Manage FlexGroup volumes

ONTAP 9

NetApp
December 01, 2021

Table of Contents

Manage FlexGroup volumes

Monitor the space usage of a FlexGroup volume

You can view a FlexGroup volume and its constituents, and monitor the space used by the FlexGroup volume.

About this task

Starting with ONTAP 9.6, elastic sizing is supported. ONTAP automatically grows a constituent of a FlexGroup volume if it is running out of space by shrinking any other constituent in the FlexGroup volume that has free space by an equivalent amount. Elastic sizing avoids any out of space errors that are generated because of one or more FlexGroup constituent volumes running out of space.

Starting with ONTAP 9.9.1, logical space reporting and enforcement is also available for FlexGroup volumes. For more information, see Logical space reporting and enforcement for volumes.

Step

1. View the space used by the FlexGroup volume and its constituents: `volume show -vserver vserver_name -volume-style-extended [flexgroup | flexgroup-constituent]`

```
cluster-2::> volume show -vserver vs1 -volume-style-extended flexgroup
Vserver   Volume       Aggregate    State      Type       Size
Available Used%
--------- ------------ ------------ ---------- ---- ----------
---------- -----
vs1       fg1          -            online     RW        500GB
207.5GB   56%
```

```
ccluster-2::> volume show -vserver vs1 -volume-style-extended flexgroup-
constituent
Vserver   Volume       Aggregate    State      Type       Size
Available Used%
--------- ------------ ------------ ---------- ---- ----------
---------- -----
vs1       fg1__0001    aggr3        online     RW      31.25GB
12.97GB   56%
vs1       fg1__0002    aggr1        online     RW      31.25GB
12.98GB   56%
vs1       fg1__0003    aggr1        online     RW      31.25GB
13.00GB   56%
vs1       fg1__0004    aggr3        online     RW      31.25GB
12.88GB   56%
vs1       fg1__0005    aggr1        online     RW      31.25GB
13.00GB   56%
vs1       fg1__0006    aggr3        online     RW      31.25GB
12.97GB   56%
vs1       fg1__0007    aggr1        online     RW      31.25GB
13.01GB   56%
vs1       fg1__0008    aggr1        online     RW      31.25GB
13.01GB   56%
vs1       fg1__0009    aggr3        online     RW      31.25GB
12.88GB   56%
vs1       fg1__0010    aggr1        online     RW      31.25GB
13.01GB   56%
vs1       fg1__0011    aggr3        online     RW      31.25GB
12.97GB   56%
vs1       fg1__0012    aggr1        online     RW      31.25GB
13.01GB   56%
vs1       fg1__0013    aggr3        online     RW      31.25GB
12.95GB   56%
vs1       fg1__0014    aggr3        online     RW      31.25GB
12.97GB   56%
vs1       fg1__0015    aggr3        online     RW      31.25GB
12.88GB   56%
vs1       fg1__0016    aggr1        online     RW      31.25GB
13.01GB   56%
16 entries were displayed.
```

You can use the available space and percentage space used to monitor the space usage of the FlexGroup volume.

Increase the size of a FlexGroup volume

You can increase the size of a FlexGroup volume either by adding more capacity to the existing constituents of the FlexGroup volume or by expanding the FlexGroup volume with new constituents.

What you'll need

Sufficient space must be available in the aggregates.

About this task

If you want to add more space, you can increase the collective size of the FlexGroup volume. Increasing the size of a FlexGroup volume resizes the existing constituents of the FlexGroup volume.

If you want to improve performance, you can expand the FlexGroup volume. You might want to expand a FlexGroup volume and add new constituents in the following situations:

- New nodes have been added to the cluster.
- New aggregates have been created on the existing nodes.
- The existing constituents of the FlexGroup volume have reached the maximum FlexVol size for the hardware, and therefore the FlexGroup volume cannot be resized.

In releases earlier than ONTAP 9.3, you must not expand FlexGroup volumes after a SnapMirror relationship is established. If you expand the source FlexGroup volume after breaking the SnapMirror relationship in releases earlier than ONTAP 9.3, you must perform a baseline transfer to the destination FlexGroup volume once again. Starting with ONTAP 9.3, you can expand FlexGroup volumes that are in a SnapMirror relationship.

Step

1. Increase the size of the FlexGroup volume by increasing the capacity or performance of the FlexGroup volume, as required:

If you want to increase the…	Then do this…
Capacity of the FlexGroup volume	Resize the constituents of the FlexGroup volume: `volume modify -vserver vserver_name -volume fg_name -size new_size`
Performance to the FlexGroup volume	Expand the FlexGroup volume by adding new constituents: `volume expand -vserver vserver_name -volume fg_name -aggr -list aggregate name,... [-aggr-list-multiplier constituents_per_aggr]` The default value of the `-aggr-list-multiplier` parameter is 1. To expand a FlexGroup volume for FabricPool in ONTAP 9.5, any new aggregates used must be FabricPool.

