Storage limits

Cloud Volumes ONTAP

NetApp
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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, BlueXP 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	2 PiB (requires multiple licenses)
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, BlueXP 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]	• 96 TiB of raw capacity • 128 TiB of raw capacity with Elastic Volumes [3]
Disks per aggregate [4]	• 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 • m6id.32xlarge	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 • m6id.32xlarge	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.

You can purchase multiple node-based licenses for a Cloud Volumes ONTAP BYOL single node or HA pair system to allocate more than 368 TiB of capacity, up to the maximum tested and supported system capacity limit of 2 PiB. 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. Though Cloud Volumes ONTAP supports up to the maximum tested and supported system capacity of 2 PiB, crossing the 2 PiB limit results in an unsupported system configuration.

AWS Secret Cloud and Top Secret Cloud regions support purchases of multiple node-based licenses starting with Cloud Volumes ONTAP 9.12.1.

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

Instance	Max disks per node	Max system capacity with disks alone	Max system capacity with disks and data tiering
• m5dn.24xlarge • m6id.32xlarge	19 [2]	304 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	2 PiB
• m5dn.24xlarge • m6id.32xlarge	19 [2]	304 TiB	368 TiB	304 TiB	2 PiB

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 • m6id.32xlarge	16 [2]	256 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	2 PiB
• m5dn.24xlarge • m6id.32xlarge	16 [2]	256 TiB	368 TiB	256 TiB	2 PiB

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	Storage VM limit
Freemium	24 storage VMs total [1,2]
Capacity-based PAYGO or BYOL [3]	24 storage VMs total [1,2]
Node-based PAYGO	• 1 storage VM for serving data • 1 storage VM for disaster recovery
Node-based BYOL [4]	• 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.
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.

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 BlueXP 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 [2]	128 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 [3]	300 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.
2. Beginning with ONTAP 9.12.1P2, the limit is 128 TB. In ONTAP 9.11.1 and earlier versions, the limit is 16 TB.
3. FlexVol volume creation up to the maximum size of 300 TiB is supported using System Manager and the ONTAP CLI starting from Cloud Volumes ONTAP 9.12.1 P2 and 9.13.0 P2.

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, BlueXP 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

License	Maximum system capacity (disks + object storage)
PAYGO Premium	368 TiB
Node-based license	2 PiB (requires multiple licenses)
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 with page blob 384 TiB of raw capacity for HA pairs with managed disks
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 VNVRAM.

- A maximum system capacity is listed when using disks alone and when using disks and cold data tiering to object storage.

- Single node and HA systems which use managed disks have a maximum of 32 TiB per disk. The number of supported disks varies by VM size.
- HA systems which use page blobs have a maximum of 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
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
L8s_v3	12	384 TiB	2 PiB
L16s_v3	28	896 TiB	2 PiB
L32s_v3	28	896 TiB	2 PiB

HA pairs in a single availability zone with page blobs

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
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

HA pairs in a single availability zone with shared managed disks

VM size	Max data disks for an HA pair	Max system capacity with disks alone	Max system capacity with disks and data tiering
E8ds_v4	12	384 TiB	2 PiB
E32ds_v4	28	896 TiB	2 PiB
E48ds_v4	28	896 TiB	2 PiB
E80ids_v4	28	896 TiB	2 PiB
L16s_v3	28	896 TiB	2 PiB
L32s_v3	28	896 TiB	2 PiB

HA pairs in multiple availability zones with shared managed disks

VM size	Max data disks for an HA pair	Max system capacity with disks alone	Max system capacity with disks and data tiering
E8ds_v4	12	384 TiB	2 PiB
E32ds_v4	28	896 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
E48ds_v4	28	896 TiB	2 PiB
E80ids_v4	28	896 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.

You can purchase multiple node-based licenses for a Cloud Volumes ONTAP BYOL single node or HA pair system to allocate more than 368 TiB of capacity, up to the maximum tested and supported system capacity limit of 2 PiB. 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. Though Cloud Volumes ONTAP supports up to the maximum tested and supported system capacity of 2 PiB, crossing the 2 PiB limit results in an unsupported system configuration.

