9.6 Release Notes

Cloud Volumes ONTAP

NetApp
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9.6 Release Notes

What's new in Cloud Volumes ONTAP 9.6

Cloud Volumes ONTAP 9.6 includes several new features and enhancements.

Additional features and enhancements are also introduced in the latest versions of Cloud Manager. See the Cloud Manager Release Notes for details.

9.6 P8 (2 June 2020)

The 9.6 P8 patch release for Cloud Volumes ONTAP is now available through Cloud Manager 3.8 and later. Cloud Manager will prompt you to upgrade your existing systems to this patch release. View the list of bugs fixed in the P8 patch (NetApp Support Site login required).

9.6 P7 (8 Apr 2020)

The 9.6 P7 patch release for Cloud Volumes ONTAP is now available through Cloud Manager 3.8 and later. Cloud Manager will prompt you to upgrade your existing systems to this patch release. View the list of bugs fixed in the P7 patch (NetApp Support Site login required).

9.6 P6 (6 Mar 2020)

The 9.6 P6 patch release for Cloud Volumes ONTAP is now available through Cloud Manager 3.8 and later. Cloud Manager will prompt you to upgrade your existing systems to this patch release. View the list of bugs fixed in the P6 patch (NetApp Support Site login required).

AWS updates (16 Feb 2020)

We've introduced support for new EC2 instances and a change in the number of supported data disks.

Support for new instances

A few new EC2 instance types are now supported with Cloud Volumes ONTAP 9.6 when using a Premium or BYOL license:

- c5.9xlarge
- c5d.18xlarge [1,2]
- m5d.8xlarge [1,2]

[1] These instance types include local NVMe storage, which Cloud Volumes ONTAP uses as *Flash Cache*. Learn more.

[2] These instance types are supported with 9.6 P3 and later.

Learn more about these EC2 instance types.

Learn more about supported 9.6 configurations in AWS.

Supported data disks

One less data disk is now supported for c5, m5, and r5 instances. For single node systems, 22 data disks are supported. For HA pairs, 19 data disks are supported per node.

Learn more about storage limits in AWS.

Support for DS15_v2 in Azure (12 Feb 2020)

Cloud Volumes ONTAP is now supported with the DS15_v2 virtual machine type in Azure, on both single node systems and HA pairs.

Learn more about the DSv2 series.

Learn more about supported 9.6 configurations in Azure.

9.6 P5 (26 Dec 2019)

The 9.6 P5 patch release for Cloud Volumes ONTAP is now available through Cloud Manager. Cloud Manager will prompt you to upgrade your existing systems to this patch release. View the list of bugs fixed in the P5 patch (NetApp Support Site login required).

9.6 P4 (14 Nov 2019)

The 9.6 P4 patch release for Cloud Volumes ONTAP is now available through Cloud Manager. Cloud Manager will prompt you to upgrade your existing systems to this patch release. View the list of bugs fixed in the P4 patch (NetApp Support Site login required).

9.6 P3 (23 Oct 2019)

The 9.6 P3 patch release for Cloud Volumes ONTAP is now available through Cloud Manager. Cloud Manager will prompt you to upgrade existing systems to this patch release. View the list of bugs fixed in the P3 patch (NetApp Support Site login required).

In addition to bug fixes, this release also enables the following:

- Support for the c5.18xlarge instance type in AWS.
- An increase to the maximum aggregate size on single node systems in Azure: 352 TB of raw capacity is now supported.

  The maximum aggregate size for a single node system was previously 200 TB.

Pay-as-you-go subscriptions in the GCP Marketplace (6 Oct 2019)

You can now pay for Cloud Volumes ONTAP as you go by subscribing to Cloud Volumes ONTAP in the Google Cloud Platform Marketplace.

Google Cloud Platform Marketplace: Cloud Manager for Cloud Volumes ONTAP

General Availability of Cloud Volumes ONTAP in GCP (3 Sept 2019)

Cloud Volumes ONTAP is now generally available in Google Cloud Platform (GCP) when you bring your own license (BYOL). A pay-as-you-go promotion is also available. The promotion offers free licenses for an

unlimited number of systems and will expire at the end of September 2019.

- Learn how to get started in GCP
- View supported configurations

9.6 P2 (29 Aug 2019)

The 9.6 P2 patch release for Cloud Volumes ONTAP is now available through Cloud Manager. Cloud Manager will prompt you to upgrade your existing 9.5 and 9.6 systems to this patch release. View the list of bugs fixed in the P2 patch (NetApp Support Site login required).

9.6 GA (15 July 2019)

The General Availability (GA) release of Cloud Volumes ONTAP 9.6 is now available. The GA release includes bug fixes. Cloud Manager will prompt you to upgrade your existing systems to this release.

Cloud Volumes ONTAP remains in private preview in Google Cloud Platform.

9.6 RC1 (16 June 2019)

Cloud Volumes ONTAP 9.6 RC1 is available in AWS, Azure, and now in Google Cloud Platform. This release includes the following features.

