

# NetBackup™ Web UI Kubernetes Administrator's Guide

Release 10.1

**VERITAS™**

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# Overview of NetBackup for Kubernetes

This chapter includes the following topics:

- [Overview](#)
- [Features of NetBackup support for Kubernetes](#)

## Overview

The NetBackup web UI provides the capability for backups and restores of Kubernetes applications in the form of namespaces. The protectable assets in the Kubernetes clusters are automatically discovered in the NetBackup environment and administrators can select one or more protection plans that contain the wanted schedule, backup, and retention settings.

The NetBackup web UI lets you perform the following operations:

- Add Kubernetes cluster for protection.
- View discovered namespaces.
- Manage permissions for roles
- Set resource limits to optimize load on your infrastructure and network.
- Manage protection and intelligent group to protect Kubernetes assets.
- Restore namespaces and persistent volumes.
- Monitor backup and restore operations.
- Image expiration, image import, and image copy operations.

# Features of NetBackup support for Kubernetes

**Table 1-1** NetBackup for Kubernetes

Feature	Description
Integration with NetBackup role-based access control (RBAC)	The NetBackup web UI provides RBAC roles to control which NetBackup users can manage Kubernetes operations in NetBackup. The user does not need to be a NetBackup administrator to manage Kubernetes operations.
Licensing	Capacity-based licensing.
Protection plans	The following benefits are included: <ul style="list-style-type: none"> <li>■ Use a single protection plan to protect multiple Kubernetes namespaces. The assets can be spread over multiple clusters.</li> <li>■ You are not required to know the Kubernetes commands to protect the Kubernetes assets.</li> </ul>
Intelligent management of Kubernetes assets	NetBackup automatically discovers the namespaces, persistent volumes, persistent volume claims, and so on, in the Kubernetes clusters. You can also perform manual discovery. After the assets are discovered, the Kubernetes workload administrator can select one or more protection plans to protect them.
Kubernetes specific credentials	Kubernetes service accounts used to authenticate and manage the clusters.
Discovery <ul style="list-style-type: none"> <li>■ Full discovery</li> <li>■ Incremental discovery</li> </ul>	Discovery using <b>Discovery now</b> option is always a full discovery. Discovery when a new cluster is added to the NetBackup is always a full discovery. Once the Kubernetes cluster is added, auto discovery cycle is triggered to discover all the assets available on the Kubernetes cluster. The first auto discovery of the day is a full discovery and subsequent auto discoveries are incremental.
Backup features <ul style="list-style-type: none"> <li>■ Snapshot only backups</li> <li>■ Backup from snapshot</li> </ul>	The following features are available for backup: <ul style="list-style-type: none"> <li>■ Backups are managed entirely by the NetBackup server from a central location. Administrators can schedule automatic, unattended backups for namespaces on different Kubernetes clusters.</li> <li>■ The NetBackup web UI supports backup and restore of namespaces from one interface.</li> <li>■ Backup schedule configuration for full backups.</li> <li>■ Manual backups and snapshot only backups.</li> <li>■ Resource throttling for each cluster to improve the performance of backups.</li> <li>■ NetBackup can perform backups of Kubernetes namespaces with snapshot methodology, achieving faster recovery time objectives.</li> </ul>

**Table 1-1** NetBackup for Kubernetes (*continued*)

Feature	Description
Restore features <ul style="list-style-type: none"> <li>■ Restore from snapshot</li> <li>■ Restore from backup copy</li> </ul>	The following features are available for restore: <ul style="list-style-type: none"> <li>■ Restore Kubernetes namespaces and persistent volumes to different locations.</li> <li>■ Restore to a different Kubernetes cluster flavor using restore from a backup copy.</li> </ul>
Client side data deduplication support	Client side data deduplication support feature is enabled for Kubernetes. For more details, refer to the <i>About client-side deduplication</i> section in the <i>NetBackup™ Deduplication Guide</i> .



# Deploying and configuring the NetBackup Kubernetes operator

This chapter includes the following topics:

- [Deploy service package on NetBackup Kubernetes operator](#)
- [Port requirements for Kubernetes operator deployment](#)
- [Upgrade the NetBackup Kubernetes operator](#)
- [Delete the NetBackup Kubernetes operator](#)
- [Configure NetBackup Kubernetes datamover](#)
- [Configure settings for NetBackup snapshot operation](#)
- [Troubleshooting NetBackup servers with short names](#)
- [Managing image groups](#)

## Deploy service package on NetBackup Kubernetes operator

Before deploying the NetBackup Kubernetes operator, you must install the Helm chart and provide space for persistent volume.

To install the latest Helm version, run the following commands:

1. `#curl -k -fsSL -o get_helm.sh https://raw.githubusercontent.com/helm`
2. `#chmod +x get_helm.sh`

### 3. #./get\_helm.sh

You must deploy the operator in each cluster, where you want to deploy NetBackup.

## Configuring the Helm chart

You can use the Helm chart to deploy the NetBackup Kubernetes operator.

---

**Note:** You must install a new NetBackup plug-in Helm chart, as Helm chart upgrade is not supported.

Before installing a new plug-in, you must uninstall the older plug-in.

---

### To install a new Helm chart

1 To uninstall an older plug-in, run the command:

- `helm uninstall <plugin-name> -n <namespace>`

2 To install a new plug-in, run the command:

- `helm install <plugin-name> <chart-path> -n <namespace>`

Here is the Helm chart and tree structure layout:

```
netbackupkops-helm-chart
```

```
├─ charts
├─ Chart.yaml
├─ templates
│   └─ deployment.yaml
└─ values.yaml
```

Directory structure:

```
tar --list -f netbackupkops-10.0.tar.gz
veritas_license.txt
netbackupkops-helm-chart/
netbackupkops-helm-chart/Chart.yaml
netbackupkops-helm-chart/Values.yaml
netbackupkops-helm-chart/.helmignore
netbackupkops-helm-chart/templates
netbackupkops-helm-chart/templates/development.yaml
netbackupkops-helm-chart/Charts/
```

**To deploy the NetBackup Kubernetes operator:**

- 1 Download the tar package from Veritas Support website:  
<https://www.veritas.com/content/support>
- 2 Extract the package to the home directory. The `netbackupkops-helm-chart` folder should be in the home directory.
- 3 To list all cluster contexts, run the command: `kubectl config get-contexts`
- 4 To switch to the cluster where you want to deploy the operator service, run the command:

```
kubectl config use-context <cluster-context-name>
```

- 5 To change the current directory to your home directory, run the command: `cd ~`
- 6 If you use a private docker registry, follow the instructions in this step to create a secret `nb-docker-cred` in NetBackup namespace. Otherwise, skip to the next step.

- To log on to the private docker registry, run the command: `docker login -u <user name><repo-name>`

After log in, the `config.json` file containing the authorization token is created or updated. To view the `config.json` file, run the command: `cat ~/.docker/config.json`

The output looks like:

```
{
  "auths": {
    "https://index.docker.io/v1/": {
      "auth": "c3R...zE2"
    }
  }
}
```

- To create a secret named as `netbackupkops-docker-cred` in the NetBackup namespace, run the command:

```
kubectl create secret generic netbackupkops-docker-cred \
--from-file=.dockerconfigjson=.docker/config.json \
--type=kubernetes.io/dockerconfigjson -n netbackup
```

You can provide any namespace to create a secret.

- To check if the secret `netbackupkops-docker-cred` is created in the NetBackup namespace, run the command:

```
kubectl get secrets -n netbackup
```

- 7** To load the image to the docker cache and push the image to the docker image repository, run the commands:

```
docker load -i <name of the tar file>./  
  
docker tag <image name:tag of the loaded image>  
  
<repo-name/image-name:tag-name>  
  
docker push <repo-name/image-name:tag-name>
```

- 8** Open the `netbackupkops-helm-chart/values.yaml` file in a text editor and then replace the value for `image` in the `manager` section, with your image name and tag `repo-name/image-name:tag-name` and then save the file.

- 9** To deploy the NetBackup Kubernetes operator service, run the command:

```
helm install <release name of the deployment>  
./netbackupkops-helm-chart -n <namespace which runs NetBackup  
operator service>
```

**Example:** `helm install veritas-netbackupkops  
./netbackupkops-helm-chart -n netbackup`

- You can change the release name of the deployment as required.
- The `-n` option is required to specify the namespace in which NetBackup operator service and NetBackup is intended to run.

- 10** To check the status of the deployment, run the command:

```
helm list -n <namespace which runs NetBackup operator service >
```

**Example:**

```
helm list -n netbackup
```

- 11** To check the release history, run the command:

```
helm history veritas-netbackupkops -n  
<namespace which runs NetBackup operator service>.
```

**Example:**

```
helm history veritas-netbackupkops -n netbackup
```

# Port requirements for Kubernetes operator deployment

Following table shows the port requirements for the Kubernetes operator deployment. If firewalls exist between the various hosts, you must open the required communication ports.

**Table 2-1** Ports that must be open in a NetBackup Kubernetes cluster environment

Source	Port number	Destination
Primary server	TCP port 443	Kubernetes cluster
Media server	TCP port 443 (new in NetBackup 10.0).	Kubernetes cluster

**Note:** Review the Kubernetes configuration to ensure that the Kubernetes API server port has not been changed from 443 to a non-default port; often 6443 or 8443.

Kubernetes cluster	TCP port 443 (applicable in NetBackup version 9.1, but not in version 10.0 or later).	Primary server
--------------------	---	----------------

**Note:** NetBackup Kubernetes Operator (KOps) and datamover pods have additional requirements (new in NetBackup 10.0).

Kubernetes cluster	TCP port 1556 outbound	Primary server
Kubernetes cluster	TCP port 1556 outbound	Media server
Kubernetes cluster	TCP port 13724 bi-directional if using Resilient Network.	Primary and media server

## Upgrade the NetBackup Kubernetes operator

You cannot upgrade the NetBackup Kubernetes operator deployment using Helm commands.

## Delete the NetBackup Kubernetes operator

You can delete a NetBackup Kubernetes operator deployment from a cluster.

As you cannot upgrade a NetBackup Kubernetes operator deployment from an older version, you can install a newer version, and delete the older version.

Deleting the NetBackup Kubernetes operator results in the loss of metadata volume, which also hosts the snapshot metadata. If any snapshots are already performed, then restore from snapshot copy operation fails in the absence of metadata.

Do not delete the associated Velero snapshots before deleting the older snapshots manually.

In NetBackup 10.0, you cannot perform expiration of Velero managed snapshots which were created using NetBackup 9.1. When the backup images are expired in NetBackup, the catalog is automatically cleared. But you must delete the snapshot on Kubernetes server manually.

For more details on manual image expiration operation, see <https://www.veritas.com/content/support>.

## Configure NetBackup Kubernetes datamover

You need to configure datamover for the NetBackup Kubernetes workload. Download the correct version of the datamover image:

`veritasnetbackup-datamover-10.0-0070.tar` for your release version, from the download center. See <https://www.veritas.com/content/support>

### To configure datamover

- 1 To push the datamover image to docker image registry, run the command:

```
docker login -u <user name> <repo-name>
```

- 2 Enter the password upon prompt. Skip this step if you are already logged in
- 3 Run `docker load -i <name of the datamover image file>`
- 4 Run `docker tag <datamover image name:tag of the loaded datamover image> <repo-name/image-name:tag-name>`
- 5 `docker push <repo-name/image-name:tag-name>`
- 6 Ensure that the configmap with primary server name, have image value set to `<repo-name/image-name:tag-name>` pushed in step no 4.

For more details on configmap, See [the section called “Prerequisites for backup from snapshot and restore from backup operations”](#) on page 19.

## Configure settings for NetBackup snapshot operation

You need to configure snapshot operation on the Kubernetes operator deployment before you perform the actual backup from snapshot operations.

1. Define a storage class pointing to the CSI plugin.
2. Define a `VolumeSnapshotClass` class consisting of CSI driver details.
3. Label the volume snapshot class for NetBackup usage. Add the following label `netbackup.veritas.com/default-csi-volume-snapshot-class=true`.

---

**Note:** Snapshot of a namespace consisting of persistent volume fails with an error message: *Failed to create snapshot of the Kubernetes namespace*.

The snapshot operation may fail due to multiple reasons, for example, a valid volume snapshot class for the driver with label `volumesnapshotclass` is not found.

---

4. Sizing for metadata persistent volume is required. The default persistent volume size for Kubernetes operator is 10Gi. The persistent volume size is configurable.

You can change the value for storage from 10Gi to a higher value before deploying the plugin. This leads to the nbukops pod have the size of the PVC mounted in the pod.

Persistent Volume Claim looks like this:

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  labels:
    component: netbackup
    name: {{ .Release.Namespace }}-netbackupkops
    namespace: {{ .Release.Namespace }}
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 10Gi
```

- During fresh installation while configuring the Helm Chart. You can modify the size of PVC storage in the deployment.yaml of the netbackupkops-helm-chart which leads to creation of the initial PVC size.
- Post installation, updating the PVC size (dynamic volume expansion) is supported by few storage vendors. For more information, refer to <https://kubernetes.io/docs/concepts/storage/persistent-volumes>

---

**Note:** The default size of persistent volume can be resized to larger value without losing the data. You are recommended to add the storage provider that supports volume expansion.

---



---

**Note:** To get the configuration value, you can run the command: `kubectl get configmaps <namespace>-backup-operator-configuration -n <namespace> -o yaml > {local.file}`

---

**Table 2-2** Kubernetes operators supported configuration parameters in <namespace>-backup-operator-configuration

Configuration	Description	Default value	Possible value
DaemonSets	A Daemonset is a dynamic object in Kubernetes which is managed by a controller. You can set the desired state that represents the specific pods that need to exist on every node. The pod compromise in the control loop can compare the current practical state with the desired state.	true	true, false
Deployments	Deployments for the Kubernetes workload.	true	true, false
Pods	A pod is the smallest execution unit in Kubernetes.	true	true, false
ReplicaSets	Replica Set ensures how many replicas of a pod should be running. It can be considered as a replacement of the replication controller.	true	true, false



**Table 2-2** Kubernetes operators supported configuration parameters in <namespace>-backup-operator-configuration (*continued*)

Configuration	Description	Default value	Possible value
Secrets	Secrets are the objects that contain sensitive data such as passwords, tokens, and credentials.	true	true, false
Services	Services offered in Kubernetes.	true	true, false
namespace	Kubernetes operator is deployed in the namespace.	Any name given to a namespace.	NetBackup namespace.
cleanStaleCRDurationMinutes	Time duration after a CR job is invoked to clean stale CRs. The interval after which stale custom resource cleanup job is triggered.	24 hours	1440 minutes
ttlCRDurationMinutes	TTL CR duration	minutes	30240 minutes
livenessProbeInitialDelay	Probe initial delay period.	minutes	60 minutes
livenessProbePeriodSeconds	Probe period.	seconds	80 seconds
checkNbcertdaemonStatusDurationMinutes	NB certificate daemon status duration.	minutes	1440 minutes

**Table 2-2** Kubernetes operators supported configuration parameters in <namespace>-backup-operator-configuration (continued)

Configuration	Description	Default value	Possible value
collectDataMoverLogs	<p>Due to high memory usage in datamover logs collection, it is recommended to enable the logs only when you are debugging, troubleshooting, or restarting the pods.</p> <p>Before enabling the logs for datamover, ensure to increase the memory limits for NetBackup Kubernetes pod to at least 2 GB or more. After the debugging or troubleshooting is done, you can reset to the previous or the default value.</p> <p><b>Note:</b> Granular support is provided for collecting datamover logs only in case of failed jobs. It provides an additional level of granularity layer, All/FailedOnly/Off.</p>	Failed	All, Failed, None
maxRetentionDataMoverLogsInHours	Maximum retention for datamover logs.	24 hours	72 hours
maxRetentionDataMoverInHours	It removes all the datamover resources that are older than the specified time.	24 hours	24 hours

**Table 2-2** Kubernetes operators supported configuration parameters in <namespace>-backup-operator-configuration (continued)

Configuration	Description	Default value	Possible value
cleanStaleCertFilesDurationMinutes	The interval after which stale certificate files cleanup job is triggered.	60 minutes	1440 minutes
maxRetentionInDiscoveryCacheHours	It is the time in hours that decides the time interval for keeping the discovery cache.	24 hours	48 hours
pollingTimeoutInMinutes	It is the timeout that keeps retrying till it expires and fails.	15 minutes	15 minutes
pollingFrequencyInSecs	Polling frequency.	seconds	5 seconds
nbcertPrerequisiteDirectoryAndFiles	NBCA prerequisites.	Certificate name	Certificate name

## Prerequisites for backup from snapshot and restore from backup operations

1. Label a valid storage class for NetBackup usage, add the following label: *netbackup.veritas.com/default-csi-storage-class=true*. If NetBackup labeled storage class is not found, then backup from snapshot job for metadata image and restore jobs fail with the error message *No eligible storage classes found*.

To label the storage classes, run the following commands given in the examples:

Example 1. Run the command: `# oc get sc`

Name	Provisioner
ocs-storagecluster-ceph-rbd (default)	openshift-storage.rbd.csi.ceph.com
ocs-storagecluster-ceph-rgw	openshift-storage.ceph.rook.io/bucket
ocs-storagecluster-cephfs	openshift-storage.cephfs.csi.ceph.com
openshift-storage.noobaa.io	openshift-storage.noobaa.io/obc
thin	kubernetes.io/vsphere-volume

Reclaim policy	Volume binding mode	Allow volume expansion	Age
Delete	Immediate	True	2d2h
Delete	Immediate	False	2d2h
Delete	Immediate	True	2d2h
Delete	Immediate	False	2d2h
Delete	Immediate	False	19h

Example 2. Run the command:  
`# oc get sc ocs-storagecluster-ceph-rbd --show-labels`

Name	Provisioner	Reclaim policy
ocs-storagecluster-ceph-rbd (default)	openshift-storage.rbd.csi.ceph.com	Delete

Volume binding mode	Allow volume expansion	Age	Label
Immediate	True	2d2h	netbackup.veritas.com/default-csi-storage-class=true

Example 3. Run the command:  
`# oc label sc ocs-storagecluster-cephfs netbackup.veritas.com/default-csi-storage-class=true storageclass.storage.k8s.io/ocs-storagecluster-cephfs labeled`

Example 4. Run the command:  
`oc get sc ocs-storagecluster-cephfs --show-labels`

Name	Provisioner	Reclaim policy
ocs-storagecluster-cephfs	openshift-storage.cephfs.csi.ceph.com	Delete

Volume binding mode	Allow volume expansion	Age	Label
Immediate	True	2d2h	netbackup.veritas.com/default-csi-storage-class=true

- Label a valid volume snapshot class for NetBackup usage, add the following label: `netbackup.veritas.com/default-csi-volume-snapshot-class=true`. If the NetBackup labeled `VolumeSnapshotClass` class is not found, then backup from snapshot job for metadata image and restore jobs fails with an error message: *Failed to create snapshot of the Kubernetes namespace*.

To label the volume snapshot classes, run the following commands given the examples:

Example 1. Run the command: `# oc get volumesnapshotclass`

Name	Driver
ocs-storagecluster-cephfsplugin-snapclass	openshift-storage.cephfs.csi.ceph.com
ocs-storagecluster-rbdplugin-snapclass	openshift-storage.rbd.csi.ceph.com
Deletion policy	Age
Delete	2d2h
Delete	2d2h

Example 2. Run the command: `# oc get volumesnapshotclass ocs-storagecluster-cephfsplugin-snapclass --show-labels`

Name	Driver
ocs-storagecluster-cephfsplugin-snapclass	openshift-storage.cephfs.csi.ceph.com
Deletion policy	Age
Delete	2d2h

Example 3. Run the command: `# oc label volumesnapshotclass ocs-storagecluster-cephfsplugin-snapclass netbackup.veritas.com/default-csi-volume-snapshot-class=true volumesnapshotclass.snapshot.storage.k8s.io/ocs-storagecluster-cephfsplugin-snapclass labeled`

Example 4. Run the command: `# oc get volumesnapshotclass ocs-storagecluster-cephfsplugin-snapclass --show-labels`

Name	Driver
ocs-storagecluster-cephfsplugin-snapclass	openshift-storage.cephfs.csi.ceph.com

Deletion policy	Age	Labels
Delete	2d2h	netbackup.veritas.com/default-csi-volume-snapshot-class=true

- Each primary server which runs the backup from snapshot and restore from backup copy operations, needs to create a separate *ConfigMap* with the primary server's name.

In the following `configmap.yaml` example,

- `backupserver.sample.domain.com` and `mediaserver.sample.domain.com` are the hostnames of NetBackup primary and media server.
- IP: `10.20.12.13` and IP: `10.21.12.13` are the IP addresses of NetBackup primary and media server.

```
apiVersion: v1
data:
  datamover.hostaliases: |
    10.20.12.13=backupserver.sample.domain.com
    10.21.12.13=mediaserver.sample.domain.com
  datamover.properties: |
    image=reg.domain.com/datamover/image:latest
    version: "1"
kind: ConfigMap
metadata:
  name: backupserver.sample.domain.com
  namespace: kops-ns
```

- Copy the `configmap.yaml` file details.
  - Open the text editor and paste the yaml file details.
  - Then, save it with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.
- Specify `datamover.properties:`  
`image=reg.domain.com/datamover/image:latest` with correct datamover image.
  - Specify `datamover.hostaliases`, if the primary server and the media servers connected to the primary server have short names and host resolution failing from datamover. Provide a mapping of all hostnames to IPs for primary and media servers.

6. Create a secret as described in detail in the Point 6 in the *Deploy service package on NetBackup Kubernetes operator* section to use a private docker registry.

Once the secret is created, add the following attributes while creating a `configmap.yaml` file.

- `datamover.properties:` |
  - `image=repo.azurecr.io/netbackup/datamover:10.0.0049`
  - `imagePullSecret=secret_name`
7. Create the `configmap.yaml` file, run the command: `kubectl create -f configmap.yaml`.
  8. If Kubernetes operator is not able to resolve the primary server based on short names
    - While fetching the certificates, if you get a message: *EXIT STATUS 8500: Connection with the web service was not established*. Then, verify the hostname resolution state from the `nbcert` logs.
    - If the hostname resolution fails, then do the following:  
Update the `kops deployment.yaml` and add the `hostAliases` in the deployment.
    - In the following `hostAliases` example,
      - `backupserver.sample.domain.com` and `mediaserver.sample.domain.com` are the hostnames of NetBackup primary and media server.
      - IP: `10.20.12.13` and IP: `10.21.12.13` are the IP addresses of NetBackup primary and media server.

