



使用 VMware VMFS 和 NetApp ASA 系統的 SnapCenter 進行 SAP HANA 資料保護 NetApp solutions for SAP

NetApp
February 25, 2026

目錄

使用 VMware VMFS 和 NetApp ASA 系統的 SnapCenter 進行 SAP HANA 資料保護	1
使用 VMware VMFS 和 NetApp ASA 系統的 SnapCenter 進行 SAP HANA 資料保護	1
本文件的範圍	1
本文檔使用的實驗室設置	1
HANA 系統資源配置與安裝	2
儲存組態	2
VM 磁碟組態	3
VM 參數 disk.EnableUUID	6
Linux 主機上的檔案系統準備工作	6
HANA 安裝	9
HANA 組態	9
配置 SnapCenter 資料庫用戶	9
設定 hdb 用戶儲存金鑰	10
組態 SnapCenter	10
先決條件	10
將 VMware 外掛程式加入 SnapCenter	16
新增 HANA 主機	16
策略和資源保護配置	17
備份作業	17
還原與還原作業	20
SAP 系統更新	24
其他資訊和版本歷程記錄	33

使用 VMware VMFS 和 NetApp ASA 系統的 SnapCenter 進行 SAP HANA 資料保護

使用 VMware VMFS 和 NetApp ASA 系統的 SnapCenter 進行 SAP HANA 資料保護

本文檔概述了使用在 VMware 上運行的 SnapCenter for HANA 系統以及使用 VMFS 和儲存在 NetApp ASA 系統上的 LUN 的資料儲存進行資料保護的最佳實務。

作者：Nils Bauer、NetApp

本文件的範圍

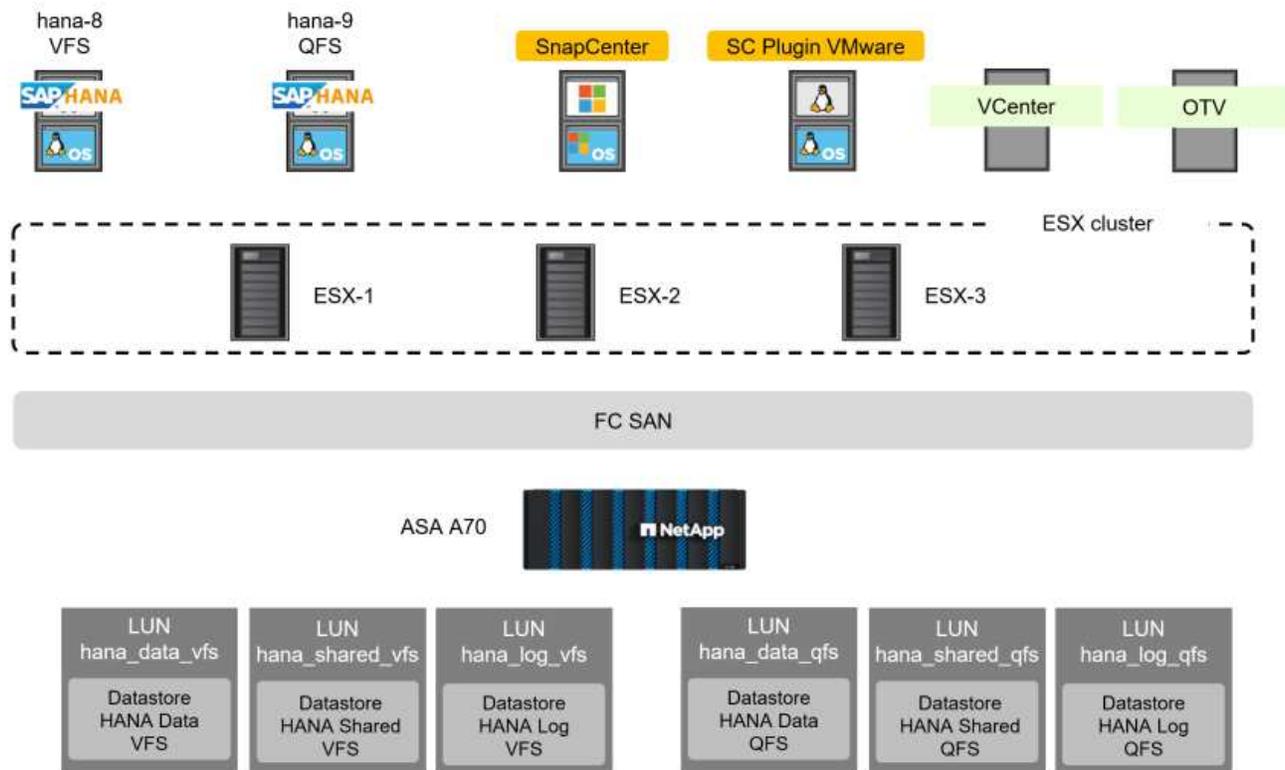
它不是配置整個環境的逐步指南，而是專注於 VMFS 上的 SnapCenter 和 HANA 的具體細節，包括：

- 使用 VMware VMFS 設定 SAP HANA 系統
- 適用於 VMware 上具有 VMFS 的 HANA 的特定 SnapCenter 配置
- SnapCenter 使用 VMFS 對 VMware 上的 HANA 進行備份、還原和復原作業
- SnapCenter SAP 系統刷新作業適用於 VMware 上使用 VMFS 的 HANA

如需更多資訊和詳細配置說明，請參閱“[附加資訊](#)”章。

本文檔使用的實驗室設置

下圖簡要概述了所使用的實驗室設置。我們使用兩個單主機 HANA MDC 系統來示範各種操作。HANA 系統 VFS 用於執行備份、還原和復原作業，而 HANA 系統 QFS 則用作 SAP 系統刷新作業的目標系統。SnapCenter for VMware SnapCenter 對於 SnapCenter 管理配置了 VMware VMFS 的 HANA 資源至關重要。雖然使用了 ONTAP for VMware 工具來為 HANA 系統配置儲存單元，但它們並非必要元件。



軟體版本

軟體	版本
ONTAP	ASA A70 ONTAP 9.16.1
vSphere 用戶端	8.0.3
ESXi	8.0.3
適用於 vSphere 的 SnapCenter 外掛程式	6.1.0
VMware vSphere適用的工具ONTAP	10.4
Linux 作業系統	適用於 SAP 15 SP6 的 SLES
SAP HANA	2.0 SPS8.
SnapCenter	6.1P1

HANA 系統資源配置與安裝

本章說明使用 VMFS 的 VMware 設定所特有的 SAP HANA 系統安裝與組態。其他一般最佳實務做法請參閱 "[採用ASA Fibre Channel Protocol的NetApp解決方案上的SAP HANA](#)"。

儲存組態

為了滿足 SAP 為生產 HANA 系統定義的儲存效能 KPI，必須為 HANA 系統的資料和日誌檔案系統配置專用 LUN 和資料儲存區。資料儲存區不得在多個 HANA 系統或其他工作負載之間共用。

已使用適用於 VMware (OTV) 的 ONTAP 工具為 HANA 系統 VFS 配置三個資料儲存庫。

- hana_資料_VFS
- hana_log_VFS
- hana_共享_VFS



HANA 共用檔案系統的資料儲存也可以在多個 HANA 系統之間共用。

The screenshot shows the vSphere Client interface for a SAPCC environment. The left sidebar lists the datacenter hierarchy, including 'hana_data_VFS', 'hana_log_VFS', and 'hana_shared_VFS'. The main content area displays 'Datacenter Details' (3 Hosts, 38 Virtual Machines, 1 Cluster, 8 Networks, 10 Datastores), 'Capacity and Usage' (CPU: 152.74 GHz free, Memory: 2.63 TB free, Storage: 7.87 TB capacity), and 'Recent Tasks'.

Task Name	Target	Status	Details	Initiator	Queued For	Start Time	Completion Time	Server
Process VMFS datastor	10.63.167.6	Completed		System	4 ms	05/19/2025, 9:20:23 AM	05/19/2025, 9:20:23 AM	vcenter8.sapcc-stf.netapp.com
Process VMFS datastor	10.63.167.4	Completed		System	5 ms	05/19/2025, 9:20:23 AM	05/19/2025, 9:20:23 AM	vcenter8.sapcc-stf.netapp.com
Create VMFS datastor	10.63.167.14	Completed		SAPCC.VCENTERAdminstrat	10 ms	05/19/2025, 9:20:22	05/19/2025, 9:20:23	vcenter8.sapcc-stf.netapp.com

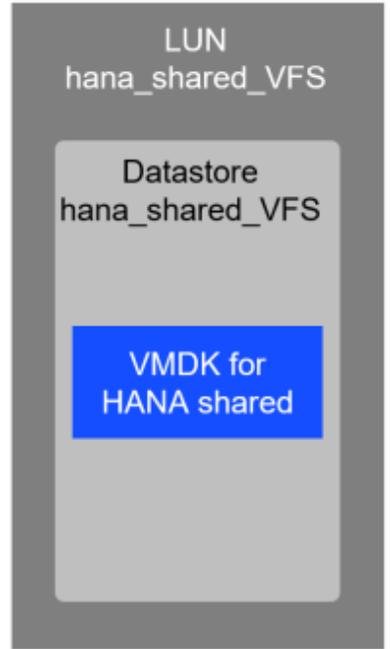
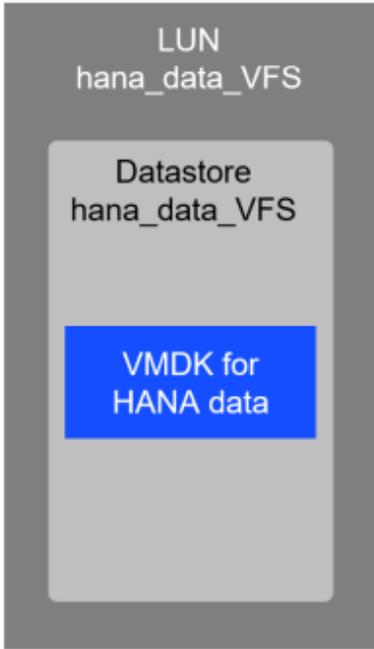
在儲存系統中，OTV 建立了三個 LUN。

The screenshot shows the NetApp ONTAP System Manager interface. The 'Storage' section displays 19 Storage units, 68.6 TiB Available, and 19 Online units. Below this, a table lists the storage units:

Name	Consistency group	Capacity	Data reduction	Host mapping	IOPS	Latency (ms)	Throughput (MB/s)
hana_data_VFS	-	100 GiB	8.75 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	0	0	0
hana_log_VFS	-	100 GiB	8.69 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	0	0	0
hana_shared_VFS	-	100 GiB	3.13 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	0	0	0

VM 磁碟組態

必須向 HANA VM 新增三個新磁碟 (VMDK)。每個磁碟都位於先前建立的資料儲存區中，如下圖所示。



vSphere Client | Administrator@SAPCC.VCENTER

hana-8

Summary Monitor Config

Guest OS

Tags

Recent Tasks

Alarms

Task Name | Target | Status | Details

Power on virtual machine | hana-8 | Completed | 05/19/2025, 9:41:32 AM

Initialize powering on | SAPCC | Completed | 05/19/2025, 9:41:22 AM

Rename virtual machine | asa_hana01 | Completed | 05/19/2025, 9:41:23 AM

Reconfiguring Virtual Mac | SAPCC.VCENTER\Administrat | 7 ms | 05/19/2025, 9:41:22 AM

