AWS Immersion Day – Data Management

Portworx | AWS

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Lab Overview

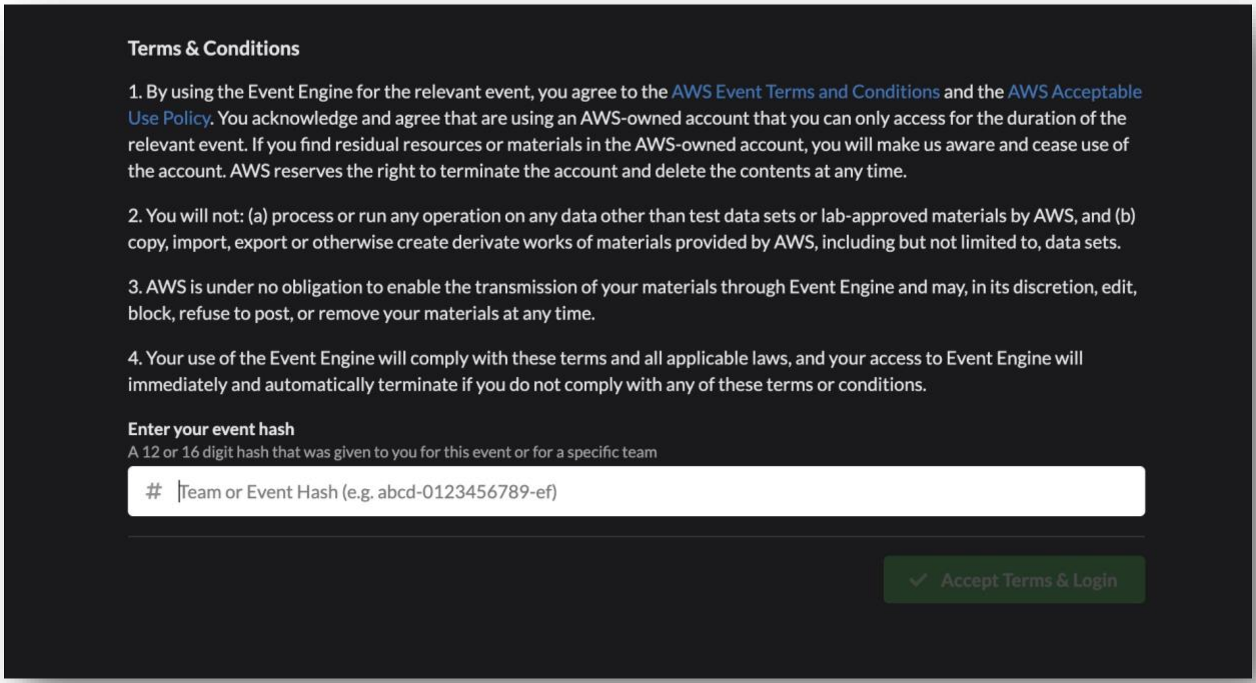
This lab guide is built for the Kubernetes Data Management Day ran by Portworx and AWS, to help users get hands-on experience with Portworx Enterprise - the #1 Kubernetes Data Platform solution in the ecosystem. As part of this lab, users will use an AWS Event Engine AWS account to deploy an Amazon EKS cluster, deploy highly available containerized applications on the Amazon EKS cluster and also use a free 30 day trial for Portworx Enterprise. The applications used in this lab are stateful applications based on PostgreSQL, Jenkins, etc. As part of the lab, we will simulate failure events like Availability Zone failures, Accidental database deletion, and see how Portworx Enterprise protects you from these scenarios. We will also look at how users can deploy block-based (ReadWriteOnce) and file-based (ReadWriteMany) applications using a unified Kubernetes storage layer from Portworx and leverage Portworx Autopilot to perform automated storage capacity management for their stateful applications.

Lab Setup

Accessing AWS Account

1. Navigate to the event engine platform using the link (https://dashboard.eventengine.run/login) and enter your 12- or 16-digit event hash.

Note: Use an incognito window to ensure that you aren't using your existing AWS account for this lab.



Terms & Conditions

1. By using the Event Engine for the relevant event, you agree to the AWS Event Terms and Conditions and the AWS Acceptable Use Policy. You acknowledge and agree that are using an AWS-owned account that you can only access for the duration of the relevant event. If you find residual resources or materials in the AWS-owned account, you will make us aware and cease use of the account. AWS reserves the right to terminate the account and delete the contents at any time.

2. You will not: (a) process or run any operation on any data other than test data sets or lab-approved materials by AWS, and (b) copy, import, export or otherwise create derivate works of materials provided by AWS, including but not limited to, data sets.

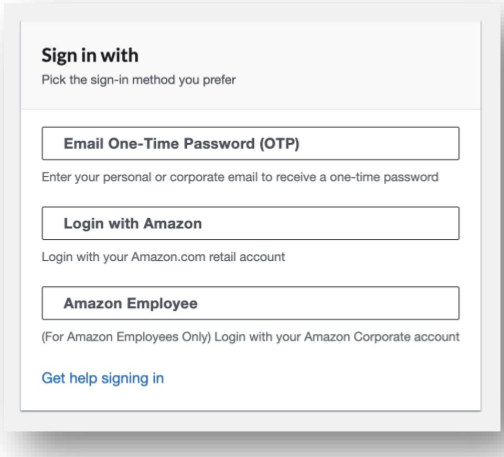
3. AWS is under no obligation to enable the transmission of your materials through Event Engine and may, in its discretion, edit, block, refuse to post, or remove your materials at any time.

4. Your use of the Event Engine will comply with these terms and all applicable laws, and your access to Event Engine will immediately and automatically terminate if you do not comply with any of these terms or conditions.

Enter your event hash

A 12 or 16 digit hash that was given to you for this event or for a specific team

2. After entering your event hash, click *"Accept Terms & Login"*.
3. Next, click on *"Email One-Time Password (OTP)"* and enter your email address and hit *"Send Passcode"* to receive the OTP.



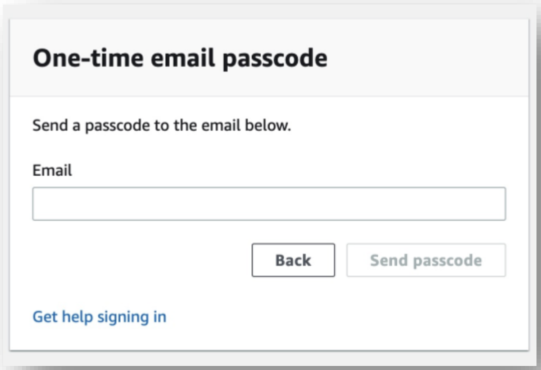
Sign in with
Pick the sign-in method you prefer

Email One-Time Password (OTP)
Enter your personal or corporate email to receive a one-time password

Login with Amazon
Login with your Amazon.com retail account

Amazon Employee
(For Amazon Employees Only) Login with your Amazon Corporate account

Get help signing in



One-time email passcode

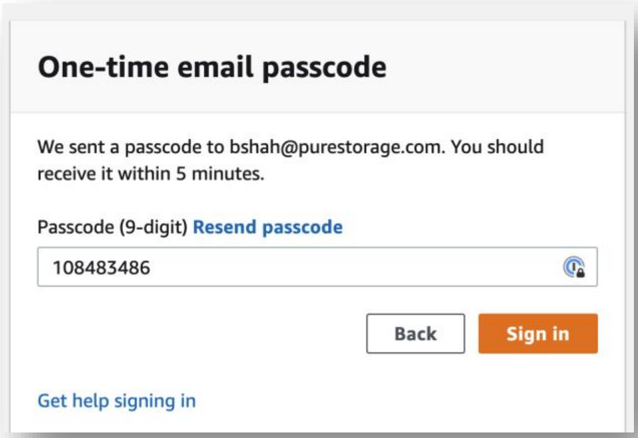
Send a passcode to the email below.

Email

Back | Send passcode

Get help signing in

4. Check your email for the OTP. Copy the passcode and enter it in the Event Engine platform and hit *"Sign In"*.



One-time email passcode

We sent a passcode to bshah@purestorage.com. You should receive it within 5 minutes.

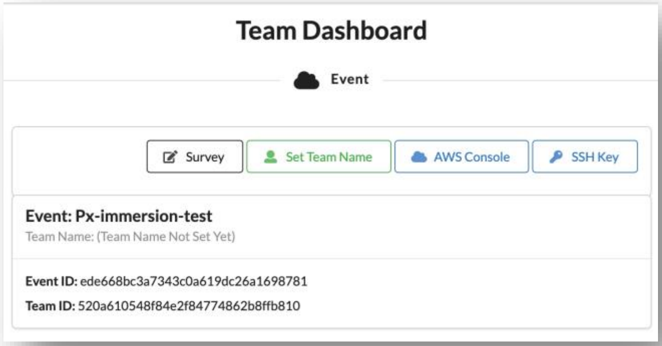
Passcode (9-digit) Resend passcode

108483486

Back | Sign in

Get help signing in

5. Next, from the event engine dashboard, click on *"AWS Console"*.



Team Dashboard

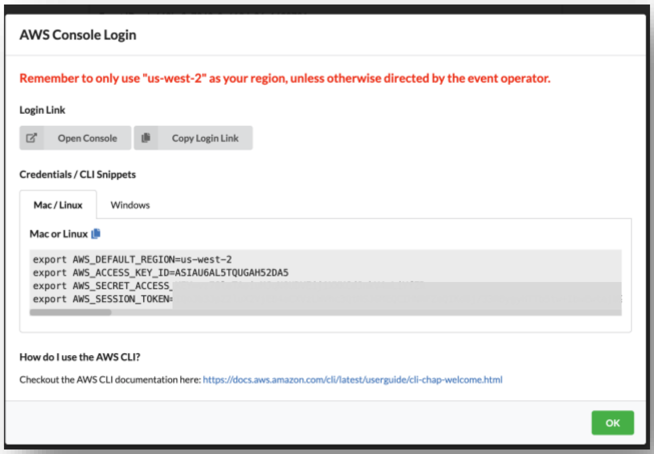
Event

Survey | Set Team Name | AWS Console | SSH Key

Event: Px-immersion-test
Team Name: (Team Name Not Set Yet)

Event ID: ede668bc3a7343c0a619dc26a1698781
Team ID: 520a610548f84e2f84774862b8ffb810

6. Next, click on Open Console to access the AWS Management console.



AWS Console Login

Remember to only use "us-west-2" as your region, unless otherwise directed by the event operator.

Login Link

Open Console | Copy Login Link

Credentials / CLI Snippets

Mac / Linux | Windows

Mac or Linux

```
export AWS_DEFAULT_REGION=us-west-2
export AWS_ACCESS_KEY_ID=ASIAU6ALSTQUGAH52DA5
export AWS_SECRET_ACCESS_[redacted]
export AWS_SESSION_TOKEN=[redacted]
```

How do I use the AWS CLI?

Checkout the AWS CLI documentation here: https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-welcome.html

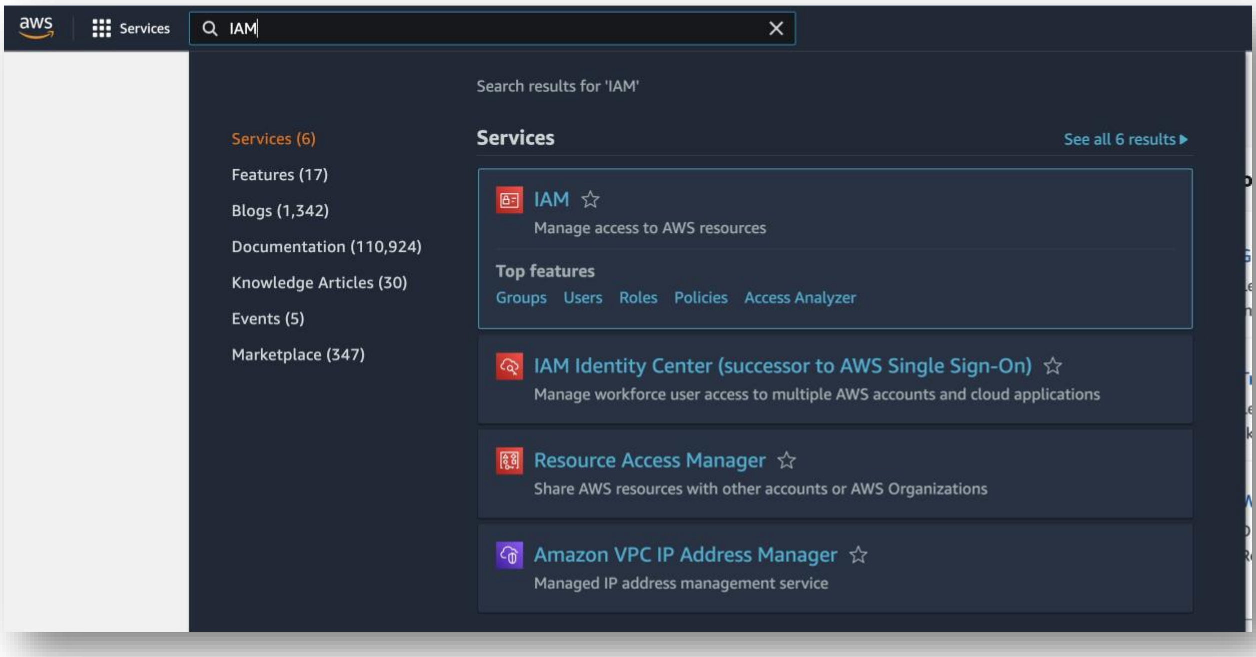
OK

At this point, you have an AWS account that can be used for this Immersion Day workshop.

Create AWS IAM Policy for Portworx

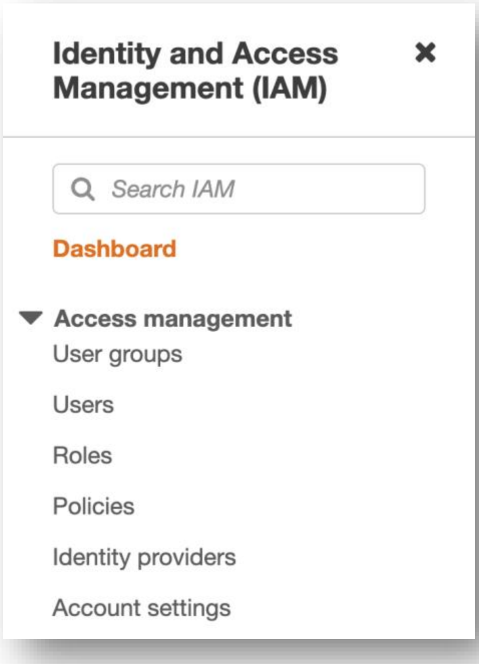
Once you have access to your AWS account using the Event Engine platform, we will go ahead and create an IAM policy that will be used by Portworx to deploy Amazon EBS volumes and mount them on the Amazon EKS worker nodes.

1. From the AWS Console, navigate to Services and search for IAM.



aws
Services
IAM
Search results for 'IAM'
Services (6)
Features (17)
Blogs (1,342)
Documentation (110,924)
Knowledge Articles (30)
Events (5)
Marketplace (347)
Services
See all 6 results
IAM
Manage access to AWS resources
Top features
Groups Users Roles Policies Access Analyzer
IAM Identity Center (successor to AWS Single Sign-On)
Manage workforce user access to multiple AWS accounts and cloud applications
Resource Access Manager
Share AWS resources with other accounts or AWS Organizations
Amazon VPC IP Address Manager
Managed IP address management service

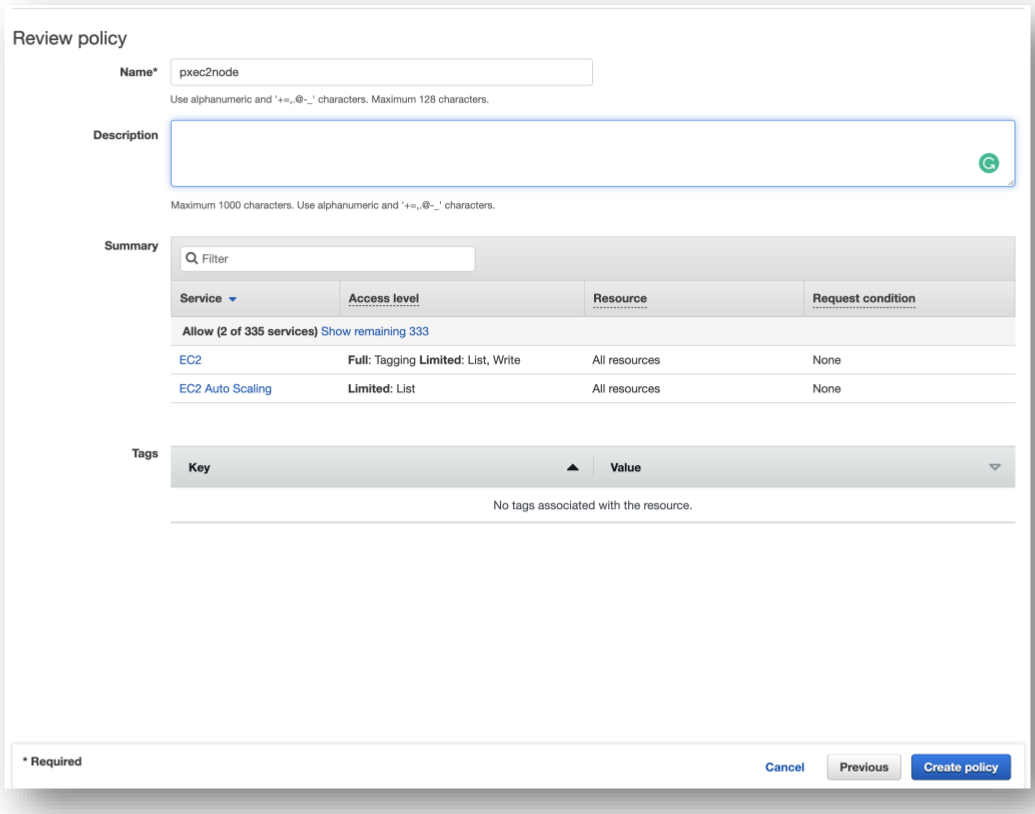
2. Click on "Policies" in the left Access Management pane.



