Homework #1 Web Application

Serverless Seekers

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This document provides a comprehensive guide on setting up, deploying, and cleaning up an AWS-based web application that utilizes AWS Directory Service for authentication and role-based access control. The application was deployed using AWS Elastic Beanstalk and integrated with AWS AD for secure authentication and authorization.

Setup Details

1. AWS Directory Service Setup

- Signed up for AWS Directory Service Free Trial.
- Created an AWS Managed Microsoft AD instance in a specified VPC.
- Configured users and groups to manage role-based access.
- Enabled security groups to allow LDAP/LDAPS traffic.

2. Elastic Beanstalk Deployment

- Created an Elastic Beanstalk application for hosting the web app.
- Configured the environment to use a custom VPC and subnets.
- Set environment variables for LDAP authentication.
- Ensured security group settings allowed communication with AWS Directory Service.

Implementation

1. Authentication Setup (LDAP)

Code Snippet:

```
const LDAP_OPTIONS = {
  server: {
    url: process.env.LDAP_URL || 'ldap://your-directory.example.com:389',
```

bindDN: process.env.LDAP_BIND_DN || 'CN=readonly,OU=Users,DC=example,DC=com',

bindCredentials: process.env.LDAP_BIND_PASSWORD || 'password',

searchBase: 'OU=Users,DC=example,DC=com',

searchFilter: '(sAMAccountName={{username}})'

}

};

2. Role-Based Access Control

Middleware to Check User Roles:

function checkRole(requiredGroup) {

return (req, res, next) => {

const groups = Array.isArray(req.user.memberOf) ? req.user.memberOf : [req.user.memberOf];

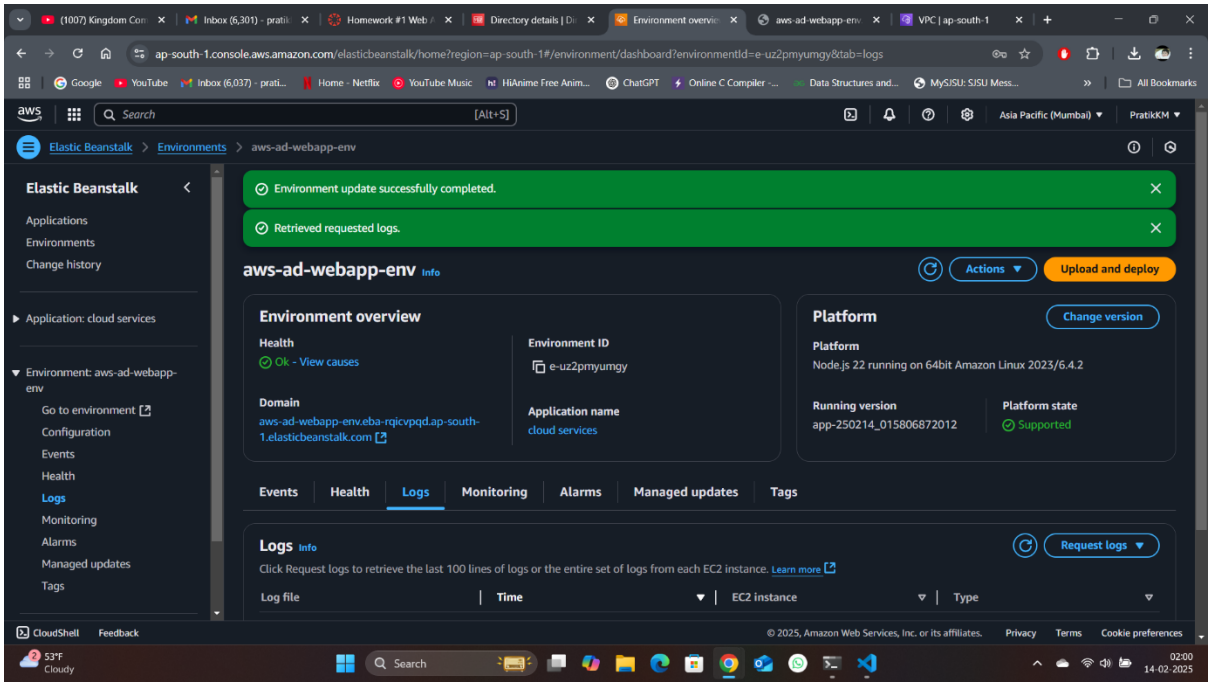
const hasRole = groups.some(group => group.includes(requiredGroup));

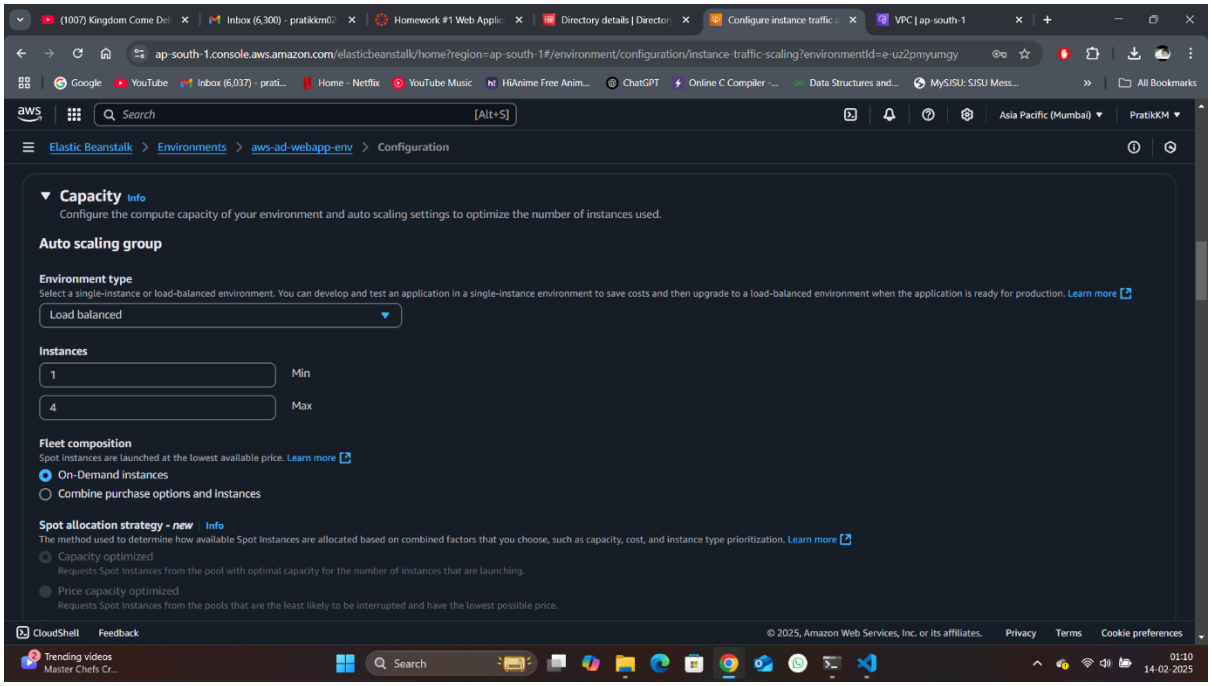
hasRole ? next() : res.status(403).send('Access Denied');

};

