



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

NetApp database solutions

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

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此解決方案概述並詳細介紹了 VMware Cloud Foundation (VCF) 中的 Oracle 部署和保護，其中 vSphere Virtual Volumes (vVols) 作為主資料庫存儲，Oracle 資料庫採用 Real Application Clusters (RAC) 配置。

目的

VMware vSphere 虛擬磁碟區 (vVols) 是一個 SAN/NAS 管理和整合框架，它將虛擬磁碟作為本機儲存物件公開，並在虛擬磁碟層級支援基於陣列的操作。換句話說，vVols使 SAN/NAS 設備能夠感知虛擬機，並能夠以虛擬機為中心的方式在單一虛擬磁碟的粒度上利用基於陣列的資料服務。vVols使客戶能夠利用其當前儲存投資的獨特功能，並在不中斷的情況下過渡到針對跨所有儲存類型的虛擬環境優化的更簡單、更有效率的營運模式。

在"TR-4996"，我們示範了使用vVols在 VCF 中部署和保護單一實例 Oracle 資料庫。本文檔示範如何在 VMware Cloud Foundation 環境中部署和保護 Oracle RAC 資料庫，並使用vVols作為NetApp ONTAP儲存叢集中的主要資料庫儲存。Oracle RAC 資料庫的配置就像部署在本機儲存系統上的本機檔案系統一樣。本技術報告重點介紹在 VCF 中為 Oracle RAC 部署建立vVols的步驟。我們也示範了使用NetApp自動化工具包在vVols上的 VCF 中部署 Oracle RAC 資料庫，以及使用NetApp SnapCenter UI 工具進行 RAC 資料庫保護。

此解決方案適用於以下用例：

- 在 VCF 中部署 Oracle RAC 資料庫，並使用NetApp ONTAP AFF上的vVols資料儲存作為主資料庫存儲
- 使用NetApp SnapCenter UI 工具在 VCF 中使用vVols資料儲存區備份和還原 Oracle 資料庫

對象

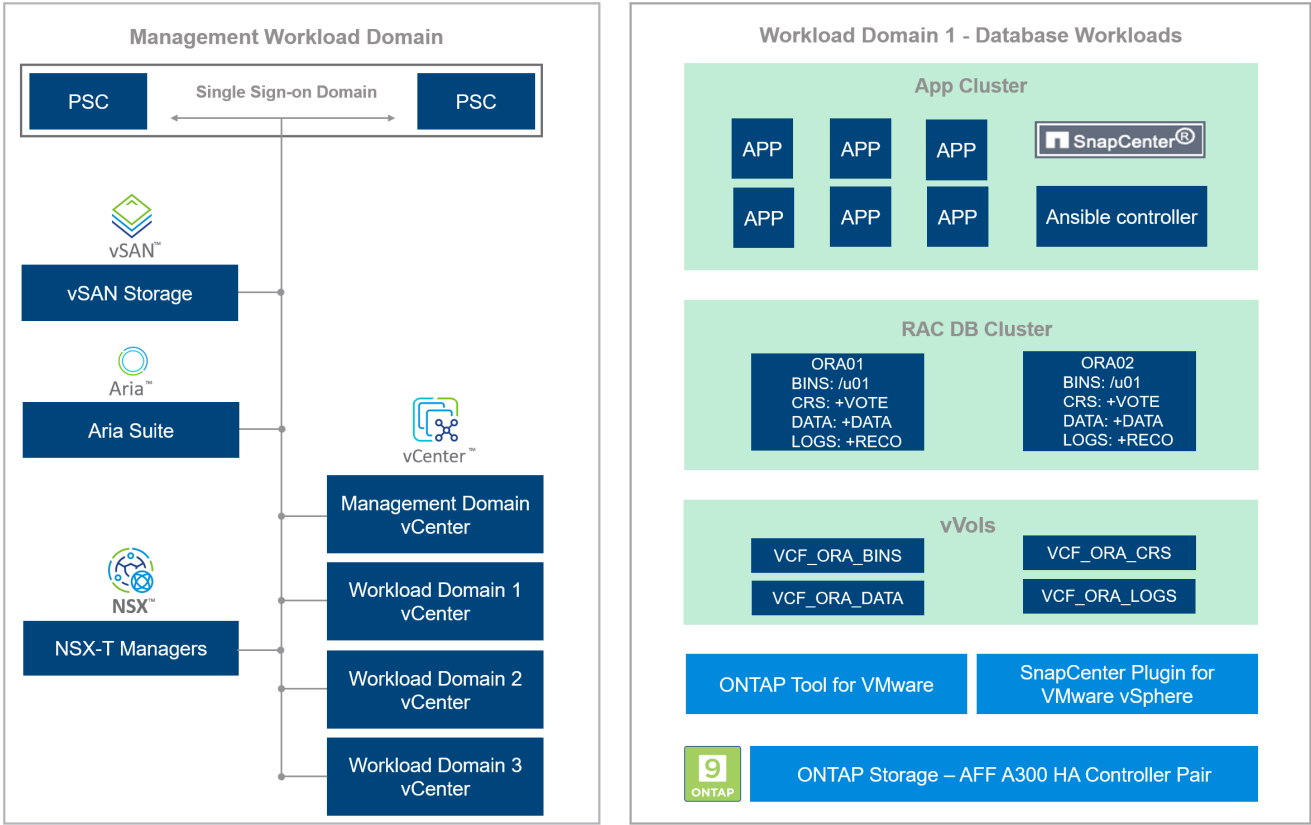
此解決方案適用於以下人群：

- 一位 DBA 希望在 VCF 中部署 Oracle RAC，並使用NetApp ONTAP AFF上的vVols資料儲存作為主資料庫存儲
- 一位資料庫解決方案架構師，希望使用NetApp ONTAP AFF儲存上的vVols資料儲存在 VCF 中測試 Oracle RAC 工作負載
- 一位儲存管理員希望在NetApp ONTAP AFF儲存上使用vVols資料儲存部署到 VCF 的 Oracle RAC 資料庫並進行管理
- 希望使用 vVol 資料儲存在 VCF 中建立 Oracle RAC 資料庫的應用程式擁有者

解決方案測試和驗證環境

此解決方案的測試和驗證是在 VCF 的實驗室環境中進行的，其中vVols資料儲存在NetApp ONTAP AFF儲存上，可能與最終部署環境不符。有關更多信息，請參閱[\[部署考慮的關鍵因素\]](#)。

Oracle RAC Database Deployment and Protection in VCF with vVols



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硬體和軟體組件

硬體		
NetApp ONTAP AFF A300	版本 9.14.1P4	DS224 磁碟架，配備 24 個 NVMe 磁碟，總容量 35.2 TiB
VMware VSphere 集群	版本 8.02	12 個 CPU x Intel® Xeon® Gold 5218 CPU @ 2.30GHz，8 個節點 (4 個管理域和 4 個工作負載域)
軟體		
紅帽Linux	RHEL-8.6，4.18.0-372.9.1.el8.x86_64 內核	託管 Oracle DB 伺服器，部署 RedHat 訂閱進行測試
Windows 伺服器	2022 標準版，10.0.20348 內部版本 20348	託管SnapCenter伺服器
Centos Linux	CentOS Linux 版本 8.5.2111	託管 Ansible 控制器
Oracle 網格基礎架構	版本 19.18	已套用RU補丁p34762026_190000_Linux-x86-64.zip

Oracle 資料庫	版本 19.18	已套用RU補丁p34765931_190000_Linux-x86-64.zip
Oracle OPatch	版本 12.2.0.1.36	最新補丁p6880880_190000_Linux-x86-64.zip
SnapCenter伺服器	版本 6.0	工作小組部署
SnapCenter Plug-in for VMware vSphere	版本 6.0	作為 OVA 虛擬機器部署到 vSphere 集群
適用於 VMware vSphere 的ONTAP 工具	版本 9.13	作為 OVA 虛擬機器部署到 vSphere 集群
開啟 JDK	版本 java-11-openjdk-11.0.23.0.9-3.el8.x86_64	資料庫虛擬機器上的SnapCenter插件要求

VCF中的Oracle RAC資料庫配置

RAC 節點	資料庫	資料庫儲存
ora01	NTAP(NTAP_pdb1,NTAP_pdb2,NTAP_pdb3)	NetApp ONTAP AFF A300上的vVols資料儲存區 (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資料儲存區 (VCF_ORA_BINS、VCF_ORA_CRS、VCF_ORA_DAT1、VCF_ORA_DAT2、VCF_ORA_LOGS)

