

StarWind Virtual SAN: Configuration Guide for Hyper-V Server [Hyper-V], VSAN Deployed as a Windows Application, using GUI

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TECHNICAL PAPERS



StarWind Virtual SAN: Configuration Guide for Hyper-V Server [Hyper-V], VSAN Deployed as a Windows Application, using GUI



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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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Annotation

Relevant products

This guide applies to StarWind Virtual SAN and StarWind Virtual SAN Free (Version V8 (build 15260) and earlier).

Purpose

This document outlines how to configure a Microsoft Hyper-V Failover Cluster using StarWind Virtual SAN (VSAN), with VSAN running as a Windows application. The guide includes steps to prepare Hyper-V hosts for clustering, configure physical and virtual networking, and set up the StarWind VSAN and devices.

For more information about StarWind VSAN architecture and available installation options, please refer to the StarWind Virtual (VSAN) Getting Started Guide.

Audience

This technical guide is intended for storage and virtualization architects, system administrators, and partners designing virtualized environments using StarWind Virtual SAN (VSAN).

Expected result

The end result of following this guide will be a fully configured high-availability Windows Failover Cluster that includes virtual machine shared storage provided by StarWind VSAN.

Prerequisites

StarWind Virtual SAN 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

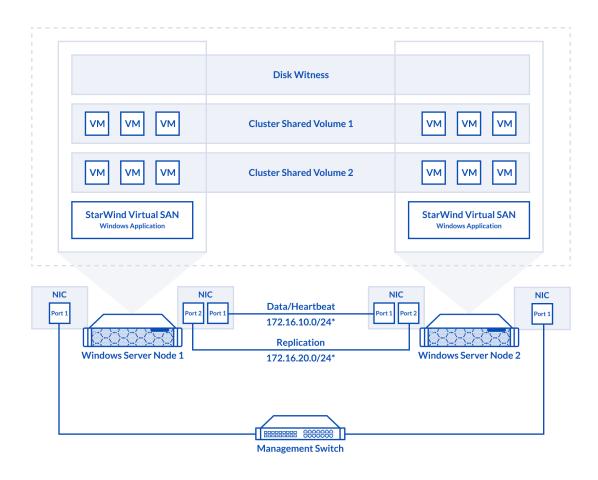
Recommended RAID settings for HDD and SSD disks: https://knowledgebase.starwindsoftware.com/guidance/recommended-raid-settings-for-h dd-and-ssd-disks/



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

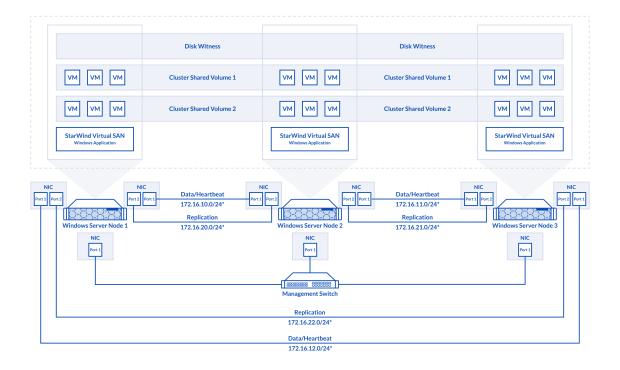
Solution diagram

The diagrams below illustrate the network and storage configuration of the solution:



2-node cluster





3-node cluster

Preconfiguring cluster nodes

1. Make sure that a domain controller is configured and the servers are added to the domain.

NOTE: Please follow the recommendation in KB article on how to place a DC in case of StarWind Virtual SAN usage.

2. Deploy Windows Server on each server and install Failover Clustering and Multipath I/O features, as well as the Hyper-V role on both servers. This can be done through Server Manager (Add Roles and Features menu item).

3. Define at least 2x network interfaces (2 node scenario) or 4x network interfaces (3 node scenario) on each node that will be used for the Synchronization and iSCSI/StarWind heartbeat traffic. 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 (see diagram above).

4. Separate external Virtual Switches should be created for iSCSI and Synchronization traffic based on the selected before iSCSI and Synchronization interfaces. Using Hyper-V Manager open Virtual Switch Manager and create two external Virtual Switches: one for



the iSCSI/StarWind Heartbeat channel (iSCSI) and another one for the Synchronization channel (Sync).

🚰 Virtual Switch Manager for SW01	- 🗆 X
 ★ Virtual Switches ↓ New virtual network switch ↓ MGMT Intel(R) 82574L Gigabit Network C ↓ Jacobia Sync Intel(R) 82574L Gigabit Network C ↓ Jacobia Sync Intel(R) 82574L Gigabit Network C 	Virtual Switch Properties Name: MGMT Notes:
Clobal Network Settings MAC Address Range 00-15-5D-0C-39-00 to 00-15-5D-0	 Connection type What do you want to connect this virtual switch to? External network: Intel(R) 82574L Gigabit Network Connection Allow management operating system to share this network adapter Enable gingle-root I/O virtualization (SR-IOV) Internal network Private network VLAN ID Enable girtual LAN identification for management operating system The VLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This setting does not affect virtual machine networking. 2 SR-IOV can only be configured when the virtual switch is created. An external virtual switch with SR-IOV enabled cannot be converted to an internal or private switch.
	QK <u>C</u> ancel Apply

5. Configure and set the IP address on each virtual switch interface. In this document, 172.16.1x.x subnets are used for iSCSI/StarWind heartbeat traffic, while 172.16.2x.x subnets are used for the Synchronization traffic.

NOTE: In case NIC supports SR-IOV, enable it for the best performance. An additional internal switch is required for iSCSI Connection. Contact support for additional details.

6. Set MTU size to 9000 on iSCSI and Sync interfaces using the following Powershell script.

```
$iSCSIs = (Get-NetAdapter -Name "*iSCSI*").Name
$Syncs = (Get-NetAdapter -Name "*Sync*").Name
foreach ($iSCSI in $iSCSIs) {
   Set-NetAdapterAdvancedProperty -Name "$iSCSI" -RegistryKeyword
   "*JumboPacket" -Registryvalue 9014
Get-NetAdapterAdvancedProperty -Name "$iSCSI" -RegistryKeyword
```



```
"*JumboPacket"
}
foreach ($Sync in $Syncs) {
Set-NetAdapterAdvancedProperty -Name "$Sync" -RegistryKeyword
"*JumboPacket" -Registryvalue 9014
Get-NetAdapterAdvancedProperty -Name "$Sync" -RegistryKeyword
"*JumboPacket"
}
```

It will apply MTU 9000 to all iSCSI and Sync interfaces if they have iSCSI or Sync as part of their name.

NOTE: MTU setting should be applied on the adapters only if there is no live production running through the NICs.

7. Open the MPIO Properties manager: Start -> Windows Administrative Tools -> MPIO. Alternatively, run the following PowerShell command :

mpiocpl

8. In the Discover Multi-Paths tab, select the Add support for iSCSI devices checkbox and click Add.



MPIO Propertie	25			\times
MPIO Devices	Discover Multi-Paths	DSM Install	Configuration Snapsh	ot
SPC-3 comp	liant			
Device Ha	rdware Id			
Add sup	port for iSCSI devices			
Add sup	port for SAS devices			
			Add	
Others				
Device Ha	rdware Id			
			Add	
			OK Creati	
			OK Cance	

9. When prompted to restart the server, click Yes to proceed.

10. Repeat the same procedure on the other server.

11. Enable Remote Desktop connection to the servers and join them to the domain by selecting the corresponding option in the Server Configuration window.



