

## Capstone Project 1

*Description:* Amazon Elastic Compute Cloud (Amazon EC2) provides scalable computing capacity in the Amazon Web Services (AWS) cloud. Using Amazon EC2 eliminates your need to invest in hardware up front so you can develop and deploy applications faster. You can use Amazon EC2 to launch as many or as few virtual servers as you need, configure security and networking, and manage storage. Amazon EC2 enables you to scale up or down to handle changes in requirements or spikes in popularity, reducing your need to forecast traffic.

*Problem Statement:* Company ABC wants to move their product to AWS. They have the following things set up right now:

1. MySQL DB
2. Website (PHP) The company wants high availability on this product, therefore wants Auto Scaling to be enabled on this website.

*Steps To Solve:*

1. Launch an EC2 Instance
2. Enable Auto Scaling on these instances (minimum 2)
3. Create an RDS Instance
4. Create Database & Table in RDS instance:
  - a. Database name: intel
  - b. Table name: data
  - c. Database password: intel123
5. Change hostname in website
6. Allow traffic from EC2 to RDS instance
7. Allow all-traffic to EC2 instance

### **SOLUTION:**

1. Created an Ubuntu EC2 instances and installed PHP custom website

## Instance: Projectserver1

The screenshot displays the AWS Management Console interface for an EC2 instance named 'projectserver1'. The instance is in a 'Running' state, using the 't2.micro' instance type, and has passed 2/2 status checks. It is located in the 'us-east-1' availability zone. The console shows various details including the instance ID, state, type, status checks, alarm status, availability zone, and public IPv4 DNS. Below the console, a browser window shows the Apache2 Default Page on Ubuntu, indicating the server is working.

**Instances (1/2) Info**

Find Instance by attribute or tag (case-sensitive) [All states]

Instance state: **Running** [Clear filters]

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
projectserver1	i-0ddca29b55c09e719	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1d	ec2-54-85-109-79.compute-1.amazonaws.com

**i-0ddca29b55c09e719 (projectserver1)**

Details | Status and alarms New | Monitoring | Security | Networking | Storage | Tags

**Instance summary Info**

Instance ID: i-0ddca29b55c09e719 (projectserver1)

IPv6 address: -

Hostname type: IP name: ip-172-31-21-174.ec2.internal

Answer private resource DNS name: IPv4 (A)

Auto-assigned IP address: 54.85.109.79 [Public IP]

IAM Role: -

Public IPv4 address: 54.85.109.79 | [open address](#)

Instance state: **Running**

Private IP DNS name (IPv4 only): ip-172-31-21-174.ec2.internal

Instance type: t2.micro

VPC ID: vpc-0cc7f12f99a9d7686

Subnet ID: subnet-0a1b2c3d4e5f6g7h8i

Private IPv4 addresses: 172.31.21.174

Public IPv4 DNS: ec2-54-85-109-79.compute-1.amazonaws.com | [open address](#)

Elastic IP addresses: -

AWS Compute Optimizer finding: [Opt-in to AWS Compute Optimizer for recommendations. | Learn more](#)

Auto Scaling Group name: -

**Apache2 Default Page**

Ubuntu **It works!**

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

**Configuration Overview**

Ubuntu's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Ubuntu tools. The configuration system is **fully documented in `/usr/share/doc/apache2/README.Debian.gz`**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the `apache2-doc` package was installed on this server.

The configuration layout for an Apache2 web server installation on Ubuntu systems is as follows:

```
/etc/apache2/
|-- apache2.conf
|   |-- ports.conf
|-- mods-enabled
|   |-- *.load
|   |-- *.conf
|-- conf-enabled
|   |-- *.conf
|-- sites-enabled
|   |-- *.conf
```

## Updated index.php

```
aws Services Search [Alt+S]
VPC EC2 S3 RDS DynamoDB CloudFront IAM Route 53 CloudFormation Simple Queue Service

ubuntu@ip-172-31-21-174:/var/www/html$ ls
index.php
ubuntu@ip-172-31-21-174:/var/www/html$ cat index.php
<!DOCTYPE html>
<html>
  <head>
    <title>PHP Test</title>
  </head>
  <body>
    <?php echo '<h1>Hello World from Server 1 </h1>'; ?>
  </body>
</html>
ubuntu@ip-172-31-21-174:/var/www/html$
```

i-0ddca29b55c09e719 (projectserver1)

