Database (DB)

Database is a systematic collection of data. Database support storage and manipulation of data.

Database two types – 1. Relational database 2. Non relational database

Relational database – A relational database is a datasturcture that allows you to link information from different table or different type of data bucket.

Tables are related to each other.

All fields must be filled.

Best suited for OLTP

Amazon Relational Database Service- Amazon Relational Database Service (Amazon RDS) is a web service that makes it easier to set up, operate, and scale a relational database in the AWS Cloud. It provides cost-efficient, resizable capacity for an industry-standard relational database and manages common database administration tasks.

AWS is responsible for- relational DB engine service

1. Security & patching
2. Automated backup
3. Software updates for the DB engine
4. If selected multi availability zone with synchronous replication between the active and stand by DB instances.(not multi region)
5. Automatic failover if multi- AZ option was selected
6. By default every database has 7 days backup window.(max 35 days)

RDS limit

Up to 40 DB instance per account.

10 of the 40 can be oracle or MS-SQL server under licenses included model.

Under BYOL model all 40 can be any DB engine you create.

RDS storage –

Amazon RDS use EBS volume (not instance store) for DB and logs storage. Two types of storage in RDS

1. General purpose- use for DB workload with moderate I/O requirement.
2. Provisional IOPS storage – use for high performance OLTP workloads.

Database instance class-

1. Standard class- m class
2. Memory optimized class- include R class
3. Burstable class

What is multi-AZ in AWS RDS?

1. You can select multi AZ option during the RDS DB instance launch. After launch you cannot select multi-AZ
2. RDS service creates a standby instance in a different AZ in the same region and configures synchronous replication between the primary and standby.
3. You cannot read/write to the standby RDS DB instances.
4. You cannot select which AZ in the region will be chosen to create standby DB instance.
5. You can see which AZ is selected after the standby is created.
6. Depending on the instance class it may take 1 to few minutes to failover to the standby instance. In this standby DB instance convert to primary DB instance and one more standby DB instance will be launch.
7. AWS recommends the use of provisioned IOPS instances for multi –AZ RDS instances.

When multi-AZ RDS failover Triggers?

1. In case of failure of primary DB instance failure.
2. In case of AZ failure.
3. Loss of network connectivity to primary DB.
4. EBS failure of primary instance.
5. The primary DB instance setting is changed.
6. Patching the OS of the DB instance.

Multi -AZ RDS failover consequences?

1. During failover the CNAME of the RDS DB instance is updated to map to the standby IP address.
2. It is recommended to use the endpoint to the reference your DB instances and not its IP address.
3. The CNAME does not change, because the RDS endpoint does not change.
4. RDS endpoint does not change by selecting the multi AZ option however the primary and standby instances will have different IP addresses as they are in different AZ.

When we do manual Failover?

1. In case of rebooting.
2. This is by selecting the reboot with failover reboot option on the primary RDS DB instance.
3. A DB instance reboot is required for changes to take effect when you change the DB parameter group or when you change static DB parameter.

RDS Multi AZ Deployment and maintenance?

1. First perform maintenance on standby.
2. Now , convert standby into primary so that maintenance can be done on primary.(currently)
3. You can manually upgrade DB instance to a supported DB engine version from AWS console as follow- RDS>DB instance>modify DB>set DB engine version.
4. By default change will take effect during the next maintance window.
5. Or you can force an immediate upgrade if you want.
6. In multi AZ version upgrade will be conducted on both primary and standby at the same time which will cause an outage. Do it during maintenance window.

RDS backup & snapshot

User initiated manual backup (snapshot) - You can create a storage volume snapshot of your entire DB instance.

AWS RDS automated backup

1. Automated backup by aws backup your DB data to multiple AZ to provide for data durability.
2. Store in Amazon s3.
3. Multi AZ automated backup will be taken from the standby instance.
4. The DB instance must be in the active state for automated backup.
5. By default backup 7 days (0-35 can be select).

Read Replica-

Up to 5 read replica can create within AZ , cross AZ or cross region.

For Read Replica within region no charges will apply.

Replication is asynchronous so reads are eventually consistent.

Use case of read replica –

You have production DB that is taking on normal load

You want to run reporting application to run some analytics.

You create read replica to run the new workload there.

The production application is unaffected.

Read replica is used for SELECT (read) not INSERT UPDATE OR DELETE.

RDS Multi-AZ (Disaster Recovery)

Synchronous Replication

One DNS name automatic failover to standby

Increase availability

AMAZON AURORA

What is Amazon Aurora?

1. Aurora is a proprietary technology from AWS (not open source)
2. Postgres and MYSQL are both supported as Aurora DB (that means your drivers will works as if Aurora was a postgre or MYSQL DB)
3. Aurora is AWS cloud optimized and claims 5X performance improvement over MYSQL RDS & 3X performance over postgre RDS.
4. Aurora store automatically grows in increments of 10GB, up to 128TB
5. Aurora can have 15 replicas while MYSQL has 5, and the replication process is faster.
6. Failover in Aurora is instantaneous. It is high availability.
7. Aurora costs more than RDS (20% more) but it is more efficient.

Best feature of Aurora

1. Automatic failover
2. Backup and recovery
3. Isolation & security
4. Push-button scaling
5. Automatic patching with zero downtime
6. Advanced monitoring
7. Backtrack – restore data at any point of time without using backups.

Non Relational DB (NO-SQL)

1. Non relational DB store data without structure mechanism.
2. Require low cost hardware.
3. Much faster performance (read/write) compared to relational DB.
4. Never provide table with flat fixed column record. Its means schema free.
5. Best suited for OLAP.
6. Example- Cassandra ,dynamo db

Types of NO-SQL DB

1. Columnar DB – A columnar DB is stores data in column instead of rows. In columnar DB all the column1 values are physically together, forward by all column2 values and so on.

Example- Cassandra, H-Base

1. Document DB – make it easy for developer to store and query data in DB by using the same document model format they use in their application code.

Document DB are efficient for storing catalogs.

Example- mongo db, couch db , raven db

1. Key value DB- is a simple that uses an associated array as fundamental model where each key is associated with one and only one value in a collection.Example- redis , riak , dynamo db
2. Graph DB- a graph db basically a collection of nodes and edge. Each node represent an entity and each edge represent a connection or relationship between two nodes. Example- nio4j , flock db