Image: C:\Windows\System32\cconfig.cmd Image: C:\Windows\System32\cconfig.cmd				
Enter selection: 2				
nabling Remote Desktop				
Server Conf	iguration			
1) Domain/Workgroup: 2) Computer Name: 3) Add Local Administrator	Domain: TEST.LOCAL SW-HYPERV-1			
4) Configure Remote Management 5) Windows Update Settings: 6) Download and Install Updates	Enabled DownloadOnly			
7) Remote Desktop: 8) Network Settings	Enabled (all clients)			
9) Date and Time 10) Telemetry settings	Enhanced			
11) Log Off User 12) Restart Server 13) Shut Down Server 14) Exit to Command Line				
Enter number to select an option:		~		

NOTE: Rename and configure a static IP address for network adapters.

12. Run powershell.exe in the Command Prompt to check the network adapters availability in the system:

Get-NetAdapter

ime	InterfaceDescription	ifIndex Status	MacAddress	LinkSpeed
	incernacebescription	ITINGER Status	nachddress	Linkspeed
hernet1	Intel(R) 82574L Gigabit Network Co#2	6 Up	00-50-56-8F-4E-F0	1 Gbps
hernet0	Intel(R) 82574L Gigabit Network Co#3		00-50-56-8F-68-61	1 Gbps
thernet2	Intel(R) 82574L Gigabit Network Conn		00-50-56-8F-86-25	1 Gbps
	istrator> Get-NetAdapter -Name "Ethernet1" Ren istrator> Get-NetAdapter	ame-NetAdapter -New	Name "ISCSI"	
ame	InterfaceDescription	ifIndex Status	MacAddress	LinkSpeed
	Intel(R) 82574L Gigabit Network Co#2	6 Up	00-50-56-8F-4E-F0	10 Gbps
 SCSI thernet0	Intel(R) 82574L Gigabit Network Co#2 Intel(R) 82574L Gigabit Network Co#3		00-50-56-8F-4E-F0 00-50-56-8F-68-61	10 Gbps 1 Gbps
SCSI	Intel(R) 82574L Gigabit Network Co#2 Intel(R) 82574L Gigabit Network Co#3 Intel(R) 82574L Gigabit Network Conn	7 Up		
SCSI thernet0	Intel(R) 82574L Gigabit Network Co#3	7 Up	00-50-56-8F-68-61	1 Gbps
SCSI thernet0	Intel(R) 82574L Gigabit Network Co#3 Intel(R) 82574L Gigabit Network Conn	7 Up	00-50-56-8F-68-61	1 Gbps
SCSI ChernetØ Chernet2	Intel(R) 82574L Gigabit Network Co#3 Intel(R) 82574L Gigabit Network Conn	7 Up	00-50-56-8F-68-61	1 Gbps
SCSI hernetØ hernet2	Intel(R) 82574L Gigabit Network Co#3 Intel(R) 82574L Gigabit Network Conn	7 Up	00-50-56-8F-68-61	1 Gbps
CSI hernet0 hernet2	Intel(R) 82574L Gigabit Network Co#3 Intel(R) 82574L Gigabit Network Conn	7 Up	00-50-56-8F-68-61	1 Gbps
CSI hernet0 hernet2	Intel(R) 82574L Gigabit Network Co#3 Intel(R) 82574L Gigabit Network Conn	7 Up	00-50-56-8F-68-61	1 Gbps

13. To change the name and set the static IP for Heartbeat/iSCSI and Synchronization channel, run the next commands via PowerShell:

Get-NetAdapter	"Ethernet1"	Rename-NetAdapter	-NewName	"Sync"
Get-NetAdapter	"iSCSI" New-	NetIPAddress —IPAd	ddress	



```
172.16.10.10 -PrefixLength 24
Get-NetAdapter "Ethernet2" | Rename-NetAdapter -NewName "Sync"
Get-NetAdapter "Sync" | New-NetIPAddress -IPAddress
172.16.20.10 -PrefixLength 24
```

NOTE: The corresponding IP addresses should be configured on the partner node.

14. Alternatively, the network settings can be changed through the sconfig.cmd window. In Network Settings (option 8), select the Index of the NIC which should be edited:

C:\Wi	ndows\System32\cmd.ex	e - C:\Windows\system32\sconfig.cmd	x
			^
Availab	le Network Adapt	ers	
Index#	IP address	Description	
1		Intel(R) 82574L Gigabit Network Connection	
2 3		<pre>Intel(R) 82574L Gigabit Network Connection #3 Intel(R) 82574L Gigabit Network Connection #2</pre>	
Select		Index# (Blank=Cancel):	

The following actions are possible:

- set Network Adapter Address selection between DHCP or Static IP (recommended);
- set DNS Servers providing DNS settings;
- clear DNS Server Settings;
- return to Main Menu.



🔤 C:\Windows\System32\cmd.exe - C:\Windows\system32\sconfig.cmd				
Notwork Adapton Sot	ting	^		
Network Adapter Set				
NIC Index	1			
Description	Intel(R) 82574L Gigabit Network Connection			
IP Address Subnet Mask DHCP enabled Default Gateway Preferred DNS Server Alternate DNS Server	169.254.188.127 fe80::8daf:d3d1:b177:bc7f 255.255.0.0 True			
1) Set Network Adapter / 2) Set DNS Servers 3) Clear DNS Server Set 4) Return to Main Menu				
Select option: _		~		

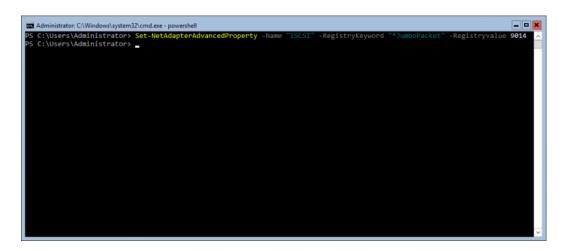
15. It is highly recommended to enable jumbo frames (9014) on the Synchronization and iSCSI networks. This can be done via PowerShell in two ways:

• Directly on the Synchronization / iSCSI adapter:

```
Set-NetAdapterAdvancedProperty -Name "Sync" -RegistryKeyword
"*JumboPacket" -Registryvalue 9014
Set-NetAdapterAdvancedProperty -Name "iSCSI" -RegistryKeyword
"*JumboPacket" -Registryvalue 9014
• For all adapters available in the system:
```

```
Set-NetAdapterAdvancedProperty -Name "*" -RegistryKeyword
"*JumboPacket" -Registryvalue 9014
```





16. Ping each node with jumbo frames (change the asterisk to the corresponding partner node's IP address):

ping 172.16.20.* -f -l 8900 - for Synchronization network; ping 172.16.10.* -f -l 8900 - for iSCSI network

17. To create a virtual switch on the Management interface, run the next command via PowerShell:

```
New-VMSwitch -Name "vSwitch" -NetAdapterName "management"
```

NOTE: The Virtual Switch name must be the same on both nodes.

18. To disable firewall, please run the following command via PowerShell on each server:

```
Get-NetFirewallProfile | Set-NetFirewallProfile — Enabled False
```

19. Install Failover Clustering and Multipath I/O features on both servers using PowerShell:

Install-WindowsFeature Failover-Clustering
-IncludeAllSubFeature -Restart

```
Enable-WindowsOptionalFeature -Online -FeatureName MultiPathIO
```

Enable-MSDSMAutomaticClaim —BusType iSCSI

20. Preparing storage for StarWind devices NOTE: Please refer to the KB article about recommended RAID settings before



proceeding:

https://knowledgebase.starwindsoftware.com/guidance/recommended-raid-settings-for-h dd-and-ssd-disks/

Any storage array intended to be used by StarWind Virtual SAN for storing virtual disk images should meet the following requirements:

- initialized as GPT;
- have a single NTFS-formatted partition;
- have a drive letter assigned.

21. To create a Local Partition for the storage drive, run the commands below in the CMD window:

Diskpart list disk select disk X //where X is the number of the disk to be processed online disk attributes disk clear readonly convert GPT create partition Primary format fs=ntfs label=X quick //where X is the name for the Volume list volume select volume X assign letter X //where X is the letter for the Volume list Volume



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.

Setup - StarWind Virtual SAN —	×
License Agreement Please read the following important information before continuing.	ð
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.	
STARWIND® LICENSE AGREEMENT	^
This StarWind License Agreement (the "Agreement") is a legal agreement between the entity indicated on the signature page as 'Licensee' or the licensee entity on whose behalf this Agreement is electronically executed by the authorized user (the "Licensee") and StarWind Software, Inc., a State of Delaware, USA corporation ("StarWind," and collectively with Licensee, the "Parties" and each, (a "Party")), that is entered into as of the date of acceptance hereof by both Parties hereto (the "Effective	
● <u>I accept the agreement</u> ○ I <u>do</u> not accept the agreement	
<u>N</u> ext > C	ancel

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.



Setup - StarWind Virtual SAN	_		×
Select Destination Location Where should StarWind Virtual SAN be installed?			Ð
Setup will install StarWind Virtual SAN into the following fold	ler.		
To continue, click Next. If you would like to select a different folder,	click Br	rowse.	
C:\Program Files\StarWind Software\StarWind	E	B <u>r</u> owse	
At least 2.4 MB of free disk space is required.			
< <u>B</u> ack <u>N</u> ex	t >	Ca	ncel

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.



Setup - StarWind Virtual SAN
Select Components
Which components should be installed?
Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.
StarWind Virtual SAN Server 🗸 🗸 🗸
Service 170,8 MB Loopback Accelerator Driver
Cloud Replicator for VTL 158,8 MB SPTD Driver (Alternative driver for exporting physical devices)
StarWind Management Console 29,4 MB Configure user account for Web-access to Management Console 0,1 MB
✓ Integration Component Library 7,8 MB
PowerShell Management Library 2,6 MB
SMI-S Agent 51.5 MB
Current selection requires at least 207,3 MB of disk space.
< <u>B</u> ack <u>N</u> ext > Cancel
6. Specify Start Menu Folder.
Setup - StarWind Virtual SAN — X
Select Start Menu Folder Where should Setup place the program's shortcuts?
Setup will create the program's shortcuts in the following Start Menu folder.
To continue, click Next. If you would like to select a different folder, click Browse.
StarWind Software\StarWind Browse

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

< <u>B</u>ack

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

 $\underline{N}ext >$

Cancel



- request time-limited fully functional evaluation key.
- request FREE version key.
- relect 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.



			?	×
\leftarrow	Add [Device Wizard		
	Select I	Device Type you want to create or export as iSCSI Target		
	۲	Hard Disk Device		
	0	Tape Device		
	0	Optical Disc Drive		
		<u>N</u> ext	Car	ncel

3. Select Virtual Disk.



			?	×
←	Add [Device Wizard		
	Select I	Disk Device Type		
	۲	Virtual Disk		
		Virtual Disk stores User Data in File		
	0	Physical Disk		
		Export existing physical Disk as iSCSI Target		
	0	RAM Disk		
		Virtual Disk with Memory Storage		
		Next	Can	cel

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



			?	×
←	Add Device Wiza	rd		
	Marcal Distance			
	Virtual Disk Loc	ation		
	Create a New	/irtual Disk		
	Name:	<pre><device name=""></device></pre>]	
	Location:	My Computer\D\		
	Size:	<size> GB ~</size>		
	OUse an Existing	Virtual Disk		
	Location:	~		
	Read-On	ly Mode		
		Next	Cano	:el

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 Dev	vice Wizard		
	Specify [Device RAM Cache Parameters		
	Mode			1
	0	Write-Back Writes are performed asynchronously, actual Writes to Disk are delayed, Read are cached	S	
	0	Write-Through Writes are performed synchronously, Reads are cached		
	۲	N/A Reads and Writes are not cached		
	Set M	laximum available Size		
	Size:	128 MB ~		
		Next	Can	cel

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.



		?	×
←	Add Device Wizard		
	Target Parameters		
	Choose a Target Attachment Method		
	Create new Target	~	
	Target Alias		_
	<target alias="" name=""></target>		
	Target Name		
	iqn.2008-08.com.starwindsoftware:sw1- <target alias="" name=""></target>		
	Allow multiple concurrent iSCSI Connections		
	<u>N</u> ext	Car	icel

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



		?	×
~	Add Device Wizard		
	Creation Page		
	Press "Create" to add new Device and attach it to new Target		
	Progress		
	Creating Device Folder		
	Creating Image File		
	Creating Header		
	Creating Device		
	Creating Target and attaching Device		
	Create	Cano	el :

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.

😴 Replication Manager for imagefile1	?	×
Refresh Add Replica Remove Replica		
Replication Partner		
Click to add replication partner		
PROPERTIES		
Host Name		
Target Name		
Mode		
Priority		
Synchronization Status		
Synchronization Channel		
	Clos	e .

3. Select Synchronous "Two-Way" replication as a replication mode.



		?	×
\leftarrow	Replication Wizard		
	Replication Mode		
	Synchronous "Two-Way" Replication Replication Partner must be connected to Client as Source Device as well, MPIO on must be enabled, needs dedicated high Performance Network Connection for Synchronization.	Client	
	Witness Node Witness node doesn't contain user data. In case when Node Majority policy is set f Synchronous replication device and there are two storage nodes, Witness Node m added to cluster to make number of nodes odd number and enable proper function Node Majority policy.	ust be	
	Next	Canc	el

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.



			?	×
←	Replic	cation Wizard		
	Failove	r Strategy		
	۲	Heartbeat		
		Process node and communication failures using additional communication channel (heartbeat). At least one synchronization or heartbeat channel must be function proper failover processing. Loss of all communication channels may lead to split b issue, so it's recommended to use client iSCSI connection interfaces as heartbeat channel.	al for rain	
	0	Node Majority		
	0	Process node and communication failures using majority policy: node stays active sees more than half of nodes including itself. In case of 2 storage nodes, require configuring additional witness node. Does not require additional heartbeat channe	s	t
		Next	Can	cel

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-synchronizati on-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 and 2-way replication and 4MB per 1 TB of HA device size for 3-way replication.

Failure journal – 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 – 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 IO performance in any scenario.	good	
	O Disk-based journal Synchronization journal placed on disk.		
	Failure journal The strategy provides good IO performance while all device nodes are in a h state.	iealthy	
	 Continuous journal The strategy guarantees fast synchronization and data consistency in all case 	ses.	
	Current Node My Computer\C\		
	Partner Node My Computer\C\		
	Next	Canc	el

5. Click Change Network Settings.



		?	×
←	Replication Wizard		
	Network Options for Replication		
	Networks for Synchronization and Heartbeat		
	Press "Change Network Settings" to configure Interfaces		
	Networks for Heartbeat		
	Press "Change Network Settings" to configure Interfaces		
	Change Network Settings		
	ALUA preferred 127.0.0.1, SW2		
	Change ALUA Settings		
	Next	Can	cel

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



Interfaces	Networks	Synchronization and H	Heartbeat
Host Name: 127	7.0.0.1		
172.16.10.10	172.16.10.0		v
172.16.20.10	172.16.20.0	v	
192.168.12.10	192.168.12.0		v
Host Name: SW	12		
172.16.10.20	172.16.10.0		v
172.16.20.20	172.16.20.0		
192.168.12.20	192.168.12.0		v

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. 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:

How to extend Image File or High Availability device



Node Majority

There are two ways to configure Witness for 2-nodes StarWind HA device, created with Node Majority Failover Strategy: File Share (SMB) as Witness and additional server as Witness Node.

- Creating HA device with File SHare(SMB) as Witness:

SMB Witness is a file, located on SMB share, which can be accessed by both nodes and help them to eliminate the split-brain issue in case of synchronization connection interruption between the nodes. To set up the SMB file share as a Witness for 2-nodes HA device with Node Majority Failover Strategy, perform the actions, described on this page:

https://www.starwindsoftware.com/help/ConfiguringFileShareSMBasWitness.html

- Creating HA device with Witness Node:

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

			?	×
←	Replie	cation Wizard		
	Failove	r Strategy		
	0	Heartbeat Process node and communication failures using additional communication channel (heartbeat). At least one synchronization or heartbeat channel must be functiona proper failover processing. Loss of all communication channels may lead to split br issue, so it's recommended to use dient iSCSI connection interfaces as heartbeat channel.		
	۲	Node Majority Process node and communication failures using majority policy: node stays active sees more than half of nodes including itself. In case of 2 storage nodes, requires configuring additional witness node. Does not require additional heartbeat channe		
		Next	Cance	el

- 2. Choose Create new Partner Device and click Next.
- 3. Specify the partner device Location and modify the target name if necessary.



Click Next. Select Synchronization Journal strategy and location and click Next.

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

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

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

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

8. The added devices will appear in StarWind Management Console. Repeat the steps above to create other virtual disks if necessary.

Adding Witness Node

Witness node can be configured on a separate host or as a virtual machine in a cloud. It requires StarWind Virtual SAN service installed on it.

NOTE: Since the device created in this guide is replicated between 2 active nodes with the Node Majority failover strategy, a Witness node must be added to it.

1. Open StarWind Management Console, right-click on the Servers field and press the Add Server button. Add a new StarWind Server which will be used as the Witness node and click OK.

📑 Ad	d new StarWind Server		?	×
Host:	witness-sw		: 3261	
Adva	anced >>	ОК	Can	cel

2. Right-click on the HA device with the configured Node Majority failover policy and select Replication Manager and press the Add Replica button.

3. Select Witness Node.



		?	×
÷	Repli	cation Wizard	
	Replica	ation Mode	
	0	Synchronous "Two-Way" Replication Replication Partner must be connected to Client as Source Device as well, MPIO on Client must be enabled, needs dedicated high Performance Network Connection for Synchronization	
	0	Asynchronous "One-Way" Replication Replica is used to store replicated Data, Data is stored as Snapshots, Client cannot connect to Replication Partner, mount Snapshot from Replica to get Access to replicated Data	
	۲	Witness Node Witness node doesn't contain user data. In case when Node Majority policy is set for Synchronous replication device and there are two storage nodes, Witness Node must be added to cluster to make number of nodes odd number and enable proper functioning of Node Majority policy.	
		Next Cance	:

4. Specify the Witness node Host Name or IP address. The default Port Number is 3261.



		?	×
Replication Wizard			
Add Partner Node			
Specify Partner Host Name	e or IP Address where Replication Node would be created		
Host Name or IP Address	witness-sw \checkmark		
Port Number	3261		
	Next	Car	ncel

5. In Partner Device Setup, specify the Witness device Location. Optionally, modify the target name by clicking the appropriate button.

6. In Network Options for Replication, select the synchronization channel with the Witness node by clicking the Change Network Settings button.

7. Specify the interface for Synchronization and Heartbeat and click OK.

8. Click Create Replica and then close the wizard.

9. 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-orhigh-availability-device/



Provisioning Starwind Ha Storage To Windows Server Host

1. Launch Microsoft iSCSI Initiator: Start -> Windows Administrative Tools -> iSCSI Initiator. Alternatively, launch it using the command below in the command line interface:

iscsicpl

2. Navigate to the Discovery tab.



iSC	iSCSI Initiator Properties										
Та	argets	Discovery	Favorite Targets	Volumes and Devices	RADIUS	Configuration					
	Target portals										
	The s	system will lo	ok for Targets on fo	I	Refresh						
	Addr	ess	Port	Adapter	I	P address					
	To add a target portal, click Discover Portal. Discover Portal										
		move a targ click Remove	et portal, select the 2.	F	Remove						
		ervers									
	The system is registered on the following iSNS servers: Refresh										
	Nam										
	To ac	dd an iSNS se	erver, <mark>click Add</mark> Serv	Add	d Server						
	To re then	move an iSN click Remove	S server, select the e.	Remove							
				ОК	Cancel	Apply					

3. Click the Discover Portal button. The Discover Target Portal dialog appears. Type 127.0.0.1.



Discover Target Portal	×			
Enter the IP address or DNS name and port number of the portal you want to add.				
To change the default settings of the discovery of the target portal, click the Advanced button.				
IP address or DNS name:	Port: (Default is 3260.) 3260			
Advanced	OK Cancel			

4. Click the Advanced button. Select Microsoft iSCSI Initiator as a Local adapter and select Initiator IP (leave default for 127.0.0.1). Confirm the actions to complete the Target Portal discovery.



Ivanced Settings	?	×
eneral IPsec		
Connect using		
Connect using		
Local adapter:	Microsoft iSCSI Initiator 🗸 🗸	
Initiator IP:	Default ~	
Target portal IP:	~	
CRC / Checksum		
Data digest	Header digest	
specified.	ign. 1991-05.com.microsoft:sw1	
Name:	Iqn. 1991-05.com.microsoft.sw1	
Target secret:		
RADIUS.	uthentication either specify an initiator secret on the Configuration page or use enerate user authentication credentials uthenticate target credentials	

5. Click the Discover Portal... button once again.

6. In Discover Target Portal dialog, type in the iSCSI interface IP address of the partner node that will be used to connect the StarWind provisioned targets. Click Advanced.



Discover Target Portal	×			
Enter the IP address or DNS name and port number of the portal you want to add.				
To change the default settings of the discovery of the target portal, click the Advanced button.				
IP address or DNS name: 172.16.10.20	Port: (Default is 3260.) 3260			
Advanced	OK Cancel			

7. Select Microsoft iSCSI Initiator as the Local adapter, select the Initiator IP in the same subnet as the IP address of the partner server from the previous step. Confirm the actions to complete the Target Portal discovery.



Connect using	
.ocal adapter:	Microsoft iSCSI Initiator \sim
nitiator IP:	172.16.10.10 ~
Farget portal IP:	\sim
CRC / Checksum	
Data digest	Header digest
on initiator. To use, specify the sa hitiator. The name w	
CHAP Log on inform CHAP helps ensure co an initiator. To use, specify the sa nitiator. The name w specified.	nation onnection security by providing authentication between a target and ame name and CHAP secret that was configured on the target for this
CHAP Log on inform CHAP helps ensure co an initiator.	nation onnection security by providing authentication between a target and ame name and CHAP secret that was configured on the target for this vill default to the Initiator Name of the system unless another name is

8. Now, all the target portals are added on the first node.



iSCS	l Initiator Proper	ties				×
	gets Discovery	Favorite Targets	Volumes and Devices	RADIUS	Configuration	
	arget portals The system will lo	ok for Targets on fo	llowing portals:		Refresh	
	Address	Port	Adapter	I	P address	
	127.0.0.1	3260	Microsoft iSCSI Initia	tor [Default	
	172.16.10.20	3260	Microsoft iSCSI Initia	tor :	172.16.10.10	
1	To add a target p	ortal, <mark>c</mark> lick Discover	Portal.	Disco	over Portal	
	To remove a targe then click Remove		address above and		Remove	
1	SNS servers The system is reg Name	istered on the follow	ving iSNS servers:		Refresh	
	To add an iSNS se	rver, click Add Serv	ver.	Ad	d Server	
	To remove an iSN then click Remove	S server, select the	server above and		Remove	
			ОК	Cance	Apply	7

