QSAN Official Document

Configuring NVMe-oF for Proxmox

Best Practice

April 2026

ANNOUNCEMENT

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Announcement
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PREFACE

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- Via the Web: https://www.qsan.com/technical_support
- Via Telephone: +886-2-77206355
- (Service hours: 09:30 - 18:00, Monday - Friday, UTC+8)
- Via Skype Chat, Teams / Skype ID: qsan.support
- (Service hours: 09:30 - 02:00, Monday - Friday, UTC+8, Summer time: 09:30 - 01:00)
- Via Email: support@qsan.com

Information, Tip, and Caution

This document uses the following symbols to draw attention to important safety and operational information.



INFORMATION

INFORMATION provides useful knowledge, definition, or terminology for reference.



TIP

TIP provides helpful suggestions for performing tasks more effectively.

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CAUTION

CAUTION indicates that failure to take a specified action could result in damage to the system.

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1. INTRODUCTION

As virtualization platforms increasingly demand lower latency, higher throughput, and more scalable shared storage, NVMe-oF (NVMe over Fabrics) has become a key technology for connecting modern storage systems and hypervisor hosts. Compared to traditional iSCSI-based storage protocols, NVMe-oF offers a block access model closer to native NVMe, making it ideal for virtualization workloads requiring fast data access and consistent service levels. QSAN QSM4 provides multi-protocol block and file services, and its software specifications include performance-oriented features such as RDMA, making it an ideal building block for enterprise-class virtualization storage architectures.

In Proxmox environments, the value of NVMe-oF extends beyond improved single-path I/O performance. More importantly, it achieves a balance between performance, availability, and operational consistency. Proxmox VE, built on Linux, integrates shared SAN-style block storage through standard Linux storage stacks. Simultaneously, the Linux NVMe host driver provides native multipathing capabilities for path redundancy and failover. Building upon this, TCP-based NVMe leverages existing Ethernet infrastructure, offering robust deployment flexibility, while RDMA-based NVMe is better suited for environments prioritizing ultra-low latency and higher CPU efficiency.

This document outlines best practices for connecting QSAN QSM4 to Proxmox via NVMe-oF, covering both TCP-based and RDMA-based NVMe. The guide focuses on architecture planning, network isolation, multipath design, host-side consolidation, and deployment considerations to help administrators choose the appropriate transport method and establish a consistent, maintainable, and scalable virtualized storage environment.

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2. CONFIGURE STEPS

This chapter will introduce the relevant storage configurations.

2.1. Environment

Demonstration Environment

- Storage
  - Model: XN5226D-12C
    Memory: 8 GB per controller
    Firmware: QSM 4.1.7
    Management Port IP: 192.168.201.133
    CTRL 1 Data Port IP: 80.80.0.10
    CTRL 2 Data Port IP: 70.70.0.10
- Server
  - Model: ASUS Server
    OS: Proxmox VE 9.1
    Server IP1: 80.80.0.1
    Server IP2: 70.70.0.1

