



Storage limits

Cloud Volumes ONTAP 9.11.1 release notes

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Storage limits

Storage limits 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 configurations, disk limits prevent you from reaching the capacity limit by using disks alone. In those cases, you can reach the 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) |
|------------------------|--|
| Freemium | 500 GiB |
| PAYGO Explore | 2 TiB (data tiering is not supported with Explore) |
| PAYGO Standard | 10 TiB |
| PAYGO Premium | 368 TiB |
| Node-based license | 368 TiB per license |
| Capacity-based license | 2 PiB |

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 limits

Cloud Volumes ONTAP uses EBS 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 ² | <ul style="list-style-type: none"> • 96 TiB of raw capacity • 128 TiB of raw capacity with Elastic Volumes ³ |
| Disks per aggregate ⁴ | <ul style="list-style-type: none"> • 1-6 • 1-8 with Elastic Volumes 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 maximum aggregate size is based on the disks that comprise the aggregate. The limit does not include object storage used for data tiering.
3. If you have a configuration that supports the Amazon EBS Elastic Volumes feature, then an aggregate can contain up to 8 disks, which provides up to 128 TiB of capacity. The Amazon EBS Elastic Volumes feature is enabled by default on *new* Cloud Volumes ONTAP 9.11.0 or later systems when using gp3 or io1 disks.
[Learn more about support for Elastic Volumes](#)
4. All disks in an aggregate must be the same size.

Disk and tiering limits by EC2 instance

Capacity limits are different depending on the EC2 instance type family that you use and whether you're using a single node system or an HA pair.

The following notes provide details about the numbers that you'll see in the tables below:

- The disk limits are specific to disks that contain user data.

The limits do not include the boot disk and root disk.

- A maximum system capacity is listed when using disks alone and when using disks and cold data tiering to object storage.
- Cloud Volumes ONTAP uses EBS volumes as disks, with a maximum disk size of 16 TiB.

Limits for capacity-based licensing

The following disk limits apply to Cloud Volumes ONTAP systems that use a capacity-based licensing package.
[Learn about Cloud Volumes ONTAP licensing options](#)

Single node

| Instance | Max disks per node | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|--------------------------|--------------------|--------------------------------------|---|
| c5, m5, and r5 instances | 21 | 336 TiB | 2 PiB |
| m5dn.24xlarge | 19 ¹ | 304 TiB | 2 PiB |

1. This instance type has more local NVMe disks than other instance types, which means a smaller number of data disks are supported.

HA pairs

| Instance | Max disks per node | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|--------------------------|--------------------|--------------------------------------|---|
| c5, m5, and r5 instances | 18 | 288 TiB | 2 PiB |
| m5dn.24xlarge | 16 ¹ | 256 TiB | 2 PiB |

1. This instance type has more local NVMe disks than other instance types, which means a smaller number of data disks are supported.

Limits for node-based licensing

The following disk limits apply to Cloud Volumes ONTAP systems that use node-based licensing, which is the previous generation licensing model that enabled you to license Cloud Volumes ONTAP by node. Node-based licensing is still available for existing customers.

- If you use node-based licensing, you can purchase multiple node-based licenses for a Cloud Volumes ONTAP BYOL system to allocate more than 368 TiB 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](#).

- c4, m4, and r4 instance types are not supported with new Cloud Volumes ONTAP systems in this release.

However, we're still showing disk limits for these instance types because you can upgrade a system to this release when running on one of these instance types.

Single node with PAYGO Premium

| Instance | 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 TiB | 368 TiB |
| m5dn.24xlarge | 19 ² | 304 TiB | 368 TiB |
| c4, m4, and r4 instances | 34 | 368 TiB | 368 TiB |

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.
2. This instance type has more local NVMe disks than other instance types, which means a smaller number of data disks are supported.

Single node with BYOL

| Instance | 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 TiB | 368 TiB | 336 TiB | 368 TiB x each license |
| m5dn.24xlarge | 19 ² | 304 TiB | 368 TiB | 304 TiB | 368 TiB x each license |
| c4, m4, and r4 instances | 34 | 368 TiB | 368 TiB | 544 TiB | 368 TiB x each license |

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.
2. This instance type has more local NVMe disks than other instance types, which means a smaller number of data disks are supported.

HA pairs with PAYGO Premium

| Instance | Max disks per node | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|--------------------------|--------------------|--------------------------------------|---|
| c5, m5, and r5 instances | 18 ¹ | 288 TiB | 368 TiB |
| m5dn.24xlarge | 16 ² | 256 TiB | 368 TiB |
| c4, m4, and r4 instances | 31 | 368 TiB | 368 TiB |

1. 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.
2. This instance type has more local NVMe disks than other instance types, which means a smaller number of data disks are supported.

