

# StarWind x Proxmox SAN Integration Services: Installation Guide

2026

TECHNICAL PAPERS



## Trademarks

“StarWind”, “StarWind Software” and the StarWind and the StarWind Software logos are registered trademarks of StarWind Software. “StarWind LSFS” is a trademark of StarWind Software which may be registered in some jurisdictions. All other trademarks are owned by their respective owners.

## Changes

The material in this document is for information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, StarWind Software assumes no liability resulting from errors or omissions in this document, or from the use of the information contained herein. StarWind Software reserves the right to make changes in the product design without reservation and without notification to its users.

## Technical Support and Services

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.

## Copyright ©2009-2018 StarWind Software Inc.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of StarWind Software.

## Annotation

Relevant products

StarWind x Proxmox SAN Integration Services.

Purpose

This document outlines what StarWind x Proxmox SAN Integration Services is, its architecture and how to configure it. The guide includes steps to add StarWind repository, install package and configure shared block storage (iSCSI, NVMe-oF, and FC) for clustering.

Audience

This technical guide is intended for storage and virtualization of architects, system administrators, and partners designing Proxmox virtualized environments with block shared storage (iSCSI, NVMe-oF, FC).

Expected result

The expected result of following this guide is a fully configured shared storage system set up for Proxmox hosts.

## Overview

StarWind x Proxmox SAN Integration Services provides a custom Proxmox VE storage plugin (StarLvmPlugin) designed to enable virtual machine snapshots on shared SAN storage using Thin LVM technology. The solution supports Proxmox VE versions 8 and 9.

In native Proxmox functionality, there are several limitations:

- LVM storage supports shared storage on SAN LUNs, which allows VM migration between cluster nodes, but does not support snapshots in PVE 8. Since Proxmox VE 9, snapshots as a volume chain have been available for VMs.
- LVM-Thin storage supports snapshots but does not support shared storage because it relies on a single Thin Pool used by multiple VMs, which is unsafe for clustered access.

StarWind starlvm plugin (StarLvmPlugin) resolves these limitations by combining the advantages of both approaches: it enables snapshot-capable storage while maintaining safe shared access across Proxmox cluster nodes.

## Architecture Concept

Storage Type	LVM (raw)		LVM-Thin		LVM + QCOW2 overlay	StarWind StarLvm	
	PVE 8	PVE 9	PVE 8	PVE 9	PVE 9	PVE 8	PVE 9
<b>Shared storage Support</b>	✓	✓	✗	✗	✓	✓	✓
<b>Snapshot Support</b>	✗	✗	✓	✓	✓*	✓	✓
<b>Thin provisioning Support</b>	✗	✗	✓	✓	✗	✓	✓
<b>Implementation Method</b>	Native LVM volumes (block-level)		Shared thin pool (metadata shared)		QCOW2 external snapshots on LVM ("volume-chain")	Dedicated Thin LVM per VM (block-level)	
<b>Cluster-aware operations</b>	✓	✓	✗	✗	△ (complex)	✓	✓
<b>Production Ready</b>	✓	✓	✓ (local only)	✓ (local only)	✗ (preview)	✓	✓
<b>Key Trade-offs</b>	No snapshots		Not safe for clustering		Performance, consistency, merge overhead	Clean architecture, no layering penalties	

*\*While the Snapshots as Volume-Chain feature provides snapshot availability in QCOW2 format, VMs running Windows OS and TPM might have limited snapshot functionality depending on the PVE version. Please review the latest official PVE documentation for details.*

There are known limitations for QCOW2 overlay:

- High performance impact: QCOW2 overhead results in 30% to 90% performance degradation.
- Data consistency and security risks: Uninitialized devices can cause QCOW2 to leak stale data.
- Thick provisioning required: Each disk and snapshot image requires a thick-

provisioned LVM logical volume.

- No support for linked clones from templates: Creating linked clones from VM templates is currently not available.
- Snapshot deletion increases storage usage: Overlay data merges during deletion can defeat SAN thin provisioning.

Unlike standard LVM-Thin deployments, StarLvmPlugin isolates storage allocation per virtual machine, avoiding shared thin pool contention and ensuring cluster-safe operations. This allows administrators to:

- Use shared SAN storage without sacrificing snapshot functionality
- Maintain compatibility with Proxmox clustering features such as live migration
- Achieve predictable and safe storage behavior in multi-node environments

#### Limitations

- Per-VM Thin Pools increase metadata usage  
Each virtual machine uses a dedicated Thin Pool, which increases overall LVM metadata consumption compared to a shared pool design.  
*What this means:* Slightly more storage overhead (approx. 10%. May vary on environment) and planning may be required, especially in environments with a large number of VMs.
- No direct LVM manipulation outside Proxmox  
Direct changes to LVM volumes (e.g., using `lvcreate`, `lvremove`, or manual edits) outside of Proxmox are not recommended.  
*What this means:* Once starlvm volume is created, all storage operations should be performed through Proxmox cluster-aware tools (via UI) to avoid inconsistencies, broken VM disks, or data corruption.
- Shared storage must be consistently available  
Storage must be presented and accessible to all cluster nodes at all times.  
*What this means:* Misconfigured SAN access, zoning issues, or network interruptions can impact VM availability or prevent migration and failover operations.
- Higher number of LVM objects  
The architecture creates more logical volumes and thin pools compared to standard LVM setups.  
*What this means:* Administrative tasks such as monitoring, backup, and troubleshooting may involve more objects, requiring proper tooling and visibility.
- Snapshot lifecycle management is important  
Snapshots consume space within each VM's Thin Pool and are not automatically cleaned up. Snapshot removal/merging uses the default LVM toolset.  
*What this means:* Users should monitor and manage snapshots to avoid unexpected storage exhaustion.

## How The StarLvmPlugin Works

### Architecture

For each virtual machine, the plugin creates a dedicated Thin LVM pool (as displayed in the Proxmox VE UI).

Each pool contains:

- The VM's primary thin-provisioned logical volume (disk)
- All snapshots associated with that VM

This design ensures that storage resources and metadata are fully isolated per VM, avoiding the risks associated with shared thin pools.

### Migration Behavior

During live migration, the entire Thin Pool associated with the VM, including all its snapshots, is moved to the target node as a single logical unit.

*What this means:*

- Snapshot chains remain intact after migration
- No additional conversion or reconfiguration is required

## Plugin Components

The StarLvmPlugin is delivered in `starwind-proxmox-plugin.deb` for Proxmox VE 8 and `starwind-proxmox-plugin-pve9.deb` for Proxmox VE 9.

The plugin consists of the following files:

- `lvmlocal.conf`
- `StarLvmInstall.sh`
- `StarLvmMonitor.pl`
- `StarLvmPlugin.pm`

The DEB installation copies the files to the following directory on the Proxmox node:

```
/usr/share/perl5/PVE/Storage/Custom
```

## Deploy And Configure Integration Package

### Prerequisites

- Proxmox VE 8 or 9 cluster
- Shared SAN storage (iSCSI / NVMe-oF / FC) accessible from all nodes
- SSH access to cluster nodes
- Root privileges
- Identical device mapping for SAN LUN on each node
- Network access to the StarWind APT repository ([repo.starwind.com](https://repo.starwind.com)) to download installation packages and scripts

### Important

The shared SAN LUN must be connected to each node in the Proxmox cluster. It must appear on all nodes using the same persistent device identifier (for example, `/dev/disk/by-id/...`).

Using inconsistent device paths across nodes (such as `/dev/sdX`) may result in storage activation failures, migration issues, or data inconsistencies.

To create a starlvm volume, shared LUNs should not already have existing LVM.

### Installing StarWind Integration on Proxmox VE 8

1. Add StarWind Proxmox repo to the Proxmox VE 8 host.

```
echo "deb [arch=amd64
trusted=yes] http://repo.starwind.com/proxmox/ master main" >
/etc/apt/sources.list.d/starwind-proxmox.list

curl --
silent https://repo.starwind.com/keys/repo\_public.key | gpg --
dearmor --yes --output /etc/apt/trusted.gpg.d/starwind-
proxmox.gpg
```

2. Run update.

```
apt update
```

3. Install StarWind Integration deb package.

```
apt install starwind-proxmox-plugin
```

4. Repeat steps 1-3 on all nodes in the cluster.

#### Installing StarWind Integration on Proxmox VE 9

1. Download the StarWind Integration installation script by executing command on each Proxmox VE 9 host:

```
curl -fsSL -o  
install-starwind-proxmox-plugin-pve9.sh http://repo.starwind.com/san-and-nas/scripts/install-starwind-proxmox-plugin-pve9.sh
```

2. Execute the script:

```
bash install-starwind-proxmox-plugin-pve9.sh
```

The script will add the StarWind Proxmox repository to Proxmox VE 9 sources, validate the currently installed version, and install or update the latest StarWind Integration for Proxmox VE 9.

3. Repeat steps 1-2 on all nodes in the cluster.

#### Configure the attached storage

1. Create an LVM Physical Volume on the shared SAN LUN.

```
pvccreate /dev/mapper/mpatha  
vgcreate swvg /dev/mapper/mpatha  
vgs
```

Where:

/dev/mapper/mpatha - shared multipath device swvg - LVM Volume Group name

2. Add a new storage to the PVE cluster using the starlvm plugin.

```
pvesm add starlvm swlun -vgname swvg -content images,rootdir -  
shared 1
```

Parameters explanation:

**Parameter Description**

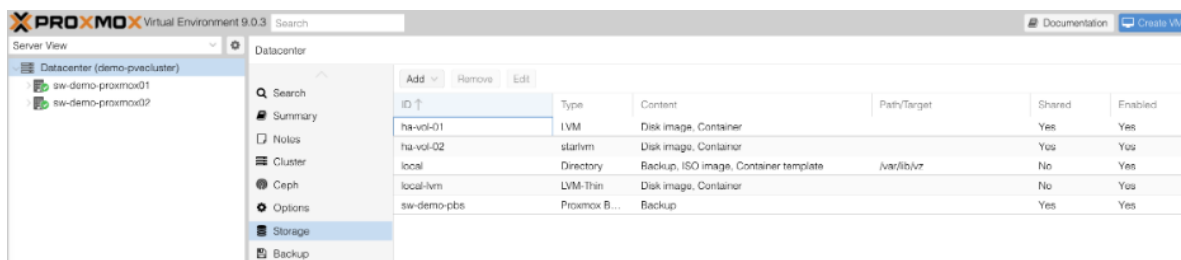
starlvm	Storage plugin type
swlun	Storage name in Proxmox
-vgname	LVM Volume Group used by the plugin
-content	Allowed content types (VM disks and containers)
-shared	Enables shared storage across the cluster

3. Repeat steps 1-2 on all nodes in the cluster.

## Using The Storage

After the storage is added:

- Open the Proxmox Web UI. You will be able to see starlvm storage type in your Datacenter -> Storage










- Create or migrate a VM.
- Select starlvm storage when choosing the disk location.

The VM disks will be created inside dedicated Thin Pools, enabling snapshot functionality while maintaining shared storage compatibility. Please note that starlvm will preallocate full space for the VM disks in the Thin LVM pool. At 80% usage of the thin lvm storage space, starlvm automatically expands storage by 10%.

## Conclusion

StarWind x Proxmox SAN Integration Services extends native Proxmox storage capabilities by enabling VM snapshots on shared SAN-based LVM storage through the starlvm plugin (StarLvmPlugin). By creating a dedicated Thin LVM pool for each virtual machine, the plugin allows safe shared storage access across cluster nodes while supporting snapshots and VM migration. This approach combines the advantages of standard LVM shared storage and LVM-Thin snapshot functionality, improving storage flexibility in Proxmox cluster environments.

## Contacts

US Headquarters	EMEA and APAC
 +1 617 829 44 95	 +44 2037 691 857 (United Kingdom)
 +1 617 507 58 45	 +49 800 100 68 26 (Germany)
 +1 866 790 26 46	 +34 629 03 07 17 (Spain and Portugal)
	 +33 788 60 30 06 (France)

Customer Support Portal: <https://www.starwind.com/support>

Support Forum: <https://www.starwind.com/forums>

Sales: [sales@starwind.com](mailto:sales@starwind.com)

General Information: [info@starwind.com](mailto:info@starwind.com)



StarWind Software, Inc. 100 Cummings Center Suite 224-C Beverly MA 01915, USA  
[www.starwind.com](http://www.starwind.com) ©2026, StarWind Software Inc. All rights reserved.