

Module 4: AWS Databases

SQL and NoSQL Databases



	SQL	NoSQL
Data Storage	Rows and Columns	Key-Value
Schemas	Fixed	Dynamic
Querying	Using SQL	Focused on a collection of documents
Scalability	Vertical	Horizontal

SQL

ISBN	Title	Author	Format
9182932465265	Cloud Computing Concepts	Wilson, Joe	Paperback
3142536475869	The Database Guru	Gomez, Maria	Ebook

NoSQL

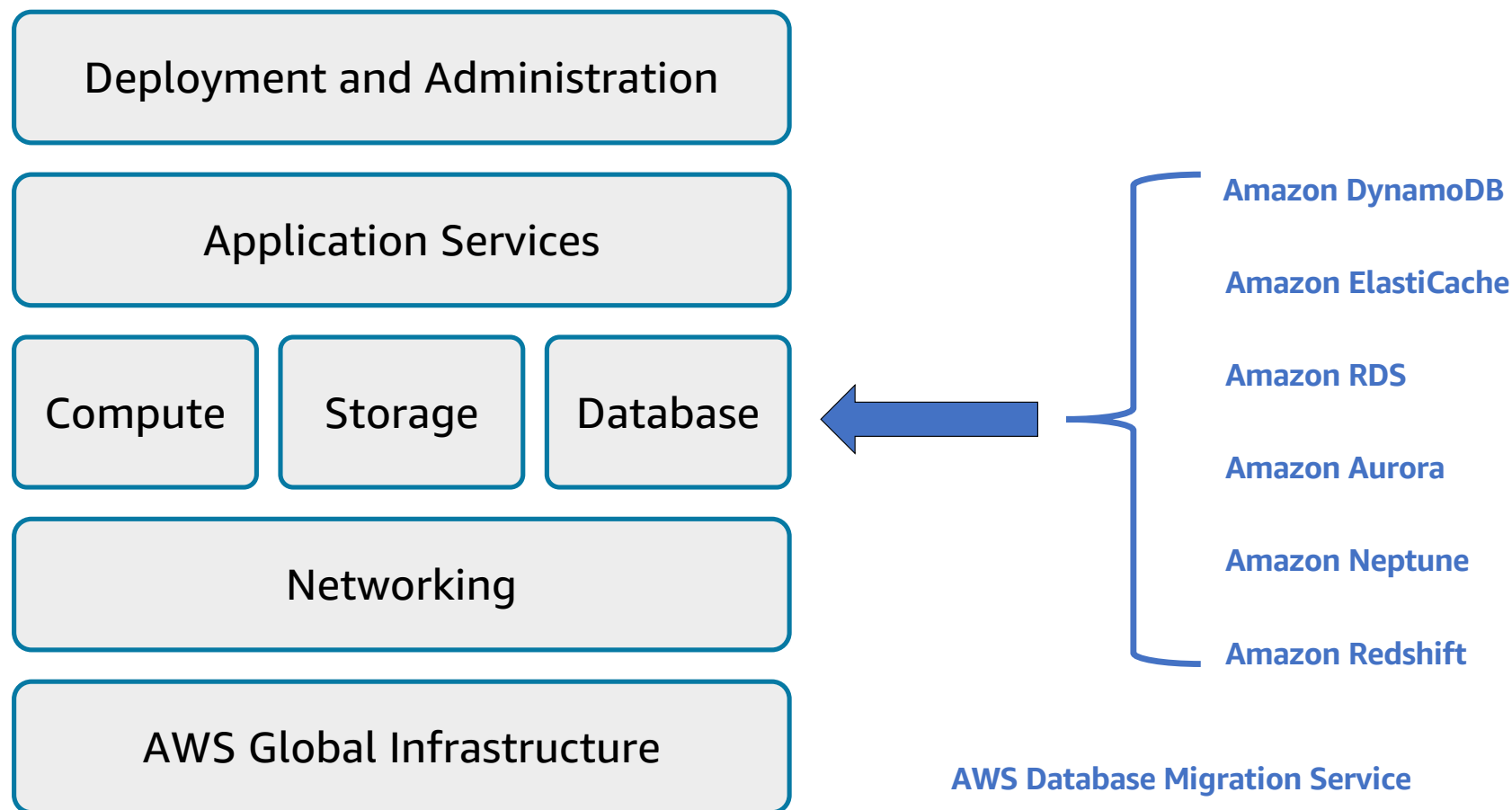
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{  
  ISBN: 9182932465265,  
  Title: "Cloud Computing Concepts",  
  Author: "Wilson, Joe",  
  Format: "Paperback"  
}
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Data Storage Considerations



- ❏ No one size fits all.
- ❏ Analyze your data requirements by considering:
 - ❏ Data formats
 - ❏ Data size
 - ❏ Query frequency
 - ❏ Data access speed
 - ❏ Data retention period

AWS Managed Database Services



Amazon Relational Database Service



Amazon
RDS

- ❏ Cost-efficient and resizable capacity
- ❏ Manages time-consuming database administration tasks
- ❏ Access to the full capabilities of Amazon Aurora, MySQL, MariaDB, Microsoft SQL Server, Oracle, and PostgreSQL databases
- ❏ Deployable on VMware

Amazon RDS



- Simple and fast to deploy
- Manages common database administrative tasks
- Compatible with your applications
- Fast, predictable performance
- Simple and fast to scale
- Secure
- Cost-effective



DB Instances



- 📦 DB instances are the basic building blocks of Amazon RDS.
- 📦 They are an isolated database environment in the cloud.
- 📦 They can contain multiple user-created databases.

