QNAP QTS 4

and

Microsoft ODX performance

White Paper

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Summary

Using resources effectively is an important target to enhance the competitiveness of enterprises and QNAP's aim is how to enhance the operation between Server and Storage. Traditional methods to transfer data need lots of resources from the Server, but with ODX system loading will shift to QNAP NAS and system resources will be used more effectively.

Introduction

Audience

This White Paper is for QNAP users, partners, and customers who are considering using QNAP NAS servers. We will introduce the ODX technology and show how this feature can improve your IT system's efficiency.

Terminology

- Storage Pool- A Storage pool aggregates physical hard drives into a big storage space and provides RAID protection.
- Thin LUN- A logical unit of storage on a pool where physical space is allocated when system used.
- Thick LUN- A logical unit of storage on a pool where physical space was reserved.
- VHD- A virtual hard disk on Win8, Hyper-v and Windows Server, capacity limited to 2TB
- VHDX- A virtual hard disk on Win8, Hyper-v and Windows Server, maximum capacity is 64TB

Introduction to QTS4.0 for SMB

The brand-new operating system, QNAP QTS 4.0, is an intuitive graphical user interface optimized for enterprise environments. Supporting multiple users and allowing easier management, better performance and efficiency, and supporting multiple virtual environments and technologies, QTS 4.0 allows organizations to do

more tasks efficiently in less time..

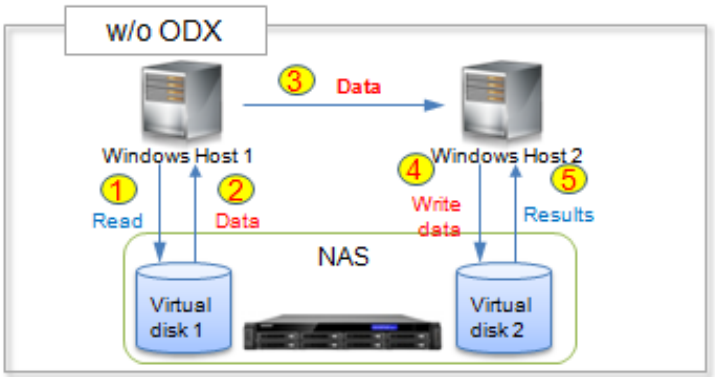
Introduction to Microsoft Offloaded Data Transfer (ODX)

Offloaded data transfer (ODX) in Windows Server 2012 enables you to accomplish more with a NAS by letting you quickly move large files and virtual machines directly between NAS servers, which reduces host CPU and network resource usage.

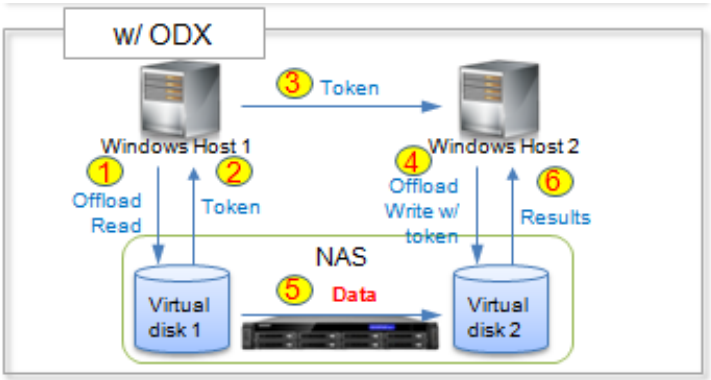
When used with QNAP NAS, ODX lets a storage device perform a file copy operation without the main processor of the host actually reading the content from one storage place and writing it to another.

How does it work?

Figure1. Without the ODX



1. A user executes a file copy, a command-line interface, or a virtual machine migration.
2. The data from NAS LUN1 is extracted by Windows Host1.
3. The data is transfer from Windows Host1 to Windows Host2.
3. The data is stored to NAS LUN2 .



1. A user executes a file copy, a command-line interface, or a virtual machine migration.
2. Windows Server automatically translates this transfer request into an ODX (if supported by the QNAP NAS) and receives a token representation of the data.
3. The token is copied between the source and target systems.(Windows Host1 to Windows Host2).
4. The token is delivered to the QNAP NAS.
5. The QNAP NAS performs the copy internally and returns progress status.

In a Windows environment, many applications need to move files, such as data replication and VHD creation. With the help of ODX, QNAP NAS can decrease server load.

