

Integration with Microsoft ODX

Application Note

July 2022

ANNOUNCEMENT

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PREFACE

Executive Summary

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 the existing IT resources within the organization.

Microsoft Windows ODX (Offloaded Data Transfer) supports direct data transfer in a compatible storage system without data transfer through the host. It can optimize system capacity and performance without increasing cost or complexity. With ODX, servers can reduce the burden of daily data transmission tasks, thereby reducing the load on servers and SANs (Storage Area Networks).

ODX reduces the burden on the server by using read/write operations to transfer data at the storage array level. Compared with the traditional data transmission method, it also greatly improves the transmission speed. Now, QSAN XCubeFAS, XCubeSAN, XCubeNXT, and XCubeNAS series are fully compatible with ODX.

QSAN storage and Windows Server ODX provide an efficient and cost-effective solution. It can also optimize IT resources and provide agility solutions for ever-increasing data.

Audience

This document is applicable for QSAN customers and partners who are familiar with QSAN products. Any settings which are configured with basic operations will not be detailed in this document. If there is any question, please refer to the user manuals of products, or contact QSAN support for further assistance.

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



CAUTION

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

1. INTRODUCTION TO MICROSOFT ODX

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 (VMware vSphere Storage 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/move scenario, when the host is connected to two volumes/LUNs on the storage array, if user tries to copy/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/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.

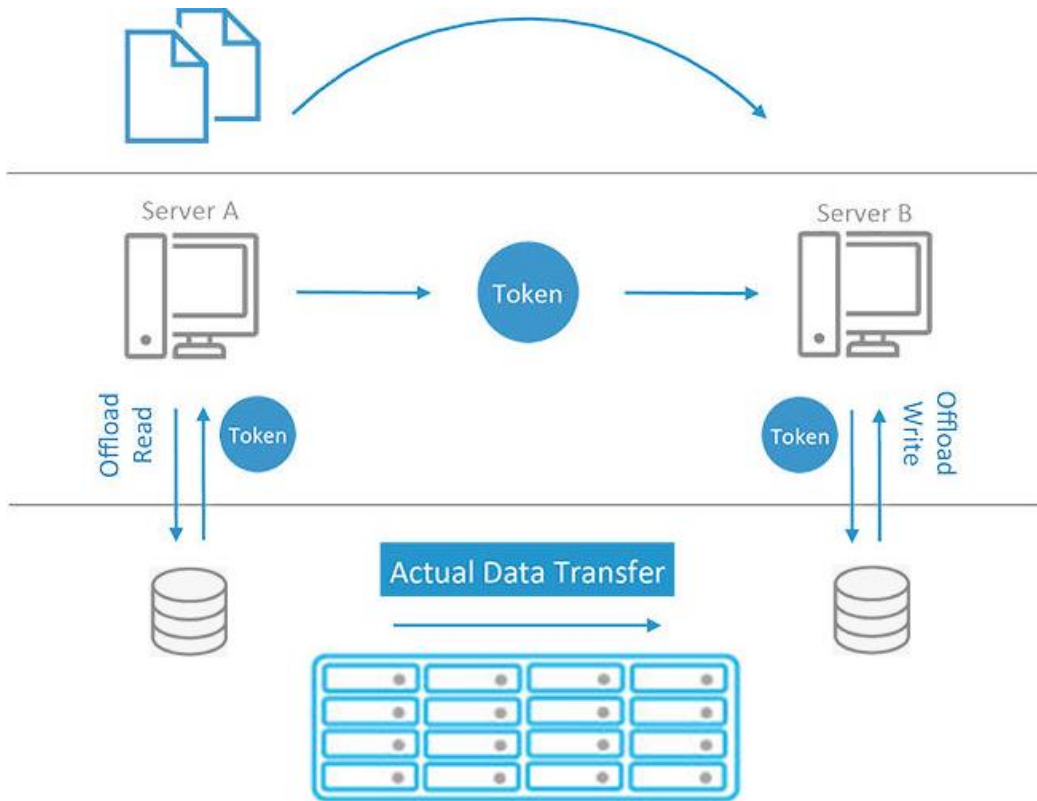


Figure 1-1 ODX Operation Flow

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.

