



**Subject-** CMPE 281 – Cloud Technologies

**Project 1** – FileStore

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## Technologies Used

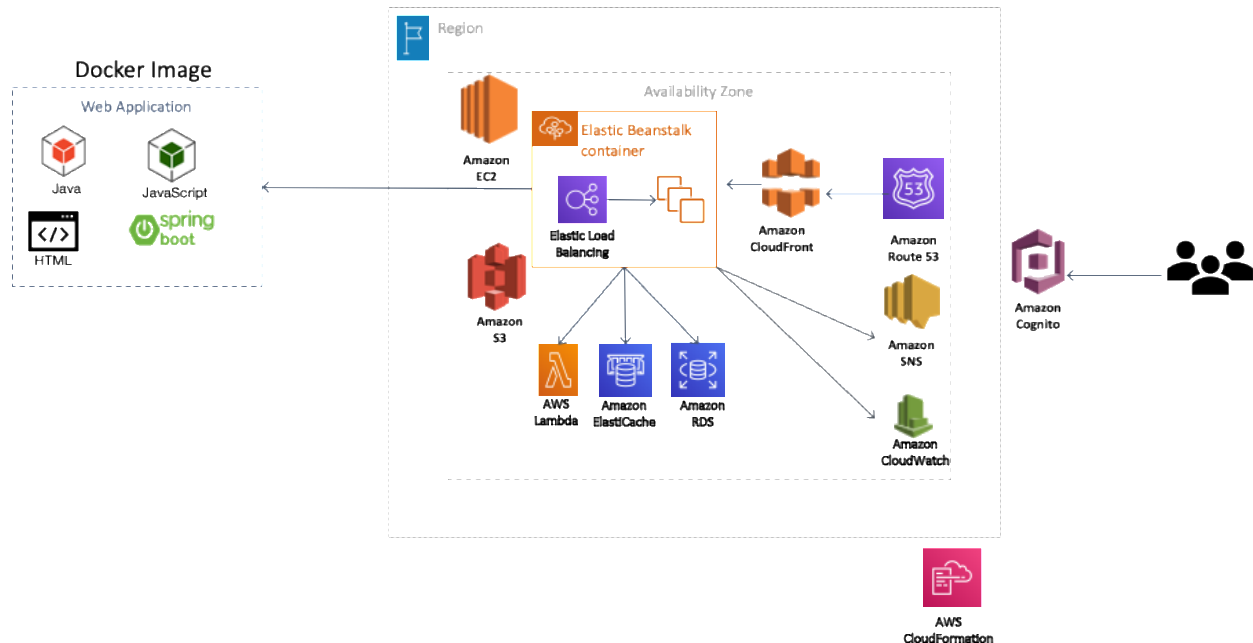
- Java 15, Gradle
- AWS account access
- Docker account
- AWS CLI and Docker CLI
- AWS Certificate Manager – generate certificate for domain proj1.parvathipai.com and associate with application load balancer in Beanstalk for SSL/TLS termination
- AWS Route 53 – hosted zone for parvathipai.com and ALIAS record for proj1.parvathipai.com
- AWS Cognito – user pool for users and admins logging into and registering to access the website and also for 1) validating security requirements including – password strength, standard attributes required for registration, account recovery and 2) registering an appclient for OAuth 2 authentication in Spring Security
- AWS RDS – for a micro free tier MySQL instance that hosts the database that the Spring application interacts with and records the logs of file uploads, etc.
- AWS S3 hosts a bucket that is partitioned by username to ensure users cannot access each other's uploads for modification or deletion
- AWS IAM configures users who can deploy the Spring application
- AWS EC2 Load Balancer is the SSL termination for requests and routes to 2 instances of the application via Beanstalk.
- AWS EC2 hosts the Spring application via a webserver listening on 80 (HTTP) and 443 (HTTPS) and connects the aforementioned services
- Spring application uses Spring Security, Spring-Starter-web, Thymeleaf, OAuth2, JPA etc. and is deployed via a Docker container in 3 environments – local development via IntelliJ IDEA, local deployment via beanstalk, and prod deployment via Beanstalk – with corresponding environment variables
- Spring application exposes a Thymeleaf page for uploading files and APIs for interacting with the application
- AWS VPC configures a bridge security group that connects to both the Beanstalk application and the RDS instance allowing only 3306 (MySQL) incoming traffic to go through.
- DataGrip to view AWS RDS

