



TR-4990: 使用 ANF 上的增量合并快速恢复 Oracle VLDB

NetApp database solutions

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此解决方案提供了概述和详细信息，用于快速恢复部署到 Azure VM 计算实例的 Oracle VLDB，并在 Azure NetApp Files 容量池上安装 NFS，以暂存通过 RMAN 不断增量合并的备用数据库副本。

目的

使用 Oracle 恢复管理器 (RMAN) 备份工具恢复 Oracle 中的超大型数据库 (VLDB) 可能是一项极具挑战性的任务。发生故障时从备份媒体恢复数据库的过程可能非常耗时，从而延迟数据库恢复并可能严重影响您的服务水平协议 (SLA)。但是，从 10g 版本开始，Oracle 引入了 RMAN 功能，允许用户在位于 DB 服务器主机上的附加磁盘存储上创建 Oracle 数据库数据文件的分阶段映像副本。这些图像副本可以使用 RMAN 每天进行增量更新。如果发生故障，数据库管理员 (DBA) 可以迅速将 Oracle 数据库从故障媒体切换到映像副本，从而无需进行完整的数据库媒体还原。尽管所需的数据库存储量增加了一倍，但其结果是 SLA 得到了极大改善。

如果您热衷于 VLDB 的 SLA 并考虑将 Oracle 数据库迁移到 Azure 等公共云，则可以使用 Microsoft Azure NetApp Files (ANF) 等资源设置类似的数据库保护结构来暂存备用数据库映像副本。在本文档中，我们演示了如何从 ANF 容量池中配置和导出 NFS 文件系统，并将其安装在 Oracle 数据库服务器上，以便在主存储发生故障时暂存备用数据库副本以便快速恢复。

此解决方案适用于以下用例：

- Oracle VLDB 映像副本通过 RMAN 在 Microsoft ANF 容量池存储的 NFS 挂载点上增量合并。
- 当同一 Azure 数据库服务器 VM 发生故障时，快速恢复 Oracle VLDB。
- 当备用 Azure 数据库服务器 VM 发生故障时，快速恢复 Oracle VLDB。

受众

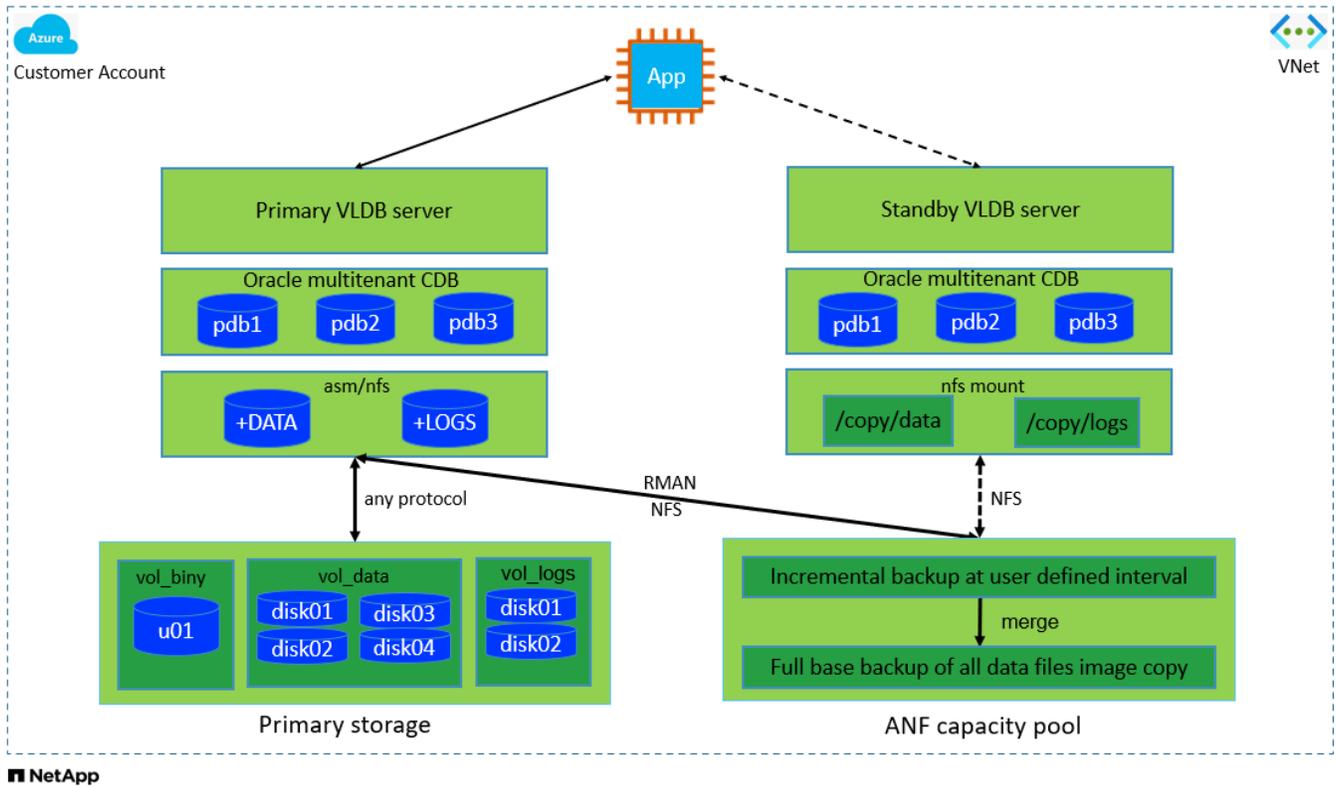
此解决方案适用于以下人群：

- 一位 DBA 通过 Azure 中的 RMAN 设置 Oracle VLDB 映像复制增量合并，以便更快地恢复数据库。
- 在 Azure 公共云中测试 Oracle 工作负载的数据库解决方案架构师。
- 管理部署到 ANF 容量池存储的 Oracle 数据库的存储管理员。
- 希望在 Azure 云环境中建立 Oracle 数据库的应用程序所有者。

解决方案测试和验证环境

该解决方案的测试和验证是在 Microsoft ANF 容量池存储和 Azure VM 计算环境中进行的，该环境可能与最终部署环境不匹配。有关更多信息，请参阅[部署考虑的关键因素](#)。

Oracle VLDB Incremental Merge via RMAN on ANF



硬件和软件组件

硬件		
ANF存储	Microsoft 提供的当前版本	具有高级服务级别的 2 TiB ANF 容量池存储
用于数据库服务器的 Azure VM	Standard_B4ms - 4 个 vCPU, 16GiB	2 个虚拟机, 一个作为主数据库服务器, 另一个作为备用
软件		
红帽Linux	RHEL Linux 8.6 (LVM) -x64 Gen2	部署 RedHat 订阅进行测试
Oracle 数据库	19.18 版	已应用RU补丁p34765931_190000_Linux-x86-64.zip
Oracle OPatch	版本 12.2.0.1.36	最新补丁p6880880_190000_Linux-x86-64.zip
NFS	3.0 版	已启用 Oracle dNFS

部署考虑的关键因素

- *用于 RMAN 增量合并的 Oracle VLDB 存储布局。*在我们的测试和验证中, Oracle 增量备份和合并的 NFS

卷是从单个 ANF 容量池分配的，每个卷有 100 TiB，总容量限制为 1000 TiB。对于超过阈值的部署，可以将多个卷和 ANF 容量池与多个 NFS 挂载点并行连接以提供更高的容量。

- 使用 **RMAN** 增量合并实现 **Oracle** 可恢复性。RMAN 增量备份和合并通常根据您的 RTO 和 RPO 目标以用户定义的频率执行。如果主数据存储和/或归档日志完全丢失，则可能会发生数据丢失。Oracle 数据库可以恢复到 ANF 数据库备份映像副本提供的最后一个增量备份。为了最大限度地减少数据丢失，可以在 ANF NFS 安装点上设置 Oracle 闪回恢复区，并将存档日志与数据库映像副本一起备份到 ANF NFS 安装点。
- *在 ANF NFS 文件系统中运行 Oracle VLDB。*与其他用于数据库备份的批量存储不同，Microsoft ANF 是一种支持云的生产级存储，可提供高水平的性能和存储效率。一旦 Oracle VLDB 从主存储切换到 ANF NFS 文件系统中的映像副本，数据库性能就可以保持在高水平，同时解决主存储故障。您可以放心，用户应用程序体验不会因主存储故障而受到影响。
- Azure 计算实例。在这些测试和验证中，我们使用 Standard_B4ms Azure VM 作为 Oracle 数据库服务器。其他 Azure VM 可能经过优化，更适合数据库工作负载。您还需要根据实际工作负载要求，适当调整 Azure VM 的 vCPU 数量和 RAM 容量。
- **ANF** 容量池服务级别。ANF 容量池提供三种服务级别：标准、高级、超级。默认情况下，自动 QoS 适用于容量池内创建的卷，这会限制卷的吞吐量。可以根据容量池的大小和服务级别手动调整卷上的吞吐量。
- **dNFS** 配置。dNFS 内置于 Oracle 内核中，并且已知当 Oracle 部署到 NFS 存储时可显著提高 Oracle 数据库性能。dNFS 打包到 Oracle 二进制文件中，但默认情况下未打开。对于 NFS 上的任何 Oracle 数据库部署，都应该启用它。对于 VLDB 的多个 ANF 容量池部署，应正确配置到不同 ANF 容量池存储的 dNFS 多路径。

解决方案部署

假设您已经在 VNet 内的 Azure 云环境中部署了 Oracle VLDB。如果您需要在 Azure 中部署 Oracle 的帮助，请参阅以下技术报告以获取帮助。

- ["使用 NFS 在 Azure NetApp Files 上简化、自动化 Oracle 部署"](#)
- ["Azure NetApp Files 上的 Oracle 数据库部署和保护"](#)

您的 Oracle VLDB 可以在 ANF 存储或 Azure 云生态系统中的任何其他存储上运行。以下部分提供了设置 RMAN 增量合并到 ANF 存储的 NFS 挂载中暂存的 Oracle VLDB 映像副本的分步部署过程。

部署先决条件

部署需要以下先决条件。

1. 已设置 Azure 帐户，并在您的 Azure 帐户内创建了必要的 Azure VNet 和网络段。
2. 从 Azure 门户控制台，您必须部署两个 Azure VM 实例，一个作为主 Oracle DB 服务器，另一个作为可选的备用 DB 服务器。有关环境设置的更多详细信息，请参阅上一节中的架构图。还请查看["Azure 虚拟机系列"](#)了解更多信息。
3. 从 Azure 门户控制台部署 ANF 存储来托管存储 Oracle 数据库备用映像副本的 NFS 卷。如果您不熟悉 ANF 的部署，请参阅文档["快速入门：设置 Azure NetApp Files 并创建 NFS 卷"](#)以获得分步说明。



确保在 Azure VM 根卷中分配了至少 128G，以便有足够的空间来暂存 Oracle 安装文件。

提供并导出要安装在主 **Oracle VLDB** 服务器上的 **NFS** 卷

在本节中，我们将展示如何通过 Azure 门户控制台从 ANF 容量池配置 NFS 卷。如果设置了多个 ANF 容量池来适应数据库的大小，请对其他 ANF 容量池重复这些过程。

1. 首先，从 Azure 门户控制台导航到用于暂存 Oracle VLDB 映像复制的 ANF 容量池。

The screenshot shows the Azure portal interface for a capacity pool named 'database (ANFAVSAcct/database)'. The left sidebar contains navigation options like Overview, Activity log, Access control, and Settings. The main content area shows the 'Essentials' section with resource group 'ANFAVSAcct', location 'South Central US', and subscription 'Hybrid Cloud TME Onprem'. Below this, there are sections for 'Storage service' and 'Usage'. The usage section features a donut chart indicating that 63.5% (1.27 TB) of the 2 TiB capacity is allocated.

2. 从选定的容量池中 - database，点击 'Volumes' 进而，'Add volume' 启动添加卷工作流程。

The screenshot shows the 'Volumes' configuration page for the 'database (ANFAVSAcct/database)' capacity pool. The page includes a search bar and a table of existing volumes. The table has columns for Name, Quota, Max. Throughput, Protocol type, Mount path, and Service level. The volumes listed are:

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. 填写 Volume name, Quota, Virtual network, 和 'Delegated subnet' 移至 'Protocol' 页。

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. 记下文件路径，输入允许的客户端 CIDR 范围，然后启用 `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"/>	<input type="text"/>

Review + create

< Previous

Next : Tags >

5. 如果需要，添加卷标签。

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. 审查并创建卷。

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

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[Download a template for automation](#)

7. 以具有 sudo 权限的用户身份登录到主 Oracle VLDB 服务器并挂载从 ANF 存储导出的 NFS 卷。根据需要更改为您的 ANF NFS 服务器 IP 地址和文件路径。可以从 ANF 卷控制台页面检索 ANF NFS 服务器 IP 地址。

```
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. 将挂载点所有权更改为 oracle:oinstall，根据需要更改为您的 oracle 用户名和主要组。

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

在 ANF 上设置 Oracle RMAN 增量合并到映像副本

RMAN 增量合并在每个增量备份/合并间隔持续更新暂存数据库数据文件映像副本。数据库备份的映像副本将与您执行增量备份/合并的频率一样最新。因此，在决定 RMAN 增量备份和合并的频率时，请考虑数据库性能、RTO 和 RPO 目标。

1. 以 oracle 用户身份登录到主 Oracle VLDB 服务器。
2. 在挂载点 /nfsanf 下创建一个 oracopy 目录，用于存储 Oracle 数据文件映像副本和用于 Oracle 闪回恢复区的 archlog 目录。

```
mkdir /nfsanf/oracopy
```

```
mkdir /nfsanf/archlog
```

3. 通过 sqlplus 登录到 Oracle 数据库，启用块更改跟踪以加快增量备份速度，并将 Oracle 闪存恢复区更改为 ANF NFS 挂载（如果它当前位于主存储上）。这允许将 RMAN 默认控制文件/spfile 自动备份和存档日志备份到 ANF NFS 挂载以进行恢复。

```
sqlplus / as sysdba
```

在 sqlplus 提示符下，执行以下命令。

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

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

预期输出：

```
[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. 创建 RMAN 备份和增量合并脚本。该脚本为并行 RMAN 备份和合并分配多个通道。第一次执行将生成初始的完整基线图像副本。在完整运行过程中，它首先清除保留窗口之外的过时备份，以保持暂存区清洁。然后它在合并和备份之前切换当前日志文件。增量备份在合并之后进行，因此数据库映像副本落后于当前数据库状态一个备份/合并周期。可以根据用户的喜好逆转合并和备份的顺序，以便更快地恢复。RMAN 脚本可以集成到一个简单的 shell 脚本中，从主 DB 服务器上的 crontab 执行。确保 RMAN 设置中的控制文件自动备份处于打开状态。

```

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 服务器上，以 oracle 用户身份本地登录到 RMAN，可以使用或不使用 RMAN 目录。在此演示中，我们没有连接到 RMAN 目录。

```

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. 从 RMAN 提示符执行脚本。第一次执行会创建基线数据库映像副本，后续执行则会逐步合并和更新基线映像副本。以下是如何执行脚本以及典型的输出。设置通道数以匹配主机上的 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. 列出备份后的数据库映像副本，观察在 ANF NFS 挂载点中是否创建了数据库映像副本。

```

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. 从 Oracle RMAN 命令提示符报告模式以观察当前 VLDB 数据文件是否位于主存储上。

```

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. 验证来自 OS NFS 挂载点的数据库映像副本。

```

[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 ~]$
```

这样就完成了 Oracle VLDB 备用映像副本备份和合并的设置。

将 **Oracle VLDB** 切换到映像副本以实现快速恢复

如果由于主存储问题（例如数据丢失或损坏）而发生故障，数据库可以快速切换到 ANF NFS 挂载上的映像副本，并恢复到当前状态，而无需数据库还原。消除媒体恢复可大大加快 VLDB 的数据库恢复速度。此用例假设 Oracle VLDB DB 服务器完好无损，并且数据库控制文件、存档日志和当前日志均可供恢复。

1. 以 oracle 用户身份登录 Azure 主 VLDB 服务器主机，并在切换之前创建一个测试表。

```
[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

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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. 通过关闭中止数据库来模拟故障，然后在挂载阶段启动 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 用户身份，通过 RMAN 连接到 Oracle 数据库以切换要复制的数据库。

```
[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. 恢复并打开数据库，使其从上次增量备份更新到当前状态。

```
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. 恢复后从 sqlplus 检查数据库结构，观察到除控制、临时和当前日志文件之外的所有 VLDB 数据文件现在都已切换到 ANF NFS 文件系统上的副本。

```

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_0s2m6n11
/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/control01.ctl
/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. 从 SQL plus 中，检查在切换到复制之前我们插入的测试表的内容。

```

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>

```

- 您可以在 ANF NFS 挂载中运行 Oracle VLDB 较长时间，同时保持预期的性能水平。当主存储问题解决后，您可以通过逆转增量备份合并过程，以最少的停机时间恢复原状。

Oracle VLDB 从映像复制到备用数据库服务器的恢复

如果发生故障，主存储和主数据库服务器主机都丢失，则无法从原始服务器进行恢复。但是，ANF NFS 文件系统中提供的 Oracle 数据库备份映像副本会很方便。您可以使用备份映像副本快速将主数据库恢复到备用数据库服务器（如果有）。在本节中，我们将演示此类恢复的逐步过程。

1. 在我们之前为 Oracle VLDB 恢复到备用主机验证而创建的测试表中插入一行。

```
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 用户身份运行 RMAN 增量备份并合并以将事务刷新到 ANF NFS 挂载上的备份集。

