Backup and Recovery on Dell PowerFlex with Nutanix Cloud Platform using HYCU and Dell Data Domain

Abstract

This white paper describes how HYCU integrates backup and recovery for Microsoft SQL Server on Dell PowerFlex with the Nutanix Cloud Platform using DDVE. The solution delivers application-aware data protection.

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Notes, cautions, and warnings

NOTE: A NOTE indicates important information that helps you make better use of your product.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

Contents

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Executive Summary

Organizations today require their applications to be fully operational around the clock. As data volumes continue to grow, it is crucial for organizations to adopt the safest and most effective ways of protection. This includes ensuring uninterrupted operations with minimum downtime and meeting stringent Recovery Time Objective (RTO) and Recovery Point Objective (RPO) requirements. As a result, demand is rising for faster, more efficient data protection solutions.

This paper presents a solution that integrates HYCU's agentless, application-aware backup and recovery capabilities with the high-performance infrastructure of Dell PowerFlex and Nutanix Cloud Platform. By leveraging Nutanix's native snapshot technology and Dell PowerProtect Data Domain for efficient storage, organizations can achieve seamless, scalable, and policy-driven data protection solutions for application workloads.

HYCU's integration with Nutanix enables point-in-time recovery, simplified policy management, and rapid restores, all while maintaining application consistency. This is especially valuable in database environments like Microsoft SQL Server, where downtime or data loss can significantly impact business operations. The solution supports recovery to the same or different instances, offering flexibility for test/dev or disaster recovery scenarios. Dell PowerFlex enhances the solution with resilient, high-throughput storage, while DDVE ensures deduplication and long-term retention efficiency.

Together, this architecture delivers a data protection strategy that reduces complexity and ensures business continuity. It simplifies backup operations through automation and centralized management. This solution is ideal for those looking to modernize their application data protection strategy without compromising performance or scalability.

Topics:

Overview

Organizations today require their applications to be fully operational around the clock. As data volumes continue to grow, it is crucial for organizations to adopt the safest and most effective ways of protection. This includes ensuring uninterrupted operations with minimum downtime and meeting stringent Recovery Time Objective (RTO) and Recovery Point Objective (RPO) requirements. As a result, demand is rising for faster, more efficient data protection solutions.

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Terminology

The following table provides definitions for some of the terms that are used in this document.

Table 1. Terminology

Term	Definition
AHV	Acropolis Hypervisor; Nutanix's native hypervisor, part of the Acropolis platform.
AOS	Acropolis Operating System; the core software running on Nutanix clusters.
CVM	Controller Virtual Machine; a virtual machine running on each node in a Nutanix cluster that manages storage and other tasks
DDVE	Dell Data Domain Virtual Edition
DNS	Domain Name System
Guest OS	The operating system running on a VM.
HCI	Hyper-Converged Infrastructure; the architectural model used by Nutanix.
Hyper-V	Microsoft's hypervisor
KVM	Kernel-based Virtual Machine
MDM	Metadata Manager
NCP	Nutanix Cloud Platform
NTP	Network Time Protocol
OLTP	Online Transaction Processing
PRISM	The Nutanix web-based interface for managing clusters.
RPO	Recovery Point Objective
RTO	Recovery Time Objective
SDC	Storage Data Client; a Dell PowerFlex component installed on a compute node that provides access to PowerFlex block volumes.
SDS	Storage Data Server; a Dell PowerFlex component that controls local disks and aggregates them into a storage pool.
VLAN	Virtual Local Area Network
VM	Virtual Machine
WSFC	Windows Server Failover Cluster
WSFCM	Windows Server Failover Cluster Manager

We value your feedback

Dell Technologies and the authors of this document welcome your feedback on the solution and the solution documentation. Contact the Dell Technologies Solutions team by email or provide your comments by completing our documentation survey.

NOTE: For links to additional documentation and other solutions, see Dell Technologies Solutions Info Hub for PowerFlex.

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Product Overview

Topics:

PowerFlex family

PowerFlex software-defined infrastructure enables broad consolidation across the data center, encompassing almost any type of workload and architecture. The software-defined architecture offers automation and programmability of the complete infrastructure and provides scalability, performance, and resiliency to enable effortless adherence to stringent workload SLAs.

The PowerFlex family provides a foundation that combines compute and high-performance storage resources in a managed unified fabric. PowerFlex comes in flexible deployment options (rack, appliance, or custom nodes and in the public cloud) that enable independent (two-layer), HCI (single-layer), or mixed architectures. PowerFlex is ideal for high-performance applications and databases, building an agile private or hybrid cloud, or consolidating resources in heterogeneous environments.

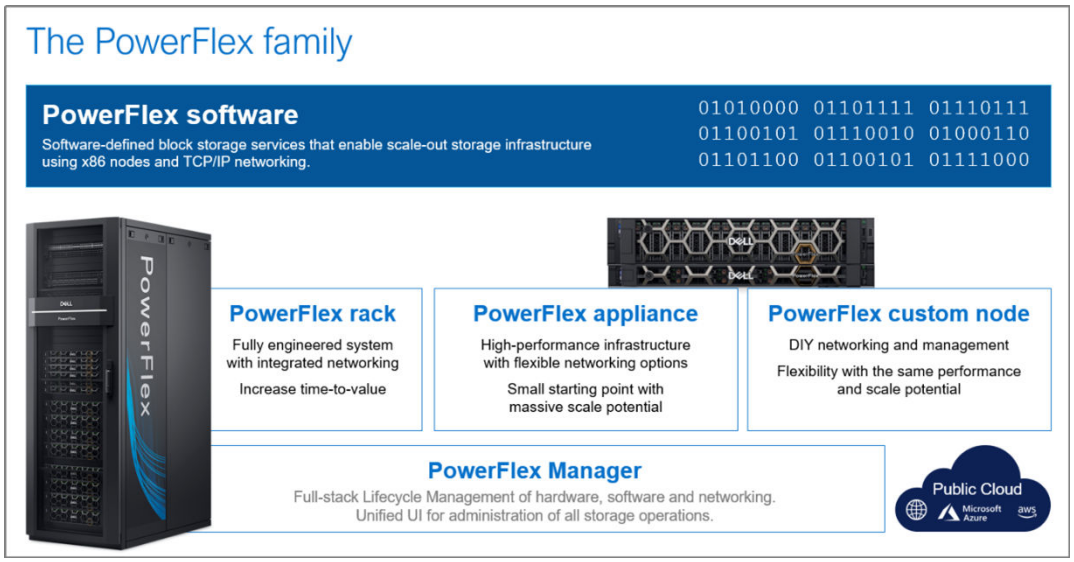

Figure 1. PowerFlex family

PowerFlex software components

Software is the key differentiation in the PowerFlex offering. PowerFlex software components not only provide software-defined storage services but also help simplify infrastructure management and orchestration. This software enables comprehensive IT Operational Management (ITOM) and Life Cycle Management (LCM) capabilities that span compute as well as storage infrastructure, from BIOS and Firmware to nodes, software, and networking.

PowerFlex

PowerFlex is the software foundation of PowerFlex software-defined infrastructure. It is a scale-out block storage service that is designed to deliver flexibility, elasticity, and simplicity with predictable high performance and resiliency at scale.

For more information, see PowerFlex specifications

PowerFlex Manager

PowerFlex Manager enables ITOM automation and LCM capabilities for PowerFlex systems. The unified PowerFlex Manager brings together three separate components used in previous releases – PowerFlex Manager, the core PowerFlex UI, and the PowerFlex gateway. The PowerFlex UI runs in Kubernetes and embraces a modern development framework.

PowerFlex deployment architectures

PowerFlex software-defined storage can be deployed in disaggregated (independent compute and storage layers) architectures.

Independent architecture

In an independent architecture, or disaggregated architecture, some nodes provide storage capacity for data in applications, while other separate and independent nodes provide compute resources for applications and workloads. Compute and storage resources can be scaled independently by adding nodes to the cluster while it remains active. This separation of compute and storage resources helps to minimize software licensing costs in certain situations. This architecture can be ideal for high-performance databases and application workloads.

Disaggregation gives organizations the freedom to choose different LCM options that best align with their operational models. Not only can PowerFlex Manager manage the LCM of the PowerFlex storage infrastructure, but it can also manage LCM of PowerFlex compute nodes. With this freedom there is also the choice to manage compute estates that connect to PowerFlex with other tooling; for example, VxRail Dynamic Nodes connected to PowerFlex using VxRail Manager automation.

PowerFlex consumption options

PowerFlex rack

PowerFlex rack is a software-defined infrastructure platform that combines compute and high-performance storage resources in a managed unified network. This rack-based engineered system, with integrated networking, enables customers to achieve the scalability and management requirements of a modern data center.

PowerFlex appliance

PowerFlex appliance is a PowerEdge-based server which has been configured to be a node in a software-defined storage deployment that runs PowerFlex software components. This offering allows customers the flexibility and savings to bring their own compatible networking or make use of full network automation using a supported set of Dell or Cisco switches.

PowerFlex custom nodes

PowerFlex custom nodes are validated server building-blocks configured for use with PowerFlex. They are available with thousands of configuration options and are available for customers who prefer to build their own environments.

PowerFlex in public cloud

PowerFlex software storage services can be deployed on recommended instances (with attached storage) in Amazon Web Services or Microsoft Azure. Only the MG data layout and Independent (disaggregated) architecture are supported. Fault Sets

may be used to distribute the cluster across multiple Availability Zones, improving resiliency even during AZ disruptions. Native asynchronous replication may be used to migrate data between cloud and on-premises PowerFlex systems, or to establish cloud-based BC/DR data protection schemes.

Dell PowerFlex and Nutanix Cloud Platform

This paper focuses on Nutanix Cloud Infrastructure Compute (NCI-C), which includes compute, networking, disaster recovery, and security. NCI-C is a new license model specifically tied to this architecture. Unlike the traditional Nutanix hyperconverged consumption model—which uses internal storage—NCI-C supports a disaggregated approach.

