Improve client performance with traditional and lease oplocks

ONTAP 9

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Table of Contents

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Learn about improving ONTAP SMB client performance with traditional and lease oplocks

Traditional oplocks (opportunistic locks) and lease oplocks enable an SMB client in certain file-sharing scenarios to perform client-side caching of read-ahead, write-behind, and lock information. A client can then read from or write to a file without regularly reminding the server that it needs access to the file in question. This improves performance by reducing network traffic.

Lease oplocks are an enhanced form of oplocks available with the SMB 2.1 protocol and later. Lease oplocks allow a client to obtain and preserve client caching state across multiple SMB opens originating from itself.

Oplocks can be controlled in two ways:

- By a share property, using the `vserver cifs share create` command when the share is created, or the `vserver share properties` command after creation.
- By a qtree property, using the `volume qtree create` command when the qtree is created, or the `volume qtree oplock` commands after creation.

Learn about writing ONTAP SMB cache data-loss considerations when using oplocks

Under some circumstances, if a process has an exclusive oplock on a file and a second process attempts to open the file, the first process must invalidate cached data and flush writes and locks. The client must then relinquish the oplock and access to the file. If there is a network failure during this flush, cached write data might be lost.

- Data-loss possibilities

  Any application that has write-cached data can lose that data under the following set of circumstances:

  - The connection is made using SMB 1.0.
  - It has an exclusive oplock on the file.
  - It is told to either break that oplock or close the file.
  - During the process of flushing the write cache, the network or target system generates an error.
- Error handling and write completion

  The cache itself does not have any error handling—the applications do. When the application makes a write to the cache, the write is always completed. If the cache, in turn, makes a write to the target system over a network, it must assume that the write is completed because if it does not, the data is lost.

Enable or disable oplocks when creating ONTAP SMB shares

Oplocks allow clients to lock files and cache content locally, which can increase performance for file operations. Oplocks are enabled on SMB shares residing on storage virtual machines (SVMs). In some circumstances, you might want to disable oplocks. You can enable or disable oplocks on a share-by-share basis.

About this task

If oplocks are enabled on the volume containing a share but the oplock share property for that share is disabled, oplocks are disabled for that share. Disabling oplocks on a share takes precedence over the volume oplock setting. Disabling oplocks on the share disables both opportunistic and lease oplocks.

You can specify other share properties in addition to specifying the oplock share property by using a comma-delimited list. You can also specify other share parameters.

Steps

1. Perform the applicable action:

If you want to…	Then…
Enable oplocks on a share during share creation	Enter the following command: `vserver cifs share create -vserver _vserver_name_ -share-name share_name -path path_to_share -share-properties [oplocks,...]` If you want the share to have only the default share properties, which are `oplocks`, `browsable`, and `changenotify` enabled, you do not have to specify the `-share-properties` parameter when creating an SMB share. If you want any combination of share properties other than the default, then you must specify the `-share-properties` parameter with the list of share properties to use for that share.

If you want to…	Then…
Disable oplocks on a share during share creation	Enter the following command: `vserver cifs share create -vserver _vserver_name_ -share-name _share_name_ -path _path_to_share_ -share-properties [other_share_property,...]` When disabling oplocks, you must specify a list of share properties when creating the share, but you should not specify the `oplocks` property.

Related information

Enable or disable oplocks on existing SMB shares

Monitor oplock status

ONTAP commands for enabling or disabling oplocks on SMB volumes and qtrees

Oplocks allow clients to lock files and cache content locally, which can increase performance for file operations. You need to know the commands for enabling or disabling oplocks on volumes or qtrees. You also must know when you can enable or disable oplocks on volumes and qtrees.

- Oplocks are enabled on volumes by default.
- You cannot disable oplocks when you create a volume.
- You can enable or disable oplocks on existing volumes for SVMs at any time.
- You can enable oplocks on qtrees for SVMs.

  The oplock mode setting is a property of qtree ID 0, the default qtree that all volumes have. If you do not specify an oplock setting when creating a qtree, the qtree inherits the oplock setting of the parent volume, which is enabled by default. However, if you do specify an oplock setting on the new qtree, it takes precedence over the oplock setting on the volume.

If you want to…	Use this command…
Enable oplocks on volumes or qtrees	`volume qtree oplocks` with the `-oplock-mode` parameter set to `enable`
Disable oplocks on volumes or qtrees	`volume qtree oplocks` with the `-oplock-mode` parameter set to `disable`

Related information

Enable or disable oplocks on existing ONTAP SMB shares

Oplocks are enabled on SMB shares on storage virtual machines (SVMs) by default. Under some circumstances, you might want to disable oplocks; alternatively, if you have previously disabled oplocks on a share, you might want to reenable oplocks.