```
[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. 关闭主 VLDB 服务器主机以模拟存储和 DB 服务器主机的完全故障。
4. 在具有相同操作系统和版本的备用数据库服务器 ora-02 上，操作系统内核应与主 VLDB 服务器主机一样进行修补。此外，已在仅使用软件选项的备用数据库服务器上安装和配置了相同版本和补丁的 Oracle。
5. 配置与主 VLDB 服务器 ora_01 类似的 oracle 环境，例如 oratab 和 oracle 用户 .bash_profile 等。将这些文件备份到 ANF NFS 挂载点是一种很好的做法。
6. 然后将 ANF NFS 文件系统上的 Oracle 数据库备份映像副本安装在备用 DB 服务器上以进行恢复。以下步骤演示了该过程的细节。

以 azueruser 身份创建挂载点。

```
sudo mkdir /nfsanf
```

以 azureuser 身份挂载存储 Oracle VLDB 备份映像副本的 NFS 卷。

```
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. 验证 ANF NFS 挂载点上的 Oracle 数据库备份映像副本。

```
[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. 验证 ANF NFS 挂载上可用的 Oracle 存档日志以进行恢复，并记下最后一个日志文件日志序列号。在本例中为 10。我们的恢复点最多到日志序列号 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 用户身份，将 ORACLE_HOME 变量设置为备用 DB 服务器 ora-02 上的当前 Oracle 安装，将 ORACLE_SID 设置为主 Oracle 实例 SID。在这种情况下，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 用户身份，在 \$ORACLE_HOME/dbs 目录中创建一个通用 Oracle 初始化文件，并配置适当的管理目录。最重要的是，拥有 Oracle flash recovery area 指向主 Oracle VLDB 服务器中定义的 ANF NFS 挂载路径。`flash recovery area` 配置在章节中进行了演示 `Setup Oracle RMAN incremental merge to image copy on ANF`。将 Oracle 控制文件设置为 ANF NFS 文件系统。

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

使用以下示例条目：

```
*.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'
```

如果出现差异，则应使用从主 Oracle VLDB 服务器恢复的备份初始化文件替换上述初始化文件。

11. 以 oracle 用户身份启动 RMAN 在备用数据库服务器主机上运行 Oracle 恢复。首先，启动 Oracle 实例 `nomount` 状态。

```
[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. 设置数据库ID。可以从 ANF NFS 挂载点上的映像副本的 Oracle 文件名中检索数据库 ID。

```
RMAN> set dbid = 2441823937;

executing command: SET DBID
```

13. 从自动备份恢复控制文件。如果启用了 Oracle 控制文件和 spfile 自动备份，则它们会在每个增量备份和合并周期中备份。如果有多个副本可用，将恢复最新的备份。

```
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. 将初始化文件从 spfile 恢复到 /tmp 文件夹，以便稍后更新参数文件以与主 VLDB 匹配。

```
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. 挂载控制文件并验证数据库备份映像副本。

```
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_1s2m9kgg
      Tag: ORACOPYBKUPONANF_LEVEL_0
      Container ID: 3, PDB Name: NTAP1_PDB1
```

16. 将数据库切换到复制以运行恢复，而无需数据库还原。

```
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. 运行 Oracle 恢复直至闪回恢复区中最后一个可用的存档日志。

```
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__9yomybbc
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.



为了更快地恢复，请使用 `recovery_parallelism` 参数启用并行会话或在数据库恢复的恢复命令中指定并行度：`RECOVER DATABASE PARALLEL (DEGREE d INSTANCES DEFAULT);`。一般来说，并行度应该等于主机上的 CPU 核心数。

- 退出 RMAN，通过 sqlplus 以 oracle 用户身份登录 Oracle，以在不完全恢复后打开数据库并重置日志。

```

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/onlinelog/redo03.log  
/u03/orareco/NTAP1/onlinelog/redo02.log  
/u03/orareco/NTAP1/onlinelog/redo01.log
```

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

```
Database altered.
```

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

```
Database altered.
```

```
SQL> alter database rename file  
'/u03/orareco/NTAP1/onlinelog/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. 验证恢复到新主机的数据库结构以及我们在主 VLDB 故障之前插入的测试行。

```
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_1n2m9gcg  
/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_1s2m9kkg
```

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. 删除无效的临时文件并将新的临时文件添加到临时表空间。

```
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. 其他恢复后任务

- 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,rsize=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.

这样就完成了从 ANF NFS 文件系统上的备份映像副本到备用 DB 服务器主机的 Oracle VLDB 数据库恢复。

在哪里可以找到更多信息

要了解有关本文档中描述的信息的更多信息，请查看以下文档和/或网站：

- RMAN: 合并增量备份策略 (文档 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 备份和恢复用户指南

["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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