



9.9.0 Release Notes

Cloud Volumes ONTAP

NetApp
May 06, 2021

Table of Contents

- 9.9.0 Release Notes 1
 - What's new in Cloud Volumes ONTAP 9.9.0 1
 - Supported configurations 3
 - Storage limits 13
 - Known issues for Cloud Volumes ONTAP 9.9.0 26
 - Known limitations 27

9.9.0 Release Notes

What's new in Cloud Volumes ONTAP 9.9.0

Cloud Volumes ONTAP 9.9.0 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.

Latest update (21 Apr 2021)

In AWS, you can now configure up to 24 storage VMs (SVMs) for disaster recovery (DR). The previous limit was 12 storage VMs used for DR.

[Learn more about storage VM limits.](#)

Latest updates (12 Apr 2021)

A few updates have been made since Cloud Volumes ONTAP 9.9.0 was released.

AWS updates

- Cloud Volumes ONTAP now supports General Purpose SSD (gp3) disks, starting with the 9.7 release. gp3 disks are the lowest-cost SSDs that balance cost and performance for a broad range of workloads.

[Learn more about using gp3 disks with Cloud Volumes ONTAP.](#)

- Cloud Volumes ONTAP no longer supports Cold HDD (sc1) disks.

These EBS disk changes were introduced as part of Cloud Manager 3.9.5.

Azure updates

- New E series VM types are supported:
 - E4s_v3 with single node systems using PAYGO Explore or BYOL
 - E8s_v3 with single node systems using PAYGO Standard or BYOL, and HA pairs using PAYGO Premium or BYOL
 - E64is_v3 with single node systems using PAYGO Premium or BYOL
- Up to 24 storage VMs (SVMs) are supported with Cloud Volumes ONTAP BYOL. Those 24 storage VMs can serve data or be configured for disaster recovery (DR).

The previous limit in Azure was 12 storage VMs used for DR.

Improved write performance

This release includes improved write performance for Cloud Volumes ONTAP in all cloud providers and on all configurations.

Support for new EC2 instance types

Cloud Volumes ONTAP is now supported with the following Amazon EC2 instance types:

- m5a.2xlarge with Standard and BYOL
- m5a.16xlarge with Premium and BYOL
- c5a.12xlarge with Premium and BYOL

Learn more about [M5a instances](#) and [C5a instances](#).

[View supported configurations in AWS.](#)

Support for 24 storage VMs in Azure

24 storage VMs are now supported with Cloud Volumes ONTAP in Azure when you bring your own license (BYOL).

An add-on license is required for each additional *data-serving* storage VM beyond the first storage VM that comes with Cloud Volumes ONTAP by default. Contact your account team to obtain an SVM add-on license.

Storage VMs that you configure for disaster recovery (DR) don't require an add-on license (they are free of charge), but they do count against the storage VM limit.

[Learn more about storage VM limits in Azure.](#)

[Learn how to create data-serving storage VMs for Cloud Volumes ONTAP in Azure.](#)

Required version of the Cloud Manager Connector

The Cloud Manager Connector must be running version 3.9.4 or later to deploy new Cloud Volumes ONTAP 9.9.0 systems and to upgrade existing systems to 9.9.0.

Changes introduced with Cloud Manager 3.9.4

The Cloud Manager 3.9.4 release includes a few enhancements for the management of Cloud Volumes ONTAP, including enhancements to AWS KMS support, shared VPC support in Google Cloud, and reduced IPs in Google Cloud.

Go to the [Cloud Manager Release Notes](#) for more details about the 3.9.4 release.

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 9.9.0 from the 9.8 release. Cloud Manager will prompt you to upgrade your existing Cloud Volumes ONTAP 9.8 systems to the 9.9.0 release.

[Learn how to upgrade when Cloud Manager notifies you.](#)

- 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 9.9.0 in AWS

Two pricing options are available for Cloud Volumes ONTAP: pay as you go and Bring Your Own License (BYOL). For PAYGO, you can choose between Explore, Standard, and Premium. Each of these licensing options enables you to choose a configuration that meets your needs.

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 AWS.
 - There are no hourly software charges, but AWS 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 or HA 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 number of nodes

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.

Supported storage

Cloud Volumes ONTAP supports several types of EBS disks, and S3 object storage for data tiering. The maximum storage capacity is determined by the license that you choose.

Storage support by license

Each license supports a different maximum system capacity. The maximum system capacity includes disk-based storage plus object storage used for data tiering. NetApp doesn't support exceeding this limit.

	Explore	Standard	Premium	BYOL
Maximum system capacity (disks + object storage) ¹	2 TB	10 TB	368 TB ²	368 TB per license ²
Supported disk types	<ul style="list-style-type: none"> • General Purpose SSD (gp3 and gp2) ³ • Provisioned IOPS SSD (io1) ³ • Throughput Optimized HDD (st1) ⁴ 			
Cold data tiering to S3	Not supported	Supported		

1. For an HA pair, the capacity limit is for the entire HA pair. It's not per node. For example, if you use the Premium license, you can have up to 368 TB of capacity between both nodes.
2. 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](#).
3. Enhanced write performance is enabled when using SSDs with Cloud Volumes ONTAP Standard, Premium, and BYOL.
4. Tiering data to object storage is not recommended when using Throughput Optimized HDDs (st1).

Supported disk sizes

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

General Purpose SSDs (gp3 and gp2)	Provisioned IOPS SSDs (io1)	Throughput Optimized HDDs (st1)
<ul style="list-style-type: none"> • 100 GB • 500 GB • 1 TB • 2 TB • 4 TB • 6 TB • 8 TB • 16 TB 	<ul style="list-style-type: none"> • 100 GB • 500 GB • 1 TB • 2 TB • 4 TB • 6 TB • 8 TB • 16 TB 	<ul style="list-style-type: none"> • 500 GB • 1 TB • 2 TB • 4 TB • 6 TB • 8 TB • 16 TB

Supported compute

Each Cloud Volumes ONTAP license supports different EC2 instance types. For your convenience, the table below shows the vCPU, RAM, and bandwidth for each supported instance type. [You should refer to AWS for](#)

[the latest and complete details about EC2 instance types.](#)

The bandwidths shown in the table below match the documented AWS limits for each instance type. These limits don't completely align with what Cloud Volumes ONTAP can provide. For the expected performance, refer to [NetApp Technical Report 4383: Performance Characterization of Cloud Volumes ONTAP in Amazon Web Services with Application Workloads.](#)

License	Supported instance	vCPU	RAM	Flash Cache ¹	Network bandwidth (Gbps)	EBS bandwidth (Mbps)	High write speed ²
Explore and BYOL	m5.xlarge	4	16	Not supported	Up to 10	Up to 4,750	Supported (single node only)
Standard and BYOL	r5.xlarge	4	32	Not supported	Up to 10	Up to 4,750	Supported (single node only)
	m5a.2xlarge	8	32	Not supported	Up to 10	Up to 2,880	Supported
	m5.2xlarge	8	32	Not supported	Up to 10	Up to 4,750	Supported

License	Supported instance	vCPU	RAM	Flash Cache ¹	Network bandwidth (Gbps)	EBS bandwidth (Mbps)	High write speed ²
Premium and BYOL	m5n.2xlarge	8	32	Not supported	Up to 25	Up to 4,750	Supported
	r5.2xlarge	8	64	Not supported	Up to 10	Up to 4,750	Supported
	r5d.2xlarge	8	64	Supported	Up to 10	Up to 4,750	Supported
	c5d.4xlarge	16	32	Supported	Up to 10	4,570	Supported
	m5.4xlarge	16	64	Not supported	Up to 10	4,750	Supported
	m5d.8xlarge	32	128	Supported	10	6,800	Supported
	r5.8xlarge	32	256	Not supported	10	6,800	Supported
	c5.9xlarge	36	72	Not supported	10	9,500	Supported
	c5d.9xlarge	36	72	Supported	10	9,500	Supported
	c5n.9xlarge	36	96	Not supported	50	9,500	Supported
	c5a.12xlarge	48 ⁴	96	Not supported	12	4,750	Supported
	c5.18xlarge	48 ⁴	144	Not supported	25	19,000	Supported
	c5d.18xlarge	48 ⁴	144	Supported	25	19,000	Supported
	m5d.12xlarge	48	192	Supported	12	9,500	Supported
	c5n.18xlarge	48 ⁴	192	Not supported	100	19,000	Supported
	m5a.16xlarge	48 ⁴	256	Not supported	12	9,500	Supported
	m5.16xlarge	48 ⁴	256	Not supported	20	13,600	Supported
r5.12xlarge ³	48	384	Not supported	10	9,500	Supported	