3. Click **“Create Policy”** on the right and select the JSON tab. Replace the text in the text editor with the following policy and click **Next: Tags**.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "pxec2node",
            "Effect": "Allow",
            "Action": [
                "ec2:AttachVolume",
                "ec2:ModifyVolume",
                "ec2:DetachVolume",
                "ec2:CreateTags",
                "ec2:CreateVolume",
                "ec2:DeleteTags",
                "ec2:DeleteVolume",
                "ec2:DescribeTags",
                "ec2:DescribeVolumeAttribute",
                "ec2:DescribeVolumesModifications",
                "ec2:DescribeVolumeStatus",
                "ec2:DescribeVolumes",
                "ec2:DescribeInstances",
                "autoscaling:DescribeAutoScalingGroups"
            ],
            "Resource": [
                "*"
            ]
        }
    ]
}
```

4. Click **Next: Review** and enter “pxec2node” as the policy Name and click **“Create Policy”**.



Review policy

Name* pxec2node

Use alphanumeric and '+=,.@-_' characters. Maximum 128 characters.

Description

Maximum 1000 characters. Use alphanumeric and '+=,.@-_' characters.

Summary

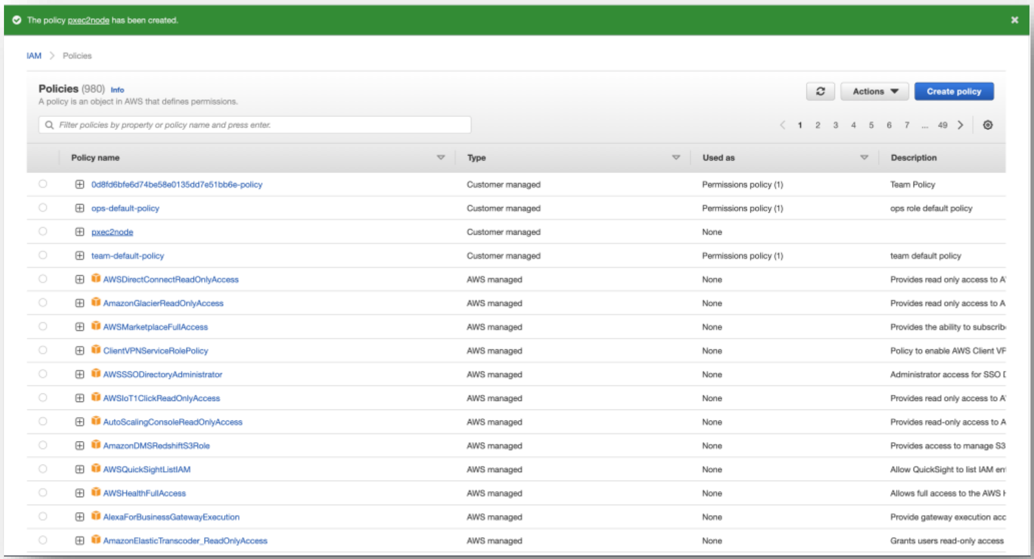
Service	Access level	Resource	Request condition
Allow (2 of 335 services) Show remaining 333			
EC2	**Full:** Tagging **Limited:** List, Write	All resources	None
EC2 Auto Scaling	**Limited:** List	All resources	None

Tags

Key	Value
No tags associated with the resource.	

* Required

5. Navigate to the pxec2node and copy the ARN for the policy and make a note of it for the next section.



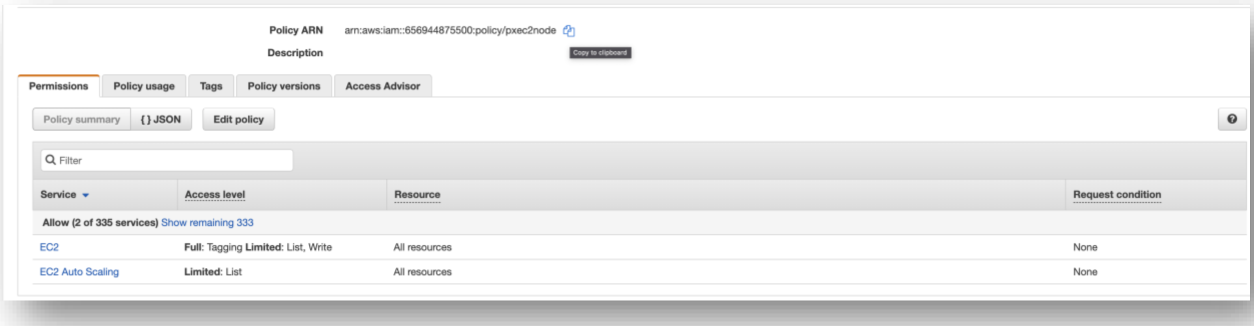
The policy pxec2node has been created.

IAM > Policies

Policies (980) Info

A policy is an object in AWS that defines permissions.

Policy name	Type	Used as	Description
0d8fd6bfe6d74be58e0135dd7e51bb6e-policy	Customer managed	Permissions policy (1)	Team Policy
ops-default-policy	Customer managed	Permissions policy (1)	ops role default policy
pxec2node	Customer managed	None	
team-default-policy	Customer managed	Permissions policy (1)	team default policy
AWSDirectConnectReadOnlyAccess	AWS managed	None	Provides read only access to A
AmazonGlacierReadOnlyAccess	AWS managed	None	Provides read only access to A
AWSMarketplaceFullAccess	AWS managed	None	Provides the ability to subscrib
ClientVPNServiceRolePolicy	AWS managed	None	Policy to enable AWS Client VF
AWSSSODirectoryAdministrator	AWS managed	None	Administrator access for SSO [
AWSIoT1ClickReadOnlyAccess	AWS managed	None	Provides read only access to A
AutoScalingConsoleReadOnlyAccess	AWS managed	None	Provides read-only access to A
AmazonDMSRedshiftS3Role	AWS managed	None	Provides access to manage S3
AWSQuickSightListIAM	AWS managed	None	Allow QuickSight to list IAM en
AWSHealthFullAccess	AWS managed	None	Allows full access to the AWS H
AlexaForBusinessGatewayExecution	AWS managed	None	Provide gateway execution acc
AmazonElasticTranscoder_ReadOnlyAccess	AWS managed	None	Grants users read-only access


Policy ARN arn:aws:iam::656944875500:policy/pxec2node

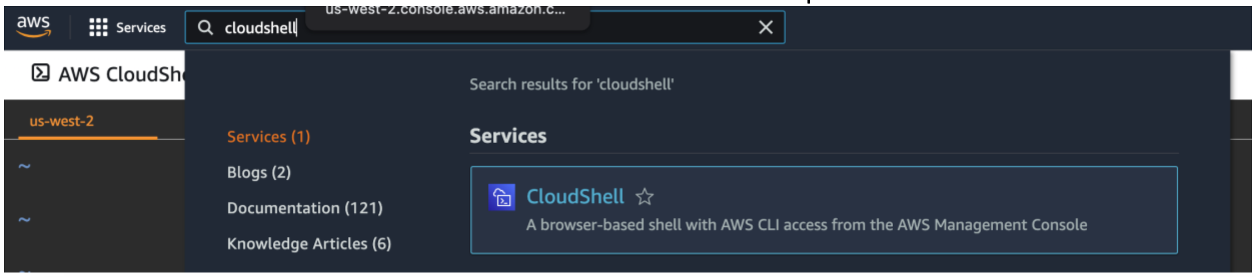
Description

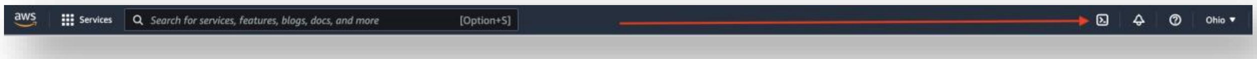
Service	Access level	Resource	Request condition
Allow (2 of 335 services) Show remaining 333			
EC2	**Full**: Tagging **Limited**: List, Write	All resources	None
EC2 Auto Scaling	**Limited**: List	All resources	None

Deploying AWS Resources

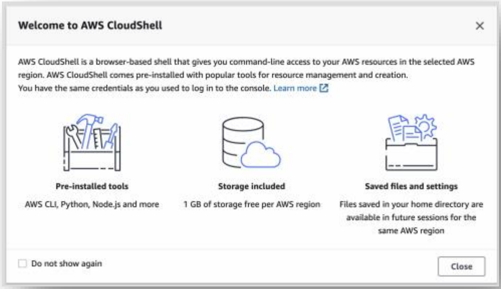
Once you have created a new IAM policy (pxec2node), let's navigate to the AWS console and use the steps below to complete the pre-reqs for the lab:

1. Search for CloudShell in the main search box on the top of the screen.


aws
Services
cloudshell
us-west-2.console.aws.amazon.c...
AWS CloudSh
us-west-2
Search results for 'cloudshell'
Services (1)
Blogs (2)
Documentation (121)
Knowledge Articles (6)
Services
CloudShell
A browser-based shell with AWS CLI access from the AWS Management Console



2. Read through the Welcome to AWS CloudShell box and click close.


Welcome to AWS CloudShell

AWS CloudShell is a browser-based shell that gives you command-line access to your AWS resources in the selected AWS region. AWS CloudShell comes pre-installed with popular tools for resource management and creation. You have the same credentials as you used to log in to the console. Learn more

Pre-installed tools
AWS CLI, Python, Node.js and more

Storage included
1 GB of storage free per AWS region

Saved files and settings
Files saved in your home directory are available in future sessions for the same AWS region

Note: It takes a couple of minutes for the CloudShell session to become responsive.

3. Clone the PX-DataManagement repository on to your CloudShell session using the following command:

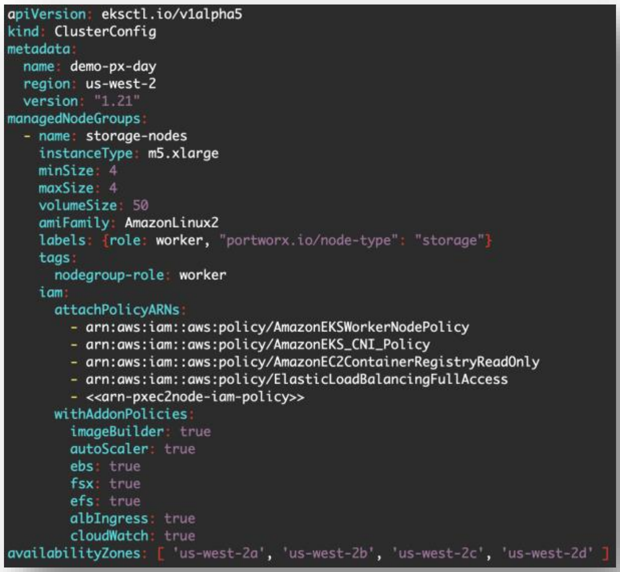
```
git clone https://github.com/bhavin04890/PX-DataMgmt.git
```

4. Once you have the repo cloned, we will go ahead and change directories.

```
cd /home/cloudshell-user/PX-DataMgmt
```

5. Next, edit the “create-eks-cluster.yaml” file and update the ARN under the attachPolicyARNs section of the yaml file.

```
vi create-eks-cluster.yaml
```



```
apiVersion: eksctl.io/v1alpha5
kind: ClusterConfig
metadata:
  name: demo-px-day
  region: us-west-2
  version: "1.21"
managedNodeGroups:
  - name: storage-nodes
    instanceType: m5.xlarge
    minSize: 4
    maxSize: 4
    volumeSize: 50
    amiFamily: AmazonLinux2
    labels: {role: worker, "portworx.io/node-type": "storage"}
    tags:
      nodegroup-role: worker
    iam:
      attachPolicyARNs:
        - arn:aws:iam::aws:policy/AmazonEKSWorkerNodePolicy
        - arn:aws:iam::aws:policy/AmazonEKS_CNI_Policy
        - arn:aws:iam::aws:policy/AmazonEC2ContainerRegistryReadOnly
        - arn:aws:iam::aws:policy/ElasticLoadBalancingFullAccess
        - <<arn-pxec2node-iam-policy>>
      withAddonPolicies:
        imageBuilder: true
        autoScaler: true
        ebs: true
        fsx: true
        efs: true
        albIngress: true
        cloudWatch: true
availabilityZones: [ 'us-west-2a', 'us-west-2b', 'us-west-2c', 'us-west-2d' ]
```

6. Save the file using “esc → :wq”
7. Next, let’s run the pre-req.sh file, which will deploy eksctl, kubectl and an Amazon EKS cluster.

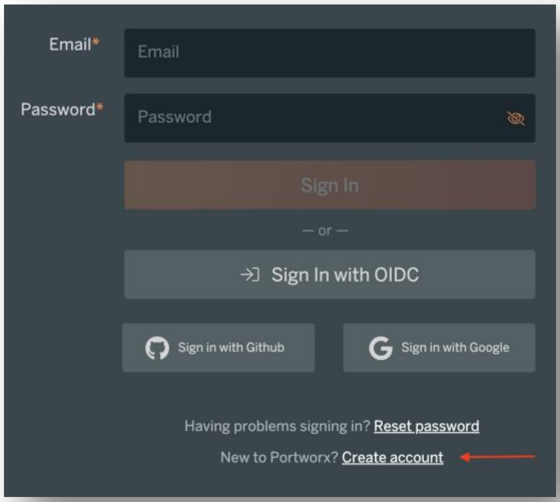
```
./pre-req.sh
```

While we wait for these resources to be deployed, we can proceed and create our Portworx Central accounts, to complete the pre-req steps.

Create Portworx Central account

1. Navigate to Portworx Central (https://central.portworx.com/) and create a new account.

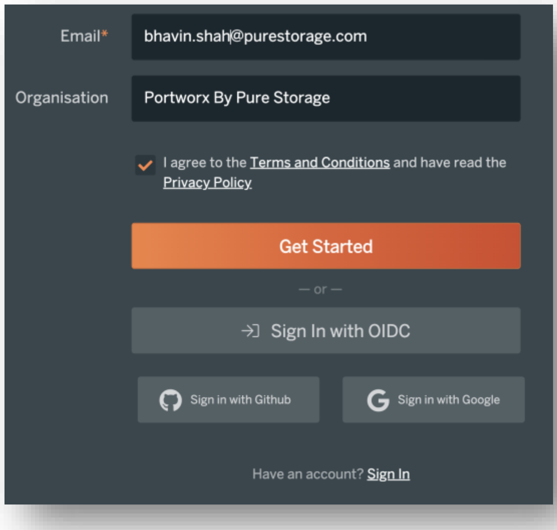
Note: Skip this section if you already have a Portworx Central account.



Having problems signing in? Reset password

New to Portworx? Create account

2. Enter your email address and name of your organization. (Note: Use your work email to register for Portworx Central)



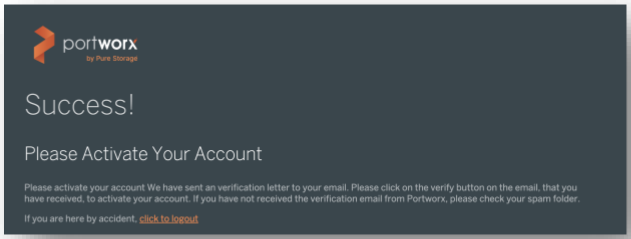
Email*: bhavin.shah@purestorage.com

Organisation: Portworx By Pure Storage

✓ I agree to the Terms and Conditions and have read the Privacy Policy

Have an account? Sign In

3. Activate your account by clicking the link in the email.



Success!

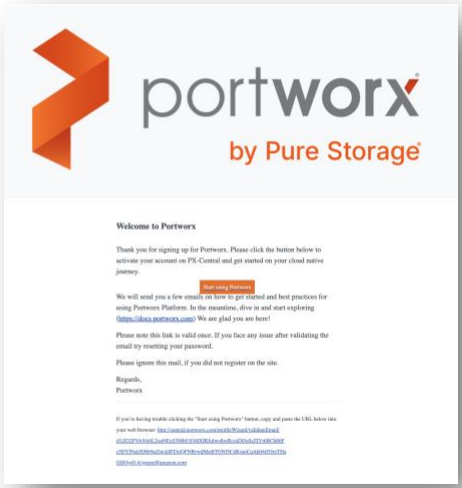
Please Activate Your Account

Please activate your account We have sent an verification letter to your email. Please click on the verify button on the email, that you have received, to activate your account. If you have not received the verification email from Portworx, please check your spam folder.

If you are here by accident, click to logout

4. Check your email and verify your account by clicking *“Start using Portworx”*.

Note: It might take a couple of minutes to get the email.



Welcome to Portworx

Thank you for signing up for Portworx. Please click the button below to activate your account on PX-Central and get started on your cloud native journey.

We will send you a few emails on how to get started and best practices for using Portworx Platform. In the meantime, dive in and start exploring (https://docs.portworx.com) We are glad you are here!

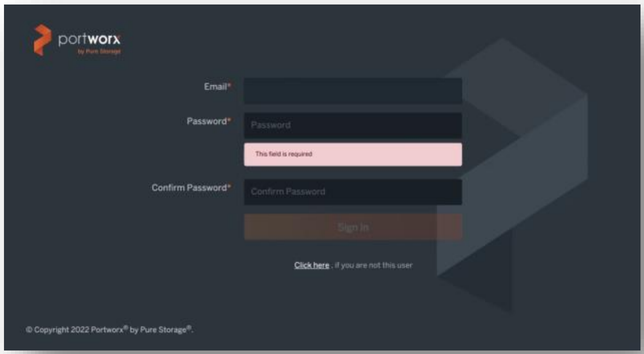
Please note this link is valid once. If you face any issue after validating the email try resetting your password.

Please ignore this mail, if you did not register on the site.

Regards,
Portworx

If you're having trouble clicking the "Start using Portworx" button, copy and paste the URL below into your web browser: http://central.portworx.com/profile/Wizard/validateEmail/ [illegible]

5. Set a new password for [Portworx Central](https://central.portworx.com) and click *"Sign In"* to confirm your account creation.



This field is required

Click here , if you are not this user

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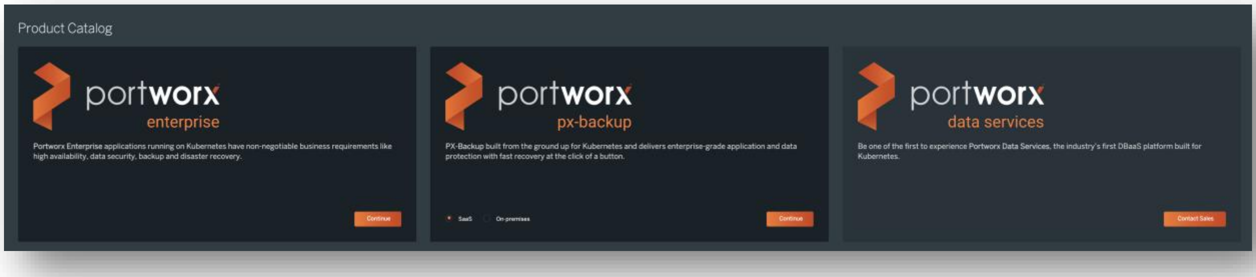
At this point, the pre-requisites for the AWS Immersion Day are done, and we will proceed to the slides portion and then come back for the hands-on lab again.

Deploying Portworx Enterprise on Amazon EKS

1. Navigate to the Portworx Central *"Product Catalog"* tab on the left pane and select Portworx Enterprise option and click *"Continue"*.


Product Catalog

portworx enterprise

Portworx Enterprise applications running on Kubernetes have non-negotiable business requirements like high availability, data security, backup and disaster recovery.

Continue

portworx px-backup

PX-Backup built from the ground up for Kubernetes and delivers enterprise-grade application and data protection with fast recovery at the click of a button.

[✓ SaaS] On-premises

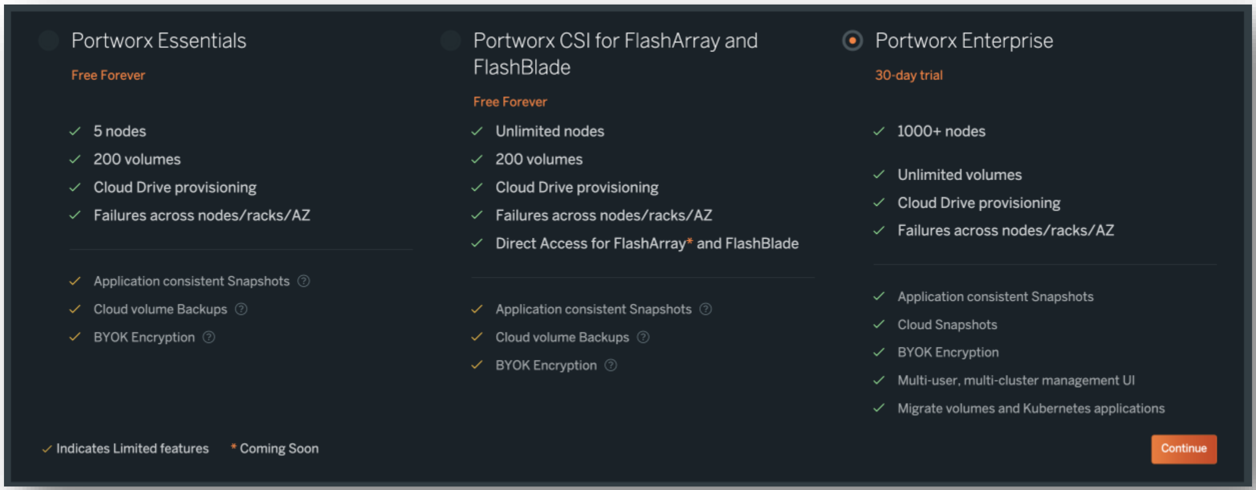
Continue

portworx data services

Be one of the first to experience Portworx Data Services, the industry's first DBaaS platform built for Kubernetes.

Contact Sales

2. Select the "Portworx Enterprise – 30-day trial" click Continue.


Portworx Essentials

Free Forever

- ✓ 5 nodes
- ✓ 200 volumes
- ✓ Cloud Drive provisioning
- ✓ Failures across nodes/racks/AZ
- ✓ Application consistent Snapshots
- ✓ Cloud volume Backups
- ✓ BYOK Encryption

Portworx CSI for FlashArray and FlashBlade

Free Forever

- ✓ Unlimited nodes
- ✓ 200 volumes
- ✓ Cloud Drive provisioning
- ✓ Failures across nodes/racks/AZ
- ✓ Direct Access for FlashArray* and FlashBlade
- ✓ Application consistent Snapshots
- ✓ Cloud volume Backups
- ✓ BYOK Encryption

[✓ Portworx Enterprise]

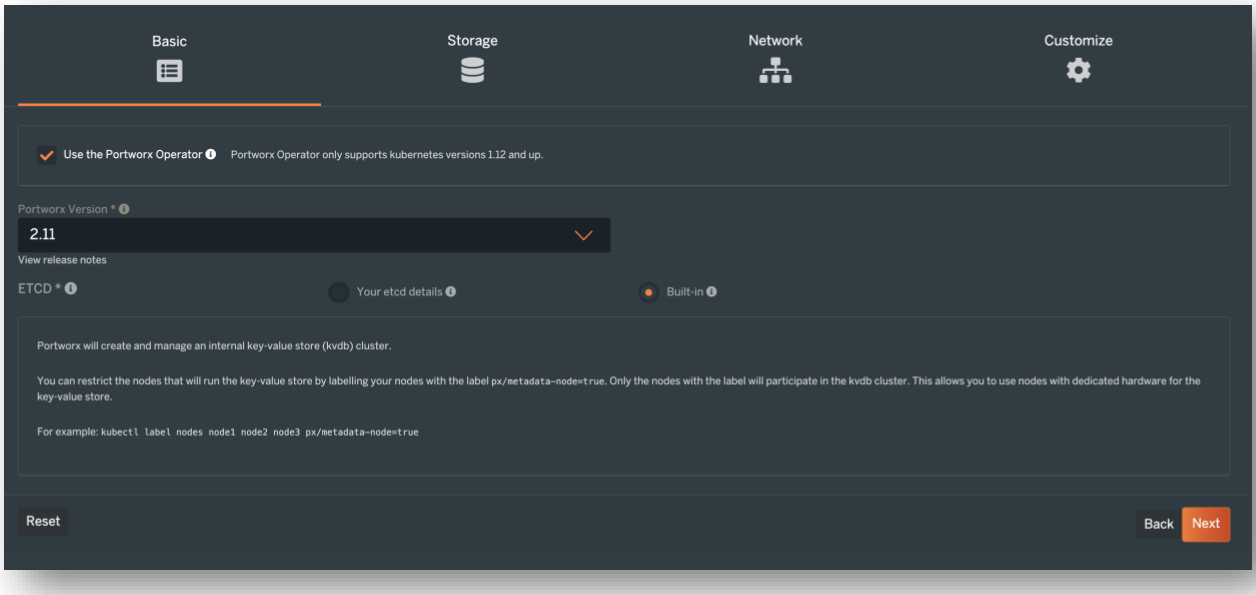
30-day trial

- ✓ 1000+ nodes
- ✓ Unlimited volumes
- ✓ Cloud Drive provisioning
- ✓ Failures across nodes/racks/AZ
- ✓ Application consistent Snapshots
- ✓ Cloud Snapshots
- ✓ BYOK Encryption
- ✓ Multi-user, multi-cluster management UI
- ✓ Migrate volumes and Kubernetes applications

✓ Indicates Limited features * Coming Soon

Continue

3. Check the box for "Portworx Operator" (If it's not checked already) and select 2.11 as the "Portworx Version" from the drop-down box. We will use the "Built-in" ETCD instance to use as the Key Value Database (KVDB) for Portworx. Click Next.



✓ Use the Portworx Operator — Portworx Operator only supports kubernetes versions 1.12 and up.

Portworx Version *: 2.11

View release notes

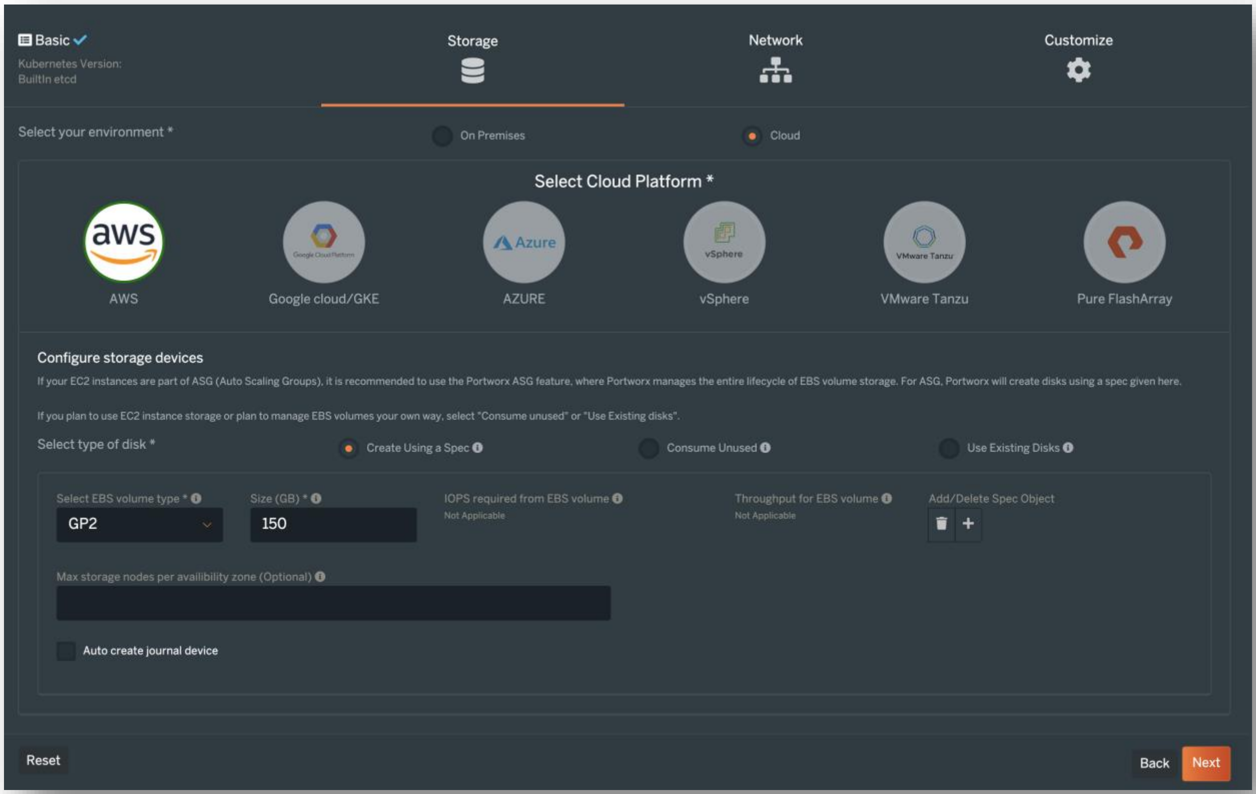
ETCD *: Your etcd details [✓ Built-in]

Portworx will create and manage an internal key-value store (kvdb) cluster.

You can restrict the nodes that will run the key-value store by labelling your nodes with the label `px/metadata-node=true`. Only the nodes with the label will participate in the kvdb cluster. This allows you to use nodes with dedicated hardware for the key-value store.

For example: `kubectl label nodes node1 node2 node3 px/metadata-node=true`

4. Select “Cloud” and select “AWS”. Click Next.



Select your environment *: On Premises [✓ Cloud]

Select Cloud Platform *: [✓ AWS] Google cloud/GKE AZURE vSphere VMware Tanzu Pure FlashArray

Configure storage devices

If your EC2 instances are part of ASG (Auto Scaling Groups), it is recommended to use the Portworx ASG feature, where Portworx manages the entire lifecycle of EBS volume storage. For ASG, Portworx will create disks using a spec given here.

If you plan to use EC2 instance storage or plan to manage EBS volumes your own way, select "Consume unused" or "Use Existing disks".

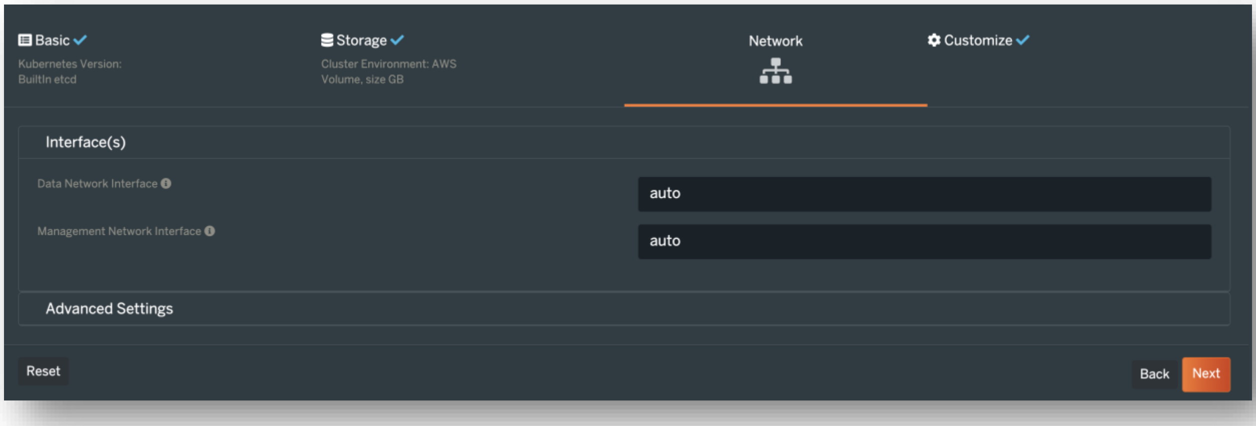
Select type of disk *: [✓ Create Using a Spec] Consume Unused Use Existing Disks

Select EBS volume type *	Size (GB) *	IOPS required from EBS volume	Throughput for EBS volume	Add/Delete Spec Object
GP2	150	Not Applicable	Not Applicable	

Max storage nodes per availibility zone (Optional):

☐ Auto create journal device

5. Leave the Network settings as default and click Next.



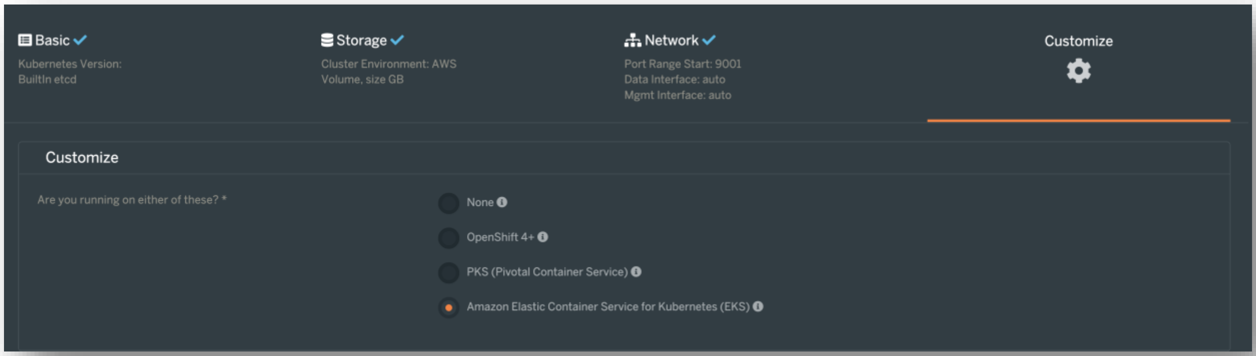
Interface(s)

Data Network Interface: auto

Management Network Interface: auto

Advanced Settings

6. Select "Amazon Elastic Container Service for Kubernetes (EKS)" in the Customize tab, and then add an Environment Variable – "ENABLE_ASG_STORAGE_PARTITIONING: true". Click Finish.



Customize

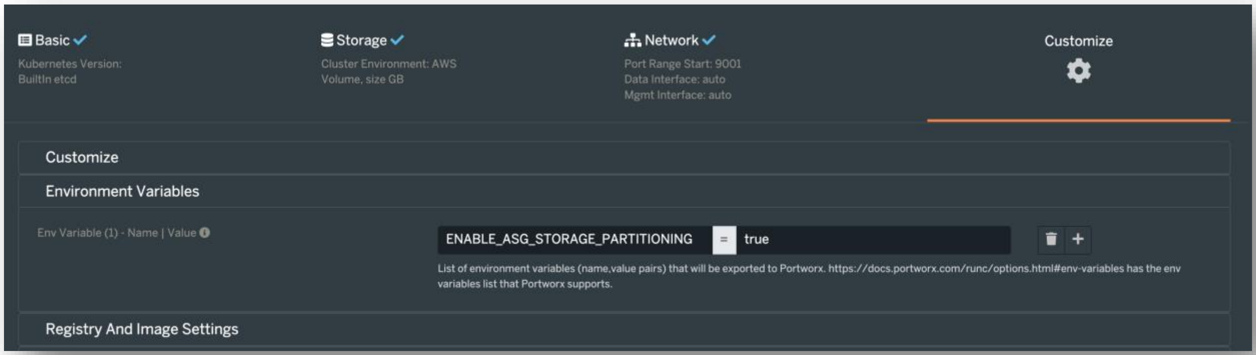
Are you running on either of these? *

None

OpenShift 4+

PKS (Pivotal Container Service)

[✓ Amazon Elastic Container Service for Kubernetes (EKS)]



Customize

Environment Variables

Env Variable (1) - Name | Value: ENABLE_ASG_STORAGE_PARTITIONING = true

List of environment variables (name,value pairs) that will be exported to Portworx. https://docs.portworx.com/runc/options.html#env-variables has the env variables list that Portworx supports.

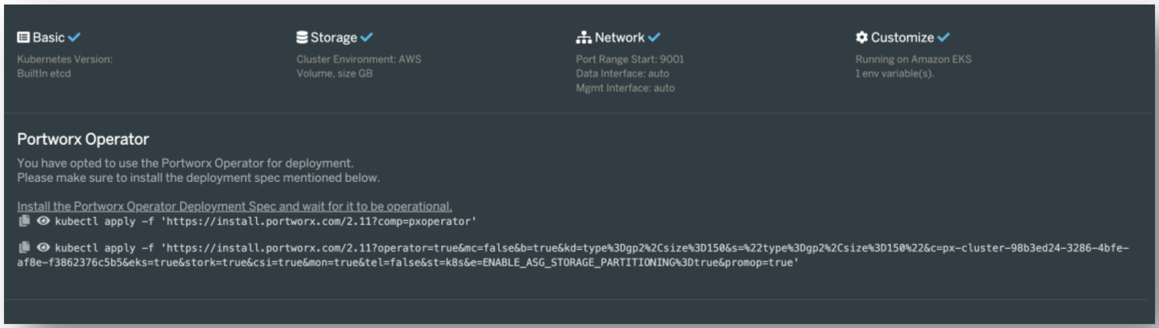
Registry And Image Settings

7. Read through the Portworx End User License Agreement and click Agree.
8. Copy both the 'kubectl' commands under the Portworx Operator section, we will use it to deploy Portworx Enterprise on our Amazon EKS cluster.
9. Next, navigate back to your AWS CloudShell session, and use the following command to connect to your Amazon EKS cluster.

Note: If your AWS CloudShell session has expired, use the following two commands to connect to your Amazon EKS cluster. You can also use these commands, to reconnect back to your Amazon EKS cluster at any point in the guide.

