Database

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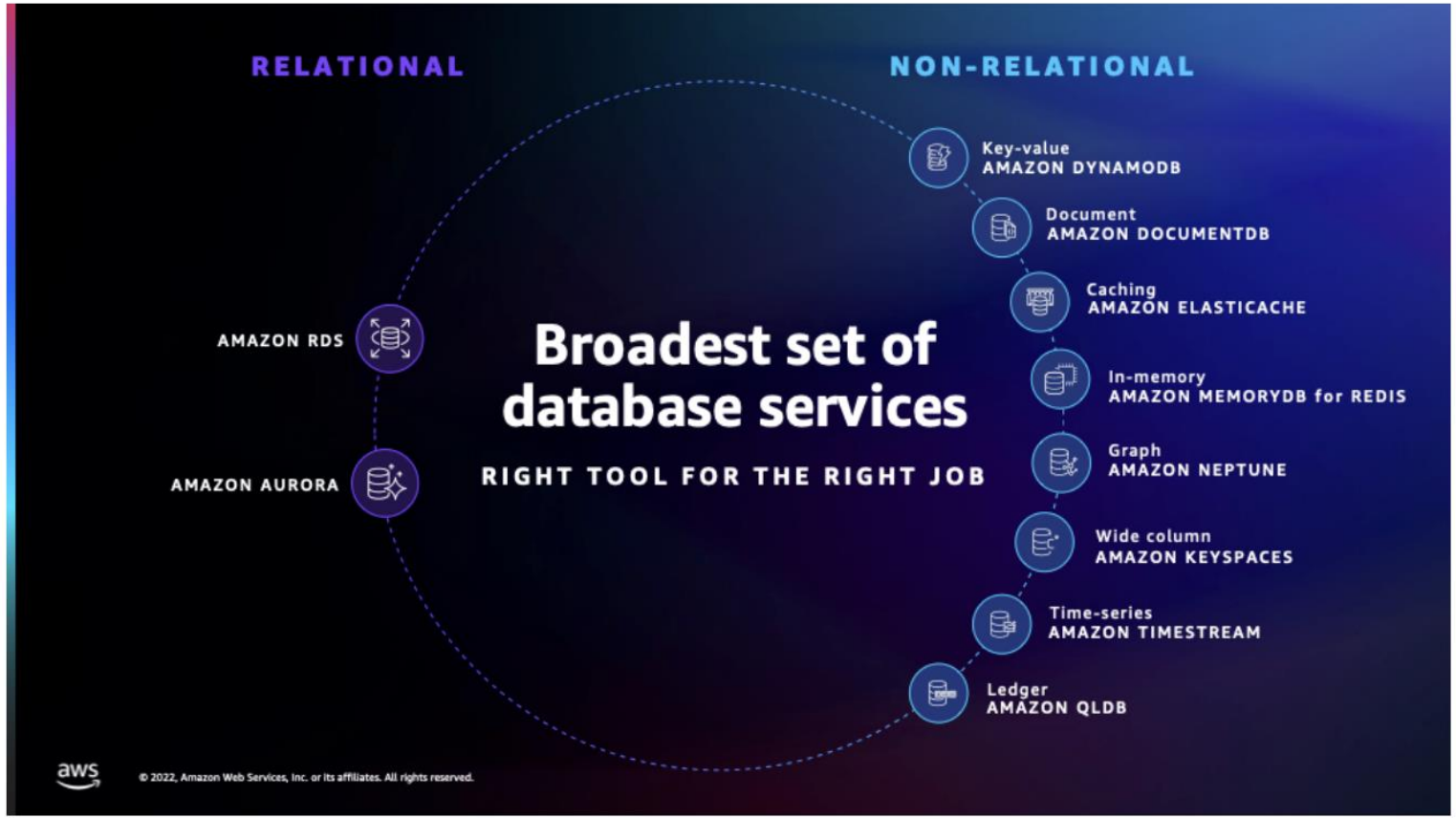
Agenda

- Database Services in AWS
- SQL
- NoSQL

Database

- A **database** is an **organized collection of data** that allows storing, retrieving, and managing information efficiently.
  - Stores **structured or unstructured** data.
  - Allows **multiple users** to access and modify data.
  - Ensures **data integrity, security, and scalability**.
- **SQL vs. NoSQL**
- **Why Do Applications Need a Database?**
  - Applications store, retrieve, and process **data**.
  - Databases provide **organized, structured storage** instead of using flat files.
  - Enable **scalability, security, and multi-user access**.

Database Services in AWS



Database Services in AWS

- **Fully managed services** (no need to set up servers manually).
- **Scalability** (handle more users & data without downtime).
- **Security** (built-in encryption, backups, access control).
- **Cost-effectiveness** (pay for what you use)

Database Services in AWS

- **Relational Databases (SQL-based)**
  - Amazon RDS (MySQL, PostgreSQL, MSSQL, etc.)
  - Amazon Aurora (Managed, high-performance SQL)
- **NoSQL Databases (Flexible, scalable)**
  - Amazon DynamoDB (Key-Value NoSQL)
  - Amazon DocumentDB (MongoDB-compatible)

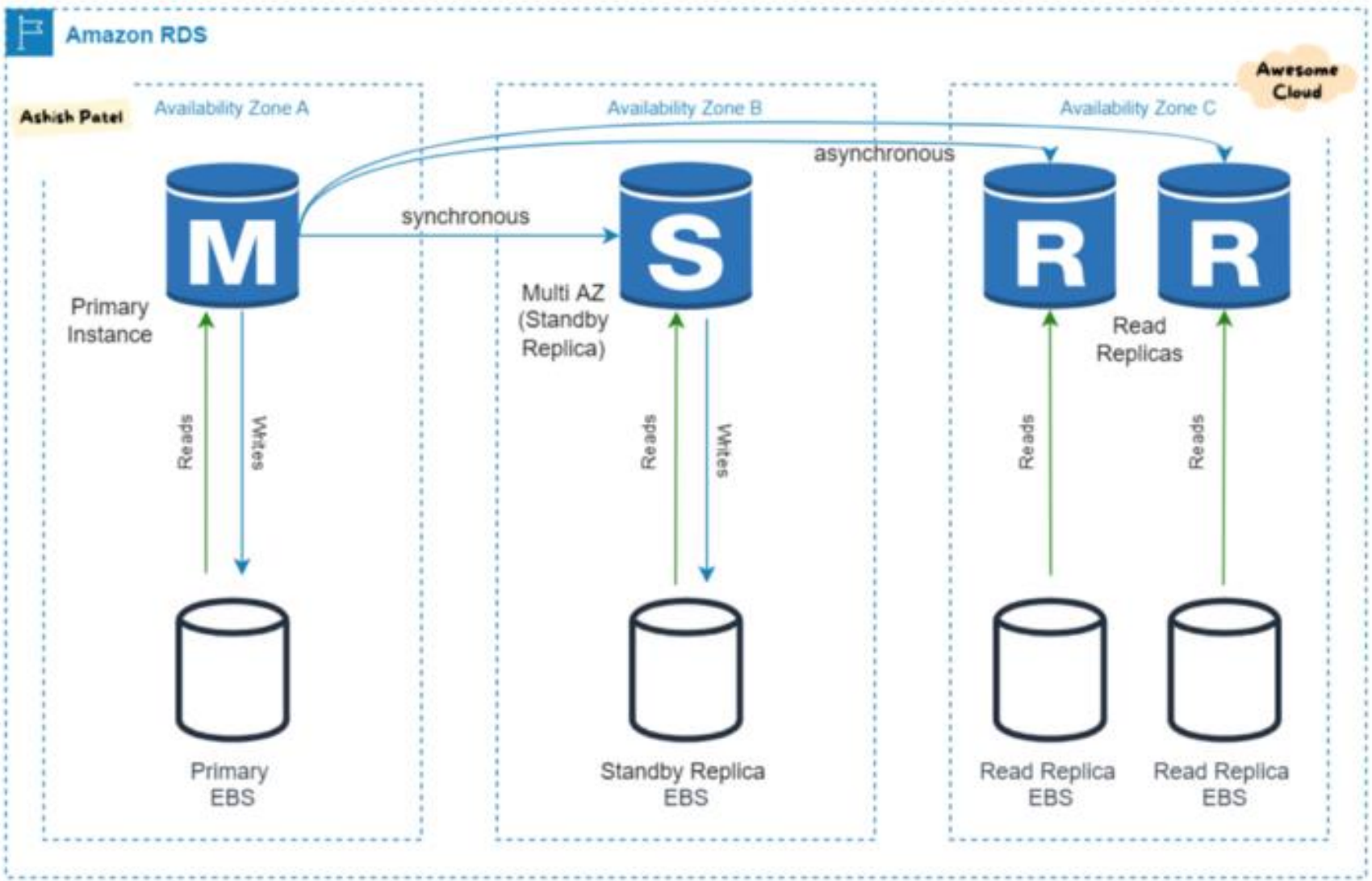
Amazon RDS

- RDS stands for **Amazon Relational Database Service.**
- **Database Engines**: Supports popular engines like **MySQL**, **PostgreSQL**, **MariaDB**, **Oracle**, **SQL Server**, and **Aurora**.
- **Managed Service**: Automates database setup, patching, backups, and scaling.
- **Scalability**:
  - Vertical scaling by resizing instances.
  - Horizontal scaling with **Read Replicas**.

Amazon RDS

- **Availability and Reliability**:
  - **Multi-AZ Deployments**: Provides high availability with synchronous standby replicas.
  - Automated failover during outages.
- **Encryption** at rest and in transit
- **Performance**:
  - Optimized storage and caching.
  - Support for high throughput and low latency workloads.

Amazon RDS (Non-Aurora)