1. Some 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's 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 about Flash Cache](#).
2. Cloud Volumes ONTAP supports high write speed with most instance types when using an HA pair. High write speed is supported with all instance types when using a single node system. [Learn more about](#)

[choosing a write speed.](#)

3. The r5.12xlarge instance type has a known limitation with supportability. If a node unexpectedly reboots due to a panic, the system might not collect core files used to troubleshoot and root cause the problem. The customer accepts the risks and limited support terms and bears all support responsibility if this condition occurs. This limitation affects newly deployed HA pairs and HA pairs upgraded from 9.8. The limitation does not affect newly deployed single node systems.
4. While these EC2 instance types support more than 48 vCPUs, Cloud Volumes ONTAP supports up to 48 vCPUs.
5. When you choose an EC2 instance type, you can specify whether it is a shared instance or a dedicated instance.
6. Cloud Volumes ONTAP can run on either a Reserved or On-demand EC2 instance. Solutions that use other instance types aren't supported.

Supported regions

For AWS region support, see [Cloud Volumes Global Regions](#).

Supported configurations for Cloud Volumes ONTAP 9.9.0 in Azure

Cloud Volumes ONTAP is available in Azure as a single node system or an HA pair. 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 Azure.

There are no hourly software charges, but Azure infrastructure charges still apply (compute, storage, and networking).

- 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 or HA 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 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	<ul style="list-style-type: none"> • DS3_v2 • E4s_v3 	<ul style="list-style-type: none"> • DS4_v2 • DS13_v2 • E8s_v3 	<ul style="list-style-type: none"> • DS5_v2 • DS14_v2 • DS15_v2 • E32s_v3 ¹ • E48s_v3 ¹ • E64is_v3 ¹ 	<ul style="list-style-type: none"> • DS3_v2 • DS4_v2 • DS5_v2 • DS13_v2 • DS14_v2 • DS15_v2 • E4s_v3 • E8s_v3 • E32s_v3 ¹ • E48s_v3 ¹ • E64is_v3 ¹ • L8s_v2 ²
Supported disk types ³	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. This VM type uses an [Ultra SSD](#) for VNVRAM, which provides better write performance.
2. This VM type includes 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. Enhanced write performance is enabled when using SSDs, but not when using the DS3_v2 virtual machine type.
4. For Azure region support, see [Cloud Volumes Global Regions](#).

- Cloud Volumes ONTAP can run on either a Reserved or On-demand VM instance from your cloud provider. Solutions that use other VM instance types aren't supported.

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	<ul style="list-style-type: none"> DS4_v2 DS13_v2 	<ul style="list-style-type: none"> DS5_v2 ¹ DS14_v2 ¹ DS15_v2 ¹ E8s_v3 ¹ E48s_v3 ¹ 	<ul style="list-style-type: none"> DS4_v2 DS5_v2 ¹ DS13_v2 DS14_v2 ¹ DS15_v2 ¹ E8s_v3 ¹ E48s_v3 ¹
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:

- Cloud Volumes ONTAP supports high write speed with these VM types when using an HA pair. High write speed is supported with all instance types when using a single node system. [Learn more about choosing a write speed.](#)
- For Azure region support, see [Cloud Volumes Global Regions.](#)
- Cloud Volumes ONTAP can run on either a Reserved or On-demand VM instance from your cloud provider. Solutions that use other VM instance types aren't supported.

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
<ul style="list-style-type: none"> • 500 GB • 1 TB • 2 TB • 4 TB • 8 TB • 16 TB • 32 TB 	<ul style="list-style-type: none"> • 100 GB • 500 GB • 1 TB • 2 TB • 4 TB • 8 TB • 16 TB • 32 TB 	<ul style="list-style-type: none"> • 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 9.9.0 in GCP

Cloud Volumes ONTAP is available in Google Cloud Platform as a single node system or an HA pair. 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 or HA 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 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 GCP.