Whenever possible, you should increase the capacity of a FlexGroup volume. If you must expand a FlexGroup volume, you should add constituents in the same multiples as the constituents of the existing FlexGroup volume to ensure consistent performance. For example, if the existing FlexGroup volume has

16 constituents with eight constituents per node, you can expand the existing FlexGroup volume by 8 or 16 constituents.

Examples

Example of increasing the capacity of the existing constituents

The following example shows how to add 20 TB space to a FlexGroup volume volX:

```
cluster1::> volume modify -vserver svm1 -volume volX -size +20TB
```

If the FlexGroup volume has 16 constituents, the space of each constituent is increased by 1.25 TB.

Example of improving performance by adding new constituents

The following example shows how to add two more constituents to the FlexGroup volume volX:

```
cluster1::> volume expand -vserver vs1 -volume volX -aggr-list aggr1,aggr2
```

The size of the new constituents is the same as that of the existing constituents.

Reduce the size of a FlexGroup volume

Starting with ONTAP 9.6, you can resize a FlexGroup volume to a value lower than its current size to free up the unused space from the volume. When you reduce the size of a FlexGroup volume, ONTAP automatically resizes all of the FlexGroup constituents.

Step

1. Reduce the size of the FlexGroup volume: `volume size -vserver vserver_name -volume fg_name -size new_size`

   `new_size` is the size of the FlexGroup volume. You can either specify a lower value than the current size or a negative value by which the current size of the FlexGroup volume is reduced.

   > If automatic shrinking is enabled for the volume (`volume autosize` command), the minimum autosize is set to the new size of the volume.

   ```
   cluster1::> volume size -vserver svm1 -volume volX -size 10TB
   ```

   ```
   cluster1::> volume size -vserver svm1 -volume volX -size -5TB
   ```

Configure FlexGroup volumes to automatically grow and shrink their size

Starting with ONTAP 9.3, you can configure FlexGroup volumes to automatically grow and shrink according to how much space they currently require.

What you'll need

The FlexGroup volume must be online.

About this task

You can autosize FlexGroup volumes in two modes:

- Increase the size of the volume automatically (`grow` mode)

  Automatic growing helps prevent a FlexGroup volume from running out of space, if the aggregate can supply more space. You can configure the maximum size for the volume. The increase is automatically triggered based on the amount of data being written to the volume in relation to the current amount of used space and any thresholds set.

  By default, the maximum size a volume can grow to is 120% of the size at which autogrow is enabled. If you need to ensure that the volume can grow to be larger than that, you must set the maximum size for the volume accordingly.

- Shrink the size of the volume automatically (`grow_shrink` mode)

  Automatic shrinking prevents a volume from being larger than needed, freeing space in the aggregate for use by other volumes.

  Autoshrink can only be used in combination with autogrow to meet changing space demands and is not available alone. When autoshrink is enabled, ONTAP automatically manages the shrinking behavior of a volume to prevent an endless loop of autogrow and autoshrink actions.

As a volume grows, the maximum number of files it can contain might be automatically increased. When a volume is shrunk, the maximum number of files it can contain is left unchanged, and a volume cannot be automatically shrunk below the size that corresponds to its current maximum number of files. For this reason, it might not be possible to automatically shrink a volume all the way to its original size.

Step

1. Configure the volume to grow and shrink its size automatically: `volume autosize -vserver vserver_name -volume vol_name -mode [grow | grow_shrink]`

   You can also specify the maximum size, minimum size, and thresholds for growing or shrinking the volume.

   The following command enables automatic size changes for a volume called fg1. The volume is configured to grow to a maximum size of 5 TB when it is 70% full.

   ```
   cluster1::> volume autosize -volume fg1 -mode grow -maximum-size 5TB
   -grow-threshold-percent 70
   vol autosize: volume "vs_src:fg1" autosize settings UPDATED.
   ```

Perform a fast directory delete by deleting files and directories asynchronously

It is recommended that you use the REST API to delete your directory. Starting with ONTAP 9.8, you can also use the `volume file async-delete` command to delete files and directories from Linux and Windows client shares in the background. You can perform asynchronous delete on both FlexVol and FlexGroup volumes.

About this task

You must be a cluster administrator or a SVM administrator using the advanced privilege mode.

Starting with ONTAP 9.9.1, you can also use System Manager to perform a fast directory delete. For more information, see Take corrective action based on analytics.

