

CAPSTONE PROJECT (Course-end Project 1)

Infra Optimization

DESCRIPTION:

Create a DevOps infrastructure for an e-commerce application to run on high-availability mode.

Background of the problem statement:

A popular payment application, EasyPay where users add money to their wallet accounts, faces an issue in its payment success rate. The timeout that occurs with the connectivity of the database has been the reason for the issue.

While troubleshooting, it is found that the database server has several downtime instances at irregular intervals. This situation compels the company to create their own infrastructure that runs in high-availability mode.

Given that online shopping experiences continue to evolve as per customer expectations, the developers are driven to make their app more reliable, fast, and secure for improving the performance of the current system.

Implementation requirements:

1. Create the cluster (EC2 instances with load balancer and elastic IP in case of AWS)
2. Automate the provisioning of an EC2 instance using Ansible or Chef Puppet
3. Install Docker and Kubernetes on the cluster
4. Implement the network policies at the database pod to allow ingress traffic from the front-end application pod
5. Create a new user with permissions to create, list, get, update, and delete pods
6. Configure application on the pod
7. Take snapshot of ETCD database
8. Set criteria such that if the memory of CPU goes beyond 50%, environments automatically get scaled up and configured

Tools used:

- ★ EC2
- ★ Kubernetes
- ★ Docker
- ★ Ansible or Chef or Puppet

Create the cluster (EC2 instances with load balancer and elastic IP)

Implement the automation distribution of incoming web traffic across EC2 instances on the AWS cloud.

→ ELB (Amazon Elastic Load Balancing):

ELB automatically distributes incoming application traffic across multiple targets and virtual appliances in one or more Availability Zones (AZs).

Advantages of ELB:

- ❖ ELB automatically distributes incoming application traffic across multiple targets, such as EC2 instances, containers, and IP addresses to achieve high availability.
- ❖ It can automatically scale to handle change in traffic demand, allowing to maintain consistent application performance.
- ❖ It can monitor the health of its registered targets and route traffic only to the healthy targets.
- ❖ It evenly distributes traffic across all availability zones in a region, improving fault tolerance.

Disadvantages of ELB:

- ELB can add latency to the application, as traffic must pass through the load balancer before being route to the targets
- It has limited customization options, so additional tools and services are needed to fully meet application's requirements.
- It can introduce additional complexity to the application architecture, requiring management and maintenance of additional resources.
- It can increase overall AWS costs, especially if there are high traffic volumes or require multiple load balancers.

Different types of Load Balancer:

There are 4 types of ELB-

- Classic Load Balancer:
It's the traditional form of load balancer. It distributes the traffic among the instances and is not intelligent enough to support host-based routing or path-based routing. It ends up reducing efficiency and performance in certain situations. It is operated on connection level as well as requesting level. Classic Load Balancer is in the Transport Layer (TCP/SSL) or the Application Layer (HTTP/HTTPS).
- Application Load Balancer:
This type of Load Balancer is used when decisions are to be made related to HTTP/HTTPS/ Nginx traffic routing. It supports path-based routing and host-based routing. This Load Balancing works at the Application Layer of the OSI Model. It also supports dynamic host port mapping.
- Network Load Balancer:
It works at the Transport Layer (TCP/SSL) of the OSI Model. It's capable of handling millions of requests per second. It's mainly used for load balancing TCP traffic.
- Gateway Load Balancer:

Gateway Load Balancer provides the facility to deploy, scale, and manage virtual appliances like firewalls. Gateway Load Balancer combines a transparent network gateway and then distributes the traffic.

Steps to configure our Application Load Balancer on AWS:

Create 4 EC2 instances and deploy 4 Availability zones(AZ). Make sure to have a Load balancer to distribute the traffic.

ELB can manage traffic across single or multiple AZ.

- ❖ Create Security Group
- ❖ Create 4 EC2 instances
- ❖ Create Target group
- ❖ Create Load Balancer
- ❖ Test Load Balancer
- ❖ Create Rules
- ❖ Test Rules

❖ Create Security Group

The screenshot shows the AWS EC2 console with the 'Create security group' wizard. The top navigation bar includes the AWS logo, Services dropdown, a search bar, and account information for 'N. Virginia' and 'Haritha Pappu'. The breadcrumb path 'EC2 > Security Groups > Create security group' is visible. The main section is titled 'Create security group' with an 'Info' link. A note states: 'A security group acts as a virtual firewall for your instance to control inbound and outbound traffic. To create a new security group, complete the fields below.' The 'Basic details' section contains fields for 'Security group name' (set to 'LB_Capstone_SecGrp'), 'Description' (set to 'Allow SSH, HTTP, HTTPS'), and 'VPC' (set to 'vpc-06292ffcc66a090247'). Below this is the 'Inbound rules' section, which is currently empty. At the bottom, there are links for CloudShell, Feedback, Language, and a footer with copyright information and links for Privacy, Terms, and Cookie preferences.

Inbound rules [Info](#)

Type	Info	Protocol	Port range	Info	Source	Info	Description - optional	Info
SSH	Info	TCP	22	Info	Anywh...	Search	Allow SSH	Delete
							0.0.0.0/0 X	
HTTP	Info	TCP	80	Info	Anywh...	Search	Allow HTTP	Delete
							0.0.0.0/0 X	
HTTPS	Info	TCP	443	Info	Anywh...	Search	Allow HTTPS	Delete
							0.0.0.0/0 X	

[Add rule](#)

Outbound rules [Info](#)

Type	Info	Protocol	Port range	Info	Destination	Info	Description - optional	Info
All traffic	Info	All	All	Info	Custom	Search		Delete
							0.0.0.0/0 X	

[Add rule](#)

Tags - optional
A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.

No tags associated with the resource.

[Add new tag](#)

You can add up to 50 more tags

[CloudShell](#) [Feedback](#) [Language](#)

© 2023, Amazon Web Services, Inc. or its affiliates. [Privacy](#) [Terms](#) [Cookie preferences](#)

[Cancel](#) [Create security group](#)

The screenshot shows the AWS EC2 Security Groups page. A green success message at the top states: "Security group (sg-007749f6c416f5fce | LB_Capstone_SecGrp) was created successfully". Below this, the security group details are shown:

Security group name	sg-007749f6c416f5fce	Description	VPC ID
Owner	067136115303	Inbound rules count	3 Permission entries
		Outbound rules count	1 Permission entry

Below the details, there are tabs for "Inbound rules", "Outbound rules", and "Tags". A message box says: "You can now check network connectivity with Reachability Analyzer" with a "Run Reachability Analyzer" button.

The screenshot shows the "Inbound rules" section for the security group. It displays three rules:

Name	Security group rule...	IP version	Type	Protocol
sgr-032524fc35ff8e2fe	IPv4	HTTP	TCP	
sgr-04e2d7ef95ca5c14	IPv4	HTTPS	TCP	
sgr-02851257d8a6cfe41	IPv4	SSH	TCP	

A "Filter security group rules" input field and "Edit inbound rules" buttons are also present.

❖ Create 4 EC2 instances

Launch 4 servers on AWS LBInstance1, LBInstance2, LBInstance3 and LBInstance4
 Below is the script to add in the user data to create the websites.

```
#!/bin/bash
# Use this for your user data (script from top to bottom)
# install httpd (Linux 2 version)
yum update -y
yum install -y httpd
systemctl start httpd
systemctl enable httpd
echo "<h1>Hello World from $(hostname -f)</h1>" >
/var/www/html/index.html
```

Launch an instance Info

Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.

Name and tags Info

Name Add additional tags

Application and OS Images (Amazon Machine Image) Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Search our full catalog including 1000s of application and OS images

Recents Quick Start

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

Application and OS Images (Amazon Machine Image) Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Search our full catalog including 1000s of application and OS images

Recents Quick Start

Amazon Linux macOS Ubuntu Windows Red Hat SUSE

Browse more AMIs

Including AMIs from AWS, Marketplace and the Community

Amazon Machine Image (AMI)

Amazon Linux 2023 AMI
ami-0715c1897453cabd1 (64-bit (x86)) / ami-041c36ce1b70dfc41 (64-bit (Arm))
Virtualization: hvm ENA enabled: true Root device type: ebs

Free tier eligible

Description

Amazon Linux 2023 AMI 2023.0.20230517.1 x86_64 HVM kernel-6.1

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

harith | Untitled | Untitled | Calte | Kuber | 1665 | All M | AWS | Untitled | Untitled | Untitled | Untitled | Untitled | Launch | El | Create | Run c | +

https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances:

New EC2 Experience Tell us what you think X

Services [Alt+S] ? ...

EC2 Dashboard EC2 Global View Events Limits

Instances Instances Instance Types Launch Templates Spot Requests Savings Plans Reserved Instances Dedicated Hosts Scheduled Instances Capacity Reservations

Images AMIs

Instance type Info

Instance type t2.micro Free tier eligible All generations Compare instance types

Family: t2 1 vCPU 1 GiB Memory Current generation: true
On-Demand Windows pricing: 0.0162 USD per Hour
On-Demand SUSE pricing: 0.0116 USD per Hour
On-Demand RHEL pricing: 0.0716 USD per Hour
On-Demand Linux pricing: 0.0116 USD per Hour

Key pair (login) Info

You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.

Key pair name - required Create new key pair

Network settings Info

Edit

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

CloudShell Feedback Language

The screenshot shows the AWS EC2 Launch Instances interface. On the left, a sidebar lists navigation options like EC2 Dashboard, Instances, and Images. The main area is titled 'Instance type' and shows a selected 't2.micro' instance. It provides details such as family, CPU, memory, current generation status, and On-Demand pricing for Windows, SUSE, RHEL, and Linux. Below this is a 'Key pair (login)' section where 'newKeyPairLB1' is specified. At the bottom, there's a 'Network settings' section with an 'Edit' button. The footer includes copyright information and links to Privacy, Terms, and Cookie preferences.

Create key pair

X

Key pair name

Key pairs allow you to connect to your instance securely.

The name can include upto 255 ASCII characters. It can't include leading or trailing spaces.

Key pair type

RSA

RSA encrypted private and public key pair

ED25519

ED25519 encrypted private and public key pair

Private key file format

.pem

For use with OpenSSH

.ppk

For use with PuTTY

[Cancel](#)

[Create key pair](#)

Network settings [Info](#)

Network [Info](#)
vpc-06292ffcc66a090247

Subnet [Info](#)
No preference (Default subnet in any availability zone)

Auto-assign public IP [Info](#)
Enable

Firewall (security groups) [Info](#)
A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.

Create security group Select existing security group

We'll create a new security group called 'launch-wizard-3' with the following rules:

Allow SSH traffic from Anywhere
Helps you connect to your instance 0.0.0.0/0

Allow HTTPS traffic from the internet
To set up an endpoint, for example when creating a web server

Allow HTTP traffic from the internet
To set up an endpoint, for example when creating a web server

© 2023, Amazon Web Services, Inc. or its affiliates. [Privacy](#) [Terms](#) [Cookie preferences](#)

Configure storage [Info](#) [Advanced](#)

1x GiB Root volume (Not encrypted)

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage

[Add new volume](#)

0 x File systems [Edit](#)

Advanced details [Info](#)

Purchasing option [Info](#)
 Request Spot Instances

Domain join directory [Info](#)
 [Create new directory](#)

© 2023, Amazon Web Services, Inc. or its affiliates. [Privacy](#) [Terms](#) [Cookie preferences](#)

New EC2 Experience Tell us what you think

EC2 Dashboard
EC2 Global View
Events
Limits

Instances

Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Scheduled Instances
Capacity Reservations

Images

AMIs

CloudShell Feedback Language

User data - *optional* [Info](#)
Enter user data in the field.

```
#!/bin/bash
# Use this for your user data (script from top to bottom)
# install httpd (Linux 2 version)
yum update -y
yum install -y httpd
systemctl start httpd
systemctl enable httpd
echo "<h1>Hello World from $(hostname -f)</h1>" > /var/www/html/index.html
```

User data has already been base64 encoded

Summary

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

New EC2 Experience Tell us what you think

EC2 Dashboard
EC2 Global View
Events
Limits

Instances

Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Scheduled Instances
Capacity Reservations

Images

AMIs

CloudShell Feedback Language

▼ Summary

Number of instances [Info](#)
1

Software Image (AMI)
Amazon Linux 2023 AMI 2023.0.2...[read more](#)
ami-0715c189745cabd1

Virtual server type (instance type)
t2.micro

Firewall (security group)
New security group

Storage (volumes)
1 volume(s) - 8 GiB

[Cancel](#) [Launch instance](#) [Review commands](#)

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

Screenshot of the AWS EC2 Instances Launch an instance page showing a successful launch.

Success
Successfully initiated launch of instance (i-0b5cb4dc5d344d3b1)

Launch log

Initializing requests	Succeeded
Creating security groups	Succeeded
Creating security group rules	Succeeded
Launch initiation	Succeeded

Next Steps

Q. What would you like to do next with this instance, for example "create alarm" or "create back"

1 2 3 4 5 6 7 >

Screenshot of the AWS EC2 Instances page showing the instance summary for i-0b5cb4dc5d344d3b1.

Instance summary for i-0b5cb4dc5d344d3b1 (LBInstance1) Info

Updated less than a minute ago

Instance ID	Public IPv4 address	Private IPv4 addresses
i-0b5cb4dc5d344d3b1 (LBInstance1)	3.89.112.152 open address	172.31.89.118
IPv6 address	Instance state	Public IPv4 DNS
-	Running	ec2-3-89-112-152.compute-1.amazonaws.com open address
Hostname type	Private IP DNS name (IPv4 only)	Elastic IP addresses
IP name: ip-172-31-89-118.ec2.internal	ip-172-31-89-118.ec2.internal	-
Answer private resource DNS name	Instance type	AWS Compute Optimizer finding
IPv4 (A)	t2.micro	Opt-in to AWS Compute Optimizer for recommendations.
Auto-assigned IP address	VPC ID	Learn more
3.89.112.152 [Public IP]	vpc-06292ffc66a090247	
IAM Role	Subnet ID	Auto Scaling Group name
-	subnet-09a1953a0c5a05bc5	-
IMDSv2		

EC2 > Instances > i-05c40c711ecd949d3

Instance summary for i-05c40c711ecd949d3 (LBInstance2)

Updated less than a minute ago

Instance ID	Public IPv4 address	Private IPv4 addresses
i-05c40c711ecd949d3 (LBInstance2)	18.212.82.121 open address	172.31.30.34
IPv6 address	Instance state	Public IPv4 DNS
-	Running	ec2-18-212-82-121.compute-1.amazonaws.com open address
Hostname type	Private IP DNS name (IPv4 only)	Elastic IP addresses
IP name: ip-172-31-30-34.ec2.internal	ip-172-31-30-34.ec2.internal	-
Answer private resource DNS name	Instance type	AWS Compute Optimizer finding
IPv4 (A)	t2.micro	Opt-in to AWS Compute Optimizer for recommendations.
Auto-assigned IP address	VPC ID	Learn more
18.212.82.121 [Public IP]	vpc-06292ffc66a090247	
IAM Role	Subnet ID	Auto Scaling Group name
-	subnet-0efbf9419bd90821d	-
IMDSv2		

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

EC2 > Instances > i-04b6e701bc2f322e3

Instance summary for i-04b6e701bc2f322e3 (LBInstance3)

Updated less than a minute ago

Instance ID	Public IPv4 address	Private IPv4 addresses
i-04b6e701bc2f322e3 (LBInstance3)	44.208.34.144 open address	172.31.88.113
IPv6 address	Instance state	Public IPv4 DNS
-	Running	ec2-44-208-34-144.compute-1.amazonaws.com open address
Hostname type	Private IP DNS name (IPv4 only)	Elastic IP addresses
IP name: ip-172-31-88-113.ec2.internal	ip-172-31-88-113.ec2.internal	-
Answer private resource DNS name	Instance type	AWS Compute Optimizer finding
IPv4 (A)	t2.micro	Opt-in to AWS Compute Optimizer for recommendations.
Auto-assigned IP address	VPC ID	Learn more
44.208.34.144 [Public IP]	vpc-06292ffc66a090247	
IAM Role	Subnet ID	Auto Scaling Group name
-	subnet-09a1953a0c5a05bc5	-
IMDSv2		

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

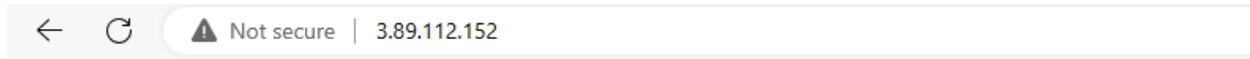
The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with navigation links like EC2 Dashboard, EC2 Global View, Events, Limits, Instances, Images, and CloudShell. The main area displays the instance summary for LBInstance4. Key details shown include:

- Instance ID: i-09b00e7e2b57d417c (LBInstance4)
- Public IPv4 address: 54.174.20.125 (highlighted with a yellow circle)
- Instance state: Running
- Private IP DNS name (IPv4 only): ip-172-31-92-223.ec2.internal
- Instance type: t2.micro
- VPC ID: vpc-06292ffc66a090247
- Subnet ID: subnet-09a1953a0c5a05bc5

On the right side, there are sections for Private IPv4 addresses (172.31.92.223), Public IPv4 DNS (ec2-54-174-20-125.compute-1.amazonaws.com), and Elastic IP addresses.

Snapshots of Websites successfully working:

LBInstance1



Hello World from ip-172-31-89-118.ec2.internal

LBInstance2-



Hello World from ip-172-31-30-34.ec2.internal

LBInstance3-



Hello World from ip-172-31-88-113.ec2.internal

LBInstance4-



Hello World from ip-172-31-92-223.ec2.internal

Assign the security group created in the previous step(LB_Capstone_SecGrp) for all the instances:

The screenshot shows the AWS EC2 Instances Change security groups interface. At the top, the navigation bar includes 'EC2 > Instances > i-0b5cb4dc5d344d3b1 > Change security groups'. The main area has two tabs: 'Instance details' (selected) and 'Associated security groups'. In the 'Instance details' tab, it shows the Instance ID as 'i-0b5cb4dc5d344d3b1 (LBInstance1)' and the Network interface ID as 'eni-0697efead01d50ab3'. In the 'Associated security groups' tab, there is a search bar with 'sg-007749f6c416f5fc' and an 'Add security group' button. Below the search bar is a table titled 'Security groups associated with the network interface (eni-0697efead01d50ab3)'. The table has columns for 'Security group name' and 'Security group ID'. A single row is visible, corresponding to the selected security group.

❖ Create Target group

The screenshot shows the 'Create target group' wizard in the AWS EC2 service. The current step is 'Step 1 Specify group details'. On the left, there are two tabs: 'Specify group details' (selected) and 'Register targets'. The main area is titled 'Register targets' with the sub-instruction: 'This is an optional step to create a target group. However, to ensure that your load balancer routes traffic to this target group you must register your targets.' Below this, a table titled 'Available instances (2/5)' lists five instances. Two instances have checkboxes checked: 'i-05c40c711ecd949d3' and 'i-0b5cb4dc5d344d3b1', both labeled 'LBInstance2' and 'Running'.

Instance ID	Name	Status	Security groups
i-09b00e7e2b57d417c	LBInstance4	Running	launch-wizard-6
i-04b6e701bc2f322e3	LBInstance3	Running	launch-wizard-5
<input checked="" type="checkbox"/> i-05c40c711ecd949d3	LBInstance2	Running	launch-wizard-4
<input checked="" type="checkbox"/> i-0b5cb4dc5d344d3b1	LBInstance1	Running	launch-wizard-3

The screenshot shows the 'Create target group' wizard in the AWS EC2 service, currently at 'Step 2 Register targets'. The top section shows '2 selected' instances and a port configuration of '80'. A button 'Include as pending below' is available. The bottom section, titled 'Review targets', shows a table for adding targets. It includes a 'Targets (0)' header, a 'Remove all pending' button, and a note: 'No instances added yet. Specify instances above, or leave the group empty if you prefer to add targets later.'

All	Filter resources by property or value							
Remove	Health status	Instance ID	Name	Port	State	Security groups	Zone	Sub

aws | Services | Search [Alt+S] | N. Virginia | Haritha Pappu

New EC2 Experience Tell us what you think

EC2 Dashboard
EC2 Global View
Events
Limits

Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Scheduled Instances
Capacity Reservations

Images
AMIs

CloudShell Feedback Language

Successfully created target group: LBInstance1andLBInstanc...ce2

EC2 > Target groups

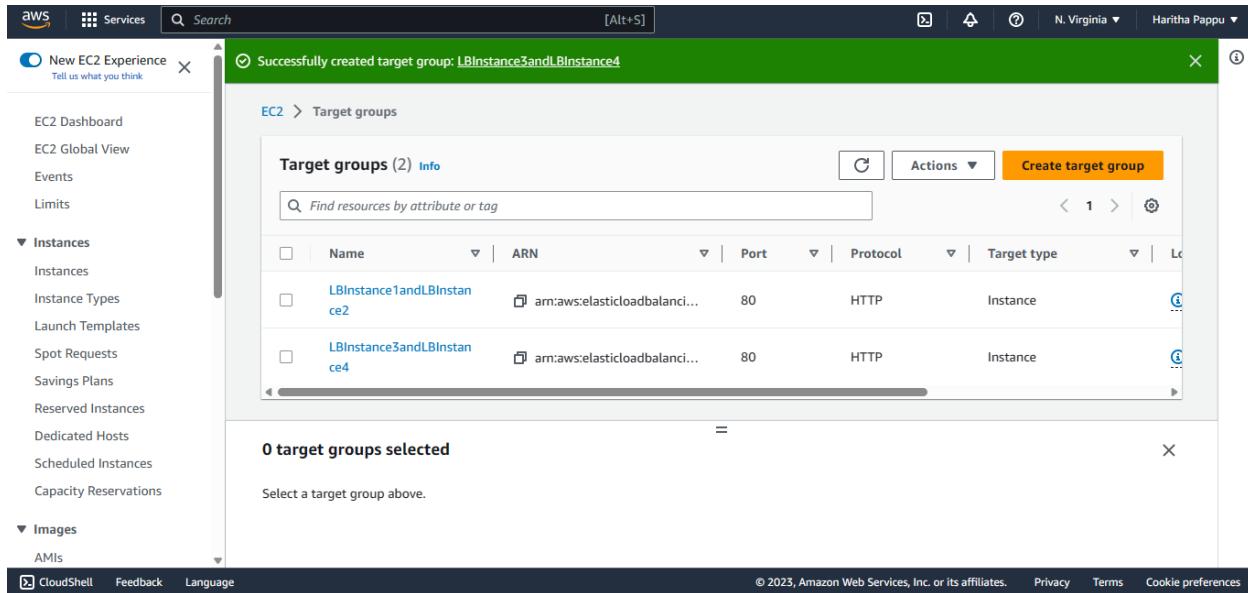
Target groups (2) Info

Name	ARN	Port	Protocol	Target type
LBInstance1andLBInstanc...ce2	arn:aws:elasticloadbalanci...	80	HTTP	Instance
LBInstance3andLBInstanc...ce4	arn:aws:elasticloadbalanci...	80	HTTP	Instance

0 target groups selected

Select a target group above.

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences



❖ Create Load Balancer

aws | Services | Search [Alt+S] | N. Virginia | Haritha Pappu

Elastic Block Store
Volumes
Snapshots
Lifecycle Manager

Network & Security
Security Groups
Elastic IPs
Placement Groups
Key Pairs
Network Interfaces

Load Balancing
Load Balancers
Target Groups

Auto Scaling
Launch Configurations
Auto Scaling Groups

CloudShell Feedback Language

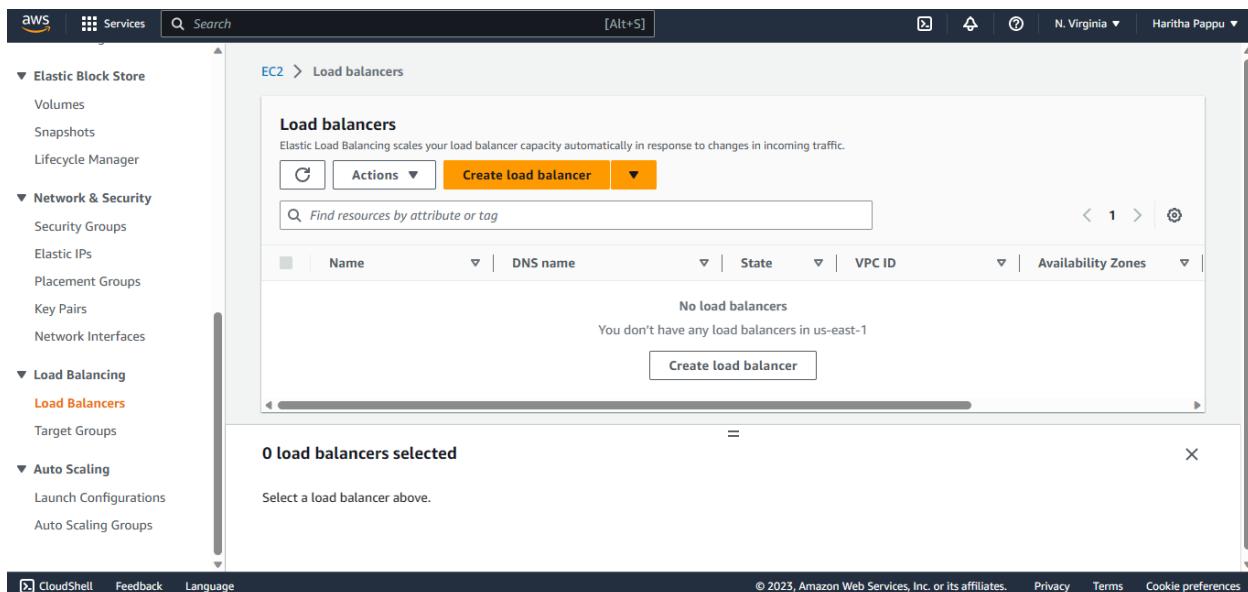
Create load balancer

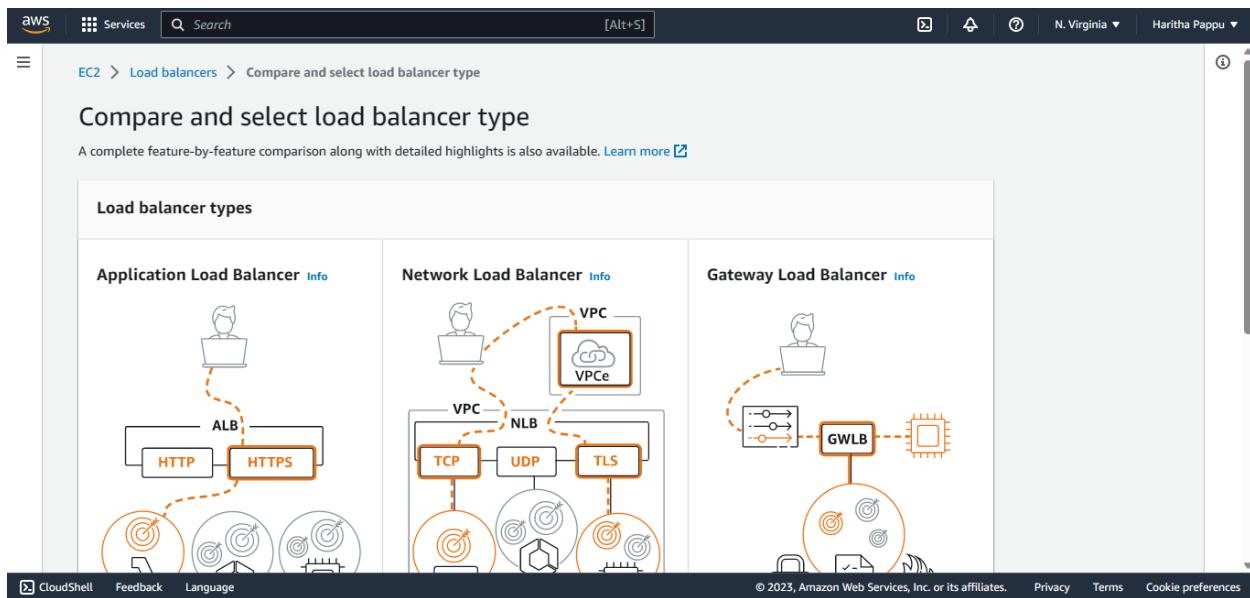
No load balancers
You don't have any load balancers in us-east-1

0 load balancers selected

Select a load balancer above.

