



TR-4990 : 使用 ANF 上的增量合併快速復原 Oracle VLDB

NetApp database solutions

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TR-4990：使用 ANF 上的增量合併快速復原 Oracle VLDB

Allen Cao、Niyaz Mohamed，NetApp

此解決方案提供了概述和詳細信息，用於快速恢復部署到 Azure VM 計算實例的 Oracle VLDB，並在 Azure NetApp Files 容量池上安裝 NFS，以暫存透過 RMAN 不斷增量合併的備用資料庫副本。

目的

使用 Oracle 復原管理器 (RMAN) 備份工具還原 Oracle 中的超大型資料庫 (VLDB) 可能是一項極具挑戰性的任務。發生故障時從備份媒體還原資料庫的過程可能非常耗時，從而延遲資料庫復原並可能嚴重影響您的服務等級協定 (SLA)。但是，從 10g 版本開始，Oracle 引入了 RMAN 功能，允許使用者在位於 DB 伺服器主機上的附加磁碟儲存上建立 Oracle 資料庫資料檔案的分階段映像副本。這些影像副本可以使用 RMAN 每天進行增量更新。如果發生故障，資料庫管理員 (DBA) 可以迅速將 Oracle 資料庫從故障媒體切換到映像副本，從而無需進行完整的資料庫媒體還原。儘管所需的資料庫儲存量增加了一倍，但其結果是 SLA 得到了極大改善。

如果您熱衷於 VLDB 的 SLA 並考慮將 Oracle 資料庫遷移到 Azure 等公有雲，則可以使用 Microsoft Azure NetApp Files (ANF) 等資源設定類似的資料庫保護結構來暫存備用資料庫映像副本。在本文檔中，我們示範如何從 ANF 容量池中配置和匯出 NFS 檔案系統，並將其安裝在 Oracle 資料庫伺服器上，以便在主儲存發生故障時暫存備用資料庫副本以便快速復原。

此解決方案適用於以下用例：

- Oracle VLDB 映像副本透過 RMAN 在 Microsoft ANF 容量池儲存的 NFS 掛載點上進行增量合併。
- 當同一 Azure 資料庫伺服器 VM 發生故障時，快速復原 Oracle VLDB。
- 當備用 Azure 資料庫伺服器 VM 發生故障時，快速復原 Oracle VLDB。

對象

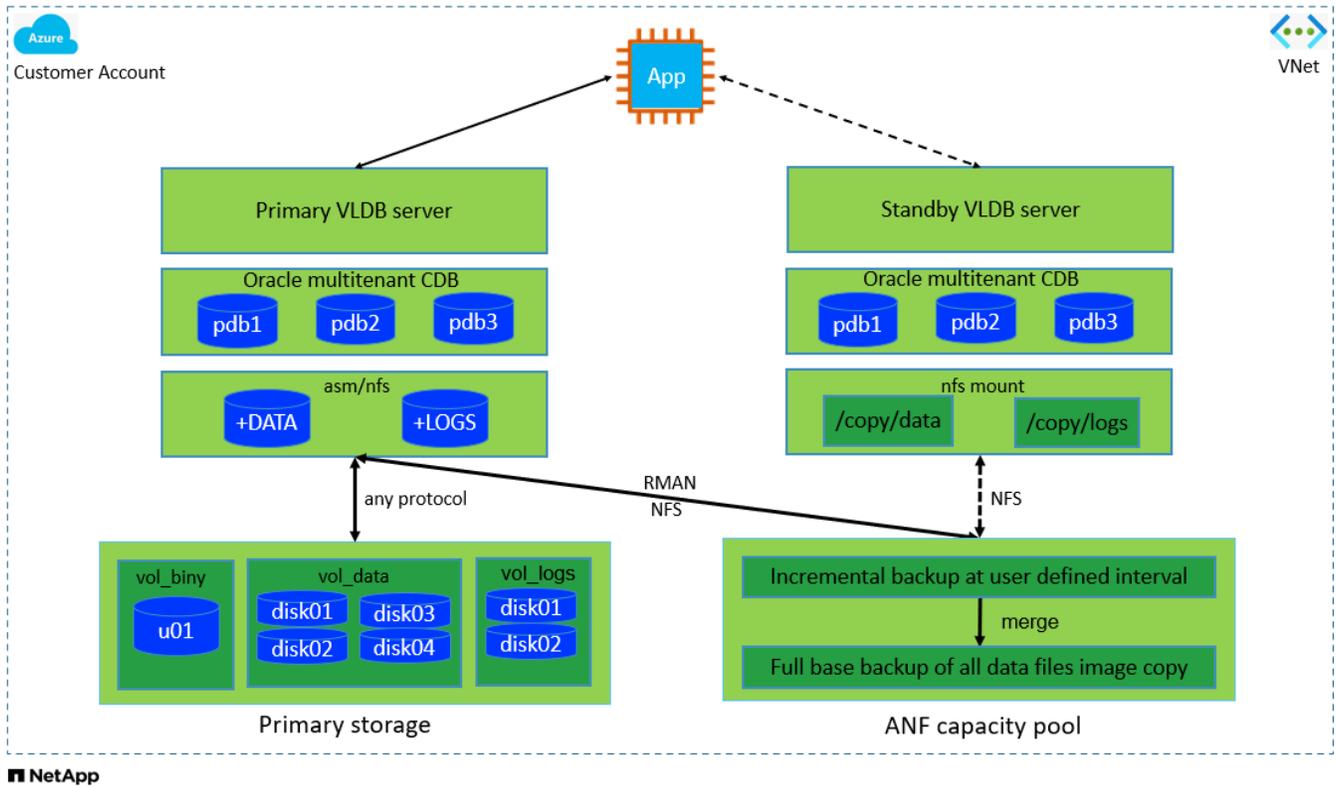
此解決方案適用於以下人群：

- 一位 DBA 透過 Azure 中的 RMAN 設定 Oracle VLDB 映像複製增量合併，以便更快復原資料庫。
- 在 Azure 公有雲中測試 Oracle 工作負載的資料庫解決方案架構師。
- 管理部署到 ANF 容量池儲存的 Oracle 資料庫的儲存管理員。
- 希望在 Azure 雲端環境中建立 Oracle 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 Microsoft ANF 容量池儲存和 Azure VM 運算環境中進行的，該環境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 VLDB Incremental Merge via RMAN on ANF



硬體和軟體組件

硬體		
ANF儲存	Microsoft 提供的目前版本	具有高級服務等級的 2 TiB ANF 容量池存儲
用於資料庫伺服器的 Azure VM	Standard_B4ms - 4 個 vCPU，16GiB	2 個虛擬機，一個作為主資料庫伺服器，另一個作為備用
軟體		
紅帽Linux	RHEL Linux 8.6 (LVM) -x64 Gen2	部署 RedHat 訂閱進行測試
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
NFS	版本 3.0	已啟用 Oracle dNFS

部署考慮的關鍵因素

- *用於 RMAN 增量合併的 Oracle VLDB 儲存佈局。*在我們的測試和驗證中，Oracle 增量備份和合併的

NFS 磁碟區是從單一 ANF 容量池分配的，每個磁碟區有 100 TiB，總容量限制為 1000 TiB。對於超過閾值的部署，可以將多個磁碟區和 ANF 容量池與多個 NFS 掛載點並行連接以提供更高的容量。

- *使用 RMAN 增量合併實作 Oracle 可恢復性。* RMAN 增量備份和合併通常會根據您的 RTO 和 RPO 目標以使用者定義的頻率執行。如果主資料儲存和/或歸檔日誌完全遺失，則可能會發生資料遺失。Oracle 資料庫可以還原到 ANF 資料庫備份映像副本提供的最後一個增量備份。為了盡量減少資料遺失，可以在 ANF NFS 安裝點上設定 Oracle 閃回復原區，並將存檔日誌與資料庫映像副本一起備份到 ANF NFS 安裝點。
- *在 ANF NFS 檔案系統上執行 Oracle VLDB。*與其他用於資料庫備份的大量儲存不同，Microsoft ANF 是一種支援雲端的生產級儲存，可提供高水準的效能和儲存效率。一旦 Oracle VLDB 從主儲存切換到 ANF NFS 檔案系統上的映像副本，資料庫效能就可以保持在高水平，同時解決主儲存故障。您可以放心，用戶應用程式體驗不會因主儲存故障而受到影響。
- Azure 計算執行個體。在這些測試和驗證中，我們使用 Standard_B4ms Azure VM 作為 Oracle 資料庫伺服器。其他 Azure VM 可能經過最佳化，更適合資料庫工作負載。您還需要根據實際工作負載需求，適當調整 Azure VM 的 vCPU 數量和 RAM 容量。
- *ANF 容量池服務等級。* ANF 容量池提供三種服務等級：標準、進階、超級。預設情況下，自動 QoS 適用於容量池內建立的捲，這會限制捲的吞吐量。可根據容量池的大小和服務等級手動調整磁碟區上的吞吐量。
- *dNFS 配置。* dNFS 內建於 Oracle 核心中，並且已知當 Oracle 部署到 NFS 儲存時可顯著提高 Oracle 資料庫效能。dNFS 打包到 Oracle 二進位檔案中，但預設未開啟。對於 NFS 上的任何 Oracle 資料庫部署，都應該啟用它。對於 VLDB 的多個 ANF 容量池部署，應正確配置到不同 ANF 容量池儲存的 dNFS 多路徑。

解決方案部署

假設您已經在 VNet 內的 Azure 雲端環境中部署了 Oracle VLDB。如果您需要在 Azure 中部署 Oracle 的協助，請參閱下列技術報告以取得協助。

- ["使用 NFS 在 Azure NetApp Files 上簡化、自動化 Oracle 部署"](#)
- ["Azure NetApp Files 上的 Oracle 資料庫部署與保護"](#)

您的 Oracle VLDB 可以在 ANF 儲存體或 Azure 雲端生態系統中的任何其他儲存體上執行。以下部分提供了設定 RMAN 增量合併到在 ANF 儲存的 NFS 掛載中暫存的 Oracle VLDB 映像副本的逐步部署程序。

部署先決條件

部署需要以下先決條件。

1. 已設定 Azure 帳戶，並在您的 Azure 帳戶內建立了必要的 Azure VNet 和網路區段。
2. 從 Azure 入口網站控制台，您必須部署兩個 Azure VM 執行個體，一個作為主 Oracle DB 伺服器，另一個作為選用的備用 DB 伺服器。有關環境設定的更多詳細信息，請參閱上一節中的架構圖。還請查看["Azure 虛擬機器系列"](#)了解更多。
3. 從 Azure 入口網站控制台部署 ANF 儲存體來託管儲存 Oracle 資料庫備用映像副本的 NFS 磁碟區。如果您不熟悉 ANF 的部署，請參閱文檔["快速入門：設定 Azure NetApp Files 並建立 NFS 卷"](#)以獲得逐步說明。



確保在 Azure VM 根磁碟區中指派了至少 128G，以便有足夠的空間來暫存 Oracle 安裝檔案。

提供並匯出要安裝在主 **Oracle VLDB** 伺服器上的 **NFS** 卷

在本節中，我們將展示如何透過 Azure 入口網站控制台從 ANF 容量池配置 NFS 磁碟區。如果設定了多個 ANF 容量池來適應資料庫的大小，請對其他 ANF 容量池重複這些過程。

1. 首先，從 Azure 入口網站控制台導覽至用於暫存 Oracle VLDB 映像複製的 ANF 容量池。

The screenshot shows the Azure portal interface for a capacity pool named 'database (ANFAVSAcct/database)'. The left-hand navigation pane includes sections for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings (Quota, Advisor recommendations, Properties, Locks), Azure NetApp Files (Active Directory connections, Encryption), Storage service (Capacity pools, Volumes, Application volume groups), and Data protection (Snapshot policies, Backups, Backup vaults, Backup Policies). The main content area is divided into several sections: Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings (Properties, Locks), Storage service (Volumes), Monitoring (Metrics), Automation (Tasks (preview), Export template), and Help (Support + Troubleshooting). A large donut chart in the Usage section indicates that 63.5% (1.27 TiB) of the 2 TiB capacity pool is currently allocated.

