# Data Protection of Container Apps Using Trident Protect

## NetApp Solutions

NetApp
February 25, 2025

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# Data Protection of Container Apps Using Trident Protect

## Data protection for Container Apps in OpenShift Container Platform using Trident protect

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This section of the reference document provides details for creating Snapshots and backups of Container Apps using Trident protect. NetApp Trident protect provides advanced application data management capabilities that enhance the functionality and availability of stateful Kubernetes applications backed by NetApp ONTAP storage systems and the NetApp Trident CSI storage provisioner.
Trident protect creates application snapshots and backups, which means not only is the snapshot and backups of application data in persistent volumes are created, but snapshots and backups of application metadata are also created. The snapshots and backups created by Trident protect can be stored in any of the following Object Storage and restored from them at a later point.

- AWS S3
- Azure Blob storage
- Google Cloud Storage
- Ontap S3
- StorageGrid
- any other S3 compatible storage

Trident protect uses the Kubernetes model of role-based access control (RBAC).
By default, Trident protect provides a single system namespace called trident-protect and its associated default service account. If you have an organization with many users or specific security needs, you can use the RBAC features of Trident protect to gain more granular control over access to resources and namespaces.

Additional information on RBAC in Trident protect can be found in the
Trident protect documentation

> ⓘ The cluster administrator has access to resources in the default trident-protect namespace and can also access resources in all other namespaces. Users cannot create application data management custom resource (CRs) like Snapshot and Backup CRs in the trident-protect namespace. As a best practice, users will need to create those CRs in the application namespace.

Trident protect can be installed using the instructions provided in the documentation here.This section will show the workflow for the data protection of container applications and restoration of the applications using Trident protect.
1. Snapshot creation (on demand on scheduled)
2. Restore from Snapshot (restore to same and different namespace)
3. Backup creation

**Pre-requisite**

Prior to creating the Snapshots and backups for an application, an Object Storage must be configured in Trident protect to store the snapshots and backups. This is done using the bucket CR. Only administrators can create a bucket CR and configure it.
The bucket CR is known as AppVault in Trident protect. AppVault objects are the declarative Kubernetes workflow representation of a storage bucket. An AppVault CR contains the configurations necessary for a bucket to be used in protection operations, such as backups, snapshots, restore operations, and SnapMirror replication.

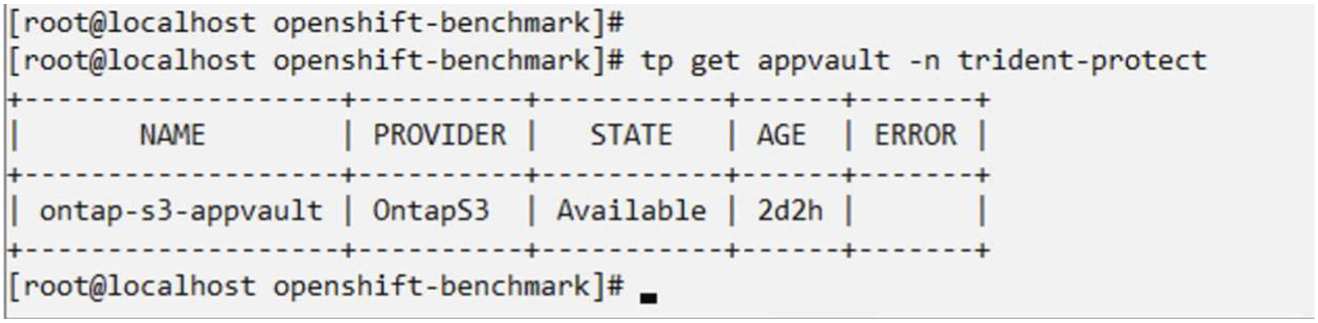
In this example, we will show the use of ONTAP S3 as Object storage.
Here is the workflow for creating AppVault CR for ONTAP S3:
1. Create S3 object store server in the SVM in ONTAP Cluster.
2. Create a bucket in the Object Store Server.
3. Create an S3 user in the SVM. Keep the access Key and the Secret Key in a safe location.
4. In OpenShift, create a secret to store the ONTAP S3 credentials.
5. Create an AppVault Object for ONTAP S3

**Configure Trident protect AppVault for ONTAP S3**

**Sample yaml file for configuring Trident protect with ONTAP S3 as the AppVault**

```
# alias tp='tridentctl-protect'

appvault-secret.yaml

apiVersion: v1
stringData:
  accessKeyID: "<access key id created for a user to access ONTAP S3
bucket>"
  secretAccessKey: "corresponding Secret Access Key"
#data:
# base 64 encoded values
#  accessKeyID: <base64 access key id created for a user to access
ONTAP S3 bucket>
#  secretAccessKey: <base 64  Secret Access Key>
kind: Secret
metadata:
  name: appvault-secret
  namespace: trident-protect
type: Opaque

appvault.yaml

apiVersion: protect.trident.netapp.io/v1
kind: AppVault
metadata:
  name: ontap-s3-appvault
  namespace: trident-protect
```

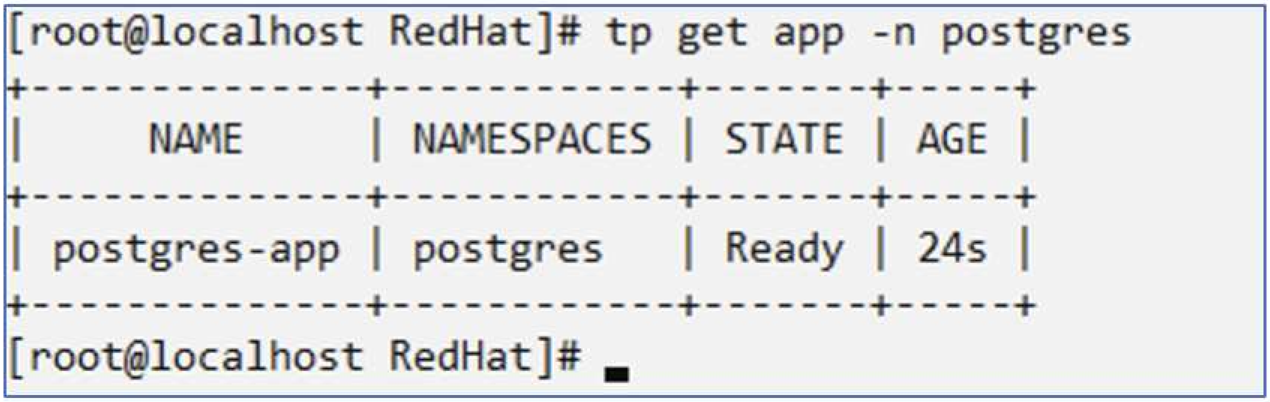
```
spec:
  providerConfig:
    azure:
      accountName: ""
      bucketName: ""
      endpoint: ""
    gcp:
      bucketName: ""
      projectID: ""
    s3:
      bucketName: <bucket-name for storing the snapshots and backups>
      endpoint: <endpoint IP for S3>
      secure: "false"
      skipCertValidation: "true"
  providerCredentials:
    accessKeyID:
      valueFromSecret:
        key: accessKeyID
        name: appvault-secret
    secretAccessKey:
      valueFromSecret:
        key: secretAccessKey
        name: appvault-secret
  providerType: OntapS3

# oc create -f appvault-secret.yaml -n trident-protect
# oc create -f appvault.yaml -n trident-protect
```



```
[root@localhost openshift-benchmark]#
[root@localhost openshift-benchmark]# tp get appvault -n trident-protect
+-------------------+----------+-----------+------+-------+
|       NAME        | PROVIDER |   STATE   | AGE  | ERROR |
+-------------------+----------+-----------+------+-------+
| ontap-s3-appvault | OntapS3  | Available | 2d2h |       |
+-------------------+----------+-----------+------+-------+
[root@localhost openshift-benchmark]# _
```

**Sample yaml file for installing postgresql app**

```
postgres.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: postgres
spec:
  replicas: 1
  selector:
    matchLabels:
      app: postgres
  template:
    metadata:
      labels:
        app: postgres
    spec:
      containers:
      - name: postgres
        image: postgres:14
        env:
        - name: POSTGRES_USER
          #value: "myuser"
          value: "admin"
        - name: POSTGRES_PASSWORD
          #value: "mypassword"
          value: "adminpass"
        - name: POSTGRES_DB
          value: "mydb"
        - name: PGDATA
          value: "/var/lib/postgresql/data/pgdata"
        ports:
        - containerPort: 5432
        volumeMounts:
        - name: postgres-storage
          mountPath: /var/lib/postgresql/data
      volumes:
      - name: postgres-storage
        persistentVolumeClaim:
          claimName: postgres-pvc
---
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: postgres-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 5Gi
---
apiVersion: v1
kind: Service
metadata:
  name: postgres
spec:
  selector:
    app: postgres
  ports:
  - protocol: TCP
    port: 5432
    targetPort: 5432
  type: ClusterIP

Now create the Trident protect application CR for the postgres app.
Include the objects in the namespace postgres and create it in the
postgres namespace.
# tp create app postgres-app --namespaces postgres -n postgres
```

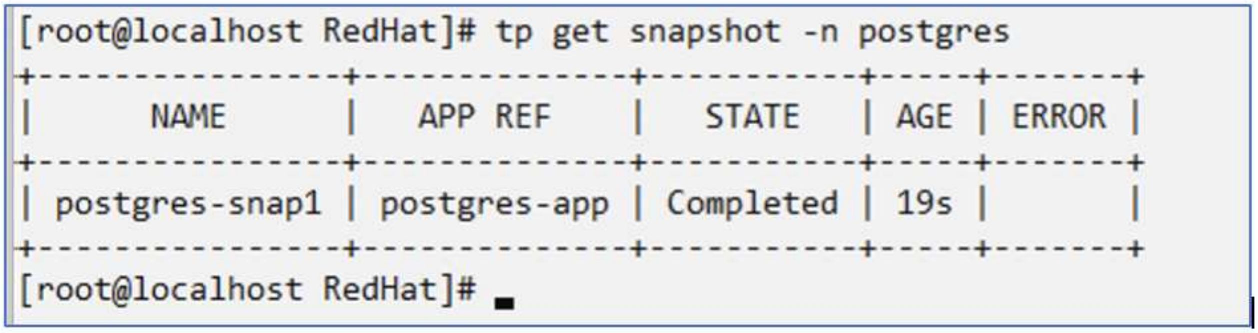


```
[root@localhost RedHat]# tp get app -n postgres
+--------------+------------+-------+-----+
|     NAME     | NAMESPACES | STATE | AGE |
+--------------+------------+-------+-----+
| postgres-app | postgres   | Ready | 24s |
+--------------+------------+-------+-----+
[root@localhost RedHat]#
```

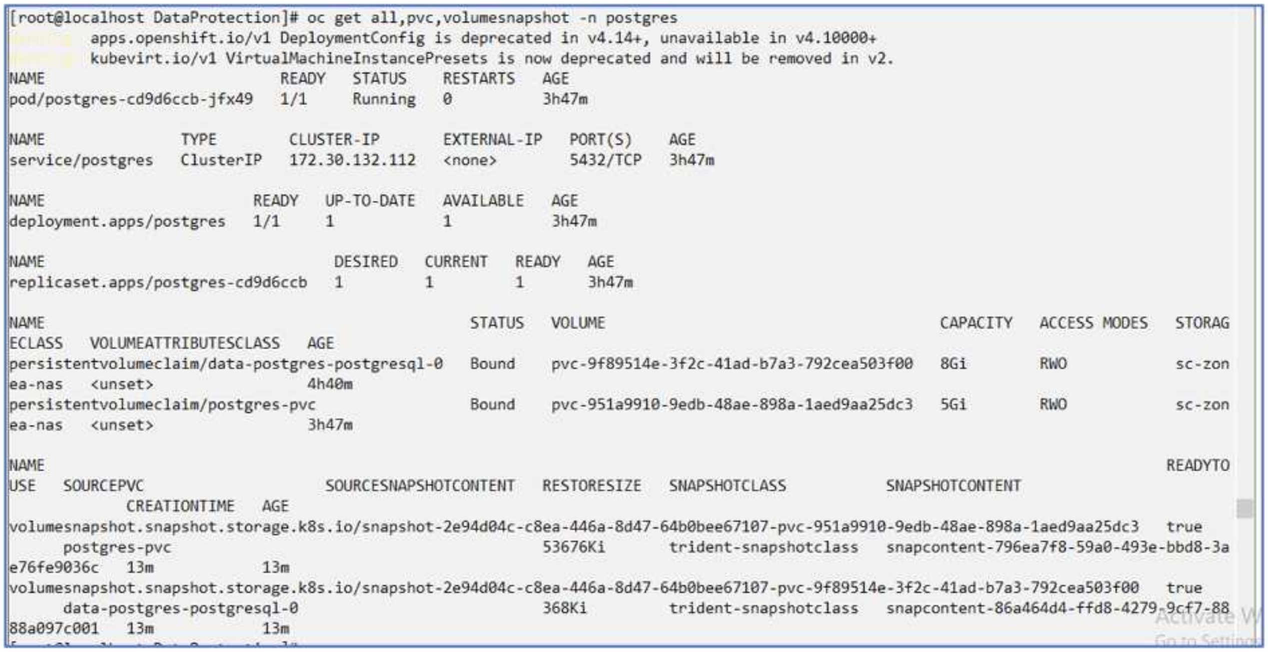
### Create Snapshots

#### Creating an on-demand snapshot

```
# tp create snapshot postgres-snap1 --app postgres-app --appvault
ontap-s3-appvault -n postgres
Snapshot "postgres-snap1" created.
```



```
[root@localhost RedHat]# tp get snapshot -n postgres
+----------------+--------------+-----------+-----+-------+
|      NAME      |   APP REF    |   STATE   | AGE | ERROR |
+----------------+--------------+-----------+-----+-------+
| postgres-snap1 | postgres-app | Completed | 19s |       |
+----------------+--------------+-----------+-----+-------+
[root@localhost RedHat]#
```



