TR-5006：在Google Cloud NetApp Volumes上使用 Data Guard 實現高吞吐量 Oracle VLDB

NetApp database solutions

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TR-5006：在Google Cloud NetApp Volumes上使用 Data Guard 實現高吞吐量 Oracle VLDB

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此解決方案提供了在Google Cloud NetApp Volumes (GCNV) 上使用 Google 雲端中的 Oracle Data Guard 配置高吞吐量 Oracle 超大型資料庫 (VLDB) 的概述和詳細資訊。

目的

高吞吐量和任務關鍵型 Oracle VLDB 對後端資料庫儲存提出了很高的要求。為了滿足服務等級協定 (SLA)，資料庫儲存必須提供所需的容量和每秒高輸入/輸出作業數 (IOPS)，同時保持亞毫秒延遲效能。在具有共享儲存資源環境的公有雲中部署此類資料庫工作負載時，這一點尤其具有挑戰性。並非所有儲存平台都是平等的。GCNV 是 Google 提供的進階儲存服務，可支援 Google 雲端中需要持續 IOPS 和低延遲效能特性的關鍵任務 Oracle 資料庫部署。此架構可適應 OLTP 和 OLAP 工作負載，並具有支援各種效能設定檔的可設定服務層。GCNV 提供超快的效能和亞毫秒級的延遲，在混合讀取/寫入工作負載下實現每卷高達 4.5 GiBps 的吞吐量。

利用 GCNV 的快速快照備份（秒）和克隆（分鐘）功能，可以從實體備用資料庫動態克隆生產資料庫的全尺寸副本，以滿足許多其他用例（如 DEV、UAT 等）的需求。您可以擺脫 Active Data Guard 授權以及低效率且複雜的快照備用資料庫。可以節省大量成本。對於在主 Oracle 和備用 Oracle 伺服器上均配備 64 個核心 CPU 的典型 Oracle Data Guard 設置，根據最新的 Oracle 價格表，僅 Active Data Guard 授權成本節省高達 1,472,000 美元。

在本文檔中，我們示範如何在具有多個 NFS 捲和 Oracle ASM 的 GCNVS 儲存體上設定具有 Data Guard 配置的 Oracle VLDB，以實現儲存負載平衡。備用資料庫磁碟區可以透過快照快速備份並複製以進行讀取/寫入存取。 NetApp解決方案工程團隊提供了自動化工具包，以透過簡化的生命週期管理來建立和刷新克隆。

此解決方案適用於以下用例：

- 在 Google 雲端區域的 GCNV 儲存服務上的 Data Guard 設定中實作 Oracle VLDB。
- 快照備份並複製實體備用資料庫，以透過自動化服務於報告、開發、測試等用例。

對象

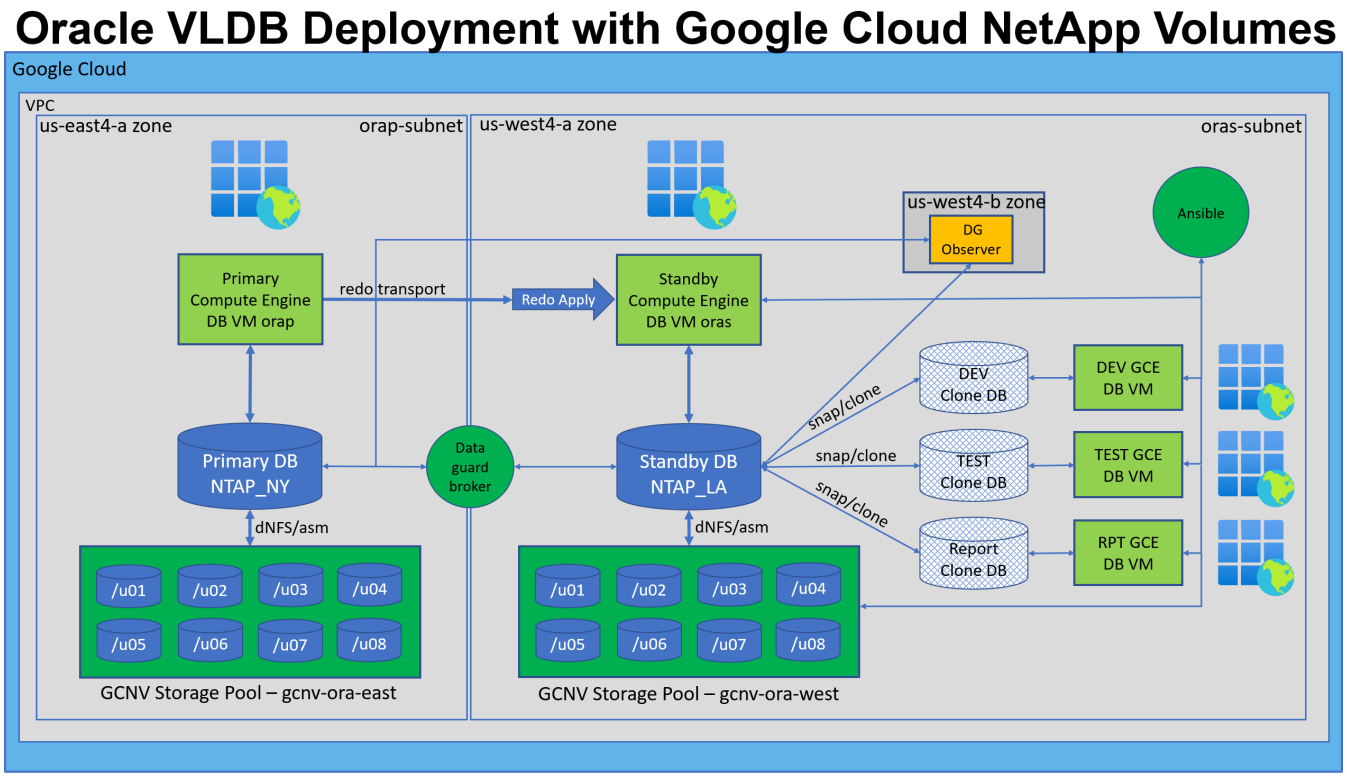
此解決方案適用於以下人群：

- 一位 DBA 在 Google 雲端中使用 Data Guard 設定 Oracle VLDB 以實現高可用性、資料保護和災難復原。
- 一位對 Google 雲端中帶有 Data Guard 配置的 Oracle VLDB 感興趣的資料庫解決方案架構師。
- 管理支援 Oracle 資料庫的 GCNV 儲存的儲存管理員。
- 喜歡在 Google 雲端環境中使用 Data Guard 建立 Oracle VLDB 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 Google 雲端實驗室設定中進行的，可能與實際使用者部署環境不符。有關更多信息，請參閱[部署考慮的關鍵因素] 。

架構



硬體和軟體組件

硬體		
Google Cloud NetApp Volumes	Google 目前提供的服務	兩個儲存池、進階服務等級、自動 QoS
用於資料庫伺服器的 Google Compute Engine 虛擬機	N1（4 個 vCPU，15 GiB 記憶體）	四個 DB VM、主 DB 伺服器、備用 DB 伺服器、複製 DB 伺服器和 Data Guard 觀察器。
軟體		
紅帽Linux	Red Hat Enterprise Linux 8.10（Ootpa）- x86/64	RHEL 市場圖像，PAYG
Oracle 網格基礎架構	版本 19.18	已套用RU補丁p34762026_190000_Linux-x86-64.zip
Oracle 資料庫	版本 19.18	已套用RU補丁p34765931_190000_Linux-x86-64.zip
dNFS一次性補丁	p32931941_190000_Linux-x86-64.zip	適用於網格和資料庫
Oracle OPatch	版本 12.2.0.1.36	最新補丁 p6880880_190000_Linux-x86-64.zip

Ansible	版本核心 2.16.2	python版本-3.10.13
NFS	版本 3.0	為 Oracle 啟用 dNFS

Oracle VLDB Data Guard 配置，模擬紐約到洛杉磯的災難復原設置

資料庫	資料庫唯一名稱	**Oracle** 網路服務名稱
基本的	NTAP_NY	NTAP_NY.cvs-pm-主機-1p.內部
支援	NTAP_LA	NTAP_LA.cvs-pm-主機-1p.內部

部署考慮的關鍵因素

- * Google Cloud NetApp Volumes配置。 * GCNV 在 Google 雲端分配為 `Storage Pools`。在這些測試和驗證中，我們部署了一個 2 TiB 儲存池來託管 East4 區域的 Oracle 主資料庫，並部署了一個 4 TiB 儲存池來託管 West4 區域的備用資料庫和資料庫克隆。 GCNV儲存池有四個服務等級：Flex、Standard、Premium、Extreme。 ANF容量池的IO容量取決於容量池的大小及其服務等級。在建立容量池時，您可以設定儲存池位置、服務等級、可用區域和儲存池容量。對於 Oracle Data Guard 配置，區域可用性應該足夠，因為 Data Guard 會因區域層級故障而提供資料庫故障轉移保護。
- *調整資料庫磁碟區的大小。 *對於生產部署， NetApp建議根據 Oracle AWR 報告對 Oracle 資料庫吞吐量需求進行全面評估。在為 VLDB 資料庫設計 GCNV 卷佈局時，請考慮資料庫大小、吞吐量需求和服務等級。建議僅使用 `Premium`或者 `Extreme`Oracle 資料庫服務。頻寬保證為每 TiB 卷容量 64 MiB/s，最高可達 4.5 GiBps `Premium`服務，每 TiB 卷容量 128 MiB/s，最高 4.5 GiBps `Extreme`服務。更高的吞吐量將需要更大的體積尺寸來滿足要求。
- *多個捲和負載平衡。 *由於 QoS 是根據磁碟區大小和儲存池服務等級嚴格執行的，因此單一大磁碟區可以提供與具有相同聚合磁碟區大小的多個磁碟區類似的效能等級。建議為 Oracle VLDB 實作多個磁碟區（多個 NFS 掛載點），以便更好地利用共用後端 GCNV 儲存資源池，並滿足超過 4.5 GiBps 的吞吐量要求。實作 Oracle ASM 以實現多個 NFS 磁碟區上的 IO 負載平衡。
- *Google Compute Engine VM 實例考慮。 *在這些測試和驗證中，我們使用了具有 4 個 vCPU 和 15 GiB 記憶體的 Compute Engine VM - N1。您需要為具有高吞吐量需求的 Oracle VLDB 選擇適當的 Compute Engine DB VM 實例。除了 vCPU 數量和 RAM 數量之外，在達到資料庫儲存吞吐量之前，VM 網路頻寬（入口和出口或 NIC 吞吐量限制）也可能成為瓶頸。
- dNFS 配置。透過使用 dNFS，在具有 GCNV 儲存的 Google Compute Engine VM 上執行的 Oracle 資料庫可以比本機 NFS 用戶端驅動更多的 I/O。確保應用 Oracle dNFS 補丁 p32931941 來解決潛在的錯誤。