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences





Create Application Load Balancer

aws Services Search [Alt+S] N. Virginia Haritha Pappu

EC2 > Load balancers > Create Application Load Balancer

Create Application Load Balancer [Info](#)

The Application Load Balancer distributes incoming HTTP and HTTPS traffic across multiple targets such as Amazon EC2 instances, microservices, and containers, based on request attributes. When the load balancer receives a connection request, it evaluates the listener rules in priority order to determine which rule to apply, and if applicable, it selects a target from the target group for the rule action.

▶ How Elastic Load Balancing works

Basic configuration

Load balancer name
Name must be unique within your AWS account and can't be changed after the load balancer is created.

A maximum of 52 alphanumeric characters including hyphens are allowed, but the name must not begin or end with a hyphen.

Scheme [Info](#)
Scheme can't be changed after the load balancer is created.

Internet-facing
An internet-facing load balancer routes requests from clients over the internet to targets. Requires a public subnet. [Learn more](#)

Internal

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

Scheme [Info](#)

Scheme can't be changed after the load balancer is created.

Internet-facing
An internet-facing load balancer routes requests from clients over the internet to targets. Requires a public subnet. [Learn more](#)

Internal
An internal load balancer routes requests from clients to targets using private IP addresses.

IP address type [Info](#)

Select the type of IP addresses that your subnets use.

IPv4
Recommended for internal load balancers.

Dualstack
Includes IPv4 and IPv6 addresses.

Network mapping [Info](#)

The load balancer routes traffic to targets in the selected subnets, and in accordance with your IP address settings.

VPC [Info](#)

Select the virtual private cloud (VPC) for your targets or you can [create a new VPC](#). Only VPCs with an internet gateway are enabled for selection. The selected VPC can't be changed after the load balancer is created. To confirm the VPC for your targets, view your [target groups](#).

-
vpc-06292ffc66a090247
IPv4: 172.31.0.0/16



VPC [Info](#)

Select the virtual private cloud (VPC) for your targets or you can [create a new VPC](#). Only VPCs with an internet gateway are enabled for selection. The selected VPC can't be changed after the load balancer is created. To confirm the VPC for your targets, view your [target groups](#).

-
vpc-06292ffc66a090247
IPv4: 172.31.0.0/16

Mappings [Info](#)

Select at least two Availability Zones and one subnet per zone. The load balancer routes traffic to targets in these Availability Zones only. Availability Zones that are not supported by the load balancer or the VPC are not available for selection.

us-east-1a (use1-az1)

Subnet

IPv4 address
Assigned by AWS

us-east-1b (use1-az2)

Subnet

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

Security groups Info

A security group is a set of firewall rules that control the traffic to your load balancer. Select an existing security group, or you can [create a new security group](#).

Security groups

Select up to 5 security groups

LB_Capstone_SecGrp sg-007749f6c416f5fce X
VPC: vpc-06292ftc66a090247

C

Listeners and routing Info

A listener is a process that checks for connection requests using the port and protocol you configure. The rules that you define for a listener determine how the load balancer routes requests to its registered targets.

▼ Listener HTTP:80

Remove

Protocol Port Default action Info

HTTP : 80 Forward to LBInstance1andLBInstance2
Target type: Instance, IPv4

HTTP C

Create target group

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

aws Services Search [Alt+S] N. Virginia Haritha Pappu

Internet-facing

IPv4

us-east-1a subnet-0c9956e0c99919de1

us-east-1b subnet-09a1953a0c5a05bc5

us-east-1c subnet-0efbf9419bd90821d

us-east-1d subnet-03bbc4e19e0ee7e66

us-east-1e subnet-0e04729cc0b043979

us-east-1f subnet-0ce68bf80e692d0a5

Add-on services Edit Tags Edit

None None

Attributes

Certain default attributes will be applied to your load balancer. You can view and edit them after creating the load balancer.

Cancel Create load balancer

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

Success Successfully created load balancer: CapstoneProject-ALB

Note: It might take a few minutes for your load balancer to be fully set up and ready to route traffic. Targets will also take a few minutes to complete the registration process and pass initial health checks.

EC2 > Load balancers > CapstoneProject-ALB > Create Application Load Balancer

Create Application Load Balancer

Suggested next steps

- Review, customize, or configure attributes for your load balancer and listeners using the **Description** and **Listeners** tabs within CapstoneProject-ALB.
- Discover other services that you can integrate with your load balancer. Visit the **Integrated services** tab within CapstoneProject-ALB.

View load balancer

New EC2 Experience Tell us what you think X

CloudShell Feedback Language

Search [Alt+S]

EC2 > Load balancers

Load balancers (1)

Elastic Load Balancing scales your load balancer capacity automatically in response to changes in incoming traffic.

Actions **Create load balancer**

Find resources by attribute or tag

CapstoneProject-ALB X **Clear filters**

Name	DNS name	State	VPC ID	Availability Zones
CapstoneProject-ALB	CapstoneProject-ALB-968...	Provisioning	vpc-06292ffcc66a090247	6 Availability Zones

0 load balancers selected

Select a load balancer above.

CloudShell Feedback Language

EC2 > Load balancers > CapstoneProject-ALB

CapstoneProject-ALB

Details

Load balancer type Application	Status 🕒 Provisioning	VPC vpc-06292fffc66a090247	IP address type IPv4
Scheme Internet-facing	Hosted zone Z35SXDOTRQ7X7K	Availability Zones subnet-0c9956e0c99919de1 us-east-1a (use1-az1) subnet-09a1953a0c5a05bc5 us-east-1b (use1-az2) subnet-0ebfbf9419bd90821d us-east-1c (use1-az4) subnet-03bbc4e19e0ee7e66 us-east-1d (use1-az6) subnet-0e04729cc0b043979 us-east-1e (use1-az3) subnet-0ce68bf80e692d0a5	Date created May 30, 2023, 12:41 (UTC-05:00)

Listeners

Load balancer ARN arn:aws:elasticloadbalancing:us-east-1:067136115303:loadbalancer/app/CapstoneProject-ALB/34eb87e869ba4de	DNS name CapstoneProject-ALB-968757051.us-east-1.elb.amazonaws.com (A Record)
---	--

Listeners (1)

A listener checks for connection requests on its port and protocol. Traffic received by the listener is routed according to its rules.

Protocol:Port	Default action	Rules	ARN	Security policy
HTTP:80	Forward to target group • LBInstance1 and LBInstance2: 1 (100%) • Group-level stickiness: Off	1 rule	Not applicable	

The screenshot shows the AWS Elastic Load Balancing (ALB) configuration page. A yellow box highlights the 'DNS name copied' message, which has been copied to the clipboard. The copied URL is shown as 'CapstoneProject-ALB-968757051.us-east-1.elb.amazonaws.com (A Record)'. The 'Listeners' tab is selected, showing one listener rule. The status bar at the bottom indicates 'DNS name copied'.

← ⏪ ⚠ Not secure | capstoneproject-alb-968757051.us-east-1.elb.amazonaws.com

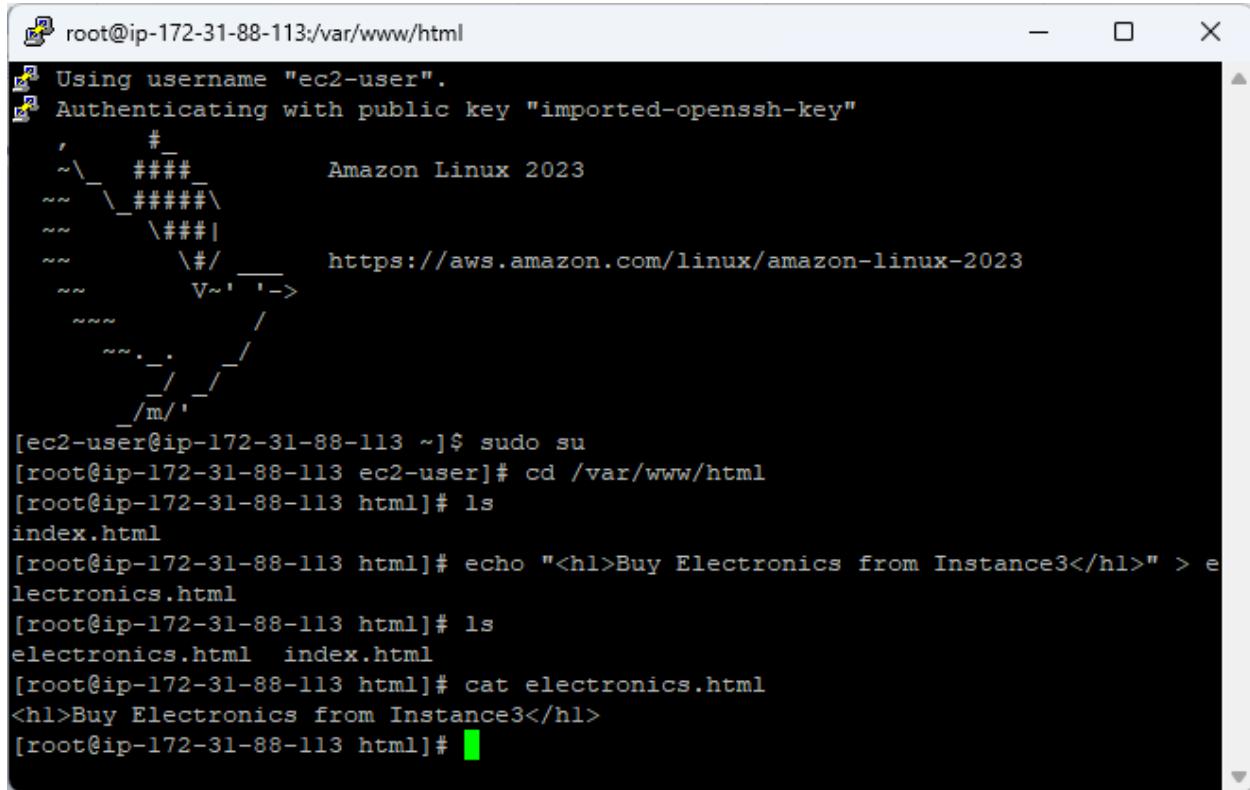
Hello World from ip-172-31-89-118.ec2.internal

← ⏪ ⚠ Not secure | capstoneproject-alb-968757051.us-east-1.elb.amazonaws.com

Hello World from ip-172-31-30-34.ec2.internal

❖ **Create Rules**

Connect to Instance3:



The screenshot shows a terminal window titled "root@ip-172-31-88-113:/var/www/html". The terminal output is as follows:

```
[root@ip-172-31-88-113 ~]$ sudo su
[root@ip-172-31-88-113 ec2-user]# cd /var/www/html
[root@ip-172-31-88-113 html]# ls
index.html
[root@ip-172-31-88-113 html]# echo "<h1>Buy Electronics from Instance3</h1>" > electronics.html
[root@ip-172-31-88-113 html]# ls
electronics.html index.html
[root@ip-172-31-88-113 html]# cat electronics.html
<h1>Buy Electronics from Instance3</h1>
[root@ip-172-31-88-113 html]#
```

Connect to Instance4:

```
root@ip-172-31-92-223:/var/www/html
Using username "ec2-user".
Authenticating with public key "imported-openssh-key"
,
~\_
  #_
  ~\_ ####_
  ~\_ #####\
  ~\_ \###|
  ~\_ \#/ _ 
  ~\_ V~' '->
  ~\_ /
  ~\_ ._
  ~\_ / _/
  _/m/' 

[ec2-user@ip-172-31-92-223 ~]$ sudo su
[root@ip-172-31-92-223 ec2-user]# cd /var/www/html
[root@ip-172-31-92-223 html]# ls
index.html
[root@ip-172-31-92-223 html]# echo "<h1>Buy Electronics from Instance4</h1>" > electronics.html
[root@ip-172-31-92-223 html]# ls
electronics.html index.html
[root@ip-172-31-92-223 html]# cat electronics.html
<h1>Buy Electronics from Instance4</h1>
[root@ip-172-31-92-223 html]#
```

Go back to Load Balancer

EC2 > Load balancers > CapstoneProject-ALB

CapstoneProject-ALB

Details				
Load balancer type	Status	VPC	IP address type	
Application	Active	vpc-06292ffcc66a090247	IPv4	
Scheme	Hosted zone	Availability Zones	Date created	
Internet-facing	Z35SXDOTRQ7X7K	subnet-0c9956e0c99919de1 us-east-1a (use1-az1) subnet-09a1953a0c5a05bc5 us-east-1b (use1-az2) subnet-0efbf9419bd90821d us-east-1c (use1-az4) subnet-03bb4e19e0ee7e66 us-east-1d (use1-az6) subnet-0e04729cc0b043979 us-east-1e (use1-az3) subnet-0ce68bf80e692d0a5	May 30, 2023, 12:41 (UTC-05:00)	

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

Elastic Block Store
Volumes
Snapshots
Lifecycle Manager

Network & Security
Security Groups
Elastic IPs
Placement Groups
Key Pairs
Network Interfaces

Load Balancing
Load Balancers
Target Groups

Auto Scaling
Launch Configurations
Auto Scaling Groups

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

subnet-0ce68bf80e692d0a5 us-east-1f (use1-az5)

Load balancer ARN: arn:aws:elasticloadbalancing:us-east-1:067136115303:loadbalancer/app/CapstoneProject-ALB/34eb87e869ba4de

DNS name: CapstoneProject-ALB-968757051.us-east-1.elb.amazonaws.com (A Record)

Listeners Network mapping Security Monitoring Integrations Attributes Tags

Listeners (1)
A listener checks for connection requests on its port and protocol. Traffic received by the listener is routed according to its rules.

C Actions Add listener Search < 1 > ⌂

Protocol:Port Default action Rules ARN Security policy

HTTP:80 Forward to target group 1 rule ARN Not applicable

LBInstance1andLBInstance2: 1 (100%)
Group-level stickiness: Off

New EC2 Experience Tell us what you think EC2 Load balancers CapstoneProject-ALB HTTP:80 listener Actions

EC2 Dashboard EC2 Global View Events Limits Instances Instances Instance Types Launch Templates Spot Requests Savings Plans Reserved Instances Dedicated Hosts Scheduled Instances Capacity Reservations Images AMIs CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

Listener details Info
A listener is a process that checks for connection requests using the port and protocol you configure. The rules that you define for a listener determine how the load balancer routes requests to its registered targets.

C Edit Listener ARN: arn:aws:elasticloadbalancing:us-east-1:067136115303:listener/app... Default actions
Forward to target group 1 rule ARN
Group-level stickiness: Off

Listener protocol:port: HTTP:80 Load balancer: CapstoneProject-ALB

New EC2 Experience Tell us what you think EC2 Load balancers CapstoneProject-ALB HTTP:80 listener Actions

EC2 Dashboard EC2 Global View Events Limits Instances Instances Instance Types Launch Templates Spot Requests Savings Plans Reserved Instances Dedicated Hosts Scheduled Instances Images AMIs CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

HTTP:80 Details Rules Tags

Listener rules (1) Info Rule limits C Manage rules

Default	If (all match) (last) If no other rule applies	Then	Priority	Tags
	Rul...	Forward to target group	default	0 tags
		LBInstance1andLBInstance2: 1 (100%)		
		Group-level stickiness: Off		

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

New EC2 Experience Tell us what you think

EC2 > Load balancers > CapstoneProject-ALB > HTTP:80 listener

HTTP:80

Actions ▾

EC Dashboard EC2 Global View Events Limits

Instances Instances Instance Types Launch Templates Spot Requests Savings Plans Reserved Instances Dedicated Hosts Scheduled Instances Capacity Reservations

Images AMIs

CloudShell Feedback Language

Listener rules (1) Info Rule limits Manage rules

Default If (all match)
(last) If no other rule applies
Rul...

Then Forward to target group
LBInstance1andLBInstance2: 1 (100%)
• Group-level stickiness: Off

Priority default Tags 0 tags

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

Rules + - | CapstoneProject-ALB | HTTP:80 ▾

To edit, select a mode above.

CapstoneProject-ALB | HTTP:80 (1 rules)

Rule limits for condition values, wildcards, and total rules.

last	HTTP 80: default action	IF Requests otherwise not routed	THEN Forward to LBInstance1andLBInstance2: 1 (100%) Group-level stickiness: Off
------	-------------------------	----------------------------------	--

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

Rules + - | CapstoneProject-ALB | HTTP:80 ▾

Click a location for your new rule. Each rule must include one action of type forward, redirect, fixed response.

CapstoneProject-ALB | HTTP:80 (1 rules)

Rule limits for condition values, wildcards, and total rules.

last HTTP 80: default action This rule cannot be moved or deleted

IF Requests otherwise not routed

THEN Forward to LBInstance1andLBInstance2: 1 (100%)
Group-level stickiness: Off

+ Insert Rule

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

Rules + - CapstoneProject-ALB | HTTP:80 ▾ Cancel Save

Click a location for your new rule. Each rule must include one action of type forward, redirect, fixed response.

CapstoneProject-ALB | HTTP:80 (2 rules)

▶ Rule limits for condition values, wildcards, and total rules.

RULE ID

1 A rule ID (ARN) is generated when you save your rule.

last **HTTP 80: default action**
This rule cannot be moved or deleted

IF (all match)

+ Add condition
Host header...
Path...
Http header...
Http request method...
Query string...
Source IP...

THEN

+ Add action
THEN
Forward to
LBInstance1andLBInstance2: 1 (100%)
Group-level stickiness: Off

Insert Rule

https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1# CapstoneProject-ALB | HTTP:80 ▾ © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

aws Services Search [Alt+S] N. Virginia Haritha Pappu

Rules + - CapstoneProject-ALB | HTTP:80 ▾ Cancel Save

Click a location for your new rule. Each rule must include one action of type forward, redirect, fixed response.

CapstoneProject-ALB | HTTP:80 (2 rules)

▶ Rule limits for condition values, wildcards, and total rules.

RULE ID

1 A rule ID (ARN) is generated when you save your rule.

IF (all match)

Path...
Is /electronics*
or Value

+ Add condition

THEN

1. Forward to...
Target group : Weight (0-999)
LBInstance3andLBInstance4 1
Traffic distribution 100%
Select a target group 0
Group-level stickiness

Insert Rule

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

< Rules + | Edit | Delete | CapstoneProject-ALB | HTTP:80 | Refresh | Help

Click a location for your new rule. Each rule must include one action of type forward, redirect, fixed response.

CapstoneProject-ALB | HTTP:80 (2 rules)

Rule limits for condition values, wildcards, and total rules.

1 arm...38785 ▾ IF Path is /electronics* THEN Forward to LBInstance3andLBInstance4: 1 (100%) Group-level stickiness: Off

+ Insert Rule

last HTTP 80: default action This rule cannot be moved or deleted IF Requests otherwise not routed THEN Forward to LBInstance1andLBInstance2: 1 (100%) Group-level stickiness: Off

+ Insert Rule

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

❖ Test Rules

← ⏪ Not secure | capstoneproject-alb-968757051.us-east-1.elb.amazonaws.com/electronics.html

Buy Electronics from Instance3

← ⏪ Not secure | capstoneproject-alb-968757051.us-east-1.elb.amazonaws.com/electronics.html

Buy Electronics from Instance4

→ **ELASTIC IP:**

An Elastic IP address is a static IPv4 address designed for dynamic cloud computing. An Elastic IP address is allocated to your AWS account, and is yours until you release it. By using an Elastic IP address, you can mask the failure of an instance or software by rapidly remapping the address to another instance in your account. Alternatively, you can specify the Elastic IP address in a DNS record for your domain, so that your domain points to your instance.

An Elastic IP address is a public IPv4 address, which is reachable from the internet. If your instance does not have a public IPv4 address, you can associate an Elastic IP address with your instance to enable communication with the internet. For example, this allows you to connect to your instance from your local computer.

The steps to be followed are as shown in the below screenshots:

Elastic IP address settings

Network Border Group: us-east-1

Public IPv4 address pool:

- Amazon's pool of IPv4 addresses (selected)
- Public IPv4 address that you bring to your AWS account (option disabled because no pools found) [Learn more](#)
- Customer owned pool of IPv4 addresses (option disabled because no customer owned pools found) [Learn more](#)

Global static IP addresses

AWS Global Accelerator can provide global static IP addresses that are announced worldwide using anycast from AWS edge locations. This can help improve the availability and latency for your user traffic by using the Amazon global network. [Learn more](#)

Elastic IP addresses (1/1)

Name	Allocated IPv4 add...	Type	Actions
54.85.221.191	54.85.221.191	Public IP	Associate Elastic IP address

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

EC2 > Elastic IP addresses > Associate Elastic IP address

Associate Elastic IP address Info

Choose the instance or network interface to associate to this Elastic IP address (54.85.221.191)

Elastic IP address: 54.85.221.191

Resource type
Choose the type of resource with which to associate the Elastic IP address.

Instance
 Network interface

⚠ If you associate an Elastic IP address with an instance that already has an Elastic IP address associated, the previously associated Elastic IP address will be disassociated, but the address will still be allocated to your account. [Learn more](#)

If no private IP address is specified, the Elastic IP address will be associated with the primary private IP address.

Instance

Private IP address

Reassociation
Specify whether the Elastic IP address can be reassigned with a different resource if it's already associated with a resource.