```
hostAliases:
- hostnames:
  - backupserver.sample.domain.com
  ip: 10.20.12.13
- hostnames:
  - mediaserver.sample.domain.com
  ip: 10.21.12.13
```

Copy, paste the `hostAliases` example details in the text editor and add to the `hostAliases` in the deployment.

---

**Note:** The `hostAliases` section must be added to the line 2104 in default `./netbackupkops-helm-chart/templates/deployment.yaml` file.

---

hostAliases example:

```
2104 hostAliases;
- ip:10.15.206.7
hostnames:
- lab02-linsvr-01.demo.sample.domain.com
- lab02-linsvr-01
- ip:10.15.206.8
hostnames:
- lab02-linsvr-02.demo.sample.domain.com
- lab02-linsvr-02
imagePullSecrets:
- name: {{ .values.netbackupKops.imagePullSecrets.name }}
```

9. Create a secret with fingerprint and authorization token.
10. Create a backupservercert request to fetch certificates.

For more information, refer to the *NetBackup™ Security and Encryption Guide*.

## DTE client settings supported in Kubernetes workload

The **DTE\_CLIENT\_MODE** option specifies the data-in-transit encryption (DTE) mode that is set on the datamover via backupserver specific configmap. Data-in-transit encryption of backup images is carried out based on the global DTE mode and the client DTE mode.

Update the backupserver specific configmap and add **DTE\_CLIENT\_MODE** key to it. This key can take following values:

- AUTOMATIC
- ON
- OFF

For more information on the **DTE\_CLIENT\_MODE**, refer to the *DTE\_CLIENT\_MODE for clients* section in the *Veritas NetBackup™ Administrator's Guide, Volume I*.

Following is the configmap with **DTE\_CLIENT\_MODE** setting added:

```
apiVersion: v1
data:
  datamover.hostaliases: |
    10.20.12.13=backupserver.sample.domain.com
    10.21.12.13=mediaserver.sample.domain.com
  datamover.properties: |
    image=reg.domain.com/datamover/image:latest
    DTE_CLIENT_MODE=ON
```



```

version: "1"
kind: ConfigMap
metadata:
  name: backupserver.sample.domain.com
  namespace: kops-ns

```

## Customization of datamover properties

You can customize datamover properties by passing key-value pairs in the backup server specific configmap.

**Table 2-3** Datamover properties

Key Name	Possible Values
VXMS_VERBOSE	Range:[0,99]
VERBOSE	Range:[0,5]
DTE_CLIENT_MODE	<ul style="list-style-type: none"> <li>■ AUTOMATIC</li> <li>■ ON</li> <li>■ OFF</li> </ul>

To update the configmap, add the key value pairs as follows:

```

apiVersion: v1
data:
  datamover.properties: |
    image=reg.domain.com/datamover/image:latest
    VERBOSE=5
    DTE_CLIENT_MODE=OFF
    VXMS_VERBOSE=5
  version: "1"
kind: ConfigMap
metadata:
  name: backupserver.sample.domain.com
  namespace: kops-ns

```

# Troubleshooting NetBackup servers with short names

- 1 If NetBackup Kubernetes operator is not able to resolve backup server or media server based on short names, perform the following steps:

- While fetching certificates if you get a message, *EXIT STATUS 8500: Connection with the web service was not established*. Then confirm from the nbcert logs whether hostname resolution successful or not. If it has failed, then perform the following steps:
- Update the Kubernetes operator `deployment.yaml` and add the `hostAliases` in the deployment.
- In the following `hostAliases` example,
  - `backupserver.sample.domain.com` and `mediaserver.sample.domain.com` are the hostnames of NetBackup primary and media server.
  - IP: `10.20.12.13` and IP: `10.21.12.13` are the IP addresses of NetBackup primary and media server.

```
hostAliases:  
- hostnames:  
  - backupserver.sample.domain.com  
  ip: 10.20.12.13  
- hostnames:  
  - mediaserver.sample.domain.com  
  ip: 10.21.12.13
```

Copy, paste the `hostAliases` example details in the text editor and add to the `hostAliases` in the deployment.

- 2 If `datamover` is not able to resolve short names of backup server or media server. To resolve this issue, perform the following steps:
  - Create a *ConfigMap* with backup server name.
  - Add `datamover.hostaliases` field, map with IP addresses to the hostname.
  - In the following `configmap.yaml` example,
    - `backupserver.sample.domain.com` and `mediaserver.sample.domain.com` are the hostnames of NetBackup primary and media server.
    - IP: `10.20.12.13` and IP: `10.21.12.13` are the IP addresses of NetBackup primary and media server.

```
apiVersion: v1  
  
data:  
  datamover.hostaliases: |  
    10.20.12.13=backupserver.sample.domain.com  
    10.21.12.13=mediaserver.sample.domain.com  
  datamover.properties: |
```

```
image=reg.domain.com/datamover/image:latest
version: "1"
kind: ConfigMap
metadata:
  name: backupserver.sample.domain.com
  namespace: kops-ns
```

- Copy the `configmap.yaml` file details.
- Open the text editor and past the yaml file details.
- Then, save it with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.
- To create the `configmap.yaml` file, run the command:`kubectl create -f ConfigMap.yaml`.

## Managing image groups

For every Kubernetes recovery point, an image group is created. An image group may include multiple images depending upon number of eligible persistent volume claims in a namespace.

A separate image is created for metadata and one image is created for every persistent volume claim.

Recovery point detail API is used to get the details about all the backup ids, resource names, copy completion status of an image group.

To support the backup from snapshot operation on the Kubernetes workload, multiple backup images are created to perform backup from snapshot for a single namespace.

For Kubernetes backup operation, a separate backup image is created for every persistent volume. All the images that are created must be grouped together to perform certain (restore, delete, import and so on) operations successfully.

## About image expiration

To reclaim the storage space occupied by the expired images, you need to delete those images.

Following are the important points related to image expiration.

For a recovery point consisting of multiple images:

- If you have expired a single image in an image group, then it does not lead to automatic expiration of remaining images. You must explicitly expire all images in an image group.
- If you have expired a few images then the recovery point will be incomplete. Restore operation is not supported for incomplete recovery point.
- If you have changed the expiration time for any of the images, then the expiration time for rest of the images must be changed. Otherwise, the expiration time for the images corresponding to recovery point gets skewed, leading to incomplete recovery point at some point in time.

## About image import

Kubernetes recovery point may consist of multiple images. To perform restore operation, all the images corresponding to the recovery point must be imported. Otherwise, the recovery point is marked as incomplete and restore is not performed.

For more information, refer to the *About importing backup images* section in the *NetBackup™ Administrator's Guide, Volume I*

## About image copy

You can create an image copy with two types of backup operations:

1. **Snapshot** is the default copy and is marked as copy no 1.
2. **Backup from snapshot** is marked as copy no 2.

Whenever any backup-now operation or scheduled backup triggers, **Snapshot** is taken. But, **Backup from snapshot** is optional as it depends whether **Backup from snapshot** option is selected or not while creating a protection plan.

An image group consists of asset images for metadata and Persistent Volume Claims (PVC). Every copy has one image for namespace and one image for each PVC present in the namespace.

Recovery point detail API is used to identify the copy completion status of an image. This API also details all the backup ids and resource name present in the respective copy. This complete or incomplete status of the image copy helps in restore functionality as an error is thrown if someone tries to restore the asset from an incomplete image copy.

## Incomplete image copy

Following are the conditions for an incomplete image:

1. When the snapshot job or backup from snapshot job is in progress then the corresponding copy is shown as incomplete copy.
2. If backup activity of any PVC fails, then the copy is marked as incomplete.

3. If the child image of a copy gets expired (with more than 1 child), then the copy is marked as incomplete.

# Deploying certificates on NetBackup Kubernetes operator

This chapter includes the following topics:

- [Deploy certificates on the Kubernetes operator](#)
- [Perform Host-ID-based certificate operations](#)
- [Perform ECA certificate operations](#)
- [Identify certificate types](#)

## Deploy certificates on the Kubernetes operator

You need to deploy certificates for secure communication between the datamover and the NetBackup media servers.

---

**Note:** You must deploy the certificates before you can perform **Backup from Snapshot** and **Restore from Backup** operations.

---

### Certificates supported for datamover communication

Datamover facilitates data movement within the NetBackup environment, it communicates with the media servers over Transport Layer Security (TLS). For more details, refer to the *About secure communication in NetBackup* section in *NetBackup™ Security and Encryption Guide*. Datamover needs a host-id-based certificate, or an ECA-signed certificate issued by NetBackup primary server for communication. A new custom resource definition BackupServerCert is introduced

to enable certificate deployment operation in NBCA (NetBackup Certificate Authority) or ECA (External Certificate Authority) mode.

Custom resource specification looks like this:

```
apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupservercert-sample-nbca
  namespace: kops-ns
spec:
  clusterName: cluster.sample.com:port
  backupServer: primary.server.sample.com
  certificateOperation: Create | Update | Remove
  certificateType: NBCA | ECA
  nbcaAttributes:
    nbcaCreateOptions:
      secretName: "Secret name consists of token and fingerprint"
    nbcaUpdateOptions:
      secretName: "Secret name consists of token and fingerprint"
      force: true | false
    nbcaRemoveOptions:
      hostID: "hostId of the nbca certificate. You can view on Netbackup UI"
  ecaAttributes:
    ecaCreateOptions:
      ecaSecretName: "Secret name consists of cert, key, passphrase, cacert"
      copyCertsFromSecret: true | false
      isKeyEncrypted: true | false
    ecaUpdateOptions:
      ecaCrlCheck: DISABLE | LEAF | CHAIN
      ecaCrlRefreshHours: [0,4380]
```

## Perform Host-ID-based certificate operations

Ensure that the primary server is configure in the NBCA mode. To check if the NBCA mode is on, run the command: `/usr/opensv/netbackup/bin/nbcertcmd -getSecConfig -caUsage`.

The output looks like this:

```
NBCA: ON
ECA: OFF
```

HostID based certificate specification looks like this:

```

apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupservercert-sample
  namespace: kops-ns
spec:
  clusterName: cluster.sample.com:port
  backupServer: primaryserver.sample.domain.com
  certificateOperation: Create | Update | Remove
  certificateType: NBCA
  nbcaAttributes:
    nbcaCreateOptions:
      secretName: "Secret name consists of token and fingerprint"
    nbcaUpdateOptions:
      secretName: "Secret name consists of token and fingerprint"
      force: true
    nbcaRemoveOptions:
      hostID: "hostId of the nbca certificate. You can view on Netbackup UI"

```

**Table 3-1** HostID based certificate operations

Operation type	Options and comments
Create	secretName: Name of the secret which contains a token and fingerprint.
Remove	hostID: Host identification of the NBCA certificate.
Update	secretName: Name of the secret which contains a token and fingerprint.

## Creating a HostID based certificate for Kubernetes operator

You can create a HostID based certificate for Kubernetes operator using the following procedure.

### To create HostID based certificate for Kubernetes operator

- 1 On the backup server run the following command and get the SHA-256 fingerprint.

```
/usr/opensv/netbackup/bin/nbcertcmd -listCACertDetails
```

- 2 To create an authorization token, refer to the *Creating authorization tokens* section in the *NetBackup™ Security and Encryption Guide*.



- 3 To create a reissue token, if required, refer to the *Creating a reissue token* section in the *NetBackup™ Security and Encryption Guide*.
- 4 Create a secret with token and fingerprint.
- 5 Provide a token as it is mandatory irrespective of security level.

Token-fingerprint-secret.yaml looks like this:

```
apiVersion: v1
kind: Secret
metadata:
  name: secret-name
  namespace: kops-ns
type: Opaque
stringData:
  token: "Authorization token | Reissue token"
  fingerprint: "SHA256 Fingerprint"
```

- Copy the Token-fingerprint-secret.yaml file text.
  - Open the text editor and paste the yaml file text.
  - Then, save the text with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.
- 6 To create the Token-fingerprint-secret.yaml file, run the command:  
kubect1 create -f Token-fingerprint-secret.yaml
  - 7 Create a backupservercert object with the

nbcaCreateOptions and then specify a secret name.

nbca-create-backupservercert.yaml looks like this:

```
apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupserver-nbca-create
  namespace: kops-ns
spec:
  clusterName: cluster.sample.com:port
  backupServer: backupserver.sample.domain.com
  certificateOperation: Create
  certificateType: NBCA
  nbcaAttributes:
    nbcaCreateOptions:
      secretName: nbcaSecretName with token and fingerprint
```

- Copy the `nbc-a-create-backupservercert.yaml` file text.
  - Open the text editor and paste the yaml file text.
  - Then, save the text with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.
- 8 To create the `nbc-a-create-backupservercert.yaml` file, run the command:
- ```
kubectl create -f nbc-a-create-backupservercert.yaml
```
- 9 Once the certificate is created, check custom resource status. If the custom resource status is successful, you can run **Backup from Snapshot** jobs.

---

**Note:** You need to check that the BackupServerCert custom resource status is successful before initiating **Backup from Snapshot** or **Restore from Backup Copy** operations.

---

---

**Note:** To renew host ID based certificate: NetBackup host ID certificate checks if it's due for renew after 24 hours cycle. Certificates get automatically renewed 180 days (6 months) before expiration date.

---

---

**Note:** Ensure to check whether the NetBackup primary server clock and the NetBackup Kubernetes operator clock are in sync. For more details on the `CheckClockSkew` errors, refer to the *Implication of clock skew on certificate validity* section in the *NetBackup™ Security and Encryption Guide*.

---

## Removing primary server certificate from Kubernetes operator

You can remove a certificate from a primary server if the server is not used for running the backup and restore operations.

### To remove primary server certificate from Kubernetes operator.

- 1 Log on to the NetBackup web UI and get a hostID for the certificate that you want to remove.  
  
To get the HostID for the certificate, refer to the *Viewing host ID-based certificate details* section in the *NetBackup™ Security and Encryption Guide*.
- 2 Create a backupservercert with operation type remove.

`nbc-a-remove-backupservercert.yaml` file looks like this:

```
apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupserver-nbca-domain.com
  namespace: kops-ns
spec:
  clusterName: cluster.sample.com:port
  backupServer: backupserver.sample.domain.com
  certificateOperation: Remove
  certificateType: NBCA
  nbcaAttributes:
    nbcaRemoveOptions:
      hostID: nbcahostID
```

- Copy the `nbca-remove-backupservercert.yaml` file text.
  - Open the text editor and paste the yaml file text.
  - Then, save the text with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.
- 3 To create the `nbca-remove-backupservercert.yaml` file, run the command:  
`kubectl create -f nbca-remove-backupservercert.yaml`
  - 4 To revoke the certificate, refer to the *Revoking a host ID-based certificate* section in the *NetBackup™ Security and Encryption Guide*.

---

**Note:** Once the `nbca-remove-backupservercert.yaml` is applied, certificates are removed from the Kubernetes operator's local certificate store. But it's still present and valid in the NetBackup database. So, the certificate needs to be revoked.

---

## Updating primary server certificates

Following is the scenario when you may want to update the certificates assuming that the certificates are readable and present in the Kubernetes operator:

When certificates present on the Netbackup Kubernetes operator are revoked, then certificates can be reissued with update operation. To resolve this issue, either you can update the server certificate or you can remove the server certificate and then create a new certificate.

---

**Note:** If update certificate operation fails, you must remove the certificate first and then create a new certificate.

---

### To update a primary server certificate on Kubernetes operator:

#### 1 Create a backupservercert object with the update operation:

`nbca-update-backupservercert.yaml` file looks like this:

```
apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupserver-nbca-update
  namespace:kops-ns
spec:
  clusterName: cluster.sample.com:port
  backupServer: backupserver.sample.domain.com
  certificateOperation: Update
  certificateType: NBCA
  nbcaAttributes:
    nbcaUpdateOptions:
      secretName: "Name of secret containing
token and fingerprint"
      force: true
```

- Copy the `nbca-update-backupservercert.yaml` file text.
  - Open the text editor and paste the yaml file text.
  - Then, save the text with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.
- 2 To create the `nbca-udpate-backupservercert.yaml` file, run the command:  
`kubectl create -f nbca-update-backupservercert.yaml`
- 3 Once the backupservercert object is created, then check the custom resource status.

## Perform ECA certificate operations

Before performing External Certificate Authority (ECA) create, update, and remove operations; you must configure the backup server in ECA mode.

To check if the ECA mode is on, run the command:

```
/usr/opensv/netbackup/bin/nbcertcmd -getSecConfig -caUsage.
```

The output looks like this:

NBCA: ON  
 ECA: ON

To configure the backup server in ECA mode, refer to the *About external CA support in NetBackup* section in the *NetBackup™ Security and Encryption Guide*

ECA certificate specification looks like this:

```

apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupservercert-sample-eca
  namespace: kops-ns
spec:
  clusterName: cluster.sample.com:port
  backupServer: primaryserver.sample.domain.com
  certificateOperation: Create | Update | Remove
  certificateType: ECA
  ecaAttributes:
    ecaCreateOptions:
      ecaSecretName: "Secret name consists of cert, key, passphrase, cacert"
      copyCertsFromSecret: true | false
      isKeyEncrypted: true | false
    ecaUpdateOptions:
      ecaCrlCheck: DISABLE | LEAF | CHAIN
      ecaCrlRefreshHours: range[0,4380]
    
```

**Table 3-2** ECA certificate operations

| Operation type | Options and comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Create         | <ul style="list-style-type: none"> <li>■ <b>secretName:</b> Name of secret containing cert, key, passphrase, cacert.</li> <li>■ <b>copyCertsFromSecret:</b> Possible values are true and false. This option is added as the External CA is common across all primary servers. Same certificates can be enrolled to Kubernetes operator for all primary servers. Thus, there is no need to copy certs and keys every time. Copying of certificates and keys can be controlled with this option. If ECAHealthCheck fails due to something wrong with certs and keys, then the certificates must be copied again.</li> <li>■ <b>isKeyEncrypted;</b> If the private key is encrypted, set this field as true else set it as false.</li> </ul> |

**Table 3-2** ECA certificate operations (*continued*)

| Operation type | Options and comments                                                                                                                                                                                                                                                                                                                                              |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remove         | NA                                                                                                                                                                                                                                                                                                                                                                |
| Update         | <ul style="list-style-type: none"> <li>■ <code>ecaCrlCheck</code>: Lets you specify the revocation check level for external certificates. Possible values are DISABLE, LEAF, and CHAIN.</li> <li>■ <code>ecaCrlRefreshHours</code> specifies the time interval in hours to download Certificate Revocation Lists. Possible values range between 0-4380</li> </ul> |

## Creating ECA signed certificate

NetBackup supports Kubernetes operator on multiple primary servers for ECA. If the external CA is common across primary servers. It is mandatory to use Certificate Revocation List distribution point for fetching Certificate Revocation List dynamically during the communication.

### To create ECA signed certificate

- 1 Use the Certificate Revocation List distribution point to fetch Certificate Revocation List.
- 2 Keep ECA signed certificate chain, private key, and passphrase (if required) ready in your home directory.
- 3 To identify different formats (like, DER, PEM and so on) that are supported for each of the files mentioned in step 2. For more information, refer to the *Configuration options for external CA-signed certificates* section in the *NetBackup™ Security and Encryption Guide*.
- 4 Create a secret using the files mentioned in step 3.
  - To create a secret if private key is unencrypted, run the command:
 

```
kubectl create secret generic <Name of secret>
--from-file=cert_chain=<File path to ECA signed certificate chain> --from-file=key=<File path to private key>
--from-file=cacert=<File path to External CA certificate> -n <Namespace where kops is deployed>
```
  - To create a secret if private key is encrypted, run the command:
 

```
kubectl create secret generic <Name of secret>
--from-file=cert_chain=<File path to ECA signed certificate chain> --from-file=key=<File path to private key>
--from-file=cacert=<File path to External CA certificate>
--from-file=passphrase=<File path to passphrase>
```

of encrypted private key> -n <Namespace where kops is deployed>

Directory structure looks like this:

```

├─ cert_chain.pem
├─ private
│  ├── key.pem
│  ├── passphrase.txt
├─ trusted
│  └── cacerts.pem

```

cert\_chain.pem is ECA signed certificate chain

private/key.pem is private key

private/passphrase.txt is passphrase for private key

trusted/cacerts.pem is External CA certificate

- To create a secret of name eca-secret when private key is unencrypted, run the command:

```

kubectl create secret generic
eca-secret--from-file=cert_chain=cert_chain.pem
--from-file=key=private/key.pem
--from-file=cacert=trusted/cacerts.pem -n kops-ns

```

- To create a secret of name eca-secret when private key is encrypted, run the command:

```

kubectl create secret generic eca-secret
--from-file=cert_chain=cert_chain.pem
--from-file=key=private/key.pem
--from-file=cacert=trusted/cacerts.pem
--from-file=passphrase=private/passphrase.txt
-n kops-ns

```

## 5 Once the secret is created, then create a backupservercert object custom resource.

eca-create-backupservercert.yaml file looks like this:

```

apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupservercert-eca-create
  namespace: kops-ns
spec:

```

```
clusterName: cluster.sample.com:port
backupServer: backupserver.sample.domain.com
certificateOperation: Create
certificateType: ECA
ecaAttributes:
  ecaCreateOptions:
    ecaSecretName: eca-secret
    copyCertsFromSecret: true
    isKeyEncrypted: false
```

- Copy the `eca-create-backupservercert.yaml` file text.
  - Open the text editor and paste the yaml file text.
  - Then, save the text with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.
- 6 To copy certificate and keys to the Kubernetes operator, do any of the following:
- Set `copyCertsFromSecret` as `true`
  - Set `copyCertsFromSecret` as `false` to avoid copying certificates and keys existing on the Kubernetes Operator.

---

**Note:** ECA is common across all primary server thus Kubernetes operator require one set of certificates and keys that can be enrolled with all primary servers as required. No need to copy certificates and keys every time unless there's issue with the previous copied certificates and keys.

---

---

**Note:** If `ecaHealthCheck` fails due to any reason related to certificates and keys (corrupted or expired or changed ECA) then you identify the reason for failure and perform a copy of a valid certificate using a flag.

---

- 7 If private key is encrypted, set `isKeyEncrypted` flag as `true` or else `false` for unencrypted key. Ensure passphrase is provided in secret if private key is encrypted.
- 8 Set `ecaSecretName` with the secret name, created `backupservercert.yaml` in step 5.
- 9 To create the `eca-create-backupservercert.yaml` file, run the command:
- ```
kubectl create -f eca-create-backupservercert.yaml
```



- 10 Once the `backupservercert` custom resource is created, check the custom resource status.
- 11 To view the external certificate details on the NetBackup web UI, refer to the *View external certificate information for the NetBackup hosts in the domain* section in the *NetBackup™ Web UI Administrator's Guide*.

## Removing the ECA signed certificate

You can remove the ECA signed certificate from the primary server.

### To remove ECA signed certificate

- 1 Create a `backupservercert` with operation as `remove` and certificate type as `ECA`.

`eca-remove-backupservercert.yaml` file looks like this:

```
apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupservercert-eca-remove
  namespace: kops-ns
spec:
  clusterName: cluster.sample.com:port
  backupServer: backupserver.sample.domain.com
  certificateOperation: Remove
  certificateType: ECA
```

- Copy the `eca-remove-backupservercert.yaml` file text.
  - Open the text editor and paste the yaml file text.
  - Then, save the text with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.
- 2 To create the `eca-remove-backupservercert.yaml` file, run the command:  
`kubectl create -f eca-remove-backupservercert.yaml`
  - 3 Once the object is created, then you need to check the custom resource status. If failed, then you can take necessary actions.

These steps removes the external certificate details with respect to the specified primary server from the local certificate store. The certificate is neither deleted from the system nor from the NetBackup database.

If you want to disable ECA then refer to the *Disabling an external CA in a NetBackup domain* section in the *NetBackup™ Security and Encryption Guide*

If you enrolled ECA on the Kubernetes operator for a backup server but later reinstalled the backup server which supports just NBCA. Then, you have to remove ECA enrolment from Kubernetes operator because during *nbcertcmd* communication with backupserver CA support might get compared and if it mismatches then an error occurs.

## Updating the ECA signed certificate

There are certain options that are configurable in ECA. You can configure these options through the update operations.

### To update the ECA signed certificate

- 1 Create a `backupservercert` object with operation type update.

`eca-update-backupservercert.yaml` file looks like this:

```
apiVersion: netbackup.veritas.com/v1
kind: BackupServerCert
metadata:
  name: backupservercert-eca-update
  namespace: kops-ns
spec:
  clusterName: cluster.sample.com:port
  backupServer: backupserver.sample.domain.com
  certificateOperation: Update
  certificateType: ECA
  ecaAttributes:
    ecaUpdateOptions:
      ecaCrlCheck: DISABLE | LEAF | CHAIN
      ecaCrlRefreshHours: [0,4380]
```

- Copy the `eca-update-backupservercert.yaml` file text.
- Open the text editor and paste the yaml file text.
- Then, save the text with the yaml file extension to the home directory from where the Kubernetes clusters are accessible.

- 2 To create the `eca-update-backupservercert.yaml` file, run the command:

```
kubectl create -f eca-update-backupservercert.yaml
```

- 3 The `ECA_CRL_CHECK` option lets you specify the revocation check level for external certificates of the host. It also lets you disable the revocation check for the external certificates. Based on the check, the revocation status of the certificate is validated against the Certificate Revocation List (CRL) during host communication. For more information, refer to the *ECA\_CRL\_CHECK for NetBackup servers and clients* section in the *NetBackup™ Security and Encryption Guide*.
- 4 The `ECA_CRL_REFRESH_HOURS` option specifies the time interval in hours to download the CRLs from the URLs that are specified in the peer host certificate's Certificate Revocation List distribution points (CDP). For more information, refer to the *ECA\_CRL\_REFRESH\_HOURS for NetBackup servers and clients* section in the *NetBackup™ Security and Encryption Guide*

## Identify certificate types

NetBackup helps you identify the certificate types enrolled on the Kubernetes operator.

### To identify the certificate type

- 1 To list the Kubernetes operator pods, run the command: `kubectl get pods -n <namespace of Kubernetes operator>`
- 2 Log on to the Kubernetes operator with administrator rights and run the command:

```
kubectl exec pod/nbu-controller-manager-7c99fb8474-hzrsl -n  
<namespace of Kubernetes operator> -c netbackupkops -it -- bash
```

- 3 To list backup servers which have NBCA certificate for Kubernetes, run the command:

```
/nbcertcmdtool/nbcertcmdtool -atLibPath/nbcertcmdtool/  
-standalone -installDir "/usr/opencv" -listCertDetails -NBCA
```

The output looks like this:

```
Master Server : masterserver.sample.domain.com  
Host ID : b06738f0-a8c1-47bf-8d95-3b9a41b7bb0a  
Issued By : /CN=broker/OU=NBCANBKOps  
Serial Number : 0x508cdf4500000008  
Expiry Date : Dec 22 05:46:32 2022 GMT  
SHA-1 Fingerprint : 4D:7A:D9:B9:61:4E:93:29:B8:93:0B:E0:  
07:0A:28:16:46:F6:39:C6  
SHA-256 Fingerprint : C2:FA:AC:B5:21:6B:63:49:30:AC:4D:5E:  
61:09:9A:8C:C6:40:4A:44:B6:39:7E:2B:B3:36:DE:D8:F5:D1:3D:EF  
Key Strength : 2048  
Subject Key Identifier : AC:C4:EF:40:7D:8D:45:B4:F1:89:DA:FB:  
E7:FD:0F:FD:EC:61:12:C6  
Authority Key Identifier : 01:08:CA:40:15:81:75:7B:37:9F:51:78:  
B2:6A:89:A1:44:2D:82:2B
```

- 4** To list of backup servers which have ECA certificate for Kubernetes, run the command:

```
/nbcertcmdtool/nbcertcmdtool -atLibPath/nbcertcmdtool/  
-standalone -installDir"/usr/opensv" -listCertDetails -ECA
```

The output looks like this:

```
Subject Name : CN=ECA-KOPS,O=Veritas,OU=ECANBKOps  
Issued By : CN=ICA-2,O=Veritas,OU=ECANBKOps  
Serial Number : 0x56cf16040258d3654339b7f39817de89240d58  
Expiry Date : Dec 16 05:48:16 2022 GMT  
SHA-1 Fingerprint : 70:DE:46:72:57:56:4E:47:DB:82:8B:8D:A3:  
4B:BB:F9:8D:2C:B7:8E  
SHA-256 Fingerprint : E0:69:5F:79:A6:60:DB:7B:69:76:D3:A8:  
E6:E1:F2:0D:8C:6C:E6:4E:C4:5D:A4:77:17:5A:C2:42:89:74:15:7D  
Key Strength : 2048  
Subject Key Identifier : F0:E7:1F:8C:50:FD:4D:25:40:69:77:6C:  
2A:35:72:B6:1D:8E:E5:17  
Authority Key Identifier : D7:53:57:C7:A6:72:E3:CB:73:BD:48:51:  
2F:CB:98:A3:0B:8B:BA:5C  
Master Server : masterserver.sample.domain.com  
Host ID : b85ba9bf-02a8-439e-b787-ed52589c37d1
```

# Managing Kubernetes assets

This chapter includes the following topics:

- [Add a Kubernetes cluster](#)
- [Configure settings](#)
- [Add protection to the assets](#)

## Add a Kubernetes cluster

Before you add a Kubernetes cluster in NetBackup, you must install and configure the Kubernetes operator in the cluster. Or else the validation of the cluster fails which further leads to fail the add cluster operation.

After Kubernetes operator configuration, you can add Kubernetes clusters in NetBackup and discover all the assets inside the cluster automatically.

### To add a cluster

- 1 On the left click **Kubernetes**, under **Workloads**.
- 2 Click the **Kubernetes clusters** tab, click **Add**.
- 3 In the **Add Kubernetes cluster** page, enter the following:
  - **Cluster name:** Enter a name for the cluster. The name should be a DNS resolvable value or an IP address. Example: cluster.sample.domain.com.
  - **Port:** Enter the Kubernetes API server port number.
  - **Controller namespace:** Enter the namespace where the NetBackup Kubernetes operator is deployed in the Kubernetes cluster. Example: kops-ns.

- 4 Click **Next**. In the **Manage credentials** page, you can add credentials to the cluster.
  - To use an existing credential, choose **Select from an existing credential**, and click **Next**. In the next page, select the required credentials, and click **Next**.
  - To create a new credential, click **Add credential**, and click **Next**. In the **Manage credentials** page, enter the following:
    - **Credential name**: Enter a name of the credential.
    - **Tag**: Enter a tag to associate with the credential.
    - **Description**: Enter a description of the credential.
    - To add Kubernetes clusters in NetBackup you need CA Certificate and a token. To get the CA Certificate and the token, run the following command in the Kubernetes cluster: 

