Google Cloud NetApp Volumes

Astra Trident

NetApp
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Google Cloud NetApp Volumes

Configure a Google Cloud NetApp Volumes backend

You can now configure Google Cloud NetApp Volumes as the backend for Astra Trident. You can attach NFS volumes using a Google Cloud NetApp Volumes backend.

```
 Google Cloud NetApp Volumes is a tech preview feature in Astra Trident
24.06.
```

Google Cloud NetApp Volumes driver details

Astra Trident provides the `google-cloud-netapp-volumes` driver to communicate with the cluster. Supported access modes are: *ReadWriteOnce* (RWO), *ReadOnlyMany* (ROX), *ReadWriteMany* (RWX), *ReadWriteOncePod* (RWOP).

Driver	Protocol	volumeMode	Access modes supported	File systems supported
`google-cloud-netapp-volumes`	NFS	Filesystem	RWO, ROX, RWX, RWOP	`nfs`

Prepare to configure a Google Cloud NetApp Volumes backend

Before you can configure your Google Cloud NetApp Volumes backend, you need to ensure the following requirements are met.

Prerequisites for NFS volumes

If you are using Google Cloud NetApp Volumes for the first time or in a new location, some initial configuration is required to set up Google Cloud NetApp Volumes and create an NFS volume. Refer to Before you begin.

Ensure that you have the following before configuring Google Cloud NetApp Volumes backend:

- A Google Cloud account configured with Google Cloud NetApp Volumes service. Refer to Google Cloud NetApp Volumes.
- Project number of your Google Cloud account. Refer to Identifying projects.
- A Google Cloud service account with the NetApp Volumes Admin (`netappcloudvolumes.admin`) role. Refer to Identity and Access Management roles and permissions.
- API key file for your GCNV account. Refer to Authenticate by using API keys
- A storage pool. Refer to Storage pools overview .

For more information about how to set up access to Google Cloud NetApp Volumes, refer to Set up access to Google Cloud NetApp Volumes.

Google Cloud NetApp Volumes backend configuration options and examples

Learn about NFS backend configuration options for Google Cloud NetApp Volumes and review configuration examples.

Backend configuration options

Each backend provisions volumes in a single Google Cloud region. To create volumes in other regions, you can define additional backends.

Parameter	Description	Default
`version`		Always 1
`storageDriverName`	Name of the storage driver	The value of `storageDriverName` must be specified as "google-cloud-netapp-volumes".
`backendName`	(Optional) Custom name of the storage backend	Driver name + "_" + part of API key
`storagePools`	Optional parameter used to specify storage pools for volume creation.	
`projectNumber`	Google Cloud account project number. The value is found on the Google Cloud portal home page.	
`location`	The Google Cloud location where Astra Trident creates GCNV volumes. When creating cross-region Kubernetes clusters, volumes created in a `location` can be used in workloads scheduled on nodes across multiple Google Cloud regions. Cross-region traffic incurs an additional cost.	
`apiKey`	API key for the Google Cloud service account with the `netappcloudvolumes.admin` role. It includes the JSON-formatted contents of a Google Cloud service account's private key file (copied verbatim into the backend configuration file). The `apiKey` must include key-value pairs for the following keys: `type`, `project_id`, `client_email`, `client_id`, `auth_uri`, `token_uri`, `auth_provider_x509_cert_url`, and `client_x509_cert_url`.	
`nfsMountOptions`	Fine-grained control of NFS mount options.	"nfsvers=3"
`limitVolumeSize`	Fail provisioning if the requested volume size is above this value.	"" (not enforced by default)

Parameter	Description	Default
`serviceLevel`	The service level of a storage pool and its volumes. The values are `flex`, `standard`, `premium`, or `extreme`.	
`network`	Google Cloud network used for GCNV volumes.	
`debugTraceFlags`	Debug flags to use when troubleshooting. Example, `{"api":false, "method":true}`. Do not use this unless you are troubleshooting and require a detailed log dump.	null

`supportedTopologies`	Represents a list of regions and zones that are supported by this backend.
	
	For more information, refer to Use CSI Topology.
	
	For example:
	`supportedTopologies:`
	`- topology.kubernetes.io/region: europe-west6`
	`topology.kubernetes.io/zone: europe-west6-b`	

Volume provisioning options

You can control default volume provisioning in the `defaults` section of the configuration file.

