

Tintri IntelliFlash™ with Veeam® Backup & Replication

IntelliFlash™ Best Known Methods

Revision History

Version	Date	Author	Notes
1.1	January 2019	Harrison Waller	Previous version.
1.2.1	June 2019	Roy Scaife	Added support for Veeam 3.9.4 USAPI plug-in. Updated images using IntelliFlash 3.9.x. Updated best practice guide template. Minor text and grammar corrections.
2.0	February 2020	Harrison Waller	Ported to Tintri with appropriate modifications. Added section on IntelliFlash plugin.

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Introduction

Combining Tintri's IntelliFlash and Veeam's Backup & Replication (VBR) provides industry-leading performance with a robust feature set—enabling a variety of data protection strategies. This includes the ability to leverage the most efficient transport mode based on the configuration of the backup infrastructure.

Data reduction and deduplication technologies in Tintri IntelliFlash systems and Veeam's Backup & Replication software combine to reduce the effective space required to store backup data. The fully redundant hardware and high availability features help maximize data availability. Working together these features dramatically cut the overall cost of storage by enabling more data to be stored and quickly accessed, resulting in an efficient, small storage footprint.

This document covers the best practices for protecting virtual machines in VMware vSphere environments using Tintri IntelliFlash systems and Veeam's Backup & Replication solution. This guide will assist individuals who are responsible for the design and deployment of data protection and disaster recovery solutions of virtual machines deployed on Tintri IntelliFlash systems.

About Tintri

Based in Silicon Valley, Tintri is a wholly owned subsidiary of DataDirect Networks (DDN), the data-at-scale powerhouse and world's largest privately held storage company. Tintri delivers unique outcomes in Enterprise data centers. Tintri's AI-enabled Intelligent Infrastructure learns your environment to drive automation. Analytical insights help you simplify and accelerate your operations and empower data-driven business insights. Thousands of Tintri customers have saved millions of management hours using Tintri. Choose differently, the choice is yours. Where will you invest your resources to increase the scale and value of your business?

Learn more about the Tintri portfolio of solutions at <https://www.tintri.com/products>.

About Veeam

Veeam enables the always-on business by providing solutions that deliver availability for the modern data center, which provides recovery time and point objectives (RTPO) of less than 15 minutes for all applications and data. Veeam recognizes the challenge in keeping a business up and running at all times. Veeam addresses them with solutions that provide high-speed recovery, data loss avoidance, verified protection, leveraged data, and complete visibility.

Veeam's Backup & Replication leverages technologies that enable the modern data center, including VMware vSphere and Microsoft Hyper-V, to help organizations meet RTPO, save time, mitigate risks, and dramatically reduce capital and operational costs. The Veeam Availability Suite provides all the benefits and features of Veeam's Backup & Replication along with advanced monitoring, reporting, and capacity planning for the backup infrastructure.

Prerequisites

Individuals and administrators should be familiar with the following topics.

1. *General knowledge and familiarity of the IntelliFlash UI and basic setup tasks*
2. *General knowledge of Veeam's Backup & Replication solution*

Solution Overview

IntelliFlash systems and Veeam Backup & Replication jointly deliver an integrated, simple, yet powerful data protection solution for today's complex virtualized environments. Veeam's Backup & Replication software takes advantage of the industry-leading inline deduplication and compression technology built into IntelliFlash arrays. When combined, the result is a fast and compact backup, providing a high availability and site recovery solution. This joint solution delivers dramatic reductions in the cost and complexity of protecting virtual server infrastructure while meeting increasingly aggressive SLAs.

The deployment of Tintri IntelliFlash systems with Veeam's Backup & Replication falls into two general categories.

1. *Backup repository - Leveraging IntelliFlash Arrays as a primary backup infrastructure target.*
2. *Virtual Machine Protection - Protect VMs on VMware (VMFS/NFS) that use IntelliFlash as a datastore.*

Tintri IntelliFlash Veeam Plugin

Starting with Veeam's Backup & Recovery application release version 9.5.4b a plug-in is available that integrates with IntelliFlash array-based snapshot capabilities. The Tintri IntelliFlash Plug-In for Veeam Backup and Replication is supported starting in IntelliFlash version 3.9.2 and was developed using Veeam's new Universal Storage API (USAPI), which is faster and more efficient than the traditional VMware API.

Now, you can use the IntelliFlash array to generate snapshots instead of the hypervisor, which consumes fewer resources and lowers RPO significantly. The plug-in enables the following VMware-specific Veeam features.

1. *Veeam Explorer from storage snapshots*
2. *Veeam snapshot-only jobs*
3. *Veeam OnDemand Labs for storage snapshots*
4. *Backup from storage snapshots*

Note: The IntelliFlash plugin for Veeam Backup & Replication is also supported starting at 3.10.1 with release 2866.

Benefits

New and existing Veeam users will realize the benefits of using IntelliFlash as a snapshot repository for a variety of use cases, including:

- *Increased backup and recovery*
- *High-speed Disaster Recovery (DR) and business continuity with low RTPO*
- *Creating copies of VMs for testing, analytics, and development*
- *Reducing data storage capacity using compression and deduplication from Veeam and IntelliFlash*

The solution offers a VM-aware storage and data protection solution that is ideal for virtualized environments. IntelliFlash arrays can take granular snapshots that provide application-consistent recoveries. These snapshots can be browsed by Veeam's Backup and Recovery application and used for recovery.

VM Protection and Transport Modes

The following sections discuss Veeam Backup & Replication use transport modes to protect virtual machines and guide you through implementing these tasks.

A VMware (VMFS/NFS) datastore is a storage location for virtual machine files. When the datastore resides on an IntelliFlash it consists of a LUN or NFS share presented to one or more ESXi hosts that has been formatted as a VMFS or NFS datastore. Veeam's Backup & Replication can be configured to protect the IntelliFlash based datastores via three supported transport modes.

- *Direct Storage Access Transport Mode - Both SAN and NFS access are supported.*
- *Virtual Appliance Transport Mode - Also called HotAdd mode.*
- *Network Transport Mode - Also called LAN Transport Mode.*

Automatic Selection

By default, Veeam's Backup & Replication will use automatic backup proxy transport selection. In this mode, the backup proxy and the connected VMFS/NFS datastores are analyzed to determine the most efficient transport mode. The default mode can be altered by editing the properties of the backup proxy.

When **Automatic Selection** transport mode (Figure 1) is configured, Veeam's Backup & Replication will scan the backup proxy configuration and its connection to the VMware vSphere infrastructure to choose the optimal transport mode.

If several transport modes are available for the same backup proxy, Veeam Backup & Replication will choose the mode in the following order.

1. *Direct storage Access Transport Mode*
2. *Virtual Appliance Transport Mode*
3. *Network Transport Mode*

Edit VMware Proxy

Server
Choose server for new backup proxy. You can only select between Microsoft Windows servers added to the managed servers which are not proxies already.

Server
Traffic Rules
Summary

Choose server:
tme126-103 Add New...

Proxy description:
Created by Veeam Backup & Replication

Transport mode:
Automatic selection Choose...

Connected datastores:
Automatic detection (recommended) Choose...

Max concurrent tasks:
8 ✓

< Previous Next > Finish Cancel

Figure 1 - Automatic Selection

In addition, there are two optional parameters that can be modified (Figure 2). The first is ***Failover to network mode if primary mode fails or is unavailable***. This option is enabled by default. The second optional parameter enables the NBDSSL protocol when LAN Transport Mode is configured.

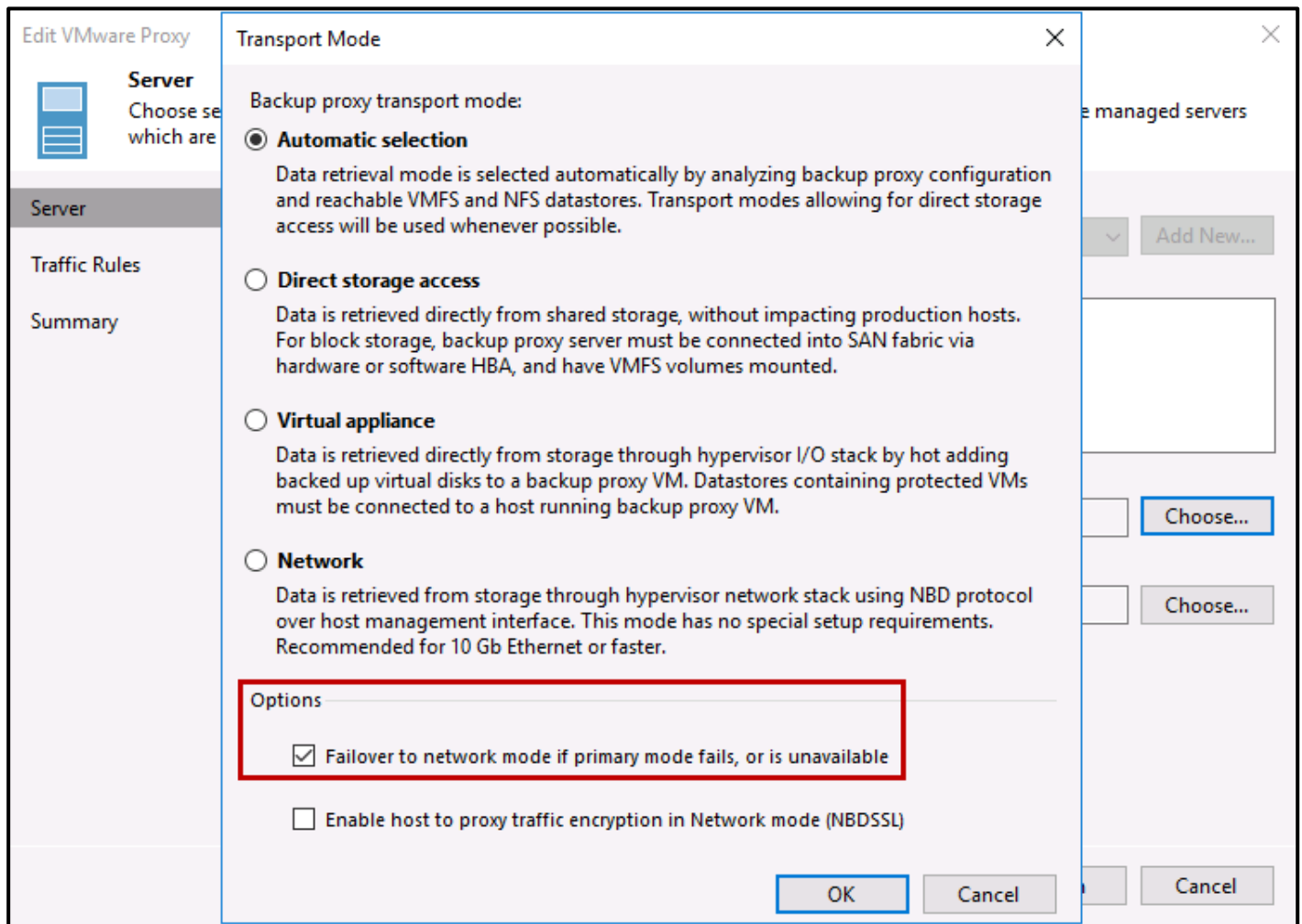


Figure 2 - Proxy Transport Mode

Let's now look at each of the transport modes in detail.

Direct Storage Access Transport Mode

In Direct Storage Access mode, Veeam Backup & Replication reads and writes data directly from and to the Tintri IntelliFlash where VM data or backups are located.

Direct Storage Access mode comprises of two transport modes.

- *Direct SAN Access*
- *Direct NFS Access*

Starting with Veeam Backup & Replication version 9.0, Veeam introduced Direct NFS Access mode. The IntelliFlash is a multi-protocol system and supports both SAN and NAS which allows customers to leverage Direct Storage Access mode using both the SAN and NAS protocols.

Note: In the following diagrams the backup server and the backup could be the same system.

Direct SAN Access Mode

During backup operations in Direct SAN Access mode, VM data blocks are retrieved directly from a LUN residing on the IntelliFlash array using either iSCSI or FC protocol.

Note: In this mode no data is transferred through the hypervisor stack, and no load is placed on the production environment. This is the most efficient transport mode to backup VMs on VMFS datastores.

In Direct SAN Access Mode, data is retrieved using the following steps as shown in Figure 3.

1. Backup proxy sends a request to the ESXi hypervisor host to locate the VM on the datastore.
2. The ESXi host locates the VM.
3. Veeam Backup & Replication triggers VMware vSphere to create a VM snapshot.
4. The VM-disk layout metadata (physical addresses of data blocks on IntelliFlash) is retrieved by ESXi.
5. The ESXi host sends the retrieved metadata to the Veeam backup proxy server.
6. The Veeam backup proxy uses the metadata to copy data blocks directly from the IntelliFlash array.
7. The Veeam backup proxy server sends the copied data blocks to the target/backup repository.

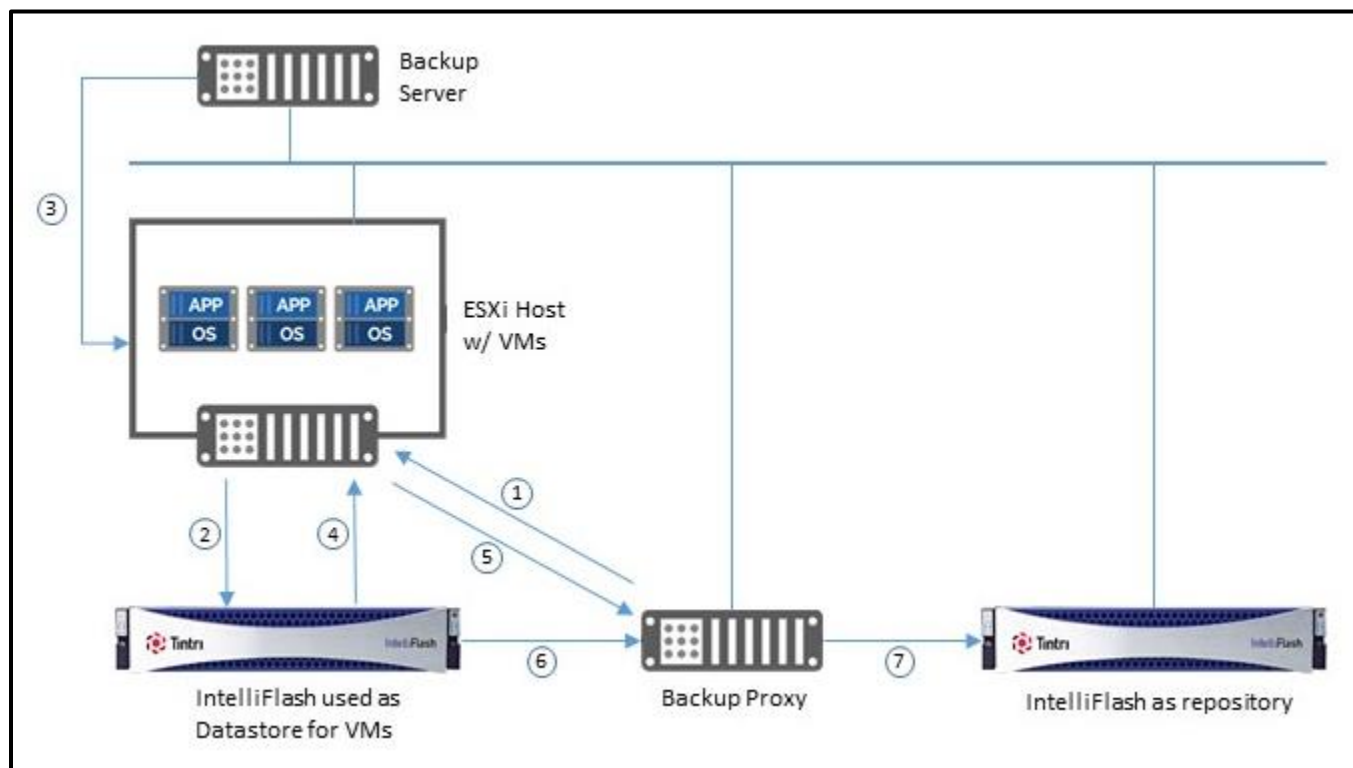


Figure 3 - Direct SAN Access Mode

In the Direct SAN Access Transport Mode, Veeam leverages VMware VADP to transport VM data directly to and from the IntelliFlash array over iSCSI and FC bypassing the hypervisor stack thereby placing no load on the production environment or network. Direct SAN access transport mode provides the fastest data transfer speed and produces no load on the production network.

Direct NFS Access Mode

Prior to the introduction of this transport mode, data on NFS datastores could only be backed up using HotAdd or Network Transport Mode (NBD). These modes place heavy load on the LAN and uses VMware VDDK to communicate with the ESXi host which produces additional load on the ESXi host. With Direct NFS access mode, Veeam Backup & Replication bypasses the ESXi host by deploying its native NFS client on the backup proxy and uses it for VM data transport. This is way there is no load on the ESXi host.

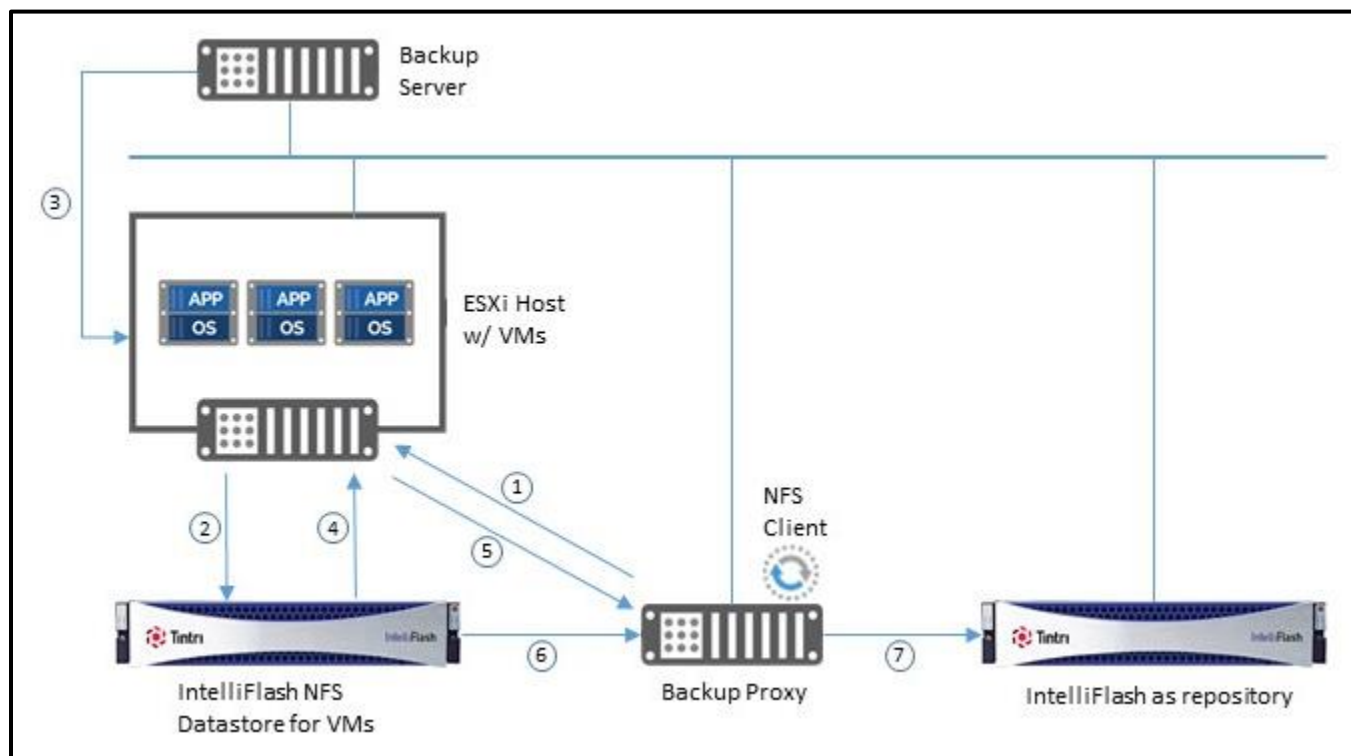


Figure 4 - Direct NFS Access Mode

In Direct NFS Access Mode (Figure 4), data is retrieved using the following steps similar to Direct FC Access:

1. The Veeam backup proxy sends a request to the ESXi host to locate the VM on the NFS datastore.
2. The ESXi host locates the VM.
3. Veeam Backup & Recovery triggers VMware vSphere to create a VM snapshot.
4. The VM-disk layout metadata (physical addresses of data blocks on IntelliFlash) is retrieved by ESXi.
5. The ESXi host sends the retrieved metadata to the Veeam backup proxy server.
6. The Veeam backup proxy uses the metadata to copy data blocks directly from the NFS datastore.
7. The Veeam backup proxy server sends the copied data blocks to the backup repository.

Note: There are some limitations with Direct NFS mode since Veeam Backup & Replication cannot parse delta disks it can't be used for VMs that have at least one snapshot. Direct NFS mode is used during the first session of a replication job. During subsequent jobs another transport mode will be used to write VM data to the backup repository.

Virtual Appliance Transport Mode

Virtual Appliance Transport mode is also referred to as HotAdd mode. In the Virtual Appliance Transport mode, Veeam uses the VMware SCSI HotAdd capability that allows attaching a device to a VM while the VM is running. Disks of the processed VMs are attached to the backup proxy during backup, replication, and restore operations. VM data is retrieved or written directly from and to the datastore instead of going through the network.