HA pairs with BYOL

| Instance | 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 TiB | 368 TiB | 288 TiB | 368 TiB x each license |
| m5dn.24xlarge | 16 ² | 256 TiB | 368 TiB | 256 TiB | 368 TiB x each license |
| c4, m4, and r4 instances | 31 | 368 TiB | 368 TiB | 496 TiB | 368 TiB x each license |

1. 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.
2. This instance type has more local NVMe disks than other instance types, which means a smaller number of data disks are supported.

Storage VM limits

Some configurations enable you to create additional storage VMs (SVMs) for Cloud Volumes ONTAP.

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

| License type | Instance family | Storage VM limit |
|--|-----------------|---|
| Freemium | c5, m5, and r5 | <ul style="list-style-type: none"> • 24 storage VMs total ^{1,2} |
| Capacity-based PAYGO or BYOL ³ | c5, m5, and r5 | <ul style="list-style-type: none"> • 24 storage VMs total ^{1,2} |
| Node-based PAYGO | c4, m4, and r4 | <ul style="list-style-type: none"> • 1 storage VM for serving data • 1 storage VM for disaster recovery |
| | c5, m5, and r5 | <ul style="list-style-type: none"> • 1 storage VM for serving data • 1 storage VM for disaster recovery |
| Node-based BYOL ⁴ | c4, m4, and r4 | <ul style="list-style-type: none"> • 1 storage VM for serving data • 1 storage VM for disaster recovery |
| | c5, m5, and r5 | <ul style="list-style-type: none"> • 24 storage VMs total ^{1,2} |

1. The limit can be lower, depending on the EC2 instance type that you use. The limits per instance are listed in the section below.
2. These 24 storage VMs can serve data or be configured for disaster recovery (DR).
3. For capacity-based licensing, there are no extra licensing costs for additional storage VMs, but there is a 4 TiB minimum capacity charge per storage VM. For example, if you create two storage VMs and each has 2

TiB of provisioned capacity, you'll be charged a total of 8 TiB.

- For node-based 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 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.

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.

The instances listed below are for the c5, m5, and r5 instance families.

| 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 | *.xlarge | 15 | 9 | 10 | 5 |
| | *.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 |
| | *.24xlarge | 50 | 44 | 24 | 12 |
| HA pair in single AZ | *.xlarge | 15 | 10 | 11 | 5 |
| | *.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 |
| | *.24xlarge | 50 | 44 | 24 | 12 |

| 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} |
|----------------------|---------------|-------------------------------|---|---|--|
| HA pair in multi AZs | *.xlarge | 15 | 12 | 13 | 13 |
| | *.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 |
| | *.24xlarge | 50 | 44 | 24 | 12 |

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 TiB |
| | 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 | 100 TiB |
| 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 TiB |
| | 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 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) |
|--------------------|--|
| Freemium | 500 GiB |
| PAYGO Explore | 2 TiB (data tiering is not supported with Explore) |
| PAYGO Standard | 10 TiB |
| PAYGO Premium | 368 TiB |
| Node-based license | 368 TiB per license |

| License | Maximum system capacity (disks + object storage) |
|------------------------|--|
| Capacity-based license | 2 PiB |

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.

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 ¹ | 384 TiB of raw capacity for single node ² 352 TiB of raw capacity for single node with PAYGO 96 TiB of raw capacity for HA pairs |
| 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. If using node-based licensing, two BYOL licenses are required to reach 384 TiB.
3. All disks in an aggregate must be the same size.

Disk and tiering limits by VM size

Capacity limits are different depending on the VM size that you use and whether you're using a single node system or an HA pair.

The following notes provide details about the numbers that you'll see in the tables below:

- The disk limits are specific to disks that contain user data.

The limits do not include the root disk, core disk, and VNV RAM.

- A maximum system capacity is listed when using disks alone and when using disks and cold data tiering to object storage.
- Single node systems use managed disks, with up to 32 TiB per disk. The number of supported disks varies by VM size.
- HA pairs use Premium page blobs as disks, with up to 8 TiB per page blob. The number of supported disks varies by VM size.

- The 896 TiB disk-based limit that's listed for single node systems with certain VM sizes is the *tested* limit.

