

Hybrid Cloud Database Solutions with SnapCenter

NetApp Solutions

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Table of Contents

ybrid Cloud Database Solutions with SnapCenter.	. 1
TR-4908: Hybrid Cloud Database Solutions with SnapCenter Overview	. 1
Solution Architecture	. 2
SnapCenter Requirements	. 3
Prerequisites configuration	. 4
Getting started overview	. 9
Workflow for dev/test bursting to cloud	86
Disaster recovery workflow	04

Hybrid Cloud Database Solutions with SnapCenter

TR-4908: Hybrid Cloud Database Solutions with SnapCenter Overview

Alan Cao, Felix Melligan, NetApp

This solution provides NetApp field and customers with instructions and guidance for configuring, operating, and migrating databases to a hybrid cloud environment using the NetApp SnapCenter GUI-based tool and the NetApp storage service CVO in public clouds for the following use cases:

- · Database dev/test operations in the hybrid cloud
- · Database disaster recovery in the hybrid cloud

Today, many enterprise databases still reside in private corporate data centers for performance, security, and/or other reasons. This hybrid cloud database solution enables enterprises to operate their primary databases on site while using a public cloud for dev/test database operations as well as for disaster recovery to reduce licensing and operational costs.

Many enterprise databases, such as Oracle, SQL Server, SAP HANA, and so on, carry high licensing and operational costs. Many customers pay a one-time license fee as well as annual support costs based on the number of compute cores in their database environment, whether the cores are used for development, testing, production, or disaster recovery. Many of those environments might not be fully utilized throughout the application lifecycle.

The solutions provide an option for customers to potentially reduce their licensable cores count by moving their database environments devoted to development, testing, or disaster recovery to the cloud. By using publiccloud scale, redundancy, high availability, and a consumption-based billing model, the cost saving for licensing and operation can be substantial, while not sacrificing any application usability or availability.

Beyond potential database license-cost savings, the NetApp capacity-based CVO license model allows customers to save storage costs on a per-GB basis while empowering them with high level of database manageability that is not available from competing storage services. The following chart shows a storage cost comparison of popular storage services available in the public cloud.



This solution demonstrates that, by using the SnapCenter GUI-based software tool and NetApp SnapMirror technology, hybrid cloud database operations can be easily setup, implemented, and operated.

The following videos demonstrate SnapCenter in action:

- Backup of an Oracle database across a Hybrid Cloud using SnapCenter
- SnapCenter- Clone DEV/TEST to AWS Cloud for an Oracle database

Notably, although the illustrations throughout this document show CVO as a target storage instance in the public cloud, the solution is also fully validated for the new release of the FSx ONTAP storage engine for AWS.

To test drive the solution and use cases for yourself, a NetApp Lab-on-Demand SL10680 can be requested at following xref:./databases/ TL_AWS_004 HCoD: AWS - NW,SnapCenter(OnPrem).

Solution Architecture

The following architecture diagram illustrates a typical implementation of enterprise database operation in a hybrid cloud for dev/test and disaster recovery operations.



In normal business operations, synchronized database volumes in the cloud can be cloned and mounted to dev/test database instances for applications development or testing. In the event of a failure, the synchronized database volumes in the cloud can then be activated for disaster recovery.

SnapCenter Requirements

This solution is designed in a hybrid cloud setting to support on-premises production databases that can burst to all of the popular public clouds for dev/test and disaster recovery operations.

This solution supports all databases that are currently supported by SnapCenter, although only Oracle and SQL Server databases are demonstrated here. This solution is validated with virtualized database workloads, although bare-metal workloads are also supported.

We assume that production database servers are hosted on-premises with DB volumes presented to DB hosts from a ONTAP storage cluster. SnapCenter software is installed on-premises for database backup and data replication to the cloud. An Ansible controller is recommended but not required for database deployment automation or OS kernel and DB configuration syncing with a standby DR instance or dev/test instances in the public cloud.

Requirements

Environment	Requirements							
On-premises	Any databases and versions supported by SnapCenter							
	SnapCenter v4.4 or higher							
	Ansible v2.09 or higher							
	ONTAP cluster 9.x							
	Intercluster LIFs configured							
	Connectivity from on-premises to a cloud VPC (VPN, interconnect, and so on)							
	Networking ports open - ssh 22 - tcp 8145, 8146, 10000, 11104, 11105							
Cloud - AWS	Cloud Manager Connector							
	Cloud Volumes ONTAP							
	Matching DB OS EC2 instances to On-prem							
Cloud - Azure	Cloud Manager Connector							
	Cloud Volumes ONTAP							
	Matching DB OS Azure Virtual Machines to On-prem							
Cloud - GCP	Cloud Manager Connector							
	Cloud Volumes ONTAP							
	Matching DB OS Google Compute Engine instances to on-premises							

Prerequisites configuration

Certain prerequisites must be configured both on-premises and in the cloud before the execution of hybrid cloud database workloads. The following section provides a high-level summary of this process, and the following links provide further information about necessary system configuration.

On premises

- SnapCenter installation and configuration
- On-premises database server storage configuration
- Licensing requirements
- Networking and security
- Automation

Public cloud

- A NetApp Cloud Central login
- · Network access from a web browser to several endpoints

- · A network location for a connector
- Cloud provider permissions
- Networking for individual services

Important considerations:

- 1. Where to deploy the Cloud Manager Connector?
- 2. Cloud Volume ONTAP sizing and architecture
- 3. Single node or high availability?

The following links provide further details:

On Premises

Public Cloud

Prerequisites on-premises

The following tasks must be completed on-premises to prepare the SnapCenter hybridcloud database workload environment.

SnapCenter installation and configuration

The NetApp SnapCenter tool is a Windows-based application that typically runs in a Windows domain environment, although workgroup deployment is also possible. It is based on a multitiered architecture that includes a centralized management server (the SnapCenter server) and a SnapCenter plug-in on the database server hosts for database workloads. Here are a few key considerations for hybrid-cloud deployment.

- **Single instance or HA deployment.** HA deployment provides redundancy in the case of a single SnapCenter instance server failure.
- **Name resolution.** DNS must be configured on the SnapCenter server to resolve all database hosts as well as on the storage SVM for forward and reverse lookup. DNS must also be configured on database servers to resolve the SnapCenter server and the storage SVM for both forward and reverse lookup.
- **Role-based access control (RBAC) configuration.** For mixed database workloads, you might want to use RBAC to segregate management responsibility for different DB platform such as an admin for Oracle database or an admin for SQL Server. Necessary permissions must be granted for the DB admin user.
- Enable policy-based backup strategy. To enforce backup consistency and reliability.
- **Open necessary network ports on the firewall.** For the on-premises SnapCenter server to communicate with agents installed in the cloud DB host.
- Ports must be open to allow SnapMirror traffic between on-prem and public cloud. The SnapCenter server relies on ONTAP SnapMirror to replicate onsite Snapshot backups to cloud CVO storage SVMs.

After careful pre-installation planning and consideration, click this SnapCenter installation workflow for details of SnapCenter installation and configuration.

On-premises database server storage configuration

Storage performance plays an important role in the overall performance of databases and applications. A welldesigned storage layout can not only improve DB performance but also make it easy to manage database backup and recovery. Several factors should be considered when defining your storage layout, including the size of the database, the rate of expected data change for the database, and the frequency with which you perform backups.

Directly attaching storage LUNs to the guest VM by either NFS or iSCSI for virtualized database workloads generally provides better performance than storage allocated via VMDK. NetApp recommends the storage layout for a large SQL Server database on LUNs depicted in the following figure.



The following figure shows the NetApp recommended storage layout for small or medium SQL Server database on LUNs.



The Log directory is dedicated to SnapCenter to perform transaction log rollup for database recovery. For an extra large database, multiple LUNs can be allocated to a volume for better performance.

For Oracle database workloads, SnapCenter supports database environments backed by ONTAP storage that are mounted to the host as either physical or virtual devices. You can host the entire database on a single or multiple storage devices based on the criticality of the environment. Typically, customers isolate data files on dedicated storage from all other files such as control files, redo files, and archive log files. This helps administrators to quickly restore (ONTAP single-file SnapRestore) or clone a large critical database (petabyte scale) using Snapshot technology within few seconds to minutes.

(i)



For mission critical workloads that are sensitive to latency, a dedicated storage volume should be deployed to different types of Oracle files to achieve the best latency possible. For a large database, multiple LUNs (NetApp recommends up to eight) per volume should be allocated to data files.



For smaller Oracle databases, SnapCenter supports shared storage layouts in which you can host multiple databases or part of a database on the same storage volume or LUN. As an example of this layout, you can host data files for all the databases on a +DATA ASM disk group or a volume group. The remainder of the files (redo, archive log, and control files) can be hosted on another dedicated disk group or volume group (LVM). Such a deployment scenario is illustrated below.



To facilitate the relocation of Oracle databases, the Oracle binary should be installed on a separate LUN that is included in the regular backup policy. This ensures that in the case of database relocation to a new server host, the Oracle stack can be started for recovery without any potential issues due to an out-of-sync Oracle binary.

Licensing requirements

SnapCenter is licensed software from NetApp. It is generally included in an on-premises ONTAP license. However, for hybrid cloud deployment, a cloud license for SnapCenter is also required to add CVO to SnapCenter as a target data replication destination. Please review following links for SnapCenter standard capacity-based license for details:

SnapCenter standard capacity-based licenses

Networking and security

In a hybrid database operation that requires an on-premises production database that is burstable to cloud for dev/test and disaster recovery, networking and security is important factor to consider when setting up the environment and connecting to the public cloud from an on-premises data center.

Public clouds typically use a virtual private cloud (VPC) to isolate different users within a public-cloud platform. Within an individual VPC, security is controlled using measures such as security groups that are configurable based on user needs for the lockdown of a VPC.

The connectivity from the on-premises data center to the VPC can be secured through a VPN tunnel. On the VPN gateway, security can be hardened using NAT and firewall rules that block attempts to establish network connections from hosts on the internet to hosts inside the corporate data center.

For networking and security considerations, review the relevant inbound and outbound CVO rules for your public cloud of choice:

- Security group rules for CVO AWS
- Security group rules for CVO Azure
- Firewall rules for CVO GCP

Using Ansible automation to sync DB instances between on-premises and the cloud - optional

To simplify management of a hybrid-cloud database environment, NetApp highly recommends but does not require that you deploy an Ansible controller to automate some management tasks, such as keeping compute instances on-premises and in the cloud in sync. This is particular important because an out-of-sync compute instance in the cloud might render the recovered database in the cloud error prone because of missing kernel packages and other issues.

The automation capability of an Ansible controller can also be used to augment SnapCenter for certain tasks, such as breaking up the SnapMirror instance to activate the DR data copy for production.

Follow these instruction to set up your Ansible control node for RedHat or CentOS machines: RedHat/CentOS Ansible Controller Setup.

Follow these instruction to set up your Ansible control node for Ubuntu or Debian machines: Ubuntu/Debian Ansible Controller Setup.

Prerequisites for the public cloud

Before we install the Cloud Manager connector and Cloud Volumes ONTAP and configure SnapMirror, we must perform some preparation for our cloud environment. This page describes the work that needs to be done as well as the considerations when deploying Cloud Volumes ONTAP.

Cloud Manager and Cloud Volumes ONTAP deployment prerequisites checklist

- □ A NetApp Cloud Central login
- □ Network access from a web browser to several endpoints
- □ A network location for a Connector
- □ Cloud provider permissions
- Networking for individual services

For more information about what you need to get started, visit our cloud documentation.

Considerations

1. What is a Cloud Manager connector?

In most cases, a Cloud Central account admin must deploy a connector in your cloud or on-premises network. The connector enables Cloud Manager to manage resources and processes within your public cloud environment.

For more information about Connectors, visit our cloud documentation.

2. Cloud Volumes ONTAP sizing and architecture

When deploying Cloud Volumes ONTAP, you are given the choice of either a predefined package or the creation of your own configuration. Although many of these values can be changed later on nondisruptively, there are some key decisions that need to be made before deployment based on the workloads to be deployed in the cloud.

Each cloud provider has different options for deployment and almost every workload has its own unique properties. NetApp has a CVO sizing tool that can help size deployments correctly based on capacity and performance, but it has been built around some basic concepts which are worth considering:

- · Capacity required
- · Network capability of the cloud virtual machine
- · Performance characteristics of cloud storage

The key is to plan for a configuration that not only satisfies the current capacity and performance requirements, but also looks at future growth. This is generally known as capacity headroom and performance headroom.

If you would like further information, read the documentation about planning correctly for AWS, Azure, and GCP.

3. Single node or high availability?

In all clouds, there is the option to deploy CVO in either a single node or in a clustered high availability pair with two nodes. Depending on the use case, you might wish to deploy a single node to save costs or an HA pair to provide further availability and redundancy.

For a DR use case or spinning up temporary storage for development and testing, single nodes are common since the impact of a sudden zonal or infrastructure outage is lower. However, for any production use case, when the data is in only a single location, or when the dataset must have more redundancy and availability, high availability is recommended.

For further information about the architecture of each cloud's version of high availability, visit the documentation for AWS, Azure and GCP.

Getting started overview

This section provides a summary of the tasks that must be completed to meet the prerequisite requirements as outlined in previous section. The following section provide a high level tasks list for both on-premises and public cloud operations. The detailed processes and procedures can be accessed by clicking on the relevant links.

On-premises

- Setup database admin user in SnapCenter
- SnapCenter plugin installation prerequisites
- SnapCenter host plugin installation
- DB resource discovery
- Setup storage cluster peering and DB volume replication
- Add CVO database storage SVM to SnapCenter
- Setup database backup policy in SnapCenter
- · Implement backup policy to protect database
- Validate backup

AWS public cloud

- Pre-flight check
- Steps to deploy Cloud Manager and Cloud Volumes ONTAP in AWS
- Deploy EC2 compute instance for database workload

Click the following links for details:

On Premises, Public Cloud - AWS

Getting started on premises

The NetApp SnapCenter tool uses role based access control (RBAC) to manage user resources access and permission grants, and SnapCenter installation creates prepopulated roles. You can also create custom roles based on your needs or applications.

On Premises

1. Setup database admin user in SnapCenter

It makes sense to have a dedicated admin user ID for each database platform supported by SnapCenter for database backup, restoration, and/or disaster recovery. You can also use a single ID to manage all databases. In our test cases and demonstration, we created a dedicated admin user for both Oracle and SQL Server, respectively.

Certain SnapCenter resources can only be provisioned with the SnapCenterAdmin role. Resources can then be assigned to other user IDs for access.

In a pre-installed and configured on-premises SnapCenter environment, the following tasks might have already have been completed. If not, the following steps create a database admin user:

- 1. Add the admin user to Windows Active Directory.
- 2. Log into SnapCenter using an ID granted with the SnapCenterAdmin role.
- 3. Navigate to the Access tab under Settings and Users, and click Add to add a new user. The new user ID is linked to the admin user created in Windows Active Directory in step 1. Assign the proper role to the user

as needed. Assign resources to the admin user as applicable.

	NetApp Snap(Center®							٠	8-	⊥ demo\administrator	SnapCenterAdmin	🖡 Sign Out
<		Global Setti	ings Policies	Users and Access	Roles C	redential	Software						
	Dashboard	Search by	y Name					Type All 👻				Add	
9	Resources		Name		15	Туре		Roles				Domain	
	Monitor		administrator			User		SnapCenterAdmin				demo	
			oradba			User		App Backup and Clone Admin				demo	
â	Reports		<u>sqldba</u>			User		App Backup and Clone Admin				demo	
A	Hosts												
h	Storage Systems												
***	Settings												
A	Alerts												

2. SnapCenter plugin installation prerequisites

SnapCenter performs backup, restore, clone, and other functions by using a plugin agent running on the DB hosts. It connects to the database host and database via credentials configured under the Setting and Credentials tab for plugin installation and other management functions. There are specific privilege requirements based on the target host type, such as Linux or Windows, as well as the type of database.

DB hosts credentials must be configured before SnapCenter plugin installation. Generally, you want to use an administrator user accounts on the DB host as your host connection credentials for plugin installation. You can also grant the same user ID for database access using OS-based authentication. On the other hand, you can also employ database authentication with different database user IDs for DB management access. If you decide to use OS-based authentication, the OS admin user ID must be granted DB access. For Windows domain-based SQL Server installation, a domain admin account can be used to manage all SQL Servers within the domain.

Windows host for SQL server:

- 1. If you are using Windows credentials for authentication, you must set up your credential before installing plugins.
- 2. If you are using a SQL Server instance for authentication, you must add the credentials after installing plugins.
- 3. If you have enabled SQL authentication while setting up the credentials, the discovered instance or database is shown with a red lock icon. If the lock icon appears, you must specify the instance or database credentials to successfully add the instance or database to a resource group.
- 4. You must assign the credential to a RBAC user without sysadmin access when the following conditions are met:
 - The credential is assigned to a SQL instance.
 - The SQL instance or host is assigned to an RBAC user.
 - \circ The RBAC DB admin user must have both the resource group and backup privileges.

Unix host for Oracle:

- 1. You must have enabled the password-based SSH connection for the root or non-root user by editing sshd.conf and restarting the sshd service. Password-based SSH authentication on AWS instance is turned off by default.
- 2. Configure the sudo privileges for the non-root user to install and start the plugin process. After installing the plugin, the processes run as an effective root user.

- 3. Create credentials with the Linux authentication mode for the install user.
- 4. You must install Java 1.8.x (64-bit) on your Linux host.
- 5. Installation of the Oracle database plugin also installs the SnapCenter plugin for Unix.

3. SnapCenter host plugin installation



Before attempting to install SnapCenter plugins on cloud DB server instances, make sure that all configuration steps have been completed as listed in the relevant cloud section for compute instance deployment.

The following steps illustrate how a database host is added to SnapCenter while a SnapCenter plugin is installed on the host. The procedure applies to adding both on-premises hosts and cloud hosts. The following demonstration adds a Windows or a Linux host residing in AWS.

Configure SnapCenter VMware global settings

Navigate to Settings > Global Settings. Select "VMs have iSCSI direct attached disks or NFS for all the hosts" under Hypervisor Settings and click Update.



Add Windows host and installation of plugin on the host

- 1. Log into SnapCenter with a user ID with SnapCenterAdmin privileges.
- 2. Click the Hosts tab from the left-hand menu, and then click Add to open the Add Host workflow.
- 3. Choose Windows for Host Type; the Host Name can be either a host name or an IP address. The host name must be resolved to the correct host IP address from the SnapCenter host. Choose the host credentials created in step 2. Choose Microsoft Windows and Microsoft SQL Server as the plugin packages to be installed.

Managed Hests							6-	L demo\administrator	SnapCenterAdmin	
manageu nosis										
Search by Name	Add Host									
Name .	Host Type	Windows -	•							
rhel2.demo.netapp.com	Host Name	sql-standby								
sgl1.demo.netapp.com	Credentials	Domain Admin -	•	+						
	Select Plug-ins to Insta	all SnapCenter Plug-ins Package 4.5 for Windows								
		Microsoft Windows								
	1	Microsoft Exchange Server								
	More Options : Por	SAP HANA rt, gMSA, Install Path, Custom Plug-Ins								
	Submit Cancel]								
	Search by Name	Search Dykame Add Host Name Host Type theiz demo.netagor.com Host Type salti.demo.netagor.com Credentials Select Plug-ins to Inst	Search Dy Name Ad Host Name Ik Install demo.netapp.com Sql:standby Sall.demo.netapp.com Credentials Sall.demo.netapp.com Credentials Select Plug-ins to Install SnapCenter Plug-ins Package 4.5 for Windows Microsoft Windows Microsoft SQL Server Microsoft SQL Server Microsoft SQL Server Submit Submit	Search y Name Add Host Name Ik Host Type Windows Soll.demo.netaop.com Soljstandby Soll.demo.netaop.com Credentials Soll.demo.netaop.com Select Plugins to Install SnapCenter Plugins Package 4.5 for Windows Microsoft Windows Microsoft Spit Server Microsoft Spit Server Microsoft Spit Server Microsoft Spit Server Selver Microsoft Spit Server Solumit Submit Cancel	Search y Name Name IL Instruction Host Type Windows Instruction Host Name IL Instruction Salidemo.netano.com Credentials Select Plugins to Install SnapCenter Plug-Ins Package 4.5 for Windows Microsoft Windows Microsoft Subserver Microsoft Subserver Microsoft Subserver Microsoft Subserver Microsoft Subserver Saletter Plug-Instruction Plug-Ins Submit Cancel	Search y Name Name Ik Host Xame Ik Host Xame Host Xame Salt.demo.netano.com Credentials Salt.demo.netano.com Credentials Select Plug-ins Datage 4.5 for Windows Microsoft Windows Microsoft Windows Microsoft SQL Server Submit Cancel	Search y Name Name IL Instruction Host Type Windows Instruction Host Name IL Instruction Salidemo.netano.com Credentials Select Plugins to Install SnapCenter Plugins Rackage 4.5 for Windows Microsoft Windows Microsoft Windows Microsoft SQL Server: Microsoft SQL Server: Microsoft SQL Server: Microsoft SQL Server: Microsoft SQL Server: Microsoft SQL Server: SAP MANA Submit Cancel	Saint of Name Name Name Host Type Windows Interconstanction Host Name Host Name Host Name Saint demonstanction Soletter Plugins Package 4.5 for Windows Interconstanction Microsoft SqL Server Microsoft SqL Server Microsoft SqL Server Microsoft SqL Server SAMerconstange Server Submit Cancel	Saint of Name Name	Saurch Valme Ad Host Name Ik Host Type Windows Intercentation.com Sql-standby Saurch Host Name Sql-standby Credentials Domain Admin Select Plugsins to Install SnapCenter Plugsins Package 4.5 for Windows Microsoft Windows Microsoft SQL Server Microsoft SQL Server Microsoft SQL Server Salt Metal Path, Custom Plug-Ins Submit Cancel

4. After the plugin is installed on a Windows host, its Overall Status is shown as "Configure log directory."

	NetApp Snap	Center	r®					٠		8 -	▲ demo\administrator	SnapCenterAdmin	🖡 Sign Out	
<		Mana	aged Hosts Disks Shares Initiator Groups iSC											
	Dashboard	Sea	arch by Name								Add		More	
	Resources		Name	45	Туре	System	Plug-in		Vers	ion	Overall Status			
-	Monitor		rhel2.demo.netapp.com		Linux	Stand-alone	UNIX, Oracle Database		4.5		Running			
			sgl1.demo.netapo.com		Windows	Stand-alone	Microsoft Windows Server, Microsoft SQL Server		4.5		Running			
â	Reports		sql-standby.demo.netapp.com		Windows	Stand-alone	Microsoft Windows Server, Microsoft SQL Server		4.5		Configure log	directory		
А	Hosts													
ł.	Storage Systems													
雏	Settings													
	Alerts													

5. Click the Host Name to open the SQL Server log directory configuration.

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s l	Mana	ged Hosts								2
	Sea	rch by Name	Host Details							
I		Name	Host Name	sql-standby.demo.netapp.com	Alerts					
		rhel2.demo.netapp.com	Host IP	10.221.2.56	Alerts					
		sgi1.demo.netapp.com	Overall Status	Configure log directory	No Alerts					
â		sql-standby.demo.netapp.com	Host Type	Windows						
Δ.,			System	Stand-alone						
֥			Credentials	Domain Admin 🕜						
橆			Plug-ins	SnapCenter Plug-ins package 4.5.0.6123 for Windows						
A				Microsoft Windows Microsoft SQL Server <u>Remove Configure log directory</u>						
			More Options : P	ort, gMSA, install Path, Add Plug-ins						
			Submit Cance	Reset						

6. Click "Configure log directory" to open "Configure Plug-in for SQL Server."

Configure Plug-	in for SQL Server	:	×
Configure the log l	backup directory for sql-standby.demo.netapp.com		
Configure host log	directory		
Host log directory	dedicated disk directory path	Browse	
		Save Close	

7. Click Browse to discover NetApp storage so that a log directory can be set; SnapCenter uses this log directory to roll up the SQL server transaction log files. Then click Save.

Configure Plug-in for SQL Server		×
Configure the log backup directory for sql-standby.demo.netapp.com		
Configure host log directory		
Host log directory G:\	Browse	
Choose directory on NetApp Storage		
 sql-standby.demo.netapp.com G:\ System Volume Information 		
	Save	Close



For NetApp storage provisioned to a DB host to be discovered, the storage (on-prem or CVO) must be added to SnapCenter, as illustrated in step 6 for CVO as an example.

8. After the log directory is configured, the Windows host plugin Overall Status is changed to Running.

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<		Managed Hosts Disks Shares Initiator Groups iSCSI Session						-		
	Dashboard	Search by Name						Add 1	lanove Adrech	More
	Resources	Name IL	Type S	ystem	Plug-in			Version	Overall Status	
	Monitor	rhel2.demo.netapp.com	Linux S	tand-alone	UNIX, Oracle Database			4.5	Running	
		sql1.demo.netapp.com	Windows S	tand-alone	Microsoft Windows Server, Microsoft SQL Server			4.5	Running	
â	Reports	sql-standby.demo.netapp.com	Windows S	tand-alone	Microsoft Windows Server, Microsoft SQL Server			4.5	Running	
A	Hosts									
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-	Settings									
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9. To assign the host to the database management user ID, navigate to the Access tab under Settings and Users, click the database management user ID (in our case the sqldba that the host needs to be assigned to), and click Save to complete host resource assignment.

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		Global Settin	gs Policies Users and Access	Roles Credential	Software						
1	Dashboard	Search by	Name			Туре Али				r Ada	Remove
Ę	Resources		Name	15	Туре	Roles			Do	nain	
4	Monitor		administrator		User	SnapCenterAdmin			der	no	
			oradba		User	App Backup and Clone Admin			der	no	
á	Reports		soldba		User	App Backup and Clone Admin			der	no	
2	Hosts										
5	Storage Systems										
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2	Alerts										

Assi	ign Assets	×
Asset	et Type Host 👻 search	
	Asset Name	45
	rhel2.demo.netapp.com	
	sql1.demo.netapp.com	
	sql-standby.demo.netapp.com	
	Sav	re Close

Add Unix host and installation of plugin on the host

- 1. Log into SnapCenter with a user ID with SnapCenterAdmin privileges.
- 2. Click the Hosts tab from left-hand menu, and click Add to open the Add Host workflow.
- 3. Choose Linux as the Host Type. The Host Name can be either the host name or an IP address. However, the host name must be resolved to correct host IP address from SnapCenter host. Choose host credentials created in step 2. The host credentials require sudo privileges. Check Oracle Database as the plug-in to be installed, which installs both Oracle and Linux host plugins.

					٠	₿-	▲ demo\administrator	SnapCenterAdmin	🖡 Sign Out
									×
Add Host									
Host Type	Linux]							
Host Name	ora-standby								
Credentials	admin 💌	+ 0							
Select Plug-ins to Inst	all SnapCenter Plug-ins Package 4.5 for Linux Gracle Database SAP HANA								
More Options : Po	rt, Install Path, Custom Plug-Ins								
Submit Cancel]								

4. Click More Options and select "Skip preinstall checks." You are prompted to confirm the skipping of the preinstall check. Click Yes and then Save.

More Options		×
Port Installation Path	8145 /opt/NetApp/snapcenter	0
	 Skip preinstall checks Add all hosts in the oracle RAC 	-
Custom Plug-ins —	Choose a File Browse Upload	
	No plug-ins found.	*
	Save	incel

5. Click Submit to start the plugin installation. You are prompted to Confirm Fingerprint as shown below.

Confirm Fingerprint								
Authenticity of the host cannot be de	ermined 🕦							
Host name 🕴	Fingerprint	Valid						
ora-standby.demo.netapp.com	ssh-rsa 3072 5C:02:EF:6B:63:54:59:10:84:DF:4D:6B:AB:FB:61:67							
	Confirm and Submit	Close						

6. SnapCenter performs host validation and registration, and then the plugin is installed on the Linux host. The status is changed from Installing Plugin to Running.

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<		Managed Hosts Disks Shares Initiator Groups ISCSI Session							
	Dashboard	Search by Name V					÷		More
	Resources	Name IE	Туре	System	Plug-in		Version	Overall Status	
-	Monitor	ora-standby.demo.netapp.com	Linux	Stand-alone	UNIX, Oracle Database		4.5	Running	
		rhel2.demo.netapp.com	Linux	Stand-alone	UNIX, Oracle Database		4.5	Running	
â	Reports	sgl1.demo.netapp.com	Windows	Stand-alone	Microsoft Windows Server, Microsoft SQL Server		4.5	Running	
4	Hosts	sgl-standby.demo.netapp.com	Windows	Stand-alone	Microsoft Windows Server, Microsoft SQL Server		4.5	Running	
÷	Storage Systems								
	Settings								
A	Alerts								

7. Assign the newly added host to the proper database management user ID (in our case, oradba).

🗖 Ne	etApp SnapCenter®	-			۰	8-	L demo\administrator	SnapCenterAdmin	🕼 Sign O	ut
>	Users and Access	Users/Groups	Details							×
	Search by Name		Jser Name oradba							
V	Name IL		Domain demo							
	administrator		Roles App Backup and Clone Admin x							
	oradba									
â	Soldba	Assign A	ssets							
A								+ Assign	Unassign	
ЪЧ —			Asset Name IE	Туре			Asset Type			
#E			10.0.0.1	DataOntapCli	uster		Storage Connecti	on	^	
Δ			192.168.0.101	DataOntapCl	uster		Storage Connecti	on		
-			admin				Credentials			
			Linux Admin				Credentials			
			Oracle Archive Log Backup				Policy			
			Oracle Full Online Backup				Policy			
			a banker of source and the source of the sou				bost		-	

Assign Assets										
Asset	t Type Host • search									
	Asset Name	ΠĘ.								
	ora-standby.demo.netapp.com									
	rhel2.demo.netapp.com									
	sql1.demo.netapp.com									
	sql-standby.demo.netapp.com									
	Save Clos	e								

4. Database resource discovery

With successful plugin installation, the database resources on the host can be immediately discovered. Click the Resources tab in the left-hand menu. Depending on the type of database platform, a number of views are available, such as the database, resources group, and so on. You might need to click the Refresh Resources tab if the resources on the host are not discovered and displayed.

•	NetApp Snap	Center	®		•		8 -	👤 demo\oradba	App Backup and Clo	ne Admin	🖡 Sign Out		
<		Oracle	e Database 🕞										
	Dashboard	View	Database	Search databa	ases V						Refre	sh Resources	New Resource Group
Ø	Resources	184	Name	Oracle Database Type	Host/Cluster	Resource Group	Polici	es			Last Backup	Overall	Status
•	Monitor		cdb2	Single Instance (Multitenant)	rhel2.demo.netapp.com							Not pro	tected
.	Reports												
A	Hosts												
÷	Storage Systems												
	Settings												
	Alerts												

When the database is initially discovered, the Overall Status is shown as "Not protected." The previous screenshot shows an Oracle database not protected yet by a backup policy.

When a backup configuration or policy is set up and a backup has been executed, the Overall Status for the database shows the backup status as "Backup succeeded" and the timestamp of the last backup. The following screenshot shows the backup status of a SQL Server user database.

Π	NetApp SnapCenter® • dev 1 demolsqldba App Backup and Clone Admin # Sign Out												
<			SQL Server 👻										
	Dashboard	View Da	atabase • search by name	T							Refresh F	lesources	New Resource Group
0	Resources	Til lan	Name	Instance	Host	Last Backup	O	verall Sta	atus		Туре		
-	Monitor		master	sql1	sql1.demo.netapp.com		Ne	ot availa	ble for b	ackup	System database		
			model	sql1	sql1.demo.netapp.com		N	ot availa	ble for b	ackup	System database		
âil	Reports		msdb	sql1	sql1.demo.netapp.com		N	ot availa	ble for b	ackup	System database		
A	Hosts		tempdb	sql1	sql1.demo.netapp.com		N	ot availa	ble for b	ackup	System database		
÷.	Storage Systems		tpcc	sql1	sql1.demo.netapp.com	09/14/2021 2:35:07 PM 🛱	Ba	ickup su	cceeded		User database		
-	Settings												
A	Alerts												

If database access credentials are not properly set up, a red lock button indicates that the database is not accessible. For example, if Windows credentials do not have sysadmin access to a database instance, then database credentials must be reconfigured to unlock the red lock.



II Ne	etApp SnapCenter®	2		٠		0-	👤 demo\sqldba	App Backup and Clone Admin	🖡 Sign Out
>	Microsoft SQL Server	Instance - Credentials							×
	search by name								Add Credential
0	Name	i The Microsoft SQL server or Windows credentials are neccessary to unlock t	he selected instance. Click Refresh Resources to run a discovery with the associate	d Auth.					×
-	sql-standby	Name	sql-standby						
1	sql1	Resource Group	None						
400		Policy	None						
A		Selectable	🖑 Not available for backup. DB is not on NetApp storage, auto-close is enable	d or in r	recovery	mode.			
֥									
莘									
A									

After the appropriate credentials are configured either at the Windows level or the database level, the red lock disappears and SQL Server Type information is gathered and reviewed.

	letApp Snap(p SnapCenter® • 🖬 🛛 - 1 demovsplitba App Backup and Clone Admin 🕴 Sign Out												
<		Microsoft S	5QL Server 👻											
	Dashboard	View Ins	stance • search by name	T								Refresh Resources	New Resource Group	
۵	Resources	15 lm	Name	Host	Resource Groups	Policies	Sta	te			Туре			
•	Monitor		sql1	sql1.demo.netapp.com			Ru	nning			Standal	one (15.0.2000)		
~			sql-standby	sql-standby.demo.netapp.com			Ru	nning			Standal	one (15.0.2000)		
and	keports													
Δ	Hosts													
ł.	Storage Systems													
ŧ	Settings													
▲	Alerts													

5. Setup storage cluster peering and DB volumes replication

To protect your on-premises database data using a public cloud as the target destination, on-premises ONTAP cluster database volumes are replicated to the cloud CVO using NetApp SnapMirror technology. The replicated target volumes can then be cloned for DEV/OPS or disaster recovery. The following high-level steps enable you to set up cluster peering and DB volumes replication.

 Configure intercluster LIFs for cluster peering on both the on-premises cluster and the CVO cluster instance. This step can be performed with ONTAP System Manger. A default CVO deployment has intercluster LIFs configured automatically.

On-premises cluster:

=	ONTAP Sy	rstem Manager (Return t	o classic version)		S	earch actions, objects, and pa	ages Q			•	\diamond	± 1
DAS	SHBOARD	Overview										
STO	DRAGE V	IPspaces			+	Broadcast Domains						+
NET Ove	rwork ^	Cluster	Broadcast Domains			Cluster	9000 MTU	Pspace: Cluster				
Ethe FC P	ernet Ports Ports	Default	Storage VMs			Default	1500 MTU	Pspace: Default onPrem-01 e0a e0b e0c e0d e0e	eOf eOg eOh eOg-100 eOe-20	0 e0f-201		
EVE	NTS & JOBS ∨		svm_onPrem Broadcast Domains Default									
PRC Ove	TTECTION ^											
Rela	itionships	Network Interfac	es							+	ŦF	lter
SAN	STS ^	Name	Status ≑	Storage VM	IPspace	Address	Current Node	Current Port	Protocols	Туре		
NVM	le Subsystem	onPrem-01_IC	0		Default	192.168.0.113	onPrem-01	e0b		Intercluster		
CLU	ISTER ^	onPrem-01_mgmt1	۲		Default	192.168.0.111	onPrem-01	e0c		Cluster/Node M	gmt	
Ove	rview	cluster_mgmt	0		Default	192.168.0.101	onPrem-01	e0a		Cluster/Node M	gmt	

Target CVO cluster:

	ystem Manager			S	earch actions, objects, and	pages Q			l,	? (>	± #
DASHBOARD	Overview										ч
STORAGE 🗸 🗸	-										
NETWORK ^	IPspaces			+	Broadcast [omains					
Overview	Cluster	Broadcast Domains			Cluster	9000	MTU IPspace: Cluster				
Ethernet Ports		Cluster					hybridcvo-01 e0	b.			
EVENTS & JOBS 💙	Default	Storage VMs			Default	0001	MTU IDensee Default				
PROTECTION 🗸		svm_hybridevo Broadcast Domains			Delaut	3001	hybridcvo-01 et	a			
HOSTS Y		Default					hybridcvo-02 et	a			
CLUSTER 🗸											
	Network Interface	S						+ Q Search	🛓 Download 🖙 Filter 🛛 👁 S	how / Hide 💊	
	Name ≑	Status	Storage VM	IPspace	Address	Current Node	Current Port	Protocols	Туре	Through	put (I
	hybridcvo-02_mgmt1	0		Default	10.221.2.104	hybridcvo-02	e0a		Cluster/Node Mgmt		0
	inter_1	0		Default	10.221.1.180	hybridcvo-01	e0a		Intercluster,Cluster/Node Mgmt		0.02
	inter_2	0		Default	10.221.2.250	hybridcvo-02	e0a		Intercluster,Cluster/Node Mgmt		0.03
	iscsi_1	0	svm_hybridcvo	Default	10.221.1.5	hybridcvo-01	e0a	iSCSI	Data		0
	iscsi_2	0	svm_hybridcvo	Default	10.221.2.168	hybridcvo-02	e0a	ISCSI	Data		0

2. With the intercluster LIFs configured, cluster peering and volume replication can be set up by using dragand-drop in NetApp Cloud Manager. See "Getting Started - AWS Public Cloud" for details.

Alternatively, cluster peering and DB volume replication can be performed by using ONTAP System Manager as follows:

3. Log into ONTAP System Manager. Navigate to Cluster > Settings and click Peer Cluster to set up cluster peering with the CVO instance in the cloud.



4. Go to the Volumes tab. Select the database volume to be replicated and click Protect.

■ ONTAP S	ystem Manager (Return to classic version)		Search actions, objects, and pages
DASHBOARD	Volumes		
STORAGE ^	+ Add Telete Protect :	More	
Overview Applications	Name	rhel2_u03 All Volumes	
Volumes	onPrem_data rhel2_u01	Overview Snapshot Copies	Clone Hierarchy SnapMirror (Local or Remote)
NVMe Namespaces	rhel2_u02		
Qtrees	rhel2_u03	status Online	Capacity
Storage VMs	8	style FlexVol	
NETWORK ^	sql1_log	/rhel2_u03	SNAPSHOT CAPACITY
Overview Ethernet Ports	sql1_snapctr	storage vm svm_onPrem	0 Bytes Available 2.36 GB Used 2.36 GB Overnow
FC Ports	svm_onPrem_root	LOCAL TIER ONPrem_01_SSD_1	
PROTECTION V		SNAPSHOT POLICY default	Performance Hour Day Week
HOSTS ~		QUOTA Off	Latency
CLUSTER V		Read Write space reservation	1.5

5. Set the protection policy to Asynchronous. Select the destination cluster and storage SVM.

■ ONTAP Sys	stem Manager (Return to classic ver	sion)		۹
DASHBOARD		Protect Volum	ies	
STORAGE ^		PROTECTION POLICY		
Overview		Asynchronous	~	
Applications		Source		Destinatio
Volumes		Source	• • • • • • • • • • • • • • • • • • •	Destinatio
LUNS		CLUSTER	CLUSTER	
NVMe Namespaces		onPrem	hybridcvo	×
Shares		STORAGE VM	STORAGE VM	
Qtrees		SWIL_OIL TEIL	sym hybri	
Quotas		SELECTED VOLUMES	3viii_iiyoii	
Storage VMs		metz_uos	∧ Destinat	ion Settings
Tiers			2 match	ng labels
NETWORK ^			VOLUME N	ME
Overview			PREFIX	SUFFIX
Ethernet Ports			vol_	<sourcevolumename> _dest</sourcevolumename>
FC Ports			Over	ride default storage service name
EVENTS & JOBS 🗡				nde deladit storage service name
			Configu	ration Details
			🔽 Initia	lize relationship 🕜
HOSTS V			Enat	le FabricPool 👩
CLUSTER 🗸				
		Save Can	cel	

6. Validate that the volume is synced between the source and target and that the replication relationship is healthy.

Volum	nes							
+ Add	🛢 Delete 🛛 🛡 Protect 🚦 I	More						∓ Filter
•	Name	rhel2 u03 All Volumes					/ E	dit : More
	onPrem_data							
	rhel2_u01	Overview Snapshot	Copies Clone Hierarchy	SnapMirror (Local or Remote)				
	rhel2 u02							
		Source	Destination	Protection Policy	Relationship Health	Relationship Status	Lag	
	metz_003	svm_onPrem:rhel2_u03	svm_hybridcvo:rhel2_u03_dr	MirrorAllSnapshots	Healthy	Mirrored	12 seconds	
	rhel2_u030923211942120311 8							

6. Add CVO database storage SVM to SnapCenter

- 1. Log into SnapCenter with a user ID with SnapCenterAdmin privileges.
- Click the Storage System tab from the menu, and then click New to add a CVO storage SVM that hosts replicated target database volumes to SnapCenter. Enter the cluster management IP in the Storage System field, and enter the appropriate username and password.



3. Click More Options to open additional storage configuration options. In the Platform field, select Cloud Volumes ONTAP, check Secondary, and then click Save.

More Options		×
Platform	Cloud Volumes ON' 🗸 🗹 Secondary 🚺	
Protocol	HTTPS 🔻	
Port	443	
Timeout	60 seconds ()	
Preferred IP	0	
Save Cance	2	

4. Assign the storage systems to SnapCenter database management user IDs as shown in 3. SnapCenter host plugin installation.

1	NetApp Snap	Center®)				۰	9-	L demo\administrator	SnapCenterAdmin	🖡 Sign Out
<		ONTAP	Storage								
=	Dashboard	Туре	ONTAP SVMs Search by Name							New	
ę	Resources	ONTA	P Storage Connections								
-	Monitor		Name IL	IP	Cluster Name	User Name		Platform	Contro	ller License	
	Reports		svm hybridevo		10.0.0.1			CVO	0		
4	Hosts		svm_onPrem		192.168.0.101			CVO	~		
ł	Storage Systems										
=	E Settings										
4	Alerts										

7. Setup database backup policy in SnapCenter

The following procedures demonstrates how to create a full database or log file backup policy. The policy can then be implemented to protect databases resources. The recovery point objective (RPO) or recovery time objective (RTO) dictates the frequency of database and/or log backups.

Create a full database backup policy for Oracle

1. Log into SnapCenter as a database management user ID, click Settings, and then click Polices.

	NetApp Snap	Center®				≅ 0·	👤 demo\a	oradba App	Backup and Clor	ne Admin	🖡 Sign Out
<		Policies Credential									
	Dashboard	Oracle Database					<u>.</u>				a
	Resources	Search by Name					New	Modity	Сару	Details	Deleta
-	Monitor	Name IE	Backup Type	Schedule Type	Replication			Verification	n		
~	Benotte	Oracle Archive Log Backup	LOG, ONLINE	Hourly	SnapMirror						
di	i Reports	Oracle Full Online Backup	FULL, ONLINE	Daily	SnapMirror						
4	Hosts										
Þ	Storage Systems										
	Settings										
A	Alerts										

2. Click New to launch a new backup policy creation workflow or choose an existing policy for modification.

Modify Oracle [Database Backup	Policy	×
1 Name	Provide a policy na	ame	
2 Backup Type	Policy name	Oracle Full Online Backup	0
3 Retention	Details	Backup all data and log files]
4 Replication			
5 Script			
6 Verification			
7 Summary			
		Previous	Next

3. Select the backup type and schedule frequency.

Modify Oracle	Database Backup Policy	×
1 Name	Select Oracle database backup options	-
2 Backup Type	Choose backup type	
3 Retention	Online backup	1
4 Replication	Otatafiles, control files, and archive logs	
5 Script	O Datafiles and control files	
6 Verification	○ Archive logs	
Summary	O Offline backup 🚯	
	◯ Shutdown	
	Save state of PDBs ()	
	Choose schedule frequency	
	Select how often you want the schedules to occur in the policy. The specific times are set at backup job creation enabling you to stagger your start times.	
	🔿 On demand	
	O Hourly	
	Daily	*
	Previous Next	

4. Set the backup retention setting. This defines how many full database backup copies to keep.

Modify Oracle	Database Backup Policy				×
1 Name	Retention settings 🚯				
2 Backup Type	Daily retention settings				
3 Retention	Total Snapshot copies to keep	7			
4 Replication	Keep Snapshot copies for	14	days		
5 Script	Archive Log backup retention settings	7			
6 Verification	Keep Snapshot copies for	14	days		
2 Summary					
				Previous Next	

5. Select the secondary replication options to push local primary snapshots backups to be replicated to a secondary location in cloud.

Modify Oracle [Database Backup Policy	×
1 Name	Select secondary replication options 1	
2 Backup Type	☑ Update SnapMirror after creating a local Snapshot copy.	
3 Retention	Update SnapVault after creating a local Snapshot copy.	
4 Replication 5 Script	Secondary policy label Daily Error retry count 3	
6 Verification		
7 Summary		
	Previou:	s Next

6. Specify any optional script to run before and after a backup run.

Modify Oracle [Database Backup	Policy			×	
1 Name	Specify optional so	cripts to run befo	re and after performing a ba	ackup job		
2 Backup Type	Prescript full path	/var/opt/snapcer	nter/spl/scripts/	Enter Prescript path		
3 Retention	Prescript arguments					
4 Replication	Postscript full path Postscript arguments	/var/opt/snapcer	nter/spl/scripts/	Enter Postscript path		
5 Script	Script timeout	60 s	ecs			
6 Verification	erification					
7 Summary						
					Previous Next	

7. Run backup verification if desired.

Modify Oracle I	Database Backup	Policy			×
1 Name	Select the options	to run backu	p verification		
2 Backup Type	Run Verifications f	for following t	oackup schedules		
3 Retention	Select how often you enabling you to stag	i want the scheo ger your verifica	dules to occur in the policy. Th ation start times.	ne specific verification times are set at backup job creation	
A Replication	Daily				
5 Script	Verification script	commands			
6 Verification	Script timeout	60	secs		
	Prescript full path	/var/opt/sna	pcenter/spl/scripts/	Enter Prescript path	
3 Summary	Prescript arguments	Choose optio	nal arguments		
	Postscript full path	/var/opt/sna	pcenter/spl/scripts/	Enter Postscript path	
	Postscript	Choose optio	nal arguments		
				Previous	ext

8. Summary.

Modify Oracle I	Database Backup Policy		(3
1 Name	Summary		
2 Backup Type	Policy name	Oracle Full Online Backup	
	Details	Backup all data and log files	
Retention	Backup type	Online backup	
Replication	Schedule type	Daily	
	RMAN catalog backup	Disabled	
Script	Archive log pruning	None	
Verification	On demand data backup retention	None	
	On demand archive log backup retentio	n None	
Summary	Hourly data backup retention	None	
	Hourly archive log backup retention	None	
	Daily data backup retention	Delete Snapshot copies older than : 14 days	
Summary	Daily archive log backup retention	Delete Snapshot copies older than : 14 days	
	Weekly data backup retention	None	
	Weekly archive log backup retention	None	
Summary	Monthly data backup retention	None	
	Monthly archive log backup retention	None	
	Replication	SnapMirror enabled , Secondary policy label: Daily , Error retry count: 3	

Create a database log backup policy for Oracle

- 1. Log into SnapCenter with a database management user ID, click Settings, and then click Polices.
- 2. Click New to launch a new backup policy creation workflow, or choose an existing policy for modification.

New Oracle Database Backup Policy				
1 Name	Provide a policy name			
2 Backup Type	Policy name	Oracle Archive Log Backup	1	
3 Retention	Details	Backup Oracle archive logs		
4 Replication				
5 Script				
6 Verification				
7 Summary				
		Previous	Next	

3. Select the backup type and schedule frequency.

New Oracle Da	atabase Backup Policy	×
1 Name	Select Oracle database backup options	Î
2 Backup Type	Choose backup type	
3 Retention	Online backup	
(4) Replication	O Datafiles, control files, and archive logs	
5 Script	O Datafiles and control files	
6 Verification	Archive logs	
7 Summary	O Offline backup 🚯	
	Save state of PDBs 🚯	
	Choose schedule frequency	
	Select how often you want the schedules to occur in the policy. The specific times are set at backup job creation enabling you to stagger your start times.	
	O n demand	
	Hourly	
	O Daily	*
	Previous Next	

4. Set the log retention period.

New Oracle Da	tabase Backup Policy			×
1 Name	Retention settings ()			
2 Backup Type 3 Retention	Hourly retention settings Data backup retention settings			
4 Replication	Total Snapshot copies to keep Keep Snapshot copies for	7	days	
5 Script	Archive Log backup retention settings O Total Snapshot copies to keep	7		
6 Verification	Keep Snapshot copies for	7 \$	days	
Junifidiy				
				Previous Next

5. Enable replication to a secondary location in the public cloud.

New Oracle Dat	tabase Backup Policy	×
1 Name	Select secondary replication options 🚯	
2 Backup Type	🗹 Update SnapMirror after creating a local Snapshot copy.	
3 Retention	Update SnapVault after creating a local Snapshot copy.	
4 Replication	Secondary policy label Hourly Error retry count	
6 Verification		
7 Summary		
	Previous	Next

6. Specify any optional scripts to run before and after log backup.

New Oracle Database Backup Policy					
1 Name	Specify optional scripts to run before and after performing a backup job				
2 Backup Type	Prescript full path	/var/opt/snapcenter/spl/scripts/	Enter Prescript path		
3 Retention	Prescript arguments				
4 Replication	Postscript full path Postscript	/var/opt/snapcenter/spl/scripts/	Enter Postscript path		
5 Script	arguments				
6 Verification	Script timeout	60 secs			
7 Summary					
				Previous Next	

7. Specify any backup verification scripts.
| New Oracle Da | tabase Backup Po | licy | | × | |
|----------------|--|---|--|------------------|--|
| 1 Name | Select the options | Select the options to run backup verification | | | |
| 2 Backup Type | Run Verifications f | or following backup schedules | | | |
| 3 Retention | Select how often you
enabling you to stag | want the schedules to occur in the policy. The golicy of your verification start times. | e specific verification times are set at bac | kup job creation | |
| 4 Replication | Verification script | commands | | | |
| 6 Verification | Prescript full path | /var/opt/snapcenter/spl/scripts/ | Enter Prescript path | | |
| 7 Summary | Prescript
arguments | Choose optional arguments | | | |
| | Postscript full path | /var/opt/snapcenter/spl/scripts/ | Enter Postscript path | | |
| | Postscript | Postscript
arguments | | | |
| | | | | | |
| | | | | Previous Next | |

8. Summary.

Name	Summary	
Backup Type	Policy name	Oracle Archive Log Backup
	Details	Backup Oracle archive logs
Retention	Backup type	Online backup
Replication	Schedule type	Hourly
	RMAN catalog backup	Disabled
Script	Archive log pruning	None
Verification	On demand data backup retention	None
	On demand archive log backup retentio	n None
7 Summary	Hourly data backup retention	None
	Hourly archive log backup retention	Delete Snapshot copies older than : 7 days
	Daily data backup retention	None
	Daily archive log backup retention	None
	Weekly data backup retention	None
	Weekly archive log backup retention	None
	Monthly data backup retention	None
	Monthly archive log backup retention	None
	Replication	SnapMirror enabled , Secondary policy label: Hourly , Error retry count: 3

Create a full database backup policy for SQL

1. Log into SnapCenter with a database management user ID, click Settings, and then click Polices.

n	NetApp Snap	Center®					٠	9-	L demo\s	qldba <i>i</i>	App Backup an	d Clone Admin	🖡 Sign Out
<		Policies Credential											
	Dashboard	Microsoft SQL Server											
	Resources	Search by Name							New	Modity	Copy	Details	Deterat
-	Monitor	Name	15	Backup Type	Schedule Type	Replication				Verifica	ation		
.	Reports	There is no match for your search or data is not a	available	8 s									
٨	Hosts												
54	Storage Systems												
	Settings												
•	Alarte												
-	ALLIS												

2. Click New to launch a new backup policy creation workflow, or choose an existing policy for modification.

New SQL Server Backup Policy				
1 Name	Provide a policy na	ame		
2 Backup Type	Policy name	SQL Server Full Backup	1	
3 Retention	Details	Backup all data and log files		
4 Replication				
5 Script				
6 Verification				
7 Summary				
		Previous	Next	

3. Define the backup option and schedule frequency. For SQL Server configured with an availability group, a preferred backup replica can be set.

New SQL Serve	r Backup Policy ×
1 Name	Select SQL server backup options
2 Backup Type	Choose backup type
3 Retention	Full backup and log backup
4 Replication	○ Full backup
5 Script	Copy only backup
6 Verification	Maximum databases backed up per Snapshot copy: 100
7 Summary	Availability Group Settings
	Schedule frequency
	Select how often you want the schedules to occur in the policy. The specific times are set at backup job creation enabling you to stagger your start times.
	○ On demand
	⊖ Hourly
	Daily
	⊖ Weekly
	○ Monthly
	Previous Next

4. Set the backup retention period.

New SQL Serve	er Backup Policy	×
1 Name	Retention settings	
2 Backup Type	Retention settings for up-to-the-minute restore operation ()	
3 Retention	Keep log backups applicable to last 7 full backups	
(4) Replication	O Keep log backups applicable to last 14 days	
5 Script		
6 Verification	Full backup retention settings 🚯 Daily	
7 Summary	Total Snapshot copies to keep 7 Keep Snapshot copies for 14 days	
	Previous	Next

5. Enable backup copy replication to a secondary location in cloud.

New SQL Serve	r Backup Policy	×
1 Name	Select secondary replication options 🚯	
2 Backup Type	✓ Update SnapMirror after creating a local Snapshot copy.	
3 Retention	Update SnapVault after creating a local Snapshot copy.	
Replication S Script 6 Verification 7 Summary	Secondary policy label Daily Error retry count 3	
	Previous Next	

6. Specify any optional scripts to run before or after a backup job.

New SQL Serve	r Backup Policy		×
1 Name	Specify optional se	cripts to run before performing a backup job	
2 Backup Type	Prescript full path		
3 Retention	Prescript arguments	Choose optional arguments	
4 Replication	Specify optional se	cripts to run after performing a backup job	
	Postscript full path		
5 Script	Postscript arguments	Choose optional arguments	
6 Verification	Script timeout	60 secs	
7 Summary			
			March
		Previous	Next

7. Specify the options to run backup verification.

New SQL Serve	r Backup Policy	×				
1 Name	Select the options to run backup verification	Select the options to run backup verification				
2 Backup Type	Run verifications for the following backup schedules	. 1				
3 Retention	Select how often you want the schedules to occur in the policy. The specific verification times are set at backup job creation enabling you to stagger your verification start times.					
4 Replication	Daily					
5 Script	Database consistency checks options	.				
6 Verification	 Limit the integrity structure to physical structure of the database (PHYSICAL_ONLY) Suppress all information message (NO_INFOMSGS) 					
7 Summary	Display all reported error messages per object (ALL_ERRORMSGS)					
	Do not check non-clustered indexes (NOINDEX) Limit the checks and obtain the locks instead of using an internal database Snapshot copy (TABLOCK)					
	Log backup					
	□ Verify log backup.	1				
Verification script settings						
	Script timeout 60 secs	•				
	Previous	t				

8. Summary.

New SQL Serve	r Backup Policy		×
1 Name	Summary		
2 Backup Type	Policy name	SQL Server Full Backup	
2 Patantian	Details	Backup all data and log files	
3 Retention	Backup type	Full backup and log backup	
4 Replication	Availability group settings	Backup only on preferred backup replica	
	Schedule Type	Daily	
5 Script	UTM retention	Total backup copies to retain : 7	
6 Verification	Daily Full backup retention	Total backup copies to retain : 7	
	Replication	SnapMirror enabled , Secondary policy label: Daily , Error retry count: 3	
7 Summary	Backup prescript settings	undefined Prescript arguments:	
	Backup postscript settings	undefined Postscript arguments:	
	Verification for backup schedule type	none	
	Verification prescript settings	undefined Prescript arguments:	
	Verification postscript settings	undefined Postscript arguments:	
		Previous Finis	h

Create a database log backup policy for SQL.

1. Log into SnapCenter with a database management user ID, click Settings > Polices, and then New to launch a new policy creation workflow.

New SQL Server Backup Policy				
1 Name	Provide a policy na	ame		
2 Backup Type	Policy name	SQL Server Log Backup	•	
3 Retention	Details	Backup SQL server log]	
4 Replication				
5 Script				
6 Verification				
7 Summary				
		Previous	Next	

2. Define the log backup option and schedule frequency. For SQL Server configured with a availability group, a preferred backup replica can be set.

New SQL Serve	er Backup Policy ×
1 Name	Select SQL server backup options
2 Backup Type	Choose backup type
3 Retention	Full backup and log backup
4 Replication	 Full backup Log backup
5 Script	Copy only backup
6 Verification	Maximum databases backed up per Snapshot copy: 100
7 Summary	Availability Group Settings
	Schedule frequency
	Select how often you want the schedules to occur in the policy. The specific times are set at backup job creation enabling you to stagger your start times.
	○ On demand
	Hourly
	O Daily
	○ Monthly
	Previous Next

3. SQL server data backup policy defines the log backup retention; accept the defaults here.

New SQL Serve	r Backup Policy ×
1 Name	Log backup retention settings
2 Backup Type	Up-to-the-minute (UTM) retention settings retains log backups created as part of full backup and full and log backup operations.
3 Retention	settings is configured to retain log backups of the last 5 full backups, then the log backups of the last 5 full backups are retained and the rest are deleted.
4 Replication	
5 Script	
6 Verification	
7 Summary	
	Previous Next

4. Enable log backup replication to secondary in the cloud.

New SQL Serve	r Backup Policy	×
1 Name	Select secondary replication options 🚯	
2 Backup Type	🛛 Update SnapMirror after creating a local Snapshot copy.	
3 Retention	Update SnapVault after creating a local Snapshot copy.	
4 Replication 5 Script	Secondary policy label Hourly	0
6 Verification		
7 Summary		
		Previous Next

5. Specify any optional scripts to run before or after a backup job.

New SQL Serve	r Backup Policy		×
1 Name	Specify optional se	ripts to run before performing a backup job	
2 Backup Type	Prescript full path		
3 Retention	Prescript arguments	Choose optional arguments	
A Replication	Specify optional se	ripts to run after performing a backup job	
	Postscript full path		
5 Script	Postscript arguments	Choose optional arguments	
6 Verification	Script timeout	60 secs	
7 Summary			
		Previous	Next

6. Summary.

New SQL Serve	r Backup Policy		×
1 Name	Summary		
2 Backup Type	Policy name	SQL Server Log Backup	
D Patantian	Details	Backup SQL server log	
3 Retention	Backup type	Log transaction backup	
4 Replication	Availability group settings	Backup only on preferred backup replica	
	Schedule Type	Hourly	
5 Script	Replication	SnapMirror enabled , Secondary policy label: Hourly , Error retry count: 3	
6 Verification	Backup prescript settings	undefined Prescript arguments:	
7 Summary	Backup postscript settings	undefined Postscript arguments:	
	Verification for backup schedule type	none	
	Verification prescript settings	undefined Prescript arguments:	
	Verification postscript settings	undefined Postscript arguments:	
		Previous	sh

8. Implement backup policy to protect database

SnapCenter uses a resource group to backup a database in a logical grouping of database resources, such as multiple databases hosted on a server, a database sharing the same storage volumes, multiple databases supporting a business application, and so on. Protecting a single database creates a resource group of its own. The following procedures demonstrate how to implement a backup policy created in section 7 to protect Oracle and SQL Server databases.

Create a resource group for full backup of Oracle

1. Log into SnapCenter with a database management user ID, and navigate to the Resources tab. In the View drop-down list, choose either Database or Resource Group to launch the resource group creation workflow.

n	NetApp Snap	Center	®				•	2 (• L demo\or	adba App Backup ar	d Clone Admin	🖡 Sign Out
<		Oracle	Database 🝷									
	Dashboard	View	Database	Search databases	8						Refresh Resources	New Resource Group
Ę	Resources	19	Name	Oracle Database Type	Host/Cluster	Resource Group	Policies			Last Backup	Overall Sta	tus
4	Monitor		cdb2	Single Instance (Multitenant)	rhel2.demo.netapp.com						Not prote	ted
â	Reports											
e	Hosts											
÷	Storage Systems											
#	E Settings											
4	Alerts											

2. Provide a name and tags for the resource group. You can define a naming format for the Snapshot copy and bypass the redundant archive log destination if configured.

	etApp Sna	apCenter®								٠	2	9- 1	demo\oradba	App Backup and Clone Admin	🖡 Sign Out
>	Oracle Data	abase 👻	New Resource Group												×
	Search da	atabases													
U	17 PF	Name	0	2	3	4	5	6							
•		cdb2	Name R	Resources	Policies	vernication	Notification	Summary							
<i></i>			Provide a name	e and tags for th	ne resource gi	roup									
٨			Name	rhel2_cdb2					0						
<u>اور</u>			Tags	orafullbkup					 0						
÷			Use custom nam	ne format for Snap:	shot copy										
▲			\$CustomText × rhel2_cdb2	¢					_						
			Backup settings	5											
			Exclude archive log destinations from backup					< ÷ + ()							

3. Add database resources to the resource group.

II N	etApp S	5napCenter®		🛊 📓 🤣 🔹 🛓 demo\oradba App Backup and Clone Admin 🛛 🕼 Sign Out
>		Database 👻	New Resource Group	×
	Searc	h databases		
U	IF IM	Name		
٠		cdb2	Name Resources Policies Verification Notification Summary	
<i></i>			Add resources to Resource Group	
A			Host	
<u>اور</u>			All Augusta	
莘			Selected Resources	
A			cdb2 (rhel2.demo.netapp.com)	
			>	
			(C	

4. Select a full backup policy created in section 7 from the drop-down list.

i	letApp Sn	apCenter®					•	♦ ≥	♦ ≅ 0-	🏚 🔤 😯 🛨 demo\oradba	🌲 🔄 🥹 🕈 L demo\oradba App Backup and Clone Admin	🌲 📓 🥹 ד 👤 demo\oradba App Backup and Clone Admin 🛙 Sign	🌲 🗃 🥹 🔹 L demo\oradba App Backup and Clone Admin 🖡 Sign Ou
>		abase 👻	New Resource Group										
	Search d	latabases											
U	17 PM	Name	1 2 Name Resources	3 4 Policies Verification	5 6 Notification Summary								
۲		cdb2			,								
ай			Select one or more policies and	configure schedules									
۸			Oracle Full Online Backup	· + 0									
54			Configure schedules for selected	d policies									
莘			Policy	LE Applied Schedules	Configure Schedules								
A			Oracle Full Online Backup	None	+								
			Total 1										

5. Click the (+) sign to configure the desired backup schedule.

Daily									
Start date	09/10/2	021 2:32 PM	#)					
Expires on	12/31/2	021 2:32 PM							
Papart quart	1	davs	<		Dece	mber	2021		,
Repeat every			Su	Mo	Tu	We	Th	Fr	S
			28	29	30	1	2	З	4
			5	б	7	8	9	10	1
			12	13	14	15	16	17	1
			19	20	21	22	23	24	2
			26	27	28	29	30	31	1
			2	З	4	5	6	7	8
2 The sche zone.	dules are trig	gered in the S	nap			Ø			
i The sche zone.	dules are trig	ggered in the S	nar 2	3	4	O	6	7	2

6. Click Load Locators to load the source and destination volume.

n N	letApp Sn	napCenter®					٠	8 -	👤 demo\oradba	App Backup and Clone Admin	🖡 Sign Out
>	Oracle Dat	tabase 👻	New Resource Group								×
	Search o	databases									
	15.16	Name				6					
-		cdb2	Name	Resources Policies	verification	Summary					
ណ៍			Load secondary l	ocators to							Ì
A			Cocoodaru stor	rade location: Coapilault or Span	Mirror						
34			Secondary stor	age location. Shapvault of Shap	Destination Volume						
			Source volume	10	Deschauon volume	1					
			svin_onPrenam	el2_002	svm_hybridcvo:rhe	l2_u02_dr -					
A			Configure ver	ification schedules							
			Policy 11	Schedule Type	Applied Schedules	Configure Schedules					
			There is no match	h for your search or data is not availa	able.						

7. Configure the SMTP server for email notification if desired.

ΠN	etApp Si	napCenter®									٠		0 -	👤 demo\oradba	App Backup and Clone Admin	🖡 Sign Out
•		atabase 👻	New Reso	ource Group												×
	Search	databases	A If you serve	u want to send i er.	notifications for schee	duled or on deman	d jobs, an SMTP serv	er must be configure	d. Continue to the S	ummary page to save	our information, an	d then go	to Settir	ngs>Global Settings>	Notification Server Settings to co	infigure the SMTP
U	17.19	Name		_	_		_									
2		cdb2		0—			0	6	6							
a il				Name	Resources	Policies	Verification	Notification	Summary							
Å				Provide em	ail settings 🕦											
÷٩.				Select the serv	vice accounts or peopl	e to notify regardin	g protection issues.									
橆				Email preferen	nce Never		-									
•				From	From email											
-				То	Email to											
				Subject	Notification											
				🗌 Attach job r	report											

8. Summary.

ΠN	etApp Sr	napCenter®				• =	② ▪ <u>1</u> demo\oradba	App Backup and Clone Admin	🖡 Sign Out
>	Oracle Da	itabase 👻	New Resource Group						×
	Search	databases							
0	17 Pe	Name	0 2	-3	6				
٠		cdb2	Name Resources	Policies Verification Notification	Summary				
ай			Resource group name	rhel2_cdb2					
Α.			Tags	orafullbkup					
34			Policy	Oracle Full Online Backup: Daily					
-			Plug-in	SnapCenter Plug-in for Oracle Database					
			Send email	No					
4									
	Total 1							Previ	ous Finish

Create a resource group for log backup of Oracle

1. Log into SnapCenter with a database management user ID, and navigate to the Resources tab. In the View drop-down list, choose either Database or Resource Group to launch the resource group creation workflow.

NetApp Snap	letApp SnapCenter®							1 demo\oradba	App Backup and Clone Admin	🖡 Sign Out
	Oracle Database 👻									
Dashboard	View Resource Group	Search resource g	roup V							New Resource Group
Resources	Name	Resources	Tags	Policies				Last Backup	Overall Status	
	rhel2_cdb2	1	orafullbkup	Oracle Full Online Backup						
Reports										
📥 Hosts										
Storage Systems										
🗱 Settings										
Alerts										

2. Provide a name and tags for the resource group. You can define a naming format for the Snapshot copy and bypass the redundant archive log destination if configured.

E N	etApp SnapCenter®		٠	9 -	👤 demo\oradba	App Backup and Clone Admin	🖡 Sign Out
>	Oracle Database 👻	New Resource Group					×
	Search resource groups						
•	Name						
•	rhel2_cdb2	Name Resources Poicles Vernication Notification Summary					
.		Provide a name and tags for the resource group					
A		Name rhel2_cdb2_log 0					
80 L		Tags Oralogbkup 0					
霊		Use custom name format for Snapshot copy					
A		ScustomText ×					
		Backup settings					
		Exclude archive log destinations from X C + 0					

3. Add database resources to the resource group.

ΠN	etApp SnapCenter®		٠	8 .	👤 demo\oradba	App Backup and Clone Admin	🖡 Sign Out
>	Oracle Database 👻	New Resource Group					×
	Search resource groups						
0	Name						
•	rhel2_cdb2	Name Resources Policies Verification Notification Summary					
a il		Add resources to Resource Group					
*		Host					
34		All -					
=		Available Resources Selected Resources					
A		cdb2 (rhel2.demo.netapp.com)					
		<					
	Total 1					Pre	vious Next

4. Select a log backup policy created in section 7 from the drop-down list.

ΠN	etApp SnapCenter®		٠	0 •	👤 demo\oradba	App Backup and Clone Admin	🖡 Sign Out
>	Oracle Database 👻	New Resource Group					×
	Search resource groups						
	Name						
٠	rhel2_cdb2	Name Resources Policies Verification Notification Summary					
		Select one or more policies and configure schedules					
A		Oracle Archive Log Backup -					
3 0		Oracle Full Online Backup ✔ Oracle Archive Log Backup S					
÷		Policy IE Applied Schedules Configure Schedules					
▲		Oracle Archive Log Backup None +					
		Total 1					
	Total 1					Pre	vious Next

5. Click on the (+) sign to configure the desired backup schedule.

Add schedules for policy Oracle Archive Log Backup ×					
Hourly					
Start date	09/10/2021 3:00 PM				
Z Expires on	12/31/2021 3:00 PM				
Repeat every	1 hours 0 mins				
i The schedules are triggered in the SnapCenter Server time zone.					
	Cancel				

6. If backup verification is configured, it displays here.

	letApp SnapCenter®		٠	8 -	👤 demo\oradba	App Backup and Clone Admin	🖡 Sign Out
>	Oracle Database 👻	New Resource Group					×
	Search resource groups						
0	Name						
•	rhel2_cdb2	Name Resources Policies Verification Notification Summary					
a il							
*		Configure verification schedules					
34		Policy Li Schedule Type Applied Schedules Configure Schedules					
-		There is no match for your search or data is not available.					
•							
-							
		Total 0					
	Total 1					Pre	vious Next

7. Configure an SMTP server for email notification if desired.

II Ne	etApp SnapCenter®	🕚 🔤 🥹 r 🎍 demoloradba App Backup and C	lone Admin 🛛 🗍 Sign Out
>	Oracle Database 👻	New Resource Group	×
	Search resource groups	1 for you want to send notifications for scheduled or on demand jobs, an SMTP server must be configured. Continue to the Summary page to save your information, and then go to Settings-Global Settings-Notification Server.	Settings to configure the SMT
0	Name		
•	rhel2_cdb2		
a i		Name Resources Policies Verification Notification Summary	
Α.		Provide email settings 0	
֥ -		Select the service accounts or people to notify regarding protection issues.	
÷=		Email preference Never	
▲		From From email	
		To Email to	
		Subject Notification	
		Attach job report	
	Total 1		Previous Next

8. Summary.

	letApp SnapCenter®				🏚 🔤 🥹 🗜 dem	o\oradba App Backup and Clone Admin	🖡 Sign Out
>	Oracle Database 👻	New Resource Group					×
	Search resource groups						
	Name	0-0-	-000-	6			
2	rhel2_cdb2	Name Resources	Policies Verification Notification	Summary			
~							
ini -		Resource group name	rhel2_cdb2_log				
^		Policy	Oracle Archive Log Backup: Hourby				
54		Plug-in	SnapCenter Plug-in for Oracle Database				
橆		Verification enabled for policy	None				
A		Send email	No				
	Total 1					Prev	ious Finish

Create a resource group for full backup of SQL Server

1. Log into SnapCenter with a database management user ID, and navigate to the Resources tab. In the View drop-down list, choose either a Database or Resource Group to launch the resource group creation workflow. Provide a name and tags for the resource group. You can define a naming format for the Snapshot copy.

n Ne	etApp SnapCenter®				٠	≥ 6	• l demo\sqldba	App Backup and Clone Admin	🖡 Sign Out
>	Microsoft SQL Server 👻	New Resource Group							×
	search by name								
U	Name		2 3 4 5 6						
•	master	Name	Resources Policies Verification Notification Summary						
- 	model	Provide a par	no and tags for the recourse group						
	tempdb	Flovide a flat							
	tpcc	Name	sql1_tpcc	0					
		Tags	sqlfullbkup	0					
====		\$CustomTex	teme formet for anepartor copy						
A		sql1_tpcc							
	Total 5								evious Next

2. Select the database resources to be backed up.

n	NetApp SnapCenter®		♦ 🔄 🚱 - L demo\sqldba App Backup and Clone Admin 🖡 Sign Out
>	Microsoft SQL Server	New Resource Group	
	search by name		
	Name		
9	master	Name Resources Policies Verification Notification Summary	
	model	Add recourses to Descurse Croup	
in	msdb	Add resources to Resource Group	
2	tempdb	Host Resource Type SQL Server Instance	
5	tpcc	All • Databases • Sql1 •	
-		Available Resources Selected Resources	
#	≖	search available resources	
4	2	Auto select all the resources from the same storage volume 0	
		tpcc (sql1)	
		>	
		ĸ	
	Total 5		Previous Next

3. Select a full SQL backup policy created in section 7.

ΠN	etApp SnapCenter®		🌲 🔤 🚱 🔹 🗜 demo\sqldba 🛛 App Backup and Clone Admin 🛛 🖡 Sign Ou
>	Microsoft SQL Server	New Resource Group	
	search by name		
	Name		
	master	Name Resources Policies Verification Notification Summary	
~	model		
ind	msdb	Select one or more policies and configure schedules	
Δ.	tempdb	SQL Server Full Backup 🔹 🕂 🚺	
34	tpcc	SQL Server Full Backup	
		SQL Server Log Backup	
===		Policy JE Applied Schedules Configure Schedules	
A		SQL Server Full Backup None +	
		Total 1	
		Use Microsoft SQL Server scheduler 🚯	
	Total 5		Previous

4. Add exact timing for backups as well as the frequency.

Add schedules for policy SQL Server Full Backup							
Daily							
Start date	09/10/2021 6:20 PM						
Z Expires on	12/31/2021 6:20 PM						
Repeat every	1 days						
i The schedu zone.	les are triggered in the SnapCenter Server time						
	Cancel OK	I					

5. Choose the verification server for the backup on secondary if backup verification is to be performed. Click Load Locator to populate the secondary storage location.

n Ne	etApp SnapCenter®		٠	0 -	👤 demo\sqldba	App Backup and Clone Admin	🖡 Sign Out
>	Microsoft SQL Server 🚽	New Resource Group					×
	search by name						
	Name						
•	master	Name Resources Policies Vernication Notification Summary					
~	model						
and	msdb	Select the verification servers					
*	tempdb	Verification server Select one or more servers					
34	tpcc	Load secondary locators to					
₩ ₩		Verify backups on secondary Load locators Secondary storage location: SnapVault or SnapMirror Destination Volume Source Volume sym_phybridcovsigli_data_dr					
	Total 5					Prev	vious Next

6. Configure the SMTP server for email notification if desired.

	etApp SnapCenter®	🌢 🗷 😯 - 主 demoisspidba App Backup and Clone Admin 🖉 Sign Ou	t
~	Microsoft SQL Server 👻	New Resource Group	x
	search by name	If you want to send notifications for scheduled or on demand jobs, an SMTP server must be configured. Continue to the Summary page to save your information, and then go to Settings-Global Settings-Notification Server Settings to configure the server.	SMT
U	Name		
æ	master		
	model	Name Resources Policies Verification Notification Summary	
â	msdb		
Δ.	tempdb	Provide email settings 👩	
34	tpcc	Select the service accounts or people to notify regarding protection issues.	
		Email preference Never -	
		From From email	
		To Email to	
		Subject Notification	
		Attach job report	
	Total 5	Previous Net	đ

7. Summary.

	etApp SnapCenter®					•	9 -	⊥ demo\sqldba	App Backup and Clone Admin	🖡 Sign Out
	Microsoft SQL Server 👻	New Resource Group								3
	search by name									
	Name	0-0-			6					
•	There is no match for your search or data is not available.	Name Resources	Policies Verification	Notification	Summary					
ай		Resource group name	sql1_tpcc							
A		Tags	sqlfullbkup							
34		Policy	SQL Server Full Backup: Dail	y						
-		Plug-in	SnapCenter Plug-in for Micro	osoft SQL Server						
-+		Verification server	None							
A		Send email	No							
	Resources are not found. Click Refresh Resources to discover databases in the database view or create new resource group									
	on the discovered databases from the resource view.								Pre	vious Finish

Create a resource group for log backup of SQL Server

1. Log into SnapCenter with a database management user ID, and navigate to the Resources tab. In the View drop-down list, choose either a Database or Resource Group to launch the resource group creation workflow. Provide the name and tags for the resource group. You can define a naming format for the Snapshot copy.

III Ne	tApp SnapCenter®		🌲 🐱 🚱 🔹 L demolsglidba App Backup and Clone Admin	Sign Out
>	Microsoft SQL Server	New Resource Group		×
	search by name			
U	Name		6	
۲	sql1_tpcc	Name Resources Policies Verification Notification St	Summary	
a ii		Provide a name and tags for the resource group		
۸		Name sql1_tpcc_log	0	
89 - E		Tags sqilogbkup	0	
#2		Use custom name format for Snapshot copy		
▲		sql1_tpcc_log		
	Total 1		Previo	IS Next

2. Select the database resources to be backed up.

	NetApp SnapCenter®		•	0 - L demo	\sqldba	App Backup and Clone Admin	🖡 Sign O	Dut
>	Microsoft SQL Server	New Resource Group						×
	search by name							
0	Name							
2	sql1_tpcc	Name Resources Policies Verification Notification Summary						
~		Add resources to Resource Group						
		Host Resource Type SQL Server Instance						
		All Databases I sql1						
		Available Resources Selected Resources						
幸		search available resources						
▲		Auto select all the resources from the same storage volume 0						
		tpcc (sql1)						
		×						
	Total 1					Pre	vious Ne	ext

3. Select a SQL log backup policy created in section 7.

ΠN	etApp SnapCenter®		🌲 🐸 😌 🔹 demo\sqldba App Backup and Clone Admin 🛛 🖗 Sign Out
\$	Microsoft SQL Server	New Resource Group	×
	search by name		
	Name		
	sql1_tpcc	Name Resources Policies Verification Notification Summary	
~		Select one or more policies and configure schedules	
		SQL Server Log Backup - 1	
54		SQL Server Full Backup	
-		SQL Server Log Backup S Delive Configure Scheduler Configure Scheduler	
•		SQL Server Log Backup None +	
		Total 1	
	Total 1		Previous Next

4. Add exact timing for the backup as well as the frequency.

III Ne	tApp SnapCenter®		٠	8	0 -	L demo\sqldba	App Backup and Clone Admin	🗊 Sign (Dut
>	Microsoft SQL Server 🚽	New Resource Group							×
	search by name								
Ø	Name								
	sql1_tpcc	Name Resources Policies Verification Notification Summary							
		Select one or more policies and configure schedules SQL Server Log Backup 							
	Total 1						Pre	vious N	lext

5. Choose the verification server for the backup on secondary if backup verification is to be performed. Click the Load Locator to populate the secondary storage location.

1	INetApp SnapCenter®		🌲 📓 🥹 🎍 demo\sqldba App Backup and Clone Admin 🖡 Sign Out
>	Microsoft SQL Server	New Resource Group	×
	search by name		
C	Name		
-	sql1_tpcc	Name Resources Policies Verification Notification Summary	
		Select the verification servers Verification server Select one or more servers verification server verify backups on secondary Secondary storage location: SnapVault or SnapMirror Source Volume Destination Volume svm_onPremsql1_data svm_hybrid svm_onPremsql1_log svm_hybrid Configure verification schedules Applied Schedules Policy Ls Shedule Type Applied Schedules Configure Schedules	
	Total 1		Previous Next

6. Configure the SMTP server for email notification if desired.

п	NetApp SnapCenter®	🌲 🐸 😔 🔹 1 demoisqidba 🛛 App Backup and Clone Admin 🖇 Sig	n Out
~	Microsoft SQL Server 👻	New Resource Group	×
	search by name	If you want to send notifications for scheduled or on demand jobs, an SMTP server must be configured. Continue to the Summary page to save your information, and then go to Settings-Global Settings-Notification Server Settings to configure server.	he SMTF
U	Name		
 	sqli_tpcc	Image: Police Image: Police<	
	Total 1	Previous	Next

7. Summary.

	e tApp SnapCenter®			٠	≅ 0-	👤 demo\sqldba	App Backup and Clone Admin	🖡 Sign Out
>	Microsoft SQL Server 🚽	New Resource Group						>
	search by name							
U	Name	0 0	-3					
	sql1_tpcc	Name Resources	Policies Verification Notification Summary					
201 201		Parource group pame	rali tore log					
*		Tags	sqliogbkup					
54		Policy	SQL Server Log Backup: Hourly					
		Plug-in	SnapCenter Plug-in for Microsoft SQL Server					
===		Verification Server	None					
A		Send email	No					
	Total 1						Previ	ious Finish
	lotar i						Flev	Philish

9. Validate backup

After database backup resource groups are created to protect database resources, the backup jobs runs according to the predefined schedule. Check the job execution status under the Monitor tab.

Π	NetApp SnapCenter®											🖡 Sign Out
<		Jobs	Schedules									
	Dashboard	searc	h by name					C Detail				
	Resources	Jobs - Filter										
0	Monitor	ID	Status	Name	Start date			Er	ıd date	Owne	r ,	
111	Reports	532	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/14/2021 8:35:01 PM 📋			09/14/2021 8:37:10	PM 🛱	demo	sqldba	
	Hosts	528	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/14/2021 7:35:01 PM 🛱			09/14/2021 7:37:09	PM 🛱	demo	sqldba	
		524	4	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/14/2021 6:35:01 PM 🛱			09/14/2021 6:37:08	PM 🛱	demo	sqldba	
54	Storage Systems	521	~	Backup of Resource Group 'sql1_tpcc' with policy 'SQL Server Full Backup'	09/14/2021 6:25:01 PM 🛱			09/14/2021 6:27:14	PM 🛱	demo	sqldba	
=	E Settings	517	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/14/2021 5:35:01 PM 🛱			09/14/2021 5:37:09	PM 🛱	demo	sqldba	
Δ	Alerts	513	4	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/14/2021 4:35:01 PM 🗂			09/14/2021 4:37:08	PM 🛱	demo	sqldba	
- 413		509	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/14/2021 3:35:01 PM 🛱			09/14/2021 3:37:10	PM 🛱	demo	sqldba	
		503	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/14/2021 2:35:01 PM 📛			09/14/2021 2:37:09	PM 🛱	demo	sqldba	

Go to the Resources tab, click the database name to view details of database backup, and toggle between Local copies and mirror copies to verify that Snapshot backups are replicated to a secondary location in the public cloud.

🗖 Ne	tApp SnapCe	enter®					a ≊ 0-	👤 demo\oradba	App Backup and Clone Ac	min 🛛 🖡 Sign Out
5	Oracle Database	-	cdb2 Topology							×
	Search databa	ses							Database Settings Pro	Kocz Refresh
Ø	17 19	Name	Manage Copies							í
		cdb2	197 Backups					ä	C 1	
	n in the second	cdb2dev	3 Clones					Summ	ary Card	
â		cdb2dr	O Clones Mirror copies					394 Backu	ps	
*	re i	cdb2dr2	Local copies					28 Da	ta Backups	-
į۹.	5	cdb2test						3 Clone	s sackups	-
₩ #			Primary Backup(s) (search IV)					• 1	¶i η ₫	▲ ²
			Backup Name	Count	Туре	l₹ End Date	Verified	Mounted	RMAN Cataloged	SCN
			rhel2_cdb2_09-23-2021_14.35.03.3242_1	1	Log	09/23/2021 2:35:45 PM 🛱	Not Applicable	False	Not Cataloged	6872761
			rhel2_cdb2_09-23-2021_14.35.03.3242_0	1	Data	09/23/2021 2:35:30 PM 🛱	Unverified	False	Not Cataloged	6872715
			rhel2_cdb2_09-22-2021_14.35.02.0014_1	1	Log	09/22/2021 2:35:24 PM 🛱	Not Applicable	False	Not Cataloged	6737479
			rhel2_cdb2_09-22-2021_14.35.02.0014_0	1	Data	09/22/2021 2:35:14 PM 🛱	Unverified	False	Not Cataloged	6737395
			rhel2_cdb2_09-21-2021_14.35.02.1884_1	1	Log	09/21/2021 2:35:35 PM 🛱	Not	False	Not Cataloged	6598735

At this point, database backup copies in the cloud are ready to clone to run dev/test processes or for disaster recovery in the event of a primary failure.

Getting Started with AWS public cloud

This section describes the process of deploying Cloud Manager and Cloud Volumes ONTAP in AWS.

AWS public cloud



To make things easier to follow, we have created this document based on a deployment in AWS. However, the process is very similar for Azure and GCP.

1. Pre-flight check

Before deployment, make sure that the infrastructure is in place to allow for the deployment in the next stage. This includes the following:

- □ AWS account
- $\hfill\square$ VPC in your region of choice
- □ Subnet with access to the public internet
- Permissions to add IAM roles into your AWS account
- $\hfill\square$ A secret key and access key for your AWS user

2. Steps to deploy Cloud Manager and Cloud Volumes ONTAP in AWS



There are many methods for deploying Cloud Manager and Cloud Volumes ONTAP; this method is the simplest but requires the most permissions. If this method is not appropriate for your AWS environment, please consult the NetApp Cloud Documentation.

Deploy the Cloud Manager connector

1. Navigate to NetApp Cloud Central and log in or sign up.

Log In to NetApp Cloud Central	
Don't have an account yet? Sign Up	
rt1600680@demo.netapp.com	
LOGIN	

2. After you log in, you should be taken to the Canvas.



3. Click "Add Working Environment" and choose Cloud Volumes ONTAP in AWS. Here, you also choose whether you want to deploy a single node system or a high availability pair. I have chosen to deploy a high availability pair.

 Cloud Manager								Account ~ Workspace ~ Connector ~ @ @ @					
Canvas	Replication	Backup & Restore	KBs	Data Sense	File Cache	Compute	Sync	All Services	(+8) 🗸				
Add New	Working Enviro	onment											×
					aws	0		-					
			Microsft An	Ana	zon Web Services	Google Cloud	Radoum	On Premis	9				
		Cho	oose Type										
			0	2	6	2	1	0					
			Cloud Volumes ONTAP		Cloud Valum	HIS ONTAP HA	ci	oud Volumes Sen	ice :				
			1.00	Node	High A	velationsy.		High Availability					
							<u> </u>						
					10	Next/							

4. If no connector has been created, a pop-up appears asking you to create a connector.



5. Click Lets Start, and then choose AWS.

***	Cloud Manager	Add Connector		Need Help?										
	Canvas Replication													
	Add New Working Envi													
	Provider													
Choose the cloud provider where you want to run the Connector:														
				0										
				aws	0									
			Microsoft Azure	Amazon Web Services	Google Cloud Platform									
				Continue										

6. Enter your secret key and access key. Make sure that your user has the correct permissions outlined on the NetApp policies page.

	Cloud Manager	oud Manager Add Connector						
	Canvas Replication	⊘ Get Ready 👩 AWS Credentials 💿 Details 🚯 Network 🔇 Security Group 🚳 Review						
_	Add New Working Env	AWS Credentials						
		AWS Access Key AWS Access Ray is required AWS Secret Key Region Us-east-1 US East (AL Virginia) Want to launch an vistance without AWS Credentials? ~						
		Previous Next						

7. Give the connector a name and either use a predefined role as described on the NetApp policies page or ask Cloud Manager to create the role for you.

Cloud Manager	Add Connector	Need Help7 🗙
Convas Replication	🕗 Get Ready 🕢 AWS Credentials 🌖 Details 🔇 Network 🕥 Security Group 🥥 Review	
Add New Working Envi	Details	
	Connector Instance Name O Connector Role O	
	#Wscloudmanager Create Role Create Role Select an existing Role	
	Role Name	
	Add Tags to Connector Instance Cloud-Manager-Operator-IBN224j	
	Previous Next	

- 8. Give the networking information needed to deploy the connector. Verify that outbound internet access is enabled by:
 - a. Giving the connector a public IP address
 - b. Giving the connector a proxy to work through
 - c. Giving the connector a route to the public internet through an Internet Gateway

-	Cloud Manager	Add Connector	Need Help? X
	Canvas Replication	🧭 Get Ready 🔗 AWS Credentials 🔗 Details 🔕 Network 🔇 Security Group 🚯 Review	
	Add New Working Env	Connectivity Proxy Configuration (Optional) VPC HTTP Proxy vpc 083fcd/19975dfb6e-10.221.0.0/16 HTTP Proxy Subnet Beline Credentials for this Proxy T0.221.4.0/24 publicSN_us-east-1a_rt1500 Upload a root certificate ~ Key Pair Image:	
		Previous Next	

9. Provide communication with the connector via SSH, HTTP, and HTTPs by either providing a security group or creating a new security group. I have enabled access to the connector from my IP address only.

 Cloud Manager	Add Connector	Need Help? X
Canvas (Replication)	🧭 Get Ready ⊘ AWS Credentials 🕝 Details ⊘ Network 🚳 Security Group 🚳 Review	
Add New Working Envi	The security group must allow inbound HTTP. HTTPS and SSH access.	
	Assign a security group: O Select an existing security group	
	HTTP (Port 80) HTTPS (Port 443) SSH (Port 22)	
	Source Type Source Type Source Type	
	My IP v My IP v	
	Source (CDPR) Source (CDPR) Source (CDPR)	
	21624031.54502 21624031.54502 21624031.54502	
	Previous Next	

10. Review the information on the summary page and click Add to deploy the connector.

-	Cloud Manager	Add Connector	Need Help? X
	Canvas Replication	🧭 Get Ready 🕑 AWS Credentials ⊘ Details ⊘ Network ⊘ Security Group 🔵 Review	
	Add New Working Envi	Code for Terraform Automation	
		Connector Name awschoudmanager	
		Region us-east-1	
		VPC vpc-083fcbd79f75dfb6e - 10.221.0.0/16	
		Subnet 10.221.4.0/24 publicSN_us-east-1a_rt1600680	
		Key Pair #11600680	
		Public IP Enable	
		Prosy None	
		Security Group HTTP: 216.240.31.145/32, HTTPS: 216.240.31,145/32, SSH: 216.240.31.145/32	
		Previous Add	

11. The connector now deploys using a cloud formation stack. You can monitor its progress from Cloud Manager or through AWS.



12. When the deployment is complete, a success page appears.

Cloud Manager	×
Canvas Replication	Connector Successfully Created The Connector win created successfully.

Deploy Cloud Volumes ONTAP

1. Select AWS and the type of deployment based on your requirements.

Cloud Manager								Account ~ Werkspace ~ Connector ~ @ ① @					9		
Canvas	Replication	Backup & Restore	Kās	Data Sense	Ele Cache	Compute	Sync	All Servi	ces (+8) 🛩						
Add New	Working Enviro	onment												>	<
					aws	0			-						
			Microstt An	re Ana	zan Web Services	Google Cloud I	Saclarm	On Pr	emilies						
		Ch	oose Type												
			0	0	6	2		0							
			Cloud Volumes ONTAP		Cloud Volum	HES ONTAP HA	d	oud Volumes	Service						
			94	Node	High As	vellabel(ty)		High Availabl	-7.)						
					<u>.</u>	<i>u</i>									
						vext /									

2. If no subscription has been assigned and you wish to purchase with PAYGO, choose Edit Credentials.

	Cloud Manager							Account Y Workspace Y	• Connector • avectmateriaria	@ @	۲
	Canvas	Replication	Backup & Restore	K8s Data S	ense File Cache	Compute	Sync	All Services (+8) 🗸			
	Create a No	ew Working Environ	nment		Details an	d Credentia	s				
	Previous	Step .	Instance Profil Credential Nam	a 3229- ne Accou	44748816 //t ID	An subscription (Marketplace Subscri	ption	Edit Credentials			
			Details Working Enviro	nment Name (Civiter	Name	Crede	ribals				
			Up to 40 cha	acters		admin					
			Add Tags	Optional Field	(Lip to fingr tags	Confin	m Password				
						soboue					
Coud M	langer3.9.9 Built	0 Aug 10, 2021 04,130	5 eri luto								

3. Choose Add Subscription.

ш	Cloud Mar	nager		Account · Workspace · Connector · 60 0 @	
	Canvas	Replication	Backup & Restore K8s	Data Sense File Cache Compute Sync All Services (+8) 🗸	
	Create a Nev	w Working Enviror	ument	Details and Credentials	
	Presidios 3	Step	Instance Profile Credential Name	Edit Credentials & Add Subscription	
			Details Working Environment IS	Associate Subscription to Credentials Credentials Instance Profile Account ID: 322944746816 -	
			Anti Tags	Marketplace Subscription Marketplace Subscription Marketplace Subscription Add Subscription	
-		Aug 10, 2011 AAAA		Apply Cancel	

4. Choose the type of contract that you wish to subscribe to. I chose Pay-as-you-go.

	Cloud Ma	nager						-	Account v 11600680		rkopace - dopace-1	Connector evolutionena.	\$ @	
	Canvas	Replication	Backup & Restore	Kās	Data Sense	File Cache reprendialis for A	Compute	Sync	All Services	i (+8) 🗸				
	Create a No	w Working Enviror	nrisent		Select a s details ar Pa Pa wit	ubscription option of then subscribe. g-Per-THE - Annual y for Cloud Volum th an annual, upfr	and click Continue Contract es ONTAP ont payment.	• The AWS Mi	arketplace enab ay-as-you-go ay for Cloud V n hourly rate.	iles you to v alumes ON	ew pricing			
. 65.00	- Constituency 45.6 - Kalol & Jug 10, 2017-1011-01-01-01				The next steps:									

5. You are redirected to AWS; choose Continue to Subscribe.

💭 aws marketplace					٩	Halla, rt1600680 -
Addot - Categorian - Dervery Addo	■ NetApp	Cloud Manager - Deplo Data Services loid by: NetKop.Inc. Eart here to drafoy and manage Gloud Idoud Backup and Cloud Volumes Servic Show more	y & Manage Ne Volumes ONTAP, Cloud Tir e. Accelerate critical busin	tApp Cloud ering, Cloud Data Sense, ess apps with speed,	Continuer to Solution be	Anna and an and an and an and an and
	Product Over	Pricing	Usage	Support	Reviews	
	NetApp Cloud Manager is th and operating NetApp's Clain - Cloud Volumes ONTAP - Fi - Cloud Backup - Increment arthiving CVD and On-Prem - Cloud Testing - Terring infr - Cloud Tasting - Terring infr - Cloud Tasting - Terring infr - Cloud Manager also manager Cloud Manager also manager Cloud Manager eases the da environment including confi	e management and automation platfor all Data Services including: lie and block storage for enterprise work to block-level Backop & Restore capabilities over ONTAP data to 53 equently-uned data to object storage for adda privacy controls and reporting per Clocel Volumes Service on AWS y-to-day requirements of operating yo guring, provisioning, and monitoring et-	m use for deploying cloads fines for protecting and er AFF er Lloud storage ich of your active	Highlights Streamline the deploys Cloud Volumes ONTAP Centrally manage your replicate across availab your data center Enable your If adminis your cloud storage res	ment of all your NetApp environments NetApp based storage and ality zones or to and from trators to audit and track surce spend	

6. Subscribe and you are redirected back to NetApp Cloud Central. If you have already subscribed and don't get redirected, choose the "Click here" link.


7. You are redirected to Cloud Central where you must name your subscription and assign it to your Cloud Central account.

T NetApp		Falstic View	Fill -	22
EE Experientee	Subscription Assignment ×			
NGE Feature Spotlight	Your subscription to Cloud Manager / Cloud Volumes ONTAP from AWS Marketplace was created successfully!			
197 Praticity (Name your subscription demo.netapp.com-cloud-volumes-ontap-386953e5			
×.	NetApp Cloud Central Account 0			
ena An	We've assigned your subtractiption to all of your NetApp Cloud Central accounts. You can choose to unassign specific accounts.			
territori Itatus (1	Sive			
Command Us				

8. When successful, a check mark page appears. Navigate back to your Cloud Manager tab.

ri NetApp		Fabric View	Full	 8
EEE Fabric Virei				
NC: Pearsen Spotlight				
19 Protecti i				
X tom :				
ба жі				
Services Status (2	Your subscription demo.netapp.com-cloud-volumes-ontap-386953e5 saved successfully			
Contact Vs				

9. The subscription now appears in Cloud Central. Click Apply to continue.

Create a New Working Environment	Edit Credentials & Add Subscription		
	Associate Subscription to Credentials		
	You subscribed successfully?	_	
	Credentals		
	Instance Profile Account ID: 322944748816		
	Subscription		
	 demo.netapp.com-cloud-volumes-ontap-386953e5 	•	
	Add Subscription		
	77 11		
	Apply Cancel	h i	
2 Charl Hengel 54.8 (Sell 8 - Aug 18, 2017 541, 500 are 177)			

- 10. Enter the working environment details such as:
 - a. Cluster name
 - b. Cluster password
 - c. AWS tags (Optional)

 Cloud Ma	nager						Account ~ Workspace ~ Core r1600880 workspace1 avec	nator_* @ @ @	
Canvas	Replication	Backup & Restore	K8s Data	Sense File Cad	te Compute	Sync	All Services (+8) ~		
Create a N	ew Working Enviro	oment		Details	and Credentia	ls			
↑ Previou	s Step	Instance Profil Credential Nam	e 322 e Acc	944748816 ount ID	demo.netapp.com Marketplace Subsc	cloud-vol	Edt Credentials		
		Details			Cred	oritials			
		Working Enviro	nment Name (Clusb	et Name)	User	Name			
		hypridawsove	16		- 207	nın			
			3.5 7.53	116 - 12 - 12 116 - 12 - 12	Parso	vord			
		ADD 1985	Oboover His	rg / rob zo nirós zráže					

					Continue				

11. Choose which additional services you would like to deploy. To discover more about these services, visit the NetApp Cloud Homepage.

ш	Cloud Ma	nager							Account ri1600880	~ *	terkapac terkapace	•	Connector avocloadmana	•	9 (8
	Canvas	Replication	Backup & Restore	K8s Da	ita Sense	File Cache	Compute	Sync	All Servic	es (+8) 🗸						
	Create a N	ew Working Enviror	ament			Ser	vices									
	t Previou	s Step														
			💿 Dat	a Sense & Com	allance						•	~				
			(i) Ван	kup to Cloud							•	~				
			(iii) Mo	nitoring							•	~				
						1										
						Cor	ntinue									

12. Choose whether to deploy in multiple availability zones (reguires three subnets, each in a different AZ), or a single availability zone. I chose multiple AZs.

***	Cloud Ma	nager						Account ~	Workspace Workspace 1		Connector ~	0	0 (9
	Canvas	Replication	Backup & Restore	K8s Dat	a Sense 🛛 File Cac	he Compute	Sync	All Services (+	8) ~					
	Create a No	ew Working Enviror	iment		HA Dep	loyment Mo	dels							
	† Previous	Step	Multiple Availabl Multiple Availabl Provides m S Finables sel An HA node Extended infe	lity Zones aximum protection ection of 3 availab e serves data if its j	n against AZ failures. lity zones. partner goes offline.	Single © © ©	Availability Z Protects again Single availabi group, spread An HA node se ed infs	one st failures within lity zone, HA node across distinct ur erves data if its pa	a single AZ. Is are in a placer identying hardwa rtrier goes offlin	cent ve.				

13. Choose the region, VPC, and security group for the cluster to be deployed into. In this section, you also assign the availability zones per node (and mediator) as well as the subnets that they occupy.

Cloud Ma	nager							Account Y W	orkopace -	Connector		® 0	
Canvas	Replication	Backup & Restore	K8s	Data Sense	Ele Cache	Compute	Sync	All Services (+8) 🛩					
Create a No	w Working Environ	oment			Regio	n & VPC							
1 Previous	Step	AWS Region			VPC			Security group					
		US East N. Virgni	a	*	vpc-683ftbd79f75d 10.221/0.0/16	106e -	*	Use a generated security g	roup •				
		Node 1:			Node 2:			Mediator:					
		Availability Zone			Availability Zone			Availability Zone					
		us-east-ta			us-east-1b		•	us-east-1c	*				
		Subnet			Subnet			Subnet					
		10.221.1.0/24		÷	10.221.2.0/24		*	10.221.3.0/24	•				
					Co	tinue							
	Cloud Ma Canvas Create a No 1 Previous	Cloud Manager Carrvas Replication Create a New Working Environ T Previous Step	Cloud Manager Carwas Replication Backup & Restore Create a New Working Environment T Previous Step Awds Region US East N. Virgen US East N. Virgen Node 1: Availability Zone st-catb-1a Subnet 10.221.1.024	Cloud Manager Convas Replication Backup & Restore Kas Create a New Working Environment T Previous Step KMV5 Region US East N. Virginia	Cloud Manager Courves Replication Backup & Restore Kits Data Sense Create a New Working Environment	Cloud Manager Conves Replication Backup & Restore X8 Data Sense File Cache Create a New Working Environment	Cloud Manager Carwas Replication Backup & Restore Kiss Data Sense File Cache Compute Create a New Working Environment Region & VPC	Cloud Manager Carwas Replication Backup & Restore Kits Data Sense File Cache Compute Sync Create a New Working Environment Region & VPC * AWS Region VPC US East N. Virgria VPC Node 1: Node 1: Node 2: Availability Zone size east-1a size east-1b size east-1b Subnet T0.221.1.0/24 Sizhnet T0.221.2.0/24 sizhnet	Account of the control	Cloud Manager Account of Monopulation M	Cloud Manager Montpack (*) Workpack (*) Contract (*) Carrwas Replication Backup & Restore Kiss Data Sense File Cache Compute Sync All Services (*8) Create a New Working Environment Region & VPC Security group Security group 1 Previous Step MVS Region VPC Security group US Edst N. Virgma VPC Security group Node 1: Us East N. Virgma VPC Security group Visitability Zone us-east-1a	Cloud Manager Account of Modepace of Workpace of Workpace of Computed of Modepace of Workpace of Computed of Compute of Sync All Services (HR) Centered of Modepace of Compute of Sync All Services (HR) Centered a New Working Environment Region & VPC Security group 1 Previous Step Attise Region VPC Security group US East (H. Wirgela VPC Security group • US East (H. Wirgela VPC Security group • US East (H. Wirgela VPC Security group • Vision VPC Security group • US East (H. Wirgela VPC Security group • Vision VPC Security group • Vision VPC Security group • VPC VPC VPC VPC VPC VPC VPC VPC <	Cloud Manager Actions Workgade Connection Connectio

14. Choose the connection methods for the nodes as well as the mediator.

	Cloud Ma	inager						Account		Workspace Workspace 1	Connector avectmates	 ۲	0	0
	Canvas	Replication	Backup & Restore	K8s Data	Sense File Cache	Compute	Sync	All Servic	tes (+8) 🗸					
	Create a N	ew Working Enviror	oment		Connectivity & S	SH Auther	itication							
	t Previou	s Step	Not	les.		<u>.</u>	Mediator							
			SSH Auther Password	tication Method		Security Gr Use a get	oup nerated secur	eity group						
						Key Pair N	inie.							
						/1160068	0			٠				
						Internet Co	nnection Me	thod						
						Public IP	address			2				
					C .	ntinue								
Coud M	lange 359 Suit	a Aug 10, 2021 04,133	5 em धराद											



The mediator requires communication with the AWS APIs. A public IP address is not required so long as the APIs are reachable after the mediator EC2 instance has been deployed.

 Floating IP addresses are used to allow access to the various IP addresses that Cloud Volumes ONTAP uses, including cluster management and data serving IPs. These must be addresses that are not already routable within your network and are added to route tables in your AWS environment. These are required to enable consistent IP addresses for an HA pair during failover. More information about floating IP addresses can be found in the NetApp Cloud Documenation.

 Cloud Mar	ager								Account rt1618549		Workspace Workspace-1	Connector 🗸	Ĺ,	0	
Canvas	Replication	Backup & Restore	K8s	Data Sense	File Cache	Compute	Sync	All Services (+8) 🗸							
Create a Nev	w Working Enviror	iment				Floa	ting IPs								
Previous !	Step		Floating IP	addresses are requ HA nodes if failu You must speci	ired for cluster an irres occur. To acce fly IP addresses th 10.222.0.200 Floating IP add 10.222.0.201 Floating IP add 10.222.0.202 Floating IP add Enter Floating	d SVM access and set to data from at are outside of 1 ress for cluster m ress 1 for NFS and ress 2 for NFS and ress for SVM man g IP Address	d for NFS and outside the Vi the CIDR block anagement d CIFS data d CIFS data	CIFS data access. These ft PC, you can set up an AW ks for all VPCs in the selec	loating IPS can ISS transit gatew	migrate be ay. n.	tween				
						Co	ontinue								

2. Select which route tables the floating IP addresses are added to. These route tables are used by clients to communicate with Cloud Volumes ONTAP.

Cloud Ma	nager							Account ~	Workspace ~	Connector ~	0	0 0
Canvas	Replication	Backup & Restore	K85	Data Sense	Ele Ga	che Compute	Sync	All Services (+8)	×			
Create a N	ew Working Enviror	ment			R	oute Tables						
1 Previour	s Step	Select the rou pai	e tables that s . If you leave a	hould include route route table unselec	s to the floa ted. clients	iting IP addresses. This en that are associated with th	ables client he route tab	access to the Cloud V ole cannot access the	olumes ONTAP HA HA pair.			
					Add	ibonal information 🕼						
		😧 Name			Main	ID	Ass	ociate with Subnet	Tags			
		[2] private	_rt_rt1600680		No	rtb-08b4cb88f65clt26at	35	ubnets	1 Tags			
		2 public	rt_rt1600680		Ves	rtb-0e46720d0da10c59	8 (15	ubriets	1 Tags			
		2 Route Table) The main ro	ute table is the defa	ult for the v	VPC						
					1	Continue						
						CONTRACT						

3. Choose whether to enable AWS managed encryption or AWS KMS to encrypt the ONTAP root, boot, and data disks.

-	Cloud Ma	nager							Account m600680		Workspace Workspace 1	Connector ~	٢	0 (9
	Canvas	Replication	Backup & Restore	K8s	Data Sense	File Cache	Compute	Sync	All Ser	vices (+8) •	×				
	Create a N	ew Working Enviro	oment			Data E	ncryption								
	1 Previous	s Step		AM B1	5 Is responsible for andled by AWS key fault Master Key: a	data encryption data encryption a management sen ws/ebs	nd decryption opi	eraboris. Key	nianageme	nt					
						Co	ntinue								

4. Choose your licensing model. If you don't know which to choose, contact your NetApp representative.

-	Cloud Ma	nager							Account +1600680		Workspace Workspace 1		Comment	lor 🗳	ø	0	
	Canvas	Replication	Backup & Restore	K8s	Data Sense	Ble Cache	Compute	Sync	All Serv	/ices (+8) >							
	Create a No	ew Working Enviro	oment.	Clou	d Volumes (ONTAP Cha	rging Meth	ods & N	ISS Acco	ount							
	1 Previous	Step	Cloud Volumes ONTAP	Charging methods by the h	Methods ods nour		Net. Lear Ta n shou Dan finisi Supp	App Suppo n more abor egister this Q ald and NetA t have a Net t have a Net t have a Net t have a Net add NetApp	rt Site Accou it NetApp Sup loud Volumes pp Support 5 App Support 5 this system At tion option to Support Site 2	unt <i>(Optie</i> sport Site i s ONTAP to ille Account Site accound fler its create an Account	mail) NSS9 account I support you It mtSelect go to treduse the NSS account	5 0					
	mane 153 Built	5 Aug 10 2021 04 19 1	0 er 070			co	ntinue										

5. Select which configuration best suits your use case. This is related to the sizing considerations covered in the prerequisites page.

	Cloud Ma	nager							Account ~	Workspace 1		Connector encloyedment.		\$	9 ®
	Canvas	Replication	Backup & Restore	K8s	Data Sense	Ble Cache	Compute	Sync	All Services (+8)						
	Create a Ne	w Working Enviro	oment			Preconfigu	red Packag	95							
	1 Previous	Step	Select a proc	configured	Cloud Volumes O Preconfi	NTAP system the guind settings ca	at best matches in be modified at	your needs, a later time	or create your own o	configuration.			Change	e Configura	ation
		POC and t	mail workloads TB of xorage	t	batabase and applik production wor Up to 10TR of at	cation data kloads torage		Cost effectiv	ve DR storage	Highest	performar workdo p to 36815 c	ce production ids fittorage			
Coud M	looge 153 Said	0 Aug 10, 2021 (04, 13)	S err L/TC			Co	otinue								

6. Optionally, create a volume. This is not required, because the next steps use SnapMirror, which creates the volumes for us.

	Cloud Ma	nager							Account ~	1 20	ekspace rkspace 1		Connector ~	۲	0	0
	Canvas	Replication	Backup & Restore	K8s	Data Sense	File Cache	Compute	Sync	All Services	(+8) 🛩						
	Create a Ne	ew Working Environ	iment			Create	Volume									
	Previous	Step	Details & Pro	tection			Protoco	d.								
			Volume Name:		Size	ice) O	14	5	CIFS	e	5C5I					
			1		VO	fume size	Access for									
			Snapshot Policy:				Custom	export policy								
			default													
			IDefault Policy				Custom ex	port policy			1	P				
							10.221.0	0/16								
							Advanced	options				<u></u>				
						*Continue :	Sk	ip]							
Cout M	mpetti tor	a Aug 18, 2021 64 53 35	and Serve													

7. Review the selections made and tick the boxes to verify that you understand that Cloud Manager deploys resources into your AWS environment. When ready, click Go.

#	Cloud Mana	ıger							Account S		Workspace Workspace 1		Connector evodoutmen		~ @		
	Canvas	Replication	Backup & Restore	Kās	Data Sense	File Cache	Compute	Sync	All Service	i (+8) 🛩							
	Create a New	Working Environr	ment			Review (& Approve										
	1 Previous St	^{ep} hybridawsc	VO ast-1 HA									5	iow API reque	d			
		I understan	d that in order to activate	e support. I mu	rst first register G	Toud Volumes ONT	AP with NetApp: M	ore informatic	00 F								
		V Lunderstan	d that Cloud Manager wi	It allocate the a	appropriate AW5	resources to comp	ly with my above re	equinoments	. More informati	ie?							
		Overview	v Networking	51	torage									-			
		Storage System:	Cloud	Volumes ONTA7	HA.		HA Deploym	nent Model:	Mul	tple Avail	ibility čones						
			1 March 1	NUMBER POPUL	Standard		Encryption		4564	Mariana	e.						
		License Type:	Cibud	Fundament Services	- (4140 H140 H2				1000	1000000	6.7						

8. Cloud Volumes ONTAP now starts its deployment process. Cloud Manager uses AWS APIs and cloud formation stacks to deploy Cloud Volumes ONTAP. It then configures the system to your specifications, giving you a ready-to-go system that can be instantly utilized. The timing for this process varies depending on the selections made.



9. You can monitor the progress by navigating to the Timeline.

	Cloud M	anager					A.	ccount ~	Workspace ~ Workspace-1	Connector ~	© ©	8
	Canvas	Replication	Backup & Restore	Kās	Data Sense	File Cache Compute 5	Sync:	All Services (+)	n~			
		Resources Canvas Review	6 Cirol, CirS, ANF & On-Premises	*	6	Digital Wallet View & Manage Digital Wallet	1	*	Timeline View Activity & Events			
		Services Replice Data lie	tion plication	*	6	Backup & Restore Data Protection for CPO and On-Premis	-	۲	KBs Cloud Native Development			
		Data S	ense overnance & Compiliance	*	0	Compliance Privacy & Compliance Controls	4		Tiering Lift and DON'T shift	<i>\$</i>		
		(ht) Monito	eing 6. Optimize and Secure	2	(1)	File Cache Convolidate your Data into the Cloud	1	\bigcirc	Compute Optimize your clinic spend			
Margin /// South	arage retapp con	Sync Automo	ned Data Synchronization	×		SnapCenter Application Data Management	1	*	Active IQ Digital Advisor	1		

10. The Timeline acts as an audit of all actions performed in Cloud Manager. You can view all of the API calls that are made by Cloud Manager during setup to both AWS as well as the ONTAP cluster. This can also be effectively used to troubleshoot any issues that you face.

 Cloud Man	iger			Acce	ount ~	Norkspace ~ Norkspace 1	Comm	etor ~	۲	0 (8
Canvas	Replication Backup & Rest	ore KBs Data Sense File	e Cache Comput	e Sync	All Services (+8) ~						
(+) Timeli	ne										
	₩ Filters:										
	Time (1) Service	Action Apont (1) Resource	e Uier [Status Peo	et.		¢	2 <u>+</u>			
	Time .	Action :	Service :	🕒 Agent ±	• Resource :	User :	Status :	٠			
	 Aug 18 2021, 9:42:32 pm 	Check Connectivity	Coud Manager	auscloudman	hybridavacio	Full Name	 Success 				
	 Aug 16 2021, 9:42:00 pm 	Create Awa Ha Working Environment	Cloud Manager	awychoudma	hybridawscvo	full Name) Pending	•			
	Aug 19 2021, 10:09:39 pm	Describe Operation Status					 Success 				
		December December Parties					. Lena				

11. After deployment is complete, the CVO cluster appears on the Canvas, which the current capacity. The ONTAP cluster in its current state is fully configured to allow a true, out-of-the-box experience.



Configure SnapMirror from on-premises to cloud

Now that you have a source ONTAP system and a destination ONTAP system deployed, you can replicate volumes containing database data into the cloud.

For a guide on compatible ONTAP versions for SnapMirror, see the SnapMirror Compatibility Matrix.

1. Click the source ONTAP system (on-premises) and either drag and drop it to the destination, select Replication > Enable, or select Replication > Menu > Replicate.



Select Enable.

CITYIC			
6	Replication	Enable] (;)

Or Options.

onPrem • On		×
DETAILS		
On-Premises ONTAP		
SERVICES		
Replication	1 Replication Target	(

Replicate.

onPrem • On	(1) (1) (2)
DETAILS	
On-Premises ONTAP	
SERVICES	
SERVICES Replication On	1 Replication Target
SERVICES Replication On Backup & Compliance	1 Replication Target

2. If you did not drag and drop, choose the destination cluster to replicate to.

Replicate Data	
From: onPrem	
To: select the Working Environment to which ye	ou want to replicate data
Replication Target	
hybridcvo (Cloud Volumes ONTAP)	``
Start Replication Wizard	Cancel

3. Choose the volume that you'd like to replicate. We replicated the data and all log volumes.

Replication Setup		Source Vi	olume Selection		
rhel2_u03	ONLINE	erhel2_u030923211942120	03118 Online	sql1_data	ONLINE
IFO CAPACI	Ŷ	INFO	CAPACITY	INFO	CAPACITY
torage VM Name svm_onPrem Tering Policy None 10 /olume Type RW	T.29 GB DISk Used cated	Storage VM Name svm_onPrem Tiering Policy None Volume Type RW	a 35.83 MB Disk Used Allocated	Storage VM Name SVM Tiering Policy No Volume Type RW	n_onPrem ne // 53.37 GB // Disk Used
sql1_log	ONLINE	sql1_snapctr	ONLINE		
IFO CAPACI torage VM Name svm_onPrem	Y	INFO Storage VM Name svm_onPrem	CAPACITY		
Tiering Policy None 21.	S GB Disk Used	Tiering Policy None	24.87 GB Allocated		

4. Choose the destination disk type and tiering policy. For disaster recovery, we recommend an SSD as the disk type and to maintain data tiering. Data tiering tiers the mirrored data into low-cost object storage and saves you money on local disks. When you break the relationship or clone the volume, the data uses the fast, local storage.

Replication Setup	De	stination Disk Type and Ti	ering	
↑ Previous Step	Destination Disk Type	General Purpose SSD - Dynamic Performance	Throughput Optimized HDD	
	S3 Tiering Enabled Disabled Note: If you enable 53 tiering, thin provi	sioning must be enabled on volumes created	What are storage tiers? In this aggregate.	
		Continue		

- Cloud Manager 3.9.10 Build: 2 Sep 12, 2021 06:47:41 am UTC
- 5. Select the destination volume name: we chose [source_volume_name]_dr.

Destination Volume Name

Destination	Volume Name	
-------------	-------------	--

sql1_data_dr

Destination Aggregate

Automatically select the best aggregate

6. Select the maximum transfer rate for the replication. This enables you to save bandwidth if you have a low bandwidth connection to the cloud such as a VPN.

Max Transfer Rate

You should limit the transfer rate. An unlimited rate might negatively impact the performance of other applications and it might impact your Internet performance.

-	1	
 Limited to: 	100	MB/s

Unlimited (recommended for DR only machines)

7. Define the replication policy. We chose a Mirror, which takes the most recent dataset and replicates that into the destination volume. You could also choose a different policy based on your requirements.

	Replicati	on Policy
	Default Policies	Additional Policies
Mirror Typically used for disaster recovery		Mirror and Backup (1 month retention) Configures disaster recovery and long-term retention of backups on the same destination volume
More info		More info

8. Choose the schedule for triggering replication. NetApp recommends setting a "daily" schedule of for the data volume and an "hourly" schedule for the log volumes, although this can be changed based on requirements.

One-time copy	10min	12-hourly	5min	6-hourly
No schedule	Every hour Minutes: 0th, 10th, 20th, 3	Every day Hours: 12 AM and 12 PM Minutes: 15th minute	Every hour Minutes: 0th, 5th, 10th, 15t	Every day Hours: 12 AM, 6 AM, 12 PM Minutes: 15th minute
	8hour	daily	hourly	monthly
	Every day Hours: 2 AM, 10 AM and 6 Minutes: 15th minute	Every day Hours: 12 AM Minutes: 10th minute	Every hour Minutes: 5th minute	 Every month Days: 2nd Hours: 12 AM Minutes: 20th minute
		ī		
	pg-15-minutely	pg-6-hourly	pg-daily	pg-daily-set2
	O Eveny hour	C Evenuday	O Even day	O Evenuday

9. Review the information entered, click Go to trigger the cluster peer and SVM peer (if this is your first time replicating between the two clusters), and then implement and initialize the SnapMirror relationship.

Replication Setup			Review & Ap	oprove			
↑ Previous Step	Source Comprem I Sql1_data	Destination (in) hybridevo I Seq11_data_copy	Review your selection and start I understand that Cloud Man. More information > Source Volume Allocated Size: Source Volume Used Size: Source Thin Provisioning: Destination Volume Allocated Siz Destination Volume Disk Type: Capacity Tiering:	the replication process ager will allocate the appropri- 53.37 G8 45.09 G8 Yes re: 53.37 G8 General Purpose SSD (S3	ate AWS resources to comply with m Destination Thin Provisioning: Destination Aggregate: Destination Storage VM: Max Transfer Rate: SnapMirror Policy: Replication Schedule:	y above requirements. Yes aggrt (Automatically s svm_hybridcvo 100 MB/s Mirror daily	
			Go				

- 10. Continue this process for data volumes and log volumes.
- 11. To check all of your relationships, navigate to the Replication tab inside Cloud Manager. Here you can manage your relationships and check on their status.

ation										
	P Volume R	elationships	ଢ	153.32 GiB Replicated Capacity	0 Currently Transf	erring	0	7 Healthy	⊗ 0 _{Failed}	
	7 Volume Relationships									٩٥
	Health Status 💠	Source Volume		Target Volume	Total Transfer Time 🕴	Status		Mirror State	Last Successful Transfer	Θ
	\odot	rhel2_u01 onPrem		rhel2_u01_dr hybridcvo	43 minutes 43 seconds	idle		snapmirrored	Sep 30, 2021, 12:12:50 Af 19.73 MiB	
	\odot	rhel2_u02 onPrem		rhel2_u02_dr hybridcvo	1 hour 37 minutes 59 seconds	idle		snapmirrored	Sep 30, 2021, 2:37:08 PM 239.78 MiB	
	\odot	rhel2_u03 onPrem		rhel2_u03_dr hybridcvo	16 hours 1 minute 9 seconds	idle		snapmirrored	Sep 30, 2021, 4:07:14 PM 225.37 KIB	•••
	\odot	sql1_data onPrem		sql1_data_dr hybridcvo	1 hour 6 minutes 50 seconds	idle		snapmirrored	Sep 30, 2021, 12:12:28 Af 24.56 KiB	•••

12. After all the volumes have been replicated, you are in a steady state and ready to move on to the disaster recovery and dev/test workflows.

3. Deploy EC2 compute instance for database workload

AWS has preconfigured EC2 compute instances for various workloads. The choice of instance type determines the number of CPU cores, memory capacity, storage type and capacity, and network performance. For the use cases, with the exception of the OS partition, the main storage to run database workload is allocated from CVO or the FSx ONTAP storage engine. Therefore, the main factors to consider are the choice of CPU cores, memory, and network performance level. Typical AWS EC2 instance types can be found here: EC2 Instance Type.

Sizing the compute instance

- 1. Select the right instance type based on the required workload. Factors to consider include the number of business transactions to be supported, the number of concurrent users, data set sizing, and so on.
- 2. EC2 instance deployment can be launched through the EC2 Dashboard. The exact deployment procedures are beyond the scope of this solution. See Amazon EC2 for details.

Linux instance configuration for Oracle workload

This section contain additional configuration steps after an EC2 Linux instance is deployed.

- 1. Add an Oracle standby instance to the DNS server for name resolution within the SnapCenter management domain.
- 2. Add a Linux management user ID as the SnapCenter OS credentials with sudo permissions without a password. Enable the ID with SSH password authentication on the EC2 instance. (By default, SSH password authentication and passwordless sudo is turned off on EC2 instances.)
- 3. Configure Oracle installation to match with on-premises Oracle installation such as OS patches, Oracle versions and patches, and so on.
- 4. NetApp Ansible DB automation roles can be leveraged to configure EC2 instances for database dev/test and disaster recovery use cases. The automation code can be download from the NetApp public GitHub site: Oracle 19c Automated Deployment. The goal is to install and configure a database software stack on an EC2 instance to match on-premises OS and database configurations.

Windows instance configuration for SQL Server workload

This section lists additional configuration steps after an EC2 Windows instance is initially deployed.

- 1. Retrieve the Windows administrator password to log in to an instance via RDP.
- 2. Disable the Windows firewall, join the host to Windows SnapCenter domain, and add the instance to the DNS server for name resolution.
- 3. Provision a SnapCenter log volume to store SQL Server log files.
- 4. Configure iSCSI on the Windows host to mount the volume and format the disk drive.
- 5. Again, many of the previous tasks can be automated with the NetApp automation solution for SQL Server. Check the NetApp automation public GitHub site for newly published roles and solutions: NetApp Automation.

Workflow for dev/test bursting to cloud

The agility of the public cloud, the time to value, and the cost savings are all meaningful value propositions for enterprises adopting the public cloud for database application development and testing effort. There is no better tool than SnapCenter to make this a

reality. SnapCenter can not only protect your production database on-premises, but can also it quickly clone a copy for application development or code testing in the public cloud while consuming very little extra storage. Following are details of the step-by-step processes for using this tool.

Clone an Oracle Database for dev/test from a replicated snapshot backup

1. Log into SnapCenter with a database management user ID for Oracle. Navigate to the Resources tab, which shows the Oracle databases being protected by SnapCenter.

NetApp Sna	pCenter@	9				٠	8 -	👤 demo\oradba	App Backup and C	one Admin	🖡 Sign Out
<		Database 👻									
Dashboard		Database	Search databa	ases V					Ref	vesh Resources	New Resource Group
Resources	1P	Name	Oracle Database Type	Host/Cluster	Resource Group	Policies			Last Backup	Overall S	tatus
🛞 Monitor		cdb2	Single Instance (Multitenant)	rhel2.demo.netapp.com	rhel2_cdb2 rhel2_cdb2_log	Oracle Archive Log Backup Oracle Full Online Backup		09/17/20	21 3:00:09 PM 🛱	Backup s	ucceeded
Reports											
📥 Hosts											
Storage System	5										
Settings											
Alerts											

2. Click the intended on-premises database name for the backup topology and the detailed view. If a secondary replicated location is enabled, it shows linked mirror backups.

II N	etApp SnapCenter®						? -	👤 demo\oradba	App Backup and Clone Ad	min 🛛 🗊 Sign Out
>	Oracle Database 🤟	cdb2 Topology								2
	Search databases								Database Settings Pro	hect Refresh
U	1F 🍽 Name	Manage Copies								
۲	cdb2	184 Backups						Sumr	mary Card	
a ii		0 Clones Mirror copies						368 Back	ups	
٨		Local copies						16 D	ata Backups	
24								0 Clon	es	
=										
•		Primary Backup(s)								
		search T						Catalog Ref	t 🖬 🖣 👼 anne Cone Resone Mour	📥 🗊 Unimount Delete
		Backup Name	Count	Туре	↓₹ End Date	Verified		Mounted	RMAN Cataloged	SCN
		rhel2_cdb2_log_09-17-2021_15.00.01.1317_1	1	Log	09/17/2021 3:00:10 PM 🛱	Not Applicab	le	False	Not Cataloged	5982003
		rhel2_cdb2_09-17-2021_14.35.01.4997_1	1	Log	09/17/2021 2:35:21 PM 🛱	Not Applicab	le	False	Not Cataloged	5980629
		rhel2_cdb2_09-17-2021_14.35.01.4997_0	1	Data	09/17/2021 2:35:12 PM 🛱	Unve	erified	False	Not Cataloged	5980588
		rhel2_cdb2_log_09-17-2021_14.00.01.1042_1	1	Log	09/17/2021 2:00:10 PM 🛱	Not Applicab	le	False	Not Cataloged	5978388
		rhel2_cdb2_log_09-17-2021_13.00.01.7389_1	1	Log	09/17/2021 1:00:11 PM 🛱	Not Applicab	le	False	Not Cataloged	5975135
		rhel2_cdb2_log_09-17-2021_12.00.01.1142_1	1	Log	09/17/2021 12:00:10 PM 🛱	Not Applicab	le	False	Not Cataloged	5971773
	Total 1	rhel2_cdb2_log_09-17-2021_11.00.01.0895_1	1	Log	09/17/2021 11:00:10 AM 🛱	Not		False	Not Cataloged	5968474

3. Toggled to the mirrored backups view by clicking mirrored backups. The secondary mirror backup(s) is then displayed.

	e tApp Sn	napCenter®						- L demo\oradba	App Backup and Clone	\dmin 🖡 Si	ign Out
>		itabase 👻	cdb2 Topology								×
	Search	databases							🗮 Database Settings	Protect	Refresh
U	17.19	Name	Manage Copies								Â
		cdb2	184 Backups					Sum	mary Card		
a ii			0 Clones Mirror copies					368 Bac	kups		
A			Local copies					161	Data Backups		
5-0								0 Clor	ies		
=											- 1
A			Secondary Mirror Backup(s)								_
			search V						e Ti + S	ant Somount-	
			Backup Name	Count	Туре	17 End Date	Verified	Mounted	RMAN Cataloged	SCN	
			rhel2_cdb2_log_09-17-2021_15.00.01.1317_1	1	Log	09/17/2021 3:00:10 PM 🛱	Not Applicable	False	Not Cataloged	5982003	8
			rhel2_cdb2_09-17-2021_14.35.01.4997_1	1	Log	09/17/2021 2:35:21 PM 🛱	Not Applicable	False	Not Cataloged	5980629	•
			rhel2_cdb2_09-17-2021_14.35.01.4997_0	1	Data	09/17/2021 2:35:12 PM 🛱	Unveri	fied False	Not Cataloged	5980588	3
			rhel2_cdb2_log_09-17-2021_14.00.01.1042_1	1	Log	09/17/2021 2:00:10 PM 🛱	Not Applicable	False	Not Cataloged	5978388	3
			rhel2_cdb2_log_09-17-2021_13.00.01.7389_1	1	Log	09/17/2021 1:00:11 PM 🛱	Not Applicable	False	Not Cataloged	5975135	5
			rhel2_cdb2_log_09-17-2021_12.00.01.1142_1	1	Log	09/17/2021 12:00:10 PM 🛱	Not Applicable	False	Not Cataloged	5971773	3
	Total 1		rhel2_cdb2_log_09-17-2021_11.00.01.0895_1	1	Log	09/17/2021 11:00:10 AM 🛱	Not Applicable	False	Not Cataloged	5968474	1

4. Choose a mirrored secondary database backup copy to be cloned and determine a recovery point either by time and system change number or by SCN. Generally, the recovery point should be trailing the full database backup time or SCN to be cloned. After a recovery point is decided, the required log file backup must be mounted for recovery. The log file backup should be mounted to target DB server where the clone database is to be hosted.

Mount backup	DS			×
Choose the host to mount the backup	ora-standby.demo.netapp.com]		
Mount path :	/var/opt/snapcenter/sco/backup_mount/rhel2_cdb2_09-1	7-2021_14.35.01.4997_1/cdb2		
Secondary stora	ge location : Snap Vault / Snap Mirror			
Source Volume		Destination Volume		
svm_onPrem:rhe	l2_u03	svm_hybridcvo:rhel2_u03_dr 🔹		
			Mount	Cancel

II Ne	tApp SnapC	Center®						? -	👤 demo\oradba	App Backup and Clone	Admin 🔋	Sign Out
>	Oracle Databas	e 🔽	cdb2 Topology								-	×
===	Search datab	ases								Database Settings	Protect	Refrests
♥ ☆ ▲ ↓ ▲	17 M	Name cdb2 cdb2dev	Manage Copies 184 Backups 1 Clone Ucal copies Secondary Mirror Backup(s)						Sumr 368 Back 16 D 352 U 1 Clon	mary Card ups ata Backups og Backups e		
			Backup Name	Count	Type	IF End Date	Verifier	4	Mounted	RMAN Cataloged	SCN	
			rhel2_cdb2_log_09-17-2021_16.00.01.2156_1	1	Log	09/17/2021 4:00:10 PM	No	t ible	False	Not Cataloged	598527	72 *
			rhel2_cdb2_log_09-17-2021_15.00.01.1317_1	1	Log	09/17/2021 3:00:10 PM 🛱	No Applica	t ible	False	Not Cataloged	598200	03
			rhel2_cdb2_09-17-2021_14.35.01.4997_1	1	Log	09/17/2021 2:35:21 PM 🗎	No Applica	t ible	True	Not Cataloged	598062	29
			rhel2_cdb2_09-17-2021_14.35.01.4997_0	1	Data	09/17/2021 2:35:12 PM 🛱	Un	verified	False	Not Cataloged	598058	38
			rhel2_cdb2_log_09-17-2021_14.00.01.1042_1	1	Log	09/17/2021 2:00:10 PM 🛱	No Applica	t ible	False	Not Cataloged	597838	38



If log pruning is enabled and the recovery point is extended beyond the last log pruning, multiple archive log backups might need to be mounted.

5. Highlight the full database backup copy to be cloned, and then click the clone button to start the DB clone Workflow.

cdb2 Topology							
						Database Settings P	♥ ₹
(search)					• I Catalog Renar	Tie Clone Restore Mou	nt Unmount Delete
Backup Name	Count	Туре	l₹ End Date	Verified	Mounted	RMAN Cataloged	SCN
rhel2_cdb2_log_09-17-2021_16.00.01.2156_1	1	Log	09/17/2021 4:00:10 PM 🛱	Not Applicable	False	Not Cataloged	5985272
rhel2_cdb2_log_09-17-2021_15.00.01.1317_1	1	Log	09/17/2021 3:00:10 PM 🛱	Not Applicable	False	Not Cataloged	5982003
rhel2_cdb2_09-17-2021_14.35.01.4997_1	1	Log	09/17/2021 2:35:21 PM 🛱	Not Applicable	True	Not Cataloged	5980629
rhel2_cdb2_09-17-2021_14.35.01.4997_0	1	Data	09/17/2021 2:35:12 PM 🛱	Unverified	False	Not Cataloged	5980588
rhel2_cdb2_log_09-17-2021_14.00.01.1042_1	1	Log	09/17/2021 2:00:10 PM 📋	Not Applicable	False	Not Cataloged	5978388

6. Choose a proper clone DB SID for a complete container database or CDB clone.

Clone from cdb	o2				×
1 Name	Complete Database	Clone			
2 Locations	Clone SID	cdb2test			
3 Credentials	Exclude PDBs	Type to find PDBs			
4 PreOps	○ PDB Clone				
5 PostOps	Secondary storage locati	on : Snap Vault / Snap Mirror			
6 Notification	⊙ Data				
	Source Volume		Destination Volume		
Junnary	svm_onPrem:rhel2_u02		svm_hybridcvo:rhel2_u02_dr	•	
	⊙ Logs				
	Source Volume		Destination Volume		
	svm_onPrem:rhel2_u03		svm_hybridcvo:rhel2_u03_dr	•	
				Previous	Next

7. Select the target clone host in the cloud, and datafile, control file, and redo log directories are created by the clone workflow.

Clone from cdb	02					×		
1 Name	Select the host to o	reate a clone						
2 Locations	Clone host	ora-standby.demo.i	netapp.com	1	•			
3 Credentials	⊙ Datafile locations	0						
4 PreOps /u02_cdb2test Reserved 5 PostOps *								
7 Summary	/u02_cdb2test/cdb2	test/control/control0	2.ctl			× Reset		
	Dede la ca							
	Group		Size	Unit	Number of files			
	RedoGroup 1	×	200	MB	1	+		
	/u02_cdb2tes	/cdb2test/redolog/re	do03.log			X TReset		
	RedoGroup 2	×	200	MB	1	+		
						Previous Next		

8. The None credential name is used for OS-based authentication, which renders the database port irrelevant. Fill in the proper Oracle Home, Oracle OS User, and Oracle OS Group as configured in the target clone DB server.

Clone from cdb	Clone from cdb2 ×									
1 Name	Database Credentials for	the clone								
2 Locations	Credential name for sys user	None 🔹 🕇 🚺								
3 Credentials	Database port	1521								
4 PreOps	Oracle Home Settings 🧃									
5 PostOps	Oracle Home	/u01/app/oracle/product/19800/cdb2								
6 Notification	Oracle OS User	oracle								
7 Summary	Oracle OS Group	oinstall								
		Previous Next								

9. Specify the scripts to run before clone operation. More importantly, the database instance parameter can be adjusted or defined here.

Clone from cdb	02						x			
1 Name	Specify scripts to r	un before c	lone opera	ation 🚺						
2 Locations	Prescript full path	/var/opt/s	napcenter/s	pl/scripts/ Enter Prescript path						
3 Credentials	Arguments									
4 PreOps	Script timeout	60	secs							
Theops	🛇 Database Paramet	ter settings								
5 PostOps	processes			320		× ^				
6 Notification	remote_login_passwordfile sga_target			EXCLUSIVE		× +				
				4311744512		× Reset	r I			
7 Summary	undo_tablespace			UNDOTBS1		×				
						Previous	Next			

10. Specify the recovery point either by the date and time or SCN. Until Cancel recovers the database up to the available archive logs. Specify the external archive log location from the target host where the archive log volume is mounted. If target server Oracle owner is different from the on-premises production server, verify that the archive log directory is readable by the target server Oracle owner.

Nume Clocations	Clone from cd	b2	×
<pre> Locations (Until Cancel Date and Time Date and Time Date time format: MM/DD/VVV hh:mm:ss Until SCN (System Change Number) S980629 SpectOps O Notification Vurtil SCN (System Change Number) S980629 Spectops Spectops Vurtil SCN (System Change Number) S980629 Spectops Spectop</pre>	1 Name	Recover Database	
Credentials Credentials Create and Time Date-time format: MM/DD/YYY hh:mm:ss Until SCN (System Change Number) S980629 Specify external archive log locations Specify external archive log locations Create and Time Create new DBD Create new DBD Create new DBD Create tempfile for temporary tablespace Create tempfile to temporary tables	2 Locations	O Until Cancel	
Dete-time format: MM/DD/YYYY hh:mm:ss Until SCN (System Change Number) 5980629 Specify external archive log locations () () Specify external archive log locations () () Var/opt/snapcenter/sco/backup_mount/thel2_cdb2_09-17-2021_14.35.01.4997_11/cdb2/1/orarecc/CDB2/archivelog/ Var/opt/snapcenter/sco/backup_mount/thel2_cdb2_09-17-2021_14.35.01.4997_11/cdb2/1/orarecc/CDB2/archivelog/ Var/opt/snapcenter/sco/backup_mount/thel2_cdb2_09-17-2021_14.35.01.4997_11/cdb2/1/orarecc/CDB2/archivelog/ Create new DBID () Create new DBID () Create tempfile for temporary tablespace () Deter SQL queries to apply when clone is created Deter scripts to run after clone operation () Previous Next	3 Credentials	🔿 Date and Time 🛛 🗎	
Outling SCN (System Change Number) <u>5980629</u> Specify external archive log locations ① ① Specify external archive log locations ② ③ ① /var/opt/ <u>snapcenter/sco/backup_mount/rhel2_cdb2_09-17-2021_14.35.01.4997_1/cdb2/1/orareco/CDB2/archivelog/ /var/opt/snapcenter/sco/backup_mount/rhel2_cdb2_09-17-2021_14.35.01.4997_1/cdb2/1/orareco/CDB2/archivelog/ /var/opt/snapcenter/sco/backup_mount/rhel2_cdb1_09-17-2021_14.35.01.4997_1/cdb2/1/orareco/CDB2/archivelog/ /var/opt/snapcenter/sco/backup_mount/rhel2_cdb1_09-17-2021_14.35.01.4997_1/cdb2/1/orareco/CDB2/archivelog/ /var/opt/snapcenter/sco/backup_mount/rhel2_cdb1_09-17-2021_14.35.01.4997_1/cdb2/1/orareco/CDB2/archivelog/ /var/opt/snapcenter/sco/backup_mount/rhel2_cdb1_09-17-2021_14.35.01.4997_1/cdb2/1/orareco/CDB2/archivelog/ /var</u>	A PreOps	Date-time format: MM/DD/YYYY hh:mm:ss	
S PostOps Specify external archive log locations Sectory and the sectory and the sectory of the sect	U	Until SCN (System Change Number) 5980629	
Image: Create new DBID I	5 PostOps	Specify external archive log locations 🖸 💿 🕚	
Image: Summary Image:	6 Notification	/var/opt/snapcenter/sco/backup_mount/rhel2_cdb2_09-17-2021_14.35.01.4997_1/cdb2/1/orareco/CDB2/archivelog/	
Create new DBID Create tempfile for temporary tablespace Previous Previous Previous Next Create tempfile for temporary tablespace Create tempfile to run after clone operation Create tempfile to run	Cummani		
Create new DBID Create tempfile for temporary tablespace Create tempfile for	Journmary		
I create new DBID Create tempfile for temporary tablespace E create tempfile fo			
Create new DBID Create tempfile for temporary tablespace tempfile for temporary tablespace Create tempfile for temporary tablespace Create tempfile for temporary tablespace tempfile for temporary tablespace tempfile for temporary tablespace tempfile for temporary tablespace temp fi			
Create them DBiD Create tempfile for temporary tablespace Enter SQL queries to apply when clone is created Enter scripts to run after clone operation Previous Previous Next recelebra-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] createGora-standby:tmp] c			
		Create tempfile for temporary tablespace	
Enter scripts to run after clone operation Previous Next Setemption of a standby/tmp for the formation of a standby tmp formation of a standby tmp formation of a standby tmp for the formation of a standby tmp formation o		Enter SQL queries to apply when clone is created	
Previous Previous		 Enter scripts to run after clone operation 	
Previous Next oracle@ora-standby/tmp			
<pre>@ oracle@ora-standby/tmp]</pre>		Previous	
1021_08_26 2021_08_28 2021_08_30 2021_09_01 2021_09_03 2021_09_05 2021_09_07 2021_09_09 2021_09_11 2021_09_13 2021_09_15 2021_09_17 0021_08_27 2021_08_29 2021_08_91 2021_09_02 2021_09_04 2021_09_06 2021_09_08 2021_09_10 2021_09_12 2021_09_14 2021_09_16 oracle@ora-standby tmp]\$	😼 oracle@ora-standby:/tmp oracle@ora-standby tmg		×
	021_08_26 2021_08_28 021_08_27 2021_08_29	2021_08_30_2021_09_01_2021_09_03_2021_09_05_2021_09_07_2021_09_09_2021_09_11_2021_09_13_2021_09_15_2021_09_17 2021_08_31_2021_09_02_2021_09_04_2021_09_06_2021_09_08_2021_09_10_2021_09_12_2021_09_14_2021_09_16 	
	Draciegora-standby tmp		

11. Configure the SMTP server for email notification if desired.

Clone from cd	b2		×							
1 Name	Provide email sett	Provide email settings 0								
2 Locations	Email preference	Never 👻								
3 Credentials	From	From email								
PraCins	To	Email to								
Unicops	Subject	Notification								
5 PostOps	🗌 Attach job report									
6 Notification										
7 Summary										
If you wan informatio	t to send notifications fo n, and then go to Setting	r Clone jobs, an SMTP server must be configured. Continue to the Summary page to save your gs>Global Settings>Notification Server Settings to configure the SMTP server.								
		Previo	us Next							

12. Clone summary.

Clone from cdb	52		×
1 Name	Summary		^
2 Locations	Clone from backup	rhel2_cdb2_09-17-2021_14.35.01.4997_0	
Cradaatiala	Clone SID	cdb2test	
3 Credentials	Clone server	ora-standby.demo.netapp.com	
4 PreOps	Exclude PDBs	none	
•	Oracle home	/u01/app/oracle/product/19800/cdb2	
5 PostOps	Oracle OS user	oracle	
6 Notification	oinstall		
	Datafile mountpaths	/u02_cdb2test	
7 Summary	Control files	/u02_cdb2test/cdb2test/control/control01.ctl /u02_cdb2test/cdb2test/control/control02.ctl	
	Redo groups	RedoGroup =1 TotalSize =200 Path =/u02_cdb2test/cdb2test/redolog/redo03.log RedoGroup =2 TotalSize =200 Path =/u02_cdb2test/cdb2test/redolog/redo02.log RedoGroup =3 TotalSize =200 Path =/u02_cdb2test/cdb2test/redolog/redo01.log	l
	Recovery scope	Until SCN 5980629	
	Prescript full path	none	
	Prescript arguments		
	Postscript full path	none	
	Postscript arguments		*
		Previous Finish	

13. You should validate after cloning to make sure that the cloned database is operational. Some additional tasks, such as starting up the listener or turning off the DB log archive mode, can be performed on the dev/test database.

