

# StarWind Virtual SAN<sup>®</sup> 3-node Hyperconverged Scenario with VMware vSphere 6.5/6.7

2024

TECHNICAL PAPERS



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If you have questions about installing or using this software, check this and other documents first - you will find answers to most of your questions on the [Technical Papers](#) webpage or in [StarWind Forum](#). If you need further assistance, please [contact us](#) .

## About StarWind

StarWind is a pioneer in virtualization and a company that participated in the development of this technology from its earliest days. Now the company is among the leading vendors of software and hardware hyper-converged solutions. The company's core product is the years-proven StarWind Virtual SAN, which allows SMB and ROBO to benefit from cost-efficient hyperconverged IT infrastructure. Having earned a reputation of reliability, StarWind created a hardware product line and is actively tapping into hyperconverged and storage appliances market. In 2016, Gartner named StarWind “Cool Vendor for Compute Platforms” following the success and popularity of StarWind HyperConverged Appliance. StarWind partners with world-known companies: Microsoft, VMware, Veeam, Intel, Dell, Mellanox, Citrix, Western Digital, etc.

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**IMPORTANT NOTE:** ESXi6.5 and ESXi 6.7 are no longer supported by VMware (see more details here: <https://lifecycle.vmware.com/>). This guide should be used for informational, test, and educational purposes only.

## Introduction To Starwind Virtual San For Hyper-V

StarWind Virtual SAN is a native Windows hypervisor-centric hardware-less VM storage solution. It creates a fully fault-tolerant and high performing storage pool built for the virtualization workloads by mirroring the existing server's storage and RAM between the participating storage cluster nodes. The mirrored storage resources are then connected to all cluster nodes and treated just as a local storage by all hypervisors and clustered applications. High Availability (HA) is achieved by providing multipath access to all storage nodes. StarWind Virtual SAN delivers supreme performance compared to any dedicated SAN solution since it runs locally on the hypervisor and all I/O is processed by local RAM, SSD cache, and disks. This way it never gets bottlenecked by storage fabric.

## Starwind Vsan System Requirements

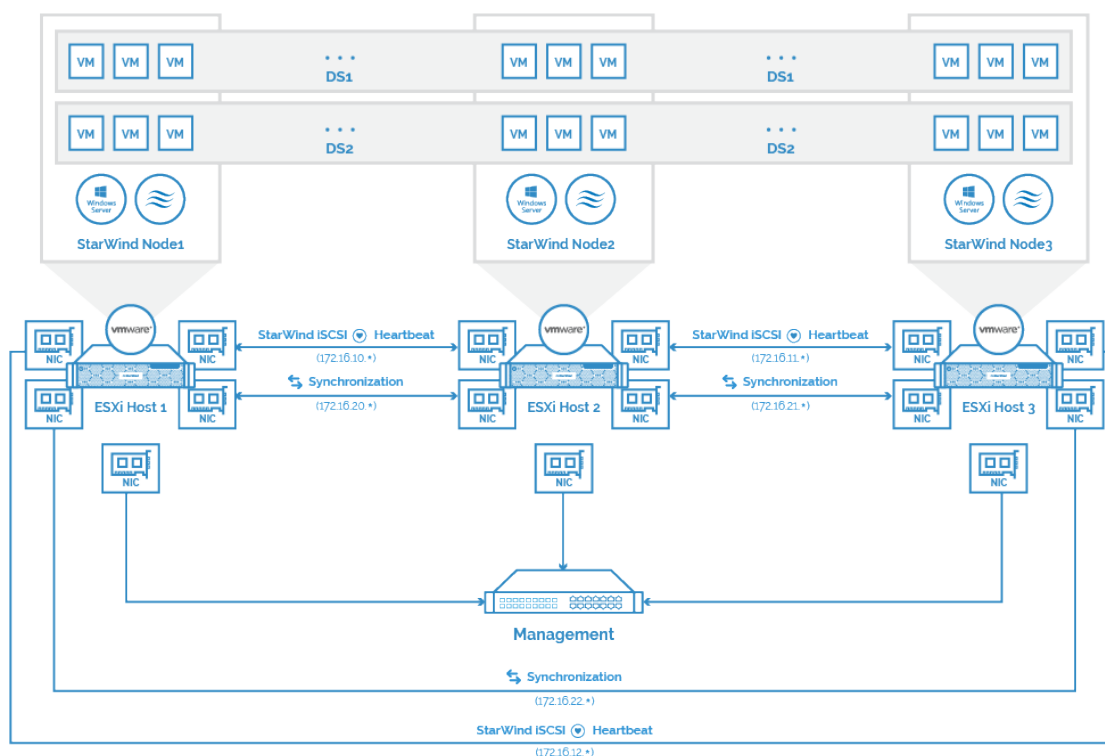
Prior to installing StarWind Virtual SAN, please make sure that the system meets the requirements, which are available via the following link:  
<https://www.starwindsoftware.com/system-requirements>

Recommended RAID settings for HDD and SSD disks:  
<https://knowledgebase.starwindsoftware.com/guidance/recommended-raid-settings-for-hdd-and-ssd-disks/>

Please read StarWind Virtual SAN Best Practices document for additional information:  
<https://www.starwindsoftware.com/resource-library/starwind-virtual-san-best-practices>

## Pre-Configuring The Servers

The diagram below illustrates the network and storage configuration of the solution.



1. ESXi hypervisor should be installed on each host.
2. StarWind Vsan should be installed on the Windows Server operating system deployed as VM on each host.
3. On each node, network interfaces to be used for Synchronization and iSCSI/StarWind heartbeat should be in different subnets and connected directly according to the network diagram above. Here, the 172.16.10.x, 172.16.11.x, 172.16.12.x subnets are used for the iSCSI/StarWind heartbeat traffic, while the 172.16.20.x, 172.16.21.x, 172.16.22.x subnets are used for the Synchronization traffic.

NOTE: Do not use iSCSI/Heartbeat and Synchronization channels over the same physical link. Synchronization and iSCSI/Heartbeat links can be connected either via redundant switches or directly between the nodes.

## Preparing Environment For Starwind Vsan Deployment

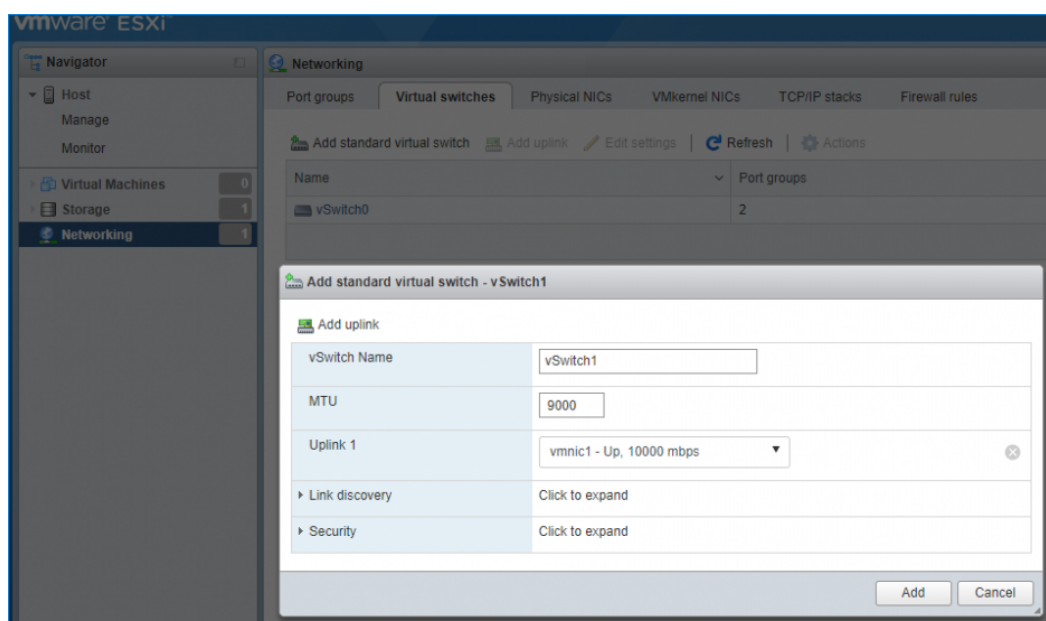
## Configuring Networks

Configure network interfaces on each node to make sure that Synchronization and iSCSI/StarWind heartbeat interfaces are in different subnets and connected physically according to the network diagram above. All actions below should be applied to each ESXi server.

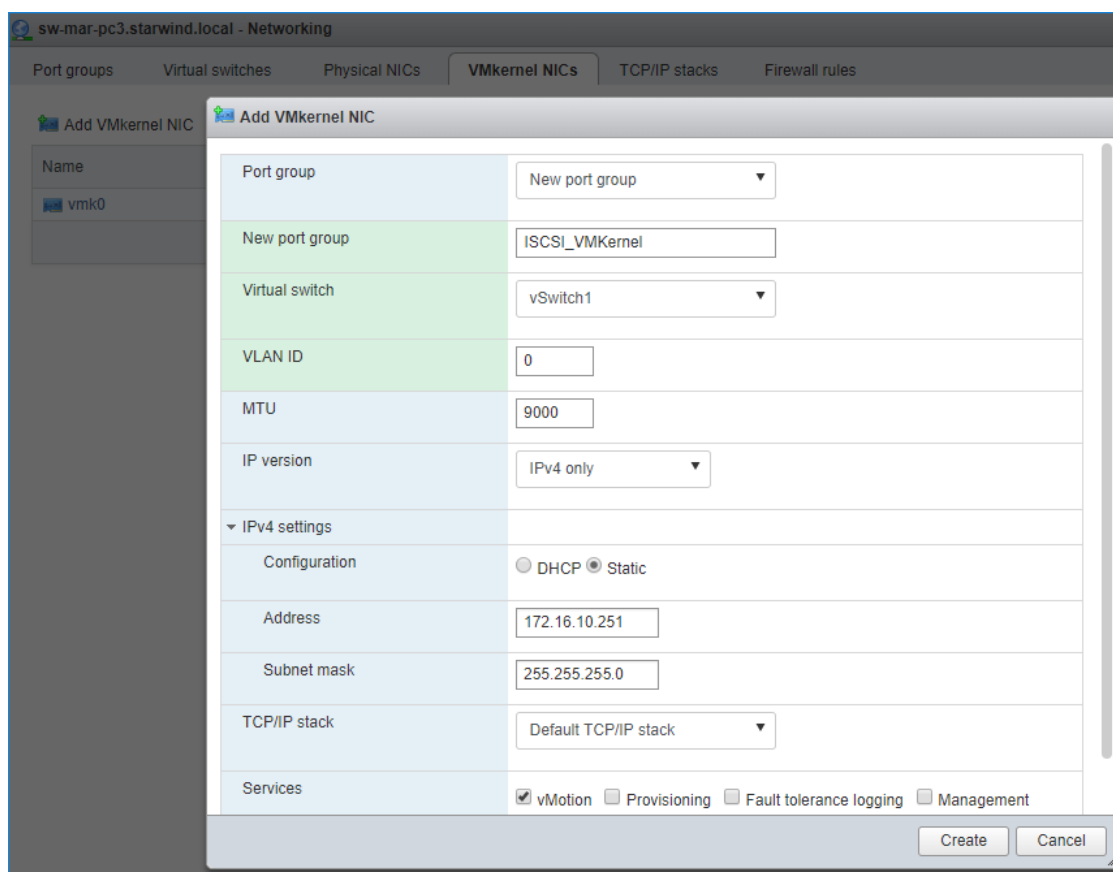
NOTE: Virtual Machine Port Group should be created for both iSCSI/ StarWind Heartbeat and the Synchronization vSwitches. VMKernel port should be created only for iSCSI traffic. Static IP addresses should be assigned to VMKernel ports.

NOTE: It is recommended to set MTU to 9000 on vSwitches and VMKernel ports for iSCSI and Synchronization traffic. Additionally, vMotion can be enabled on VMKernel ports.

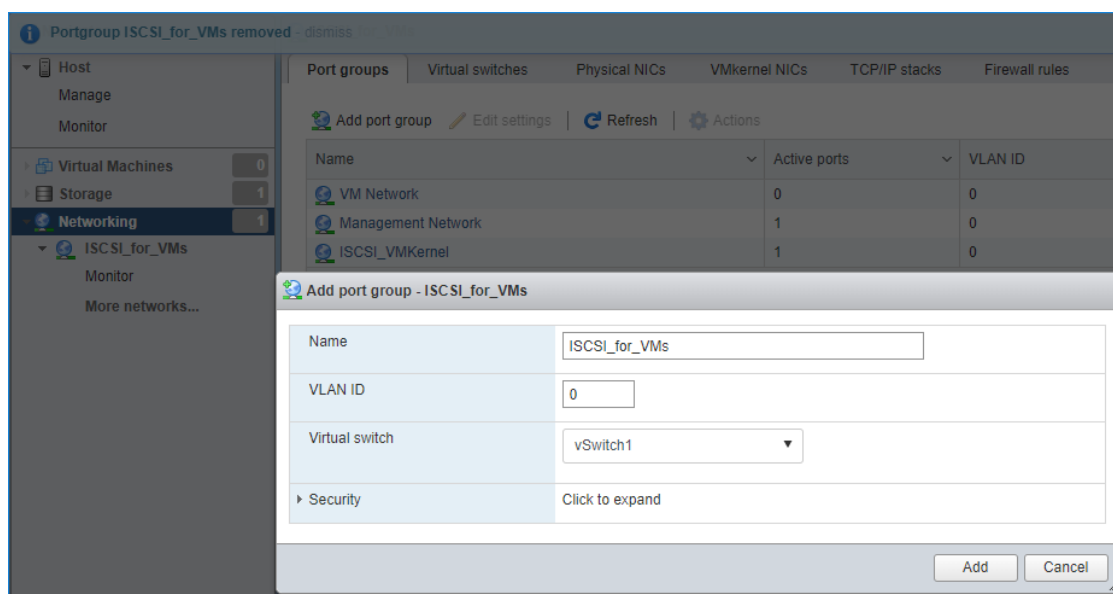
1. Using the VMware ESXi web console, create two standard vSwitches: one for the iSCSI/ StarWind Heartbeat channel (vSwitch1) and the other one for the Synchronization channel (vSwitch2).



2. Create a VMKernel port for the iSCSI/ StarWind Heartbeat channel.



3. Add a Virtual Machine Port Groups on the vSwitch for iSCSI traffic (vSwitch1) and on the vSwitch for Synchronization traffic (vSwitch2).



4. Repeat steps 1-3 for any other links intended for Synchronization and iSCSI/Heartbeat

traffic on ESXi hosts.

## Preparing Starwind Virtual Machines

Create Virtual Machines (VMs) on each ESXi host with supported Windows Server OS for StarWind VSAN (see system requirements: <https://www.starwindsoftware.com/system-requirements>) and further StarWind VSAN installation.

StarWind VMs on ESXi hosts should be configured with the following settings:

RAM: at least 4 GB (plus the size of the RAM cache if it is planned to be used) reserved for the VM;

CPUs: at least 4 virtual processors with 2 GHz reserved;

Network adapter 1: Management

Network adapter 2: iSCSI

Network adapter 3: Sync

NOTE: Network adapters for iSCSI and Sync should be of the VMXNET3 type. Network adapter for Management should be of the E1000 type.

Hard disk 1: 100 GB for OS (recommended) – Thick Provisioned Eager Zeroed.

Hard disk 2: Depends on the storage volume to be used as shared storage – Thick Provisioned Eager Zeroed.

NOTE: Alternatively, the disk can be added to StarWind VSAN VM as RDM. The link to VMware documentation is below:

[https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vm\\_admin.doc/GUID-4236E44E-E11F-4EDD-8CC0-12BA664BB811.html](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vm_admin.doc/GUID-4236E44E-E11F-4EDD-8CC0-12BA664BB811.html)

Also, if a separate RAID controller is available, it can be used as dedicated storage for StarWind VM, and RAID controller can be added to StarWind VM as a PCI device. In this case RAID volume will be available as a virtual disk in the Drives section in the Web console. Follow the instructions in the [section below](#) on how to add RAID controller as PCI device to StarWind VM.

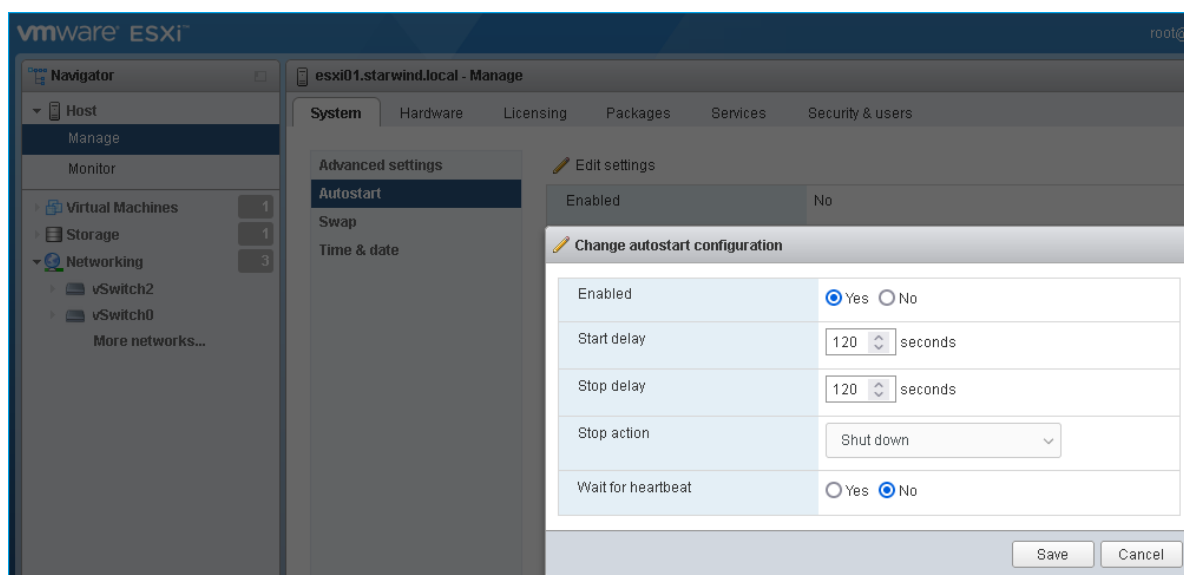
NOTE: The Active Directory Domain Services role can be added on StarWind Virtual Machine (VM) if necessary, thus it can serve as a domain controller.

NOTE: When using StarWind with the synchronous replication feature inside of a Virtual

Machine, it is recommended not to make backups and/or snapshots of the Virtual Machine with the StarWind VSAN service installed, as this could pause the StarWind Virtual Machine. Pausing the Virtual Machines while the StarWind VSAN service is under load may lead to split-brain issues in synchronous replication devices, thus to data corruption.

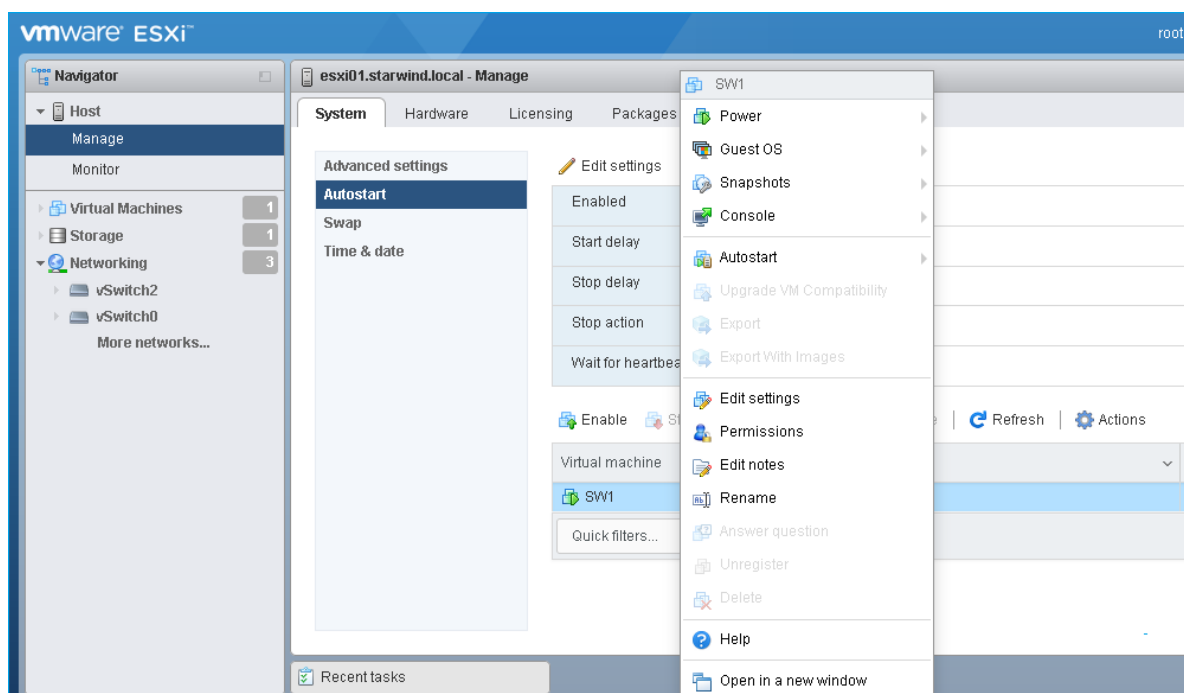
## Configuring Starwind Vms Startup/shutdown

1. Setup the VMs startup policy on ESXi hosts from the Manage -> System tab in the ESXi web console. In the popup window, select Yes to enable the option and set the stop action to Shut down. Click on Save to proceed.



2. To configure VM autostart, right-click on it, navigate to Autostart and click on Enable.

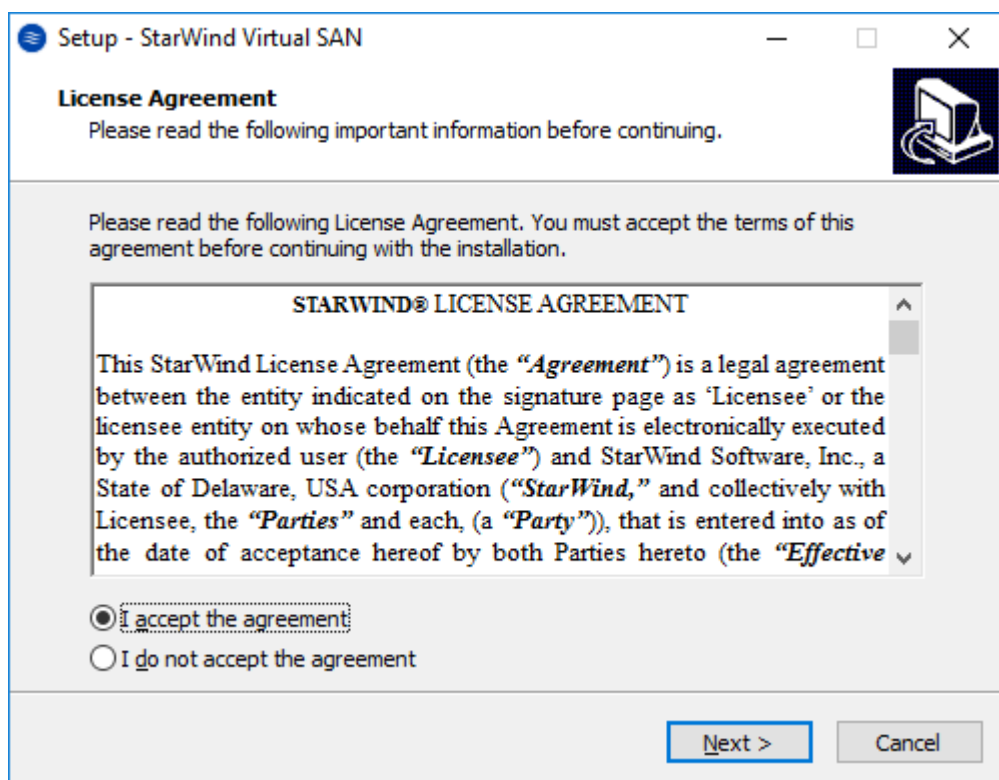




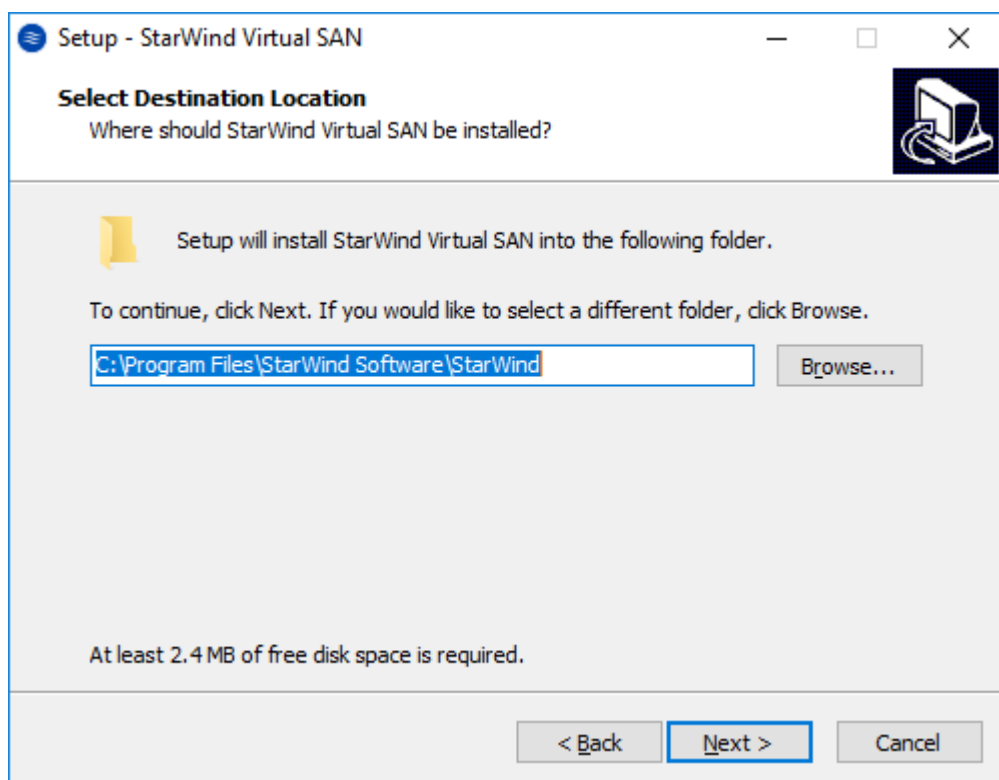
3. Complete the actions above on the StarWind VM located on another host.
4. Start virtual machines, install Windows Server OS and StarWind Virtual SAN.

## Installing Starwind Vsan For Hyper-V

1. Download the StarWind setup executable file from the StarWind website:  
<https://www.starwind.com/registration-starwind-virtual-san>
2. Launch the downloaded setup file on the server to install StarWind Virtual SAN or one of its components. The Setup wizard will appear. Read and accept the License Agreement.

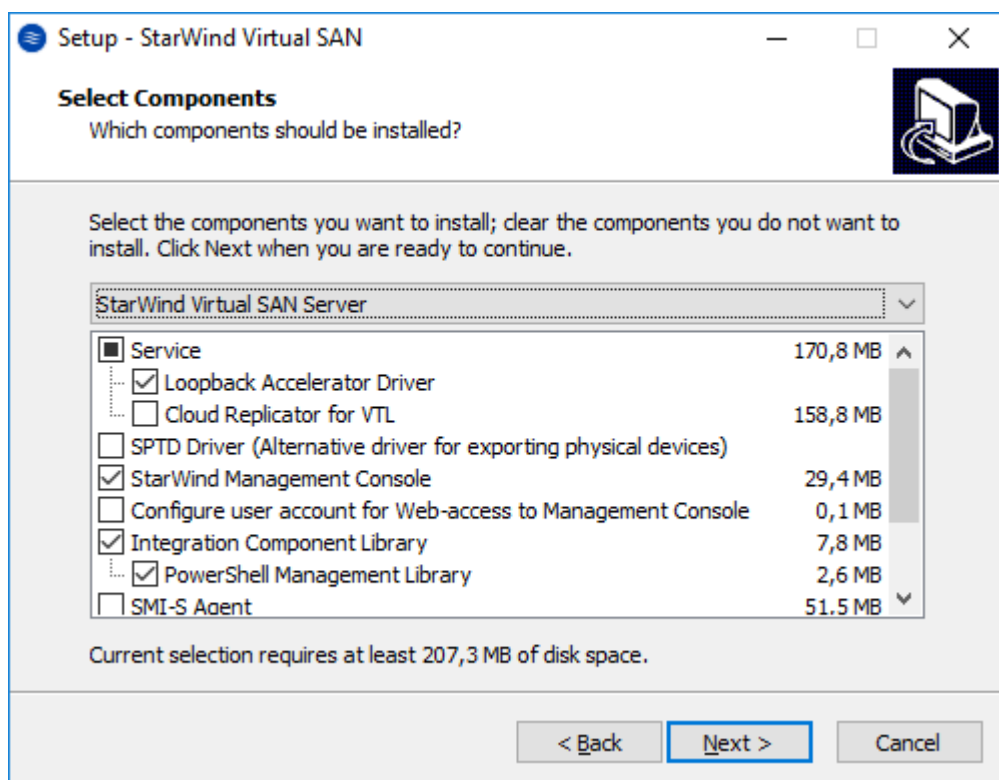


3. Carefully read the information about the new features and improvements. Red text indicates warnings for users that are updating the existing software installations.
4. Select Browse to modify the installation path if necessary. Click on Next to continue.

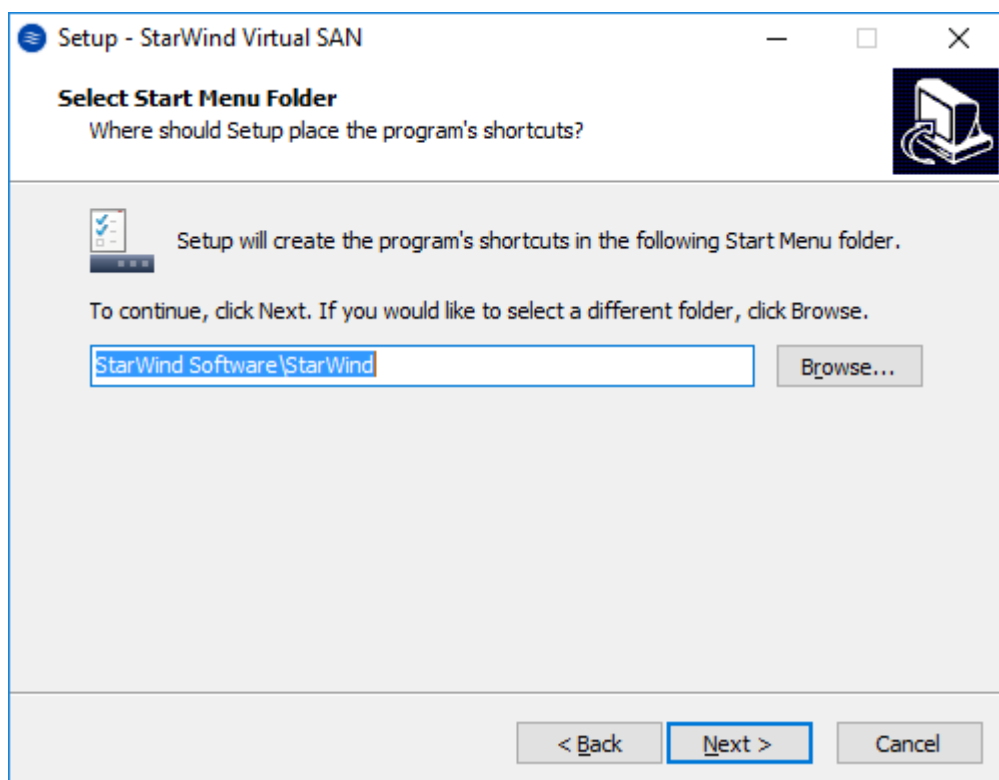


5. Select the following components for the minimum setup:

- StarWind Virtual SAN Service. The StarWind Virtual SAN service is the “core” of the software. It can create iSCSI targets as well as share virtual and physical devices. The service can be managed from StarWind Management Console on any Windows computer that is on the same network. Alternatively, the service can be managed from StarWind Web Console deployed separately.
  - StarWind Management Console. Management Console is the Graphic User Interface (GUI) part of the software that controls and monitors all storage-related operations (e.g., allows users to create targets and devices on StarWind Virtual SAN servers connected to the network).
- NOTE: To manage StarWind Virtual SAN installed on a Windows Server Core edition with no GUI, StarWind Management Console should be installed on a different computer running the GUI-enabled Windows edition.



6. Specify Start Menu Folder.



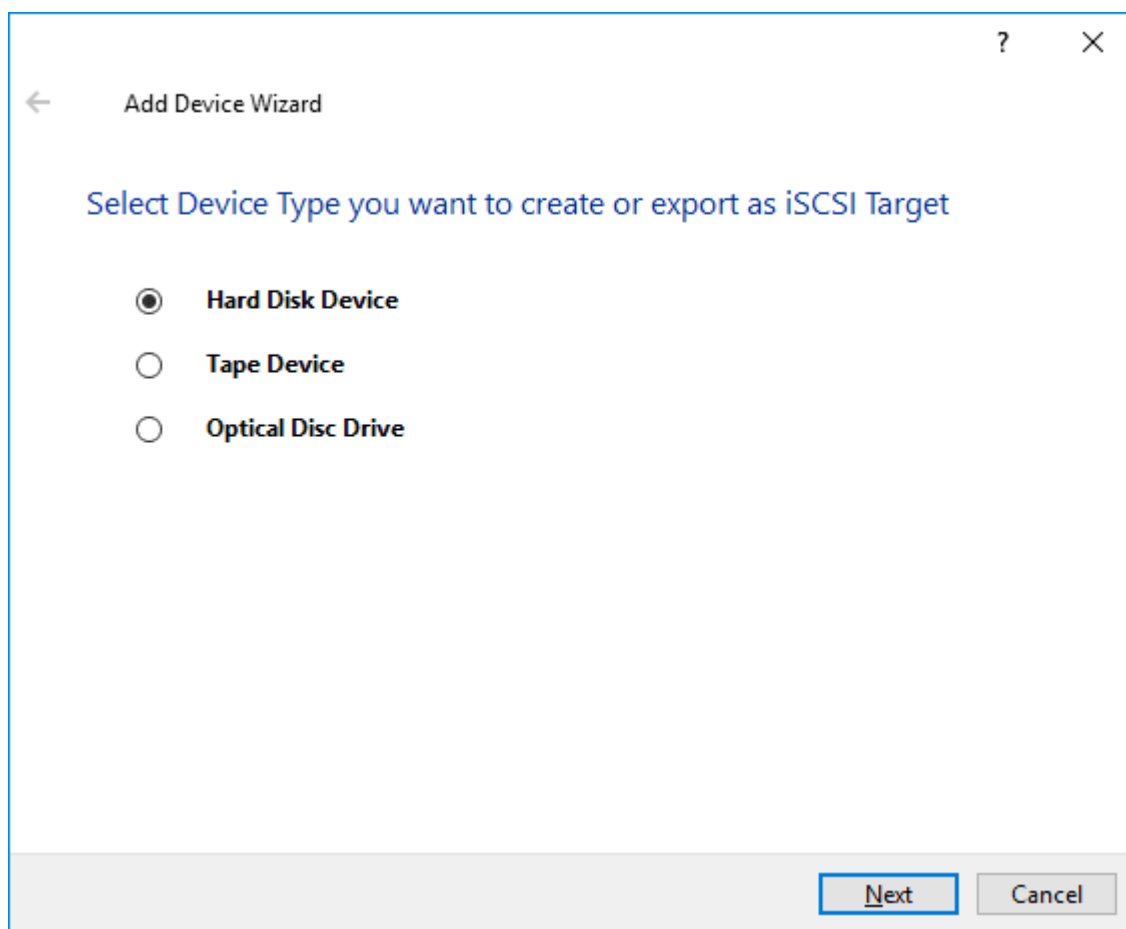
7. Enable the checkbox if a desktop icon needs to be created. Click on Next to continue.

8. When the license key prompt appears, choose the appropriate option:

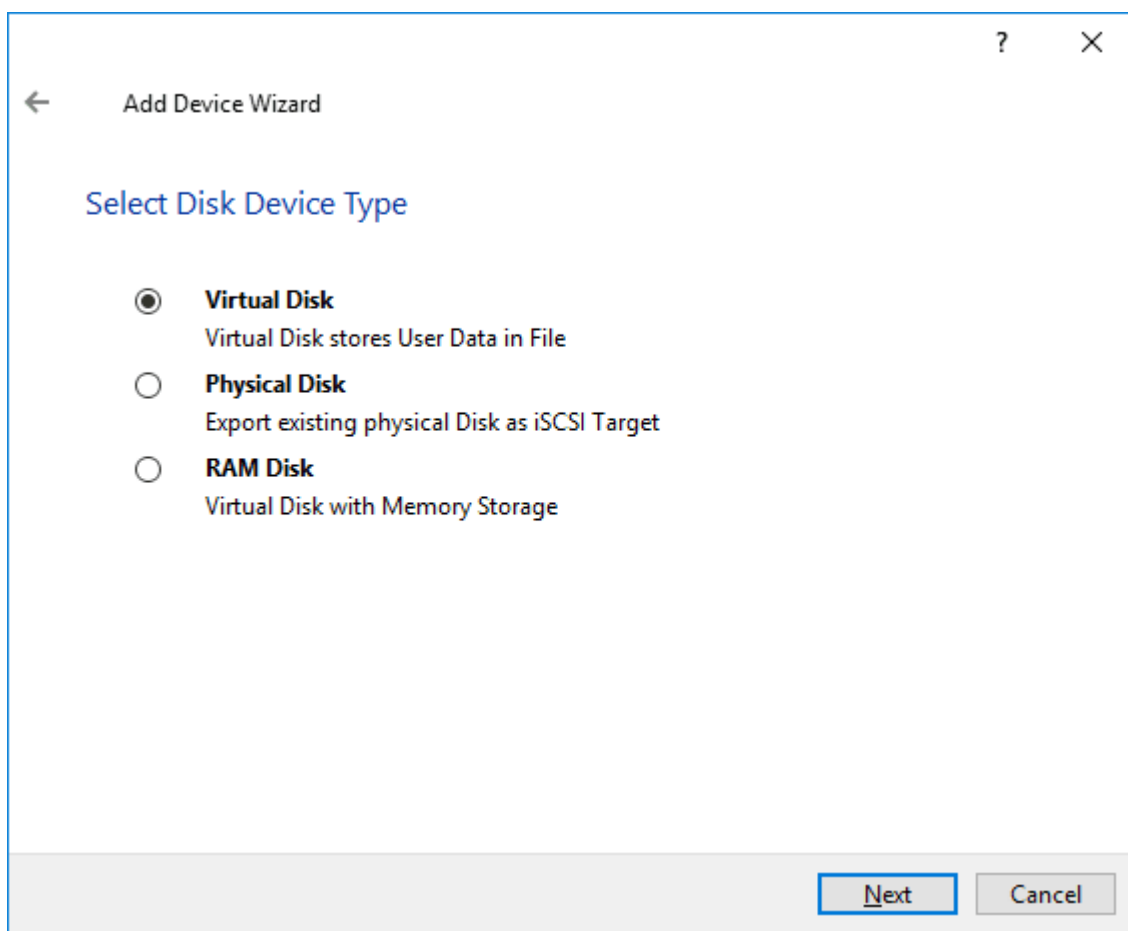
- request time-limited fully functional evaluation key.
  - request FREE version key.
  - select the previously purchased commercial license key.
9. Click on the Browse button to locate the license file.
  10. Review the licensing information.
  11. Verify the installation settings. Click on Back to make any changes or Install to proceed with installation.
  12. Enable the appropriate checkbox to launch StarWind Management Console right after the setup wizard is closed and click on Finish.
  13. Repeat the installation steps on the partner node.

## Creating Starwind Devices

1. In the StarWind Management Console click to Add Device (advanced) button and open Add Device (advanced) Wizard.
2. Select Hard Disk Device as the type of device to be created.



3. Select Virtual Disk.



4. Specify a virtual disk Name, Location, and Size.

← Add Device Wizard

Virtual Disk Location

☒ Create a New Virtual Disk

Name: <device name>

Location: My Computer\D\

Size: <size> GB

☐ Use an Existing Virtual Disk

Location:

☐ Read-Only Mode

Next Cancel

5. Select the Thick provisioned disk type and block size.

NOTE: Use 4096 sector size for targets, connected on Windows-based systems and 512 bytes sector size for targets, connected on Linux-based systems (ESXi/Xen/KVM).

6. Define a caching policy and specify a cache size (in MB). Also, the maximum available cache size can be specified by selecting the appropriate checkbox. Optionally, define the L2 caching policy and cache size.



← Add Device Wizard

Specify Device RAM Cache Parameters

Mode

☐ **Write-Back**  
Writes are performed asynchronously, actual Writes to Disk are delayed, Reads are cached

☐ **Write-Through**  
Writes are performed synchronously, Reads are cached

☒ **N/A**  
Reads and Writes are not cached

☐ Set Maximum available Size

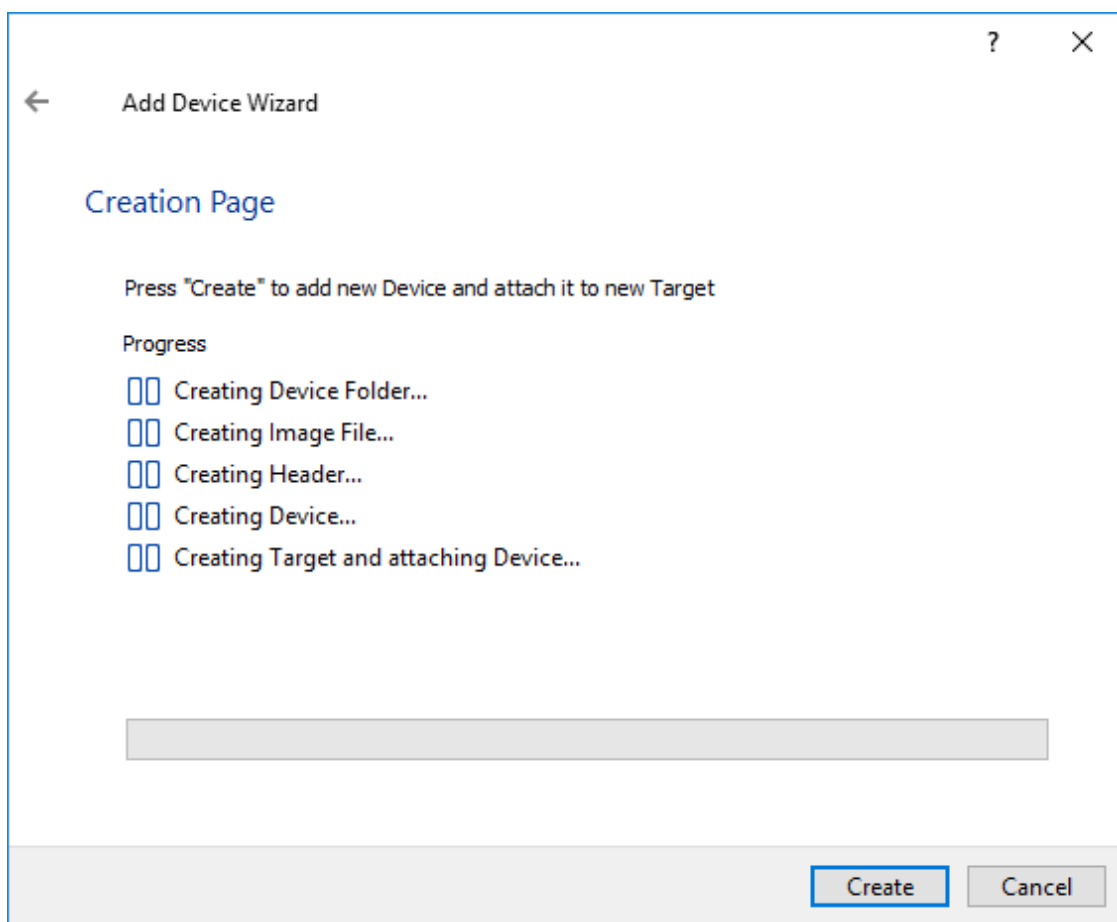
Size:  MB

Next Cancel

7. Specify Target Parameters. Select the Target Name checkbox to enter a custom target name. Otherwise, the name is generated automatically in accordance with the specified target alias.

The screenshot shows a window titled "Add Device Wizard" with a back arrow, a help icon (?), and a close icon (X). The main heading is "Target Parameters". Below this, there is a section "Choose a Target Attachment Method" with a dropdown menu currently showing "Create new Target". Underneath is a text field for "Target Alias" containing the placeholder "<target alias name>". Below that is a checkbox labeled "Target Name" which is currently unchecked. Underneath the checkbox is a text field containing the iSCSI Qualified Name (QNAM) "iqn.2008-08.com.starwindsoftware:sw1- <target alias name>". At the bottom of the form is a checkbox labeled "Allow multiple concurrent iSCSI Connections" which is checked. At the bottom right of the window are two buttons: "Next" and "Cancel".

8. Click Create to add a new device and attach it to the target.



9. Click Close to finish the device creation.

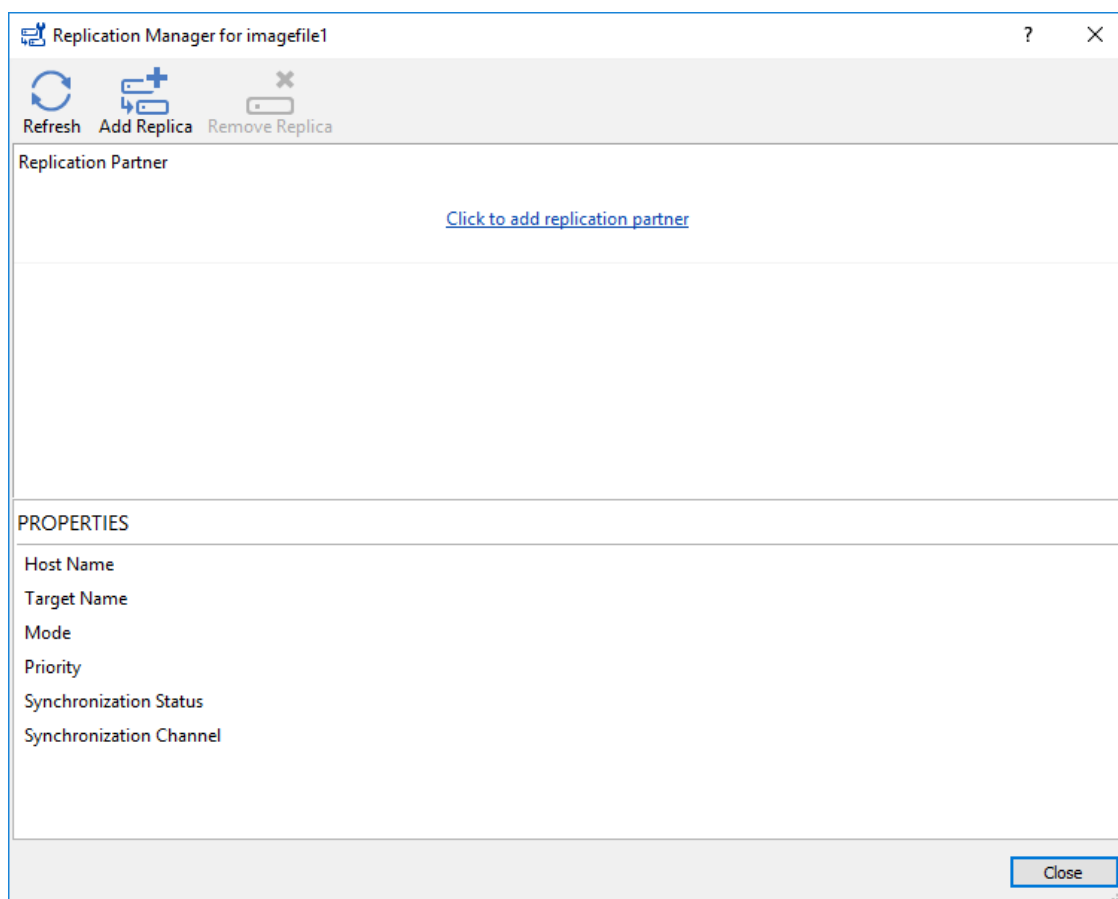
10. The successfully added devices appear in the StarWind Management Console.

## Select The Required Replication Mode

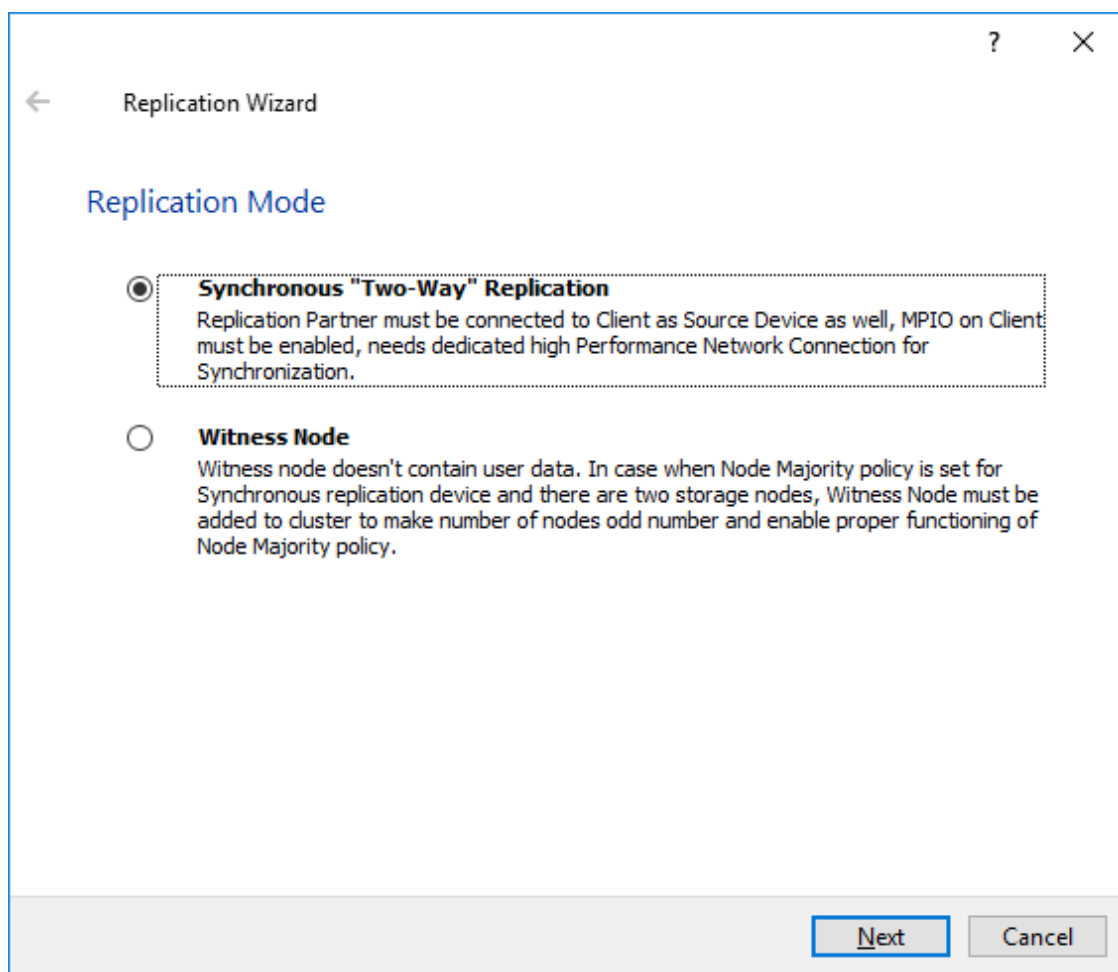
The replication can be configured using Synchronous “Two-Way” Replication mode: Synchronous or active-active replication ensures real-time synchronization and load balancing of data between two or three cluster nodes. Such a configuration tolerates the failure of two out of three storage nodes and enables the creation of an effective business continuity plan. With synchronous mirroring, each write operation requires control confirmation from both storage nodes. It guarantees the reliability of data transfers but is demanding in bandwidth since mirroring will not work on high-latency networks.

## Synchronous “Two-Way” Replication

1. Right-click the recently created device and select Replication Manager from the shortcut menu.
2. Select the Add Replica button in the top menu.



3. Select Synchronous “Two-Way” replication as a replication mode.



4. Specify a partner Host name or IP address and Port Number.

## Selecting The Failover Strategy

StarWind provides 2 options for configuring a failover strategy:

### Heartbeat

The Heartbeat failover strategy allows avoiding the “split-brain” scenario when the HA cluster nodes are unable to synchronize but continue to accept write commands from the initiators independently. It can occur when all synchronization and heartbeat channels disconnect simultaneously, and the partner nodes do not respond to the node’s requests. As a result, StarWind service assumes the partner nodes to be offline and continues operations on a single-node mode using data written to it.

If at least one heartbeat link is online, StarWind services can communicate with each other via this link. The device with the lowest priority will be marked as not synchronized and get subsequently blocked for the further read and write operations until the synchronization channel resumption. At the same time, the partner device on the

synchronized node flushes data from the cache to the disk to preserve data integrity in case the node goes down unexpectedly. It is recommended to assign more independent heartbeat channels during the replica creation to improve system stability and avoid the “split-brain” issue.

With the heartbeat failover strategy, the storage cluster will continue working with only one StarWind node available.

## Node Majority

The Node Majority failover strategy ensures the synchronization connection without any additional heartbeat links. The failure-handling process occurs when the node has detected the absence of the connection with the partner.

The main requirement for keeping the node operational is an active connection with more than half of the HA device’s nodes. Calculation of the available partners is based on their “votes”.

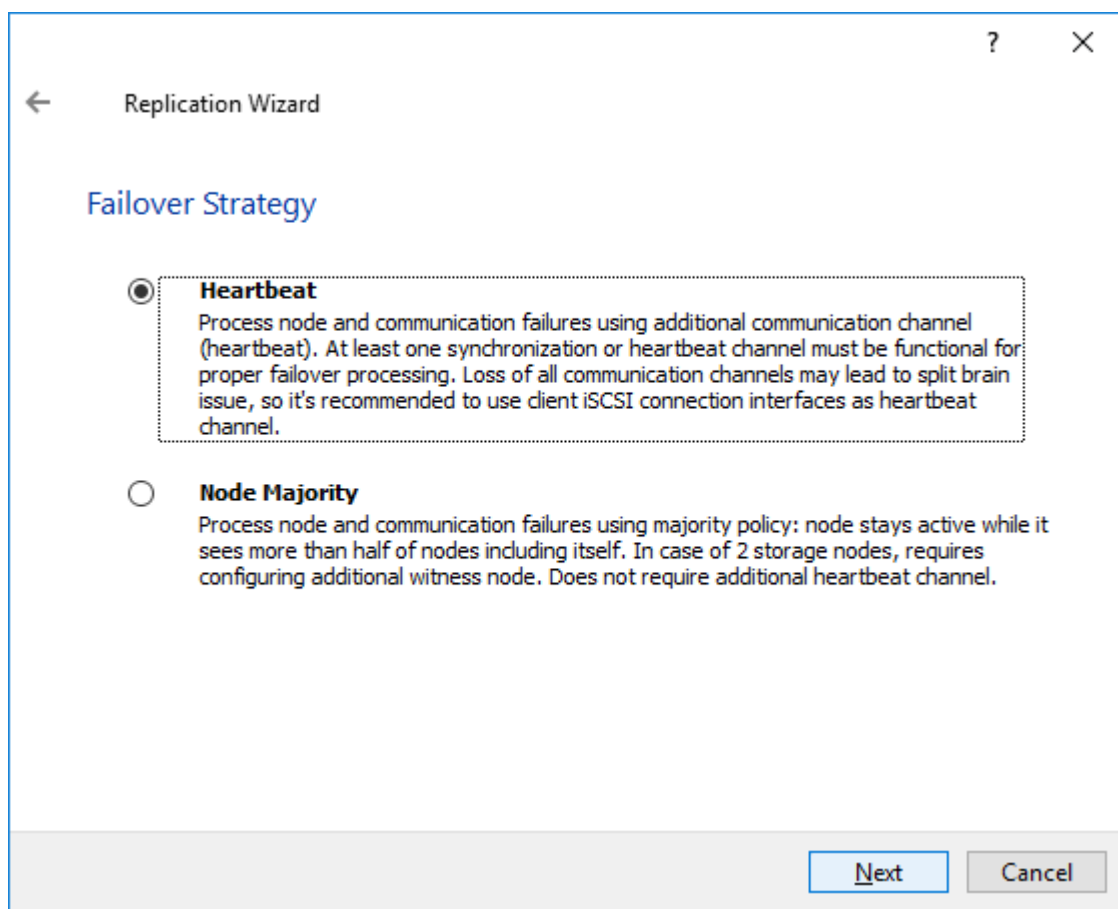
In case of a two-node HA storage, all nodes will be disconnected if there is a problem on the node itself, or in communication between them. Therefore, the Node Majority failover strategy requires the addition of the third Witness node or file share (SMB) which participates in the nodes count for the majority, but neither contains data on it nor is involved in processing clients’ requests. In case an HA device is replicated between 3 nodes, no Witness node is required.

With Node Majority failover strategy, failure of only one node can be tolerated. If two nodes fail, the third node will also become unavailable to clients’ requests.

Please select the required option:

## Heartbeat

1. Select Failover Strategy.



2. Select Create new Partner Device and click Next.

3. Select a partner device Location and click Next.

4. Select Synchronization Journal Strategy and click Next.

NOTE: There are several options – RAM-based journal (default) and Disk-based journal with failure and continuous strategy, that allow to avoid full synchronization cases.

RAM-based (default) synchronization journal is placed in RAM. Synchronization with RAM journal provides good I/O performance in any scenario. Full synchronization could occur in the cases described in this KB:

<https://knowledgebase.starwindsoftware.com/explanation/reasons-why-full-synchronization-may-start/>

Disk-based journal placed on a separate disk from StarWind devices. It allows to avoid full synchronization for the devices where it's configured even when StarWind service is being stopped on all nodes. Disk-based synchronization journal should be placed on a separate, preferably faster disk from StarWind devices. SSDs and NVMe disks are recommended as the device performance is defined by the disk speed, where the journal is located. For example, it can be placed on the OS boot volume.

It is required to allocate 2 MB of disk space for the synchronization journal per 1 TB of HA device size with a disk-based journal configured with 2-way replication and 4MB per 1 TB of HA device size for 3-way replication.

#### Failure journal

The strategy provides good I/O performance, as a RAM-based journal, while all device nodes are in a healthy synchronized state. If a device on one node went into a not synchronized state, the disk-based journal activates and a performance drop could occur as the device performance is defined by the disk speed, where the journal is located. Fast synchronization is not guaranteed in all cases. For example, if a simultaneous hard reset of all nodes occurs, full synchronization will occur.

#### Continuous journal

The strategy guarantees fast synchronization and data consistency in all cases. Although, this strategy has the worst I/O performance, because of frequent write operations to the journal, located on the disk, where the journal is located.

Replication Wizard

### Synchronization Journal Setup

- ☒ **RAM-based journal**  
Synchronization journal placed in RAM. Synchronization with RAM journal provides good IO performance in any scenario.
- ☐ **Disk-based journal**  
Synchronization journal placed on disk.
- ☐ **Failure journal**  
The strategy provides good IO performance while all device nodes are in a healthy state.
- ☐ **Continuous journal**  
The strategy guarantees fast synchronization and data consistency in all cases.

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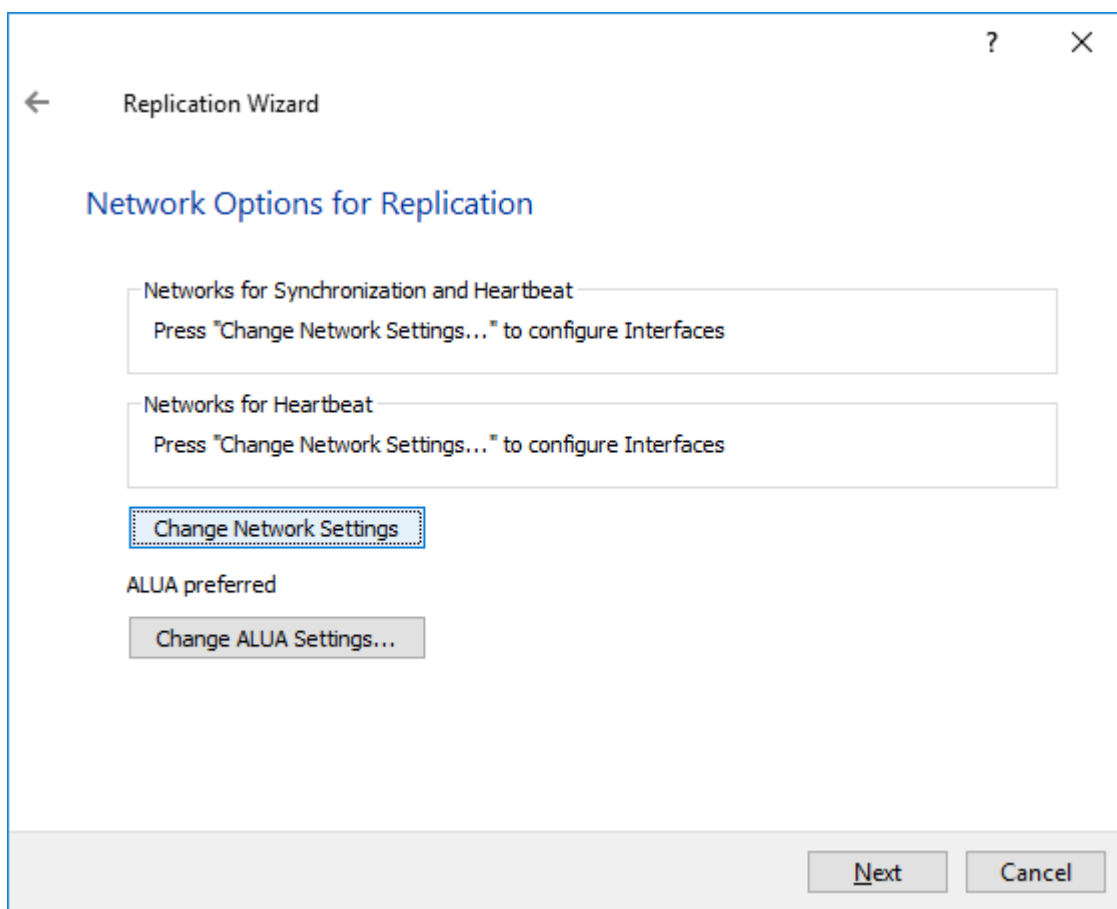
Current Node:  ...

Partner Node:  ...

**Next** **Cancel**

5. Click Change Network Settings.





6. Specify the interfaces for Synchronization and Heartbeat Channels. Click OK and then click Next.

Specify Interfaces for Synchronization Channels

Select synchronization channel

Interfaces	Networks	Synchronization and H...	Heartbeat
[-] Host Name: 192.168.12.10			
172.16.10.10	172.16.10.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
172.16.12.10	172.16.12.0	<input type="checkbox"/>	<input type="checkbox"/>
172.16.20.10	172.16.20.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
172.16.22.10	172.16.22.0	<input type="checkbox"/>	<input type="checkbox"/>
192.168.12.10	192.168.12.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
[-] Host Name: SW2			
172.16.10.20	172.16.10.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
172.16.11.20	172.16.11.0	<input type="checkbox"/>	<input type="checkbox"/>
172.16.20.20	172.16.20.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
172.16.21.20	172.16.21.0	<input type="checkbox"/>	<input type="checkbox"/>
192.168.12.20	192.168.12.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>

☐ Allow Free Select Interfaces

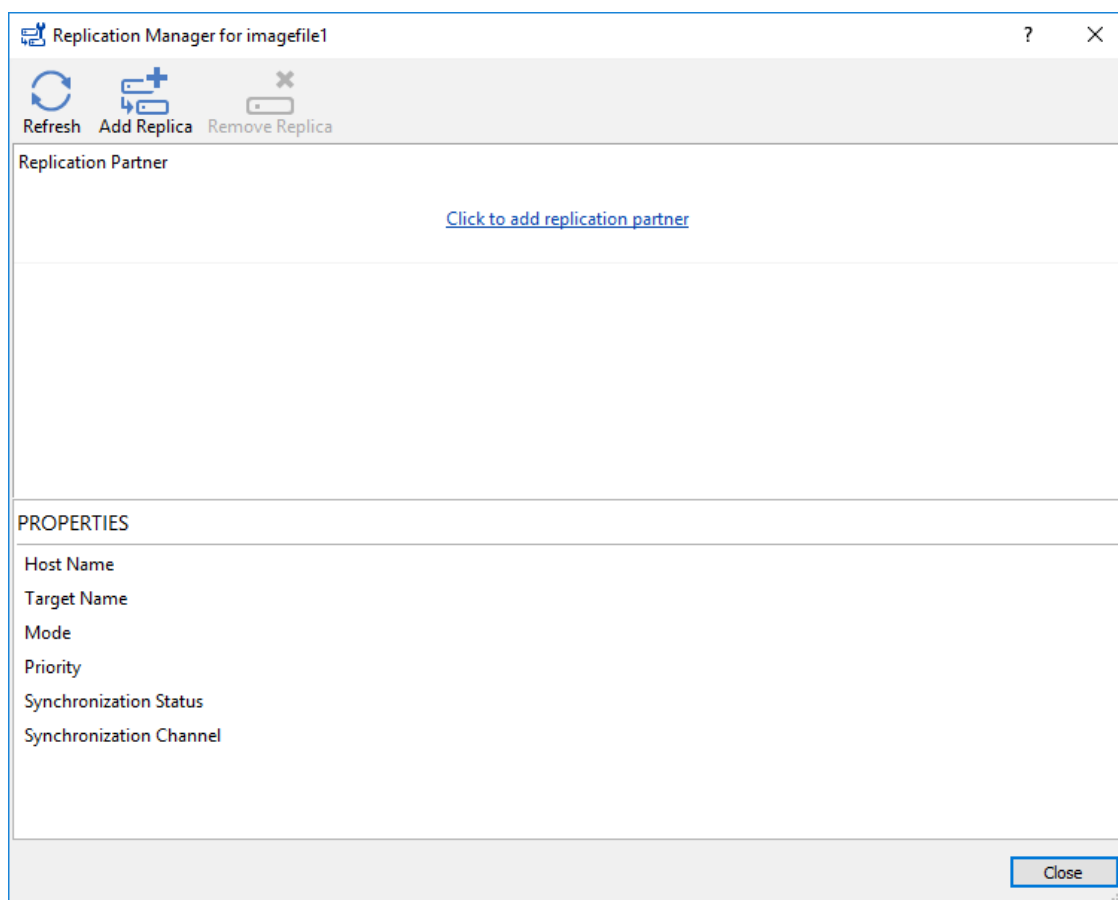
OK Cancel

7. In Select Partner Device Initialization Mode, select Synchronize from existing Device and click Next.

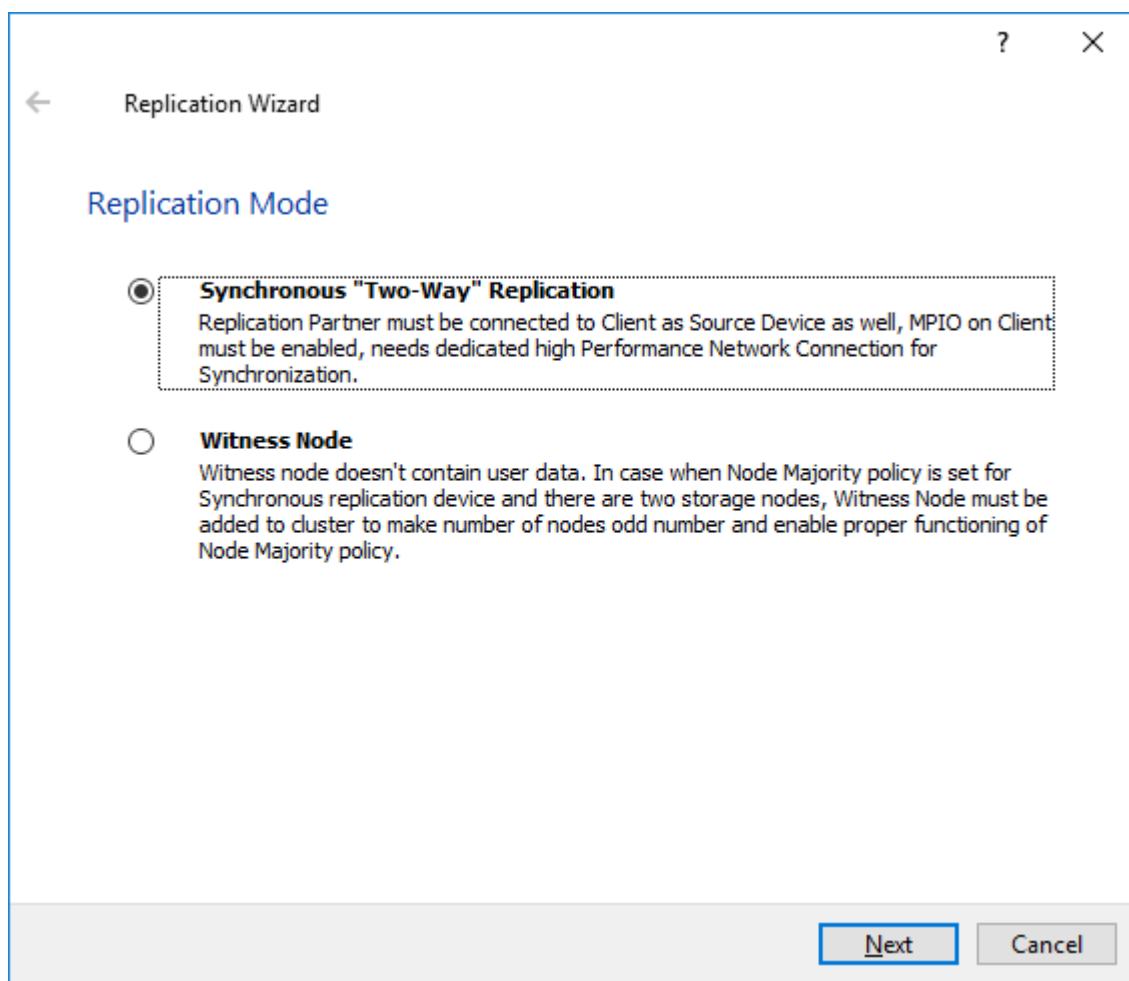
8. Click Create Replica. Click Finish to close the wizard.

The successfully added device appears in StarWind Management Console.

9. Choose device, open Replication Manager and click Add replica again.



10. Select Synchronous “Two-Way” Replication as a replication mode. Click Next to proceed.



11. Specify a partner Host name or IP address and Port Number.

?
×

←
Replication Wizard

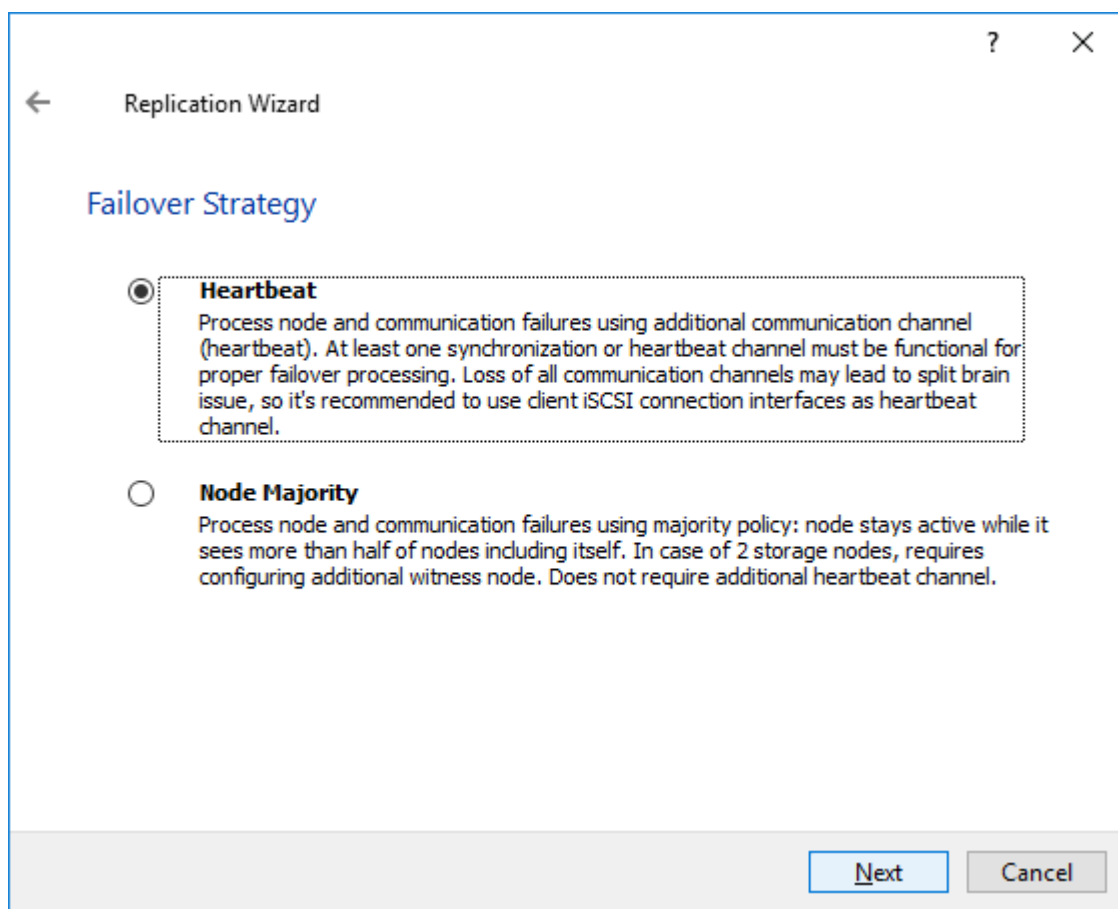
Add Partner Node

Specify Partner Host Name or IP Address where Replication Node would be created

Host Name or IP Address

Port Number

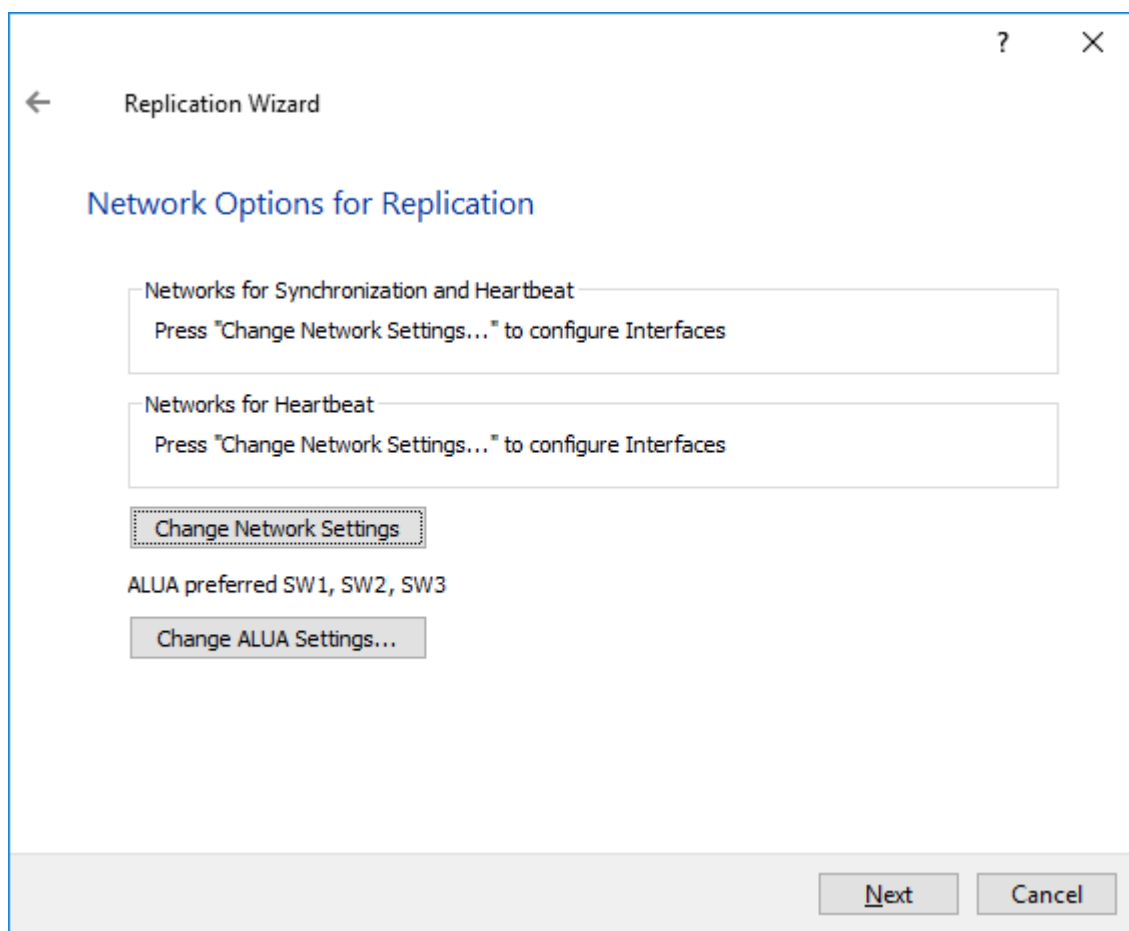
12. Select Failover Strategy.



13. Select Create new Partner Device and click Next.

14. Select a partner device Location and Synchronization Journal Strategy and click Next.

15. Click Change Network Settings.



16. Specify the interfaces for Synchronization and Heartbeat Channels. Click OK and then click Next.

Specify Interfaces for Synchronization Channels

Select synchronization channel

Interfaces	Networks	Synchronization and ...	Heartbeat
172.16.20.10	172.16.20.0	<input type="checkbox"/>	<input type="checkbox"/>
172.16.22.10	172.16.22.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
192.168.12.10	192.168.12.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Host Name: SW2.starwind.local			
172.16.10.20	172.16.10.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
172.16.11.20	172.16.11.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
172.16.20.20	172.16.20.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
172.16.21.20	172.16.21.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
192.168.12.20	192.168.12.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Host Name: SW3			
172.16.11.30	172.16.11.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
172.16.12.30	172.16.12.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
172.16.21.30	172.16.21.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
172.16.22.30	172.16.22.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
192.168.12.30	192.168.12.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>

☐ Allow Free Select Interfaces

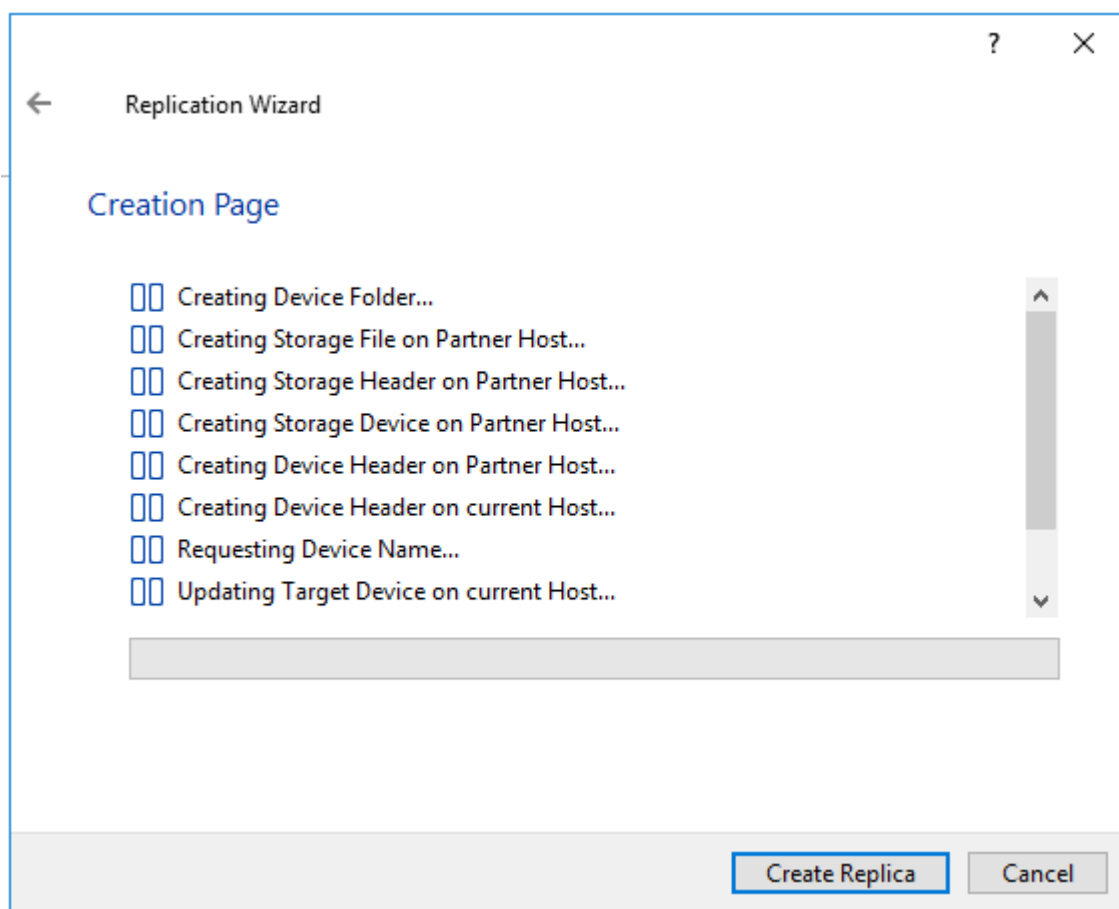
OK Cancel

NOTE: It is not recommended to configure the Heartbeat and iSCSI channels on the same interfaces to avoid the split-brain issue. If the Synchronization and Heartbeat interfaces are located on the same network adapter, it is recommended to assign one more Heartbeat interface to a separate adapter.

17. In Select Partner Device Initialization Mode, select Synchronize from existing Device and click Next.

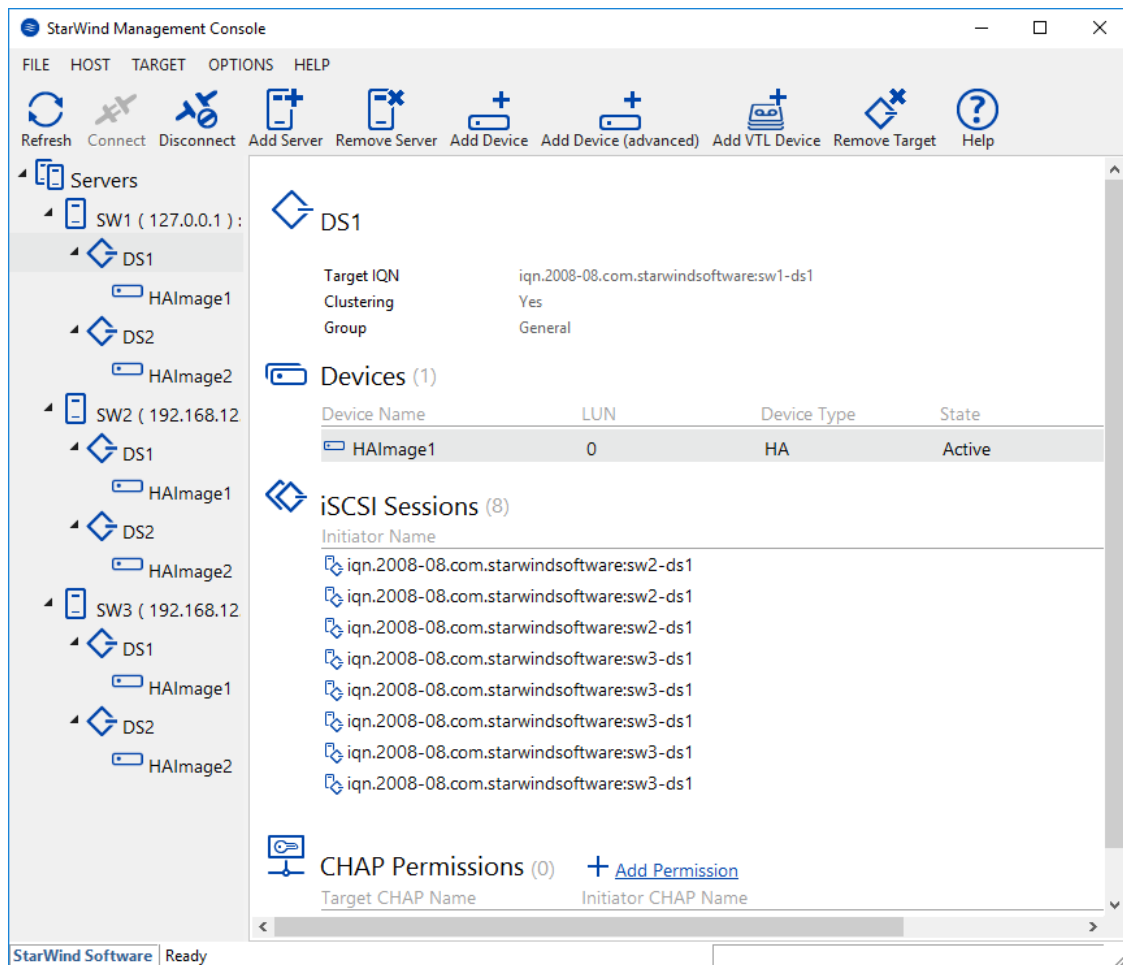
18. Click Create Replica. Click Finish to close the wizard.





The successfully added device appears in StarWind Management Console.

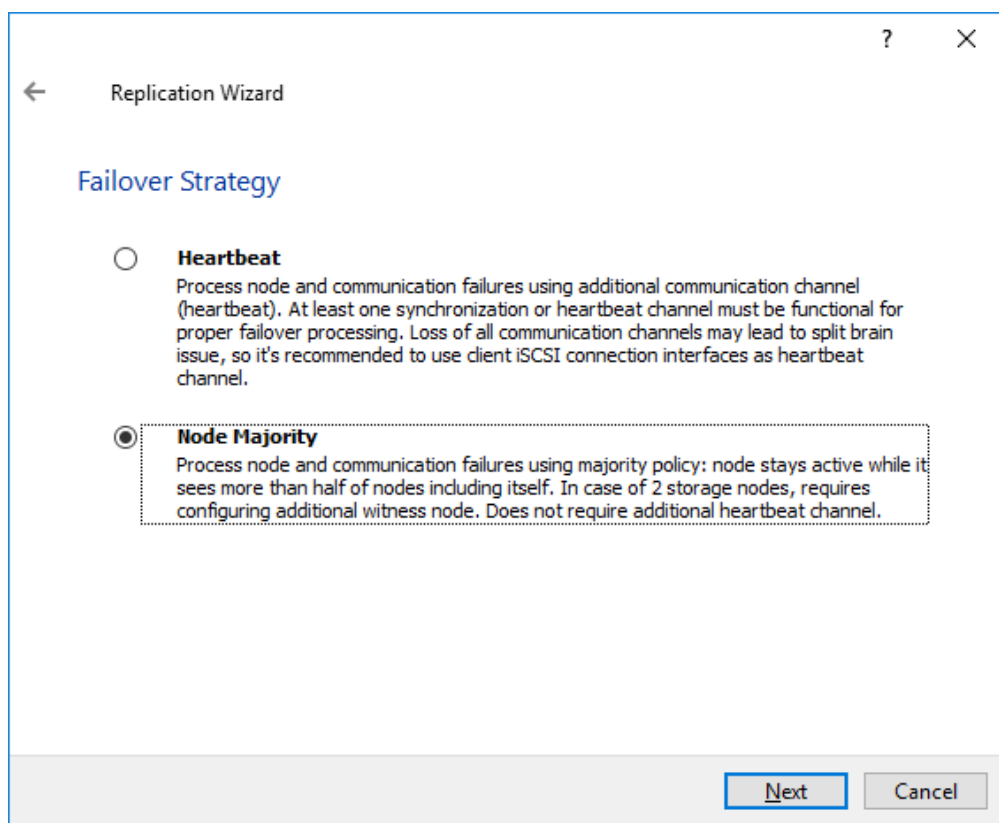
19. Follow the similar procedure for the creation of other virtual disks that will be used as storage repositories.



NOTE: To extend an Image File or a StarWind HA device to the required size, please check the article below:  
<https://knowledgebase.starwindsoftware.com/maintenance/how-to-extend-image-file-or-high-availability-device/>

## Node Majority

1. Select the Node Majority failover strategy and click Next.



2. Choose Create new Partner Device and click Next.

3. Specify the partner device Location and modify the target name if necessary. Click Next.

4. Select Synchronization Journal Strategy and click Next.

NOTE: There are several options – RAM-based journal (default) and Disk-based journal with failure and continuous strategy, that allow to avoid full synchronization cases.

RAM-based (default) synchronization journal is placed in RAM. Synchronization with RAM journal provides good I/O performance in any scenario. Full synchronization could occur in the cases described in this KB:

<https://knowledgebase.starwindsoftware.com/explanation/reasons-why-full-synchronization-may-start/>

Disk-based journal placed on a separate disk from StarWind devices. It allows to avoid full synchronization for the devices where it's configured even when StarWind service is being stopped on all nodes. Disk-based synchronization journal should be placed on a separate, preferably faster disk from StarWind devices. SSDs and NVMe disks are recommended as the device performance is defined by the disk speed, where the journal is located. For example, it can be placed on the OS boot volume.

It is required to allocate 2 MB of disk space for the synchronization journal per 1 TB of HA device size with a disk-based journal configured with 2-way replication and 4MB per 1 TB of HA device size for 3-way replication.

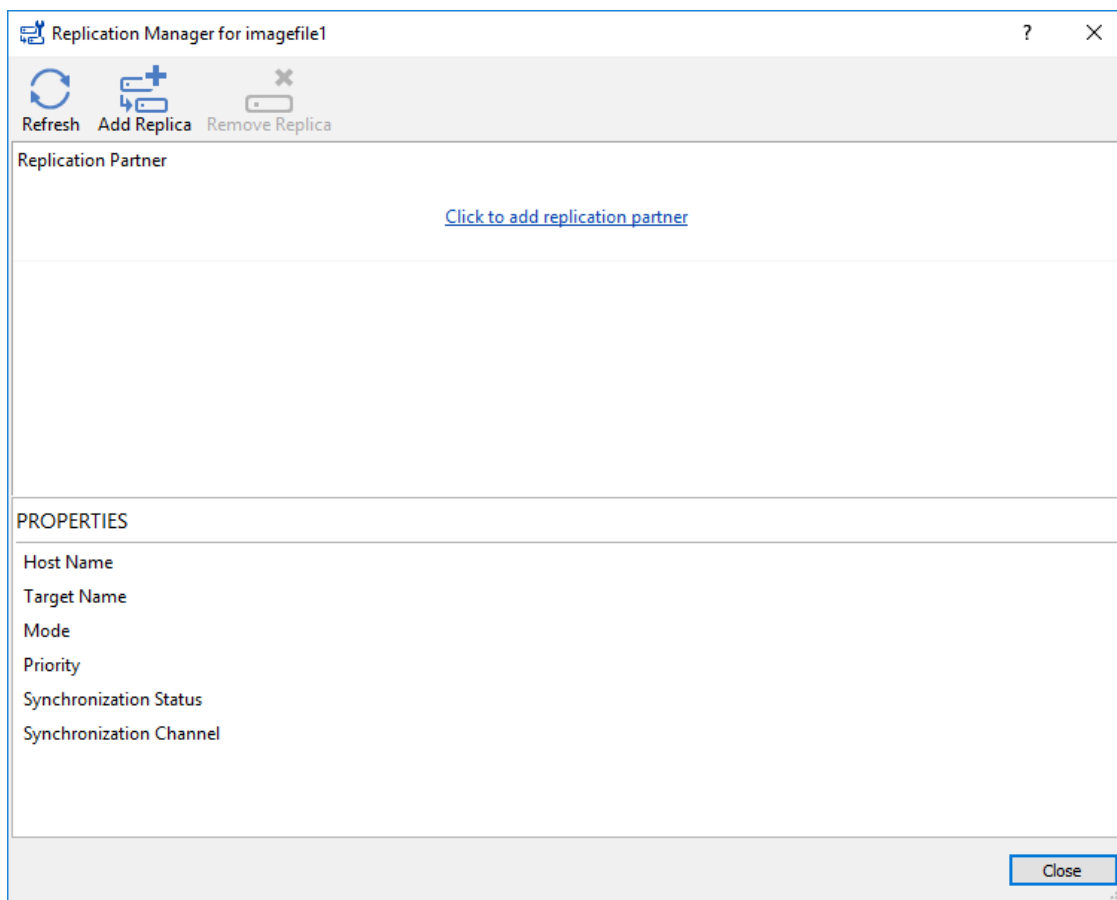
#### Failure journal

The strategy provides good I/O performance, as a RAM-based journal, while all device nodes are in a healthy synchronized state. If a device on one node went into a not synchronized state, the disk-based journal activates and a performance drop could occur as the device performance is defined by the disk speed, where the journal is located. Fast synchronization is not guaranteed in all cases. For example, if a simultaneous hard reset of all nodes occurs, full synchronization will occur.

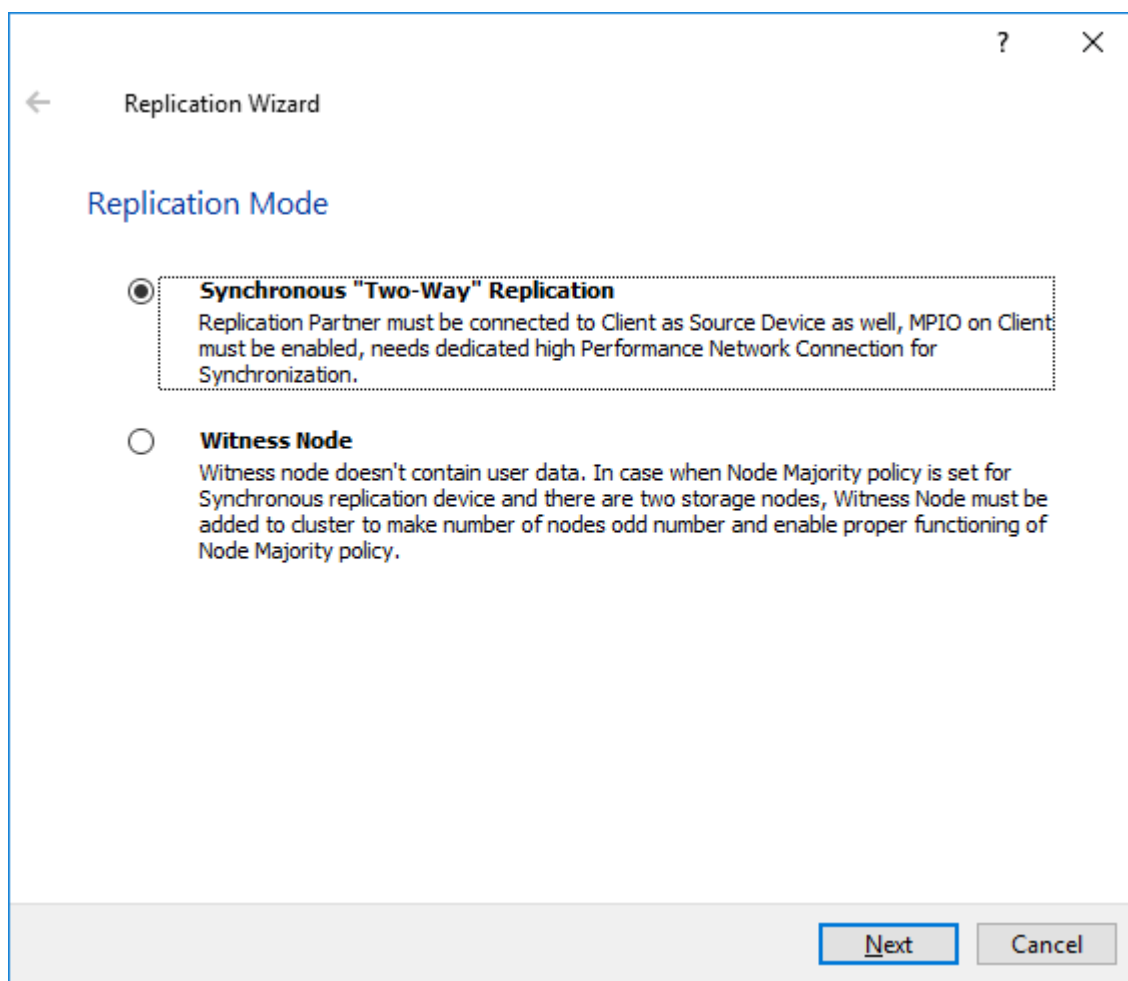
#### Continuous journal

The strategy guarantees fast synchronization and data consistency in all cases. Although, this strategy has the worst I/O performance, because of frequent write operations to the journal, located on the disk, where the journal is located.

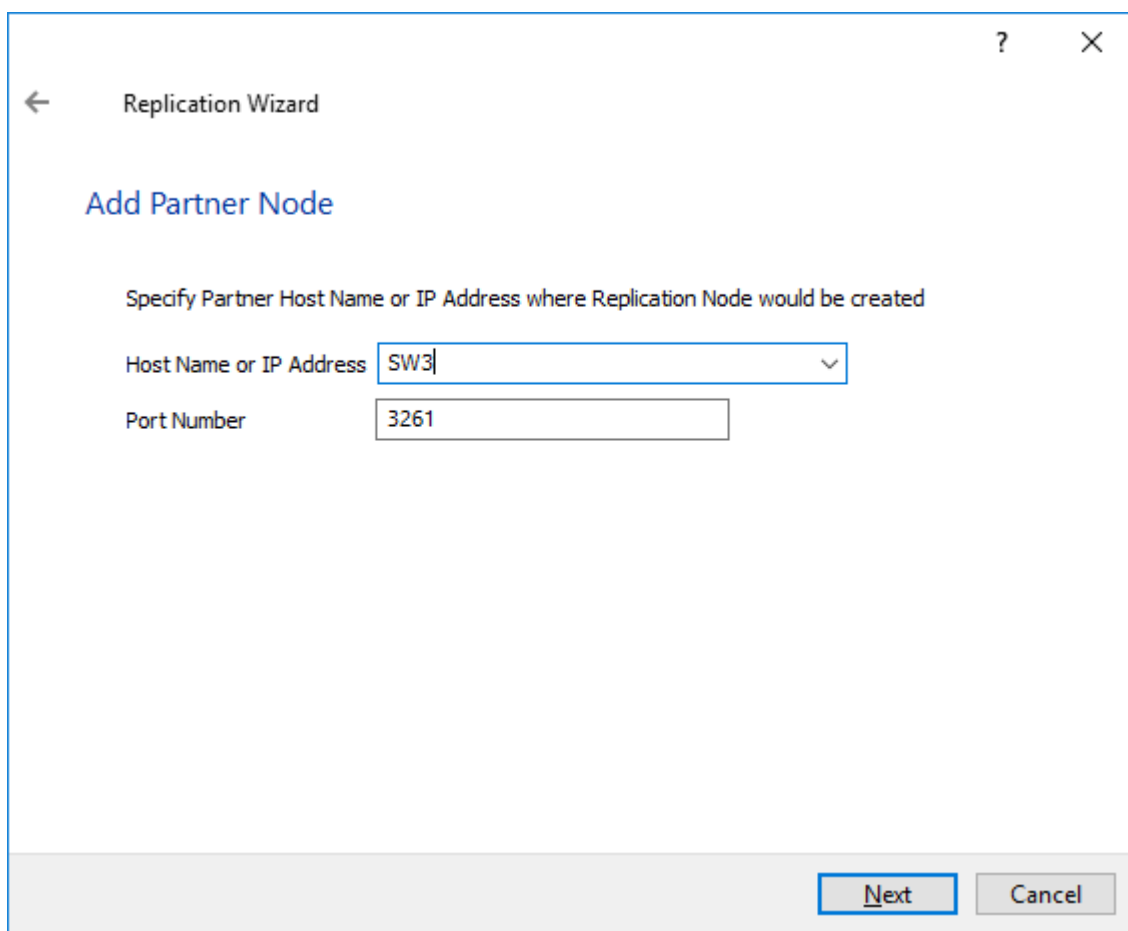
5. In Network Options for Replication, press the Change network settings button and select the synchronization channel for the HA device.
6. In Specify Interfaces for Synchronization Channels, select the checkboxes with the appropriate networks and click OK. Then click Next.
7. Select Synchronize from existing Device as the partner device initialization mode.
8. Press the Create Replica button and close the wizard.
9. The added devices will appear in StarWind Management Console.
10. Choose device, open Replication Manager and click Add replica again.



11. Select Synchronous “Two-Way” Replication as a replication mode. Click Next to proceed.

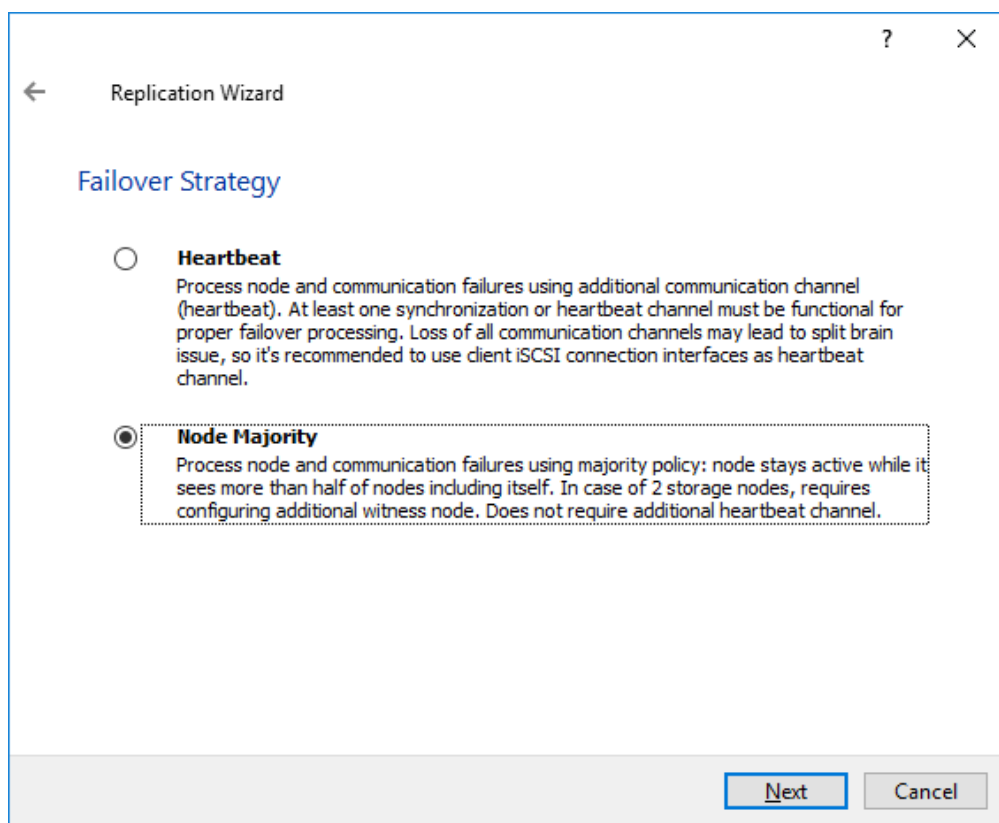


12. Specify a partner Host name or IP address and Port Number.



The image shows a 'Replication Wizard' window with a title bar containing a question mark and a close button. Inside the window, there is a back arrow and the text 'Replication Wizard'. Below this is the section header 'Add Partner Node'. A descriptive text reads: 'Specify Partner Host Name or IP Address where Replication Node would be created'. There are two input fields: 'Host Name or IP Address' with the value 'SW3' and a dropdown arrow, and 'Port Number' with the value '3261'. At the bottom right, there are 'Next' and 'Cancel' buttons. The 'Next' button is highlighted with a blue border.

13. Select the Node Majority failover strategy and click Next.



14. Choose Create new Partner Device and click Next.

15. Specify the partner device Location and modify the target name if necessary. Click Next.

16. Select Synchronization Journal Strategy and click Next.

17. In Network Options for Replication, press the Change network settings button and select the synchronization channel for the HA device.

18. In Specify Interfaces for Synchronization Channels, select the checkboxes with the appropriate networks and click OK. Then click Next.

19. Select Synchronize from existing Device as the partner device initialization mode.

20. Press the Create Replica button and close the wizard.

21. The added devices will appear in StarWind Management Console.

Repeat the steps above to create other virtual disks if necessary.

NOTE: To extend an Image File or a StarWind HA device to the required size, please check the article below:



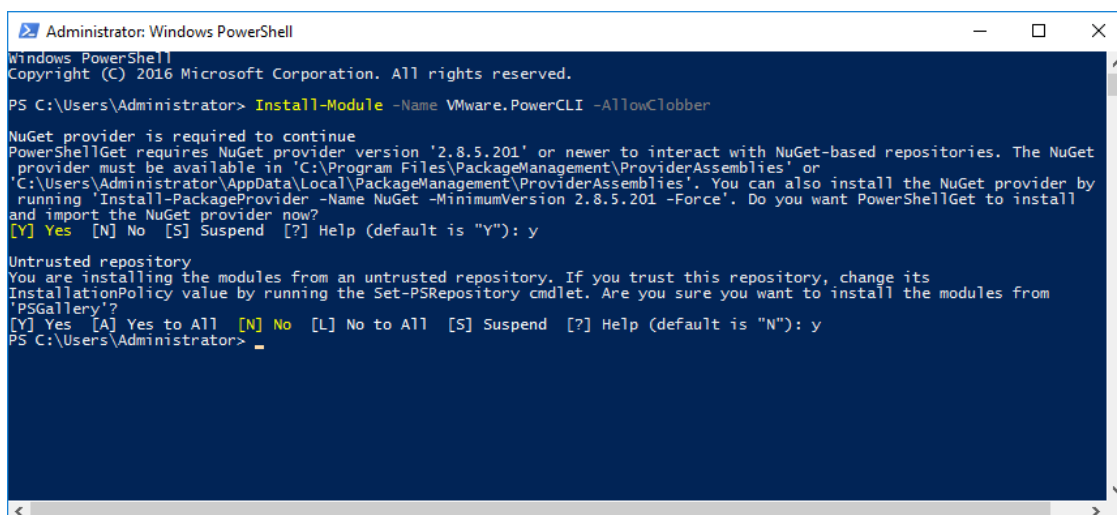
<https://knowledgebase.starwindsoftware.com/maintenance/how-to-extend-image-file-or-high-availability-device/>

## Configuring Automatic Storage Rescan

For faster paths recovery, for example, after StarWind HA device synchronization, configuring automatic storage rescan is required for each ESXi host.

1. Log in to StarWind VM and install VMware PowerCLI on each StarWind virtual machine by adding the PowerShell module (Internet connectivity is required). To do so, run the following command in PowerShell:

Install-Module -Name VMware.PowerCLI -AllowClobber



```

Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator> Install-Module -Name VMware.PowerCLI -AllowClobber

NuGet provider is required to continue
PowerShellGet requires NuGet provider version '2.8.5.201' or newer to interact with NuGet-based repositories. The NuGet
provider must be available in 'C:\Program Files\PackageManagement\ProviderAssemblies' or
'C:\Users\Administrator\AppData\Local\PackageManagement\ProviderAssemblies'. You can also install the NuGet provider by
running 'Install-PackageProvider -Name NuGet -MinimumVersion 2.8.5.201 -Force'. Do you want PowerShellGet to install
and import the NuGet provider now?
[Y] Yes [N] No [S] Suspend [?] Help (default is "Y"): y

Untrusted repository
You are installing the modules from an untrusted repository. If you trust this repository, change its
InstallationPolicy value by running the Set-PSRepository cmdlet. Are you sure you want to install the modules from
'PSGallery'?
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default is "N"): y
PS C:\Users\Administrator>
  
```

NOTE: In case of using Windows Server 2012 R2, online installation of PowerCLI requires Windows Management Framework 5.1 or upper version available on VMs. Windows Management Framework 5.1 can be downloaded from <https://go.microsoft.com/fwlink/?linkid=839516>

2. Open PowerShell and change the Execution Policy to Unrestricted by running the following command:

Set-ExecutionPolicy Unrestricted

```

Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator> Set-ExecutionPolicy Unrestricted

Execution Policy Change
The execution policy helps protect you from scripts that you do not trust. Changing the execution policy might expose
you to the security risks described in the about_Execution_Policies help topic at
http://go.microsoft.com/fwlink/?LinkID=135170. Do you want to change the execution policy?
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default is "N"): y
PS C:\Users\Administrator>
  
```

3. Create a PowerShell script which will perform an HBA rescan on the hypervisor host.

```

"C:\rescan_script.ps1 - Notepad++ [Administrator]
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
rescan_script.ps1
1 Import-Module VMware.PowerCLI
2 $counter = 0
3 if ($counter -eq 0){
4     Set-PowerCLIConfiguration -InvalidCertificateAction ignore -Confirm:$false | Out-Null
5 }
6 $ESXiHost = "IP address" # insert IP address ESXiHost
7 $ESXiUser = "Login" # insert login to ESXiHost
8 $ESXiPassword = "Password" # insert password to ESXiHost
9 Connect-VIServer $ESXiHost -User $ESXiUser -Password $ESXiPassword | Out-Null
10 Get-VMHostStorage $ESXiHost -RescanAllHba | Out-Null
11 Get-ScsiLun -VMHost $ESXiHost -LunType disk | Where-Object Vendor -EQ "STARWIND" |
12 Where-Object ConsoleDeviceName -NE " " | Set-ScsiLun -MultipathPolicy RoundRobin | Out-Null
13 $StarwindCN = Get-ScsiLun -VMHost $ESXiHost -LunType disk |
14 Where-Object Vendor -EQ "STARWIND" | Where-Object ConsoleDeviceName -NE " " |
15 Select-Object CanonicalName
16 $esxcli = Get-EsxCLI -VMHost $ESXiHost
17 foreach($CN in $StarwindCN){
18     $esxcli.storage.nmp.psp.roundrobin.deviceconfig.set(0,$null,$CN.CanonicalName,1,"iops",0) |
19     Out-Null
20 }
21 Disconnect-VIServer $ESXiHost -Confirm:$false
22 $file = Get-Content "$PSScriptRoot\rescan_script.ps1"
23 if ($file[1] -ne "`$counter = 1") {
24     $file[1] = "`$counter = 1"
25     $file > "$PSScriptRoot\rescan_script.ps1"
26 }
  
```

```

Import-Module VMware.PowerCLI
$counter = 0
if ($counter -eq 0){
    Set-PowerCLIConfiguration -InvalidCertificateAction
ignore -Confirm:$false | Out-Null
}
$ESXiHost = "IP address" # insert IP address ESXiHost
$ESXiUser = "Login" # insert login to ESXiHost
$ESXiPassword = "Password" # insert password ESXiHost
Connect-VIServer $ESXiHost -User $ESXiUser -Password
$ESXiPassword | Out-Null
Get-VMHostStorage $ESXiHost -RescanAllHba | Out-Null
Get-ScsiLun -VMHost $ESXiHost -LunType disk | Where-Object
  
```

```
Vendor -EQ "STARWIND"|
Where-Object ConsoleDeviceName -NE " " | Set-ScsiLun -
MultipathPolicy RoundRobin -CommandsToSwitchPath 1 |
Out-Null
Disconnect-VIServer $ESXiHost -Confirm:$false
$file = Get-Content "$PSScriptRoot\rescan_script.ps1"
if ($file[1] -ne "`$counter = 1") {
    $file[1] = "`$counter = 1"
    $file > "$PSScriptRoot\rescan_script.ps1"
}
```

In the appropriate lines, specify the IP address and login credentials of the ESXi host on which the current StarWind VM is stored and running:

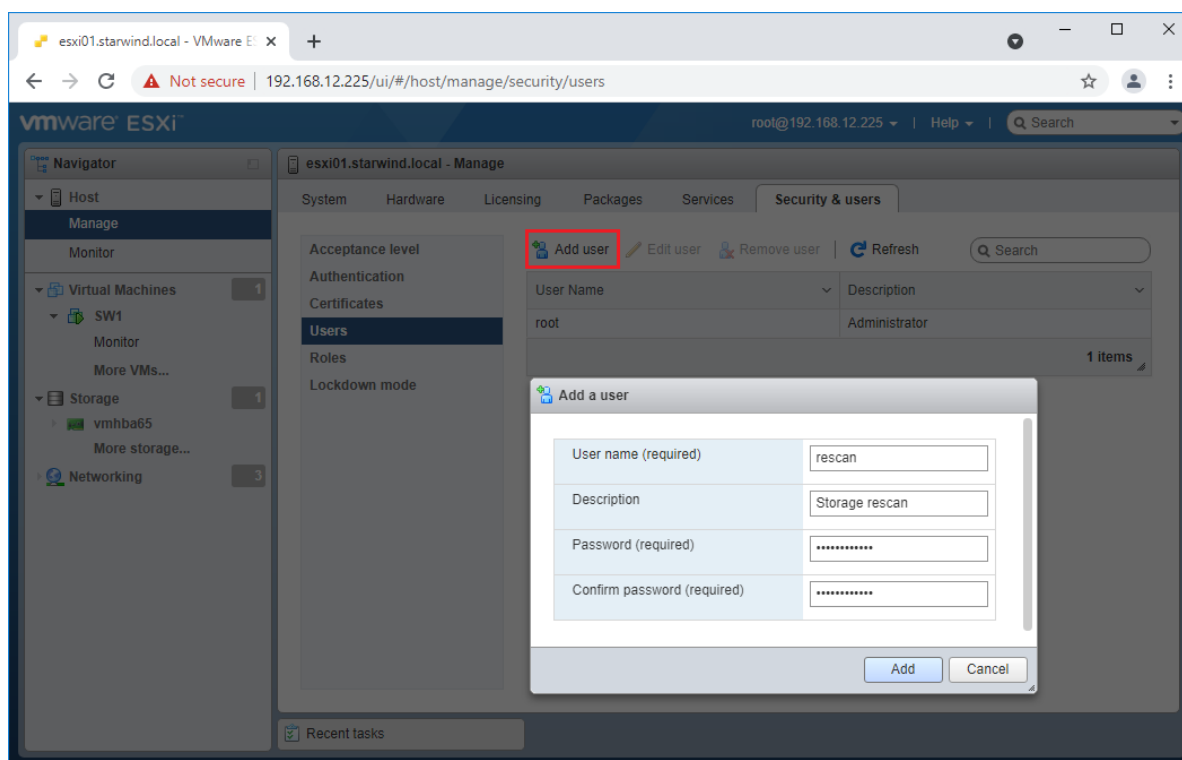
```
$ESXiHost = "IP address"
$ESXiUser = "Login"
$ESXiPassword = "Password"
```

Save the script as `rescan_script.ps1` to the root of the C:\ drive of the Virtual Machine.

NOTE: In some cases the rescan script can be changed and storage rescan added for another ESXi host. Appropriate lines should be duplicated and changed with properly edited variables if required.

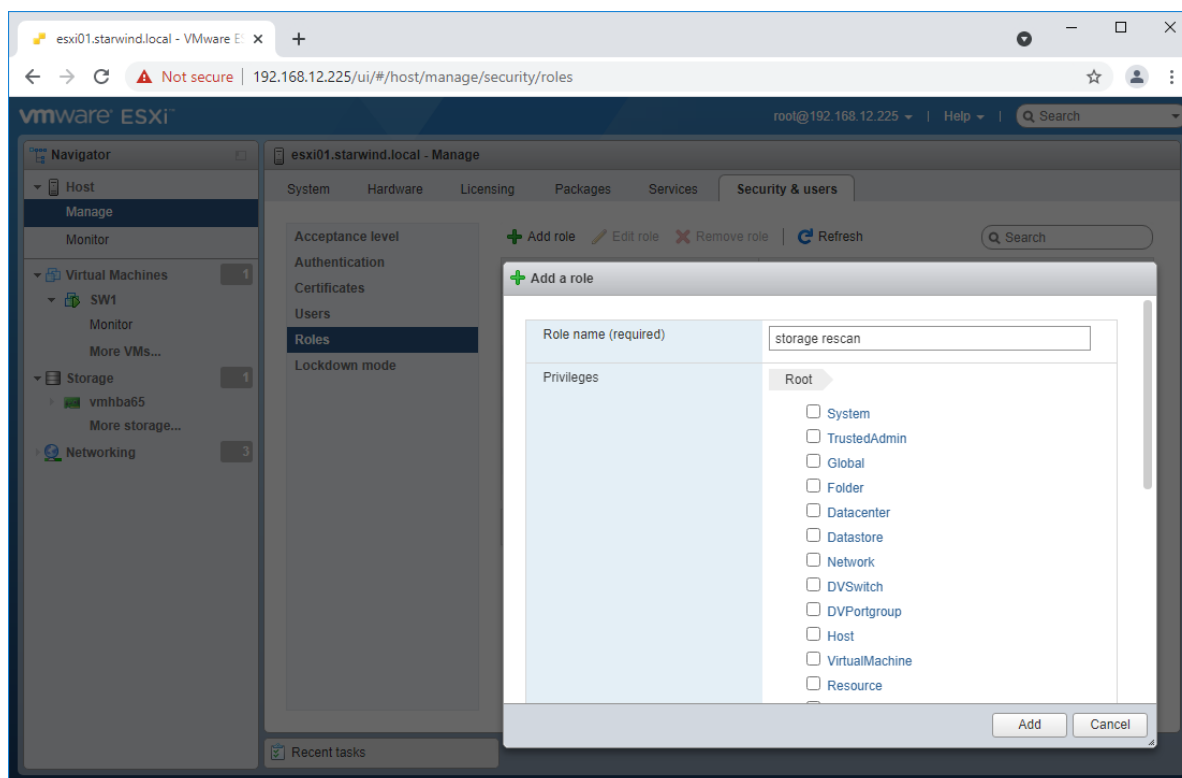
NOTE: In some cases, it makes sense to create a separate ESXi user for storage rescans. To create the user, please follow the steps below:

Log in to ESXi with the VMware Host Client. Click Manage, and under Security & users tab, in the Users section click Add user button. In the appeared window, enter a user name, and a password.



Create a new Role, under Roles section, and click New Role button. Type a name for the new role. Select privileges for the role and click OK.

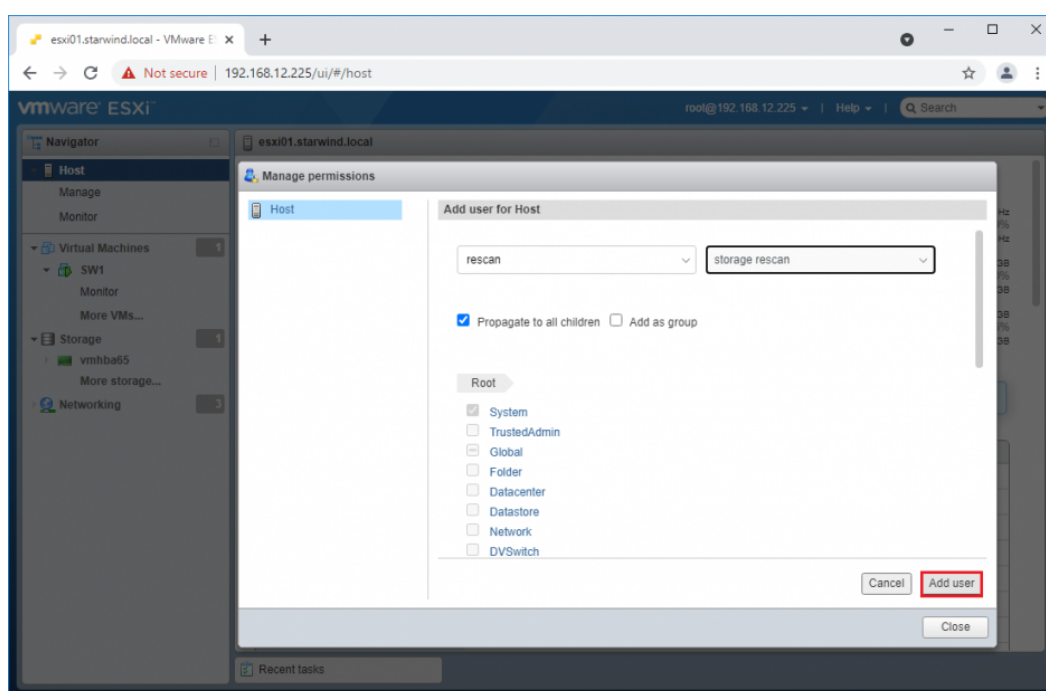
The following privileges might be assigned: Host – Inventory, Config, Local Cim, and Global – Settings.



Assign permission to the storage rescan user for an ESXi host – right-click Host in the VMware Host Client inventory and click Permissions. In the appeared window click Add user.

Click the arrow next to the Select a user text box and select the user that you want to assign a role to. Click the arrow next to the Select a role text box and select a role from the list.

(Optional) Select Propagate to all children or Add as group. Click Add user and click Close.



3. Repeat all steps from this section on the other ESXi hosts.

4. Perform the configuration steps above on the partner node.

5. Go to Control Panel -> Administrative Tools -> Task Scheduler -> Create Basic Task and follow the wizard steps:

Create Basic Task Wizard

Create a Basic Task

Use this wizard to quickly schedule a common task. For more advanced options or settings such as multiple task actions or triggers, use the Create Task command in the Actions pane.

Name: Rescan ESXi

Description:

< Back Next > Cancel

6. Specify the task name, select When a specific event is logged, and click on Next.

Create Basic Task Wizard

Task Trigger

When do you want the task to start?

☐ Daily

☐ Weekly

☐ Monthly

☐ One time

☐ When the computer starts

☐ When I log on

☒ When a specific event is logged

< Back Next > Cancel

7. Select Application in the Log dropdown, type StarWindService for the event source and 788 as the event ID. Click the Next button.

Create Basic Task Wizard

When a Specific Event Is Logged

Create a Basic Task

Trigger

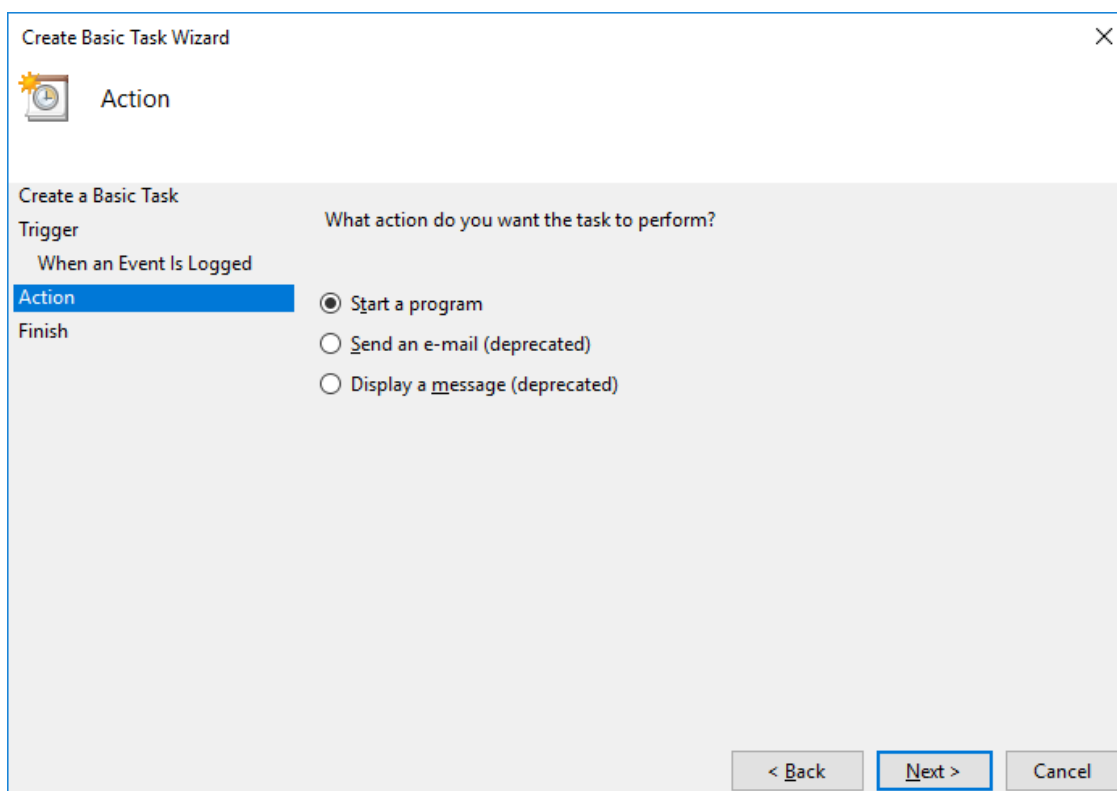
Log: Application

Source: StarWindService

Event ID: 788

Next >

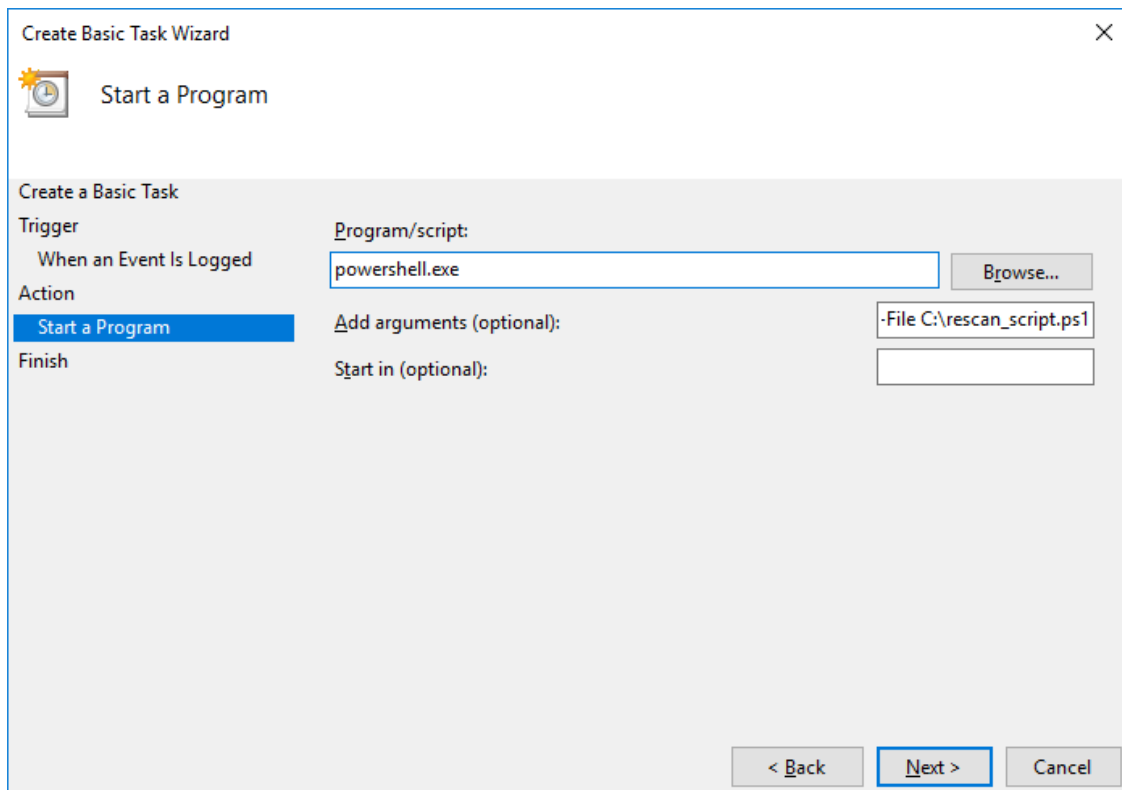
8. Choose Start a Program as the action that the task will perform and click on Next.



9. Type powershell.exe in the Program/script field. In the Add arguments field, type:

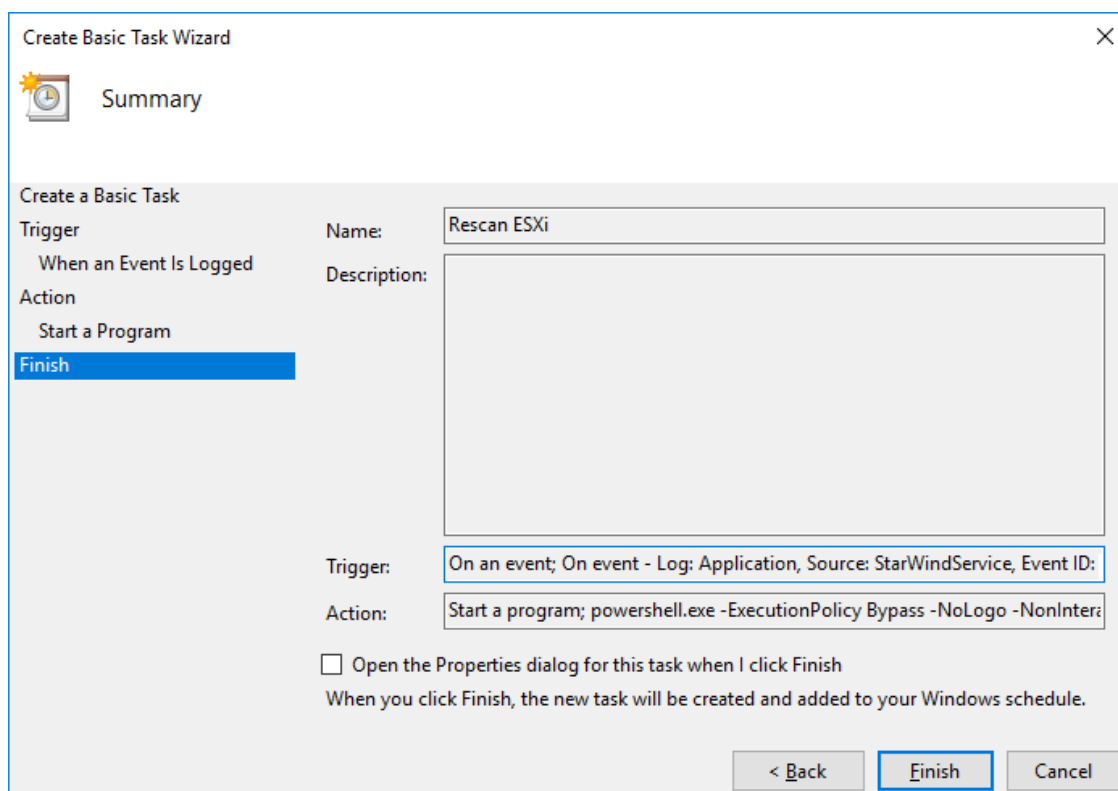
" -ExecutionPolicy Bypass -NoLogo -NonInteractive -NoProfile -WindowStyle Hidden -File C:\rescan\_script.ps1 "



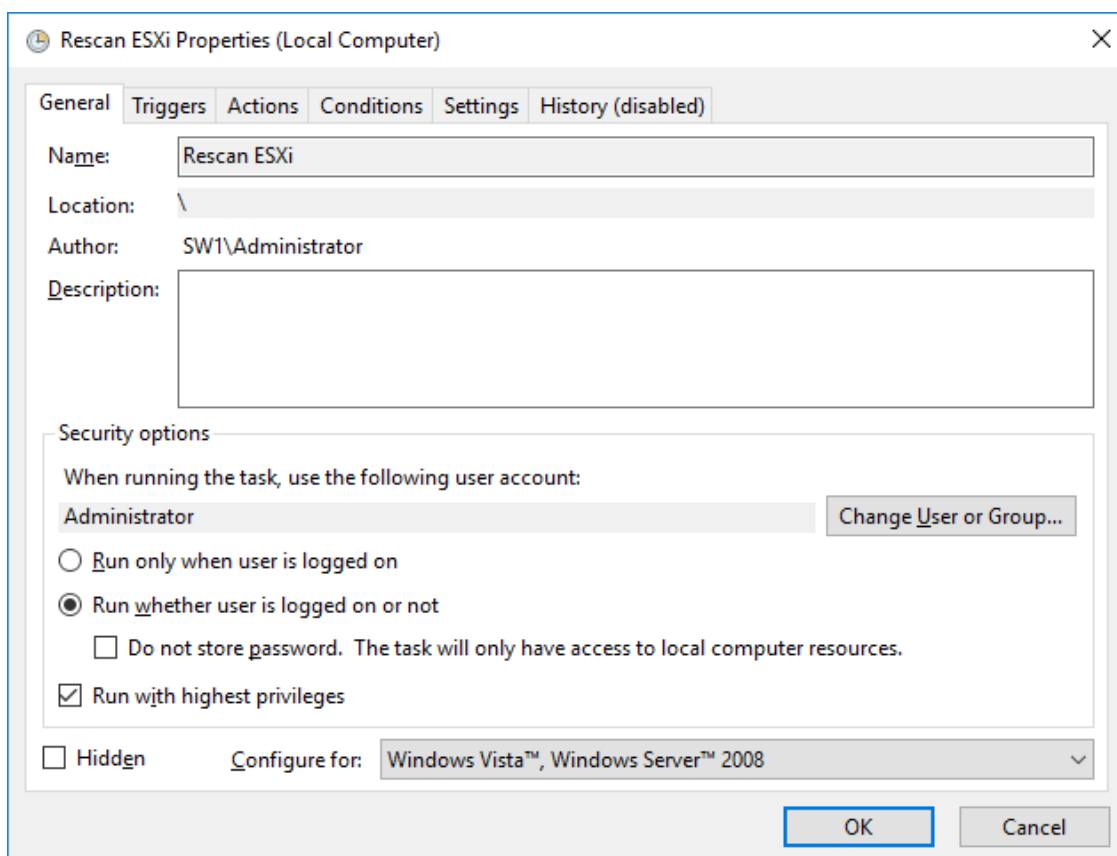


Click the Next button to continue.

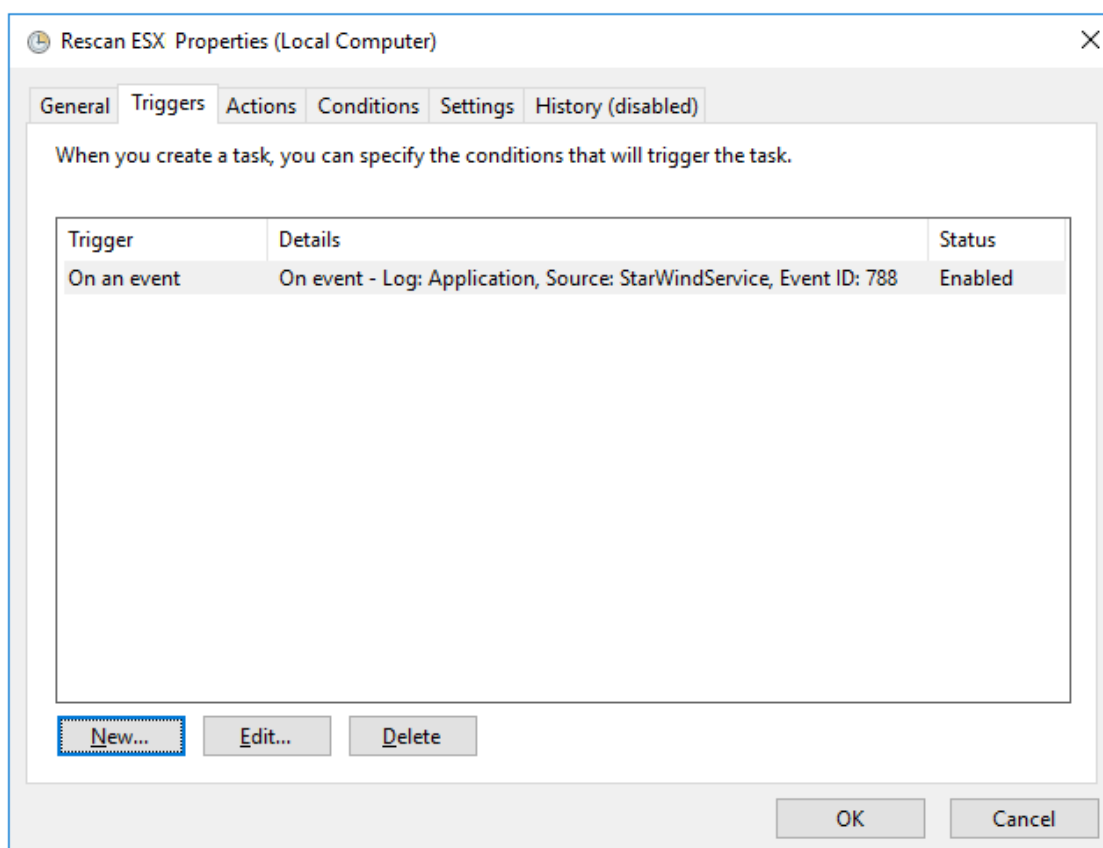
10. Click Finish to exit the Wizard.



11. Configure the task to run with highest privileges by enabling the checkbox at the bottom of the window. Also, make sure that the “Run whether user is logged on or not” option is selected.



12. Switch to the Triggers tab. Verify that the trigger on event 788 is set up correctly.



13. Click New and add other triggers by Event ID 782, 769, 773, and 817.

**New Trigger**

Begin the task: On an event

**Settings**

☒ Basic  
☐ Custom

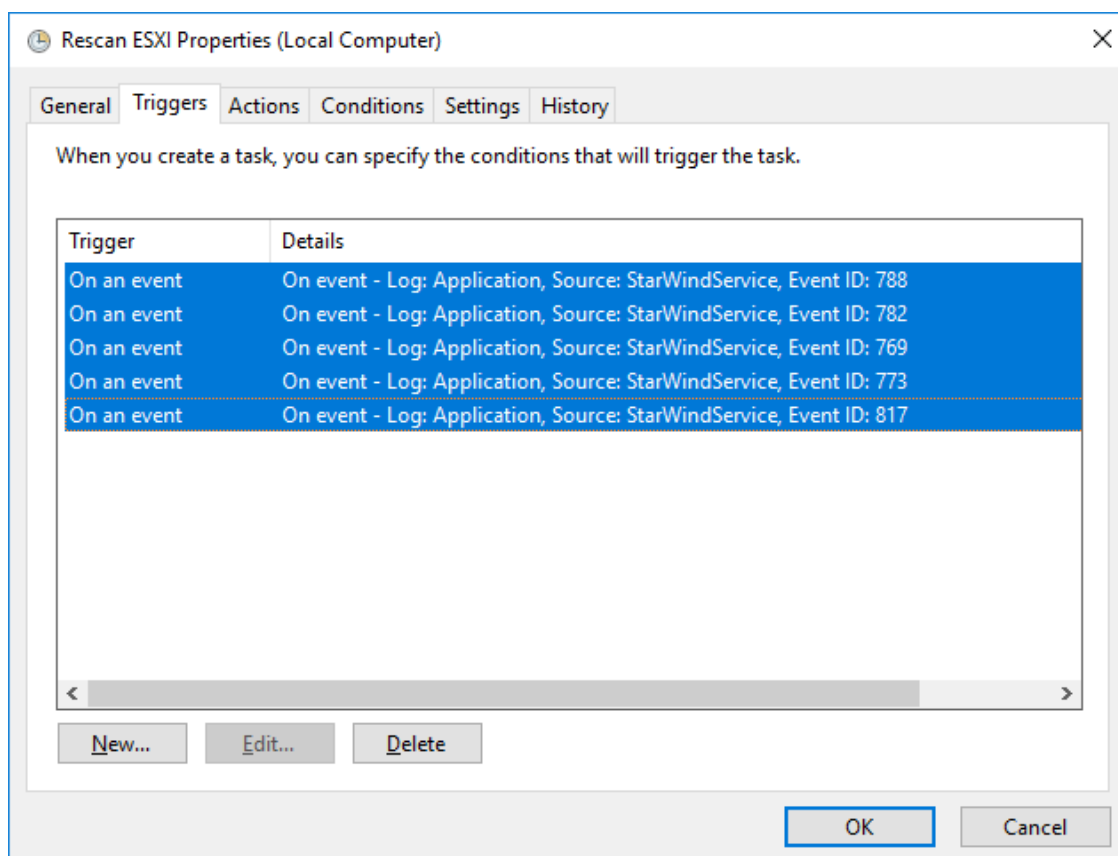
Log: Application  
Source: StarWindService  
Event ID: 782

**Advanced settings**

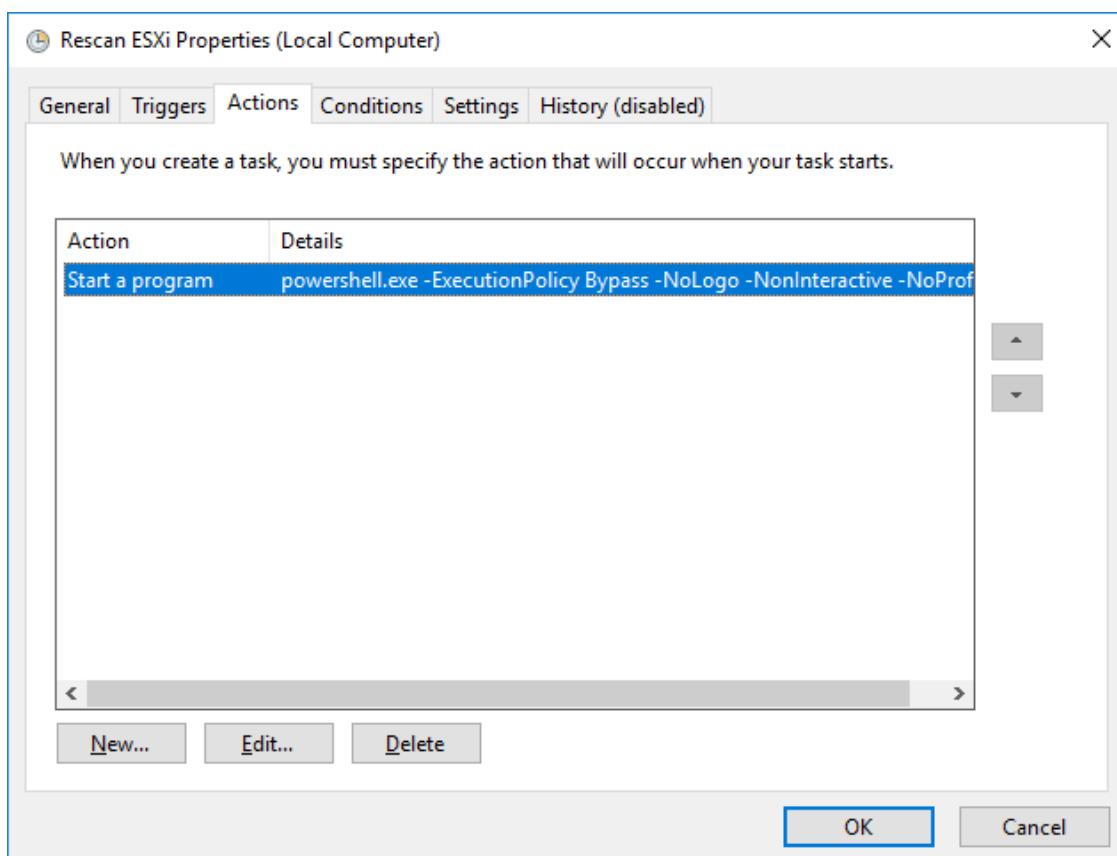
☐ Delay task for: 15 minutes  
☐ Repeat task every: 1 hour for a duration of: 1 day  
☐ Stop all running tasks at end of repetition duration  
☐ Stop task if it runs longer than: 3 days  
☐ Activate: 3/ 8/2019 6:52:08 AM ☐ Synchronize across time zones  
☐ Expire: 3/ 8/2020 6:52:08 AM ☐ Synchronize across time zones  
☒ Enabled

OK Cancel

14. All added triggers should look like in the picture below.



15. Switch to the Actions tab and verify the parameters for the task.



Press OK and type in the credentials for the user whose rights will be used to execute the command.

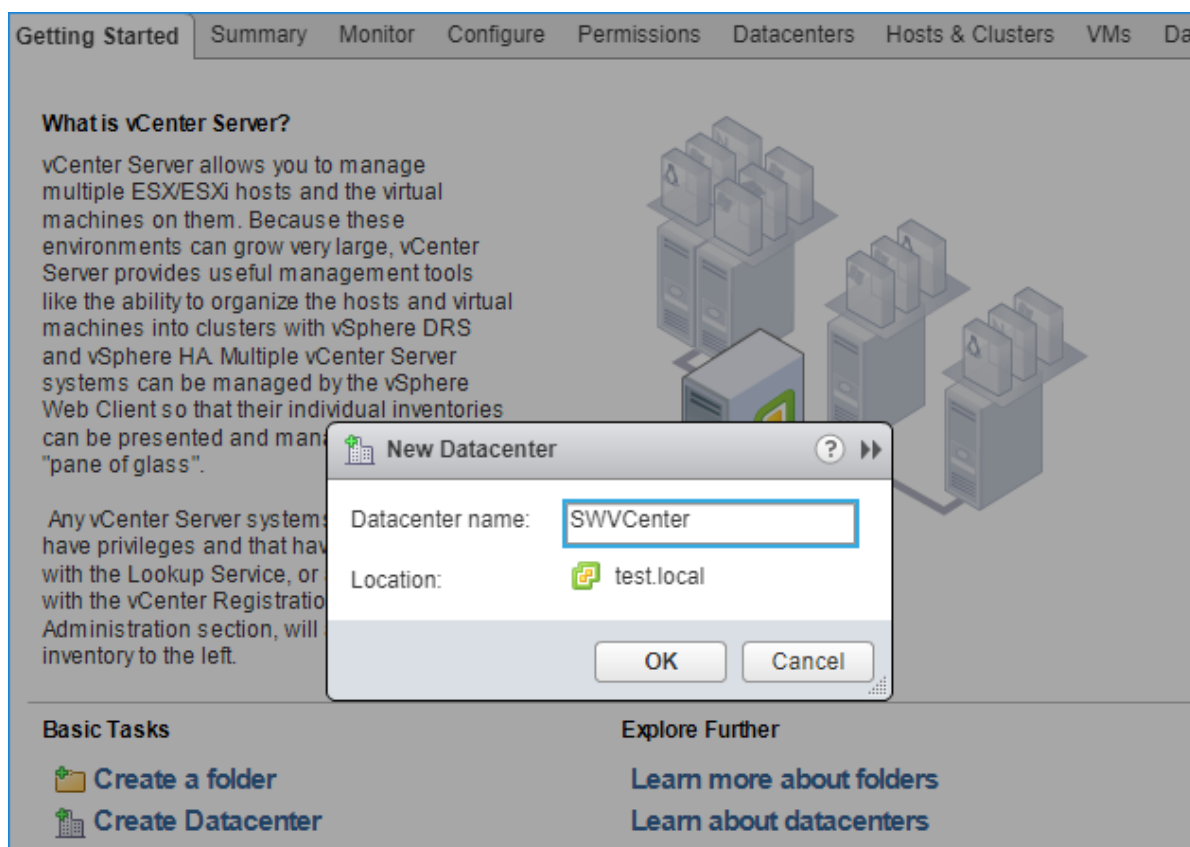
16. Perform the same steps on another StarWind VM, specifying the corresponding settings.

## Datacenter And Cluster Creation

### Creating Datacenter

NOTE: Creating Datacenter requires deployment of vCenter prior to this step. In case of deploying vCenter as a virtual machine (vCenter Server Appliance) located on the local storage it is recommended to move vCenter to a StarWind HA datastore after its creation.

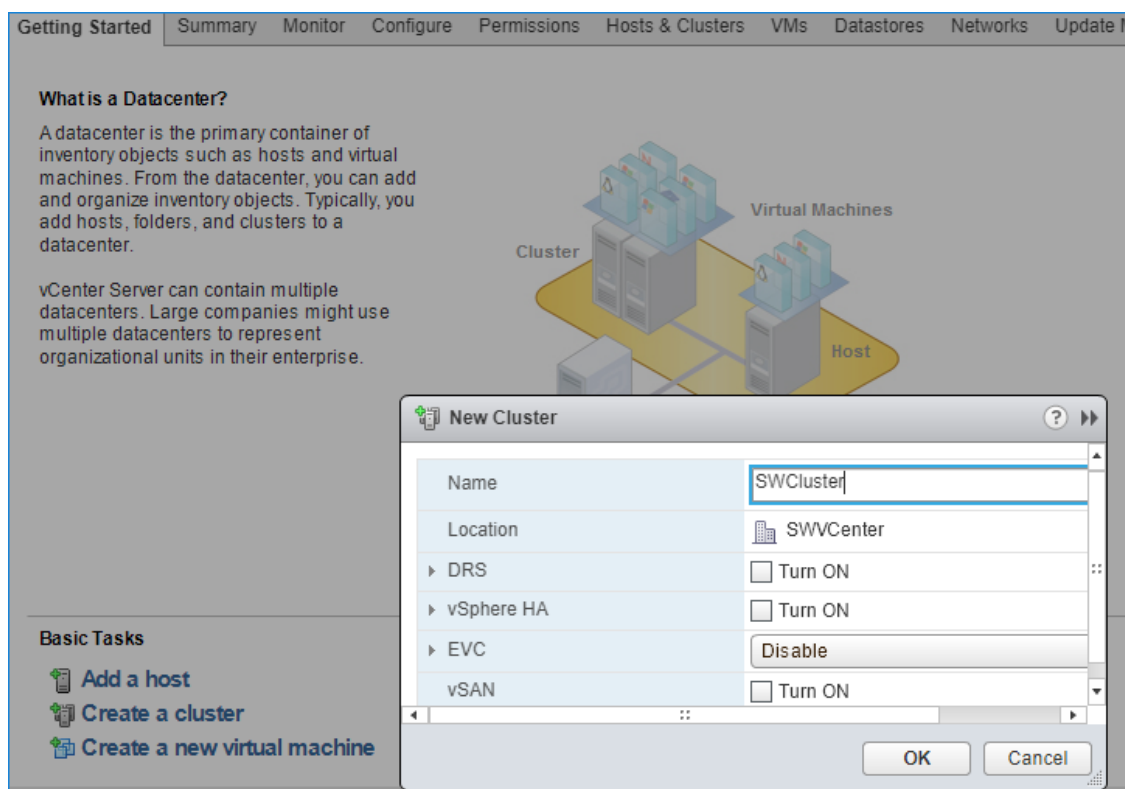
1. Connect to vCenter, select the Getting Started tab, click on Create Datacenter, and enter the Datacenter name.



## Creating Cluster

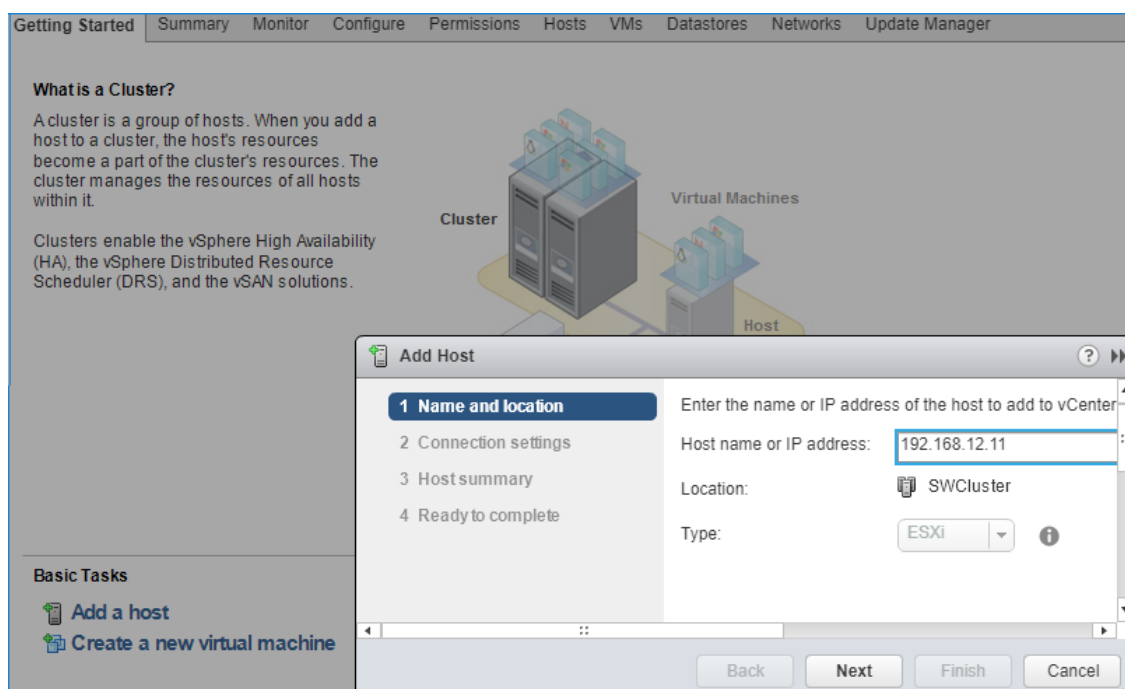
2. Click the Datacenter's Getting Started tab and click Create a cluster. Enter the name of the cluster and click Next.



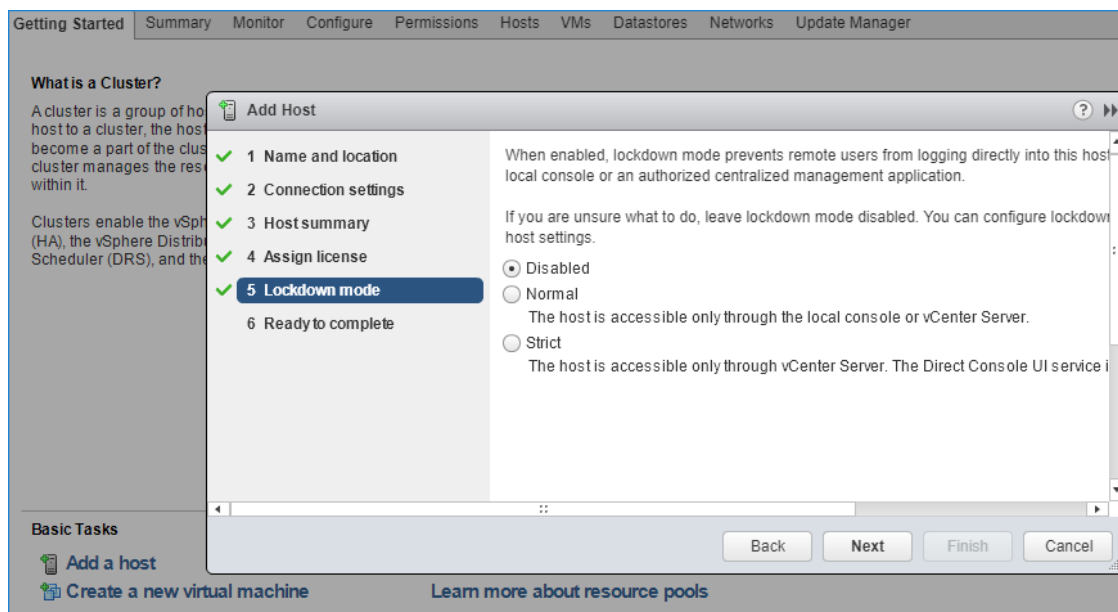


Adding Hosts to Cluster

3. Open the Cluster tab and click on Add a host.
4. Enter the name or IP address of the ESXi host and its administrative account.

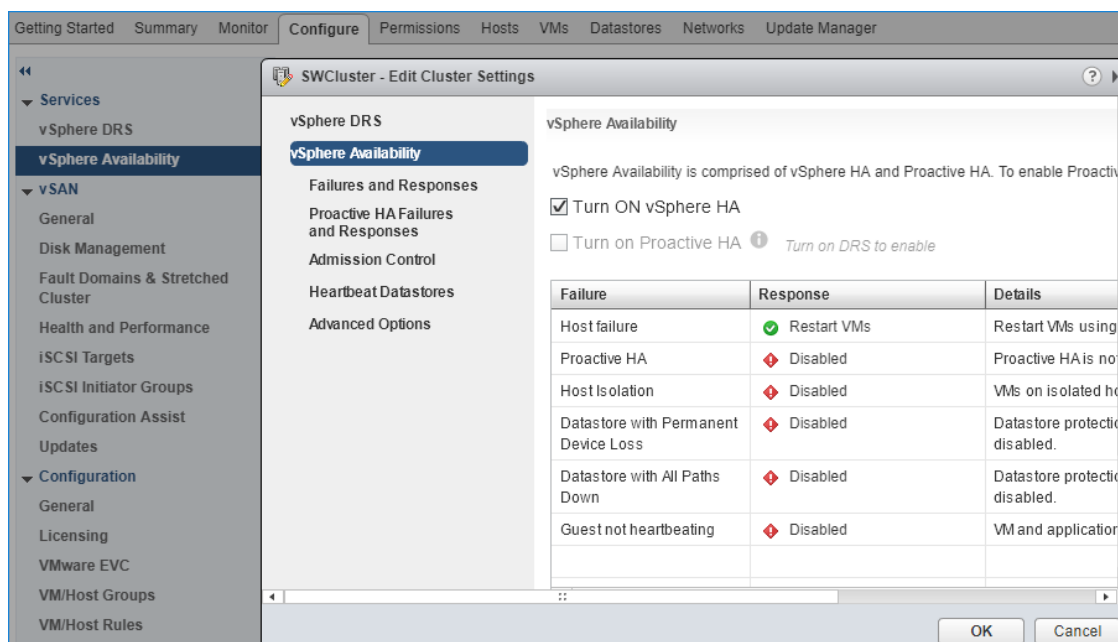


5. Lockdown mode is not enabled by default.



6. Assign the License from the Licensing tab.

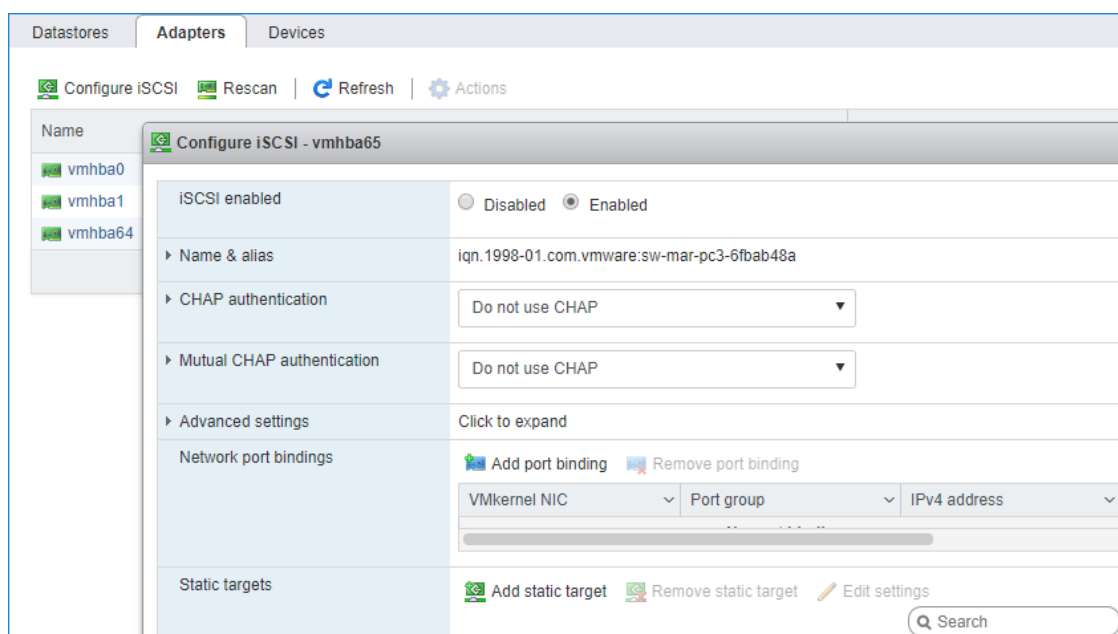
7. Turn on vSphere HA by clicking on Cluster -> Configure -> Edit



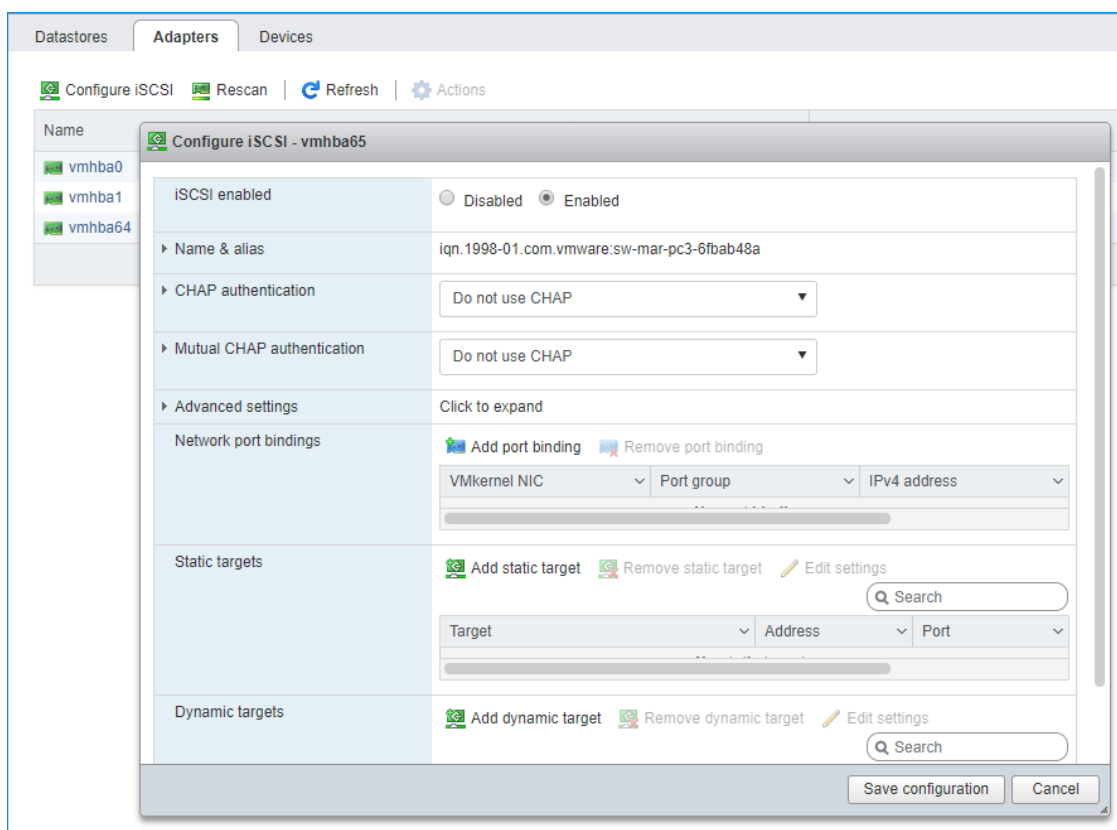
## Preparing Datastores

### Adding Discover Portals

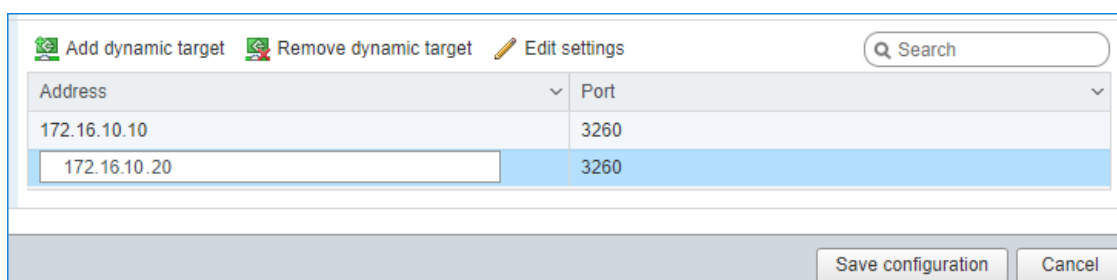
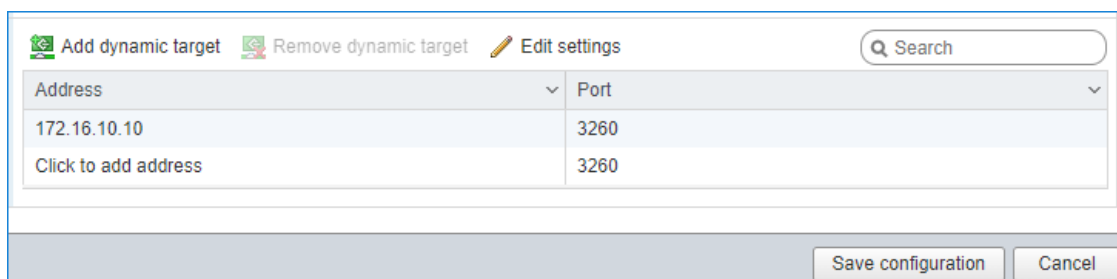
1. To connect the previously created devices to the ESXi host, click on the Storage -> Adapters -> Configure iSCSI and choose the Enabled option to enable Software iSCSI storage adapter.



2. In the Configure iSCSI window, under Dynamic Targets, click on the Add dynamic target button to specify iSCSI interfaces.



3. Enter the iSCSI IP addresses of all StarWind nodes for the iSCSI traffic.



Confirm the actions by pressing Save configuration.

4. The result should look like in the image below:

**Configure iSCSI**

iSCSI enabled: ☐ Disabled ☒ Enabled

Name & alias: iqn.1998-01.com.vmware:sw-mar-pc3-6fbab48a

CHAP authentication: Do not use CHAP

Mutual CHAP authentication: Do not use CHAP

Advanced settings: Click to expand

Network port bindings: Add port binding Remove port binding

VMkernel NIC	Port group	IPv4 address
No port bindings		

Static targets: Add static target Remove static target Edit settings Search

Target	Address	Port
iqn.2008-08.com.starwindsoftware:sw1-ds1	172.16.10.10	3260
iqn.2008-08.com.starwindsoftware:sw1-ds2	172.16.10.10	3260
iqn.2008-08.com.starwindsoftware:sw2-ds1	172.16.10.20	3260
iqn.2008-08.com.starwindsoftware:sw2-ds2	172.16.10.20	3260

Dynamic targets: Add dynamic target Remove dynamic target Edit settings Search

Address	Port
172.16.10.10	3260
172.16.10.20	3260

Save configuration Cancel

5. Click on the Rescan button to rescan storage.

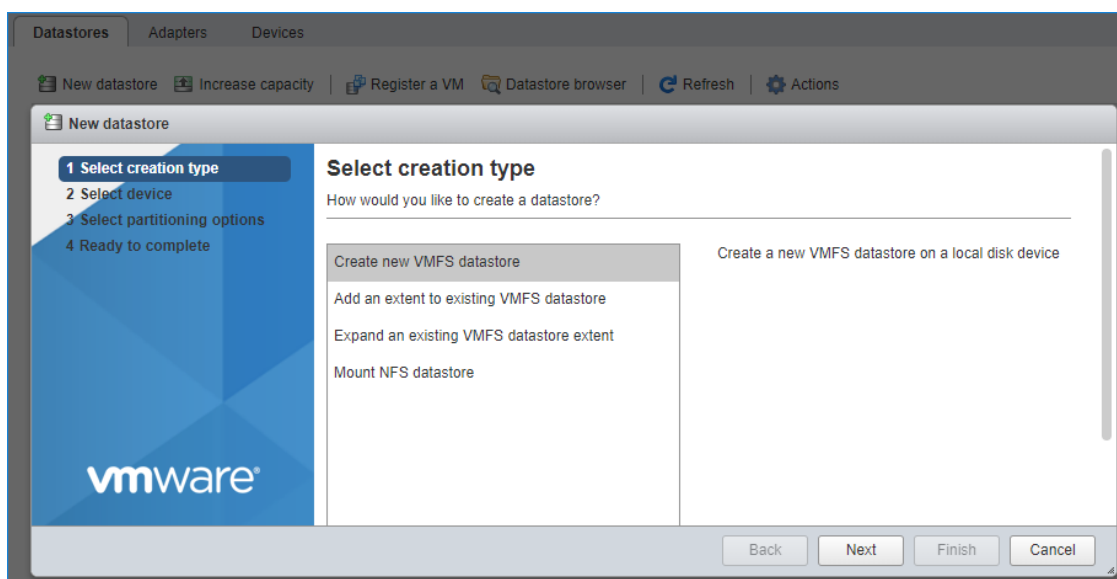
Name	Status	Type	Capacity
STARWIND iSCSI Disk (eui.f8289e52a311c08d)	Normal	Disk	3 GB
Local NECVMWare CD-ROM (mpx.vmhba64.C0:T0:L0)	Normal	CDROM	Unknown
STARWIND iSCSI Disk (eui.ccd882632aff4068)	Normal	Disk	3 GB
Local VMware Disk (mpx.vmhba0.C0:T0:L0)	Normal	Disk	40 GB

6. Now, the previously created StarWind devices are visible to the system.

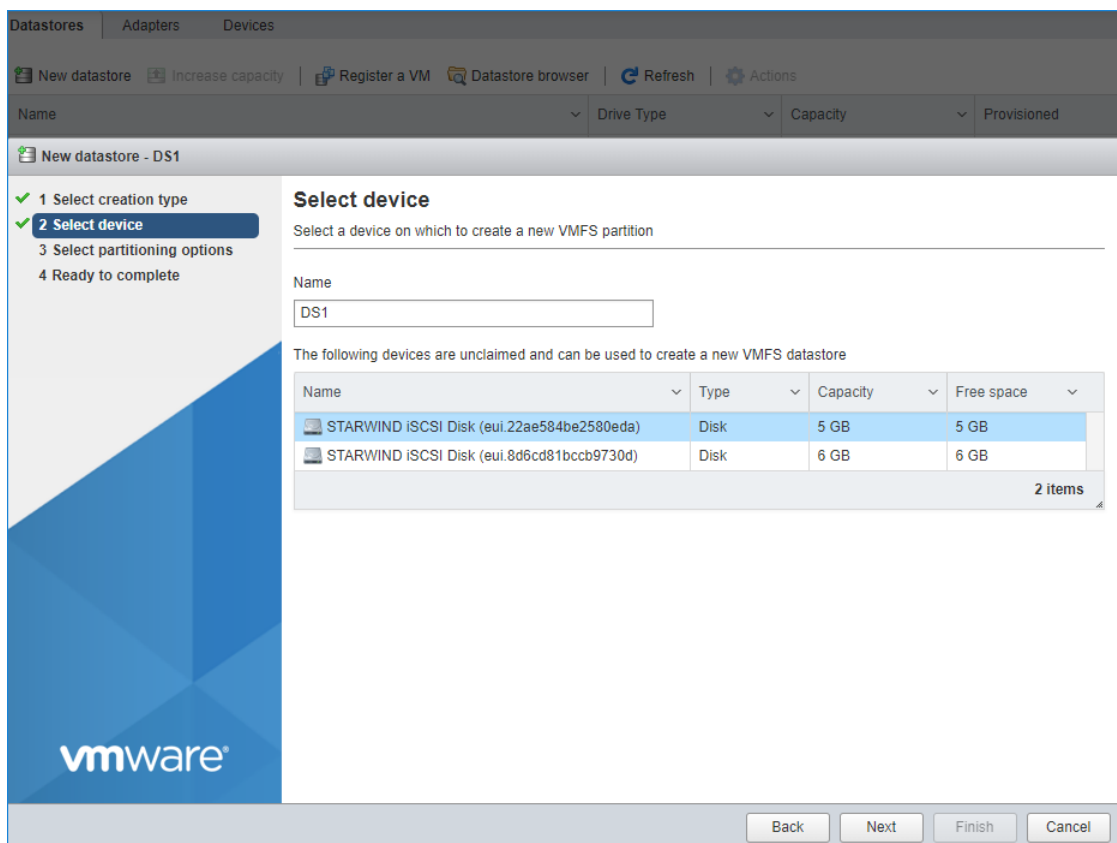
7. Repeat all the steps from this section on the other ESXi host, specifying corresponding IP addresses for the iSCSI subnet.

## Creating Datastores

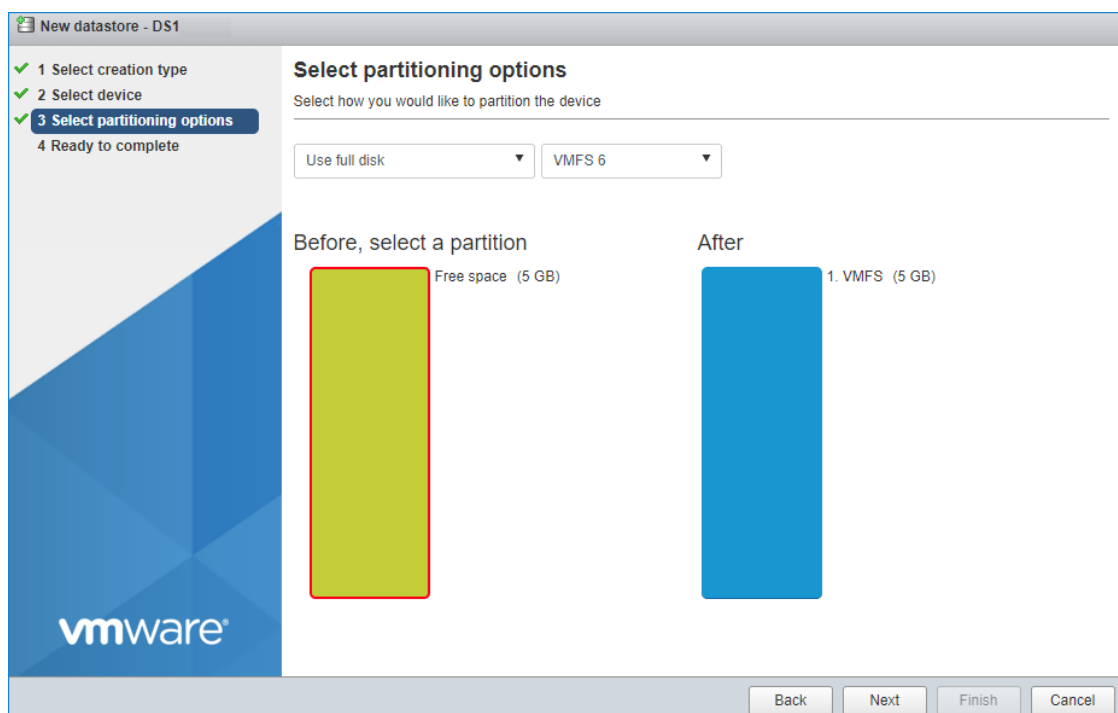
1. Open the Storage tab on one of the hosts and click on New Datastore.



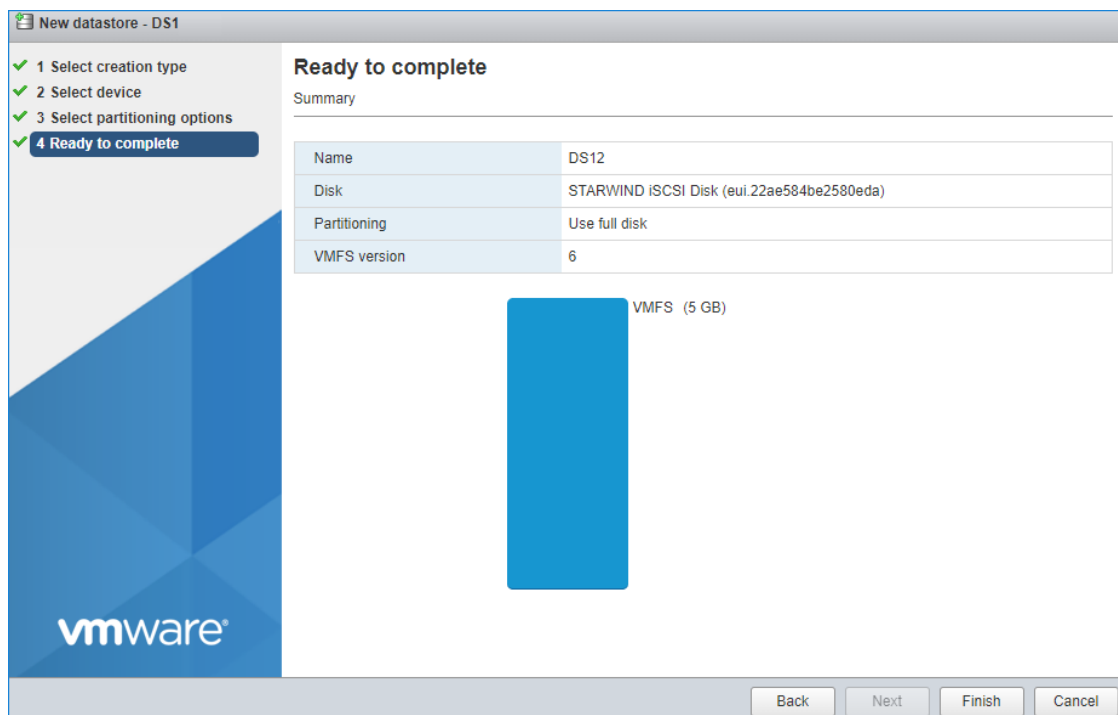
2. Specify the datastore name, select the previously discovered StarWind device, and click on Next.



3. Enter datastore size. Click on Next.



4. Verify the settings. Click on Finish.



5. Add another datastore (DS2) in the same way but select the second device for it.

6. Verify that storage (DS1, DS2) is connected to both hosts. Otherwise, rescan the storage adapter.

Datastores				
<a href="#">New datastore</a>   <a href="#">Increase capacity</a>   <a href="#">Register a VM</a>   <a href="#">Datastore browser</a>   <a href="#">Refresh</a>   <a href="#">Actions</a>				
Name	Drive Type	Capacity	Provisioned	Free
datastore1 (1)	Non-SSD	32.5 GB	972 MB	31.55 GB
DS1	Non-SSD	4.75 GB	1.41 GB	3.34 GB
DS2	Non-SSD	5.75 GB	1.41 GB	4.34 GB

7. Path Selection Policy changing for Datastores from Most Recently Used (VMware) to Round Robin (VMware) has been already added into the Rescan Script, and this action is performed automatically. For checking and changing this parameter manually, the hosts should be connected to vCenter.

8. Multipathing configuration can be checked only from vCenter. To check it, click the Configure button, choose the Storage Devices tab, select the device, and click on the Edit Multipathing button.

Getting Started
Summary
Monitor
Configure
Permissions
VMs
Datastores
Networks
Update Manager

Storage
Storage Adapters
Storage Devices
Datastores
Host Cache Configuration
Protocol Endpoints
I/O Filters
Networking
Virtual switches
VMkernel adapters
Physical adapters
TCP/IP configuration
Advanced
Virtual Machines
VM Startup/Shutdown

Storage Devices

Name	LUN	Type	Capacity	Operational State	Hardware Acceleration	Drive Type	Transport
Local VMware Disk (mpx.vmhba0:C0:T0:L0)	0	disk	40,00 GB	Attached	Not supported	HDD	Parallel SCSI
Local NECVMWar CD-ROM (mpx.vmhba64:C0:T0:L0)	0	cdrom		Attached	Not supported	HDD	Block Adapter
STARWIND iSCSI Disk (eui.22ae584be2580eda)	0	disk	5,00 GB	Attached	Supported	HDD	iSCSI
STARWIND iSCSI Disk (eui.8d6cd81bccb9730d)	0	disk	6,00 GB	Attached	Supported	HDD	iSCSI

Device Details

Properties

Logical Pathnames

Path Selection Policy

Most Recently Used (VMware)

Storage Array Type Policy

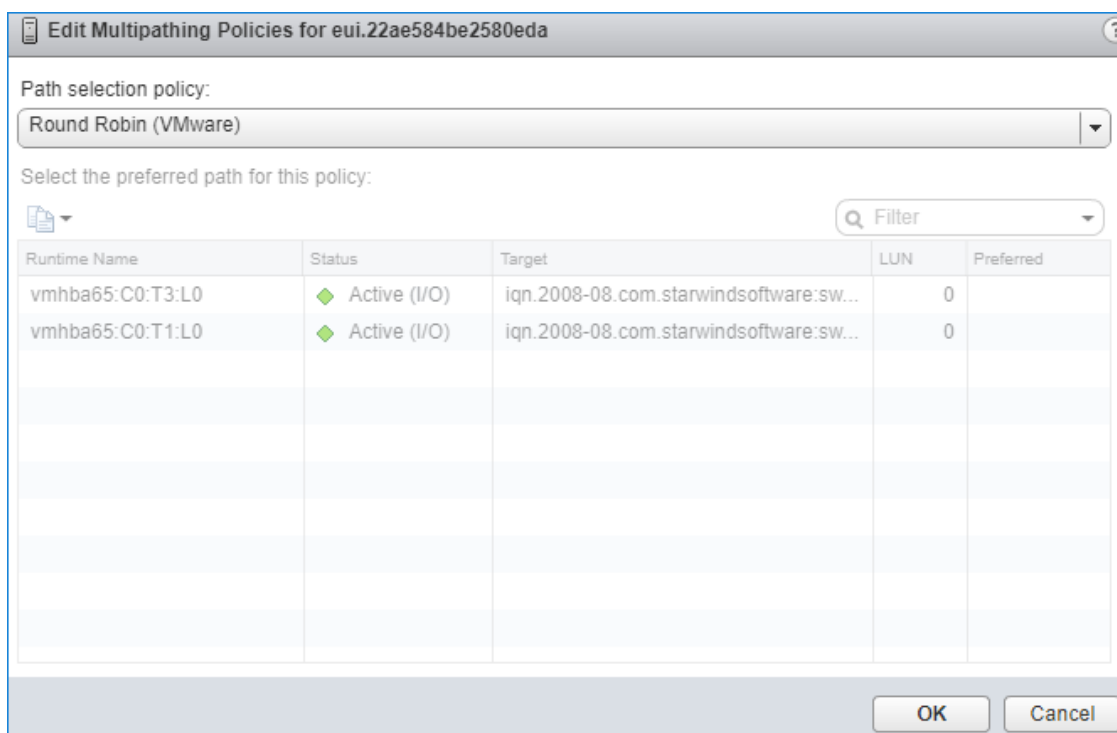
VMW\_SATP\_ALUA

Edit Multipathing...

StarWind Virtual SAN ® 3-node Hyperconverged Scenario with VMware vSphere 6.5/6.7

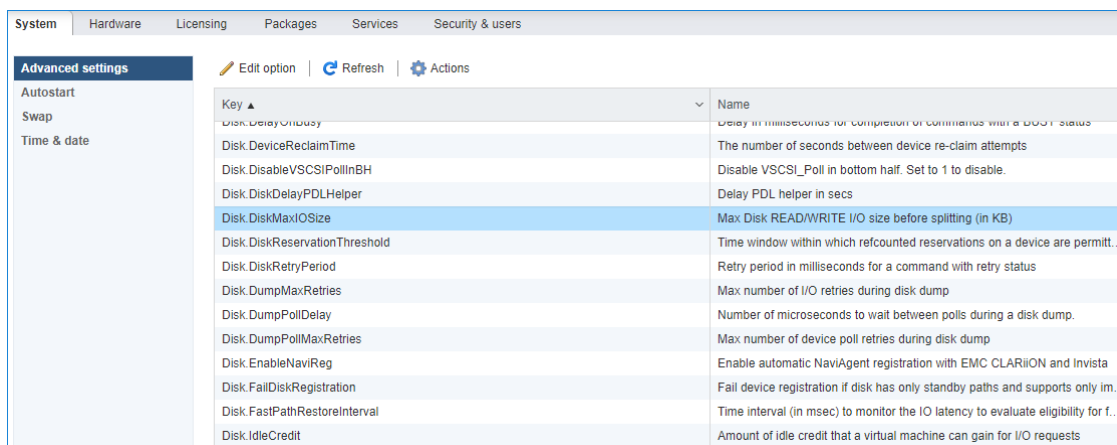
64



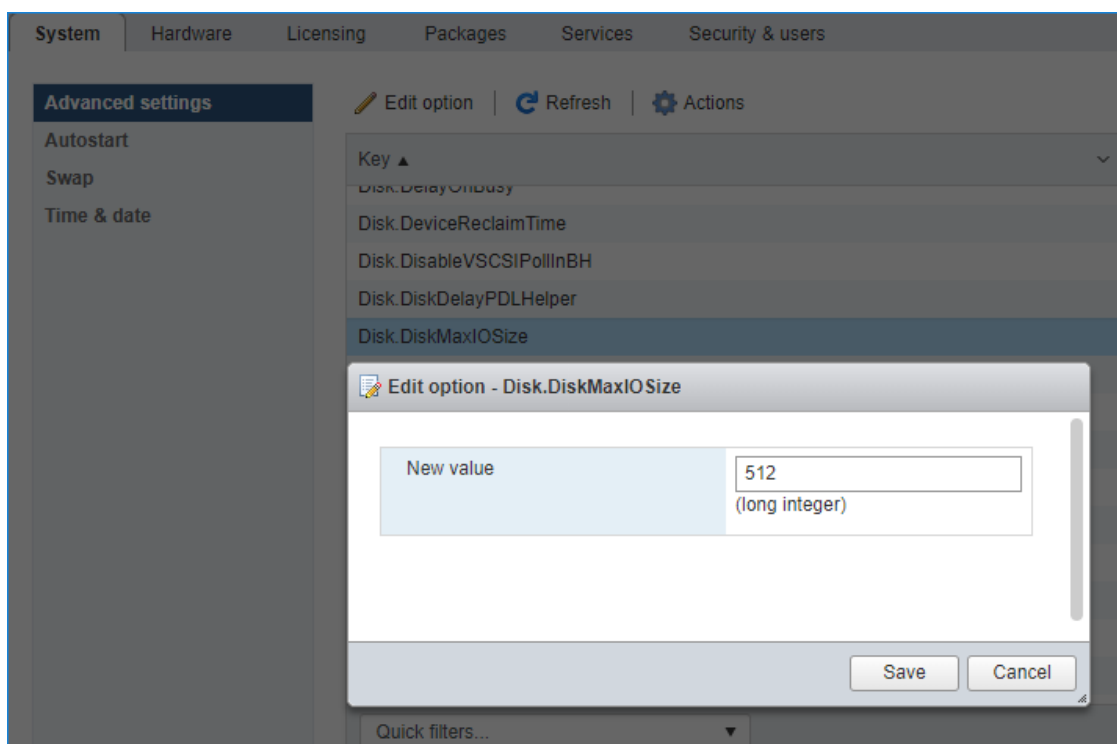


## Performance Tweaks

1. Click on the Configuration tab on all of the ESXi hosts and choose Advanced Settings.










2. Select Disk and change the Disk.DiskMaxIOSize parameter to 512.



NOTE: Changing Disk.DiskMaxIOSize to 512 might cause startup issues with Windows-based VMs, located on the datastore where specific ESX builds are installed. If the issue with VMs start appears, leave this parameter as default or update the ESXi host to the next available build.

NOTE: In certain cases, in Virtual Machine, Windows event log may report an error similar to "Reset to device, \Device\RaidPort0, was issued". Check this [KB article](#) for a possible solution.

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