Dell PowerFlex is a software-defined platform that integrates compute and storage with independent scaling capabilities. It offers flexible infrastructure management to ensure performance, reliability, and scalability across diverse workloads.

Integrating Dell PowerFlex with Nutanix Cloud Platform (NCP) allows organizations to scale compute and storage resources independently. Nutanix AHV and AOS run on Dell PowerFlex compute servers, consuming storage from an external Dell PowerFlex Storage cluster. This architecture combines Dell's software-defined PowerFlex storage with the Nutanix Acropolis Hypervisor to optimize resource management.

The solution supports data protection, disaster recovery, and networking, while enabling hybrid cloud operations for scalable workloads.

NOTE: For more information about hardware and software specifications, see Dell PowerFlex with Nutanix Cloud Platform Technical Overview.

Dell PowerProtect DD Series

Dell PowerProtect DD Series is a set of purpose-built data protection appliances designed to deliver scalable and efficient backup and recovery. These systems offer deduplication, encryption, and replication capabilities to reduce storage costs while ensuring data integrity and security. The DD series systems integrates seamlessly into hybrid and multi-cloud environments and supports a wide range of applications and workloads, making it a reliable choice for modern data protection strategies.

DDVE is the software-defined version of Dell PowerProtect DD Series - a virtual deduplication appliance that provides data protection for small-to-medium-sized business, enterprise, and service provider environments. The DD Boost File System (BoostFS) offers a general file-system interface to the DD Boost library, similar to an NFS mount. BoostFS is mounted on the application server, presenting a standard file system target, while the DD software manages the objects placed within that file system.

NOTE: For more details on Dell PowerProtect Data Domain, see the official documentation.

HYCU

HYCU is a high-performance, software-based data protection solution that delivers scalable backup, migration, and disaster recovery across on-premises, cloud, and SaaS environments. It is the first solution purpose-built for the Nutanix platform, offering comprehensive coverage across all Nutanix components - including AHV, rapid restores using Nutanix Snapshots, ROBO with Nutanix Protection Domains, NDB, and more.

Its lightweight, agentless architecture and intuitive UI simplify the complexity and maintenance of a backup infrastructure by:

- Minimizing CPU and memory resources with fast deployment workflow to be production ready
- Eliminating the need to manage and update agents on individual servers, with automated application discovery
- Providing a simple and user-friendly design that allows IT and backup administrators to adopt the solution quickly

HYCU offers flexible recovery options, including granular recovery of application-specific tables or databases, and full virtual machine or application restores. Its web-based user interface provides a streamlined, intuitive way to manage and monitor their data protection environment. With a single pane of glass for managing VMs, applications, backup storage, jobs, and events, HYCU enables customizable views of the entire Nutanix data estate, helping administrators quickly identify protection gaps and verify compliance.

Policy-driven data protection with HYCU

HYCU uses a policy-based approach to streamline and automate data protection strategies. Users can apply predefined policies or create custom ones tailored to their specific requirements. These policies define key parameters such as backup frequency, retention periods, and protection rules. Once assigned to an application or data source, HYCU automatically initiates and manages backups according to the defined rules, ensuring consistent and reliable data protection.

Table 2. Built-in policies provided by HYCU

Type of predefined policy	Description
Gold	Data is backed up every 4 hours and restored within 4 hours
Silver	Data is backed up every 12 hours and restored within 12 hours
Bronze	Data is backed up every 24 hours and restored within 24 hours
Exclude	To exclude specific entities from backup

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Solution Architecture

Topics:

Overview

This section provides an overview of the architecture and design for deploying a Microsoft SQL Server 2022 database on Dell PowerFlex with Nutanix Cloud Platform. The integration of HYCU and Dell PowerProtect Data Domain adds robust data protection and data management capabilities.

Dell PowerFlex and Nutanix Cloud Platform

Dell PowerFlex serves as external storage for Nutanix Cloud Platform. This combination is designed for large, mission-critical environments where resiliency, security, scalability, and performance are essential. Integrating Dell PowerFlex with Nutanix Cloud Platform enables organizations to scale compute and storage resources independently. Nutanix AHV and AOS operate on Dell PowerFlex compute servers, consuming storage from an external Dell PowerFlex storage cluster. This architecture supports data protection, disaster recovery, and hybrid cloud operations for scalable workloads.

NOTE: For more information, see the Dell PowerFlex with Nutanix Cloud Platform Technical Overview.

Logical architecture

The following figure illustrates the logical architecture of the disaggregated Dell PowerFlex system running Microsoft SQL Server database. It highlights:

- The Dell PowerFlex compute layer installed with Nutanix Cloud Platform, hosting the SQL Server database and the PowerFlex SDC device driver
- The PowerFlex storage layer
- The associated PowerFlex management components
- The integration of HYCU for application-consistent backups to Dell Data Domain, configured as the backup destination

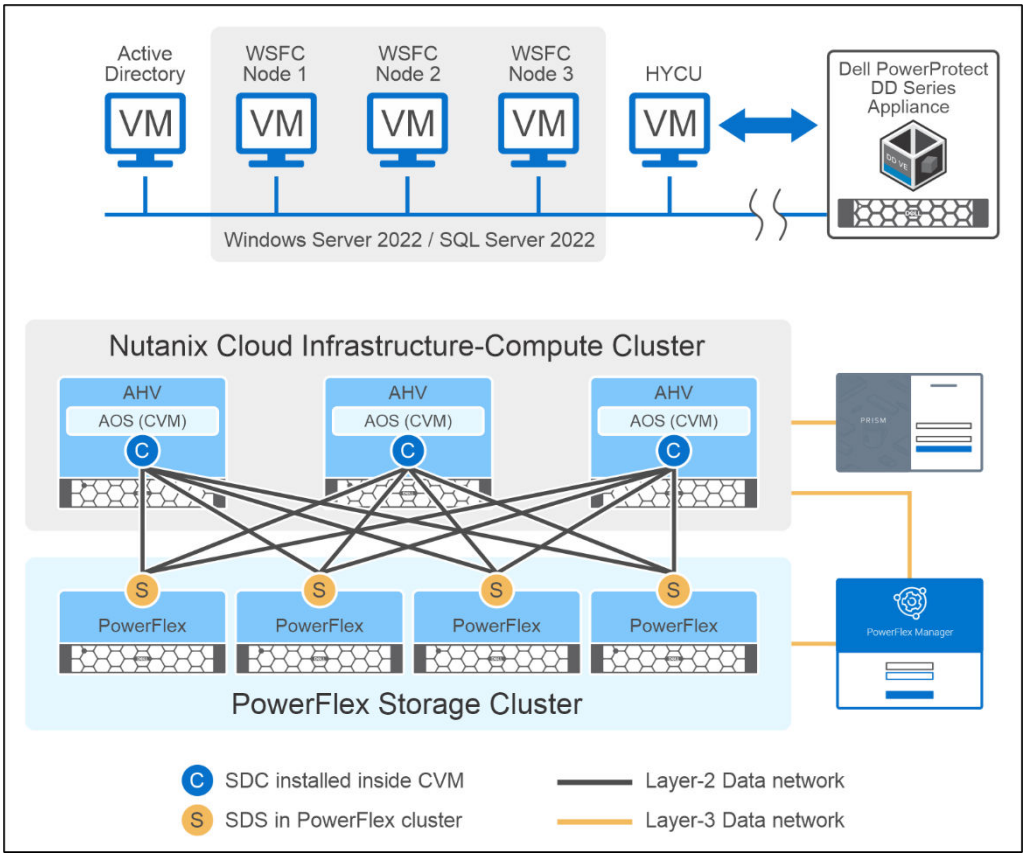


Figure 2. SQL Server 2022 architecture on Dell PowerFlex and Nutanix Cloud Platform integrated with HYCU and Dell Data Domain

As shown in the logical architecture, Dell PowerFlex with Nutanix Cloud Platform is deployed using a disaggregated architecture and consists of following components:

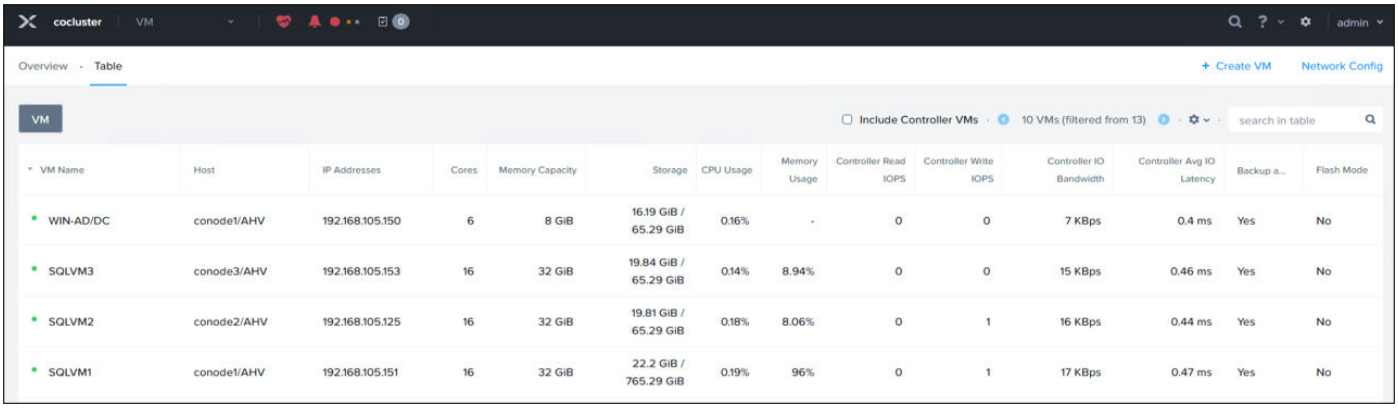
- **Compute Layer**: A Nutanix Cloud Infrastructure Compute (NCI-C) cluster running AOS and AHV on Dell PowerFlex compute-only nodes.
- **Storage Layer**: A Dell PowerFlex cluster operates in a storage-only model, compatible with standard PowerFlex configurations.

