

ENGENHARIA DE SOFTWARE

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Module 8: Databases

SECTION 1: AMAZON RELATIONAL DATABASE SERVICE

Amazon Relational Database Service



Amazon Relational Database Service (Amazon RDS)

Unmanaged versus managed services

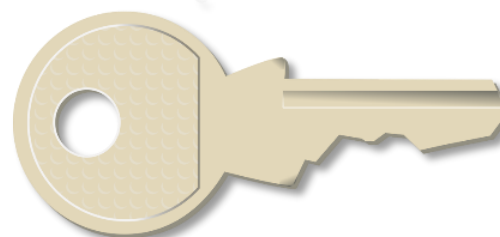
Unmanaged:

Scaling, fault tolerance, and availability are managed by you.



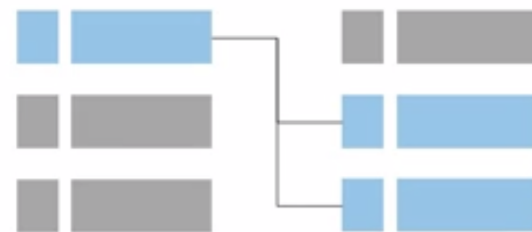
Managed:

Scaling, fault tolerance, and availability are typically built into the service.



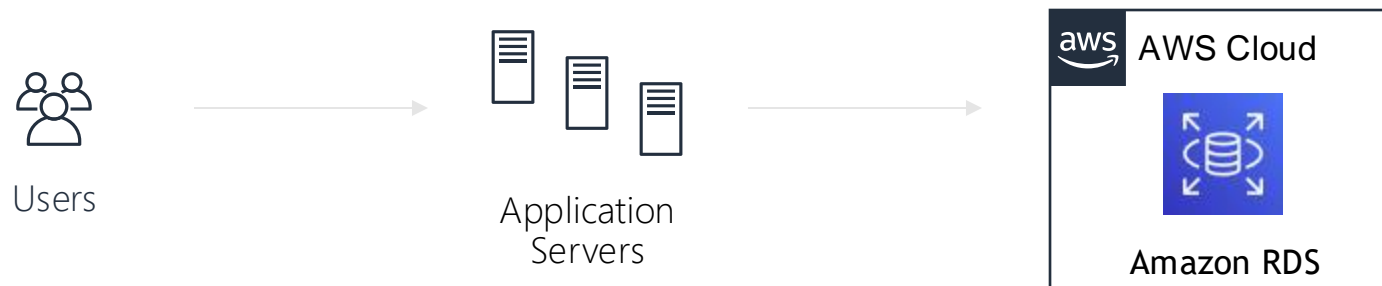
Challenges of relational databases

- Server maintenance and energy footprint
- Software installation and patches
- Database backups and high availability
- Limits on scalability
- Data security
- Operating system (OS) installation and patches

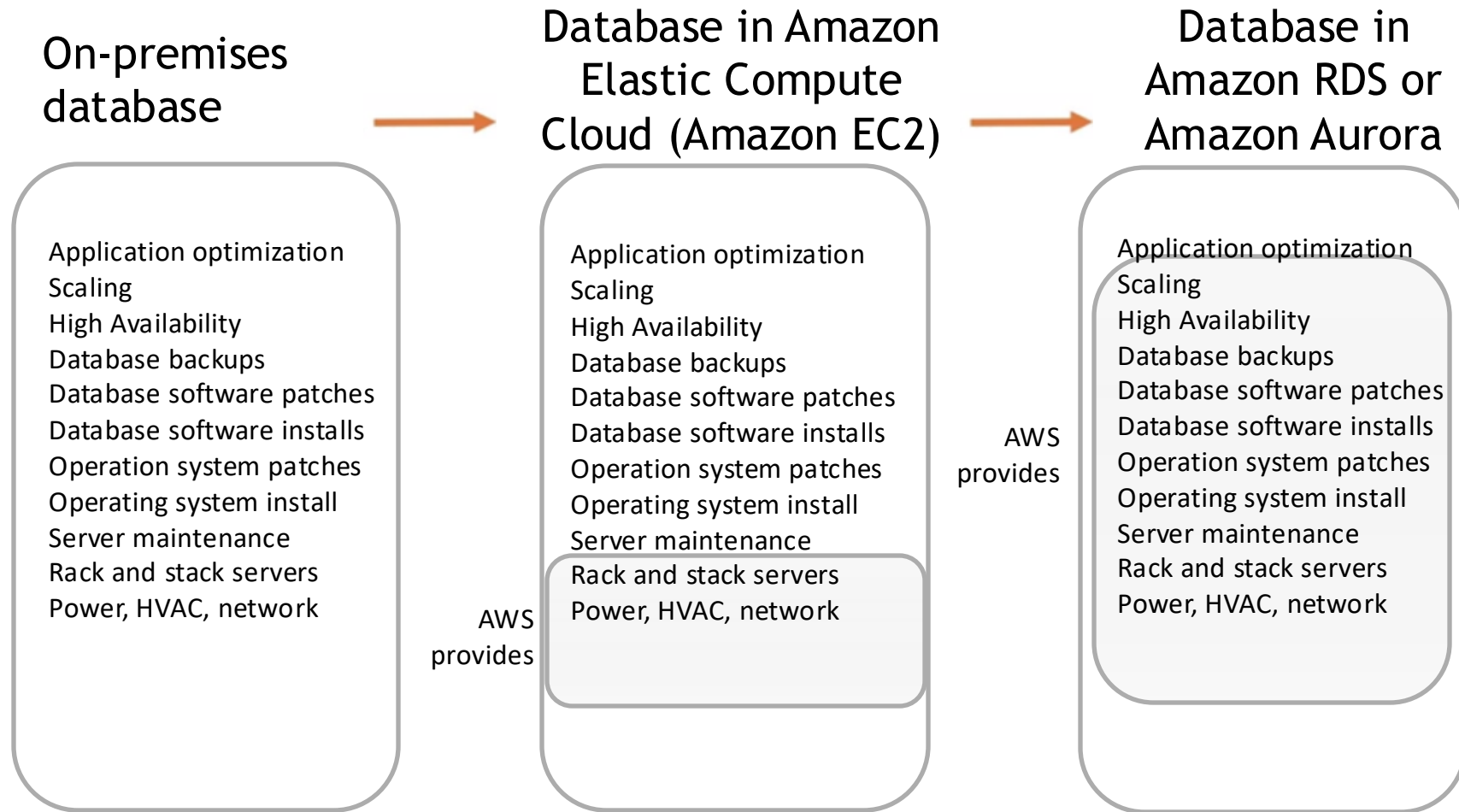


Amazon RDS

Managed service that sets up and operates a relational database in the cloud.



