Simplifying Backup, Recovery, and Continuous Business Resilience in Kubernetes with Veeam Kasten

Implementation Guide for Data Protection in Kubernetes with Veeam Kasten and Lightbits

August 2025

Abstract

This white paper goes beyond simple installation, guiding you through the essential steps to connect Veeam Kasten with your existing Kubernetes and Lightbits infrastructure, ensuring seamless integration. We will illustrate how to execute backups and restores with confidence, ensuring that all components work together seamlessly. By following this approach, you can protect your critical application data, simplify disaster recovery, and maintain business continuity - all while leveraging the performance and efficiency of Lightbits software-defined storage. Get ready to transform your data protection strategy from a complex challenge into a streamlined, automated process.

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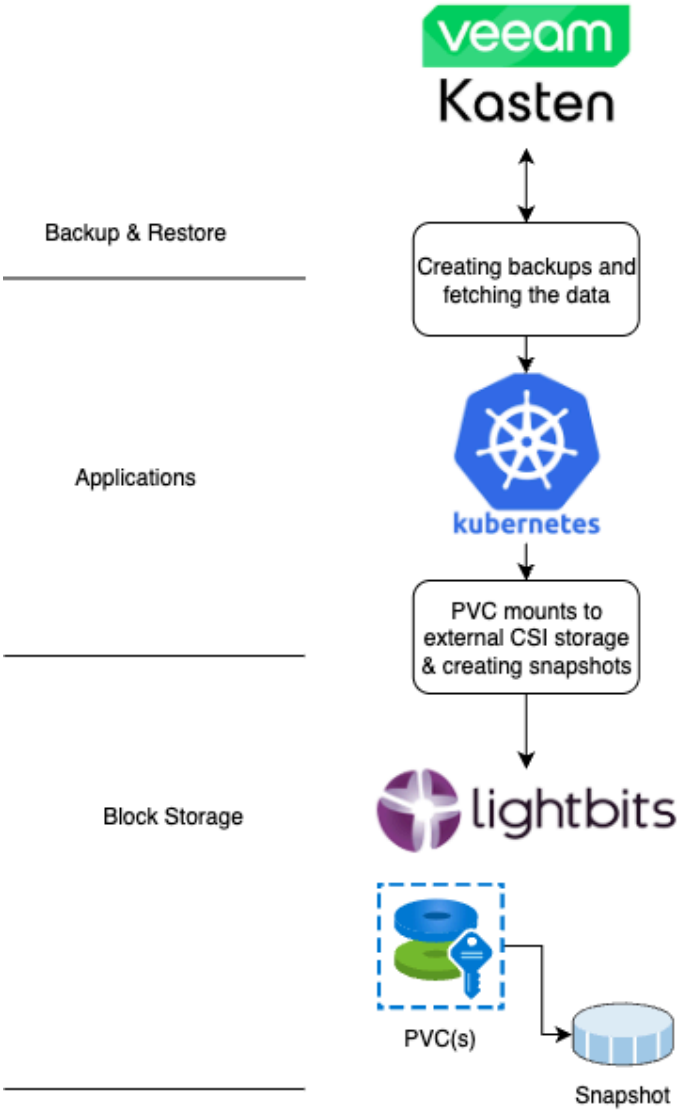
1. Introduction

In this white paper, we will illustrate how to achieve a fully integrated backup and restore solution for Kubernetes, utilizing its Physical Volume Claims (PVC) on top of Lightbits software-defined block storage.

We will use Veeam Kasten as the backup and restore engine. The paper focuses on the Veeam Kasten installation and its integration with Kubernetes and Lightbits software-defined storage.

The diagram below illustrates the architecture for this implementation:



2. Installing and Configuring Veeam Kasten

For the Veeam Kasten Kubernetes server, we will use Ubuntu 24.04.

Before we install helm and Veeam Kasten, it is essential to have a default CSI storage class. In this example, we have been using a local-path storage class.

```
Shell
kubectl apply -f
https://raw.githubusercontent.com/rancher/local-path-provisioner/master/deploy/
local-path-storage.yaml
```

To verify:

```
Shell
kubectl get sc

Output:
NAME                   PROVISIONER             RECLAIMPOLICY   VOLUMEBINDINGMODE
ALLOWVOLUMEEXPANSION   AGE
local-path (default)   rancher.io/local-path   Delete          WaitForFirstConsumer
false                  21h
```

To install Helm, download the correct version from https://github.com/helm/helm/releases. We have used helm-v3.18.6-linux-amd64.tar.gz. Unzip the helm-v3.18.6-linux-amd64.tar.gz file as follows:

```
Shell
tar -zxvf helm-v3.18.6-linux-amd64.tar.gz

Output:
linux-amd64/
linux-amd64/README.md
linux-amd64/helm
linux-amd64/LICENSE
```

Move the Helm binary to the /usr/local/bin directory:

```shell
sudo mv linux-amd64/helm /usr/local/bin/helm
```

Verify that Helm works:

```shell
helm help

Output:
The Kubernetes package manager

Common actions for Helm:

- helm search:    search for charts
- helm pull:      download a chart to your local directory to view
- helm install:   upload the chart to Kubernetes
- helm list:      list releases of charts

Environment variables:
etc...
```

Then add the Veeam Kasten repository:

```shell
helm repo add kasten https://charts.kasten.io/

Output:
"kasten" has been added to your repositories
```

Download the RPM-KASTEN for security:

```shell
wget https://repository.veeam.com/keys/RPM-KASTEN
```

Create a namespace in Kubernetes called kasten-io:

```
Shell
kubectl create namespace kasten-io

Output:
namespace/kasten-io created
```

Install Veeam Kasten with Helm into the Kasten namespace:

```
Shell
$ helm install k10 kasten/k10 --namespace=kasten-io --verify
--keyring=./RPM-KASTEN

Output:
NAME: k10
LAST DEPLOYED: Thu Aug 28 09:48:02 2025
NAMESPACE: kasten-io
STATUS: deployed
REVISION: 1
TEST SUITE: None
NOTES:
Thank you for installing Kasten's K10 Data Management Platform 8.0.7!

Documentation can be found at https://docs.kasten.io/.

How to access the K10 Dashboard:

To establish a connection to it use the following `kubectl` command:

`kubectl --namespace kasten-io port-forward service/gateway 8080:80`

The Kasten dashboard will be available at: `http://127.0.0.1:8080/k10/#/`
```

Verify that the Kasten implementation is working correctly:

```
Shell
kubectl get pods --namespace kasten-io --watch
```

```
Output:
NAME                                      READY   STATUS    RESTARTS   AGE
aggregatedapis-svc-646b5468c-rdc9n        1/1     Running   0          13m
auth-svc-64b9b847fb-nq4fr                 1/1     Running   0          13m
catalog-svc-85499778c5-hkzzb              2/2     Running   0          13m
controllermanager-svc-7f68c79cc6-rrbzm    1/1     Running   0          13m
crypto-svc-f6b654f88-rkjsq                0/4     Pending   0          13m
dashboardbff-svc-b59d55b44-5cjjn          0/2     Pending   0          13m
executor-svc-9cdfdc89-2h7kz               1/1     Running   0          13m
executor-svc-9cdfdc89-2rhdm               1/1     Running   0          13m
executor-svc-9cdfdc89-klfj5               1/1     Running   0          13m
frontend-svc-74d4c4c784-z42qr             1/1     Running   0          13m
gateway-67969974fd-8h4g8                  1/1     Running   0          13m
jobs-svc-799b8b97d4-c7kzd                 1/1     Running   0          13m
kanister-svc-77bb4bb868-xnlbv             1/1     Running   0          13m
logging-svc-884b44498-rrhrb               1/1     Running   0          13m
metering-svc-575dd4b954-mrhj8             1/1     Running   0          13m
prometheus-server-79944c88f4-mztq7        2/2     Running   0          13m
state-svc-7c7f545865-444h4                2/2     Running   0          13m
```

