Capstone Project 01

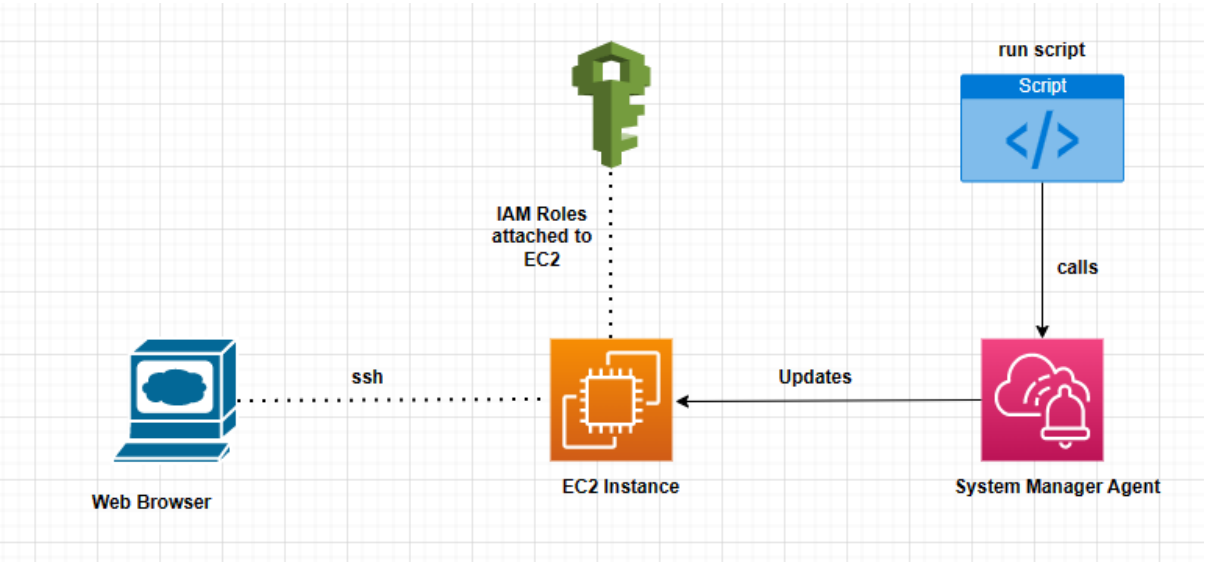
(1) Process that needs to be setup to remote manage EC2 instances from an operations perspective.

Modules:

This project is divided into five modules

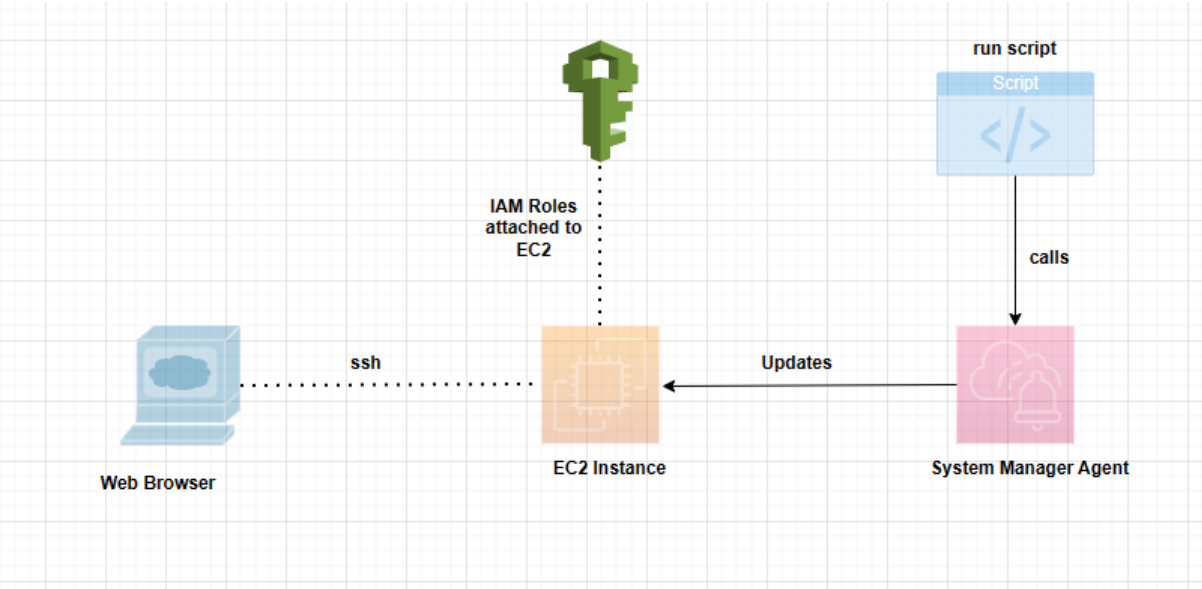
(1) **Create an Identity and Access Management (IAM) role:** Create an IAM role that will be used to give Systems Manager permission to perform actions on your instances.
(2) **Create an EC2 instance:** Create an EC2 instance using the EnablesEC2ToAccessSystemsManagerRole role. This will allow the EC2 instance to be managed by Systems Manager.
(3) **Update the Systems Manager Agent**: Automate administration tasks and manage the instance
(4) **Run a remote shell script:** Upgrade the packages on the EC2 instance
(5) **Terminate your resources:** Terminate Systems Manager and EC2 related resources

Architectural Diagram

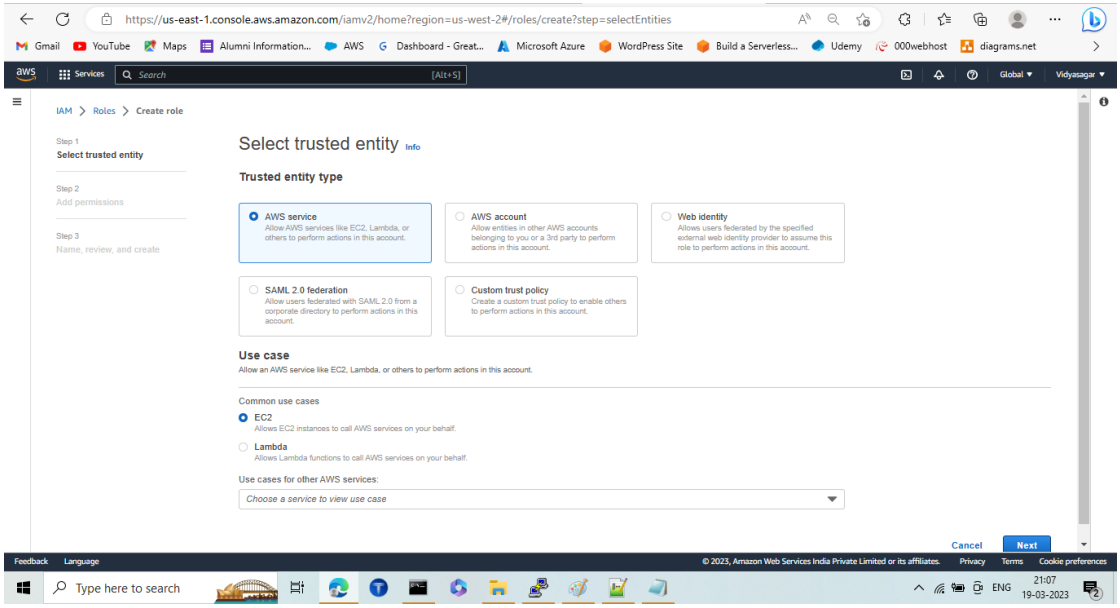


Module 1: Create an Identity and Access Management (IAM) role

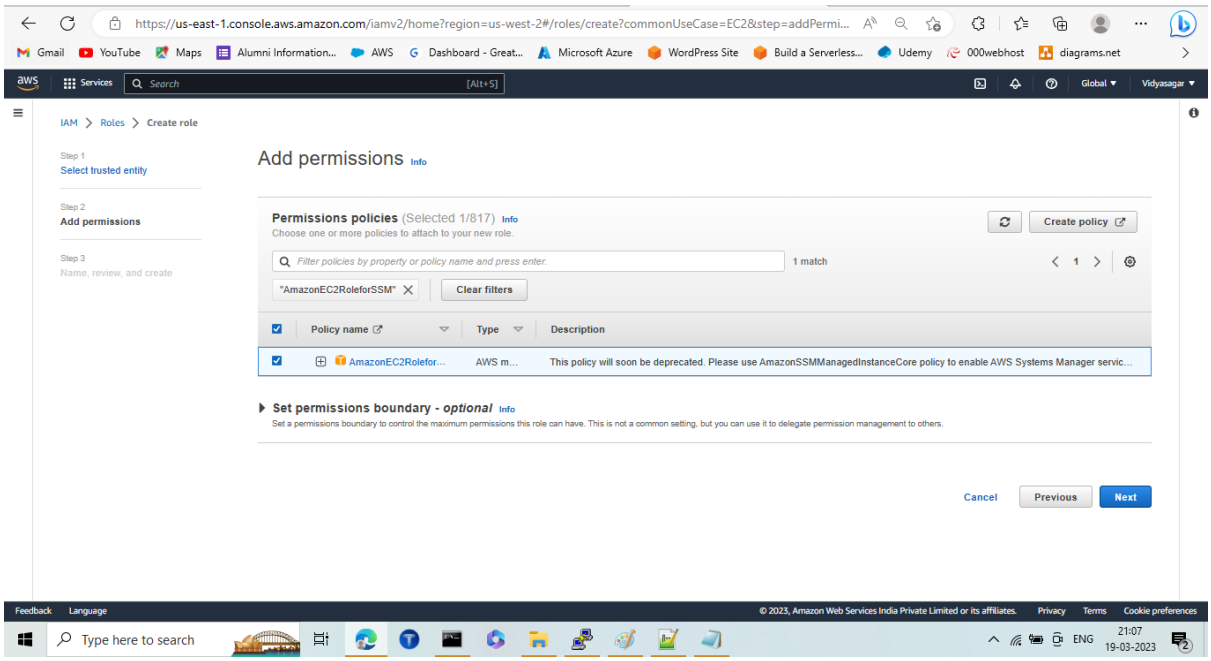
Architectural Diagram



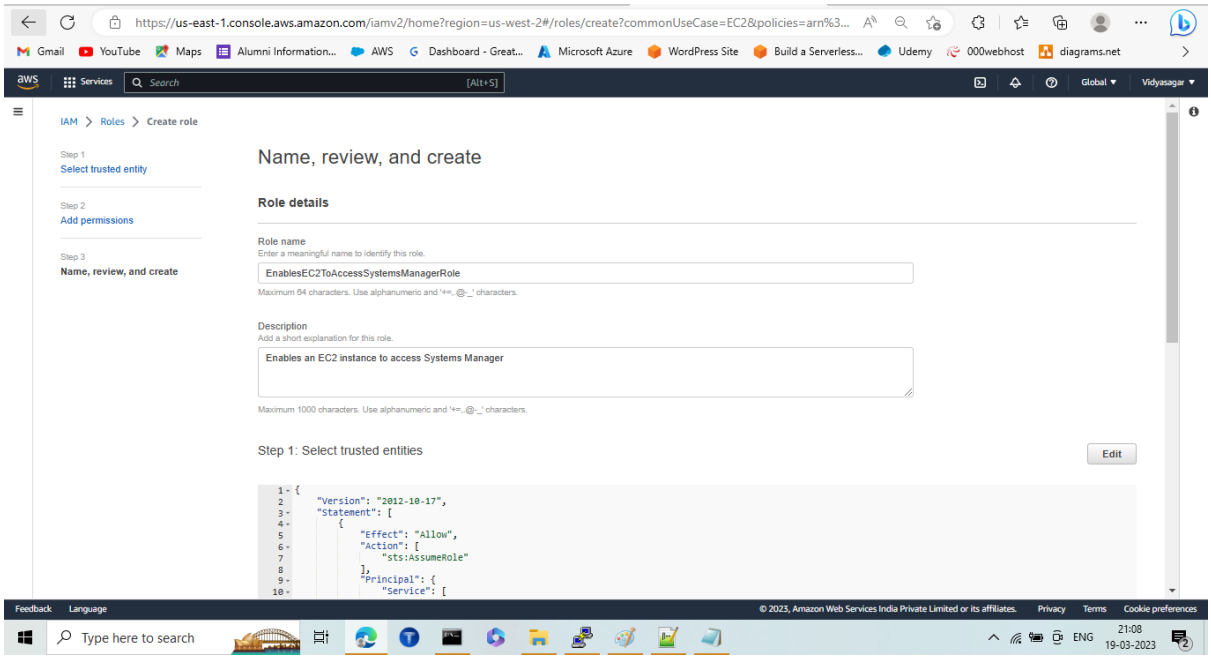
(a) Open the IAM console from the search bar
(b) Create Role is selected
(c) On the Select trusted entity page, under AWS Service, choose EC2, and then choose Next.



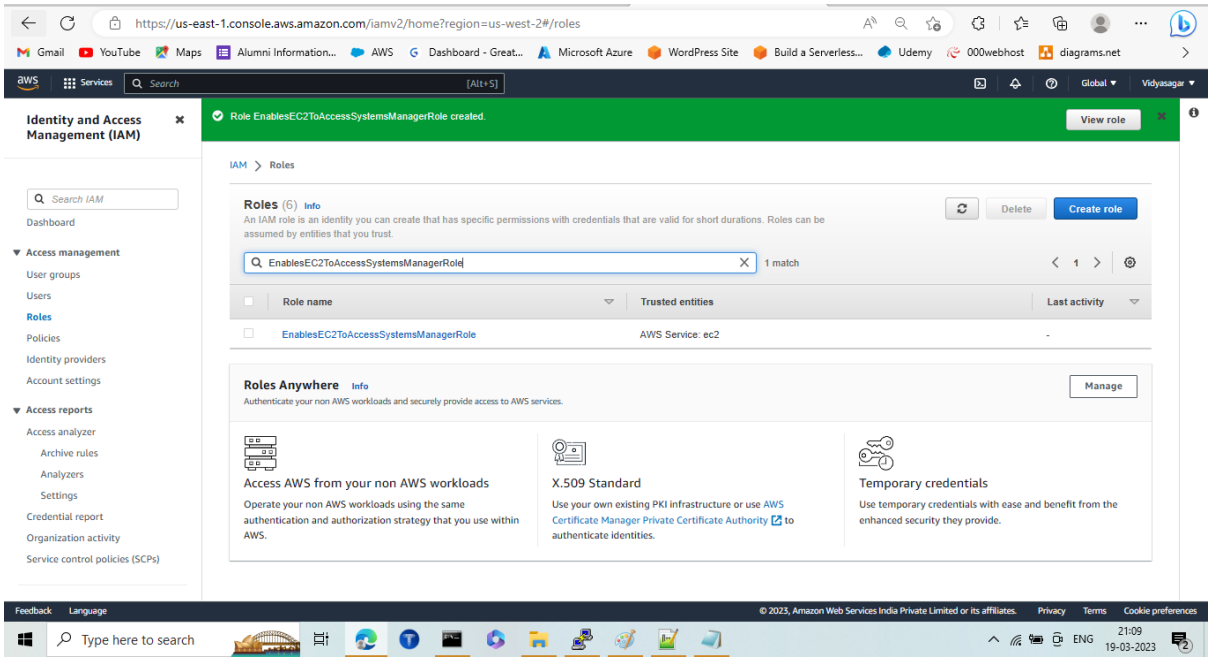
(d) On the Add permissions page, in the search bar type AmazonEC2RoleforSSM. From the policy list select AmazonEC2RoleforSSM and then choose Next.



(e) On the Name, review, and create page, In the Role name box, type in EnablesEC2ToAccessSystemsManagerRole. In the Description box, type in Enables an EC2 instance to access Systems Manager. Choose Create role.

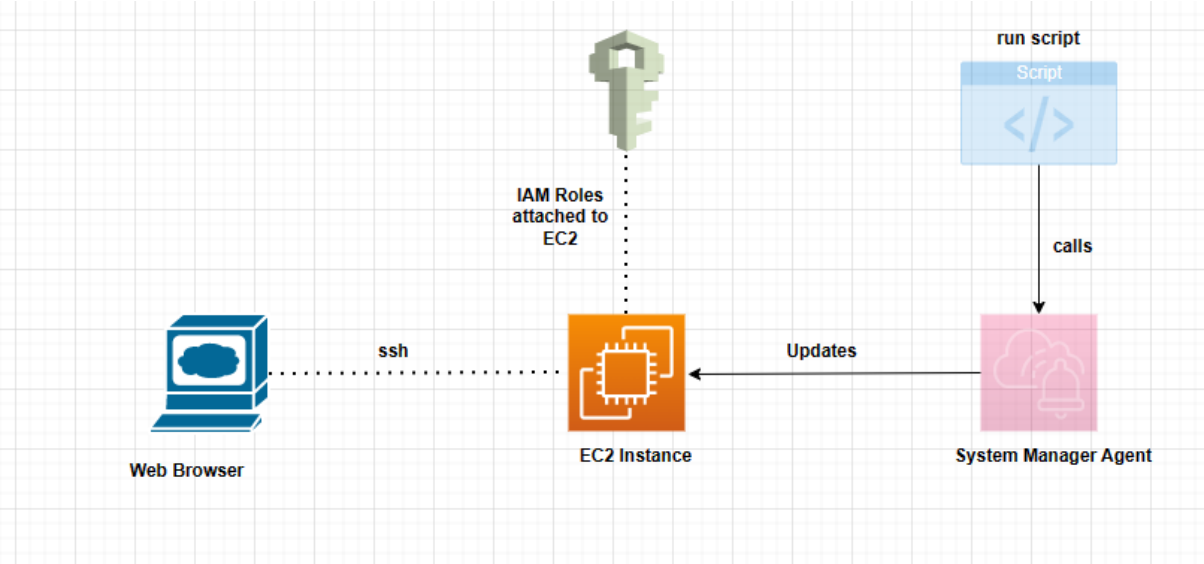


(f) IAM role successfully created as shown below

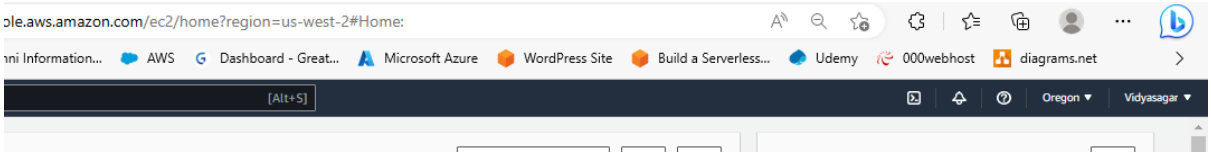


Module 2: Create an EC2 Instance

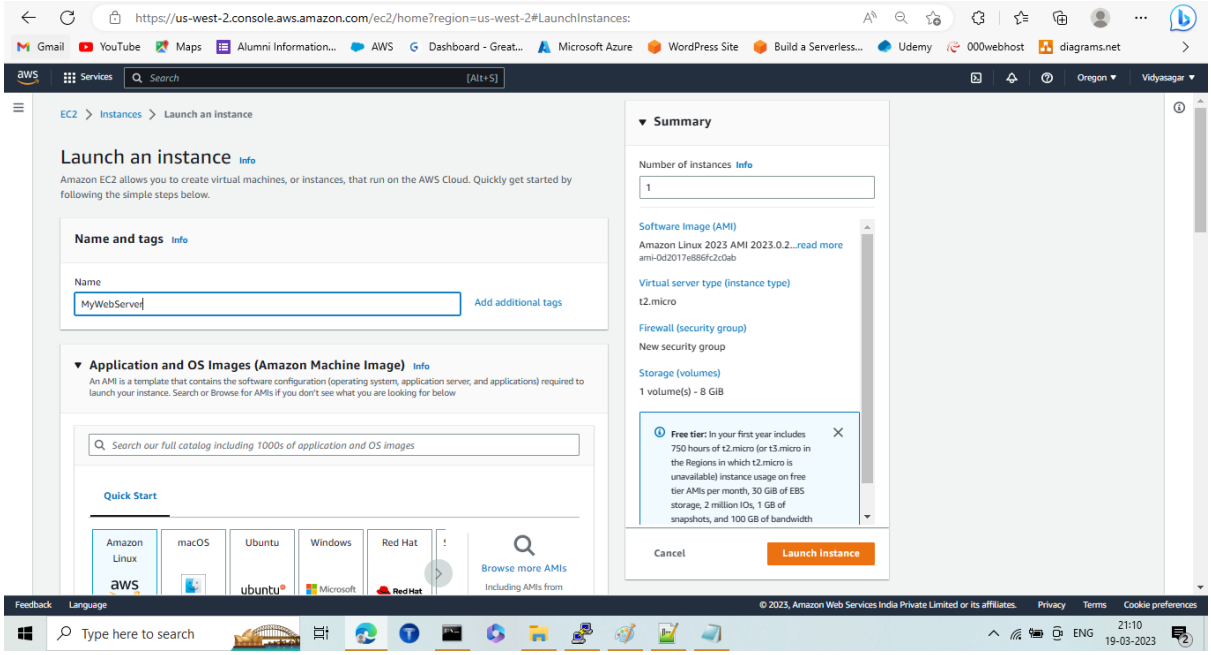
Architectural Diagram



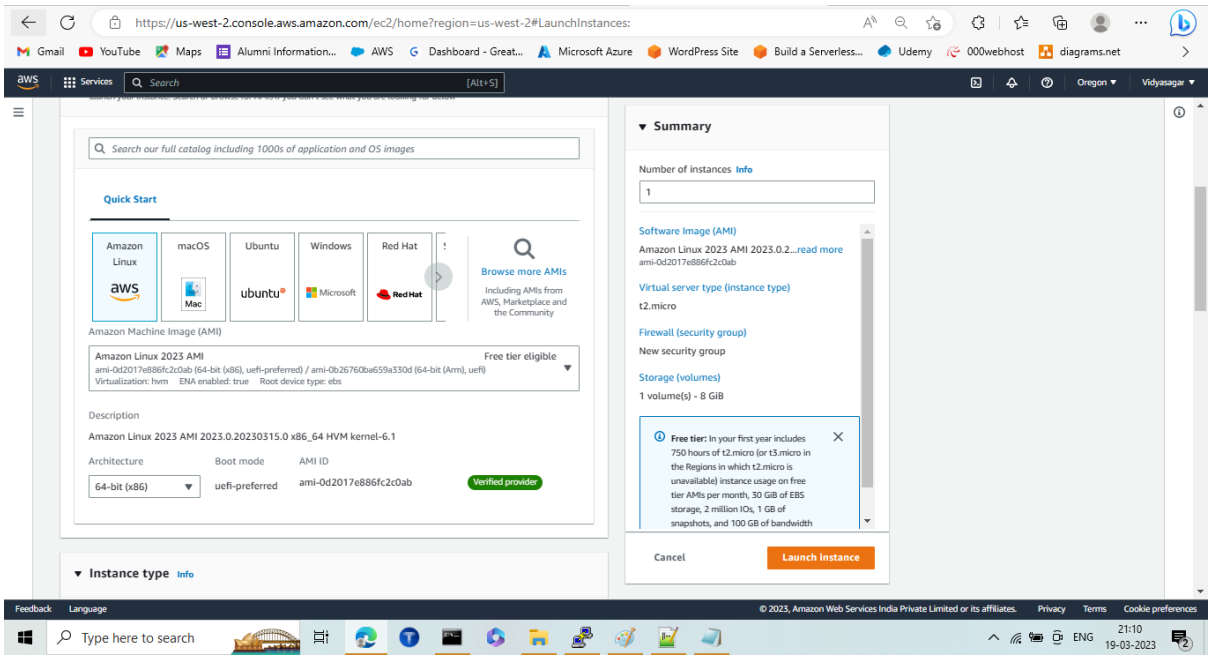
(a) Open the Amazon EC2 console. From the EC2 console, select your preferred Region. Systems Manager is supported in all AWS Regions. Now choose Launch instance.



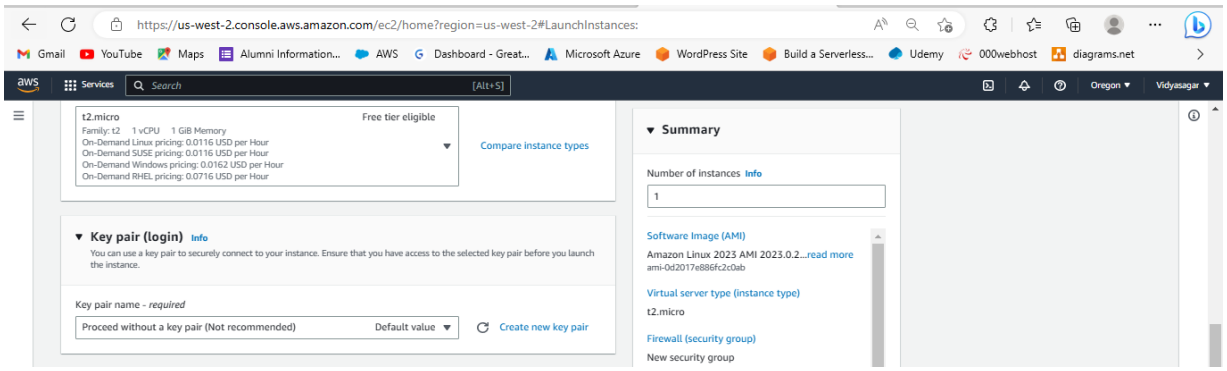
(b) In the Name field, enter MyWebServer.



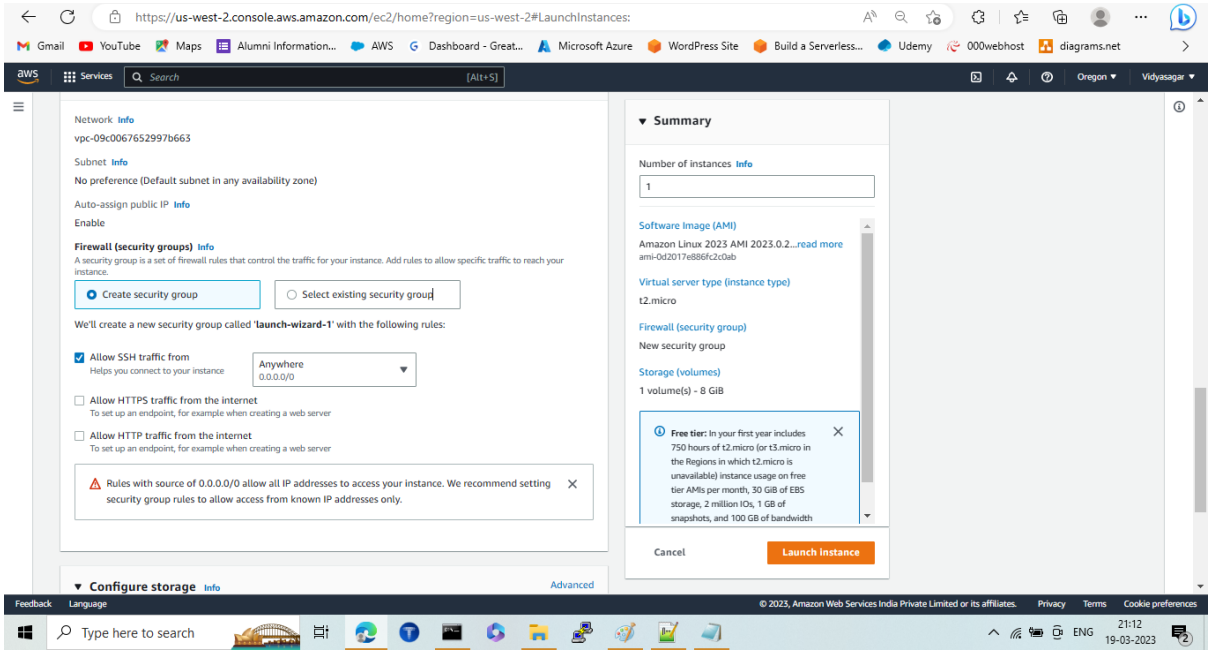
(c) Select the Amazon Linux AMI. Retain the default selection that appears in the dropdown.



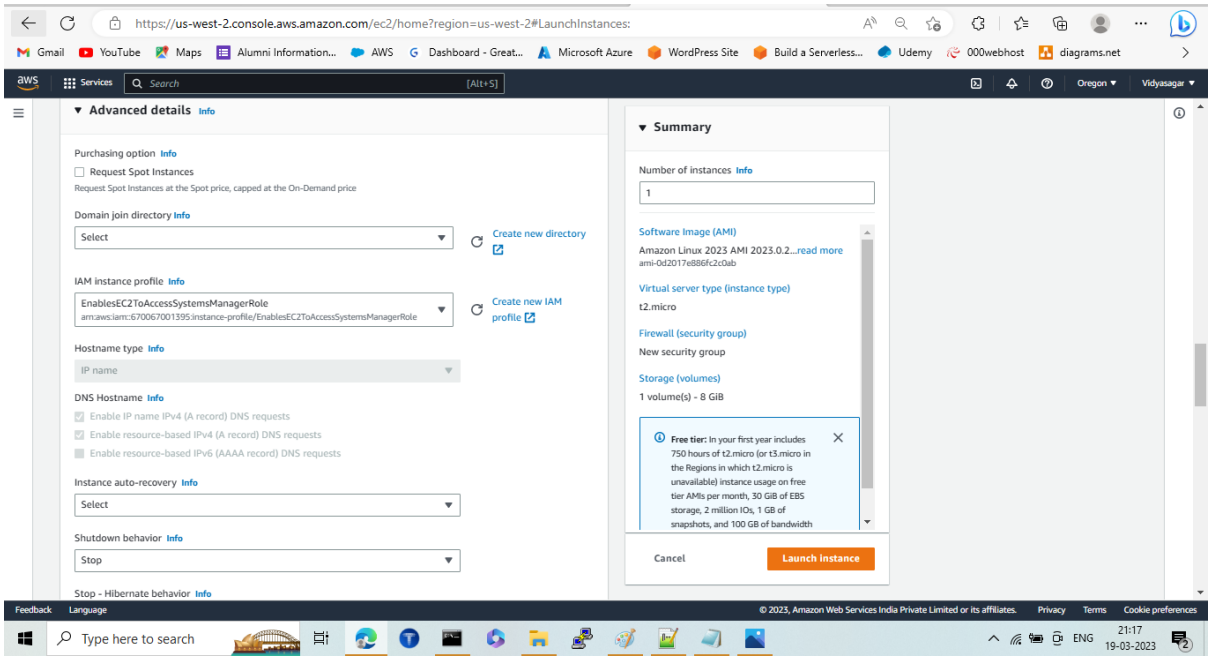
(d) Choose the t2.micro instance type and Scroll down to Key pair and under the Key pair name dropdown, choose Proceed without a key pair.



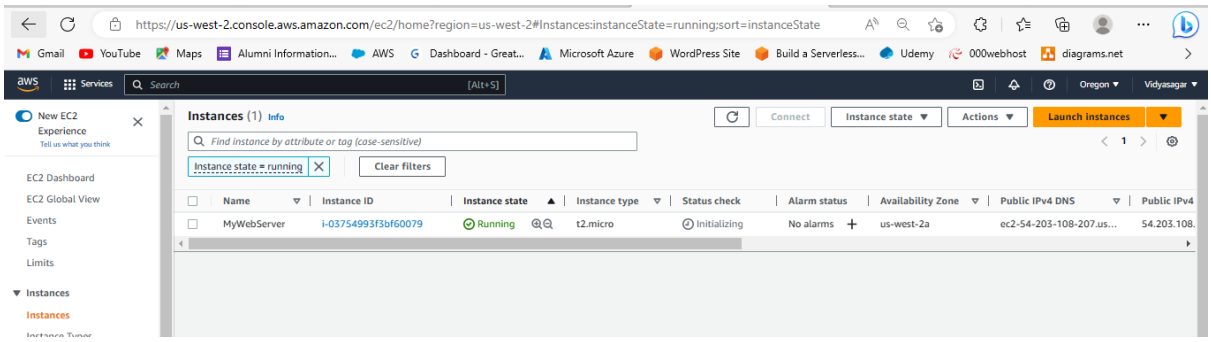
(e) Retain default settings under Network settings and Configure storage.



(f) Under Advanced details, in the IAM instance profile dropdown choose the EnablesEC2ToAccessSystemsManagerRole role you created earlier. Leave everything else as default. Choose Launch instance.

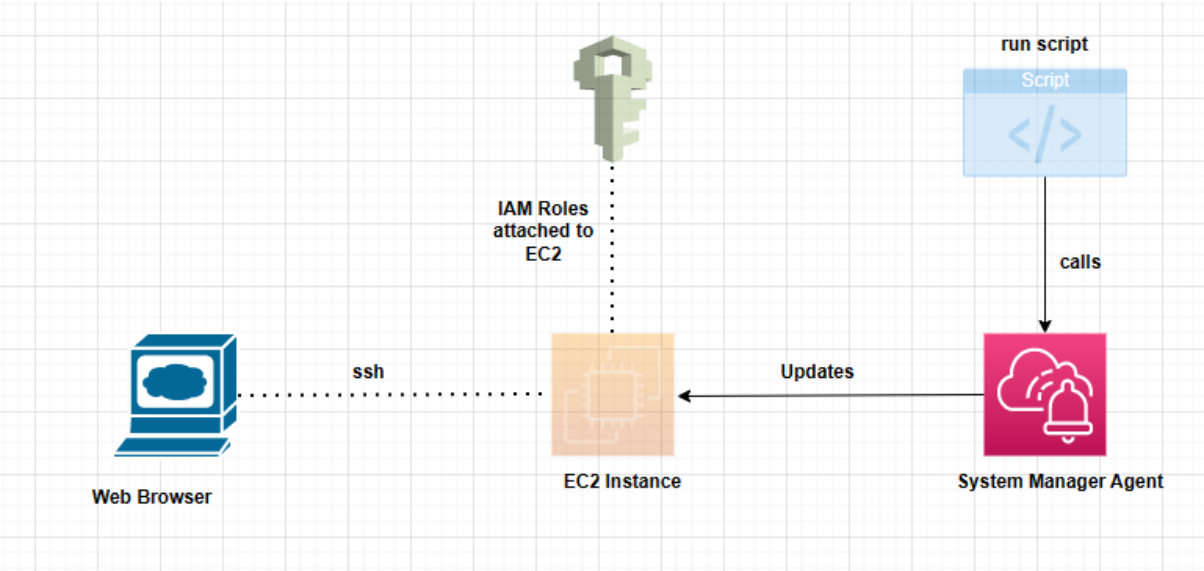


(g) EC2 instance will be created successfully as shown below



Module 3: Update the Systems Manager Agent

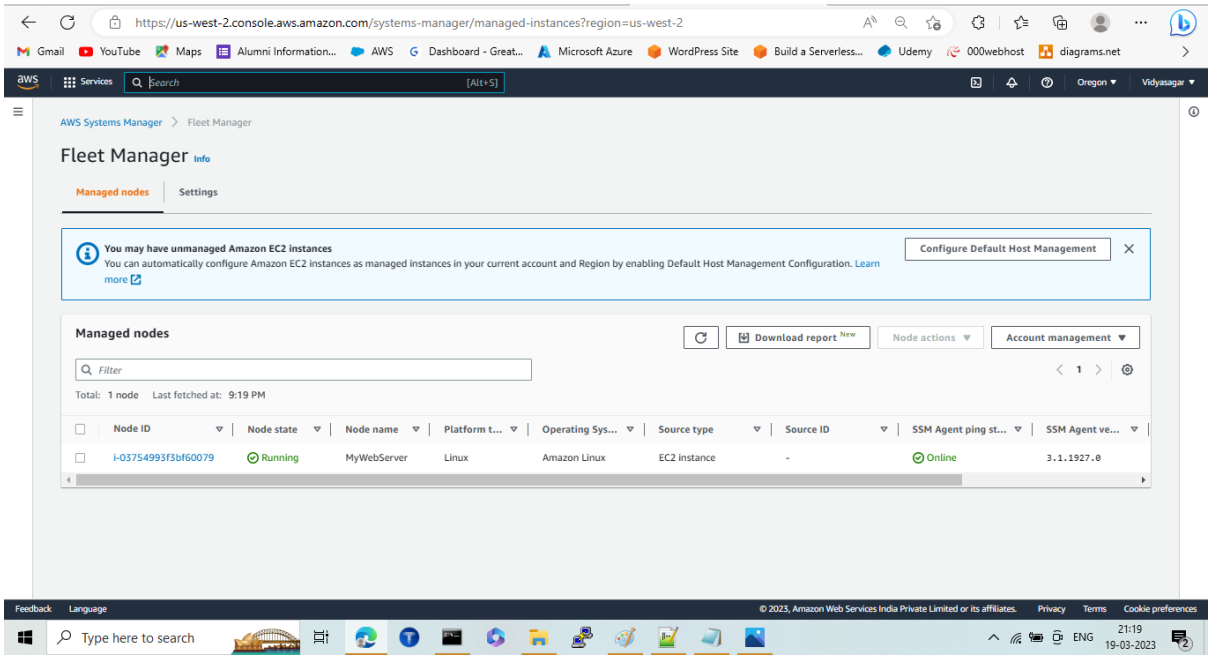
Architectural Diagram



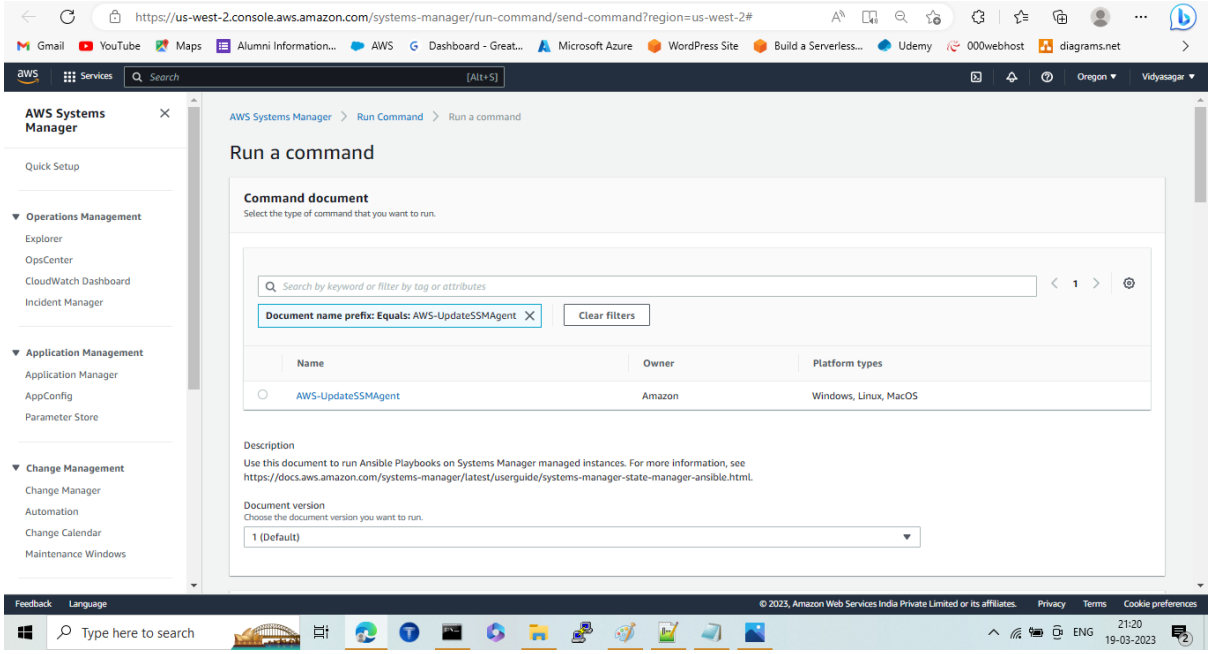
(a) In the top navigation bar, search for Systems Manager and open the Systems Manager console.

(b) Under the Node Management section on the left navigation bar, choose Fleet Manager.

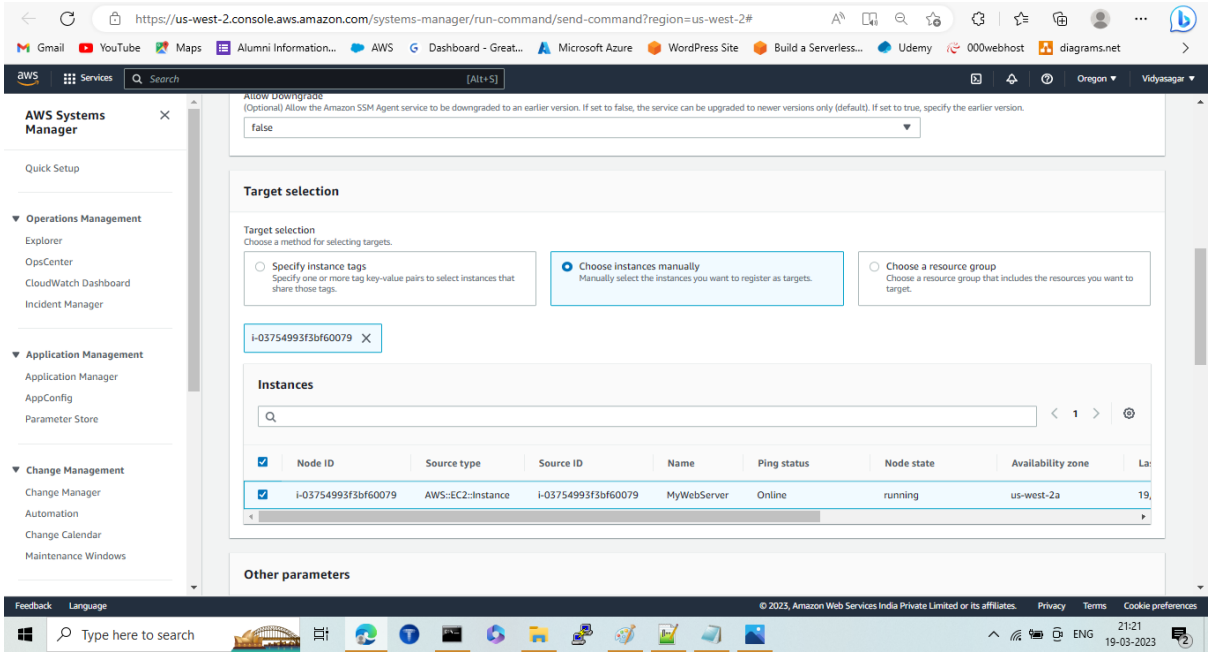
(c) Select the node ID created in step 2, MyWebServer, to open the node detail page.



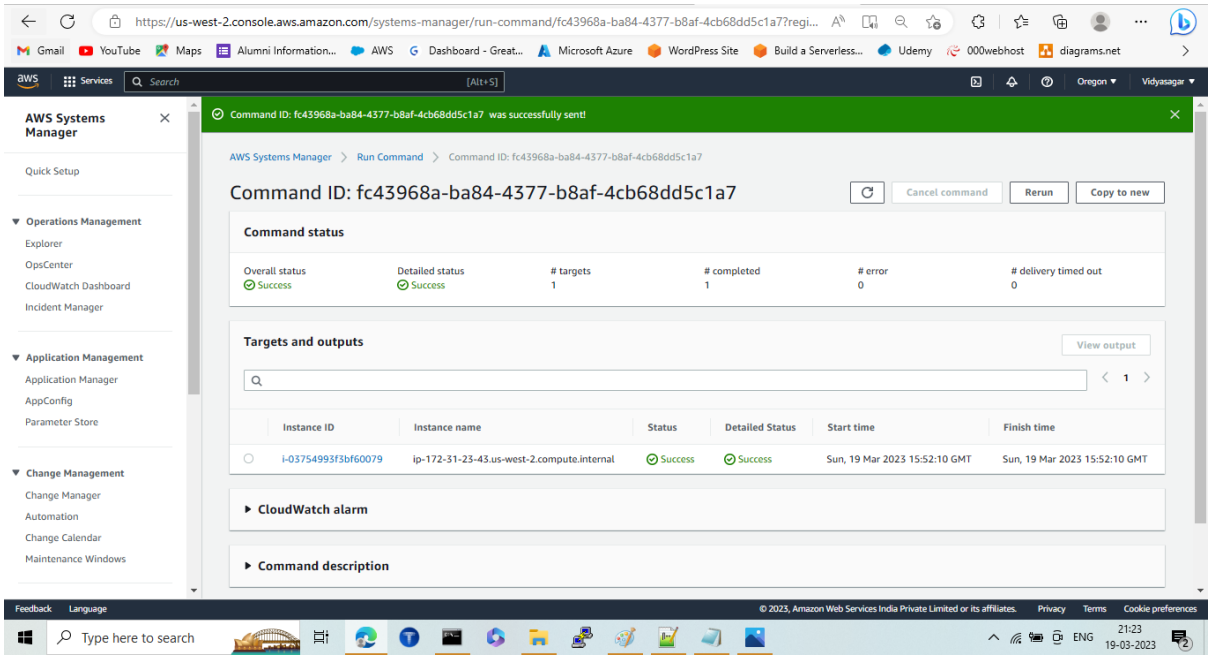
(d) On the node detail page, in the Node actions dropdown, select Execute run command and On the Run a command page, click in the search bar and select, Document name prefix, then click on Equals, then type in AWS-UpdateSSMAgent.



