AWS RDS HIGH AVAILABILITY AND DISASTER RECOVERY

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1. Project background and description

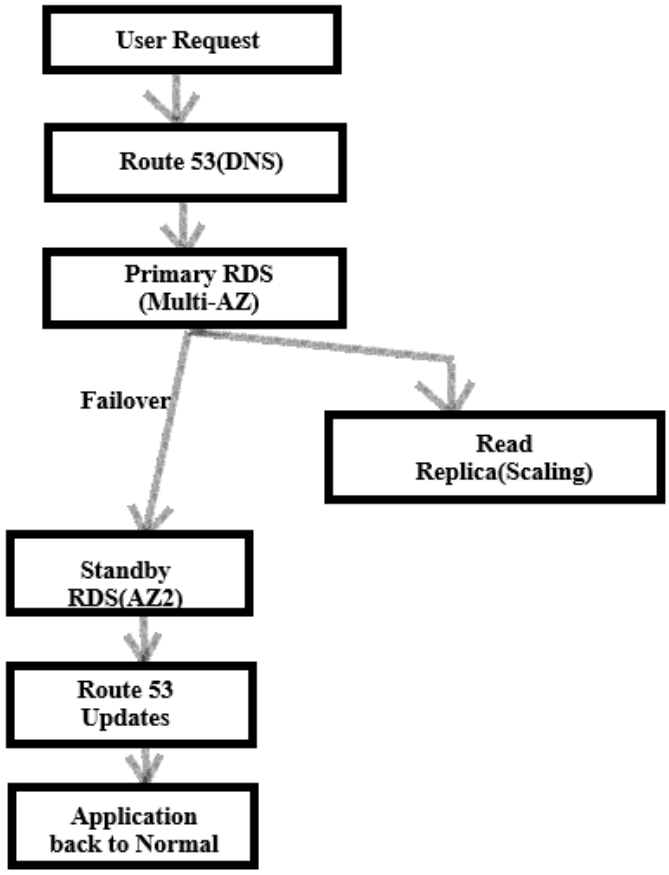
This project demonstrates the configuration of AWS RDS for High Availability (HA) and Disaster Recovery (DR) using Multi-AZ deployment, Read Replicas, and Route 53. The goal is to ensure minimal downtime, improved scalability, and disaster recovery readiness for a database infrastructure. The implementation was performed using the AWS Management Console (GUI).

2. Objectives & Purpose

- **Ensure High Availability**: Configure **Multi-AZ Deployment** to enable automatic failover.
- **Improve Performance**: Use **Read Replicas** to distribute read-heavy traffic.
- **Enable Disaster Recovery**: Test and promote a Read Replica in case of a failure.
- **Maintain Uptime**: Update **Route 53 DNS records** to redirect traffic to the new database endpoint after failover.
- **Real-World Application**: Suitable for **mission-critical applications, high-traffic websites, and enterprise databases**.

3. Flow Diagram

This diagram illustrates the **AWS RDS Multi-AZ Deployment and Read Replica setup**.



4. Key Components in the Diagram:

- **Primary RDS Instance** (Availability Zone 1 - AZ1)
- **Standby RDS Instance** (Availability Zone 2 - AZ2 for failover, Multi-AZ Deployment)
- **Read Replica** (Additional zone for performance optimization)
- **AWS Route 53** (Directs traffic to the correct database endpoint)
- **Failover Arrows** (Indicating automatic transition from Primary to Standby)
- **End Users/Web Application** (Accessing the database)

5. Technologies & Tools Used:

- AWS RDS (Relational Database Service)
- AWS Route 53 (DNS Management)
- Multi-AZ Deployment for High Availability

- Read Replicas for Scalability
- AWS Management Console (GUI)

6. Step-by-Step Implementation:

Enabling Multi-AZ Deployment

- Navigate to **AWS RDS Console**.
- Select the database instance and modify it to enable **Multi-AZ Deployment**.
- AWS will create a **standby instance in a different availability zone (AZ)**.
- **Outcome**: Automatic failover capability is enabled.

Creating a Read Replica

- In **AWS RDS Console**, select the database instance.
- Click **Create Read Replica**, choose an instance class, storage, and region.
- The Read Replica starts asynchronously replicating data from the primary database.
- **Outcome**: Read queries are offloaded to improve database performance.

Promoting a Read Replica to Primary

- Navigate to AWS RDS Console.
- Select the Read Replica and click Promote to Primary.
- AWS will stop replication and convert the Read Replica into an independent database.
- **Outcome**: Ensures disaster recovery with minimal downtime.

Updating Route 53 DNS Records

- Navigate to **AWS Route 53**.
- Edit the **CNAME record** to point to the new RDS endpoint.
- Propagate the DNS changes to ensure a smooth transition.
- **Outcome**: No service disruption after failover.

7. Project Results

- **High Availability:** Successfully enabled **automatic failover** via Multi-AZ Deployment.
- **Scalability:** Read Replicas improved database performance by distributing read queries.

- **Disaster Recovery:** Manual failover using Read Replica promotion ensured business continuity.
- **Minimal Downtime:** Updating Route 53 DNS ensured uninterrupted service.

8. Lessons Learned

- ☑ Practical experience with AWS RDS HA & DR configurations.
- ☑ Understanding of Multi-AZ vs. Read Replicas and their differences.
- ☑ Hands-on knowledge of Route 53 for database failover management.
- ☑ Importance of database redundancy and automated failover for mission-critical applications.

9. Project Files & Folder Structure

aws-rds-high-availability/

│── project-report.pdf # This Detailed Documentation

│── README.md # Short Summary & How-To Guide

│── architecture-diagram.png # AWS RDS HA Architecture Diagram

│── screenshots/ # Folder containing step-by-step screenshots

│ ├──file containing screenshots

10. Future Enhancements

- ◇ Automate the setup using **Terraform or AWS CLI**.
- ◇ Implement **AWS Lambda for automated failover detection**.
- ◇ Set up **Amazon CloudWatch for RDS monitoring and alerts**.

12. References & Acknowledgments

- This project was inspired by a hands-on lab from ACloudGuru13.

Author & Contact Information

Name :C Apoorva A Kamath

Email : capoorvakamath@gmail.com