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9 Steps to Setup Kubernetes on AWS using KOPS

November 25, 2021 by Shivdas Kanade

InIn this article We are going to perform How to Setup Kubernetes on AWS using KOPS.

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What is KOPS in Kubernetes?

Kops (Kubernetes Operations) used to you create, destroy, upgrade and maintain production-grade, highly available, Kubernetes clusters using command line.

Kubernetes KOPS Features

- Automatic creation of Kubernetes clusters in AWS and GCE
- We can create multi master with HA
- Automatic creation of VPC, Security Groups, etc., while creating Cluster
- Support Public and Private DNS
- Runs in Auto scaling
- We can Add and Edit the Cluster configuration such as Master and worker nodes

Below are prerequisites to setup kubernetes on aws using kops.

1. AWS account
2. Create a Domain to Access Kubernetes API

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6. Ubuntu 20.04/18.04/16.04 LTS with minimal installation
7. AWS-CLI

Assuming you have created Ubuntu Instance in your AWS account.

Step #1: Install AWS CLI on Ubuntu

To download the latest AWS CLI version for 64 bit Linux using curl use below command

```
curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"
```

if you want download specific version of AWS CLI version then use below command

```
curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64-awscliversion.zip" -o "awscliv2.zip"
```

To download AWS CLI Version 2.0.30 use below command

```
curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64-2.0.30.zip" -o "awscliv2.zip"
```

Install the unzip on Ubuntu if not installed

```
sudo apt install unzip
```

Extract AWS CLI Setup on Linux using unzip

```
unzip awscliv2.zip
```

Install AWS CLI on Linux

once extracted Install AWS CLI on Linux using below command

```
sudo ./aws/install
```

Output:

```
sudo ./aws/install
You can now run: /usr/local/bin/aws --version
```

Check the AWS CLI version using command line on Linux

```
/usr/local/bin/aws --version
```

Output:

```
aws-cli/2.1.28 Python/3.8.8 Linux/4.14.214-160.339.amzn2.x86_64 exe/x86_64.amzn.2
prompt/off
```
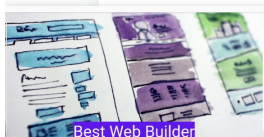
OR

```
aws --version
```

Output:

Step #2: Install Kubectl Binary with CURL on Ubuntu

Download kubectl binary with curl on Ubuntu using below command

```
sudo curl -LO https://storage.googleapis.com/kubernetes-release/release/$(curl -s h
```

Make the kubectl binary executable

```
sudo chmod +x ./kubectl
```

Move kubectl to /usr/local/bin/kubectl directory

```
sudo mv ./kubectl /usr/local/bin/kubectl
```

Step #3: Install KOPS on Ubuntu Instance

Download the KOPS setup on Ubuntu using curl

```
curl -LO https://github.com/kubernetes/kops/releases/download/$(curl -s https://apt
```

set the execution permission

```
sudo chmod +x kops-linux-amd64
```

move the kops to /usr/local/bin directory

```
sudo mv kops-linux-amd64 /usr/local/bin/kops
```

Step #4: Creating Domain and Hosted Zone in AWS

Kubernetes kops need DNS to discover within cluster and to connect Kubernetes API Server from Clients

You can create either public or private hosted zone, if you created public hosted zone you have to point AWS nameservers in Domain.

Here We have domain in GoDaddy, created public hosted zone in AWS and pointed AWS nameservers in GoDaddy Domain

We have created domain **k8s.fosstechnix.com,**

Step #5: Create and configure IAM User in AWS

Create IAM user in AWS using login console -> IAM -> ADD User -> Username -> Select

```
aws configure
```

Step #6: Create IAM User with full S3, EC2, Route53 and VPC access in AWS

Now create IAM user with full S3, EC2, Route 53 and VPC access in your AWS account as shown below

1. AmazonS3FullAccess
2. AmazonEC2FullAccess
3. AmazonRoute53FullAccess
4. IAMFullAccess
5. AmazonVPCFullAccess

Step #7: Creating S3 Bucket using command line

Create the S3 bucket to store Kubernetes cluster states

```
aws s3 mb s3://k8s.fosstechnix.info
```

Enable versioning on S3 bucket

```
aws s3api put-bucket-versioning --bucket k8s.fosstechnix.info --versioning-configu
```

Export kops state

```
export KOPS_STATE_STORE=s3://k8s.fosstechnix.info
```

Step #8: Create SSH Keys

Create ssh keys on Ubuntu instance to exchange kubernetes cluster and connect

```
ssh-keygen
```

Step #9: Setup Kubernetes on AWS using KOPS

Create Kubernetes on AWS using Kops using below command

```
kops create cluster --cloud=aws --zones=ap-south-1a --name=k8s.fosstechnix.info --
```

If you want to create K8s cluster using multimaster and different availability zone use below command

```
kops create cluster --cloud=aws --zones=ap-south-1a,ap-south-1b --networking calic
```