PublicIPs: 54.85.109.79 PrivateIPs: 172.31.21.174

← → ↻ Not secure 54.85.109.79

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# Hello World from Server 1

2. Autoscaling group is created and associated the instances

AMI created

Amazon Machine Images (AMIs) (1/1)

Owned by me

Find AMI by attribute or tag

Recycle Bin

EC2 Image Builder

Actions

Launch instance from AMI

Name	AMI name	AMI ID	Source	Owner	Visibility	Status	Creation date
ubuntu-php-AMI	ubuntu-php	ami-0ed637a8262472043	590184123293/ubuntu-php	590184123293	Private	Pending	2024/04/26 12:4

AMI ID: ami-0ed637a8262472043 (ubuntu-php-AMI)

Details

Permissions

Storage

Tags

AMI ID

ami-0ed637a8262472043 (ubuntu-php-AMI)

Image type

machine

Platform details

Linux/UNIX

Root device type

EBS

AMI name

ubuntu-php

Owner account ID

590184123293

Architecture

x86\_64

Usage operation

RunInstances

Root device name

/dev/sda1

Status

Pending

Source

590184123293/ubuntu-php

Virtualization type

hvm

Boot mode

uefi-preferred

State reason

-

Creation date

Fri Apr 26 2024 12:42:18 GMT+0530 (India Standard Time)

Kernel ID

-

Description

-

Product codes

-

RAM disk ID

-

Deprecation time

-

Last launched time

-

Block devices

/dev/sda1=8:true:gp2

/dev/sdb=ephemeral0

/dev/sdc=ephemeral1

Deregistration protection

Disabled

Launch Template created

Launch Templates (1/1)

Search

Actions

Create launch template

Launch Template ID	Launch Template Name	Default Version	Latest Version	Create Time	Created By
lt-0d05b13519a4a8124	ubuntu-php	1	1	2024-04-26T07:17:30.000Z	arn:aws:iam::590184123293:user/cloudintel

ubuntu-php (lt-0d05b13519a4a8124)

Launch template details

Actions

Delete template

Launch template ID

lt-0d05b13519a4a8124

Launch template name

ubuntu-php

Default version

1

Owner

arn:aws:iam::590184123293:user/cloudintel

Details

Versions

Template tags

Launch template version details

Actions

Delete template version

Version

1 (Default)

Description

-

Date created

2024-04-26T07:17:30.000Z

Created by

arn:aws:iam::590184123293:user/cloudintel

Instance details

Storage

Resource tags

Network interfaces

Advanced details

AMI ID

ami-0ed637a8262472043

Instance type

t2.micro

Availability Zone

-

Key pair name

casestudy

Autoscaling Group Created

Services

Search

[Alt+S]

VPC

EC2

S3

RDS

DynamoDB

CloudFront

IAM

Route 53

CloudFormation

Simple Queue Service

N. Virginia

cloudintel @ cloudprogram

EC2 > Auto Scaling groups > ubuntu-php-asg

ubuntu-php-asg

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

Group details

Auto Scaling group name  
ubuntu-php-asg

Date created  
Fri Apr 26 2024 13:20:15 GMT+0530 (India Standard Time)

Desired capacity  
2

Minimum capacity  
2

Maximum capacity  
3

Desired capacity type  
Units (number of instances)

Status  
-

Amazon Resource Name (ARN)  
arn:aws:autoscaling:us-east-1:590184123293:autoScalingGroup:db0f560b-f8e0-4c25-900e-7a4e75c7b0c:autoScalingGroupName/ubuntu-php-asg

Edit

Launch template

Launch template  
lt-0d05b13519a4a8124  
ubuntu-php

Version  
Default

Description  
-

AMI ID  
ami-0ed637a8262472043

Security groups  
-

Storage (volumes)  
-

Instance type  
t2.micro

Security group IDs  
sg-02b49bb4afe1a9cf

Key pair name  
casestudy

Owner  
arn:aws:iam::590184123293:user/cloudintel

Create time  
Fri Apr 26 2024 12:47:30 GMT+0530 (India Standard Time)

