FlexCache volumes management

ONTAP 9

NetApp
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FlexCache overview

NetApp FlexCache technology accelerates data access, reduces WAN latency and lowers WAN bandwidth costs for read-intensive workloads, especially where clients need to access the same data repeatedly. When you create a FlexCache volume, you create a remote cache of an already existing (origin) volume that contains only the actively accessed data (hot data) of the origin volume.

When a FlexCache volume receives a read request of the hot data it contains, it can respond faster than the origin volume because the data does not need to travel as far to reach the client. If a FlexCache volume receives a read request for infrequently read data (cold data), it retrieves the needed data from the origin volume and then stores the data before serving the client request. Subsequent read requests for that data are then served directly from the FlexCache volume. After the first request, the data no longer needs to travel across the network, or be served from a heavily loaded system. For example, suppose you are experiencing bottlenecks within your cluster at a singular access point for frequently requested data. You can use FlexCache volumes within the cluster to provide multiple mount points to the hot data, thereby reducing the bottlenecks and increasing performance. As another example, suppose you need to decrease network traffic to a volume that is accessed from multiple clusters. You can use FlexCache volumes to distribute hot data from the origin volume across the clusters within your network. This reduces WAN traffic by giving users closer access points.

You can also use FlexCache technology to improve performance in cloud and hybrid cloud environments. A FlexCache volume can help you transition workloads to the hybrid cloud by caching data from an on-premises data center to cloud. You can also use FlexCache volumes to remove cloud silos by caching data from one cloud provider to another or between two regions of the same cloud provider.

Beginning with ONTAP 9.10.1, you can enable global file locking across all FlexCache volumes. Global file locking prevents a user from accessing a file that is already opened by another user. Updates to the origin volume are then distributed to all FlexCache volumes simultaneously.

Beginning with ONTAP 9.9.1, FlexCache volumes maintain a list of files not found. This helps reduce network traffic by removing the need to send multiple calls to the origin when clients search for non-existent files.

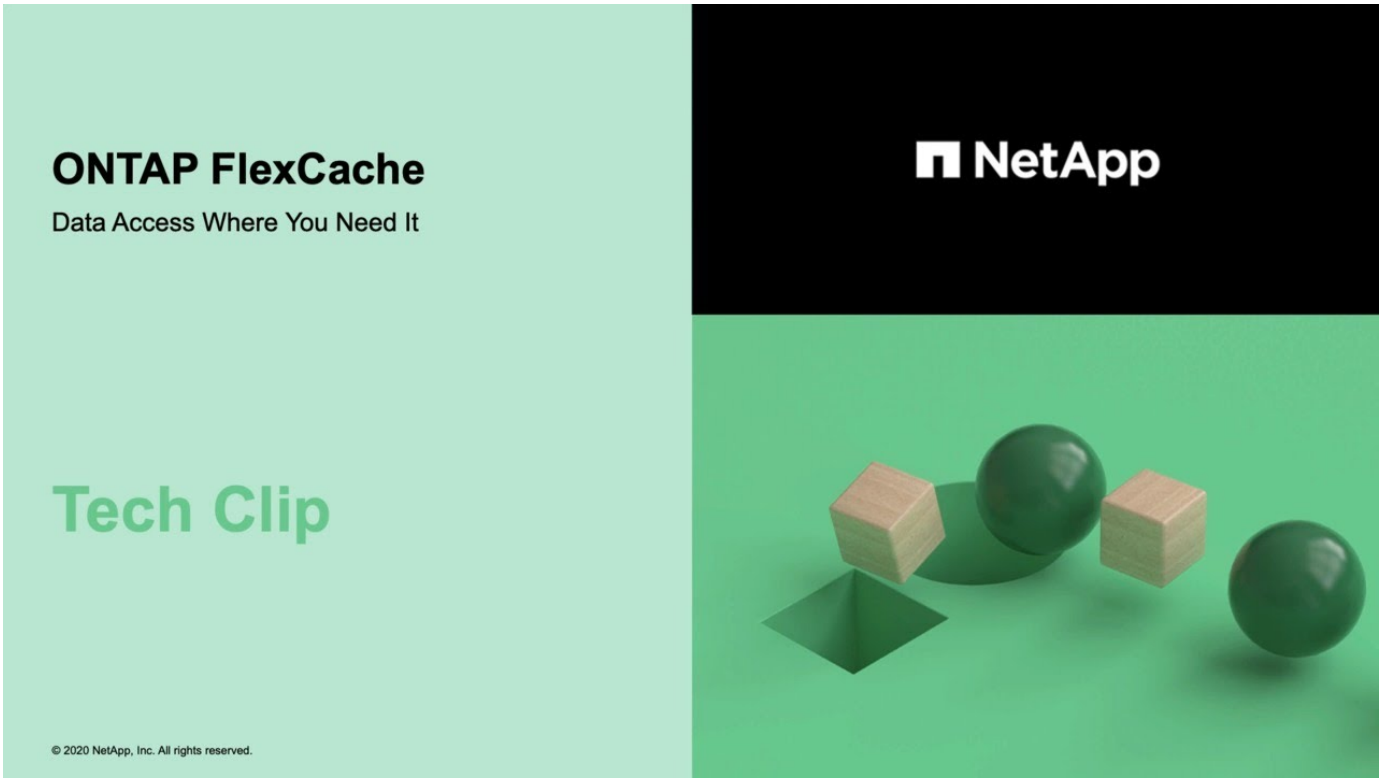
A list of additional features supported for FlexCache volumes and their origin volumes, including a list of supported protocols by ONTAP version, is also available.