解決方案部署

以下部分示範了在 Oracle Data Guard 設定中 GCNV 上的 Oracle VLDB 的配置，該設定位於東部地區 Google 雲端中使用 GCNV 儲存的主 Oracle 資料庫和西部地區 Google 雲端中使用 GCNV 儲存的實體備用 Oracle 資料庫之間。

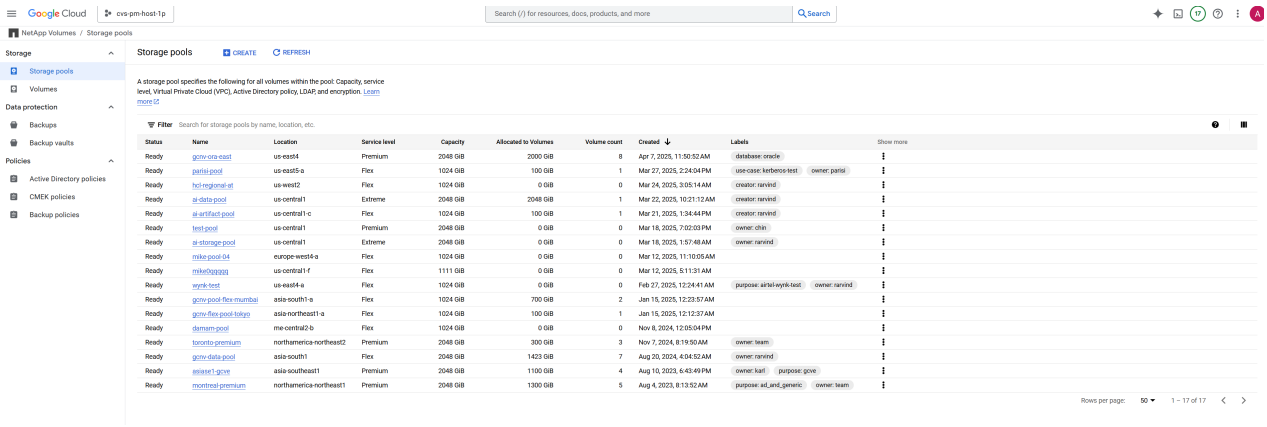
部署先決條件

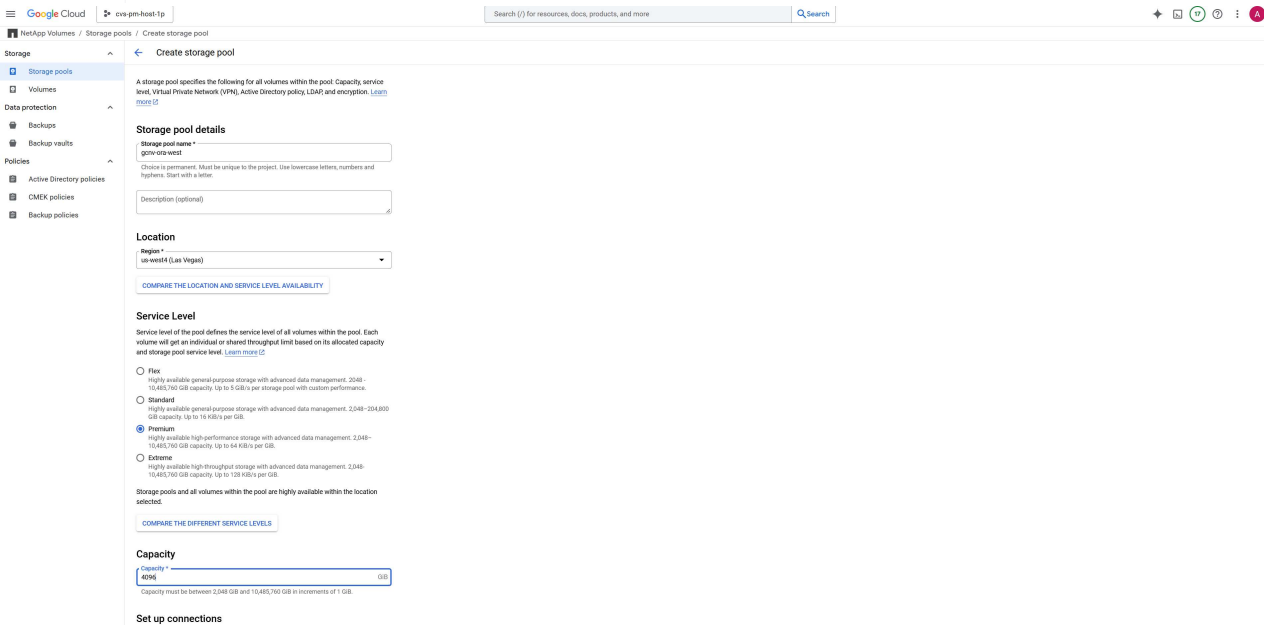
部署需要以下先決條件。

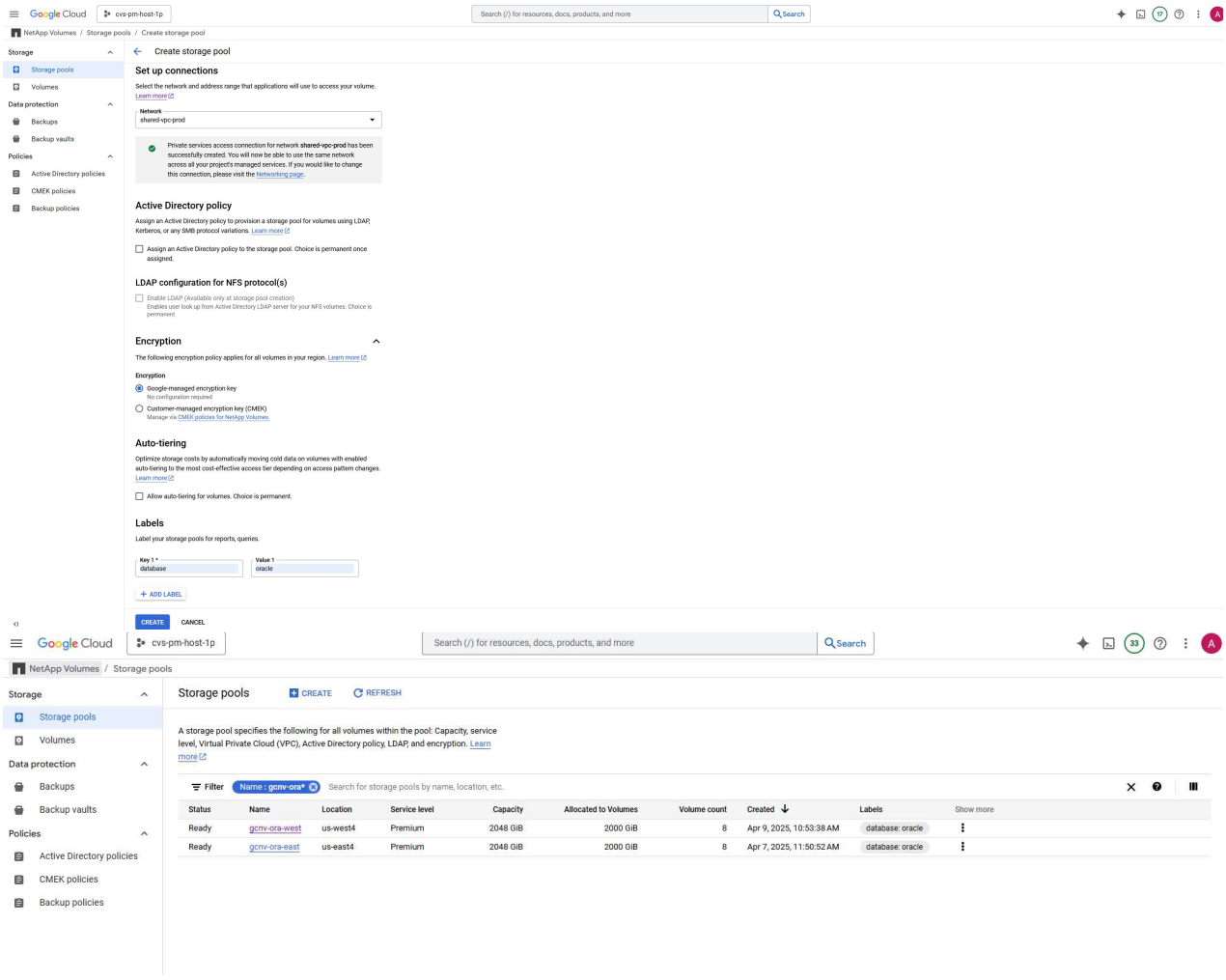
1. 已設定 Google 雲端帳戶，並在您的 Google 帳戶內建立專案以部署設定 Oracle Data Guard 的資源。
2. 建立跨越 Data Guard 所需區域的 VPC 和子網路。對於有彈性的 DR 設置，請考慮將主資料庫和備用資料庫放置在可以容忍本地區域發生重大災難的不同地理位置。
3. 從 Google 雲端入口網站控制台部署四個 Google 運算引擎 Linux VM 實例，一個作為主 Oracle DB 伺服器，一個作為備用 Oracle DB 伺服器，一個複製目標 DB 伺服器和一個 Oracle Data Guard 觀察器。有關環境設定的更多詳細信息，請參閱上一節中的架構圖。按照 Google 文件操作"在 Compute Engine 中建立 Linux 虛擬機器實例"以獲得詳細說明。

> 確保在 Azure VM 根磁碟區中分配了至少 50G，以便有足夠的空間來暫存 Oracle 安裝檔案。預設情況下，Google 計算引擎虛擬機器在實例層級被鎖定。為了實現虛擬機器之間的通信，應該建立特定的防火牆規則來開啟 TCP 連接埠流量，例如典型的 Oracle 連接埠 1521。