```
kubectl get secret <[namespace-name]-backup-server-token-<id>> -n <namespace name> -o yaml.
```
    - **Token**: Enter the authentication token value in Base64 encoded form.
    - **CA certificate**: Enter the CA certificate file contents.

- 5 Click **Next**.

The credentials are validated and on successful validation, the cluster is added. After the cluster is added, autodiscovery runs to discover available assets in the cluster.

---

**Note:** In NetBackup Kubernetes version 10.1, edit cluster operation fails giving an error message. The recommended action to resolve this issue is to first delete the cluster and add the cluster again.

---

## Configure settings

The Kubernetes settings let you configure the various aspects of the Kubernetes deployment.

### Setting the Kubernetes resource limit

With this setting you can control the number of backups that can be performed simultaneously on Kubernetes clusters. There are two different default values for running snapshot and backup from snapshot jobs 1 and 4 respectively.

For an example to run a snapshot only backup job, if you protect 20 assets, and you have set the limit to 5, only five assets can perform backup simultaneously, rest of the 15 assets stand in a queue. After one of the first 5 assets completes the backup, an asset from the queue takes its place.

For example, when running a snapshot job, the default value for the resource limit is 1. Indicating that only one backup job per cluster can be in progress, while the rest of the assets are the queued state.

Configuring this setting is recommended for optimized use of your system and network resources. The settings apply to all Kubernetes backups for the selected primary server.

### To set the resource limit

- 1 On the left, **Workloads > Kubernetes**.
- 2 On top right, click **Kubernetes settings > Resource limits**.
- 3 Do any of the following to set the resource limits:
  - Click **Edit**, next to **Backup jobs per Kubernetes cluster**. By default, the limit is 1.  
By default, the resource limit is 1 for the Backup jobs per cluster.
  - Click **Edit**, next to **Backup from Snapshot Jobs per Kubernetes Cluster**.  
By default, the resource limit is 4 for the Backup from Snapshot jobs per cluster.
- 4 In the **Edit Kubernetes cluster** dialog:
  - Enter a value in the **Global** field, to set a global limit for all the clusters. This limit denotes the number of *Backup* and *Backup from Snapshot* jobs that are performed simultaneously on a cluster.
  - You can add individual limits to the clusters that override the global limit for that cluster. To set individual limits to the clusters, click **Add**.
  - You must enter the cluster name manually and then enter a value for the limit. You can add limits to each available cluster in your deployment.
  - Click **Save** to save the changes.

---

**Note:** In the NetBackup 10.0 release, the data mover pods exceed the Kubernetes resource limit settings.

For more details, See [“Datamover pods exceed the Kubernetes resource limit”](#) on page 75.

---



## Configuring autodiscovery frequency

Autodiscovery keeps a count of the NetBackup protected assets in your clusters. This setting lets you set the frequency by which NetBackup runs autodiscovery to locate new assets in your clusters and gather count of the assets that are removed or deleted from the clusters.

Possible values are between 5 minutes to one year. The default value is 30 minutes.

### To set the autodiscovery frequency

- 1 On the left, click **Workloads > Kubernetes**.
- 2 On top-right, click **Kubernetes settings > Autodiscovery**.
- 3 Click **Edit**, near **Frequency**.
- 4 Enter the number of hours after which NetBackup runs autodiscovery. Click **Save**.

## Running full and incremental discovery

Once the Kubernetes cluster is added, auto discovery cycle is triggered to discover all the assets available on the Kubernetes cluster. The first auto discovery of the day is a full discovery and subsequent auto discoveries are incremental.

### To run a discovery

- 1 On the left, click **Workloads > Kubernetes**.
- 2 On the **Kubernetes clusters** list, click the Actions menu (Vertical ellipsis dots) in the row of the cluster and click **Discovery now**.

Here, incremental discovery fetches only those NetBackup assets which are changed in the cluster since last discovery run. Therefore, the first discovery is full and all subsequent ones will be incremental discovery.

## Configuring permissions

Using manage permissions, you can assign different access privileges to the user roles. For more information see the *Managing role-based access control* chapter in the *NetBackup Web UI Administrator's Guide*.

# Add protection to the assets

The **Namespaces** tab (**Workloads > Kubernetes**), lets you monitor the assets in your Kubernetes clusters, see their protection status, and easily add protection to any unprotected assets. You can also take a quick backup of asset using the backup now feature. This feature creates a one-time backup of the selected asset without affecting any scheduled backups.

The Namespaces tab displays with all the discovered and imported Kubernetes assets that NetBackup can protect. This tab displays the following information:

- **Namespaces:** Display name of the asset.
- **Cluster:** The cluster to which the asset belongs.
- **Protected by:** Name of the protection plan applied to the asset.
- **Last successful backup:** Date and time of the last successful backup of the asset.

You can perform the following action in the **Namespaces** tab.

#### **To add protection to an unprotected asset**

- 1 On the left, click **Workloads > Kubernetes**.
- 2 Select the option in the rows of the assets. Click **Add protection** on top right. Alternatively, click the Actions menu in the row of the asset and click **Add protection**.
- 3 Select a protection plan from the list and click **Next**. In the next page, click **Protect**.

#### **To quickly back up an asset**

- 1 Select the option in the rows of the assets, click **Backup now** on top right. Alternatively, click the Actions menu in the row of the asset and click **Backup now**.
- 2 In the next page,
  - If you backup an already protected asset, select a protection plan from the list of plans to which the asset is already subscribed, and click **Start backup**.
  - If you are backing up an unprotected asset, select a protection plan from the available plans for the asset, click **Start backup**.

# Managing Kubernetes intelligent groups

This chapter includes the following topics:

- [About intelligent group](#)
- [Create an intelligent group](#)
- [Delete an intelligent group](#)
- [Edit an intelligent group](#)

## About intelligent group

You can create and protect a dynamic group of assets by defining the intelligent asset groups based on a set of filters called queries. NetBackup selects the Kubernetes namespaces based on the queries and then adds them to the group. An intelligent group automatically reflects changes in the asset environment and eliminates the need to manually revise the list of assets in the group when the assets are added or removed from the environment.

When you apply protection plan to an intelligent group, all the assets satisfying the query conditions are automatically protected.

---

**Note:** You can create, update, or delete the intelligent groups only if your role has the necessary RBAC permissions for the assets that you require to manage. The NetBackup security administrator can grant you access for an asset type (clusters, namespaces, and VMGroup). Refer to the *NetBackup Web UI Administrator's Guide*.

---

# Create an intelligent group

## To create an intelligent group

- 1 On the left click **Kubernetes**, under **Workloads**.
- 2 Click the **Intelligent groups** tab and then, click **+ Add**.
- 3 Enter a name and description for the group.
- 4 Under **Clusters** section, click **+Add clusters**
- 5 In the **Add clusters** window, select one or multiple clusters from the list and click **Select** the selected clusters are added to the intelligent group.

---

**Note:** Intelligent group can be created across multiple clusters. Ensure that you have the required permissions to add clusters in the group. To view and manage the group, the group administrator must have the view and manage permission for the selected clusters and groups.

---

- 6 Under the **Select assets** section, do one of the following:
  - Select **Include all assets**.  
This option uses a default query to select all assets for backup when the protection plan runs.
  - To select only the assets that meet specific conditions, create your own query: Click **Add condition**.
  - To add label conditions for the assets, click **Add label condition** to add
- 7 To add a condition, use the drop-downs to select a keyword and operator and then enter a value.

To change the effect of the query, click **+ Condition** and click **AND** or **OR**, then select the keyword, operator, and value for the condition.

---

**Note:** To add label conditions, click **Add label condition** enter the label key and value.

---

---

**Note:** You can choose to have only a label key in the condition without the label value. As value is optional parameter to add a label condition.

---

---

**Note:** To add sub-query, click **Add sub-query**. You can add multiple level sub-queries.

---

- 8 To test the query, click **Preview**.

The query-based selection process is dynamic. Changes in the Kubernetes cluster can affect which assets the query selects when the protection plan runs. As a result, the assets that the query selects later when the protection plan runs may not be identical to those currently listed in the preview.

---

**Note:** When using queries in **Intelligent groups**, the NetBackup web UI might not display an accurate list of assets that match the query if the query condition has non-English characters.

Using the `not equals` filter condition on any attribute returns assets including those that have no value (null) present for the attribute.

---

**Note:** When you click **Preview** or you save the group, the query options are treated as case-sensitive when the assets are selected for the group.

---

- 9 To save the group without adding it to a protection plan, click **Add**.
- 10 To save the group with adding it to a protection plan, click **Add and protect**.
- 11 To subscribe the group to a protection plan, click **Add protection**.

Select the group and apply a protection plan to it, click **Protect**.

The selected asset group is successfully subscribed to the protection plan.

## Limitations while adding label conditions to the assets

The following considerations and limitations are applicable:

- In the query builder of intelligent group creation, the first label condition must have a [label key] and [value] defined.
- In the subsequent conditions, you can define either a [label key] condition] or a [label key plus value] condition
- If you have a combination of conditions and labels, then you must first define a namespace condition and then a label condition.

---

**Note:** For conditions, only a namespace value is allowed.

---

## Delete an intelligent group

### To delete an intelligent group

- 1 On the left, click **Kubernetes**, under **Workloads**.
- 2 Locate the group, under the **Intelligent groups** tab.
- 3 If the group is not protected, select it and click **Delete**.
- 4 If the group is protected, select it, and then click **Remove protection** to remove all protection plans.
- 5 Then select that group under the **Intelligent groups** tab and click **Delete**.

## Edit an intelligent group

You can edit the name and description details of an intelligent group. You can edit certain settings for a protection plan, including schedule backup windows and other options.

### To edit an intelligent group

- 1 On the left, click **Kubernetes**, under **Workloads**.
- 2 On the **Intelligent groups** tab, click the group that you want to edit the protection for.
- 3 Do one of the following:
  - Click **Edit name and description** to edit name and description of the selected group and then click **Save**.
  - On the **Assets** tab, click **Edit** to add or remove the cluster. You can update the query condition for the selected asset and then, click **Save**.  
You can edit the cluster list in the group, add or remove the clusters from the group. You can also modify the query condition for the selected asset group.
  - On the **Permissions** tab, click **Add** to update the permissions for available roles and then, click **Save**.

# Protecting Kubernetes assets

This chapter includes the following topics:

- [Protect an intelligent group](#)
- [Remove protection from an intelligent group](#)
- [Configure backup schedule](#)
- [Configure backup options](#)
- [Configure backups](#)
- [Configure Auto Image Replication \(AIR\) and duplication](#)
- [Configure storage units](#)

## Protect an intelligent group

You can create the Kubernetes specific protection plans for your Kubernetes workloads. Then you can subscribe an intelligent group to a protection Plan.

Use the following procedure to subscribe an intelligent group to a protection plan.

---

**Note:** The RBAC role that is assigned to you must give you access to the intelligent groups that you want to manage and to the protection plans that you want to use.

---

### To protect an intelligent group

- 1 On the left, click **Kubernetes**.
- 2 On the **Intelligent groups** tab, click the box for the groups and then, click **Add protection**.
- 3 Select a protection plan and click **Next**.
- 4 Select a group and click **Protect** to subscribe to a protection plan.

### 'Backup now' option for immediate protection

Apart from the scheduled protection plans, you can also use the **Backup now** option to backup a group immediately, to safeguard against any unplanned circumstances.

## Remove protection from an intelligent group

You can unsubscribe an intelligent group from a protection plan. When an intelligent group is unsubscribed from a protection plan, backups are no longer performed.

### To remove protection from an intelligent group

- 1 On the left, click **Kubernetes**, under **Workloads**.
- 2 On the **Intelligent groups** tab, click the group that you want to remove the protection for.
- 3 Click **Remove Protection > Yes**.

## Configure backup schedule

You can add backup schedule in the **Attributes** tab of the **Add backup** schedule dialog, while creating a protection plan for the Kubernetes workloads.

See the *Managing protection plans* section of the *NetBackup Web UI Administrator's Guide*, for details of how to create a protection plan.

### To add backup schedule for the Kubernetes backup job

- 1 On the left, click **Protection > Protection plans** and then click **Add**.
- 2 In **Basic properties**, enter a **Name**, **Description**, and select **Kubernetes**, from the **Workload** drop-down list.
- 3 Click **Next**. In **Schedules**, click **Add schedule**.

In the **Add backup schedule** tab, you can configure the options for retaining the backup and the snapshot.



- 4 From the **Recurrence** drop-down, specify the frequency of the backup.
- 5 In the **Snapshot and backup copy** options, do any of the following:
  - Select **Create backup from snapshot** option, to configure backup from snapshot for the protection plan. Specify retention period for the backup from snapshot using the **Keep backup for** drop-down.

---

**Note:** Only full backup schedules are supported on the Kubernetes workloads. You can set the backup duration in hours, days, weeks, months, and years.

By default, four weeks is the backup retention duration.

---

**Note:** You must select the **Create backup from snapshot** option to enable the replicate and duplicate options for backup copy.

---

- If you do not select **Create backup from snapshot** option, then by default, **Snapshot only storage** backup will get configured to run the backup jobs.
  - Select **Create a replica copy (Auto Image Replication) of the backup from snapshot** option to create a replica copy of the backup.
  - Select **Create a duplicate copy of the backup from snapshot** option to create a duplicate copy of the backup.
- 6 Continue creating the schedule in the **Start window** tab, as described in the *Managing protection plans* section of the *NetBackup Web UI Administrator's Guide*
  - 7 Continue to configure the **Storage options** for backup from snapshot, as described in the *Managing protection plans* section of the *NetBackup Web UI Administrator's Guide*

## Configure backup options

You can configure backup options for a protection plan.

See the *Managing protection plans* section of the *NetBackup Web UI Administrator's Guide*, for details of how to create a protection plan.