9. Repeat the steps 1-8 on the partner node.

Connecting Targets

1. Click the Targets tab. The previously created targets are listed in the Discovered Targets section.

NOTE: If the created targets are not listed, check the firewall settings of the StarWind Server as well as the list of networks served by the StarWind Server (go to StarWind Management Console -> Configuration -> Network). Alternatively, check the Access Rights tab on the corresponding StarWind VSAN server in StarWind Management Console



for any restrictions.

iSCSI Initiator Properties			Х
Targets Discovery Favorite Targets Volumes and Devices Quick Connect			
DNS name of the target and then click Quick Connect. Target:	Q	uick Connect	d
Discovered targets			- 1
		Refresh	
Name	Status		
iqn.2008-08.com.starwindsoftware:sw1-csv1	Inactive		
iqn.2008-08.com.starwindsoftware:sw1-csv2	Inactive		
ign.2008-08.com.starwindsoftware:sw1-witness ign.2008-08.com.starwindsoftware:sw2-csv1	Inactive Inactive		
ign. 2008-08.com.starwindsoftware:sw2-csv1	Inactive		
ign. 2008-08. com. starwindsoftware: sw2-witness	Inactive		
To connect using advanced options, select a target and then click Connect.	1	Connect	
To completely disconnect a target, select the target and then click Disconnect.		Disconnect	
For target properties, including configuration of sessions, select the target and click Properties.		Properties	
For configuration of devices associated with a target, select the target and then click Devices.		Devices	
ОК	Cance	l Apply	ŗ

- 2. Select the Witness target from the local server and click Connect.
- 3. Enable checkboxes as shown in the image below. Click Advanced.



Connect To Target	×
Target name:	
iqn.2008-08.com.starwindsoftware:sw1-witness	
Add this connection to the list of Favorite Targets. This will make the system automatically attempt to restore the connection every time this computer restarts.	
✓ Enable multi-path	
<u>A</u> dvanced OK	Cancel

4. Select Microsoft iSCSI Initiator in the Local adapter dropdown menu. In Target portal IP, select 127.0.0.1. Confirm the actions.



	?	
neral IPsec		
Connect using		
Local adapter:	Microsoft iSCSI Initiator \checkmark	
Initiator IP:	Default ~	
Target portal IP:	127.0.0.1 / 3260 🗸	
CRC / Checksum		
Data digest	Header digest	
	vill default to the Initiator Name of the system unless another name is	
	iqn. 1991-05.com.microsoft:sw1	
specified. Name: Target secret:	-	
Vame: Target secret: Perform mutual au To use mutual CHAP, RADIUS. Use RADIUS to ge	iqn.1991-05.com.microsoft:sw1	

NOTE: It is recommended to connect the Witness device only by loopback (127.0.0.1) address. Do not connect the target to the Witness device from the partner StarWind node.

5. Select the CSV1 target discovered from the local server and click Connect.

6. Enable checkboxes as shown in the image below. Click Advanced.



Connect To Target	×
Target name:	
iqn.2008-08.com.starwindsoftware:sw1-csv1	
Add this connection to the list of Favorite Targets. This will make the system automatically attempt to restore the connection every time this computer restarts.	
Enable multi-path	
Advanced OK	Cancel

7. Select Microsoft iSCSI Initiator in the Local adapter dropdown menu. In Target portal IP, select 127.0.0.1. Confirm the actions.

8. Select the partner target from the other StarWind node and click Connect.

9. Repeat the step 6.

10. Select Microsoft iSCSI Initiator in the Local adapter dropdown menu. In the Initiator IP field, select the IP address for the iSCSI channel. In the Target portal IP, select the corresponding portal IP from the same subnet. Confirm the actions.



	?	
neral IPsec		
Connect using		
Local adapter:	Microsoft iSCSI Initiator	
Initiator IP:	172.16.10.10	
Target portal IP:	172.16.10.20 / 3260	
CRC / Checksum	Header digest	
Enable CHAP log o	n	
CHAP Log on inform	ation	
	onnection security by providing authentication between a target and	
an initiator.		
an Iniciacor.		
	ame name and CHAP secret that was configured on the target for this	
To use, specify the sa initiator. The name w	ame name and CHAP secret that was configured on the target for this vill default to the Initiator Name of the system unless another name is	
To use, specify the sa		
To use, specify the sa initiator. The name w	ill default to the Initiator Name of the system unless another name is	_
To use, specify the sa initiator. The name w		
To use, specify the sa initiator. The name w specified.	ill default to the Initiator Name of the system unless another name is	
To use, specify the sa initiator. The name w specified.	ill default to the Initiator Name of the system unless another name is	
To use, specify the sa initiator. The name w specified. Name:	ill default to the Initiator Name of the system unless another name is	
To use, specify the sa initiator. The name w specified. Name:	ill default to the Initiator Name of the system unless another name is iqn. 1991-05.com.microsoft:sw1	
To use, specify the sa initiator. The name w specified. Name: Target secret:	ill default to the Initiator Name of the system unless another name is iqn. 1991-05.com.microsoft:sw1	
To use, specify the sa initiator. The name w specified. Name: Target secret: Perform mutual au To use mutual CHAP, RADIUS.	ill default to the Initiator Name of the system unless another name is iqn. 1991-05.com.microsoft:sw1]
To use, specify the sa initiator. The name w specified. Name: Target secret: Perform mutual au To use mutual CHAP, RADIUS.	ill default to the Initiator Name of the system unless another name is iqn. 1991-05.com.microsoft:sw1 uthentication either specify an initiator secret on the Configuration page or use merate user authentication credentials]
To use, specify the sa initiator. The name w specified. Name: Target secret: Perform mutual au To use mutual CHAP, RADIUS. Use RADIUS to ge	ill default to the Initiator Name of the system unless another name is iqn.1991-05.com.microsoft:sw1]
To use, specify the sa initiator. The name w specified. Name: Target secret: Perform mutual au To use mutual CHAP, RADIUS. Use RADIUS to ge	ill default to the Initiator Name of the system unless another name is iqn. 1991-05.com.microsoft:sw1 uthentication either specify an initiator secret on the Configuration page or use merate user authentication credentials]

11. Repeat the steps 1-10 for all remaining HA device targets.

12. Repeat the steps 1-11 on the other StarWind node, specifying corresponding local and data channel IP addresses.

Configuring Multipath

NOTE: It is recommended to configure the different MPIO policies depending on iSCSI channel throughput. For 1 Gbps iSCSI channel throughput, it is recommended to set Failover Only or Least Queue Depth MPIO load balancing policy. For 10 Gbps iSCSI channel throughput, it is recommended to set Round Robin or Least Queue Depth MPIO



load balancing policy.

1. Configure the MPIO policy for each target except for Witness with the load balance policy of choice. Select the Target located on the local server and click Devices.

2. In the Devices dialog, click MPIO.

Devices			×
Name	Address		
Disk 2	Port 5: Bus	0: Target 2: LUN 0	
Volume path			
Legacy devic	te name:	\\.\PhysicalDrive2	
		\\?\mpio#disk&ven_starwind&pro	od_starwind&rev_000
Device interf	face name:		
6 f M	the state of the	<	>
	ultipath IO (M e the MPIO p	-	
selected dev	vice, click MP	IO.	MPIO
			OK

3. Select the appropriate load balancing policy.



Device Detai	ls				×
MPIO					
Load balan	ce policy:				
Least Que	ue Depth			~	
distribut	t queue dept			r uneven loads by s to lightly loaded	
This device	has the follo	wing paths	:		_
Path Id	Status	Туре	Weight	Session ID	
	. Conne . Conne		n/a n/a	ffffb0026edae010-400 ffffb0026edae010-400	-
<				2	×
			De	tails Edit	
		C	ж	Cancel Apply	

4. For the Witness target, set the load balance policy to Failover Only.

5. Repeat the steps 1-4 for configuring the MPIO policy for each remaining device on the current node and on the partner node.