The compute cluster accesses storage over the network from the external PowerFlex storage cluster using the SDC that is installed on the Controller Virtual Machine (CVM). The CVM runs on each node of the Nutanix cluster and is responsible for core storage functions and cluster management. Additionally, the CVM helps with provisioning storage volumes from PowerFlex to virtual machines, ensuring efficient access to storage resources.

The HYCU virtual appliance is a preconfigured software solution deployed within a Nutanix AHV cluster. HYCU on AHV provides protection against virtual machines and applications running on these VMs. HYCU ensures that data is recoverable and available when needed with agentless, application-consistent backup and granular recovery. Policies are used within HYCU to define virtual machines and application backup requirements.

HYCU is configured to use Dell PowerProtect Data Domain as the backup target, ensuring efficient and reliable data protection. Application data is backed up at the target using DD Boost proprietary protocol, which optimizes data transfer and reduces network load.

A three-node Microsoft SQL Server 2022 database cluster is deployed on Nutanix. Each of the three VMs is hosted on a separate node and clustered using the Windows Server Failover Cluster (WSFC) feature. The SQL Server database is configured as a Failover Cluster Instance (FCI). Shared volumes for SQL Server data, logs, and temp directories are created and mapped from Dell PowerFlex. An additional VM running Active Directory Domain Services is deployed to manage authentication and domain services for the SQL Server VMs.



VM Name	Host	IP Addresses	Cores	Memory Capacity	Storage	CPU Usage	Memory Usage	Controller Read IOPS	Controller Write IOPS	Controller IO Bandwidth	Controller Avg IO Latency	Backup a...	Flash Mode
WIN-AD/DC	conode1/AHV	192.168.105.150	6	8 GiB	16.19 GiB / 65.29 GiB	0.16%	-	0	0	7 KBps	0.4 ms	Yes	No
SQLVM3	conode3/AHV	192.168.105.153	16	32 GiB	19.84 GiB / 65.29 GiB	0.14%	8.94%	0	0	15 KBps	0.46 ms	Yes	No
SQLVM2	conode2/AHV	192.168.105.125	16	32 GiB	19.81 GiB / 65.29 GiB	0.18%	8.06%	0	1	16 KBps	0.44 ms	Yes	No
SQLVM1	conode1/AHV	192.168.105.151	16	32 GiB	22.2 GiB / 765.29 GiB	0.19%	96%	0	1	17 KBps	0.47 ms	Yes	No

Figure 3. 3-node Microsoft SQL Server cluster running on Nutanix environment using Dell PowerFlex storage

NOTE: For more information on configuring Microsoft SQL Server on Nutanix with Dell PowerFlex as external storage, see this implementation guide.

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Deploying HYCU Virtual Appliance

Topics:

Overview

This section outlines how to configure the HYCU virtual appliance and protect SQL Server running on Nutanix AHV by configuring a policy for regular, application-consistent backup.

The following steps cover the deployment of HYCU virtual appliance on the Nutanix AHV environment:

1. Download the HYCU image from the HYCU support website. This qcow2-based image was downloaded to ensure compatibility with Nutanix AHV.
2. Upload the hycu qcow2 image to the Nutanix AHV.

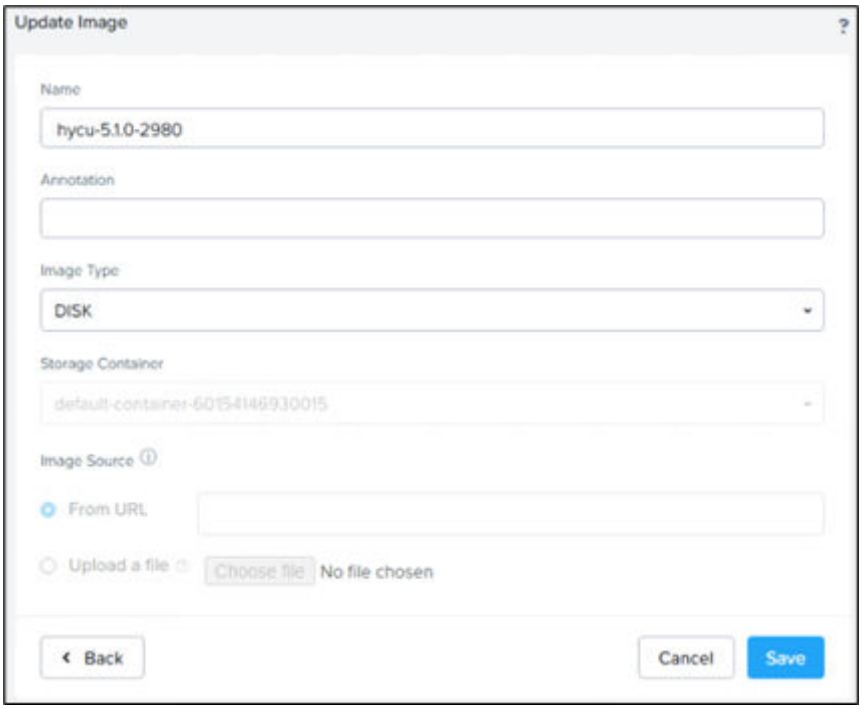

Figure 4. HYCU image upload into Nutanix environment

3. Create a VM in Nutanix by selecting the uploaded image. Make sure to create 2 disks for the VM. Then, add a network adaptor for network communication.
   - One 10GB disk acts as the boot disk from the uploaded qow2 image
   - Another 64GB disk acts as the SCSI disk to serve as the HYCU data disk

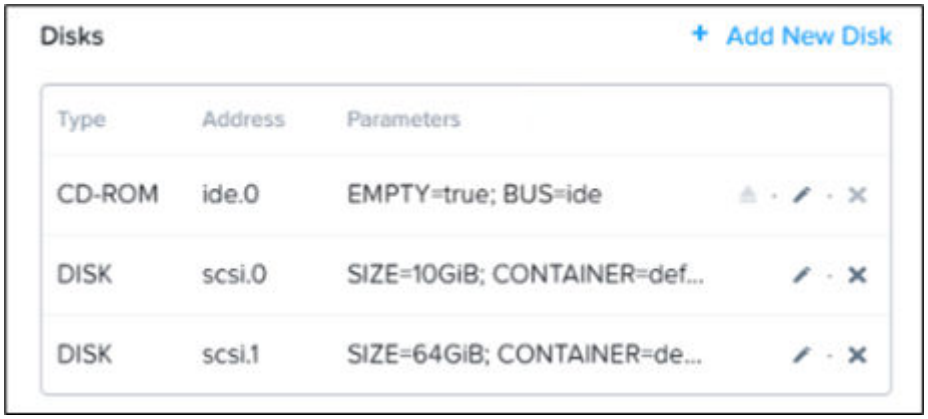

Figure 5. HYCU VM storage disks creation

4. Configure the VM for CPU and Memory and power on the VM. In the test environment, the VM was configured with 16 vCPUs and 32 GB memory.
5. Once the VM is powered on, proceed with the configuration process. Select the HYCU backup controller.

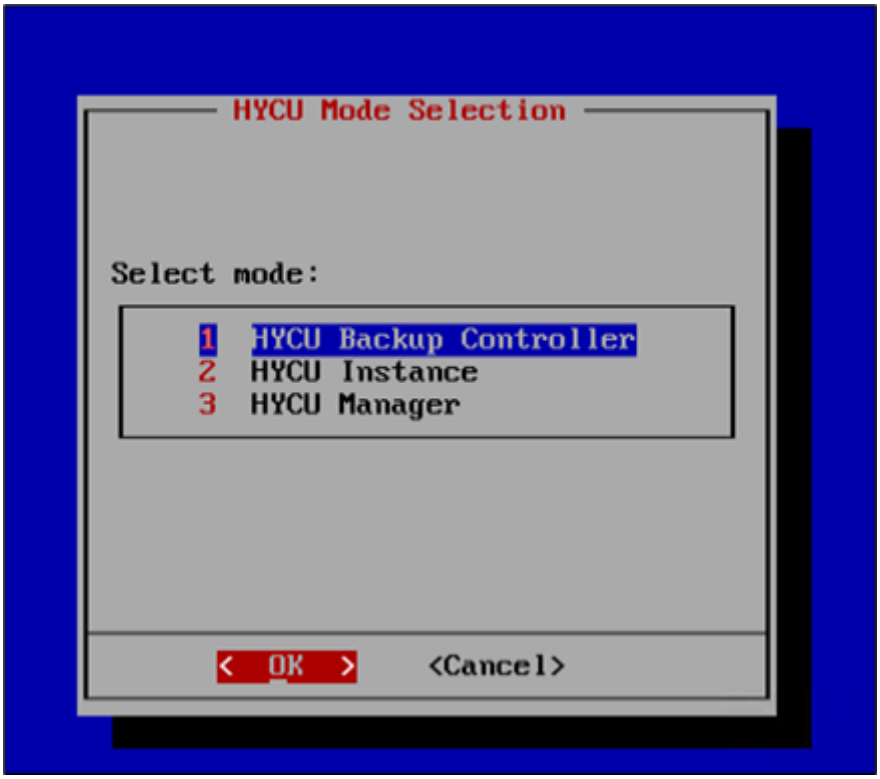

Figure 6. HYCU configuration options

6. Provide the hostname, IP address, subnet mask, and other required details.

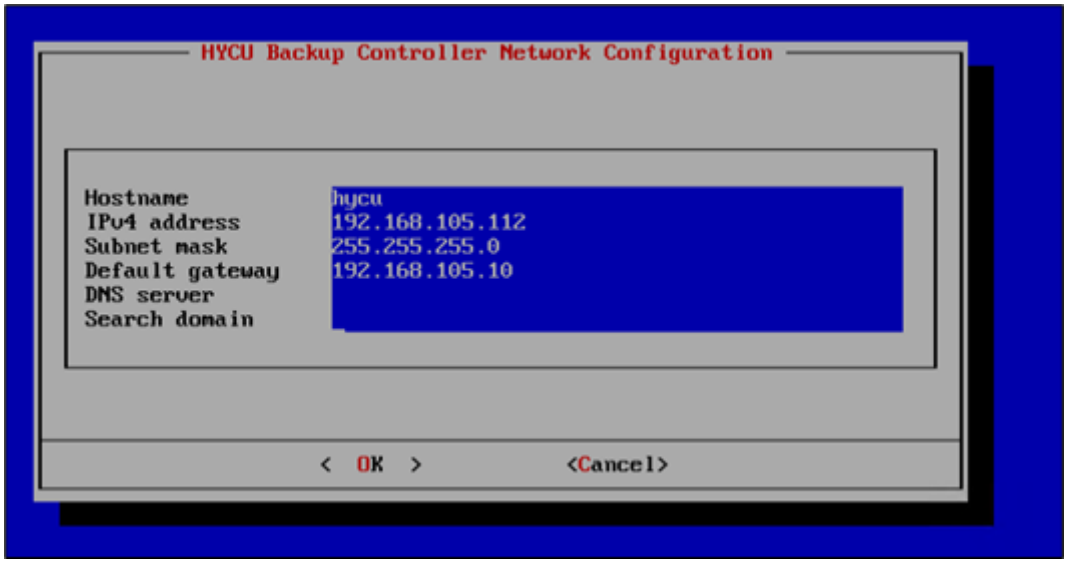

Figure 7. HYCU network configuration

7. Review the details and proceed. The HYCU appliance will be deployed.
8. The HYCU web console can be accessed using the following URL: `https://<ServerName>:8443`

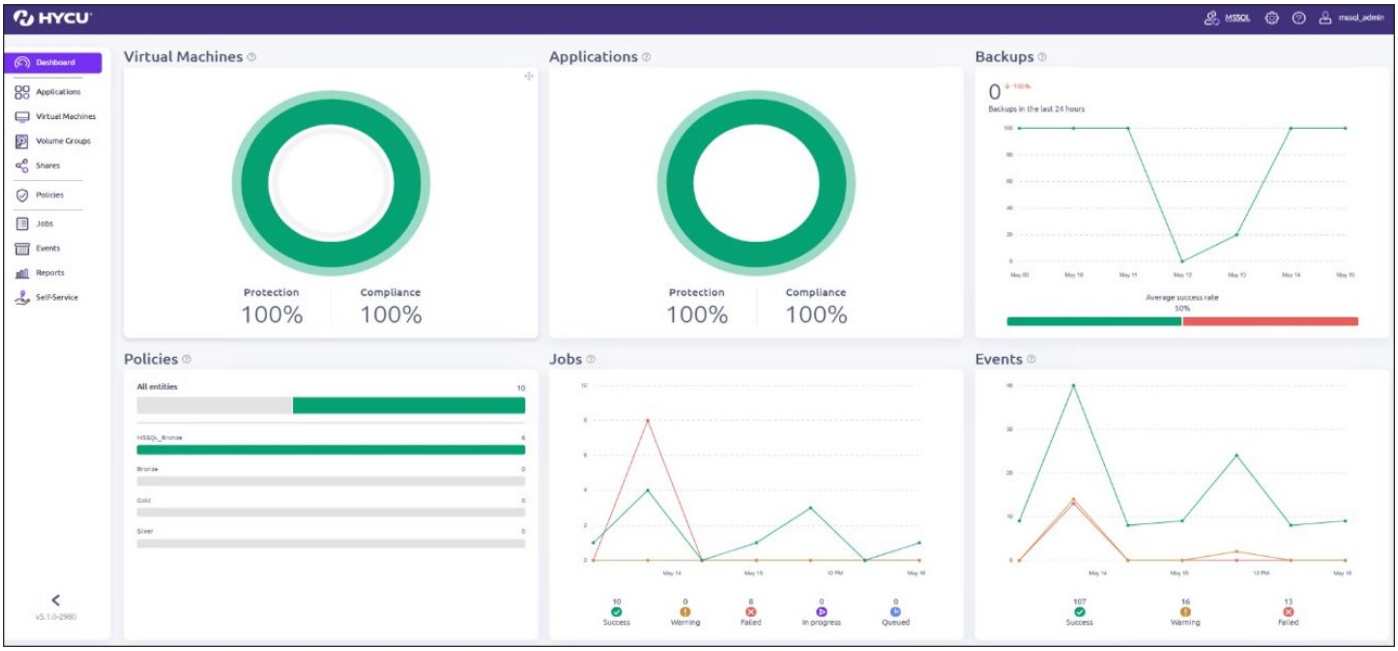

Figure 8. HYCU dashboard

Adding source

The next step in the HYCU configuration is to add a source. A source in HYCU is an environment for which HYCU provides data protection.

1. On the HYCU Dashboard, go to **Administration** > **Sources**. In the hypervisor tab, select **New** and provide the Nutanix URL with the format below. `https://<ServerName>:<Port>`

