

Solution Brief

FlexPod Datacenter Oracle Database Backup with SnapCenter

Superior data protection with NetApp Snapshots
and DevOps with NetApp FlexClones

Key Benefits

Back Up Databases Fast

NetApp® SnapCenter® uses NetApp Snapshot™ technology to create a copy of an entire Oracle database at storage-volume level almost instantaneously.

Recover Databases Fast

An Oracle database can be quickly restored with SnapCenter by flipping the pointers to a point-in-time application-consistent Snapshot copy. Archive logs can then be applied to bring the database up to date.

Clone Databases Fast

NetApp SnapCenter FlexClone® technology allows the creation of many writable copies of a database while consuming only incremental storage capacity. Cloned copies of the database can be used for dev/test, data recovery from user error, and more.

Improve Database Performance and RTO and RPO

Removing long-running Oracle backup processes improves overall database performance. More frequent and shorter backup windows improve RTO and RPO.

Increase Productivity

SnapCenter provides a single pane of glass and end-to-end data protection for Oracle databases and allows DBAs to deliver more workloads in less time.

The Challenge

In an era of data-driven business and applications, data is the lifeblood of any enterprise. Data powers essentially every operation in the modern enterprise, from keeping the supply chain operating efficiently to managing customer relationships.

FlexPod® Datacenter with NetApp AFF systems is a shared infrastructure solution that combines best-of-breed technologies from Cisco and NetApp in a powerful converged platform to meet enterprise Oracle database requirements. Cisco and NetApp work closely with Oracle to support the demanding transactional and response-time-sensitive databases required by today's businesses.

It's crucial to protect your mission-critical Oracle database running on FlexPod Datacenter. Traditionally, Oracle DBAs use Oracle Recovery Manager (RMAN) to perform database backup and recovery. RMAN is a reliable tool for Oracle DBAs that is built into the Oracle database software stack. However, backup can take a long time, especially for large databases. It can also take a long time to restore the database in a recovery scenario, which might take a heavy toll on the RTO. A large amount of precious storage space must be reserved for storing the backup of Oracle data and log files.

Is there a better way?

The Solution

NetApp SnapCenter for Oracle on FlexPod Datacenter

FlexPod Datacenter is built on a storage array managed by NetApp ONTAP® data management software. Developed over 20 years, ONTAP offers many data management features for Oracle database protection, such as NetApp Snapshot, SnapMirror®, and FlexClone technologies. SnapCenter is a NetApp GUI tool to implement these ONTAP features for Oracle database backup and recovery.

In general, Oracle database backups using RMAN create a full database backup copy on a predefined schedule, such as weekly, as a baseline, followed by incremental backups during the rest of the week. Depending on the size of the database, the initial full backup can take a long time. The backup file can be stored at a staging area or a flash recovery area in the Oracle database. Subject to your retention policy, backups can be archived to tape before they are purged from the disks. The archived tape media can be sent offsite for protection. Storage space as large as the database must be allocated either in a staging area or in an Oracle flash recovery area for the backup, and a DBA must monitor the free space to ensure that there is enough space for the backup.

In an Oracle database recovery scenario, an RMAN backup is restored, and archived log files are applied to bring the database up to date. It can take a long time to run the RMAN database restore because of the size of the database and where the files are restored from. Cloning the Oracle database via RMAN is a complex process and can be error prone. Like the RMAN backup, a cloned database is duplicated from a backup by copying data to a clone location block by block. For any production-size database, this is a lengthy process.

On the other hand, NetApp SnapCenter employs NetApp Snapshot technology to create a copy of an entire Oracle database from a NetApp storage volume instantaneously. Compared with RMAN, Snapshot copies do not require a full baseline backup copy because they are not stored as physical copies of blocks. Instead, snapshots consist of pointers to the data blocks that existed when the Snapshot copies were created.

ONTAP snapshots are based on redirect-on-write logic. Changes to a data managed by ONTAP are always consolidated and written to free blocks and written to media as a new RAID stripe. If prior versions of those blocks are no longer referenced by other storage objects, such as a snapshot, clone, or deduplicated data, they are then released back into the pool of free blocks. This process avoids double writes, and the associated performance damage caused by copy-on-write approaches.

For Oracle database backups, Snapshot copies yield dramatic time savings. For example, a backup that took 26 hours to complete using Oracle RMAN alone can take less than 2 minutes to complete using SnapCenter.

A Snapshot backup copy can also be restored almost instantaneously, because the data restoration does not copy any data blocks but rather flips the pointers to the application-consistent Snapshot block images when the Snapshot was taken. A SnapCenter clone creates a separate copy of metadata pointers to an existing Snapshot copy and mounts the new copy to a target host. The process is fast and storage efficient.

The following table summarizes the primary differences between Oracle RMAN and NetApp SnapCenter.

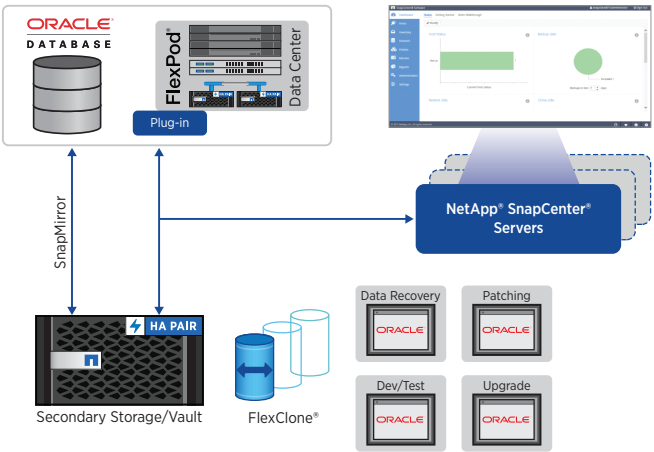
	Backup	Restore	Clone	Need Full Backup	Space Usage	Offsite Copy
RMAN	Slow	Slow	Slow	Yes	High	Yes
SnapCenter	Fast	Fast	Fast	No	Low	Yes

One frequently asked question is whether Snapshot is a valid backup solution because a Snapshot copy coexists with current production data. If the current production data is lost, then so is the backup copy. This is a legitimate concern. However, the same concern also applies to an RMAN backup. For example, if there is disk-level failure or site loss, all backup data that resides in the Oracle flash recovery area is also lost.