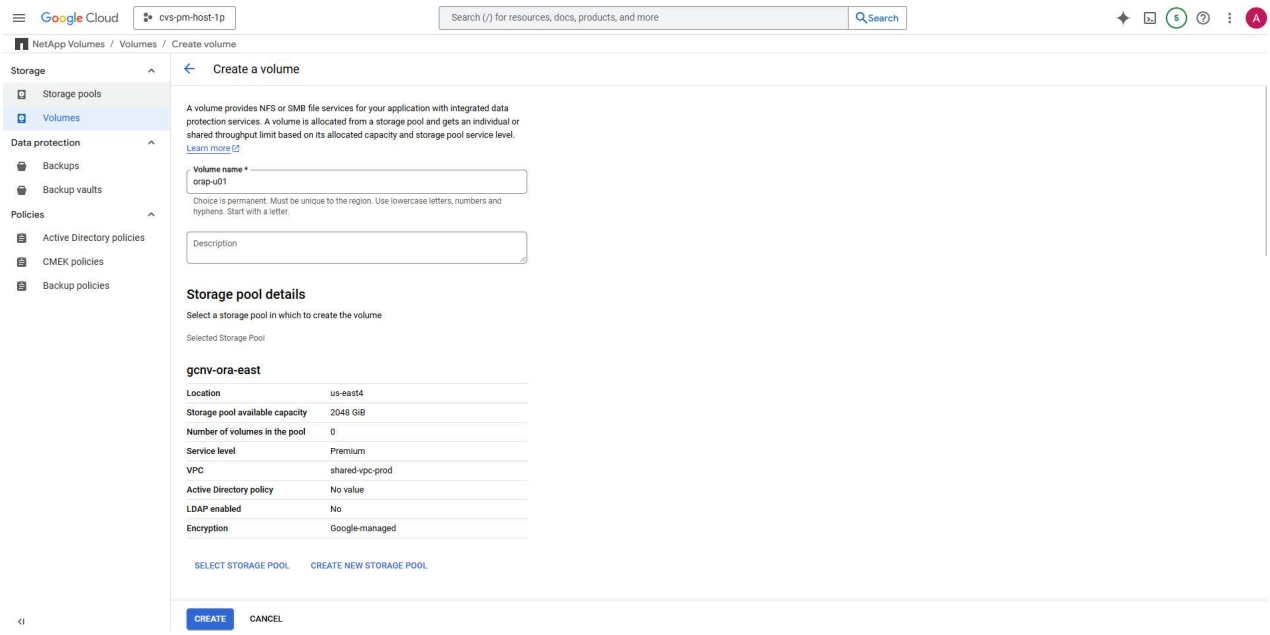
4. 從 Google 雲端入口網站控制台部署兩個 GCNV 儲存池來託管 Oracle 資料庫磁碟區。參考文檔"建立儲存池快速入門"以獲得逐步說明。以下是一些螢幕截圖，供快速參考。

