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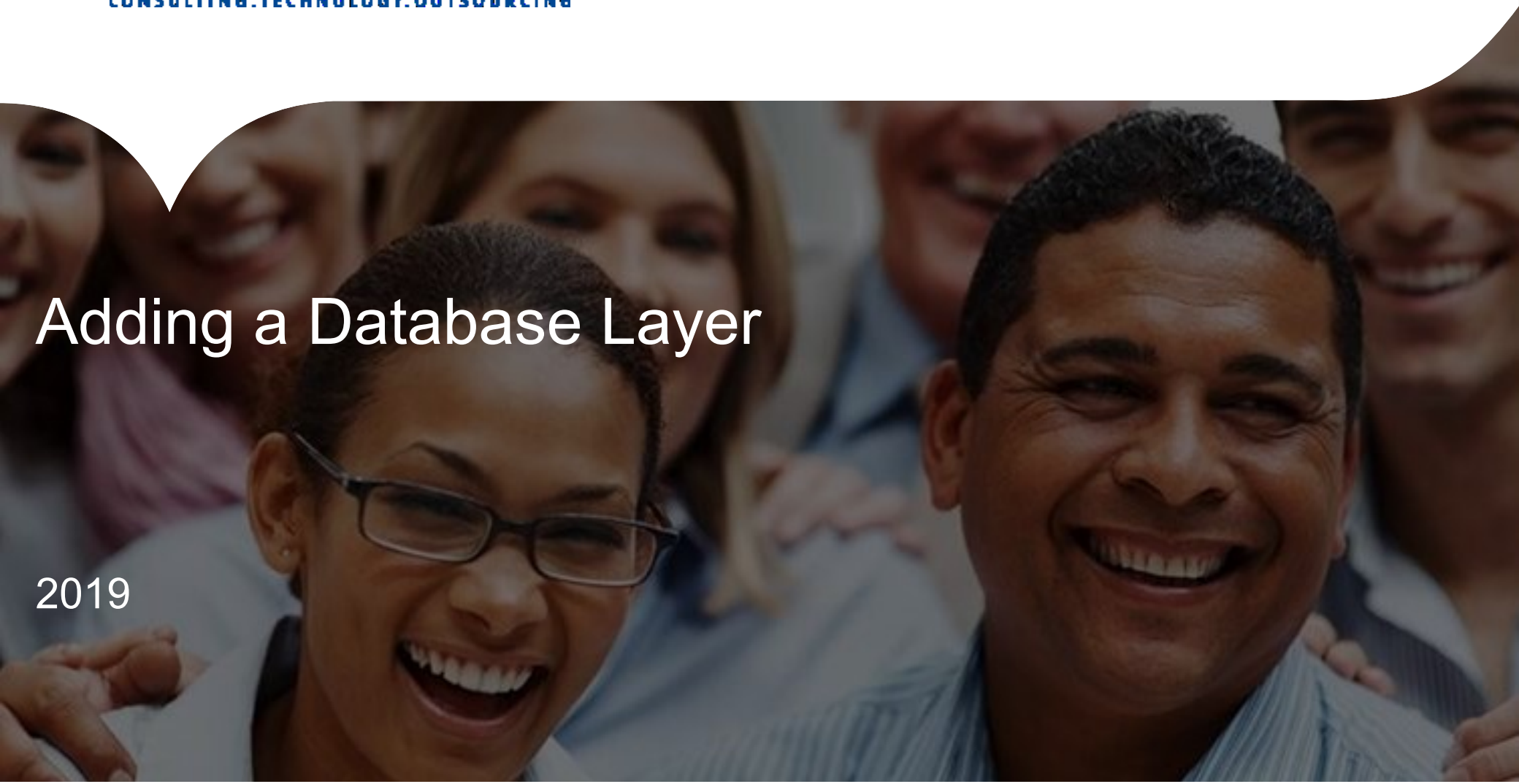
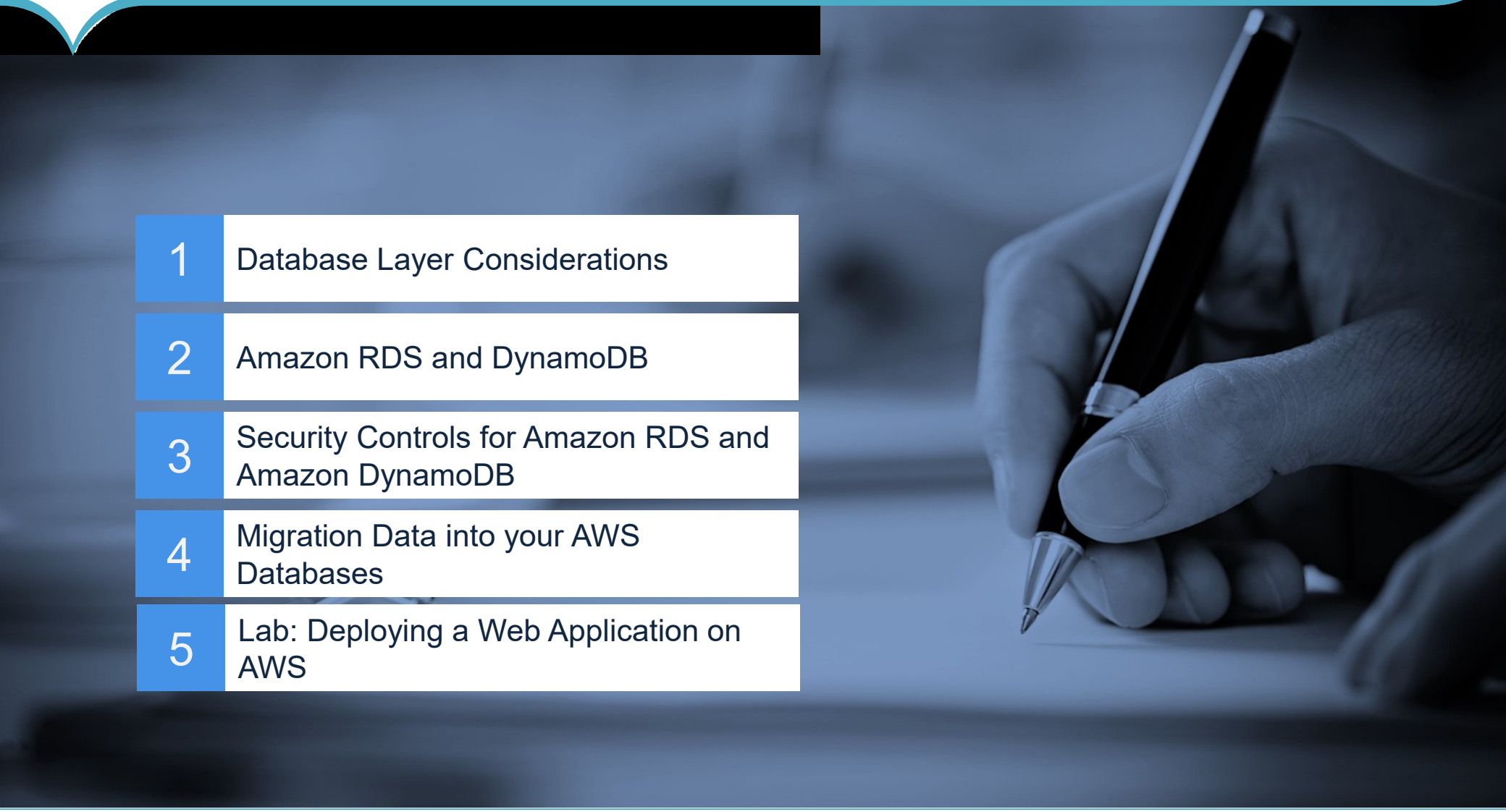


Adding a Database Layer

2019

People matter, results count.

