



Manage FlexCache volumes

ONTAP 9

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Manage FlexCache volumes

Enable and manage FlexCache writeback

Beginning with ONTAP 9.15.1, you can enable FlexCache writeback mode on FlexCache volumes to provide better performance for edge computing environments and caches with write-heavy workloads. You can also determine whether writeback is enabled on a FlexCache volume or disable writeback on the volume when necessary.

When writeback is enabled on the cache volume, write requests are sent to the local cache rather than to the origin volume.

Before you begin

You must be in advanced privilege mode.

Create a new FlexCache volume with writeback enabled


Steps

You can create a new FlexCache volume with writeback enabled by using ONTAP System Manager or the ONTAP CLI.

System Manager

1. If the FlexCache volume is on a different cluster than the origin volume, create a cluster peer relationship:
 - a. On the local cluster, click **Protection > Overview**.
 - b. Expand **Intercluster Settings**, click **Add Network Interfaces**, and add intercluster interfaces to the cluster.

Repeat this on the remote cluster.

- c. On the remote cluster, click **Protection > Overview**. Click  in the Cluster Peers section and click **Generate Passphrase**.
 - d. Copy the generated passphrase and paste it in the local cluster.
 - e. On the local cluster, under Cluster Peers, click **Peer Clusters** and peer the local and remote clusters.
2. If the FlexCache volume is on the same cluster as the origin volume but is in a different SVM, create an intercluster SVM peer relationship of type "flexcache":

Under Storage VM Peers, click  and then **Peer Storage VMs** to peer the storage VMs.

3. Select **Storage > Volumes**.
4. Select **Add**.
5. Select **More Options** and then select **Add as cache for a remote volume**.
6. Select **Enable FlexCache write-back**.

CLI

1. If the FlexCache volume to be created is in a different cluster, create a cluster peer relationship:
 - a. On the destination cluster, create a peer relationship with the data protection source cluster:

```
cluster peer create -generate-passphrase -offer-expiration  
MM/DD/YYYY HH:MM:SS|1...7days|1...168hours -peer-addr  
<peer_LIF_IPs> -initial-allowed-vserver-peers <svm_name>,...|*  
-ipspace <ipspace_name>
```

Beginning with ONTAP 9.6, TLS encryption is enabled by default when creating a cluster peer relationship. TLS encryption is supported for the intercluster communication between the origin and FlexCache volumes. You can also disable TLS encryption for the cluster peer relationship, if required.

```
cluster02::> cluster peer create -generate-passphrase -offer
-expiration 2days -initial-allowed-vserver-peers *
```

Passphrase: UCa+6lRVICXeL/gq1WrK7ShR
Expiration Time: 6/7/2017 08:16:10 EST
Initial Allowed Vserver Peers: *
Intercluster LIF IP: 192.140.112.101
Peer Cluster Name: Clus_7ShR (temporary generated)

Warning: make a note of the passphrase - it cannot be displayed again.

- b. On the source cluster, authenticate the source cluster to the destination cluster:

```
cluster peer create -peer-addr <peer_LIF_IPs> -ip-space <ip-space>
```

```
cluster01::> cluster peer create -peer-addr
192.140.112.101,192.140.112.102
```

Notice: Use a generated passphrase or choose a passphrase of 8 or more characters.

To ensure the authenticity of the peering relationship, use a phrase or sequence of characters that would be hard to guess.

Enter the passphrase:
Confirm the passphrase:

Clusters cluster02 and cluster01 are peered.

2. If the FlexCache volume is in a different SVM than that of the origin volume, create an SVM peer relationship with flexcache as the application:

- a. If the SVM is in a different cluster, create an SVM permission for the peering SVMs:

```
vserver peer permission create -peer-cluster <cluster_name>
-vserver <svm-name> -applications flexcache
```

The following example illustrates how to create an SVM peer permission that applies for all of the local SVMs:

```
cluster1::> vservers peer permission create -peer-cluster cluster2
-vserver "*" -applications flexcache
```

Warning: This Vserver peer permission applies to all local Vservers. After that no explicit "vservers peer accept" command required for Vserver peer relationship creation request from peer cluster "cluster2" with any of the local Vservers. Do you want to continue? {y|n}: y

b. Create the SVM peer relationship:

```
vservers peer create -vserver <local_SVM> -peer-vserver
<remote_SVM> -peer-cluster <cluster_name> -applications flexcache
```