}

3. Screenshots




Elastic Beanstalk > Environments > aws-ad-webapp-env > Configuration
Capacity Info
Configure the compute capacity of your environment and auto scaling settings to optimize the number of instances used.
Auto scaling group
Environment type
Select a single-instance or load-balanced environment. You can develop and test an application in a single-instance environment to save costs and then upgrade to a load-balanced environment when the application is ready for production. Learn more
Load balanced
Instances
1
Min
4
Max
Fleet composition
Spot instances are launched at the lowest available price. Learn more
On-Demand instances
Combine purchase options and instances
Spot allocation strategy - new Info
The method used to determine how available Spot Instances are allocated based on combined factors that you choose, such as capacity, cost, and instance type prioritization. Learn more
Capacity optimized
Requests Spot Instances from the pool with optimal capacity for the number of instances that are launching.
Price capacity optimized
Requests Spot Instances from the pools that are the least likely to be interrupted and have the lowest possible price.
CloudShell
Feedback
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Terms
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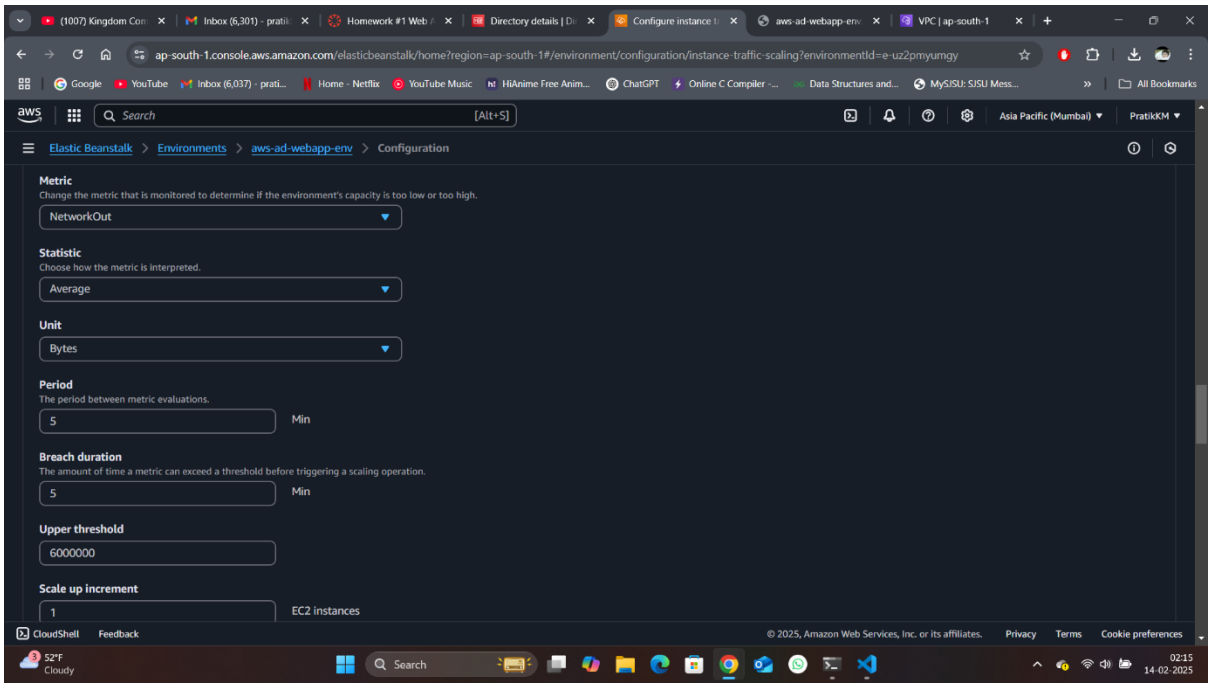
Elastic Beanstalk > Environments > aws-ad-webapp-env > Configuration
Metric
Change the metric that is monitored to determine if the environment's capacity is too low or too high.
NetworkOut
Statistic
Choose how the metric is interpreted.
Average
Unit
Bytes
Period
The period between metric evaluations.
5
Min
Breach duration
The amount of time a metric can exceed a threshold before triggering a scaling operation.
5
Min
Upper threshold
6000000
Scale up increment
1
EC2 instances
CloudShell
Feedback
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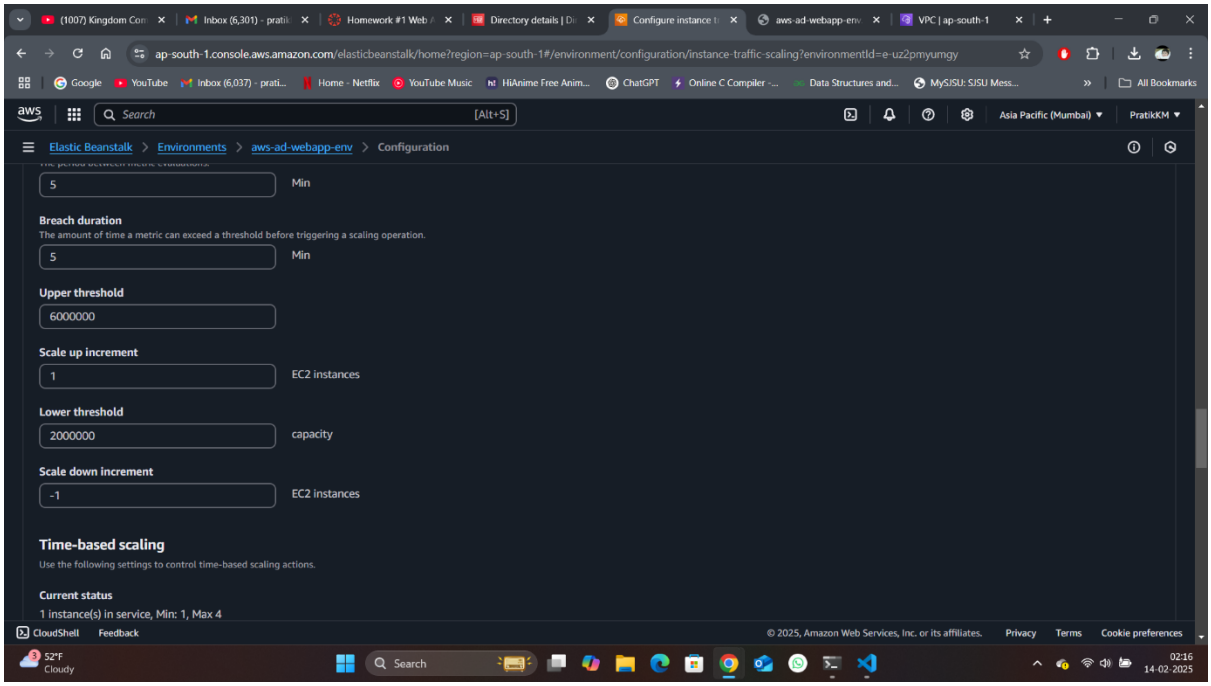
Terms
Cookie preferences


