QSAN Official Document

# Microsoft Hyper-V Setup Guide

## Application Note

November 2024

# ANNOUNCEMENT

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- Via Telephone: +886-2-77206355
- (Service hours: 09:30 - 18:00, Monday - Friday, UTC+8)
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- 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.

## CAUTION

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

# 1. INTRODUCTION TO MICROSOFT HYPER-V

Hyper-V is a native hypervisor developed by Microsoft that enables the creation and management of virtual machines on Windows systems. Initially released in 2008, Hyper-V allows multiple operating systems to run concurrently on a single physical server, optimizing resource utilization and providing flexibility for various computing environments.

Chapter 2 offers a detailed guide on creating a VM (Virtual Machine) using Hyper-V. It walks through the steps for mounting an iSCSI LUN, configuring it as a datastore, and deploying a virtual machine. By utilizing the iSCSI protocol for block-level storage, it enables efficient resource allocation and management in virtualized environments, making it a preferred choice for high-performance storage solutions.

Chapter 3 introduces the concept of ODX (Offloaded Data Transfer), which is a feature introduced in Windows Server 2012 that enhances the efficiency of data transfer operations by offloading the copy process from the host server to the storage system. This capability allows for direct data transfers within a storage device or between compatible storage devices without routing the data through the host computer, significantly improving performance and reducing resource utilization. Finally, we provide test results to prove it.

In summary, Microsoft Hyper-V has become a critical tool in modern IT infrastructure, enabling organizations to maximize their hardware investments while enhancing flexibility, security, and disaster recovery capabilities.

## 1.1. Recommended Storage for Virtualization

Before starting, first understand which storage is suitable for virtualization. The table below summarizes our findings and provides a clear overview of the maximum number of VMs that each storage type can support, regardless of latency. This comprehensive analysis is designed to assist in selecting the most appropriate storage solution based on specific performance needs and workload requirements, ensuring optimal deployment and scalability of virtual environments.

*Table 1-1 Storage Options to Enhance VM Performance*

| STORAGE TYPE | LATENCY THRESHOLD | ADDITIONAL VMS SUPPORTED UNDER LATENCY | NUMBER OF VMS SUPPORTED |
|---|---|---|---|
| **NVMe Storage** | < 100 µs | 50+ VMs | Up to 1,000 VMs |
| **SAS SSD Storage** | < 500 µs | 20 ~ 30 VMs | Up to 300 VMs |
| **Hybrid Drive Storage** | < 1 ms | 10 ~ 20 VMs | Up to 150 VMs |
| **SAS HDD Storage** | < 50 ms | 3 ~ 4 VMs | Up to 15 VMs |

In addition, we provide a tool to select the appropriate storage for virtualization. Here are the steps.

1. Use XCalc. tool on the QSAN website to obtain recommended storages.
2. Enter the **Total Usable Capacity Required** and the desired **RAID Level**.

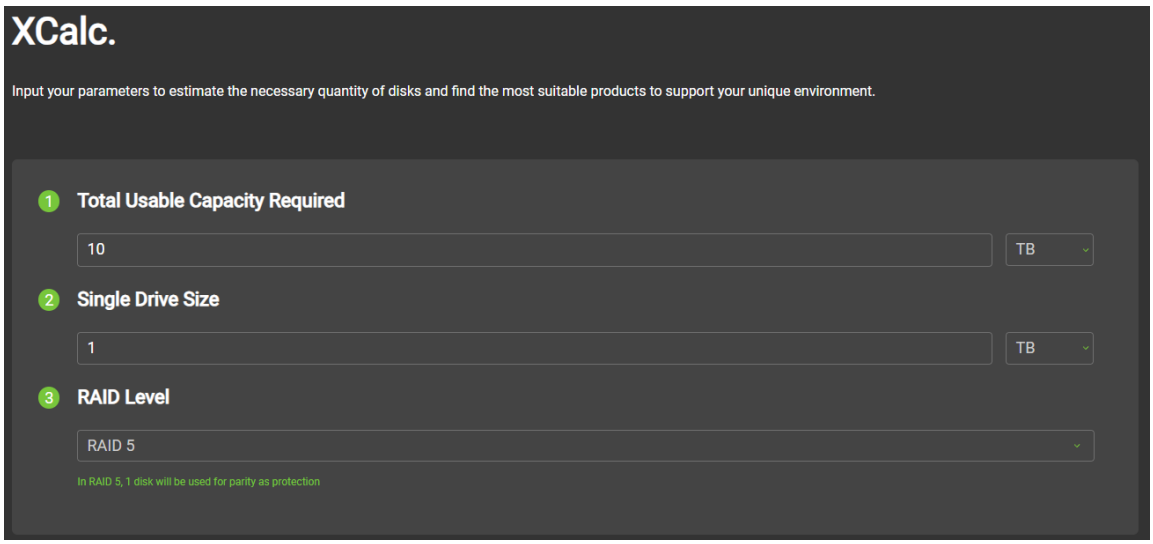


*Figure 1-1 Use XCalc. Tool to Obtain Recommended Storages*

3. Select the **Virtualization** option.

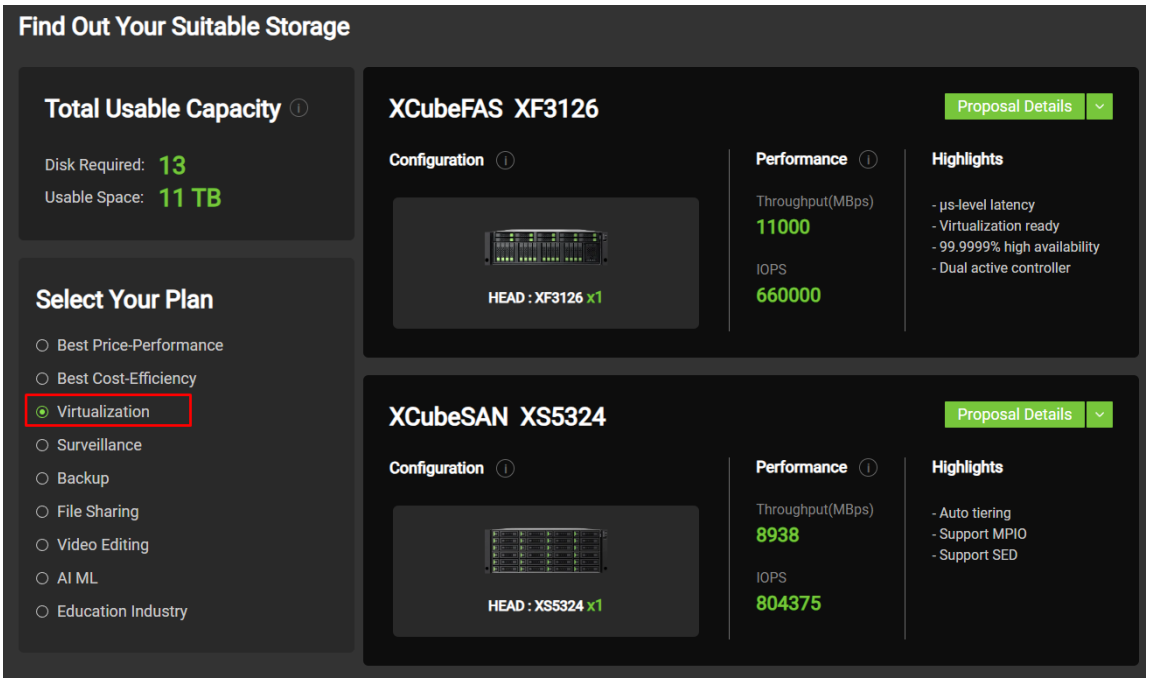


*Figure 1-2 Select Virtualization Option*

4. Select the model and click the **Proposal Details** button to view more.

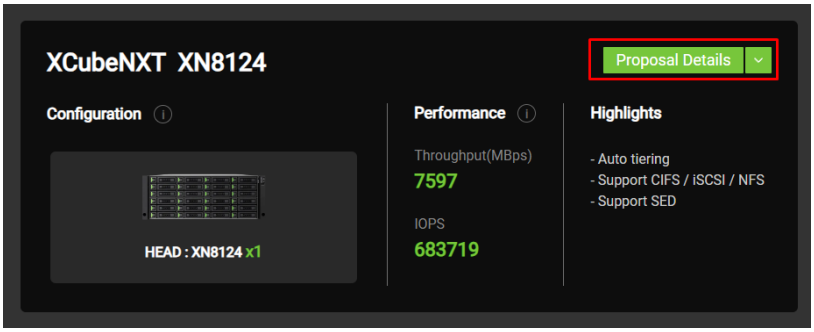


*Figure 1-3 Click Proposal Details Button to View More*

5. If necessary, click the **Export the Result** button to export the report.

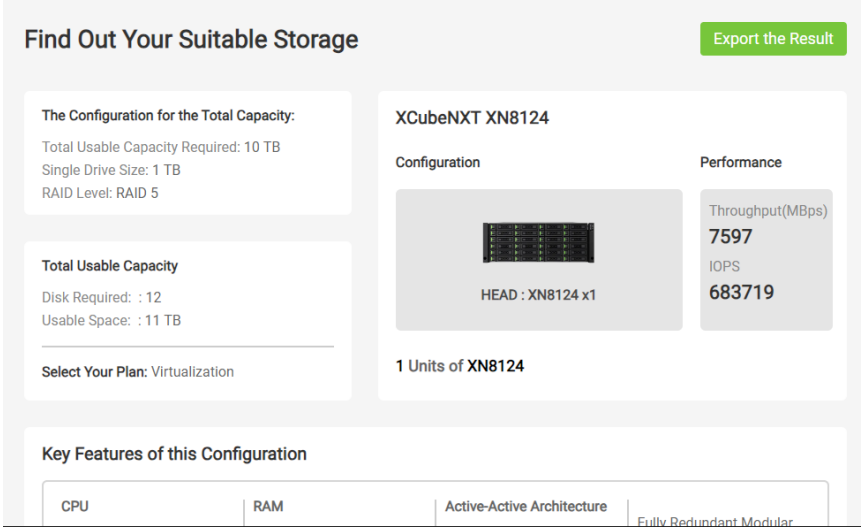


*Figure 1-4 Click Export Button to Export Result*

# 2. CONNECT WITH HYPER-V

With the rapid advancement of virtualization technology, enterprises increasingly rely on virtual machines to enhance flexibility and resource utilization within their IT infrastructure. This document outlines the specific steps to mount the iSCSI LUN from QSM to a Windows host and explains how to create a virtual machine using Windows Hypervisor Manager. This process not only improves storage management efficiency but also supports the deployment of virtualized environments. By following the correct procedures, businesses can utilize resources more effectively, achieving sustainable development.

## 2.1. Configure Steps

In this section we will provide an example of setting up in QSM.

### 2.1.1. Environment and Topology

**Demonstration Environment**

- Storage
  - Model: XN8116D
    Memory: 16 GB per controller
    Firmware: QSM 4.1.0
    Data Port IP: 192.168.222.91
- Server
  - Model: ASUS Server
    OS: Windows Server 2016
    Server IP: 192.168.202.121

