

Quest® QoreStor™ 7.0

Interoperability Guide



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Legend

 **CAUTION: A CAUTION icon indicates potential damage to hardware or loss of data if instructions are not followed.**

 **IMPORTANT, NOTE, TIP, MOBILE, or VIDEO:** An information icon indicates supporting information.

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Introduction

This guide provides information about hardware and software requirements for Quest® QoreStor™ installation, as well as additional third-party software applications supported for use with QoreStor.

Other information you may need

The following table lists the documentation available for QoreStor. The documents listed in this table are available on the Quest support website by selecting your specific QoreStor version at:

<http://support.quest.com/QoreStor>

Table 1: QoreStor documentation

Document	Description
QoreStor Installation Guide	Provides information on installation and operation requirements, supported platforms as well as procedures for installing QoreStor.
QoreStor User Guide	Provides information on configuring and using QoreStor.
QoreStor Release Notes	Provides the latest information about new features and known issues with a specific product release.
QoreStor Command Line Reference Guide	Provides information about managing QoreStor data backup and replication operations using the QoreStor command line interface (CLI).
QoreStor Interoperability Guide	Provides information on supported infrastructure components.
QoreStor Virtual Machine Deployment Guide	Provides information on deploying the QoreStor virtual machine on VMware ESX or Microsoft Hyper-V.
Additional whitepapers	Instructions and best practices for configuring additional Quest and third-party applications to work with QoreStor.

i NOTE: Check for the latest documentation updates and release notes at <http://support.quest.com/qorestor>. Read the release notes first because they contain the most recently documented information about known issues with a specific product release.

Information on compatible products

QoreStor offers direct integration with Quest Software's NetVault® Backup and vRanger®, as well as Veritas NetBackup and Backup Exec. For more information on those products refer to the documents below.

Table 2: Quest NetVault Backup documentation

Document	Description
NetVault Backup Installation Guide	Provides information about installing and upgrading the NetVault Backup server and client software.
NetVault Backup Administration Guide	Describes how to configure and use NetVault Backup to protect your data. This document also provides information on configuring QoreStor repositories and migrating NetVault SmartDisk data to the new QoreStor repository.
NetVault Backup Release Notes	Provides the latest information about new features and known issues with a specific product release.

i NOTE: See the complete NetVault Backup documentation at <https://support.quest.com/netvault-backup>.

Table 3: Quest vRanger documentation

Document	Description
vRanger Installation/Upgrade Guide	This document provides information on supported platforms, system requirements, and instructions on installing and upgrading vRanger.
vRanger User Guide	This document provides information and procedures on configuring and using vRanger to protect virtual and physical environments.
vRanger Release Notes	This document details the issues resolved in this release, the known issues as of this release, and the third party components in vRanger.

i NOTE: See the complete vRanger documentation at <https://support.quest.com/vranger>.

Table 4: Veritas documentation

Document	Description
Veritas NetBackup	For information on Veritas NetBackup, refer to the NetBackup product documentation .
Veritas Backup Exec	For information on Veritas Backup Exec, refer to the Backup Exec product documentation .

Installation Requirements

The information in this section describes the minimum hardware and software requirements for QoreStor installation.

QoreStor installation modes

QoreStor can be installed in one several installation modes, each with different hardware requirements and expected performance levels. When QoreStor is installed in Object Direct mode, the installation modes available are slightly different and support different capacities.

Installation modes for standard QoreStor installations

- **Large** - This is the mode of installation that will yield the highest capacity and performance. Large mode supports a back-end capacity of up to 360 TB. It also requires that the data and metadata volumes are on separate RAID sets.
- **Standard** - This is the mode of installation that will suit most environments as it supports a back end capacity of up to 150TB.
- **Cloud Optimized** - This is a smaller footprint installation designed to maximize cost-effectiveness for operation in cloud environments. The data dictionary size is reduced to reflect the lower backend capacity limit of 43TB.
- **Demo** - Demo mode is the least hardware-intensive option used for initial evaluation or lightweight testing. Demo mode can easily be installed on a virtual machine running on most workstations. Demo mode is not suitable for any production application and does not allow any license expansion. Demo mode supports a back end capacity of up to 100GB.

i | **NOTE:** When QoreStor is installed in Cloud Optimized or Demo mode, Archive tier is not supported.

i | **NOTE:** For information on available virtual machine configurations, refer to the topic "QoreStor VM Specifications" in Chapter 5.

Installation modes for installing QoreStor in Object Direct Configuration

- **Large** - This is the mode of installation that will yield the highest capacity and performance. Large mode supports a back-end capacity of up to 360 TB. Additionally, 10TB of SSD storage must be configured for QoreStor metadata.
- **Standard** - This is the mode of installation that will suit most environments as it supports a back end capacity of up to 150TB. Additionally, 4TB of SSD storage must be configured for QoreStor metadata.
- **Cloud Optimized** - This is a smaller footprint installation designed to maximize cost-effectiveness for operation in cloud environments. The data dictionary size is reduced to reflect the lower backend capacity limit of 40TB. Additionally, 1TB of additional storage must be configured for QoreStor metadata.

