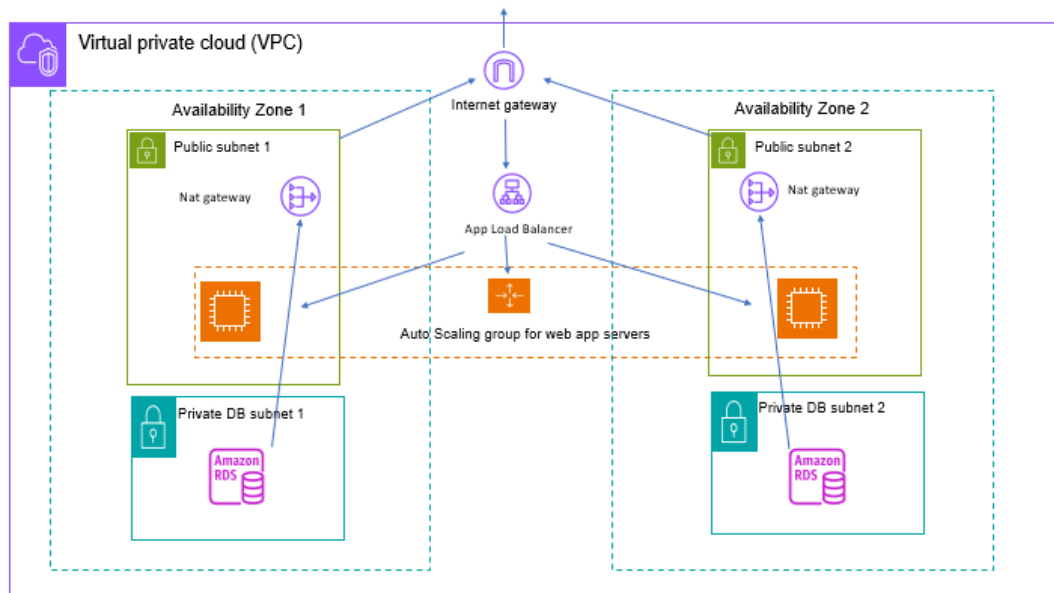


Network Diagram



Challenge: There is no second db in these instructions because our free tier doesn't allow multiAZ replication

Challenge: Writing HTML and PHP files to connect to the database and properly display data

Challenge: Finding out proper PHP and MYSQL dependencies to download for operation of web app

Challenge: S3 bucket implementation due to Learner Lab restrictions of IAM Roles, GitHub is our substitute

Steps To Setup

1. Go to the **VPC Dashboard** and click **Create VPC**
 - a. VPC Only
 - b. Name: FinalProject
 - c. CIDR block: 192.168.0.0/16
 - d. Ipv6 CIDR block: none
 - e. Tenancy: Default

Your VPCs (2) Info				
<input type="text" value="Search"/>				
<input type="checkbox"/>	Name	VPC ID	State	IPv4 CIDR
<input type="checkbox"/>	-	vpc-026fb802e33169ede	Available	172.31.0.0/16
<input type="checkbox"/>	FinalProject	vpc-008b34043b1636013	Available	192.168.0.0/16

2. Go to **Subnets** and click **Create Subnet**
 - a. Choose the **FinalProject** VPC
 - b. Create the below subnets
 - i. Public
 1. FinalPubA: 192.168.1.0/24 in us-east-1a
 2. FinalPubB: 192.168.2.0/24 in us-east-1b
 - ii. Database

1. FinalDBA: 192.168.5.0/24 in us-east-1a
2. FinalDBB: 192.168.6.0/24 in us-east-1b

Subnets (10) [Info](#)

Find resources by attribute or tag

<input type="checkbox"/>	Name	Subnet ID	State	VPC	IPv4 CIDR
<input type="checkbox"/>	FinalPubB	subnet-0510616a35a935fe1	Available	vpc-008b34043b1636013 Fin...	192.168.2.0/24
<input type="checkbox"/>	FinalPubA	subnet-0cb86d1bdbec1b90b	Available	vpc-008b34043b1636013 Fin...	192.168.1.0/24
<input type="checkbox"/>	FinalDBB	subnet-058462ec3b8077692	Available	vpc-008b34043b1636013 Fin...	192.168.6.0/24
<input type="checkbox"/>	FinalDBA	subnet-0522ac3c63246c314	Available	vpc-008b34043b1636013 Fin...	192.168.5.0/24

- c. Enable auto-assign public IPv4 for FinalPubA and FinalPubB by selecting the subnets and clicking **Actions > Edit Subnet Settings** and selecting **enable auto-assign ipv4 address**
3. Go to **Internet Gateways** and click **create the internet gateway**.
 - a. Name it **FinalIGW** and create it
 - b. Attach it to our FinalProject VPC by clicking **Actions > Attach to VPC** and selecting the FinalProject VPC

Internet gateways (2) [Info](#)

Search

<input type="checkbox"/>	Name	Internet gateway ID	State	VPC ID
<input type="checkbox"/>	-	igw-0a6ddbcb9bef31a	Attached	vpc-026fb802e33169ede
<input type="checkbox"/>	FinalIGW	igw-008a881ccf7cd1dbc	Attached	vpc-008b34043b1636013 FinalProject

4. Go to **Route Tables > Create Route Table**
 - a. Name: FinalRtTable
 - b. VPC: FinalProject VPC
 - c. Once Created, select the created route table and click **Actions > Edit Routes**
 - i. Add the below route:
 1. Destination 0.0.0.0/0
 2. Target: Internet Gateway, FinalIGW
 - d. Select the route table and go to **Actions > Edit Subnet Associations**
 - i. Associate FinalPubA and FinalPubB with FinalRtTable

<input checked="" type="checkbox"/>	FinalRtTable	rtb-06aed1b010d4adae9	2 subnets	subnet-0510616a35a935fe1 / FinalPubB subnet-0cb86d1bdbec1b90b / FinalPubA
-------------------------------------	--------------	-----------------------	-----------	---

rtb-06aed1b010d4adae9 / FinalRtTable

Details | **Routes** | Subnet associations | Edge associations | Route propagation | Tags

Routes (2)

Filter routes

Destination	Target	Status
0.0.0.0/0	igw-008a881ccf7cd1dbc	Active

5. Create Nat Gateways and Routes to them
 - a. Go to **Nat Gateways > Create NAT Gateway**

- i. Name: FinalNATA
 - ii. Subnet: FinalPubA
 - iii. Allocate an Elastic IP for the gateway
- b. Go to **Route Tables > Create Route Table**
 - i. Name: FinalNATRТА
 - ii. VPC: FinalProject
 - iii. Once created, click **Actions > Subnet Associations**
 1. Associate it with FinalDBA
 - iv. Click **Actions > Edit Routes**
 1. Destination: 0.0.0.0/0
 2. Target: NAT Gateway, FinalNATA
- c. Repeat these steps for another NAT Gateway called FinalNATB with the subnet as FinalPubB, and a route table called FinalNATRТВ associated with FinalDBB

NAT gateways (2) [info](#)

Filter NAT gateways

	Name	NAT gateway ID	State	Primary public I...	Primary p...	VPC	Subnet
<input type="radio"/>	FinalNatB	nat-080475846cf916c9b	Available	34.202.222.30	192.168.2.18	vpc-008b34043b1636013 / FinalProject	subnet-0510616a35a935fe1 / FinalPubB
<input type="radio"/>	FinalNATA	nat-0cf7611de3df7877	Available	44.217.210.101	192.168.1.102	vpc-008b34043b1636013 / FinalProject	subnet-0cb86d1bdbec1b90b / FinalPubA

	Name	Route table ID	Explicit subnet associations	Edge associations
<input checked="" type="checkbox"/>	FinalNatRTB	rtb-06844ed6c951d80ae	subnet-058462ec3b8077692 / FinalDBB	-
<input type="checkbox"/>	FinalNatRTA	rtb-0b0f880b8deed1d05	subnet-0522ac3c63246c314 / FinalDBA	-
<input type="checkbox"/>	-	rtb-01637ce0c62ad5249	-	-
<input type="checkbox"/>	FinalRtTable	rtb-06aed1b010d4adae9	2 subnets	-
<input type="checkbox"/>	-	rtb-0f16d498faf114edb	-	-

rtb-06844ed6c951d80ae / FinalNatRTB

Details | **Routes** | Subnet associations | Edge associations | Route propagation | Tags

Routes (2)

Filter routes

Destination	Target	Status
0.0.0.0/0	nat-080475846cf916c9b	Active

6. Database Setup

- a. Go to the **VPC Dashboard > Security Groups**
 - i. Create security group
 1. Name: FinalEC2SG
 2. Description : Final EC2 SG
 3. VPC: FinalProject
 4. Inbound rules
 - a. Allow ssh from anywhere ipv4
 - i. Usually, you would only allow this from a bastion host, for this example we will allow from anywhere
 - b. Allow http from anywhere ipv4
 - ii. Create security group

