Knowledge and support

Trident

NetApp
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Knowledge and support

Frequently asked questions

Find answers to the frequently asked questions about installing, configuring, upgrading, and troubleshooting Trident.

General questions

How frequently is Trident released?

Beginning with the 24.02 release, Trident is released every four months: February, June, and October.

Does Trident support all the features that are released in a particular version of Kubernetes?

Trident usually does not support alpha features in Kubernetes. Trident might support beta features within the two Trident releases that follow the Kubernetes beta release.

Does Trident have any dependencies on other NetApp products for its functioning?

Trident does not have any dependencies on other NetApp software products and it works as a standalone application. However, you should have a NetApp backend storage device.

How can I obtain complete Trident configuration details?

Use the `tridentctl get` command to obtain more information about your Trident configuration.

Can I obtain metrics on how storage is provisioned by Trident?

Yes. Prometheus endpoints that can be used to gather information about Trident operation, such as the number of backends managed, the number of volumes provisioned, bytes consumed, and so on. You can also use Cloud Insights for monitoring and analysis.

Does the user experience change when using Trident as a CSI Provisioner?

No. There are no changes as far as the user experience and functionalities are concerned. The provisioner name used is `csi.trident.netapp.io`. This method of installing Trident is recommended if you want to use all the new features provided by current and future releases.

Install and use Trident on a Kubernetes cluster

Does Trident support an offline install from a private registry?

Yes, Trident can be installed offline. Refer to Learn about Trident installation.

Can I install Trident be remotely?

Yes. Trident 18.10 and later support remote installation capability from any machine that has `kubectl` access to the cluster. After `kubectl` access is verified (for example, initiate a `kubectl get nodes` command from the remote machine to verify), follow the installation instructions.

Can I configure High Availability with Trident?

Trident is installed as a Kubernetes Deployment (ReplicaSet) with one instance, and so it has HA built in. You should not increase the number of replicas in the deployment. If the node where Trident is installed is lost or the pod is otherwise inaccessible, Kubernetes automatically re-deploys the pod to a healthy node in your cluster. Trident is control-plane only, so currently mounted pods are not affected if Trident is re-deployed.

Does Trident need access to the kube-system namespace?

Trident reads from the Kubernetes API Server to determine when applications request new PVCs, so it needs access to kube-system.

What are the roles and privileges used by Trident?

The Trident installer creates a Kubernetes ClusterRole, which has specific access to the cluster’s PersistentVolume, PersistentVolumeClaim, StorageClass, and Secret resources of the Kubernetes cluster. Refer to Customize tridentctl installation.

Can I locally generate the exact manifest files Trident uses for installation?

You can locally generate and modify the exact manifest files Trident uses for installation, if needed. Refer to Customize tridentctl installation.

Can I share the same ONTAP backend SVM for two separate Trident instances for two separate Kubernetes clusters?

Although it is not advised, you can use the same backend SVM for two Trident instances. Specify a unique volume name for each instance during installation and/or specify a unique `StoragePrefix` parameter in the `setup/backend.json` file. This is to ensure the same FlexVol volume is not used for both instances.

Is it possible to install Trident under ContainerLinux (formerly CoreOS)?

Trident is simply a Kubernetes pod and can be installed wherever Kubernetes is running.

Can I use Trident with NetApp Cloud Volumes ONTAP?

Yes, Trident is supported on AWS, Google Cloud, and Azure.

Troubleshooting and support

Does NetApp support Trident?

Although Trident is open source and provided for free, NetApp fully supports it provided your NetApp backend is supported.

How do I raise a support case?

To raise a support case, do one of the following:

1. Contact your Support Account Manager and get help to raise a ticket.
2. Raise a support case by contacting NetApp Support.

How do I generate a support log bundle?

You can create a support bundle by running `tridentctl logs -a`. In addition to the logs captured in the bundle, capture the kubelet log to diagnose the mount problems on the Kubernetes side. The instructions to get the kubelet log varies based on how Kubernetes is installed.

What do I do if I need to raise a request for a new feature?

Create an issue on Trident Github and mention **RFE** in the subject and description of the issue.

Where do I raise a defect?

Create an issue on Trident Github. Make sure to include all the necessary information and logs pertaining to the issue.