NOTE: In case the Failover Only MPIO policy is used, make sure to check that the local path (127.0.0.1) is set to Active, while the partner connection is set to Standby.

Connecting Disks to Servers

1. Open the Disk Management snap-in. The StarWind disks will appear as unallocated and offline.



📅 Disk Manager	ment						_		×
File Action V	/iew Help								
🔶 🔿 🛛 📰 🛛 🚺									
Volume	Layout	Туре	File Syste		Capacity	Free Spa	% Free		
Storage (D:)	Simple	Basic	NTFS	Healthy (P.,		32.78 GB	66 %		
System (C:)	Simple	Basic	NTFS	Healthy (B.		6.53 GB	27 %		
- System Reserve	ed Simple	Basic	NTFS	Healthy (S	500 MB	172 MB	34 %		
-Disk 0									^
Basic	System Reserv	ed		System (C:)					
25.00 GB Online	500 MB NTFS Healthy (System	Active Pri	many Partiti	24.51 GB NTFS Healthy (Boot, Pa	ge File, Crash Di	ump Primary Pa	rtition)		
	Treating (System	, Active, i fi			gerne, enamer	amp, i innary i a	interesting		
	-		1	,					_
Disk 1 Basic	Storage (D:)						///////////////////////////////////////	77777	777
49.88 GB	49.87 GB NTFS								
Online	Healthy (Primar	y Partition)							
O Disk 2									
Unknown									
6.00 GB Offline ()	6.00 GB Unallocated								
•	ondirocated								
	·								
Olisk 3 Unknown									
10.00 GB	10.00 GB								
Offline 🚺	Unallocated								
Olisk 4									
Unknown 1.00 GB	1.00 GB								
Offline 1	Unallocated								
-									
Linalla estad	Drimono nontition]				`
Unallocated	Primary partition								

2. Bring the disks online by right-clicking on them and selecting the Online menu option.

3. Select the CSV disk (check the disk size to be sure) and right-click on it to initialize.

4. By default, the system will offer to initialize all non-initialized disks. Use the Select Disks area to choose the disks. Select GPT (GUID Partition Style) for the partition style to be applied to the disks. Press OK to confirm.



Initialize Disk	×
You must initialize a disk before Logical Disk Manager can access it. Select disks:	
 ✓ Disk 2 ✓ Disk 3 ✓ Disk 4 	
Use the following partition style for the selected disks: MBR (Master Boot Record) GPT (GUID Partition Table)	_
Note: The GPT partition style is not recognized by all previous versions of Windows.	
OK Cancel	

- 5. Right-click on the selected disk and choose New Simple Volume.
- 6. In New Simple Volume Wizard, indicate the volume size. Click Next.
- 7. Assign a drive letter to the disk. Click Next.

New Simple Volume Wizard	×					
Assign Drive Letter or Path For easier access, you can assign a drive letter or drive path to your partition.						
 Assign the following drive letter: Mount in the following empty NTFS folder: Browse 						
O Do not assign a drive letter or drive path						
< Back Next > Can	;el					



8. Select NTFS in the File System dropdown menu. Keep Allocation unit size as Default. Set the Volume Label of choice. Click Next.

New Simple Volume Wizard		×
Format Partition To store data on this partition, you m	ust format it first.	
Choose whether you want to format	this volume, and if so, what settings you want to use.	
O Do not format this volume		
Format this volume with the format	llowing settings:	
File system:	NTFS ~	
Allocation unit size:	Default ~	
Volume label:	CSV1	
Perform a quick format		
Enable file and folder co	ompression	
	< Back Next > Cancel	

9. Press Finish to complete.

10. Complete the steps 1-9 for the Witness disk. Do not assign any drive letter or drive path for it.



New Simple Volume Wizard	×				
Assign Drive Letter or Path For easier access, you can assign a drive letter or drive path to your partition.					
 Assign the following drive letter: Mount in the following empty NTFS folder: 	E v				
Do not assign a drive letter or drive path	Browse				
	< Back Next > Cancel				

11. On the partner node, open the Disk Management snap-in. All StarWind disks will appear offline. If the status is different from the one shown below, click Action->Refresh in the top menu to update the information about the disks.

12. Repeat step 2 to bring all the remaining StarWind disks online.

Creating A Failover Cluster In Windows Server

NOTE: To avoid issues during the cluster validation configuration, it is recommended to install the latest Microsoft updates on each node.

NOTE: Server Manager can be opened on the server with desktop experience enabled (necessary features should be installed). Alternatively, the Failover cluster can be managed with Remote Server Administration Tools:

https://docs.microsoft.com/en-us/windows-server/remote/remote-server-administration-t ools

NOTE: For converged deployment (SAN & NAS running as a dedicated storage cluster) the Microsoft Failover Cluster is deployed on separate computing nodes. Additionally, for the converged deployment scenario, the storage nodes that host StarWind SAN & NAS as CVM or bare metal do not require a domain controller and Failover Cluster to operate.

1. Open Server Manager. Select the Failover Cluster Manager item from the Tools menu.



🚡 Server Manager		- 🗆 X
Server Ma	anager 🕻 Dashboard 🛛 🗸 🕫 🖡 Manage	e <mark>Tools</mark> View Help
Tashboard	WELCOME TO SERVER MANAGER	Cluster-Aware Updating Component Services Computer Management
Local Server All Servers File and Storage Services	1 Configure this local serve	Defragment and Optimize Drives Disk Cleanup Event Viewer
Hyper-V	QUICK START 2 Add roles and features	Failover Cluster Manager Hyper-V Manager iSCSI Initiator
	3 Add other servers to manage WHAT'S NEW 4 Create a server group	E Local Security Policy Microsoft Azure Services MPIO
	5 Connect this server to cloud	ODBC Data Sources (32-bit) SET ODBC Data Sources (64-bit) Performance Monitor
		Print Management Resource Monitor Services
	ROLES AND SERVER GROUPS Roles: 2 Server groups: 1 Servers total: 1 File and Storage	System Configuration System Information Task Scheduler
	Image: Services 1 Image: Manageability Imageability	Windows Firewall with Advanced Security Windows Memory Diagnostic

2. Click the Create Cluster link in the Actions section of Failover Cluster Manager.

🗟 Failover Cluster Manager						_	×
File Action View Help							
💐 Failover Cluster Manager	Failover Cluster Manager		^	Act	ons		
	Create failover clusters, validate hardware for potential	failover clusters, and perform		Fail	over Cluster Manager		-
	configuration changes to your failover clusters.			N.	Validate Configuration		
				鷝	Create Cluster		
	Overview			暳	Connect to Cluster		
	A failover cluster is a set of independent computers that work availability of server roles. The clustered servers (called node	s) are connected by physical			View		•
	cables and by software. If one of the nodes fails, another nod This process is known as failover.	e begins to provide services.		Q	Refresh		
					Properties		
	Clusters			?	Help		
	Name R	ole Status					
	No items found.						
	Management]					
	Management	Farmelian and them					
	To begin to use failover clustering, first validate your hardwar create a cluster. After these steps are complete, you can ma	nage the cluster. Managing a					
	cluster can include copying roles to it from a cluster running V supported previous versions of Windows Server.	Vindows Server 2016 or					
	Validate Configuration						
	Create Cluster						
	Connect to Cluster						
	More Information						
	Failover cluster topics on the Web						
	Failover cluster communities on the Web						
	Microsoft support page on the Web						
			~				