8.sapcc.stf.netapp.com

Edit Settings | hana-8

Maximum Size: 14 TB

VM storage policy: Datastore Default

Type: Thin Provision

Sharing: No sharing

Disk File: [Datastore_One] asa_hana01/asa_hana01.vmdk

Disk Mode: Dependent

Virtual Device Node: SCSI controller 0 | SCSI(0:0) Hard disk 1

New Hard disk * 95 GB

Maximum Size: 98.34 GB

VM storage policy: Datastore Default

Location: hana_data_VFS

Disk Provisioning: Thin Provision

Sharing: No sharing

Disk Mode: Dependent

Virtual Device Node: SCSI controller 0 | SCSI(0:1) New Hard disk

CANCEL OK

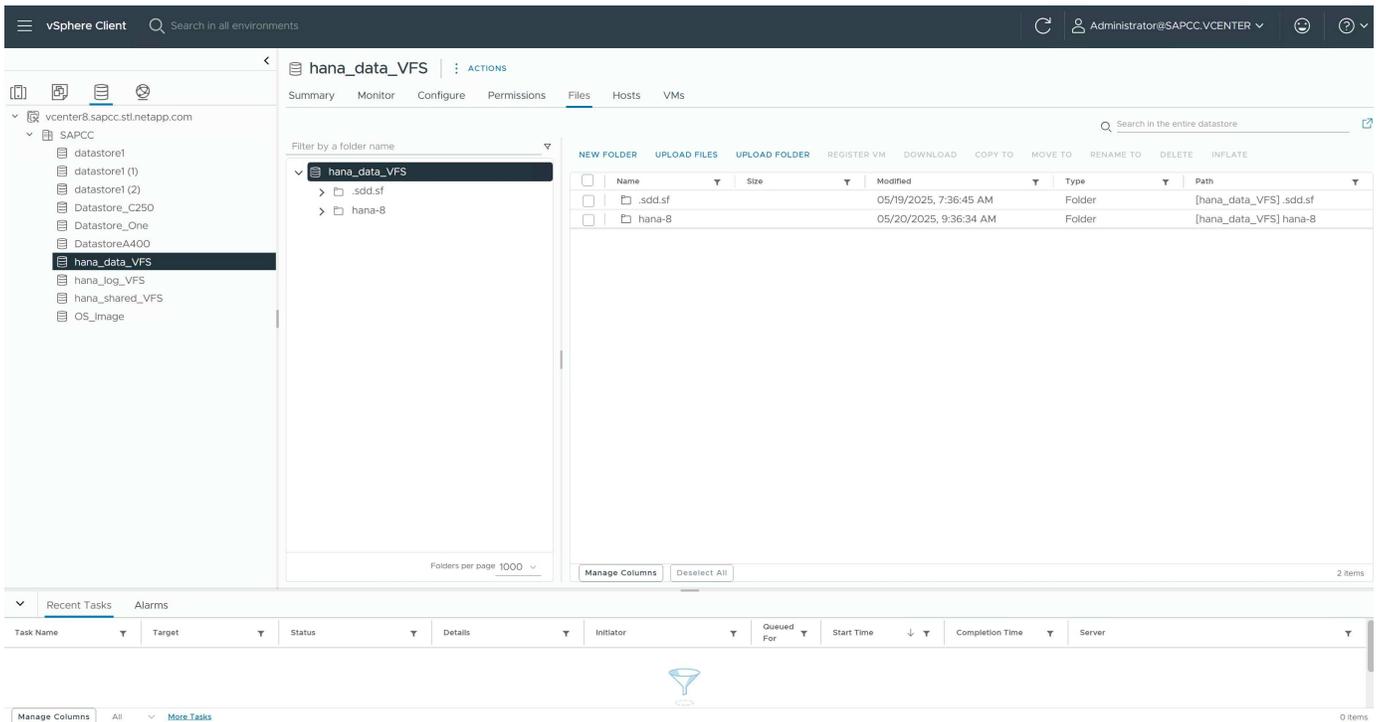
PCI Devices: No PCI devices

Related Objects:

- Cluster
- Host: 10.63.107.6
- Resource pool: ASA12
- Networks: DPportGroup-NFS, ESXAccess
- Storage: Datastore_One

Storage Policies:

- VM Storage Policies
- VM Storage Policy Compliance
- Last Checked Date
- VM Replication Groups



當這三個磁碟被添加到虛擬機器後，它們可以在作業系統層級列出。

```

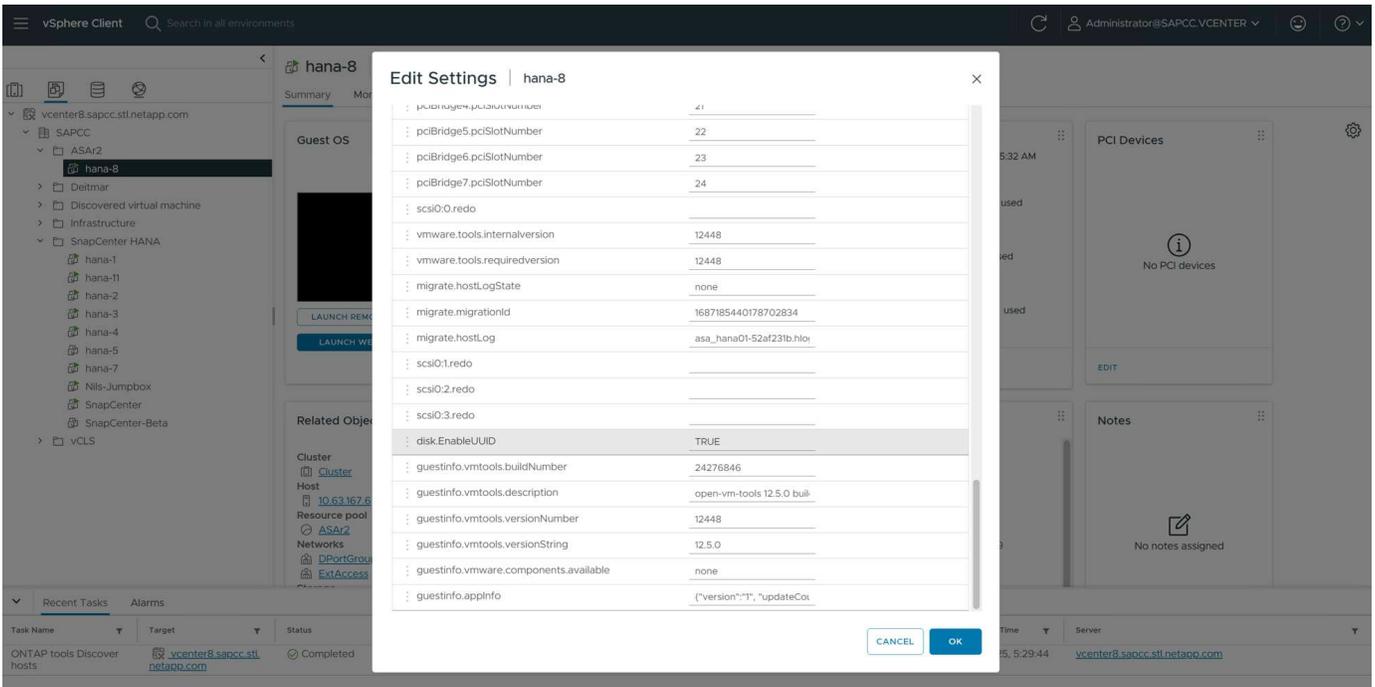
hana-8:~ # lsblk
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS
sda 8:0 0 100G 0 disk
├─sda1 8:1 0 256M 0 part /boot/efi
└─sda2 8:2 0 82G 0 part
├─system-root 254:0 0 60G 0 lvm /root
│ /var
│ /usr/local
│ /tmp
│ /srv
│ /opt
│ /home
│ /boot/grub2/x86++_++64-efi
│ /boot/grub2/i386-pc
│ /.snapshots
│ /
└─system-swap 254:1 0 2G 0 lvm [SWAP]
sdb 8:16 0 95G 0 disk
sdc 8:32 0 95G 0 disk
sdd 8:48 0 95G 0 disk
sr0 11:0 1 17.1G 0 rom

```

VM 參數 disk.EnableUUID

必須相應地設定此參數，否則SnapCenter資料庫自動發現將失敗。

1. 關閉虛擬機
2. 新增參數“disk.EnableUUID”並設定為“TRUE”
3. 啟動虛擬機



Linux 主機上的檔案系統準備工作

在新磁碟上建立 xfs 檔案系統

已在三個新磁碟的每個磁碟上建立 xfs 檔案系統。

```
hana-8:~ # mkfs.xfs /dev/sdb
meta-data=/dev/sdb isize=512 agcount=4, agsize=6225920 blks
= sectsz=512 attr=2, projid32bit=1
= crc=1 finobt=1, sparse=1, rmapbt=1
= reflink=1 bigtime=1 inobtcount=0 nnext64=0
data = bsize=4096 blocks=24903680, imaxpct=25
= sunit=0 swidth=0 blks
naming =version 2 bsize=4096 ascii-ci=0, ftype=1
log =internal log bsize=4096 blocks=16384, version=2
= sectsz=512 sunit=0 blks, lazy-count=1
realtime =none extsz=4096 blocks=0, rtextents=0
Discarding blocks...Done.
```

```
hana-8:~ # mkfs.xfs /dev/sdc
meta-data=/dev/sdc isize=512 agcount=4, agsize=6225920 blks
= sectsz=512 attr=2, projid32bit=1
= crc=1 finobt=1, sparse=1, rmapbt=1
= reflink=1 bigtime=1 inobtcount=0 nnext64=0
data = bsize=4096 blocks=24903680, imaxpct=25
= sunit=0 swidth=0 blks
naming =version 2 bsize=4096 ascii-ci=0, ftype=1
log =internal log bsize=4096 blocks=16384, version=2
= sectsz=512 sunit=0 blks, lazy-count=1
realtime =none extsz=4096 blocks=0, rtextents=0
Discarding blocks...Done.
```

```
hana-8:~ # mkfs.xfs /dev/sdd
meta-data=/dev/sdd isize=512 agcount=4, agsize=6225920 blks
= sectsz=512 attr=2, projid32bit=1
= crc=1 finobt=1, sparse=1, rmapbt=1
= reflink=1 bigtime=1 inobtcount=0 nnext64=0
data = bsize=4096 blocks=24903680, imaxpct=25
= sunit=0 swidth=0 blks
naming =version 2 bsize=4096 ascii-ci=0, ftype=1
log =internal log bsize=4096 blocks=16384, version=2
= sectsz=512 sunit=0 blks, lazy-count=1
realtime =none extsz=4096 blocks=0, rtextents=0
Discarding blocks...Done.
```

```
hana-8:~ #
```

建立掛載點

```
hana-8:/ # mkdir -p /hana/data/VFS/mnt00001
hana-8:/ # mkdir -p /hana/log/VFS/mnt00001
hana-8:/ # mkdir -p /hana/shared
hana-8:/ # chmod -R 777 /hana/log/SMA
hana-8:/ # chmod -R 777 /hana/data/SMA
hana-8:/ # chmod -R 777 /hana/shared
```