(e) Scroll down to the Targets panel and select the check box next to your managed EC2 instance.

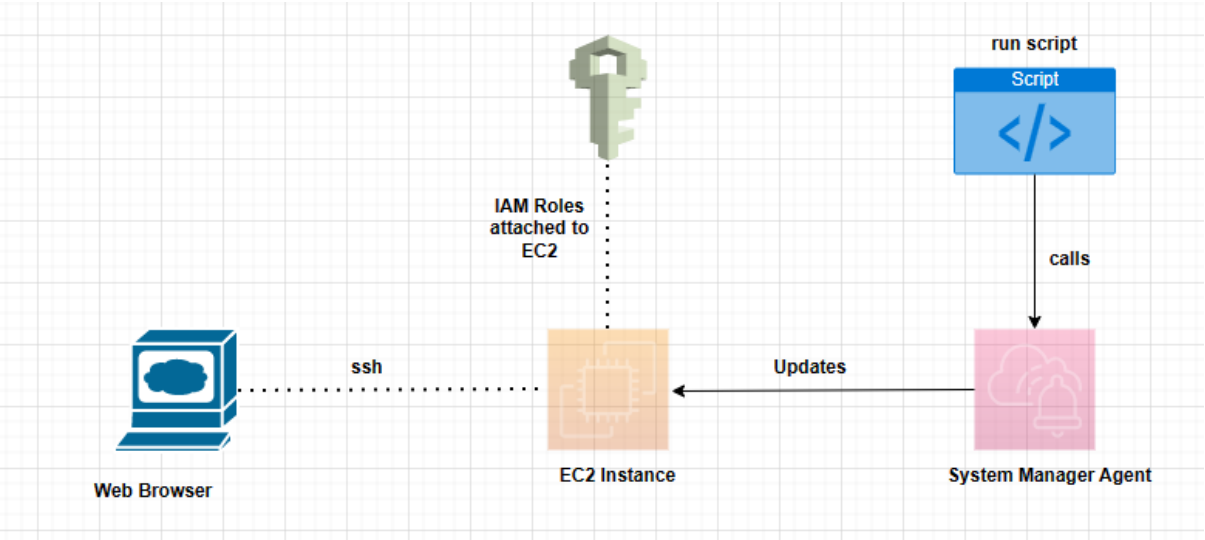


(f) Finally, scroll down and select Run, Next you will see a page documenting your running command, and then overall success in green as shown below



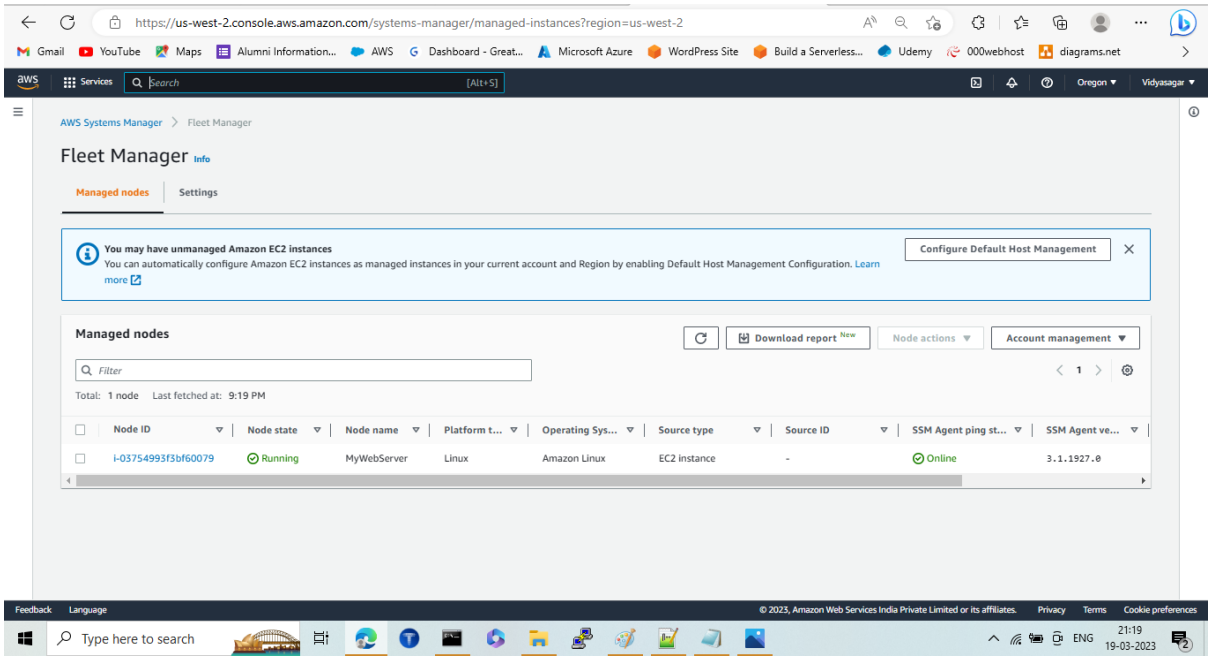
Module 4: Run a remote shell script

Architectural Diagram

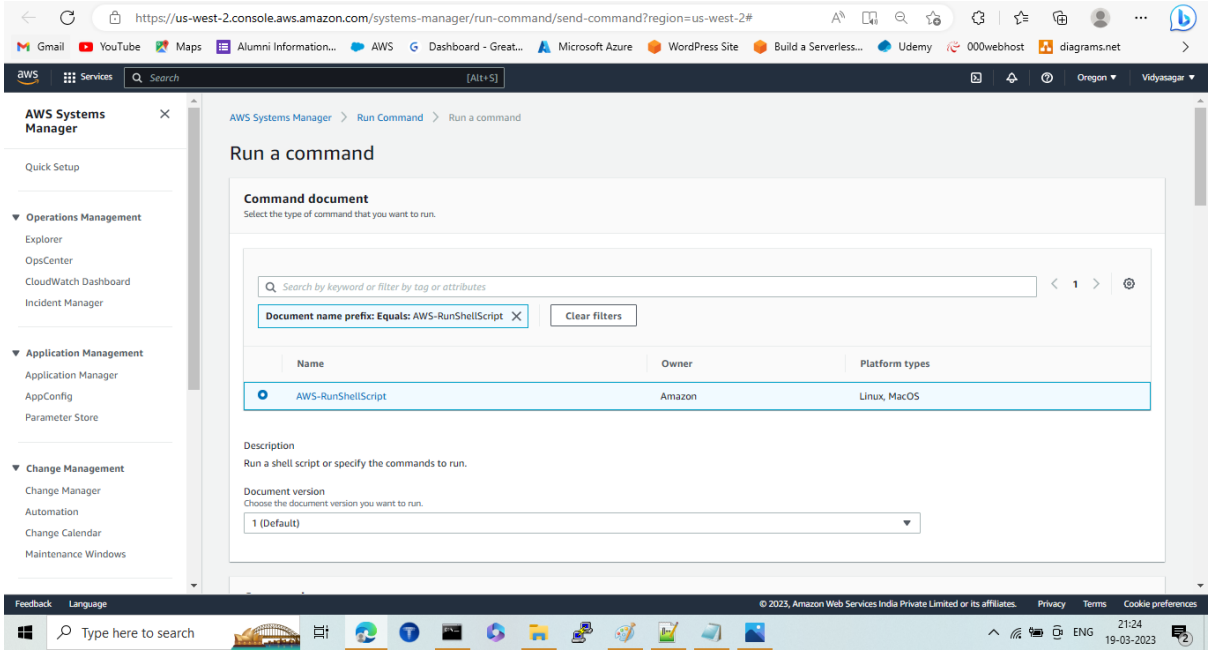


(a) Under the Node Management section on the left navigation bar, choose Fleet Manager.

(b) Select the node ID created in step 2, MyWebServer, to open the node detail page.

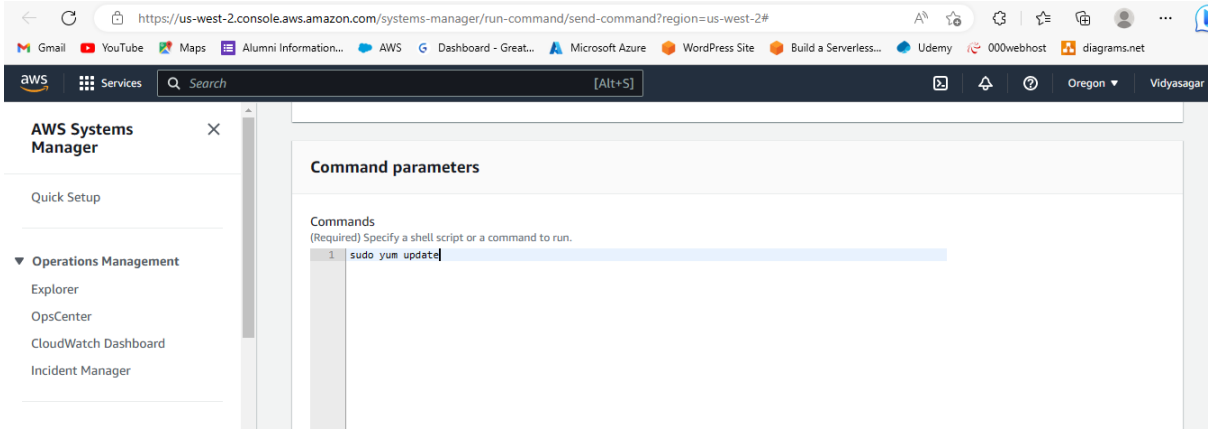


(c) On the node detail page, in the Node actions dropdown, select Execute run command and On the Run a command page, click in the search bar and select, Document name prefix, then click on Equals, then type in AWS-RunShellScript.

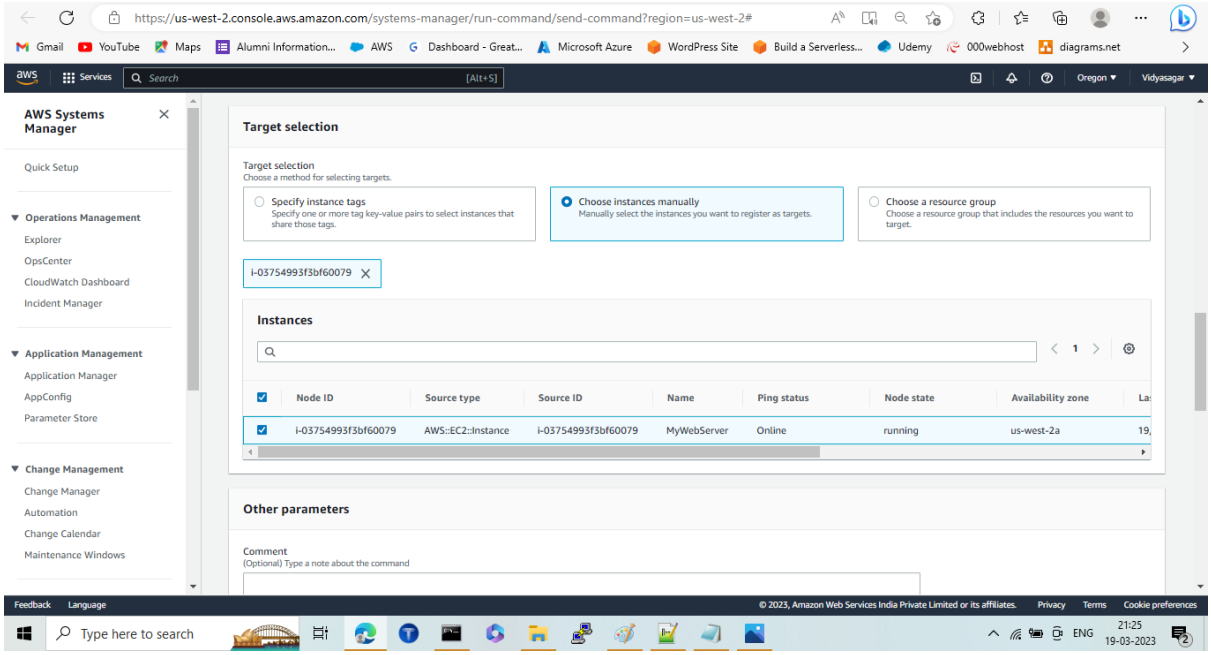


(d) Scroll down to the Command Parameters panel and insert the following command in the Commands text box:

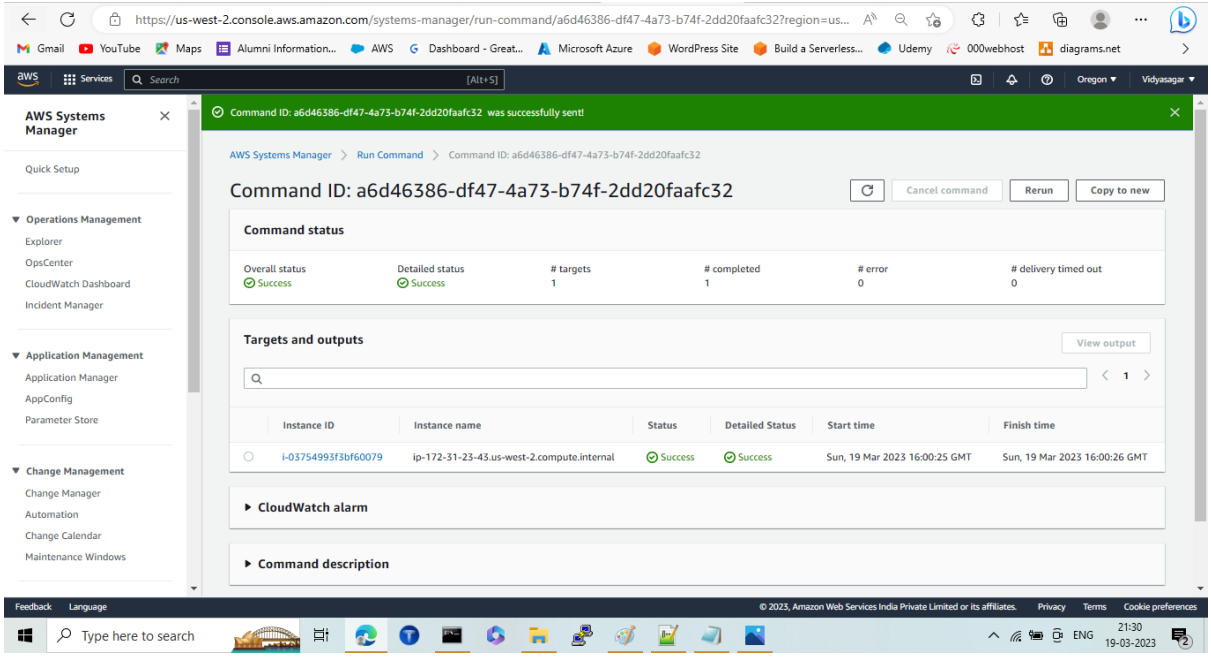
"sudo yum update"