3. Specify the servers to be added to the cluster. Click Next to continue.

🏶 Create Cluster Wiz	zard		×
Select Se	ervers		
Before You Begin Select Servers	Add the names of all the s	ervers that you want to have in the cluster. You must add at least one se	erver.
Validation Warning			
Access Point for Administering the	Enter server name:	Br	rowse
Cluster	Selected servers:	SW1.starwind.local SW2.starwind.local	Add
Confirmation			emove
Creating New Cluster			
Summary			
		< Previous Next > C	ancel

4. Validate the configuration by running the cluster validation tests: select Yes... and click Next to continue.



🚏 Create Cluster Wi	zard	×
Validation	n Warning	
Before You Begin Select Servers Validation Warning	For the servers you selected for this cluster, the reports from cluster configuration validation tests appear to be missing or incomplete. Microsoft supports a cluster solution only if the complete configuration (servers, network and storage) can pass all the tests in the Validate a Configuration wizard.	
Access Point for Administering the Cluster	Do you want to run configuration validation tests before continuing?	
Confirmation		
Creating New Cluster	• Yes. When I click Next, run configuration validation tests, and then return to the process of creating	
Summary	the cluster.	
	No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests. When I click Next, continue creating the cluster.	
	More about cluster validation tests	
	< Previous Next > Cancel]

5. Specify the cluster name.

NOTE: If the cluster servers get IP addresses over DHCP, the cluster also gets its IP address over DHCP. If the IP addresses are set statically, set the cluster IP address manually.



🏶 Create Cluster Wi	Preate Cluster Wizard				×
Access P	oint for Adminis	tering the Clus	er		
Before You Begin	Type the name you w	vant to use when admir	istering the cluster.		
Select Servers Access Point for	Cluster Name:	Production			
Access Foint for Administering the Cluster Confirmation	The NetBIOS name is limited to 15 characters. One or more IPv4 addresses could not be configured automatically. For each network to be used, make sure the network is selected, and then type an address.				
Creating New Cluster		Networks		Address	
Summary		19	2.168.12.0/23	192.168.12.86	
			< Previous	Next > Can	cel

6. Make sure that all settings are correct. Click Previous to make any changes or Next to proceed.

🚏 Create Cluster Wiz	zard X
Confirmat	tion
Before You Begin Select Servers	You are ready to create a cluster. The wizard will create your cluster with the following settings:
Access Point for Administering the	Cluster
Cluster	Production
Confirmation	Node
Creating New Cluster	SW1.starwind.local
Summary	SW2.starwind.local
	Cluster registration
	DNS and Active Directory Domain Services
	IP Address
	192.168.12.86
	Add all eligible storage to the cluster.
	To continue, click Next.
	< Previous Next > Cancel

NOTE: If checkbox Add all eligible storage to the cluster is selected, the wizard will add all disks to the cluster automatically. The device with the smallest storage volume will be assigned as a Witness. It is recommended to uncheck this option before clicking Next and add cluster disks and the Witness drive manually.

7. The process of the cluster creation starts. Upon the completion, the system displays the summary with the detailed information. Click Finish to close the wizard.

🚏 Create Cluster Wi	zard	×
Summary	,	
Before You Begin Select Servers	You have successfully completed the Create Cluster Wizard.	
Access Point for Administering the Cluster Confirmation Creating New Cluster Summary	Node SW1.starwind.local SW2.starwind.local Cluster Production IP Address 192.168.12.86 Warnings * An appropriate disk was not found for configuring a disk witness. The cluster is not configured with a witness. As a best practice, configure a witness to help achieve the highest availability of the cluster. If this cluster does not have shared storage, configure a File Share Witness or a Cloud Witness.	
	To view the report created by the wizard, click View Report. To close this wizard, click Finish.	View Report Finish

Adding Storage to the Cluster

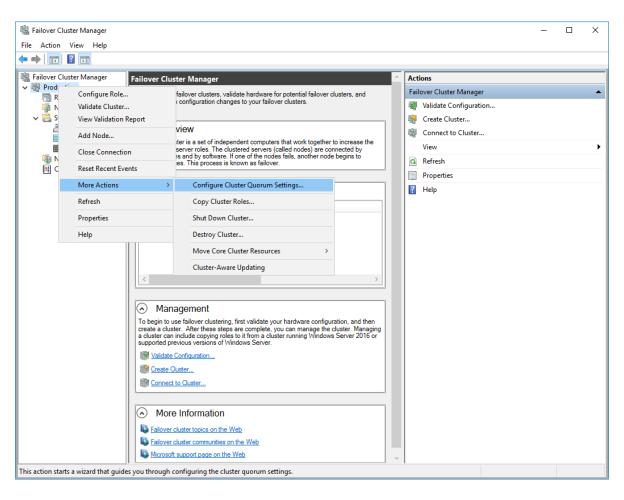
1. In Failover Cluster Manager, navigate to Cluster -> Storage -> Disks. Click Add Disk in the Actions panel, choose StarWind disks from the list and confirm the selection.



Failover Cluster Manager File Action View Help						- 0	×
🗢 🤿 🖄 🖬 🛛 🖬							
Failover Cluster Manager	Disks (0)				Actions		
 Production Roles 	Search		۶ C	Queries 🔻 🔛 💌 오	Disks		•
Nodes	Name	Status	Assigned To	Owner Nod	🛃 Add Disk		
✓ Contraction Storage					📑 Move Available Storage		►
Disks	Add Disks to a Cluster				×		►
Enclosures	Select the disk or disks t	hat you want to add.					
Networks Cluster Events							
<u>La</u>	Available disks:		-				
	Resource Name	Disk Info	Capacity	Signature/Id			
	Cluster Disk 1	Disk 3 on node SW2 Disk 4 on node SW2	10.0 GB 1.00 GB	{080ffb0a-c594-4790-a {2bd3a199-b684-4147			
	Cluster Disk 3	Disk 2 on node SW2	6.00 GB	{b4ade0c2-d87c-4aff-t			
				OK	Cancel		

2. To configure the cluster witness disk, right-click on Cluster and proceed to More Actions -> Configure Cluster Quorum Settings.





3. Follow the wizard and use the Select the quorum witness option. Click Next.



📲 Configure Cluster Quorum Wizard						
Select Qu	uorum Configuration Option					
Before You Begin	Select a quorum configuration for your cluster.					
Select Quorum Configuration Option	O Use default quorum configuration					
Select Quorum Witness	The cluster determines quorum management options, including the quorum witness.					
Confirmation	Select the quorum witness					
Configure Cluster Quorum Settings	You can add or change the quorum witness. The cluster determines the other quorum management options.					
Summary	Advanced quorum configuration					
	You determine the quorum management options, including the quorum witness.					
	Failover Cluster Quorum and Witness Configuration Options					
	< Previous Next > Cancel					

4. Select Configure a disk witness. Click Next.



📲 Configure Cluster	🛍 Configure Cluster Quorum Wizard X					
Select Qu	uorum Witness					
Before You Begin Select Quorum Configuration Option	Select a quorum witness option to add or change the quorum witness for your cluster configuration. As a best practice, configure a quorum witness to help achieve the highest availability of the cluster.					
Select Quorum Witness	 Configure a disk witness Adds a quorum vote of the disk witness 					
Configure Storage Witness Confirmation Configure Cluster	 Configure a file share witness Adds a quorum vote of the file share witness Configure a cloud witness 					
Quorum Settings Summary	Adds a quorum vote of the cloud witness Do not configure a quorum witness 					
	Failover Cluster Quorum and Witness Configuration Options					
	< Previous Next > Cancel					

5. Select the Witness disk to be assigned as the cluster witness disk. Click Next and press Finish to complete the operation.