Parameter	Description	Default
`exportRule`	The export rules for new volumes. Must be a comma-separated list of any combination of IPv4 addresses.	"0.0.0.0/0"
`snapshotDir`	Access to the `.snapshot` directory	"false"
`snapshotReserve`	Percentage of volume reserved for snapshots	"" (accept default of 0)
`unixPermissions`	The unix permissions of new volumes (4 octal digits).	""

Example configurations

The following examples show basic configurations that leave most parameters to default. This is the easiest way to define a backend.

Minimal configuration

This is the absolute minimum backend configuration. With this configuration, Astra Trident discovers all of your storage pools delegated to Google Cloud NetApp Volumes in the configured location, and places new volumes on one of those pools randomly. Because `nasType` is omitted, the `nfs` default applies and the backend will provision for NFS volumes.

This configuration is ideal when you are just getting started with Google Cloud NetApp Volumes and trying things out, but in practice you will most likely need to provide additional scoping for the volumes you provision.

```
---

apiVersion: v1
kind: Secret
metadata:
  name: backend-tbc-gcnv-secret
type: Opaque
stringData:
  private_key_id: 'f2cb6ed6d7cc10c453f7d3406fc700c5df0ab9ec'
  private_key: |
    -----BEGIN PRIVATE KEY-----
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    XsYg6gyxy4zq7OlwWgLwGa==
    -----END PRIVATE KEY-----

---

apiVersion: trident.netapp.io/v1
kind: TridentBackendConfig
metadata:
  name: backend-tbc-gcnv
spec:
  version: 1
  storageDriverName: google-cloud-netapp-volumes
  projectNumber: '123455380079'
  location: europe-west6
  serviceLevel: premium
  apiKey:
    type: service_account
    project_id: my-gcnv-project
    client_email: myproject-prod@my-gcnv-
project.iam.gserviceaccount.com
    client_id: '103346282737811234567'
    auth_uri: https://accounts.google.com/o/oauth2/auth
    token_uri: https://oauth2.googleapis.com/token
    auth_provider_x509_cert_url:
https://www.googleapis.com/oauth2/v1/certs
    client_x509_cert_url:
https://www.googleapis.com/robot/v1/metadata/x509/myproject-prod%40my-
gcnv-project.iam.gserviceaccount.com
  credentials:
    name: backend-tbc-gcnv-secret
```

Configuration with StoragePools filter

```
apiVersion: v1
kind: Secret
metadata:
  name: backend-tbc-gcnv-secret
type: Opaque
stringData:
  private_key_id: 'f2cb6ed6d7cc10c453f7d3406fc700c5df0ab9ec'
  private_key: |
    -----BEGIN PRIVATE KEY-----
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    XsYg6gyxy4zq7OlwWgLwGa==
    -----END PRIVATE KEY-----

---

apiVersion: trident.netapp.io/v1
kind: TridentBackendConfig
metadata:
  name: backend-tbc-gcnv
spec:
  version: 1
  storageDriverName: google-cloud-netapp-volumes
  projectNumber: '123455380079'
  location: europe-west6
  serviceLevel: premium
  storagePools:
  - premium-pool1-europe-west6
  - premium-pool2-europe-west6
  apiKey:
    type: service_account
    project_id: my-gcnv-project
    client_email: myproject-prod@my-gcnv-
project.iam.gserviceaccount.com
    client_id: '103346282737811234567'
    auth_uri: https://accounts.google.com/o/oauth2/auth
    token_uri: https://oauth2.googleapis.com/token
    auth_provider_x509_cert_url:
https://www.googleapis.com/oauth2/v1/certs
    client_x509_cert_url:
https://www.googleapis.com/robot/v1/metadata/x509/myproject-prod%40my-
gcnv-project.iam.gserviceaccount.com
  credentials:
    name: backend-tbc-gcnv-secret
```

Virtual pool configuration

This backend configuration defines multiple virtual pools in a single file. Virtual pools are defined in the `storage` section. They are useful when you have multiple storage pools supporting different service levels and you want to create storage classes in Kubernetes that represent those. Virtual pool labels are used to differentiate the pools. For instance, in the example below `performance` label and `serviceLevel` type is used to differentiate virtual pools.

You can also set some default values to be applicable to all virtual pools, and overwrite the default values for individual virtual pools. In the following example, `snapshotReserve` and `exportRule` serve as defaults for all virtual pools.