2. 從選定的容量池 - database，點選 `Volumes` 進而，`Add volume` 啟動新增磁碟區工作流程。

The screenshot shows the 'Volumes' page for the 'database (ANFAVSAcct/database)' capacity pool. The left-hand navigation pane is identical to the previous screenshot. The main content area shows the 'Volumes' section with a table of existing volumes. The table has columns for Name, Quota, Max. Throughput, Protocol type, Mount path, and Service level. The table contains six rows of volume information.

Name	Quota	Max. Throughput	Protocol type	Mount path	Service level
ora-01-u01	100 GiB	6.25 MiB/s	NFSv3	172.30.136.68:/ora-01-	Premium
ora-01-u02	500 GiB	31.25 MiB/s	NFSv3	172.30.136.68:/ora-01-	Premium
ora-01-u03	400 GiB	25 MiB/s	NFSv3	172.30.136.68:/ora-01-	Premium
ora-02-u01	100 GiB	6.25 MiB/s	NFSv3	172.30.136.68:/ora-02-	Premium
ora-02-u02	100 GiB	6.25 MiB/s	NFSv3	172.30.136.68:/ora-02-	Premium
ora-02-u03	100 GiB	6.25 MiB/s	NFSv3	172.30.136.68:/ora-02-	Premium

3. 填寫 Volume name, Quota, Virtual network, 和 `Delegated subnet` 移至 `Protocol` 頁。

Create a volume ...

[Basics](#) [Protocol](#) [Tags](#) [Review + create](#)

This page will help you create an Azure NetApp Files volume in your subscription and enable you to access the volume from within your virtual network. [Learn more about Azure NetApp Files](#) 

Volume details

Volume name *	<input type="text" value="ora-01-u02-copy"/> 
Available quota (GiB) ⓘ	<input type="text" value="748"/> 748 GiB
Quota (GiB) * ⓘ	<input type="text" value="500"/>  500 GiB
Available throughput (MiB/s) ⓘ	<input type="text" value="46.75"/>
Max. Throughput (MiB/s) ⓘ	<input type="text" value="31.25"/>
Enable Cool Access ⓘ	<input type="checkbox"/>
Coolness Period ⓘ	<input type="text" value="31"/>
Cool Access Retrieval Policy ⓘ	<input type="text" value="Default"/> 
Virtual network * ⓘ	<input type="text" value="ANFAVSVAl (172.30.136.64/26,172.30.137.128/25,172.30.152.0/27)"/>  Create new virtual network
Delegated subnet * ⓘ	<input type="text" value="ANF_Sub (172.30.136.64/26)"/>  Create new subnet
Network features ⓘ	<input type="radio"/> Basic <input checked="" type="radio"/> Standard
Availability Zone ⓘ	<input type="text" value="None"/> 
Encryption key source ⓘ	<input type="text"/> 
Show advanced section	<input type="checkbox"/>

[Review + create](#)

[< Previous](#)

[Next : Protocol >](#)

4. 記下檔案路徑，輸入允許的客戶端 CIDR 範圍，然後啟用 `Root Access` 音量。

Create a volume ...

Basics **Protocol** Tags Review + create

Configure access to your volume.

Access

Protocol type NFS SMB Dual-protocol

Configuration

File path * ⓘ

Versions * ▼

Kerberos Enabled Disabled

LDAP Enabled Disabled

Unix Permissions ⓘ

Azure VMware Solution DataStore ⓘ

Export policy

Configure the volume's export policy. This can be edited later. [Learn more](#) ↗

↑ Move up ↓ Move down ↕ Move to top ⏴ Move to bottom 🗑 Delete

<input type="checkbox"/>	Index	Allowed clients	Access	Root Access	Chown Mode
<input type="checkbox"/>	1	<input type="text" value="172.30.137.128/25,1"/> ✓	<input type="text" value="Read & Write"/> ▼	<input type="text" value="On"/> ▼	<input type="text" value="Restricted"/>
		<input type="text"/>	<input type="text"/> ▼	<input type="text"/> ▼	

Review + create

< Previous

Next : Tags >

5. 如果需要，請新增磁碟區標籤。

Create a volume ...

Basics Protocol **Tags** Review + create

Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. [Learn more about tags](#) 

Note that if you create tags and then change resource settings on other tabs, your tags will be automatically updated.

Name 	Value 	
<input type="text" value="database"/>	:	<input type="text" value="oracle"/> 
<input type="text"/>	:	<input type="text"/>

Review + create

< Previous

Next : Review + create >

6. 審查並創建卷。

Create a volume ...

✓ Validation passed

Basics Protocol Tags Review + create

Basics

Subscription	Hybrid Cloud TME Onprem
Resource group	ANFAVSRG
Region	South Central US
Volume name	ora-01-u02-copy
Capacity pool	database
Service level	Premium
Quota	500 GiB
Encryption key source	None
Availability Zone	None

Networking

Virtual network	ANFAVSV1 (172.30.136.64/26,172.30.137.128/25,172.30.152.0/27)
Delegated subnet	ANF_Sub (172.30.136.64/26)
Network features	Standard

Protocol

Protocol	NFSv3
File path	ora-01-u02-copy
Unix Permissions	0770

Tags

database	oracle
----------	--------

Create

< Previous

Next >

[Download a template for automation](#)

7. 以具有 `sudo` 權限的使用者身分登入主 Oracle VLDB 伺服器並掛載從 ANF 儲存匯出的 NFS 磁碟區。根據需要變更為您的 ANF NFS 伺服器 IP 位址和檔案路徑。可以從 ANF 磁碟區控制台頁面擷取 ANF NFS 伺服器 IP 位址。

```
sudo mkdir /nfsanf
```

```
sudo mount 172.30.136.68:/ora-01-u02-copy /nfsanf -o  
rw,bg,hard,vers=3,proto=tcp,timeo=600,rsiz=262144,wsiz=262144,noi  
tr
```

8. 將掛載點所有權更改為 oracle:oinstall，根據需要更改為您的 oracle 使用者名稱和主要群組。

```
sudo chown oracle:oinstall /nfsanf
```

在 ANF 上設定 Oracle RMAN 增量合併到映像副本

RMAN 增量合併在每個增量備份/合併間隔持續更新暫存資料庫資料檔案映像副本。資料庫備份的映像副本將與您執行增量備份/合併的頻率一樣最新。因此，在決定 RMAN 增量備份和合併的頻率時，請考慮資料庫效能、RTO 和 RPO 目標。

1. 以 oracle 使用者登入主 Oracle VLDB 伺服器。
2. 在掛載點 /nfsanf 下建立一個 oracopy 目錄，用於儲存 Oracle 資料檔案映像副本和用於 Oracle 閃回復原區的 archlog 目錄。

```
mkdir /nfsanf/oracopy
```

```
mkdir /nfsanf/archlog
```

3. 透過 sqlplus 登入 Oracle 資料庫，啟用區塊變更追蹤以加快增量備份速度，並將 Oracle 快閃記憶體復原區變更為 ANF NFS 掛載（如果它目前位於主儲存上）。這允許將 RMAN 預設控制檔/spfile 自動備份和存檔日誌備份到 ANF NFS 掛載以進行還原。

```
sqlplus / as sysdba
```

在 sqlplus 提示字元下，執行以下命令。

```
alter database enable block change tracking using file  
'/nfsanf/oracopy/bct_ntap1.ctf'
```

```
alter system set db_recovery_file_dest='/nfsanf/archlog/'  
scope=both;
```

預期輸出：

```
[oracle@ora-01 ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Mar 20 16:44:21
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> alter database enable block change tracking using file
'/nfsanf/oracopy/bct_ntap1.ctf';

Database altered.

SQL> alter system set db_recovery_file_dest='/nfsanf/archlog/'
scope=both;

System altered.

SQL>
```

4. 建立 RMAN 備份和增量合併腳本。該腳本為並行 RMAN 備份和合併分配多個通道。第一次執行將產生初始的完整基線影像副本。在完整運行過程中，它首先清除保留視窗之外的過時備份，以保持暫存區清潔。然後它在合併和備份之前切換當前日誌檔案。增量備份在合併之後進行，因此資料庫映像副本落後於目前資料庫狀態備份/合併週期。可以根據使用者的喜好逆轉合併和備份的順序，以便更快地恢復。RMAN 腳本可以整合到一個簡單的 shell 腳本中，從主 DB 伺服器上的 crontab 執行。確保 RMAN 設定中的控制檔自動備份處於開啟狀態。

```

vi /home/oracle/rman_bkup_merge.cmd

Add following lines:

RUN
{
  allocate channel c1 device type disk format '/nfsanf/oracopy/%U';
  allocate channel c2 device type disk format '/nfsanf/oracopy/%U';
  allocate channel c3 device type disk format '/nfsanf/oracopy/%U';
  allocate channel c4 device type disk format '/nfsanf/oracopy/%U';
  delete obsolete;
  sql 'alter system archive log current';
  recover copy of database with tag 'OraCopyBKUPonANF_level_0';
  backup incremental level 1 copies=1 for recover of copy with tag
'OraCopyBKUPonANF_level_0' database;
}

```

5. 在主 Oracle VLDB 伺服器上，以 oracle 使用者身分本地登入 RMAN，可以使用或不使用 RMAN 目錄。在此示範中，我們沒有連接到 RMAN 目錄。

```

rman target / nocatalog;

output:

[oracle@ora-01 ~]$ rman target / nocatalog

Recovery Manager: Release 19.0.0.0.0 - Production on Wed Mar 20
16:54:24 2024
Version 19.18.0.0.0

Copyright (c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

connected to target database: NTAP1 (DBID=2441823937)
using target database control file instead of recovery catalog

```

6. 從 RMAN 提示字元執行腳本。第一次執行會建立基準資料庫映像副本，後續執行則會逐步合併和更新基準映像副本。以下是如何執行腳本以及典型的輸出。設定通道數以符合主機上的 CPU 核心。

```

RMAN> @/home/oracle/rman_bkup_merge.cmd

RMAN> RUN
2> {
3>   allocate channel c1 device type disk format

```

```

'/nfsanf/oracopy/%U';
4> allocate channel c2 device type disk format
'/nfsanf/oracopy/%U';
5> allocate channel c3 device type disk format
'/nfsanf/oracopy/%U';
6> allocate channel c4 device type disk format
'/nfsanf/oracopy/%U';
7> delete obsolete;
8> sql 'alter system archive log current';
9> recover copy of database with tag 'OraCopyBKUPonANF_level_0';
10> backup incremental level 1 copies=1 for recover of copy with
tag 'OraCopyBKUPonANF_level_0' database;
11> }

