AWS Solutions Architect Project

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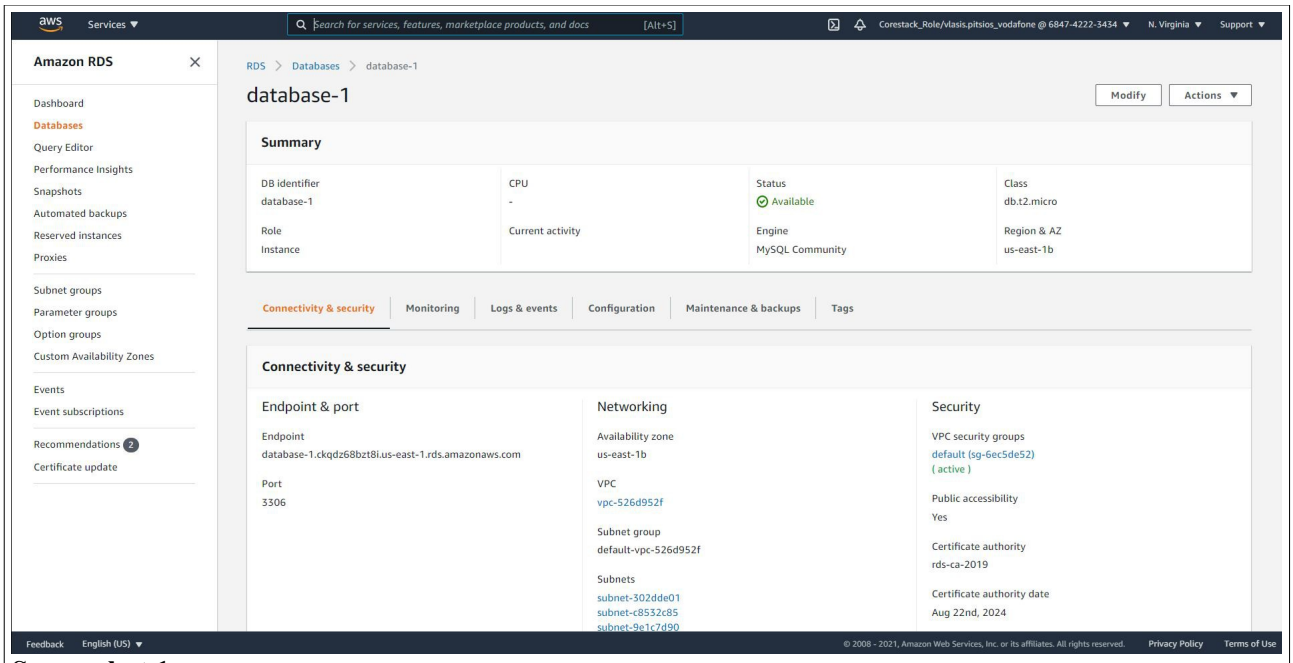
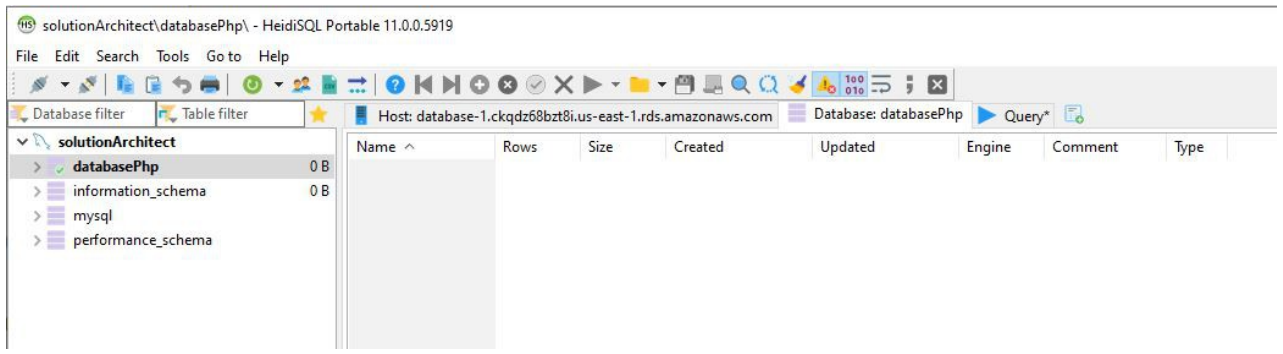
Main project (Description): You are working as a database administrator for an IT firm. You have been asked to create a new database instance on AWS cloud and connect it with the employee management portal hosted on a web server. Your organization wants to deploy a new multi-tier application. The application will take live inputs from the employees and it will be hosted on a web server running on the AWS cloud. The development team has asked you to set up the web server and configure it to scale automatically in cases of a traffic surge, to make the application highly available. They have also asked you to take the inputs from the employees and store them securely in the database.