ap-south-1.console.aws.amazon.com/elasticbeanstalk/home?region=ap-south-1#/environment/configuration/instance-traffic-scaling?environmentId=e-uz2pmyumgy
Elastic Beanstalk > Environments > aws-ad-webapp-env > Configuration
5
Min
Breach duration
The amount of time a metric can exceed a threshold before triggering a scaling operation.
5
Min
Upper threshold
6000000
Scale up increment
1
EC2 instances
Lower threshold
2000000
capacity
Scale down increment
-1
EC2 instances
Time-based scaling
Use the following settings to control time-based scaling actions.
Current status
1 instance(s) in service, Min: 1, Max 4
CloudShell
Feedback
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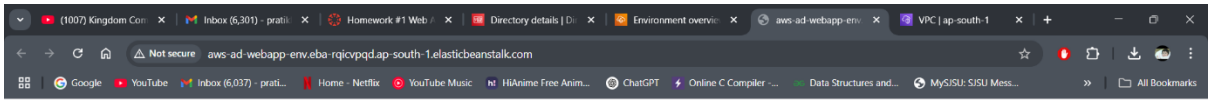
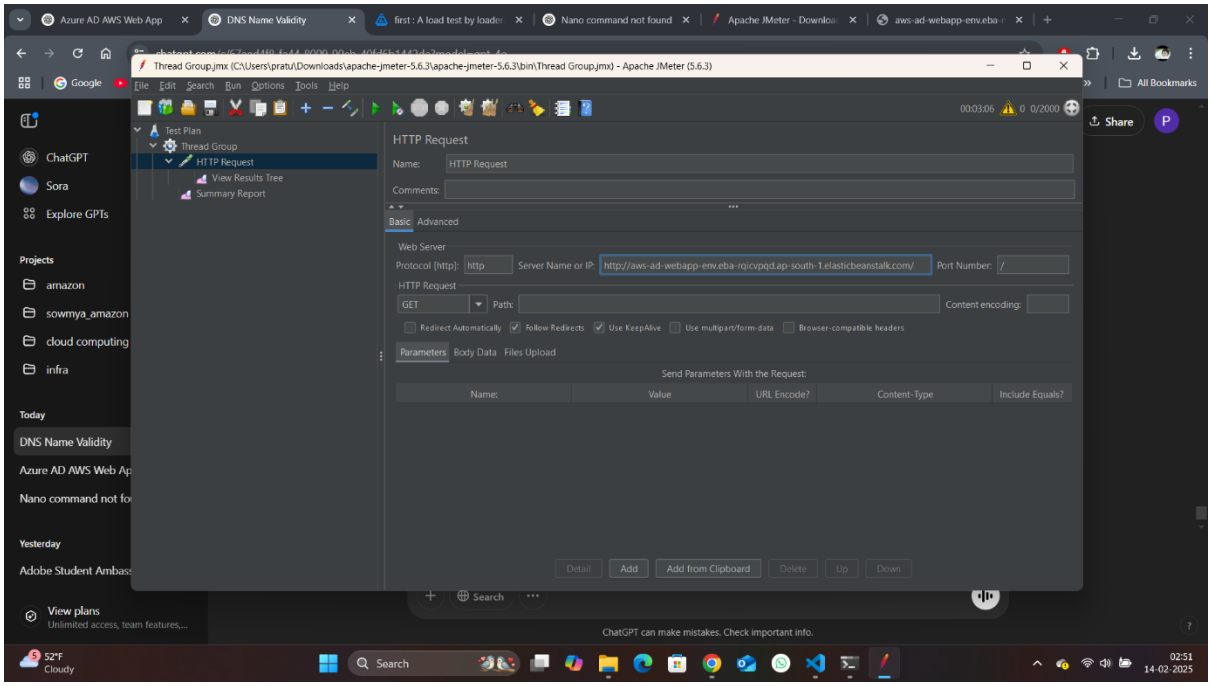
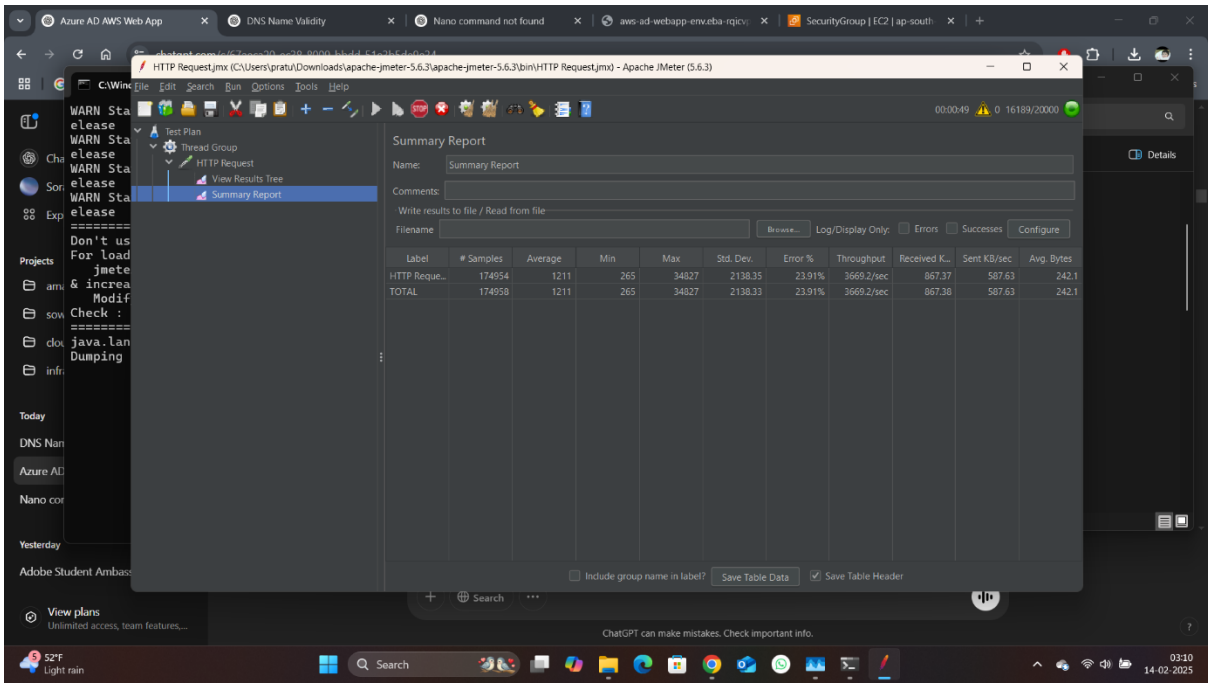
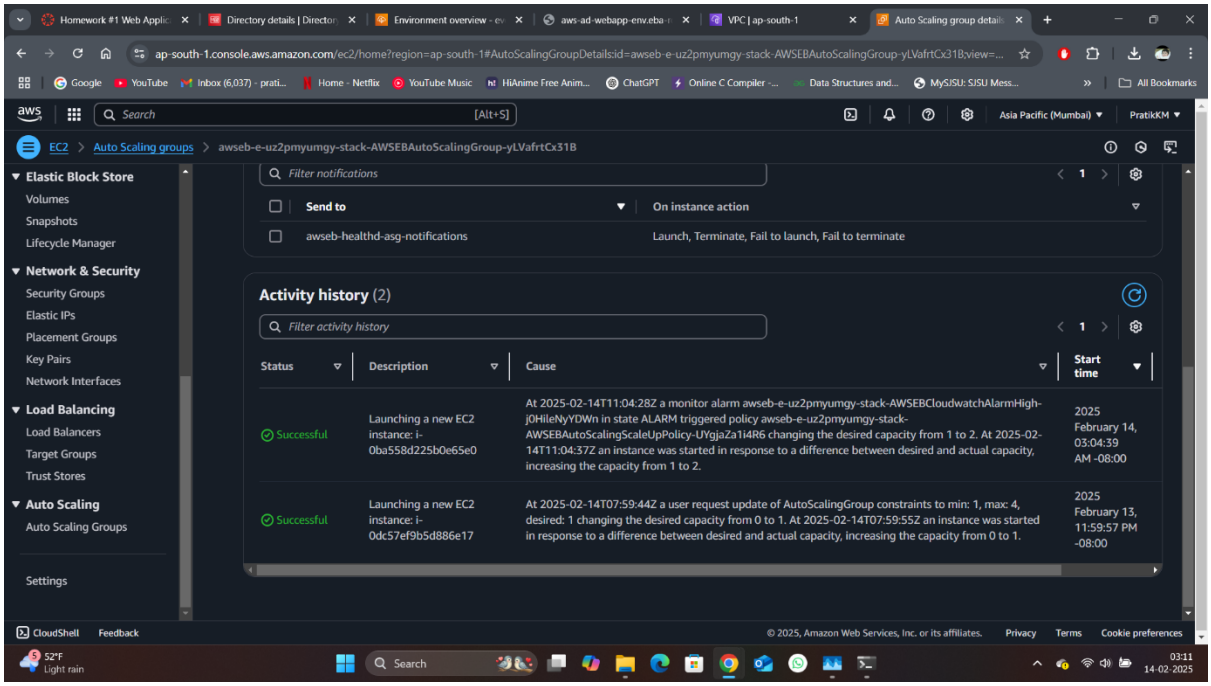
Terms
Cookie preferences


Not secure
aws-ad-webapp-env.eba-rqicvpqd.ap-south-1.elasticbeanstalk.com

Hello World!


Thread Group.jmx (C:\Users\pratu\Downloads\apache-jmeter-5.6.3\apache-jmeter-5.6.3\bin\Thread Group.jmx) - Apache JMeter (5.6.3)
Test Plan
Thread Group
HTTP Request
View Results Tree
Summary Report
HTTP Request
Name: HTTP Request
Comments:
Basic Advanced
Web Server
Protocol [http]: http
Server Name or IP: http://aws-ad-webapp-env.eba-rqicvpqd.ap-south-1.elasticbeanstalk.com/
Port Number: /
HTTP Request
GET
Path:
Content encoding:
Redirect Automatically
Follow Redirects
Use KeepAlive
Use multipart/form-data
Browser-compatible headers
Parameters
Body Data
Files Upload
Send Parameters With the Request:
Name:
Value
URL Encode?
Content-Type
Include Equals?
Detail
Add
Add from Clipboard
Delete
Up
Down
Search
ChatGPT can make mistakes. Check important info.
52°F
Cloudy
Search
02:51
14-02-2025


HTTP Request.jmx (C:\Users\pratu\Downloads\apache-jmeter-5.6.3\apache-jmeter-5.6.3\bin\HTTP Request.jmx) - Apache JMeter (5.6.3)
Test Plan
Thread Group
HTTP Request
View Results Tree
Summary Report
Summary Report
Name: Summary Report
Comments:
Write results to file / Read from file
Filename
Browse...
Log/Display Only:
Errors
Successes
Configure
Label
Samples
Average
Min
Max
Std. Dev.
Error %
Throughput
Received K...
Sent KB/sec
Avg. Bytes
HTTP Reque...
174954
1211
265
34827
2138.35
23.91%
3669.2/sec
867.37
587.63
242.1
TOTAL
174958
1211
265
34827
2138.33
23.91%
3669.2/sec
867.38
587.63
242.1
Include group name in label?
Save Table Data
Save Table Header
Search
ChatGPT can make mistakes. Check important info.
52°F
Light rain
Search
03:10
14-02-2025