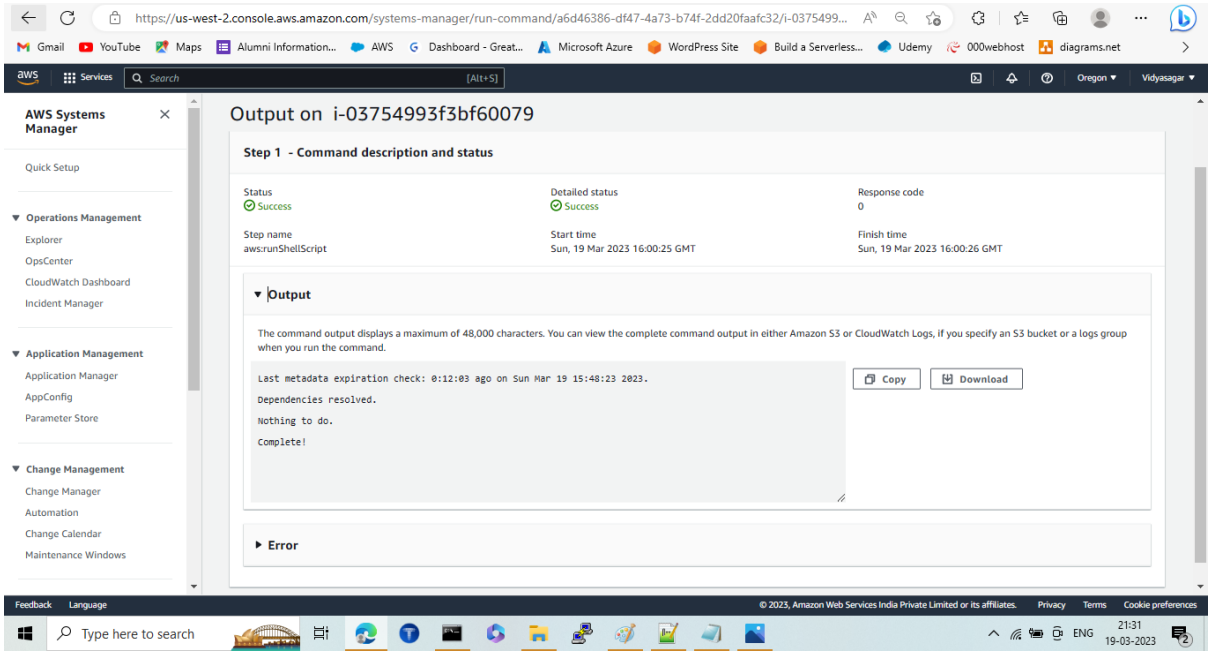
(e) Scroll down to the Targets panel and select the check box next to your managed EC2 instance.



(f) The Overall status will be In Progress as shown below

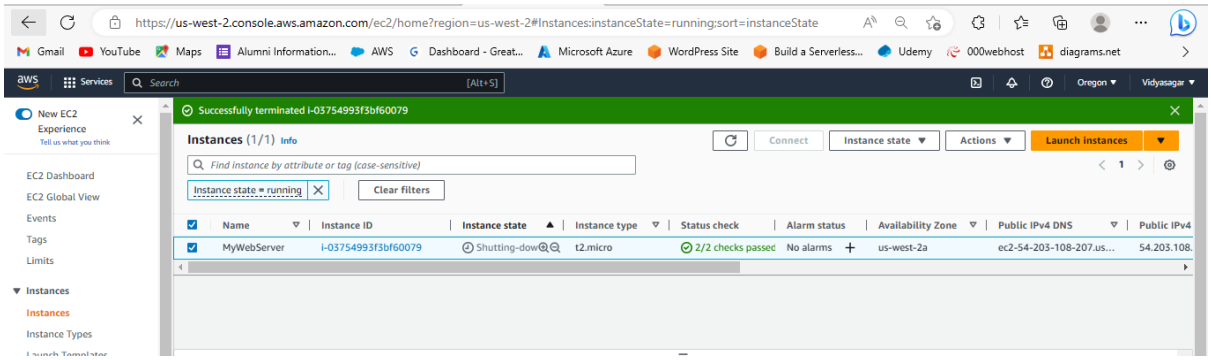


(g) From the Output on: page, select the header of the Output panel to view the output of the update command from the instance can be seen and shown below.



Module 5: Terminate your resources

(a) All the resources were terminates successfully.



Cost Analysis

Region	Service	Upfront	Monthly	Year	Currency	Summary
US West Oregon	Amazon EC2	136.66	0	136.66	USD	Tenancy (Shared), Operating system (Linux), Instance name (t2.micro), Number of Instance (1)
Total		136.66	0	136.66	USD	

Lessons & Observations

1. Learnt to create an EC2 instance.
2. Learnt to create IAM roles.
3. Learnt to remote access an EC2 instance.

(2) Build a Jenkins build server for the development team

Modules:

This project is divided into four modules

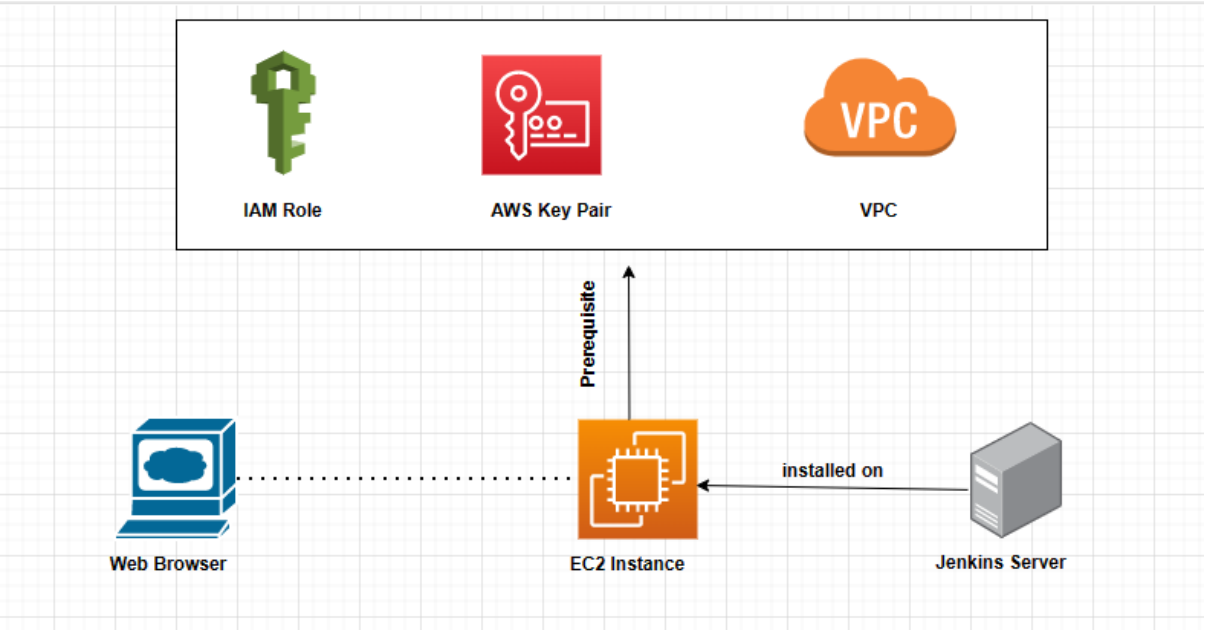
(1) **Set Up Prerequisites:** An AWS account, an AWS Identity and Access Management (IAM) user name and password, an Amazon EC2 key pair, and a configured Virtual Private Cloud (VPC)

(2) **Launch an EC2 Instance:** Launch a virtual server to host Jenkins. These virtual servers are called EC2 instances. Typically, you start from a base image called an Amazon Machine Image (AMI)

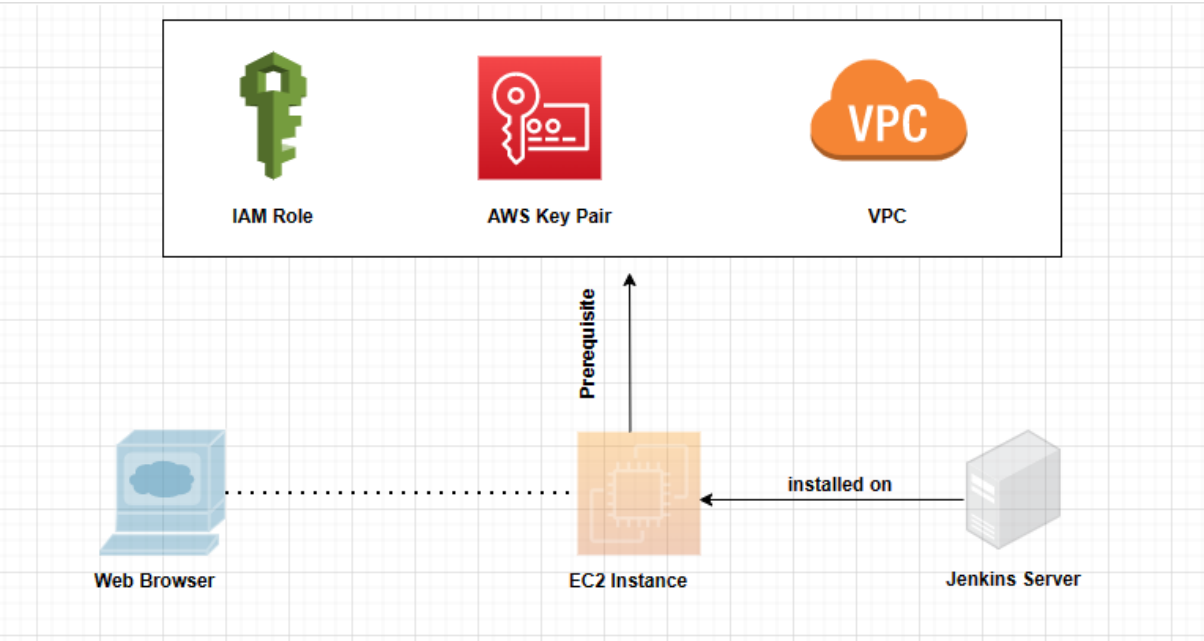
(3) **Install and Configure Jenkins:** Deploy Jenkins on your EC2 instance

(4) **Terminate Resources:** Delete the AWS resources created for the completion of this project

