Define a backup strategy for Oracle databases

SnapCenter Software

Soumik Das, Archana
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Defining a backup strategy before you create your backup jobs ensures that you have the backups that you require to successfully restore or clone your databases. Your service-level agreement (SLA), recovery time objective (RTO), and recovery point objective (RPO) largely determine your backup strategy.

An SLA defines the level of service that is expected and addresses many service-related issues, including the availability and performance of the service. RTO is the time by which a business process must be restored after a disruption in service. RPO defines the strategy for the age of the files that must be recovered from backup storage for regular operations to resume after a failure. SLA, RTO, and RPO contribute to the data protection strategy.

Supported Oracle database configurations for backups

SnapCenter supports backup of different Oracle database configurations.

- Oracle Standalone
- Oracle Real Application Clusters (RAC)
- Oracle Standalone Legacy
- Oracle Standalone Container Database (CDB)
- Oracle Data Guard standby

  You can only create offline-mount backups of Data Guard standby databases. Offline-shutdown backup, archive log only backup, and full backup are not supported.

- Oracle Active Data Guard standby

  You can only create online backups of Active Data Guard standby databases. Archive log only backup and full backup are not supported.

  Before creating a backup of Data Guard standby or Active Data Guard standby database, the managed recovery process (MRP) is stopped and once the backup is created, MRP is started.

- Automatic Storage Management (ASM)
  - ASM standalone and ASM RAC on Virtual Machine Disk (VMDK)

    Among all the restore methods supported for Oracle databases, you can perform only connect-and-copy restore of ASM RAC databases on VMDK.

  - ASM standalone and ASM RAC on Raw device mapping (RDM) You can perform backup, restore, and clone operations on Oracle databases on ASM, with or without ASMLib.
  - Oracle ASM Filter Driver (ASMFD)

    PDB migration and PDB cloning operations are not supported.

  - Oracle Flex ASM

For the latest information about supported Oracle versions, see the NetApp Interoperability Matrix Tool.

Types of backup supported for Oracle databases

Backup type specifies the type of backup that you want to create. SnapCenter supports online and offline backup types for Oracle databases.

Online backup

A backup that is created when the database is in the online state is called an online backup. Also called a hot backup, an online backup enables you to create a backup of the database without shutting it down.

As part of online backup, you can create a backup of the following files:

- Datafiles and control files only
- Archive log files only (the database is not brought to backup mode in this scenario)
- Full database that includes datafiles, control files, and archive log files

Offline backup

A backup created when the database is either in a mounted or shutdown state is called an offline backup. An offline backup is also called a cold backup. You can include only datafiles and control files in offline backups. You can create either an offline mount or offline shutdown backup.

- When creating an offline mount backup, you must ensure that the database is in a mounted state.

  If the database is in any other state, the backup operation fails.

- When creating an offline shutdown backup, the database can be in any state.

  The database state is changed to the required state to create a backup. After creating the backup, the database state is reverted to the original state.

How SnapCenter discovers Oracle databases

"Resources" are Oracle databases on the host that are maintained by SnapCenter. You can add these databases to resource groups to perform data protection operations after you discover the databases that are available. You should be aware of the process that SnapCenter follows to discover different types and versions of Oracle databases.

For Oracle versions 11*g* to 12*c*R1	**For Oracle versions 12*c*R2 to 18*c***
RAC database: The RAC databases are discovered only on the basis of /etc/oratab entries. You should have the database entries in the /etc/oratab file.	**RAC database**: The RAC databases are discovered using the srvctl config command.

For Oracle versions 11*g* to 12*c*R1	For Oracle versions 12*c*R2 to 18*c*
Standalone: The standalone databases are discovered only on the basis of /etc/oratab entries. You should have the database entries in the /etc/oratab file.	**Standalone**: The standalone databases are discovered based on the entries in the /etc/oratab file and the output of the srvctl config command.
ASM: The ASM instance entry should be available in the /etc/oratab file.	**ASM**: The ASM instance entry need not be in the /etc/oratab file.
RAC One Node: The RAC One Node databases are discovered only on the basis of /etc/oratab entries. The databases should be either in *nomount*, *mount*, or *open* state. You should have the database entries in the /etc/oratab file. The RAC One Node database status will be marked as renamed or deleted if the database is already discovered and backups are associated with the database. You should perform the following steps if the database is relocated: 1. Manually add the relocated database entry in the /etc/oratab file on the failed-over RAC node. 2. Manually refresh the resources. 3. Select the RAC One Node database from the resource page, and then click **Database Settings**. 4. Configure the database to set the preferred cluster nodes to the RAC node currently hosting the database. 5. Perform the SnapCenter operations. If you have relocated a database from one node to another node and if the oratab entry in the earlier node is not deleted, you should manually delete the oratab entry to avoid the same database being displayed twice.	**RAC One Node**: The RAC One Node databases are discovered using the srvctl config command only. The databases should be either in *nomount*, *mount*, or *open* state. The RAC One Node database status will be marked as renamed or deleted if the database is already discovered and backups are associated with the database. You should perform the following steps if the database is relocated: 1. Manually refresh the resources. 2. Select the RAC One Node database from the resource page, and then click **Database Settings**. 3. Configure the database to set the preferred cluster nodes to the RAC node currently hosting the database. 4. Perform the SnapCenter operations.

