Amazon Relational Database Service

Relational Database Service

Infrastructure Management

Supported Databases by AWS

RDS DB Instances

DB instance classes and storage

Relational Database Service

- All relational DBs use Structured Query Language (SQL)
- Best suited for OLTP (On Line Transaction Processing)
- DBs are usually used in Enterprise applications/scenarios.
- Amazon Relational Database Service is a distributed relational database service by AWS.
- You can set up, operate, and scale a relational database in the AWS cloud.
- It provides cost-efficient and resizable capacity
- AWS will responsible to do hardware provisioning, database setup, patching and backups.
- You only focus on your applications so you can give them the fast performance, high availability, security and compatibility they need.

Infrastructure Management

- You are responsible for
  - Managing DB Settings
  - Building a relational DB schema
  - DB performance tuning
- AWS is responsible for
  - Security and patching of the DB instances
  - Automated backups
  - Software updates for the DB engine
  - Multi-AZ with Synchronous replication between the active and standby DB instances
  - Automatic failover if Multi-AZ option
  - Providing the ability to create DB read replicas for DB read scaling

Supported Databases by AWS

- Supported DBs
  - AWS Aurora
  - PostgreSQL
  - MariaDB
  - MySQL
  - MS SQL Server
  - ORACLE
- Free Tier Details
  - 12 MONTHS FREE
  - 750 hours per month of db.t2.micro
  - 20 GB of general purpose (SSD) database storage
  - 20 GB of storage for database backups and database snapshots

RDS DB Instances

- A DB instance is a virtual machine with database environment running in the cloud.
- Can contain multiple user-created databases, accessed using the client tools and applications
- DB instances created and modified with
  - AWS CLI
  - Amazon RDS API operations
  - AWS Management Console.
- Each DB instance has a DB instance identifier and it must be unique for that customer in an AWS Region

DB instance classes and storage

- The DB instance class determines the compute and memory capacity the instance
- DB instance class types
  - Standard (balanced compute, memory, and networking)
    - Ex: db.m3, db.m4, db.m5
  - Memory Optimized (memory-intensive applications)
    - Ex: db.r3, db.r5, db.x1
  - Burstable Performance (burstable performance DB instance)
    - Db.t2, db.t3, db.t4g
- Amazon RDS storage types
  - General Purpose SSD – offer cost-effective storage that is ideal for a broad range of workloads
  - Provisioned IOPS – designed to meet the needs of I/O-intensive workloads
  - Magnetic – low performance

Demo

- Demo on MySQL Database

RDS Backup

- Two types of backup for your RDS DB instances
  - Automated backups
  - Manual backups

Automated backups

- Amazon RDS creates and saves automated backups of your DB instance.
- RDS creates a storage volume snapshot of your DB instance, backing up the entire DB instance.
- Backups are stored in Amazon S3
- The first snapshot is a full one, and then subsequent snapshots are **incremental**
- Retention period: AWS RDS keeps the automated backup for 7 days by default
  - Min 0 days (means no retention)
  - Max 35 days
- RDS automatically backs up the DB instances daily, by creating a storage volume snapshot of your DB instance including the **DB transaction logs**
  - You can choose the Backup Window time
  - Enabled by default, you can disable it by setting retention period to zero
- Transaction logs are backed-up by RDS every 5 minutes

Automated backups

- Automated backups are used for point-in-time DB instance recovery
- It can restore the DB up to **5 minutes** in time using the **DB transaction logs** and the **automated snapshot**
- During your daily backup window, your I/O may be suspended (for standalone RDS deployments)
- For Multi-AZ deployment, backups are taken from the standby DB instance
- Automated backups are deleted when you delete your RDS DB instance