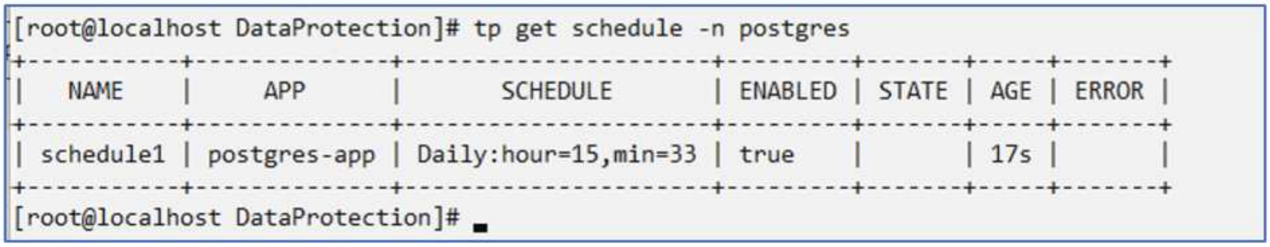
```
[root@localhost DataProtection]# oc get all,pvc,volumesnapshot -n postgres
Warning: apps.openshift.io/v1 DeploymentConfig is deprecated in v4.14+, unavailable in v4.10000+
Warning: kubevirt.io/v1 VirtualMachineInstancePresets is now deprecated and will be removed in v2.
NAME                         READY   STATUS    RESTARTS   AGE
pod/postgres-cd9d6ccb-jfx49  1/1     Running   0          3h47m

NAME               TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)    AGE
service/postgres   ClusterIP   172.30.132.112   <none>        5432/TCP   3h47m

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/postgres   1/1     1            1           3h47m

NAME                                DESIRED   CURRENT   READY   AGE
replicaset.apps/postgres-cd9d6ccb   1         1         1       3h47m

NAME                                              STATUS   VOLUME                                     CAPACITY   ACCESS MODES   STORAG
ECLASS   VOLUMEATTRIBUTESCLASS   AGE
persistentvolumeclaim/data-postgres-postgresql-0   Bound    pvc-9f89514e-3f2c-41ad-b7a3-792cea503f00   8Gi        RWO            sc-zon
ea-nas   <unset>                 4h40m
persistentvolumeclaim/postgres-pvc                 Bound    pvc-951a9910-9edb-48ae-898a-1aed9aa25dc3   5Gi        RWO            sc-zon
ea-nas   <unset>                 3h47m

NAME                                                                                                                            READYTO
USE   SOURCEPVC                   SOURCESNAPSHOTCONTENT   RESTORESIZE   SNAPSHOTCLASS            SNAPSHOTCONTENT
             CREATIONTIME   AGE
volumesnapshot.snapshot.storage.k8s.io/snapshot-2e94d04c-c8ea-446a-8d47-64b0bee67107-pvc-951a9910-9edb-48ae-898a-1aed9aa25dc3   true
      postgres-pvc                                        53676Ki       trident-snapshotclass   snapcontent-796ea7f8-59a0-493e-bbd8-3a
e76fe9036c   13m            13m
volumesnapshot.snapshot.storage.k8s.io/snapshot-2e94d04c-c8ea-446a-8d47-64b0bee67107-pvc-9f89514e-3f2c-41ad-b7a3-792cea503f00   true
      data-postgres-postgresql-0                          368Ki         trident-snapshotclass   snapcontent-86a464d4-ffd8-4279-9cf7-88
88a097c001   13m            13m
```

Activate W
Go to Settings

#### Creating a Schedule

Using the following command, Snapshots will be created daily at 15:33 and two snapshots and backups will be retained.

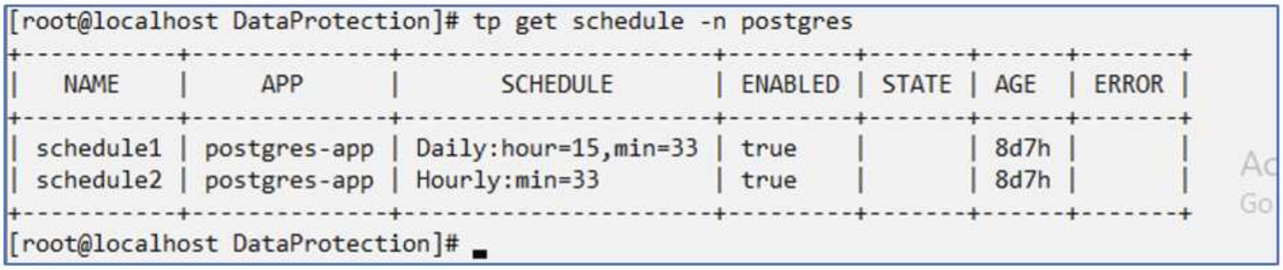
```
# tp create schedule schedule1 --app postgres-app --appvault ontap-s3-
appvault --backup-retention 2 --snapshot-retention 2 --granularity
Daily --hour 15 --minute 33 --data-mover Restic -n postgres
Schedule "schedule1" created.
```



```
[root@localhost DataProtection]# tp get schedule -n postgres
+-----------+-------------+---------------------+---------+-------+-----+-------+
|   NAME    |     APP     |      SCHEDULE       | ENABLED | STATE | AGE | ERROR |
+-----------+-------------+---------------------+---------+-------+-----+-------+
| schedule1 | postgres-app | Daily:hour=15,min=33 | true    |       | 17s |       |
+-----------+-------------+---------------------+---------+-------+-----+-------+
[root@localhost DataProtection]# 
```

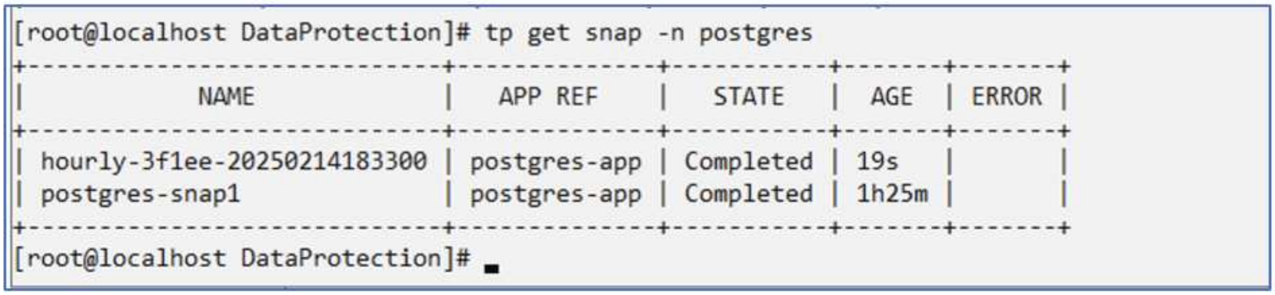
### Creating a Schedule using yaml

```
# tp create schedule schedule2 --app postgres-app --appvault ontap-s3-
appvault --backup-retention 2 --snapshot-retention 2 --granularity
Daily --hour 15 --minute 33 --data-mover Restic -n postgres --dry-run >
hourly-snapshotschedule.yaml

cat hourly-snapshotschedule.yaml

apiVersion: protect.trident.netapp.io/v1
kind: Schedule
metadata:
  creationTimestamp: null
  name: schedule2
  namespace: postgres
spec:
  appVaultRef: ontap-s3-appvault
  applicationRef: postgres-app
  backupRetention: "2"
  dataMover: Restic
  dayOfMonth: ""
  dayOfWeek: ""
  enabled: true
  granularity: Hourly
  #hour: "15"
  minute: "33"
  recurrenceRule: ""
  snapshotRetention: "2"
status: {}
```



