Veeam Backup & Restore in VMware Cloud, with AWS FSx for NetApp ONTAP

NetApp Solutions

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Overview

Veeam Backup & Replication is an effective and reliable solution for protecting data in VMware Cloud. This solution demonstrates the proper setup and configuration for using Veeam Backup and Replication to backup and restore application VMs residing on FSx for ONTAP NFS datastores in VMware Cloud.

VMware Cloud (in AWS) supports the use of NFS datastores as supplemental storage, and FSx for NetApp ONTAP is a secure solution for customers who need to store large amounts of data for their cloud applications that can scale independent of the number of ESXi hosts in the SDDC cluster. This integrated AWS storage service offers highly efficient storage with all of the traditional NetApp ONTAP capabilities.

Use Cases

This solution addresses the following use cases:

- Backup and restore of Windows and Linux virtual machines hosted in VMC using FSx for NetApp ONTAP as a backup repository.
- Backup and restore of Microsoft SQL Server application data using FSx for NetApp ONTAP as a backup repository.
- Backup and restore of Oracle application data using FSx for Netapp ONTAP as a backup repository.

NFS Datastores Using Amazon FSx for ONTAP

All virtual machines in this solution reside on FSx for ONTAP supplemental NFS datastores. Using FSx for ONTAP as a supplemental NFS datastore has several benefits. For example, it allows you to:

- Create a scalable and highly available file system in the cloud without the need for complex setup and management.
- Integrate with your existing VMware environment, allowing you to use familiar tools and processes to manage your cloud resources.
- Benefit from the advanced data management features provided by ONTAP, such as snapshots and replication, to protect your data and ensure its availability.

Solution Deployment Overview

This list provides the high level steps necessary to configure Veeam Backup & Replication, execute backup and restore jobs using FSx for ONTAP as a backup repository, and perform restores of SQL Server and Oracle VMs and databases:

1. Create the FSx for ONTAP file system to be used as iSCSI backup repository for Veeam Backup & Replication.
2. Deploy Veeam Proxy to distribute backup workloads and mount iSCSI backup repositories hosted on FSx for ONTAP.
3. Configure Veeam Backup Jobs to backup SQL Server, Oracle, Linux and Windows virtual machines.
4. Restore SQL Server virtual machines and individual databases.
5. Restore Oracle virtual machines and individual databases.

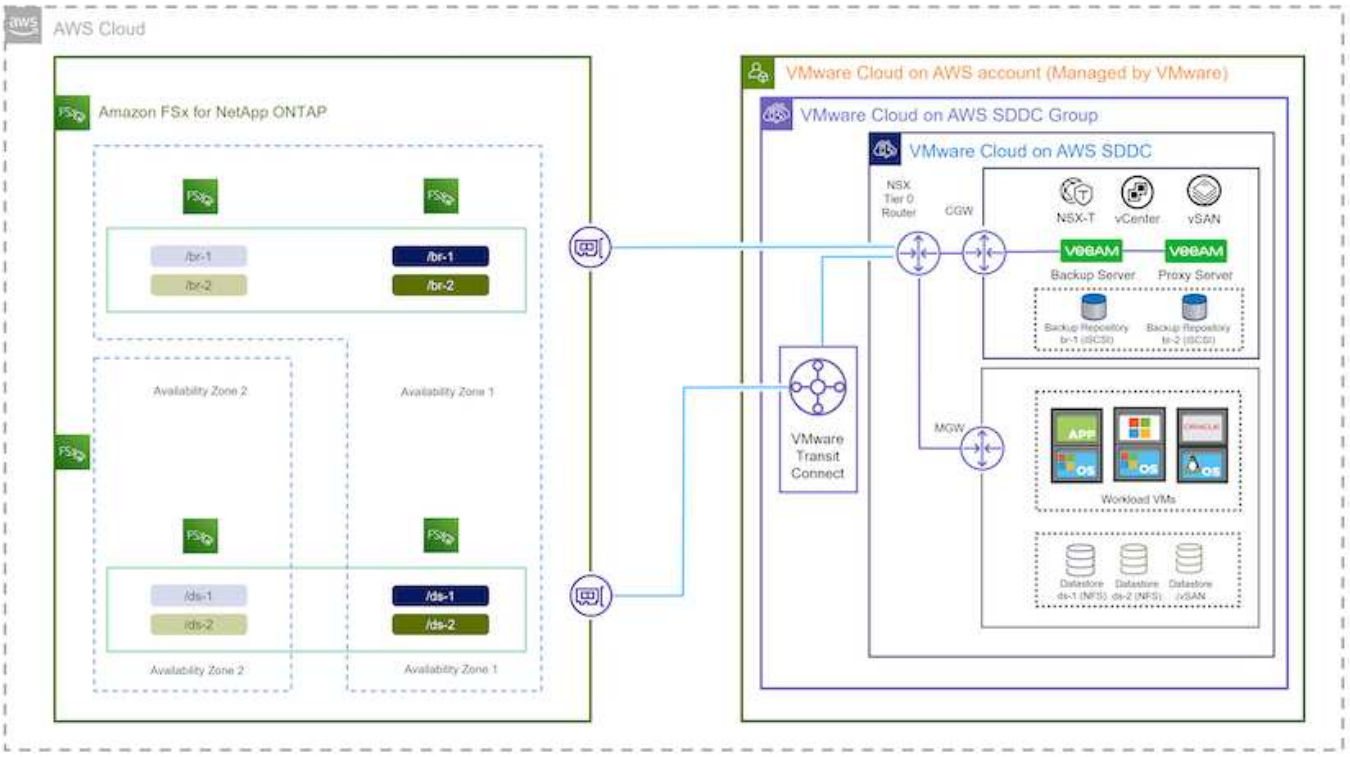
Prerequisites

The purpose of this solution is to demonstrate data protection of virtual machines running in VMware Cloud and located on NFS Datastores hosted by FSx for NetApp ONTAP. This solution assumes the following components are configured and ready for use:

1. FSx for ONTAP filesystem with one or more NFS datastores connected to VMware Cloud.
2. Microsoft Windows Server VM with Veeam Backup & Replication software installed.
    - vCenter server has been discovered by the Veeam Backup & Replication server using their IP address or fully qualified domain name.
3. Microsoft Windows Server VM to be installed with Veeam Backup Proxy components during the solution deployment.
4. Microsoft SQL Server VMs with VMDKs and application data residing on FSx for ONTAP NFS datastores. For this solution we had two SQL databases on two separate VMDKs.
    - Note: As a best practice database and transaction log files are placed on separate drives as this will improve performance and reliability. This is in part due to the fact that transaction logs are written sequentially, whereas database files are written randomly.
5. Oracle Database VMs with VMDKs and application data residing on FSx for ONTAP NFS datastores.
6. Linux and Windows file server VMs with VMDKs residing on FSx for ONTAP NFS datastores.
7. Veeam requires specific TCP ports for communication between servers and components in the backup environment. On Veeam backup infrastructure components, the required firewall rules are automatically created.
   For a full listing of the network port requirements refer to the Ports section of the Veeam Backup and Replication User Guide for VMware vSphere.

High Level Architecture

The testing / validation of this solution was performed in a lab that may or may not match the final deployment environment. For more information, please refer to the following sections.



Hardware / Software Components

The purpose of this solution is to demonstrate data protection of virtual machines running in VMware Cloud and located on NFS Datastores hosted by FSx for NetApp ONTAP. This solution assumes the following components are already configured and ready for use:

- Microsoft Windows VM's located on an FSx for ONTAP NFS Datastore
- Linux (CentOS) VM's located on an FSx for ONTAP NFS Datastore
- Microsoft SQL Server VM's located on an FSx for ONTAP NFS Datastore
  - Two databases hosted on separate VMDK's
- Oracle VM's located on an FSx for ONTAP NFS Datastore

Solution Deployment

In this solution we provide detailed instructions for deploying and validating a solution utilizing Veeam Backup and Replication software to perform backup and recovery of SQL Server, Oracle, and Windows and Linux file server virtual machines in a VMware Cloud SDDC on AWS. The Virtual Machines in this solution reside on a supplemental NFS datastore hosted by FSx for ONTAP. In addition, a separate FSx for ONTAP file system is used to host iSCSI volumes that will be used for Veeam backup repositories.

We will go over FSx for ONTAP file system creation, mounting iSCSI volumes to be used as backup repositories, creating and running backup jobs, and performing VM and database restores.

For detailed information on FSx for NetApp ONTAP refer to the FSx for ONTAP User Guide.

For detailed information on Veeam Backup and Replication refer to the Veeam Help Center Technical Documentation site.

For considerations and limitations when using Veeam Backup and Replication with VMware Cloud on AWS, refer to VMware Cloud on AWS and VMware Cloud on Dell EMC Support. Considerations and Limitations.

Deploy Veeam Proxy server

A Veeam proxy server is a component of the Veeam Backup & Replication software that acts as an intermediary between the source and the backup or replication target. The proxy server helps to optimize and accelerate data transfer during backup jobs by processing data locally and can use different Transport Modes to access data using VMware vStorage APIs for Data Protection or through direct storage access.

When choosing a Veeam proxy server design it is important to consider the number of concurrent tasks and the transport mode or type of storage access desired.

For sizing the number of proxy servers, and for their system requirements, refer to the Veeam VMware vSphere Best Practice Guide.

The Veeam Data Mover is a component of the Veeam Proxy Server and utilizes a Transport Mode as a method for obtaining VM data from the source and transferring it to the target. The transport mode is specified during the configuration of the backup job. It is possible to increase the efficiency backups from NFS datastores by using direct storage access.

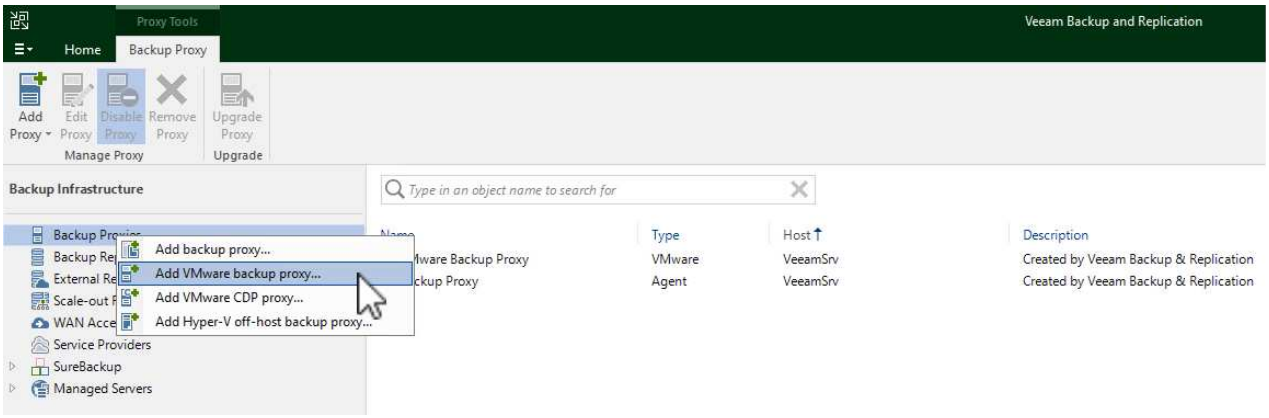
For more information on Transport Modes refer to the Veeam Backup and Replication User Guide for VMware vSphere.

In the following step we cover deployment of the Veeam Proxy Server on a Windows VM in the VMware Cloud SDDC.

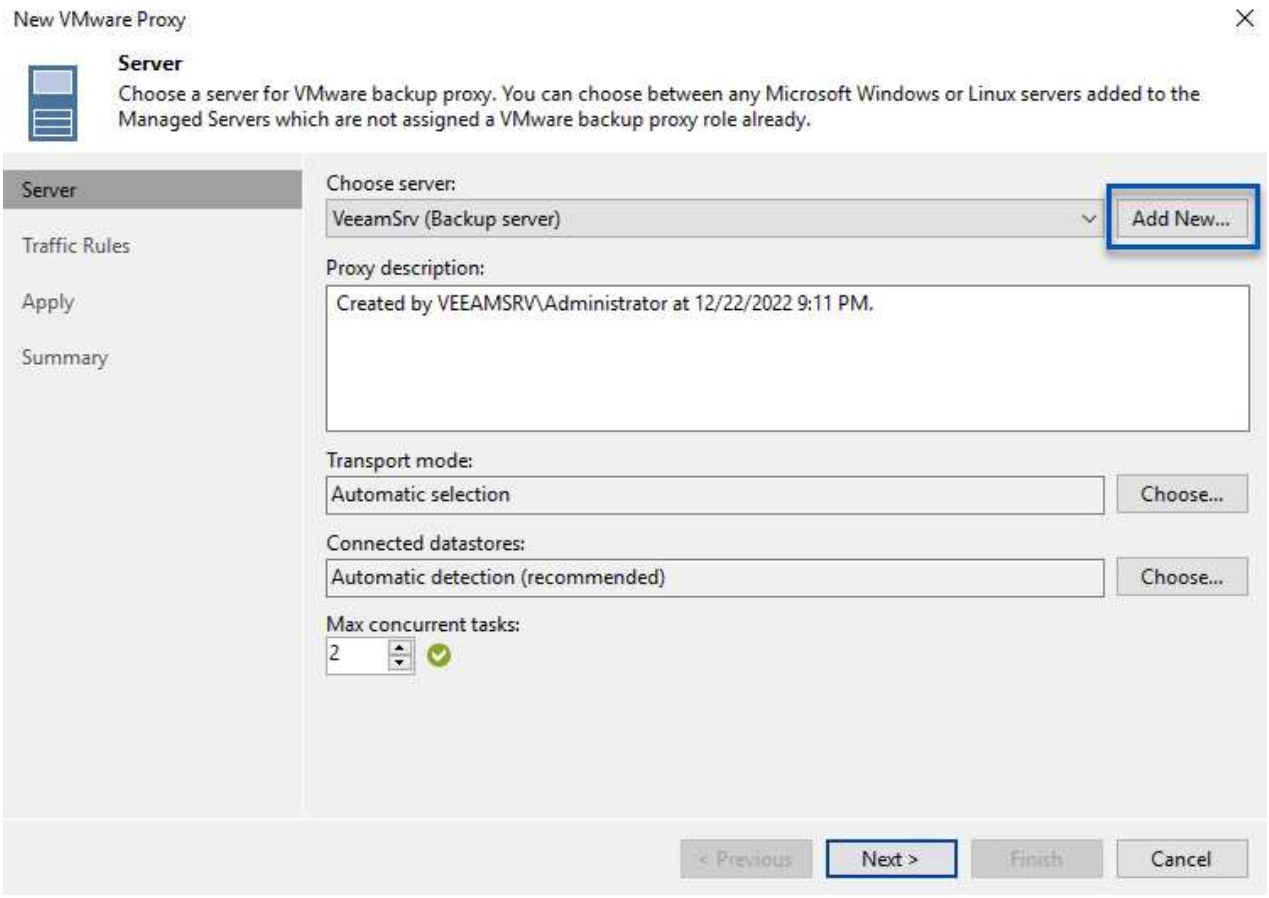
Deploy Veeam Proxy to distribute backup workloads

In this step the Veeam Proxy is deployed to an existing Windows VM. This allows backup jobs to be distributed between the primary Veeam Backup Server and the Veeam Proxy.

1. On the Veeam Backup and Replication server, open the administration console and select **Backup Infrastructure** in the lower left menu.
2. Right click on **Backup Proxies** and click on **Add VMware backup proxy…** to open the wizard.