# GitHub

Link to GitHub - <https://github.com/ParvathiRPai/FileStore>

## Architecture

Displayed using for one **region** in the below diagram for simplicity but during deployment it's **made multiple regions**.



## Steps for deployment

### User Registration

- Register the account with amazon Cognito explanation video in one drive link - <https://1drv.ms/v/s!Atlj3hm1Xtus50PzYuEYQukg4M1>
- Enter the username, email and password and verify the email

## Filestore application

[Log in with Amazon Cognito](#)

Sign up with a new account

Username

testuser4

Given name

Family name

Email

name@host.com

Password

.....

✓ Password must contain a lower case letter

✓ Password must contain an upper case letter

✓ Password must contain a special character

✓ Password must contain a number

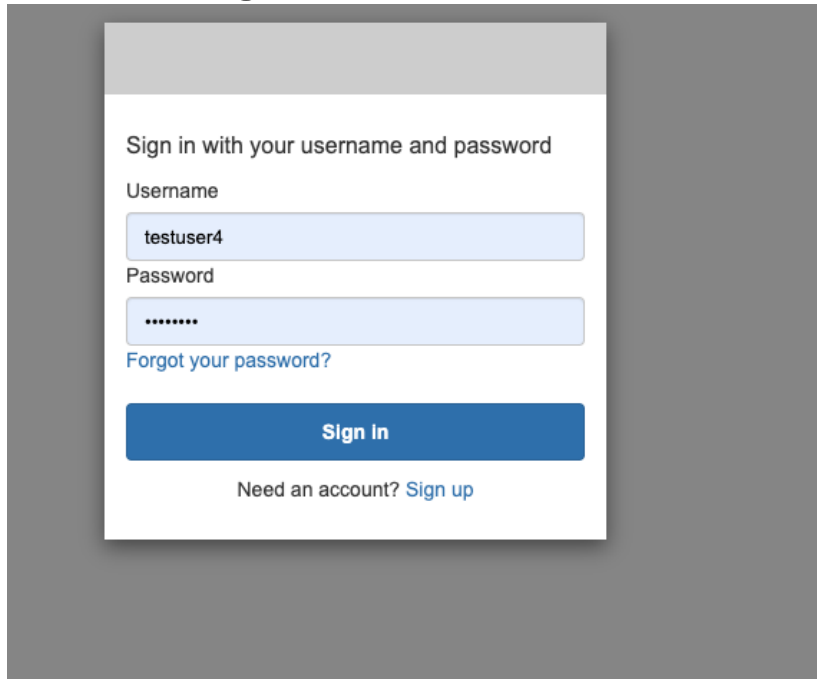
✓ Password must contain at least 8 characters

Sign up

Already have an account? [Sign in](#)

The user should enter the username and password created at the time of registration.

## Custom Login



Sign in with your username and password

Username

testuser4

Password

\*\*\*\*\*

[Forgot your password?](#)

**Sign In**

Need an account? [Sign up](#)

AWS Cognito verified the user details as shown below  
In the Test user pool, the user account will be created

**Users** > **a93e8edd-e529-4097-87d6-4c7cba3a3270**

[Add to group](#)

[Reset password](#)

[Enable SMS MFA](#)

[Disable user](#)

Groups -

**Account Status** Enabled / CONFIRMED

**SMS MFA Status** Disabled

**Last Modified** Oct 24, 2020 8:22:33 PM

**Created** Oct 24, 2020 8:22:21 PM

**sub** a93e8edd-e529-4097-87d6-4c7cba3a3270

**email\_verified** true

**email** parvathirpai@gmail.com

# File upload and download

One drive link showing the working of upload and download -

<https://1drv.ms/u/s!Atlj3hm1Xtus50Z42mOLSvlceJXK>

After login the user goes to the page to upload and download and delete the file –

## Filestore application

Hello, **testuser4**!