遣 Configure Cluster Quorum Wizard							
Configure	e Storage Witness						
Before You Begin Select Quorum Configuration Option	Select the storage volume th	nat you want to assign a	is the disk witness.				
Select Quorum Witness	Name	Status	Node	Location			
Configure Storage Witness Configure Cluster Quorum Settings Summary	 □ I Cluster Disk 1 Volume: (G) ☑ □ I Cluster Disk 2 Volume: (\\?\ □ I Cluster Disk 3 Volume: (E) 	File System: NTFS The Online File System: NTFS	SW2 959 MB free of 990 MB SW2	Available Storage Available Storage Available Storage			
			< Previous Ne	xt > Cancel			

6. In Failover Cluster Manager, Right-click the disk and select Add to Cluster Shared Volumes.

闂 Failover Cluster Manager						_		×
File Action View Help								
🗢 🔿 🖄 🖬 🚺 🗊								
🝓 Failover Cluster Manager	Disks (3)					Actions		
 Production.starwind.local Roles 	Search				🔎 Queries 🔻 🕁 👻	Disks		<u>^</u> ^
🍯 Nodes	Name	Status	Assigned To	Owner Node	Disk Number Partit	🛃 👌 Add Disk		
 Corage 21 Disks 22 Pools 23 Enclosures 34 Networks 35 Cluster Events 	3 Cluster Disk 1 3 Cluster Disk 2 3 Cluster Disk 3 <	 Online Online Online Online 	Available Storage Disk Witness in Quorum Available Storage	SW2 SW2 SW2	Image: Shing Online Image: Shing Online Image: Shing Online Image: Shing Online		ble Stor	•
	Cluster Disk 1 Volumes (1) CSV2 (G) Volumes				Replication More Actions Remove Properties	۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲ ۲	er Shar Details Events	
Disks: Cluster Disk 1	Jr					Janes e e		•

7. If renaming of the cluster shared volume is required, right-click on the disk and select Properties. Type the new name for the disk and click Apply followed by OK.



👪 Failover Cluster Manager			[_ — — ×	$\langle $
File Action View Help				Cluster D	isk 1 Proper	ties		×		
				General						
¥ Failover Cluster Manager Yeduction.starwind.local Roles Nodes Storage Zi Disks Pools Folosures	Disks (3) Search Name Cluster Disk 1 Cluster Disk 2 Cluster Disk 3	Status	Assigned Cluster S Disk Wit Cluster S	Volun		CSV2 Physical [Online	File System Redirected Access		Disk e Available Storage ; esh	•
■ Enclosures ● Networks ● Cluster Events	<			2 C:	\ClusterStora	ge\Volume1	No	9.97 GI	isk 1 g Online Offline mation Details v Critical Events	
	v 🧸 Cluster Disk 1			<				>	e	۲
									ication	⊁
	Volumes (1)								e Actions	Þ
	CSV2 (C:\ClusterS						OK Cancel	Apply	ove from Cluster S _)erties	
Disks: Cluster Disk 1										

8. Perform the steps 6-7 for any other disk in Failover Cluster Manager. The resulting list of disks will look similar to the screenshot below.

闂 Failover Cluster Manager							- 0	×
File Action View Help								
🗢 🄿 🙍 🖬 🚺								
📲 Failover Cluster Manager	Disks (3)						Actions	
 Production.starwind.local Roles 	Search			P	Queries 🔻 🕁	• •	Disks	^
🖷 Nodes	Name	Status	Assigned To	Owner Node	Disk Number	Partit	🛃 Add Disk	
🗸 🔚 Storage	ESV1	🕥 Online	Cluster Shared Volume	SW2		2	📑 Move Available Sto	or 🕨
Disks	📇 CSV2	🕥 Online	Cluster Shared Volume	SW1		3	View	•
Enclosures	🔠 Witness	Online	Disk Witness in Quorum	SW2		4	Refresh	
Networks							🕐 Help	
<u></u>							CSV1	•
							🙀 Bring Online	
	<					>	🙀 Take Offline	
	*1m						🚯 Information Detail	5
	👻 🍓 CSV1						Show Critical Even	ts
							🔯 Move	•
	Volumes (1)						neplication	•
	CSV1 (C:\C	lusterStorage\Volume2)					More Actions	•
	CSVFS 5.9	3 GB free of 5.97 GB		J			Remove from Clus	t
	Volumes						Properties	~
Disks: CSV1								

Configuring Cluster Network Preferences

1. In the Networks section of the Failover Cluster Manager, right-click on the network from the list. Set its new name if required to identify the network by its subnet. Apply the change and press OK.

NOTE: Please double-check that cluster communication is configured with redundant networks:



https://docs.microsoft.com/en-us/windows-server/failover-clustering/smb-multichannel

Failover Cluster Manager File Action View Help					ter Network 1 Properties		×	×
(* *) 🖄 🖬 🚺 🖬				General				
 Isolaria Isolaria	Networks (3) Search			Ŵ	a	luster Network 1		
Roles Nodes Storage Bisks Pools Enclosures Networks Cluster Events	Name Duster Network 1 Duster Network 2 Duster Network 2 Duster Network 3 Cluster Network 3 Cluster Network 3 Cluster Network 3 Subnets: 172.16.2 Summary Network Conn	20.0/24	Cluster Use Cluster Only None Cluster and Client	Ir Sync	•	Allow cluster network communication on this network Allow cluster network communication on this network Do not allow cluster network communication on this network Up 172.16.20.0/24 OK Cancel Apply		gs

2. Rename other networks as described above, if required.

orks (3)					Actions	
ch			P Queri	es 🕶 🔛 🐨 👽	Networks	-
3	Status	Cluster Use	Information		Uive Migration Setting	5
Sync	() Up	Cluster Only			View	•
SCSI	🛞 Up	None			G Refresh	
Management	🛞 Up	Cluster and Client			👔 Help	
				>	iSCSI	*
					Show Critical Events Properties	
	ch a bync SCSI Management iSCSI iSCSI bnets: 172.16.1	ch e Status Syme Up SCSI Up Management Up iSCSI brnets: 172.16.10.0/24	ch e Status Ouster Use Syme I Up Cluster Only SCSI I Up None Management I Up Cluster and Client iSCSI iSCSI brnets: 172.16.10.0/24	ch P Queri e Status Queter Use Information SCSI I Up Cluster Only SCSI I Up None Management I Up Cluster and Client I SCSI I SCSI brnets: 172.16.10.0/24	ch P Queries V V Queries V V V Queries V V V V V V V V V V V V V V V V V V V	ch P Queries Networks a Status Sync Up Queries Ive Migration Setting: SCSI Up None Refresh Imagement Up Queries Ive Migration Setting: SCSI Up Information Details Information Details Show Critical Events Information Details Information Details

3. In the Actions tab, click Live Migration Settings. Uncheck the synchronization network, while the iSCSI network can be used if it is 10+ Gbps. Apply the changes and click OK.



📲 Failover Cluster Manager			- 🗆 X
File Action View Help	Live Migration Settings Networks for Live Migration	×	
Image: Storage Image	Name		Actions Networks Image: Live Migration Settings View Image: Refresh Image: Re

The cluster configuration is completed and it is ready for virtual machines deployment. Select Roles and in the Action tab, click Virtual Machines -> New Virtual Machine. Complete the wizard.

Conclusion

Following this guide, the Failover Cluster was deployed and configured with StarWind Virtual SAN (VSAN) running in Windows application on each host. As a result, a virtual shared storage "pool" accessible by all cluster nodes was created for storing highly available virtual machines.



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