Project Report: Java-Based Quiz Application (QuizApp)

1. Introduction

The **QuizApp** is a **Java-based quiz application** built using **JFrame** for the graphical user interface and **MySQL** as the backend database. The project is hosted on two separate **VirtualBox Virtual Machines (VMs)** for **application logic** and **database management**. The application enables users to take quizzes, track scores, and manage quiz questions through an admin panel.

2. System Requirements

- **VirtualBox** (For VM creation and networking)
- **Debian Linux (or any Linux distribution)** for VMs
- **Java Development Kit (JDK 11 or later)**
- **MySQL Server (MariaDB)**
- **Visual Studio Code or IntelliJ IDEA**
- **MySQL Workbench (Optional for database management)**

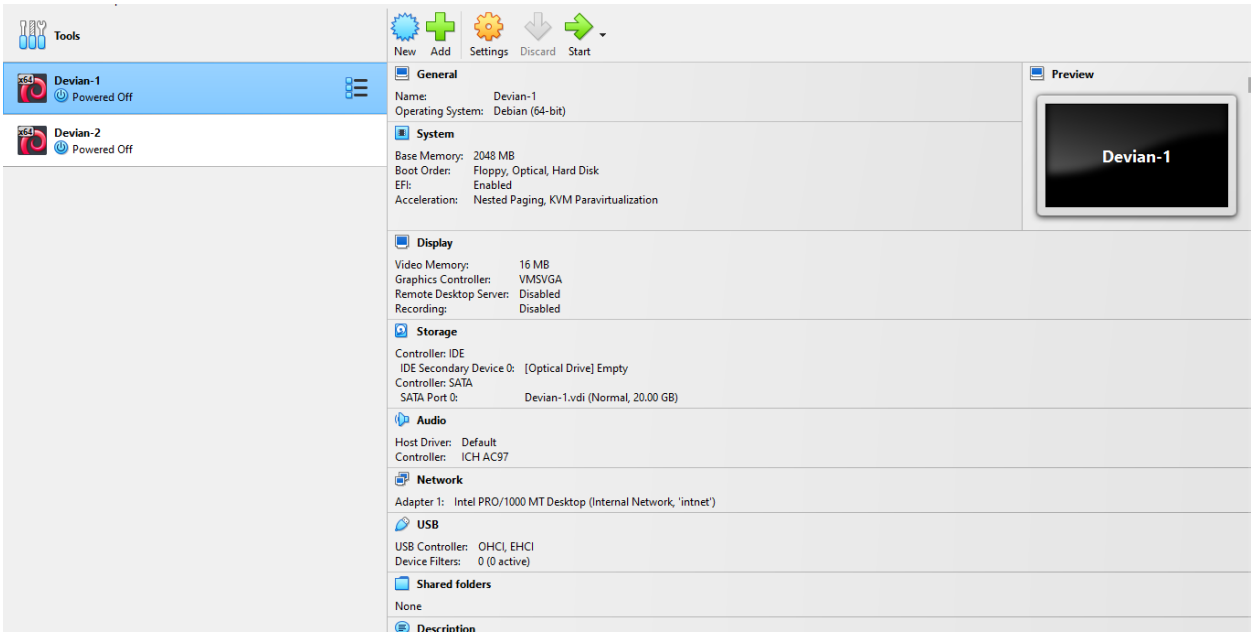
3. Installation of VirtualBox and Creation of VMs

Step 1: Install VirtualBox

1. Download VirtualBox from VirtualBox Official Site
2. Install it on system following the on-screen instructions.

Step 2: Create Virtual Machines

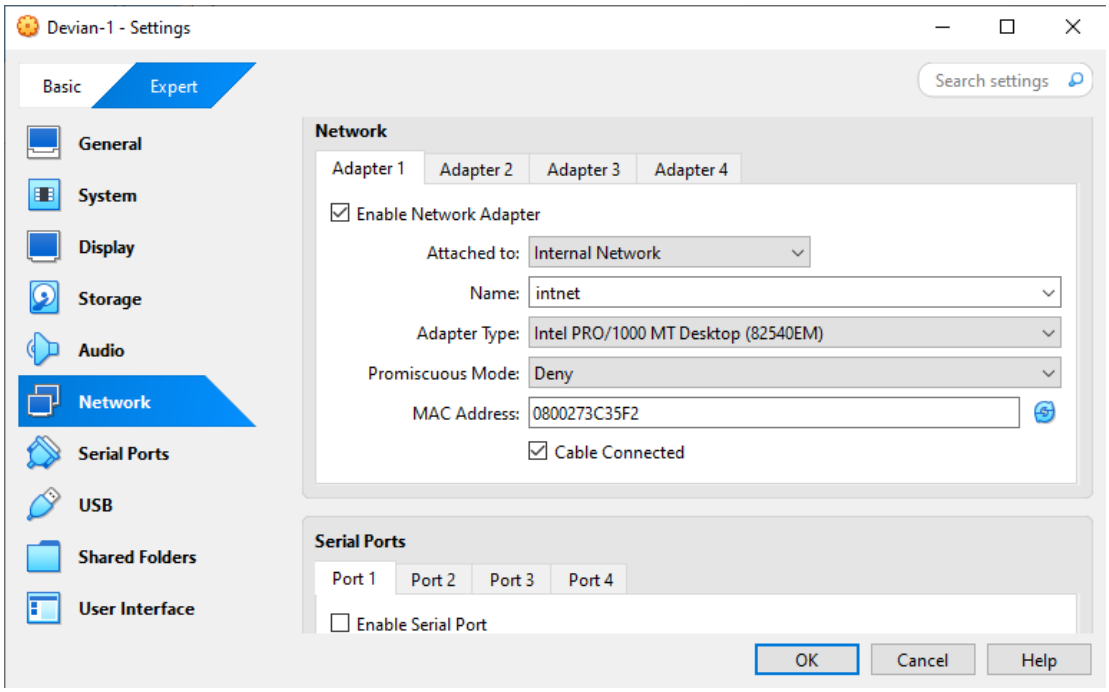
1. Open **VirtualBox** and click **New**.
2. Name the VM as **Debian-1 (Application Server)** and select:
    - **Type:** Linux
    - **Version:** Debian (64-bit)
    - **Memory Size:** 2GB or more
    - **Storage:** Create a 20GB Virtual Hard Disk (VDI)
3. Repeat the same for **Debian-2 (Database Server)**.