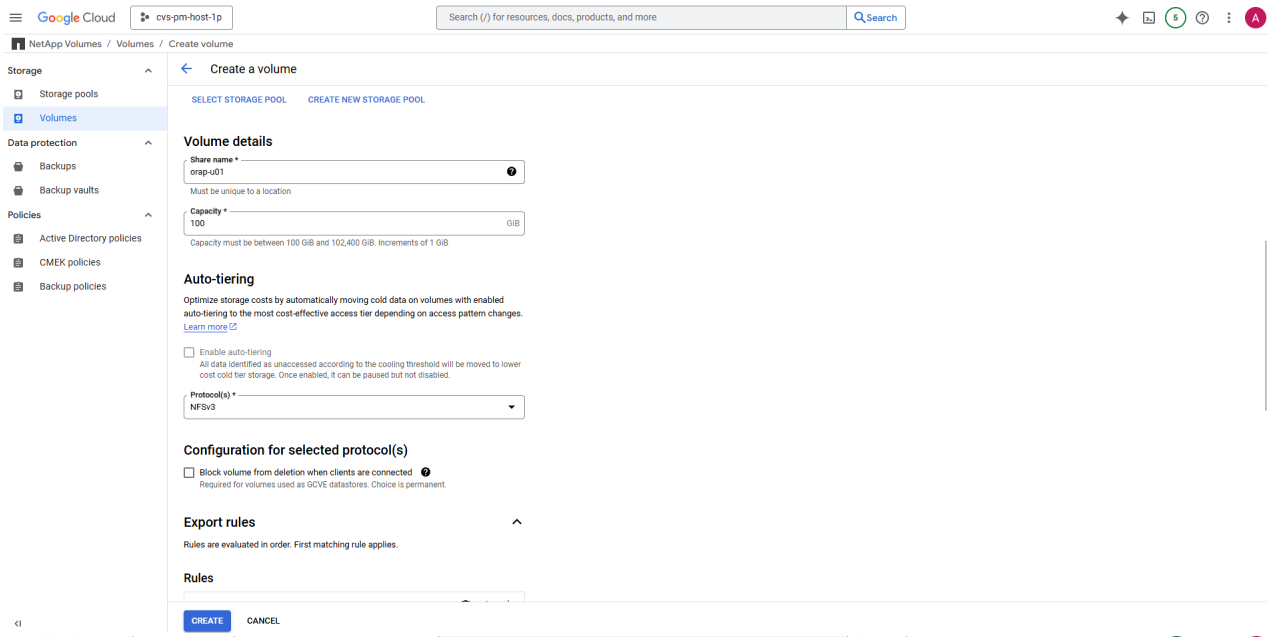


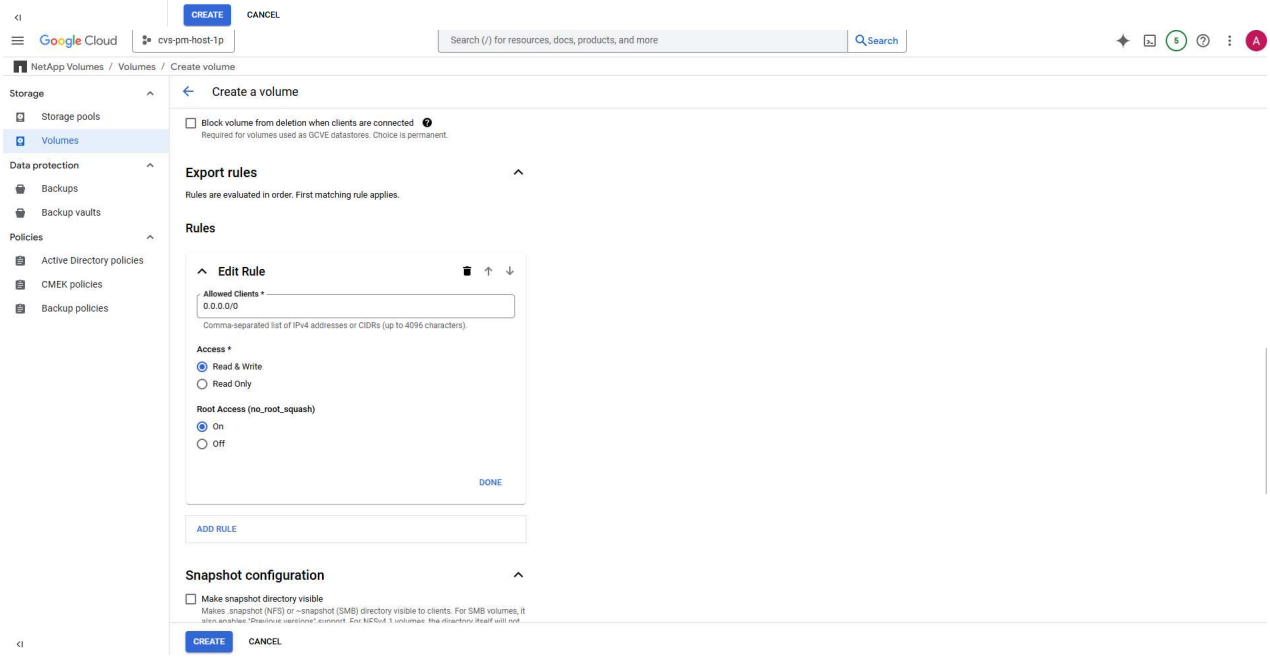


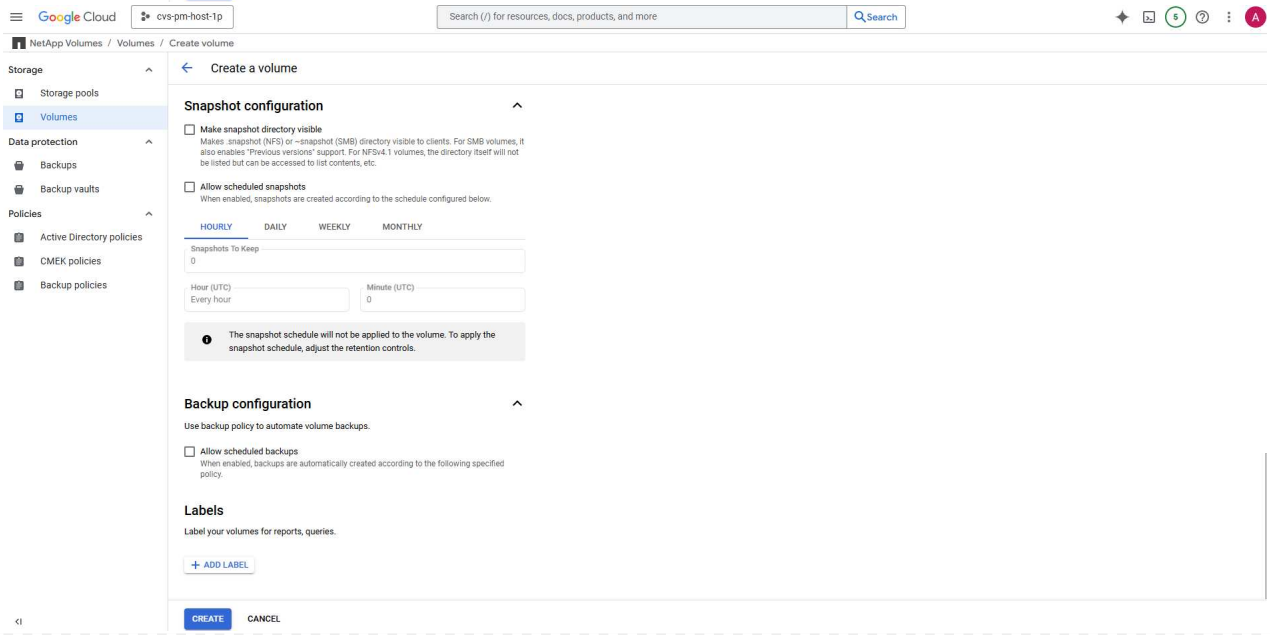


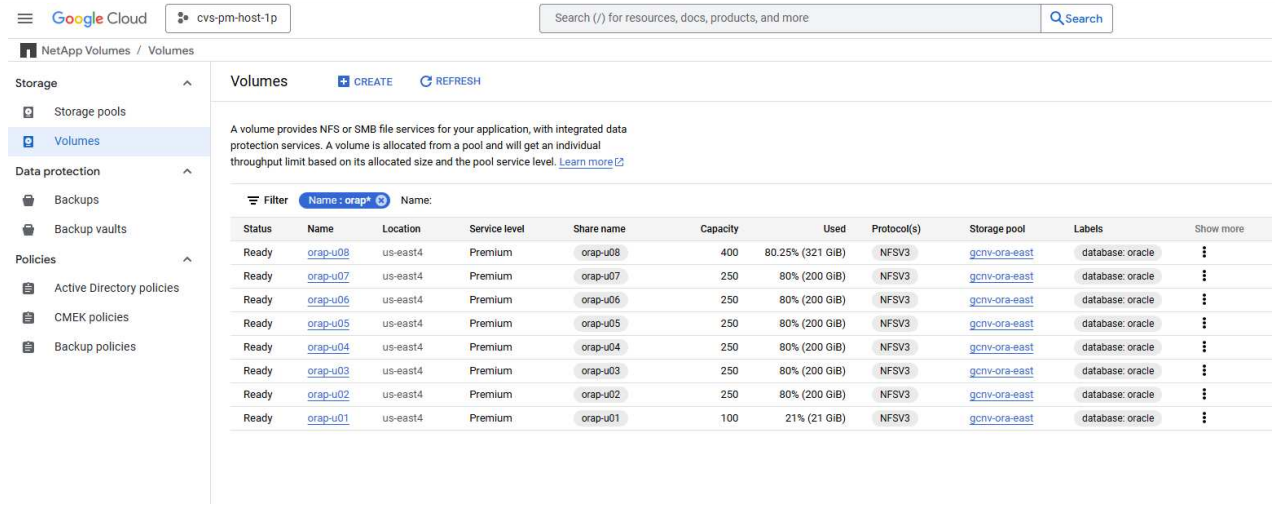
5. 在儲存池中建立資料庫磁碟區。參考文檔"創建卷快速入門"以獲得逐步說明。以下是一些螢幕截圖，供快速參考。

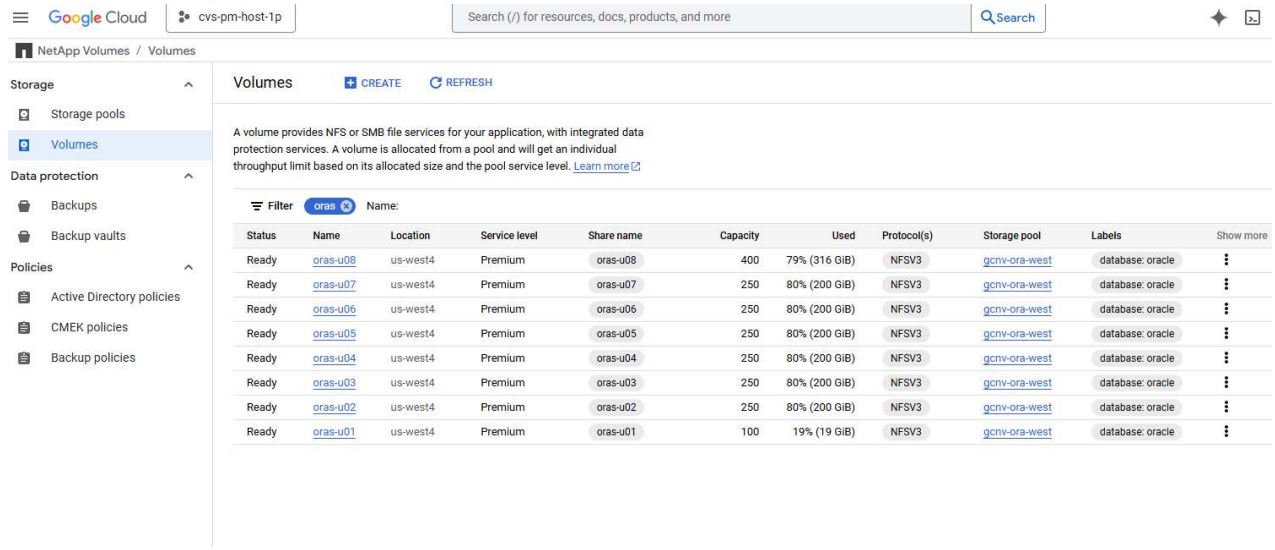



Google Cloud
cvs-pm-host-1p
Search (/) for resources, docs, products, and more
Search
NetApp Volumes / Volumes / Create volume
Storage
Storage pools
Volumes
Data protection
Backups
Backup vaults
Policies
Active Directory policies
CMEK policies
Backup policies
Create a volume
SELECT STORAGE POOL
CREATE NEW STORAGE POOL
Volume details
Share name *
orap-u01
Must be unique to a location
Capacity *
100
GiB
Capacity must be between 100 GiB and 102,400 GiB. Increments of 1 GiB
Auto-tiering
Optimize storage costs by automatically moving cold data on volumes with enabled auto-tiering to the most cost-effective access tier depending on access pattern changes.
Learn more
Enable auto-tiering
All data identified as unaccessed according to the cooling threshold will be moved to lower cost cold tier storage. Once enabled, it can be paused but not disabled.
Protocol(s) *
NFSv3
Configuration for selected protocol(s)
Block volume from deletion when clients are connected
Required for volumes used as GCVE datastores. Choice is permanent.
Export rules
Rules are evaluated in order. First matching rule applies.
Rules
CREATE
CANCEL


Google Cloud
cvs-pm-host-1p
Search (/) for resources, docs, products, and more
Search
NetApp Volumes / Volumes / Create volume
Storage
Storage pools
Volumes
Data protection
Backups
Backup vaults
Policies
Active Directory policies
CMEK policies
Backup policies
Create a volume
Block volume from deletion when clients are connected
Required for volumes used as GCVE datastores. Choice is permanent.
Export rules
Rules are evaluated in order. First matching rule applies.
Rules
Edit Rule
Allowed Clients *
0.0.0.0/0
Comma-separated list of IPv4 addresses or CIDRs (up to 4096 characters).
Access *
Read & Write
Read Only
Root Access (no_root_squash)
On
Off
DONE
ADD RULE
Snapshot configuration
Make snapshot directory visible
CREATE
CANCEL


Google Cloud
cvs-pm-host-1p
Search (/) for resources, docs, products, and more
Search
NetApp Volumes / Volumes / Create volume
Storage
Storage pools
Volumes
Data protection
Backups
Backup vaults
Policies
Active Directory policies
CMEK policies
Backup policies
Create a volume
Snapshot configuration
Make snapshot directory visible
Makes .snapshot (NFS) or ~snapshot (SMB) directory visible to clients. For SMB volumes, it also enables "Previous versions" support. For NFSv4.1 volumes, the directory itself will not be listed but can be accessed to list contents, etc.
Allow scheduled snapshots
When enabled, snapshots are created according to the schedule configured below.
HOURLY
DAILY
WEEKLY
MONTHLY
Snapshots To Keep
0
Hour (UTC)
Every hour
Minute (UTC)
0
The snapshot schedule will not be applied to the volume. To apply the snapshot schedule, adjust the retention controls.
Backup configuration
Use backup policy to automate volume backups.
Allow scheduled backups
When enabled, backups are automatically created according to the following specified policy.
Labels
Label your volumes for reports, queries.
+ ADD LABEL
CREATE
CANCEL





6. 主 Oracle 資料庫應該已經在主 Oracle DB 伺服器中安裝並配置。另一方面，在備用 Oracle DB 伺服器或複製 Oracle DB 伺服器中，僅安裝了 Oracle 軟體，而沒有建立 Oracle 資料庫。理想情況下，Oracle 檔案目錄佈局應該與所有 Oracle DB 伺服器完全相符。有關使用 NFS/ASM 安裝和設定 Oracle 網格基礎架構和資料庫的協助，請參閱 TR-4974。雖然該解決方案在 AWS FSx/EC2 環境上得到了驗證，但它同樣可以應用於 Google GCNV/Compute Engine 環境。
    - "TR-4974：在 AWS FSx/EC2 上使用 NFS/ASM 進行獨立重新啟動時 Oracle 19c"

Data Guard 的主要 Oracle VLDB 配置

在本示範中，我們在主 DB 伺服器上設定了一個名為 NTAP 的主 Oracle 資料庫，該資料庫具有八個 NFS 掛載點：/u01 用於 Oracle 二進位文件，/u02、/u03、/u04、/u05、/u06、/u07 用於 Oracle 資料檔案，並使用 Oracle ASM 磁碟負載用於 Oracle /活動日誌、歸檔日誌文件，並使用 Oracle ASM 磁碟組 +LOGS 進行負載平衡。 Oracle 控制檔放置在 +DATA 和 +LOGS 磁碟組上以實現冗餘。此設定可作為參考配置。您的實際部署應該考慮到儲存池大小、服務等級、資料庫磁碟區數量和每個磁碟區的大小的特定需求和要求。

有關使用 ASM 在 NFS 上設定 Oracle Data Guard 的詳細逐步流程，請參閱 TR-5002 -"使用Azure NetApp Files降低 Oracle Active Data Guard 成本" 。雖然 TR-5002 中的程式是在 Azure ANF 環境上驗證的，但它們同樣適用於 Google GCNV 環境。

