Name: Shoaib Akhtar Roll no: p20-0147 Cloud Project demo:

Deploying an application on a three-tier architecture.

First we created the vpc

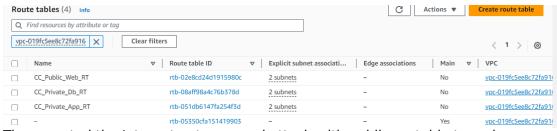


Then we have created the 6 subnnets

Name	▼ Subnet ID	▼ State	▼ VPC	▼ IPv4 CIDR
CC_Private_App_subnet02	subnet-02565a03278f3a95c	Available	<u>vpc-019fc5ee8c72f</u>	fa916 CC Pr 172.20.4.0/24
CC_Private_Db_subnet01	subnet-0d152b1b1dcc13dcb	Available	<u>vpc-019fc5ee8c72f</u>	fa916 CC Pr 172.20.5.0/24
CC_Private_App_subnet01	subnet-0e1865e38020fc11f	Available	<u>vpc-019fc5ee8c72f</u>	fa916 CC Pr 172.20.3.0/24
CC_Public_Web_subnet02	subnet-0ce9fe4bd83e12f87	Available	<u>vpc-019fc5ee8c72f</u>	fa916 CC Pr 172.20.2.0/24
CC_Public_Web_subnet01	subnet-04dffa2e5f4906293	Available	vpc-019fc5ee8c72f	fa916 CC_Pr 172.20.1.0/24
CC_Private_Db_subnet02	subnet-0b7aaaee3f461a60d	Available	vpc-019fc5ee8c72f	fa916 CC Pr 172.20.6.0/24

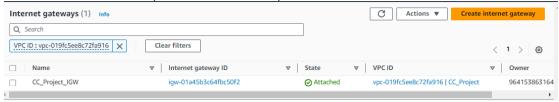
Then created the 3 route table and also attach the subnets

- 1 Public web route table with 2 public subnet
- 1 Private App route table with 2 Private App subnet
- 1 Private DB route table with 2 private Db subnet



Then created the Internet gateway and attach with public routable to make connect with internet

And also attach with vpc and add it with public rout table in bound rule



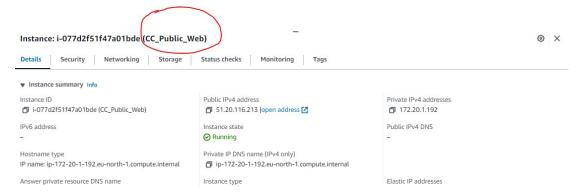
Then created the NAT gateway to make connection between the public and private instances

Attach it with private rout tables as inbound rule



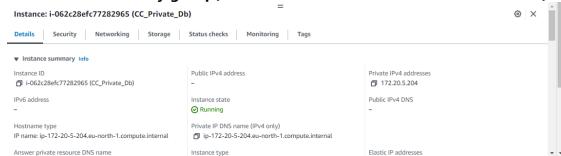
Now EC2 instances creating Configure CC_Public_Web

- Enable assign IP
- Security group --> connect with ssh only as inbound rule

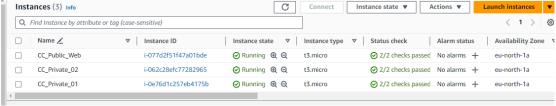


Configure CC_Private_App

- Disable assign IP
- Security group --> connect with ssh only as inbound rule + load balancer security group(added later after creation of load balancer)



Creating 3 intances 1 public and 2 priavate:



Acessing locally private instances with public instances

Acessing public instance:

```
ECDSA key fingerprint is SHA256:F7M0uM8MdV1gmVm7pLEqw3ueuPe67EN1t50hRQnUbzI.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '51.20.116.213' (ECDSA) to the list of known hosts.
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-1017-aws x86_64)
 * Documentation: https://help.ubuntu.com

* Management: https://landscape.canonical.com

* Support: https://ubuntu.com/advantage
 * Support:
   System information as of Tue Dec 26 18:10:03 UTC 2023

      System load:
      0.0
      Processes:
      99

      Usage of /:
      21.7% of 7.57GB
      Users logged in:
      0

      Memory usage:
      20%
      IPv4 address for ens5:
      172.20.1.192

   Swap usage:
Expanded Security Maintenance for Applications is not enabled.
0 updates can be applied immediately.
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status
Expanded Security Maintenance for Applications is not enabled.
0 updates can be applied immediately.
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status
The list of available updates is more than a week old.
To check for new updates run: sudo apt update
Last login: Tue Dec 26 11:14:57 2023 from 39.47.22.130
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
ubuntu@ip-172-20-1-192:~$
```

Access successfully

Now accessing the private instances with public

First I have transfer the file over server with the command mean private key send over the public instance using command

scp -i CloudProject.pem /home/abdulsubhan/Downloads/CloudProject.pem ubuntu@51.20.116.213:/home/ubuntu/

Which come on the public server by the use of it now we can be able to access the private instances

```
ubuntu@ip-172-20-1-192:~$ ls
CloudProject.pem
ubuntu@ip-172-20-1-192:~$
```