Agenda



1. Database Layer Considerations
2. Amazon RDS and DynamoDB
3. Security Controls for Amazon RDS and Amazon DynamoDB
4. Migration Data into your AWS Databases
5. Lab: Deploying a Web Application on AWS

Database Layer Considerations

What should you consider?

Scalability

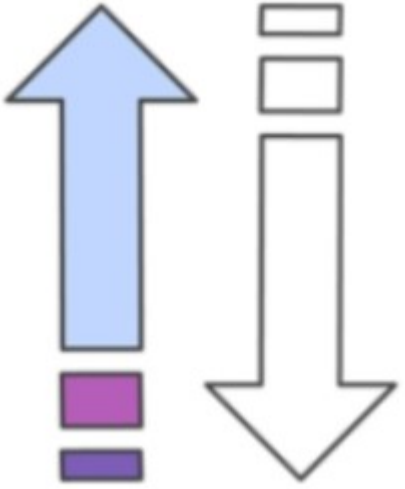
Total storage requirements

Object size and type

Durability

How much throughput do we need?

Will the solution we choose be able to scale up later if needed?



What should you consider?

Scalability

How large does our database need to be?

Will we have GB, TB or PB of data?

Total storage requirements

Object size and type

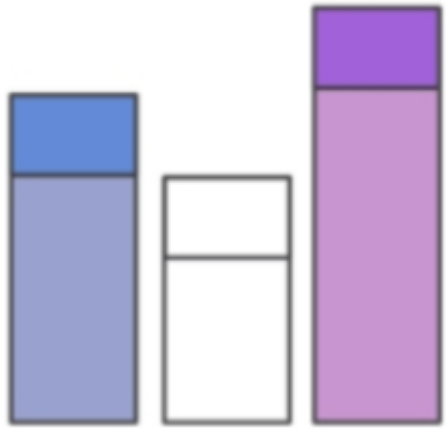
Durability

What should you consider?

Scalability Do we need to store simple data structures, large data objects or both?

Total storage requirements

Object size and type



Durability

What should you consider?

Scalability

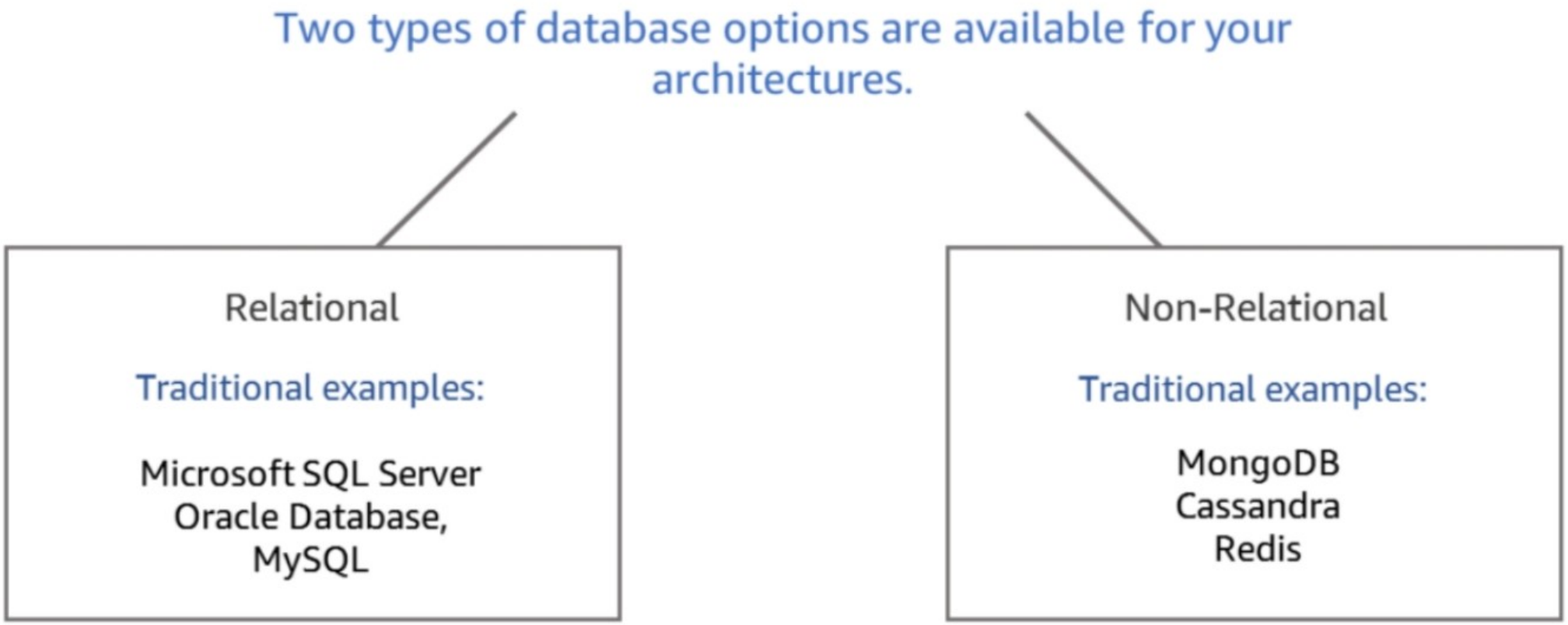
What level of data durability, data availability, and recoverability do you require?
Do you have a related regulatory obligation?

Total storage requirements

Object size and type

Durability

Database Types



Database Type - Relational

ISBN	Title	Author	Format
9182932465265	Cloud Computing Concepts	Wilson, Joe	Paperback

Sales	Revenue	Author
1143	10503	Wilson, Joe

Author	AccountNumber
Wilson, Joe	8017330011

Database Type - Relational

When to choose a relational database:

- You require strict schema rules and data quality enforcement
- Your database doesn't need extreme read/write capacity
- If you have relational dataset that does not require extreme performance, an RDBMS can be the best, lowest effort solution.

