



TR-4997: 使用vVols在 VCF 中部署和保护 Oracle RAC

NetApp database solutions

NetApp
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TR-4997：使用vVols在 VCF 中部署和保护 Oracle RAC

Allen Cao、Niyaz Mohamed，NetApp

该解决方案概述并详细介绍了 VMware Cloud Foundation (VCF) 中的 Oracle 部署和保护，其中使用 vSphere Virtual Volumes (vVols) 作为主数据库存储，并使用 Real Application Clusters (RAC) 配置中的 Oracle 数据库。

目的

VMware vSphere 虚拟卷 (vVols) 是一个 SAN/NAS 管理和集成框架，它将虚拟磁盘作为本机存储对象公开，并在虚拟磁盘级别支持基于阵列的操作。换句话说，vVols 使 SAN/NAS 设备能够感知虚拟机，并能够以虚拟机为中心的方式在单个虚拟磁盘的粒度上利用基于阵列的数据服务。vVols 使客户能够利用其当前存储投资的独特功能，并在不中断的情况下过渡到针对跨所有存储类型的虚拟环境优化的更简单、更高效的运营模式。

在"TR-4996"，我们演示了使用vVols在 VCF 中部署和保护单实例 Oracle 数据库。本文档演示了如何在 VMware Cloud Foundation 环境中部署和保护 Oracle RAC 数据库，并使用vVols作为NetApp ONTAP存储集群中的主要数据库存储。Oracle RAC 数据库的配置就像部署在本地存储系统上的本地文件系统中一样。本技术报告重点介绍在 VCF 中为 Oracle RAC 部署创建vVols的步骤。我们还演示了使用NetApp自动化工具包在vVols上的 VCF 中部署 Oracle RAC 数据库，以及使用NetApp SnapCenter UI 工具进行 RAC 数据库保护。

此解决方案适用于以下用例：

- 在 VCF 中部署 Oracle RAC 数据库，并使用NetApp ONTAP AFF上的vVols数据存储作为主数据库存储
- 使用NetApp SnapCenter UI 工具在 VCF 中使用vVols数据存储区备份和恢复 Oracle 数据库

受众

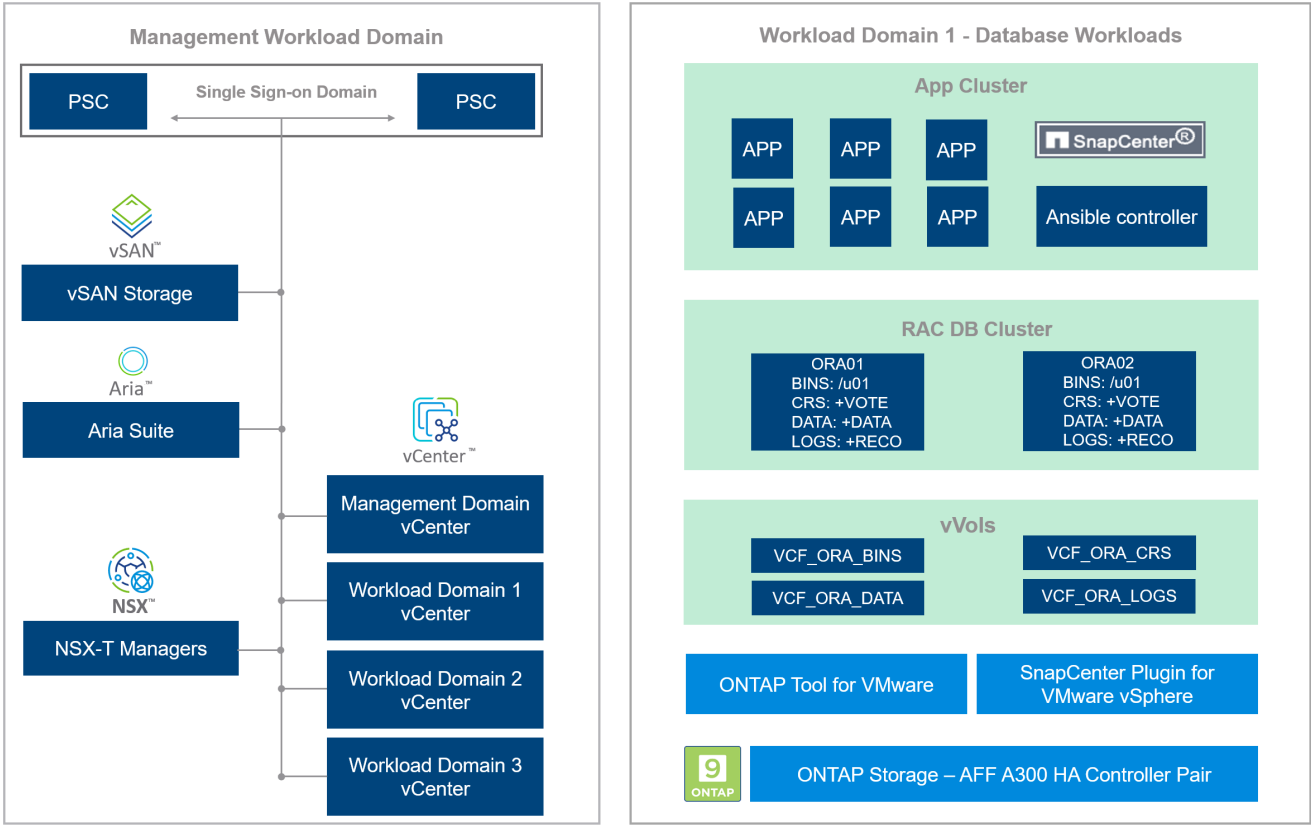
此解决方案适用于以下人群：

- 一位 DBA 希望在 VCF 中部署 Oracle RAC，并使用NetApp ONTAP AFF上的vVols数据存储作为主数据库存储
- 一位数据库解决方案架构师，希望使用NetApp ONTAP AFF存储上的vVols数据存储在 VCF 中测试 Oracle RAC 工作负载
- 一位存储管理员希望在NetApp ONTAP AFF存储上使用vVols数据存储部署到 VCF 的 Oracle RAC 数据库并进行管理
- 希望使用 vVol 数据存储在 VCF 中建立 Oracle RAC 数据库的应用程序所有者

解决方案测试和验证环境

该解决方案的测试和验证是在 VCF 的实验室环境中进行的，其中vVols数据存储在NetApp ONTAP AFF存储上，可能与最终部署环境不匹配。有关更多信息，请参阅[部署考虑的关键因素](#)。

Oracle RAC Database Deployment and Protection in VCF with vVols



NetApp

硬件和软件组件

硬件		
NetApp ONTAP AFF A300	版本 9.14.1P4	DS224 磁盘架，配备 24 个 NVMe 磁盘，总容量 35.2 TiB
VMware VSphere 集群	8.02 版	12 个 CPU x Intel® Xeon® Gold 5218 CPU @ 2.30GHz，8 个节点 (4 个管理域和 4 个工作负载域)
软件		
红帽Linux	RHEL-8.6，4.18.0-372.9.1.el8.x86_64 内核	托管 Oracle DB 服务器，部署 RedHat 订阅进行测试
Windows Server	2022 标准版，10.0.20348 内部版本 20348	托管 SnapCenter 服务器
Centos Linux	CentOS Linux 版本 8.5.2111	托管 Ansible 控制器
Oracle 网络基础设施	19.18 版	已应用 RU 补丁 p34762026_190000_Linux-x86-64.zip

Oracle 数据库	19.18 版	已应用RU补丁p34765931_190000_Linux-x86-64.zip
Oracle OPatch	版本 12.2.0.1.36	最新补丁p6880880_190000_Linux-x86-64.zip
SnapCenter 服务器	6.0 版	工作组部署
适用于 VMware vSphere 的 SnapCenter 插件	6.0 版	作为 OVA 虚拟机部署到 vSphere 集群
适用于 VMware vSphere 的ONTAP 工具	9.13 版	作为 OVA 虚拟机部署到 vSphere 集群
打开 JDK	版本 java-11-openjdk-11.0.23.0.9-3.el8.x86_64	数据库虚拟机上的SnapCenter插件要求

VCF中的Oracle RAC数据库配置

RAC 节点	数据库	数据库存储
ora01	NTAP(NTAP_pdb1,NTAP_pdb2,NTAP_pdb3)	NetApp ONTAP AFF A300上的vVols数据存储区 (VCF_ORA_BINS、VCF_ORA_CRS、VCF_ORA_DAT1、VCF_ORA_DAT2、VCF_ORA_LOGS)
ora02	NTAP(NTAP_pdb1,NTAP_pdb2,NTAP_pdb3)	NetApp ONTAP AFF A300上的vVols数据存储区 (VCF_ORA_BINS、VCF_ORA_CRS、VCF_ORA_DAT1、VCF_ORA_DAT2、VCF_ORA_LOGS)

部署考虑的关键因素

- * vVols到ONTAP集群连接的协议。* NFS 或 iSCSI 都是不错的选择。性能水平相当。在此解决方案演示中，我们使用 iSCSI 作为vVols连接到下划线ONTAP存储集群的存储协议。如果 VCF 基础架构支持，NetApp ONTAP上的vVols数据存储也支持 FC/FCoE、NVMe/FC 协议。
- * vVols数据存储上的 Oracle 存储布局。*在我们的测试和验证中，我们为 Oracle 二进制文件、Oracle 集群注册表/投票、Oracle 数据和 Oracle 日志文件部署了五个vVols数据存储区。将不同类型的 Oracle 文件分离到各自的数据存储中是一种很好的做法，这样可以轻松管理和执行数据库备份、恢复或克隆。为大型数据库创建专用vVols，并为较小的数据库或具有类似 QoS 配置文件的数据库共享vVols。
- * Oracle 存储冗余。使用 `Normal Redundancy`用于关键的 Oracle RAC 集群注册表/投票文件，以便三个 ASM 磁盘故障组上的三个投票文件提供最佳集群保护，并且集群注册表在 ASM 磁盘故障组之间镜像。使用 `External Redundancy`用于 Oracle 二进制文件、数据文件和日志文件，以优化存储利用率。带下划线的ONTAP RAID-DP 在以下情况下提供数据保护 `External Redundancy`受雇。
- * ONTAP存储身份验证的凭证。*仅使用ONTAP集群级凭据进行ONTAP存储集群身份验证，包括SnapCenter与ONTAP存储集群的连接或ONTAP工具与ONTAP存储集群的连接。
- *从vVols数据存储区到数据库虚拟机配置存储。*一次只能从vVols数据存储向数据库虚拟机添加一个磁盘。目前不支持同时从vVols数据存储添加多个磁盘。

- 数据库保护。NetApp提供了用于数据库备份和恢复的SnapCenter software套件，并具有用户友好的 UI 界面。NetApp建议实施这样的管理工具来实现快速的 Snapshot 备份、快速的数据库还原和恢复。

解决方案部署

以下部分提供了在 Oracle RAC 配置中的NetApp ONTAP存储上使用vVols数据存储的 VCF 中部署 Oracle 19c 数据库的分步过程。

部署先决条件

部署需要以下先决条件。

1. VMware VCF 已设置。有关如何创建 VCF 的信息或说明，请参阅 VMware 文档["VMware 云基础文档"](#)。
2. 在 VCF 工作负载域中配置三个 Linux VM、两个用于 Oracle RAC 数据库集群的 VM 和一个用于 Ansible 控制器的 VM。配置一个 Windows 服务器 VM 以运行NetApp SnapCenter服务器。有关设置 Ansible 控制器以自动部署 Oracle 数据库的信息，请参阅以下资源["NetApp解决方案自动化入门"](#)。
3. Oracle RAC 数据库虚拟机应该至少配置两个网络接口 - 一个用于 Oracle RAC 专用互连，一个用于应用程序或公共数据流量。
4. VMware vSphere 的SnapCenter插件版本 6.0 已在 VCF 中部署。有关插件部署，请参考以下资源：["SnapCenter Plug-in for VMware vSphere文档"](#)。
5. VMware vSphere 的ONTAP工具已在 VCF 中部署。有关适用于 VMware vSphere 部署的ONTAP工具，请参阅以下资源：["ONTAP tools for VMware vSphere文档"](#)



确保您已在 Oracle VM 根卷中分配至少 50G，以便有足够的空间来存放 Oracle 安装文件。

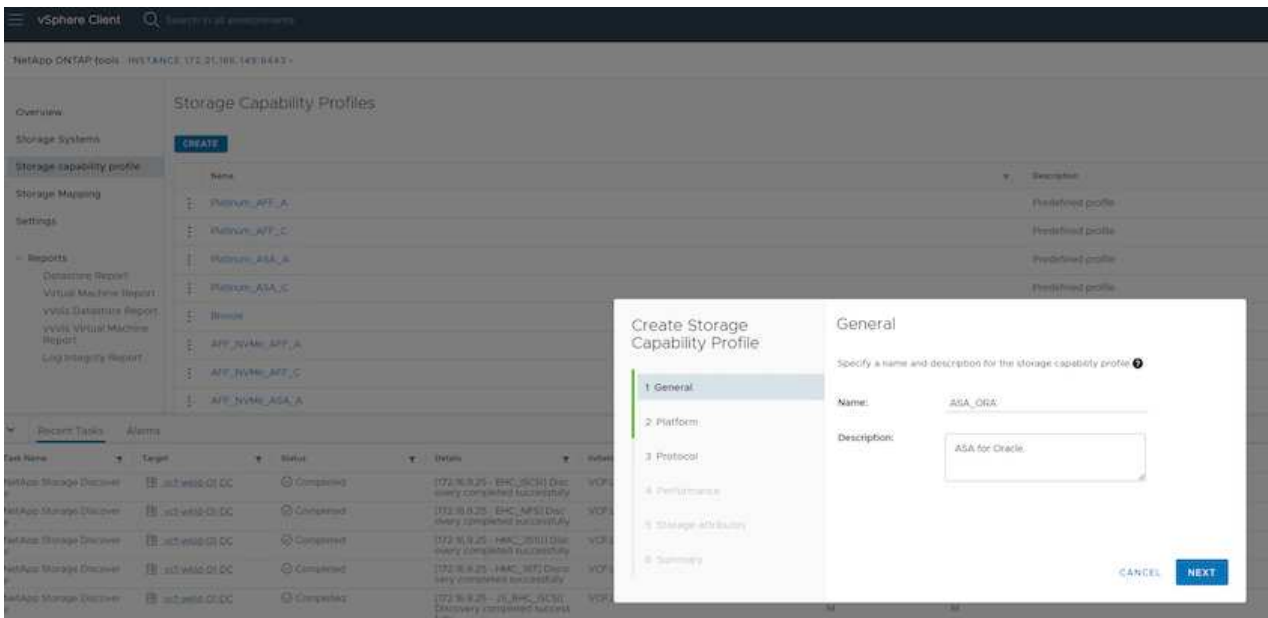
创建存储功能配置文件

首先，为托管vVols数据存储的下划线ONTAP存储创建自定义存储功能配置文件。

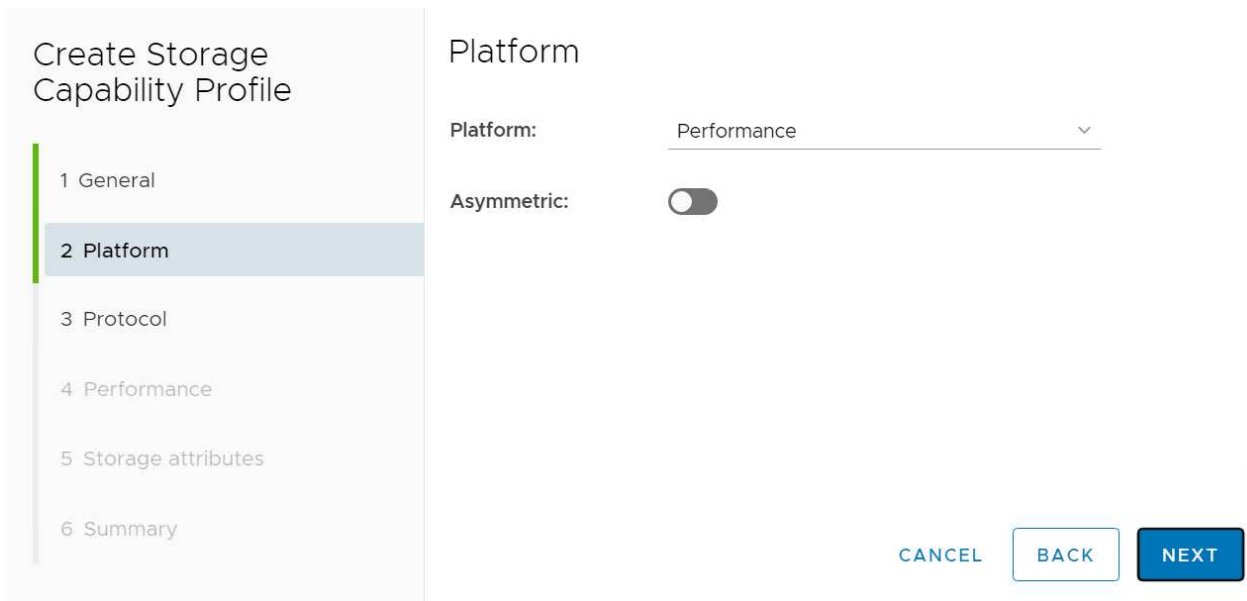
1. 从 vSphere 客户端快捷方式打开NetApp ONTAP工具。确保ONTAP存储集群已添加到 `Storage Systems` 作为ONTAP工具部署的一部分。

The screenshot displays the vSphere Client interface. The top navigation bar includes the 'vSphere Client' title and a search bar. Below this, the 'Shortcuts' section lists various management areas: Hosts and Clusters, VMs and Templates, Storage, Networking, Content Libraries, Global Inventory Lists, and Workload Management. The 'Monitoring' section includes Task Console, Event Console, VM Customization Specifications, VM Storage Policies, Host Profiles, and Lifecycle Manager. The 'Plugins' section shows two installed plugins: 'SnapCenter Plug-in for VMware vSphere' and 'NetApp ONTAP tools', the latter highlighted with an orange background. The 'Administration' section includes a 'Licensing' link. Below the navigation bar, the 'NetApp ONTAP tools' section is active, showing the instance ID '172.21.166.149:8443'. The 'Storage Systems' overview page is displayed, featuring a table with columns for Name, Type, IP Address, ONTAP Release, Status, Capacity, NFS VAAI, and Supported Protocols. The table contains one entry: 'ntapci-4300e9u25' of type 'Cluster' with IP '172.16.9.25' and release '9.14.1'. The status is 'Normal' and capacity is '43.76%'. A left sidebar lists various reports under the 'Reports' section, including Datastore Report, Virtual Machine Report, vVols Datastore Report, vVols Virtual Machine Report, and Log Integrity Report. The bottom right corner shows 'Storage Systems per page: 10' and '1 item'.

2. 点击 `Storage capability profile` 为 Oracle 添加自定义配置文件。命名配置文件并添加简短描述。



3. 选择存储控制器类别：性能、容量或混合。



4. 选择协议。

Create Storage Capability Profile

1 General

2 Platform

3 Protocol

4 Performance

5 Storage attributes

6 Summary

Protocol

Protocol:

Any

CANCEL

BACK

NEXT

5. 如果需要，定义 QoS 策略。

Create Storage Capability Profile

1 General

2 Platform

3 Protocol

4 Performance

5 Storage attributes

6 Summary

Performance

☒ None ⓘ

☐ QoS policy group ⓘ

Min IOPS:

Max IOPS:

☐ Unlimited

CANCEL

BACK

NEXT

6. 配置文件的附加存储属性。如果您想要具有加密功能，请确保在NetApp控制器上启用了加密，否则在应用配置文件时可能会导致问题。

Create Storage Capability Profile

- 1 General
- 2 Platform
- 3 Protocol
- 4 Performance
- 5 Storage attributes
- 6 Summary

Storage attributes

Deduplication:	Yes	▼
Compression:	Yes	▼
Space reserve:	Thin	▼
Encryption:	Yes	▼
Tiering policy (FabricPool):	None	▼

CANCEL

BACK

NEXT

7. 查看摘要并完成存储能力配置文件的创建。

Create Storage Capability Profile

- 1 General
- 2 Platform
- 3 Protocol
- 4 Performance
- 5 Storage attributes
- 6 Summary

Summary

Name:	ASA_ORA
Description:	ASA for Oracle.
Platform:	Performance
Asymmetric:	No
Protocol:	Any
Performance:	None
Space reserve:	Thin
Deduplication:	Yes
Compression:	Yes
Encryption:	Yes
Tiering policy (FabricPool):	None

CANCEL

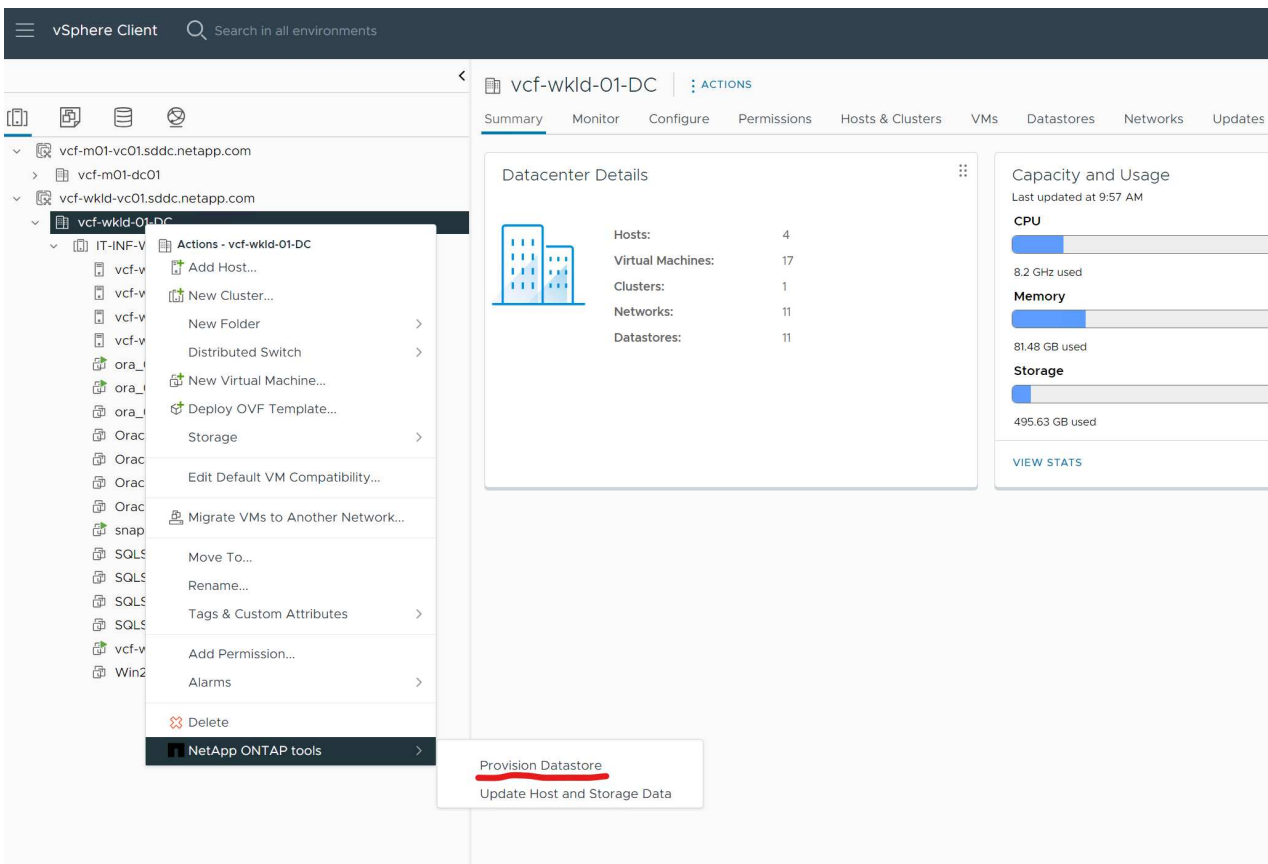
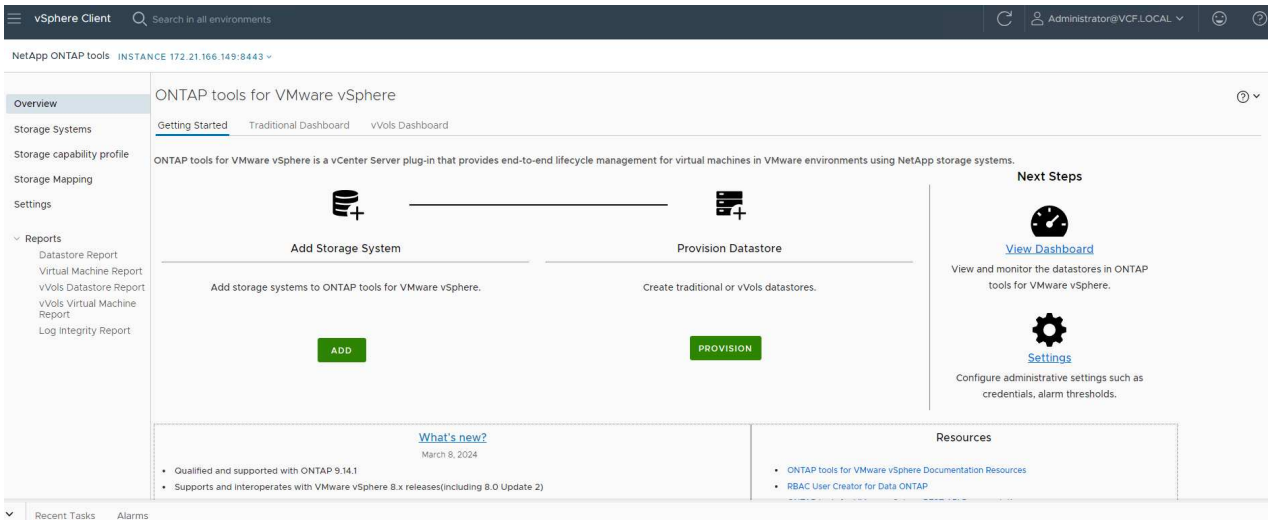
BACK

FINISH

创建并配置vVols数据存储

完成先决条件后，通过 vSphere 客户端以管理员用户身份登录 VCF，导航到工作负载域。不要使用内置 VMware 存储选项来创建 vVols。相反，使用 NetApp ONTAP 工具来创建 vVols。下面演示了创建和配置 vVols 的过程。

1. vVols 创建工作流可以从 ONTAP 工具界面或 VCF 工作负载域集群触发。



2. 填写数据存储的一般信息，包括配置目标、类型、名称和协议。

New Datastore

- 1 General
- 2 Storage system
- 3 Storage attributes
- 4 Summary

General

Specify the details of the datastore to provision [?]

Provisioning destination: [BROWSE](#)

Type: ☐ NFS ☐ VMFS ☒ vVols

Name:

Description:

Protocol: ☐ NFS ☒ iSCSI ☐ FC / FCoE ☐ NVMe/FC

[CANCEL](#) [NEXT](#)

3. 选择上一步创建的自定义存储功能配置文件，Storage system，和 Storage VM，要在其中创建vVols。

New Datastore

- 1 General
- 2 Storage system
- 3 Storage attributes
- 4 Summary

Storage system

Specify the storage capability profiles and the storage system you want to use.

Storage capability profiles:

Storage system:

Storage VM:

[CANCEL](#) [BACK](#) [NEXT](#)

4. 选择 Create new volumes，填写卷名称和大小，然后点击 `ADD` 然后 `NEXT` 移至摘要页面。

New Datastore

- 1 General
- 2 Storage system
- 3 Storage attributes
- 4 Summary

Storage attributes

Specify the storage details for provisioning the datastore.

Volumes: ☒ Create new volumes ☐ Select volumes

Create new volumes

Name	Size	Storage Capability Profile	Aggregate
 FlexVol volumes are not added.			

Name	Size(GB)	Storage capability profile	Aggregates	Space reserve
vcf_ora_bins	150	ASA_ORA	EHCaggr02 - (17714.69 Gi	Thin

New Datastore

- 1 General
- 2 Storage system
- 3 Storage attributes
- 4 Summary

Storage attributes

Volumes: ☒ Create new volumes ☐ Select volumes

Create new volumes

Name	Size	Storage Capability Profile	Aggregate
vcf_ora_bins	150 GB	ASA_ORA	EHCaggr02

1 - 1 of 1 Item

Name	Size(GB)	Storage capability profile	Aggregates	Space reserve
		ASA_ORA	EHCaggr02 - (17714.69 Gi	Thin

Default storage capability profile: ASA_ORA

5. 点击 'Finish' 为 Oracle 二进制文件创建vVols数据存储。

New Datastore

- 1 General
- 2 Storage system
- 3 Storage attributes
- 4 Summary

Summary

General

vCenter server: vcf-wkld-vc01.sddc.netapp.com
Provisioning destination: vcf-wkld-01-DC
Datastore name: VCF_ORA_BINS
Datastore type: vVols
Protocol: iSCSI
Storage capability profile: ASA_ORA

Storage system details

Storage system: ntaphci-a300e9u25
SVM: VCF_iSCSI

Storage attributes

New FlexVol Name	New FlexVol Size	Aggregate	Storage Capability Profile
vcf_ora_bins	150 GB	EHCaggr02	ASA_ORA

6. 为 Oracle 集群注册表或 CRS 创建数据存储。

New Datastore

1 General

2 Storage system

3 Storage attributes

4 Summary

Storage attributes

Specify the storage details for provisioning the datastore.

Volumes: ☒ Create new volumes ☐ Select volumes

Create new volumes:

Name	Size	Storage Capability Profile	Aggregate
vcf_ora_crs1	25 GB	ASA_ORA	EHCaggr01
vcf_ora_crs2	25 GB	ASA_ORA	EHCaggr02

1 - 2 of 2 items

Name	Size(GB)	Storage capability profile	Aggregates	Space reserve
		ASA_ORA	EHCaggr02 - (17651.8 GB	Thin

ADD

CANCELBACKNEXT



您可以向vVols数据存储区添加多个卷，或者将vVols数据存储区卷分布在ONTAP控制器节点之间，以提高性能或实现冗余。

7. 为 Oracle 数据创建数据存储。理想情况下，在每个ONTAP控制器节点上创建单独的数据存储，并使用 Oracle ASM 在控制器节点之间对数据进行条带化，以最大限度地利用ONTAP存储集群容量。

New Datastore

1 General

2 Storage system

3 Storage attributes

4 Summary

Storage attributes

Specify the storage details for provisioning the datastore.

Volumes: ☒ Create new volumes ☐ Select volumes

Create new volumes:

Name	Size	Storage Capability Profile	Aggregate
vcf_ora_dat1	200 GB	ASA_ORA	EHCaggr01

1 - 1 of 1 item

Name	Size(GB)	Storage capability profile	Aggregates	Space reserve
		ASA_ORA	EHCaggr02 - (17467.05 G	Thin

ADD

Default storage capability profile: ASA_ORA

CANCELBACKNEXT

New Datastore

1 General

2 Storage system

3 Storage attributes

4 Summary

Storage attributes

Specify the storage details for provisioning the datastore.

Volumes:

☒ Create new volumes
 ☐ Select volumes

Create new volumes

Name	Size	Storage Capability Profile	Aggregate
vcf_ora_dat2	200 GB	ASA_ORA	EHCAGgr02

1 - 1 of 1 item

Name

Size(GB) ①

Storage capability profile

Aggregates

Space reserve

ASA_ORA

EHCAGgr02 - (17467.05 G

Thin

ADD

Default storage capability profile:

ASA_ORA

CANCEL

BACK

NEXT

8. 为 Oracle 日志创建数据存储。鉴于 Oracle 日志写入的顺序性，最好将其放在单个ONTAP控制器节点上。

New Datastore

1 General

2 Storage system

3 Storage attributes

4 Summary

Storage attributes

Specify the storage details for provisioning the datastore.