Auto Scaling group details
ap-south-1.console.aws.amazon.com/ec2/home?region=ap-south-1#AutoScalingGroupDetails:id=awseb-e-uz2pmyumgy-stack-AWSEBAutoScalingGroup-yLVafrtCx31B;view=...
Search [Alt+S]
Asia Pacific (Mumbai)
PratikKM
EC2 > Auto Scaling groups > awseb-e-uz2pmyumgy-stack-AWSEBAutoScalingGroup-yLVafrtCx31B
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
Trust Stores
Auto Scaling
Auto Scaling Groups
Settings
Filter notifications
Send to
On instance action
awseb-healthd-asg-notifications
Launch, Terminate, Fail to launch, Fail to terminate
Activity history (2)
Filter activity history
Status
Description
Cause
Start time
Successful
Launching a new EC2 instance: i-0ba558d225b0e65e0
At 2025-02-14T11:04:28Z a monitor alarm awseb-e-uz2pmyumgy-stack-AWSEBCloudwatchAlarmHigh-j0HileNyYDWn in state ALARM triggered policy awseb-e-uz2pmyumgy-stack-AWSEBAutoScalingScaleUpPolicy-UYgjaZa1i4R6 changing the desired capacity from 1 to 2. At 2025-02-14T11:04:37Z an instance was started in response to a difference between desired and actual capacity, increasing the capacity from 1 to 2.
2025 February 14, 03:04:39 AM -08:00
Successful
Launching a new EC2 instance: i-0dc57ef9b5d886e17
At 2025-02-14T07:59:44Z a user request update of AutoScalingGroup constraints to min: 1, max: 4, desired: 1 changing the desired capacity from 0 to 1. At 2025-02-14T07:59:55Z an instance was started in response to a difference between desired and actual capacity, increasing the capacity from 0 to 1.
2025 February 13, 11:59:57 PM -08:00
CloudShell
Feedback
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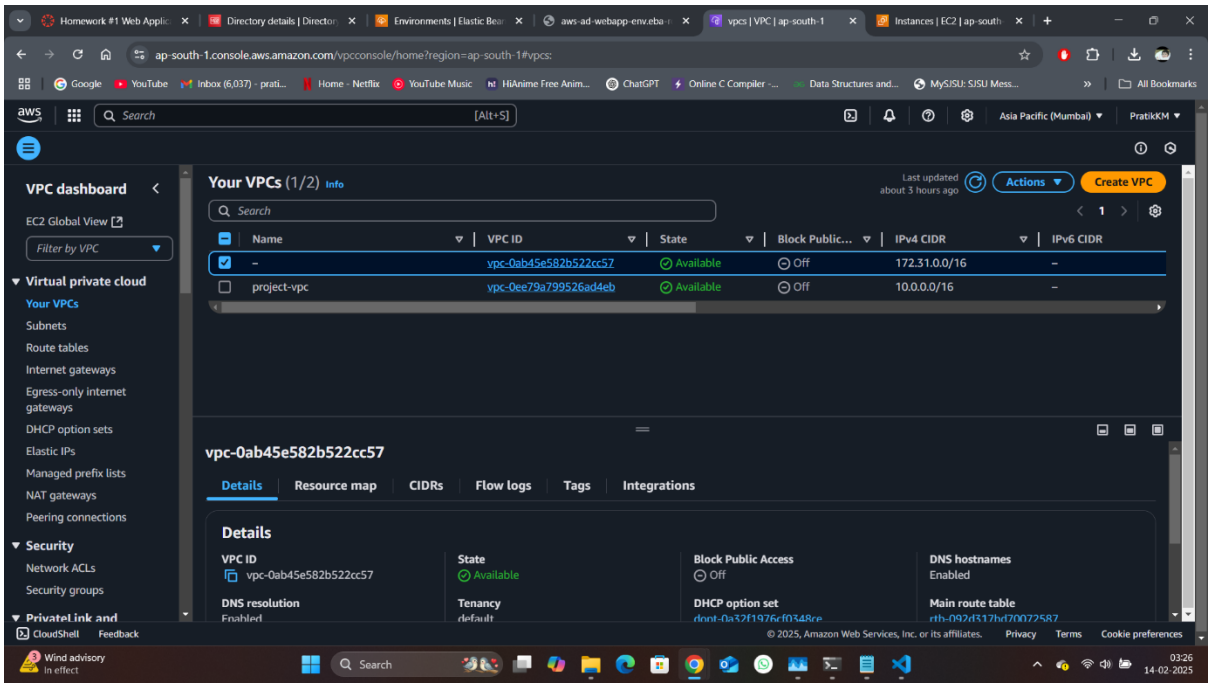
Cookie preferences
52°F Light rain
03:11 14-02-2025


vpcs | VPC | ap-south-1
ap-south-1.console.aws.amazon.com/vpcconsole/home?region=ap-south-1#vpcs:
Search [Alt+S]
Asia Pacific (Mumbai)
PratikKM
VPC dashboard
EC2 Global View
Filter by VPC
Virtual private cloud
Your VPCs
Subnets
Route tables
Internet gateways
Egress-only internet gateways
DHCP option sets
Elastic IPs
Managed prefix lists
NAT gateways
Peering connections
Security
Network ACLs
Security groups
Your VPCs (1/2) Info
Last updated about 3 hours ago
Actions
Create VPC
Search
Name
VPC ID
State
Block Public...
IPv4 CIDR
IPv6 CIDR
–
vpc-0ab45e582b522cc57
Available
Off
172.31.0.0/16
project-vpc
vpc-0ee79a799526ad4eb
Available
Off
10.0.0.0/16
vpc-0ab45e582b522cc57
Details
Resource map
CIDRs
Flow logs
Tags
Integrations
Details
VPC ID
vpc-0ab45e582b522cc57
State
Available
Block Public Access
Off
DNS hostnames
Enabled
DNS resolution
Enabled
Tenancy
default
DHCP option set
Main route table
CloudShell
Feedback
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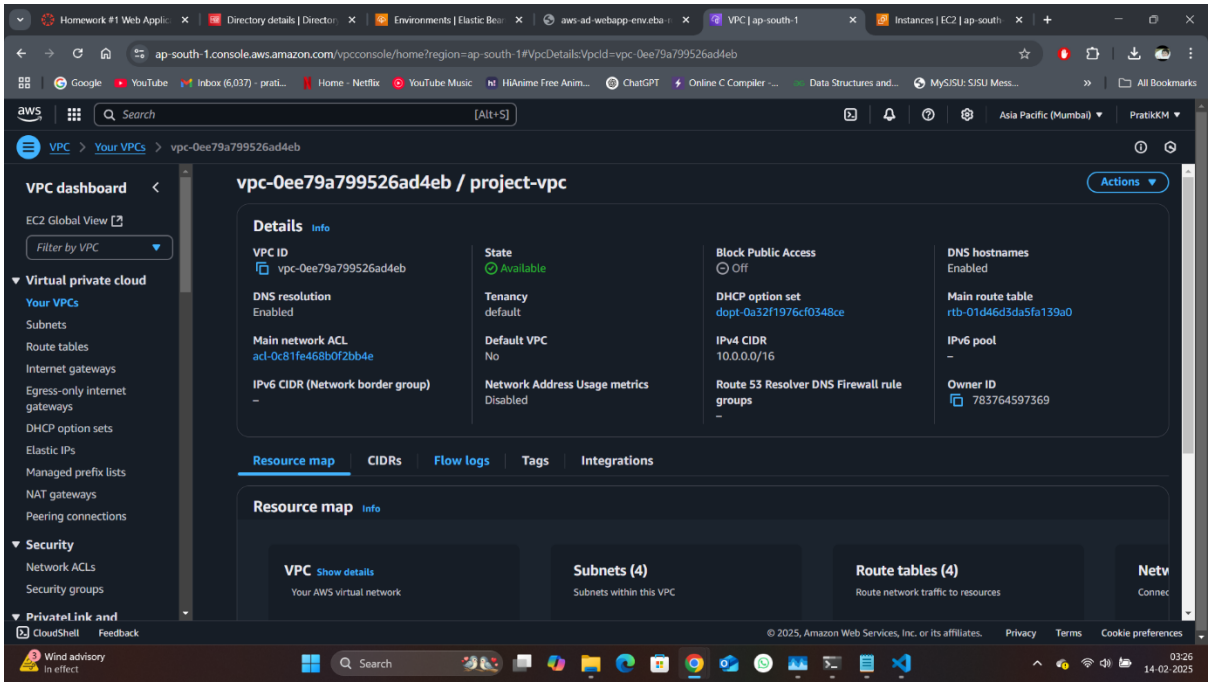
Cookie preferences
Wind advisory In effect
03:26 14-02-2025