Steps

1. Enter advanced privilege mode: `-privilege advance`
2. Delete files or directories on a FlexVol or FlexGroup volume: `volume file async-delete start -vserver vserver_name -volume volume_name -path file_path -throttle throttle`

   The minimum throttle value is 10, the maximum is 100,000, and the default is 5000.

   The following example deletes the directory named d2, which is located in the directory named d1.

   ```
   cluster::*>volume file async-delete start -vserver vs1 -volume vol1
   -path d1/d2
   ```

3. Verify that the directory was deleted: `event log show`

   The following example shows output for the event log when the directory is successfully deleted.

   ```
   cluster-cli::*> event log show
   Time                 Node             Severity      Event
   -------------------  ---------------- ------------- --------------------
   MM/DD/YYYY 00:11:11  cluster-vsim     INFORMATIONAL
   asyncDelete.message.success: Async delete job on path d1/d2 of volume
   (MSID: 2162149232) was completed.
   ```

Create qtrees with FlexGroup volumes

Starting with ONTAP 9.3, you can create qtrees with FlexGroup volumes. Qtrees enable you to partition your FlexGroup volumes into smaller segments that you can manage individually.

About this task

- If you want to revert to ONTAP 9.2 or earlier and if you have created one or more qtrees in the FlexGroup volume or modified the attributes (security style and SMB oplocks) of the default qtree, you must delete all of the non-default qtrees and then disable the qtree functionality on each FlexGroup volume before reverting to ONTAP 9.2 or earlier.

  Disable qtree functionality in FlexGroup volumes before reverting

- If the source FlexGroup volume has qtrees in a SnapMirror relationship, the destination cluster must be running ONTAP 9.3 or later (a version of ONTAP software that supports qtrees).
- Starting with ONTAP 9.5, qtree statistics are supported for FlexGroup volumes.

Steps

1. Create a qtree in the FlexGroup volume: `volume qtree create -vserver vserver_name -volume volume_name -qtree qtree name`

   You can optionally specify the security style, SMB oplocks, UNIX permissions, and export policy for the qtree.

   ```
   cluster1::> volume qtree create -vserver vs0 -volume fg1 -qtree qtree1
   -security-style mixed
   ```

Related information

Logical storage management

Use quotas for FlexGroup volumes

In ONTAP 9.4 and earlier, you can apply quotas rules to FlexGroup volumes only for reporting purposes, but not for enforcing quota limits. Starting with ONTAP 9.5, you can enforce limits on quota rules that are applied to FlexGroup volumes.

About this task

- Starting with ONTAP 9.5, you can specify hard, soft, and threshold limit quotas for FlexGroup volumes.

  You can specify these limits to constrain the amount of space, the number of files that a specific user, group, or qtree can create, or both. Quota limits generate warning messages in the following scenarios:

  - When usage exceeds a configured soft limit, ONTAP issues a warning message, but further traffic is still allowed.

    If usage later drops below the configured soft limit again, an all-clear message is issued.

  - When usage exceeds a configured threshold limit, ONTAP issues a second warning message.

    No all-clear administrative message is issued when usage later drops below a configured threshold limit.

  - If usage reaches a configured hard limit, ONTAP prevents further resource consumption by rejecting traffic.
- In ONTAP 9.5, quota rules cannot be created or activated on the destination FlexGroup volume of a

SnapMirror relationship.

Quota targets and types

Quotas have a type: they can be either user, group, or tree. Quota targets specify the user, group, or qtree for which the quota limits are applied.

The following table lists the kinds of quota targets, what types of quotas each quota target is associated with, and how each quota target is represented:

Quota target	Quota type	How target is represented	Notes
user	user quota	UNIX user name UNIX UID Windows user name in pre-Windows 2000 format Windows SID	User quotas can be applied for a specific volume or qtree.
group	group quota	UNIX group name UNIX GID	Group quotas can be applied for a specific volume or qtree. ONTAP does not apply group quotas based on Windows IDs.
qtree	tree quota	qtree name	Tree quotas are applied to a particular volume and do not affect qtrees in other volumes.
	user quotagroup quota tree quota	Double quotation marks ("")	A quota target of "" denotes a *default quota*. For default quotas, the quota type is determined by the value of the type field.

Behavior of FlexGroup volumes when quota limits are exceeded

Starting with ONTAP 9.5, quota limits are supported on FlexGroup volumes. There are some differences in the way quota limits are enforced on a FlexGroup volume when compared to a FlexVol volume.

FlexGroup volumes might show the following behaviors when the quota limits are exceeded:

- The space and file usage in a FlexGroup volume might reach up to 5 percent higher than the configured hard limit before the quota limit is enforced by rejecting further traffic.

  To provide the best performance, ONTAP might allow the space consumption to exceed the configured hard limit by a small margin before the quota enforcement begins. This additional space consumption does not exceed 5 percent of the configured hard limits, 1 GB, or 65536 files, whichever is lower.

