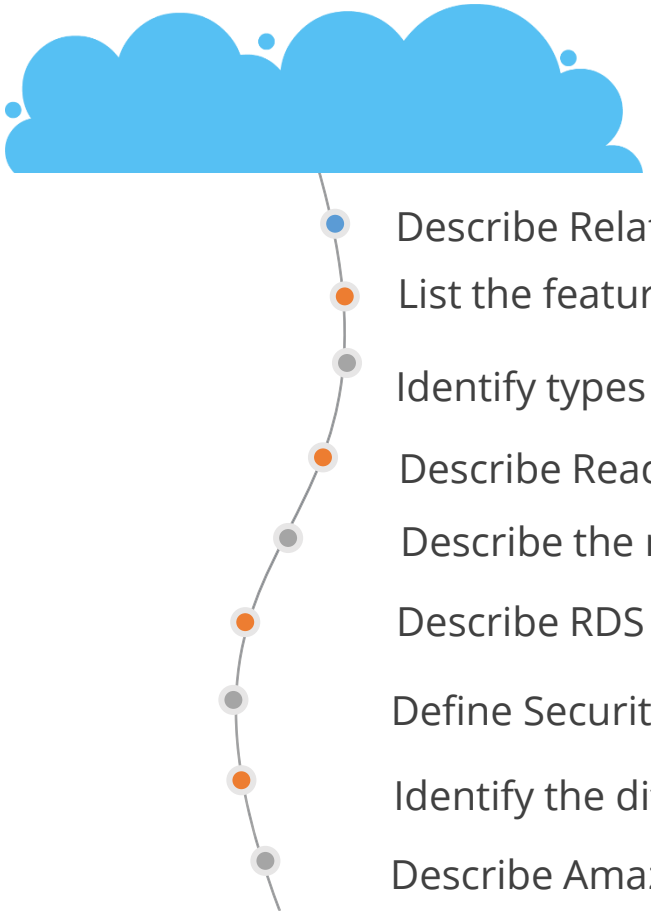
AWS Certified Developer Associate

Lesson 5: AWS DB Services

simplilearn

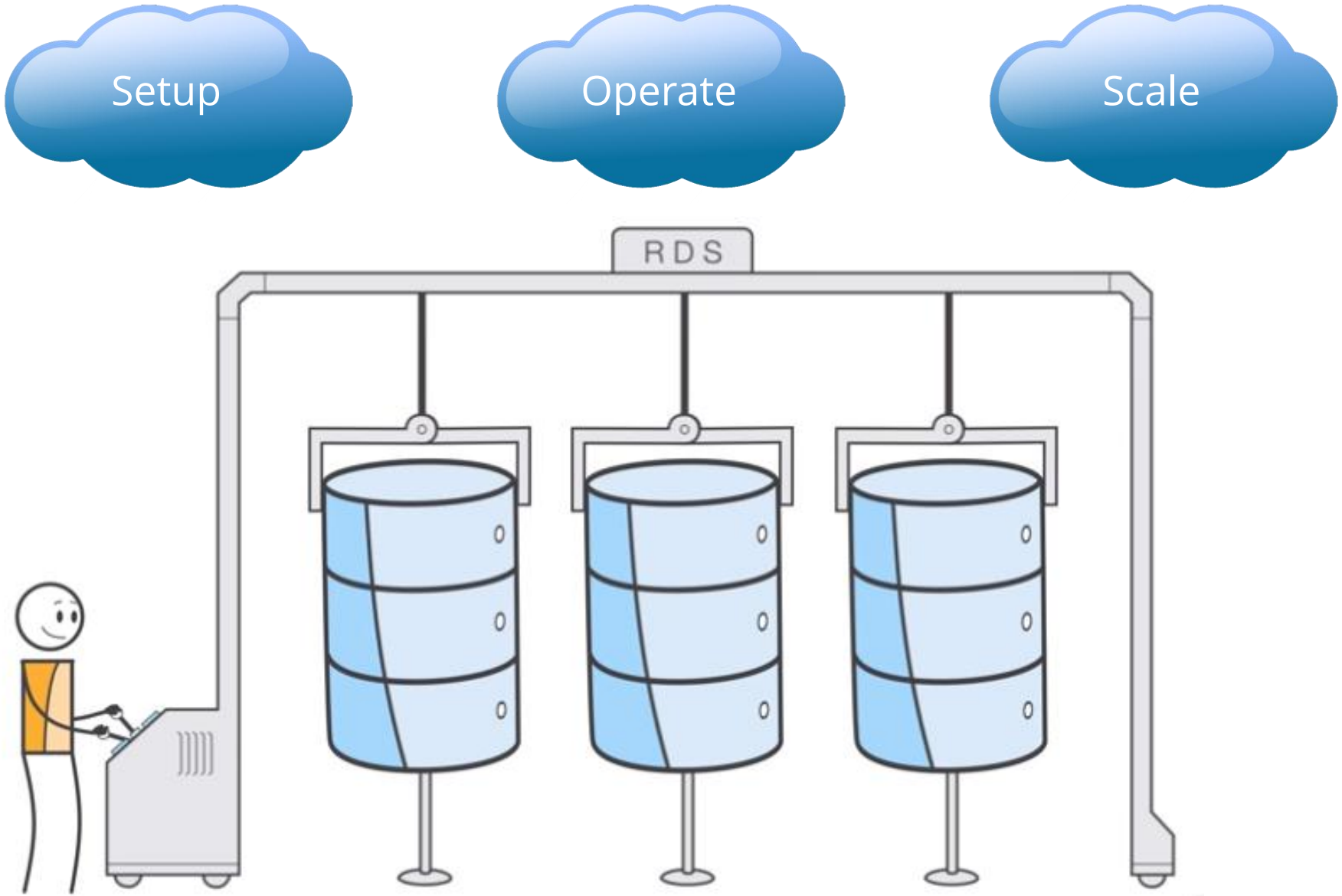
What You'll Learn



- Describe Relational Database Service
- List the features of DB instance
- Identify types of DB instance backups
- Describe Read Replicas
- Describe the management of DB instance
- Describe RDS storage and maintenance
- Define Security Groups
- Identify the differences between Aurora and other DB engines
- Describe Amazon ElastiCache and Redshift

Basic Concepts of RDS

Overview of RDS



Characteristics of RDS

- Database Engine Support
- Independent Scaling
- Automated Backups
- IAM Integration

Amazon RDS

Characteristics of RDS

Database Engine Support	• Amazon Aurora • MySQL • MariaDB • Oracle • Microsoft SQL Server • PostgreSQL
Independent Scaling	
Automated Backups	
IAM Integration	

Characteristics of RDS

Database Engine Support

Independent Scaling

Automated Backups

IAM Integration

- Scale underlying resources independently
- Allocate more CPU/Storage/IOPS without high-end server

Characteristics of RDS

Database Engine Support

Independent Scaling

Automated Backups

IAM Integration

- Supports automated backups
- Facilitates primary and secondary instances during failover