- NOTE:** When QoreStor is installed in Cloud Optimized mode, Archive tier is not supported.
- NOTE:** When QoreStor is installed in an Object Direct configuration, VTL containers are not supported.
- NOTE:** When QoreStor is installed in an Object Direct configuration, the Demo mode is not available.
- NOTE:** When QoreStor is installed in an Object Direct configuration, the minimum required swap space is 16 GB.

Hardware requirements

The hardware requirements for QoreStor installation differ depending on whether you are installing QoreStor in Object Direct mode or standard mode.

Hardware requirements for standard installations

QoreStor can be installed in one of four modes: Large, Standard, Cloud Optimized, and Demo. Each installation mode has different minimum installation requirements, as described below. Refer to [QoreStor installation modes](#) for more information on the installation modes.

- NOTE:** The table below lists the minimum hardware requirements for installation. Refer to "QoreStor Sizing Guidelines" in the *QoreStor Interoperability Guide* for information on sizing your QoreStor server.

Table 5: Hardware requirements for installation

	Large Mode	Standard Mode	Cloud Optimized Mode	Demo Mode
CPU cores	32	4	4	4
RAM	64 GB	24 GB	14 GB	6 GB

Storage capacity	Minimum of 500GB free space on repository volume. Minimum of 1 TB free space on metadata volume 3.2 TB is recommended	Minimum of 500GB free space on repository volume. Minimum of 600 GB free space on metadata volume. 1.5 TB is recommended	Minimum of 500GB free space on repository volume.	Minimum of 50GB free space on repository volume.
Additional storage requirements	Storage back-end should support: <ul style="list-style-type: none"> • 20,000 IOPS for sequential writes • 20,000 IOPS for Metadata with random writes • 450 IOPS for data volume with random writes. Recommended back-end configuration is: <ul style="list-style-type: none"> • RAID 6 with 48 to 60 disks for repository • RAID1 or RAID10 with 2 to 4 drives for metadata. Maximum supported physical capacity is 360TB	Storage back-end should support: <ul style="list-style-type: none"> • 450 IOPS for sequential writes • 450 IOPS with random writes Recommended back-end configuration is RAID 6 with 12 disks. Maximum supported physical capacity is 150TB	Storage back-end should support: <ul style="list-style-type: none"> • 450 IOPS for sequential writes • 450 IOPS with random writes Recommended back-end configuration is RAID 6 with 6 disks. Maximum supported physical capacity is 43TB	When installing in Demo mode, QoreStor does not perform a pre-check for IOPS Maximum supported physical capacity is 100GB

Hardware requirements for installation in Object Direct mode

When installed in an object direct configuration, QoreStor can be installed in one of three modes: Large, Standard, and Cloud Optimized. Each installation mode has different minimum installation requirements, as described below. Refer to [QoreStor installation modes](#) for more information on the installation modes.

i | **NOTE:** The table below lists the minimum hardware requirements for installation. Refer to "QoreStor Sizing Guidelines" in the *QoreStor Interoperability Guide* for information on sizing your QoreStor server.

Table 6: Hardware requirements for installation

	Large Mode	Standard Mode	Cloud Optimized Mode
CPU cores	32	8	4
RAM	64 GB	32 GB	16 GB
Dictionary Size	256 GB	256 GB	64 GB
Storage capacity	Minimum of 10 TB free space on metadata volume	Minimum of 4 TB free space on metadata volume	Minimum of 1 TB free space on metadata volume
Additional storage requirements	Storage back-end should support: <ul style="list-style-type: none"> • 450 IOPS for metadata volume sequential writes • 450 IOPS for metadata volume random writes 	Storage back-end should support: <ul style="list-style-type: none"> • 450 IOPS for metadata volume sequential writes • 450 IOPS for metadata volume random writes 	Storage back-end should support: <ul style="list-style-type: none"> • 450 IOPS for metadata volume sequential writes • 450 IOPS for metadata volume random writes

Networking requirements

The following network configurations need to be made in order to successfully install and run QoreStor.

i **NOTE:** If you install QoreStor with the **-f** option, or answer **yes** to the prompt regarding firewall changes, the QoreStor installer will ensure these ports are open.

Port configuration

The ports below need to be available for the QoreStor service:

Component/Function	Ports required
UI / Cloud Tier	<ul style="list-style-type: none"> • 80 • 5233
OST / RDA¹	<ul style="list-style-type: none"> • 9920 • 10011 • 11000
NFS¹	<ul style="list-style-type: none"> • 111 • 2049

Component/Function	Ports required
Replication	<ul style="list-style-type: none"> • 9904 • 9911 • 9915 • 9916
CIFS¹	<ul style="list-style-type: none"> • 138 • 139 • 445
Object (S3)	<ul style="list-style-type: none"> • 9000
NDMP	<ul style="list-style-type: none"> • 10000 • 43000-43040
RDA-NDMP	<ul style="list-style-type: none"> • 12000-12127
iSCSI	<ul style="list-style-type: none"> • 3260
Secure Connect²	<ul style="list-style-type: none"> • 9443

¹ When using Rapid NFS or Rapid CIFS, the ports for both RDA and NFS or RDA and CIFS, respectively, are required. If Secure Connect is used with Rapid CIFS, then the Secure Connect port is also required.

² If Secure Connect is used for all RDA and OST clients, then only the Secure Connect port is needed for RDA and OST.

Verify connectivity

The usage of the QoreStor repository requires stable TCP/IP connectivity between the backup application server and the QoreStor repository server.

i | NOTE: The QoreStor repository and backup application server need to be on the same local network.

Supported installation platforms

QoreStor is supported on the following platforms:

Table 7: Operating systems supported for installation

Operating System	Bit level
CentOS ¹ Linux 7.3 - 7.8, 8.2	64-bit
RHEL Linux 7.3 - 7.8, 8.2	64-bit
Oracle ² Linux 7.3 - 7.8, 8.2	64-bit

i **NOTE:** CentOS, RHEL, or Oracle Linux¹ version 8.2 is recommended for fresh installations. Existing QoreStor installations on 7.x release of CentOS, RHEL or Oracle Linux are recommended to upgrade the OS release to 7.8.

8.2 is only supported for fresh installations.

i **NOTE:** Only CentOS, RHEL, or Oracle Linux¹ versions using the following kernels are supported:

- 3.10.0-514
- 3.10.0-693
- 3.10.0-862
- 3.10.0-957
- 3.10.0-1062
- 3.10.0-1127
- 4.18.0-193

i **IMPORTANT:** Before upgrading the operating system on the QoreStor server, refer to "Upgrading the QoreStor Operating System" in the *QoreStor Installation Guide*.

i **IMPORTANT:** The above operating systems should be installed in Minimal or Server mode (without GUI components). Using the Linux GUI will result in poor QoreStor performance.

¹When installed as a minimal installation, CentOS is missing two required packages: bc, and bzip2. Install these packages before installing QoreStor

²With Oracle Linux, the Red Hat Compatible Kernel (RHCK) must be used. The Oracle Unbreakable Enterprise Kernel is not supported.

Supported file systems

Only the file system listed below is supported for the QoreStor server.

- XFS
- VxFS (DR migrated machine only)

Supported file system protocols

QoreStor supports the following file system protocols. The Rapid Data Access (RDA) protocols below provide a logical disk interface that can be used with network storage devices to store data and support data storage operation.

- RDA with NetVault Backup
- RDA with vRanger
- OpenStorage Technology (OST)
- Common Internet File System (CIFS)
- Network File System (NFS)
- Rapid CIFS (RCIFS)

- Rapid NFS (RNFS)
- VTL ¹
 - iSCSI
 - NDMP

1

iSCSI and NDMP are not supported when QoreStor is installed in Demo mode. VTL is not supported when QoreStor is installed in Object Direct mode.

Other supported protocols

QoreStor supports the following file additional protocols:

- Object (S3 Compatible)

Supported VTL replication configurations

When configuring replication for VTL containers from DR Series appliances to QoreStor instances, the configurations below are supported:

Table 8: Supported VTL OEM configurations for replication

Source (DR Series)	Target (QoreStor)
Dell OEM type	Quest OEM type
Quest OEM type	Quest OEM type

Supported virtual environments

This section lists the supported virtual environments for the QoreStor virtual machine.

Supported virtual platforms

Delete this text and replace it with your own content.

Table 9: Supported virtualization platforms

Platform	Versions
VMware	<ul style="list-style-type: none"> • ESXi 5.5 or later <ul style="list-style-type: none"> • vSAN 6.5 • vSAN 6.6 • Workstation 15.x and later¹ • Fusion 11.x and later¹
Microsoft Hyper-V	<ul style="list-style-type: none"> • Hyper-V Server 2012 R2 • Hyper-V Server 2016 • Windows 10²
Oracle VirtualBox ³	<ul style="list-style-type: none"> • Any version that supports OVF 1.1

¹VMware Workstation and Fusion are supported only for demonstration purposes using the demo image.

²Windows 10 is supported for hosting only VMs in Demo mode.

³

Oracle VirtualBox is supported only for demonstration purposes using the demo image.

QoreStor VM Specifications

The QoreStor virtual machine templates are available in four configurations as described below:

Table 10: QoreStor VM Specifications

	Demo	Tier 1	Tier 2	Tier 3
CPU	4	4	8	32
RAM	6	24	32	64
OS Disk	64 GB (Thin provisioned)	64 GB (Thick provisioned)	64 GB (Thick provisioned)	64 GB (Thick provisioned)
Metadata disk	N/A	300 GB	512 GB	512 GB
Data Disk	128 GB (Thin provisioned)	1 TiB expandable up to 40 TiB	5 TiB (3 individual disks of 1.7 TiB each) expandable up to 150 TiB.	10 TiB (6 individual disks of 1.7 TiB each) expandable up to 360 TiB.
QoreStor Mode (Dictionary type)	Based on Demo installation	Based on Cloud-optimized installation	Based on Standard installation	Based on Large installation
VM OS	Oracle Linux 7.7 - minimal install	Oracle Linux 7.7 - minimal install	Oracle Linux 7.7 - minimal install	Oracle Linux 7.7 - minimal install
NIC	1	1	1	1
Virtual hardware version	10	10	10	10

Supported Software

The applications listed in the sections below are supported for use with QoreStor

Supported browsers

This section lists the minimum supported web browsers for use with the QoreStor UI.

Table 11: Supported browsers

Software	Versions
Mozilla Firefox	67 or later
Microsoft Internet Explorer	11.0 ¹
Microsoft Edge	44 or later
Google Chrome	75 or later

¹Internet Explorer 11 is supported only for use with the QoreStor Web Terminal. When IE11 users log in to the QoreStor UI, the Terminal page will be displayed and navigation options will be hidden.

Supported clients

This section details the operating systems supported for installation of the QoreStor clients.

Table 12: Supported QoreStor clients

Client type	Client installation platform
RDA ¹	<ul style="list-style-type: none">• Linux<ul style="list-style-type: none">• CentOS/Oracle Linux /RHEL 5• CentOS/Oracle Linux /RHEL 6• CentOS/Oracle Linux /RHEL 7• CentOS/Oracle Linux /RHEL 8• SLES 10• SLES 11• SLES 12• SLES 15• Unix<ul style="list-style-type: none">• Solaris 10• Solaris 11• AIX 7.1 and later• HPUX 11.31• Windows<ul style="list-style-type: none">• Windows Server 2008 R2• Windows Server 2012 R2• Windows Server 2016• Windows Server 2019
OST ¹	<ul style="list-style-type: none">• Linux<ul style="list-style-type: none">• CentOS/Oracle Linux /RHEL 5• CentOS/Oracle Linux /RHEL 6• CentOS/Oracle Linux /RHEL 7• CentOS/Oracle Linux /RHEL 8• SLES 10• SLES 11• SLES 12• SLES 15• Windows<ul style="list-style-type: none">• Windows Server 2012 R2• Windows Server 2016• Windows Server 2019

Client type Client installation platform

Rapid CIFS	<ul style="list-style-type: none">• Windows<ul style="list-style-type: none">• Windows Server 2008 R2• Windows Server 2012 R2• Windows Server 2016²• Windows Server 2019³
Rapid NFS	<ul style="list-style-type: none">• Linux<ul style="list-style-type: none">• CentOS/Oracle Linux /RHEL 6• CentOS/Oracle Linux /RHEL 7• CentOS/Oracle Linux /RHEL 8.2• SLES 11• SLES 12• SLES 15
iSCSI	<ul style="list-style-type: none">• Linux<ul style="list-style-type: none">• CentOS/Oracle Linux /RHEL 6• CentOS/Oracle Linux /RHEL 7• CentOS 6.6• Windows<ul style="list-style-type: none">• Windows Server 2008 R2• Windows Server 2012 R2• Windows Server 2016• Windows Server 2019
NDMP	<ul style="list-style-type: none">• Dell FluidFS<ul style="list-style-type: none">• v3• v4• Windows Server 2016• NetApp<ul style="list-style-type: none">• ONTAP 8.x 7-Mode• ONTAP 8.x C-Mode• ONTAP 9.x C-Mode

Client type	Client installation platform
-------------	------------------------------

- EMC
 - VNX OE 7.x and 8.0.x
 - Isilon OneFS 7.0.x
 - Isilon OneFS 8.0.x
- SUN NAS
 - 2011

¹To enable secure WAN reconnection functionality, the Secure Connect client must be version 4.1.0.265 and the QoreStor server version must be 5.1.0.833.

²Rapid CIFS is not supported on Windows Server 2016 with secure boot enabled

³SMB 1.0/CIFS File Sharing Support may need to be installed on Server 2019 depending on your QoreStor version.

Supported client plug-ins

This section lists the client plug-in versions supported by QoreStor.

Table 13: Supported client plug-in versions (without Secure Connect)

Client Plug-in	Version(s)
RDA	4.0.3049.0 or greater
OST	4.0.3049.0 or greater
Rapid NFS	4.0.3049.0 or greater
Rapid CIFS	4.0.3101.1 or greater

Table 14: Supported client plug-in versions (with Secure Connect)

Client Plug-in	Version(s)
RDA	4.1.0.265 or greater
OST	4.1.0.265 or greater
Rapid NFS	4.0.3310.0
Rapid CIFS	4.0.3233.1 or greater

Supported cloud providers

This section lists the cloud providers supported for each of the cloud-focused features in QoreStor.

Cloud Replication

- Microsoft Azure Blob Storage
- Amazon S3
- Wasabi S3
- Google S3
- S3 Compatible Storage Providers

Archive Tier

- Amazon S3 Glacier
- Amazon S3 Glacier Deep Archive

Object Direct Installations

- **Cloud Deployments**
 - Microsoft Azure Blob with Azure VM from same region
 - Amazon S3 with Amazon EC2 instance from same region
- **On-Premises**
 - S3 Compatible Storage (such as MinIO) with on-Prem Qorestor Server

Supported backup software

This section lists the supported backup applications and protocols for QoreStor.

Table 15: Supported backup applications and protocols

Data Management Application (DMA)	RDA	OST	NFS	RDNFS	CIFS	RDCIFS	Object (S3 Compatible)	NDMP VTL	iSCSI VTL
NetVault Backup¹									
12.0.1	✓							✓	✓

Data Management Application (DMA)	RDA	OST	NFS	RDNFS	CIFS	RDCIFS	Object (S3 Compatible)	NDMP VTL	iSCSI VTL
12.1	✓							✓	✓
12.2	✓							✓	✓
12.3	✓							✓	✓
12.4	✓							✓	✓
13.0	✓							✓	✓
vRanger¹									
7.6.5	✓				✓	✓			
7.7	✓				✓	✓			
7.8	✓				✓	✓			
7.8.2	✓				✓	✓			
Backup Exec									
16		✓			✓	✓			✓
20		✓			✓	✓	✓		✓
NetBackup									
8.0		✓	✓	✓	✓	✓		✓	✓
8.1		✓	✓	✓	✓	✓		✓	✓
8.1.1		✓	✓	✓	✓	✓		✓	✓
8.1.2		✓	✓	✓	✓	✓		✓	✓
8.2		✓ ²	✓	✓	✓	✓		✓	✓
CommVault Simpana									
10			✓	✓	✓	✓		✓	✓
11			✓	✓	✓	✓	✓	✓	✓
DELL EMC NetWorker									
9.1			✓	✓	✓	✓		✓	✓
Microsoft SQL Server Backup									
2016					✓	✓			
Oracle RMAN									
Oracle Linux 12c			✓	✓					
Oracle 12c for Windows					✓	✓			

Data Management Application (DMA)	RDA	OST	NFS	RDNFS	CIFS	RDCIFS	Object (S3 Compatible)	NDMP VTL	iSCSI VTL
CA Arcserve									
v16			✓		✓				
v17.5			✓		✓				
VEEAM									
9.0					✓	✓			
9.5					✓	✓	✓		✓
HP Data Protector									
9			✓		✓				
10.04			✓		✓				
Bridgehead									
x3.2			✓		✓				
Atempo Time Navigator (TiNa)									
4.3			✓		✓				
4.4			✓		✓				
4.5			✓		✓				
Acronis									
11.5			✓		✓				
Native OS or third-party utilities									
UNIX dump			✓	✓					

¹Refer to "NetVault Backup and vRanger Feature Compatibility" in the *QoreStor Interoperability Guide* for more detailed information on NetVault Backup and vRanger Support

²AIR support for NetBackup 8.2 requires an update to the mapping file.

NetVault Backup and vRanger Feature Compatibility

The tables below provide more detailed information on NetVault Backup and vRanger feature compatibility with QoreStor.

Table 16: NetVault Backup feature compatibility

Feature	NVBU 12.0.1	NVBU 12.1	NVBU 12.2	NVBU 12.3	NVBU 12.4	NVBU 13
Integrated RDA plug-in version	4.1.0.234	4.1.0.234	4.1.0.237	4.1.0.263	4.1.0.266	4.1.0.328

Compatible RDA plug-in versions	4.1	4.1	4.1	4.1	4.1	4.1
Secure Connect WAN restart-ability ¹	Yes	Yes	Yes	Yes	Yes	Yes
Create storage groups and containers from DMA	Yes	Yes	Yes	Yes	Yes	Yes
OpDup DR to QoreStor ²	Yes	Yes	Yes	Yes	Yes	Yes
OpDup QoreStor to DR	Yes	Yes	Yes	Yes	Yes	Yes

Table 17: vRanger feature compatibility

Feature	vRanger 7.6.5	vRanger 7.7	vRanger 7.8
Integrated RDA plug-in version	4.03	4.0.3202.1	4.1.0.263
Secure Connect WAN restart-ability ¹	No	No	No
Create storage groups and containers from DMA	No	No	No
OpDup DR to QoreStor ²	Yes	Yes	Yes
OpDup QoreStor to DR	Yes	Yes (w/ DRv4.0.3203.1b)	Yes (w/ DRv4.0.3203.1b)

¹To enable secure WAN reconnection functionality, the Secure Connect client must be version 4.1.0.265 and the QoreStor server version must be 5.1.0.833.