Limits for capacity-based licensing

The following disk limits apply to Cloud Volumes ONTAP systems that use a capacity-based licensing package.
[Learn about Cloud Volumes ONTAP licensing options](#)

Single node

| VM size | Max data disks per node | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|-----------|-------------------------|--------------------------------------|---|
| DS4_v2 | 29 | 896 TiB | 2 PiB |
| DS5_v2 | 61 | 896 TiB | 2 PiB |
| DS13_v2 | 29 | 896 TiB | 2 PiB |
| DS14_v2 | 61 | 896 TiB | 2 PiB |
| DS15_v2 | 61 | 896 TiB | 2 PiB |
| L8s_v2 | 13 | 416 TiB | 2 PiB |
| E4s_v3 | 5 | 160 TiB | 2 PiB |
| E8s_v3 | 13 | 416 TiB | 2 PiB |
| E32s_v3 | 29 | 896 TiB | 2 PiB |
| E48s_v3 | 29 | 896 TiB | 2 PiB |
| E64is_v3 | 29 | 896 TiB | 2 PiB |
| E4ds_v4 | 5 | 160 TiB | 2 PiB |
| E8ds_v4 | 13 | 416 TiB | 2 PiB |
| E32ds_v4 | 29 | 896 TiB | 2 PiB |
| E48ds_v4 | 29 | 896 TiB | 2 PiB |
| E80ids_v4 | 61 | 896 TiB | 2 PiB |

HA pairs

| VM size | Max data disks for an HA pair | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|---------|-------------------------------|--------------------------------------|---|
| DS4_v2 | 29 | 232 TiB | 2 PiB |
| DS5_v2 | 61 | 488 TiB | 2 PiB |
| DS13_v2 | 29 | 232 TiB | 2 PiB |
| DS14_v2 | 61 | 488 TiB | 2 PiB |

| VM size | Max data disks for an HA pair | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|-----------|-------------------------------|--------------------------------------|---|
| DS15_v2 | 61 | 488 TiB | 2 PiB |
| E8s_v3 | 13 | 104 TiB | 2 PiB |
| E48s_v3 | 29 | 232 TiB | 2 PiB |
| E8ds_v4 | 13 | 104 TiB | 2 PiB |
| E32ds_v4 | 29 | 232 TiB | 2 PiB |
| E48ds_v4 | 29 | 232 TiB | 2 PiB |
| E80ids_v4 | 61 | 488 TiB | 2 PiB |

Limits for node-based licensing

The following disk limits apply to Cloud Volumes ONTAP systems that use node-based licensing, which is the previous generation licensing model that enabled you to license Cloud Volumes ONTAP by node. Node-based licensing is still available for existing customers.

If you use node-based licensing, you can purchase multiple node-based licenses for a Cloud Volumes ONTAP BYOL system to allocate more than 368 TiB 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 PAYGO Premium

| 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 TiB | 368 TiB |
| DS14_v2 | 61 | 368 TiB | 368 TiB |
| DS15_v2 | 61 | 368 TiB | 368 TiB |
| E32s_v3 | 29 | 368 TiB | 368 TiB |
| E48s_v3 | 29 | 368 TiB | 368 TiB |
| E64is_v3 | 29 | 368 TiB | 368 TiB |
| E32ds_v4 | 29 | 368 TiB | 368 TiB |
| E48ds_v4 | 29 | 368 TiB | 368 TiB |

| VM size | Max data disks per node | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|----------------|--------------------------------|---|--|
| E80ids_v4 | 61 | 368 TiB | 368 TiB |

Single node with BYOL

| 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 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| DS5_v2 | 61 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| DS13_v2 | 29 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| DS14_v2 | 61 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| DS15_v2 | 61 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| L8s_v2 | 13 | 368 TiB | 368 TiB | 416 TiB | 368 TiB x each license |
| E4s_v3 | 5 | 160 TiB | 368 TiB | 160 TiB | 368 TiB x each license |
| E8s_v3 | 13 | 368 TiB | 368 TiB | 416 TiB | 368 TiB x each license |
| E32s_v3 | 29 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| E48s_v3 | 29 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| E64is_v3 | 29 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| E4ds_v4 | 5 | 160 TiB | 368 TiB | 160 TiB | 368 TiB x each license |
| E8ds_v4 | 13 | 368 TiB | 368 TiB | 416 TiB | 368 TiB x each license |
| E32ds_v4 | 29 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |
| E48ds_v4 | 29 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |

| VM size | Max data disks per node | Max system capacity with one license | | Max system capacity with multiple licenses | |
|-----------|-------------------------|--------------------------------------|---------|--|------------------------|
| E80ids_v4 | 61 | 368 TiB | 368 TiB | 896 TiB | 368 TiB x each license |

HA pairs with PAYGO Premium

| VM size | Max data disks for an HA pair | Max system capacity with disks alone | Max system capacity with disks and data tiering |
|-----------|-------------------------------|--------------------------------------|---|
| DS5_v2 | 61 | 368 TiB | 368 TiB |
| DS14_v2 | 61 | 368 TiB | 368 TiB |
| DS15_v2 | 61 | 368 TiB | 368 TiB |
| E8s_v3 | 13 | 104 TiB | 368 TiB |
| E48s_v3 | 29 | 232 TiB | 368 TiB |
| E32ds_v4 | 29 | 232 TiB | 368 TiB |
| E48ds_v4 | 29 | 232 TiB | 368 TiB |
| E80ids_v4 | 61 | 368 TiB | 368 TiB |