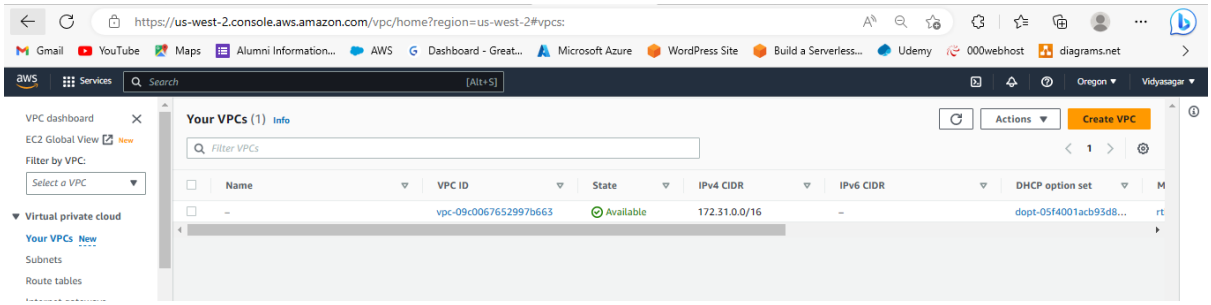
Architectural Diagram



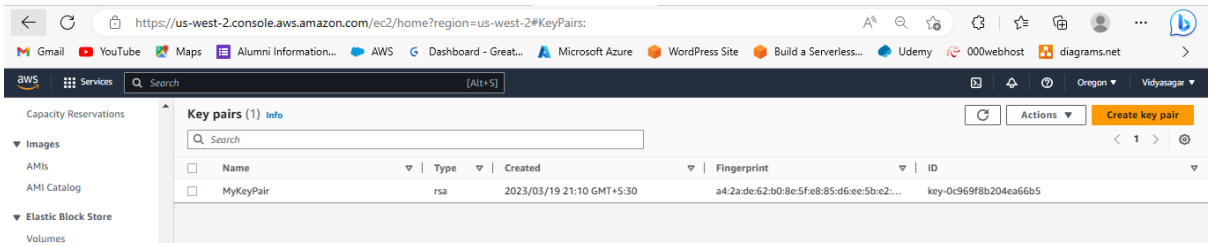
Module 1: Set up Prerequisites



(a) Keep the default VPC and default IAM Role

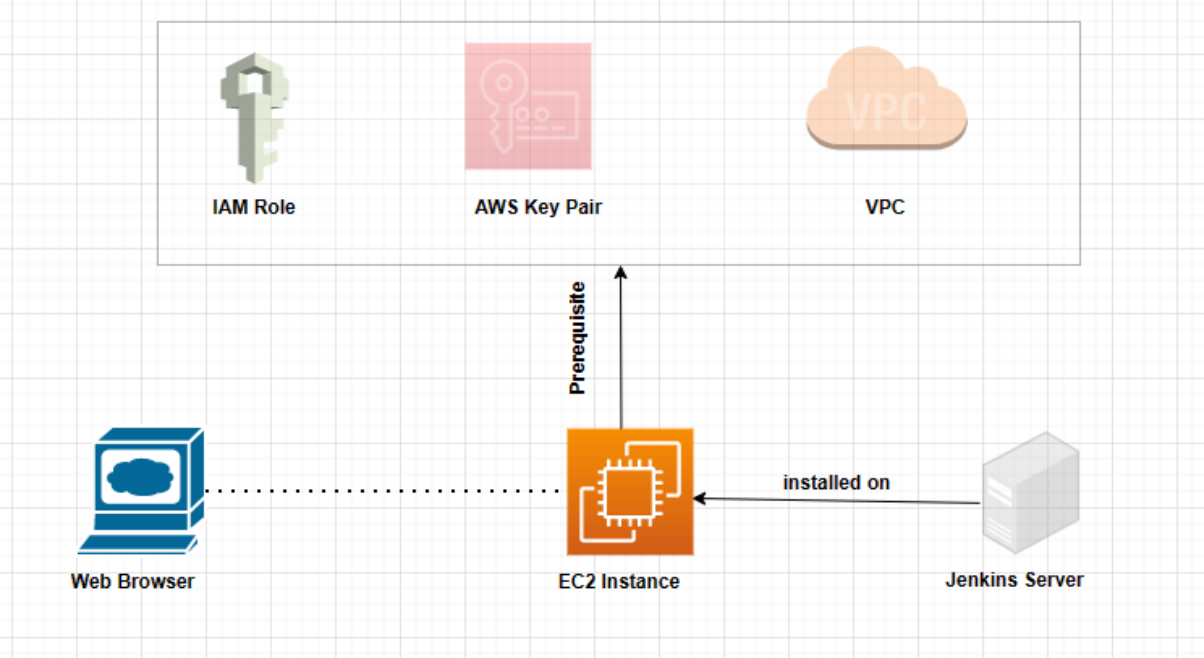


(b) Create a new key pair



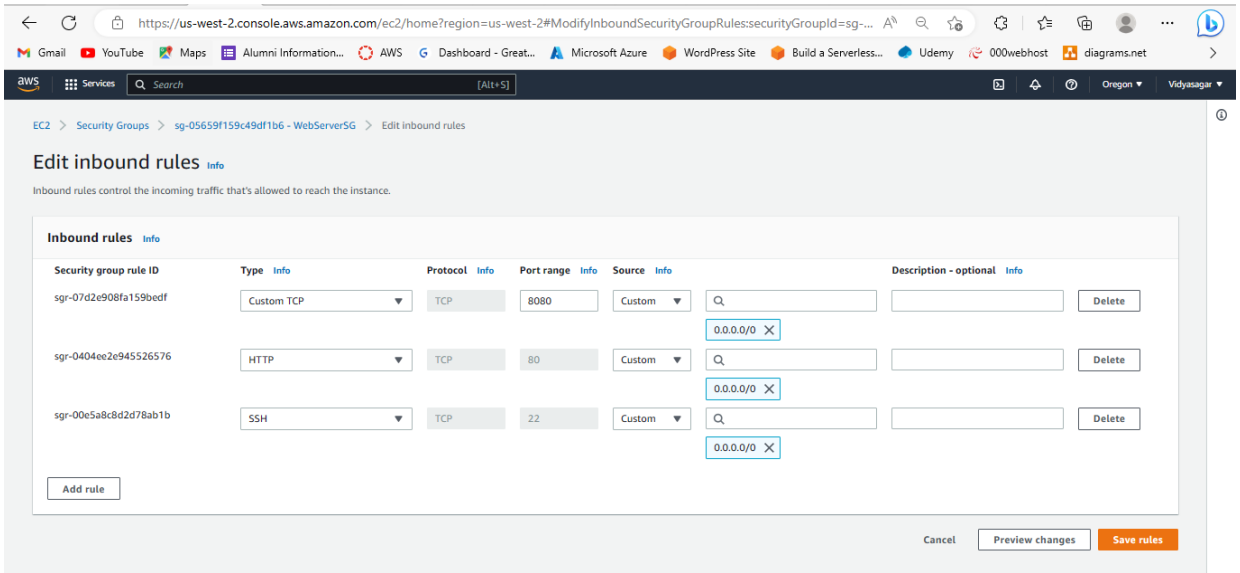
Module 2: Launch an EC2 Instance

Architectural Diagram



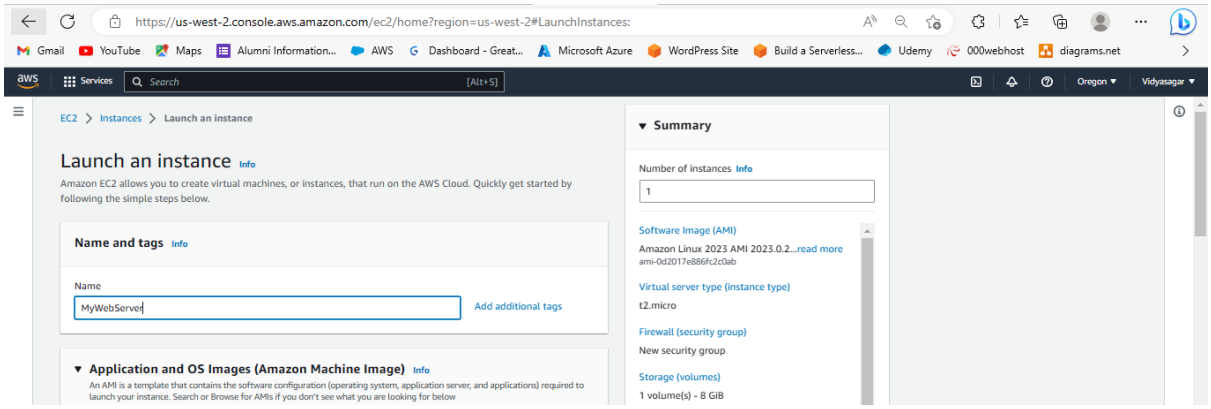
Step 1: Create s Security Group

(a) Create a security group names WebServerSG and allow inbound HTTP traffic from anywhere, allow inbound SSH traffic from your computer's public IP address so that you can connect to your instance and Custom TCP Rule 8080.

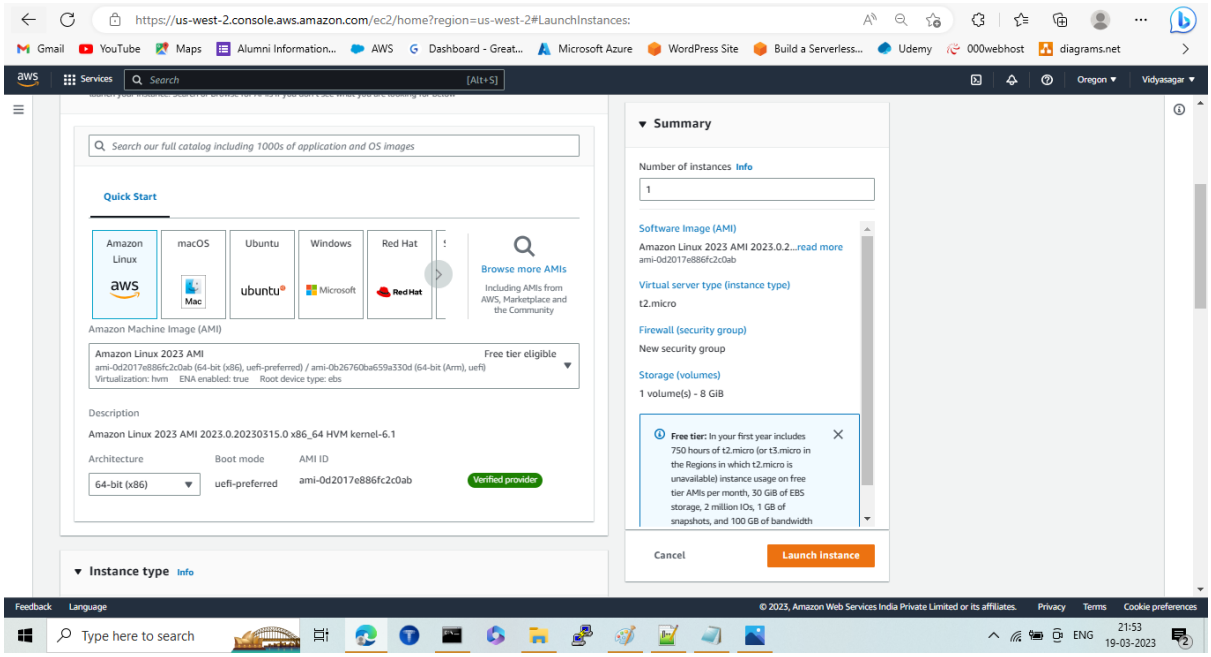


Step 2: Launch an EC2 instance

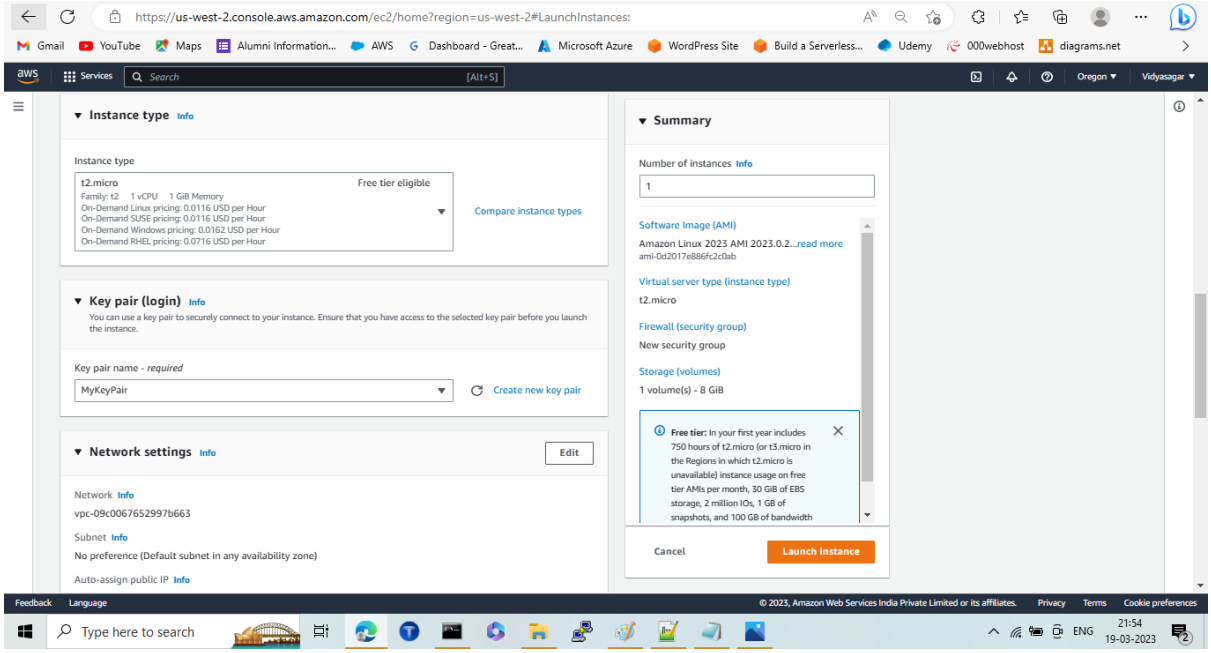
(a) From the navigation bar of the Amazon EC2 console, choose Instances, and then click Launch Instance and enter name as MyWebServer.



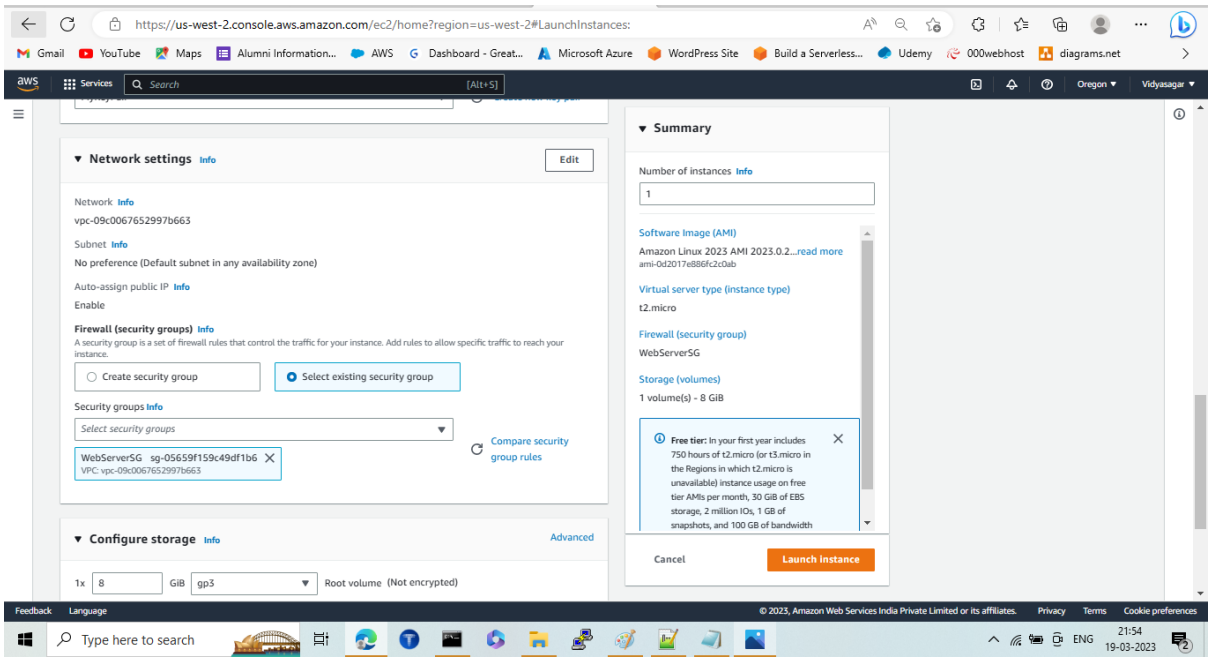
(b) On the Choose an Amazon Machine Image page, select Free tier only, and then select an Amazon Linux AMI with the HVM virtualization type.



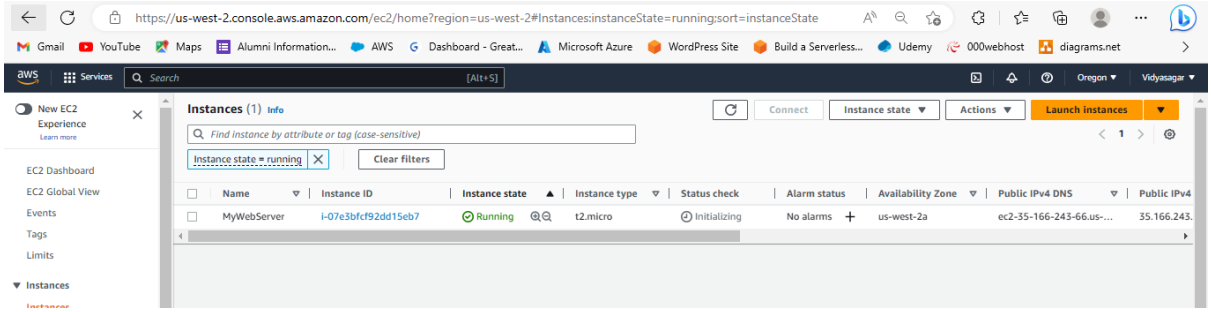
(c) On the Choose an Instance Type page, the t2.micro instance is selected by default. Keep it default and select the key pair name as MyKeyPair.



