

Assignment 5 – RDS

Don't launch or practice Amazon Relation Database Server (RDS) in your personal account. Even if you stopped the database, it starts automatically after a week and you will receive a surprising bill (hundreds of dollars) at the end of the month. General advice, please don't practice IaaS services (such as RDS, EC2, Load Balancers, NAT Gateway in VPC, and data analytical services with servers) that require you to run instances (or servers). Use serverless services instead which will not cost.

Task1. Create an Aurora Database and connect to it from an EC2

1. Create database SG – Allow inbound access from the EC2
 - a. Go to EC2 -> In the sidebar, there are Security groups, click on that -> Click Create Security Group
 - b. Give name as MyRdsSg -> give description -> select your VPC
 - c. In the inbound rules section, click on add rule
 - d. Click on Type -> Look for MYSQL/Aurora
 - e. Source -> select the SG of the web server that accesses the database -> Create Security Group
2. Create an RDS database. Highly encourage you to play with the creation wizard and review all fields.
 - a. Templates -> select dev/test.
 - b. Enter the username and password for the database.
 - c. DB instance class -> Select Burstable classes -> Select the smallest.
 - d. Availability & durability -> Create an Aurora Replica.
 - e. Monitoring -> expand Additional configuration -> uncheck “**Enable Enhanced monitoring**”.
3. SSH into the instance and install mysql client on EC2

```
sudo yum install mysql -y
```

4. Connect to the RDS instance, both primary or read replica.

```
mysql -h <endpointUrl> -P 3306 -u root -p
```

5. Create a table and insert some records. These queries are only for your reference. **Make up your own database, tables, and data.**

```
show databases;
```

```

create database university;

CREATE TABLE TEACHER (
    TEACHER_ID int,
    NAME varchar(255)
);

CREATE TABLE COURSE (
    COURSE_ID int,
    COURSE_CODE varchar(255),
    COURSE_NAME varchar(255),
    TEACHER_ID int
);

INSERT INTO TEACHER (TEACHER_ID, NAME)
VALUES (1, "UNUBOLD"),
(2, "ASAAD"),
(3, "UMUR");

INSERT INTO COURSE (COURSE_ID, COURSE_CODE, COURSE_NAME, TEACHER_ID)
VALUES (1, "CS516", "CLOUD COMPUTING", 1),
(2, "CS568", "React", 1),
(3, "CS569", "Angular", 1),
(3, "CS569", "Angular", 2);

```

6. Connect to the read instance and run some queries.

Task 2. Run NodeJS and MySQL app on Elastic BeanStalk

Deploy the “**Hiking log** application that uses the Express framework and an RDS database” (Only this, the second app in the image below) on Elastic BeanStalk.

1. Download the zip file for the app.
2. Extract and remove the “.ebextensions” file. And zip it again. That is the code you will upload on AWS.
3. Go to Elastic Beanstalk. When creating the application, click on “Configure more options” right next to “Create application”.
4. Go to the Security panel and hit Edit. Select the LabRole there.
5. [Optionally] you can specify the username and password for the database.

<https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/nodejs-getstarted.html>

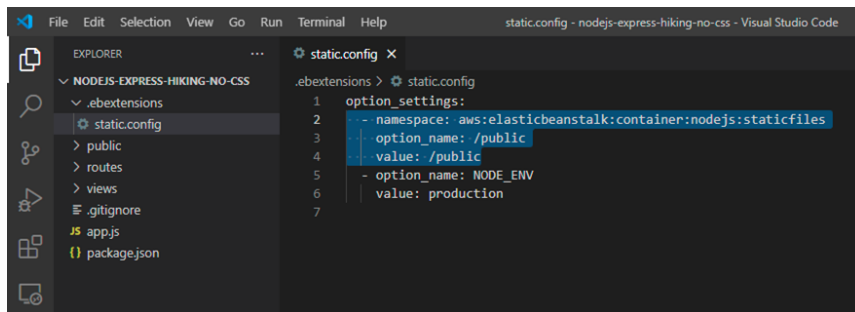
Launching an environment with a sample Node.js application

Elastic Beanstalk provides single page sample applications for each platform as well as more complex examples that show the use of additional AWS resources such as Amazon RDS and language or platform-specific features and APIs.

Samples		
Environment type	Source bundle	Description
Web Server	nodejs.zip	Single page application. Use the procedure at Create an Example Application to launch this example.
Web Server with Amazon RDS	nodejs-express-hiking-v1.zip	Hiking log application that uses the Express framework and an RDS database. Tutorial
Web Server with Amazon ElastiCache	nodejs-example-express-elasticache.zip	Express web application that uses Amazon ElastiCache for clustering. Clustering enhances your web application's high availability, performance, and security. Tutorial
Web Server with DynamoDB, Amazon SNS and Amazon SQS	eb-node-express-sample-v1.0.zip Clone the repo at GitHub.com	Express web site that collects user contact information for a new company's marketing campaign. Uses the AWS SDK for JavaScript in Node.js to write entries to a DynamoDB table, and Elastic Beanstalk configuration files to create resources in DynamoDB, Amazon SNS and Amazon SQS. Tutorial

Steps:

1. Download the code. Delete the 3 lines. And ZIP back. Upload the code in ElasticBeanstalk.



```
static.config
1  option_settings:
2    - namespace: aws:elasticbeanstalk:container:nodejs:staticfiles
3      option_name: /public
4      value: /public
5    - option_name: NODE_ENV
6      value: production
7
```

2. Select LabRole in the security.
3. Give database username and password.
4. Give environment variable NODE_ENV = "production". Database username, password, and ports are automatically injected by Elastic Beanstalk.

Environment properties

The following properties are passed in the application as environment properties. [Learn more](#)

Name	Value
NODE_ENV	production

Extra – Tasks

1. Log in to the database using IAM. You can practice this in your account and we will delete it together when showing your result to me in person.
2. Set up PhpMyAdmin for connecting to the RDS database on ECS.

Spin up PhpMyAdmin in your AWS account then use PhpMyAdmin to connect to your DB instead of a Bastion server. Your reference is uploaded to the “Extra” folder. Below are some main steps:

- Change the configuration in the image. Then it will pick up the endpoint and there will be 3 fields, URL, Username, and Password.
- Write a docker image from <https://hub.docker.com/r/phpmyadmin/phpmyadmin/>
- Upload the image to AWS ECR
- Deploy this on ECS Fargate
- Check SG and IAM configs

Step by step instructions - RDS

Create a Security Group at first

EC2 > Security Groups > sg-0fb7d4ed504d20cd0 - MyDBSg > Edit inbound rules

Edit inbound rules

Inbound rules control the incoming traffic that's allowed to reach the instance.

Security group rule ID	Type	Protocol	Port range	Source	Description - optional
sg-0c6cc772cd6662121	MySQL/Aurora	TCP	3306	Custom	

Inbound rules

WebServerBehindAlbSg | sg-040bdc1b1672cc9

sg-040bdc1b1672cc9

Cancel Preview changes Save rules

Create a database in RDS

Choose a database creation method

☒ **Standard create**
You set all of the configuration options, including ones for availability, security, backups, and maintenance.

☐ **Easy create**
Use recommended best-practice configurations. Some configuration options can be changed after the database is created.

Engine options

Engine type

☒ **Amazon Aurora**

☐ MySQL

☐ MariaDB

☐ PostgreSQL

☐ Oracle

☐ Microsoft SQL Server

Edition

☒ **Amazon Aurora MySQL-Compatible Edition**

☐ Amazon Aurora PostgreSQL-Compatible Edition

Engine version

View the engine versions that support the following database features.

Hide filters

☐ Show versions that support the global database feature
Allows a single Amazon Aurora database to span multiple AWS Regions.

☐ Show versions that support the parallel query feature
Improves the performance of analytic queries by pushing processing down to the Aurora storage layer.

☐ Show versions that support Serverless v2
Offers instance scaling for even the most demanding workloads.

Available versions (58/58)

Aurora (MySQL 5.7) 2.10.2

Templates

Choose a sample template to meet your use case.

☐ **Production**

Use defaults for high availability and fast, consistent performance.

☒ **Dev/Test**

This instance is intended for development use outside of a production environment.

Settings

DB cluster identifier [Info](#)

Type a name for your DB cluster. The name must be unique across all DB clusters owned by your AWS account in the current AWS Region.

myDBCluster

The DB cluster identifier is case-insensitive, but is stored as all lowercase (as in "mydbcluster"). Constraints: 1 to 60 alphanumeric characters or hyphens. First character must be a letter. Can't contain two consecutive hyphens. Can't end with a hyphen.

▼ Credentials Settings

Master username [Info](#)

Type a login ID for the master user of your DB instance.

root

1 to 32 alphanumeric characters. First character must be a letter.

☐ **Auto generate a password**

Amazon RDS can generate a password for you, or you can specify your own password.

Master password [Info](#)

Constraints: At least 8 printable ASCII characters. Can't contain any of the following: / (slash), ' (single quote), " (double quote) and @ (at sign).

Confirm password [Info](#)

Instance configuration

The DB instance configuration options below are limited to those supported by the engine that you selected above.

DB instance class [Info](#)

☐ **Memory optimized classes (includes r classes)**

☒ **Burstable classes (includes t classes)**

db.t3.small

2 vCPUs 2 GiB RAM Network: 2,085 Mbps

☐ **Include previous generation classes**

Availability & durability

Multi-AZ deployment [Info](#)

- ☒ Create an Aurora Replica or Reader node in a different AZ (recommended for scaled availability)
Creates an Aurora Replica for fast failover and high availability.
- ☐ Don't create an Aurora Replica

Connectivity [Info](#)



Compute resource

Choose whether to set up a connection to a compute resource for this database. Setting up a connection will automatically change connectivity settings so that the compute resource can connect to this database.

- ☒ Don't connect to an EC2 compute resource
Don't set up a connection to a compute resource for this database. You can manually set up a connection to a compute resource later.

- ☐ Connect to an EC2 compute resource
Set up a connection to an EC2 compute resource for this database.

Virtual private cloud (VPC) [Info](#)

Choose the VPC. The VPC defines the virtual networking environment for this DB cluster.

Default VPC (vpc-01b8fb7c355b68fc8)

Only VPCs with a corresponding DB subnet group are listed.

After a database is created, you can't change its VPC.

DB Subnet group [Info](#)

Choose the DB subnet group. The DB subnet group defines which subnets and IP ranges the DB cluster can use in the VPC that you selected.

default-vpc-01b8fb7c355b68fc8

Public access [Info](#)

- ☐ Yes
RDS assigns a public IP address to the cluster. Amazon EC2 instances and other resources outside of the VPC can connect to your cluster. Resources inside the VPC can also connect to the cluster. Choose one or more VPC security groups that specify which resources can connect to the cluster.
- ☒ No
RDS doesn't assign a public IP address to the cluster. Only Amazon EC2 instances and other resources inside the VPC can connect to your cluster. Choose one or more VPC security groups that specify which resources can connect to the cluster.

VPC security group (firewall) [Info](#)

Choose one or more VPC security groups to allow access to your database. Make sure that the security group rules allow the appropriate incoming traffic.

- ☒ Choose existing
Choose existing VPC security groups
- ☐ Create new
Create new VPC security group


Existing VPC security groups

Choose one or more options

MyDBSg X

Monitoring

Monitoring

- ☐ Enable Enhanced monitoring  **Uncheck**
Enabling Enhanced monitoring metrics are useful when you want to see how different processes or threads use the CPU.

▼ Additional configuration

Database options, encryption turned on, failover, backup turned on, backtrack turned off, maintenance, CloudWatch Logs, delete protection turned off.

Database options

Initial database name [Info](#)

university 

If you do not specify a database name, Amazon RDS does not create a database.

DB cluster parameter group [Info](#)

default:aurora-mysql5.7 ▼

DB parameter group [Info](#)

default:aurora-mysql5.7 ▼

Option group [Info](#)

default:aurora-mysql-5-7 ▼

Failover priority

No preference ▼

Backup

Backup retention period [Info](#)

The number of days (1-35) for which automatic backups are kept.

1 ▼ day

- ☒ Copy tags to snapshots

Encryption

- ☒ Enable encryption

Choose to encrypt the given instance. Master key IDs and aliases appear in the list after they have been created using the AWS Key Management Service console. [Info](#)

AWS KMS key [Info](#)

(default) aws/rds ▼

Account

846866515154

KMS key ID

c3fd8794-e81f-42ae-85bd-d680ff16efa0

Backtrack

database-lab5	Regional cluster	Aurora MySQL	us-east-1	2 instances	Available	-
database-lab5-instance-1	Writer instance	Aurora MySQL	us-east-1a	db.t3.small	Available	
database-lab5-instance-1-us-east-1c	Reader instance	Aurora MySQL	us-east-1c	db.t3.small	Available	

Connectivity & security	Monitoring	Logs & events	Configuration	Maintenance & backups	Tags
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Endpoints (2)

Filter by endpoint

Endpoint name

mysql -h <endpoint_url> -P 3306 -u root -p

Status

Type

Port

database-lab5.cluster-cbmm9bcuz21g.us-east-1.rds.amazonaws.com	-h standby instance	Available	Writer instance	3306
database-lab5.cluster-ro-cbmm9bcuz21g.us-east-1.rds.amazonaws.com	-h read only read replicas	Available	Reader instance	3306

Database created

Install mysql client on EC2

```
mysql -h myfirstclouddb-instance-1.cqzw6byf7zkj.us-east-1.rds.amazonaws.com -P 3306 -u root -p
```

```
sh-4.2$ sudo -s
[root@ip-10-0-0-204 bin]# mysql -h myfirstclouddb-instance-1.cqzw6byf7zkj.us-east-1.rds.amazonaws.com -P 3306 -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 17
Server version: 5.7.12 MySQL Community Server (GPL)

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)]> create database cloudlabdb
-> ;
Query OK, 1 row affected (0.03 sec)

MySQL [(none)]> show database;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version f
e 1
MySQL [(none)]> show databases;
+-----+
| Database |
+-----+
| information_schema |
| cloudlabdb |
| mysql |
| performance_schema |
| sys |
+-----+
5 rows in set (0.01 sec)

MySQL [(none)]> use cloudlabdb;
Database changed
mysql>
```

```

MySQL [cloudlabdb]> CREATE TABLE COURSE (
  -> COURSE_ID int,
  -> COURSE_CODE varchar(255),
  -> COURSE_NAME varchar(255),
  -> TEACHER_ID int
  -> );
Query OK, 0 rows affected (0.06 sec)

MySQL [cloudlabdb]> show tables;
+-----+
| Tables_in_cloudlabdb |
+-----+
| COURSE                |
| TEACHER               |
+-----+
2 rows in set (0.01 sec)

MySQL [cloudlabdb]> INSERT INTO TEACHER (TEACHER_ID, NAME)
  -> VALUES (1, "UNUBOLD"),
  -> (2, "ASAAD"),
  -> (3, "UMUR");
Query OK, 3 rows affected (0.02 sec)
Records: 3 Duplicates: 0 Warnings: 0

MySQL [cloudlabdb]> INSERT INTO COURSE (COURSE_ID, COURSE_CODE, COURSE_NAME, TEACHER_ID)
  -> VALUES (1, "CS516", "CLOUD COMPUTING", 1),
  -> (2, "CS568", "React", 1),
  -> (3, "CS569", "Angular", 1),
  -> (3, "CS569", "Angular", 2);
Query OK, 4 rows affected (0.01 sec)
Records: 4 Duplicates: 0 Warnings: 0

```

```

MySQL [cloudlabdb]> SELECT TEACHER.NAME, COURSE.COURSE_ID, COURSE.COURSE_NAME
  -> FROM TEACHER JOIN COURSE ON TEACHER.TEACHER_ID = COURSE.TEACHER_ID;
+-----+-----+-----+
| NAME    | COURSE_ID | COURSE_NAME |
+-----+-----+-----+
| UNUBOLD |          1 | CLOUD COMPUTING |
| UNUBOLD |          2 | React          |
| UNUBOLD |          3 | Angular        |
| ASAAD   |          3 | Angular        |
+-----+-----+-----+
4 rows in set (0.00 sec)

```

For the Reader Instance:

```
[root@ip-10-0-0-204 bin]# mysql -h myfirstcloudodb.cluster-ro-cqzw6byf7zkj.us-east-1.rds.amazonaws.com -P 3306 -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 11
Server version: 5.7.12 MySQL Community Server (GPL)

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)]> use cloudlabdb;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MySQL [cloudlabdb]> show tables;
+-----+
| Tables_in_cloudlabdb |
+-----+
| COURSE                |
| TEACHER                |
+-----+
2 rows in set (0.00 sec)

MySQL [cloudlabdb]> INSERT INTO TEACHER (TEACHER_ID, NAME)
-> VALUES (1, "UNUBOLD"),
-> (2, "ASAAD"),
-> (3, "UMUR");
ERROR 1290 (HY000): The MySQL server is running with the --read-only option so it cannot execute this statement
MySQL [cloudlabdb]>
```