**Demonstration Topology**

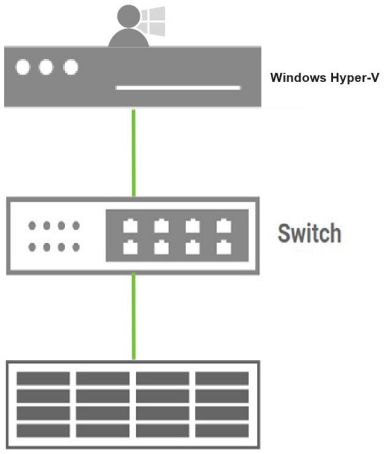


*Figure 2-1 Demonstration Topology*

## 2.1.2. Configure Storage

1. In XN8116D, create a pool and a block volume, then create a block HostGroup and add the volume to the HostGroup.

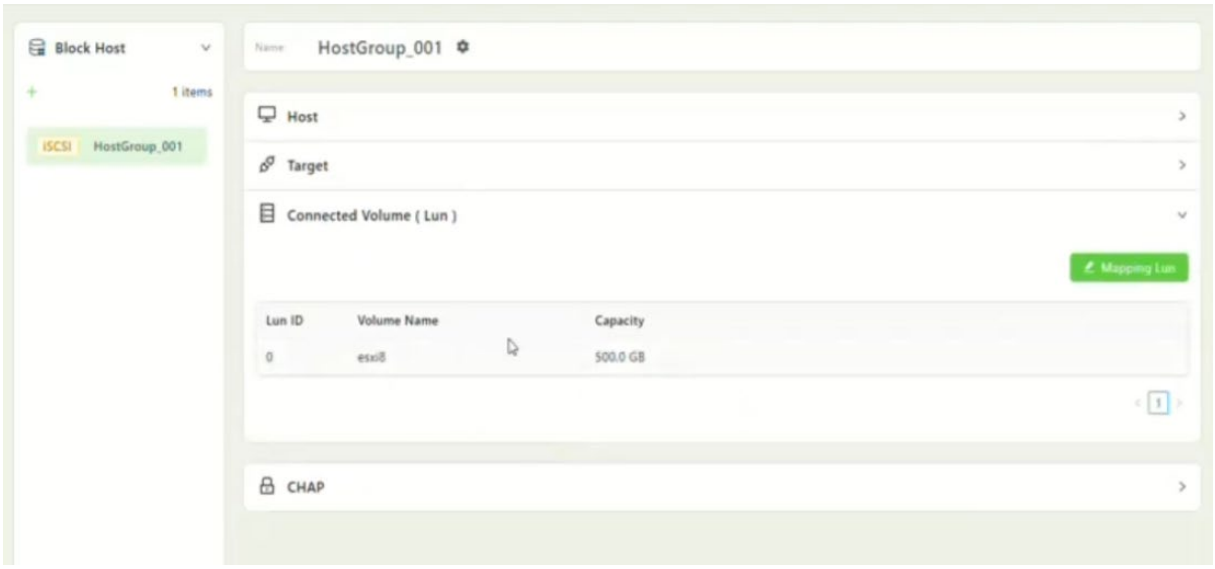


*Figure 2-2 Create a Block Volume and Add into HostGroup*

## 2.1.3. Configure Windows Server

1. Use iSCSI initiator to connect iSCSI LUN, and then format it as drive “H:\”.

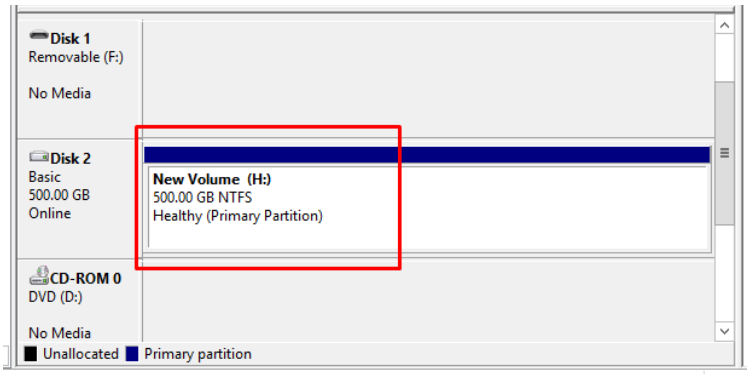


*Figure 2-3 Mount and Format iSCSI LUN*

2. Open Hyper-V manager, and click the **Virtual Switch Manager** function.

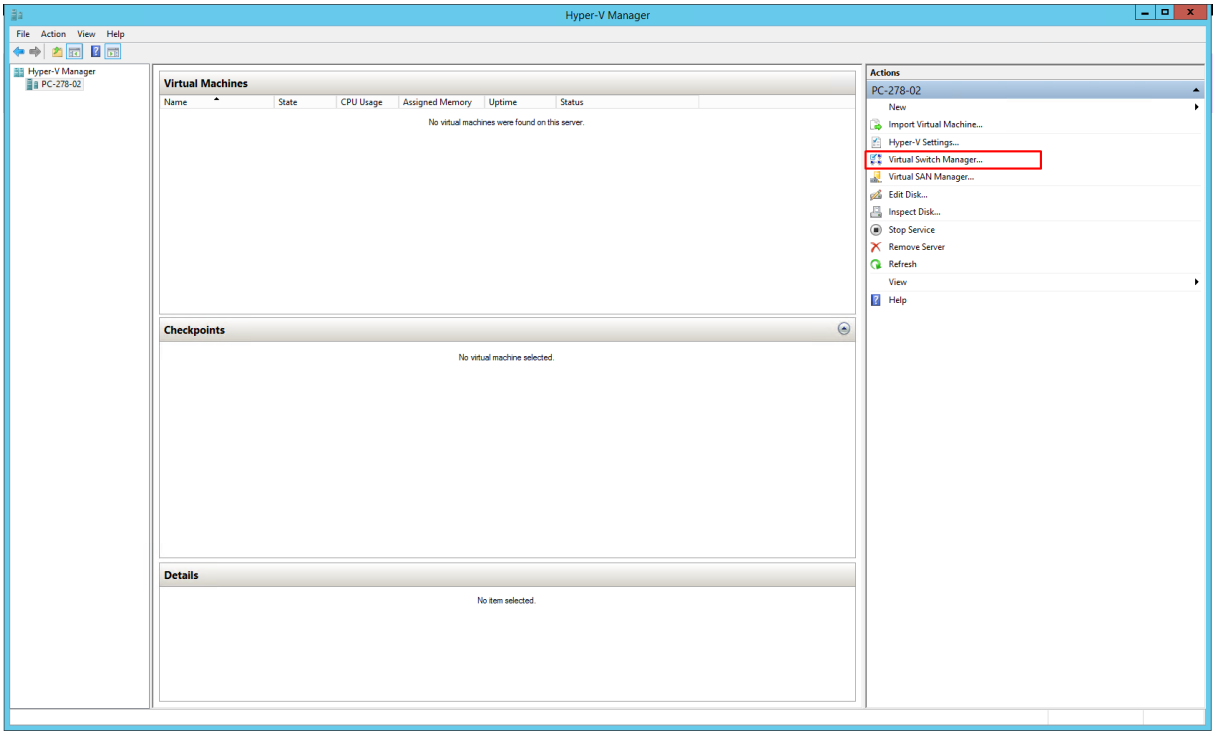


*Figure 2-4 Create vSwitch Step 1*

3. Create external network and select the network port in Windows Server. Then create both internal and private network.

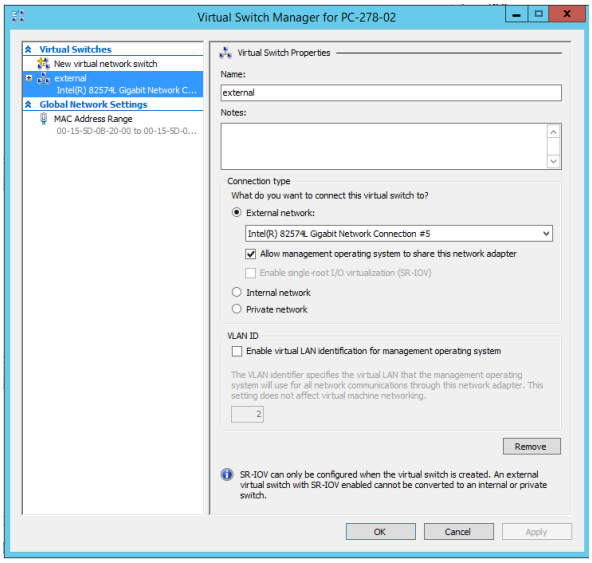


