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BANGALORE · INDIA

DEPARTMENT OF COMPUTER SCIENCE

LAB6-DBaaS

CLOUD COMPUTING

SUBMITTED BY

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SECTION: 5 MCA B

1. Describe DBaaS

DBaaS stands for Database as a Service. It is a cloud computing service model that provides database management and access to databases as a fully managed service. In a **DBaaS** model, the cloud service provider takes care of all aspects of database administration, maintenance, and infrastructure management, allowing users to focus on their applications and data rather than the underlying database infrastructure.

Key characteristics of **DBaaS** include:

Managed Service:

- DBaaS providers handle routine database management tasks such as setup, configuration, patching, backups, and monitoring. Users are relieved of the operational burden associated with maintaining a database.

Scalability:

- DBaaS platforms often offer automated scalability features. Users can easily scale their database resources up or down based on demand without worrying about the underlying hardware or infrastructure.

Multi-Tenancy:

- DBaaS allows multiple users or organizations to share the same database infrastructure while maintaining data isolation and security. This multi-tenancy feature is particularly useful in cloud environments where resources are shared among multiple users.

Cost Efficiency:

- Users pay for the resources and services they consume, making DBaaS a cost-effective solution. There is no need to invest in and manage physical hardware or worry about upfront costs associated with traditional database setups.

Accessibility and Connectivity:

- DBaaS offerings usually provide easy access to databases through standard interfaces and protocols. Users can connect to and manage their databases remotely, facilitating collaborative development and administration.

Automatic Updates and Maintenance:

- The service provider takes care of software updates, security patches, and routine maintenance tasks. This ensures that the database infrastructure is always up-to-date and secure without requiring user intervention.

Security and Compliance:

- DBaaS providers implement security measures to protect data integrity and confidentiality. They often comply with industry standards and regulations, providing a secure environment for sensitive data.

Popular DBaaS offerings include Amazon RDS (Relational Database Service), Google Cloud SQL, Microsoft Azure SQL Database, and various managed NoSQL databases. DBaaS is suitable for a wide range of applications, from small projects to large-scale enterprise solutions, offering flexibility, scalability, and ease of use.

2. List the Different Database Engines available in AWS and GCP.

Amazon Web Services (AWS):

Amazon RDS (Relational Database Service):

- Supports various relational database engines, including:
  - MySQL
  - PostgreSQL
  - MariaDB
  - Oracle Database
  - Microsoft SQL Server
  - Amazon Aurora (a MySQL and PostgreSQL-compatible relational database engine developed by AWS)

Amazon DynamoDB:

- A fully managed NoSQL database service that supports both document and key-value data models.

Amazon DocumentDB:

- A managed MongoDB-compatible database service designed for document-oriented applications.

Amazon Neptune:

- A fully managed graph database service that supports both Property Graph and RDF (Resource Description Framework) models.

Amazon Redshift:

- A fully managed data warehouse service designed for fast query performance using standard SQL.

Google Cloud Platform (GCP):

Cloud SQL:

- Managed relational database service that supports:
  - MySQL
  - PostgreSQL
  - SQL Server

Cloud Spanner:

- A globally distributed, horizontally scalable, and strongly consistent database service that supports both relational and NoSQL data models.

Cloud Firestore:

- A fully managed NoSQL document database that is part of the Firebase platform.

Cloud Bigtable:

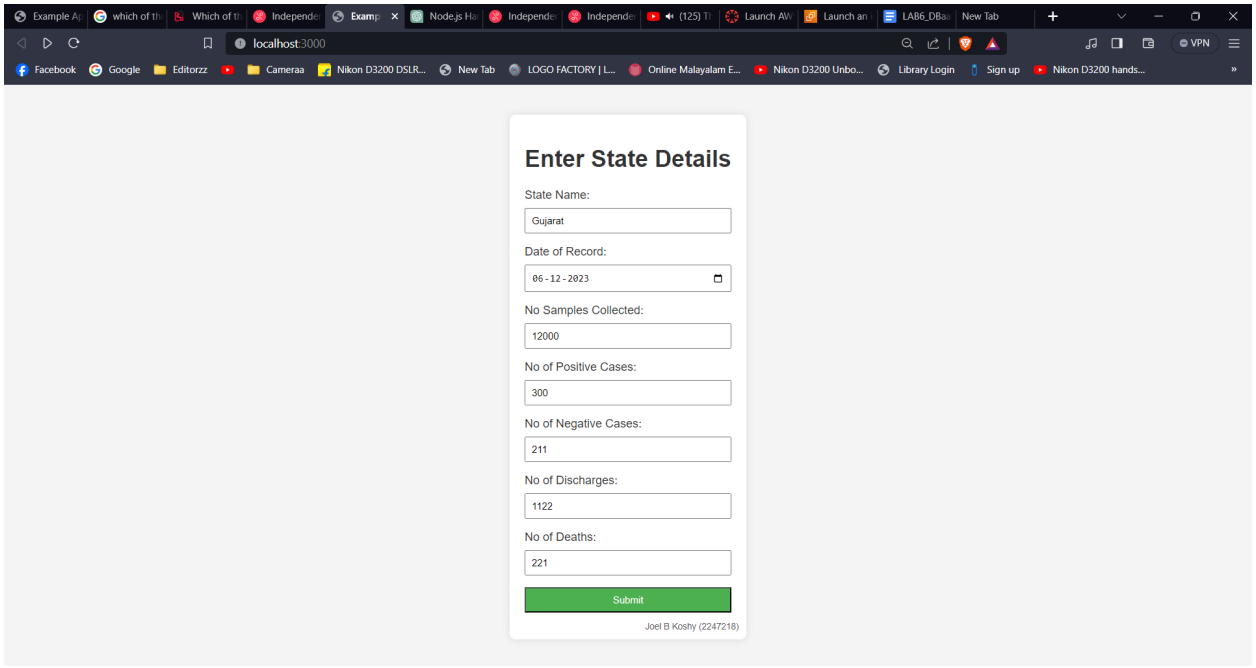
- A fully managed, scalable NoSQL wide-column store for large analytical and operational workloads.

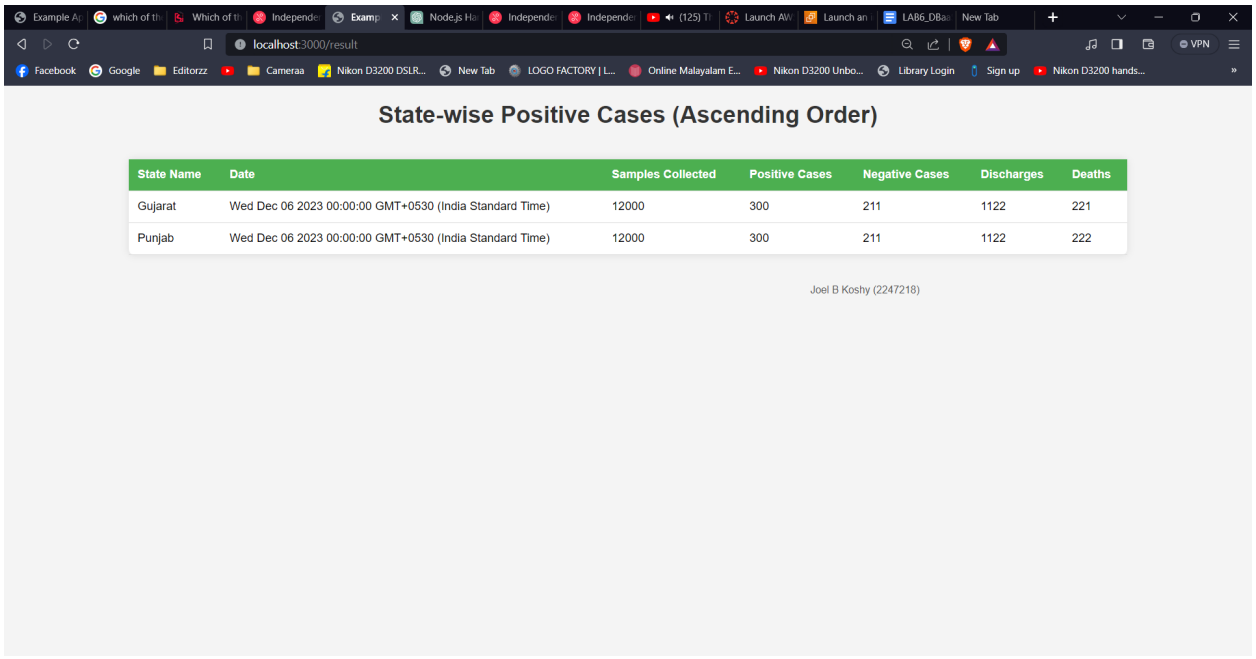
Cloud Memorystore:

- A managed in-memory data store service that is compatible with the Redis protocol.

Cloud Storage:

- While not a traditional database, Google Cloud Storage provides scalable object storage for unstructured data.






```
MariaDB [lab6]> select * from state_data;
+----+-----------+------------+------------------+---------------+---------------+------------+--------+
| id | stateName | date       | samplesCollected | positiveCases | negativeCases | discharges | deaths |
+----+-----------+------------+------------------+---------------+---------------+------------+--------+
|  1 | Gujarat   | 2023-12-06 |            12000 |           300 |           211 |       1122 |    221 |
|  2 | Punjab    | 2023-12-06 |            12000 |           300 |           211 |       1122 |    222 |
+----+-----------+------------+------------------+---------------+---------------+------------+--------+
2 rows in set (0.002 sec)

MariaDB [lab6]>
```

Hosting the app on EC2

Step 1: Launch an EC2 Instance

Log in to AWS Console:

- Log in to the AWS Management Console.

Navigate to EC2:

- Go to the EC2 service.

Launch Instance:

- Click on "Launch Instance."
- Choose an Amazon Machine Image (AMI). A common choice is an Amazon Linux 2 AMI.
- Select an instance type (e.g., t2.micro).
- Configure instance details (optional).
- Add storage and configure any additional settings as needed.
- Add tags (optional).
- Configure security groups to allow inbound traffic on the required ports (e.g., 22 for SSH, 80 for HTTP).
- Review and launch the instance.