	Explore	Standard	Premium	BYOL
Supported machine types ¹	<ul style="list-style-type: none"> • custom-4-16384 • n2-standard-4 	<ul style="list-style-type: none"> • n1-standard-8 • n2-standard-8 	<ul style="list-style-type: none"> • n1-standard-32 • n2-standard-32 	<ul style="list-style-type: none"> • custom-4-16384 • n1-standard-8 • n1-standard-32 • n2-standard-4 • n2-standard-8 • n2-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.](#)

- The Cloud Manager interface shows an additional supported machine type for Standard and BYOL: n1-highmem-4. However, this machine type isn't meant for production environments. We've made it available for a specific lab environment only.
- For Google Cloud Platform region support, see [Cloud Volumes Global Regions](#).
- Cloud Volumes ONTAP can run on either a Reserved or On-demand VM instance from your cloud provider. Solutions that use other VM instance types aren't supported.

HA pairs

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

	Explore	Standard	Premium	BYOL
Supported machine types	<ul style="list-style-type: none"> • custom-4-16384 • n2-standard-4 	<ul style="list-style-type: none"> • n1-standard-8 • n2-standard-8 	<ul style="list-style-type: none"> • n1-standard-32 • n2-standard-32 	<ul style="list-style-type: none"> • custom-4-16384 • n1-standard-8 • n1-standard-32 • n2-standard-4 • n2-standard-8 • n2-standard-32
Supported disk types ¹	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 ²	368 TB per license ²

Notes:

- 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](#).
- Enhanced write performance is enabled when using SSDs.
- 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.](#)

- The Cloud Manager interface shows an additional supported machine type for Standard and BYOL: n1-highmem-4. However, this machine type isn't meant for production environments. We've made it available for a specific lab environment only.
- For Google Cloud Platform region support, see [Cloud Volumes Global Regions](#).
- Cloud Volumes ONTAP can run on either a Reserved or On-demand VM instance from your cloud provider. Solutions that use other VM instance types aren't supported.

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
- 64 TB

Storage limits

Storage limits for Cloud Volumes ONTAP 9.9.0 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 the system capacity limit. If you reach the licensed capacity limit, Cloud Manager displays an action required message and no longer allows you to add additional disks.

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 family because many EC2 instance types have different disk limits. Disk limits are also different between single node systems and HA pairs.

Note the following:

- c4, m4, and r4 instance types are not supported with new Cloud Volumes ONTAP 9.9.0 systems. However, we're still showing disk limits for these instance types because you can upgrade a system to the 9.9.0 release when running on one of these instance types.
- The disk limits below are specific to disks that contain user data. The limits do not include the boot disk and root disk.
- Limits are shown for Premium and BYOL licenses only because capacity limits can't be reached with Explore or Standard licenses.
- You can now purchase multiple licenses for a Cloud Volumes ONTAP BYOL system to allocate more than 368 TB of capacity. The number of licenses that you can purchase for a single node system or HA pair is unlimited. Be aware that disk limits can prevent you from reaching the capacity limit by using disks alone. You can go beyond the disk limit by [tiering inactive data to object storage](#). [Learn how to add additional system licenses to Cloud Volumes ONTAP](#).

Single node with a Premium license

Instance family	Max disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
c5, m5, and r5 instances	21 ¹	336 TB	368 TB
c4, m4, and r4 instances	34	368 TB	368 TB

1. 21 data disks is the limit for *new* deployments of Cloud Volumes ONTAP. If you upgrade a system that was created with version 9.7 or earlier, then the system continues to support 22 disks. One less data disk is supported on new systems that use these instance types because of the addition of a core disk starting with the 9.8 release.

Single node with one or more BYOL licenses

Instance family	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
c5, m5, and r5 instances	21 ¹	336 TB	368 TB	336 TB	368 TB x each license

Instance family	Max disks per node	Max system capacity with one license		Max system capacity with multiple licenses	
c4, m4, and r4 instances	34	368 TB	368 TB	544 TB	368 TB x each license

- 21 data disks is the limit for *new* deployments of Cloud Volumes ONTAP. If you upgrade a system that was created with version 9.7 or earlier, then the system continues to support 22 disks. One less data disk is supported on new systems that use these instance types because of the addition of a core disk starting with the 9.8 release.