Volumes:

☒ Create new volumes
 ☐ Select volumes

Create new volumes

Name	Size	Storage Capability Profile	Aggregate
vcf_ora_logs	250 GB	ASA_ORA	EHCAGgr02

1 - 1 of 1 item

Name

Size(GB) ①

Storage capability profile

Aggregates

Space reserve

ASA_ORA

EHCAGgr02 - (17467.05 G

Thin

ADD

Default storage capability profile:

ASA_ORA

CANCEL

BACK

NEXT

9. 部署后验证 Oracle 数据存储。

vSphere Client

Search in all environments

Administrator@VCFLocal

vcf-wkld-01-DC

ACTIONS

Summary

Monitor

Configure

Permissions

Hosts & Clusters

VMs

Datastores

Networks

Updates

vcf-m01-vc01.sddc.netapp.com

vcf-wkld-vc01.sddc.netapp.com

vcf-wkld-01-DC

vcf-wkld-esx01-esx-install-datastore

vcf-wkld-esx02-esx-install-datastore

vcf-wkld-esx03-esx-install-datastore

vcf-wkld-esx04-esx-install-datastore

VCF_ORA_BINS

VCF_ORA_CRS

VCF_ORA_DAT1

VCF_ORA_DAT2

VCF_ORA_LOGS

VCF_WKLD_01

VCF_WKLD_03_ISCSI

VCF_WKLD_04_NVMe

Datacenter Details

Hosts:

4

Virtual Machines:

17

Clusters:

1

Networks:

11

Datastores:

12

Capacity and Usage

Last updated at 11:29 AM

CPU

66.8 GHz free

6.64 GHz used

73.44 GHz capacity

Memory

58.97 GB used

511.98 GB capacity

Storage

491.04 GB used

11.88 TB capacity

VIEW STATS

Tags

No tags assigned

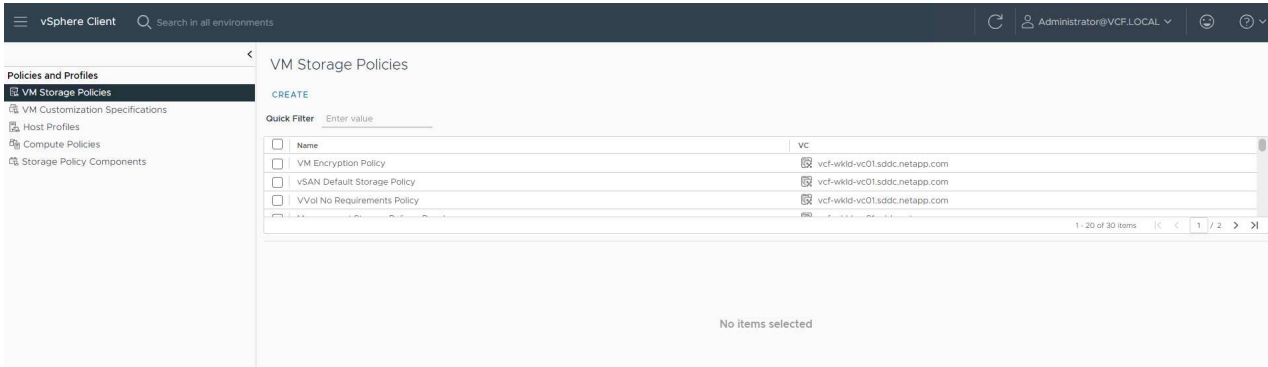
ASSIGN

Custom Attributes

根据存储能力配置文件创建虚拟机存储策略

在将存储从vVols数据存储配置到数据库 VM 之前，请根据上一步创建的存储功能配置文件添加 VM 存储策略。以下是具体步骤。

1. 从 vSphere Client 菜单打开 Policies and Profiles 并突出显示 VM Storage Policies。点击 'Create' 打开 'VM Storage Policies' 工作流程。



2. 命名虚拟机存储策略。

Edit VM Storage Policy

1 Name and description

2 Policy structure

3 NetApp.clustered.Data.ONTAP.VP.vvol rules

4 Storage compatibility

5 Review and finish

Name and description

Name:

vVol_database

Description:

CANCEL

NEXT

3. 在 Datastore specific rules, 查看 Enable rules for "NetAPP.clustered.Data.ONTAP.VP.vvol" storage

Edit VM Storage Policy

1 Name and description

2 Policy structure

3 NetApp.clustered.Data.ONTAP.VP.vvol rules

4 Storage compatibility

5 Review and finish

Policy structure

×

Host based services

Create rules for data services provided by hosts. Available data services could include encryption, I/O control, caching, etc. Host based services will be applied in addition to any datastore specific rules.

☐ Enable host based rules

Datastore specific rules

Create rules for a specific storage type to configure data services provided by the datastores. The rules will be applied when VMs are placed on the specific storage type.

☐ Enable rules for "vSAN" storage

☐ Enable rules for "vSANDirect" storage

☐ Enable rules for "VMFS" storage

☒ Enable rules for "NetApp.clustered.Data.ONTAP.VP.vvol" storage

☐ Enable tag based placement rules

Storage topology

Create rules for storage consumption domain topology. The storage topology will be applied to all datastore specific rules.

☐ Enable consumption domain

CANCEL

BACK

NEXT

- 对于NetApp.clustered.Data. ONTAP.VP.vvol 规则 Placement，选择上一步创建的自定义存储容量配置文件。

Create VM Storage Policy

1 Name and description

2 Policy structure

3 **NetApp.clustered.Data.ONTAP.VP.vvol rules**

4 Storage compatibility

5 Review and finish

NetApp.clustered.Data.ONTAP.VP.vvol rules

×

Placement Replication Tags

ProfileName ⓘ

ASA_ORA

CANCEL

BACK

NEXT

5. 对于NetApp.clustered.Data. ONTAP.VP.vvol 规则 Replication， 选择 `Disabled` 如果vVols未被复制。

Create VM Storage Policy

1 Name and description

2 Policy structure

3 **NetApp.clustered.Data.ONTAP.VP.vvol rules**

4 Storage compatibility

5 Review and finish

NetApp.clustered.Data.ONTAP.VP.vvol rules

×

Placement Replication Tags

☒ Disabled

☐ Custom

CANCEL

BACK

NEXT

6. 存储兼容性页面显示 VCF 环境中兼容的vVols数据存储。

Edit VM Storage Policy

1 Name and description

2 Policy structure

3 NetApp.clustered.Data.ONTAP.VP.
vvol rules

4 Storage compatibility

5 Review and finish

Storage compatibility

×

COMPATIBLE INCOMPATIBLE

☐ Expand datastore clusters

Compatible storage 850 GB (849.99 GB free)

Quick Filter Enter value

Name	Datacenter	Type	Free Space	Capacity	Warnings
VCF_ORA_BINS	vcf-wkld-01-DC	vVol	149.99 GB	150.00 GB	
VCF_ORA_DAT1	vcf-wkld-01-DC	vVol	200.00 GB	200.00 GB	
VCF_ORA_DAT2	vcf-wkld-01-DC	vVol	200.00 GB	200.00 GB	
VCF_ORA_LOGS	vcf-wkld-01-DC	vVol	250.00 GB	250.00 GB	
VCF_ORA_CRS	vcf-wkld-01-DC	vVol	50.00 GB	50.00 GB	

Manage Columns

5 items

CANCEL

BACK

NEXT

7. 审查并完成创建虚拟机存储策略。

Create VM Storage Policy

1 Name and description

2 Policy structure

3 NetApp.clustered.Data.ONTAP.VP.vvol rules

4 Storage compatibility

5 Review and finish

Review and finish

General

Name

vVol_database

Description

vcf-wkld-vc01.sddc.netapp.com

vCenter Server

vcf-wkld-vc01.sddc.netapp.com

NetApp.clustered.Data.ONTAP.VP.vvol rules

Placement

ProfileName

ASA_ORA

CANCEL

BACK

FINISH

8. 验证刚刚创建的虚拟机存储策略。

vsphere Client

Search in all environments

Adminstrator@VCF-LOCAL

Policies and Profiles

VM Storage Policies

VM Customization Specifications

Host Profiles

Compute Policies

Storage Policy Components

VM Storage Policies

CREATE

CHECK

REAPPLY

EDIT

CLONE

DELETE

Quick Filter

Enter value

☐

Name

vc

☐

vSAN ESA Default Policy - RAID5

vcf-wkld-vc01.sddc.netapp.com

☐

vSAN ESA Default Policy - RAID6

vcf-wkld-vc01.sddc.netapp.com

☐

NFS

vcf-wkld-vc01.sddc.netapp.com

☒

vVol_database

vcf-wkld-vc01.sddc.netapp.com

☐

VM Encryption Policy

vcf-m01-vc01.sddc.netapp.com

☐

vSAN Default Storage Policy

vcf-m01-vc01.sddc.netapp.com

☐

VVol No Requirements Policy

vcf-m01-vc01.sddc.netapp.com

☐

Management Storage Policy - Regular

vcf-m01-vc01.sddc.netapp.com

1-20 of 30 items

1 / 2

Rules

VM Compliance

VM Template

Storage Compatibility

General

Name

vVol_database

Description

Rule-set 1: NetApp.clustered.Data.ONTAP.VP.vvol

Placement

Storage Type

NetApp.clustered.Data.ONTAP.VP.vvol

ProfileName

ASA_ORA

从vVols数据存储向 RAC VM 分配磁盘并配置 DB 存储

从 vSphere 客户端，通过编辑 VM 设置将vVols数据存储中的所需磁盘添加到数据库 VM。然后，登录 VM 格式化并将二进制磁盘挂载到挂载点 /u01。下面演示了具体的步骤和任务。

1. 在将磁盘从数据存储分配到数据库虚拟机之前，请登录 VMware ESXi 主机进行验证并确保在 ESXi 级别启用了多写入器（GBLAllowMW 值设置为 1）。

```
[root@vcf-wkld-esx01:~] which esxcli
/bin/esxcli
[root@vcf-wkld-esx01:~] esxcli system settings advanced list -o
/VMFS3/GBLAllowMW
  Path: /VMFS3/GBLAllowMW
  Type: integer
  Int Value: 1
  Default Int Value: 1
  Min Value: 0
  Max Value: 1
  String Value:
  Default String Value:
  Valid Characters:
  Description: Allow multi-writer GBLs.
  Host Specific: false
  Impact: none
[root@vcf-wkld-esx01:~]
```

2. 添加一个新的专用 SCSI 控制器以供 Oracle RAC 磁盘使用。禁用 SCSI 总线共享。

> CPU	4 ▾ ⓘ	
> Memory	16	GB ▾
> Hard disk 1	50	GB ▾ ⋮
> SCSI controller 0	VMware Paravirtual	⋮
▼ New SCSI controller *	VMware Paravirtual	⋮
Change Type	VMware Paravirtual ▾	
SCSI Bus Sharing	None ▾	
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt ▾	☒ Connected ⋮
> Network adapter 2	vlan-180 ▾	☒ Connected ⋮
> CD/DVD drive 1	Client Device ▾	☒ Connect At Power On ⋮
> Video card	Specify custom settings ▾	
> Other	Additional Hardware	

CANCEL

OK

3. 从 RAC 节点 1 - ora01，向 VM 添加一个磁盘用于 Oracle 二进制存储（不共享）。

> CPU	4 ▾ 
> Memory	16 ▾ GB ▾
> Hard disk 1	50 GB ▾ ⋮
▼ New Hard disk *	50 GB ▾ ⋮
Maximum Size	150 GB
VM storage policy	vVol_database ▾
Location	VCF_ORA_BINS ▾
Disk Provisioning	Thin Provision ▾
Sharing	No sharing ▾
Disk Mode	Independent - Persistent ▾
Virtual Device Node	SCSI controller 1 ▾ SCSI(1:0) New Hard disk ▾
> SCSI controller 0	VMware Paravirtual ⋮
> SCSI controller 1	VMware Paravirtual ⋮
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt ▾ ☒ Connected ⋮
> Network adapter 2	vlan-180 ▾ ☒ Connected ⋮
> CD/DVD drive 1	Client Device ▾ ☒ Connect At Power On ⋮
> Video card	Specify custom settings ▾
> Other	Additional Hardware

CANCEL

OK

4. 从 RAC 节点 1 开始，向 VM 添加三个磁盘用于 Oracle RAC CRS 存储并启用多写入器共享。

ADD NEW DEVICE ▾

> CPU	4 ▾ 
> Memory	16 ▾ GB ▾
> Hard disk 1	50 GB ▾ ⋮
> Hard disk 2	50 GB ▾ ⋮
✓ New Hard disk *	10 GB ▾ ⋮
Maximum Size50 GB VM storage policyvVol_database ▾ LocationVCF_ORA_CRSS ▾ Disk ProvisioningThin Provision ▾ SharingMulti-writer ▾ Disk ModeIndependent - Persistent ▾ Virtual Device NodeSCSI controller 1 ▾ SCSI(1:1) New Hard disk ▾	
> SCSI controller 0	VMware Paravirtual ⋮
> SCSI controller 1	VMware Paravirtual ⋮
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt ▾ ☒ Connected ⋮
> Network adapter 2	vlan-180 ▾ ☒ Connected ⋮
> CD/DVD drive 1	Client Device ▾ ☒ Connect At Power On ⋮
> Video card	Specify custom settings ▾
> Other	Additional Hardware

CANCEL

OK

ADD NEW DEVICE ▾

> CPU	4 ▾	
> Memory	16	GB ▾
> Hard disk 1	50	GB ▾
> Hard disk 2	50	GB ▾
> Hard disk 3	10	GB ▾
✓ New Hard disk *	10	GB ▾
Maximum Size49.98 GB VM storage policyvVol_database ▾ LocationVCF_ORA_CRSS ▾ Disk ProvisioningThin Provision ▾ SharingMulti-writer ▾ Disk ModeIndependent - Persistent ▾ Virtual Device NodeSCSI controller 1 ▾ SCSI(1:2) New Hard disk ▾		
> SCSI controller 0	VMware Paravirtual	
> SCSI controller 1	VMware Paravirtual	
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt ▾	☒ Connected
> Network adapter 2	vlan-180 ▾	☒ Connected
> CD/DVD drive 1	Client Device ▾	☒ Connect At Power On
> Video card	Specify custom settings ▾	

CANCEL

OK

> CPU	4 ▾	
> Memory	16	GB ▾
> Hard disk 1	50	GB ▾
> Hard disk 2	50	GB ▾
> Hard disk 3	10	GB ▾
> Hard disk 4	10	GB ▾
▼ New Hard disk *	10	GB ▾
Maximum Size 49.99 GB		
VM storage policy	vVol_database ▾	
Location	VCF_ORA_CRS ▾	
Disk Provisioning	Thin Provision ▾	
Sharing	Multi-writer ▾	
Disk Mode	Independent - Persistent ▾	
Virtual Device Node	SCSI controller 1 ▾ SCSI(1:3) New Hard disk ▾	
> SCSI controller 0	VMware Paravirtual	
> SCSI controller 1	VMware Paravirtual	
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt ▾	☒ Connected
> Network adapter 2	vlan-180 ▾	☒ Connected
> CD/DVD drive 1	Client Device ▾	☒ Connect At Power On