Request Spot Instances  
No

Edit

View details in the launch template console

Load Balancer created

RDS

DynamoDB

CloudFront

IAM

Route 53

CloudFormation

Simple Queue Service

N. Virginia

cloudintel @ cloudprogram

EC2 > Load balancers

Load balancers (1/1)

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

Filter load balancers

< 1 >

<input checked="" type="checkbox"/>	Name	DNS name	State	VPC ID	Availability Zones	Type	Date created
<input checked="" type="checkbox"/>	ubuntu-php-asg-1	ubuntu-php-asg-1-13907...	Active	vpc-0cc7f12f99a9d7686	6 Availability Zones	application	April 26, 2024, 13:20 (UTC+05:30)

Load balancer: ubuntu-php-asg-1

Details | Listeners and rules | Network mapping | Resource map - new | Security | Monitoring | Integrations | Attributes | Tags

Details

Load balancer type  
Application

Scheme  
Internet-facing

Status  
Active

Hosted zone  
Z355XDOTRQ7X7K

VPC  
vpc-0cc7f12f99a9d7686

Availability Zones  
subnet-0759728e5e9dd5fbd us-east-1a (use1-az6)  
subnet-07055bf2d69520671 us-east-1b (use1-az1)  
subnet-085086d4c050c3253 us-east-1e (use1-az3)  
subnet-09271199f47bbaf8e us-east-1d (use1-az4)  
subnet-0f1f2399b58414207 us-east-1f (use1-az5)  
subnet-0a104e3a937085b22 us-east-1c (use1-az2)

IP address type  
IPv4

Date created  
April 26, 2024, 13:20 (UTC+05:30)

Devi Sukumar

Instances created by ASG – php1 & php2

[Alt+S]

RDS DynamoDB CloudFront IAM Route 53 CloudFormation Simple Queue Service

Instances (1/3) info

Find Instance by attribute or tag (case-sensitive)

All states

Instance state = running Clear filters

Launch instances

	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
<input checked="" type="checkbox"/>	php2	i-000f26a9bf2fe9d0	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1d	ec2-52-91-58-127.compu
<input type="checkbox"/>	projectserver1	i-0ddca29b55c09e719	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1d	ec2-54-85-109-79.compu
<input type="checkbox"/>	php1	i-05c382b2df9a53b71	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1a	ec2-52-205-28-194.compu

i-000f26a9bf2fe9d0 (php2)

Details Status and alarms new Monitoring Security Networking Storage Tags

▼ Instance summary info

Instance ID  
i-000f26a9bf2fe9d0 (php2)

IPv6 address  
-

Hostname type  
IP name: ip-172-31-18-42.ec2.internal

Answer private resource DNS name  
-

Auto-assigned IP address  
52.91.58.127 [Public IP]

IAM Role  
-

Public IPv4 address  
52.91.58.127 open address

Instance state  
Running

Private IP DNS name (IPv4 only)  
ip-172-31-18-42.ec2.internal

Instance type  
t2.micro

VPC ID  
vpc-0cc7f12f99a9d7686

Subnet ID  
subnet-09271199f47bba8e

Private IPv4 addresses  
172.31.18.42

Public IPv4 DNS  
ec2-52-91-58-127.compute-1.amazonaws.com open address

Elastic IP addresses  
-

AWS Compute Optimizer finding  
Opt-in to AWS Compute Optimizer for recommendations. Learn more

Auto Scaling Group name  
ubuntu-php-asg

← → ↻ ⚠ Not secure 52.205.28.194

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# Hello World from Server 1

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## Hello World from Server 2