部署考慮的關鍵因素

- * vVols到ONTAP集群連線的協定。* NFS 或 iSCSI 都是不錯的選擇。性能水平相當。在此解決方案示範中，我們使用 iSCSI 作為vVols連接到下劃線ONTAP儲存叢集的儲存協定。如果 VCF 基礎架構支持，NetApp ONTAP上的vVols資料儲存也支援 FC/FCoE、NVMe/FC 協定。
- * vVols資料儲存上的 Oracle 儲存佈局。*在我們的測試和驗證中，我們為 Oracle 二進位檔案、Oracle 叢集註冊表/投票、Oracle 資料和 Oracle 日誌檔案部署了五個vVols資料儲存區。將不同類型的 Oracle 檔案分離到各自的資料儲存體是一種很好的做法，這樣可以輕鬆管理和執行資料庫備份、復原或複製。為大型資料庫建立專用vVols，並為較小的資料庫或具有類似 QoS 設定檔的資料庫共用vVols。
- * Oracle 儲存冗餘。使用 `Normal Redundancy`用於關鍵的 Oracle RAC 叢集註冊表/投票文件，以便三個 ASM 磁碟故障群組上的三個投票文件提供最佳叢集保護，並且叢集註冊表在 ASM 磁碟故障群組之間鏡像。使用 `External Redundancy`用於 Oracle 二進位檔案、資料檔案和日誌文件，以最佳化儲存使用率。帶下劃線的ONTAP RAID-DP 在以下情況下提供資料保護 `External Redundancy`受僱。
- * ONTAP儲存驗證的憑證。*僅使用ONTAP叢集級憑證進行ONTAP儲存叢集驗證，包括SnapCenter與ONTAP儲存叢集的連線或ONTAP工具與ONTAP儲存叢集的連線。
- *從vVols資料儲存區到資料庫虛擬機器配置儲存。*一次只能從vVols資料儲存到資料庫虛擬機器中新增一個磁碟。目前不支援同時從vVols資料儲存新增多個磁碟。

- *資料庫保護。* NetApp提供了用於資料庫備份和復原的SnapCenter software套件，並具有使用者友好的 UI 介面。NetApp建議實作這樣的管理工具來實現快速的 Snapshot 備份、快速的資料庫還原和復原。

解決方案部署

以下部分提供了在 Oracle RAC 配置中的NetApp ONTAP儲存上使用vVols資料儲存在 VCF 中部署 Oracle 19c 資料庫的逐步程序。

部署先決條件

部署需要以下先決條件。

1. VMware VCF 已設定。有關如何建立 VCF 的資訊或說明，請參閱 VMware 文檔["VMware 雲端基礎文檔"](#)。
2. 在 VCF 工作負載域中配置三個 Linux VM、兩個用於 Oracle RAC 資料庫叢集的 VM 和一個用於 Ansible 控制器的 VM。配置一個 Windows 伺服器 VM 以執行NetApp SnapCenter伺服器。有關設定 Ansible 控制器以自動部署 Oracle 資料庫的信息，請參閱以下資源["NetApp解決方案自動化入門"](#)。
3. Oracle RAC 資料庫虛擬機器應該至少配置兩個網路介面 - 一個用於 Oracle RAC 專用互連，一個用於應用程式或公共資料流量。
4. VMware vSphere 的SnapCenter外掛程式版本 6.0 已在 VCF 中部署。有關插件部署，請參考以下資源：["SnapCenter Plug-in for VMware vSphere文檔"](#)。
5. VMware vSphere 的ONTAP工具已在 VCF 中部署。有關適用於 VMware vSphere 部署的ONTAP工具，請參閱下列資源：["ONTAP tools for VMware vSphere文檔"](#)



請確定您已在 Oracle VM 根磁碟區中指派至少 50G，以便有足夠的空間儲存 Oracle 安裝檔案。

建立儲存能力設定檔

首先，為託管vVols資料儲存的下劃線ONTAP儲存建立自訂儲存功能設定檔。

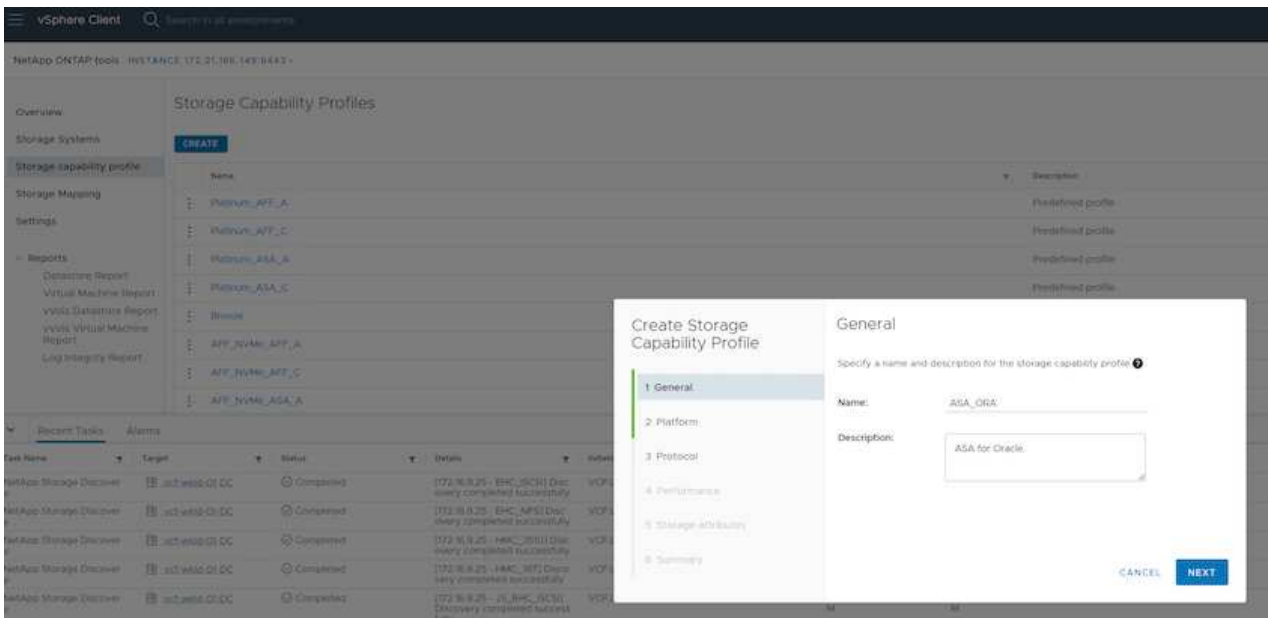
1. 從 vSphere 用戶端捷徑開啟NetApp ONTAP工具。確保ONTAP儲存叢集已新增至 `Storage Systems` 作為ONTAP工具部署的一部分。

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 the 'SnapCenter Plug-in for VMware vSphere' and the 'NetApp ONTAP tools' plugin, which is highlighted with an orange background. The 'Administration' section includes the 'Licensing' option.

Below the main navigation, the 'NetApp ONTAP tools' plugin is selected, showing its 'Overview' page. The 'Storage Systems' section is active, displaying a table of storage systems. The table has columns for Name, Type, IP Address, ONTAP Release, Status, Capacity, NFS VAAI, and Supported Protocols. A single entry is listed: 'ntapci-4300e9u25' of type 'Cluster' with IP address '172.16.9.25' and ONTAP Release '9.14.1'. The status is 'Normal' and the capacity is '43.76%'. The left sidebar shows the 'Reports' section expanded, listing various reports like Datastore Report, Virtual Machine Report, vVols Datastore Report, vVols Virtual Machine Report, and Log Integrity Report.

Name	Type	IP Address	ONTAP Release	Status	Capacity	NFS VAAI	Supported Protocols
ntapci-4300e9u25	Cluster	172.16.9.25	9.14.1	Normal	43.76%		

2. 點選 `Storage capability profile` 為 Oracle 新增自訂設定檔。命名設定檔並新增簡短描述。



3. 選擇儲存控制器類別：效能、容量或混合。

Create Storage Capability Profile

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

Platform

Platform: Performance

Asymmetric: ☐

CANCEL

BACK

NEXT

4. 選擇協議。

Create Storage Capability Profile

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

Protocol

Protocol:

CANCEL

BACK

NEXT

5. 如果需要，定義 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. 設定檔的附加儲存屬性。如果您想要具有加密功能，請確保在NetApp控制器上啟用了加密，否則在套用設定檔時可能會導致問題。