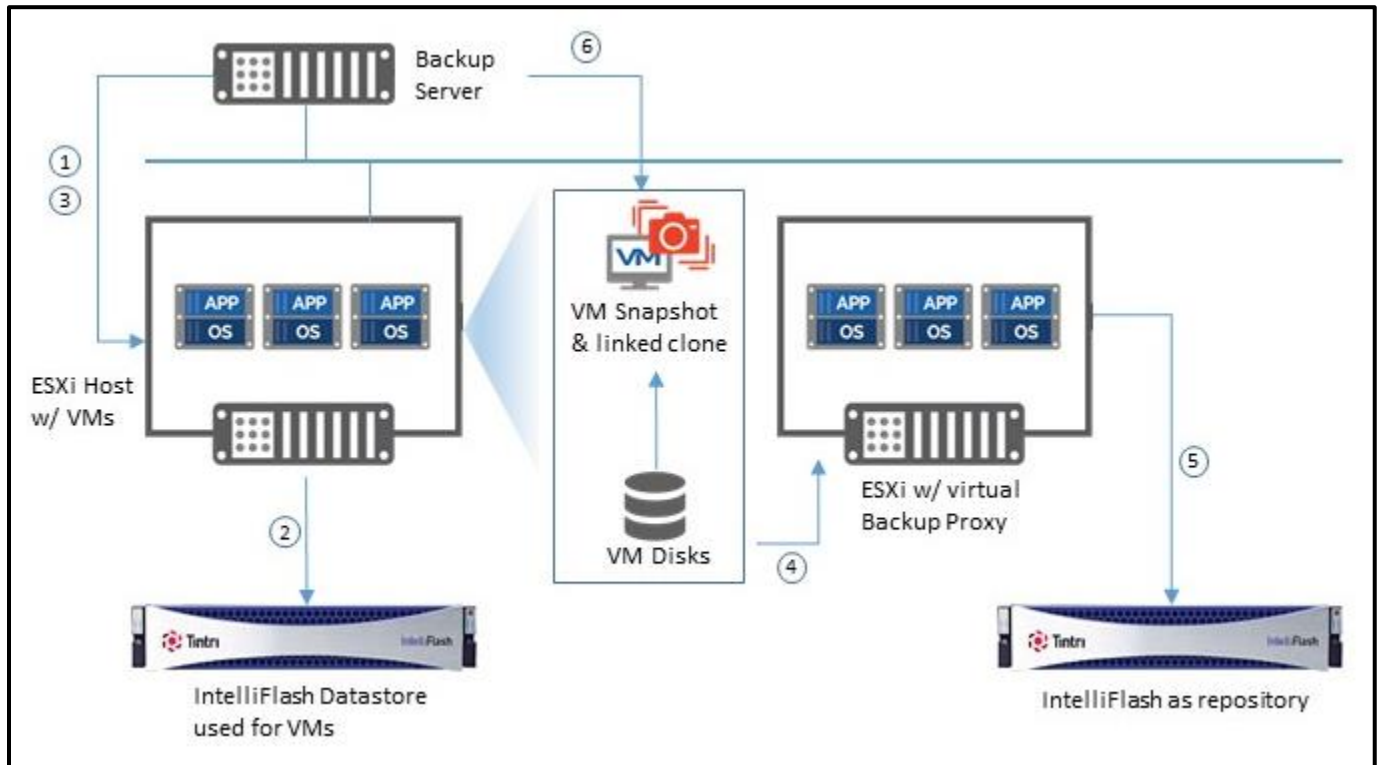


Figure 5 - Virtual Appliance Transport Mode

In Virtual Appliance Mode, data is retrieved using the following steps.

1. The Veeam backup server sends a request to the ESXi host to locate the VM on the NFS datastore.
2. The ESXi host locates the VM.
3. Veeam Backup & Replication triggers VMware vSphere to create a VM snapshot and linked clone.
4. The VM disks of the linked clone are attached (hot-added) to the Veeam backup proxy server.
5. Veeam Backup & Replication reads data directly from disks through the ESXi hypervisor.
6. VM disks are detached from the Veeam backup proxy and the VM snapshot is deleted.

Note: This mode is not as efficient as the Direct Storage Access Mode because the load is on the production environment. However, this mode provides relatively better performance than the Network Transport Mode, as the load is off the LAN. VM data is retrieved or written directly from and to the datastore, instead of going through the network.

Network Transport Mode

This mode is also referred to as LAN Transport Mode. Network Transport mode uses the NBD or NBDSSL protocol to move data over a TCP/IP connection. In this mode, data is retrieved via the ESXi host over the LAN using the NBD protocol.

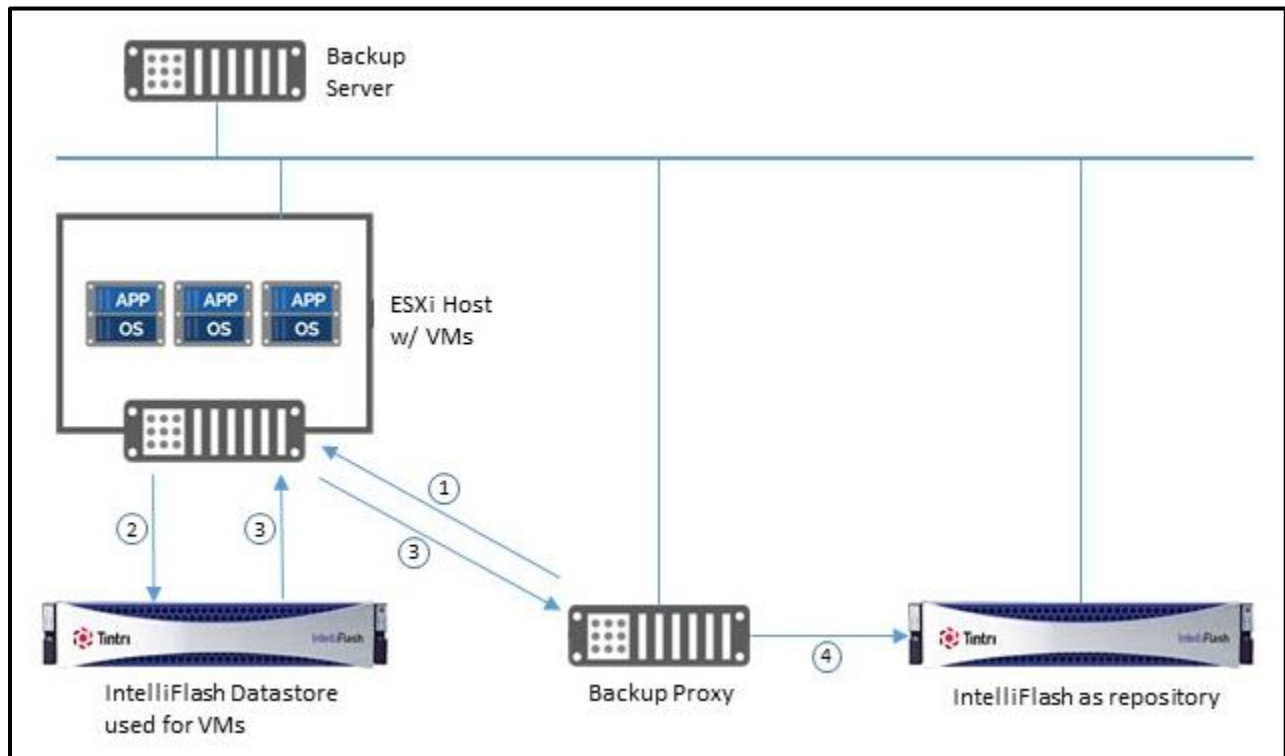


Figure 6 - Network Transport Mode

In Network mode, data is retrieved using the following steps.

1. The backup proxy sends a request to the ESXi host to locate the VM on the datastore.
2. The ESXi host locates the VM on the datastore.
3. The VM data blocks are copied from the storage to the backup proxy over the LAN.
4. The Veeam backup proxy server sends the data to the target/backup repository.

Note: The Network Transport Mode is not recommended because of low data transfer speeds over the LAN. Two other modes are recommended to reduce the load on the LAN.

Best Practices

The following list summarizes the key best practices identified in this guide.

Usage	Recommendation
VMFS Datastore	Use Direct SAN Access Transport mode to backup VMs on VMFS datastores.
NFS Datastore ¹	Use Direct NFS Access Transport mode to backup VMs on NFS datastores.
Storage Efficiency	<ul style="list-style-type: none">▪ Enable deduplication and compression on the IntelliFlash Array.▪ Align backup file data blocks with 64KB LUNs/shares.▪ Use gzip compression
Backup Repository	Enable the following backup repository settings. <ul style="list-style-type: none">▪ Decompress backup data blocks before storing▪ Use per-VM backup files
Mount Server	Enable the vPower NFS service on the mount server.

Note: Veeam Backup & Replication cannot parse delta disks in Direct NFS mode therefore only the first session of a backup will use this mode. Additional sessions will use a different transport mode.

Prerequisites

Before adding the IntelliFlash as a backup target or installing the IntelliFlash Veeam Plugin ensure you've reviewed the following prerequisites.

Adding a Server

Several of the tasks in the following sections require access to the **Storage Infrastructure** tab of Veeam Backup & Replication. By default, the Storage Infrastructure tab is not visible until you add a server in the **Infrastructure** tab under **Virtual Infrastructure**. Since this document focuses on an example around ESXi the steps to add that type of server are shown below.

1. Click on the Inventory tab and then highlight Virtual Infrastructure. In the right window click Add Server. (Figure 7)

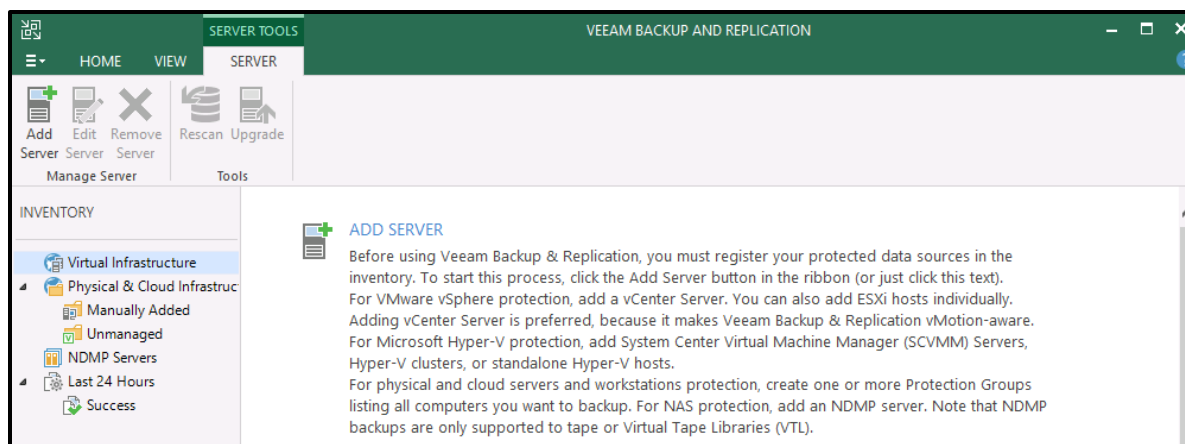


Figure 7 - Adding a Server

2. On the Add Server window click on VMware vSphere (Figure 8).

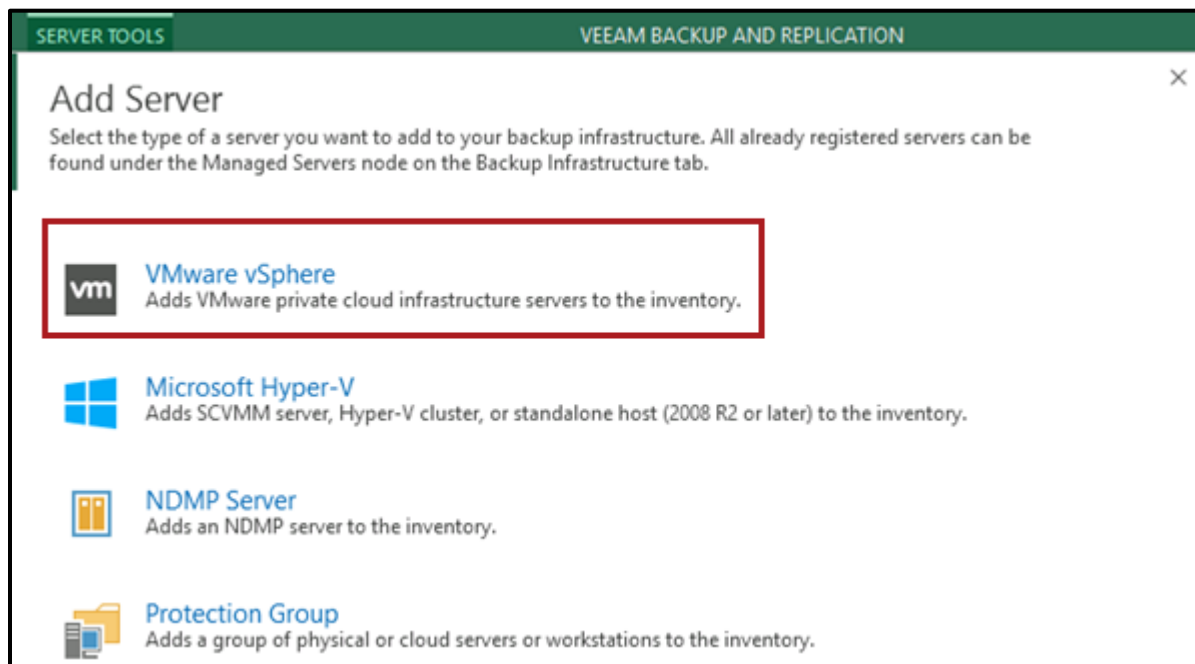


Figure 8 - Select VMware vSphere

3. Click on vSphere (Figure 9).

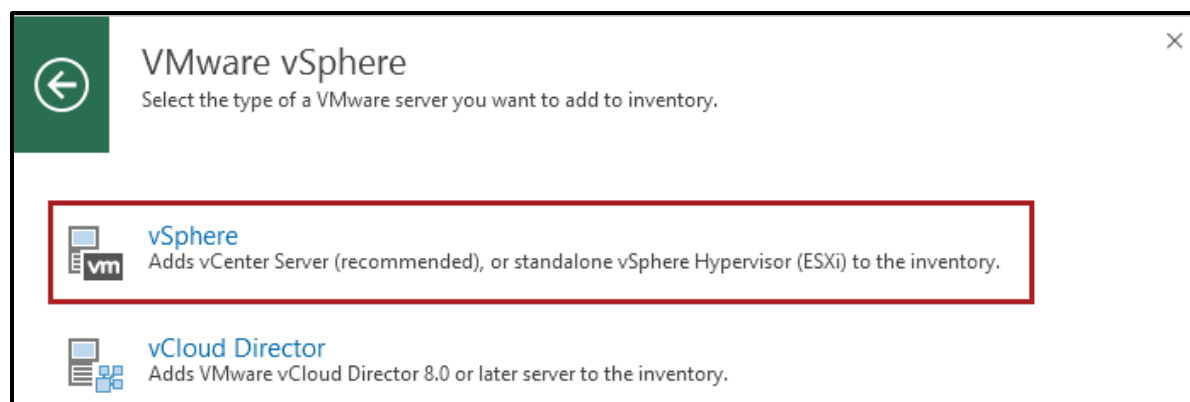


Figure 9 - Select vSphere

4. Enter in the ESXi and vSphere IP address and click **Next** (Figure 10).

The screenshot shows the 'New VMware Server' wizard window. On the left is a sidebar with a 'vm' icon and a list of steps: 'Name', 'Credentials', 'SSH Connection', and 'Summary'. The 'Name' step is selected. The main area has a title 'Name' and a subtitle 'Specify DNS name or IP address of VMware server.' Below this is a text input field labeled 'DNS name or IP address:' containing the IP address '10.204.126.137'. This field is highlighted with a red rectangular box. Below the input field is a 'Description:' label and a text area containing the text 'Created by TME126-103\Administrator at 2/18/2020 5:33 PM.' At the bottom right of the window are four buttons: '< Previous' (disabled), 'Next >' (highlighted with a blue box), 'Finish' (disabled), and 'Cancel' (disabled).

Figure 10 - IP Address of ESXi or vSphere server

5. Enter an account with local administrative privileges for that server and click next (Figure 11). After clicking next you may need to accept a certificate.

The screenshot shows the 'New VMware Server' wizard with the 'Credentials' step selected. The left sidebar contains 'Name', 'Credentials', 'SSH Connection', and 'Summary'. The main area has a title bar 'Credentials' and a subtitle 'Select server administrator's credentials. If required, specify additional connection settings including web-service port number.' Below this, a text box instructs to 'Select an account with local administrator privileges on the server you are adding. Use DOMAIN\USER format for domain accounts, or HOST\USER for local accounts.' A dropdown menu labeled 'Credentials:' shows 'administrator (administrator, last edited: 8 days ago)' with a magnifying glass icon. To the right of the dropdown is an 'Add...' button and a 'Manage accounts' link. At the bottom, a text box states 'Default VMware web services port is 443. If connection cannot be established, check for possible port customization in the vCenter Server or ESX(i) server settings.' Below this is a 'Port:' label and a spinner box set to '443'. The bottom of the window has four buttons: '< Previous', 'Next >', 'Finish', and 'Cancel'.

New VMware Server

Credentials
Select server administrator's credentials. If required, specify additional connection settings including web-service port number.

Name

Credentials

SSH Connection

Summary

Select an account with local administrator privileges on the server you are adding. Use DOMAIN\USER format for domain accounts, or HOST\USER for local accounts.

Credentials:

administrator (administrator, last edited: 8 days ago)

Add...

[Manage accounts](#)

Default VMware web services port is 443. If connection cannot be established, check for possible port customization in the vCenter Server or ESX(i) server settings.

Port: 443

< Previous Next > Finish Cancel

Figure 11 - Select credentials

6. Review the summary page and click **Finish** (Figure 12).

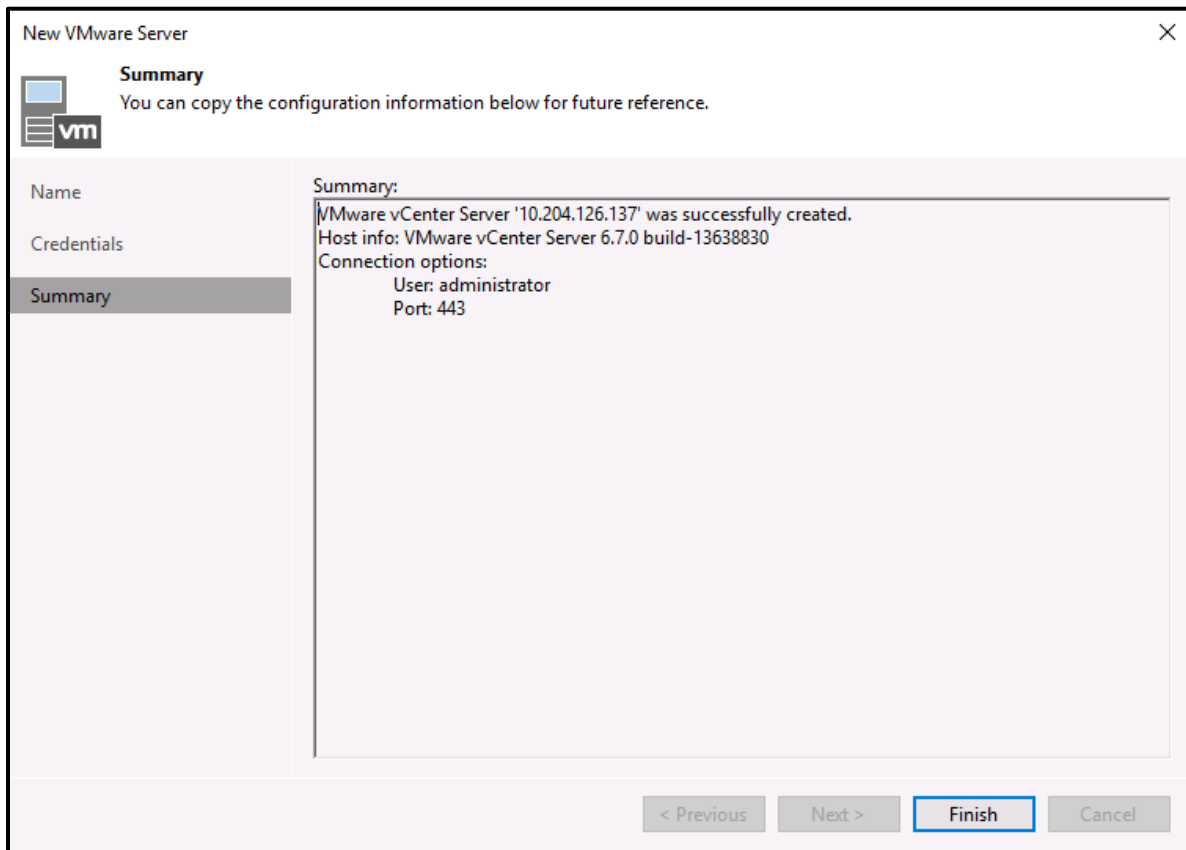


Figure 12 - Add server summary

With a server now added to the infrastructure the Storage Infrastructure tab becomes available. Now you can continue with adding backup repositories by adding generic or plugin supported storage.

IntelliFlash as a Backup Target

The following sections provide the appropriate steps to configure your virtual machine backups using an IntelliFlash array as a backup target. This does not require installation of the IntelliFlash Veeam Plugin.

Creating a Veeam Backup Repository

A backup repository is a location used by Veeam Backup & Replication jobs to store backup files, VM copies, and metadata for replicated VMs. This section examines the use of an IntelliFlash volume deployed as a backup repository.

Configuring a Veeam backup repository is accomplished quite easily in 2 phases:

- *Create and mount an IntelliFlash LUN*
- *Add the mounted IntelliFlash LUN to Veeam as a backup repository.*
- *Configure a Veeam backup job.*

Create an IntelliFlash LUN as a Veeam Backup Repository

Follow the steps below to create an IntelliFlash LUN.

1. In the IntelliFlash UI, click Provision | Projects.
2. In the Projects panel, select the Project where the LUN will reside.
3. In the Pool/Project panel, select the LUNS tab and click New.
4. In the LUN page, click the Add LUN button at the bottom left of the Dataset panel.
5. Enter a name for the LUN and set the LUN size based on your requirements. In the below example, a 4TB LUN named Repository is being created.
6. Select the Backup purpose and choose the intended protocol. In Figure 13 iSCSI is used.

New LUN in pool-a > Veeam-Block

LUN Properties

- LUN Properties
- iSCSI Target
- iSCSI Initiator
- FC Target Group
- FC Initiator Group
- Snapshots
- Summary

Name and Size configuration

Quantity: ☒ Single ☐ Multiple

LUN Name: * Repository

LUN Size: * 4 TiB

Thin Provisioning: ☒

Purpose

Purpose: Backup

Block Size: 64KiB

Protocol: iSCSI

Cancel Back Next

Figure 13 - Creating an IntelliFlash LUN

Note: It is a best practice to enable deduplication and compression on the IntelliFlash. IntelliFlash's native deduplication and compression complement Veeam's deduplication. Veeam handles data deduplication within a backup job and IntelliFlash's native deduplication efficiently deduplicates data across multiple backup jobs.