### 3. Created an RDS instance with MySQL engine

The screenshot shows the AWS Management Console interface for an Amazon RDS instance named 'intel'. The top navigation bar includes links to various AWS services like DynamoDB, CloudFront, IAM, Route 53, CloudFormation, and Simple Queue Service. The breadcrumb trail indicates the path: RDS > Databases > intel. The instance details are displayed in a summary card, showing the DB identifier 'intel', CPU usage at 2.90%, Status as 'Available', Role as 'Instance', Engine as 'MySQL Community', and Region & AZ as 'us-east-1a'. Below the summary card, there are tabs for 'Connectivity & security', 'Monitoring', 'Logs & events', 'Configuration', 'Zero-ETL integrations', 'Maintenance & backups', 'Tags', and 'Recommendations'. The 'Connectivity & security' tab is selected, showing details for Endpoint & port, Networking, and Security. The Endpoint & port section shows the endpoint 'intel.c7qge622w7a1.us-east-1.rds.amazonaws.com' and port '3306'. The Networking section shows the Availability Zone 'us-east-1a', VPC 'vpc-0cc7f12f99a9d7686', Subnet group 'default-vpc-0cc7f12f99a9d7686', and Subnets 'subnet-0f1f2399b58414207' and 'subnet-0a104e3a937085b22'. The Security section shows VPC security groups 'default (sg-061ac73787bd874ec)' and 'Active', Publicly accessible 'No', Certificate authority 'Info', and Certificate authority date 'May 26, 2061, 05:04 (UTC+05:30)'.

### 4. Database and Table creation

```
mysql> use intel;
Database changed
mysql> create table data (firstname varchar(20), email varchar(25));
Query OK, 0 rows affected (0.03 sec)

mysql> insert into data values("ABC","abc@gmail.com");
Query OK, 1 row affected (0.00 sec)

mysql> select * from data;
+-----+-----+
| firstname | email |
+-----+-----+
| ABC      | abc@gmail.com |
+-----+-----+
1 row in set (0.00 sec)

mysql> exit
Bye
ubuntu@ip-172-31-18-42:/var/www/html$ history
1 sudo apt-get update
2 sudo apt-get install -y php
3 sudo systemctl start php
4 cd ../../var/www/html
5 ls
6 sudo vi index.html
7 ls
8 sudo rm index.html
9 sudo vi index.php
10 clear
11 ls
12 cat index.php
13 hostname
14 cd ../../var/www/html/
15 ls
16 sudo vi index.php
17 sudo add-apt-repository -y ppa:ondrej/php
18 sudo apt install php5.6 mysql-client php5.6-mysqli -y
19 mysql -h intel.c7qge622w7a1.us-east-1.rds.amazonaws.com -u admin -p
20 history
ubuntu@ip-172-31-18-42:/var/www/html$
```

The terminal window shows the execution of MySQL commands to create a database and a table. The commands are: 'use intel;', 'create table data (firstname varchar(20), email varchar(25));', 'insert into data values("ABC","abc@gmail.com");', and 'select \* from data;'. The output shows the table creation, the insertion of a row, and the selection of the row. The terminal also shows the execution of 'exit' and 'history' commands. The terminal window is titled 'i-000f26a9bff2fe9d0 (php2)' and shows the public and private IP addresses.

## Table CREATED from php2

```
aws Services [Alt+S]
VPC EC2 S3 RDS DynamoDB CloudFront IAM Route 53 CloudFormation Simple Queue Service

Copyright (c) 2000, 2024, Oracle and/or its affiliates.
Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| performance_schema |
| sys |
+-----+
5 rows in set (0.00 sec)

mysql> create database intel;
Query OK, 1 row affected (0.00 sec)

mysql> use intel;
Database changed
mysql> create table data (firstname varchar(20), email varchar(25));
Query OK, 0 rows affected (0.03 sec)

mysql> insert into data values("ABC","abc@gmail.com");
Query OK, 1 row affected (0.00 sec)

mysql> select * from data;
+-----+-----+
| firstname | email |
+-----+-----+
| ABC | abc@gmail.com |
+-----+-----+
1 row in set (0.00 sec)

mysql>
```