If there are any Oracle 12*c*R2 and 18*c* database entries in the /etc/oratab file and the same database is registered with the srvctl config command, SnapCenter will eliminate the duplicate database entries. If there are stale database entries, the database will be discovered but the database will be unreachable and the status will be offline.

Preferred nodes in RAC setup

In Oracle Real Application Clusters (RAC) setup, you can specify the preferred nodes on which the backup operation will be performed. If you do not specify the preferred node, SnapCenter automatically assigns a node as the preferred node and backup is created on that node.

The preferred nodes might be one or all of the cluster nodes where the RAC database instances are present. The backup operation will be triggered only on these preferred nodes in the order of the preference.

Example: The RAC database cdbrac has three instances: cdbrac1 on node1, cdbrac2 on node2, and cdbrac3 on node3. The node1 and node2 instances are configured to be the preferred nodes, with node2 as the first preference and node1 as the second preference. When you perform a backup operation, the operation is first attempted on node2 because it is the first preferred node. If node2 is not in the state to back up, which could be due to multiple reasons such as the plug-in agent is not running on the host, the database instance on the host is not in the required state for the specified backup type, or the database instance on node2 in a FlexASM configuration is not being served by the local ASM instance; then the operation will be attempted on node1. The node3 will not be used for backup because it is not on the list of preferred nodes.

In a Flex ASM setup, Leaf nodes will not be listed as preferred nodes if the cardinality is less than the number nodes in the RAC cluster. If there is any change in the Flex ASM cluster node roles, you should manually discover so that the preferred nodes are refreshed.

Required database state

The RAC database instances on the preferred nodes must be in the required state for the backup to finish successfully:

- One of the RAC database instances in the configured preferred nodes must be in the open state to create an online backup.
- One of the RAC database instances in the configured preferred nodes must be in the mount state, and all other instances, including other preferred nodes, must be in the mount state or lower to create an offline mount backup.
- RAC database instances can be in any state, but you must specify the preferred nodes to create an offline shutdown backup.

How to catalog backups with Oracle Recovery Manager

The backups of Oracle databases can be cataloged with Oracle Recovery Manager (RMAN) to store the backup information in the Oracle RMAN repository.

The cataloged backups can be used later for block-level restore or tablespace point-in-time recovery operations. When you do not need these cataloged backups, you can remove the catalog information.

The database must be in mounted or higher state for cataloging. You can perform cataloging on data backups, archive log backups, and full backups. If cataloging is enabled for a backup of a resource group that has multiple databases, cataloging is performed for each database. For Oracle RAC databases, cataloging will be performed on the preferred node where the database is at least in mounted state.

If you want to catalog backups of a RAC database, ensure that no other job is running for that database. If another job is running, the cataloging operation fails instead of getting queued.

By default, the target database control file is used for cataloging. If you want to add external catalog database,

you can configure it by specifying the credential and Transparent Network Substrate (TNS) name of the external catalog using the Database Settings wizard from the SnapCenter graphical user interface (GUI). You can also configure the external catalog database from the CLI by running the Configure-SmOracleDatabase command with the -OracleRmanCatalogCredentialName and -OracleRmanCatalogTnsName options.

If you enabled the cataloging option while creating an Oracle backup policy from the SnapCenter GUI, the backups are cataloged using Oracle RMAN as a part of the backup operation. You can also perform deferred cataloging of backups by running the Catalog-SmBackupWithOracleRMAN command. After cataloging the backups, you can run the Get-SmBackupDetails command to obtain the cataloged backup information such as the tag for cataloged datafiles, the control file catalog path, and the cataloged archive log locations.

If the ASM disk group name is greater than or equal to 16 characters, from SnapCenter 3.0, the naming format used for the backup is SC_HASHCODEofDISKGROUP_DBSID_BACKUPID. However, If the disk group name is less than 16 characters, the naming format used for the backup is DISKGROUPNAME_DBSID_BACKUPID, which is the same format used in SnapCenter 2.0.

> The HASHCODEofDISKGROUP is an automatically generated number (2 to 10 digit) unique for each ASM disk group.

You can perform crosschecks to update outdated RMAN repository information about backups whose repository records do not match their physical status. For example, if a user removes archived logs from disk with an operating system command, the control file still indicates that the logs are on disk, when in fact they are not. The crosscheck operation enables you to update the control file with the information. You can enable crosscheck by running the Set-SmConfigSettings command and assigning the value TRUE to the ENABLE_CROSSCHECK parameter. The default value is set to FALSE.

```
sccli Set-SmConfigSettings-ConfigSettingsTypePlugin-PluginCodeSCO-ConfigSettings
"KEY=ENABLE_CROSSCHECK, VALUE=TRUE"
```

You can remove the catalog information by running the Uncatalog-SmBackupWithOracleRMAN command. You cannot remove the catalog information using the SnapCenter GUI. However, information of a cataloged backup is removed while deleting the backup or while deleting the retention and resource group associated with that cataloged backup.