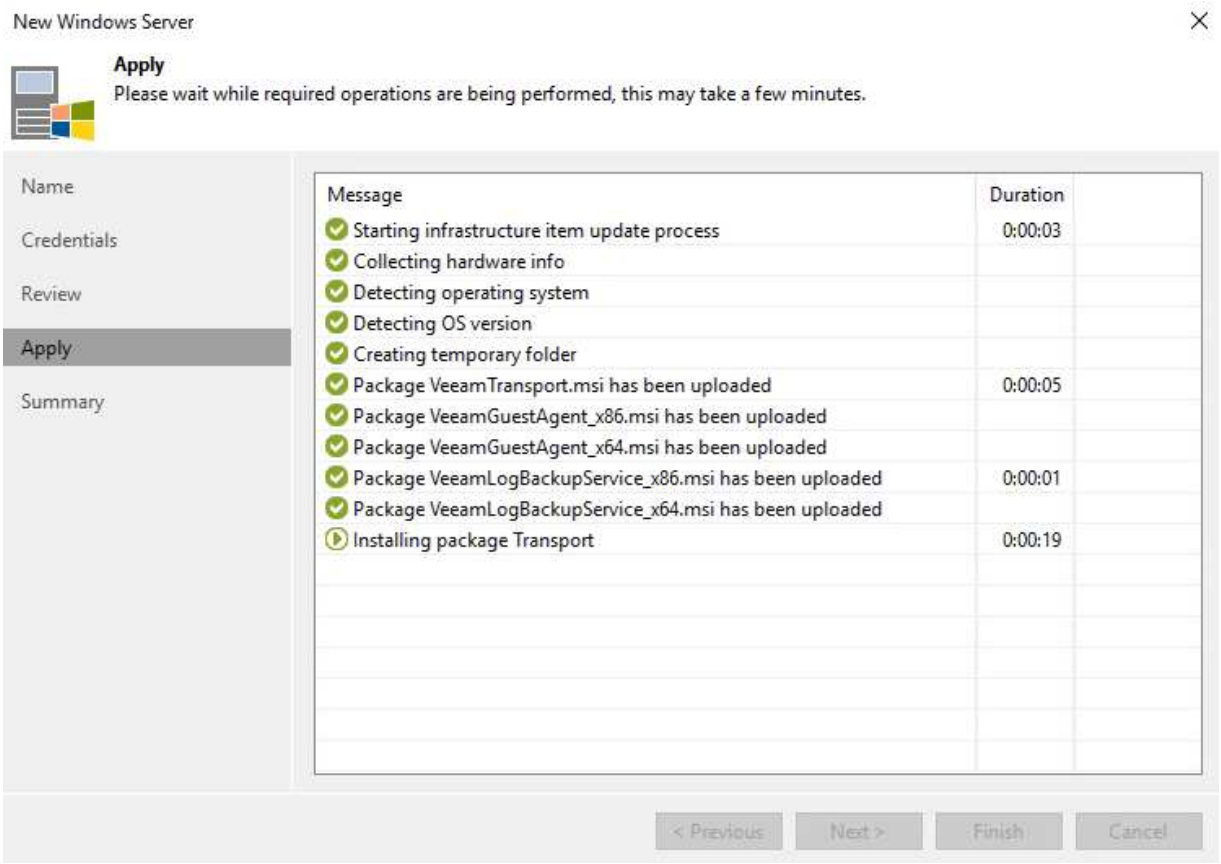


3. In the **Add VMware Proxy** wizard click the **Add New…** button to add a new proxy server.

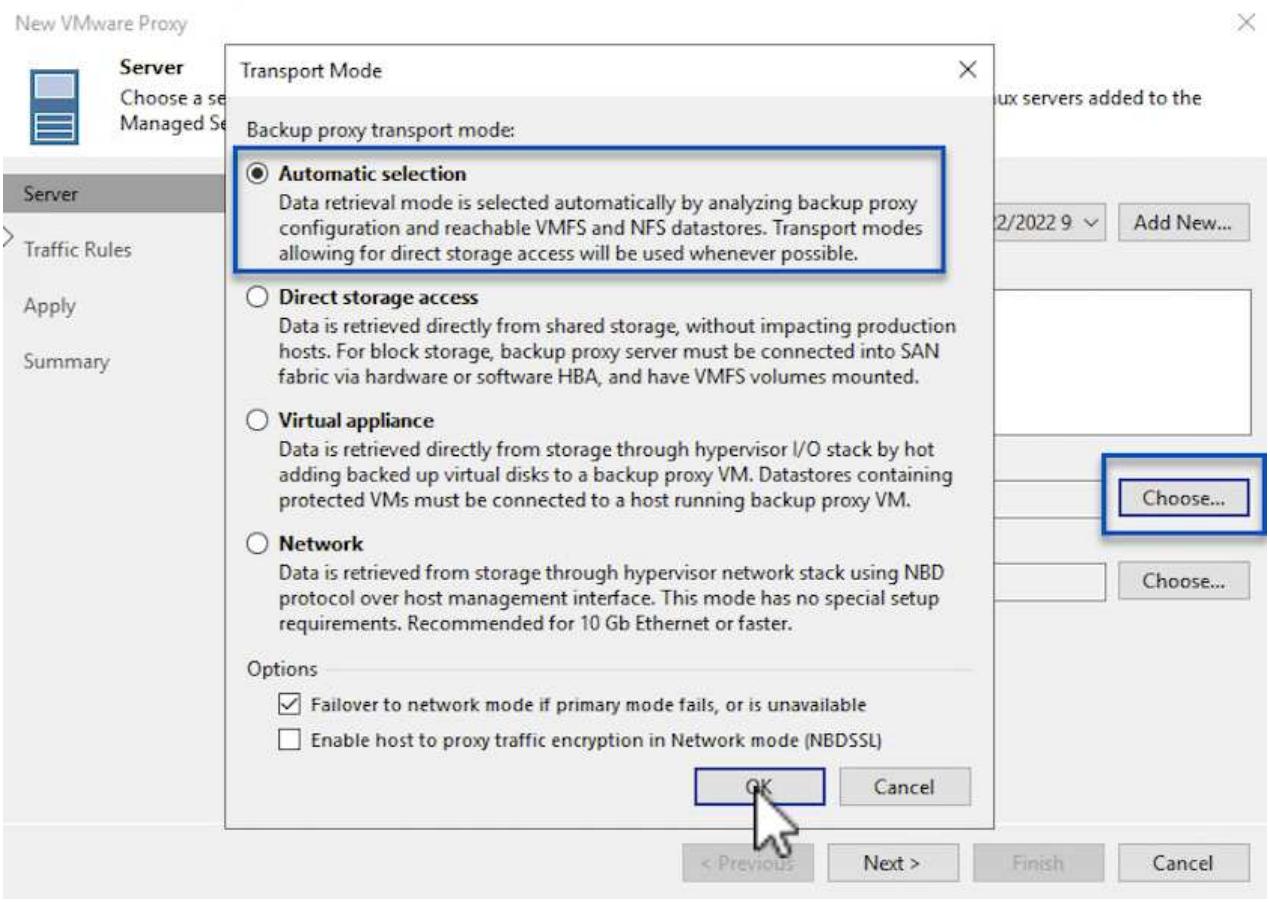


4. Select to add Microsoft Windows and follow the prompts to add the server:
   - Fill out the DNS name or IP address

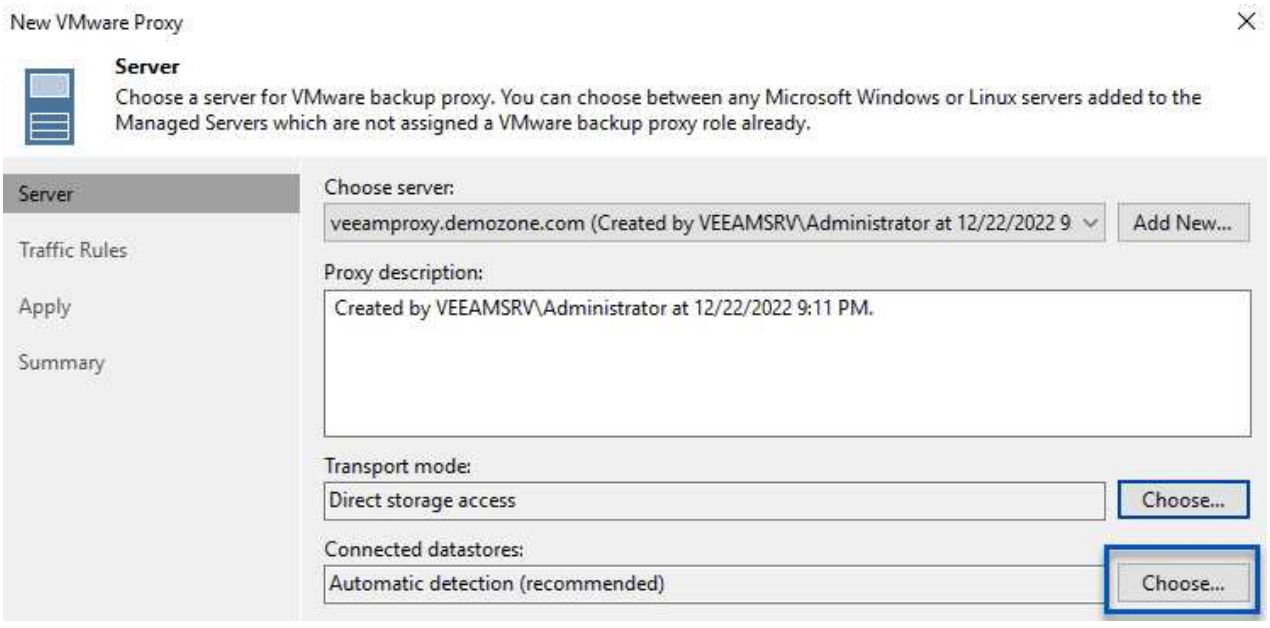
- Select an account to use for Credentials on the new system or add new credentials
- Review the components to be installed and then click on **Apply** to begin the deployment

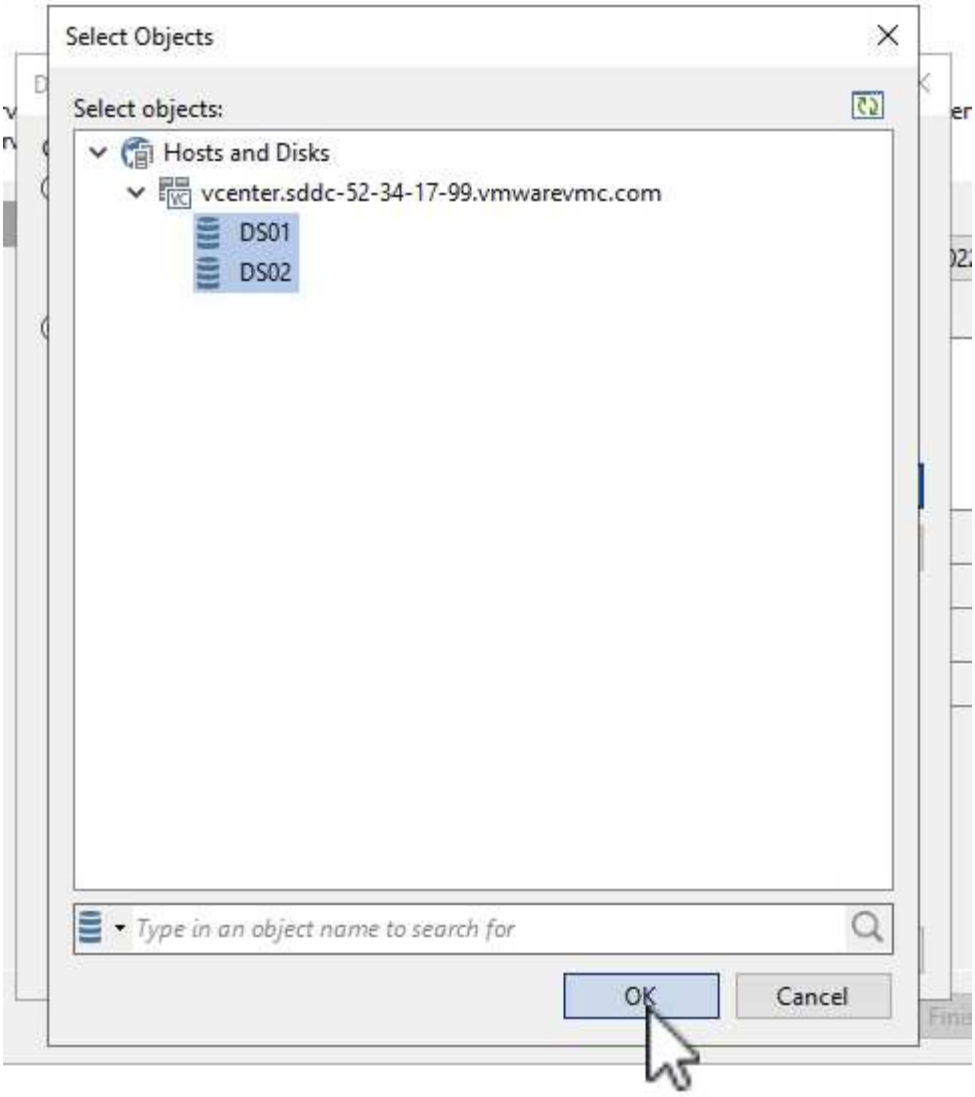


5. Back in the **New VMware Proxy** wizard, choose a Transport Mode. In our case we chose **Automatic Selection**.

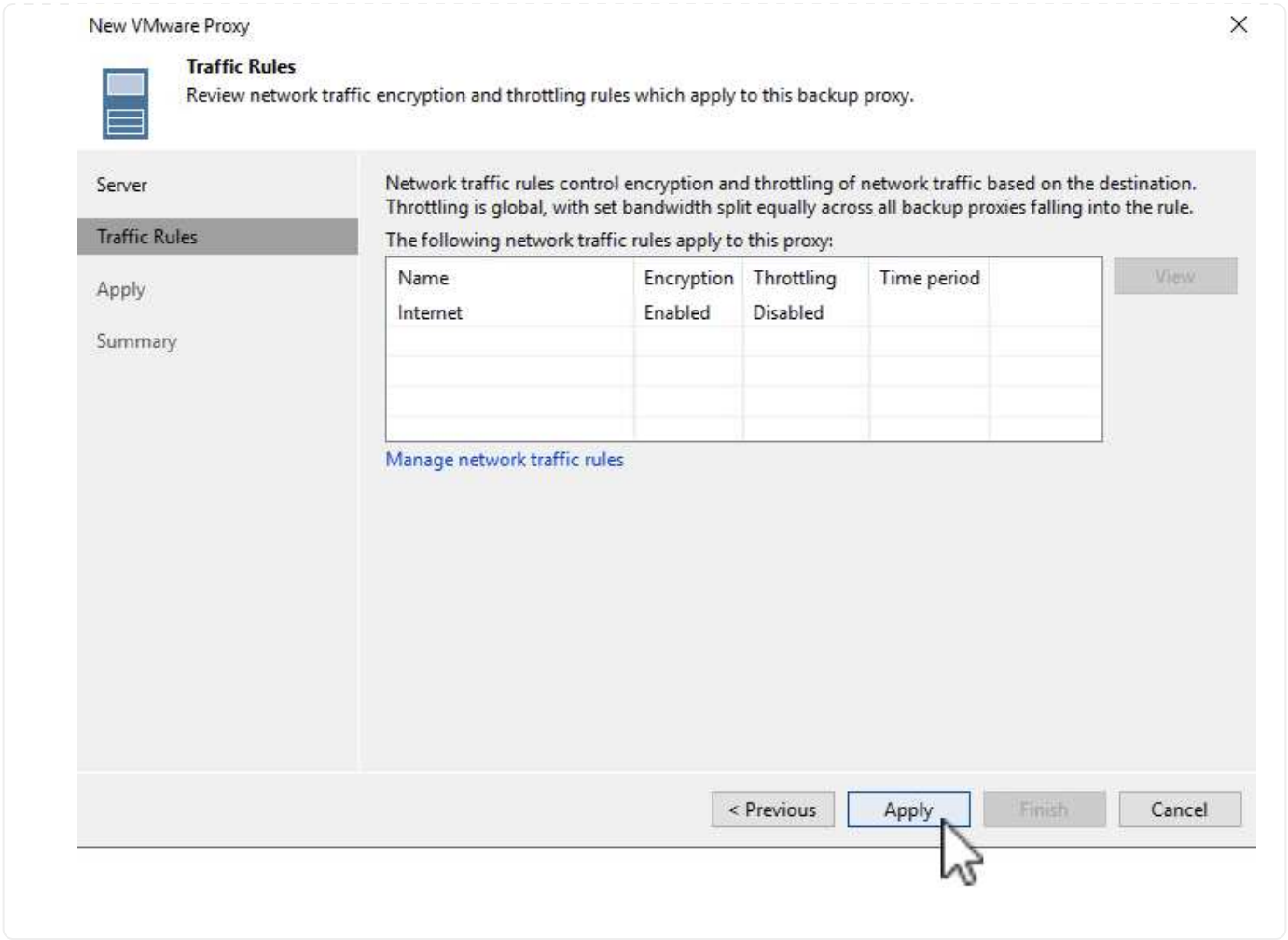


6. Select the Connected datastores that you want the VMware Proxy to have direct access to.





7. Configure and apply any specific network traffic rules such as encryption or throttling that are desired. When complete click on the **Apply** button to complete the deployment.