From on-premises databases to Amazon RDS



Managed services responsibilities

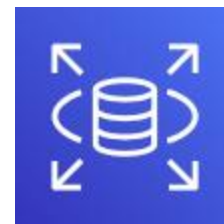
You manage:

- Application optimization



AWS manages:

- OS installation and patches
- Database software installation and patches
- Database backups
- High availability
- Scaling
- Power and racking and stacking servers
- Server maintenance



Amazon RDS

Amazon RDS DB instances

Amazon



Amazon RDS DB
main instance

DB Instance Class

- CPU
- Memory
- Network performance

DB Instance Storage

- Magnetic
- General Purpose (solid state drive, or SSD)
- Provisioned IOPS

MySQL

Amazon Aurora

Microsoft SQL Server

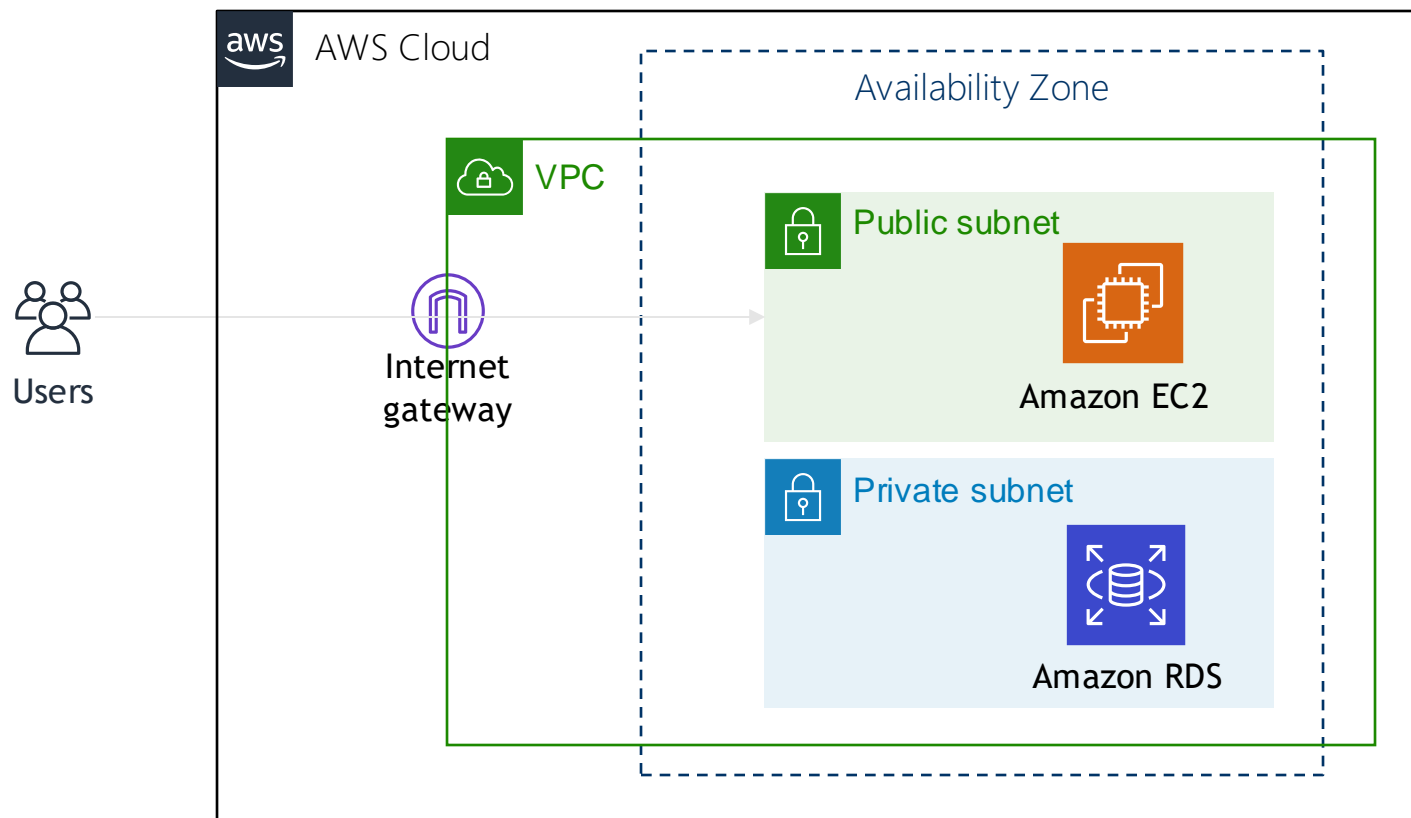
PostgreSQL

MariaDB

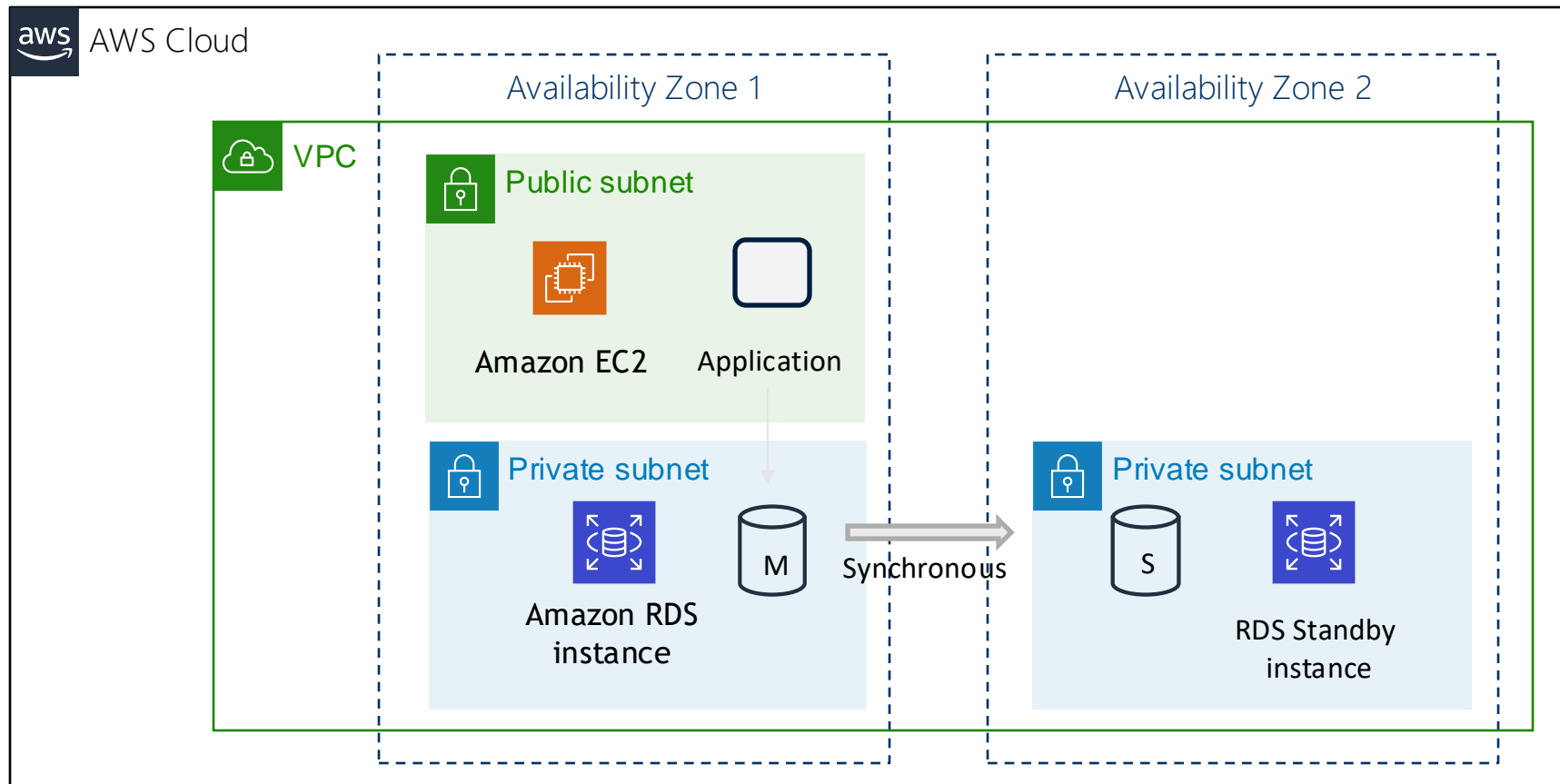
Oracle

DB engines

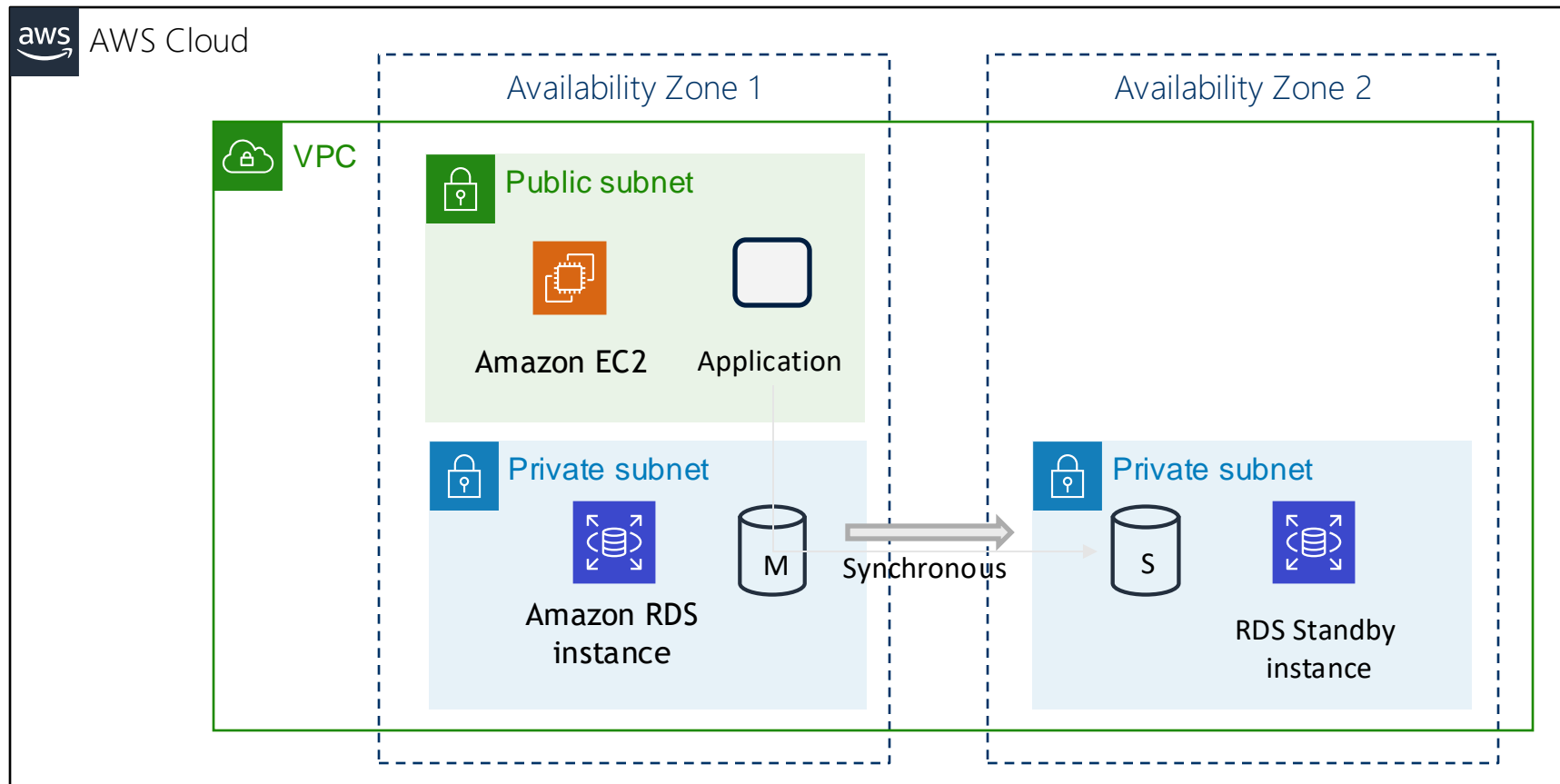
Amazon RDS in a virtual private cloud (VPC)



High availability with Multi-AZ deployment (1 of 2)



High availability with Multi-AZ deployment (2 of 2)