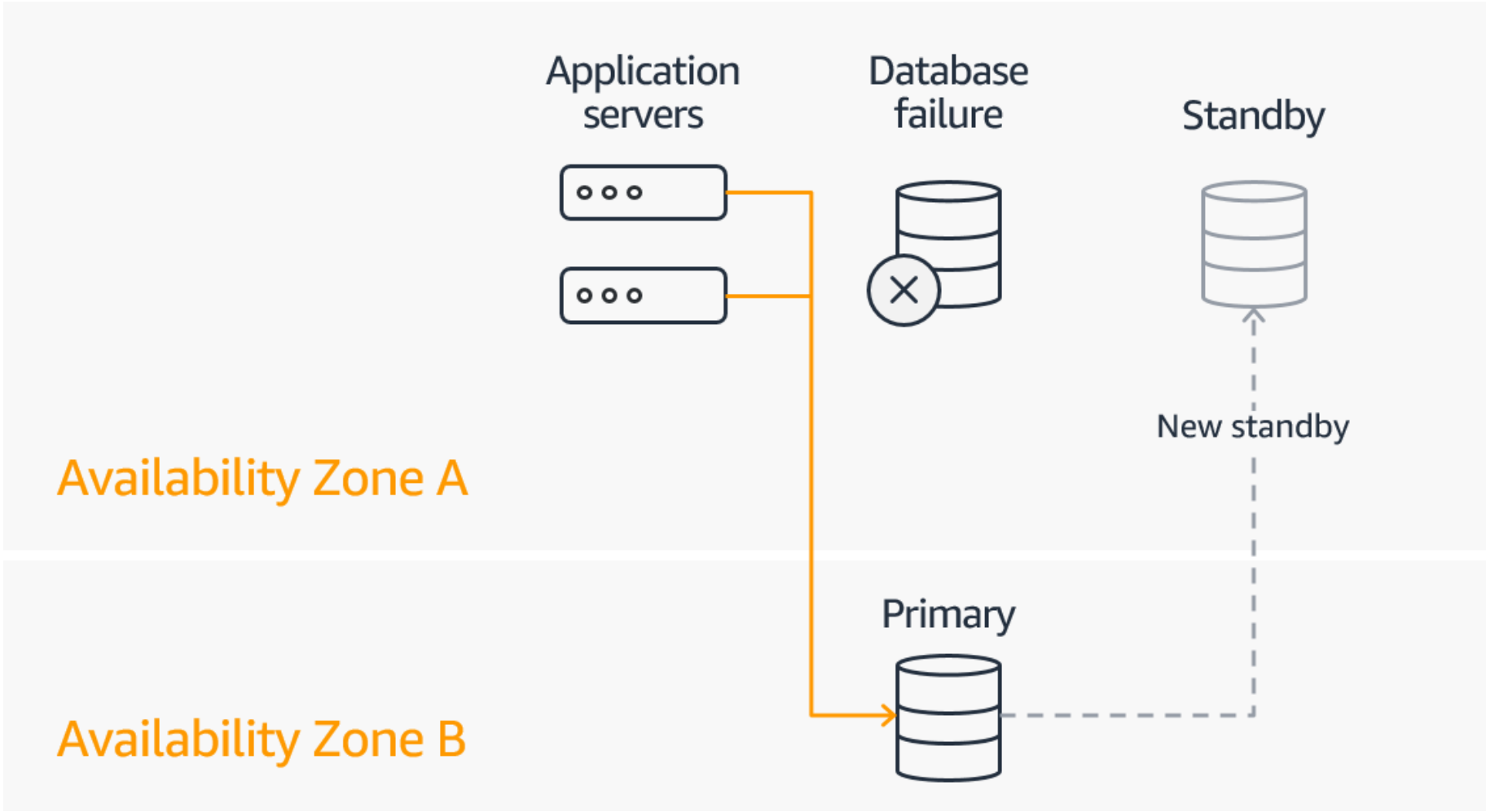
Manual backups

- Manual snapshot not used for point-in-time recovery
- These snapshots stored in Amazon S3
- They are not **deleted automatically** when you delete your RDS instance. You have to manually delete from S3
- It is recommended to take a final snapshot before deleting your RDS DB instance
- Can be shared with other AWS accounts directly

Amazon RDS Multi-AZ Deployments - Disaster Recovery

- Amazon RDS creates a primary DB Instance and **synchronously replicates** the data to a standby instance in a **different Availability Zone**
- Amazon RDS detects and automatically recovers from the most common failure scenarios for Multi-AZ deployments.
- Amazon RDS automatically performs a failover in the event of any of the following happens
  - Loss of availability in primary Availability Zone
  - Loss of network connectivity to primary
  - Compute unit failure on primary
  - Storage failure on primary

Amazon RDS Multi-AZ Deployments

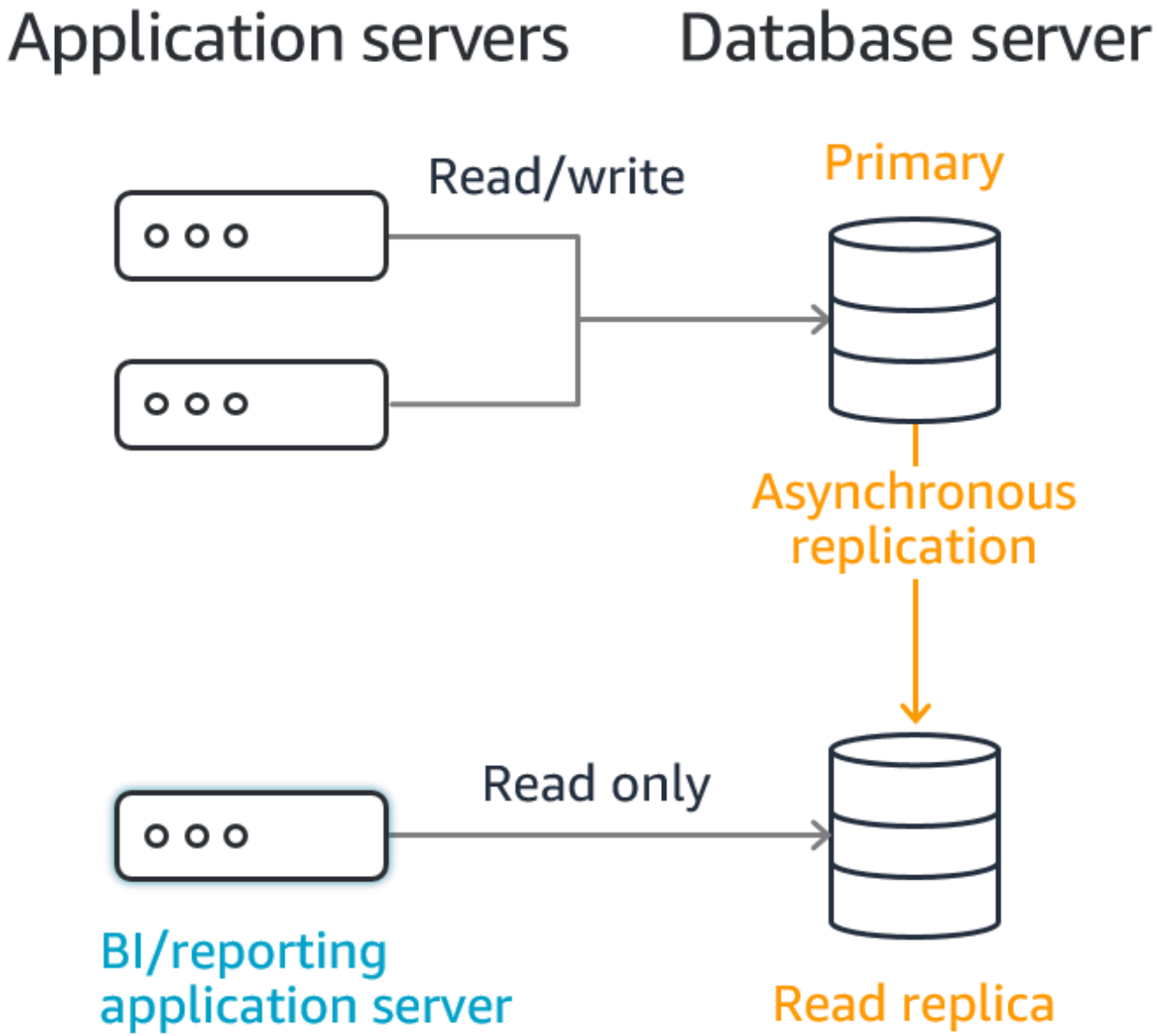


RDS Multi-AZ Deployments

- You can select the Multi-AZ option during RDS **DB instance launch** or modify an existing standalone RDS instance
- You can NOT read/write to the Standby RDS DB instance
- You will be alerted by a DB instance event when a failover occurs. AWS RDS uses AWS SNS to send RDS events via SNS notifications
- In Multi-AZ, snapshots and automated backups are done on Standby instance to avoid I/O suspension on Primary instance
- **Maintenance sequence of events in Multi-AZ**:
  - Maintenance on Standby is performed
  - Standby promoted to Primary
  - Maintenance performed on old primary (Current Standby)