- After the quota limit is reached, if a user or administrator deletes some files or directories such that the quota usage is now below the limit, the subsequent quota-consuming file operation might resume with a delay (might take up to 5 seconds to resume).
- When the total space and file usage of a FlexGroup volume exceed the configured quota limits, there might be a slight delay in logging an event log message.
- You might get “no space” errors if some constituents of the FlexGroup volume get full, but the quota limits are not reached.
- Operations, such as renaming a file or directory or moving files between qtrees, on quota targets, for which quota hard limits are configured, might take longer when compared to similar operations on FlexVol volumes.

Examples of quota enforcement for FlexGroup volumes

You can use the examples to understand how to configure quotas with limits in ONTAP 9.5 and later.

Example 1: Enforcing a quota rule with disk limits

1. You should create a quota policy rule of type `user` with both an achievable soft disk limit and hard disk limit.

```
cluster1::> volume quota policy rule create -vserver vs0 -policy-name
default -volume FG -type user -target "" -qtree "" -disk-limit 1T -soft
-disk-limit 800G
```

2. You can view the quota policy rule:

```
cluster1::> volume quota policy rule show -vserver vs0 -policy-name
default -volume FG

Vserver: vs0               Policy: default           Volume: FG

                                                Soft             Soft
                         User          Disk     Disk    Files    Files
Type    Target    Qtree  Mapping      Limit    Limit    Limit    Limit
Threshold
-----  --------  ------- -------  --------  -------  ------  -------
---------
user    ""        ""     off           1TB    800GB       -        -
-
```

3. To activate the new quota rule, you initialize quotas on the volume:

```
cluster1::> volume quota on -vserver vs0 -volume FG -foreground true
[Job 49] Job succeeded: Successful
```

4. You can view the disk usage and file usage information of the FlexGroup volume by using the quota report.

```
cluster1::> volume quota report -vserver vs0 -volume FG
Vserver: vs0

                                    ----Disk----  ----Files-----   Quota
Volume   Tree      Type    ID        Used  Limit    Used   Limit
Specifier
-------  --------  ------  -------  -----  -----  ------  ------
---------
FG                 user    root      50GB      -       1       -
FG                 user    *         800GB    1TB      0       -   *
2 entries were displayed.
```

After the hard disk limit is reached, the quota policy rule target (user, in this case) is blocked from writing more data to the files.

Example 2: Enforcing a quota rule for multiple users

1. You should create a quota policy rule of type `user`, where multiple users are specified in the quota target (UNIX users, CIFS users, or a combination of both) and where the rule has both an achievable soft disk limit and hard disk limit.

```
cluster1::> quota policy rule create -vserver vs0 -policy-name default
-volume FG -type user -target "rdavis,ABCCORP\RobertDavis" -qtree ""
-disk-limit 1TB -soft-disk-limit  800GB
```

2. You can view the quota policy rule:

```
cluster1::> quota policy rule show -vserver vs0 -policy-name default
-volume FG

Vserver: vs0               Policy: default           Volume: FG

                                                 Soft             Soft
                         User         Disk       Disk    Files    Files
Type   Target    Qtree   Mapping      Limit      Limit    Limit    Limit
Threshold
-----  --------  ------- -------  --------  -------  ------  -------
---------
user   "rdavis,ABCCORP\RobertDavis"  "" off  1TB  800GB  -  -
```

3. To activate the new quota rule, you initialize quotas on the volume:

```
cluster1::> volume quota on -vserver vs0 -volume FG -foreground true
[Job 49] Job succeeded: Successful
```

4. You can verify that the quota state is active:

```
cluster1::> volume quota show -vserver vs0 -volume FG
              Vserver Name: vs0
               Volume Name: FG
               Quota State: on
               Scan Status: -
          Logging Messages: on
          Logging Interval: 1h
          Sub Quota Status: none
  Last Quota Error Message: -
Collection of Quota Errors: -
```

5. You can view the disk usage and file usage information of the FlexGroup volume by using the quota report.

```
cluster1::> quota report -vserver vs0 -volume FG
Vserver: vs0

                                       ----Disk----  ----Files-----   Quota
Volume   Tree      Type    ID        Used  Limit    Used   Limit
Specifier
-------  --------  ------  -------  -----  -----  ------  ------
---------
FG                 user    rdavis,ABCCORP\RobertDavis  0B  1TB  0  -
rdavis,ABCCORP\RobertDavis
```

The quota limit is shared among all users listed in the quota target.

After the hard disk limit is reached, users listed in the quota target are blocked from writing more data to the files.

Example 3: Enforcing quota with user mapping enabled

1. You should create a quota policy rule of type `user`, specify a UNIX user or a Windows user as the quota target with `user-mapping` set to `on`, and create the rule with both an achievable soft disk limit and hard disk limit.

   The mapping between UNIX and Windows users must be configured earlier by using the `vserver name-mapping create` command.

```
cluster1::> quota policy rule create -vserver vs0 -policy-name default
-volume FG -type user -target rdavis -qtree "" -disk-limit 1TB -soft
-disk-limit  800GB -user-mapping on
```

2. You can view the quota policy rule:

```
cluster1::> quota policy rule show -vserver vs0 -policy-name default
-volume FG

Vserver: vs0               Policy: default           Volume: FG

                                                Soft             Soft
                         User          Disk     Disk   Files    Files
Type   Target    Qtree   Mapping      Limit    Limit   Limit    Limit
Threshold
-----  --------  ------- -------  --------  -------  ------  -------
---------
user   rdavis    ""      on            1TB    800GB       -        -
-
```

3. To activate the new quota rule, you initialize quotas on the volume:

```
cluster1::> volume quota on -vserver vs0 -volume FG -foreground true
[Job 49] Job succeeded: Successful
```

4. You can verify that the quota state is active:

```
cluster1::> volume quota show -vserver vs0 -volume FG
               Vserver Name: vs0
                Volume Name: FG
                Quota State: on
                Scan Status: -
           Logging Messages: on
           Logging Interval: 1h
           Sub Quota Status: none
  Last Quota Error Message: -
Collection of Quota Errors: -
```

5. You can view the disk usage and file usage information of the FlexGroup volume by using the quota report.

```
cluster1::> quota report -vserver vs0 -volume FG
Vserver: vs0

                                     ----Disk----  ----Files-----   Quota
Volume   Tree      Type    ID        Used  Limit    Used   Limit
Specifier
-------  --------  ------  -------  -----  -----  ------  ------
---------
FG                 user    rdavis,ABCCORP\RobertDavis  0B  1TB  0  -
rdavis
```

The quota limit is shared between the user listed in the quota target and its corresponding Windows or UNIX user.

After the hard disk limit is reached, both the user listed in the quota target and its corresponding Windows or UNIX user is blocked from writing more data to the files.

Example 4: Verifying the qtree size when quota is enabled

1. You should create a quota policy rule of type `tree` and where the rule has both an achievable soft disk limit and hard disk limit.

```
cluster1::> quota policy rule create -vserver vs0 -policy-name default
-volume FG -type tree -target tree_4118314302 -qtree "" -disk-limit 48GB
-soft-disk-limit 30GB
```

2. You can view the quota policy rule:

```
cluster1::> quota policy rule show -vserver vs0

Vserver: vs0                Policy: default           Volume: FG

                                                 Soft              Soft
                          User          Disk     Disk    Files     Files
Type   Target    Qtree    Mapping      Limit    Limit    Limit     Limit
Threshold
-----  --------  -------  -------  --------  -------  ------  -------
---------
tree   tree_4118314302  "" -           48GB        -      20        -
```

3. To activate the new quota rule, you initialize quotas on the volume:

```
cluster1::> volume quota on -vserver vs0 -volume FG -foreground true
[Job 49] Job succeeded: Successful
```

   a. You can view the disk usage and file usage information of the FlexGroup volume by using the quota report.

```
cluster1::> quota report -vserver vs0
Vserver: vs0
----Disk---- ----Files----- Quota
Volume Tree Type ID Used Limit Used Limit Specifier
------- -------- ------ ------- ----- ----- ------ ------ ---------
FG tree_4118314302 tree 1 30.35GB 48GB 14 20 tree_4118314302
```

      The quota limit is shared between the user listed in the quota target and its corresponding Windows or UNIX user.

4. From an NFS client, use the `df` command to view the total space usage, available space, and the used space.

```
scsps0472342001# df -m /t/10.53.2.189/FG-3/tree_4118314302
Filesystem 1M-blocks Used Available Use% Mounted on
10.53.2.189/FG-3 49152 31078 18074 63% /t/10.53.2.189/FG-3
```

With hard limit, the space usage is calculated from an NFS client as follows:

- Total space usage = hard limit for tree
- Free space = Hard limit minus qtree space usage Without hard limit, the space usage is calculated from an NFS client as follows:
- Space usage = quota usage
- Total space = Sum of quota usage and physical free space in the volume

5. From the SMB share, use Windows Explorer to view the total space usage, available space, and the used space.

   From an SMB share, you should be aware of the following considerations for calculating the space usage:

   - The user quota hard limit for the user and group is taken into consideration for calculating the total available space.
   - The minimum value among the free space of the tree quota rule, the user quota rule, and the group quota rule is considered as the free space for the SMB share.
   - The total space usage is variable for SMB and depends on the hard limit that corresponds to the minimum free space among the tree, user, and group.

Apply rules and limits on the FlexGroups volume

Steps

1. Create quota rules for targets : `volume quota policy rule create -vserver vs0 -policy -name quota_policy_of_the_rule -volume flexgroup_vol -type {tree|user|group} -target target_for_rule -qtree qtree_name [-disk-limit hard_disk_limit_size] [-file-limit hard_limit_number_of_files] [-threshold threshold_disk_limit_size] [-soft-disk-limit soft_disk_limit_size] [-soft-file-limit soft_limit_number_of_files]`

   - In ONTAP 9.2 and ONTAP 9.1, the quota target type can be only `user` or `group` for FlexGroup volumes.

     Tree quota type is not supported for FlexGroup volumes in ONTAP 9.2 and ONTAP 9.1.

   - In ONTAP 9.3 and later, the quota target type can be `user`, `group`, or `tree` for FlexGroup volumes.
   - A path is not supported as the target when creating quota rules for FlexGroup volumes.
   - Starting with ONTAP 9.5, you can specify hard disk limit, hard file limit, soft disk limit, soft file limit, and threshold limit quotas for FlexGroup volumes.

     In ONTAP 9.4 and earlier, you cannot specify the disk limit, file limit, threshold for disk limit, soft disk limit, or soft file limit when you create quota rules for FlexGroup volumes.

The following example shows a default quota rule being created for the user target type:

```
cluster1::> volume quota policy rule create -vserver vs0 -policy-name
quota_policy_vs0_1 -volume fg1 -type user -target "" -qtree ""
```

The following example shows a tree quota rule being created for the qtree named qtree1:

```
cluster1::> volume quota policy rule create -policy-name default -vserver
vs0 -volume fg1 -type tree -target "qtree1"
```

1. Activate the quotas for the specified FlexGroup volume: `volume quota on -vserver svm_name -volume flexgroup_vol -foreground true`

```
cluster1::> volume quota on -vserver vs0 -volume fg1 -foreground true
```

1. Monitor the state of quota initialization: `volume quota show -vserver svm_name`

FlexGroup volumes might show the `mixed` state, which indicates that all of the constituent volumes are not in the same state yet.

```
cluster1::> volume quota show -vserver vs0
                                          Scan
Vserver    Volume        State            Status
---------  ------------  ---------------  ------
vs0        fg1           initializing         95%
vs0        vol1          off                   -
2 entries were displayed.
```

1. View the quota report for the FlexGroup volume with active quotas: `volume quota report -vserver svm_name -volume flexgroup_vol`

   You cannot specify a path with the `volume quota report` command for FlexGroup volumes.

   The following example shows the user quota for the FlexGroup volume fg1:

```
cluster1::> volume quota report -vserver vs0 -volume fg1
  Vserver: vs0
                                     ----Disk----  ----Files-----
Quota
  Volume   Tree      Type    ID        Used  Limit    Used   Limit
Specifier
  -------  --------  ------  -------  -----  -----  ------  ------
---------
  fg1                user    *           0B      -       0       -   *
  fg1                user    root       1GB      -       1       -   *
  2 entries were displayed.
```

   The following example shows the tree quota for the FlexGroup volume fg1:

```
cluster1::> volume quota report -vserver vs0 -volume fg1
Vserver: vs0

                                    ----Disk----  ----Files-----   Quota
Volume   Tree      Type    ID        Used  Limit    Used   Limit
Specifier
-------  --------  ------  -------  -----  -----  ------  ------
---------
fg1      qtree1  tree      1         68KB      -      18       -
qtree1
fg1              tree      *           0B      -       0       -   *
2 entries were displayed.
```

Results

The quota rules and limits are applied on the FlexGroups volume.

The usage might reach up to 5 percent higher than a configured hard limit before ONTAP enforces the quota by rejecting further traffic.

Related information

ONTAP 9 commands

Enable storage efficiency on a FlexGroup volume

You can run deduplication and data compression together or independently on a FlexGroup volume to achieve optimal space savings.

What you'll need

The FlexGroup volume must be online.

Steps

1. Enable storage efficiency on the FlexGroup volume: `volume efficiency on -vserver svm_name -volume volume_name`

   Storage efficiency operations are enabled on all the constituents of the FlexGroup volume.

   If a FlexGroup volume is expanded after storage efficiency is enabled on the volume, storage efficiency is automatically enabled on the new constituents.

2. Enable the required storage efficiency operation on the FlexGroup volume by using the `volume efficiency modify` command.

   You can enable inline deduplication, postprocess deduplication, inline compression, and postprocess compression on FlexGroup volumes. You can also set the type of compression (secondary or adaptive) and specify a schedule or efficiency policy for the FlexGroup volume.