i-000f26a9bff2fe9d0 (php2)  
PublicIPs: 52.91.58.127 PrivateIPs: 172.31.18.42

## Table ACCESSED from php1

```
aws Services [Alt+S]
VPC EC2 S3 RDS DynamoDB CloudFront IAM Route 53 CloudFormation Simple Queue Service

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| intel |
| mysql |
| performance_schema |
| sys |
+-----+
5 rows in set (0.00 sec)

mysql> use intel;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables;
+-----+
| Tables_in_intel |
+-----+
| data |
+-----+
1 row in set (0.00 sec)

mysql> select * from data;
+-----+-----+
| firstname | email |
+-----+-----+
| ABC | abc@gmail.com |
+-----+-----+
1 row in set (0.00 sec)

mysql>
```

i-000f26a9bff2fe9d0 (php2)  
PublicIPs: 52.91.58.127 PrivateIPs: 172.31.18.42



## 5. Security Group Rules of RDS with traffic only from EC2

The screenshot shows the Amazon RDS console interface. The left sidebar contains navigation links for various RDS features. The main content area is divided into three sections:

- Proxies (0):** A section with a search bar and a table. It currently shows no proxies.
- Security group rules (2):** A section with a search bar and a table showing two rules for the default security group.
- Replication (1):** A section with a search bar and a table showing one replication instance.

Security group	Type	Rule
default (sg-061ac73787bd874ec)	EC2 Security Group - Inbound	sg-02b49bb41afe1a9cf
default (sg-061ac73787bd874ec)	EC2 Security Group - Outbound	sg-02b49bb41afe1a9cf

DB Identifier	Role	Region & AZ	Replication source	Replication state	Lag
intel	Instance	us-east-1a	-	-	-

The screenshot shows the Amazon Security Groups console interface. The main content area displays the details for the default security group (sg-061ac73787bd874ec).

**Security Groups (1/1) Info**

Name	Security group ID	Security group name	VPC ID	Description	Owner
-	sg-061ac73787bd874ec	default	vpc-0cc7f12f99a9d7686	default VPC security group	590184123293

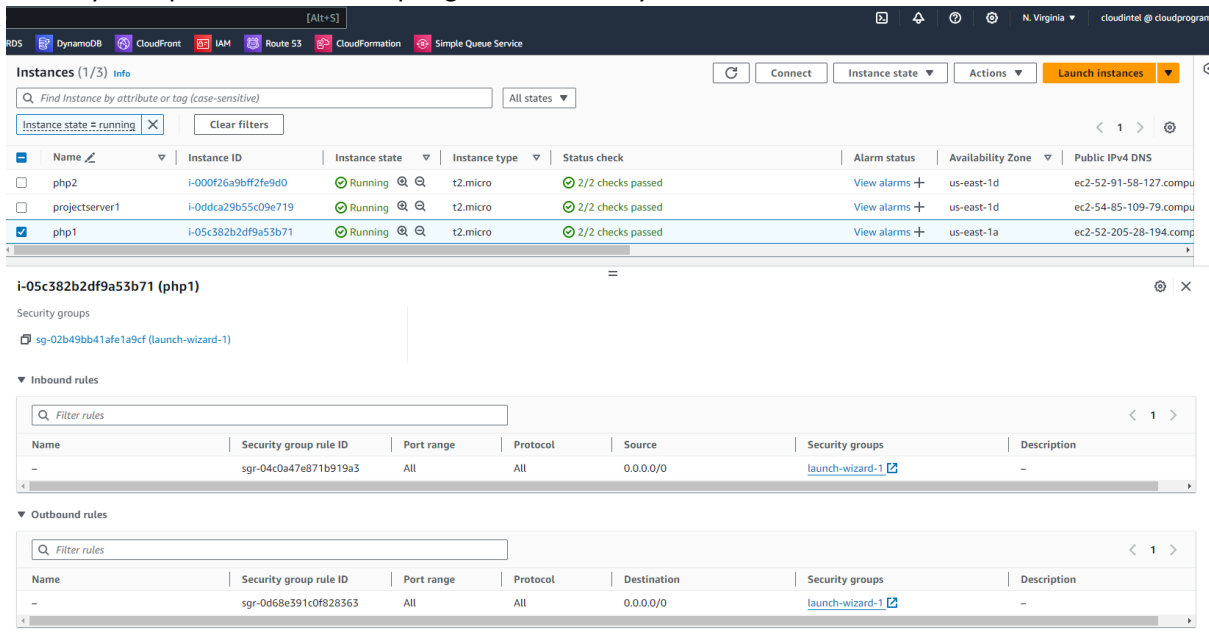
**sg-061ac73787bd874ec - default**

Details | **Inbound rules** | Outbound rules | Tags

**Inbound rules (1)**

Name	Security group rule...	IP version	Type	Protocol	Port range	Source	Description
-	sgr-042fc498c66021ac5	-	All traffic	All	All	sg-02b49bb41afe1a9cf / launch-wizard-1	-