Demonstration Topology

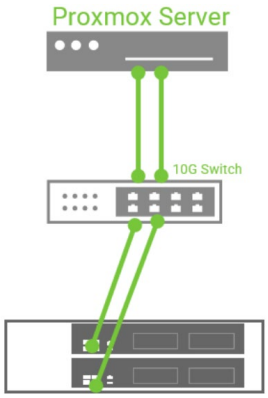


Figure 2-1 Demonstration Topology

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2.2. Configure Storage

1. Log in to the user interface using the **admin** account. Then create a pool, volume, and an NVMe-oF host group.

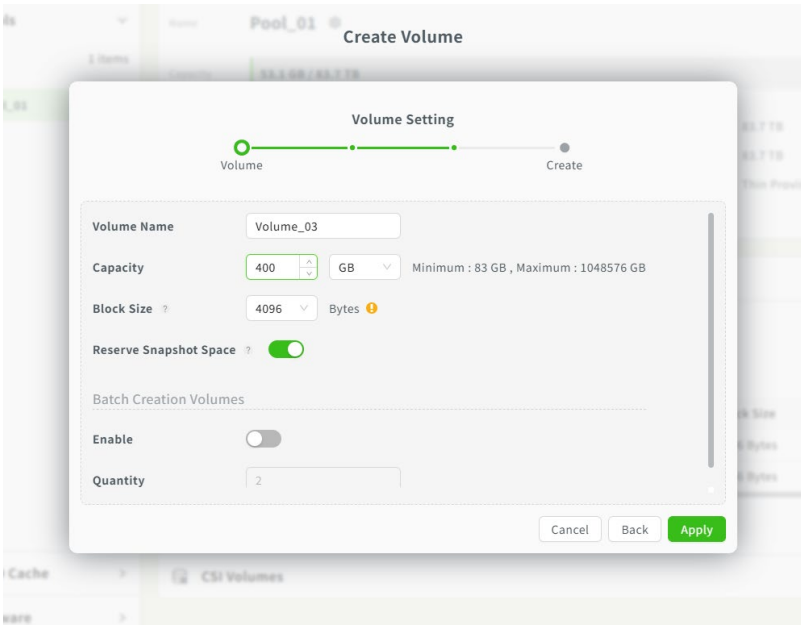


Figure 2-2 Create a Pool and a Volume

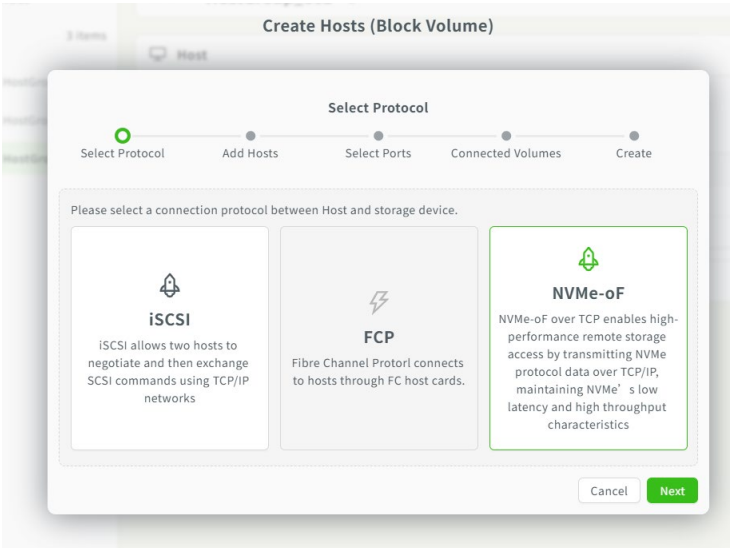


Figure 2-3 Create an NVMe-oF Host Group

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2. Configure the network IP in controller 1 and controller 2. Please note that if you need to mount via NVMe over RDMA, you must configure a network port that supports RDMA.