DB instances acessed successfully

```
ubuntu@ip-172-20-1-192:~$ ssh -i "CloudProject.pem" ubuntu@172.20.5.204
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-1017-aws x86_64)
 * Documentation: https://help.ubuntu.com
 * Management:
                    https://landscape.canonical.com
https://ubuntu.com/advantage
 * Support:
  System information as of Tue Dec 26 18:16:25 UTC 2023
  System load: 0.080078125
                                     Processes:
                                                              109
  Usage of /: 32.2% of 7.57GB Users logged in:
                                                              0
  Memory usage: 60%
                                     IPv4 address for ens5: 172.20.5.204
  Swap usage: 0%
Expanded Security Maintenance for Applications is not enabled.
26 updates can be applied immediately.
19 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable
2 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm
Last login: Tue Dec 26 13:10:01 2023 from 172.20.1.192
ubuntu@ip-172-20-5-204:~$
```

App instances private accessing

```
ubuntu@ip-172-20-1-192:~$ ssh -i "CloudProject.pem" ubuntu@172.20.3.232
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-1017-aws x86_64)
* Documentation: https://help.ubuntu.com
                  https://landscape.canonical.com
* Management:
* Support:
                  https://ubuntu.com/advantage
 System information as of Tue Dec 26 18:18:17 UTC 2023
 System load: 0.01220703125
                                 Processes:
                                                        107
 Usage of /: 32.2% of 7.57GB Users logged in:
                                                        0
 Memory usage: 60%
                                 IPv4 address for ens5: 172.20.3.232
 Swap usage:
* Ubuntu Pro delivers the most comprehensive open source security and
  compliance features.
  https://ubuntu.com/aws/pro
Expanded Security Maintenance for Applications is not enabled.
26 updates can be applied immediately.
19 of these updates are standard security updates.
Fo see these additional updates run: apt list --upgradable
 additional security updates can be applied with ESM Apps.
earn more about enabling ESM Apps service at https://ubuntu.com/esm
```

```
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-1017-aws x86 64)
 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support:
                   https://ubuntu.com/advantage
 System information as of Tue Dec 26 18:18:17 UTC 2023
 System load: 0.01220703125 Processes:
Usage of /: 32.2% of 7.57GB Users logged in:
                                                           107
  Memory usage: 60%
                                  IPv4 address for ens5: 172.20.3.232
 Swap usage:
 * Ubuntu Pro delivers the most comprehensive open source security and
   compliance features.
   https://ubuntu.com/aws/pro
Expanded Security Maintenance for Applications is not enabled.
26 updates can be applied immediately.
19 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable
2 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm
Last login: Tue Dec 26 11:27:40 2023 from 172.20.1.192
ubuntu@ip-172-20-3-232:~$
accessed successfully
```

Now I have installed some pakages on both private instancess:

Php Apache2 Php-mysql(mysqli solution) Mysql

Attach load balancer

In its configuration I created the security group which attach above private instances as inbound rule

Also create the target group in which attach the private instances Also defined the regions by attaching it with private subnet groups

Access the index.php file created custom on the browser using its DNS

Launch the RDS instance and configure that also:

In it created the subnet groups in which attach availbility zones and also the private db subnets

Then by selecting by my sql in RDS instance I have configured that ensuring not public accessing

Now by going in the the App instances I try to make database using this command

mysql -h database-1.c71hach5464j.eu-north-1.rds.amazonaws.com - u admin -P 3306 -p

Here this is rds endpoint database-1.c71hach5464j.eu-north-1.rds.amazonaws.com

and created student database

```
CREATE DATABASE student;
USE student;

CREATE TABLE students (
   id INT AUTO_INCREMENT PRIMARY KEY,
   name VARCHAR(255) NOT NULL,
   age INT NOT NULL,
   grade VARCHAR(10) NOT NULL
);

Adding dummy data in that

INSERT INTO students (name, age, grade) VALUES
   ('John Doe', 20, 'A'),
   ('Jane Smith', 22, 'B'),
   ('Bob Johnson', 21, 'C');
```

Index.php and setting the nessary requirments db name username host as endpoint of rds

```
width: 50%;
      margin: 20px;
    }
    th, td {
      border: 1px solid #ddd;
      padding: 8px;
      text-align: left;
    }
    th {
      background-color: #f2f2f2;
  </style>
</head>
<body>
<h2>Student Information From the machine2</h2>
<?php
// Database connection parameters
$host = 'database-1.c71hach5464j.eu-north-1.rds.amazonaws.com';
$username ='admin':
$password = 'admin123';
$database = 'student';
// Create a connection to the MySQL database
$mysqli = new mysqli($host, $username, $password, $database);
// Check connection
if ($mysqli->connect error) {
  die("Connection failed: " . $mysqli->connect error);
}
// Query to retrieve student data
$sql = "SELECT * FROM students";
$result = $mysqli->query($sql);
// Display data in a table
if ($result->num\ rows > 0) {
  echo "";
"IDNameAgeGrade
>";
  while ($row = $result->fetch assoc()) {
    echo "";
    echo "" . $row['id'] . "";
    echo "" . $row['name'] . "";
```

```
echo "". $row['age'] . "";
echo "". $row['grade'] . "";
echo "";
}

echo "";
} else {
echo "No records found";
}

// Close the database connection
$mysqli->close();
?>

</body>
</html>
```

This is from instance 1 private reponse

Student Information App - Machine1

ID	Name	Age	Grade
1	John Doe	20	A
2	Jane Smith	22	В
3	Bob Johnson	21	С

This is from the private instace2

Student Information From the machine2

ID	Name	Age	Grade
1	John Doe	20	A
2	Jane Smith	22	В
3	Bob Johnson	21	C

Both are accessing the same database: