

# Microsoft Hyper-V Setup Guide

**Application Note** 

November 2024

# ANNOUNCEMENT

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# 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.



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

 Table 1-1
 Storage Options to Enhance VM Performance

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

- 1. Use <u>XCalc.</u> tool on the QSAN website to obtain recommended storages.
- 2. Enter the Total Usable Capacity Required and the desired RAID Level.

X	XCalc.					
Input	Input your parameters to estimate the necessary quantity of disks and find the most suitable products to support your unique environment.					
	1	Total Usable Capacity Required				
		10	ТВ			
	2	Single Drive Size				
		1	ТВ			
	3	RAID Level				
		RAID 5				

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

3. Select the Virtualization option.



#### Microsoft Hyper-V Setup Guide Application Note

Find Out Your Suitable Storage			
Total Usable Capacity 🕕	XCubeFAS XF3126		Proposal Details 🗸
Disk Required: <b>13</b>	Configuration (i)	Performance ()	Highlights
Usable Space: <b>11 TB</b>		Throughput(MBps) 11000	- µs-level latency - Virtualization ready - 99,9999% high availability
Select Your Plan	HEAD : XF3126 ×1	IOPS 660000	- Dual active controller
O Best Price-Performance			
O Best Cost-Efficiency			
<ul> <li>Virtualization</li> </ul>	XCubeSAN XS5324		Proposal Details 🗸 🗸
○ Surveillance			
⊖ Backup	Configuration ()	Performance ()	Highlights
○ File Sharing		Throughput(MBps)	- Auto tiering
○ Video Editing		8938	- Support MPIO - Support SED
○ AI ML		IOPS	
○ Education Industry	HEAD : XS5324 x1	804375	

Figure 1-2 Select Virtualization Option

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

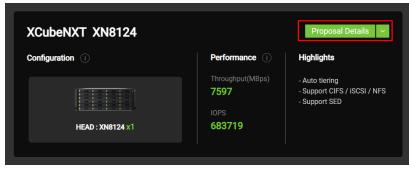


Figure 1-3 Click Proposal Details Button to View More

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



Find Out Your S	uitable Storag	ge	Export the Result
The Configuration for the Total Usable Capacity Re Single Drive Size: 1 TB		XCubeNXT XN8124 Configuration	Performance
RAID Level: RAID 5		HEAD : XN8124 x1	Throughput(MBps) 7597 IOPS 683719
Usable Space: : 11 TB	zation	1 Units of XN8124	
Key Features of this	Configuration		
CPU	RAM	Active-Active Architectu	re Fully Redundant Modular

*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

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Model: ASUS Server
 OS: Windows Server 2016
 Server IP: 192.168.202.121



#### **Demonstration Topology**

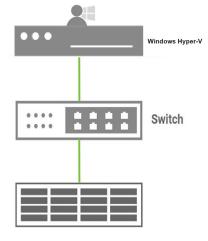


Figure 2-1 Demonstration Topology

## 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.

🗟 Block Host 🗸 🗸	Name HostGroup_001 ¢	
+ 1 items		
	Host	\$
ISCSI HostGroup_001	5 <sup>9</sup> Target	>
	Connected Volume ( Lun )	×
		🗶 Mapping Lun
	Lun ID Volume Name Capacity	
	0 essi8 🔽 500.0 GB	
		< 1 >
	В снар	>

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



## 2.1.3. Configure Windows Server

Removable (F:)		
No Media		
💷 Disk 2		
Basic 500.00 GB Online	New Volume (H:) 500.00 GB NTFS Healthy (Primary Partition)	
CD-ROM 0 DVD (D:)		
No Media		

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.

	Hyper-V Manager	
e Action View Help		
🔶 🖄 📰 📓 📰		
Hyper-V Manager PC-278-02	Virtual Machines	Actions
PC-278-02		PC-278-02
		New
	No vitual machines were found on this server.	🎧 Import Virtual Machine
		Hyper-V Settings
		👯 Virtual Switch Manager
		📓 Virtual SAN Manager
		💋 Edit Disk
		📑 Inspect Disk
		Stop Service
		Remove Server
		🖓 Refresh
		View
		2 Help
	Checkpoints	۲
	No vitual machine selected.	
	Details	
	No item selected.	

*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.

	VI	irtual Switch Manager for PC-278-02
÷	Virtual Switches New virtual network switch external Intel(R) 82574. Gigabit Network C Global Network Settings	w <sup>*</sup> Virtud Switch Properties     Name:     (external     Notes:
	MAC Address Range 00-15-50-08-20-00 to 00-15-50-0	Connection type Connect this virtual switch to? © External network:
		Intel(R) 82574. Gigabit Network Connection #5 v  Allow management operating system to share this network adapter  Install single-root I(0 virtualization (SR-10v)  Install network  Private network
		VLN ID  VLN ID  KNN LDN LDN LDN LDN LDN LDN LDN LDN LDN L
		Remove SR-IOV can only be configured when the virbual switch is created. An external virbual switch with SR-IOV enabled cannot be converted to an internal or private switch.
		OK Cancel Apply

*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.