Your authorities are: **ROLE\_USER SCOPE\_openid**

This section is only visible only for **ROLE\_USER**.

This section is only visible only to authenticated users.

### Filestore application

Your user name is **testuser4** Your first name is **Test4** Your last name is **User** Your email is **testuser4@example.com**

File to upload:  No file chosen

# File Updates

One drive link showing file updates - <https://1drv.ms/v/s!Atlj3hm1Xtus50cAwC3ngc6alLKG>

File upload and delete and view in AWS RDS –

In this project I have made use of DataGrip software to analyze the Amazon RDS database

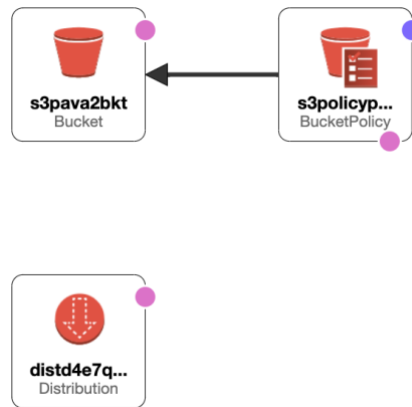
	id	description	email	first_name	last_modified_at	last_name	uploaded_at	user_name
1	1	Test Description	testuser4@example.com	Test4	2020-10-23 22:00:55	User	2020-10-23 22:00:55	testuser4
2	2	Test Description	testuser4@example.com	Test4	2020-10-23 23:10:02	User	2020-10-23 23:10:02	testuser4
3	3	Test Description	testuser4@example.com	Test4	2020-10-24 00:27:49	User	2020-10-24 00:27:49	testuser4
4	4	Test Description	testuser4@example.com	Test4	2020-10-24 00:59:13	User	2020-10-24 00:59:13	testuser4
5	5	Test Description	testuser4@example.com	Test4	2020-10-24 23:57:59	User	2020-10-24 23:57:59	testuser4
6	6	Test Description	testuser4@example.com	Test4	2020-10-25 00:01:50	User	2020-10-25 00:01:50	testuser4

## AWS resources

- I have made use of the same AWS resources as that of HW-2
- Made use of cloud formation template to create highly available, scalable solution with DR measures.
- The link to template is here - <https://github.com/ParvathiRPai/aws-cloud>
- Video explanation one drive link - <https://1drv.ms/v/s!Atlj3hm1Xtus50Tpstwi5E8DF7d3>
- Cloud formation bucket policy –

## CloudFront and Bucket Policy

Added cloud front to block the IP address of Cuba and downloading of the file is done via the cloud front. Only authorized users can access the AWS buckets and after 75 days the contents of AWS resources is added in AWS Glacier.



## AWS Lambda, Cloud Watch and AWS SNS

For this project I have created a trigger between AWS lambda and S3 when a file is deleted a lambda trigger is created and a log will be posted in the cloud watch and notification will be sent via AWS SNS.

One drive explanation link -

<https://1drv.ms/v/s!Atlj3hm1Xtus50WQ3eiZKejh-vRE>

## AWS Lambda

Gets triggered when file in S3 gets deleted



▼ Designer

test

Layers (0)

S3

+ Add trigger

+ Add destination

Function code [Info](#)

Deploy Actions ▼

File Edit Find View Go Tools Window Test Deploy

Environment

test - /

lambda\_function.py

1 import json

2

3 def lambda\_handler(event, context):

4 # TODO implement

5 print("deleted")

test

Throttle Qualifiers ▼ Actions ▼ test ▼ Test

test

Layers (0)

S3

+ Add trigger

+ Add destination

S3 (1)

Enable Disable Fix Delete

ⓘ The Lambda console no longer supports disabling S3 and CloudWatch Logs triggers. Delete these triggers to stop further actions.