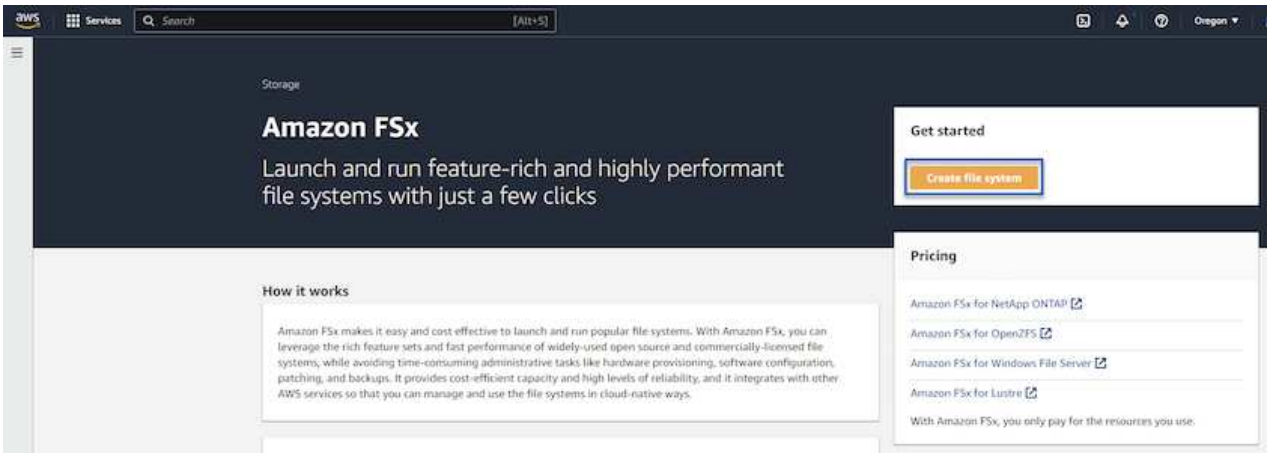
Configure storage and Backup Repositories

The primary Veeam Backup server and Veeam Proxy server have access to a backup repository in the form of direct connected storage. In this section we cover creating an FSx for ONTAP file system, mounting iSCSI LUNs to the Veeam servers and creating Backup Repositories.

Create FSx for ONTAP file system

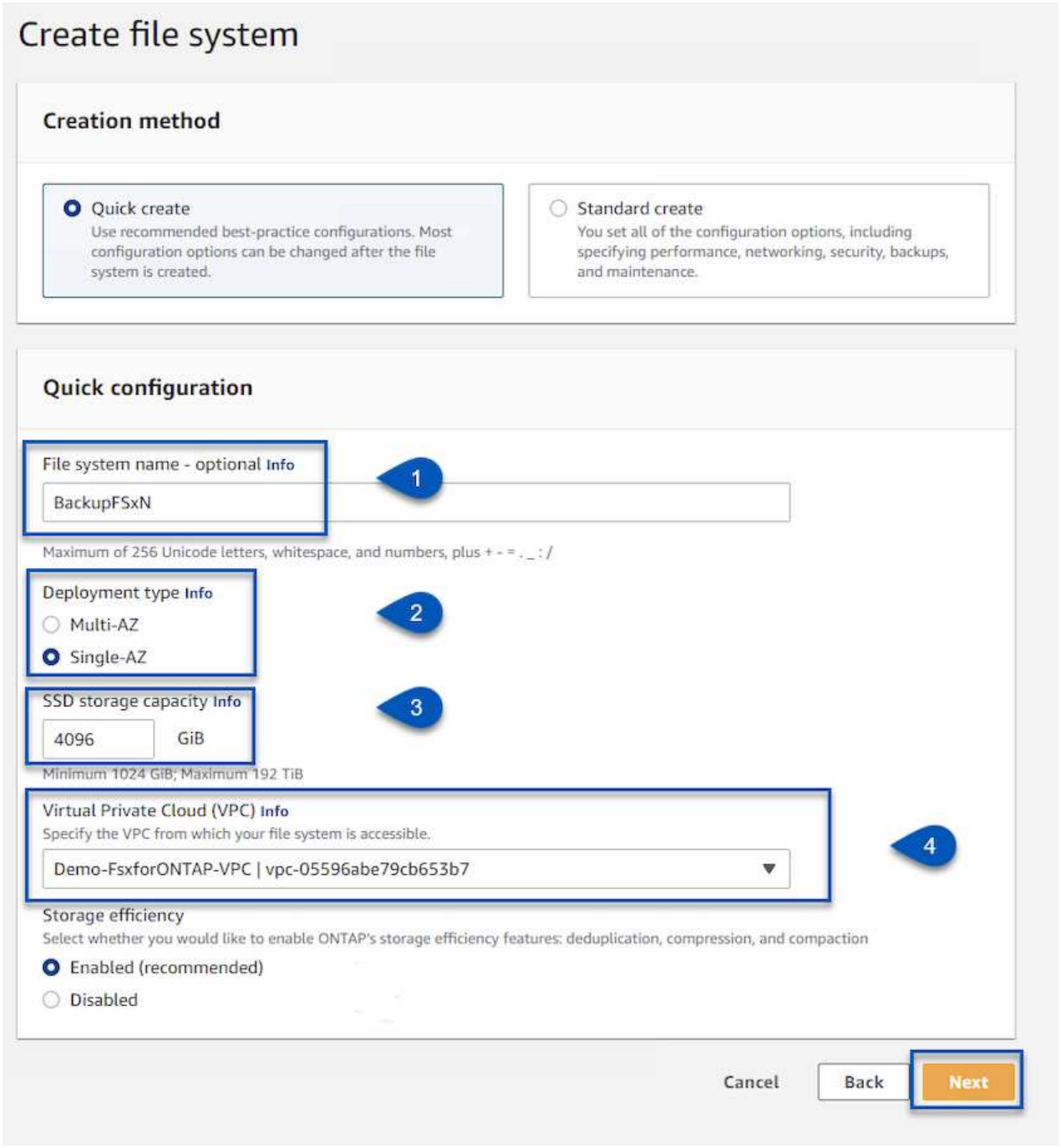
Create an FSx for ONTAP file system that will be used to host the iSCSI volumes for the Veeam Backup Repositories.

1. In the AWS console, Go to FSx and then **Create file system**



2. Select **Amazon FSx for NetApp ONTAP** and then **Next** to continue.

3. Fill in the file system name, deployment type, SSD storage capacity and the VPC in which the FSx for ONTAP cluster will reside. This must be a VPC configured to communicate with the virtual machine network in VMware Cloud. Click on **Next**.



4. Review the deployment steps and click on **Create File System** to begin the file system creation process.

Configure and mount iSCSI LUNs

Create and configure the iSCSI LUNs on FSx for ONTAP and mount to the Veeam backup and proxy servers. These LUNs will later be used to create Veeam backup repositories.

> Creating an iSCSI LUN on FSx for ONTAP is a multi-step process. The first step of creating the volumes can be accomplished in the Amazon FSx Console or with the NetApp ONTAP CLI.

> For more information on using FSx for ONTAP, see the FSx for ONTAP User Guide.

1. From the NetApp ONTAP CLI create the initial volumes using the following command:

```
FSx-Backup::> volume create -vserver svm_name -volume vol_name
-aggregate aggregate_name -size vol_size -type RW
```

2. Create LUNs using the volumes created in the previous step:

```
FSx-Backup::> lun create -vserver svm_name -path
/vol/vol_name/lun_name -size size -ostype windows -space-allocation
enabled
```

3. Grant access to the LUNs by creating an initiator group containing the iSCSI IQN of the Veeam backup and proxy servers:

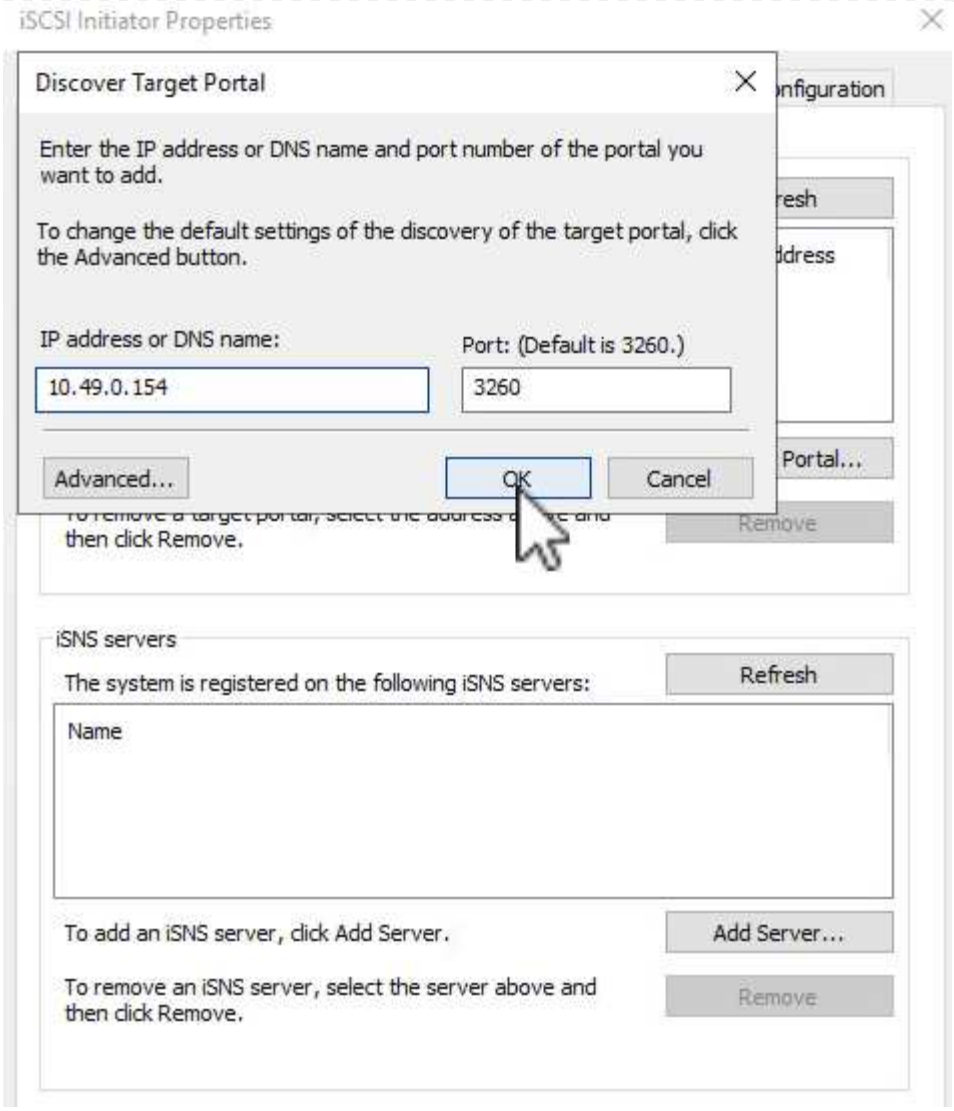
```
FSx-Backup::> igroup create -vserver svm_name -igroup igroup_name
-protocol iSCSI -ostype windows -initiator IQN
```

> To complete the preceding step you will need to first retrieve the IQN from the iSCSI initiator properties on the Windows servers.

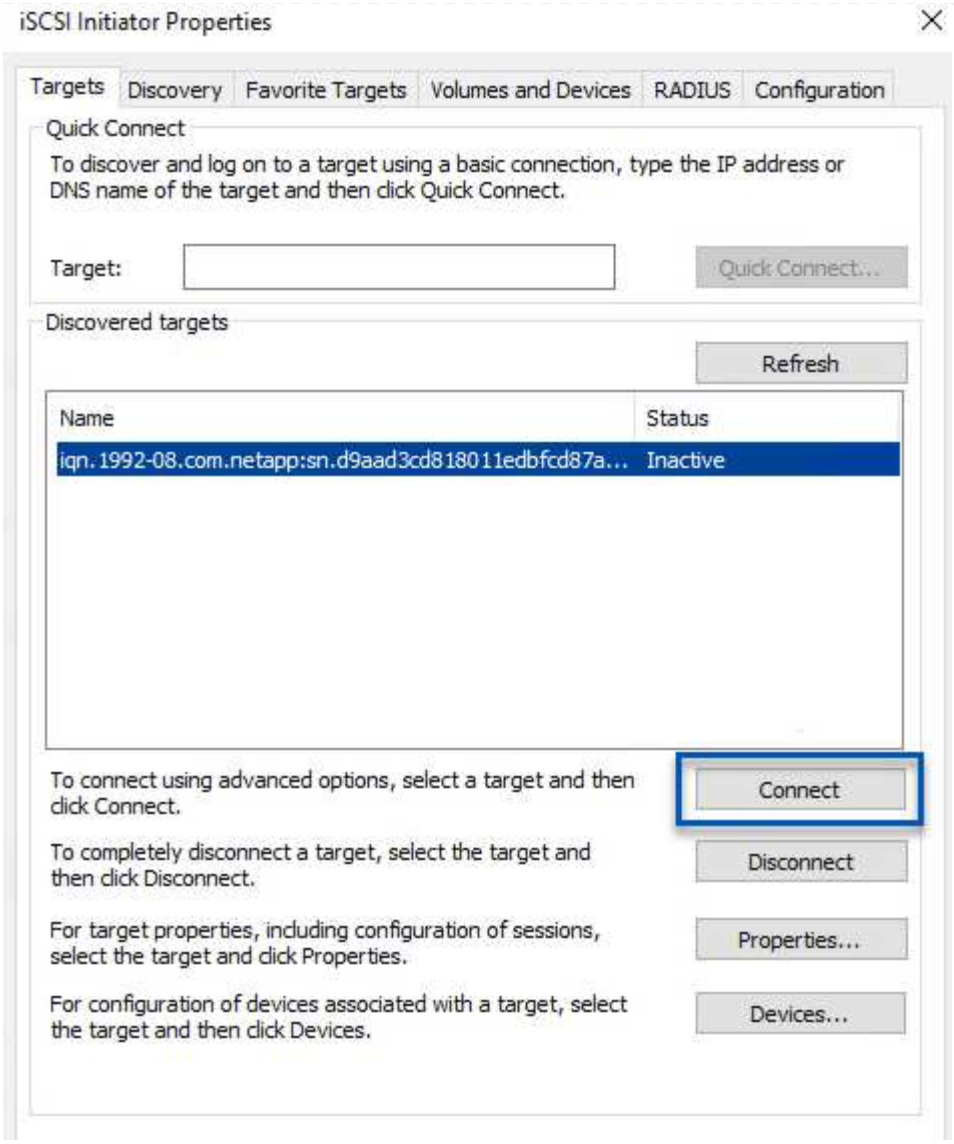
4. Finally, map the LUNs to the initiator group that you just created:

```
FSx-Backup::> lun mapping create -vserver svm_name -path
/vol/vol_name/lun_name igroup igroup_name
```