HA pairs with BYOL

| VM size | Max data disks for an HA pair | 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 | 232 TiB | 368 TiB | 232 TiB | 368 TiB x each license |
| DS5_v2 | 61 | 368 TiB | 368 TiB | 488 TiB | 368 TiB x each license |
| DS13_v2 | 29 | 232 TiB | 368 TiB | 232 TiB | 368 TiB x each license |
| DS14_v2 | 61 | 368 TiB | 368 TiB | 488 TiB | 368 TiB x each license |
| DS15_v2 | 61 | 368 TiB | 368 TiB | 488 TiB | 368 TiB x each license |
| E8s_v3 | 13 | 104 TiB | 368 TiB | 104 TiB | 368 TiB x each license |
| E48s_v3 | 29 | 232 TiB | 368 TiB | 232 TiB | 368 TiB x each license |

| VM size | Max data disks for an HA pair | Max system capacity with one license | | Max system capacity with multiple licenses | |
|-----------|-------------------------------|--------------------------------------|---------|--|------------------------|
| E8ds_v4 | 13 | 104 TiB | 368 TiB | 104 TiB | 368 TiB x each license |
| E32ds_v4 | 29 | 232 TiB | 368 TiB | 232 TiB | 368 TiB x each license |
| E48ds_v4 | 29 | 232 TiB | 368 TiB | 232 TiB | 368 TiB x each license |
| E80ids_v4 | 61 | 368 TiB | 368 TiB | 488 TiB | 368 TiB x each license |

Storage VM limits

Some configurations enable you to create additional storage VMs (SVMs) for Cloud Volumes ONTAP.

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

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

| License type | Storage VM limit |
|--|---|
| Freemium | 24 storage VMs total ^{1,2} |
| Capacity-based PAYGO or BYOL ³ | 24 storage VMs total ^{1,2} |
| Node-based BYOL ⁴ | 24 storage VMs total ^{1,2} |
| Node-based PAYGO | <ul style="list-style-type: none"> • 1 storage VM for serving data • 1 storage VM for disaster recovery |

1. These 24 storage VMs can serve data or be configured for disaster recovery (DR).
2. Each storage VM can have up to three LIFs where two are data LIFs and one is an SVM management LIF.
3. For capacity-based licensing, there are no extra licensing costs for additional storage VMs, but there is a 4 TiB minimum capacity charge per storage VM. For example, if you create two storage VMs and each has 2 TiB of provisioned capacity, you'll be charged a total of 8 TiB.
4. For node-based 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 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.

File and volume limits

| Logical storage | Parameter | Limit |
|--------------------------|---------------------------------------|--|
| Files | Maximum size | 16 TiB |
| | 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 | 100 TiB |
| 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 TiB |
| | 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 in Google Cloud

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 configurations, disk limits prevent you from reaching the capacity limit by using disks alone. You can reach the 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) |
|------------------------|---|
| Freemium | 500 GB |
| PAYGO Explore | 2 TB (data tiering is not supported with Explore) |
| PAYGO Standard | 10 TB |
| PAYGO Premium | 368 TB |
| Node-based license | 368 TB per license |
| Capacity-based license | 2 PiB |

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.

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 |

| Parameter | Limit |
|---|-------|
| 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.

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, root disk, or NVRAM.

| 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 |
| Maximum system capacity with disks and cold data tiering to a Google Cloud Storage bucket | Depends on the license. Refer to the maximum system capacity limits above. |

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

Storage VM limits

Some configurations enable you to create additional storage VMs (SVMs) for Cloud Volumes ONTAP.

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

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

| License type | Storage VM limit |
|---|-----------------------------------|
| Freemium | 24 storage VMs total ¹ |
| Capacity-based PAYGO or BYOL ² | 24 storage VMs total ¹ |
| Node-based BYOL ³ | 24 storage VMs total ¹ |

| License type | Storage VM limit |
|-------------------------|---|
| Node-based PAYGO | <ul style="list-style-type: none"> • 1 storage VM for serving data • 1 storage VM for disaster recovery |

1. These 24 storage VMs can serve data or be configured for disaster recovery (DR).
2. For capacity-based licensing, there are no extra licensing costs for additional storage VMs, but there is a 4 TiB minimum capacity charge per storage VM. For example, if you create two storage VMs and each has 2 TiB of provisioned capacity, you'll be charged a total of 8 TiB.
3. For node-based 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 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.

Logical storage 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 ¹² | 499 |
| 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 |

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 |

| 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 | 1 |
| | Maximum per portset | 32 |
| Portsets | Maximum per node | 256 |

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