1. Name: FinalDBSG
2. Description : Final DB SG
3. VPC: FinalProject
4. Inbound rules
 - a. Allow ssh from anywhere ipv4
 - i. Usually, you would only allow this from a bastion host, for this example we will allow from anywhere
 - b. Allow MYSQL/Aurora from FinalEC2SG security group

Security Groups (4) [Info](#)

Q

Find resources by attribute or tag

<input type="checkbox"/>	Name ▾	Security group ID ▾	Security group name ▾	VPC ID ▾	Description
<input type="checkbox"/>	-	sg-0579dddf907ac36751	default	vpc-026fb802e33169ede	default VPC security group
<input type="checkbox"/>	-	sg-0ac6eed1100f83858	FinalEC2SG	vpc-008b34043b1636013	Final EC2 SG
<input type="checkbox"/>	-	sg-0ed48bc9d368cca77	FinalDBSG	vpc-008b34043b1636013	Final DB SG
<input type="checkbox"/>	-	sg-0bbf88b0f810b20e4	default	vpc-008b34043b1636013	default VPC security group

b. Go to RDS Dashboard > Subnet Groups

- i. Create DB subnet group
 1. Name: FinalDBSubGroup
 2. Description: DB Subnet Group
 3. VPC: FinalProject
 4. Availability Zones: us-east-1a,us-east-1b
 5. Subnets:
 - a. 192.168.5.0/24
 - b. 192.168.6.0/24

finaldbsubgroup

Subnet group details

VPC ID

vpc-008b34043b1636013

ARN

arn:aws:rds:us-east-1:269278490714:subgrp:finaldbsubgroup



Supported network types

IPv4

Description

DB Subnet Group

Subnets (2)

Availability zone	Subnet ID	CIDR block
us-east-1b	subnet-058462ec3b8077692 	192.168.6.0/24
us-east-1a	subnet-0522ac3c63246c314 	192.168.5.0/24

c. Go to RDS > Databases

- i. Click Create Database
 1. Creation Method: Standard Create
 2. Engine Type: MySQL
 3. Templates: Free tier
 4. Settings
 - a. DB Instance Identifier: FinalDB

- b. Credentials
 - i. Username: admin
 - ii. Password: goldowl77
5. Connectivity
 - a. VPC: FinalProject
 - b. Subnet Group: FinalDBSubGroup
 - c. Existing Security Group: FinalDBSG
 - d. Availability zone: us-east-1a
6. Additional Configuration:
 - a. Initial Database Name: FinalDBName
7. Create Database and wait until it is created. Then, select the database and copy its Endpoint into a text file to be used later

RDS > Databases > finaldb

finaldb

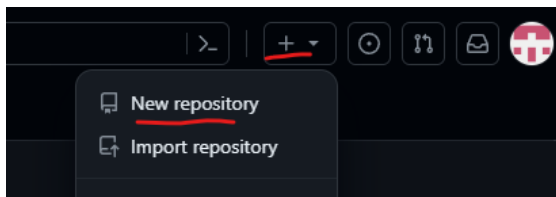
Summary

DB identifier finaldb	CPU 2.96%	Status Available	Class db.t3.micro
Role Instance	Current activity 0 Connections	Engine MySQL Community	Region & AZ us-east-1a

Connectivity & security

Endpoint & port Endpoint finaldb.cpyr107ra164.us-east-1.rds.amazonaws.com Port 3306	Networking Availability Zone us-east-1a VPC FinalProject (vpc-008b34043b1636013) Subnet group finaldbsubgroup	Security VPC security groups FinalDBSG (sg-0ed48bc9d368cca77) Active Publicly accessible No Certificate authority info
--	--	---

7. Go to github.com and make a **public** github repository



- a. Add a file to the created repository with a filename of index.html and save it with the following data

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Wonderful Cloud Website</title>
</head>
<body>
```

```

<h1>Look at these very awesome movies :D</h1>
<div id="output"></div>
<script>
// Use JavaScript to make an AJAX request to the PHP file
var xhttp = new XMLHttpRequest();
xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {
        // Display the response in the 'output' div
        document.getElementById("output").innerHTML = this.responseText;
    }
};
xhttp.open("GET", "request.php", true);
xhttp.send();
</script>
</body>
</html>

```

- b. Add a file to the repository called request.php and save to it the following data.
BE SURE TO REPLACE SERVERNAME WITH THE ENDPOINT OF YOUR RDS DATABASE INSTANCE

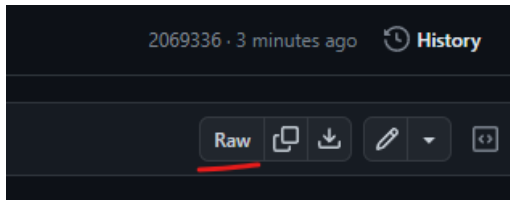
```

<?php
$hostname = gethostname();
$servername = "REPLACE ME";
$username = "admin";
$password = "goldowl77";
$dbname = "FinalDBName";
// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);
// Check connection
if ($conn->connect_error) {
    die("Connection failed: " . $conn->connect_error);
}
//RDS Movie Table Data
$sql = "SELECT title, genre, director, release_year FROM movies;";
$result = $conn->query($sql);
if($result->num_rows > 0) {
    while ($row = $result->fetch_assoc()){
        $title=$row['title'];
        $genre=$row['genre'];
        $release=$row['release_year'];
        $director=$row['director'];
        echo "Title: $title, Genre: $genre, Released in: $release, Directed by: $director <br>";
    }
}
}

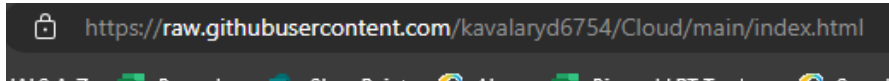
```

```
echo "<p>Hostname: $hostname</p>";  
?>
```

- c. Select each file and get the raw file content link by clicking the **raw** button



- d. Copy each files raw link in the address bar



8. Go to **EC2 Dashboard > Instances > Launch Instances**

a. EC2 Details

- i. Name: FinalEC2
- ii. AMI: Amazon linux 2023 AMI
- iii. Key pair: vockey
- iv. Network Settings
 1. VPC: FinalProject
 2. Subnet: FinalPubA
 3. Existing Security Group: FinalEC2SG
- v. Advanced details
 1. User Data: **Replace the two git links with the raw github links**

```
#!/bin/bash
```

```
sudo su
```

```
yum update -y
```

```
yum install -y httpd
```

```
yum install -y php
```

```
yum install -y mysql
```

```
yum install -y php8.2-mysqlnd.x86_64
```

```
dnf -y localinstall https://dev.mysql.com/get/mysql80-community-release-el9-4.noarch.rpm
```

```
yum install mysql mysql-community-client -y
```

```
wget https://raw.githubusercontent.com/ReplacementPath/index.html -P /var/www/html/
```

```
wget https://raw.githubusercontent.com/ReplacementPath/request.php -P /var/www/html/
```

```
systemctl start httpd
```

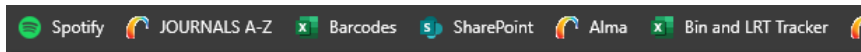
```
systemctl enable httpd
```

- b. Launch the instance, and when it's available and passed its checks, enter its public address into the address bar in a browser to see the web server work. It will list no movies because we have not populated the database with data yet
- c. Connect to the EC2 instance by selecting the instance and clicking **Connect > Connect**
 - i. Type the below command to connect to the database: **REPLACE THE BOLD LETTERS WITH THE DATABASE ENDPOINT**
 1. `sudo mysql -h DatabaseEndpoint -u admin -pgoldowl77`

- ii. Type the below to begin database creation stuff:
 1. use FinalDBName;
- iii. Copy paste the below commands all at once to create a table and fill it with data, then examine the creation of data

