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NORTH AMERICA

Technology Overview

Database: 18c / 19c

Company: Oracle Corporation

Topic: ASM Database Clones and
ASM Flex Disk Group

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On the Eighth Day of 18c/19c, Viscosity Gave to me...

ASM Database Clones and Flex Disk Group

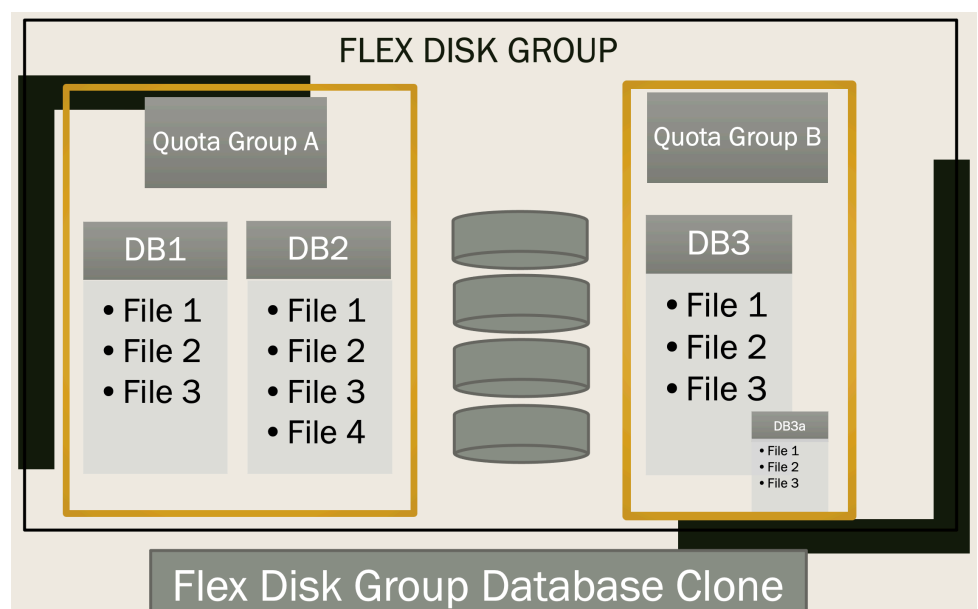
December 17, 2020

In keeping with today's storage-based replication technologies, such as "mirror splitting" within a storage array, or "snapshot replication" in a file system, and ASM with Flex Disk Groups in Oracle Grid Infrastructure, 18c and 19c provides the ability for creating near instantaneous copies of databases. These quick database copies are typically leveraged as Development and Test environments. They can also be used to create a read-only master for an Exadata snapshot copy (when used with Exadata). Greatest advantages of using this "ASM Database Clone" feature are:

- Instantaneous capability to provisioning databases no matter the size
- Limited consumption of physical storage to provision copies of databases

Prerequisites and requirements exist to leverage this database cloning innovation. First, it is supported only in Oracle ASM flex and extended disk groups. The feature is supported only with Oracle Database 18c, version 18.1 or higher. The disk group compatibility attributes, COMPATIBLE.ASM and COMPATIBLE.RDBMS needs to be set to 18.0 or higher. Lastly, the source database (parent) must be a pluggable database, and the database clone (child) is created as a pluggable database in the same container database.

When an ASM database clone is made, all the files associated with the database are split together to provide an independent database. The following diagram represents the splitting of the files for database "DB3" providing a separate and independent database "DB3a".



To utilize the ASM Database Cloning feature, we must first prepare a Mirror Copy. During this step, Oracle ASM allocates space for the additional copies of data. This process involves creating the cloned files and linking them with the source files. *Note: that the data is not copied in this step; the copying is done during re-mirroring (shown later).* Remirroring occurs during the prepare phase of rebalance, which is initiated as part of this step.

```
SQL> show pdbs
```

CON_ID	CON_NAME	OPEN MODE	RESTRICTED
2	PDB\$SEED	READ ONLY	NO
3	DB3	READ WRITE	NO

Currently, we have:

```
SQL> alter session set container = DB3;
```

Session altered.

```
SQL> show pdbs
```

CON_ID	CON_NAME	OPEN MODE	RESTRICTED
3	DB3	READ WRITE	NO

```
SQL> alter pluggable database prepare mirror copy DB3_MIRROR;
alter pluggable database prepare mirror copy PCWFCFG_MIRROR
```

*

ERROR at line 1:

ORA-15221: ASM operation requires compatible.asm of 18.0.0.0.0 or higher

In this example, the prepare mirror copy command produced an error, because one of the required parameters “compatible.asm” was not set to 18.0. After advancing the “compatible.asm” attribute, the command completed successfully:

```
SQL> ALTER PLUGGABLE DATABASE PREPARE MIRROR COPY DB3_MIRROR.
Pluggable database altered.
```

We can check the status of the database clone by querying V\$ASM_DBCLONE_INFO view, particularly paying attention to the DBCLONE_STATUS column as shown below:

```
SQL> SELECT * FROM V$ASM_DBCLONE_INFO;
```

GROUP_NUMBER	DBCLONE_NAME	MIRRORCOPY_NAME	DBCLONE_STATUS	PARENT_DBNAME	PARENT_FILEGROUP_NAME	CON_ID
1	DB_UNKNOWN	DB3_MIRROR	PREPARED	DB3	DB3	0

After the PREPARE phase completes successfully, we can connect to the CBD root container. Essentially, we can snapshot clone from the mirrored copy and create the database clone leveraging the USING MIRROR COPY syntax:

```
SQL> SHOW CON_NAME
CON_NAME
```

```

-----
CDB$ROOT

SQL> CREATE PLUGGABLE DATABASE DB3a FROM DB3 USING MIRROR COPY DB3_mirror;
Pluggable database created.

SQL> ALTER SESSION SET CONTAINER = DB3a;
Session altered.

SQL> SHOW CON_NAME
CON_NAME
-----
DB3a

```

We can query the V\$ASM_DBCLONE_INFO view again and look at the DBCLONE_STATUS to confirm the status of SPLIT COMPLETED.

If done with the mirror copy of the PDB, we can remove the PDB with the DROP MIRROR COPY clause. The DROP MIRROR COPY clause triggers a rebalance on the appropriate disk group.

```

SQL> ALTER SESSION SET CONTAINER = DB3;
Session altered.

SQL> ALTER PLUGGABLE DATABASE DROP MIRROR COPY DB3_mirror;
Pluggable database altered.

```

Cleaning Up After Failed Attempts

If the clone process fails for some reason, the DBCLONE_STATUS column of the V\$ASM_DBCLONE_INFO view will display a status as FAILED. A REBALANCE can be initiated against the disk group to clean up the file group. For example, after connecting to the Oracle ASM instance, we can run the following:

```
SQL> ALTER DISKGROUP data REBALANCE WAIT;
```

Other ASM 18c New Features

In Oracle ASM 18c, we can convert a conventional disk group (disk group created before Oracle ASM 18c) to an Oracle ASM flex disk group, without using the restrictive mount (MOUNTED RESTRICTED) option. We can also drop a file group and its associated files (*drop including content*) using the CASCADE keyword with ALTER DISKGROUP ... DROPFILEGROUP SQL statement.

New ASM Feature in Oracle 19c

Oracle Grid Infrastructure 19c provides another important feature for reducing the total cost of storage management. With Oracle ASM disk group, we have two way mirroring (normal redundancy) and three way mirroring (high redundancy), for database files and for write once files like Archive logs and backup sets which is wasteful of space. To reduce the storage overhead to write once type of files, Oracle introduced single parity settings in Oracle Database 19c. Parity protection is provided for ASM disk group setup as flex disk groups. The parity setting is intended for write-once files and is not supported on data files and read/write files.

To establish parity, we need a minimum of three regular (not quorum) failure groups in the flex disk group. If there are three or four failure groups when the parity file is created, then each parity extent set has two data extents. That scenario incurs 50% redundancy overhead, rather than 100% redundancy overhead, for two-way mirror files. If there are five or more failure groups when the parity file is created, then each parity extent set has four data extents. That scenario incurs 25% redundancy overhead.

Below is an example of changing the group property of archive logs, to utilize parity protection for newly created archive files.

```
ALTER DISKGROUP ARC MODIFY FILEGROUP FileGroup_PDB1 SET 'archivelog.redundancy' = 'PARITY';
```

We can also do this for database backups. Imagine the storage savings from setting the parity to be equivalent to external redundancy on Oracle engineered systems; that only leverage normal or high redundancy for disk storage.

Other New Features in Oracle Grid Infrastructure 19c include:

- The ability to flush the password file metadata

```
SQL> ALTER SYSTEM FLUSH PASSWORDFILE_METADATA_CACHE
```

- Automatic block corruption recovery with the CONTENT.CHECK disk group attribute
- New and updated ASMCMD commands
 - The password option with the ASMCMD **pwcreate** command is now optional
 - ASMCMD introduces the **setspareparent** command to set the parent for a sparse child file
 - The ASMCMD **mvfile** command moves a file to the specified file group in the same disk group

Summary

Enhancements to ASM disk groups in Oracle Grid Infrastructure 18c and 19c, in conjunction with Oracle Database 19c features, will revolutionize how we create snapshot copies of pluggable databases. Features like single parity will reduce storage consumption for engineered systems, so that customers can leverage storage for critical business use cases. Storage savings and the ability to rapidly provision pluggable databases are just two of the biggest new features of Oracle Grid Infrastructure. Come back to Viscosity's website for more documents featuring new features in the future.

One of the sayings we have at Viscosity is our customer's, "have four aces in their pocket". Over the next 4 days, the talented staff at Viscosity along with our Oracle ACEs will address more Oracle Database 18c and 19c new features. Continue to join us next year, as we continue our Oracle Database 19c hands-on-lab workshops.

Happy Holidays!