How Amazon RDS Backups Work

Automatic Backups:

- ❏ Restore your database to a point in time.
- ❏ Are enabled by default.
- ❏ Let you choose a retention period up to 35 days.



Manual Snapshots:

- ❏ Let you build a new database instance from a snapshot.
- ❏ Are initiated by the user.
- ❏ Persist until the user deletes them.
- ❏ Are stored in Amazon S3.

Cross-Region Snapshots

- ❏ Are a copy of a database snapshot stored in a different AWS Region.
- ❏ Provide a backup for disaster recovery.
- ❏ Can be used as a base for migration to a different region.

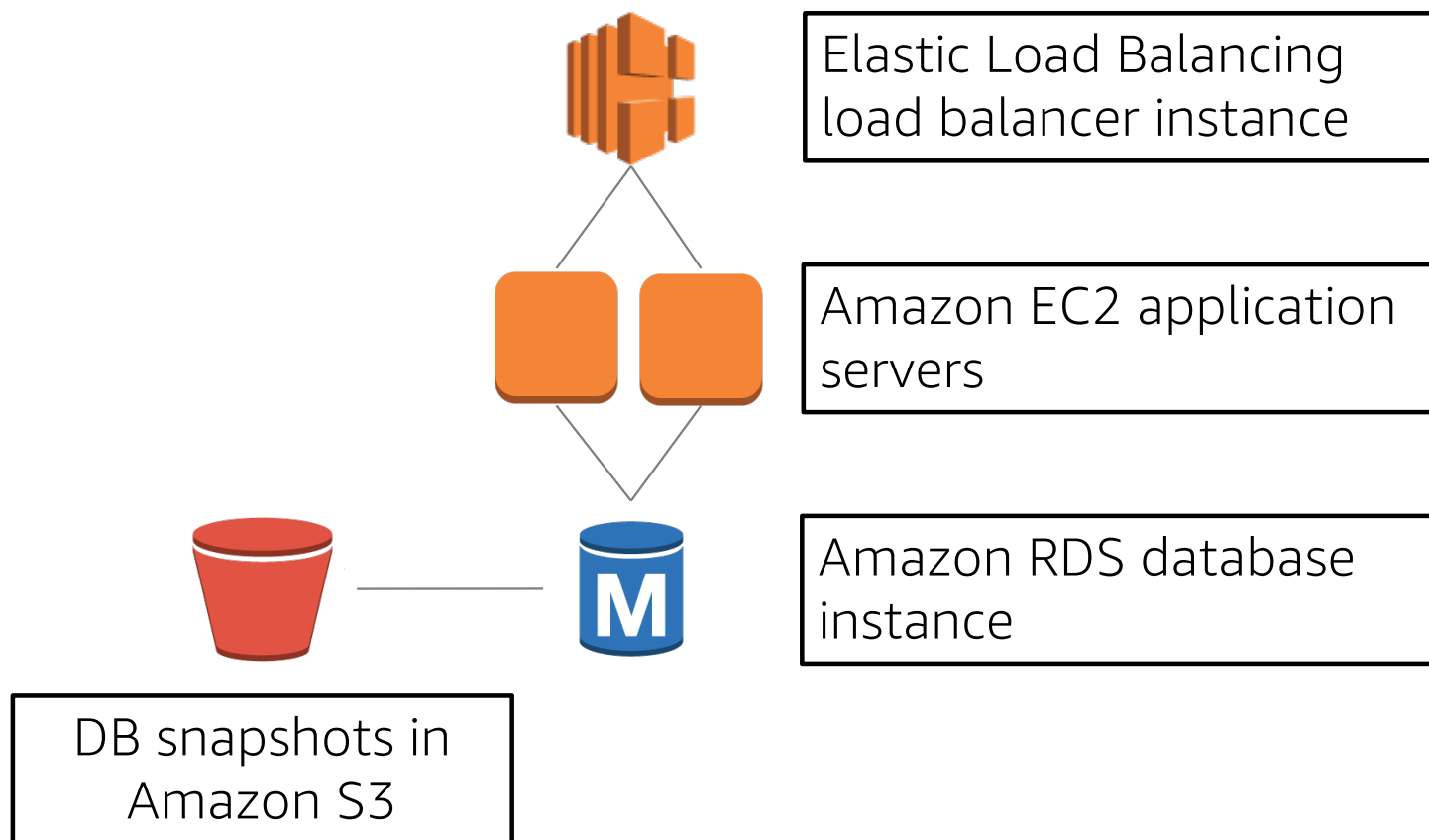


Amazon RDS Security



- ❏ Run your DB instance in an **Amazon VPC**.
- ❏ Use **IAM** policies to grant access to RDS resources.
- ❏ Use **security groups**.
- ❏ Use Secure Socket Layer (**SSL**) connections with DB instances (Amazon Aurora, Oracle, MySQL, MariaDB, PostgreSQL, Microsoft SQL Server).
- ❏ Use RDS **encryption** to secure instances and snapshots at rest.
- ❏ Use network encryption and Transparent Data Encryption (**TDE**) with Oracle DB and Microsoft SQL Server instances.
- ❏ Use security features of your DB engine to control access to DB instance.

Simple Application Architecture

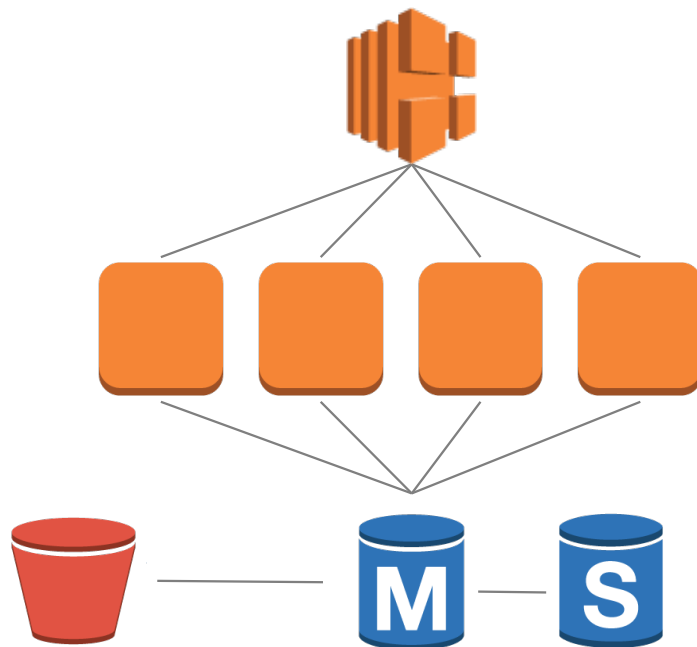


Multi-AZ RDS Deployment



- ❏ With Multi-AZ operation, your database is synchronously replicated to another Availability Zone in the same AWS Region.
- ❏ Fail over to the standby automatically occurs in case of a master database failure.
- ❏ Planned maintenance is applied first to standby databases.

Resilient, Durable Application Architecture



Elastic Load Balancing
load balancer instance

Application, in Amazon
EC2 instances

Amazon RDS database instances:
Master and Multi-AZ standby

DB snapshots in
Amazon S3

Amazon RDS Best Practices



- ❏ **Monitor** your memory, CPU, and storage usage.
- ❏ Use **Multi-AZ** deployments to automatically provision and maintain a synchronous standby in a different Availability Zone.
- ❏ Enable automatic **backups**.
- ❏ Set the backup window to occur during the daily low in Write IOPS.
- ❏ To increase the **I/O** capacity of a DB instance:
 - ❏ Migrate to a DB instance class with high I/O capacity.
 - ❏ Convert from standard storage to Provisioned IOPS storage and use a DB instance class optimized for Provisioned IOPS.
 - ❏ Provision additional throughput capacity (if using Provisioned IOPS storage).
- ❏ If your client application is caching the DNS data of your DB instances, set a TTL of less than 30 seconds.
- ❏ Test failover for your DB instance.

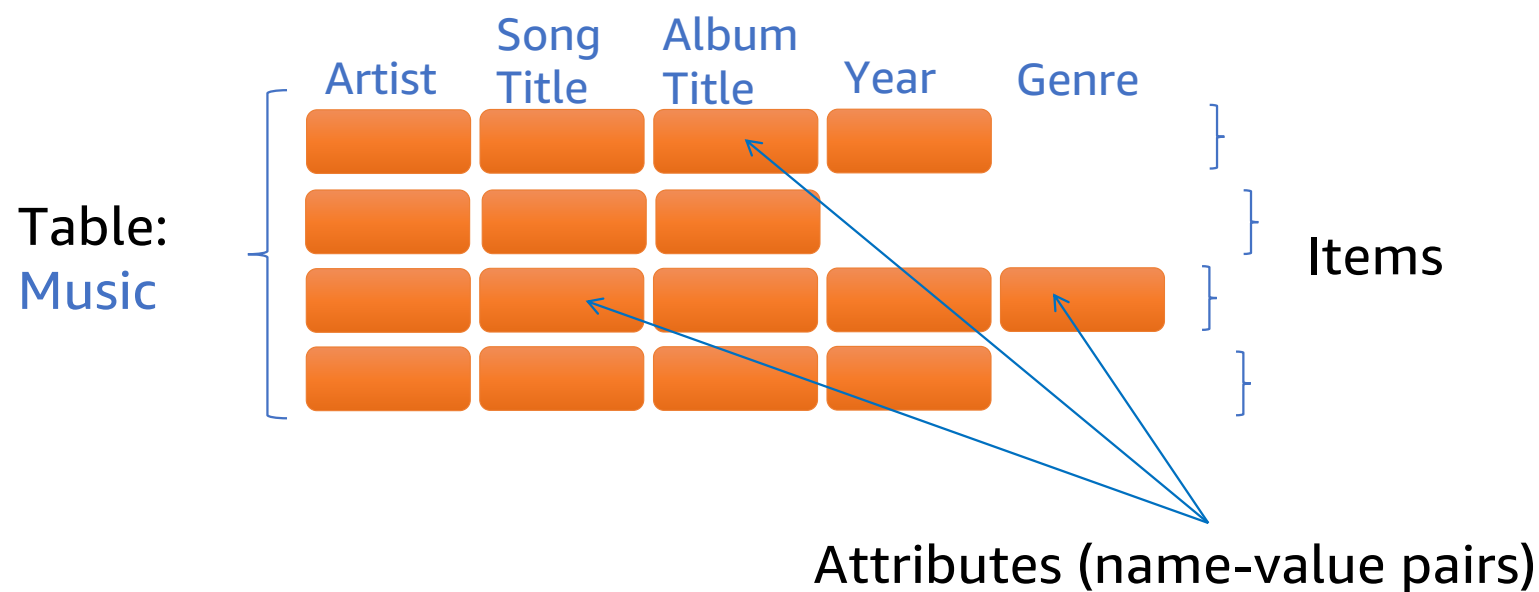
Amazon DynamoDB



**Amazon
DynamoDB**

- ❏ Allows you to store any amount of data with no limits.
- ❏ Provides fast, predictable performance using SSDs.
- ❏ Allows you to easily provision and change the request capacity needed for each table.
- ❏ Is a fully managed, NoSQL database service.
- ❏ Accommodate changing workloads with on-demand mode

DynamoDB Data Model



Primary Keys



(DynamoDB maintains a sorted index for both keys)

Provisioned Throughput



- ❏ You specify how much provisioned throughput capacity you need for reads and writes.
- ❏ Amazon DynamoDB allocates the necessary machine resources to meet your needs.

Supported Operations

Query:

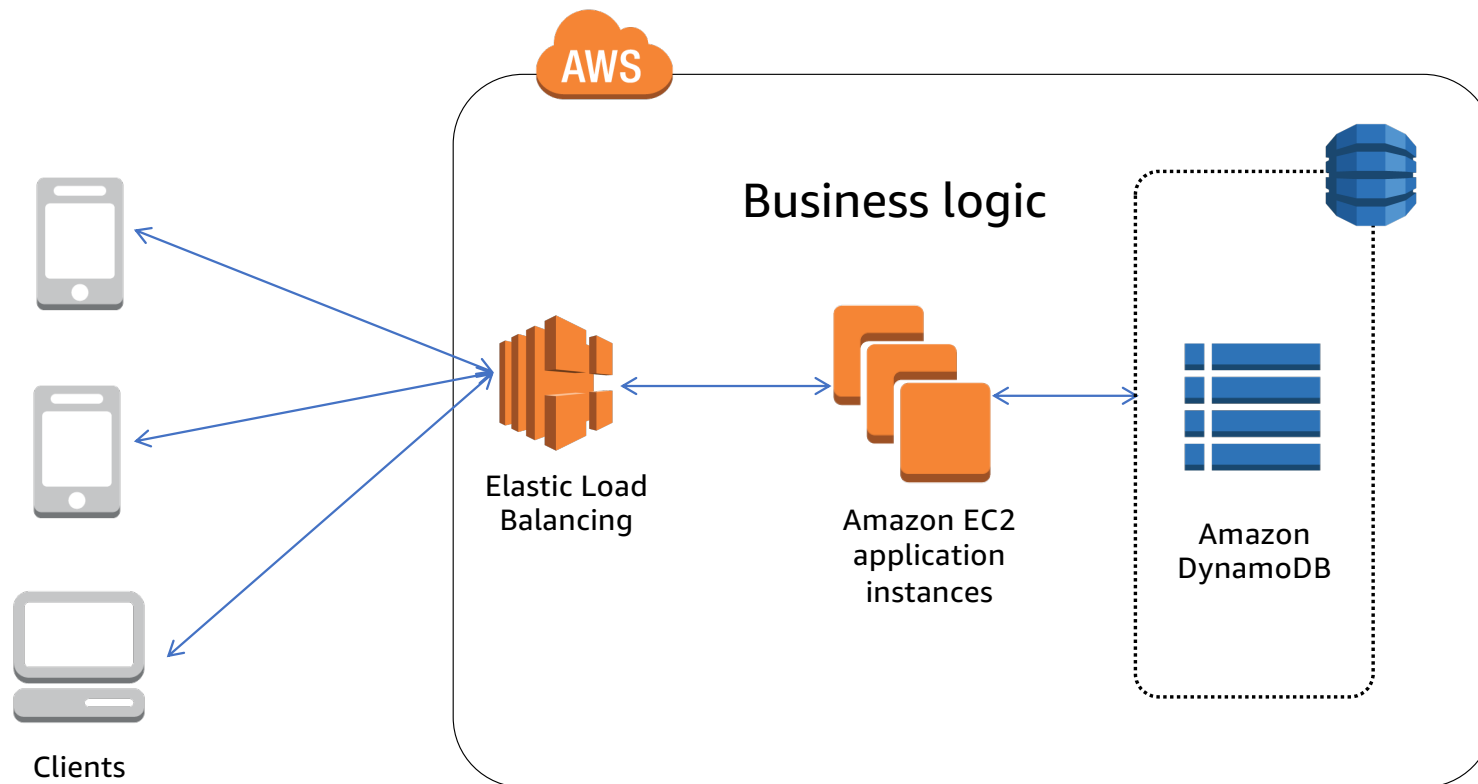
-  Query a table using the partition key and an optional sort key filter.
-  If the table has a secondary index, query using its key.
-  It is the most efficient way to retrieve items from a table or secondary index.

Scan:

-  You can scan a table or secondary index.
-  Scan reads every item – slower than querying.

 You can use conditional expressions in both Query and Scan operations.