Any carefully planned backup solution mandates a secondary copy at a secondary site. SnapCenter provides an option to protect Snapshot copies at a secondary site. SnapCenter advanced configuration can enable a policy to replicate copies to a secondary site via NetApp SnapMirror or SnapVault® so that the primary data is fully protected with a copy stored at the secondary site. Starting with ONTAP 9.5, you can enable synchronous SnapMirror technology to achieve even higher RTO and RPO.

Compared to RMAN, NetApp SnapCenter is a very useful tool. It allows almost instantaneous backup, recovery, and cloning of production Oracle databases in a storage efficient way. It can provide real storage cost savings and make the daily activities of the Oracle DBA easier. Fast Snapshot copies remediate throttle issues with storage bandwidth in backing up databases and improving database performance. Fast backup and restore can also dramatically improve RTO and RPO.

SnapCenter Implementation for Oracle on FlexPod



- Single pane of glass
- Enterprise ready
- End-to-end data protection
- Do more, faster
- Scalable architecture
- HA capable
- Easy-to-use GUI
- Lightweight plug-ins
- Role-based access control
- Policy-based backup, replication, and cloning

How SnapCenter Backup works

Backup types supported:

- Full backup (data + archive log + control file)
- Partial backup (archive log only)

Features:

- RMAN catalog of Snapshot backups for granular recoveries
- Backup verification (verify corrupt blocks in backup)
- Mount backup
- Replication (replicate backups to secondary long-term SnapMirror and SnapVault storage)
- Resource groups (group multiple databases in a dataset for backup)
- Snapshot optimization (reduce the number of Snapshot copies for databases sharing the same volume)
- Support for various file system layouts

How SnapCenter Recovery works

Restore types supported:

- Full database restores
- Partial: PDB, PDB tablespaces, tablespaces, control files

Features:

- Point-in-time recovery for full database restore
- Provision for passing external archive log location
- Recovery types: Until SCN, date and time, full logs
- Block-level or tablespace point-in-time recovery using RMAN via cataloging NetApp Snapshot copies
- Quick restore and recovery of database from long-term secondary replicated storage.

How SnapCenter Clone works

Clone for the following purposes:

- Dev/test data refresh
- Oracle upgrade and patching validation
- Data recovery due to logical corruption or user errors
- And more

Features:

- Clone to same or alternate host
- Clone from primary or secondary SnapMirror or SnapVault storage
- Clone from secondary unified storage
- Clone from NetApp Cloud ONTAP running in AWS or Azure as secondary or primary
- Clone CLI automation
- Change NID (database ID)
- Customize clone database parameters (pfile, spfile)
- Customize mount point location

SnapCenter does not change the normal Oracle database backup and recovery mechanism. For example, for a SnapCenter-based online backup, the following steps are executed:

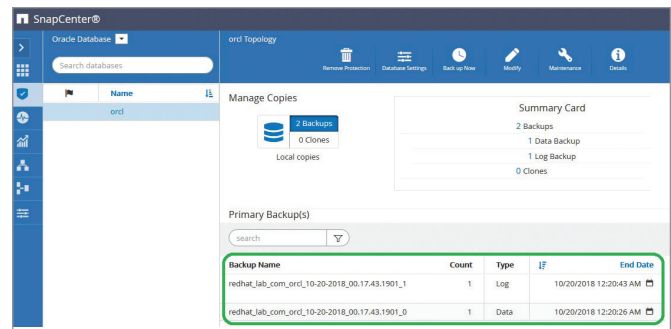
1. SnapCenter agent issues an Alter Database Begin Backup command.
2. SnapCenter makes a Snapshot copy of all volumes that are hosting Oracle data files.
3. The SnapCenter agent issues an Alter System Archive Log Current command to force a current log switch and archive the active log file.
4. SnapCenter makes a Snapshot copy of all volumes hosting the archive logs.
5. SnapCenter agent issues an Alter Database End Backup command.

A typical RMAN backup follows the same procedure. The only difference is that RMAN makes a copy of the database and log file block by block in steps 2 and 4, while SnapCenter makes Snapshot copies instead.

Likewise, the SnapCenter Oracle database recovery restores a backup copy of a Snapshot point-in-time copy quickly instead of restoring data and log files block by block and applying the archived log file to make the database current.

The results of implementing NetApp SnapCenter for Oracle include much faster backup, recovery, and clone while maintaining normal Oracle backup, recovery, and clone procedures. Storage saving are achieved with ONTAP storage efficiency.

Point-and-click SnapCenter GUI interface



To see the tool in action, you can experiment with SnapCenter for your FlexPod Oracle database protection today. Download the SnapCenter software: [SnapCenter software download](#).

For more technical information about SnapCenter for Oracle, see [TR 4700, "SnapCenter Plug-In for Oracle Database,"](#) and the NetApp [SnapCenter resources page](#) at NetApp.com.

About NetApp

NetApp is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation and optimize their operations. For more information, visit www.netapp.com. #DataDriven