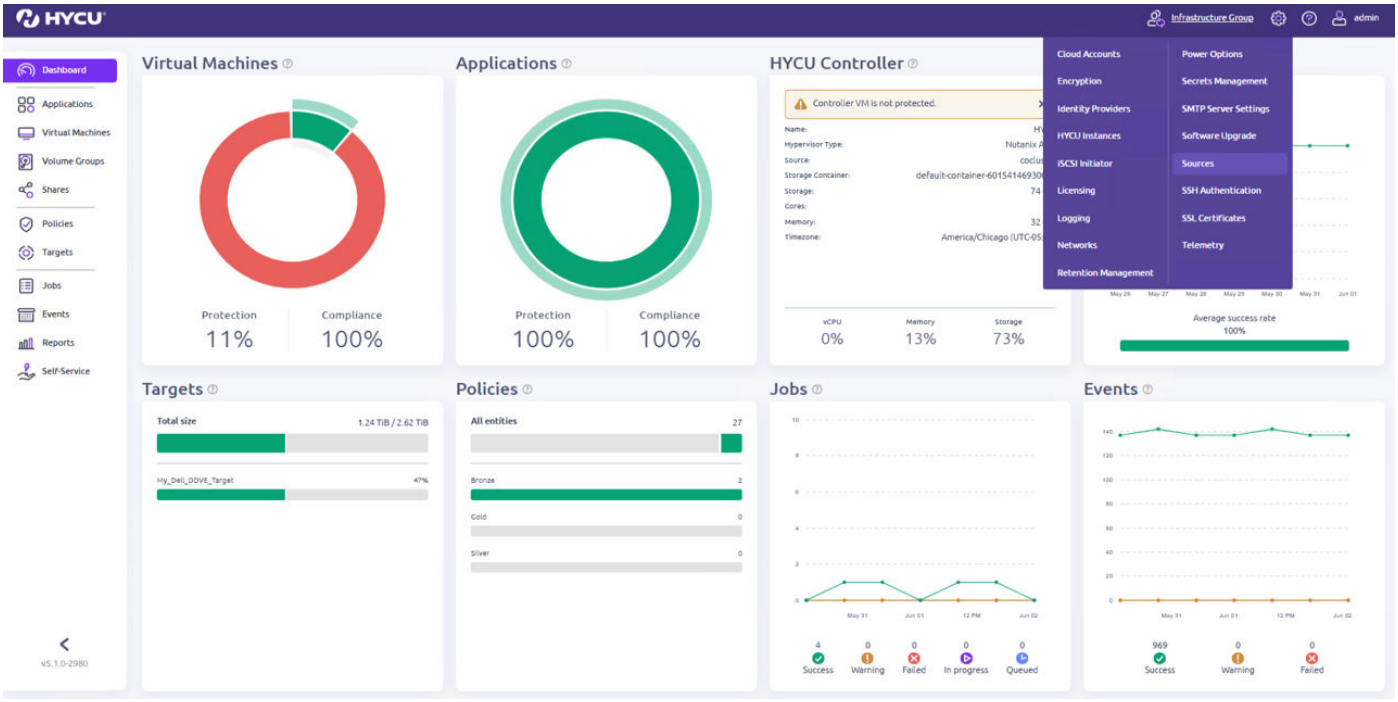

Figure 9. Adding source in HYCU

2. Provide the username and password with cluster administrator.

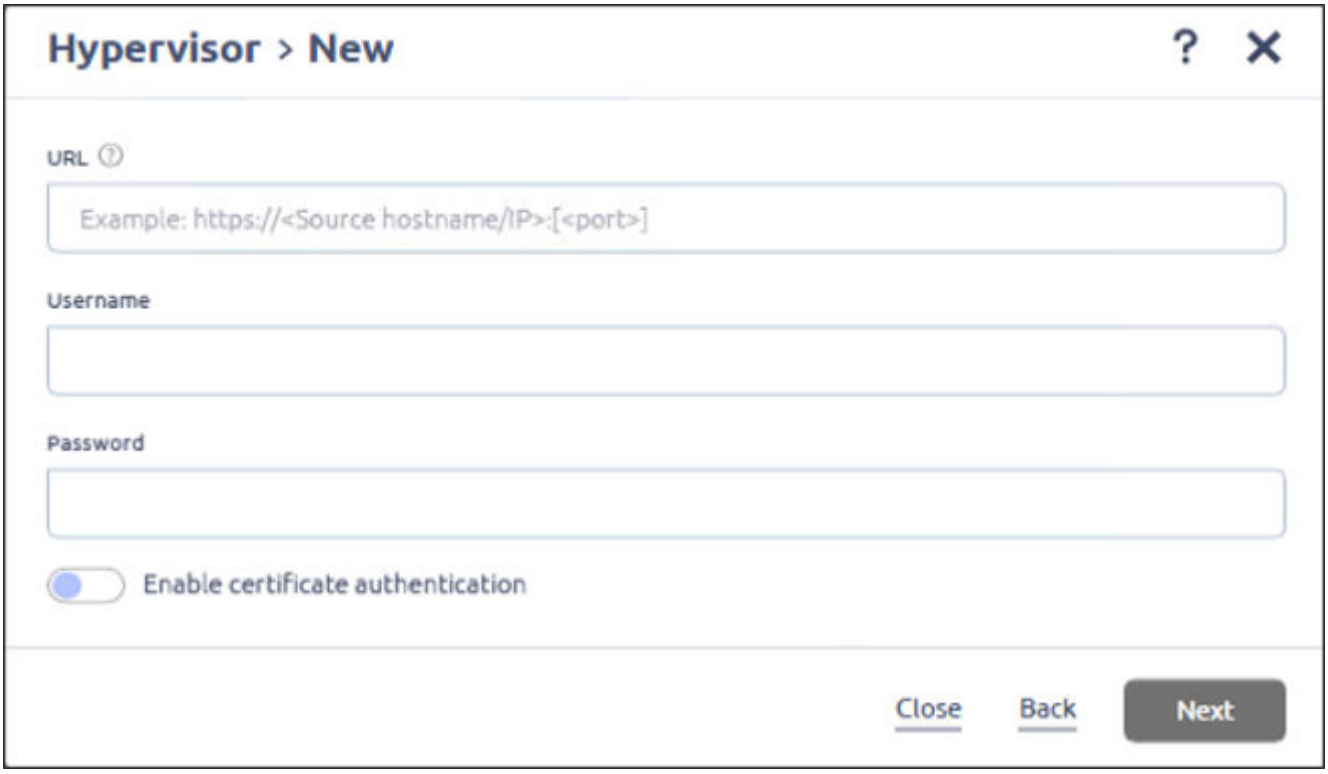

Figure 10. Adding hypervisor details while adding source

3. In the summary box, verify that validation is successful and save.

NOTE: HYCU automatically discovers the VMs running on AHV cluster, which can be viewed in Virtual Machines tab.

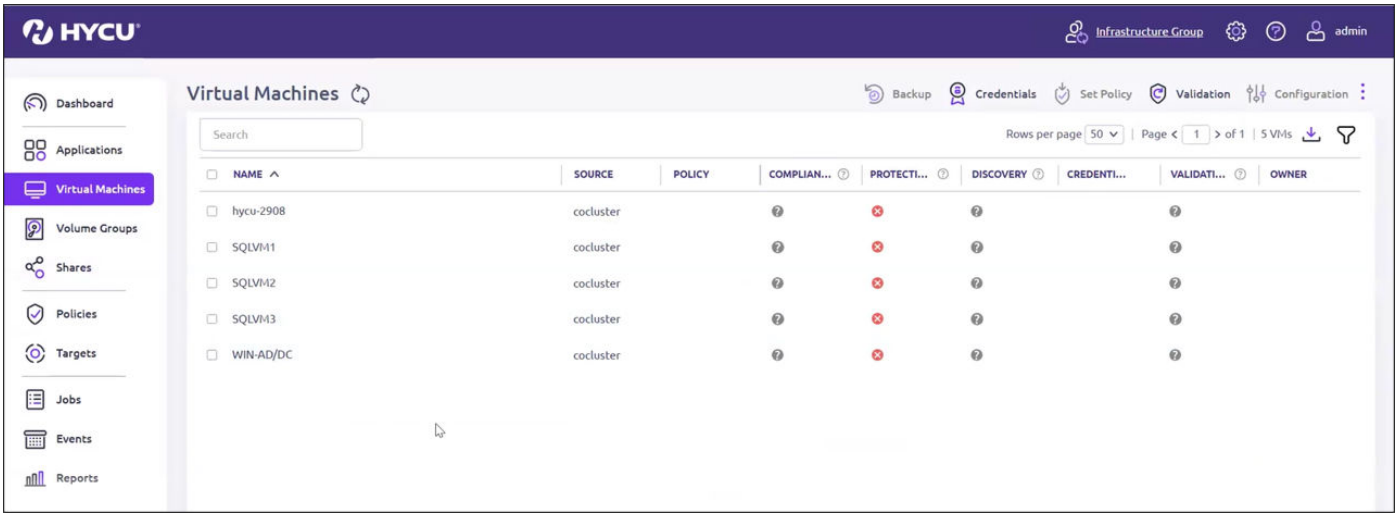

Figure 11. Virtual machines running on AHV cluster

4. Select any one of the SQL VMs, then select **Choose Credentials** > **New** > **Assign Protocol as Automatic** and provide the username and password of the Windows VM.

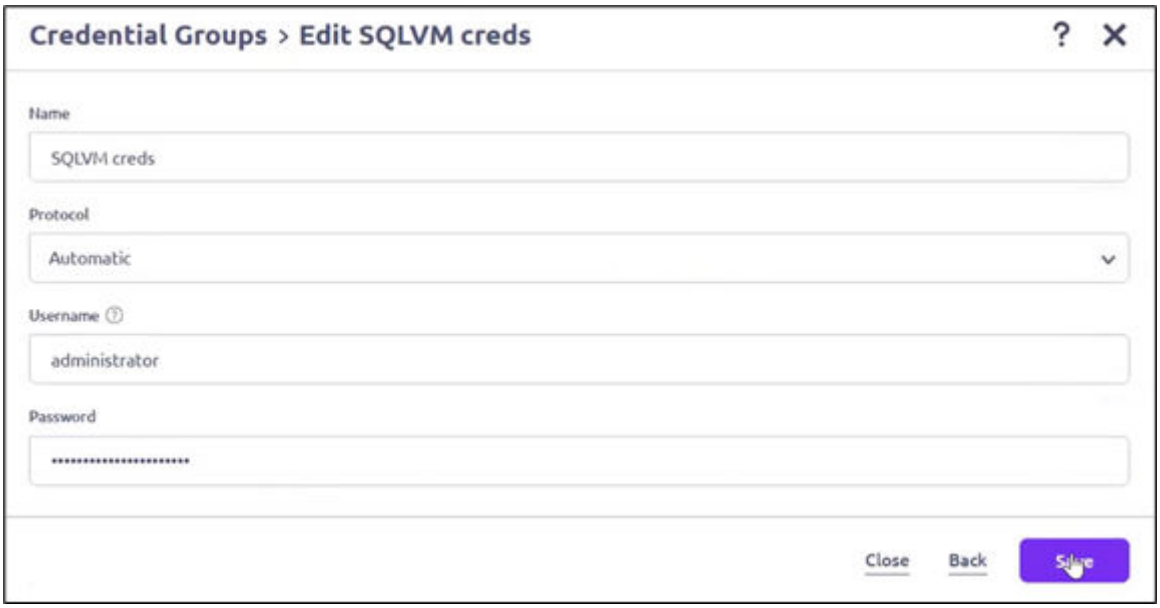

Figure 12. Creating new credentials for Windows VM

5. Assign the credentials to each of the SQL VMs.

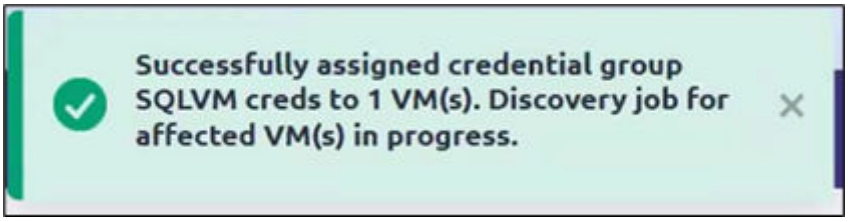

Figure 13. Message indicating successful assignment of credentials to VM

6. The discovery status can be viewed from the Jobs tab.

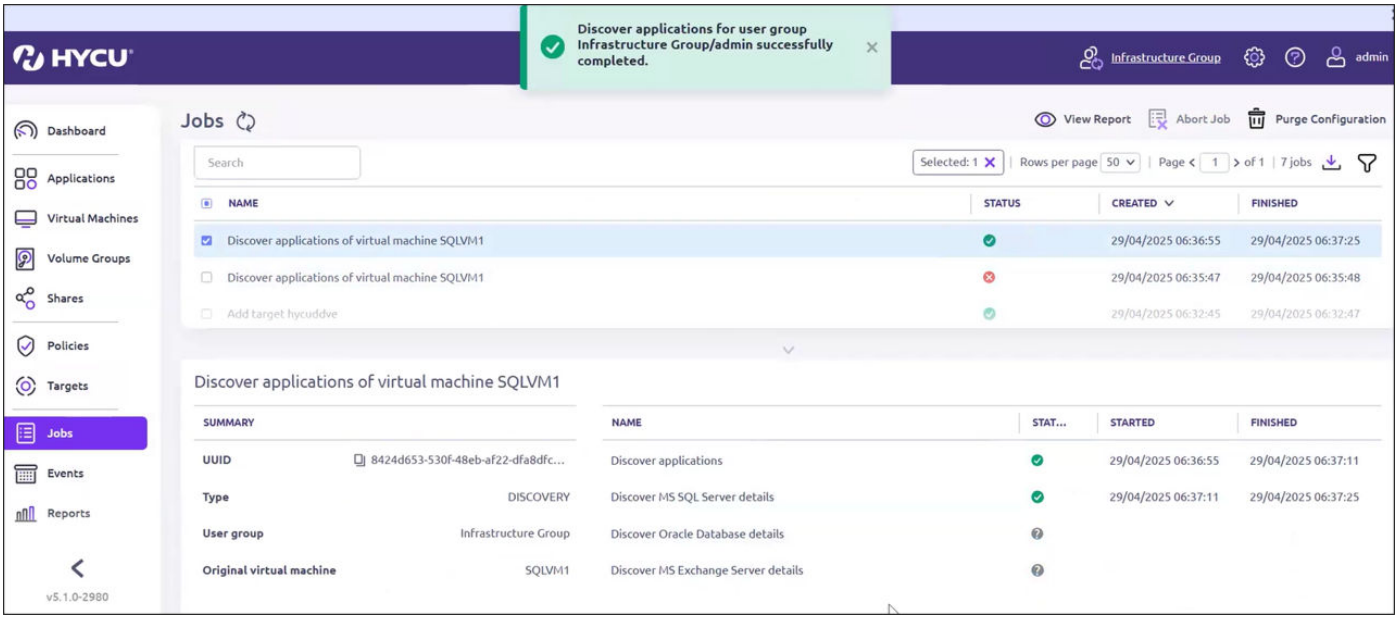

Figure 14. Successful discovery of VM

7. The Microsoft SQL Server database application running on SQL VM1 is autodiscovered and can be viewed from the Applications tab.

