

AWS Technical Essentials

Lesson 5—AWS Managed Services and Database



WHAT YOU'LL LEARN

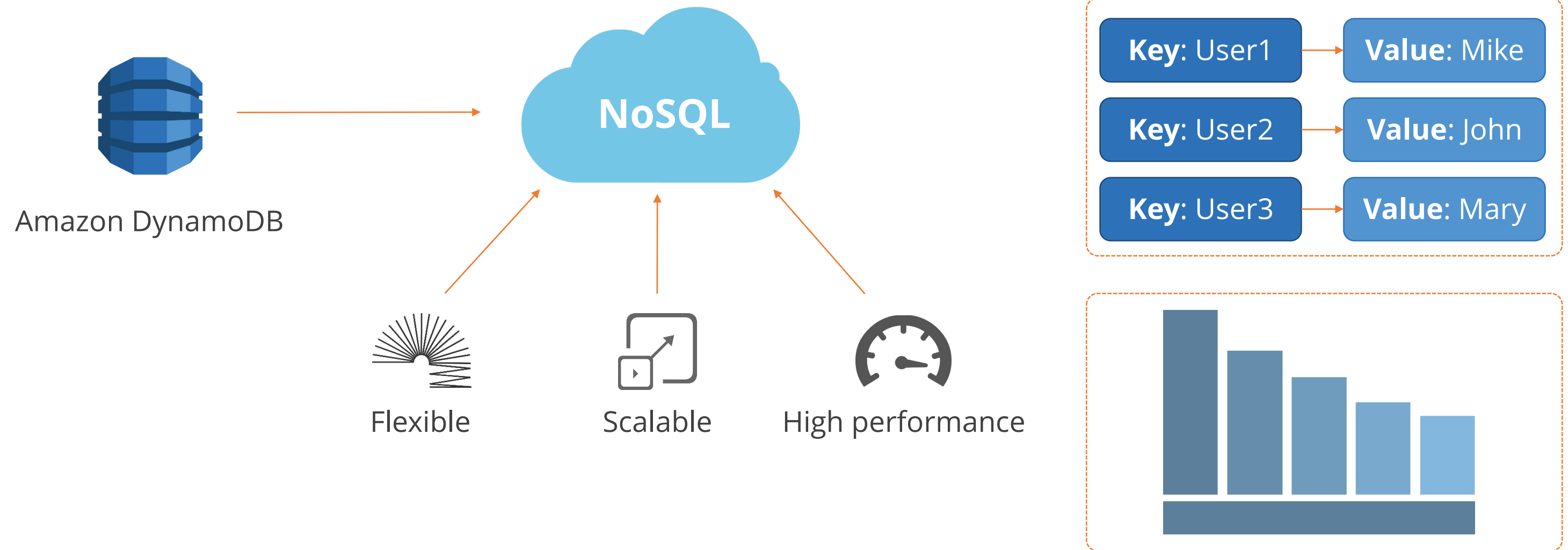
- Describe Amazon DynamoDB
- Verify key aspects of Amazon RDS
- Execute an Amazon RDS driven application



Amazon DynamoDB

Introduction to Amazon DynamoDB

Amazon DynamoDB is a service that offers NoSQL databases.



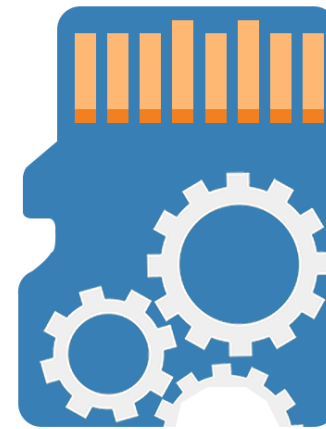
DynamoDB is a fully managed service and it relieves you from the administrative load of running and scaling a distributed database. You can employ it to perform all critical tasks such as setting up a database, provisioning the required hardware, replicating the tables, and scaling the database capacity.

Use of Amazon DynamoDB

With DynamoDB, creating tables in a NoSQL database is easy.



Tables



Storing and fetching any
amount of data



DynamoDB service operates fast, delivers the expected performance, and scales flawlessly.

DynamoDB Concepts

Tables

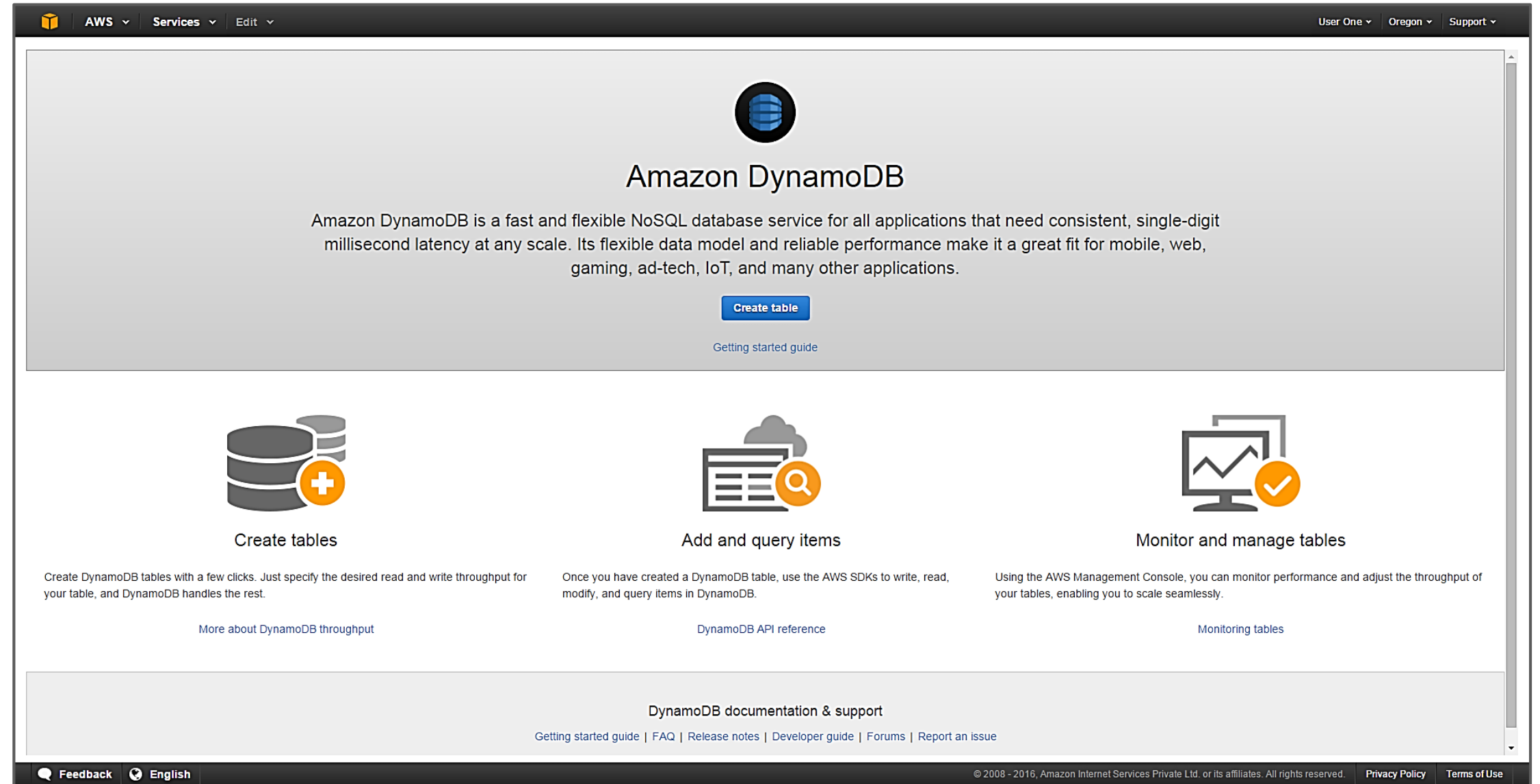
Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution



Amazon DynamoDB Home Page

DynamoDB Tables

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

DynamoDB Dashboard

Create table Actions

Filter by table name X

Viewing 2 of 2 Tables

Name	Status	Partition key	Sort key	Indexes	Total read capacity	Total write capacity
<input checked="" type="radio"/> Books	Active	ISBN (Number)	Genre (String)	0	5	5
<input type="radio"/> Movies	Active	Movie_ID (String)	-	0	5	5

DynamoDB Items and Attributes

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

Table name

Books

Overview Items Metrics Alarms Capacity Indexes Triggers Access control

Create item Actions

Scan: [Table] Books: ISBN, Genre Viewing 1 to 3 items

Scan [Table] Books: ISBN, Genre

+ Add filter

Start search

Items

	ISBN	Genre	Author	Book Name	Date of Release	Version Number
<input type="checkbox"/>	00003	Horror	Unknown	Terrible Mist...	Jan 21, 1990	01
<input type="checkbox"/>	00002	Romance	Unknown	Known Stran...	Jan 19, 1990	01
<input type="checkbox"/>	00001	Thriller	Unknown	Dark Secrets	Jan 15, 1990	01

Attribute

DynamoDB Items and Attributes

Each attribute of an item is a name-value pair.

An attribute can be:

Tables

Items and attributes

Primary Key

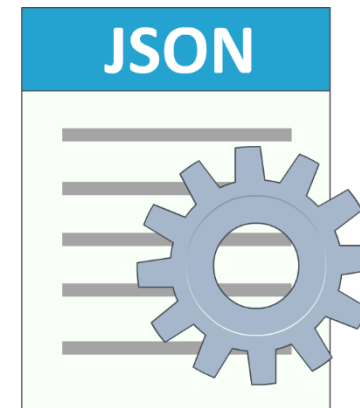
Secondary indexes

Data types

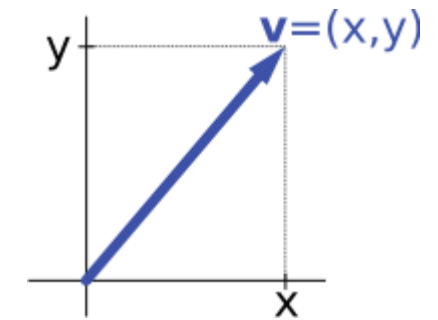
Item distribution

001, 002, 003, 004, 005....

Set of values



JSON format



A single value



The size of an item cannot go beyond 400 kilobytes. The size refers to the total length of its attribute values.

DynamoDB Primary Key

A Primary Key refers to the attribute whose value uniquely identifies each item or row so that no two rows have the same Primary Key value.

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

Edit item

Tree ▾

Item {6}

- Author String : Unknown
- Book Name String : Terrible Mistake
- Date of Release String : Jan 21, 1990
- Genre String : Horror
- ISBN Number : 00003**
- Version Number String : 01

Cancel Save



While adding, deleting, or updating an item, you need to state the value of its Primary Key. DynamoDB requires you to mention the Primary Key attribute, although it is not mandatory for you to define all other attribute names and their data types in advance.

Two Types of Primary Keys

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

Primary Keys

Partition Key

- Simple Primary Key, consists of a single attribute
- Its value acts as the input for a built-in hash function
- Also known as the hash attribute
- No two items can possess an identical partition key value

Composite Primary Key

- Has two attributes, Partition Key and Sort Key
- Use of the Partition Key remains the same
- There can be items that have the same partition key value
- Sort Key is also known as the range attribute

DynamoDB Secondary Indexes

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

Create index

Primary key*

Partition key

BookCode

String

☒ Add sort key

BookName

String

Index name*

BookCode-BookName-index

Projected attributes

All

Read capacity units

5

Write capacity units

5

Estimated cost

\$2.91 / month (Capacity calculator)

Approximate creation time is 5 minutes. Additional write capacity may decrease creation time. A notification will be sent to the SNS topic dynamodb once the index creation is complete. Basic Alarms with 80% upper threshold using SNS topic 'dynamodb' will be automatically created. Additional charges may apply if you exceed the AWS Free Tier levels for CloudWatch or Simple Notification Service. Advanced configuration for alarms can be done in the alarms tab.

Cancel

Create index



Through this query, you can efficiently retrieve all customers who have brought the specified book of that particular genre. You don't need to go through any other purchases.