You can learn more about the architecture of ONTAP FlexCache technology in TR-4743: FlexCache in ONTAP.

Videos

How FlexCache can reduce WAN latency and read times for global data

Learn about the performance benefits of ONTAP FlexCache!



Supported and unsupported features for FlexCache volumes

Beginning in ONTAP 9.5, you can configure FlexCache volumes. FlexVol volumes are

supported as origin volumes and FlexGroup volumes are supported as FlexCache volumes. Beginning in ONTAP 9.7 both FlexVol volume and FlexGroup volumes are supported as origin volumes. The supported features and protocols for the origin volume and the FlexCache volume vary.

Supported protocols

Protocol	Supported at the origin volume?	Supported at the FlexCache volume?
NFSv3	Yes	Yes
NFSv4	Yes To access cache volumes using NFSv4.x protocol, both the origin and cache clusters must be using ONTAP 9.10.1 or later. The origin cluster and FlexCache cluster can have different ONTAP versions, but both should be ONTAP 9.10.1 and later versions, for example, the origin can have ONTAP 9.10.1, and the cache can have ONTAP 9.11.1.	Yes Supported beginning with ONTAP 9.10.1. To access cache volumes using NFSv4.x protocol, both the origin and cache clusters must be using ONTAP 9.10.1 or later. The origin cluster and FlexCache cluster can have different ONTAP versions, but both should be ONTAP 9.10.1 and later versions, for example, the origin can have ONTAP 9.10.1, and the cache can have ONTAP 9.11.1.
NFSv4.2	Yes	No
SMB	Yes	Yes Supported beginning with ONTAP 9.8.

Supported features

Feature	Supported at the origin volume?	Supported at the FlexCache volume?
Autonomous ransomware protection	Yes Supported for FlexVol origin volumes beginning with ONTAP 9.10.1, not supported for FlexGroup origin volumes.	No

Antivirus	Yes Supported beginning with ONTAP 9.7.	Not applicable If you configure antivirus scanning at the origin, it is not required on the cache. The origin antivirus scanning detects files infected with viruses before writes are committed, regardless of the write source. For more information about using antivirus scanning with FlexCache, see the FlexCache with ONTAP technical report.
Auditing	Yes Supported beginning with ONTAP 9.7. You can audit NFS file access events in FlexCache relationships using native ONTAP auditing. For more information, see Considerations for auditing FlexCache volumes	Yes Supported beginning with ONTAP 9.7. You can audit NFS file access events in FlexCache relationships using native ONTAP auditing. For more information, see Considerations for auditing FlexCache volumes
Cloud Volumes ONTAP	Yes Supported beginning with ONTAP 9.6	Yes Supported beginning with ONTAP 9.6
Compaction	Yes Supported beginning with ONTAP 9.6	Yes Supported beginning with ONTAP 9.7
Compression	Yes Supported beginning with ONTAP 9.6	Yes Supported beginning with ONTAP 9.6
Deduplication	Yes	Yes Inline deduplication is supported on FlexCache volumes beginning with ONTAP 9.6. Cross-volume deduplication is supported on FlexCache volumes beginning with ONTAP 9.7.
FabricPool	Yes	Yes Supported beginning with ONTAP 9.7

FlexCache DR	Yes	Yes Supported beginning with ONTAP 9.9.1, with NFSv3 protocol, only. FlexCache volumes must be in separate SVMs or in separate clusters.
FlexGroup volume	Yes Supported beginning with ONTAP 9.7	Yes
FlexVol volume	Yes	No
FPolicy	Yes Supported beginning with ONTAP 9.7	Yes Supported for NFS beginning with ONTAP 9.7. Supported for SMB beginning with ONTAP 9.14.1.
MetroCluster configuration	Yes Supported beginning with ONTAP 9.7	Yes Supported beginning with ONTAP 9.7
Microsoft Offloaded Data Transfer (ODX)	Yes	No
NetApp Aggregate Encryption (NAE)	Yes Supported beginning with ONTAP 9.6	Yes Supported beginning with ONTAP 9.6
NetApp Volume Encryption (NVE)	Yes Supported beginning with ONTAP 9.6	Yes Supported beginning with ONTAP 9.6
ONTAP S3 NAS bucket	Yes Supported beginning with ONTAP 9.12.1	No
QoS	Yes	Yes  File-level QoS is not supported for FlexCache volumes.

Qtrees	Yes Beginning with ONTAP 9.6, you can create and modify qtrees. Qtrees created on the source can be accessed on the cache.	No
Quotas	Yes Beginning with ONTAP 9.6, quota enforcement on FlexCache origin volumes is supported for users and groups.	No With FlexCache writearound mode (the default mode), writes on the cache are forwarded to the origin volume. Quotas are enforced at the origin. Beginning with ONTAP 9.6, remote quota (rquota) is supported at FlexCache volumes.
SMB Change Notify	Yes	No
SnapLock volumes	No	No
SnapMirror Asynchronous relationships*	Yes	No
	*FlexCache origins: • You can have a FlexCache volume from an origin FlexVol • You can have a FlexCache volume from an origin FlexGroup • You can have a FlexCache volume from an origin primary volume in SnapMirror relationship. • Beginning with ONTAP 9.8, a SnapMirror secondary volume can be a FlexCache origin volume.	
SnapMirror Synchronous relationships	No	No
SnapRestore	Yes	No
Snapshot copies	Yes	No

SVM DR configuration	Yes Supported beginning withONTAP 9.5. The primary SVM of an SVM DR relationship can have the origin volume; however, if the SVM DR relationship is broken, the FlexCache relationship must be re-created with a new origin volume.	No You can have FlexCache volumes in primary SVMs, but not in secondary SVMs. Any FlexCache volume in the primary SVM is not replicated as part of the SVM DR relationship.
Storage-level Access Guard (SLAG)	No	No
Thin provisioning	Yes	Yes Supported beginning with ONTAP 9.7
Volume cloning	Yes Cloning of an origin volume and the files in the origin volume is supported beginning with ONTAP 9.6.	No
Volume move	Yes	Yes (only for volume constituents) Moving volume constituents of a FlexCache volume is supported with ONTAP 9.6 and later.
Volume rehost	No	No
vStorage API for Array Integration (VAAI)	Yes	No

In ONTAP 9 releases earlier than 9.5, origin FlexVol volumes can only serve data to FlexCache volumes created on systems running Data ONTAP 8.2.x operating in 7-Mode. Beginning with ONTAP 9.5, origin FlexVol volumes can also serve data to FlexCache volumes on ONTAP 9 systems. For information about migrating from 7-mode FlexCache to ONTAP 9 FlexCache see NetApp Technical Report 4743: FlexCache in ONTAP.

Guidelines for sizing a FlexCache volume

You must be aware of the limits for FlexCache volumes before you start provisioning the volumes.

The size limit of a FlexVol volume is applicable to an origin volume. The size of a FlexCache volume can be less than or equal to the origin volume. The best practice for the size of a FlexCache volume is to be at least

10 percent of the size of the origin volume.

You must also be aware of the following additional limits on FlexCache volumes:

Limit	ONTAP 9.5-9.6	ONTAP 9.7	ONTAP 9.8 and later
Maximum number of FlexCache volumes that you can create from an origin volume	10	10	100
Recommended maximum number of origin volumes per node	10	100	100
Recommended maximum number of FlexCache volumes per node	10	100	100
Recommended maximum number of FlexGroup constituents in a FlexCache volume per node	40	800	800
Maximum number of constituents per FlexCache volume per node	32	32	32

Related information

NetApp Interoperability

Create a FlexCache volume

You can create a FlexCache volume in the same cluster for improving performance when accessing a hot object. If you have data centers in different locations, you can create FlexCache volumes on remote clusters for accelerating data access.

About this task

- Beginning with ONTAP 9.5, FlexCache supports FlexVol volumes as origin volumes and FlexGroup volumes as FlexCache volumes.
- Beginning in ONTAP 9.7 both FlexVol volume and FlexGroup volumes are supported as origin volumes.
- Beginning with ONTAP 9.14.0, you can create an unencrypted FlexCache volume from an encrypted source.

Before you begin

- You must be running ONTAP 9.5 or later.
- If you are running ONTAP 9.6 or earlier, you must add a FlexCache license.

  A FlexCache license is not required for ONTAP 9.7 or later. Beginning with ONTAP 9.7, FlexCache functionality is included with ONTAP and no longer requires a license or activation.

Unresolved directive in flexcache/create-volume-task.adoc - include::_include/reinitialize-fips-sed-note.adoc[]

Example 1. Steps

System Manager

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

      Repeat this step on the remote cluster.

   c. In 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. In 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**. Unresolved directive in flexcache/create-volume-task.adoc - include::_include/98_qos_how_to_modify.adoc[]

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-addrs
      <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-addrs <peer_LIF_IPs> -ipspace <ipspace>
```

```
cluster01::> cluster peer create -peer-addrs
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::> vserver peer permission create -peer-cluster cluster2
-vserver "*" -applications flexcache

Warning: This Vserver peer permission applies to all local
Vservers. After that no explict
"vserver 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:

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

3. Create a FlexCache volume:

```
volume flexcache create -vserver <cache_svm> -volume
<cache_vol_name> -auto-provision-as flexgroup -size <vol_size>
-origin-vserver <origin_svm> -origin-volume <origin_vol_name>
```

The following example creates a FlexCache volume and automatically selects existing aggregates for provisioning:

```
cluster1::> volume flexcache create -vserver vs_1 -volume fc1 -auto
-provision-as flexgroup -origin-volume vol_1 -size 160MB -origin
-vserver vs_1
[Job 443] Job succeeded: Successful
```

The following example creates a FlexCache volume and sets the junction path:

```
cluster1::> flexcache create -vserver vs34 -volume fc4 -aggr-list
aggr34,aggr43 -origin-volume origin1 -size 400m -junction-path /fc4
[Job 903] Job succeeded: Successful
```

4. Verify the FlexCache relationship from the FlexCache volume and the origin volume.

a. View the FlexCache relationship in the cluster:

```
volume flexcache show
```

```
cluster1::> volume flexcache show
Vserver Volume      Size       Origin-Vserver Origin-Volume
Origin-Cluster
------- ----------- ---------- -------------- -------------
--------------
vs_1    fc1         160MB      vs_1           vol_1
cluster1
```

b. View all of the FlexCache relationships in the origin cluster:
`volume flexcache origin show-caches`

```
cluster::> volume flexcache origin show-caches
Origin-Vserver Origin-Volume   Cache-Vserver    Cache-Volume
Cache-Cluster
-------------- --------------- ---------------  --------------
---------------
vs0            ovol1           vs1              cfg1
clusA
vs0            ovol1           vs2              cfg2
clusB
vs_1           vol_1           vs_1             fc1
cluster1
```

Result

The FlexCache volume is successfully created. Clients can mount the volume by using the junction path of the FlexCache volume.

Related information

Cluster and SVM peering

Manage FlexCache volumes

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 cache1_origin1 -fields atime-update,atime-
   update-period
   vserver volume         atime-update atime-update-period
   ------- -------------- ------------ -------------------
   vs2_c1  cache1_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 vserver_name -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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