Q

< 1 >

☐ Trigger

☐ S3: pava-hw (Enabled)

arn:aws:s3::pava-hw

► Details

## AWS CloudWatch

Logs get created when files in S3 gets deleted

9

CloudWatch > CloudWatch Logs > Log groups > /aws/lambda/test

Switch to the original interface.

### /aws/lambda/test

Actions View in Logs Insights Search log group

**Log group details**

Retention Never expire	Creation time 1 day ago	Stored bytes 3.74 KB	ARN arn:aws:logs-us-west-2:192075818472:log-group:/aws/lambda/test*
KMS key ID -	Metric filters 0	Subscription filters 0	Contributor insights rules -

Log streams Metric filters Subscription filters Contributor insights

**Log streams (7)**

Filter log streams or try prefix search

Log stream	Last event time
2020/10/25/[\$LATEST]c46c0bb2a7154217af0d0934403a916	2020-10-25T01:27:33.288Z
2020/10/24/[\$LATEST]fec28ad8ff64027a60c6b32685873a7	2020-10-25T00:01:56.863Z
2020/10/24/[\$LATEST]3f5f6fcbec14a24973118eff4657d71	2020-10-24T21:24:00.210Z
2020/10/24/[\$LATEST]ea6d3ca470342028ba9f46d2f60b3a	2020-10-24T00:59:20.158Z
2020/10/24/[\$LATEST]a8300d5cf09249b5a5b6e69000a26407	2020-10-24T00:27:55.624Z
2020/10/23/[\$LATEST]ab56a330d2ee42f5af5510d9542ee79	2020-10-23T23:10:05.648Z
2020/10/23/[\$LATEST]3299e7fdec2b40f499592ec2e9e1b472	2020-10-23T22:21:07.579Z

## Elastic Beanstalk

Uploaded the docker image generated through gradle on Elastic Beanstalk and the application is running in the EC2 instance

Elastic Beanstalk > Environments

### All environments

Filter results matching the display values

Environment name	Health	Application name	Date created	Last modified	URL	Running versions	Platform	Platform state	Tier name
testenv	Ok	filestore	2020-10-23 15:03:44 UTC-0700	2020-10-24 17:00:56 UTC-0700	testenv.eba-ia8vjdb.us-west-2.elasticbeanstalk.com	app-201024_165857	Docker running on 64bit Amazon Linux 2	Supported	WebServer

**testenv**  
testenv.eba-ia8vjdb.us-west-2.elasticbeanstalk.com (e-bsammjkbwh)  
Application name: filestore

Refresh Actions

**Health**

Ok

Causes

**Running version**

app-201024\_165857

Upload and deploy

**Platform**

docker

Docker running on 64bit Amazon Linux 2/3.2.0

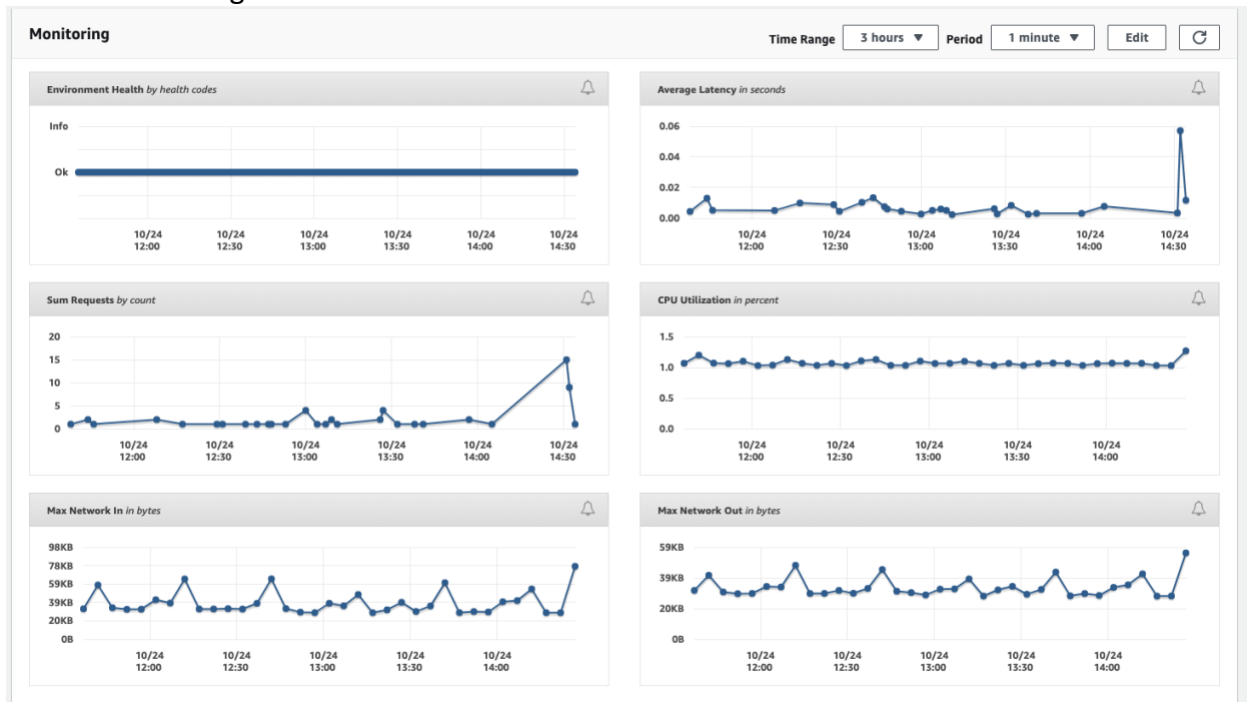
Change

**Recent events**

Show all

Time	Type	Details
2020-10-24 17:02:32 UTC-0700	INFO	Environment health has transitioned from Info to Ok. Application update completed 84 seconds ago and took 44 seconds.
2020-10-24 17:00:56 UTC-0700	INFO	Environment update completed successfully.
2020-10-24 17:00:56 UTC-0700	INFO	New application version was deployed to running EC2 instances.
2020-10-24 17:00:49 UTC-0700	INFO	Instance deployment completed successfully.
2020-10-24 17:00:32 UTC-0700	INFO	Environment health has transitioned from Ok to Info. Application update in progress on 1 Instance. 0 out of 1 instance completed (running for 18 seconds).