Allow this Elastic IP address to be reassigned

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

Elastic IP address associated successfully.
Elastic IP address 54.85.221.191 has been associated with instance i-04b6e701bc2f322e3

Elastic IP addresses (1/1)

Public IPv4 address: 54.85.221.191

Name	Allocated IPv4 add...	Type	Allocation ID	Reverse DN
54.85.221.191	54.85.221.191	Public IP	eipalloc-074ce05cd6550a4ed	-

Summary

Summary

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

Elastic IP address associated successfully.
Elastic IP address 54.85.221.191 has been associated with instance i-04b6e701bc2f322e3

EC2 > Elastic IP addresses > 54.85.221.191

Summary

Allocated IPv4 address 54.85.221.191	Type Public IP	Allocation ID eipalloc-074ce05cd6550a4ed	Reverse DNS record -
Association ID eipassoc-0e482df1b551aa3be	Scope VPC	Associated instance ID i-04b6e701bc2f322e3	Private IP address 172.31.88.113
Network interface ID eni-0465e07c851b8d5e8	Network interface owner account ID 067136115303	Public DNS ec2-54-85-221-191.compute-1.amazonaws.com	NAT Gateway ID -
Address pool Amazon	Network Border Group us-east-1		

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

AWS Services Search [Alt+S] N. Virginia Haritha Pappu

New EC2 Experience Tell us what you think

EC2 Instances i-04b6e701bc2f322e3 (LBInstance3)

Instance summary for i-04b6e701bc2f322e3 (LBInstance3) Info Connect Instance state Actions

Updated less than a minute ago

Instance ID i-04b6e701bc2f322e3 (LBInstance3)	Public IPv4 address 54.85.221.191 open address	Private IPv4 addresses 172.31.88.113
IPv6 address -	Instance state Running	Public IPv4 DNS ec2-54-85-221-191.compute-1.amazonaws.com open address
Hostname type IP name: ip-172-31-88-113.ec2.internal	Private IP DNS name (IPv4 only) ip-172-31-88-113.ec2.internal	Elastic IP addresses 54.85.221.191 [Public IP]
Answer private resource DNS name IPv4 (A)	Instance type t2.micro	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for recommendations.
Auto-assigned IP address -	VPC ID vpc-06292ffc66a090247	Learn more
IAM Role -	Subnet ID subnet-09a1953a0c5a05bc5	Auto Scaling Group name -
IMDsv2		

CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

```
root@ip-172-31-88-113:/home/ec2-user
[root@ip-172-31-88-113 ec2-user]# sudo yum update
Last metadata expiration check: 3:16:23 ago on Tue May 30 16:35:45 2023.
Dependencies resolved.
Nothing to do.
Complete!
[root@ip-172-31-88-113 ec2-user]# sudo yum install nginx -y
Last metadata expiration check: 3:16:39 ago on Tue May 30 16:35:45 2023.
Dependencies resolved.
=====
Package           Arch      Version       Repository      Size
=====
Installing:
nginx            x86_64    1:1.22.1-1.amzn2023.0.3   amazonlinux   40 k
Installing dependencies:
gperftools-libs  x86_64    2.9.1-1.amzn2023.0.2   amazonlinux   309 k
libunwind         x86_64    1.4.0-5.amzn2023.0.2   amazonlinux   66 k
nginx-core        x86_64    1:1.22.1-1.amzn2023.0.3   amazonlinux   583 k
nginx-filesystem noarch    1:1.22.1-1.amzn2023.0.3   amazonlinux   12 k
nginx-mimetypes   noarch    2.1.49-3.amzn2023.0.3   amazonlinux   21 k
Transaction Summary
=====
Install 6 Packages
```

```
root@ip-172-31-88-113:/home/ec2-user
=====
Transaction Summary
=====
Install 6 Packages

Total download size: 1.0 M
Installed size: 3.4 M
Downloading Packages:
(1/6): nginx-1.22.1-1.amzn2023.0.3.x86_64.rpm      535 kB/s | 40 kB    00:00
(2/6): libunwind-1.4.0-5.amzn2023.0.2.x86_64.rpm   3.0 MB/s | 66 kB    00:00
(3/6): nginx-core-1.22.1-1.amzn2023.0.3.x86_64     5.0 MB/s | 583 kB   00:00
(4/6): nginx-mimetypes-2.1.49-3.amzn2023.0.3.no    853 kB/s | 21 kB    00:00
(5/6): nginx-filesystem-1.22.1-1.amzn2023.0.3.n    193 kB/s | 12 kB    00:00
(6/6): gperftools-libs-2.9.1-1.amzn2023.0.2.x86_1.5 MB/s | 309 kB   00:00
-----
Total                                         3.7 MB/s | 1.0 MB   00:00

Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing           :                               1/1
  Running scriptlet: nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch          1/6
  Installing        : nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch          1/6
  Installing        : nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch          2/6
```

```
root@ip-172-31-88-113:/home/ec2-user
=====
Running transaction
  Preparing           :                               1/1
  Running scriptlet: nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch          1/6
  Installing        : nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch          1/6
  Installing        : nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch          2/6
  Installing        : libunwind-1.4.0-5.amzn2023.0.2.x86_64                  3/6
  Installing        : gperftools-libs-2.9.1-1.amzn2023.0.2.x86_64             4/6
  Installing        : nginx-core-1:1.22.1-1.amzn2023.0.3.x86_64              5/6
  Installing        : nginx-1:1.22.1-1.amzn2023.0.3.x86_64                  6/6
  Running scriptlet: nginx-1:1.22.1-1.amzn2023.0.3.x86_64              6/6
  Verifying         : nginx-core-1:1.22.1-1.amzn2023.0.3.x86_64             1/6
  Verifying         : nginx-1:1.22.1-1.amzn2023.0.3.x86_64                  2/6
  Verifying         : gperftools-libs-2.9.1-1.amzn2023.0.2.x86_64             3/6
  Verifying         : libunwind-1.4.0-5.amzn2023.0.2.x86_64                  4/6
  Verifying         : nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch          5/6
  Verifying         : nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch          6/6

Installed:
  gperftools-libs-2.9.1-1.amzn2023.0.2.x86_64
  libunwind-1.4.0-5.amzn2023.0.2.x86_64
  nginx-1:1.22.1-1.amzn2023.0.3.x86_64
  nginx-core-1:1.22.1-1.amzn2023.0.3.x86_64
  nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch
  nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch
```

```
root@ip-172-31-88-113:/home/ec2-user
Installing      : nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch          1/6
Installing      : nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch           2/6
Installing      : libunwind-1.4.0-5.amzn2023.0.2.x86_64                  3/6
Installing      : gperftools-libs-2.9.1-1.amzn2023.0.2.x86_64             4/6
Installing      : nginx-core-1:1.22.1-1.amzn2023.0.3.x86_64              5/6
Installing      : nginx-1:1.22.1-1.amzn2023.0.3.x86_64                  6/6
Running scriptlet: nginx-1:1.22.1-1.amzn2023.0.3.x86_64                6/6
Verifying       : nginx-core-1:1.22.1-1.amzn2023.0.3.x86_64               1/6
Verifying       : nginx-1:1.22.1-1.amzn2023.0.3.x86_64                  2/6
Verifying       : gperftools-libs-2.9.1-1.amzn2023.0.2.x86_64             3/6
Verifying       : libunwind-1.4.0-5.amzn2023.0.2.x86_64                 4/6
Verifying       : nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch           5/6
Verifying       : nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch            6/6

Installed:
gperftools-libs-2.9.1-1.amzn2023.0.2.x86_64
libunwind-1.4.0-5.amzn2023.0.2.x86_64
nginx-1:1.22.1-1.amzn2023.0.3.x86_64
nginx-core-1:1.22.1-1.amzn2023.0.3.x86_64
nginx-filesystem-1:1.22.1-1.amzn2023.0.3.noarch
nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch

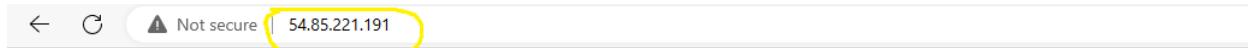
Complete!
[root@ip-172-31-88-113 ec2-user]#
```

```
[root@ip-172-31-88-113 ~]# sudo fuser -k 80/tcp
80/tcp:                      3516  3638  3639  3640  25244
[root@ip-172-31-88-113 ~]# sudo fuser -k 443/tcp
```

```
root@ip-172-31-88-113:~
[root@ip-172-31-88-113 ~]# sudo fuser -k 443/tcp
[root@ip-172-31-88-113 ~]# sudo service nginx restart
Redirecting to /bin/systemctl restart nginx.service
[root@ip-172-31-88-113 ~]# sudo service nginx status
Redirecting to /bin/systemctl status nginx.service
● nginx.service - The nginx HTTP and reverse proxy server
   Loaded: loaded (/usr/lib/systemd/system/nginx.service; disabled; preset: d>
   Active: active (running) since Wed 2023-05-31 17:38:10 UTC; 58s ago
     Process: 99864 ExecStartPre=/usr/bin/rm -f /run/nginx.pid (code=exited, sta>
     Process: 99865 ExecStartPre=/usr/sbin/nginx -t (code=exited, status=0/SUCCE>
     Process: 99866 ExecStart=/usr/sbin/nginx (code=exited, status=0/SUCCESS)
   Main PID: 99867 (nginx)
      Tasks: 2 (limit: 1108)
    Memory: 2.2M
      CPU: 58ms
     CGroup: /system.slice/nginx.service
             └─99867 "nginx: master process /usr/sbin/nginx"
                  ├─99868 "nginx: worker process"

May 31 17:38:10 ip-172-31-88-113.ec2.internal systemd[1]: Starting nginx.service>
May 31 17:38:10 ip-172-31-88-113.ec2.internal nginx[99865]: nginx: the configur>
May 31 17:38:10 ip-172-31-88-113.ec2.internal nginx[99865]: nginx: configuratio>
May 31 17:38:10 ip-172-31-88-113.ec2.internal systemd[1]: Started nginx.service>
lines 1-18/18 (END)
```

Test: nginx is running successfully by browsing the Elastic ip address-



Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org. Commercial support is available at nginx.com.

Thank you for using nginx.

Automate the provisioning of an EC2 instance using Ansible

When launching the instance, under configure Instance details- provide network, subnet details from the drop down list-

A screenshot of the AWS Launch Instance wizard. The left panel shows "Network settings" with fields for VPC (selected), Subnet (selected), Auto-assign public IP (selected), Firewall (security groups) (selected), and Common security groups (selected). The right panel shows "Summary" with fields for Number of instances (1), Software Image (AMI) (Amazon Linux 2023 AMI 2023.0.2...), Virtual server type (instance type) (t2.micro), Firewall (security group) (MY_CAPSTONE_PROJECT1_SG), and Storage (volumes) (1 volume(s) - 8 GiB). At the bottom, there are "Cancel", "Launch instance", and "Review commands" buttons.

Screenshot of the AWS EC2 Instances Launch an instance page showing a successful launch.

Success
Successfully initiated launch of instance (i-0a385183fd8055852)

Next Steps

- Create billing and free tier usage alerts
- Connect to your instance
- Connect an RDS database

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

Instances (1) Info

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
MY_CAPSTONE_...	i-0a385183fd8055852	Running	t2.micro	Initializing	No alarms	us-east-1c

Select an instance

CloudShell Feedback Language

AWS Services Search [Alt+S]

New EC2 Experience Tell us what you think

EC2 Instances i-0a385183fd8055852

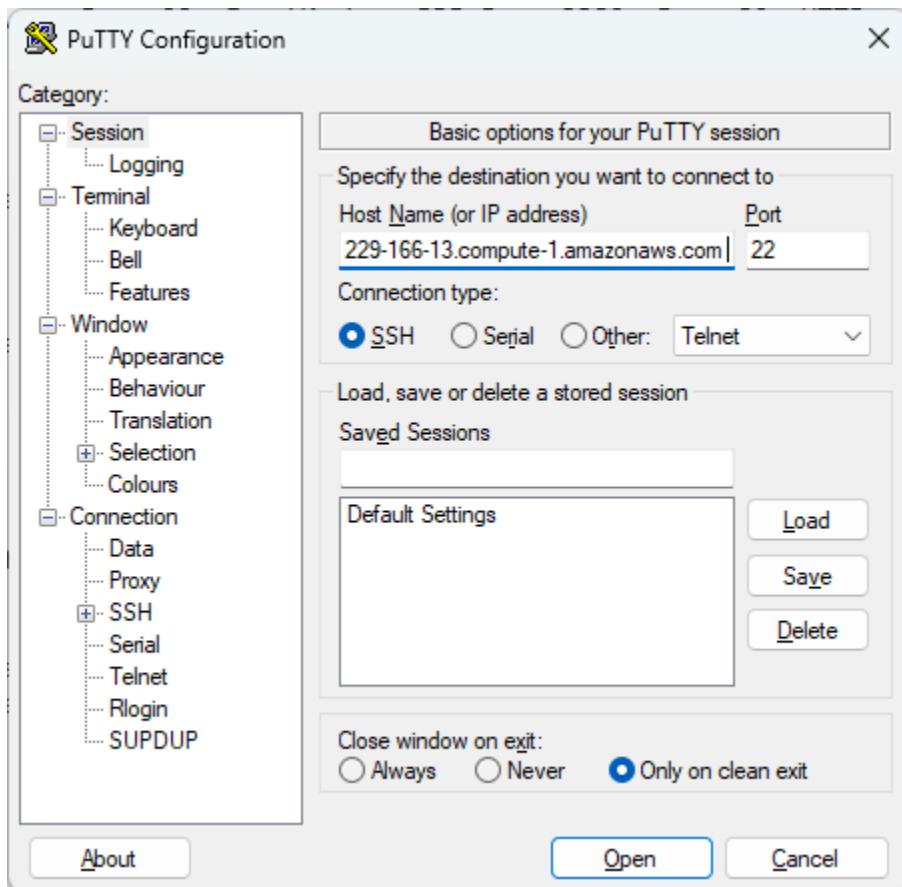
Instance summary for i-0a385183fd8055852 (MY_CAPSTONE_PROJECT1_SERVER) Info

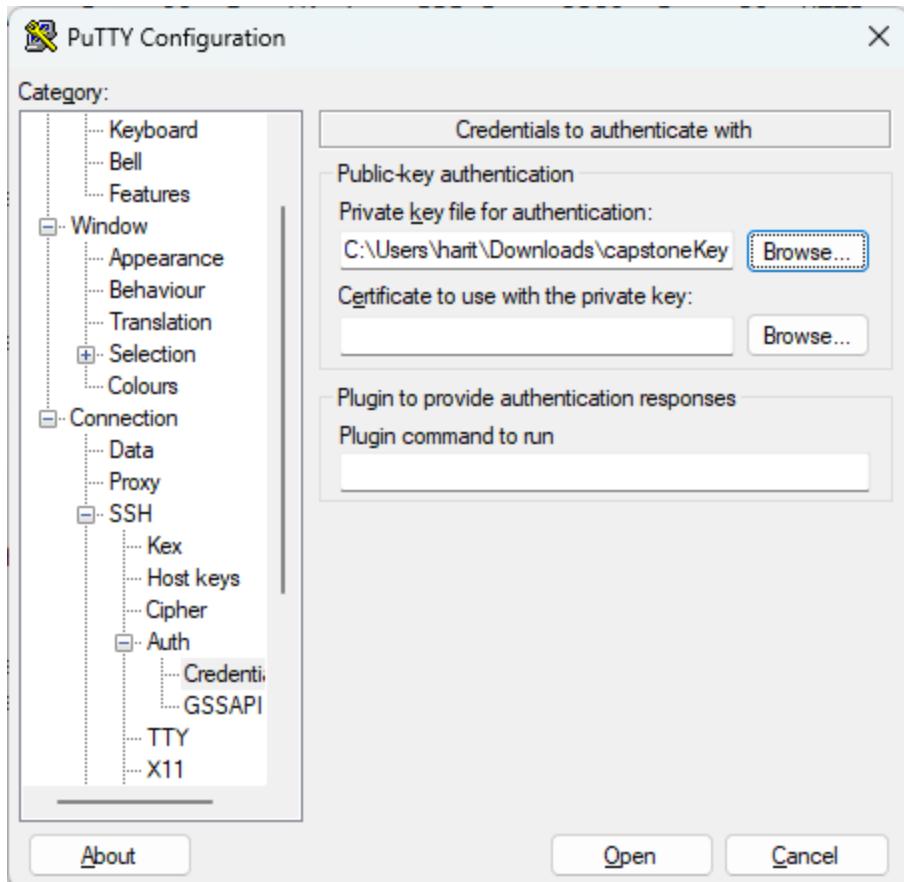
Updated less than a minute ago

C Connect Instance state Actions

Instance ID i-0a385183fd8055852 (MY_CAPSTONE_PROJECT1_SERVER)	Public IPv4 address 34.229.166.13 open address	Private IPv4 addresses 10.7.3.183
IPv6 address -	Instance state Running	Public IPv4 DNS ec2-34-229-166-13.compute-1.amazonaws.com open address
Hostname type IP name: ip-10-7-3-183.ec2.internal	Private IP DNS name (IPv4 only) ip-10-7-3-183.ec2.internal	Elastic IP addresses -
Answer private resource DNS name -	Instance type t2.micro	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for recommendations. Learn more
Auto-assigned IP address 34.229.166.13 [Public IP]	VPC ID vpc-08605c5d046b63c91 (MY_CAPSTONE_PROJECT1)	Auto Scaling Group name
IAM Role	Subnet ID	

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences





```
ec2-user@ip-10-7-3-183:~$ Using username "ec2-user".
ec2-user@ip-10-7-3-183:~$ Authenticating with public key "imported-openssh-key"
'#
~\_\#\#\#_          Amazon Linux 2023
~~ \_\#\#\#\\
~~ \#\#\#
~~ \#/      https://aws.amazon.com/linux/amazon-linux-2023
~~ V~'__->
~~ /
~~ ._
~~ /_/
~/m/'
```

[ec2-user@ip-10-7-3-183 ~]\$

```
root@ip-10-7-3-183:~  
Using username "ec2-user".  
Authenticating with public key "imported-ssh-key"  
Amazon Linux 2023  
https://aws.amazon.com/linux/amazon-linux-2023  
[ec2-user@ip-10-7-3-183 ~]$ sudo su -  
[root@ip-10-7-3-183 ~]#
```

```
root@ansibleserver:~  
Using username "ec2-user".  
Authenticating with public key "imported-ssh-key"  
Amazon Linux 2023  
https://aws.amazon.com/linux/amazon-linux-2023  
[ec2-user@ip-10-7-3-183 ~]$ sudo su -  
[root@ip-10-7-3-183 ~]# hostname ansibleserver  
[root@ip-10-7-3-183 ~]# sudo -i  
[root@ansibleserver ~]#
```

Install the dependencies

```
[root@ansibleserver ~]# yum install git python python-devel python-pip openssl ansible
```

```
[root@ansibleserver ~]# yum install git python python-devel python-pip
Last metadata expiration check: 0:19:00 ago on Sat May 27 05:08:15 2023.
Dependencies resolved.
=====
Package          Arch    Version        Repository      Size
=====
Installing:
git              x86_64  2.40.1-1.amzn2023.0.1      amazonlinux   57 k
python-unversioned-command noarch 3.9.16-1.amzn2023.0.3      amazonlinux  12 k
python3-devel    x86_64  3.9.16-1.amzn2023.0.3      amazonlinux 207 k
python3-pip     noarch  21.3.1-2.amzn2023.0.5      amazonlinux 1.8 M
Installing dependencies:
git-core         x86_64  2.40.1-1.amzn2023.0.1      amazonlinux 4.3 M
git-core-doc    noarch  2.40.1-1.amzn2023.0.1      amazonlinux 2.6 M
perl-Error       noarch  1.37-477.amzn2023.0.2      amazonlinux 41 k
perl-File-Find   noarch  1.37-477.amzn2023.0.4      amazonlinux 26 k
perl-Git         noarch  2.40.1-1.amzn2023.0.1      amazonlinux 45 k
perl-TermReadKey x86_64  2.38-5.amzn2023.0.2      amazonlinux 36 k
perl-lib         x86_64  0.65-477.amzn2023.0.4      amazonlinux 15 k
Installing weak dependencies:
libcrypt-compat x86_64  4.4.33-7.amzn2023      amazonlinux 92 k
=====
Transaction Summary
=====
Install 12 Packages

Total download size: 9.2 M
Installed size: 46 M
Is this ok [y/N]: y
Downloading Packages:
(1/12): perl-TermReadKey-2.38-5.amzn2023.0.2.x86_426 kB/s | 36 kB  00:00
(2/12): git-2.40.1-1.amzn2023.0.1.x86_64.rpm 2.1 MB/s | 57 kB  00:00
(3/12): python3-devel-3.9.16-1.amzn2023.0.3.x86_1.7 MB/s | 207 kB 00:00
(4/12): perl-lib-0.65-477.amzn2023.0.4.x86_64.r 1.0 MB/s | 15 kB  00:00
(5/12): perl-Error-0.17029-5.amzn2023.0.2.noarch 2.5 MB/s | 41 kB  00:00
(6/12): libcrypt-compat-4.4.33-7.amzn2023.x86_2.9 MB/s | 92 kB  00:00
(7/12): perl-File-Find-1.37-477.amzn2023.0.4.no 1.8 MB/s | 26 kB  00:00
(8/12): git-core-2.40.1-1.amzn2023.0.1.x86_64.r 22 MB/s | 4.3 MB 00:00
(9/12): perl-Git-2.40.1-1.amzn2023.0.1.noarch.r 1.4 MB/s | 45 kB  00:00
(10/12): python-unversioned-command-3.9.16-1.am 747 kB/s | 12 kB  00:00
(11/12): python3-pip-21.3.1-2.amzn2023.0.5.noar 41 MB/s | 1.8 MB  00:00
(12/12): git-core-doc-2.40.1-1.amzn2023.0.1.noa 16 MB/s | 2.6 MB  00:00
=====

```

```
Total                                         24 MB/s | 9.2 MB  00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
Preparing :
=====
Installing : git-core-2.40.1-1.amzn2023.0.1.x86_64          1/1
Installing : git-core-doc-2.40.1-1.amzn2023.0.1.noarch          2/12
Installing : perl-File-Find-1.37-477.amzn2023.0.4.noarch          3/12
Installing : perl-Error-1.0.17029-5.amzn2023.0.2.noarch          4/12
Installing : libcrypt-compat-4.4.33-7.amzn2023.x86_64          5/12
Installing : perl-lib-0.65-477.amzn2023.0.4.x86_64          6/12
Installing : perl-TermReadKey-2.38-5.amzn2023.0.2.x86_64          7/12
Installing : perl-Git-2.40.1-1.amzn2023.0.1.noarch          8/12
Installing : git-2.40.1-1.amzn2023.0.1.x86_64          9/12
Installing : python3-pip-21.3.1-2.amzn2023.0.5.noarch          10/12
Installing : python-unversioned-command-3.9.16-1.amzn2023.0.3.n 11/12
Installing : python3-devel-3.9.16-1.amzn2023.0.3.x86_64          12/12
Running scriptlet
=====
Installing : python3-devel-3.9.16-1.amzn2023.0.3.x86_64          12/12
Verifying   : git-core-2.40.1-1.amzn2023.0.1.x86_64          1/12
Verifying   : python3-devel-3.9.16-1.amzn2023.0.3.x86_64          2/12
Verifying   : perl-TermReadKey-2.38-5.amzn2023.0.2.x86_64          3/12
Verifying   : git-2.40.1-1.amzn2023.0.1.x86_64          4/12
Verifying   : perl-lib-0.65-477.amzn2023.0.4.x86_64          5/12
Verifying   : libcrypt-compat-4.4.33-7.amzn2023.x86_64          6/12
Verifying   : perl-Error-1.0.17029-5.amzn2023.0.2.noarch          7/12
Verifying   : git-core-doc-2.40.1-1.amzn2023.0.1.noarch          8/12
Verifying   : perl-File-Find-1.37-477.amzn2023.0.4.noarch          9/12
Verifying   : perl-Git-2.40.1-1.amzn2023.0.1.noarch          10/12
Verifying   : python-unversioned-command-3.9.16-1.amzn2023.0.3.n 11/12
Verifying   : python3-pip-21.3.1-2.amzn2023.0.5.noarch          12/12
=====
Installed:
git-2.40.1-1.amzn2023.0.1.x86_64
git-core-2.40.1-1.amzn2023.0.1.x86_64
git-core-doc-2.40.1-1.amzn2023.0.1.noarch
libcrypt-compat-4.4.33-7.amzn2023.x86_64
perl-Error-1.0.17029-5.amzn2023.0.2.noarch
perl-File-Find-1.37-477.amzn2023.0.4.noarch
perl-Git-2.40.1-1.amzn2023.0.1.noarch
perl-TermReadKey-2.38-5.amzn2023.0.2.x86_64
perl-lib-0.65-477.amzn2023.0.4.x86_64

```

```

root@ansibleserver:~#
Preparing : 1/1
Installing : git-core-2.40.1-1.amzn2023.0.1.x86_64 1/1
Installing : git-core-doc-2.40.1-1.amzn2023.0.1.noarch 2/12
Installing : perl-File-Find-1.37-477.amzn2023.0.4.noarch 3/12
Installing : perl-Error-1:0.17029-5.amzn2023.0.2.noarch 4/12
Installing : libcrypt-compat-4.4.33-7.amzn2023.x86_64 5/12
Installing : perl-lib-0.65-477.amzn2023.0.4.x86_64 6/12
Installing : perl-TermReadKey-2.38-9.amzn2023.0.2.x86_64 7/12
Installing : perl-Git-2.40.1-1.amzn2023.0.1.noarch 8/12
Installing : git-2.40.1-1.amzn2023.0.1.x86_64 9/12
Installing : python3-pip-21.3.1-2.amzn2023.0.5.noarch 10/12
Installing : python-unversioned-command-3.9.16-1.amzn2023.0.3.n 11/12
Installing : python3-devel-3.9.16-1.amzn2023.0.3.x86_64 12/12
Running scriptlet: python3-devel-3.9.16-1.amzn2023.0.3.x86_64 1/12
Verifying : git-core-2.40.1-1.amzn2023.0.1.x86_64 1/12
Verifying : python3-devel-3.9.16-1.amzn2023.0.3.x86_64 2/12
Verifying : perl-TermReadKey-2.38-9.amzn2023.0.2.x86_64 3/12
Verifying : git-2.40.1-1.amzn2023.0.1.x86_64 4/12
Verifying : perl-lib-0.65-477.amzn2023.0.4.x86_64 5/12
Verifying : libcrypt-compat-4.4.33-7.amzn2023.x86_64 6/12
Verifying : perl-Error-1:0.17029-5.amzn2023.0.2.noarch 7/12
Verifying : git-core-doc-2.40.1-1.amzn2023.0.1.noarch 8/12
Verifying : perl-File-Find-1.37-477.amzn2023.0.4.noarch 9/12
Verifying : perl-Git-2.40.1-1.amzn2023.0.1.noarch 10/12
Verifying : python-unversioned-command-3.9.16-1.amzn2023.0.3.n 11/12
Verifying : python3-pip-21.3.1-2.amzn2023.0.5.noarch 12/12

Installed:
git-2.40.1-1.amzn2023.0.1.x86_64
git-core-2.40.1-1.amzn2023.0.1.x86_64
git-core-doc-2.40.1-1.amzn2023.0.1.noarch
libcrypt-compat-4.4.33-7.amzn2023.x86_64
perl-Error-1:0.17029-5.amzn2023.0.2.noarch
perl-File-Find-1.37-477.amzn2023.0.4.noarch
perl-Git-2.40.1-1.amzn2023.0.1.noarch
perl-TermReadKey-2.38-9.amzn2023.0.2.x86_64
perl-lib-0.65-477.amzn2023.0.4.x86_64
python-unversioned-command-3.9.16-1.amzn2023.0.3.noarch
python3-devel-3.9.16-1.amzn2023.0.3.x86_64
python3-pip-21.3.1-2.amzn2023.0.5.noarch

Complete!
[root@ansibleserver ~]# 

