

Name: Shoaib Akhtar

Roll no: p20-0147

Cloud Project demo:

Deploying an application on a three-tier architecture.

First we created the vpc

VPC > Your VPCs > vpc-019fc5ee8c72fa916

vpc-019fc5ee8c72fa916 / CC_Project

Actions

Details Info

VPC ID vpc-019fc5ee8c72fa916	State Available	DNS hostnames Disabled	DNS resolution Enabled
Tenancy Default	DHCP option set dopt-07de626d2bfb5837f	Main route table rtb-05350cfa151419903	Main network ACL acl-05138720c53b9099c
Default VPC No	IPv4 CIDR 172.20.0.0/20	IPv6 pool -	IPv6 CIDR (Network border group) -
Network Address Usage metrics Disabled	Route 53 Resolver DNS Firewall rule groups -	Owner ID 964153863164	

Then we have created the 6 subnets

	Name	Subnet ID	State	VPC	IPv4 CIDR
<input type="checkbox"/>	CC_Private_App_subnet02	subnet-02565a03278f3a95c	Available	vpc-019fc5ee8c72fa916 CC_Pr...	172.20.4.0/24
<input type="checkbox"/>	CC_Private_Db_subnet01	subnet-0d152b1b1dcc13dcb	Available	vpc-019fc5ee8c72fa916 CC_Pr...	172.20.5.0/24
<input type="checkbox"/>	CC_Private_App_subnet01	subnet-0e1865e38020fc11f	Available	vpc-019fc5ee8c72fa916 CC_Pr...	172.20.3.0/24
<input type="checkbox"/>	CC_Public_Web_subnet02	subnet-0ce9fe4bd83e12f87	Available	vpc-019fc5ee8c72fa916 CC_Pr...	172.20.2.0/24
<input type="checkbox"/>	CC_Public_Web_subnet01	subnet-04dffa2e5f4906293	Available	vpc-019fc5ee8c72fa916 CC_Pr...	172.20.1.0/24
<input type="checkbox"/>	CC_Private_Db_subnet02	subnet-0b7aaae3f461a60d	Available	vpc-019fc5ee8c72fa916 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

Route tables (4) Info

Find resources by attribute or tag

vpc-019fc5ee8c72fa916 Clear filters

< 1 > ⌕

	Name	Route table ID	Explicit subnet associati...	Edge associations	Main	VPC
<input type="checkbox"/>	CC_Public_Web_RT	rtb-02e8cd24d1915980c	2 subnets	-	No	vpc-019fc5ee8c72fa916
<input type="checkbox"/>	CC_Private_Db_RT	rtb-08aff98a4c76b378d	2 subnets	-	No	vpc-019fc5ee8c72fa916
<input type="checkbox"/>	CC_Private_App_RT	rtb-051db6147fa254f3d	2 subnets	-	No	vpc-019fc5ee8c72fa916
<input type="checkbox"/>	-	rtb-05350cfa151419903	-	-	Yes	vpc-019fc5ee8c72fa916

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 route table in bound rule

Internet gateways (1) Info

Search

VPC ID : vpc-019fc5ee8c72fa916 Clear filters

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	Name	Internet gateway ID	State	VPC ID	Owner
<input type="checkbox"/>	CC_Project_IGW	igw-01a45b3c64fbc50f2	Attached	vpc-019fc5ee8c72fa916 CC_Project	964153863164

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

Attach it with private route tables as inbound rule

nat-0a9f1fe7088e5a3ed / CC_Project_NGW

Actions ▾

Details info

NAT gateway ID nat-0a9f1fe7088e5a3ed	Connectivity type Public	State Available	State message -
NAT gateway ARN arn:aws:ec2:eu-north-1:964153863164:natgateway/nat-0a9f1fe7088e5a3ed	Primary public IPv4 address 13.51.4.249	Primary private IPv4 address 172.20.1.95	Primary network interface ID eni-0bf9319fa2cec1475
VPC vpc-019fc5ee8c72fa916 / CC_Project	Subnet subnet-04dffa2e5f4906293 / CC_Public_Web_subnet01	Created Monday, 25 December 2023 at 19:20:52 GMT+5	Deleted -

Now EC2 instances creating Configure CC_Public_Web

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

Instance: i-077d2f51f47a01bde (CC_Public_Web)

Details | Security | Networking | Storage | Status checks | Monitoring | Tags

▼ Instance summary info

Instance ID i-077d2f51f47a01bde (CC_Public_Web)	Public IPv4 address 51.20.116.213 open address	Private IPv4 addresses 172.20.1.192
IPv6 address -	Instance state Running	Public IPv4 DNS -
Hostname type IP name: ip-172-20-1-192.eu-north-1.compute.internal	Private IP DNS name (IPv4 only) ip-172-20-1-192.eu-north-1.compute.internal	Elastic IP addresses -
Answer private resource DNS name	Instance type	

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)

Instance: i-062c28efc77282965 (CC_Private_Db)

Details | Security | Networking | Storage | Status checks | Monitoring | Tags

▼ Instance summary info

Instance ID i-062c28efc77282965 (CC_Private_Db)	Public IPv4 address -	Private IPv4 addresses 172.20.5.204
IPv6 address -	Instance state Running	Public IPv4 DNS -
Hostname type IP name: ip-172-20-5-204.eu-north-1.compute.internal	Private IP DNS name (IPv4 only) ip-172-20-5-204.eu-north-1.compute.internal	Elastic IP addresses -
Answer private resource DNS name	Instance type	

Creating 3 instances 1 public and 2 private:

Instances (3) info

Find Instance by attribute or tag (case-sensitive)

	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
<input type="checkbox"/>	CC_Public_Web	i-077d2f51f47a01bde	Running	t3.micro	2/2 checks passed	No alarms	eu-north-1a
<input type="checkbox"/>	CC_Private_02	i-062c28efc77282965	Running	t3.micro	2/2 checks passed	No alarms	eu-north-1a
<input type="checkbox"/>	CC_Private_01	i-0e76d1c257eb4175b	Running	t3.micro	2/2 checks passed	No alarms	eu-north-1a

Accessing locally private instances with public instances

Accessing public instance:

```
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
```

```
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:    0%
```

```
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 accessed 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
 * Support:       https://ubuntu.com/advantage

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
 * 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:           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:   0%

 * Ubuntu Pro delivers the most comprehensive open source security and
   compliance features.

   https://ubuntu.com/aws/pro

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```

```
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-1017-aws x86_64)

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* 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:            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:   0%

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  compliance features.

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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 packages on both private instances:

```
Php
Apache2
Php-mysql(mysql 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 availability 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

```
ubuntu@ip-172-20-3-232:/var/www/html$ cat index.php
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Student Information</title>
  <style>
    table {
      border-collapse: collapse;
```

```

        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 "<table>";
    echo
    "<tr><th>ID</th><th>Name</th><th>Age</th><th>Grade</th>
    </tr>";

    while ($row = $result->fetch_assoc()) {
        echo "<tr>";
        echo "<td>" . $row['id'] . "</td>";
        echo "<td>" . $row['name'] . "</td>";
    }
}
}

```

```

        echo "<td>" . $row['age'] . "</td>";
        echo "<td>" . $row['grade'] . "</td>";
        echo "</tr>";
    }

    echo "</table>";
} 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	B
3	Bob Johnson	21	C

This is from the private instace2

Student Information From the machine2

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

Both are accessing the same database: