Amazon RDS for Db2

Built for the world's mission critical workloads

Amazon RDS For Db2 Overview
Andrew Hilden (ahilden@ca.ibm.com)
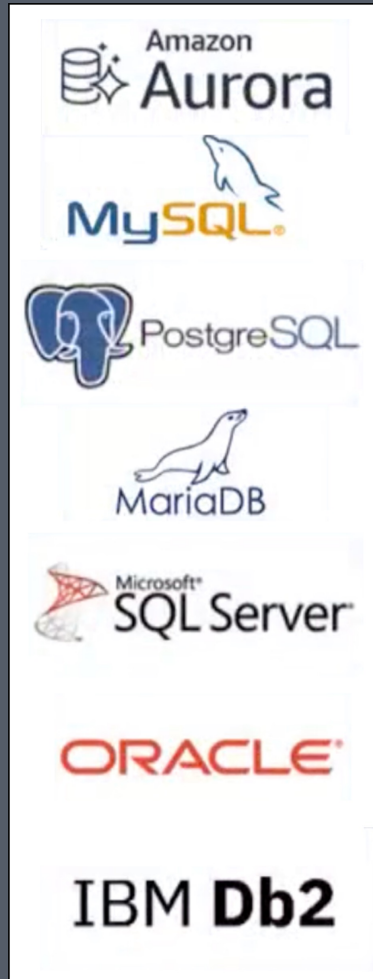Chief Architect Db2 on Cloud, Amazon RDS for Db2
Thursday June 20, 2024

IBM

Amazon RDS
Managed relational database service in the AWS Cloud

Amazon Aurora

MySQL

PostgreSQL

MariaDB

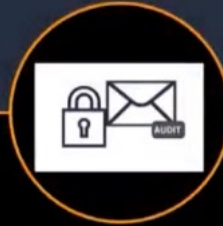Microsoft SQL Server

ORACLE

IBM Db2

Easy to administer

Easily deploy and maintain hardware, OS and DB software; built-in monitoring

Secure & compliant

Data encryption at rest and in transit; industry compliance and assurance programs

Available & durable

Automatic Multi-AZ data replication; automated backup, snapshots, failover

Performant & scalable

Scale compute and storage with a few clicks; minimal downtime for your application

Common AWS Integrated Experience

IBM **Db2**

+

Amazon RDS

Bringing together one of the LARGEST WEB SERVICE in the world with a database that runs the most COMPLEX TRANSACTIONAL WORKLOADS in the World

Released at re:Invent 2023

- Automates time-consuming tasks like provisioning, patching and backups.

- Highly available across availability zones with managed snapshot backups and point in time recovery.

- Built in IBM and AWS technical expertise integrated and accessible via standard RDS interfaces

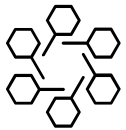- Built-in compliance and tested for security
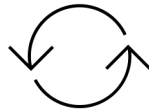
Amazon RDS for Db2 — Key Attributes

Increase Efficiency   Focus on innovation   Reduce Costs

- **Db2 11.5.9** - Standard and Advanced Edition (BYOL and AWS Marketplace)

- Scalable up to **128 vCPU** and **4 TB of memory.**

- Grow Storage up **to 64 TiB** and scale storage performance independent of storage size up to **256K IOPS and 4000 MiB/s**
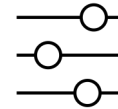
- **Automatic patching** with customizable maintenance windows and policies

- **Customizable configuration parameters** and ability to manage shared configurations.

- **Storage replication** with automatic health and repair capability.

Key Overall Benefits of Amazon RDS for Db2

- Allows rapid migration of existing workloads to the cloud without rearchitecting or replacing applications.
- Allows for more common management of database instances leveraging RDS interfaces used by multiple database types
- Spend less time managing databases and more time on innovation.
- Reduce capital and operational expenses
- Secure architecture that is integrated natively into the AWS ecosystem.

What aspects does AWS RDS for Db2 Manage for you?

Provisioning – infrastructure, OS, database, configuration

Patching – provides packages for updates, orchestration and auto apply

Backups – automated snapshots, configurable

Recovery – restore, PITR to a new RDS system

Failure detection – health detection, failover to another AZ

Security – Encryption at REST, in transit, security protocols, elevated controls (Db2 considered the most secure offering on RDS)

Architecture – system design and implementation

High Availability/ Replication/Data Durability – storage replication

Responsibility Matrix

	End User	Amazon	IBM
Schema Design	X		
Query Optimization	X		
Workload Management & Sizing	X		
Authentication and Authorization	X	X	
Backup and Recovery		X	
Monitoring Capabilities	X	X	X
Patching and upgrades		X	X
Automated Patching		X	
Support		X	X
Scaling		X	
Security Monitoring		X	
Durability Management		X	
Db2 Feature Development			X
RDS Feature Development		X	
Industry Compliance		X	X

Push-button scaling

Scale your Db2 database in just a few clicks or API call

Simplified scaling and resource management

- Manually scale database to various machine sizes

- Pause, reboot, or restore databases to a point in time with actions menu on the dashboard

- Enable autoscaling on storage for automated management

Amazon RDS for Db2 Storage Attributes

- **Provisioned IOPS (io1)**
- Maximum Size 64 TiB
- Single digit millisecond latencies
- Delivers 100% of IOPS 99.9% of the time
- High and consistent performance
- Max 256K IOPS/instance
- Max 4K MiB/s Throughput

- **Provisioned IOPS (io2)**
- Maximum Size 64 TiB
- Sub millisecond latencies
- Delivers 100% of IOPS 99.9% of the time
- High and consistent performance
- Upto 20x more IOPS per GB
- Max 256K IOPS/instance
- Max 4K MiB/s Throughput

- **General Purpose Storage (gp3)**
- Maximum Size 64 TiB
- Single digit millisecond latencies
- >400 GiB – Min 12K IOPS and 500 MiB/s
- <400 Gib- Min 3K IOPS and 125 MiB/s
- Max 64K IOPS/instance
- Max 4K MiB/s Throughput