The screenshot shows the IntelliFlash web interface. At the top is a dark navigation bar with the IntelliFlash logo and menu items: Dashboard, Analytics, Provision (highlighted), Services, and Settings. Below the navigation bar is a breadcrumb trail: 'Back' button followed by 'You are at : pool-a/Veeam-Block/Repository'. The main section is titled 'LUN Settings' and has three tabs: 'General' (selected), 'Thresholds', and 'Advanced'. Under the 'General' tab, the following settings are visible: 'LUN Name: Repository', 'LUN Size: 4' (with a spinner) and 'TiB' (with a dropdown arrow), 'Purpose: Backup' (highlighted with a red rectangle), 'Block Size: 64KiB', and 'Protocol: ☒ iSCSI' (with a dropdown arrow).

Figure 14 - IntelliFlash LUN Settings - General Tab

Selecting the **Backup** template ensures the settings highlighted in Figure 14 are enabled. These settings are displayed by selecting the LUN name, then clicking the Manage option, and selecting Settings.

Select the Advanced menu tab (Figure 15) to see the compression and deduplication settings. Ensure the **compression** is set to **gzip** and **deduplication** is **on**.

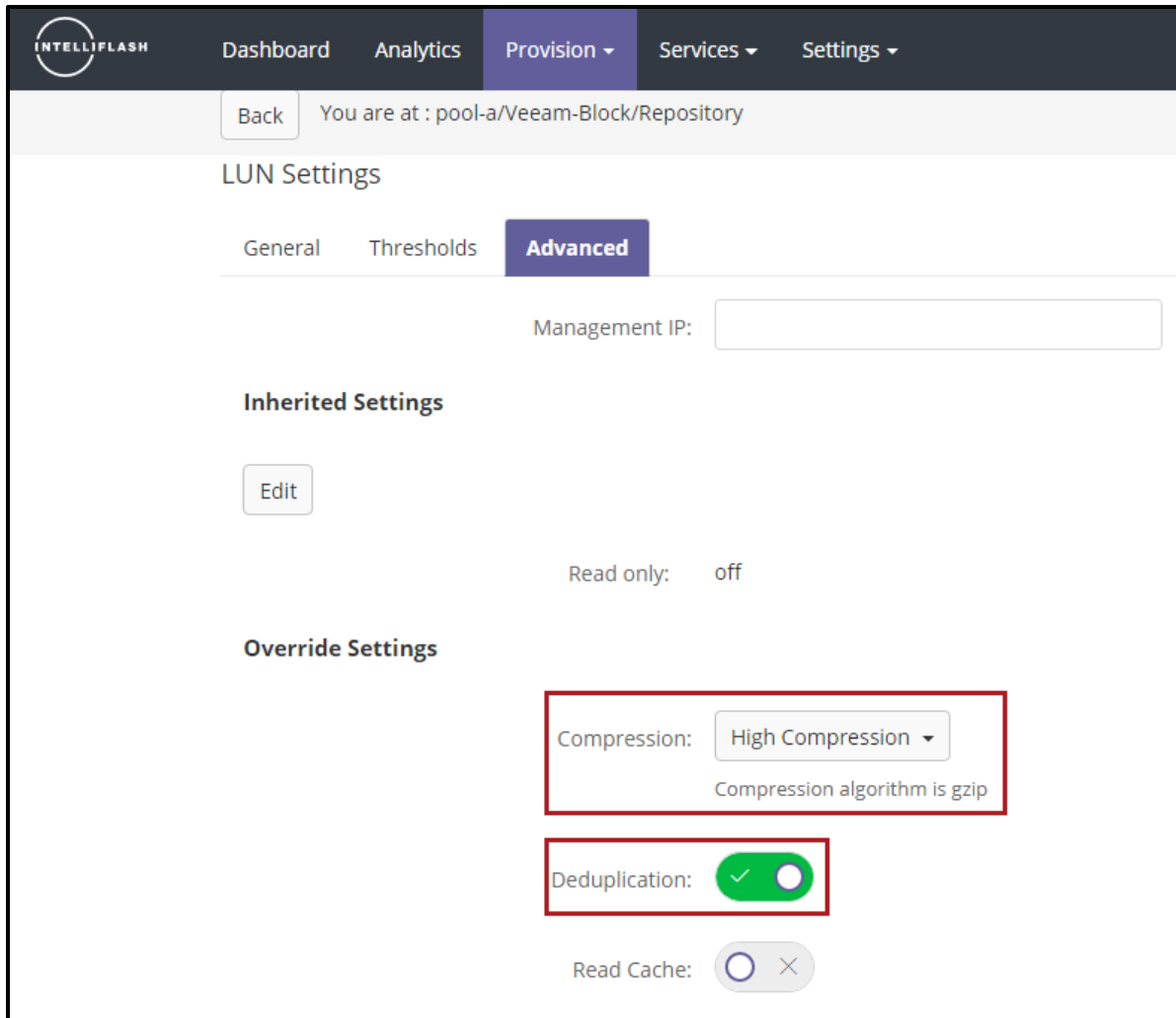


Figure 15 - IntelliFlash LUN Settings – Advanced

After the LUN has been created mount it to the Veeam

Adding IntelliFlash LUNs as a Veeam Backup Repository

Follow the steps below to add the IntelliFlash LUN as a Veeam Backup Repository.

1. Ensure the iSCSI or FC LUN is visible to the Veeam Backup proxy and that all multipathing is properly configured.
2. The unformatted disk should be listed under **Computer Management | Storage | Disk Management**.
3. Create a new simple volume on the unformatted disk and ensure the Allocation unit size is set to **64K**. (See Figure 16)

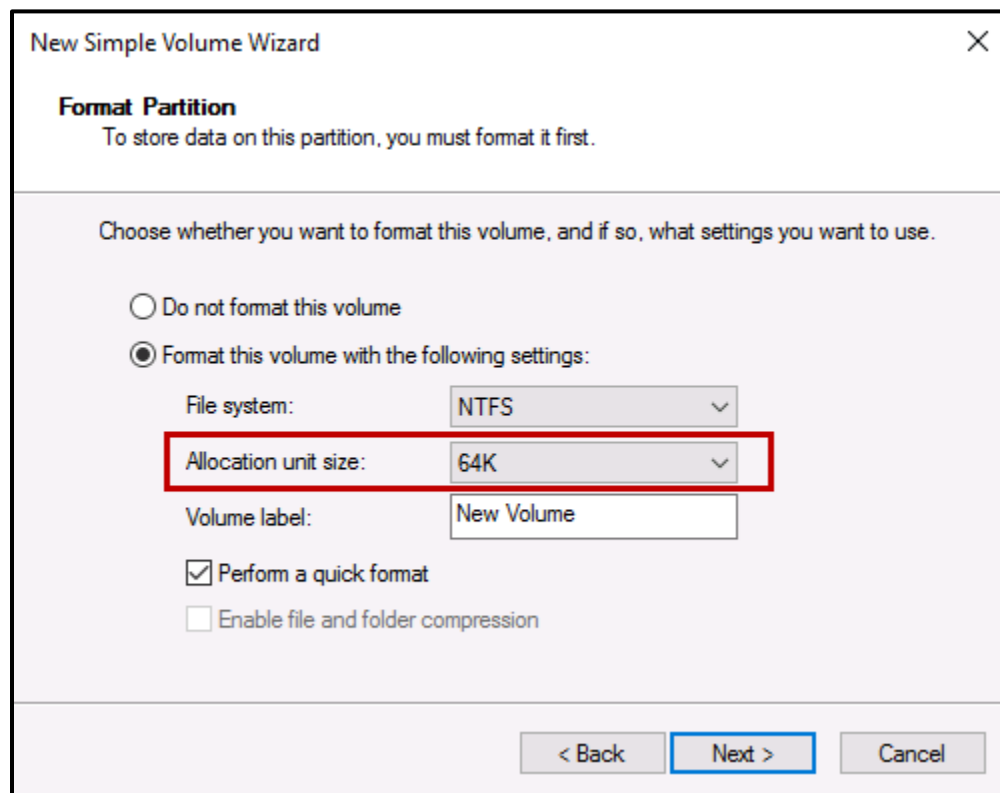


Figure 16 - Format Partition

4. In the Veeam Backup & Replication UI, select Backup Repositories.
5. Click the Add Repository icon in the upper menu.
6. Click the Direct attached storage option in the Add Backup Repository window (Figure 17).

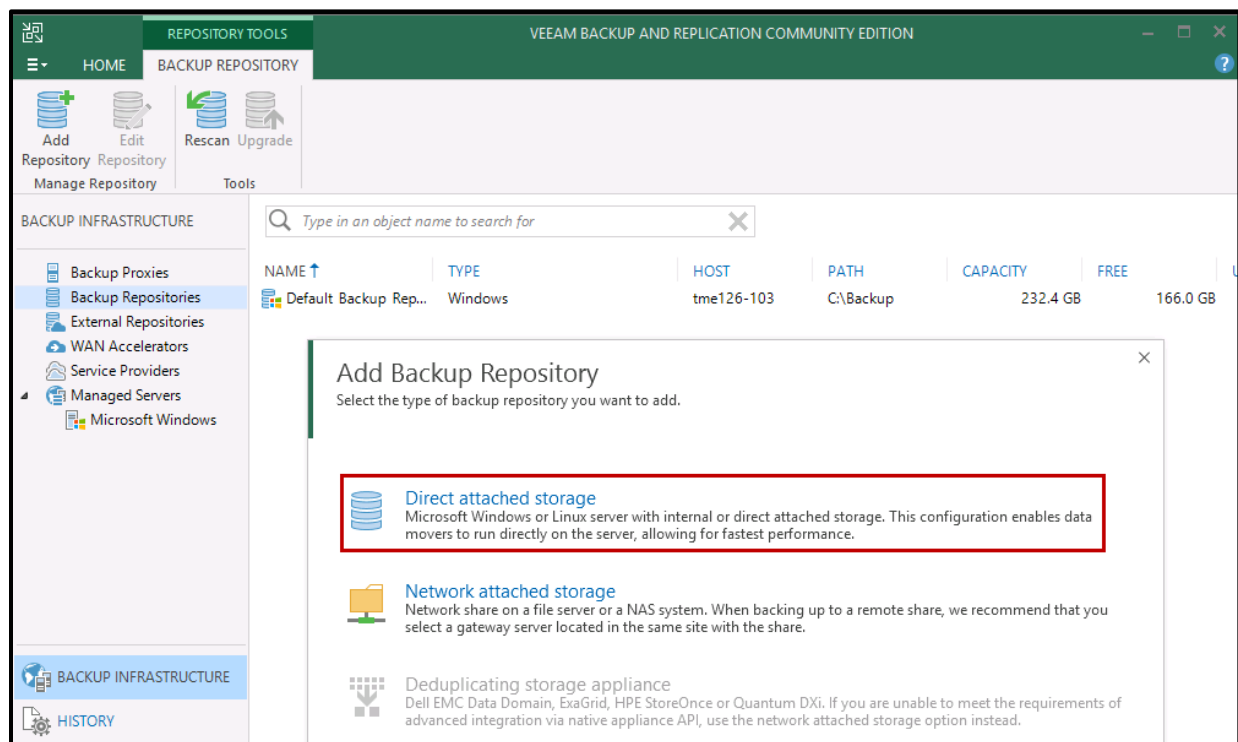


Figure 17 –Direct Attached Storage as Backup Repository

7. The Microsoft Windows server option is recommended for most deployments, as shown in Figure 18 below.
8. Provide a name for the new backup repository and click the Next button.

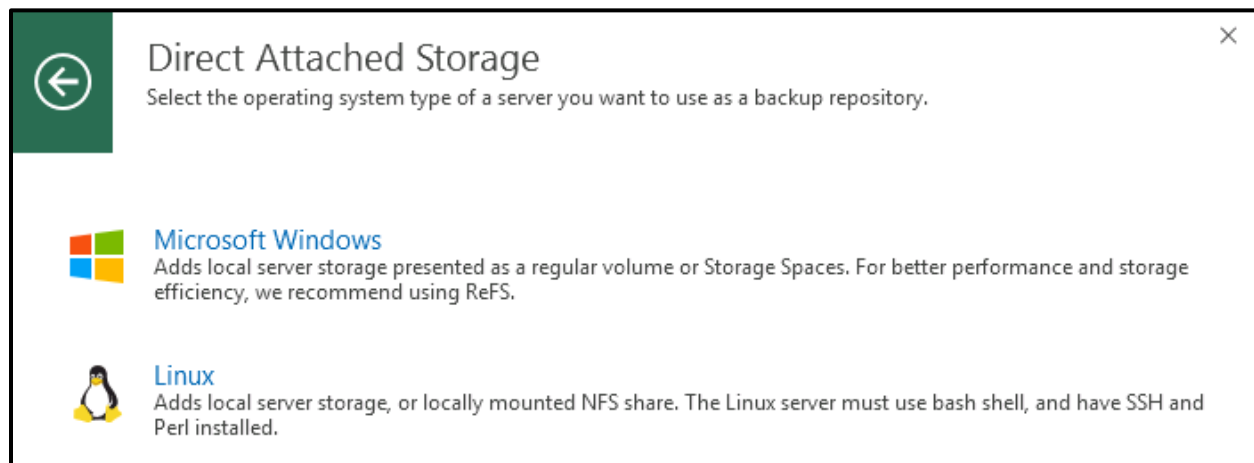


Figure 18 - Direct Attached Storage OS Selection

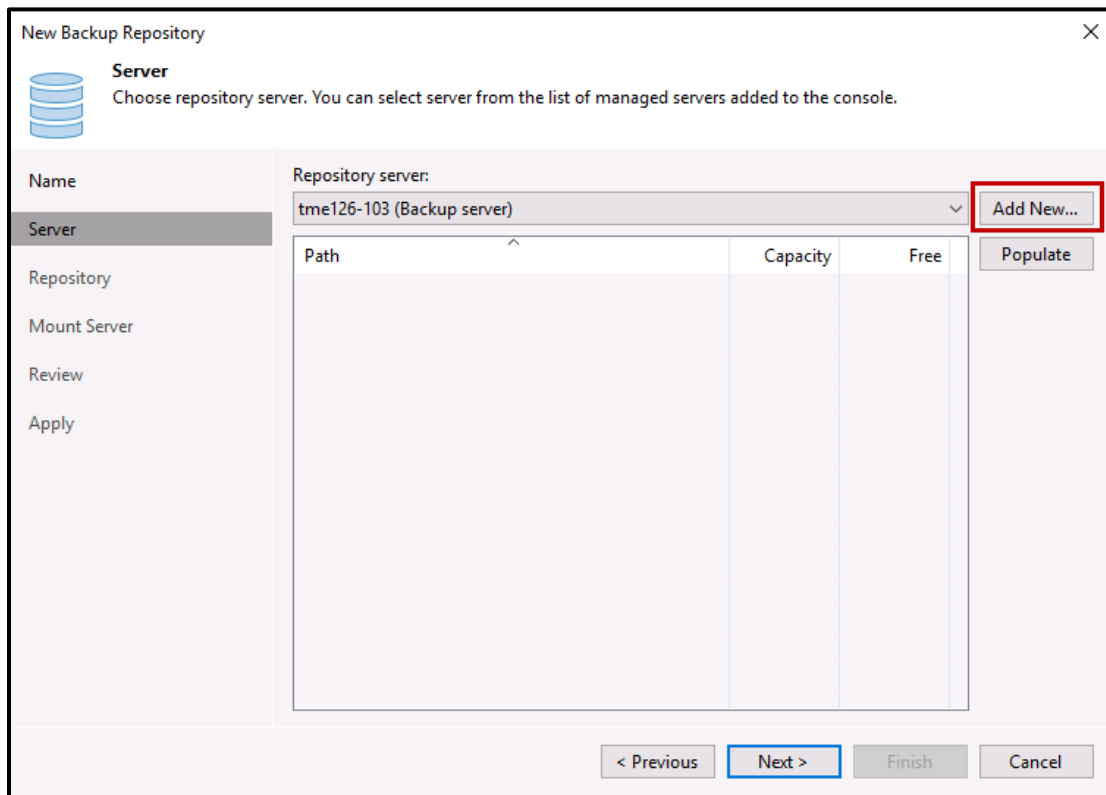


Figure 19 – Add New Repository Server

9. Click the **Add New** button to provide the repository server details (Figure 19).

10. Specify the IP address or the FQDN name of the Microsoft Windows Server and click **Next** (Figure 20).

Figure 20 - Add a New Windows Server

11. Navigate through the wizard to provide the credentials.
12. Review the summary and click **Finish**. The configuration of the server performing backups of the repository is complete.
13. In the New Backup Repository window, click the **Populate** button to display the available file system paths, capacity, and free space.

The screenshot shows the 'New Backup Repository' window at the 'Server' step. A sidebar on the left contains navigation links: Name, Server (highlighted), Repository, Mount Server, Review, and Apply. The main area displays 'Repository server:' with a dropdown menu showing 'tme126-103 (Backup server)'. Below this is a table listing available paths:

Path	Capacity	Free
C:\	232.4 GB	166.0 GB
D:\	4.0 TB	4.0 TB

To the right of the table are two buttons: 'Add New...' and 'Populate' (which is highlighted with a red rectangle). At the bottom of the window are four buttons: '< Previous', 'Next >' (highlighted with a blue border), 'Finish', and 'Cancel'.

Figure 21 - Select Backup Repository Path

15. The Repository window displays the location of the backup. Verify the correct **Path to folder** is selected. By default, a folder named **Backups** is created in the selected location.

16. Click the **Populate** button to display the capacity and free space on the specified path (Figure 22).

Note: Veeam will prompt that your chosen filesystem is not formatted with ReFS. IntelliFlash Repositories should not be formatted as ReFS as NTFS is best practice for SAN volumes. This also provides support for UNMAP, whereas ReFS does not provide this and results in Thin-provisioned LUN's becoming thick over time (unallocated space not returned).

New Backup Repository

Repository
Type in path to the folder where backup files should be stored, and set repository load control options.

Name

Server

Repository

Mount Server

Review

Apply

Location

Path to folder:
D:\Backups

Browse...

Populate

Capacity: 4.0 TB
Free space: 4.0 TB

Load control

Running too many concurrent tasks against the same repository may reduce overall performance, and cause I/O operations to timeout. Control storage device saturation with the following settings:

☒ Limit maximum concurrent tasks to: 4

☐ Limit read and write data rates to: MB/s

Click Advanced to customize repository settings

Advanced...

< Previous Next > Finish Cancel

Figure 22 - Display Capacity and Free Space

17. Click the Advanced button to display the Storage Compatibility Settings dialog window (Figure 23).
18. Select **Align backup file data blocks**, **Decompress backup data blocks before storing**, and **Use per-VM backup files**. These options are disabled by default.
19. Click **OK**.

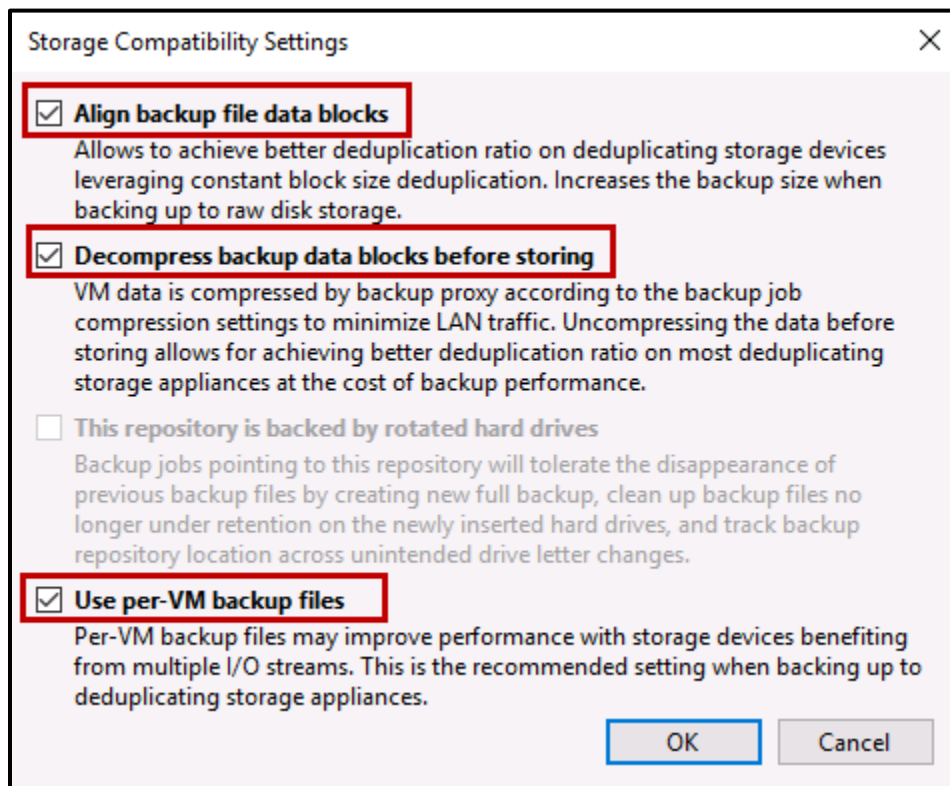



Figure 23 - Configure Storage Compatibility Settings

Note: Enabling **Use per-VM backup files** is beneficial when more than one virtual machine will be backed up and can increase backup performance significantly. When this option is enabled Veeam creates a separate backup chain for every VM added to the job.

20. It is recommended to enable the vPower NFS service. After enabling the vPower NFS service, specify a vPower NFS write cache location on the mount server.
21. Review the settings and click the **Next** button to continue (not shown).

New Backup Repository



Review

Please review the settings, and click Apply to continue.