以下說明了 Google GCNV 環境中 Data Guard 配置中主 Oracle VLDB 的詳細資訊。

1. 主計算引擎 DB 伺服器中的主資料庫 NTAP 作為單一實例資料庫在 GCNV 儲存上的獨立重新啟動設定中部署，使用 NFS 協定和 ASM 作為資料庫儲存磁碟區管理器。

```
orap.us-east4-a.c.cvs-pm-host-1p.internal:
Zone: us-east-4a
size: n1-standard-4 (4 vCPUs, 15 GB Memory)
OS: Linux (redhat 8.10)
pub_ip: 35.212.124.14
pri_ip: 10.70.11.5

[oracle@orap ~]$ df -h
Filesystem                Size  Used Avail Use% Mounted on
devtmpfs                  7.2G     0  7.2G   0% /dev
tmpfs                     7.3G     0  7.3G   0% /dev/shm
tmpfs                     7.3G  8.5M  7.2G   1% /run
tmpfs                     7.3G     0  7.3G   0% /sys/fs/cgroup
/dev/sda2                  50G   40G   11G  80% /
/dev/sda1                 200M  5.9M  194M   3% /boot/efi
10.165.128.180:/orap-u05  250G  201G   50G  81% /u05
10.165.128.180:/orap-u08  400G  322G   79G  81% /u08
10.165.128.180:/orap-u04  250G  201G   50G  81% /u04
10.165.128.180:/orap-u07  250G  201G   50G  81% /u07
10.165.128.180:/orap-u02  250G  201G   50G  81% /u02
10.165.128.180:/orap-u06  250G  201G   50G  81% /u06
10.165.128.180:/orap-u01  100G   21G   80G  21% /u01
10.165.128.180:/orap-u03  250G  201G   50G  81% /u03


[oracle@orap ~]$ cat /etc/oratab
#



# This file is used by ORACLE utilities.  It is created by root.sh
```

```
# and updated by either Database Configuration Assistant while
creating
# a database or ASM Configuration Assistant while creating ASM
instance.

# A colon, ':', is used as the field terminator.  A new line
terminates
# the entry.  Lines beginning with a pound sign, '#', are comments.
#
# Entries are of the form:
#   $ORACLE_SID:$ORACLE_HOME:<N|Y>:
#
# The first and second fields are the system identifier and home
# directory of the database respectively.  The third field indicates
# to the dbstart utility that the database should , "Y", or should
not,
# "N", be brought up at system boot time.
#
# Multiple entries with the same $ORACLE_SID are not allowed.
#
#
+ASM:/u01/app/oracle/product/19.0.0/grid:N
NTAP:/u01/app/oracle/product/19.0.0/NTAP:N
```

2. 以 oracle 使用者登入主資料庫伺服器。驗證電網配置。

```
$GRID_HOME/bin/crsctl stat res -t
```

```
[oracle@orap ~]$ $GRID_HOME/bin/crsctl stat res -t
--------------------------------------------------------------------------------
------------
Name           Target  State        Server                   State
details
--------------------------------------------------------------------------------
------------
Local Resources
--------------------------------------------------------------------------------
------------
ora.DATA.dg
               ONLINE  ONLINE       orap                     STABLE
ora.LISTENER.lsnr
               ONLINE  ONLINE       orap                     STABLE
ora.LOGS.dg
               ONLINE  ONLINE       orap                     STABLE
ora.asm
               ONLINE  ONLINE       orap
Started,STABLE
ora.ons
               OFFLINE OFFLINE      orap                     STABLE
--------------------------------------------------------------------------------
------------
Cluster Resources
--------------------------------------------------------------------------------
------------
ora.cssd
      1        ONLINE  ONLINE       orap                     STABLE
ora.diskmon
      1        OFFLINE OFFLINE                               STABLE
ora.evmd
      1        ONLINE  ONLINE       orap                     STABLE
ora.ntap.db
      1        ONLINE  ONLINE       orap
Open,HOME=/u01/app/o

racle/product/19.0.0

/NTAP,STABLE
--------------------------------------------------------------------------------
------------
[oracle@orap ~]$
```

3. ASM 磁碟組配置。

```
asmcmd
```

```
[oracle@orap ~]$ asmcmd
ASMCMD> lsdg
State    Type    Rebal  Sector  Logical_Sector  Block       AU
Total_MB  Free_MB  Req_mir_free_MB  Usable_file_MB  Offline_disks
Voting_files  Name
MOUNTED  EXTERN  N         512             512   4096  4194304
1228800  1219888                0         1219888              0
N  DATA/
MOUNTED  EXTERN  N         512             512   4096  4194304
327680   326556                0          326556              0
N  LOGS/
ASMCMD> lsdsk
Path
/u02/oradata/asm/orap_data_disk_01
/u02/oradata/asm/orap_data_disk_02
/u02/oradata/asm/orap_data_disk_03
/u02/oradata/asm/orap_data_disk_04
/u03/oradata/asm/orap_data_disk_05
/u03/oradata/asm/orap_data_disk_06
/u03/oradata/asm/orap_data_disk_07
/u03/oradata/asm/orap_data_disk_08
/u04/oradata/asm/orap_data_disk_09
/u04/oradata/asm/orap_data_disk_10
/u04/oradata/asm/orap_data_disk_11
/u04/oradata/asm/orap_data_disk_12
/u05/oradata/asm/orap_data_disk_13
/u05/oradata/asm/orap_data_disk_14
/u05/oradata/asm/orap_data_disk_15
/u05/oradata/asm/orap_data_disk_16
/u06/oradata/asm/orap_data_disk_17
/u06/oradata/asm/orap_data_disk_18
/u06/oradata/asm/orap_data_disk_19
/u06/oradata/asm/orap_data_disk_20
/u07/oradata/asm/orap_data_disk_21
/u07/oradata/asm/orap_data_disk_22
/u07/oradata/asm/orap_data_disk_23
/u07/oradata/asm/orap_data_disk_24
/u08/oralogs/asm/orap_logs_disk_01
/u08/oralogs/asm/orap_logs_disk_02
/u08/oralogs/asm/orap_logs_disk_03
/u08/oralogs/asm/orap_logs_disk_04
ASMCMD>
```

4. 主資料庫上 Data Guard 的參數設定。

```
SQL> show parameter name

NAME                                 TYPE        VALUE
------------------------------------ -----------
------------------------------
cdb_cluster_name                     string
cell_offloadgroup_name               string
db_file_name_convert                 string
db_name                              string      ntap
db_unique_name                       string      ntap_ny
global_names                         boolean     FALSE
instance_name                        string      NTAP
lock_name_space                      string
log_file_name_convert                string
pdb_file_name_convert                string
processor_group_name                 string

NAME                                 TYPE        VALUE
------------------------------------ -----------
------------------------------
service_names                        string      ntap_ny.cvs-pm-
host-1p.interna

SQL> sho parameter log_archive_dest

NAME                                 TYPE        VALUE
------------------------------------ -----------
------------------------------
log_archive_dest                     string
log_archive_dest_1                   string
LOCATION=USE_DB_RECOVERY_FILE_
                                                 DEST
VALID_FOR=(ALL_LOGFILES,A
                                                 LL_ROLES)
DB_UNIQUE_NAME=NTAP_
                                                 NY
log_archive_dest_10                  string
log_archive_dest_11                  string
log_archive_dest_12                  string
log_archive_dest_13                  string
log_archive_dest_14                  string
log_archive_dest_15                  string

NAME                                 TYPE        VALUE
------------------------------------ -----------
------------------------------
```

```
log_archive_dest_16                  string
log_archive_dest_17                  string
log_archive_dest_18                  string
log_archive_dest_19                  string
log_archive_dest_2                   string      SERVICE=NTAP_LA
ASYNC VALID_FO

R=(ONLINE_LOGFILES,PRIMARY_ROL
                                                 E)
DB_UNIQUE_NAME=NTAP_LA
log_archive_dest_20                  string
log_archive_dest_21                  string
log_archive_dest_22                  string
```

5. 主資料庫配置。

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

NAME      OPEN_MODE            LOG_MODE
--------- -------------------- ------------
NTAP      READ WRITE           ARCHIVELOG


SQL> show pdbs

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


SQL> select name from v$datafile;

NAME
------------------------------------------------------------------------
------------
+DATA/NTAP/DATAFILE/system.257.1198026005
+DATA/NTAP/DATAFILE/sysaux.258.1198026051
+DATA/NTAP/DATAFILE/undotbs1.259.1198026075
+DATA/NTAP/86B637B62FE07A65E053F706E80A27CA/DATAFILE/system.266.1198
027075
+DATA/NTAP/86B637B62FE07A65E053F706E80A27CA/DATAFILE/sysaux.267.1198
027075
```

```
+DATA/NTAP/DATAFILE/users.260.1198026077
+DATA/NTAP/86B637B62FE07A65E053F706E80A27CA/DATAFILE/undotbs1.268.11
98027075
+DATA/NTAP/32639B76C9BC91A8E063050B460A2116/DATAFILE/system.272.1198
028157
+DATA/NTAP/32639B76C9BC91A8E063050B460A2116/DATAFILE/sysaux.273.1198
028157
+DATA/NTAP/32639B76C9BC91A8E063050B460A2116/DATAFILE/undotbs1.271.11
98028157
+DATA/NTAP/32639B76C9BC91A8E063050B460A2116/DATAFILE/users.275.11980
28185

NAME
--------------------------------------------------------------------
------------
+DATA/NTAP/32639D40D02D925FE063050B460A60E3/DATAFILE/system.277.1198
028187
+DATA/NTAP/32639D40D02D925FE063050B460A60E3/DATAFILE/sysaux.278.1198
028187
+DATA/NTAP/32639D40D02D925FE063050B460A60E3/DATAFILE/undotbs1.276.11
98028187
+DATA/NTAP/32639D40D02D925FE063050B460A60E3/DATAFILE/users.280.11980
28209
+DATA/NTAP/32639E973AF79299E063050B460AFBAD/DATAFILE/system.282.1198
028209
+DATA/NTAP/32639E973AF79299E063050B460AFBAD/DATAFILE/sysaux.283.1198
028209
+DATA/NTAP/32639E973AF79299E063050B460AFBAD/DATAFILE/undotbs1.281.11
98028209
+DATA/NTAP/32639E973AF79299E063050B460AFBAD/DATAFILE/users.285.11980
28229

19 rows selected.


SQL> select member from v$logfile;

MEMBER
--------------------------------------------------------------------
------------
+DATA/NTAP/ONLINELOG/group_3.264.1198026139
+LOGS/NTAP/ONLINELOG/group_3.259.1198026147
+DATA/NTAP/ONLINELOG/group_2.263.1198026137
+LOGS/NTAP/ONLINELOG/group_2.258.1198026145
+DATA/NTAP/ONLINELOG/group_1.262.1198026137
+LOGS/NTAP/ONLINELOG/group_1.257.1198026145
```

```
+DATA/NTAP/ONLINELOG/group_4.286.1198511423
+LOGS/NTAP/ONLINELOG/group_4.265.1198511425
+DATA/NTAP/ONLINELOG/group_5.287.1198511445
+LOGS/NTAP/ONLINELOG/group_5.266.1198511447
+DATA/NTAP/ONLINELOG/group_6.288.1198511459

MEMBER
--------------------------------------------------------------------------------
------------
+LOGS/NTAP/ONLINELOG/group_6.267.1198511461
+DATA/NTAP/ONLINELOG/group_7.289.1198511477
+LOGS/NTAP/ONLINELOG/group_7.268.1198511479

14 rows selected.


