CSI Driver for Dell EMC VxFlex OS

Product Guide

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DELL EMC

Notes, cautions, and warnings

NOTE: A NOTE indicates important information that helps you make better use of your product.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

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Introduction

This chapter contains the following section:

Topics:

- Product overview

Product overview

The CSI Driver for Dell EMC VxFlex OS is a plug-in that is installed into Kubernetes to provide persistent storage using Dell EMC VxFlex OS storage system.

The CSI Driver for Dell EMC VxFlex OS and Kubernetes communicate using the Container Storage Interface protocol. CSI Driver for Dell EMC VxFlex OS conforms to CSI specification 1.1 and compatible with Kubernetes versions 1.14/1.16 and OpenShift 4.2/4.3. The CSI Driver for Dell EMC VxFlex OS is validated against the Kubernetes CSI Driver Tests version 1.0.3.

Features of CSI Driver for Dell EMC VxFlex OS

The CSI Driver for Dell EMC VxFlex OS supports the following features:

- Persistent volume (PV) capabilities - create, list, delete, and create-from-snapshot.
- Dynamic and static PV provisioning
- Snapshot capabilities - create, delete, and list (Kubernetes Only, not supported on Openshift).
- Volume mount as *ext4* or *xfs* file system on the worker node.
- Supports the following access modes:
  - single-node-writer
  - single-node-reader-only
  - multi-node-reader-only
  - multi-node-single-writer
- Volume prefix for easy LUN identification
- Supports HELM 3 charts installer
- Supports Dell EMC Storage CSI Operator deployment
- Supports Red Hat Enterprise Linux (RHEL) 7.6 and 7.7 as host operating system
- Supports Dell EMC VxFlex OS 3.0.0, 3.0.1 and 3.5 versions.
- Supports CSI 1.1
- Supports Kubernetes version 1.14 and 1.16
- Supports OpenShift 4.2 and 4.3 with Red Hat Enterprise Linux CoreOS on master nodes and Red Hat Enterprise Linux 7.6 on worker nodes
- Compatible with VxFlex OS 3.0/3.5 with medium and fine granularity storage pools

  NOTE: Volume Snapshots is an Alpha feature in Kubernetes. It is recommended for use only in short-lived testing clusters, as features in the Alpha stage have an increased risk of bugs and a lack of long-term support. See Kubernetes documentation for more information about feature stages.

The CSI Driver for Dell EMC VxFlex OS depends on the following libraries:

- *gofsutil*
- *gocsi*
- *goscaleio*
- *godog*
- *protobuf*
- *logrus*
- *gosync*
- *grpc*

These libraries are used in the current version of the driver.

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Installing CSI Driver for Dell EMC VxFlex OS

Installation overview

The CSI Driver for Dell EMC VxFlex OS can be deployed in Kubernetes platforms using HELM version 3 charts or the Dell EMC Storage CSI Operator. The CSI Driver for Dell EMC VxFlex OS can be deployed on Openshift platforms using the Dell EMC Storage CSI Operator. The CSI Driver repository includes HELM charts that use a shell script to deploy the CSI Driver for Dell EMC VxFlex OS. The shell script installs the CSI Driver container image along with the required Kubernetes sidecar containers.

The CSI Driver for Dell EMC VxFlex OS can be installed using HELM version 3 charts or the new Dell EMC Storage CSI Operator.

NOTE: In the earlier releases, the driver was installed using HELM version 2. From version 1.1.5, the driver installation charts and test charts have been upgraded to be compatible with HELM 3. Since HELM 3 is not backward compatible with HELM 2, it means that any existing installations of the driver must be uninstalled and then the users may choose to use the HELM 3 based installer or the Dell EMC Storage CSI Operator to install v1.1.5 of the driver (See, Update CSI Driver for Dell EMC VxFlex OS).

The controller section of the Helm chart installs the following components in a *Stateful Set* in the namespace *vxflexos*:

- CSI Driver for Dell EMC VxFlex OS
- Kubernetes Provisioner, which provisions the volumes
- Kubernetes Attacher, which attaches the volumes to the containers
- Kubernetes Snapshotter, which provides snapshot support

The node section of the Helm chart installs the following component in a *Daemon Set* in the namespace *vxflexos*:

- CSI Driver for Dell EMC VxFlex OS
- Kubernetes Registrar, which handles the driver registration

Prerequisites

Before you install CSI Driver for Dell EMC VxFlex OS, verify the requirements that are mentioned in this topic are installed and configured.

Requirements

- Install Kubernetes. The CSI Driver for Dell EMC VxFlex OS works with Kubernetes version 1.14.x and 1.16.x

  OR
- Install OpenShift. The CSI Driver for Dell EMC VxFlex OS works with OpenShift 4.2 and 4.3 with Red Hat Enterprise Linux (RHEL) 7.6 worker nodes
- For HELM 3 based install (Kubernetes only): Install Helm package manager.
- For Operator based install (Kubernetes and Openshift): Install using Operator.
- Verify that zero padding is enabled on the VxFlex OS storage pools that must be used. Use VxFlex OS GUI in the VxFlex OS CLI to check this setting. See Dell EMC VxFlex OS documentation for more information to configure this setting.
- Enable the feature gates (Kubernetes only)
- Configure Docker service (Kubernetes only)
- Install VxFlex OS SDC

Enable feature gates (Kubernetes only)

The Kubernetes feature gates must be enabled before installing CSI Driver for Dell EMC VxFlex OS.

About this task

NOTE: You may need to enable other feature gates for different Kubernetes versions and distributions. The feature gates that are described in this section are applicable for Kubernetes 1.14/1.16. Some of the feature gates might already be enabled by default (the value already set to true). For these feature gates, leave them as they are.

The Feature Gates section of Kubernetes home page lists the Kubernetes feature gates. The following Kubernetes feature gates must be enabled:

- VolumeSnapshotDataSource
- KubeletPluginsWatcher
- CSINodeInfo
- CSIDriverRegistry
- BlockVolume
- CSIBlockVolume

Steps

1. On each master and node of Kubernetes, edit /var/lib/kubelet/config.yaml and add the following lines at the end to set feature-gate settings for the kubelets:

```
/var/lib/kubelet/config.yaml
VolumeSnapshotDataSource: true
KubeletPluginsWatcher: true
CSINodeInfo: true
CSIDriverRegistry: true
BlockVolume: true
CSIBlockVolume: true
```

2. On the master, set the feature gate settings of the *kube-apiserver.yaml* file as follows:

```
/etc/kubernetes/manifests/kube-apiserver.yaml - --feature-
gates=VolumeSnapshotDataSource=true,KubeletPluginsWatcher=true,CSINodeInfo=true,CSIDriverRe
gistry=true,BlockVolume=true,CSIBlockVolume=true
```

3. On the master, set the feature gate settings of the *kube-controller-manager.yaml* file as follows:

```
/etc/kubernetes/manifests/kube-controller-manager.yaml - --feature-
gates=VolumeSnapshotDataSource=true,KubeletPluginsWatcher=true,CSINodeInfo=true,CSIDriverRe
gistry=true,BlockVolume=true,CSIBlockVolume=true
```

4. On the master, set the feature gate settings of the *kube-scheduler.yaml* file as follows:

```
/etc/kubernetes/manifests/kube-scheduler.yaml - --feature-
gates=VolumeSnapshotDataSource=true,KubeletPluginsWatcher=true,CSINodeInfo=true,CSIDriverRe
gistry=true,BlockVolume=true,CSIBlockVolume=true
```