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. 查看摘要並完成儲存能力設定檔的建立。

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

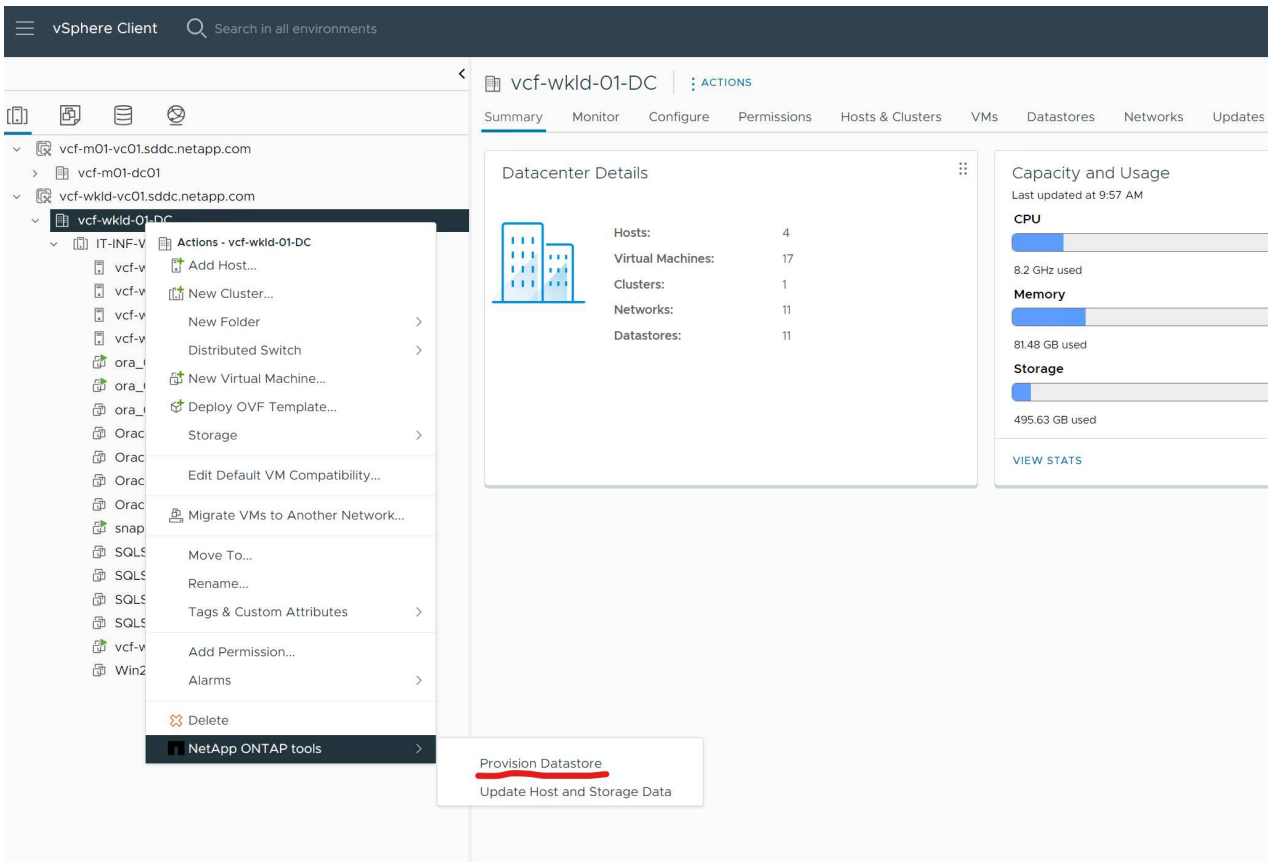
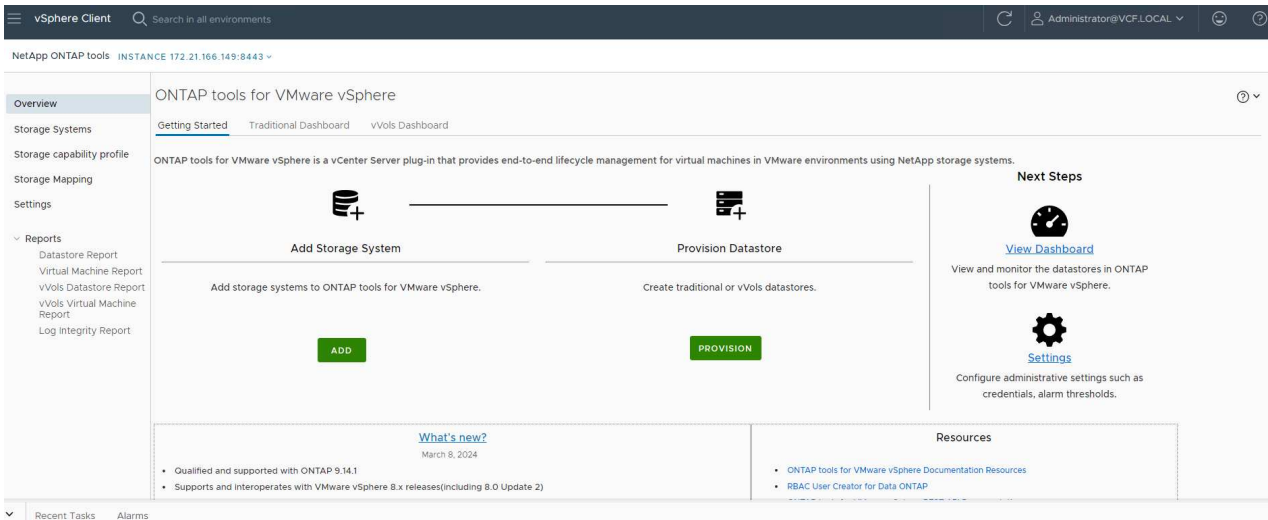
BACK

FINISH

建立並配置vVols資料存儲

完成先決條件後，透過 vSphere 用戶端以管理員使用者身分登入 VCF，導覽至工作負載網域。不要使用內建 VMware 儲存選項來建立 vVols。相反，使用 NetApp ONTAP 工具來建立 vVols。下面示範了建立和配置 vVols 的過程。

1. vVols 建立工作流程可以從 ONTAP 工具介面或 VCF 工作負載域叢集觸發。



2. 填寫資料儲存的一般信息，包括配置目標、類型、名稱和協定。

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. 選擇上一步驟建立的自訂儲存功能設定文件，Storage system，和 Storage VM，要在其中建立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. 選擇 Create new volumes，填寫磁碟區名稱和大小，然後點擊 `ADD` 然後 `NEXT` 移至摘要頁面。

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. 點選 `Finish` 為 Oracle 二進位檔案建立vVols資料儲存。

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. 為 Oracle 叢集註冊表或 CRS 建立資料儲存。

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

CANCEL BACK NEXT



您可以為vVols資料儲存區新增多個卷，或將vVols資料儲存區卷分佈在ONTAP控制器節點之間，以提高效能或實現冗餘。

7. 為 Oracle 資料建立資料儲存。理想情況下，在每個ONTAP控制器節點上建立單獨的資料存儲，並使用 Oracle ASM 在控制器節點之間對資料進行條帶化，以最大限度地利用ONTAP儲存叢集容量。

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

CANCEL BACK NEXT

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)	Storage capability profile	Aggregates	Space reserve
		ASA_ORA	EHCAGgr02 - (17467.05 G	Thin

ADD

Default storage capability profile:

ASA_ORA

CANCEL

BACK

NEXT

8. 為 Oracle 日誌建立資料儲存。鑑於 Oracle 日誌寫入的順序性，最好將其放在單一ONTAP控制器節點上。

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)	Storage capability profile	Aggregates	Space reserve
		ASA_ORA	EHCAGgr02 - (17467.05 G	Thin

ADD

Default storage capability profile:

ASA_ORA

CANCEL

BACK

NEXT

9. 部署後驗證 Oracle 資料儲存。

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

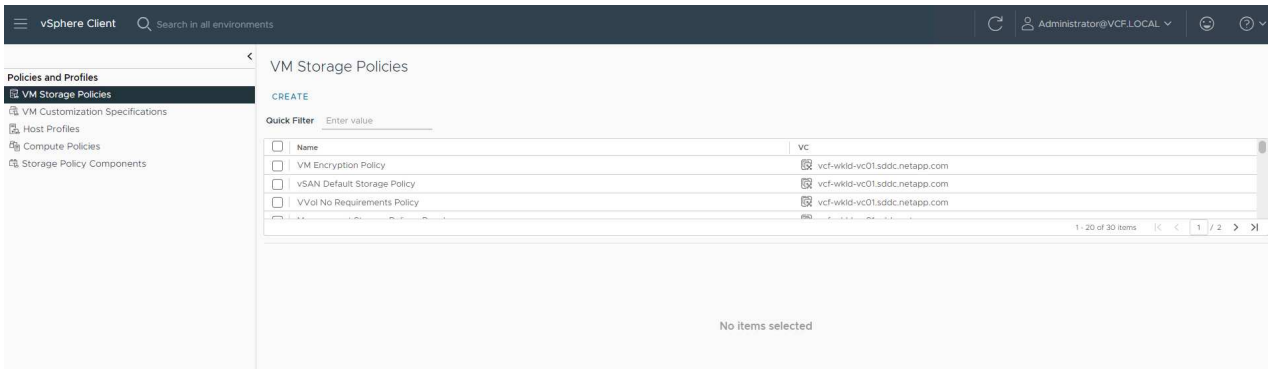
ASSIGN

Custom Attributes

根據儲存能力設定檔建立虛擬機器儲存策略

在將儲存空間從vVols資料儲存配置到資料庫 VM 之前，請根據上一個步驟建立的儲存功能設定檔新增 VM 儲存策略。以下是具體步驟。

1. 從 vSphere Client 選單打開 Policies and Profiles`並突出顯示 `VM Storage Policies`。點選 `Create` 打開 `VM Storage Policies` 工作流程。



2. 命名虛擬機器儲存策略。

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

4. 對於NetApp.clustered.Data. ONTAP.VP.vvol 規則 Placement，選擇上一步驟建立的自訂儲存容量設定檔。

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. 對於NetApp.clustered.Data. ONTAP.VP.vvol 規則 Replication，選擇`Disabled`如果vVols未被複製。

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. 儲存相容性頁面顯示 VCF 環境中相容的vVols資料儲存。

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

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. 審查並完成建立虛擬機器儲存策略。

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

General

Name

vVol_database

Description

vCenter Server

vcf-wkld-vc01.sddc.netapp.com

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

Placement

ProfileName

ASA_ORA

CANCEL

BACK

FINISH

8. 驗證剛剛建立的虛擬機器儲存策略。

vsphere Client

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

1-20 of 30 items

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

從vVols資料儲存體向 RAC VM 指派磁碟並配置 DB 存儲

從 vSphere 用戶端，透過編輯 VM 設定將vVols資料儲存中的所需磁碟新增至資料庫 VM。然後，登入 VM 格式化並將二進位磁碟掛載到掛載點 /u01。下面示範了具體的步驟和任務。