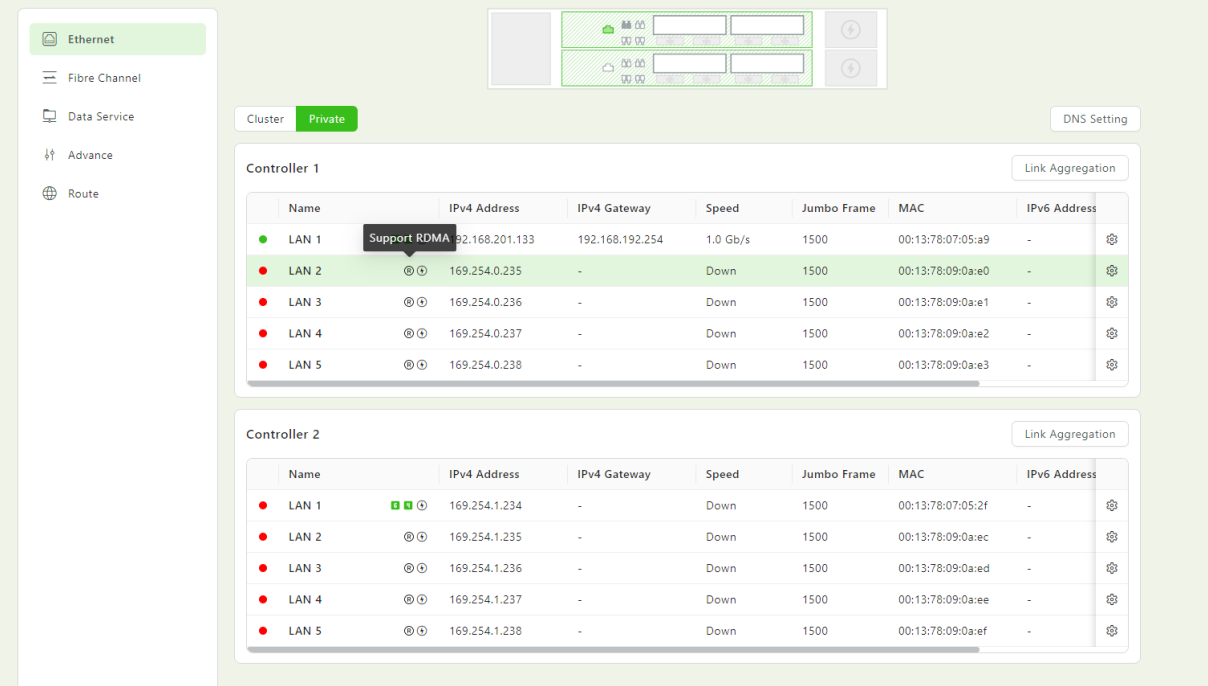


Figure 2-4 Configure Network Settings

2.3. Configure Proxmox

1. Log in to the Proxmox VE Web UI, go to the edit node **pve** network, and configure the IP addresses. Then log in to Proxmox via SSH and execute the following command to discover the storage connection.

```
# nvme discover -t tcp -a 80.80.0.10 -s 4420

Discovery Log Number of Records 1, Generation counter 107
=====Discovery Log Entry 0======
trtype: tcp
adrfam: ipv4
subtype: nvme subsystem
```


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```
treq: not specified, sq flow control disable supported
portid: 200
trsvcid: 4420
subnqn: nqn.2024-11.com.qsan:dev3
traddr: 80.80.0.10
eflags: none
sectype: none
```

Figure 2-5 Discover Network in Proxmox

2. Execute the following command to connect the NMVe connection. To mount it as a multipath, simply type the second connection.

```
# nvme connect -t tcp -n nqn.2024-11.com.qsan:dev3 -a 80.80.0.10 -s 4420 ; nvme connect
-t tcp -n nqn.2024-11.com.qsan:dev3 -a 70.70.0.10 -s 4420


connecting to device: nvm5
connecting to device: nvm6
```

Figure 2-6 Connect with NVMe-oF



TIP

Please note that if you want to mount via RDMA using NVMe, use the following command.

```
# nvme connect -t rdma -n nqn.2024-11.com.qsan:dev3 -a 80.80.0.10 -s 4420
```


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3. Executing the following command to show that the created 400 GB disk partition has been mounted.

```
# nvme list

nvme list-subsys
lsblk

Node              SN                Model    Namespace         Usage
----------------  ----------------- -------- ----------------- ---------------------
/dev/nvme5n1      XN5226D-12C       QSAN     0x1               429.50 GB / 429.50 GB

nvme-subsys1 - NQN=nqn.2024-11.com.qsan:dev2
               hostnqn=nqn.2014-08.org.nvmexpress:uuid:68fb17e0-d850e61a6375
\
 +- nvme1 rdma traddr=80.80.0.10,trsvcid=4420 live
 +- nvme2 rdma traddr=70.70.0.10,trsvcid=4420 live

nvme-subsys0 - NQN=nqn.2024-11.com.qsan:dev1
               hostnqn=nqn.2014-08.org.nvmexpress:uuid:68fb17e0-d850e61a6375
\
 +- nvme3 rdma traddr=70.70.0.10,trsvcid=4420 live
 +- nvme4 rdma traddr=80.80.0.10,trsvcid=4420 live
```

Figure 2-7 NVMe List

4. Executing the following commands to create a physical volume and a volume group.

```
# pvcreate /dev/nvme5n1 ; vgcreate nvmevg300tcp /dev/nvme5n1

  Physical volume "/dev/nvme5n1" successfully created.
  Volume group "nvmevg300tcp" successfully created.
```

Figure 2-8 Create a PV and a VG

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5. Executing the following commands to display the status.

```
# pvs

vgs
vgdisplay nvmevg300tcp

  PV              VG               Fmt      Attr     PSize    PFree
  /dev/nvme5n1    nvmevg300tcp     lvm2     a--      <400.00g <400.00g

  VG              #PV      #LV      #SN      Attr     VSize    VFree
  Nvmevg300tcp      1        0        0      wz--n-   <400.00g <400.00g