Applications

- Hyper-V management operations that transfer large amounts of data at a time, such as creating a fixed size virtual hard disk (VHD), merging snapshots or converting virtual hard disks
- File Explorer
- Copy commands in Windows PowerShell
- Copy commands in Windows command prompt (including Robocopy)

Performance test

Test Environment

1. NAS+ Expansion Enclosure: TS-EC1279U-SAS-RP + REXP1600U x 1
2. Server: Windows 2012 R2
   Intel® Xeon ® CPU E5-2420 1.90GHz X 2 CPU X 8 core
   Memory: 64GB
   System type: 64-bit
3. Hard Disks: SEAGATE ST9300653SS (SAS drives) x 10 location on NAS
   SEAGATE ST9300653SS (SAS drives) x 10 location on REXP

Test methodology

Case 1: VHDX Creation performance With ODX.
Case 2: File copy performance with/without ODX

Case1: VHDX Creation performance With ODX.

VHD creation is frequently utilized when new VMs are created in a Hyper-V virtualization environment. This test indicates how ODX can improve creation speed.

VHDX Creation (100GB-Fixed size)
RAID 6 - QNAP TurboNAS TS-EC1279U-SAS-RP compared to local disk

100GB-VHDX	Thin LUN - 512 bytes	Thin LUN - 4K bytes	Thick LUN - 512 bytes	Thick LUN - 4K bytes	Local Disk
Used Time	27"	27"	127"	126"	885"
Host-CPU %	2%	1%	1%	2%	1%
NAS-CPU %	2.50%	2%	80%	74%	N/A
Host-Net %	1%	2%	3%	2%	N/A

Case 2: File copy performance with/without ODX

This use case involves copying large amounts of data, which is a common task performed on Windows servers.

Large file copy (10 GB - fixed size)
RAID 6 - QNAP TurboNAS TS-EC1679U-SAS-RP with/without ODX (physical servers)

Without ODX	Thin LUN - 512 bytes	Thin LUN - 4K bytes	Thick LUN - 512 bytes	Thick LUN - 4K bytes
Used Time	104"	114"	125"	121"
Host-CPU %	5%	5%	5%	5%
NAS-CPU %	13%	11%	16%	12%
Host-Net %	96%	100%	95%	100%
Throughput	98 MB/sec	89 MB/sec	82 MB/sec	85 MB/sec

With ODX	Thin LUN - 512 bytes	Thin LUN - 4K bytes	Thick LUN - 512 bytes	Thick LUN - 4K bytes
Used Time	30"	26"	28"	23"
Host-CPU %	1%	1%	1%	1%
NAS-CPU %	48%	41%	48%	55%
Host-Net %	0%	0%	0%	0%
Throughput	341 MB/sec	393 MB/sec	640 MB/sec	640 MB/sec

Large file copy (100 GB - fixed size)

RAID 6 - QNAP TurboNAS TS-EC1679U-SAS-RP with/without ODX (physical servers)

Without ODX	Thin LUN - 512 bytes	Thin LUN - 4K bytes	Thick LUN - 512 bytes	Thick LUN - 4K bytes
Used Time	1044"	1101"	1204"	1077"
Host-CPU %	4%	5%	4%	4%
NAS-CPU %	13%	15%	15%	11%
Host-Net %	95%	100%	100%	100%
Throughput	98 MB/sec	93 MB/sec	85 MB/sec	95 MB/sec

With ODX	Thin LUN - 512 bytes	Thin LUN - 4K bytes	Thick LUN - 512 bytes	Thick LUN - 4K bytes
Used Time	234"	206"	235"	207"
Host-CPU %	2%	1%	1%	2%
NAS-CPU %	60%	58%	53%	58%
Host-Net %	0%	0%	0%	0%
Throughput	438 MB/sec	497 MB/sec	640 MB/sec	640 MB/sec

Conclusion

Offloaded Data Transfer (ODX) with Windows Server 2012 and QNAP NAS provides accelerated data movement. This technology will help customers in many cases with QNAP NAS in Windows environments.

Reference

Windows Offloaded data transfer Overview
http://technet.microsoft.com/en-us/library/hh831628.aspx

Hyper-V Offloaded Data Transfer Overview
http://technet.microsoft.com/en-us/library/hh831375.aspx

Offloaded Data Transfer (Windows Drivers)

http://msdn.microsoft.com/en-us/library/windows/hardware/dn265282(v=vs.85).aspx