2.1 Configuration of `volumesnapshotclass`

Check the default `volumesnapshotclass` in Kubernetes:

Shell

```
kubectl get volumesnapshotclass

Output:
NAME                  DRIVER                  DELETIONPOLICY   AGE
example-snapshot-sc   csi.lightbitslabs.com   Delete           16h
```

There is no default `volumesnapshotclass` appointed in Kubernetes yet. Make the following changes:

Shell

```
kubectl edit volumesnapshotclass example-snapshot-sc
```

Add the following annotation underneath the name, as shown below:

```shell
metadata:
  name: example-snapshot-sc
  annotations:
    snapshot.storage.kubernetes.io/is-default-class: "true"
    k10.kasten.io/is-default-class: "true"
    k10.kasten.io/is-snapshot-class: "true"
```

Verify that `volumesnapshotclass` is the default:

```shell
kubectl describe volumesnapshotclass example-snapshot-sc

Output:
Name:             example-snapshot-sc
Namespace:
Labels:           <none>
Annotations:      k10.kasten.io/is-default-class: true
                  k10.kasten.io/is-snapshot-class: true
                  snapshot.storage.kubernetes.io/is-default-class: true
API Version:      snapshot.storage.k8s.io/v1
Deletion Policy:  Delete
Driver:           csi.lightbitslabs.com
Kind:             VolumeSnapshotClass
Metadata:
  Creation Timestamp:  2025-08-28T07:56:33Z
  Generation:          1
  Resource Version:    5904
  UID:                 413ba814-911d-4fb6-80f6-eefdbb46b595
Parameters:
  csi.storage.k8s.io/snapshotter-list-secret-name:           example-secret
  csi.storage.k8s.io/snapshotter-list-secret-namespace:      default
  csi.storage.k8s.io/snapshotter-secret-name:                example-secret
  csi.storage.k8s.io/snapshotter-secret-namespace:           default
  snapshot.storage.kubernetes.io/deletion-secret-name:       example-secret
  snapshot.storage.kubernetes.io/deletion-secret-namespace:  default
Events:                                                      <none>
```

2.2 Veeam Kasten Dashboard on its Own Internal IP Address

By default, the Kasten dashboard is only visible internally, accessible via the IP address 127.0.0.1.

Verify that the dashboard is functional:

```
Shell
kubectl --namespace kasten-io port-forward service/gateway 8080:80

Output:
Forwarding from 127.0.0.1:8080 -> 8000
Forwarding from [::1]:8080 -> 8000
```

To access the dashboard with the IP address of the server - in this case 192.168.1.56 - do the following:

```
Shell
kubectl edit service gateway -n kasten-io
```

Change the annotation type from `clusterIP` to `NodePort` (the third line from the bottom):

```
Shell
  sessionAffinity: None
  type: NodePort
status:
  loadBalancer: {}
```

Check the port on which the service is running now:

```
Shell
kubectl get svc gateway -n kasten-io

Output:
NAME      TYPE       CLUSTER-IP     EXTERNAL-IP   PORT(S)        AGE
```

```
gateway   NodePort   10.43.82.119   <none>        80:32604/TCP   32m
```

Restart `port-forward` as follows:

```
Shell
kubectl port-forward --address 0.0.0.0 service/gateway 8080:80 -n kasten-io

Output:
Forwarding from 0.0.0.0:8080 -> 8000
```

The Kasten dashboard is now open on 192.168.1.56:32604/k10/#/.

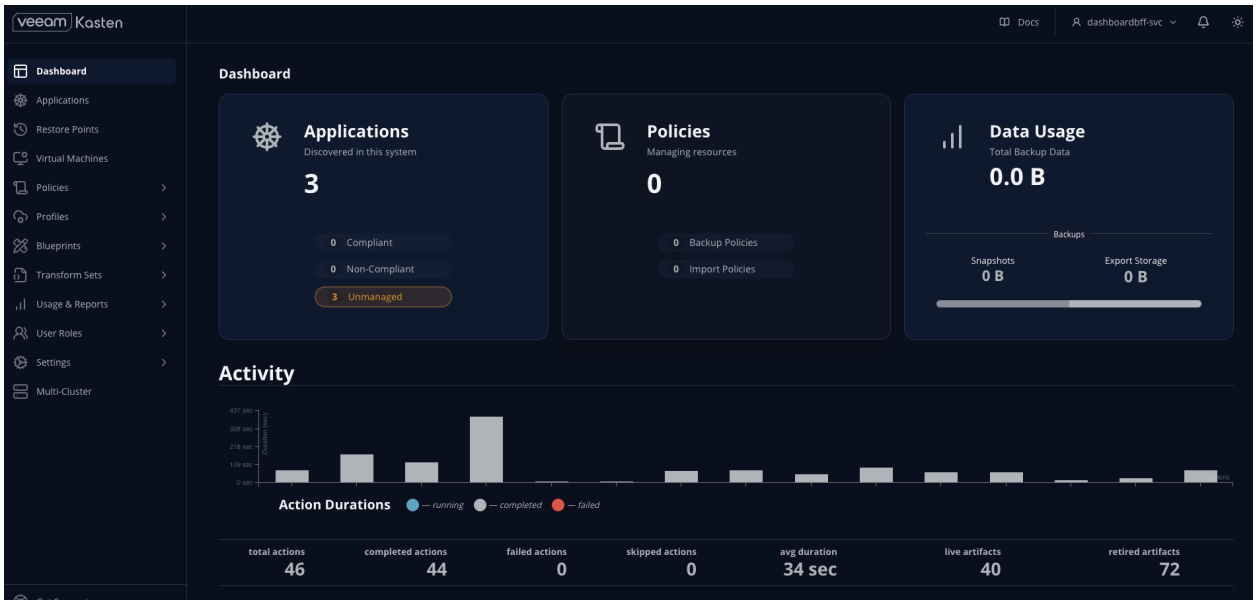
Note: The port may differ in your specific situation.

3. Backup and Restore

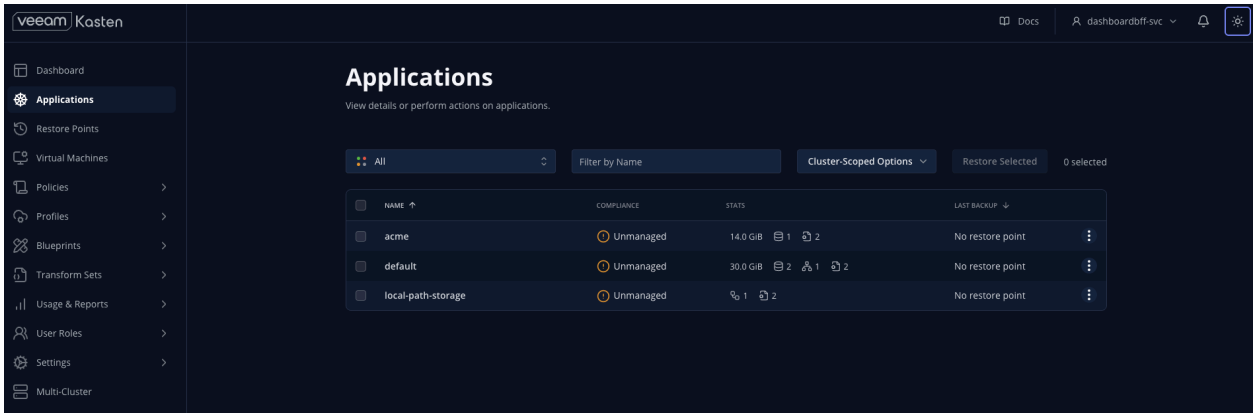
Veeam Kasten utilizes the browser to perform backup and restore activities. In our example, the address is: http://192.168.1.56:31376/k10/#/dashboard. Below, we will detail four examples: two for backup and two for restore.

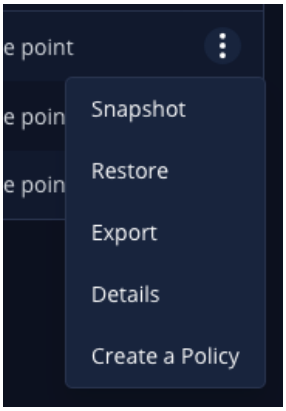
3.1 Backup volumeMode FileSystem

When the browser uses the http://192.168.1.56:31376/k10/#/dashboard URL, the following screen displays:



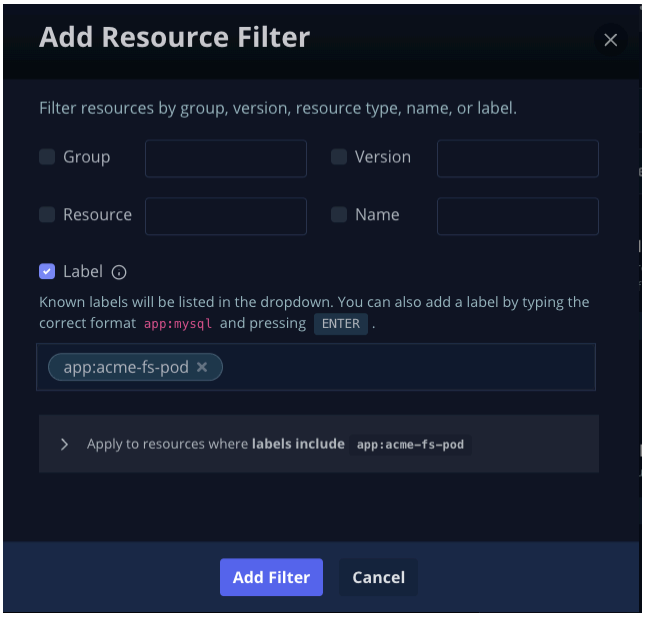
To create our first backup, select applications in the left menu bar. The following screen displays:



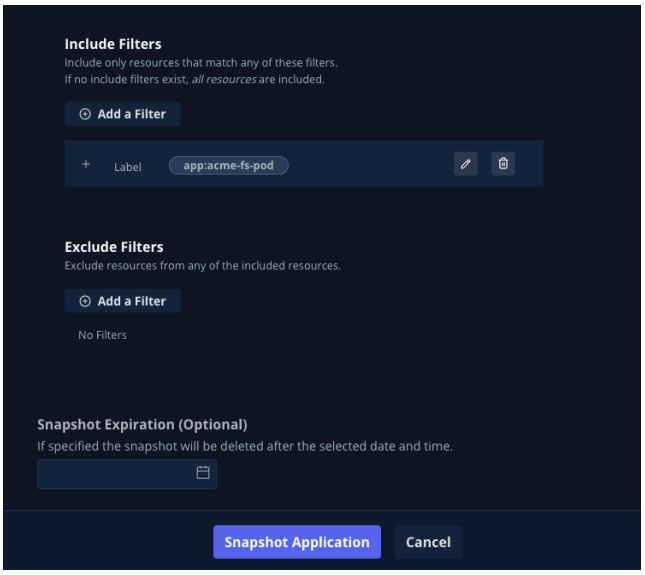


We will use the **Acme** application. From the top right, from the three-dots menu, select **Snapshot**.

Click **> Snapshot all resources** and **> Filter Resources**. Then click **Add the filter** and in the filter, enter the app name you want to back up. In our example, it is `app:acme-fs-pod`. Notice the screen that appears on the right side.

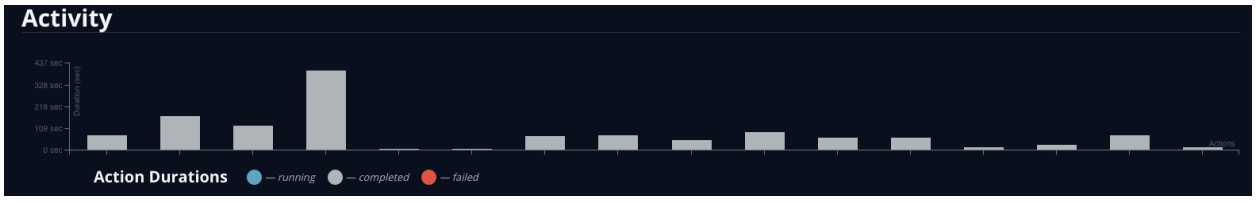


Click **Add Filter**.

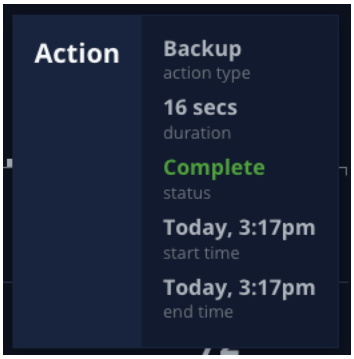


Click **Snapshot Application**.

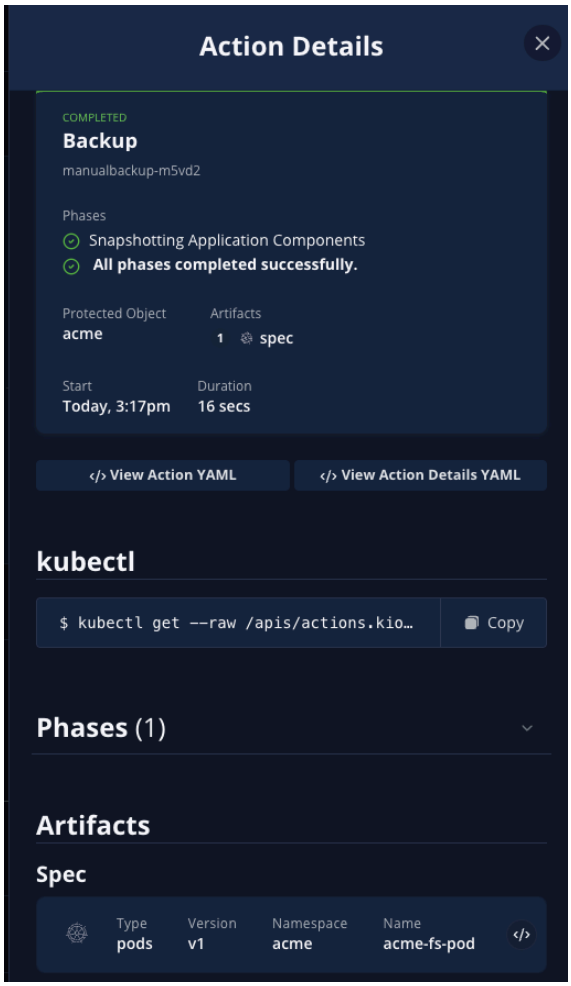
Go to the **Dashboard** (left menu item), and on the action scroll bar, click the latest backup action in the bar:



From the pop-up menu, click **Complete** to find all the details of the backup operation.