3. If you are not using schedules or efficiency policies for running the storage efficiency operations, start the

efficiency operation: `volume efficiency start -vserver svm_name -volume volume_name`

If deduplication and data compression are enabled on a volume, data compression is run initially followed by deduplication. This command fails if any efficiency operation is already active on the FlexGroup volume.

4. Verify the efficiency operations that are enabled on the FlexGroup volume: `volume efficiency show -vserver svm_name -volume volume_name`

```
cluster1::> volume efficiency show -vserver vs1 -volume fg1
             Vserver Name: vs1
              Volume Name: fg1
              Volume Path: /vol/fg1
                    State: Enabled
                   Status: Idle
                 Progress: Idle for 17:07:25
                     Type: Regular
                 Schedule: sun-sat@0

...

             Compression: true
      Inline Compression: true
Incompressible Data Detection: false
      Constituent Volume: false
Compression Quick Check File Size: 524288000
           Inline Dedupe: true
         Data Compaction: false
```

Protect FlexGroup volumes using Snapshot copies

You can create Snapshot policies that automatically manage the creation of Snapshot copies or you can manually create Snapshot copies for FlexGroup volumes. A valid Snapshot copy is created for a FlexGroup volume only after ONTAP can successfully create a Snapshot copy for each constituent of the FlexGroup volume.

About this task

If you have multiple FlexGroup volumes associated with a Snapshot policy, you should ensure that the FlexGroup volumes schedules do not overlap. Starting in ONTAP 9.8, the maximum number of Snapshot copies supported on a FlexGroup volume is 1023.

Steps

1. Create a Snapshot policy or manually create a Snapshot copy:

If you want to create a…	Enter this command…
Snapshot policy	`volume snapshot policy create` The schedules that are associated with the Snapshot policy of a FlexGroup volume must have an interval greater than 30 minutes. When you create a FlexGroup volume, the `default` Snapshot policy is applied to the FlexGroup volume.
Snapshot copy manually	`volume snapshot create` After you create a Snapshot copy for a FlexGroup volume, you cannot modify the attributes of the Snapshot copy. If you want to modify the attributes, you must delete and then re-create the Snapshot copy.

Client access to the FlexGroup volume is briefly quiesced when a Snapshot copy is created.

2. Verify that a valid Snapshot copy is created for the FlexGroup volume: `volume snapshot show -volume volume_name -fields state`

```
cluster1::> volume snapshot show -volume fg -fields state
vserver volume snapshot                state
------- ------ ---------------------- -----
fg_vs   fg     hourly.2016-08-23_0505 valid
```

3. View the Snapshot copies for the constituents of the FlexGroup volume: `volume snapshot show -is -constituent true`

```
cluster1::> volume snapshot show -is-constituent true

---Blocks---
Vserver  Volume   Snapshot                                  Size Total%
Used%
-------- -------- ------------------------------------ -------- ------
-----
fg_vs    fg__0001
                  hourly.2016-08-23_0505                    72MB     0%
27%
         fg__0002
                  hourly.2016-08-23_0505                    72MB     0%
27%
         fg__0003
                  hourly.2016-08-23_0505                    72MB     0%
27%
...
         fg__0016
                  hourly.2016-08-23_0505                    72MB     0%
27%
```

Move the constituents of a FlexGroup volume

You can move the constituents of a FlexGroup volume from one aggregate to another for balancing the load when certain constituents experience more traffic. Moving constituents also helps in freeing up space on an aggregate for resizing the existing constituents.

What you'll need

To move a FlexGroup volume constituent that is in a SnapMirror relationship, you must have initialized the SnapMirror relationship.

About this task

You cannot perform a volume move operation while the constituents of the FlexGroup volume are being expanded.

Steps

1. Identify the FlexGroup volume constituent that you want to move: `volume show -vserver svm_name -is-constituent *`

```
cluster1::> volume show -vserver vs2 -is-constituent *
Vserver   Volume       Aggregate    State      Type       Size
Available Used%
--------- ------------ ------------ ---------- ---- ----------
---------- -----
vs2       fg1          -            online     RW        400TB
15.12TB   62%
vs2       fg1__0001    aggr1        online     RW         25TB
8.12MB   59%
vs2       fg1__0002    aggr2        online     RW         25TB
2.50TB   90%
...
```

2. Identify an aggregate to which you can move the FlexGroup volume constituent: `volume move target-aggr show -vserver svm_name -volume vol_constituent_name`