ii a	Hyper-V Manager	_ <b>_</b> ×			
File Action View Help					
🗢 🌩 🙍 📰 🖬 🖬					
Hyper-V Manager		Actions			
■ PC-278-02	Virtual Machines	PC-278-02			
	Harre Sale ero sage Asigned Herrory Optime Sales	New			
	No virtual machines were found on this server.	💫 Import Virtual Machine			
		Hyper-V Settings			
		🗱 Virtual Switch Manager			
		Virtual SAN Manager			
		💋 Edit Disk			
		Inspect Disk			
		Stop Service			
		X Remove Server			
	Checkpoints	🔉 Refresh			
	No virtual machine selected.	View +			
		и нер			
	Details				
	No tem selected.				
	<u>  </u>				
Opens a cascading menu specifying	objects which can be created on this server.				

Figure 2-6 Create VM Step 1



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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.

<b>b</b>	New Virtual Machine Wizard
Specify	Name and Location
Before You Begin Specify Name and Locatio Specify Generation Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options	Choose a name and location for this virtual machine. The name is deviaived in higher 'V Manager. We recommend that you use a name that helps you easily identify this virtual machine, such as the name of the guest operating system or workload. Name: [W1] You can create a folder or use an existing folder to store the virtual machine. If you don't select a folder, the virtual machine is stored in the defuelt folder configured for this server. J Store wirkland and the virtual machine and different location
Summary	Location: [H-1] Browse 1 frow plan to take checkpoints of this virtual machine, select a location that has enough free space. Checkpoints include virtual machine data and may require a large amount of space.
	< Previous Next > Finish Cancel

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.

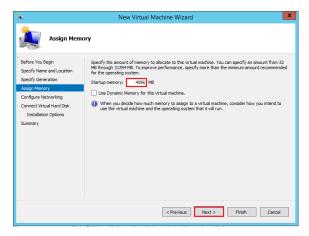


Figure 2-8 Create VM Step 3

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.

Concect Virtual Hard Disk      Specify frame and location     Specify frame and location	b	New Virtual Machine Wizard
Specify Name and Location       storage non or configure It later by modifying the virtual machine's properties.         Specify Generation       Configure It later by modifying the virtual machine's properties.         Assign Menory       Configure It later by modifying the virtual machine's properties.         Configure Iteleviroling       This database AVDX dynamically expanding virtual hard dak.         Configure Iteleviroling       Name:       VML-Indul         Installation Options       Size:       300 GB (Maximum: 64 TB)       Browse         Summary       Use an existing virtual hard dak.       Use this option to a tabch an existing virtual hard dak.       Use this option to a tabch an existing virtual hard dak.       Browse         Constance:       CityLisers/Public/Documental/Hyper-Vivirtual Hard Disks/       Browse	Connect Virt	ual Hard Disk
< Previous Next > Finish Cance	Specify Name and Location Specify Generation Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options	Create a virtual hard dak     Les this option to create a VHDX dynamically expanding virtual hard disk.     Name: VHD.VHDX dynamically expanding virtual hard disk.     Location: (+1/M1/VHLd)     Location: (+1/M1/VHLd) Hard Disks     See: 300 GB (Maximum: 64 TB)     Use an existing virtual hard disk     Location: C:\Users\PLBkC\pocuments\Pyper-V\Wrtual Hard Disks\     Erowse     Attach a virtual hard disk later     Use this option to skip this step now and attach an existing virtual hard disk later.

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

ðu	New Virtual Machine Wizard
installation	Options
Before You Begn Specify Name and Location Specify Generation Assign Memory Confract Prival Hard Dick Installation Options Summary	You can instal an operating system how if you have access to the setup media, or you can instal it later.  Instal an operating system later  Instal an operating system from a bootable CD/DVD-ROM  Media  Physical CD/DVD drive:  Physical CD/DVD dri
	<previous next=""> Finish Cancel</previous>

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.



Microsoft Hyper-V Setup Guide

Application Note

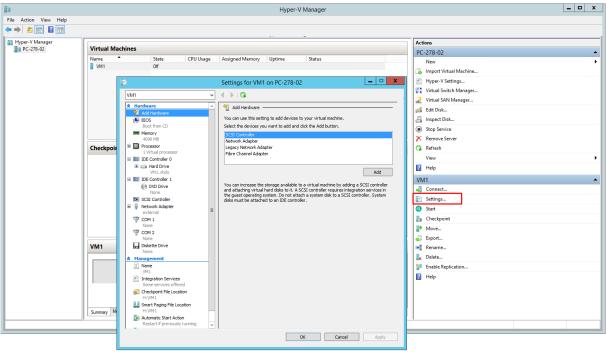


Figure 2-11 Configure VM

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

	Hyper-V Manager		_ 0
Action View Help			
/per-V Manager		Actions	
PC-278-02	Virtual Machines		
	Name State CPU Usage Assigned Memory Uptime Status	PC-278-02	
	VM1 Off	New	
		import Virtual Machine	
	VM1 on PC-278-02 - Virtual Machine Connection	- 🗆 🗙 Hyper-V Settings	
	File Action Media View Help	Virtual Switch Manager	
		🔬 Virtual SAN Manager	
		Edit Disk	
		Inspect Disk	
		Stop Service	
		Remove Server	
	Checkpoints	🛞 🗔 Refresh	
		View	
	<b>T</b> I I NOLUL I	Help	
	The virtual machine 'VM1' is turned off	VM1	
	To start the virtual machine, select 'Start' from the Action menu	Connect	
	To start the virtual machine, select Start from the Action menu	Settings	
		(2) Start	
		-	
		Checkpoint	
		Move	
		a Export	
	VM1	Rename	
	Crv Crv	🖡 Delete	
	Ve Status: Off	Enable Replication	
	Ge	Help	
	Notes: None		
	Summary Memory Networking Replication		