ap-south-1.console.aws.amazon.com/vpcconsole/home?region=ap-south-1#VpcDetails:VpcId=vpc-0ee79a799526ad4eb
VPC dashboard
EC2 Global View
Filter by VPC
Virtual private cloud
Your VPCs
Subnets
Route tables
Internet gateways
Egress-only internet gateways
DHCP option sets
Elastic IPs
Managed prefix lists
NAT gateways
Peering connections
Security
Network ACLs
Security groups
vpc-0ee79a799526ad4eb / project-vpc
Actions
Details Info
VPC ID
vpc-0ee79a799526ad4eb
State
Available
Block Public Access
Off
DNS hostnames
Enabled
DNS resolution
Enabled
Tenancy
default
DHCP option set
dopt-0a32f1976cf0348ce
Main route table
rtb-01d46d3da5fa139a0
Main network ACL
acl-0c81fe468b0f2bb4e
Default VPC
No
IPv4 CIDR
10.0.0.0/16
IPv6 pool
–
IPv6 CIDR (Network border group)
–
Network Address Usage metrics
Disabled
Route 53 Resolver DNS Firewall rule groups
–
Owner ID
783764597369
Resource map
CIDRs
Flow logs
Tags
Integrations
Resource map Info
VPC Show details
Your AWS virtual network
Subnets (4)
Subnets within this VPC
Route tables (4)
Route network traffic to resources
CloudShell
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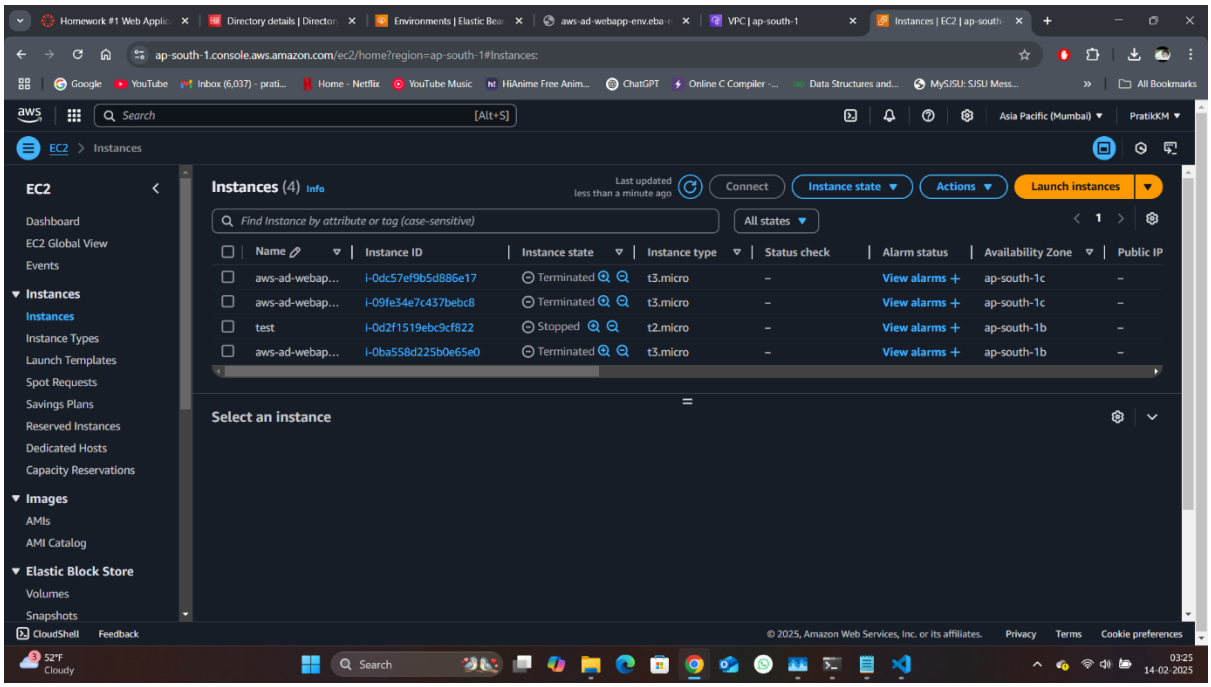
ap-south-1.console.aws.amazon.com/ec2/home?region=ap-south-1#Instances:
EC2
Dashboard
EC2 Global View
Events
Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Capacity Reservations
Images
AMIs
AMI Catalog
Elastic Block Store
Volumes
Snapshots
Instances (4) Info
Last updated less than a minute ago
Connect
Instance state
Actions
Launch instances
Find Instance by attribute or tag (case-sensitive)
All states
Name
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Zone
Public IP
aws-ad-webap...
i-0dc57ef9b5d886e17
Terminated
t3.micro
View alarms
ap-south-1c
aws-ad-webap...
i-09fe34e7c437bebc8
Terminated
t3.micro
View alarms
ap-south-1c
test
i-0d2f1519ebc9cf822
Stopped
t2.micro
View alarms
ap-south-1b
aws-ad-webap...
i-0ba558d225b0e65e0
Terminated
t3.micro
View alarms
ap-south-1b
Select an instance
CloudShell
Feedback
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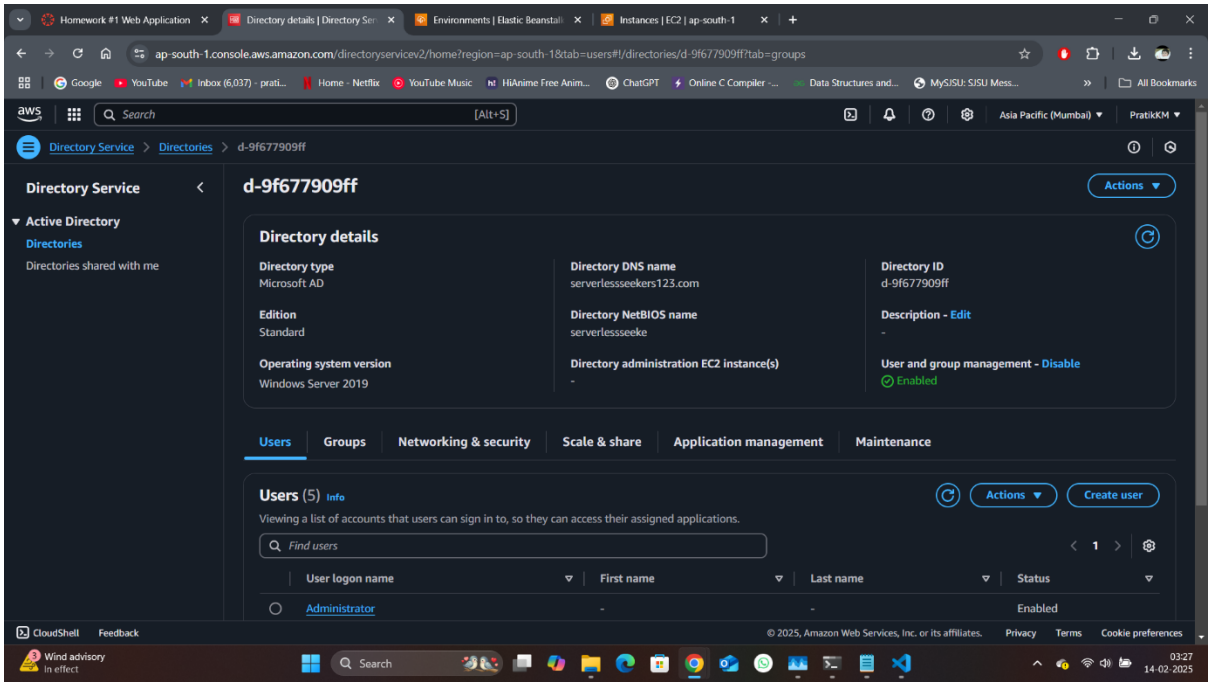
Homework #1 Web Application
Directory details | Directory Ser
Environments | Elastic Beanstalk
Instances | EC2 | ap-south-1
ap-south-1.console.aws.amazon.com/directoryservicev2/home?region=ap-south-1&tab=users#!/directories/d-9f677909ff?tab=groups
Search [Alt+S]
Asia Pacific (Mumbai)
PratikKM
Directory Service > Directories > d-9f677909ff
Directory Service
Active Directory
Directories
Directories shared with me
d-9f677909ff
Actions
Directory details
Directory type
Microsoft AD
Directory DNS name
serverlessseekers123.com
Directory ID
d-9f677909ff
Edition
Standard
Directory NetBIOS name
serverlessseeke
Description - Edit
Operating system version
Windows Server 2019
Directory administration EC2 instance(s)
User and group management - Disable
Enabled
Users
Groups
Networking & security
Scale & share
Application management
Maintenance
Users (5) Info
Viewing a list of accounts that users can sign in to, so they can access their assigned applications.
Actions
Create user
Find users
User logon name
First name
Last name
Status
Administrator
Enabled
CloudShell
Feedback
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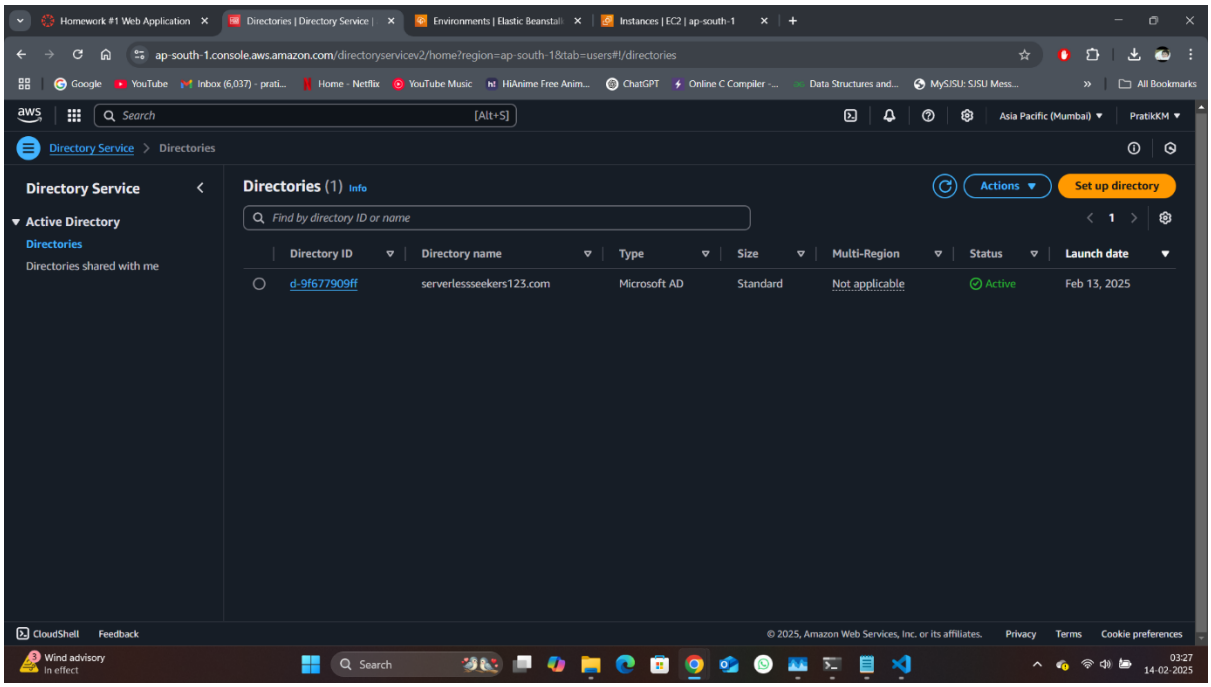
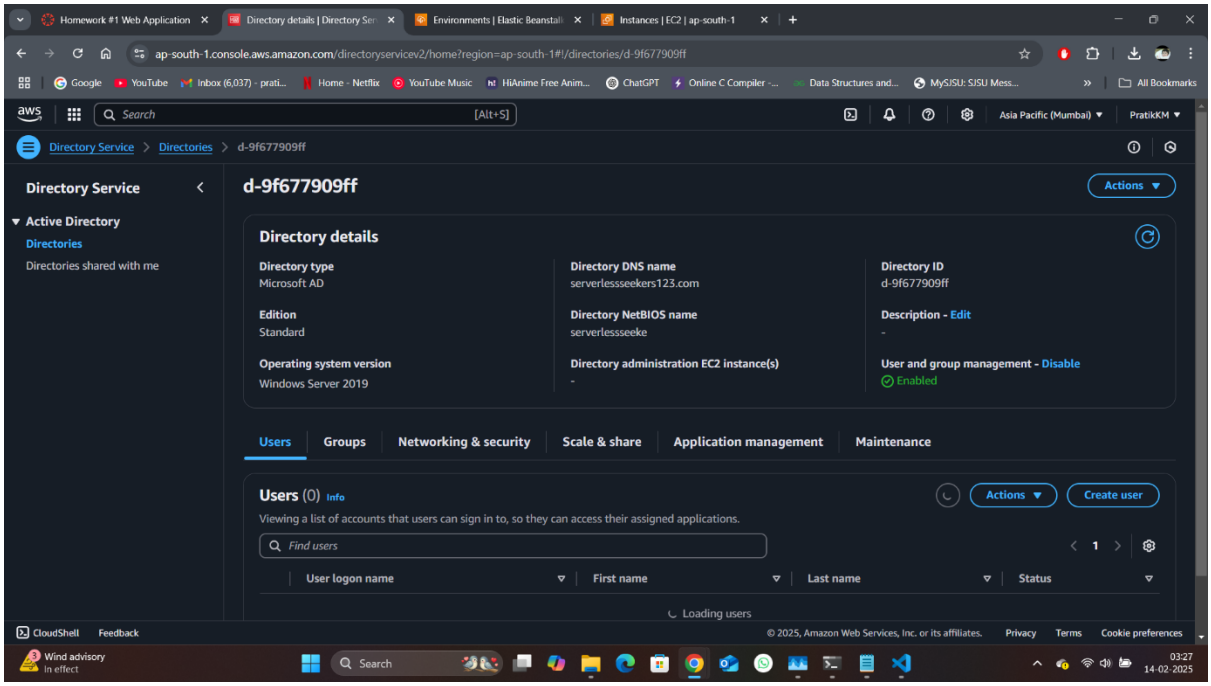
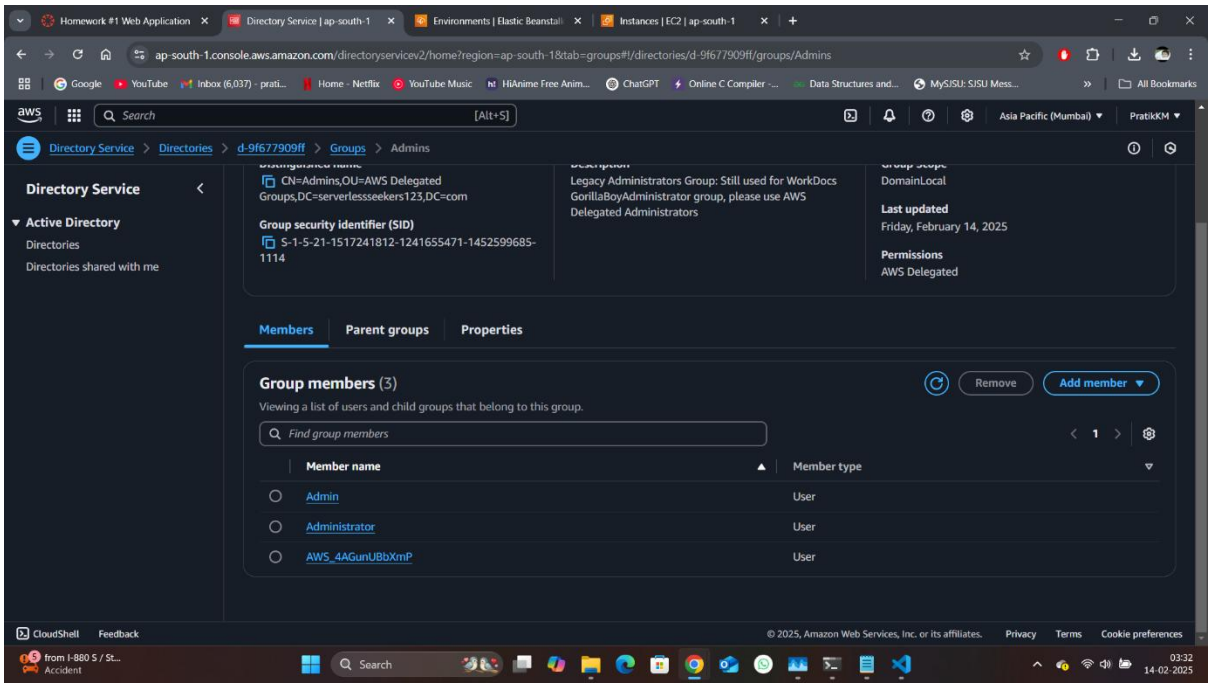
Privacy
Terms
Cookie preferences
Wind advisory
In effect
Search
03:27
14-02-2025