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

```
NAME
--------------------------------------------------------------------------------
------------
+DATA/NTAP/CONTROLFILE/current.261.1198026135
+LOGS/NTAP/CONTROLFILE/current.256.1198026135
```

6. Oracle 監聽器配置。

```
lsnrctl status listener
```

```
[oracle@orap admin]$ lsnrctl status

LSNRCTL for Linux: Version 19.0.0.0.0 - Production on 15-APR-2025
16:14:00

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

Connecting to (ADDRESS=(PROTOCOL=tcp)(HOST=)(PORT=1521))
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for Linux: Version 19.0.0.0.0 -
Production
Start Date                14-APR-2025 19:44:21
Uptime                    0 days 20 hr. 29 min. 38 sec
Trace Level               off
```

```
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File
/u01/app/oracle/product/19.0.0/grid/network/admin/listener.ora
Listener Log File
/u01/app/oracle/diag/tnslsnr/orap/listener/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=orap.us-east4-a.c.cvs-
pm-host-1p.internal)(PORT=1521)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))
Services Summary...
Service "+ASM" has 1 instance(s).
  Instance "+ASM", status READY, has 1 handler(s) for this
service...
Service "+ASM_DATA" has 1 instance(s).
  Instance "+ASM", status READY, has 1 handler(s) for this
service...
Service "+ASM_LOGS" has 1 instance(s).
  Instance "+ASM", status READY, has 1 handler(s) for this
service...
Service "32639b76c9bc91a8e063050b460a2116.cvs-pm-host-1p.internal"
has 1 instance(s).
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
Service "32639d40d02d925fe063050b460a60e3.cvs-pm-host-1p.internal"
has 1 instance(s).
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
Service "32639e973af79299e063050b460afbad.cvs-pm-host-1p.internal"
has 1 instance(s).
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
Service "86b637b62fdf7a65e053f706e80a27ca.cvs-pm-host-1p.internal"
has 1 instance(s).
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
Service "NTAPXDB.cvs-pm-host-1p.internal" has 1 instance(s).
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
Service "NTAP_NY_DGMGRL.cvs-pm-host-1p.internal" has 1 instance(s).
  Instance "NTAP", status UNKNOWN, has 1 handler(s) for this
service...
Service "ntap.cvs-pm-host-1p.internal" has 1 instance(s).
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
Service "ntap_pdb1.cvs-pm-host-1p.internal" has 1 instance(s).
```

```
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
Service "ntap_pdb2.cvs-pm-host-1p.internal" has 1 instance(s).
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
Service "ntap_pdb3.cvs-pm-host-1p.internal" has 1 instance(s).
  Instance "NTAP", status READY, has 1 handler(s) for this
service...
The command completed successfully
```

7. 主資料庫已啟用閃回。

```
SQL> select name, database_role, flashback_on from v$database;

NAME      DATABASE_ROLE    FLASHBACK_ON
--------- ---------------- ------------------
NTAP      PRIMARY          YES
```

8. 主資料庫上的 dNFS 配置。

```
SQL> select svrname, dirname from v$dnfs_servers;

SVRNAME
--------------------------------------------------------------------------
------------
DIRNAME
--------------------------------------------------------------------------
------------
10.165.128.180
/orap-u04

10.165.128.180
/orap-u05

10.165.128.180
/orap-u07


SVRNAME
--------------------------------------------------------------------------
------------
DIRNAME
--------------------------------------------------------------------------
------------
```

```
10.165.128.180
/orap-u03

10.165.128.180
/orap-u06

10.165.128.180
/orap-u02


SVRNAME
------------------------------------------------------------------------
------------
DIRNAME
------------------------------------------------------------------------
------------
10.165.128.180
/orap-u08

10.165.128.180
/orap-u01


8 rows selected.
```

這樣就完成了在 GCNV 主站點上使用 NFS/ASM 為 VLDB NTAP 設定 Data Guard 的示範。

針對 **Data Guard** 的備用 **Oracle VLDB** 配置

Oracle Data Guard 需要 OS 核心配置和 Oracle 軟體堆疊（包括備用 DB 伺服器上的修補程式集）以與主 DB 伺服器相符。為了便於管理和簡單起見，備用資料庫伺服器的資料庫儲存配置理想情況下也應該與主資料庫伺服器匹配，例如資料庫目錄佈局和 NFS 掛載點的大小。

再次強調，有關使用 ASM 在 NFS 上設定 Oracle Data Guard 備用伺服器的詳細逐步流程，請參閱"TR-5002 - 使用Azure NetApp Files降低 Oracle Active Data Guard 成本"和"TR-4974 - 使用 NFS/ASM 在 AWS FSx/EC2 上獨立重新啟動 Oracle 19c"相關章節。以下說明了 Google GCNV 環境中 Data Guard 設定中備用資料庫伺服器上備用 Oracle VLDB 配置的詳細資訊。

1. 演示實驗室中備用站點的備用 Oracle DB 伺服器配置。

```
oras.us-west4-a.c.cvs-pm-host-1p.internal:
Zone: us-west4-a
size: n1-standard-4 (4 vCPUs, 15 GB Memory)
OS: Linux (redhat 8.10)
pub_ip: 35.219.129.195
pri_ip: 10.70.14.16

[oracle@oras ~]$ df -h
Filesystem                Size  Used Avail Use% Mounted on
devtmpfs                  7.2G     0  7.2G   0% /dev
tmpfs                     7.3G  1.1G  6.2G  16% /dev/shm
tmpfs                     7.3G  8.5M  7.2G   1% /run
tmpfs                     7.3G     0  7.3G   0% /sys/fs/cgroup
/dev/sda2                  50G   40G   11G  80% /
/dev/sda1                 200M  5.9M  194M   3% /boot/efi
10.165.128.197:/oras-u07  250G  201G   50G  81% /u07
10.165.128.197:/oras-u06  250G  201G   50G  81% /u06
10.165.128.197:/oras-u02  250G  201G   50G  81% /u02
10.165.128.196:/oras-u03  250G  201G   50G  81% /u03
10.165.128.196:/oras-u01  100G   20G   81G  20% /u01
10.165.128.197:/oras-u05  250G  201G   50G  81% /u05
10.165.128.197:/oras-u04  250G  201G   50G  81% /u04
10.165.128.197:/oras-u08  400G  317G   84G  80% /u08

[oracle@oras ~]$ cat /etc/oratab
#Backup file is
/u01/app/oracle/crsdata/oras/output/oratab.bak.oras.oracle line
added by Agent
#



# This file is used by ORACLE utilities.  It is created by root.sh
# and updated by either Database Configuration Assistant while
creating
```

```
# a database or ASM Configuration Assistant while creating ASM
instance.

# A colon, ':', is used as the field terminator.  A new line
terminates
# the entry.  Lines beginning with a pound sign, '#', are comments.
#
# Entries are of the form:
#   $ORACLE_SID:$ORACLE_HOME:<N|Y>:
#
# The first and second fields are the system identifier and home
# directory of the database respectively.  The third field indicates
# to the dbstart utility that the database should , "Y", or should
not,
# "N", be brought up at system boot time.
#
# Multiple entries with the same $ORACLE_SID are not allowed.
#
#
+ASM:/u01/app/oracle/product/19.0.0/grid:N
NTAP:/u01/app/oracle/product/19.0.0/NTAP:N              # line added
by Agent
```

2. 備用資料庫伺服器上的網格基礎架構配置。

```
[oracle@oras ~]$ $GRID_HOME/bin/crsctl stat res -t
--------------------------------------------------------------------------------
------------
Name           Target  State        Server                   State
details
--------------------------------------------------------------------------------
------------
Local Resources
--------------------------------------------------------------------------------
------------
ora.DATA.dg
               ONLINE  ONLINE       oras                     STABLE
ora.LISTENER.lsnr
               ONLINE  ONLINE       oras                     STABLE
ora.LOGS.dg
               ONLINE  ONLINE       oras                     STABLE
ora.asm
               ONLINE  ONLINE       oras
Started,STABLE
ora.ons
               OFFLINE OFFLINE      oras                     STABLE
--------------------------------------------------------------------------------
------------
Cluster Resources
--------------------------------------------------------------------------------
------------
ora.cssd
      1        ONLINE  ONLINE       oras                     STABLE
ora.diskmon
      1        OFFLINE OFFLINE                               STABLE
ora.evmd
      1        ONLINE  ONLINE       oras                     STABLE
ora.ntap_la.db
      1        ONLINE  INTERMEDIATE oras
Dismounted,Mount Ini

tiated,HOME=/u01/app

/oracle/product/19.0

.0/NTAP,STABLE
--------------------------------------------------------------------------------
------------
```

3. 備用資料庫伺服器上的 ASM 磁碟組配置。

```
[oracle@oras ~]$ asmcmd
ASMCMD> lsdg
State    Type    Rebal  Sector  Logical_Sector  Block       AU
Total_MB  Free_MB  Req_mir_free_MB  Usable_file_MB  Offline_disks
Voting_files  Name
MOUNTED  EXTERN  N         512             512   4096  4194304
1228800  1228420                0         1228420              0
N  DATA/
MOUNTED  EXTERN  N         512             512   4096  4194304
322336   322204                0          322204              0
N  LOGS/
ASMCMD> lsdsk
Path
/u02/oradata/asm/oras_data_disk_01
/u02/oradata/asm/oras_data_disk_02
/u02/oradata/asm/oras_data_disk_03
/u02/oradata/asm/oras_data_disk_04
/u03/oradata/asm/oras_data_disk_05
/u03/oradata/asm/oras_data_disk_06
/u03/oradata/asm/oras_data_disk_07
/u03/oradata/asm/oras_data_disk_08
/u04/oradata/asm/oras_data_disk_09
/u04/oradata/asm/oras_data_disk_10
/u04/oradata/asm/oras_data_disk_11
/u04/oradata/asm/oras_data_disk_12
/u05/oradata/asm/oras_data_disk_13
/u05/oradata/asm/oras_data_disk_14
/u05/oradata/asm/oras_data_disk_15
/u05/oradata/asm/oras_data_disk_16
/u06/oradata/asm/oras_data_disk_17
/u06/oradata/asm/oras_data_disk_18
/u06/oradata/asm/oras_data_disk_19
/u06/oradata/asm/oras_data_disk_20
/u07/oradata/asm/oras_data_disk_21
/u07/oradata/asm/oras_data_disk_22
/u07/oradata/asm/oras_data_disk_23
/u07/oradata/asm/oras_data_disk_24
/u08/oralogs/asm/oras_logs_disk_01
/u08/oralogs/asm/oras_logs_disk_02
/u08/oralogs/asm/oras_logs_disk_03
/u08/oralogs/asm/oras_logs_disk_04
ASMCMD>
```