Two Types of Secondary Indexes

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

Global Secondary Index

Has a Partition Key and a Sort Key. These may differ from those already defined for the table.

Local Secondary Index

Has the same Partition Key as the one already defined for the table, but it has a different Sort Key.



You can have up to five local and global secondary indexes per table.

Three DynamoDB Data Types

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

Scalar Data Types

Number, String, Binary, Boolean, and Null

Document Types

Lists and Maps

Set Data Types

String set, Binary set, and Number set

Scalar Data Type—Strings

Strings are Unicode characters with following features:

- Stored independently of the platform and software language in use
- Employ Unicode Transformation Format or U-T-F 8 binary encoding
- Each Unicode character has a unique decimal number or a code point
- Binary encoding determines how to transform these into binary numbers for storage purpose
- U-T-F 8 encoding uses up to four blocks, each 8 bits long, to represent a character into its binary state

Tables

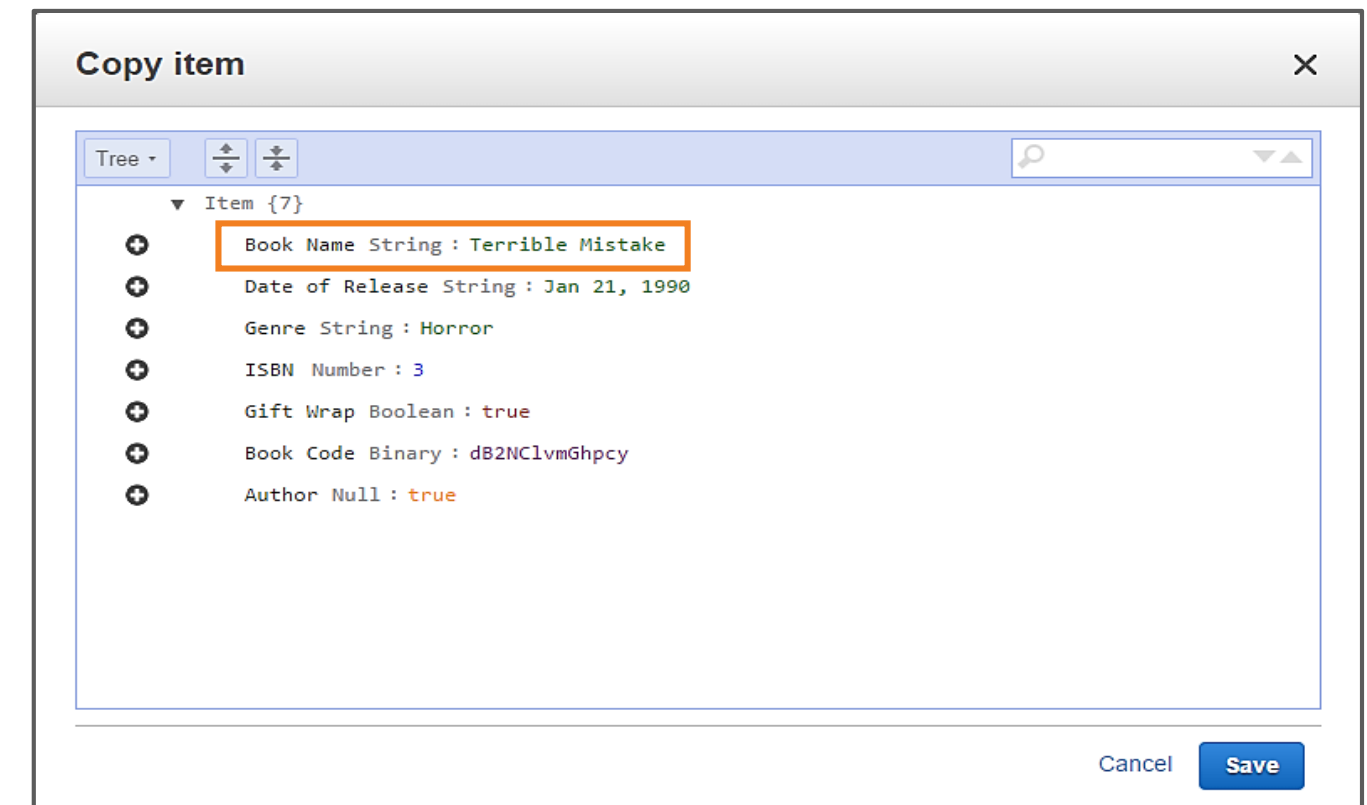
Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution



String

Scalar Data Type—Strings

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

- No maximum limit for the size of a string value when you assign it to an attribute
- Not applicable to the primary key attribute
- At the time of sorting, string values are compared to the American Standard Code for Information Interchange or ASCII character code values

Scalar Data Type—Strings

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

AWS

Services

Edit

User One

Oregon

Support

Books

Overview

Items

Metrics

Alarms

Capacity

Indexes

Triggers

Access control

Create item

Actions

Scan: [Table] Books: ISBN, Genre

Viewing 1 to 4 items

Scan

[Table] Books: ISBN, Genre

+

Add filter

Start search

	ISBN	Genre	Author	Book Name	Date of Release	Version Number
<input type="checkbox"/>	4	Horror	Unknown	terrible mistake	Jan 21, 1990	01
<input type="checkbox"/>	3	Horror	Unknown	Terrible Mist...	Jan 21, 1990	01
<input type="checkbox"/>	2	Romance	Unknown	Known Stran...	Jan 19, 1990	01
<input type="checkbox"/>	1	Thriller	Unknown	Dark Secrets	Jan 15, 1990	01

Feedback

English

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AS-CII value of "t" is greater than that of "T."

AS-CII value of "2" is greater than that of "1."

Sorted String

Scalar Data Type—Numbers

A number can be zero, positive, or negative with following features:

- Has a variable length but the limit of precision is only up to 38 digits
- If there are any trailing and leading zeroes, they are trimmed
- All numbers are sent as string values to DynamoDB so that the maximum compatibility is ensured across languages
- For mathematical operations, DynamoDB considers all such values as numbers

Tables

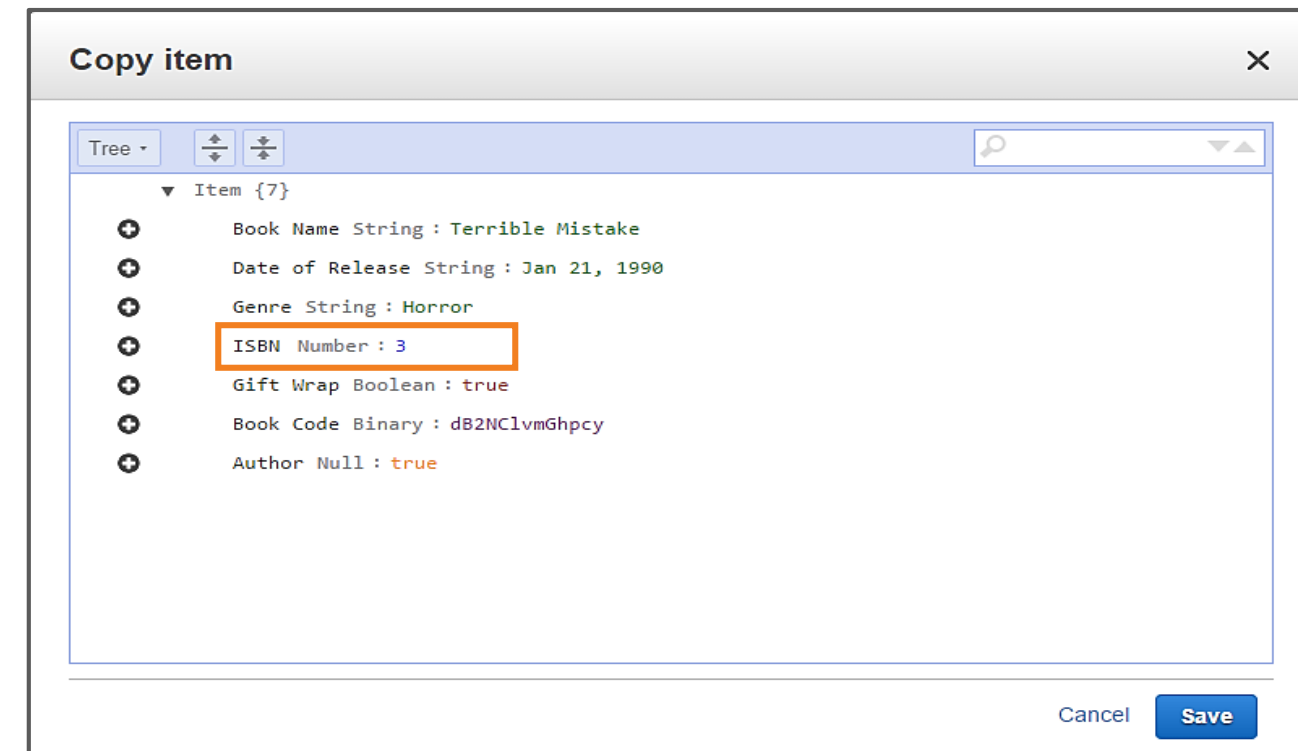
Items and attributes

Primary Key

Secondary indexes

Data types

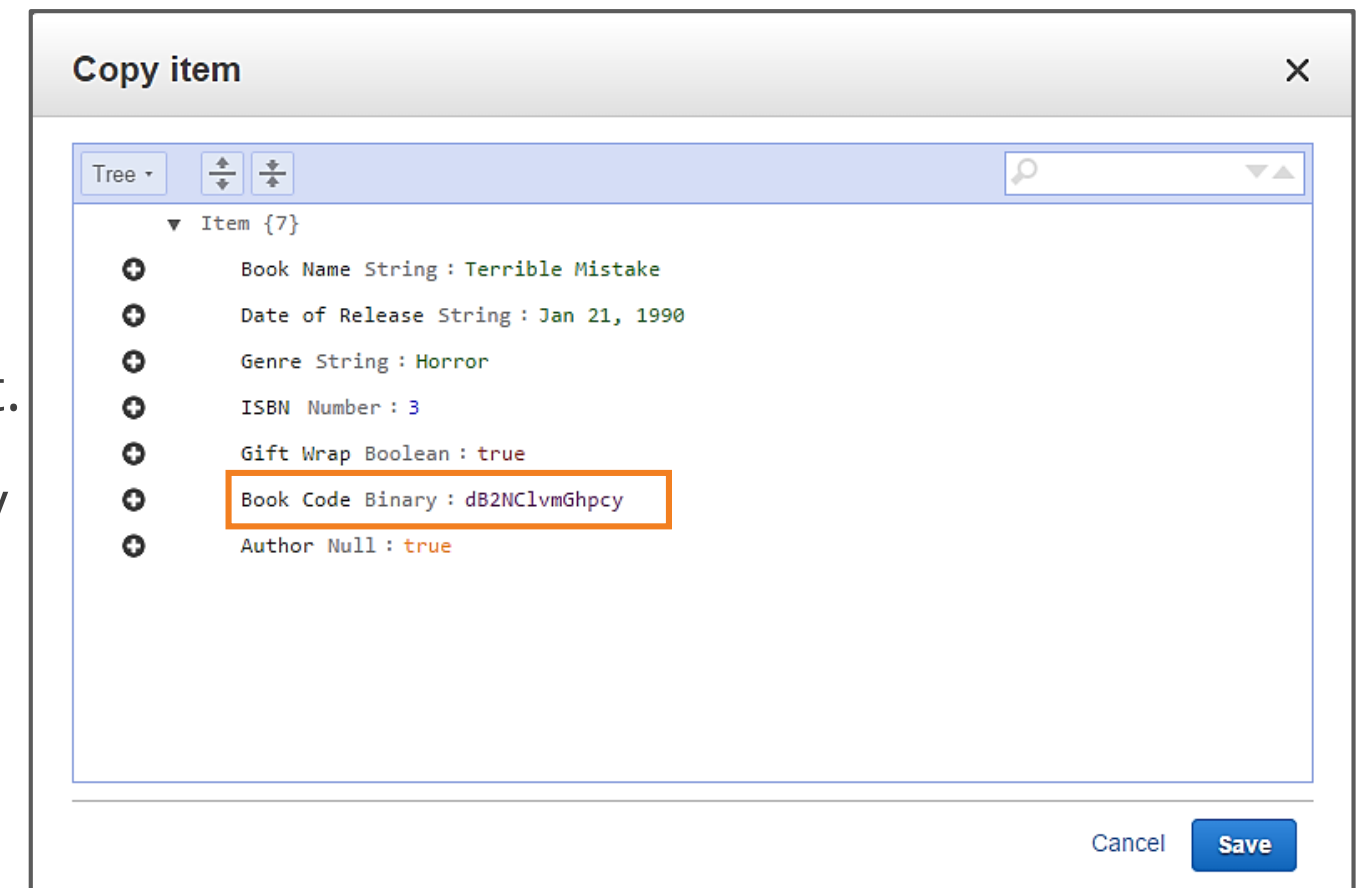
Item distribution



Scalar Data Type—Binary

Binary type attributes can have any kind of binary values such as images and compressed data with following features:

- While comparing binary values at the time of processing a query, each byte is treated as unsigned, meaning it is accepted without negative values.
- For processing in DynamoDB, your applications need to encode the binary values by using the Base64 format.
- When DynamoDB obtains this encoded data, it decodes it into an unsigned byte set.
- There is no upper limit to how long a binary value can be, except for the primary key value.