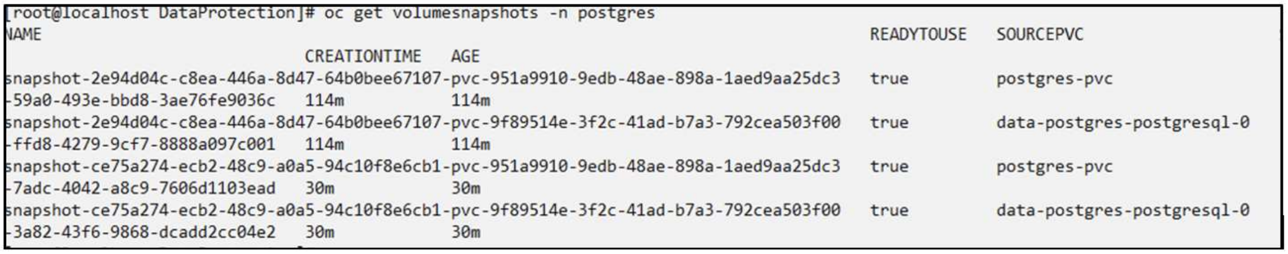
```
[root@localhost DataProtection]# tp get schedule -n postgres
+-----------+--------------+----------------------+---------+-------+------+-------+
|   NAME    |     APP      |       SCHEDULE       | ENABLED | STATE | AGE  | ERROR |
+-----------+--------------+----------------------+---------+-------+------+-------+
| schedule1 | postgres-app | Daily:hour=15,min=33 | true    |       | 8d7h |       |
| schedule2 | postgres-app | Hourly:min=33        | true    |       | 8d7h |       |
+-----------+--------------+----------------------+---------+-------+------+-------+
[root@localhost DataProtection]# 
```

You can see snapshots created on this schedule.



```
[root@localhost DataProtection]# tp get snap -n postgres
+----------------------------+-------------+-----------+-------+-------+
|            NAME            |   APP REF   |   STATE   |  AGE  | ERROR |
+----------------------------+-------------+-----------+-------+-------+
| hourly-3f1ee-20250214183300 | postgres-app | Completed | 19s   |       |
| postgres-snap1             | postgres-app | Completed | 1h25m |       |
+----------------------------+-------------+-----------+-------+-------+
[root@localhost DataProtection]#
```

Volume snapshots are also created.



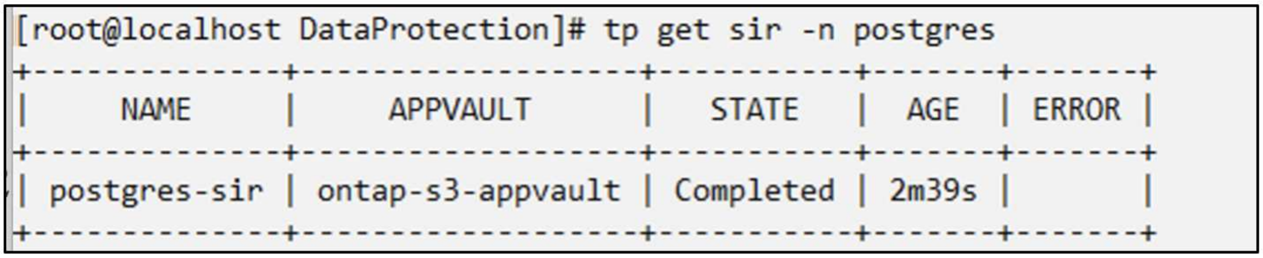
```
[root@localhost DataProtection]# oc get volumesnapshots -n postgres
NAME                                                                                   READYTOUSE   SOURCEPVC
                                 CREATIONTIME   AGE
snapshot-2e94d04c-c8ea-446a-8d47-64b0bee67107-pvc-951a9910-9edb-48ae-898a-1aed9aa25dc3   true         postgres-pvc
-59a0-493e-bbd8-3ae76fe9036c   114m           114m
snapshot-2e94d04c-c8ea-446a-8d47-64b0bee67107-pvc-9f89514e-3f2c-41ad-b7a3-792cea503f00   true         data-postgres-postgresql-0
-ffd8-4279-9cf7-8888a097c001   114m           114m
snapshot-ce75a274-ecb2-48c9-a0a5-94c10f8e6cb1-pvc-951a9910-9edb-48ae-898a-1aed9aa25dc3   true         postgres-pvc
-7adc-4042-a8c9-7606d1103ead   30m            30m
snapshot-ce75a274-ecb2-48c9-a0a5-94c10f8e6cb1-pvc-9f89514e-3f2c-41ad-b7a3-792cea503f00   true         data-postgres-postgresql-0
-3a82-43f6-9868-dcadd2cc04e2   30m            30m
```

#### Delete the Application to simulate loss of application

```
# oc delete deployment/postgres -n postgres
# oc get pod,pvc -n postgres
No resources found in postgres namespace.
```

### Restore from Snapshot to the same namespace

```
# tp create sir postgres-sir --snapshot postgres/hourly-3f1ee-
20250214183300 -n postgres
SnapshotInplaceRestore "postgres-sir" created.
```

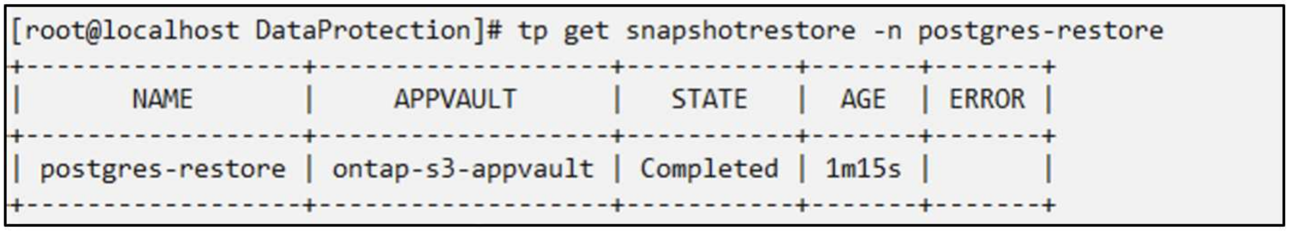


```
[root@localhost DataProtection]# tp get sir -n postgres
+--------------+-------------------+-----------+-------+-------+
|     NAME     |      APPVAULT     |   STATE   |  AGE  | ERROR |
+--------------+-------------------+-----------+-------+-------+
| postgres-sir | ontap-s3-appvault | Completed | 2m39s |       |
+--------------+-------------------+-----------+-------+-------+
```

Application and its PVCis restored to the same namespace.

### Restore from Snapshot to a different namespace

```
# tp create snapshotrestore postgres-restore --snapshot
postgres/hourly-3f1ee-20250214183300 --namespace-mapping
postgres:postgres-restore -n postgres-restore
SnapshotRestore "postgres-restore" created.
```



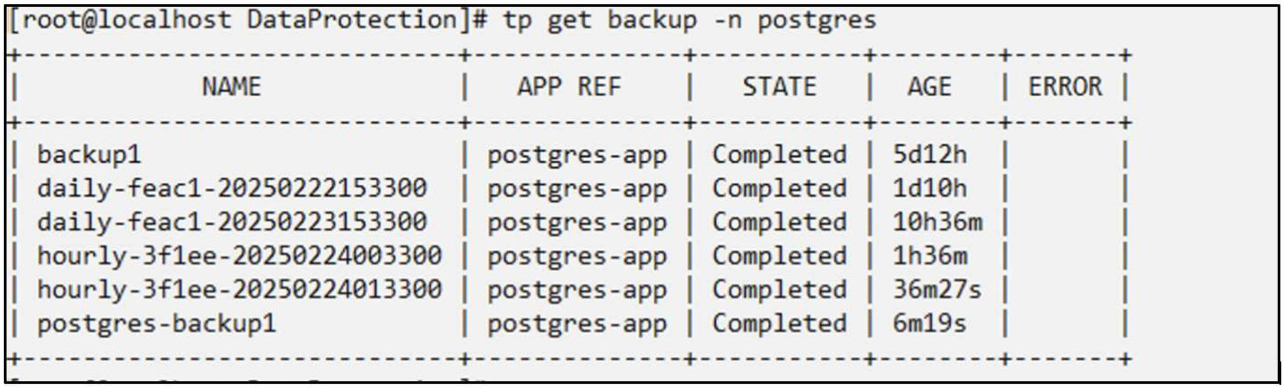
```
[root@localhost DataProtection]# tp get snapshotrestore -n postgres-restore
+------------------+-------------------+-----------+-------+-------+
|       NAME       |      APPVAULT     |   STATE   |  AGE  | ERROR |
+------------------+-------------------+-----------+-------+-------+
| postgres-restore | ontap-s3-appvault | Completed | 1m15s |       |
+------------------+-------------------+-----------+-------+-------+
```

You can see that the application has been restored to a new namespace.