What happens if I have quick question on Trident that I need clarification on? Is there a community or a forum?

If you have any questions, issues, or requests, reach out to us through our Trident Discord channel or GitHub.

My storage system's password has changed and Trident no longer works, how do I recover?

Update the backend's password with `tridentctl update backend myBackend -f </path/to_new_backend.json> -n trident`. Replace `myBackend` in the example with your backend name, and `` `/path/to_new_backend.json `` with the path to the correct `backend.json` file.

Trident cannot find my Kubernetes node. How do I fix this?

There are two likely scenarios why Trident cannot find a Kubernetes node. It can be because of a networking issue within Kubernetes or a DNS issue. The Trident node daemonset that runs on each Kubernetes node must be able to communicate with the Trident controller to register the node with Trident. If networking changes occurred after Trident was installed, you encounter this problem only with new Kubernetes nodes that are added to the cluster.

If the Trident pod is destroyed, will I lose the data?

Data will not be lost if the Trident pod is destroyed. Trident metadata is stored in CRD objects. All PVs that have been provisioned by Trident will function normally.

Upgrade Trident

Can I upgrade from a older version directly to a newer version (skipping a few versions)?

NetApp supports upgrading Trident from one major release to the next immediate major release. You can upgrade from version 18.xx to 19.xx, 19.xx to 20.xx, and so on. You should test upgrading in a lab before production deployment.

Is it possible to downgrade Trident to a previous release?

If you need a fix for bugs observed after an upgrade, dependency issues, or an unsuccessful or incomplete upgrade, you should uninstall Trident and reinstall the earlier version using the specific instructions for that version. This is the only recommended way to downgrade to an earlier version.

Manage backends and volumes

Do I need to define both Management and DataLIFs in an ONTAP backend definition file?

The management LIF is mandatory. DataLIF varies:

- ONTAP SAN: Do not specify for iSCSI. Trident uses ONTAP Selective LUN Map to discover the iSCI LIFs needed to establish a multi path session. A warning is generated if `dataLIF` is explicitly defined. Refer to ONTAP SAN configuration options and examples for details.
- ONTAP NAS: NetApp recommends specifying `dataLIF`. If not provided, Trident fetches dataLIFs from the SVM. You can specify a fully-qualified domain name (FQDN) to be used for the NFS mount operations, allowing you to create a round-robin DNS to load-balance across multiple dataLIFs. Refer to ONTAP NAS configuration options and examples for details

Can Trident configure CHAP for ONTAP backends?

Yes. Trident supports bidirectional CHAP for ONTAP backends. This requires setting `useCHAP=true` in your backend configuration.

How do I manage export policies with Trident?

Trident can dynamically create and manage export policies from version 20.04 onwards. This enables the storage administrator to provide one or more CIDR blocks in their backend configuration and have Trident add node IPs that fall within these ranges to an export policy it creates. In this manner, Trident automatically manages the addition and deletion of rules for nodes with IPs within the given CIDRs.

Can IPv6 addresses be used for the Management and DataLIFs?

Trident supports defining IPv6 addresses for:

- `managementLIF` and `dataLIF` for ONTAP NAS backends.
- `managementLIF` for ONTAP SAN backends. You cannot specify `dataLIF` on an ONTAP SAN backend.

Trident must be installed using the flag `--use-ipv6` (for `tridentctl` installation), `IPv6` (for Trident operator), or `tridentTPv6` (for Helm installation) for it to function over IPv6.

Is it possible to update the Management LIF on the backend?

Yes, it is possible to update the backend Management LIF using the `tridentctl update backend` command.

Is it possible to update the DataLIF on the backend?

You can update the DataLIF on `ontap-nas` and `ontap-nas-economy` only.

Can I create multiple backends in Trident for Kubernetes?

Trident can support many backends simultaneously, either with the same driver or different drivers.

How does Trident store backend credentials?

Trident stores the backend credentials as Kubernetes Secrets.

How does Trident select a specific backend?

If the backend attributes cannot be used to automatically select the right pools for a class, the `storagePools` and `additionalStoragePools` parameters are used to select a specific set of pools.

How do I ensure that Trident will not provision from a specific backend?

The `excludeStoragePools` parameter is used to filter the set of pools that Trident uses for provisioning and will remove any pools that match.

If there are multiple backends of the same kind, how does Trident select which backend to use?

If there are multiple configured backends of the same type, Trident selects the appropriate backend based on the parameters present in `StorageClass` and `PersistentVolumeClaim`. For example, if there are multiple ontap-nas driver backends, Trident tries to match parameters in the `StorageClass` and `PersistentVolumeClaim` combined and match a backend which can deliver the requirements listed in `StorageClass` and `PersistentVolumeClaim`. If there are multiple backends that match the request, Trident selects from one of them at random.

Does Trident support bi-directional CHAP with Element/SolidFire?

Yes.

How does Trident deploy Qtrees on an ONTAP volume? How many Qtrees can be deployed on a single volume?

The `ontap-nas-economy` driver creates up to 200 Qtrees in the same FlexVol volume (configurable between 50 and 300), 100,000 Qtrees per cluster node, and 2.4M per cluster. When you enter a new `PersistentVolumeClaim` that is serviced by the economy driver, the driver looks to see if a FlexVol volume already exists that can service the new Qtree. If the FlexVol volume does not exist that can service the Qtree, a new FlexVol volume is created.

How can I set Unix permissions for volumes provisioned on ONTAP NAS?

You can set Unix permissions on the volume provisioned by Trident by setting a parameter in the backend definition file.

How can I configure an explicit set of ONTAP NFS mount options while provisioning a volume?

By default, Trident does not set mount options to any value with Kubernetes. To specify the mount options in the Kubernetes Storage Class, follow the example given here.

How do I set the provisioned volumes to a specific export policy?

To allow the appropriate hosts access to a volume, use the `exportPolicy` parameter configured in the backend definition file.

How do I set volume encryption through Trident with ONTAP?

You can set encryption on the volume provisioned by Trident by using the encryption parameter in the backend definition file. For more information, refer to: How Trident works with NVE and NAE

What is the best way to implement QoS for ONTAP through Trident?

Use `StorageClasses` to implement QoS for ONTAP.

How do I specify thin or thick provisioning through Trident?

The ONTAP drivers support either thin or thick provisioning. The ONTAP drivers default to thin provisioning. If thick provisioning is desired, you should configure either the backend definition file or the `StorageClass`. If both are configured, `StorageClass` takes precedence. Configure the following for ONTAP:

1. On `StorageClass`, set the `provisioningType` attribute as thick.
2. In the backend definition file, enable thick volumes by setting `backend spaceReserve parameter` as volume.

How do I make sure that the volumes being used are not deleted even if I accidentally delete the PVC?

PVC protection is automatically enabled on Kubernetes starting from version 1.10.

Can I grow NFS PVCs that were created by Trident?

Yes. You can expand a PVC that has been created by Trident. Note that volume autogrow is an ONTAP feature that is not applicable to Trident.

Can I import a volume while it is in SnapMirror Data Protection (DP) or offline mode?

The volume import fails if the external volume is in DP mode or is offline. You receive the following error message:

```
Error: could not import volume: volume import failed to get size of
volume: volume <name> was not found (400 Bad Request) command terminated
with exit code 1.
Make sure to remove the DP mode or put the volume online before importing
the volume.
```

How is resource quota translated to a NetApp cluster?

Kubernetes Storage Resource Quota should work as long as NetApp storage has capacity. When the NetApp storage cannot honor the Kubernetes quota settings due to lack of capacity, Trident tries to provision but errors out.

Can I create Volume Snapshots using Trident?

Yes. Creating on-demand volume snapshots and Persistent Volumes from Snapshots are supported by Trident. To create PVs from snapshots, ensure that the `VolumeSnapshotDataSource` feature gate has been enabled.

What are the drivers that support Trident volume snapshots?

As of today, on-demand snapshot support is available for our `ontap-nas`, `ontap-nas-flexgroup`, `ontap-san`, `ontap-san-economy`, `solidfire-san`, and `azure-netapp-files` backend drivers.

How do I take a snapshot backup of a volume provisioned by Trident with ONTAP?

This is available on `ontap-nas`, `ontap-san`, and `ontap-nas-flexgroup` drivers. You can also specify a `snapshotPolicy` for the `ontap-san-economy` driver at the FlexVol level.