The details of the backup operation are displayed in the following screen:

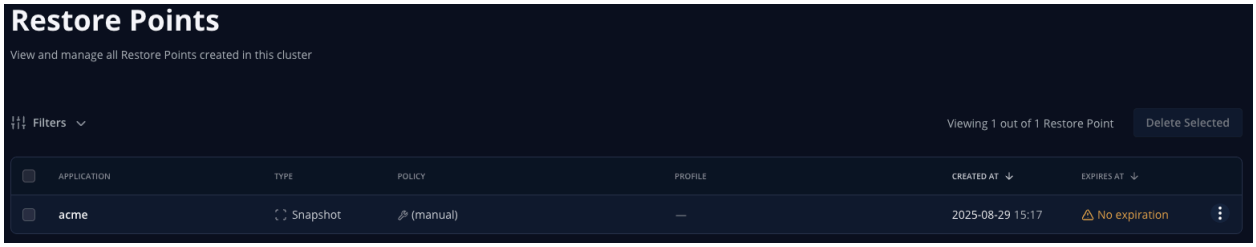


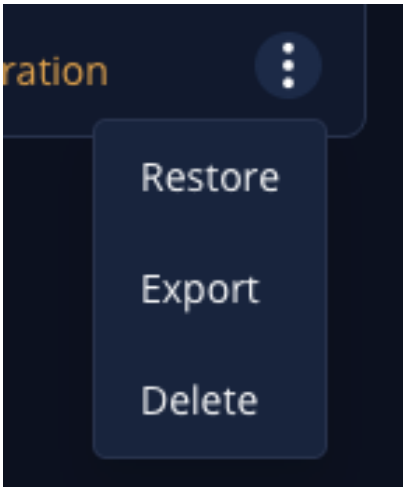
3.2 Restore volumeMode FileSystem

To make sure the restore operation works, first delete the pod. In our example, `acme-fs-pod in namespace acme`.

```
Shell
kubectl delete pod acme-fs-pod -n acme
```

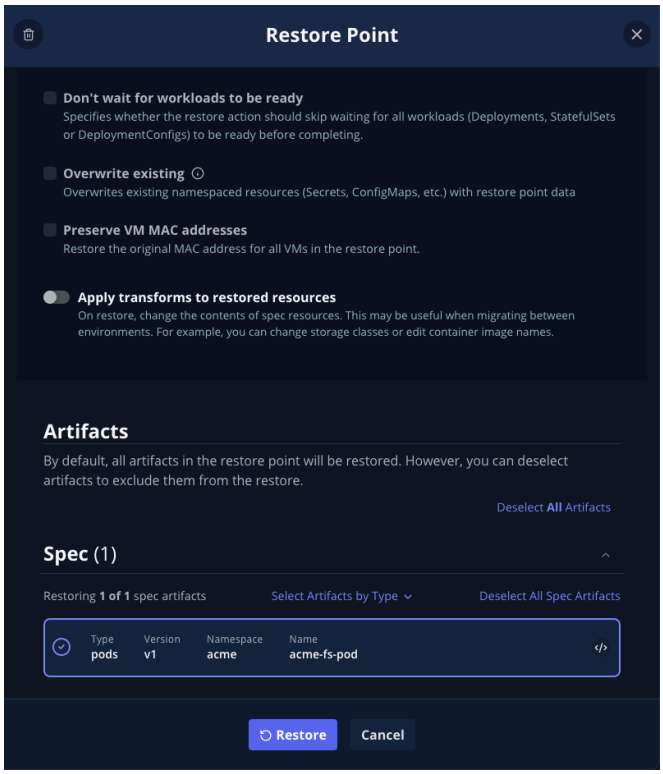
In the Veeam Kasten dashboard, click the left menu bar and select the **Restore Points** item. The following screen will appear:



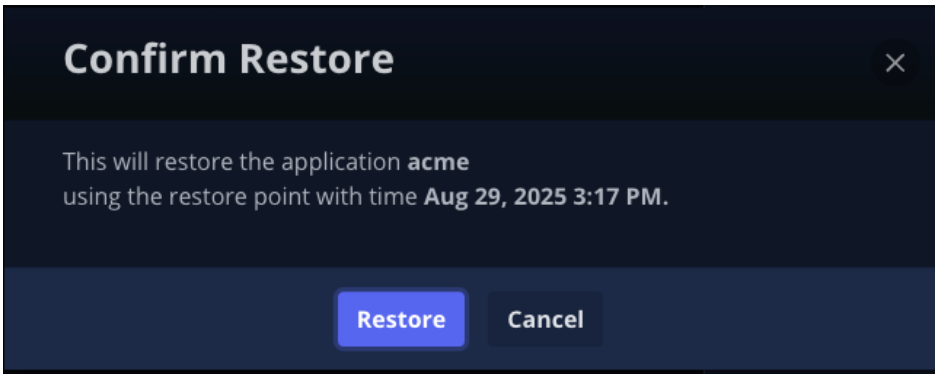


To restore the acme application, go to the right of the three buttons and click the **Restore** option.

The following screen displays:

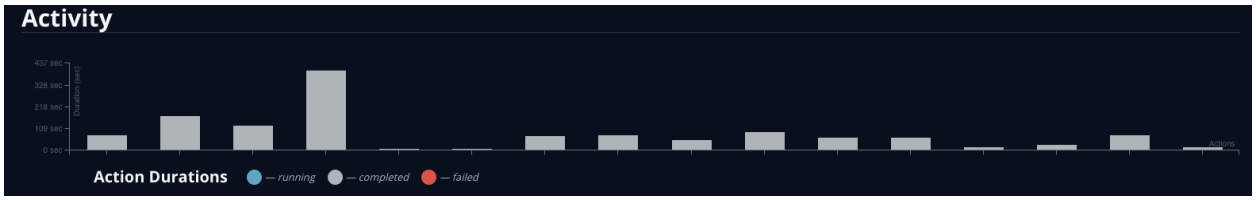


Click **Restore**, and the following pop-up displays:

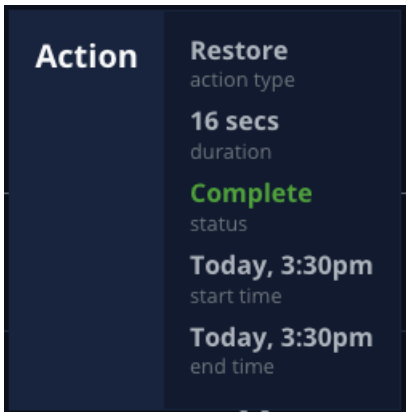


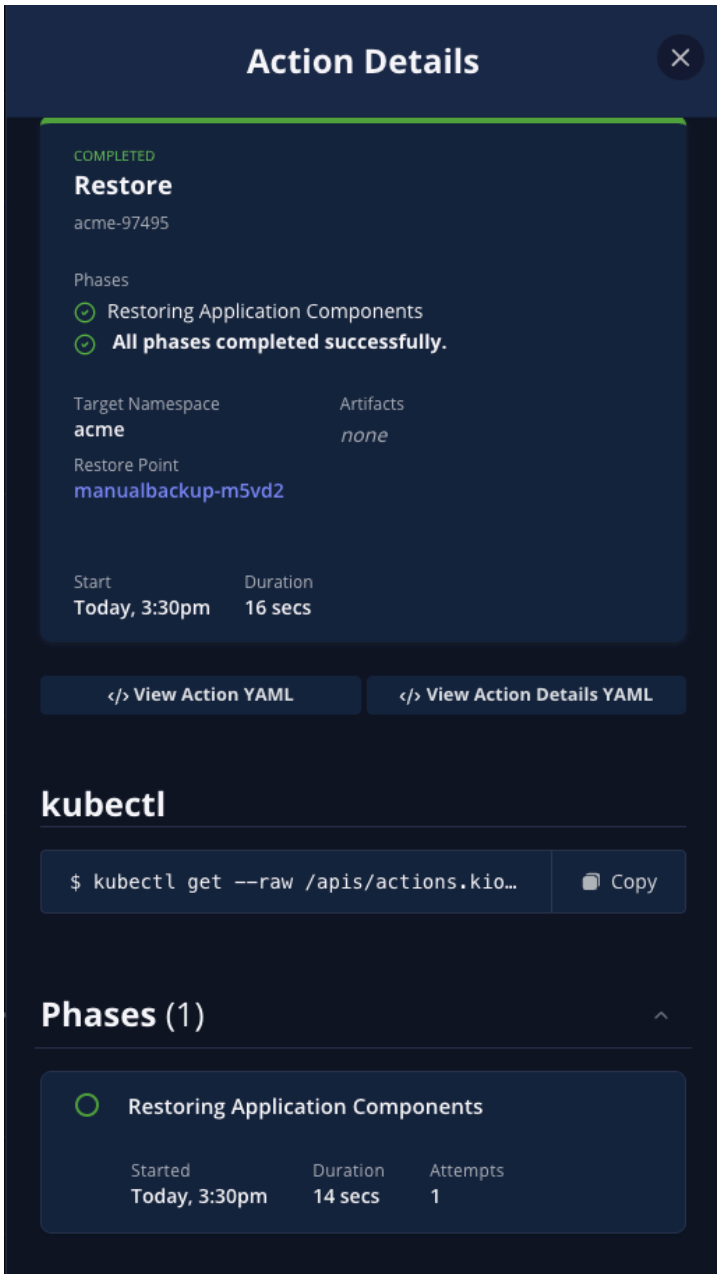
Click **Restore**, and the pod acme-fs-pod will be restored on the PVC.

Go to the **Dashboard** (left menu item), and on the action scroll bar, click on the latest restore action in the bar.



In the pop-up menu, click **Complete** to find all the details of the restore operation.



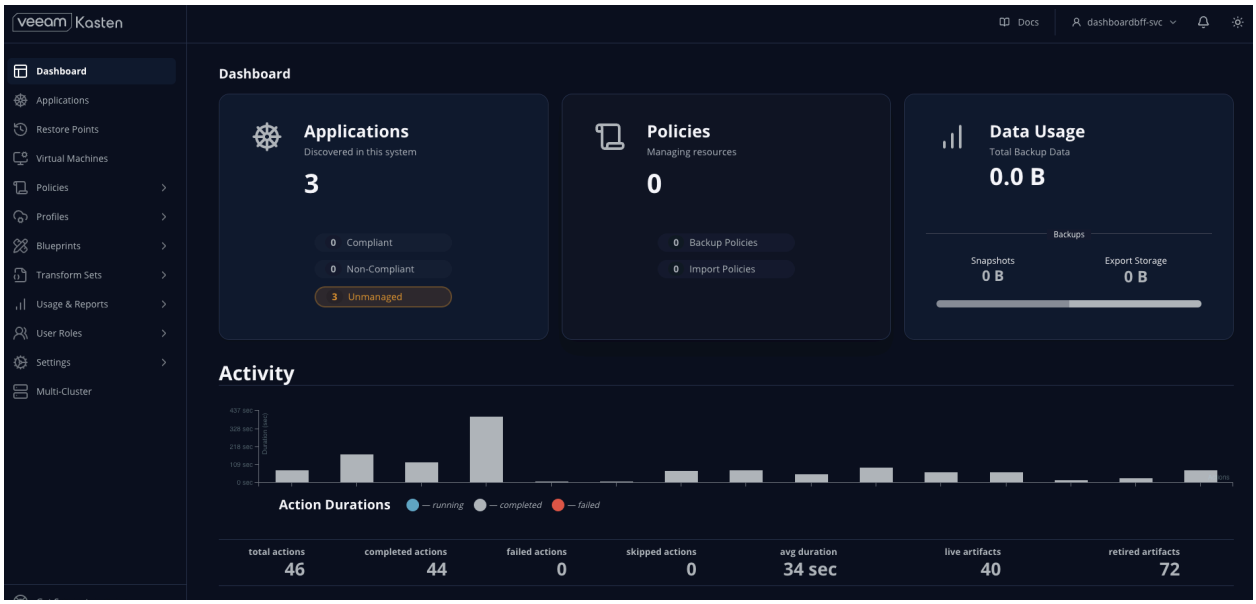


Verify the status of the pod in Kubernetes:

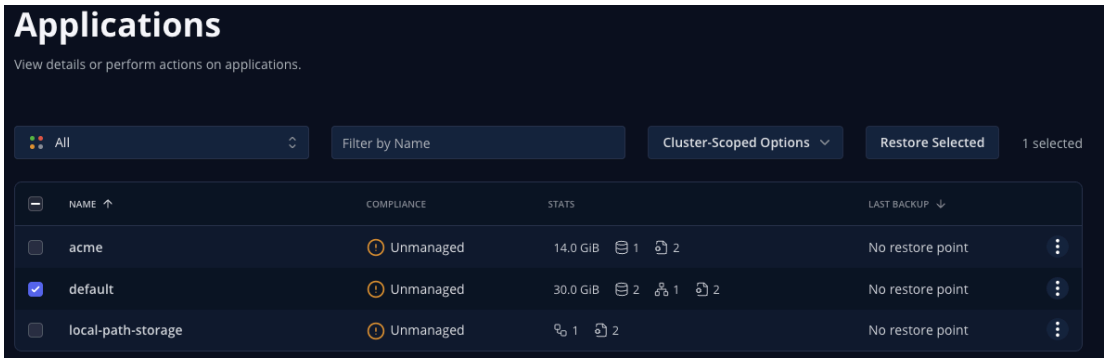
```
Shell
kubectl get pod acme-fs-pod -n acme

Output:
NAME          READY   STATUS    RESTARTS   AGE
acme-fs-pod   1/1     Running   0          60s
```

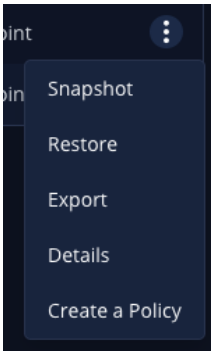
3.3 Backup volumeMode Block

When the browser uses the http://192.168.1.56:31376/k10/#/dashboard URL, the following screen displays:



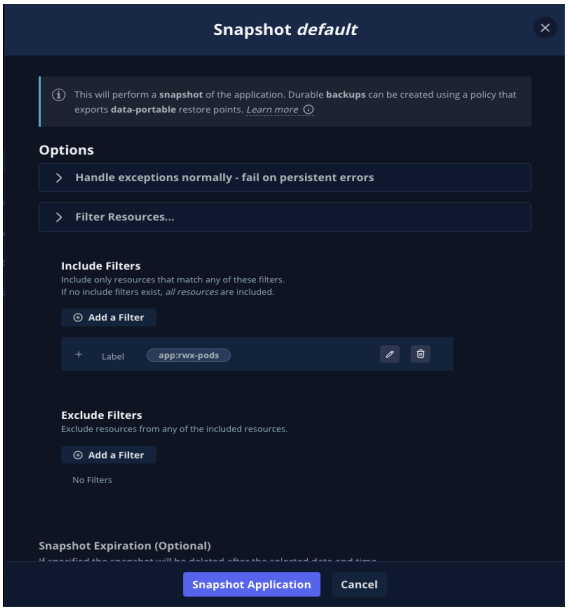
To create our first backup, select **Applications** from the left menu bar. The following screen displays:



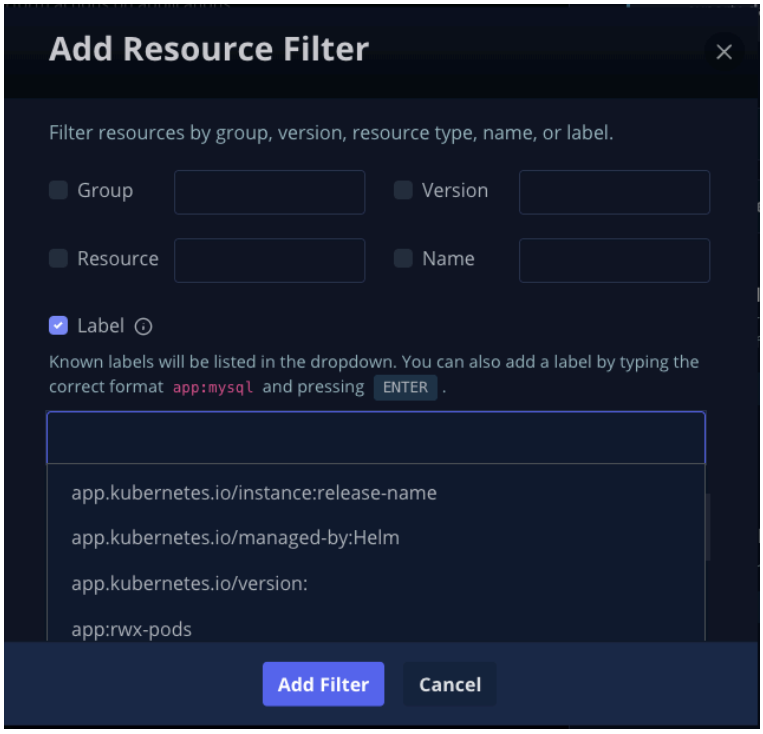


We will use the default application. From the top right, from the three-dots menu, select **Snapshot**:

Click **> Snapshot all resources** and **> Filter Resources**. Then click **Add the filter** and in the filter, enter the app name you want to back up. In our example, it is `app:rwx-pods`. Notice the screen that appears on the right side.



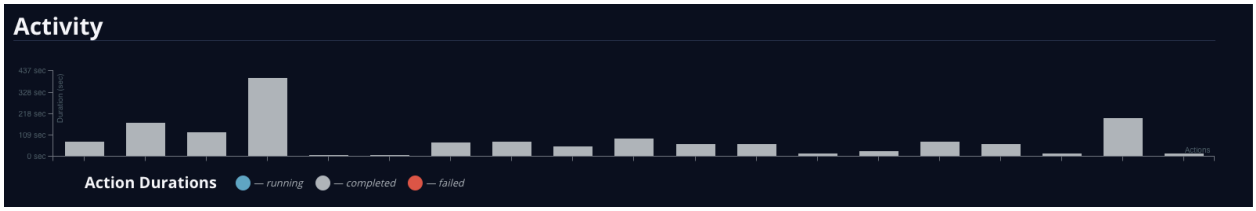
Click **Add Filter** and select the **app:rwx-pods**.



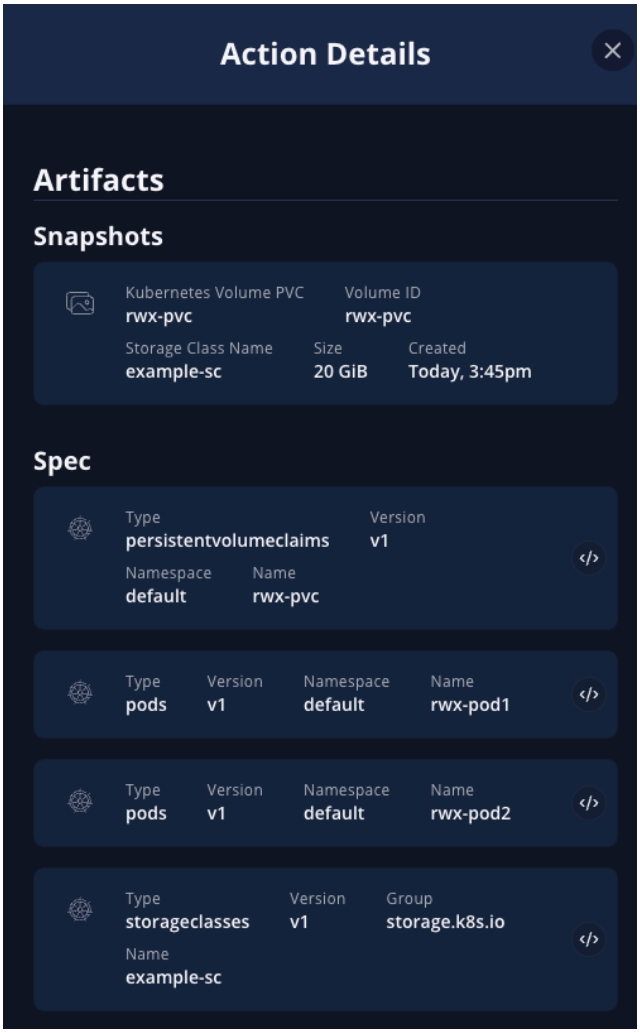
Click **Snapshot Application**. The backup will now be created.

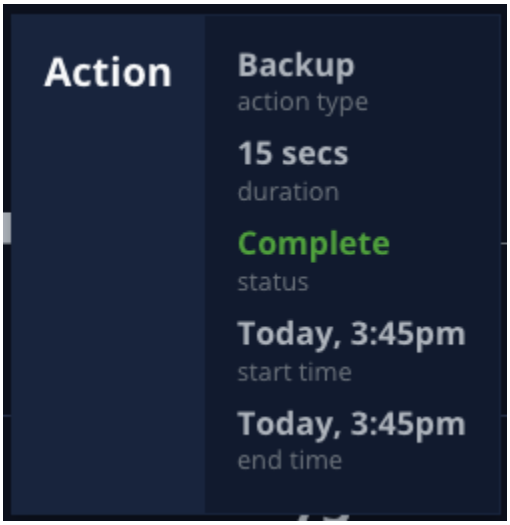
Veeam Kasten will issue a snapshot to be created on Lightbits. The snapshot will be used to copy the pods for Veeam Kasten to back up. The snapshot will be used to restore the pods and the PVC at a later stage.

Go to the **Dashboard** (located in the left menu), and examine the activity bar.



When you hover over the latest backup activity, the pop-up menu on the right will appear. Click **Complete** to view the backup details.





The action details on the left screen provide information about the pods, PVC, and storage class used to create the snapshot. All are part of the backup.

3.4 Restore volumeMode Block

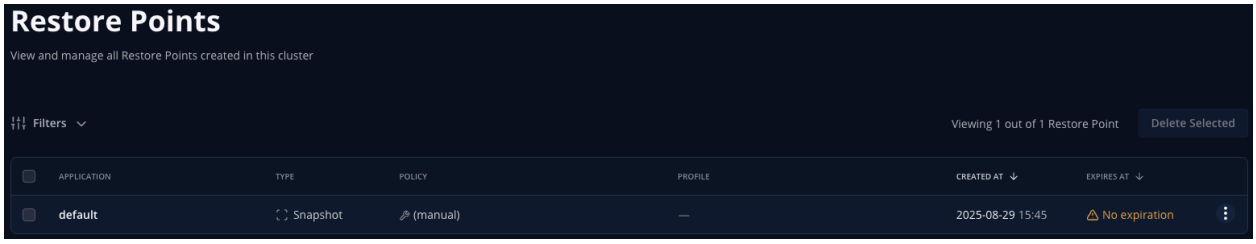
To ensure that the restore operation works, we delete the pods and the PVC in our example, specifically the pods `rwx-pod1` and `rwx-pod2`, and the PVC `rwx-pvc` - all within the default namespace.