3. Create a FlexCache volume with writeback enabled:

```
volume flexcache create -vserver <cache_vserver_name> -volume
<cache_flexgroup_name> -aggr-list <list_of_aggregates> -origin
-vserver <origin_vserver_name> -origin-vserver <origin_vserver_name>
-junction-path <junction_path> -is-writeback-enabled true
```

Enable FlexCache writeback on an existing FlexCache volume

You can enable FlexCache writeback on an existing FlexCache volume using ONTAP System Manager or the ONTAP CLI.

System Manager

1. Select **Storage > Volumes** and select an existing FlexCache volume.
2. On the volume's Overview page, click **Edit** in the upper right corner.
3. In the **Edit Volume** window, select **Enable FlexCache write-back**.

CLI

1. Enable writeback on an existing FlexCache volume:

```
volume flexcache config modify -volume <cache_flexgroup_name> -is
-writeback-enabled true
```

Check if FlexCache writeback is enabled

Steps

You can use System Manager or the ONTAP CLI to determine whether FlexCache writeback is enabled.

System Manager

1. Select **Storage > Volumes** and select a volume.
2. In the volume **Overview**, locate **FlexCache details** and check if FlexCache writeback is set to **Enabled** on the FlexCache volume.

CLI

1. Check if FlexCache writeback is enabled:

```
volume flexcache config show -volume cache -fields is-writeback-enabled
```

Disable writeback on a FlexCache volume

Before you can delete a FlexCache volume you need to disable FlexCache writeback.

Steps

You can use System Manager or the ONTAP CLI to disable FlexCache writeback.

System Manager

1. Select **Storage > Volumes** and select an existing FlexCache volume that has FlexCache writeback enabled.
2. On the volume's Overview page, click Edit in the upper right corner.
3. In the **Edit Volume** window, deselect **Enable FlexCache write-back**.

CLI

1. Disable writeback:

```
volume flexcache config modify -volume <cache_vol_name> -is-writeback-enabled false
```

Considerations for auditing FlexCache volumes

Beginning with ONTAP 9.7, you can audit NFS file access events in FlexCache relationships using native ONTAP auditing and file policy management with FPolicy.

Beginning with ONTAP 9.14.1, FPolicy is supported for FlexCache volumes with NFS or SMB. Previously, FPolicy was not supported for FlexCache volumes with SMB.

Native auditing and FPolicy are configured and managed with the same CLI commands used for FlexVol volumes. However, there is some different behavior with FlexCache volumes.

- **Native auditing**

- You can't use a FlexCache volume as the destination for audit logs.
- If you want to audit read and writes on FlexCache volumes, you must configure auditing on both the cache SVM as well as on the origin SVM.

This is because file system operations are audited where they are processed. That is, reads are audited on the cache SVM and writes are audited on the origin SVM.

- To track the origin of write operations, the SVM UUID and MSID are appended in the audit log to identify the FlexCache volume from which the write originated.
- Although system access control lists (SACLs) can be set on a file using NFSv4 or SMB protocols, FlexCache volumes support only NFSv3. Therefore, SACLs can only be set on the origin volume.

- **FPolicy**

- Although writes to a FlexCache volume are committed on the origin volume, FPolicy configurations monitor the writes on the cache volume. This is unlike native auditing, in which the writes are audited on the origin volume.
- While ONTAP does not require the same FPolicy configuration on cache and origin SVMs, it is recommended that you deploy two similar configurations. You can do so by creating a new FPolicy policy for the cache, configured like that of the origin SVM but with the scope of the new policy limited to the cache SVM.

Synchronize properties of a FlexCache volume from an origin volume

Some of the volume properties of the FlexCache volume must always be synchronized with those of the origin volume. If the volume properties of a FlexCache volume fail to synchronize automatically after the properties are modified at the origin volume, you can manually synchronize the properties.

About this task

The following volume properties of a FlexCache volume must always be synchronized with those of the origin volume:

- Security style (`-security-style`)
- Volume name (`-volume-name`)
- Maximum directory size (`-maxdir-size`)
- Minimum read ahead (`-min-readahead`)

Step

1. From the FlexCache volume, synchronize the volume properties:

```
volume flexcache sync-properties -vserver svm_name -volume flexcache_volume
```



```
cluster1::> volume flexcache sync-properties -vserver vs1 -volume fc1
```

Update the configurations of a FlexCache relationship

After events such as volume move, aggregate relocation, or storage failover, the volume configuration information on the origin volume and FlexCache volume is updated automatically. In case the automatic updates fail, an EMS message is generated and then you must manually update the configuration for the FlexCache relationship.

If the origin volume and the FlexCache volume are in the disconnected mode, you might need to perform some additional operations to update a FlexCache relationship manually.

About this task

If you want to update the configurations of a FlexCache volume, you must run the command from the origin volume. If you want to update the configurations of an origin volume, you must run the command from the FlexCache volume.

Step

1. Update the configuration of the FlexCache relationship:

```
volume flexcache config-refresh -peer-vserver peer_svm -peer-volume  
peer_volume_to_update -peer-endpoint-type [origin | cache]
```

Enable file access time updates

Beginning with ONTAP 9.11.1, you can enable the `-atime-update` field on the FlexCache volume to permit file access time updates. You can also set an access time update period with the `-atime-update-period` attribute. The `-atime-update-period` attribute controls how often access time updates can take place and when they can propagate to the origin volume.

Overview

ONTAP provides a volume-level field called `-atime-update`, to manage access time updates on files and directories that are read using `READ`, `READLINK`, and `REaddir`. Atime is used for data lifecycle decisions for files and directories that are infrequently accessed. The infrequently accessed files are eventually migrated to archive storage and are often later moved to tape.

The `atime-update` field is disabled by default on existing and newly created FlexCache volumes. If you are using FlexCache volumes with ONTAP releases earlier than 9.11.1, you should leave the `atime-update` field disabled so caches aren't unnecessarily evicted when a read operation is performed on the origin volume. With large FlexCache caches, however, administrators use special tools to manage data and help to ensure that hot data remains in the cache and cold data is purged. This is not possible when `atime-update` is disabled. However, beginning with ONTAP 9.11.1, you can enable `-atime-update` and `-atime-update-period`, and use the tools required to manage the cached data.

Before you begin

All FlexCache volumes must be running ONTAP 9.11.1 or later.

About this task

Setting `-atime-update-period` to 86400 seconds allows no more than one access time update per 24-hour period, regardless of the number of read-like operations performed on a file.

Setting the `-atime-update-period` to 0 sends messages to the origin for each read access. The origin then informs each FlexCache volume that the atime is outdated, which impacts performance.

Steps

1. Enable file access time updates and set the update frequency:

```
volume modify -volume vol_name -vserver SVM_name -atime-update true -atime-update-period seconds
```

The following example enables `-atime-update` and sets `-atime-update-period` to 86400 seconds, or 24 hours:

```
c1: volume modify -volume origin1 vs1_c1 -atime-update true -atime-update-period 86400
```

2. Verify that `-atime-update` is enabled:

```
volume show -volume vol_name -fields atime-update,atime-update-period
```

```
c1::*> volume show -volume cachel_origin1 -fields atime-update,atime-update-period
vserver volume          atime-update atime-update-period
-----
vs2_c1  cachel_origin1 true          86400
```

Enable global file locking

Beginning with ONTAP 9.10.1, global file locking can be applied to prevent reads across all related cached files.

With global file locking enabled, modifications to the origin volume are suspended until all FlexCache volumes are online. You should only enable global file locking when you have control over the reliability of the connections between cache and origin due to suspension and possible timeouts of modifications when FlexCache volumes are offline.

Before you begin

- Global file locking requires the clusters containing the origin and all associated caches to be running ONTAP 9.9.1 or later. Global file locking can be enabled on new or existing FlexCache volumes. The

command can be run on one volume and applies to all associated FlexCache volumes.