(d) On the Configure Security Group page, Select an existing security group WebServerSG as shown below and click launch instance

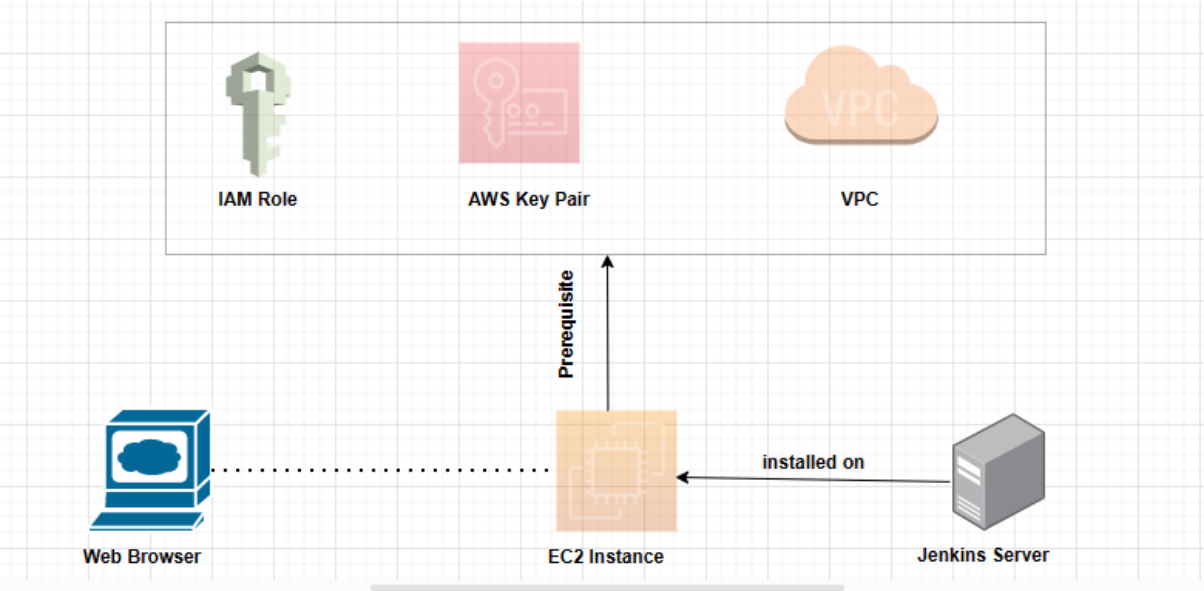


(e) A new EC2 instance will be created successfully



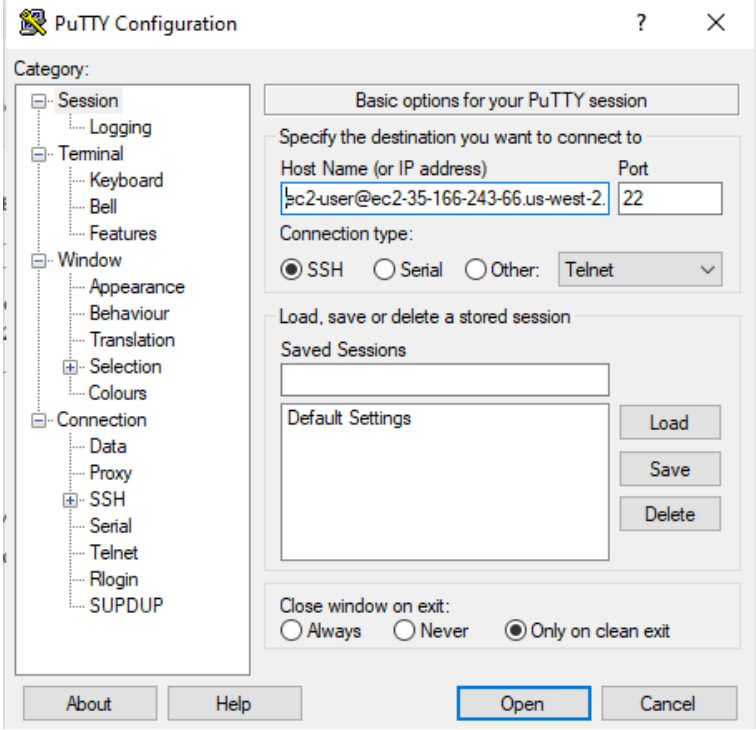
Module 3: Install and Configure Jenkins

Architectural Diagram

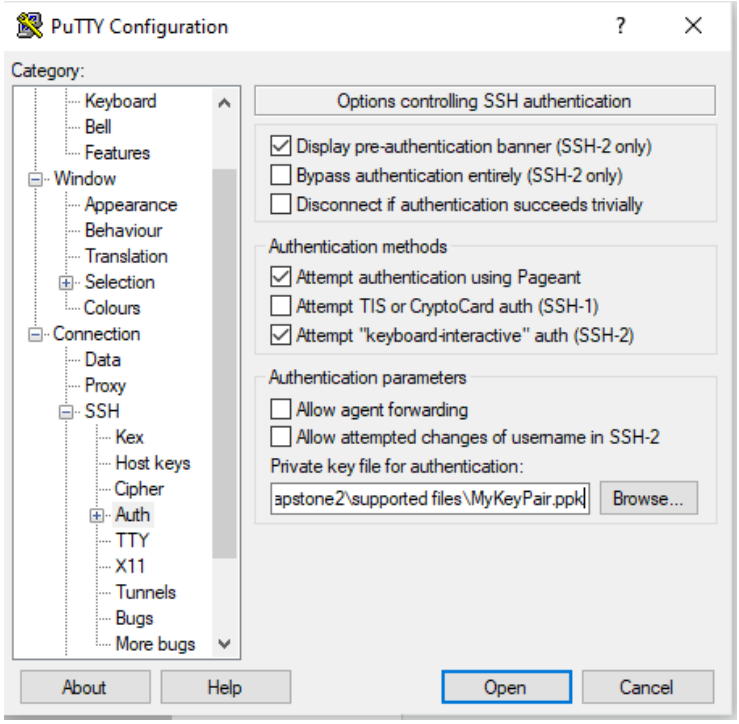


Step 1: Connect to your Linux Instance

(a) From the Start menu, choose All Programs > PuTTY
In Host Name, enter ec2-user@public_dns_name.



(b) In the Category pane, expand Connection, expand SSH, and then select Auth.
Browse the key pair created in Step 1 and click open



(c) Successfully logged in to EC2 instance as shown below

```
ec2-user@ip-172-31-24-102:~
Using username "ec2-user".
Authenticating with public key "MyKeyPair"
  ,     #_
  ~\_  ####_        Amazon Linux 2023
 ~~  \_#####\
 ~~     \###|
 ~~       \#/ ___   https://aws.amazon.com/linux/amazon-linux-2023
  ~~       V~' '->
   ~~~         /
     ~~._.   _/
        _/ _/
      _/m/'
[ec2-user@ip-172-31-24-102 ~]$
```

Step 2: Download and Install Jenkins

(a) To ensure that your software packages are up to date on your instance, use the following command to perform a quick software update.
"sudo yum update"

```
[ec2-user@ip-172-31-24-102 ~]$ sudo yum update
Amazon Linux 2023 repository                                    27 MB/s |  11 MB     00:00
Amazon Linux 2023 Kernel Livepatch repository                  811 kB/s | 155 kB     00:00
Last metadata expiration check: 0:00:01 ago on Sun Mar 19 16:37:34 2023.
Dependencies resolved.
Nothing to do.
Complete!
```

(b) Add the Jenkins repo using the following command:

"sudo wget -O /etc/yum.repos.d/jenkins.repo http://pkg.jenkins.ci.org/redhat/jenkins.repo"

```
[ec2-user@ip-172-31-24-102 ~]$ sudo wget -O /etc/yum.repos.d/jenkins.repo https://pkg.jenkins.io/redhat-stable/jenkins.repo
--2023-03-19 16:37:58--  https://pkg.jenkins.io/redhat-stable/jenkins.repo
Resolving pkg.jenkins.io (pkg.jenkins.io)... 151.101.22.133, 2a04:4e42:5::645
Connecting to pkg.jenkins.io (pkg.jenkins.io)|151.101.22.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 85
Saving to: '/etc/yum.repos.d/jenkins.repo'

/etc/yum.repos.d/jenkins.repo       100%[===================================================================================>]      85  --.-KB/s    in 0s

2023-03-19 16:37:59 (5.32 MB/s) - '/etc/yum.repos.d/jenkins.repo' saved [85/85]

[ec2-user@ip-172-31-24-102 ~]$
```

(c) Import a key file from Jenkins-CI to enable installation from the package:
"sudo rpm --import https://pkg.jenkins.io/redhat/jenkins.io.key"

```
[ec2-user@ip-172-31-24-102 ~]$ sudo rpm --import https://pkg.jenkins.io/redhat-stable/jenkins.io.key
[ec2-user@ip-172-31-24-102 ~]$
```

(d) Install Java as a dependency for Jenkins

"sudo yum install java –y"

```
[ec2-user@ip-172-31-24-102 ~]$ sudo yum install java -y
Jenkins-stable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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Dependencies resolved.
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Installing:
 java-17-amazon-corretto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                
Installing dependencies:
 alsa-lib                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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 dejavu-sans-fonts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                
 dejavu-sans-mono-fonts                                                                                                                                                                                                                                                                                                                                                                                
 dejavu-serif-fonts                                                                                                                                
 fontconfig                                                                                                                                
 fonts-filesystem                                                                                                                                
 freetype                                                                                                                                
 giflib                                                                                                                                
 google-noto-fonts-common                                                                                                                                
 google-noto-sans-vf-fonts                                                                                                                                
 graphite2                                                                                                                                
 harfbuzz                                                                                                                                
 java-17-amazon-corretto-headless                                                                                                                                
 javapackages-filesystem                                                                                                                                
 langpacks-core-font-en                                                                                                                                
 libICE                                                                                                                                
 libSM                                                                                                                                
 libX11                                                                                                                                
 libX11-common                                                                                                                                
 libXau                                                                                                                                
 libXext                                                                                                                                
 libXi                                                                                                                                
 libXinerama                                                                                                                                
 libXrandr                                                                                                                                
 libXrender                                                                                                                                
 libXt                                                                                                                                
 libXtst                                                                                                                                
 libbrotli                                                                                                                                
 libjpeg-turbo                                                                                                                                
```

(e) Install Jenkins

"sudo yum install Jenkins"

```
[ec2-user@ip-172-31-24-102 ~]$ sudo yum install jenkins
Last metadata expiration check: 0:01:25 ago on Sun Mar 19 16:38:54 2023.
Dependencies resolved.
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 Package                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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Installing:
 jenkins                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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Transaction Summary
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Install  1 Package

Total download size: 94 M
Installed size: 94 M
Is this ok [y/N]: y
Downloading Packages:
jenkins-2.387.1-1.1.noarch.rpm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :
  Running scriptlet: jenkins-2.387.1-1.1.noarch
  Installing       : jenkins-2.387.1-1.1.noarch
  Running scriptlet: jenkins-2.387.1-1.1.noarch
  Verifying        : jenkins-2.387.1-1.1.noarch

Installed:
  jenkins-2.387.1-1.1.noarch

Complete!
[ec2-user@ip-172-31-24-102 ~]$
```

(f) Start Jenkins as a service:

"sudo service jenkins start"

```
[ec2-user@ip-172-31-24-102 ~]$ sudo service jenkins start
Starting jenkins (via systemctl):                          [  OK  ]
[ec2-user@ip-172-31-24-102 ~]$
```

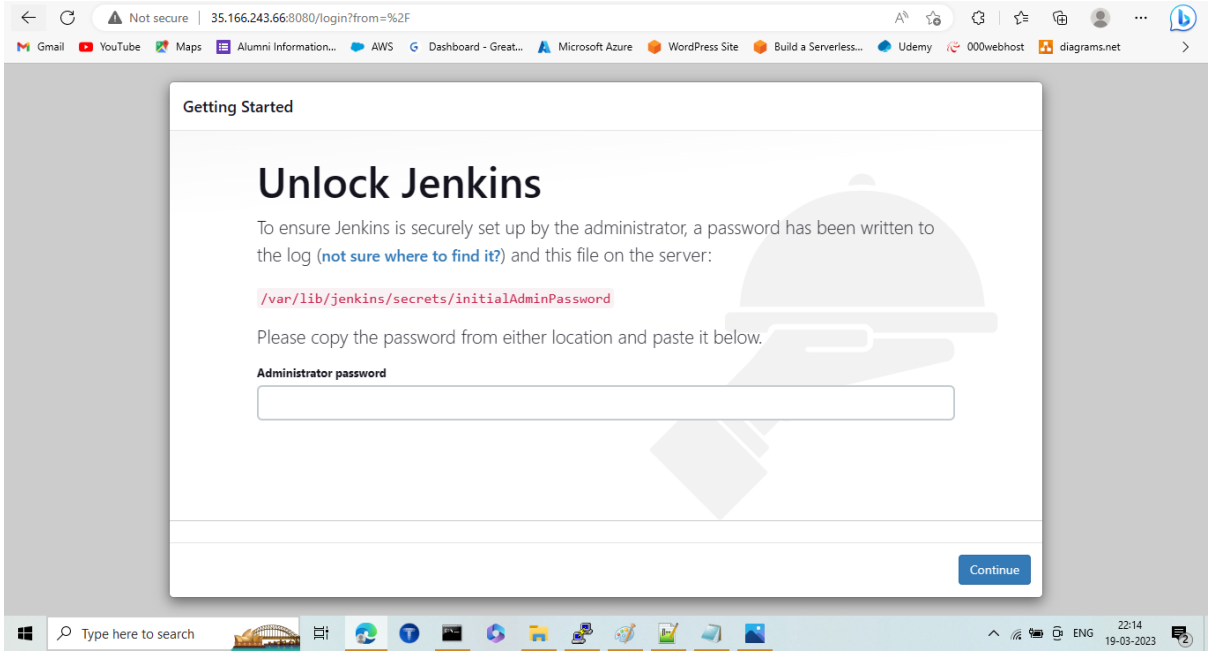
(g) Check the status of Jenkins by using below command
"sudo service Jenkins status"

```
[ec2-user@ip-172-31-24-102 ~]$ sudo service jenkins status
● jenkins.service - Jenkins Continuous Integration Server
     Loaded: loaded (/usr/lib/systemd/system/jenkins.service; disabled; preset: disabled)
     Active: active (running) since Sun 2023-03-19 16:42:39 UTC; 22s ago
   Main PID: 25944 (java)
      Tasks: 46 (limit: 1125)
     Memory: 327.9M
        CPU: 34.966s
     CGroup: /system.slice/jenkins.service
             └─25944 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=/var/cache/jenkins/war --httpPort=8080