Name

Repository type:

Windows

Server

Mount host:

tme126-103

Repository

Account:

Not set

Mount Server

Backup folder:

D:\Backups

Write throughput:

Unlimited

Max parallel tasks:

4

Review

Apply

The following components will be processed on server tme126-103:

Component name	Status	
Transport	already exists	
vPower NFS	already exists	
Mount Server	already exists	

☐ Import existing backups automatically

☐ Import guest file system index

< Previous

Apply

Finish

Cancel

Figure 24 - Review Backup Repository Settings

22. Click the **Apply** button to deploy the backup repository (Figure 24).

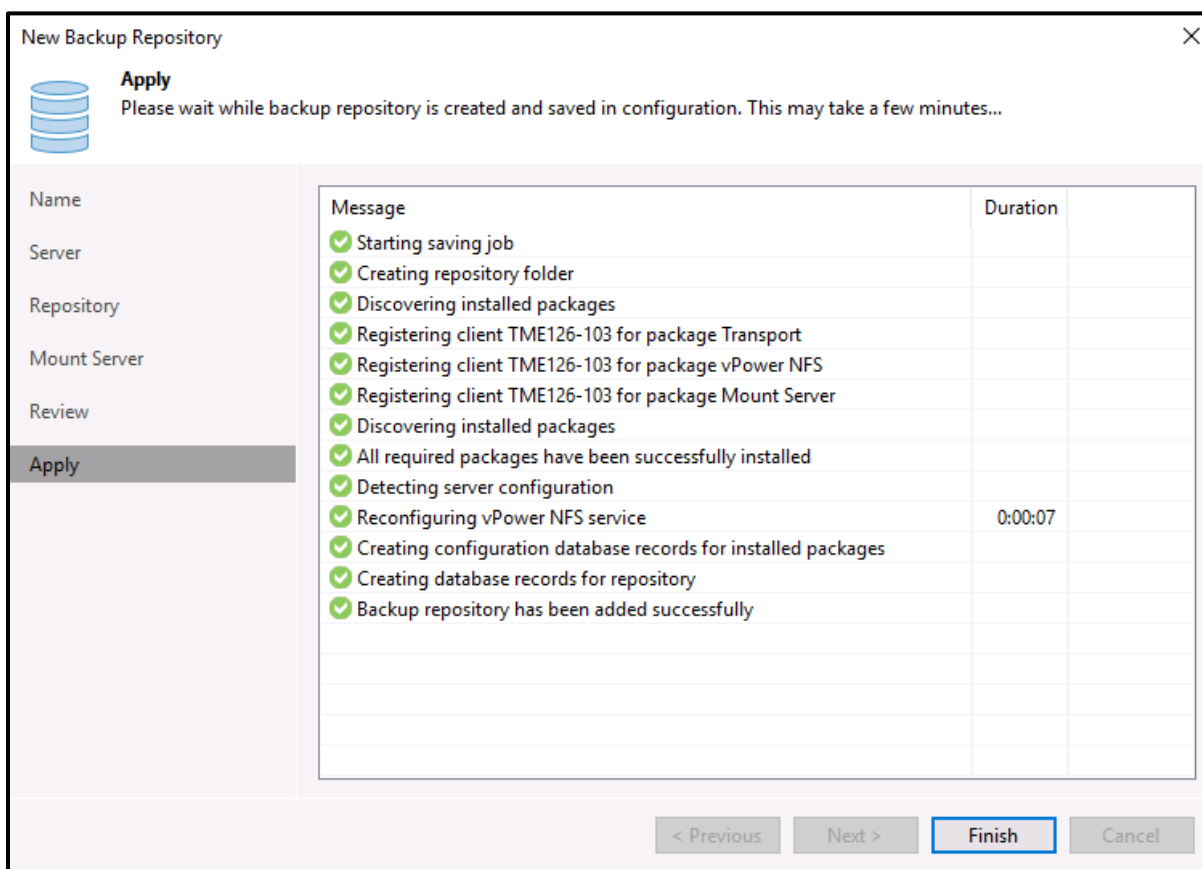


Figure 25 - Apply Backup Repository Configuration

23. The new backup repository configuration with an IntelliFlash Array LUN is complete. Click the **Finish** button (Figure 25).

Configuring a Veeam Backup Job

A Veeam backup job defines how, where, and when to backup VM data. Below are the recommended settings when configuring an IntelliFlash LUN or NFS share. Ensure the backup repository field is set to the repository created in the previous section.

Note: Being able to proceed with the following steps requires that a hypervisor-based server has already been added to the Virtual Infrastructure tab. Once added it exposes the Storage Infrastructure section of Veeam Backup & Replication used in adding backup jobs and the specific plugin supported IntelliFlash.

1. In the Veeam Backup & Replication UI, select **Storage Infrastructure**. If you don't see the Storage Infrastructure tab go back to the section **Prerequisites**
2. **Before adding the IntelliFlash** as a backup target or installing the IntelliFlash Veeam Plugin ensure you've reviewed the following prerequisites.
3. Adding a Server and add a server.
4. Click the **Backup Job** dropdown and select **Virtual Machine** in the upper menu.

5. Enter a name for the backup job and click **Next** (Figure 26).

The screenshot shows the 'New Backup Job' wizard in Veeam Backup & Replication. The window has a title bar 'New Backup Job' and a close button. On the left is a sidebar with a 'vm' icon and a list of steps: 'Name' (selected), 'Virtual Machines', 'Storage', 'Guest Processing', 'Schedule', and 'Summary'. The main area is titled 'Name' and contains the instruction 'Type in a name and description for this backup job.' Below this are two text boxes: 'Name:' with the value 'IntelliFlash Backup Job' and 'Description:' with the value 'Created by TME126-103\Administrator at 2/18/2020 5:45 PM.' At the bottom right are four buttons: '< Previous' (disabled), 'Next >' (active/highlighted with a red box), 'Finish' (disabled), and 'Cancel' (disabled).

Figure 26 - Name Backup Job

- Click the **Add** button (Figure 27).

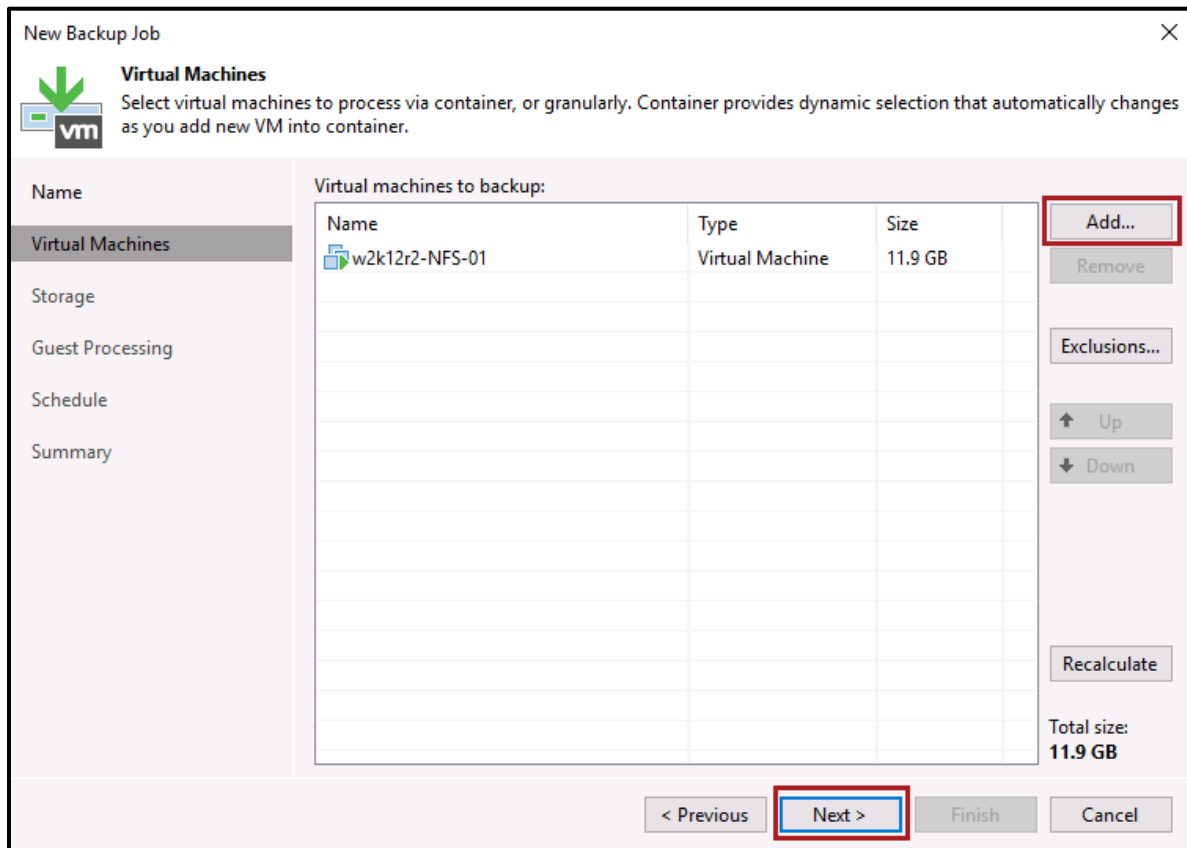


Figure 27 - Add Backup Job

7. Within the appropriate ESXi host (Figure 28) select the virtual machine to backup and click **Add**.

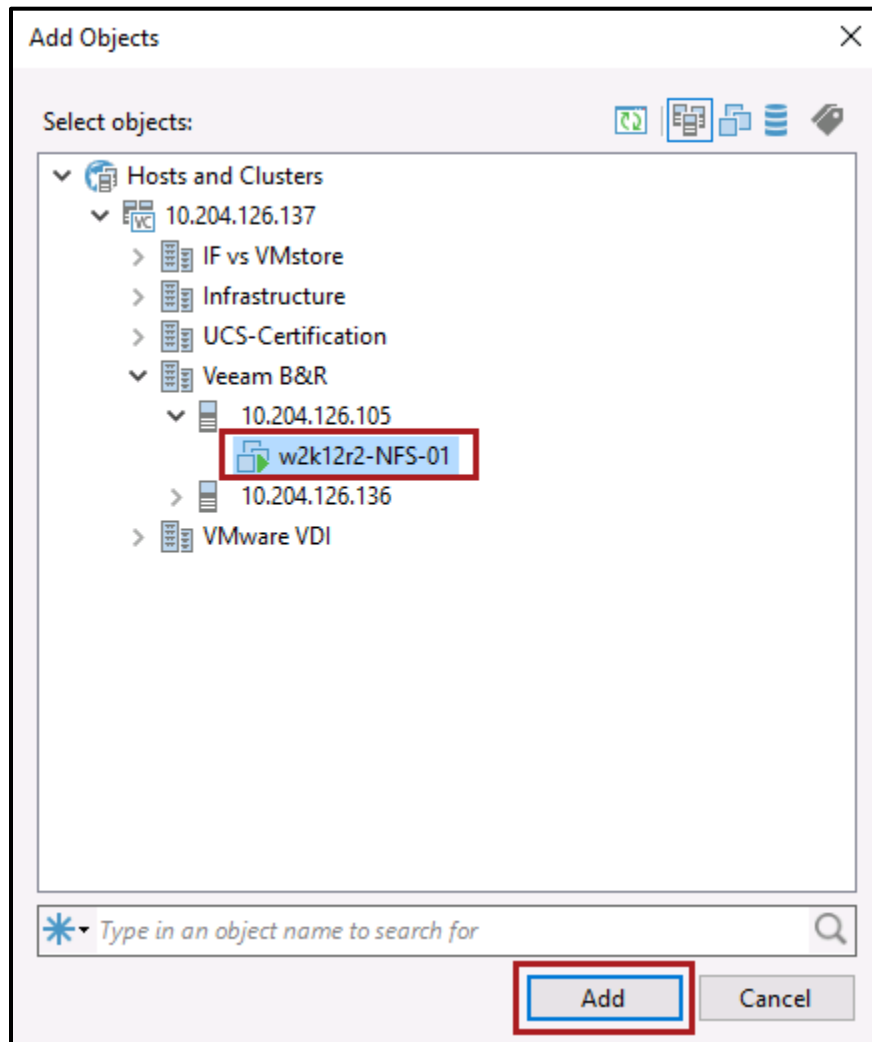


Figure 28 - Select Virtual Machine Host

8. After choosing the virtual machine host click **Next** (Figure 27).

9. Select the backup repository that was previously created and click the **Next** button (Figure 29).

New Backup Job

Storage
Specify processing proxy server to be used for source data retrieval, backup repository to store the backup files produced by this job and customize advanced job settings if required.

Name

Virtual Machines

Storage

Guest Processing

Schedule

Summary

Backup proxy:
Automatic selection Choose...

Backup repository:
Repository (Created by TME126-103\Administrator at 2/14/2020 5:07 PM.) Map backup
3.99 TB free of 3.99 TB

Restore points to keep on disk: 14 i

☐ **Configure secondary destinations for this job**
Copy backups produced by this job to another backup repository, or to tape. Best practices recommend maintaining at least 2 backups of production data, with one of them being off-site.

Advanced job settings include backup mode, compression and deduplication, block size, notification settings, automated post-job activity and other settings. Advanced

< Previous Next > Finish Cancel

Figure 29 - Select Backup Repository

10. In the **Guest Processing** windows click **Next**.

11. In the **Schedule** window, select **Run the job automatically** and choose daily, monthly, or periodic scheduling. Click **Apply** (Figure 30).

New Backup Job

Schedule
Specify the job scheduling options. If you do not set the schedule, the job will need to be controlled manually.

Run the job automatically

☒ Daily at this time: 10:00 PM Everyday Days...

☐ Monthly at this time: 10:00 PM Fourth Saturday Months...

☐ Periodically every: 1 Hours Schedule...

☐ After this job:

Automatic retry

☒ Retry failed items processing: 3 times

Wait before each retry attempt for: 10 minutes

Backup window

☐ Terminate job if it exceeds allowed backup window Window...

If the job does not complete within allocated backup window, it will be terminated to prevent snapshot commit during production hours.

< Previous Apply Finish Cancel

Figure 30 - Apply Backup Job

12. Review the backup job configuration and click **Finish** (Figure 31).

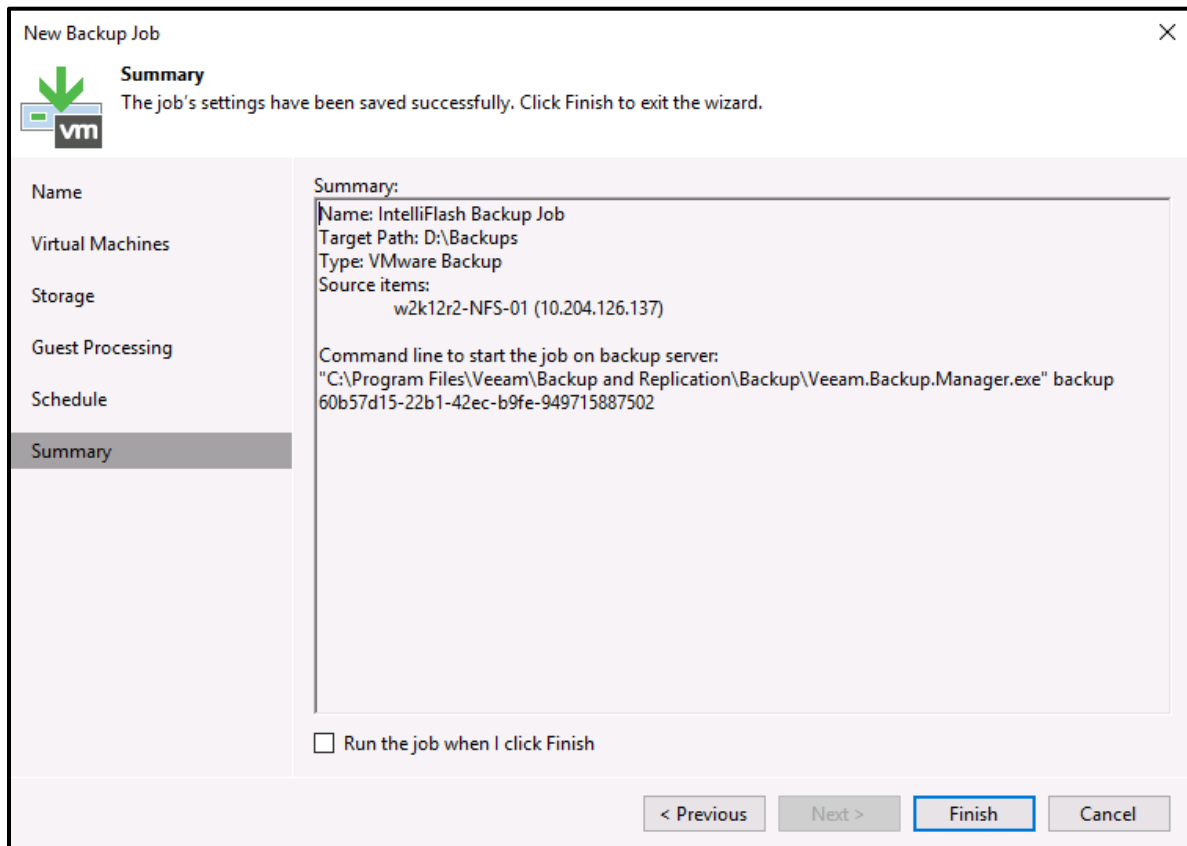


Figure 31 - Finish Backup Job Configuration

13. From the Inventory menu option, right-click on the virtual machine host. Select **Rescan** (Figure 32).

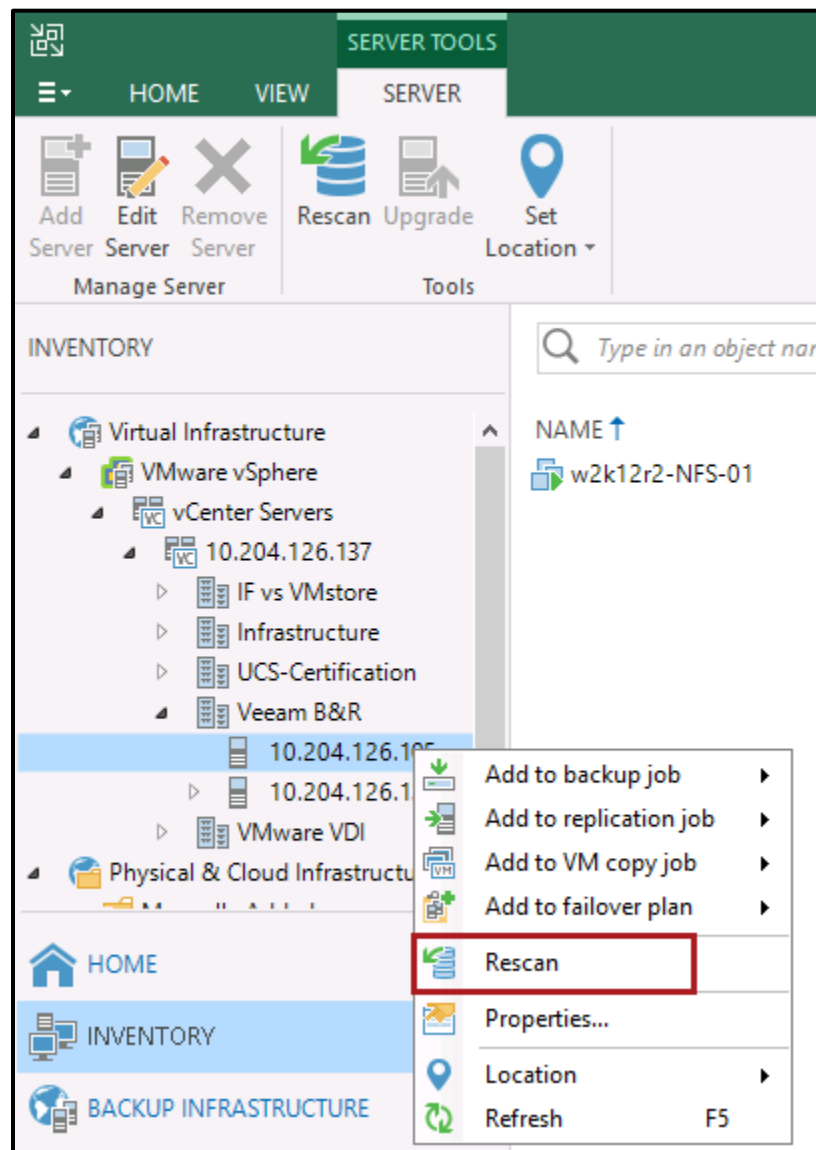


Figure 32 - Rescan the Virtual Machine Host

At this stage the backup proxy is configured, the IntelliFlash LUN has been added as Veeam backup repository, and the backup job is configured and ready for use.

Configuring Direct NFS Access Transport Mode

Due to the efficiency of the NFS access transport mode it is the recommended transport mode for VMs whose disks are located on NFS datastores. Direct NFS Access Transport mode is similar to Direct SAN Access Transport mode where the VMs residing on the VMFS datastores use FC or iSCSI LUNs and are presented back to the backup proxy server.

When using Direct NFS access transport mode, NFS datastores residing on NFS shares are presented to the backup proxy server. Veeam has a custom-built NFS agent which will go directly to the datastore on the NFS share and export the snapshot data during backup operations.

Veeam Backup & Replication version 9.0 must be installed and connected to a vSphere environment with one or more NFS datastores. The Direct NFS Access feature is implemented automatically for Direct Storage access and Automatic Selection transport modes from a VMware backup proxy inside the Veeam Backup & Replication UI.

Prerequisites for Direct NFS Access Mode

There are two requirements for Veeam backup proxy to use Direct NFS Access transport mode.

- **IntelliFlash Settings** - The Veeam backup proxy must have read only and write permissions, and root access, to the NFS share where the datastore is located (Steps 1 – 6).
- **Veeam Backup & Replication Settings** - The backup proxy used for VM-data processing must have access to the network of the NFS datastore(s) where VM disks are located (Steps 7 – 10).

Follow the steps below to complete the first prerequisite for configuring Veeam backup proxy.

1. On the IntelliFlash array hosting the NFS share used as datastore ensure the **NFS Sharing** is set to **on**. This can be set at the project or per-share level (Figure 33).