Database Type – Non Relational

Key-Value

Document

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

Database Type – Non Relational

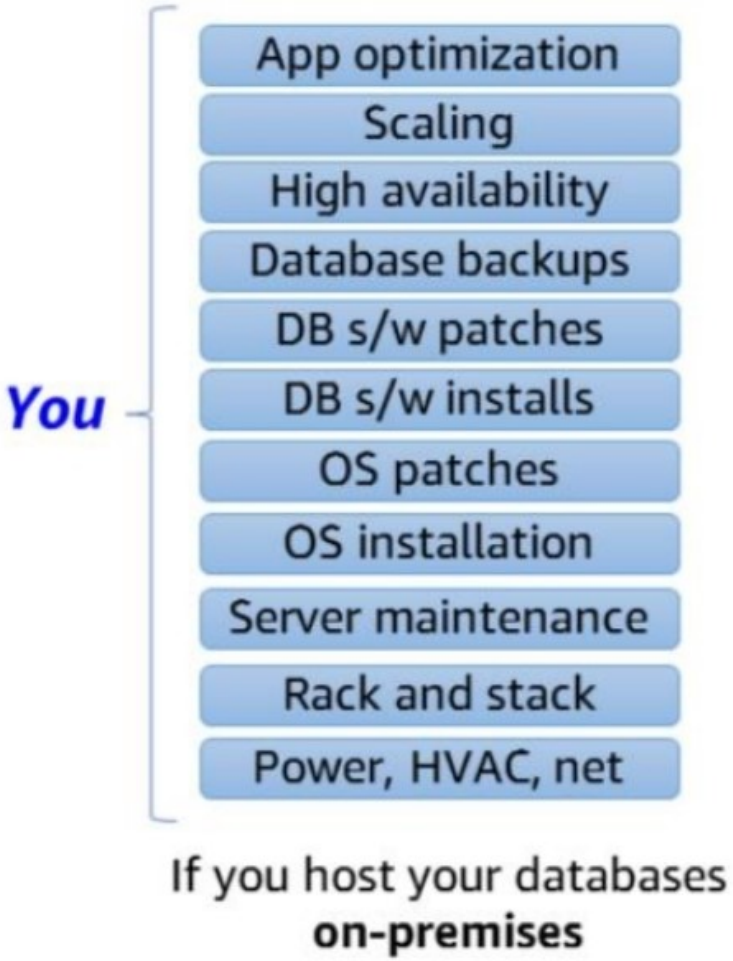
When to choose a non-relational database:

- You need your database to scale horizontally
- Your data does not lend itself well to traditional schemas
- Your read/write rates exceed those that can be economically supported through traditional SQL DB

Compare and Contrast Structured Data Storage

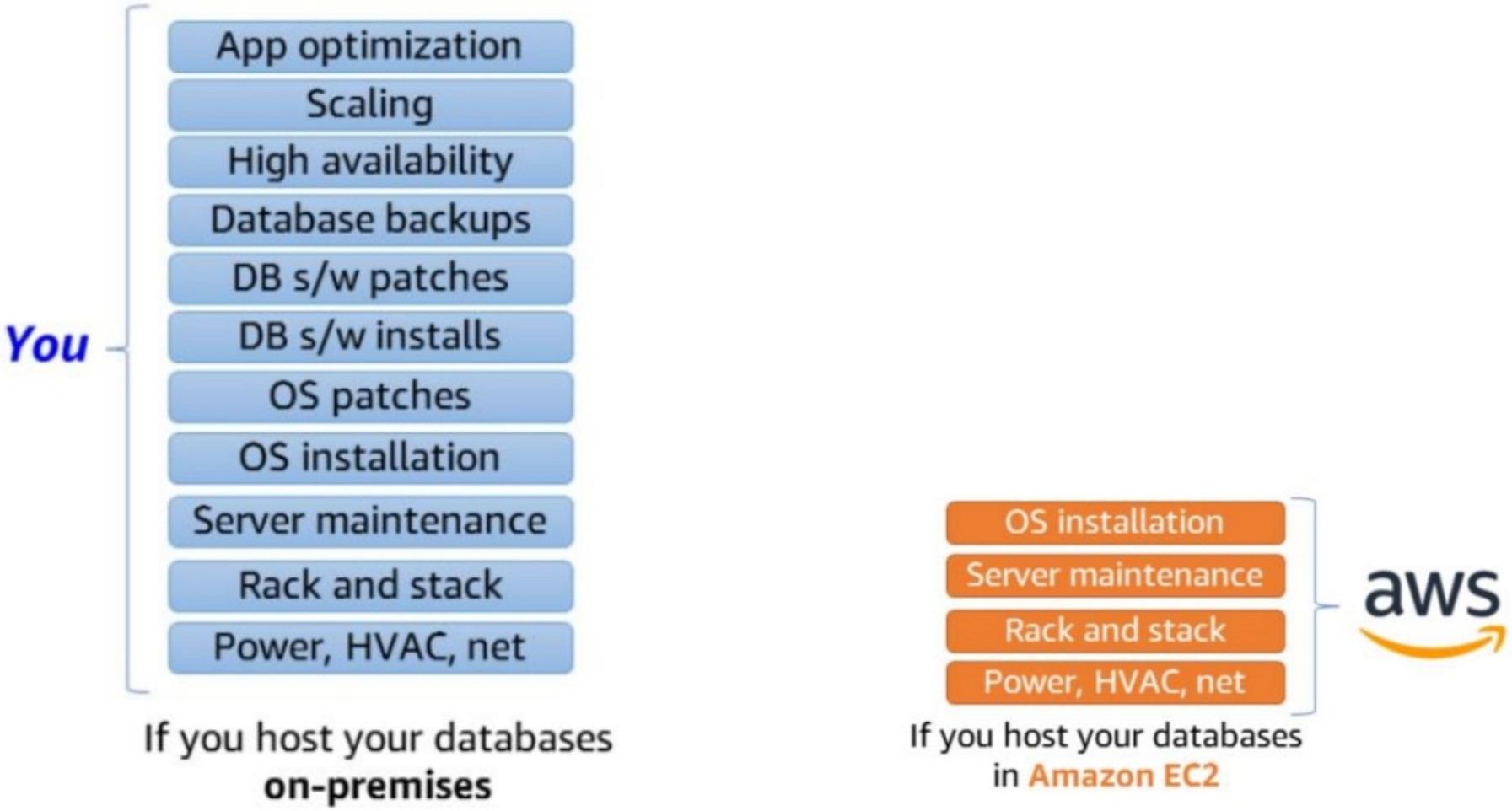
	Relational/SQL	NoSQL
Data Storage	Rows and columns	Key value, documents, and graphs
Schemas	Fixed	Dynamic
Querying	SQL-based querying	Focused on collection of documents
Scalability	Vertical	Horizontal

