Cloud Computing Exercise #10

Creating a Database Table in RDS

A. Preparation

1. Sign in to your AWS account as the non-root admin user.

B. Create an EC2 instance

1. Go to the EC2 dashboard, and launch a new EC2 instance using the t2.micro instance type and the “Amazon Linux 2023 AMI” image from the AWS marketplace. You can use the default security group configuration (SSH is allowed from anywhere), and note the security group name for your EC2 instance (It must be something like launch-wizard). Start PuTTY on your local machine and start an SSH session with your running EC2 instance.
2. Install the psql CLI client on your EC2 instance (sudo dnf install postgresql15.x86\_64” ). This program will be used to interact with the PostgreSQl server: connect to the database, list tables, create tables, etc.

C. Create a security group for the RDS instance

1. Go to the VPC dashboard (Services/ Networking & Content Delivery/VPC).
2. Create a security group for your RDS instance. Go to RDS main dashboard (Services/Database/RDS). Scroll down to and select Security/Security groups and select “Create security group”. Give an easy to remember name to your security group (e.g. “RDS Security Group”), note its name, and provide some description. Scroll down to “Inbound rules”, click on “Add rule”, and add a firewall rule with the following parameters:

* Protocol: TCP (this is the default)
* Port range: 5432 (this is the port number for the PostgreSQL server will be listening on)
* Source: select the security group for your EC2 instance (e.g. “launch-wizard..”).

This firewall setting will allow inbound traffic from your EC2 instance to the PostgreSQL server, so the EC2 instance will be able to talk to the RDS instance. However, nobody (including yourself) will be able to directly connect to the PostgreSQL server from the Internet. Scroll down all the way and select “Create security group”. You should see a message that the security group was created successfully.

D. Create an RDS instance

1. Go to the main RDS dashboard and select “Create database”. Keep the default database creation method (Standard create), select the “PostgreSQL” database engine and choose the “PostgreSQL 15.8-R1” version. From the RDS templates, select “Free tier”.
2. Scroll down to “Settings”, and provide an RDS instance identifier (e.g. “MyRDS”). You can keep the master username (set to “postgres”), and provide a master password. You will use this user name and password to log into the database server.
3. Keep the default instance class (db.t4g.micro), and in the “Storage” section, uncheck the “Enable storage autoscaling” checkbox (leave everything else unchanged). Scroll down to the “Connectivity” section and look for “VPC Security Group (firewall) “ and select the RDS security group that you created previously (e.g. “RDS Security Group” in the “Existing VPC security groups” drop-down box. Remove the default security group. Scroll down and select “Additional configuration”, and provide an initial database name (e.g. “testdb”) – this database will be automatically created when the RDS instance is launched. You can also disable automated backups and performance insights as these features will not be needed for the lab.
4. Everything else can be left unchanged. Select “Create database”. Wait until the RDS instance is launched – it may take a few minutes. Eventually, in the RDS database list (Services/RDS/Databases) the new database will appear with status “Available”.

E. Connect to the database from your EC2 instance

1. In the database list, click on the RDS instance, and scroll down to the “Connectivity & security” section. Here find and note the endpoint URL. This is the URL you will need to use to connect to the database server.
2. Go to the SSH window of your EC2 instance (now with psql installed), and use the ‘psql’ command to connect to the database server (check out the slides for the command’s syntax and options).

Example: psql –h <hostname/IP> -d <dbname> -U <username>

The host parameter should be the RDS instance’s endpoint URL, the user name should be the master username, and the database name should be the name you provided for initial database creation. For example:

psql -h myrds.cwsdpbtovosg.us-east-1.rds.amazonaws.com -U postgres -d testdb

You will be prompted to enter the master password you provided during the RDS instance creation. If you are successful, you will see the psql prompt (e.g. “testdb=>”) in your SSH window. Now you can issue psql commands and SQL statements to create tables, add data to tables, etc. The psql CLI client will forward your commands to the PostgreSQL database server via the network, and display the server’s response to you on the screen.

F. Create a table in the database

1. Use SQL commands to create the following table with the name “Students”:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **id**  [int]  (primary key) | **first\_name**  [text]  (no NULLs) | **last\_name**  [text]  (no NULLs) | **age**  [int] | **start\_date**  [date] |
| X | Joe | Apple | 23 | August 30, 2021 |
| X | Jill | Pear | 21 | January 24, 2022 |
| X | Adam | Peach | 21 | August 29, 2022 |
| X | Amy | Coconut | 19 | January 24, 2022 |

First, create the table based on the information in the table’s headers (that is, the table’s schema). The id column should hold the primary key to the table, so you can use the serial type to increment its value automatically for each insert operation. The first\_name and the last\_name columns should not allow NULL values. Use the \d psql command to verify that the table is there, and the \d <table name> command to check the table’s schema. Then, insert the content of the table into the database table row by row. You need to enter the date values as strings (e.g. August 30, 2021 should be represented as ‘2021-08-30’ in year-month-date format). Check the table’s content by listing all columns and all rows in the Students table (select \* from Students;). Then, write and execute two more queries using the select SQL command:

* List the first and last names of all students whose name starts with the letter “P”, ordered by their first names (in ascending order).
* List the first names and ages of all students who start attending the university on January 24, 2022 (again, specify the date as a string in the where clause).

1. Delete the Students table and quit psql. Exit the SSH session with your EC2 instance.

G. Clean up after yourself

1. Go to the EC2 dashboard and terminate your EC2 instance.
2. Go back to the list of RDS instances (Services/RDS/Databases) and delete your RDS instance by selecting it and then selecting “Delete” on the “Actions” drop-down menu. Uncheck the “Create final snapshot?” option as we do not need that for this lab.
3. Log out of AWS.