B oracle@ora-standby:/tmp				- 🗆 ×
[oracle@ora-standby tmp]\$ export ORACLE SI] [oracle@ora-standby tmp]\$ export ORACLE MO [oracle@ora-standby tmp]\$ export PATH=\$PAT] [oracle@ora-standby tmp]\$ sqlplus / as syst	D=cdb2test HE=/u01/app/oracle/product H:\$ORACLE_HOME/bin Aba	:/19800/cdb2		
SQL*Plus: Release 19.0.0.0.0 - Production (Version 19.3.0.0.0	on Fri Sep 17 17:49:29 202	21		
Copyright (c) 1982, 2019, Oracle. All right	nts reserved.			
Connected to: Oracle Database 19c Enterprise Edition Rel Version 19.3.0.0.0	ease 19.0.0.0.0 - Producti			
SQL> select name, log_mode from v\$database				
NAME LOG_MODE				
CDB2TEST ARCHIVELOG				
SQL> select instance_name, host_name from `	v\$instance;			
INSTANCE_NAME				
HOST_NAME				
cdb2test ora-standby.demo.netapp.com				
SQL> show pdbs				
CON_ID CON_NAME	OPEN MODE RESTRICTED			
2 PDB\$SEED 3 3 CDB2_PDB1 1 4 CDB2_PDB2 5 5 CDB2_PDB3	READ ONLY NO READ WRITE NO READ WRITE NO READ WRITE NO			
SQL>				

Clone a SQL database for dev/test from a replicated Snapshot backup

1. Log into SnapCenter with a database management user ID for SQL Server. Navigate to the Resources tab, which shows the SQL Sever user databases being protected by SnapCenter and a target standby SQL instance in the public cloud.

■ NetApp Sr	napCenter®					• = 0	• L demo\sqldba	App Backup and Clone Admin	🖡 Sign Out
<	Microsof	t SQL Server 👻							
Dashboard	View [Database •	earch by name					Refresh Resources	New Resource Group
Resources	15.14	Name	Instance	Host	Last Backup	Overall Status	×	Туре	
		master	sql1	sql1.demo.netapp.com		Not available f	or backup	System database	
		model	sql1	sql1.demo.netapp.com		Not available f	or backup	System database	
Reports		msdb	sql1	sql1.demo.netapp.com		Not available f	or backup	System database	
📥 Hosts		tempdb	sql1	sql1.demo.netapp.com		Not available fo	or backup	System database	
- Storage Syste	ems	tpcc	sql1	sql1.demo.netapp.com	09/16/2021 7:35:05 PM 🛱	Backup succee	eded	User database	
		master	sql-standby	sql-standby.demo.netapp.com		Not available f	or backup	System database	
Settings		model	sql-standby	sql-standby.demo.netapp.com		Not available f	or backup	System database	
Alerts		msdb	sql-standby	sql-standby.demo.netapp.com		Not available f	or backup	System database	
		tempdb	sql-standby	sql-standby.demo.netapp.com		Not available f	or backup	System database	

2. Click on the intended on-premises SQL Server user database name for the backups topology and detailed view. If a secondary replicated location is enabled, it shows linked mirror backups.

II Ne	tApp SnapCenter®				• =	i @•	L demo\sqldba App Backup a	nd Clone Admin 🛛 🚺	🕽 Sign Out
5	Microsoft SQL Server 🚽	tpcc (sql1) Topology							×
	search by name						Cione Lifecycle Protect	i Decals	Refresh
0	Name	Manage Copies							
	master	7 Backups					c		
	model	0 Clones					Summary Card		
â	msdb	Mirror copies					14 Backups		
A	tempdb	Local copies					0 ciones		
5.0	tpcc								
₩ #		Primary Backup(s)						E The A	ta E
		Backup Name	Count	Туре	4F		End Date	Verified	
		sql1_tpcc_09-16-2021_18.25.01.4024	1	Full backup			09/16/2021 6:25:05 PM 🛱	Unverified	
		sql1_tpcc_09-15-2021_18.25.01.4604	1	Full backup			09/15/2021 6:25:06 PM 🛱	Unverified	
		sql1_tpcc_09-14-2021_18.25.01.5233	1	Full backup			09/14/2021 6:25:05 PM 🛱	Unverified	
		sql1_tpcc_09-13-2021_18.25.01.4500	1	Full backup			09/13/2021 6:25:05 PM 🛱	Unverified	
		sql1_tpcc_09-12-2021_18.25.01.4016	1	Full backup			09/12/2021 6:25:05 PM 🛱	Unverified	
		sql1_tpcc_09-11-2021_18.25.01.3753	1	Full backup			09/11/2021 6:25:05 PM 🛱	Unverified	
		sql1_tpcc_09-10-2021_18.36.25.5430	1	Full backup			09/10/2021 6:36:29 PM 🛱	Unverified	

 Toggle to the Mirrored Backups view by clicking Mirrored Backups. Secondary Mirror Backup(s) are then displayed. Because SnapCenter backs up the SQL Server transaction log to a dedicated drive for recovery, only full database backups are displayed here.

	etApp SnapCenter®				• =	0-	👤 demo\sqldba	App Backup a	nd Clone Admin	🖡 Sign Out
5	Microsoft SQL Server 👻	tpcc (sql1) Topology								×
	search by name						Clone Life	cycle Protect	i Detaits	tt Refresh
	Name	Manage Copies								
-	master	7 Backups					C	mmary Card		
~	model	0 Clones					301	initially caru		
1111	msdb	Local copies	O Clones Mirror copies				14 Ba			
Δ.	tempdb	waren en pres					U Ch	Jiles		
54	tpcc									
₩ ₩		Secondary Mirror Backup(s)							Cont	41 Restore
		Backup Name	Count	Туре	17			End Date	Verified	
		sql1_tpcc_09-16-2021_18.25.01.4024	1	Full backup			09/16/2021 6	5:25:05 PM 🛱	Unverifi	ed
		sql1_tpcc_09-15-2021_18,25.01.4604	1	Full backup			09/15/2021 6	5:25:06 PM 🛱	Unverifi	ed
		sql1_tpcc_09-14-2021_18.25.01.5233	1	Full backup			09/14/2021 6	3:25:05 PM 🛱	Unverifi	ed
		sql1_tpcc_09-13-2021_18.25.01.4500	1	Full backup			09/13/2021 6	:25:05 PM 🛱	Unverifi	ed
		sql1_tpcc_09-12-2021_18.25.01.4016	1	Full backup			09/12/2021 6	:25:05 PM 🛱	Unverifi	ed
		sql1_tpcc_09-11-2021_18.25.01.3753	1	Full backup			09/11/2021 6	:25:05 PM 🛱	Unverifi	ed
		sql1_tpcc_09-10-2021_18.36.25.5430	1	Full backup			09/10/2021 6	5:36:29 PM 🛱	Unverifi	ed

4. Choose a backup copy, and then click the Clone button to launch the Clone from Backup workflow.

n Ne	tApp SnapCenter®						♦ ≅ 0-	1 demo\sqldba App	Backup an	l Clone Admin	🖡 Sign Out
>	Microsoft SQL Server 👻	tpcc (sql1) Topology									×
	search by name							Coopeliferencie	Protort	1 Details	Referch
U	Name	Manage Copies						- cone creeyoe	- Joura	0.000	- ALICAL
	master	Wanage copies	7 Backups					~	2.1		
~	model	7 Backups 0 Clones	1 Clone					Summa	ry Card		
<u> </u>	msdb	Local copies	Mirror copies					14 Backup: 1 Clone			
^	tempdb										
8	master										
	model	Secondary Mirror Backup(s)									
A	msdb	Secondary million Backap(s)								-	
	tempdb	(search Y)								Clone	Restore
	tpcc_clone	Backup Name			Count	Туре	17	E	nd Date	Verified	
		sql1_tpcc_09-19-2021_18.25.01.4134			1	Full backup		09/19/2021 6:25:0	5 PM 🛱	Unverifier	t
		sql1_tpcc_09-18-2021_18.25.01.3963			1	Full backup		09/18/2021 6:25:0	5 PM 🗂	Unverifie	ł
		sql1_tpcc_09-17-2021_18-25-01-4218			1	Full backup		09/16/2021 6:25:0		Unverifie	4
		sql1_tpcc_09-15-2021_18.25.01.4604			1	Full backup		09/15/2021 6:25:0	5 PM 🗂	Unverifier	d d
		sql1_tpcc_09-14-2021_18.25.01.5233			1	Full backup		09/14/2021 6:25:0	5 PM 🛱	Unverifier	ł
		sql1_tpcc_09-13-2021_18.25.01.4500			1	Full backup		09/13/2021 6:25:0	5 PM 🛱	Unverifie	ł
C	lone from back	up									×
G	Clone Options	Clone settings									
(2	2 Logs	Clone server	Choose		-	Ð					
	Script	Clone instance	Nothing selected		-	Ð					
2	Notification	Clone name	tpcc								
(Summary	Choose mount opt	ion								
		Auto assign mou	nt point 🜖								
		 Auto assign volu 	me mount point under path	full file path		0					
		Secondary storage	location : Snap Vault / Sn	nap Mirror							
		Source Volume		Destination V	olume						
		svm_onPrem:sql1_c	ata	svm_hybrid	cvo:sql	1_data_dr		•			
		svm_onPrem:sql1_b	ql1_log svm_hybridcvo:sq			1_log_dr		•			
								Prev		Ne	ĸt

5. Select a cloud server as the target clone server, clone instance name, and clone database name. Choose either an auto-assign mount point or a user-defined mount point path.

Clone from back	up				×			
1 Clone Options	Clone settings							
2 Logs	Clone server	sql-standby.demo.netapp.o	.com •	0				
3 Script	Clone instance	sql-standby	•	0				
4 Notification	Clone name	tpcc_clone						
5 Summary Choose mount option								
	Auto assign mou	int point 🚺						
	 Auto assign volu 	me mount point under path	full file path	0				
	Secondary storage location : Snap Vault / Snap Mirror							
	Source Volume		Destination Volu	ime				
	svm_onPrem:sql1_o	data	svm_hybridcvc	xsql1_data_dr •				
	svm_onPrem:sql1_l	og	svm_hybridcvc	xsql1_log_dr 🔹				
					Previous Next			

6. Determine a recovery point either by a log backup time or by a specific date and time.

Clone from back	up		×
1 Clone Options	Choose logs		
2 Logs	○ All log backups		
3 Script	By log backups until	9/17/2021 6:25:10 PM 🔻	
4 Notification	By specific date until	09/17/2021 6:25:05 PM	
5 Summary	⊖ None		
			Previous Next

7. Specify optional scripts to run before and after the cloning operation.

Clone from back	up		×
1 Clone Options	Specify optional se	cripts to run before and after performing a clone from backup job	
2 Logs	Prescript full path		
3 Script	Prescript arguments	Choose optional arguments	
4 Notification	Postscript full path		
	Postscript arguments	Choose optional arguments	
5 Summary	Script timeout	60 secs	
		Previous	xt

8. Configure an SMTP server if email notification is desired.

Clone from back	up		×
1 Clone Options	Provide email setti	ngs 🕦	
2 Logs	Email preference	Never •	
3 Script	From	From email	
	То	Email to	
4 Notification	Subject	Notification	
5 Summary	🗌 Attach Job Report		
information,	o send notifications for Cl and then go to Settings>(one Jobs, an SMTP server must be configured. Continue to the Summary page to save your Global Settings>Notification Server Settings to configure the SMTP server.	
		Previous	Next

9. Clone Summary.

Clone from back	up		×
1 Clone Options	Summary		
2 Logs	Clone server	sql-standby.demo.netapp.com	
2 Covint	Clone instance	sql-standby	
3 Schpt	Clone name	tpcc_dev	
4 Notification	Mount option	Auto assign volume mount point under custom path	
0	Prescript full path	None	
5 Summary	Prescript arguments		
	Postscript full path	None	
	Postscript arguments		
	Send email	No	
		Previous	Finish

10. Monitor the job status and validate that the intended user database has been attached to a target SQL instance in the cloud clone server.

	NetApp Snap	Center	9		•	≅ 0 -	L demo\sqldba	App Bac	kup and Clone Admin	🖡 Sign Out
<	Dashboard	Jobs	Schedules	Events Logs						
Ę	Resources	Jobs -	Filter				Details		Report Download Logs	Cancel Job
4	Monitor	ID	Status	Name	Start date		Ene	d date	Owner	
-	Penorts	766	~	Clone from backup 'sql1_tpcc_09-16-2021_18.25.01.4024'	09/16/2021 8:05:25 PM 🗂		09/16/2021 8:06:17 F	PM 🛱	demo\sqldba	
	-	763	~	Discover resources for all hosts	09/16/2021 7:56:49 PM 🛱		09/16/2021 7:56:54 F	PM 🛱	demo\sqldba	
6	Hosts	761	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/16/2021 7:35:00 PM 🛱		09/16/2021 7:37:08 F	PM 🛱	demo\sqldba	
3	Storage Systems	760	A	Discover resources for all hosts	09/16/2021 7:19:05 PM 🛱		09/16/2021 7:19:09 F	PM 🛱	demo\sqldba	
-		759	A	Discover resources for all hosts	09/16/2021 7:18:43 PM 🛱		09/16/2021 7:18:48 F	PM 🛱	demo\sqldba	
-		756		Discover resources for all hosts	09/16/2021 6:59:51 PM 🛱		09/16/2021 6:59:56 F	PM 🛱	demo\sqldba	
4	Alerts	753	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/16/2021 6:35:00 PM 🛱		09/16/2021 6:37:07 F	PM 🛱	demo\sqldba	
		750	~	Backup of Resource Group 'sql1_tpcc' with policy 'SQL Server Full Backup'	09/16/2021 6:25:01 PM 🛱		09/16/2021 6:27:14 F	PM 🛱	demo\sqldba	
		749	~	Discover resources for host 'sql-standby.demo.netapp.com'	09/16/2021 6:19:00 PM 🛱		09/16/2021 6:19:05 F	PM 🛱	Demo\administrato	r .
		745	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/16/2021 5:35:00 PM 🛱		09/16/2021 5:37:08 F	PM 🛱	demo\sqldba	

Post-clone configuration

- 1. An Oracle production database on-premises is usually running in log archive mode. This mode is not necessary for a development or test database. To turn off log archive mode, log into the Oracle DB as sysdba, execute a log mode change command, and start the database for access.
- 2. Configure an Oracle listener, or register the newly cloned DB with an existing listener for user access.
- 3. For SQL Server, change the log mode from Full to Easy so that the SQL Server dev/test log file can be readily shrunk when it is filling up the log volume.

Refresh clone database

- 1. Drop cloned databases and clean up the cloud DB server environment. Then follow the previous procedures to clone a new DB with fresh data. It only takes few minutes to clone a new database.
- 2. Shutdown the clone database, run a clone refresh command by using the CLI. See the following SnapCenter documentation for details: Refresh a clone.

Where to go for help?

If you need help with this solution and use cases, join the NetApp Solution Automation community support Slack channel and look for the solution-automation channel to post your questions or inquires.

Disaster recovery workflow

Enterprises have embraced the public cloud as a viable resource and destination for disaster recovery. SnapCenter makes this process as seamless as possible. This disaster recovery workflow is very similar to the clone workflow, but database recovery runs through the last available log that was replicated to cloud to recover all the business transactions possible. However, there are additional pre-configuration and post-configuration steps specific to disaster recovery.

Clone an on-premises Oracle production DB to cloud for DR

1. To validate that the clone recovery runs through last available log, we created a small test table and inserted a row. The test data would be recovered after a full recovery to last available log.

🖉 orscie@httl:~ —	×
<pre>SQL> create table dr_test(2 id integer, 3 event varchar(200), 4 dt timestamp);</pre>	^
Table created.	
SQL> insert into dr_test values(1, 'testing DB clone for DR and roll forward DB to last available log', sysdate);	
l row created.	
SQL> select * from dr_test;	
ID	
event	
τī	
l testing DB clone for DR and roll forward DB to last available log 17-SEP-21 02.12.13.000000 PM	
SQL> conmit;	
Commit complete.	
SOT>	~

2. Log into SnapCenter as a database management user ID for Oracle. Navigate to the Resources tab, which shows the Oracle databases being protected by SnapCenter.

п	NetApp Snap	Center®				•	8 -	👤 demo\oradba	Арр Ва	lackup and Clone Admin	🖡 Sign Out
<		Oracle Database 👻									
	Dashboard	View Resource Group	Search resource g	roup V							New Resource Group
	Resources	Name	Resources	Tags	Policies			Last Ba	ckup	Overall Status	
•	Monitor	rhel2_cdb2	1	orafullbkup	Oracle Full Online Backup		09/1	7/2021 2:38:16 PN	10	Completed	
~		rhel2_cdb2_log	1	oralogbkup	Oracle Archive Log Backup		09/1	7/2021 6:02:13 PN	10	Completed	
âŭl	Reports										
A	Hosts										
ł۹	Storage Systems										
莘	Settings										
▲	Alerts										

3. Select the Oracle log resource group and click Backup Now to manually run an Oracle log backup to flush the latest transaction to the destination in the cloud. In a real DR scenario, the last transaction recoverable depends on the database log volume replication frequency to the cloud, which in turn depends on the RTO or RPO policy of the company.

ΠN	letApp SnapCenter®				🌲 🔤 🚱 🕶 👤 demoly	loradba	App Backup and Clone A	Admin	🖡 Sign Ou
>	Oracle Database 👻	rhel2_cdb2_log Details							
	Search resource groups	search			Modil	ify Resource Gro	oup Back up Now Mai	intenance	Delete
U	Name	Resource Name	Туре	Host					
٩	rhel2_cdb2	cdb2	Oracle Database	rhel2.demo.netapp.com					
M	rhel2_cdb2_log								
*									
34									
==									
4									
	-								
	- I								
	Backup				x				
	Create a backu	up for the seled	ted resource g	roup					
				, I					
	Resource Group	rhel2 cdb2	log						
	1		0						
				•					
	Policy	Oracle Archi	ve Log Backup	• 0					
				Cancel	Backup				
				cancel	Dackup				



Asynchronous SnapMirror loses data that has not made it to the cloud destination in the database log backup interval in a disaster recovery scenario. To minimize data loss, more frequent log backup can be scheduled. However there is a limit to the log backup frequency that is technically achievable.

4. Select the last log backup on the Secondary Mirror Backup(s), and mount the log backup.

unt 1 1 1 2021	Type Log Log	الآ 09/1 09/1	End Date 9/17/2021 6:30:13 PM 9/17/2021 5:00:20 PM 9/17/2021 5:00:20 PM 1/1772_1/cdb2	e Verified 3 Not Applicable 3 Not Applicable 3 Not Applicable	Summ 370 Backs 16 Da 354 Lo 2 Clone Con Con False False False	Analy Card Anary Card App sta Backups g Backups s RMAN Cataloged Not Cataloged Not Cataloged	₹ ▲ ret SSCN 5992073 5998842
unt 1 1 1	Type Log Log	ا ؟ 09/ 09/	End Date 9/17/2021 6:20:13 РМ С 9/17/2021 5:00:20 РМ С 9/17/2021 5:00:20 РМ С	 Verified Not Applicable Not Applicable 	Summ 370 Backu 16 Da 354 Lo 2 Clone 2 Clone Mounted False False	Analy Card Anary Card Anary Card Anary Card Anary Card Anary Card Reg Analysis RMAN Cataloged Not Cataloged Not Cataloged	Image: Control of the second
unt 1 1 1	Type Log Log	l₹ 09/ 09/ 09/	End Date 9/17/2021 6:20:13 PM 9/17/2021 6:00:20 PM 9/17/2021 5:00:20 PM 11777_1/cdb2	e Verifled) Not Applicable] Not Applicable	Summ 370 Backu 16 Da 354 Lo 2 Clone Mounted False False	hary Card sps tata Backups g Backups s RMAN Cataloged Not Cataloged Not Cataloged	2 CN 50% 5992079 5998842
unt 1 1 1	Type Log Log _18.20	ابة 09/1 09/1	End Date 9/17/2021 6:20:13 PM 9/17/2021 6:00:20 PM 9/17/2021 5:00:20 PM 11777_1/cdb2	 Verified Not Applicable Not Applicable Not Applicable 	False	RMAN Cataloged Not Cataloged Not Cataloged	e Constant SCN 5994710 5998842
unt 1 1 1	Type Log Log	الَّةِ 09/1 09/1	End Date ar(17/2021 6:20:13 PM ar(17/2021 6:00:09 PM ar(17/2021 5:00:20 PM ar(17/201 5:00:20 PM ar(17/20)	 Verified Not Applicable Not Applicable Not Applicable 	A Mounted False False	Reg Trans Anno Market Mar Market Market Mark	a a SCN 5994710 S992079 5998842
unt 1 1 1	Type Log Log _18.20	l₹ 09/ 09/	End Date 3117/2021 6:00:13 PM 3117/2021 6:00:09 PM 3117/2021 5:00:20 PM 311772_11/cdb2	 Verified Not Applicable Not Applicable Not Applicable Not 	Case Advanced False False False	RMAN Cataloged Not Cataloged Not Cataloged Not Cataloged	SON 5994710 5994710 5992079 5992079 5992042
1 1 1	Type Log Log _18.20	09// 09// 09//	End Data #17/2021 6:20:13 PM #17/2021 6:00:09 PM #17/2021 5:00:20 PM #17/2021 5:00:20 PM #17/2021 5:00:20 PM #1/2021 5:00:20 PM #1/2021 5:00:20 PM #1/2021 6:20:20 PM #1/2021 FM #1/2021 6:20:20 PM #1/2021 FM #1/2021 FM	 Vertified Not Applicable Not Applicable Not Applicable Not Applicable 	Mounted False False False	RKAAK Cataloged Not Cataloged Not Cataloged	SCN 5394710 5992079 5998842
1	Log Log	09/ 09/	9/17/2021 6:00:09 PM 9/17/2021 5:00:20 PM 9/17/2021 5:00:20 PM 9/17/2021 5:00:20 PM 9/17/2021 5:00:20 PM 9/17/2021 6:00:09 PM 9/17/2021 6:00:00 PM 9/17/2020 FM 9/17/2020 FM 9/17/2000 FM 9/17/2	Applicable Not Applicable Not Applicable	False False	Not Cataloged	\$992079 \$998842
2021	_18.20	09/ ⁻ 09/-	9/17/2021 5:00:20 PM E	Applicable Not Applicable	False	Not Cataloged	5950/9 598842 X
2021	_18.20	09/	1177201 5:00:20 PM E) Not Applicable	False	Not Cataloged	598842 X
021	_18.20).04.1 <i>°</i>	1177_1/cdb2				×
inat	ion Vol	lume					
n_hj	ybridcv	/o:rhe	el2_u03_dr		•		
	n_hy	n_hybridcv	nation Volume	ination Volume	nation Volume 	ination Volume	n_hybridcvo:rhel2_u03_dr

