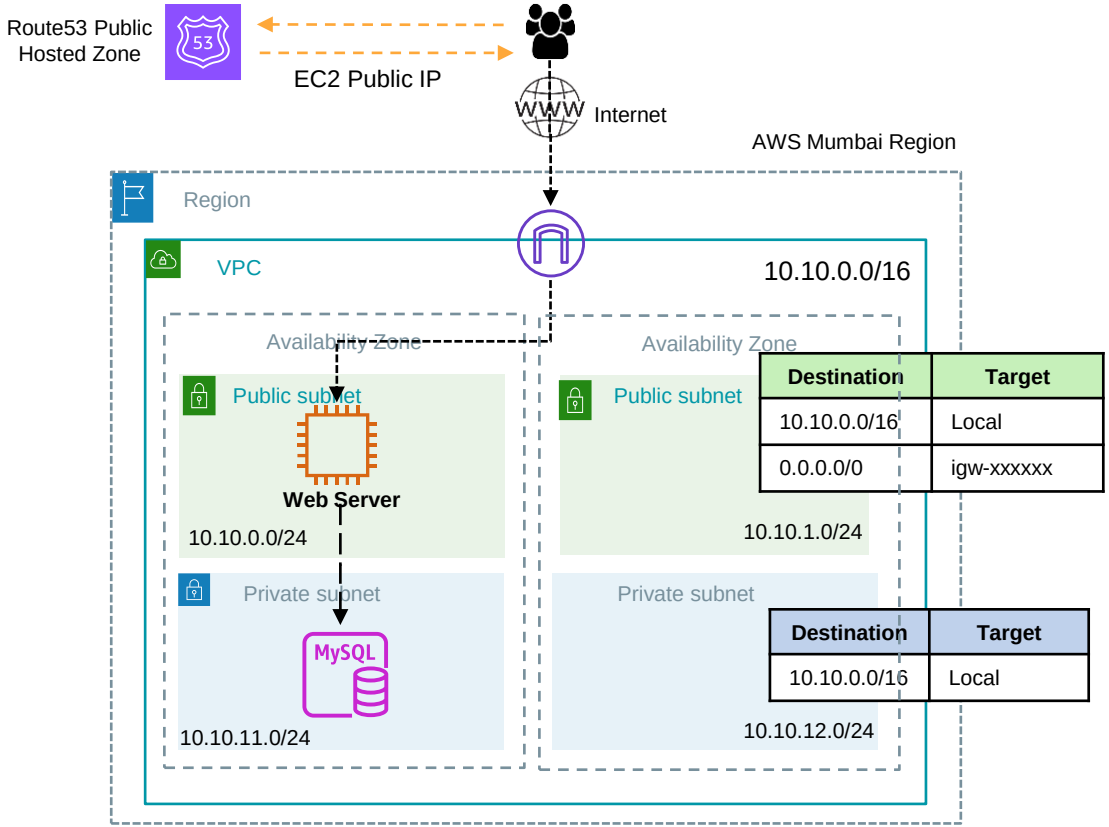
Assignment (Part 1):

Deploy 2-tier web application

Using EC2 and RDS database

Architecture & High level steps



High level steps

1. Using VPC wizard, create a new VPC, an internet gateway, 2 Public Subnets, 2 Private subnets and corresponding route tables.
2. Launch an EC2 instance in the Public subnet and connect over SSH.
3. Create MySQL RDS database in the Private subnet
4. Install a web server on EC2 and configure the web application to connect to RDS database. *[sample code provided in the github repo]*
5. Access web application using EC2 Public IP. Add data from the application screen and verify that data is stored into the backend MySQL database.

Step 1 – Create VPC, Subnets & Route tables

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1. Go to VPC console -> Your VPCs -> Create VPC
    a. VPC Settings -> select **VPC & more**
    b. Name Tag: webapp
    c. IPv4 CIDR: 10.10.0.0/16
    d. Number of Availability Zones (AZs): 2
    e. Number of Public Subnets: 2
    f. Number of Private Subnets: 2
    g. Customize subnets CIDR blocks
        a. Public subnet CIDR in Availability Zone 1: 10.10.0.0/24
        b. Public subnet CIDR in Availability Zone 2: 10.10.1.0/24
        c. Private subnet CIDR in Availability Zone 1: 10.10.11.0/24
        d. Private subnet CIDR in Availability Zone 2: 10.10.12.0/24
    h. NAT Gateways: None
    i. VPC Endpoints: None
    j. Create VPC

Step 1 – Create VPC, Subnets & Route tables

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aws | Services | rds | Mumbai

IPv4 CIDR block Info
Determine the starting IP and the size of your VPC using CIDR notation.
10.10.0.0/16 — 65,536 IPs