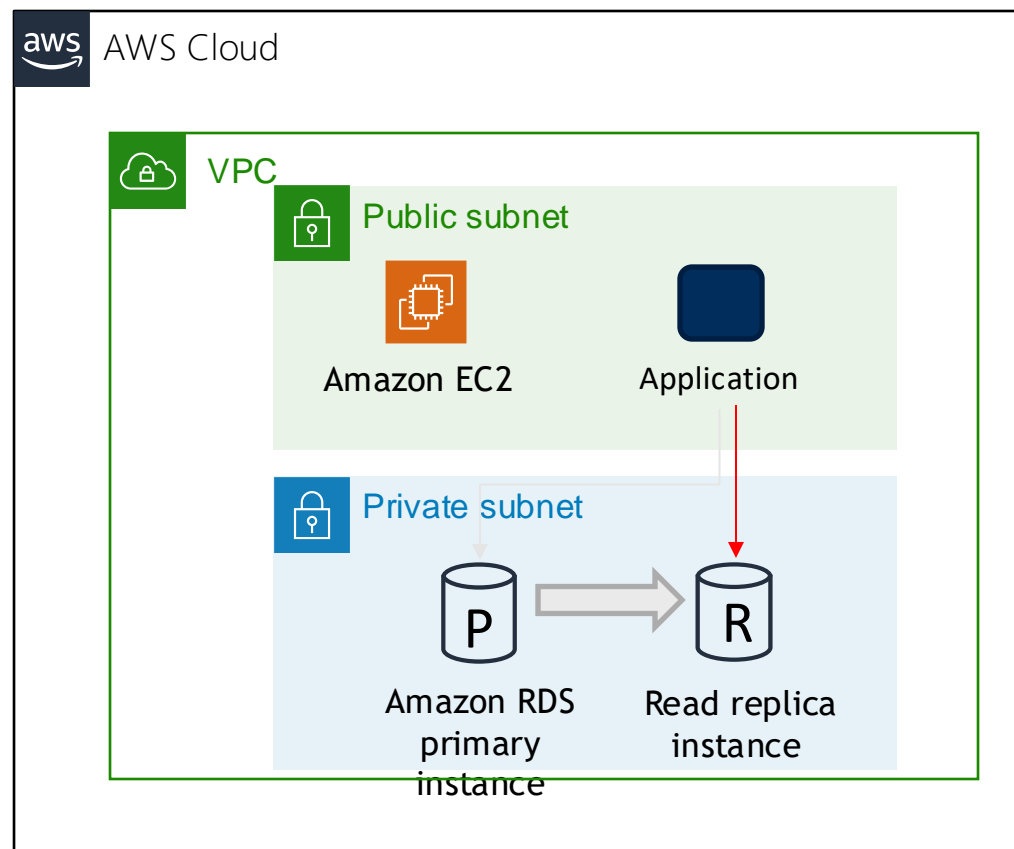
Amazon RDS read replicas

Features

- Offers asynchronous replication
- Can be promoted to primary if needed

Functionality

- Use for read-heavy database workloads
- Offload read queries



Use cases

Web and mobile applications	<ul style="list-style-type: none">✓ High throughput✓ Massive storage scalability✓ High availability
Ecommerce applications	<ul style="list-style-type: none">✓ Low-cost database✓ Data security✓ Fully managed solution
Mobile and online games	<ul style="list-style-type: none">✓ Rapidly grow capacity✓ Automatic scaling✓ Database monitoring

When to Use Amazon RDS

- Complex transactions or complex queries
- A medium to high query or write rate – Up to 30,000 IOPS (15,000 reads + 15,000 writes)
- No more than a single worker node or shard
- High durability

Amazon RDS: Clock-hour billing and database characteristics

Clock-hour billing –

- Resources incur charges when running

Database characteristics –

- Physical capacity of database:
 - Engine
 - Size
 - Memory class

Amazon RDS: DB purchase type and multiple DB instances

DB purchase type –

- On-Demand Instances
 - Compute capacity by the hour
- Reserved Instances
 - Low, one-time, upfront payment for database instances that are reserved with a 1-year or 3-year term

Number of DB instances –

- Provision multiple DB instances to handle peak loads

Amazon RDS: Storage

Provisioned storage –

- No charge
 - Backup storage of up to 100 percent of database storage for an active database
- Charge (*GB/month*)
 - Backup storage for terminated DB instances

Additional storage –

- Charge (*GB/month*)
 - Backup storage in addition to provisioned storage

Amazon RDS: Deployment type and data transfer

Requests –

- The number of input and output requests that are made to the database

Deployment type—Storage and I/O charges vary, depending on whether you deploy to –

- Single Availability Zone
- Multiple Availability Zones

Data transfer –

- No charge for inbound data transfer
- Tiered charges for outbound data transfer

Module 8: Databases

SECTION 2: AMAZON DYNAMODB

Relational versus non-relational databases

	Relational (SQL)	Non-Relational												
Data Storage	Rows and columns	Key-value, document, graph												
Schemas	Fixed	Dynamic												
Querying	Uses SQL	Focuses on collection of documents												
Scalability	Vertical	Horizontal												
Example	<table><thead><tr><th>ISBN</th><th>Title</th><th>Author</th><th>Format</th></tr></thead><tbody><tr><td>3111111223439</td><td>Withering Depths</td><td>Jackson, Mateo</td><td>Paperback</td></tr><tr><td>312222223439</td><td>Wily Willy</td><td>Wang, Xiulan</td><td>Ebook</td></tr></tbody></table>	ISBN	Title	Author	Format	3111111223439	Withering Depths	Jackson, Mateo	Paperback	312222223439	Wily Willy	Wang, Xiulan	Ebook	<pre>{ ISBN: 3111111223439, Title: "Withering Depths", Author: "Jackson, Mateo", Format: "Paperback" }</pre>
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What is Amazon DynamoDB?

Fast and flexible NoSQL database service for any scale



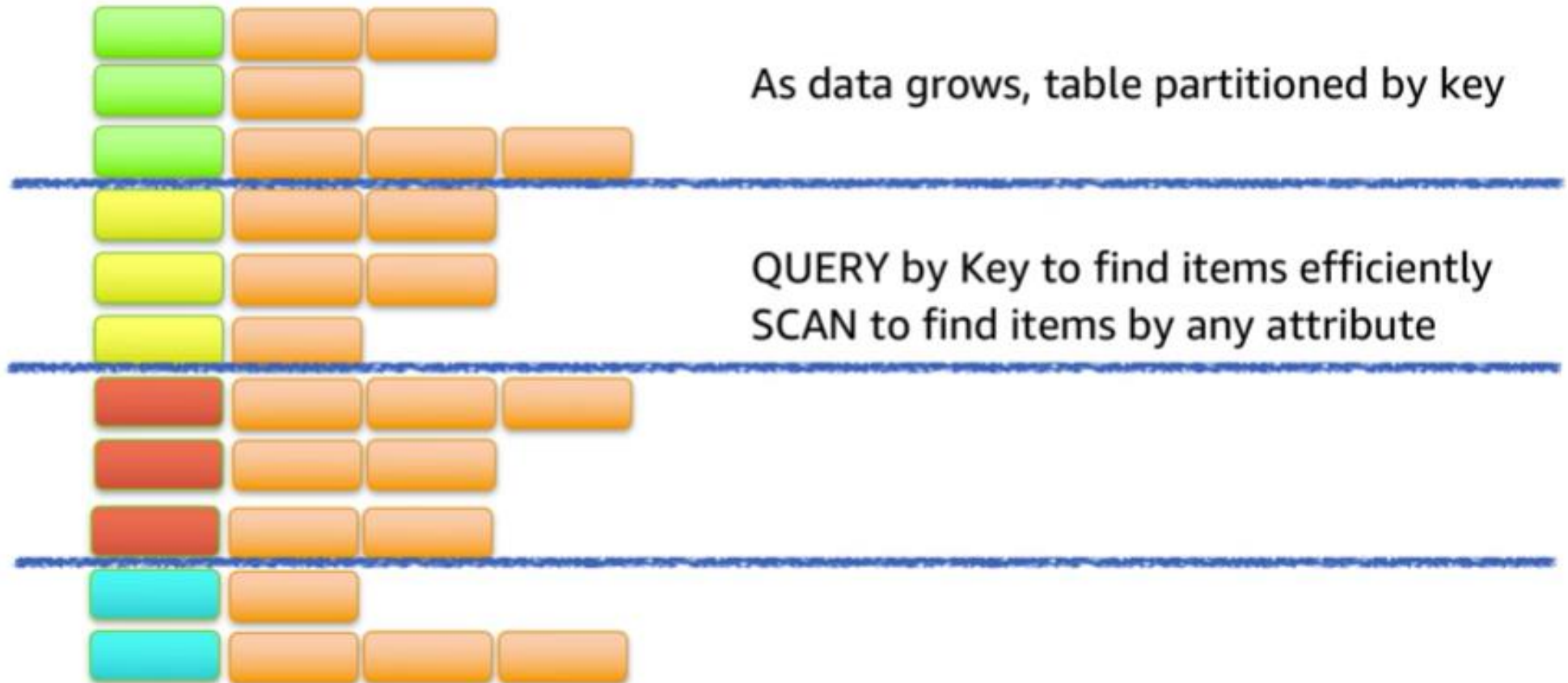
Amazon DynamoDB

- NoSQL database tables
- Virtually unlimited storage
- Items can have differing attributes
- Low-latency queries
- Scalable read/write throughput

Amazon DynamoDB core components

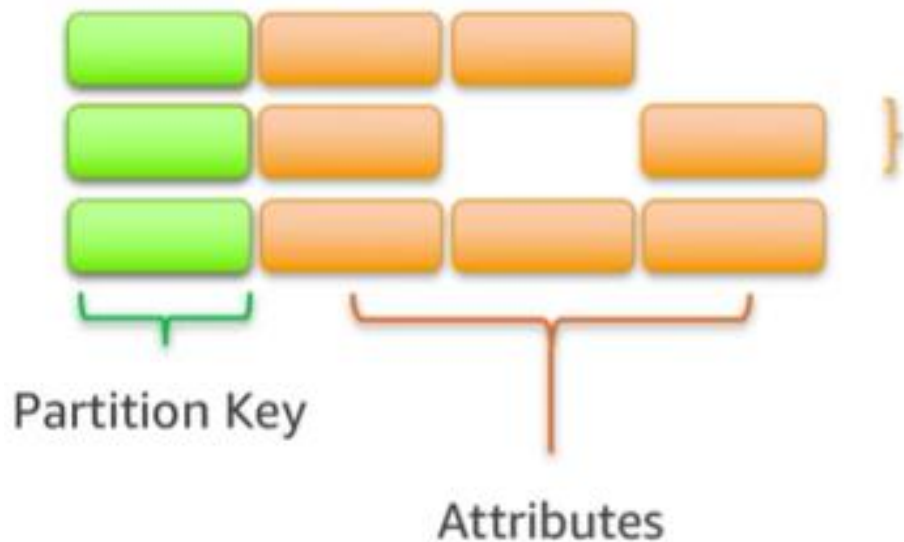
- Tables, items, and attributes are the core DynamoDB components
- DynamoDB supports two different kinds of primary keys:
Partition key and partition and sort key

Partitioning

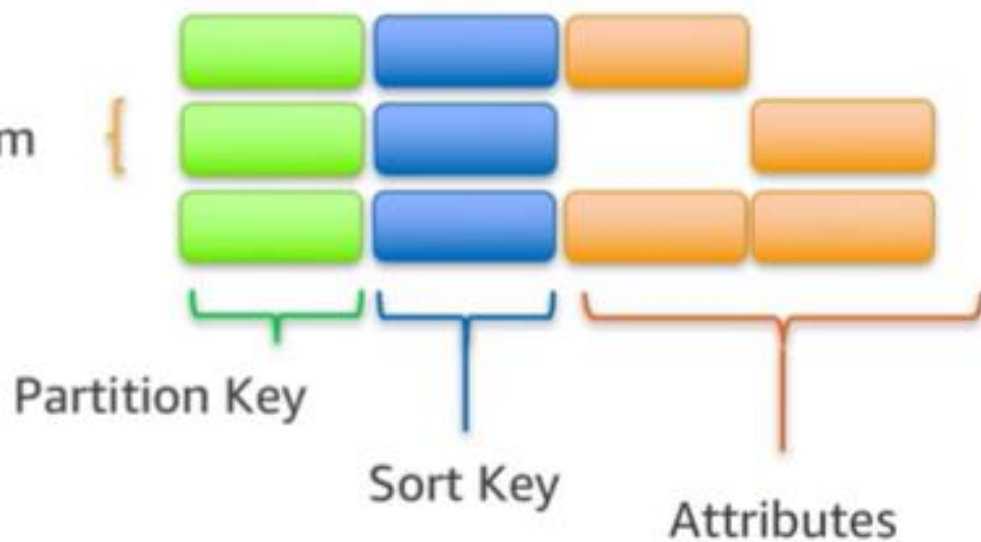


Items in a table must have a key

Single Key



Compound Key



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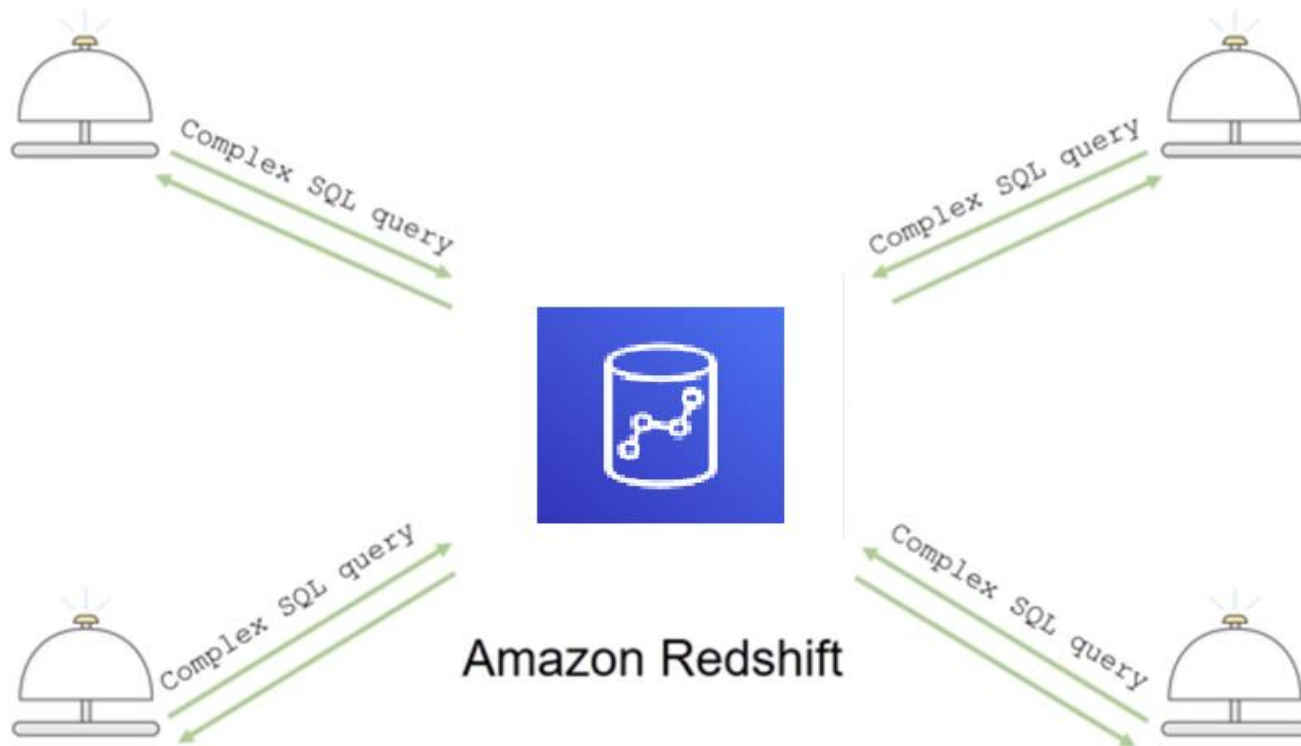
SECTION 3: AMAZON REDSHIFT

Amazon Redshift

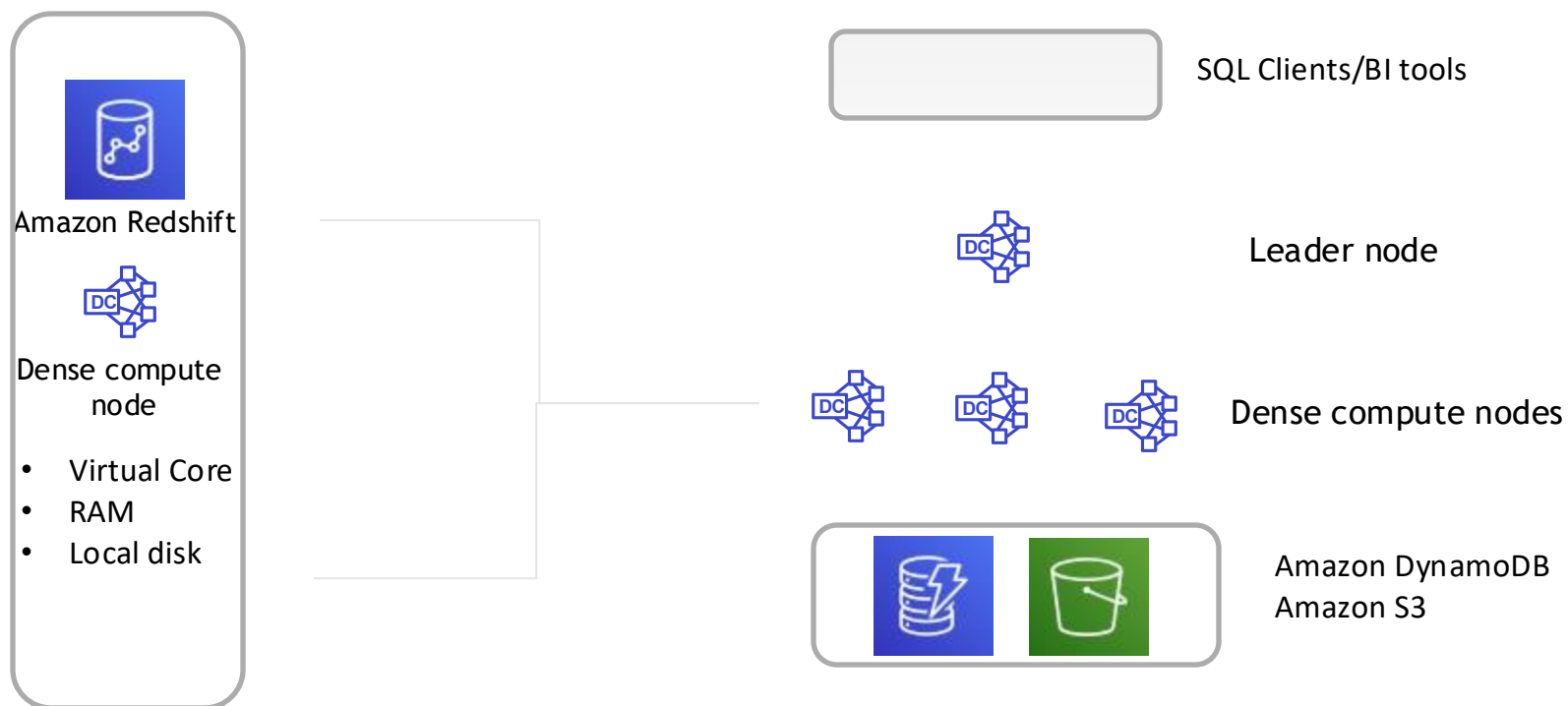


Amazon Redshift

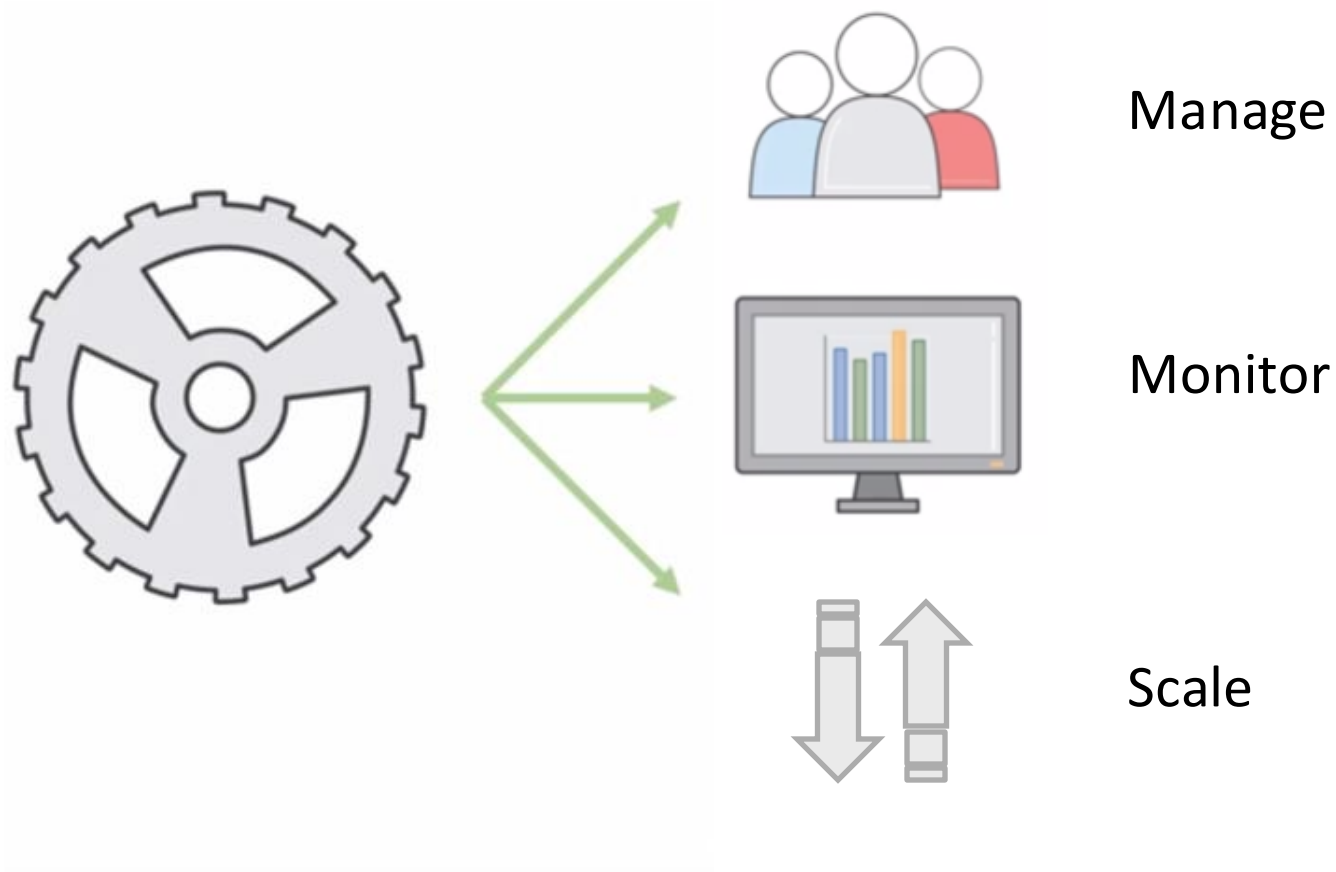
Introduction to Amazon Redshift



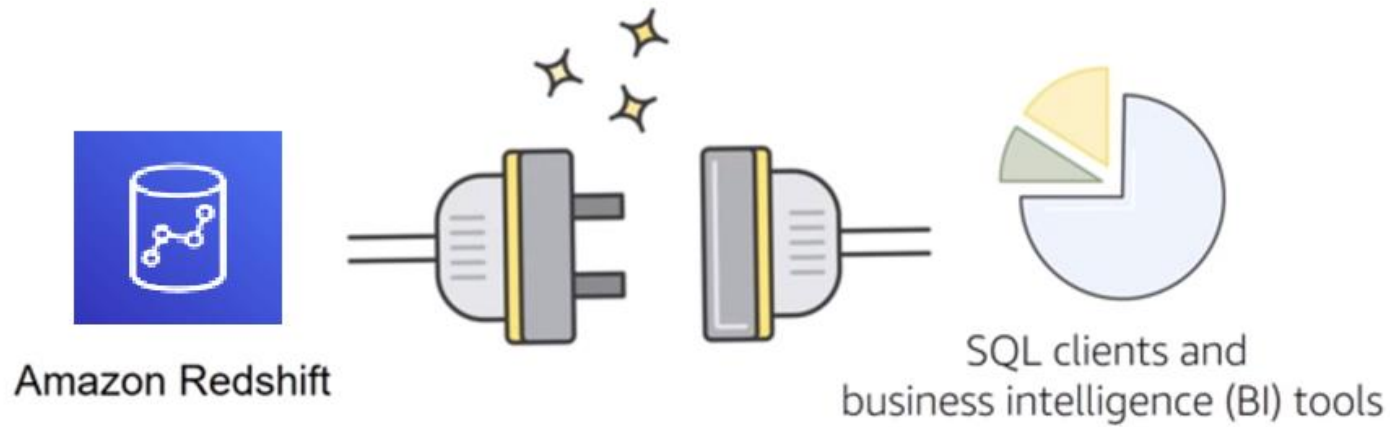
Parallel processing architecture



Automation and scaling

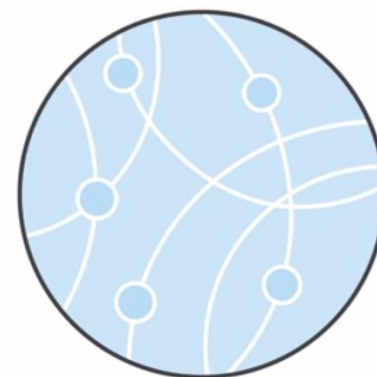


Compatibility



Amazon Redshift use cases (1 of 2)

- Enterprise data warehouse (EDW)
 - Migrate at a pace that customers are comfortable with
 - Experiment without large upfront cost or commitment
 - Respond faster to business needs
- Big data
 - Low price point for small customers
 - Managed service for ease of deployment and maintenance
 - Focus more on data and less on database management



Amazon Redshift use cases (2 of 2)

- Software as a service (SaaS)
 - Scale the data warehouse capacity as demand grows
 - Add analytic functionality to applications
 - Reduce hardware and software costs