## Health Monitoring of elastic beanstalk -



## Deployment of EC2 through elastic beanstalk –

Time	Type	Details
2020-10-23 17:57:44 UTC-0700	INFO	Environment health has transitioned from Info to Ok. Application update completed 47 seconds ago and took 31 seconds.
2020-10-23 17:56:44 UTC-0700	INFO	Environment health has transitioned from Ok to Info. Application update in progress on 1 instance. 0 out of 1 instance completed (running for 28 seconds).
2020-10-23 17:56:41 UTC-0700	INFO	Environment update completed successfully.
2020-10-23 17:56:41 UTC-0700	INFO	New application version was deployed to running EC2 instances.
2020-10-23 17:56:37 UTC-0700	INFO	Instance deployment completed successfully.
2020-10-23 17:56:10 UTC-0700	INFO	Deploying new version to instance(s).
2020-10-23 17:56:06 UTC-0700	INFO	Environment update is starting.
2020-10-23 17:46:44 UTC-0700	INFO	Environment health has transitioned from Info to Ok. Application update completed 44 seconds ago and took 31 seconds.
2020-10-23 17:45:44 UTC-0700	INFO	Environment health has transitioned from Ok to Info. Application update in progress on 1 instance. 0 out of 1 instance completed (running for 25 seconds).
2020-10-23 17:45:28 UTC-0700	INFO	Environment update completed successfully.
2020-10-23 17:45:28 UTC-0700	INFO	New application version was deployed to running EC2 instances.
2020-10-23 17:45:22 UTC-0700	INFO	Instance deployment completed successfully.
2020-10-23 17:44:57 UTC-0700	INFO	Deploying new version to instance(s).
2020-10-23 17:44:52 UTC-0700	INFO	Environment update is starting.
2020-10-23 17:41:44 UTC-0700	INFO	Environment health has transitioned from Info to Ok. Application restart completed 50 seconds ago and took 7 seconds.
2020-10-23 17:40:44 UTC-0700	INFO	Environment health has transitioned from Ok to Info. Application restart in progress (running for 7 seconds).
2020-10-23 17:40:43 UTC-0700	INFO	Restarted application server on all ec2 instances.
2020-10-23 17:40:38 UTC-0700	INFO	Instance deployment completed successfully.
2020-10-23 17:40:36 UTC-0700	INFO	restartAppServer is starting.
2020-10-23 17:37:45 UTC-0700	INFO	Environment health has transitioned from Info to Ok. Configuration update completed 64 seconds ago and took 2 minutes.

# Route 53

Website hosted zone. My route - <https://proj1.parvathipai.com>

Route 53 > Hosted zones

Hosted zones [Info](#)

Hosted zones (1)

Automatic mode is the current search behavior optimized for best filter results. [To change modes go to settings.](#)

< 1 > ⌕

☐

Domain name

▼

Type

▼

Created by

▼

Record count

▼

Description

▼

Hosted zone ID

▼

☐

parvathipai.com

Public

Route 53

4

HostedZone created by Route53 Registrar

Z03543683PMF5BN2VRF4B

parvathipai.com [Info](#)

Delete

Test record

Configure query logging

► Hosted zone details

Edit

Records (4)

Hosted zone tags (0)

Records (4) [Info](#)

Automatic mode is the current search behavior optimized for best filter results. [To change modes go to settings.](#)

Type ▼ Routing policy ▼ Alias ▼

< 1 > ⌕

☐

Record name

▼

Type

▼

Routing policy

▼

Differentiator

▼

Alias

▼

Value/Route traffic to

▼

TTL (seconds)

▼

Health check

▼

Evaluate target health

▼

Record ID

▼

☐

parvathipai.com

NS

Simple

-

No

ns-1937.awsdns-50.co.uk.  
ns-608.awsdns-12.net.  
ns-1166.awsdns-17.org.  
ns-208.awsdns-26.com.

172800

-

-

-

☐

parvathipai.com

SOA

Simple

-

No

ns-1937.awsdns-50.co.uk.  
awsdns-hostmaster.amazon.com. 1  
7200 900 1209600 86400

900

-

-

-

☐

proj1.parvathipai.com

A

Simple

-

Yes

testenv.eba-la8vjdb.us-west-2.elasticbeanstalk.com.

-

-

Yes

-

☐

\_0a269bd0eced82ebc85dd762f1be54ac.proj1.parvathipai.com

CNAME

Simple

-

No

\_062f83c90f6aff1983d1b5421e4a1dcb.zbkrxrfvj.acm-validations.aws.

300

-

-

-

# RDS

## SQL database

RDS > Databases > testdbinstance3

testdbinstance3

Modify

Actions

Summary

DB identifier

testdbinstance3

CPU

1.86%

Info

Available

Class

db.t2.micro

Role

Instance

Current activity

11 Connections

Engine

MySQL Community

Region & AZ

us-west-2c

Connectivity & security

Monitoring

Logs & events

Configuration

Maintenance & backups

Tags

Connectivity & security

Endpoint & port

Endpoint

testdbinstance3.cb0tzhehmaym.us-west-2.rds.amazonaws.com

Port

3306

Networking

Availability zone

us-west-2c

VPC

vpc-8b7c1df3

Subnet group

default-vpc-8b7c1df3

Subnets

subnet-b6f13ceb

subnet-fdc98cd6

subnet-30a95b48

subnet-169e825d

Security

VPC security groups

beanstalk-rds-bridge (sg-0fb7a362fd1c327cc)