Homework #1 Web Application
Directories | Directory Service
Environments | Elastic Beanstalk
Instances | EC2 | ap-south-1
ap-south-1.console.aws.amazon.com/directoryservicev2/home?region=ap-south-1&tab=users#!/directories
Search [Alt+S]
Asia Pacific (Mumbai)
PratikKM
Directory Service > Directories
Directory Service
Active Directory
Directories
Directories shared with me
Directories (1) Info
Actions
Set up directory
Find by directory ID or name
Directory ID
Directory name
Type
Size
Multi-Region
Status
Launch date
d-9f677909ff
serverlessseekers123.com
Microsoft AD
Standard
Not applicable
Active
Feb 13, 2025
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences
Wind advisory
In effect
Search
03:27
14-02-2025


Homework #1 Web Application
Directory details | Directory Ser
Environments | Elastic Beanstalk
Instances | EC2 | ap-south-1
ap-south-1.console.aws.amazon.com/directoryservicev2/home?region=ap-south-1#!/directories/d-9f677909ff
Search [Alt+S]
Asia Pacific (Mumbai)
PratikKM
Directory Service > Directories > d-9f677909ff
Directory Service
Active Directory
Directories
Directories shared with me
d-9f677909ff
Actions
Directory details
Directory type
Microsoft AD
Directory DNS name
serverlessseekers123.com
Directory ID
d-9f677909ff
Edition
Standard
Directory NetBIOS name
serverlessseeke
Description - Edit
-
Operating system version
Windows Server 2019
Directory administration EC2 instance(s)
-
User and group management - Disable
Enabled
Users
Groups
Networking & security
Scale & share
Application management
Maintenance
Users (0) Info
Actions
Create user
Viewing a list of accounts that users can sign in to, so they can access their assigned applications.
Find users
User logon name
First name
Last name
Status
Loading users
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences
Wind advisory
In effect
Search
03:27
14-02-2025