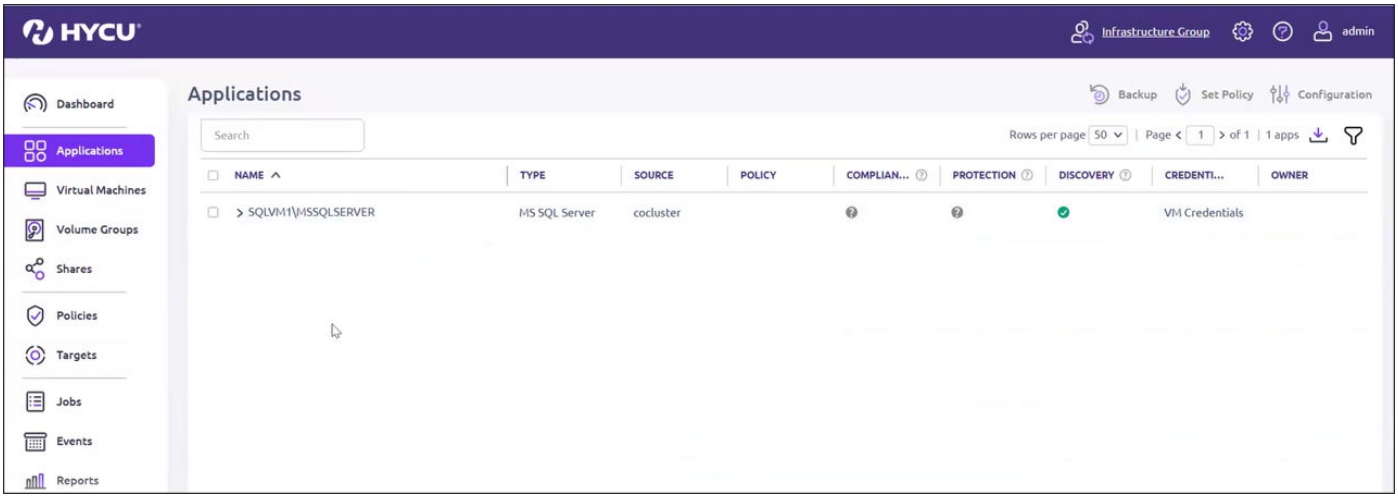

Figure 15. SQL Server database application is discovered successfully

Backup target

The next step is to add a backup target to store the application backups. In our test environment, Dell PowerProtect Data Domain Virtual Edition (DDVE) is used as a backup target.

- HYCU supports Dell PowerProtect Data Domain as a target storage for backup and recovery operations.
- DDVE was installed on a separate node in the test environment.
- A logical storage unit is carved out from the available storage in Data Domain, which is a virtualized storage container that is used to manage and allocate storage resources for backup operations.

1. To add Dell Data Domain as target in HYCU, in HYCU dashboard navigate to targets, choose **Dell Data Domain**.

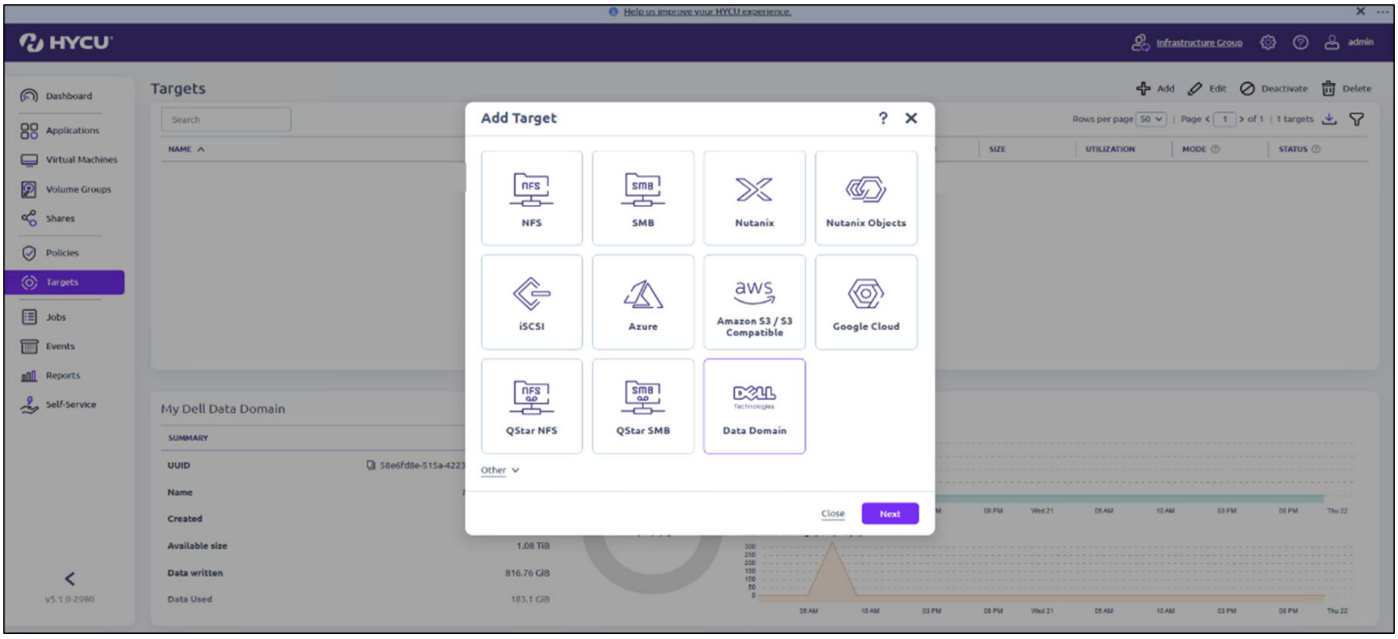

Figure 16. Setting Dell Data Domain as backup target

2. On the next screen, provide the credentials for Data Domain. Data Domain is then added as the destination for backup target.

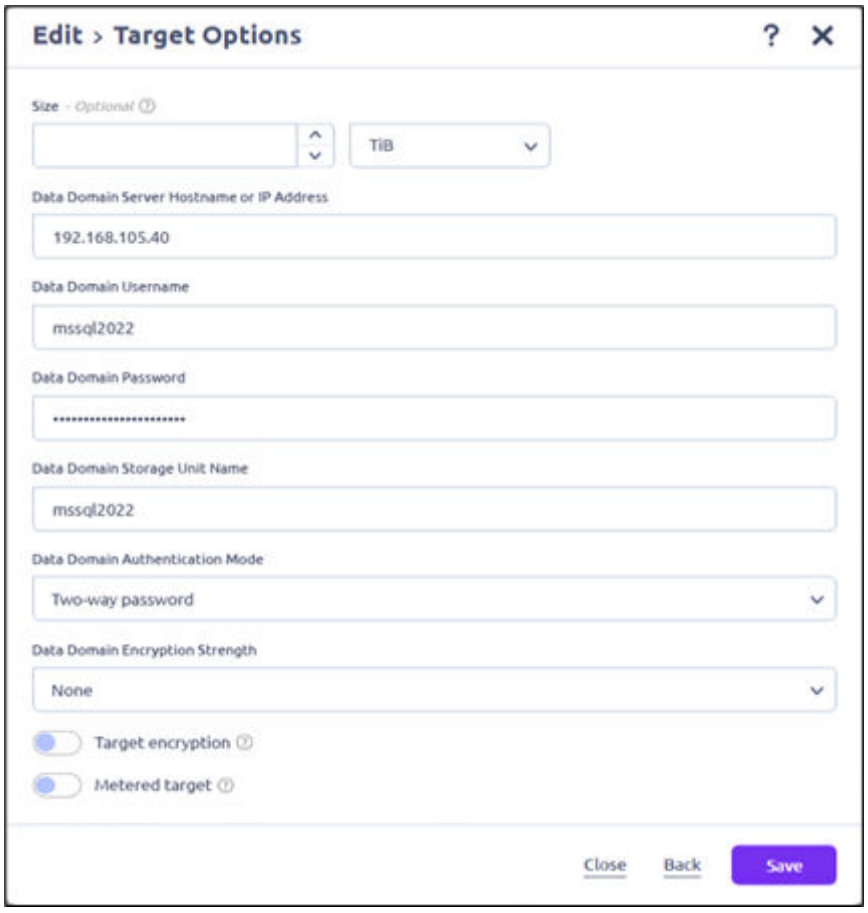

Figure 17. Credentials for Data Domain as backup target

NOTE: In the **Data Domain Username** field, provide the storage unit name that was created, not the default sysadmin username.

Backup procedure

HYCU operates on a policy-based backup model. In this use case, we used the predefined Bronze policy to ensure consistent backups of the Microsoft SQL Server database.