```
cd /home/cloudshell-user/PX-DataMgmt
./connect-eks.sh
```

10. Paste the first kubectl command from Portworx Central to deploy the Portworx Operator, wait a minute, and then paste the second kubectl command to deploy the Portworx Storage Cluster.



Kubernetes Version:
BuiltIn etcd

Cluster Environment: AWS
Volume, size GB

Port Range Start: 9001
Data Interface: auto
Mgmt Interface: auto

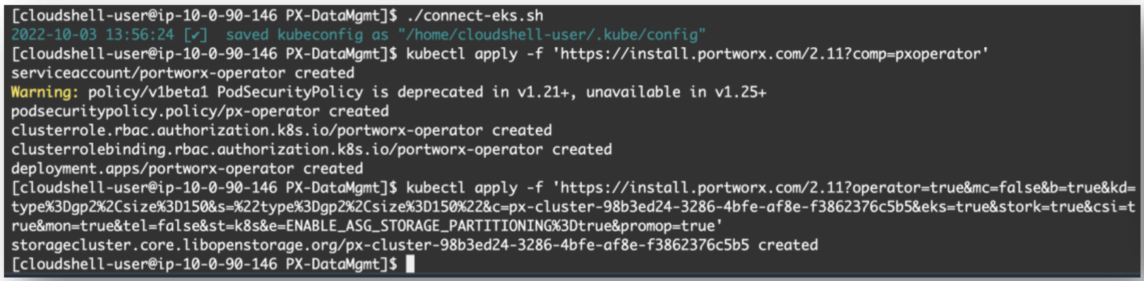
Running on Amazon EKS
1 env variable(s).

Portworx Operator

You have opted to use the Portworx Operator for deployment.
Please make sure to install the deployment spec mentioned below.

Install the Portworx Operator Deployment Spec and wait for it to be operational.

```
kubectl apply -f 'https://install.portworx.com/2.11?comp=pxoperator'

kubectl apply -f 'https://install.portworx.com/2.11?operator=true&mc=false&b=true&kd=type%3Dgp2%2Csize%3D150&s=%22type%3Dgp2%2Csize%3D150%22&c=px-cluster-98b3ed24-3286-4bfe-
af8e-f3862376c5b5&eks=true&stork=true&csi=true&mon=true&tel=false&st=k8s&e=ENABLE_ASG_STORAGE_PARTITIONING%3Dtrue&promop=true'
```



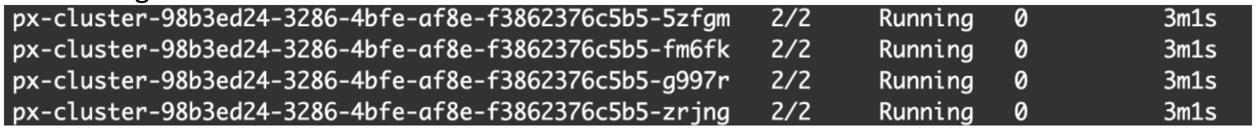
```
[cloudshell-user@ip-10-0-90-146 PX-DataMgmt]$ ./connect-eks.sh
2022-10-03 13:56:24 [✓]  saved kubeconfig as "/home/cloudshell-user/.kube/config"
[cloudshell-user@ip-10-0-90-146 PX-DataMgmt]$ kubectl apply -f 'https://install.portworx.com/2.11?comp=pxoperator'
serviceaccount/portworx-operator created
Warning: policy/v1beta1 PodSecurityPolicy is deprecated in v1.21+, unavailable in v1.25+
podsecuritypolicy.policy/px-operator created
clusterrole.rbac.authorization.k8s.io/portworx-operator created
clusterrolebinding.rbac.authorization.k8s.io/portworx-operator created
deployment.apps/portworx-operator created
[cloudshell-user@ip-10-0-90-146 PX-DataMgmt]$ kubectl apply -f 'https://install.portworx.com/2.11?operator=true&mc=false&b=true&kd=
type%3Dgp2%2Csize%3D150&s=%22type%3Dgp2%2Csize%3D150%22&c=px-cluster-98b3ed24-3286-4bfe-af8e-f3862376c5b5&eks=true&stork=true&csi=t
rue&mon=true&tel=false&st=k8s&e=ENABLE_ASG_STORAGE_PARTITIONING%3Dtrue&promop=true'
storagecluster.core.libopenstorage.org/px-cluster-98b3ed24-3286-4bfe-af8e-f3862376c5b5 created
[cloudshell-user@ip-10-0-90-146 PX-DataMgmt]$
```

11. To monitor the Portworx Enterprise deployment, you can use the following command:

```
kubectl get pods -n kube-system -w
```

Note: You can use "Ctrl + C" to exit out of the kubectl watch command.

12. Once all the Portworx storage cluster pods are 2/2, your Portworx storage cluster is ready to go!



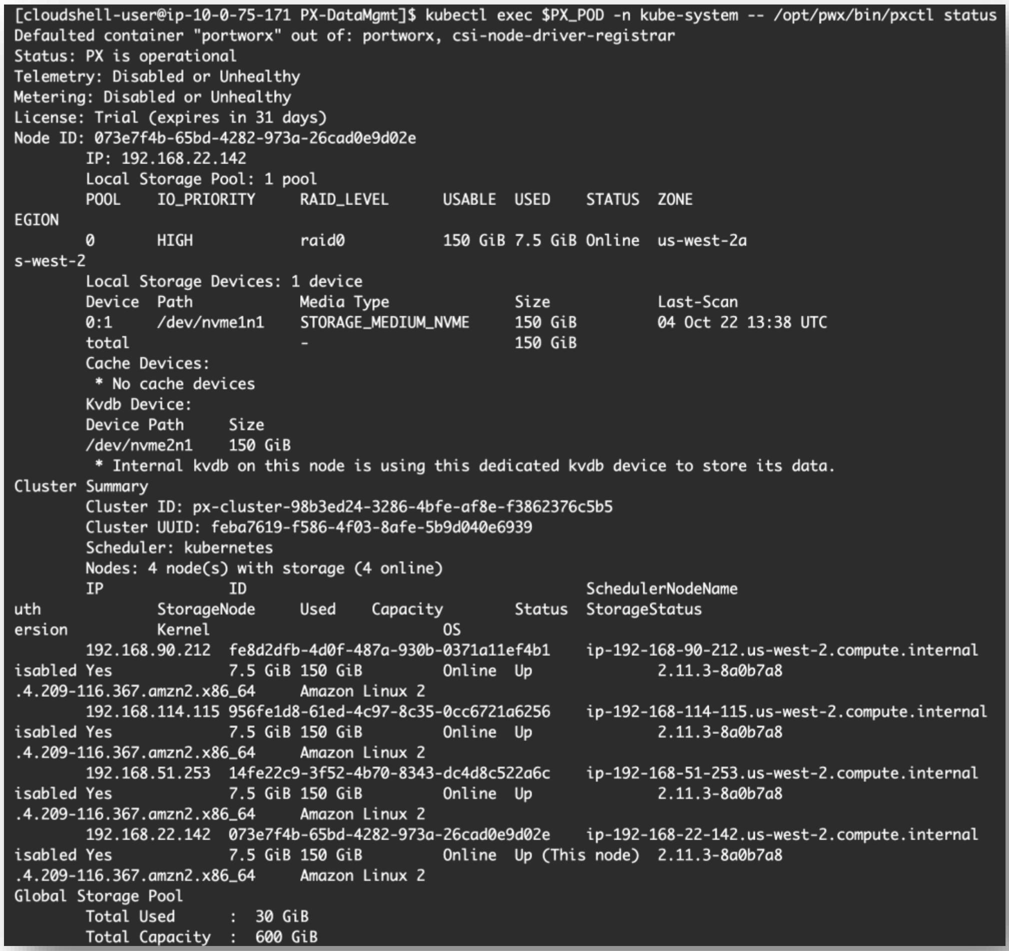
```
px-cluster-98b3ed24-3286-4bfe-af8e-f3862376c5b5-5zfgm   2/2     Running   0          3m1s
px-cluster-98b3ed24-3286-4bfe-af8e-f3862376c5b5-fm6fk   2/2     Running   0          3m1s
px-cluster-98b3ed24-3286-4bfe-af8e-f3862376c5b5-g997r   2/2     Running   0          3m1s
px-cluster-98b3ed24-3286-4bfe-af8e-f3862376c5b5-zrjng   2/2     Running   0          3m1s
```

13. Use the following command to look at the Portworx StorageCluster status and the pre-created storageclasses.

```
kubectl get storagecluster -n kube-system
kubectl get sc
```

Note: Copy the following two commands together and hit Enter.

```
PX_POD=$(kubectl get pods -l name=portworx -n kube-system \
-o jsonpath='{.items[0].metadata.name}')

kubectl exec $PX_POD -n kube-system -- /opt/pwx/bin/pxctl status
```



```
[cloudshell-user@ip-10-0-75-171 PX-DataMgmt]$ kubectl exec $PX_POD -n kube-system -- /opt/pwx/bin/pxctl status
Defaulted container "portworx" out of: portworx, csi-node-driver-registrar
Status: PX is operational
Telemetry: Disabled or Unhealthy
Metering: Disabled or Unhealthy
License: Trial (expires in 31 days)
Node ID: 073e7f4b-65bd-4282-973a-26cad0e9d02e
        IP: 192.168.22.142
        Local Storage Pool: 1 pool
        POOL    IO_PRIORITY     RAID_LEVEL      USABLE  USED    STATUS  ZONE
EGION
        0       HIGH            raid0           150 GiB 7.5 GiB Online  us-west-2a
s-west-2
        Local Storage Devices: 1 device
        Device  Path            Media Type              Size            Last-Scan
        0:1     /dev/nvme1n1    STORAGE_MEDIUM_NVME     150 GiB         04 Oct 22 13:38 UTC
        total                   -                       150 GiB
        Cache Devices:
         * No cache devices
        Kvdb Device:
        Device Path     Size
        /dev/nvme2n1    150 GiB
         * Internal kvdb on this node is using this dedicated kvdb device to store its data.
Cluster Summary
        Cluster ID: px-cluster-98b3ed24-3286-4bfe-af8e-f3862376c5b5
        Cluster UUID: feba7619-f586-4f03-8afe-5b9d040e6939
        Scheduler: kubernetes
        Nodes: 4 node(s) with storage (4 online)
        IP              ID                                      SchedulerNodeName
uth             StorageNode     Used    Capacity        Status  StorageStatus
ersion          Kernel                          OS
        192.168.90.212  fe8d2dfb-4d0f-487a-930b-0371a11ef4b1    ip-192-168-90-212.us-west-2.compute.internal
isabled Yes             7.5 GiB 150 GiB         Online  Up              2.11.3-8a0b7a8
.4.209-116.367.amzn2.x86_64     Amazon Linux 2
        192.168.114.115 956fe1d8-61ed-4c97-8c35-0cc6721a6256    ip-192-168-114-115.us-west-2.compute.internal
isabled Yes             7.5 GiB 150 GiB         Online  Up              2.11.3-8a0b7a8
.4.209-116.367.amzn2.x86_64     Amazon Linux 2
        192.168.51.253  14fe22c9-3f52-4b70-8343-dc4d8c522a6c    ip-192-168-51-253.us-west-2.compute.internal
isabled Yes             7.5 GiB 150 GiB         Online  Up              2.11.3-8a0b7a8
.4.209-116.367.amzn2.x86_64     Amazon Linux 2
        192.168.22.142  073e7f4b-65bd-4282-973a-26cad0e9d02e    ip-192-168-22-142.us-west-2.compute.internal
isabled Yes             7.5 GiB 150 GiB         Online  Up (This node)  2.11.3-8a0b7a8
.4.209-116.367.amzn2.x86_64     Amazon Linux 2
Global Storage Pool
        Total Used      :  30 GiB
        Total Capacity  :  600 GiB
```

14. Install Grafana on your Amazon EKS cluster using the following command:

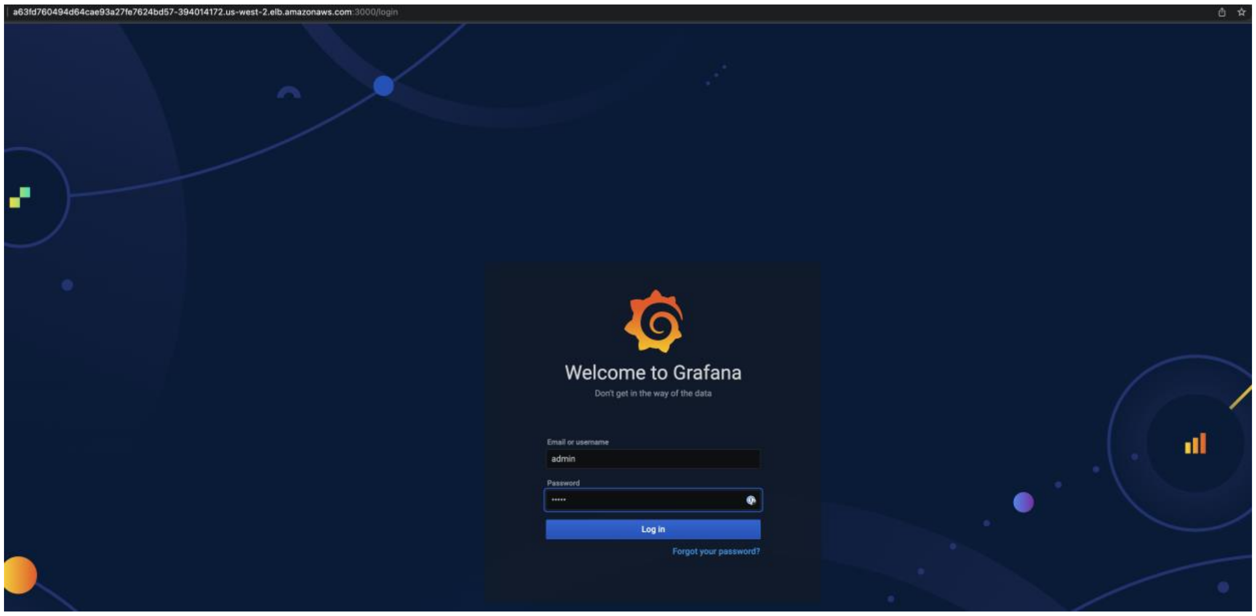
```
./install-grafana.sh
```

15. Navigate to the Grafana UI using the load balancer endpoint for Grafana over port 3000, and login using the default credentials (admin/admin).

Note: Append port 3000 at the end of the load balancer URL (See example below) and navigate to the Grafana dashboard

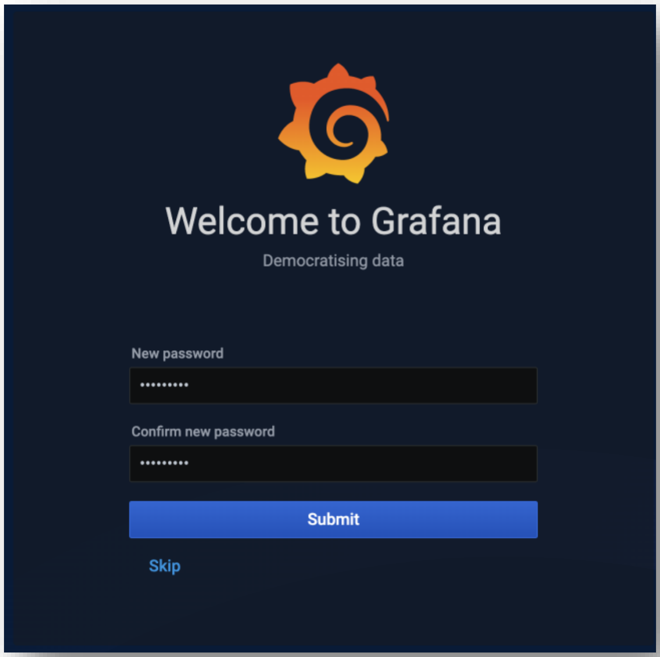
```
http://adc886f8c913040bf8da8ade62f267c7-1960369372.us-west-
2.elb.amazonaws.com:3000/
```

Note: If you are having issues connecting to the Amazon ELB endpoint, please disconnect from any VPNs you might be using. It might take a couple of minutes for the Grafana dashboard to be accessible.

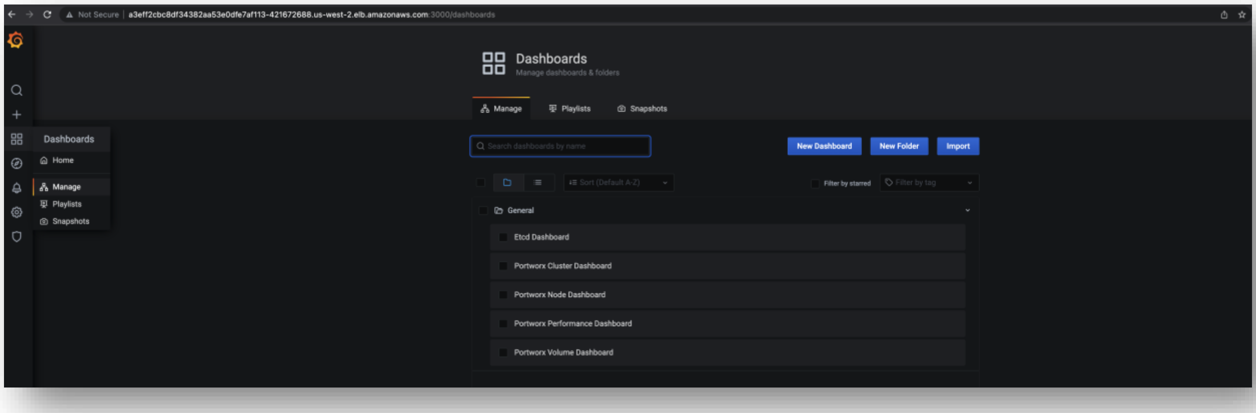


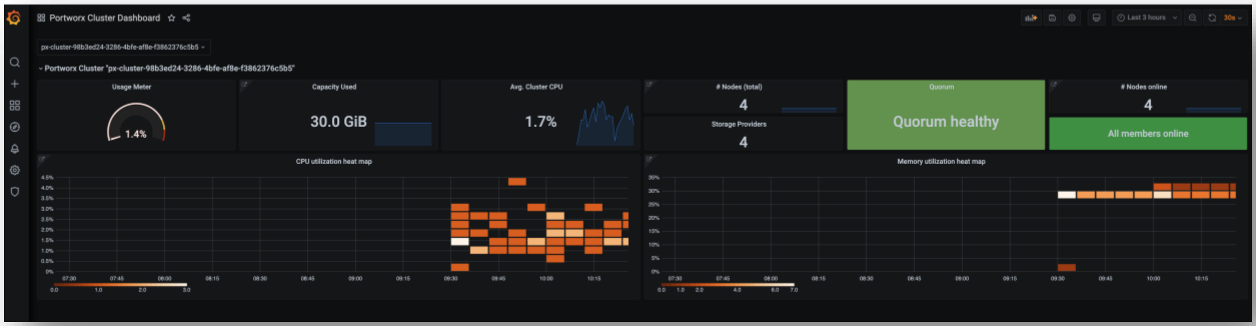
a63fd760494d64cae93a27fe7624bd57-394014172.us-west-2.elb.amazonaws.com:3000/login

16. Set a new password for your Grafana instance on the next screen and then log into the Grafana instance.



17. Find the Portworx cluster dashboard by clicking on the Dashboard → Manage in the left pane, and then click on Portworx Cluster Dashboard.


Dashboards
Manage dashboards & folders
Manage
Playlists
Snapshots
New Dashboard
New Folder
Import
General
Etcd Dashboard
Portworx Cluster Dashboard
Portworx Node Dashboard
Portworx Performance Dashboard
Portworx Volume Dashboard



In the next section, we will deploy a couple of demo applications, to learn how Portworx can help you customize your StorageClass definitions and provision ReadWriteOnce and ReadWriteMany volumes from a unified storage pool.

Dynamic storage provisioning using Portworx Storage Classes

In this section, we will deploy two different storage classes, one for block and one for file persistent volumes, and then deploy demo applications that use those storage classes to deploy persistent volumes on demand.

1. Use the following commands to look at the StorageClass configuration and deploy them against your Amazon EKS cluster.

```
cat block-sc.yaml
```

```
kubectl apply -f block-sc.yaml
```

```
cat file-sc.yaml
```

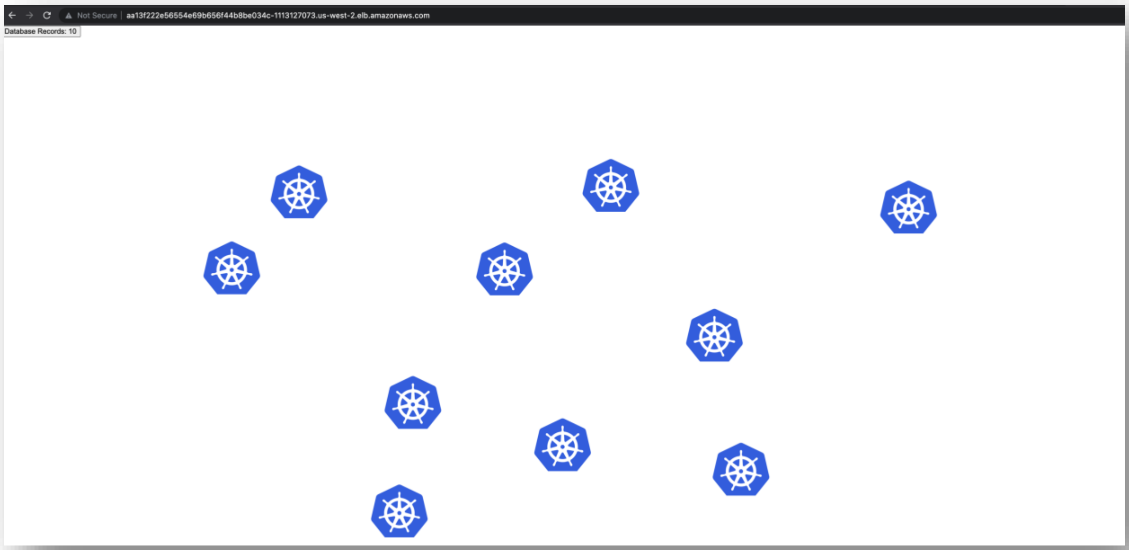
```
kubectl apply -f file-sc.yaml
```

Deploying Block-based (ReadWriteOnce) application on Amazon EKS

1. Let's deploy a simple demo application that has a PostgreSQL database for backend and a simple nginx based frontend component.

```
./k8s-app.sh
```

2. Once the script completes execution, copy, and navigate to the Amazon ELB endpoint using your browser and click a few times on the screen, to generate Kubernetes logos. The coordinate locations (X,Y) for these logos are stored in the backend Postgres database.



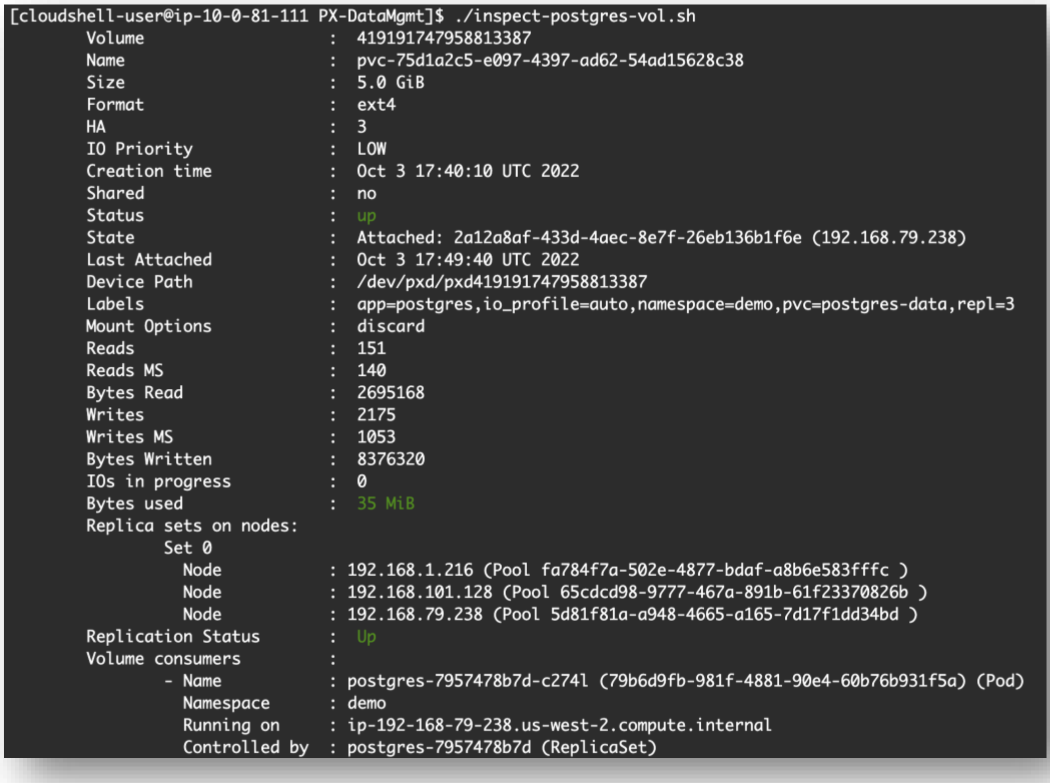
Not Secure | aa13f222e56554e69b656f44b8be034c-1113127073.us-west-2.elb.amazonaws.com

Database Records: 10

3. Next, let's use the following command to inspect the Postgres volume. You will see how the Portworx persistent volume has been provisioned, the size, the file system format, the read and write throughout and IOPS, and how many replicas and where they are stored in your Amazon EKS cluster.

```
cat inspect-postgres-vol.sh
```

```
./inspect-postgres-vol.sh
```



```
[cloudshell-user@ip-10-0-81-111 PX-DataMgmt]$ ./inspect-postgres-vol.sh
        Volume                   :  419191747958813387
        Name                     :  pvc-75d1a2c5-e097-4397-ad62-54ad15628c38
        Size                     :  5.0 GiB
        Format                   :  ext4
        HA                       :  3
        IO Priority              :  LOW
        Creation time            :  Oct 3 17:40:10 UTC 2022
        Shared                   :  no
        Status                   :  up
        State                    :  Attached: 2a12a8af-433d-4aec-8e7f-26eb136b1f6e (192.168.79.238)
        Last Attached            :  Oct 3 17:49:40 UTC 2022
        Device Path              :  /dev/pxd/pxd419191747958813387
        Labels                   :  app=postgres,io_profile=auto,namespace=demo,pvc=postgres-data,repl=3
        Mount Options            :  discard
        Reads                    :  151
        Reads MS                 :  140
        Bytes Read               :  2695168
        Writes                   :  2175
        Writes MS                :  1053
        Bytes Written            :  8376320
        IOs in progress          :  0
        Bytes used               :  35 MiB
        Replica sets on nodes:
                Set 0
                  Node           : 192.168.1.216 (Pool fa784f7a-502e-4877-bdaf-a8b6e583fffc )
                  Node           : 192.168.101.128 (Pool 65cdcd98-9777-467a-891b-61f23370826b )
                  Node           : 192.168.79.238 (Pool 5d81f81a-a948-4665-a165-7d17f1dd34bd )
        Replication Status       :  Up
        Volume consumers         :
                - Name           : postgres-7957478b7d-c274l (79b6d9fb-981f-4881-90e4-60b76b931f5a) (Pod)
                  Namespace      : demo
                  Running on     : ip-192-168-79-238.us-west-2.compute.internal
                  Controlled by  : postgres-7957478b7d (ReplicaSet)
```

4. Show the entries in the Postgres table using the following commands

```
POD=$(kubectl get pods -l app=postgres -n demo | grep 1/1 | awk '{print $1}')
kubectl exec -it $POD -n demo -- bash
psql -U $POSTGRES_USER
\c postgres
Select * from mywhales;
\q
```

```
exit
```

Deploying File-based (ReadWriteMany) application on Amazon EKS

```
Applications like Jenkins, Wordpress, etc need a shared persistent volume
between different application pods. This is where the ReadWriteMany capability
of Portworx Enterprise helps users leverage a single solution for both Block
and File needs. Users can create custom Kubernetes StorageClass for block and
file based applications and use the same underlying storage pool for
provisioning block and file persistent volumes.
```

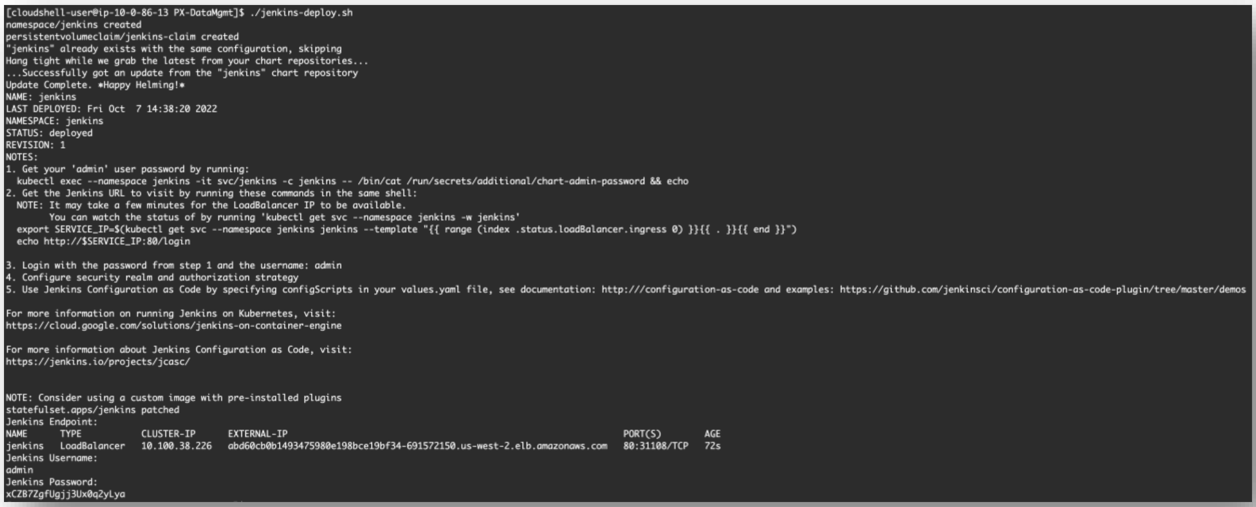
In this section, we will deploy a Highly available Jenkins deployment using a simple helm chart and a single ReadWriteMany persistent volume.

1. Let’s look at the PVC config file and the script we will use to deploy Jenkins, and then run that script.