### To configure the backup options while configuring a protection plan

- 1 In the **Backup options** page, under the **Resource kind selection** section,
  - By default, **Include all resource kinds in the backup** option is selected to include all resource kinds for the backup job.

- Select **Exclude the following resource kinds from the backup** option to exclude the resource kinds from the backup job. Click **Select** to choose the resource kinds from the static list. The selected resource kinds are displayed in the text field or you can manually enter the custom resource definition (CRD) with correct format (type.group). You can delete the selected resource kinds from the exclude list.

In case, the custom resource kind definitions are not present in the static list then you can enter custom resource definition (CRD) manually. For example: demo.nbu.com.

---

**Note:** Exclude list of resource kinds takes precedence in terms of mapping the resources over the labels selected for backup.

---

- 2 Under the **Labels selection** section, click **Add** to add the labels to map its associated resources for the backup, enter the label prefix and key, and then select an operator. All associated resources of the included labels are mapped for the backup job.

Following are the four operators which you can add to a label:

- Enter a label key equal to a value.
- Enter a label key which already exists, without any values.
- Enter a label key which is in a set of values.
- Enter a label key not in a set of values.

You can add multiple values for in/not in operators in the set of values with comma separated.

---

**Note:** Selected labels must be present at the time of backup to ensure that the conditions are applied successfully.

---

---

**Note:** Label selection must only be exclusive of selecting any resource kind which doesn't contradict between multiple label conditions.

---

**Review** page displays the excluded list of resource kinds and the selected labels for inclusions, and the selected storage units selected.

---

**Note:** You can edit or delete the protection plan created for Kubernetes workloads. You cannot customize the protection plan created for Kubernetes workloads.

---

# Configure backups

NetBackup allows you to run two types of backup jobs in Kubernetes workload: Snapshots only and Backup from Snapshot. Follow the steps to configure a backup job for Kubernetes operator.

## To perform backup on Kubernetes workload

- 1 On the left, click **Protection > Protection plans** and then click **Add**.
- 2 In **Basic properties**, enter a **Name**, **Description**, and select **Kubernetes**, from the **Workload** drop-down list.
- 3 Click **Next**. In **Schedules**, click **Add schedule**.

In the **Add backup schedule** tab, you can configure the options for retaining the backup and the snapshot.

- 4 From the **Recurrence** drop-down, specify the frequency of the backup.
- 5 In the **Snapshot and backup copy** options, do any of the following:

- Select **Create backup from snapshot** option, to configure backup from snapshot for the protection plan. Specify retention period for the backup from snapshot using the **Keep backup for** drop-down.

---

**Note:** Only full backup schedules are supported on the Kubernetes workloads. You can set the backup duration in hours, days, weeks, months, and years. By default, four weeks is the backup retention duration.

---

**Note:** You must select the **Create backup from snapshot** option to enable the replicate and duplicate options for backup copy.

---

- If you do not select **Create backup from snapshot** option, then by default, **Snapshot only storage** backup is configured to run the backup jobs.
- Select **Create a replica copy (Auto Image Replication) of the backup from snapshot** option to create a replica copy of the backup.
- Select **Create a duplicate copy of the backup from snapshot** option to create a duplicate copy of the backup.

- 6 Continue creating the schedule in the **Start window** tab, as described in the *Managing protection plans* section of the *NetBackup Web UI Administrator's Guide*
- 7 Continue to configure the **Storage options** for backup from snapshot, as described in the *Managing protection plans* section of the *NetBackup Web UI Administrator's Guide*
  - While selecting a storage for **Backup from Snapshot** option, the selected storage unit must have the media servers of NetBackup version 10.0 or later.
  - Media server managing the storage must have access to the selected Kubernetes clusters.
  - Media server must be able to connect with the API server. The port corresponding to the API server must be open for the outbound connection from the media server. The datamover pod must be able to connect to the media server.

## Configure Auto Image Replication (AIR) and duplication

The backups that are generated in one NetBackup domain can be replicated to storage in one or more target NetBackup domains. This process is referred to as Auto Image Replication (AIR).

NetBackup Kubernetes supports Auto Image Replication from a Media Server Deduplication Pool (MSDP) in one NetBackup domain to a Media Server Deduplication Pool (MSDP) in another domain. NetBackup uses storage lifecycle policies (SLP) in the source domain and the target domain to manage A.I.R. operations.

For more information about configuring Auto Image Replication, refer to the *About NetBackup replication* chapter in the *NetBackup™ Administrator's Guide, Volume I*.

---

**Note:** Kubernetes AIR configuration requires NetBackup primary and media servers of version 10.0.1 or later.

---

### To configure Auto Image Replication (AIR) and duplication for Kubernetes backups

- 1 Configure an Auto Image Replication between two NetBackup primary servers.

- Establish the trust relationship between two primary servers for interdomain operations.
    - Log onto the source primary server, on the left, click **Hosts > Host properties** to build a connection between a source and target primary server.
    - Select a source primary server from the **Hosts** tab, and then click **Connect**.
    - Click **Edit primary server > Servers > Trusted primary servers > Add** to add a source server.
      - Click **Validate Certificate Authority** button, and then click **Next** to proceed with the certificate authority validation.
      - There are two options to create trusted primary servers, do any of the following:
        - Select **Specify authentication token of the trusted primary server** to add an existing token or create a new token for the source primary server.
        - Select **Specify credentials of the trusted primary server** to add user credentials for the source primary server.
      - Click **Create trust**.
- The database for the host properties is updated successfully.
- Click **Save**.
- 2 Configure a Media Server Deduplication Pool (MSDP) storage in the source primary server and add a replication target in MSDP disk pool.
    - On the left, click **Storage > Storage configuration**
    - Add a MSDP storage and disk pool.
    - Click **Disk pool > Add** to add a replication target.
      - Select a trusted primary server and a target storage server.
      - Add user credentials for the replication target server in the **Username** and `Password` fields.
    - Click **Add**.
  - 3 Create SLP with **Import** operation in the target primary server.
    - On the left, click **Storage > Storage lifecycle policies > + Add**.
    - In the **Storage lifecycle policy name** field, enter the policy name and then, click **Add**.

- In the **New operations > Properties > Operation**, select the **Import** option from the list.
  - In the **Destination storage attributes > Destination storage** select a MSDP storage unit from the list.
  - Click **Create**.
- 4 Create Kubernetes protection plan with **Create backup from snapshot** option to enable the replicate copy option.

On the left, click **Kubernetes** workloads > **Protection plan > Schedules > Add backup schedule**

- 5 In the **Snapshot and backup copy options** section, select **Create backup from snapshot** option to enable the replicate and duplicate copy options.
- 6 Select **Create a replica copy (Auto Image Replication) of the backup from snapshot** option, and set a time duration to retain the replica copy.

---

**Note:** Auto Image Replication can only be created on the trusted NetBackup primary servers.

---

- 7 Select **Create a duplicate copy of the backup from snapshot** option and set a time duration to retain the duplicate copy.
- 8 Click **Add**.
- 9 Continue creating the schedule in the **Start window** tab, as described in the *Managing protection plans* section of the *NetBackup Web UI Administrator's Guide*.
- 10 Click **Next**.
- 11 In the **Storage options** tab, select the storage units to backup from snapshot, replicate or duplicate copy.

---

**Note:** For Backup from snapshot and duplication, you can add simple storage units. But for replication, you must add a trusted storage unit with a import storage lifecycle policies (SLPs).

---

- 12 On the right of the selected backup options, click **Edit** to modify selected the storage units for backup.
- For replica copy option, **select replication target** dialog, select the primary server for replication copy, click **Next**.

- In the **Select storage lifecycle policy** dialog, select an import storage lifecycle policy defined in the trusted server and then click **Use selected replication target**.
- 13 Click **Finish** to create a protection plan with a replicate or duplicate copy.  
Review the replicate and duplicate copy details.

## Configure storage units

You can configure all types of storage units for backup in a protection plan.

---

**Note:** All storage types supported in Storage Lifecycle Policy (SLP) are supported for backup jobs.

---

### To configure a storage unit for backup

- 1 On the left, click **Storage configuration**, under the **Storage** tab.
- 2 Click the **Storage unit** tab and then click **+ Add** to add a storage unit configuration.
- 3 Select the storage type from the list and click **Start**.
- 4 Enter the storage unit name in the **Name** field.
- 5 In the **Maximum concurrent jobs** field, choose the maximum number for the backup jobs.
- 6 In the **Maximum fragment size** field, choose the maximum number for the storage unit fragment size and then click **Next**.
- 7 In **Disk pool**, select the disk pool you want to use in the storage unit and then click **Next**.
- 8 The **On demand only** option specifies whether the storage unit is available exclusively on demand. A policy or schedule must be explicitly configured to use this storage unit.
- 9 On the **Media server** tab, select the media servers that you want to use and then click **Next**. You can have NetBackup select your media server automatically or you can select your media servers manually using the radio buttons.
  - All media servers must of NetBackup version 10.0 or later
  - All media server managing the storage must have access to the selected Kubernetes clusters.

- Media server must be able to connect with the API server. The port corresponding to the API server must be open for the outbound connection from the media server. The datamover pod must be able to connect to the media server.

**10** Review the setup of the storage unit and then click **Save**.



# Recovering Kubernetes assets

This chapter includes the following topics:

- [Explore and validate recovery points](#)
- [Restore from snapshot](#)
- [Restore from backup copy](#)

## Explore and validate recovery points

NetBackup version 10.0 onwards supports recovery of Kubernetes assets using restore from snapshot and restore from backup copy operations.

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**Note:** After recovery, the newly created namespaces, persistent volumes, and other resources get new system-generated UIDs.

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NetBackup helps you to perform backup image validation through complete or incomplete state of the backup copy in the Kubernetes workload. NetBackup does not let you run a restore operation from an incomplete backup copy.

The recovery point corresponding to Kubernetes namespace consists of multiple images. The recovery point may be incomplete as the copy for some of the images might not be available. Such recovery points are marked as incomplete.

### To perform validation of recovery point

- 1 On the left, click **Kubernetes**, under **Workloads**
- 2 In the **Namespaces** tab, click the namespace of the asset that you want to recover.

- 3 Click the **Recovery points** tab.
- 4 The **Recovery points** tab shows you all the recovery points with the date, time, and copies of the backup.

Click the number of copies button next to the recovery point, to view the location, default copy, copy type, and complete state.

Complete state helps you to validate the selected recovery point to run the restore operation.

There can be multiple reasons for incomplete backup copy, backup in progress, image expiration, hardware failure, or network communication issues.

## Restore from snapshot

NetBackup features a restore from snapshot function where you can restore all the backup images in a recovery point, using a single restore job. You can view the restore from snapshot job in the NetBackup web UI.

### To run a restore from snapshot

- 1 On the left, click **Kubernetes**, under **Workloads**.
- 2 In the **Namespace** tab, click the namespace of the asset that you want to recover. Click the **Recovery points** tab.

- 3 The **Recovery points** tab shows you all the recovery points with the date, time, and copies of the backup. You can set filters to filter the displayed recovery points. Click the date in the **Date** column, to view the details of the recovery point. The **Recovery points details** dialog shows the resources that were backed up, like configmaps, secrets, persistent volumes, pod, and so on. For details about these resources, see <https://kubernetes.io/docs/reference/kubernetes-api/>

---

**Note:** On the NetBackup web UI, a new column **Copies** is added, under **Recovery points** tab of Kubernetes asset. This column displays the total number of copies.

---

**Note:** By default, for a newly installed NetBackup version 10.0, the **Copies** column is visible to you.

If NetBackup primary server is upgraded from version 9.1 to 10.0, and if you are an existing user who have already visited the **Recovery points** tab, then the **Copies** column is not visible to you.

---

**Note:** You can enable the visibility of **Copies** column using **Show or hide columns** option available on **Recovery points** page.

---

- 4 Click **Copies**, click the ellipsis menu (three dots), in the row of the recovery point that have the **Snapshot** type and a complete copy to restore.
- 5 In the **Recovery target** page, target cluster is auto populated.

---

**Note:** Alternate cluster restore is not supported for snapshot copy.

---

- 6 Under **Specify destination namespace**, select any of the following options for restore:
  - **Use original namespace** to use the original namespace backed up for restore. By default, this option is selected.
  - **Use alternate namespace** to use an alternate namespace for restore and then, click **Next**.
- 7 Under **Select resource types to recover**, select any of the following resource types to restore:
  - **All resource types** to recover all resource types. By default, this option is selected.

- **Recover selected resource types** to recover only the selected resource types.

---

**Note:** **Select resource types to recover** option is for advance users. If you are not careful in selecting the resources that you want to restore, you may not get a fully functional namespace after restoring.

---

- 8 Under **Select Persistent volume claims to recover**, select any of the following persistent volume claims to recover:
- **All Persistent volume claims** to recover all persistent volume claims. By default, this option is selected.
  - **Recover selected Persistent volume claims** to recover selected persistent volume claims.

---

**Note:** If you do not select any option in **Recover selected resource types**, then include empty persistent volume claims option is selected and no persistent volume claims is restored.

If you do not select any options in the **Recover selected persistent volume claims**, and click **Next**, then in the **Recovery options** section, it includes empty persistent volume claims and no persistent volume claims is restored.

---

**Note:** **Restore only persistent volume** enables toggle in the selected persistent volume claims to restore only the persistent volume. This does not create corresponding persistent volume claim.

---