5. On each node, edit the variable *KUBELET_KUBECONFIG_ARGS* of `/etc/systemd/system/kubelet.service.d/10-kubeadm.conf` file as follows:

```
Environment="KUBELET_KUBECONFIG_ARGS=--bootstrap-kubeconfig=/etc/kubernetes/bootstrap-
kubelet.conf --kubeconfig=/etc/kubernetes/kubelet.conf --allow-privileged=true --feature-
gates=VolumeSnapshotDataSource=true,KubeletPluginsWatcher=true,CSINodeInfo=true,CSIDriverRe
gistry=true,BlockVolume=true,CSIBlockVolume=true"
```

NOTE: The location of the *10-kubeadm.conf* file depends on the Kubernetes version and the installation process.

6. Restart the kublet with `systemctl daemon-reload` and `systemctl restart kubelet` on all nodes.

Configure Docker service (Kubernetes only)

The mount propagation in Docker must be configured on all Kubernetes nodes before installing CSI Driver for Dell EMC VxFlex OS.

Prerequisites

NOTE: Configure docker service does not apply to Openshift based installations.

Steps

1. Edit the service section of `/etc/systemd/system/multi-user.target.wants/docker.service` file as follows:

```
docker.service
[Service]
...
MountFlags=shared
```

2. Restart the docker service with `systemctl daemon-reload` and `systemctl restart docker` on all the nodes.

Install HELM package manager

Procedure to install HELM package manager.

About this task

The VxFlex OS version 1.1.5 supports HELM 3 only. HELM 3 is easier to install than previous versions and poses less security risks, because no Tiller installation or special privileges are required. See, Install HELM 3 for instructions to install HELM 3.

Install VxFlex OS Storage Data Client

Use the procedure in this topic to install VxFlex OS Storage Data Client.

About this task

Install the VxFlex OS Storage Data Client (SDC) on all Kubernetes nodes or with OpenShift on the RHEL worker nodes.

For detailed VxFlex OS installation procedure, see the *Dell EMC VxFlex OS Deployment Guide*. Install the VxFlex OS SDC as follows:

Steps

1. Download the VxFlex OS SDC from Dell EMC Online support. The filename is EMC-ScaleIO-sdc-*.rpm, where * is the SDC name corresponding to the VxFlex OS installation version.
2. Export the shell variable *MDM_IP* in a comma-separated list. This list contains the IP addresses of the MDMs.

   `export MDM_IP=xx.xxx.xx.xx,xx.xxx.xx.xx`, where *xxx* represents the actual IP address in your environment.
3. Install the SDC using the following commands:
   - For Red Hat Enterprise Linux and Cent OS, run `rpm -iv ./EMC-ScaleIO-sdc-*.x86_64.rpm`, where * is the SDC name corresponding to the VxFlex OS installation version.
   - For Ubuntu, run `EMC-ScaleIO-sdc-3.0-0.769.Ubuntu.18.04.x86_64.deb`.

Install CSI Driver for Dell EMC VxFlex OS using HELM

Procedure to install CSI Driver for Dell EMC VxFlex OS using HELM.

Prerequisites

- Download the installation source files from `github.com/dell/csi-vxflexos`, using the following command:

```
/home/test# git clone https://github.com/dell/csi-vxflexos
```

- In the top level helm directory, there should be two shell scripts, `install.vxflexos` and `uninstall.vxflexos`. These scripts handle some of the pre and post operations that cannot be performed in the helm chart, such as creating Custom Resource Definitions (CRDs), if needed.
- Create a Kubernetes secret with your VxFlex OS username and password. Use the *secret.yaml* file to create the secret with the following values to match the default installation parameters:
  - Name: **`vxflexos-creds`**
  - Namespace: **`vxflexos`**

NOTE:

- **Create the namespace using `kubectl create namespace vxflexos`.**
- **For more information about creating a Kubernetes secret, see: Kubernetes documentation: Overview of Secrets**

Steps

1. Collect information from the VxFlex OS SDC (Storage Data Client) by executing the `get_vxflexos_info.sh` script located in the top-level helm directory.

   This script shows the *VxFlex OS system ID* and *MDM IP* addresses. Make a note of the value for these parameters as they must be entered in the *myvalues.yaml* file.

   NOTE: Your SDC might have multiple VxFlex OS systems registered. Ensure that you choose the correct values.

2. Copy the `csi-vxflexos/values.yaml` into a file in the same directory as the *install.vxflexos* named *myvalues.yaml*, to customize settings for installation.
3. Edit *myvalues.yaml* to set the following parameters for your installation:
   - Set the *systemName* string variable to the VxFlex OS system name or system ID. This value was obtained by running the `get_vxflexos_info.sh` script in Step 1 of this procedure.
   - Set the *restGateway* string variable to the URL of your system's REST API Gateway. You can obtain this value from the VxFlex OS administrator.
   - Set the *storagePool* string variable to a default (already existing) storage pool name in your VxFlex OS system.

     NOTE: New storage pools can be created in VxFlex OS UI and CLI utilities.
   - Set the *mdmIP* string variable to a comma separated list of MDM IP addresses.
   - Set the *volumeNamePrefix* string variable so that volumes created by the driver have a default prefix. If one VxFlex OS system is servicing several different Kubernetes installations or users, these prefixes help you distinguish them.
   - The *controllerCount* variable is used by advanced users to deploy multiple controller instances. The specified default value **`1`** is designed to work as expected. You can modify the value of this variable to set the desired number of CSI controller replicas.
   - Set the *enablelistvolumesnapshot* variable **`false`** unless instructed otherwise, by Dell EMC support. It causes snapshots to be included in the CSI operation ListVolumes.
   - The Helm charts create a Kubernetes *StorageClass* while deploying CSI Driver for Dell EMC VxFlex OS. The *StorageClass* section includes following variables:
     - The *name* string variable defines the name of the Kubernetes storage class that the Helm charts will create. For example, the *vxflexos* base name will be used to generate names such as *vxflexos* and *vxflexos-xfs*.
     - The *isDefault* variable (valid values for this variable are `true` or `false`) will set the newly created storage class as default for Kubernetes.

       NOTE:

       - **Set this value to `true` only if you expect VxFlex OS to be your principle storage provider, as it will be used in *PersitentVolumeClaims* where no *storageclass* is provided. After installation, you can add custom storage classes if desired.**
       - **All strings must be contained within double quotes.**
     - The *reclaimPolicy* string variable defines whether the volumes will be retained or deleted when the assigned pod is destroyed. The valid values for this variable are `Retain` or `Delete`.
4. Run the `sh install.vxflexos` command to proceed with the installation.
   A successful installation should emit messages that look similar to the following samples:

```
[root@k8s113a-10-247-102-211 helm]# sh install.vxflexos
NAME:   vxflexos
LAST DEPLOYED: Thu Jan 24 18:28:35 2019
NAMESPACE: vxflexos
STATUS: DEPLOYED
```

```
… omitted lots here …

NAME                     READY   STATUS    RESTARTS   AGE
vxflexos-controller-0    4/4     Running   0          20s
vxflexos-node-r5kdt      2/2     Running   0          20s
vxflexos-node-tq5tj      2/2     Running   0          20s
CSIDrivers:
NAME       AGE
vxflexos   21s
CSINodeInfos:
NAME                                  AGE
k8s113a-10-247-102-213.lss.emc.com    21h
k8s113a-10-247-102-215.lss.emc.com    21h
StorageClasses:
NAME                  PROVISIONER     AGE
vxflexos (default)    csi-vxflexos    21s
vxflexos-xfs          csi-vxflexos    21s
VolumeSnapshotClasses:
NAME                  AGE
vxflexos-snapclass    2d
```

Results

At the end of the script, the `kubectl get pods -n vxflexos` is called to GET the status of the pods and you will see the following:

- Vxflex-controller-0 with 4/4 containers ready, and status displayed as `Running`.
- Agent pods with 2/2 containers and the status displayed as `Running`.

Finally, the script lists the created *storageclasses* such as, *vxflexos* and *vxflexos-xfs*. Additional storage classes can be created for different combinations of file system types and VxFlex OS storage pools. The script also creates *volumesnapshotclasses* such as, *vxflexos-snapclass* and other snapshots classes.

Install using Operator

Install using Dell EMC Storage CSI Operator.

Starting version 1.1.4, CSI Driver for Dell EMC VxFlex OS can also be installed using the new Dell EMC Storage CSI Operator. The Dell EMC Storage CSI Operator is a Kubernetes Operator, which can be used to install and manage the CSI Drivers that are provided by Dell EMC for various storage platforms.

This operator is available as a community operator for upstream Kubernetes and can be deployed using OperatorHub.io. It is also available as a community operator for Openshift clusters and can be deployed using OpenShift Container Platform. Both these methods of installation use OLM (Operator Lifecycle Manager).

The operator can also be deployed directly by following the instructions available here - https://github.com/dell/dell-csi-operator.

Instructions on how to deploy the CSI Driver for Dell EMC VxFlex OS using the operator can be found here - https://github.com/dell/dell-csi-operator There are sample manifests provided which can be edited to do an easy installation of the driver.

NOTE: The deployment of the driver using the operator does not use any Helm charts. The installation and configuration parameters are slightly different from the ones that are specified by the Helm installer.

Kubernetes Operators make it easy to deploy and manage entire lifecycle of complex Kubernetes applications. Operators use Custom Resource Definitions (CRD) which represents the application and use custom controllers to manage them.

Update CSI Driver for Dell EMC VxFlex OS

Use the procedure in this topic to update the CSI Driver for Dell EMC VxFlex OS.

About this task

Users can upgrade the driver using HELM:

Steps

1. Uninstall the driver using `uninstall.vxflexos` under `csi-vxflexos/helm` .
2. Get the latest code from GitHub (CSI Driver for Dell EMC VxFlex OS v1.1.5)
3. Prepare *myvalues.yaml*.
4. Execute `./install.vxflexos` to upgrade the driver.

5. List the pods with the following command (to verify the status):
   - `kubectl get pods -n vxflexos`

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Testing VxFlex OS driver

This chapter contains the following sections:

Topics:

- Test deploying a simple pod with VxFlex OS storage
- Test creating snapshots
- Test restoring from a snapshot

Test deploying a simple pod with VxFlex OS storage

Test the deployment workflow of a simple pod on VxFlex OS storage.

Prerequisites

In the source code, there is a directory that contains examples of how you can use the driver. To use these examples, you must create a *helmtest-vxflexos* namespace, using `kubectl create namespace helmtest-vxflexos`, before you can start testing. HELM 3 must be installed to perform the tests.

About this task

The *starttest.sh* script is located in the `csi-vxflexos/test/helm` directory. This script is used in the following procedure to deploy helm charts that test the deployment of a simple pod.

Steps

1. Navigate to the `test/helm` directory, which contains the *starttest.sh* and the *2vols* directories.
   This directory contains a simple Helm chart that will deploy a pod that uses two VxFlex OS volumes.
   NOTE: Helm tests are designed assuming users are using the default *storageclass* names (*vxflexos* and *vxflexos-xfs*). If your *storageclass* names differ from the default values, such as when deploying with the Operator, please update the templates in 2vols accordingly (located in `test/helm/2vols/templates` directory). You can use `kubectl get sc` to check for the *storageclass* names.
2. Run the `sh starttest.sh 2vols` command to deploy the pod.
   You should see the following:

```
 Normal   Pulled                 38s                kubelet,
k8s113a-10-247-102-215.lss.emc.com  Successfully pulled image "docker.io/centos:latest"
  Normal   Created                38s                kubelet,
k8s113a-10-247-102-215.lss.emc.com  Created container
  Normal   Started                38s                kubelet,
k8s113a-10-247-102-215.lss.emc.com  Started container
/dev/scinib           8125880   36852   7653216   1% /data0
/dev/scinia          16766976   32944  16734032   1% /data1
/dev/scinib on /data0 type ext4 (rw,relatime,data=ordered)
/dev/scinia on /data1 type xfs (rw,relatime,attr2,inode64,noquota)
```

3. To stop the test, run `sh stoptest.sh 2vols`.
   This script deletes the pods and the volumes depending on the retention setting you have configured.

Results

An outline of this workflow is described below:

1. The *2vols* helm chart contains two PersistentVolumeClaim definitions, one in *pvc0.yaml*, and the other in *pvc1*.yaml. They are referenced by the *test.yaml* which creates the pod. The contents of the *Pvc0.yaml* file are described below:

```
kind: PersistentVolumeClaim
apiVersion: v1
metadata:
  name: pvol0
  namespace: helmtest-vxflexos
spec:
  accessModes:
  - ReadWriteOnce
  volumeMode: Filesystem
  resources:
    requests:
      storage: 8Gi
  storageClassName: vxflexos
```

2. The *volumeMode: Filesystem* requires a mounted file system, and the *resources.requests.storage* of 8Gi requires an 8 GB file. In this case, the *storageClassName: vxflexos* directs the system to use one of the pre-defined storage classes created by the CSI Driver for Dell EMC VxFlex OS installation process. This step yields a mounted *ext4* file system. You can see the storage class definitions in the VxFlex OS installation helm chart files *storageclass.yaml* and *storageclass-xfs.yaml*.
3. If you compare *pvol0.yaml* and *pvol1.yaml*, you will find that the latter uses a different storage class; *vxflexos-xfs*. This class gives you an *xfs* file system.
4. To see the volumes you created, run `kubectl get persistentvolumeclaim -n helmtest-vxflexos` and `kubectl describe persistentvolumeclaim -n helmtest-vxflexos`.

   NOTE: For more information about Kubernetes objects like *StatefulSet* and *PersistentVolumeClaim* see Kubernetes documentation: Concepts.

Test creating snapshots

Use the procedure in this topic to create snapshots.

Prerequisites

NOTE: Test the workflow for snapshot creation. Snapshots are not enabled for Openshift.

Steps

1. Start the *2vols* container and leave it running.

   NOTE:

   - **Helm tests are designed assuming users are using the default *storageclass* names (*vxflexos* and *vxflexos-xfs*). If your *storageclass* names differ from the default values, such as when deploying with the Operator, update the templates in 2vols accordingly (located in `test/helm/2vols/templates` directory). You can use `kubectl get sc` to check for the *storageclass* names.**
   - **Helm tests are designed assuming users are using the default *snapshotclass* name. If your *snapshotclass* names differ from the default values, update *snap1.yaml* and *snap2.yaml* accordingly.**

2. Run the `snaptest.sh` shell script.

   This will create a snapshot of each of the volumes in the container using *VolumeSnapshot* objects defined in *snap1.yaml* and *snap2.yaml*. The following are the contents of *snap1.yaml*:

```
apiVersion: snapshot.storage.k8s.io/v1alpha1
kind: VolumeSnapshot
metadata:
  name: pvol0-snap1
  namespace: helmtest-vxflexos
spec:
  snapshotClassName: vxflexos-snapclass
  source:
    name: pvol0
    kind: PersistentVolumeClaim
```

Results

The *snaptest.sh* script will create a snapshot using the definitions in the *snap1.yaml* file. The *spec.source* section contains the volume that will be snapped. For example, if the volume to be snapped is *pvol0*, then the created snapshot is named *pvol0-snap1*.