Scalar Data Type—Boolean

A Boolean type attribute can have one of the two values, namely true or false.

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

The screenshot shows a 'Copy item' dialog box with a close button (X) in the top right corner. Inside the dialog, there is a 'Tree' view with a search bar and expand/collapse icons. The tree shows a single item, 'Item {7}', which is expanded to reveal a list of attributes. The attributes are:

- Book Name String : Terrible Mistake
- Date of Release String : Jan 21, 1990
- Genre String : Horror
- ISBN Number : 3
- Gift Wrap Boolean : true** (highlighted with an orange box)
- Book Code Binary : dB2NClvmGhpcy
- Author Null : true

At the bottom right of the dialog, there are 'Cancel' and 'Save' buttons.

Scalar Data Type—Null

The null type attribute indicates an unknown or undefined state with following features:

- The value of such an attribute is always 'NULL', which can never be set as a value for a primary key attribute.

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

The screenshot shows a 'Copy item' dialog box with a close button (X) in the top right corner. Inside the dialog, there is a search bar and a tree view. The tree view is expanded to show 'Item {7}'. Under this item, there is a list of attributes, each with a plus icon to its left. The attributes are: 'Book Name String : Terrible Mistake', 'Date of Release String : Jan 21, 1990', 'Genre String : Horror', 'ISBN Number : 3', 'Gift Wrap Boolean : true', 'Book Code Binary : dB2NC1vmGhpcy', and 'Author Null : true'. The 'Author Null : true' attribute is highlighted with an orange rectangular box. At the bottom right of the dialog, there are 'Cancel' and 'Save' buttons.

Document Data Types

The document data types include lists and maps with following features:

Tables

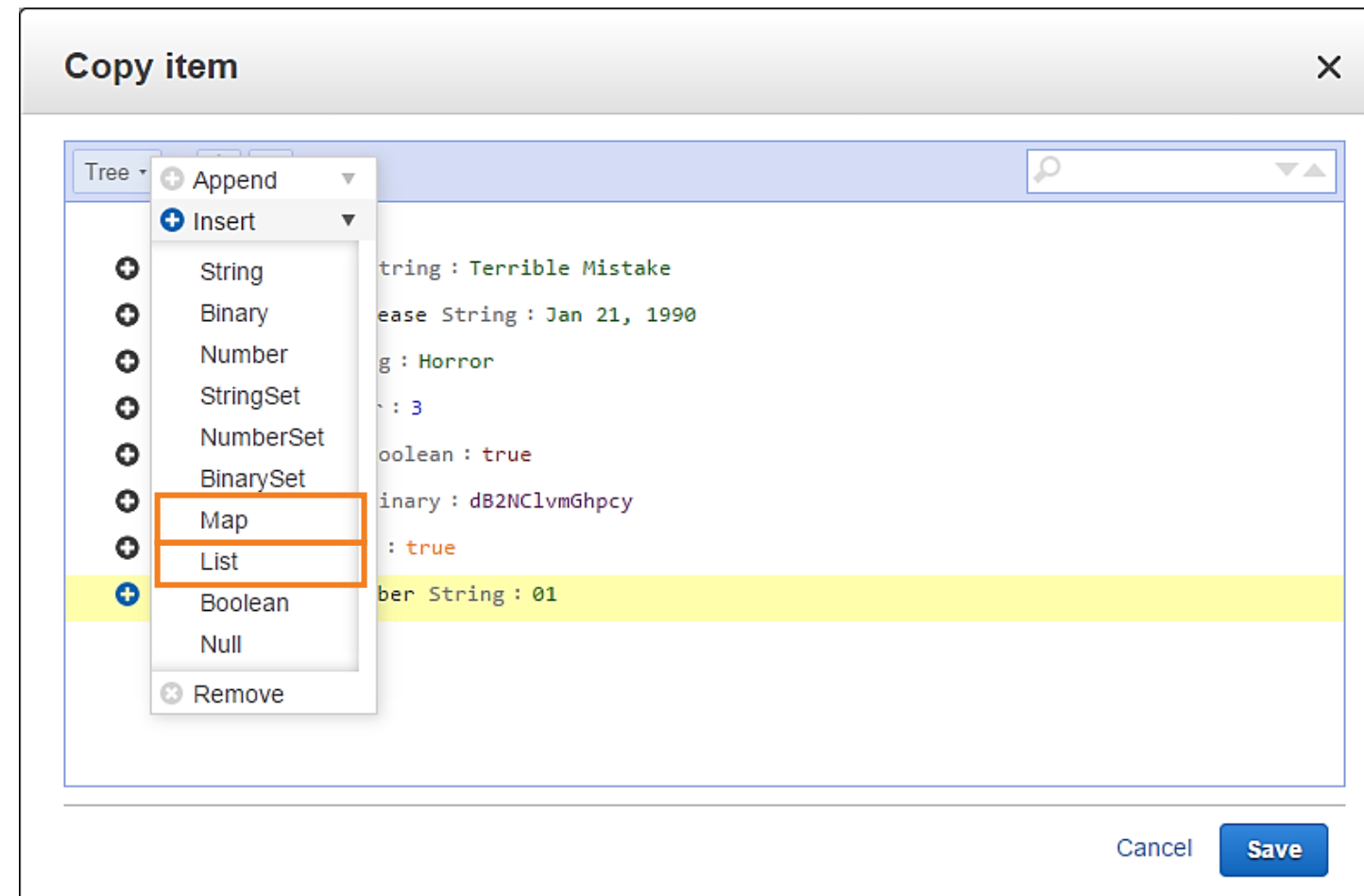
Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution



Set Data Types

DynamoDB also accepts string sets, binary sets, and number sets with following features:

Tables

Items and attributes

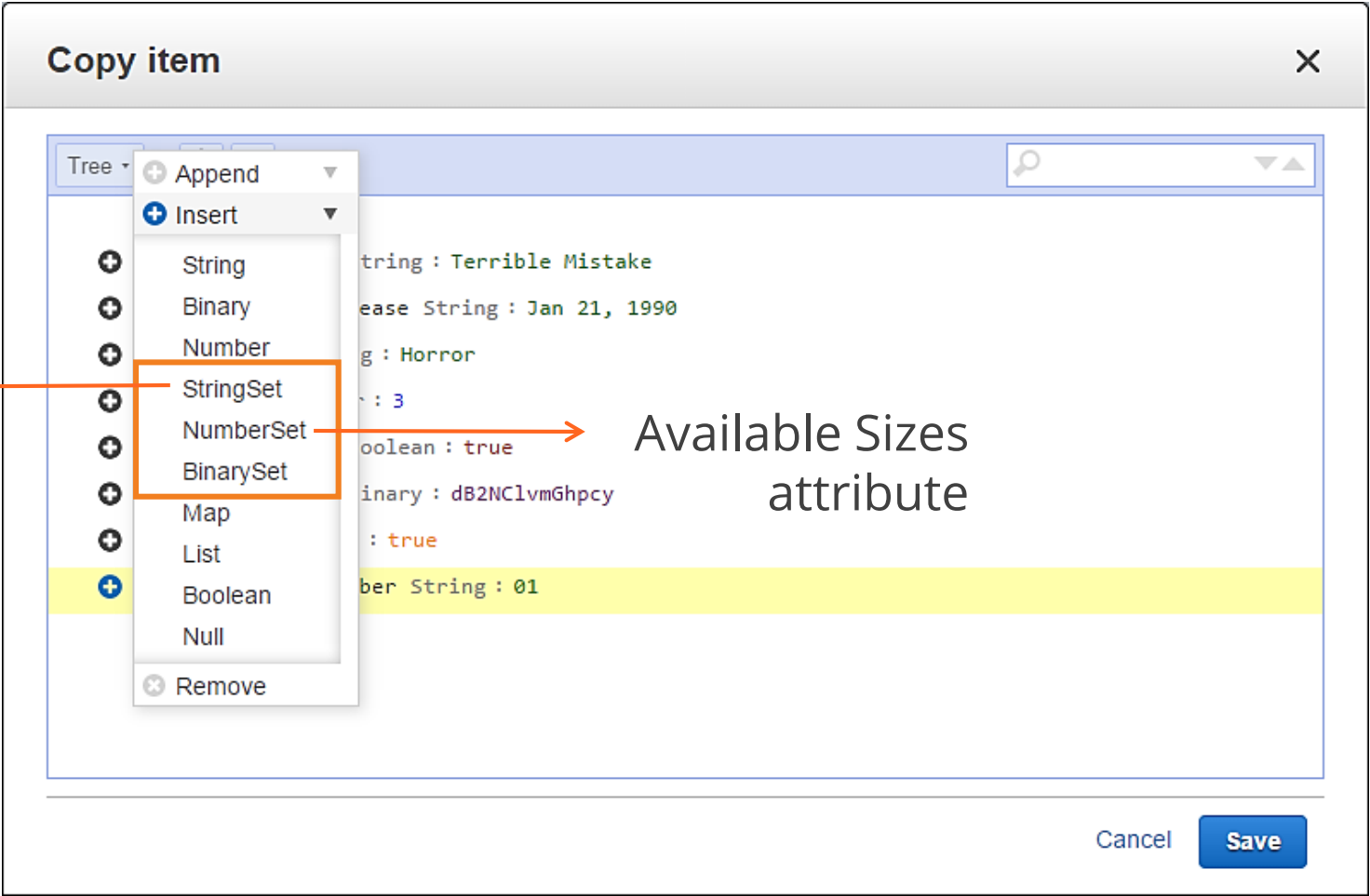
Primary Key

Secondary indexes

Data types

Item distribution

Author Name
attribute



Sort Key



The values or elements in each of these sets must be unique as you cannot repeat any value in a set. It is possible to have an empty set. Sets do not follow an order, that is, the values are not retrieved in a fixed order.

Item Distribution

DynamoDB stores data in separate partitions. A partition refers to a storage space allocated for a table, which is supported by S-S-Ds and managed fully by DynamoDB.

Tables

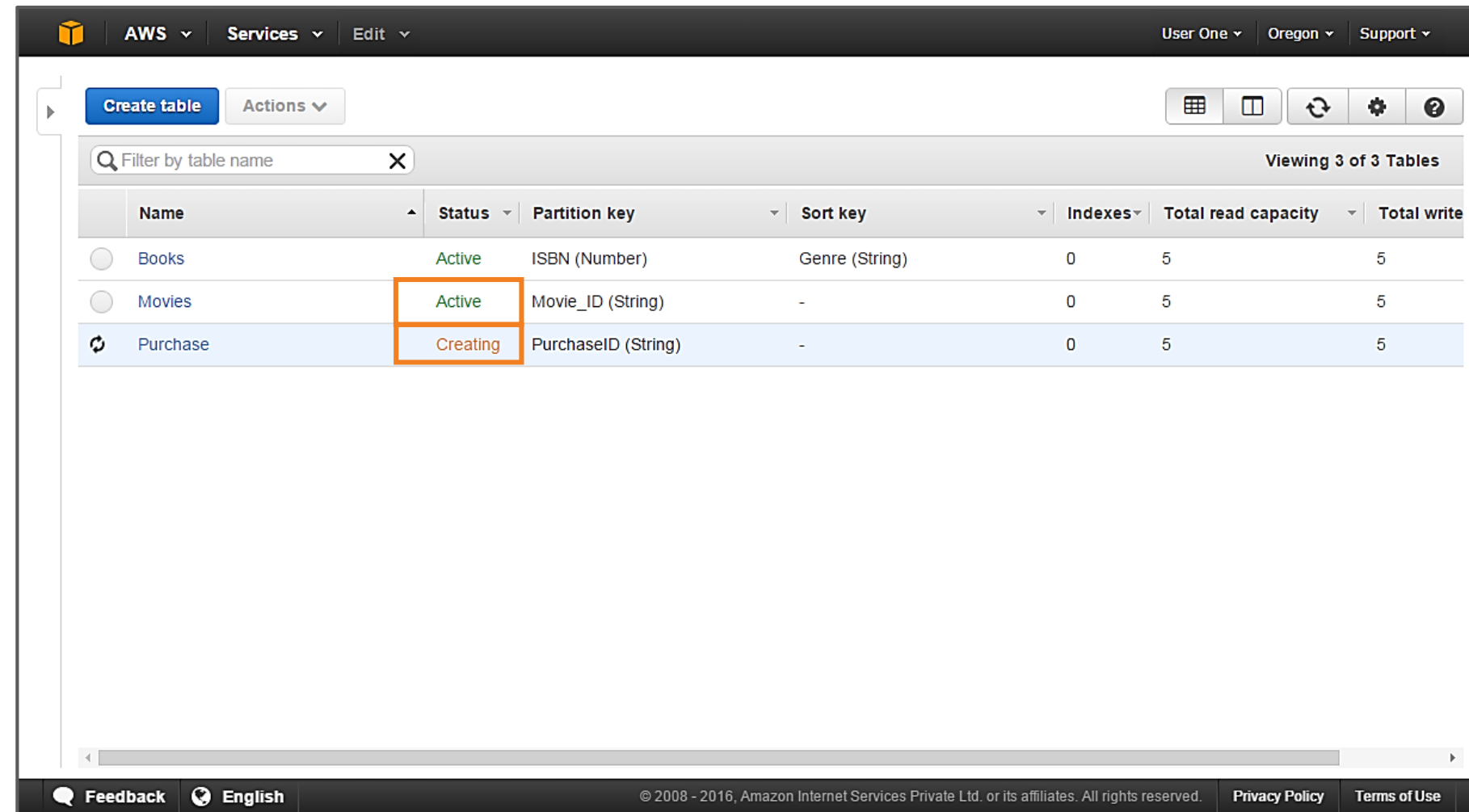
Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution



The screenshot shows the AWS Management Console interface for DynamoDB. At the top, there's a navigation bar with 'AWS', 'Services', and 'Edit' dropdowns, along with user and region information. Below this, a 'Create table' button and an 'Actions' dropdown are visible. A search bar for filtering by table name is present. The main content area displays a table with 3 rows and 8 columns: Name, Status, Partition key, Sort key, Indexes, Total read capacity, and Total write. The 'Purchase' table is highlighted in blue, and its 'Status' is 'Creating', which is enclosed in an orange box. The other two tables, 'Books' and 'Movies', have a status of 'Active'.

Name	Status	Partition key	Sort key	Indexes	Total read capacity	Total write
Books	Active	ISBN (Number)	Genre (String)	0	5	5
Movies	Active	Movie_ID (String)	-	0	5	5
Purchase	Creating	PurchaseID (String)	-	0	5	5

Table in the CREATING State



Once the maximum capacity of this partition is reached, DynamoDB assigns another partition and distributes items between the old and new partitions.

Item Distribution

DynamoDB never combines the allocated partitions. It also never deallocates the allocated partitions. If you delete some or all items from the table, the corresponding partitions will still remain allocated to the table.

Tables

Items and attributes

Primary Key

Secondary indexes

Data types

Item distribution

Primary Key

Books

Overview Items Metrics Alarms Capacity Indexes Triggers Access control

Create item Actions

Scan: [Table] Books: ISBN, Genre

Viewing 1 to 4 items

Scan	[Table] Books: ISBN, Genre	+
+	Add filter	
Start search		

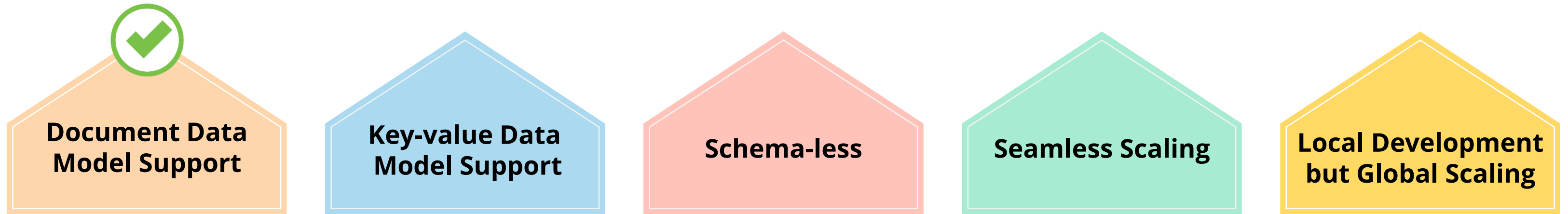
ISBN	Genre	Author	Book Name	Date of Release	Version Number
3	Horror	Unknown	Terrible Mist...	Jan 21, 1990	01
2	Romance	Unknown	Known Stran...	Jan 19, 1990	01
4	Horror	Unknown	terrible mistake	Jan 21, 1990	01
1	Thriller	Unknown	Dark Secrets	Jan 15, 1990	01

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Sort Key

Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:



DynamoDB allows storing, updating, and querying documents written in the JSON format. These documents are stored directly into tables. Because you can add, retrieve, update, and delete items of a table throughout a graphical interface, there is no need to write new code to perform these tasks for the JSON documents stored in that table.

**Strong Consistency,
Atomic Counters**

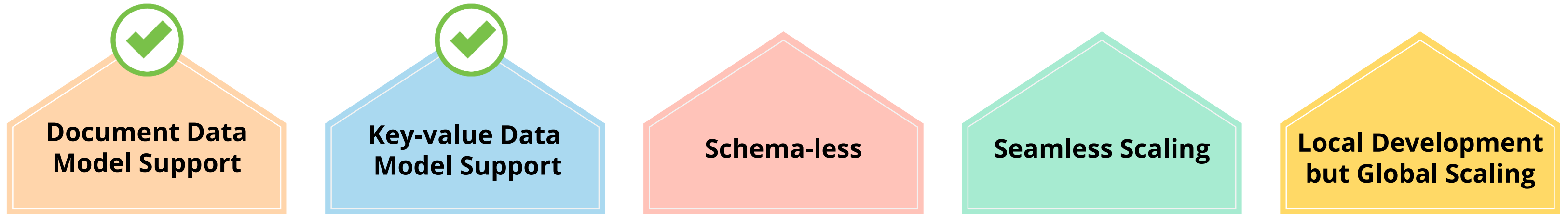
**Integrated
Monitoring**

Security

**Integration
with AWS
Data Pipeline**

Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:



Each item or row in a table has a key-value pair. Here, only the Primary Key column is mandatory for each row as its value identifies each row uniquely in the table.

**Strong Consistency,
Atomic Counters**

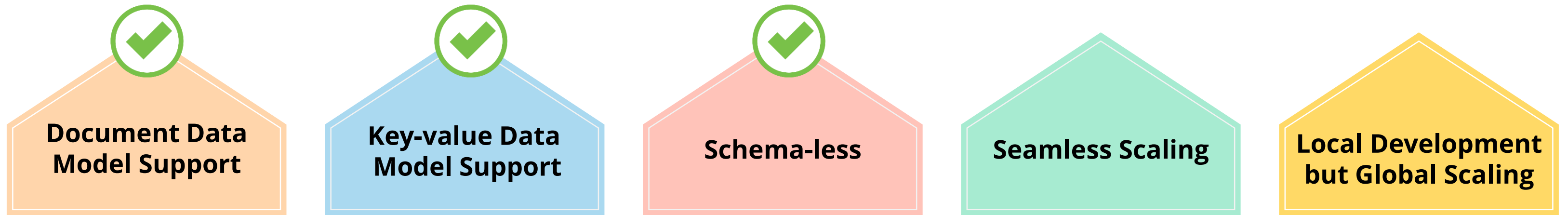
**Integrated
Monitoring**

Security

**Integration
with AWS
Data Pipeline**

Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:



DynamoDB has no schema, which means that each row in a table need not have the same attributes or even the same number of attributes. The items can have attribute values of different data types, such as strings, binary values, numbers, and sets.

**Strong Consistency,
Atomic Counters**

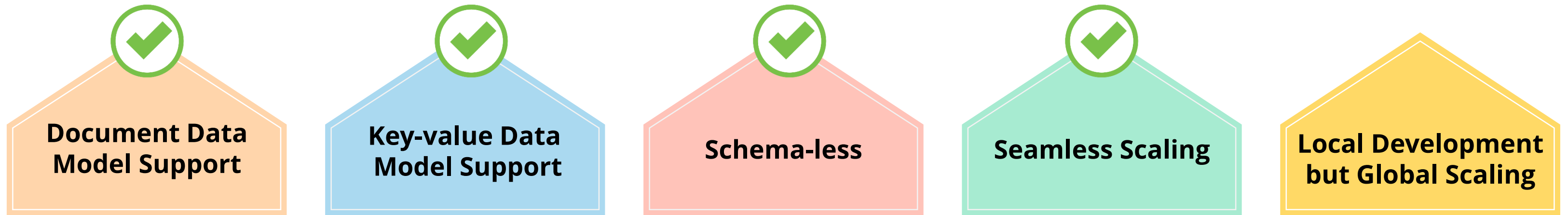
**Integrated
Monitoring**

Security

**Integration
with AWS
Data Pipeline**

Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:



DynamoDB ensures flawless storage and throughput scaling through both the AWS Management Console and Application Program Interface (API). There is no maximum limit for you to demand the storage size or read or write throughput.

**Strong Consistency,
Atomic Counters**

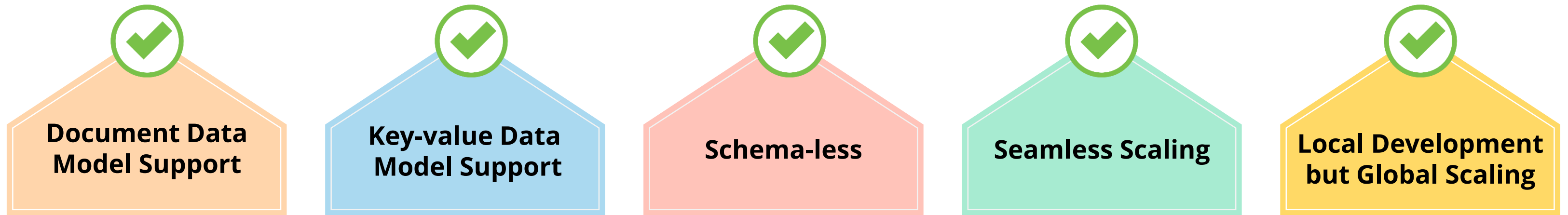
**Integrated
Monitoring**

Security

**Integration
with AWS
Data Pipeline**

Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:



DynamoDB allows you to build and test applications easily on an EC2 instance in the cloud. Once these applications are ready, DynamoDB allows you scale them quickly in the cloud.

**Strong Consistency,
Atomic Counters**

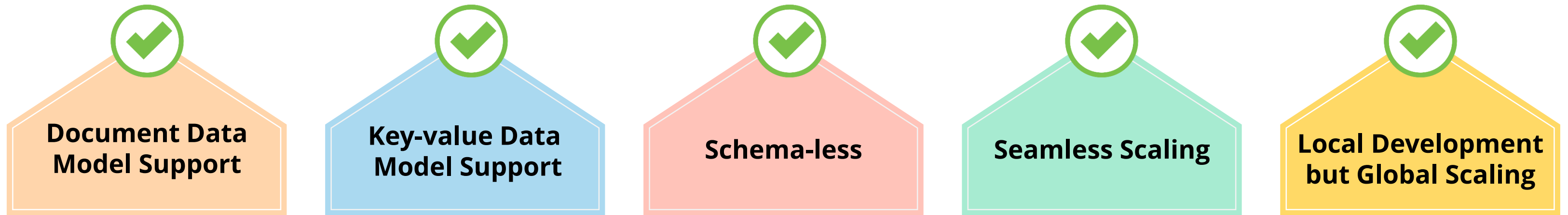
**Integrated
Monitoring**

Security

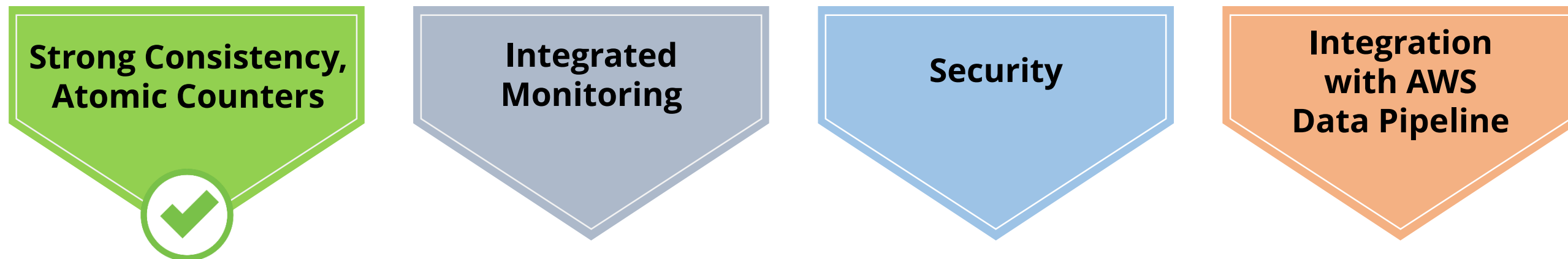
**Integration
with AWS
Data Pipeline**

Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:

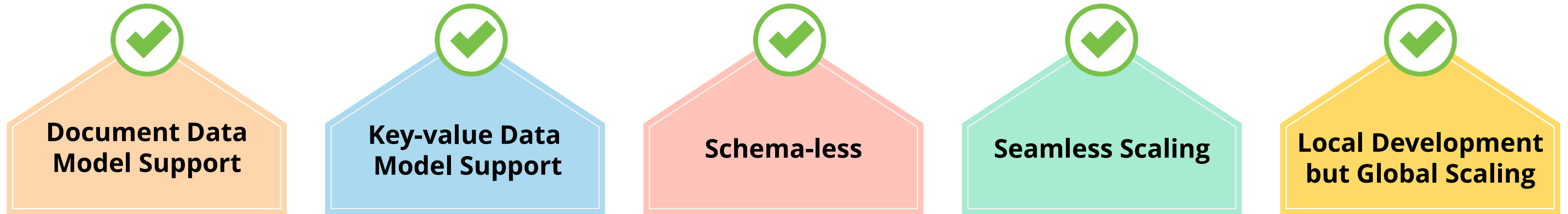


As compared with several other non-relational databases, DynamoDB ensures easier development of your database environment. It does so by employing strong consistency on reads so that you can read only the latest values. Atomic counters allow you increase or decrease numerical attributes in the atomic manner, through an A-P-I call.

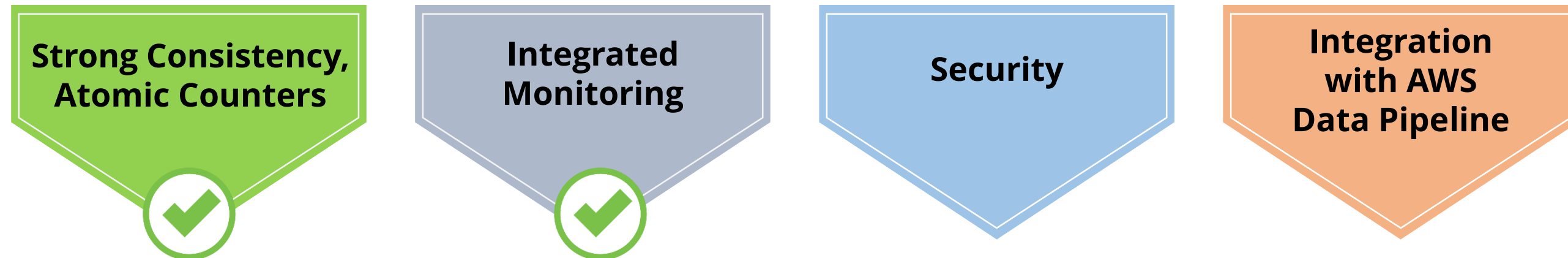


Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:

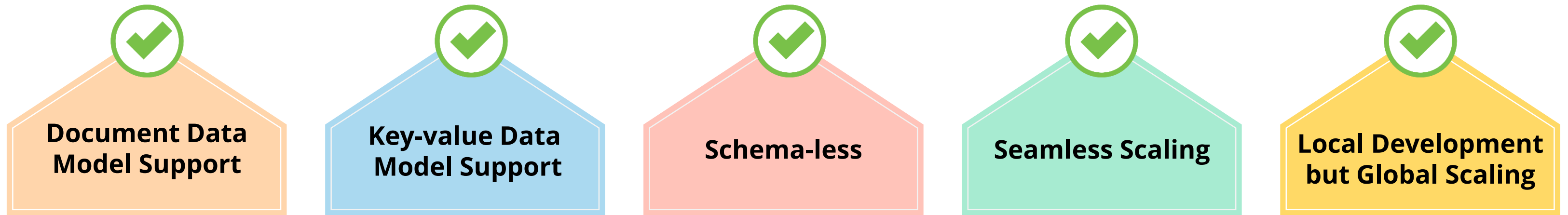


Apart from making major operational metrics available through the AWS Management Console, DynamoDB integrates with CloudWatch to comprehensively monitor your databases.

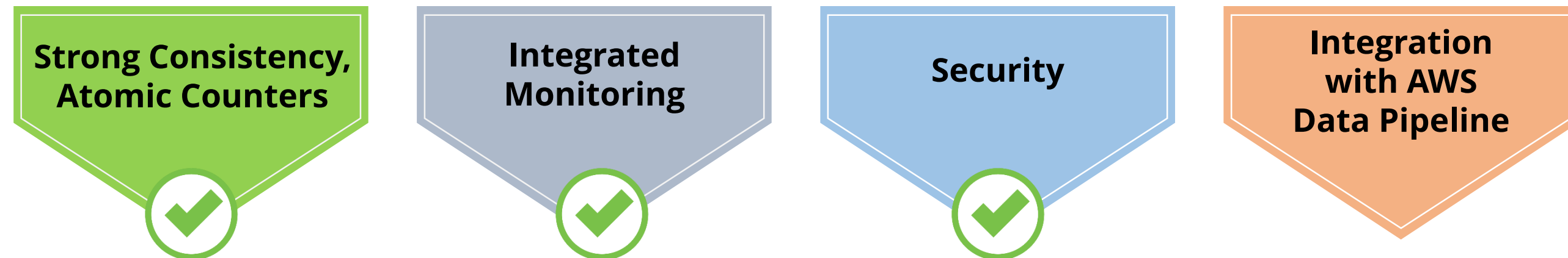


Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:

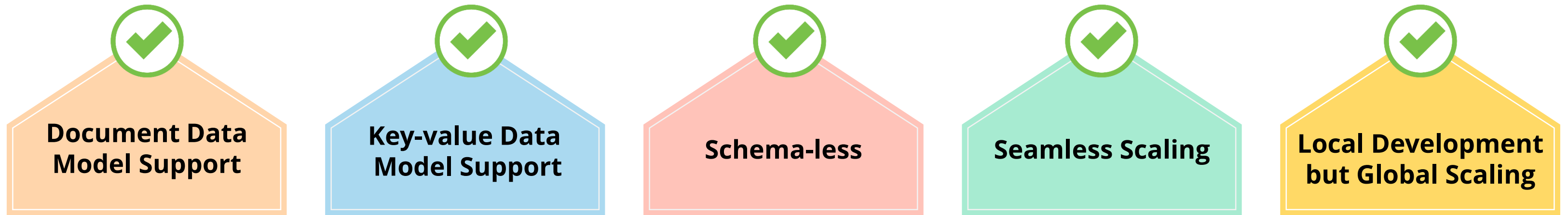


DynamoDB also integrates with the AWS Identity and Access Management service to control access permissions for your organizational users.

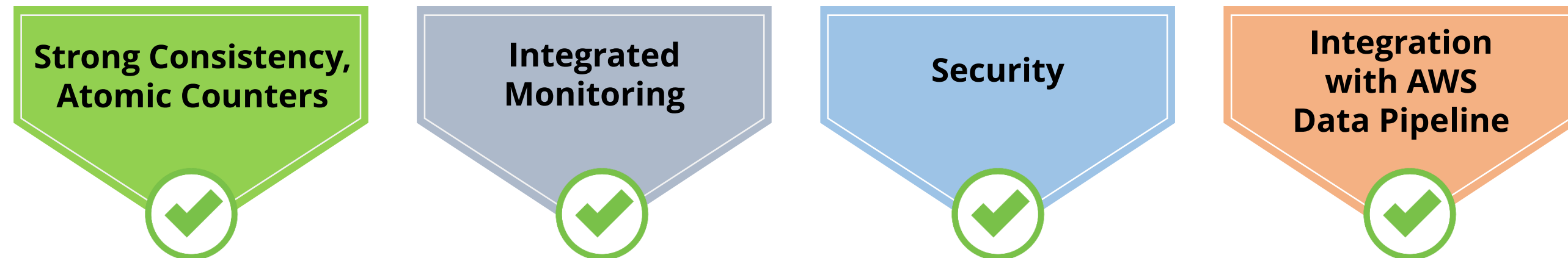


Nine DynamoDB Features

Amazon DynamoDB offers the following salient features:



This integration allows you to automatically move and transform data into and out of DynamoDB. You can schedule and run recurring jobs without any kind of programming.



Five New DynamoDB Features

Streams

- Is a timed sequence of changes at the item level in a table
- Helps track the latest changes or updates in the last 24 hours
- Helps take backups, analyze trends, and create innovative applications for replication

Cross-region Replication

- Replicates its tables over several regions, without any intervention
- Helps develop globally distributed applications with quicker data migration, better traffic management, lower-latency access, and effortless disaster recovery

Triggers

- Integrates with Lambda to offer triggers
- Helps execute a user-defined task or function when a change occurs at an item level in the desired table

Free-text Search

- Offers a quick and easy-to-use search facility
- Enables you to search its content, such as keywords, tags, and locations

Integration with Titan Graph Database

- Allows efficient storage and navigation through the graphs
- Enables you to optimize graphs for quick navigation

Demonstrate how to create a table and add items to that table.



Demo 02—Query a Table

(Refer to the E-Learning course: Screen Number – 5.4)

Demonstrate how to query a table.



Knowledge Check

KNOWLEDGE
CHECK
1

Which service offers NoSQL databases?

- a. AWS CloudWatch
- b. AWS CloudFormation
- c. AWS DynamoDB
- d. AWS CloudFront



KNOWLEDGE
CHECK
1

Which service offers NoSQL databases?

- a. AWS CloudWatch
- b. AWS CloudFormation
- c. AWS DynamoDB
- d. AWS CloudFront



The correct answer is **c.**

Explanation: Amazon DynamoDB refers to a service that offers NoSQL databases. It operates **fast, according** to expected **performance, and** scales flawlessly.

KNOWLEDGE
CHECK
2

Choose the correct types of Secondary Index. *Select all that apply.*

- a. Global Secondary Index
- b. Alternate Secondary Index
- c. Multiple Secondary Index
- d. Local Secondary Index



KNOWLEDGE
CHECK
2

Choose the correct types of Secondary Index. *Select all that apply.*

- a. Global Secondary Index
- b. Alternate Secondary Index
- c. Multiple Secondary Index
- d. Local Secondary Index



The correct answer is **a and d.**

Explanation: Global secondary index has partition and **Sort Keys** that may differ from those defined for the table. Local secondary index has the same **Partition Key** as the one defined in the table but has a different **Sort Key**.

Amazon Relational Database Service

Introduction to Amazon Relational Database Service

Amazon RDS refers to a Web Service aimed at setting up, running, and scaling a relational database automatically in the cloud.



Offers profitable, resizable capacity for a database



Handles time-consuming and tiresome administrative tasks



Free to concentrate on other business tasks



Fully managed service

Six Popular Database Engines

The Oracle logo consists of the word "ORACLE" in a bold, red, sans-serif font.

Oracle



MySQL



Microsoft SQL



PostgreSQL



Maria DB



Amazon Aurora

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Eight Reasons for Using Amazon RDS



Scalability

Makes it easy to scale database resources

01



Handling critical tasks

Handles critical tasks on its own, such as software patching, backups, failure detection, and recovery

02



Fast service

Provides different sizing options for a database server, which are up to 244 Gigabytes and 32 vCPUs

03



Database engine

A familiar database engine can be chosen and used

04

Eight Reasons for Using Amazon RDS



High availability & reliability

Service copies data synchronously to a reserved instance residing in another Availability Zone and allows taking automatic backups or snapshots whenever you want

05



Tracking performance of relational database instances

Allows tracking by offering the CloudWatch metrics for free

06



Low rates

You pay low rates and only for the resources you use

07




Security and full control

Ensured over who can access what from your relational databases

08

Four Amazon RDS Components

 AWS

Services

Edit

RDS Dashboard

Instances

Reserved Purchases

Snapshots

Security Groups

Parameter Groups


Option Groups

Subnet Groups

Events

Event Subscriptions

Notifications

 **Amazon RDS for Aurora**

Amazon Aurora is a MySQL-compatible, enterprise-class database at 1/10th the cost of commercial databases. Aurora is available in multiple Availability Zones. [Learn more.](#)

Aurora is available in US East (N. Virginia), US West (Oregon), EU (Ireland) and Asia Pacific (Tokyo).

Launch an Aurora DB Instance

Resources

You are using the following Amazon RDS resources in the US West (Oregon) region (used/quota):

DB Instances (1/40)	Parameter Groups (1)
Allocated Storage (5.00 GB/100.00 TB)	Default (1)
Click here to increase DB instances limit	Custom (0/100)
Reserved DB Purchases (0/40)	Option Groups (1)
Snapshots (11)	Default (1)
Manual (0/50)	Custom (0/20)
Automated (11)	Subnet Groups (1/20)
Recent Events (2)	Supported Platforms VPC
Event Subscriptions (0/20)	Default Network vpc-51a28e34

Create Instance

Amazon Relational Database Service (RDS) makes it easy to set up, operate, and scale a relational database in the cloud.

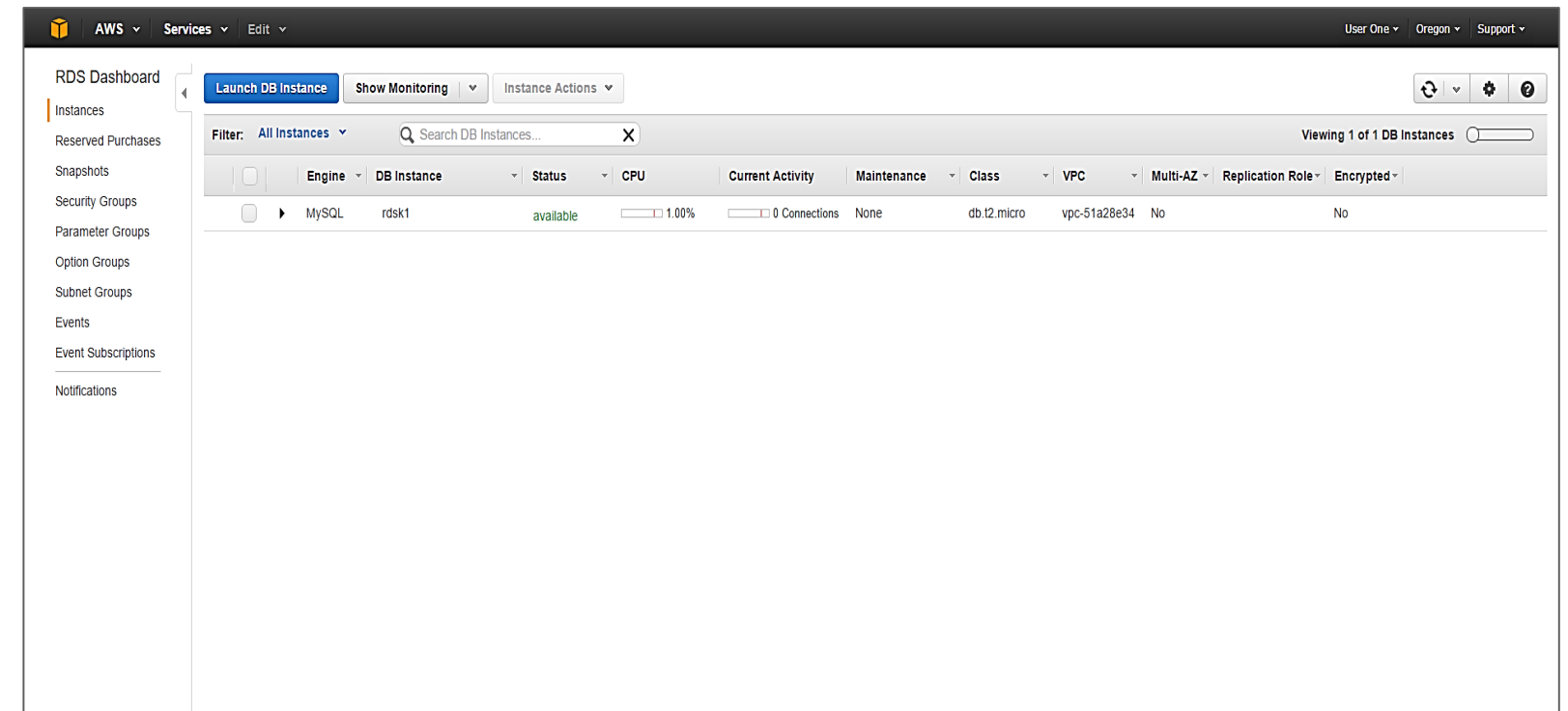
Launch a DB Instance

Note: Your DB Instances will launch in the US West (Oregon) region:

DB Instances

Regarded as the building block of Amazon R-D-S, a DB instance refers to a secluded database environment containing several created databases with following features:

- Can store from five Gigabytes to six Terabytes of data
- Each such instance has a DB engine and a set of parameters to control the database behavior
- At the time of creating the instance, the DB engine is loaded automatically with its own set of features
- You may get new features if you choose the latest version of the engine while creating the instance
- You can make the necessary changes to a DB instance whenever required



DB Instance Class

The R-D-S service uses a DB instance class to identify the computing and memory capacity of an instance.

Step 1: Select Engine

Step 2: Production?

Step 3: Specify DB Details

Step 4: Configure Advanced Settings

The following selections disqualify the instance from being eligible for the free tier:

- Allocated Storage > 20GB

Learn More.

Estimate your monthly costs for the DB Instance using the [RDS Instance Cost Calculator](#).

Specify DB Details

Instance Specifications

DB Engine

mysql

License Model

general-public-license

DB Engine Version

5.6.23

Review the [Known Issues/Limitations](#) to learn about potential compatibility issues with specific database versions.

DB Instance Class

- Select One -

- Select One -

db.t2.micro — 1 vCPU, 1 GiB RAM

db.t2.small — 1 vCPU, 2 GiB RAM

db.t2.medium — 2 vCPU, 4 GiB RAM

db.t2.large — 2 vCPU, 8 GiB RAM

db.m4.large — 2 vCPU, 8 GiB RAM

db.m4.xlarge — 4 vCPU, 16 GiB RAM

db.m4.2xlarge — 8 vCPU, 32 GiB RAM

db.m4.4xlarge — 16 vCPU, 64 GiB RAM

db.m4.10xlarge — 40 vCPU, 160 GiB RAM

db.m3.medium — 1 vCPU, 3.75 GiB RAM

db.m3.large — 2 vCPU, 7.5 GiB RAM

db.m3.xlarge — 4 vCPU, 15 GiB RAM

db.m3.2xlarge — 8 vCPU, 30 GiB RAM

db.r3.large — 2 vCPU, 15 GiB RAM

db.r3.xlarge — 4 vCPU, 30.5 GiB RAM

db.r3.2xlarge — 8 vCPU, 61 GiB RAM

db.r3.4xlarge — 16 vCPU, 122 GiB RAM

db.r3.8xlarge — 32 vCPU, 244 GiB RAM

db.m2.xlarge — 2 vCPU, 17.1 GiB RAM

Multi-AZ Deployment

Storage Type

Allocated Storage*

Settings

DB Instance Identifier*

Master Username*

Master Password*

Confirm Password*

Select the DB instance class that allocates the computational, network, and memory capacity required by planned workload of this DB instance. [Learn More.](#)

* Required

Cancel

Previous

Next Step

DB Instance Storage Types

Three types of DB Instance Storage:

1. General Purpose S-S-D
2. Provisioned IOPS S-S-D
3. Magnetic

Step 1: [Select Engine](#)
Step 2: [Production?](#)
Step 3: Specify DB Details
Step 4: [Configure Advanced Settings](#)

Specify DB Details

Instance Specifications

DB Engine: mysql
License Model: general-public-license
DB Engine Version: 5.6.23

DB Instance Class: db.t2.micro — 1 vCPU, 1 GiB RAM
Multi-AZ Deployment: - Select One -
Storage Type: General Purpose (SSD) (selected)
Allocated Storage*: - Select One -
General Purpose (SSD)
Provisioned IOPS (SSD)
Magnetic

Settings

DB Instance Identifier*:
Master Username*:
Master Password*:
Confirm Password*:

* Required

[Cancel](#) [Previous](#) [Next Step](#)

Storage Type Descriptions:

- General Purpose (SSD)** storage is suitable for a broad range of database workloads. Provides baseline of 3 IOPS/GB and ability to burst to 3,000 IOPS.
- Provisioned IOPS (SSD)** storage is suitable for I/O-intensive database workloads. Provides flexibility to provision I/O ranging from 1,000 to 30,000 IOPS.
- Magnetic** storage may be used for small database workloads where data is accessed less frequently.

To learn more about these storage options please [click here](#)



Each of these types is different in terms of price and performance aspects so that you can customize your storage cost and performance according to your database requirements.

DB Instances in Regions and Availability Zones

Launch the DB instances in different Availability Zones, as it can prevent your applications from being affected by the failure to access a database stored at one location.

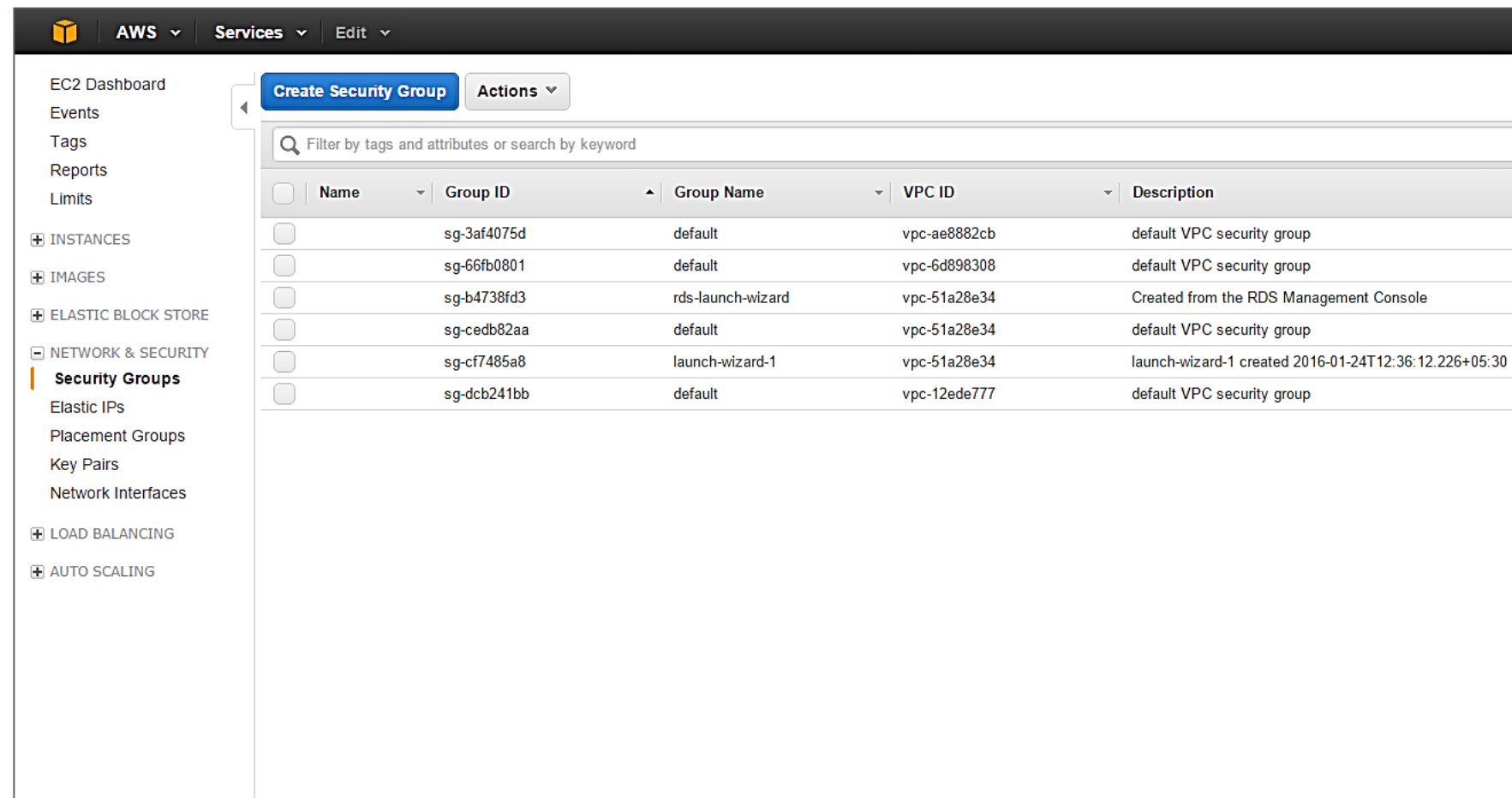
The screenshot shows the 'Specify DB Details' step in the AWS Management Console. On the left, a sidebar lists four steps: Step 1: Select Engine, Step 2: Production?, Step 3: Specify DB Details (current), and Step 4: Configure Advanced Settings. Below the steps, there are two informational messages. The first message states that certain selections disqualify the instance from the free tier, specifically 'Allocated Storage > 20GB', with a 'Learn More' link. The second message prompts the user to estimate monthly costs using the 'RDS Instance Cost Calculator'.

The main content area is titled 'Specify DB Details' and is divided into two sections: 'Instance Specifications' and 'Settings'. In the 'Instance Specifications' section, the following fields are visible: 'DB Engine' set to 'mysql', 'License Model' set to 'general-public-license', 'DB Engine Version' set to '5.6.23', 'DB Instance Class' set to 'db.t2.micro — 1 vCPU, 1 GiB RAM', 'Multi-AZ Deployment' set to 'No', 'Storage Type' set to 'Yes', and 'Allocated Storage*' set to '100 GB'. A blue callout box with a speech bubble icon is positioned above the 'Multi-AZ Deployment' and 'Storage Type' fields, containing the text: 'Review the [Known Issues/Limitations](#) to learn about potential compatibility issues with specific database versions.' To the right of the 'Multi-AZ Deployment' dropdown, there is a detailed explanation: 'Select Yes to have Amazon RDS maintain a synchronous standby replica in a different Availability Zone than the DB instance. Amazon RDS will automatically fail over to the standby in the case of a planned or unplanned outage of the primary. [Learn More](#).' The 'Settings' section contains four required fields: 'DB Instance Identifier*', 'Master Username*', 'Master Password*', and 'Confirm Password*'. At the bottom left, there is a note '* Required'. At the bottom right, there are three buttons: 'Cancel', 'Previous', and 'Next Step'.

Security Groups

A security group aims to control access to a DB instance. The RDS service utilizes three different security groups:

1. DB security groups for DB instances not in a V-P-C
2. E-C-2 security groups for DB instances
3. V-P-C security groups for DB instances in a V-P-C



AWS Services Edit					
EC2 Dashboard Events Tags Reports Limits					
+ INSTANCES					
+ IMAGES					
+ ELASTIC BLOCK STORE					
- NETWORK & SECURITY					
Security Groups					
Elastic IPs					
Placement Groups					
Key Pairs					
Network Interfaces					
+ LOAD BALANCING					
+ AUTO SCALING					
Create Security Group Actions					
Filter by tags and attributes or search by keyword					
<input type="checkbox"/>	Name	Group ID	Group Name	VPC ID	Description
<input type="checkbox"/>		sg-3af4075d	default	vpc-ae8882cb	default VPC security group
<input type="checkbox"/>		sg-66fb0801	default	vpc-6d898308	default VPC security group
<input type="checkbox"/>		sg-b4738fd3	rds-launch-wizard	vpc-51a28e34	Created from the RDS Management Console
<input type="checkbox"/>		sg-cedb82aa	default	vpc-51a28e34	default VPC security group
<input type="checkbox"/>		sg-cf7485a8	launch-wizard-1	vpc-51a28e34	launch-wizard-1 created 2016-01-24T12:36:12.226+05:30
<input type="checkbox"/>		sg-dcb241bb	default	vpc-12ede777	default VPC security group

Security Groups

DB security group rules are only for inbound traffic as outbound traffic is currently prohibited for DB instances.



Name	Group ID	Group Name	VPC ID	Description
launch-wizard-1	sg-cf7485a8	launch-wizard-1	vpc-51a28e34	launch-wizard-1 created 2016-01-24T12:36:12.226+05:30
default	sg-dcb241bb	default	vpc-12ede777	default VPC security group

Security Group: sg-dcb241bb

Description Inbound Outbound Tags

Edit

Type	Protocol	Port Range	Source
All traffic	All	All	sg-dcb241bb (default)

Inbound Traffic



Name	Group ID	Group Name	VPC ID	Description
launch-wizard-1	sg-cf7485a8	launch-wizard-1	vpc-51a28e34	launch-wizard-1 created 2016-01-24T12:36:12.226+05:30
default	sg-dcb241bb	default	vpc-12ede777	default VPC security group

Security Group: sg-dcb241bb

Description Inbound Outbound Tags

Edit

Type	Protocol	Port Range	Destination
All traffic	All	All	0.0.0.0/0

Outbound Traffic



If you use an EC2 security group, you permit incoming traffic from any EC2 instance using that security group.

DB Parameter Groups

A DB Parameter Group allows you to specify the configuration of a DB engine.

- It contains engine configuration values that you can apply to one or more DB instances of the same type.
- By default, a parameter group is applied to a DB instance if you do not specify your desired parameter group while creating the instance.

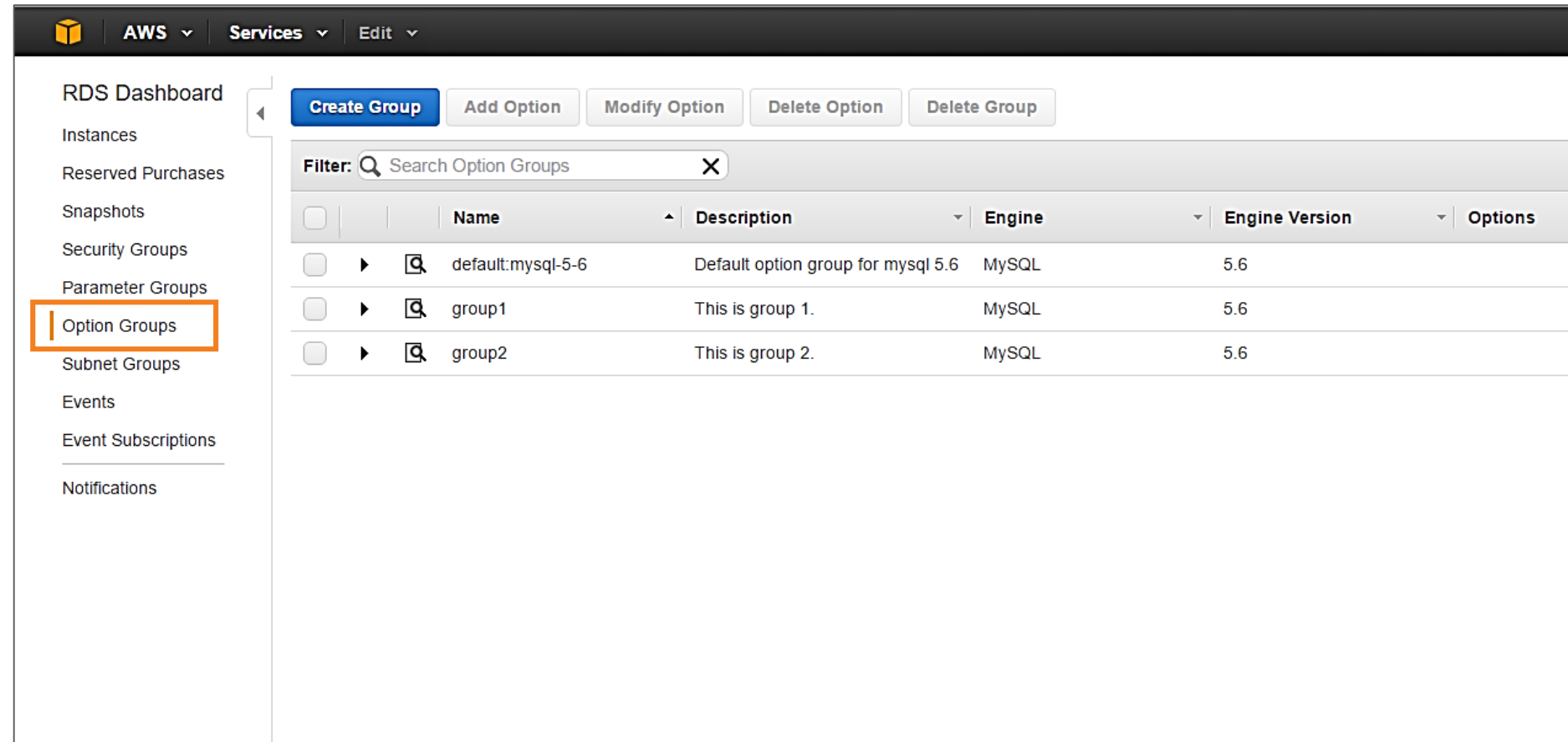
	Name	Family	Type	Description
<input type="checkbox"/>	default.mysql5.6	mysql5.6	DB Parameter Group	Default parameter group for mysql5.6
<input type="checkbox"/>	group2	mariadb10.0	DB Parameter Group	This is group 2.
<input type="checkbox"/>	sample1	mariadb10.0	DB Parameter Group	This is sample parameter group 1.



The default parameter group has default settings for a particular database engine and an instance class.

DB Options Groups

A few DB engines provide tools to easily manage the relational databases. Such tools are accessible via the DB option groups.



The screenshot displays the AWS RDS console interface. On the left, the 'Option Groups' link in the navigation sidebar is highlighted with an orange box. The main content area shows a table of option groups. At the top, there are buttons for 'Create Group', 'Add Option', 'Modify Option', 'Delete Option', and 'Delete Group'. Below these is a search bar labeled 'Filter: Search Option Groups'. The table has the following data:

	Name	Description	Engine	Engine Version	Options
<input type="checkbox"/>	default:mysql-5-6	Default option group for mysql 5.6	MySQL	5.6	
<input type="checkbox"/>	group1	This is group 1.	MySQL	5.6	
<input type="checkbox"/>	group2	This is group 2.	MySQL	5.6	



Currently, the option groups exist only for Microsoft SQL Server, MySQL 5.6, and Oracle DB instances.



Knowledge Check

KNOWLEDGE
CHECK
1

How does the Amazon Relational Database Service ensure high availability and reliability of a database instance?

- a. By using an efficient datacenter
- b. By synchronously copying data to a reserved instance
- c. By providing high security
- d. By using a familiar database engine



KNOWLEDGE
CHECK
1

How does the Amazon Relational Database Service ensure high availability and reliability of a database instance?

- a. By using an efficient datacenter
- b. By synchronously copying data to a reserved instance
- c. By providing high security
- d. By using a familiar database engine



The correct answer is **b.**

Explanation: The service copies data synchronously to a reserved instance in another Availability Zone. It allows taking automatic backups or backup snapshots whenever you want.

KNOWLEDGE
CHECK
2

A security group aims to control access to _____ by allowing or denying access to the specified Amazon EC2 instances.

- a. a DB instance
- b. an availability zone
- c. data redundancy
- d. default settings



KNOWLEDGE
CHECK
2

A security group aims to control access to ____, by allowing or denying access to the specified Amazon EC2 instances.

- a. a DB instance
- b. an availability zone
- c. data redundancy
- d. default settings



The correct answer is **a.**

Explanation: A security group aims to control access to a DB instance by allowing or denying access to the specified Amazon EC2 instances and IP address ranges.



Demo 03—Executing an RDS-Driven Application

(Refer to the E-Learning course: Screen Number – 5.9)

Demonstrate how to execute an RDS-driven Application.



QUIZ 1

DynamoDB has no _____, which means that each row need not possess the same columns or attributes.

- a. logic
- b. pattern
- c. designs
- d. schema



QUIZ 1

DynamoDB has no _____, which means that each row need not possess the same columns or attributes.

- a. logic
- b. pattern
- c. designs
- d. schema



The correct answer is **d.**

Explanation: DynamoDB has no schema, which means that each row need not possess the same columns or attributes, or even the same number of columns.

QUIZ 2

From the following, identify the database engines supported by the Relational Database service.

- a. NoSQL
- b. MySQL
- c. Microsoft SQL
- d. PostgreSQL



QUIZ 2

From the following, identify the database engines supported by the Relational Database service.

- a. NoSQL
- b. MySQL
- c. Microsoft SQL
- d. PostgreSQL



The correct answer is **b, c, and d.**

Explanation: Relational Database Service supports only six database engines namely, Oracle, MySQL, Microsoft SQL, PostgreSQL, Maria DB, and Amazon Aurora Oracle.

QUIZ 3

DB instances, Security groups, DB parameter groups, and DB option groups are components of _____.

- a. Amazon RDS
- b. Amazon Dynamo
- c. Amazon CloudFormation
- d. Amazon EC2



QUIZ 3

DB instances, Security groups, DB parameter groups, and DB option groups are components of _____.

- a. Amazon RDS
- b. Amazon Dynamo
- c. Amazon CloudFormation
- d. Amazon EC2



The correct answer is **a.**

Explanation: Amazon RDS has the following four components, namely DB instances, Security groups, DB parameter groups, and DB option groups.

QUIZ 4

In Amazon DynamoDB, number, string, binary, Boolean, and null are _____.

- a. scalar data types
- b. document types
- c. set data types
- d. global data types



QUIZ 4

In Amazon DynamoDB, number, string, binary, Boolean, and null are _____.

- a. scalar data types
- b. document types
- c. set data types
- d. global data types



The correct answer is **a.**

Explanation: Amazon DynamoDB supports three major data types, one of which is scalar data types, such as number, string, binary, Boolean, and null.

QUIZ 5

Strings are _____ with Unicode Transformation Format or UTF 8 binary encoding.

- a. Unicode characters
- b. Unicode types
- c. Unicode blocks
- d. Unicode values



QUIZ 5

Strings are _____ with Unicode Transformation Format or UTF 8 binary encoding.

- a. Unicode characters
- b. Unicode types
- c. Unicode blocks
- d. Unicode values



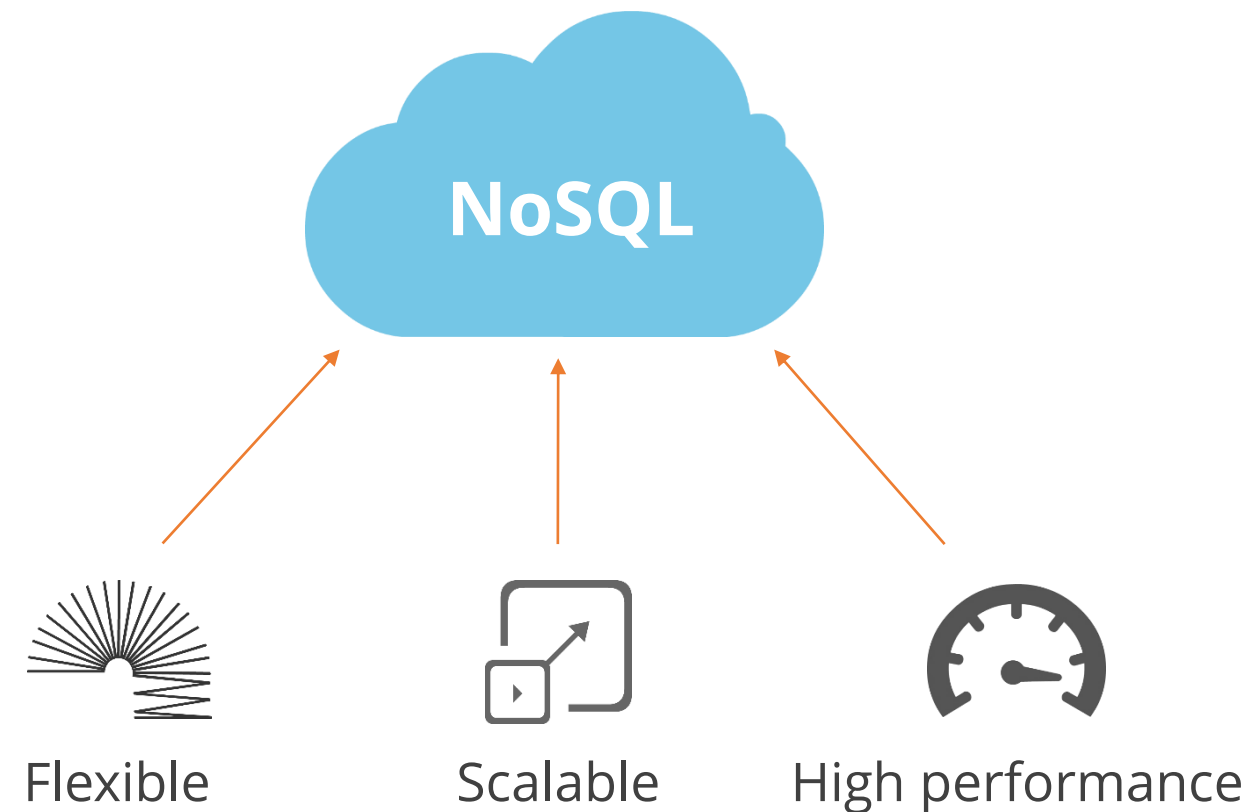
The correct answer is **a.**

Explanation: Strings are Unicode characters with Unicode Transformation Format or UTF 8 binary encoding.

Key Takeaways

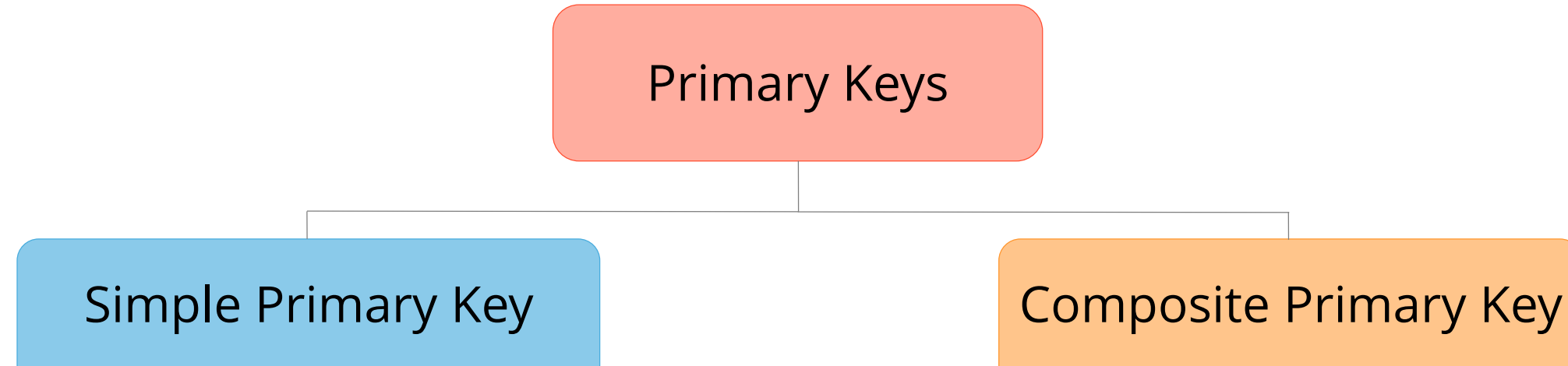
Key Takeaways

Amazon DynamoDB refers to a managed service offering NoSQL databases with high scalability, high availability, and high performance.



Key Takeaways

A Primary Key refers to the attribute whose value uniquely identifies each item.



Key Takeaways

Amazon Relational Database Service aims to set, run, and scale a relational database easily in the Cloud.



Offers profitable, resizable capacity for a database



Handles time-consuming and tiresome administrative tasks



Free to concentrate on other business tasks



Fully managed service

Key Takeaways

Relational Database Service supports six database engines: Oracle, MySQL, Microsoft SQL, PostgreSQL, Maria DB, and Amazon Aurora Oracle.

The Oracle logo, featuring the word "ORACLE" in a bold, red, sans-serif font.

Oracle



MySQL



Microsoft SQL



PostgreSQL



Maria DB



Amazon Aurora

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Key Takeaways

You can run a DB instance in several Availability Zones with the Multi-AZ deployment option.

The screenshot shows the 'Specify DB Details' step in the AWS Management Console. The left sidebar indicates the current step is 'Step 3: Specify DB Details'. The main content area is divided into 'Instance Specifications' and 'Settings'.

Instance Specifications:

- DB Engine:** mysql
- License Model:** general-public-license
- DB Engine Version:** 5.6.23
- DB Instance Class:** db.t2.micro — 1 vCPU, 1 GiB RAM
- Multi-AZ Deployment:** A dropdown menu is open, showing options: '- Select One -', '+ Select One -', No, and Yes. The '+ Select One -' option is highlighted.
- Storage Type:** A dropdown menu with options: No and Yes.
- Allocated Storage*:** 100 GB

Settings:

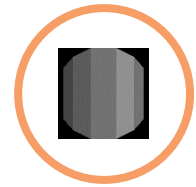


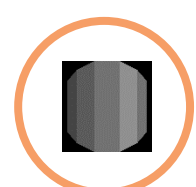

- DB Instance Identifier*:** [Text input field]
- Master Username*:** [Text input field]
- Master Password*:** [Text input field]
- Confirm Password*:** [Text input field]

At the bottom, there are buttons for 'Cancel', 'Previous', and 'Next Step'. A note on the right side explains the Multi-AZ deployment options.

* Required

DB Instances in Regions and Availability Zones

Key Takeaways

-  Amazon DynamoDB refers to a managed service offering NoSQL databases with high scalability, high availability, and high performance.
-  A Primary Key refers to the attribute whose value uniquely identifies each item. It can be either a simple primary key or a composite primary key.
-  Amazon Relational Database Service aims to set, run, and scale a relational database easily in the cloud.
-  Relational Database Service supports six database engines, namely Oracle, MySQL, Microsoft SQL, PostgreSQL, Maria DB, and Amazon Aurora Oracle.
-  You can run a DB instance in several Availability Zones with the Multi-AZ deployment option.

This Concludes 'AWS Managed Services and Database.'

The Next Lesson is 'Deployment and Management.'