4. Network Configuration to Connect VMs

Step 1: Configure Internal Network

1. Select **VM1 (QuizApp-Application Server)** → Go to **Settings** → **Network**.
2. Set **Adapter 1** to **Internal Network**.
3. Repeat the process for **VM2 (QuizApp-Database Server)**.



Step 2: Assign Static IPs

Modify network configurations in both VMs:

sudo nano /etc/network/interfaces

For **VM1**:

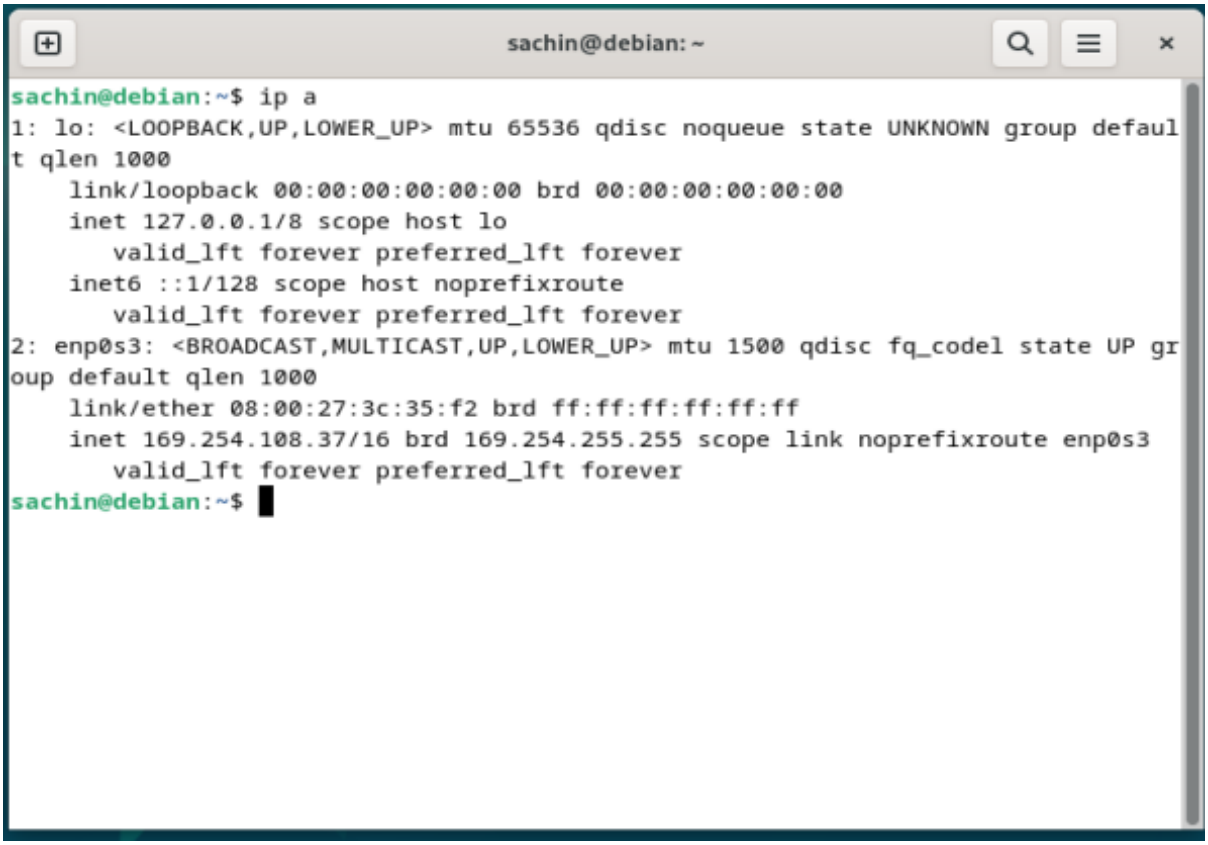
auto eth0

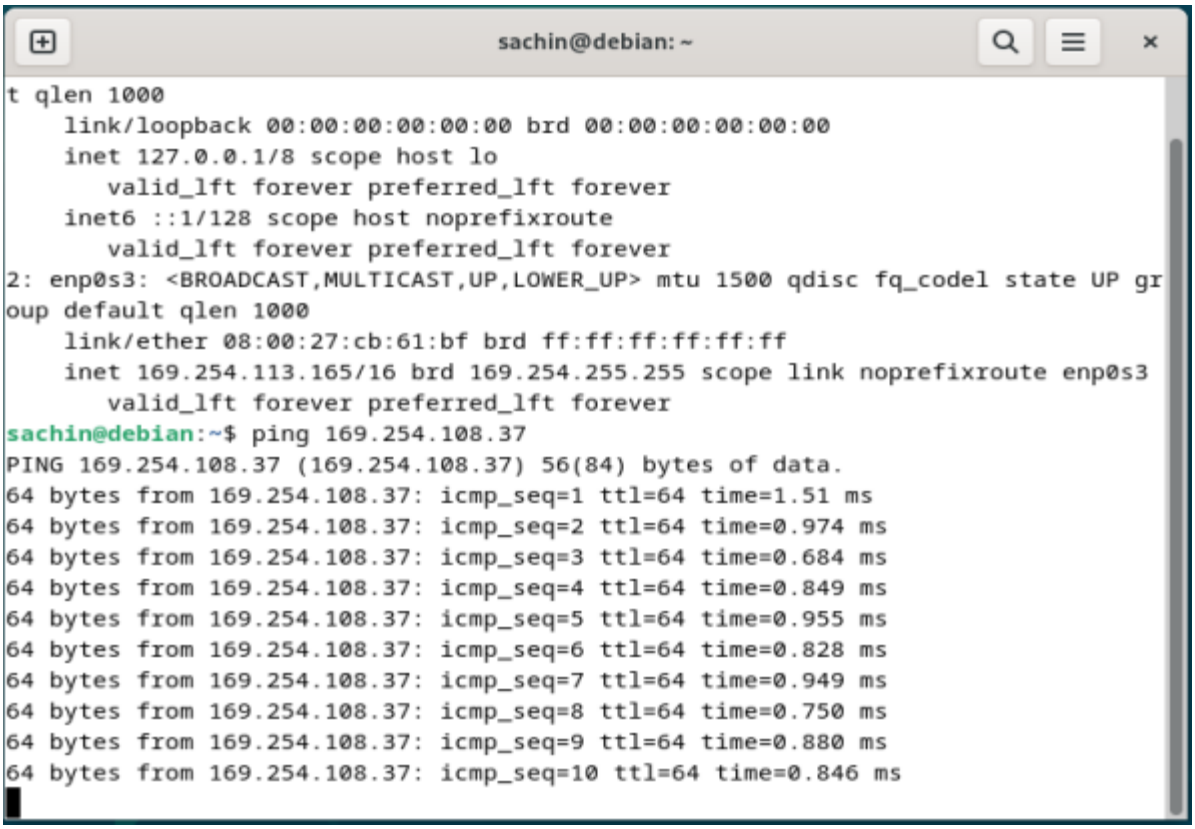
iface eth0 inet static

address 192.168.1.101

netmask 255.255.255.0

gateway 192.168.1.1





For **VM2**:

auto eth0

iface eth0 inet static

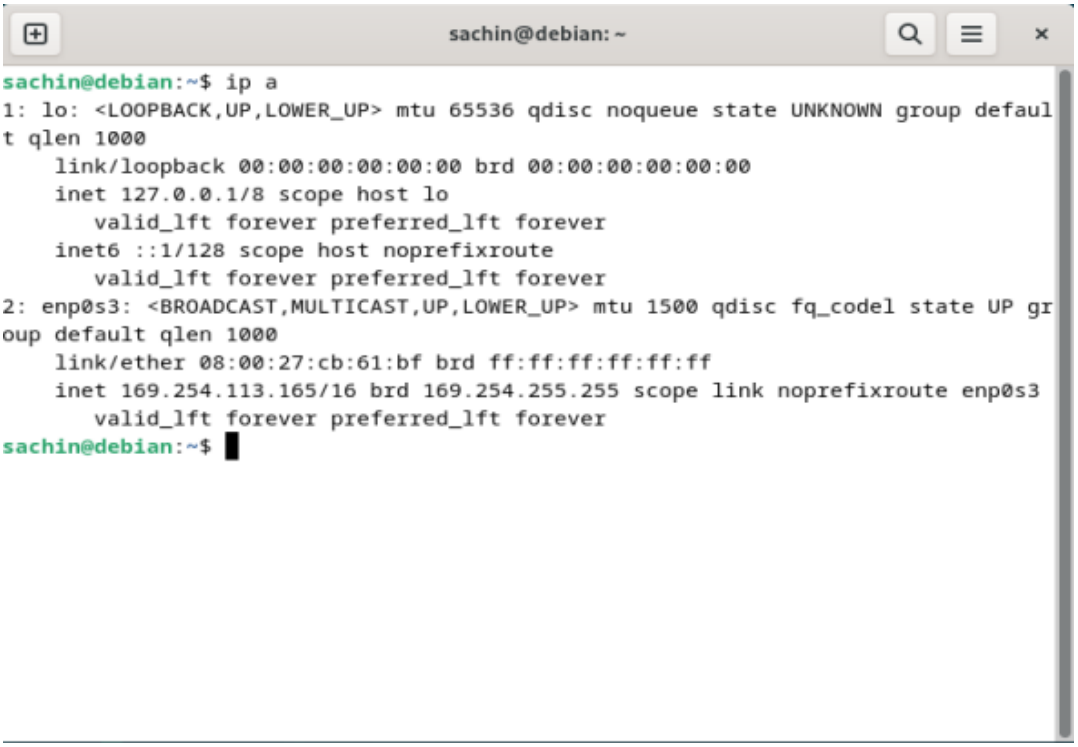
address 192.168.1.102

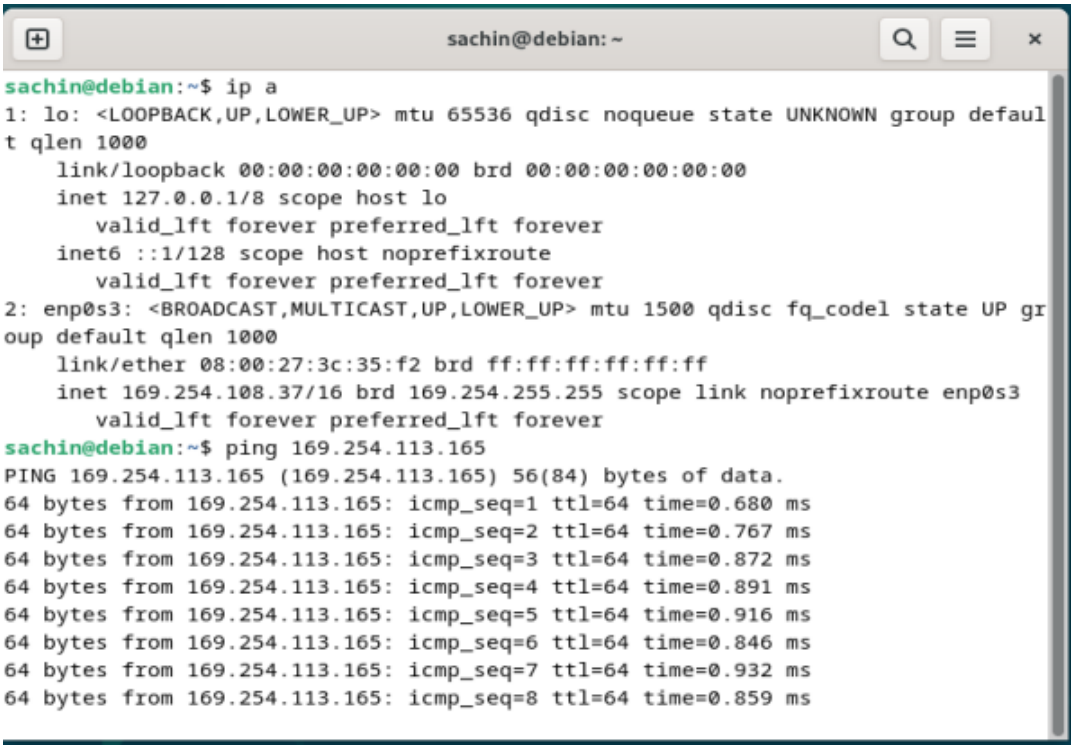
netmask 255.255.255.0

gateway 192.168.1.1

Restart networking:

sudo systemctl restart networking





5. Deployment of QuizApp on VMs

Step 1: Install Dependencies on VM1 (Application Server)

sudo apt update

sudo apt install default-jdk -y

Download and configure **MySQL Connector for Java**:

wget https://repo1.maven.org/maven2/mysql/mysql-connector-java/8.0.28/mysql-connector-java-8.0.28.jar

Step 2: Install MySQL on VM2 (Database Server)

sudo apt update

sudo apt install mysql-server -y

Configure MySQL for remote access:

sudo nano /etc/mysql/mysql.conf.d/mysqld.cnf

Change:

bind-address = 0.0.0.0

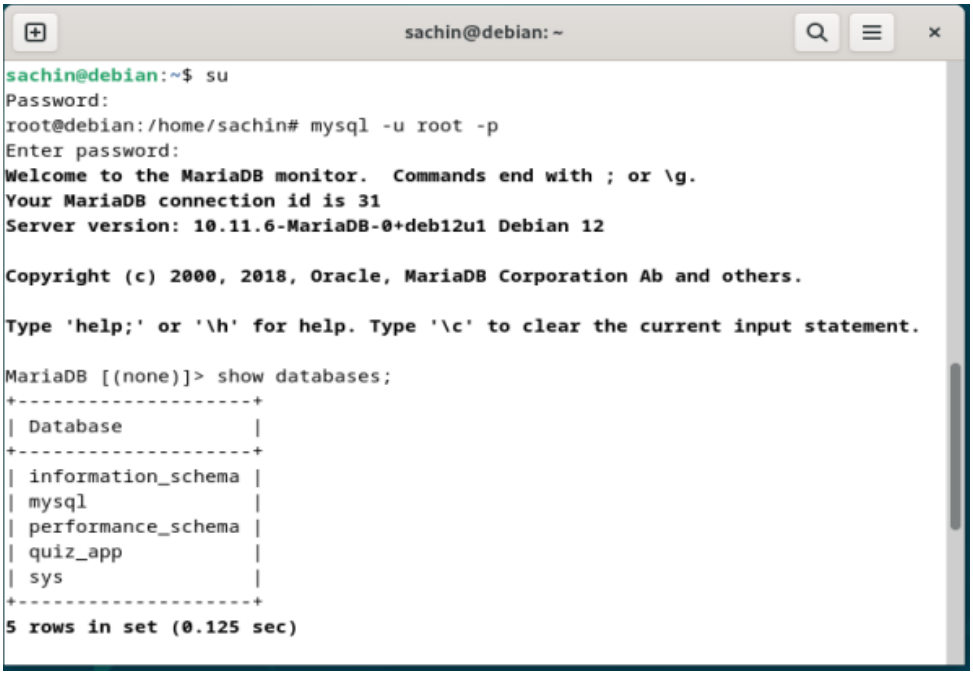
Restart MySQL:

sudo systemctl restart mysql

Grant privileges:

GRANT ALL PRIVILEGES ON quiz_app.* TO 'root'@'169.254.108.37' IDENTIFIED BY 'password';

FLUSH PRIVILEGES;



6. QuizApp Folder Structure

The application follows **MVC (Model-View-Controller) architecture**.

```
MariaDB [quiz_app]> show tables;
+--------------------+
| Tables_in_quiz_app |
+--------------------+
| admins             |
| high_scores        |
| players            |
| questions          |
| reports            |
+--------------------+
5 rows in set (0.000 sec)
```

7. Running the Application

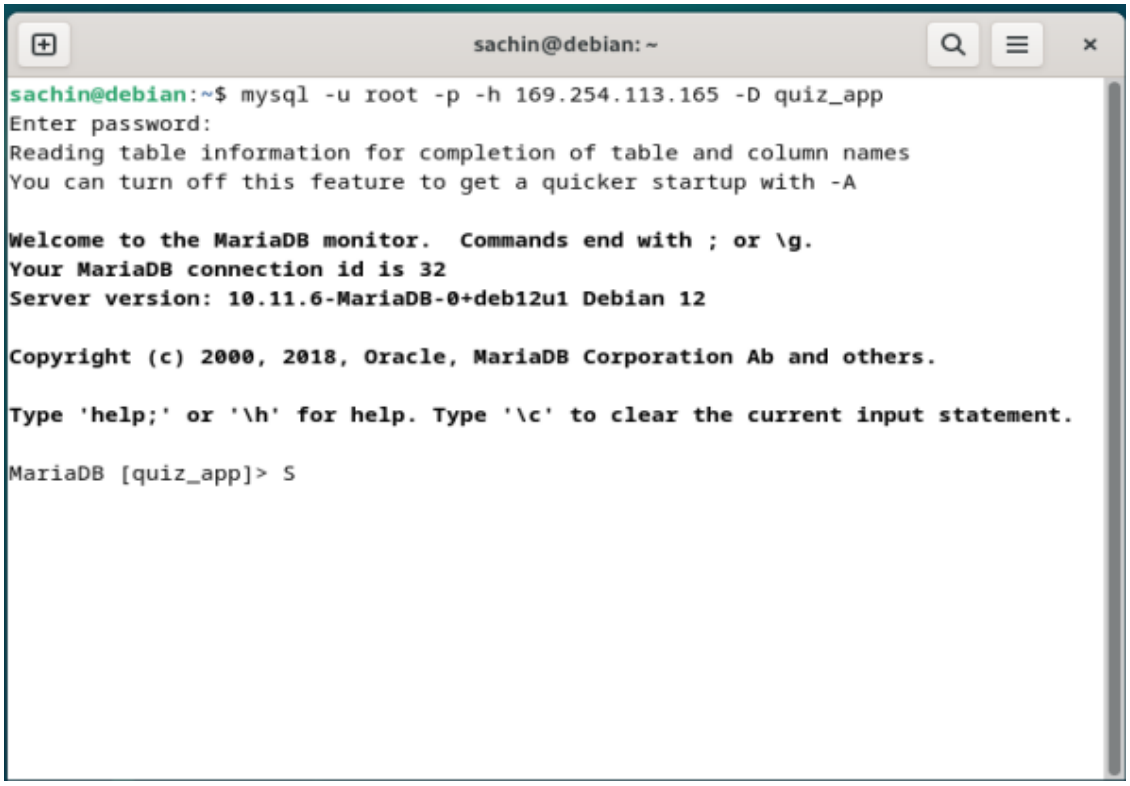
Step 1: Start MySQL on VM2

mysql -u root -p

Step 2: Compile and Run the Application on VM1

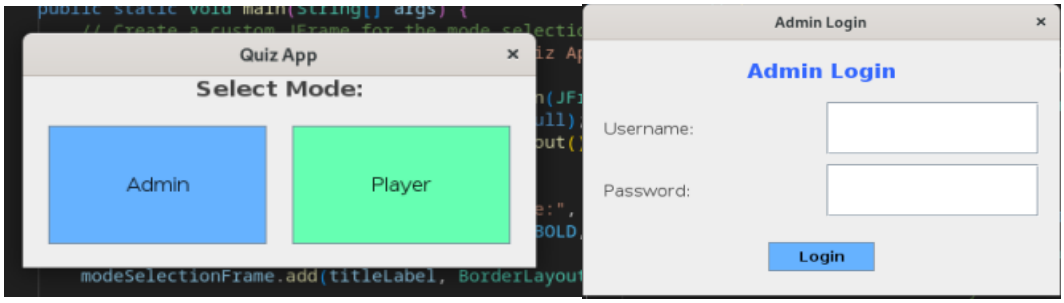
javac -cp .:mysql-connector-java-8.0.28.jar src/App.java

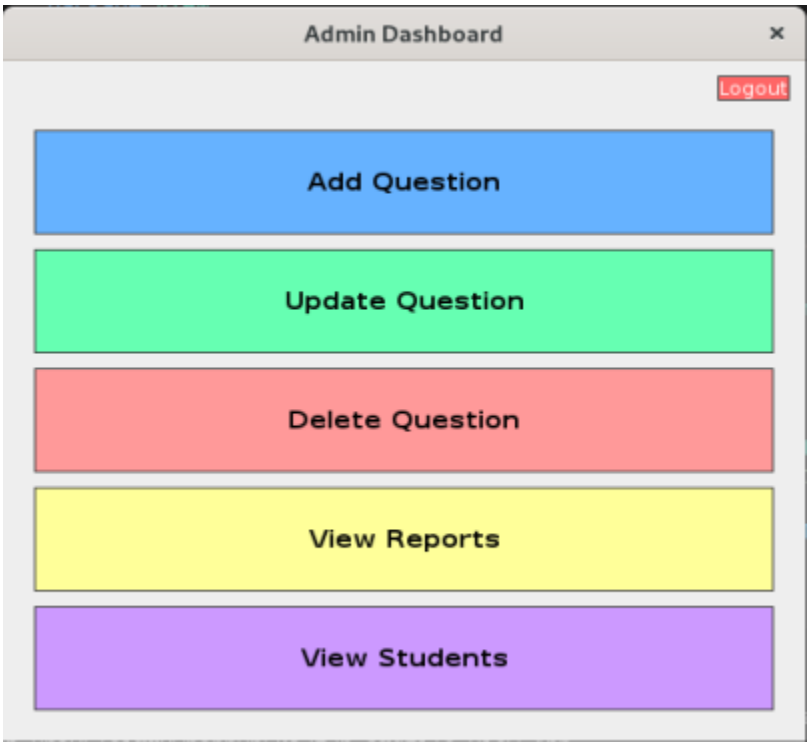
java -cp .:mysql-connector-java-8.0.28.jar App



8. Key Features & Functionality

- **User Login & Registration** (PlayerDAO, PlayerController)
- **Quiz Management** (QuestionDAO, QuizController)
- **Admin Dashboard** (AdminController, Add/Delete Questions)
- **Score Reports & Leaderboard** (ReportDAO, HighScoreDAO)
- **Secure Password Hashing** (PasswordUtils.java)





9. Challenges Faced & Solutions

Issue: MySQL Connection Refused

- Fixed by updating bind-address = 0.0.0.0.

- Opened **port 3306** in the firewall.

sudo ufw allow 3306/tcp

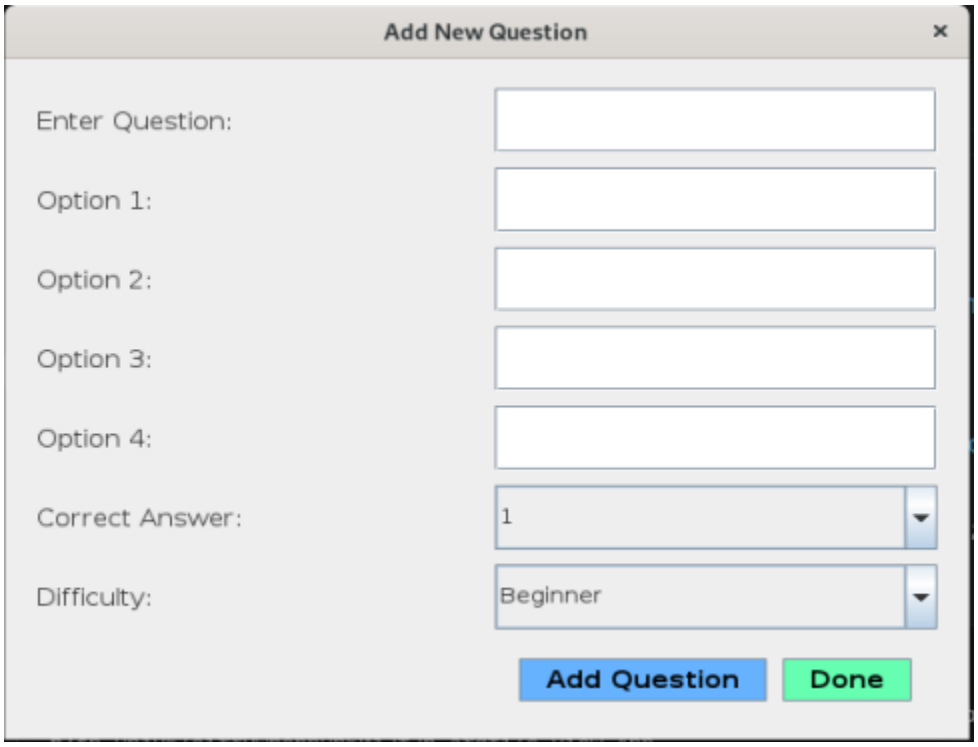
sudo ufw reload

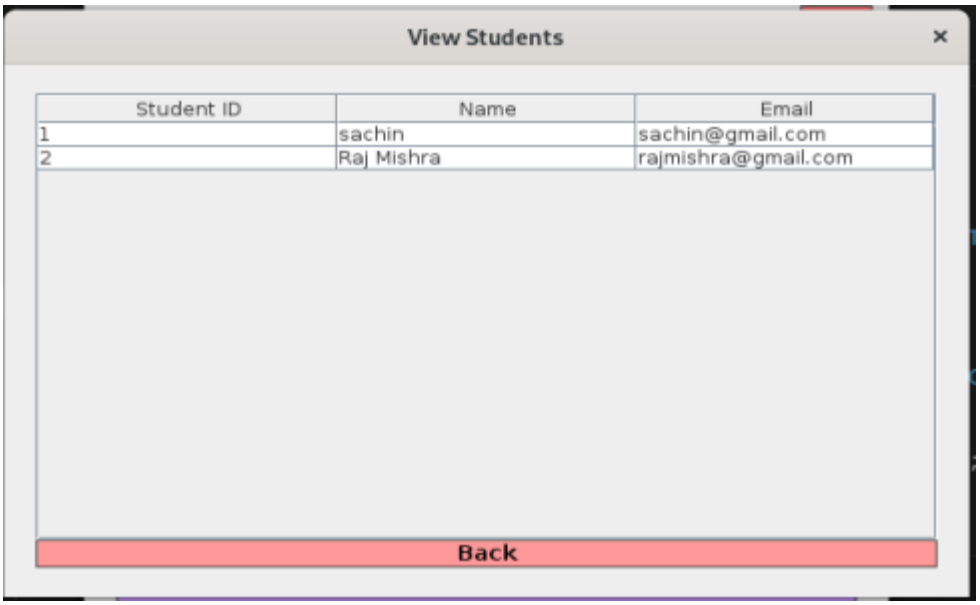
Issue: Network Issues Between VMs

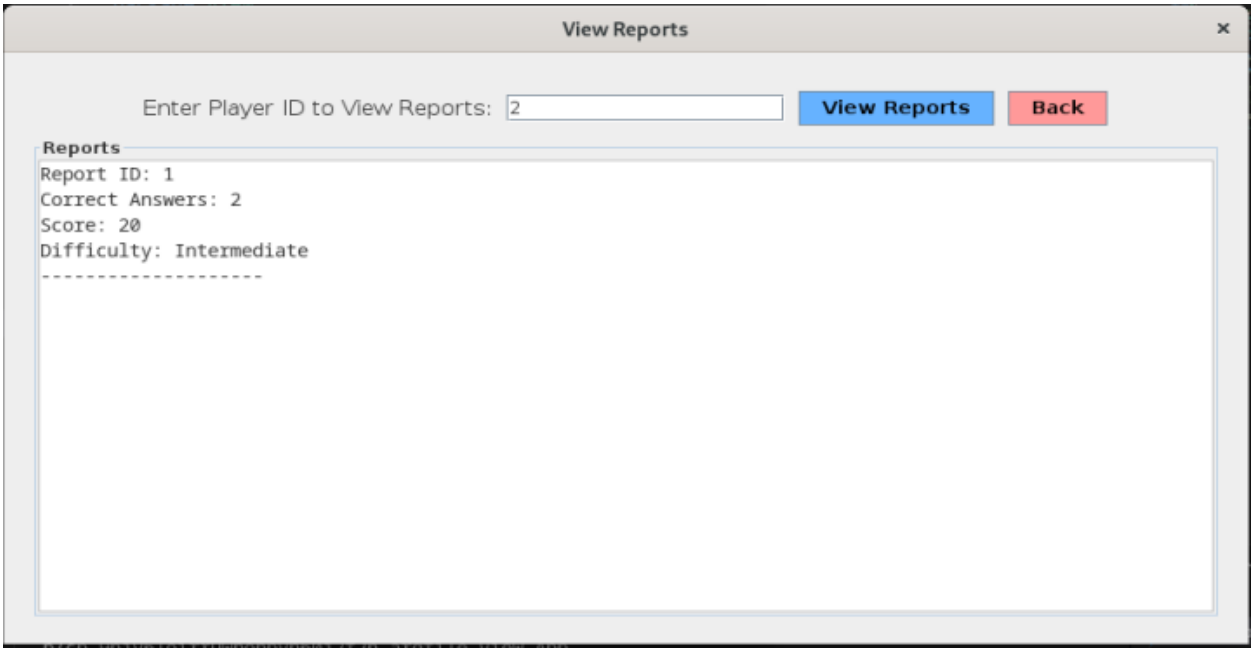
- Ensured both VMs were on the same **Internal Network**.
- Assigned **static IP addresses** to both VMs.

10. Conclusion

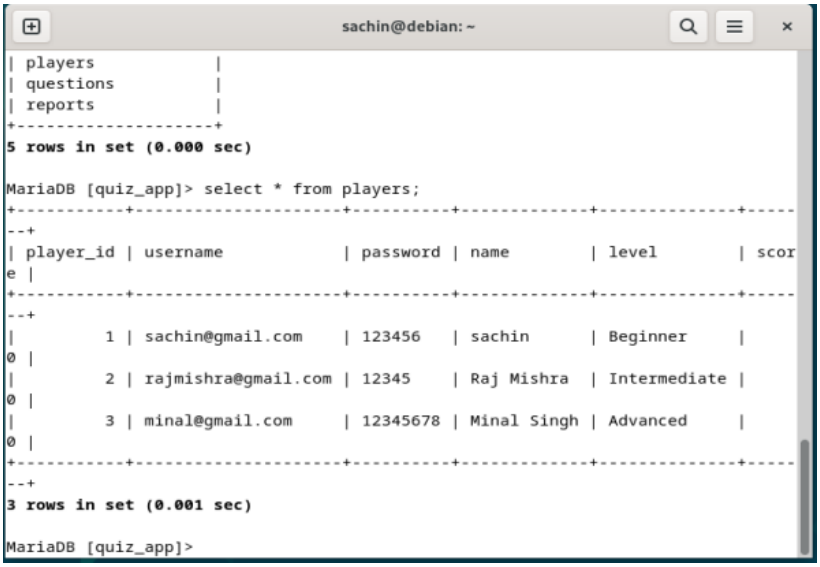
The **QuizApp** successfully demonstrates a **distributed system setup**, integrating a **Java application with a remote database** hosted on separate VirtualBox VMs.