```

```

allocated channel: c1
channel c1: SID=142 device type=DISK

```

```

allocated channel: c2
channel c2: SID=277 device type=DISK

```

```

allocated channel: c3
channel c3: SID=414 device type=DISK

```

```

allocated channel: c4
channel c4: SID=28 device type=DISK

```

```

RMAN retention policy will be applied to the command
RMAN retention policy is set to redundancy 1
Deleting the following obsolete backups and copies:

```

Type	Key	Completion Time	Filename/Handle
Backup Set	1	18-MAR-24	
Backup Piece	1	18-MAR-24	/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163958359__04h19dgr_.bkp
Backup Set	2	18-MAR-24	
Backup Piece	2	18-MAR-24	/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163961675__0711m21g_.bkp
Backup Set	3	18-MAR-24	
Backup Piece	3	18-MAR-24	/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163962888__08p6y71x_.bkp
Backup Set	4	18-MAR-24	
Backup Piece	4	18-MAR-24	/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163963796__09k8g1m4_.bkp

```

Backup Set          5          18-MAR-24
  Backup Piece      5          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163964697__0bd3tqg
3_.bkp
Backup Set          6          18-MAR-24
  Backup Piece      6          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163965895__0chx6mz
t_.bkp
Backup Set          7          18-MAR-24
  Backup Piece      7          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163966806__0dbyx34
4_.bkp
Backup Set          8          18-MAR-24
  Backup Piece      8          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163968012__0fgvg80
5_.bkp
Backup Set          9          18-MAR-24
  Backup Piece      9          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163968919__0g9x5t1
v_.bkp
Backup Set         10          18-MAR-24
  Backup Piece     10          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163969821__0h4rfdz
j_.bkp
Backup Set         11          18-MAR-24
  Backup Piece     11          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163971026__0j8o4wk
8_.bkp
Backup Set         12          18-MAR-24
  Backup Piece     12          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163971931__0k3pnn2
o_.bkp
Backup Set         13          18-MAR-24
  Backup Piece     13          18-MAR-24
/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163972835__0kyg92t
1_.bkp
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163963796__
09k8g1m4_.bkp RECID=4 STAMP=1163963804
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163962888__
08p6y7lx_.bkp RECID=3 STAMP=1163962897
deleted backup piece
backup piece

```

```
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163961675__
0711m21g_.bkp RECID=2 STAMP=1163961683
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163958359__
04h19dgr_.bkp RECID=1 STAMP=1163958361
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163964697__
0bd3tqg3_.bkp RECID=5 STAMP=1163964705
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163965895__
0chx6mzt_.bkp RECID=6 STAMP=1163965906
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163966806__
0dbyx344_.bkp RECID=7 STAMP=1163966814
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163968012__
0fgvg805_.bkp RECID=8 STAMP=1163968018
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163968919__
0g9x5t1v_.bkp RECID=9 STAMP=1163968926
deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163969821__
0h4rfdzj_.bkp RECID=10 STAMP=1163969827
Deleted 3 objects

deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163971026__
0j8o4wk8_.bkp RECID=11 STAMP=1163971032
Deleted 3 objects

deleted backup piece
backup piece
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163971931__
0k3pnn2o_.bkp RECID=12 STAMP=1163971938
Deleted 3 objects

deleted backup piece
backup piece
```

```
handle=/u03/orareco/NTAP1/autobackup/2024_03_18/o1_mf_s_1163972835__
0kyg92t1_.bkp RECID=13 STAMP=1163972837
Deleted 4 objects
```

```
sql statement: alter system archive log current
```

```
Starting recover at 20-MAR-24
no copy of datafile 1 found to recover
no copy of datafile 3 found to recover
no copy of datafile 4 found to recover
.
.
no copy of datafile 31 found to recover
no copy of datafile 32 found to recover
Finished recover at 20-MAR-24
```

```
Starting backup at 20-MAR-24
no parent backup or copy of datafile 1 found
no parent backup or copy of datafile 3 found
no parent backup or copy of datafile 4 found
.
.
no parent backup or copy of datafile 19 found
no parent backup or copy of datafile 20 found
channel c1: starting datafile copy
input datafile file number=00021
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_01.dbf
channel c2: starting datafile copy
input datafile file number=00022
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_02.dbf
channel c3: starting datafile copy
input datafile file number=00023
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_03.dbf
channel c4: starting datafile copy
input datafile file number=00024
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_04.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-22_0g2m6brl tag=ORACOPYBKUPONANF_LEVEL_0 RECID=4
STAMP=1164132108
channel c2: datafile copy complete, elapsed time: 01:06:39
channel c2: starting datafile copy
input datafile file number=00025
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_05.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-24_0i2m6brl tag=ORACOPYBKUPONANF_LEVEL_0 RECID=5
```

```
STAMP=1164132121
channel c4: datafile copy complete, elapsed time: 01:06:45
channel c4: starting datafile copy
input datafile file number=00026
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_06.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-23_0h2m6brl tag=ORACOPYBKUPONANF_LEVEL_0 RECID=6
STAMP=1164132198
channel c3: datafile copy complete, elapsed time: 01:08:05
channel c3: starting datafile copy
input datafile file number=00027
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_07.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-21_0f2m6brl tag=ORACOPYBKUPONANF_LEVEL_0 RECID=7
STAMP=1164132248
channel c1: datafile copy complete, elapsed time: 01:08:57
channel c1: starting datafile copy
input datafile file number=00028
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_08.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-25_0j2m6fol tag=ORACOPYBKUPONANF_LEVEL_0 RECID=9
STAMP=1164136123
channel c2: datafile copy complete, elapsed time: 01:06:46
channel c2: starting datafile copy
input datafile file number=00029
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_09.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-26_0k2m6fot tag=ORACOPYBKUPONANF_LEVEL_0 RECID=8
STAMP=1164136113
channel c4: datafile copy complete, elapsed time: 01:06:36
channel c4: starting datafile copy
input datafile file number=00030
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_10.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-27_0l2m6frc tag=ORACOPYBKUPONANF_LEVEL_0 RECID=10
STAMP=1164136293
channel c3: datafile copy complete, elapsed time: 01:08:10
channel c3: starting datafile copy
input datafile file number=00031
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_11.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-28_0m2m6fsu tag=ORACOPYBKUPONANF_LEVEL_0 RECID=11
STAMP=1164136333
channel c1: datafile copy complete, elapsed time: 01:07:52
channel c1: starting datafile copy
input datafile file number=00032
```

```
name=/u02/oradata/NTAP1/NTAP1_pdb1/soe_12.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-29_0n2m6jlr tag=ORACOPYBKUPONANF_LEVEL_0 RECID=12
STAMP=1164140082
channel c2: datafile copy complete, elapsed time: 01:06:01
channel c2: starting datafile copy
input datafile file number=00001
name=/u02/oradata/NTAP1/system01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-30_0o2m6jlr tag=ORACOPYBKUPONANF_LEVEL_0 RECID=13
STAMP=1164140190
channel c4: datafile copy complete, elapsed time: 01:07:49
channel c4: starting datafile copy
input datafile file number=00003
name=/u02/oradata/NTAP1/sysaux01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSTEM_FNO-1_0r2m6nhk tag=ORACOPYBKUPONANF_LEVEL_0 RECID=14
STAMP=1164140240
channel c2: datafile copy complete, elapsed time: 00:02:38
channel c2: starting datafile copy
input datafile file number=00004
name=/u02/oradata/NTAP1/undotbs01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
UNDOTBS1_FNO-4_0t2m6nml tag=ORACOPYBKUPONANF_LEVEL_0 RECID=15
STAMP=1164140372
channel c2: datafile copy complete, elapsed time: 00:02:15
channel c2: starting datafile copy
input datafile file number=00011
name=/u02/oradata/NTAP1/NTAP1_pdb1/undotbs01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSAux_FNO-3_0s2m6n1l tag=ORACOPYBKUPONANF_LEVEL_0 RECID=16
STAMP=1164140377
channel c4: datafile copy complete, elapsed time: 00:03:01
channel c4: starting datafile copy
input datafile file number=00010
name=/u02/oradata/NTAP1/NTAP1_pdb1/sysaux01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-32_0q2m6jsi tag=ORACOPYBKUPONANF_LEVEL_0 RECID=17
STAMP=1164140385
channel c1: datafile copy complete, elapsed time: 01:07:29
channel c1: starting datafile copy
input datafile file number=00014
name=/u02/oradata/NTAP1/NTAP1_pdb2/sysaux01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SOE_FNO-31_0p2m6jrb tag=ORACOPYBKUPONANF_LEVEL_0 RECID=18
STAMP=1164140406
```

```
channel c3: datafile copy complete, elapsed time: 01:08:31
channel c3: starting datafile copy
input datafile file number=00018
name=/u02/oradata/NTAP1/NTAP1_pdb3/sysaux01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSAUX_FNO-10_0v2m6nqs tag=ORACOPYBKUPONANF_LEVEL_0 RECID=19
STAMP=1164140459
channel c4: datafile copy complete, elapsed time: 00:01:26
channel c4: starting datafile copy
input datafile file number=00006
name=/u02/oradata/NTAP1/pdbseed/sysaux01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSAUX_FNO-14_102m6nr3 tag=ORACOPYBKUPONANF_LEVEL_0 RECID=20
STAMP=1164140468
channel c1: datafile copy complete, elapsed time: 00:01:22
channel c1: starting datafile copy
input datafile file number=00009
name=/u02/oradata/NTAP1/NTAP1_pdb1/system01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
UNDOTBS1_FNO-11_0u2m6nqs tag=ORACOPYBKUPONANF_LEVEL_0 RECID=21
STAMP=1164140471
channel c2: datafile copy complete, elapsed time: 00:01:33
channel c2: starting datafile copy
input datafile file number=00013
name=/u02/oradata/NTAP1/NTAP1_pdb2/system01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSAUX_FNO-18_112m6nrt tag=ORACOPYBKUPONANF_LEVEL_0 RECID=22
STAMP=1164140476
channel c3: datafile copy complete, elapsed time: 00:00:57
channel c3: starting datafile copy
input datafile file number=00017
name=/u02/oradata/NTAP1/NTAP1_pdb3/system01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSAUX_FNO-6_122m6nti tag=ORACOPYBKUPONANF_LEVEL_0 RECID=23
STAMP=1164140488
channel c4: datafile copy complete, elapsed time: 00:00:25
channel c4: starting datafile copy
input datafile file number=00005
name=/u02/oradata/NTAP1/pdbseed/system01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSTEM_FNO-13_142m6ntp tag=ORACOPYBKUPONANF_LEVEL_0 RECID=24
STAMP=1164140532
channel c2: datafile copy complete, elapsed time: 00:01:06
channel c2: starting datafile copy
input datafile file number=00008
name=/u02/oradata/NTAP1/pdbseed/undotbs01.dbf
```

```
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSTEM_FNO-17_152m6nts tag=ORACOPYBKUPONANF_LEVEL_0 RECID=25
STAMP=1164140539
channel c3: datafile copy complete, elapsed time: 00:01:03
channel c3: starting datafile copy
input datafile file number=00015
name=/u02/oradata/NTAP1/NTAP1_pdb2/undotbs01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSTEM_FNO-9_132m6ntm tag=ORACOPYBKUPONANF_LEVEL_0 RECID=26
STAMP=1164140541
channel c1: datafile copy complete, elapsed time: 00:01:13
channel c1: starting datafile copy
input datafile file number=00019
name=/u02/oradata/NTAP1/NTAP1_pdb3/undotbs01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSTEM_FNO-5_162m6nuc tag=ORACOPYBKUPONANF_LEVEL_0 RECID=27
STAMP=1164140541
channel c4: datafile copy complete, elapsed time: 00:00:41
channel c4: starting datafile copy
input datafile file number=00007 name=/u02/oradata/NTAP1/users01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
UNDOTBS1_FNO-8_172m6nvr tag=ORACOPYBKUPONANF_LEVEL_0 RECID=28
STAMP=1164140552
channel c2: datafile copy complete, elapsed time: 00:00:16
channel c2: starting datafile copy
input datafile file number=00012
name=/u02/oradata/NTAP1/NTAP1_pdb1/users01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
UNDOTBS1_FNO-15_182m6nvs tag=ORACOPYBKUPONANF_LEVEL_0 RECID=30
STAMP=1164140561
channel c3: datafile copy complete, elapsed time: 00:00:24
channel c3: starting datafile copy
input datafile file number=00016
name=/u02/oradata/NTAP1/NTAP1_pdb2/users01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
USERS_FNO-7_1a2m6o01 tag=ORACOPYBKUPONANF_LEVEL_0 RECID=29
STAMP=1164140560
channel c4: datafile copy complete, elapsed time: 00:00:16
channel c4: starting datafile copy
input datafile file number=00020
name=/u02/oradata/NTAP1/NTAP1_pdb3/users01.dbf
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
UNDOTBS1_FNO-19_192m6nvv tag=ORACOPYBKUPONANF_LEVEL_0 RECID=31
STAMP=1164140564
channel c1: datafile copy complete, elapsed time: 00:00:21
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
```

```

USERS_FNO-12_1b2m6o0e tag=ORACOPYBKUPONANF_LEVEL_0 RECID=32
STAMP=1164140564
channel c2: datafile copy complete, elapsed time: 00:00:02
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
USERS_FNO-16_1c2m6o0k tag=ORACOPYBKUPONANF_LEVEL_0 RECID=34
STAMP=1164140565
channel c3: datafile copy complete, elapsed time: 00:00:01
output file name=/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
USERS_FNO-20_1d2m6o0k tag=ORACOPYBKUPONANF_LEVEL_0 RECID=33
STAMP=1164140565
channel c4: datafile copy complete, elapsed time: 00:00:01
Finished backup at 20-MAR-24

Starting Control File and SPFILE Autobackup at 20-MAR-24
piece
handle=/nfsanf/archlog/NTAP1/autobackup/2024_03_20/o1_mf_s_116414056
5_5g56ypks_.bkp comment=NONE
Finished Control File and SPFILE Autobackup at 20-MAR-24
released channel: c1
released channel: c2
released channel: c3
released channel: c4

RMAN> **end-of-file**

RMAN>