Following requirements should be met:

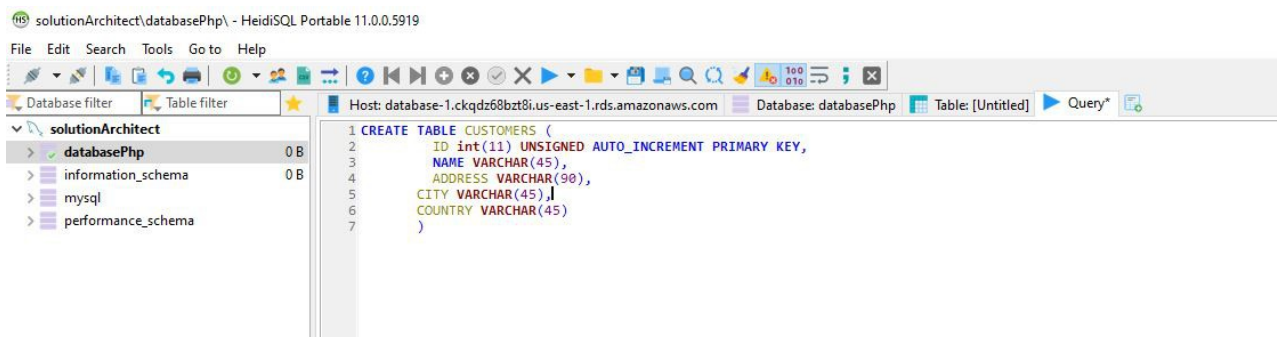
-Follow the above-mentioned specifications
-Make sure that the Availability Zone is similar throughout the instances and volumes
-Ensure that the server scales automatically and the traffic is optimally routed among the scaled servers
-Document the step-by-step process involved in completing this task



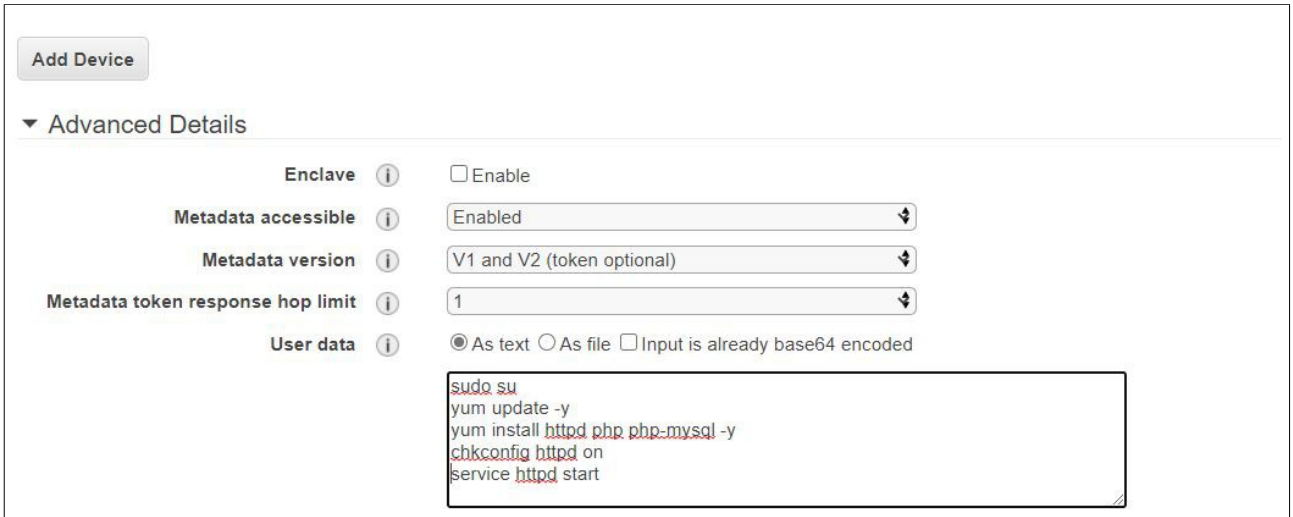
Screenshot 1
MySQL database created using Amazon RDS.



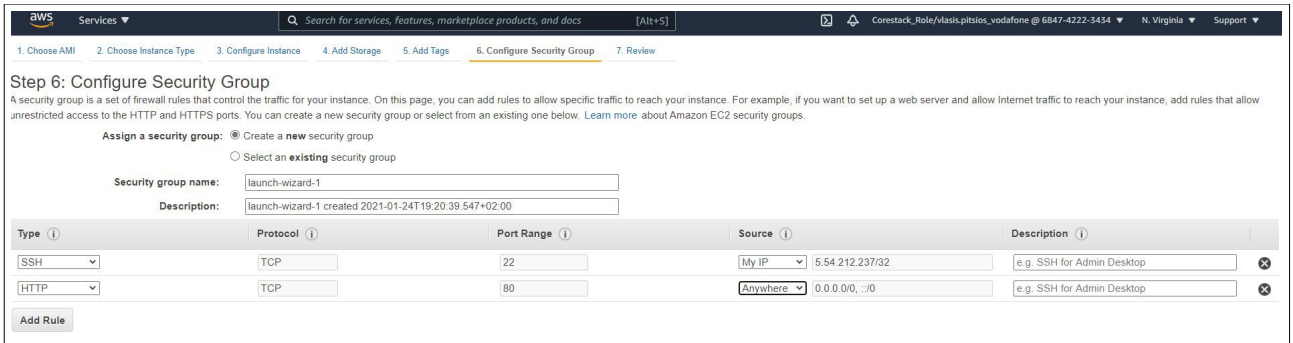
Screenshot 2
Connection established to MySQL by using an SQL client. Database "databasePhp" was created successfully.