Single node

Single node has two node-based licensing options: PAYGO Premium and BYOL.

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
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	2 PiB
DS5_v2	61	368 TiB	368 TiB	896 TiB	2 PiB
DS13_v2	29	368 TiB	368 TiB	896 TiB	2 PiB
DS14_v2	61	368 TiB	368 TiB	896 TiB	2 PiB
DS15_v2	61	368 TiB	368 TiB	896 TiB	2 PiB
L8s_v2	13	368 TiB	368 TiB	416 TiB	2 PiB
E4s_v3	5	160 TiB	368 TiB	160 TiB	2 PiB
E8s_v3	13	368 TiB	368 TiB	416 TiB	2 PiB
E32s_v3	29	368 TiB	368 TiB	896 TiB	2 PiB
E48s_v3	29	368 TiB	368 TiB	896 TiB	2 PiB
E64is_v3	29	368 TiB	368 TiB	896 TiB	2 PiB
E4ds_v4	5	160 TiB	368 TiB	160 TiB	2 PiB
E8ds_v4	13	368 TiB	368 TiB	416 TiB	2 PiB
E32ds_v4	29	368 TiB	368 TiB	896 TiB	2 PiB
E48ds_v4	29	368 TiB	368 TiB	896 TiB	2 PiB
E80ids_v4	61	368 TiB	368 TiB	896 TiB	2 PiB

HA pairs

HA pairs have two configuration types: page blob and multiple availability zone. Each configuration has two node-based licensing options: PAYGO Premium and BYOL.

PAYGO Premium: HA pairs in single availability zone with page blobs

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

PAYGO Premium: HA pairs in a multiple availability zone configuration with shared managed disks

VM size	Max data disks for an HA pair	Max system capacity with disks alone	Max system capacity with disks and data tiering
E32ds_v4	28	368 TiB	368 TiB
E48ds_v4	28	368 TiB	368 TiB
E80ids_v4	28	368 TiB	368 TiB

BYOL: HA pairs in single availability zone with page blobs

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	2 PiB
DS5_v2	61	368 TiB	368 TiB	488 TiB	2 PiB
DS13_v2	29	232 TiB	368 TiB	232 TiB	2 PiB
DS14_v2	61	368 TiB	368 TiB	488 TiB	2 PiB
DS15_v2	61	368 TiB	368 TiB	488 TiB	2 PiB
E8s_v3	13	104 TiB	368 TiB	104 TiB	2 PiB
E48s_v3	29	232 TiB	368 TiB	232 TiB	2 PiB
E8ds_v4	13	104 TiB	368 TiB	104 TiB	2 PiB
E32ds_v4	29	232 TiB	368 TiB	232 TiB	2 PiB
E48ds_v4	29	232 TiB	368 TiB	232 TiB	2 PiB
E80ids_v4	61	368 TiB	368 TiB	488 TiB	2 PiB

BYOL: HA pairs in a multiple availability zone configuration with shared managed disks

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
E8ds_v4	12	368 TiB	368 TiB	368 TiB	2 PiB
E32ds_v4	28	368 TiB	368 TiB	368 TiB	2 PiB
E48ds_v4	28	368 TiB	368 TiB	368 TiB	2 PiB
E80ids_v4	28	368 TiB	368 TiB	368 TiB	2 PiB

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	• 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 [2]	128 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 [3]	300 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.

2. Beginning with ONTAP 9.12.1P2, the limit is 128 TB. In ONTAP 9.11.1 and earlier versions, the limit is 16 TB.
3. FlexVol volume creation up to the maximum size of 300 TiB is supported using System Manager and the ONTAP CLI starting from Cloud Volumes ONTAP 9.12.1 P2 and 9.13.0 P2.

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, BlueXP 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

License	Maximum system capacity (disks + object storage)
PAYGO Premium	368 TB
Node-based license	2 PiB (requires multiple licenses)
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, BlueXP 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]	• 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.

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	• 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]
Node-based PAYGO	• 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 [2]	128 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 [3]	300 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.
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	Maximum per portset	32
Portsets	Maximum per node	256

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 Google Cloud.

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