*Figure 2-5 Create vSwitch Step 2*

4. After the virtual switch is created, click the **Add** button and select the **Virtual Machine** item to create a virtual machine.

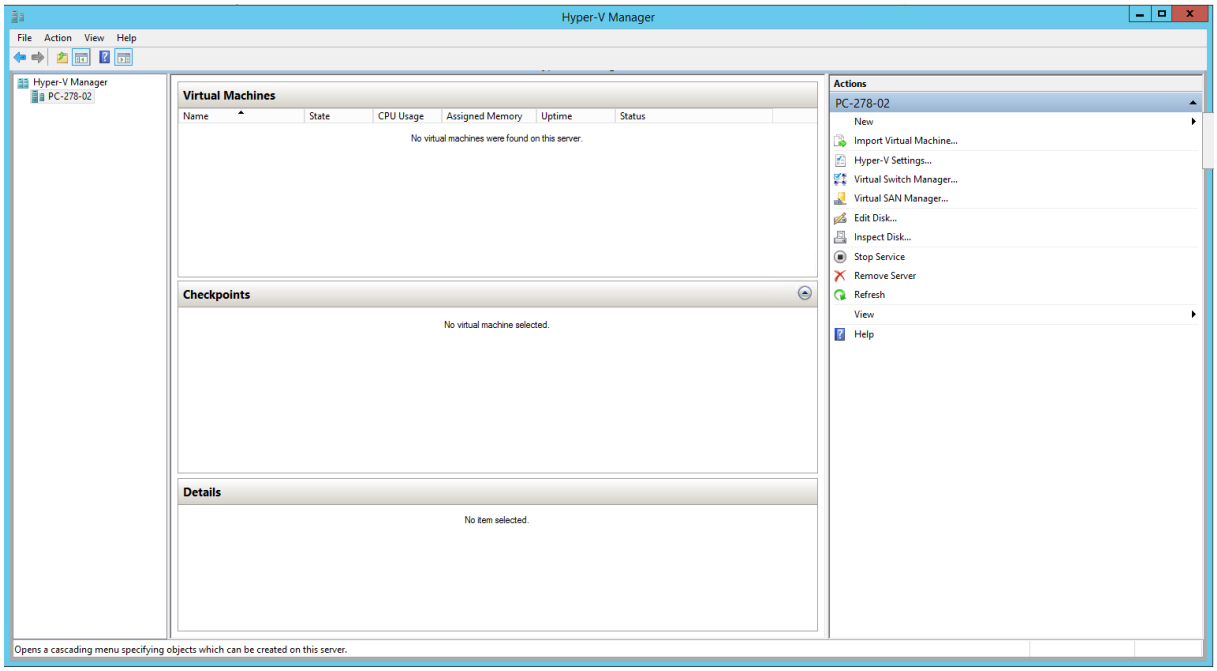


*Figure 2-6 Create VM Step 1*

5. Enter a VM name, and then check the **Store the virtual machine in a different location** item, click the **Browse** button to select the path "H:\". Last, click the **Next** button.

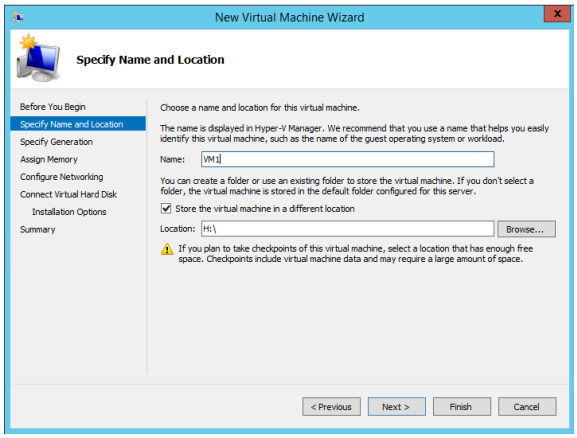


*Figure 2-7 Create VM Step 2*

6. Select the generation, then adjust the VM's memory size according to your physical memory size. Click the **Next** button when finished.

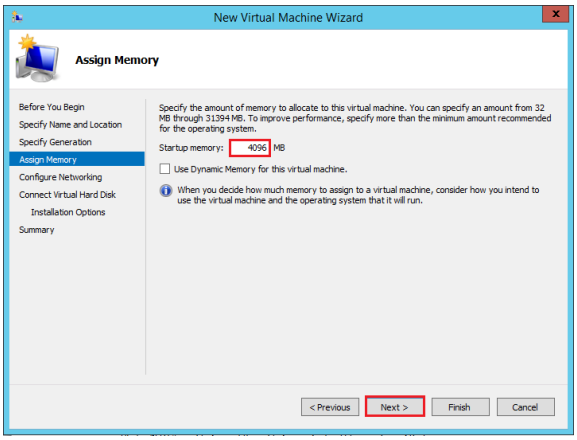


*Figure 2-8 Create VM Step 3*

7. Select the **Create a virtual hard disk** item, use the default name and location, enter the hard disk size, and click the **Next** button.