²Requires DR OS 4.0 or later.

QoreStor supported system limits

This section lists the supported configuration limits for the QoreStor system.

Table 18: Supported configuration limits

Feature	Cloud-optimized	Standard	Large
Maximum containers	16	32	64
Maximum VTL containers	1	2	4
Maximum storage groups	5	5	5
Maximum streams	32	64	128
Maximum connections - CIFS/ Rapid CIFS	16	32	128
Maximum connections - NFS/ Rapid NFS	16	32	128
Maximum connections - RDA	32	128	256
Maximum connections - OST	32	128	256
Maximum replications	16	32	64

Table 19: Supported configuration limits - Object Direct installations

Feature	Cloud-optimized	Standard	Large
Maximum containers	32	32	64
Maximum storage groups	5	5	5
Maximum streams	32	64	128

Reference architectures

The information in the sections below is intended to help you properly size your QoreStor server.

Reference guidelines

The specifications detailed in [Hardware references](#) were constructed with the performance guidelines listed below in mind. Please review the performance guidelines below and select an option suitable for your environment. Use that same reference in the [Hardware references](#) section to identify the representative reference architecture.

Table 20: Reference guidelines

Reference Guidelines	CPU (cores)	Memory (GB)	NIC Minimum	IO Minimums		Inbound bandwidth
				SSD Support	IOPS BW	
Extreme	32-64	128+	4 x 10GbE	Required	IOPS = 100K+ BW = 700MiB/Sec	RAID6 48+ 30+ TB/HR
Enterprise	32-64	64-128	2x 10GbE	Optional	IOPS = 20K+ BW = 300MiB/Sec	RAID6 24-48 20 TB/HR
Standard	8-32	32-64	2x 10GbE	Optional	IOPS = 10K+ BW = 200MiB/Sec	RAID6 8-12 10 TB/HR
Starter	4-8	24-32	4+ x 1GbE	NA	IOPS = 5K+ BW = 100MiB/Sec	RAID5-6 4-8 5 TB/HR

Hardware references

The table below provides reference architectures for different levels of performance. Two of the examples below use SSD storage to host the QoreStor metadata, which will improve QoreStor performance.