HA pairs with a Premium license

Instance family	Max disks per node	Max system capacity with disks	
		alone	and data tiering
c5, m5, and r5 instances	18 ¹	288 TB	368 TB
c4, m4, and r4 instances	31	368 TB	368 TB

- 18 data disks is the limit for *new* deployments of Cloud Volumes ONTAP. If you upgrade a system that was created with version 9.7 or earlier, then the system continues to support 19 disks. One less data disk is supported on new systems that use these instance types because of the addition of a core disk starting with the 9.8 release.

HA pairs with one or more BYOL licenses

Instance family	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
c5, m5, and r5 instances	18 ¹	288 TB	368 TB	288 TB	368 TB x each license
c4, m4, and r4 instances	31	368 TB	368 TB	496 TB	368 TB x each license

- 18 data disks is the limit for *new* deployments of Cloud Volumes ONTAP. If you upgrade a system that was created with version 9.7 or earlier, then the system continues to support 19 disks. One less data disk is supported on new systems that use these instance types because of the addition of a core disk starting with the 9.8 release.

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

Parameter	Limit
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's 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.

Storage VM limits

Limit for BYOL with C5, M5, or R5 instances

Up to 24 storage VMs are supported with Cloud Volumes ONTAP BYOL when you use a C5, M5, or R5 instance type. But the limit can be lower, depending on the EC2 instance type that you use. The limits per instance are listed in the section below.

Those 24 storage VMs can serve data or be configured for disaster recovery (DR).

An add-on license is required for each additional *data-serving* storage VM beyond the first storage VM that comes with Cloud Volumes ONTAP by default. Contact your account team to obtain a storage VM add-on license.

Storage VMs that you configure for disaster recovery (DR) don't require an add-on license (they are free of charge), but they do count against the storage VM limit. For example, if you have 12 data-serving storage VMs and 12 storage VMs configured for disaster recovery, then you've reached the limit and can't create any additional storage VMs.

[Learn how to create additional storage VMs.](#)

Limit for all other configurations

All PAYGO configurations and all other BYOL configurations support one data-serving storage VM and one destination storage VM used for disaster recovery.

Storage VM limit by EC2 instance type

When you create an additional storage VM, you need to allocate private IP addresses to port e0a. The table below identifies the maximum number of private IPs per interface, as well as the number of IP addresses that are available on port e0a after Cloud Volumes ONTAP has been deployed. The number of available IP addresses directly affects the maximum number of storage VMs for that configuration.

Configuration	Instance type	Max private IPs per interface	IPs remaining after deployment ¹	Max storage VMs without a mgmt LIF ^{2,3}	Max storage VMs with a mgmt LIF ^{2,3}
Single node	*.2xlarge	15	9	10	5
	*.4xlarge	30	24	24	12
	*.8xlarge	30	24	24	12
	*.9xlarge	30	24	24	12
	*.12xlarge	30	24	24	12
	*.16xlarge	50	44	24	12
	*.18xlarge	50	44	24	12
HA pair in single AZ	*.2xlarge	15	10	11	5
	*.4xlarge	30	25	24	12
	*.8xlarge	30	25	24	12
	*.9xlarge	30	25	24	12
	*.12xlarge	30	25	24	12
	*.16xlarge	50	45	24	12
	*.18xlarge	50	45	24	12
HA pair in multi AZs	*.2xlarge	15	12	13	13
	*.4xlarge	30	27	24	24
	*.8xlarge	30	27	24	24
	*.9xlarge	30	27	24	24
	*.12xlarge	30	27	24	24
	*.16xlarge	50	47	24	24
	*.18xlarge	50	47	24	24

1. This number indicates how many *remaining* private IP addresses are available on port e0a after Cloud Volumes ONTAP is deployed and set up. For example, a *.2xlarge system supports a maximum of 15 IP addresses per network interface. When an HA pair is deployed in a single AZ, 5 private IP addresses are allocated to port e0a. As a result, an HA pair that uses a *.2xlarge instance type has 10 private IP addresses remaining for additional storage VMs.
2. The number listed in these columns includes the initial storage VM that Cloud Manager creates by default. For example, if 24 is listed in this column, it means that you can create 23 additional storage VMs for a total of 24.
3. A management LIF for the storage VM is optional. A management LIF provides a connection to management tools like SnapCenter.