Characteristics of RDS

Database Engine Support

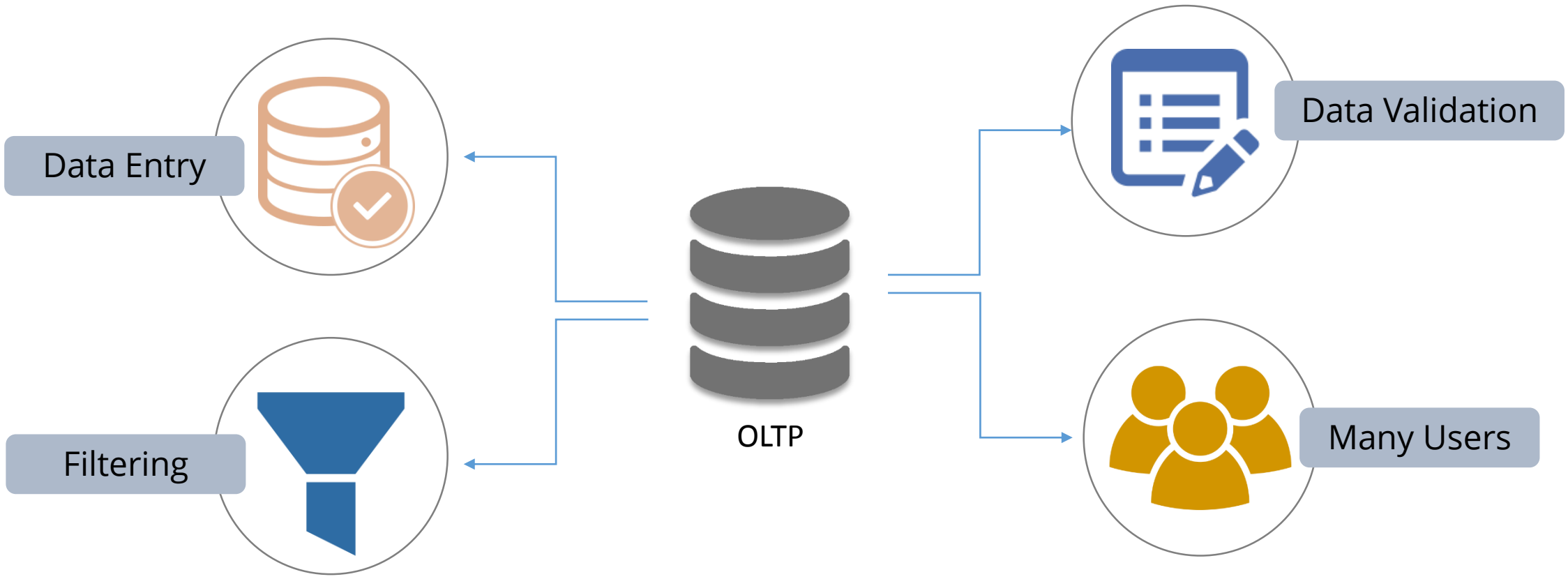
Independent Scaling

Automated Backups

IAM Integration

- Highly integrated with IAM
- Control over RDS access
- Supports security group configurations

OLTP

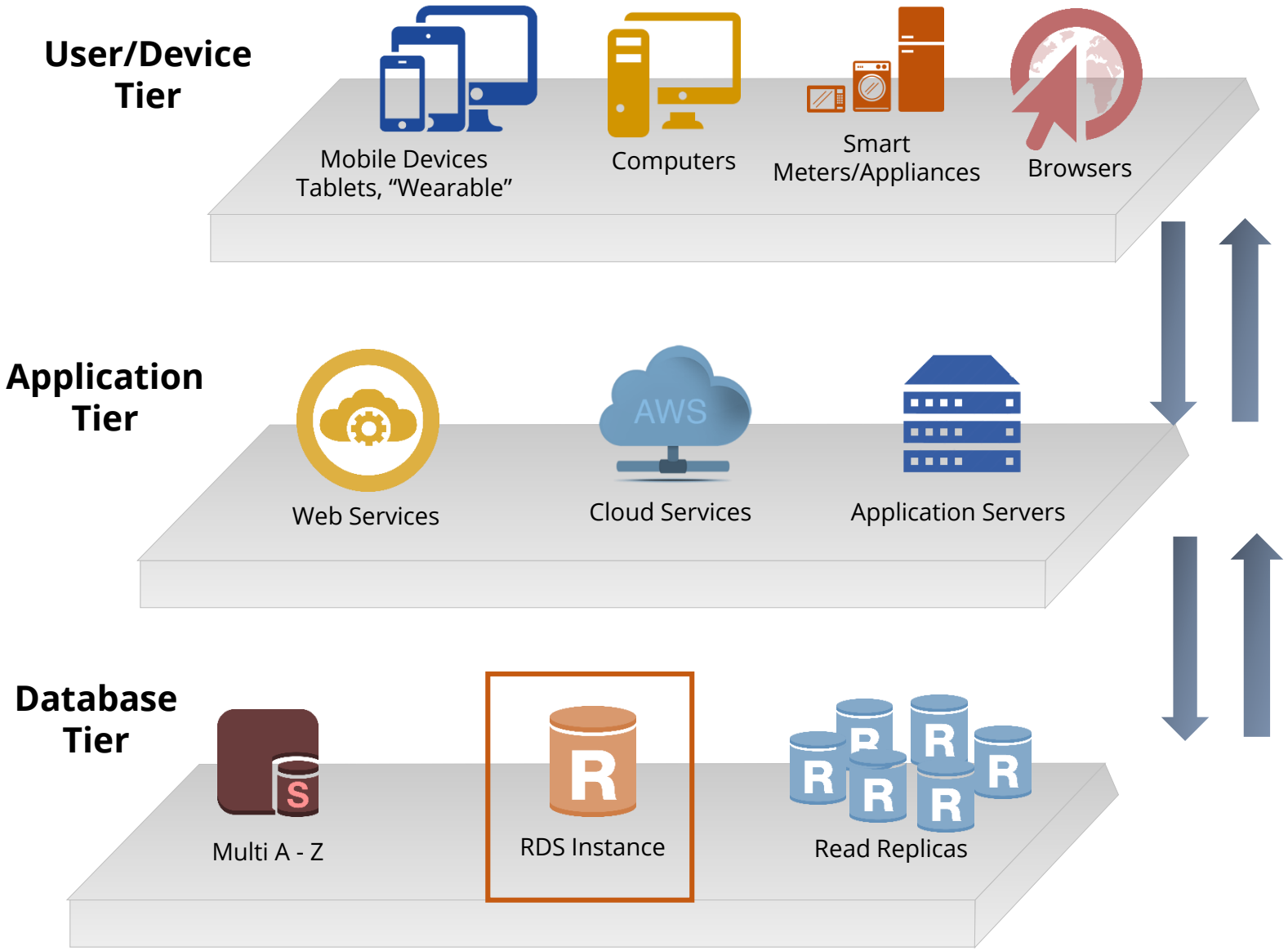


OLTP – Example

S.NO	Date	Name	Last Name	Order Number	Shipping Location	Cost
1	9/18/2016	Joy	Freeman	12091	MD	$455.00
2	9/20/2016	George	Stands	12890	NY	$78.00
3	9/30/2016	David	Biel	11899	DC	$900.00
4	10/10/2016	Lisa	Ray	23990	TX	$121.00

3	9/30/2016	David	Biel	11899	DC	$900.00

RDS DB Instance



Features of RDS DB Instance

- Performs Database Management Activities
- Supports Database Engine Features
- Divided into Classes
- Health Status Indications
- Supports Diverse Storage Capacities and Types

Features of RDS DB Instance

Performs Database Management Activities

- Performs all database management activities:
  - Create
  - Update
  - Modify
  - Query
  - Delete
- Use AWS Command Line Interface/Amazon RDS API/AWS Management Console

Features of RDS DB Instance

Supports Database Engine Features

- Supports familiar DB engines
- Each DB engine supports set of features and parameters
- Example: Data encryption in MySQL is different from Oracle

Features of RDS DB Instance

Divided into Classes

- Class indicates memory capacity and computational offerings
- Class can be changed as required
- AWS allows 40 DB instances in each region