Unmanaged Databases

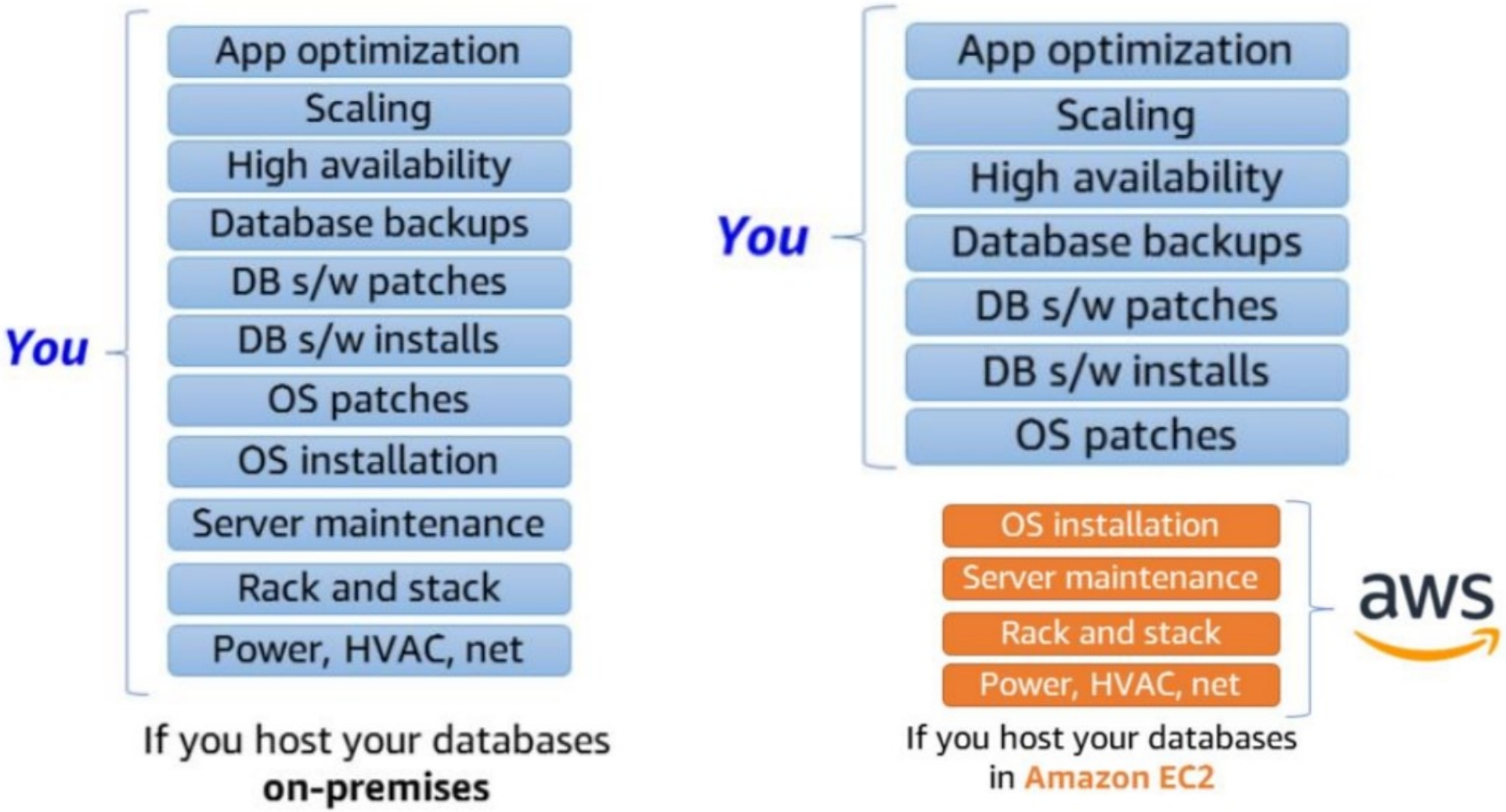


If you host your databases **on-premises**

Unmanaged Databases



Unmanaged Databases



Managed Databases

Amazon RDS and DynamoDB

Amazon Database Options

Amazon RDS

Amazon Redshift

Amazon DynamoDB

Amazon ElastiCache

Amazon Neptune

Relational Databases

Non-Relational Databases

Our Focus

Relational

Amazon RDS

Non-Relational

Amazon DynamoDB

Amazon RDS

Fully managed relational database service

Provisions new instances in a few minutes

Scaling vertically with a few mouse clicks

Amazon RDS in General

Relational

Amazon RDS

Works well for applications that:

Have more complex data

Need to combine and join data sets

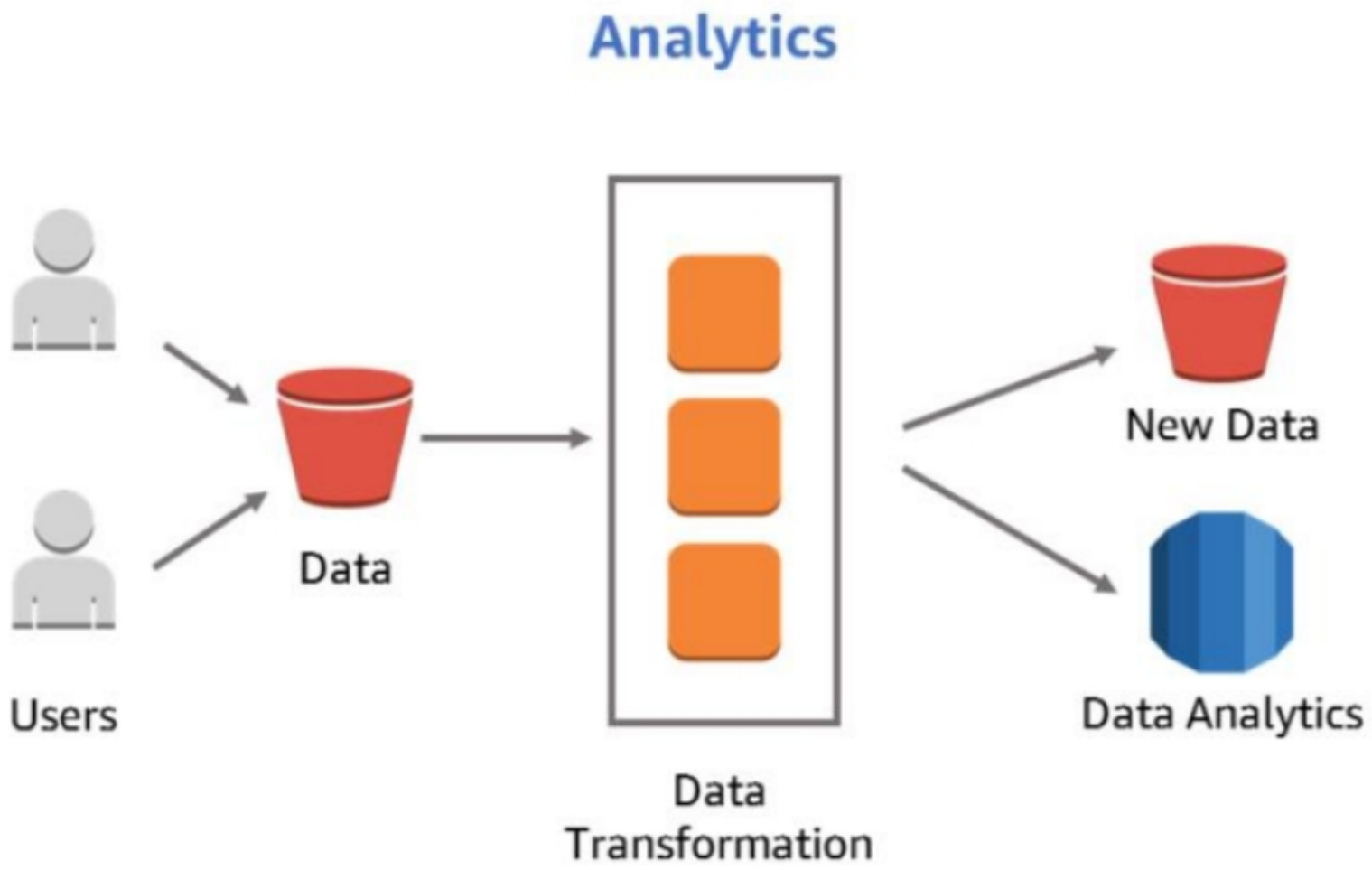
Require enforced syntax rules

Amazon RDS and Amazon Aurora

Amazon Aurora is fully managed, MYSQL- and Postgres-compatible, relational database engine.