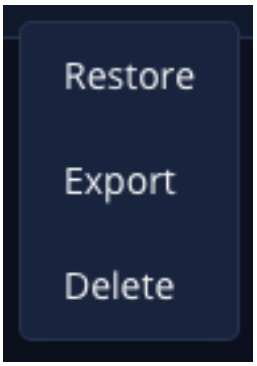
Before we delete the pods, let's first have an overview of how long the runtime is for the pods before we delete them:

```
Shell
kubectl get pods

Output:
NAME       READY   STATUS    RESTARTS   AGE
rwx-pod1   1/1     Running   0          85m
rwx-pod2   1/1     Running   0          85m
```

```
Shell
kubectl delete pod rwx-pod1
kubectl delete pod rwx-pod2
kubeclt delete pvc rwx-pvc
```

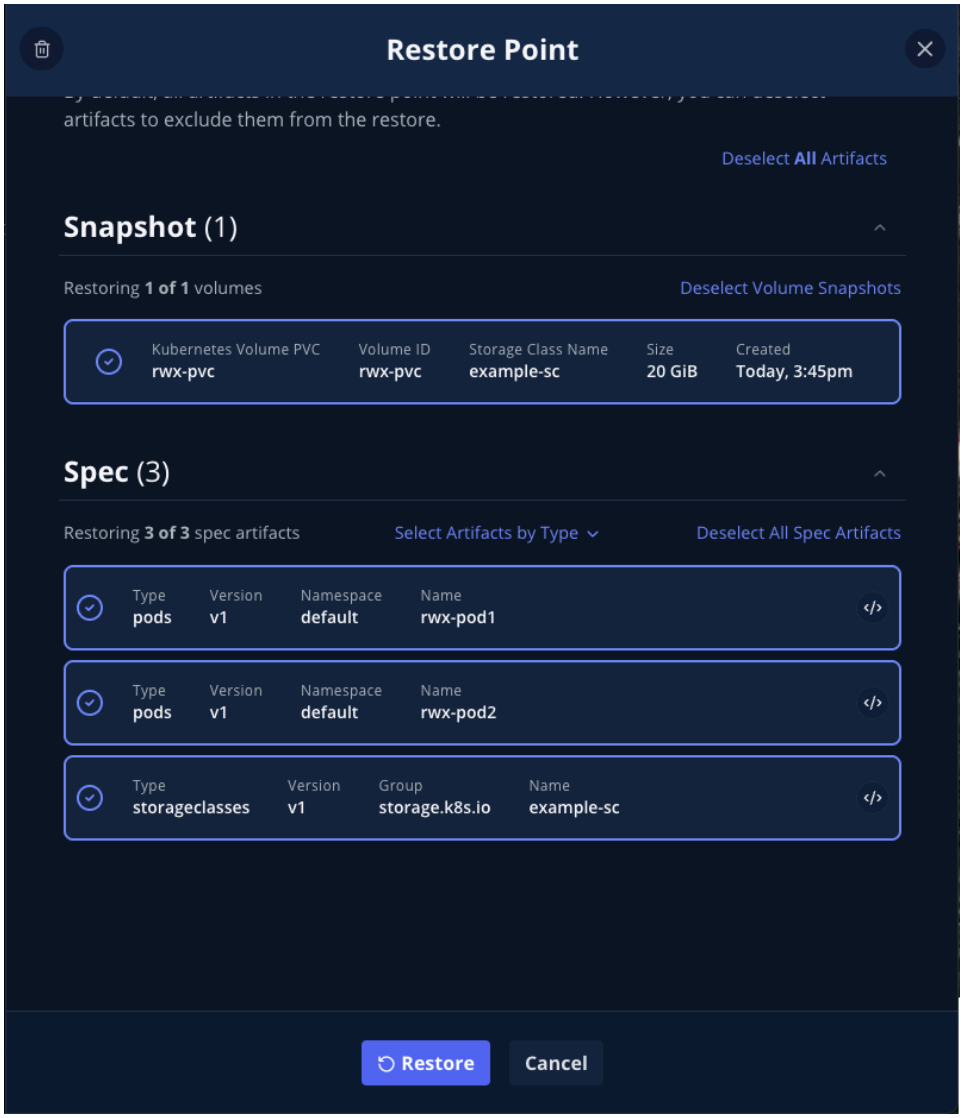
In the Veeam Kasten dashboard, click on the left menu bar and select **Restore Points**. The following screen displays:





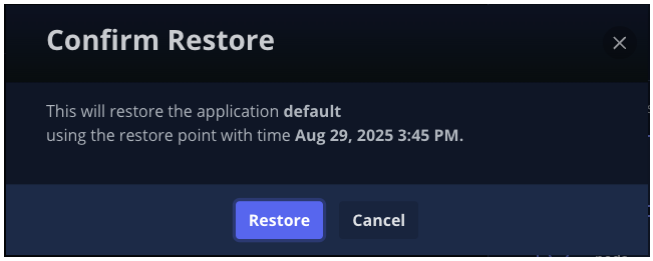
Click the three-dots menu option on the right and click **Restore** in the pop-up menu.

The following screen displays:

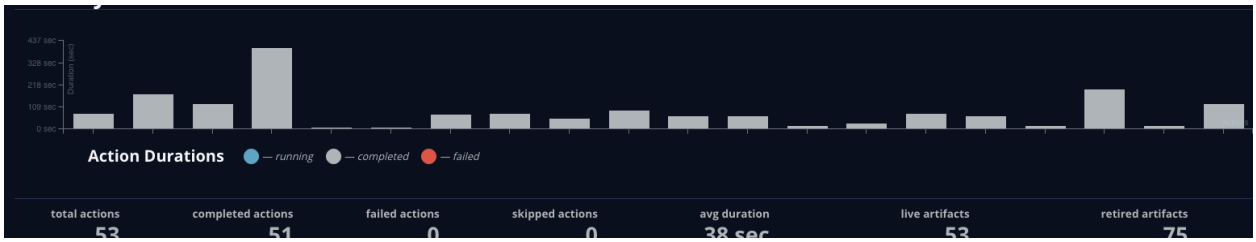


The screen above shows the pods and the PVC, which will be recreated. To create the `rwx-pvc`, the storage class `example-sc` will be used.

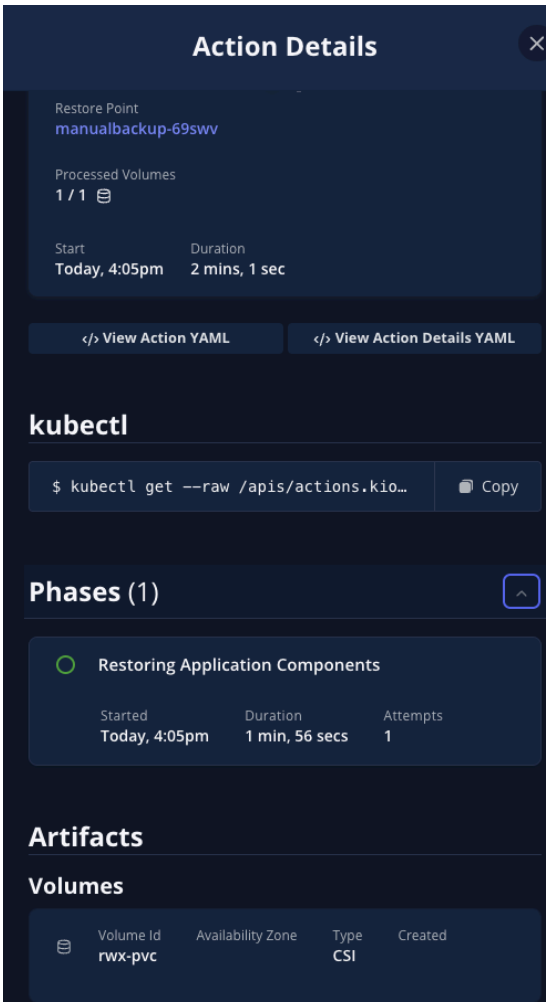
Click **Restore**. The pods and the PVC will be restored. The PVC will be created, and the pods will be restored from the associated snapshot in Lightbits.