```

7. 列出備份後的資料庫映像副本，觀察在 ANF NFS 掛載點中是否建立了資料庫映像副本。

```

RMAN> list copy of database tag 'OraCopyBKUPonANF_level_0';

List of Datafile Copies
=====

Key          File S Completion Time Ckp SCN      Ckp Time      Sparse
-----
14           1      A 20-MAR-24          4161498      20-MAR-24      NO
           Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSTEM_FNO-1_0r2m6nhk
           Tag: ORACOPYBKUPONANF_LEVEL_0

16           3      A 20-MAR-24          4161568      20-MAR-24      NO
           Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSAUX_FNO-3_0s2m6n11
           Tag: ORACOPYBKUPONANF_LEVEL_0

```

15	4	A	20-MAR-24	4161589	20-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-4_0t2m6nml						
Tag: ORACOPYBKUPONANF_LEVEL_0						
27	5	A	20-MAR-24	2379694	18-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-5_162m6nuc						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 2, PDB Name: PDB\$SEED						
23	6	A	20-MAR-24	2379694	18-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-6_122m6nti						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 2, PDB Name: PDB\$SEED						
29	7	A	20-MAR-24	4161872	20-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-7_1a2m6o01						
Tag: ORACOPYBKUPONANF_LEVEL_0						
28	8	A	20-MAR-24	2379694	18-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-8_172m6nvr						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 2, PDB Name: PDB\$SEED						
26	9	A	20-MAR-24	4161835	20-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-9_132m6ntm						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 3, PDB Name: NTAP1_PDB1						
19	10	A	20-MAR-24	4161784	20-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-10_0v2m6nqs						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 3, PDB Name: NTAP1_PDB1						
21	11	A	20-MAR-24	4161780	20-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-11_0u2m6nqs						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 3, PDB Name: NTAP1_PDB1						

32	12	A	20-MAR-24	4161880	20-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS- USERS_FNO-12_1b2m6o0e					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 3, PDB Name: NTAP1_PDB1					
24	13	A	20-MAR-24	4161838	20-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS- SYSTEM_FNO-13_142m6ntp					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 4, PDB Name: NTAP1_PDB2					
20	14	A	20-MAR-24	4161785	20-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS- SYSAUX_FNO-14_102m6nr3					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 4, PDB Name: NTAP1_PDB2					
30	15	A	20-MAR-24	4161863	20-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS- UNDOTBS1_FNO-15_182m6nvs					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 4, PDB Name: NTAP1_PDB2					
34	16	A	20-MAR-24	4161884	20-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS- USERS_FNO-16_1c2m6o0k					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 4, PDB Name: NTAP1_PDB2					
25	17	A	20-MAR-24	4161841	20-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS- SYSTEM_FNO-17_152m6nts					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 5, PDB Name: NTAP1_PDB3					
22	18	A	20-MAR-24	4161810	20-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS- SYSAUX_FNO-18_112m6nrt					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 5, PDB Name: NTAP1_PDB3					
31	19	A	20-MAR-24	4161869	20-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS- UNDOTBS1_FNO-19_192m6nvv					
	Tag: ORACOPYBKUPONANF_LEVEL_0					

Container ID: 5, PDB Name: NTAP1_PDB3

```
33      20    A 20-MAR-24      4161887      20-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
      USERS_FNO-20_1d2m6o0k
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 5, PDB Name: NTAP1_PDB3

7       21    A 20-MAR-24      4152514      20-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
      21_0f2m6brl
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 3, PDB Name: NTAP1_PDB1

4       22    A 20-MAR-24      4152518      20-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
      22_0g2m6brl
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 3, PDB Name: NTAP1_PDB1

6       23    A 20-MAR-24      4152522      20-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
      23_0h2m6brl
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 3, PDB Name: NTAP1_PDB1

5       24    A 20-MAR-24      4152529      20-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
      24_0i2m6brl
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 3, PDB Name: NTAP1_PDB1

9       25    A 20-MAR-24      4156120      20-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
      25_0j2m6fol
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 3, PDB Name: NTAP1_PDB1

8       26    A 20-MAR-24      4156130      20-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
      26_0k2m6fot
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 3, PDB Name: NTAP1_PDB1

10      27    A 20-MAR-24      4156159      20-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
```

```

27_0l2m6frc
    Tag: ORACOPYBKUPONANF_LEVEL_0
    Container ID: 3, PDB Name: NTAP1_PDB1

11      28      A 20-MAR-24      4156183      20-MAR-24      NO
    Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
28_0m2m6fsu
    Tag: ORACOPYBKUPONANF_LEVEL_0
    Container ID: 3, PDB Name: NTAP1_PDB1

12      29      A 20-MAR-24      4158795      20-MAR-24      NO
    Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
29_0n2m6jlr
    Tag: ORACOPYBKUPONANF_LEVEL_0
    Container ID: 3, PDB Name: NTAP1_PDB1

13      30      A 20-MAR-24      4158803      20-MAR-24      NO
    Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
30_0o2m6jlr
    Tag: ORACOPYBKUPONANF_LEVEL_0
    Container ID: 3, PDB Name: NTAP1_PDB1

18      31      A 20-MAR-24      4158871      20-MAR-24      NO
    Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
31_0p2m6jrb
    Tag: ORACOPYBKUPONANF_LEVEL_0
    Container ID: 3, PDB Name: NTAP1_PDB1

17      32      A 20-MAR-24      4158886      20-MAR-24      NO
    Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
32_0q2m6jsi
    Tag: ORACOPYBKUPONANF_LEVEL_0
    Container ID: 3, PDB Name: NTAP1_PDB1

```

8. 從 Oracle RMAN 命令提示字元報告模式以觀察目前 VLDB 資料檔案是否位於主儲存上。

```

RMAN> report schema;

Report of database schema for database with db_unique_name NTAP1

List of Permanent Datafiles
=====
File Size(MB) Tablespace          RB segs Datafile Name
-----
1      1060      SYSTEM          YES

```

```

/u02/oradata/NTAP1/system01.dbf
3    1000    SYSAUX          NO
/u02/oradata/NTAP1/sysaux01.dbf
4    695     UNDOTBS1        YES
/u02/oradata/NTAP1/undotbs01.dbf
5    400     PDB$SEED:SYSTEM NO
/u02/oradata/NTAP1/pdbseed/system01.dbf
6    440     PDB$SEED:SYSAUX NO
/u02/oradata/NTAP1/pdbseed/sysaux01.dbf
7    5       USERS           NO
/u02/oradata/NTAP1/users01.dbf
8    235     PDB$SEED:UNDOTBS1 NO
/u02/oradata/NTAP1/pdbseed/undotbs01.dbf
9    410     NTAP1_PDB1:SYSTEM YES
/u02/oradata/NTAP1/NTAP1_pdb1/system01.dbf
10   520     NTAP1_PDB1:SYSAUX NO
/u02/oradata/NTAP1/NTAP1_pdb1/sysaux01.dbf
11   580     NTAP1_PDB1:UNDOTBS1 YES
/u02/oradata/NTAP1/NTAP1_pdb1/undotbs01.dbf
12   5       NTAP1_PDB1:USERS NO
/u02/oradata/NTAP1/NTAP1_pdb1/users01.dbf
13   410     NTAP1_PDB2:SYSTEM YES
/u02/oradata/NTAP1/NTAP1_pdb2/system01.dbf
14   500     NTAP1_PDB2:SYSAUX NO
/u02/oradata/NTAP1/NTAP1_pdb2/sysaux01.dbf
15   235     NTAP1_PDB2:UNDOTBS1 YES
/u02/oradata/NTAP1/NTAP1_pdb2/undotbs01.dbf
16   5       NTAP1_PDB2:USERS NO
/u02/oradata/NTAP1/NTAP1_pdb2/users01.dbf
17   410     NTAP1_PDB3:SYSTEM YES
/u02/oradata/NTAP1/NTAP1_pdb3/system01.dbf
18   500     NTAP1_PDB3:SYSAUX NO
/u02/oradata/NTAP1/NTAP1_pdb3/sysaux01.dbf
19   235     NTAP1_PDB3:UNDOTBS1 YES
/u02/oradata/NTAP1/NTAP1_pdb3/undotbs01.dbf
20   5       NTAP1_PDB3:USERS NO
/u02/oradata/NTAP1/NTAP1_pdb3/users01.dbf
21   31744   NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_01.dbf
22   31744   NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_02.dbf
23   31744   NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_03.dbf
24   31744   NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_04.dbf
25   31744   NTAP1_PDB1:SOE NO

```

```

/u02/oradata/NTAP1/NTAP1_pdb1/soe_05.dbf
26 31744 NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_06.dbf
27 31744 NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_07.dbf
28 31744 NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_08.dbf
29 31744 NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_09.dbf
30 31744 NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_10.dbf
31 31744 NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_11.dbf
32 31744 NTAP1_PDB1:SOE NO
/u02/oradata/NTAP1/NTAP1_pdb1/soe_12.dbf

```

List of Temporary Files

=====

File	Size (MB)	Tablespace	Maxsize (MB)	Tempfile Name
1	123	TEMP	32767	/u02/oradata/NTAP1/temp01.dbf
2	123	PDB\$SEED:TEMP	32767	/u02/oradata/NTAP1/pdbseed/temp012024-03-18_16-07-32-463-PM.dbf
3	31744	NTAP1_PDB1:TEMP	32767	/u02/oradata/NTAP1/NTAP1_pdb1/temp01.dbf
4	123	NTAP1_PDB2:TEMP	32767	/u02/oradata/NTAP1/NTAP1_pdb2/temp01.dbf
5	123	NTAP1_PDB3:TEMP	32767	/u02/oradata/NTAP1/NTAP1_pdb3/temp01.dbf
6	31744	NTAP1_PDB1:TEMP	31744	/u02/oradata/NTAP1/NTAP1_pdb1/temp02.dbf

RMAN>

9. 驗證來自 OS NFS 掛載點的資料庫映像副本。

```

[oracle@ora-01 ~]$ ls -l /nfsanf/oracopy
total 399482176
-rw-r----- 1 oracle oinstall 11600384 Mar 20 21:44 bct_ntap1.ctf
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 18:03 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-21_0f2m6brl
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 18:01 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-22_0g2m6brl
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 18:03 data_D-

```

```

NTAP1_I-2441823937_TS-SOE_FNO-23_0h2m6brl
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 18:02 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-24_0i2m6brl
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 19:08 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-25_0j2m6fol
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 19:08 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-26_0k2m6fot
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 19:11 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-27_0l2m6frc
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 19:12 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-28_0m2m6fsu
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 20:14 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-29_0n2m6jlr
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 20:16 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-30_0o2m6jlr
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 20:20 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-31_0p2m6jrb
-rw-r----- 1 oracle oinstall 33286004736 Mar 20 20:19 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-32_0q2m6jsi
-rw-r----- 1 oracle oinstall 545267712 Mar 20 20:20 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-10_0v2m6nqs
-rw-r----- 1 oracle oinstall 524296192 Mar 20 20:21 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-14_102m6nr3
-rw-r----- 1 oracle oinstall 524296192 Mar 20 20:21 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-18_112m6nrt
-rw-r----- 1 oracle oinstall 1048584192 Mar 20 20:19 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-3_0s2m6nl1
-rw-r----- 1 oracle oinstall 461381632 Mar 20 20:21 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-6_122m6nti
-rw-r----- 1 oracle oinstall 1111498752 Mar 20 20:17 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-1_0r2m6nhk
-rw-r----- 1 oracle oinstall 429924352 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-13_142m6ntp
-rw-r----- 1 oracle oinstall 429924352 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-17_152m6nts
-rw-r----- 1 oracle oinstall 419438592 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-5_162m6nuc
-rw-r----- 1 oracle oinstall 429924352 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-9_132m6ntm
-rw-r----- 1 oracle oinstall 608182272 Mar 20 20:21 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-11_0u2m6nqs
-rw-r----- 1 oracle oinstall 246423552 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-15_182m6nvs
-rw-r----- 1 oracle oinstall 246423552 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-19_192m6nvv
-rw-r----- 1 oracle oinstall 728768512 Mar 20 20:19 data_D-

```

```
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-4_0t2m6nml
-rw-r----- 1 oracle oinstall 246423552 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-8_172m6nvr
-rw-r----- 1 oracle oinstall 5251072 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-USERS_FNO-12_1b2m6o0e
-rw-r----- 1 oracle oinstall 5251072 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-USERS_FNO-16_1c2m6o0k
-rw-r----- 1 oracle oinstall 5251072 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-USERS_FNO-20_1d2m6o0k
-rw-r----- 1 oracle oinstall 5251072 Mar 20 20:22 data_D-
NTAP1_I-2441823937_TS-USERS_FNO-7_1a2m6o01
[oracle@ora-01 ~]$
```

這樣就完成了 Oracle VLDB 備用映像副本備份和合併的設定。

將 **Oracle VLDB** 切換到映像副本以實現快速恢復

如果因主儲存問題（例如資料遺失或損壞）而發生故障，資料庫可以快速切換到 ANF NFS 掛載上的映像副本，並恢復到目前狀態，而無需資料庫還原。消除媒體復原可大幅加快 VLDB 的資料庫復原速度。此用例假設 Oracle VLDB DB 伺服器完好無損，且資料庫控制文件、存檔日誌和目前日誌均可供復原。

1. 以 oracle 使用者登入 Azure 主 VLDB 伺服器主機，並在切換之前建立測試表。

```
[oracle@ora-01 ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Mar 21 15:13:52
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 NTAP1_PDB1                                READ WRITE NO
          4 NTAP1_PDB2                                READ WRITE NO
          5 NTAP1_PDB3                                READ WRITE NO

SQL> alter session set container=ntap1_pdb1;

Session altered.

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

Table created.

SQL> insert into test values(1, sysdate, 'test oracle incremental
merge switch to copy');

1 row created.

SQL> commit;

Commit complete.
```

```
SQL> select * from test;

          ID
-----
DT
-----
EVENT
-----
          1
21-MAR-24 03.15.03.000000 PM
test oracle incremental merge switch to copy
```

2. 透過關閉中止資料庫來模擬故障，然後在掛載階段啟動 oracle。

```
SQL> shutdown abort;
ORACLE instance shut down.
SQL> startup mount;
ORACLE instance started.

Total System Global Area 6442449688 bytes
Fixed Size                  9177880 bytes
Variable Size              1325400064 bytes
Database Buffers          5100273664 bytes
Redo Buffers                7598080 bytes
Database mounted.
SQL> exit
```

3. 以 oracle 使用者身份，透過 RMAN 連接到 Oracle 資料庫切換要複製的資料庫。

```
[oracle@ora-01 ~]$ rman target / nocatalog

Recovery Manager: Release 19.0.0.0.0 - Production on Thu Mar 21
15:20:58 2024
Version 19.18.0.0.0

Copyright (c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

connected to target database: NTAP1 (DBID=2441823937, not open)
using target database control file instead of recovery catalog

RMAN> switch database to copy;
```

datafile 1 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-1_0r2m6nhk"
datafile 3 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-3_0s2m6n11"
datafile 4 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-4_0t2m6nml"
datafile 5 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-5_162m6nuc"
datafile 6 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-6_122m6nti"
datafile 7 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-7_1a2m6o01"
datafile 8 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-8_172m6nvr"
datafile 9 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-9_132m6ntm"
datafile 10 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-10_0v2m6nqs"
datafile 11 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-11_0u2m6nqs"
datafile 12 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-12_1b2m6o0e"
datafile 13 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-13_142m6ntp"
datafile 14 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-14_102m6nr3"
datafile 15 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-15_182m6nvs"
datafile 16 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-16_1c2m6o0k"
datafile 17 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-17_152m6nts"
datafile 18 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-18_112m6nrt"
datafile 19 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-19_192m6nvv"
datafile 20 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-20_1d2m6o0k"
datafile 21 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-21_0f2m6brl"
datafile 22 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-22_0g2m6brl"
datafile 23 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-23_0h2m6brl"
datafile 24 switched to datafile copy "/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-24_0i2m6brl"

```
datafile 25 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-25_0j2m6fol"
datafile 26 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-26_0k2m6fot"
datafile 27 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-27_0l2m6frc"
datafile 28 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-28_0m2m6fsu"
datafile 29 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-29_0n2m6jlr"
datafile 30 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-30_0o2m6jlr"
datafile 31 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-31_0p2m6jrb"
datafile 32 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-32_0q2m6jsi"
```

4. 還原並開啟資料庫，使其從上次增量備份更新到目前狀態。

```
RMAN> recover database;

Starting recover at 21-MAR-24
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=392 device type=DISK
channel ORA_DISK_1: starting incremental datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup
set
destination for restore of datafile 00009: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-9_0q1sd7cm
destination for restore of datafile 00023: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-23_041sd6s5
destination for restore of datafile 00027: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-27_081sd70i
destination for restore of datafile 00031: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-31_0c1sd74u
destination for restore of datafile 00034: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-34_0f1sd788
channel ORA_DISK_1: reading from backup piece
/nfsanf/oracopy/321sfous_98_1_1
channel ORA_DISK_1: piece handle=/nfsanf/oracopy/321sfous_98_1_1
tag=ORACOPYBKUPONANF_LEVEL_0
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01
channel ORA_DISK_1: starting incremental datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup
```

```

set
destination for restore of datafile 00010: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-10_0k1sd7bb
destination for restore of datafile 00021: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-21_021sd6pv
destination for restore of datafile 00025: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-25_061sd6uc
.
.
.
channel ORA_DISK_1: starting incremental datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup
set
destination for restore of datafile 00016: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-USERS_FNO-16_121sd7dn
channel ORA_DISK_1: reading from backup piece
/nfsanf/oracopy/3i1sf0v0_114_1_1
channel ORA_DISK_1: piece handle=/nfsanf/oracopy/3i1sf0v0_114_1_1
tag=ORACOPYBKUPONANF_LEVEL_0
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01
channel ORA_DISK_1: starting incremental datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup
set
destination for restore of datafile 00020: /nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-USERS_FNO-20_131sd7do
channel ORA_DISK_1: reading from backup piece
/nfsanf/oracopy/3j1sf0v0_115_1_1
channel ORA_DISK_1: piece handle=/nfsanf/oracopy/3j1sf0v0_115_1_1
tag=ORACOPYBKUPONANF_LEVEL_0
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01

starting media recovery
media recovery complete, elapsed time: 00:00:01

Finished recover at 21-MAR-24

RMAN> alter database open;

Statement processed

RMAN>

```

5. 復原後從 sqlplus 檢查資料庫結構，觀察到除控制、臨時和目前日誌檔案之外的所有 VLDB 資料檔案現在都已切換到 ANF NFS 檔案系統上的副本。

```

SQL> select name from v$datafile
      2 union
      3 select name from v$tempfile
      4 union
      5 select name from v$controlfile
      6 union
      7* select member from v$logfile
SQL> /

```

NAME

```

-----
-----
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-21_0f2m6brl
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-22_0g2m6brl
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-23_0h2m6brl
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-24_0i2m6brl
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-25_0j2m6fol
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-26_0k2m6fot
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-27_0l2m6frc
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-28_0m2m6fsu
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-29_0n2m6jlr
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-30_0o2m6jlr
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-31_0p2m6jrb

```

NAME

```

-----
-----
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-32_0q2m6jsi
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-10_0v2m6nqs
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-14_102m6nr3
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-18_112m6nrt
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-3_0s2m6nll
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-6_122m6nti
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-13_142m6ntp
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-17_152m6nts
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-1_0r2m6nhk
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-5_162m6nuc
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-9_132m6ntm

```

NAME

```

-----
-----
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-
11_0u2m6nqs
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-

```

```

15_182m6nvs
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-
19_192m6nvv
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-4_0t2m6nm1
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-8_172m6nvr
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-12_1b2m6o0e
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-16_1c2m6o0k
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-20_1d2m6o0k
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-7_1a2m6o01
/u02/oradata/NTAP1/NTAP1_pdb1/temp01.dbf
/u02/oradata/NTAP1/NTAP1_pdb1/temp02.dbf

NAME
-----
-----
/u02/oradata/NTAP1/NTAP1_pdb2/temp01.dbf
/u02/oradata/NTAP1/NTAP1_pdb3/temp01.dbf
/u02/oradata/NTAP1/control01ctl
/u02/oradata/NTAP1/pdbseed/temp012024-03-18_16-07-32-463-PM.dbf
/u02/oradata/NTAP1/temp01.dbf
/u03/orareco/NTAP1/control02.ctl
/u03/orareco/NTAP1/onlinelog/redo01.log
/u03/orareco/NTAP1/onlinelog/redo02.log
/u03/orareco/NTAP1/onlinelog/redo03.log

42 rows selected.

```

6. 從 SQL plus 中，檢查在切換到複製之前我們插入的測試表的內容。

```

SQL> alter session set container=ntapl_pdb1;

Session altered.

SQL> select * from test;

          ID
-----
DT
-----
EVENT
-----
          1
21-MAR-24 03.15.03.000000 PM
test oracle incremental merge switch to copy

SQL>

```

7. 您可以在 ANF NFS 掛載中執行 Oracle VLDB 較長時間，同時保持預期的效能水準。當主儲存問題解決後，您可以透過逆轉增量備份合併過程，以最少的停機時間恢復原狀。

Oracle VLDB 從映像複製到備用資料庫伺服器的恢復

如果發生故障，主儲存和主資料庫伺服器主機都會遺失，則無法從原始伺服器進行復原。但是，ANF NFS 檔案系統上提供的 Oracle 資料庫備份映像副本會很方便。您可以使用備份映像副本快速將主資料庫還原到備用資料庫伺服器（如果有）。在本節中，我們將示範此類恢復的逐步過程。

1. 在我們之前為 Oracle VLDB 還原到備用主機驗證而建立的測試表中插入一行。

```
SQL> insert into test values(2, sysdate, 'test recovery on a new
Azure VM host with image copy on ANF');
```

```
1 row created.
```

```
SQL> commit;
```

```
Commit complete.
```

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

```
          ID
-----
DT
-----
EVENT
-----
          1
21-MAR-24 03.15.03.000000 PM
test oracle incremental merge switch to copy

          2
22-MAR-24 02.22.06.000000 PM
test recovery on a new Azure VM host with image copy on ANF
```

```
          ID
-----
DT
-----
EVENT
-----
```

```
SQL>
```

2. 以 oracle 使用者身分執行 RMAN 增量備份並合併以將交易刷新到 ANF NFS 掛載上的備份集。

```
[oracle@ip-172-30-15-99 ~]$ rman target / nocatalog

Recovery Manager: Release 19.0.0.0.0 - Production on Tue May 30
17:26:03 2023
Version 19.18.0.0.0

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reserved.

connected to target database: NTAP1 (DBID=2441823937)
using target database control file instead of recovery catalog

RMAN> @rman_bkup_merge.cmd
```

3. 關閉主 VLDB 伺服器主機以模擬儲存和 DB 伺服器主機的完全故障。
4. 在具有相同作業系統和版本的備用資料庫伺服器 ora-02 上，作業系統核心應與主 VLDB 伺服器主機一樣進行修補。此外，已在僅使用軟體選項的備用資料庫伺服器上安裝和設定了相同版本和修補程式的 Oracle。
5. 配置與主 VLDB 伺服器 ora_01 類似的 oracle 環境，例如 oratab 和 oracle 使用者 .bash_profile 等。將這些檔案備份到 ANF NFS 掛載點是一種很好的做法。
6. 然後將 ANF NFS 檔案系統上的 Oracle 資料庫備份映像副本安裝在備用 DB 伺服器上以進行還原。以下步驟示範了流程的細節。

以 azueruser 身分建立掛載點。

```
sudo mkdir /nfsanf
```

以 azureuser 身分掛載儲存 Oracle VLDB 備份映像副本的 NFS 磁碟區。

```
sudo mount 172.30.136.68:/ora-01-u02-copy /nfsanf -o
rw,bg,hard,vers=3,proto=tcp,timeo=600,rsize=262144,wsiz=262144,noi
tr
```

7. 驗證 ANF NFS 掛載點上的 Oracle 資料庫備份映像副本。

```
[oracle@ora-02 ~]$ ls -ltr /nfsanf/oracopy/
total 400452728
-rw-r-----. 1 oracle oinstall 461381632 Mar 21 23:47 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-6_242m9oan
-rw-r-----. 1 oracle oinstall 419438592 Mar 21 23:49 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-5_282m9oem
```

```

-rw-r-----. 1 oracle oinstall 246423552 Mar 21 23:49 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-8_292m9oem
-rw-r-----. 1 oracle oinstall 21438464 Mar 22 14:35
2h2mbccv_81_1_1
-rw-r-----. 1 oracle oinstall 17956864 Mar 22 14:35
2i2mbcd0_82_1_1
-rw-r-----. 1 oracle oinstall 17956864 Mar 22 14:35
2j2mbcd1_83_1_1
-rw-r-----. 1 oracle oinstall 15245312 Mar 22 14:35
2k2mbcd3_84_1_1
-rw-r-----. 1 oracle oinstall 1638400 Mar 22 14:35
2m2mbcdn_86_1_1
-rw-r-----. 1 oracle oinstall 40042496 Mar 22 14:35
2l2mbcdn_85_1_1
-rw-r-----. 1 oracle oinstall 21856256 Mar 22 14:35
2n2mbcdo_87_1_1
-rw-r-----. 1 oracle oinstall 3710976 Mar 22 14:35
2o2mbcdv_88_1_1
-rw-r-----. 1 oracle oinstall 3416064 Mar 22 14:35
2p2mbcdv_89_1_1
-rw-r-----. 1 oracle oinstall 2596864 Mar 22 14:35
2r2mbce0_91_1_1
-rw-r-----. 1 oracle oinstall 2531328 Mar 22 14:35
2s2mbce1_92_1_1
-rw-r-----. 1 oracle oinstall 4718592 Mar 22 14:35
2v2mbce2_95_1_1
-rw-r-----. 1 oracle oinstall 4243456 Mar 22 14:35
302mbce2_96_1_1
-rw-r-----. 1 oracle oinstall 57344 Mar 22 14:35
312mbce3_97_1_1
-rw-r-----. 1 oracle oinstall 57344 Mar 22 14:35
322mbce3_98_1_1
-rw-r-----. 1 oracle oinstall 57344 Mar 22 14:35
332mbce3_99_1_1
-rw-r-----. 1 oracle oinstall 608182272 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-11_202m9o22
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-30_1q2m9k7a
-rw-r-----. 1 oracle oinstall 555753472 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-10_212m9o52
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-26_1m2m9g9j
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-27_1n2m9gcg
-rw-r-----. 1 oracle oinstall 429924352 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-9_252m9oc5

```

```
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-22_1i2m9cap
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-23_1j2m9cap
-rw-r-----. 1 oracle oinstall      5251072 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-USERS_FNO-12_2d2m9ofs
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-28_1o2m9gd4
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-31_1r2m9kfk
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-29_1p2m9ju6
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-32_1s2m9kgg
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-25_1l2m9g3u
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-24_1k2m9cap
-rw-r-----. 1 oracle oinstall 33286004736 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SOE_FNO-21_1h2m9cap
-rw-r-----. 1 oracle oinstall 1121984512 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-1_1t2m9nij
-rw-r-----. 1 oracle oinstall 1142956032 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-3_1u2m9nog
-rw-r-----. 1 oracle oinstall   728768512 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-4_1v2m9nu6
-rw-r-----. 1 oracle oinstall   534781952 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-14_222m9o53
-rw-r-----. 1 oracle oinstall   534781952 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-18_232m9oa8
-rw-r-----. 1 oracle oinstall   429924352 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-13_262m9oca
-rw-r-----. 1 oracle oinstall   246423552 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-15_2a2m9of6
-rw-r-----. 1 oracle oinstall   429924352 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-17_272m9oel
-rw-r-----. 1 oracle oinstall      5251072 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-USERS_FNO-7_2c2m9ofn
-rw-r-----. 1 oracle oinstall      5251072 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-USERS_FNO-16_2e2m9og8
-rw-r-----. 1 oracle oinstall   246423552 Mar 22 15:31 data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-19_2b2m9ofn
-rw-r-----. 1 oracle oinstall      5251072 Mar 22 15:32 data_D-
NTAP1_I-2441823937_TS-USERS_FNO-20_2f2m9og8
-rw-r-----. 1 oracle oinstall   76546048 Mar 22 15:37
362mbft5_102_1_1
```

```

-rw-r-----. 1 oracle oinstall      14671872 Mar 22 15:37
392mbg1i_105_1_1
-rw-r-----. 1 oracle oinstall      79462400 Mar 22 15:37
372mbftb_103_1_1
-rw-r-----. 1 oracle oinstall        917504 Mar 22 15:37
3a2mbg23_106_1_1
-rw-r-----. 1 oracle oinstall    428498944 Mar 22 15:37
352mbfst_101_1_1
-rw-r-----. 1 oracle oinstall    88702976 Mar 22 15:37
382mbftm_104_1_1
-rw-r-----. 1 oracle oinstall     5021696 Mar 22 15:37
3b2mbg2b_107_1_1
-rw-r-----. 1 oracle oinstall      278528 Mar 22 15:38
3c2mbg2f_108_1_1
-rw-r-----. 1 oracle oinstall      278528 Mar 22 15:38
3d2mbg2i_109_1_1
-rw-r-----. 1 oracle oinstall      425984 Mar 22 15:38
3f2mbg2m_111_1_1
-rw-r-----. 1 oracle oinstall     442368 Mar 22 15:38
3g2mbg2q_112_1_1
-rw-r-----. 1 oracle oinstall      278528 Mar 22 15:38
3j2mbg37_115_1_1
-rw-r-----. 1 oracle oinstall     270336 Mar 22 15:38
3k2mbg3a_116_1_1
-rw-r-----. 1 oracle oinstall       57344 Mar 22 15:38
3l2mbg3f_117_1_1
-rw-r-----. 1 oracle oinstall       57344 Mar 22 15:38
3n2mbg3k_119_1_1
-rw-r-----. 1 oracle oinstall       57344 Mar 22 15:38
3m2mbg3g_118_1_1
-rw-r-----. 1 oracle oinstall    11600384 Mar 22 15:52 bct_ntap1.ctf
[oracle@ora-02 ~]$

```

8. 驗證 ANF NFS 掛載上可用的 Oracle 存檔日誌以進行恢復，並記下最後一個日誌檔案日誌序號。在本例中為 10。我們的恢復點最多到日誌序號 11。

```

[oracle@ora-02 ~]$ ls -ltr
/nfsanf/archlog/NTAP1/archivelog/2024_03_22
total 1429548
-r--r-----. 1 oracle oinstall 176650752 Mar 22 12:00
o1_mf_1_2__9m198x6t_.arc
-r--r-----. 1 oracle oinstall 17674752 Mar 22 14:34
o1_mf_1_3__9vn701r5_.arc
-r--r-----. 1 oracle oinstall 188782080 Mar 22 15:20
o1_mf_1_4__9y6gn5co_.arc
-r--r-----. 1 oracle oinstall 183638016 Mar 22 15:21
o1_mf_1_5__9y7p68s6_.arc
-r--r-----. 1 oracle oinstall 193106944 Mar 22 15:21
o1_mf_1_6__9y8ygtss_.arc
-r--r-----. 1 oracle oinstall 179439104 Mar 22 15:22
o1_mf_1_7__9ybjdp55_.arc
-r--r-----. 1 oracle oinstall 198815232 Mar 22 15:23
o1_mf_1_8__9yctxjgy_.arc
-r--r-----. 1 oracle oinstall 185494528 Mar 22 15:24
o1_mf_1_9__9yfrj0b1_.arc
-r--r-----. 1 oracle oinstall 134470144 Mar 22 15:29
o1_mf_1_10__9yomybbc_.arc
[oracle@ora-02 ~]$

```

9. 以 oracle 使用者身份，將 ORACLE_HOME 變數設定為備用 DB 伺服器 ora-02 上的目前 Oracle 安裝，將 ORACLE_SID 設定為主 Oracle 實例 SID。在這種情況下，它是 NTAP1。

```

[oracle@ora-02 ~]$ export
ORACLE_HOME=/u01/app/oracle/product/19.0.0/NTAP2
[oracle@ora-02 ~]$ export ORACLE_SID=NTAP1
[oracle@ora-02 ~]$ export PATH=$PATH:$ORACLE_HOME/bin

```

10. 以 oracle 使用者身份，在 \$ORACLE_HOME/dbs 目錄中建立一個通用 Oracle 初始化文件，並配置適當的管理目錄。最重要的是，擁有 Oracle flash recovery area 指向主 Oracle VLDB 伺服器中定義的 ANF NFS 掛載路徑。`flash recovery area` 配置在章節中進行了演示 `Setup Oracle RMAN incremental merge to image copy on ANF`。將 Oracle 控制檔設定為 ANF NFS 檔案系統。

```
vi $ORACLE_HOME/dbs/initNTAP1.ora
```

使用以下範例條目：

```
*.audit_file_dest='/u01/app/oracle/admin/NTAP1/adump'  
*.audit_trail='db'  
*.compatible='19.0.0'  
*.control_files=('/nfsanf/oracopy/NTAP1.ctl')  
*.db_block_size=8192  
*.db_create_file_dest='/nfsanf/oracopy/'  
*.db_domain='solutions.netapp.com'  
*.db_name='NTAP1'  
*.db_recovery_file_dest_size=85899345920  
*.db_recovery_file_dest='/nfsanf/archlog/'  
*.diagnostic_dest='/u01/app/oracle'  
*.dispatchers='(PROTOCOL=TCP) (SERVICE=NTAP1XDB)'  
*.enable_pluggable_database=true  
*.local_listener='LISTENER'  
*.nls_language='AMERICAN'  
*.nls_territory='AMERICA'  
*.open_cursors=300  
*.pga_aggregate_target=1024m  
*.processes=320  
*.remote_login_passwordfile='EXCLUSIVE'  
*.sga_target=10240m  
*.undo_tablespace='UNDOTBS1'
```

如果出現差異，則應使用從主 Oracle VLDB 伺服器復原的備份初始化檔案取代上述初始化檔案。

11. 以 oracle 使用者身分啟動 RMAN 在備用資料庫伺服器主機上執行 Oracle 復原。首先，啟動 Oracle 實例 `nomount` 狀態。

```
[oracle@ora-02 ~]$ rman target / nocatalog

Recovery Manager: Release 19.0.0.0.0 - Production on Fri Mar 22
16:02:55 2024
Version 19.18.0.0.0

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reserved.

connected to target database (not started)

RMAN> startup nomount;

Oracle instance started

Total System Global Area      10737418000 bytes

Fixed Size                     9174800 bytes
Variable Size                  1577058304 bytes
Database Buffers               9126805504 bytes
Redo Buffers                    24379392 bytes
```

12. 設定資料庫ID。可以從 ANF NFS 掛載點上的映像副本的 Oracle 檔案名稱中檢索資料庫 ID。

```
RMAN> set dbid = 2441823937;

executing command: SET DBID
```

13. 從自動備份還原控制檔。如果啟用了 Oracle 控制檔案和 spfile 自動備份，則它們會在每個增量備份和合併週期中備份。如果有多個副本可用，將還原最新的備份。

```

RMAN> restore controlfile from autobackup;

Starting restore at 22-MAR-24
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=2 device type=DISK

recovery area destination: /nfsanf/archlog/
database name (or database unique name) used for search: NTAP1
channel ORA_DISK_1: AUTOBACKUP
/nfsanf/archlog/NTAP1/autobackup/2024_03_22/o1_mf_s_1164296325__9z77
zyxb_.bkp found in the recovery area
channel ORA_DISK_1: looking for AUTOBACKUP on day: 20240322
channel ORA_DISK_1: restoring control file from AUTOBACKUP
/nfsanf/archlog/NTAP1/autobackup/2024_03_22/o1_mf_s_1164296325__9z77
zyxb_.bkp
channel ORA_DISK_1: control file restore from AUTOBACKUP complete
output file name=/nfsanf/oracopy/NTAP1.ctl
Finished restore at 22-MAR-24

```

14. 將初始化檔案從 spfile 還原到 /tmp 資料夾，以便稍後更新參數檔案以與主 VLDB 相符。

```

RMAN> restore spfile to pfile '/tmp/archive/initNTAP1.ora' from
autobackup;

Starting restore at 22-MAR-24
using channel ORA_DISK_1

recovery area destination: /nfsanf/archlog/
database name (or database unique name) used for search: NTAP1
channel ORA_DISK_1: AUTOBACKUP
/nfsanf/archlog/NTAP1/autobackup/2024_03_22/o1_mf_s_1164296325__9z77
zyxb_.bkp found in the recovery area
channel ORA_DISK_1: looking for AUTOBACKUP on day: 20240322
channel ORA_DISK_1: restoring spfile from AUTOBACKUP
/nfsanf/archlog/NTAP1/autobackup/2024_03_22/o1_mf_s_1164296325__9z77
zyxb_.bkp
channel ORA_DISK_1: SPFILE restore from AUTOBACKUP complete
Finished restore at 22-MAR-24

```

15. 掛載控制檔並驗證資料庫備份映像副本。

```

RMAN> alter database mount;

released channel: ORA_DISK_1

```

Statement processed

RMAN> list copy of database tag 'ORACOPYBKUPONANF_LEVEL_0';

List of Datafile Copies

=====

Key	File	S	Completion Time	Ckp SCN	Ckp Time	Sparse
82	1	A	22-MAR-24	4598427	22-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-1_1t2m9nij					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
83	3	A	22-MAR-24	4598423	22-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-3_1u2m9nog					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
84	4	A	22-MAR-24	4598431	22-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-4_1v2m9nu6					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
58	5	A	21-MAR-24	2379694	18-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-5_282m9oem					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 2, PDB Name: PDB\$SEED					
52	6	A	21-MAR-24	2379694	18-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-6_242m9oan					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 2, PDB Name: PDB\$SEED					
90	7	A	22-MAR-24	4598462	22-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-7_2c2m9ofn					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
59	8	A	21-MAR-24	2379694	18-MAR-24	NO
	Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-8_292m9oem					
	Tag: ORACOPYBKUPONANF_LEVEL_0					
	Container ID: 2, PDB Name: PDB\$SEED					

71	9	A	22-MAR-24	4598313	22-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-						
SYSTEM_FNO-9_252m9oc5						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 3, PDB Name: NTAP1_PDB1						
68	10	A	22-MAR-24	4598308	22-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-						
SYSAUX_FNO-10_212m9o52						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 3, PDB Name: NTAP1_PDB1						
66	11	A	22-MAR-24	4598304	22-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-						
UNDOTBS1_FNO-11_202m9o22						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 3, PDB Name: NTAP1_PDB1						
74	12	A	22-MAR-24	4598318	22-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-						
USERS_FNO-12_2d2m9ofs						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 3, PDB Name: NTAP1_PDB1						
86	13	A	22-MAR-24	4598445	22-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-						
SYSTEM_FNO-13_262m9oca						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 4, PDB Name: NTAP1_PDB2						
85	14	A	22-MAR-24	4598437	22-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-						
SYSAUX_FNO-14_222m9o53						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 4, PDB Name: NTAP1_PDB2						
87	15	A	22-MAR-24	4598454	22-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-						
UNDOTBS1_FNO-15_2a2m9of6						
Tag: ORACOPYBKUPONANF_LEVEL_0						
Container ID: 4, PDB Name: NTAP1_PDB2						
89	16	A	22-MAR-24	4598466	22-MAR-24	NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-						
USERS_FNO-16_2e2m9og8						
Tag: ORACOPYBKUPONANF_LEVEL_0						

```

Container ID: 4, PDB Name: NTAP1_PDB2

91      17      A 22-MAR-24      4598450      22-MAR-24      NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSTEM_FNO-17_272m9oel
Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 5, PDB Name: NTAP1_PDB3

88      18      A 22-MAR-24      4598441      22-MAR-24      NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
SYSAUX_FNO-18_232m9oa8
Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 5, PDB Name: NTAP1_PDB3

92      19      A 22-MAR-24      4598458      22-MAR-24      NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
UNDOTBS1_FNO-19_2b2m9ofn
Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 5, PDB Name: NTAP1_PDB3

93      20      A 22-MAR-24      4598470      22-MAR-24      NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-
USERS_FNO-20_2f2m9og8
Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 5, PDB Name: NTAP1_PDB3

81      21      A 22-MAR-24      4598318      22-MAR-24      NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
21_1h2m9cap
Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

72      22      A 22-MAR-24      4598304      22-MAR-24      NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
22_1i2m9cap
Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

73      23      A 22-MAR-24      4598308      22-MAR-24      NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
23_1j2m9cap
Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

80      24      A 22-MAR-24      4598313      22-MAR-24      NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-

```

24_1k2m9cap

Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

79 25 A 22-MAR-24 4598318 22-MAR-24 NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-

25_112m9g3u

Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

69 26 A 22-MAR-24 4598304 22-MAR-24 NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-

26_1m2m9g9j

Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

70 27 A 22-MAR-24 4598308 22-MAR-24 NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-

27_1n2m9gcg

Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

75 28 A 22-MAR-24 4598313 22-MAR-24 NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-

28_1o2m9gd4

Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

77 29 A 22-MAR-24 4598318 22-MAR-24 NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-

29_1p2m9ju6

Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

67 30 A 22-MAR-24 4598304 22-MAR-24 NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-

30_1q2m9k7a

Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

76 31 A 22-MAR-24 4598308 22-MAR-24 NO
Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-

31_1r2m9kfk

Tag: ORACOPYBKUPONANF_LEVEL_0
Container ID: 3, PDB Name: NTAP1_PDB1

```
78      32      A 22-MAR-24      4598313      22-MAR-24      NO
      Name: /nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-
32_1s2m9kkg
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 3, PDB Name: NTAP1_PDB1
```