- Up to five times the throughput of MySQL
- Up to three times the throughput of PostgresSQL
- Replicates data six ways across three Availability Zones
- Requires very little change to your existing application

Amazon RDS Use Case



Amazon DynamoDB

Non-Relational

Amazon DynamoDB

Fully managed non-relational database service

Event-driven programming (serverless computing)

Extreme horizontal scaling capability

Amazon DynamoDB

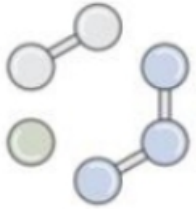
Non-Relational

Amazon DynamoDB

Works well for applications that:

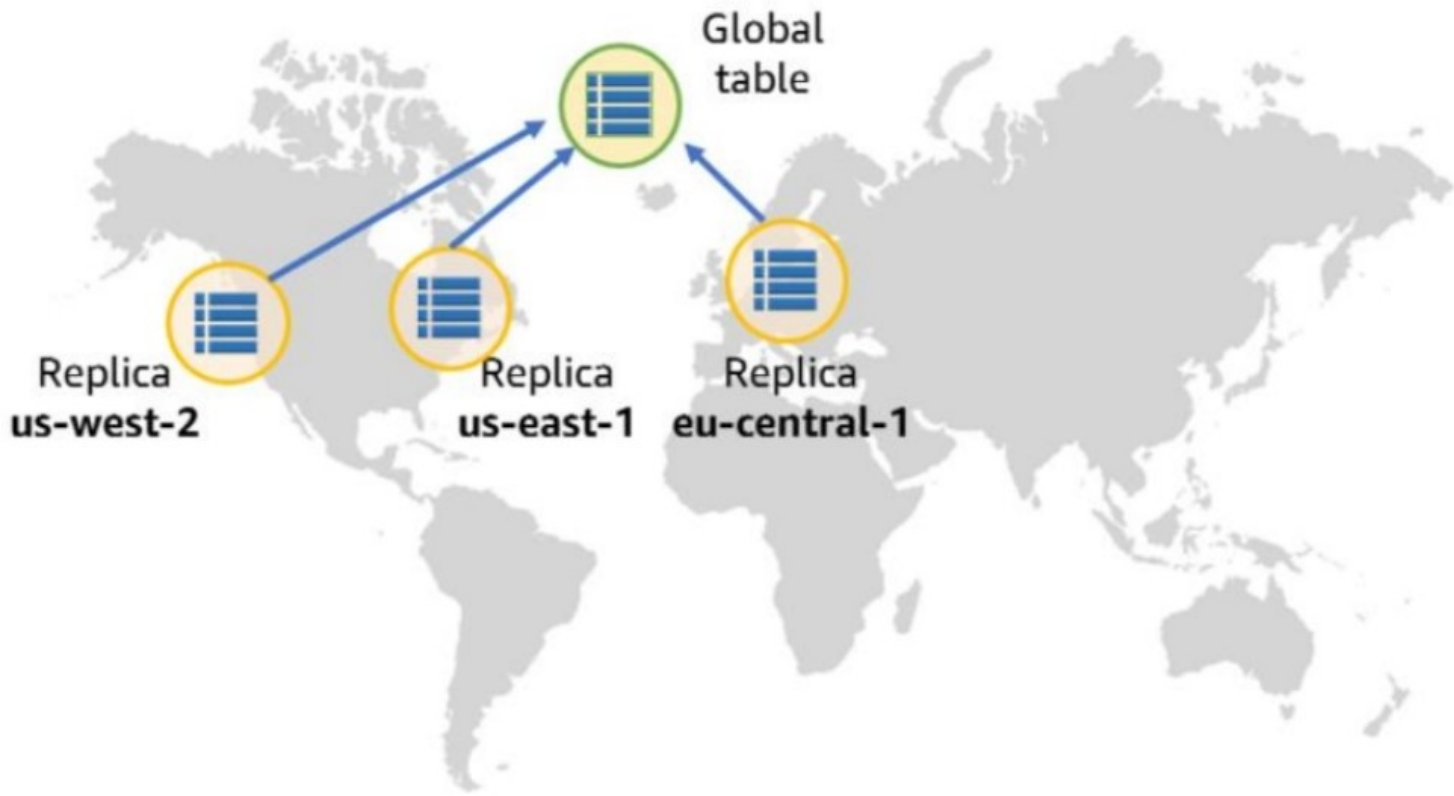
Have simple high-volume data

Need to scale quickly and with ease



Don't need complex joins

Amazon DynamoDB has Global Tables



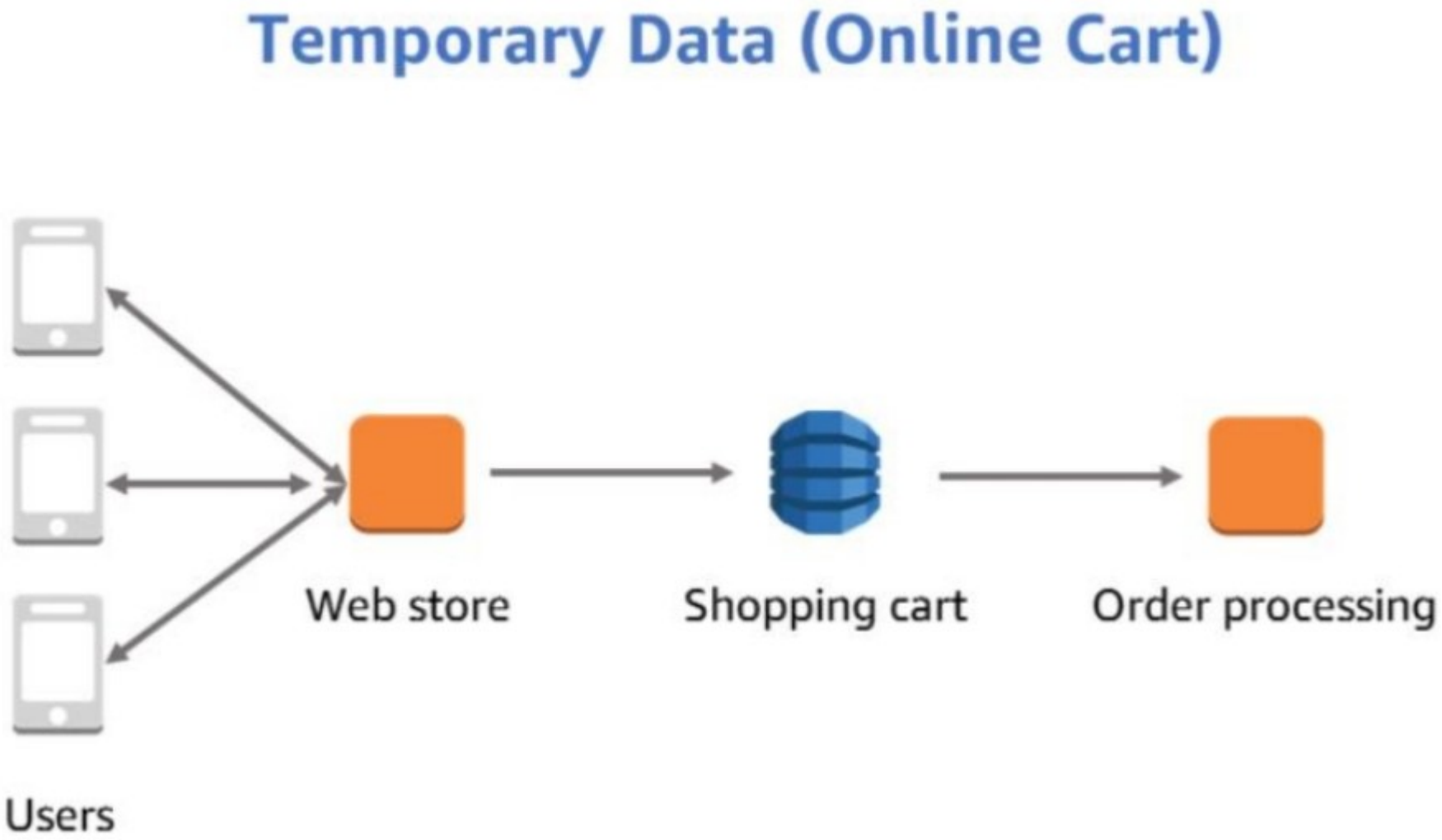
Amazon DynamoDB Use Case

Leaderboards and Scoring

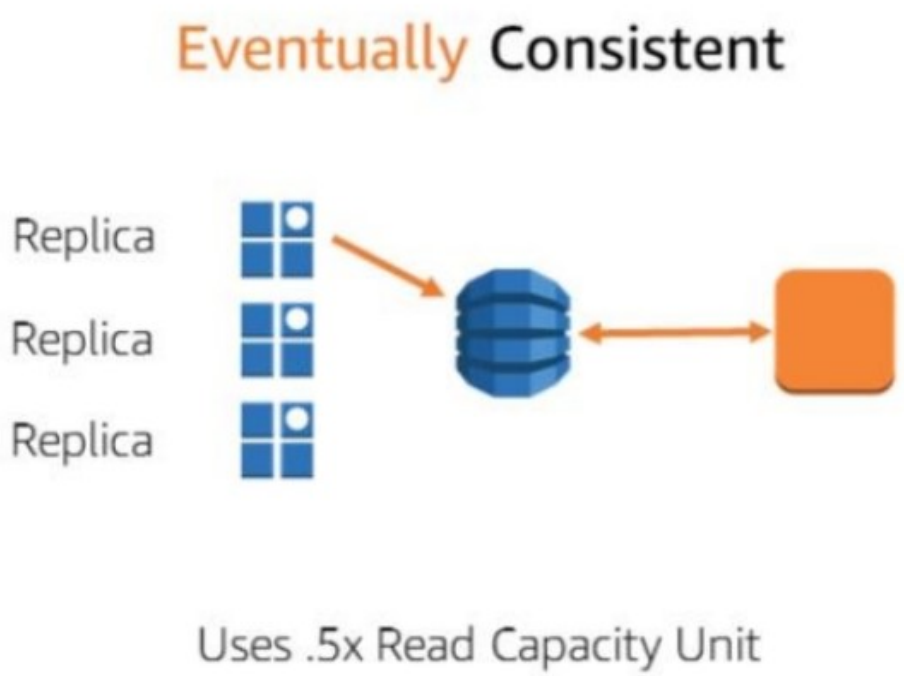
GameScores

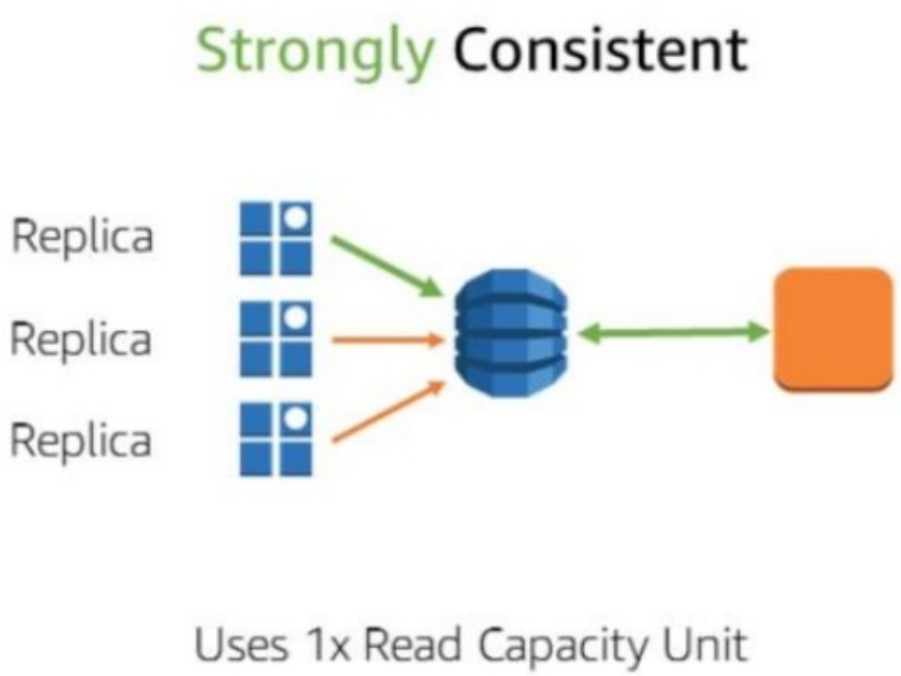
UserId	GameTitle	TopScore	TopScoreDateTime	Wins	Losses	...
"101"	"Galaxy Invaders"	5842	"2015-09-15:17:24:31"	21	72	...
"101"	"Meteor Blasters"	1000	"2015-10-22:23:18:01"	12	3	...
"101"	"Starship X"	24	"2015-08-31:13:14:21"	4	9	...
"102"	"Alien Adventure"	192	"2015-07-12:11:07:56"	32	192	...
"102"	"Galaxy Invaders"	0	"2015-09-18:07:33:42"	0	5	...
"103"	"Attack Ships"	3	"2015-10-19:01:13:24"	1	8	...
"103"	"Galaxy Invaders"	2317	"2015-09-11:06:53:00"	40	3	...
"103"	"Meteor Blasters"	723	"2015-10-19:01:13:24"	22	12	...
"103"	"Starship X"	42	"2015-07-11:06:53:00"	4	19	...
...	...	...	...	...	...	