5. Select the last full database backup and click Clone to initiate the clone workflow.
| n Ne | NetApp SnapCenter® | | | | | | | | | 👤 demo\oradba | App Backup and Clone A | dmin 🛛 🖡 Sign Out | |
|-----------|--------------------|----------|-----|---|-------|------|-------------------------|--------------|---------------|---------------|------------------------|-----------------------|---|
| > | Oracle Databas | e 🔽 | | cdb2 Topology | | | | | | | | | × |
| | Search datab | ases | | | | | | | | | Database Settings P | ✓ ≓
rotect Refresh | |
| U | 14 | Name | IL. | Manage Copies | | | | | | | | | ľ |
| ٠ | | cdb2 | | 2 Clones | | | | Summary Card | | | | | |
| ~ | 6 | cdb2dev | | 0 Clones Mirror copies | | | | | | 370 Back | ups | | |
| ** | 6 | cdb2test | | Local copies | | | | | | 16 0 | lata Backups | | |
| Å. | | | | | | | | | | 2 Clon | og Backups
es | | |
| <u>}</u> | | | | | | | | | | | | | |
| 華 | | | | Secondary Mirror Backup(s) | | | | | | | | | |
| ▲ | | | | search 7 | | | | | | 0 | e Fil +1 A | nt Unercount | |
| | | | | Backup Name | Count | Туре | 17 End Date | Verifi | ied | Mounted | RMAN Cataloged | SCN | |
| | | | | rhel2_cdb2_log_09-17-2021_18.20.04.1177_1 | 1 | Log | 09/17/2021 6:20:13 PM 🛱 | N
Appli | lot
icable | True | Not Cataloged | 5994710 | Ĩ |
| | | | | rhel2_cdb2_log_09-17-2021_18.00.01.2424_1 | 1 | Log | 09/17/2021 6:00:09 PM 🛱 | N
Appli | lot
icable | False | Not Cataloged | 5992079 | 1 |
| | | | | rhel2_cdb2_log_09-17-2021_17.00.01.1566_1 | 1 | Log | 09/17/2021 5:00:20 PM 🛱 | N
Appli | lot
icable | False | Not Cataloged | 5988842 | |
| | | | | rhel2_cdb2_log_09-17-2021_16.00.01.2156_1 | 1 | Log | 09/17/2021 4:00:10 PM 🛱 | N
Appli | lot
icable | False | Not Cataloged | 5985272 | Ĩ |
| | | | | rhel2_cdb2_log_09-17-2021_15.00.01.1317_1 | 1 | Log | 09/17/2021 3:00:10 PM 🛱 | Appli | lot
icable | False | Not Cataloged | 5982003 | |
| | | | | rhel2_cdb2_09-17-2021_14.35.01.4997_1 | 1 | Log | 09/17/2021 2:35:21 PM 🛱 | Appli | lot
icable | False | Not Cataloged | 5980629 | |
| | Total 3 | | | rhel2_cdb2_09-17-2021_14.35.01.4997_0 | 1 | Data | 09/17/2021 2:35:12 PM 🛱 | L | Inverified | False | Not Cataloged | 5980588 | |

6. Select a unique clone DB ID on the host.

Clone from cdb	02				×			
1 Name	Complete Database (Ilone						
2 Locations	Clone SID	<u>cdb2dr</u>						
3 Credentials	Exclude PDBs	Type to find PDBs						
4 PreOps	○ PDB Clone							
5 PostOps	Secondary storage location	on : Snap Vault / Snap Mirror						
6 Notification	⊙ Data							
7 Summary	Source Volume		Destination Volume					
	svm_onPrem:rhel2_u02		svm_hybridcvo:rhel2_u02_dr	•				
	⊙ Logs							
	Source Volume		Destination Volume					
	svm_onPrem:rhel2_u03		svm_hybridcvo:rhel2_u03_dr	•				
				Previous	Next			

7. Provision a log volume and mount it to the target DR server for the Oracle flash recovery area and online logs.

	AP Syst	tem Manag	er			Search act	ions, objects, and pages	۹	
DASHBOARD		Volumes	;						
STORAGE	^	+ Add	More						
Overview		Na	ame	Storage VM	Status	Capacity			
Applications Volumes		✓ or	a_standby_u01	svm_hybridcvo	🕑 Online	12.3 GB used	31.6 17.7 GB available	GB	
LUNs		✓ rh	el2_u01_dr	svm_hybridcvo	🖉 o 🛇	d Volume		×	
Qtrees		✓ rh	el2_u02_dr	svm_hybridcvo	O NAME				
Quotas Storage VMs		✓ rh 60	el2_u02_dr09172116081	193 svm_hybridcvo		a_standby_u03			
Tiers NETWORK	~	✓ rh 63	el2_u02_dr09172117035	348 svm_hybridcvo	⊘ 0 20	GB 🗸			
EVENTS & JOBS	~	✓ rh	el2_u03_dr	svm_hybridcvo	© °			_ [
PROTECTION	~	✓ rh 75	el2_u03_dr09172118245	747 svm_hybridcvo	o o	More Options	Cancel	ave	
HOSTS	Ý								
<pre>e2-user@ora-standb;// [ec2-user@ora-standb [ec2-user@ora-standb chown: changing owne [ec2-user@ora-standb [ec2-user@ora-standb [ec2-user@ora-standb]</pre>	tmp by tmp]\$ so by tmp]\$ cl ership of by tmp]\$ so by tmp]\$ so by tmp]\$ d	udo mkdir /u03 hown oracle:oir '/u03_cdb2dr': udo chown orac] udo mount -t ni if -h	_cdb2dr nstall <u>/u03_cdb2dr</u> Operation not permi le:oinstall /u03_cdb fs 10.221.1.6:/ora_s	tted 2dr tandby_u03 /u03_cdb	2dr			×	<
Filesystem devtmpfs tmpfs tmpfs /dev/nvme0n1p2 10.221.1.6:/ora stan	idby u01		Size Used 7.6G 0 7.6G 17M 7.6G 17M 7.6G 0 10G 9.0G 31G 13G	Avail Use% Mounted 7.6G 0% /dev 7.6G 0% /dev/shm 7.6G 1% /run 7.6G 0% /sys/fs/ 1.1G 90% / 18G 42% /u01	on cgroup				
tmpfs 10.221.1.6:/Sc281824 tmpfs 10.221.1.6:/Sc39c05d 10.221.1.6:/Sccf886a 10.221.1.6:/ora_stan [ec2-user@ora-standb	 152-3fa8-4 1f8-4b00-41 15c-3273-4 1dby_u03 by tmp]\$	48c-9e4a-c5a9e4 b3a-853c-9d6d33 75e-ad97-472b2a	1.6G 0 465f353 100G 3.1G 1.6G 0 38e5df7 100G 3.7G a8dccee 100G 3.8G 21G 320K	1.6G 0% /run/use 97G 4% /u02_cdb 1.6G 0% /run/use 97G 4% /u02_cdb 97G 4% /v02_cdb 97G 4% /var/opt 20G 1% /u03_cdb	r/1000 2dev r/54321 2test /snapcenter/sco/backup 2dr	mount/rhe12_cdb2_log_09-	17-2021_18.20.04.1177_1/c	:db2/l	

8. Select the target clone host and location to place the data files, control files, and redo logs.

The Oracle clone procedure does not create a log volume, which needs to be provisioned on

the DR server before cloning.

Clone from cd	b2						×
1 Name	Select the host to	create a clone					
2 Locations	Clone host	ora-standby.demo.	.netapp.con	n •			
3 Credentials	O Datafile locations	0					
4 PreOps	/u02_cdb2dr		Reset				
5 PostOps							
6 Notification	⊙ Control files ①	r/control/control01 c	۲I			× * +	
7 Summary	/u03_cdb2dr/cdb2d	r/control/control02.cl	tl			× Reset	
	🛇 Redo logs 🚯						
	Group		Size	Unit	Number of files		
	 RedoGroup 1 	×	200	MB	1	*	
	/u03_cdb2dr/	cdb2dr/redolog/redo	03.log			×	
	RedoGroup 2	×	200	MB	1		
						Previous	xt

9. Select the credentials for the clone. Fill in the details of the Oracle home configuration on the target server.

Clone from cdb	52			x
1 Name	Database Credentials fo	r the clone		
2 Locations	Credential name for sys user	None 🔻	+ 0	
3 Credentials	Database port	1521		
4 PreOps	Oracle Home Settings	0		
5 PostOps	Oracle Home	/u01/app/oracle/product/19800/cdb2		
6 Notification	Oracle OS User	oracle		
7 Summary	Oracle OS Group	oinstall		
			Previous	t

10. Specify the scripts to run before cloning. Database parameters can be adjusted if needed.

Clone from cdb	02						×		
1 Name	Specify scripts to r	Specify scripts to run before clone operation 🚯							
2 Locations	Prescript full path	/var/opt/s	napcen	ter/spl/scr	ipts/ Enter Prescript path				
3 Credentials	Arguments								
4 PreOps	Script timeout	60	secs						
5 PostOps	audit_file_dest				/u01/app/oracle/admin/cdb2dr/adump	×			
6 Notification	audit_trail				DB	× +			
	open_cursors				300	× Reset			
7 Summary	pga_aggregate_targ	et			1432354816	×			
						Previous	Next		

11. Select Until Cancel as the recovery option so that the recovery runs through all available archive logs to recoup the last transaction replicated to the secondary cloud location.

Clone from cd	db2	×
1 Name	Recover Database	
2 Locations	Until Cancel	
3 Credentials	🔿 Date and Time	
A PreOps	Date-time format: MM/DD/YYYY hh:mm:ss	_
	O Until SCN (System Change Number)	_
5 PostOps	Specify external archive log locations 🖸 🧿 🕦	
6 Notification	/var/opt/snapcenter/sco/backup_mount/rhel2_cdb2_log_09-17-2021_18.20.04.1177_1/cdb2/1/orareco/CDB2/archivelo	g/
7 Summary		_
	Create new DBID 🚯	
	Create tempfile for temporary tablespace 1	
	③ Enter SQL queries to apply when clone is created	
	 Enter scripts to run after clone operation 	
		Next
	Previous	Mext

12. Configure the SMTP server for email notification if needed.

Clone from cdb	o2		×
1 Name	Provide email sett	ings 🚯	
2 Locations	Email preference	Never 👻	
3 Credentials	From	From email	
PreCins	То	Email to	
O mops	Subject	Notification	
5 PostOps	🗌 Attach job report		
6 Notification			
7 Summary			
If you want information	to send notifications fo n, and then go to Setting	r Clone jobs, an SMTP server must be configured. Continue to the Summary page to save your ts>Global Settings>Notification Server Settings to configure the SMTP server.	
		Previous	Next

13. DR clone summary.

Clone from cdl	b2		×
1 Name	Summary		^
2 Locations	Clone from backup	rhel2_cdb2_09-17-2021_14.35.01.4997_0	
	Clone SID	cdb2dr	
3 Credentials	Clone server	ora-standby.demo.netapp.com	
4 PreOps	Exclude PDBs	none	
	Oracle home	/u01/app/oracle/product/19800/cdb2	
5 PostOps	Oracle OS user	oracle	
6 Notification	Oracle OS group	oinstall	
	Datafile mountpaths	/u02_cdb2dr	
7 Summary	Control files	/u02_cdb2dr/cdb2dr/control/control01.ctl /u03_cdb2dr/cdb2dr/control/control02.ctl	
	Redo groups	RedoGroup =1 TotalSize =200 Path =/u03_cdb2dr/cdb2dr/redolog/redo03.log RedoGroup =2 TotalSize =200 Path =/u03_cdb2dr/cdb2dr/redolog/redo02.log RedoGroup =3 TotalSize =200 Path =/u03_cdb2dr/cdb2dr/redolog/redo01.log	
	Recovery scope	Until Cancel	
	Prescript full path	none	
	Prescript arguments		
	Postscript full path	none	
	Postscript arguments		*
		Previous Finis	h

14. Cloned DBs are registered with SnapCenter immediately after clone completion and are then available for backup protection.

	🖬 NetApp SnapCenter® 🔹 🗣 🖬 demotoratioa App Backup and Cione Adm								one Admin 🛛 🗊 Sign Out
<			tabase 📕						
	Dashboard	View D	atabase	Search databases	V				sh Resources New Resource Group
C	Resources	Ti. lan	Name	Oracle Database Type	Host/Cluster	Resource Group	Policies	Last Backup	Overall Status
-	Monitor		cdb2	Single Instance (Multitenant)	rhel2.demo.netapp.com	rhel2_cdb2 rhel2_cdb2_log	Oracle Archive Log Backup Oracle Full Online Backup	09/17/2021 7:00:10 PM 🗂	Backup succeeded
a	Reports	a	cdb2dev	Single Instance (Multitenant)	ora-standby.demo.netapp.com				Not protected
	Hosts		cdb2dr	Single Instance (Multitenant)	ora-standby.demo.netapp.com				Not protected
	10505	- B	cdb2test	Single Instance (Multitenant)	ora-standby.demo.netapp.com				Not protected
8	Storage Systems								
=	E Settings								
	Alerts								

Post DR clone validation and configuration for Oracle

1. Validate the last test transaction that has been flushed, replicated, and recovered at the DR location in the cloud.

Protele@ora-standby:/u01/app/oracle/product/19800/c8b2/dbs	-	□ ×
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production Version 19.3.0.0.0		· · · · ·
SQL> set lin 200 SQL> select instance_name, host_name from v\$instance;		
INSTANCE_NAME HOST_NAME		
cdb2dr ora-standby.demo.netapp.com		
SQL> alter pluggable database cdb2_pdbl open;		
Pluggable database altered.		
SQL> alter session set container=cdb2_pdb1;		
Session altered.		
SQL> select * from pdbadmin.dr_test;		
ID		
EVENT		
 DT		
l testing DB clone for DR and roll forward DB to last available log 17-5EP-21 02.12.13.000000 PM		
SQL>		

2. Configure the flash recovery area.



- 3. Configure the Oracle listener for user access.
- 4. Split the cloned volume off of the replicated source volume.
- 5. Reverse replication from the cloud to on-premises and rebuild the failed on-premises database server.



Clone split may incur temporary storage space utilization that is much higher than normal operation. However, after the on-premises DB server is rebuilt, extra space can be released.

Clone an on-premises SQL production DB to cloud for DR

1. Similarly, to validate that the SQL clone recovery ran through last available log, we created a small test table and inserted a row. The test data would be recovered after a full recovery to the last available log.

Administrator: Command Prompt - sqlcmd - SQLCMD	-	- 🗆	\times
C:\Users\administrator.DEMO>sqlcmd 1> select host_name() 2> go			^
SQL1			
 (1 rows affected) 1> use tpcc 2> go Changed database context to 'tpcc'. 1> insert into snap_sync values ('test snap mirror D 2> go (1 rows affected) 	R for SQL', getdate())		
<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>			
event d	t		
test snap mirror DR for SQL 2	021-09-20 14:23:04.533		
(1 rows affected) 1> _			

2. Log into SnapCenter with a database management user ID for SQL Server. Navigate to the Resources tab, which shows the SQL Server protection resources group.

II Ne	tApp SnapCenter®				٠	=	0 -	1 demo	sqldba Ap	o Backup and C	Clone Admin	🖡 Sign Out
>	Microsoft SQL Server 🚽	sql1_tpcc_logDetails										×
	search by name	search			Modify F	lesource Gro		L ack up Now	Cione Lifecycle	Maintenance	i Edit/View Details	Delete
•	Name	Resource Name	Туре	Host								
2	sql1_tpcc	tpcc (sql1)	SQL Database	sql1.demo.netapp.com								
a il	sql1_tpcc_log											
A												
20												

3. Manually run a log backup to flush the last transaction to be replicated to secondary storage in the public cloud.

Backup			×
Create a backup f	or the selected resource group		
Resource Group	sql1_tpcc_log		
Policy	SQL Server Log Backup 🔻	0	
			_
		Cancel Backup	

4. Select the last full SQL Server backup for the clone.

■ NetApp SnapCenter®								👤 demo\sqldba	App Backup and	d Clone Admin	🖡 Sign Out
>	Microsoft SQL Server 👻	tpcc (sql1) Topology									×
	search by name							Clone Lifeq	rcle Protect	1 Details	Refresh
U	Name	Manage Copies									
	master	72.4	7 Backups					ç	man Canad		
	model	O Classe	2 Clones					Sun	imary card		
â	msdb	U ciones N	O Clones Mirror copies Local copies					14 Bac	kups		
A	tempdb	Locar copies						2 (10	nes		
54	tpcc										
	master										
#	model	Secondary Mirror Backup(s)									
A	msdb									-	4
	tempdb	(search y								Clone	Restore
	tpcc_clone	Backup Name		Count	Туре	17			End Date	Verified	
	tpcc_dev 🗊	sql1_tpcc_09-19-2021_18.25.01.4134		1	Full backup			09/19/2021 6:	25:05 PM 🛱	Unverifi	ied
		sql1_tpcc_09-18-2021_18.25.01.3963		1	Full backup			09/18/2021 6:	25:05 PM 🛱	Unverifi	led
		sql1_tpcc_09-17-2021_18.25.01.4218		1	Full backup			09/17/2021 6:	25:05 PM 🛱	Unverifi	ied

5. Set the clone setting such as the Clone Server, Clone Instance, Clone Name, and mount option. The secondary storage location where cloning is performed is auto-populated.

Clone from back	up				×
1 Clone Options	Clone settings				
2 Logs	Clone server	sql-standby.demo.netapp.c	om 🔻	0	
3 Script	Clone instance	sql-standby	•	0	
4 Notification	Clone name	tpcc_dr			
5 Summary	Choose mount opt	tion			
	Auto assign mou				
	 Auto assign volu 	me mount point under path	full file path	0	
	Secondary storage	location : Snap Vault / Sn	ap Mirror		
	Source Volume		Destination Volu	ume	
	svm_onPrem:sql1_c	lata	svm_hybridcv	o:sql1_data_dr 🔹	
	svm_onPrem:sql1_b	og	svm_hybridcv	o:sql1_log_dr 🔹	_
					Previous Next

6. Select all log backups to be applied.

Clone from back	kup	×
1 Clone Options	Choose logs	
2 Logs	All log backups	
3 Script 4 Notification 5 Summary	 ○ By log backups until 9/19/2021 6:25:10 PM ○ By specific date until ○ 9/19/2021 6:25:05 PM ○ None 	
	Prev	vious

7. Specify any optional scripts to run before or after cloning.

Clone from back	up		×
1 Clone Options	Specify optional so	cripts to run before and after performing a clone from backup job	
Clone Options Cone Options Cone Options Cone Options Script 4 Notification 5 Summary	Specify optional so Prescript full path Prescript arguments Postscript full path Postscript arguments Script timeout	cripts to run before and after performing a clone from backup job Choose optional arguments Choose optional arguments 60 secs	
		Previous	Next

8. Specify an SMTP server if email notification is desired.

Clone from back	up		×
1 Clone Options	Provide email setti	ngs 🚯	
2 Logs	Email preference	Never •	
3 Script	From	From email	
	То	Email to	
4 Notification	Subject	Notification	
5 Summary	🗌 Attach Job Report		
A 15-11-11-11-11-11-11-11-11-11-11-11-11-1			
information, a	and then go to Settings>	one jobs, an SMTP server must be configured. Continue to the Summary page to save your Global Settings>Notification Server Settings to configure the SMTP server.	
		Previous	Next

9. DR clone summary. Cloned databases are immediately registered with SnapCenter and available for backup protection.

Clone from back	up		×
1 Clone Options	Summary		
2 Logs	Clone server	sql-standby.demo.netapp.com	
Covint.	Clone instance	sql-standby	
3 Script	Clone name	tpcc_dr	
4 Notification	Mount option	Auto Mount	
0	Prescript full path	None	
5 Summary	Prescript arguments		
	Postscript full path	None	
	Postscript arguments		
	Send email	No	
			Previous Finish

	letApp Snap	Center®					🏚 🔤 🥹 🗜 demo\sqldba	App Backup and Clone Admin 🛛 🖡 Sign Ou
		Microsoft	: SQL Server 💌					
	Dashboard	View	Database • Search by name	Y				Refresh Resources New Resource (
0	Resources	12.14	Name	Instance	Host	Last Backup	Overall Status	Туре
	Monitor		master	sql1	sql1.demo.netapp.com		Not available for backup	System database
			model	sql1	sql1.demo.netapp.com		Not available for backup	System database
â	Reports		msdb	sql1	sql1.demo.netapp.com		Not available for backup	System database
A	Hosts		tempdb	sql1	sql1.demo.netapp.com		Not available for backup	System database
54	Storage Sustems		tpcc	sql1	sql1.demo.netapp.com	09/22/2021 5:35:08 PM 🛱	Backup failed, Schedules on hold	User database
	Storage Systems		master	sql-standby	sql-standby.demo.netapp.com		Not available for backup	System database
華	Settings		model	sql-standby	sql-standby.demo.netapp.com		Not available for backup	System database
	Alerts		msdb	sql-standby	sql-standby.demo.netapp.com		Not available for backup	System database
			tempdb	sql-standby	sql-standby.demo.netapp.com		Not available for backup	System database
		5	tpcc_clone	sql-standby	sql-standby.demo.netapp.com		Not protected	User database
		6	tpcc_dev	sql-standby	sql-standby.demo.netapp.com		Not protected	User database
		n.	tpcc_dr	sql-standby	sql-standby.demo.netapp.com		Not protected	User database

Post DR clone validation and configuration for SQL

1. Monitor clone job status.

	NetApp Snap	Center®		🛛 🔹 👤 demo\sqldba	App Back	up and Clone Admin	🖡 Sign Out		
<		Jobs	Schedules						
	Dashboard	search	by name	<u>_</u> 7 9		() Detail			
	Resources	Jobs - F	ilter						
0	Monitor	ID	Status	Name	Start date	Er	d date	Owner	
<i></i>	Reports	1052	~	Clone from backup 'sql1_tpcc_09-19-2021_18.25.01.4134'	09/20/2021 2:36:17 PM 🛱	09/20/2021 2:37:06	PM 🛱	demo\sqldba	
		1047	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/20/2021 2:35:01 PM 🛱	09/20/2021 2:37:08	PM 🛱	demo\sqldba	
â	Hosts	1045	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/20/2021 2:28:17 PM 🛱	09/20/2021 2:30:25	PM 🛱	demo\sqldba	
÷.	Storage Systems	1044	~	Clone from backup 'sql1_tpcc_09-17-2021_18.25.01.4218'	09/20/2021 1:39:24 PM 🛱	09/20/2021 1:40:09	PM 🛱	demo\sqldba	
-	Settings	1042	~	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/20/2021 1:35:01 PM 🛱	09/20/2021 1:37:08	PM 🛱	demo\sqldba	
	- Setungs		×	Backup of Resource Group 'sql1_tpcc_log' with policy 'SQL Server Log Backup'	09/20/2021 12:35:01 PM 🛱	09/20/2021 12:37:08	PM 🛱	demo\sqldba	

2. Validate that last transaction has been replicated and recovered with all log file clones and recovery.

Administrator: Command Prompt - sqlcmd - SQLCMD		-	×
C:\Users\administrator.DEMO>sqlcmd > select host_name() 2> go			Í
SQL-STANDBY (1 rows affected) 3> ges tpcc_dr 2> gg Changed database context to 'tpcc_dr'. 1> select * from snap_sync 2> go event			
test snap mirror DR for SQL (1 rows affected) 1> select getdate() 2> go	2021-09-20 14:23:04.533		
2021-09-20 14:39:19.937 (1 rows affected) 1> _			

- 3. Configure a new SnapCenter log directory on the DR server for SQL Server log backup.
- 4. Split the cloned volume off of the replicated source volume.
- 5. Reverse replication from the cloud to on-premises and rebuild the failed on-premises database server.

Where to go for help?

If you need help with this solution and use cases, please join the NetApp Solution Automation community support Slack channel and look for the solution-automation channel to post your questions or inquires.

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