- Private preview of Cloud Volumes ONTAP in Google Cloud Platform
- Data tiering with HA pairs in Azure
- Support for FlexCache volumes
- Additional ONTAP changes

Private preview of Cloud Volumes ONTAP in Google Cloud Platform

A private preview of Cloud Volumes ONTAP in Google Cloud Platform is now available. Similar to other cloud providers, Cloud Volumes ONTAP for Google Cloud Platform helps you reduce costs, improve performance, and increase availability.

Cloud Volumes ONTAP is available in GCP as a single node system and supports data tiering to object storage.

To join the private preview, send a request to ng-Cloud-Volume-ONTAP-preview@netapp.com.

Data tiering with HA pairs in Azure

Data tiering is now supported with Cloud Volumes ONTAP HA pairs in Microsoft Azure. Data tiering enables automated tiering of inactive data to low-cost Blob storage.

Learn how to set up data tiering in Cloud Manager.

Support for FlexCache volumes

A FlexCache volume is a storage volume that caches NFS read data from an origin (or source) volume. Subsequent reads to the cached data result in faster access to that data.

You can use FlexCache volumes to speed up access to data or to offload traffic from heavily accessed

volumes. FlexCache volumes help improve performance, especially when clients need to access the same data repeatedly, because the data can be served directly without having to access the origin volume. FlexCache volumes work well for system workloads that are read-intensive.

Cloud Manager does not provide management of FlexCache volumes at this time, but you can use the ONTAP CLI or ONTAP System Manager to create and manage FlexCache volumes:

- FlexCache Volumes for Faster Data Access Power Guide
- Creating FlexCache volumes in System Manager

Starting with the 3.7.2 release, Cloud Manager generates a FlexCache license for all new Cloud Volumes ONTAP systems. The license includes a 500 GB usage limit.

Additional ONTAP changes

ONTAP 9.6 includes other changes that Cloud Volumes ONTAP users might be interested in:

- SnapMirror replication now supports TLS 1.2 encryption for communication in-flight
- Data tiering (FabricPool) enhancements include:
  - Volume move support without needing to re-tier cold data
  - SVM disaster recovery support

For more details about the 9.6 release, see the ONTAP 9 Release Notes.

Upgrade notes

- Upgrades of Cloud Volumes ONTAP must be completed from Cloud Manager. You should not upgrade Cloud Volumes ONTAP by using System Manager or the CLI. Doing so can impact system stability.
- You can upgrade to Cloud Volumes ONTAP 9.6 from the 9.5 release.
- The upgrade of a single node system takes the system offline for up to 25 minutes, during which I/O is interrupted.
- Upgrading an HA pair is nondisruptive and I/O is uninterrupted. During this nondisruptive upgrade process, each node is upgraded in tandem to continue serving I/O to clients.

Supported configurations

Supported configurations for Cloud Volumes ONTAP 9.6 in AWS

Cloud Volumes ONTAP is available in AWS in two pricing options: pay-as-you-go and Bring Your Own License (BYOL). For pay-as-you-go, you can choose from three configurations: Explore, Standard, or Premium.

Supported configurations by license

Cloud Volumes ONTAP is available in AWS as a single node system and as a high-availability (HA) pair of nodes for fault tolerance and nondisruptive operations.

Upgrading a single node system to an HA pair is not supported. If you want to switch between a single node system and an HA pair, then you need to deploy a new system and replicate data from the existing system to the new system.

	Explore	Standard	Premium	BYOL
Supported EC2 instance types [1]	• m4.xlarge • m5.xlarge	• m4.2xlarge • m5.2xlarge • r4.xlarge • r5.xlarge	• c4.4xlarge • c4.8xlarge • c5.9xlarge • c5.18xlarge • c5d.4xlarge [2] • c5d.9xlarge [2] • c5d.18xlarge [2,3] • m4.4xlarge • m5.4xlarge • m5d.8xlarge [2,3] • r4.2xlarge • r5.2xlarge • r5d.2xlarge [2]	• c4.4xlarge • c4.8xlarge • c5.9xlarge • c5.18xlarge • c5d.4xlarge [2] • c5d.9xlarge [2] • c5d.18xlarge [2,3] • m4.xlarge • m4.2xlarge • m4.4xlarge • m5.xlarge • m5.2xlarge • m5.4xlarge • m5d.8xlarge [2,3] • r4.xlarge • r4.2xlarge • r5.xlarge • r5.2xlarge • r5d.2xlarge [2]
Supported disk types [4]	General Purpose SSDs (gp2) [5], Provisioned IOPS SSDs (io1), and Throughput Optimized HDDs (st1)			
Cold data tiering to S3	Not supported	Supported		
Maximum system capacity (disks + object storage)	2 TB	10 TB	368 TB [5]	368 TB per license [5]

Notes:

1. When you choose an EC2 instance type, you can specify whether it is a shared instance or a dedicated instance.
2. These instance types include local NVMe storage, which Cloud Volumes ONTAP uses as *Flash Cache*. Flash Cache speeds access to data through real-time intelligent caching of recently read user data and NetApp metadata. It is effective for random read-intensive workloads, including databases, email, and file services. Compression must be disabled on all volumes to take advantage of the Flash Cache performance improvements. Learn more.
3. c5d.18xlarge and m5d.8xlarge are supported starting with Cloud Volumes ONTAP 9.6 P3.
4. Enhanced write performance is enabled when using SSDs with Cloud Volumes ONTAP Standard, Premium, and BYOL.

5. gp3 SSDs are not supported.
6. For some HA configurations, disk limits prevent you from reaching the 368 TB capacity limit by using disks alone. In those cases, you can reach the 368 TB capacity limit by tiering inactive data to object storage. For information about disk limits, refer to storage limits.
7. For AWS region support, see Cloud Volumes Global Regions.

Supported disk sizes

In AWS, an aggregate can contain up to 6 disks that are all the same type and size.

General Purpose SSDs (gp2)	Provisioned IOPS SSDs (io1)	Throughput Optimized HDDs (st1)
• 100 GB • 500 GB • 1 TB • 2 TB • 4 TB • 6 TB • 8 TB • 16 TB	• 100 GB • 500 GB • 1 TB • 2 TB • 4 TB • 6 TB • 8 TB • 16 TB	• 500 GB • 1 TB • 2 TB • 4 TB • 6 TB • 8 TB • 16 TB

Supported configurations for Cloud Volumes ONTAP 9.6 in Azure

Cloud Volumes ONTAP is available in Azure in two pricing options: pay-as-you-go and Bring Your Own License (BYOL). For pay-as-you-go, you can choose from three configurations: Explore, Standard, or Premium.

Supported configurations by license

Cloud Volumes ONTAP is available in Azure as a single node system and as a high-availability (HA) pair of nodes for fault tolerance and nondisruptive operations.

Upgrading a single node system to an HA pair is not supported. If you want to switch between a single node system and an HA pair, then you need to deploy a new system and replicate data from the existing system to the new system.

Single node systems

You can choose from the following configurations when deploying Cloud Volumes ONTAP as a single-node system in Azure:

	Explore	Standard	Premium	BYOL
Supported virtual machine types	DS3_v2	• DS4_v2 • DS13_v2	• DS5_v2 • DS14_v2 • DS15_v2	• DS3_v2 • DS4_v2 • DS5_v2 • DS13_v2 • DS14_v2 • DS15_v2
Supported disk types [1]	Standard HDD Managed Disks, Standard SSD Managed Disks, and Premium SSD Managed Disks			
Cold data tiering to Blob storage	Not supported	Supported		
Maximum system capacity (disks + object storage)	2 TB	10 TB	368 TB	368 TB per license

Notes:

1. Enhanced write performance is enabled when using SSDs, but not when using the DS3_v2 virtual machine type.
2. For Azure region support, see Cloud Volumes Global Regions.

HA pairs

You can choose from the following configurations when deploying Cloud Volumes ONTAP as an HA pair in Azure:

	Explore	Standard	Premium	BYOL
Supported virtual machine types	Not supported	• DS4_v2 • DS13_v2	• DS5_v2 • DS14_v2 • DS15_v2	• DS4_v2 • DS5_v2 • DS13_v2 • DS14_v2 • DS15_v2
Supported disk types	Not supported	Premium page blobs		
Cold data tiering to Blob storage [2]	Not supported	Supported		
Maximum system capacity (disks + object storage)	Not supported	10 TB	368 TB	368 TB per license

Notes:

1. For Azure region support, see Cloud Volumes Global Regions.

Supported disk sizes

In Azure, an aggregate can contain up to 12 disks that are all the same type and size.

Single node systems

Single node systems use Azure Managed Disks. The following disk sizes are supported:

Premium SSD	Standard SSD	Standard HDD
• 500 GB • 1 TB • 2 TB • 4 TB • 8 TB • 16 TB • 32 TB	• 100 GB • 500 GB • 1 TB • 2 TB • 4 TB • 8 TB • 16 TB • 32 TB	• 100 GB • 500 GB • 1 TB • 2 TB • 4 TB • 8 TB • 16 TB • 32 TB

HA pairs

HA pairs use Premium page blobs. The following disk sizes are supported:

- 500 GB
- 1 TB
- 2 TB
- 4 TB
- 8 TB

Supported configurations for Cloud Volumes ONTAP 9.6 in GCP

Cloud Volumes ONTAP is available in Google Cloud Platform as a single node system. Two pricing options are available: pay as you go and Bring Your Own License (BYOL).

Pay-as-you-go overview

- Offers Cloud Volumes ONTAP in three different licensing options: Explore, Standard, and Premium.
- A 30-day free trial is available for the first Cloud Volumes ONTAP system that you deploy in GCP.
  - There are no hourly software charges, but GCP infrastructure charges still apply (compute, storage, and networking).
  - When the free trial ends, you'll be charged hourly according to the selected license, as long as you subscribed. If you haven't subscribed, the system shuts down.
- Conversions from PAYGO to BYOL aren't currently supported.

- Basic technical support is offered, but you must register and activate the NetApp serial number associated with your system.