( active )

launch-wizard-1 (sg-0ddff0e3c5027baf94)

( active )

Public accessibility

Yes

Certificate authority

rds-ca-2019

Certificate authority date

Aug 22nd, 2024

### View in DataGrip

<Filter Criteria>

id	description	email	first_name	last_modified_at	last_name	uploaded_at	user_name
1	Test Description	testuser4@example.com	Test4	2020-10-23 22:00:55	User	2020-10-23 22:00:55	testuser4
2	Test Description	testuser4@example.com	Test4	2020-10-23 23:10:02	User	2020-10-23 23:10:02	testuser4
3	Test Description	testuser4@example.com	Test4	2020-10-24 00:27:49	User	2020-10-24 00:27:49	testuser4
4	Test Description	testuser4@example.com	Test4	2020-10-24 00:59:13	User	2020-10-24 00:59:13	testuser4
5	Test Description	testuser4@example.com	Test4	2020-10-24 23:57:59	User	2020-10-24 23:57:59	testuser4
6	Test Description	testuser4@example.com	Test4	2020-10-25 00:01:50	User	2020-10-25 00:01:50	testuser4

# EC2 instances

EC2 > Instances > i-0f94778b3d0520123

**Instance summary for i-0f94778b3d0520123 (testenv)** Info  
Updated less than a minute ago

**Instance ID**  
i-0f94778b3d0520123 (testenv)

**Instance state**  
Running

**Instance type**  
t2.micro

**IAM Role**  
aws-elasticbeanstalk-ec2-role

**Public IPv4 address**  
18.237.216.154 | [open address](#)

**Public IPv4 DNS**  
ec2-18-237-216-154.us-west-2.compute.amazonaws.com | [open address](#)

**Elastic IP addresses**  
-

**Subnet ID**  
subnet-b6f13ceb

**Private IPv4 addresses**  
172.31.15.151

**Private IPv4 DNS**  
ip-172-31-15-151.us-west-2.compute.internal

**VPC ID**  
vpc-8b7c1df3

**AWS Compute Optimizer**  
Opt-in to AWS Compute Optimizer for recommendations. [Learn more](#)**Details** | Security | Networking | Storage | Monitoring | Tags**Instance details** Info

**Platform**  
Linux/UNIX

**Platform details**  
Linux/UNIX

**Launch time**  
Fri Oct 23 2020 15:30:14 GMT-0700 (Pacific Daylight Time) (1 day)

**Stop-hibernate behavior**  
disabled

**AMI ID**  
ami-05a1bbda6ce073d6

**AMI name**  
aws-elasticbeanstalk-amzn-2.0.20200928.64bit-eb\_docker\_amazon\_linux\_2-hvm-2020-10-02T11-20

**AMI location**  
amazon/aws-elasticbeanstalk-amzn-2.0.20200928.64bit-eb\_docker\_amazon\_linux\_2-hvm-2020-10-02T11-20

**AMI Launch index**  
0

**Monitoring**  
disabled

**Termination protection**  
Disabled

**Lifecycle**  
normal

**Key pair name**  
-

# Load balancer

**Create Load Balancer** | **Actions**

< 1 to 1 of 1 >

Name	DNS name	State	VPC ID	Availability Zones	Type	Created At	Monitoring
awseb-e-b-AWSEBLoa-PW...	awseb-e-b-AWSEBLoa-PW...		vpc-8b7c1df3	us-west-2c, us-west-2b...	classic	October 23, 2020 at 3:04:04 ...	

**Load balancer:** awseb-e-b-AWSEBLoa-PWDGIG080PCX

**Description** | Instances | Health check | Listeners | Monitoring | Tags | Migration

**Basic Configuration**

**Name**  
awseb-e-b-AWSEBLoa-PWDGIG080PCX

**\* DNS name**  
awseb-e-b-AWSEBLoa-PWDGIG080PCX-1364866426.us-west-2.elb.amazonaws.com (A Record)

**Type**  
Classic ([Migrate Now](#))

**Scheme**  
Internet-facing

**Availability Zones**  
subnet-169e825d - us-west-2b,  
subnet-30a95b48 - us-west-2a,  
subnet-b6f13ceb - us-west-2c

**Creation time**  
October 23, 2020 at 3:04:04 PM UTC-7

**Hosted zone**  
Z1H1FL5HABSF5

**Status**  
1 of 1 instances in service

**VPC**  
vpc-8b7c1df3

# Auto Scaling groups

EC2 > Auto Scaling groups > awseb-e-bsammjkbwh-stack-AWSEBAutoScalingGroup-10G1GEHFLEAV5

Details | Activity | Automatic scaling | Instance management | Monitoring | Instance refresh

### Group details

Desired capacity	1	Auto Scaling group name	awseb-e-bsammjkbwh-stack-AWSEBAutoScalingGroup-10G1GEHFLEAV5
Minimum capacity	1	Date created	Fri Oct 23 2020 15:04:19 GMT-0700 (Pacific Daylight Time)
Maximum capacity	4	Amazon Resource Name (ARN)	arn:aws:autoscaling:us-west-2:192075818472:autoScalingGroup:3379fb24-a1c4-4a20-9892-9e35efb42aca:autoScalingGroupName/awseb-e-bsammjkbwh-stack-AWSEBAutoScalingGroup-10G1GEHFLEAV5

### Launch configuration

Launch configuration	awseb-e-bsammjkbwh-stack-AWSEBAutoScalingLaunchConfiguration-W4MD1GAWAD06	AMI ID	ami-05a1bbdab6ce073d6	Security groups	awseb-e-bsammjkbwh-stack-AWSEBSecurityGroup-AHJ3HCGTVUSV <a href="#">beanstalk-rds-bridge</a>
Instance type	t2.micro	Key pair name	-	Create time	Fri Oct 23 2020 15:29:45 GMT-0700 (Pacific Daylight Time)
Storage (volumes)	-				

[View details in the launch configuration console](#)

# Cognito

## App client settings

### What identity providers and OAuth 2.0 settings should be used for your app clients?

Each of your app clients can use different identity providers and OAuth 2.0 settings. You must enable at least one identity provider for each app client. [Learn more about identity providers.](#)

#### App client testappclient1

ID 51an9opmenne1oha1vufu142dk

**Enabled Identity Providers** ☒ Select all

☒ Cognito User Pool

**Sign in and sign out URLs**

Enter your callback URLs below that you will include in your sign in and sign out requests. Each field can contain multiple URLs by entering a comma after each URL.

**Callback URL(s)**

<http://localhost:8080/login/oauth2/code/cognito>, <https://proj1.parvathipai.com/login/oauth2/code/cognito>

**Sign out URL(s)**

<http://localhost:8080/logout>, <https://proj1.parvathipai.com/logout>

**OAuth 2.0**

Select the OAuth flows and scopes enabled for this app. [Learn more about flows and scopes.](#)

**Allowed OAuth Flows**

☒ Authorization code grant ☐ Implicit grant ☐ Client credentials

**Allowed OAuth Scopes**

☐ phone ☒ email ☒ openid ☐ aws.cognito.signin.user.admin ☐ profile

**Hosted UI**

The hosted UI provides an OAuth 2.0 authorization server with built-in webpages that can be used to sign up and sign in users using the domain you created. [Learn more about the hosted UI](#)

[Launch Hosted UI](#)

## References

- <https://spring.io/guides>
- AWS documentation
- AWS java SDK