  --- Volume group ---
  VG Name                  nvmevg300tcp
  SYss=tem ID
  Formant                  lvm2
  Megadata Areas           1
  Metadata Sequence No     1
  VG Access                read/write
  VG Status                resizable
  MAX LV                   0
  Cur LV                   0
  Open LV                  0
  Max PV                   0
  Cur PV                   1
  Act PV                   1
  VG Size                  <400.00 GiB
  PE Size                  4.00 MiB
  Total PE                 102399
  Alloc PE / Size          0 / 0
  Free PE / Size           102399 / <400.00 GiB
  VG UUID                  MayBKf-KcLS-EpPe-l7kS-BY9D-6TPC-eeSIxf
```

Figure 2-9 Display VG Status

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6. Return to the Proxmox UI and set up an LVM.

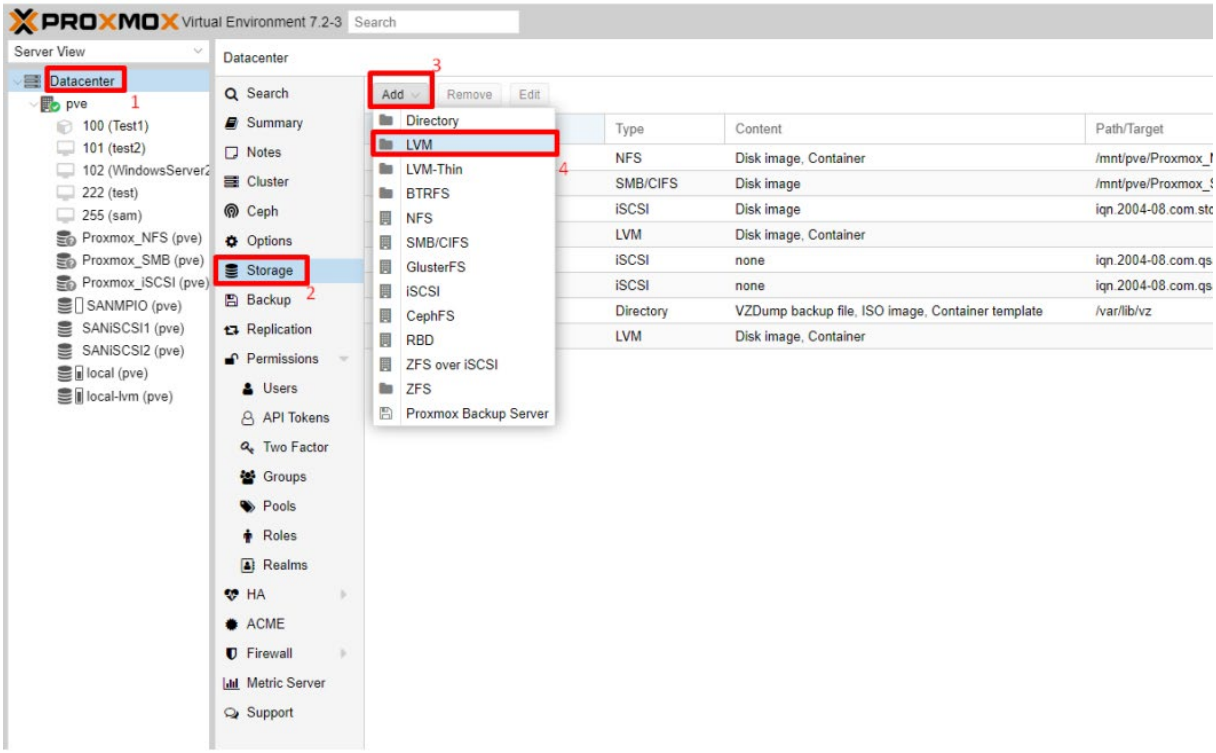


Figure 2-10 Create an LVM Step 1

7. Select the volume group that was just created.

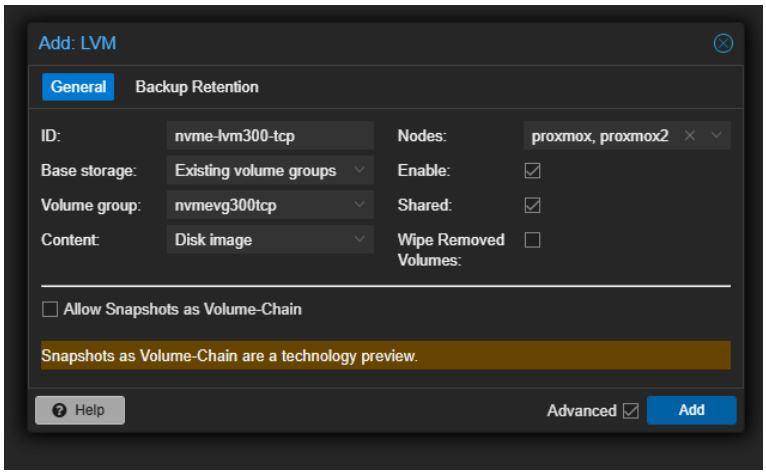


Figure 2-11 Create an LVM Step 2

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8. Finally, when creating a virtual machine, simply select the LVM name to start the virtualization service via NVMe-oF.

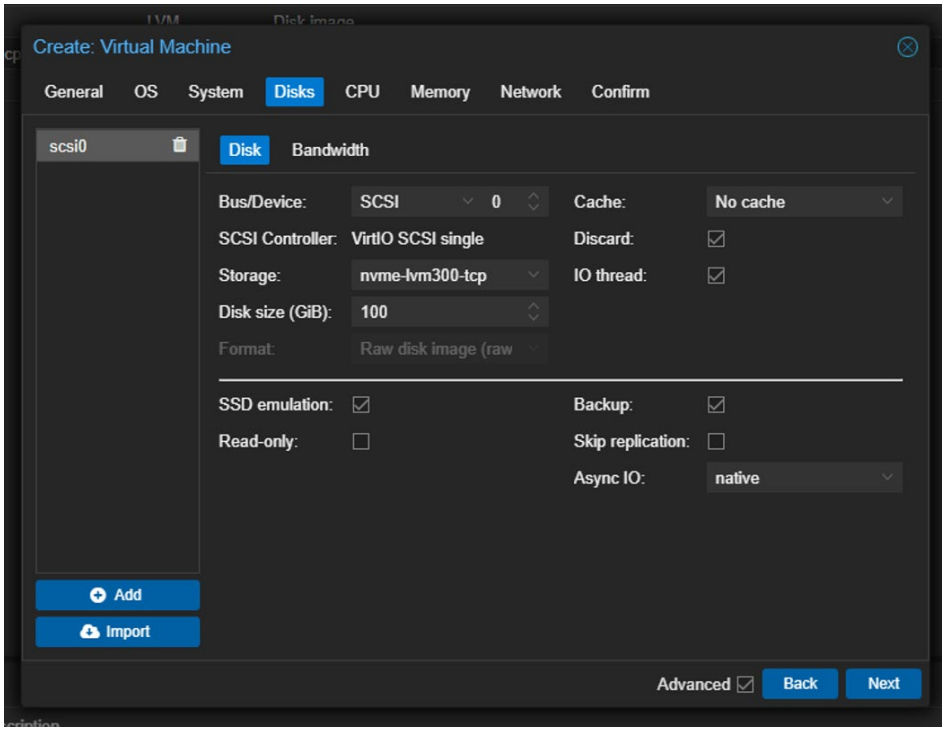


Figure 2-12 Create a Virtual Machine

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3. CONCLUSION

Overall, the combination of QSAN QSM4 and NVMe-oF provides Proxmox with a shared block storage architecture that balances high performance and high availability. For enterprises looking to deploy quickly on existing Ethernet infrastructure while controlling implementation complexity, TCP-based NVMe is a more practical and scalable option. For environments with existing RDMA networks operating workloads particularly