For more information, refer to Virtual pools.

```
---

apiVersion: v1
kind: Secret
metadata:
  name: backend-tbc-gcnv-secret
type: Opaque
stringData:
  private_key_id: 'f2cb6ed6d7cc10c453f7d3406fc700c5df0ab9ec'
  private_key: |
    -----BEGIN PRIVATE KEY-----
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    znHczZsrrtHisIsAbOguSaPIKeyAZNchRAGzlzZE4jK3bl/qp8B4Kws8zX5ojY9m
    XsYg6gyxy4zq7OlwWgLwGa==
    -----END PRIVATE KEY-----

---

apiVersion: trident.netapp.io/v1
kind: TridentBackendConfig
metadata:
  name: backend-tbc-gcnv
spec:
  version: 1
  storageDriverName: google-cloud-netapp-volumes
  projectNumber: '123455380079'
  location: europe-west6
  apiKey:
    type: service_account
    project_id: my-gcnv-project
    client_email: myproject-prod@my-gcnv-
project.iam.gserviceaccount.com
    client_id: '103346282737811234567'
    auth_uri: https://accounts.google.com/o/oauth2/auth
    token_uri: https://oauth2.googleapis.com/token
    auth_provider_x509_cert_url:
https://www.googleapis.com/oauth2/v1/certs
    client_x509_cert_url:
https://www.googleapis.com/robot/v1/metadata/x509/myproject-prod%40my-
gcnv-project.iam.gserviceaccount.com
  credentials:
    name: backend-tbc-gcnv-secret
  defaults:
    snapshotReserve: '10'
    exportRule: 10.0.0.0/24
  storage:
    - labels:
        performance: extreme
      serviceLevel: extreme
      defaults:
        snapshotReserve: '5'
        exportRule: 0.0.0.0/0
    - labels:
        performance: premium
      serviceLevel: premium
    - labels:
        performance: standard
      serviceLevel: standard
```

What's next?

After you create the backend configuration file, run the following command:

```
kubectl create -f <backend-file>
```

To verify that the backend is successfully created, run the following command:

```
kubectl get tridentbackendconfig

NAME               BACKEND NAME       BACKEND UUID
PHASE   STATUS
backend-tbc-gcnv   backend-tbc-gcnv   b2fd1ff9-b234-477e-88fd-713913294f65
Bound   Success
```

If the backend creation fails, something is wrong with the backend configuration. You can describe the backend using the `kubectl get tridentbackendconfig <backend-name>` command or view the logs to determine the cause by running the following command:

```
tridentctl logs
```

After you identify and correct the problem with the configuration file, you can delete the backend and run the create command again.

More examples

Storage class definition examples

The following is a basic `StorageClass` definition that refers to the backend above.

```
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: gcnv-nfs-sc
provisioner: csi.trident.netapp.io
parameters:
  backendType: "google-cloud-netapp-volumes"
```

Example definitions using the `parameter.selector` field:

Using `parameter.selector` you can specify for each `StorageClass` the virtual pool that is used to host a volume. The volume will have the aspects defined in the chosen pool.

```
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: extreme-sc
provisioner: csi.trident.netapp.io
parameters:
  selector: "performance=extreme"
  backendType: "google-cloud-netapp-volumes"
---
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: premium-sc
provisioner: csi.trident.netapp.io
parameters:
  selector: "performance=premium"
  backendType: "google-cloud-netapp-volumes"
---
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: standard-sc
provisioner: csi.trident.netapp.io
parameters:
  selector: "performance=standard"
  backendType: "google-cloud-netapp-volumes"
```

For more details on storage classes, refer to Create a storage class.

PVC definition example

```
kind: PersistentVolumeClaim
apiVersion: v1
metadata:
  name: gcnv-nfs-pvc
spec:
  accessModes:
    - ReadWriteMany
  resources:
    requests:
      storage: 100Gi
  storageClassName: gcnv-nfs-sc
```

To verify if the PVC is bound, run the following command:

```
kubectl get pvc gcnv-nfs-pvc

NAME           STATUS   VOLUME                                    CAPACITY
ACCESS MODES   STORAGECLASS AGE
gcnv-nfs-pvc  Bound    pvc-b00f2414-e229-40e6-9b16-ee03eb79a213  100Gi
RWX            gcnv-nfs-sc  1m
```