Automated backups

Automated backups, snapshots, and failover to support durability of business-critical workloads
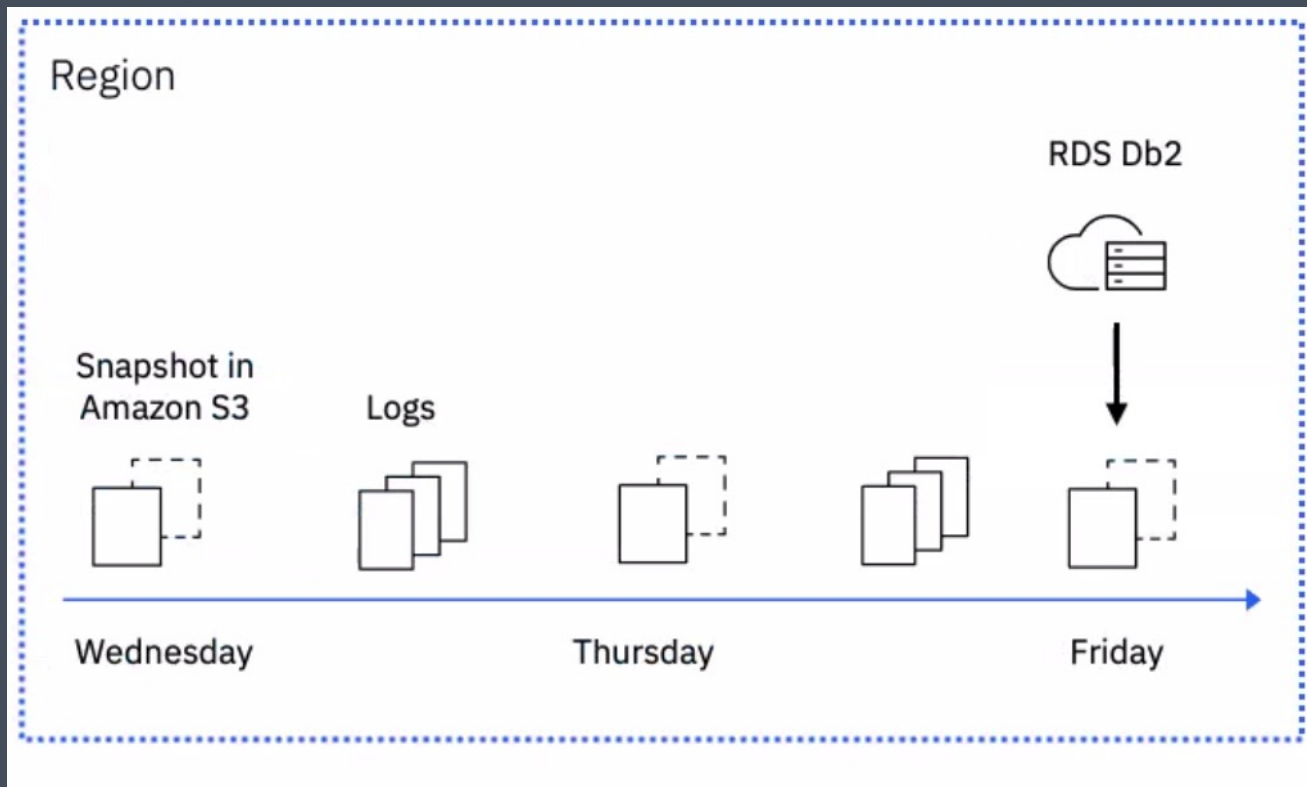
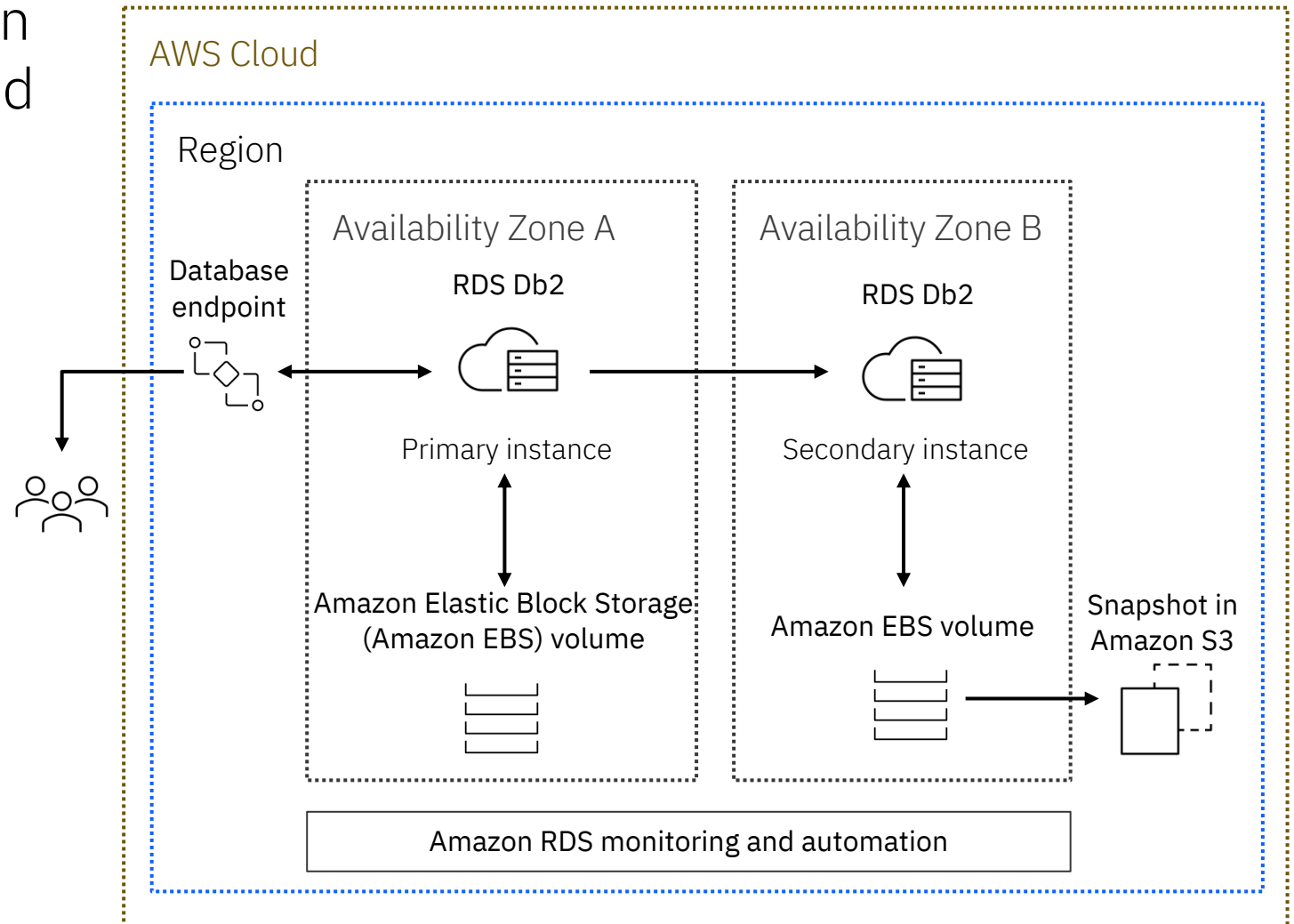### Easily configure and manage backups