CANCEL

OK

- 从 RAC 节点 1 开始，从每个数据存储区中分别添加两个磁盘，用于将数据发送到 VM，以共享 Oracle 数据存储。

Edit Settings | ora_01



Virtual Hardware VM Options Advanced Parameters

ADD NEW DEVICE ▾

> CPU	4 ▾ 
> Memory	16 ▾ GB ▾
▾ Hard disks * 6 total 170 GB	
> Hard disk 1	50 GB ▾ 
> Hard disk 2	50 GB ▾ 
> Hard disk 3	10 GB ▾ 
> Hard disk 4	10 GB ▾ 
> Hard disk 5	10 GB ▾ 
▾ New Hard disk *	40 GB ▾ 
Maximum Size	200 GB
VM storage policy	vVol_database ▾
Location	VCF_ORA_DAT1 ▾
Disk Provisioning	Thin Provision ▾
Sharing	Multi-writer ▾
Disk Mode	Independent - Persistent ▾
Virtual Device Node	SCSI controller 0 ▾ SCSI(0:1) New Hard disk ▾
> SCSI controller 0	VMware Paravirtual 
> SCSI controller 1	VMware Paravirtual 

CANCEL

OK

> Hard disk 1	50	GB	⋮
> Hard disk 2	50	GB	⋮
> Hard disk 3	10	GB	⋮
> Hard disk 4	10	GB	⋮
> Hard disk 5	10	GB	⋮
> Hard disk 6	40	GB	⋮
▼ New Hard disk *	40	GB	⋮

Maximum Size 199.98 GB

VM storage policy vVol_database

Location VCF_ORA_DAT1

Disk Provisioning Thin Provision

Sharing Multi-writer

Disk Mode Independent - Persistent

Virtual Device Node SCSI controller 1 SCSI(1:5) New Hard disk

> SCSI controller 0	VMware Paravirtual	⋮
> SCSI controller 1	VMware Paravirtual	⋮
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt	☒ Connected ⋮
> Network adapter 2	vlan-180	☒ Connected ⋮
> CD/DVD drive 1	Client Device	☒ Connect At Power On ⋮
> Video card	Specify custom settings	⋮

CANCEL

OK

> CPU	4	1
> Memory	16	GB
▼ Hard disks * 8 total 250 GB		
> Hard disk 1	50	GB
> Hard disk 2	50	GB
> Hard disk 3	10	GB
> Hard disk 4	10	GB
> Hard disk 5	10	GB
> Hard disk 6	40	GB
> Hard disk 7	40	GB
▼ New Hard disk *	40	GB
Maximum Size 200 GB		
VM storage policy vVol_database		
Location VCF_ORA_DAT2		
Disk Provisioning Thin Provision		
Sharing Multi-writer		
Disk Mode Independent - Persistent		
Virtual Device Node SCSI controller 1 SCSI(1:6) New Hard disk		
> SCSI controller 0	VMware Paravirtual	
> SCSI controller 1	VMware Paravirtual	

CANCEL

OK

> Hard disk 1	50	GB	⋮
> Hard disk 2	50	GB	⋮
> Hard disk 3	10	GB	⋮
> Hard disk 4	10	GB	⋮
> Hard disk 5	10	GB	⋮
> Hard disk 6	40	GB	⋮
> Hard disk 7	40	GB	⋮
> Hard disk 8	40	GB	⋮
▼ New Hard disk *	40	GB	⋮
Maximum Size 199.98 GB			
VM storage policy	vVol_database ▼		
Location	VCF_ORA_DAT2 ▼		
Disk Provisioning	Thin Provision ▼		
Sharing	Multi-writer ▼		
Disk Mode	Independent - Persistent ▼		
Virtual Device Node	SCSI controller 1 ▼ SCSI(1:8) New Hard disk ▼		
> SCSI controller 0	VMware Paravirtual		⋮
> SCSI controller 1	VMware Paravirtual		⋮
> Network adapter 1	vcf-wkld-01-HT-INF-WKLD-01-vds-01-pg-mgmt ▼	☒ Connected	⋮
> Network adapter 2	vlan-180 ▼	☒ Connected	⋮

CANCELOK

6. 从 RAC 节点 1，从日志数据存储向 VM 添加两个磁盘，用于共享 Oracle 日志文件存储。

> Hard disk 2	50	GB	⋮
> Hard disk 3	10	GB	⋮
> Hard disk 4	10	GB	⋮
> Hard disk 5	10	GB	⋮
> Hard disk 6	40	GB	⋮
> Hard disk 7	40	GB	⋮
> Hard disk 8	40	GB	⋮
> Hard disk 9	40	GB	⋮
✓ New Hard disk *	80	GB	⋮

Maximum Size 250 GB

VM storage policy vVol_database

Location VCF_ORA_LOGS

Disk Provisioning Thin Provision

Sharing Multi-writer

Disk Mode Independent - Persistent

Virtual Device Node SCSI controller 1 SCSI(1:9) New Hard disk

> SCSI controller 0	VMware Paravirtual	⋮
> SCSI controller 1	VMware Paravirtual	⋮
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt	☒ Connected ⋮
> Network adapter 2	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt	☒ Connected ⋮

CANCEL

OK

> Hard disk 3	10	GB	⋮
> Hard disk 4	10	GB	⋮
> Hard disk 5	10	GB	⋮
> Hard disk 6	40	GB	⋮
> Hard disk 7	40	GB	⋮
> Hard disk 8	40	GB	⋮
> Hard disk 9	40	GB	⋮
> Hard disk 10	80	GB	⋮
✓ New Hard disk *	80	GB	⋮

Maximum Size 249.98 GB

VM storage policy vVol_database

Location VCF_ORA_LOGS

Disk Provisioning Thin Provision

Sharing Multi-writer

Disk Mode Independent - Persistent

Virtual Device Node SCSI controller 1 SCSI(1:10) New Hard disk

> SCSI controller 0	VMware Paravirtual	⋮
> SCSI controller 1	VMware Paravirtual	⋮
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt	☒ Connected ⋮
> Network adapter 2	vlan-180	☒ Connected ⋮

CANCEL

OK

7. 从 RAC 节点 2 开始，向 VM 添加一个磁盘用于 Oracle 二进制存储（不共享）。

> CPU	4 ▾ ⓘ	
> Memory	16	GB ▾
> Hard disk 1	50	GB ▾
▼ New Hard disk *	50	GB ▾
Maximum Size	149.99 GB	
VM storage policy	vVol_database ▾	
Location	VCF_ORA_BINS ▾	
Disk Provisioning	Thin Provision ▾	
Sharing	No sharing ▾	
Disk Mode	Independent - Persistent ▾	
Virtual Device Node	SCSI controller 1 ▾ SCSI(1:0) New Hard disk ▾	
> SCSI controller 0	VMware Paravirtual	
> SCSI controller 1	VMware Paravirtual	
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt ▾	☒ Connected
> Network adapter 2	vlan-180 ▾	☒ Connected
> CD/DVD drive 1	Client Device ▾	☒ Connect At Power On
> Video card	Specify custom settings ▾	
> Other	Additional Hardware	

CANCEL

OK

8. 从 RAC 节点 2，通过选择添加其他共享磁盘 `Existing Hard Disks` 选项并为每个共享磁盘启用多写入器共享。

Select File



[GO BACK TO DATASTORES](#)

Filter by a folder name

▼

VCF_ORA_CRS

▼

ora_01

.sdd.sf

Folders per page 1000 ▼

File Type: Compatible Virtual Disks(*.vmdk, *.dsk, *.raw) ▼

	Name	Size	Modified
☒	ora_01.vmdk	10,485,760 KB	07/30/2024, 1:55:17 PM
☐	ora_01_1.vmdk	10,485,760 KB	07/30/2024, 2:03:05 PM
☐	ora_01_2.vmdk	10,485,760 KB	07/30/2024, 2:06:13 PM

Manage Columns

3 items

CANCEL

OK

> CPU	4 ▾ 
> Memory	16 ▾ GB ▾
> Hard disk 1	50 GB ▾ ⋮
> Hard disk 2	50 GB ▾ ⋮
▾ New Hard disk *	10 GB ▾ ⋮
Maximum Size	4.83 TB
VM storage policy	vVol_database ▾
Sharing	Multi-writer ▾
Disk File	[VCF_ORA_CRS] naa.600a0980383043595a2b506b67777a70/ora_01.vmdk
Disk Mode	Independent - Persistent ▾
Virtual Device Node	SCSI controller 1 ▾ SCSI(1:1) New Hard disk ▾
> SCSI controller 0	VMware Paravirtual ⋮
> SCSI controller 1	VMware Paravirtual ⋮
> Network adapter 1	vcf-wkld-01-IT-INF-WKLD-01-vds-01-pg-mgmt ▾ ☒ Connected ⋮
> Network adapter 2	vlan-180 ▾ ☒ Connected ⋮
> CD/DVD drive 1	Client Device ▾ ☒ Connect At Power On ⋮
> Video card	Specify custom settings ▾
> Other	Additional Hardware

CANCEL

OK

9. 从虚拟机 Edit Settings, Advanced Parameters, 添加属性 `disk.enableuuid`具有价值`TRUE`。需要关闭虚拟机才能添加高级参数。设置此选项可使SnapCenter准确识别您环境中的 vVol。这应该在所有 RAC 节点上完成。

Virtual Hardware VM Options Advanced Parameters**Advanced Configuration Parameters**

Modify or add configuration parameters as needed for experimental features or as instructed by technical support. Empty values will be removed (supported on ESXi 6.0 and later).

Attribute

Value

ADD

Attribute	Value
sched.cpu.latencySensitivity	normal
tools.guest.desktop.autolock	TRUE
svga.present	TRUE
pciBridge0.present	TRUE
pciBridge4.present	TRUE
pciBridge4.virtualDev	pcieRootPort
pciBridge4.functions	8
pciBridge5.present	TRUE
pciBridge5.virtualDev	pcieRootPort
pciBridge5.functions	8
pciBridge6.present	TRUE

CANCEL

OK

10. 现在，重新启动虚拟机。通过 ssh 以管理员用户身份登录 VM 以查看新添加的磁盘驱动器。

```
[admin@ora01 ~]$ sudo lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda                  8:0    0   50G  0 disk
├─sda1                8:1    0  600M  0 part /boot/efi
├─sda2                8:2    0    1G  0 part /boot
└─sda3                8:3    0  48.4G  0 part
   └─rhel-root        253:0    0  43.4G  0 lvm  /
      └─rhel-swap     253:1    0    5G  0 lvm  [SWAP]
sdb                  8:16    0   50G  0 disk
sdc                  8:32    0   10G  0 disk
sdd                  8:48    0   10G  0 disk
sde                  8:64    0   10G  0 disk
sdf                  8:80    0   40G  0 disk
sdg                  8:96    0   40G  0 disk
sdh                  8:112   0   40G  0 disk
sdi                  8:128   0   40G  0 disk
sdj                  8:144   0   80G  0 disk
sdk                  8:160   0   80G  0 disk
sr0                  11:0    1 1024M  0 rom
[admin@ora01 ~]$
```

```
[admin@ora02 ~]$ sudo lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda                  8:0    0   50G  0 disk
├─sda1                8:1    0  600M  0 part /boot/efi
├─sda2                8:2    0    1G  0 part /boot
└─sda3                8:3    0  48.4G  0 part
   └─rhel-root        253:0    0  43.4G  0 lvm  /
      └─rhel-swap     253:1    0    5G  0 lvm  [SWAP]
sdb                  8:16    0   50G  0 disk
sdc                  8:32    0   10G  0 disk
sdd                  8:48    0   10G  0 disk
sde                  8:64    0   10G  0 disk
sdf                  8:80    0   40G  0 disk
sdg                  8:96    0   40G  0 disk
sdh                  8:112   0   40G  0 disk
sdi                  8:128   0   40G  0 disk
sdj                  8:144   0   80G  0 disk
sdk                  8:160   0   80G  0 disk
sr0                  11:0    1 1024M  0 rom
[admin@ora02 ~]$
```

11. 从每个 RAC 节点，通过接受默认选择将 Oracle 二进制磁盘 (/dev/sdb) 分区为主分区和单个分区。

```
sudo fdisk /dev/sdb
```

12. 将分区的磁盘格式化为xfs文件系统。

```
sudo mkfs.xfs /dev/sdb1
```

13. 将磁盘挂载到挂载点 /u01。

```
[admin@ora01 ~]$ df -h
```

Filesystem	Size	Used	Avail	Use%	Mounted on
devtmpfs	7.7G	36K	7.7G	1%	/dev
tmpfs	7.8G	1.4G	6.4G	18%	/dev/shm
tmpfs	7.8G	34M	7.7G	1%	/run
tmpfs	7.8G	0	7.8G	0%	/sys/fs/cgroup
/dev/mapper/rhel-root	44G	29G	16G	66%	/
/dev/sda2	1014M	249M	766M	25%	/boot
/dev/sda1	599M	5.9M	593M	1%	/boot/efi
/dev/sdb1	50G	24G	27G	47%	/u01
tmpfs	1.6G	12K	1.6G	1%	/run/user/42
tmpfs	1.6G	0	1.6G	0%	/run/user/54331
tmpfs	1.6G	4.0K	1.6G	1%	/run/user/1000

14. 将挂载点添加到 /etc/fstab，以便在 VM 重新启动时挂载磁盘驱动器。

```
sudo vi /etc/fstab
```

```

[oracle@ora_01 ~]$ cat /etc/fstab

#
# /etc/fstab
# Created by anaconda on Wed Oct 18 19:43:31 2023
#
# Accessible filesystems, by reference, are maintained under
# '/dev/disk/'.
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for
# more info.
#
# After editing this file, run 'systemctl daemon-reload' to update
# systemd
# units generated from this file.
#
/dev/mapper/rhel-root    /                    xfs      defaults
0 0
UUID=aff942c4-b224-4b62-807d-6a5c22f7b623 /boot
xfs      defaults        0 0
/dev/mapper/rhel-swap    none                 swap     defaults
0 0
/root/swapfile swap swap defaults 0 0
/dev/sdb1                /u01                 xfs      defaults
0 0

```

VCF中的Oracle RAC部署

建议利用NetApp自动化工具包在带有vVols的 VCF 中部署 Oracle RAC。仔细阅读随附的说明（README），并按照工具包中的说明配置部署参数文件，例如部署目标文件 - hosts、全局变量文件 - vars/vars.yml 和本地 DB VM 变量文件 - host_vars/host_name.yml。以下是逐步的程序。

1. 通过 ssh 以管理员用户身份登录到 Ansible 控制器 VM，并使用vVols克隆用于在 VCF 中部署 Oracle RAC 的自动化工具包副本。

```
git clone https://bitbucket.ngage.netapp.com/scm/ns-  
bb/na_oracle_deploy_rac.git
```

2. 将以下 Oracle 安装文件暂存于 RAC 节点 1 数据库 VM 上的 /tmp/archive 文件夹中。该文件夹应允许所有用户以 777 权限访问。

```
LINUX.X64_193000_grid_home.zip  
p34762026_190000_Linux-x86-64.zip  
LINUX.X64_193000_db_home.zip  
p34765931_190000_Linux-x86-64.zip  
p6880880_190000_Linux-x86-64.zip
```

3. 在 Ansible 控制器和数据库虚拟机之间设置 ssh 无密钥身份验证，这需要生成 ssh 密钥对并将公钥复制到数据库虚拟机管理员用户根目录 .ssh 文件夹 authorized_keys 文件中。

```
ssh-keygen
```

4. 配置用户定义的目标主机参数文件。以下是目标主机文件 hosts 的典型配置示例。

```
#Oracle hosts  
[oracle]  
ora01 ansible_host=10.61.180.21  
ansible_ssh_private_key_file=ora01.pem  
ora02 ansible_host=10.61.180.22  
ansible_ssh_private_key_file=ora02.pem
```

5. 配置用户定义的本地主机特定参数文件。以下是本地 host_name.yml 文件 - ora01.yml 的典型配置示例。

```
# Binary lun
ora_bin: /dev/sdb

# Host DB configuration
ins_sid: "{{ oracle_sid }}"
asm_sid: +ASM1
```