Table 21: Hardware references

Hardware references	Extreme	Enterprise	Standard	Starter
	R740-05 – HDD/SSD MetaData	R740-05 – ALL HDD	R730-10 – HDD/SSD MetaData	R730-10 – ALL HDD
Model	Dell EMC OEMR XL R740xd	Dell EMC OEMR XL R740xd	Dell EMC PowerEdge R730xd	Dell EMC PowerEdge R730xd
Drives	2x 2TB 7.2K RPM NLSAS 12Gbps 512n 12x 8TB 7.2K RPM NLSAS 12Gbps 512e	2x 2TB 7.2K RPM NLSAS 12Gbps 512n 12x 8TB 7.2K RPM NLSAS 12Gbps 512e	2x 500GB 7.2K RPM SATA 6Gbps 2.5i n Flex Bay Hard Drive,13G 12x 8TB 7.2K RPM Self-Encrypting NLSAS 6Gbps 3.5in Hot-plug Hard Drive, FIPS140-2,13G	2x 500GB 7.2K RPM SATA 6Gbps 2.5i n Flex Bay Hard Drive,13G 12x 8TB 7.2K RPM Self-Encrypting NLSAS 6Gbps 3.5in Hot-plug Hard Drive, FIPS140-2,13G
Drive Qty	2 x 2TB INT 12 x 8TB EXT 2 x 400GB SSD INT	2 x 2TB INT 12 x 8TB EXT 2 x 400GB SSD INT	2 x 500GB 24x 8TB / 36x 6TB	2 x 500GB 24x 8TB / 36x 6TB
Internal SSD (optional)	4x 400GB SSD SAS Mix Use 12Gbps 5 12e	4x 400GB SSD SAS Mix Use 12Gbps 5 12e	4x 400GB SSD SAS Mix Use 12Gbps 5 12e	4x 400GB SSD SAS Mix Use 12Gbps 5 12e
CPU	2x Intel Xeon Gold 5118 2.3G, 1 2C/24T, 10.4GT/s 2UPI, 16M Cache, Turbo, HT (105W) DDR4-2400 , OEM XL	2x Intel Xeon Gold 5118 2.3G, 1 2C/24T, 10.4GT/s 2UPI, 16M Cache, Turbo, HT (105W) DDR4-2400 , OEM XL	2x Intel Xeon E5-2660 v3 2.6GHz,2 5M Cache,9.60GT/s QPI,Turbo,HT ,10C/20T (105W) Max Mem 2133MH z	2x Intel Xeon E5-2660 v3 2.6GHz,2 5M Cache,9.60GT/s QPI,Turbo,HT ,10C/20T (105W) Max Mem 2133MH z
Memory	208GB 13 x DUAL IN-LINE MEMORY MODULE, 16GB, 2666, 2RX8, 8G, DDR4, R	208GB 13 x DUAL IN-LINE MEMORY MODULE, 16GB, 2666, 2RX8, 8G, DDR4, R	8x 16GB RDIMM, 2400MT/s, Dual Rank, x8 Data Width	8x 16GB RDIMM, 2400MT/s, Dual Rank, x8 Data Width
PERC RAID	1x PERC H740P RAID Controller, 8GB NV Cache, Mini card 1x PERC H840 RAID Adapter for External MD14XX Only, 8GB NV Cache, Full Height	1x PERC H740P RAID Controller, 8GB NV Cache, Mini card 1x PERC H840 RAID Adapter for External MD14XX Only, 8GB NV Cache, Full Height	1x PERC H730P RAID Controller, 2GB NV Cache, Mini card 1x PERC H830 RAID Adapter for External MD14XX Only, 2GB NV Cache, Full Height	1x PERC H730P RAID Controller, 2GB NV Cache, Mini card 1x PERC H830 RAID Adapter for External MD14XX Only, 2GB NV Cache, Full Height
Network	1x QLogic 57800 2x10Gb DA/SFP+ + 2x1Gb BT Network	1x QLogic 57800 2x10Gb DA/SFP+ + 2x1Gb BT Network	1x QLogic 57840S Quad Port 10Gb SFP+ Direct Attach	1x QLogic 57840S Quad Port 10Gb SFP+ Direct Attach

	Daughter Card	Daughter Card	Rack Network Daughter Card	Rack Network Daughter Card
External Storage	3x1400	3x1400	4x1400	4x1400
HW RAID CONFIG <Level (0-5-6-10)> :: <# Groups (GRP)> :: <# Spindles per GRP> :: <#Channels> ::	RAID 10 :: 1 :: 4 :: 1 RAID 6 :: 4 :: 12 :: 2	RAID 6 :: 4 :: 12 :: 2	RAID 10 :: 1 :: 4 :: 1 RAID 6 :: 4 :: 12 :: 2	RAID 10 :: 1 :: 4 :: 1 RAID 6 :: 4 :: 12 :: 2
LVM CONFIG	Striped LVM :: 64KB :: 4xStripes	Striped LVM :: 64KB :: 4xStripes	Striped LVM :: 64KB :: 4xStripes	Striped LVM :: 64KB :: 4xStripes
FS CONFIG	XFS	XFS	XFS	XFS
SEQ FIO A + B	IOPS=98.5 K/Sec + 18.2 K/Sec BW=385 MiB/Sec + 71.1 MiB/Sec	IOPS=105K/Sec BW=412 MiB/Sec		
RAND FIO	IOPS=95.7 K/Sec + 39 K/Sec BW=374 MiB/Sec + 152 MiB/Sec	IOPS=91.7K/Sec BW=358 MiB/Sec		
MAX INGEST @ 0%	Total Connections :: TB/Hr 8 :: 9.48 16 :: 8.58 24 :: 7.32 32 :: 6.98 48 :: 7.00 64 :: 4.71	Total Connections :: TB/Hr 8 :: 9.00 16 :: 8.52 24 :: 8.00 32 :: 7.02 48 :: 4.31 64 :: 3.25		
MAX INGEST @ 90%	Total Connections :: TB/Hr 8 :: 37.34 16 :: 19.40 24 :: 16.73 32 :: 13:77 48 :: 12.03 64 :: 11.96	Total Connections :: TB/Hr 8 :: 31.41 16 :: 18.94 24 :: 16.05 32 :: 14:53 48 :: 13.82 64 :: 12.96		

Cloud deployment reference configurations

The tables below describe reference configurations for deployments to Microsoft Azure. These configurations are based on QoreStor images available in the Azure Marketplace. Configurations are described for 4 installation modes, as described below:

- Tier 0 - Community edition
- Tier 1 - Cloud Optimized
- Tier 2 - Standard
- Tier 3 - Large

QoreStor Tier 0 configurations

The following VM Size Instance is then recommended and validated for Tier 0, with expected Performance rate between 1 TiB/Hr to 1.5 TiB/Hr.(measured for a 90% dedupe ingest data with RDA/RapidNFS).

