



Manage WORM files

ONTAP 9

NetApp
January 23, 2026

This PDF was generated from <https://docs.netapp.com/us-en/ontap/snaplock/manage-worm-files-concept.html> on January 23, 2026. Always check docs.netapp.com for the latest.

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Manage WORM files

Manage WORM files with ONTAP SnapLock

You can manage WORM files in the following ways:

- Commit files to WORM
- Commit snapshots to WORM on a vault destination
- Mirror WORM files for disaster recovery
- Retain WORM files during litigation
- Delete WORM files

Commit files to WORM using ONTAP SnapLock

You can commit files to WORM (write once, read many) either manually or by committing them automatically. You can also create WORM appendable files.

Commit files to WORM manually

You commit a file to WORM manually by making the file read-only. You can use any suitable command or program over NFS or CIFS to change the read-write attribute of a file to read-only. You might choose to manually commit files if you want to ensure an application has finished writing to a file so that the file isn't committed prematurely or if there are scaling issues for the autocommit scanner because of a high number of volumes.

Before you begin

- The file you want to commit must reside on a SnapLock volume.
- The file must be writable.

About this task

The volume ComplianceClock time is written to the `ctime` field of the file when the command or program is executed. The ComplianceClock time determines when the retention time for the file has been reached.

Steps

1. Use a suitable command or program to change the read-write attribute of a file to read-only.

In a UNIX shell, use the following command to make a file named `document.txt` read-only:

```
chmod -w document.txt
```

In a Windows shell, use the following command to make a file named `document.txt` read-only:

```
attrib +r document.txt
```

Commit files to WORM automatically

The SnapLock autocommit feature enables you to commit files to WORM automatically. The autocommit feature commits a file to WORM state on a SnapLock volume if the file did not change for the autocommit-period duration. The autocommit feature is disabled by default.

Before you begin

- The files you want to autocommit must reside on a SnapLock volume.
- The SnapLock volume must be online.
- The SnapLock volume must be a read-write volume.

 The SnapLock autocommit feature scans through all of the files in the volume and commits a file if it meets the autocommit requirement. There might be a time interval between when the file is ready for autocommit and when it is actually committed by the SnapLock autocommit scanner. However, the file is still protected from modifications and deletion by the file system as soon as it is eligible for autocommit.

About this task

The *autocommit period* specifies the amount of time that files must remain unchanged before they are autocommitted. Changing a file before the autocommit period has elapsed restarts the autocommit period for the file.

The following table shows the possible values for the autocommit period:

Value	Unit	Notes
none	-	The default.
5 - 5256000	minutes	-
1 - 87600	hours	-
1 - 3650	days	-
1 - 120	months	-
1 - 10	years	-



The minimum value is 5 minutes and the maximum value is 10 years.

Steps

1. Autocommit files on a SnapLock volume to WORM:

```
volume snaplock modify -vserver SVM_name -volume volume_name -autocommit -period autocommit_period
```

Learn more about `volume snaplock modify` in the [ONTAP command reference](#).

The following command autocommits the files on volume `vol1` of SVM `vs1`, as long as the files remain

unchanged for 5 hours:

```
cluster1::>volume snaplock modify -vserver vs1 -volume vol1 -autocommit  
-period 5hours
```

Create a WORM appendable file

A WORM appendable file retains data written incrementally, like log entries. You can use any suitable command or program to create a WORM appendable file, or you can use the SnapLock *volume append mode* feature to create WORM appendable files by default.

Use a command or program to create a WORM appendable file

You can use any suitable command or program over NFS or CIFS to create a WORM appendable file. A WORM appendable file retains data written incrementally, like log entries. Data is appended to the file in 256 KB chunks. As each chunk is written, the previous chunk becomes WORM-protected. You cannot delete the file until the retention period has elapsed.

Before you begin

The WORM appendable file must reside on a SnapLock volume.

About this task

Data does not have to be written sequentially to the active 256 KB chunk. When data is written to byte $n \times 256\text{KB} + 1$ of the file, the previous 256 KB segment becomes WORM-protected.

Any unordered writes beyond the current active 256 KB chunk will result in the active 256KB chunk being reset to the latest offset and will cause writes to older offsets to fail with a 'Read Only File System (ROFS)' error. The write offsets are dependent on the client application. A client that does not conform to the WORM append file write semantics can cause incorrect termination of the write contents. Therefore, it is recommended to either ensure that the client follows the offset restrictions for unordered writes, or to ensure synchronous writes by mounting the file system in synchronous mode.

Steps

1. Use a suitable command or program to create a zero-length file with the desired retention time.

In a UNIX shell, use the following command to set a retention time of 21 November 2020 6:00 a.m. on a zero-length file named `document.txt`:

```
touch -a -t 202011210600 document.txt
```

2. Use a suitable command or program to change the read-write attribute of the file to read-only.

In a UNIX shell, use the following command to make a file named `document.txt` read-only:

```
chmod 444 document.txt
```

3. Use a suitable command or program to change the read-write attribute of the file back to writable.



This step is not deemed a compliance risk because there is no data in the file.

In a UNIX shell, use the following command to make a file named `document.txt` writable:

```
chmod 777 document.txt
```

4. Use a suitable command or program to start writing data to the file.

In a UNIX shell, use the following command to write data to `document.txt`:

```
echo test data >> document.txt
```



Change the file permissions back to read-only when you no longer need to append data to the file.

Use volume append mode to create WORM appendable files

Beginning with ONTAP 9.3, you can use the SnapLock *volume append mode* (VAM) feature to create WORM appendable files by default. A WORM appendable file retains data written incrementally, like log entries. Data is appended to the file in 256 KB chunks. As each chunk is written, the previous chunk becomes WORM-protected. You cannot delete the file until the retention period has elapsed.

Before you begin

- The WORM appendable file must reside on a SnapLock volume.
- The SnapLock volume must be unmounted and empty of snapshots and user-created files.

About this task

Data does not have to be written sequentially to the active 256 KB chunk. When data is written to byte $n \times 256\text{KB} + 1$ of the file, the previous 256 KB segment becomes WORM-protected.

If you specify an autocommit period for the volume, WORM appendable files that are not modified for a period greater than the autocommit period are committed to WORM.



VAM is not supported on SnapLock audit log volumes.

Steps

1. Enable VAM:

```
volume snaplock modify -vserver SVM_name -volume volume_name -is-volume-append-mode-enabled true|false
```

Learn more about `volume snaplock modify` in the [ONTAP command reference](#).

The following command enables VAM on volume `vol1` of SVM`vs1`:

```
cluster1::>volume snaplock modify -vserver vs1 -volume vol1 -is-volume  
-append-mode-enabled true
```

2. Use a suitable command or program to create files with write permissions.

The files are WORM-appendable by default.

Commit snapshots to WORM on an ONTAP vault destination

You can use SnapLock for SnapVault to WORM-protect snapshots on secondary storage. You perform all of the basic SnapLock tasks on the vault destination. The destination volume is automatically mounted read-only, so there is no need to explicitly commit the snapshots to WORM.

Before you begin

- If you want to use System Manager to configure the relationship, both the source and the destination clusters must be running ONTAP 9.15.1 or later.
- On the destination cluster:
 - [Install the SnapLock license](#).
 - [Initialize the Compliance Clock](#).
 - If you are using the CLI with an ONTAP release earlier than 9.10.1, [create a SnapLock aggregate](#).
- The protection policy must be of type "vault".
- The source and destination aggregates must be 64-bit.
- The source volume cannot be a SnapLock volume.
- If you are using the ONTAP CLI, the source and destination volumes must be created in [peered clusters](#) and [SVMs](#).

About this task

The source volume can use NetApp or non-NetApp storage.



You cannot rename a snapshot that is committed to the WORM state.

You can clone SnapLock volumes, but you cannot clone files on a SnapLock volume.



LUNs are not supported in SnapLock volumes. LUNs are supported in SnapLock volumes only in scenarios where snapshots created on a non-SnapLock volume are transferred to a SnapLock volume for protection as part of SnapLock vault relationship. LUNs are not supported in read/write SnapLock volumes. Tamperproof snapshots, however, are supported on both SnapMirror source volumes and destination volumes that contain LUNs.

Beginning with ONTAP 9.10.1, SnapLock and non-SnapLock volumes can exist on the same aggregate; therefore, you are no longer required to create a separate SnapLock aggregate if you are using ONTAP 9.10.1. You use the volume '-snaplock-type' option to specify a Compliance or Enterprise SnapLock volume type. In ONTAP releases earlier than ONTAP 9.10.1, the SnapLock mode, Compliance or Enterprise, is inherited from the aggregate. Version-flexible destination volumes are not supported. The language setting of the destination

volume must match the language setting of the source volume.

A SnapLock volume that is a vault destination has a default retention period assigned to it. The value for this period is initially set to a minimum of 0 years for SnapLock Enterprise volumes and a maximum of 30 years for SnapLock Compliance volumes. Each NetApp snapshot is committed with this default retention period at first. The retention period can be extended later, if needed. For more information, see [Set retention time overview](#).

Beginning with ONTAP 9.14.1, you can specify retention periods for specific SnapMirror labels in the SnapMirror policy of the SnapMirror relationship so that the replicated snapshots from the source to the destination volume are retained for the retention-period specified in the rule. If no retention period is specified, the default-retention-period of the destination volume is used.

Beginning with ONTAP 9.13.1, you can instantaneously restore a locked snapshot on the destination SnapLock volume of a SnapLock vault relationship by creating a FlexClone with the `snaplock-type` option set to `non-snaplock` and specifying the snapshot as the "parent-snapshot" when executing the volume clone creation operation. Learn more about [creating a FlexClone volume with a SnapLock type](#).

For MetroCluster configurations, you should be aware of the following:

- You can create a SnapVault relationship only between sync-source SVMs, not between a sync-source SVM and a sync-destination SVM.
- You can create a SnapVault relationship from a volume on a sync-source SVM to a data-serving SVM.
- You can create a SnapVault relationship from a volume on a data-serving SVM to a DP volume on a sync-source SVM.

The following illustration shows the procedure for initializing a SnapLock vault relationship:

Steps

You can use the ONTAP CLI to create a SnapLock vault relationship or, beginning with ONTAP 9.15.1, you can use System Manager to create a SnapLock vault relationship.

System Manager

1. If the volume doesn't already exist, on the source cluster, navigate to **Storage > Volumes** and select **Add**.
2. In the **Add Volume** window, choose **More Options**.
3. Enter the volume name, size, export policy and share name.
4. Save your changes.
5. On the destination cluster, navigate to **Protection > Relationships**.
6. Above the **Source** column, select **Protect** and choose **Volumes** from the menu.
7. In the **Protect volumes** window, choose **Vault** as the protection policy.
8. In the **Source** section, select the cluster, storage VM, and volume you want to protect.
9. In the **Destination** section, under **Configuration details**, select **Lock destination snapshots**, and then choose **SnapLock for SnapVault** as the locking method. **Locking method** is not displayed if the policy type selected is not of type `vault`, if the SnapLock license is not installed, or if the Compliance Clock is not initialized.
10. If it is not already enabled, select **Initialize SnapLock Compliance Clock**.
11. Save your changes.

CLI

1. On the destination cluster, create a SnapLock destination volume of type `DP` that is either the same or greater in size than the source volume:

```
volume create -vserver <SVM_name> -volume <volume_name> -aggregate
<aggregate_name> -snaplock-type <compliance|enterprise> -type DP
-size <size>
```

The following command creates a 2GB SnapLock Compliance volume named `dstvolB` in `SVM2` on the aggregate `node01_aggr`:

```
cluster2::> volume create -vserver SVM2 -volume dstvolB -aggregate
node01_aggr -snaplock-type compliance -type DP -size 2GB
```

2. On the destination cluster, [set the default retention period](#).
3. [Create a new replication relationship](#) between the non-SnapLock source and the new SnapLock destination you created.

This example creates a new SnapMirror relationship with destination SnapLock volume `dstvolB` using a policy of `XDPDefault` to vault snapshots labeled daily and weekly on an hourly schedule:

```
cluster2::> snapmirror create -source-path SVM1:srcvolA -destination
-path SVM2:dstvolB -vserver SVM2 -policy XDPDefault -schedule hourly
```



Create a custom replication policy or a [custom schedule](#) if the available defaults are not suitable.

4. On the destination SVM, initialize the SnapVault relationship created:

```
snapmirror initialize -destination-path <destination_path>
```

The following command initializes the relationship between the source volume `srcvolA` on SVM1 and the destination volume `dstvolB` on SVM2:

```
cluster2::> snapmirror initialize -destination-path SVM2:dstvolB
```

5. After the relationship is initialized and idle, use the `snapshot show` command on the destination to verify the SnapLock expiry time applied to the replicated snapshots.

This example lists the snapshots on volume `dstvolB` that have the SnapMirror label and the SnapLock expiration date:

```
cluster2::> snapshot show -vserver SVM2 -volume dstvolB -fields snapmirror-label, snaplock-expiry-time
```

Related information

- [Cluster and SVM peering](#)
- [Volume backup using SnapVault](#)
- [snapmirror initialize](#)

Mirror WORM files with ONTAP SnapMirror for disaster recovery

You can use SnapMirror to replicate WORM files to another geographic location for disaster recovery and other purposes. Both the source volume and destination volume must be configured for SnapLock, and both volumes must have the same SnapLock mode, Compliance or Enterprise. All key SnapLock properties of the volume and files are replicated.

Prerequisites

The source and destination volumes must be created in peered clusters with peered SVMs. For more information, see [Cluster and SVM peering](#).

About this task

- Beginning with ONTAP 9.5, you can replicate WORM files with the XDP (extended data protection) type SnapMirror relationship rather than the DP (data protection) type relationship. XDP mode is ONTAP version-independent, and is able to differentiate files stored in the same block, making it much easier to

resync replicated Compliance-mode volumes. For information on how to convert an existing DP-type relationship to an XDP-type relationship, see [Data Protection](#).

- A resync operation on a DP type SnapMirror relationship fails for a Compliance-mode volume if SnapLock determines that it will result in a loss of data. If a resync operation fails, you can use the `volume clone create` command to make a clone of the destination volume. You can then resync the source volume with the clone.
- A SnapMirror relationship of a SnapLock volume only supports the `MirrorAllSnapshots` policy of type `async-mirror`. The retention period of a SnapLock volume is determined by the maximum retention period among all the WORM files that it holds. Because the destination is a DR copy of the source, the retention period of the destination SnapLock volume will be same as the source.
- A SnapMirror relationship of type XDP between SnapLock compliant volumes supports a resync after a break even if data on the destination has diverged from the source post the break.

On a resync, when data divergence is detected between the source and the destination beyond the common snapshot, a new snapshot is cut on the destination to capture this divergence. The new snapshot and the common snapshot are both locked with a retention time as follows:

- The volume expiry time of the destination
- If the volume expiry time is in the past or has not been set, then the snapshot is locked for a period of 30 days
- If the destination has legal-holds, the actual volume expiry period is masked and shows up as 'indefinite'; however, the snapshot is locked for the duration of the actual volume expiry period.

If the destination volume has an expiry period that is later than the source, the destination expiry period is retained and will not be overwritten by the expiry period of the source volume post the resync.

If the destination has legal-holds placed on it that differ from the source, a resync is not allowed. The source and destination must have identical legal-holds or all legal-holds on the destination must be released before a resync is attempted.

A locked snapshot on the destination volume created to capture the divergent data can be copied to the source using the CLI by running the `snapmirror update -s snapshot` command. The snapshot once copied will continue to be locked at the source as well.

- SVM data protection relationships are not supported.
- Load-sharing data protection relationships are not supported.

The following illustration shows the procedure for initializing a SnapMirror relationship:

System Manager

Beginning with ONTAP 9.12.1, you can use System Manager to set up SnapMirror replication of WORM files.

Steps

1. Navigate to **Storage > Volumes**.
2. Click **Show/Hide** and select **SnapLock Type** to display the column in the **Volumes** window.
3. Locate a SnapLock volume.
4. Click  and select **Protect**.
5. Choose the destination cluster and the destination storage VM.
6. Click **More Options**.
7. Select **Show legacy policies** and select **DPDefault (legacy)**.
8. In the **Destination Configuration details** section, select **Override transfer schedule** and select **hourly**.
9. Click **Save**.
10. To the left of the source volume name, click the arrow to expand the volume details, and on the right side of the page, review the remote SnapMirror protection details.
11. On the remote cluster, navigate to **Protection Relationships**.
12. Locate the relationship and click the destination volume name to view the relationship details.
13. Verify that the destination volume SnapLock type and other SnapLock information.

CLI

1. Identify the destination cluster.
2. On the destination cluster, [install the SnapLock license](#), [initialize the Compliance Clock](#), and, if you are using an ONTAP release earlier than 9.10.1, [create a SnapLock aggregate](#).
3. On the destination cluster, create a SnapLock destination volume of type **DP** that is either the same size as or greater in size than the source volume:

```
volume create -vserver SVM_name -volume volume_name -aggregate
aggregate_name -snaplock-type compliance|enterprise -type DP -size size
```



Beginning with ONTAP 9.10.1, SnapLock and non-SnapLock volumes can exist on the same aggregate; therefore, you are no longer required to create a separate SnapLock aggregate if you are using ONTAP 9.10.1. You use the volume -snaplock-type option to specify a Compliance or Enterprise SnapLock volume type. In ONTAP releases earlier than ONTAP 9.10.1, the SnapLock mode—Compliance or Enterprise—is inherited from the aggregate. The language setting of the destination volume must match the language setting of the source volume.

The following command creates a 2 GB SnapLock Compliance volume named `dstvolB` in `SVM2` on the aggregate `node01_aggr`:

```
cluster2::> volume create -vserver SVM2 -volume dstvolB -aggregate node01_aggr -snaplock-type compliance -type DP -size 2GB
```

4. On the destination SVM, create a SnapMirror policy:

```
snapmirror policy create -vserver SVM_name -policy policy_name
```

The following command creates the SVM-wide policy SVM1-mirror:

```
SVM2::> snapmirror policy create -vserver SVM2 -policy SVM1-mirror
```

5. On the destination SVM, create a SnapMirror schedule:

```
job schedule cron create -name schedule_name -dayofweek day_of_week -hour hour -minute minute
```

The following command creates a SnapMirror schedule named weekendcron:

```
SVM2::> job schedule cron create -name weekendcron -dayofweek "Saturday, Sunday" -hour 3 -minute 0
```

6. On the destination SVM, create a SnapMirror relationship:

```
snapmirror create -source-path source_path -destination-path destination_path -type XDP|DP -policy policy_name -schedule schedule_name
```

The following command creates a SnapMirror relationship between the source volume `srcvolA` on SVM1 and the destination volume `dstvolB` on SVM2, and assigns the policy `SVM1-mirror` and the schedule `weekendcron`:

```
SVM2::> snapmirror create -source-path SVM1:srcvolA -destination-path SVM2:dstvolB -type XDP -policy SVM1-mirror -schedule weekendcron
```



The XDP type is available in ONTAP 9.5 and later. You must use the DP type in ONTAP 9.4 and earlier.

7. On the destination SVM, initialize the SnapMirror relationship:

```
snapmirror initialize -destination-path destination_path
```

The initialization process performs a *baseline transfer* to the destination volume. SnapMirror makes a snapshot of the source volume, then transfers the copy and all the data blocks that it references to the destination volume. It also transfers any other snapshots on the source volume to the destination volume.

The following command initializes the relationship between the source volume `srcvolA` on SVM1 and the destination volume `dstvolB` on SVM2:

```
SVM2::> snapmirror initialize -destination-path SVM2:dstvolB
```

Related information

- [Cluster and SVM peering](#)
- [Volume disaster recovery preparation](#)
- [Data protection](#)
- [snapmirror create](#)
- [snapmirror initialize](#)
- [snapmirror policy create](#)

Retain WORM files during litigation using ONTAP SnapLock Legal Hold

Beginning with ONTAP 9.3, you can retain Compliance-mode WORM files for the duration of a litigation by using the *Legal Hold* feature.

Before you begin

- You must be a SnapLock administrator to perform this task.

[Create a SnapLock administrator account](#)

- You must have logged in on a secure connection (SSH, console, or ZAPI).

About this task

A file under a Legal Hold behaves like a WORM file with an indefinite retention period. It is your responsibility to specify when the Legal Hold period ends.

The number of files you can place under a Legal Hold depends on the space available on the volume.

Steps

1. Start a Legal Hold:

```
snaplock legal-hold begin -litigation-name <litigation_name> -volume  
<volume_name> -path <path_name>
```

The following command starts a Legal Hold for all the files in `vol1`:

```
cluster1::>snaplock legal-hold begin -litigation-name litigation1  
-volume vol1 -path /
```

2. End a Legal Hold:

```
snaplock legal-hold end -litigation-name <litigation_name> -volume  
<volume_name> -path <path_name>
```

The following command ends a Legal Hold for all the files in `vol1`:

```
cluster1::>snaplock legal-hold end -litigation-name litigation1 -volume  
vol1 -path /
```

Related information

- [snaplock legal-hold begin](#)
- [snaplock legal-hold end](#)

Delete WORM files with ONTAP SnapLock

You can delete Enterprise-mode WORM files during the retention period using the privileged delete feature. Before you can use this feature, you must create a SnapLock administrator account and then using the account, enable the feature.

Create a SnapLock administrator account

You must have SnapLock administrator privileges to perform a privileged delete. These privileges are defined in the `vsadmin-snaplock` role. If you have not already been assigned that role, you can ask your cluster administrator to create an SVM administrator account with the SnapLock administrator role.

Before you begin

- You must be a cluster administrator to perform this task.
- You must have logged in on a secure connection (SSH, console, or ZAPI).

Steps

1. Create an SVM administrator account with the SnapLock administrator role:

```
security login create -vserver SVM_name -user-or-group-name user_or_group_name  
-application application -authmethod authentication_method -role role -comment  
comment
```

The following command enables the SVM administrator account `SnapLockAdmin` with the predefined `vsadmin-snaplock` role to access `SVM1` using a password:

```
cluster1::> security login create -vserver SVM1 -user-or-group-name  
SnapLockAdmin -application ssh -authmethod password -role vsadmin-  
snaplock
```

Learn more about `security login create` in the [ONTAP command reference](#).

Enable the privileged delete feature

You must explicitly enable the privileged delete feature on the Enterprise volume that contains the WORM files you want to delete.

About this task

The value of the `-privileged-delete` option determines whether privileged delete is enabled. Possible values are `enabled`, `disabled`, and `permanently-disabled`.



`permanently-disabled` is the terminal state. You cannot enable privileged delete on the volume after you set the state to `permanently-disabled`.

Steps

1. Enable privileged delete for a SnapLock Enterprise volume:

```
volume snaplock modify -vserver SVM_name -volume volume_name -privileged  
-delete disabled|enabled|permanently-disabled
```

The following command enables the privileged delete feature for the Enterprise volume `dataVol` on `SVM1`:

```
SVM1::> volume snaplock modify -vserver SVM1 -volume dataVol -privileged  
-delete enabled
```

Delete Enterprise-mode WORM files

You can use the privileged delete feature to delete Enterprise-mode WORM files during the retention period.

Before you begin

- You must be a SnapLock administrator to perform this task.
- You must have created a SnapLock audit log and enabled the privileged delete feature on the Enterprise volume.

About this task

You cannot use a privileged delete operation to delete an expired WORM file. You can use the `volume file retention show` command to view the retention time of the WORM file that you want to delete. Learn more about `volume file retention show` in the [ONTAP command reference](#).

Step

1. Delete a WORM file on an Enterprise volume:

```
volume file privileged-delete -vserver SVM_name -file file_path
```

The following command deletes the file `/vol/dataVol/f1` on the SVM `SVM1`:

```
SVM1::> volume file privileged-delete -file /vol/dataVol/f1
```

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