Amazon DynamoDB Use Case



Amazon DynamoDB Consistency Options





Security Controls for Amazon RDS and Amazon DynamoDB

Security Control for Amazon RDS

A few things to think about:

- **Access to the DB itself** - Who has visibility and can run actions on the database?

Security Control for Amazon RDS

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Security Control for Amazon RDS

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- **Encryption in Transit -** Encryption in transit can be accomplished with SSL.

Security Control for Amazon RDS

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- **Encryption at rest** - Data that is encrypted at rest includes the underlying storage for a DB instance, its automated backups, read replicas and snapshots.
- **Encryption in Transit -** Encryption in transit can be accomplished with SSL.
- **Event Notification** - You can receive notifications of a variety of important events that can occur on your RDS instance

Security Control for Amazon DynamoDB

A few things to think about:

- **Definable access permissions** - With DynamoDB, you can grant access to everything from the table to the item to even the attributes of your database.
- **Encryption at rest** - DynamoDB offers fully managed encryption at rest.
- **SSL/TLS** - By default, communications to and from DynamoDB use the HTTPS protocols, which protects network traffic by using SSL/TLS encryption.

Migration Data into your AWS Databases

AWS Database Migration Service (AWS DMS)

- Supports migration to and from most commercial and open source databases
- Can be used to migrate between databases on Amazon EC2, Amazon RDS and on-premises

Migration Options

One Time Migration

Ongoing migration

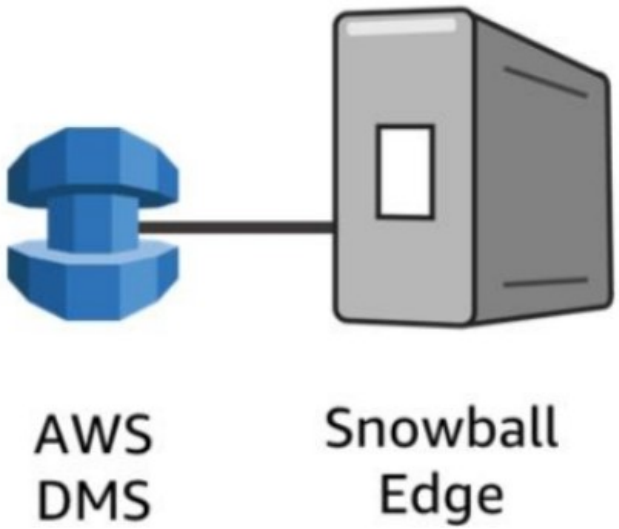
Using AWS Snowball Edge with AWS DMS

When migrating data is unfeasible:

- Database is too large
- Connection is too slow
- Privacy and security concerns

We recommend **AWS Snowball Edge**

Using AWS Snowball Edge with AWS DMS



AWS DMS has a Snowball Edge integration point.

You can migrate one or more databases using the Snowball Edge device.

- Multi-terabyte storage
- Without using network bandwidth

AWS Schema conversion Tool

A standalone application that enables you to convert your existing database schema from one database engine to another

Source Database	Target Database
Microsoft SQL Server	Amazon Aurora, MySQL, PostgreSQL
MySQL	PostgreSQL
Oracle	Amazon Aurora, MySQL, PostgreSQL
Oracle Data Warehouse	Amazon Redshift
PostgreSQL	Amazon Aurora, MySQL
Teradata	Amazon Redshift

Lab: Deploying a Web Application on AWS

Lab: Deploying a Web Application on AWS

"I want to host a web application and database."

Technologies used:

- Amazon EC2
- Amazon RDS
- Security groups

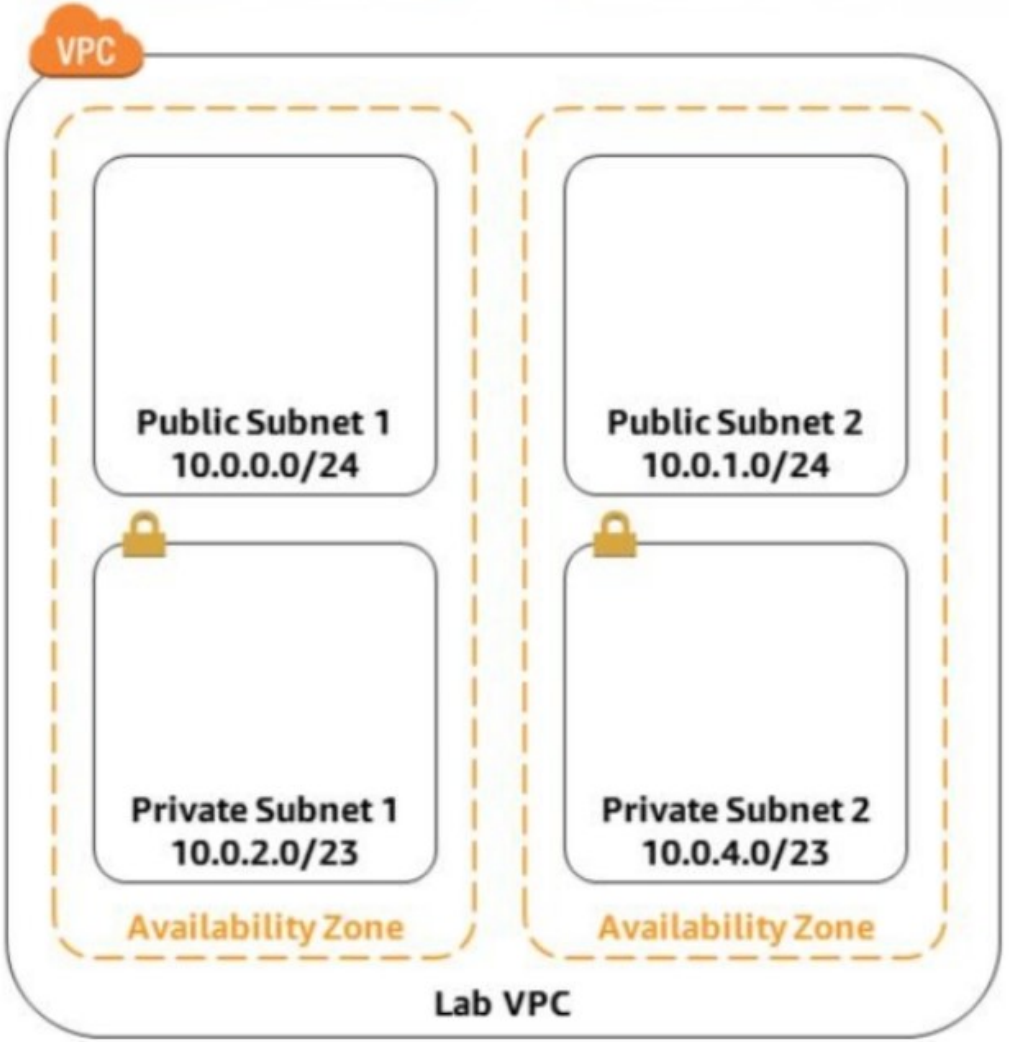
Lab: Deploying a Web Application on AWS

Provided at start of lab:

VPC across two availability zones

2 x public subnets

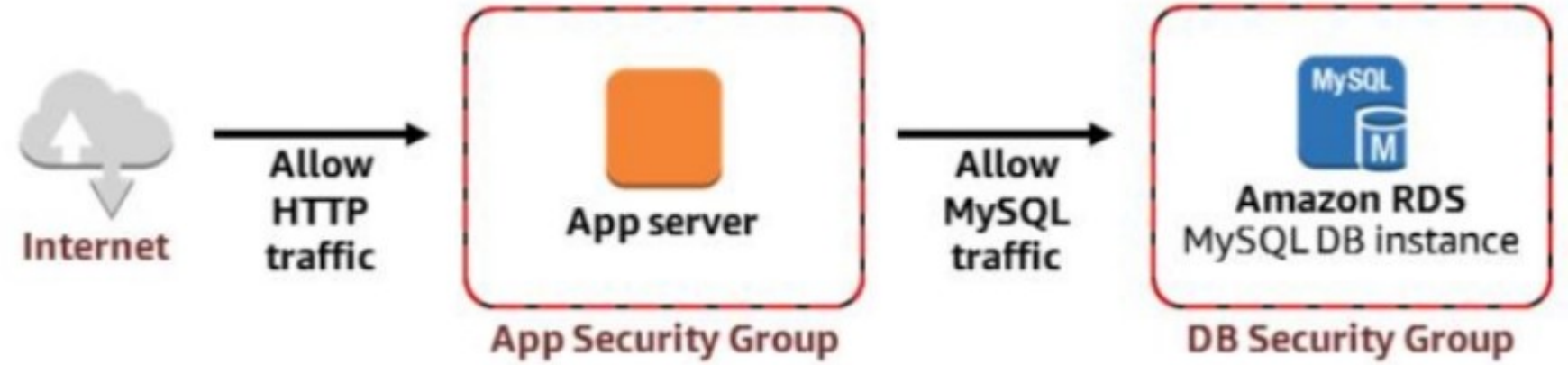
2 x private subnets



Lab: Deploying a Web Application on AWS

Security Configurations:

- App Security Group: Permit access from the internet
- DB Security Group: Permit access from App Security Group



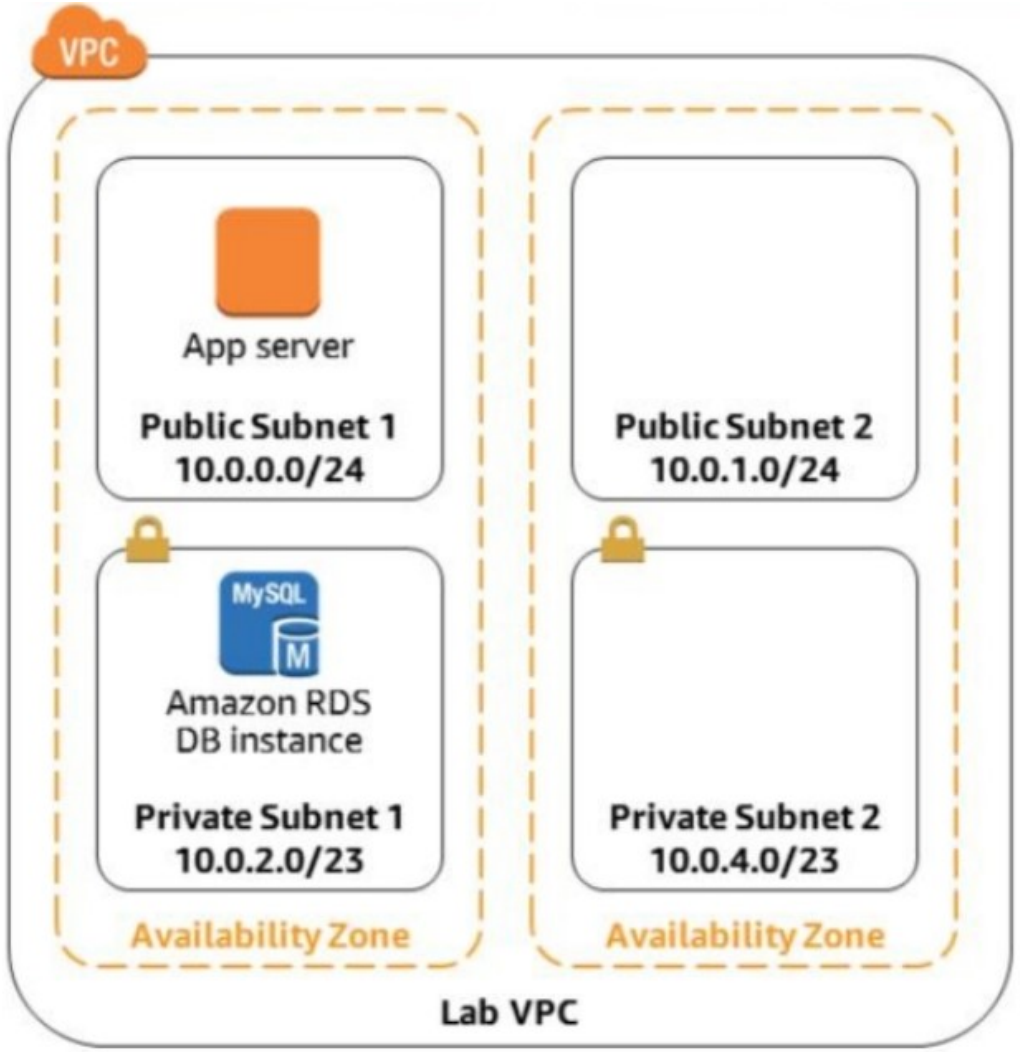
"Build the fence, then put resources inside the fence."

Lab: Deploying a Web Application on AWS

You will then:

- Deploy a database server
- Deploy an application server
- Test the application

Duration: 30 minutes



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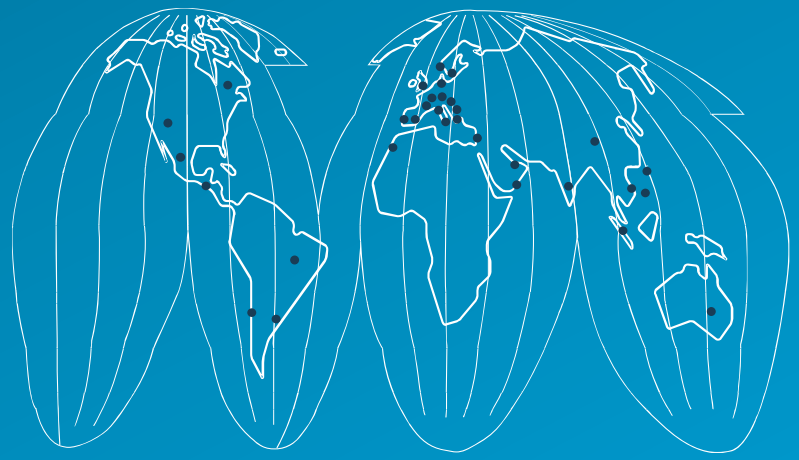

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