sensitive to latency and CPU efficiency, RDMA-based NVMe can unlock additional performance advantages. Therefore, the best solution is not a one-size-fits-all approach, but rather depends on infrastructure readiness, operational capabilities, and business priorities.

In actual deployments, optimal results do not come solely from a single high-speed link, but from the overall stack architecture specifications, including isolated storage networks, well-designed multipath connections, consistent host configurations, and storage layouts consistent with the Proxmox operating model. It is particularly important to note that Proxmox explicitly states that LVM thin pools cannot be shared across multiple nodes; therefore, shared block storage planning must be aligned with cluster behavior and storage management design from the outset.

By following the best practices outlined in this document, enterprises can establish a high-performance, stable, and easy-to-maintain NVMe-oF platform between QSAN QSM4 and Proxmox, providing a future-proof storage foundation for virtualization, databases, and other mission-critical workloads. The same design principles can also serve as a basis for future expansions, such as high-availability clustering, automatic reconnection after restarts, performance validation, and failover testing.

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4. APPENDIX

4.1. Apply To

- QSM firmware 4.1.7 and later
- XEVO firmware 3.1.2 and later

4.2. Reference

Product Page for Unified Storage

- XN5 Series
- XN4 Series
- XN3 Series

Product Page for Block Storage

- XF5 Series
- XF4 Series
- XF3 Series

Document

- QSM 4 Software Manual
- XEVO 3 Software Manual

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