## 6. Security Group Rules of EC2 accepting traffic from Anywhere



The screenshot displays the AWS Management Console interface. At the top, navigation tabs for various services like RDS, DynamoDB, CloudFront, IAM, Route 53, CloudFormation, and Simple Queue Service are visible. The main section is titled "Instances (1/3)" and includes a search bar and a filter for "Instance state = running". Below this, a table lists three EC2 instances: php2, projectserver1, and php1. The instance php1 is selected, and its details are shown in a sidebar. The details include the instance ID i-05c382b2df9a53b71, its state (Running), type (t2.micro), and status checks (2/2 checks passed). The security group attached to the instance is sg-02b49bb41afe1a9cf (launch-wizard-1). Under the "Inbound rules" section, a single rule is listed with the name "-", security group rule ID sgr-04c0a47e871b919a3, port range All, protocol All, source 0.0.0.0/0, and security groups launch-wizard-1. The "Outbound rules" section also shows a single rule with the name "-", security group rule ID sgr-0d68e391c0f828363, port range All, protocol All, destination 0.0.0.0/0, and security groups launch-wizard-1.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
php2	i-000f26a9bf2fe9d0	Running	t2.micro	2/2 checks passed	View alarms	us-east-1d	ec2-52-91-58-127.compu
projectserver1	i-0ddca29b55c09e719	Running	t2.micro	2/2 checks passed	View alarms	us-east-1d	ec2-54-85-109-79.compu
php1	i-05c382b2df9a53b71	Running	t2.micro	2/2 checks passed	View alarms	us-east-1a	ec2-52-205-28-194.comp

**i-05c382b2df9a53b71 (php1)**

Security groups

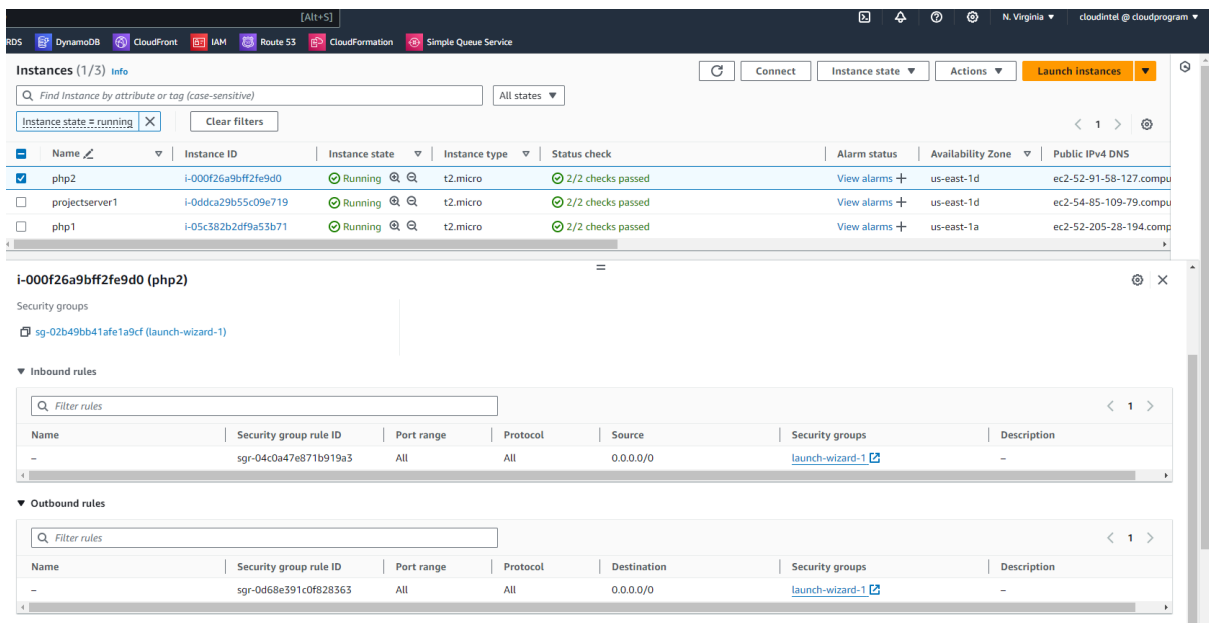
sg-02b49bb41afe1a9cf (launch-wizard-1)