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.

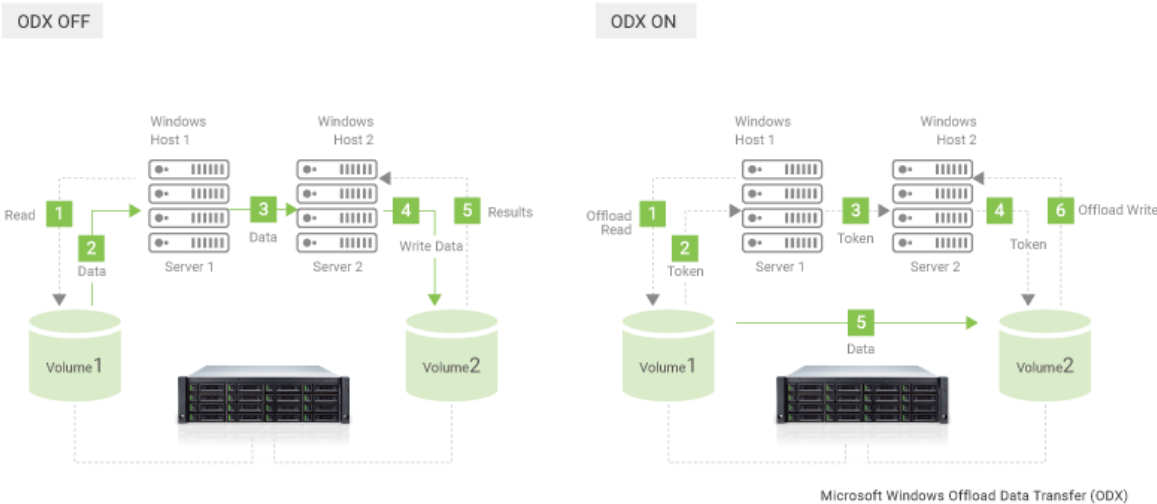


Figure 2-1 Comparison of Enabling and Disabling ODX

Host

- Operating System: Windows Server 2012 R2 Datacenter Edition

Storage

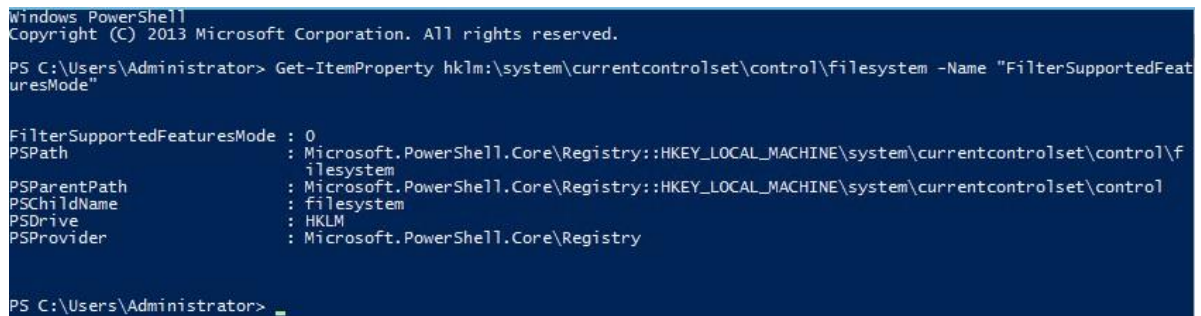
- Model: QSAN XCubeSAN XS5216D
- Firmware version: 1.0.0
- Volume/LUN: 2 x 100GB (named as VD-a and VD-b)

Test file

- 12GB 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"
```



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

Figure 2-2 ODX Status

Command to Disable ODX

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