- Daily Amazon EBS volume snapshot with configurable backup windows

- Backups your entire DB instance in Amazon S3

  - 99.999999999% durability

  - Supports encryption

  - Copy across accounts, across regions

- Archive logs backed up to Amazon S3 (Simple Storage Service) every 5 minutes

- Oldest backups automatically deleted based on retention, from 1 to 35 days

Availability & reliability

Keep critical applications always-on with high availability and automated multi-AZ data replication

Cross-Region Disaster Recovery and Multi-AZ

- Automated snapshot and archive logs replicated to target region as soon as available in source region

- Specify independent recovery window for replicated backup region

- Enables Point In Time Recovery (PiTR) in second region for mission- critical databases

AWS Cloud

Region

Availability Zone A

RDS Db2

Database endpoint

Primary instance

Amazon Elastic Block Storage (Amazon EBS) volume

Availability Zone B

RDS Db2

Secondary instance

Amazon EBS volume

Snapshot in Amazon S3

Amazon RDS monitoring and automation

RDS for Db2 – High Availability

- Amazon RDS for Db2 supports Multi-AZ deployments which provides additional availability and durability features

- This feature is enabled during creation or can be enabled later
  - When enabled a new node will be provisioned automatically and storage will be replicated.

- RDS will monitor the heal of the primary system and orchestrate a failover automatically to the other node if there is a problem that is detected
  - Loss of network connectivity, compute unit failure, storage failure, etc.
  - It will also take care of follow on recovery operations, like reestablishing a new standby