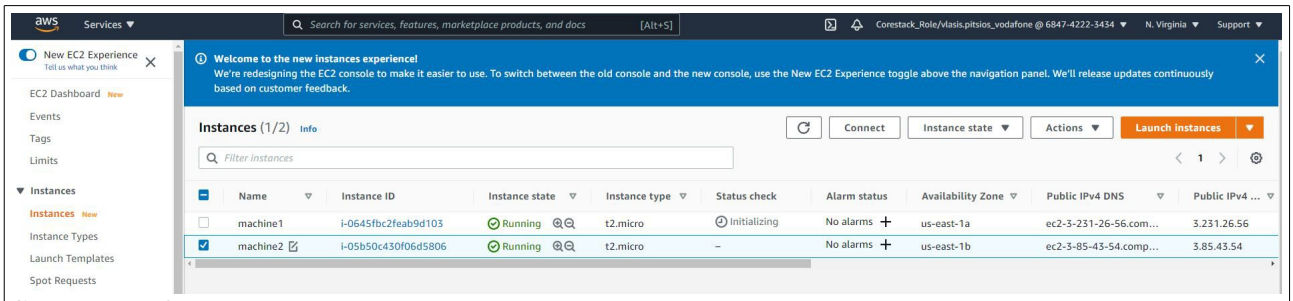
Screenshot 3
Create CUSTOMERS table on "databasePhp" database.



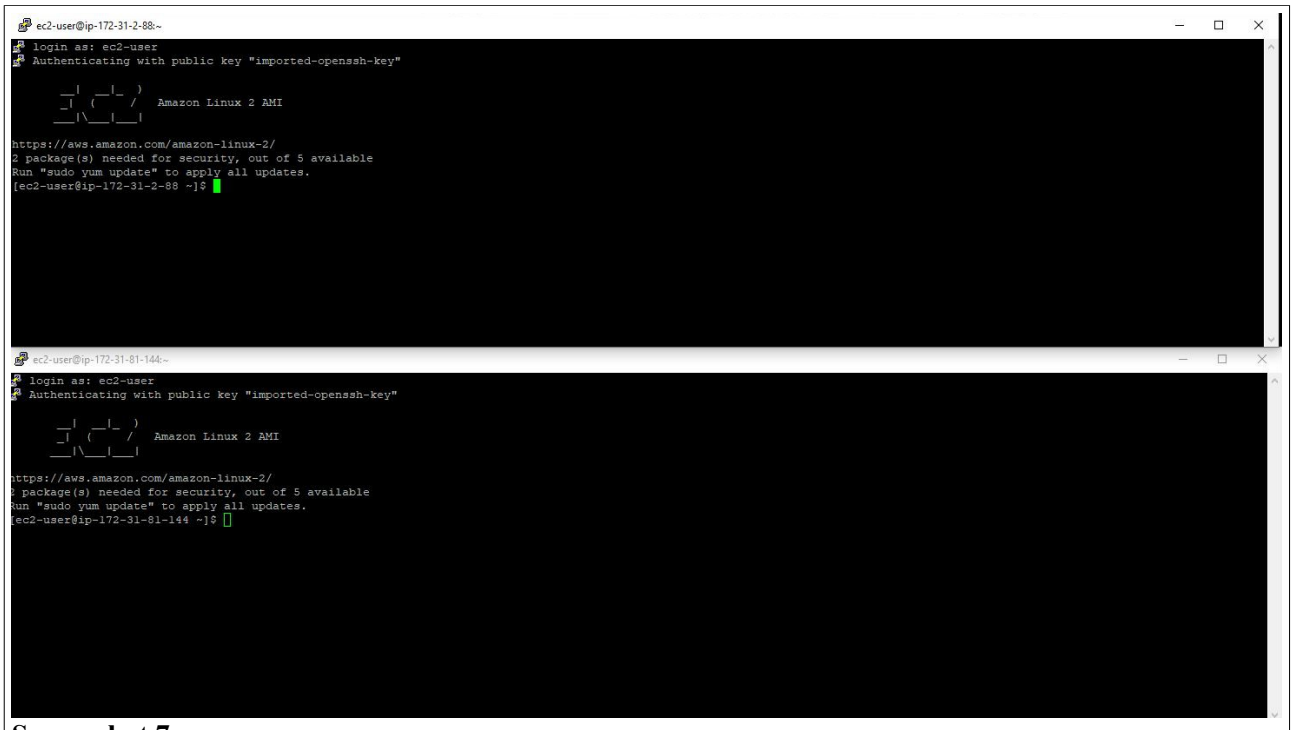
Screenshot 4
Create two EC2 instances on different availability zones and run the commands in the screenshot in order to install php, php-mysql and start an apache server.