1. 在將磁碟從資料儲存分配到資料庫虛擬機器之前，請登入 VMware ESXi 主機進行驗證並確保在 ESXi 層級啟用了多寫入器（GBLAllowMW 值設定為 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. 新增一個新的專用 SCSI 控制器以供 Oracle RAC 磁碟使用。停用 SCSI 總線共用。

> 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. 從 RAC 節點 1 - ora01，向 VM 新增一個磁碟用於 Oracle 二進位儲存（不共用）。

> 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. 從 RAC 節點 1 開始，向 VM 新增三個磁碟用於 Oracle RAC CRS 儲存並啟用多寫入器共用。

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_CRS ▾ 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

Edit Settings | ora_01



Virtual Hardware

VM Options

Advanced Parameters

ADD NEW DEVICE ▾

> 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

- 從 RAC 節點 1 開始，從每個資料儲存區分別新增兩個磁碟，用於將資料傳送至 VM，以實現共用 Oracle 資料儲存。

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. 從 RAC 節點 1，從日誌資料儲存體向 VM 新增兩個磁碟，用於共用 Oracle 日誌檔案儲存。

> 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. 從 RAC 節點 2 開始，向 VM 新增一個磁碟用於 Oracle 二進位儲存（不共用）。

> 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. 從 RAC 節點 2，透過選擇新增其他共用磁碟 `Existing Hard Disks` 選項並為每個共用磁碟啟用多寫入器共用。

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. 從虛擬機 Edit Settings, Advanced Parameters, 添加屬性 `disk.enableuuid` 具有價值 `TRUE`。需要關閉虛擬機器才能新增進階參數。設定此選項可使 SnapCenter 準確地識別您環境中的 vVol。這應該在所有 RAC 節點上完成。

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. 現在，重新啟動虛擬機器。透過 ssh 以管理員使用者身分登入 VM 以查看新新增的磁碟機。

```
[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. 從每個 RAC 節點，透過接受預設選擇將 Oracle 二進位磁碟 (/dev/sdb) 分割區為主分割區和單一分割區。

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

12. 將分割區的磁碟格式化為xfs檔案系統。

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

13. 將磁碟掛載到掛載點 /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. 將掛載點新增至 /etc/fstab，以便在 VM 重新啟動時掛載磁碟機。

```
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

建議利用NetApp自動化工具包在具有vVols的 VCF 中部署 Oracle RAC。仔細閱讀隨附的說明（README），並按照工具包中的說明配置部署參數文件，例如部署目標文件 - hosts、全域變數文件 - vars/vars.yml 和本地 DB VM 變數檔案 - host_vars/host_name.yml。以下是逐步的程序。

1. 透過 ssh 以管理員使用者身分登入 Ansible 控制器 VM，並使用vVols複製用於在 VCF 中部署 Oracle RAC 的自動化工具包副本。

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

2. 將下列 Oracle 安裝檔案暫存於 RAC 節點 1 資料庫 VM 上的 /tmp/archive 資料夾中。該資料夾應允許所有使用者以 777 權限存取。

```
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 控制器和資料庫虛擬機器之間設定 ssh 無密鑰身份驗證，這需要產生 ssh 密鑰對並將公鑰複製到資料庫虛擬機器管理員用戶根目錄 .ssh 資料夾 authorized_keys 檔案中。

```
ssh-keygen
```

4. 設定使用者定義的目標主機參數檔。以下是目標主機檔案 hosts 的典型設定範例。

```
#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. 設定使用者定義的本機特定參數檔。以下是本機 host_name.yml 檔案 - ora01.yml 的典型設定範例。

```
# Binary lun  
ora_bin: /dev/sdb  
  
# Host DB configuration  
ins_sid: "{{ oracle_sid }}"  
asm_sid: +ASM1
```

6. 配置使用者定義的全域參數檔。以下是全域參數檔 vars.yml 的典型配置範例

```
#####
###
### 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. 從 Ansible 控制器，複製自動化工具包主目錄 /home/admin/na_oracle_deploy_rac，執行先決條件劇本來設定 ansible 先決條件。

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

8. 執行 Linux 配置劇本。

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

9. 執行 Oracle 部署劇本。

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

10. 或者，上述所有劇本也可以透過單一劇本運行來執行。

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

VCF 中的 Oracle RAC 部署驗證

本節提供有關 VCF 中的 Oracle RAC 部署驗證的詳細信息，以確保所有 Oracle RAC 資源都已完全部署、配置並按預期運行。

1. 以管理員使用者身分登入 RAC VM 以驗證 Oracle 網格基礎架構。

```
[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
details				

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. 驗證 Oracle ASM。

```
[grid@ora01 ~]$ asmcmd
ASMCMD> 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/
ASMCMD> lsdk
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
ASMCMD> afd_state
ASMCMD-9526: The AFD state is 'LOADED' and filtering is 'ENABLED' on
host 'ora01'
ASMCMD>
```

3. 列出叢集節點。

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

4. 驗證 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. 驗證 Oracle 監聽器。

```

[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. 更改為 oracle 使用者來驗證叢集資料庫。

```
[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

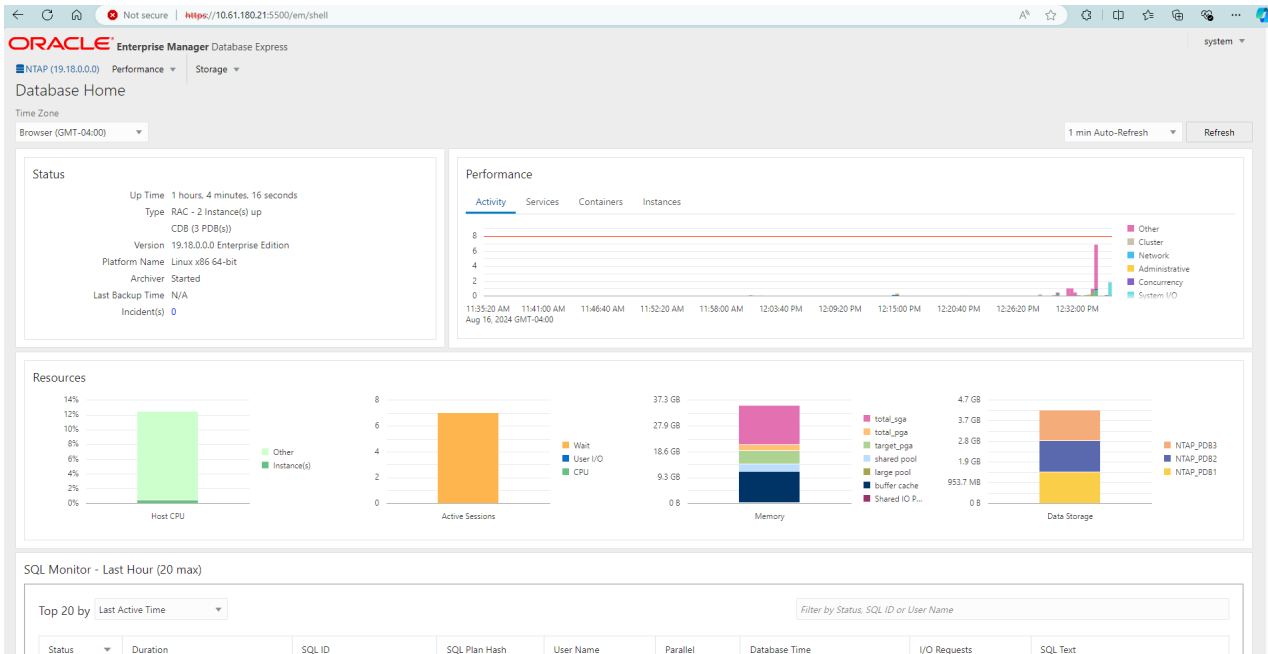
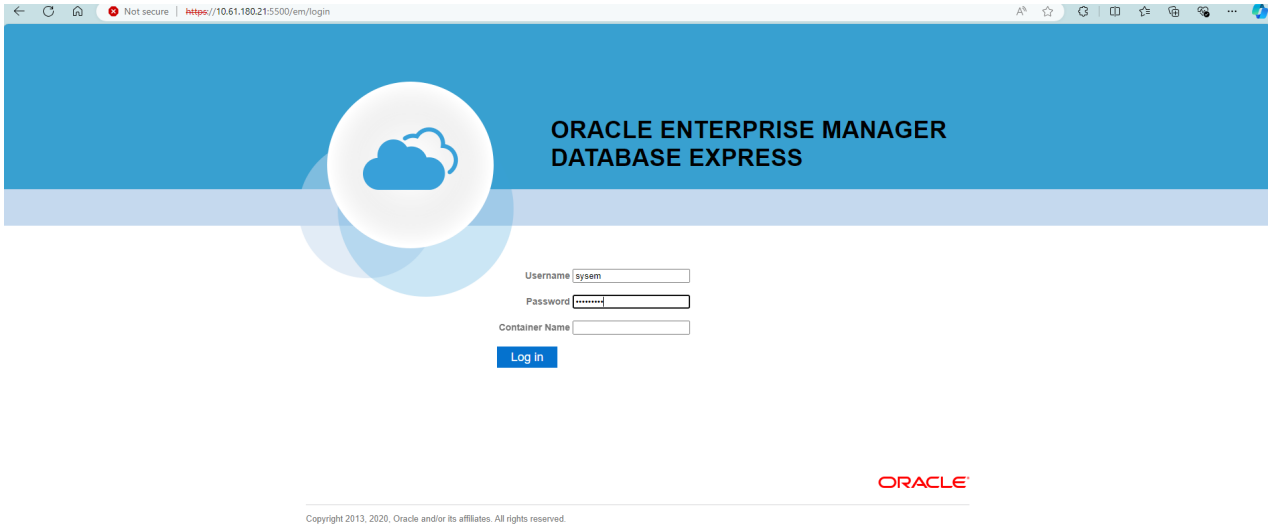
```
-----
-----
+DATA/NTAP/DATAFILE/undotbs2.269.1177082203
+DATA/NTAP/DATAFILE/users.260.1177080311
+DATA/NTAP/ONLINELOG/group_1.262.1177080427
+DATA/NTAP/ONLINELOG/group_2.263.1177080427
+DATA/NTAP/ONLINELOG/group_3.270.1177083297
+DATA/NTAP/ONLINELOG/group_4.271.1177083313
+RECO/NTAP/CONTROLFILE/current.256.1177080403
+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. 或在成功執行劇本後登入 EM express 來驗證 RAC 資料庫。

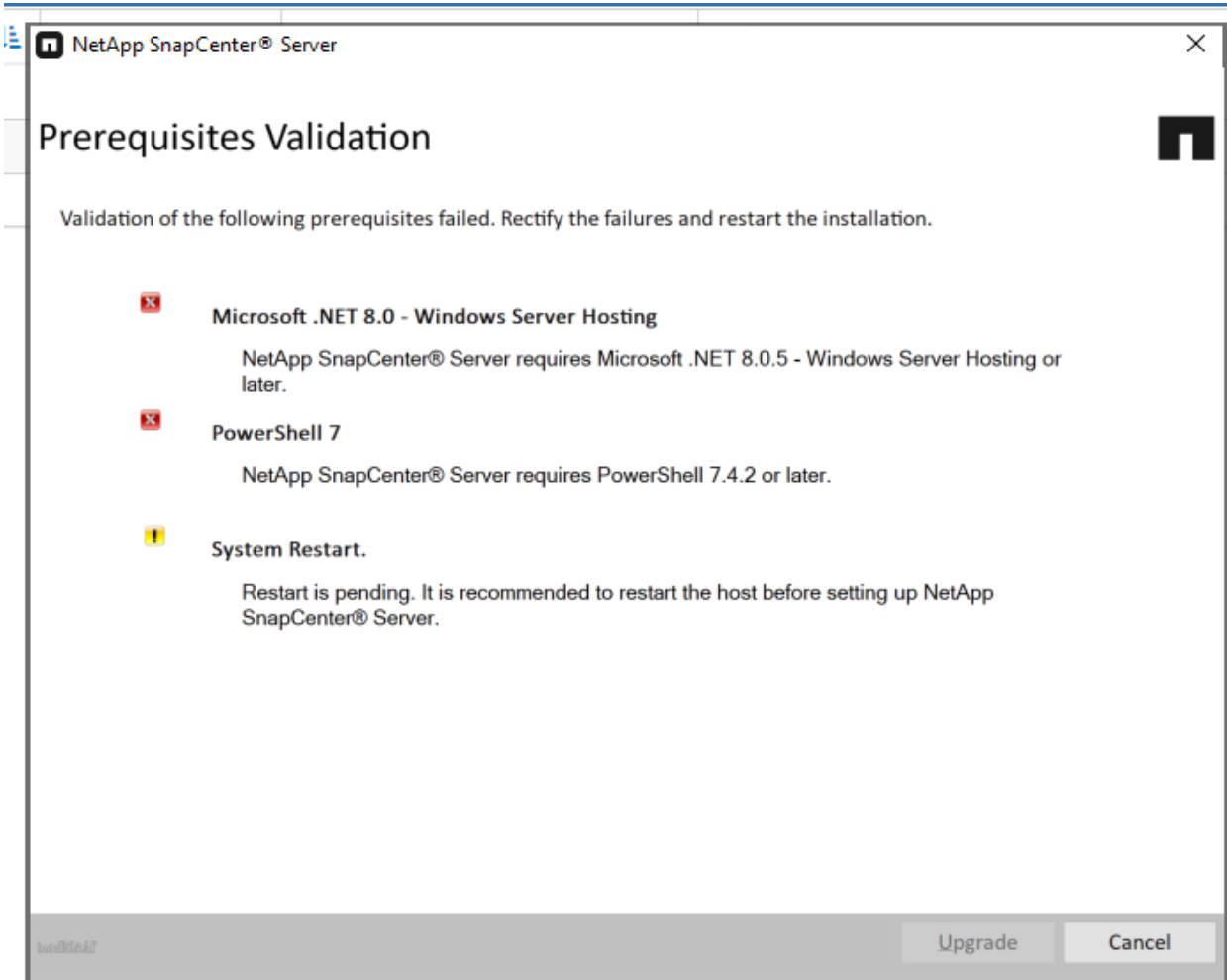


使用SnapCenter在 VCF 中備份和還原 Oracle RAC 資料庫

SnapCenter設定

SnapCenter版本 6 比版本 5 有許多功能增強，包括對 VMware vVols資料儲存的支援。SnapCenter依賴資料庫虛擬機器上的主機端插件來執行應用程式感知的資料保護管理活動。有關適用於 Oracle 的NetApp SnapCenter插件的詳細信息，請參閱此文檔["您可以使用 Oracle 資料庫插件做什麼"](#)。下面提供了在 VCF 中設定SnapCenter版本 6 以進行 Oracle RAC 資料庫備份和復原的進階步驟。

1. 從NetApp支援網站下載SnapCenter software版本 6：["NetApp支援下載"](#)。
2. 以管理員身分登入託管 Windows VM 的SnapCenter。安裝SnapCenter 6.0 的先決條件。

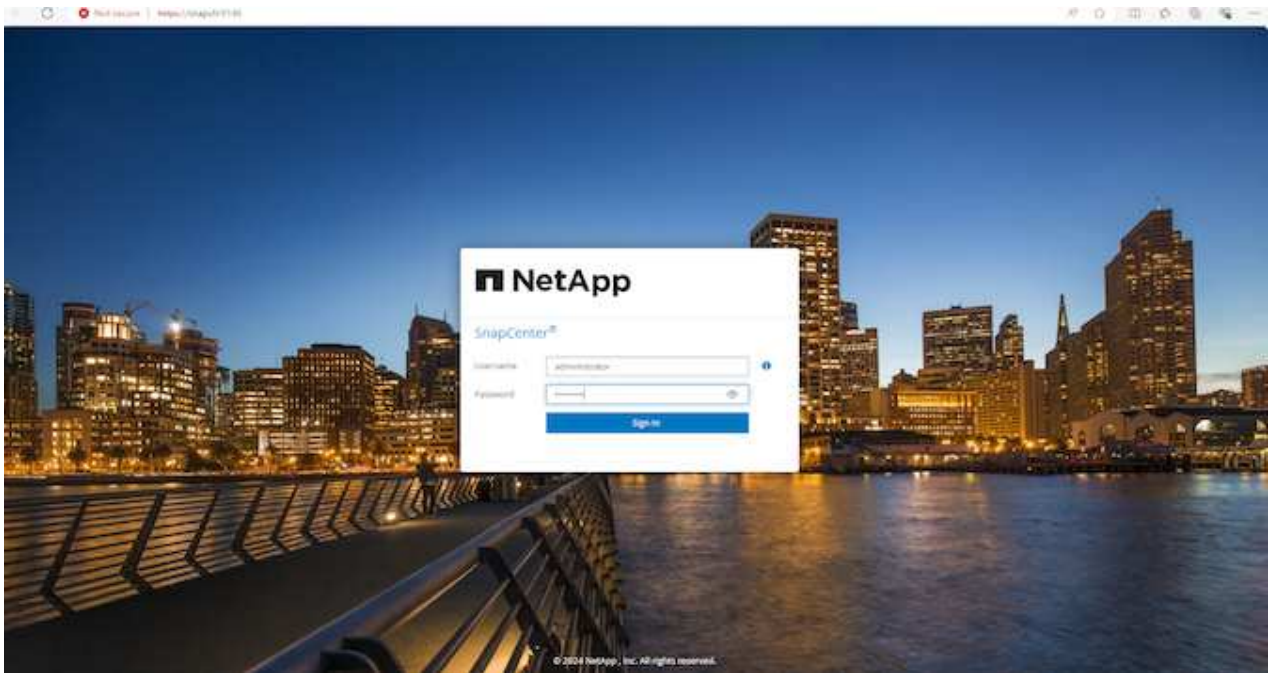


3. 以管理員身份安裝最新的 Java JDK["取得用於桌面應用程式的 Java"](#)。

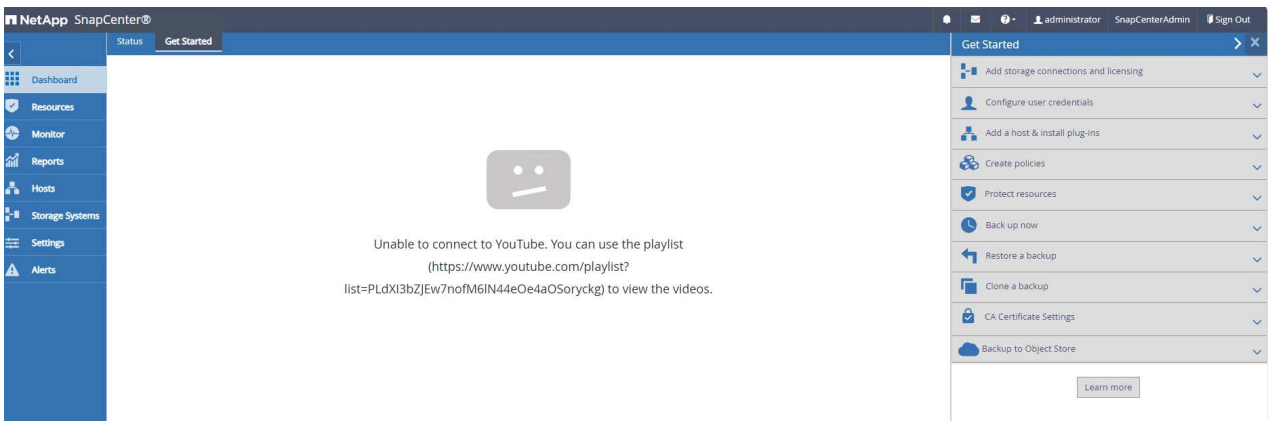


如果 Windows 伺服器部署在網域環境中，請將網域使用者新增至SnapCenter伺服器本機管理員群組，並使用網域使用者執行SnapCenter安裝。

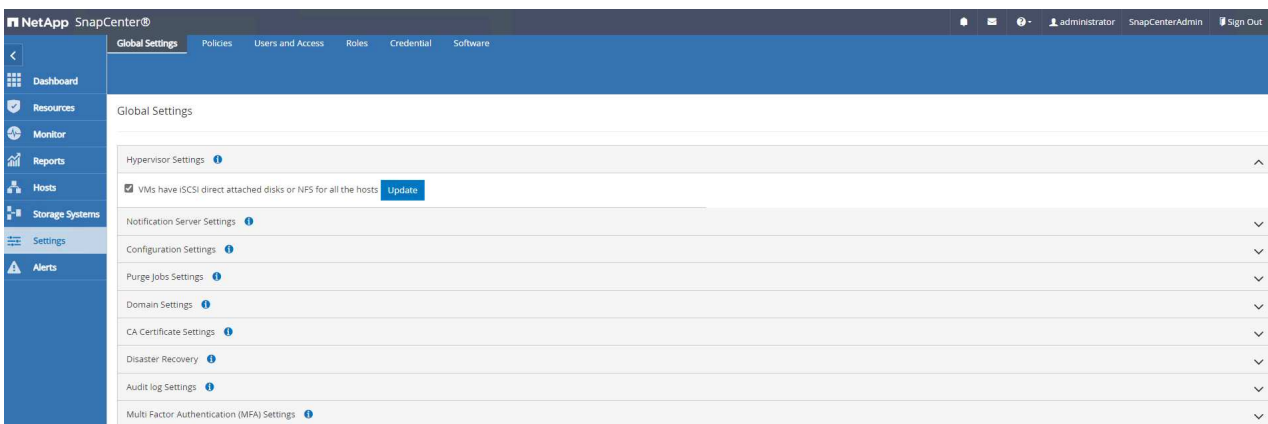
4. 以安裝使用者身分透過 HTTPS 連接埠 8846 登入SnapCenter UI 以設定SnapCenter for Oracle。



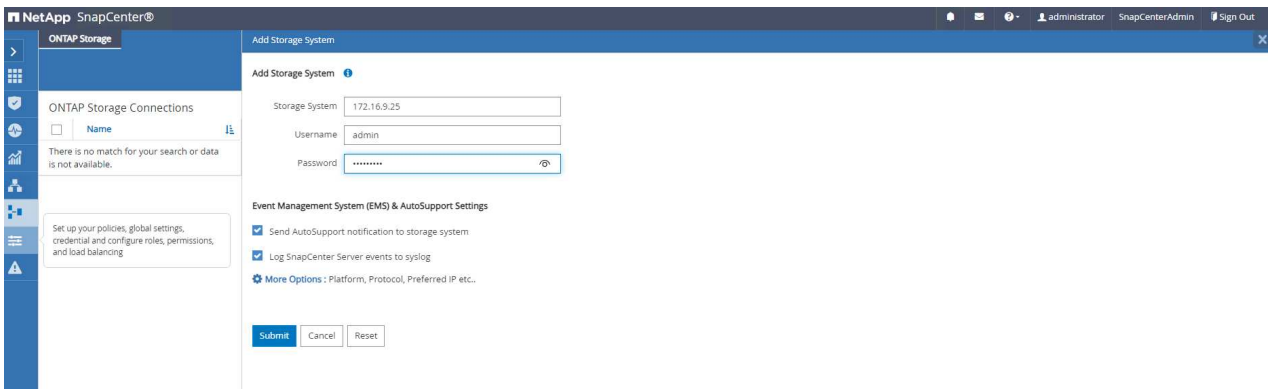
5. 審查 `Get Started` 如果您是 newUser，可以透過選單快速了解 SnapCenter。



6. 更新 `Hypervisor Settings` 在全域設定中。



7. 將 ONTAP 儲存叢集新增至 `Storage Systems` 使用群集管理 IP 並透過群集管理員使用者 ID 進行身份驗證。



NetApp SnapCenter®

ONTAP Storage

Add Storage System

Storage System: 172.16.9.25

Username: admin

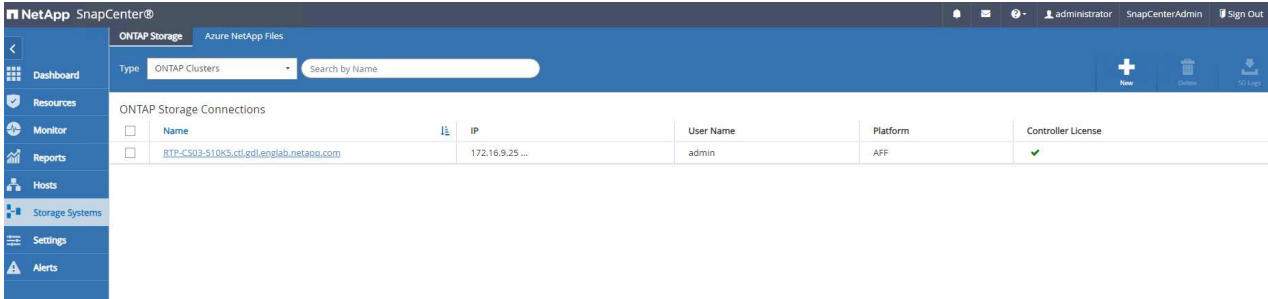
Password: [REDACTED]

Event Management System (EMS) & AutoSupport Settings

- ☒ Send AutoSupport notification to storage system
- ☒ Log SnapCenter Server events to syslog

More Options: Platform, Protocol, Preferred IP etc.

Submit Cancel Reset



NetApp SnapCenter®

ONTAP Storage

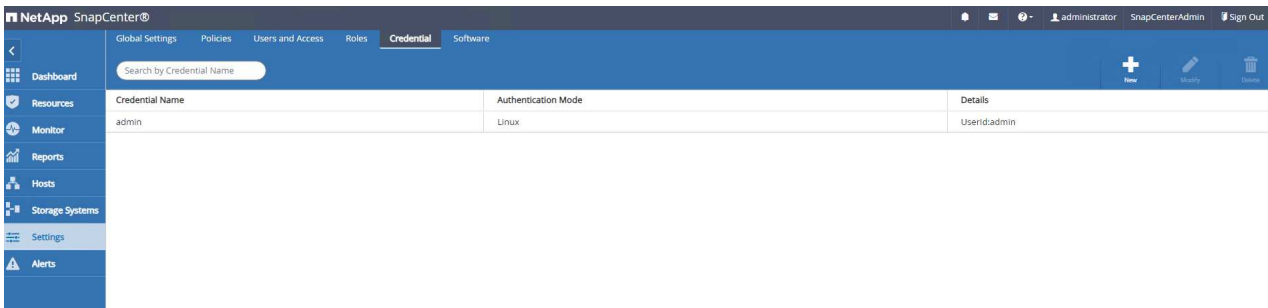
Azure NetApp Files

Type: ONTAP Clusters

Search by Name

Name	IP	User Name	Platform	Controller License
RTP-C503-510K5.cti.gdi.englab.netapp.com	172.16.9.25 ...	admin	AFF	✓

- 新增 Oracle RAC 資料庫虛擬機器和 vSphere 插件虛擬機 `Credential` 用於 SnapCenter 存取 DB VM 和 vSphere 插件 VM。該憑證應在 Linux VM 上具有 sudo 權限。您可以為虛擬機器的不同管理使用者 ID 建立不同的憑證。vSphere 外掛程式虛擬機器管理使用者 ID 是在 vCenter 中部署插件虛擬機器時定義的。



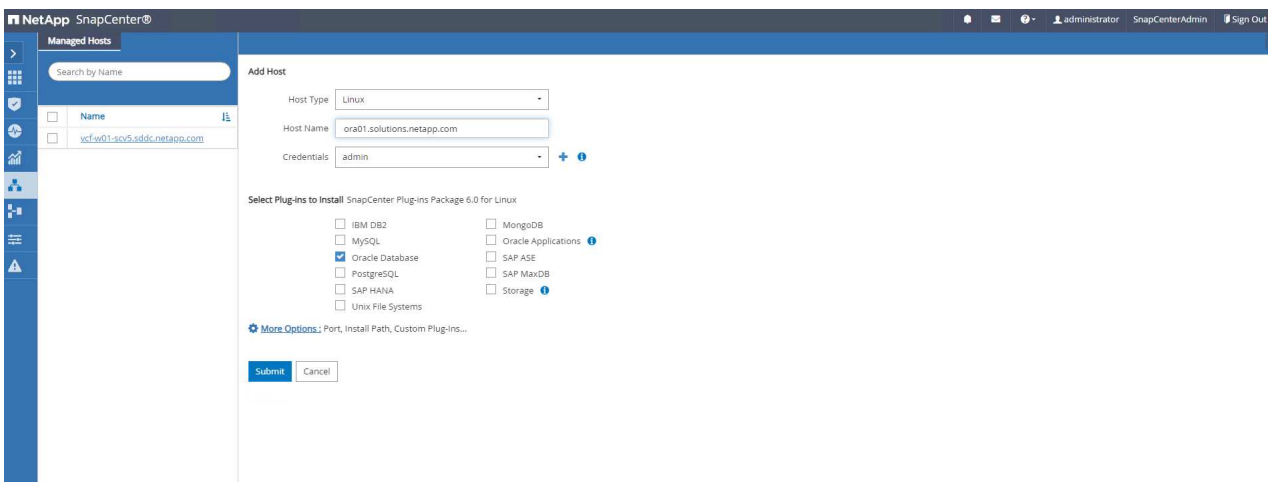
NetApp SnapCenter®

Global Settings Policies Users and Access Roles **Credential** Software

Search by Credential Name

Credential Name	Authentication Mode	Details
admin	Linux	User:admin

- 在 VCF 中新增 Oracle RAC 資料庫虛擬機 `Hosts` 使用上一個步驟中建立的 DB VM 憑證。



NetApp SnapCenter®

Managed Hosts

Search by Name

Add Host

Host Type: Linux

Host Name: ora01.solutions.netapp.com

Credentials: admin

Select Plug-ins to Install SnapCenter Plug-ins Package 6.0 for Linux

- ☐ IBM DB2
- ☐ MySQL
- ☒ Oracle Database
- ☐ PostgreSQL
- ☐ SAP HANA
- ☐ Unix File Systems
- ☐ MongoDB
- ☐ Oracle Applications
- ☐ SAP ASE
- ☐ SAP MaxDB
- ☐ Storage

More Options: Port, Install Path, Custom Plug-ins...

Submit Cancel

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

10. 類似地，將NetApp VMware 外掛程式 VM 新增至 `Hosts` 使用上一個步驟中建立的 vSphere 外掛程式 VM 憑證。

NetApp SnapCenter®

Managed Hosts

Search by Name

Add Host

Host Type

Host Name

Credentials

vSphere

172.21.166.140

admin

Submit

Cancel

NetApp SnapCenter®

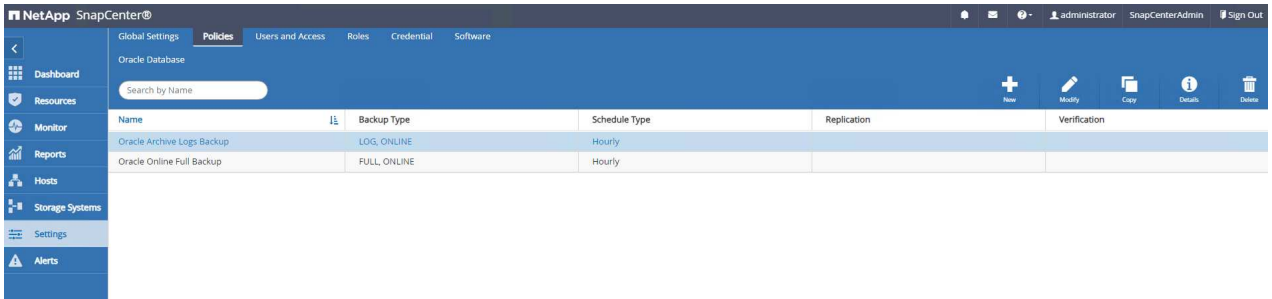
Managed Hosts

Search by Name

Name	Type	System	Plugin	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
vxf-v01.s00b.s00t.netapp.com	vSphere	Stand-alone	VMware vSphere	6.0	Running

11. 最後，在 DB VM 上發現 Oracle 資料庫後，回到 Settings-`Policies` 建立 Oracle 資料庫備份策略。理想情況下，建立單獨的存檔日誌備份策略，以允許更頻繁的備份間隔，從而最大限度地減少故障時的資料遺失。

56



The screenshot shows the NetApp SnapCenter web interface. The top navigation bar includes 'Global Settings', 'Policies', 'Users and Access', 'Roles', 'Credential', and 'Software'. The left sidebar contains 'Dashboard', 'Resources', 'Monitor', 'Reports', 'Hosts', 'Storage Systems', 'Settings', and 'Alerts'. The main content area is titled 'Oracle Database' and contains a table with backup policies.

Name	Backup Type	Schedule Type	Replication	Verification
Oracle Archive Logs Backup	LOG, ONLINE	Hourly		
Oracle Online Full Backup	FULL, ONLINE	Hourly		

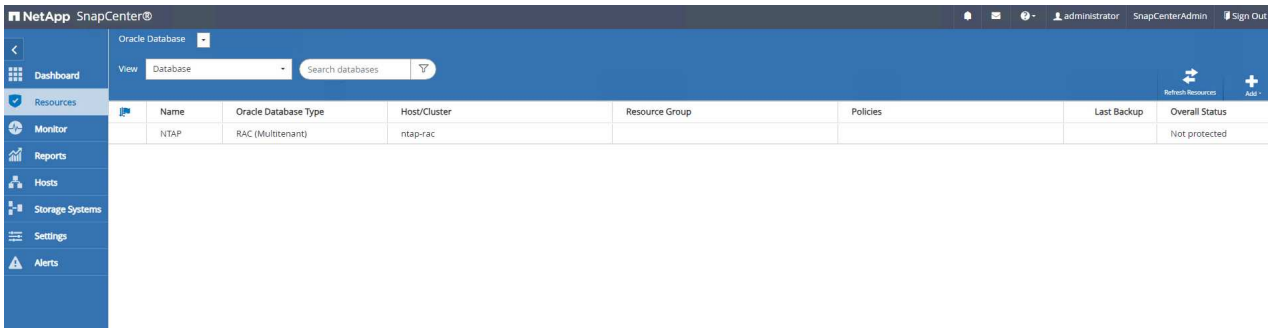


確保SnapCenter伺服器名稱可以解析為 DB VM 和 vSphere 插件 VM 的 IP 位址。同樣，DB VM 名稱和 vSphere 外掛程式 VM 名稱可以解析為SnapCenter伺服器的 IP 位址。

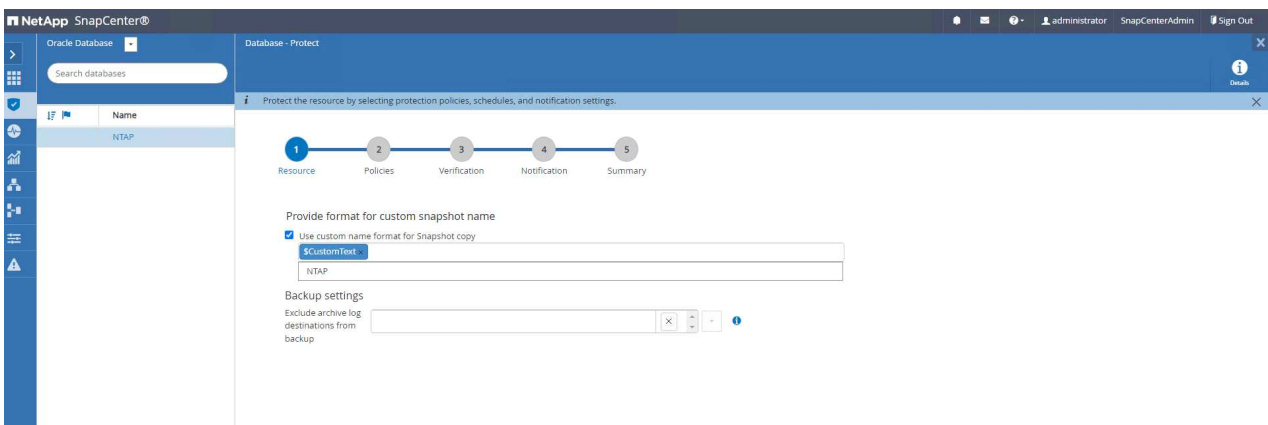
資料庫備份

與傳統的基於 RMAN 的方法相比，SnapCenter利用ONTAP磁碟區快照實現更快的資料庫備份、復原或複製。由於資料庫在快照之前處於 Oracle 備份模式，因此快照與應用程式一致。

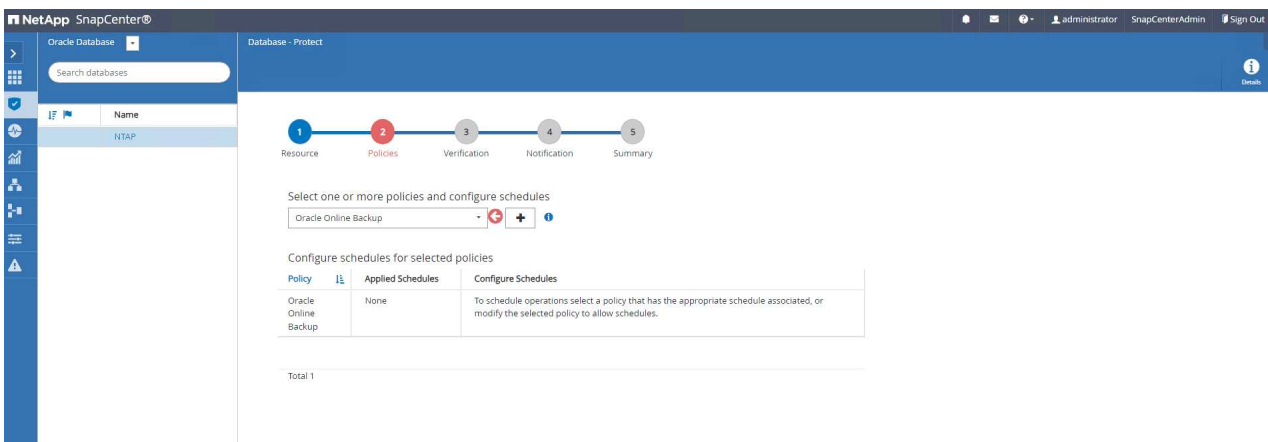
1. 從 Resources 選項卡，將 VM 新增至SnapCenter後，會自動發現 VM 上的任何資料庫。最初，資料庫狀態顯示為 `Not protected`。



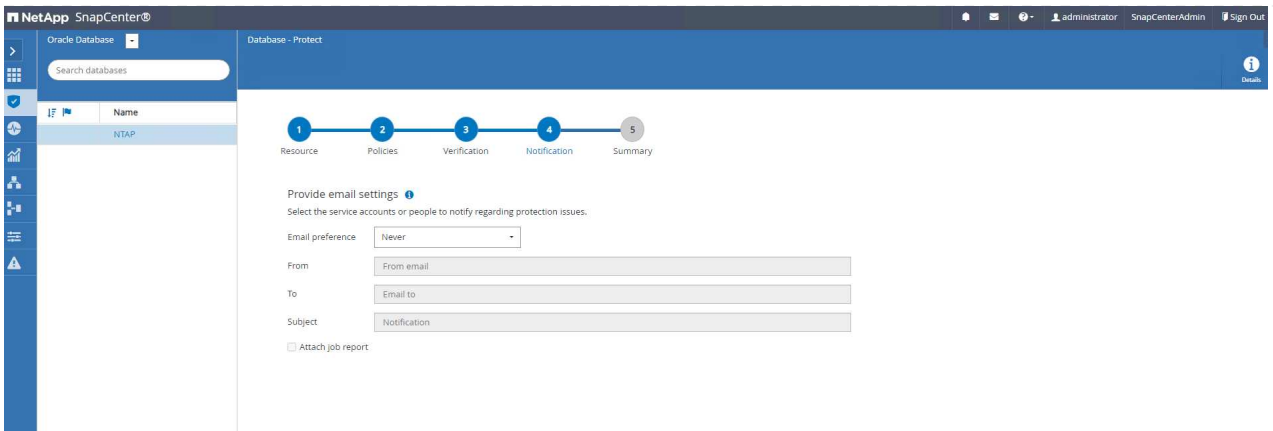
2. 按一下資料庫以啟動工作流程來啟用資料庫保護。



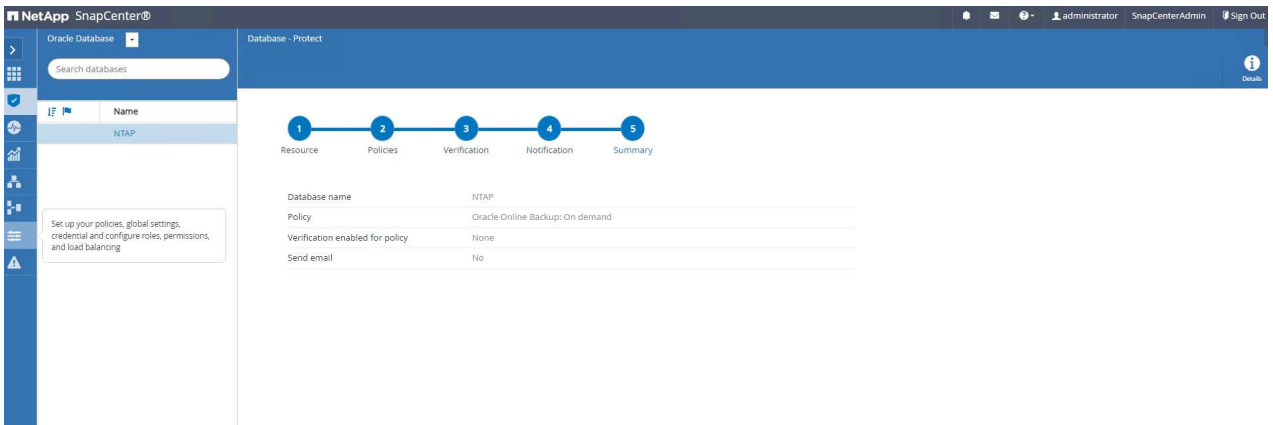
3. 如果需要，請套用備份策略並設定計劃。



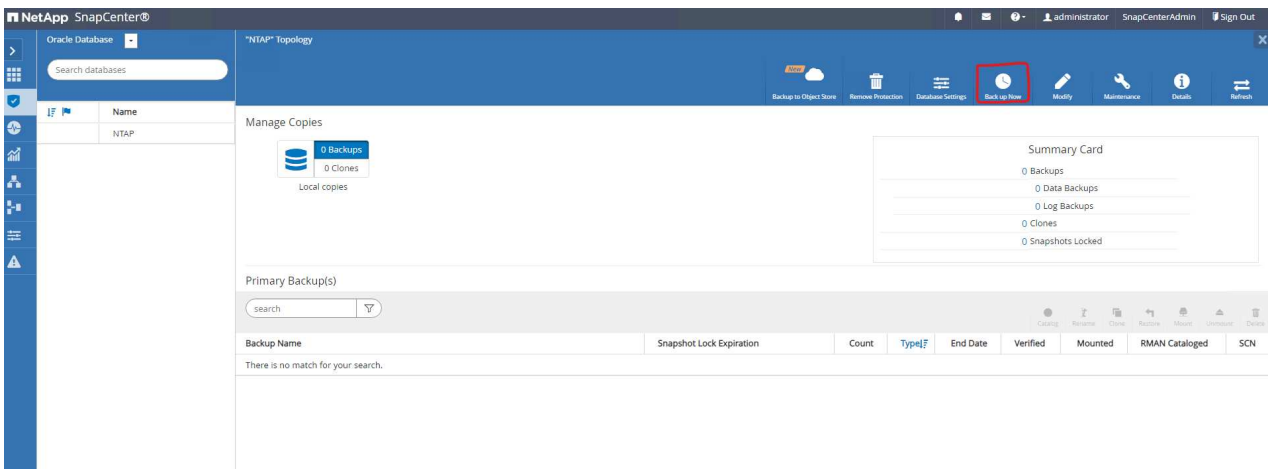
4. 如果需要，設定備份作業通知。



5. 查看摘要並完成以啟用資料庫保護。



6. 只需點擊即可觸發按需備份作業 Back up Now。



Backup



Create a backup for the selected resource

Resource Name

NTAP

Policy

Oracle Online Backup



☐ Verify after backup

Cancel

Backup

7. 備份作業可以在 `Monitor` 按一下正在執行的作業來開啟選項卡。

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

i 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. 按一下資料庫以查看 RAC 資料庫的已完成備份集。

NTWP1 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

資料庫還原/復原

SnapCenter為 Oracle RAC 資料庫提供了多種從快照備份中復原的選項。在此範例中，我們示範如何從較舊的快照備份進行恢復，然後將資料庫前滾到最後一個可用日誌。

1. 首先，執行快照備份。然後，建立測試表並向表中插入一行，以驗證在建立測試表之前從快照映像還原的資料庫是否重新取得測試表。

```
[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. 來自SnapCenter `Resources` 選項卡，開啟資料庫NTAP1備份拓模頁面。反白顯示3天前建立的快照資料備份集。點選 `Restore` 啟動復原工作流程。

NetApp SnapCenter®

Oracle Database

Search databases

NTAP Topology

Manage Copies

2 Backups
0 Clones
Local copies

Summary Card

- 2 Backups
- 1 Data Backup
- 1 Log Backup
- 0 Clones
- 0 Snapshots Locked

Primary Backup(s)

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. 選擇恢復範圍。

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. 選擇恢復範圍 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. 指定要執行的任何可選預腳本。

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. 指定要執行的任何可選的後續腳本。

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. 如果需要的話，發送工作報告。

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. 查看摘要並點擊 `Finish` 啟動恢復和復甦。

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. 從 RAC DB VM ora01 驗證資料庫的還原/復原是否成功前滾到其最新狀態並還原 3 天後所建立的測試表。

```
[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 pdba

      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

```

這完成了使用vVols在 VCF 中對 Oracle RAC 資料庫進行SnapCenter備份、還原和復原的示範。

在哪裡可以找到更多信息

要了解有關本文檔中描述的信息的更多信息，請查看以下文檔和/或網站：

- ["VMware 雲端基礎"](#)
- ["SnapCenter software文檔"](#)
- ["ONTAP tools for VMware vSphere文檔"](#)

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