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SECTION 4: AMAZON AURORA

Amazon Aurora



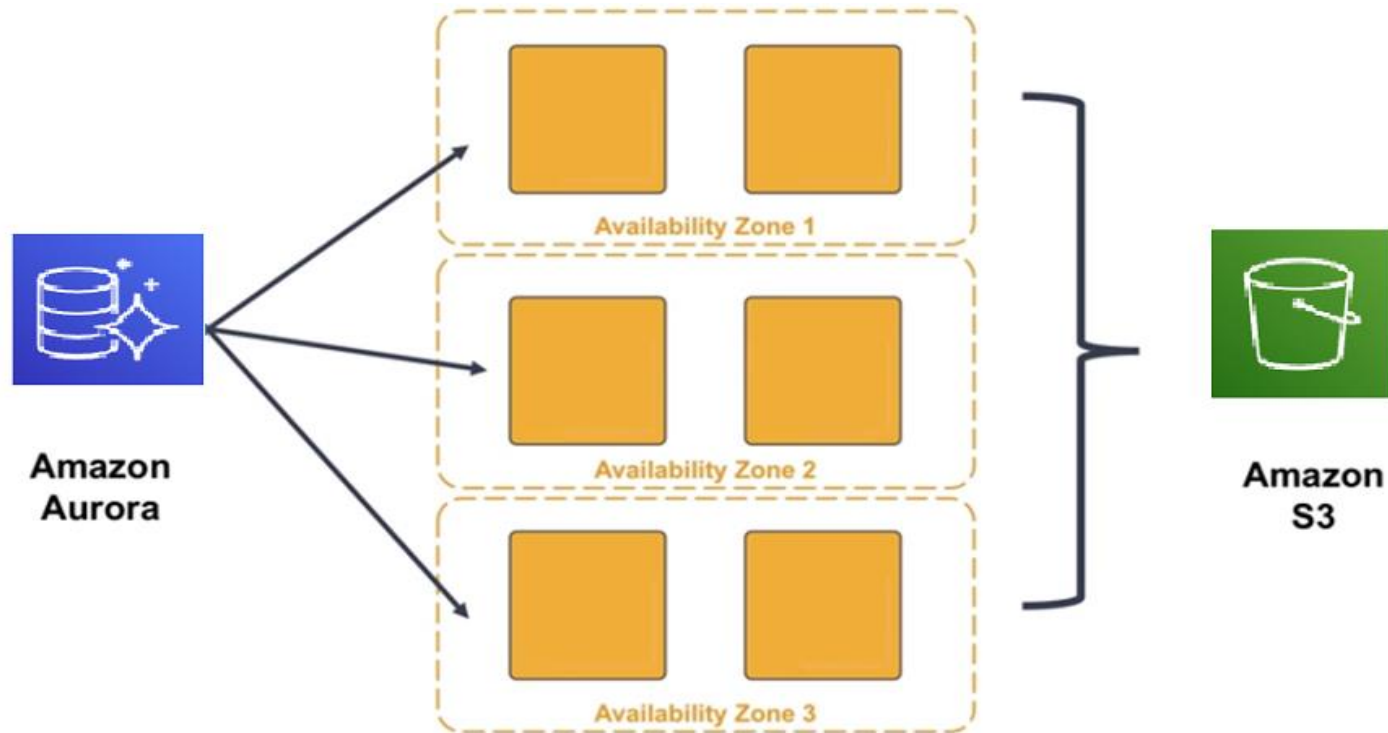
Amazon Aurora

- Enterprise-class relational database
- Compatible with MySQL or PostgreSQL
- Automate time-consuming tasks (such as provisioning, patching, backup, recovery, failure detection, and repair).

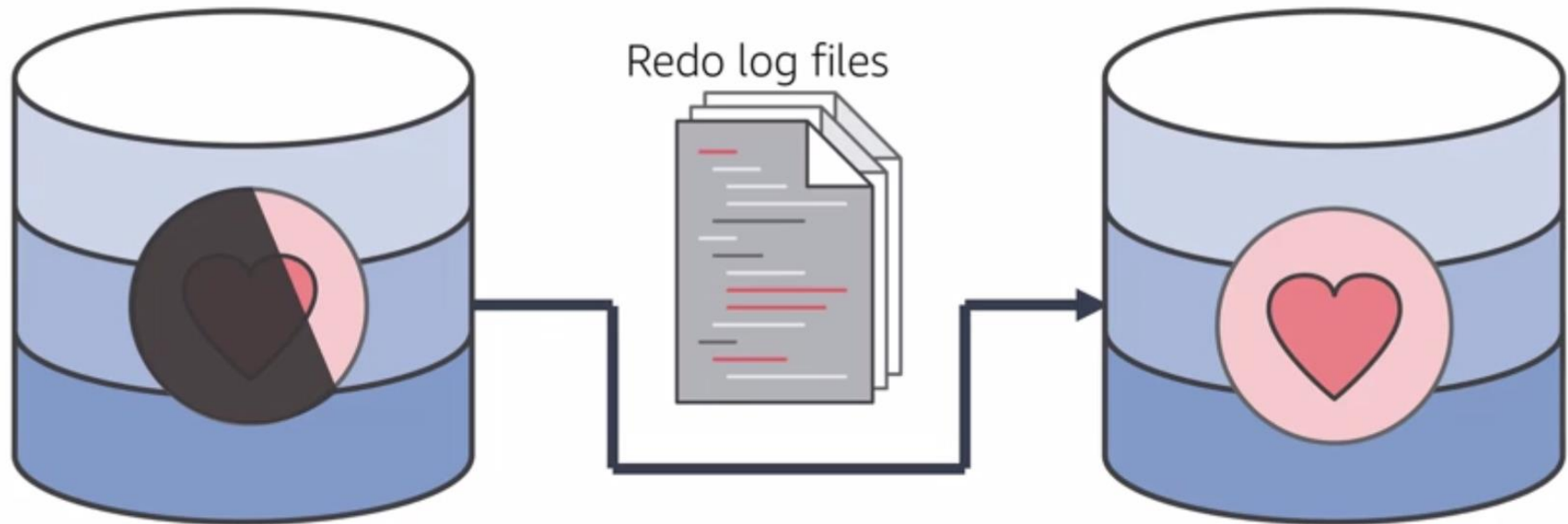
Amazon Aurora service benefits



High availability



Resilient design



The right tool for the right job

What are my requirements?

Enterprise-class relational database

Amazon RDS

Fast and flexible NoSQL database service for any scale

Amazon DynamoDB

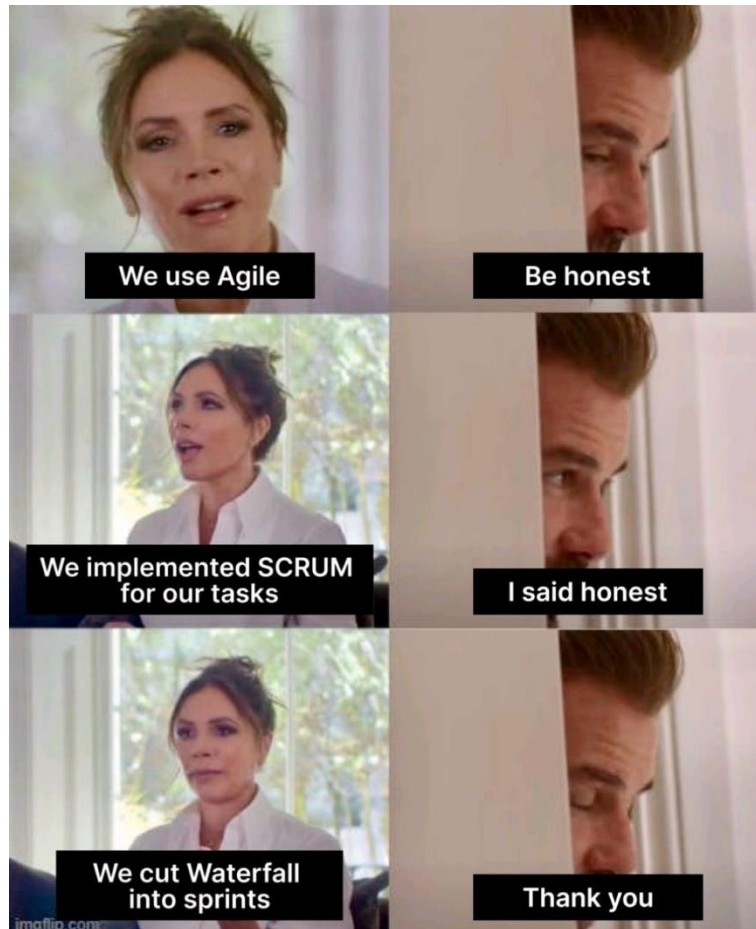
Operating system access or application features that are not supported by AWS database services

Databases on Amazon EC2

Specific case-driven requirements (machine learning, data warehouse, graphs)

AWS purpose-built database services

OFF TOPIC



IF YOU ARE
NOT BUILDING SW
YOU ARE
NOT LEARNING!