```

sudo pip install ansible

```

root@ansibleserver:~#
epel-release noarch 7-14 @commandline 15 k
Transaction Summary
=====
Skip 1 Package
Nothing to do.
Complete!
[root@ansibleserver ~]# pip install ansible
Collecting ansible
  Downloading ansible-7.6.0-py3-none-any.whl (43.8 MB)
|██████████| 43.8 MB 189 kB/s
Collecting ansible-core==2.14.6
  Downloading ansible_core-2.14.6-py3-none-any.whl (2.2 MB)
|██████████| 2.2 MB 32.5 kB/s
Collecting packaging
  Downloading packaging-23.1-py3-none-any.whl (48 kB)
|██████████| 48 kB 7.7 MB/s
Requirement already satisfied: cryptography in /usr/lib64/python3.9/site-packages (from ansible-core==2.14.6->ansible) (36.0.1)
Collecting jinja2<3.0
  Downloading Jinja2-3.1.2-py3-none-any.whl (133 kB)
|██████████| 133 kB 49.6 MB/s
Requirement already satisfied: PyYAML>=5.1 in /usr/lib64/python3.9/site-packages (from ansible-core==2.14.6->ansible) (5.4.1)
Collecting resolvelib<0.9.0,>=0.5.3
  Downloading resolvelib-0.8.1-py2.py3-none-any.whl (16 kB)
Collecting MarkupSafe>2.0
  Downloading MarkupSafe-2.1.2-cp39-cp39-manylinux2_17_x86_64.manylinux2014_x86_64.whl (25 kB)
Requirement already satisfied: cffi>1.12 in /usr/lib64/python3.9/site-packages (from cryptography->ansible-core==2.14.6->ansible) (1.14.5)
Requirement already satisfied: pycparser in /usr/lib/python3.9/site-packages (from cffi>1.12->cryptography->ansible-core==2.14.6->ansible) (2.20)
Requirement already satisfied:ply>=3.11 in /usr/lib/python3.9/site-packages (from pycparser->cffi>1.12->cryptography->ansible-core==2.14.6->ansible) (3.11)
Installing collected packages: MarkupSafe, resolvelib, packaging, jinja2, ansible-core, ansible
  Attempting uninstall: MarkupSafe
    Found existing installation: MarkupSafe 1.1.1
    Uninstalling MarkupSafe-1.1.1:
      Successfully uninstalled MarkupSafe-1.1.1
  Attempting uninstall: jinja2
    Found existing installation: Jinja2 2.11.3
    Uninstalling Jinja2-2.11.3:
      Successfully uninstalled Jinja2-2.11.3
Successfully installed MarkupSafe-2.1.2 ansible-7.6.0 ansible-core-2.14.6 jinja2-3.1.2 packaging-23.1 resolvelib-0.8.1
WARNING: Running pip as the 'root' user can result in broken permissions and conflicting behaviour with the system package manager. It is recommended to use a virtual environment instead: https://pip.pypa.io/warnings/venv
[root@ansibleserver ~]# 

```

ansible -version

```
[root@ansibleserver ansible]# ansible [core 2.14.6]
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/root/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/local/lib/python3.9/site-packages/ansible
  e
  ansible collection location = /root/.ansible/collections:/usr/share/ansible/col
llections
  executable location = /usr/local/bin/ansible
  python version = 3.9.16 (main, Feb 23 2023, 00:00:00) [GCC 11.3.1 20221121 (Re
d Hat 11.3.1-4)] (/usr/bin/python3)
  jinja version = 3.1.2
  libyaml = True
```

```
ansible-config [core 2.14.6]
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/root/.ansible/plugins/modules',
  ansible python module location = /usr/local/lib/python3.9/site-pac
  ansible collection location = /root/.ansible/collections:/usr/share
  executable location = /usr/local/bin/ansible-config
  python version = 3.9.16 (main, Feb 23 2023, 00:00:00) [GCC 11.3.1 2
  jinja version = 3.1.2
  libyaml = True
```

cd /etc/ansible***mkdir AWS_CLOUD******cd AWS_CLOUD***

```
[ec2-user@ansibleserver ~]$ cd /etc/ansible
[ec2-user@ansibleserver ansible]$ mkdir AWS_CLOUD
mkdir: cannot create directory 'AWS_CLOUD': Permission denied
[ec2-user@ansibleserver ansible]$ sudo mkdir AWS_CLOUD
[ec2-user@ansibleserver ansible]$ sudo su -
Last login: Sat May 27 05:13:56 UTC 2023 on pts/0
[root@ansibleserver ~]$ cd AWS_CLOUD
-bash: cd: AWS_CLOUD: No such file or directory
[root@ansibleserver ~]$ cd /etc/ansible
[root@ansibleserver ansible]$ cd AWS_CLOUD
```

In order for the EC2 module to run from the Ansible playbook, install Boto3. It is the Amazon Web Services(AWS) SDK for Python. It enables python developers to create,configure, and manage AWS services such as EC2 and S3.

```
sudo pip install boto boto3
```

```
[root@ansibleserver AWS_CLOUD]# pip install boto boto3
Collecting boto
  Downloading boto-2.49.0-py2.py3-none-any.whl (1.4 MB)
    1.4/1.4 MB 33.9 MB/s eta 0:00:00
Collecting boto3
  Downloading boto3-1.26.142-py3-none-any.whl (135 kB)
    135.6/135.6 kB 23.6 MB/s eta 0:00:00
Collecting botocore<1.30.0,>=1.29.142 (from boto3)
  Downloading botocore-1.29.142-py3-none-any.whl (10.8 MB)
    10.8/10.8 MB 67.5 MB/s eta 0:00:00
Requirement already satisfied: jmespath<2.0.0,>=0.7.1 in /usr/lib/python3.9/site-packages (from boto3) (0.10.0)
Collecting s3transfer<0.7.0,>=0.6.0 (from boto3)
  Downloading s3transfer-0.6.1-py3-none-any.whl (79 kB)
    79.8/79.8 kB 14.9 MB/s eta 0:00:00
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /usr/lib/python3.9/site-packages (from botocore<1.30.0,>=1.29.142->boto3) (2.8.1)
Requirement already satisfied: urllib3<1.27,>=1.25.4 in /usr/lib/python3.9/site-packages (from botocore<1.30.0,>=1.29.142->boto3) (1.25.10)
Requirement already satisfied: six>=1.5 in /usr/lib/python3.9/site-packages (from python-dateutil<3.0.0,>=2.1->botocore<1.30.0,>=1.29.142->boto3) (1.15.0)
Installing collected packages: boto, botocore, s3transfer, boto3
Successfully installed boto-2.49.0 boto3-1.26.142 botocore-1.29.142 s3transfer-0.6.1
```

```
[ec2-user@ansibleserver ~]$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/ec2-user/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/ec2-user/.ssh/id_rsa
Your public key has been saved in /home/ec2-user/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:mZ/2cRtSF1rVbF3lpF2b1T7AMi10ulXqSDJz4ub/GR0 ec2-user@ansibleserver
The key's randomart image is:
+---[RSA 3072]---+
|       .. .o.oX|
|       ..*.*B*|
|=o+++=oo|
|.oB =. o |
| So o ..E.|
| o. . . .|
| .+ o.o. |
| ... +oo |
| .oo. |
+---[SHA256]---+
[ec2-user@ansibleserver ~]$ cat /home/ec2-user/.ssh/id_rsa.pub
ssh-rsa AAAAB3NzaC1yc2EAAAQABAAQgQC3IIInOrS9T+lVMW/NFiQCfd0160t94MoAPo9y9fUFw
oK7VopYpX1FqTVXtquoe0CELU9XyXaXD13NXFeiaazTOH1U5hE6mufvq6mxCKbpiYp2bxFI/s5VaZYFD
```

Playbook test:

```
[ec2-user@ansibleserver ~]$ vi playbooktest.yml
[ec2-user@ansibleserver ~]$ ansible-playbook -i inventory playbooktest.yml

PLAY [localhost] ****
TASK [Gathering Facts] ****
[WARNING]: Platform linux on host localhost is using the discovered Python
interpreter at /usr/bin/python3.9, but future installation of another Python
interpreter could change the meaning of that path. See
https://docs.ansible.com/ansible-core/2.14/reference\_appendices/interpreter\_discovery.html for more information.
ok: [localhost]

TASK [Print message] ****
ok: [localhost] => {
    "msg": "Hello Ansible World"
}

PLAY RECAP ****
localhost                  : ok=2      changed=0      unreachable=0      failed=0      s
kipped=0      rescued=0      ignored=0

[ec2-user@ansibleserver ~]$ vi playbooktest.yml
[ec2-user@ansibleserver ~]$ 
```

```
[ec2-user@ansibleserver ~]$ vi playbooktest.yml

ec2-user@ansibleserver:~ - X

```
- hosts: localhost
 connection: local
 tasks:
 - name: Print message
 debug:
 msg: Hello Ansible World
```

"playbooktest.yml" 8L, 125B          3,19          All
```

Prerequisites installs:

```
ec2-user@ansibleserver:~$ sudo yum install python python-pip python-setuptools
*
Amazon Linux 2023 repository           24 kB/s | 3.6 kB   00:00
Amazon Linux 2023 Kernel Livepatch repository 23 kB/s | 2.9 kB   00:00
Amazon Linux 2023 Kernel Livepatch repository 619 kB/s | 158 kB   00:00
Docker CE Stable - x86_64             2.3 kB/s | 397 B   00:00
Errors during downloading metadata for repository 'docker-ce-stable':
  - Status code: 404 for https://download.docker.com/linux/centos/2023.0.2023051
7/x86_64/stable/repo/repodata/repomd.xml (IP: 13.32.151.28)
Error: Failed to download metadata for repo 'docker-ce-stable': Cannot download
repomd.xml: Cannot download repodata/repomd.xml: All mirrors were tried
Kubernetes                           1.5 kB/s | 454 B   00:00
Ignoring repositories: docker-ce-stable
Package python-unversioned-command-3.9.16-1.amzn2023.0.3.noarch is already installed.
Package python3-pip-21.3.1-2.amzn2023.0.5.noarch is already installed.
Package python3-setuptools-59.6.0-2.amzn2023.0.3.noarch is already installed.
Package python3-setuptools-wheel-59.6.0-2.amzn2023.0.3.noarch is already installed.
Dependencies resolved.
=====
 Package          Arch    Version      Repository      Size
=====
Installing:
```

```
ec2-user@ansibleserver:~
```

Installing:

python3-setuptools-rust	noarch	0.12.1-1.amzn2023.0.3	amazonlinux	46 k
python3-setuptools_scm	noarch	6.0.1-4.amzn2023.0.2	amazonlinux	52 k
python3-setuptools_scm+toml	noarch	6.0.1-4.amzn2023.0.2	amazonlinux	9.6 k

Installing dependencies:

annobin-docs	noarch	10.93-1.amzn2023.0.1	amazonlinux	92 k
annobin-plugin-gcc	x86_64	10.93-1.amzn2023.0.1	amazonlinux	887 k
cargo	x86_64	1.68.2-1.amzn2023.0.1	amazonlinux	4.8 M
cpp	x86_64	11.3.1-4.amzn2023.0.3	amazonlinux	10 M
gc	x86_64	8.0.4-5.amzn2023.0.2	amazonlinux	105 k
gcc	x86_64	11.3.1-4.amzn2023.0.3	amazonlinux	32 M
glibc-devel	x86_64	2.34-52.amzn2023.0.2	amazonlinux	48 k
glibc-headers-x86	noarch	2.34-52.amzn2023.0.2	amazonlinux	448 k
guile22	x86_64	2.2.7-2.amzn2023.0.2	amazonlinux	6.4 M
kernel-headers	x86_64	6.1.27-43.48.amzn2023	amazonlinux	1.4 M
libmpc	x86_64	1.2.1-2.amzn2023.0.2	amazonlinux	62 k
libtool-ltdl	x86_64	2.4.7-1.amzn2023.0.3	amazonlinux	38 k
libxcrypt-devel	x86_64	4.4.33-7.amzn2023	amazonlinux	32 k
llvm-libs	x86_64	15.0.6-2.amzn2023.0.2	amazonlinux	25 M
make	x86_64	1:4.3-5.amzn2023.0.2	amazonlinux	534 k
python3-rust2rpm	x86_64	21-88.amzn2023.0.2	amazonlinux	54 k
python3-semantic_version	noarch	2.8.4-6.amzn2023.0.2	amazonlinux	39 k
python3-toml	noarch	0.10.2-2.amzn2023.0.2	amazonlinux	39 k
python3-tqdm	noarch	4.61.1-1.amzn2023.0.2	amazonlinux	128 k

```
ec2-user@ansibleserver:~
```

python3-rust2rpm	x86_64	21-88.amzn2023.0.2	amazonlinux	54 k
python3-semantic_version	noarch	2.8.4-6.amzn2023.0.2	amazonlinux	39 k
python3-toml	noarch	0.10.2-2.amzn2023.0.2	amazonlinux	39 k
python3-tqdm	noarch	4.61.1-1.amzn2023.0.2	amazonlinux	128 k
rust	x86_64	1.68.2-1.amzn2023.0.1	amazonlinux	28 M
rust-packaging	x86_64	21-88.amzn2023.0.2	amazonlinux	13 k
rust-std-static	x86_64	1.68.2-1.amzn2023.0.1	amazonlinux	30 M

Transaction Summary

Install 25 Packages

Total download size: 141 M
Installed size: 513 M
Is this ok [y/N]: y
Downloading Packages:
(1/25): guile22-2.2.7-2.amzn2023.0.2.x86_64.rpm 42 MB/s | 6.4 MB 00:00
(2/25): glibc-devel-2.34-52.amzn2023.0.2.x86_64 2.8 MB/s | 48 kB 00:00
(3/25): libtool-ltdl-2.4.7-1.amzn2023.0.3.x86_6 2.5 MB/s | 38 kB 00:00
(4/25): kernel-headers-6.1.27-43.48.amzn2023.x86_6 6.7 MB/s | 1.4 MB 00:00
(5/25): rust-packaging-21-88.amzn2023.0.2.x86_6 358 kB/s | 13 kB 00:00
(6/25): annobin-plugin-gcc-10.93-1.amzn2023.0.1 20 MB/s | 887 kB 00:00
(7/25): cpp-11.3.1-4.amzn2023.0.3.x86_64.rpm 33 MB/s | 10 MB 00:00
(8/25): python3-rust2rpm-21-88.amzn2023.0.2.x86_64 1.1 MB/s | 54 kB 00:00

```
ec2-user@ansibleserver:~  
Is this ok [y/N]: y  
Downloading Packages:  
(1/25): guile22-2.2.7-2.amzn2023.0.2.x86_64.rpm 42 MB/s | 6.4 MB 00:00  
(2/25): glibc-devel-2.34-52.amzn2023.0.2.x86_64 2.8 MB/s | 48 kB 00:00  
(3/25): libtool-ltdl-2.4.7-1.amzn2023.0.3.x86_6 2.5 MB/s | 38 kB 00:00  
(4/25): kernel-headers-6.1.27-43.48.amzn2023.x8 6.7 MB/s | 1.4 MB 00:00  
(5/25): rust-packaging-21-88.amzn2023.0.2.x86_6 358 kB/s | 13 kB 00:00  
(6/25): annobin-plugin-gcc-10.93-1.amzn2023.0.1 20 MB/s | 887 kB 00:00  
(7/25): cpp-11.3.1-4.amzn2023.0.3.x86_64.rpm 33 MB/s | 10 MB 00:00  
(8/25): python3-rust2rpm-21-88.amzn2023.0.2.x86 1.1 MB/s | 54 kB 00:00  
(9/25): libmpc-1.2.1-2.amzn2023.0.2.x86_64.rpm 3.3 MB/s | 62 kB 00:00  
(10/25): rust-1.68.2-1.amzn2023.0.1.x86_64.rpm 31 MB/s | 28 MB 00:00  
(11/25): cargo-1.68.2-1.amzn2023.0.1.x86_64.rpm 13 MB/s | 4.8 MB 00:00  
(12/25): gcc-11.3.1-4.amzn2023.0.3.x86_64.rpm 37 MB/s | 32 MB 00:00  
(13/25): make-4.3-5.amzn2023.0.2.x86_64.rpm 2.9 MB/s | 534 kB 00:00  
(14/25): gc-8.0.4-5.amzn2023.0.2.x86_64.rpm 4.5 MB/s | 105 kB 00:00  
(15/25): libcrypt-devel-4.4.33-7.amzn2023.x86_64 1.4 MB/s | 32 kB 00:00  
(16/25): python3-tqdm-4.61.1-1.amzn2023.0.2.noa 1.1 MB/s | 128 kB 00:00  
(17/25): python3-setuptools_scm+toml-6.0.1-4.amzn2023.0.2.noa 322 kB/s | 9.6 kB 00:00  
(18/25): annobin-docs-10.93-1.amzn2023.0.1.noarch 4.6 MB/s | 92 kB 00:00  
(19/25): python3-setuptools_scm-6.0.1-4.amzn2023.0.2.noarch 1.0 MB/s | 52 kB 00:00  
(20/25): llvm-libs-15.0.6-2.amzn2023.0.2.x86_64 48 MB/s | 25 MB 00:00  
(21/25): rust-std-static-1.68.2-1.amzn2023.0.1.noarch 34 MB/s | 30 MB 00:00  
(22/25): python3-semantic_version-2.8.4-6.amzn2023.0.2.x86_64 96 kB/s | 39 kB 00:00
```

```
ec2-user@ansibleserver:~  
  
(23/25): glibc-headers-x86-2.34-52.amzn2023.0.2 2.9 MB/s | 448 kB 00:00  
(24/25): python3-toml-0.10.2-2.amzn2023.0.2.noarch 1.1 MB/s | 39 kB 00:00  
(25/25): python3-setuptools-rust-0.12.1-1.amzn2023.0.2.noarch 667 kB/s | 46 kB 00:00  
  
-----  
Total 72 MB/s | 141 MB 00:01  
  
Running transaction check  
Transaction check succeeded.  
Running transaction test  
Transaction test succeeded.  
Running transaction  
Preparing : 1/1  
Installing : python3-toml-0.10.2-2.amzn2023.0.2.noarch 1/25  
Installing : libmpc-1.2.1-2.amzn2023.0.2.x86_64 2/25  
Installing : cpp-11.3.1-4.amzn2023.0.3.x86_64 3/25  
Installing : glibc-headers-x86-2.34-52.amzn2023.0.2.noarch 4/25  
Installing : python3-semantic_version-2.8.4-6.amzn2023.0.2.noarch 5/25  
Installing : python3-setuptools_scm-6.0.1-4.amzn2023.0.2.noarch 6/25  
Installing : annobin-docs-10.93-1.amzn2023.0.1.noarch 7/25  
Installing : python3-tqdm-4.61.1-1.amzn2023.0.2.noarch 8/25  
Installing : llvm-libs-15.0.6-2.amzn2023.0.2.x86_64 9/25  
Installing : gc-8.0.4-5.amzn2023.0.2.x86_64 10/25  
Installing : libtool-ltdl-2.4.7-1.amzn2023.0.3.x86_64 11/25  
Installing : guile22-2.2.7-2.amzn2023.0.2.x86_64 12/25  
Installing : make-4.3-5.amzn2023.0.2.x86_64 13/25
```

```
ec2-user@ansibleserver:~
```

Installing	:	make-1:4.3-5.amzn2023.0.2.x86_64	13/25
Installing	:	kernel-headers-6.1.27-43.48.amzn2023.x86_64	14/25
Installing	:	libxcrypt-devel-4.4.33-7.amzn2023.x86_64	15/25
Installing	:	glibc-devel-2.34-52.amzn2023.0.2.x86_64	16/25
Installing	:	gcc-11.3.1-4.amzn2023.0.3.x86_64	17/25
Running scriptlet:	gcc-11.3.1-4.amzn2023.0.3.x86_64		17/25
Installing	:	rust-std-static-1.68.2-1.amzn2023.0.1.x86_64	18/25
Installing	:	rust-1.68.2-1.amzn2023.0.1.x86_64	19/25
Installing	:	cargo-1.68.2-1.amzn2023.0.1.x86_64	20/25
Installing	:	python3-rust2rpm-21-88.amzn2023.0.2.x86_64	21/25
Installing	:	rust-packaging-21-88.amzn2023.0.2.x86_64	22/25
Installing	:	python3-setuptools-rust-0.12.1-1.amzn2023.0.3.noarch	23/25
Installing	:	annobin-plugin-gcc-10.93-1.amzn2023.0.1.x86_64	24/25
Running scriptlet:	annobin-plugin-gcc-10.93-1.amzn2023.0.1.x86_64		24/25
Installing	:	python3-setuptools_scm+toml-6.0.1-4.amzn2023.0.2.noarch	25/25
Running scriptlet:	python3-setuptools_scm+toml-6.0.1-4.amzn2023.0.2.noarch		25/25
Verifying	:	rust-1.68.2-1.amzn2023.0.1.x86_64	1/25
Verifying	:	guile22-2.2.7-2.amzn2023.0.2.x86_64	2/25
Verifying	:	kernel-headers-6.1.27-43.48.amzn2023.x86_64	3/25
Verifying	:	glibc-devel-2.34-52.amzn2023.0.2.x86_64	4/25
Verifying	:	libtool-ltdl-2.4.7-1.amzn2023.0.3.x86_64	5/25
Verifying	:	rust-packaging-21-88.amzn2023.0.2.x86_64	6/25
Verifying	:	cpp-11.3.1-4.amzn2023.0.3.x86_64	7/25
Verifying	:	annobin-plugin-gcc-10.93-1.amzn2023.0.1.x86_64	8/25

```
ec2-user@ansibleserver:~
```

Verifying	:	gcc-11.3.1-4.amzn2023.0.3.x86_64	9/25
Verifying	:	python3-rust2rpm-21-88.amzn2023.0.2.x86_64	10/25
Verifying	:	libmpc-1.2.1-2.amzn2023.0.2.x86_64	11/25
Verifying	:	cargo-1.68.2-1.amzn2023.0.1.x86_64	12/25
Verifying	:	rust-std-static-1.68.2-1.amzn2023.0.1.x86_64	13/25
Verifying	:	make-1:4.3-5.amzn2023.0.2.x86_64	14/25
Verifying	:	gc-8.0.4-5.amzn2023.0.2.x86_64	15/25
Verifying	:	llvm-libs-15.0.6-2.amzn2023.0.2.x86_64	16/25
Verifying	:	libxcrypt-devel-4.4.33-7.amzn2023.x86_64	17/25
Verifying	:	python3-tqdm-4.61.1-1.amzn2023.0.2.noarch	18/25
Verifying	:	python3-setuptools_scm+toml-6.0.1-4.amzn2023.0.2.noarch	19/25
Verifying	:	annobin-docs-10.93-1.amzn2023.0.1.noarch	20/25
Verifying	:	python3-setuptools_scm-6.0.1-4.amzn2023.0.2.noarch	21/25
Verifying	:	python3-semantic_version-2.8.4-6.amzn2023.0.2.noarch	22/25
Verifying	:	glibc-headers-x86-2.34-52.amzn2023.0.2.noarch	23/25
Verifying	:	python3-setuptools-rust-0.12.1-1.amzn2023.0.3.noarch	24/25
Verifying	:	python3-toml-0.10.2-2.amzn2023.0.2.noarch	25/25

WARNING:
A newer release of "Amazon Linux" is available.

Available Versions:

Version 2023.0.20230607:

```
ec2-user@ansibleserver:~  
Version 2023.0.20230607:  
Run the following command to upgrade to 2023.0.20230607:  
  
dnf upgrade --releasever=2023.0.20230607  
  
Release notes:  
https://docs.aws.amazon.com/linux/al2023/release-notes/relnotes.html  
  
Version 2023.0.20230614:  
Run the following command to upgrade to 2023.0.20230614:  
  
dnf upgrade --releasever=2023.0.20230614  
  
Release notes:  
https://docs.aws.amazon.com/linux/al2023/release-notes/relnotes.html  
  
=====  
Installed:  
annobin-docs-10.93-1.amzn2023.0.1.noarch  
annobin-plugin-gcc-10.93-1.amzn2023.0.1.x86_64  
cargo-1.68.2-1.amzn2023.0.1.x86_64  
cpp-11.3.1-4.amzn2023.0.3.x86_64  
gc-8.0.4-5.amzn2023.0.2.x86_64
```

```
ec2-user@ansibleserver:~
```

```
gc-8.0.4-5.amzn2023.0.2.x86_64  
gcc-11.3.1-4.amzn2023.0.3.x86_64  
glibc-devel-2.34-52.amzn2023.0.2.x86_64  
glibc-headers-x86-2.34-52.amzn2023.0.2.noarch  
guile22-2.2.7-2.amzn2023.0.2.x86_64  
kernel-headers-6.1.27-43.48.amzn2023.x86_64  
libmpc-1.2.1-2.amzn2023.0.2.x86_64  
libtool-ltdl-2.4.7-1.amzn2023.0.3.x86_64  
libxcrypt-devel-4.4.33-7.amzn2023.x86_64  
llvm-libs-15.0.6-2.amzn2023.0.2.x86_64  
make-1:4.3-5.amzn2023.0.2.x86_64  
python3-rust2rpm-21-88.amzn2023.0.2.x86_64  
python3-semantic_version-2.8.4-6.amzn2023.0.2.noarch  
python3-setuptools-rust-0.12.1-1.amzn2023.0.3.noarch  
python3-setuptools_scm-6.0.1-4.amzn2023.0.2.noarch  
python3-setuptools_scm+toml-6.0.1-4.amzn2023.0.2.noarch  
python3-toml-0.10.2-2.amzn2023.0.2.noarch  
python3-tqdm-4.61.1-1.amzn2023.0.2.noarch  
rust-1.68.2-1.amzn2023.0.1.x86_64  
rust-packaging-21-88.amzn2023.0.2.x86_64  
rust-std-static-1.68.2-1.amzn2023.0.1.x86_64
```

Complete!

```
[ec2-user@ansibleserver ~]$
```

```
[ec2-user@ansibleserver ~]$ curl -O https://bootstrap.pypa.io/get-pip.py
```

% Total	% Received	% Xferd	Average Speed	Time	Time	Time	Current	
			Dload	Upload	Total	Spent	Left	Speed
100	2518k	100	2518k	0	0	36.6M	0	--::-- --::-- --::-- 36.7M

```
[ec2-user@ansibleserver ~]$ python get-pip.py
```

```
Defaulting to user installation because normal site-packages is not writeable
```

```
Collecting pip
```

```
  Downloading pip-23.1.2-py3-none-any.whl (2.1 MB)
```

```
           2.1/2.1 MB 41.6 MB/s eta 0:00:00
```

```
Collecting wheel
```

```
  Downloading wheel-0.40.0-py3-none-any.whl (64 kB)
```

```
           64.5/64.5 kB 12.8 MB/s eta 0:00:00
```

```
Installing collected packages: wheel, pip
```

```
Successfully installed pip-23.1.2 wheel-0.40.0
```