## Create Backups

### Creating an on-demand Backup

```
# tp create backup postgres-backup1 --app postgres-app --appvault
ontap-s3-appvault -n postgres
Backup "postgres-backup1" created.
```

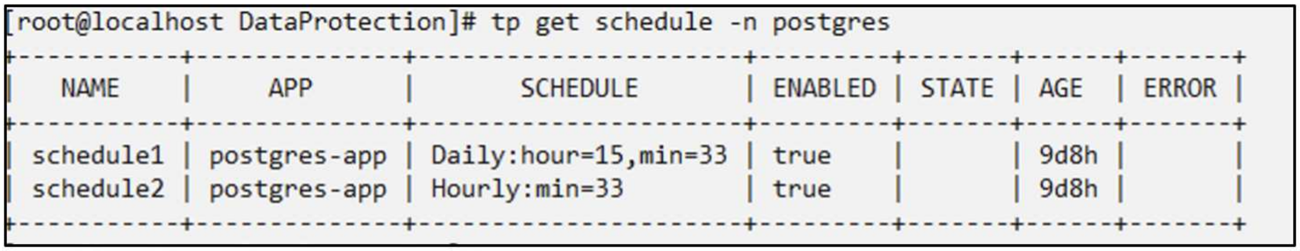


```
[root@localhost DataProtection]# tp get backup -n postgres
+-------------------------------+--------------+-----------+---------+-------+
|             NAME              |   APP REF    |   STATE   |   AGE   | ERROR |
+-------------------------------+--------------+-----------+---------+-------+
| backup1                       | postgres-app | Completed | 5d12h   |       |
| daily-feac1-20250222153300    | postgres-app | Completed | 1d10h   |       |
| daily-feac1-20250223153300    | postgres-app | Completed | 10h36m  |       |
| hourly-3f1ee-20250224003300   | postgres-app | Completed | 1h36m   |       |
| hourly-3f1ee-20250224013300   | postgres-app | Completed | 36m27s  |       |
| postgres-backup1              | postgres-app | Completed | 6m19s   |       |
+-------------------------------+--------------+-----------+---------+-------+
```

### Creating Schedule for Backup

The daily and the hourly backups in the list above are created from the schedule set up previously.

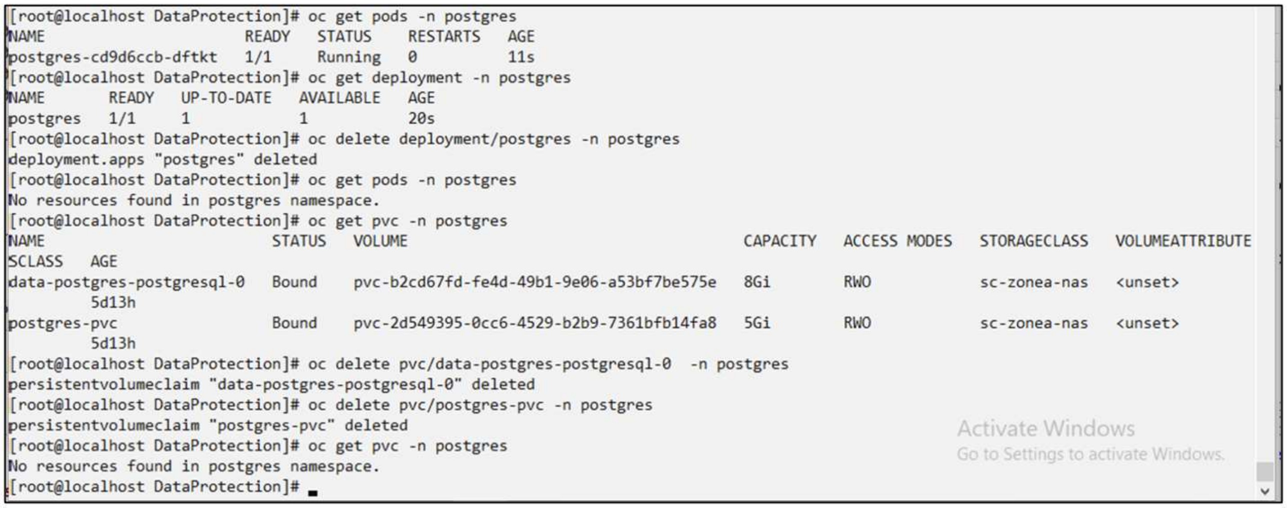
```
# tp create schedule schedule1 --app postgres-app --appvault ontap-s3-
appvault --backup-retention 2 --snapshot-retention 2 --granularity
Daily --hour 15 --minute 33 --data-mover Restic -n postgres
Schedule "schedule1" created.
```



```
[root@localhost DataProtection]# tp get schedule -n postgres
+-----------+--------------+----------------------+---------+-------+------+-------+
|   NAME    |     APP      |       SCHEDULE       | ENABLED | STATE | AGE  | ERROR |
+-----------+--------------+----------------------+---------+-------+------+-------+
| schedule1 | postgres-app | Daily:hour=15,min=33 | true    |       | 9d8h |       |
| schedule2 | postgres-app | Hourly:min=33        | true    |       | 9d8h |       |
+-----------+--------------+----------------------+---------+-------+------+-------+
```

### Restore from backup

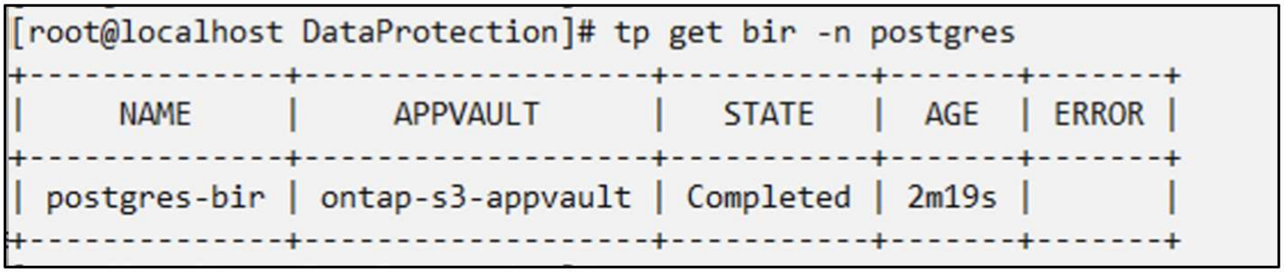
**Delete the application and PVCs to simulate a data loss.**



```
[root@localhost DataProtection]# oc get pods -n postgres
NAME                      READY   STATUS    RESTARTS   AGE
postgres-cd9d6ccb-dftkt   1/1     Running   0          11s
[root@localhost DataProtection]# oc get deployment -n postgres
NAME       READY   UP-TO-DATE   AVAILABLE   AGE
postgres   1/1     1            1           20s
[root@localhost DataProtection]# oc delete deployment/postgres -n postgres
deployment.apps "postgres" deleted
[root@localhost DataProtection]# oc get pods -n postgres
No resources found in postgres namespace.
[root@localhost DataProtection]# oc get pvc -n postgres
NAME                         STATUS   VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS   VOLUMEATTRIBUTE
SCLASS   AGE
data-postgres-postgresql-0   Bound    pvc-b2cd67fd-fe4d-49b1-9e06-a53bf7be575e   8Gi        RWO            sc-zonea-nas   <unset>
         5d13h
postgres-pvc                 Bound    pvc-2d549395-0cc6-4529-b2b9-7361bfb14fa8   5Gi        RWO            sc-zonea-nas   <unset>
         5d13h
[root@localhost DataProtection]# oc delete pvc/data-postgres-postgresql-0  -n postgres
persistentvolumeclaim "data-postgres-postgresql-0" deleted
[root@localhost DataProtection]# oc delete pvc/postgres-pvc -n postgres
persistentvolumeclaim "postgres-pvc" deleted
[root@localhost DataProtection]# oc get pvc -n postgres
No resources found in postgres namespace.
[root@localhost DataProtection]#
```