- RDS for Db2 uses storage replication instead of HADR

- When a failover is performed the DNS for the RDS system will point to the new primary
  - Applications can use ACR to automatically reconnect to the database system and replay any failed transactions.
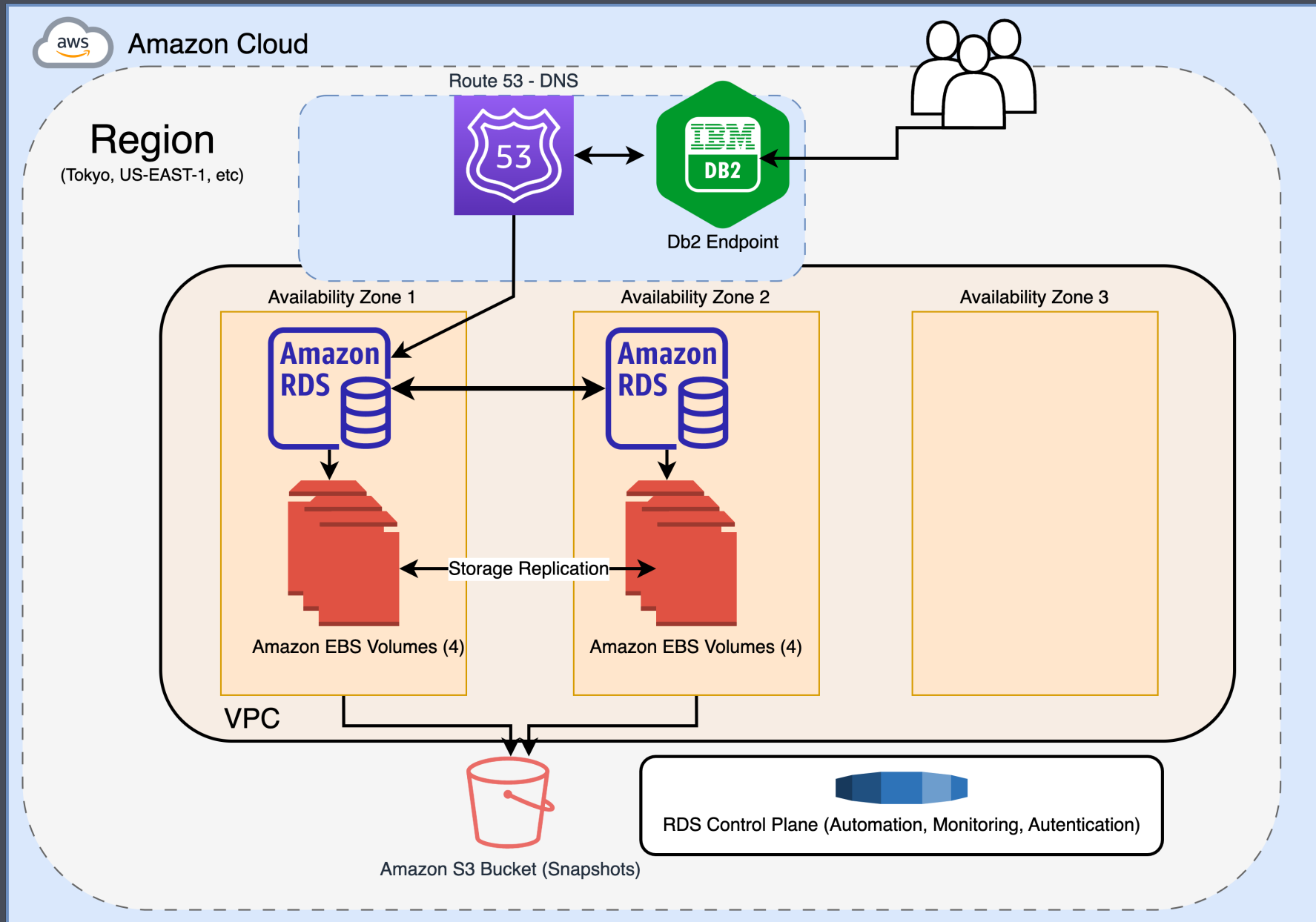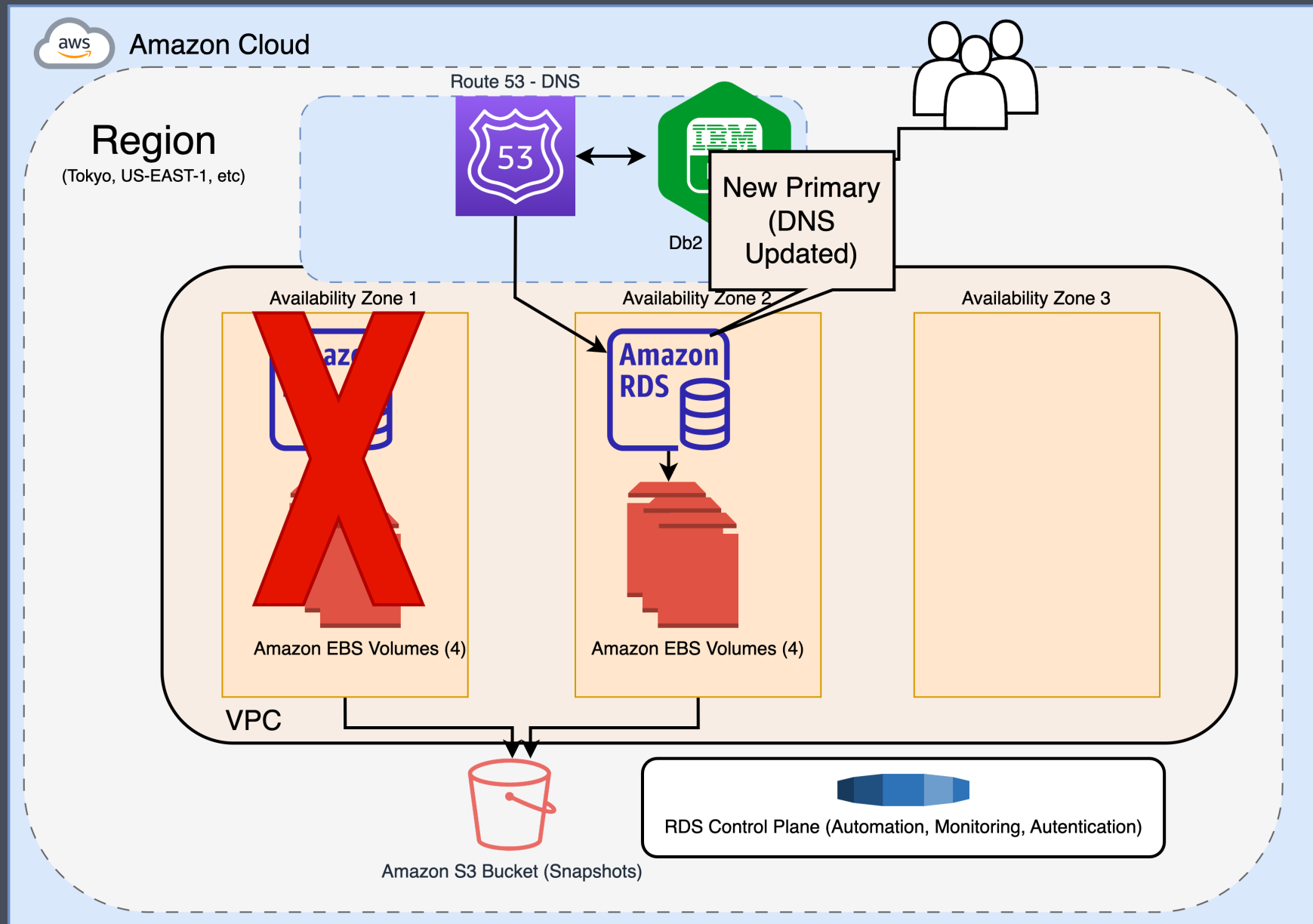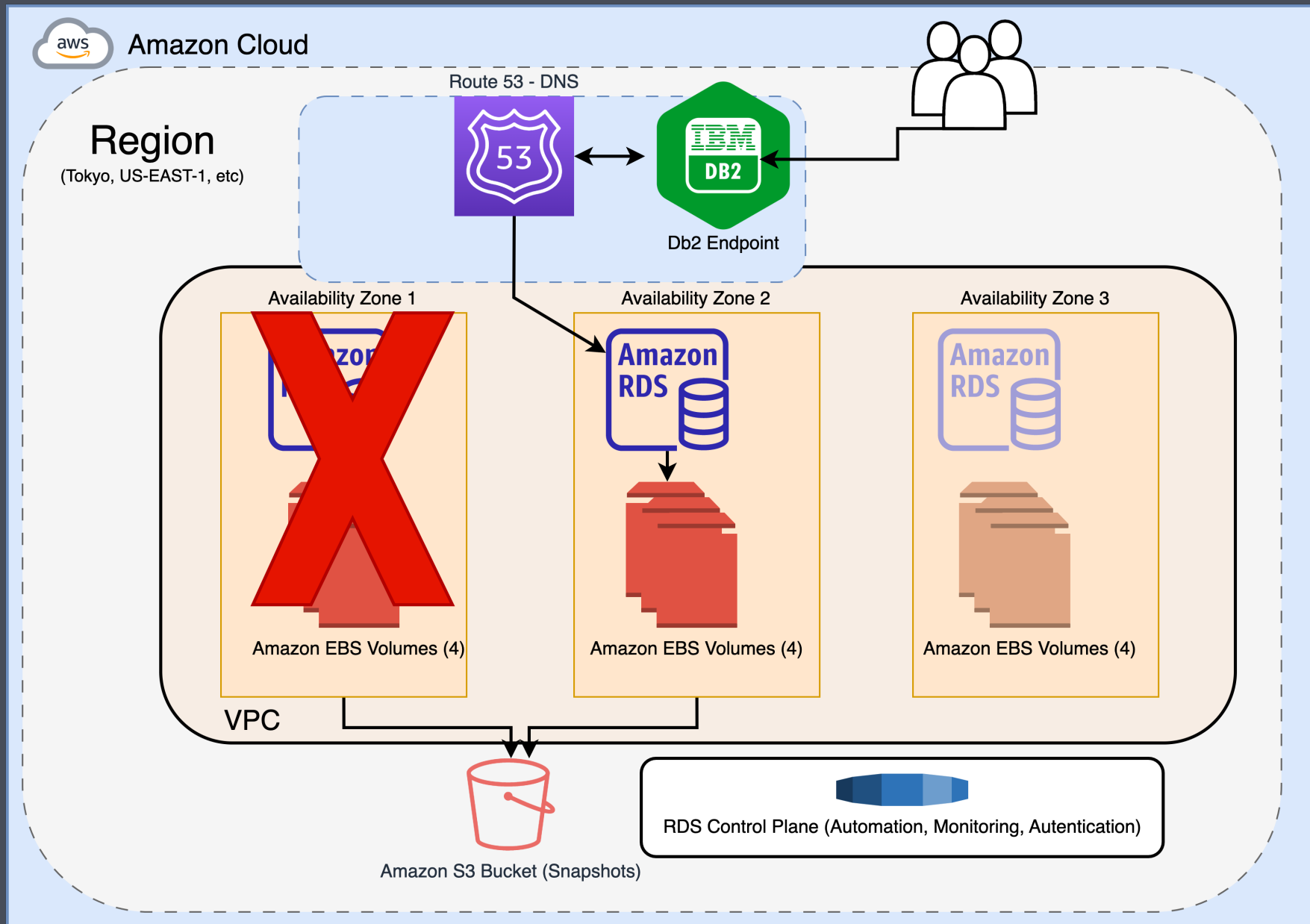
Db2 on Amazon RDS HA overall architecture