Simple Application Architecture



Amazon RDS and Amazon DynamoDB

Factors	Relational (Amazon RDS)	NoSQL (Amazon DynamoDB)
Application Type	• Existing database apps • Business process–centric apps	• New web-scale applications • Large number of small writes and reads
Application Characteristics	• Relational data models, transactions • Complex queries, joins, and updates	• Simple data models, transactions • Range queries, simple updates
Scaling	Application or DBA–architected (clustering, partitions, sharding)	Seamless, on-demand scaling based on application requirements
QoS	• Performance—depends on data model, indexing, query, and storage optimization • Reliability and availability • Durability	• Performance—Automatically optimized by the system • Reliability and availability • Durability

Database Considerations

If You Need	Consider Using
A relational database service with minimal administration	Amazon RDS • Choice of Amazon Aurora, MySQL, MariaDB, Microsoft SQL Server, Oracle, or PostgreSQL database engines • Scale compute and storage • Multi-AZ availability 
A fast, highly scalable NoSQL database service	Amazon DynamoDB • Extremely fast performance • Seamless scalability and reliability • Low cost 
A database you can manage on your own	Your choice of AMIs on Amazon EC2 and Amazon EBS that provide scale compute and storage, complete control over instances, and more. 

Knowledge Check

❏ Q: What are the basic building blocks of Amazon Relational Database Service (Amazon RDS)?

DB instances

❏ Q: You are creating a resilient, durable application using Amazon RDS. In addition to Amazon RDS's automatic backups, what feature should you use to ensure that your backups are durable retained?

Manual snapshots

❏ True or False: Amazon DynamoDB allows you to store any amount of data with no limits.

True

❏ True or False: Scan is the most efficient way to retrieve items from a DynamoDB table.

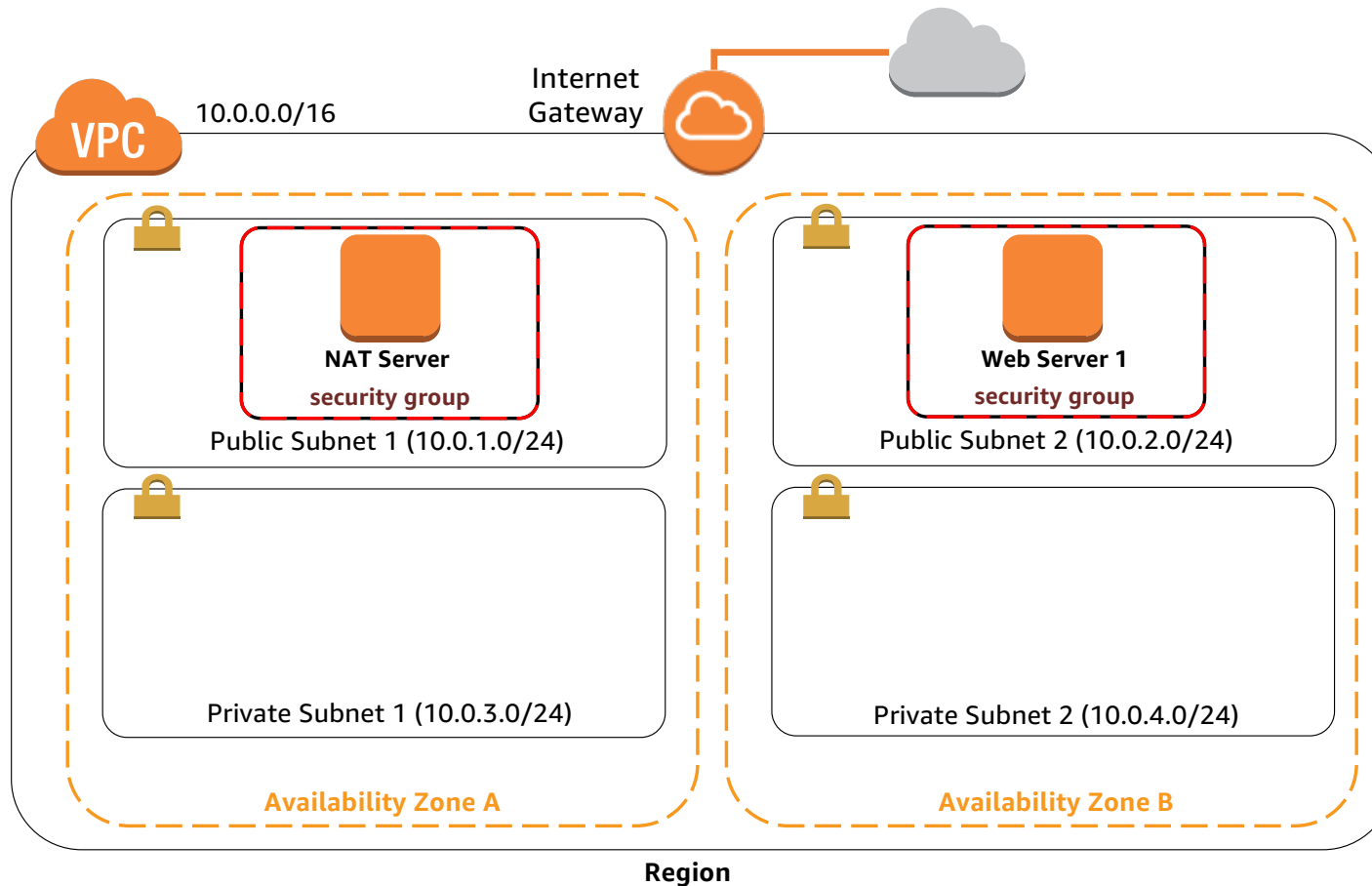
False

Lab 2: Build Your Database Server and Interact with Your Database Using an Application