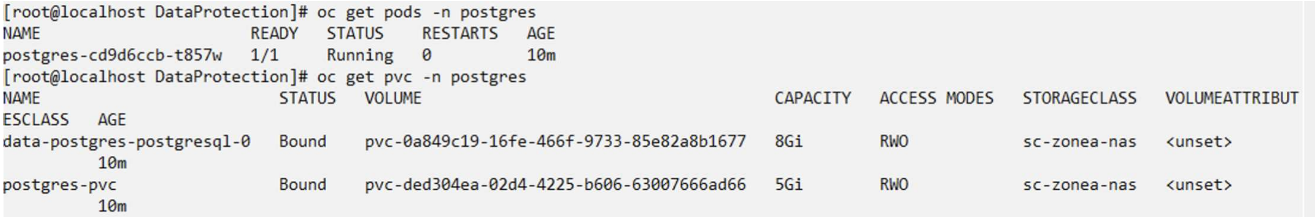
Activate Windows
Go to Settings to activate Windows.

**Restore to same namespace**
#tp create bir postgres-bir --backup postgres/hourly-3f1ee-20250224023300 -n postgres
BackupInplaceRestore "postgres-bir" created.



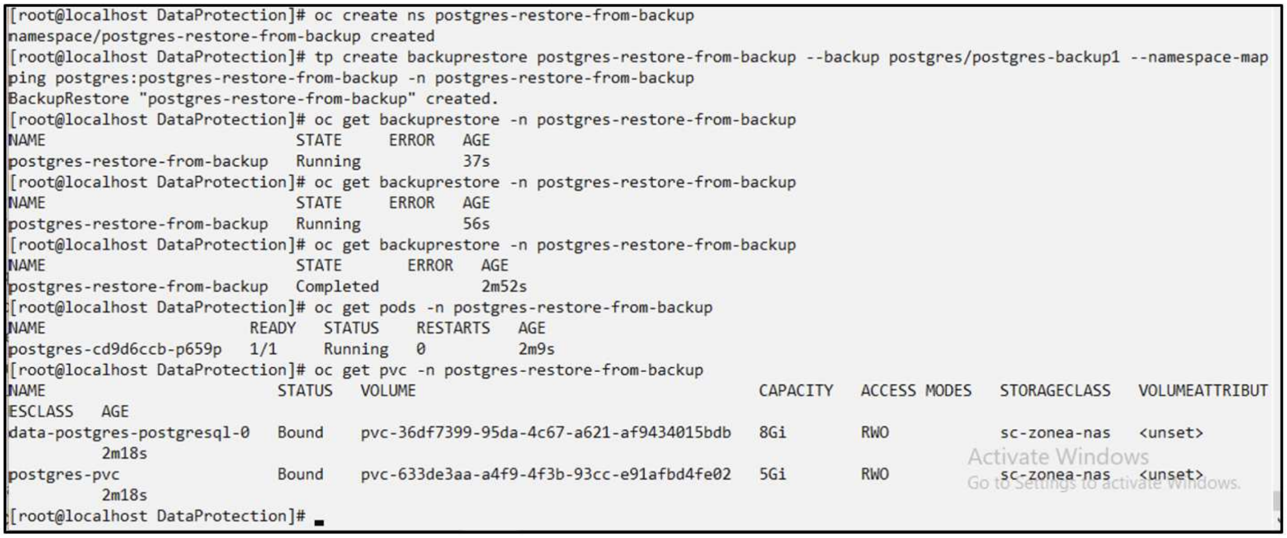
```
[root@localhost DataProtection]# tp get bir -n postgres
+--------------+------------------+-----------+-------+-------+
|     NAME     |     APPVAULT     |   STATE   |  AGE  | ERROR |
+--------------+------------------+-----------+-------+-------+
| postgres-bir | ontap-s3-appvault | Completed | 2m19s |       |
+--------------+------------------+-----------+-------+-------+
```

The application and the PVCs are restored in the same namespace.



```
[root@localhost DataProtection]# oc get pods -n postgres
NAME                      READY   STATUS    RESTARTS   AGE
postgres-cd9d6ccb-t857w   1/1     Running   0          10m
[root@localhost DataProtection]# oc get pvc -n postgres
NAME                         STATUS   VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS   VOLUMEATTRIBUT
ESCLASS   AGE
data-postgres-postgresql-0   Bound    pvc-0a849c19-16fe-466f-9733-85e82a8b1677   8Gi        RWO            sc-zonea-nas   <unset>
         10m
postgres-pvc                 Bound    pvc-ded304ea-02d4-4225-b606-63007666ad66   5Gi        RWO            sc-zonea-nas   <unset>
         10m
```

**Restore to a different namespace**
Create a new namespace.
Restore from a backup to the new namespace.



```
[root@localhost DataProtection]# oc create ns postgres-restore-from-backup
namespace/postgres-restore-from-backup created
[root@localhost DataProtection]# tp create backuprestore postgres-restore-from-backup --backup postgres/postgres-backup1 --namespace-map
ping postgres:postgres-restore-from-backup -n postgres-restore-from-backup
BackupRestore "postgres-restore-from-backup" created.
[root@localhost DataProtection]# oc get backuprestore -n postgres-restore-from-backup
NAME                           STATE     ERROR   AGE
postgres-restore-from-backup   Running           37s
[root@localhost DataProtection]# oc get backuprestore -n postgres-restore-from-backup
NAME                           STATE     ERROR   AGE
postgres-restore-from-backup   Running           56s
[root@localhost DataProtection]# oc get backuprestore -n postgres-restore-from-backup
NAME                           STATE       ERROR   AGE
postgres-restore-from-backup   Completed           2m52s
[root@localhost DataProtection]# oc get pods -n postgres-restore-from-backup
NAME                      READY   STATUS    RESTARTS   AGE
postgres-cd9d6ccb-p659p   1/1     Running   0          2m9s
[root@localhost DataProtection]# oc get pvc -n postgres-restore-from-backup
NAME                         STATUS   VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS   VOLUMEATTRIBUT
ESCLASS   AGE
data-postgres-postgresql-0   Bound    pvc-36df7399-95da-4c67-a621-af9434015bdb   8Gi        RWO            sc-zonea-nas   <unset>
          2m18s
postgres-pvc                 Bound    pvc-633de3aa-a4f9-4f3b-93cc-e91afbd4fe02   5Gi        RWO            sc-zonea-nas   <unset>
          2m18s
[root@localhost DataProtection]# 
```