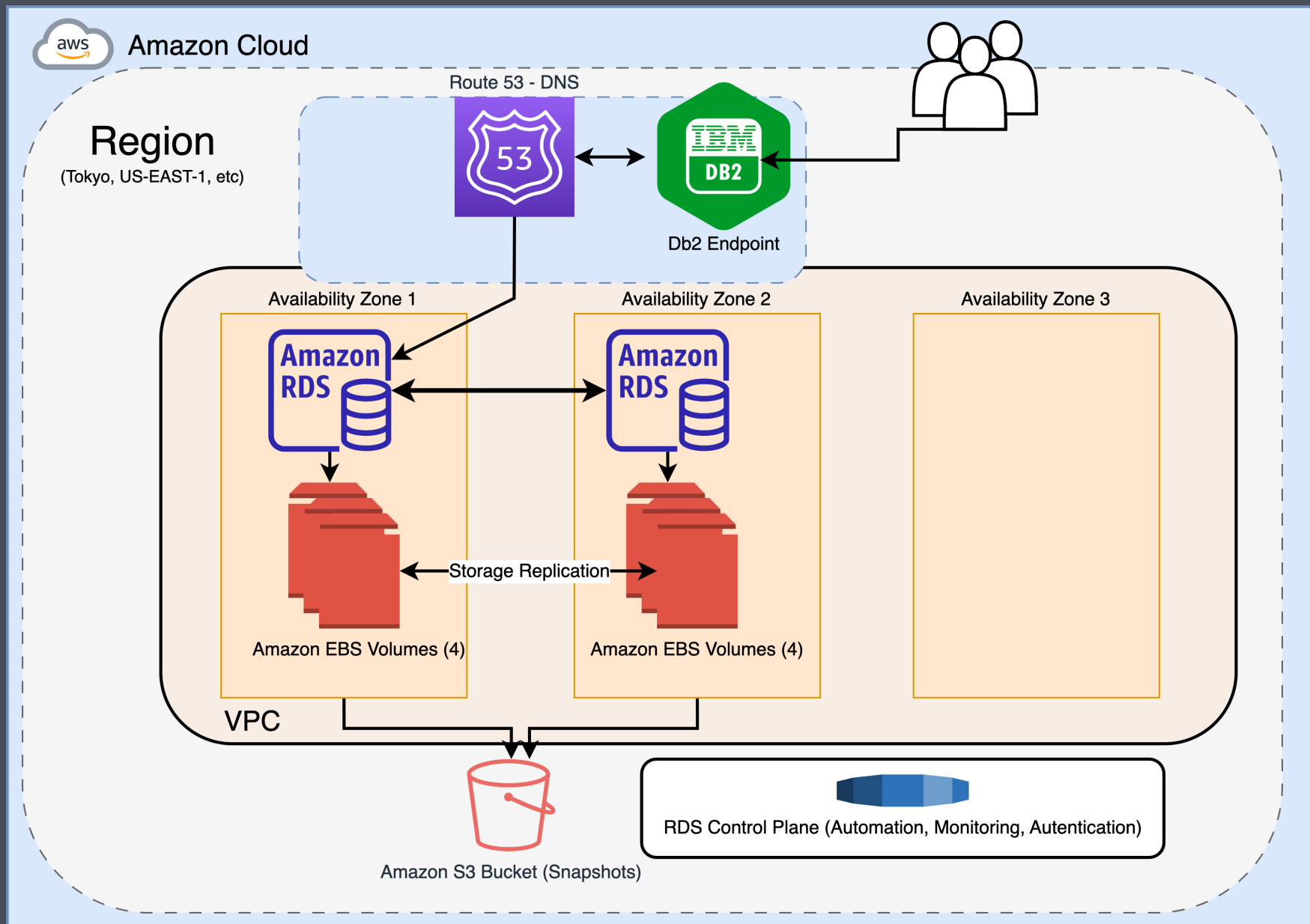
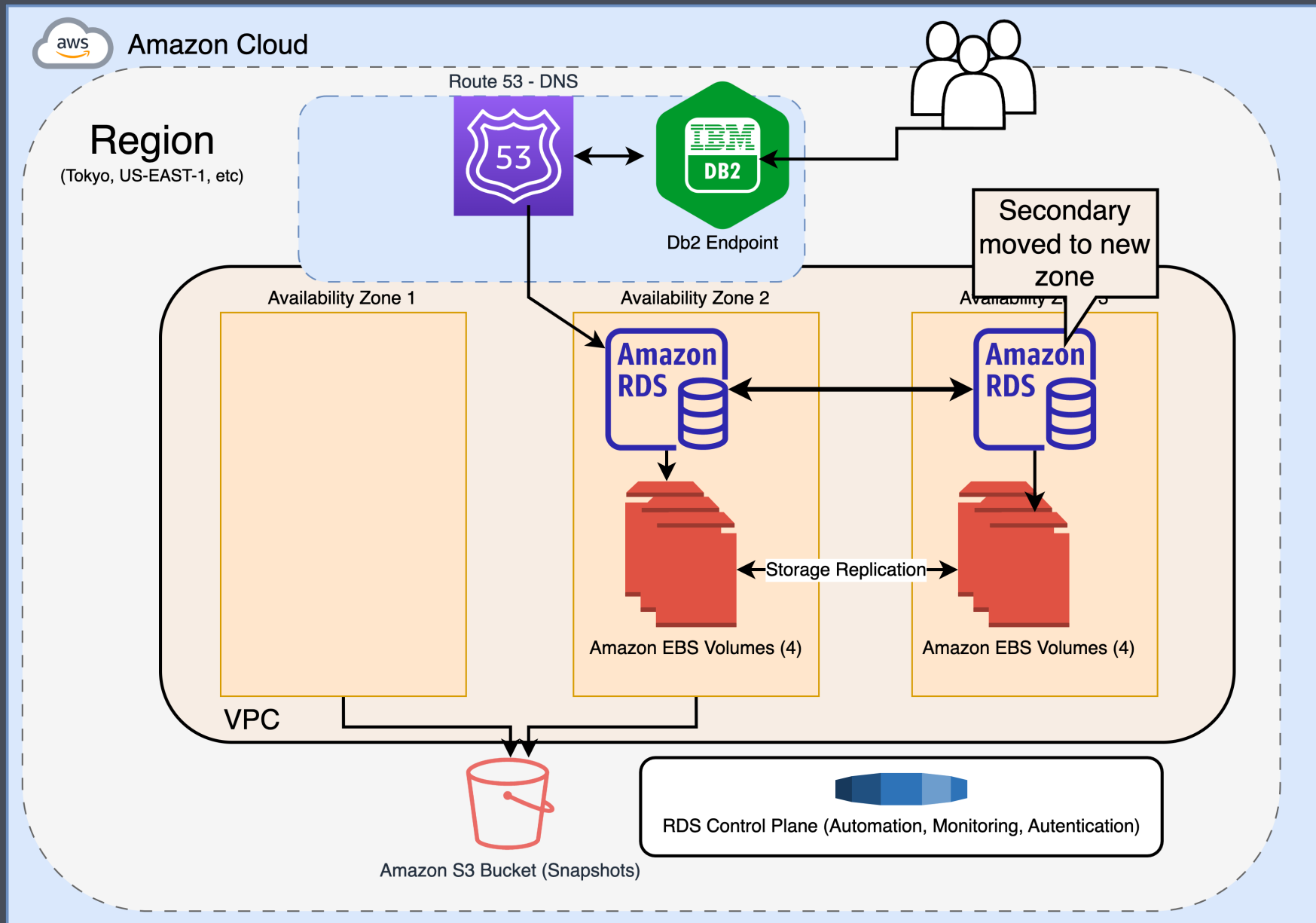Amazon RDS for Db2 – AZ and Primary Node Failure Scenario
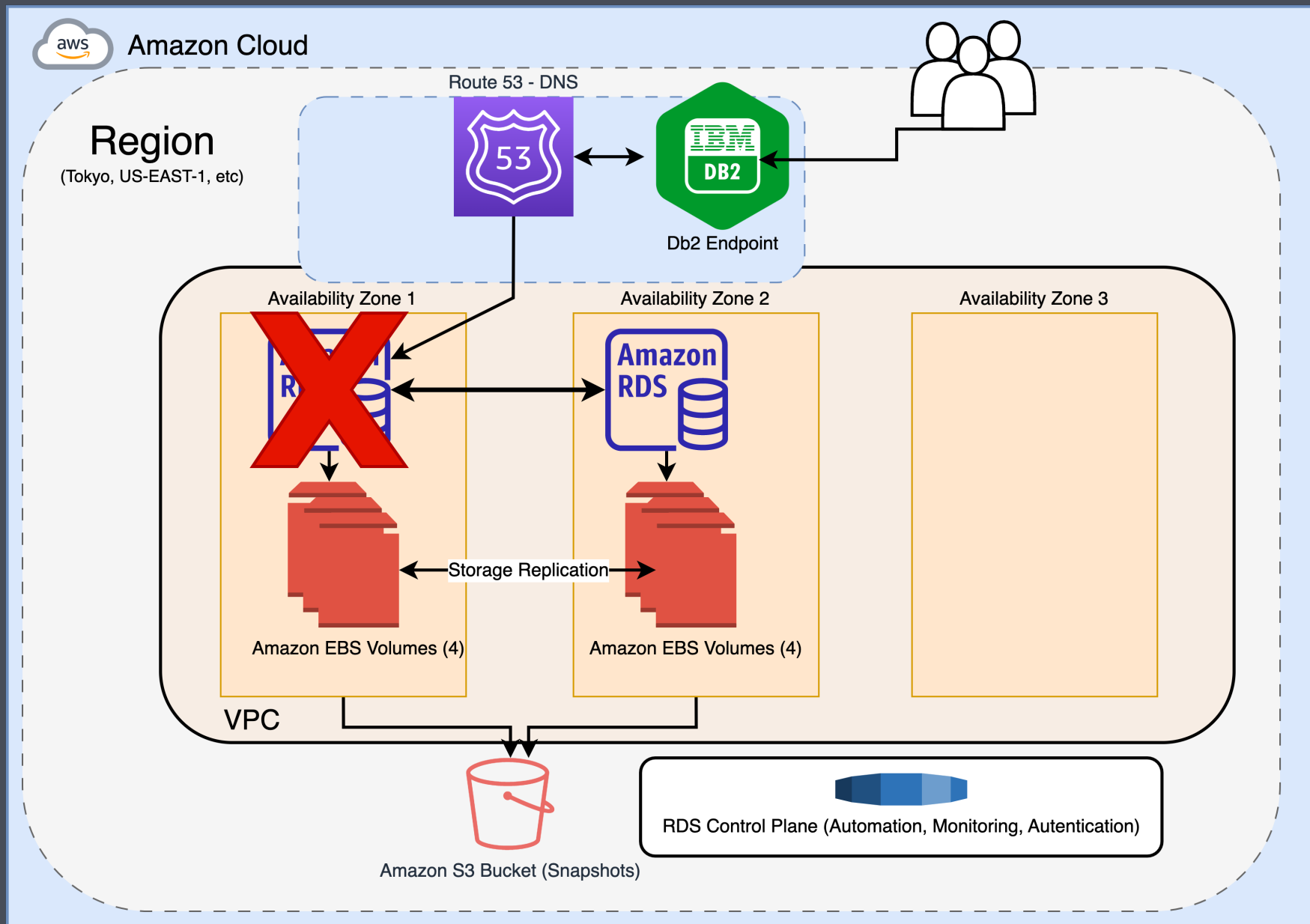
Amazon RDS for Db2 - AZ and Primary Node Failure - 1