16. 將資料庫切換到複製以運行恢復，而無需資料庫還原。

```
RMAN> switch database to copy;

Starting implicit crosscheck backup at 22-MAR-24
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=12 device type=DISK
Crosschecked 33 objects
Finished implicit crosscheck backup at 22-MAR-24

Starting implicit crosscheck copy at 22-MAR-24
using channel ORA_DISK_1
Crosschecked 31 objects
Finished implicit crosscheck copy at 22-MAR-24

searching for all files in the recovery area
cataloging files...
cataloging done

List of Cataloged Files
=====
File Name:
/nfsanf/archlog/NTAP1/autobackup/2024_03_20/o1_mf_s_1164140565__5g56
ypks_.bkp
File Name:
/nfsanf/archlog/NTAP1/autobackup/2024_03_22/o1_mf_s_1164296325__9z77
zyxb_.bkp

datafile 1 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-1_1t2m9nij"
datafile 3 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-3_1u2m9nog"
datafile 4 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-4_1v2m9nu6"
datafile 5 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-5_282m9oem"
datafile 6 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-6_242m9oan"
datafile 7 switched to datafile copy "/nfsanf/oracopy/data_D-
```

NTAP1_I-2441823937_TS-USERS_FNO-7_2c2m9ofn"
datafile 8 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-8_292m9oem"
datafile 9 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-9_252m9oc5"
datafile 10 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-10_212m9o52"
datafile 11 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-11_202m9o22"
datafile 12 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-USERS_FNO-12_2d2m9ofs"
datafile 13 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-13_262m9oca"
datafile 14 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-14_222m9o53"
datafile 15 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-15_2a2m9of6"
datafile 16 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-USERS_FNO-16_2e2m9og8"
datafile 17 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSTEM_FNO-17_272m9oel"
datafile 18 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SYSAUX_FNO-18_232m9oa8"
datafile 19 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-UNDOTBS1_FNO-19_2b2m9ofn"
datafile 20 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-USERS_FNO-20_2f2m9og8"
datafile 21 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-21_1h2m9cap"
datafile 22 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-22_1i2m9cap"
datafile 23 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-23_1j2m9cap"
datafile 24 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-24_1k2m9cap"
datafile 25 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-25_1l2m9g3u"
datafile 26 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-26_1m2m9g9j"
datafile 27 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-27_1n2m9gcg"
datafile 28 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-28_1o2m9gd4"
datafile 29 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-29_1p2m9ju6"
datafile 30 switched to datafile copy "/nfsanf/oracopy/data_D-

```
NTAP1_I-2441823937_TS-SOE_FNO-30_1q2m9k7a"
datafile 31 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-31_1r2m9kfk"
datafile 32 switched to datafile copy "/nfsanf/oracopy/data_D-
NTAP1_I-2441823937_TS-SOE_FNO-32_1s2m9kkg"
```

17. 執行 Oracle 復原直到閃回復原區中最後一個可用的存檔日誌。

```
RMAN> run {
2> set until sequence=11;
3> recover database;
4> }

executing command: SET until clause

Starting recover at 22-MAR-24
using channel ORA_DISK_1

starting media recovery

archived log for thread 1 with sequence 4 is already on disk as file
/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_4__9y6gn5co_.arc
archived log for thread 1 with sequence 5 is already on disk as file
/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_5__9y7p68s6_.arc
archived log for thread 1 with sequence 6 is already on disk as file
/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_6__9y8ygtss_.arc
archived log for thread 1 with sequence 7 is already on disk as file
/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_7__9ybjdp55_.arc
archived log for thread 1 with sequence 8 is already on disk as file
/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_8__9yctxjgy_.arc
archived log for thread 1 with sequence 9 is already on disk as file
/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_9__9yfrj0b1_.arc
archived log for thread 1 with sequence 10 is already on disk as
file
/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_10__9yomybbc_.ar
c
archived log file
name=/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_4__9y6gn5co
_.arc thread=1 sequence=4
archived log file
name=/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_5__9y7p68s6
_.arc thread=1 sequence=5
archived log file
name=/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_6__9y8ygtss
_.arc thread=1 sequence=6
```

```

archived log file
name=/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_7__9ybjdp55
_.arc thread=1 sequence=7
archived log file
name=/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_8__9yctxjgy
_.arc thread=1 sequence=8
archived log file
name=/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_9__9yfrj0b1
_.arc thread=1 sequence=9
archived log file
name=/nfsanf/archlog/NTAP1/archivelog/2024_03_22/o1_mf_1_10__9yomybb
c_.arc thread=1 sequence=10
media recovery complete, elapsed time: 00:01:17
Finished recover at 22-MAR-24

RMAN> exit

```

Recovery Manager complete.



為了更快地恢復，請使用 `recovery_parallelism` 參數啟用並行會話或在資料庫恢復的恢復命令中指定並行度：`RECOVER DATABASE PARALLEL (DEGREE d INSTANCES DEFAULT)`；。一般來說，並行度應該等於主機上的 CPU 核心數。

- 退出 RMAN，透過 sqlplus 以 oracle 使用者登入 Oracle，以在不完全恢復後開啟資料庫並重設日誌。

```

SQL> select name, open_mode from v$database;

NAME          OPEN_MODE
-----
NTAP1         MOUNTED

SQL> select instance_name, host_name from v$instance;

INSTANCE_NAME
-----
HOST_NAME
-----
NTAP1
ora-02

SQL>

```

```
SQL> select member from v$logfile;
```

```
MEMBER
```

```
-----  
-----  
/u03/orareco/NTAP1/onlineelog/redo03.log  
/u03/orareco/NTAP1/onlineelog/redo02.log  
/u03/orareco/NTAP1/onlineelog/redo01.log
```

```
SQL> alter database rename file  
'/u03/orareco/NTAP1/onlineelog/redo01.log' to  
'/nfsanf/oracopy/redo01.log';
```

```
Database altered.
```

```
SQL> alter database rename file  
'/u03/orareco/NTAP1/onlineelog/redo02.log' to  
'/nfsanf/oracopy/redo02.log';
```

```
Database altered.
```

```
SQL> alter database rename file  
'/u03/orareco/NTAP1/onlineelog/redo03.log' to  
'/nfsanf/oracopy/redo03.log';
```

```
Database altered.
```

```
SQL> alter database open resetlogs;
```

```
Database altered.
```

```
SQL> show pdbs
```

CON_ID	CON_NAME	OPEN MODE	RESTRICTED
2	PDB\$SEED	READ ONLY	NO
3	NTAP1_PDB1	READ WRITE	NO
4	NTAP1_PDB2	READ WRITE	NO
5	NTAP1_PDB3	READ WRITE	NO

19. 驗證還原到新主機的資料庫結構以及我們在主 VLDB 故障之前插入的測試行。

```
SQL> select name from v$datafile;
```

```
NAME
```

```
-----  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-1_1t2m9nij  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-3_1u2m9nog  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-4_1v2m9nu6  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-5_282m9oem  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-6_242m9oan  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-7_2c2m9ofn  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-8_292m9oem  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-9_252m9oc5  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-10_212m9o52  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-  
11_202m9o22  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-12_2d2m9ofs
```

NAME

```
-----  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-13_262m9oca  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-14_222m9o53  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-  
15_2a2m9of6  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-16_2e2m9og8  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSTEM_FNO-17_272m9oe1  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SYSAUX_FNO-18_232m9oa8  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-UNDOTBS1_FNO-  
19_2b2m9ofn  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-USERS_FNO-20_2f2m9og8  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-21_1h2m9cap  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-22_1i2m9cap  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-23_1j2m9cap
```

NAME

```
-----  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-24_1k2m9cap  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-25_1l2m9g3u  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-26_1m2m9g9j  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-27_1n2m9g9j  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-28_1o2m9gd4  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-29_1p2m9ju6  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-30_1q2m9k7a  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-31_1r2m9kfk  
/nfsanf/oracopy/data_D-NTAP1_I-2441823937_TS-SOE_FNO-32_1s2m9k9g
```

31 rows selected.

```
SQL> select member from v$logfile;
```

```
MEMBER
```

```
-----  
-----
```

```
/nfsanf/oracopy/redo03.log  
/nfsanf/oracopy/redo02.log  
/nfsanf/oracopy/redo01.log
```

```
SQL> select name from v$controlfile;
```

```
NAME
```

```
-----  
-----
```

```
/nfsanf/oracopy/NTAP1.ctl
```

```
SQL> alter session set container=ntap1_pdb1;
```

```
Session altered.
```

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

```
          ID
```

```
-----  
DT
```

```
-----  
-----
```

```
EVENT
```

```
-----  
-----
```

```
          1
```

```
21-MAR-24 03.15.03.000000 PM
```

```
test oracle incremental merge switch to copy
```

```
          2
```

```
22-MAR-24 02.22.06.000000 PM
```

```
test recovery on a new Azure VM host with image copy on ANF
```

20. 刪除無效的臨時檔案並將新的臨時檔案新增至臨時表空間。

```
SQL> select name from v$tempfile;
```

```
NAME
```

```
-----  
-----
```

```
/u02/oradata/NTAP1/NTAP1_pdb1/temp01.dbf
```

```
/u02/oradata/NTAP1/NTAP1_pdb1/temp02.dbf
```

```
SQL> alter tablespace temp add tempfile  
'/nfsanf/oracopy/ntap1_pdb1_temp01.dbf' size 100M;
```

```
Tablespace altered.
```

```
SQL> select name from v$tempfile;
```

```
NAME
```

```
-----  
-----
```

```
/u02/oradata/NTAP1/NTAP1_pdb1/temp01.dbf
```

```
/u02/oradata/NTAP1/NTAP1_pdb1/temp02.dbf
```

```
/nfsanf/oracopy/ntap1_pdb1_temp01.dbf
```

```
SQL> alter database tempfile  
'/u02/oradata/NTAP1/NTAP1_pdb1/temp01.dbf' offline;
```

```
Database altered.
```

```
SQL> alter database tempfile  
'/u02/oradata/NTAP1/NTAP1_pdb1/temp01.dbf' drop;
```

```
Database altered.
```

```
SQL> alter database tempfile  
'/u02/oradata/NTAP1/NTAP1_pdb1/temp02.dbf' offline;
```

```
Database altered.
```

```
SQL> alter database tempfile  
'/u02/oradata/NTAP1/NTAP1_pdb1/temp02.dbf' drop;
```

```
Database altered.
```

```
SQL> select name from v$tempfile;
```

```
NAME
```

```
-----  
-----
```

```
/nfsanf/oracopy/ntap1_pdb1_temp01.dbf
```

```
SQL>
```

21. 其他恢復後任務

- Add ANF NFS mount to fstab so that the NFS file system will be mounted when DB server host rebooted.

As azureuser, sudo vi /etc/fstab and add following entry:

```
172.30.136.68:/ora-01-u02-copy          /nfsanf          nfs
rw,bg,hard,vers=3,proto=tcp,timeo=600,rsiz=262144,wsiz=262144,noi
tr 0          0
```

- Update the Oracle init file from primary database init file backup that is restored to /tmp/archive and create spfile as needed.

這樣就完成了從 ANF NFS 檔案系統上的備份映像副本到備用 DB 伺服器主機的 Oracle VLDB 資料庫復原。

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：

- RMAN：合併增量備份策略（文件 ID 745798.1）

["https://support.oracle.com/knowledge/Oracle%20Database%20Products/745798_1.html"](https://support.oracle.com/knowledge/Oracle%20Database%20Products/745798_1.html)

- RMAN 備份與還原使用者指南

["https://docs.oracle.com/en/database/oracle/oracle-database/19/bradv/getting-started-rman.html"](https://docs.oracle.com/en/database/oracle/oracle-database/19/bradv/getting-started-rman.html)

- Azure NetApp Files

["https://azure.microsoft.com/en-us/products/netapp"](https://azure.microsoft.com/en-us/products/netapp)

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