IPv6 CIDR block Info
- No IPv6 CIDR block
- Amazon-provided IPv6 CIDR block

Tenancy Info
Default

Number of Availability Zones (AZs) Info
Choose the number of AZs in which to provision subnets. We recommend at least two AZs for high availability.
1 | 2 | 3

▶ Customize AZs

Number of public subnets Info
The number of public subnets to add to your VPC. Use public subnets for web applications that need to be publicly accessible over the internet.
0 | 2

Number of private subnets Info
The number of private subnets to add to your VPC. Use private subnets to secure backend resources that don't need public access.
0 | 2 | 4

▼ Customize subnets CIDR blocks

Public subnet CIDR block in ap-south-1a
10.10.0.0/24 — 256 IPs

Public subnet CIDR block in ap-south-1b
10.10.1.0/24 — 256 IPs

Private subnet CIDR block in ap-south-1a
10.10.11.0/24 — 256 IPs

Private subnet CIDR block in ap-south-1b
10.10.12.0/24 — 256 IPs

Preview

VPC Show details
Your AWS virtual network
webapp-vpc

Subnets (4)
Subnets within this VPC
ap-south-1a
webapp-subnet-public1-ap-south-1a
webapp-subnet-private1-ap-south-1a
ap-south-1b
webapp-subnet-public2-ap-south-1b
webapp-subnet-private2-ap-south-1b

Route tables (3)
Route network traffic to resources
webapp-rtb-public
webapp-rtb-private1-ap-south-1a
webapp-rtb-private2-ap-south-1b

Network connections (1)
Connections to other networks
webapp-igw

Step 2 - Launch an EC2 instance and connect

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1. Launch EC2 instance in newly created Public Subnet
    a. Go to EC2 Service -> EC2 Dashboard -> Launch Instances
    b. Name: Webserver
    c. Select AMI: Amazon Linux (default) *[by default it should select Amazon Linux 2023 AMI – Free tier eligible]*
    d. Select instance type: t2.micro (default)
    e. Select key pair : *<key-pair that you had created earlier>*
        a. *If you don't see the key-pair in the dropdown then check if you are using the correct AWS region in which you had previously created key-pair.*
        b. *If you still don't see key-pair, then cancel the ec2 creation flow and first create a new key-pair as described in the prerequisites section*
    f. Network settings -> Edit -> Select your VPC (webapp-vpc) and you're a public subnet in availability zone a
    g. Auto-Assign Public IP: **Enable**
    h. Firewall -> Create security group
        a. Name: webapp-ec2-sg
        b. Add Inbound Security group rule: SSH (port 22) for source CIDR 0.0.0.0/0
        c. Add Inbound Security group rule: HTTP (port 80) for source CIDR 0.0.0.0/0
    i. Configure Storage -> 1 x 8GiB, gp3 (default)
    j. Launch Instance
    k. Go to instances page -> Select the instance you just launched -> see the Details -> Copy Public IPv4 address

Step 2 - Launch an EC2 instance and connect

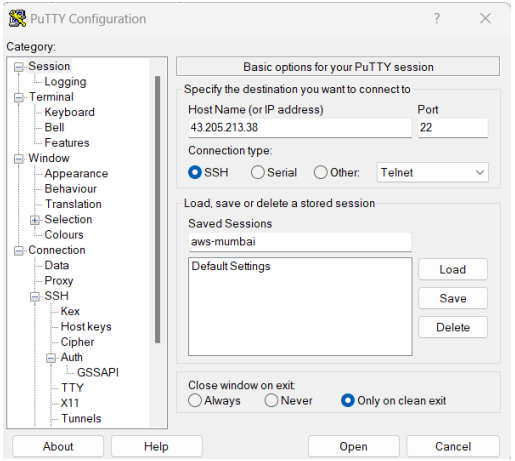
2. Connect to EC2 instance with *Public IP* from your workstation

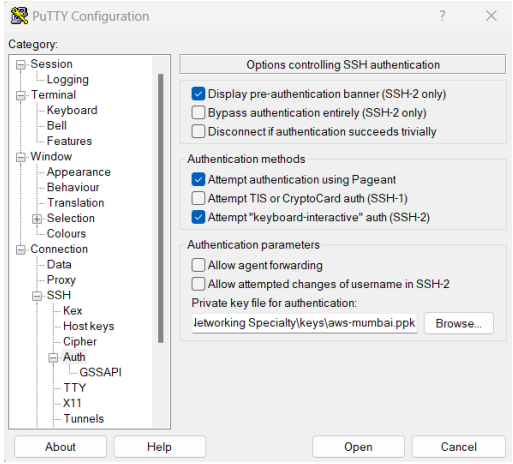
If using Windows workstation:

i. Open PuTTy -> In the “Host name” provide the Public IP of EC2 instance
ii. Left panel -> SSH -> Auth -> Browse and select your ssh .pem key file
iii. Open -> Accept
iv. Provide username as ec2-user