6. 配置用户定义的全局参数文件。以下是全局参数文件 vars.yml 的典型配置示例

```
#####
###
### ONTAP env specific config variables
###
#####

# ONTAP storage platform: on-prem, vmware-vvols
ontap_platform: vmware-vvols

# Prerequisite to create five vVolss in VMware vCenter
# VCF_ORA_BINS - Oracle binary
# VCF_ORA_CRS - Oracle cluster registry and vote
# VCF_ORA_DAT1 - Oracle data on node1
# VCF_ORA_DAT2 - Oracle data on node2
# VCF_ORA_LOGS - Oracle logs on node1 or node2

# Oracle disks are added to VM from vVols: 1 binary disk, 3 CRS
disks, 4 data disks, and 2 log disks.

#####
##
### Linux env specific config variables
###
#####
##

redhat_sub_username: XXXXXXXX
redhat_sub_password: "XXXXXXXX"

# Networking configuration
cluster_pub_ip:
  - {ip: 10.61.180.21, hostname: ora01}
  - {ip: 10.61.180.22, hostname: ora02}
```

```

cluster_pri_ip:
- {ip: 172.21.166.22, hostname: ora01-pri}
- {ip: 172.21.166.24, hostname: ora02-pri}

cluster_vip_ip:
- {ip: 10.61.180.93, hostname: ora01-vip}
- {ip: 10.61.180.94, hostname: ora02-vip}

cluster_scan_name: ntap-scan
cluster_scan_ip:
- {ip: 10.61.180.90, hostname: ntap-scan}
- {ip: 10.61.180.91, hostname: ntap-scan}
- {ip: 10.61.180.92, hostname: ntap-scan}

#####
#
### DB env specific install and config variables
###
#####
#

# Shared Oracle RAC storage
ora_crs:
- { device: /dev/sdc, name: ora_crs_01 }
- { device: /dev/sdd, name: ora_crs_02 }
- { device: /dev/sde, name: ora_crs_03 }

ora_data:
- { device: /dev/sdf, name: ora_data_01 }
- { device: /dev/sdg, name: ora_data_02 }
- { device: /dev/sdh, name: ora_data_03 }
- { device: /dev/sdi, name: ora_data_04 }

ora_logs:
- { device: /dev/sdj, name: ora_logs_01 }
- { device: /dev/sdk, name: ora_logs_02 }

# Oracle RAC configuration

oracle_sid: NTAP
cluster_name: ntap-rac
cluster_nodes: ora01,ora02
cluster_domain: solutions.netapp.com
grid_cluster_nodes: ora01:ora01-vip:HUB,ora02:ora02-vip:HUB
network_interface_list: ens33:10.61.180.0:1,ens34:172.21.166.0:5

```

```
memory_limit: 10240
```

```
# Set initial password for all required Oracle passwords. Change  
them after installation.
```

```
initial_pwd_all: "XXXXXXXX"
```

7. 从 Ansible 控制器，克隆自动化工具包主目录 /home/admin/na_oracle_deploy_rac，执行先决条件剧本来设置 ansible 先决条件。

```
ansible-playbook -i hosts 1-ansible_requirements.yml
```

8. 执行 Linux 配置剧本。

```
ansible-playbook -i hosts 2-linux_config.yml -u admin -e  
@vars/vars.yml
```

9. 执行 Oracle 部署剧本。

```
ansible-playbook -i hosts 4-oracle_config.yml -u admin -e  
@vars/vars.yml
```

10. 或者，上述所有剧本也可以通过单个剧本运行来执行。

```
ansible-playbook -i hosts 0-all_playbook.yml -u admin -e  
@vars/vars.yml
```

VCF 中的 Oracle RAC 部署验证

本节提供有关 VCF 中的 Oracle RAC 部署验证的详细信息，以确保所有 Oracle RAC 资源都已完全部署、配置并按预期运行。

1. 以管理员用户身份登录 RAC VM 以验证 Oracle 网格基础架构。

```
[admin@ora01 ~]$ sudo su
[root@ora01 admin]# su - grid
[grid@ora01 ~]$ crsctl stat res -t
```

Name	Target	State	Server	State

Name				
Target				
State				
Server				
State				

Local Resources				

ora.LISTENER.lsnr				
	ONLINE	ONLINE	ora01	STABLE
	ONLINE	ONLINE	ora02	STABLE
ora.chad				
	ONLINE	ONLINE	ora01	STABLE
	ONLINE	ONLINE	ora02	STABLE
ora.net1.network				
	ONLINE	ONLINE	ora01	STABLE
	ONLINE	ONLINE	ora02	STABLE
ora.ons				
	ONLINE	ONLINE	ora01	STABLE
	ONLINE	ONLINE	ora02	STABLE
ora.proxy_advm				
	OFFLINE	OFFLINE	ora01	STABLE
	OFFLINE	OFFLINE	ora02	STABLE

Cluster Resources				

ora.ASMNET1LSNR_ASM.lsnr(ora.asmgroup)				
1	ONLINE	ONLINE	ora01	STABLE
2	ONLINE	ONLINE	ora02	STABLE
ora.DATA.dg(ora.asmgroup)				
1	ONLINE	ONLINE	ora01	STABLE
2	ONLINE	ONLINE	ora02	STABLE
ora.LISTENER_SCAN1.lsnr				
1	ONLINE	ONLINE	ora01	STABLE

```

ora.LISTENER_SCAN2.lsnr
    1          ONLINE  ONLINE          ora02          STABLE
ora.LISTENER_SCAN3.lsnr
    1          ONLINE  ONLINE          ora02          STABLE
ora.RECO.dg(ora.asmgroup)
    1          ONLINE  ONLINE          ora01          STABLE
    2          ONLINE  ONLINE          ora02          STABLE
ora.VOTE.dg(ora.asmgroup)
    1          ONLINE  ONLINE          ora01          STABLE
    2          ONLINE  ONLINE          ora02          STABLE
ora.asm(ora.asmgroup)
    1          ONLINE  ONLINE          ora01
Started,STABLE
    2          ONLINE  ONLINE          ora02
Started,STABLE
ora.asmnet1.asmnetwork(ora.asmgroup)
    1          ONLINE  ONLINE          ora01          STABLE
    2          ONLINE  ONLINE          ora02          STABLE
ora.cvu
    1          ONLINE  ONLINE          ora02          STABLE
ora.ntap.db
    1          ONLINE  ONLINE          ora01
Open,HOME=/u01/app/o

rac1e2/product/19.0.

0/NTAP,STABLE
    2          ONLINE  ONLINE          ora02
Open,HOME=/u01/app/o

rac1e2/product/19.0.

0/NTAP,STABLE
ora.ora01.vip
    1          ONLINE  ONLINE          ora01          STABLE
ora.ora02.vip
    1          ONLINE  ONLINE          ora02          STABLE
ora.qosmserver
    1          ONLINE  ONLINE          ora02          STABLE
ora.scan1.vip
    1          ONLINE  ONLINE          ora01          STABLE
ora.scan2.vip
    1          ONLINE  ONLINE          ora02          STABLE
ora.scan3.vip
    1          ONLINE  ONLINE          ora02          STABLE
-----

```

```
[grid@ora01 ~]$
```

2. 验证 Oracle ASM。

```
[grid@ora01 ~]$ asmcmd
ASMCMDS> lsdg
State      Type      Rebal  Sector  Logical_Sector  Block      AU
Total_MB   Free_MB   Req_mir_free_MB  Usable_file_MB  Offline_disks
Voting_files  Name
MOUNTED    EXTERN    N       512      512      4096      1048576
163840     163723      0       163723      0
N  DATA/
MOUNTED    EXTERN    N       512      512      4096      1048576
163840     163729      0       163729      0
N  RECO/
MOUNTED    NORMAL    N       512      512      4096      4194304
30720      29732      10240    9746      0
Y  VOTE/
ASMCMDS> lsdsk
Path
AFD:ORA_CRS_01
AFD:ORA_CRS_02
AFD:ORA_CRS_03
AFD:ORA_DATA_01
AFD:ORA_DATA_02
AFD:ORA_DATA_03
AFD:ORA_DATA_04
AFD:ORA_LOGS_01
AFD:ORA_LOGS_02
ASMCMDS> afd_state
ASMCMDS-9526: The AFD state is 'LOADED' and filtering is 'ENABLED' on
host 'ora01'
ASMCMDS>
```

3. 列出集群节点。

```
[grid@ora01 ~]$ olsnodes
ora01
ora02
```

4. 验证 OCR/VOTE。

```

[grid@ora01 ~]$ ocrcheck
Status of Oracle Cluster Registry is as follows :
    Version                      :          4
    Total space (kbytes)         :       901284
    Used space (kbytes)          :       84536
    Available space (kbytes)     :       816748
    ID                           :    118267044
    Device/File Name             :      +VOTE
                                Device/File integrity check
succeeded

                                Device/File not configured
                                Device/File not configured
                                Device/File not configured
                                Device/File not configured

Cluster registry integrity check succeeded

Logical corruption check bypassed due to non-privileged
user

[grid@ora01 ~]$ crsctl query css votedisk
##  STATE      File Universal Id                  File Name Disk group
--  -
  1.  ONLINE    1ca3fcb0bd354f8ebf00ac97d70e0824  (AFD:ORA_CRS_01)
[VOTE]
  2.  ONLINE    708f84d505a54f58bf41124e09a5115a  (AFD:ORA_CRS_02)
[VOTE]
  3.  ONLINE    133ecfcedb684fe6bfdc1899b90f91c7  (AFD:ORA_CRS_03)
[VOTE]
Located 3 voting disk(s).
[grid@ora01 ~]$

```

5. 验证 Oracle 监听器。

```

[grid@ora01 ~]$ lsnrctl status listener

LSNRCTL for Linux: Version 19.0.0.0.0 - Production on 16-AUG-2024
10:21:38

Copyright (c) 1991, 2022, Oracle. All rights reserved.

```

```

Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=IPC) (KEY=LISTENER)))
STATUS of the LISTENER
-----
Alias                               LISTENER
Version                             TNSLSNR for Linux: Version 19.0.0.0.0 -
Production
Start Date                           14-AUG-2024 16:24:48
Uptime                               1 days 17 hr. 56 min. 49 sec
Trace Level                           off
Security                             ON: Local OS Authentication
SNMP                                  OFF
Listener Parameter File
/u01/app/grid/19.0.0/network/admin/listener.ora
Listener Log File
/u01/app/oracle/diag/tnslsnr/ora01/listener/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc) (KEY=LISTENER)))

  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=10.61.180.21) (PORT=1521)))

  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=10.61.180.93) (PORT=1521)))

  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcps) (HOST=ora01.solutions.netapp.co
m) (PORT=5500)) (Security=(my_wallet_directory=/u01/app/oracle2/produc
t/19.0.0/NTAP/admin/NTAP/xdw_wallet)) (Presentation=HTTP) (Session=RAW
))
Services Summary...
Service "+ASM" has 1 instance(s).
  Instance "+ASM1", status READY, has 1 handler(s) for this
service...
Service "+ASM_DATA" has 1 instance(s).
  Instance "+ASM1", status READY, has 1 handler(s) for this
service...
Service "+ASM_RECO" has 1 instance(s).
  Instance "+ASM1", status READY, has 1 handler(s) for this
service...
Service "+ASM_VOTE" has 1 instance(s).
  Instance "+ASM1", status READY, has 1 handler(s) for this
service...
Service "1fbf0aaa1d13cb5ae06315b43d0ab734.solutions.netapp.com" has
1 instance(s).
  Instance "NTAP1", status READY, has 1 handler(s) for this
service...
Service "1fbf142e7db2d090e06315b43d0a6894.solutions.netapp.com" has
1 instance(s).
  Instance "NTAP1", status READY, has 1 handler(s) for this

```

```

service...
Service "1fbf203c3a46d7bae06315b43d0ae055.solutions.netapp.com" has
1 instance(s).
    Instance "NTAP1", status READY, has 1 handler(s) for this
service...
Service "NTAP.solutions.netapp.com" has 1 instance(s).
    Instance "NTAP1", status READY, has 1 handler(s) for this
service...
Service "NTAPXDB.solutions.netapp.com" has 1 instance(s).
    Instance "NTAP1", status READY, has 1 handler(s) for this
service...
Service "ntap_pdb1.solutions.netapp.com" has 1 instance(s).
    Instance "NTAP1", status READY, has 1 handler(s) for this
service...
Service "ntap_pdb2.solutions.netapp.com" has 1 instance(s).
    Instance "NTAP1", status READY, has 1 handler(s) for this
service...
Service "ntap_pdb3.solutions.netapp.com" has 1 instance(s).
    Instance "NTAP1", status READY, has 1 handler(s) for this
service...
The command completed successfully
[grid@ora01 ~]$

[grid@ora01 ~]$ tnsping ntap-scan

TNS Ping Utility for Linux: Version 19.0.0.0.0 - Production on 16-
AUG-2024 12:07:58

Copyright (c) 1997, 2022, Oracle. All rights reserved.

Used parameter files:
/u01/app/grid/19.0.0/network/admin/sqlnet.ora

```

```

Used EZCONNECT adapter to resolve the alias
Attempting to contact
  (DESCRIPTION=(CONNECT_DATA=(SERVICE_NAME=)) (ADDRESS=(PROTOCOL=tcp) (H
OST=10.61.180.90) (PORT=1521)) (ADDRESS=(PROTOCOL=tcp) (HOST=10.61.180.
91) (PORT=1521)) (ADDRESS=(PROTOCOL=tcp) (HOST=10.61.180.92) (PORT=1521)
))
OK (10 msec)

```

6. 更改为 oracle 用户来验证集群数据库。

```
[oracle@ora02 ~]$ sqlplus / as sysdba
```

```
SQL*Plus: Release 19.0.0.0.0 - Production on Fri Aug 16 11:32:23
2024
Version 19.18.0.0.0
```

```
Copyright (c) 1982, 2022, Oracle. All rights reserved.
```

```
Connected to:
```

```
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.18.0.0.0
```

```
SQL> select name, open_mode, log_mode from v$database;
```

NAME	OPEN_MODE	LOG_MODE
NTAP	READ WRITE	ARCHIVELOG

```
SQL> show pdbs
```

CON_ID	CON_NAME	OPEN MODE	RESTRICTED
2	PDB\$SEED	READ ONLY	NO
3	NTAP_PDB1	READ WRITE	NO
4	NTAP_PDB2	READ WRITE	NO
5	NTAP_PDB3	READ WRITE	NO

```
SQL> select name from v$datafile
2 union
3 select name from v$controlfile
4 union
5 select member from v$logfile;
```

```
NAME
-----
+DATA/NTAP/1FBF0AAA1D13CB5AE06315B43D0AB734/DATAFILE/sysaux.275.1177
083797
+DATA/NTAP/1FBF0AAA1D13CB5AE06315B43D0AB734/DATAFILE/system.274.1177
083797
+DATA/NTAP/1FBF0AAA1D13CB5AE06315B43D0AB734/DATAFILE/undo_2.277.1177
083853
+DATA/NTAP/1FBF0AAA1D13CB5AE06315B43D0AB734/DATAFILE/undotbs1.273.11
77083797
+DATA/NTAP/1FBF0AAA1D13CB5AE06315B43D0AB734/DATAFILE/users.278.11770
83901
+DATA/NTAP/1FBF142E7DB2D090E06315B43D0A6894/DATAFILE/sysaux.281.1177
```

```
083903
+DATA/NTAP/1FBF142E7DB2D090E06315B43D0A6894/DATAFILE/system.280.1177
083903
+DATA/NTAP/1FBF142E7DB2D090E06315B43D0A6894/DATAFILE/undo_2.283.1177
084061
+DATA/NTAP/1FBF142E7DB2D090E06315B43D0A6894/DATAFILE/undotbs1.279.11
77083903
+DATA/NTAP/1FBF142E7DB2D090E06315B43D0A6894/DATAFILE/users.284.11770
84103
+DATA/NTAP/1FBF203C3A46D7BAE06315B43D0AE055/DATAFILE/sysaux.287.1177
084105
```

NAME

```
-----
-----
+DATA/NTAP/1FBF203C3A46D7BAE06315B43D0AE055/DATAFILE/system.286.1177
084105
+DATA/NTAP/1FBF203C3A46D7BAE06315B43D0AE055/DATAFILE/undo_2.289.1177
084123
+DATA/NTAP/1FBF203C3A46D7BAE06315B43D0AE055/DATAFILE/undotbs1.285.11
77084105
+DATA/NTAP/1FBF203C3A46D7BAE06315B43D0AE055/DATAFILE/users.290.11770
84125
+DATA/NTAP/86B637B62FE07A65E053F706E80A27CA/DATAFILE/sysaux.266.1177
081837
+DATA/NTAP/86B637B62FE07A65E053F706E80A27CA/DATAFILE/system.265.1177
081837
+DATA/NTAP/86B637B62FE07A65E053F706E80A27CA/DATAFILE/undotbs1.267.11
77081837
+DATA/NTAP/CONTROLFILE/current.261.1177080403
+DATA/NTAP/DATAFILE/sysaux.258.1177080245
+DATA/NTAP/DATAFILE/system.257.1177080129
+DATA/NTAP/DATAFILE/undotbs1.259.1177080311
```

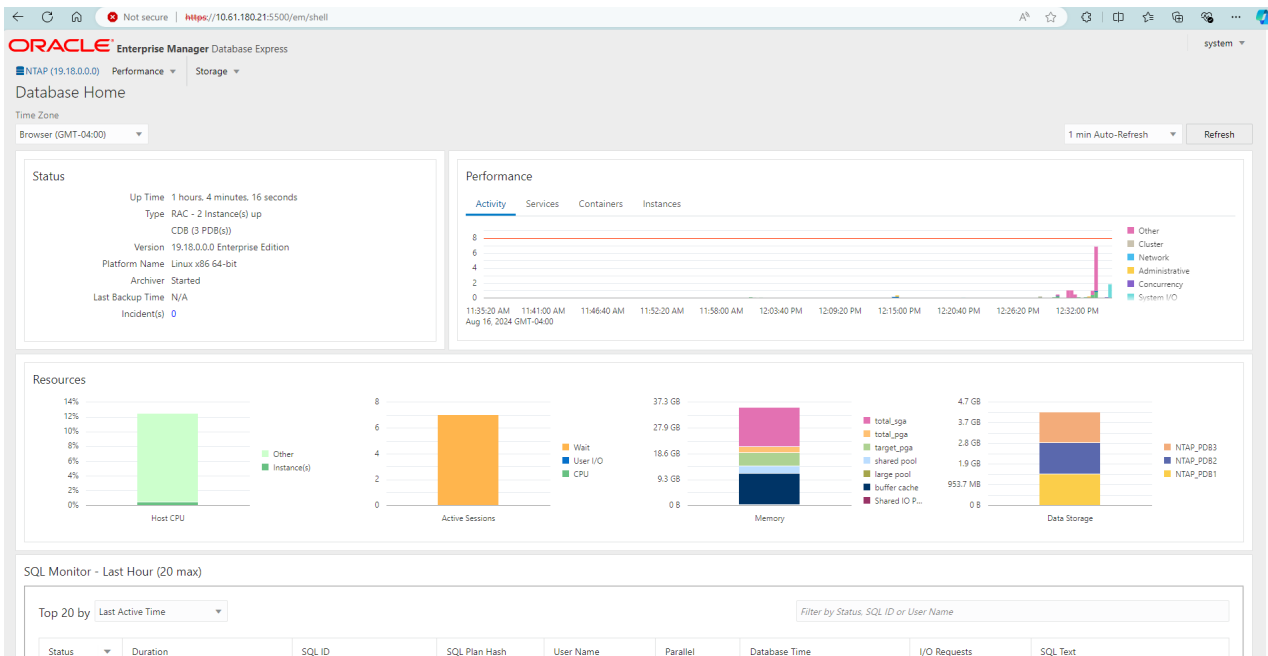
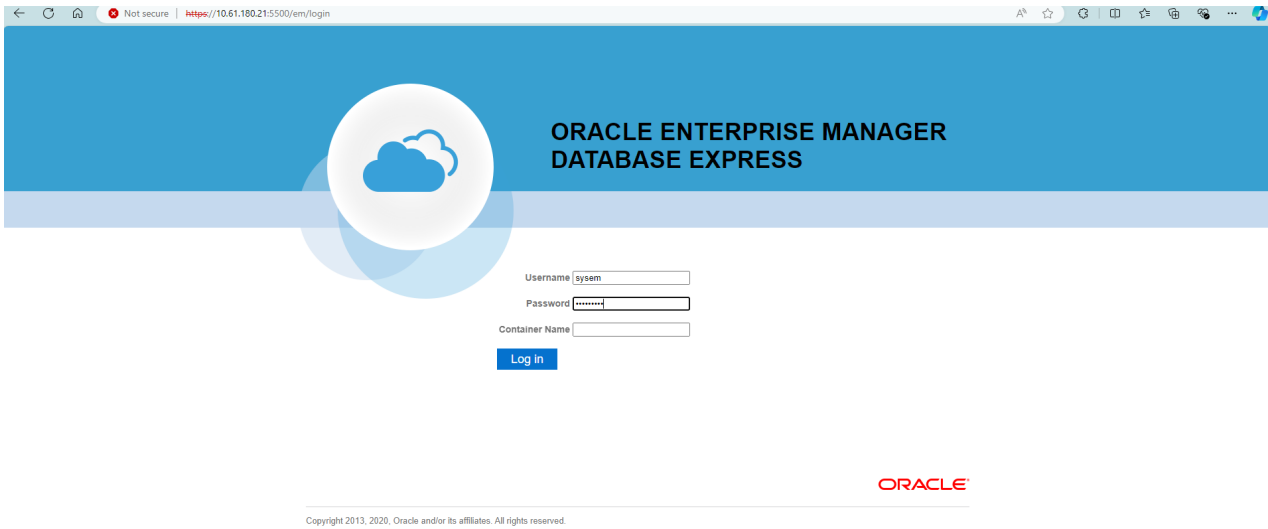
NAME

```
-----
-----
+DATA/NTAP/DATAFILE/undotbs2.269.1177082203
+DATA/NTAP/DATAFILE/users.260.1177080311
+DATA/NTAP/ONLINELOG/group_1.262.1177080427
+DATA/NTAP/ONLINELOG/group_2.263.1177080427
+DATA/NTAP/ONLINELOG/group_3.270.1177083297
+DATA/NTAP/ONLINELOG/group_4.271.1177083313
+RECO/NTAP/CONTROLFILE/current.256.1177080403
+RECO/NTAP/ONLINELOG/group_1.257.1177080427
+RECO/NTAP/ONLINELOG/group_2.258.1177080427
```

```
+RECO/NTAP/ONLINELOG/group_3.259.1177083313
+RECO/NTAP/ONLINELOG/group_4.260.1177083315
```

33 rows selected.

7. 或者在成功执行脚本后登录 EM express 来验证 RAC 数据库。

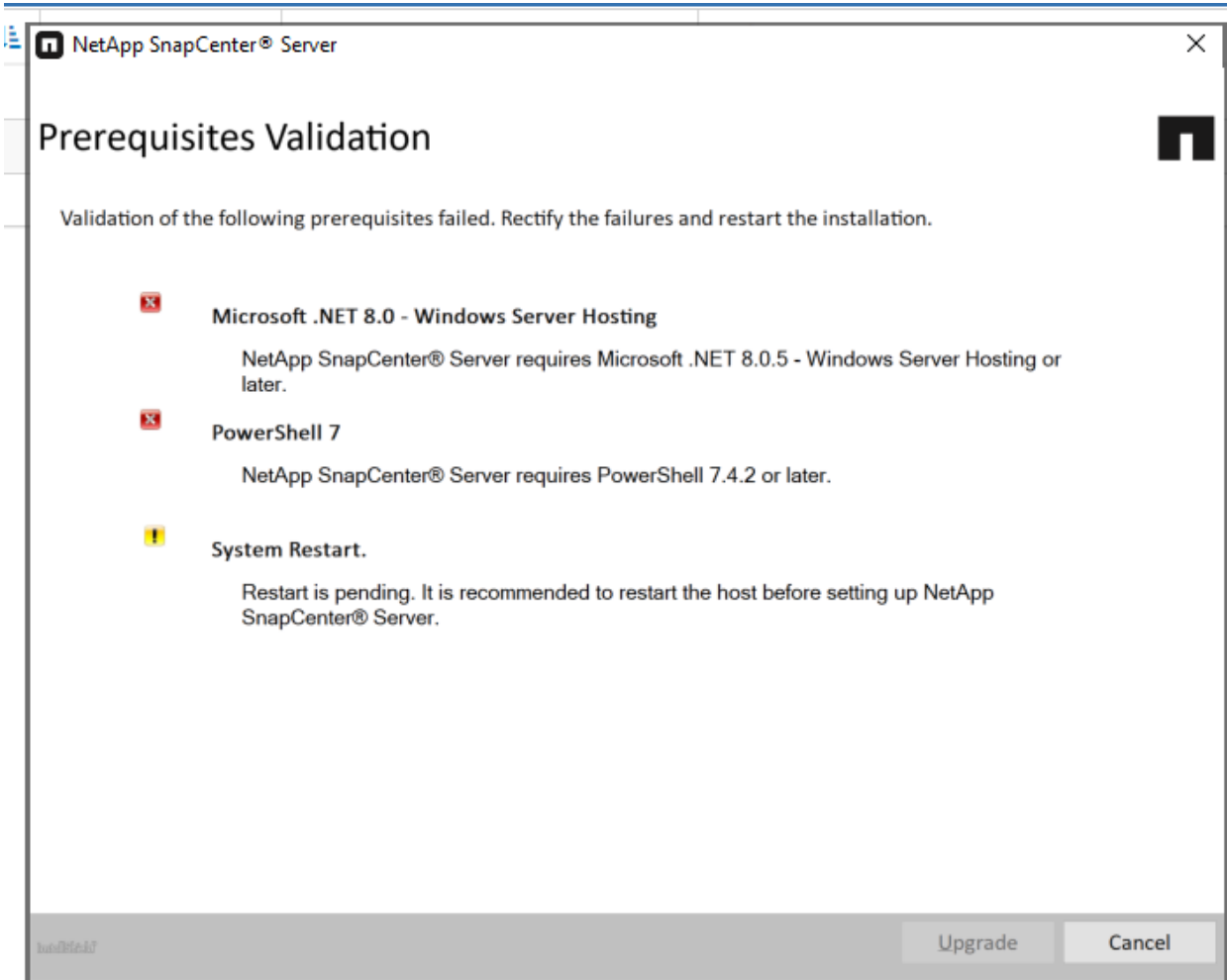


使用SnapCenter在 VCF 中备份和恢复 Oracle RAC 数据库

SnapCenter设置

SnapCenter版本 6 比版本 5 有许多功能增强，包括对 VMware vVols数据存储的支持。SnapCenter依靠数据库虚拟机上的主机端插件来执行应用程序感知的数据保护管理活动。有关适用于 Oracle 的NetApp SnapCenter插件的详细信息，请参阅此文档["您可以使用 Oracle 数据库插件做什么"](#)。下面提供了在 VCF 中设置SnapCenter版本 6 以进行 Oracle RAC 数据库备份和恢复的高级步骤。

1. 从NetApp支持站点下载SnapCenter software版本 6: ["NetApp支持下载"](#)。
2. 以管理员身份登录托管 Windows VM 的SnapCenter。安装SnapCenter 6.0 的先决条件。

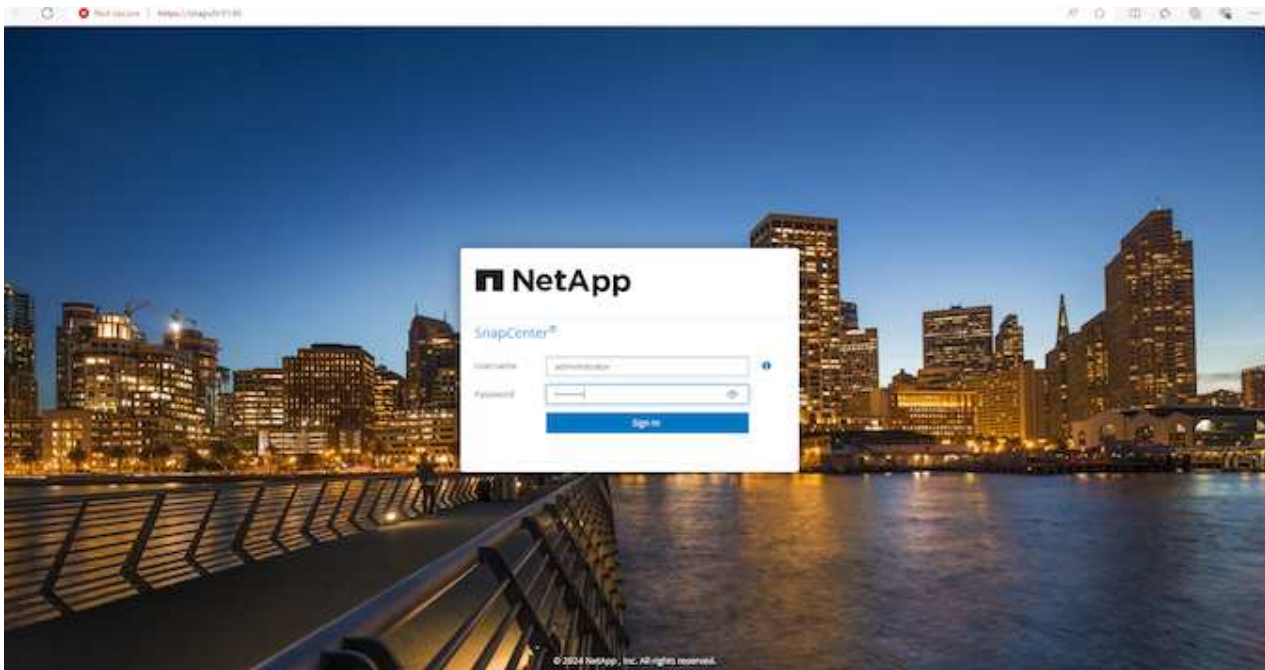


3. 以管理员身份安装最新的 Java JDK["获取用于桌面应用程序的 Java"](#)。

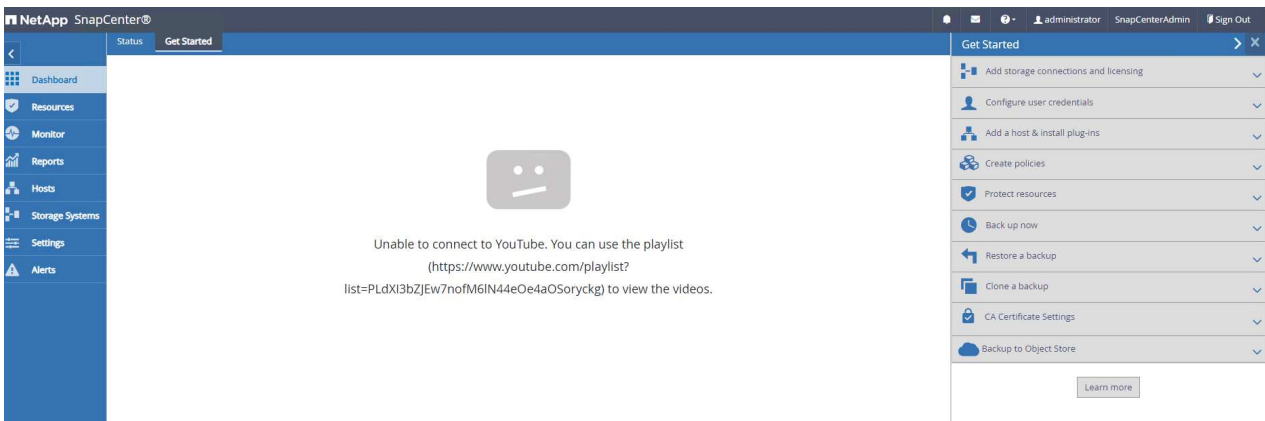


如果 Windows 服务器部署在域环境中，请将域用户添加到SnapCenter服务器本地管理员组，并使用域用户运行SnapCenter安装。

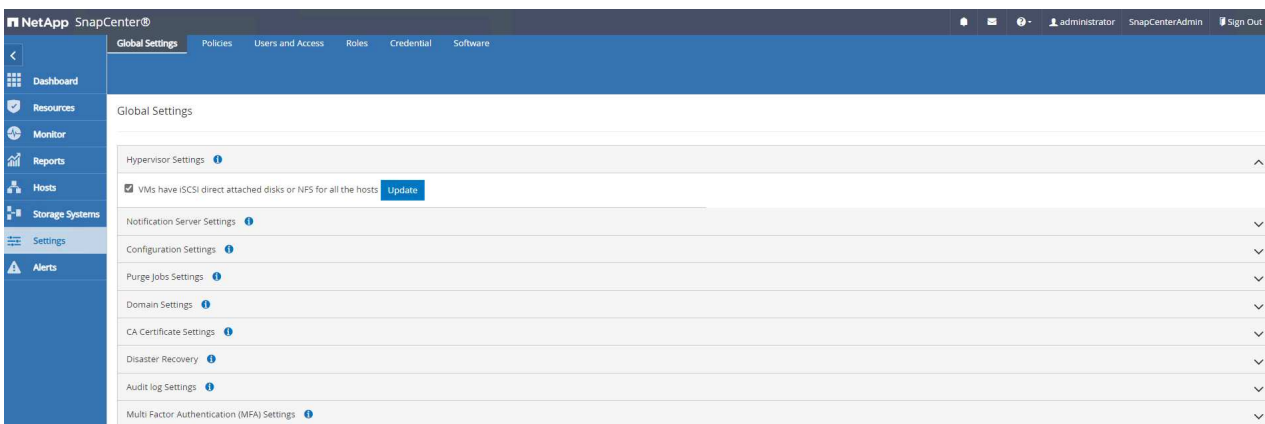
4. 以安装用户身份通过 HTTPS 端口 8846 登录SnapCenter UI 以配置SnapCenter for Oracle。



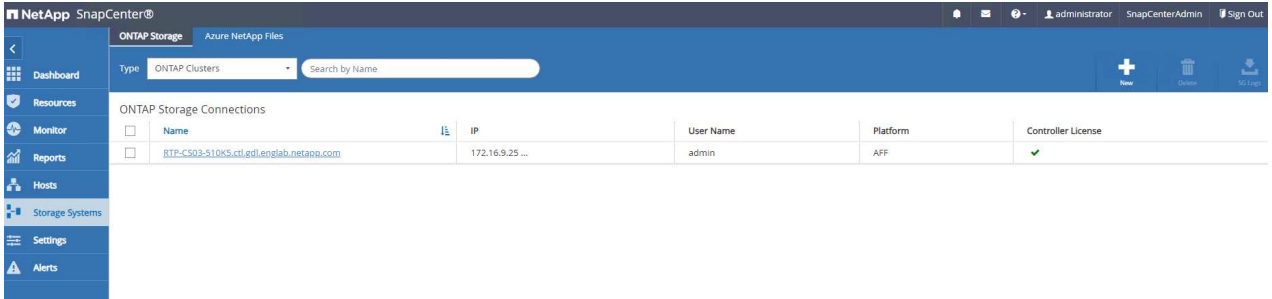
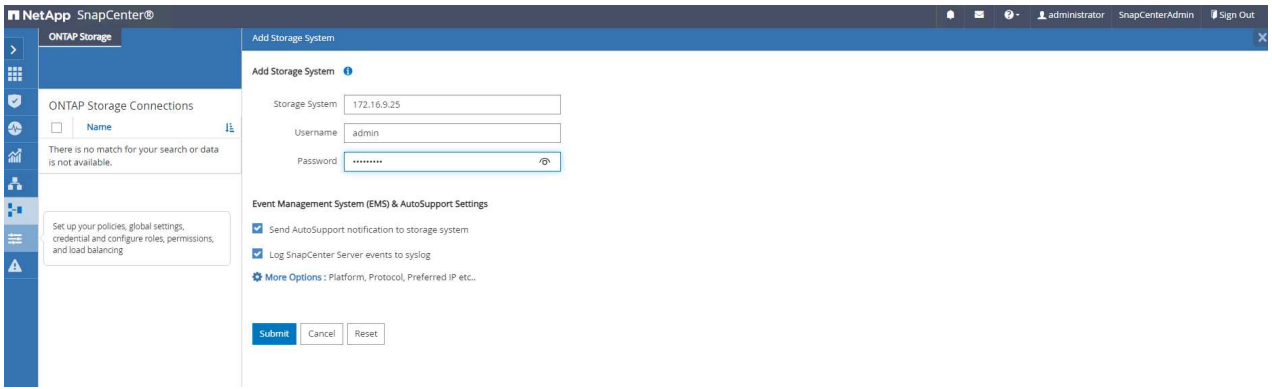
5. 审查 `Get Started` 如果您是新用户，可以通过菜单快速了解SnapCenter。



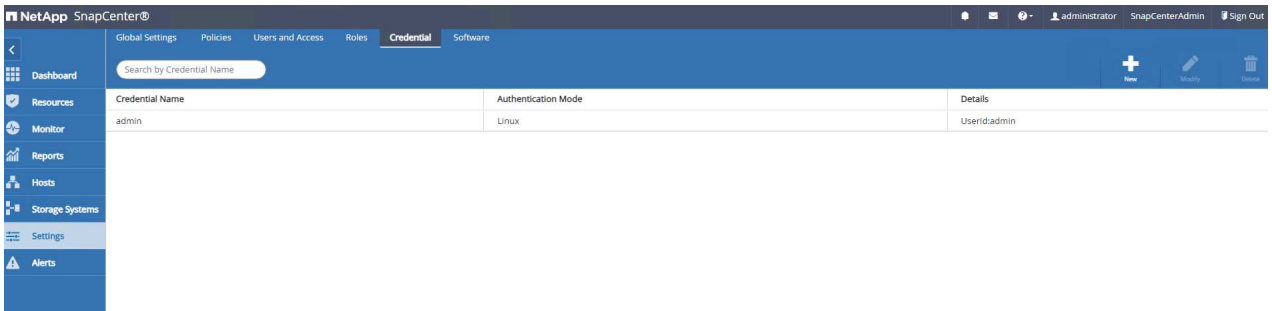
6. 更新 `Hypervisor Settings` 在全局设置中。



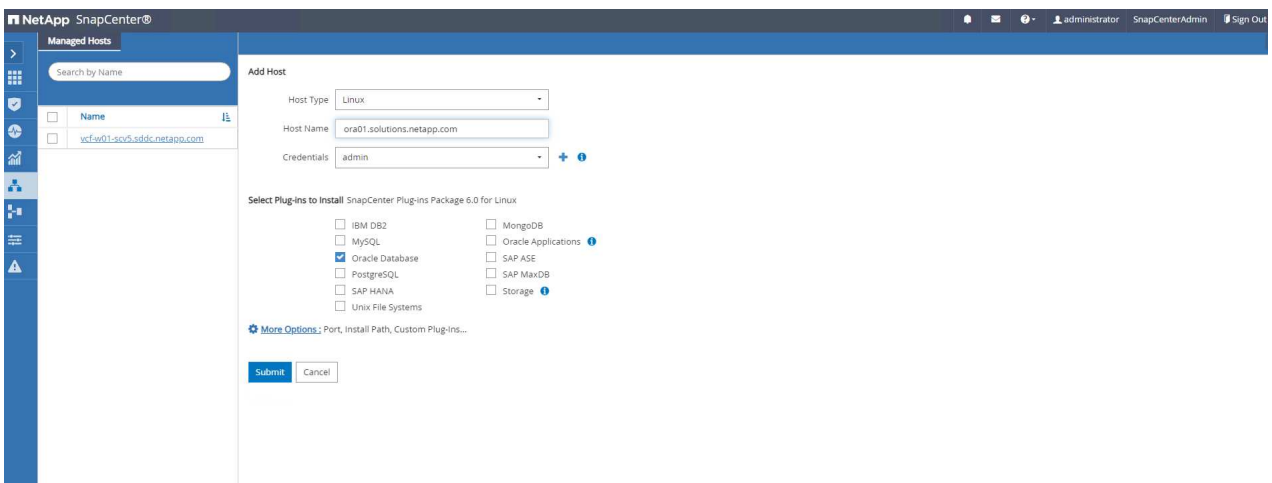
7. 将ONTAP存储集群添加到 `Storage Systems` 使用集群管理 IP 并通过集群管理员用户 ID 进行身份验证。



8. 添加 Oracle RAC 数据库虚拟机和 vSphere 插件虚拟机 `Credential` 用于 SnapCenter 访问 DB VM 和 vSphere 插件 VM。该凭证应在 Linux VM 上具有 sudo 权限。您可以为虚拟机的不同管理用户 ID 创建不同的凭据。vSphere 插件虚拟机管理用户 ID 是在 vCenter 中部署插件虚拟机时定义的。



9. 在 VCF 中添加 Oracle RAC 数据库虚拟机 `Hosts` 使用上一步中创建的 DB VM 凭证。



Confirm Fingerprint

Authenticity of the host cannot be determined

Host name	Fingerprint	Valid
ora01.solutions.netapp.com	ssh-ed25519 256 FA:ED:C8:FC:C3:A3:95:6B:C8:BF:0A:C4:69:E6:FF:6A	

Confirm and Submit

Close

Confirm Fingerprint

Authenticity of the host cannot be determined

Host name	Fingerprint	Valid
ora01.solutions.netapp.com	ssh-ed25519 256 FA:ED:C8:FC:C3:A3:95:6B:C8:BF:0A:C4:69:E6:FF:6A	✓
ora02.solutions.netapp.com	ssh-ed25519 256 FA:ED:C8:FC:C3:A3:95:6B:C8:BF:0A:C4:69:E6:FF:6A	

Confirm Others and Submit

Close

- 类似地，将NetApp VMware 插件 VM 添加到 `Hosts`使用上一步中创建的 vSphere 插件 VM 凭据。

NetApp SnapCenter®

Managed Hosts

Search by Name

Add Host

Host Type

Host Name

Credentials

vSphere

172.21.166.140

admin

Submit

Cancel

NetApp SnapCenter®

Managed Hosts

Search by Name

Name

Type

System

Plug-in

Version

Overall Status

ora01.solutions.netapp.com

Linux

RAC Node

Oracle Database, UNIX

6.0

Running

ora02.solutions.netapp.com

Linux

RAC Node

Oracle Database, UNIX

6.0

Running

vxf001.solutions.netapp.com

vSphere

Stand-alone

VMware vSphere

6.0

Running

- 最后，在 DB VM 上发现 Oracle 数据库后，返回到 Settings-`Policies`创建 Oracle 数据库备份策略。理想情况下，创建单独的存档日志备份策略，以允许更频繁的备份间隔，从而最大限度地减少故障时的数据丢失。

56

Global Settings Policies Users and Access Roles Credential Software					
Oracle Database					
Search by Name					
Name	Backup Type	Schedule Type	Replication	Verification	
Oracle Archive Logs Backup	LOG, ONLINE	Hourly			
Oracle Online Full Backup	FULL, ONLINE	Hourly			

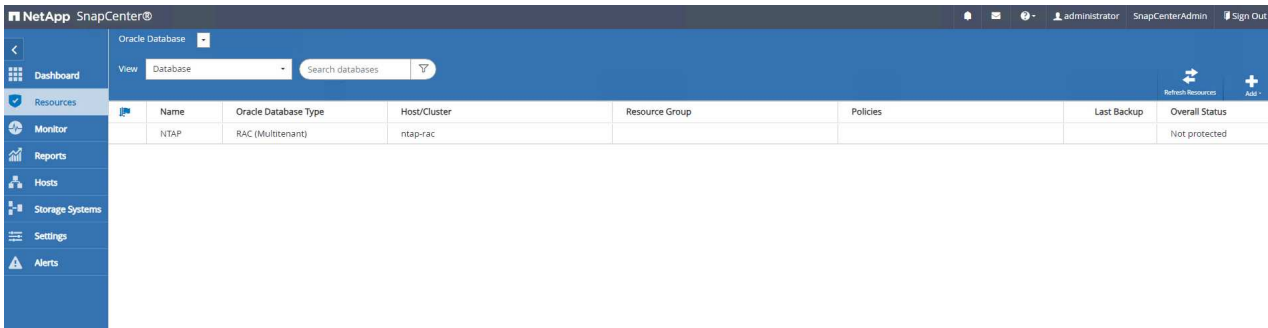


确保SnapCenter服务器名称可以解析为 DB VM 和 vSphere 插件 VM 的 IP 地址。同样，DB VM 名称和 vSphere 插件 VM 名称可以解析为SnapCenter服务器的 IP 地址。

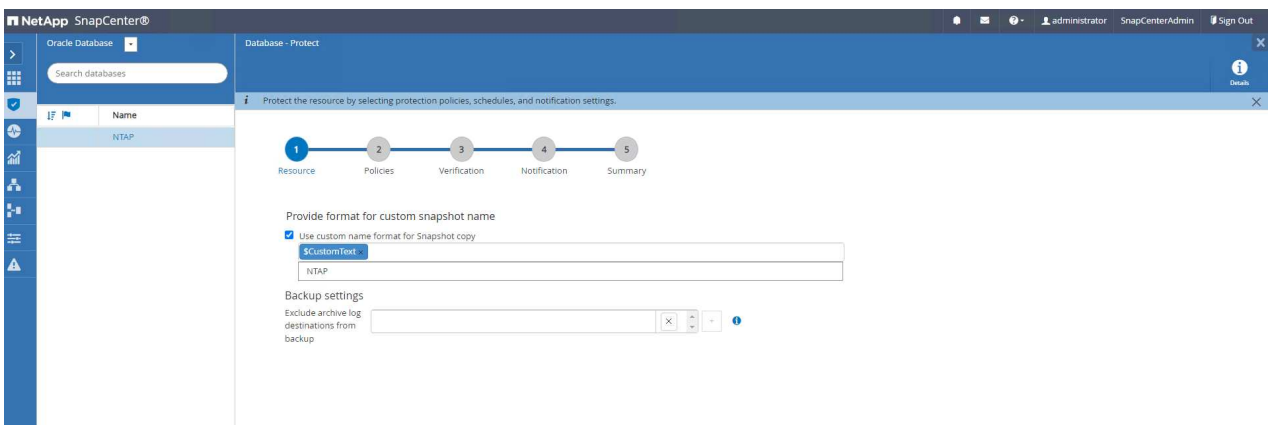
数据库备份

与传统的基于 RMAN 的方法相比，SnapCenter 利用 ONTAP 卷快照实现更快的数据库备份、恢复或克隆。由于数据库在快照之前处于 Oracle 备份模式，因此快照与应用程序一致。

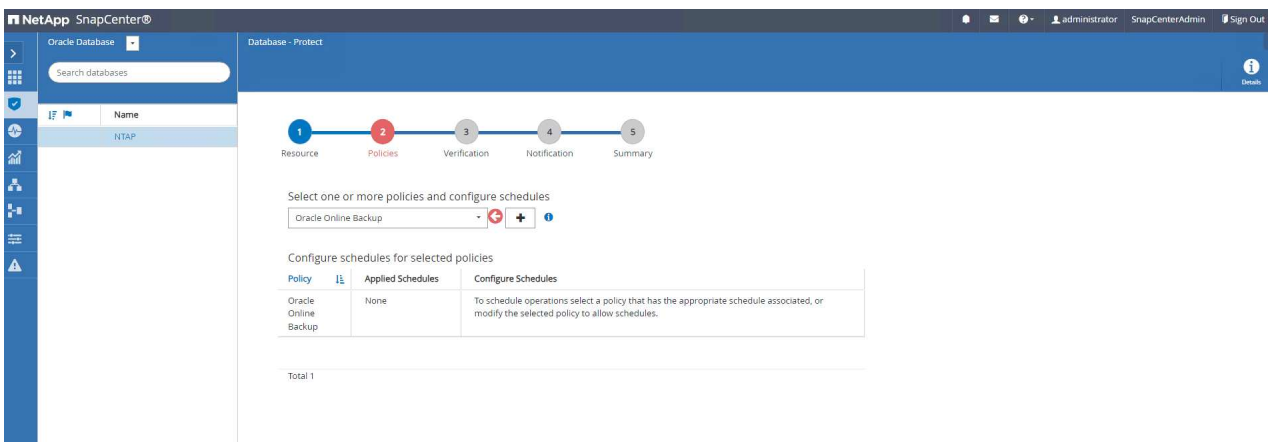
1. 从 Resources 选项卡，将 VM 添加到 SnapCenter 后，会自动发现 VM 上的任何数据库。最初，数据库状态显示为 `Not protected`。



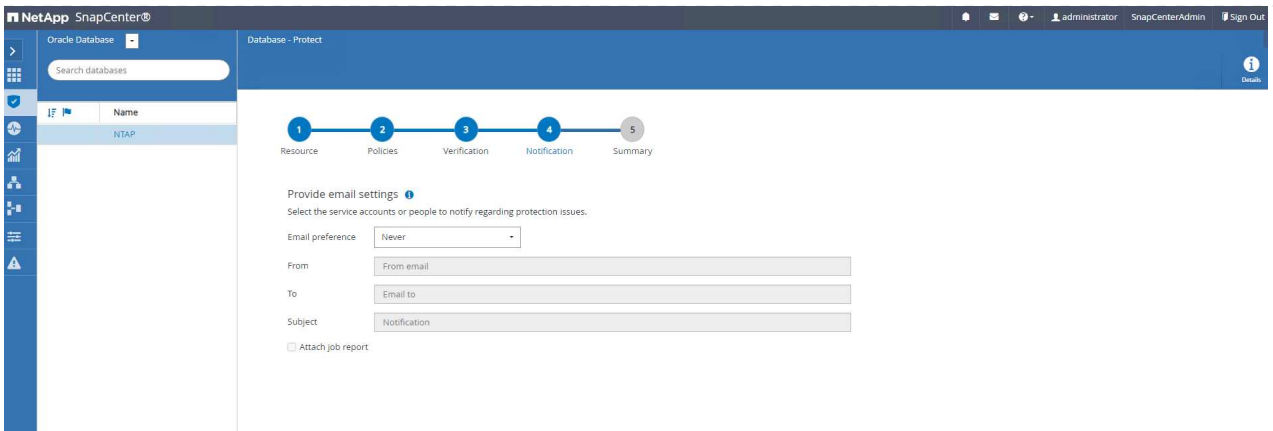
2. 单击数据库以启动工作流程来启用数据库保护。



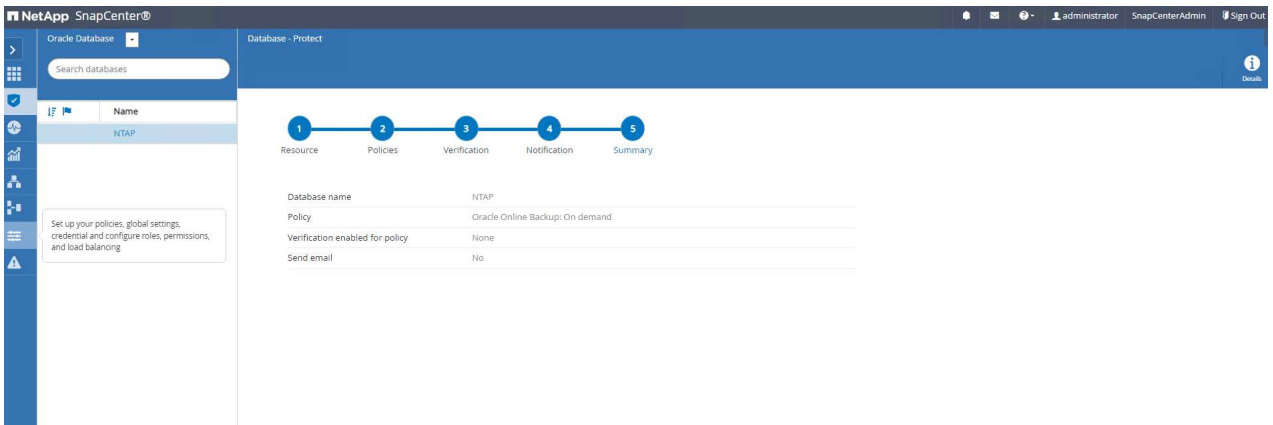
3. 如果需要，应用备份策略并设置计划。



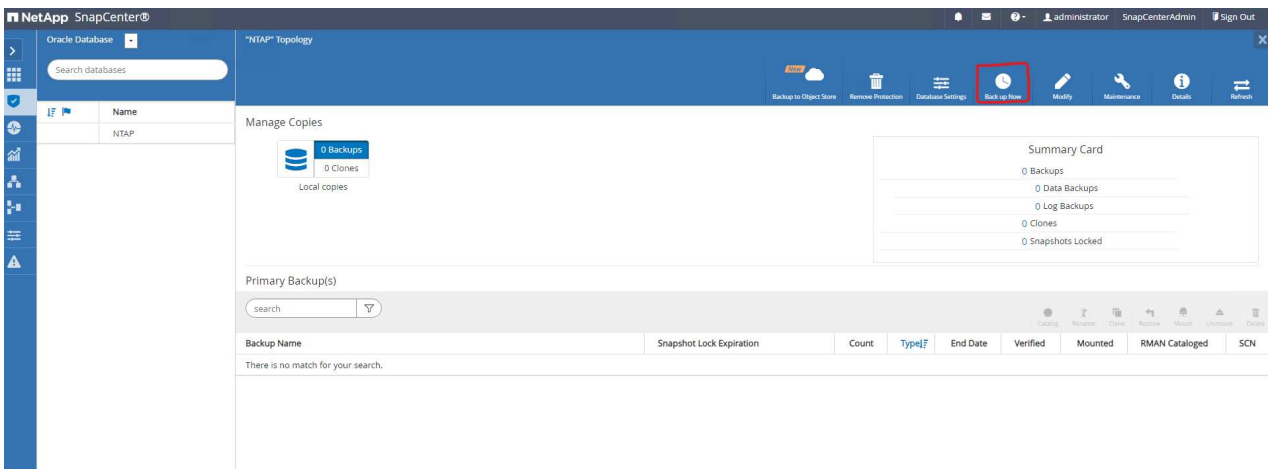
4. 如果需要，设置备份作业通知。



5. 查看摘要并完成以启用数据库保护。



6. 只需点击即可触发按需备份作业 Back up Now。



Backup



Create a backup for the selected resource

Resource Name

NTAP

Policy

Oracle Online Backup



☐ Verify after backup

Cancel

Backup

7. 备份作业可以在 `Monitor` 单击正在运行的作业来打开选项卡。

Job Details



Backup of Resource Group 'ntap-rac_NTAP' with policy 'Oracle Online Backup'

✓ ▾ Backup of Resource Group 'ntap-rac_NTAP' with policy 'Oracle Online Backup'

✓ ▶ Identifying preferred host

✓ ▾ ora01.solutions.netapp.com

✓ ▶ Prescripts

✓ ▶ Preparing for Oracle Database Backup

✓ ▶ Preparing for File-System Backup

✓ ▶ Backup datafiles and control files

✓ ▶ Backup archive logs

✓ ▶ Finalizing Oracle Database Backup

✓ ▶ Finalizing File-System Backup

✓ ▶ Postscripts

✓ ▶ Data Collection

✓ ▶ Send EMS Messages

Task Name: ora01.solutions.netapp.com Start Time: 08/16/2024 6:10:10 PM End Time: 08/16/2024 6:14:33 PM

View Logs

Cancel Job

Close

8. 单击数据库以查看 RAC 数据库已完成的备份集。

NTAP1 Topology

Backup to Cloud Store

Remove Protection

Database Settings

Back up Now

Modify

Maintenance

Details

Refresh

Manage Copies

4 Backups

1 Clone

Local copies

Summary Card

4 Backups

2 Data Backups

2 Log Backups

1 Clone

0 Snapshots Locked

Primary Backup(s)

search

Backup Name	Snapshot Lock Expiration	Count	Type	End Date	Verified	Mounted	RMAN Cataloged	SCN
ora_01_07-18-2024_11.17.20.8165_1		1	Log	07/18/2024 11:17:55 AM	Not Applicable	False	Not Cataloged	2874360
ora_01_07-18-2024_11.17.20.8165_0		1	Data	07/18/2024 11:17:41 AM	Unverified	False	Not Cataloged	2874313
ora_01_07-18-2024_11.09.08.6002_1		1	Log	07/18/2024 11:09:44 AM	Not Applicable	False	Not Cataloged	2873909
ora_01_07-18-2024_11.09.08.6002_0		1	Data	07/18/2024 11:09:30 AM	Unverified	False	Not Cataloged	2873861

数据库还原/恢复

SnapCenter为 Oracle RAC 数据库提供了多种从快照备份中恢复的选项。在此示例中，我们演示了如何从较旧的快照备份进行恢复，然后将数据库前滚到最后一个可用日志。

1. 首先，运行快照备份。然后，创建一个测试表并向表中插入一行，以验证在创建测试表之前从快照映像恢复的数据库是否重新获得测试表。

```
[oracle@ora01 ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon Aug 19 10:31:12
2024
Version 19.18.0.0.0

Copyright (c) 1982, 2022, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.18.0.0.0

SQL> show pdbs

          CON_ID CON_NAME                                OPEN MODE RESTRICTED
-----
          2 PDB$SEED                                READ ONLY NO
          3 NTAP_PDB1                                READ WRITE NO
          4 NTAP_PDB2                                READ WRITE NO
          5 NTAP_PDB3                                READ WRITE NO

SQL> alter session set container=ntap_pdb1;

Session altered.

SQL> create table test (id integer, dt timestamp, event
varchar(100));

Table created.

SQL> insert into test values (1, sysdate, 'validate SnapCenter rac
database restore on VMware vVols storage');

1 row created.

SQL> commit;

Commit complete.
```

```
SQL> select * from test;
```

ID

DT

EVENT

1

19-AUG-24 10.36.04.000000 AM

validate SnapCenter rac database restore on VMware vVols storage

```
SQL>
```

2. 来自SnapCenter `Resources`选项卡，打开数据库NTAP1备份拓扑页面。突出显示3天前创建的快照数据备份集。点击 `Restore` 启动恢复工作流程。

The screenshot shows the NetApp SnapCenter interface. The left sidebar contains navigation icons. The main content area is titled 'NTAP Topology'. Below the title, there's a 'Manage Copies' section with a '2 Backups' indicator and '0 Clones' under 'Local copies'. To the right is a 'Summary Card' showing '2 Backups', '1 Data Backup', '1 Log Backup', '0 Clones', and '0 Snapshots Locked'. Below this is a table of 'Primary Backup(s)'. The table has columns: Backup Name, Snapshot Lock Expiration, Count, Type, End Date, Verified, Mounted, RMAN Cataloged, and SCN. Two rows are visible: 'NTAP_08-16-2024_18.10.10.0274_1' (Log backup) and 'NTAP_08-16-2024_18.10.10.0274_0' (Data backup). The 'Restore' button in the table's header row is highlighted with a red box.

Backup Name	Snapshot Lock Expiration	Count	Type	End Date	Verified	Mounted	RMAN Cataloged	SCN
NTAP_08-16-2024_18.10.10.0274_1		1	Log	08/16/2024 6:14:25 PM	Not Applicable	False	Not Cataloged	3165738
NTAP_08-16-2024_18.10.10.0274_0		1	Data	08/16/2024 6:13:39 PM	Unverified	False	Not Cataloged	3164834

3. 选择恢复范围。

Restore NTAP

1 Restore Scope

2 Recovery Scope

3 PreOps

4 PostOps

5 Notification

6 Summary

Select RAC Node: ora01.solutions.netapp.com ▼

Restore Scope ⓘ

- ☒ All Datafiles
☐ Pluggable databases (PDBs)
☐ Pluggable database (PDB) tablespaces

☐ Control files

Database State

☒ Change database state if needed for restore and recovery

Restore Mode ⓘ

☒ Force in place restore

In place restore will skip the foreign files(files which are not part of the database) validation check. The Oracle database and the ASM disk group will be restored to the point when the backup was created.

Previous

Next

4. 选择恢复范围 All Logs。

Restore NTAP

1 Restore Scope

2 Recovery Scope

3 PreOps

4 PostOps

5 Notification

6 Summary

Choose Recovery Scope

☒ All Logs ⓘ

☐ Until SCN (System Change Number)

☐ Date and Time

☐ No recovery

Specify external archive log files locations ⓘ

Previous

Next

5. 指定要运行的任何可选预脚本。

Restore NTAP

1 Restore Scope

2 Recovery Scope

3 PreOps

4 PostOps

5 Notification

6 Summary

Specify optional scripts to run before performing a restore job ⓘ

Prescript full path

/var/opt/snapcenter/spl/scripts/

Enter Prescript path

Arguments

Script timeout

60

secs

Previous

Next

6. 指定要运行的任何可选的后续脚本。

Restore NTAP

1 Restore Scope

2 Recovery Scope

3 PreOps

4 PostOps

5 Notification

6 Summary

Specify optional scripts to run after performing a restore job ⓘ

Postscript full path

/var/opt/snapcenter/spl/scripts/Enter Postscript path

Arguments

☒ Open the database or container database in READ-WRITE mode after recovery

Previous

Next

7. 如果需要的话，发送工作报告。

Restore NTAP



1 Restore Scope

2 Recovery Scope

3 PreOps

4 PostOps

5 Notification

6 Summary

Provide email settings ⓘ

Email preference:

From:

To:

Subject:

☐ Attach job report

Previous

Next

8. 查看摘要并点击 `Finish` 启动恢复和复苏。

Restore NTAP ✕

1 Restore Scope

2 Recovery Scope

3 PreOps

4 PostOps

5 Notification

6 Summary

Summary

Restore node	ora01.solutions.netapp.com
Backup name	NTAP_08-16-2024_18.10.10.0274_0
Backup date	08/16/2024 6:13:39 PM
Restore scope	All DataFiles
Recovery scope	All Logs
Options	Change database state if necessary , Open the database or container database in READ-WRITE mode after recovery , Force in place restore mode
Prescript full path	None
Prescript arguments	
Postscript full path	None
Postscript arguments	
Send email	No

Previous

Finish

9. 从 RAC DB VM ora01 验证数据库的还原/恢复是否成功前滚到其最新状态并恢复 3 天后创建的测试表。

```
[root@ora01 ~]# su - oracle
[oracle@ora01 ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon Aug 19 11:51:15
2024
Version 19.18.0.0.0

Copyright (c) 1982, 2022, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.18.0.0.0

SQL> select name, open_mode from v$database;
```

```

NAME          OPEN_MODE
-----
NTAP          READ WRITE

SQL> sho pdbs

      CON_ID CON_NAME                                OPEN MODE  RESTRICTED
-----
          2 PDB$SEED                                READ ONLY  NO
          3 NTAP_PDB1                                READ WRITE NO
          4 NTAP_PDB2                                READ WRITE NO
          5 NTAP_PDB3                                READ WRITE NO

SQL> alter session set container=ntap_pdb1;

Session altered.

SQL> select * from test;

      ID
-----
DT
-----
EVENT
-----
      1
19-AUG-24 10.36.04.000000 AM
validate SnapCenter rac database restore on VMware vVols storage

SQL> select current_timestamp from dual;

CURRENT_TIMESTAMP
-----
19-AUG-24 11.55.20.079686 AM -04:00

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.18.0.0.0

```

这完成了使用vVols在 VCF 中对 Oracle RAC 数据库进行SnapCenter备份、还原和恢复的演示。

在哪里可以找到更多信息

要了解有关本文档中描述的信息的更多信息，请查看以下文档和/或网站：

- ["VMware 云基础"](#)
- ["SnapCenter software文档"](#)
- ["ONTAP tools for VMware vSphere文档"](#)

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