Mar 19 16:42:13 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: f0977aff5f76485a9d2f50cffc134015
Mar 19 16:42:13 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: This may also be found at: /var/lib/jenkins/secrets/initialAdminPassword
Mar 19 16:42:13 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: *************************************************************
Mar 19 16:42:13 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: *************************************************************
Mar 19 16:42:13 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: *************************************************************
Mar 19 16:42:38 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: 2023-03-19 16:42:38.961+0000 [id=30]        INFO        jenkins.InitReactorRunner$1#onAttai
Mar 19 16:42:39 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: 2023-03-19 16:42:39.000+0000 [id=24]        INFO        hudson.lifecycle.Lifecycle#onReady:
Mar 19 16:42:39 ip-172-31-24-102.us-west-2.compute.internal systemd[1]: Started jenkins.service - Jenkins Continuous Integration Server.
Mar 19 16:42:39 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: 2023-03-19 16:42:39.335+0000 [id=46]        INFO        h.m.DownloadService$Downloadable#lo
Mar 19 16:42:39 ip-172-31-24-102.us-west-2.compute.internal jenkins[25944]: 2023-03-19 16:42:39.335+0000 [id=46]        INFO        hudson.util.Retrier#start: Performe
lines 1-20/20 (END)
```

Step 3: Configure Jenkins

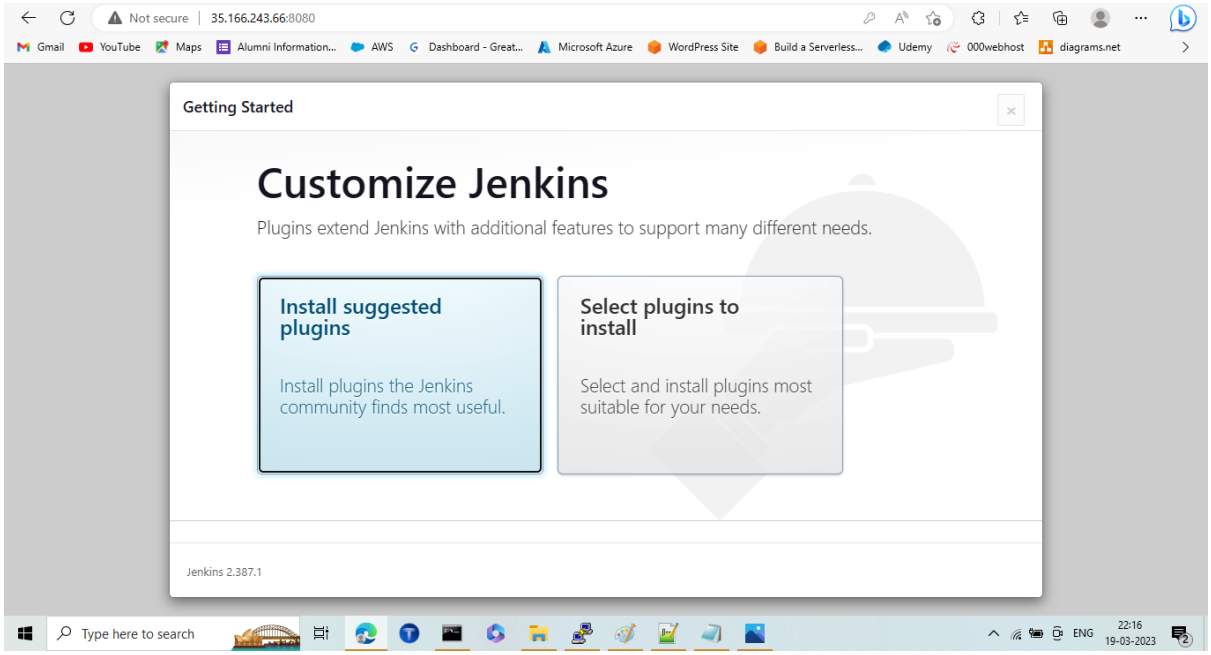
(a) Connect to http://<dns server name>:8080 from your favorite browser. You will be able to access Jenkins through its management interface:



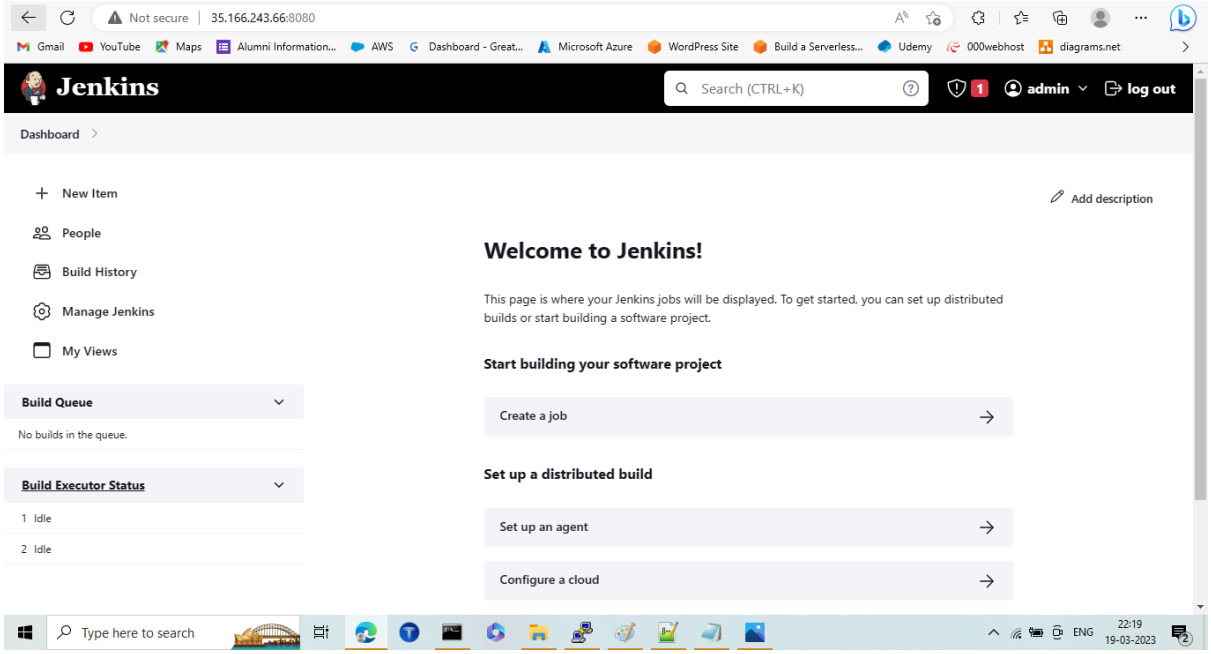
(b) Password can be found in /var/lib/jenkins/secrets/initialAdminPassword

```
[ec2-user@ip-172-31-24-102 ~]$ sudo cat /var/lib/jenkins/secrets/initialAdminPassword
f0977aff5f76485a9d2f50cffc134015
```

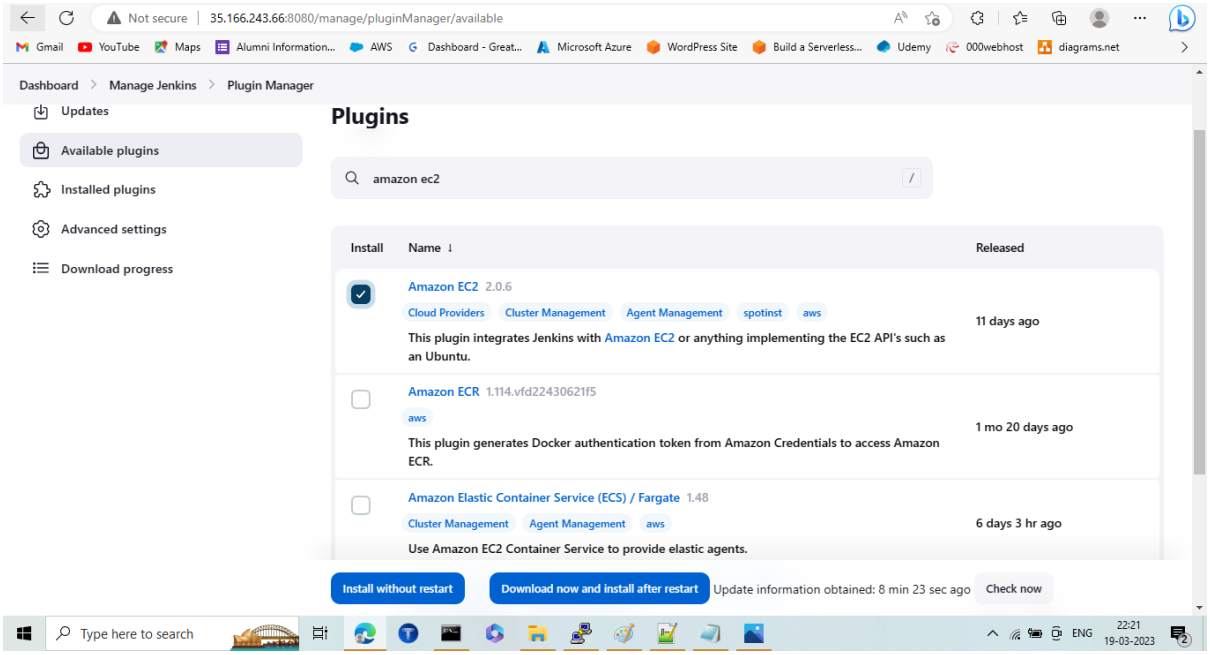
(c) After passing the password we can access Jenkins and then click on Install suggested plugins.



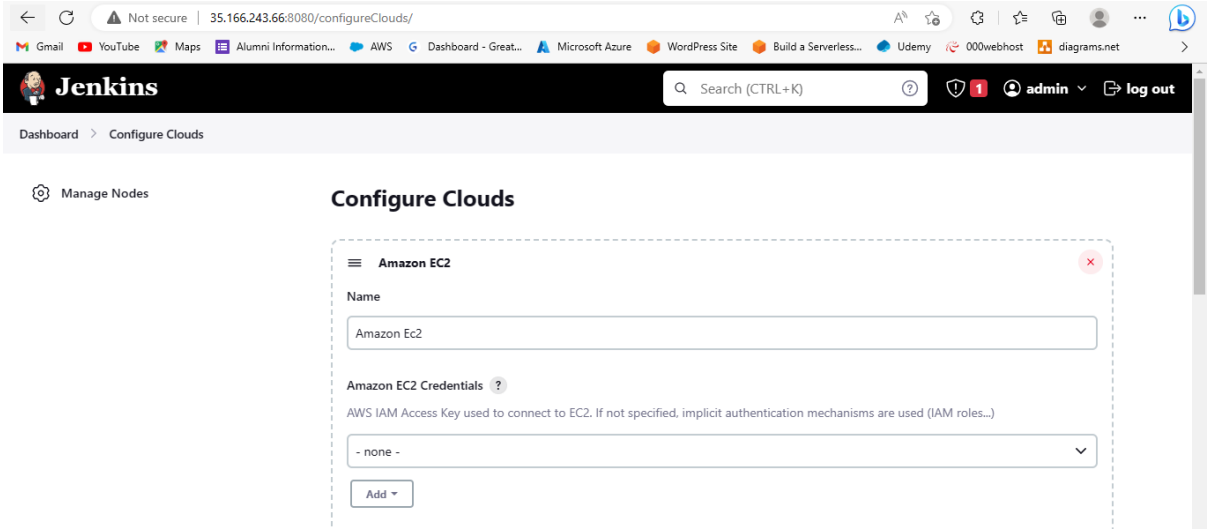
(d) On the left-hand side, click Manage Jenkins, and then click Manage Plugins



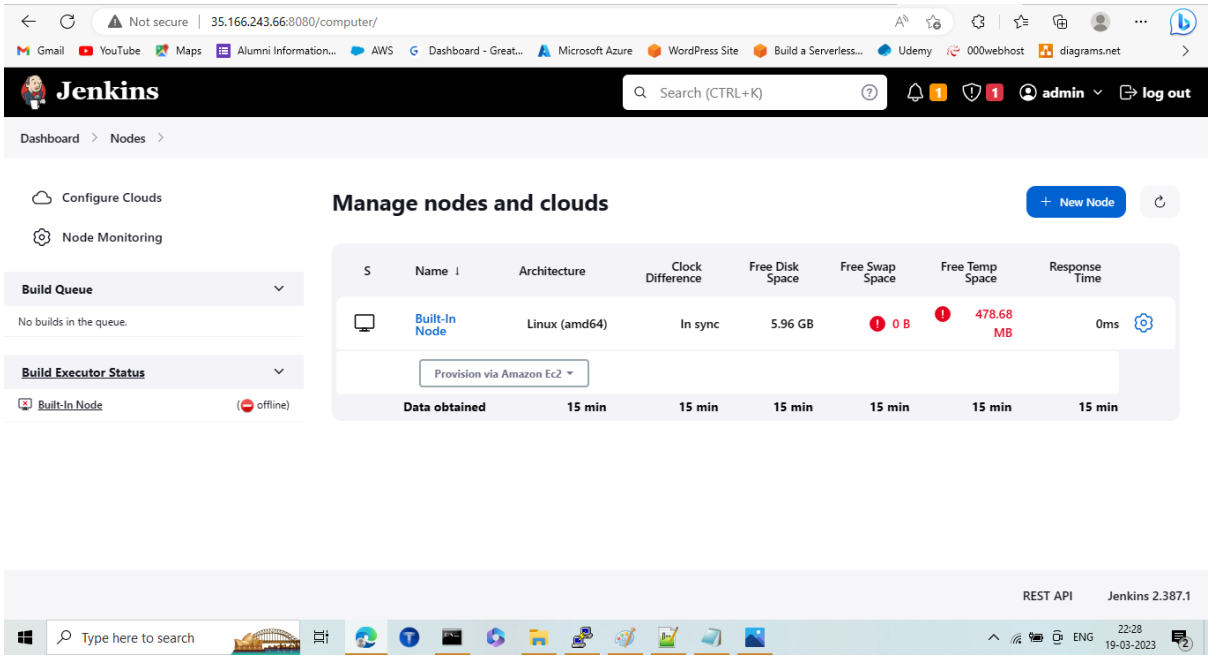
(e) Click on the Available tab, and then enter Amazon EC2 plugin at the top right and select the checkbox next to Amazon EC2 plugin, and then click Install without restart.



(f) Once the installation is done, click Go back to the top page and click on Manage Jenkins, and then Configure Clouds and add a new cloud, and select Amazon EC2.

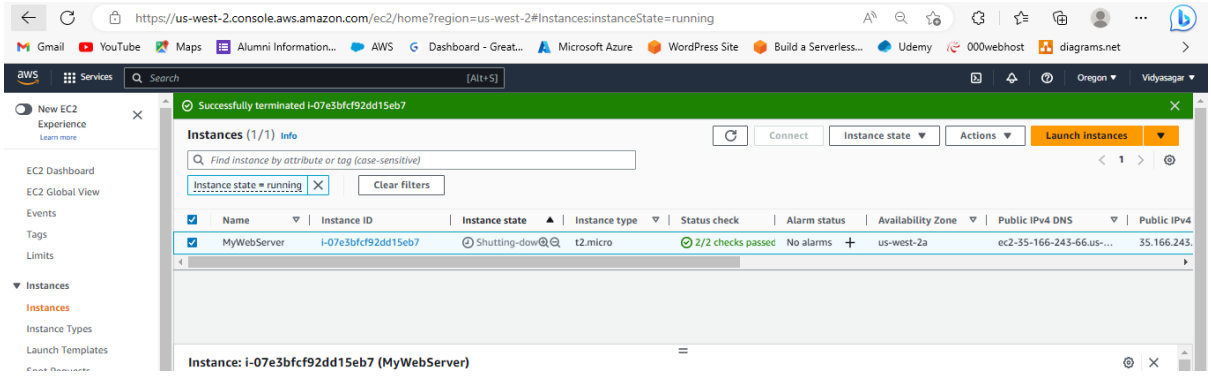


(g) Jenkins server is ready to use as shown below



Module 4: Terminate Resources

(a) All the resources were terminates successfully.



Cost Analysis

Region	Service	Upfront	Monthly	Year	Currency	Summary
US West Oregon	Amazon EC2	136.66	0	136.66	USD	Tenancy (Shared), Operating system (Linux), Instance name (t2.micro), Number of Instance (1)
Total		136.66	0	136.66	USD	

Lessons & Observations

1. Learnt to create an EC2 instance.
2. Learnt to install Jenkins server on an EC2 instance.