```
CREATE TABLE movies(title VARCHAR(50) NOT NULL,genre VARCHAR(30) NOT NULL,director VARCHAR(60) NOT NULL,release_year INT NOT NULL,PRIMARY KEY(title));
DESCRIBE movies;
INSERT INTO movies VALUE ("Joker", "psychological thriller", "Todd Phillips", 2019);
INSERT INTO movies VALUE ("Alec The Movie", "Horror", "Elon Musk", 1887);
select * FROM movies;
```

- d. Refresh the EC2 Public IP and you will see the page update. Adding any data to the database will show up once you request the page again



Look at these very awesome movies :D

Title: Alec The Movie, Genre: Horror, Released in: 1887, Directed by: Elon Musk

Title: Joker, Genre: psychological thriller, Released in: 2019, Directed by: Todd Phillips

Hostname: ip-192-168-2-87.ec2.internal

9. Go to **EC2 Dashboard >Load Balancers > Create Load Balancer**

- a. Choose Application Load Balancer
 - i. Name: FinalELB
 - ii. Scheme: Internet facing
 - iii. Network Mapping
 1. VPC: FinalProject VPC
 2. Select both us-east-1a and us-east-1b
 - a. Choose the FinalPubA and FinalPubB subnets for the availability zones
 - iv. Use the FinalEC2SG security group and de-select the default security group
 - v. Under Listeners and routing click **Create target group**
 1. Target type: Instances
 2. Name: FinalTargetGroup
 3. VPC: FinalProject
 4. Next
 5. Select the EC2 instance and click "Include as pending below" to add it to the target group
 6. Click create target group
 7. Go back to the application load balancer tab
 - vi. Click the refresh button next to target group and select the new FinalTargetGroup target group
 - vii. Click create load balancer

Load balancers (1)

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

Q Filter load balancers

<input type="checkbox"/>	Name	DNS name	State	VPC ID	Availability Zones	Type
<input type="checkbox"/>	FinalELB	FinalELB-326134083.us-e...	Active	vpc-008b34043b1636...	2 Availability Zones	application

10. Go back to the EC2 instances page and select the instance
 - a. Click **Actions > Image and Templates > Create Image**
 - i. Name: FinalAMI
 - ii. Create Image
 - b. Click **Instances > launch templates** in the left hand nav bar in the EC2 dashboard
 - i. Click Create Launch Template
 - ii. Name: FinalTemplate
 - iii. Description: Template For EC2 Instances
 - iv. Select the Auto Scaling guidance checkbox
 - v. Application and OS Images:
 1. Select **My AMIs > Owned by me** and choose the FinalAMI AMI for the Image
 - vi. Instance type:t2.Micro
 - vii. KeyPair: Don't include in launch template
 - viii. Network settings:
 1. Subnet: Don't include in launch template
 2. Security group: FinalEC2SG
 - ix. Create launch template

Launch Templates (1) Info

Q Search

Launch Template ID	Launch Template Name
<input type="radio"/> lt-05ad6a151ec46ffc6	FinalTemplate

11. Go to **EC2 Dashboard > Auto Scaling Groups > Create Auto Scaling Group**
 - a. Choose Launch Template
 - i. Name: FinalASG
 - ii. Launch templates: FinalTemplate
 - iii. Click next
 - b. Choose instance launch options
 - i. VPC: Final Project
 - ii. Availability Zones and Subnets
 1. us-east-1a, FinalPubA
 2. us-east-1b, FinalPubB
 3. Click next
 - c. Configure Advanced Options

- i. Attach an existing load balancer
 1. Choose from your load balancer target groups
 - a. Existing LBTG: FinalTargetGroup
- ii. Click next
- d. Configure group size and scaling
 - i. Group size
 1. Desired capacity: 3
 - ii. Scaling:
 1. Minimum capacity 2
 2. Maximum capacity 4
 3. Select Target Tracking Scaling Policy
 - a. Policy name: FinalTTSP
 - b. Metric type: Average CPU Utilization
 - c. Target Value: 50%
 - iii. Next
- e. Continue with defaults until creation

Auto Scaling groups (1) Info									
<input type="text"/> Search your Auto Scaling groups									
<input type="checkbox"/>	Name	Launch template/configuration	Instances	Status	Desired capacity	Min	Max	Availability Zones	
<input type="checkbox"/>	FinalASG	FinalTemplate Version Default	2	-	2	2	4	us-east-1a, us-east-1b	

12. After the group is created, go back to the EC2 instance dashboard and view the created instances. Wait until these have finished being created and passed their checks before proceeding. Once finished, **terminate** the FinalEC2 EC2 instance

Instances (4) Info							
<input type="text"/> Find Instance by attribute or tag (case-sensitive)							
<input type="checkbox"/>	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
<input type="checkbox"/>		i-03823c2351b267bf5	Terminated	t2.micro	-	No alarms	us-east-1b
<input type="checkbox"/>		i-0ac84cc93f47ddfdf	Running	t2.micro	2/2 checks passed	No alarms	us-east-1b
<input type="checkbox"/>	FinalEC2	i-00acddf0e85d14340	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a
<input type="checkbox"/>		i-057074b11d611a9a6	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a

13. Copy the DNS name of the FinalELB load balancer into several web browsers and see the effects of the load balancer

Title: Alec The Movie, Genre: Horror, Released
 Title: Joker, Genre: psychological thriller, Released

Hostname: ip-192-168-1-4 ec2.internal

Look at these very awe

Title: Alec The Movie, Genre: Horror, Released
 Title: Joker, Genre: psychological thriller, Released

Hostname: ip-192-168-2-87 ec2.internal