- You must be in the advanced privilege level to enable global file locking.
- If you revert to a version of ONTAP earlier than 9.9.1, global file locking must first be disabled on the origin and associated caches. To disable, from the origin volume, run: `volume flexcache prepare-to-downgrade -disable-feature-set 9.10.0`
- The process to enable global file locking depends on whether the origin has existing caches:
 - [Enable global file locking on new FlexCache volumes](#)
 - [Enable global file locking on existing FlexCache volumes](#)

Enable global file locking on new FlexCache volumes

Steps

1. Create the FlexCache volume with `-is-global-file-locking` set to true:

```
volume flexcache create volume volume_name -is-global-file-locking-enabled true
```



The default value of `-is-global-file-locking` is “false”. When any subsequent `volume flexcache create` commands are run on a volume, they must be passed with `-is-global-file-locking enabled` set to “true”.

Enable global file locking on existing FlexCache volumes

Steps

1. Global file locking must be set from the origin volume.
2. The origin cannot have any other existing relationships (for example, SnapMirror). Any existing relationships must be dissociated. All caches and volumes must be connected at the time of running the command. To check the connection status, run:

```
volume flexcache connection-status show
```

The status for all the listed volumes should display as `connected`. For more information, see [View the status of a FlexCache relationship](#) or [Synchronize properties of a FlexCache volume from an origin](#).

3. Enable global file locking on the caches:

```
volume flexcache origin config show/modify -volume volume_name -is-global-file-locking-enabled true
```

Prepopulate a FlexCache volume

You can prepopulate a FlexCache volume to reduce the time it takes to access cached data.

What you'll need

- You must be a cluster administrator at the advanced privilege level

- The paths you pass for prepopulation must exist or the prepopulate operation fails.

About this task

- Prepopulate reads files only and crawls through directories
- The `-isRecursion` flag applies to the entire list of directories passed to prepopulate

Steps

1. Prepopulate a FlexCache volume:

```
volume flexcache prepopulate -cache-vserver vs1 -cache-volume -path
-list path_list -isRecursion true|false
```

- The `-path-list` parameter indicates the relative directory path you want to prepopulate starting from the origin root directory. For example, if the origin root directory is named `/origin` and it contains directories `/origin/dir1` and `/origin/dir2`, you can specify the path list as follows: `-path-list dir1, dir2` or `-path-list /dir1, /dir2`.
- The default value of the `-isRecursion` parameter is `True`.

This example prepopulates a single directory path:

```
cluster1::*> flexcache prepopulate start -cache-vserver vs2 -cache
-volume fg_cachevol_1 -path-list /dir1
(volume flexcache prepopulate start)
[JobId 207]: FlexCache prepopulate job queued.
```

This example prepopulates files from several directories:

```
cluster1::*> flexcache prepopulate start -cache-vserver vs2 -cache
-volume fg_cachevol_1 -path-list /dir1,/dir2,/dir3,/dir4
(volume flexcache prepopulate start)
[JobId 208]: FlexCache prepopulate job queued.
```

This example prepopulates a single file:

```
cluster1::*> flexcache prepopulate start -cache-vserver vs2 -cache
-volume fg_cachevol_1 -path-list /dir1/file1.txt
(volume flexcache prepopulate start)
[JobId 209]: FlexCache prepopulate job queued.
```

This example prepopulates all files from the origin:

```
cluster1::*> flexcache prepopulate start -cache-vserver vs2 -cache
-volume fg_cachevol_1 -path-list / -isRecursion true
(volume flexcache prepopulate start)
[JobId 210]: FlexCache prepopulate job queued.
```

This example includes an invalid path for prepopulation:

```
cluster1::*> flexcache prepopulate start -cache-volume
vol_cache2_vs3_c2_vol_origin1_vs1_c1 -cache-vserver vs3_c2 -path-list
/dir1, dir5, dir6
(volume flexcache prepopulate start)

Error: command failed: Path(s) "dir5, dir6" does not exist in origin
volume
      "vol_origin1_vs1_c1" in Vserver "vs1_c1".
```

2. Display the number of files read:

```
job show -id job_ID -ins
```

Delete a FlexCache relationship

You can delete a FlexCache relationship and the FlexCache volume if you no longer require the FlexCache volume.

Steps

1. From the cluster that has the FlexCache volume, take the FlexCache volume offline:

```
volume offline -vserver svm_name -volume volume_name
```

2. Delete the FlexCache volume:

```
volume flexcache delete -vserver svm_name -volume volume_name
```

The FlexCache relationship details are removed from the origin volume and the FlexCache volume.

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