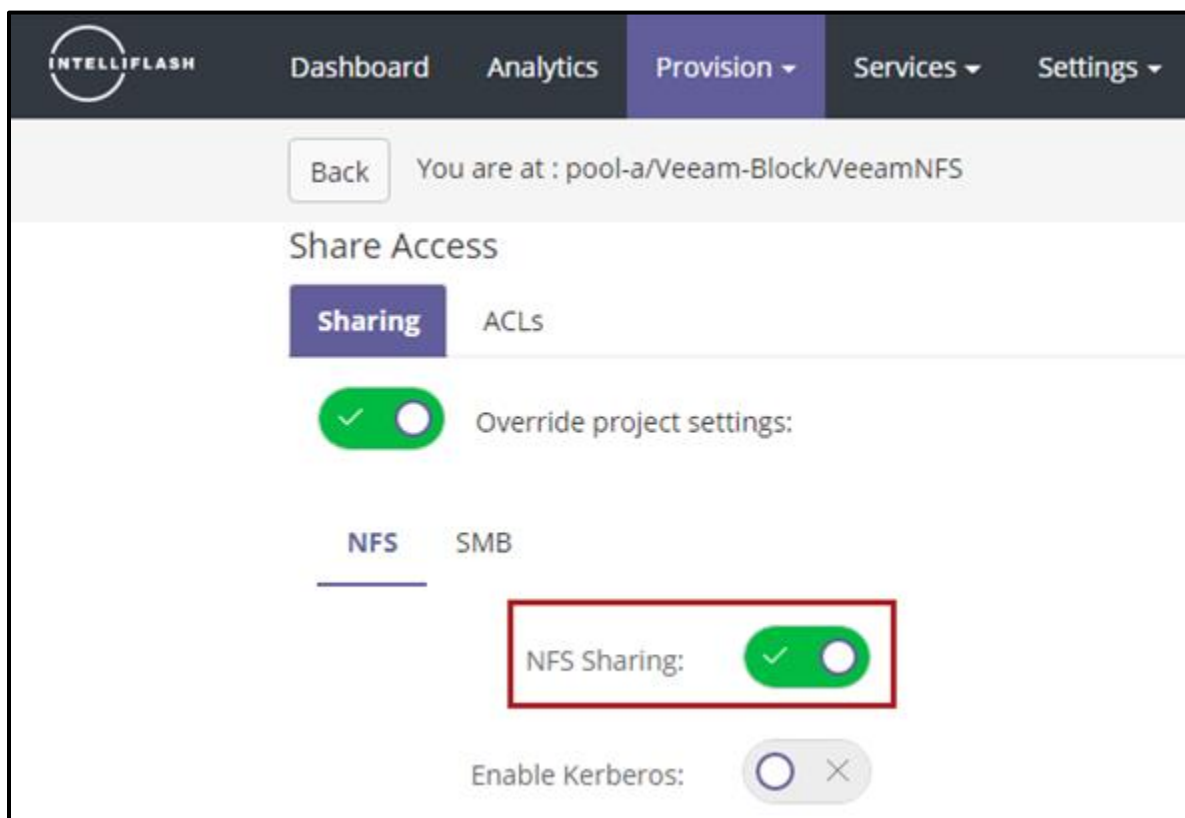
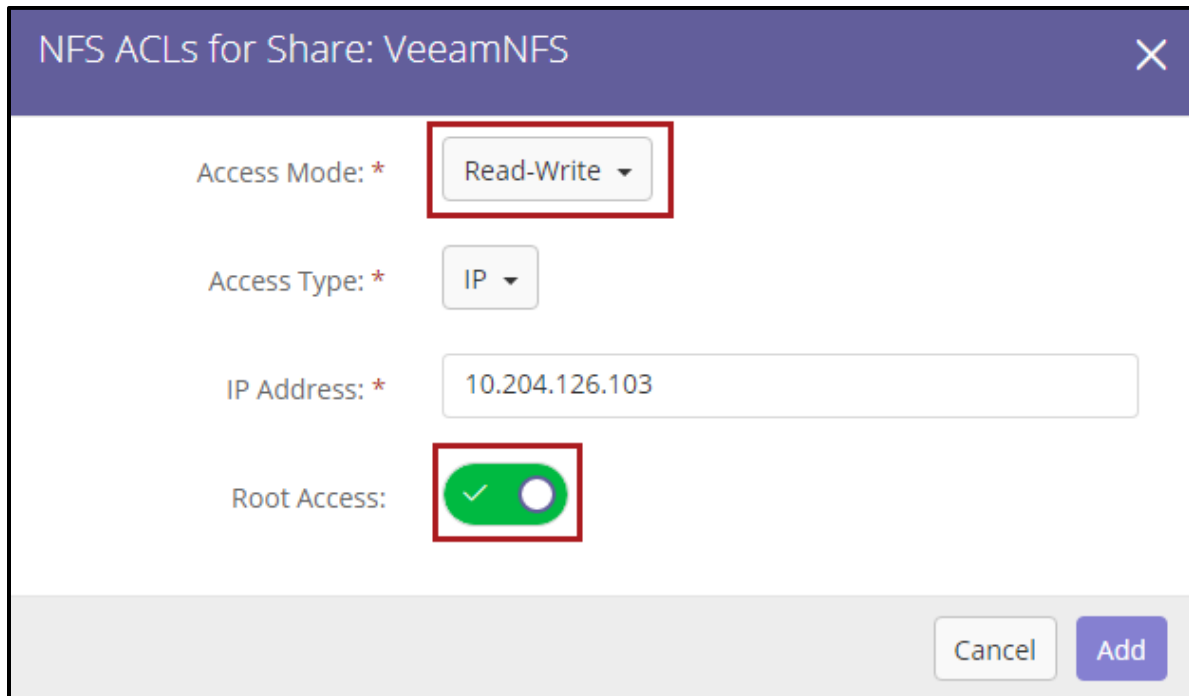


Figure 33 - Configure NFS Sharing

2. The default Network ACL policy needs to have **Root Access** enabled. Root access is not enabled by default.
3. Click **Add** in the **Sharing** tab (Figure 34).
4. In the NFS ACLs for Share window, select **Read-Write** in the Access Mode dropdown.
5. Enter the IP address or FQDN of the Veeam proxy server.
6. Enable **Root Access** to provide the Veeam proxy server root access to the array. This option preserves the root UID without squashing.



NFS ACLs for Share: VeeamNFS

Access Mode: * Read-Write ▼

Access Type: * IP ▼

IP Address: * 10.204.126.103

Root Access: ☒

Cancel Add

Figure 34 - Configure NFS ACLs

Follow the steps below to complete the second prerequisite for configuring Veeam backup proxy to configure access to the NFS datastores where the VM disks are located.

7. From the main menu in the Veeam Backup & Replication Console, select **Network Traffic Rules** (Figure 35).

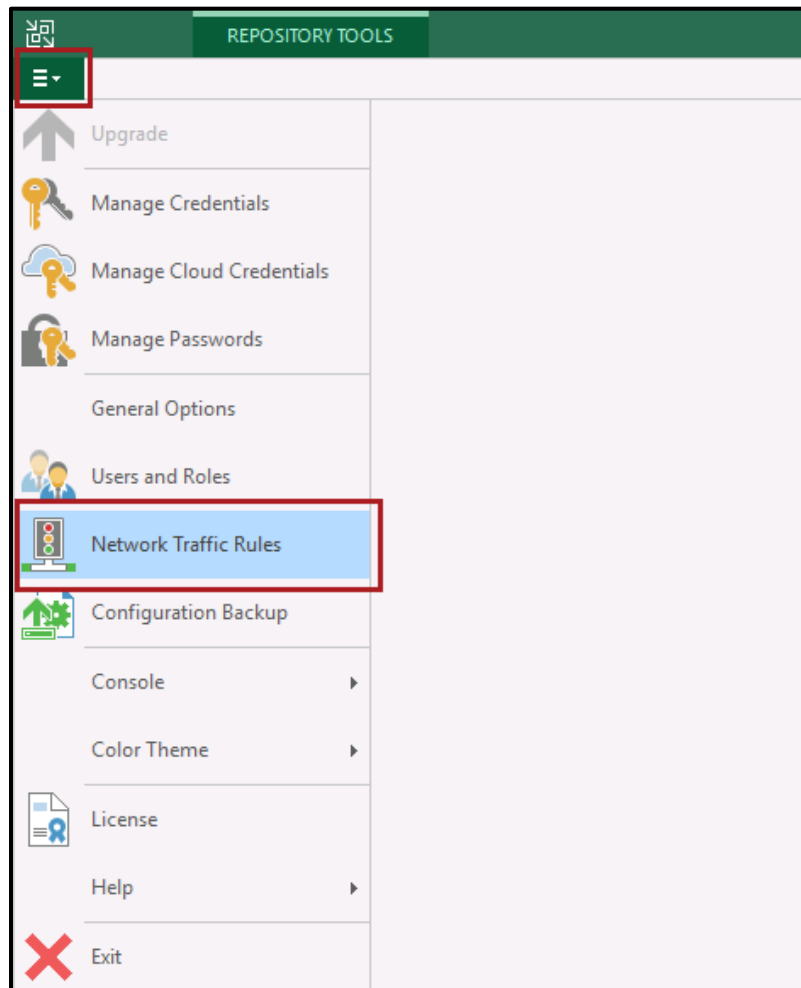


Figure 35 - Configure Network Traffic

8. In the Global Network Traffic Rules window, select **Networks** (Figure 36).
9. Click the **Prefer the following networks for backup and replication traffic** checkbox and then click **Add**. Provide the preferred network address and subnet for backup and replication traffic. Click **OK**.

Note: Veeam Backup & Replication will automatically failover to the production network if a connection over the preferred network cannot be established.

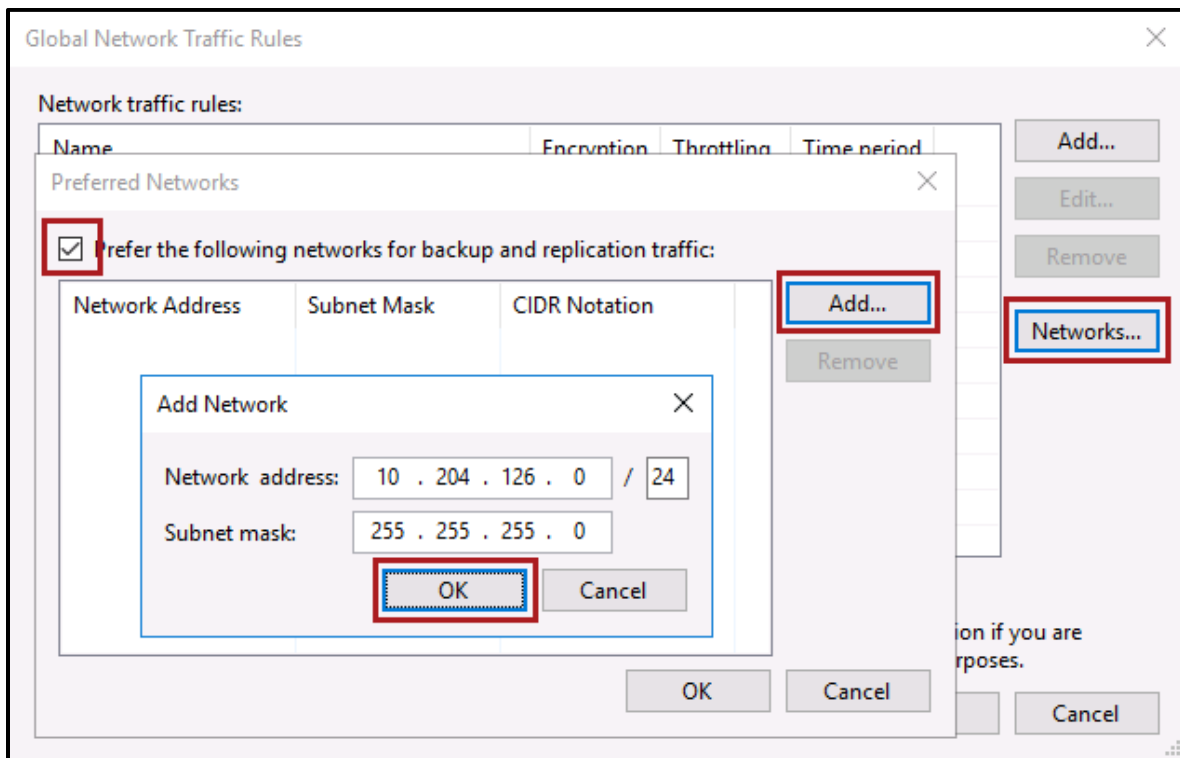


Figure 36 - Add the Preferred Networks

Configuring Direct NFS Mode

Follow the steps below to configure the Veeam repository and backup proxy for Direct NFS Access Mode.

1. Create a Veeam repository. For iSCSI or FC repositories follow the steps provided in [Create an IntelliFlash LUN as a Veeam Backup Repository](#).
2. Open the Veeam Backup & Replication Console.
3. Select **Backup Infrastructure** option in the menu at the left.
4. Select the **Backup Proxies** menu option in the upper-left menu.
5. Right-click the backup proxy for Direct NFS access and select **Properties**.

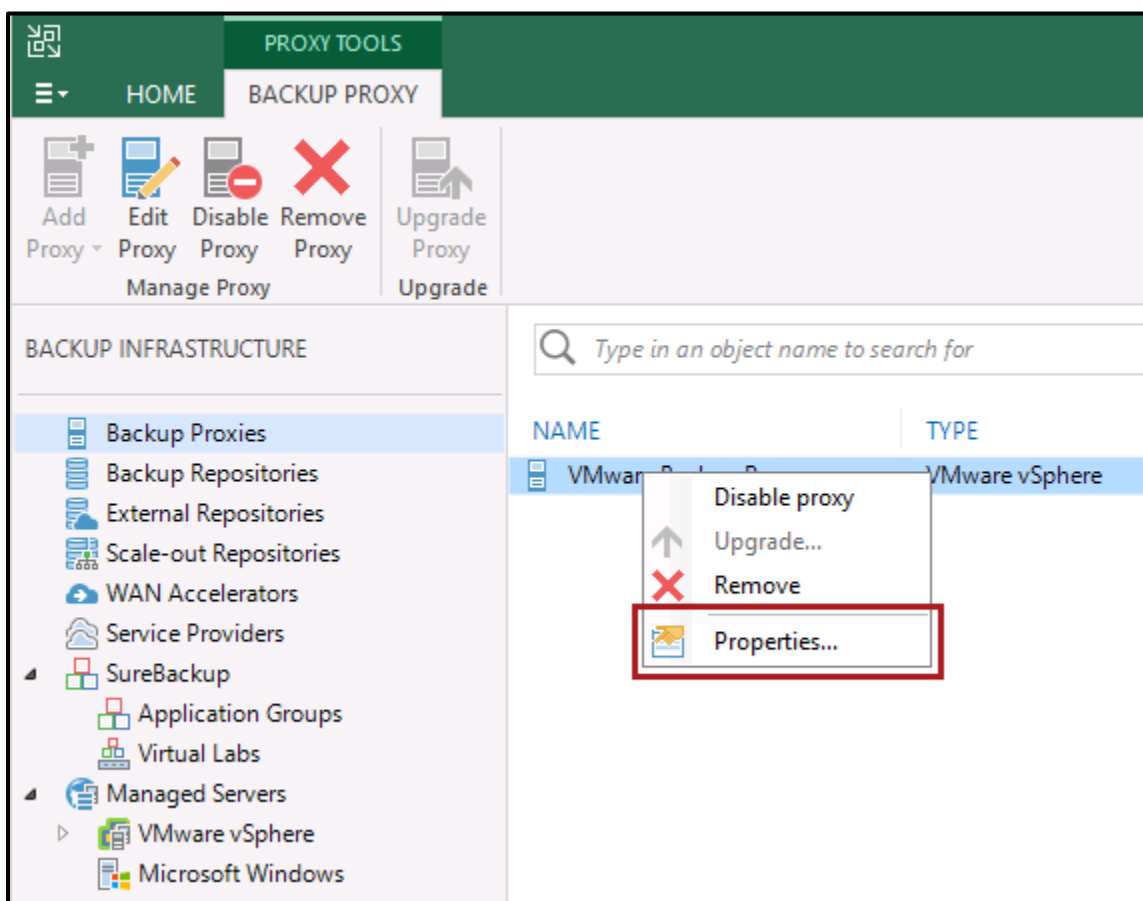


Figure 37 - Configure Backup Proxy Properties

6. Verify the transport mode is set to **Automatic selection** as was shown back in Figure 1.
7. Enable the option Failover to network mode if primary node fails or is unavailable (Figure 2).

Verifying the Backup with Direct NFS

1. From the Home menu, select **Jobs | Backup**. Then click the big green **Start** arrow button (Figure 38). You can also right-click on the backup job and click **Start**.

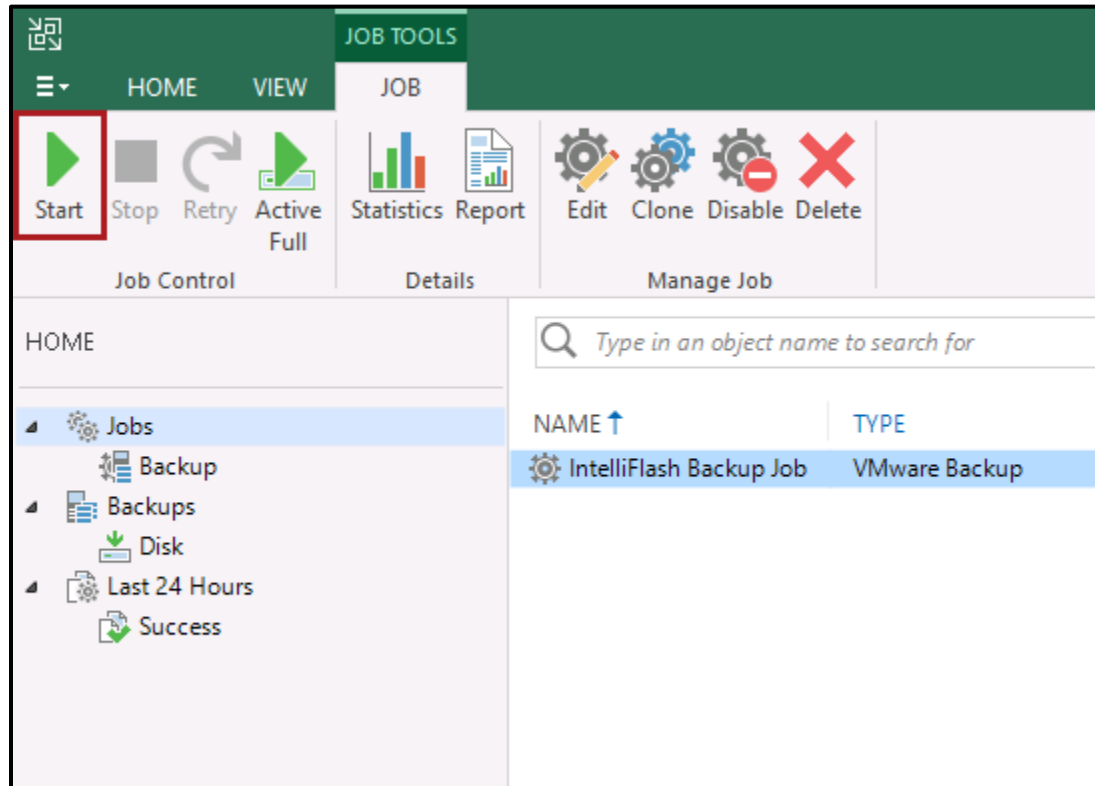


Figure 38 - Start the Backup Proxy

2. Verify the backup job started and finishes as expected by right-clicking the backup job and select **Statistics** to view the details of the backup log and verify the proxy configuration (Figure 39).

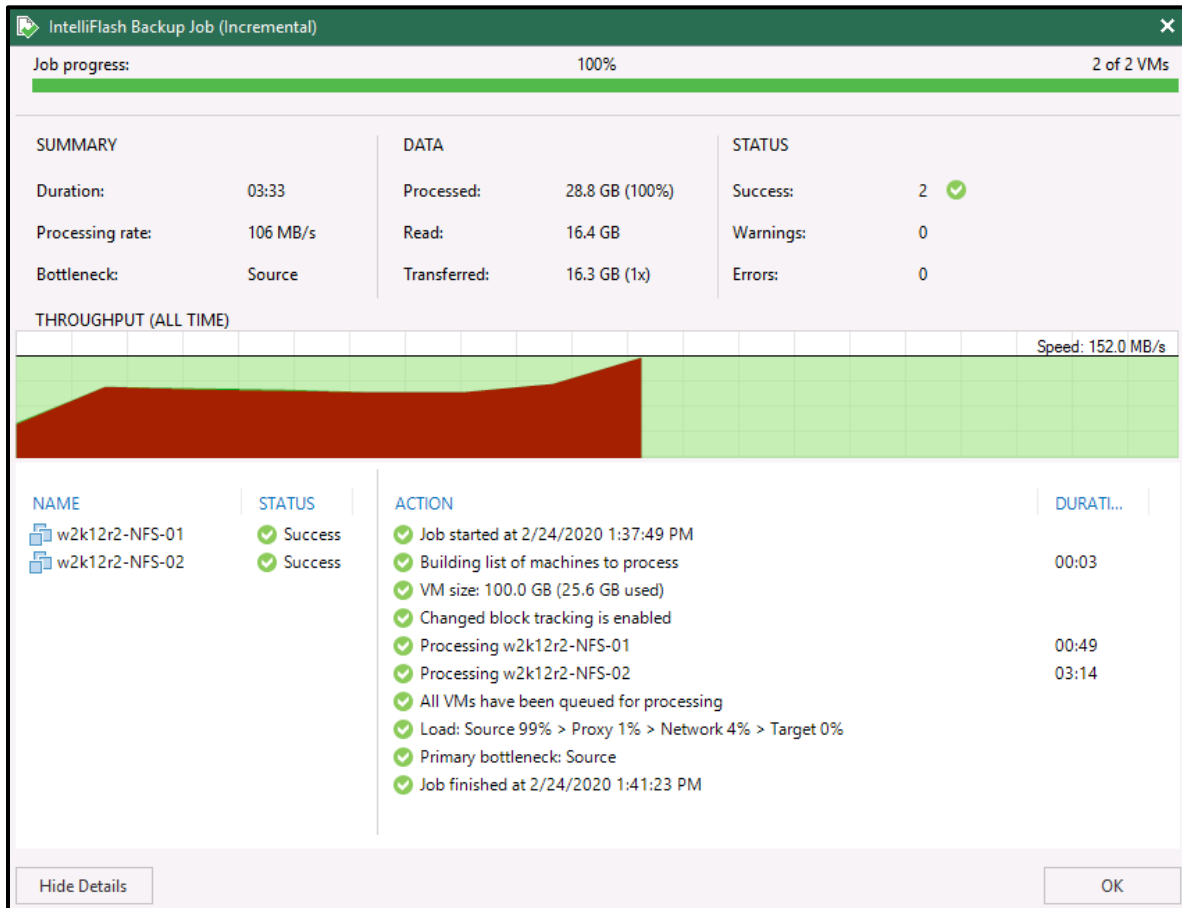


Figure 39 - Verify the Backup Proxy Configuration

IntelliFlash as a VM repository w/ Plugin Installed

The previous section discussed using the IntelliFlash system as a backup target. You could attach a LUN or share to the Veeam Backup proxy in a number of different configurations but in no configuration was the IntelliFlash plugin necessary to achieve your goals of backing up your data to storage.