Table 22: Tier 0 configuration

Series	Size	vCPU	Memory:GiB	Temp Storage (SSD) GiB	Max data disks	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network bandwidth (Mbps)
DSv3	Standard_D4s_v3	4	16	32	8	6400 / 96	2 / 2000

This will add 6 Standard SSDs or Standard HDD as Data Repository, starting with 256 GB, can be later expanded up to 20 TiB.

- 1 TiB (1.5 TiB raw space) -- No License needed.
- 5 TiB (6 TiB raw space)
- 10 TiB (12 TiB raw space)
- 20 TiB (24 TiB raw space)

Additional VMs Size that are tested and validated for tier 0:

Table 23: Tier 0 additional configuration

Series	Size	vCPU	Memory:GiB	Temp Storage (SSD) GiB	Max data disks	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network bandwidth (Mbps)
Esv3	Standard_E4s_v3	4	32	64	8	6400 / 96	2 / 2000

QoreStor Tier 1 configurations

The following are the recommended VM instances validated for Tier 1 configurations. These configurations have an expected performance rate between 1.5 TiB/Hr and 2.5 TiB/Hr (measured for a 90 % dedupe ingest data).

Table 24: Tier 1 configurations

Series	Size	vCPU	Memory:GiB	Temp Storage (SSD) GiB	Max data disks	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network bandwidth (Mbps)
DSv2 - 11-15	Standard_DS12_v23	4	28	56	16	12,800 / 192	4 / 3000

The Pre-configured image is Standard_D12s_v2. This will create one Premium SSD of 1024 GB for Metadata and 5 Standard SSDs or Standard HDD of 5 TiB. Storage can be later expanded to 10 TiB, 20 TiB, or 40 TiB

- 5 TiB
- 10 TiB
- 20 TiB
- 40 TiB

Additional VM size tested and validated for Tier 1:

Table 25: Tier 1 additional configuration

Series	Size	vCPU	Memory:GiB	Temp Storage (SSD) GiB	Max data disks	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network bandwidth (Mbps)
Esv3	Standard_E4s_v3	4	32	64	8	6400 / 96	2 / 2000

QoreStor Tier 2 configurations

The following are the recommended VM instances validated for Tier 2 configurations. These configurations have an expected performance rate between 2 TiB/Hr and 3.5 TiB/Hr (measured for a 90 % dedupe ingest data with RDA/RapidNFS).

Table 26: Tier 2 configurations

Series	Size	vCPU	Memory:GiB	Temp Storage (SSD) GiB	Max data disks	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network bandwidth (Mbps)
DSv3	Standard_D8s_v3	8	32	64	16	12,800 / 192	4 / 4000

The Pre-configured Image is Standard_D8s_v3. This will create two Premium SSD of 1TiB for Metadata and 10 Standard SSDs or Standard HDD of 512 GB. Storage can be later expanded to 10 TiB, 20 TiB, 40 TiB, 80 TiB, or 160 TiB.

- 5 TiB
- 10 TiB
- 20 TiB
- 40 TiB
- 80 TiB
- 160 TiB

Additional VMs sizes that can be used for Tier2

Table 27: Tier 2 configurations

Series	Size	vCPU	Memory:GiB	Temp Storage (SSD) GiB	Max data disks	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network bandwidth (Mbps)
ESv3	Standard_E8s_v3 2	8	64	128	16	12,800 / 192	4 / 4000
DSv2	Standard_DS4_v2	8	28	56	32	25,000 / 384	8 / 6000

QoreStor Tier 3 configurations

The following are the recommended VM instances validated for Tier 3 configurations. These configurations have an expected performance rate between 3 TiB/Hr and 5 TiB/Hr (measured for a 90 % dedupe ingest data with RDA/RapidNFS).

Table 28: Tier 3 configuration

Series	Size	vCPU	Memory:GiB	Temp Storage (SSD) GiB	Max data disks	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network bandwidth (Mbps)
DSv3	Standard_D16s_v3	16	64	128	32	25,600 / 384	8 / 8000

The Pre-configured Image is Standard_D16s_v3. This will create 3 Premium SSD of 1TiB for Metadata and 20 Standard SSDs of 1024 GB. Storage can be later expanded to 40 TiB, 80 TiB, 160 TiB, or 320 TiB.

- 20 TiB
- 40 TiB
- 80 TiB
- 160 TiB
- 320 TiB

Additional VMs sizes that can be used for Tier 3:

Table 29: Tier 3 additional configurations

Series	Size	vCPU	Memory:GiB	Temp Storage (SSD) GiB	Max data disks	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network bandwidth (Mbps)
DSv2	Standard_DS5_v2	16	56	112	64	51,200 / 768	8 / 12000
DSv2-11-15	Standard_DS13_v2_3	8	56	112	32	25,600 / 384	8 / 6000

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