Features of RDS DB Instance

Health Status Indications

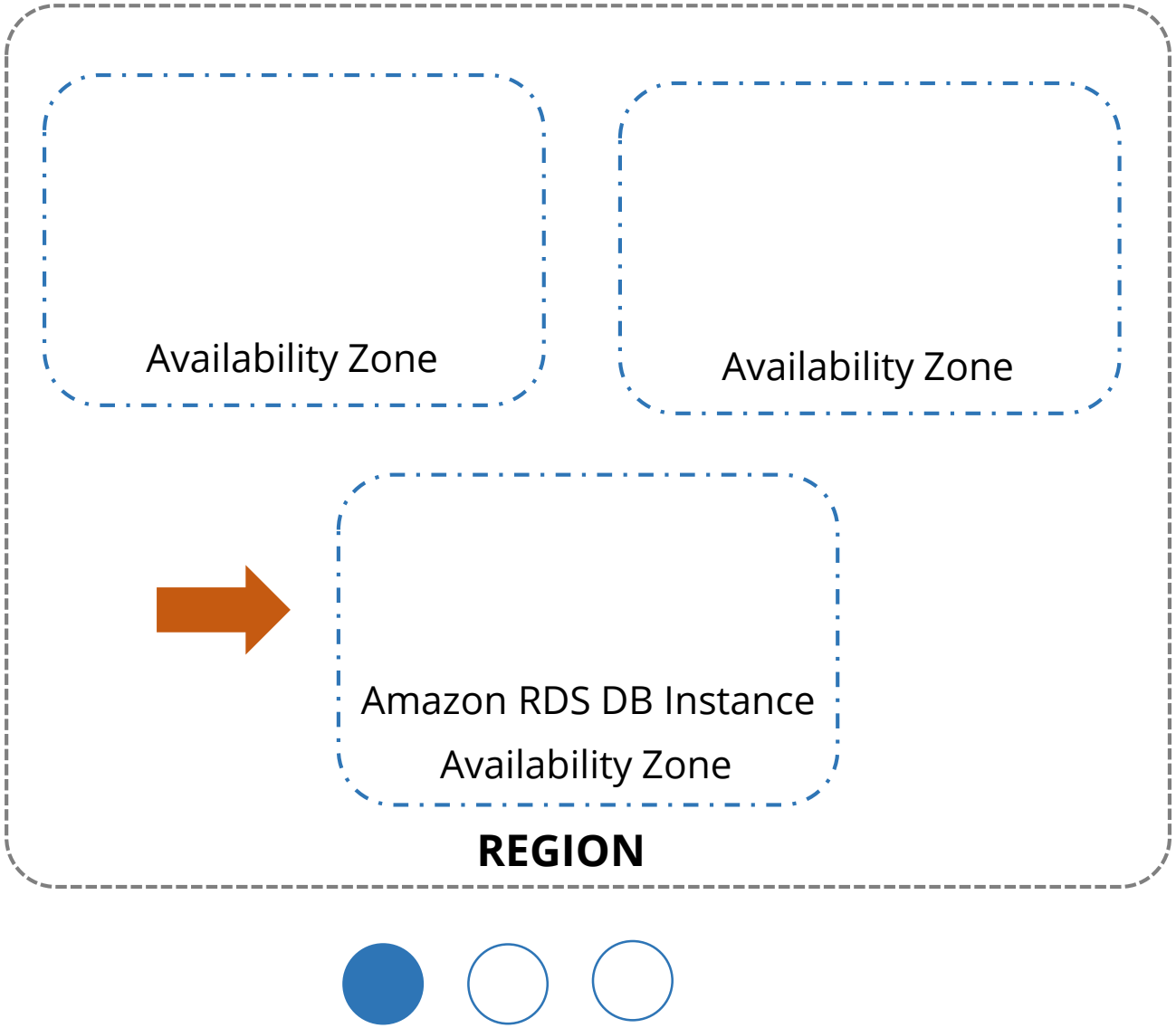
- Indicates health and activity being performed
- Status can be viewed using:
  - RDS console
  - DescibeDBInstances API call

Features of RDS DB Instance

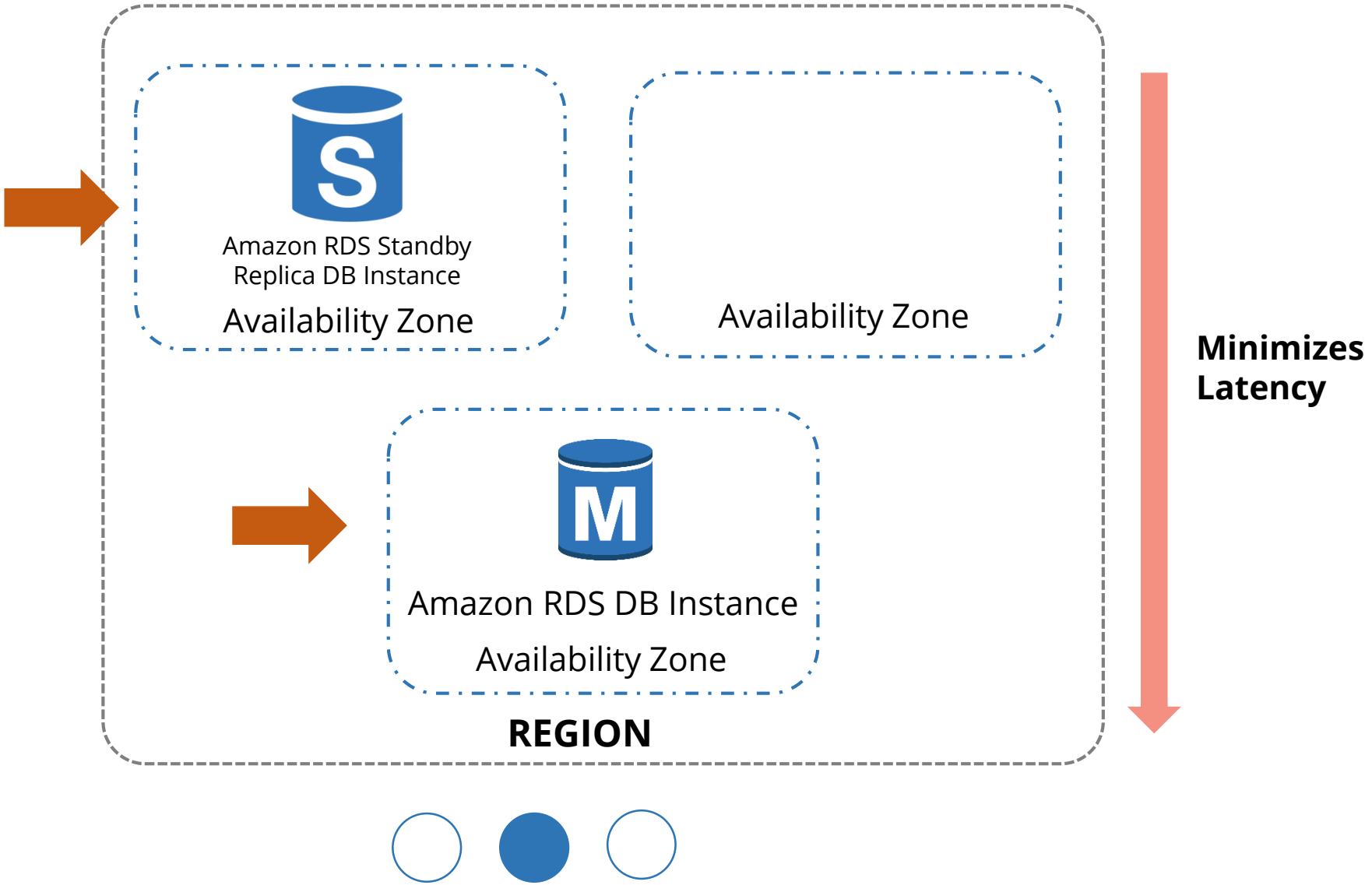
Supports Diverse Storage Capacities and Types

- Supports 5GB to 6TB data storage
- Types supported:
  - Magnetic, General Purpose SSD
  - Provisioned IOPS SSD