```
Windows PowerShell
Copyright (C) 2013 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator>
PS C:\Users\Administrator> Set-ItemProperty hk1m:\system\currentcontrolset\control\filesystem -Name "FilterSupportedFeaturesMode" -Value 1
PS C:\Users\Administrator> Get-ItemProperty hk1m:\system\currentcontrolset\control\filesystem -Name "FilterSupportedFeaturesMode"

FilterSupportedFeaturesMode : 1
PSPath                       : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control\filesystem
PSParentPath                 : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control
PSChildName                  : filesystem
PSDrive                      : HKLM
PSProvider                   : Microsoft.PowerShell.Core\Registry

PS C:\Users\Administrator> _
```

Figure 2-3 Disable ODX

Command to Enable ODX

```
C:\> Set-ItemProperty hk1m:\system\currentcontrolset\control\filesystem -Name "FilterSupportedFeaturesMode" -Value 0
```

```
Windows PowerShell
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PS C:\Users\Administrator> Set-ItemProperty hk1m:\system\currentcontrolset\control\filesystem -Name "FilterSupportedFeaturesMode" -Value 0
PS C:\Users\Administrator> Get-ItemProperty hk1m:\system\currentcontrolset\control\filesystem -Name "FilterSupportedFeaturesMode"

FilterSupportedFeaturesMode : 0
PSPath                       : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control\filesystem
PSParentPath                 : Microsoft.PowerShell.Core\Registry::HKEY_LOCAL_MACHINE\system\currentcontrolset\control
PSChildName                  : filesystem
PSDrive                      : HKLM
PSProvider                   : Microsoft.PowerShell.Core\Registry

PS C:\Users\Administrator> _
```

Figure 2-4 Enable ODX



TIP

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

2.2. Test Results

Here are the test procedures and results of ODX functions.

Without ODX

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

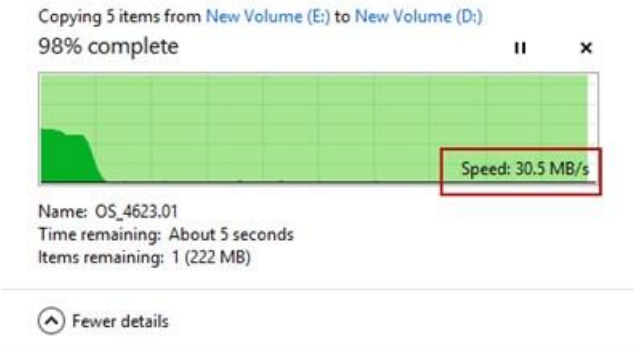


Figure 2-5 Test Result without ODX

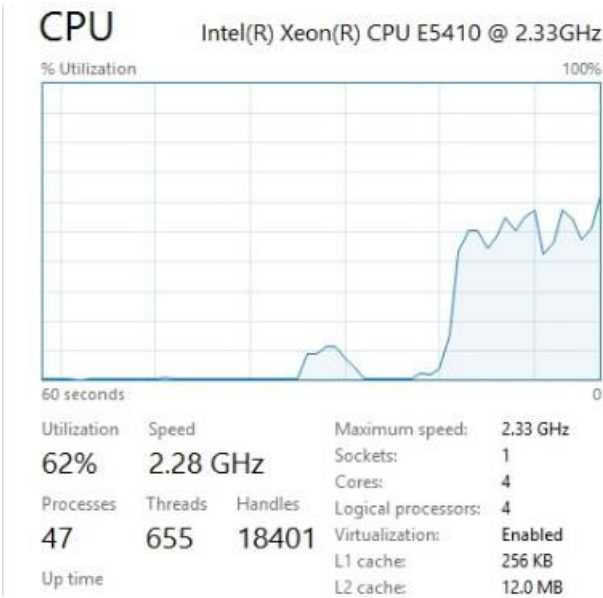


Figure 2-6 CPU Utilization without ODX

With ODX

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

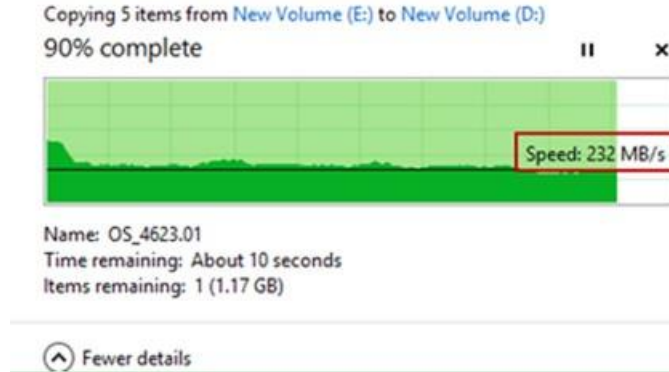


Figure 2-7 Test Result with ODX

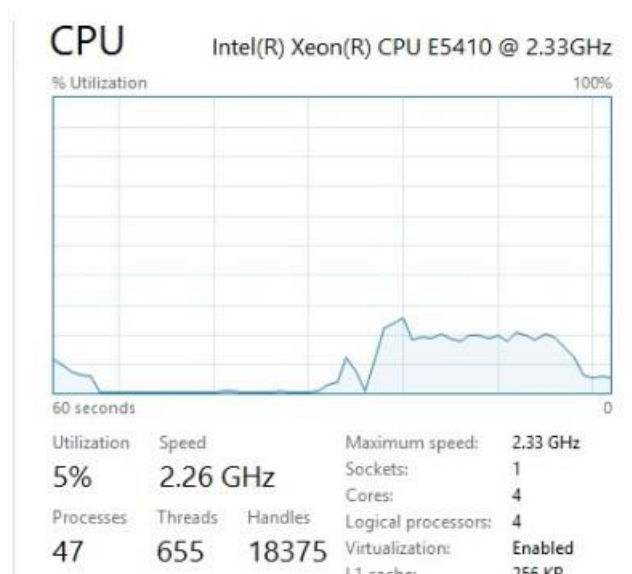


Figure 2-8 CPU Utilization with ODX

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.

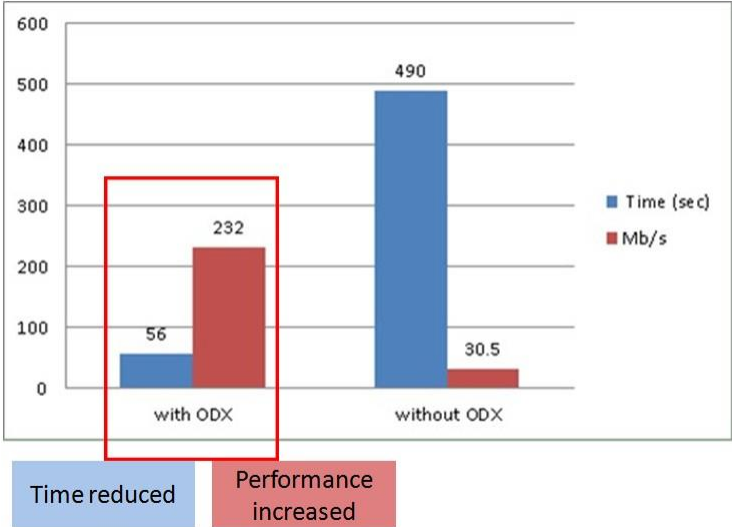


Figure 2-9 Performance Comparison

3. CONCLUSION

When trying to move/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. The QSAN storage array supports the ODX function. For more information, please refer to the "Applied To" section below for the exact model and firmware version.

4. APPENDIX

4.1. Apply To

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

4.2. Reference

Microsoft Documentations

- [Microsoft Developer Resources — Offloaded Data Transfer](#)
- [Microsoft TechNet – Windows Offloaded Data Transfers Overview](#)
- [Microsoft TechNet – Deploy Windows Offloaded Data Transfers](#)