Sample Output:

```
Must specify --yes to apply changes

Cluster configuration has been created.

Suggestions:
* list clusters with: kops get cluster
* edit this cluster with: kops edit cluster k8s.fosstechnix.info
* edit your node instance group: kops edit ig --name=k8s.fosstechnix.info nodes-us-
* edit your master instance group: kops edit ig --name=k8s.fosstechnix.info master-

Finally configure your cluster with: kops update cluster --name k8s.fosstechnix.inf
```

Configure the k8s kops cluster using below command,

```
kops update cluster k8s.fosstechnix.info --yes --admin
```

Sample Output:

```
Cluster is starting.  It should be ready in a few minutes.

 Suggestions:

 * validate cluster: kops validate cluster

 * list nodes: kubectl get nodes --show-labels

 * ssh to the master: ssh -i ~/.ssh/id_rsa admin@api.k8s.fosstechnix.info

 * the admin user is specific to Debian. If not using Debian please use the appropr

 * read about installing addons at: https://github.com/kubernetes/kops/blob/master/
```

Validate the Kubernetes KOPS cluster

```
kops validate cluster
```

To list the nodes

```
kubectl get nodes
```

To get Cluster Information

```
kubectl cluster-info
```

To delete Kubernetes KOPS cluster

```
kops delete cluster k8s.fosstechnix.info --yes
```

```
kops get ig
```

Output:

```
Using cluster from kubectl context: k8s.fosstechnix.info

NAME ROLE MACHINETYPE MIN MAX ZONES
master-ap-south-1a Master t3.medium 1 1 ap-south-1a
nodes-ap-south-1a Node t3.medium 1 1 ap-south-1a
```

```
kops edit ig master-ap-south-1a
```

Output:

```
apiVersion: kops.k8s.io/v1alpha2
kind: InstanceGroup
metadata:
creationTimestamp: "2021-03-06T05:29:52Z"
labels:
kops.k8s.io/cluster: k8s.fosstechnix.info
name: master-ap-south-1a
spec:
image: 099720109477/ubuntu/images/hvm-ssd/ubuntu-focal-20.04-amd64-server-20210119
machineType: t3.medium
maxSize: 1
minSize: 1
nodeLabels:
kops.k8s.io/instancegroup: master-ap-south-1a
role: Master
subnets:
- ap-south-1a
```

Troubleshooting:

```
kubectl get nodes
```

Error:

```
You must be logged in to the server (Unauthorized)
```

if you are getting above error on Kubernetes kops cluster

Solution:

Login to Kubernetes kops cluster Master node from management node

```
ssh -i ~/.ssh/id_rsa ubuntu@api.k8s.fosstechnix.info
```

Navigate to .kube directory

```
cd .kube
```

copy the `client-certificate-data` and `client-key-data` values, exit from master node

Replace above values to management node **/.kube/config** file

Error: exactly one 'admin' SSH public key can be specified when running with AWS; please delete a key using `kops delete secret`

Solution:

To check list of secrets in Kubernetes Kops cluster

```
kops get secret
```

Output:

```
TYPE             NAME                          ID

Keypair          apiserver-aggregator-ca       6933429814222041362322666137

Keypair          ca                            6933429813663588303876984541

Keypair          etcd-clients-ca               6933429813788008634835356814

Keypair          etcd-manager-ca-events        6933429814919214502125133873

Keypair          etcd-manager-ca-main          6933429813961434714756350017

Keypair          etcd-peers-ca-events          6933429814048350100913985823

Keypair          etcd-peers-ca-main            6933429814135513819119005976

Keypair          master                        6933429813874453479985214673

SSHPublicKey     admin                         01:98:16:b4:a0:44:99:6c:a8:f7:6c:3b

SSHPublicKey     admin                         6e:14:33:11:9c:4a:0c:0a:70:68:53:c1

SSHPublicKey     admin                         78:6a:e1:00:74:e6:ee:95:fa:32:fc:ae

Secret           admin

Secret           kube

Secret           kube-proxy

Secret           kubelet

Secret           system:controller_manager

Secret           system:dns

Secret           system:logging

Secret           system:monitoring

Secret           system:scheduler
```
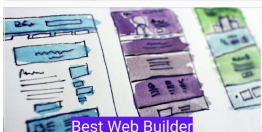
Delete the duplicate secret from kops cluster using below command

```
kops delete secret SSHPublicKey admin 78:6a:e1:00:74:e6:ee:95:fa:32:fc:ae:2a:d7:63
```

Creating Kubernetes KOPS Cluster in Existing VPC

```
export KOPS_STATE_STORE=s3://k8s.fosstechnix.info
```

Export the cluster name

```
export CLUSTER_NAME=k8s.fosstechnix.info
```

Export the existing AWS VPC

```
export VPC_ID=VPC_ID
```

Export the VPC CIDR range

```
export NETWORK_CIDR=172.20.0.0/16
```

Now create Kubernetes Kops cluster

```
kops create cluster --zones=ap-south-1a,ap-south-1b --name=${CLUSTER_NAME} --vpc=$
```

To create a secret on Kubernetes KOPS cluster

```
kops create secret --name k8s.fosstechnix.info sshpublickey admin -i ~/.ssh/id_rsa
```

Login to kops master node

```
ssh -i ~/.ssh/id_rsa ubuntu@api.k8s.fosstechnix.info
```

Conclusion:

We have covered How to Setup Kubernetes on AWS using KOPS, install kops, install kubectl, creating S3 bucket, genrate ssh keygen.

