



# Cloud Volumes ONTAP 9.4 Release Notes

Cloud Volumes ONTAP 9.4 release notes

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# Cloud Volumes ONTAP 9.4 Release Notes

# What's new in Cloud Volumes ONTAP 9.4

Cloud Volumes ONTAP 9.4 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.

## Support for pay-as-you-go in the AWS GovCloud (US) region

The pay-as-you-go version of Cloud Volumes ONTAP is now supported in the AWS GovCloud (US) region. This is in addition to supporting Cloud Volumes ONTAP BYOL in the GovCloud (US) region.

You can deploy Cloud Volumes ONTAP in the GovCloud (US) region just like any other region. Go to NetApp Cloud Central and launch Cloud Manager in GovCloud (US). Then launch Cloud Volumes ONTAP PAYGO or BYOL by creating a new working environment in Cloud Manager.

## Tiering cold data with Cloud Volumes ONTAP Premium and BYOL

The 9.2 release introduced automated data tiering between a performance tier (SSD or HDD) and a capacity tier (an object store). The cold data sent to the capacity tier included Snapshot copies of read-write volumes (the *Snapshot only* tiering policy) or data from destination volumes (the *backup* tiering policy).

With Cloud Volumes ONTAP 9.4 Premium and BYOL, you now have a third option: you can use the *auto* tiering policy to tier cold data blocks in a read-write volume to a capacity tier. The cold data includes not just Snapshot copies but also cold user data from the active file system.

If read by random reads, the cold data blocks in the capacity tier become hot and move to the performance tier. If read by sequential reads, such as those associated with index and antivirus scans, the cold data blocks stay cold and do not move to the performance tier.

You can choose the tiering policy when you create or edit a volume in Cloud Manager. For details, refer to [Cloud Manager documentation](#).

## Data tiering in Microsoft Azure

You can now reduce your Azure storage costs by combining a performance tier for hot data (Premium or Standard managed disks) with a capacity tier for cold data (Azure Blob storage). The same tiering policies that are supported in AWS are also supported in Azure: auto, Snapshot only, and backup.



Data tiering is not supported with the DS3\_v2 virtual machine type.

You can choose the tiering policy when you create or edit a volume in Cloud Manager. For details, refer to [Cloud Manager documentation](#).

## Data tiering with Provisioned IOPS SSDs

Data tiering is now supported in AWS with Provisioned IOPS SSDs. You can use these SSDs as the

performance tier for hot data with Amazon S3 as the capacity tier for cold data.

## Improved performance when tiering data

The enhanced write performance that was introduced in the 9.2 and 9.3 releases is now supported with volumes that tier cold data to an object store capacity tier. This applies to volumes created on new SSD aggregates in Cloud Volumes ONTAP 9.4.

## Improved performance for multiple workloads in AWS

Cloud Volumes ONTAP now has additional networking bandwidth in AWS, which provides improved performance for systems with multiple workloads. The additional bandwidth is available for the following EC2 instance types when you upgrade to 9.4 and when you launch new 9.4 systems:

- m4.xlarge
- m4.2xlarge
- m4.4xlarge
- c4.4xlarge
- c4.8xlarge

## EC2 instance types no longer supported

All versions of Cloud Volumes ONTAP no longer support several EC2 instance types. Existing systems running these instance types will continue to operate normally; however, NetApp strongly recommends changing to a different instance type.

To review pricing differences between instance types and NetApp licenses, go to the AWS Marketplace for [single-node systems](#) and for [HA pairs](#).

| Instance type no longer supported | Recommended instance type |
|-----------------------------------|---------------------------|
| c3.2xlarge                        | m4.xlarge                 |
| c4.2xlarge                        | m4.2xlarge                |
| m3.xlarge                         | m4.xlarge                 |
| m3.2xlarge                        | m4.2xlarge                |
| r3.xlarge                         | m4.2xlarge                |
| r3.2xlarge                        | r4.2xlarge                |



M3 and R3 instance types are not supported with data tiering and enhanced performance, so moving to the M4 and R4 instance types allows you to take advantage of those Cloud Volumes ONTAP features.

## 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 9.4 from the 9.3 release.

To understand version requirements, refer to [ONTAP 9 Documentation: Cluster update requirements](#).

- 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

Cloud Volumes ONTAP is available in AWS and 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.

## Cloud Volumes ONTAP for AWS

In AWS, you can deploy Cloud Volumes ONTAP as a single system or an HA pair.

|   | Explore  | Standard   | Premium   | BYOL   |
|---|--|--|---|--|
| <b>EC2 instance types</b>                               | m4.xlarge  | <ul style="list-style-type: none"><li>• m4.2xlarge</li><li>• r4.xlarge</li></ul> | <ul style="list-style-type: none"><li>• c4.4xlarge</li><li>• c4.8xlarge</li><li>• m4.4xlarge</li><li>• r4.2xlarge</li></ul> | <ul style="list-style-type: none"><li>• c4.4xlarge</li><li>• c4.8xlarge</li><li>• m4.xlarge</li><li>• m4.2xlarge</li><li>• m4.4xlarge</li><li>• r4.xlarge</li><li>• r4.2xlarge</li></ul> |
| <b>Underlying storage</b>                               | General Purpose SSDs, Provisioned IOPS SSDs, Throughput Optimized HDDs, and Cold HDDs, up to 16 TiB per disk |  |   |  |
| <b>Maximum system capacity (disks + object storage)</b> | 2 TiB  | 10 TiB   | 368 TiB   | 368 TiB per license  |

