files from offline backup tape media. If the files pertaining to the most current backup are already on disk, high restore time can be avoided—an important reason for maintaining the most recent online backup on disk. Figure 3 shows rapid recovery possible in a reasonable time.

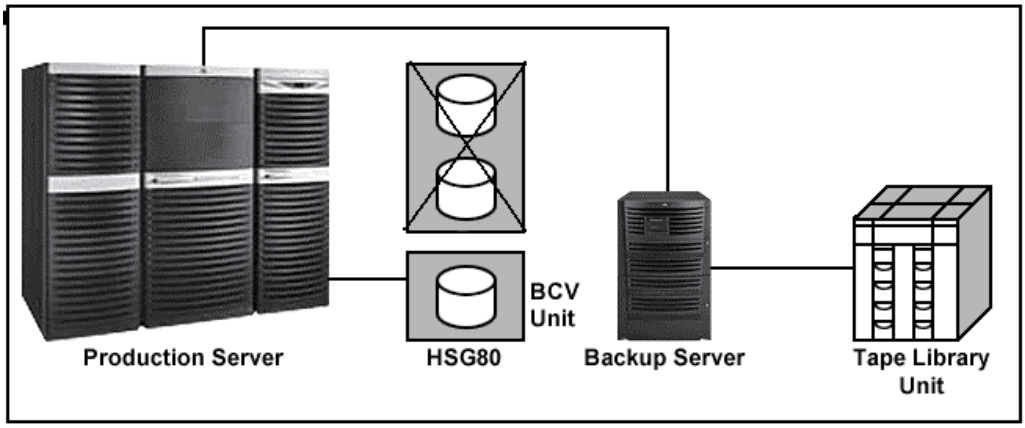

figure 3. rapid restore from BCV unit to production server

applying the redo logs

This step in the recovery process depends on what is being restored and whether the database must be open during recovery. Oracle provides methods for performing data file, tablespace, and database recovery. For more information, refer to the Oracle backup/recovery documentation by Oracle Press. When recovering the database, you must give the command "Recover database until cancel! Or until time 'yyyy-mm-dd:hh:mm:ss:ms.'" When it requests to apply redo logs, if you satisfy the location of the redo logs, press the **Enter** key, otherwise you must specify the location of the redo logs.

resilient, extensible, controllable

- resilient — simplifies management and implementation of you 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. An online-split backup is a best practice for high-availability, mission-critical applications like SAP. During the online-split backup, the database performance is minimally affected while the data is accessible to users and the application while using the backup server with load on the production system. An offline backup can be performed with this solution, which will minimize 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.
- Queries that can be issued on the backup server as long as BCV units are available, instead of issuing real-time queries on production data.
- A test system for development and debugging application code.

- 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. HP has quantified results of tested resynchronizing of RAID sets in a zero-latency SAN for a medium-sized SAP database in the range of 30 MB/s per HSG80 with direct Fibre inter-switch links (ISLs) and 21 MB/s using FC-IP gateways. 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.

solution-services and specific configuration hardware

hp professional services

- HSTK-HP Professional Services (required)

hardware sample configuration

The solution can be configured for small, medium, and large SAP environments.

HSTK-HP Professional Services
ACS 8.6P Controller Software
ema12000 with two Chassis Four HSG80 Controllers
Hard Disk Drives, 18.2 GB, 10K UWSE
Two Alpha Server DS20 (production and backup systems)
Fibre Channel HBA (switched fabric), KGPSA-CA
Fibre Channel Storage two SAN Switches, 16 port
FC Optical Short Wave GBIC
Fibre Channel Optical Cable
Modular Data Router
Super DLT 110/220 Tape Library

software

Tru64 UNIX 5.1a	Oracle RDBMS 8.1.7.2.3
Advfs 4	SAP R/3 4.6c
C complier	Legato Networker 6.1
NFS	
NLS	

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

array controller software (ACS) — Software contained on a removable PCMCIA program card providing the operating environment for the array controller.

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.

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

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.

mirroring — The act of creating an exact copy or image of data.

planned failover — As applied to the data protection, an orderly shutdown of the controllers for installing new hardware, updating the software, and so on. The host applications are quiesced and all write operations are permitted to be completed before the shutdown.

remote copy sets — A feature allowing data to be copied (mirrored) from the originating site (initiator) to a remote site (target). The result is a mirror copy of the data (remote copy set) at two disparate sites. Used in disaster-tolerant applications such as the HP StorageWorks Data Replication Manager. CLI commands available are ADD REMOTE_COPY_SETS, SET *remote-copy-set-name*, SET *controller* REMOTE_COPY.

unplanned failover — As applied to the Data Replication Manager, recovery from an unplanned outage of the controllers. This may occur when the site communication is lost or it may be because of some other failure whereby remote copy sets cannot be implemented. The controllers do not perform an orderly shutdown.

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: www.hp.com/go/sap

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