   The available space in the aggregate that you select must be greater than the size of the FlexGroup volume constituent that you are moving.

```
cluster1::> volume move target-aggr show -vserver vs2 -volume fg1_0002
Aggregate Name   Available Size   Storage Type
--------------   --------------   ------------
aggr2            467.9TB          hdd
node12a_aggr3    100.34TB         hdd
node12a_aggr2    100.36TB         hdd
node12a_aggr1    100.36TB         hdd
node12a_aggr4    100.36TB         hdd
5 entries were displayed.
```

3. Verify that the FlexGroup volume constituent can be moved to the intended aggregate: `volume move start -vserver svm_name -volume vol_constituent_name -perform-validation-only true`

```
cluster1::> volume move start -vserver vs2 -volume fg1_0002 -destination
-aggregate node12a_aggr3 -perform-validation-only true
Validation succeeded.
```

4. Move the FlexGroup volume constituent: `volume move start -vserver svm_name -volume vol_constituent_name -destination-aggregate aggr_name [-allow-mixed-aggr-types {true|false}]`

   The volume move operation runs as a background process.

   Starting with ONTAP 9.5, you can move FlexGroup volume constituents from a Fabric Pool to a non-Fabric Pool, or vice versa by setting the `-allow-mixed-aggr-types` parameter to `true`. By default, the

`-allow-mixed-aggr-types` option is set to `false`.

> You cannot use the `volume move` command for enabling encryption on FlexGroup volumes.

```
cluster1::> volume move start -vserver vs2 -volume fg1_002 -destination
-aggregate node12a_aggr3
```

> If the volume move operation fails due to an active SnapMirror operation, you should abort the SnapMirror operation by using the `snapmirror abort -h` command. In some cases, the SnapMirror abort operation might also fail. In such situations, you should abort the volume move operation and retry later.

5. Verify the state of the volume move operation: `volume move show -volume vol_constituent_name`

   The following example shows the state of a FlexGroup constituent volume that completed the replication phase and is in the cutover phase of the volume move operation:

```
cluster1::> volume move show -volume fg1_002
Vserver   Volume     State    Move Phase  Percent-Complete Time-To-
Complete
--------- ---------- -------- ----------  ----------------
----------------
vs2       fg1_002    healthy  cutover     -                -
```

Use aggregates in FabricPool for existing FlexGroup volumes

Starting with ONTAP 9.5, FabricPool is supported for FlexGroup volumes. If you want to use aggregates in FabricPool for your existing FlexGroup volumes, you can either convert the aggregates on which the FlexGroup volume resides to aggregates in FabricPool or migrate the FlexGroup volume constituents to aggregates in FabricPool.

What you'll need

- The FlexGroup volume must have space-guarantee set to `none`.
- If you want to convert the aggregates on which the FlexGroup volume resides to aggregates in FabricPool, the aggregates must be using all SSD disks.

About this task

If an existing FlexGroup volume resides on non-SSD aggregates, you must migrate the FlexGroup volume constituents to aggregates in FabricPool.

Choices

- To convert the aggregates on which the FlexGroup volume resides to aggregates in FabricPool, perform the following steps:

  a. Set the tiering policy on the existing FlexGroup volume: `volume modify -volume flexgroup_name -tiering-policy [auto|snapshot|none|backup]`

  ```
  cluster-2::> volume modify -volume fg1 -tiering-policy auto
  ```

  b. Identify the aggregates on which the FlexGroup volume resides: `volume show -volume flexgroup_name -fields aggr-list`

  ```
  cluster-2::> volume show -volume fg1 -fields aggr-list
  vserver volume aggr-list
  ------- ------ -----------
  vs1     fg1    aggr1,aggr3
  ```

  c. Attach an object store to each aggregate listed in the aggregate list: `storage aggregate object-store attach -aggregate aggregate name -name object-store-name -allow -flexgroup true`

  You must attach all of the aggregates to an object store.

```
cluster-2::> storage aggregate object-store attach -aggregate aggr1
-object-store-name Amazon01B1
```

- To migrate the FlexGroup volume constituents to aggregates in FabricPool, perform the following steps:

  a. Set the tiering policy on the existing FlexGroup volume: `volume modify -volume flexgroup_name -tiering-policy [auto|snapshot|none|backup]`

  ```
  cluster-2::> volume modify -volume fg1 -tiering-policy auto
  ```

  b. Move each constituent of the FlexGroup volume to an aggregate in FabricPool in the same cluster: `volume move start -volume constituent-volume -destination-aggregate FabricPool_aggregate -allow-mixed-aggr-types true`

  You must move all FlexGroup volume constituents to aggregates in FabricPool (in case the FlexGroup volume constituents are on mixed aggregate types) and ensure that all the constituents are balanced across the nodes in the cluster.

  ```
  cluster-2::> volume move start -volume fg1_001 -destination-aggregate
  FP_aggr1 -allow-mixed-aggr-types true
  ```

Related information