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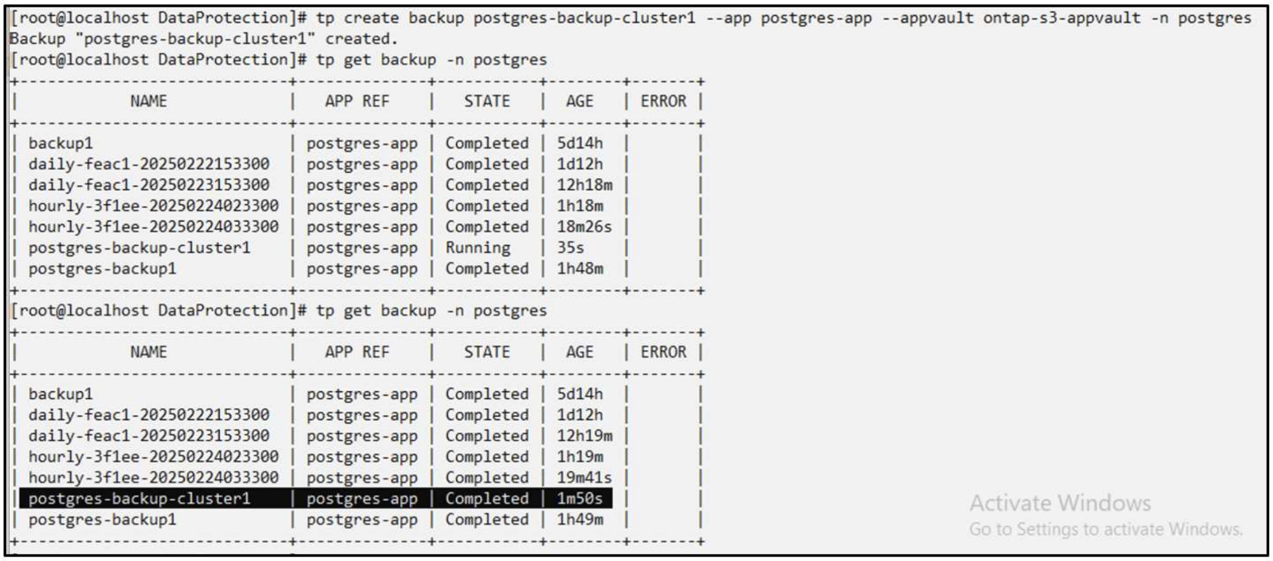
Go to Settings to activate Windows.

### Migrate Applications

To clone or migrate an application to a different cluster (perform a cross-cluster clone), create a backup on the source cluster, and then restore the backup to a different cluster. Make sure that Trident protect is installed on the destination cluster.

On the source cluster, perform the steps as shown in the image below:



```
[root@localhost DataProtection]# tp create backup postgres-backup-cluster1 --app postgres-app --appvault ontap-s3-appvault -n postgres
Backup "postgres-backup-cluster1" created.
[root@localhost DataProtection]# tp get backup -n postgres
+-----------------------------+--------------+-----------+--------+-------+
|            NAME             |   APP REF    |   STATE   |  AGE   | ERROR |
+-----------------------------+--------------+-----------+--------+-------+
| backup1                     | postgres-app | Completed | 5d14h  |       |
| daily-feac1-20250222153300  | postgres-app | Completed | 1d12h  |       |
| daily-feac1-20250223153300  | postgres-app | Completed | 12h18m |       |
| hourly-3f1ee-20250224023300 | postgres-app | Completed | 1h18m  |       |
| hourly-3f1ee-20250224033300 | postgres-app | Completed | 18m26s |       |
| postgres-backup-cluster1    | postgres-app | Running   | 35s    |       |
| postgres-backup1            | postgres-app | Completed | 1h48m  |       |
+-----------------------------+--------------+-----------+--------+-------+
[root@localhost DataProtection]# tp get backup -n postgres
+-----------------------------+--------------+-----------+--------+-------+
|            NAME             |   APP REF    |   STATE   |  AGE   | ERROR |
+-----------------------------+--------------+-----------+--------+-------+
| backup1                     | postgres-app | Completed | 5d14h  |       |
| daily-feac1-20250222153300  | postgres-app | Completed | 1d12h  |       |
| daily-feac1-20250223153300  | postgres-app | Completed | 12h19m |       |
| hourly-3f1ee-20250224023300 | postgres-app | Completed | 1h19m  |       |
| hourly-3f1ee-20250224033300 | postgres-app | Completed | 19m41s |       |
| postgres-backup-cluster1    | postgres-app | Completed | 1m50s  |       |
| postgres-backup1            | postgres-app | Completed | 1h49m  |       |
+-----------------------------+--------------+-----------+--------+-------+
```