4. 備用資料庫上的 Data Guard 參數設定。

```
SQL> show parameter name

NAME                                 TYPE        VALUE
------------------------------------ -----------
------------------------------
cdb_cluster_name                     string
cell_offloadgroup_name               string
db_file_name_convert                 string
db_name                              string      NTAP
db_unique_name                       string      NTAP_LA
global_names                         boolean     FALSE
instance_name                        string      NTAP
lock_name_space                      string
log_file_name_convert                string
pdb_file_name_convert                string
processor_group_name                 string

NAME                                 TYPE        VALUE
------------------------------------ -----------
------------------------------
service_names                        string      NTAP_LA.cvs-pm-
host-1p.interna
                                                 l

SQL> show parameter log_archive_config

NAME                                 TYPE        VALUE
------------------------------------ -----------
------------------------------
log_archive_config                   string
DG_CONFIG=(NTAP_NY,NTAP_LA)
SQL> show parameter fal_server

NAME                                 TYPE        VALUE
------------------------------------ -----------
------------------------------
fal_server                           string      NTAP_NY
```

5. 備用資料庫配置。

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

NAME      OPEN_MODE            LOG_MODE
--------- -------------------- ------------
NTAP      MOUNTED              ARCHIVELOG
```

```
SQL> show pdbs

    CON_ID CON_NAME                       OPEN MODE  RESTRICTED
---------- ------------------------------ ---------- ----------
         2 PDB$SEED                       MOUNTED
         3 NTAP_PDB1                      MOUNTED
         4 NTAP_PDB2                      MOUNTED
         5 NTAP_PDB3                      MOUNTED

SQL> select name from v$datafile;

NAME
--------------------------------------------------------------------------------
------------
+DATA/NTAP_LA/DATAFILE/system.261.1198520347
+DATA/NTAP_LA/DATAFILE/sysaux.262.1198520373
+DATA/NTAP_LA/DATAFILE/undotbs1.263.1198520399
+DATA/NTAP_LA/32635CC1DCF58A60E063050B460AB746/DATAFILE/system.264.1
198520417
+DATA/NTAP_LA/32635CC1DCF58A60E063050B460AB746/DATAFILE/sysaux.265.1
198520435
+DATA/NTAP_LA/DATAFILE/users.266.1198520451
+DATA/NTAP_LA/32635CC1DCF58A60E063050B460AB746/DATAFILE/undotbs1.267
.1198520455
+DATA/NTAP_LA/32639B76C9BC91A8E063050B460A2116/DATAFILE/system.268.1
198520471
+DATA/NTAP_LA/32639B76C9BC91A8E063050B460A2116/DATAFILE/sysaux.269.1
198520489
+DATA/NTAP_LA/32639B76C9BC91A8E063050B460A2116/DATAFILE/undotbs1.270
.1198520505
+DATA/NTAP_LA/32639B76C9BC91A8E063050B460A2116/DATAFILE/users.271.11
98520513

NAME
--------------------------------------------------------------------------------
------------
+DATA/NTAP_LA/32639D40D02D925FE063050B460A60E3/DATAFILE/system.272.1
198520517
+DATA/NTAP_LA/32639D40D02D925FE063050B460A60E3/DATAFILE/sysaux.273.1
198520533
+DATA/NTAP_LA/32639D40D02D925FE063050B460A60E3/DATAFILE/undotbs1.274
.1198520551
+DATA/NTAP_LA/32639D40D02D925FE063050B460A60E3/DATAFILE/users.275.11
98520559
+DATA/NTAP_LA/32639E973AF79299E063050B460AFBAD/DATAFILE/system.276.1
```

```
198520563
+DATA/NTAP_LA/32639E973AF79299E063050B460AFBAD/DATAFILE/sysaux.277.1
198520579
+DATA/NTAP_LA/32639E973AF79299E063050B460AFBAD/DATAFILE/undotbs1.278
.1198520595
+DATA/NTAP_LA/32639E973AF79299E063050B460AFBAD/DATAFILE/users.279.11
98520605

19 rows selected.


SQL> select name from v$controlfile;

NAME
------------------------------------------------------------------------
------------
+DATA/NTAP_LA/CONTROLFILE/current.260.1198520303
+LOGS/NTAP_LA/CONTROLFILE/current.257.1198520305


SQL> select group#, type, member from v$logfile order by 2, 1;

    GROUP# TYPE    MEMBER
---------- -------
------------------------------------------------------------
         1 ONLINE  +DATA/NTAP_LA/ONLINELOG/group_1.280.1198520649
         1 ONLINE  +LOGS/NTAP_LA/ONLINELOG/group_1.259.1198520651
         2 ONLINE  +DATA/NTAP_LA/ONLINELOG/group_2.281.1198520659
         2 ONLINE  +LOGS/NTAP_LA/ONLINELOG/group_2.258.1198520661
         3 ONLINE  +DATA/NTAP_LA/ONLINELOG/group_3.282.1198520669
         3 ONLINE  +LOGS/NTAP_LA/ONLINELOG/group_3.260.1198520671
         4 STANDBY +DATA/NTAP_LA/ONLINELOG/group_4.283.1198520677
         4 STANDBY +LOGS/NTAP_LA/ONLINELOG/group_4.261.1198520679
         5 STANDBY +DATA/NTAP_LA/ONLINELOG/group_5.284.1198520687
         5 STANDBY +LOGS/NTAP_LA/ONLINELOG/group_5.262.1198520689
         6 STANDBY +DATA/NTAP_LA/ONLINELOG/group_6.285.1198520697

    GROUP# TYPE    MEMBER
---------- -------
------------------------------------------------------------
         6 STANDBY +LOGS/NTAP_LA/ONLINELOG/group_6.263.1198520699
         7 STANDBY +DATA/NTAP_LA/ONLINELOG/group_7.286.1198520707
         7 STANDBY +LOGS/NTAP_LA/ONLINELOG/group_7.264.1198520709

14 rows selected.
```

6. 驗證備用資料庫復原狀態。注意 `recovery logmerger`在 `APPLYING_LOG`行動。

```
SQL> SELECT ROLE, THREAD#, SEQUENCE#, ACTION FROM
V$DATAGUARD_PROCESS;

ROLE                        THREAD#  SEQUENCE# ACTION
--------------------------- ---------- ---------- ------------
post role transition             0          0 IDLE
recovery apply slave             0          0 IDLE
recovery apply slave             0          0 IDLE
recovery apply slave             0          0 IDLE
recovery apply slave             0          0 IDLE
recovery logmerger               1         24 APPLYING_LOG
managed recovery                 0          0 IDLE
RFS ping                         1         24 IDLE
archive redo                     0          0 IDLE
archive redo                     0          0 IDLE
gap manager                      0          0 IDLE

ROLE                        THREAD#  SEQUENCE# ACTION
--------------------------- ---------- ---------- ------------
archive local                    0          0 IDLE
redo transport timer             0          0 IDLE
archive redo                     0          0 IDLE
RFS async                        1         24 IDLE
redo transport monitor           0          0 IDLE
log writer                       0          0 IDLE

17 rows selected.
```

7. 備用資料庫已啟用閃回。

```
SQL> select name, database_role, flashback_on from v$database;

NAME      DATABASE_ROLE    FLASHBACK_ON
--------- ---------------- ------------------
NTAP      PHYSICAL STANDBY YES
```

8. 備用資料庫上的 dNFS 配置。

```
SQL> select svrname, dirname from v$dnfs_servers;

SVRNAME
--------------------------------------------------------------------------------
---------
DIRNAME
--------------------------------------------------------------------------------
---------
10.165.128.197
/oras-u04

10.165.128.197
/oras-u05

10.165.128.197
/oras-u06

10.165.128.197
/oras-u07

10.165.128.197
/oras-u02

10.165.128.197
/oras-u08

10.165.128.196
/oras-u03

10.165.128.196
/oras-u01


8 rows selected.
```

這樣就完成了 VLDB NTAP 的 Data Guard 設定演示，並在備用網站啟用了託管備用復原。

使用觀察者設定 **Data Guard Broker** 和 **FSFO**

設定 **Data Guard Broker**

Oracle Data Guard 代理程式是一個分散式管理框架，可自動並集中執行 Oracle Data Guard 配置的建立、維護和監控。以下部分示範如何設定 Data Guard Broker 來管理 Data Guard 環境。

1. 透過 sqlplus 使用以下命令在主資料庫和備用資料庫上啟動資料保護代理程式。

```
alter system set dg_broker_start=true scope=both;
```

2. 從主資料庫，以 SYSDBA 身分連接到 Data Guard Borker。

```
[oracle@orap ~]$ dgmgrl sys@NTAP_NY
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Wed Dec 11
20:53:20 2024
Version 19.18.0.0.0

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

Welcome to DGMGRL, type "help" for information.
Password:
Connected to "NTAP_NY"
Connected as SYSDBA.
DGMGRL>
```

3. 建立並啟用 Data Guard Broker 配置。

```
DGMGRL> create configuration dg_config as primary database is
NTAP_NY connect identifier is NTAP_NY;
Configuration "dg_config" created with primary database "ntap_ny"
DGMGRL> add database NTAP_LA as connect identifier is NTAP_LA;
Database "ntap_la" added
DGMGRL> enable configuration;
Enabled.
DGMGRL> show configuration;

Configuration - dg_config

  Protection Mode: MaxPerformance
  Members:
  ntap_ny - Primary database
    ntap_la - Physical standby database

Fast-Start Failover:  Disabled

Configuration Status:
SUCCESS   (status updated 3 seconds ago)
```

4. 在 Data Guard Broker 管理框架內驗證資料庫狀態。

```
DGMGRL> show database ntap_ny;

Database - ntap_ny

  Role:               PRIMARY
  Intended State:     TRANSPORT-ON
  Instance(s):
    NTAP

Database Status:
SUCCESS


DGMGRL> show database ntap_la;

Database - ntap_la

  Role:               PHYSICAL STANDBY
  Intended State:     APPLY-ON
  Transport Lag:      0 seconds (computed 0 seconds ago)
  Apply Lag:          0 seconds (computed 0 seconds ago)
  Average Apply Rate: 3.00 KByte/s
  Real Time Query:    OFF
  Instance(s):
    NTAP

Database Status:
SUCCESS

DGMGRL>
```

如果發生故障，可以使用 Data Guard Broker 立即將主資料庫故障轉移到備用資料庫。如果 `Fast-Start Failover`啟用後，當偵測到故障時，Data Guard Broker 可以將主資料庫故障轉移到備用資料庫，而無需使用者乾預。

使用觀察者配置 **FSFO**

或者，可以為 Data Guard Broker 啟用快速啟動故障轉移 (FSFO)，以便在發生故障時自動將主資料庫故障轉移到備用資料庫。以下是使用觀察者實例設定 FSFO 的步驟。

1. 建立一個輕量級的 Google 運算引擎實例，以在與主資料庫伺服器或備用資料庫伺服器不同的區域執行 Observer。在測試案例中，我們使用了具有 2 個 vCPU、7.5G 記憶體的 N1 實例。在主機上安裝相同版本的 Oracle。
2. 以 oracle 使用者身分登入並在 oracle 使用者 .bash_profile 中設定 oracle 環境。

```
vi ~/.bash_profile
```

```
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
        . ~/.bashrc
fi

# User specific environment and startup programs

export ORACLE_HOME=/u01/app/oracle/product/19.0.0/NTAP
export PATH=$ORACLE_HOME/bin:$PATH
```

3. 將主資料庫和備用資料庫 TNS 名稱條目新增至 tnsname.ora 檔案。

```
vi $ORACLE_HOME/network/admin/tsnames.ora
```

```
NTAP_NY =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = orap.us-east4-a.c.cvs-pm-
host-1p.internal)(PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = NTAP_NY.cvs-pm-host-1p.internal)
      (UR=A)
    )
  )

NTAP_LA =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = oras.us-west4-a.c.cvs-pm-
host-1p.internal)(PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = NTAP_LA.cvs-pm-host-1p.internal)
      (UR=A)
    )
  )
```

4. 建立並使用密碼初始化錢包。

```
mkdir -p /u01/app/oracle/admin/NTAP/wallet
```

```
mkstore -wrl /u01/app/oracle/admin/NTAP/wallet -create
```

```
[oracle@orao NTAP]$ mkdir -p /u01/app/oracle/admin/NTAP/wallet
[oracle@orao NTAP]$ mkstore -wrl /u01/app/oracle/admin/NTAP/wallet
-create
Oracle Secret Store Tool Release 19.0.0.0.0 - Production
Version 19.4.0.0.0
Copyright (c) 2004, 2022, Oracle and/or its affiliates. All rights
reserved.

Enter password:
Enter password again:
[oracle@orao NTAP]$
```

5. 為主資料庫和備資料庫的使用者 sys 啟用無密碼認證。先輸入系統密碼，然後輸入上一個步驟的錢包密碼。

mkstore -wrl /u01/app/oracle/admin/NTAP/wallet -createCredential NTAP_NY sys

mkstore -wrl /u01/app/oracle/admin/NTAP/wallet -createCredential NTAP_LA sys

```
[oracle@orao NTAP]$ mkstore -wrl /u01/app/oracle/admin/NTAP/wallet
-createCredential NTAP_NY sys
Oracle Secret Store Tool Release 19.0.0.0.0 - Production
Version 19.4.0.0.0
Copyright (c) 2004, 2022, Oracle and/or its affiliates. All rights
reserved.

Your secret/Password is missing in the command line
Enter your secret/Password:
Re-enter your secret/Password:
Enter wallet password:
[oracle@orao NTAP]$ mkstore -wrl /u01/app/oracle/admin/NTAP/wallet
-createCredential NTAP_LA sys
Oracle Secret Store Tool Release 19.0.0.0.0 - Production
Version 19.4.0.0.0
Copyright (c) 2004, 2022, Oracle and/or its affiliates. All rights
reserved.

Your secret/Password is missing in the command line
Enter your secret/Password:
Re-enter your secret/Password:
Enter wallet password:
[oracle@orao NTAP]$
```

6. 使用錢包位置更新 sqlnet.ora。

```
vi $ORACLE_HOME/network/admin/sqlnet.ora
```

```
WALLET_LOCATION =
   (SOURCE =
      (METHOD = FILE)
      (METHOD_DATA = (DIRECTORY =
/u01/app/oracle/admin/NTAP/wallet))
)
SQLNET.WALLET_OVERRIDE = TRUE
```

7. 驗證憑證。

```
mkstore -wrl /u01/app/oracle/admin/NTAP/wallet -listCredential
```

```
sqlplus /@NTAP_LA as sysdba
```

```
sqlplus /@NTAP_NY as sysdba
```

```
[oracle@orao NTAP]$ mkstore -wrl /u01/app/oracle/admin/NTAP/wallet
-listCredential
Oracle Secret Store Tool Release 19.0.0.0.0 - Production
Version 19.4.0.0.0
Copyright (c) 2004, 2022, Oracle and/or its affiliates. All rights
reserved.

Enter wallet password:
List credential (index: connect_string username)
2: NTAP_LA sys
1: NTAP_NY sys
```

8. 配置並啟用快速啟動故障轉移。

```
mkdir /u01/app/oracle/admin/NTAP/fsfo
```

```
dgmgrl
```

```
Welcome to DGMGRL, type "help" for information.
DGMGRL> connect /@NTAP_NY
Connected to "ntap_ny"
Connected as SYSDBA.
DGMGRL> show configuration;

Configuration - dg_config

  Protection Mode: MaxAvailability
  Members:
  ntap_ny - Primary database
    ntap_la - Physical standby database

Fast-Start Failover:  Disabled

Configuration Status:
SUCCESS   (status updated 58 seconds ago)

DGMGRL> enable fast_start failover;
Enabled in Zero Data Loss Mode.
DGMGRL> show configuration;

Configuration - dg_config

  Protection Mode: MaxAvailability
  Members:
  ntap_ny - Primary database
    Warning: ORA-16819: fast-start failover observer not started

    ntap_la - (*) Physical standby database

Fast-Start Failover: Enabled in Zero Data Loss Mode

Configuration Status:
WARNING   (status updated 43 seconds ago)
```

9. 啟動並驗證觀察者。

```
nohup dgmgrl /@NTAP_NY "start observer
file='/u01/app/oracle/admin/NTAP/fsfo/fsfo.dat'" >>
/u01/app/oracle/admin/NTAP/fsfo/dgmgrl.log &
```

```
[oracle@orao NTAP]$ nohup dgmgrl /@NTAP_NY "start observer
```

```
file='/u01/app/oracle/admin/NTAP/fsfo/fsfo.dat'" >>
/u01/app/oracle/admin/NTAP/fsfo/dgmgrl.log &
[1] 94957

[oracle@orao fsfo]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Wed Apr 16
21:12:09 2025
Version 19.18.0.0.0

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reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect /@NTAP_NY
Connected to "ntap_ny"
Connected as SYSDBA.
DGMGRL> show configuration verbose;

Configuration - dg_config

  Protection Mode: MaxAvailability
  Members:
  ntap_ny - Primary database
    ntap_la - (*) Physical standby database

  (*) Fast-Start Failover target

  Properties:
    FastStartFailoverThreshold      = '30'
    OperationTimeout                = '30'
    TraceLevel                      = 'USER'
    FastStartFailoverLagLimit       = '30'
    CommunicationTimeout            = '180'
    ObserverReconnect               = '0'
    FastStartFailoverAutoReinstate  = 'TRUE'
    FastStartFailoverPmyShutdown    = 'TRUE'
    BystandersFollowRoleChange      = 'ALL'
    ObserverOverride                = 'FALSE'
    ExternalDestination1            = ''
    ExternalDestination2            = ''
    PrimaryLostWriteAction          = 'CONTINUE'
    ConfigurationWideServiceName    = 'ntap_CFG'

Fast-Start Failover: Enabled in Zero Data Loss Mode
  Lag Limit:          30 seconds (not in use)
  Threshold:          30 seconds
```

```
  Active Target:       ntap_la
  Potential Targets:   "ntap_la"
    ntap_la     valid
  Observer:            orao
  Shutdown Primary:    TRUE
  Auto-reinstate:      TRUE
  Observer Reconnect: (none)
  Observer Override:   FALSE

Configuration Status:
SUCCESS

DGMGRL>
```

為了實現零資料遺失，需要將 Oracle Data Guard 保護模式設定為 `MaxAvailability`或者 `MaxProtection`模式。預設保護模式 `MaxPerformance`可以透過編輯 Data Guard 配置並更改來從 Data Guard Broker 介面進行更改 `LogXptMode`從異步到同步。 Oracle 歸檔日誌目標日誌模式需要相應變更。當根據需要為 Data Guard 啟用即時日誌應用程式時 `MaxAvailability`，避免自動重新啟動資料庫，因為自動重新啟動資料庫可能會無意中開啟備用資料庫 `READ ONLY WITH APPLY`模式，該模式需要 Active Data Guard 許可證。相反，手動啟動資料庫以確保它保持 `MOUNT`即時管理恢復的狀態。

透過自動化克隆其他用例的備用資料庫

以下自動化工具包專門用於建立或刷新部署到 GCNV 的 Oracle Data Guard 備用資料庫的克隆，並使用 NFS/ASM 配置實現完整的克隆生命週期管理。

```
https://bitbucket.ngage.netapp.com/projects/NS-
BB/repos/na_oracle_clone_gcnv/browse
```

目前，只有具有 bitbucket 存取權限的NetApp內部使用者才能存取該工具包。對於有興趣的外部用戶，請向您的客戶團隊要求存取權限或聯絡NetApp解決方案工程團隊。參考"使用 ASM 在 GCNV 上實現 Oracle 克隆生命週期自動化"了解使用說明。

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：

- TR-5002：使用Azure NetApp Files降低 Oracle Active Data Guard 成本

  "TR-5002：使用Azure NetApp Files降低 Oracle Active Data Guard 成本"

- TR-4974：在 AWS FSx/EC2 上使用 NFS/ASM 進行獨立重新啟動時 Oracle 19c

"TR-4974：在 AWS FSx/EC2 上使用 NFS/ASM 進行獨立重新啟動時 Oracle 19c"

- NetApp 在 Google Cloud 上提供一流的文件儲存服務

  https://cloud.google.com/netapp-volumes?hl=en

- Oracle Data Guard 概念與管理

  "https://docs.oracle.com/en/database/oracle/oracle-database/19/sbydb/index.html#Oracle%C2%AE-Data-Guard"