



# **Logical space reporting and enforcement for volumes**

**ONTAP 9**

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# Logical space reporting and enforcement for volumes

## Logical space reporting and enforcement for volumes overview

Beginning with ONTAP 9.4, you can allow the logical space used in a volume and the amount of remaining storage space to be displayed to users. Beginning with ONTAP 9.5, you can limit the amount of logical space consumed by users.

Logical space reporting and enforcement are disabled by default.

The following volume types support logical space reporting and enforcement.

Volume type	Is space reporting supported?	Is space enforcement supported?
FlexVol volumes	Yes, beginning with ONTAP 9.4	Yes, beginning with ONTAP 9.5
SnapMirror destination volumes	Yes, beginning with ONTAP 9.8	Yes, beginning with ONTAP 9.13.1
FlexGroup volumes	Yes, beginning with ONTAP 9.9.1	Yes, beginning with ONTAP 9.9.1
FlexCache volumes	Origin setting is used at the cache	Not applicable

## What logical space reporting shows

When you enable logical space reporting on a volume, your system can display the amount of logical used and available space in addition to the total space in a volume. In addition, users on Linux and Windows client systems can see logical used and available space instead of physical used and physical available space.

Definitions:

- Physical space refers to the physical blocks of storage available or used in the volume.
- Logical space refers to the usable space in a volume.
- Logical space used is physical space used plus savings from storage efficiency features (such as deduplication and compression) that have been configured.

Beginning with ONTAP 9.5, you can enable logical space enforcement together with space reporting.

When enabled, logical space reporting displays the following parameters with the `volume show` command:

Parameter	Meaning
<code>-logical-used</code>	Displays information only about the volume or volumes that have the specified logical used size. This value includes all the space saved by the storage efficiency features along with the physically used space. This does not include Snapshot reserve but does consider Snapshot spill.
<code>-logical-used-by-afs</code>	Displays information only about the volume or volumes that have the specified logical size used by the active file system. This value differs from the <code>-logical-used</code> value by the amount of Snapshot spill that exceeds the Snapshot reserve.
<code>-logical-available</code>	When only logical space reporting is enabled, only physical-available space is displayed. When both space reporting and enforcement are enabled, it displays the amount of free space currently available considering space saved by the storage efficiency features as being used. This does not include the Snapshot reserve.
<code>-logical-used-percent</code>	<p>Displays the percentage of the current <code>-logical-used</code> value with the provisioned size excluding Snapshot reserve of the volume.</p> <p>This value can be greater than 100%, because the <code>-logical-used-by-afs</code> value includes efficiency savings in the volume. The <code>-logical-used-by-afs</code> value of a volume does not include Snapshot spill as used space. The <code>-physical-used</code> value of a volume includes Snapshot spill as used space.</p>
<code>-used</code>	Displays the amount of space occupied by user data and file system metadata. It differs from <code>physical-used</code> space by the sum of the space that is reserved for future writes and the space that is saved by aggregate storage efficiency. It includes Snapshot spill (the amount of space by which Snapshot copies exceed Snapshot reserve). It does not include the Snapshot reserve.

Enabling logical space reporting in the CLI also allows the Logical Used Space (%) and Logical Space values to display in System Manager

Client systems see logical space displayed as “used” space on the following system displays:

- **df** output on Linux systems
- Space details under Properties using Windows Explorer on Windows systems.



If logical space reporting is enabled without logical space enforcement, the total displayed on client systems can be higher than the provisioned space.

## What logical space enforcement does

When you enable logical space enforcement in ONTAP 9.5 and later, ONTAP counts the logical-used blocks in a volume to determine the amount of space that is still available in that volume. If there is no space available in a volume, the system returns an ENOSPC (out-of-space) error message.

Logical space enforcement ensures that users are notified when a volume is full or nearly full. Logical space enforcement returns three types of alerts to inform you about the available space in a volume:

- `Monitor.vol.full.inc.sav`: This alert is triggered when 98% of the logical space in the volume has been used.
- `Monitor.vol.nearFull.inc.sav`: This alert is triggered when 95% of the logical space in the volume has been used.
- `Vol.log.overalloc.inc.sav`: This alert is triggered when the logical space used in the volume is greater than the total size of the volume.

This alert tells you that adding to the size of the volume might not create available space since that space will already be consumed by overallocated logical blocks.



Total (logical space) should be equal to provisioned space excluding Snapshot reserve of the volume with logical space enforcement.

For more information, see [Configuring volumes to automatically provide more space when they are full](#)

## Enable logical space reporting and enforcement

Beginning with ONTAP 9.4, you can enable logical space reporting. Beginning with 9.5, you can enable logical space enforcement, or both reporting and enforcement together.

### About this task

In addition to enabling logical space reporting and enforcement at the individual volume level, you can enable them at the SVM level for every volume that supports the functionality. If you enable logical space features for the entire SVM, you can also disable them for individual volumes.

Beginning with ONTAP 9.8, if you enable logical space reporting on a SnapMirror source volume, it is automatically enabled on the destination volume after the transfer.

Beginning with ONTAP 9.13.1, if the enforcement option is enabled on a SnapMirror source volume, the destination will report logical space consumption and will honor its enforcement, enabling better capacity planning.



If you are running an ONTAP release earlier than ONTAP 9.13.1, you should understand that although the enforcement setting is transferred to the SnapMirror destination volume, the destination volume does not support enforcement. As a result, the destination will report logical space consumption but not honor its enforcement.

Learn more about [ONTAP release support for logical space reporting](#).