  Register pay-as-you-go systems in Cloud Manager

BYOL overview

- Single node license with term-based subscription options like 12 months, 24 months, and more.
- Support is included for the length of the subscription term.
- You can purchase multiple licenses for a Cloud Volumes ONTAP BYOL system to allocate more than 368 TB of capacity.

  For example, you might purchase two licenses to allocate up to 736 TB of capacity to Cloud Volumes ONTAP. Or you could purchase four licenses to get up to 1.4 PB.

Supported configurations by license

Cloud Volumes ONTAP is available in Google Cloud Platform as a single node system.

	Explore	Standard	Premium	BYOL
Supported machine types [1]	custom-4-16384	n1-standard-8	n1-standard-32	• custom-4-16384 • n1-standard-8 • n1-standard-32
Supported disk types [2]	Zonal persistent disks (SSD and standard)			
Cold data tiering to object storage	Not supported	Supported		
Maximum system capacity (disks + object storage)	2 TB	10 TB	368 TB [3]	368 TB per license [3]

Notes:

1. The custom machine type has 4 vCPUs and 16 GB of memory. For details about standard machine types, refer to Google Cloud Documentation: Machine Types.
2. Enhanced write performance is enabled when using SSDs.
3. Disk limits prevent you from reaching the 368 TB capacity limit by using disks alone. You can reach the 368 TB capacity limit by tiering inactive data to object storage.

   Learn more about disk limits in GCP.

4. For Google Cloud Platform region support, see Cloud Volumes Global Regions.

Supported disk sizes

In GCP, an aggregate can contain up to 6 disks that are all the same type and size. The following disk sizes

are supported:

- 100 GB
- 500 GB
- 1 TB
- 2 TB
- 4 TB
- 8 TB
- 16 TB

Storage limits

Storage limits for Cloud Volumes ONTAP 9.6 in AWS

Cloud Volumes ONTAP has storage configuration limits to provide reliable operations. For best performance, do not configure your system at the maximum values.

Maximum system capacity by license

The maximum system capacity for a Cloud Volumes ONTAP system is determined by its license. The maximum system capacity includes disk-based storage plus object storage used for data tiering. NetApp doesn't support exceeding this limit.

For some HA configurations, disk limits prevent you from reaching the 368 TB capacity limit by using disks alone. In those cases, you can reach the 368 TB capacity limit by tiering inactive data to object storage. Refer to capacity and disk limits below for more details.

License	Maximum system capacity (disks + object storage)
Explore	2 TB (data tiering is not supported with Explore)
Standard	10 TB
Premium	368 TB
BYOL	368 TB per license

For HA, is the license capacity limit per node or for the entire HA pair?

The capacity limit is for the entire HA pair. It is not per node. For example, if you use the Premium license, you can have up to 368 TB of capacity between both nodes.

For an HA system in AWS, does mirrored data count against the capacity limit?

No, it doesn't. Data in an AWS HA pair is synchronously mirrored between the nodes so that the data is available in the event of failure. For example, if you purchase an 8 TB disk on node A, Cloud Manager also allocates an 8 TB disk on node B that is used for mirrored data. While 16 TB of capacity was provisioned, only 8 TB counts against the license limit.

Disk and tiering limits by EC2 instance

Cloud Volumes ONTAP uses EBS volumes as disks, with a maximum disk size of 16 TB. The sections below show disk and tiering limits by EC2 instance type because many EC2 instance types have different disk limits. Disk limits are also different between single node systems and HA pairs.

The disk limits below are specific to disks that contain user data. The limits do not include the boot disk and root disk.

Disk limits are shown by instance for Premium and BYOL licenses only because disk limits can’t be reached with Explore or Standard licenses.

Single node with a Premium license

Instance type	Max disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
c4.4xlarge	34	368 TB	368 TB
c4.8xlarge	34	368 TB	368 TB
c5.9xlarge	22	352 TB	368 TB
c5.18xlarge	22	352 TB	368 TB
c5d.4xlarge	22	352 TB	368 TB
c5d.9xlarge	22	352 TB	368 TB
c5d.18xlarge	22	352 TB	368 TB
m4.4xlarge	34	368 TB	368 TB
m5.4xlarge	22	352 TB	368 TB
m5d.8xlarge	22	352 TB	368 TB
r4.2xlarge	34	368 TB	368 TB
r5.2xlarge	22	352 TB	368 TB
r5d.2xlarge	22	352 TB	368 TB

Single node with one or more BYOL licenses

Instance type	Max disks per node	Max system capacity with one license		Max system capacity with multiple licenses	
		Disks alone	Disks + data tiering	Disks alone	Disks + data tiering
c4.4xlarge	34	368 TB	368 TB	544 TB	368 TB x each license