1. Assign a backup target to the backup policy: Go to **Policies** > **Bronze Policy** > **Edit** and select the target.

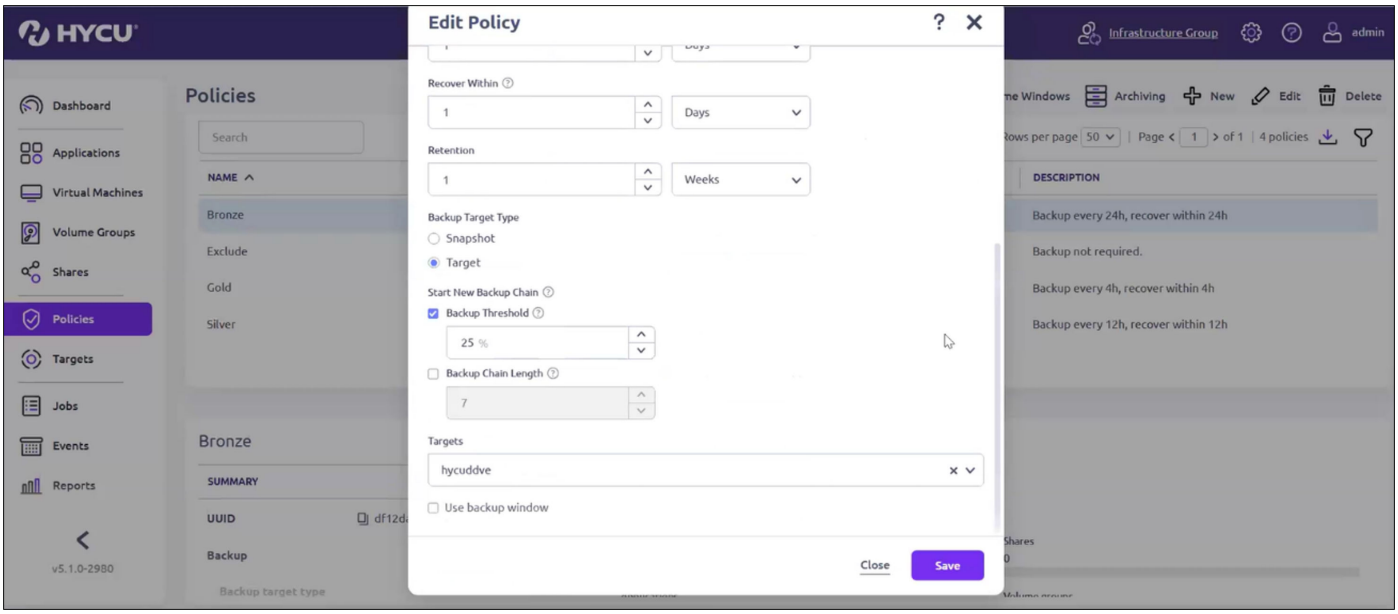

Figure 18. Configuration of backup policy to a backup target

2. To initiate backup, go to **Applications**, select **SQL Server Database** > **Set Policy**, then assign **Bronze**.

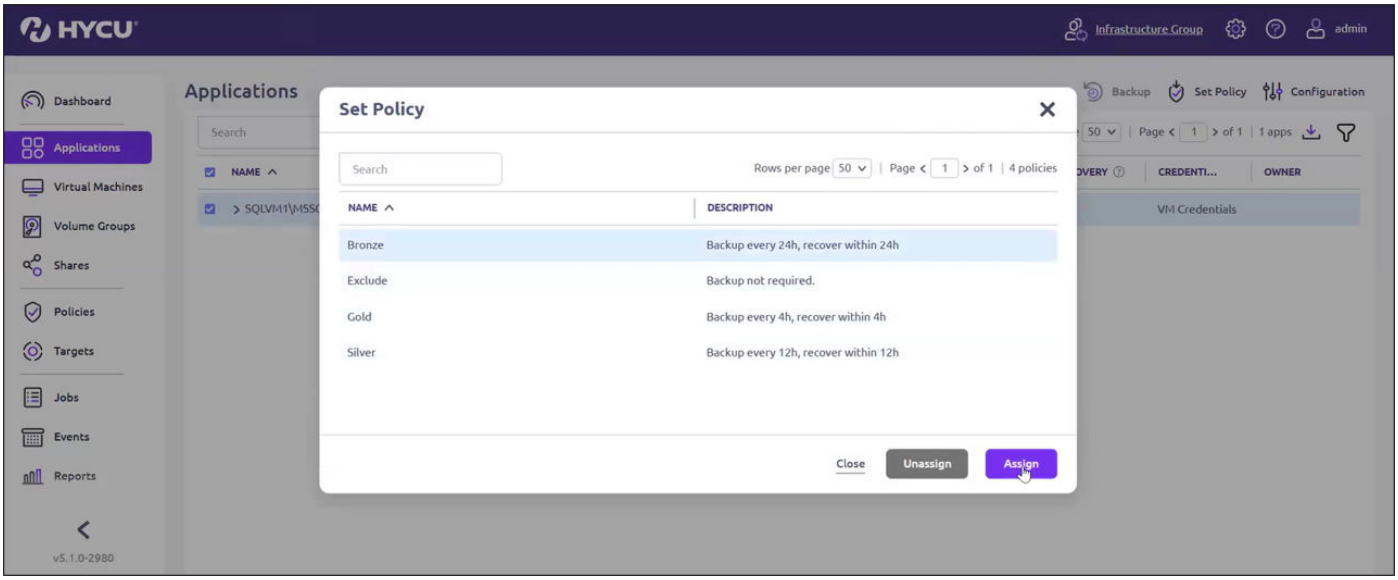

Figure 19. Assigning backup policy to database application

3. The backup job status can viewed in the **Jobs** tab.

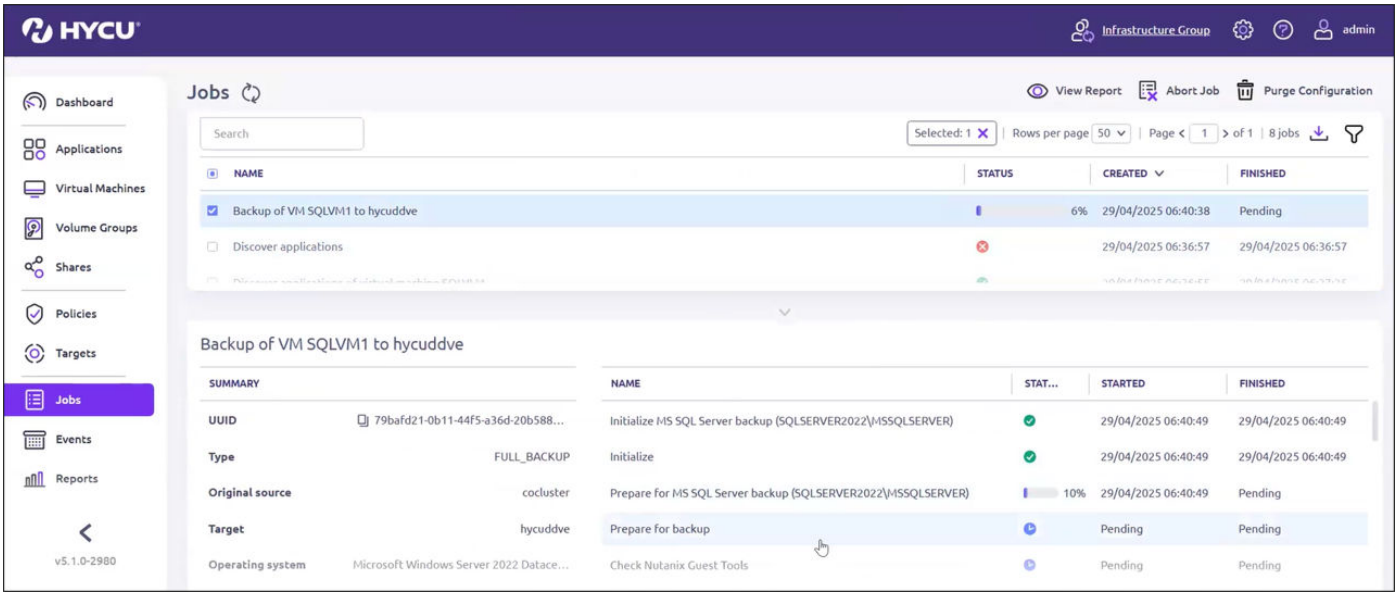

Figure 20. Status of backup job in progress

Restore procedure

The following steps are used to restore the application.

1. From the HYCU Dashboard, select **Applications**, then the SQL Server database application.
2. Select the backup to be restored and initiate the restore.

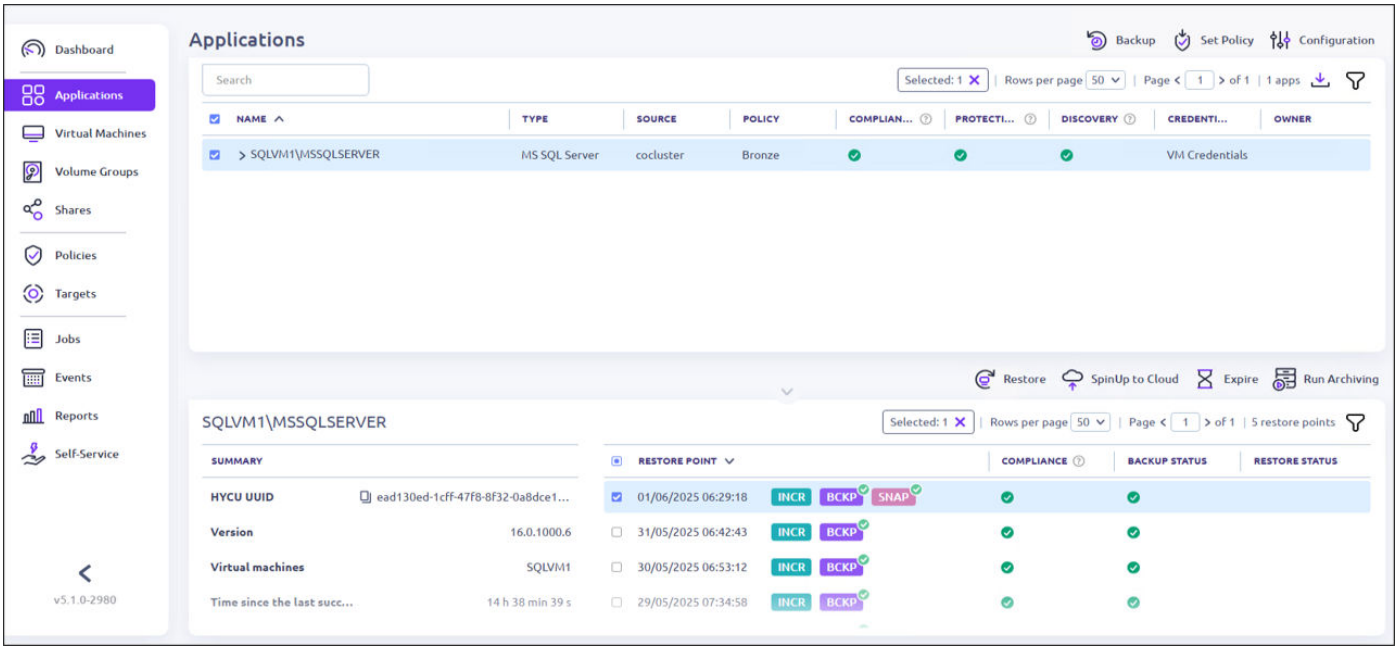

Figure 21. Restoring the SQL Server database

3. Select **Restore Database**.

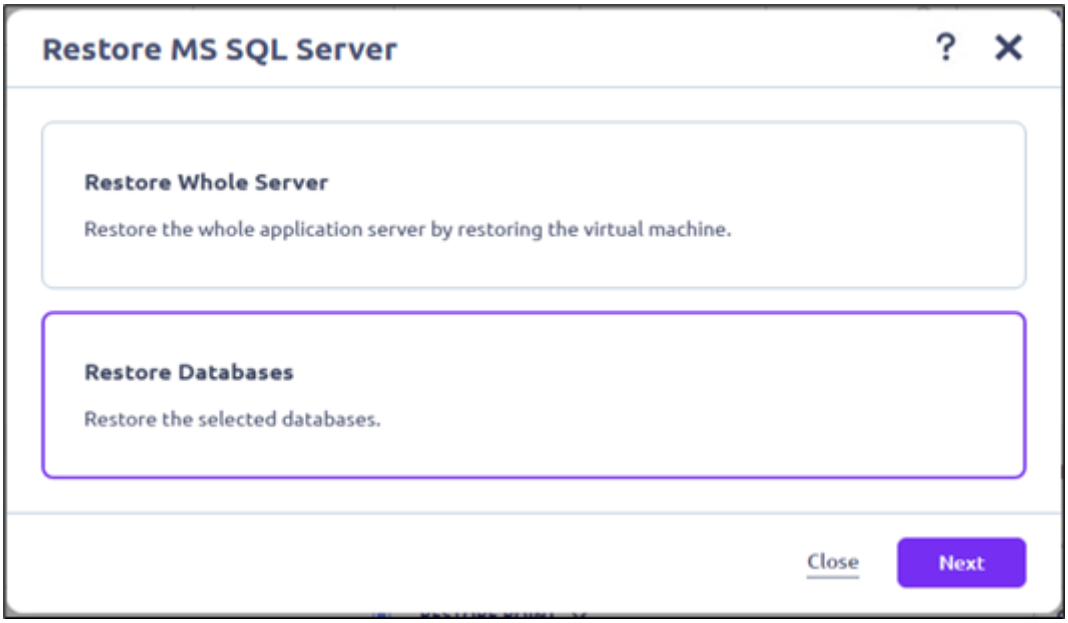

Figure 22. Restore options

4. Select the database(s) to be restored.

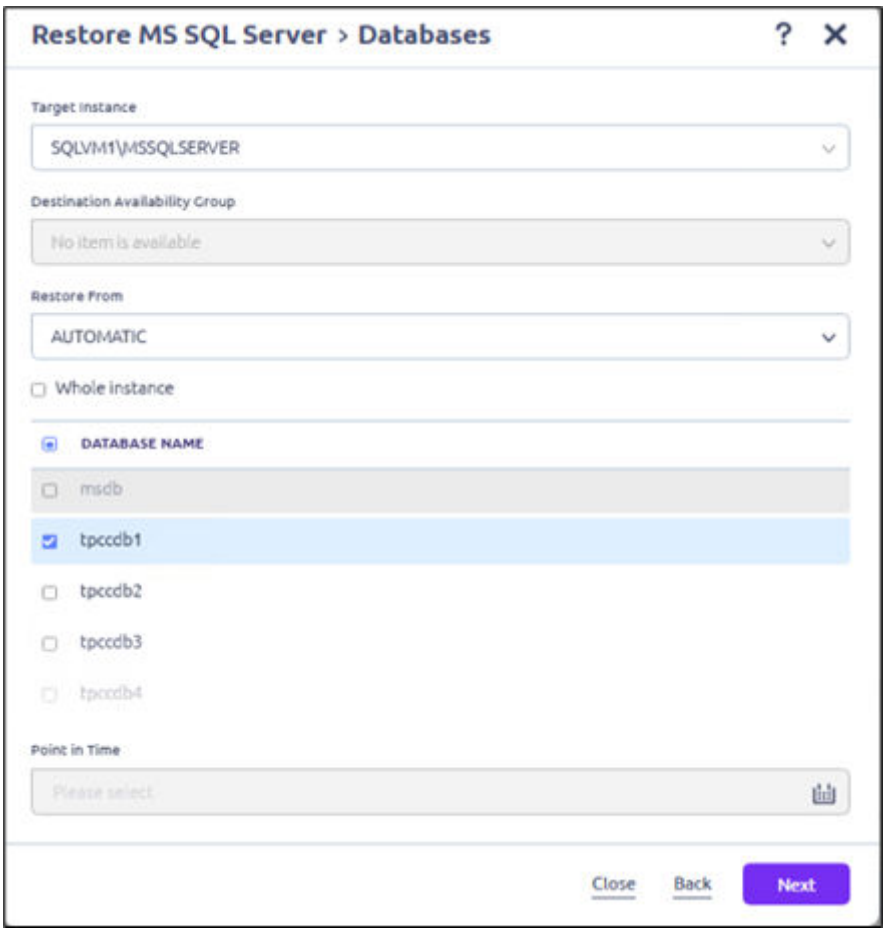

Figure 23. Selecting database to be restored

5. Toggle the option to overwrite existing databases and select **Restore**.

Figure 24. Database restore options

6. Once the operation is completed, the corresponding database is restored.

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Conclusion

This white paper demonstrated the integration of HYCU purpose-built backup and recovery solution with Dell PowerFlex running on Nutanix Cloud Platform, alongside Dell PowerProtect Data Domain. HYCU offers a rich set of features that support a robust, scalable, and efficient data protection architecture. These capabilities enable the creation of database copies that can be restored when needed. These copies can be used for testing, development, reporting, and for creating valid full and incremental database backup and recovery.

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Test Configurations

The following table provides the hardware and software components used for this solution:

Table 3. Storage-only nodes - hardware

Hardware	Configuration
Server	PowerFlex node R650
CPU	2x 28 core, Intel(R) Xeon(R) Gold 6330
Memory (GiB)	256 GB
NIC	Mellanox ConnectX-5 Dual Port 10/25GbE SFP28
Physical disks	10x 1.6 TB, SSD SAS

Table 4. Storage-only nodes - software

Software	Version
Operating system	SUSE Linux Enterprise Server 15 SP5
PowerFlex SDS	EMC-ScaleIO-sds-4.5-4000.111

Table 5. Compute-only nodes

Hardware	Configuration
Server	PowerFlex node R650
CPU	2x 28 core, Intel(R) Xeon(R) Gold 6330
Memory (GiB)	256 GB
NIC	Mellanox ConnectX-5 Dual Port 10/25GbE SFP28

Table 6. Compute-only nodes

Software	Version
Operating system	Nutanix AOS 7.1, AHV 10.1-276
PowerFlex SDS	EMC-ScaleIO-sdc-4.5-4000.111
Benchmark Tool	HammerDB 5.0
Microsoft SQL Server	2022
HYCU	hycu-5.1.0-2980
DDVE	8.3.0.15
DDVE Disk Size	1.8 TB

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References

Topics:

NCP documentation

The following documentation provides information for Dell PowerFlex with Nutanix Cloud Platform:

- Dell PowerFlex with Nutanix Cloud Platform overview
- Dell PowerFlex with Nutanix Cloud Platform Technical Overview
- Using Dell PowerFlex with Nutanix
- Dell PowerFlex with Nutanix Cloud Platform: Providing Flexibility and Choice When Modernizing IT Environments
- Dell PowerFlex with Nutanix Cloud Platform Solution Brief: Enhance Your Modern IT with Next-Level Flexible and Secure Software-Defined Infrastructure

Dell Technologies documentation

The following Dell Technologies documentation provides additional and relevant information. Access to these documents depends on your login credentials. If you do not have access to a document, contact your Dell Technologies representative.

- PowerFlex Overview — Video
- PowerFlex Solutions Document — Info Hub
- PowerFlex implementation guide

Dell Data Domain documentation

The following Dell Technologies documentation provides additional and relevant information for Dell Data Domain.

- Dell Data Domain Documentation
- Dell Data Domain Virtual Edition

Microsoft documentation

The following Microsoft documentation provides additional information:

- Microsoft SQL Server 2022 features

HammerDB documentation

The following documentation provides additional information for HammerDB.

- HammerDB Best practices for SQL Server Performance and Scalability
- HammerDB Documentation

HYCU documentation

The following documentation provides additional information for HYCU.

- HYCU User Guide
- HYCU 5.1.0 User Documentation