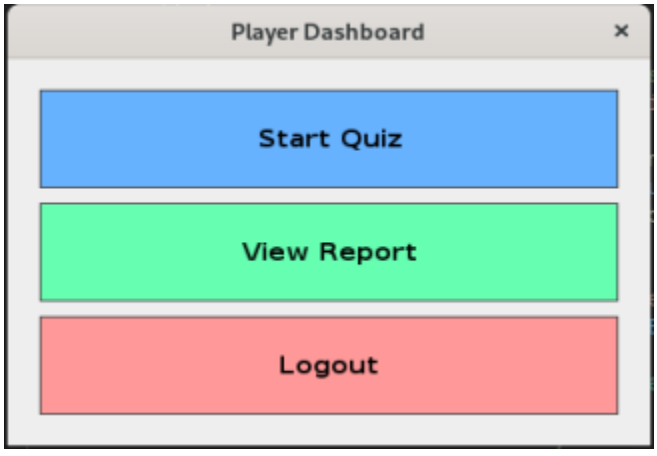


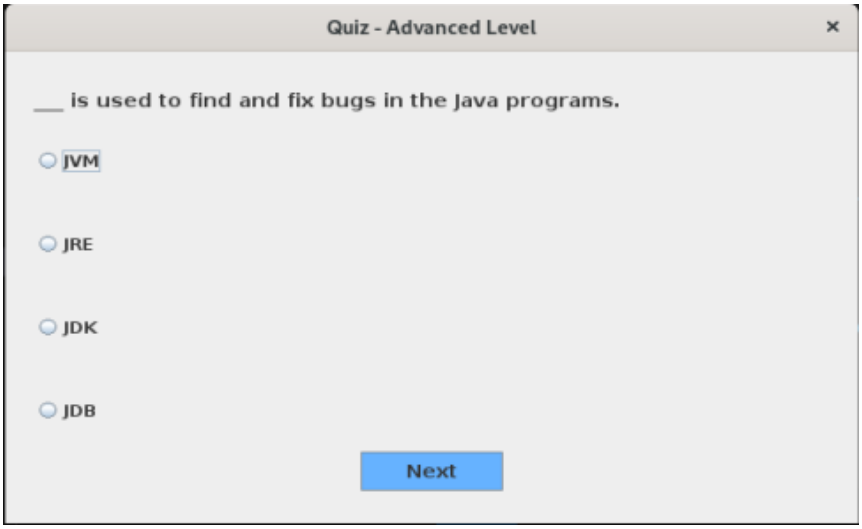

View Students
Student ID
Name
Email
1
sachin
sachin@gmail.com
2
Raj Mishra
rajmishra@gmail.com
Back

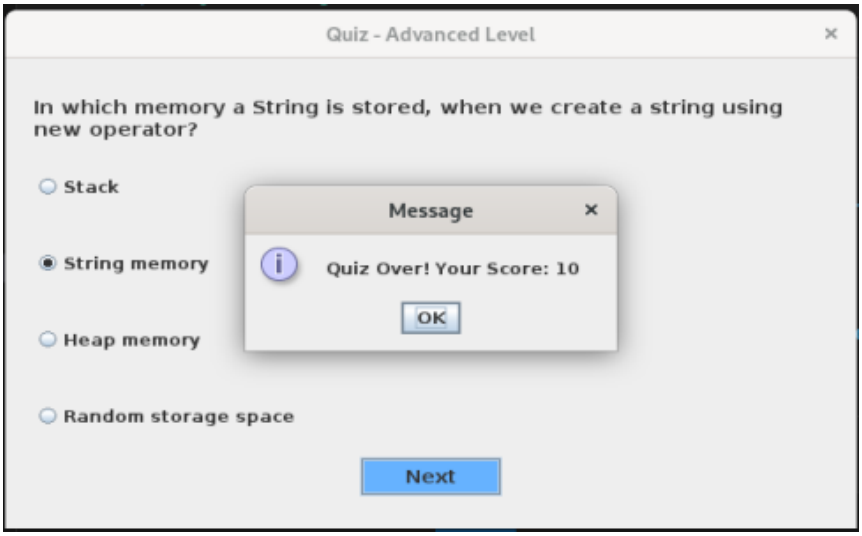

View Reports
Enter Player ID to View Reports:
2
View Reports
Back
Reports
Report ID: 1
Correct Answers: 2
Score: 20
Difficulty: Intermediate


Register New Player
Back
Username:
minal@gmail.com
Password:
••••••••
Name:
Minal Singh
Level:
Advanced
Register


sachin@debian: ~
| players |
| questions |
| reports |
5 rows in set (0.000 sec)
MariaDB [quiz_app]> select * from players;
player_id	username	password	name	level	score
1	sachin@gmail.com	123456	sachin	Beginner	0
2	rajmishra@gmail.com	12345	Raj Mishra	Intermediate	0
3	minal@gmail.com	12345678	Minal Singh	Advanced	0
3 rows in set (0.001 sec)
MariaDB [quiz_app]>


Player Dashboard
Start Quiz
View Report
Logout


Quiz - Advanced Level
___ is used to find and fix bugs in the Java programs.
JVM
JRE
JDK
JDB
Next


Quiz - Advanced Level
In which memory a String is stored, when we create a string using new operator?
Stack
String memory
Heap memory
Random storage space
Message
Quiz Over! Your Score: 10
OK
Next


sachin@debian: ~
player_id	username	password	name	level	score
1	sachin@gmail.com	123456	sachin	Beginner	0
2	rajmishra@gmail.com	12345	Raj Mishra	Intermediate	0
3	minal@gmail.com	12345678	Minal Singh	Advanced	0
3 rows in set (0.001 sec)
MariaDB [quiz_app]> select * from reports;
report_id	player_id	correct_answers	score	difficulty
1	2	2	20	Intermediate
2	3	1	10	Advanced
2 rows in set (0.000 sec)
MariaDB [quiz_app]>

11. References

1. Java JDBC Documentation (https://docs.oracle.com/javase/tutorial/jdbc/basics/index.html)
2. VirtualBox Networking Guide (https://www.virtualbox.org/manual/ch06.html)
3. MySQL Administration Guide (https://dev.mysql.com/doc/refman/8.4/en/tutorial.html)

Appendix

1. **Video Presentation Link :** https://drive.google.com/file/d/1zVjpoStiEZXm7My8wdX0YmkPxeaGuu8x/view?usp=sharing
2. **PPT Link:** https://docs.google.com/presentation/d/1CCbHlrMiOCFHyNH0o5fRjLY6gZT1ACGF/edit?usp=drive_link&ouid=110909031381492795570&rtpof=true&sd=true
3. **System Architecture Diagram:** https://drive.google.com/file/d/1pfjKadke4axnqI3tp-6ZwTUfVyrNsg0w/view?usp=drive_link
4. **GitHub Repository Link:** https://github.com/sachinsingh2156/Java-based-quiz-app-Using-virtualization.git