Notes:

1. If you enable data tiering, a system's capacity limit stays the same. The capacity limit includes both disks and object storage.
2. Data tiering is supported with Cloud Volumes ONTAP Standard, Premium, and BYOL.
3. When you choose an EC2 instance type, you can specify whether it is a shared instance or a dedicated instance.
4. Enhanced write performance is supported when using EBS SSDs with Cloud Volumes ONTAP Standard, Premium, and BYOL.
5. For AWS region support, see [Cloud Volumes Global Regions](#).

## Cloud Volumes ONTAP for Azure

In Azure, you can deploy Cloud Volumes ONTAP as a single node system.

|   | Explore  | Standard  | Premium   | BYOL   |
|---|--|---|---|--|
| <b>Virtual machine types</b>                            | DS3_v2   | <ul style="list-style-type: none"> <li>• DS4_v2</li> <li>• DS13_v2</li> </ul> | <ul style="list-style-type: none"> <li>• DS5_v2</li> <li>• DS14_v2</li> </ul> | <ul style="list-style-type: none"> <li>• DS3_v2</li> <li>• DS4_v2</li> <li>• DS5_v2</li> <li>• DS13_v2</li> <li>• DS14_v2</li> </ul> |
| <b>Underlying storage</b>                               | Standard HDD Managed Disks, Standard SSD Managed Disks, and Premium SSD Managed Disks, up to 32 TiB per disk |   |   |  |
| <b>Maximum system capacity (disks + object storage)</b> | 2 TiB  | 10 TiB  | 368 TiB   | 368 TiB per license  |

Notes:

1. If you enable data tiering, a system's capacity limit stays the same. The capacity limit includes both disks and object storage.
2. Data tiering is not supported with the DS3\_v2 virtual machine type.
3. Enhanced write performance is enabled when using Azure Premium Storage disks, but not when using the DS3\_v2 virtual machine type.
4. For Azure region support, see [Cloud Volumes Global Regions](#).



# Storage limits

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.

In Azure, disk limits prevent you from reaching the 368 TiB capacity limit by using disks alone. In those cases, you can reach the 368 TiB capacity limit by [tiering inactive data to object storage](#). Refer to [capacity and disk limits by Azure VM size](#) for more details.

| License  | Maximum system capacity (disks + object storage)   |
|----------|--|
| Explore  | 2 TiB (data tiering is not supported with Explore) |
| Standard | 10 TiB   |
| Premium  | 368 TiB  |
| BYOL     | 368 TiB 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 TiB 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 TiB disk on node A, Cloud Manager also allocates an 8 TiB disk on node B that is used for mirrored data. While 16 TiB of capacity was provisioned, only 8 TiB counts against the license limit.

## Aggregate and disk limits for Cloud Volumes ONTAP in AWS

In Cloud Volumes ONTAP 9.4, all EC2 instance types can reach the 368 TiB capacity limit using EBS storage alone, or by using EBS storage and tiering to S3 (both single node and HA).

| Physical storage            | Parameter   | Limit  |
|-----------------------------|---|--|
| <b>Aggregates and disks</b> | Maximum number of aggregates                                    | 34 for single-node configurations<br>18 per node in an HA configuration <sup>1</sup> |
|                             | Maximum aggregate size  | 96 TiB of raw capacity <sup>2</sup>  |
|                             | Disks per aggregate   | 1-6 <sup>3</sup>   |
|                             | Maximum disk size   | 16 TiB   |
|                             | Maximum number of data disks across all aggregates <sup>4</sup> | 34 for single-node configurations<br>31 per node in an HA configuration              |
| <b>RAID groups</b>          | Maximum 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.
4. The data disk limit is specific to disks that contain user data. The boot disk and root disk for each node are not included in this limit.

## Aggregate and disk limits for Cloud Volumes ONTAP in Azure

| Physical storage            | Parameter   | Limit  |
|-----------------------------|---|--|
| <b>Aggregates and disks</b> | Maximum number of aggregates                                    | Same as the disk limit                         |
|                             | Maximum aggregate size  | 200 TiB of raw capacity <sup>1</sup>           |
|                             | Disks per aggregate   | 1-12 <sup>2</sup>                              |
|                             | Maximum disk size   | 32 TiB   |
|                             | Maximum number of data disks across all aggregates <sup>3</sup> | Depends on VM size. <a href="#">See below.</a> |
| <b>RAID groups</b>          | Maximum 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.
3. The data disk limit is specific to disks that contain user data. The boot disk and root disk for each node are not included in this limit.

## Capacity and disk limits by Azure VM size

In Azure, single node systems can use Standard HDD Managed Disks, Standard SSD Managed Disks, and Premium SSD Managed Disks, with up to 32 TiB per disk. The number of supported disks varies by VM size.