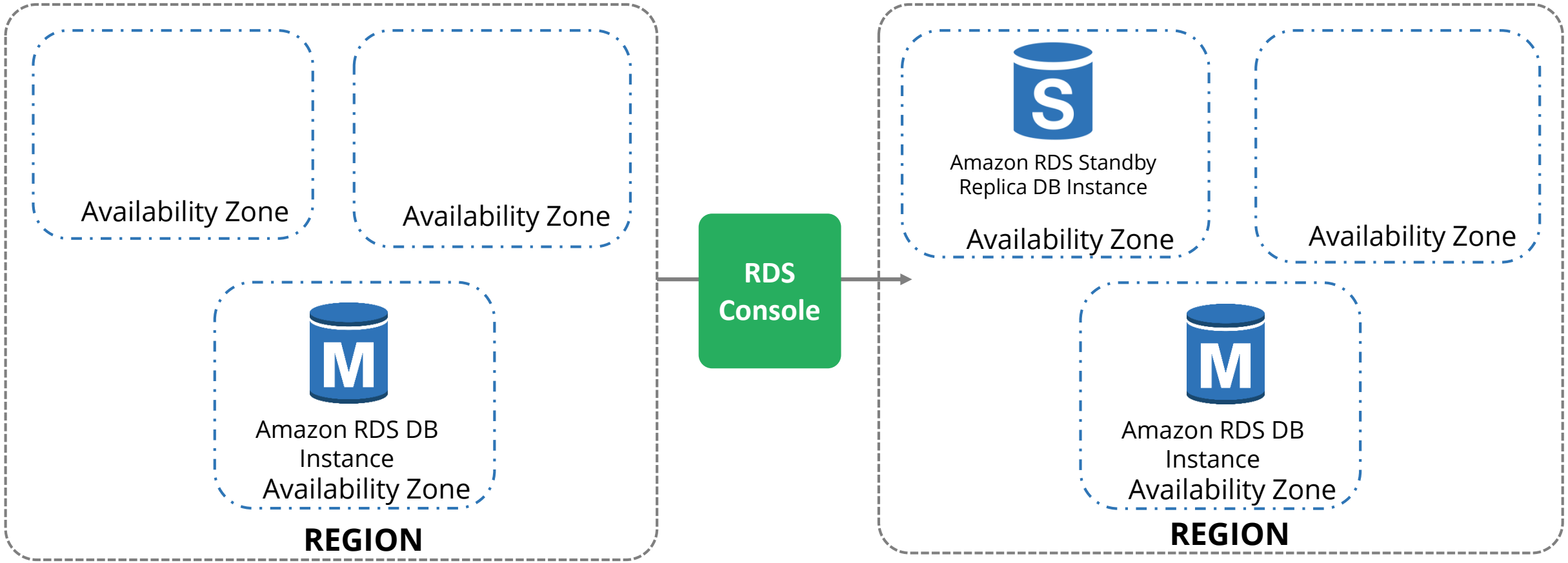
High Availability of RDS



High Availability of RDS



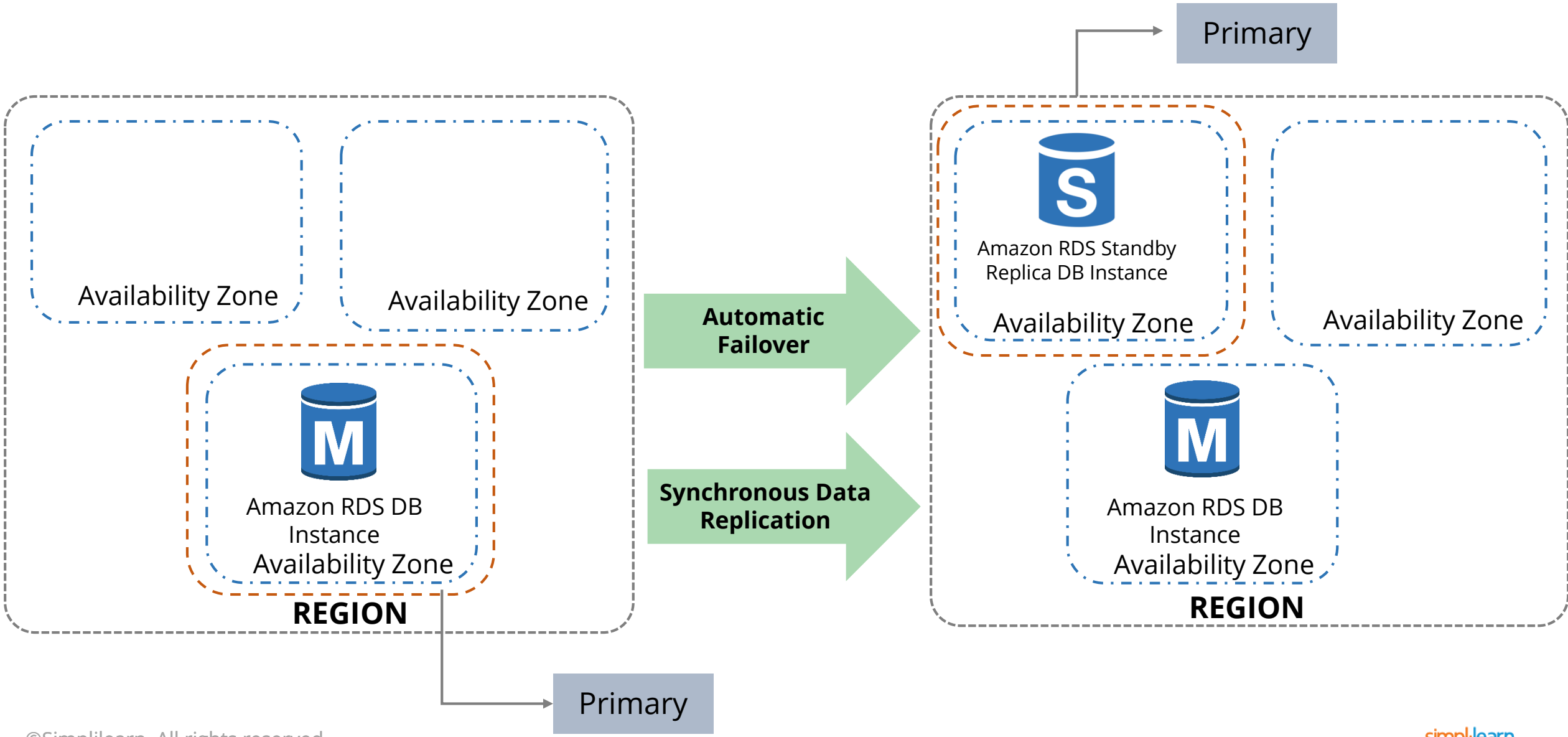
High Availability of RDS



Single AZ Database

Multiple AZ Database

Failover Process



Common Failover Scenarios

Outage of Availability Zone

Failure of Primary DB instance

Change of DB instance Type

Patching of Operating Systems

Manual Failover Using “Reboot with failover” Option

Knowledge Check

KNOWLEDGE CHECK

Which RDS DB engines are supported by AWS? (Choose 2)

a. MySQL

b. DynamoDB

c. Oracle

d. Redshift

KNOWLEDGE CHECK

Which RDS DB engines are supported by AWS? (Choose 2)

a. MySQL

b. DynamoDB

c. Oracle

d. Redshift

The correct answer is **MySQL & Oracle**

Explanation: RDS supports six familiar database engines ~~to select~~ including Amazon Aurora, MySQL, MariaDB, Oracle, Microsoft SQL Server, and PostgreSQL.

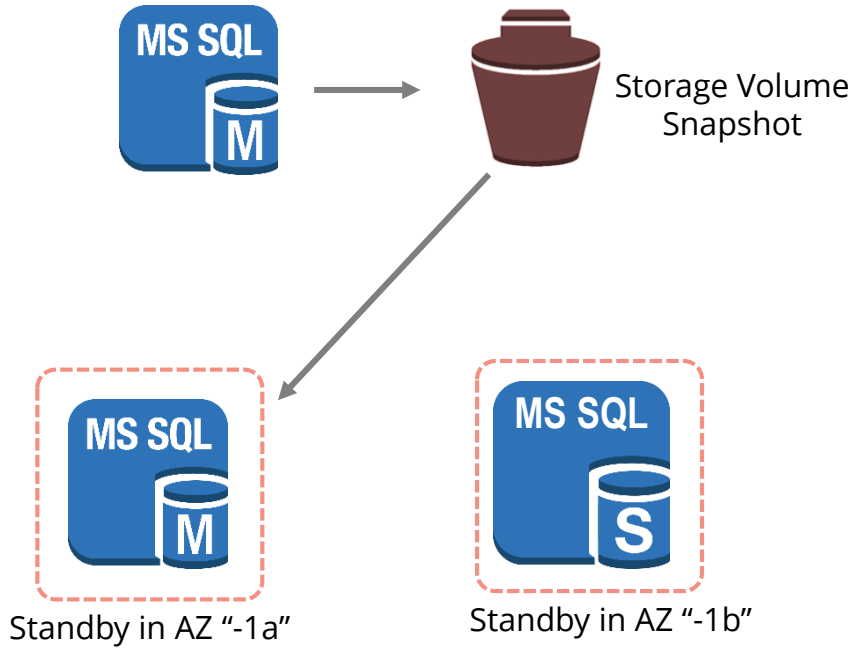
RDS Backups and Replicas

DB instance Backups

DB instance Backup

Automated Backup

Manual Backup



Automated DB instance Backups

AUTOMATED

Backups will be created during **user-configured period** or **backup window**

After retention period, backups are automatically deleted

When DB instance is deleted, backups are automatically deleted

During backup window, storage I/O operation is suspended and latency may get elevated

RDS supports Point-In-Time recovery up to last five minutes of DB usage

Manual DB instance Backups

MANUAL

Backups the **entire DB instances**

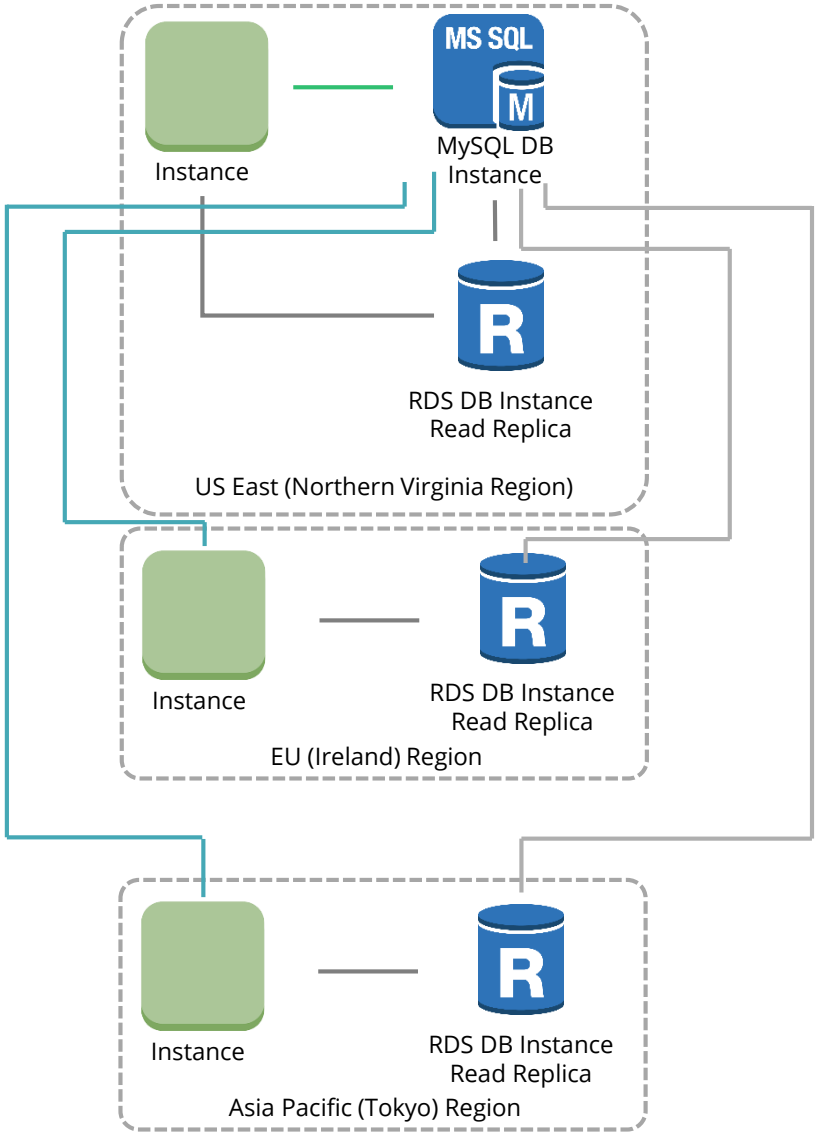
Ideal when a snapshot of DB instance in a known state is needed

Snapshots are retained even after DB instance is deleted

Can be operated using Amazon RDS Console/CreateDBSnapshot/DeleteDBSnapshot APIs

Amazon RDS allows you to make a copy of up to 5 manual/automated DB snapshots in any region

Read Replicas



Creating Read Replicas

- Mitigates data latency issues
- Stand by replica and read replica are different
- Inbuilt functionality to perform replication
- Enable automated backups to create read replica
- Do not set retention period to 0

Knowledge Check

KNOWLEDGE CHECK

Select true statements about DB Snapshot (Choose 2)

a. You can’t copy snapshots to other regions

b. Snapshots are deleted when the DB instance is deleted

c. Snapshots are retained even when the DB instance is deleted

d. You can copy snapshots to other regions

KNOWLEDGE CHECK

Select true statements about DB Snapshot (Choose 2)

a. You can't copy snapshots to other regions

b. Snapshots are deleted when the DB instance is deleted

c. Snapshots are retained even when the DB instance is deleted

d. You can copy snapshots to other regions

The correct answer is **Snapshots are retained even when the DB instance is deleted & You can copy snapshots to other regions**

Explanation: Snapshot will continue to be retained until you manually delete them. Unlike backups, the snapshots are retained even when the DB instance is deleted. You can make a copy of your manual or automated DB snapshot in the same region or a different region.

RDS Management and Maintenance

Managing DB instance

When can you apply the changes to the DB instance?

Can you rename an existing DB instance? If so, how?
What are the possible repercussions?

What happens when a DB instance is deleted?

Managing DB instance

When can you apply the changes to the DB instance?

- Based on user preferences
- Can be applied immediately/during next maintenance window
- Manually applied during reboot

Can you rename an existing DB instance? If so, how? What are the possible repercussions?

What happens when a DB instance is deleted?

Managing DB instance

When can you apply the changes to the DB instance?

Can you rename an existing DB instance? If so, how? What are the possible repercussions?

- You can rename an existing DB instance
- Use AWS Management Console/AWS CLI/Amazon RDS ModifyDBinstance API
- Renaming impacts end point and DNS name

What happens when a DB instance is deleted?

Managing DB instance

When can you apply the changes to the DB instance?

Can you rename an existing DB instance? If so, how? What are the possible repercussions?

What happens when a DB instance is deleted?

- Once deleted, content cannot be restored

RDS Maintenance

Scheduled maintenance

Less maintenance time for Multi-AZ

30 mins to apply changes

Required items are mandatory

Performance degradation during maintenance

RDS Data Storage

Data storage is added at the time of creation

Storage type can be changed for an existing DB instance
(Not applicable to SQL Server)

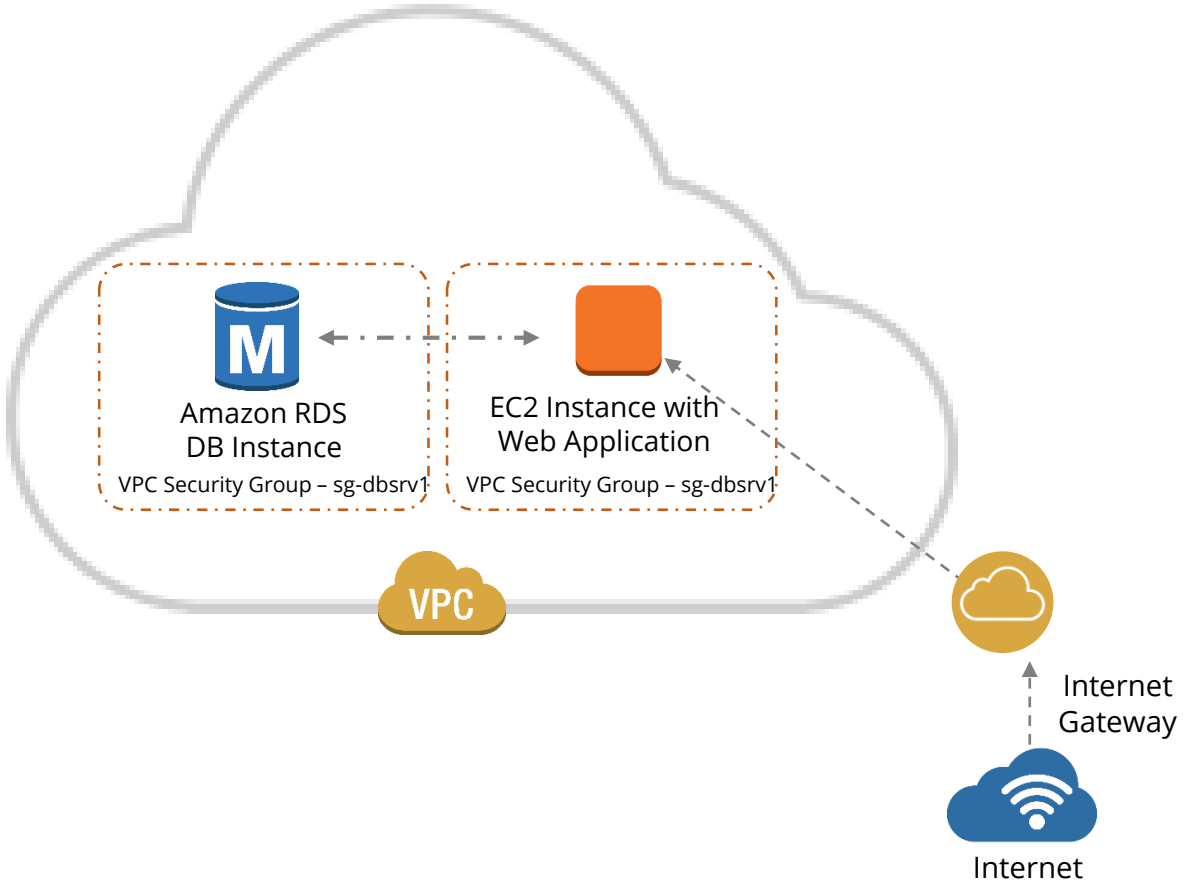
Storage size can be increased but not reduced
(Not applicable to SQL Server)

RDS allocates 3% storage space for file structures

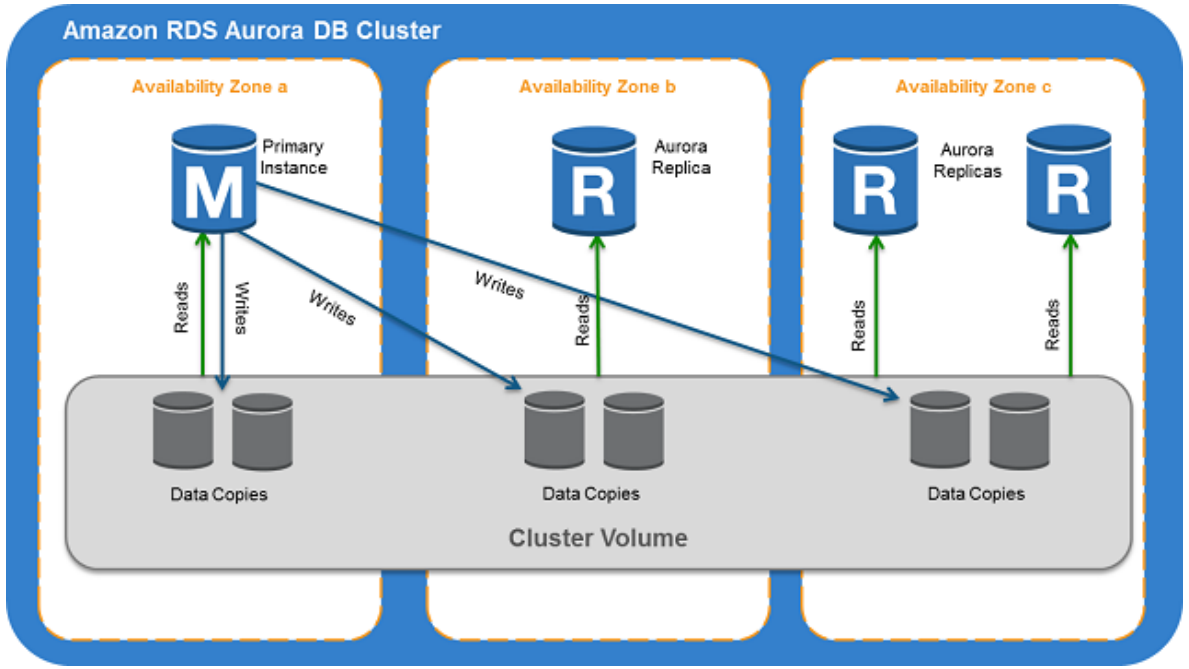
RDS can setup Cloud Watch alarms to monitor storage size

Security Groups

- DB security group controls access to your DB instance that is not inside a VPC
- Rules can be configured for incoming traffic
- Single security group can be assigned to multiple DB instances
- For DB instances that are inside a VPC, use one of the VPC security groups
- The same security group can be used in case of the same VPC



Aurora on RDS



Fives times better performance than MySQL

- Amazon owned, fully managed, MySQL-compatible, relational database
- Cluster volume manages the data and spreads across multiple availability zones
- Aurora DB cluster is the **combination of Primary and Replica instances**
- Primary instance supports read and write workloads, and handles all data modifications
- Aurora Replica supports only the read operations
- To connect Aurora, endpoint can be used

Knowledge Check

KNOWLEDGE CHECK

When do you need to reboot a DB instance? (Choose 2)

a. Parameter group associated with the instance is modified

b. Storage size is decreased

c. Static DB parameter in a parameter group is modified

d. Storage size is increased

KNOWLEDGE CHECK

When do you need to reboot a DB instance? (Choose 2)

a. Parameter group associated with the instance is modified

b. Storage size is decreased

c. Static DB parameter in a parameter group is modified

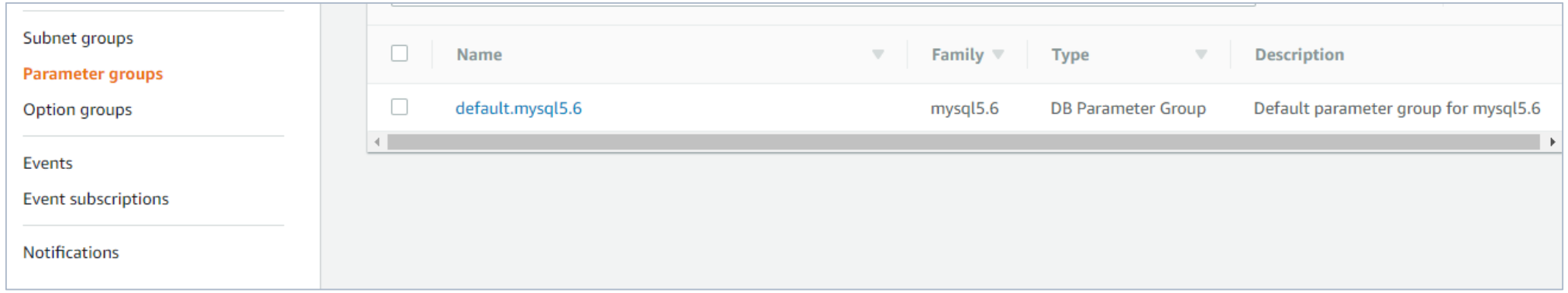
d. Storage size is increased

The correct answer is **Parameter group associated with the instance is modified & Static DB parameter in a parameter group is modified**

Explanation: DB rebooting is necessary to get the changes effective when the parameter group associated with the instance or static DB parameter in a parameter group are modified.

RDS Options

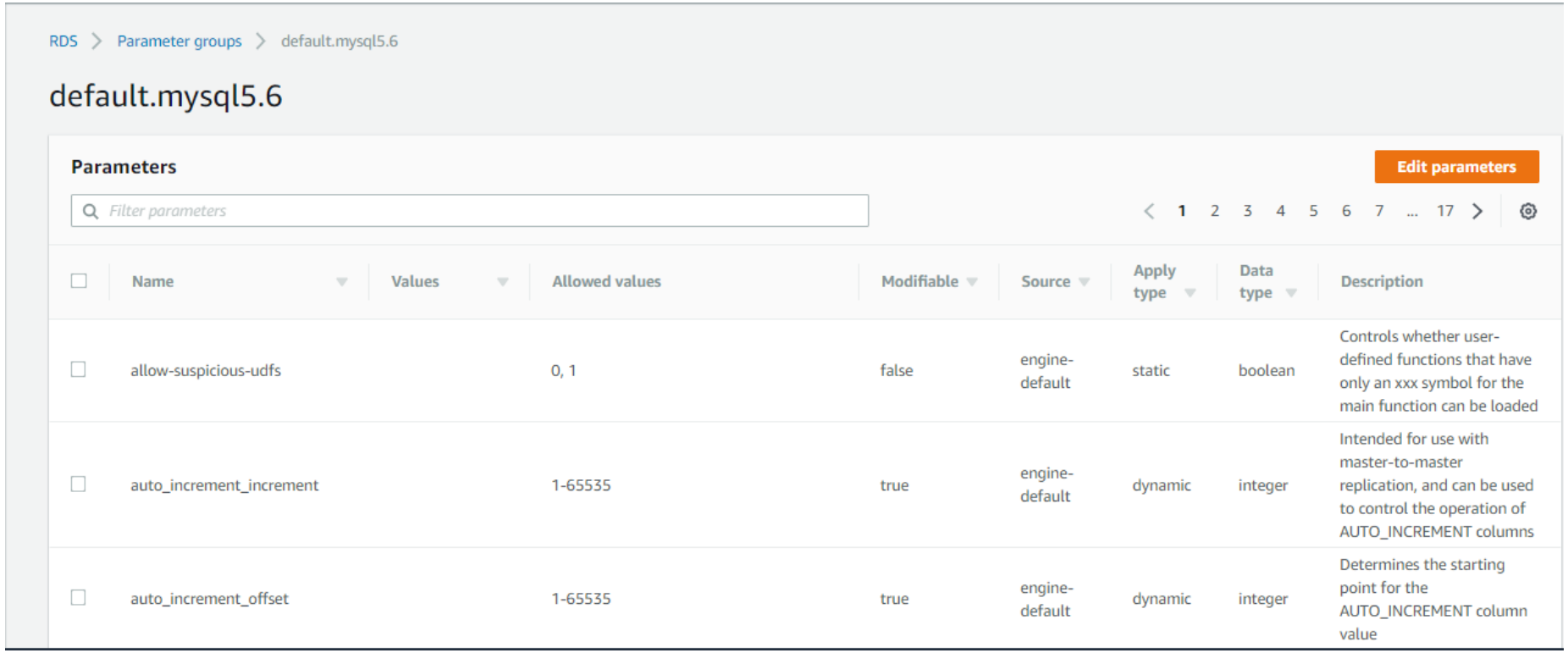
DB Parameter Group



You can configure your DB engine's parameter using a parameter group.

Parameter groups contain a set of values that can be maintained as a template and can then be applied to more than one instance.

Default Parameter Group



In case a parameter group is not chosen, a default parameter group is applied by RDS.

The default group contains defaults for the specific database engine and instance class of the DB instance.

Working with Parameters

When a dynamic parameter is changed, changes apply immediately.

In case of static parameter change, the change will take effect after you manually reboot the DB instance.

In case complete DB parameter group is changed, you must manually reboot the instance to see the change effect.

If the parameters are set with in-apt values, there may be adverse effects, including system unavailability. Be cautious while setting these values and try values for a test environment first.

Option Group

RDS offers option groups to add certain DB tools with the engine to help support and manage their DBs.

Option group provides support for extra DB-specific tools.

Example

Oracle offers Oracle enterprise Manager, Oracle Mutimedia, etc. One can add this option with Oracle DB instance and make use of both these applications.

Options With Oracle

Option	Option ID
Oracle Application Express	APEX
	APEX-DEV
Oracle Enterprise Manager	OEM
	OEM_AGENT
Oracle Label Security	OLS
Oracle Locator	LOCATOR
Oracle Multimedia	MULTIMEDIA
Oracle Native Network Encryption	NATIVE_NETWORK_ENCRYPTION
Oracle SQLT	SQLT
Oracle SSL	SSL
Oracle Spatial	SPATIAL
Oracle Statspack	STATSPACK
Oracle Time Zone	Timezone

Knowledge Check

KNOWLEDGE CHECK

Choose the correct statement(s).

a. An instance cannot be created without choosing an apt DB Parameter group

b. DB Parameter groups can't be modified as they are defined by the system, which contains engine defaults and Amazon RDS system defaults optimized for the DB Instance you are running.

c. Custom DB Parameter group can be created. In case no such group is selected, default is applied.

d. DB Parameter group is a DBA activity that is completely taken care of by RDS.

KNOWLEDGE CHECK

Choose the correct statement(s).

a. An instance cannot be created without choosing an apt DB Parameter group

b. DB Parameter groups can't be modified as they are defined by the system, which contains engine defaults and Amazon RDS system defaults optimized for the DB Instance you are running.

c. Custom DB Parameter group can be created. In case no such group is selected, default is applied.

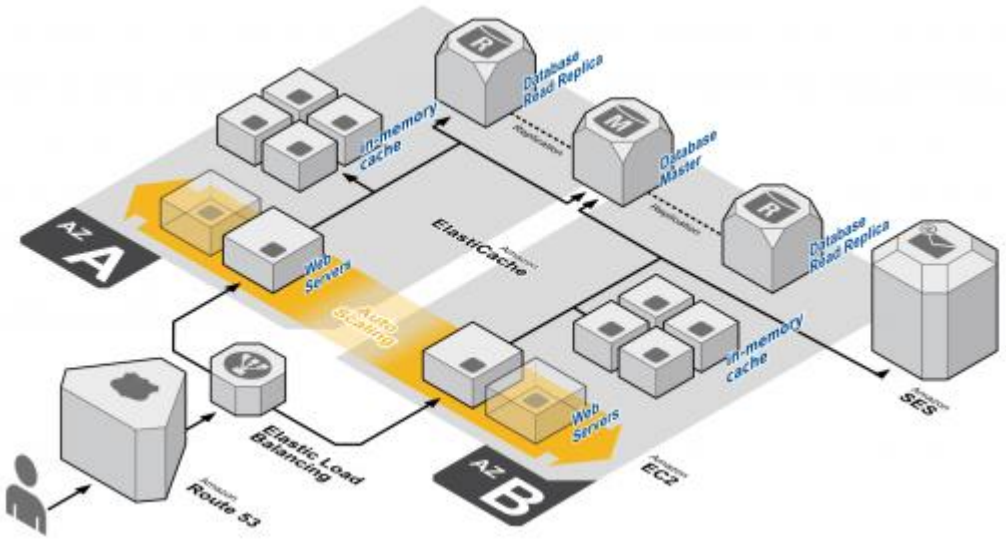
d. DB Parameter group is a DBA activity that is completely taken care of by RDS.

The correct answer is **c**

If you create a DB Instance without specifying a DB Parameter Group, a default DB Parameter Group is used. This default group contains engine defaults and Amazon RDS system defaults optimized for the DB Instance you are running. However, if you want your DB Instance to run with your custom-specified engine configuration values, you can simply create a new DB Parameter Group, modify the desired parameters, and modify the DB Instance to use the new DB Parameter Group.

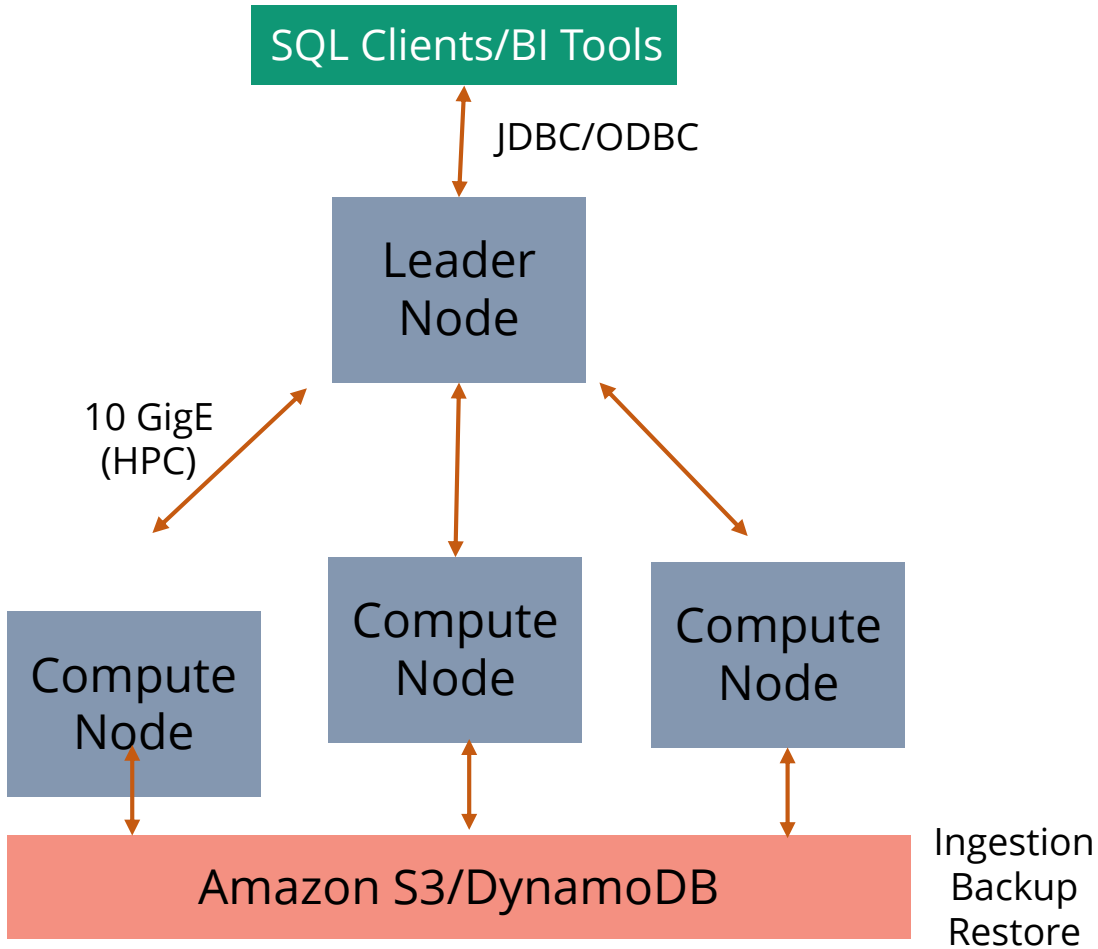
Other Database Services

Amazon ElastiCache



- In-memory cache or data store in cloud
- Reads frequently accessed data from in-memory data store
- Supports two engines: Redis and Memcached
- Memcached cluster may have multiple nodes, but Redis uses a single node
- Provides end points for applications to connect to its cluster or node

Amazon Redshift



Fully managed, petabyte-scale data warehouse solution

- Cluster is composed of one or more compute nodes
- Additional leader node manages multiple compute nodes
- Leader node interacts with client applications
- Dedicated CPU, memory, and disk storage for each node
- Uses data compression and query optimization

Knowledge Check

KNOWLEDGE CHECK

What are the different nodes used by Redshift? (Choose 2)

a. Master Node

b. Leader Node

c. Compute Note

d. Slave Node

KNOWLEDGE CHECK

What are the different nodes used by Redshift? (Choose 2)

a. Master Node

b. Leader Node

c. Compute Note

d. Slave Node

The correct answer is **Leader Node & Compute Node**

Explanation: Cluster is composed of one or more compute nodes. If a cluster has more than one compute node, it uses an additional leader node to manage the compute nodes.

Practice Assignment: AWS DB Services

To use Database snapshot for restoring data for an DB instance.

Restore Database instance

You have a new product being launched in your company next month and want to conduct an internal survey on it to understand the expectation of employees, prior to launching it publicly. So you will have an EC2 instance hosting a customer survey website in the same VPC as the one with DB instance that will retain your customer survey data. The EC2 instance will be stopped and DB instance will be deleted prior to which a final DB snapshot is created toward the end of the survey. The DB snapshot can be restored at any later point by starting the EC instance on need basis.

Prerequisites:

- Retain the DB parameter group and security group that were associated with the DB instance used to create the DB snapshot.
- Must have already created a DB snapshot of the DB instance.
- Must retain parameter group and security group associated with the DB instance which was used to create the snapshot.
- Must retain VPC used for making DB snapshot from the DB instance.
- Identify the option group needed for the restored DB instance.
- Configure EC2 instance security group to allow access from the Internet.
- Configure DB instance security group to allow access only to and from the EC2 instance.

Task:

Database snapshot to be used to restore data for DB instance at any later point as needed by starting the EC2 instance.

Quiz

QUIZ 1	What should you get with Multi AZ deployments?

a. Standby Replica

b. Read Replica

c. Snapshot

d. Worker Node

QUIZ 1	What should you get with Multi AZ deployments?

a. Standby Replica

b. Read Replica

c. Snapshot

d. Worker Node

The correct answer is **Standby Replica**

Explanation: When Multi AZ is enabled, Amazon RDS automatically provisions and maintains a synchronous standby replica in a different Availability Zone.

QUIZ 2	What is the difference between automated backups and snapshots?

a. Both are same

b. Backups are stored in EBS, Snapshots are stored in S3

c. Backups are free, Snapshots are a paid service

d. Unlike backups, Snapshots are retained even when the DB instance is deleted

QUIZ 2

What is the difference between automated backups and snapshots?

a. Both are same

b. Backups are stored in EBS, Snapshots are stored in S3

c. Backups are free, Snapshots are a paid service

d. Unlike backups, Snapshots are retained even when the DB instance is deleted

The correct answer is **Unlike backups, the snapshots are retained even when the DB instance is deleted**

Explanation: Snapshots will continue to be retained until you manually delete them. Unlike backups, Snapshots are retained even when the DB instance is deleted.

QUIZ 3	What is the default duration of a maintenance window?

a. 15 Minutes

b. 30 Minutes

c. 60 Minutes

d. 12 Hours

QUIZ

3

What is the default duration of a maintenance window?

a. 15 Minutes

b. 30 Minutes

c. 60 Minutes

d. 12 Hours

The correct answer is **30 Minutes**

Explanation: To apply the changes to your DB instance, RDS uses a 30-minute maintenance window. You can select your preferred maintenance window during the DB instance creation time.

QUIZ 4	Which is not the use of a DB Security Group?

a. Provide access to Redshift cluster

b. Provide inbound access to RDS DBs

c. Restrict access to certain IPS

d. Restrict access to selected Ports

QUIZ 4	Which is not the use of a DB Security Group?

a. Provide access to Redshift cluster

b. Provide inbound access to RDS DBs

c. Restrict access to certain IPS

d. Restrict access to selected Ports

The correct answer is **Provide access to Redshift cluster**

Explanation: Security groups are used to control access to your DB instance that is not inside a VPC. When a DB instance is not inside a VPC, then rules specified in a security group decide who can access the DB instance including IP range, port, and EC2 security group.

QUIZ 5	Select two in-memory caching engines supported by ElastiCache.

a. DynamoDB

b. Redcached

c. Redis

d. Memcached

QUIZ 5	Select two in-memory caching engines supported by ElastiCache.

a. DynamoDB

b. Redcached

c. Redis

d. Memcached

The correct answer is **Redis & Memcached**

Explanation: ElastiCache is an in-memory cache or data store in the cloud. It helps to improve the performance of web applications by reading frequently accessed data from in-memory data store instead of from a slower disk-based database. It supports two open-source in-memory engines: Redis and Memcached.

Key Takeaways

- Supports the Amazon Aurora, MySQL, MariaDB, Oracle, Microsoft SQL Server, and PostgreSQL DB engines.
- When Multi AZ enabled, the Amazon RDS automatically provisions and maintains a synchronous standby replica.
- Two types of backups: Automated backups and User initiated manual backups.
- Stand by replicas from Multi AZ deployments and read replicas are not the same.
- Aurora is an Amazon owned, fully managed, MySQL-compatible, relational database.
- ElastiCache supports two memory engines: Redis and Memcached.
- Amazon Redshift uses a cluster, composed of one or more compute nodes.

This concludes ‘AWS DB Services’

The next lesson is ‘AWS DynamoDB.’