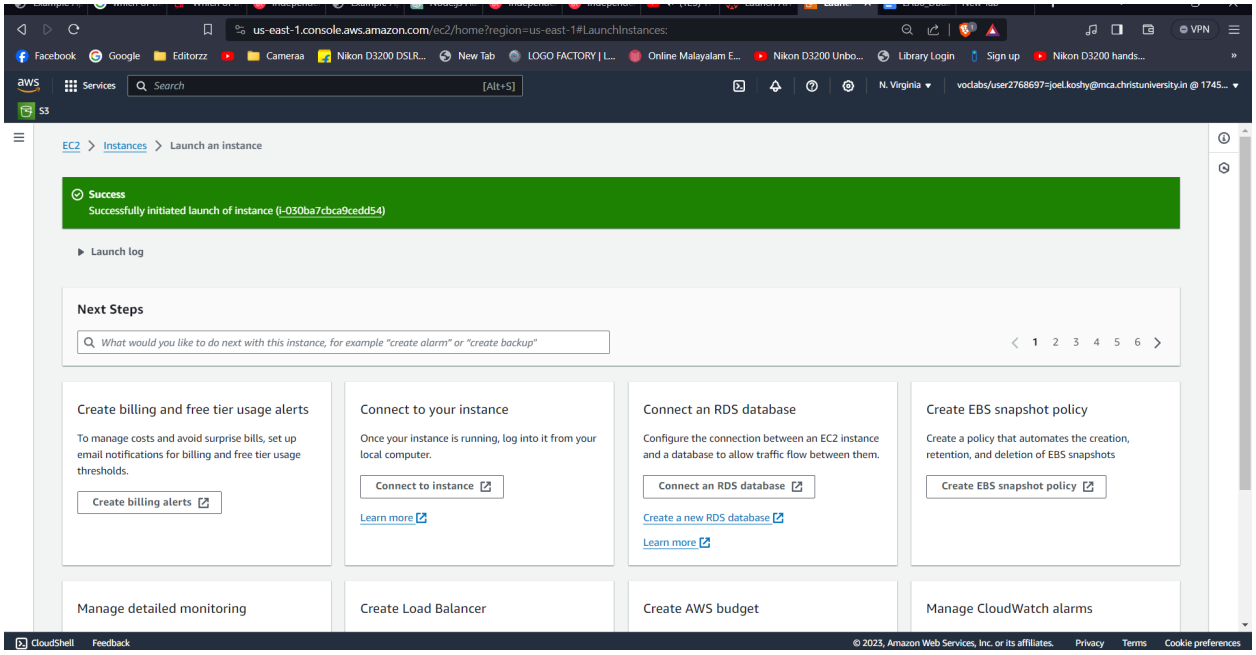
Create Key Pair:

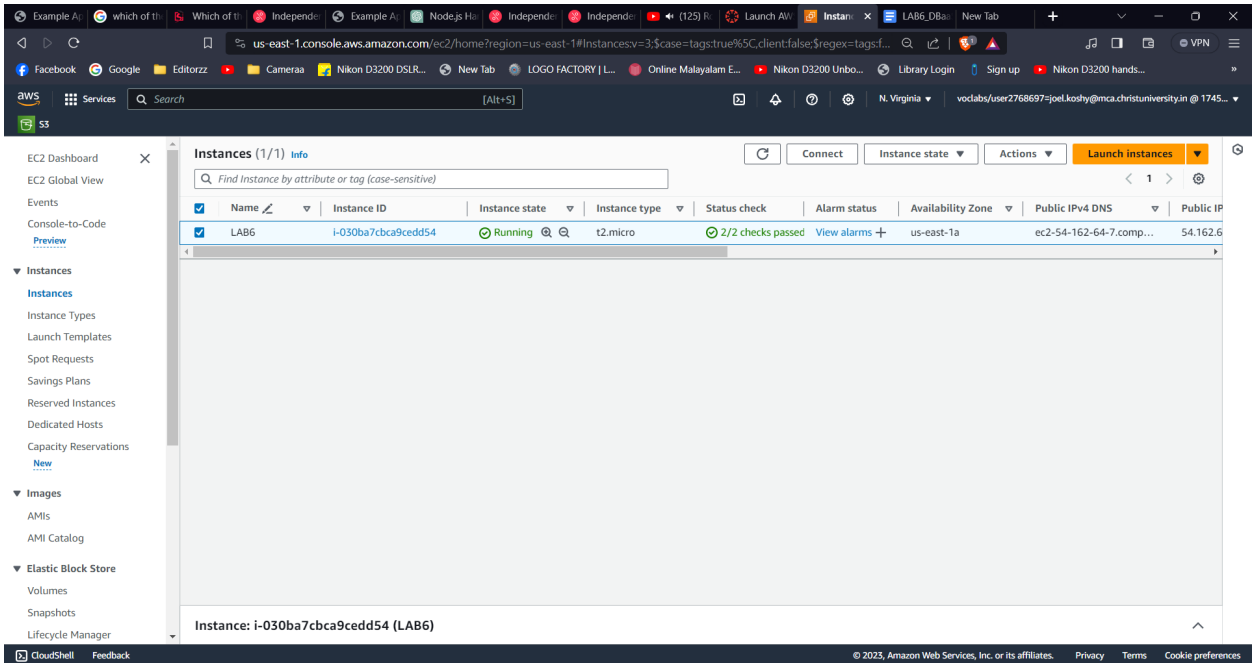
- Create a new key pair or use an existing one. This key pair is needed to connect to your EC2 instance.

Launch the Instance:

- Click "Launch Instance."

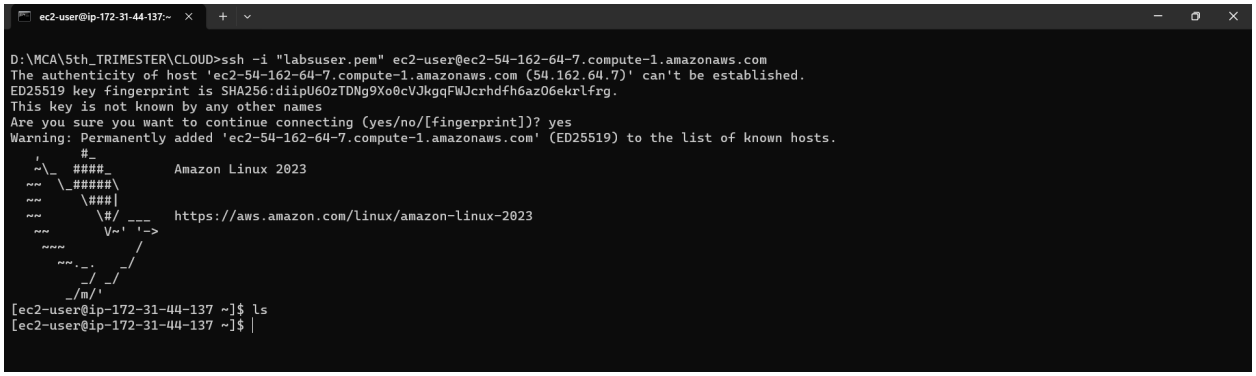
Step 2: Connect to EC2 Instance



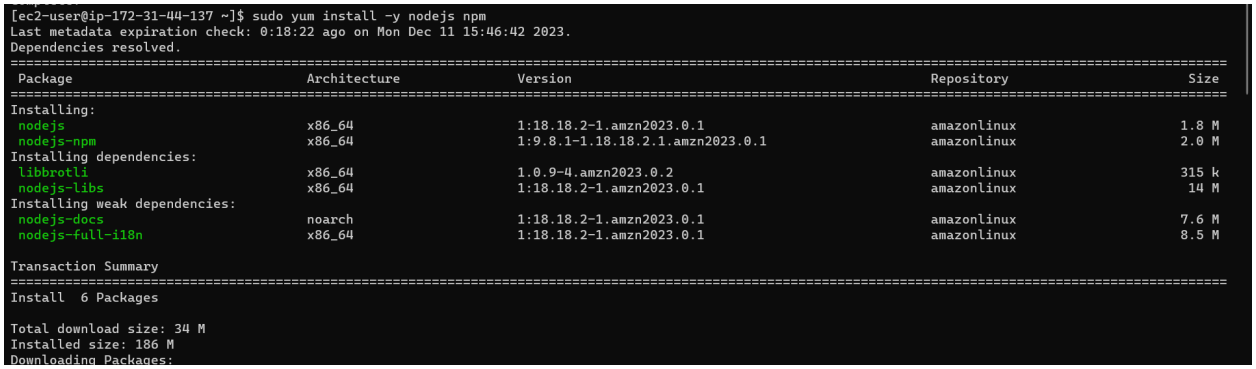


SSH into EC2:

- Use the private key associated with your key pair to connect to the EC2 instance.