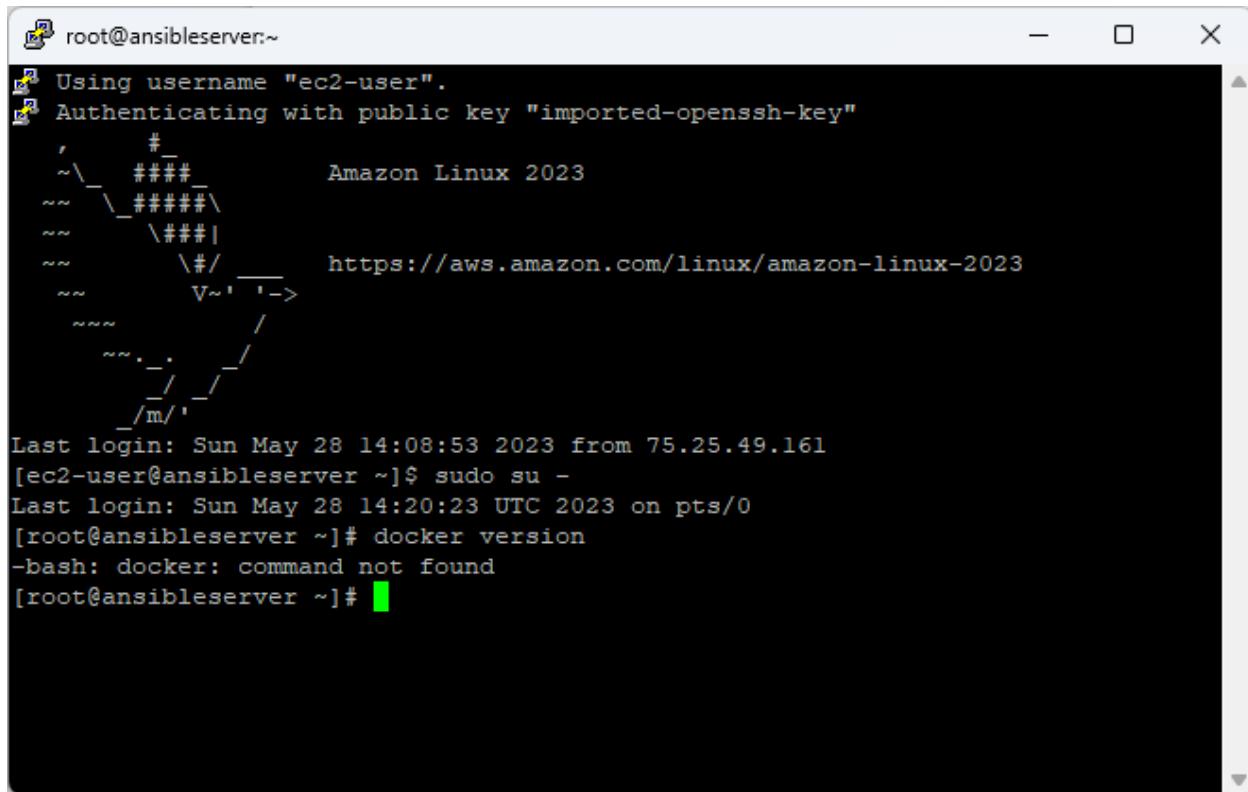
```
[ec2-user@ansibleserver ~]$ python --version
```

```
Python 3.9.16
```

```
[ec2-user@ansibleserver ~]$ pip --version
```

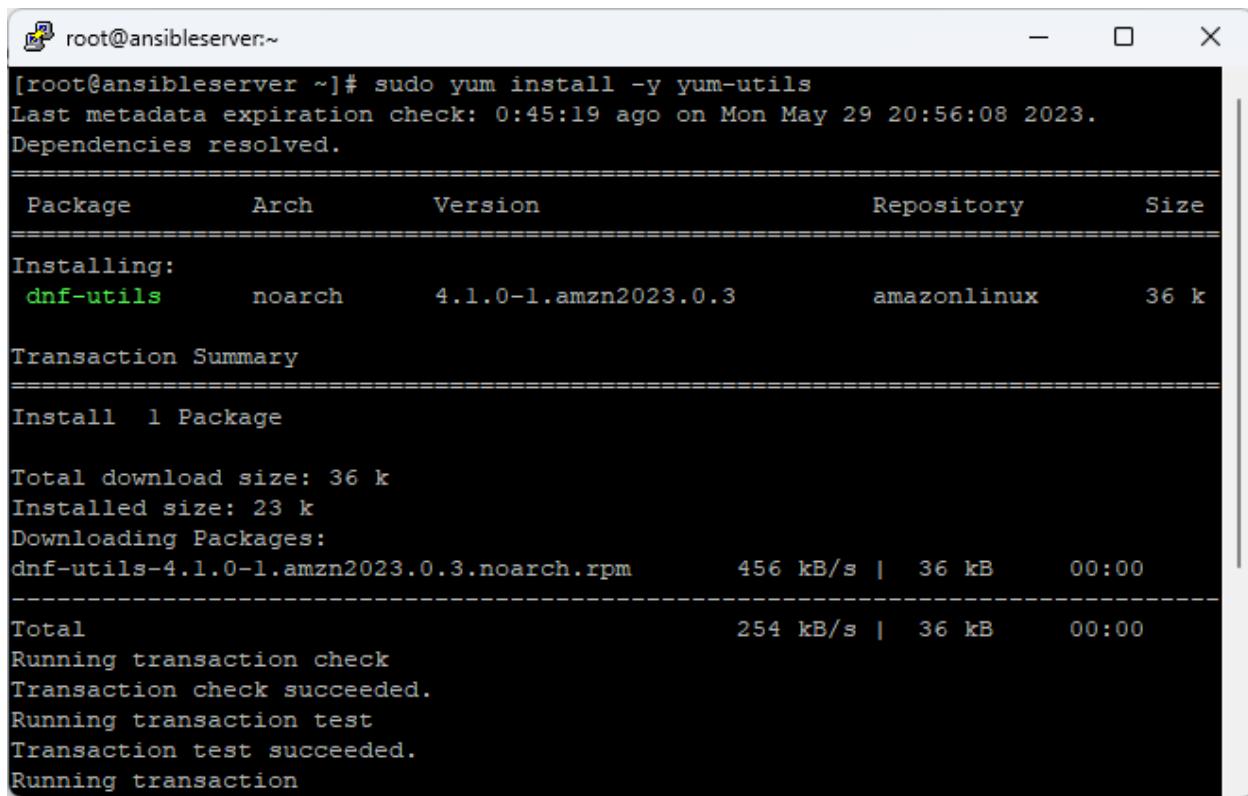
```
pip 23.1.2 from /home/ec2-user/.local/lib/python3.9/site-packages/pip (python 3.9)
```

Install Docker and Kubernetes on the cluster:



```
root@ansibleserver:~  
Using username "ec2-user".  
Authenticating with public key "imported-openssh-key"  
Amazon Linux 2023  
https://aws.amazon.com/linux/amazon-linux-2023  
Last login: Sun May 28 14:08:53 2023 from 75.25.49.161  
[ec2-user@ansibleserver ~]$ sudo su -  
Last login: Sun May 28 14:20:23 UTC 2023 on pts/0  
[root@ansibleserver ~]# docker version  
bash: docker: command not found  
[root@ansibleserver ~]#
```

sudo yum install -y yum-utils



```
root@ansibleserver:~  
[root@ansibleserver ~]# sudo yum install -y yum-utils  
Last metadata expiration check: 0:45:19 ago on Mon May 29 20:56:08 2023.  
Dependencies resolved.  
=====  
 Package           Arch      Version            Repository      Size  
=====  
 Installing:  
  dnf-utils        noarch    4.1.0-1.amzn2023.0.3    amazonlinux    36 k  
  
Transaction Summary  
=====  
Install 1 Package  
  
Total download size: 36 k  
Installed size: 23 k  
Downloading Packages:  
dnf-utils-4.1.0-1.amzn2023.0.3.noarch.rpm      456 kB/s | 36 kB   00:00  
=====  
Total                                         254 kB/s | 36 kB   00:00  
Running transaction check  
Transaction check succeeded.  
Running transaction test  
Transaction test succeeded.  
Running transaction
```

```
root@ansibleserver:~  
=====  
Install 1 Package  
  
Total download size: 36 k  
Installed size: 23 k  
Downloading Packages:  
dnf-utils-4.1.0-1.amzn2023.0.3.noarch.rpm      456 kB/s | 36 kB    00:00  
-----  
Total                                         254 kB/s | 36 kB    00:00  
  
Running transaction check  
Transaction check succeeded.  
Running transaction test  
Transaction test succeeded.  
Running transaction  
Preparing          : 1/1  
Installing        : dnf-utils-4.1.0-1.amzn2023.0.3.noarch 1/1  
Running scriptlet: dnf-utils-4.1.0-1.amzn2023.0.3.noarch 1/1  
Verifying         : dnf-utils-4.1.0-1.amzn2023.0.3.noarch 1/1  
  
Installed:  
  dnf-utils-4.1.0-1.amzn2023.0.3.noarch  
  
Complete!  
[root@ansibleserver ~]#
```

sudo yum-config-manager --add-repo
https://download.docker.com/linux/centos/docker-ce.repo

```
root@ansibleserver:~  
=====  
Total download size: 36 k  
Installed size: 23 k  
Downloading Packages:  
dnf-utils-4.1.0-1.amzn2023.0.3.noarch.rpm      456 kB/s | 36 kB    00:00  
-----  
Total                                         254 kB/s | 36 kB    00:00  
  
Running transaction check  
Transaction check succeeded.  
Running transaction test  
Transaction test succeeded.  
Running transaction  
Preparing          : 1/1  
Installing        : dnf-utils-4.1.0-1.amzn2023.0.3.noarch 1/1  
Running scriptlet: dnf-utils-4.1.0-1.amzn2023.0.3.noarch 1/1  
Verifying         : dnf-utils-4.1.0-1.amzn2023.0.3.noarch 1/1  
  
Installed:  
  dnf-utils-4.1.0-1.amzn2023.0.3.noarch  
  
Complete!  
[root@ansibleserver ~]# sudo yum-config-manager --add-repo https://download.docker.com/linux/centos/docker-ce.repo  
Adding repo from: https://download.docker.com/linux/centos/docker-ce.repo  
[root@ansibleserver ~]#
```

Install the Dependencies

```
sudo yum install -y yum-utils device-mapper-persistent-data lvm2
```

```
[root@ansibleserver ~]# sudo yum install -y yum-utils device-mapper-persistent-d  
ata lvm2  
Docker CE Stable - x86_64 2.9 kB/s | 397 B 00:00  
Errors during downloading metadata for repository 'docker-ce-stable':  
- Status code: 404 for https://download.docker.com/linux/centos/2023.0.2023051  
7/x86_64/stable/repo/repodata/repomd.xml (IP: 18.160.41.19)  
Error: Failed to download metadata for repo 'docker-ce-stable': Cannot download  
repomd.xml: Cannot download repodata/repomd.xml: All mirrors were tried  
Ignoring repositories: docker-ce-stable  
Last metadata expiration check: 0:50:02 ago on Mon May 29 20:56:08 2023.  
Package dnf-utils-4.1.0-1.amzn2023.0.3.noarch is already installed.  
Dependencies resolved.  
=====  
 Package Arch Version Repository Size  
=====  
Installing:  
 device-mapper-persistent-data x86_64 0.9.0-7.amzn2023.0.2 amazonlinux 781 k  
 lvm2 x86_64 2.03.16-1.amzn2023.0.4 amazonlinux 1.5 M  
Installing dependencies:  
 device-mapper-event x86_64 1.02.185-1.amzn2023.0.4 amazonlinux 34 k  
 device-mapper-event-libs x86_64 1.02.185-1.amzn2023.0.4 amazonlinux 33 k  
 lvm2-libs x86_64 2.03.16-1.amzn2023.0.4 amazonlinux 988 k  
Transaction Summary
```

```
[root@ansibleserver ~]  
Transaction Summary  
=====  
Install 5 Packages  
  
Total download size: 3.3 M  
Installed size: 9.3 M  
Downloading Packages:  
(1/5): device-mapper-event-1.02.185-1.amzn2023. 371 kB/s | 34 kB 00:00  
(2/5): lvm2-libs-2.03.16-1.amzn2023.0.4.x86_64. 6.5 MB/s | 988 kB 00:00  
(3/5): lvm2-2.03.16-1.amzn2023.0.4.x86_64.rpm 9.0 MB/s | 1.5 MB 00:00  
(4/5): device-mapper-persistent-data-0.9.0-7.am 8.6 MB/s | 781 kB 00:00  
(5/5): device-mapper-event-libs-1.02.185-1.amzn 952 kB/s | 33 kB 00:00  
----  
Total 13 MB/s | 3.3 MB 00:00  
Running transaction check  
Transaction check succeeded.  
Running transaction test  
Transaction test succeeded.  
Running transaction  
Preparing : 1/1  
Installing : device-mapper-event-libs-1.02.185-1.amzn2023.0.4.x86 1/5  
Installing : device-mapper-event-1.02.185-1.amzn2023.0.4.x86_64 2/5  
Running scriptlet: device-mapper-event-1.02.185-1.amzn2023.0.4.x86_64 2/5  
Created symlink /etc/systemd/system/sockets.target.wants/dm-event.socket → /usr/
```

```
root@ansibleserver:~  
Created symlink /etc/systemd/system/sockets.target.wants/dm-event.socket → /usr/lib/systemd/system/dm-event.socket.  
  
Installing : lvm2-libs-2.03.16-1.amzn2023.0.4.x86_64 3/5  
Installing : device-mapper-persistent-data-0.9.0-7.amzn2023.0.2.x 4/5  
Installing : lvm2-2.03.16-1.amzn2023.0.4.x86_64 5/5  
Running scriptlet: lvm2-2.03.16-1.amzn2023.0.4.x86_64 5/5  
Created symlink /etc/systemd/system/sysinit.target.wants/lvm2-monitor.service → /usr/lib/systemd/system/lvm2-monitor.service.  
Created symlink /etc/systemd/system/sysinit.target.wants/lvm2-lvmpolld.socket → /usr/lib/systemd/system/lvm2-lvmpolld.socket.  
  
Verifying : device-mapper-event-1.02.185-1.amzn2023.0.4.x86_64 1/5  
Verifying : lvm2-libs-2.03.16-1.amzn2023.0.4.x86_64 2/5  
Verifying : lvm2-2.03.16-1.amzn2023.0.4.x86_64 3/5  
Verifying : device-mapper-persistent-data-0.9.0-7.amzn2023.0.2.x 4/5  
Verifying : device-mapper-event-libs-1.02.185-1.amzn2023.0.4.x86 5/5  
  
Installed:  
device-mapper-event-1.02.185-1.amzn2023.0.4.x86_64  
device-mapper-event-libs-1.02.185-1.amzn2023.0.4.x86_64  
device-mapper-persistent-data-0.9.0-7.amzn2023.0.2.x86_64  
lvm2-2.03.16-1.amzn2023.0.4.x86_64  
lvm2-libs-2.03.16-1.amzn2023.0.4.x86_64
```

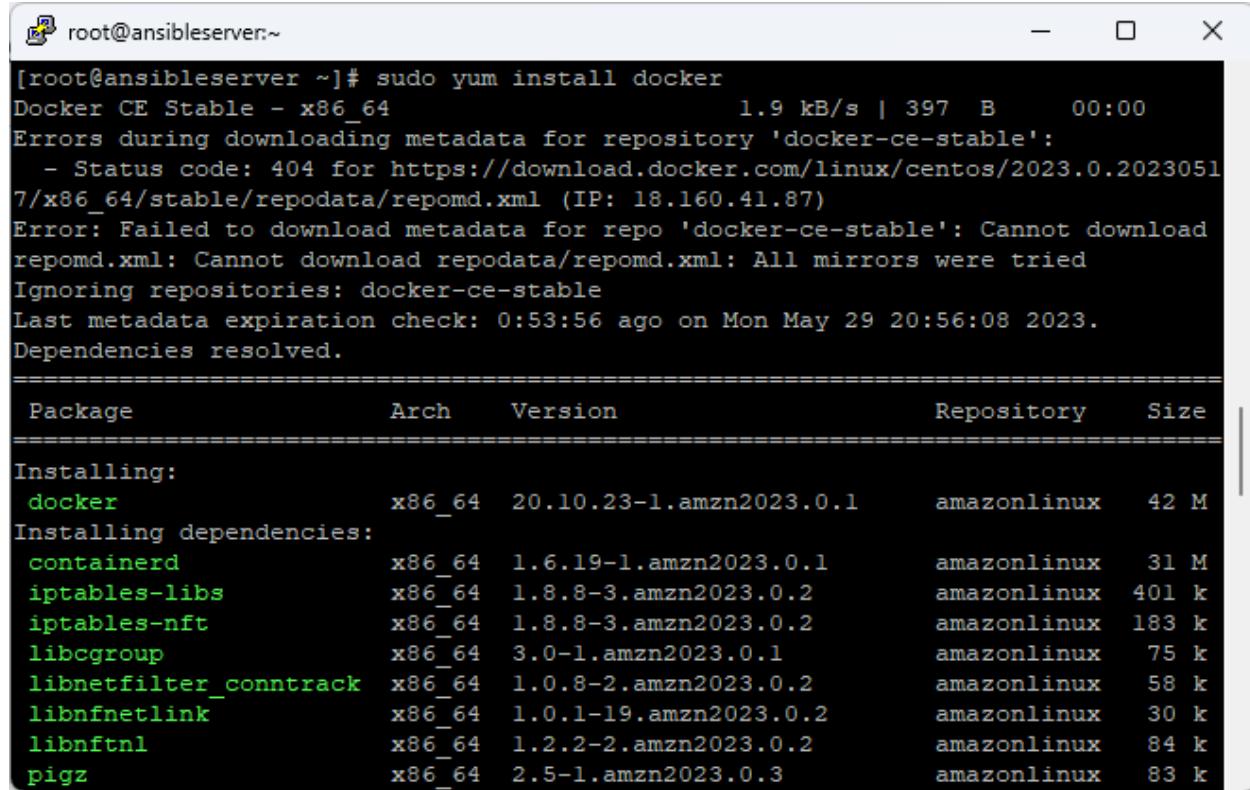
```
root@ansibleserver:~  
Installing : lvm2-libs-2.03.16-1.amzn2023.0.4.x86_64 3/5  
Installing : device-mapper-persistent-data-0.9.0-7.amzn2023.0.2.x 4/5  
Installing : lvm2-2.03.16-1.amzn2023.0.4.x86_64 5/5  
Running scriptlet: lvm2-2.03.16-1.amzn2023.0.4.x86_64 5/5  
Created symlink /etc/systemd/system/sysinit.target.wants/lvm2-monitor.service → /usr/lib/systemd/system/lvm2-monitor.service.  
Created symlink /etc/systemd/system/sysinit.target.wants/lvm2-lvmpolld.socket → /usr/lib/systemd/system/lvm2-lvmpolld.socket.  
  
Verifying : device-mapper-event-1.02.185-1.amzn2023.0.4.x86_64 1/5  
Verifying : lvm2-libs-2.03.16-1.amzn2023.0.4.x86_64 2/5  
Verifying : lvm2-2.03.16-1.amzn2023.0.4.x86_64 3/5  
Verifying : device-mapper-persistent-data-0.9.0-7.amzn2023.0.2.x 4/5  
Verifying : device-mapper-event-libs-1.02.185-1.amzn2023.0.4.x86 5/5  
  
Installed:  
device-mapper-event-1.02.185-1.amzn2023.0.4.x86_64  
device-mapper-event-libs-1.02.185-1.amzn2023.0.4.x86_64  
device-mapper-persistent-data-0.9.0-7.amzn2023.0.2.x86_64  
lvm2-2.03.16-1.amzn2023.0.4.x86_64  
lvm2-libs-2.03.16-1.amzn2023.0.4.x86_64  
  
Complete!  
[root@ansibleserver ~]#
```

Add the Docker Repository to CentOS

```
sudo yum-config-manager --add-repo  
https://download.docker.com/linux/centos/docker-ce.repo
```

```
[root@ansibleserver ~]# sudo yum-config-manager --add-repo https://download.docker.com/linux/centos/docker-ce.repo  
Adding repo from: https://download.docker.com/linux/centos/docker-ce.repo
```

sudo yum install docker



```
root@ansibleserver:~  
[root@ansibleserver ~]# sudo yum install docker  
Docker CE Stable - x86_64 1.9 kB/s | 397 B 00:00  
Errors during downloading metadata for repository 'docker-ce-stable':  
- Status code: 404 for https://download.docker.com/linux/centos/2023.0.20230517/x86_64/stable/repo/repodata/repomd.xml (IP: 18.160.41.87)  
Error: Failed to download metadata for repo 'docker-ce-stable': Cannot download repomd.xml: Cannot download repodata/repomd.xml: All mirrors were tried  
Ignoring repositories: docker-ce-stable  
Last metadata expiration check: 0:53:56 ago on Mon May 29 20:56:08 2023.  
Dependencies resolved.  
=====  
Package Arch Version Repository Size  
=====  
Installing:  
 docker x86_64 20.10.23-1.amzn2023.0.1 amazonlinux 42 M  
Installing dependencies:  
 containerd x86_64 1.6.19-1.amzn2023.0.1 amazonlinux 31 M  
 iptables-libs x86_64 1.8.8-3.amzn2023.0.2 amazonlinux 401 k  
 iptables-nft x86_64 1.8.8-3.amzn2023.0.2 amazonlinux 183 k  
 libcgroup x86_64 3.0-1.amzn2023.0.1 amazonlinux 75 k  
 libnetfilter_conntrack x86_64 1.0.8-2.amzn2023.0.2 amazonlinux 58 k  
 libnftnetlink x86_64 1.0.1-19.amzn2023.0.2 amazonlinux 30 k  
 libnftnl x86_64 1.2.2-2.amzn2023.0.2 amazonlinux 84 k  
 pigz x86_64 2.5-1.amzn2023.0.3 amazonlinux 83 k
```

```
root@ansibleserver:~  
libnftnl           x86_64  1.2.2-2.amzn2023.0.2      amazonlinux   84 k  
pigz              x86_64  2.5-1.amzn2023.0.3      amazonlinux   83 k  
runc              x86_64  1.1.4-1.amzn2023.0.1      amazonlinux  3.1 M  
  
Transaction Summary  
=====  
Install 10 Packages  
  
Total download size: 77 M  
Installed size: 300 M  
Is this ok [y/N]: y  
Downloading Packages:  
(1/10): libnfnetlink-1.0.1-19.amzn2023.0.2.x86_64.rpm 458 kB/s | 30 kB 00:00  
(2/10): runc-1.1.4-1.amzn2023.0.1.x86_64.rpm 28 MB/s | 3.1 MB 00:00  
(3/10): iptables-nft-1.8.8-3.amzn2023.0.2.x86_64 3.6 MB/s | 183 kB 00:00  
(4/10): iptables-libs-1.8.8-3.amzn2023.0.2.x86_64 3.2 MB/s | 401 kB 00:00  
(5/10): pigz-2.5-1.amzn2023.0.3.x86_64.rpm 4.8 MB/s | 83 kB 00:00  
(6/10): libcgroup-3.0-1.amzn2023.0.1.x86_64.rpm 4.8 MB/s | 75 kB 00:00  
(7/10): libnetfilter_conntrack-1.0.8-2.amzn2023.0.2.x86_64.rpm 3.9 MB/s | 58 kB 00:00  
(8/10): libnftnl-1.2.2-2.amzn2023.0.2.x86_64.rpm 5.2 MB/s | 84 kB 00:00  
(9/10): containerd-1.6.19-1.amzn2023.0.1.x86_64 56 MB/s | 31 MB 00:00  
(10/10): docker-20.10.23-1.amzn2023.0.1.x86_64 47 MB/s | 42 MB 00:00  
-----  
Total 70 MB/s | 77 MB 00:01
```

```
root@ansibleserver:~  
Running transaction check  
Transaction check succeeded.  
Running transaction test  
Transaction test succeeded.  
Running transaction  
  Preparing : 1/1  
  Installing : runc-1.1.4-1.amzn2023.0.1.x86_64 1/10  
  Installing : containerd-1.6.19-1.amzn2023.0.1.x86_64 2/10  
  Running scriptlet: containerd-1.6.19-1.amzn2023.0.1.x86_64 2/10  
  Installing : libnftnl-1.2.2-2.amzn2023.0.2.x86_64 3/10  
  Installing : libcgroup-3.0-1.amzn2023.0.1.x86_64 4/10  
  Installing : pigz-2.5-1.amzn2023.0.3.x86_64 5/10  
  Installing : libnfnetlink-1.0.1-19.amzn2023.0.2.x86_64 6/10  
  Installing : libnetfilter_conntrack-1.0.8-2.amzn2023.0.2.x86_64 7/10  
  Installing : iptables-libs-1.8.8-3.amzn2023.0.2.x86_64 8/10  
  Installing : iptables-nft-1.8.8-3.amzn2023.0.2.x86_64 9/10  
  Running scriptlet: iptables-nft-1.8.8-3.amzn2023.0.2.x86_64 9/10  
  Running scriptlet: docker-20.10.23-1.amzn2023.0.1.x86_64 10/10  
  Installing : docker-20.10.23-1.amzn2023.0.1.x86_64 10/10  
  Running scriptlet: docker-20.10.23-1.amzn2023.0.1.x86_64 10/10  
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /usr/lib/systemd/system/docker.socket.  
  Verifying : iptables-libs-1.8.8-3.amzn2023.0.2.x86_64 1/10
```

```
root@ansibleserver:~ Verifying : iptables-libs-1.8.8-3.amzn2023.0.2.x86_64 1/10  
root@ansibleserver:~ Verifying : runc-1.1.4-1.amzn2023.0.1.x86_64 2/10  
root@ansibleserver:~ Verifying : libnftnetlink-1.0.1-19.amzn2023.0.2.x86_64 3/10  
root@ansibleserver:~ Verifying : iptables-nft-1.8.8-3.amzn2023.0.2.x86_64 4/10  
root@ansibleserver:~ Verifying : pigz-2.5-1.amzn2023.0.3.x86_64 5/10  
root@ansibleserver:~ Verifying : libcgroup-3.0-1.amzn2023.0.1.x86_64 6/10  
root@ansibleserver:~ Verifying : libnetfilter_conntrack-1.0.8-2.amzn2023.0.2.x86_64 7/10  
root@ansibleserver:~ Verifying : containerd-1.6.19-1.amzn2023.0.1.x86_64 8/10  
root@ansibleserver:~ Verifying : libnftnl-1.2.2-2.amzn2023.0.2.x86_64 9/10  
root@ansibleserver:~ Verifying : docker-20.10.23-1.amzn2023.0.1.x86_64 10/10  
  
Installed:  
containerd-1.6.19-1.amzn2023.0.1.x86_64  
docker-20.10.23-1.amzn2023.0.1.x86_64  
iptables-libs-1.8.8-3.amzn2023.0.2.x86_64  
iptables-nft-1.8.8-3.amzn2023.0.2.x86_64  
libcgroup-3.0-1.amzn2023.0.1.x86_64  
libnetfilter_conntrack-1.0.8-2.amzn2023.0.2.x86_64  
libnftnetlink-1.0.1-19.amzn2023.0.2.x86_64  
libnftnl-1.2.2-2.amzn2023.0.2.x86_64  
pigz-2.5-1.amzn2023.0.3.x86_64  
runc-1.1.4-1.amzn2023.0.1.x86_64  
  
Complete!
```

Manage Docker Service

sudo systemctl start docker

sudo systemctl enable docker

```
[root@ansibleserver ~]# sudo systemctl start docker  
[root@ansibleserver ~]# sudo systemctl enable docker  
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /usr/lib/systemd/system/docker.service.
```

Check the status of the service with:

sudo systemctl status docker

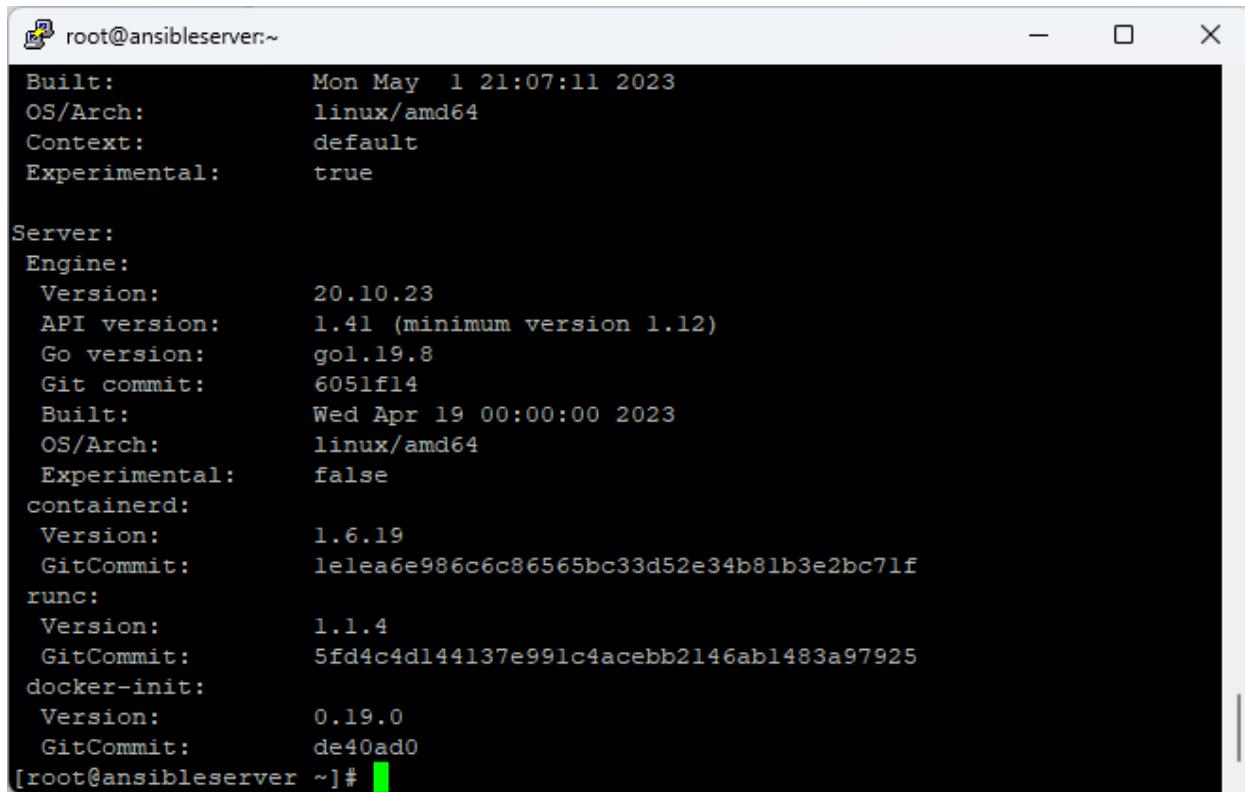
```
[root@ansibleserver ~]# sudo systemctl status docker
● docker.service - Docker Application Container Engine
    Loaded: loaded (/usr/lib/systemd/system/docker.service; enabled; preset: d...
      Active: active (running) since Mon 2023-05-29 21:52:00 UTC; 31s ago
TriggeredBy: ● docker.socket
              Docs: https://docs.docker.com
        Main PID: 144399 (dockerd)
          Tasks: 7 (limit: 1108)
        Memory: 31.9M
          CPU: 289ms
        CGroup: /system.slice/docker.service
                  └─144399 /usr/bin/dockerd -H fd:/// --containerd=/run/containerd/co...

May 29 21:51:59 ansibleserver dockerd[144399]: time="2023-05-29T21:51:59.454746...
May 29 21:51:59 ansibleserver dockerd[144399]: time="2023-05-29T21:51:59.454838...
May 29 21:51:59 ansibleserver dockerd[144399]: time="2023-05-29T21:51:59.456956...
May 29 21:51:59 ansibleserver dockerd[144399]: time="2023-05-29T21:51:59.504576...
May 29 21:51:59 ansibleserver dockerd[144399]: time="2023-05-29T21:51:59.763943...
May 29 21:51:59 ansibleserver dockerd[144399]: time="2023-05-29T21:51:59.895116...
May 29 21:52:00 ansibleserver dockerd[144399]: time="2023-05-29T21:52:00.024894...
May 29 21:52:00 ansibleserver dockerd[144399]: time="2023-05-29T21:52:00.025343...
May 29 21:52:00 ansibleserver dockerd[144399]: time="2023-05-29T21:52:00.059298...
May 29 21:52:00 ansibleserver systemd[1]: Started docker.service - Docker Appli...
lines 1-22/22 (END)
```

Docker version:

```
[root@ansibleserver ~]# docker version
Client:
Version:          20.10.23
API version:      1.41
Go version:       go1.19.8
Git commit:       7155243
Built:            Mon May 1 21:07:11 2023
OS/Arch:          linux/amd64
Context:          default
Experimental:     true

Server:
Engine:
Version:          20.10.23
API version:      1.41 (minimum version 1.12)
Go version:       go1.19.8
Git commit:       6051f14
Built:            Wed Apr 19 00:00:00 2023
OS/Arch:          linux/amd64
Experimental:     false
containerd:
Version:          1.6.19
GitCommit:        lelea6e986c6c86565bc33d52e34b81b3e2bc71f
runc:
```



A screenshot of a terminal window titled "root@ansibleserver:~". The window displays the output of the "docker --version" command. The output shows various components and their versions:

```
Built: Mon May 1 21:07:11 2023
OS/Arch: linux/amd64
Context: default
Experimental: true

Server:
Engine:
Version: 20.10.23
API version: 1.41 (minimum version 1.12)
Go version: go1.19.8
Git commit: 6051f14
Built: Wed Apr 19 00:00:00 2023
OS/Arch: linux/amd64
Experimental: false
containerd:
Version: 1.6.19
GitCommit: leleaae986c6c86565bc33d52e34b81b3e2bc71f
runc:
Version: 1.1.4
GitCommit: 5fd4c4d144137e991c4acebb2146abl483a97925
docker-init:
Version: 0.19.0
GitCommit: de40ad0
[root@ansibleserver ~] #
```

Configure Kubernetes Repository

```
cat <<EOF > /etc/yum.repos.d/kubernetes.repo
[kubernetes]
name=Kubernetes
baseurl=https://packages.cloud.google.com/yum/repos/kubernetes-el7-x86_64
enabled=1
gpgcheck=1
repo_gpgcheck=1
gpgkey=https://packages.cloud.google.com/yum/doc/yum-key.gpg
https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg
EOF
```

```
root@ansibleserver ~]# cat <<EOF > /etc/yum.repos.d/kubernetes.repo
[kubernetes]
name=Kubernetes
baseurl=https://packages.cloud.google.com/yum/repos/kubernetes-el7-x86_64
enabled=1
gpgcheck=1
repo_gpgcheck=1
gpgkey=https://packages.cloud.google.com/yum/doc/yum-key.gpg https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg
EOF
[root@ansibleserver ~]#
```

sudo yum install -y kubelet kubeadm kubectl

```
root@ansibleserver ~]# sudo yum install -y kubelet kubeadm kubectl
Docker CE Stable - x86_64                                2.7 kB/s | 397 B   00:00
Errors during downloading metadata for repository 'docker-ce-stable':
 - Status code: 404 for https://download.docker.com/linux/centos/2023.0.20230517/x86_64/stable/repo/repodata/repomd.xml (IP: 18.160.41.19)
Error: Failed to download metadata for repo 'docker-ce-stable': Cannot download repomd.xml: Cannot download repodata/repomd.xml: All mirrors were tried
Kubernetes                                         1.4 kB/s | 454 B   00:00
Kubernetes                                         51 kB/s | 2.6 kB   00:00
Importing GPG key 0x13EDEF05:
 Userid      : "Rapture Automatic Signing Key (cloud-rapture-signing-key-2022-03-07-08_01_01.pub)"
 Fingerprint: A362 B822 F6DE DC65 2817 EA46 B53D C80D 13ED EF05
 From       : https://packages.cloud.google.com/yum/doc/yum-key.gpg
Importing GPG key 0xDC6315A3:
 Userid      : "Artifact Registry Repository Signer <artifact-registry-repository-signer@google.com>"
 Fingerprint: 35BA A0B3 3E9E B396 F59C A838 COBA 5CE6 DC63 15A3
 From       : https://packages.cloud.google.com/yum/doc/yum-key.gpg
Kubernetes                                         18 kB/s | 975 B   00:00
Importing GPG key 0x3E1BA8D5:
 Userid      : "Google Cloud Packages RPM Signing Key <gc-team@google.com>"
 Fingerprint: 3749 E1BA 95A8 6CE0 5454 6ED2 F09C 394C 3E1B A8D5
 From       : https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg
```

```
root@ansibleserver:~  
From      : https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg  
Kubernetes          323 kB/s | 173 kB    00:00  
Ignoring repositories: docker-ce-stable  
Dependencies resolved.  
=====  
 Package        Arch      Version       Repository      Size  
=====  
Installing:  
 kubeadm       x86_64    1.27.2-0     kubernetes      11 M  
 kubectl       x86_64    1.27.2-0     kubernetes      11 M  
 kubelet       x86_64    1.27.2-0     kubernetes      20 M  
Installing dependencies:  
 conntrack-tools x86_64    1.4.6-2.amzn2023.0.2  amazonlinux   208 k  
 cri-tools      x86_64    1.26.0-0     kubernetes     8.6 M  
 kubernetes-cni x86_64    1.2.0-0      kubernetes     17 M  
 libnetfilter_cthelper x86_64    1.0.0-21.amzn2023.0.2  amazonlinux   24 k  
 libnetfilter_cttimeout x86_64    1.0.0-19.amzn2023.0.2  amazonlinux   24 k  
 libnetfilter_queue  x86_64    1.0.5-2.amzn2023.0.2  amazonlinux   30 k  
 socat          x86_64    1.7.4.2-1.amzn2023.0.2  amazonlinux   303 k  
Transaction Summary  
=====  
Install 10 Packages
```

```
root@ansibleserver:~  
  
Total download size: 67 M  
Installed size: 284 M  
Downloading Packages:  
(1/10): libnetfilter_queue-1.0.5-2.amzn2023.0.2.x86_64.rpm 347 kB/s | 30 kB    00:00  
(2/10): libnetfilter_cttimeout-1.0.0-19.amzn2022.0.2.x86_64.rpm 248 kB/s | 24 kB    00:00  
(3/10): socat-1.7.4.2-1.amzn2023.0.2.x86_64.rpm 2.6 MB/s | 303 kB   00:00  
(4/10): libnetfilter_cthelper-1.0.0-21.amzn2023.0.2.x86_64.rpm 656 kB/s | 24 kB    00:00  
(5/10): conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64.rpm 2.2 MB/s | 208 kB   00:00  
(6/10): 3f5ba2b53701ac9102ea7c7ab2ca6616a8cd596 24 MB/s | 8.6 MB   00:00  
(7/10): e9c9fbb0572c93dfed395364783d069d1ecede3 29 MB/s | 11 MB    00:00  
(8/10): fd2bd2879d4a52a4a57ebfd7eal5f5617ce1494 20 MB/s | 11 MB    00:00  
(9/10): 0f2a2afdf740d476ad77c508847badlf559afc24 36 MB/s | 17 MB    00:00  
(10/10): 9b9120983b1691b7f47b51f43a276207ab8312 25 MB/s | 20 MB    00:00  
-----  
Total                                         50 MB/s | 67 MB   00:01  
Kubernetes                                    50 kB/s | 2.6 kB  00:00  
Importing GPG key 0x13EDEF05:  
  Userid : "Rapture Automatic Signing Key (cloud-rapture-signing-key-2022-03-07-08_01_01.pub)"  
  Fingerprint: A362 B822 F6DE DC65 2817 EA46 B53D C80D 13ED EF05  
  From    : https://packages.cloud.google.com/yum/doc/yum-key.gpg  
Key imported successfully  
Importing GPG key 0xDC6315A3:
```

```
root@ansibleserver:~ Importing GPG key 0xDC6315A3:  
  Userid      : "Artifact Registry Repository Signer <artifact-registry-repository-signer@google.com>"  
  Fingerprint: 35BA A0B3 3E9E B396 F59C A838 COBA 5CE6 DC63 15A3  
  From        : https://packages.cloud.google.com/yum/doc/yum-key.gpg  
Key imported successfully  
Kubernetes                               18 kB/s | 975 B   00:00  
Importing GPG key 0x3E1BA8D5:  
  Userid      : "Google Cloud Packages RPM Signing Key <gc-team@google.com>"  
  Fingerprint: 3749 E1BA 95A8 6CEO 5454 6ED2 F09C 394C 3E1B A8D5  
  From        : https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg  
Key imported successfully  
Running transaction check  
Transaction check succeeded.  
Running transaction test  
Transaction test succeeded.  
Running transaction  
  Preparing      : 1/1  
  Installing    : kubectl-1.27.2-0.x86_64 1/10  
  Installing    : cri-tools-1.26.0-0.x86_64 2/10  
  Installing    : libnetfilter_cthelper-1.0.0-21.amzn2023.0.2.x86_64 3/10  
  Installing    : libnetfilter_cttimeout-1.0.0-19.amzn2023.0.2.x86_6 4/10  
  Installing    : libnetfilter_queue-1.0.5-2.amzn2023.0.2.x86_64 5/10  
  Installing    : conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64 6/10
```

```
root@ansibleserver:~ Running transaction  
  Preparing      : 1/1  
  Installing    : kubectl-1.27.2-0.x86_64 1/10  
  Installing    : cri-tools-1.26.0-0.x86_64 2/10  
  Installing    : libnetfilter_cthelper-1.0.0-21.amzn2023.0.2.x86_64 3/10  
  Installing    : libnetfilter_cttimeout-1.0.0-19.amzn2023.0.2.x86_6 4/10  
  Installing    : libnetfilter_queue-1.0.5-2.amzn2023.0.2.x86_64 5/10  
  Installing    : conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64 6/10  
  Running scriptlet: conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64 6/10  
  Installing    : socat-1.7.4.2-1.amzn2023.0.2.x86_64 7/10  
  Installing    : kubernetes-cni-1.2.0-0.x86_64 8/10  
  Installing    : kubelet-1.27.2-0.x86_64 9/10  
  Installing    : kubeadm-1.27.2-0.x86_64 10/10  
  Running scriptlet: kubeadm-1.27.2-0.x86_64 10/10  
  Verifying      : socat-1.7.4.2-1.amzn2023.0.2.x86_64 1/10  
  Verifying      : libnetfilter_queue-1.0.5-2.amzn2023.0.2.x86_64 2/10  
  Verifying      : libnetfilter_cttimeout-1.0.0-19.amzn2023.0.2.x86_6 3/10  
  Verifying      : libnetfilter_cthelper-1.0.0-21.amzn2023.0.2.x86_64 4/10  
  Verifying      : conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64 5/10  
  Verifying      : cri-tools-1.26.0-0.x86_64 6/10  
  Verifying      : kubeadm-1.27.2-0.x86_64 7/10  
  Verifying      : kubelet-1.27.2-0.x86_64 8/10  
  Verifying      : kubernetes-cni-1.2.0-0.x86_64 9/10  
  Verifying      : kubeadm-1.27.2-0.x86_64 10/10
```

```
root@ansibleserver:~ Verifying : libnetfilter_queue-1.0.5-2.amzn2023.0.2.x86_64 2/10  
Verifying : libnetfilter_cttimeout-1.0.0-19.amzn2023.0.2.x86_6 3/10  
Verifying : libnetfilter_cthelper-1.0.0-21.amzn2023.0.2.x86_64 4/10  
Verifying : conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64 5/10  
Verifying : cri-tools-1.26.0-0.x86_64 6/10  
Verifying : kubeadm-1.27.2-0.x86_64 7/10  
Verifying : kubectl-1.27.2-0.x86_64 8/10  
Verifying : kubelet-1.27.2-0.x86_64 9/10  
Verifying : kubernetes-cni-1.2.0-0.x86_64 10/10  
  
Installed:  
conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64  
cri-tools-1.26.0-0.x86_64  
kubeadm-1.27.2-0.x86_64  
kubectl-1.27.2-0.x86_64  
kubelet-1.27.2-0.x86_64  
kubernetes-cni-1.2.0-0.x86_64  
libnetfilter_cthelper-1.0.0-21.amzn2023.0.2.x86_64  
libnetfilter_cttimeout-1.0.0-19.amzn2023.0.2.x86_64  
libnetfilter_queue-1.0.5-2.amzn2023.0.2.x86_64  
socat-1.7.4.2-1.amzn2023.0.2.x86_64  
  
Complete!  
[root@ansibleserver ~]#
```

Step1: Create the “kops” AWS IAM user

Create an IAM user called “kops” with required permissions by running the below commands:

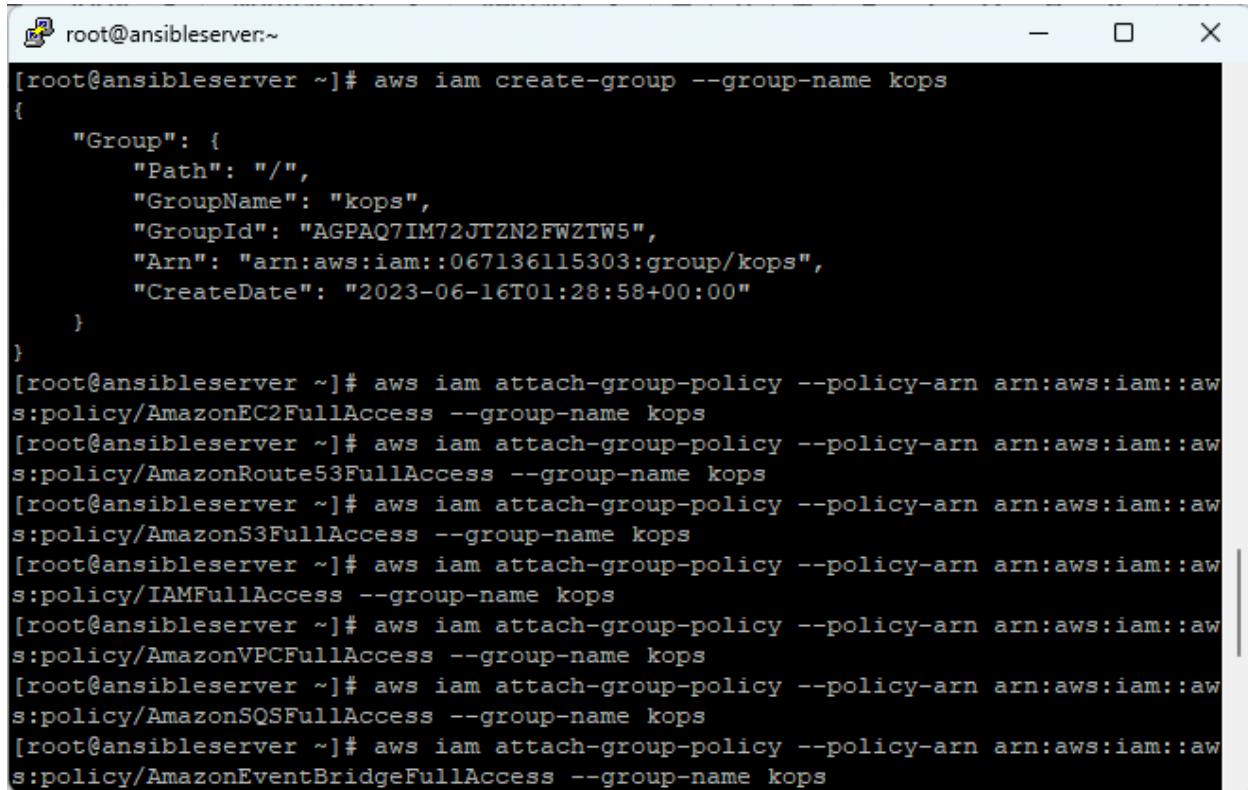
aws iam create-group --group-name kops

```
aws iam attach-group-policy --policy-arn  
arn:aws:iam::aws:policy/AmazonEC2FullAccess --group-name kops  
aws iam attach-group-policy --policy-arn  
arn:aws:iam::aws:policy/AmazonRoute53FullAccess --group-name kops  
aws iam attach-group-policy --policy-arn  
arn:aws:iam::aws:policy/AmazonS3FullAccess --group-name kops  
aws iam attach-group-policy --policy-arn arn:aws:iam::aws:policy/IAMFullAccess  
--group-name kops  
aws iam attach-group-policy --policy-arn  
arn:aws:iam::aws:policy/AmazonVPCFullAccess --group-name kops  
aws iam attach-group-policy --policy-arn  
arn:aws:iam::aws:policy/AmazonSQSFullAccess --group-name kops  
aws iam attach-group-policy --policy-arn  
arn:aws:iam::aws:policy/AmazonEventBridgeFullAccess --group-name kops
```

aws iam create-user --user-name kops

aws iam add-user-to-group --user-name kops --group-name kops

```
aws iam create-access-key --user-name kops
```



```
[root@ansibleserver ~]# aws iam create-group --group-name kops
{
    "Group": {
        "Path": "/",
        "GroupName": "kops",
        "GroupId": "AGPAQ7IM72JTZN2FWZTW5",
        "Arn": "arn:aws:iam::067136115303:group/kops",
        "CreateDate": "2023-06-16T01:28:58+00:00"
    }
}
[root@ansibleserver ~]# aws iam attach-group-policy --policy-arn arn:aws:iam::aws:policy/AmazonEC2FullAccess --group-name kops
[root@ansibleserver ~]# aws iam attach-group-policy --policy-arn arn:aws:iam::aws:policy/AmazonRoute53FullAccess --group-name kops
[root@ansibleserver ~]# aws iam attach-group-policy --policy-arn arn:aws:iam::aws:policy/AmazonS3FullAccess --group-name kops
[root@ansibleserver ~]# aws iam attach-group-policy --policy-arn arn:aws:iam::aws:policy/IAMFullAccess --group-name kops
[root@ansibleserver ~]# aws iam attach-group-policy --policy-arn arn:aws:iam::aws:policy/AmazonVPCFullAccess --group-name kops
[root@ansibleserver ~]# aws iam attach-group-policy --policy-arn arn:aws:iam::aws:policy/AmazonSQSFullAccess --group-name kops
[root@ansibleserver ~]# aws iam attach-group-policy --policy-arn arn:aws:iam::aws:policy/AmazonEventBridgeFullAccess --group-name kops
```

Record the SecretAccessKey and AccessKeyID values in the output of the previous command (**aws iam create-access-key --user-name kops**), and then use them in the commands below:

```
Username: "kops"
AccessKeyId = "<<AWS-ACCESS-KEY>>"
SecretAccessKey = "<<AWS-SECRET-ACCESS-KEY>>"
```

```
# configure the AWS CLI to use 'kops' user
aws configure      # use the new access and secret key
aws iam list-users # you should see a list of all your IAM users here
```

```
#Export the following variables for a session:
export AWS_ACCESS_KEY_ID=$(aws configure get aws_access_key_id)
export AWS_SECRET_ACCESS_KEY=$(aws configure get aws_secret_access_key)
```

Step 2: Configure DNS setup

Next, create a hosted zone in AWS for your kops subdomain:

```
#install jq locally before running the below command
```

```
aws route53 create-hosted-zone --name kops.yourdomain.com --caller-reference $(uuidgen) | jq .DelegationSet.NameServers
```

```
[root@ansibleserver ~]# aws route53 create-hosted-zone --name kops.yourdomain.co
m --caller-reference $(uuidgen) | jq .DelegationSet.NameServers
[
  "ns-1966.awsdns-53.co.uk",
  "ns-746.awsdns-29.net",
  "ns-291.awsdns-36.com",
  "ns-1482.awsdns-57.org"
]
```

Record the nameservers (NS entries) from the above command output.

Next, you need to add these NS records for the subdomain in the DNS setting of the main domain. Exactly how you need to add the subdomain will vary depending on your domain registrar.

ns-1966.awsdns-53.co.uk
ns-746.awsdns-29.net
ns-291.awsdns-36.com
ns-1482.awsdns-57.org

The screenshot shows the AWS Route 53 console interface. On the left, there's a navigation sidebar with options like Dashboard, Hosted zones, IP-based routing, Traffic flow, Domains, and Resolver. The 'Hosted zones' section is currently active. In the main content area, the URL is 'Route 53 > Hosted zones > kops.yourdomain.com'. The 'kops.yourdomain.com' hosted zone is selected. Under the 'Hosted zone details' section, the 'Records' tab is selected, showing two NS records: ns-1966.awsdns-53.co.uk, ns-746.awsdns-29.net, ns-291.awsdns-36.com, and ns-1482.awsdns-57.org. There are also tabs for 'DNSSEC signing' and 'Hosted zone tags (0)'. At the bottom, there are buttons for 'Delete record', 'Import zone file', and 'Create record'.

Step 3: Create cluster state storage

kOps stores its configurations, keys, and related items, in an S3 bucket to manage Kubernetes clusters. You need to create a dedicated S3 bucket for this purpose. Run the below command to create an S3 bucket named “kops-state-storage-cluster1”:

```
aws s3api create-bucket \
--bucket kops-state-storage-cluster2 \
--region us-east-1
```

```
[root@ansibleserver ~]# aws s3api create-bucket \
    --bucket kops-state-storage-cluster2 \
    --region us-east-1
{
    "Location": "/kops-state-storage-cluster2"
}
```

Step 4: Install Kops

curl -Lo kops

<https://github.com/kubernetes/kops/releases/download/v1.22.2/kops-linux-amd64>

chmod +x kops

sudo mv kops /usr/local/bin/kops

```
[root@ansibleserver ~]# curl -Lo kops https://github.com/kubernetes/kops/releases/download/v1.22.2/kops-linux-amd64
% Total    % Received % Xferd  Average Speed   Time     Time      Time  Current
          Dload  Upload   Total   Spent    Left  Speed
0       0     0     0       0       0       0 ---:---:---:---:---:---:---:--- 0
100  155M  100  155M     0     0  53.2M      0  0:00:02  0:00:02 ---:--- 47.6M
[root@ansibleserver ~]# chmod +x kops
[root@ansibleserver ~]# sudo mv kops /usr/local/bin/kops
```

Step 5: Create Kubernetes Cluster

The next step is to create the Kubernetes cluster. Set up the name and point to the S3 bucket so that kOps can be aware of it.

export NAME=kops.yourdomain.com

export KOPS_STATE_STORE=s3://kops-state-storage-cluster2

Then, create the Kubernetes cluster in the “ap-south-1” region and under the “ap-south-1a” zone.

```
kops create cluster \
--zones=us-east-1a \
--name ${NAME}
```

```
root@ansibleserver:~ [root@ansibleserver ~]# kops create cluster \
--zones=us-east-la \
--name ${NAME}
I0616 18:17:54.569846 2153186 new_cluster.go:245] Inferred "aws" cloud provider
from zone "us-east-la"
I0616 18:17:54.570047 2153186 new_cluster.go:1072] Cloud Provider ID = aws
I0616 18:17:54.638111 2153186 subnets.go:180] Assigned CIDR 172.20.32.0/19 to su
bnet us-east-la
I0616 18:17:55.242597 2153186 create_cluster.go:832] Using SSH public key: /root
/.ssh/id_rsa.pub
Previewing changes that will be made:

*****
*
A new kops version is available: 1.26.2
Upgrading is recommended
More information: https://github.com/kubernetes/kops/blob/master/permalinks/upgr
ade\_kops.md#1.26.2
*****
```

```
root@ansibleserver:~ [root@ansibleserver ~]# kops create cluster \
--zones=us-east-la \
--name ${NAME}
I0616 18:17:57.077520 2153186 executor.go:111] Tasks: 0 done / 90 total; 45 can
run
W0616 18:17:57.189950 2153186 vfs_castore.go:377] CA private key was not found
I0616 18:17:57.258032 2153186 executor.go:111] Tasks: 45 done / 90 total; 19 can
run
I0616 18:17:57.393783 2153186 executor.go:111] Tasks: 64 done / 90 total; 24 can
run
I0616 18:17:57.470708 2153186 executor.go:111] Tasks: 88 done / 90 total; 2 can
run
I0616 18:17:57.536839 2153186 executor.go:111] Tasks: 90 done / 90 total; 0 can
run
Will create resources:
  AutoscalingGroup/master-us-east-la.masters.kops.yourdomain.com
    Granularity          1Minute
    InstanceProtection   false
    LaunchTemplate       name:master-us-east-la.masters.kops.yourdomain.c
om
    LoadBalancers        []
    MaxSize              1
    Metrics               [GroupDesiredCapacity, GroupInServiceInstances,
GroupMaxSize, GroupMinSize, GroupPendingInstances, GroupStandbyInstances, GroupT
erminatingInstances, GroupTotalInstances]
    MinSize              1
    Subnets              [name:us-east-la.kops.yourdomain.com]
```

```
root@ansibleserver:~  
      Subnets          [name:us-east-la.kops.yourdomain.com]  
      SuspendProcesses []  
      Tags            {k8s.io/cluster-autoscaler/node-template/label/n  
ode.kubernetes.io/exclude-from-external-load-balancers: , k8s.io/cluster-autosca  
ler/node-template/label/node-role.kubernetes.io/control-plane: , k8s.io/cluster-  
autoscaler/node-template/label/kops.k8s.io/kops-controller-pki: , k8s.io/cluster-  
autoscaler/node-template/label/kops.k8s.io/instancegroup: master-us-east-la, ko  
ps.k8s.io/instancegroup: master-us-east-la, Name: master-us-east-la.masters.kops  
.yourdomain.com, KubernetesCluster: kops.yourdomain.com, kubernetes.io/cluster/k  
ops.yourdomain.com: owned, k8s.io/cluster-autoscaler/node-template/label/kuberne  
tes.io/role: master, k8s.io/cluster-autoscaler/node-template/label/node-role.kub  
ernetes.io/master: , k8s.io/role/master: 1}  
      TargetGroups     []  
  
AutoscalingGroup/nodes-us-east-la.kops.yourdomain.com  
  Granularity      1Minute  
  InstanceProtection false  
  LaunchTemplate   name:nodes-us-east-la.kops.yourdomain.com  
  LoadBalancers    []  
  MaxSize          1  
  Metrics          [GroupDesiredCapacity, GroupInServiceInstances,  
GroupMaxSize, GroupMinSize, GroupPendingInstances, GroupStandbyInstances, GroupT  
erminatingInstances, GroupTotalInstances]  
  MinSize          1
```

```
root@ansibleserver:~  
      Subnets          [name:us-east-la.kops.yourdomain.com]  
      SuspendProcesses []  
      Tags            {k8s.io/cluster-autoscaler/node-template/label/n  
ode-role.kubernetes.io/node: , k8s.io/cluster-autoscaler/node-template/label/kub  
ernetes.io/role: node, k8s.io/cluster-autoscaler/node-template/label/kops.k8s.io  
/instancegroup: nodes-us-east-la, k8s.io/role/node: 1, kops.k8s.io/instancegroup  
: nodes-us-east-la, Name: nodes-us-east-la.kops.yourdomain.com, KubernetesCluste  
r: kops.yourdomain.com, kubernetes.io/cluster/kops.yourdomain.com: owned}  
      TargetGroups     []  
  
DHCPOptions/kops.yourdomain.com  
  DomainName        ec2.internal  
  DomainNameServers AmazonProvidedDNS  
  Shared            false  
  Tags              {kubernetes.io/cluster/kops.yourdomain.com: owne  
d, Name: kops.yourdomain.com, KubernetesCluster: kops.yourdomain.com}  
  
EBSVolume/a.etcd-events.kops.yourdomain.com  
  AvailabilityZone us-east-la  
  Encrypted         true  
  SizeGB           20  
  Tags              {kubernetes.io/cluster/kops.yourdomain.com: owne  
d, Name: a.etcd-events.kops.yourdomain.com, KubernetesCluster: kops.yourdomain.c  
om, k8s.io/etcd/events: a/a, k8s.io/role/master: 1}
```

```
root@ansibleserver:~  
      VolumeIops          3000  
      VolumeThroughput    125  
      VolumeType          gp3  
  
EBSVolume/a.etcd-main.kops.yourdomain.com  
      AvailabilityZone    us-east-1a  
      Encrypted            true  
      SizeGB               20  
      Tags                 {k8s.io/role/master: 1, kubernetes.io/cluster/ko  
ps.yourdomain.com: owned, Name: a.etcd-main.kops.yourdomain.com, KubernetesClust  
er: kops.yourdomain.com, k8s.io/etcd/main: a/a}  
      VolumeIops          3000  
      VolumeThroughput    125  
      VolumeType          gp3  
  
InternetGateway/kops.yourdomain.com  
      VPC                  name:kops.yourdomain.com  
      Shared               false  
      Tags                 {Name: kops.yourdomain.com, KubernetesCluster: k  
ops.yourdomain.com, kubernetes.io/cluster/kops.yourdomain.com: owned}  
  
Keypair/apiserver-aggregator-ca  
      Subject              cn=apiserver-aggregator-ca  
      Type                 ca
```

```
root@ansibleserver:~  
      LegacyFormat         false  
  
Keypair/etcd-clients-ca  
      Subject              cn=etcd-clients-ca  
      Type                 ca  
      LegacyFormat         false  
  
Keypair/etcd-manager-ca-events  
      Subject              cn=etcd-manager-ca-events  
      Type                 ca  
      LegacyFormat         false  
  
Keypair/etcd-manager-ca-main  
      Subject              cn=etcd-manager-ca-main  
      Type                 ca  
      LegacyFormat         false  
  
Keypair/etcd-peers-ca-events  
      Subject              cn=etcd-peers-ca-events  
      Type                 ca  
      LegacyFormat         false  
  
Keypair/etcd-peers-ca-main  
      Subject              cn=etcd-peers-ca-main
```

```
root@ansibleserver:~  
      Type          ca  
  LegacyFormat    false  
  
Keypair/kubernetes-ca  
  Subject        cn=kubernetes-ca  
  Type          ca  
  LegacyFormat    false  
  
Keypair/service-account  
  Subject        cn=service-account  
  Type          ca  
  LegacyFormat    false  
  
LaunchTemplate/master-us-east-la.masters.kops.yourdomain.com  
  AssociatePublicIP   true  
  CPUCredits  
  HTTPPutResponseHopLimit 3  
  HTTPTokens        required  
  HTTPProtocolIPv6  disabled  
  IAMInstanceProfile name:masters.kops.yourdomain.com id:masters.kops.yourdomain.com  
  ImageID          099720109477/ubuntu/images/hvm-ssd/ubuntu-focal-20.04-amd64-server-20230502  
  InstanceMonitoring false
```

```
root@ansibleserver:~  
  InstanceType      t3.medium  
  IPv6AddressCount 0  
  RootVolumeIops    3000  
  RootVolumeSize    64  
  RootVolumeThroughput 125  
  RootVolumeType    gp3  
  RootVolumeEncryption true  
  RootVolumeKmsKey  
  SSHKey            name:kubernetes.kops.yourdomain.com-ef:2d:21:10:  
cf:46:ec:ff:lb:d7:80:60:c0:cd:bd:62 id:kubernetes.kops.yourdomain.com-ef:2d:21:1  
0:cf:46:ec:ff:lb:d7:80:60:c0:cd:bd:62  
  SecurityGroups    [name:masters.kops.yourdomain.com]  
  SpotPrice  
  Tags               {kops.k8s.io/instancegroup: master-us-east-la, N  
ame: master-us-east-la.masters.kops.yourdomain.com, kubernetes.io/cluster/kops.y  
ourdomain.com: owned, k8s.io/cluster-autoscaler/node-template/label/kops.k8s.io/  
instancegroup: master-us-east-la, k8s.io/cluster-autoscaler/node-template/label/  
kops.k8s.io/kops-controller-pki: , k8s.io/role/master: 1, KubernetesCluster: kop  
s.yourdomain.com, k8s.io/cluster-autoscaler/node-template/label/node.kubernetes.  
io/exclude-from-external-load-balancers: , k8s.io/cluster-autoscaler/node-templa  
te/label/kubernetes.io/role: master, k8s.io/cluster-autoscaler/node-template/lab  
el/node-role.kubernetes.io/master: , k8s.io/cluster-autoscaler/node-template/lab  
el/node-role.kubernetes.io/control-plane: }
```

```
root@ansibleserver:~  
LaunchTemplate/nodes-us-east-la.kops.yourdomain.com  
  AssociatePublicIP      true  
  CPUCredits  
  HTTPPutResponseHopLimit 1  
  HTTPTokens          required  
  HTTPProtocolIPv6    disabled  
  IAMInstanceProfile   name:nodes.kops.yourdomain.com id:nodes.kops.you  
rdomain.com  
  ImageID              099720109477/ubuntu/images/hvm-ssd/ubuntu-focal-  
20.04-amd64-server-20230502  
  InstanceMonitoring    false  
  InstanceType          t3.medium  
  IPv6AddressCount     0  
  RootVolumeIops        3000  
  RootVolumeSize        128  
  RootVolumeThroughput  125  
  RootVolumeType        gp3  
  RootVolumeEncryption  true  
  RootVolumeKmsKey     name:kubernetes.kops.yourdomain.com-ef:2d:21:10:  
cf:46:ec:ff:lb:d7:80:60:c0:cd:bd:62 id:kubernetes.kops.yourdomain.com-ef:2d:21:1  
0:cf:46:ec:ff:lb:d7:80:60:c0:cd:bd:62  
  SecurityGroups       [name:nodes.kops.yourdomain.com]  
  SpotPrice
```

```
root@ansibleserver:~  
  Tags          {Name: nodes-us-east-la.kops.yourdomain.com, Kub  
ernetesCluster: kops.yourdomain.com, kubernetes.io/cluster/kops.yourdomain.com:  
owned, k8s.io/cluster-autoscaler/node-template/label/node-role.kubernetes.io/nod  
e:, k8s.io/cluster-autoscaler/node-template/label/kubernetes.io/role: node, k8s  
.io/cluster-autoscaler/node-template/label/kops.k8s.io/instancegroup: nodes-us-e  
ast-la, k8s.io/role/node: 1, kops.k8s.io/instancegroup: nodes-us-east-la}  
  
  ManagedFile/cluster-completed.spec  
    Base          s3://kops-state-storage-cluster2/kops.yourdomain  
.com  
    Location      cluster-completed.spec  
  
  ManagedFile/etcfd-cluster-spec-events  
    Base          s3://kops-state-storage-cluster2/kops.yourdomain  
.com/backups/etcfd/events  
    Location      /control/etcfd-cluster-spec  
  
  ManagedFile/etcfd-cluster-spec-main  
    Base          s3://kops-state-storage-cluster2/kops.yourdomain  
.com/backups/etcfd/main  
    Location      /control/etcfd-cluster-spec  
  
  ManagedFile/kops-version.txt  
    Base          s3://kops-state-storage-cluster2/kops.yourdomain
```

```
root@ansibleserver:~  
.com  
    Location          kops-version.txt  
  
ManagedFile/kops.yourdomain.com-addons-aws-ebs-csi-driver.addons.k8s.io-k8s-1.  
17  
    Location          addons/aws-ebs-csi-driver.addons.k8s.io/k8s-1.17  
.yaml  
  
ManagedFile/kops.yourdomain.com-addons-bootstrap  
    Location          addons/bootstrap-channel.yaml  
  
ManagedFile/kops.yourdomain.com-addons-core.addons.k8s.io  
    Location          addons/core.addons.k8s.io/v1.4.0.yaml  
  
ManagedFile/kops.yourdomain.com-addons-coredns.addons.k8s.io-k8s-1.12  
    Location          addons/coredns.addons.k8s.io/k8s-1.12.yaml  
  
ManagedFile/kops.yourdomain.com-addons-dns-controller.addons.k8s.io-k8s-1.12  
    Location          addons/dns-controller.addons.k8s.io/k8s-1.12.yaml  
1  
  
ManagedFile/kops.yourdomain.com-addons-kops-controller.addons.k8s.io-k8s-1.16  
    Location          addons/kops-controller.addons.k8s.io/k8s-1.16.yaml
```

```
root@ansibleserver:~  
  
ManagedFile/kops.yourdomain.com-addons-kubelet-api.rbac.addons.k8s.io-k8s-1.9  
    Location          addons/kubelet-api.rbac.addons.k8s.io/k8s-1.9.yaml  
ml  
  
ManagedFile/kops.yourdomain.com-addons-limit-range.addons.k8s.io  
    Location          addons/limit-range.addons.k8s.io/v1.5.0.yaml  
  
ManagedFile/kops.yourdomain.com-addons-storage-aws.addons.k8s.io-v1.15.0  
    Location          addons/storage-aws.addons.k8s.io/v1.15.0.yaml  
  
Manifests/etcmanager-events  
    Location          manifests/etcmanager-events.yaml  
  
Manifests/etcmanager-main  
    Location          manifests/etcmanager-main.yaml  
  
Manifests/static-kube-apiserver-healthcheck  
    Location          manifests/static-kube-apiserver-healthcheck.yaml  
  
Manifests/nodeupconfig-master-us-east-la  
    Location          manifests/nodeupconfig-master-us-east-la/nodeupconfig.yaml
```

```
root@ansibleserver:~  
ManagedFile/nodeupconfig-nodes-us-east-la  
  Location          igconfig/node/nodes-us-east-la/nodeupconfig.yaml  
  
Route/0.0.0.0/0  
  RouteTable        name:kops.yourdomain.com  
  CIDR             0.0.0.0/0  
  InternetGateway name:kops.yourdomain.com  
  
Route/:/:0  
  RouteTable        name:kops.yourdomain.com  
  IPv6CIDR         ::/0  
  InternetGateway name:kops.yourdomain.com  
  
RouteTable/kops.yourdomain.com  
  VPC              name:kops.yourdomain.com  
  Shared            false  
  Tags              {kubernetes.io/kops/role: public, Name: kops.you  
rdomain.com, KubernetesCluster: kops.yourdomain.com, kubernetes.io/cluster/kops.  
yourdomain.com: owned}  
  
RouteTableAssociation/us-east-la.kops.yourdomain.com  
  RouteTable        name:kops.yourdomain.com  
  Subnet           name:us-east-la.kops.yourdomain.com
```

```
root@ansibleserver:~  
SSHKey/kubernetes.kops.yourdomain.com-ef:2d:21:10:cf:46:ec:ff:lb:d7:80:60:c0:c  
d:bd:62  
  Shared            false  
  KeyFingerprint   lf:a0:14:43:b7:50:83:cf:d2:4e:72:d2:b3:1e:0a:bd  
  Tags              {Name: kops.yourdomain.com, KubernetesCluster: k  
ops.yourdomain.com, kubernetes.io/cluster/kops.yourdomain.com: owned}  
  
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
```

```
root@ansibleserver:~  
SecurityGroup/masters.kops.yourdomain.com  
  Description          Security group for masters  
  VPC                 name:kops.yourdomain.com  
  RemoveExtraRules    [port=22, port=443, port=2380, port=2381, port=4001, port=4002, port=4789, port=179, port=8443]  
  Tags                {Name: masters.kops.yourdomain.com, KubernetesCluster: kops.yourdomain.com, kubernetes.io/cluster/kops.yourdomain.com: owned}  
  
SecurityGroup/nodes.kops.yourdomain.com  
  Description          Security group for nodes  
  VPC                 name:kops.yourdomain.com  
  RemoveExtraRules    [port=22]  
  Tags                {Name: nodes.kops.yourdomain.com, KubernetesCluster: kops.yourdomain.com, kubernetes.io/cluster/kops.yourdomain.com: owned}  
  
SecurityGroupRule/from-0.0.0.0/0-ingress-tcp-22to22-masters.kops.yourdomain.com  
  SecurityGroup        name:masters.kops.yourdomain.com  
  CIDR                0.0.0.0/0  
  Protocol            tcp  
  FromPort             22  
  ToPort               22  
  
SecurityGroupRule/from-0.0.0.0/0-ingress-tcp-22to22-nodes.kops.yourdomain.com
```

```
root@ansibleserver:~  
SecurityGroupRule/from-0.0.0.0/0-ingress-tcp-22to22-nodes.kops.yourdomain.com  
  SecurityGroup        name:nodes.kops.yourdomain.com  
  CIDR                0.0.0.0/0  
  Protocol            tcp  
  FromPort             22  
  ToPort               22  
  
SecurityGroupRule/from-0.0.0.0/0-ingress-tcp-443to443-masters.kops.yourdomain.com  
  SecurityGroup        name:masters.kops.yourdomain.com  
  CIDR                0.0.0.0/0  
  Protocol            tcp  
  FromPort             443  
  ToPort               443  
  
SecurityGroupRule/from-::/0-ingress-tcp-22to22-masters.kops.yourdomain.com  
  SecurityGroup        name:masters.kops.yourdomain.com  
  IPv6CIDR            ::/0  
  Protocol            tcp  
  FromPort             22  
  ToPort               22  
  
SecurityGroupRule/from-::/0-ingress-tcp-22to22-nodes.kops.yourdomain.com  
  SecurityGroup        name:nodes.kops.yourdomain.com
```

```
root@ansibleserver:~  
SecurityGroupRule/from-::/0-ingress-tcp-22to22-nodes.kops.yourdomain.com  
  SecurityGroup      name:nodes.kops.yourdomain.com  
  IPv6CIDR          ::/0  
  Protocol          tcp  
  FromPort          22  
  ToPort            22  
  
SecurityGroupRule/from-::/0-ingress-tcp-443to443-masters.kops.yourdomain.com  
  SecurityGroup      name:masters.kops.yourdomain.com  
  IPv6CIDR          ::/0  
  Protocol          tcp  
  FromPort          443  
  ToPort            443  
  
SecurityGroupRule/from-masters.kops.yourdomain.com-egress-all-0to0-0.0.0.0/0  
  SecurityGroup      name:masters.kops.yourdomain.com  
  CIDR              0.0.0.0/0  
  Egress            true  
  
SecurityGroupRule/from-masters.kops.yourdomain.com-egress-all-0to0-::/0  
  SecurityGroup      name:masters.kops.yourdomain.com  
  IPv6CIDR          ::/0  
  Egress            true
```

```
root@ansibleserver:~  
SecurityGroupRule/from-masters.kops.yourdomain.com-ingress-all-0to0-masters.ko  
ps.yourdomain.com  
  SecurityGroup      name:masters.kops.yourdomain.com  
  SourceGroup        name:masters.kops.yourdomain.com  
  
SecurityGroupRule/from-masters.kops.yourdomain.com-ingress-all-0to0-nodes.kops  
.yourdomain.com  
  SecurityGroup      name:nodes.kops.yourdomain.com  
  SourceGroup        name:masters.kops.yourdomain.com  
  
SecurityGroupRule/from-nodes.kops.yourdomain.com-egress-all-0to0-0.0.0.0/0  
  SecurityGroup      name:nodes.kops.yourdomain.com  
  CIDR              0.0.0.0/0  
  Egress            true  
  
SecurityGroupRule/from-nodes.kops.yourdomain.com-egress-all-0to0-::/0  
  SecurityGroup      name:nodes.kops.yourdomain.com  
  IPv6CIDR          ::/0  
  Egress            true  
  
SecurityGroupRule/from-nodes.kops.yourdomain.com-ingress-all-0to0-nodes.kops.y  
ourdomain.com  
  SecurityGroup      name:nodes.kops.yourdomain.com  
  SourceGroup        name:nodes.kops.yourdomain.com
```

```
root@ansibleserver:~  
SecurityGroupRule/from-nodes.kops.yourdomain.com-ingress-tcp-lto2379-masters.k  
ops.yourdomain.com  
  SecurityGroup      name:masters.kops.yourdomain.com  
  Protocol          tcp  
  FromPort          1  
  ToPort            2379  
  SourceGroup       name:nodes.kops.yourdomain.com  
  
SecurityGroupRule/from-nodes.kops.yourdomain.com-ingress-tcp-2382to4000-maste  
rs.kops.yourdomain.com  
  SecurityGroup      name:masters.kops.yourdomain.com  
  Protocol          tcp  
  FromPort          2382  
  ToPort            4000  
  SourceGroup       name:nodes.kops.yourdomain.com  
  
SecurityGroupRule/from-nodes.kops.yourdomain.com-ingress-tcp-4003to65535-maste  
rs.kops.yourdomain.com  
  SecurityGroup      name:masters.kops.yourdomain.com  
  Protocol          tcp  
  FromPort          4003  
  ToPort            65535  
  SourceGroup       name:nodes.kops.yourdomain.com
```

```
root@ansibleserver:~  
SecurityGroupRule/from-nodes.kops.yourdomain.com-ingress-udp-lto65535-masters.  
kops.yourdomain.com  
  SecurityGroup      name:masters.kops.yourdomain.com  
  Protocol          udp  
  FromPort          1  
  ToPort            65535  
  SourceGroup       name:nodes.kops.yourdomain.com  
  
Subnet/us-east-la.kops.yourdomain.com  
  ShortName        us-east-la  
  VPC              name:kops.yourdomain.com  
  AvailabilityZone us-east-la  
  CIDR             172.20.32.0/19  
  Shared            false  
  Tags              {KubernetesCluster: kops.yourdomain.com, kuberne  
tes.io/cluster/kops.yourdomain.com: owned, SubnetType: Public, kubernetes.io/rol  
e/elb: 1, kubernetes.io/role/internal-elb: 1, Name: us-east-la.kops.yourdomain.c  
om}  
  
VPC/kops.yourdomain.com  
  CIDR             172.20.0.0/16  
  AmazonIPv6       true  
  EnableDNSHostnames true  
  EnableDNSSupport true
```

```
root@ansibleserver:~  
      Shared          false  
      Tags           {Name: kops.yourdomain.com, KubernetesCluster: k  
ops.yourdomain.com, kubernetes.io/cluster/kops.yourdomain.com: owned}  
  
VPCAmazonIPv6CIDRBlock/AmazonIPv6  
  VPC             name:kops.yourdomain.com  
  Shared          false  
  
VPCDHCOptionsAssociation/kops.yourdomain.com  
  VPC             name:kops.yourdomain.com  
  DHCPOptions     name:kops.yourdomain.com  
  
WarmPool/master-us-east-la.masters.kops.yourdomain.com  
  Enabled         false  
  MinSize        0  
  
WarmPool/nodes-us-east-la.kops.yourdomain.com  
  Enabled         false  
  MinSize        0  
  
Will modify resources:  
  IAMRolePolicy/masters.kops.yourdomain.com  
    PolicyDocument  
      ...
```

```
root@ansibleserver:~  
  IAMRolePolicy/masters.kops.yourdomain.com  
    PolicyDocument  
      ...  
      ],  
      "Effect": "Allow",  
      "Resource": "arn:aws:s3:::kops-state-sto  
rage-cluster2/kops.yourdomain.com/*"  
      -  
      "Resource": "arn:aws:s3:::kops-state-sto  
rage-cluster1/kops.yourdomain.com/*"  
    },  
    {  
      ...  
      ],  
      "Effect": "Allow",  
      "Resource": "arn:aws:s3:::kops-state-sto  
rage-cluster2/kops.yourdomain.com/backups/etcdb/main/*"  
      -  
      "Resource": "arn:aws:s3:::kops-state-sto  
rage-cluster1/kops.yourdomain.com/backups/etcdb/main/*"  
    },  
    {  
      ...  
      ],  
      "Effect": "Allow",  
      "Resource": "arn:aws:s3:::kops-state-sto
```

```
root@ansibleserver:~  
          "Resource": [  
er2"  
      +     "arn:aws:s3:::kops-state-storage-clust  
er1"  
      -     "arn:aws:s3:::kops-state-storage-clust  
] ,  
...  
Managed           false -> false  
  
IAMRolePolicy/nodes.kops.yourdomain.com  
  PolicyDocument  
    ...  
      "Effect": "Allow",  
      "Resource": [  
er2/kops.yourdomain.com/addons/*",  
      -     "arn:aws:s3:::kops-state-storage-clust  
er1/kops.yourdomain.com/addons/*",  
      +     "arn:aws:s3:::kops-state-storage-clust  
er2/kops.yourdomain.com/cluster-completed.spec",  
      -     "arn:aws:s3:::kops-state-storage-clust  
er1/kops.yourdomain.com/cluster-completed.spec",
```

```
root@ansibleserver:~  
          -     "arn:aws:s3:::kops-state-storage-clust  
er1"  
        ] ,  
...  
Managed           false -> false  
  
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 kops.yourdomain.com  
* edit your node instance group: kops edit ig --name=kops.yourdomain.com nodes-  
us-east-1a  
* edit your master instance group: kops edit ig --name=kops.yourdomain.com mast  
er-us-east-1a  
  
Finally configure your cluster with: kops update cluster --name=kops.yourdomain.  
com --yes --admin  
[root@ansibleserver ~]#
```