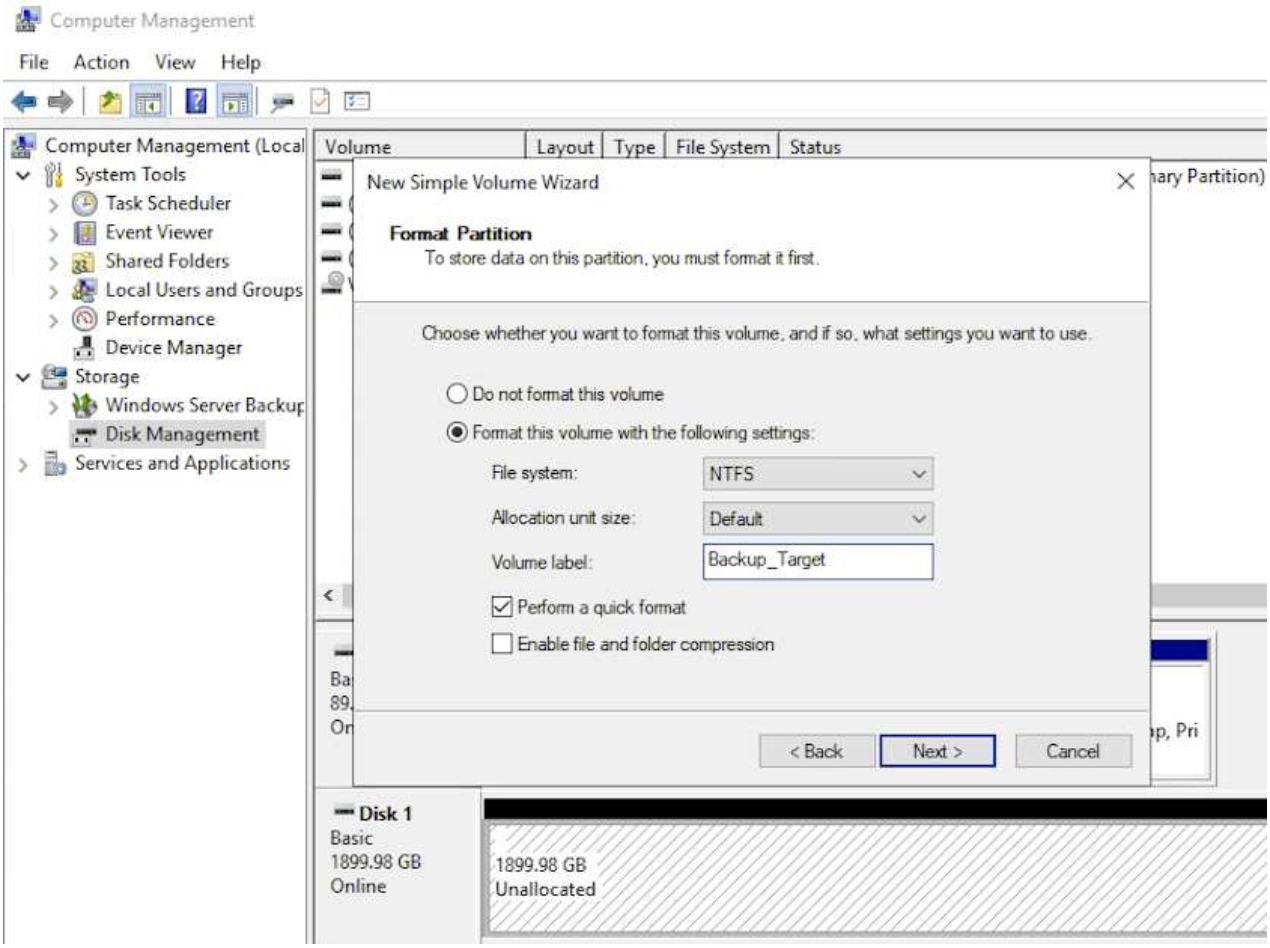
5. To mount the iSCSI LUNs, log into the Veeam Backup & Replication Server and open iSCSI Initiator Properties. Go to the **Discover** tab and enter the iSCSI target IP address.



6. On the **Targets** tab, highlight the inactive LUN and click on **Connect**. Check the **Enable multi-path** box and click on **OK** to connect to the LUN.



7. In the Disk Management utility initialize the new LUN and create a volume with the desired name and drive letter. Check the **Enable multi-path** box and click on **OK** to connect to the LUN.

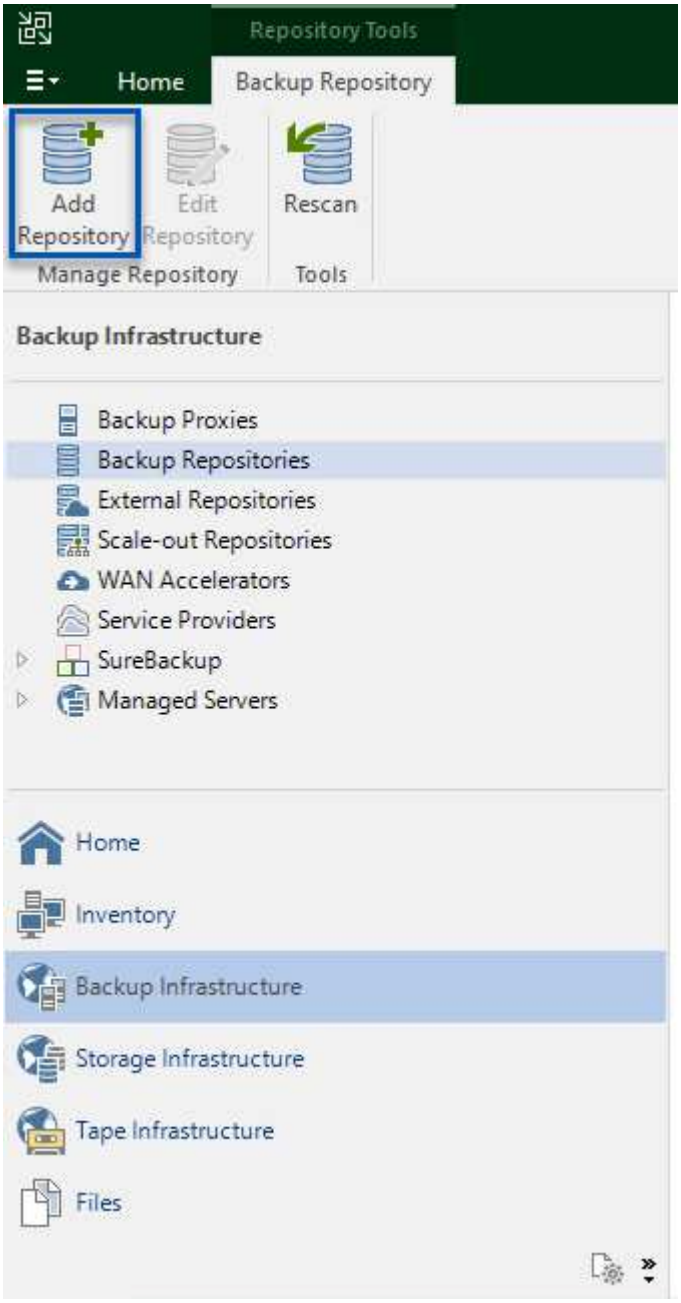


8. Repeat these steps to mount the iSCSI volumes on the Veeam Proxy server.

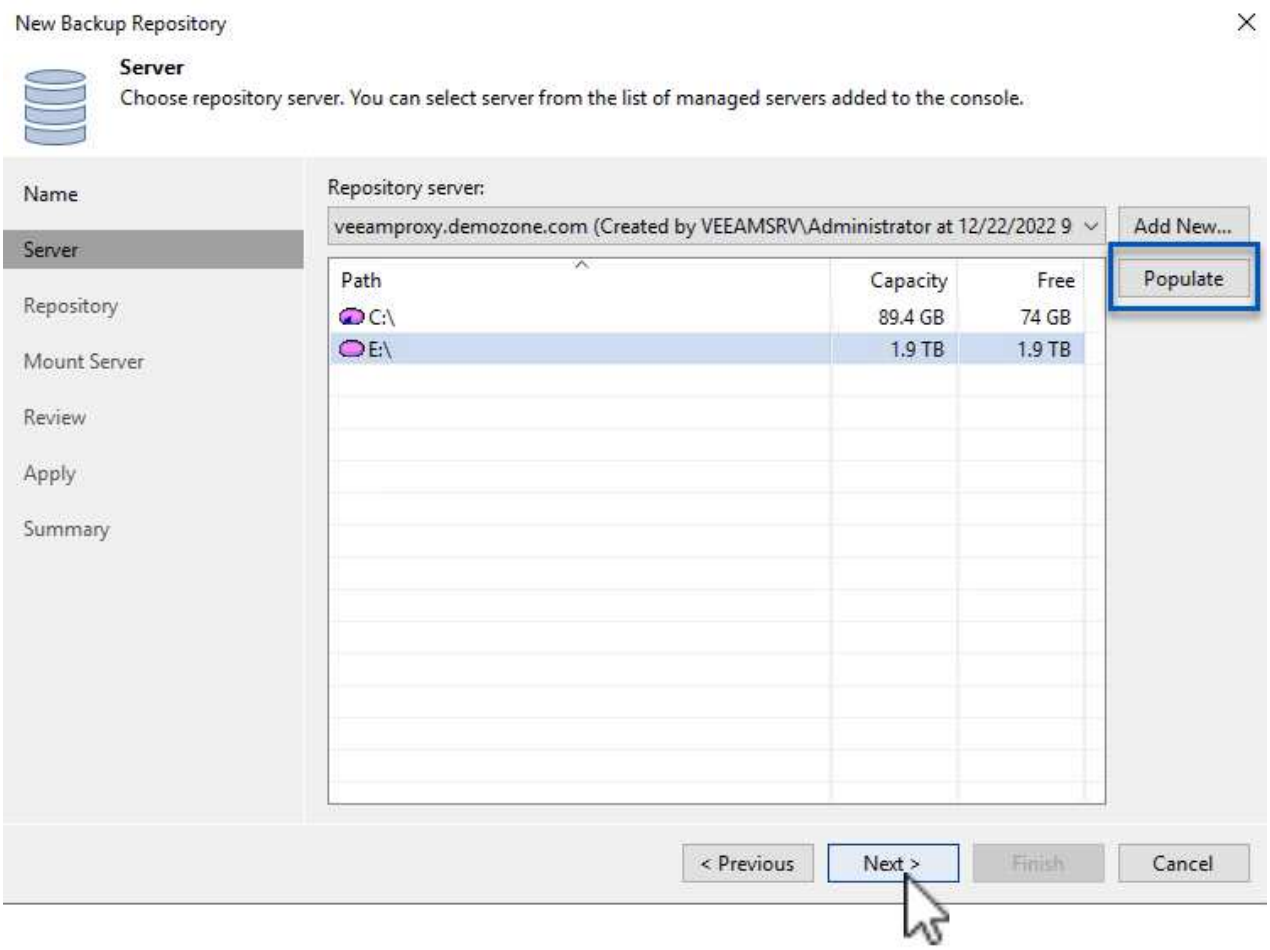
Create Veeam Backup Repositories

In the Veeam Backup and Replication console, create backup repositories for the Veeam Backup and Veeam Proxy servers. These repositories will be used as backup targets for the virtual machines backups.

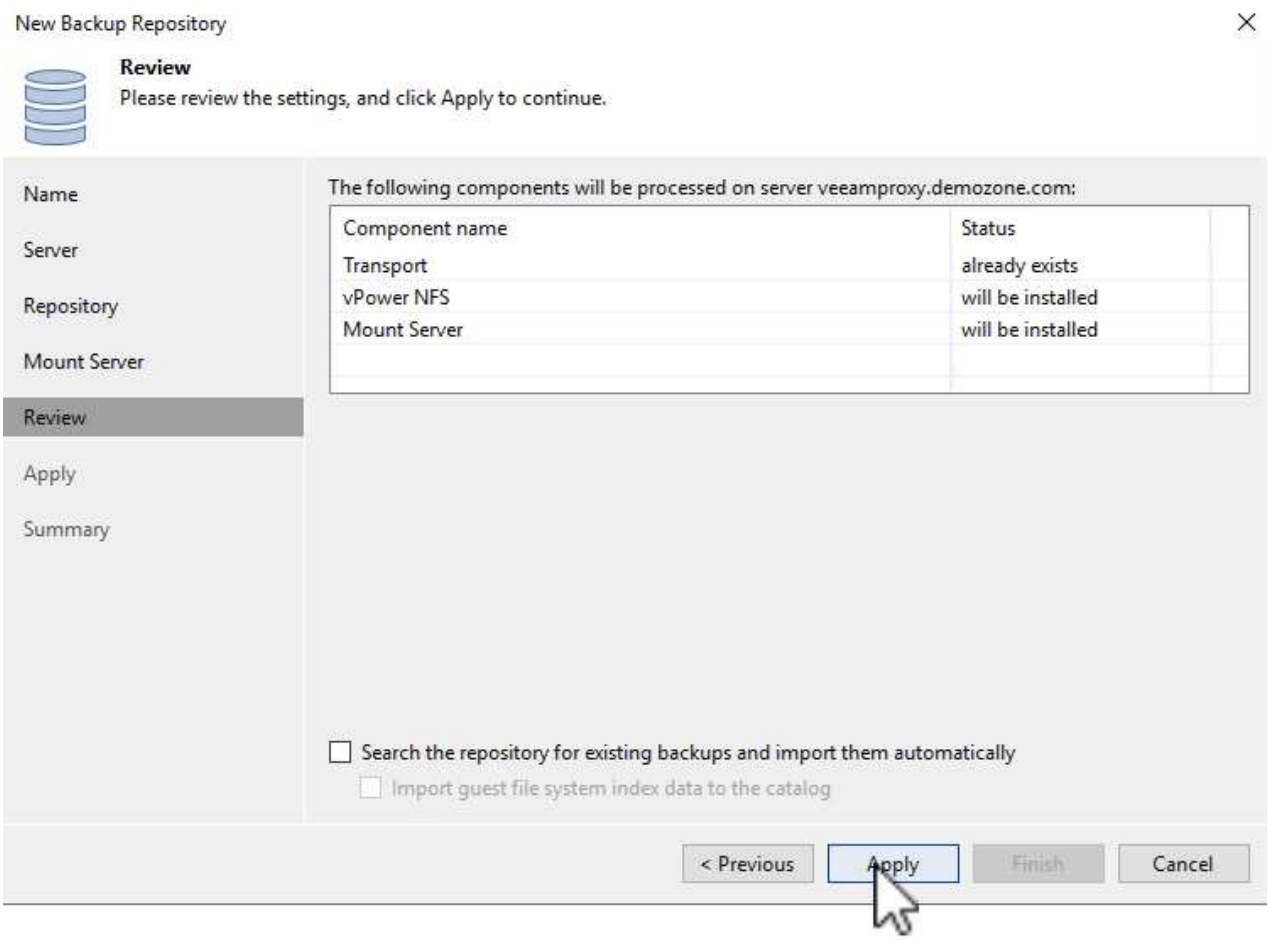
1. In the Veeam Backup and Replication console click on **Backup Infrastructure** in the lower left and then select **Add Repository**



2. In the New Backup Repository wizard, enter a name for the repository and then select the server from the drop-down list and click on the **Populate** button to choose the NTFS volume that will be used.



3. On the next page choose a Mount server that will be used to mount backups to when performing advanced restores. By default this is the same server that has the repository storage connected.
4. Review your selections and click on **Apply** to start the backup repository creation.



5. Repeat these steps for any additional proxy servers.

Configure Veeam backup jobs

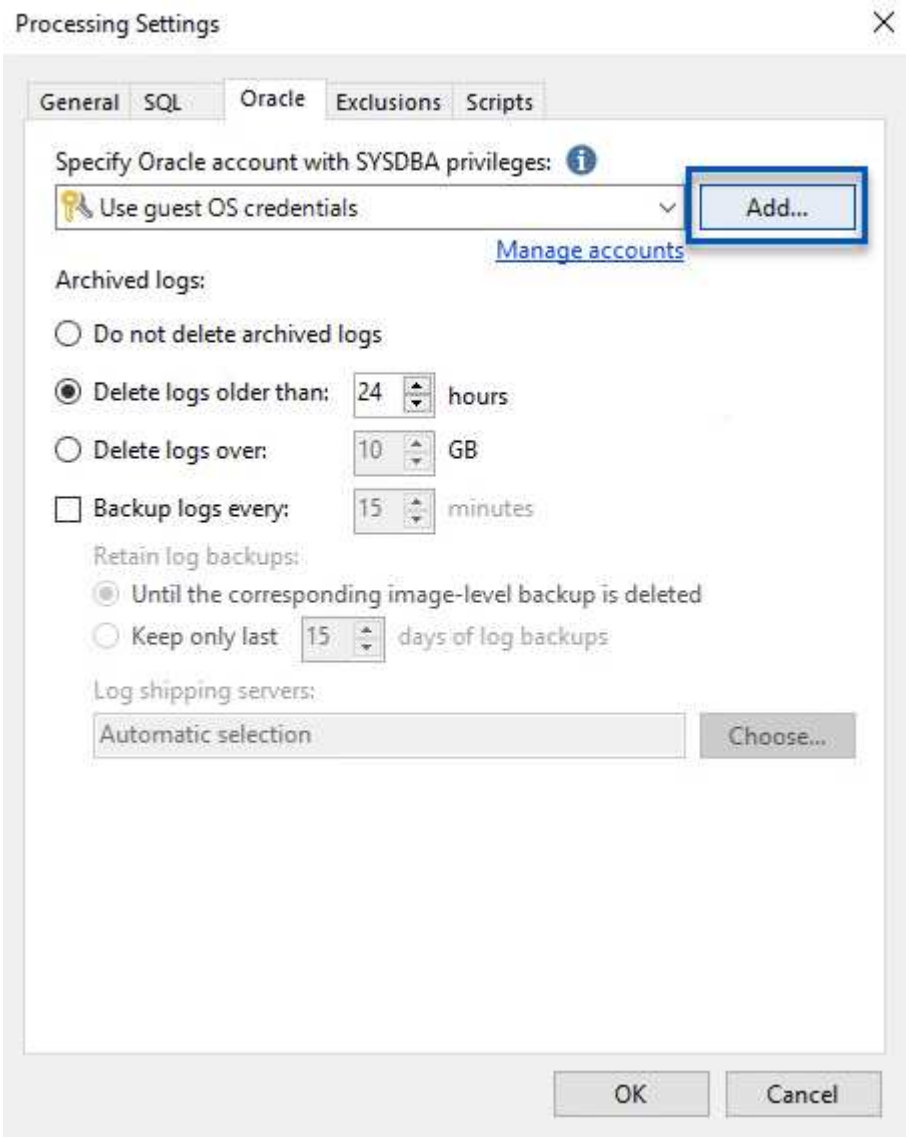
Backup jobs should be created utilizing the the Backup Repositories in the previous section. Creating backup jobs is a normal part of any storage administrator's repertoire and we do not cover all of the steps here. For more complete information on creating backup jobs in Veeam, see the Veeam Help Center Technical Documentation.