Instance type	Max disks per node	Max system capacity with one license		Max system capacity with multiple licenses	
c4.8xlarge	34	368 TB	368 TB	544 TB	368 TB x each license
c5.9xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
c5.18xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
c5d.4xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
c5d.9xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
c5d.18xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
m4.xlarge	34	368 TB	368 TB	544 TB	368 TB x each license
m4.2xlarge	34	368 TB	368 TB	544 TB	368 TB x each license
m4.4xlarge	34	368 TB	368 TB	544 TB	368 TB x each license
m5.xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
m5.2xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
m5.4xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
m5d.8xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
r4.xlarge	34	368 TB	368 TB	544 TB	368 TB x each license
r4.2xlarge	34	368 TB	368 TB	544 TB	368 TB x each license
r5.xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
r5.2xlarge	22	352 TB	368 TB	352 TB	368 TB x each license
r5d.2xlarge	22	352 TB	368 TB	352 TB	368 TB x each license

HA pairs with a Premium license

Instance type	Max disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
c4.4xlarge	31	368 TB	368 TB
c4.8xlarge	31	368 TB	368 TB
c5.9xlarge	19	304 TB	368 TB
c5.18xlarge	19	304 TB	368 TB
c5d.4xlarge	19	304 TB	368 TB
c5d.9xlarge	19	304 TB	368 TB
c5d.18xlarge	19	304 TB	368 TB
m4.4xlarge	31	368 TB	368 TB
m5.4xlarge	19	304 TB	368 TB
m5d.8xlarge	19	304 TB	368 TB
r4.2xlarge	31	368 TB	368 TB
r5.2xlarge	19	304 TB	368 TB
r5d.2xlarge	19	304 TB	368 TB

HA pairs with one or more BYOL licenses

Instance type	Max disks per node	Max system capacity with one license		Max system capacity with multiple licenses	
		Disks alone	Disks + data tiering	Disks alone	Disks + data tiering
c4.4xlarge	31	368 TB	368 TB	496 TB	368 TB x each license
c4.8xlarge	31	368 TB	368 TB	496 TB	368 TB x each license
c5.9xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
c5.18xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
c5d.4xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
c5d.9xlarge	19	304 TB	368 TB	304 TB	368 TB x each license

Instance type	Max disks per node	Max system capacity with one license		Max system capacity with multiple licenses	
c5d.18xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
m4.xlarge	31	368 TB	368 TB	496 TB	368 TB x each license
m4.2xlarge	31	368 TB	368 TB	496 TB	368 TB x each license
m4.4xlarge	31	368 TB	368 TB	496 TB	368 TB x each license
m5.xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
m5.2xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
m5.4xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
m5d.8xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
r4.xlarge	31	368 TB	368 TB	496 TB	368 TB x each license
r4.2xlarge	31	368 TB	368 TB	496 TB	368 TB x each license
r5.xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
r5.2xlarge	19	304 TB	368 TB	304 TB	368 TB x each license
r5d.2xlarge	19	304 TB	368 TB	304 TB	368 TB x each license

Aggregate limits

Cloud Volumes ONTAP uses AWS volumes as disks and groups them into *aggregates*. Aggregates provide storage to volumes.

Parameter	Limit
Maximum number of aggregates	Single node: Same as the disk limit HA pairs: 18 in a node [1]
Maximum aggregate size	96 TB of raw capacity [2]
Disks per aggregate	1-6 [3]
Maximum number of RAID groups per aggregate	1

Notes:

1. It is not possible to create 18 aggregates on both nodes in an HA pair because doing so would exceed the data disk limit.
2. The aggregate capacity limit is based on the disks that comprise the aggregate. The limit does not include object storage used for data tiering.
3. All disks in an aggregate must be the same size.

Logical storage limits

Logical storage	Parameter	Limit
Storage virtual machines (SVMs)	Maximum number for Cloud Volumes ONTAP (HA pair or single node)	One data-serving SVM and one destination SVM used for disaster recovery. You can activate the destination SVM for data access if there's an outage on the source SVM. [1] The one data-serving SVM spans the entire Cloud Volumes ONTAP system (HA pair or single node).
Files	Maximum size	16 TB
	Maximum per volume	Volume size dependent, up to 2 billion
FlexClone volumes	Hierarchical clone depth [2]	499
FlexVol volumes	Maximum per node	500
	Minimum size	20 MB
	Maximum size	Dependent on the size of the aggregate
Qtrees	Maximum per FlexVol volume	4,995
Snapshot copies	Maximum per FlexVol volume	1,023

Notes:

1. Cloud Manager does not provide any setup or orchestration support for SVM disaster recovery. It also does not support storage-related tasks on an additional SVM. You must use System Manager or the CLI for SVM disaster recovery.
   - SVM Disaster Recovery Preparation Express Guide
   - SVM Disaster Recovery Express Guide
2. Hierarchical clone depth is the maximum depth of a nested hierarchy of FlexClone volumes that can be created from a single FlexVol volume.

iSCSI storage limits

iSCSI storage	Parameter	Limit
LUNs	Maximum per node	1,024
	Maximum number of LUN maps	1,024
	Maximum size	16 TB
	Maximum per volume	512
igroups	Maximum per node	256
Initiators	Maximum per node	512
	Maximum per igroup	128
iSCSI sessions	Maximum per node	1,024
LIFs	Maximum per port	32
	Maximum per portset	32
Portsets	Maximum per node	256

Storage limits for Cloud Volumes ONTAP 9.6 in Azure

Cloud Volumes ONTAP has storage configuration limits to provide reliable operations. For best performance, do not configure your system at the maximum values.