Step 3: Update and Install Dependencies



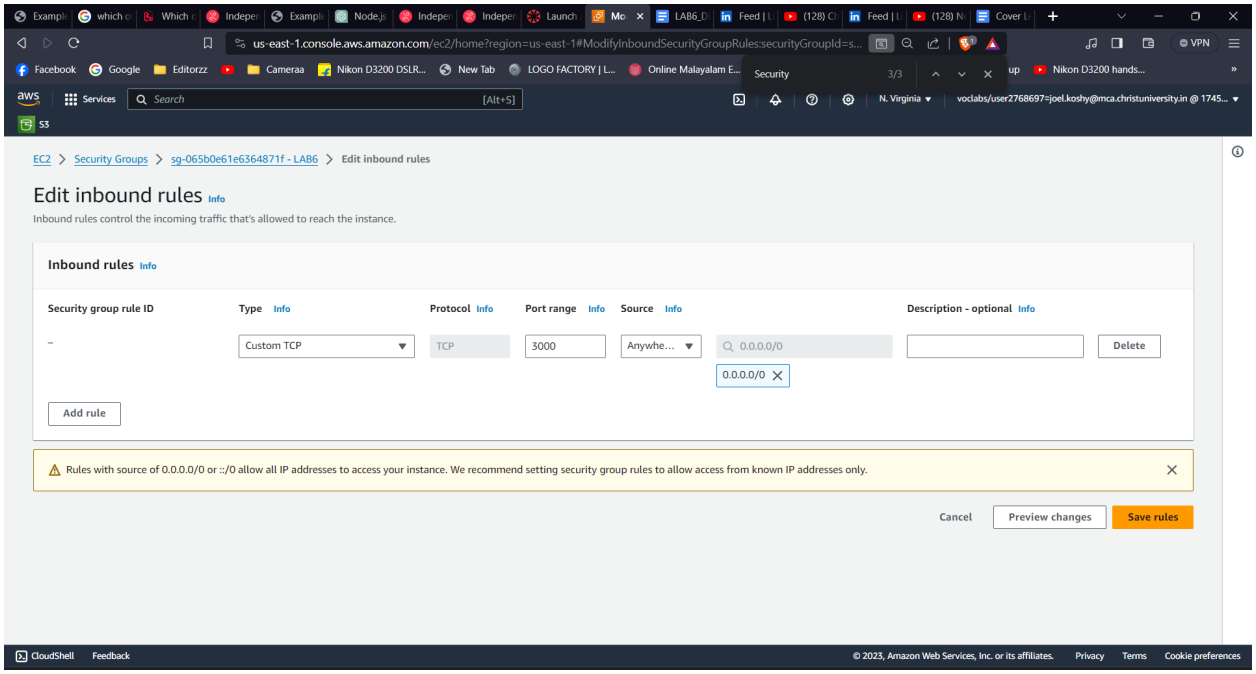
Step 4: Copy Your Node.js App to EC2

Copy Files:

- Use SCP or SFTP to copy your Node.js app files to the EC2 instance.

scp -i your-key.pem -r your-app-folder ec2-user@your-ec2-instance-ip:~/

Step 5 : Changing Security Groups


EC2 > Security Groups > sg-065b0e61e6364871f - LAB6 > Edit inbound rules
Edit inbound rules Info
Inbound rules control the incoming traffic that's allowed to reach the instance.
Inbound rules Info
Security group rule ID
Type Info
Protocol Info
Port range Info
Source Info
Description - optional Info
Custom TCP
TCP
3000
Anywhe...
0.0.0.0/0
0.0.0.0/0
Delete
Add rule
Rules with source of 0.0.0.0/0 or ::/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.
Cancel
Preview changes
Save rules
CloudShell
Feedback
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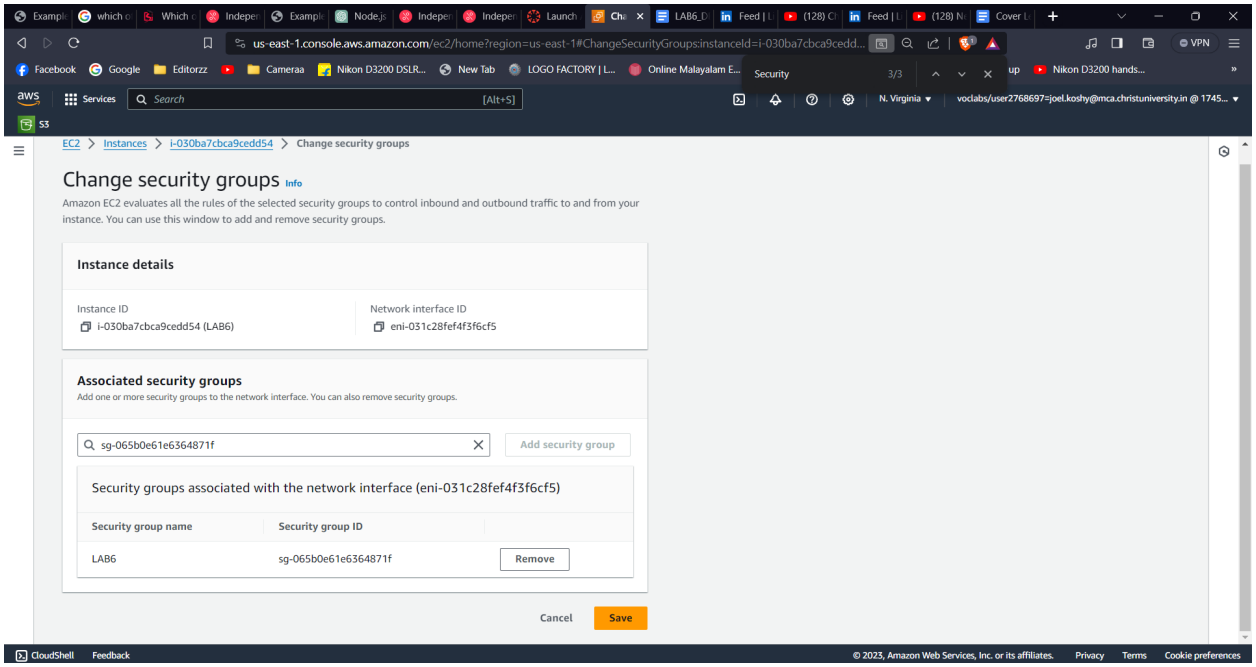
EC2 > Instances > i-030ba7cbca9cedd54 > Change security groups
Change security groups Info
Amazon EC2 evaluates all the rules of the selected security groups to control inbound and outbound traffic to and from your instance. You can use this window to add and remove security groups.
Instance details
Instance ID
i-030ba7cbca9cedd54 (LAB6)
Network interface ID
eni-031c28fef4f3f6cf5
Associated security groups
Add one or more security groups to the network interface. You can also remove security groups.
sg-065b0e61e6364871f
Add security group
Security groups associated with the network interface (eni-031c28fef4f3f6cf5)
Security group name
Security group ID
LAB6
sg-065b0e61e6364871f
Remove
Cancel
Save
CloudShell
Feedback
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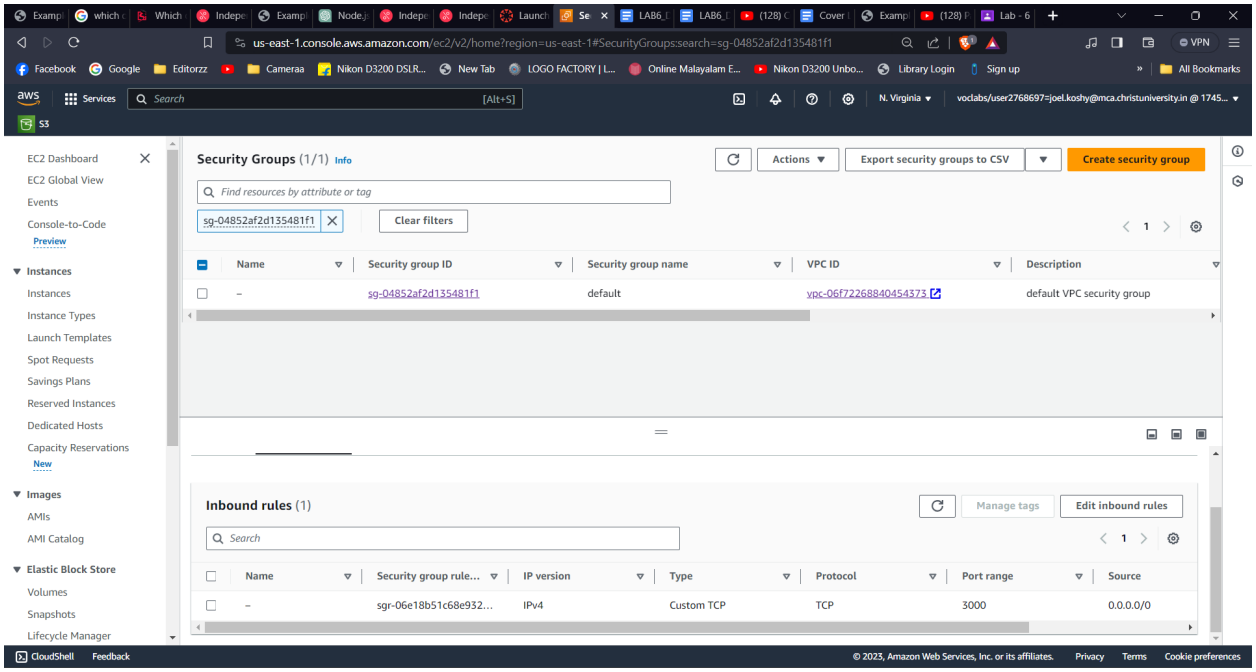
us-east-1.console.aws.amazon.com/ec2/v2/home?region=us-east-1#SecurityGroups:search=sg-04852af2d135481f1
Security Groups (1/1) Info
Actions
Export security groups to CSV
Create security group
Find resources by attribute or tag
sg-04852af2d135481f1
Clear filters
Name
Security group ID
Security group name
VPC ID
Description
sg-04852af2d135481f1
default
vpc-06f72268840454373
default VPC security group
Inbound rules (1)
Manage tags
Edit inbound rules
Search
Name
Security group rule...
IP version
Type
Protocol
Port range
Source
sgr-06e18b51c68e932...
IPv4
Custom TCP
TCP
3000
0.0.0.0/0
CloudShell
Feedback
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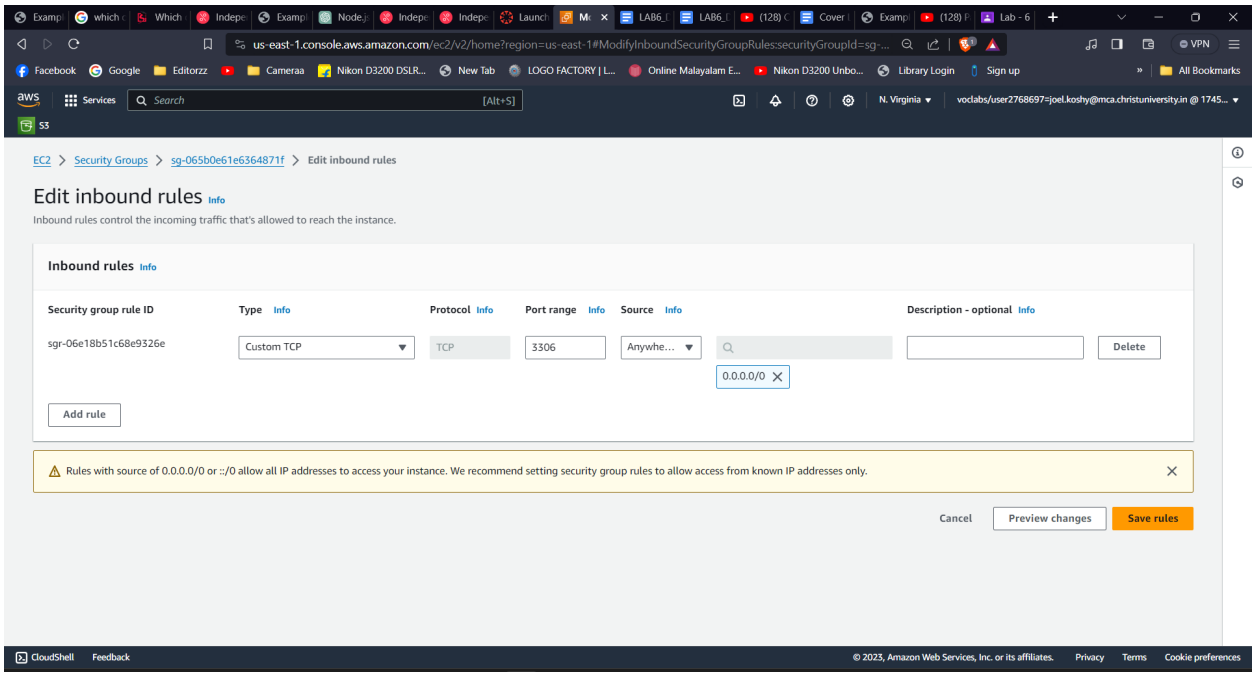
Privacy
Terms
Cookie preferences


us-east-1.console.aws.amazon.com/ec2/v2/home?region=us-east-1#ModifyInboundSecurityGroupRules:securityGroupId=sg-...
EC2 > Security Groups > sg-065b0e61e6364871f > Edit inbound rules
Edit inbound rules Info
Inbound rules control the incoming traffic that's allowed to reach the instance.
Inbound rules Info
Security group rule ID
Type Info
Protocol Info
Port range Info
Source Info
Description - optional Info
sgr-06e18b51c68e9326e
Custom TCP
TCP
3306
Anywhe...
0.0.0.0/0
Delete
Add rule
Rules with source of 0.0.0.0/0 or ::/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.
Cancel
Preview changes
Save rules
CloudShell
Feedback
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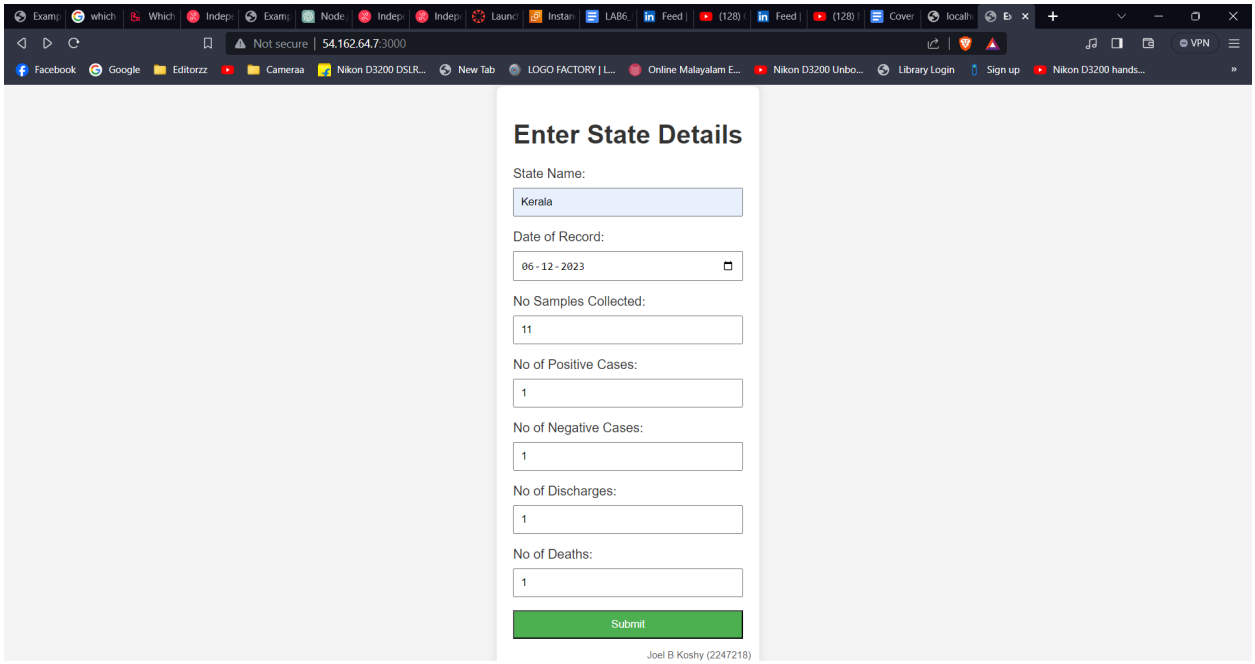
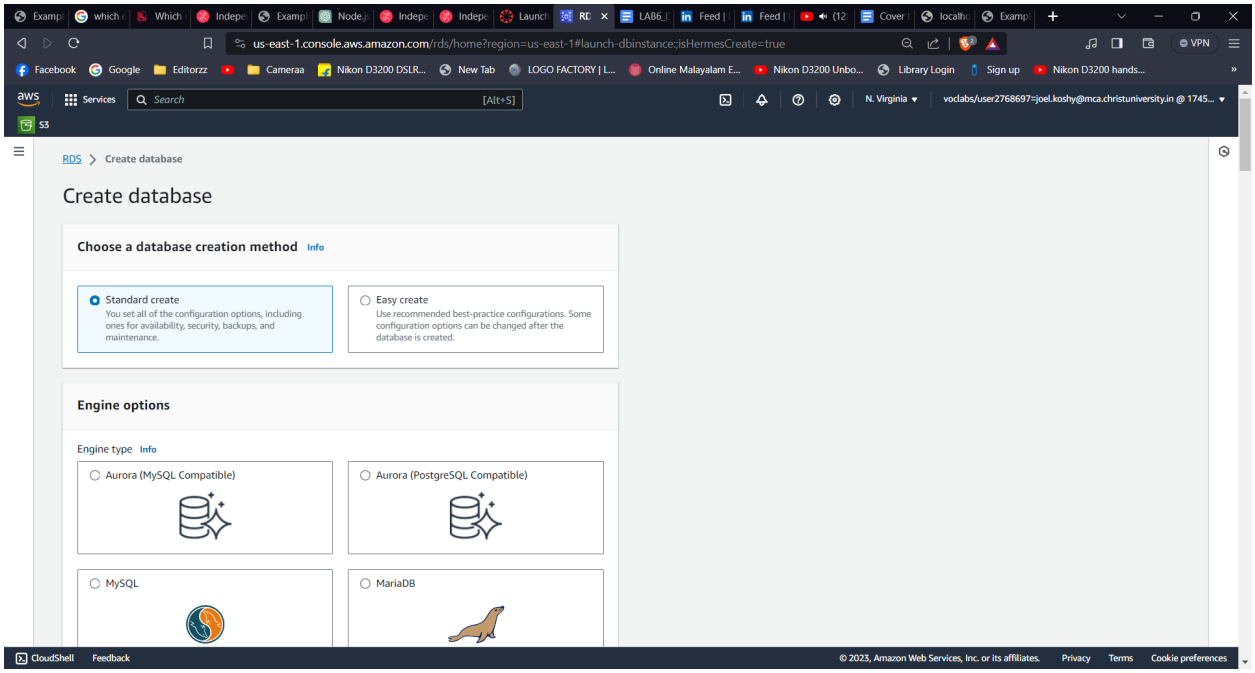
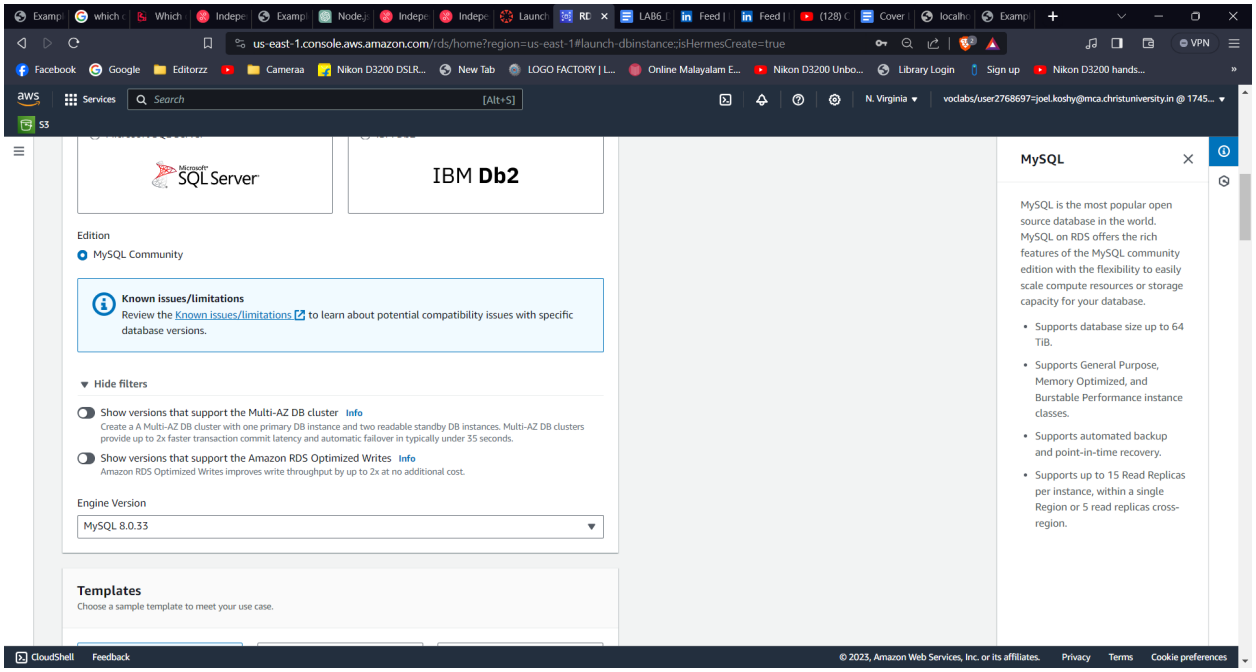
Hosted nodejs app



Step7 : Connecting with RDS




us-east-1.console.aws.amazon.com/rds/home?region=us-east-1#launch-dbinstance;isHermesCreate=true
Services
Search
[Alt+S]
N. Virginia
S3
SQL Server
IBM Db2
Edition
MySQL Community
Known issues/limitations
Review the Known issues/limitations to learn about potential compatibility issues with specific database versions.
Hide filters
Show versions that support the Multi-AZ DB cluster Info
Create a A Multi-AZ DB cluster with one primary DB instance and two readable standby DB instances. Multi-AZ DB clusters provide up to 2x faster transaction commit latency and automatic failover in typically under 35 seconds.
Show versions that support the Amazon RDS Optimized Writes Info
Amazon RDS Optimized Writes improves write throughput by up to 2x at no additional cost.
Engine Version
MySQL 8.0.33
Templates
Choose a sample template to meet your use case.
MySQL
MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.
Supports database size up to 64 TiB.
Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
Supports automated backup and point-in-time recovery.
Supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas cross-region.
CloudShell
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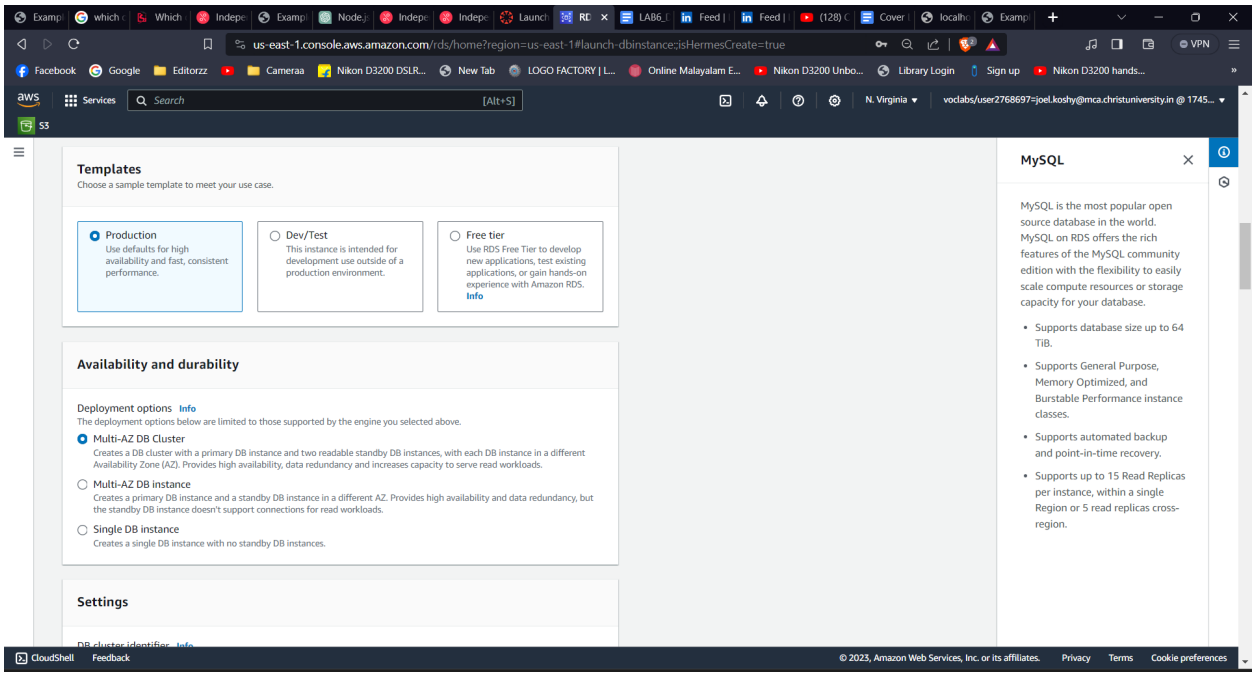
us-east-1.console.aws.amazon.com/rds/home?region=us-east-1#launch-dbinstance;isHermesCreate=true
Services
Search
[Alt+S]
N. Virginia
S3
Templates
Choose a sample template to meet your use case.
Production
Use defaults for high availability and fast, consistent performance.
Dev/Test
This instance is intended for development use outside of a production environment.
Free tier
Use RDS Free Tier to develop new applications, test existing applications, or gain hands-on experience with Amazon RDS.
Info
Availability and durability
Deployment options Info
The deployment options below are limited to those supported by the engine you selected above.
Multi-AZ DB Cluster
Creates a DB cluster with a primary DB instance and two readable standby DB instances, with each DB instance in a different Availability Zone (AZ). Provides high availability, data redundancy and increases capacity to serve read workloads.
Multi-AZ DB instance
Creates a primary DB instance and a standby DB instance in a different AZ. Provides high availability and data redundancy, but the standby DB instance doesn't support connections for read workloads.
Single DB instance
Creates a single DB instance with no standby DB instances.
Settings
MySQL
MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.
Supports database size up to 64 TiB.
Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
Supports automated backup and point-in-time recovery.
Supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas cross-region.
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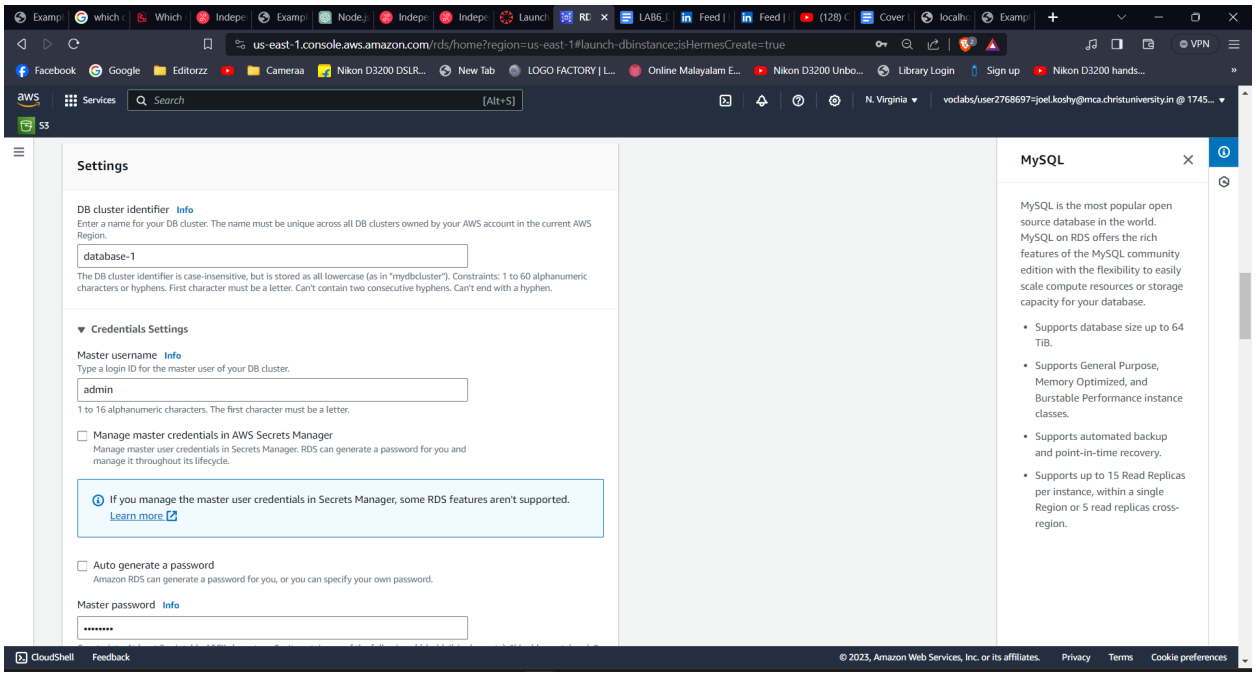
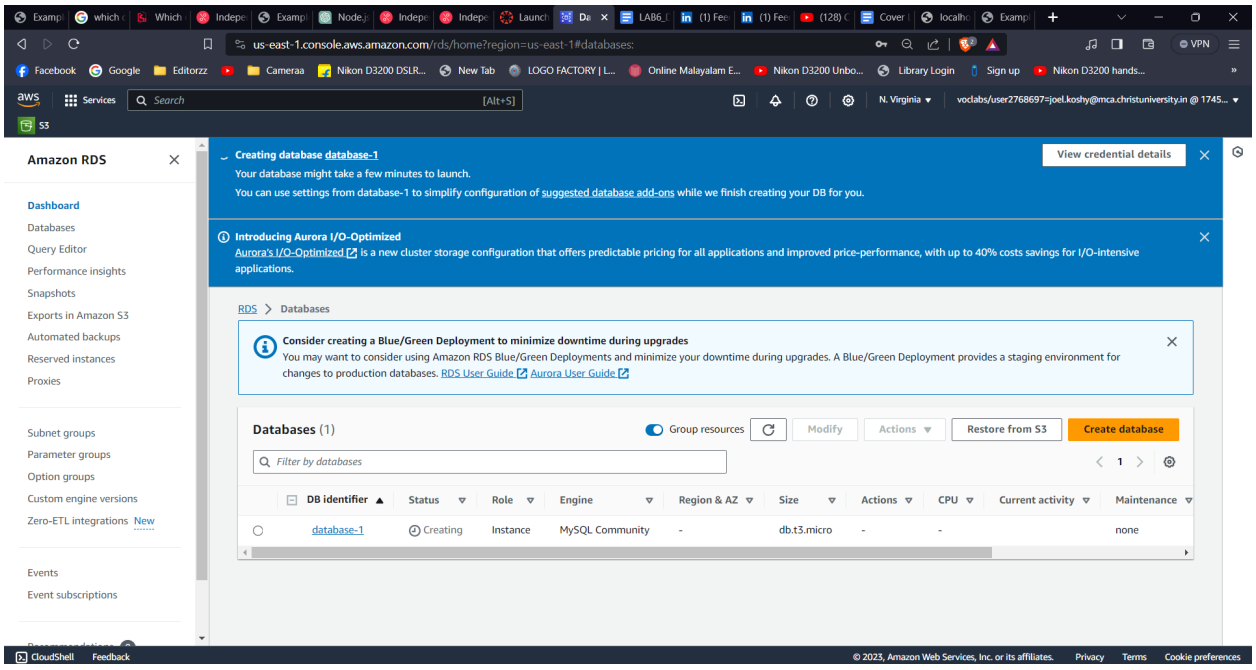
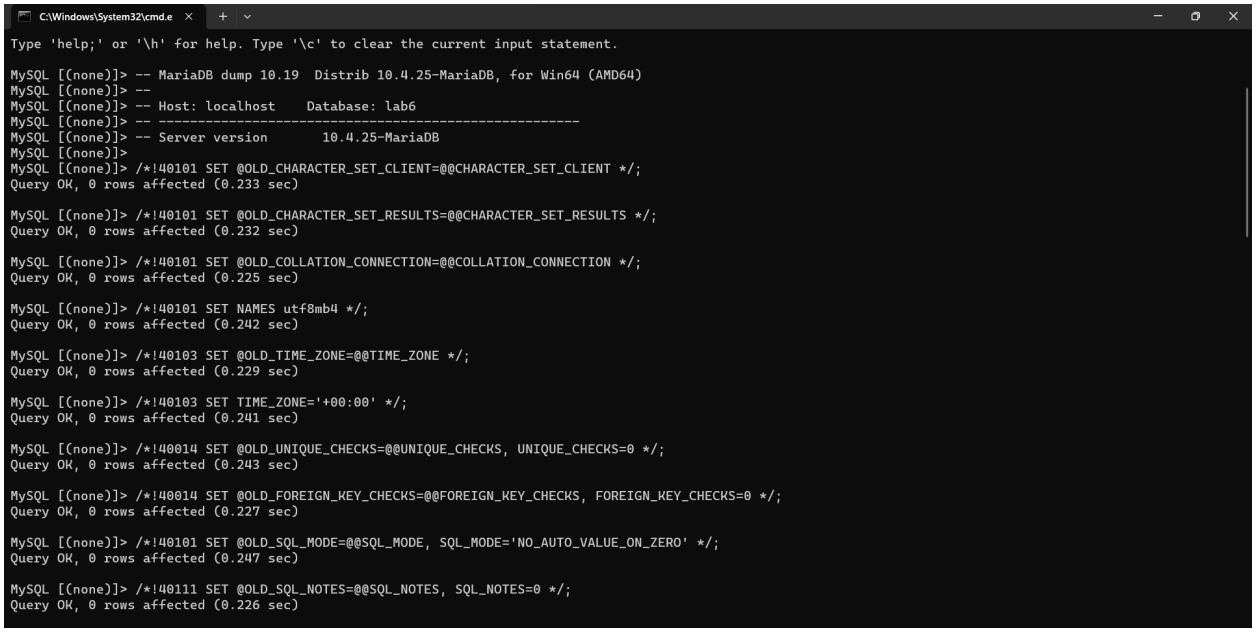
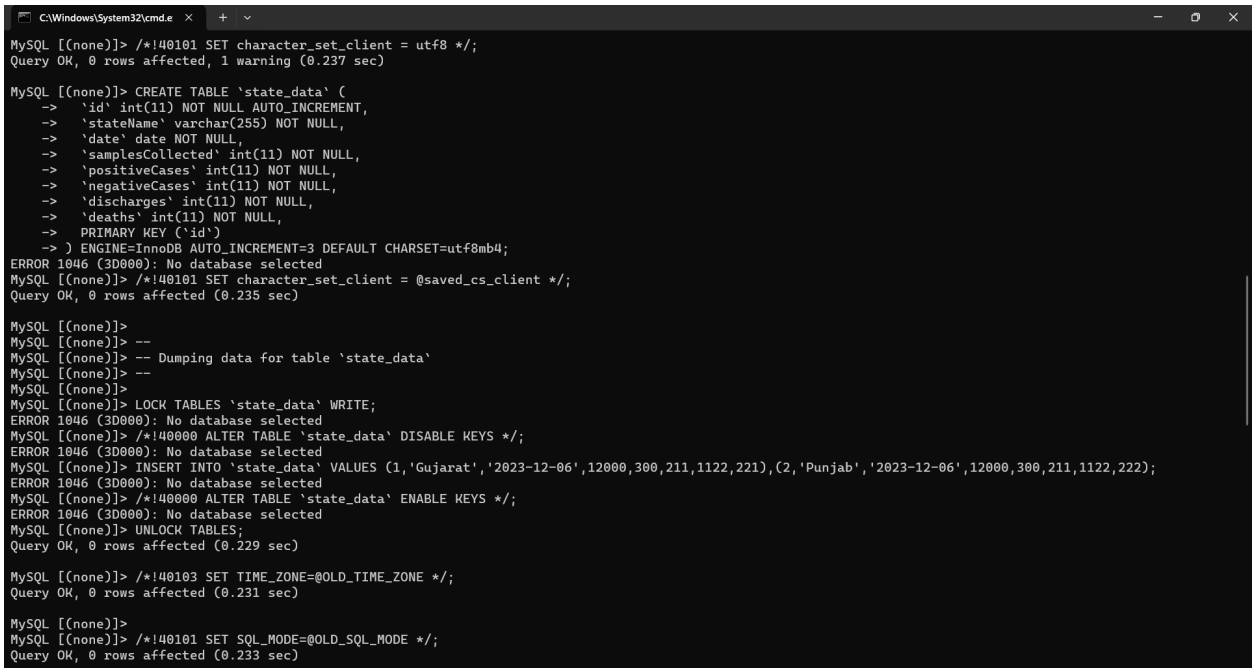
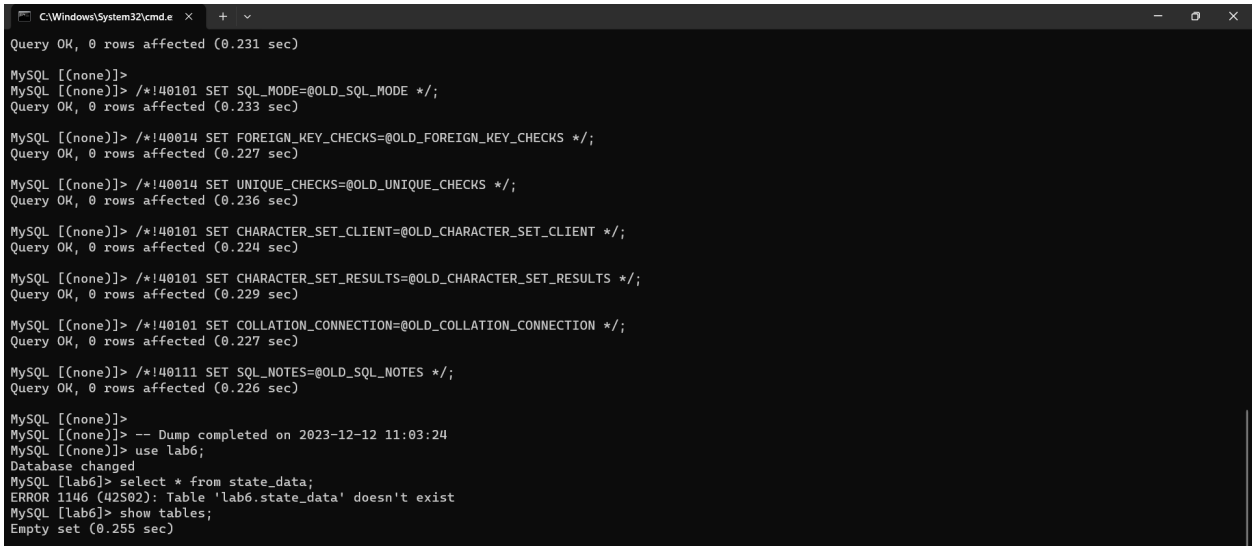





```
D:\MCA\GITHUB-REPOS\Notio\Notio\app>mysql -h database-1.cd0fnifgefp8.us-east-1.rds.amazonaws.com -u admin -p
Enter password: ********
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 141
Server version: 8.0.33 Source distribution

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)]>
```

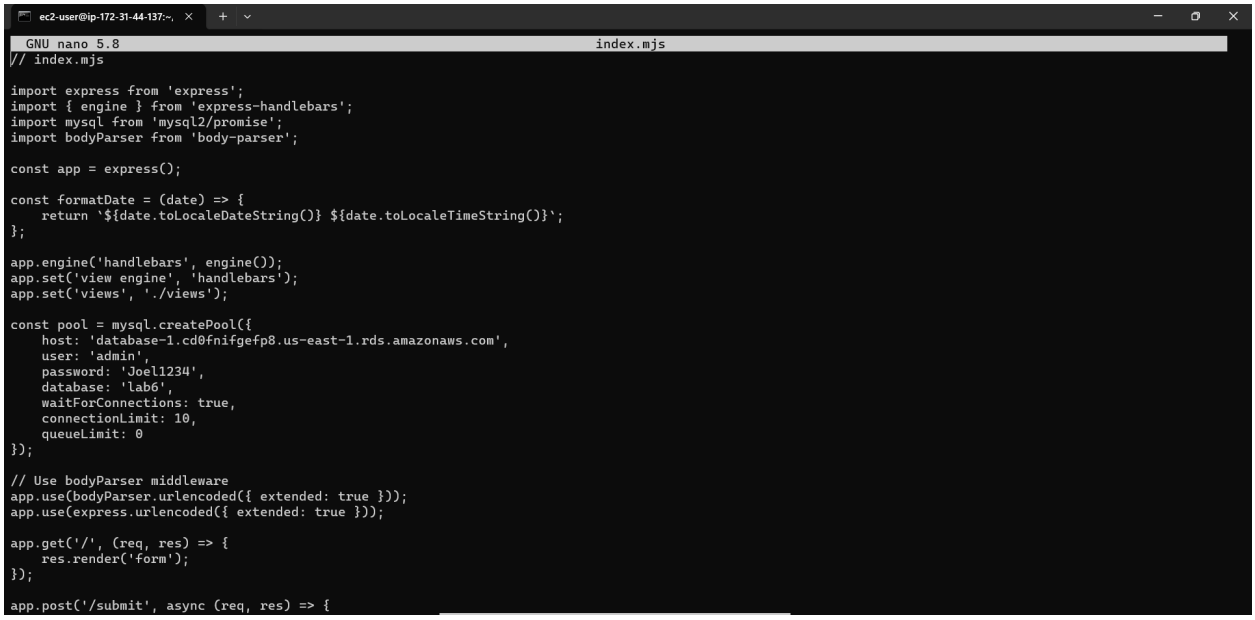

C:\Windows\System32\cmd.e
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
MySQL [(none)]> -- MariaDB dump 10.19 Distrib 10.4.25-MariaDB, for Win64 (AMD64)
MySQL [(none)]> --
MySQL [(none)]> -- Host: localhost   Database: lab6
MySQL [(none)]> -- --
MySQL [(none)]> -- Server version   10.4.25-MariaDB
MySQL [(none)]>
MySQL [(none)]> /*!40101 SET @OLD_CHARACTER_SET_CLIENT=@@CHARACTER_SET_CLIENT */;
Query OK, 0 rows affected (0.233 sec)
MySQL [(none)]> /*!40101 SET @OLD_CHARACTER_SET_RESULTS=@@CHARACTER_SET_RESULTS */;
Query OK, 0 rows affected (0.232 sec)
MySQL [(none)]> /*!40101 SET @OLD_COLLATION_CONNECTION=@@COLLATION_CONNECTION */;
Query OK, 0 rows affected (0.225 sec)
MySQL [(none)]> /*!40101 SET NAMES utf8mb4 */;
Query OK, 0 rows affected (0.242 sec)
MySQL [(none)]> /*!40103 SET @OLD_TIME_ZONE=@@TIME_ZONE */;
Query OK, 0 rows affected (0.229 sec)
MySQL [(none)]> /*!40103 SET TIME_ZONE='+00:00' */;
Query OK, 0 rows affected (0.241 sec)
MySQL [(none)]> /*!40014 SET @OLD_UNIQUE_CHECKS=@@UNIQUE_CHECKS, UNIQUE_CHECKS=0 */;
Query OK, 0 rows affected (0.243 sec)
MySQL [(none)]> /*!40014 SET @OLD_FOREIGN_KEY_CHECKS=@@FOREIGN_KEY_CHECKS, FOREIGN_KEY_CHECKS=0 */;
Query OK, 0 rows affected (0.227 sec)
MySQL [(none)]> /*!40101 SET @OLD_SQL_MODE=@@SQL_MODE, SQL_MODE='NO_AUTO_VALUE_ON_ZERO' */;
Query OK, 0 rows affected (0.247 sec)
MySQL [(none)]> /*!40111 SET @OLD_SQL_NOTES=@@SQL_NOTES, SQL_NOTES=0 */;
Query OK, 0 rows affected (0.226 sec)

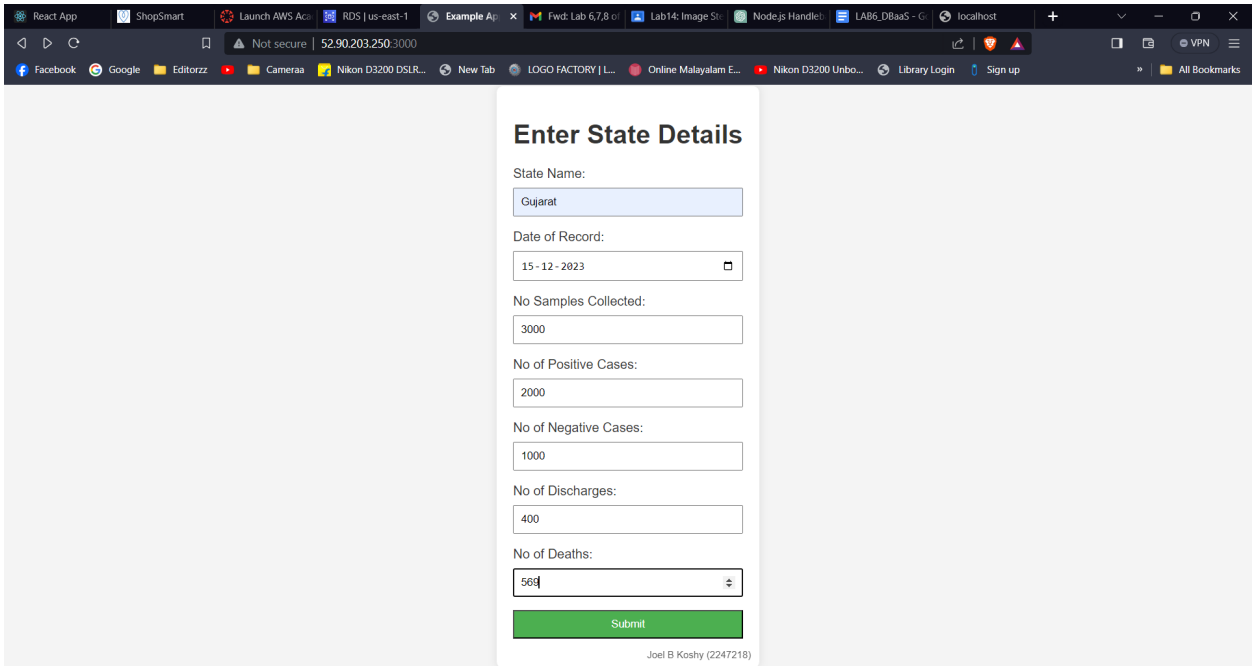

C:\Windows\System32\cmd.e
MySQL [(none)]> /*!40101 SET character_set_client = utf8 */;
Query OK, 0 rows affected, 1 warning (0.237 sec)
MySQL [(none)]> CREATE TABLE `state_data` (
    ->   `id` int(11) NOT NULL AUTO_INCREMENT,
    ->   `stateName` varchar(255) NOT NULL,
    ->   `date` date NOT NULL,
    ->   `samplesCollected` int(11) NOT NULL,
    ->   `positiveCases` int(11) NOT NULL,
    ->   `negativeCases` int(11) NOT NULL,
    ->   `discharges` int(11) NOT NULL,
    ->   `deaths` int(11) NOT NULL,
    ->   PRIMARY KEY (`id`)
    ->) ENGINE=InnoDB AUTO_INCREMENT=3 DEFAULT CHARSET=utf8mb4;
ERROR 1046 (3D000): No database selected
MySQL [(none)]> /*!40101 SET character_set_client = @saved_cs_client */;
Query OK, 0 rows affected (0.235 sec)
MySQL [(none)]>
MySQL [(none)]> --
MySQL [(none)]> -- Dumping data for table `state_data`
MySQL [(none)]> --
MySQL [(none)]>
MySQL [(none)]> LOCK TABLES `state_data` WRITE;
ERROR 1046 (3D000): No database selected
MySQL [(none)]> /*!40000 ALTER TABLE `state_data` DISABLE KEYS */;
ERROR 1046 (3D000): No database selected
MySQL [(none)]> INSERT INTO `state_data` VALUES (1,'Gujarat','2023-12-06',12000,300,211,1122,221),(2,'Punjab','2023-12-06',12000,300,211,1122,222);
ERROR 1046 (3D000): No database selected
MySQL [(none)]> /*!40000 ALTER TABLE `state_data` ENABLE KEYS */;
ERROR 1046 (3D000): No database selected
MySQL [(none)]> UNLOCK TABLES;
Query OK, 0 rows affected (0.229 sec)
MySQL [(none)]> /*!40103 SET TIME_ZONE=@OLD_TIME_ZONE */;
Query OK, 0 rows affected (0.231 sec)
MySQL [(none)]>
MySQL [(none)]> /*!40101 SET SQL_MODE=@OLD_SQL_MODE */;
Query OK, 0 rows affected (0.233 sec)

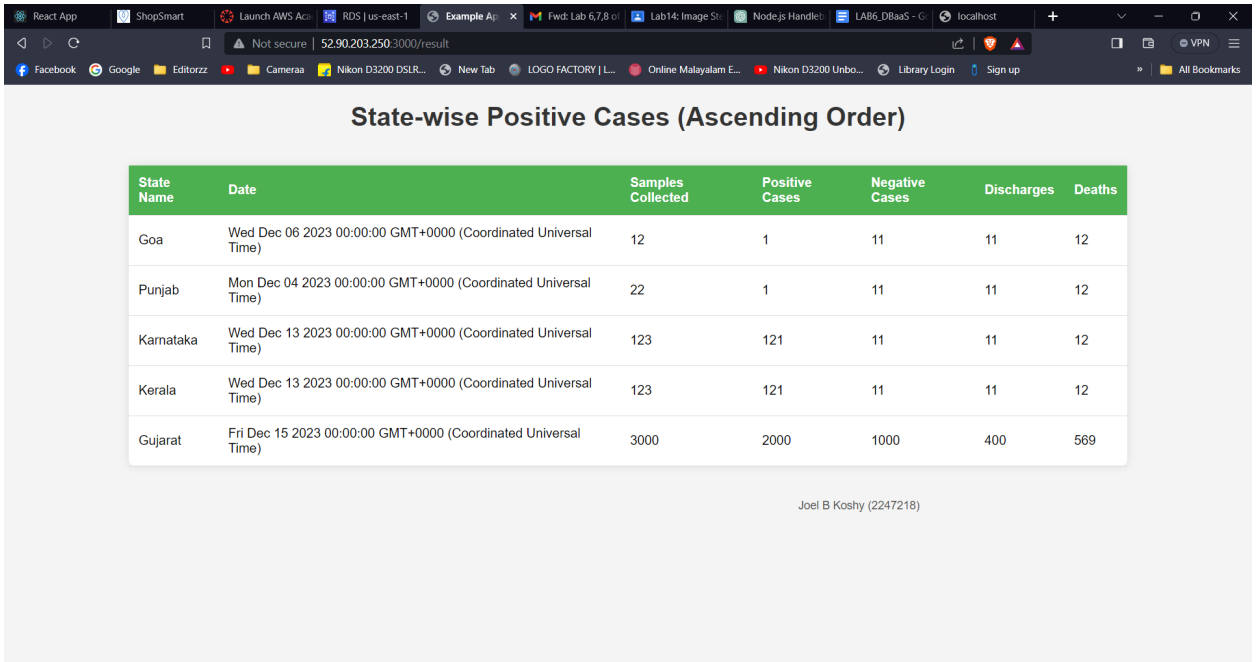


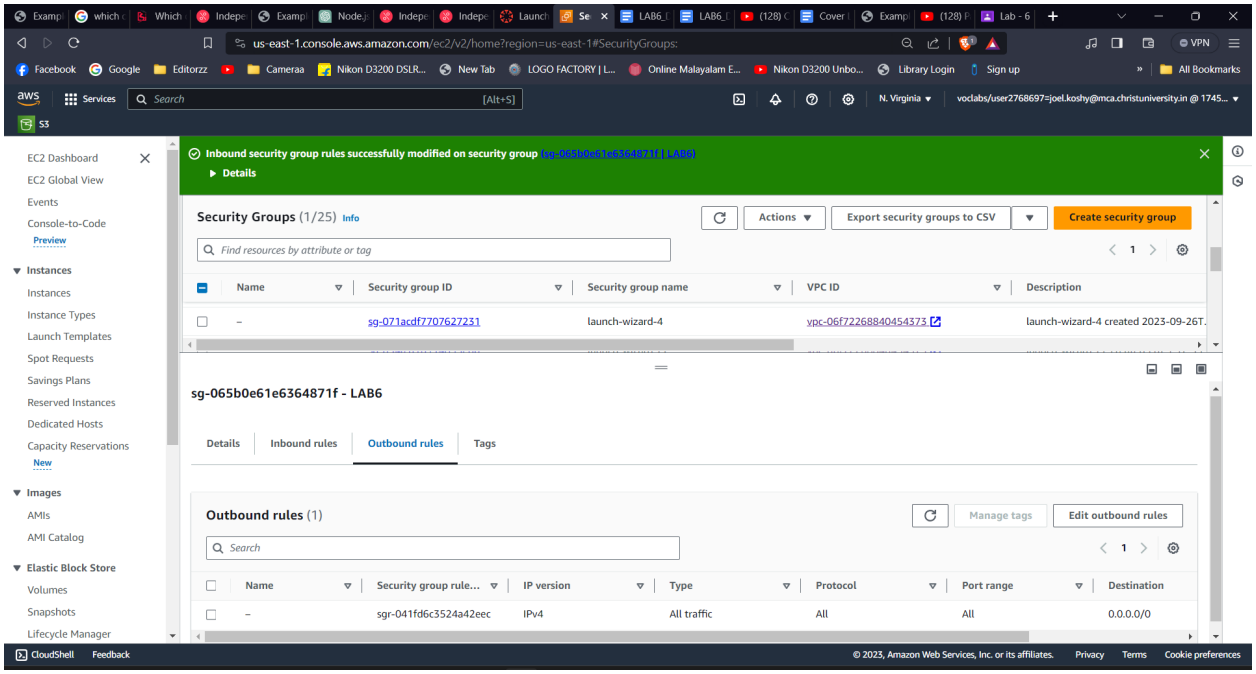

```
MySQL [lab6]> CREATE TABLE state_data (
    ->   id INT AUTO_INCREMENT PRIMARY KEY,
    ->   stateName VARCHAR(255) NOT NULL,
    ->   date DATE NOT NULL,
    ->   samplesCollected INT NOT NULL,
    ->   positiveCases INT NOT NULL,
    ->   negativeCases INT NOT NULL,
    ->   discharges INT NOT NULL,
    ->   deaths INT NOT NULL
    -> );
Query OK, 0 rows affected (0.307 sec)

MySQL [lab6]> show tables;
+----------------+
| Tables_in_lab6 |
+----------------+
| state_data     |
+----------------+
1 row in set (0.227 sec)

MySQL [lab6]>
```

Connecting the nodejs app with the rds database




Not secure | 52.90.203.250:3000
Enter State Details
State Name:
Gujarat
Date of Record:
15-12-2023
No Samples Collected:
3000
No of Positive Cases:
2000
No of Negative Cases:
1000
No of Discharges:
400
No of Deaths:
569
Submit
Joel B Koshy (2247218)


Not secure | 52.90.203.250:3000/result
State-wise Positive Cases (Ascending Order)
State Name | Date | Samples Collected | Positive Cases | Negative Cases | Discharges | Deaths
Goa | Wed Dec 06 2023 00:00:00 GMT+0000 (Coordinated Universal Time) | 12 | 1 | 11 | 11 | 12
Punjab | Mon Dec 04 2023 00:00:00 GMT+0000 (Coordinated Universal Time) | 22 | 1 | 11 | 11 | 12
Karnataka | Wed Dec 13 2023 00:00:00 GMT+0000 (Coordinated Universal Time) | 123 | 121 | 11 | 11 | 12
Kerala | Wed Dec 13 2023 00:00:00 GMT+0000 (Coordinated Universal Time) | 123 | 121 | 11 | 11 | 12
Gujarat | Fri Dec 15 2023 00:00:00 GMT+0000 (Coordinated Universal Time) | 3000 | 2000 | 1000 | 400 | 569
Joel B Koshy (2247218)


Inbound security group rules successfully modified on security group
Details
Security Groups (1/25) Info
Actions
Export security groups to CSV
Create security group
Find resources by attribute or tag
Name
Security group ID
Security group name
VPC ID
Description
sg-071acdf7707627231
launch-wizard-4
vpc-06f72268840454373
launch-wizard-4 created 2023-09-26T
sg-065b0e61e6364871f - LAB6
Details
Inbound rules
Outbound rules
Tags
Outbound rules (1)
Manage tags
Edit outbound rules
Search
Name
Security group rule...
IP version
Type
Protocol
Port range
Destination
sgr-041fd6c3524a42eec
IPv4
All traffic
All
All
0.0.0.0/0
EC2 Dashboard
EC2 Global View
Events
Console-to-Code
Preview
Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Capacity Reservations
New
Images
AMIs
AMI Catalog
Elastic Block Store
Volumes
Snapshots
Lifecycle Manager
CloudShell
Feedback
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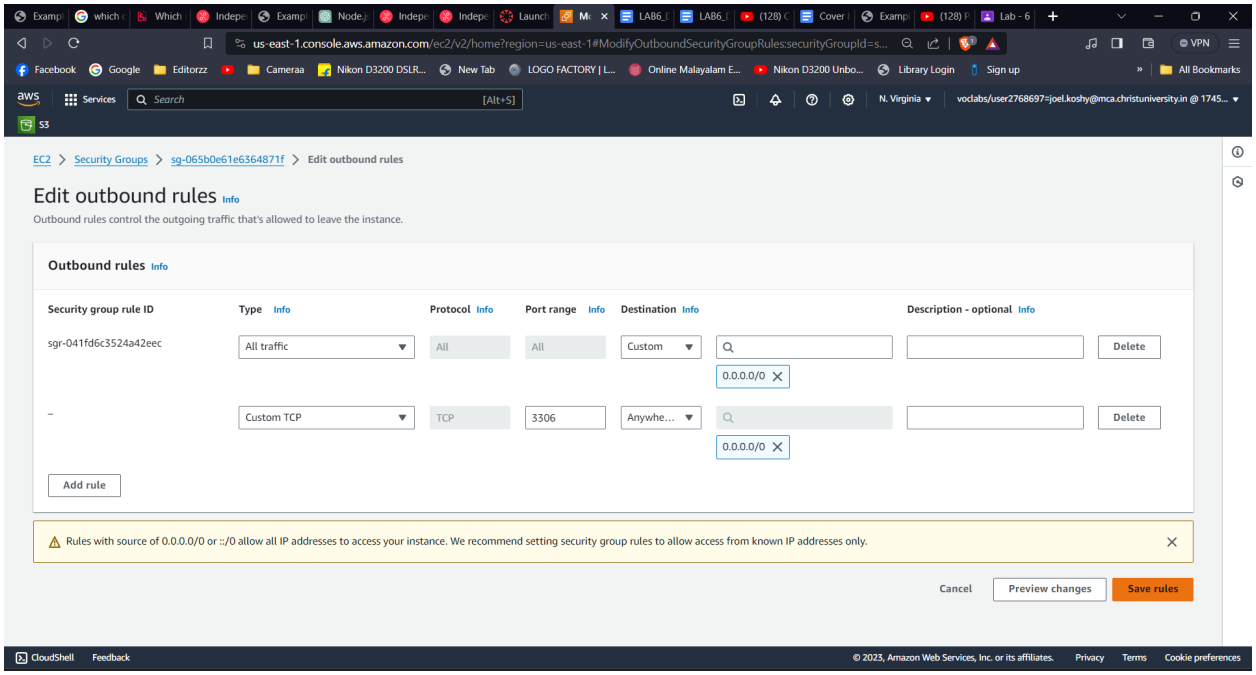
EC2 > Security Groups > sg-065b0e61e6364871f > Edit outbound rules
Edit outbound rules Info
Outbound rules control the outgoing traffic that's allowed to leave the instance.
Outbound rules Info
Security group rule ID
Type Info
Protocol Info
Port range Info
Destination Info
Description - optional Info
sgr-041fd6c3524a42eec
All traffic
All
All
Custom
0.0.0.0/0
Delete
Custom TCP
TCP
3306
Anywhe...
0.0.0.0/0
Delete
Add rule
Rules with source of 0.0.0.0/0 or ::/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.
Cancel
Preview changes
Save rules
CloudShell
Feedback
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