In this solution separate backup jobs were created for:

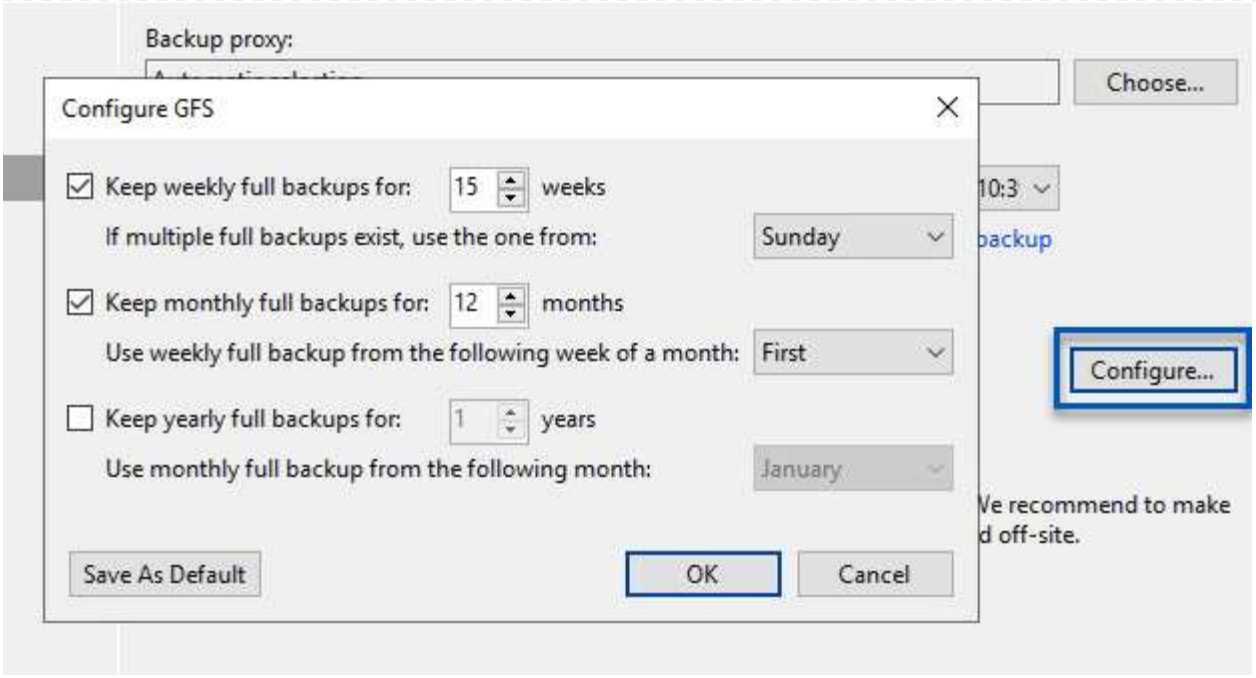
- Microsoft Windows SQL Servers
- Oracle database servers
- Windows file servers
- Linux file servers

General considerations when configuring Veeam backup jobs

1. Enable application-aware processing to create consistent backups and perform transaction log processing.
2. After enabling application-aware processing add the correct credentials with admin privileges to the application as this may be different than the guest OS credentials.



3. To manage the retention policy for the backup check the **Keep certain full backups longer for archival purposes** and click the **Configure…** button to configure the policy.



Restore Application VMs with Veeam full restore

Performing a full restore with Veeam is the first step in performing an application restore. We validated that full restores of our VMs powered on and all services were running normally.

Restoring servers is a normal part of any storage administrator's repertoire and we do not cover all of the steps here. For more complete information on performing full restores in Veeam, see the Veeam Help Center Technical Documentation.

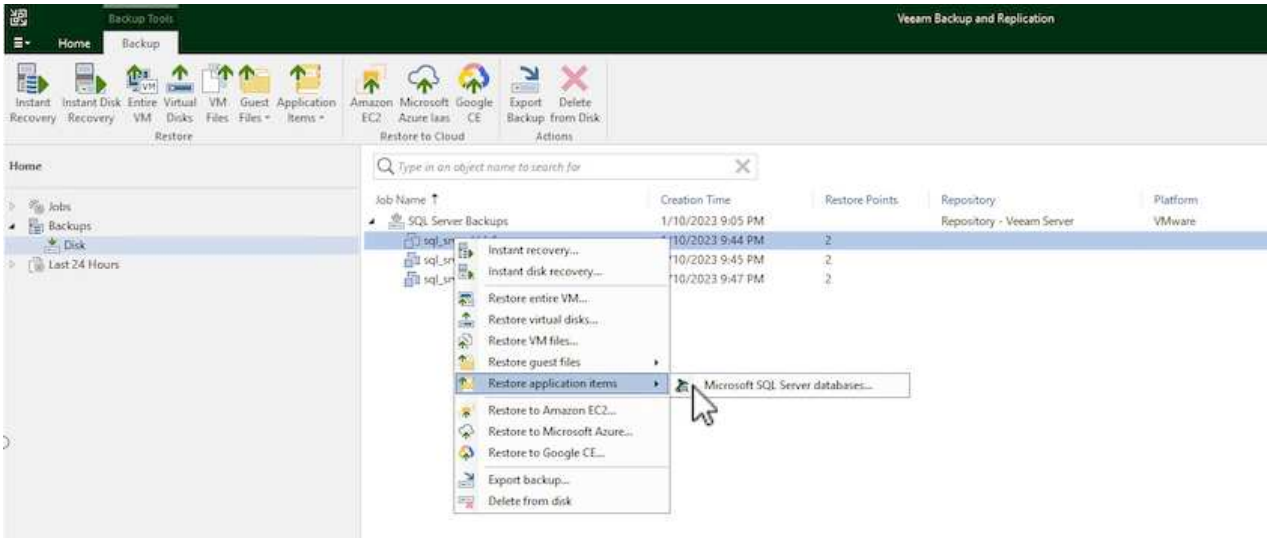
Restore SQL Server databases

Veeam Backup & Replication provides several options for restoring SQL Server databases. For this validation we used the Veeam Explorer for SQL Server with Instant Recovery to execute restores of our SQL Server databases. SQL Server Instant Recovery is a feature that allows you to quickly restore SQL Server databases without having to wait for a full database restore. This rapid recovery process minimizes downtime and ensures business continuity. Here's how it works:

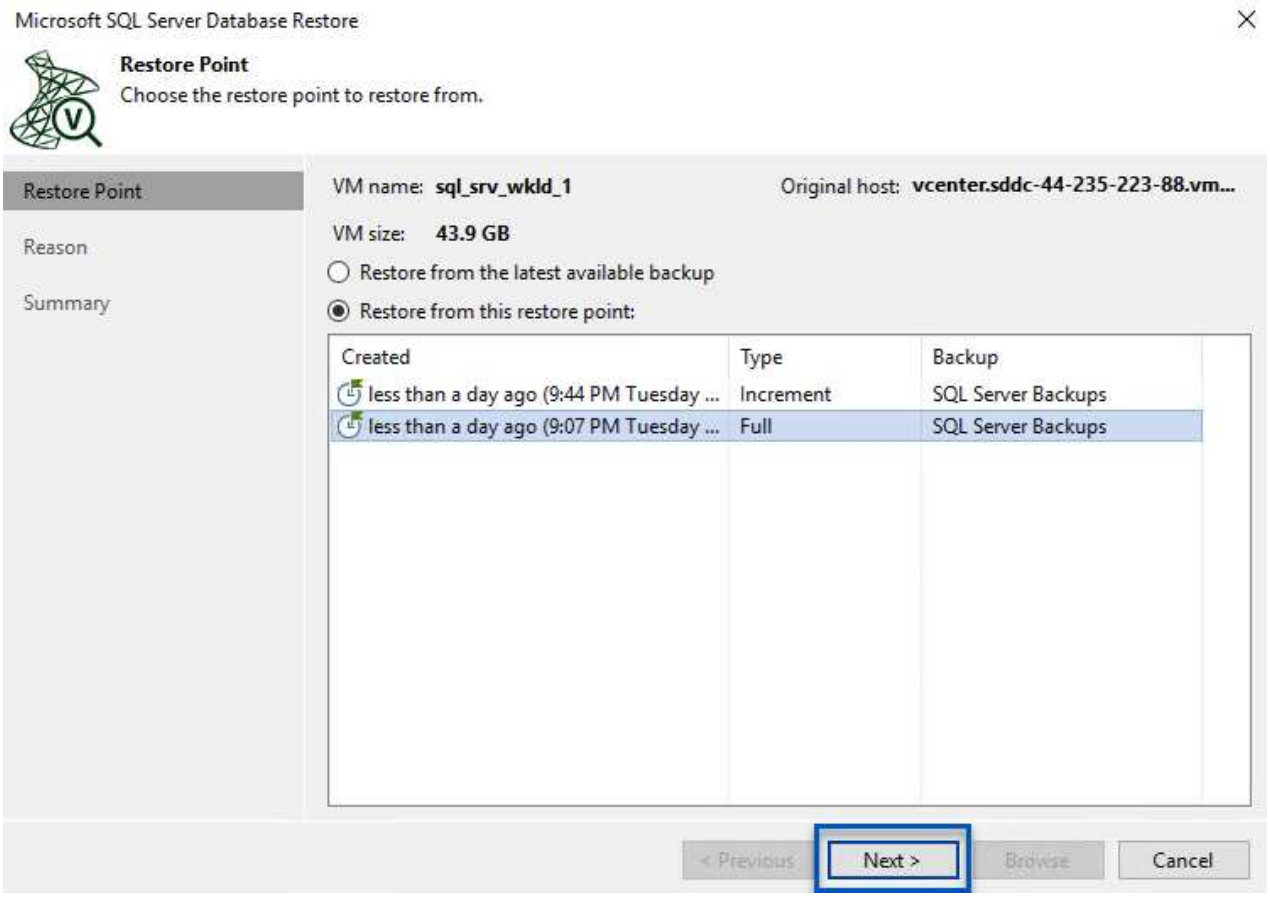
- Veeam Explorer **mounts the backup** containing the SQL Server database to be restored.
- The software **publishes the database** directly from the mounted files, making it accessible as a temporary database on the target SQL Server instance.
- While the temporary database is in use, Veeam Explorer **redirects user queries** to this database, ensuring that users can continue to access and work with the data.
- In the background, Veeam **performs a full database restore**, transferring data from the temporary database to the original database location.
- Once the full database restore is complete, Veeam Explorer **switches user queries back to the original** database and removes the temporary database.

Restore SQL Server database with Veeam Explorer Instant Recovery

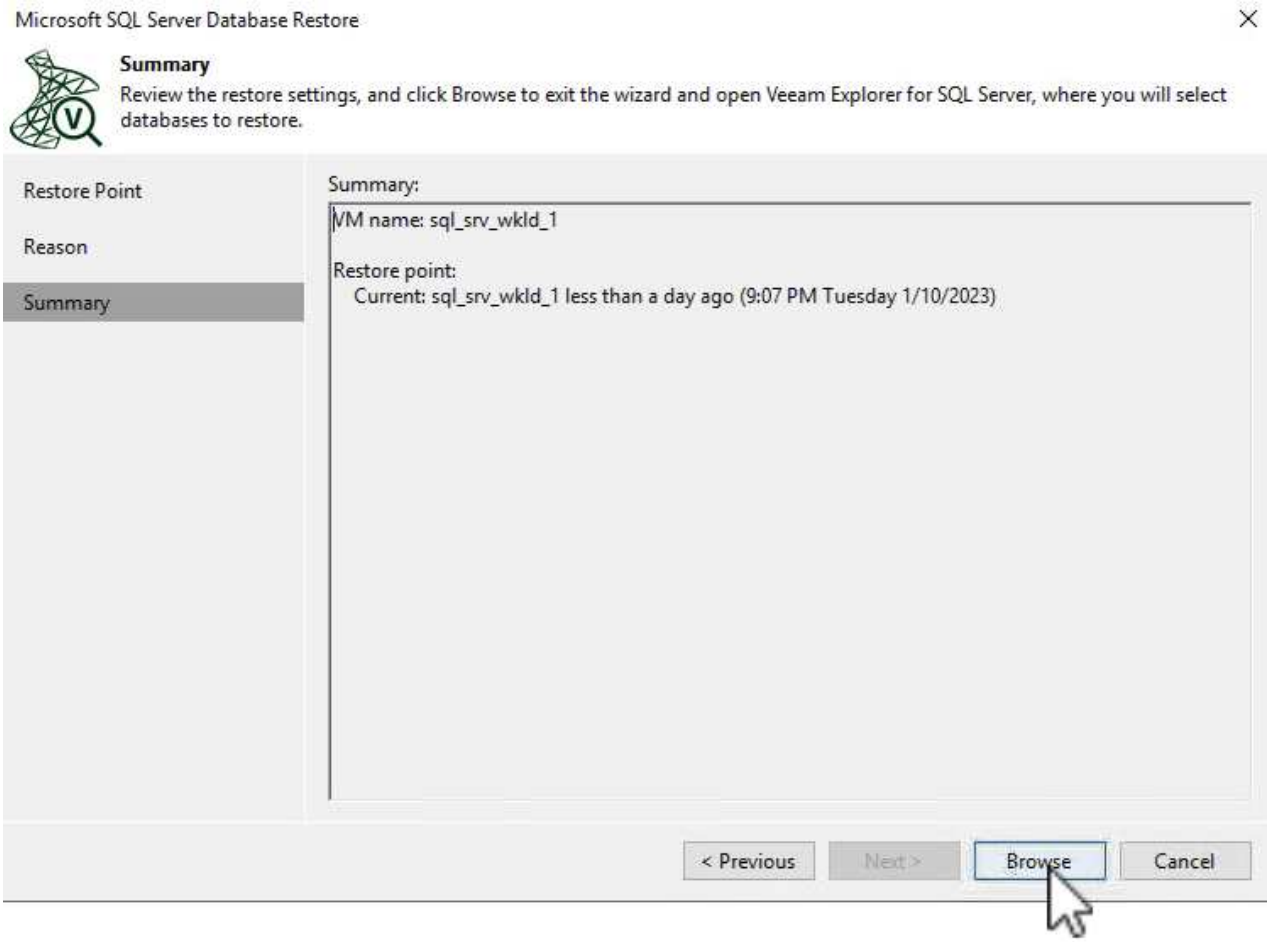
1. In the Veeam Backup and Replication console, navigate to the list of SQL Server backups, right click on a server and select **Restore application items** and then **Microsoft SQL Server databases…**.