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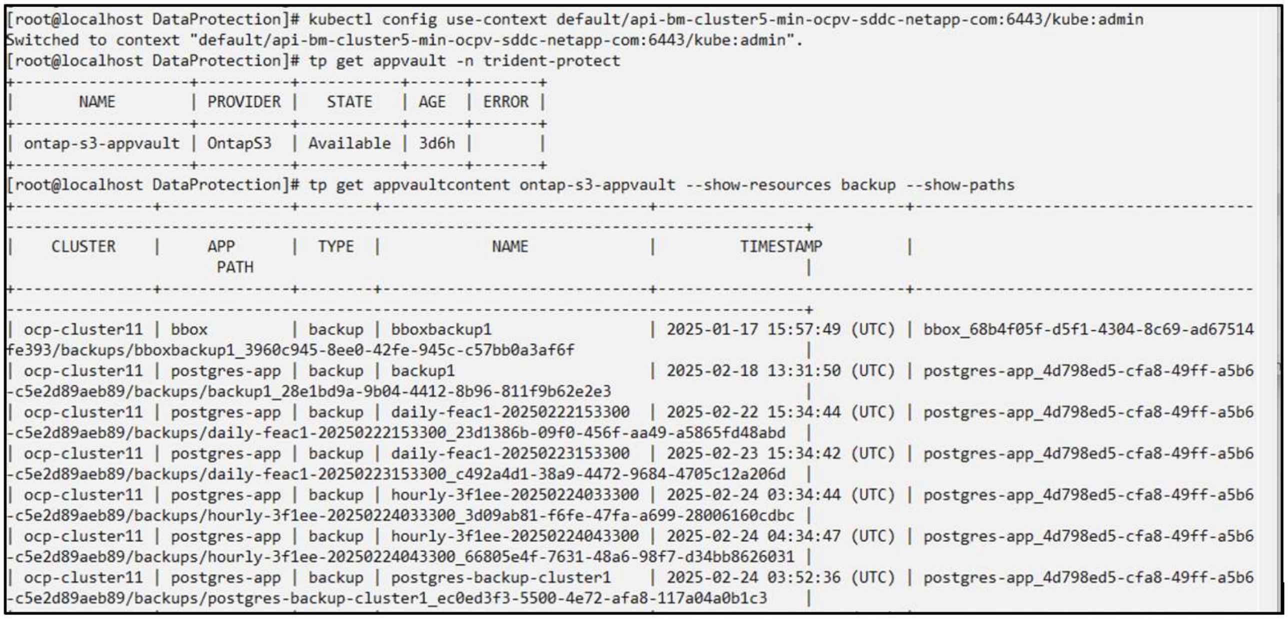
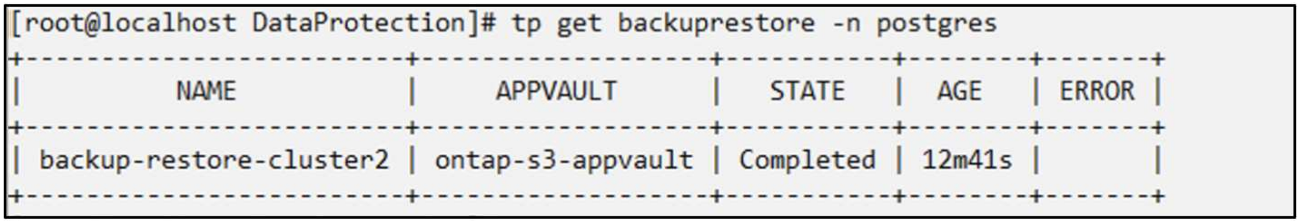
From the source cluster, switch context to the destination cluster.
Then, ensure that the AppVault is accessible from the destination cluster context and get the AppVault contents from the destination cluster.



```
[root@localhost DataProtection]# kubectl config use-context default/api-bm-cluster5-min-ocpv-sddc-netapp-com:6443/kube:admin
Switched to context "default/api-bm-cluster5-min-ocpv-sddc-netapp-com:6443/kube:admin".
[root@localhost DataProtection]# tp get appvault -n trident-protect
+-------------------+----------+-----------+------+-------+
|       NAME        | PROVIDER |   STATE   | AGE  | ERROR |
+-------------------+----------+-----------+------+-------+
| ontap-s3-appvault | OntapS3  | Available | 3d6h |       |
+-------------------+----------+-----------+------+-------+
[root@localhost DataProtection]# tp get appvaultcontent ontap-s3-appvault --show-resources backup --show-paths
+---------------+--------------+--------+-----------------------------+-------------------------+--------------------------------
--------------------------------------------------------------------------------+
|    CLUSTER    |     APP      |  TYPE  |            NAME             |        TIMESTAMP        |
                  PATH                                                          |
+---------------+--------------+--------+-----------------------------+-------------------------+--------------------------------
--------------------------------------------------------------------------------+
| ocp-cluster11 | bbox         | backup | bboxbackup1                 | 2025-01-17 15:57:49 (UTC) | bbox_68b4f05f-d5f1-4304-8c69-ad67514
fe393/backups/bboxbackup1_3960c945-8ee0-42fe-945c-c57bb0a3af6f                  |
| ocp-cluster11 | postgres-app | backup | backup1                     | 2025-02-18 13:31:50 (UTC) | postgres-app_4d798ed5-cfa8-49ff-a5b6
-c5e2d89aeb89/backups/backup1_28e1bd9a-9b04-4412-8b96-811f9b62e2e3              |
| ocp-cluster11 | postgres-app | backup | daily-feac1-20250222153300  | 2025-02-22 15:34:44 (UTC) | postgres-app_4d798ed5-cfa8-49ff-a5b6
-c5e2d89aeb89/backups/daily-feac1-20250222153300_23d1386b-09f0-456f-aa49-a5865fd48abd |
| ocp-cluster11 | postgres-app | backup | daily-feac1-20250223153300  | 2025-02-23 15:34:42 (UTC) | postgres-app_4d798ed5-cfa8-49ff-a5b6
-c5e2d89aeb89/backups/daily-feac1-20250223153300_c492a4d1-38a9-4472-9684-4705c12a206d |
| ocp-cluster11 | postgres-app | backup | hourly-3f1ee-20250224033300 | 2025-02-24 03:34:44 (UTC) | postgres-app_4d798ed5-cfa8-49ff-a5b6
-c5e2d89aeb89/backups/hourly-3f1ee-20250224033300_3d09ab81-f6fe-47fa-a699-28006160cdbc |
| ocp-cluster11 | postgres-app | backup | hourly-3f1ee-20250224043300 | 2025-02-24 04:34:47 (UTC) | postgres-app_4d798ed5-cfa8-49ff-a5b6
-c5e2d89aeb89/backups/hourly-3f1ee-20250224043300_66805e4f-7631-48a6-98f7-d34bb8626031 |
| ocp-cluster11 | postgres-app | backup | postgres-backup-cluster1    | 2025-02-24 03:52:36 (UTC) | postgres-app_4d798ed5-cfa8-49ff-a5b6
-c5e2d89aeb89/backups/postgres-backup-cluster1_ec0ed3f3-5500-4e72-afa8-117a04a0b1c3    |
```

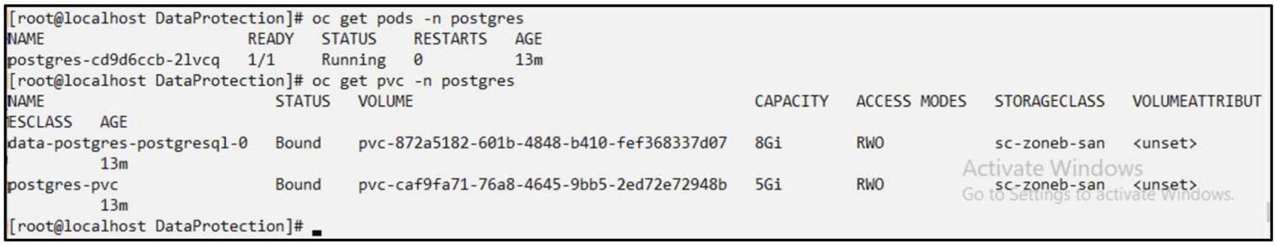
Use the backup path from the list and create a backuprestore CR object as shown in the command below.

```
# tp create backuprestore backup-restore-cluster2 --namespace-mapping
postgres:postgres --appvault ontap-s3-appvault --path postgres-
app_4d798ed5-cfa8-49ff-a5b6-c5e2d89aeb89/backups/postgres-backup-
cluster1_ec0ed3f3-5500-4e72-afa8-117a04a0b1c3 -n postgres
BackupRestore "backup-restore-cluster2" created.
```



```
[root@localhost DataProtection]# tp get backuprestore -n postgres
+-------------------------+-------------------+-----------+--------+-------+
|          NAME           |     APPVAULT      |   STATE   |  AGE   | ERROR |
+-------------------------+-------------------+-----------+--------+-------+
| backup-restore-cluster2 | ontap-s3-appvault | Completed | 12m41s |       |
+-------------------------+-------------------+-----------+--------+-------+
```

You can now see that the application pods and the pvcs are created in the destination cluster.



```
[root@localhost DataProtection]# oc get pods -n postgres
NAME                       READY   STATUS    RESTARTS   AGE
postgres-cd9d6ccb-2lvcq    1/1     Running   0          13m
[root@localhost DataProtection]# oc get pvc -n postgres
NAME                          STATUS   VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS   VOLUMEATTRIBUT
ESCLASS   AGE
data-postgres-postgresql-0    Bound    pvc-872a5182-601b-4848-b410-fef368337d07   8Gi        RWO            sc-zoneb-san   <unset>
          13m
postgres-pvc                  Bound    pvc-caf9fa71-76a8-4645-9bb5-2ed72e72948b   5Gi        RWO            sc-zoneb-san   <unset>
          13m
[root@localhost DataProtection]# 
```

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