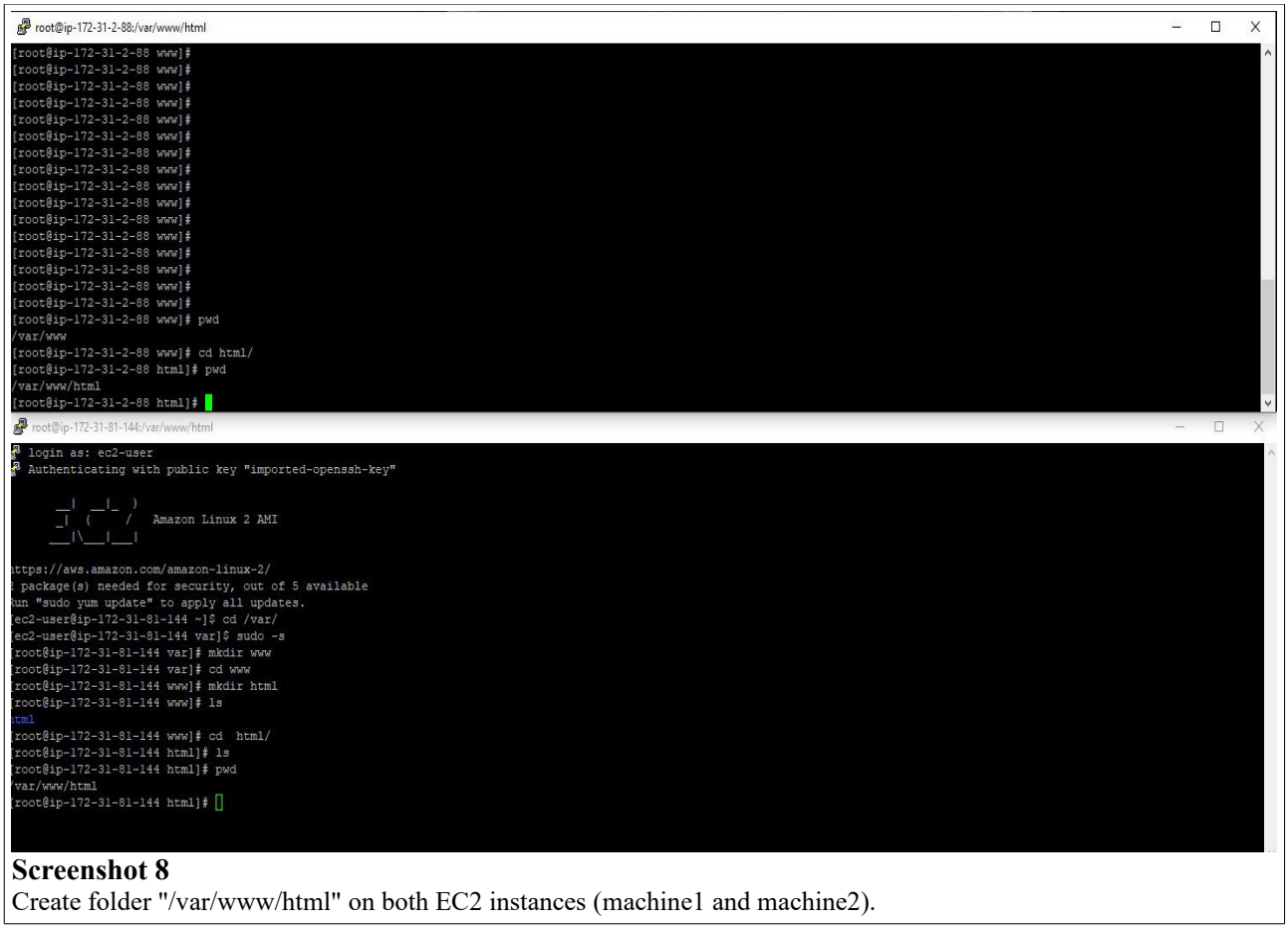
Screenshot 5
Configure security groups on each EC2 instance. HTTP traffic must be permitted from anywhere.



Screenshot 6
The two EC2 instances (machine1 and machine2) are running on different availability zones (us-east-1a and us-east-1b).



Screenshot 7
Connect to EC2 instances (machine1 and machine2) with Putty.



Screenshot 8

Create folder "/var/www/html" on both EC2 instances (machine1 and machine2).