About this task

If oplocks are enabled on the volume containing a share, but the oplock share property for that share is disabled, oplocks are disabled for that share. Disabling oplocks on a share takes precedence over enabling oplocks on the volume. Disabling oplocks on the share, disables both opportunistic and lease oplocks. You can enable or disable oplocks on existing shares at any time.

Step

1. Perform the applicable action:

If you want to…	Then…
Enable oplocks on a share by modifying an existing share	Enter the following command: `vserver cifs share properties add -vserver` *`vserver_name`* `-share-name share_name -share-properties oplocks` ⓘ You can specify additional share properties to add by using a comma-delimited list. Newly added properties are appended to the existing list of share properties. Any share properties that you have previously specified remain in effect.
Disable oplocks on a share by modifying an existing share	Enter the following command: `vserver cifs share properties remove -vserver` *`vserver_name`* `-share-name` *`share_name`* `-share-properties oplocks` ⓘ You can specify additional share properties to remove by using a comma-delimited list. Share properties that you remove are deleted from the existing list of share properties; however, previously configured share properties that you do not remove remain in effect.

Examples

The following command enables oplocks for the share named “Engineering” on storage virtual machine (SVM,

formerly known as Vserver) vs1:

```
cluster1::> vserver cifs share properties add -vserver vs1 -share-name
Engineering -share-properties oplocks

cluster1::> vserver cifs share properties show
Vserver          Share            Properties
---------------- ---------------- -----------------
vs1              Engineering      oplocks
                                  browsable
                                  changenotify
                                  showsnapshot
```

The following command disables oplocks for the share named “Engineering” on SVM vs1:

```
cluster1::> vserver cifs share properties remove -vserver vs1 -share-name
Engineering -share-properties oplocks

cluster1::> vserver cifs share properties show
Vserver          Share            Properties
---------------- ---------------- -----------------
vs1              Engineering      browsable
                                  changenotify
                                  showsnapshot
```

Related information

- Enable or disable oplocks when creating SMB shares
- Monitor oplock status
- Add or remove share properties on existing shares

Monitor ONTAP SMB oplock status

You can monitor and display information about oplock status. You can use this information to determine which files have oplocks, what the oplock level and oplock state level are, and whether oplock leasing is used. You can also determine information about locks that you might need to break manually.

About this task

You can display information about all oplocks in summary form or in a detailed list form. You can also use optional parameters to display information about a smaller subset of existing locks. For example, you can specify that the output return only locks with the specified client IP address or with the specified path.

You can display the following information about traditional and lease oplocks:

- SVM, node, volume, and LIF on which the oplock is established

- Lock UUID
- IP address of the client with the oplock
- Path at which the oplock is established
- Lock protocol (SMB) and type (oplock)
- Lock state
- Oplock level
- Connection state and SMB expiration time
- Open Group ID if a lease oplock is granted

Learn more about `vserver oplocks show` in the ONTAP command reference.

Steps

1. Display oplock status by using the `vserver locks show` command.

Examples

The following command displays default information about all locks. The oplock on the displayed file is granted with a `read-batch` oplock level:

```
cluster1::> vserver locks show

Vserver: vs0
Volume   Object Path        LIF         Protocol  Lock Type   Client
-------- ------------------ ----------- --------- ----------- ----------
vol1     /vol1/notes.txt    node1_data1
                                        cifs      share-level 192.168.1.5
         Sharelock Mode: read_write-deny_delete
                                                  op-lock     192.168.1.5
         Oplock Level: read-batch
```

The following example displays more detailed information about the lock on a file with the path `/data2/data2_2/intro.pptx`. A lease oplock is granted on the file with a `batch` oplock level to a client with an IP address of `10.3.1.3`:

> When displaying detailed information, the command provides separate output for oplock and sharelock information. This example only shows the output from the oplock section.

```
cluster1::> vserver lock show -instance -path /data2/data2_2/intro.pptx

                    Vserver: vs1
                     Volume: data2_2
          Logical Interface: lif2
                Object Path: /data2/data2_2/intro.pptx
                  Lock UUID: ff1cbf29-bfef-4d91-ae06-062bf69212c3
              Lock Protocol: cifs
                  Lock Type: op-lock
   Node Holding Lock State: node3
                 Lock State: granted
  Bytelock Starting Offset: -
    Number of Bytes Locked: -
     Bytelock is Mandatory: -
     Bytelock is Exclusive: -
     Bytelock is Superlock: -
          Bytelock is Soft: -
              Oplock Level: batch
   Shared Lock Access Mode: -
       Shared Lock is Soft: -
           Delegation Type: -
            Client Address: 10.3.1.3
              SMB Open Type: -
         SMB Connect State: connected
SMB Expiration Time (Secs): -
          SMB Open Group ID:
78a90c59d45ae211998100059a3c7a00a007f70da0f8ffffcd445b0300000000
```

Related information

Enable or disable oplocks when creating SMB shares

Enable or disable oplocks on existing SMB shares

Commands for enabling or disabling oplocks on SMB volumes and qtrees

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