AWS Fundamentals - RDS + Aurora + ElastiCache (Cheat Sheet)

Lesson 1: Amazon RDS Overview

RDS (Relational Database Service) is a managed service for SQL-based databases like Postgres, MySQL, MariaDB, Oracle, SQL Server, IBM DB2, and AWS Aurora. - Managed Service: Automated provisioning, patching, backups, scaling, monitoring. - Supports vertical/horizontal scaling and Multi-AZ for Disaster Recovery. - RDS Storage Auto Scaling adjusts storage automatically to handle unpredictable workloads.

Lesson 2: RDS Read Replicas vs Multi-AZ

- Read Replicas: Used for read scalability (up to 15 replicas), asynchronous replication. - Multi-AZ: Used for disaster recovery, synchronous replication, automatic failover. - Read Replicas handle SELECT queries; Multi-AZ handles availability.

Lesson 3: RDS Custom (Oracle & SQL Server)

- RDS Custom: Allows OS-level access to configure, patch, and enable native features. - RDS: Fully managed by AWS; RDS Custom: Full admin access to OS & database.

Lesson 4: Amazon Aurora

- AWS's proprietary, MySQL/Postgres-compatible database with 5x performance over MySQL on RDS. - Automatically scales storage up to 128TB and supports up to 15 replicas. - High Availability: 6 copies across 3 AZs, sub-10ms replication, automatic failover. - Features: automatic failover, backups, push-button scaling, and backtrack restore.

Lesson 5: Aurora Advanced Concepts

- Aurora Replicas can auto-scale and be grouped via Custom Endpoints. - Aurora Serverless: auto-start, scale, and stop based on usage; pay per second. - Global Aurora: 1 primary (read/write) + up to 10 secondary (read-only) regions. - Aurora ML integrates with SageMaker & Comprehend for predictive analytics. - Babelfish: enables Aurora PostgreSQL to understand SQL Server commands.

Lesson 6: RDS & Aurora Backup & Monitoring

- Automated Backups: Daily full backups, transaction logs every 5 minutes. - Manual Snapshots: User-triggered, kept indefinitely. - Aurora Cloning: Fast and efficient using copy-on-write protocol. - Restore Options: Create new DB from backup or S3 import.

Lesson 7: RDS Security

- Encryption: At-rest via KMS, in-flight via TLS. - IAM Authentication replaces username/password for DB access. - Security Groups control network access; CloudWatch stores audit logs. - SSH access only on RDS Custom.

Lesson 8: RDS Proxy

- Manages DB connections, reduces CPU/RAM load, improves failover time (by 66%). - Serverless, auto-scaling, supports IAM Auth and Secrets Manager. - Compatible with RDS & Aurora (MySQL, PostgreSQL, SQL Server, MariaDB).

Lesson 9: ElastiCache Overview

- Managed in-memory cache (Redis or Memcached) for high-speed performance. - Reduces DB load and supports stateless app design. - Redis supports HA, replication, persistence, and backups. - Memcached supports sharding and multi-threading but lacks persistence.

Lesson 10: ElastiCache for Solution Architects

- Security: Redis AUTH & IAM, SSL support, SASL (Memcached). - Cache Patterns: * Lazy Loading (can become stale) * Write Through (keeps fresh data) * Session Store (temporary session caching) - Redis Use Case: Gaming leaderboards using sorted sets for real-time ranking.