This is also available on the `ontap-nas-economy` drivers but on the FlexVol volume level granularity and not on the qtree level granularity. To enable the ability to snapshot volumes provisioned by Trident, set the backend parameter option `snapshotPolicy` to the desired snapshot policy as defined on the ONTAP backend. Any snapshots taken by the storage controller are not known by Trident.

Can I set a snapshot reserve percentage for a volume provisioned through Trident?

Yes, you can reserve a specific percentage of disk space for storing the snapshot copies through Trident by setting the `snapshotReserve` attribute in the backend definition file. If you have configured `snapshotPolicy` and `snapshotReserve` in the backend definition file, snapshot reserve percentage is set according to the `snapshotReserve` percentage mentioned in the backend file. If the `snapshotReserve` percentage number is not mentioned, ONTAP by default takes the snapshot reserve percentage as 5. If the `snapshotPolicy` option is set to none, the snapshot reserve percentage is set to 0.

Can I directly access the volume snapshot directory and copy files?

Yes, you can access the snapshot directory on the volume provisioned by Trident by setting the `snapshotDir` parameter in the backend definition file.

Can I set up SnapMirror for volumes through Trident?

Currently, SnapMirror has to be set externally by using ONTAP CLI or OnCommand System Manager.

How do I restore Persistent Volumes to a specific ONTAP snapshot?

To restore a volume to an ONTAP snapshot, perform the following steps:

1. Quiesce the application pod which is using the Persistent volume.
2. Revert to the required snapshot through ONTAP CLI or OnCommand System Manager.
3. Restart the application pod.

Can Trident provision volumes on SVMs that have a Load-Sharing Mirror configured?

Load-sharing mirrors can be created for root volumes of SVMs that serve data over NFS. ONTAP automatically updates load-sharing mirrors for volumes that have been created by Trident. This may result in delays in mounting volumes. When multiple volumes are created using Trident, provisioning a volume is dependent on ONTAP updating the load-sharing mirror.

How can I separate out storage class usage for each customer/tenant?

Kubernetes does not allow storage classes in namespaces. However, you can use Kubernetes to limit usage of a specific storage class per namespace by using Storage Resource Quotas, which are per namespace. To deny a specific namespace access to specific storage, set the resource quota to 0 for that storage class.

Troubleshooting

Use the pointers provided here for troubleshooting issues you might encounter while installing and using Trident.

For help with Trident, create a support bundle using `tridentctl logs -a -n trident` and send it to NetApp Support.

General troubleshooting

- If the Trident pod fails to come up properly (for example, when the Trident pod is stuck in the `ContainerCreating` phase with fewer than two ready containers), running `kubectl -n trident describe deployment trident` and `kubectl -n trident describe pod trident--**` can provide additional insights. Obtaining kubelet logs (for example, via `journalctl -xeu kubelet`) can also be helpful.
- If there is not enough information in the Trident logs, you can try enabling the debug mode for Trident by passing the `-d` flag to the install parameter based on your installation option.

  Then confirm debug is set using `./tridentctl logs -n trident` and searching for `level=debug msg` in the log.

  Installed with Operator

  ```
  kubectl patch torc trident -n <namespace> --type=merge -p
  '{"spec":{"debug":true}}'
  ```

  This will restart all Trident pods, which can take several seconds. You can check this by observing the 'AGE' column in the output of `kubectl get pod -n trident`.

  For Trident 20.07 and 20.10 use `tprov` in place of `torc`.

  Installed with Helm

  ```
  helm upgrade <name> trident-operator-21.07.1-custom.tgz --set
  tridentDebug=true`
  ```

  Installed with tridentctl

  ```
  ./tridentctl uninstall -n trident
  ./tridentctl install -d -n trident
  ```

- You can also obtain debug logs for each backend by including `debugTraceFlags` in your backend definition. For example, include `debugTraceFlags: {"api":true, "method":true,}` to obtain API calls and method traversals in the Trident logs. Existing backends can have `debugTraceFlags` configured with a `tridentctl backend update`.
- When using Red Hat Enterprise Linux CoreOS (RHCOS), ensure that `iscsid` is enabled on the worker nodes and started by default. This can be done using OpenShift MachineConfigs or by modifying the ignition templates.
- A common problem you could encounter when using Trident with Azure NetApp Files is when the tenant and client secrets come from an app registration with insufficient permissions. For a complete list of Trident requirements, Refer to Azure NetApp Files configuration.

- If there are problems with mounting a PV to a container, ensure that `rpcbind` is installed and running. Use the required package manager for the host OS and check if `rpcbind` is running. You can check the status of the `rpcbind` service by running a `systemctl status rpcbind` or its equivalent.
- If a Trident backend reports that it is in the `failed` state despite having worked before, it is likely caused by changing the SVM/admin credentials associated with the backend. Updating the backend information using `tridentctl update backend` or bouncing the Trident pod will fix this issue.
- If you encounter permission issues when installing Trident with Docker as the container runtime, attempt the installation of Trident with the `--in cluster=false` flag. This will not use an installer pod and avoid permission troubles seen due to the `trident-installer` user.
- Use the `uninstall parameter <Uninstalling Trident>` for cleaning up after a failed run. By default, the script does not remove the CRDs that have been created by Trident, making it safe to uninstall and install again even in a running deployment.
- If you want to downgrade to an earlier version of Trident, first run the `tridentctl uninstall` command to remove Trident. Download the desired Trident version and install using the `tridentctl install` command.
- After a successful install, if a PVC is stuck in the `Pending` phase, running `kubectl describe pvc` can provide additional information about why Trident failed to provision a PV for this PVC.

Unsuccessful Trident deployment using the operator

If you are deploying Trident using the operator, the status of `TridentOrchestrator` changes from `Installing` to `Installed`. If you observe the `Failed` status, and the operator is unable to recover by itself, you should check the logs of the operator by running following command:

```
tridentctl logs -l trident-operator
```

Trailing the logs of the trident-operator container can point to where the problem lies. For example, one such issue could be the inability to pull the required container images from upstream registries in an airgapped environment.

To understand why the installation of Trident was unsuccessful, you should take a look at the `TridentOrchestrator` status.

```
kubectl describe torc trident-2
Name:         trident-2
Namespace:
Labels:       <none>
Annotations:  <none>
API Version:  trident.netapp.io/v1
Kind:         TridentOrchestrator
...
Status:
  Current Installation Params:
    IPv6:
    Autosupport Hostname:
    Autosupport Image:
    Autosupport Proxy:
    Autosupport Serial Number:
    Debug:
    Image Pull Secrets:         <nil>
    Image Registry:
    k8sTimeout:
    Kubelet Dir:
    Log Format:
    Silence Autosupport:
    Trident Image:
  Message:                      Trident is bound to another CR 'trident'
  Namespace:                    trident-2
  Status:                       Error
  Version:
Events:
  Type     Reason  Age                From                        Message
  ----     ------  ----               ----                        -------
  Warning  Error   16s (x2 over 16s)  trident-operator.netapp.io  Trident
is bound to another CR 'trident'
```

This error indicates that there already exists a `TridentOrchestrator` that was used to install Trident. Since each Kubernetes cluster can only have one instance of Trident, the operator ensures that at any given time there only exists one active `TridentOrchestrator` that it can create.

In addition, observing the status of the Trident pods can often indicate if something is not right.

```
kubectl get pods -n trident

NAME                                READY   STATUS             RESTARTS
AGE
trident-csi-4p5kq                   1/2     ImagePullBackOff   0
5m18s
trident-csi-6f45bfd8b6-vfrkw        4/5     ImagePullBackOff   0
5m19s
trident-csi-9q5xc                   1/2     ImagePullBackOff   0
5m18s
trident-csi-9v95z                   1/2     ImagePullBackOff   0
5m18s
trident-operator-766f7b8658-ldzsv   1/1     Running            0
8m17s
```

You can clearly see that the pods are not able to initialize completely
because one or more container images were not fetched.

To address the problem, you should edit the `TridentOrchestrator` CR.
Alternatively, you can delete `TridentOrchestrator`, and create a new
one with the modified and accurate definition.

Unsuccessful Trident deployment using `tridentctl`

To help figure out what went wrong, you could run the installer again using the `-d` argument, which will turn on debug mode and help you understand what the problem is:

```
./tridentctl install -n trident -d
```

After addressing the problem, you can clean up the installation as follows, and then run the `tridentctl install` command again:

```
./tridentctl uninstall -n trident
INFO Deleted Trident deployment.
INFO Deleted cluster role binding.
INFO Deleted cluster role.
INFO Deleted service account.
INFO Removed Trident user from security context constraint.
INFO Trident uninstallation succeeded.
```

Completely remove Trident and CRDs

You can completely remove Trident and all created CRDs and associated custom resources.