設定 /etc/fstab

```
hana-8:/ # cat /etc/fstab

/dev/system/root / btrfs defaults 0 0
/dev/system/root /var btrfs subvol=@/var 0 0
/dev/system/root /usr/local btrfs subvol=@/usr/local 0 0
/dev/system/root /tmp btrfs subvol=@/tmp 0 0
/dev/system/root /srv btrfs subvol=@/srv 0 0
/dev/system/root /root btrfs subvol=@/root 0 0
/dev/system/root /opt btrfs subvol=@/opt 0 0
/dev/system/root /home btrfs subvol=@/home 0 0
/dev/system/root /boot/grub2/x86++_++64-efi btrfs
subvol=@/boot/grub2/x86++_++64-efi 0 0
/dev/system/root /boot/grub2/i386-pc btrfs subvol=@/boot/grub2/i386-pc 0
0
/dev/system/swap swap swap defaults 0 0
/dev/system/root /.snapshots btrfs subvol=@/.snapshots 0 0
UUID=FB79-24DC /boot/efi vfat utf8 0 2
### SAPCC_share
192.168.175.86:/sapcc_share /mnt/sapcc-share nfs
rw,vers=3,hard,timeo=600,rsz=1048576,wsz=1048576,intr,noatime,nolock 0
0
/dev/sdb /hana/data/VFS/mnt00001 xfs relatime,inode64 0 0
/dev/sdc /hana/log/VFS/mnt00001 xfs relatime,inode64 0 0
/dev/sdd /hana/shared xfs defaults 0 0
hana-8:/ #

hana-8:/ # df -h
Filesystem Size Used Avail Use% Mounted on
/dev/mapper/system-root 60G 4.4G 54G 8% /
devtmpfs 4.0M 0 4.0M 0% /dev
tmpfs 49G 0 49G 0% /dev/shm
efivarfs 256K 57K 195K 23% /sys/firmware/efi/efivars
tmpfs 13G 18M 13G 1% /run
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup-dev-
early.service
```

```

tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-sysctl.service
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup-dev.service
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-vconsole-setup.service
/dev/mapper/system-root 60G 4.4G 54G 8% /.snapshots
/dev/mapper/system-root 60G 4.4G 54G 8% /boot/grub2/i386-pc
/dev/mapper/system-root 60G 4.4G 54G 8% /boot/grub2/x86++_++64-efi
/dev/mapper/system-root 60G 4.4G 54G 8% /home
/dev/mapper/system-root 60G 4.4G 54G 8% /opt
/dev/mapper/system-root 60G 4.4G 54G 8% /srv
/dev/mapper/system-root 60G 4.4G 54G 8% /tmp
/dev/mapper/system-root 60G 4.4G 54G 8% /usr/local
/dev/mapper/system-root 60G 4.4G 54G 8% /var
/dev/sda1 253M 5.9M 247M 3% /boot/efi
/dev/mapper/system-root 60G 4.4G 54G 8% /root
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup.service
tmpfs 6.3G 72K 6.3G 1% /run/user/464
tmpfs 1.0M 0 1.0M 0% /run/credentials/getty@tty1.service
tmpfs 6.3G 52K 6.3G 1% /run/user/0
192.168.175.86:/sapcc_share 1.4T 840G 586G 59% /mnt/sapcc-share
/dev/sdb 95G 1.9G 94G 2% /hana/data/VFS/mnt00001
/dev/sdc 95G 1.9G 94G 2% /hana/log/VFS/mnt00001
/dev/sdd 95G 1.9G 94G 2% /hana/shared

hana-8:/ #

```

HANA 安裝

HANA 安裝現在可以執行。

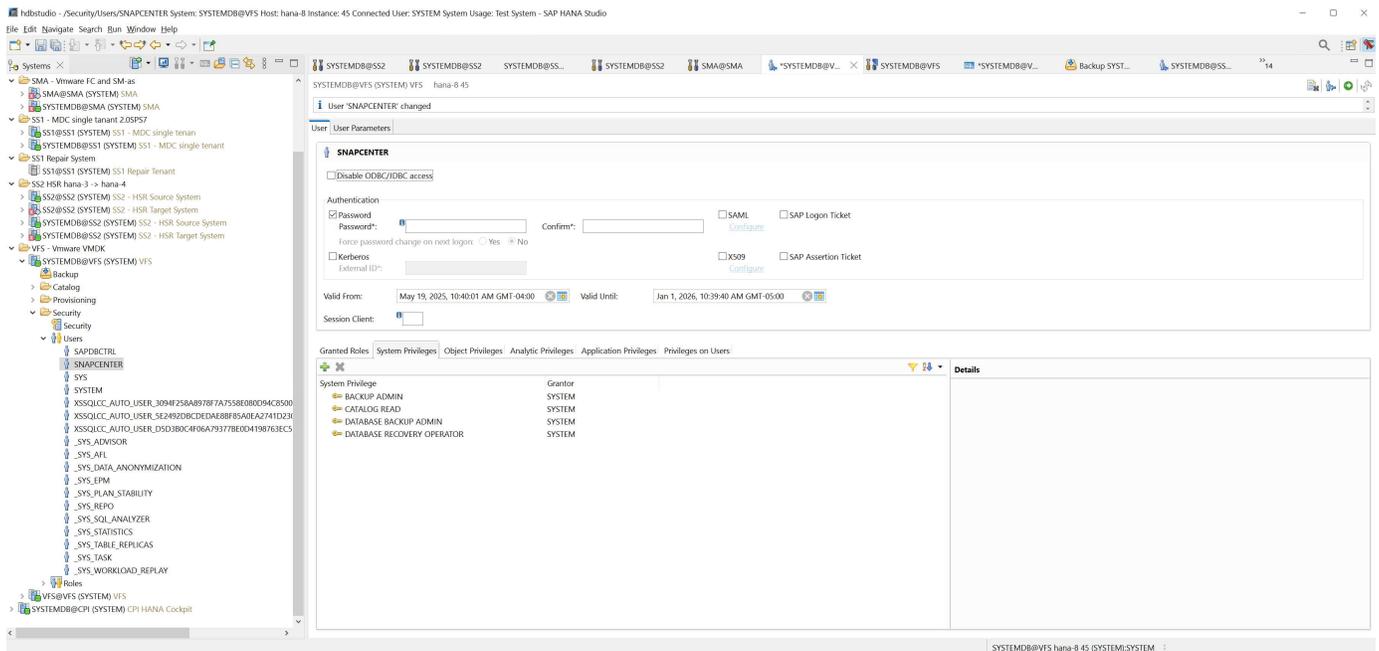


依照所述配置，`/usr/sap/VFS` 目錄將位於 OS VMDK 上。如果要將 `/usr/sap/VFS` 儲存在共用 VMDK 中，則可以對 hana 共用磁碟進行分割區，以便為 `/usr/sap/VFS` 提供另一個檔案系統。

HANA 組態

配置 SnapCenter 資料庫用戶

必須為系統資料庫使用者建立使用者存放區，SnapCenter 應使用該存放區。



設定 hdb 用戶儲存金鑰

必須為使用者 vfsadm 建立使用者儲存密鑰。必須相應地設定 HANA 實例編號以便與連接埠通訊。在我們的設定執行個體編號「45」中使用。

```
vfsadm@hana-8:/usr/sap/VFS/HDB45> hdbuserstore SET VFSKEY hana-8:34513
SNAPCENTER <password>

Retroactive report: Operation succeed.
```

使用以下方式檢查存取權限：

```
vfsadm@hana-8:/usr/sap/VFS/HDB45> hdbsql -U VFSKEY

Welcome to the SAP HANA Database interactive terminal.
Type: \h for help with commands
\q to quit
hdbsql SYSTEMDB=> exit

vfsadm@hana-8:/usr/sap/VFS/HDB45>
```

組態SnapCenter

先決條件

必須自動探索 **SnapCenter HANA** 資源

使用 VMware VMFS 配置的資源必須由SnapCenter自動發現，才能啟用這些配置所需的特定操作。

由於 HANA 非資料磁碟區始終是SnapCenter中手動配置的資源，因此帶有 VMFS 的SnapCenter不支援它們。

SAP HANA 多主機系統必須使用中央 HANA 插件進行配置，因此預設需要手動配置。使用 VMware VMFS 時，SnapCenter也不支援此類系統。

SnapCenter for VMware vSphere 外掛程式

SnapCenter for VMware vSphere 外掛程式必須部署在 VMware 環境中。

儲存**SVM**管理IP

託管 LUN 的儲存 SVM 必須配置管理接口，否則使用「新增叢集」選項新增儲存裝置時 SVM 將不會在SnapCenter中列出，並且自動發現操作將會失敗。

Job Details



Discover resources for host 'hana-8.sapcc.stl.netapp.com'

✘ ▼ Discover resources for host 'hana-8.sapcc.stl.netapp.com'

✘ ▼ hana-8.sapcc.stl.netapp.com

✘ ▼ Discover

✔ ▶ Complete Application Discovery

✔ ▶ Discover Filesystem Resources

✘ ▶ Discover Virtual Resources

✔ ▶ Discover_OnFailure

✘ Failure in virtual resources discovery: [Failed to resolve the storage associated with the VMware virtual disks 6000c2964ec4375910dc9953d9f870ca]

View Logs

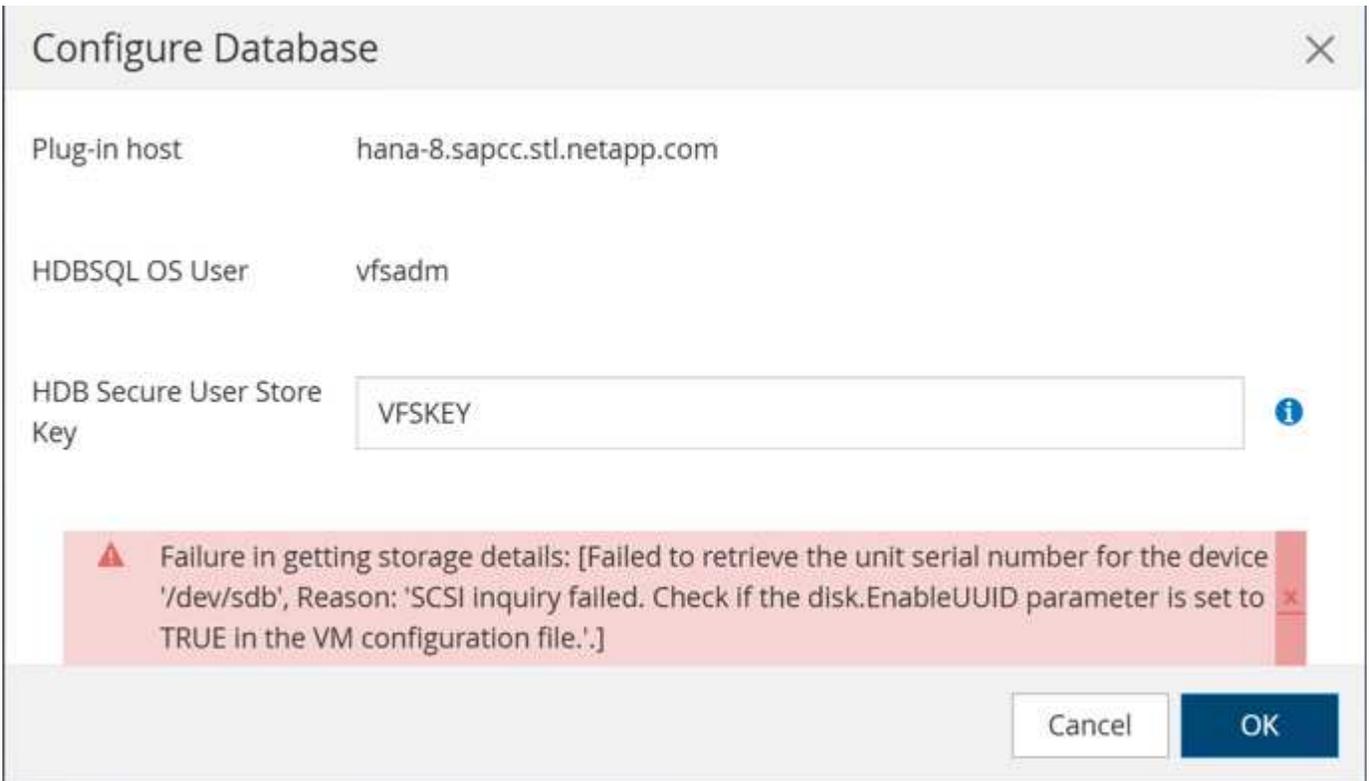
Cancel Job

Close

Name	IP	Cluster Name	User Name	Platform	Controller License
svm1	10.63.167.55	10.63.167.54		ASA	✓
hana		10.63.150.245		AFF	✓
hana-backup	10.63.150.246	10.63.150.245		AFF	✓
hana-cloud-dr		10.1.2.175		FSx	Not applicable
hana-dr	10.63.150.247	10.63.150.245		AFF	✓
hana-primary	10.63.150.248 ...	10.63.150.245		AFF	✓