root@ip-172-31-2-88:/var/www/html

```
[root@ip-172-31-2-88 html]# cat index.php
<?php include "dbinfo.inc"; ?>
<html>
<body>

<?php
  $instance_id = file_get_contents("http://instance-data/latest/meta-data/instance-id");
  echo "<h1>Information about customers from ",$instance_id, "</h1>";

  /* Connect to MySQL and select the database. */
  $connection = mysqli_connect(DB_SERVER, DB_USERNAME, DB_PASSWORD);

  if (mysqli_connect_errno()) echo "Failed to connect to MySQL: " . mysqli_connect_error();

  $database = mysqli_select_db($connection, DB_DATABASE);

  /* Ensure that the EMPLOYEES table exists. */
  verifyCustomersTable($connection, DB_DATABASE);

  /* If input fields are populated, add a row to the EMPLOYEES table. */
  $customer_name = htmlentities($_POST['NAME']);
  $customer_address = htmlentities($_POST['ADDRESS']);
  $customer_city = htmlentities($_POST['CITY']);
  $customer_country = htmlentities($_POST['COUNTRY']);

  if (strlen($customer_name) || strlen($customer_address) || strlen($customer_city) || strlen($customer_country) {
    addCustomer($connection, $customer_name, $customer_address, $customer_city, $customer_country);
  }
?>

<!-- Input form -->
<form action="<?PHP echo $_SERVER['SCRIPT_NAME'] ?>" method="POST">
  <table border="0">
    <tr>
      <td>NAME</td>
      <td>ADDRESS</td>
          <td>CITY</td>
          <td>COUNTRY</td>
    </tr>
    <tr>
      <td>
        <input type="text" name="NAME" maxlength="45" size="30" />
      </td>
      <td>
        <input type="text" name="ADDRESS" maxlength="90" size="60" />
      </td>
          <td>
        <input type="text" name="CITY" maxlength="90" size="60" />
      </td>
          <td>
        <input type="text" name="COUNTRY" maxlength="90" size="60" />
      </td>
      <td>
        <input type="submit" value="Add Data" />
      </td>
    </tr>
  </table>
</form>

<!-- Display table data. -->
<table border="1" cellpadding="2" cellspacing="2">
  <tr>
    <td>ID</td>
```

Screenshot 9
Create on path "/var/www/html" the file "index.php" with the following PHP code.

Below there is the PHP code which is located in path "/var/www/html". The "index.php" file is a simple form to add some information about a new customer, for example customer name, customer address, customer city and customer country. The PHP script reads the inserted data from the user information and insert the data on the MySQL database. When the insertion of the data is done, the script runs a select query to the database on table CUSTOMERS and shows the result as a table. Also there is one more PHP script named as "dbinfo.inc" which contains information about the database to connect to, for example the database url, database username, database password and database name.

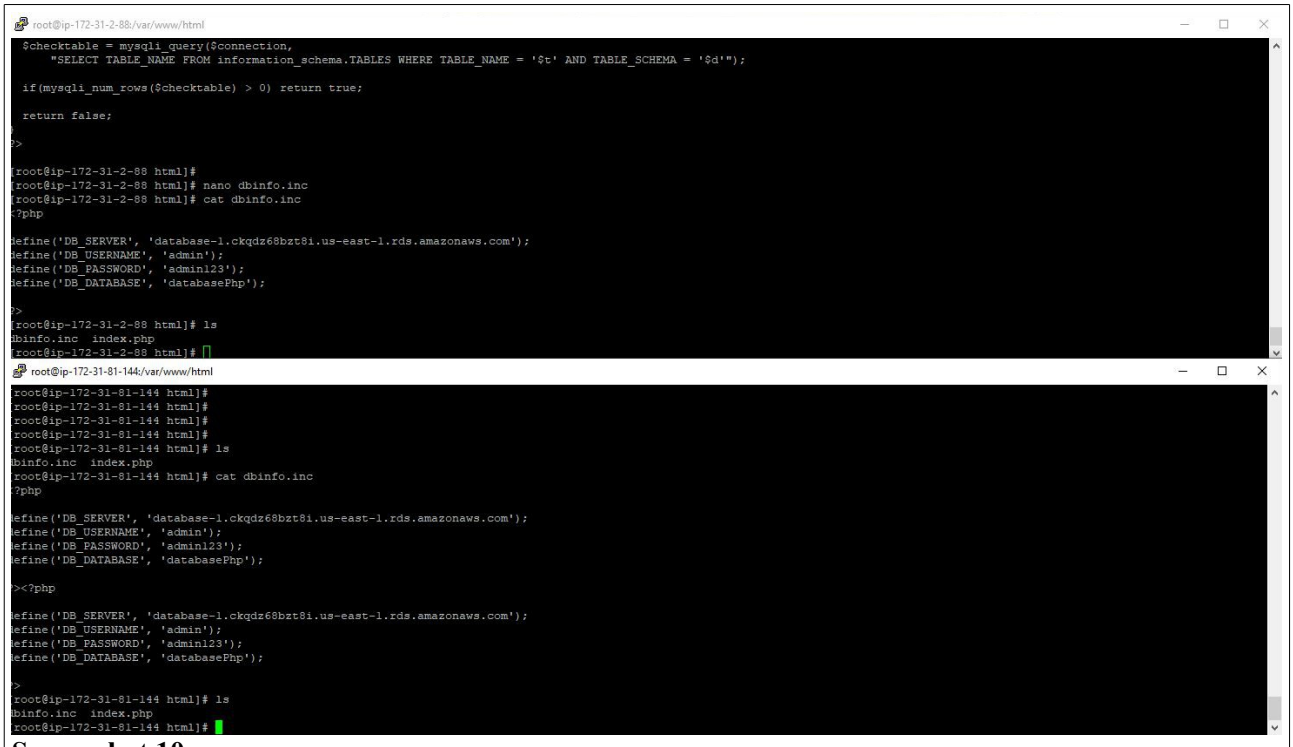
index.php

```
<?php include "../inc/dbinfo.inc"; ?>
<html>
<body>
<?php
 $instance_id = file_get_contents("http://instance-data/latest/meta-data/instance-id");
 echo "<h1>Information about customers from ",$instance_id, "</h1>";
 /* Connect to MySQL and select the database. */
 $connection = mysqli_connect(DB_SERVER, DB_USERNAME, DB_PASSWORD);
 if (mysqli_connect_errno()) echo "Failed to connect to MySQL: " . mysqli_connect_error();
 $database = mysqli_select_db($connection, DB_DATABASE);
 /* Ensure that the EMPLOYEES table exists. */
 verifyCustomersTable($connection, DB_DATABASE);
 /* If input fields are populated, add a row to the EMPLOYEES table. */
 $customer_name = htmlentities($_POST['NAME']);
 $customer_address = htmlentities($_POST['ADDRESS']);
 $customer_city = htmlentities($_POST['CITY']);
 $customer_country = htmlentities($_POST['COUNTRY']);
 if (strlen($customer_name) || strlen($customer_address) || strlen($customer_city) || strlen($customer_country)) {
   addCustomer($connection, $customer_name, $customer_address, $customer_city, $customer_country);
 }
?>
<!-- Input form -->
<form action="<?PHP echo $_SERVER['SCRIPT_NAME'] ?>" method="POST">
 <table border="0">
   <tr>
     <td>NAME</td>
     <td>ADDRESS</td>
     <td>CITY</td>
     <td>COUNTRY</td>
   </tr>
   <tr>
     <td>
       <input type="text" name="NAME" maxlength="45" size="30" />
     </td>
     <td>
       <input type="text" name="ADDRESS" maxlength="90" size="60" />
     </td>
     <td>
       <input type="text" name="CITY" maxlength="90" size="60" />
     </td>
     <td>
       <input type="text" name="COUNTRY" maxlength="90" size="60" />
     </td>
     <td>
       <input type="submit" value="Add Data" />
     </td>
   </tr>
 </table>
</form>
<!-- Display table data. -->
<table border="1" cellpadding="2" cellspacing="2">
 <tr>
   <td>ID</td>
   <td>NAME</td>
   <td>ADDRESS</td>
   <td>CITY</td>
   <td>COUNTRY</td>
 </tr>
<?php
$result = mysqli_query($connection, "SELECT * FROM CUSTOMERS");
while($query_data = mysqli_fetch_row($result)) {
 echo "<tr>";
 echo "<td>",$query_data[0], "</td>",
      "<td>",$query_data[1], "</td>",
     "<td>",$query_data[2], "</td>",
      "<td>",$query_data[3], "</td>",
      "<td>",$query_data[4], "</td>";
 echo "</tr>";
}
?>
</table>
<!-- Clean up. -->
<?php
 mysqli_free_result($result);
 mysqli_close($connection);
?>
</body>
</html>
<?php
/* Add an customer to the table. */
function addCustomer($connection, $name, $address, $city, $country) {
  $n = mysqli_real_escape_string($connection, $name);
  $a = mysqli_real_escape_string($connection, $address);
  $b = mysqli_real_escape_string($connection, $city);
  $c = mysqli_real_escape_string($connection, $country);
  $query = "INSERT INTO CUSTOMERS (NAME, ADDRESS, CITY, COUNTRY) VALUES ('$n', '$a', '$b', '$c');";
  if(!mysqli_query($connection, $query)) echo("<p>Error adding customer data.</p>");
}
/* Check whether the table exists and, if not, create it. */
function verifyCustomersTable($connection, $dbName) {
 if(!TableExists("CUSTOMERS", $connection, $dbName))
 {
    $query = "CREATE TABLE CUSTOMERS (
       ID int(11) UNSIGNED AUTO_INCREMENT PRIMARY KEY,
       NAME VARCHAR(45),
       ADDRESS VARCHAR(90),
      CITY VARCHAR(45),
      COUNTRY VARCHAR(45)
      )";
```

```
    if(!mysqli_query($connection, $query)) echo("<p>Error creating table.</p>");
  }
}
/* Check for the existence of a table. */
function TableExists($tableName, $connection, $dbName) {
  $t = mysqli_real_escape_string($connection, $tableName);
  $d = mysqli_real_escape_string($connection, $dbName);
  $checktable = mysqli_query($connection,
      "SELECT TABLE_NAME FROM information_schema.TABLES WHERE TABLE_NAME = '$t' AND TABLE_SCHEMA = '$d'");
  if(mysqli_num_rows($checktable) > 0) return true;
  return false;
}
?>
```

dbinfo.php

```
<?php
define('DB_SERVER', 'database-2.ckqdz68bzt8i.us-east-1.rds.amazonaws.com');
define('DB_USERNAME', 'admin');
define('DB_PASSWORD', 'admin123');
define('DB_DATABASE', 'databasePhp');
?>
```



Screenshot 10

The two PHP (index.php and dbinfo.inc) scripts are available on path "/var/www/html". In a next step the dbinfo.inc will be moved to path "/var/www/inc".

Screenshot 11

Request to first EC2 instance (machine1). The user should add some information about a customer and the data will be stored in MySQL.

Screenshot 12

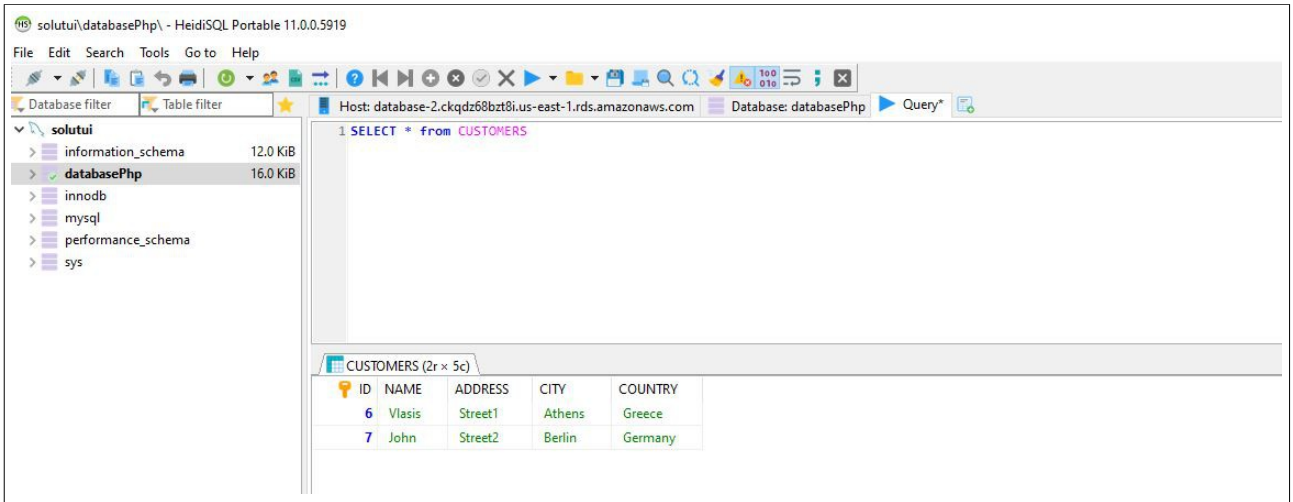
Request to second EC2 instance (machine2).

Screenshot 13

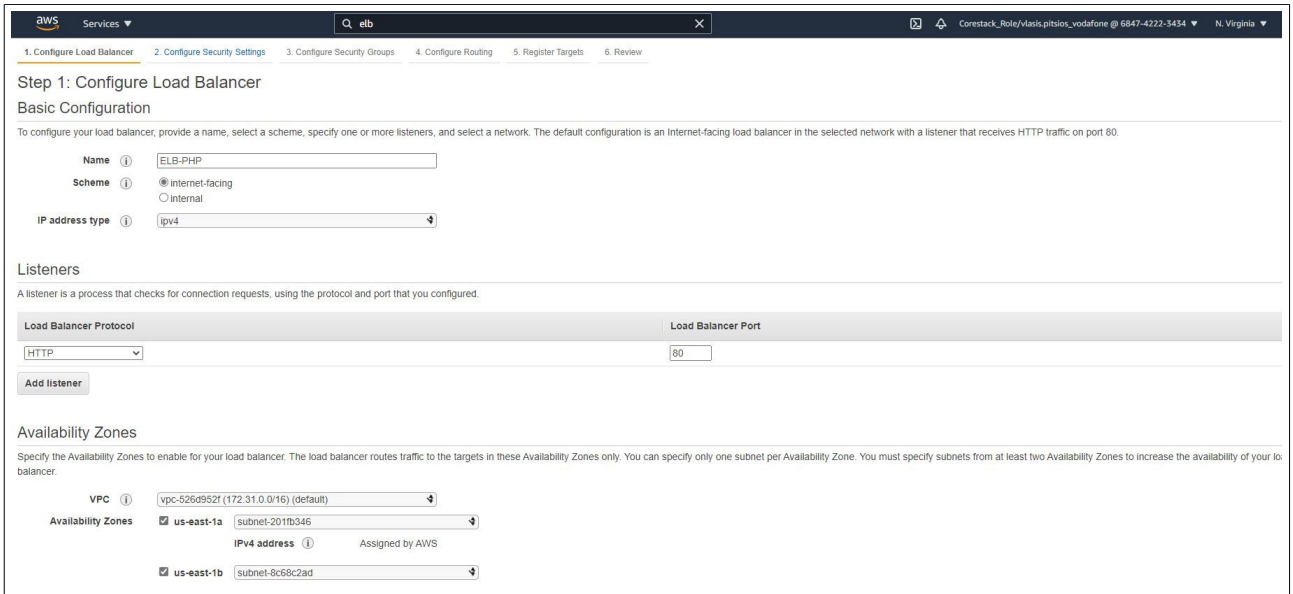
A customer was inserted successfully on MySQL after pushing the "Add Data" button on the first EC2 instance (machine 1).

Screenshot 14

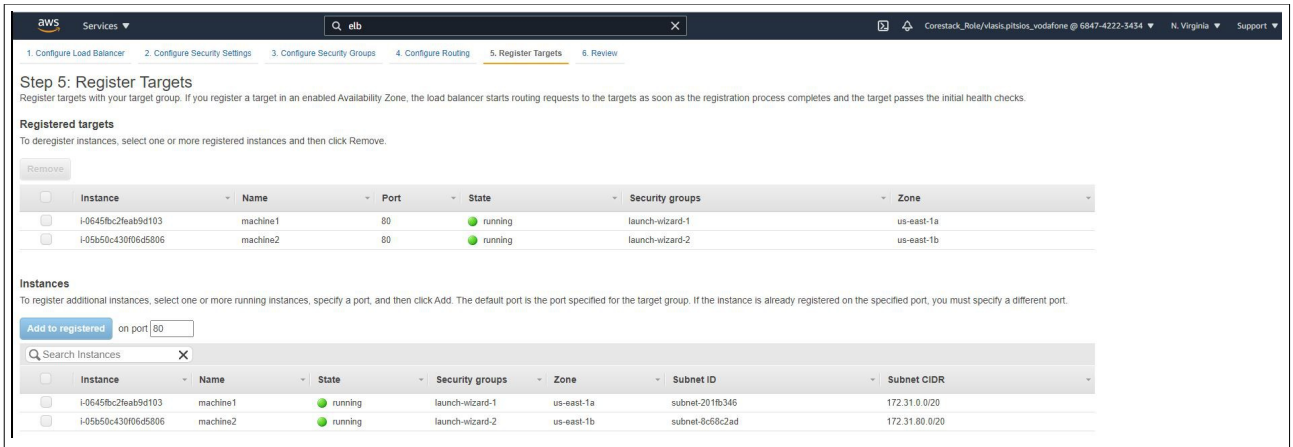
A second customer was inserted successfully on MySQL after pushing the "Add Data" button on the second EC2 instance (machine 2).



Screenshot 15
The two customers are inserted successfully on MySQL. Checking by running a Select statement on the database directly.

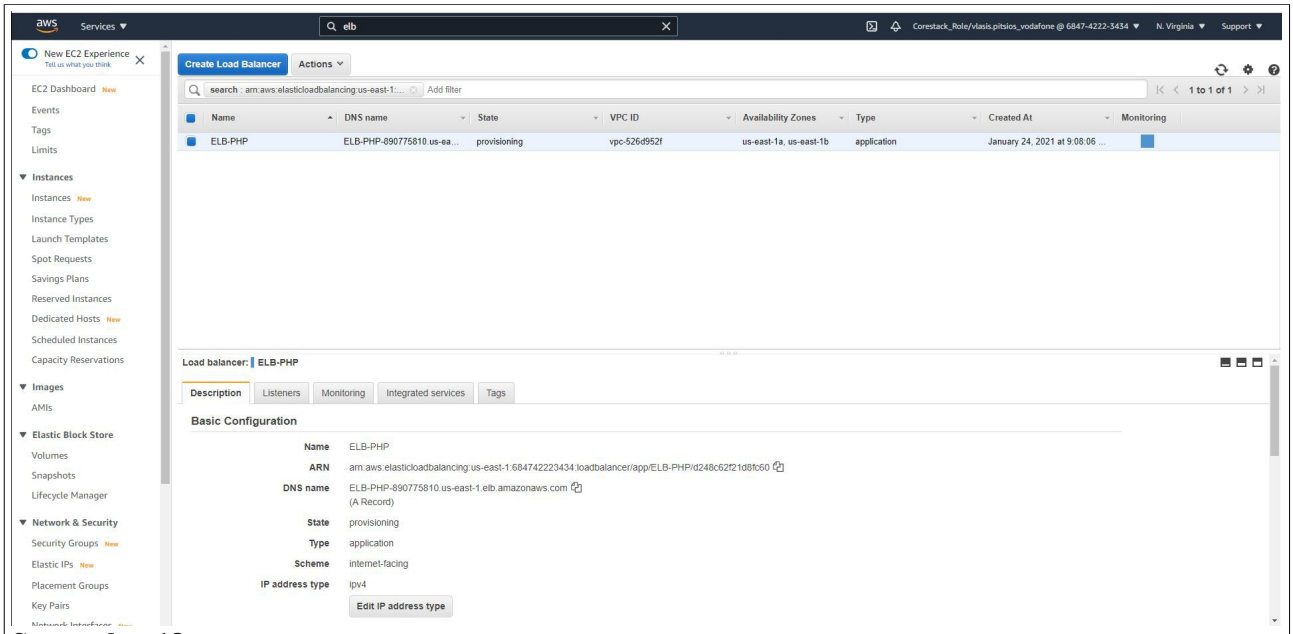


Screenshot 16
Configuration of an Elastic Load Balancer (AWS ELB) in order to split traffic in two EC2 instances on different availability zones (us-east-1 and us-east-2).



Screenshot 17

Register the two EC2 instances as targets on the load balancer.



Screenshot 18

The Load balancer is ready. Also a DNS name is available in order to have access to the load balancer and execute requests.

Screenshot 19

Access the load balancer on the DNS name with "index.php" included and add one more customer. The request is served by the first EC2 instance (machine 2).

Screenshot 20

Run again the same request on load balancer's DNS name. The second request is served by the second EC2 instance (machine 1).