This cannot be undone. Do not do this unless you want a completely fresh installation of Trident. To uninstall Trident without removing CRDs, refer to Uninstall Trident.

Trident operator

To uninstall Trident and completely remove CRDs using the Trident operator:

```
kubectl patch torc <trident-orchestrator-name> --type=merge -p
'{"spec":{"wipeout":["crds"],"uninstall":true}}'
```

Helm

To uninstall Trident and completely remove CRDs using Helm:

```
kubectl patch torc trident --type=merge -p
'{"spec":{"wipeout":["crds"],"uninstall":true}}'
```

`tridentctl`

To completely remove CRDs after uninstalling Trident using `tridentctl`

```
tridentctl obliviate crd
```

NVMe node unstaging failure with RWX raw block namespaces o Kubernetes 1.26

If you are running Kubernetes 1.26, node unstaging might fail when using NVMe/TCP with RWX raw block namespaces. The following scenarios provide workaround to the failure. Alternatively, you can upgrade Kubernetes to 1.27.

Deleted the namespace and pod

Consider a scenario where you have a Trident managed namespace (NVMe persistent volume) attached to a pod. If you delete the namespace directly from the ONTAP backend, the unstaging process gets stuck after you attempt to delete the pod. This scenario does not impact the Kubernetes cluster or other functioning.

Workaround

Unmount the persistent volume (corresponding to that namespace) from the respective node and delete it.

Blocked dataLIFs

```
If you block (or bring down) all the dataLIFs of the NVMe Trident backend,
the unstaging process gets stuck when you attempt to delete the pod. In
this scenario, you cannot run any NVMe CLI commands on the Kubernetes
node.
```

Workaround

Bring up the dataLIFS to restore full functionality.

Deleted namespace mapping

```
If you remove the `hostNQN` of the worker node from the corresponding
subsystem, the unstaging process gets stuck when you attempt to delete the
pod. In this scenario, you cannot run any NVMe CLI commands on the
Kubernetes node.
```

Workaround

Add the `hostNQN` back to the subsystem.

NFSv4.2 clients report "invalid argument" after upgrading ONTAP when when expecting "v4.2-xattrs" being enabled

After upgrading ONTAP, NFSv4.2 clients might report "invalid argument" errors when attempting to mount NFSv4.2 exports. This issue occurs when the `v4.2-xattrs` option is not enabled on the SVM.
.Workaround
Enable the `v4.2-xattrs` option on the SVM or upgrade to ONTAP 9.12.1 or later, where this option is enabled by default.

Support

NetApp provides support for Trident in a variety of ways. Extensive free self-support options are available 24x7, such as knowledgebase (KB) articles and a Discord channel.

Trident support lifecycle

Trident provides three levels of support based on your version. Refer to NetApp software version support for definitions.

Full support

Trident provides full support for twelve months from the release date.

Limited support

Trident provides limited support for months 13 - 24 from the release date.

Self-support

Trident documentation is available for months 25 - 36 from the release date.

Table 1. Trident version support schedule

Version	Full support	Limited support	Self-support
25.10	October 2026	October 2027	October 2028
25.06	June 2026	June 2027	June 2028

25.02	February 2026	February 2027	February 2028
24.10	—	October 2026	October 2027
24.06	—	June 2026	June 2027
24.02	—	February 2026	February 2027
23.10	—	—	October 2026
23.07	—	—	July 2026
23.04	—	—	April 2026
23.01	—	—	January 2026

Self-support

For a comprehensive list of troubleshooting articles, Refer to NetApp Knowledgebase (login required).

Community support

There is a vibrant public community of container users (including Trident developers) on our Discord channel. This is a great place to ask general questions about the project and discuss related topics with like-minded peers.

NetApp technical support

For help with Trident, create a support bundle using `tridentctl logs -a -n trident` and send it to `NetApp Support <Getting Help>`.

For more information

- Trident resources
- Kubernetes Hub

Copyright information

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