虛擬機器磁碟參數

必須依照章節說明設定參數“[虛擬機器參數磁碟.EnableUUID](#)”，否則SnapCenter資料庫自動發現將失敗。



配置SnapCenter以使用 REST API 進行儲存通信

必須將SnapCenter配置為使用 REST API 進行儲存通訊。否則，建立快照操作將會失敗，並顯示下列錯誤訊息。

Job Details ✕

Backup of Resource Group 'hana-8_sapcc_stl_netapp_com_hana_MDC_VFS' with policy 'LocalSnap'

- ✕ ▾ Backup of Resource Group 'hana-8_sapcc_stl_netapp_com_hana_MDC_VFS' with policy 'LocalSnap'
- ✕ ▾ hana-8.sapcc.stl.netapp.com
- ✕ ▾ Backup
 - ✓ ▶ Validate Dataset Parameters
 - ✓ ▶ Validate Plugin Parameters
 - ✓ ▶ Complete Application Discovery
 - ✓ ▶ Initialize Filesystem Plugin
 - ✓ ▶ Discover Filesystem Resources
 - ✓ ▶ Discover Virtual Resources
 - ✓ ▶ Populate storage details
 - ✓ ▶ Validate Retention Settings
 - ✓ ▶ Quiesce Application
 - ✓ ▶ Quiesce Filesystem
 - ✕ ▾ Create Snapshot
 - ⚠ ▶ Backup_OnFailure

✖ SCC-STORAGE-02002: Creating Snapshot copy [SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_10.33.58.2195] on storage resource [svm1:hana_data_VFS] failed with error [Snapshot operation failed. [400]: POST, DELETE, and PATCH requests on the snapshot session endpoint are not supported on this platform.]

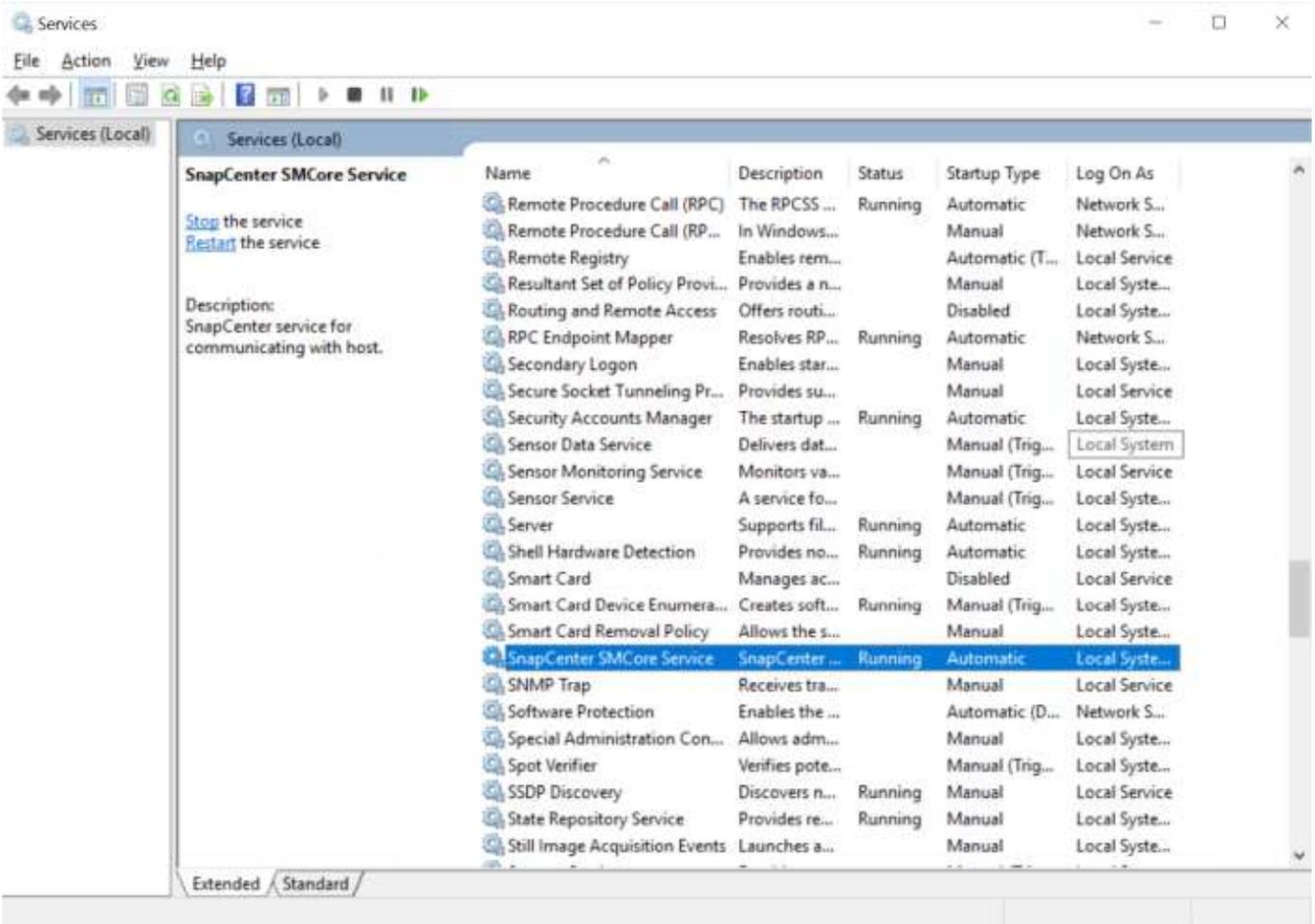
View Logs Cancel job Close

設定檔+C:\Program Files\NetApp\SMCore\SMCoreServiceHost.dll.config中的參數「IsRestEnabledForStorageConnection」必須設定為「true」。

<新增鍵="IsRestEnabledForStorageConnection"值="true"/>

```
SMCoreServiceHost.dll.config - Notepad
File Edit Format View Help
<add key="EnableCancelJob" value="true" />
<add key="PSErrorString" value="Internal network error,API invoke failed,No such file or directory" />
<add key="CommandErrorDuringMcCFailure" value="timed out,Unknown internal error,API invoke failed,metrocluster" />
<add key="VolumeEnumerationOptimized" value="true" />
<add key="CloneSplitStatusCheckPollTime" value="300000" />
<add key="ConfigCheckerJobStatusTimeout" value="20" />
<add key="ConfigCheckerJobStatusRetry" value="30" />
<add key="AzureEnvironment" value="AzureGlobalCloud" />
<add key="AzureLongRunningOperationRetryTimeoutInSec" value="20" />
<add key="AzureClientType" value="sdk" />
<add key="AzureThreadSleepTime" value="10000" />
<add key="AzureRestVersion" value="2019-11-01" />
<add key="GetStorageIDBeforeCacheInitialize" value="true" />
<add key="SccCloneSuffix" value="Clone" />
<add key="SourceComponent" value="smcore" />
<add key="WmiTimeoutIntervalMinutes" value="30" />
<add key="WmiTimeoutSet" value="true" />
<add key="OracleAlmActivityParallelExecution" value="true" />
<add key="OracleAlmActivityParallelMountInterval" value="20" />
<add key="OracleAlmActivityParallelUnmountInterval" value="10" />
<add key="SkipOracleAlmBackupsCatalogAndUncatalog" value="false" />
<add key="UseVolumeFilterInGetSnapshot" value="true" />
<add key="EnablePredefinedWindowsScriptsDirectory" value="true" />
<add key="PredefinedWindowsScriptsDirectory" value="C:\Program Files\NetApp\SMCore\Scripts" />
<add key="IsRestEnabledForStorageConnection" value="true" />
<add key="ExecutePredefinedWindowsScriptsCommands" value="Add-NetLunMap" />
<add key="MinOntapVersionToUseREST" value="9.13.1" />
<add key="IS_COLO_SNAPCENTER_AGENT" value="true" />
<add key="IS_SCN_PLUGIN_SERVICE_PRESENT" value="false" />
<add key="SMCORE_IMAGE_PATH" value="C:\Program Files\NetApp\SMCore\" />
<add key="REPOSITORY_PATH" value="C:\ProgramData\NetApp\SnapCenter" />
<add key="SNAPGATHERS_PATH" value="C:\Program Files\NetApp\SnapGathers\" />
<add key="SNAPGATHERS_PATH_WINDOWS" value="C:\Program Files\NetApp\SnapCenter\SnapGathers\" />
<add key="smcoreprotocol" value="https" />
<add key="SERVICE_CERTIFICATE_PATH" value="/var/opt/snapcenter/certs/snapcenter.pfx" />
<add key="SERVICE_CERTIFICATE_PASSWORD" value="" />
<add key="ForceSHA256EncryptionKey" value="false" />
<add key="WINRM_PROTOCOL" value="http" />
<add key="WINRM_PORT" value="5985" />
<add key="WINRM_AUTH_TYPE" value="ntlm" />
<add key="DoNotSaveOracleBlob" value="false" />
<add key="IsRestEnabledForLowerONTAP" value="false" />
</appSettings>
</configuration>
```

完成變更後，必須停止並啟動SnapCenter SMCore 服務。



將 VMware 外掛程式加入 SnapCenter

在將主機新增至 SnapCenter 之前，VMware vSphere 的 SnapCenter 外掛程式必須部署在 VMware 環境中。另請參閱 "部署 SnapCenter VMware vSphere 的 VMware vCenter 外掛程式"。



必須在主機新增工作流程期間設定認證，以便將 vSphere 選取為主機類型。

The screenshot shows the 'Host Details' configuration page in NetApp SnapCenter. The 'Host Name' is 'scv-vmw.sapcc.stl.netapp.com' and the 'Host IP' is '10.63.167.24'. The 'Overall Status' is 'Running'. The 'Host Type' is 'vSphere' and the 'System' is 'Stand-alone'. The 'Credentials' are set to 'SCV-sapcc'. The 'vCenter Host' is '10.63.167.20' and the 'vCenter Port' is '443'. The 'vCenter User' is 'administrator@sapcc.vcenter'. The 'Plug-ins' section shows 'SnapCenter Plug-in 6.1.0 for VMware vSphere' with 'VMware vSphere' checked. There are 'Submit', 'Cancel', and 'Reset' buttons at the bottom.

新增 HANA 主機

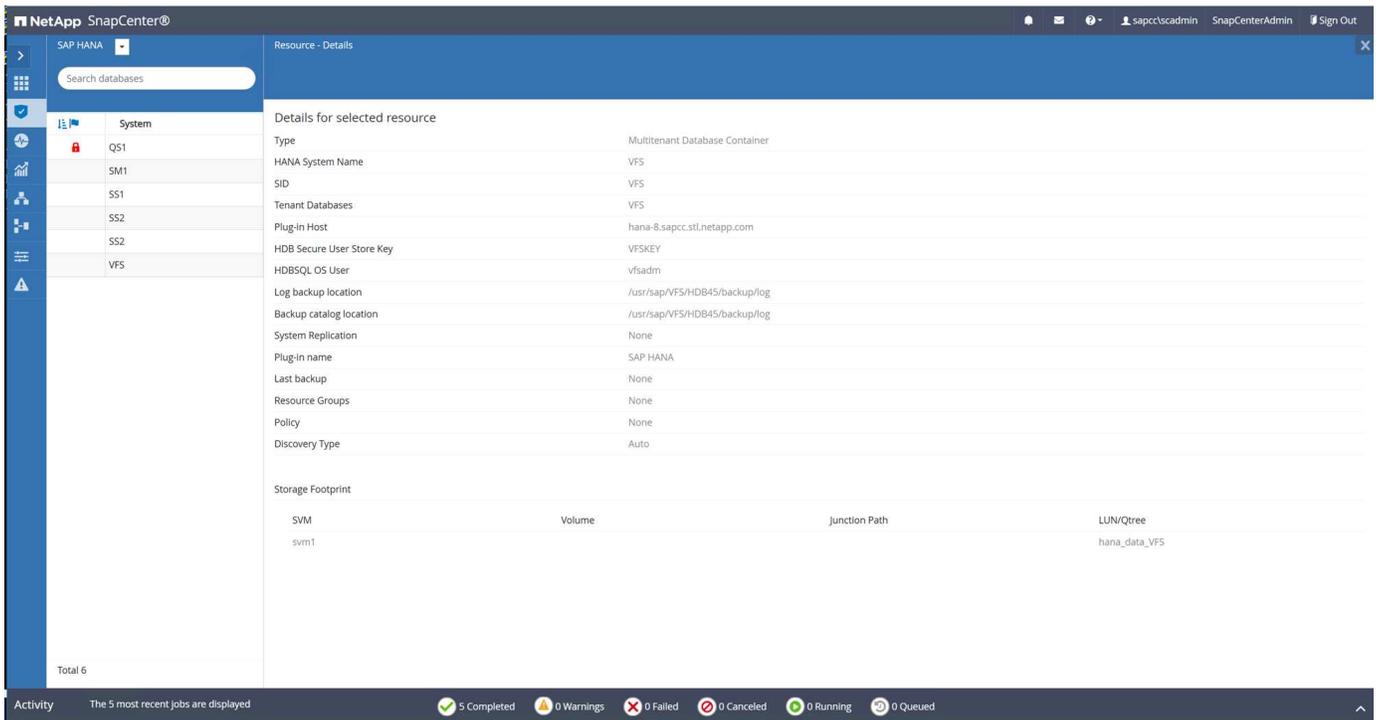


無特定要求。外掛程式部署和自動探索會照常進行。

The screenshot shows the 'Managed Hosts' list in NetApp SnapCenter. The table has columns for Name, Type, System, Plug-in, Version, and Overall Status. The row for 'hana-8.sapcc.stl.netapp.com' is highlighted with a red box, showing its status as 'Installing plug-in'. The other hosts are in a 'Running' state.

Name	Type	System	Plug-in	Version	Overall Status
hana-1.sapcc.stl.netapp.com	Linux	Stand-alone	SAP HANA, UNIX	6.1	Running
hana-2.sapcc.stl.netapp.com	Linux	Stand-alone	SAP HANA, UNIX	6.1	Running
hana-3.sapcc.stl.netapp.com	Linux	Stand-alone	SAP HANA, UNIX	6.1	Running
hana-4.sapcc.stl.netapp.com	Linux	Stand-alone	SAP HANA, UNIX	6.1	Running
hana-7.sapcc.stl.netapp.com	Linux	Stand-alone	SAP HANA, UNIX	6.1	Running
hana-8.sapcc.stl.netapp.com	Linux	Stand-alone	VMware vSphere	6.1	Installing plug-in
scv-vmw.sapcc.stl.netapp.com	vSphere	Stand-alone	VMware vSphere	6.1	Running

透過自動發現過程，SnapCenter偵測到 HANA 資源正在使用 VMFS 虛擬化運作。



策略和資源保護配置

對於具有 VMFS 的 VMware 來說沒有什麼特別之處。

備份作業

對於具有 VMFS 的 VMware 來說沒有什麼特別之處。

Job Details



Backup of Resource Group 'hana-8_sapcc_stl_ne.....na_MDC_VFS' with policy 'LocalSnap'

✓ Backup of Resource Group 'hana-8_sapcc_stl_netapp_com_hana_MDC_VFS' with policy 'LocalSnap'

✓ ▼ hana-8.sapcc.stl.netapp.com

✓ ▼ Backup

- ✓ ▶ Validate Dataset Parameters
- ✓ ▶ Validate Plugin Parameters
- ✓ ▶ Complete Application Discovery
- ✓ ▶ Initialize Filesystem Plugin
- ✓ ▶ Discover Filesystem Resources
- ✓ ▶ Discover Virtual Resources
- ✓ ▶ Populate storage details
- ✓ ▶ Validate Retention Settings
- ✓ ▶ Quiesce Application
- ✓ ▶ Quiesce Filesystem
- ✓ ▶ Create Snapshot
- ✓ ▶ UnQuiesce Filesystem
- ✓ ▶ UnQuiesce Application
- ✓ ▶ Get Snapshot Details
- ✓ ▶ Get Filesystem Metadata
- ✓ ▶ Get Virtualization Metadata
- ✓ ▶ Finalize Filesystem Plugin
- ✓ ▶ Collect Autosupport data
- ✓ ▶ Register Backup and Apply Retention
- ✓ ▶ Register Snapshot attributes
- ✓ ▶ Application Clean-Up
- ✓ ▶ Data Collection
- ✓ ▶ Agent Finalize Workflow

i Task Name: Backup Start Time: 05/21/2025 10:29:05 PM End Time: 05/21/2025 10:30:38 PM

View Logs

Cancel Job

Close

Manage Copies

Local copies: 12 Backups, 0 Clones

Summary Card

- 12 Backups
- 12 Snapshot based backups
- 0 File-Based backups
- 0 Clones
- 0 Snapshots Locked

Primary Backup(s)

Backup Name	Snapshot Lock Expiration	Count	End Date
SnapCenter_hana-8_LocalSnap_Hourly_05-22-2025_06.29.00.3706		1	05/22/2025 6:30:14 AM
SnapCenter_hana-8_LocalSnap_Hourly_05-22-2025_02.29.00.3541		1	05/22/2025 2:30:12 AM
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_22.29.03.2699		1	05/21/2025 10:30:19 PM
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_18.29.00.3956		1	05/21/2025 6:30:12 PM
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_14.29.00.3696		1	05/21/2025 2:30:12 PM
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_10.29.00.3581		1	05/21/2025 10:30:12 AM
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_06.29.00.3960		1	05/21/2025 6:30:12 AM
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_02.29.00.3515		1	05/21/2025 2:30:12 AM
SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_22.29.00.3896		1	05/20/2025 10:30:12 PM
SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_18.29.00.3611		1	05/20/2025 6:30:12 PM
SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_14.29.00.3840		1	05/20/2025 2:30:12 PM
SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_11.03.44.3420		1	05/20/2025 11:05:03 AM

Total 6 (System), Total 12 (Backups)

Activity: The 5 most recent jobs are displayed. 5 Completed, 0 Warnings, 0 Failed, 0 Canceled, 0 Running, 0 Queued.

SnapCenter建立一個一致性群組 (CG)，並將儲存單元 hana_data_VFS 新增至 CG。快照在 CG 層級建立。

Storage

The basic unit of storage is a LUN (for SCSI hosts) or NVMe namespace (for NVMe). You can add LUN or NVMe namespace storage units based on your data center configuration. [More](#)

19 Storage units | 68.5 TiB Available | 19 Online | 0 Offline

Consistency groups

Name	Consistency group	Capacity	Data reduction	Host mapping	IOPS	Latency (ms)	Throughput (MB/s)
hana_data_VFS	sc20250520_110422_689	100 GiB	1 to 1	otv_host-44_e3d7e9d4-46f3-4fd1	1	0.07	0
hana_log_VFS	-	100 GiB	1.19 to 1	otv_host-44_e3d7e9d4-46f3-4fd1	4	0.23	0.41
hana_shared_VFS	-	100 GiB	2.8 to 1	otv_host-44_e3d7e9d4-46f3-4fd1	6	0.23	0.43

NetApp ONTAP System Manager | A70-SAPCC

Search actions, objects, and pages

Dashboard

Insights

Storage

Hosts

Network

Events & Jobs

Protection

Consistency groups

Policies

Replication

Cluster

← Back to consistency groups

sc20250520_11...

Overview Snapshots Replication

Storage VM svm1

Storage units 1

Application type VMware

Protection Show uninitialized

Snapshots None

Replication None

Storage units

Delete Remove from consistency group

Name	Capacity	Host mapping
hana_data_VFS	100 GiB	otv_host-44_e3d7e9d4-46f3-4fda-aba3-00c1be4c0fcf +2

NetApp ONTAP System Manager | A70-SAPCC

Search actions, objects, and pages

Dashboard

Insights

Storage

Hosts

Network

Events & Jobs

Protection

Consistency groups

Policies

Replication

Cluster

← Back to consistency groups

sc20250520_110422...

Overview Snapshots Replication

+ Add Policy: -

Name	Created	SnapMirror label
SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_11.03.44.3420	May/20/2025 11:10 AM	
SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_14.29.00.3840	May/20/2025 2:36 PM	
SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_18.29.00.3611	May/20/2025 6:36 PM	
SnapCenter_hana-8_LocalSnap_Hourly_05-20-2025_22.29.00.3896	May/21/2025 10:36 PM	
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_02.29.00.3515	May/21/2025 2:36 AM	
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_06.29.00.3960	May/21/2025 6:36 AM	
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_10.29.00.3581	May/21/2025 10:36 AM	
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_14.29.00.3696	May/21/2025 2:36 PM	
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_18.29.00.3956	May/21/2025 6:36 PM	
SnapCenter_hana-8_LocalSnap_Hourly_05-21-2025_22.29.03.2699	May/21/2025 10:36 PM	
SnapCenter_hana-8_LocalSnap_Hourly_05-22-2025_02.29.00.3541	May/22/2025 2:36 AM	
SnapCenter_hana-8_LocalSnap_Hourly_05-22-2025_06.29.00.3706	May/22/2025 6:36 AM	

還原與還原作業

對於儲存在 VMFS/VMDK 的 SnapCenter 上的虛擬資源，復原作業始終透過複製、掛載、複製作業完成。

1. SnapCenter 根據所選快照建立儲存克隆
2. SnapCenter 將 LUN 作為新的資料儲存掛載到 ESX 主機
3. SnapCenter 將資料存放區內的 VMDK 新增為 HANA VM 的新磁碟
4. SnapCenter 會將新磁碟裝載到 Linux 作業系統
5. SnapCenter 會將資料從新磁碟複製回原始位置

6. 複製作業完成後，上述所有資源都會再次移除
7. SnapCenter執行 HANA 系統資料庫的恢復
8. SnapCenter執行 HANA 租戶資料庫的恢復

還原作業的整體運作時間取決於資料庫大小以及儲存叢集與 ESX 主機之間 FC 連線的吞吐量。在我們初步安裝 HANA 的實驗室設置中，運行時間約為 12 分鐘。

Restore from SnapCenter_hana-8_LocalSnap_Hourly_05-22-2025_06.29.00.3706

1 Restore scope

Select the restore types

- Complete Resource ?
- Tenant Database

2 Recovery scope

3 PreOps

4 PostOps

5 Notification

6 Summary

Restore from SnapCenter_hana-8_LocalSnap_Hourly_05-22-2025_06.29.00.3706

2 Recovery scope

Recover database files using

- Recover to most recent state ?
- Recover to point in time ?
- Recover to specified data backup ?
- No recovery ?

Specify log backup locations ?

[Add](#)

Specify backup catalog location ?

3 PreOps

4 PostOps

5 Notification

6 Summary

在還原和復原作業運作時，您可以看到一個新的複製儲存單元。

NetApp ONTAP System Manager | A70-SAPCC

Search actions, objects, and pages

Storage

The basic unit of storage is a LUN (for SCSI hosts) or NVMe namespace (for NVMe). You can add LUN or NVMe namespace storage units based on your data center configuration. [More](#)

20 Storage units | 68.6 TiB Available | 20 Online | 0 Offline

Name	Consistency group	Capacity	Data reduction	Host mapping	IOPS	Latency (ms)	Throughput (MB/s)
hana_data_VFS	sc20250520_110422_689	100 GiB	1.01 to 1	otv_host-44_e3d7e9d4-46f3-4f6d	0	0	0
hana_data_VFS_Clone_0522250947396031	-	100 GiB	1 to 1	otv_host-57_e3d7e9d4-46f3-4f6d	-	-	-
hana_log_VFS	-	100 GiB	1.19 to 1	otv_host-44_e3d7e9d4-46f3-4f6d	0	0	0
hana_shared_VFS	-	100 GiB	2.33 to 1	otv_host-44_e3d7e9d4-46f3-4f6d	0	0	0

基於克隆儲存單元的新 LUN (資料儲存) 將連接到 ESX 叢集。

The screenshot displays the vSphere Client interface. The main window shows a data store named 'hana_data_VFS(sc-20250522094807386)'. The file browser shows a folder named 'hana-8' containing two files: '.sdd.sf' and 'hana-8'. The task log at the bottom shows three completed tasks:

Task Name	Target	Status	Details	Initiator	Queued For	Start Time	Completion Time	Server
Reconfigure virtual machine	hana-8	Completed		SAPCC.VCENTER\Administrator	7 ms	05/22/2025, 9:48:25 AM	05/22/2025, 9:48:26 AM	vcenter8.sapcc.stf.netapp.com
Rename datastore	hana-8	Completed		SAPCC.VCENTER\Administrator	5 ms	05/22/2025, 9:48:15 AM	05/22/2025, 9:48:21 AM	vcenter8.sapcc.stf.netapp.com
Resignature storage	hana-8	Completed		SAPCC.VCENTER\Administrator	4 ms	05/22/2025, 9:48:05 AM	05/22/2025, 9:48:05 AM	vcenter8.sapcc.stf.netapp.com

資料儲存內的 VMDK 對應到目標 HANA VM 並安裝到 HANA 系統。

```
hana-8:~ # df -h
```

```
Filesystem Size Used Avail Use% Mounted on
/dev/mapper/system-root 60G 5.3G 54G 9% /
devtmpfs 4.0M 8.0K 4.0M 1% /dev
tmpfs 49G 0 49G 0% /dev/shm
efivarfs 256K 57K 195K 23% /sys/firmware/efi/efivars
tmpfs 13G 26M 13G 1% /run
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup-dev-
early.service
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-sysctl.service
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-sysusers.service
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup-dev.service
/dev/mapper/system-root 60G 5.3G 54G 9% /.snapshots
/dev/mapper/system-root 60G 5.3G 54G 9% /boot/grub2/i386-pc
/dev/mapper/system-root 60G 5.3G 54G 9% /boot/grub2/x86++_++64-efi
/dev/mapper/system-root 60G 5.3G 54G 9% /home
/dev/mapper/system-root 60G 5.3G 54G 9% /opt
/dev/mapper/system-root 60G 5.3G 54G 9% /root
/dev/mapper/system-root 60G 5.3G 54G 9% /srv
/dev/mapper/system-root 60G 5.3G 54G 9% /usr/local
/dev/mapper/system-root 60G 5.3G 54G 9% /tmp
/dev/mapper/system-root 60G 5.3G 54G 9% /var
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-vconsole-setup.service
/dev/sdc 95G 8.9G 87G 10% /hana/log/VFS/mnt00001
/dev/sdb 95G 7.6G 88G 8% /hana/data/VFS/mnt00001
/dev/sdd 95G 15G 81G 16% /hana/shared
/dev/sda1 253M 5.9M 247M 3% /boot/efi
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup.service
192.168.175.86:/sapcc_share 1.4T 858G 568G 61% /mnt/sapcc-share
tmpfs 6.3G 72K 6.3G 1% /run/user/464
tmpfs 1.0M 0 1.0M 0% /run/credentials/getty@tty1.service
tmpfs 6.3G 52K 6.3G 1% /run/user/0
/dev/sde 95G 9.2G 86G 10%
/var/opt/snapcenter/scu/clones/hana_data_VFS_mnt00001_142592_scu_clone_1
```

```
hana-8:~ #
```

Job Details



Restore 'hana-8.sapcc.stl.netapp.com\hana\MDC\VFS'

- ✓ ▾ Restore 'hana-8.sapcc.stl.netapp.com\hana\MDC\VFS'
- ✓ ▾ hana-8.sapcc.stl.netapp.com
- ✓ ▾ Restore
- ✓ ▶ Validate Plugin Parameters
- ✓ ▾ Pre Restore Application
 - ✓ ▾ Stopping HANA Instance
- ✓ ▾ Filesystem Pre Restore
- ✓ ▾ PreRestore for Virtual Resources
- ✓ ▾ Detach Virtual Disks
- ✓ ▶ Restore Filesystem
- ✓ ▶ Restore for Virtual Resources
- ✓ ▶ Attach Virtual Disks
- ✓ ▶ Filesystem Post Restore
- ✓ ▶ Recover Application
- ✓ ▶ PostRestore for Virtual Resources
- ✓ ▶ Cleaning Storage Resources
- ✓ ▶ Post Restore Cleanup FileSystem
- ✓ ▶ Application Clean-Up
- ✓ ▶ Data Collection
- ✓ ▶ Agent Finalize Workflow
- ✓ ▶ (Job 142596) (Job 142596) read UnmountBackup

i Task Name: Recover Application Start Time: 05/22/2025 9:56:13 AM End Time: 05/22/2025 9:58:15 AM

View Logs

Cancel Job

Close

SAP 系統更新

有關使用 SnapCenter 進行 SAP 系統刷新操作的詳細資訊，請參閱 ["利用SnapCenter 功能實現SAP HANA系統"](#)

複製與複製作業自動化"。

第二個 HANA 系統 QFS 已依照第章所述的方式進行配置""[HANA 系統配置和安裝](#)""。

先決條件

對於 SnapCenter 版本 < 6.2，存在一些需要考慮的限制。

1. 每次「克隆建立」和「克隆刪除」工作流程之後，都需要在目標 HANA 主機上使用指令「systemctl restart spl」重新啟動 spl 進程。
2. 用作 SAP 系統刷新操作的來源和目標的 HANA VM 必須在同一 ESX 主機上運作。

工作流程摘要

在執行第一個 SAP 系統刷新操作之前，必須安裝目標 HANA 系統，並且必須將主機新增至 SnapCenter。然後，必須關閉 HANA 系統並從主機上卸載 HANA 資料磁碟。

SnapCenter克隆創建工作流程

1. 建立儲存克隆
2. 配置儲存克隆的主機映射
3. 將儲存克隆（資料儲存）附加到 ESX 主機
4. 將新磁碟從資料儲存新增至目標 HANA VM
5. 將磁碟裝載到 HANA VM OS
6. 使用後腳本恢復 HANA 系統

時長：12分鐘



與還原作業相比，複製作業的運行時間與 HANA 資料庫的大小無關。對於非常大的資料庫，步驟 1 至 5 的運行時間也類似。當然，對於更大的 HANA 系統，恢復需要更長的時間。

SnapCenter克隆刪除工作流程

1. 使用預先腳本關閉 HANA 系統
2. 從 HANA VM OS 卸載磁碟
3. 從 HANA VM 中刪除磁碟
4. 從 ESX 主機移除資料存儲
5. 刪除儲存克隆

時長：11分鐘

SnapCenter克隆創建工作流程

透過選擇所需的快照並點擊克隆按鈕來啟動克隆創建工作流程。

The screenshot shows the NetApp SnapCenter interface. On the left, a navigation pane lists systems: QFS, OS1, SM1, SS1, SS2, and VFS. The main area displays 'VFS Topology' with 'Manage Copies' showing 12 Backups and 0 Clones. A 'Summary Card' on the right indicates 13 Backups, 1 File-based backup, 0 Clones, and 0 Snapshots Locked. Below, the 'Primary Backup(s)' table lists backup names, snapshot lock expiration, counts, and end dates.

Backup Name	Snapshot Lock Expiration	Count	End Date
SnapCenter_hana-8_LocalSnap_Hourly_06-16-2025_06.29.00.4157		1	06/16/2025 6:30:29 AM
SnapCenter_hana-8_LocalSnap_Hourly_06-16-2025_02.29.00.4072		1	06/16/2025 2:30:28 AM
SnapCenter_hana-8_LocalSnap_Hourly_06-15-2025_22.29.00.4010		1	06/15/2025 10:30:30 PM
SnapCenter_hana-8_LocalSnap_Hourly_06-15-2025_18.29.00.3828		1	06/15/2025 6:30:28 PM
SnapCenter_hana-8_LocalSnap_Hourly_06-15-2025_14.29.00.3772		1	06/15/2025 2:30:28 PM
SnapCenter_hana-8_LocalSnap_Hourly_06-15-2025_10.29.00.4143		1	06/15/2025 10:30:28 AM
SnapCenter_hana-8_LocalSnap_Hourly_06-15-2025_06.29.00.3640		1	06/15/2025 6:30:28 AM
SnapCenter_hana-8_LocalSnap_Hourly_06-15-2025_02.29.03.3879		1	06/15/2025 2:30:34 AM
SnapCenter_hana-8_LocalSnap_Hourly_06-14-2025_22.29.00.3826		1	06/14/2025 10:30:28 PM
SnapCenter_hana-8_LocalSnap_Hourly_06-14-2025_18.29.00.3832		1	06/14/2025 6:30:28 PM
SnapCenter_hana-8_LocalSnap_Hourly_06-14-2025_14.29.00.3741		1	06/14/2025 2:30:28 PM
SnapCenter_hana-8_LocalSnap_Hourly_06-14-2025_10.29.00.3930		1	06/14/2025 10:30:29 AM

必須提供目標主機和 SID。

The 'Clone From Backup' dialog box is shown at Step 1: Location. The title is 'Select the host to create the clone'. The 'Plug-in host' dropdown is set to 'hana-9.sapcc.stl.netapp.com'. The 'Target Clone SID' dropdown is set to 'QFS'.

The 'Clone From Backup' dialog box is shown at Step 2: Settings. The title is 'LUN Map Settings'. The 'igroup protocol' dropdown is open, showing options: Select, Mixed, FCP (highlighted), and ISCSI.

在我們的範例中，我們使用後腳本在目標主機上執行復原。

Clone From Backup

- 1 Location
- 2 Settings
- 3 Scripts
- 4 Notification
- 5 Summary

The following commands will run on the Plug-in Host: **hana-9.sapcc.stl.netapp.com**

Enter optional commands to run before performing a clone operation ⓘ

Pre clone command

Enter optional commands to run after performing a clone operation ⓘ

Post clone command

工作流程啟動時，SnapCenter會根據所選快照建立複製儲存單元。

Storage

The basic unit of storage is a LUN (for SCSI hosts) or NVMe namespace (for NVMe). You can add LUN or NVMe namespace storage units based on your data center configuration. [More](#)

22 Storage units | 68.5 TiB Available | 22 Online | 0 Offline

Name	Consistency group	Capacity	Data reduction	Host mapping	IOPS	Latency (ms)	Throughput (MB/s)
hana_data_QFS	-	100 GiB	5.46 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	4	0.11	0.39
hana_data_VFS	sc20250520_110422_689	100 GiB	1 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	5	0.12	0.39
hana_data_VFS_Clone_06172507005037511	-	100 GiB	1 to 1	otv_host-57_e3d7e9d4-46f3-4f5d	23	0.11	1.24
hana_log_QFS	-	100 GiB	4.1 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	5	0.10	0.39
hana_log_VFS	-	100 GiB	1.22 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	8	0.12	0.40
hana_shared_QFS	-	100 GiB	2.81 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	5	0.11	0.39
hana_shared_VFS	-	100 GiB	1.69 to 1	otv_host-44_e3d7e9d4-46f3-4f5d	5	0.13	0.39

然後，SnapCenter將 LUN（資料儲存）附加到目標 HANA VM 正在執行的 ESX 主機。

vSphere Client | Search in all environments | Administrator@SAPCC.VCENTER

10.63.167.6 | ACTIONS

Summary | Monitor | Configure | Permissions | VMS | **Datastores** | Networks | Updates

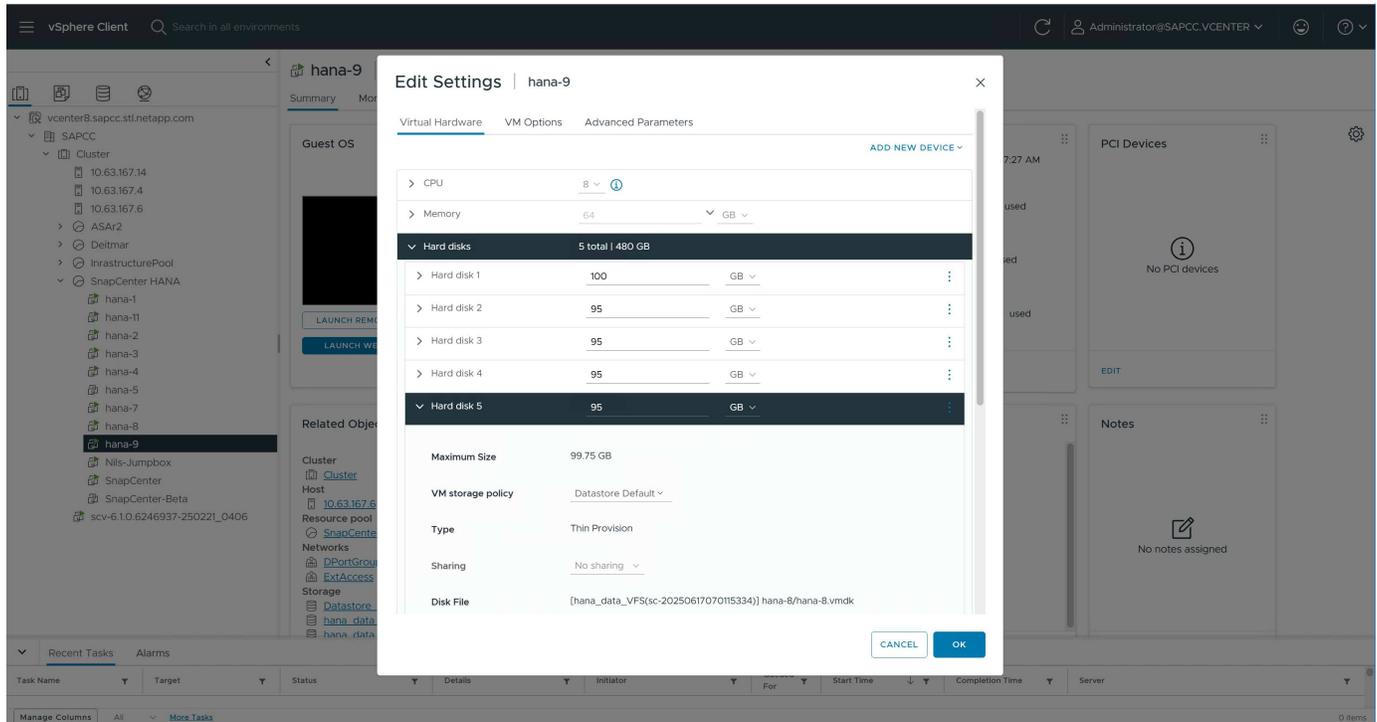
Quick Filter: Enter value

Name	Status	Type	Datastore Cluster	Capacity	Free
datastore1[2]	✓ Norm	VMFS 6		766 GB	764.58 GB
Datastore_C250	✓ Norm	NFS 3		1.95 TB	1.95 TB
Datastore_One	✓ Norm	NFS 3		2.85 TB	1.22 TB
DatastoreA40Q	✓ Norm	NFS 3		500 GB	271.24 GB
hana_data_QFS	✓ Norm	VMFS 6		99.75 GB	87.26 GB
hana_data_VFS	✓ Norm	VMFS 6		99.75 GB	90.94 GB
hana_data_VFS[sc-2025061707015334]	✓ Norm	VMFS 6		99.75 GB	90.94 GB
hana_log_QFS	✓ Norm	VMFS 6		99.75 GB	91.31 GB
hana_log_VFS	✓ Norm	VMFS 6		99.75 GB	91.3 GB
hana_shared_QFS	✓ Norm	VMFS 6		99.75 GB	87 GB
hana_shared_VFS	✓ Norm	VMFS 6		99.75 GB	80.55 GB
OS_image	✓ Norm	NFS 3		142.5 GB	55.39 GB

Recent Tasks | Alarms

Task Name	Target	Status	Details	Initiator	Quiesced For	Start Time	Completion Time	Server
Manage Columns All More Tasks								

然後將新資料儲存內的 VMDK 新增到 HANA VM 。



然後， SnapCenter在 HANA Linux 系統上配置並安裝新磁碟。

```
hana-9:/mnt/sapcc-share/SAP-System-Refresh # df -h

Filesystem Size Used Avail Use% Mounted on
/dev/mapper/system-root 60G 5.2G 52G 10% /
devtmpfs 4.0M 4.0K 4.0M 1% /dev
tmpfs 49G 0 49G 0% /dev/shm
efivarfs 256K 57K 195K 23% /sys/firmware/efi/efivars
tmpfs 13G 26M 13G 1% /run
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup-dev-early.service
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-sysctl.service
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-sysusers.service
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup-dev.service
/dev/mapper/system-root 60G 5.2G 52G 10% /.snapshots
/dev/mapper/system-root 60G 5.2G 52G 10% /boot/grub2/i386-pc
/dev/mapper/system-root 60G 5.2G 52G 10% /boot/grub2/x86++_++64-efi
/dev/mapper/system-root 60G 5.2G 52G 10% /home
/dev/mapper/system-root 60G 5.2G 52G 10% /opt
/dev/mapper/system-root 60G 5.2G 52G 10% /srv
/dev/mapper/system-root 60G 5.2G 52G 10% /root
/dev/mapper/system-root 60G 5.2G 52G 10% /tmp
/dev/mapper/system-root 60G 5.2G 52G 10% /usr/local
/dev/mapper/system-root 60G 5.2G 52G 10% /var
```

```

tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-vconsole-setup.service
/dev/sdc 95G 8.9G 87G 10% /hana/log/QFS/mnt00001
/dev/sdd 95G 14G 82G 14% /hana/shared
/dev/sda1 253M 5.9M 247M 3% /boot/efi
tmpfs 1.0M 0 1.0M 0% /run/credentials/systemd-tmpfiles-setup.service
192.168.175.86:/sapcc+_+_share 1.4T 858G 568G 61% /mnt/sapcc-share
tmpfs 6.3G 72K 6.3G 1% /run/user/464
tmpfs 1.0M 0 1.0M 0% /run/credentials/getty@tty1.service
tmpfs 6.3G 52K 6.3G 1% /run/user/0
/dev/sde 95G 9.2G 86G 10% /hana/data/QFS/mnt00001
tmpfs 6.3G 56K 6.3G 1% /run/user/1001
hana-9:/mnt/sapcc-share/SAP-System-Refresh #

hana-9:/mnt/sapcc-share/SAP-System-Refresh # cat /etc/fstab
/dev/system/root / btrfs defaults 0 0
/dev/system/root /var btrfs subvol=@/var 0 0
/dev/system/root /usr/local btrfs subvol=@/usr/local 0 0
/dev/system/root /tmp btrfs subvol=@/tmp 0 0
/dev/system/root /srv btrfs subvol=@/srv 0 0
/dev/system/root /root btrfs subvol=@/root 0 0
/dev/system/root /opt btrfs subvol=@/opt 0 0
/dev/system/root /home btrfs subvol=@/home 0 0
/dev/system/root /boot/grub2/x86+_+_64-efi btrfs
subvol=@/boot/grub2/x86+_+_64-efi 0 0
/dev/system/root /boot/grub2/i386-pc btrfs subvol=@/boot/grub2/i386-pc 0
0
/dev/system/swap swap swap defaults 0 0
/dev/system/root /.snapshots btrfs subvol=@/.snapshots 0 0
UUID=FB79-24DC /boot/efi vfat utf8 0 2
192.168.175.86:/sapcc+_+_share /mnt/sapcc-share nfs
rw,vers=3,hard,timeo=600,rsz=1048576,wsz=1048576,intr,noatime,nolock 0
0
#/dev/sdb /hana/data/QFS/mnt00001 xfs relatime,inode64 0 0
/dev/sdc /hana/log/QFS/mnt00001 xfs relatime,inode64 0 0
/dev/sdd /hana/shared xfs defaults 0 0
# The following entry has been added by NetApp (SnapCenter Plug-in for
UNIX)
/dev/sde /hana/data/QFS/mnt00001 xfs
rw,relatime,attr2,inode64,logbufs=8,logbsize=32k,noquota 0 0
hana-9:/mnt/sapcc-share/SAP-System-Refresh #

```

以下螢幕截圖顯示了SnapCenter執行的作業步驟。

Job Details

Clone from backup 'SnapCenter_hana-8_LocalSnap_Hourly_06-17-2025_10.29.00.4260'

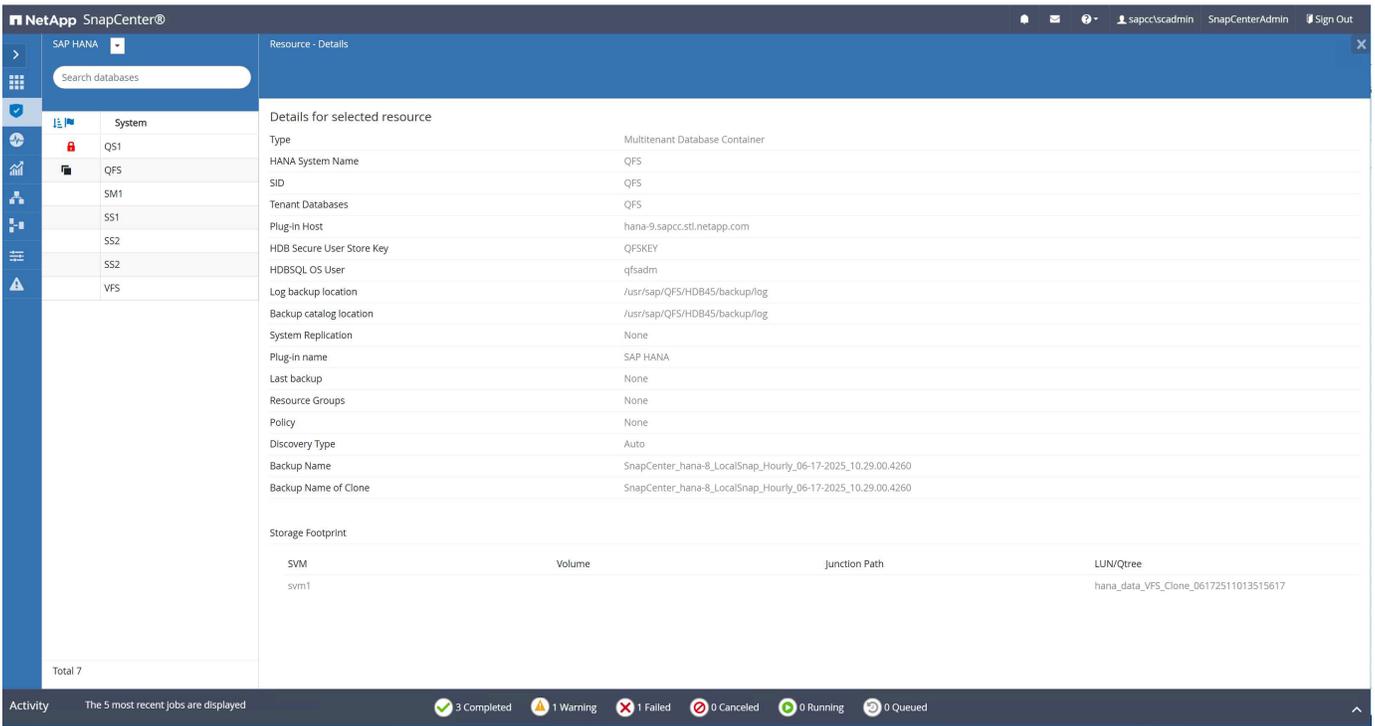
- ✓ ▾ Clone from backup 'SnapCenter_hana-8_LocalSnap_Hourly_06-17-2025_10.29.00.4260'
- ✓ ▾ hana-9.sapcc.stl.netapp.com
 - ✓ ▾ Clone
 - ✓ ▶ Application Pre Clone
 - ✓ ▶ Storage Clone
 - ✓ ▶ Can Execute Clone Virtual or RDM disks
 - ✓ ▶ Clone Virtual or RDM disks
 - ✓ ▶ Unmount Filesystem
 - ✓ ▾ Mount Filesystem
 - ✓ ▶ Performing rescan of devices
 - ✓ ▶ Building clone for data file systems and associated entities
 - ✓ ▾ Application Post Clone
 - ✓ ▾ Register Clone Metadata
 - ✓ ▾ Clean-up Snapshot entries on Server
 - ✓ ▾ Application Clean-Up
 - ✓ ▶ Data Collection
 - ✓ ▶ Agent Finalize Workflow

Task Name: Mount Filesystem Start Time: 06/17/2025 11:02:42 AM End Time: 06/17/2025 11:10:17 AM

View Logs Cancel Job Close

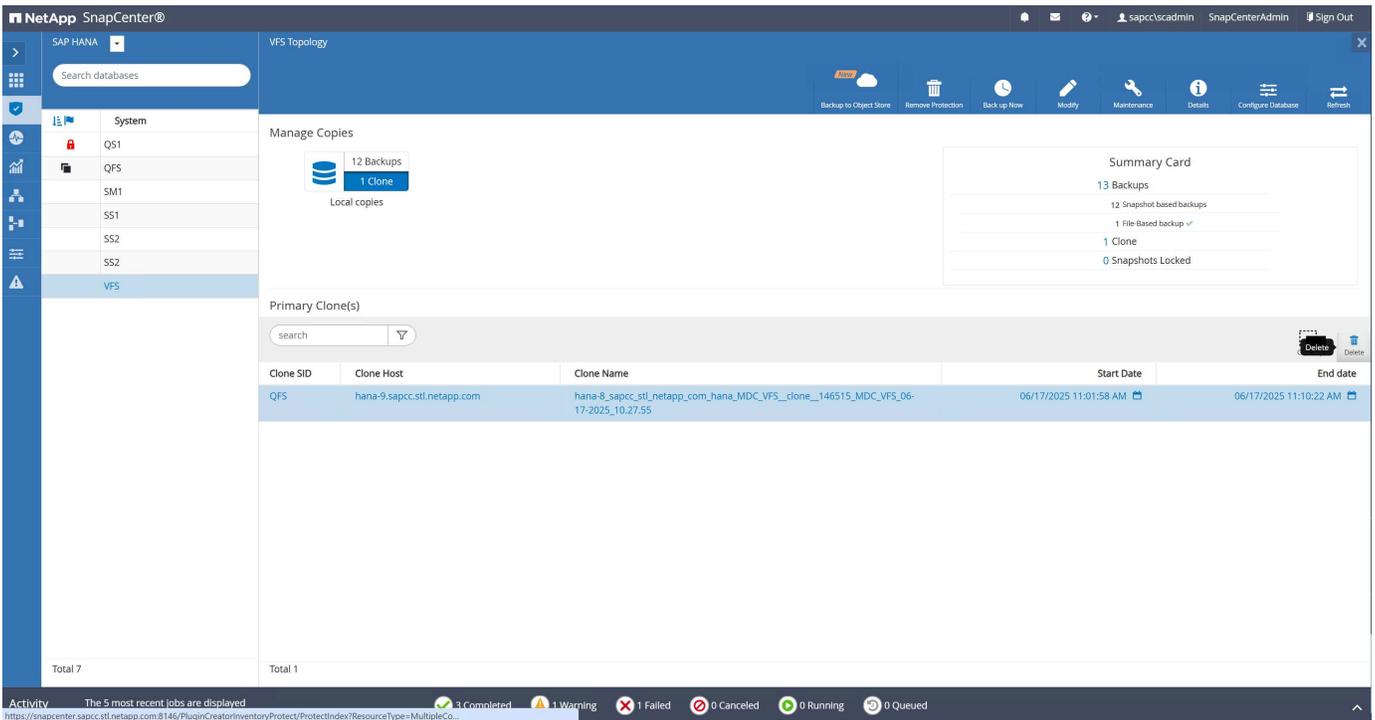
如「先決條件」部分所述，必須使用指令「systemctl restart spl」重新啟動 HANA 主機上的 SnapCenter spl 服務，才能啟動正確的清理工作。此操作必須在作業完成後執行。

克隆工作流程完成後，可以透過點選資源 QFS 來啟動自動發現。自動發現過程完成後，新的儲存空間將列在資源的詳細資訊視圖中。



SnapCenter克隆刪除工作流程

透過在來源 HANA 資源處選擇複製並點選刪除按鈕來啟動複製刪除工作流程。



在我們的範例中，我們使用預先腳本來關閉目標 HANA 資料庫。

Delete Clone



i Cloned volume will be deleted. SnapCenter backups and HANA backup catalog must be deleted manually.

Enter commands to execute before clone deletion

Pre clone delete :

```
/mnt/sapcc-share/SAP-System-Refresh/sc-system-refresh.sh  
shutdown
```

The selected clone(s) will be permanently deleted. If the selected clone contains other resource(s) it will also be deleted.

If the cloned databases are protected then the protection needs to be removed to delete the clone.

Do you want to proceed?

Force Delete

Cancel

OK

以下螢幕截圖顯示了SnapCenter執行的作業步驟。

Job Details ×

Deleting clone 'hana-8_sapcc_stl_netapp_com_h.....S_clone_146534_MDC_VFS_06-17-2025_10.27.55'

- ✓ ▼ Deleting clone 'hana-8_sapcc_stl_netapp_com_hana_MDC_VFS_clone_146534_MDC_VFS_06-17-2025_10.27.55'
- ✓ ▼ hana-9.sapcc.stl.netapp.com
 - ✓ ▼ Delete Clone
 - ▶ Validate Plugin Parameters
 - ▶ Application Clone Delete
 - ▶ Delete Pre Clone Commands
 - ▼ Unmount Filesystem
 - ▶ Deporting cloned file systems and associated entities
 - ▶ Performing rescan of devices
 - ▶ Deleting Virtual Resources
 - ▼ Delete Storage Clone
 - ▼ Unregister Clone Metadata
 - ▼ Filesystem Clone Metadata Cleanup
 - ▶ Performing rescan of devices
 - ▶ Agent Finalize Workflow

Task Name: Application Clone Delete Start Time: 06/17/2025 1:36:24 PM End Time: 06/17/2025 1:37:02 PM

View Logs Cancel Job Close

如「先決條件」部分所述，對於 SnapCenter 版本 < 6.2，必須使用命令「systemctl restart spl」重新啟動 HANA 主機上的 SnapCenter spl 服務，以啟動正確的清理工作。

其他資訊和版本歷程記錄

HANA 最佳實踐：

- "採用ASA Fibre Channel Protocol的NetApp解決方案上的SAP HANA"。

產品特色：SnapCenter

- "SAP HANA利用SnapCenter NetApp備份與還原"
- "SAP HANA 系統複寫：使用 SnapCenter 進行備份與還原"
- "利用SnapCenter 功能實現SAP HANA系統複製與複製作業自動化"
- "透過 SnapCenter™ SnapMirror主動同步和 VMware Metro Storage Cluster 實現 SAP HANA 資料保護和高可用性"
- "軟件文檔SnapCenter"

版本歷程記錄：

版本	日期	留言
1.0版	07/2025	初始版本

版權資訊

Copyright © 2026 NetApp, Inc. 版權所有。台灣印製。非經版權所有人事先書面同意，不得將本受版權保護文件的任何部分以任何形式或任何方法（圖形、電子或機械）重製，包括影印、錄影、錄音或儲存至電子檢索系統中。

由 NetApp 版權資料衍伸之軟體必須遵守下列授權和免責聲明：

此軟體以 NETAPP「原樣」提供，不含任何明示或暗示的擔保，包括但不限於有關適售性或特定目的適用性之擔保，特此聲明。於任何情況下，就任何已造成或基於任何理論上責任之直接性、間接性、附隨性、特殊性、懲罰性或衍生性損害（包括但不限於替代商品或服務之採購；使用、資料或利潤上的損失；或企業營運中斷），無論是在使用此軟體時以任何方式所產生的契約、嚴格責任或侵權行為（包括疏忽或其他）等方面，NetApp 概不負責，即使已被告知有前述損害存在之可能性亦然。

NetApp 保留隨時變更本文所述之任何產品的權利，恕不另行通知。NetApp 不承擔因使用本文所述之產品而產生的責任或義務，除非明確經過 NetApp 書面同意。使用或購買此產品並不會在依據任何專利權、商標權或任何其他 NetApp 智慧財產權的情況下轉讓授權。

本手冊所述之產品受到一項（含）以上的美國專利、國外專利或申請中專利所保障。

有限權利說明：政府機關的使用、複製或公開揭露須受 DFARS 252.227-7013（2014 年 2 月）和 FAR 52.227-19（2007 年 12 月）中的「技術資料權利 - 非商業項目」條款 (b)(3) 小段所述之限制。

此處所含屬於商業產品和 / 或商業服務（如 FAR 2.101 所定義）的資料均為 NetApp, Inc. 所有。根據本協議提供的所有 NetApp 技術資料和電腦軟體皆屬於商業性質，並且完全由私人出資開發。美國政府對於該資料具有非專屬、非轉讓、非轉授權、全球性、有限且不可撤銷的使用權限，僅限於美國政府為傳輸此資料所訂合約所允許之範圍，並基於履行該合約之目的方可使用。除非本文另有規定，否則未經 NetApp Inc. 事前書面許可，不得逕行使用、揭露、重製、修改、履行或展示該資料。美國政府授予國防部之許可權利，僅適用於 DFARS 條款 252.227-7015(b)（2014 年 2 月）所述權利。

商標資訊

NETAPP、NETAPP 標誌及 <http://www.netapp.com/TM> 所列之標章均為 NetApp, Inc. 的商標。文中所涉及的所有其他公司或產品名稱，均為其各自所有者的商標，不得侵犯。