**Inbound rules**

Name	Security group rule ID	Port range	Protocol	Source	Security groups	Description
-	sgr-04c0a47e871b919a3	All	All	0.0.0.0/0	launch-wizard-1	-

**Outbound rules**

Name	Security group rule ID	Port range	Protocol	Destination	Security groups	Description
-	sgr-0d68e391c0f828363	All	All	0.0.0.0/0	launch-wizard-1	-



The screenshot displays the AWS Management Console interface, similar to the one above. The main section is titled "Instances (1/3)". The instance php2 is selected, and its details are shown in a sidebar. The details include the instance ID i-000f26a9bf2fe9d0, its state (Running), type (t2.micro), and status checks (2/2 checks passed). The security group attached to the instance is sg-02b49bb41afe1a9cf (launch-wizard-1). Under the "Inbound rules" section, a single rule is listed with the name "-", security group rule ID sgr-04c0a47e871b919a3, port range All, protocol All, source 0.0.0.0/0, and security groups launch-wizard-1. The "Outbound rules" section also shows a single rule with the name "-", security group rule ID sgr-0d68e391c0f828363, port range All, protocol All, destination 0.0.0.0/0, and security groups launch-wizard-1.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
php2	i-000f26a9bf2fe9d0	Running	t2.micro	2/2 checks passed	View alarms	us-east-1d	ec2-52-91-58-127.compu
projectserver1	i-0ddca29b55c09e719	Running	t2.micro	2/2 checks passed	View alarms	us-east-1d	ec2-54-85-109-79.compu
php1	i-05c382b2df9a53b71	Running	t2.micro	2/2 checks passed	View alarms	us-east-1a	ec2-52-205-28-194.comp

**i-000f26a9bf2fe9d0 (php2)**

Security groups

sg-02b49bb41afe1a9cf (launch-wizard-1)

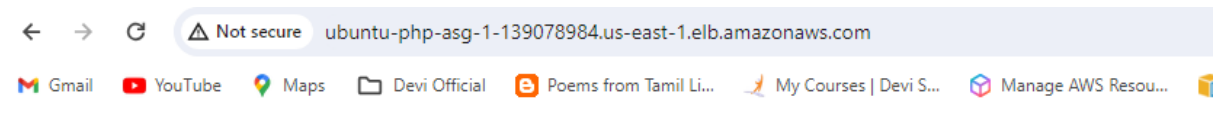
**Inbound rules**

Name	Security group rule ID	Port range	Protocol	Source	Security groups	Description
-	sgr-04c0a47e871b919a3	All	All	0.0.0.0/0	launch-wizard-1	-

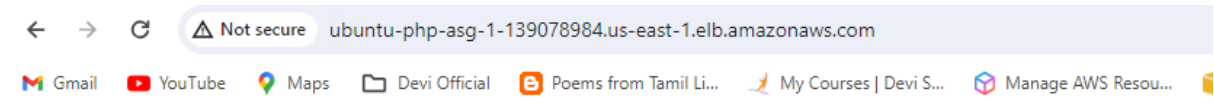
**Outbound rules**

Name	Security group rule ID	Port range	Protocol	Destination	Security groups	Description
-	sgr-0d68e391c0f828363	All	All	0.0.0.0/0	launch-wizard-1	-

## Load Balancer DNS



## Hello World from Server 1



## Hello World from Server 2

Hostname modification to be done as below with Route53 to direct traffic to load balancer