```
cat jenkins-pvc.yaml
```

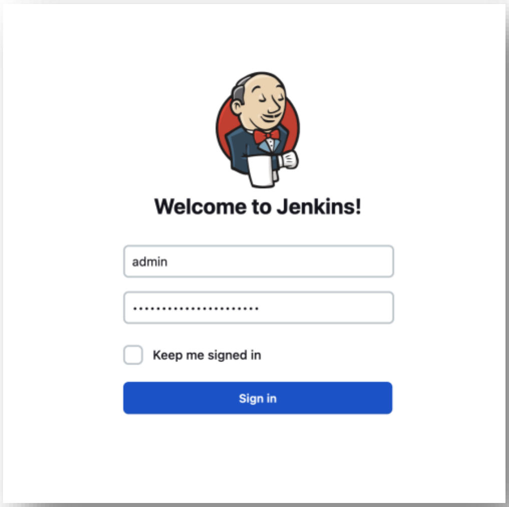
```
cat jenkins-deploy.sh
```

```
./jenkins-deploy.sh
```



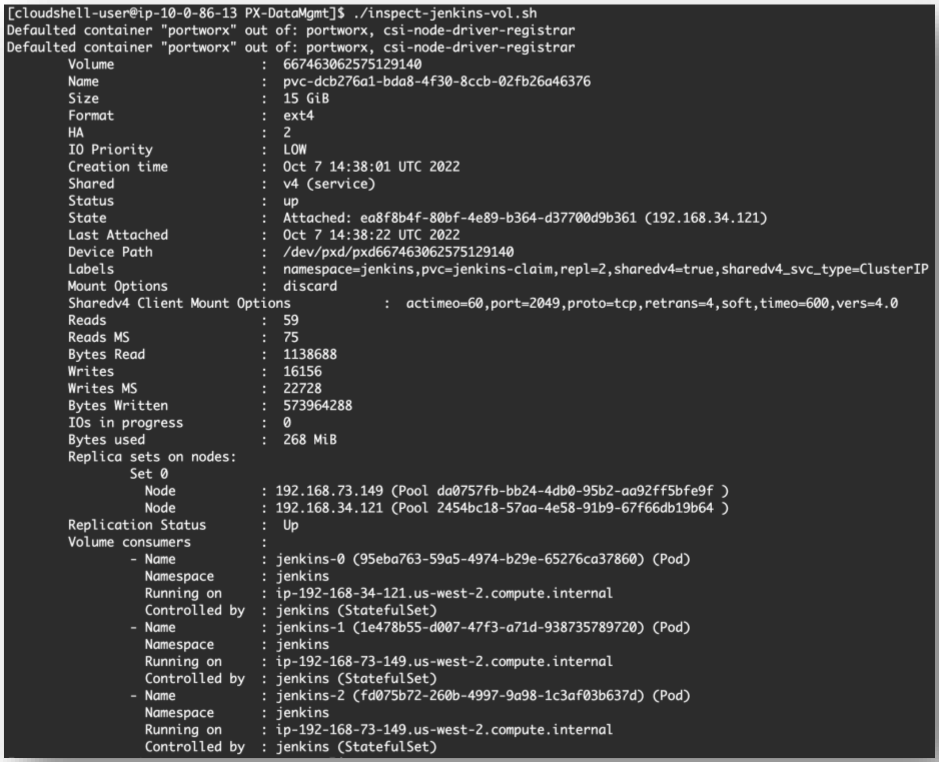
```
[cloudshell-user@ip-10-0-86-13 PX-DataMgmt]$ ./jenkins-deploy.sh
namespace/jenkins created
persistentvolumeclaim/jenkins-claim created
"jenkins" already exists with the same configuration, skipping
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the "jenkins" chart repository
Update Complete. *Happy Helming!*
NAME: jenkins
LAST DEPLOYED: Fri Oct  7 14:38:20 2022
NAMESPACE: jenkins
STATUS: deployed
REVISION: 1
NOTES:
1. Get your 'admin' user password by running:
  kubectl exec --namespace jenkins -it svc/jenkins -c jenkins -- /bin/cat /run/secrets/additional/chart-admin-password && echo
2. Get the Jenkins URL to visit by running these commands in the same shell:
  NOTE: It may take a few minutes for the LoadBalancer IP to be available.
        You can watch the status of by running 'kubectl get svc --namespace jenkins -w jenkins'
  export SERVICE_IP=$(kubectl get svc --namespace jenkins jenkins --template "{{ range (index .status.loadBalancer.ingress 0) }}{{ . }}{{ end }}")
  echo http://$SERVICE_IP:80/login

3. Login with the password from step 1 and the username: admin
4. Configure security realm and authorization strategy
5. Use Jenkins Configuration as Code by specifying configScripts in your values.yaml file, see documentation: http:///configuration-as-code and examples: https://github.com/jenkinsci/configuration-as-code-plugin/tree/master/demos

For more information on running Jenkins on Kubernetes, visit:
https://cloud.google.com/solutions/jenkins-on-container-engine

For more information about Jenkins Configuration as Code, visit:
https://jenkins.io/projects/jcasc/


NOTE: Consider using a custom image with pre-installed plugins
statefulset.apps/jenkins patched
Jenkins Endpoint:
NAME      TYPE           CLUSTER-IP      EXTERNAL-IP                                                               PORT(S)        AGE
jenkins   LoadBalancer   10.100.38.226   abd60cb0b1493475980e198bce19bf34-691572150.us-west-2.elb.amazonaws.com   80:31108/TCP   72s
Jenkins Username:
admin
Jenkins Password:
xCZB7ZgfUgjj3Ux0q2yLya
```

2. Navigate to Jenkins dashboard and log in using the credentials on the screen displayed on the screen.



3. Next, go back to your CloudShell session and Inspect the persistent volume using the following script.

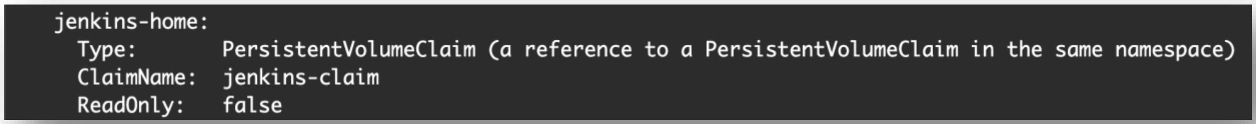
```
cat inspect-jenkins-vol.sh

./inspect-jenkins-vol.sh
```



```
[cloudshell-user@ip-10-0-86-13 PX-DataMgmt]$ ./inspect-jenkins-vol.sh
Defaulted container "portworx" out of: portworx, csi-node-driver-registrar
Defaulted container "portworx" out of: portworx, csi-node-driver-registrar
        Volume                   :  667463062575129140
        Name                     :  pvc-dcb276a1-bda8-4f30-8ccb-02fb26a46376
        Size                     :  15 GiB
        Format                   :  ext4
        HA                       :  2
        IO Priority              :  LOW
        Creation time            :  Oct 7 14:38:01 UTC 2022
        Shared                   :  v4 (service)
        Status                   :  up
        State                    :  Attached: ea8f8b4f-80bf-4e89-b364-d37700d9b361 (192.168.34.121)
        Last Attached            :  Oct 7 14:38:22 UTC 2022
        Device Path              :  /dev/pxd/pxd667463062575129140
        Labels                   :  namespace=jenkins,pvc=jenkins-claim,repl=2,sharedv4=true,sharedv4_svc_type=ClusterIP
        Mount Options            :  discard
        Sharedv4 Client Mount Options           :  actimeo=60,port=2049,proto=tcp,retrans=4,soft,timeo=600,vers=4.0
        Reads                    :  59
        Reads MS                 :  75
        Bytes Read               :  1138688
        Writes                   :  16156
        Writes MS                :  22728
        Bytes Written            :  573964288
        IOs in progress          :  0
        Bytes used               :  268 MiB
        Replica sets on nodes:
                Set 0
                  Node           : 192.168.73.149 (Pool da0757fb-bb24-4db0-95b2-aa92ff5bfe9f )
                  Node           : 192.168.34.121 (Pool 2454bc18-57aa-4e58-91b9-67f66db19b64 )
        Replication Status       :  Up
        Volume consumers         :
                - Name           : jenkins-0 (95eba763-59a5-4974-b29e-65276ca37860) (Pod)
                  Namespace      : jenkins
                  Running on     : ip-192-168-34-121.us-west-2.compute.internal
                  Controlled by  : jenkins (StatefulSet)
                - Name           : jenkins-1 (1e478b55-d007-47f3-a71d-938735789720) (Pod)
                  Namespace      : jenkins
                  Running on     : ip-192-168-73-149.us-west-2.compute.internal
                  Controlled by  : jenkins (StatefulSet)
                - Name           : jenkins-2 (fd075b72-260b-4997-9a98-1c3af03b637d) (Pod)
                  Namespace      : jenkins
                  Running on     : ip-192-168-73-149.us-west-2.compute.internal
                  Controlled by  : jenkins (StatefulSet)
```

4. Next, let’s describe a couple of jenkins pods and verify that the same pvc is mounted on multiple pods.

```
kubectl describe pods jenkins-0 -n jenkins

kubectl describe pods jenkins-2 -n jenkins
```



```
  jenkins-home:
    Type:       PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
    ClaimName:  jenkins-claim
    ReadOnly:   false
```

As you can see all three Jenkins pods have mounted the jenkins-claim persistent volume to the jenkins-home directory and are simultaneously accessing and writing data to the persistent volume. In this scenario, if you lose any Jenkins pod, the user will still be able to access the application using the surviving pods and access the same build pipelines and plugins.

5. In scenarios where you need to scale up your Jenkins deployment, to ensure that you can keep up with developer demands, you can use the following command to add two more pods to the Jenkins StatefulSet. These new pods will also mount the same persistent volume and will have access to the same application data.

Note: It will take a couple of minutes for the two new pods to be online and running.

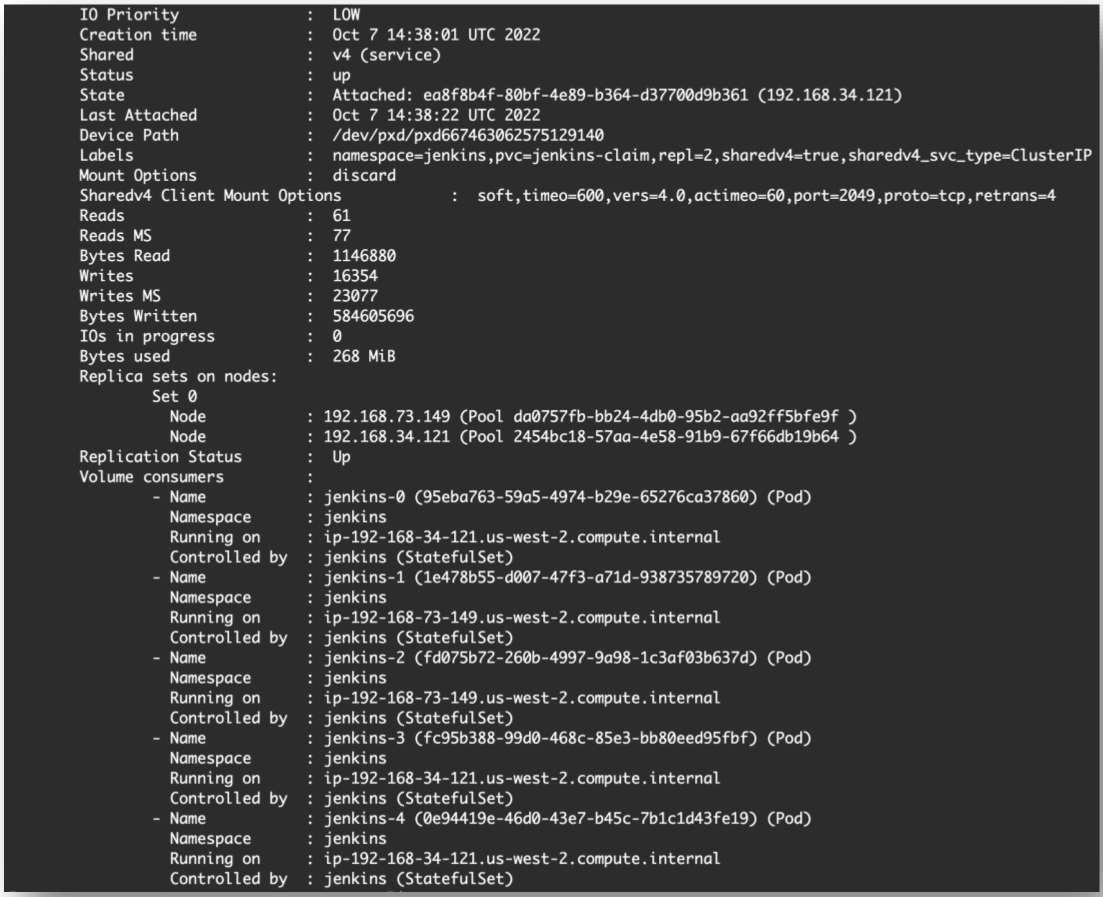
```
kubectl patch statefulsets jenkins -p '{"spec":{"replicas":5}}' -n jenkins

watch kubectl get sts,pods -n jenkins
```

Note: Use Ctrl + C to exit out of the watch command.

```
kubectl get all -n jenkins
```

6. To validate that all five pods have the persistent volume mounted, let’s use the inspect-jenkins-vol script again and look at the output.

```
./inspect-jenkins-vol.sh
```



```
        IO Priority              :  LOW
        Creation time            :  Oct 7 14:38:01 UTC 2022
        Shared                   :  v4 (service)
        Status                   :  up
        State                    :  Attached: ea8f8b4f-80bf-4e89-b364-d37700d9b361 (192.168.34.121)
        Last Attached            :  Oct 7 14:38:22 UTC 2022
        Device Path              :  /dev/pxd/pxd667463062575129140
        Labels                   :  namespace=jenkins,pvc=jenkins-claim,repl=2,sharedv4=true,sharedv4_svc_type=ClusterIP
        Mount Options            :  discard
        Sharedv4 Client Mount Options           :  soft,timeo=600,vers=4.0,actimeo=60,port=2049,proto=tcp,retrans=4
        Reads                    :  61
        Reads MS                 :  77
        Bytes Read               :  1146880
        Writes                   :  16354
        Writes MS                :  23077
        Bytes Written            :  584605696
        IOs in progress          :  0
        Bytes used               :  268 MiB
        Replica sets on nodes:
                Set 0
                  Node          : 192.168.73.149 (Pool da0757fb-bb24-4db0-95b2-aa92ff5bfe9f )
                  Node          : 192.168.34.121 (Pool 2454bc18-57aa-4e58-91b9-67f66db19b64 )
        Replication Status       :  Up
        Volume consumers         :
                - Name          : jenkins-0 (95eba763-59a5-4974-b29e-65276ca37860) (Pod)
                  Namespace     : jenkins
                  Running on    : ip-192-168-34-121.us-west-2.compute.internal
                  Controlled by : jenkins (StatefulSet)
                - Name          : jenkins-1 (1e478b55-d007-47f3-a71d-938735789720) (Pod)
                  Namespace     : jenkins
                  Running on    : ip-192-168-73-149.us-west-2.compute.internal
                  Controlled by : jenkins (StatefulSet)
                - Name          : jenkins-2 (fd075b72-260b-4997-9a98-1c3af03b637d) (Pod)
                  Namespace     : jenkins
                  Running on    : ip-192-168-73-149.us-west-2.compute.internal
                  Controlled by : jenkins (StatefulSet)
                - Name          : jenkins-3 (fc95b388-99d0-468c-85e3-bb80eed95fbf) (Pod)
                  Namespace     : jenkins
                  Running on    : ip-192-168-34-121.us-west-2.compute.internal
                  Controlled by : jenkins (StatefulSet)
                - Name          : jenkins-4 (0e94419e-46d0-43e7-b45c-7b1c1d43fe19) (Pod)
                  Namespace     : jenkins
                  Running on    : ip-192-168-34-121.us-west-2.compute.internal
                  Controlled by : jenkins (StatefulSet)
```

```
kubectl describe pods jenkins-3 -n jenkins

kubectl describe pods jenkins-4 -n jenkins
```

This is how easy it is to leverage Portworx to deploy different types of storage for different application needs on the same Amazon EKS cluster.

Cross Availability Zone (AZ) application availability

```
Portworx allows you to spread volume replicas across different Amazon Availability Zones (AZs). So, even if you lose a Kubernetes worker node, your pod can be rescheduled to another Amazon EKS worker node and continue using the persistent volume replica on the new node. This process makes the AZ-level fault tolerance faster, as your pods don’t have to wait for administrators to manually restore the EBS volume from a snapshot and mount it on the new Amazon EKS worker node.
```

1. For this exercise, we will use the simple K8s logo application that we deployed in the previous section. To look at the application components, use the following command:

```
kubectl get pods -n demo -o wide -l app=postgres
```

2. We have our postgres pod and it’s persistent volume, that is running in one of the AZs in the us-west-2 region. Using the following commands, we will look at where the pod is running currently, simulate an AZ failure, and see how Amazon EKS recovers it instantly to a different AZ in the region. This failover operation is almost instantaneous as Portworx already have a replica of the persistent volume running in the new AZ.

```
cat get-node-az.sh

./get-node-az.sh
```

```
cat simulate-node-failure.sh

./simulate-node-failure.sh
```

```
kubectl get pods -n demo -o wide -l app=postgres
```

```
./get-node-az.sh
```

3. Navigate back to the application endpoint using the following command and refresh the page, to ensure your application is online and you can see all the different logos.

```
kubectl get svc -n demo
```

4. To verify that the Postgres pod got rescheduled to a different AWS AZ based Amazon EKS worker node, with a local persistent volume replica, use the following commands:

```
kubectl get pods -n demo -o wide

./inspect-postgres-vol.sh
```

5. Next, let’s uncordon the Amazon EKS worker node using the following commands

```
kubectl get nodes

kubectl uncordon <<cordoned-node>>
```

Working with Portworx Snapshots

```
Portworx allows you to create snapshots for your persistent volumes, to protect
you from scenarios where you accidently delete a database or drop a table in
the database. Using Portworx snapshots, you can either store those snapshots
locally on the cluster, or you can also offload them to an Amazon S3 bucket.
These snapshots can either be for one persistent volumes, individually, or it
can be for multiple persistent volumes that belong to the same application at
the same time. Portworx also allows you to specify pre- and post-snapshot rules,
so your snapshots are always application consistent.
```

In this scenario, we are going to take a simple snapshot of the persistent volume that is being used by our Postgres database.

1. To take a snapshot, we will create a new VolumeSnapshot object using a yaml file below:

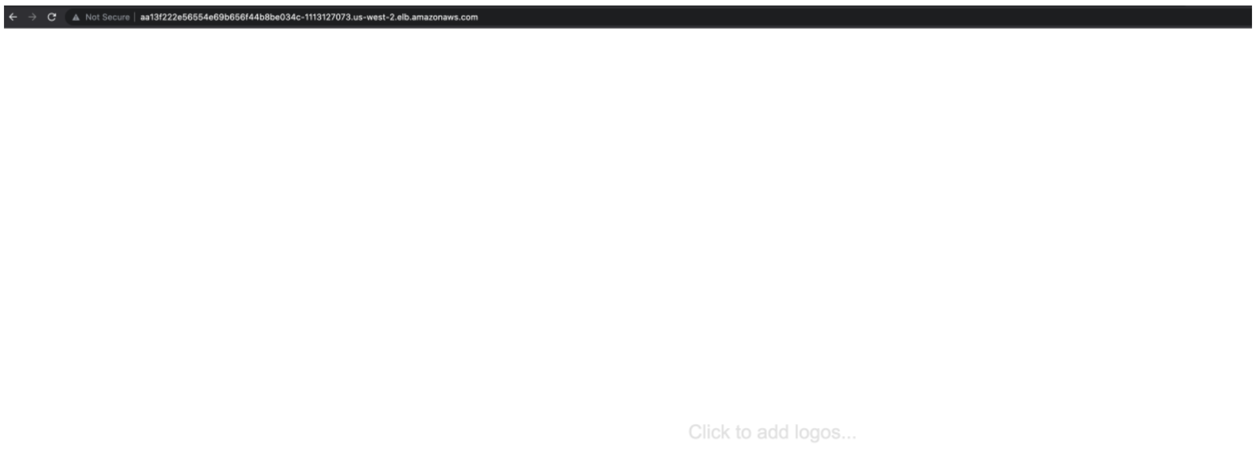
```
cat pg-snapshot.yaml

kubectl apply -f pg-snapshot.yaml

kubectl get stork-volumesnapshots,volumesnapshotdatas -n demo
```

2. Now that we have a snapshot for our persistent volume, let's accidently perform a "Drop table" operation in our Postgres database. This will remove all the location entries for our Kubernetes logos.

```
POD=$(kubectl get pods -l app=postgres -n demo | grep 1/1 | awk '{print $1}')
kubectl exec -it $POD -n demo -- bash
psql -U $POSTGRES_USER
\c postgres
drop table mywhales cascade;


\q
```

```
exit
```

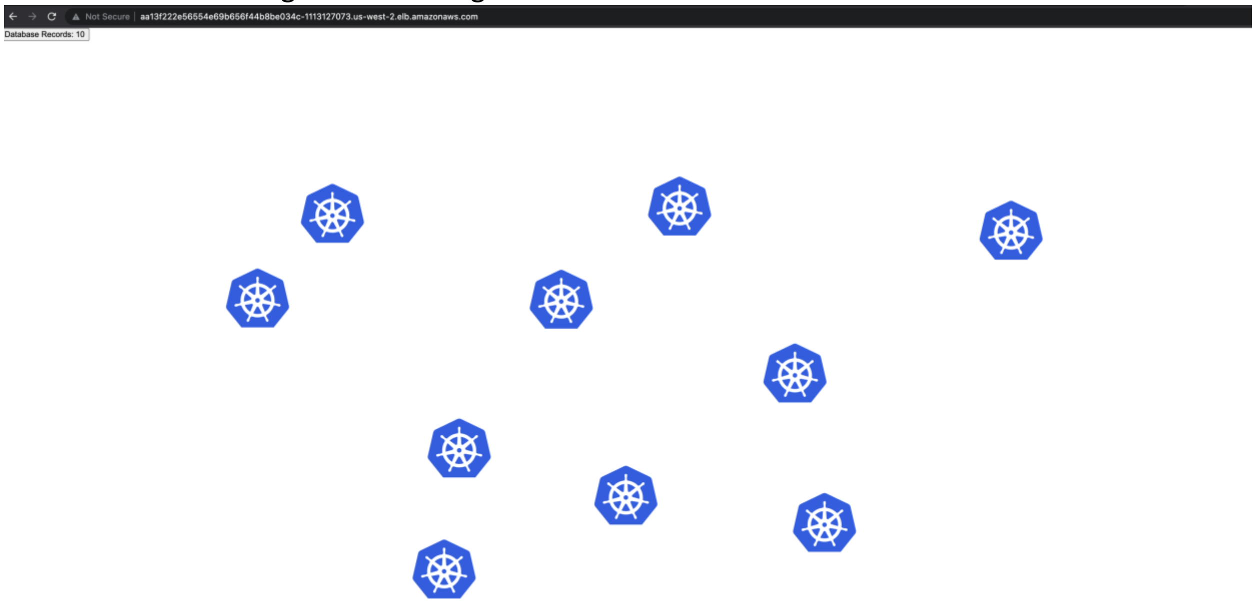
3. Once the entries have been deleted, we can go back to the UI and try to refresh the page. And, as you can see in the screenshot below, the UI is completely empty, as we deleted all the location information for the Kubernetes logos.


Not Secure | aa13f222e56554e69b656f44b8be034c-1113127073.us-west-2.elb.amazonaws.com
Click to add logos...

4. Next, let’s try to restore our Postgres database using the persistent volume snapshot that we took in the first step. Once we create a new persistent volume from the snapshot, we will also scale down and scale up the front end component of our application, so it reconnects to our database.

```
cat restore-from-snap.sh

./restore-from-snap.sh
```

5. Next, navigate back to the UI and refresh the page. You should be able to see all the Kubernetes logos at their original location.


Not Secure | aa13f222e56554e69b656f44b8be034c-1113127073.us-west-2.elb.amazonaws.com
Database Records: 10

This is how Portworx allows you to protect your applications running on Amazon EKS from accidental deletions or data corruptions scenarios.

Building Multi-tenant Amazon EKS clusters

```
We see two different types of deployment architectures amongst our customers.
The first type runs individual Kubernetes clusters for each application team.
These clusters tend to have a smaller footprint, maybe 10 Amazon EKS worker
nodes. The second type runs bigger Kubernetes clusters that are multi-tenant
and run multiple applications in parallel. Regardless of the type of
organization, ensuring that all applications on your Amazon EKS cluster get the
required number of resources is important. Kubernetes allows you to set pod-
based CPU and memory requests and limits, that help ensure that there isn't a
noisy neighbor issue. Portworx allows you to do the same thing for your storage
resources. With Application IO control, Portworx allows administrators to set
limits to the read and write IOPS or Bandwidth each persistent volume can
consume, at Day 0 as part of StorageClass configuration, or on Day 2, using our
pxctl cli utility.
```

In this section, we will run a script that create an FIO job to generate random IO against our Portworx storage cluster, and we will see how we can update the IOPS limit in real time, and see the limit enforced almost instantly.

1. Let's look at the io-gen.sh file which runs that FIO job against the default namespace of our Amazon EKS cluster.

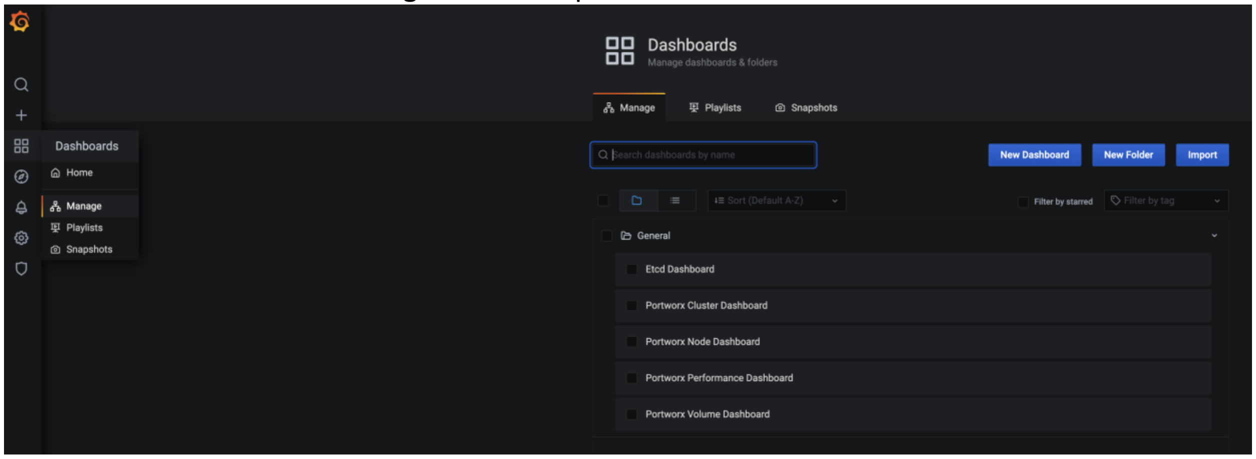
```
cat io-gen.sh

./io-gen.sh
```

2. Look at the PVC and get the volume ID.

Note: Rerun the following command till you see Bound on the persistent volume claim

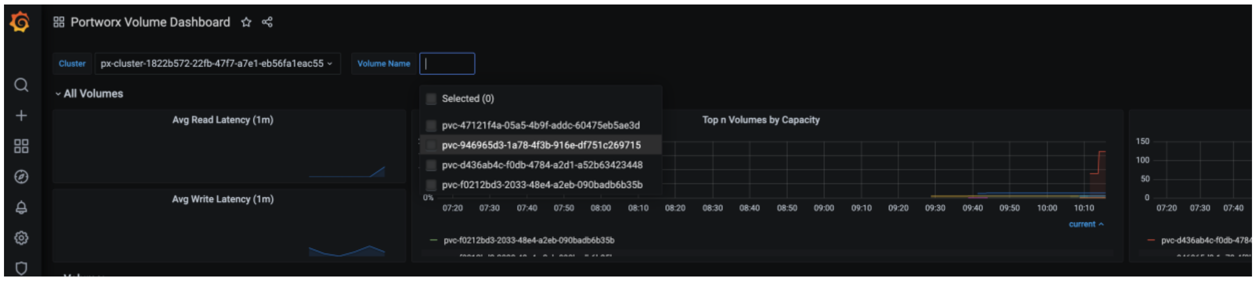
```
kubectl get pvc
```

3. Go back to the Grafana UI and navigate to the Portworx Volume Dashboard by clicking on Dashboard → Manage in the left pane and select the Portworx Volume Dashboard.

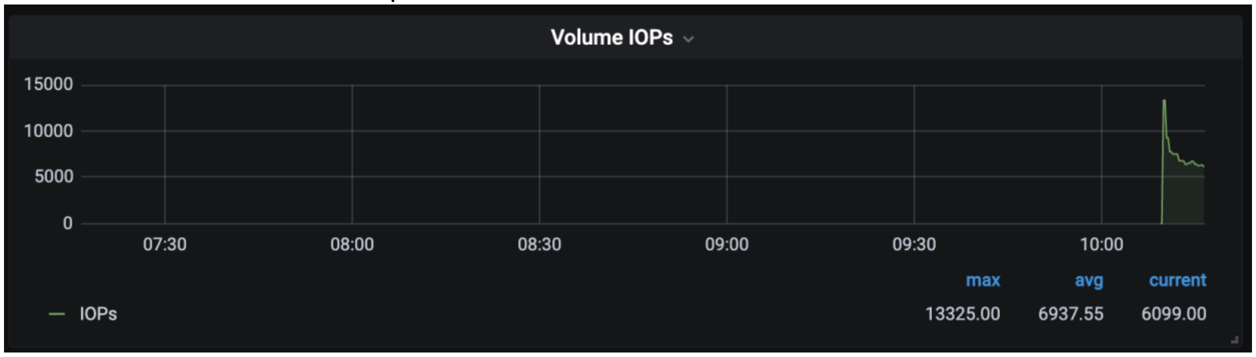


General
Etcd Dashboard
Portworx Cluster Dashboard
Portworx Node Dashboard
Portworx Performance Dashboard
Portworx Volume Dashboard

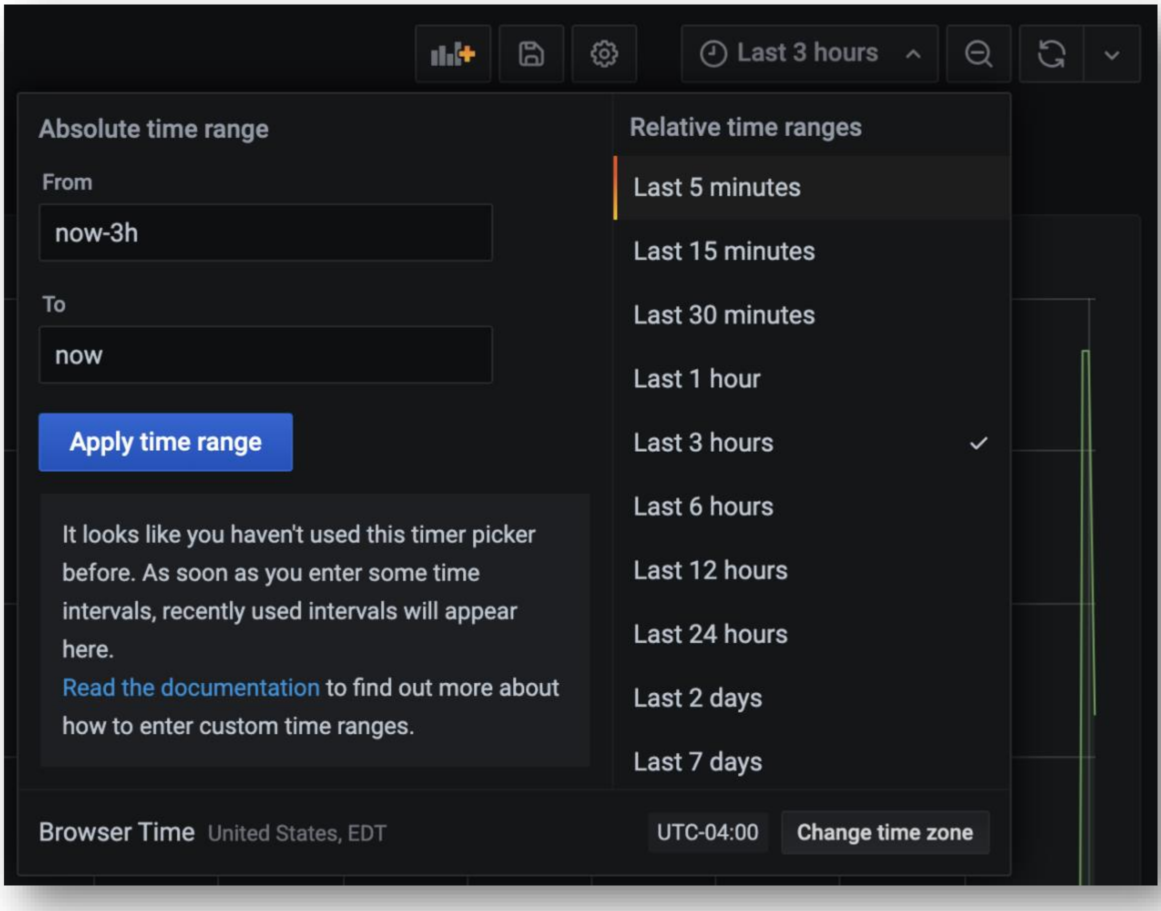
4. On the Portworx Volume Dashboard, select our FIO volume from the Volume Name drop down box.


Portworx Volume Dashboard
Cluster
px-cluster-1822b572-22fb-47f7-a7e1-eb56fa1eac55
Volume Name
All Volumes
Avg Read Latency (1m)
Avg Write Latency (1m)
Selected (0)
pvc-47121f4a-05a5-4b9f-addc-60475eb5ae3d
pvc-946965d3-1a78-4f3b-916e-df751c269715
pvc-d436ab4c-f0db-4784-a2d1-a52b63423448
pvc-f0212bd3-2033-48e4-a2eb-090badb6b35b
Top n Volumes by Capacity
pvc-f0212bd3-2033-48e4-a2eb-090badb6b35b

5. Find the Volume IOPS pane in the dashboard and click on View.

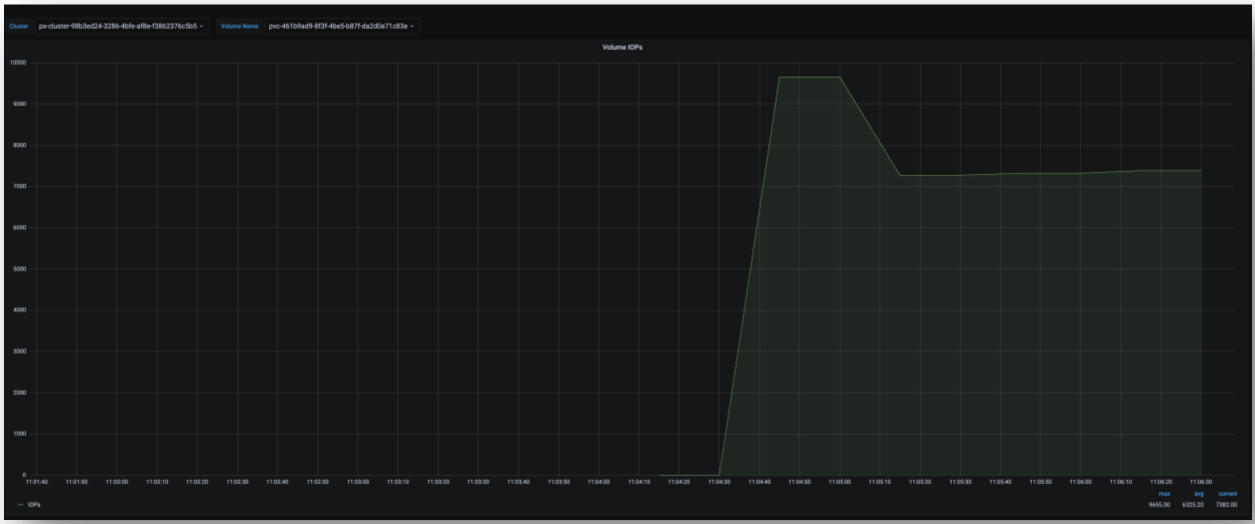


6. Change the timeline view to last 5 mins using the drop-down box on the top right.



It looks like you haven't used this timer picker before. As soon as you enter some time intervals, recently used intervals will appear here.
Read the documentation to find out more about how to enter custom time ranges.

7. Look at the IOPS graph, your IOPS should be more 5000.

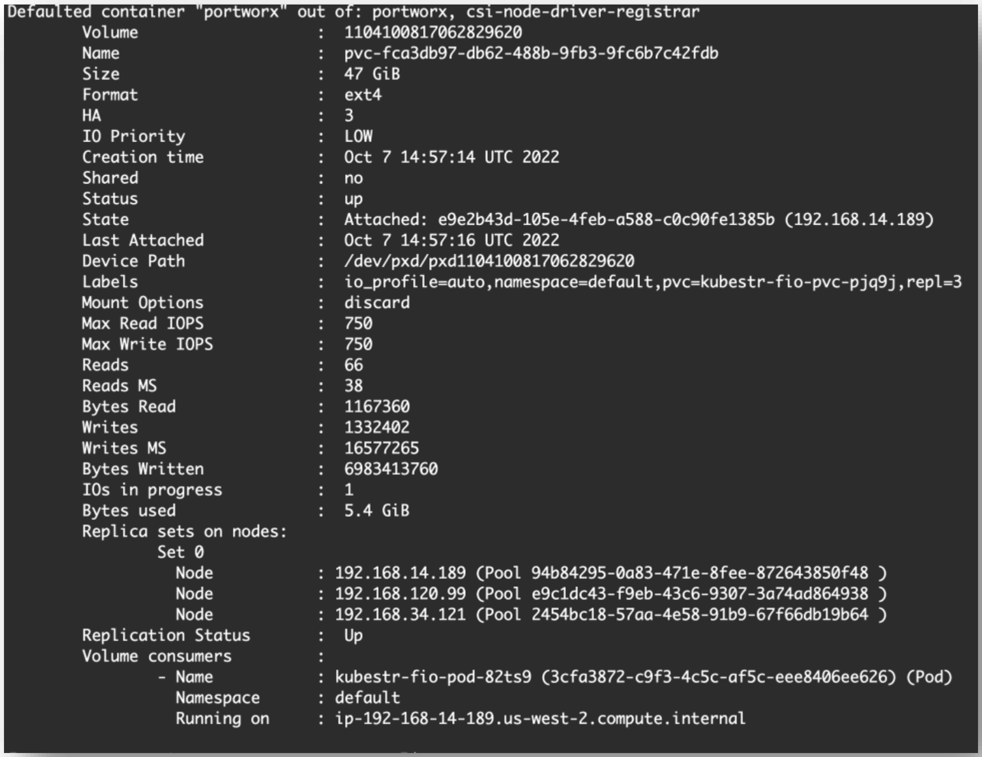


8. Navigate back to AWS CloudShell, and use a simple pxctl command to update the max read and write IOPS to 750 each. We will use a simple script called update-iops.sh to set these maximum limits for our persistent volume.

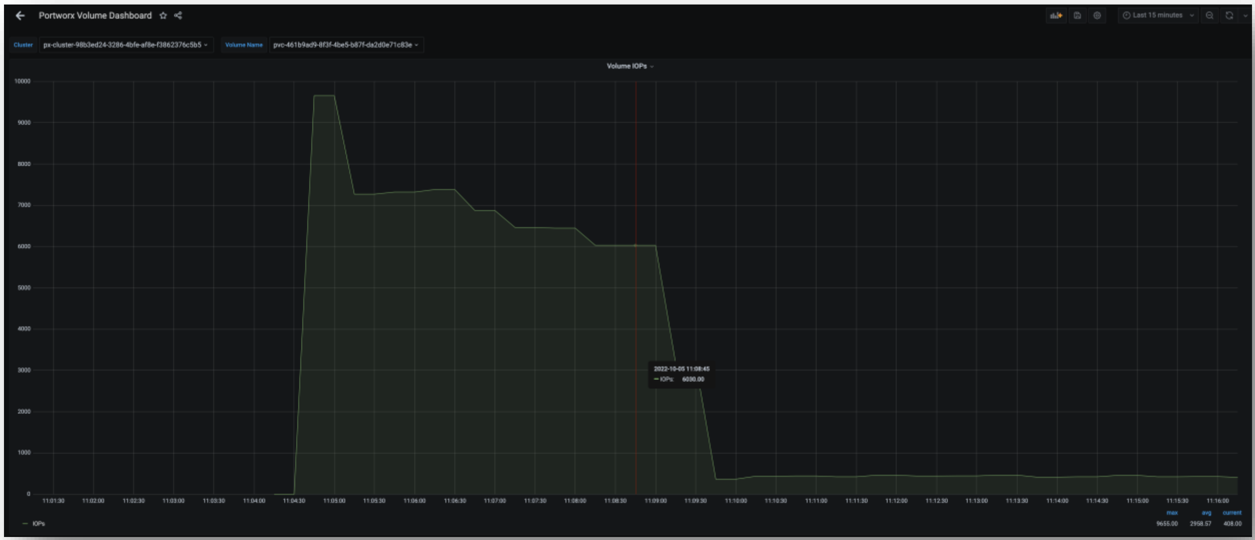
```
cat update-iops.sh

./update-iops.sh
```

9. Once the parameters are set, we will navigate back to the volume dashboard in Grafana and refresh to look at the new IOPS number.

Note: Grafana graphs update every minute, so we will have to wait for a couple of minutes to see the drop in IOPS.



```
Defaulted container "portworx" out of: portworx, csi-node-driver-registrar
        Volume                  :  1104100817062829620
        Name                    :  pvc-fca3db97-db62-488b-9fb3-9fc6b7c42fdb
        Size                    :  47 GiB
        Format                  :  ext4
        HA                      :  3
        IO Priority             :  LOW
        Creation time           :  Oct 7 14:57:14 UTC 2022
        Shared                  :  no
        Status                  :  up
        State                   :  Attached: e9e2b43d-105e-4feb-a588-c0c90fe1385b (192.168.14.189)
        Last Attached           :  Oct 7 14:57:16 UTC 2022
        Device Path             :  /dev/pxd/pxd1104100817062829620
        Labels                  :  io_profile=auto,namespace=default,pvc=kubestr-fio-pvc-pjq9j,repl=3
        Mount Options           :  discard
        Max Read IOPS           :  750
        Max Write IOPS          :  750
        Reads                   :  66
        Reads MS                :  38
        Bytes Read              :  1167360
        Writes                  :  1332402
        Writes MS               :  16577265
        Bytes Written           :  6983413760
        IOs in progress         :  1
        Bytes used              :  5.4 GiB
        Replica sets on nodes:
                Set 0
                  Node          : 192.168.14.189 (Pool 94b84295-0a83-471e-8fee-872643850f48 )
                  Node          : 192.168.120.99 (Pool e9c1dc43-f9eb-43c6-9307-3a74ad864938 )
                  Node          : 192.168.34.121 (Pool 2454bc18-57aa-4e58-91b9-67f66db19b64 )
        Replication Status      :  Up
        Volume consumers        :
                - Name          : kubestr-fio-pod-82ts9 (3cfa3872-c9f3-4c5c-af5c-eee8406ee626) (Pod)
                  Namespace     : default
                  Running on    : ip-192-168-14-189.us-west-2.compute.internal
```



Portworx Volume Dashboard

Cluster px-cluster-98b3ed24-3286-4bfe-af8e-f3862376c5b5

Volume Name pvc-461b9ad9-8f3f-4be5-b87f-da2d0e71c83e

This is how Portworx allows administrators to set either IOPS or bandwidth limits, so that they don’t have to worry about the noisy neighbor issues, where one application consumes more than its share of the resources and starves the other applications running on the same Amazon EKS cluster.

Automated Storage Capacity Management – Portworx Autopilot

```
Monitoring and managing storage utilization for your applications is a crucial
factor to ensure applications uptime. If applications run out of storage, they
will go offline, and this is true even for modern applications running on Amazon
EKS. Portworx Autopilot allows administrators to set policies in place where
Portworx will monitor the utilization of your individual persistent volumes and
your storage pool and perform expansion operations on your behalf. This allows
administrators to offload the storage management onto Portworx and ensure
application uptime.
```

In this scenario, we will go through a simple Postgres and pgbench deployment, where pgbench will generate 70GB work of data against a 10G persistent volume, and we will see how you can use Portworx Autopilot rules, to automate the persistent volume expansion operations for your Postgres PVC.

1. Let's start by looking at all the configuration files for autopilot.

```
cat autopilotrule.yaml

cat autopilot-script.sh

cat autopilot-postgres.yaml

cat autopilot-app.yaml
```

2. Let's use the autopilot-script.sh file to configure Autopilot, and use the autopilot rule to perform volume expansion operation:

```
./autopilot-script.sh
```

Note: Ignore the AlreadyExists error during the script execution.

3. Once the script has been executed, you can monitor the random data generation by looking at the logs of the pgbench container.

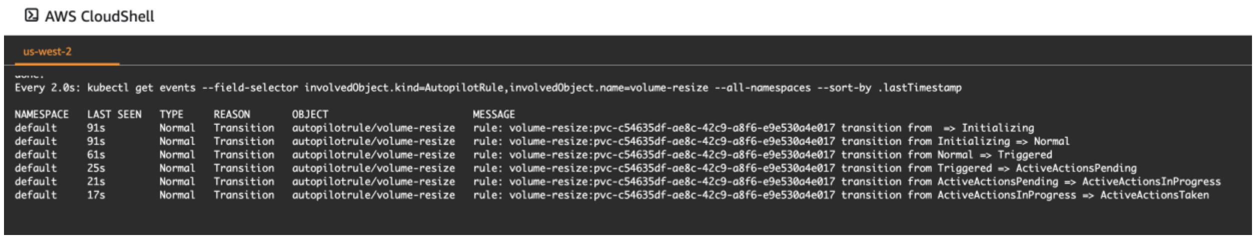
```
kubectl get pvc -n pg1
```

```
POSTGRES_POD=$(kubectl get pods -n pg1 | grep 2/2 | awk '{print $1}')

kubectl logs $POSTGRES_POD -n pg1 pgbench
```

4. Next, let's use the watch command to monitor how Autopilot rule works:

```
watch kubectl get events --field-selector \
involvedObject.kind=AutopilotRule,involvedObject.name=volume-resize \
 --all-namespaces --sort-by .lastTimestamp
```

Note: Once you see ActiveActionsTaken in the event output, click Ctrl + C to exit the watch command.



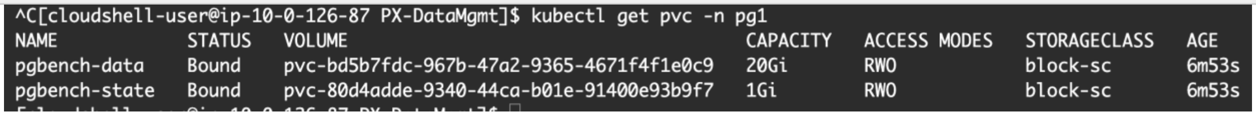
AWS CloudShell

us-west-2

```
Every 2.0s: kubectl get events --field-selector involvedObject.kind=AutopilotRule,involvedObject.name=volume-resize --all-namespaces --sort-by .lastTimestamp

NAMESPACE   LAST SEEN   TYPE     REASON       OBJECT                         MESSAGE
default     91s         Normal   Transition   autopilotrule/volume-resize   rule: volume-resize:pvc-c54635df-ae8c-42c9-a8f6-e9e530a4e017 transition from  => Initializing
default     91s         Normal   Transition   autopilotrule/volume-resize   rule: volume-resize:pvc-c54635df-ae8c-42c9-a8f6-e9e530a4e017 transition from Initializing => Normal
default     61s         Normal   Transition   autopilotrule/volume-resize   rule: volume-resize:pvc-c54635df-ae8c-42c9-a8f6-e9e530a4e017 transition from Normal => Triggered
default     25s         Normal   Transition   autopilotrule/volume-resize   rule: volume-resize:pvc-c54635df-ae8c-42c9-a8f6-e9e530a4e017 transition from Triggered => ActiveActionsPending
default     21s         Normal   Transition   autopilotrule/volume-resize   rule: volume-resize:pvc-c54635df-ae8c-42c9-a8f6-e9e530a4e017 transition from ActiveActionsPending => ActiveActionsInProgress
default     17s         Normal   Transition   autopilotrule/volume-resize   rule: volume-resize:pvc-c54635df-ae8c-42c9-a8f6-e9e530a4e017 transition from ActiveActionsInProgress => ActiveActionsTaken
```

5. Once you see ActiveActionsTaken, we can check the size of the PVC again.

```
kubectl get pvc -n pg1
```



```
^C[cloudshell-user@ip-10-0-126-87 PX-DataMgmt]$ kubectl get pvc -n pg1
NAME            STATUS   VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS   AGE
pgbench-data    Bound    pvc-bd5b7fdc-967b-47a2-9365-4671f4f1e0c9   20Gi       RWO            block-sc       6m53s
pgbench-state   Bound    pvc-80d4adde-9340-44ca-b01e-91400e93b9f7   1Gi        RWO            block-sc       6m53s
```

6. As you can see the size of the volume has now been increased to 20Gi to accommodate for the increased application requirement. Following the rule, these expansion operations will continue till you hit a max size of 100GB.

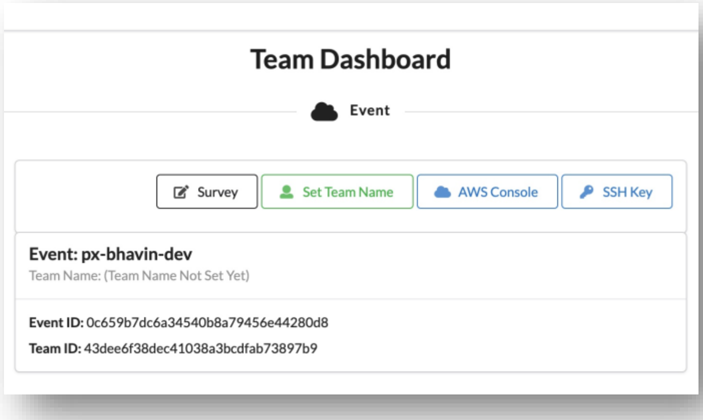
This is how Portworx allows you to reduce the operational burden when it comes to Day 2 operations for Amazon EKS clusters.

Clean Up

1. Once you are done with the lab, navigate back to AWS CloudShell and use the following commands to clean up the resources deployed.

```
./cleanup.sh
```

2. Go back to the AWS Event Engine dashboard and click *"Survey"* to complete the survey.



Team Dashboard

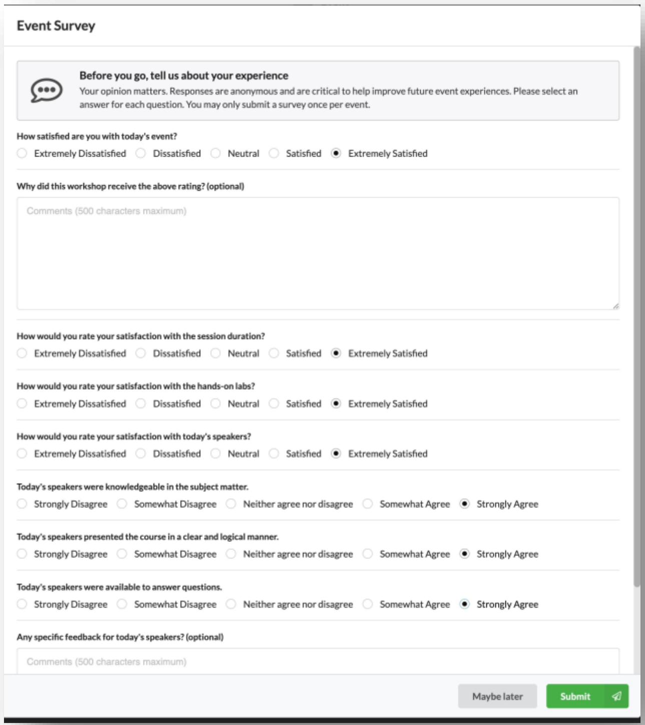
Event

Event: px-bhavin-dev

Team Name: (Team Name Not Set Yet)

Event ID: 0c659b7dc6a34540b8a79456e44280d8

Team ID: 43dee6f38dec41038a3bcdfab73897b9



Event Survey

Before you go, tell us about your experience

Your opinion matters. Responses are anonymous and are critical to help improve future event experiences. Please select an answer for each question. You may only submit a survey once per event.

How satisfied are you with today's event?

Extremely Dissatisfied Dissatisfied Neutral Satisfied [✓ Extremely Satisfied]

Why did this workshop receive the above rating? (optional)

Comments (500 characters maximum)

How would you rate your satisfaction with the session duration?

Extremely Dissatisfied Dissatisfied Neutral Satisfied [✓ Extremely Satisfied]

How would you rate your satisfaction with the hands-on labs?

Extremely Dissatisfied Dissatisfied Neutral Satisfied [✓ Extremely Satisfied]

How would you rate your satisfaction with today's speakers?

Extremely Dissatisfied Dissatisfied Neutral Satisfied [✓ Extremely Satisfied]

Today's speakers were knowledgeable in the subject matter.

Strongly Disagree Somewhat Disagree Neither agree nor disagree Somewhat Agree [✓ Strongly Agree]

Today's speakers presented the course in a clear and logical manner.

Strongly Disagree Somewhat Disagree Neither agree nor disagree Somewhat Agree [✓ Strongly Agree]

Today's speakers were available to answer questions.

Strongly Disagree Somewhat Disagree Neither agree nor disagree Somewhat Agree [✓ Strongly Agree]

Any specific feedback for today's speakers? (optional)

Comments (500 characters maximum)

3. Once you have filled out the survey, click *"Exit Event"* from the top right of the dashboard.

Additional Resources

- Portworx Blogs
- Portworx Demos
- Portworx Documentation