Amazon Aurora

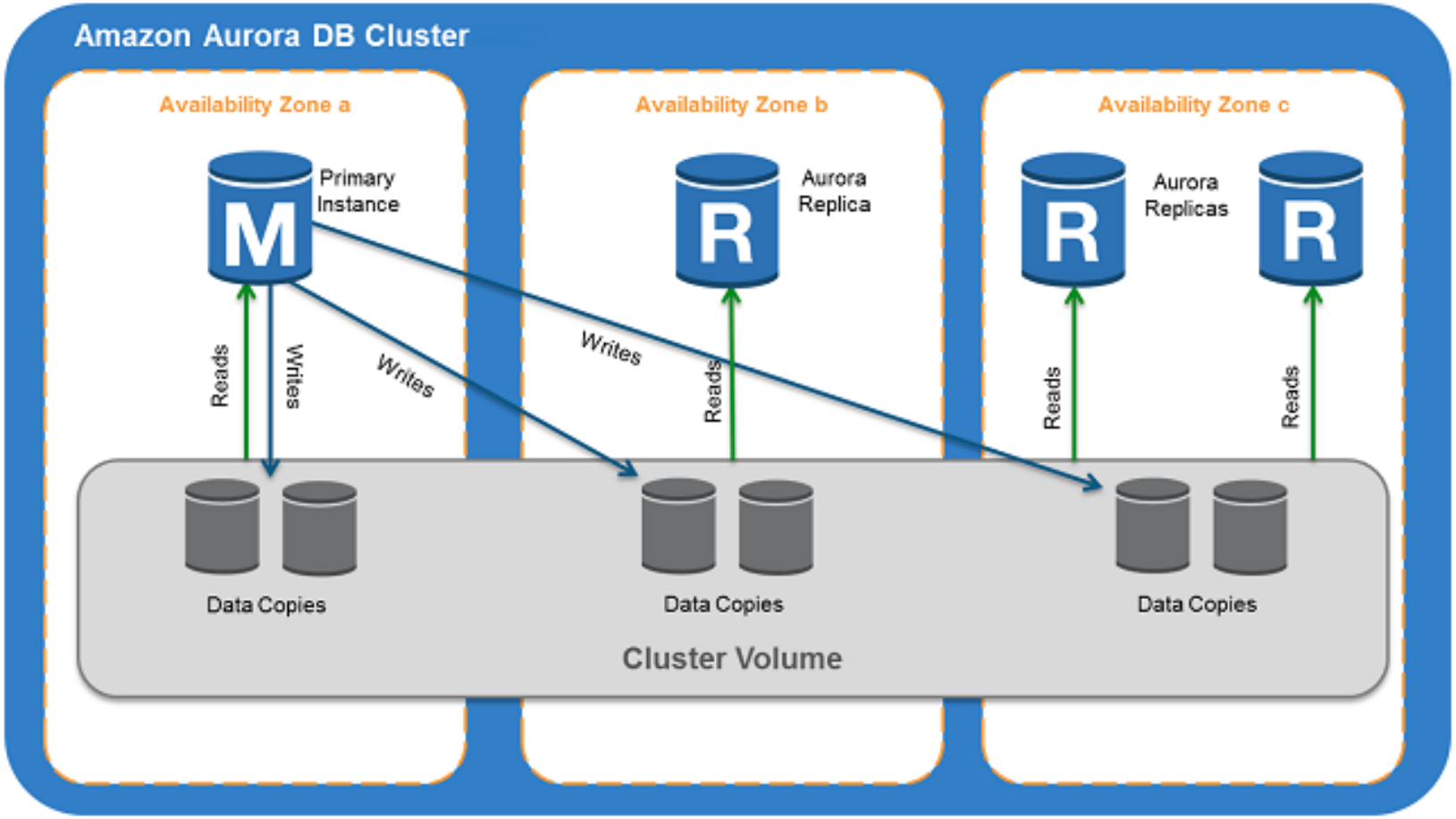
- Amazon Aurora is a fully managed relational database engine designed for high performance, scalability, and availability, compatible with **MySQL** and **PostgreSQL**.
- **Performance**:
  - Up to **5x faster** than standard MySQL and **3x faster** than PostgreSQL.
  - Supports millions of transactions per second.
- **Scalability**:
  - Automatically scales storage up to **128 TiB**.
  - Supports up to **15 low-latency read replicas** for read-heavy workloads.

Amazon Aurora

- **High Availability**:
  - Replicates data across **6 copies** in 3 Availability Zones (AZs).
  - Automatic failover within seconds for high resilience.
- **Failover in <30 seconds** (high availability).
- **Parallel Query & Machine Learning Integration**.
- **Serverless Option** (Aurora Serverless).