Related Articles:

- How to Setup Kubernetes Dashboard
- How To Setup Kubernetes Cluster Using Kubeadm on Ubuntu 18.04/16.04 LTS
- Deploy to Kubernetes using Helm and GitLab
- How to Install AWS CLI on Windows
- How to Install Minikube on Ubuntu

Reference:

Kubernetes Official Guide

Sharing is Caring:
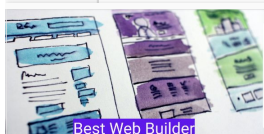
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Shivdas Kanade

I am Shivdas Kanade working as Senior Site Reliability Engineer(SRE) on Cloud, DevOps, Docker and Kubernetes . Believes in Sharing Knowledge.

4 thoughts on "9 Steps to Setup Kubernetes on AWS using KOPS"

Ashwath
July 20, 2020 at 4:32 AM

Can you please help me with private dns zone syntax instead of public DNS.

Reply

FOSS TechNix
July 20, 2020 at 5:12 AM

Hello Ashwath,

Please use below syntax for private DNS
kops create cluster –cloud=aws –zones=ap-south-1a –name=k8s.fosstechnix.com –dns-zone=k8s.fosstechnix.com –dns private

Reply

Sunil Bhimanapalli
February 24, 2021 at 4:39 AM

ubuntu@ip-172-31-22-237:~$ kops update cluster sunil-k8s.xyz –yes
I0224 04:28:45.362973 13729 dns.go:97] Private DNS: skipping DNS validation
I0224 04:28:45.740729 13729 executor.go:111] Tasks: 0 done / 79 total; 44 can run
W0224 04:28:45.838261 13729 vfs_castore.go:604] CA private key was not found
I0224 04:28:45.849785 13729 keypair.go:195] Issuing new certificate: "apiserver-aggregator-ca"
I0224 04:28:45.879178 13729 keypair.go:195] Issuing new certificate: "etcd-clients-ca"
I0224 04:28:45.940271 13729 keypair.go:195] Issuing new certificate: "etcd-manager-ca-main"
W0224 04:28:45.960099 13729 vfs_castore.go:604] CA private key was not found
I0224 04:28:45.960230 13729 keypair.go:195] Issuing new certificate: "ca"
I0224 04:28:46.020605 13729 keypair.go:195] Issuing new certificate: "etcd-peers-ca-main"
I0224 04:28:46.040859 13729 keypair.go:195] Issuing new certificate: "etcd-peers-ca-events"
I0224 04:28:46.081525 13729 keypair.go:195] Issuing new certificate: "master"
I0224 04:28:46.384669 13729 keypair.go:195] Issuing new certificate: "etcd-manager-ca-events"
I0224 04:28:48.110174 13729 executor.go:111] Tasks: 44 done / 79 total; 15 can run
I0224 04:28:48.992312 13729 executor.go:111] Tasks: 59 done / 79 total; 18 can run
I0224 04:28:49.763387 13729 executor.go:111] Tasks: 77 done / 79 total; 2 can run
I0224 04:28:50.838421 13729 executor.go:137] Task "AutoscalingGroup/nodes-us-east-1a.sunil-k8s.xyz" not ready: waiting for the IAM Instance Profile to be propagated
I0224 04:28:50.838631 13729 executor.go:137] Task "AutoscalingGroup/master-us-east-1a.masters.sunil-k8s.xyz" not ready: waiting for the IAM Instance Profile to be propagated
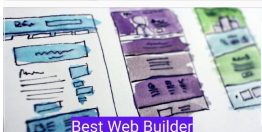
I0224 04:29:02.580279 13729 executor.go:111] Tasks: 79 done / 79 total; 0 can run
I0224 04:29:02.580496 13729 dns.go:157] Pre-creating DNS records
I0224 04:29:02.993496 13729 update_cluster.go:313] Exporting kubecfg for cluster
W0224 04:29:03.033873 13729 create_kubecfg.go:91] Did not find API endpoint for gossip hostname; may not be able to reach cluster
kops has set your kubectl context to sunil-k8s.xyz
W0224 04:29:03.082836 13729 update_cluster.go:337] Exported kubecfg with no user authentication; use –admin, –user or –auth-plugin flags with `kops export kubecfg`

Cluster is starting. It should be ready in a few minutes.

I got the error as CA private key was not found. I dont know how to resolve this issue. pls help me

Reply

> **FOSS TechNix**
> February 24, 2021 at 5:31 AM
>
> as per error message, follow below link.
>
> https://kops.sigs.k8s.io/cli/kops_export_kubecfg/
>
> Reply

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