Amazon RDS for Db2 – Primary moved to Previous Standby

Amazon RDS for Db2 – RDS instance started in new AZ

Amazon RDS for Db2 – Storage is hydrated and secondary is ready for future failovers

Amazon RDS for Db2 - HA Properties

Typical recovery time is 1-2 mins but can be affected by the time it takes crash recovery to complete which will be based on the types of workload that are running on the system.

RPO is 0 based on the use of synchronous replication
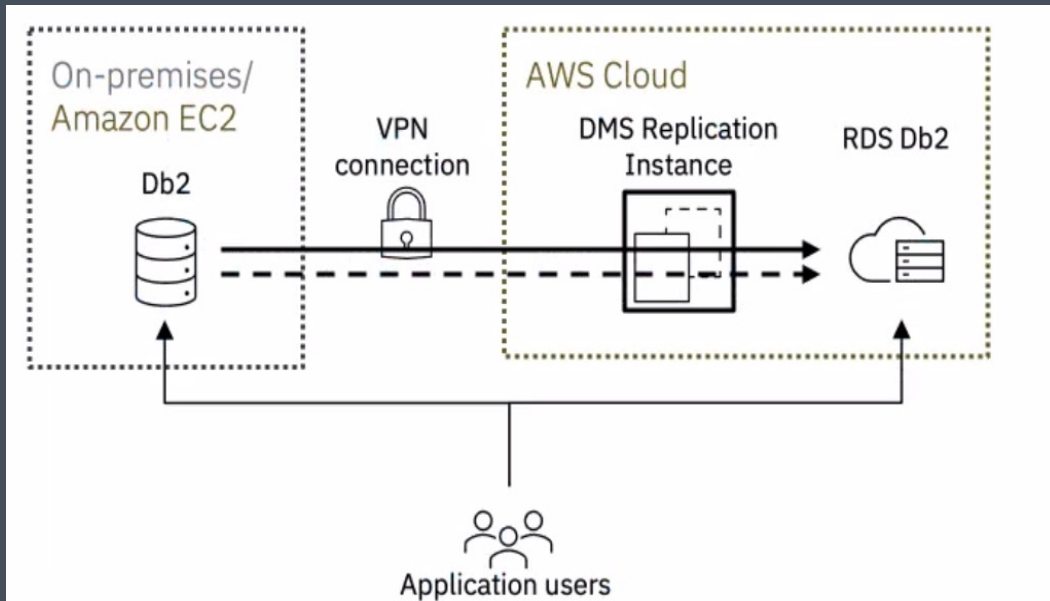
In flight transactions that did not commit will be lost

Standby recovery may take hours depending on data sizes

Migration to Amazon RDS for Db2

Easily modernize from on-premises Db2 to Amazon RDS for Db2

− Db2MT − used to provide assistance with migrations

One-Time Migrations

Native Db2 Tools

- Full offline backups from v11.1 and v11.5

- Full online backup (S3) and rollforward of transaction logs in backup for v11.5

- Customer provided db2look output and export and load/import

Continuous Migrations

Native Db2 Tools

- Full online backup (S3) and synchronization using log shipping (reduced downtime)

AWS Database Migration Service

- Database Migration Service with Change Data Capture with Db2 as the Target

Db2MT – Db2 Migration Tooling for RDS

A Command Line Tools that allows for a simplified, optimized and directed process for migrating Db2 On Premise workload to Amazon RDS.

- Joint work between Amazon and IBM
- Used to migrate Linux and AIX systems to Amazon RDS for Db2
- Supports many types of migrations
  - Air Gapped Environments
  - Big Endian/Little Endian
  - Via Backup and Restore
  - Via db2look/export/load
- Very Transparent & Flexible
  - Generates scripts that can be viewed and potentially customized

21

- Optimized for transfers of large amounts of Data to Amazon RDS for Db2

- Parallel processing used to optimize throughput
  - Full unload in parallel, directly to S3
  - Full load in parallel, directly from S3
  - Multiple stream upload
  - Parallel restore from S3

–https://github.com/IBM/db2-db2mt

AWS RDS for Db2 Migration Scenarios

	Db2MT	Offline Backup	Online Backup	db2look/db2export/db2 import	AWS Database Migration service
Linux Db2 11.5	Yes (Recommended)	Yes	Yes (near zero downtime)	Yes	Yes
Linux DB2 11.1	Yes	Yes	No	Yes	Yes
AIX Db2 11.5	Yes	No	No	Yes	Yes
AIX Db2 11.1	Yes	No	No	Yes	Yes
Windows Db2 11.5	TBD	No	No	Yes	Yes
Windows Db2 11.1	TBD	No	No	Yes	Yes
Other Database	No	No	No	Indirectly	Yes(for supported sources)

Demo

RDS For Db2 – Creation

RDS For Db2 – Migration via Db2MT - Demo
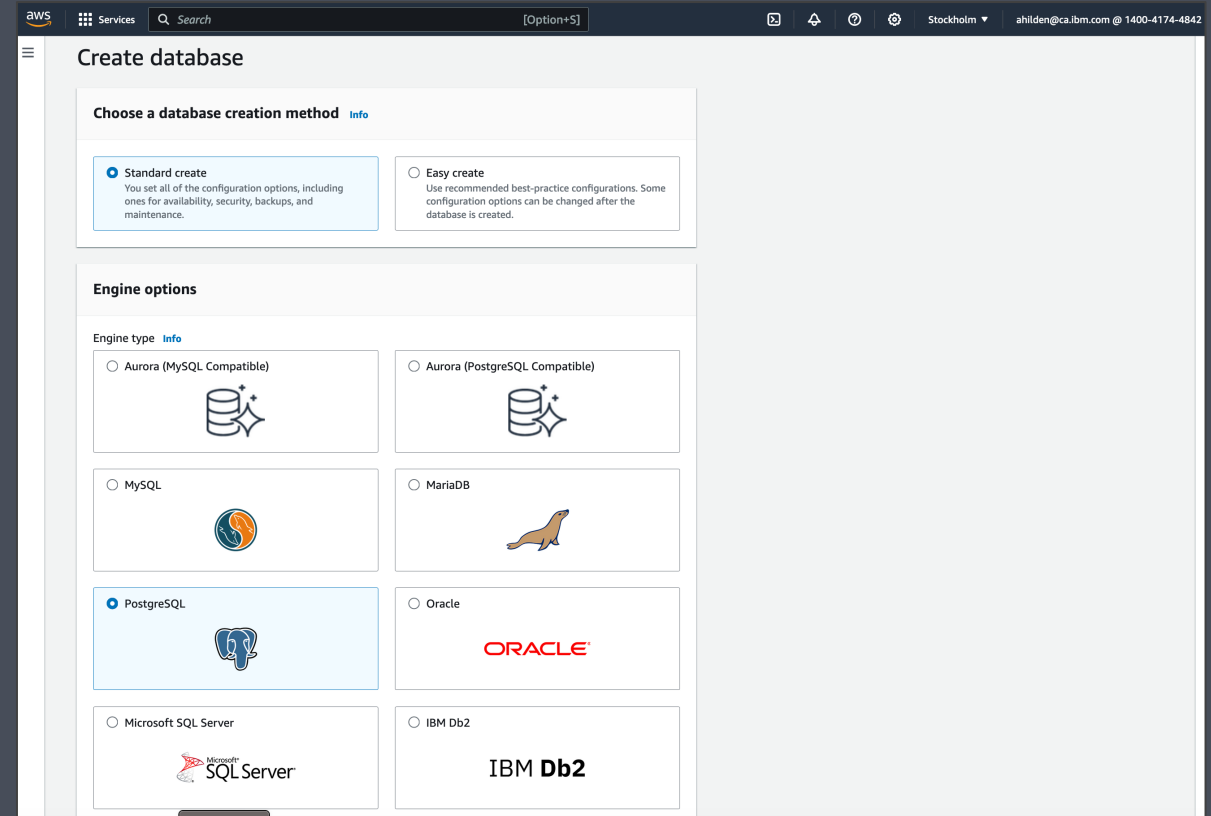
Why does Db2 on AWS RDS have superior security attributes?

- Network Level Security
  - Leverage Amazon Virtual Private Cloud to control inbound and outbound rules based access.
- Resource Access Permissions
  - Access to RDS management capabilities controlled by AWS Identity and Access Management allows policy based access to functions.
  - Future intentions to allow access to Db2 database via IAM like capability.
- Fully Encrypted
  - TLS v2 Network protection
  - Encryption at rest.
- Local user and group management
  - User created users and groups
  - Kerberos and Active directory in the future
- Enhanced security reviews and security testing
  - Ongoing and enhanced security testing between IBM and Amazon
  - Focus both on the AWS RDS platform as well as Db2 with a high bar for release.
  - Identified and developed areas to help address potential security improvement areas
- Compliance programs – HIPAA, SOC2, FedRAMP, PCI
- **Ongoing engagement** – in short Amazon RDS and IBM have a strong relationship with daily collaboration.