Amazon Aurora

- It contains a primary instance and multiple replicas



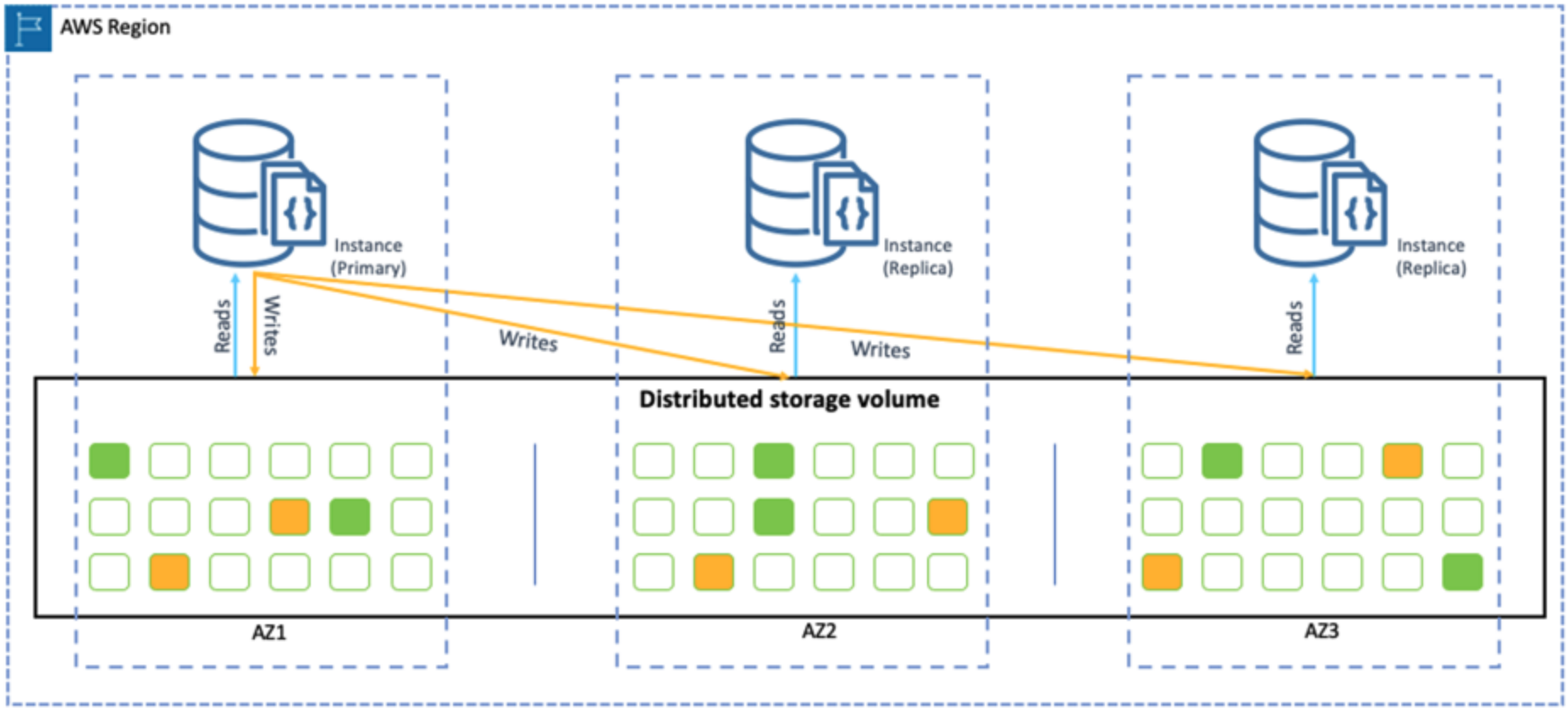
Amazon DocumentDB

- Amazon DocumentDB is a fully managed NoSQL document database service designed for scalable, secure, and high-performance applications.
- **Compatible with MongoDB**: Built to support applications written for MongoDB, allowing seamless migration of MongoDB workloads to AWS with minimal changes to application code or tools.
- **Highly Scalable**:
  - Automatically scales storage up to **64 TB** per database cluster as your application grows.
  - Supports up to **15 read replicas** to scale read operations for high-traffic workloads.

Amazon DocumentDB

- **Fault Tolerant**:
  - Stores six copies of your data across three AWS Availability Zones to ensure durability and high availability.
  - Provides automated failover to minimize downtime in the event of a failure.
- **High Performance**: Optimized for high-speed read and write operations with low latency, designed to support large-scale, mission-critical applications.
- **Highly Secure**:
  - Provides encryption at rest and in transit using AWS Key Management Service (KMS).
  - Supports fine-grained access control using AWS Identity and Access Management (IAM).

Amazon DocumentDB



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Reference

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- Google AI: https://gemini.google.com
- Practical Tutorials: https://thaovu.org