Maximum system capacity by license

The maximum system capacity for a Cloud Volumes ONTAP system is determined by its license. The maximum system capacity includes disk-based storage plus object storage used for data tiering. NetApp doesn't support exceeding this limit.

License	Maximum system capacity (disks + object storage)
Explore	2 TB (data tiering is not supported with Explore)
Standard	10 TB
Premium	368 TB
BYOL	368 TB per license

For HA, is the license capacity limit per node or for the entire HA pair?

The capacity limit is for the entire HA pair. It is not per node. For example, if you use the Premium license, you can have up to 368 TB of capacity between both nodes.

Disk and tiering limits by VM size

The disk limits below are specific to disks that contain user data. The limits do not include the boot disk and root disk. The tables below show the maximum system capacity by VM size with disks or alone, and with disks and cold data tiering to object storage.

Disk limits are shown by VM size for Premium and BYOL licenses only because disk limits can't be reached

with Explore or Standard licenses due to system capacity limits.

- Single node systems can use Standard HDD Managed Disks, Standard SSD Managed Disks, and Premium SSD Managed Disks, with up to 32 TB per disk. The number of supported disks varies by VM size.
- HA systems use Premium page blobs as disks, with up to 8 TB per page blob. The number of supported disks varies by VM size.

Single node with a Premium license

VM size	Max disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
DS5_v2	63	368 TB	368 TB
DS14_v2	63	368 TB	368 TB
DS15_v2	63	368 TB	368 TB

Single node with one or more BYOL licenses

For some VM types, you'll need several BYOL licenses to reach the max system capacity listed below. For example, you'd need 6 BYOL licenses to reach 2 PB with DS5_v2.

VM size	Max disks per node	Max system capacity with one license		Max system capacity with multiple licenses	
		Disks alone	Disks + data tiering	Disks alone	Disks + data tiering
DS3_v2	15	368 TB	368 TB	480 TB	368 TB x each license
DS4_v2	31	368 TB	368 TB	992 TB	368 TB x each license
DS5_v2	63	368 TB	368 TB	2 PB	368 TB x each license
DS13_v2	31	368 TB	368 TB	992 TB	368 TB x each license
DS14_v2	63	368 TB	368 TB	2 PB	368 TB x each license
DS15_v2	63	368 TB	368 TB	2 PB	368 TB x each license

HA pairs with a Premium license

VM size	Max disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
DS5_v2	63	368 TB	368 TB

VM size	Max disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
DS14_v2	63	368 TB	368 TB
DS15_v2	63	368 TB	368 TB

HA pairs with one or more BYOL licenses

For some VM types, you'll need several BYOL licenses to reach the max system capacity listed below. For example, you'd need 3 BYOL licenses to reach 1 PB with DS5_v2.

VM size	Max disks per node	Max system capacity with one license		Max system capacity with multiple licenses	
		Disks alone	Disks + data tiering	Disks alone	Disks + data tiering
DS4_v2	31	368 TB	368 TB	496 TB	368 TB x each license
DS5_v2	63	368 TB	368 TB	1 PB	368 TB x each license
DS13_v2	31	368 TB	368 TB	496 TB	368 TB x each license
DS14_v2	63	368 TB	368 TB	1 PB	368 TB x each license
DS15_v2	63	368 TB	368 TB	1 PB	368 TB x each license

Aggregate limits

Cloud Volumes ONTAP uses Azure storage as disks and groups them into *aggregates*. Aggregates provide storage to volumes.

Parameter	Limit
Maximum number of aggregates	Same as the disk limit
Maximum aggregate size	352 TB of raw capacity for single node [1, 2] 96 TB of raw capacity for HA pairs [1]
Disks per aggregate	1-12 [3]
Maximum number of RAID groups per aggregate	1

Notes:

1. The aggregate capacity limit is based on the disks that comprise the aggregate. The limit does not include object storage used for data tiering.
2. The 352 TB limit is supported starting with 9.6 P3. Releases prior to 9.6 P3 support up to 200 TB of raw capacity in an aggregate on a single node system.

3. All disks in an aggregate must be the same size.

Logical storage limits

Logical storage	Parameter	Limit
Storage virtual machines (SVMs)	Maximum number for Cloud Volumes ONTAP (HA pair or single node)	One data-serving SVM and one destination SVM used for disaster recovery. You can activate the destination SVM for data access if there's an outage on the source SVM. [1] The one data-serving SVM spans the entire Cloud Volumes ONTAP system (HA pair or single node).
Files	Maximum size	16 TB
	Maximum per volume	Volume size dependent, up to 2 billion
FlexClone volumes	Hierarchical clone depth [2]	499
FlexVol volumes	Maximum per node	500
	Minimum size	20 MB
	Maximum size	Azure HA: Dependent on the size of the aggregate [3] Azure single node: 100 TB
Qtrees	Maximum per FlexVol volume	4,995
Snapshot copies	Maximum per FlexVol volume	1,023

Notes:

1. Cloud Manager does not provide any setup or orchestration support for SVM disaster recovery. It also does not support storage-related tasks on an additional SVM. You must use System Manager or the CLI for SVM disaster recovery.
   - SVM Disaster Recovery Preparation Express Guide
   - SVM Disaster Recovery Express Guide
2. Hierarchical clone depth is the maximum depth of a nested hierarchy of FlexClone volumes that can be created from a single FlexVol volume.
3. Less than 100 TB is supported for this configuration because aggregates on HA pairs are limited to 96 TB of *raw* capacity.

iSCSI storage limits

iSCSI storage	Parameter	Limit
LUNs	Maximum per node	1,024
	Maximum number of LUN maps	1,024
	Maximum size	16 TB
	Maximum per volume	512

iSCSI storage	Parameter	Limit
igroups	Maximum per node	256
Initiators	Maximum per node	512
	Maximum per igroup	128
iSCSI sessions	Maximum per node	1,024
LIFs	Maximum per port	32
	Maximum per portset	32
Portsets	Maximum per node	256

Storage limits for Cloud Volumes ONTAP 9.6 in GCP

Cloud Volumes ONTAP has storage configuration limits to provide reliable operations. For best performance, do not configure your system at the maximum values.

Maximum system capacity by license

The maximum system capacity for a Cloud Volumes ONTAP system is determined by its license. The maximum system capacity includes disk-based storage plus object storage used for data tiering. NetApp doesn't support exceeding this limit.

For the Premium and BYOL licenses, disk limits prevent you from reaching the 368 TB capacity limit by using disks alone. You can reach the 368 TB capacity limit by tiering inactive data to object storage. Refer to the disk limits below for more details.

License	Maximum system capacity (disks + object storage)
Explore	2 TB (data tiering is not supported with Explore)
Standard	10 TB
Premium	368 TB
BYOL	368 TB per license

Disk and tiering limits

The table below shows the maximum system capacity with disks alone, and with disks and cold data tiering to object storage. The disk limits are specific to disks that contain user data. The limits do not include the boot disk and root disk.

Parameter	Limit
Maximum disks per system	16
Maximum disk size	16 TB
Maximum system capacity with disks alone	64 TB

Parameter	Limit
Maximum system capacity with disks and cold data tiering to a Google Cloud Storage bucket	• Premium: 368 TB • BYOL: 368 TB per license

Aggregate limits

Cloud Volumes ONTAP groups Google Cloud Platform disks into *aggregates*. Aggregates provide storage to volumes.

Parameter	Limit
Maximum number of aggregates	16
Maximum aggregate size	64 TB of raw capacity [1]
Disks per aggregate	1-6 [2]
Maximum number of RAID groups per aggregate	1

Notes:

1. The aggregate capacity limit is based on the disks that comprise the aggregate. The limit does not include object storage used for data tiering.
2. All disks in an aggregate must be the same size.

Logical storage limits

Logical storage	Parameter	Limit
Storage virtual machines (SVMs)	Maximum number for Cloud Volumes ONTAP	One data-serving SVM and one destination SVM used for disaster recovery. You can activate the destination SVM for data access if there's an outage on the source SVM. [1] The one data-serving SVM spans the entire Cloud Volumes ONTAP system.
Files	Maximum size	16 TB
	Maximum per volume	Volume size dependent, up to 2 billion
FlexClone volumes	Hierarchical clone depth [2]	499
FlexVol volumes	Maximum per node	500
	Minimum size	20 MB
	Maximum size	Dependent on the size of the aggregate
Qtrees	Maximum per FlexVol volume	4,995

Logical storage	Parameter	Limit
Snapshot copies	Maximum per FlexVol volume	1,023

Notes:

1. Cloud Manager does not provide any setup or orchestration support for SVM disaster recovery. It also does not support storage-related tasks on an additional SVM. You must use System Manager or the CLI for SVM disaster recovery.
    - SVM Disaster Recovery Preparation Express Guide
    - SVM Disaster Recovery Express Guide
2. Hierarchical clone depth is the maximum depth of a nested hierarchy of FlexClone volumes that can be created from a single FlexVol volume.

iSCSI storage limits

iSCSI storage	Parameter	Limit
LUNs	Maximum per node	1,024
	Maximum number of LUN maps	1,024
	Maximum size	16 TB
	Maximum per volume	512
igroups	Maximum per node	256
Initiators	Maximum per node	512
	Maximum per igroup	128
iSCSI sessions	Maximum per node	1,024
LIFs	Maximum per port	1
	Maximum per portset	32
Portsets	Maximum per node	256

Known issues for Cloud Volumes ONTAP 9.6

Known issues identify problems that might prevent you from using this release of the product successfully.

There are no known issues in this release specific to Cloud Volumes ONTAP.

You can find known issues for ONTAP software in the ONTAP Release Notes.