Homework #1 Web Application
Directory Service | ap-south-1
Environments | Elastic Beanstalk
Instances | EC2 | ap-south-1
ap-south-1.console.aws.amazon.com/directoryservicev2/home?region=ap-south-1&tab=groups#!/directories/d-9f677909ff/groups/Admins
Search [Alt+S]
Asia Pacific (Mumbai)
PratikKM
Directory Service > Directories > d-9f677909ff > Groups > Admins
Directory Service
Active Directory
Directories
Directories shared with me
CN=Admins,OU=AWS Delegated Groups,DC=serverlessseekers123,DC=com
Group security identifier (SID)
S-1-5-21-1517241812-1241655471-1452599685-1114
Legacy Administrators Group: Still used for WorkDocs GorillaBoyAdministrator group, please use AWS Delegated Administrators
DomainLocal
Last updated
Friday, February 14, 2025
Permissions
AWS Delegated
Members
Parent groups
Properties
Group members (3)
Remove
Add member
Viewing a list of users and child groups that belong to this group.
Find group members
Member name
Member type
Admin
User
Administrator
User
AWS_4AGunUBbXmP
User
CloudShell
Feedback
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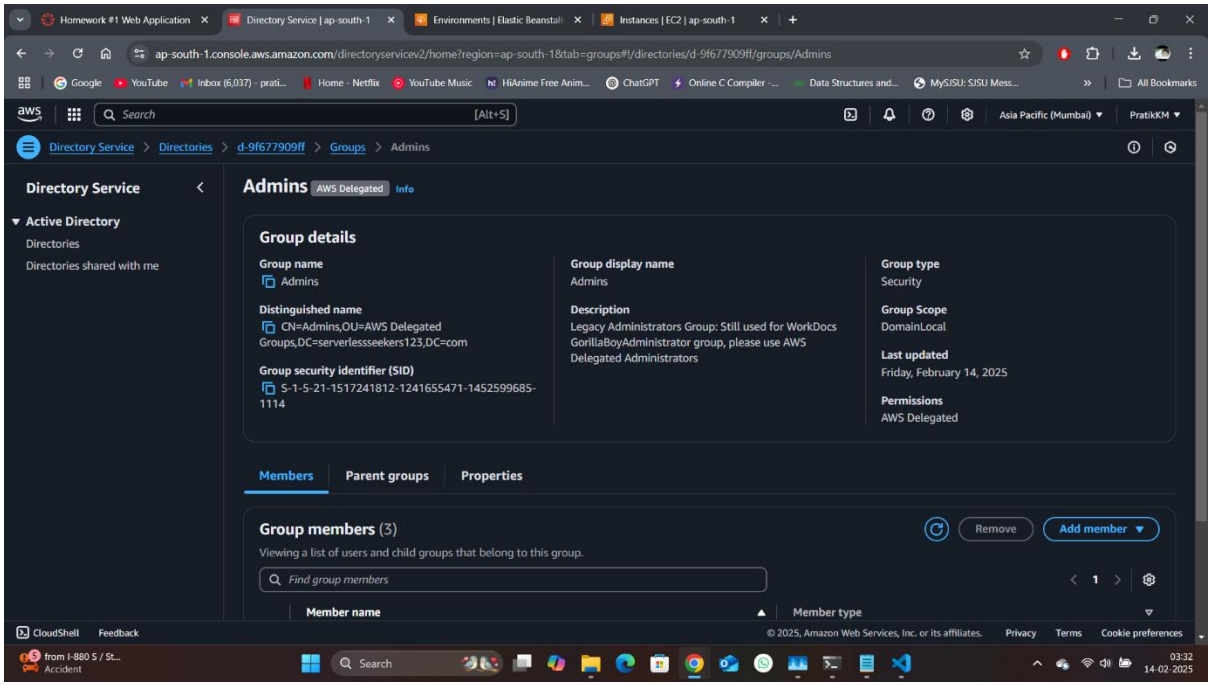
Privacy
Terms
Cookie preferences
from I-880 S / St...
Accident
Search
03:32
14-02-2025


Homework #1 Web Application
Directory Service | ap-south-1
Environments | Elastic Beanstalk
Instances | EC2 | ap-south-1
ap-south-1.console.aws.amazon.com/directoryservicev2/home?region=ap-south-1&tab=groups#!/directories/d-9f677909ff/groups/Admins
Search [Alt+S]
Asia Pacific (Mumbai)
PratikKM
Directory Service > Directories > d-9f677909ff > Groups > Admins
Directory Service
Active Directory
Directories
Directories shared with me
Admins
AWS Delegated
Info
Group details
Group name
Admins
Distinguished name
CN=Admins,OU=AWS Delegated Groups,DC=serverlessseekers123,DC=com
Group security identifier (SID)
S-1-5-21-1517241812-1241655471-1452599685-1114
Group display name
Admins
Description
Legacy Administrators Group: Still used for WorkDocs GorillaBoyAdministrator group, please use AWS Delegated Administrators
Group type
Security
Group Scope
DomainLocal
Last updated
Friday, February 14, 2025
Permissions
AWS Delegated
Members
Parent groups
Properties
Group members (3)
Viewing a list of users and child groups that belong to this group.
Remove
Add member
Find group members
Member name
Member type
CloudShell
Feedback
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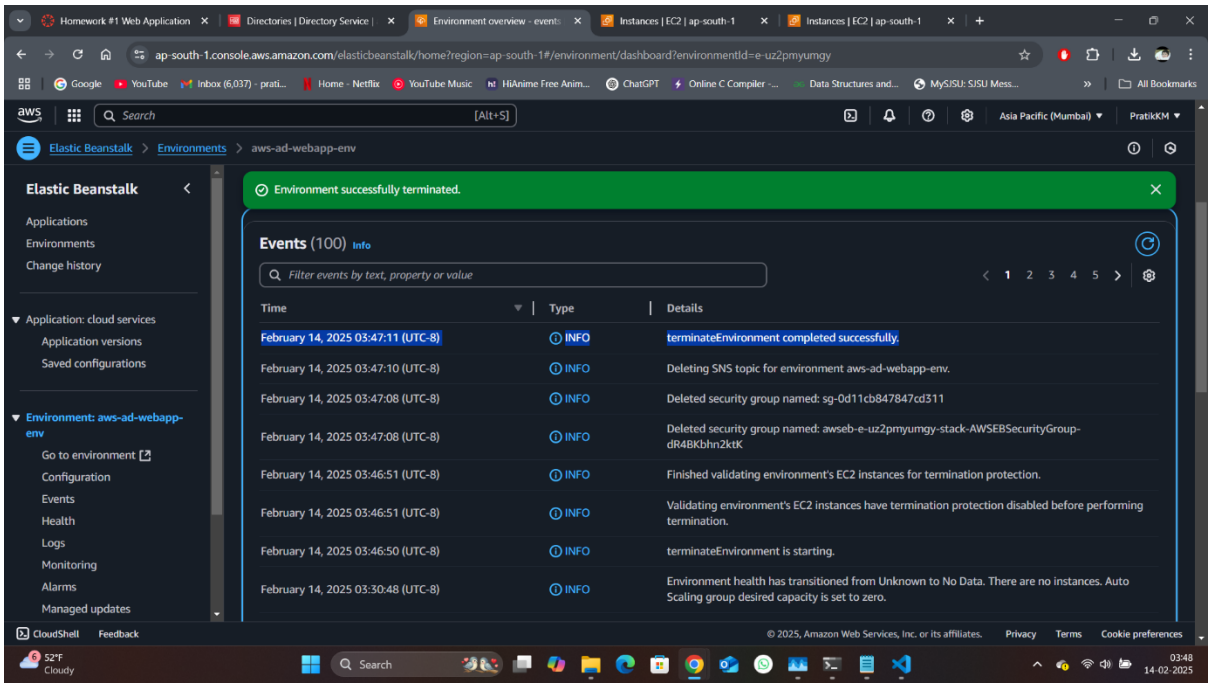
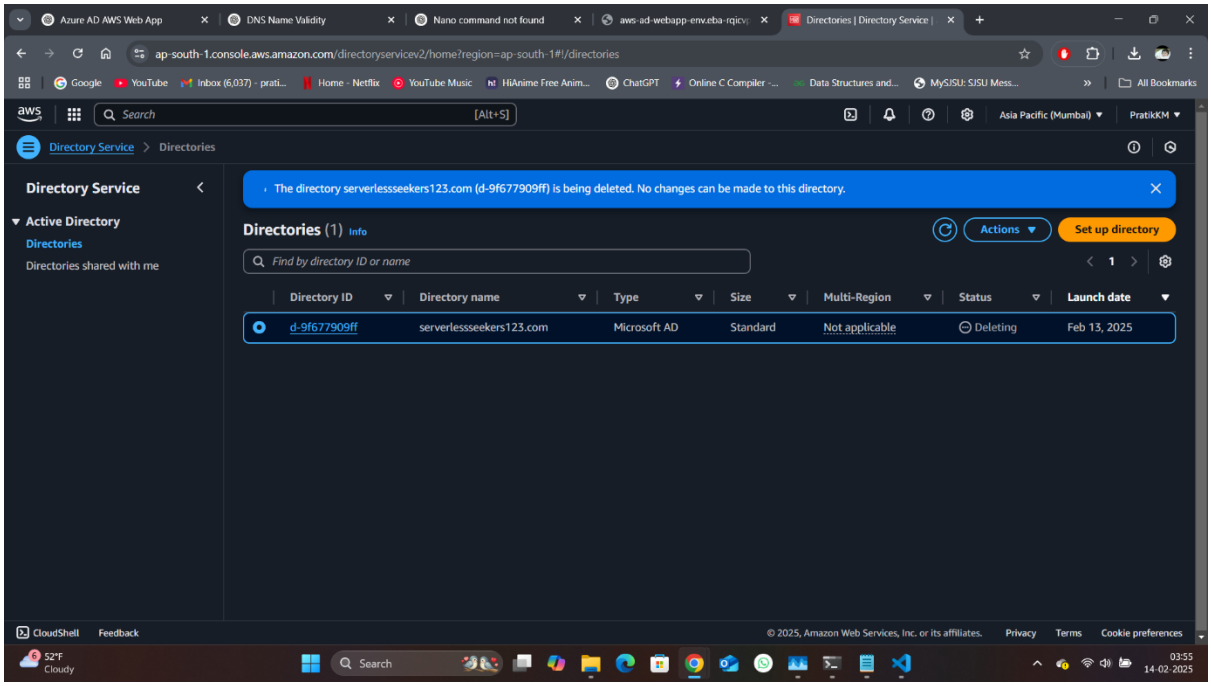
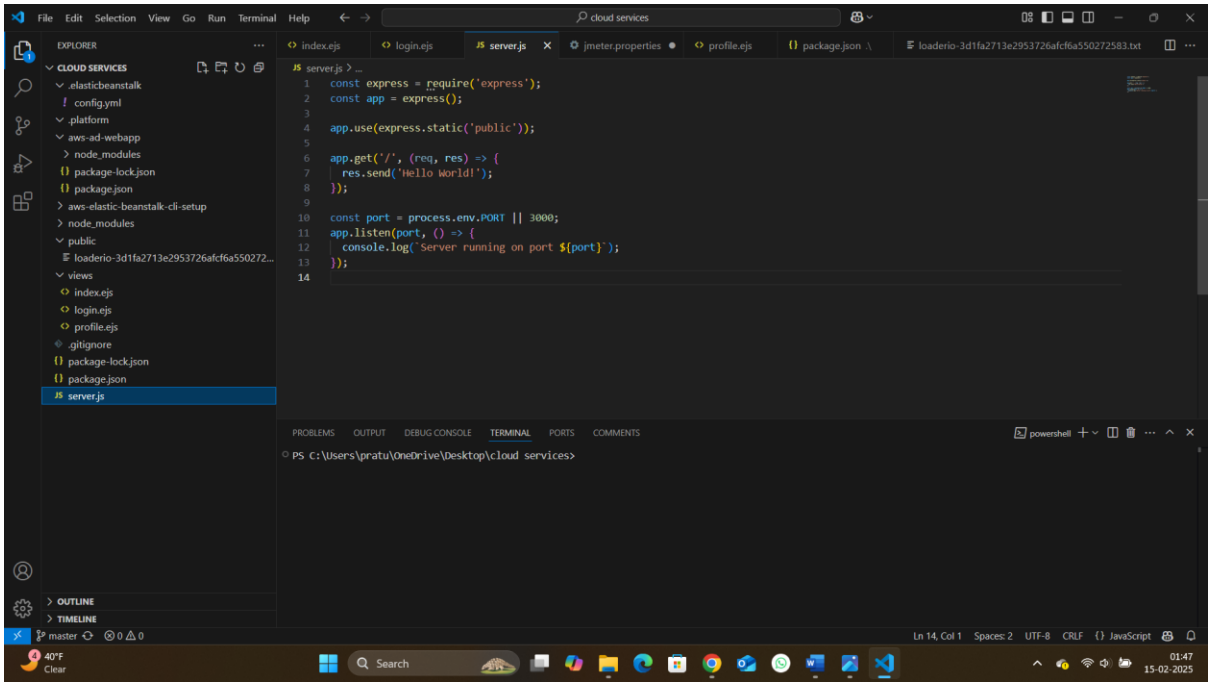
Privacy
Terms
Cookie preferences
03:32
14-02-2025