- 9 Click on the **Failure strategy** section, to view the failure strategy options to recover.
- 10 Under **Select failure strategy to recover**, select any of the following failure strategies to recover:

---

**Note:** On occurrence of any failure while restoring metadata or PVCs, a restore job runs as per the failure strategy selected.

---

- **Fail Fast** to terminate the restore for any failure occurrence.
- **Proceed Ahead** to continue restoring the next PVC, If parent image (first image) restore fails then restore job terminates.

- **Retry** to specify a retry count for metadata or PVC restore. If restore fails even after retries then restore job terminates.

---

**Note:** The selected failure strategy is displayed on the activity monitor.

---

- 11 Click **Next**.
- 12 In **Recovery options** page, click **Start recovery** to submit the recovery entry.
- 13 In the **Activity monitor** tab, click the **Job ID**, to view the restore job details.

---

**Note:** NetBackup Kubernetes restore uses single job to restore all the persistent volume claims and a namespace. You can view logs on the **Activity monitor** to track which persistent volume, persistent volume claims or metadata is being restored.

---

## Restore from backup copy

NetBackup 10.0 onwards lets you restore from a backup copy. You can follow same procedure explained in restoring from snapshot, select the copy type as **Backup**. You can also restore to alternate target cluster.

### To restore from backup copy

- 1 On the left, click **Kubernetes**, under **Workloads**.
- 2 In the **Namespace** tab, click the namespace of the asset that you want to recover. Click the **Recovery points** tab.

- 3 The **Recovery points** tab shows you all the recovery points with the date, time, and copies of the backup. You can set filters to filter the displayed recovery points. Click the date in the **Date** column, to view the details of the recovery point. The **Recovery points details** dialog shows the resources that were backed up, like ConfigMaps, secrets, persistent volumes, pod, and so on. For details about these resources, see <https://kubernetes.io/docs/reference>

---

**Note:** On the NetBackup web UI, a new column **Copies** is added, under **Recovery points** tab of Kubernetes asset. This column displays the total number of copies.

---

**Note:** By default, if you have newly installed NetBackup version 10.0, the **Copies** column is visible to you.

But, if the NetBackup primary server is upgraded from version 9.1 to 10.0, and if you are an existing user who has already visited the **Recovery points** tab, then the **Copies** column is not visible to you.

---

**Note:** You can enable the visibility of **Copies** column using **Show or hide columns** option available on the **Recovery points** page.

---

- 4 Click **Copies**, click the ellipsis menu (three dots), in the row of the recovery point that have the **Backup** type and a complete copy to restore.
- 5 In the **Recovery target** page, to recover the asset to the same cluster source are auto populated. Click **Next**
- 6 Under **Specify destination namespace**, select any of the following options to restore:
  - **Use original namespace** to use original namespace. By default, this option is selected.
  - **Use alternate namespace** and enter the alternate namespace and then, click **Next**.
- 7 Under **Select resource types to recover**, select any of the following resource types to restore:
  - **All resource types** to recover all resource types. By default, this option is selected.
  - **Recover selected resource types** to recover only the selected resource types.

8 Under **Select Persistent volume claims to recover**, select any of the following persistent volume claims to recover:

- **All Persistent volume claims** to recover all persistent volume claims. By default, this option is selected.
- **Recover selected Persistent volume claims** to recover selected persistent volume claims.

---

**Note:** If you do not select any option in **Recover selected resource types**, then include empty persistent volume claims option is selected and no persistent volume claims is restored.

If you do not select any options in the **Recover selected persistent volume claims**, and click **Next**, then in the **Recovery options** section, it includes empty persistent volume claims and no persistent volume claims is restored.

---

**Note: Restore only persistent volume** enables toggle in the selected persistent volume claims to restore only the persistent volume. This will not create corresponding persistent volume claim.

---

9 Click on the **Failure strategy** section, to view the failure strategy options to recover.

10 Under **Select failure strategy to recover**, select any of the following failure strategies to recover:

---

**Note:** On occurrence of any failure while restoring metadata or PVCs, a restore job runs as per the failure strategy selected.

---

- **Fail Fast** to terminate the restore for any failure occurrence.  
terminate restore
- **Proceed Ahead** to continue restoring the next PVC, If parent image (first image) restore fails then restore job terminates.
- **Retry** to specify a retry count for metadata or PVC restore If restore fails even after retries then restore job terminates.

---

**Note:** The selected failure strategy is displayed on the activity monitor.

---

- Click **Next**

- 11** Click **Start recovery** to submit the recovery entry.
- 12** In the **Activity monitor** tab, click the **Job ID**, to view the restore job details.
- 13** On the **Job Details** page, click **Details** tab, the restore job sequence (pre-restore, data movement, and then the post-restore job) is displayed.

---

**Note:** NetBackup Kubernetes restore uses single job to restore all the persistent volume claims and a namespace. You can view logs in the **Activity monitor** to track which persistent volume, persistent volume claims, or metadata is being restored.

---

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**Note:** NetBackup version 10.0 do not support the restore job cancellation.

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**Note:** NetBackup version 10.0 onwards support an alternate cluster restore only for **Restore from backup copy** job. In some cases, restore to alternate cluster might fail partially due to different object versions on the cluster.

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# Troubleshooting Kubernetes issues

This chapter includes the following topics:

- [Error during the primary server upgrade: NBCheck fails](#)
- [Error during an old image restore: Operation fails](#)
- [Error during persistent volume recovery API](#)
- [Error during restore: Final job status shows partial failure](#)
- [Error during restore on the same namespace](#)
- [Datamover pods exceed the Kubernetes resource limit](#)
- [Error during restore: Job fails on the highly loaded cluster](#)
- [Custom Kubernetes role created for specific clusters cannot view the jobs](#)
- [Openshift creates blank non-selected PVCs while restoring applications installed from OperatorHub](#)

## Error during the primary server upgrade: NBCheck fails

NetBackup primary server upgrade from version 9.1 to 10.0 fails with a non-critical NBCheck error.

**Error message** : The test found {{no. of policies}} active Kubernetes policy. This test fails if the NetBackup instance has any active Kubernetes policies.

**Recommended action:** To deactivate all the active Kubernetes policies on the primary server before upgrading NetBackup to 10.0. version.

For more details, see <https://www.veritas.com/content/support>

## Error during an old image restore: Operation fails

Kubernetes restore operation fails for the older images which were created using NetBackup 9.1. version.

**Error message:** Restore operation is not supported on the backup images of NetBackup older than 10.0 version.

**Recommended action:** Restore the older image using Velero commands. Velero is an open-source tool to safely backup and restore, perform disaster recovery, and migrate Kubernetes cluster resources and persistent volumes. Thus, to restore old image from Velero, installation is a pre-requisite on the cluster.

Get the backup name / backup id from the NetBackup Administrator Web UI and use it in Velero commands to restore it.

For more details, see <https://www.veritas.com/content/support>

## Error during persistent volume recovery API

On NetBackup Kubernetes operator version 10.0, the persistent volume recovery API is removed and not supported. On the older versions of NetBackup this API was used to restore the persistent volume. So, if you have upgraded NetBackup 10.0 version, and using the persistent volume recovery API to restore, then the restore operation will fail.

**Error message:** Kubernetes persistent volume recovery API is no longer in use and has been removed from the product due to redesign at NetBackup Kubernetes recovery process.

**Recommended action:** In NetBackup Kubernetes operator version 10.0, NetBackup is upgraded to recover selected resources from backups. So, if you want to recover persistent-volume or persistent-volume claims then you can select the persistent volumes from NetBackup and recover on to the destination namespace.

For more details, see <https://www.veritas.com/content/support>

## Error during restore: Final job status shows partial failure

Final restore job status is partially failed with few warnings specific to the resource RoleBinding.

The warnings displayed are specific to the resource RoleBinding for API groups `groupauthorization.openshift.io` and `rbac.authorization.kubernetes.io` are seen. Because the RoleBinding are auto managed using the controller and gets created when we create a new namespace.

**Recommended action:** You can exclude the relevant RoleBinding resources from the restore or ignore the warnings created.

## Error during restore on the same namespace

Restoring PVCs on an original namespace might fail, if the selected PVCs are already present in the namespace.

**Recommended actions:**

- You can use alternate namespace restore
- You can select the PVCs in the **Recovery option** which are not overlapping with the existing PVCs while running the restore operation.

## Datamover pods exceed the Kubernetes resource limit

NetBackup controls the total number of in-progress backup jobs on Kubernetes workload using the two resource limit properties. In NetBackup version 10.0, datamover pods exceeds the **Backup** and **Backup From Snapshot** resource limits set for per Kubernetes cluster.

**Following is the example with resource limit issue**

Scenario no 1

Activity monitor

Activity monitor				
Jobs		Daemons	Processes	Background tasks
Search...				
Job ID ↓	Type	Client or display name	Job state	
<input type="checkbox"/> 3021	Backup From Snapshot	nginx-logs;34.68.168.50	Queued	
▼ <input type="checkbox"/> 3020	Backup From Snapshot	nginx-rfb;34.68.168.50	Active	
<input type="checkbox"/> 3022	Backup From Snapshot	nginx-rfb;34.68.168.50	Active	
▼ <input type="checkbox"/> 3018	Backup	kaclustervm	Done	
<input type="checkbox"/> 3019	Snapshot	nginx-rfb;34.68.168.50	Done	

Resource limit for Backup from Snapshot jobs per Kubernetes cluster is set to 1.

Job IDs 3020 and 3021 are the parent jobs for Backup from snapshot. The creation of the data mover pod and its cleanup process are part of the backup job life cycle.

Job ID 3022 is the child job, where the data movement takes place from the cluster to the storage unit.

Based on the resource limit setting, while job ID 3022 is in the running state, job ID 3021 will continue to be in queued state. Once, the backup job ID 3022 is completed, then the parent Job ID 3021 will start.

Notice that the job ID 3020 is still in progress, since we are in process to clean up the data mover pod and complete the life cycle of the parent job ID 3020.

### Scenario no 2

Activity monitor

Activity monitor				
Jobs		Daemons	Processes	Background tasks
Search...				
Job ID ↓	Type	Client or display name	Job state	
<input type="checkbox"/> 3021	Backup From Snapshot	nginx-logs;34.68.168.50	Active	
▼ <input type="checkbox"/> 3020	Backup From Snapshot	nginx-rfb;34.68.168.50	Active	
<input type="checkbox"/> 3022	Backup From Snapshot	nginx-rfb;34.68.168.50	Done	
▼ <input type="checkbox"/> 3018	Backup	kaclustervm	Done	
<input type="checkbox"/> 3019	Snapshot	nginx-rfb;34.68.168.50	Done	

At this stage, we may encounter that there are 2 data mover pods running simultaneously in the NetBackup Kubernetes operator deployment namespace. Because the data mover pod created as part of job ID 3020 is still not cleaned up, but we started with creation of data mover pod for job 3021.

In a busy environment, where multiple Backup from Snapshot jobs are triggered, a low resource limit value setting may lead to backup jobs spending most of the time in the queued state.

But if we have a higher resource limit setting, we may observe that the data mover pods might exceed the count specified in the resource limit. This may lead to resource starvation in the Kubernetes cluster.

While the data movement job like 3022 runs in parallel, cleanup activities are handled sequentially. This when combined with the time it takes to cleanup the datamover resource, if closer to the time it takes to backup the pvc/namespace data leads to longer delay in the completion of the jobs.

If the combined time duration for data movement and clean up resources is like the backup job. Then, the backup job of persistent volume or namespace data may lead to delay in the job completion.

**Recommended action:** Ensure to review your system resources and performance, to set the resource limit value accordingly. This measure will help you achieve the best performance for all backup jobs.

## Error during restore: Job fails on the highly loaded cluster

Restore jobs fails on the heavily loaded Kubernetes cluster.

**Error messages:** ERR - Unable to initialize VxMS, cannot write data to socket, Connection reset by peer.

Error bpbrm (pid=712755) from client cluster.sample.domain.com: ERR - Unable to initialize VxMS.

Error bptm (pid=712795) cannot write data to socket, Connection reset by peer.

**Recommended action:** If you face this issue during restore operation, then you should run the restore operation on a less loaded cluster or when the cluster is idle.

# Custom Kubernetes role created for specific clusters cannot view the jobs

When a custom RBAC role is created for Kubernetes workload with specific Kubernetes clusters then the system administrator must explicitly provide the permissions to view Kubernetes jobs, else all the Kubernetes specific jobs will not be visible.

If the system administrator does not provide the permission to view the Kubernetes jobs, then the user may view the following jobs:

- Only restore jobs in the hierarchy view.
- Only snapshot and restore jobs in the list view.

If a custom based Kubernetes role created is not able to view the jobs for specific Kubernetes clusters. Then perform the following steps to provide view permissions.

## To provide view permissions

- 1 On the left click **Kubernetes** under **Workload**.
- 2 On the right click **Kubernetes setting>Manage permissions**.
- 3 Click the vertical ellipse next to the corresponding role and select **Edit**.
- 4 In the **Edit permissions**, select **Edit**, and **View jobs** permissions for the role and then, click **Save**.

Kubernetes custom role user will be able to view backup, snapshot, restore and backup form snapshot jobs both in the hierarchical and list view.

## Assumptions:

- If the setup is upgraded, then the user may view the following:
  - Only restore jobs in the hierarchy view from the existing jobs.
  - Only snapshot and restore jobs in the list view from the existing jobs.
- If a custom role for Kubernetes is created with permission to the selected Kubernetes clusters, then user can **cancel** and **restart** operations only on the snapshot jobs.

# Openshift creates blank non-selected PVCs while restoring applications installed from OperatorHub

In an Openshift environment, where an application is installed via OperatorHub catalog sources. When a user tries to perform a selective PVC restore from such application namespace's backup. But instead, all the PVCs gets created.

This issue happens because, an Openshift environment provisions the non-selected PVCs with required size in the destination namespace.

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**Note:** For such applications, the PVCs, are auto-provisioned as per the deployment configurations even if a user does not select them for restore.

---