NOTE: The *snaptest.sh* shell script creates the snapshots, describes them, and then deletes them. You can see your snapshots using *kubectl get volumesnapshot -n test*.

Notice that this *VolumeSnapshot* class has a reference to a *snapshotClassName: vxflexos-snapclass*. The CSI Driver for Dell EMC VxFlex OS installation creates this class as its default snapshot class. You can see its definition in the installation directory file *volumesnapshotclass.yaml*.

Test restoring from a snapshot

Test the restore operation workflow to restore from a snapshot.

Prerequisites

Ensure that you have stopped any previous test instance before performing this procedure.

About this task

To test the restore operation from a snapshot:

Steps

Run the `snaprestoretest.sh` shell script.

This script deploys the *2vols* example, creates a snap of pvol0, and then updates the deployed helm chart from the updated directory *2vols+restore*. This then adds an additional volume that is created from the snapshot.

NOTE:

- **Helm tests are designed assuming users are using the default *storageclass* names (*vxflexos* and *vxflexos-xfs*). If your *storageclass* names differ from the default values, such as when deploying with the Operator, update the templates for snap restore tests accordingly (located in `test/helm/2vols+restore/template` directory). You can use `kubectl get sc` to check for the *storageclass* names.**
- **Helm tests are designed assuming users are using the default *snapshotclass* name. If your *snapshotclass* names differ from the default values, update *snap1.yaml* and *snap2.yaml* accordingly.**

Results

An outline of this workflow is described below:

1. The snapshot is taken using *snap1.yaml*.
2. *Helm* is called to upgrade the deployment with a new definition, which is found in the *2vols+restore* directory. The `csi-vxflexos/test/helm/2vols+restore/templates` directory contains the newly created *createFromSnap.yaml* file. The script then creates a *PersistentVolumeClaim*, which is a volume that is dynamically created from the snapshot. Then the helm deployment is upgraded to contain the newly created third volume. In other words, when the *snaprestoretest.sh* creates a new volume with data from the snapshot, the restore operation is tested. The contents of the *createFromSnap.yaml* are described below:

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: restorepvc
  namespace: helmtest-vxflexos
spec:
  storageClassName: vxflexos
  dataSource:
    name: pvol0-snap1
    kind: VolumeSnapshot
    apiGroup: snapshot.storage.k8s.io
  accessModes:
    - ReadWriteOnce
  resources:
```

```
    requests:
      storage: 8Gi
```

NOTE: The *spec.dataSource* clause, specifies a source *VolumeSnapshot* named *pvol0-snap1* which matches the snapshot's name in *snap1.yaml*.

4

Troubleshooting

This chapter contains the following section:

Topics:

- Troubleshooting

Troubleshooting

The following table lists the CSI Driver for Dell EMC VxFlex OS installation troubleshooting scenarios when installing on Kubernetes:

Table 1. Troubleshooting

Symptoms	Prevention, resolution, or workaround
The installation fails with the following error message: `Node xxx does not have the SDC installed`	Install the VxFlex OS SDC on listed nodes. The SDC must be installed on all the nodes that needs to pull an image of the driver.

When you run the command `kubectl describe pods vxflexos-controller-0 –n vxflexos`, the system indicates that the driver image could not be loaded.	• If on Kubernetes, edit the *daemon.json* file found in the registry location and add
	`{ "insecure-registries" :`
	`[ "hostname.cloudapp.net:5000" ] }`
	• If on Openshift, run the command `oc edit image.config.openshift.io/cluster` and add registries to yaml file that is displayed when you run the command.
	.

The `kubectl logs -n vxflexos vxflexos-controller-0 driver` logs shows that the driver is not authenticated.	Check the username, password, and the gateway IP address for the VxFlex OS system.
The `kubectl logs vxflexos-controller-0 -n vxflexos driver` logs shows that the system ID is incorrect.	Use the `get_vxflexos_info.sh` to find the correct system ID. Add the system ID to *myvalues.yaml* script.