Homework #1 Web Application
Directories | Directory Service |
Environment overview - events
Instances | EC2 | ap-south-1
Instances | EC2 | ap-south-1
ap-south-1.console.aws.amazon.com/elasticbeanstalk/home?region=ap-south-1#/environment/dashboard?environmentId=e-uz2pmyumgy
Search [Alt+S]
Asia Pacific (Mumbai)
PratikKM
Elastic Beanstalk > Environments > aws-ad-webapp-env
Elastic Beanstalk
Applications
Environments
Change history
Application: cloud services
Application versions
Saved configurations
Environment: aws-ad-webapp-env
Go to environment
Configuration
Events
Health
Logs
Monitoring
Alarms
Managed updates
Environment successfully terminated.
Events (100)
Info
Filter events by text, property or value
Time
Type
Details
February 14, 2025 03:47:11 (UTC-8)
INFO
terminateEnvironment completed successfully.
February 14, 2025 03:47:10 (UTC-8)
INFO
Deleting SNS topic for environment aws-ad-webapp-env.
February 14, 2025 03:47:08 (UTC-8)
INFO
Deleted security group named: sg-0d11cb847847cd311
February 14, 2025 03:47:08 (UTC-8)
INFO
Deleted security group named: awseb-e-uz2pmyumgy-stack-AWSEBSecurityGroup-dR4BKbhn2ktK
February 14, 2025 03:46:51 (UTC-8)
INFO
Finished validating environment's EC2 instances for termination protection.
February 14, 2025 03:46:51 (UTC-8)
INFO
Validating environment's EC2 instances have termination protection disabled before performing termination.
February 14, 2025 03:46:50 (UTC-8)
INFO
terminateEnvironment is starting.
February 14, 2025 03:30:48 (UTC-8)
INFO
Environment health has transitioned from Unknown to No Data. There are no instances. Auto Scaling group desired capacity is set to zero.
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences
03:48
14-02-2025


Azure AD AWS Web App
DNS Name Validity
Nano command not found
aws-ad-webapp-env.eba-rqicvj
Directories | Directory Service |
ap-south-1.console.aws.amazon.com/directoryservicev2/home?region=ap-south-1#/directories
Search
[Alt+S]
Asia Pacific (Mumbai)
PratikKM
Directory Service
Directories
Directory Service
Active Directory
Directories
Directories shared with me
The directory serverlessseekers123.com (d-9f677909ff) is being deleted. No changes can be made to this directory.
Directories (1) Info
Actions
Set up directory
Find by directory ID or name
Directory ID
Directory name
Type
Size
Multi-Region
Status
Launch date
d-9f677909ff
serverlessseekers123.com
Microsoft AD
Standard
Not applicable
Deleting
Feb 13, 2025
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences
52°F
Cloudy
Search
03:55
14-02-2025


File Edit Selection View Go Run Terminal Help
cloud services
EXPLORER
CLOUD SERVICES
.elasticbeanstalk
config.yml
.platform
aws-ad-webapp
node_modules
package-lock.json
package.json
aws-elastic-beanstalk-cli-setup
node_modules
public
loaderio-3d1fa2713e2953726afcf6a550272...
views
index.ejs
login.ejs
profile.ejs
.gitignore
package-lock.json
package.json
server.js
index.ejs
login.ejs
server.js
jmeter.properties
profile.ejs
package.json
loaderio-3d1fa2713e2953726afcf6a550272583.txt
server.js > ...
1 const express = require('express');
2 const app = express();
3
4 app.use(express.static('public'));
5
6 app.get('/', (req, res) => {
7 res.send('Hello World!');
8 });
9
10 const port = process.env.PORT || 3000;
11 app.listen(port, () => {
12 console.log(`Server running on port ${port}`);
13 });
14
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
COMMENTS
powershell
PS C:\Users\pratu\OneDrive\Desktop\cloud services>
OUTLINE
TIMELINE
master
Ln 14, Col 1
Spaces: 2
UTF-8
CRLF
JavaScript
40°F
Clear
Search
01:47
15-02-2025

Deployment Steps

1. **Upload Code to Elastic Beanstalk**
    - Used AWS CLI: eb init and eb deploy commands.
2. **Verify Application Logs**
    - Checked application and health logs in AWS Elastic Beanstalk.
3. **Load Balancer Health Check**
    - Configured health checks for proper request routing.
4. **Environment Variables Setup**
    - Defined LDAP-related credentials and configurations securely.

Scalability (Extra Credit)

- Configured AWS Elastic Beanstalk to auto-scale instances based on traffic load.
- Integrated Amazon CloudWatch for real-time monitoring and alerts.
- Performed a load test using Loader.io to simulate user traffic.

Resource Cleanup

To ensure no unnecessary AWS costs, the following resources were deleted:

1. **Delete Elastic Beanstalk Environment**

   aws elasticbeanstalk terminate-environment --environment-name aws-ad-webapp-env
2. **Delete Elastic Beanstalk Application**

   aws elasticbeanstalk delete-application --application-name my-app
3. **Delete RDS Database (if created)**

   aws rds delete-db-instance --db-instance-identifier mydatabase --skip-final-snapshot
4. **Delete S3 Buckets**

   aws s3 rb s3://my-bucket-name --force
5. **Delete Security Groups & IAM Roles**

   aws ec2 delete-security-group --group-id sg-12345678

   aws iam delete-role --role-name aws-elasticbeanstalk-ec2-role

6. **Delete Load Balancers (if left behind)**

   aws elb delete-load-balancer --load-balancer-name my-load-balancer

7. **Delete VPC (If created for this project)**

   aws ec2 delete-vpc --vpc-id vpc-12345678

8. **Final Billing Check**
    - Verified AWS **Billing Dashboard** to ensure all resources were removed.

Link to Code Repository

- https://github.com/PratikKM2002/Web-Application