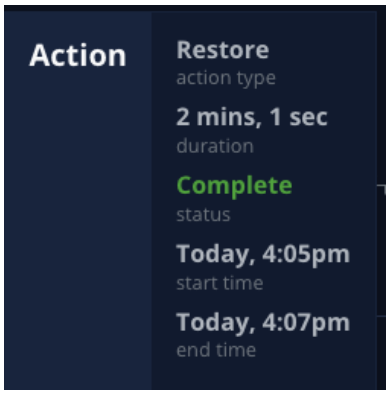


Go to the **Dashboard** (located in the left menu bar), and examine the activity bar.



Hover over the last action item, and the following pop-up screen (the screen on the right) displays:





The screen on the left shows that the restore was successful and that the `Volume-id` with the name `rwx-pvc` was successfully created with CSI.

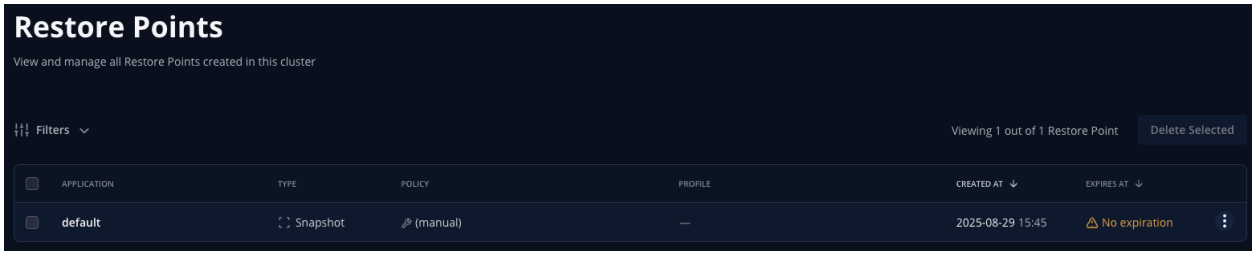
Check the runtime of the now-restored pods on the newly-created PVC:

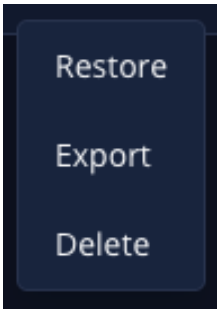
```
Shell
kubectl get pod

Output:
NAME       READY   STATUS    RESTARTS   AGE
rwx-pod1   1/1     Running   0          19s
rwx-pod2   1/1     Running   0          19s
```

3.5 Snapshot Liaison with the Backup and the Snapshot in Lightbits

When a backup is actioned, Lightbits receives the command to create a snapshot. Veeam Kasten is directly associated with that snapshot. Even when the volume is deleted in Lightbits, the snapshot remains. The integration with CSI even goes this deep, so that when this backup is deleted from Veeam Kasten, the snapshot will also be automatically deleted in Lightbits. This prevents orphaned snapshots in the Lightbits cluster.

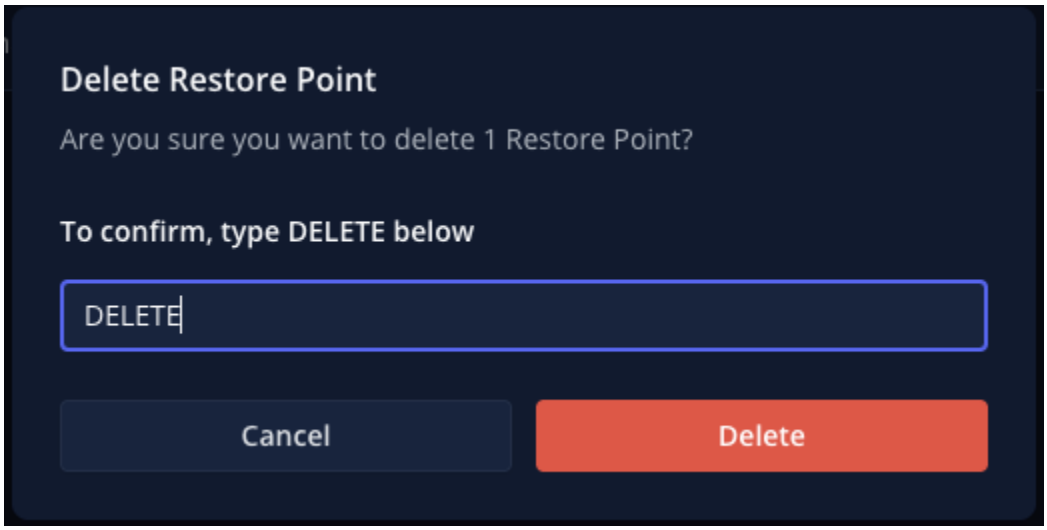
To delete the backup in Veeam Kasten, navigate to the dashboard and select **Restore Points** from the left menu. The following screen appears:





From the three buttons on the right, click one of them, and in the pop-up menu, click **Delete**.

The following screen appears:



Type the word **DELETE** in the field and click **Delete**. The restore point will be deleted, and the snapshot in Lightbits will be deleted as well.

4. Conclusion

This comprehensive guide has demonstrated how the powerful combination of **Veeam Kasten** and **Lightbits** transforms Kubernetes data protection from a complex, labor-intensive chore into a seamless, automated process.

By integrating these leading technologies, organizations can establish a robust backup and restore solution that not only safeguards critical application data but also simplifies disaster recovery and ensures business continuity.

Veeam Kasten and Lightbits Synergy

The proven, step-by-step approach illustrated in this paper highlights the synergy between **Veeam Kasten's** intelligent backup capabilities and **Lightbits'** high-performance, efficient data platform. The result is an integrated solution that leverages external CSI snapshots for lightning-fast block-level backups and restores, as well as efficient file-system backups.

Whether you are recovering an entire namespace or a single pod, the process is streamlined and reliable. The ease of configuration and the demonstrated performance gains of this architecture empower IT teams to focus less on data loss and more on innovation.

By embracing this strategic data protection framework, organizations can confidently scale their Kubernetes environments, knowing that their data is secure, accessible, and prepared for any challenges that lie ahead. The integration of **Veeam Kasten** and **Lightbits** offers a sophisticated yet easy-to-manage solution that ensures data integrity and business resilience in the dynamic world of cloud-native applications. This framework represents a significant step forward in simplifying and enhancing the crucial task of data protection for modern enterprises.

About Lightbits Labs

Lightbits Labs® (Lightbits) invented the NVMe over TCP protocol and offers best-in-class software-defined block storage that enables data center infrastructure modernization for organizations building a private or public cloud. Built from the ground up for low consistent latency, scalability, resiliency, and cost-efficiency, Lightbits software delivers the best price/performance for real-time analytics, transactional, and AI/ML workloads. Lightbits Labs is backed by enterprise technology leaders [Cisco Investments, Dell Technologies Capital, Intel Capital, Lenovo, and Micron] and is on a mission to deliver the fastest and most cost-efficient data storage for performance-sensitive workloads at scale.

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