> When you force a deletion of the SnapCenter host, the information of the cataloged backups associated with that host are not removed. You must remove information of all the cataloged backups for that host before forcing the deletion of the host.

If the cataloging and uncataloging fails because the operation time exceeded the time out value specified for the ORACLE_PLUGIN_RMAN_CATALOG_TIMEOUT parameter, you should modify the value of the parameter by running the following command:

```
/opt/Netapp/snapcenter/spl/bin/sccli Set-SmConfigSettings-ConfigSettingsType
Plugin -PluginCode SCO-ConfigSettings
"KEY=ORACLE_PLUGIN_RMAN_CATALOG_TIMEOUT,VALUE=user_defined_value"
```

After modifying the value of the parameter, restart the SnapCenter Plug-in Loader (SPL) service by running the following command:

```
/opt/NetApp/snapcenter/spl/bin/spl restart
```

The information regarding the parameters that can be used with the command and their descriptions can be obtained by running Get-Help command_name. Alternatively, you can also refer to the SnapCenter Software Command Reference Guide.

Backup schedules

Backup frequency (schedule type) is specified in policies; a backup schedule is specified in the resource group configuration. The most critical factor in determining a backup frequency or schedule is the rate of change for the resource and the importance of the data. You might back up a heavily used resource every hour, while you might back up a rarely used resource once a day. Other factors include the importance of the resource to your organization, your Service Level Agreement (SLA), and your Recover Point Objective (RPO).

An SLA defines the level of service expected and addresses many service-related issues, including the availability and performance of service. An RPO defines the strategy for the age of the files that must be recovered from backup storage for regular operations to resume after a failure. The SLA and RPO contribute to the data protection strategy.

Even for a heavily used resource, there is no requirement to run a full backup more than once or twice a day. For example, regular transaction log backups might be sufficient to ensure that you have the backups you need. The more often you back up your databases, the fewer transaction logs SnapCenter has to use at restore time, which can result in faster restore operations.

Backup schedules have two parts, as follows:

- Backup frequency

  Backup frequency (how often backups are to be performed), called *schedule type* for some plug-ins, is part of a policy configuration. You can select hourly, daily, weekly, or monthly as the backup frequency for the policy. If you do not select any of these frequencies, then the policy created is an on-demand-only policy. You can access policies by clicking **Settings** > **Policies**.

- Backup schedules

  Backup schedules (exactly when backups are to be performed) are part of a resource group configuration. For example, if you have a resource group that has a policy configured for weekly backups, you might configure the schedule to back up every Thursday at 10:00 PM. You can access resource group schedules by clicking **Resources** > **Resource Groups**.

Backup naming conventions

You can either use the default Snapshot copy naming convention or use a customized naming convention. The default backup naming convention adds a timestamp to Snapshot copy names that helps you identify when the copies were created.

The Snapshot copy uses the following default naming convention:

```
resourcegroupname_hostname_timestamp
```

You should name your backup resource groups logically, as in the following example:

```
dts1_mach1x88_03-12-2015_23.17.26
```

In this example, the syntax elements have the following meanings:

- *dts1* is the resource group name.

- *mach1x88* is the host name.
- *03-12-2015_23.17.26* is the date and timestamp.

Alternatively, you can specify the Snapshot copy name format while protecting resources or resource groups by selecting **Use custom name format for Snapshot copy**. For example, customtext_resourcegroup_policy_hostname or resourcegroup_hostname. By default, the time stamp suffix is added to the Snapshot copy name.

Backup retention options

You can choose either the number of days for which to retain backup copies or specify the number of backup copies you want to retain, up to a ONTAP maximum of 255 copies. For example, your organization might require that you retain 10 days of backup copies or 130 backup copies.

While creating a policy, you can specify the retention options for the backup type and the schedule type.

If you set up SnapMirror replication, the retention policy is mirrored on the destination volume.

SnapCenter deletes the retained backups that have retention labels that match the schedule type. If the schedule type was changed for the resource or resource group, backups with the old schedule type label might still remain on the system.

For long-term retention of backup copies, you should use SnapVault backup.

Verify backup copy using the primary or secondary storage volume

You can verify backup copies on the primary storage volume or on either the SnapMirror or SnapVault secondary storage volume. Verification using a secondary storage volume reduces load on the primary storage volume.

When you verify a backup that is either on the primary or secondary storage volume, all the primary and the secondary Snapshot copies are marked as verified.

SnapRestore license is required to verify backup copies on SnapMirror and SnapVault secondary storage volume.