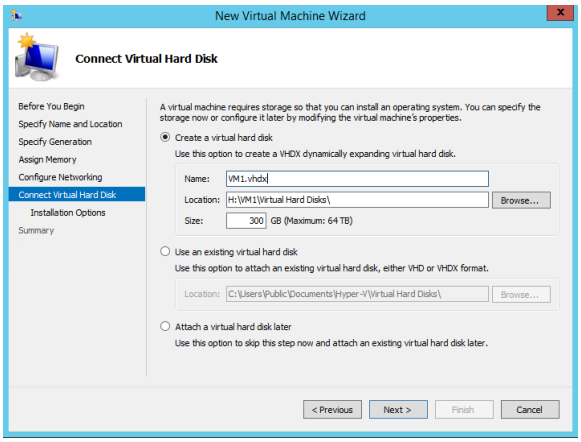


*Figure 2-9 Create VM Step 4*

8. Set installation option, for example, browse ISO file in windows local drive.

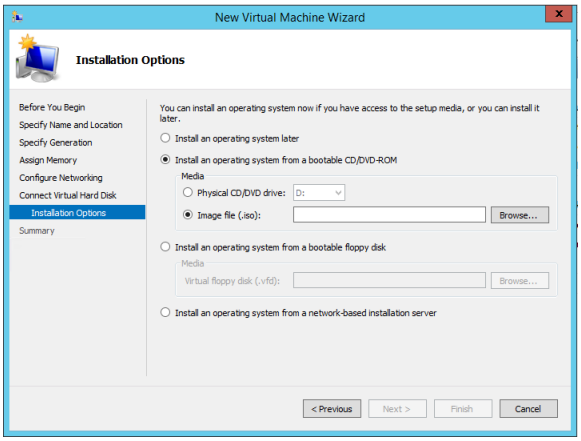


*Figure 2-10 Create VM Step 5*

9. Click on **Settings** to configure the VM further. For example, you can add a disk to the VM in the SCSI controller. Once the configuration is complete, click the OK button.

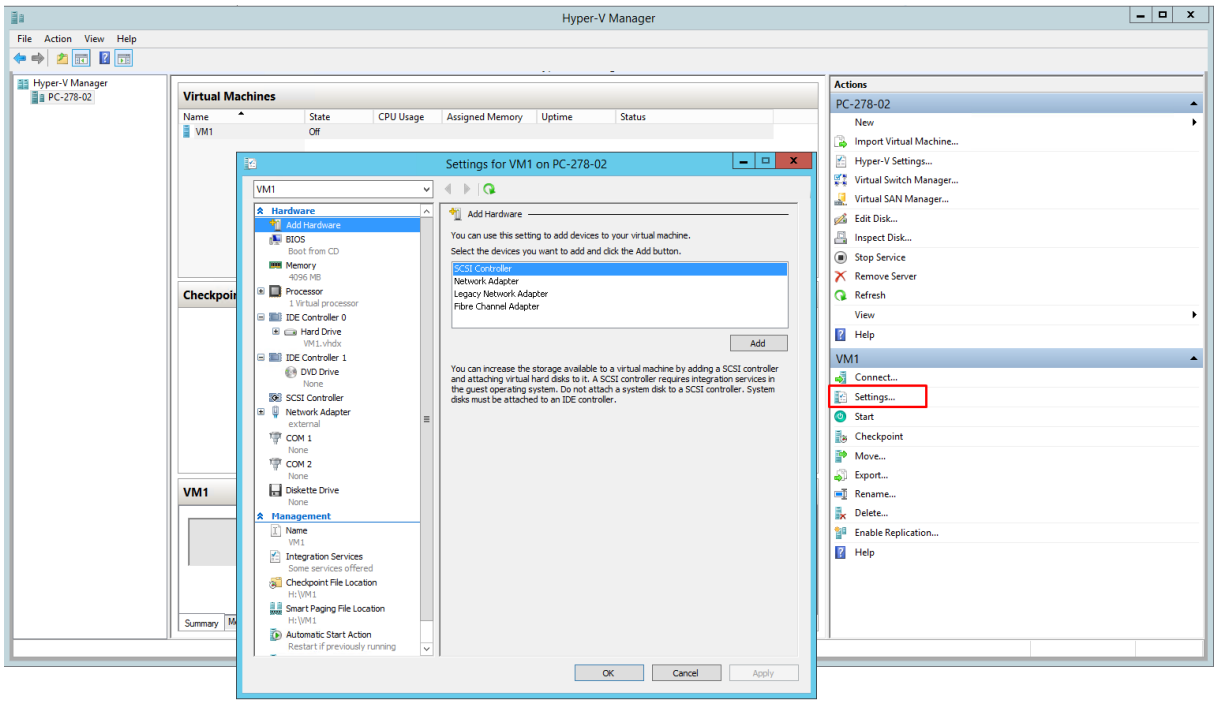


*Figure 2-11 Configure VM*

10. Click the Connect item and then start the VM. Now you can start your virtualization application.

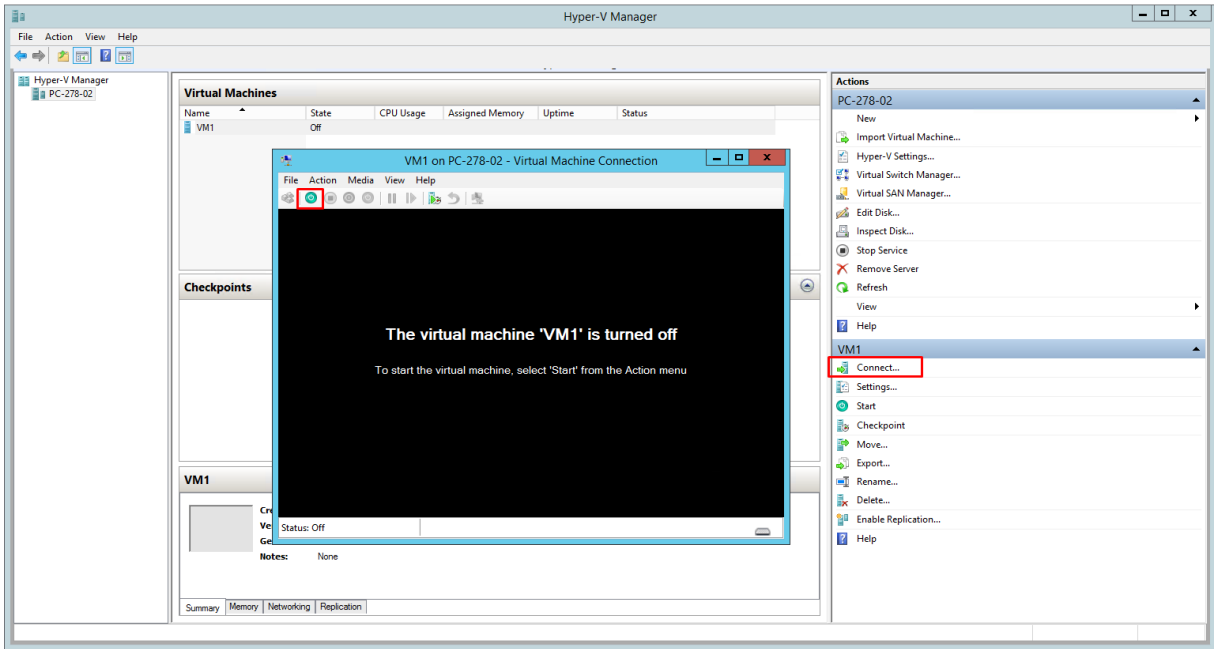


*Figure 2-12 Start VM*

## 2.2. Conclusion

This document provides a detailed guide on how to mount an iSCSI LUN from QSM to a Windows host and create a virtual machine using Windows Hypervisor Manager. By following the correct configurations and procedures, enterprises can significantly enhance resource utilization within their IT infrastructure while ensuring the stability and scalability of their virtualized environments. This not only simplifies the storage management process but also optimizes system resource allocation, supporting the long-term development goals of businesses. With these technologies, companies can remain competitive in a rapidly evolving market while achieving sustainable IT deployment strategies.

## 2.3. Appendix

### 2.3.1. Apply To

- QSM firmware 4.1.0 and later

### 2.3.2. Reference

Document

- QSM 4 Software Manual

# 3. INTEGRATION WITH MICROSOFT ODX

In virtualization and cloud environments, the ever-increasing data production and demand continue to grow, resulting in an increasing demand for high-speed data transmission. Considering the consumption of server and network resources, budget and limited IT resources, it is necessary to find ways to optimize within the organization.

## 3.1. Introduction to Microsoft ODX

Microsoft ODX (Offloaded Data Transfer) is a function supported by Windows Server, which aims to improve performance through a compatible SAN (Storage Area Network) and unified storage. Similar to VMware's VAAI (vSphere APIs for Array Integration), ODX can improve the performance of data copy from one volume to another in the same SAN box. By reducing the network traffic and CPU load on the server, data will be moved inside the SAN box to obtain better performance, which is an important function in the Hyper-V virtualization environment. By storing the data internally in a SAN box instead of transmitting it through the host, network traffic and CPU load will be offloaded from the server. This helps to achieve better performance and has proven to be an important feature in the Hyper-V virtualization environment.

In the Hyper-V environment, reducing CPU and network load means that technicians can add more virtual machines or increase the density (allocate more vCPUs to mission-critical virtual machines) upon the hypervisor on the physical server.

In the traditional file copy or move scenario, when the host is connected to two volumes / LUNs on the storage array, if user tries to copy or move data from one volume / LUN to another volume/LUN, the data transfer will follow the following steps are performed:

- The host reads data from a volume / LUN through the network between the host and the storage array.
- The host then writes the data to another volume / LUN through the same network.

ODX accelerates copy or move operations by offloading the storage array, and uses tokens to communicate with storage to directly command reads and writes inside the storage array, which ultimately reduces the CPU cycles on the host.

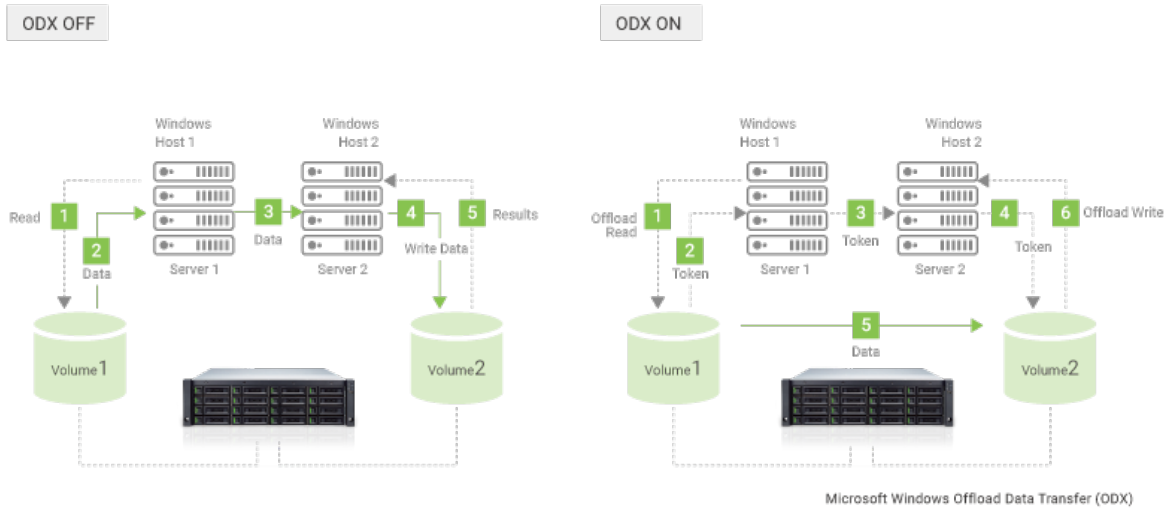


*Figure 3-1 Comparison of Enabling and Disabling ODX*

## 3.2. Test Results

The integration of ODX provides many benefits for improved performance. We have prepared tests and provided some experimental data to prove that ODX is effective.

### 3.2.1. Test Environment

In this test, we use an example to build an environment that connects a Windows Server with a QSAN XS5216D storage array to test the ODX function.

**Host**

- Operating System: Windows Server 2012 R2 Datacenter Edition

**Storage**

- Model: QSAN XCubeSAN XS5216D
- Firmware version: 1.0.0
- Volume / LUN: 2 x 100 GB (named as VD-a and VD-b)

**Test File**

- 12 GB video file compressed with WinRAR

Before starting the test, make sure that the ODX function is enabled on the host. Please check the value of ODX with the following command on PowerShell:

```
C:\> Get-ItemProperty hklm:\system\currentcontrolset\control\filesystem -Name
"FilterSupportedFeaturesMode
```

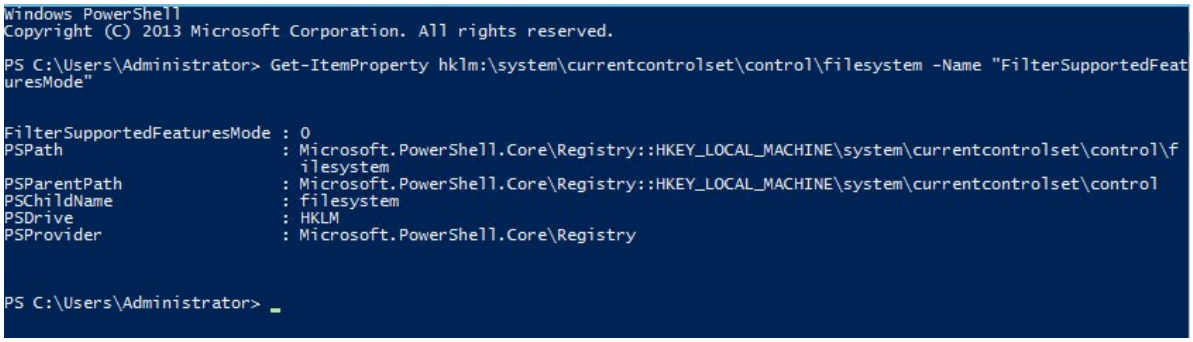


*Figure 3-2 ODX Status*

**Command to Disable ODX**

```
C:\> Set-ItemProperty hklm:\system\currentcontrolset\control\filesystem -Name
"FilterSupportedFeaturesMode" -Value 1
```

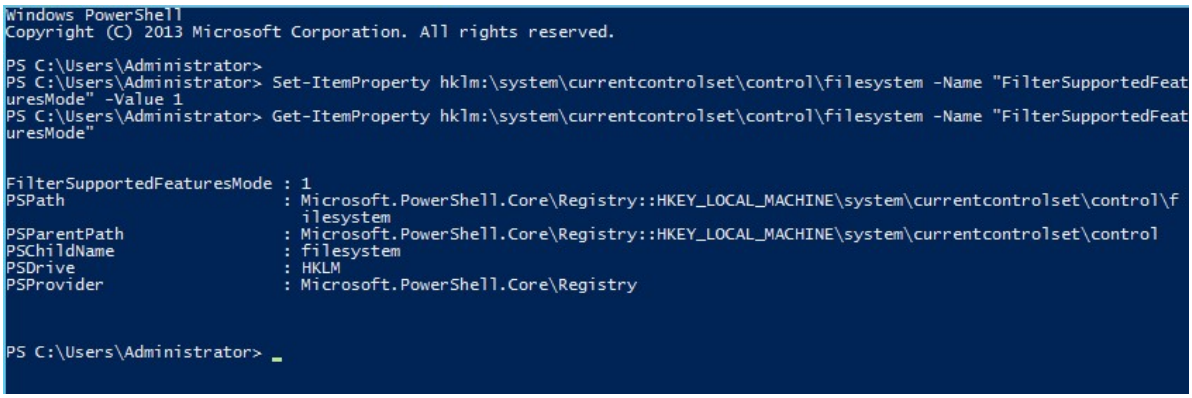


*Figure 3-3 Disable ODX*

### Command to Enable ODX

```
C:\> Set-ItemProperty hklm:\system\currentcontrolset\control\filesystem -Name
"FilterSupportedFeaturesMode" -Value 0
```

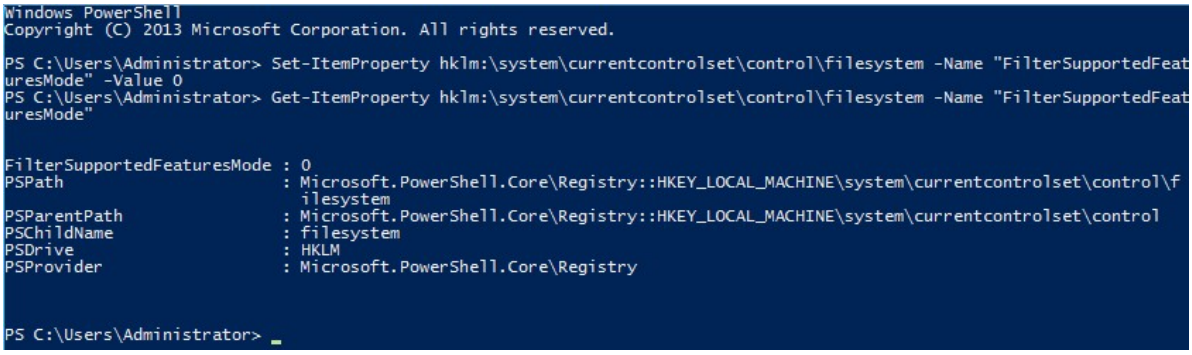


*Figure 3-4 Enable ODX*

---

**TIP**

QSAN series products support ODX by default. The user does not need to do anything to enable it.

---

### 3.2.2. Test Results

Here are the test procedures and results of ODX functions.

**Without ODX**

Copy a 12 GB file from Volume A to Volume B on the host through a single GbE NIC.

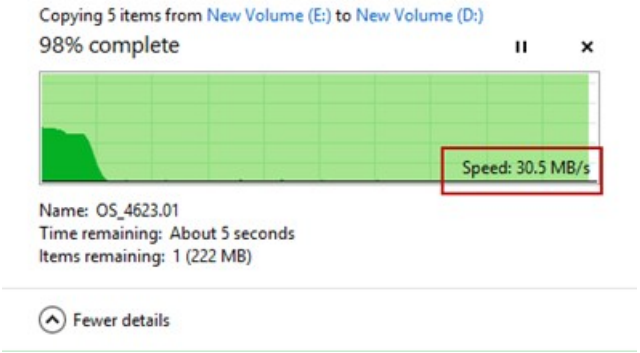


*Figure 3-5 Test Result without ODX*

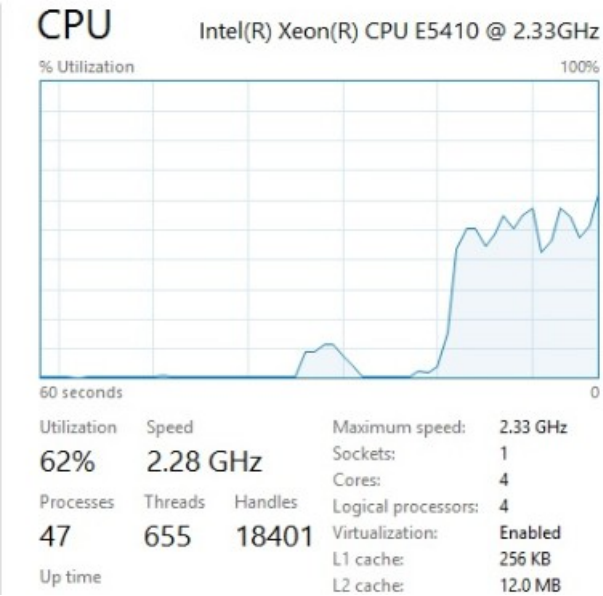


*Figure 3-6 CPU Utilization without ODX*

**With ODX**

Copy a 12 GB file from Volume A to Volume B on the host through a single GbE NIC.

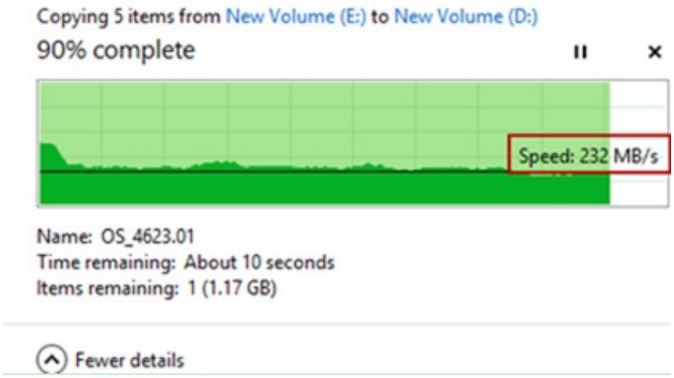


*Figure 3-7 Test Result with ODX*

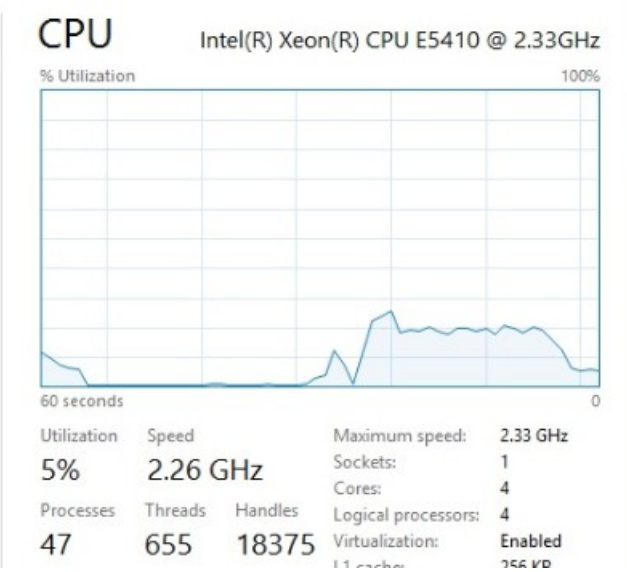


*Figure 3-8 CPU Utilization with ODX*

### 3.2.3. Performance Comparison

**Time Consuming and Throughput**

Without ODX enabled, it costs 490 seconds and 30.5 Mb/s throughputs only. With ODX enabled, the time consuming reduces to 56 seconds and throughput increases to 232 Mb/s. In total, it has increased around 8 times.

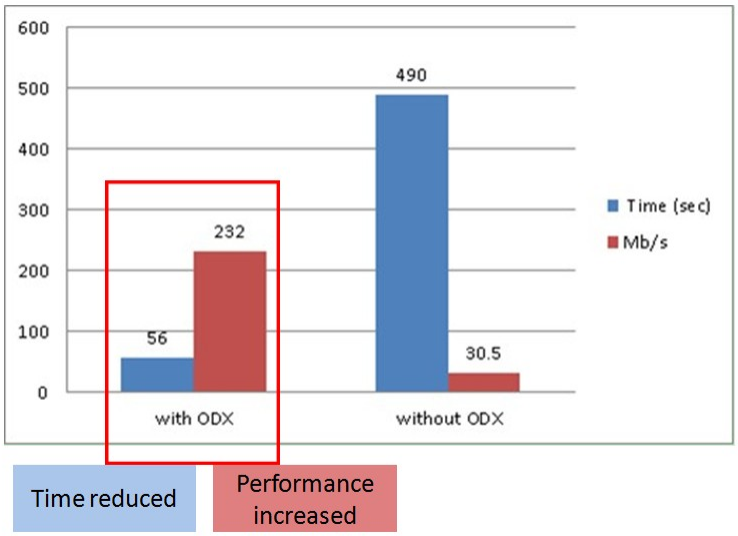


*Figure 3-9 Performance Comparison*

## 3.3. Conclusion

When trying to move or copy data from one volume to another volume created in the same storage array and connected to the same server (or another server in the same cluster group as the source volume), ODX helps to improve performance.

# 3.4. Appendix

## 3.4.1. Apply To

- XEVO firmware 2.0.0 and later
- QSM firmware 3.3.0 and later

## 3.4.2. Reference

Document

- Microsoft Developer Resources – Offloaded Data Transfer
- Microsoft TechNet – Windows Offloaded Data Transfers Overview
- Microsoft TechNet – Deploy Windows Offloaded Data Transfers