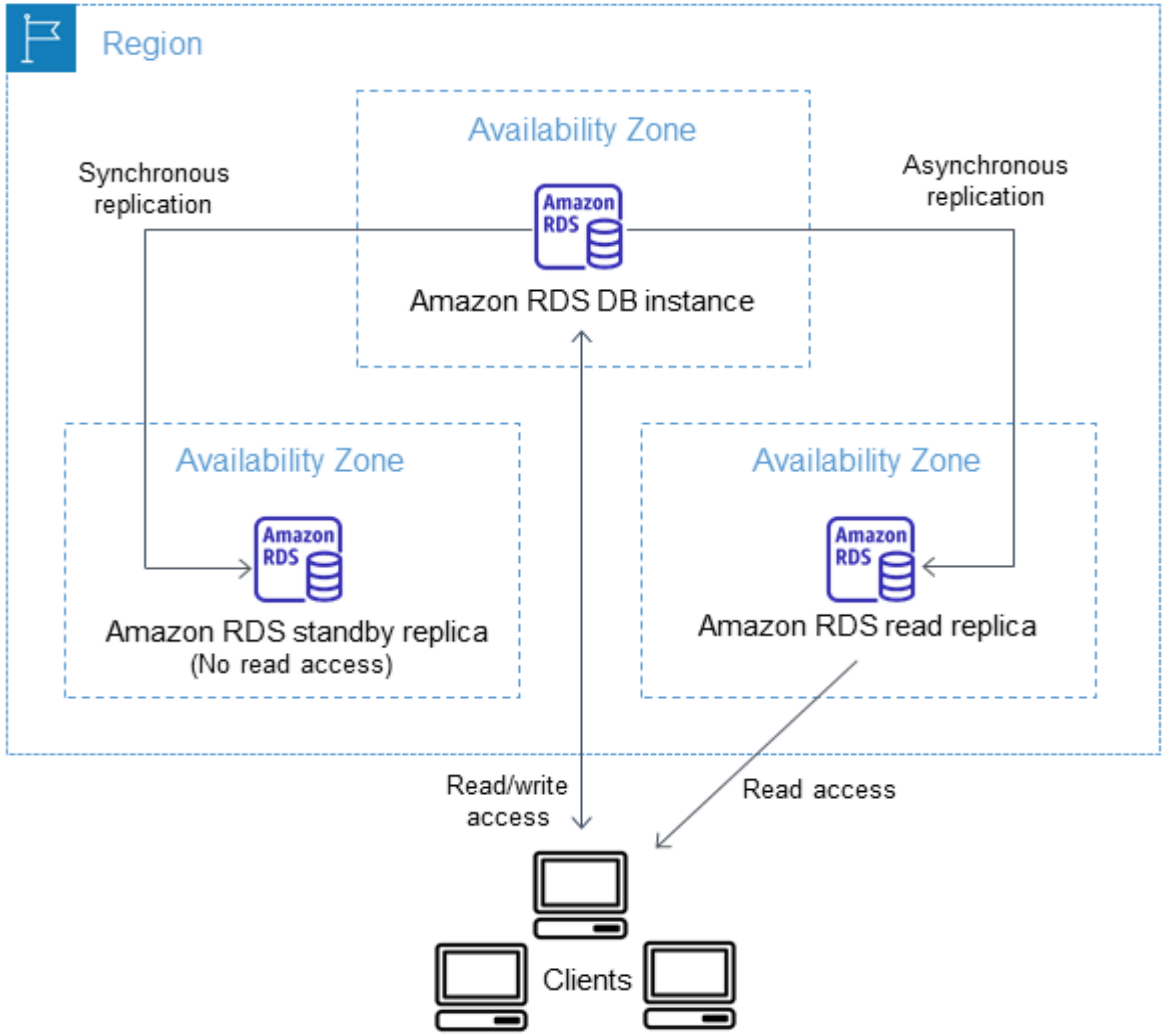
DB Read Replicas

- **RDS Read Scalability**
- A read replica is a replica of the primary RDS DB instance that can only be used for read operation
- Asynchronous replication. Reads are eventually consistent
- Read replicas are available in Amazon RDS for MySQL, MariaDB, PostgreSQL, Oracle, and SQL Server as well as Amazon Aurora
- Within **AZ, Cross AZ or Cross Region**
- Read replicas are used for SELECT
  - not INSERT, UPDATE, DELETE
- Shifting read intensive applications such as Business reporting, or Data Warehousing to read from read replicas as opposed to overload the primary DB


Application servers
Database server
Read/write
Primary
Asynchronous replication
Read only
BI/reporting application server
Read replica

RDS Read Replicas – Use Cases

- You have a production database that is taking on normal load
- You want to run some analytics on your data
- You create a Read Replica to run the new workload there
- The production application performance is unaffected

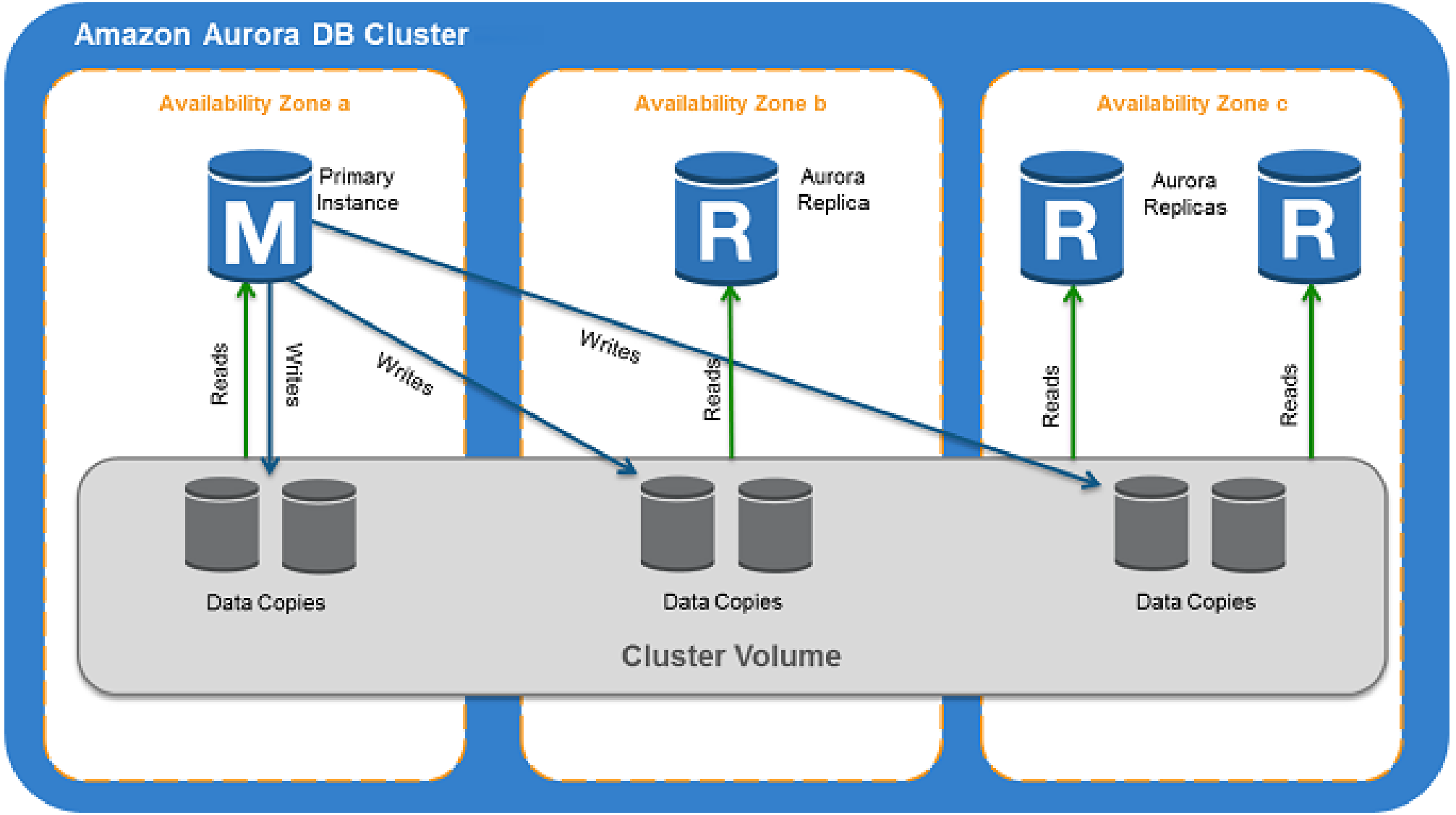


Amazon Aurora

- Aurora is a RDS from AWS (not open sourced)
- Aurora database build on top of Postgres and MySQL
- Aurora is AWS optimized and claims 5x performance improvement over MySQL and 3x over Postgres
- Aurora storage automatically grows in increments of 10GB, up to 64 TB.
- Aurora can have 15 replicas while MySQL has 5, and the replication process is faster
- Aurora costs more than RDS (20% more) – but is more efficient

Amazon Aurora DB clusters

- An Aurora cluster volume is a virtual database storage volume that spans multiple AZs, with each Az having a copy of the DB cluster data.
- Primary DB instance
  - Supports read and write operations. Each Aurora DB cluster has one primary DB instance.
- Aurora Replica –
  - Can have up to 15 Aurora Replicas.
  - Maintain HA by locating Replicas in separate AZs.
  - Automatically fails over to an Aurora Replica in case the primary DB instance becomes unavailable.


Amazon Aurora DB Cluster
Availability Zone a
Availability Zone b
Availability Zone c
M
Primary Instance
R
Aurora Replica
R
R
Aurora Replicas
Reads
Writes
Writes
Writes
Reads
Reads
Reads
Data Copies
Data Copies
Data Copies
Cluster Volume

Features of Aurora

- Automatic fail-over
- Backup and Recovery
- Isolation and security
- Industry compliance
- Automated Patching with Zero Downtime
- Advanced Monitoring
- Routine Maintenance
- Backtrack: restore data at any point of time without using backups