Known limitations

Limitations for Cloud Volumes ONTAP 9.6 in all cloud providers

Known limitations identify platforms, devices, or functions that are not supported by this release of the product, or that do not interoperate correctly with it. Review these limitations carefully.

The following limitations apply to Cloud Volumes ONTAP in all cloud providers: AWS, Azure, and GCP.

Software updates must be completed by Cloud Manager

Upgrades of Cloud Volumes ONTAP must be completed from Cloud Manager. You should not upgrade Cloud Volumes ONTAP by using System Manager or the CLI. Doing so can impact system stability.

Cloud Volumes ONTAP deployment must not be modified from your cloud provider's console

Changes to a Cloud Volumes ONTAP configuration from your cloud provider's console results in an unsupported configuration. Any changes to the Cloud Volumes ONTAP resources that Cloud Manager creates and manages can impact system stability and Cloud Manager's ability to manage the system.

Disks and aggregates must be managed from Cloud Manager

All disks and aggregates must be created and deleted directly from Cloud Manager. You should not perform these actions from another management tool. Doing so can impact system stability, hamper the ability to add disks in the future, and potentially generate redundant cloud provider fees.

SnapManager licensing limitation

SnapManager per-server licenses are supported with Cloud Volumes ONTAP. Per-storage system (SnapManager suite) licenses are not supported.

Unsupported ONTAP features

The following features are not supported with Cloud Volumes ONTAP:

- Aggregate-level inline deduplication
- Aggregate-level background deduplication
- Disk maintenance center
- Disk sanitization
- Fibre Channel (FC)
- Flash Pools
- Infinite Volumes
- Interface groups
- Intranode LIF failover
- MetroCluster
- Multi-tenancy (only one data-serving SVM is supported)
- RAID4, RAID-DP, RAID-TEC (RAID0 is supported)
- Service Processor

- SnapLock Compliance mode (Enterprise mode is supported)
- SnapMirror Synchronous
- VLANs

Known limitations for Cloud Volumes ONTAP 9.6 in AWS

The following known limitations are specific to Cloud Volumes ONTAP in Amazon Web Services. Be sure to also review Limitations for Cloud Volumes ONTAP 9.6 in all cloud providers.

Flash Cache limitations

C5D and R5D instance types include local NVMe storage, which Cloud Volumes ONTAP uses as *Flash Cache*. Note the following limitations:

- Compression must be disabled on all volumes to take advantage of the Flash Cache performance improvements.

  You can choose no storage efficiency when creating a volume from Cloud Manager, or you can create a volume and then disable data compression by using the CLI.

- Cache rewarming after a reboot is not supported with Cloud Volumes ONTAP.

False alarms reported by Amazon CloudWatch

Cloud Volumes ONTAP does not release CPUs when idle, so Amazon CloudWatch can report a high CPU warning for the EC2 instance because it sees 100% usage. You can ignore this alarm. The ONTAP statistics command displays the true usage of the CPUs.

Cloud Volumes ONTAP HA pairs do not support immediate storage giveback

After a node reboots, the partner must sync data before it can return the storage. The time that it takes to resync data depends on the amount of data written by clients while the node was down and the data write speed during the time of giveback.

Learn how storage works in a Cloud Volumes ONTAP HA pair running in AWS.

Limitations in the AWS C2S environment

See the Quick Start Guide for the AWS Commercial Cloud Services Environment.

Limitations in AWS GovCloud (US) regions

- Cloud Manager must be deployed in an AWS GovCloud (US) region if you want to launch Cloud Volumes ONTAP instances in any AWS GovCloud (US) region.
- When deployed in an AWS GovCloud (US) region, Cloud Manager cannot discover ONTAP clusters in a NetApp Private Storage for Microsoft Azure configuration or a NetApp Private Storage for SoftLayer configuration.

Known limitations for Cloud Volumes ONTAP 9.6 in Azure

The following known limitations are specific to Cloud Volumes ONTAP in Microsoft Azure.

Be sure to also review Limitations for Cloud Volumes ONTAP 9.6 in all cloud providers.

New deployments aren't supported

New deployments of Cloud Volumes ONTAP 9.6 are no longer supported in Azure. You'll need to deploy Cloud Volumes ONTAP 9.7.

HA limitations

The following limitations affect Cloud Volumes ONTAP HA pairs in Microsoft Azure:

- NFSv4 is not supported. NFSv3 is supported.
- HA pairs are not supported in some regions.

  See the list of supported Azure regions.

Pay-as-you-go not available for CSP partners

If you are a Microsoft Cloud Solution Provider (CSP) partner, you cannot deploy Cloud Volumes ONTAP Explore, Standard, or Premium because pay-as-you-go subscriptions are not available for CSP partners. You must purchase a license and deploy Cloud Volumes ONTAP BYOL.

Known limitations for Cloud Volumes ONTAP 9.6 in GCP

There are no known limitations specific to Cloud Volumes ONTAP in Google Cloud Platform. See the Limitations for Cloud Volumes ONTAP 9.6 in all cloud providers.