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

12

<u>QSM 4 Software Manual</u>



# **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.

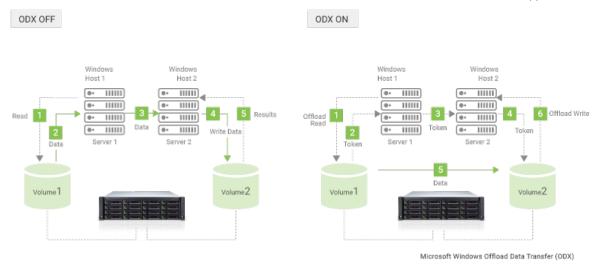
In the Hyper-V environment, reducing CPU and network load means that technicians can add more virtual machines or increase the density (allocate more vCPUs to mission-critical virtual machines) upon the hypervisor on the physical server.

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.







## 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:

"FilterSupportedFeaturesMode	
Windows PowerShell Copyright (C) 2013 Microsoft Corporation. All rights reserved. PS C:\Users\Administrator> Get-ItemProperty hklm:\system\currentcontrolset\control\filesystem -Name "FilterSupportedFuresMode" FilterSupportedFeaturesMode : 0 PSPath : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control ilesystem : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control PSParentPath : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control PSDrive : HKLM PSDrive : HKLM PSProvider : Microsoft.PowerShell.Core\Registry	\f

#### Figure 3-2 ODX Status

#### **Command to Disable ODX**

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



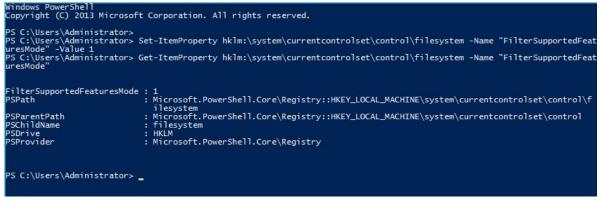


Figure 3-3 Disable ODX

#### **Command to Enable ODX**

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

Windows PowerShell Copyright (C) 2013 Mi	crosoft Corporation. All rights reserved.
uresMode" -Value O PS C:\Users\Administr	ator> Set-ItemProperty hklm:\system\currentcontrolset\control\filesystem -Name "FilterSupportedFeat ator> Get-ItemProperty hklm:\system\currentcontrolset\control\filesystem -Name "FilterSupportedFeat
uresMode"	
FilterSupportedFeatur	
PSPath	: Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control\f ilesvstem
PSParentPath	: Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control
PSChildName PSDrive	: filesystem : HKLM
PSProvider	: Microsoft.PowerShell.Core\Registry
P5 C:\Users\Administr	ator> _

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.

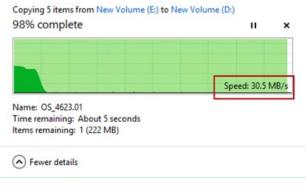


Figure 3-5 Test Result without ODX

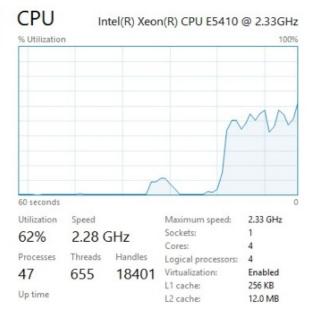


Figure 3-6 CPU Utilization without ODX



#### With ODX

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

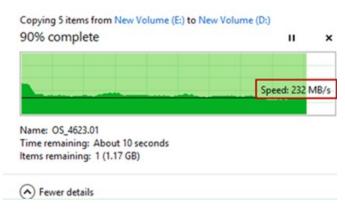


Figure 3-7 Test Result with ODX

	, Ann	~
seconds		
ilization Speed	Maximum speed:	2.33 GHz
% 2.26 GHz	Sockets:	1
70 2.20 GHZ	Cores:	4
ocesses Threads Handles	Logical processors:	4
7 655 18375	Virtualization:	Enabled
	Logical processors:	4 Er

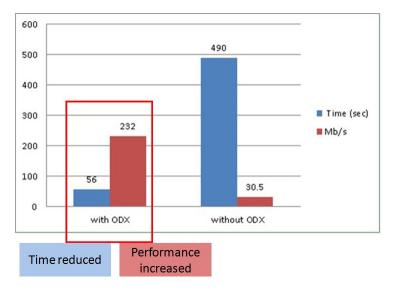
Figure 3-8 CPU Utilization with ODX



### 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