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 with a Premium license

| VM size | Max disks per node | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|---------|--------------------|--------------------------------------|---|
| DS3_v2  | 15                 | 368 TiB                              | Tiering not supported                           |
| DS4_v2  | 31                 | 368 TiB                              | 368 TiB   |
| DS5_v2  | 63                 | 368 TiB                              | 368 TiB   |
| DS13_v2 | 31                 | 368 TiB                              | 368 TiB   |
| DS14_v2 | 63                 | 368 TiB                              | 368 TiB   |

### 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 PiB 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 TiB                              | Tiering not supported | 480 TiB                                    | Tiering not supported  |
| DS4_v2  | 31                 | 368 TiB                              | 368 TiB               | 992 TiB                                    | 368 TiB x each license |
| DS5_v2  | 63                 | 368 TiB                              | 368 TiB               | 2 PiB                                      | 368 TiB x each license |
| DS13_v2 | 31                 | 368 TiB                              | 368 TiB               | 992 TiB                                    | 368 TiB x each license |
| DS14_v2 | 63                 | 368 TiB                              | 368 TiB               | 2 PiB                                      | 368 TiB x each license |

## Logical storage limits

| Logical storage                        | Parameter   | Limit  |
|--|---|--|
| <b>Storage virtual machines (SVMs)</b> | 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. <sup>1</sup><br><br>The one data-serving SVM spans the entire Cloud Volumes ONTAP system (HA pair or single node). |
|  |   |  |
| <b>Files</b>                           | Maximum size  | 16 TiB   |
|  | Maximum per volume  | Volume size dependent, up to 2 billion   |
| <b>FlexClone volumes</b>               | Hierarchical clone depth <sup>2</sup>                           | 499  |
| <b>FlexVol volumes</b>                 | Maximum per node  | 500  |
|  | Minimum size  | 20 MB  |
|  | Maximum size  | AWS: Dependent on the size of the aggregate <sup>3</sup><br>Azure: 100 TiB   |
| <b>Qtrees</b>                          | Maximum per FlexVol volume                                      | 4,995  |
| <b>Snapshot copies</b>                 | 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 TiB is supported because aggregates for this configuration are limited to 96 TiB of *raw* capacity.

## iSCSI storage limits

| iSCSI storage  | Parameter                  | Limit  |
|----------------|----------------------------|--------|
| <b>LUNs</b>    | Maximum per node           | 1,024  |
|                | Maximum number of LUN maps | 1,024  |
|                | Maximum size               | 16 TiB |
|                | Maximum per volume         | 512    |
| <b>igroups</b> | Maximum per node           | 256    |

| <b>iSCSI storage</b>  | <b>Parameter</b>    | <b>Limit</b> |
|-----------------------|---------------------|--------------|
| <b>Initiators</b>     | Maximum per node    | 512          |
|                       | Maximum per igroup  | 128          |
| <b>iSCSI sessions</b> | Maximum per node    | 1,024        |
| <b>LIFs</b>           | Maximum per port    | 32           |
|                       | Maximum per portset | 32           |
| <b>Portsets</b>       | Maximum per node    | 256          |

# Known issues

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

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.

## General limitations

The following limitations apply to Cloud Volumes ONTAP in AWS and in Azure.

### Maximum concurrent replication operations

The maximum number of concurrent SnapMirror or SnapVault transfers for Cloud Volumes ONTAP is 100 per node, regardless of the instance type or machine 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.

### Encryption is not supported on boot and root disks

If you enabled an option from your cloud provider that automatically encrypts all new volumes or disks, then you must temporarily disable that option when deploying Cloud Volumes ONTAP. If you don't, then deployment of Cloud Volumes ONTAP will fail. Encryption is not supported on the boot and root disks for the Cloud Volumes ONTAP system.

### 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
- FlexCache
- Infinite Volumes
- Interface groups
- Intranode LIF failover
- MetroCluster
- Multi-tenancy (only one data-serving SVM is supported)
- NetApp Volume Encryption
- RAID4, RAID-DP, RAID-TEC (RAID0 is supported)
- Service Processor
- SnapLock Compliance and Enterprise modes (only Cloud WORM is supported)
- SnapMirror Synchronous
- VLANs

## Known limitations in AWS

The following known limitations affect Cloud Volumes ONTAP in AWS.

### 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.

### Limitations with the AWS GovCloud (US) region

- 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 the 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.



## **Detaching and reattaching EBS volumes is not supported**

Detaching an EBS volume from a Cloud Volumes ONTAP instance and then reattaching it to another Cloud Volumes ONTAP instance is not supported. You should use Cloud Manager to replicate data between instances.

## **Encryption limitations**

- LUN move is not supported on systems that have Cloud Volumes ONTAP encryption enabled.
- Cloud Volumes ONTAP sends encryption keys to key managers even for aggregates that it failed to create.

You must manually delete the keys from key managers.

## **Known limitations in Microsoft Azure**

The following known limitations affect Cloud Volumes ONTAP in Azure.

### **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.

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