If using Linux/Mac workstation

i. Open Terminal and run following command with correct path for the .pem key file
ii. *$ssh -i <path/to/key.pem> ec2-user@<ec2-public-ip-address>*





Step 3 - Create a RDS database

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1. Go to RDS console
2. Create DB Subnet group
    a. Select Subnet Groups from the left panel -> Create DB subnet group
    b. Name: webapp-db-subnet-group, Description: DB Subnet group
    c. VPC: select webapp-vpc
    d. Add Subnets: Availability Zones: Select a and b
    e. Subnets: Select 10.10.11.0/24 for AZ a and 10.10.12.0/24 for AZ b
    f. Create
3. Go to Databases -> Create Database
    a. Select Standard Create
    b. Engine Options: Select **MySQL**
    c. Templates: Select Free tier
    d. DB cluster identifier: webapp-db
    e. Credential Settings -> Master Username: admin, Master password: <password of your choice>, Confirm master password
    f. Connectivity
        a. Virtual Private Cloud (VPC): Select webapp-vpc,
        b. DB Subnet group: Select webapp-db-subnet-group
        c. Public access: No
        d. VPC security group (firewall) -> Create new -> Name: webapp-db-security-group
        e. Database authentication: Password authentication
        f. Additional configuration -> Initial database name: **corp**
        g. Create database & wait for database to be fully created

Step 3 - Create a RDS database

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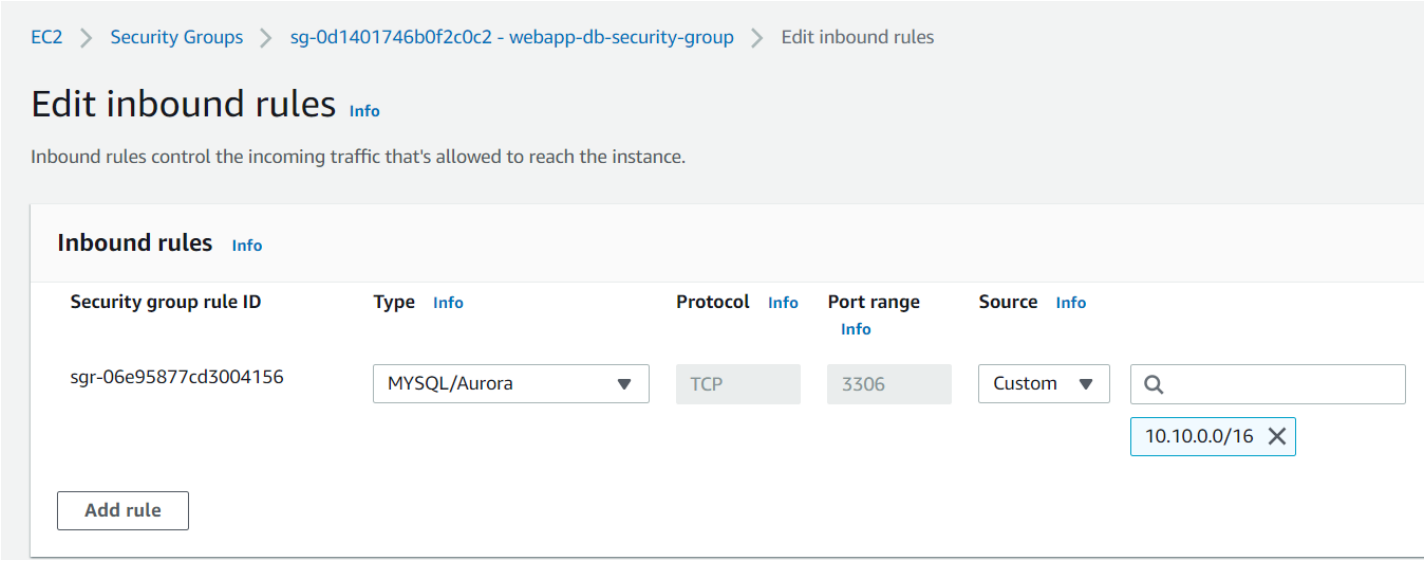
4. Update DB security group to allow inbound traffic from VPC CIDR
   a. Select the database you just created -> Connectivity & Security -> Click on VPC Security groups link (this should open EC2 console with DB security group selected)
   b. Select inbound rules -> Edit inbound rules -> Update the source to 10.10.0.0/16



Step 3 - Create a RDS database

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RDS > Databases > webapp-db

webapp-db

Summary

DB identifier webapp-db	CPU 17.26%	Status Backing-up	Class db.t3.micro
Role Instance	Current activity 0 Connections	Engine MySQL Community	Region & AZ ap-south-1a

Connectivity & security | Monitoring | Logs & events | Configuration | Maintenance & backups | Tags

Connectivity & security

Endpoint & port

Endpoint
webapp-db.c7hlm0zu48q0.ap-south-1.rds.amazonaws.com

Port
3306

DB instance endpoint

Networking

Availability Zone
ap-south-1a

VPC
webapp-vpc (vpc-01e46c1a43e6c21bd)

Subnet group
webapp-db-subnet-group

Subnets
subnet-071d1c9a830519788
subnet-0003144382ac507fe

Security

VPC security groups
webapp-db-security-group (sg-074821d16ef63f6ec)
Active

Publicly accessible
No

Certificate authority Info
rds-ca-2019

Certificate authority date
August 22, 2024, 18:08 (UTC+01:00)

Step 4 - Install and configure webapp on EC2

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1. Connect EC2 instance over the SSH using EC2 Public IP
2. Install Apache web server and PHP packages

```
$sudo su
$dnf update -y
$dnf install -y httpd php php-mysqli mariadb105
$systemctl start httpd
$systemctl enable httpd
```

3. Configure DB connection settings

```
$cd /var/www
$mkdir inc
$cd inc
```

Create a new file called dbinfo.inc [using your favourite editor like vi or nano] and add following content. Replace the values for the parameters based on your environment. (You can download sample file from the lecture resources.)

```
<?php
define('DB_SERVER', 'db_instance_endpoint');
define('DB_USERNAME', 'admin');
define('DB_PASSWORD', 'master password');
define('DB_DATABASE', 'corp');
?>
```

Step 4 - Install and configure webapp on EC2

AWS with Chetan

4. Create application file corp.php in /var/www/html directory.
   a. You can use the corp.php file from github repo: https://github.com/chetanagrawal/aws-networking-exercises/tree/main/Deploy-2-Tier-Web-Application or can also download it from the lecture resources.
5. Open your browser and hit the URL http://PUBLICIP/corp.php
6. Add few sample entries from the form on the webpage

Step 5 – Verify data in the database

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1. Install mqsql client in the ec2 instance

```
# install pip (Amazon Linux 2023 does not have one by default)
$dnf install -y pip

# install dependencies
$dnf install -y mariadb105-devel gcc python3-devel

# install mysqlclient
$pip install mysqlclient
```

2. Connect to Database and query the data

```
$mysql -h <database endpoint> -u admin –p
$MySQL [(none)]> connect corp
$MySQL [corp]> select * from EMPLOYEES;
```

3. Add more data from the web page and see if changes reflect. Optionally insert the data into the database table directly and see if webpage displays the data.

```
MySQL [corp]> insert into EMPLOYEES values ('2','Pankaj','35','Mumbai');
Query OK, 1 row affected (0.003 sec)
```

Step 5 – Verify the data into the database

```
[root@ip-10-10-0-18 inc]# mysql -h webapp-db.c7hlm0zu48q0.ap-south-1.rds.amazonaws.com -u admin -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 28
Server version: 8.0.32 Source distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

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

MySQL [(none)]> connect corp
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Connection id:    29
Current database: corp

MySQL [corp]> select * from EMPLOYEES;
+----+--------+------+------+
| ID | NAME   | AGE  | CITY |
+----+--------+------+------+
|  1 | Chetan |   40 | Pune |
+----+--------+------+------+
1 row in set (0.001 sec)

MySQL [corp]>
```

Step 5 – Verify the data from the web page

Not secure | 43.205.213.38/corp.php

Welcome to my project website !

NAME AGE CITY

Add Data

ID	NAME	AGE	CITY
1	Chetan	40	Pune
2	Pankaj	35	Mumbai

Congratulations !! You have completed part 1 of the assignment successfully.

Step 6 – Setup Public DNS

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1. Setup the public DNS for your web application
   a. Assuming you have already got the Public domain name and you have created Route53 Public hosted zone as described in the pre-requisites section. You can't proceed with following steps if you haven't done those steps.
   b. Go to Route 53 console -> Hosted Zones -> click your domain name
   c. Create record
      a. Record name: leave blank
      b. Record type: A – Routes traffic to an IPv4 address and some AWS resources
      c. Value: enter the value of Public IP of EC2 instance
      d. Create records
2. Verify DNS
   a. Open browser and access your webapp using http://YOUR_DOMAIN_NAME/corp.php

Well Done !!

Do not delete this setup as you will need it for Assignment Part 2