### Choices

- Enable logical space reporting for a volume:

```
volume modify -vserver svm_name -volume volume_name -size volume_size -is  
-space-reporting-logical true
```

- Enable logical space enforcement for a volume:

```
volume modify -vserver svm_name -volume volume_name -size volume_size -is
```

```
-space-enforcement-logical true
```

- Enable logical space reporting and enforcement together for a volume:

```
volume modify -vserver svm_name -volume volume_name -size volume_size -is-space-reporting-logical true -is-space-enforcement-logical true
```

- Enable logical space reporting or enforcement for a new SVM:

```
vserver create -vserver _svm_name_ -rootvolume root-_volume_name_ -rootvolume -security-style unix -data-services {desired-data-services} [-is-space-reporting-logical true] [-is-space-enforcement-logical true]
```

- Enable logical space reporting or enforcement for an existing SVM:

```
vserver modify -vserver _svm_name_ {desired-data-services} [-is-space-reporting-logical true] [-is-space-enforcement-logical true]
```

## Manage SVM capacity limits

Beginning with ONTAP 9.13.1, you can set a maximum capacity for a storage VM (SVM). You can also configure alerts when the SVM approaches a threshold capacity level.

### About this task

Capacity on an SVM is calculated as the sum of FlexVols, FlexGroup volumes, FlexClones, FlexCache volumes. Volumes impact capacity calculation even if they are restricted, offline, or in the recovery queue after deletion. If you have volumes configured with auto-grow, the maximum autosize value of the volume will be calculated toward the SVM size; without auto-grow, the actual size of the volume will be calculated.

The following table captures how `autosize-mode` parameters impact the capacity calculation.

<code>autosize-mode off</code>	Size parameter will be used for computation
<code>autosize-mode grow</code>	The <code>max-autosize</code> parameter will be used for computation
<code>autosize-mode grow-shrink</code>	The <code>max-autosize</code> parameter will be used for computation

### Before you begin

- You must be a cluster administrator to set an SVM limit.
- Storage limits cannot be configured for any SVM that contains data protection volumes, volumes in a SnapMirror relationship, or in a MetroCluster configuration.
- When you migrate an SVM, the source SVM cannot have a storage limit enabled. To complete the migrate operation, disable the storage limit on the source then complete the migration.
- SVM capacity is distinct from [quotas](#). Quotas cannot exceed the max size.
- You cannot set a storage limit when other operations are in progress on the SVM. Use the `job show vserver svm_name` command to see existing jobs. Try running the command again when any jobs have been completed.

## Capacity impact

When you reach the capacity limit, the following operations will fail:

- Creating a LUN, namespace, or volume
- Cloning a LUN, namespace, or volume
- Modifying a LUN, namespace, or volume
- Increasing the size of a LUN, namespace, or volume
- Expanding a LUN, namespace, or volume
- Rehosting a LUN, namespace, or volume

## Set a capacity limit on a new SVM

### System Manager

#### Steps

1. Select **Storage** > **Storage VMs**.
2. Select  to create the SVM.
3. Name the SVM and select an **Access protocol**.
4. Under **Storage VM settings**, select **Enable maximum capacity limit**.

Provide a maximum capacity size for the SVM.

5. Select **Save**.

### CLI

#### Steps

1. Create the SVM. To set a storage limit, provide a `storage-limit` value. To set a threshold alert for the storage limit, provide a percentage value for `-storage-limit-threshold-alert`.

```
vserver create -vserver vserver_name -aggregate aggregate_name -rootvolume root_volume_name -rootvolume-security-style {unix|ntfs|mixed} -storage -limit value [GiB|TiB] -storage-limit-threshold-alert percentage [-ipSPACE IPspace_name] [-language <language>] [-snapshot-policy snapshot_policy_name] [-quota-policy quota_policy_name] [-comment comment]
```

If you do not provide threshold value, by default an alert will be triggered when the SVM is at 90% capacity. To disable the threshold alert, provide a value of zero.

2. Confirm the SVM was created successfully:

```
vserver show -vserver vserver_name
```

3. If you wish to disable the storage limit, modify the SVM with `-storage-limit` parameter set to zero:

```
vserver modify -vserver vserver_name -storage-limit 0
```

## Set or modify a capacity limit on an existing SVM

You can set a capacity limit and threshold alert on an existing SVM or disable a capacity limit.

Once you set the capacity limit, you cannot modify the limit to a value less than the currently allocated capacity.

### System Manager

#### Steps

1. Select **Storage > Storage VMs**.
2. Select the SVM you want to modify. Next to the name of the SVM, select  then **Edit**.
3. To enable a capacity limit, select the box next to **Enable capacity limit**. Enter a value for the **Maximum capacity** and a percentage value for **Alert threshold**.

If you wish to disable the capacity limit, uncheck the box next **Enable capacity limit**.

4. Select **Save**.

### CLI

#### Steps

1. On the cluster hosting the SVM, issue the `vserver modify` command. Provide a numerical value for `-storage-limit` and a percent value for `-storage-limit-threshold-alert`.

```
vserver modify -vserver vserver_name -storage-limit value [GiB|TiB]
-storage-limit-threshold-alert percentage
```

If you do not provide threshold value, you will have a default alert at 90% capacity. To disable the threshold alert, provide a value of zero.

2. If you wish to disable the storage limit, modify the SVM with `-storage-limit` set to zero:

```
vserver modify -vserver vserver_name -storage-limit 0
```

## Reaching capacity limits

When you reach the maximum capacity or the alert threshold, you can consult the `vserver.storage.threshold` EMS messages or use the **Insights** page in System Manager to learn about possible actions. Possible resolutions include:

- Editing the SVM maximum capacity limits
- Purging the volumes recovery queue to free up space
- Delete snapshot to provide space for the volume

### Additional information

- [Capacity measurements in System Manager](#)
- [Monitor capacity in System Manager](#)



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