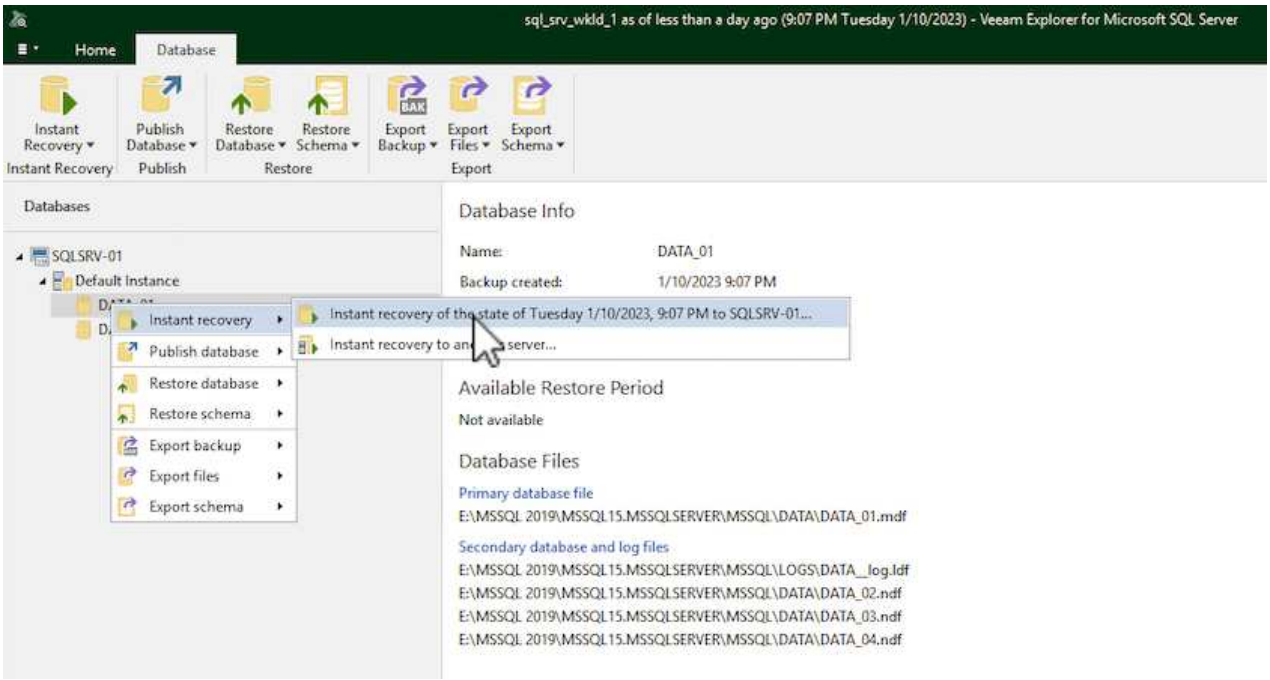
2. In the Microsoft SQL Server Database Restore Wizard select a restore point from the list and click on **Next**.



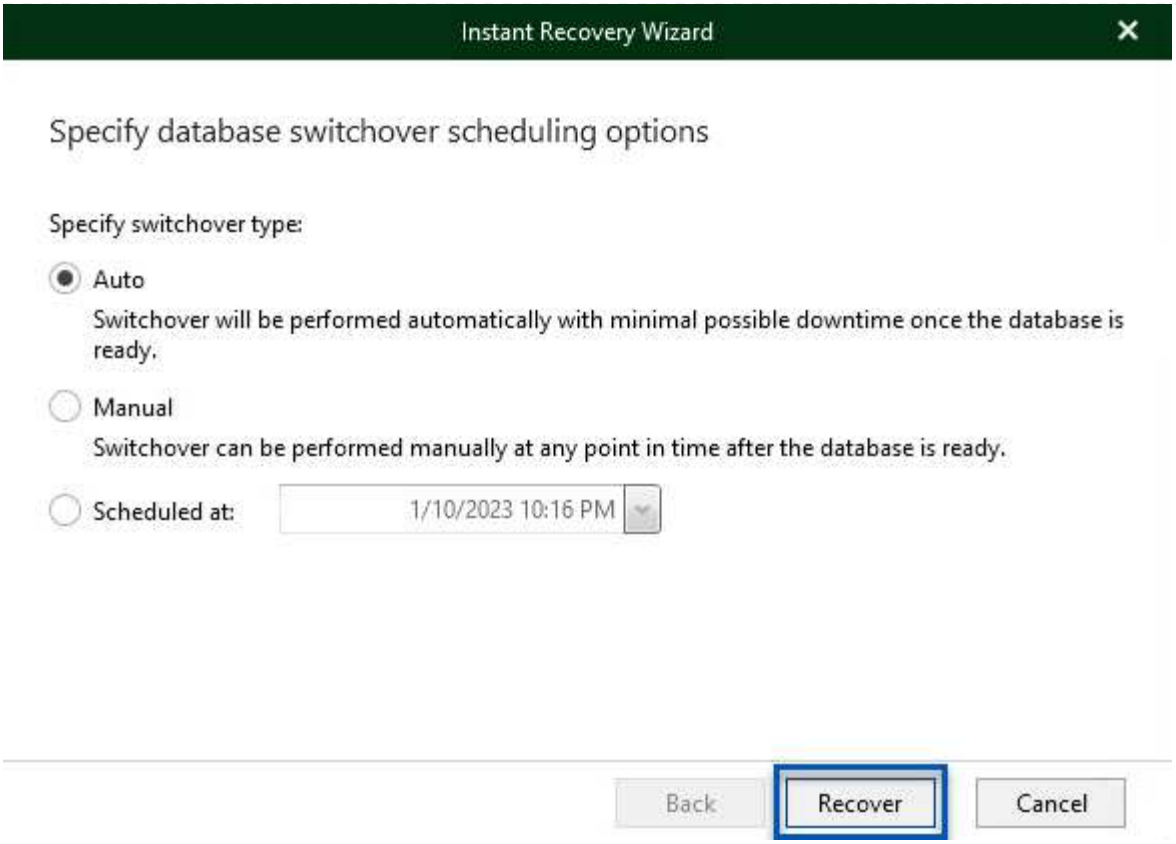
3. Enter a **Restore reason** if desired and then, on the Summary page, click on the **Browse** button to launch Veeam Explorer for Microsoft SQL Server.



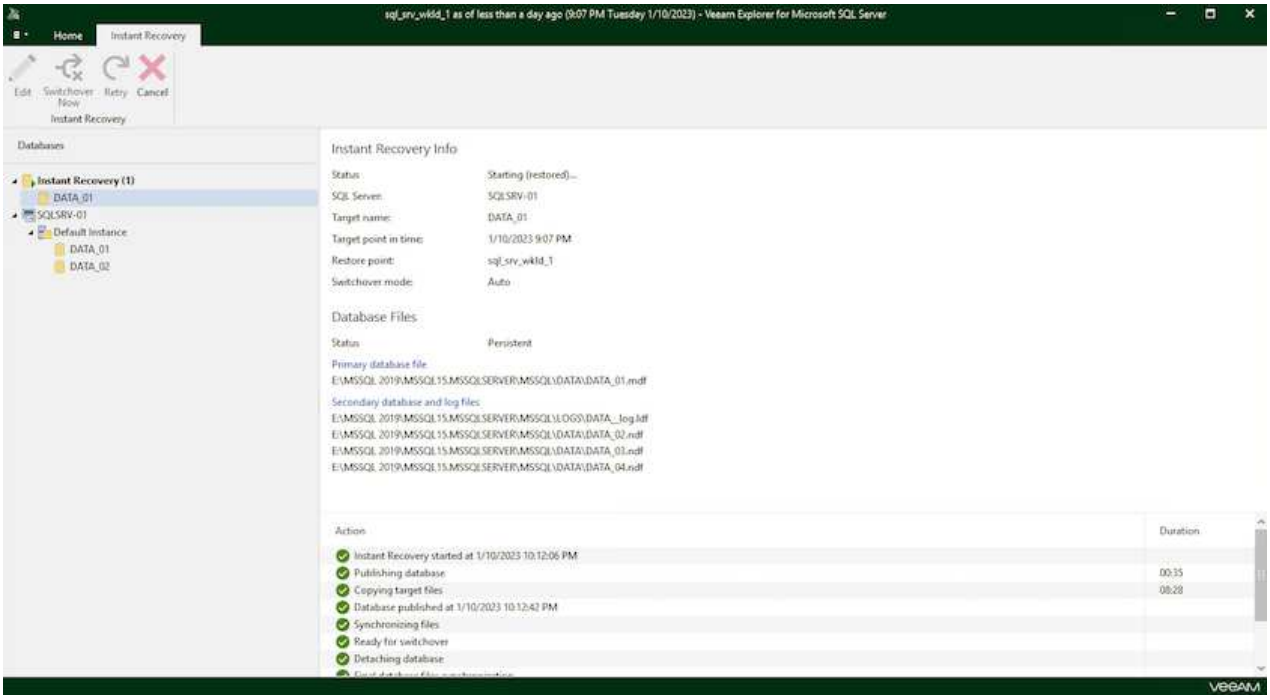
4. In Veeam Explorer expand the list of database instances, right click and select **Instant recovery** and then the specific restore point to recover to.



5. In the Instant Recovery Wizard specify the switchover type. This can either be automatically with minimal downtime, manually, or at a specified time. Then click the **Recover** button to begin the restore process.



6. The recovery process can be monitored from Veeam Explorer.



For more detailed information on performing SQL Server restore operations with Veeam Explorer refer to the Microsoft SQL Server section in the Veeam Explorers User Guide.

Restore Oracle databases with Veeam Explorer

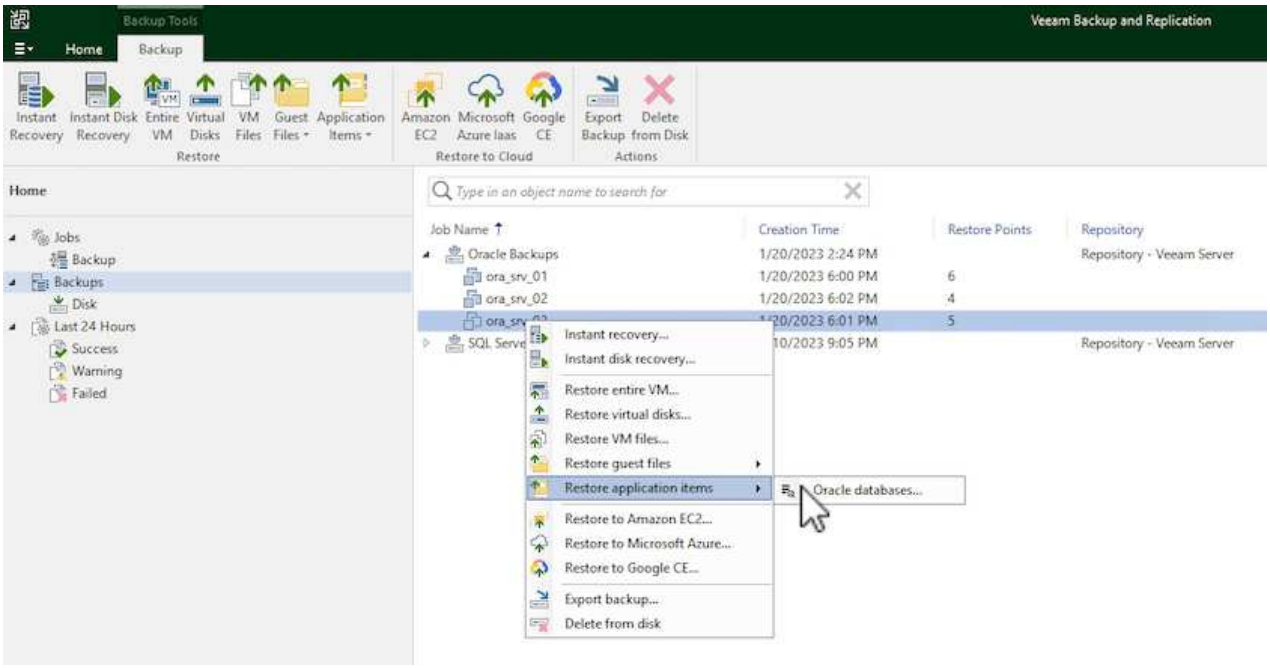
Veeam Explorer for Oracle database provides the ability to perform a standard Oracle database restore or an uninterrupted restore using Instant Recovery. It also supports publishing databases for fast access, recovery of Data Guard databases and restores from RMAN backups.

For more detailed information on performing Oracle database restore operations with Veeam Explorer refer to the Oracle section in the Veeam Explorers User Guide.

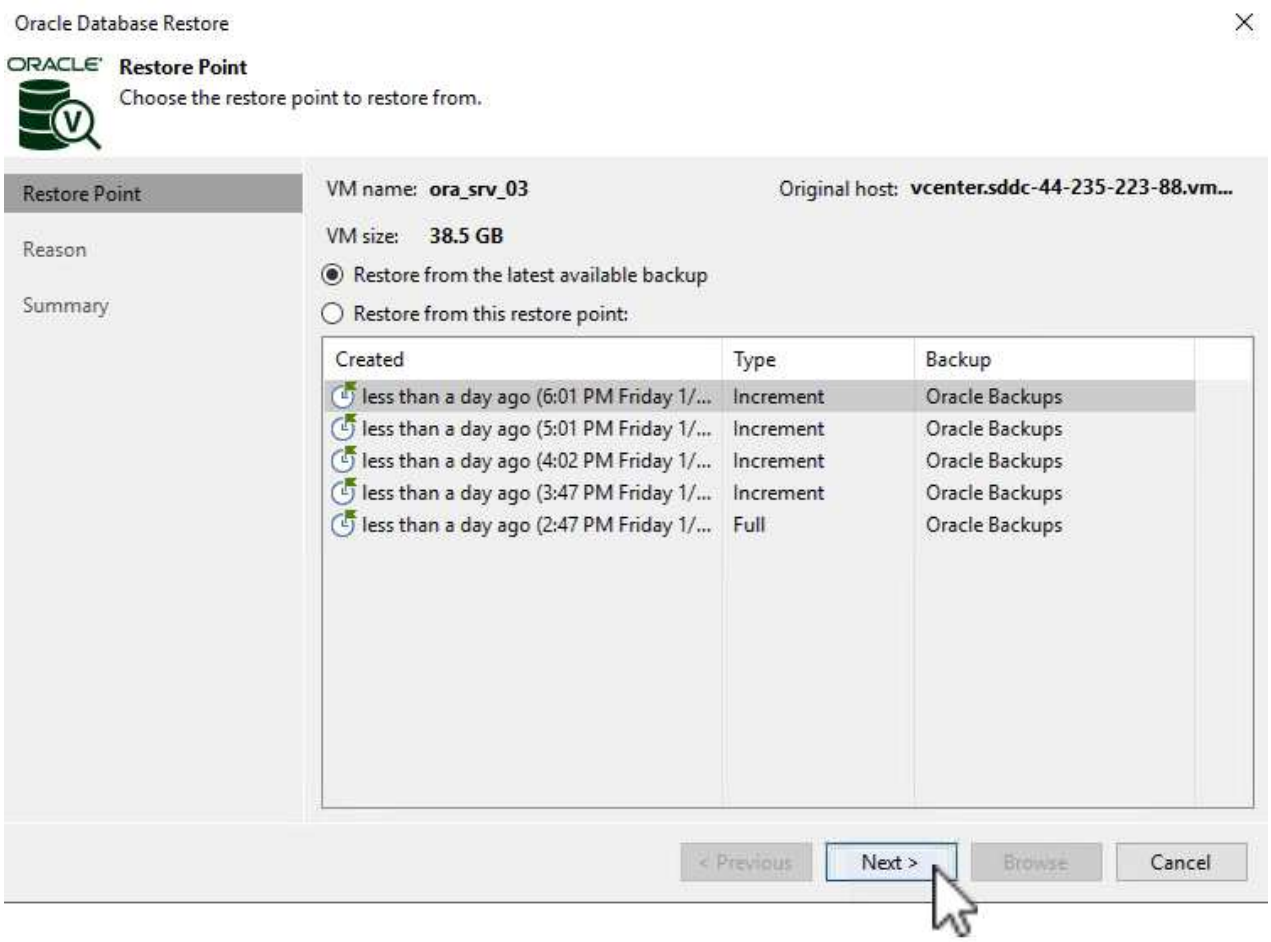
Restore Oracle database with Veeam Explorer

In this section an Oracle database restore to a different server is covered using Veeam Explorer.

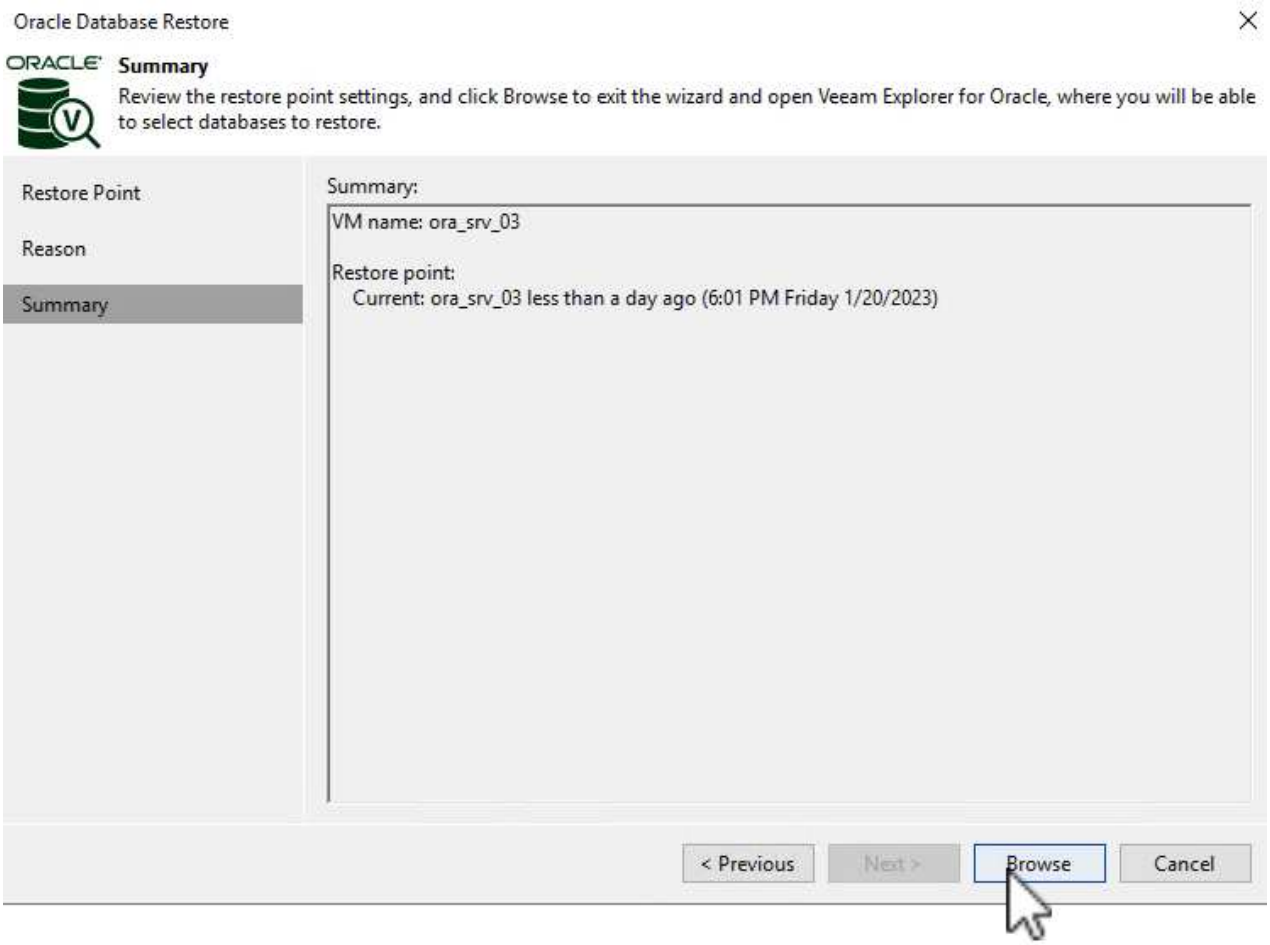
1. In the Veeam Backup and Replication console, navigate to the list of Oracle backups, right click on a server and select **Restore application items** and then **Oracle databases…**.



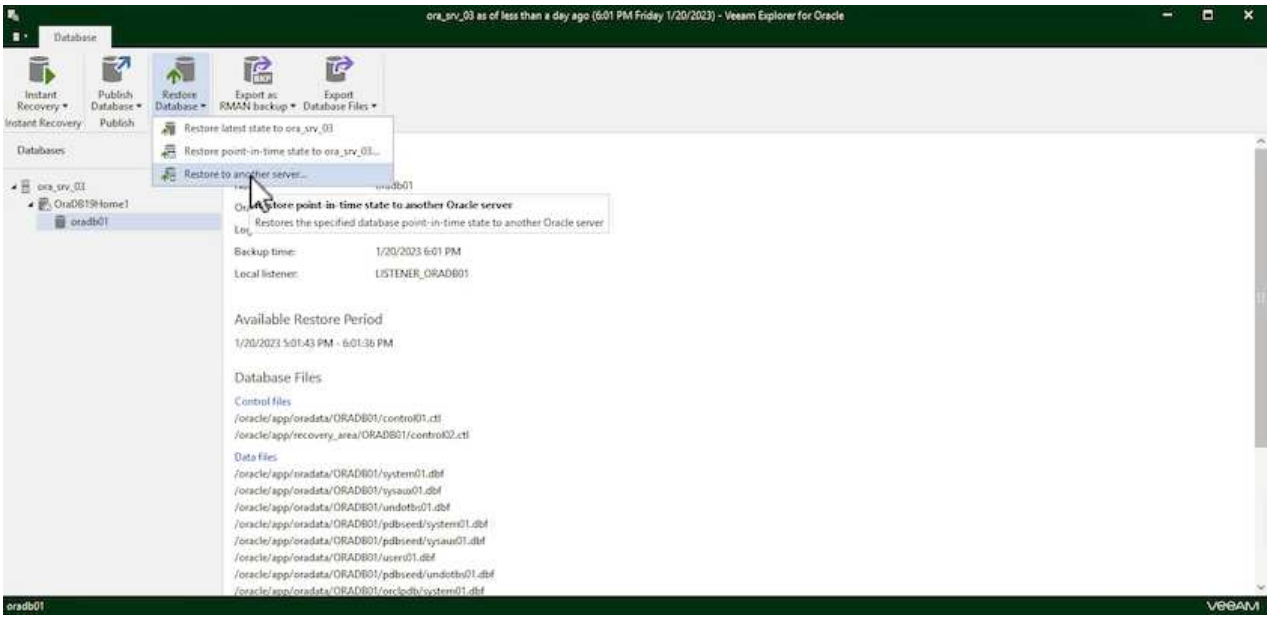
2. In the Oracle Database Restore Wizard select a restore point from the list and click on **Next**.



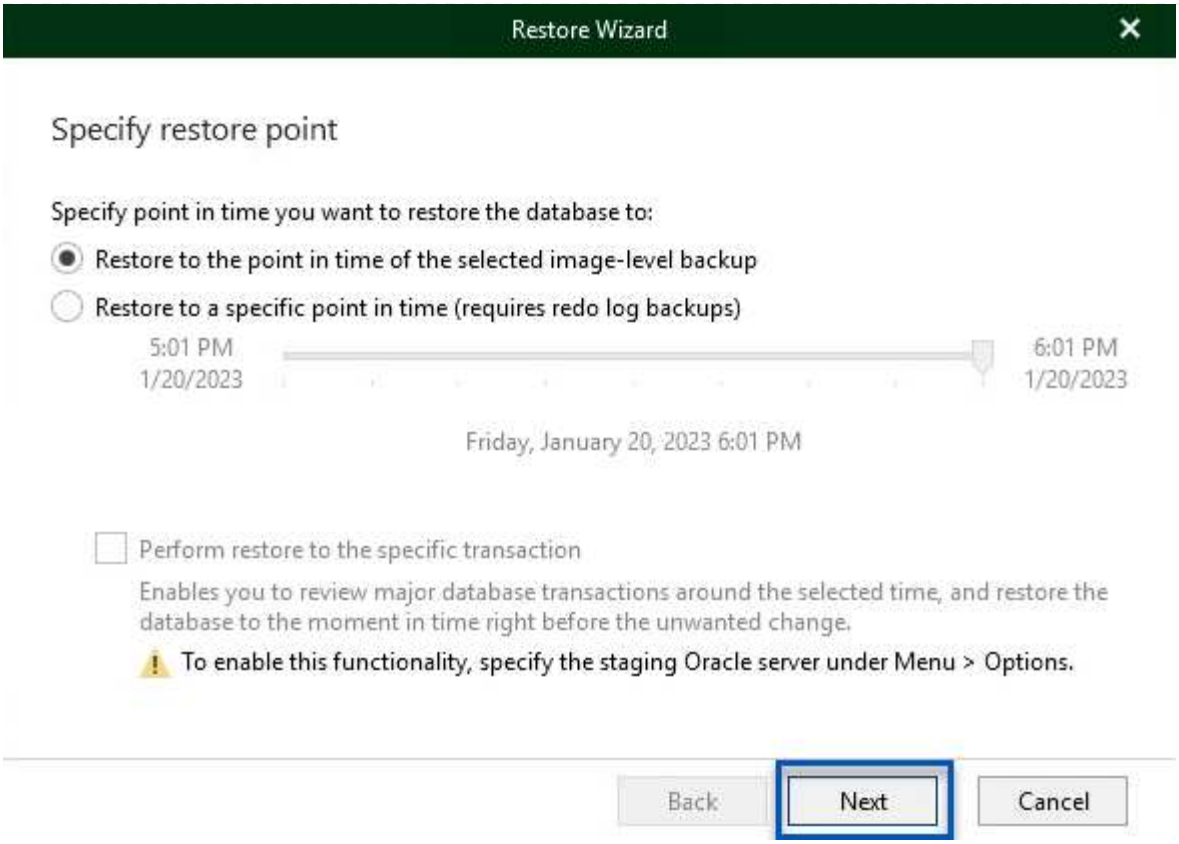
3. Enter a **Restore reason** if desired and then, on the Summary page, click on the **Browse** button to launch Veeam Explorer for Oracle.



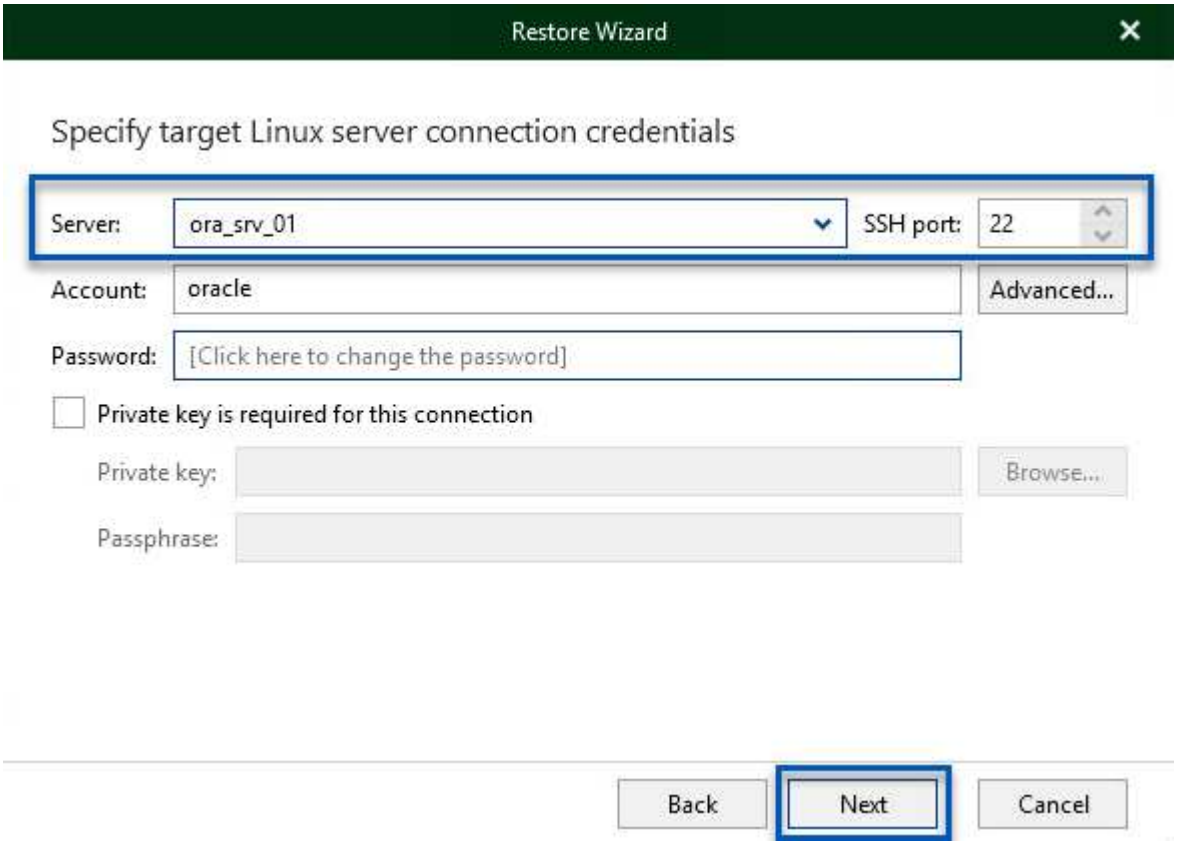
4. In Veeam Explorer expand the list of database instances, click on the database to be restored and then from the **Restore Database** drop-down menu at the top select **Restore to another server…**.



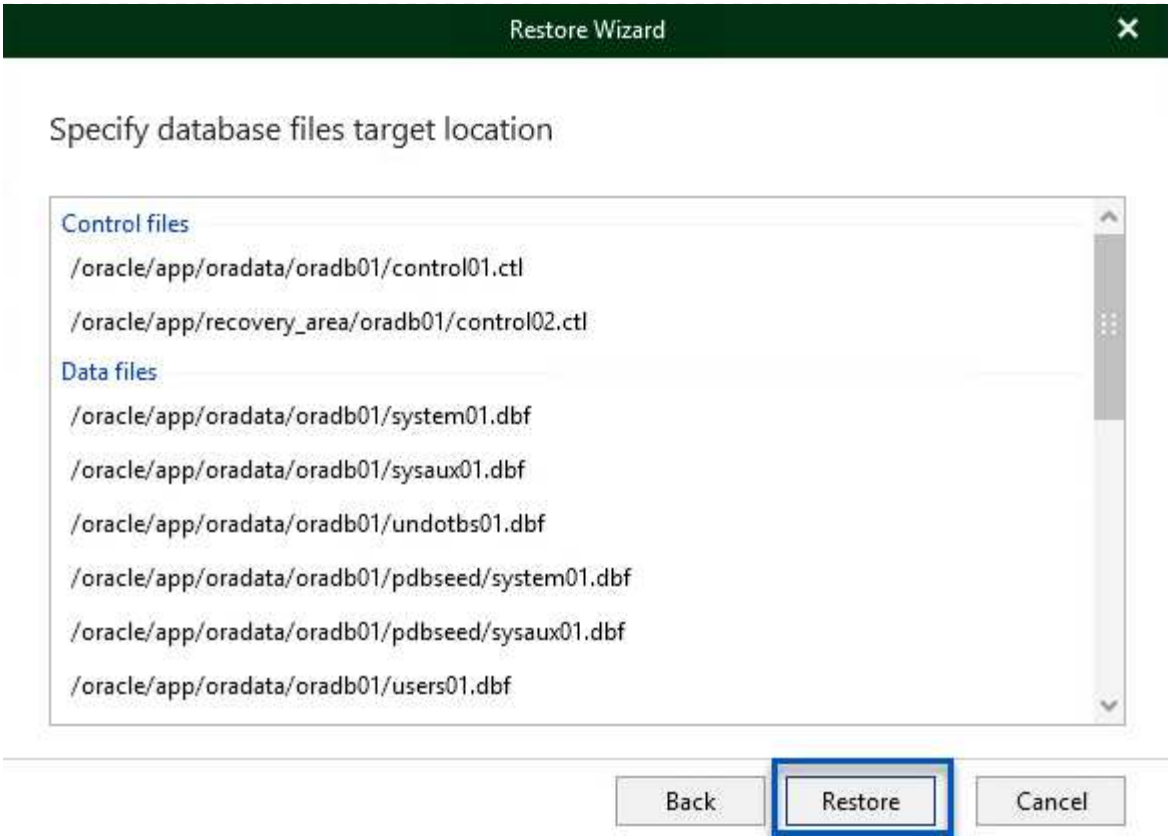
5. In the Restore Wizard specify the restore point to restore from and click **Next**.



6. Specify the target server the database will be restored to and the account credentials and click **Next**.



7. Finally, specify the database files target location and click the **Restore** button to start the restore process.

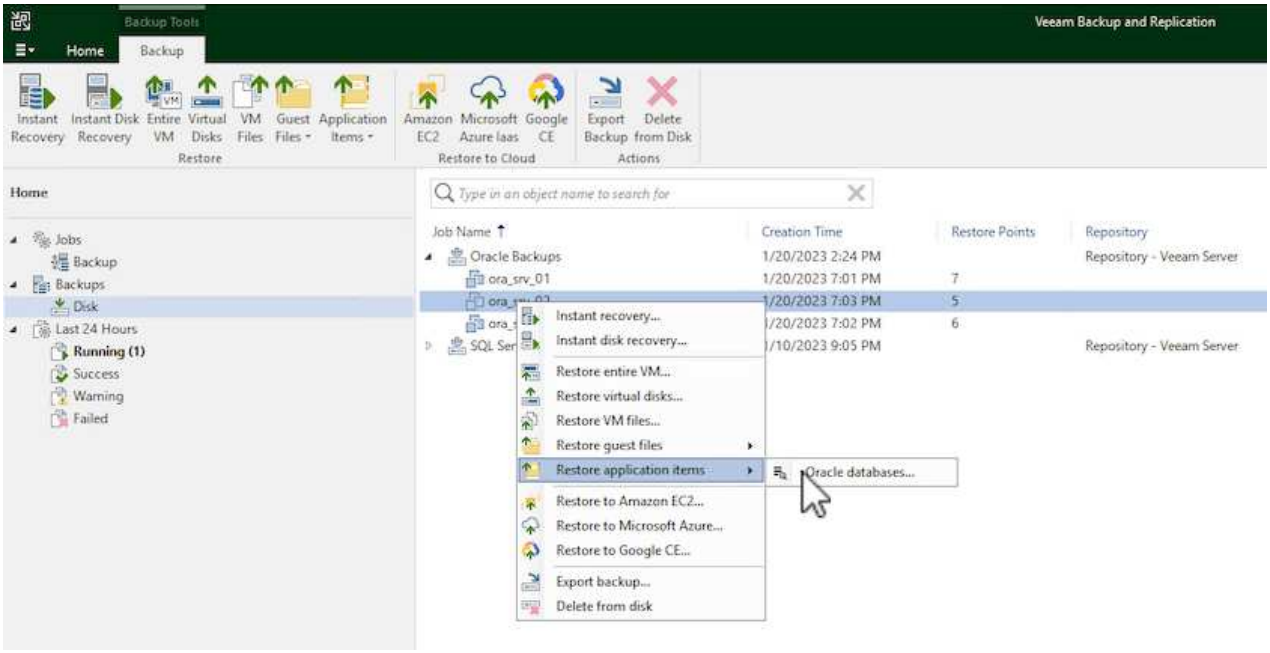


8. Once the database recovery is complete check that the Oracle database starts properly on the server.

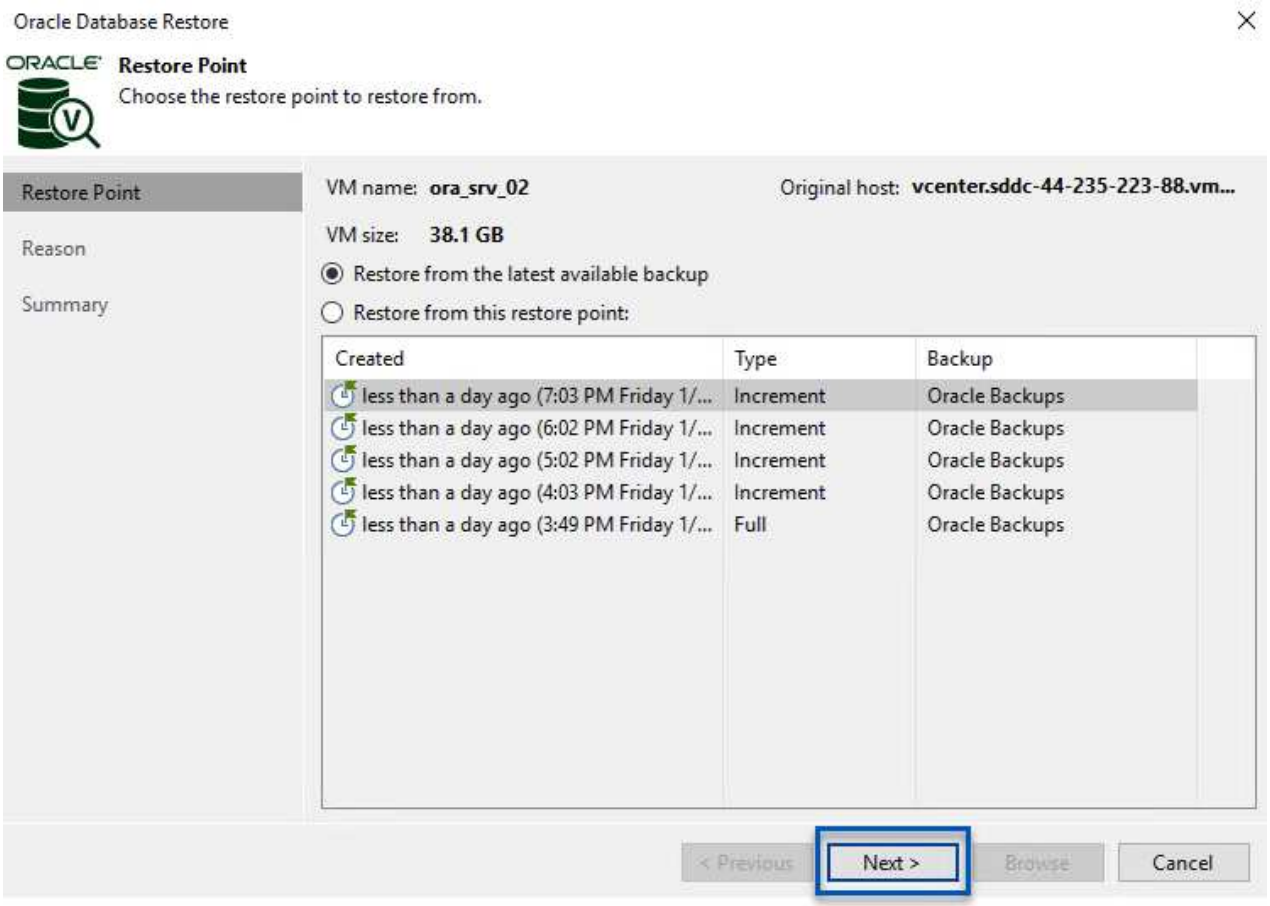
Publish Oracle database to alternate server

In this section a database is published to an alternate server for fast access without launching a full restore.

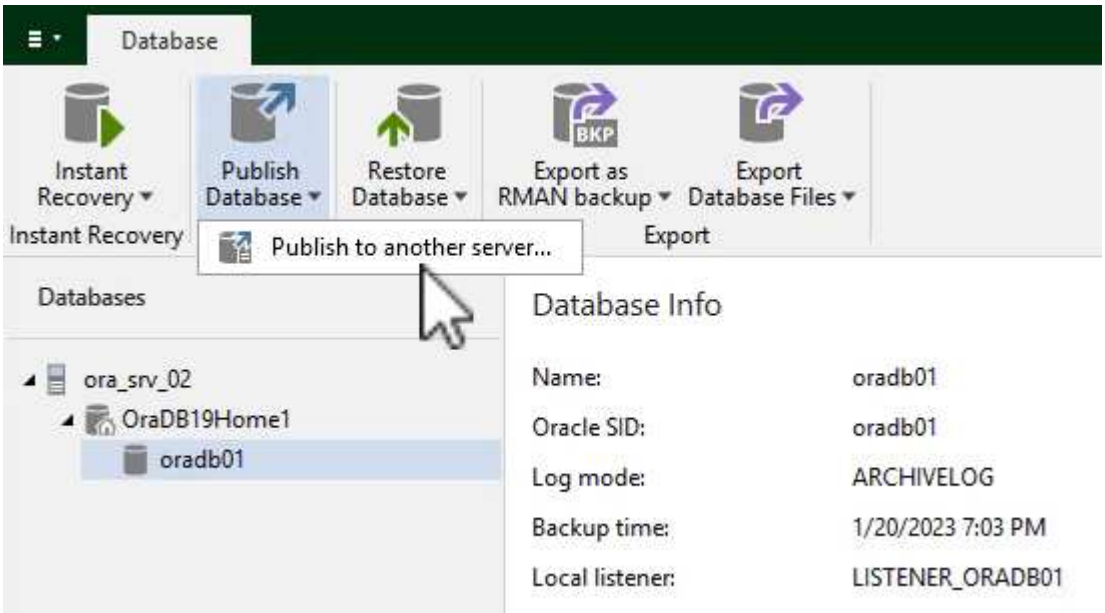
1. In the Veeam Backup and Replication console, navigate to the list of Oracle backups, right click on a server and select **Restore application items** and then **Oracle databases…**.



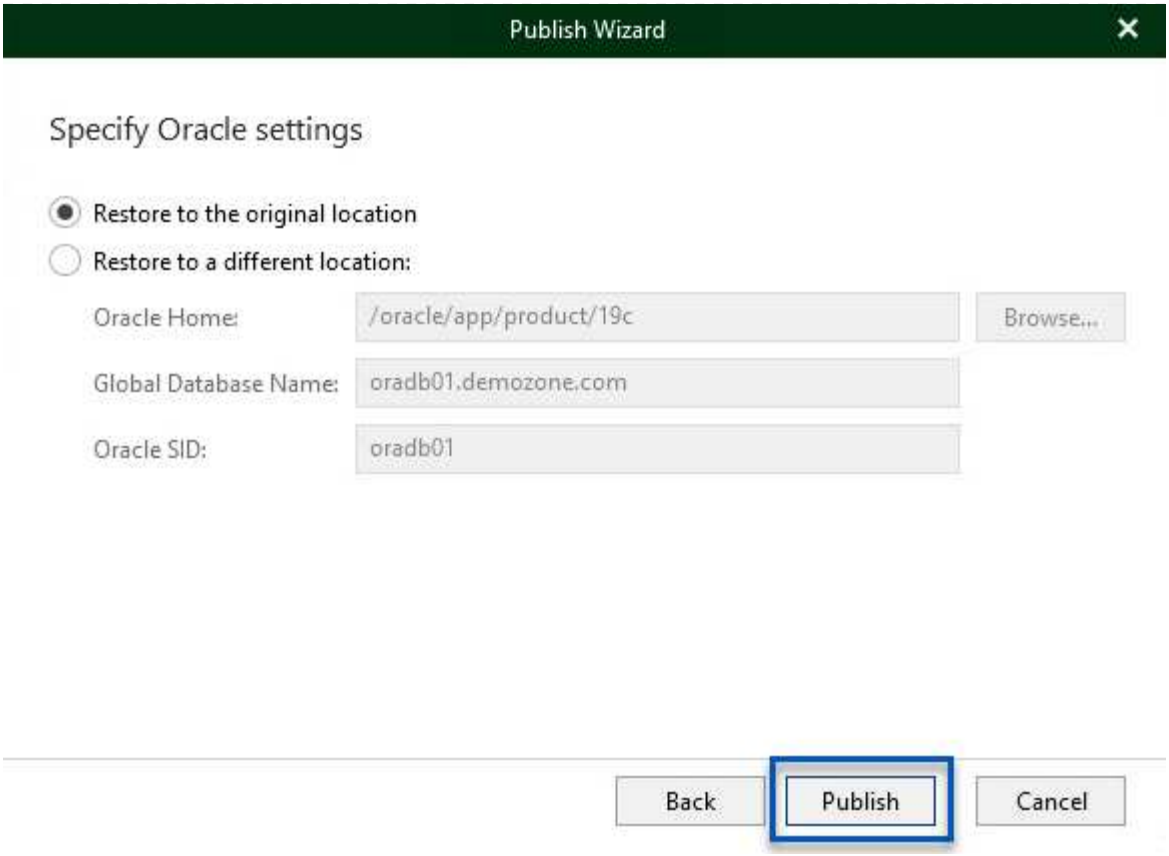
2. In the Oracle Database Restore Wizard select a restore point from the list and click on **Next**.



3. Enter a **Restore reason** if desired and then, on the Summary page, click on the **Browse** button to launch Veeam Explorer for Oracle.
4. In Veeam Explorer expand the list of database instances, click on the database to be restored and then from the **Publish Database** drop-down menu at the top select **Publish to another server…**.



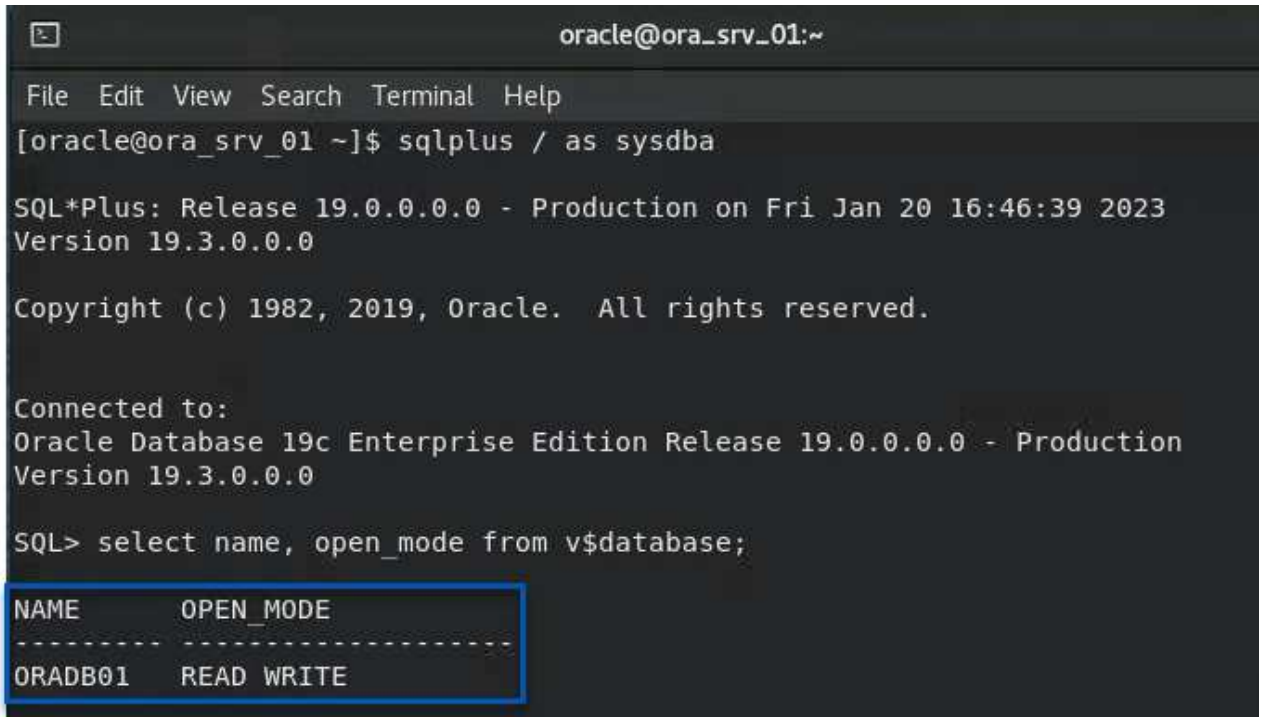
5. In the Publish wizard, specify the restore point at which to publish the database from and click **Next**.
6. Finally, specify the target linux file system location and click on **Publish** to begin the restore process.



7. Once the publish has completed log into the target server and run the following commands to ensure the database is running:

```
oracle@ora_srv_01> sqlplus / as sysdba
```

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



Conclusion

VMware Cloud is a powerful platform for running business-critical applications and storing sensitive data. A secure data protection solution is essential for businesses that rely on VMware Cloud to ensure business continuity and help protect against cyber threats and data loss. By choosing a reliable and robust data protection solution, businesses can be confident that their critical data is safe and secure, no matter what.

The use case presented in this documentation focuses on proven data protection technologies that highlight the integration between NetApp, VMware, and Veeam. FSx for ONTAP is supported as supplemental NFS datastores for VMware Cloud in AWS and is used for all virtual machine and application data. Veeam Backup & Replication is a comprehensive data protection solution designed to help businesses improve, automate, and streamline their backup and recovery processes. Veeam is used in conjunction with iSCSI backup target volumes, hosted on FSx for ONTAP, to provide a secure and easy to manage data protection solution for application data residing in VMware Cloud.

Additional Information

To learn more about the technologies presented in this solution refer to the following additional information.

- FSx for ONTAP User Guide
- Veeam Help Center Technical Documentation
- VMware Cloud on AWS Support. Considerations and Limitations

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