Verify you see your cluster listed with this command:

kops get cluster --name=kops.yourdomain.com

```
[root@ansibleserver ~]# kops get cluster --name=kops.yourdomain.com
NAME          CLOUD      ZONES
kops.yourdomain.com    aws        us-east-1a
```

Now, create the Kubernetes cluster with this command:

```
kops update cluster --name=kops.yourdomain.com --yes --admin
```

```
[root@ansibleserver ~]# kops update cluster --name=kops.yourdomain.com --yes --admin
```

```
I0616 18:49:42.742540 2155763 executor.go:111] Tasks: 45 done / 90 total; 19 can run
I0616 18:49:43.013059 2155763 executor.go:111] Tasks: 64 done / 90 total; 24 can run
I0616 18:49:43.409143 2155763 executor.go:111] Tasks: 88 done / 90 total; 2 can run
I0616 18:49:43.517534 2155763 executor.go:111] Tasks: 90 done / 90 total; 0 can run
I0616 18:49:43.854285 2155763 dns.go:234] Pre-creating DNS records
I0616 18:49:43.917574 2155763 update_cluster.go:326] Exporting kubeconfig for cluster
kOps has set your kubectl context to kops.yourdomain.com
```

Cluster changes have been applied to the cloud.

```
Changes may require instances to restart: kops rolling-update cluster
```

```
[root@ansibleserver ~]# kops rolling-update cluster --name=kops.yourdomain.com --cloudonly
NAME          STATUS  NEEDUPDATE   READY  MIN  TARGET  MAX
master-us-east-1a  Ready  0           1     1     1       1
nodes-us-east-1a  Ready  0           1     1     1       1
```

```
No rolling-update required.
```

The screenshot shows the AWS EC2 Instances page. The left sidebar has 'New EC2 Experience' checked. Under 'Instances', 'Instances' is selected. The main pane displays two instances:

Name	Instance ID	Instance state	Instance type	Status check
nodes-us-east-1a.kops.yourdomain.com	i-03ab2355955deb898	Running	t3.medium	2/2 checks passed
master-us-east-1a.masters.kops.yourdomain.com	i-064b7685a1721729e	Running	t3.medium	2/2 checks passed

Implement the network policies at the database pod to allow ingress traffic from the front-end application pod

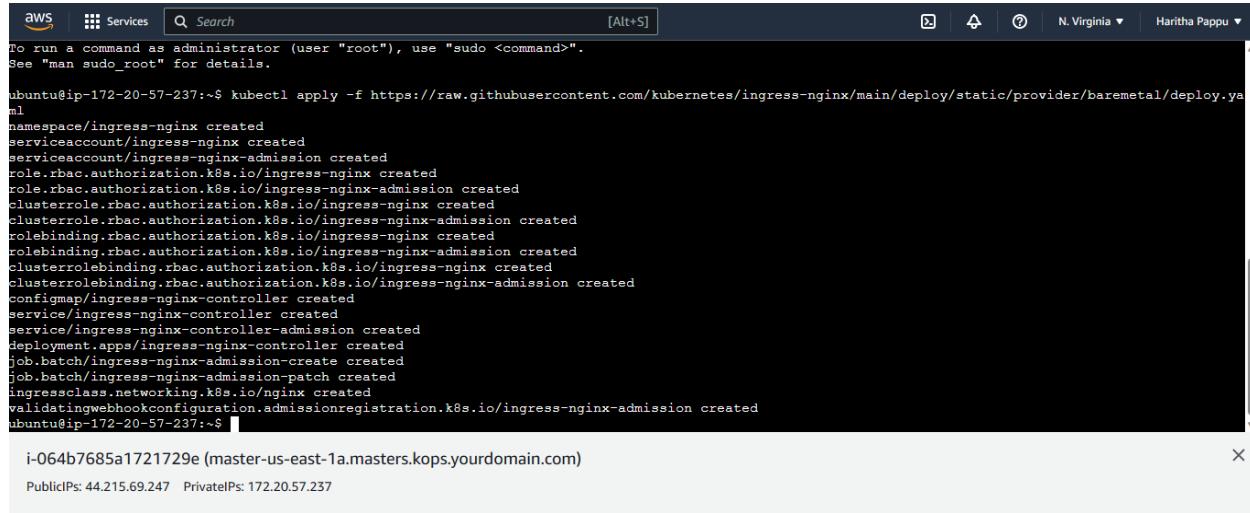
Connect to the master node-

Run the below commands:

Kubernetes Ingress traffic controllers-

kubectl apply -f

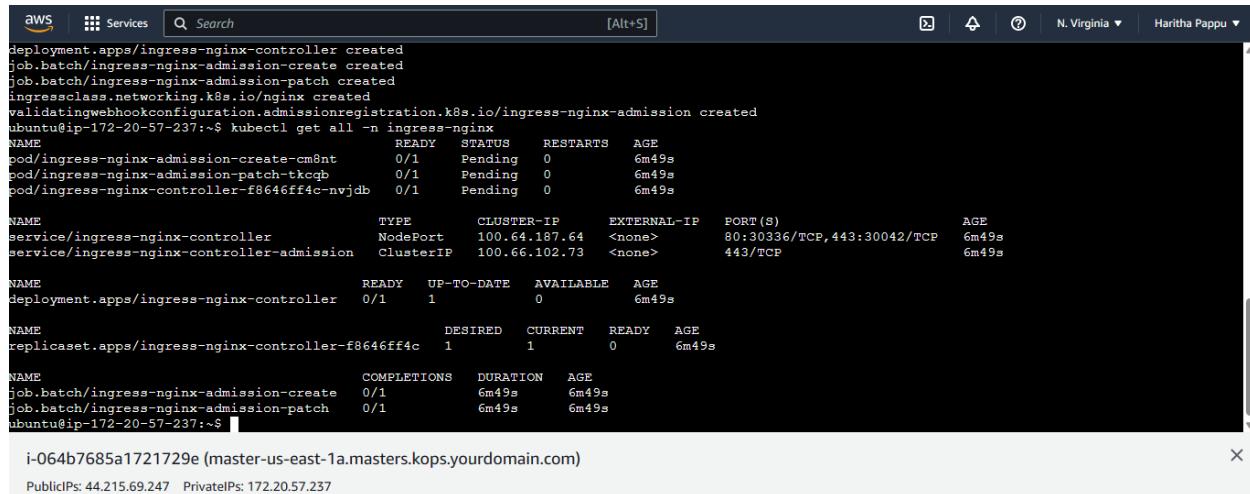
<https://raw.githubusercontent.com/kubernetes/ingress-nginx/main/deploy/static/provider/baremetal/deploy.yaml>



```
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
ubuntu@ip-172-20-57-237:~$ kubectl apply -f https://raw.githubusercontent.com/kubernetes/ingress-nginx/main/deploy/static/provider/baremetal/deploy.yaml  
namespace/ingress-nginx created  
serviceaccount/ingress-nginx created  
serviceaccount/ingress-nginx-admission created  
role/rbac.authorization.k8s.io/ingress-nginx created  
role/rbac.authorization.k8s.io/ingress-nginx-admission created  
clusterrole/rbac.authorization.k8s.io/ingress-nginx created  
clusterrole/rbac.authorization.k8s.io/ingress-nginx-admission created  
rolebinding/rbac.authorization.k8s.io/ingress-nginx created  
rolebinding/rbac.authorization.k8s.io/ingress-nginx-admission created  
clusterrolebinding/rbac.authorization.k8s.io/ingress-nginx created  
clusterrolebinding/rbac.authorization.k8s.io/ingress-nginx-admission created  
configmap/ingress-nginx-controller created  
service/ingress-nginx-controller created  
service/ingress-nginx-controller-admission created  
deployment.apps/ingress-nginx-controller created  
job.batch/ingress-nginx-admission-create created  
job.batch/ingress-nginx-admission-patch created  
ingressclass.networking.k8s.io/nginx created  
validatingwebhookconfiguration.admissionregistration.k8s.io/ingress-nginx-admission created  
ubuntu@ip-172-20-57-237:~$  
  
i-064b7685a1721729e (master-us-east-1a.masters.kops.yourdomain.com)  
PublicIPs: 44.215.69.247 PrivateIPs: 172.20.57.237
```

Get all ingress-nginx-

kubectl get all -n ingress-nginx



```
deployment.apps/ingress-nginx-controller created  
job.batch/ingress-nginx-admission-create created  
job.batch/ingress-nginx-admission-patch created  
ingressclass.networking.k8s.io/nginx created  
validatingwebhookconfiguration.admissionregistration.k8s.io/ingress-nginx-admission created  
ubuntu@ip-172-20-57-237:~$ kubectl get all -n ingress-nginx  
NAME                                     READY   STATUS    RESTARTS   AGE  
pod/ingress-nginx-admission-create-cm8nt   0/1    Pending   0          6m49s  
pod/ingress-nginx-admission-patch-tkcg8   0/1    Pending   0          6m49s  
pod/ingress-nginx-controller-f8646fff4c-nvjdb 0/1    Pending   0          6m49s  
  
NAME           TYPE      CLUSTER-IP     EXTERNAL-IP   PORT(S)          AGE  
service/ingress-nginx-controller   NodePort   100.64.187.64  <none>        80:30336/TCP,443:30042/TCP   6m49s  
service/ingress-nginx-controller-admission ClusterIP 100.66.102.73  <none>        443/TCP         6m49s  
  
NAME          READY   UP-TO-DATE   AVAILABLE   AGE  
deployment.apps/ingress-nginx-controller  0/1     1           0          6m49s  
  
NAME          DESIRED   CURRENT   READY   AGE  
replicaset.apps/ingress-nginx-controller-f8646fff4c  1        1       0      6m49s  
  
NAME          COMPLETIONS   DURATION   AGE  
job.batch/ingress-nginx-admission-create  0/1        6m49s    6m49s  
job.batch/ingress-nginx-admission-patch  0/1        6m49s    6m49s  
ubuntu@ip-172-20-57-237:~$  
  
i-064b7685a1721729e (master-us-east-1a.masters.kops.yourdomain.com)  
PublicIPs: 44.215.69.247 PrivateIPs: 172.20.57.237
```

sudo vi ingress-deployment.yml

```
ubuntu@ip-172-20-57-237:~$ sudo vi ingress-deployment.yml
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: cart
    name: cart
spec:
  replicas: 1
  selector:
    matchLabels:
      app: ing1
  template:
    metadata:
      labels:
        app: ing1
    spec:
      containers:
        - image: nginx
          name: nginx
          ports:
            - containerPort: 80
---
apiVersion: apps/v1
kind: Deployment
"ingress-deployment.yaml" 70L, 1094C
```

```
kind: Deployment
metadata:
  labels:
    app: orders
    name: orders
spec:
  replicas: 1
  selector:
    matchLabels:
      app: ing3
  template:
    metadata:
      creationTimestamp: null
      labels:
        app: ing3
    spec:
      containers:
        - env:
            - name: TOMCAT_PASSWORD
              value: rootroot
            image: bitnami/tomcat
            name: tomcat
            ports:
              - containerPort: 8080
```

```
- containerPort: 8080
---
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: accounts
    name: accounts
spec:
  replicas: 1
  selector:
    matchLabels:
      app: ing2
  template:
    metadata:
      labels:
        app: ing2
    spec:
      containers:
        - image: httpd
          name: httpd
          ports:
            - containerPort: 80
---
```

kubectl apply -f ingress-deployment.yml

```
ubuntu@ip-172-20-57-237:~$ kubectl apply -f ingress-deployment.yml
deployment.apps/cart created
deployment.apps/orders created
deployment.apps/accounts created
```

kubectl expose deployment cart --name cart --port 80

kubectl expose deployment orders --name orders --port 80 --target-port 8080

kubectl expose deployment orders --name orders --port 80 --target-port 8080

```
ubuntu@ip-172-20-57-237:~$ kubectl expose deployment cart --name cart --port 80
service/cart exposed
ubuntu@ip-172-20-57-237:~$ kubectl expose deployment orders --name orders --port 80 --target-port 8080
service/orders exposed
ubuntu@ip-172-20-57-237:~$ kubectl expose deployment accounts --name accounts --port 80
service/accounts exposed
```

Create a new user with permissions to create, list, get, update, and delete pods

Create a namespace company for a role developer and associate the user haritha

kubectl create ns company

kubectl create role developer --verb=create --verb=get --verb=list --verb=update

--verb=delete --resource=pods -n company

kubectl create rolebinding developer-binding-haritha --role=developer

--user=haritha -n company

kubectl get roles -n company

```
aws Services Search [Alt+S] N. Virginia Haritha Pappu
ubuntu@ip-172-20-57-237:~$ kubectl create ns company
namespace/company created
ubuntu@ip-172-20-57-237:~$ kubectl create role developer --verb=create --verb=get --verb=list --verb=update --verb=delete --resource=pods -n company
role.rbac.authorization.k8s.io/developer created
ubuntu@ip-172-20-57-237:~$ kubectl create rolebinding developer-binding-haritha --role=developer --user=haritha -n company
rolebinding.rbac.authorization.k8s.io/developer-binding-haritha created
ubuntu@ip-172-20-57-237:~$ kubectl get roles -n company
NAME      CREATED AT
developer  2023-06-17T00:10:46Z
```

kubectl describe clusterrole admin

```
aws Services Search [Alt+S] N. Virginia Haritha Pappu
ubuntu@ip-172-20-57-237:~$ kubectl describe clusterrole admin
Name:           admin
Labels:         kubernetes.io/bootstrapping=rbac-defaults
Annotations:   rbac.authorization.kubernetes.io/autoupdate: true
PolicyRule:
  Resources          Non-Resource URLs  Resource Names  Verbs
  -----            -----                -----          -----
  rolebindings.rbac.authorization.k8s.io    []                  []             [create delete deletecollection get list patch update watch]
  roles.rbac.authorization.k8s.io        []                  []             [create delete deletecollection get list patch update watch]
  configmaps                         []                  []             [create delete deletecollection patch update get list watch]
  events                            []                  []             [create delete deletecollection patch update get list watch]
  persistentvolumeclaims            []                  []             [create delete deletecollection patch update get list watch]
  pods                             []                  []             [create delete deletecollection patch update get list watch]
  replicationcontrollers/scale     []                  []             [create delete deletecollection patch update get list watch]
  replicationcontrollers           []                  []             [create delete deletecollection patch update get list watch]
  services                          []                  []             [create delete deletecollection patch update get list watch]
  daemonsets.apps                  []                  []             [create delete deletecollection patch update get list watch]
  deployments.apps/scale          []                  []             [create delete deletecollection patch update get list watch]
  deployments.apps                 []                  []             [create delete deletecollection patch update get list watch]
  replicaset.apps/scale           []                  []             [create delete deletecollection patch update get list watch]
  replicaset.apps                  []                  []             [create delete deletecollection patch update get list watch]
  statefulsets.apps/scale         []                  []             [create delete deletecollection patch update get list watch]
  statefulsets.apps               []                  []             [create delete deletecollection patch update get list watch]
  horizontalpodautoscalers.autoscaling []
  cronjobs.batch                   []                  []             [create delete deletecollection patch update get list watch]
```

kubectl get clusterroles

```
aws Services Search [Alt+S] N. Virginia Haritha Pappu
ubuntu@ip-172-20-57-237:~$ kubectl get clusterroles
NAME          CREATED AT
admin          2023-06-16T18:32:16Z
cluster-admin  2023-06-16T18:32:16Z
coredns-autoscaler 2023-06-16T18:32:24Z
ebs-csi-node-role 2023-06-16T18:32:22Z
ebs-external-attacher-role 2023-06-16T18:32:22Z
ebs-external-provisioner-role 2023-06-16T18:32:22Z
ebs-external-resizer-role 2023-06-16T18:32:22Z
ebs-external-snapshotter-role 2023-06-16T18:32:22Z
edit           2023-06-16T18:32:16Z
ingress-nginx  2023-06-16T20:29:13Z
ingress-nginx-admission 2023-06-16T20:29:13Z
kopa-controller 2023-06-16T18:32:23Z
kopa:dns-controller 2023-06-16T18:32:22Z
system:aggregate-to-admin 2023-06-16T18:32:16Z
system:aggregate-to-edit 2023-06-16T18:32:16Z
system:aggregate-to-view 2023-06-16T18:32:16Z
system:auth-delegator 2023-06-16T18:32:16Z
system:aws-cloud-provider 2023-06-16T18:32:22Z
system:basic-user 2023-06-16T18:32:16Z
system:certificates.k8s.io:certificatesigningrequests:nodeclient 2023-06-16T18:32:16Z
system:certificates.k8s.io:certificatesigningrequests:selfnodeclient 2023-06-16T18:32:16Z
system:certificates.k8s.io:kube-apiserver-client approver 2023-06-16T18:32:16Z
system:certificates.k8s.io:kube-apiserver-client kubebuilder 2023-06-16T18:32:16Z
```

kubectl get clusterrolebindings

NAME	ROLE	AGE
cluster-admin	ClusterRole/cluster-admin	5h48m
coredns-autoscaler	ClusterRole/coredns-autoscaler	5h48m
ebs-csi-attacher-binding	ClusterRole/ebs-external-attacher-role	5h48m
ebs-csi-node-getter-binding	ClusterRole/ebs-csi-node-role	5h48m
ebs-csi-provisioner-binding	ClusterRole/ebs-external-provisioner-role	5h48m
ebs-csi-resizer-binding	ClusterRole/ebs-external-resizer-role	5h48m
ebs-csi-snapshotter-binding	ClusterRole/ebs-external-snapshotter-role	5h48m
ingress-nginx	ClusterRole/ingress-nginx	3h51m
ingress-nginx-admission	ClusterRole/ingress-nginx-admission	3h51m
kops-controller	ClusterRole/kops-controller	5h48m
kops dns controller	ClusterRole/kops dns controller	5h48m
kops:system:kubelet-api-admin	ClusterRole/system:kubelet-api-admin	5h48m
system:aws-cloud-provider	ClusterRole/system:aws-cloud-provider	5h48m
system:basic-user	ClusterRole/system:basic-user	5h48m
system:controller:attachdetach-controller	ClusterRole/system:controller:attachdetach-controller	5h48m
system:controller:certificate-controller	ClusterRole/system:controller:certificate-controller	5h48m
system:controller:clusterrole-aggregation-controller	ClusterRole/system:controller:clusterrole-aggregation-controller	5h48m
system:controller:cronjob-controller	ClusterRole/system:controller:cronjob-controller	5h48m
system:controller:daemon-set-controller	ClusterRole/system:controller:daemon-set-controller	5h48m
system:controller:deployment-controller	ClusterRole/system:controller:deployment-controller	5h48m
system:controller:disruption-controller	ClusterRole/system:controller:disruption-controller	5h48m
system:controller:endpoint-controller	ClusterRole/system:controller:endpoint-controller	5h48m
system:controller:endpointslice-controller	ClusterRole/system:controller:endpointslice-controller	5h48m

kubectl get clusterrole cluster-admin -o yaml

ClusterRole/system:volume-scheduler	ClusterRole/system:volume-scheduler	5h48m
ubuntu@ip-172-20-57-237:~\$ kubectl get clusterrole cluster-admin -o yaml	apiVersion: rbac.authorization.k8s.io/v1	

User created for permissions to get,list,watch,create, and delete nodes-

kubectl create clusterrole nodes-admin --verb=get,list,watch,create,delete

--resource=nodes

kubectl create clusterrolebinding nodes-admin-binding-haritha

--clusterrole=nodes-admin --user=haritha

ubuntu@ip-172-20-57-237:~\$ kubectl create clusterrole nodes-admin --verb=get,list,watch,create,delete --resource=nodes	clusterrole.rbac.authorization.k8s.io/nodes-admin created
ubuntu@ip-172-20-57-237:~\$ kubectl create clusterrolebinding nodes-admin-binding-haritha --clusterrole=nodes-admin --user=haritha	clusterrolebinding.rbac.authorization.k8s.io/nodes-admin-binding-haritha created
ubuntu@ip-172-20-57-237:~\$ kubectl auth can-i get nodes --as=haritha	Warning: resource 'nodes' is not namespace scoped
yes	
ubuntu@ip-172-20-57-237:~\$ kubectl auth can-i list nodes --as=haritha	Warning: resource 'nodes' is not namespace scoped
yes	
ubuntu@ip-172-20-57-237:~\$ kubectl auth can-i watch nodes --as=haritha	Warning: resource 'nodes' is not namespace scoped
yes	
ubuntu@ip-172-20-57-237:~\$ kubectl auth can-i create nodes --as=haritha	Warning: resource 'nodes' is not namespace scoped
yes	

User created for permissions to create, list, get, update, and delete pods-

```
kubectl create clusterrole pods-admin-role --verb=get,list,watch,create,delete  
--resource=pods
```

```
ubuntu@ip-172-20-57-237:~$ kubectl create clusterrole pods-admin-role --verb=get,list,watch,create,update,delete --resource=pods  
clusterrole.rbac.authorization.k8s.io/pods-admin-role created
```

```
kubectl create clusterrolebinding pods-admin-role-binding-haritha
```

```
--clusterrole=pods-admin --user=haritha
```

```
kubectl auth can-i get pods --as=haritha
```

```
kubectl auth can-i list pods --as=haritha
```

```
kubectl auth can-i create pods --as=haritha
```

```
kubectl auth can-i delete pods --as=haritha
```

```
kubectl auth can-i update pods --as=haritha
```

```
kubectl auth can-i watch pods --as=haritha
```

```
ubuntu@ip-172-20-57-237:~$ kubectl create clusterrolebinding pods-admin-role-binding-haritha --clusterrole=pods-admin-role --user=haritha  
clusterrolebinding.rbac.authorization.k8s.io/pods-admin-role-binding-haritha created  
ubuntu@ip-172-20-57-237:~$ kubectl auth can-i update pods --as=haritha  
yes  
ubuntu@ip-172-20-57-237:~$ kubectl auth can-i get pods --as=haritha  
yes  
ubuntu@ip-172-20-57-237:~$ kubectl auth can-i create pods --as=haritha  
yes  
ubuntu@ip-172-20-57-237:~$ kubectl auth can-i update pods --as=haritha  
yes  
ubuntu@ip-172-20-57-237:~$ kubectl auth can-i delete pods --as=haritha  
yes  
ubuntu@ip-172-20-57-237:~$ kubectl auth can-i list pods --as=haritha  
yes  
ubuntu@ip-172-20-57-237:~$ kubectl auth can-i watch pods --as=haritha  
yes
```

Take snapshot of ETCD database

The screenshot shows the AWS S3 console interface. The left sidebar is collapsed. The main area displays the contents of the 'etcd/' folder within the 'kops.yourdomain.com/backups/etcd/' bucket. The 'Objects' tab is selected, showing two items: 'events/' and 'main/'. The 'Properties' tab is also visible. At the top right, there is a 'Copy S3 URI' button. Below the objects, there is a search bar labeled 'Find objects by prefix'. At the bottom, there is a table with columns: Name, Type, Last modified, Size, and Storage class.

Name	Type	Last modified	Size	Storage class
events/	Folder	-	-	-
main/	Folder	-	-	-

The screenshot shows the AWS S3 console with a green success message banner at the top stating "Successfully calculated total size. View details below." Below this, a modal window titled "Calculate total size" is displayed. It contains a note: "The information below will no longer be available after you navigate away from this page." A "Summary" section shows the following data:

Source	Total number of objects	Total size
s3://kops-state-storage-cluster2/kops.yourdomain.com/backups/	48	2.7 MB

Below the summary is a "Specified objects" section with a table:

Name	Type	Last modified	Size	Total number of objects	Error
etcdf/	Folder	-	2.7 MB	48	-

At the bottom of the modal, there are links for CloudShell, Feedback, Language, and a footer with copyright information and links for Privacy, Terms, and Cookie preferences.

Set criteria such that if the memory of CPU goes beyond 50%, environments automatically get scaled up and configured

kubectl create deployment auto-regul --image=nginx --replicas=2

```
ubuntu@ip-172-20-57-237:~$ kubectl create deployment auto-regul --image=nginx --replicas=2
deployment.apps/auto-regul created
```

kubectl autoscale deployment auto-regul --cpu-percent=50 --min=1 --max=10

```
ubuntu@ip-172-20-57-237:~$ kubectl autoscale deployment auto-regul --cpu-percent=50 --min=1 --max=10
horizontalpodautoscaler.autoscaling/auto-regul autoscaled
```