~ 40 minutes

What You're Starting With – Lab 1 Review



Lab 2 Overview

1

Create a **database server**
Create a **security group**
Create a **DB subnet group**
Create an **Amazon RDS DB instance**
Get database connection string

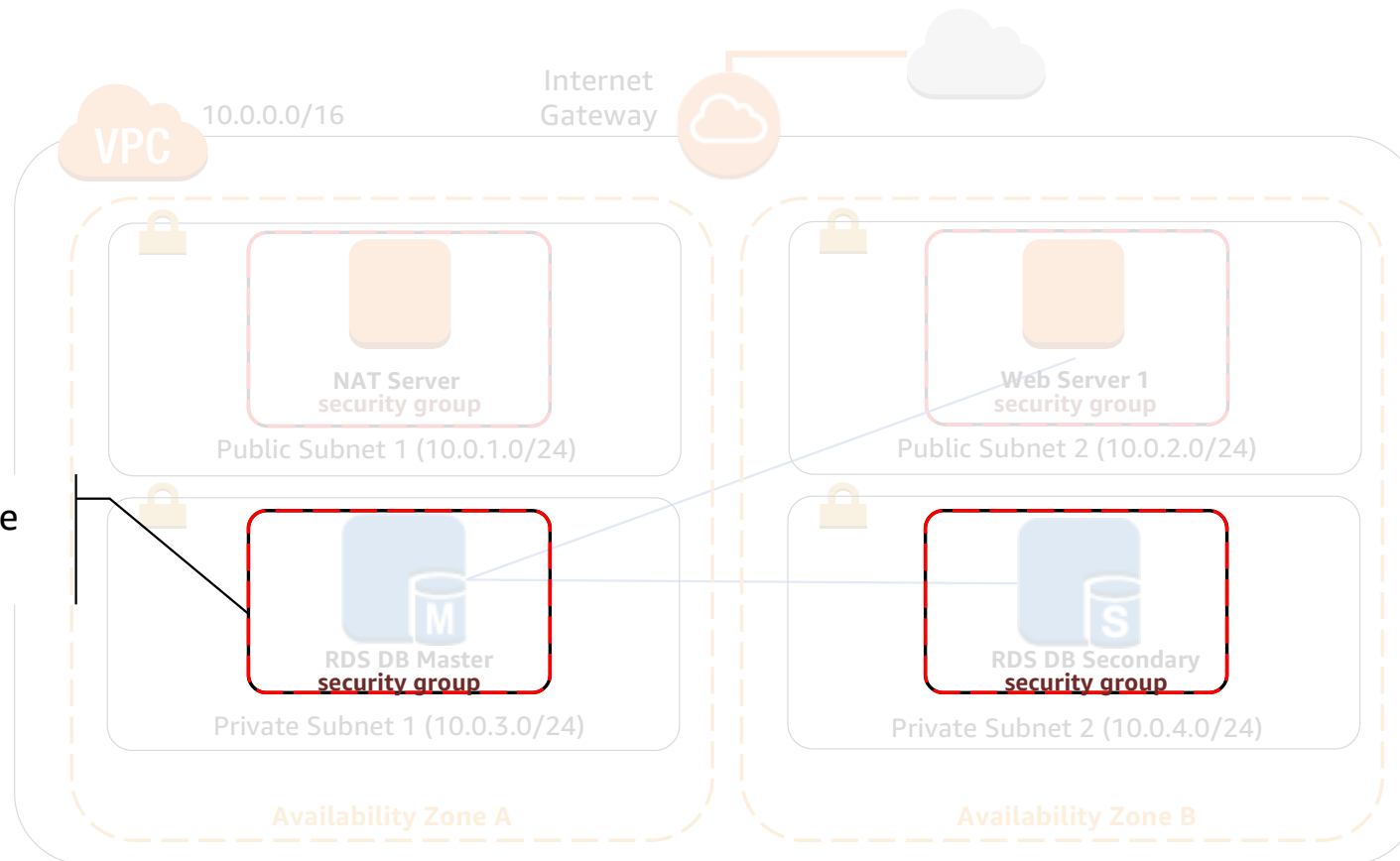
While waiting for the database to start, grab a coffee!

2

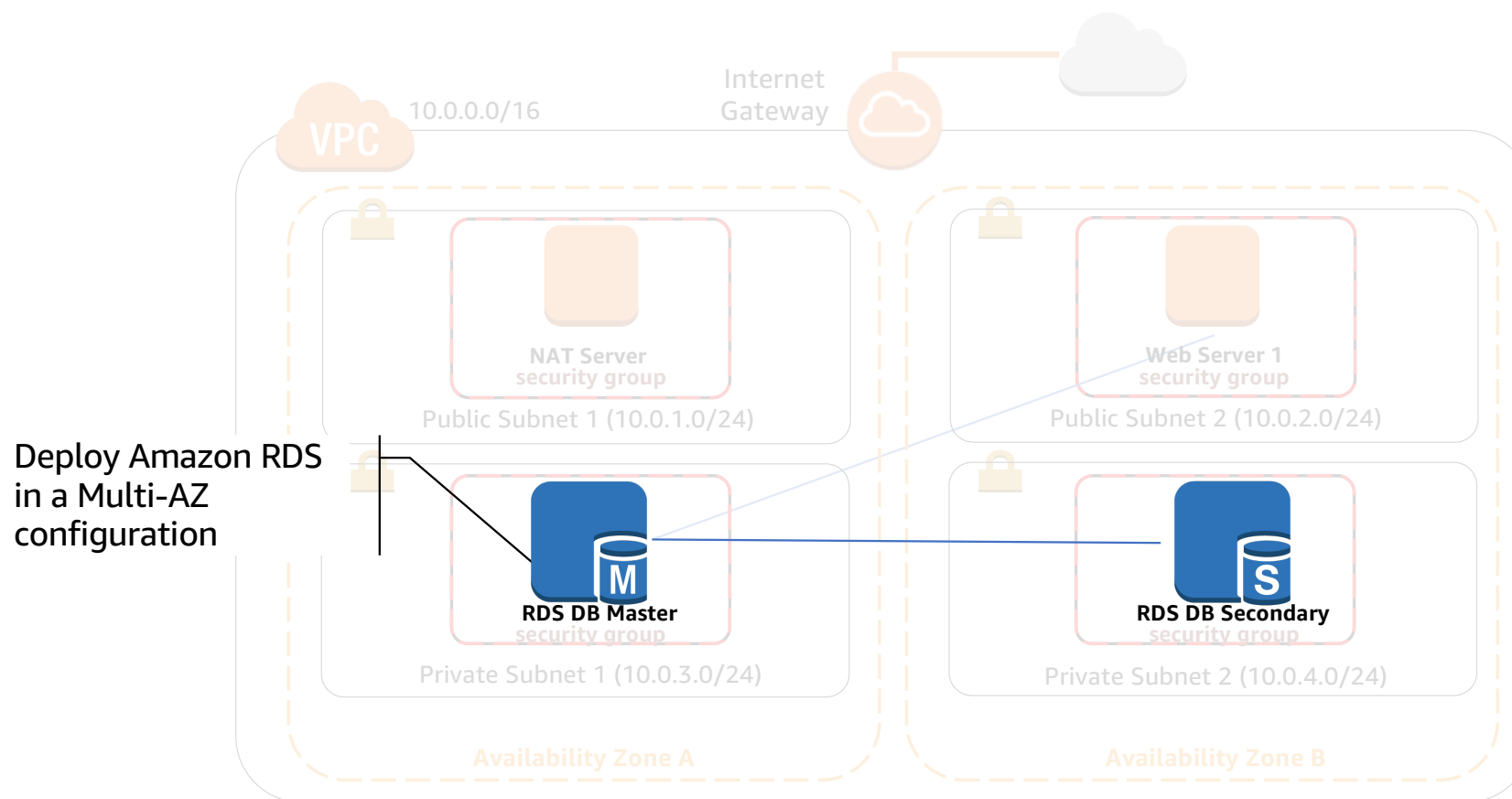
- Open a web application from a browser
- Insert DB connection string
 - App will **populate a table** with records
 - App will **display records** for a table

Lab 2 – Build Your Database Server and Connect to It (1 of 4)

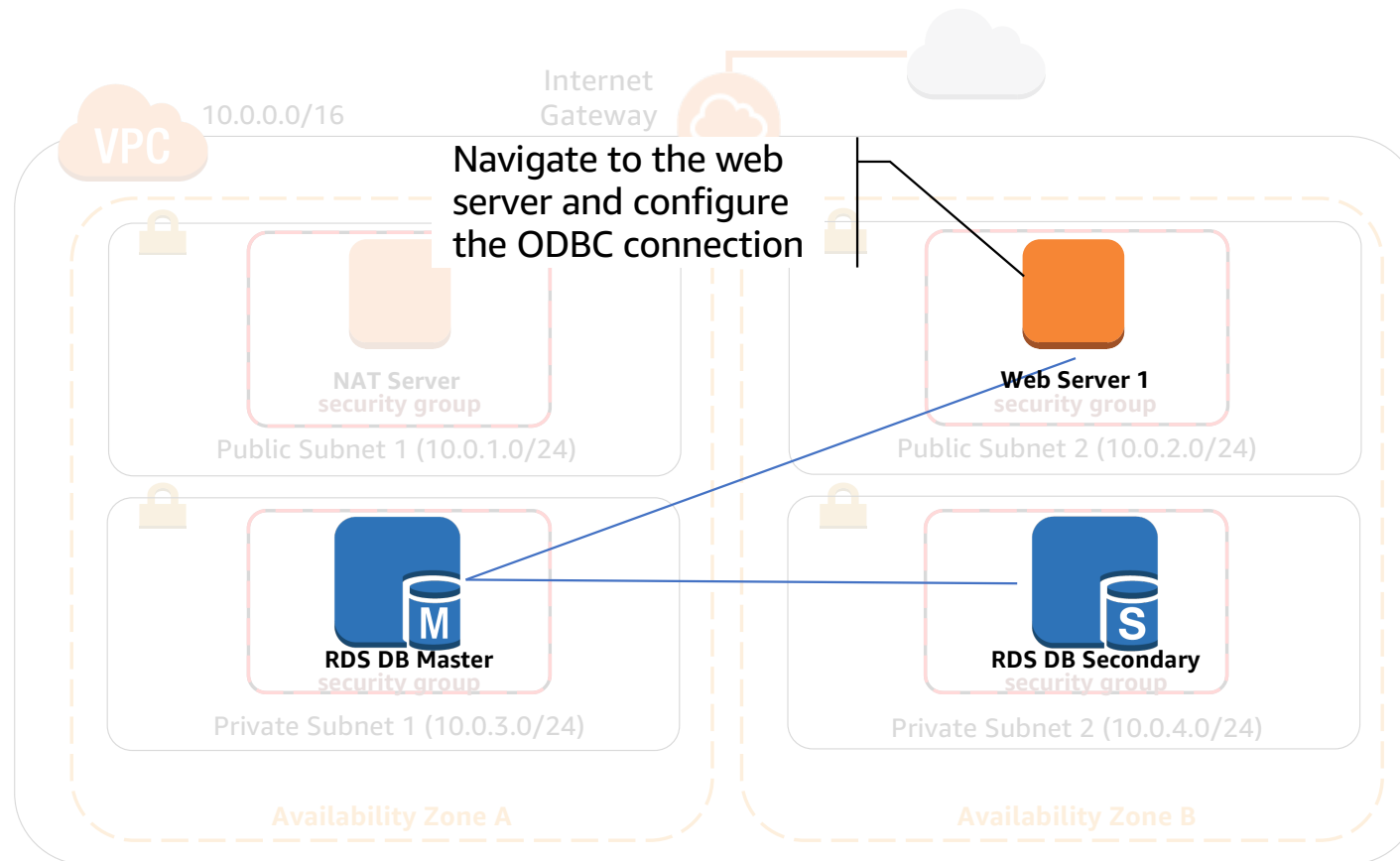
You will create a security group for the Amazon RDS instances.



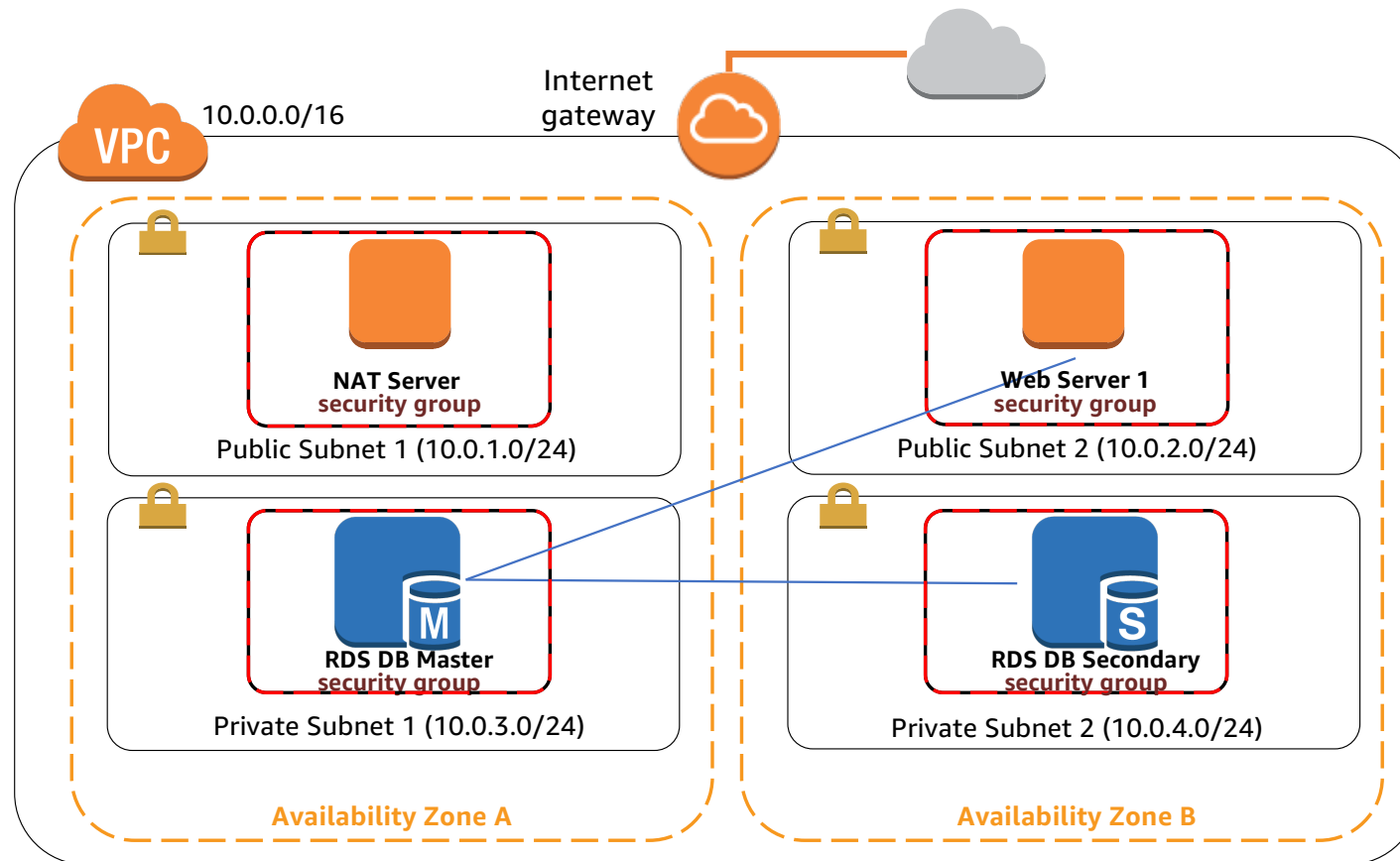
Lab 2 – Build Your Database Server and Connect to It (2 of 4)



Lab 2 – Build Your Database Server and Connect to It (3 of 4)



Lab 2 – Build Your Database Server and Connect to It (4 of 4)





Thanks for participating!

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