Because it requires a private IP address, it will limit the number of additional storage VMs that you can create. The only exception is an HA pair in multiple AZs. In that case, the IP address for the management LIF is a *floating* IP address so it doesn't count against the *private* IP limit.

File and volume limits

Logical storage	Parameter	Limit
Files	Maximum size	16 TB
	Maximum per volume	Volume size dependent, up to 2 billion
FlexClone volumes	Hierarchical clone depth ¹	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

1. 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 9.9.0 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 the system capacity limit. If you reach the licensed capacity limit, Cloud Manager displays an action required message and no longer allows you to add additional disks.

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 root disk, core disk, and VNVRAM.

The tables below show the maximum system capacity by VM size with disks 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.



You can now purchase multiple licenses for a Cloud Volumes ONTAP BYOL system to allocate more than 368 TB of capacity. The number of licenses that you can purchase for a single node system or HA pair is unlimited. Be aware that disk limits can prevent you from reaching the capacity limit by using disks alone. You can go beyond the disk limit by [tiering inactive data to object storage](#). [Learn how to add additional system licenses to Cloud Volumes ONTAP](#).

Single node with a Premium license

VM size	Max data disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
DS5_v2	61	368 TB	368 TB
DS14_v2	61	368 TB	368 TB
DS15_v2	61	368 TB	368 TB

VM size	Max data disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
E32s_v3	29	368 TB	368 TB
E48s_v3	29	368 TB	368 TB
E64is_v3	29	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 1.95 PB with DS5_v2.

VM size	Max data 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	13	368 TB	368 TB	416 TB	368 TB x each license
DS4_v2	29	368 TB	368 TB	928 TB	368 TB x each license
DS5_v2	61	368 TB	368 TB	1.95 PB	368 TB x each license
DS13_v2	29	368 TB	368 TB	928 TB	368 TB x each license
DS14_v2	61	368 TB	368 TB	1.95 PB	368 TB x each license
DS15_v2	61	368 TB	368 TB	1.95 PB	368 TB x each license
E4s_v3	5	160 TB	368 TB	160 TB	368 TB x each license
E8s_v3	13	368 TB	368 TB	416 TB	368 TB x each license
E32s_v3	29	368 TB	368 TB	928 TB	368 TB x each license
E48s_v3	29	368 TB	368 TB	928 TB	368 TB x each license
E64is_v3	29	368 TB	368 TB	928 TB	368 TB x each license
L8s_v2	13	368 TB	368 TB	416 TB	368 TB x each license

HA pairs with a Premium license

VM size	Max data disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
DS5_v2	61	368 TB	368 TB
DS14_v2	61	368 TB	368 TB
DS15_v2	61	368 TB	368 TB
E8s_v3	13	208 TB	368 TB
E48s_v3	29	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 976 TB with DS5_v2.

VM size	Max data 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	29	368 TB	368 TB	464 TB	368 TB x each license
DS5_v2	61	368 TB	368 TB	976 TB	368 TB x each license
DS13_v2	29	368 TB	368 TB	464 TB	368 TB x each license
DS14_v2	61	368 TB	368 TB	976 TB	368 TB x each license
DS15_v2	61	368 TB	368 TB	976 TB	368 TB x each license
E8s_v3	13	208 TB	368 TB	208 TB	368 TB x each license
E48s_v3	29	368 TB	368 TB	464 TB	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

Parameter	Limit
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.

Storage VM limits

Limit for BYOL

Up to 24 storage VMs (SVMs) are supported with Cloud Volumes ONTAP BYOL. Those 24 storage VMs can serve data or be configured for disaster recovery (DR). Each storage VM can have up to three LIFs where two are data LIFs and one is an SVM management LIF.

These are the tested limits. While it is theoretically possible to configure additional storage VMs, it's not supported.

An add-on license is required for each additional *data-serving* storage VM beyond the first storage VM that comes with Cloud Volumes ONTAP by default. Contact your account team to obtain a storage VM add-on license.

Storage VMs that you configure for disaster recovery (DR) don't require an add-on license (they are free of charge), but they do count against the storage VM limit. For example, if you have 12 data-serving storage VMs and 12 storage VMs configured for disaster recovery, then you've reached the limit and can't create any additional storage VMs.

[Learn how to create additional storage VMs.](#)

Limit for PAYGO

All PAYGO configurations support one data-serving storage VM and one destination storage VM used for disaster recovery.

File and volume limits

Logical storage	Parameter	Limit
Files	Maximum size	16 TB
	Maximum per volume	Volume size dependent, up to 2 billion
FlexClone volumes	Hierarchical clone depth ²	499

Logical storage	Parameter	Limit
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
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 9.9.0 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 the system capacity limit. If you reach the licensed capacity limit, Cloud Manager displays an action required message and no longer allows you to add additional disks.

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

For an HA pair, is the licensed 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 pair, does mirrored data count against the licensed capacity limit?

No, it doesn't. Data in an HA pair is synchronously mirrored between the nodes so that the data is available in the event of failure in Google Cloud. 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

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 data disks	<ul style="list-style-type: none">• 124 for single node systems• 123 per node for HA pairs
Maximum disk size	64 TB
Maximum system capacity with disks alone	256 TB ¹

Parameter	Limit
Maximum system capacity with disks and cold data tiering to a Google Cloud Storage bucket	<ul style="list-style-type: none"> • Premium: 368 TB • BYOL: 368 TB per license

¹ This limit is defined by virtual machine limits in Google Cloud Platform.

Aggregate limits

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

Parameter	Limit
Maximum number of data aggregates ¹	<ul style="list-style-type: none"> • 99 for single node • 64 for an entire HA pair
Maximum aggregate size	256 TB of raw capacity ²
Disks per aggregate	1-6 ³
Maximum number of RAID groups per aggregate	1

Notes:

1. The maximum number of data aggregates doesn't include the root aggregate.
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

Logical storage	Parameter	Limit
FlexVol volumes	Maximum per node	500
	Minimum size	20 MB
	Maximum size	100 TB
Qtrees	Maximum per FlexVol volume	4,995
Snapshot copies	Maximum per FlexVol volume	1,023

Notes:

- 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](#)
- 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 9.9.0

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 9.9.0 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.

Cloud Volumes ONTAP supports Reserved and On-demand VM instances

Cloud Volumes ONTAP can run on either a Reserved or On-demand VM instance from your cloud provider. Other types of VM instances aren't supported.

Automatic application resource management solutions shouldn't be used

Automatic application resource management solutions should not manage Cloud Volumes ONTAP systems. Doing so can result in a change to an unsupported configuration. For example, the solution might change Cloud Volumes ONTAP to an unsupported VM instance type.

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

- FabricPool mirroring
- Fibre Channel (FC)
- Flash Pools
- Infinite Volumes
- Interface groups
- Intranode LIF failover
- MetroCluster
- ONTAP S3
- 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 9.9.0 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 9.9.0 in all cloud providers](#).

AWS Outpost limitations

If you have an AWS Outpost, you can deploy Cloud Volumes ONTAP in that Outpost by selecting the Outpost VPC in the Working Environment wizard. The experience is the same as any other VPC that resides in AWS. Note that you will need to first deploy a Connector in your AWS Outpost.

There are a few limitations to point out:

- Only single node Cloud Volumes ONTAP systems are supported at this time
- The EC2 instances that you can use with Cloud Volumes ONTAP are limited to what's available in your Outpost
- Only General Purpose SSDs (gp2) are supported at this time

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.](#)

Known limitations for Cloud Volumes ONTAP 9.9.0 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 9.9.0 in all cloud providers](#).

Flash Cache limitations

The Standard_L8s_v2 VM type includes local NVMe storage, which Cloud Volumes ONTAP uses as *Flash Cache*. Note the following limitations for Flash Cache:

- 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.

HA limitations

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

- NFSv4 isn't supported. NFSv3 is supported.
- HA pairs aren't 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 9.9.0 in GCP

There are no known limitations specific to Cloud Volumes ONTAP in Google Cloud Platform. See the [Limitations for Cloud Volumes ONTAP 9.9.0 in all cloud providers](#).

Copyright Information

Copyright © 2021 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system-without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.