However, if you're using the IntelliFlash system as not only a backup target but also as a location to house your VMs then the IntelliFlash Plugin is a must. This section will introduce the IntelliFlash Veeam Plugin and show you the additional benefit to your backup environment. Since the benefits of using the plugin are superior, we will only discuss the scenario where your VMs are on the IntelliFlash with the plugin installed.

Transport Modes with IntelliFlash Plugin

Let's revisit the Direct Attach concepts for both SAN and SAN. Back in Figure 3, Figure 4, and Figure 5 we showed how the communication occurred for Direct Attached and Virtual Appliance transport modes.

With the plugin installed the backup server communicates directly to the IntelliFlash array, bypassing the ESXi host, triggering an array level snapshot which offloads the task to the array and dramatically increases backup times. This is illustrated in Figure 40 for Direct SAN and NFS access mode.

You can see the backup server has the plugin installed. All of the communication and traffic flow remain the same except for step 3. Previously, the Backup server would trigger vSphere to create a VM snapshot thereby putting the burden on the ESXi host.

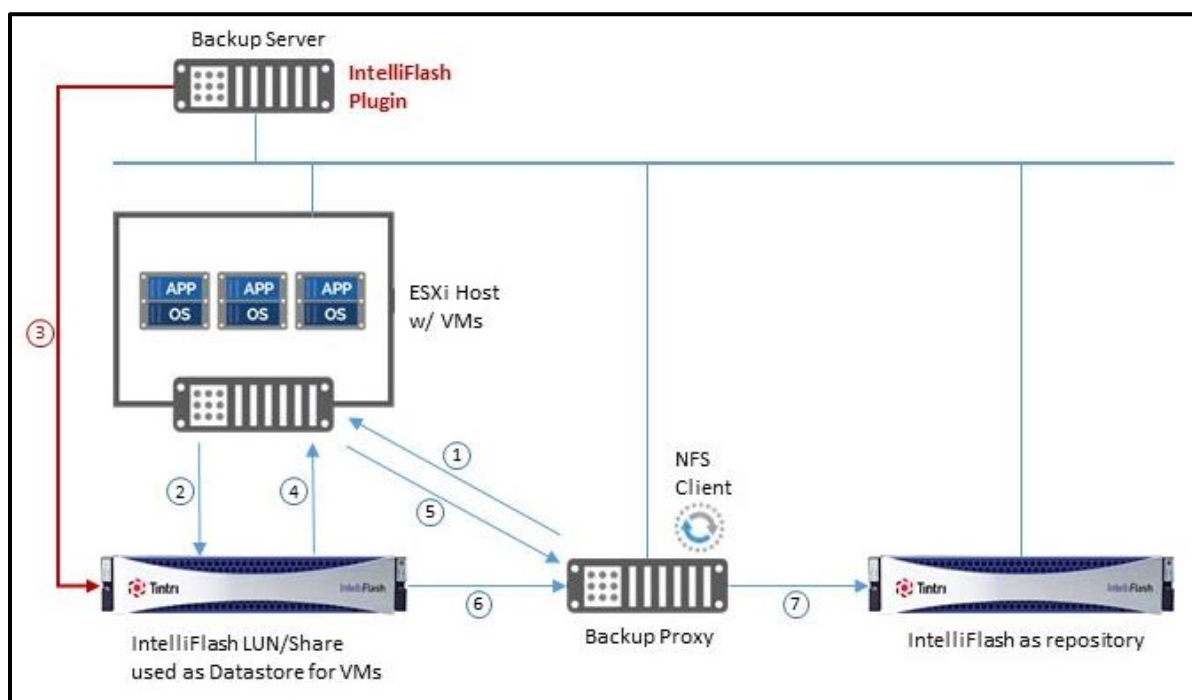


Figure 40 - Direct SAN/NFS access w/ IntelliFlash Plugin

Figure 41 illustrates how the modified flow for Virtual Appliance mode is with the IntelliFlash plugin. Again step 3 bypasses the ESXi host and communicates directly with the IntelliFlash array to trigger an array level snapshot and clone which are then attached (hot added) to the virtual backup proxy.

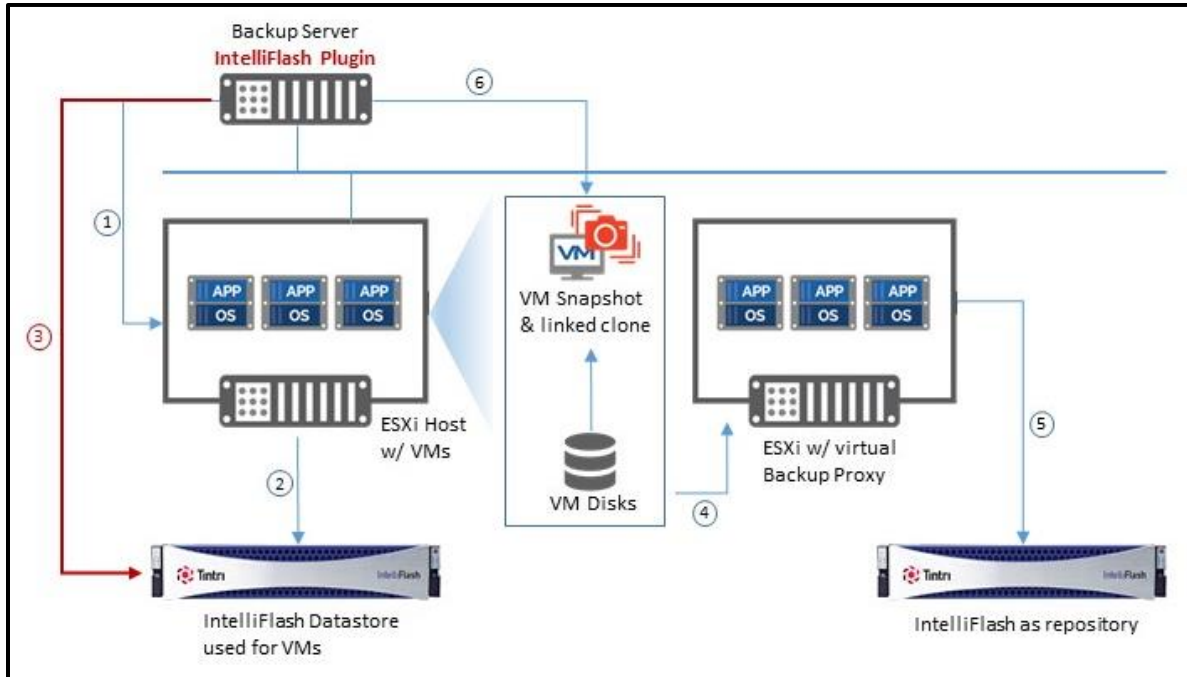


Figure 41 - Virtual Appliance Mode w/ IntelliFlash Plugin

Installing IntelliFlash Plugin

The Veeam Backup & Recovery Plugin for IntelliFlash is easy to install and available for download from Veeam's Support website at <https://www.veeam.com/backup-replication-download.html>.

Before installing the plugin quit or close all instances of Veeam Backup & Replication as the installation needs access to certain files that are locked while the software is running.

1. Double click the install file and click next on the first window (Figure 42).

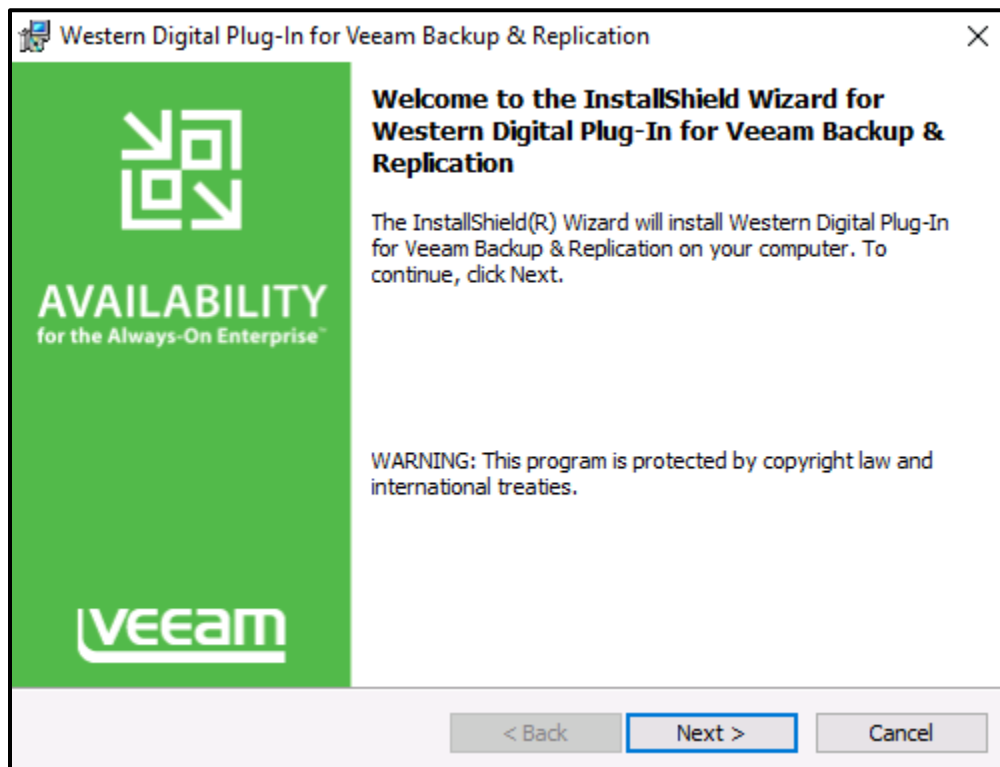


Figure 42 - Installing Veeam IntelliFlash Plugin

2. Accept the Terms of Usage on the next screen.

3. Click **Install** on the final screen (Figure 43).
4. After installation Click **Finish** on the last window.

The installation is complete at this point and Veeam Backup & Replication can be started again.

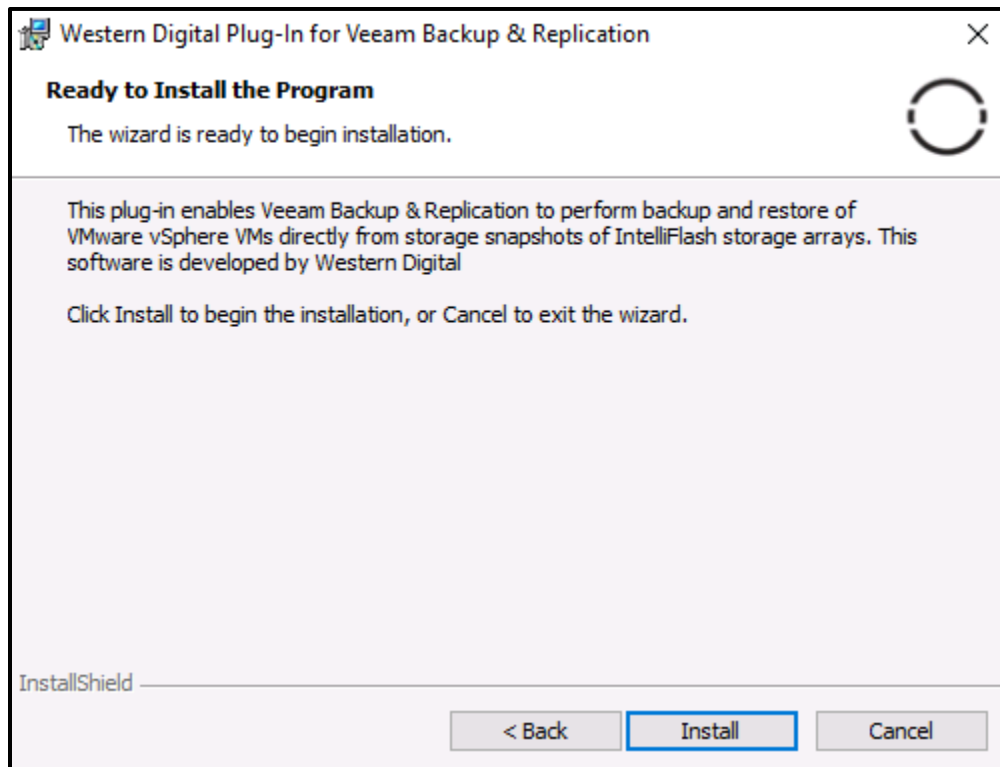


Figure 43 - Ready to Install Plugin

Adding an IntelliFlash System

With the IntelliFlash plugin installed let's add an IntelliFlash system into Veeam Backup & Replication. From the Storage Infrastructure section click on Add Storage in the right pane (Figure 44).

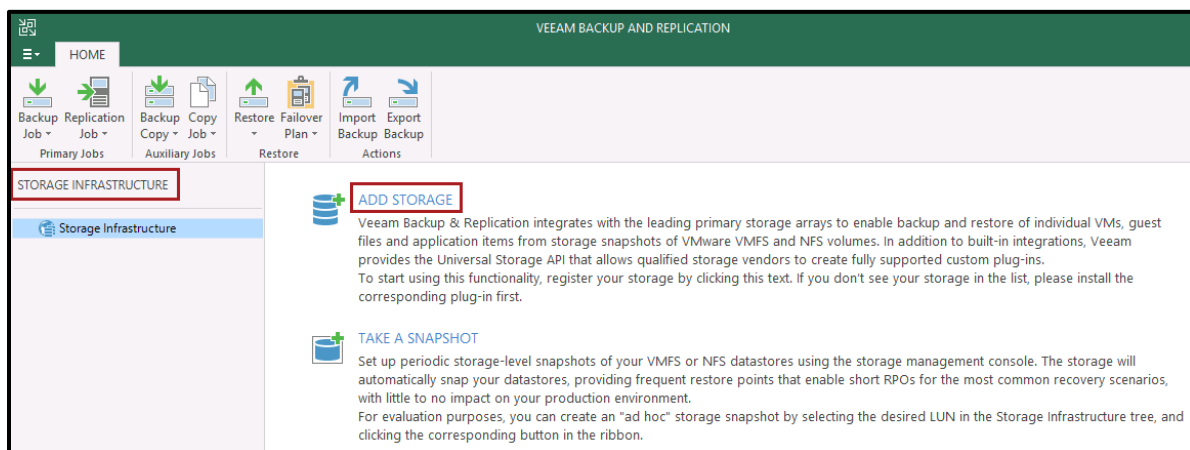


Figure 44 - Register Plugin Supported IntelliFlash

On the Add Storage window click on **Show more vendors**. Select the Tintri IntelliFlash shown in Figure 45 (Older versions of the plugin may show Western Digital IntelliFlash – Please update to the latest version).

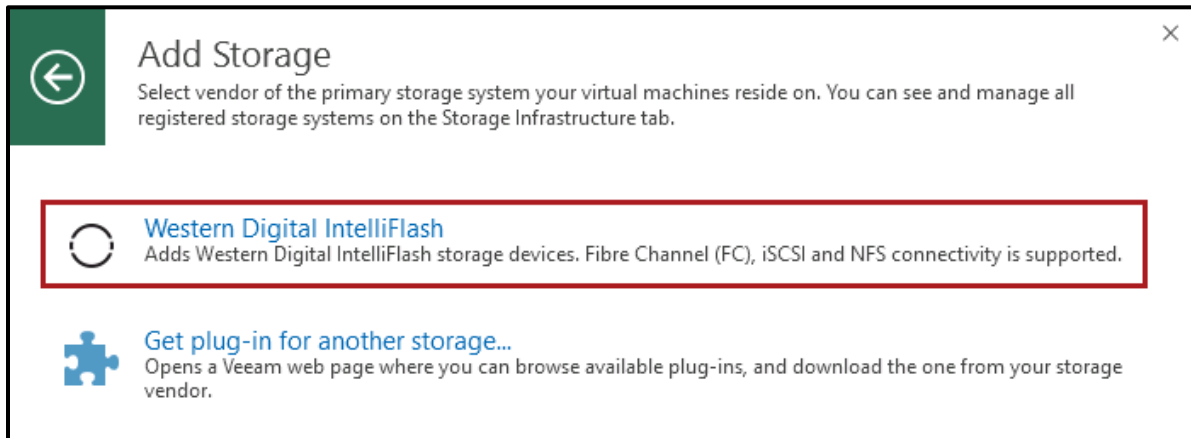


Figure 45 - Select IntelliFlash

In the next windows enter either a DNS name or an IP address of an IntelliFlash (Figure 46) and click **Next**.

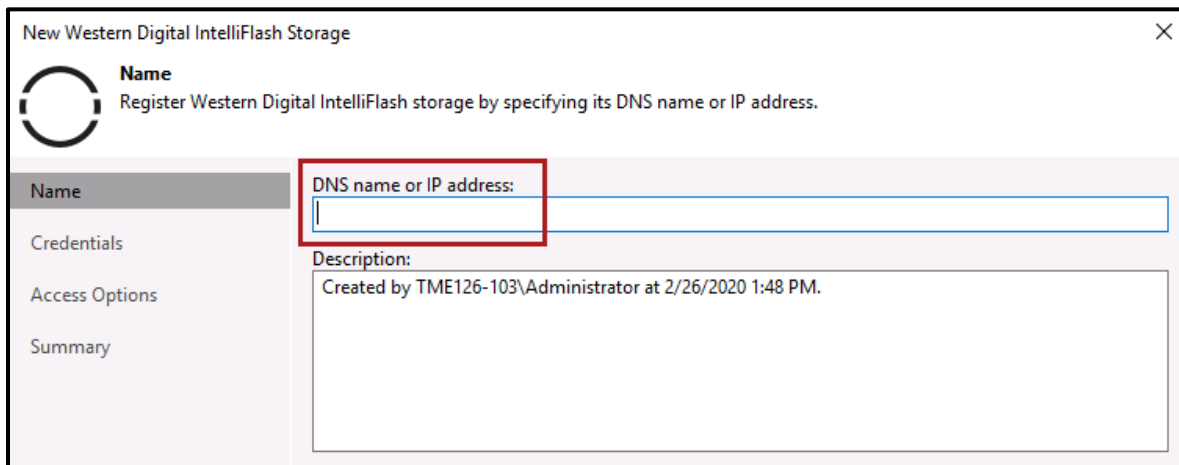


Figure 46 - Enter IntelliFlash DNS Name or IP Address

On the Credentials window click the **Add** button and then add the IntelliFlash username and password click OK and click **Next** (Figure 47).

New Western Digital IntelliFlash Storage

Credentials
Specify account with storage administrator privileges.

Name

Credentials

Access Options

Summary

Credentials:

Add...

[Manage accounts](#)

Credentials

Username: admin

Password:

Description:
admin

OK Cancel

< Previous Next > Finish Cancel

Figure 47 - Enter IntelliFlash Credentials

On the Access Option page choose the appropriate protocols. If you want to pick specific volumes to scan to limit the scan time that can be achieved by selecting the **Choose** button (Figure 48).

New Western Digital IntelliFlash Storage

Access Options
Specify how this storage can be accessed by Veeam.

Access Options

Name

Credentials

Access Options

Summary

Protocol to use:

- ☒ Fibre Channel (FC)
- ☒ iSCSI
- ☒ NFS

Volumes to scan:

Automatic detection (all VMFS volumes found with the initial scan) Choose...

Backup proxies to use:

Automatic selection Choose...

< Previous Next > Finish Cancel

Figure 48 - Select Protocol and Volumes

Finally review the summary page and click **Finish**. The IntelliFlash system is now added to Veeam Backup & Replication with integration through the plugin.

Using the IntelliFlash Plugin

With the plugin installed and an IntelliFlash added to Veeam Backup & Replication now you can take advantage of the plugin features. Under the Storage Infrastructure tab, you'll now see the IntelliFlash system that was just added.

Plugin Basics

Looking at Figure 49, if you click on the IntelliFlash it will list all of the LUNs and Shares contained on the system. A full list will be on the left side underneath the IntelliFlash but also on the right with a summary of statistics including the total snapshot count per LUN and share. Right clicking on the IntelliFlash will give several options including **Edit volumes**, which allows the user to modify the scope of LUNs and shares included in a scan.

Also, in the same figure on the left pane, if you open up one of the LUNs or shares by toggling the arrow, you'll see all of snapshots taken, both IntelliFlash scheduled and manually executed from the Veeam UI.

The screenshot displays the Veeam Backup and Replication console interface. The top navigation bar includes 'HOME' and 'STORAGE' tabs. Below the navigation bar, there are icons for 'Add Storage', 'Edit Storage', 'Remove Storage', 'Edit Volumes', and 'Rescan'. The main area is divided into two panes. The left pane, titled 'STORAGE INFRASTRUCTURE', shows a tree view of storage objects. The right pane, titled 'STORAGE TOOLS', shows a table of storage objects.

In the left pane, the 'Storage Infrastructure' folder is expanded, showing 'Western Digital IntelliFlash' and 'tme127-219.test.com'. The 'tme127-219.test.com' folder is selected, and a context menu is open over it, showing options: 'Edit storage...', 'Remove storage', 'Edit volumes...', and 'Rescan storage'. Below this, the 'VeeamNFS' folder is expanded, showing two scheduled tasks: 'Scheduled: 'Every 30 Minute(s)'' and 'Scheduled: 'Every 30 Minute(s)''.

The right pane shows a table of storage objects with the following columns: NAME, REPORTED ..., SNAPSHOTS C..., and LAST SNAPSHOT. The table contains the following data:

NAME	REPORTED ...	SAPSHOTS C...	LAST SNAPSHOT
CouchBase-DB	1024 GB	0	<no snapshots>
CouchBase-DB-96	1024 GB	0	<no snapshots>
CouchBase-Indexes	500 GB	0	<no snapshots>
CouchBase-Indexes-96	500 GB	0	<no snapshots>
Data	1024 GB	0	<no snapshots>
Logs	500 GB	0	<no snapshots>
Nimesa	500 GB	0	<no snapshots>
Repository	4 TB	0	<no snapshots>
tme60-146-01	80 GB	0	<no snapshots>
tme60-146i-01	40 GB	0	<no snapshots>
tme60-147i-01	80 GB	0	<no snapshots>
Veeam-Repo	1024 GB	0	<no snapshots>
VeeamNFS	3.3 TB	66	3/17/2020 3:30 PM
vms	3.5 TB	0	<no snapshots>

Figure 49 - IntelliFlash's LUNs and Shares

Right clicking on a specific LUN or share on the left side gives you the option to create a new snapshot or rescan that particular volume for any newly created snapshots (Figure 50). The same functionality is at the top of the UI in the form of 2 large icons.

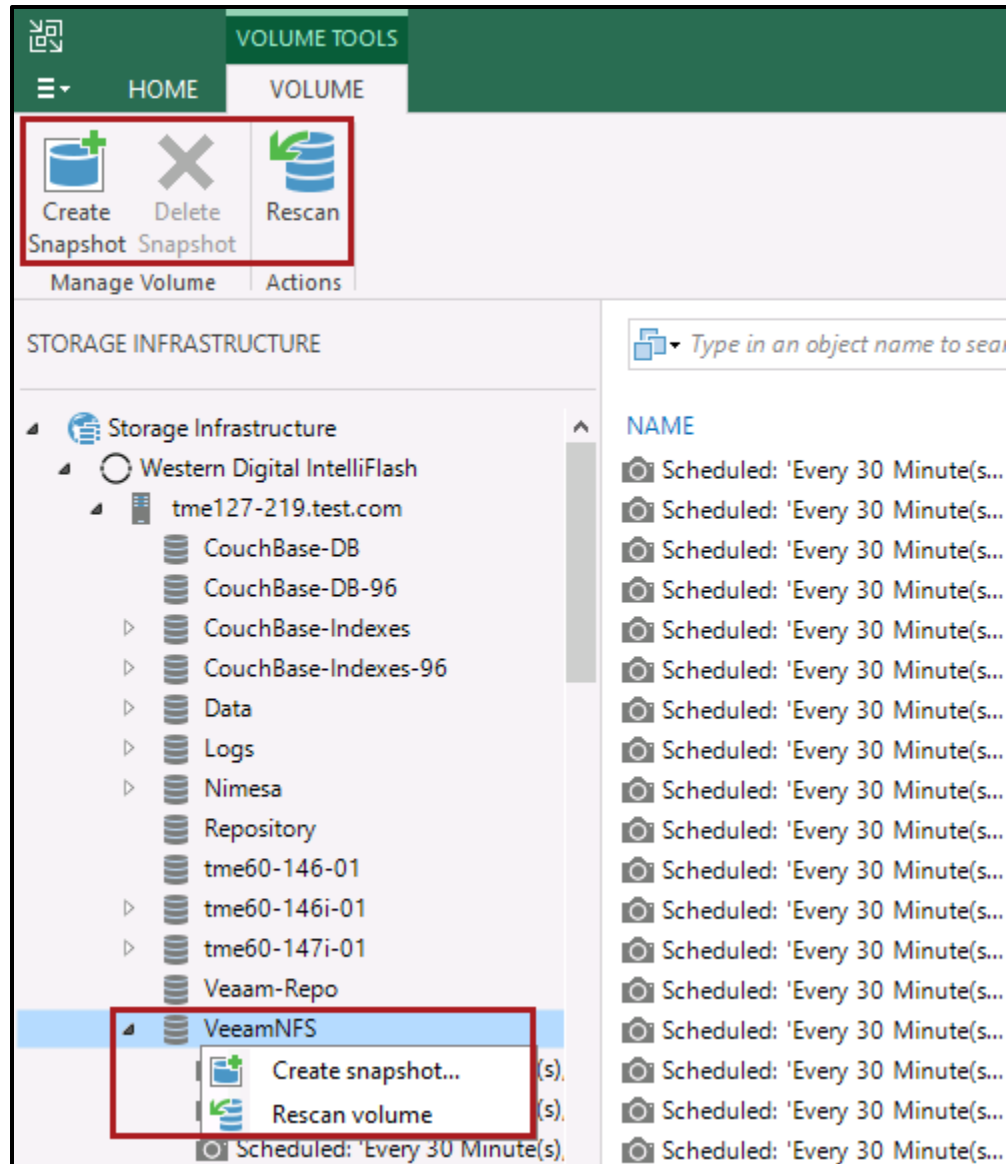


Figure 50 - Right Click IntelliFlash Share

Directly clicking on a snapshot will show all of the VMs located within that LUN or Share (Figure 51). In this example there are 2 VMs sitting on an NFS datastore called **VeeamNFS**.

The screenshot shows the Veeam Backup & Replication Volume Tools interface. The left pane displays the Storage Infrastructure tree, with 'VeeamNFS' selected under 'tme127-219.test.com'. The right pane shows a table of VMs residing on this NFS share.

NAME	HOST	STATE	SIZE
w2k12r2-NFS-01	10.204.126.105	<Unknown>	13.2 GB
w2k12r2-NFS-02	10.204.126.105	<Unknown>	12.8 GB

Figure 51 - VMs Residing on NFS Share

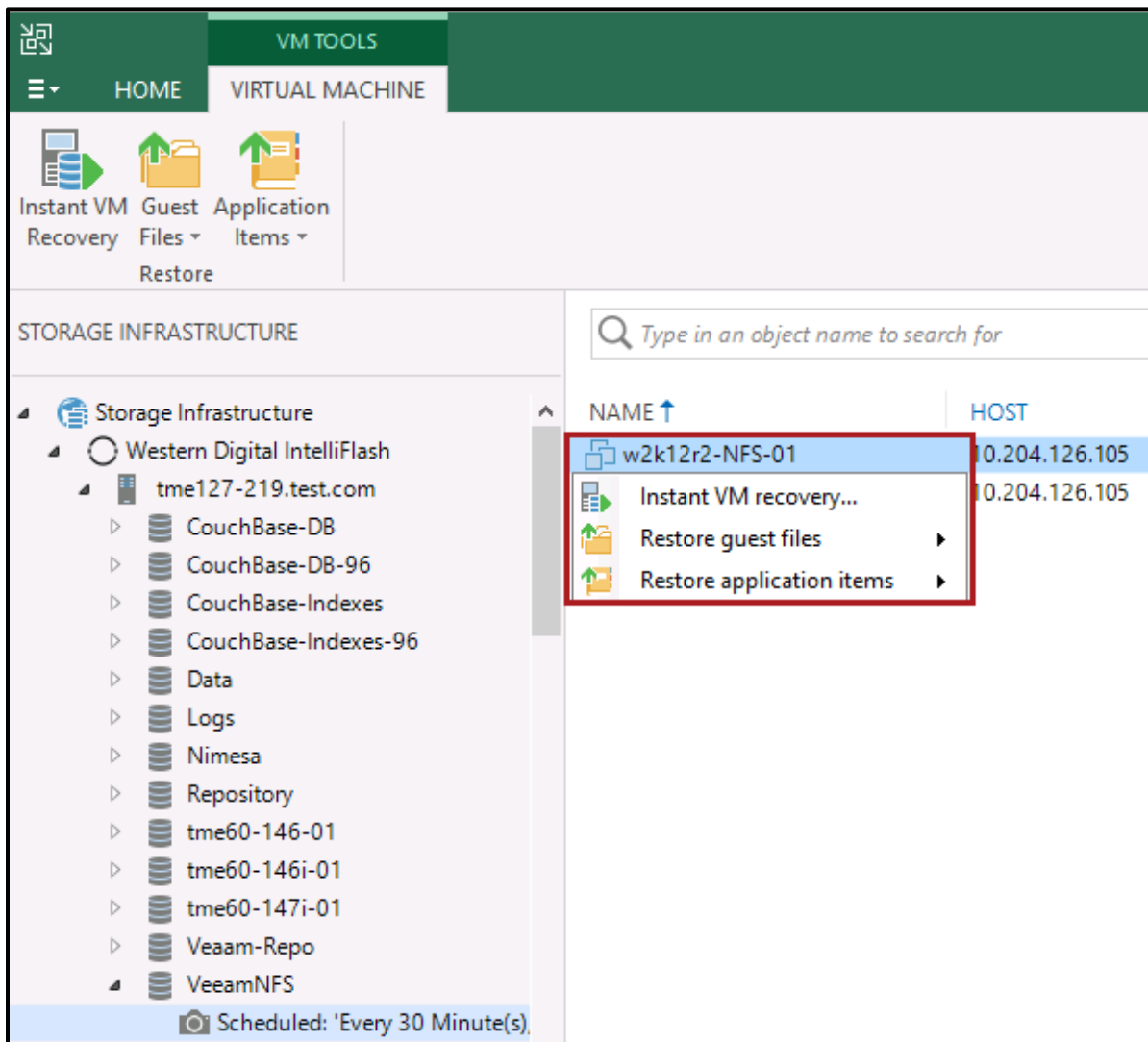


Figure 52 - Snapshot Options

Instant Recovery Example

Let's pretend that some data was lost in some manner on a VM. It's easy to recover a snapshot of the VM instantly. In Figure 52 with a snapshot highlighted, that we know contains the missing data, we'll simply right click and choose the **Instant VM Recovery** option. This process does not create an entire new VM or initially take up additional space

This will bring up a wizard to recover the VM. In Figure 53 the snapshot that was chosen is listed. It can be modified by clicking on **Point**. If another VM needs to be recovered, you can click on **Add** to add additional VMs. When the appropriate snapshot of the VM has been determined simply click **Next**.



On the next window, Figure 54, you'll need to determine if you want to alter any settings or restore to the original location. For scenarios where you want to check a VM to determine if it contains the missing data then choose the second option.

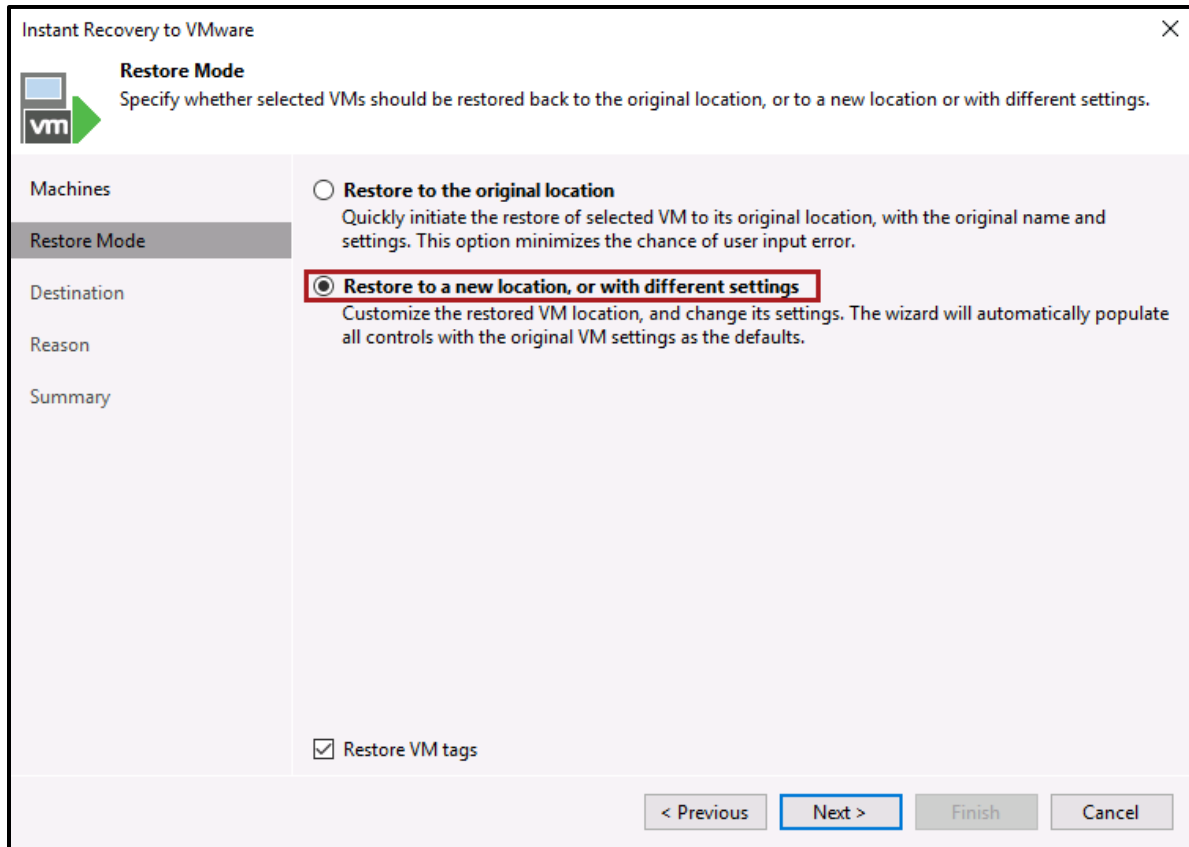
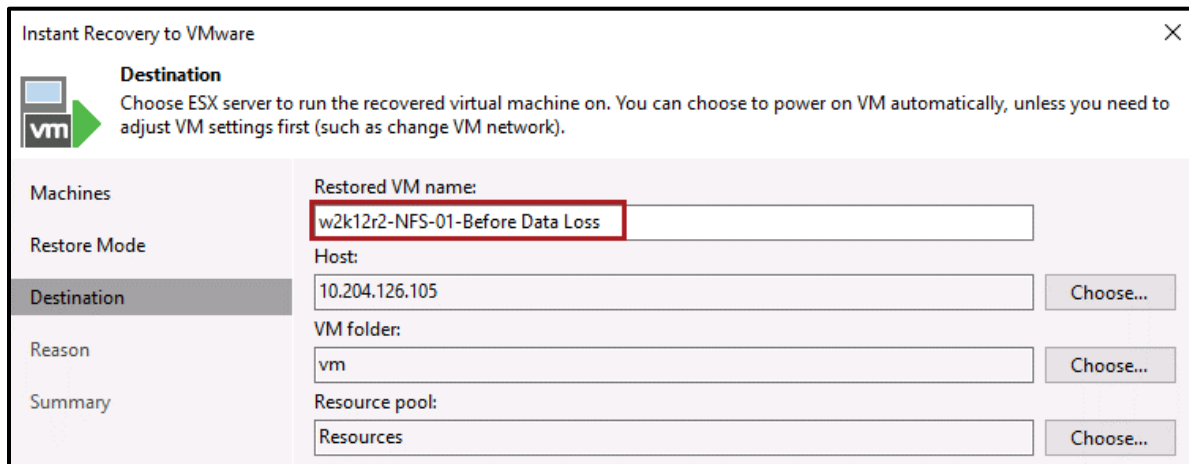


Figure 54 - Restore VM with Different Settings

Note: *If restoring to the original location is chosen and the original VM exists it will be removed.*

This process of instantly spinning up a VM from snapshot can also be used to determine the efficacy of a point in time. Perhaps before a virus was accidentally downloaded. You can also use this to spin off a point in time for some specific testing based on a certain environment.

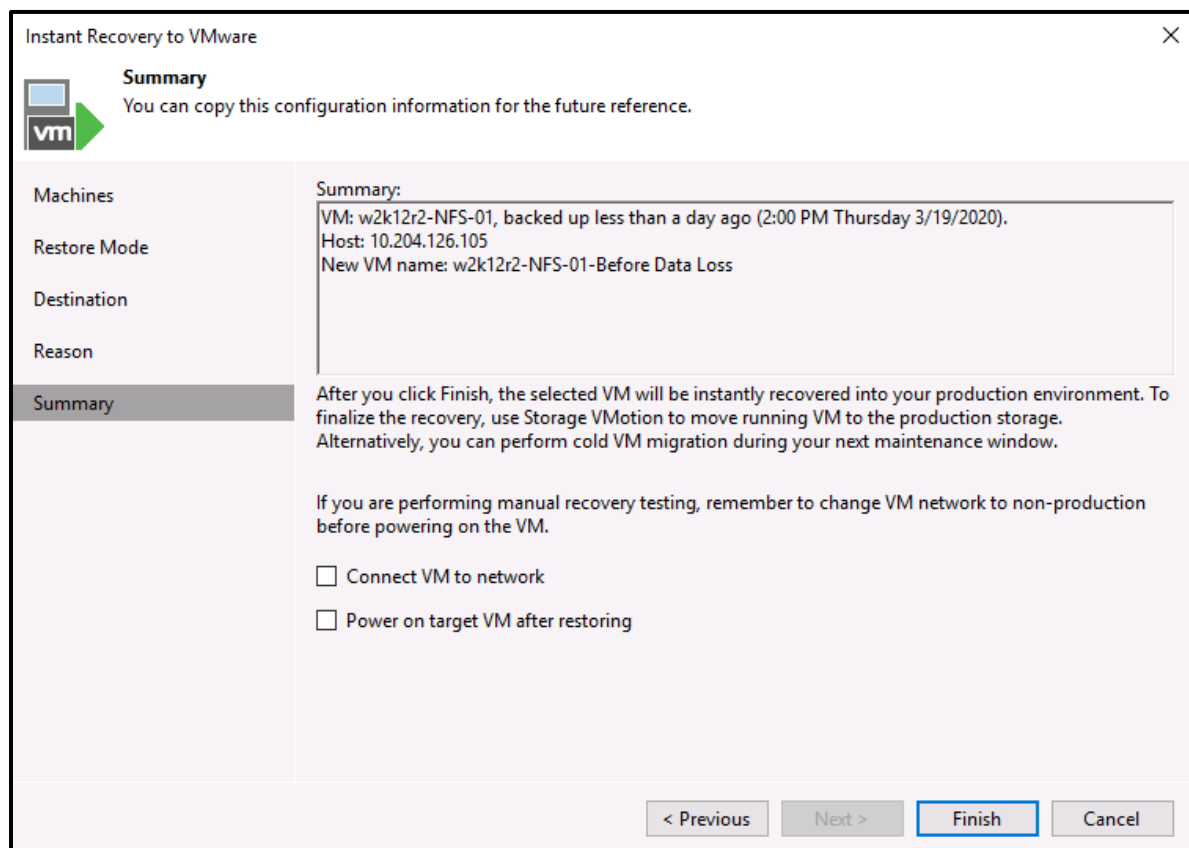
On the next, Figure 55, you can enter a new name for the VM. Change any other setting that's appropriate.



The screenshot shows the 'Instant Recovery to VMware' window with the 'Destination' tab selected. The left sidebar contains 'Machines', 'Restore Mode', 'Destination', 'Reason', and 'Summary'. The main area has the following fields: 'Restored VM name:' with the value 'w2k12r2-NFS-01-Before Data Loss' (highlighted with a red box), 'Host:' with the value '10.204.126.105' and a 'Choose...' button, 'VM folder:' with the value 'vm' and a 'Choose...' button, and 'Resource pool:' with the value 'Resources' and a 'Choose...' button. A description at the top says: 'Choose ESX server to run the recovered virtual machine on. You can choose to power on VM automatically, unless you need to adjust VM settings first (such as change VM network).'

Figure 55 - Alter VM Name

After entering in a new name click next. On the next window (Not Shown) enter a restore reason and click next. On the Summary window (Figure 56) ensure everything is correct. You can power on the VM immediately after restoring but it may be a good idea to adjust the network settings to be on a different network than the production network. When done reviewing click **Finish** and the recovery will begin.



The screenshot shows the 'Instant Recovery to VMware' window with the 'Summary' tab selected. The left sidebar contains 'Machines', 'Restore Mode', 'Destination', 'Reason', and 'Summary'. The main area has a 'Summary:' section with the following text: 'VM: w2k12r2-NFS-01, backed up less than a day ago (2:00 PM Thursday 3/19/2020).', 'Host: 10.204.126.105', and 'New VM name: w2k12r2-NFS-01-Before Data Loss'. Below this is a paragraph: 'After you click Finish, the selected VM will be instantly recovered into your production environment. To finalize the recovery, use Storage VMotion to move running VM to the production storage. Alternatively, you can perform cold VM migration during your next maintenance window.' followed by another paragraph: 'If you are performing manual recovery testing, remember to change VM network to non-production before powering on the VM.' At the bottom are two checkboxes: 'Connect VM to network' and 'Power on target VM after restoring', both of which are unchecked. At the very bottom are four buttons: '< Previous', 'Next >', 'Finish' (highlighted with a blue border), and 'Cancel'.

Figure 56 - Finalize Settings for VM Recovery

A summary screen appears that shows all the details of the recovery process (Figure 57). You can see from the figure that the recovery is complete. If you had powered on the VM after recovery you could click **Open console** from here but let's go to the Home tab on the Veeam UI for the next steps.

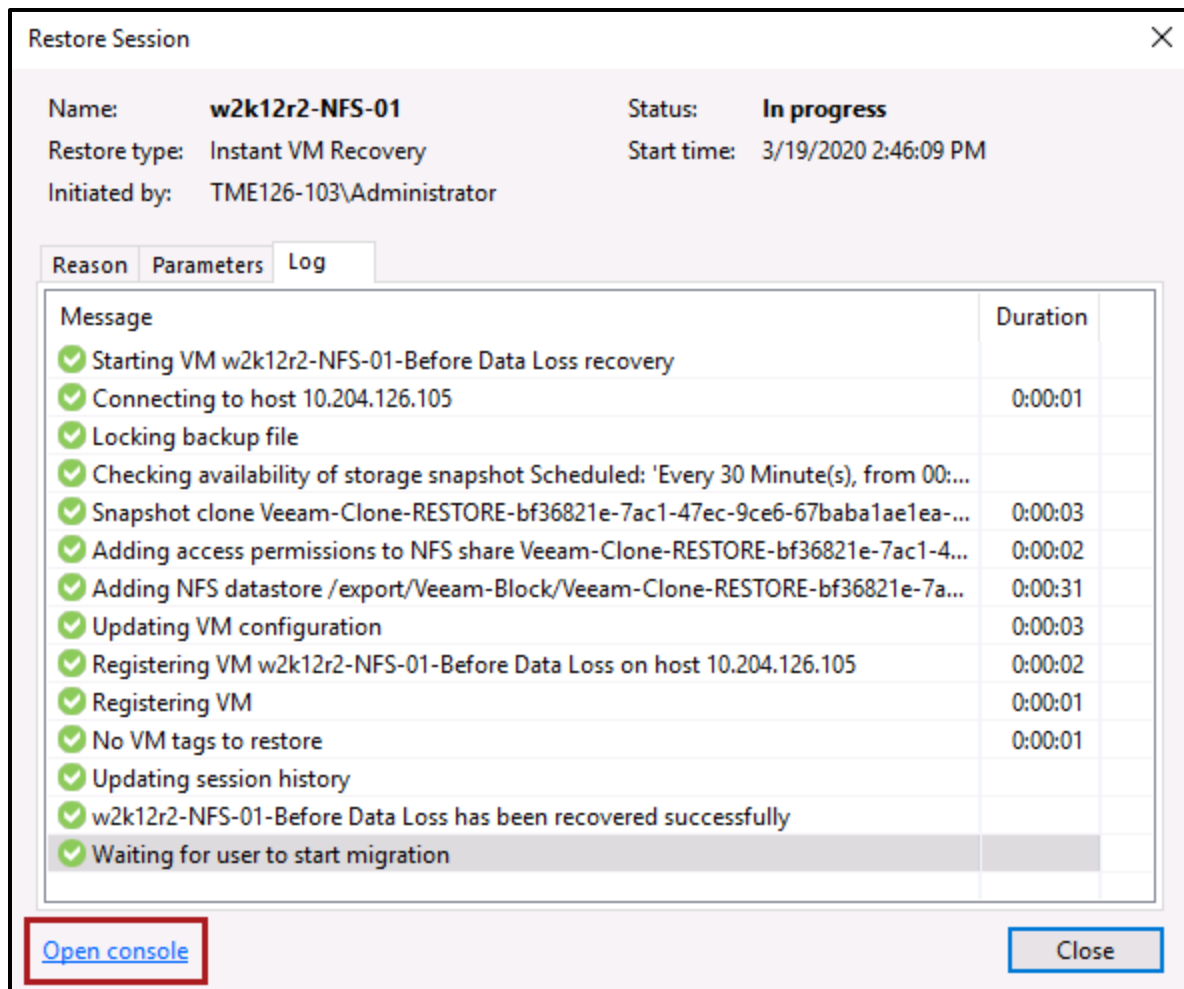


Figure 57 - VM is Recovered

Back on Home screen (Figure 58) there will be an entry, **Instant Recovery**. Clicking on that you'll find the VM snapshot that we've recovered. From here you can open the console and log into the VM and ensure the missing data is there. If it is, you can copy the data off or simply move on to migrating that VM back to production.

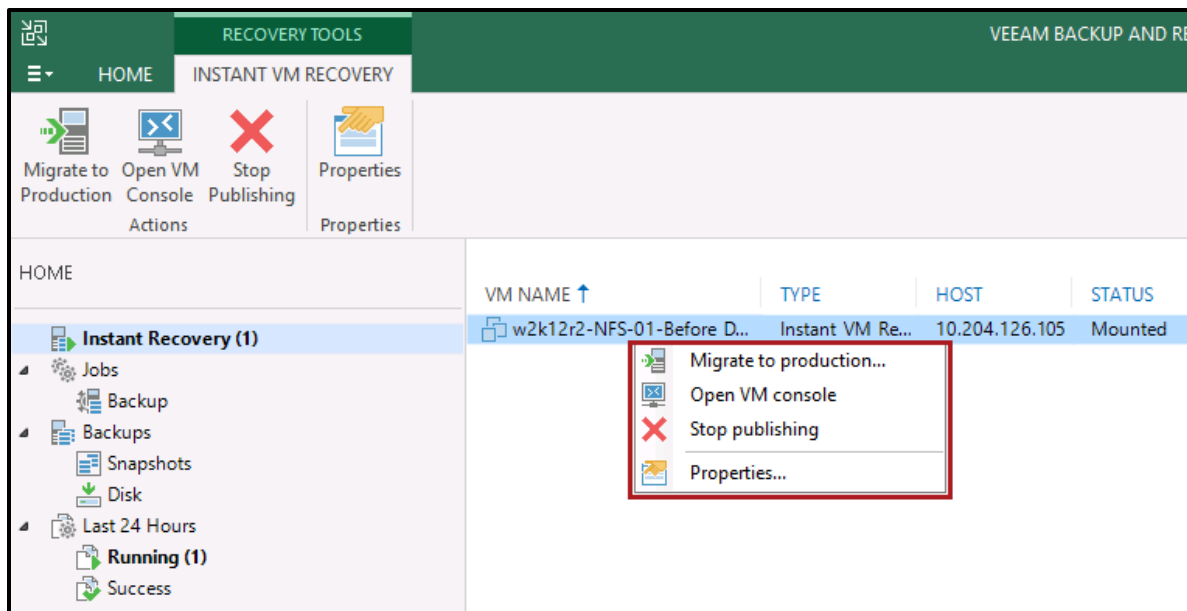


Figure 58 - Recovered VM Options

Just to reemphasize the current Instant recovered VM is not permanent in its current state. It's also not taking up any significant new space on the IntelliFlash. This is simply a clone of the snapshot and the array is keeping track of the delta between the snapshot and the original VM. This is highlighted in Figure 59.

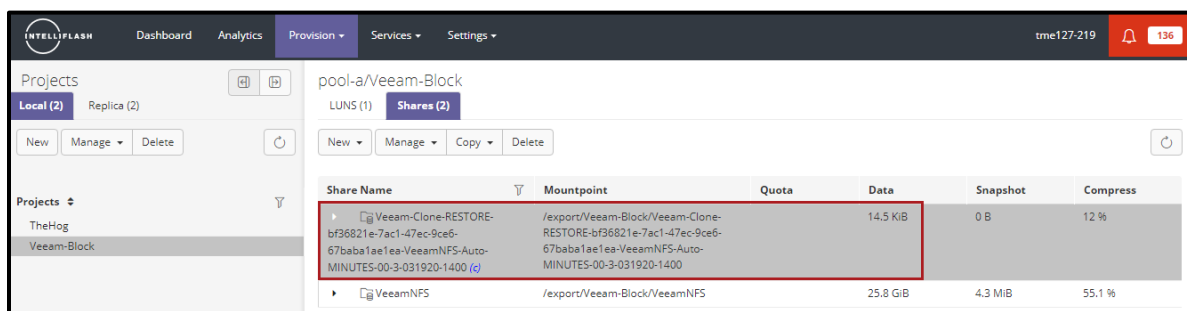


Figure 59 - IntelliFlash Behavior of Recovered VM

After recovering the missing the VM can easily be removed by selecting **Stop publishing** (Figure 58). If it's determined that this VM needs to be permanent it can easily be migrated over to the production environment by selecting **Migrate to production**. Please see the next section that discusses this process.

Migrate to Production Example

If a VM needs to be moved from Instant Recovery to full production this can easily be done by clicking on **Migrate to Production** (Figure 58).

On the Destination window (Figure 60) select the appropriate location for the new VM. In this example we're placing the VM on the same NFS share that the other 2 VMs reside on.

Quick Migration

Destination
Choose destination host, resource pool, VM folder and datastore.

Destination
Transfer
Ready

Host or cluster:
10.204.126.105 Choose...

Resource pool:
Resources Choose...

VM folder:
vm Choose...

Datastore:
IF-NFS [3.3 TB free] Choose...

[Pick datastore](#) for selected virtual disks

< Previous Next > Finish Cancel

Figure 60 - Migrate to Production

Select the appropriate transfer method (Figure 61). In this example we're just using the default **Automatic Selection**.

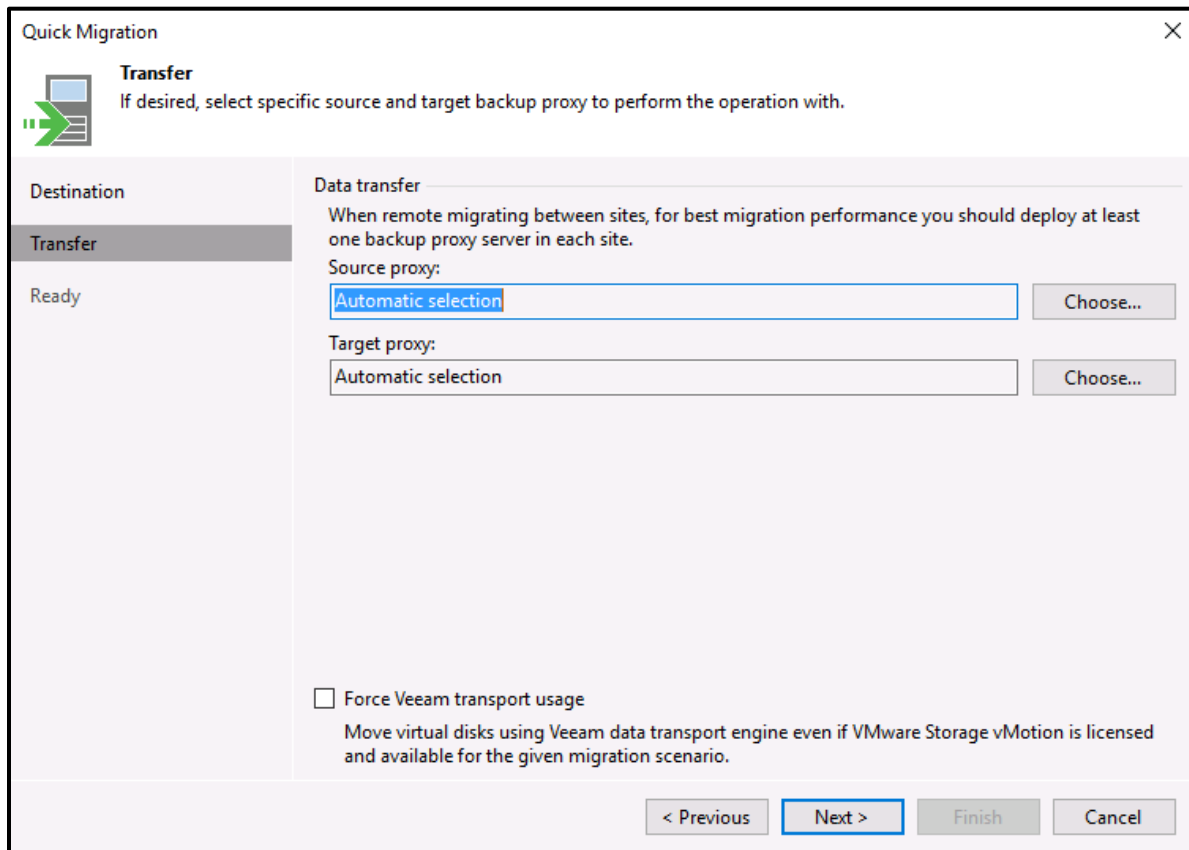


Figure 61 - Select Data Transfer Method

Finally review the migration settings and click **Finish** (Figure 62).

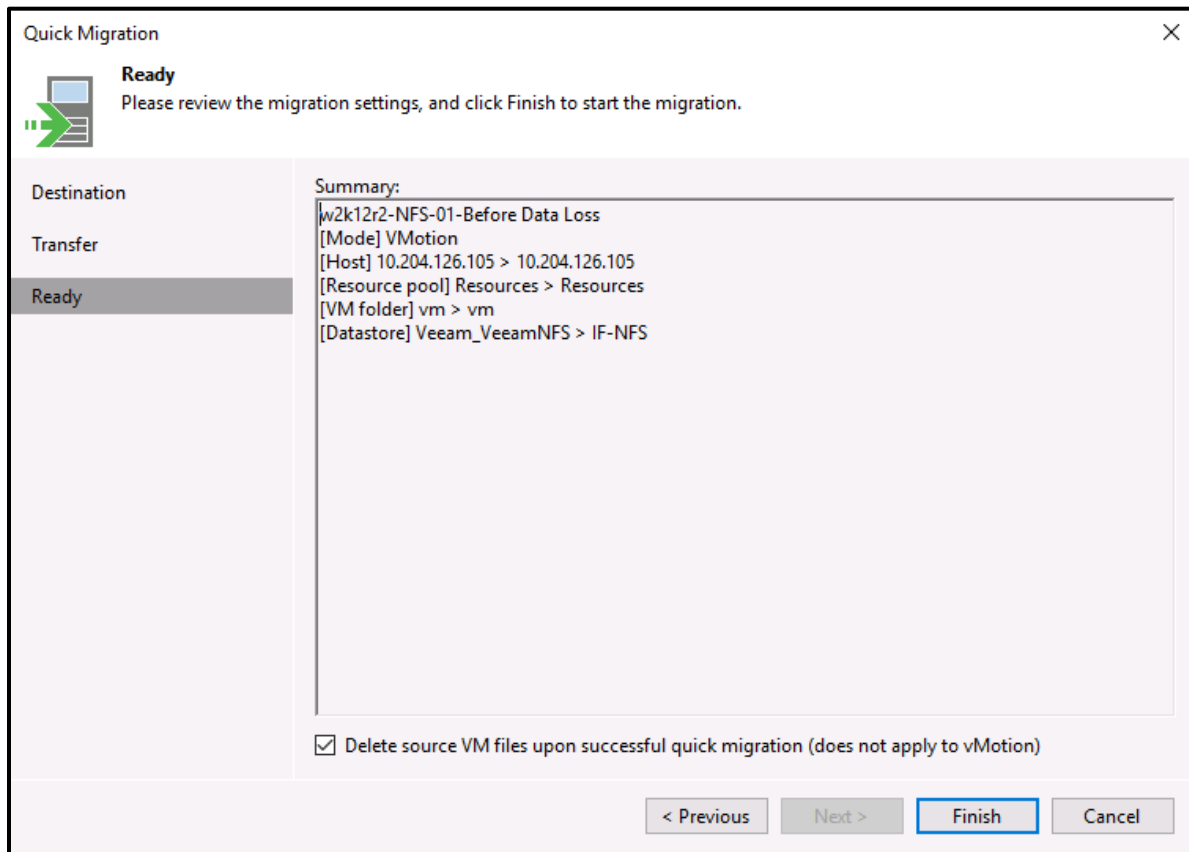


Figure 62 - Review VM Migration to Production

The process of migrating the VM to production is completely done by the IntelliFlash. It promotes the clone to full file on the array. All the I/O is on the array as you can see in Figure 63 from the Veeam UI no traffic is going across the network.

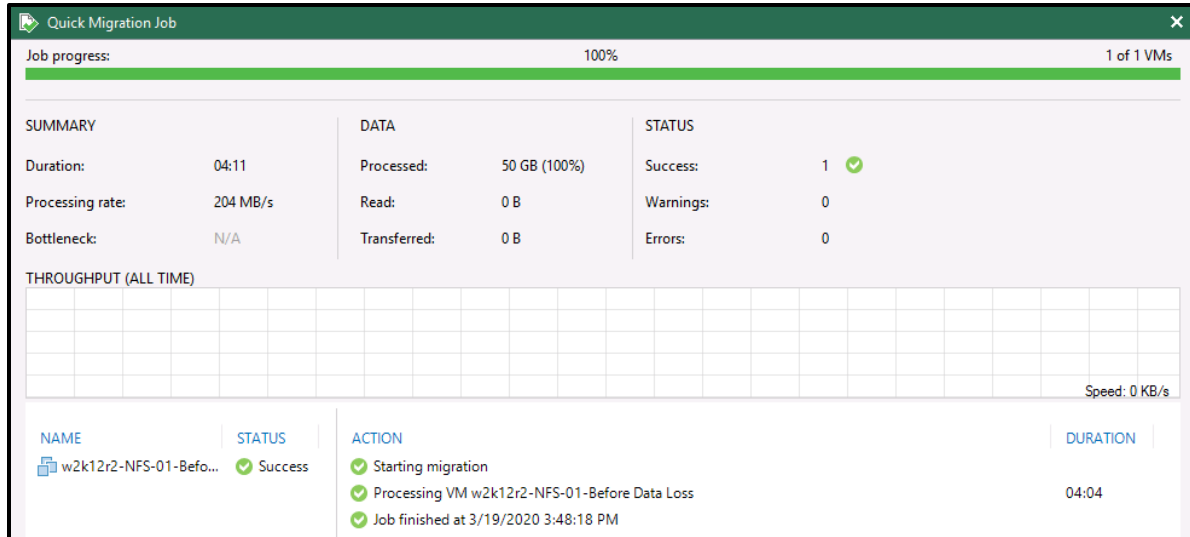


Figure 63 - VM Recovery Complete

Glancing again at the IntelliFlash UI (Figure 64) you can see the clone is gone and now there are 3 separate entries for VMs. On the Veeam UI the Instant recovery VM is gone from the **Home** page.

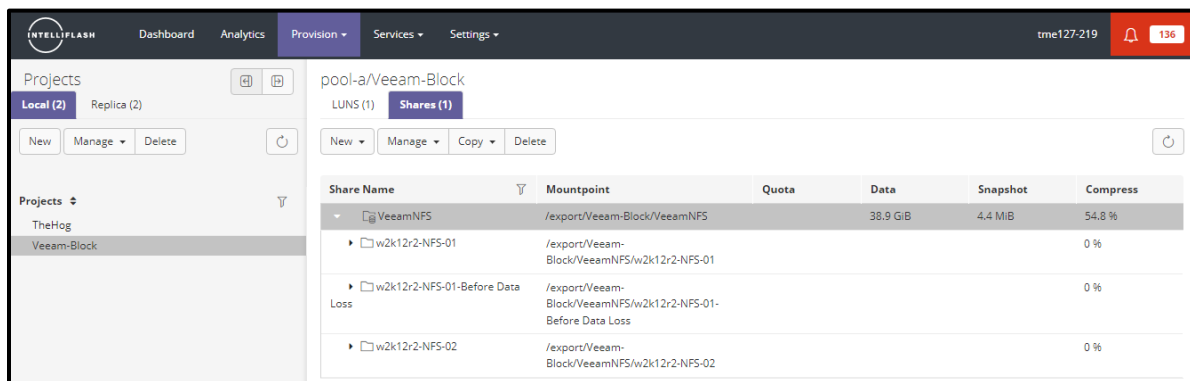


Figure 64 - IntelliFlash Share After Migration

And finally, within the ESXi host you can see 3 fully functional production VMs (Figure 65).

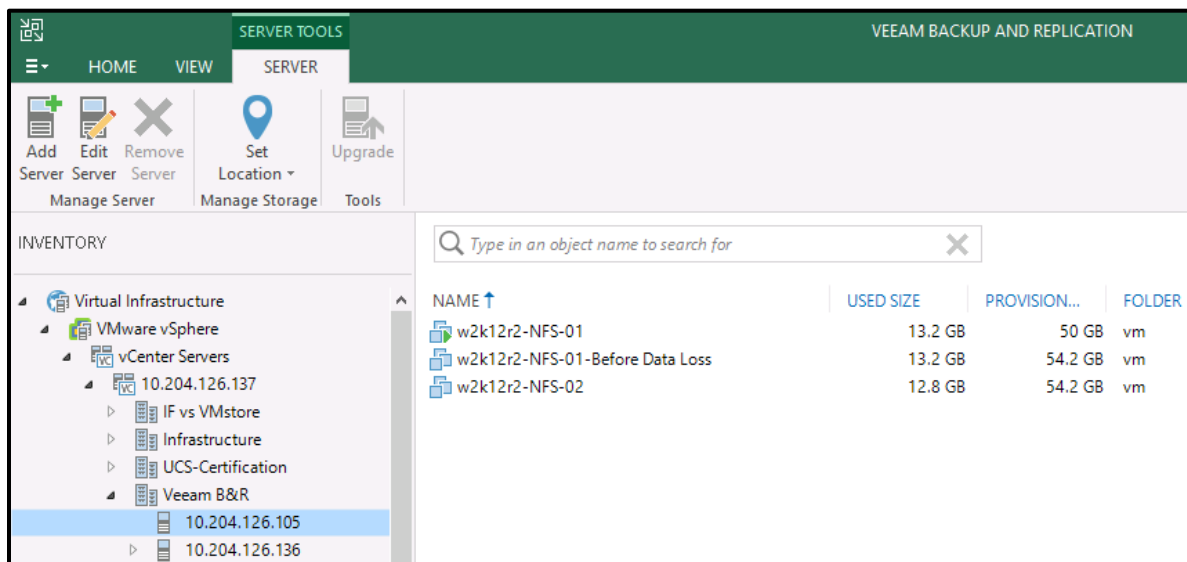


Figure 65 - VMs Now in Production

Appendix

Definitions

- **API** – *Application Programming Interface*
- **CIFS/SMB** – *Common Internet File System/Server Message Block*
- **DCS** – *Data Center Systems*
- **ESXi** – *Elastic Sky X Integrated is the enterprise server virtualization platform from VMWare.*
- **FAQ** – *Frequently Asked Questions*
- **FC** – *Fiber Channel*
- **FQDN** – *Fully Qualified Domain Name*
- **HotAdd Mode** – *Another name for Virtual Application Transport Mode*
- **iSCSI** – *Internet Small Computer System Interface*
- **LAN** – *Local Area Network*
- **LUN** – *Logical Unit Number*
- **NAS** – *Network Attached Storage*
- **NBD** – *Network Block Device protocol*
- **NBDSSL** – *NBD protocol with SSL encryption*
- **NFS** – *Network File System*
- **RESTful API** – *Representational State Transfer Application Transfer Interface*
- **RTPO** – *Recovery Time and Point Objectives*
- **SAN** – *Storage Area Network*
- **SCSI** – *Small Computer System Interface*
- **SLA** – *Service-Level Agreement*
- **SSL** – *Secure Socket Layer*
- **TCP/IP** – *Transmission Control Protocol/Internet Protocol*
- **TME** – *Technical Marketing Engineering*
- **UI** – *User Interface*
- **USAPI** – *Veeam Universal Storage API*
- **VADP** – *VMware vStorage API for Data Protection*
- **VDDK** – *Virtual Disk Development Kit*
- **VM** – *Virtual Machine*
- **VMFS** – *Virtual Machine File System*

This document contains recommendations for building a generic VMware vSphere implementation. It does not take into account requirements for security, performance, resilience, and other operational aspects that may vary for individual customer deployments. If recommendations in this document conflict with current operational guidelines, those existing policies should be given higher priority. Tintri provides this document as is without warranty of any kind, either express or implied, including the implied warranties of merchantability of fitness for a particular purpose.

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