RDS, Aurora and ElasticCache

- Overview on Relational Database Service (RDS)
- RDS read replicas vs Multi-AZ
- Amazon Aurora
- RDS and Aurora Backup
- RDS & Aurora Restore
- RDS security and proxy
- ElasticCache
- Demos

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Overview on Relational Database Service

- RDS stands for Relational Database Service
- DB service for DBs which use SQL as a query language.
- Allows you to create databases in the cloud that are managed by AWS: MySQL, Postgres, MariaDB, Oracle, Microsoft SQL Server and Aurora.
- RDS is a managed service(Just like Elastic Load Balancer):
  - Automated provisioning, OS patching
  - Continuous backups and restore to specific timestamp
  - Read replicas for improved read performance
  - Multi AZ setup for DR (Disaster Recovery)
  - Scaling capability (vertical and horizontal)
  - BUT you can’t SSH into your instances (AWS Managed service)
  - **RDS custom**: Managed Oracle and Microsoft SQL Server Database with OS and database customization, with SSH

RDS - Storage Auto Scaling

- Helps you increase storage dynamically
- RDS detects you are running out of free database storage, it scales automatically
- You have to set Maximum Storage Threshold
- Automatically modify storage if:
  - Free storage is less than 10% of allocated storage
  - Low-storage lasts at least 5 minutes
  - 6 hours have passed since last modification
- Useful for applications with unpredictable workloads
- Supports all RDS database engines (MariaDB, MySQL, PostgreSQL, SQL Server, Oracle)

RDS read replicas vs Multi-AZ

Read Replicas for read scalability

- Up to 15 Read Replicas
- Within AZ, Cross AZ or Cross Region
- Replication is ASYNC, so reads are eventually consistent
- Replicas can be promoted to different DB
- Applications must update the connection string to leverage read
- Use case: read replica for reporting tool
- Same AZ data transfer is free, but Cross AZ and cross region data transfer is costly

Multi-AZ

- Increase availability, No manual intervention in apps
- For Disaster Recovery, SYNC replication (snapshot is used to copy data from 1 DB to another)
- Zero downtime operation
- Not used for scaling (The read replica here is kep as a copy for DR and can not be used for read/write)

Amazon Aurora

- Aurora is ‘AWS cloud optimized’ Database(Not open source)
- Postgres and MySQL are both supported as Aurora DB
- AWS claims 5x performance improvement over MySQL on RDS, over 3x the performance of Postgres on RDS
- Storage automatically grows in increments of 10GB, up to 128 TB.
- Up to 15 replicas and faster then RDS
- Costs 20% more than RDS
- **High availability and read scaling**:
  - One aurora instance takes write(master)
  - Master + up to 15 read replicas and automated failover in less than 30 seconds
  - 6 copies of your data across 3 AZ
    - 4 copies out of 6 for write
    - 3 copes out of 6 for read
    - Self healing and peer-to-peer replication


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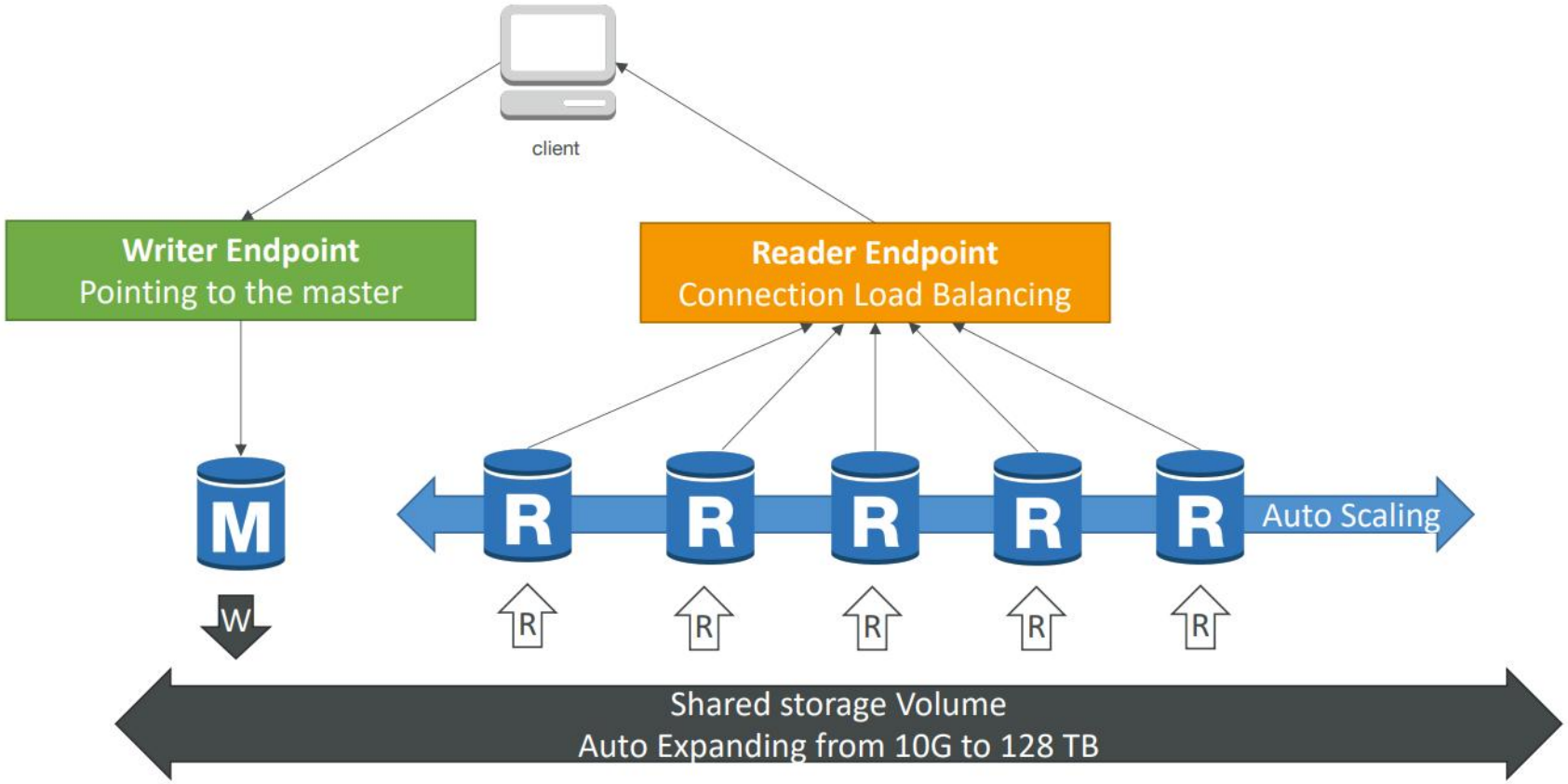
Aurora DB Cluster



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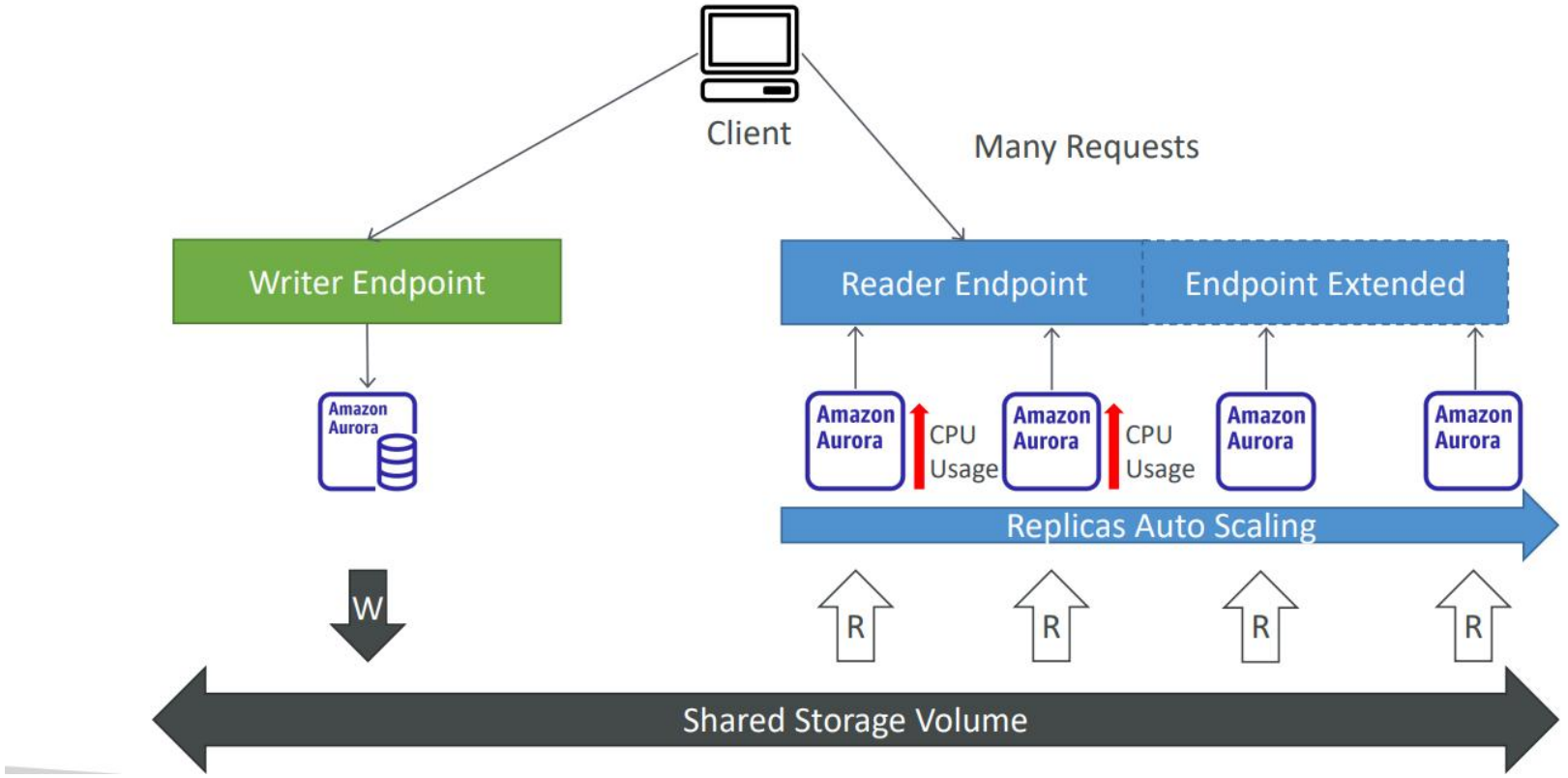
Aurora Replicas - Auto Scaling



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RDS and Aurora Backup

Manual backup for both RDS and Aurora

- Manually triggered by the user
- Retention of backup for as long as you want

Aurora - Automated backups

- 1 to 35 days (cannot be disabled)
- point-in-time recovery in that timeframe

RDS - Automated backups

- Daily full backup of the database
- 1 to 35 days of retention, set 0 to disable automated backups
- ability to restore to any point in time


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RDS and Aurora Restore

- Restoring a RDS / Aurora backup or a snapshot creates a new database
- Restoring MySQL Aurora cluster from S3
  - Create a backup of your on-premises database using Percona XtraBackup and store backup file in S3
  - Restore the backup file onto a new Aurora cluster running MySQL
- Restoring MySQL RDS database from S3
  - Create a backup of your on-premises database and store it in S3
  - Restore the backup file onto a new RDS instance running MySQL

Database Cloning: Create a new aurora DB cluster from existing one, faster than snapshot and restoe, Uses *copy-on-write* protocol . Very fast and cost effective.
Use case: Creating an staging databse from production database without impacting the production DB


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RDS security and proxy

Security

- At-rest encryption
- In-flight encryption
- IAM Authentication
- Security group and Audit Logs can be enabled

RDS Proxy

- Fully managed database proxy for RDS (Serverless, autoscaling, highly available)
- Allows apps to pool and share DB connections established with the database
- Reduced RDS & Aurora failover, improved efficiency
- RDS Proxy is never publicly accessible


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ElasticCache

- ElastiCache is to get managed Redis or Memcached, just like RDS is for managed Relational Database
- Caches are in-memory databases with really high performance, low latency
- Reduce load on databases and make the application stateless(doesn't require the server to retain data)
- OS maintenance / patching, optimizations, setup, configuration, monitoring, failure recovery and backups are taken care by AWS
- Use case: Applications queries ElastiCache, if not available, get from RDS and store in ElastiCache
- **Security**:
  - ElastiCache supports IAM Authentication for Redis
  - IAM policies on ElastiCache are only used for AWS API-level security
  - Memcached:
    - Supports SASL-based authentication (advanced)
  - Redis AUTH
    - set a "password/token" while creating cluster
    - Support SSL in flight encryption


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MCQ

Amazon RDS supports the following databases, EXCEPT:

A. MongoDB
B. MySQL
C. MariaDB
D. Microsoft SQL Server


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MCQ

You're planning for a new solution that requires a MySOL database that must be available even in case of a disaster in one of the Availability Zones. What should you use?

A. Enable Multi-AZ
B. Enable Encryption
C. Create Read Replicas
D. None of the above


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MCQ

How can you enhance the security of your ElastiCache Redis Cluster by allowing users to access your ElastiCache Redis Cluster using their IAM Identities (e.g., Users, Roles)?

A. Using Redis Authentication
B. Using IAM Authentication
C. Use Security Groups


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MCQ

For your RDS database, you can have up to ..... Read Replicas.

A. 10
B. 25
C. 15
D. 5


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