Xerris Bootcamp Series

Introduction to DynamoDB

xerris

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What is AWS DynamoDB

- A fully managed NoSQL datastore
- Removes the need to manage a database
- Handles any amount of throughput needed
- Data is encrypted at rest.

- Used to store JSON documents
- Not a relational database
- DynamoDB provides High Availability and Durability.

Introduction to DynamoDB

DynamoDB is highly available.

- DynamoDB data is spread across several servers to improve throughput
- ALL Dynamo data is stored on SSD drives

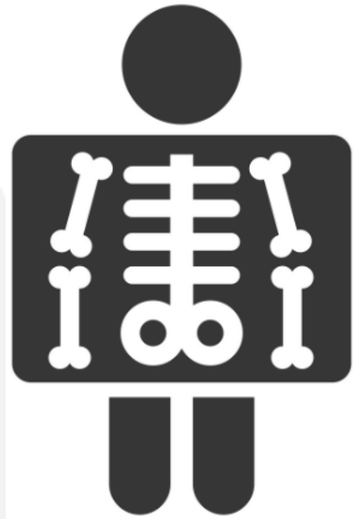
DynamoDB is Durable

- Data is replicated across availability zones
- Data is globally synced between AWS Regions

DynamoDB Anatomy

- **Table** - Similar to a relational database table
- **Partition Key** - Similar to a relational database primary key
- **Sort Key** - Similar to a composite primary key
- **Secondary Index** - Similar to an Alternate Key
- **Item** - Similar to a database row
- **Attribute** - Similar to a database column

DynamoDB Anatomy



Partition Key (Hash Attribute)

- An attribute used to generate an internal hash
- Used to physically store internally within Dynamo
- Used to ‘partition’ data across different shards within Dynamo.

Partition Key & Sort Key (Composite Primary Key)

- An Item is unique if the Partition Key & Sort Key are unique in that table
- The partition key determines where physically the item is stored.

All items with the same partition key are stored together

Example:

BlogPost.**Author** (Partition Key)
BlogPost.**PostedDate** (Sort Key)

DynamoDB Anatomy

DynamoDB is a Document Database

- Used to store unstructured data
- Data is in **JavaScript Notation (JSON)** format
- JSON is a structured key-value pair
- JSON is an open standard way for data interchange between services

JSON Document


```
{
  "_id": "BCCD12CBB",
  "_rev": "1-AB764C",
  "type": "person",
  "name": "Darth Vader",
  "age": 63,
  "headware": ["Helmet", "Sombrero"],
  "dark_side": true,
  "weapons": {
    "right_arm": "light_saber",
    "left_arm":  null
  }
}
```

DynamoDB Anatomy

DynamoDB is a NoSQL database.

Stores Key-value data

- Use Dynamo to store JSON data based on a key.

Graph databases

- Stores graph nodes and allows for the graph schema to change over time

Wide-column stores

- Each row does not have to follow the same structure
- Each column is stored separately

Creating a Table (MacOS)

```
aws dynamodb create-table \
 --table-name Music \
 --attribute-definitions \
      AttributeName=Artist,AttributeType=S \
      AttributeName=SongTitle,AttributeType=S \
 --key-schema \
      AttributeName=Artist,KeyType=HASH \
      AttributeName=SongTitle,KeyType=RANGE \
 --provisioned-throughput \
      ReadCapacityUnits=10,WriteCapacityUnits=5
```

Creating a Table (Windows PowerShell)

```
aws dynamodb create-table `
 --table-name Music `
 --attribute-definitions `
       AttributeName=Artist,AttributeType=S `
       AttributeName=SongTitle,AttributeType=S `
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       AttributeName=Artist,KeyType=HASH `
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```

Provisioned Read/Writes

- Specifies the Read/Write capacity units for your application
- **Read Capacity** - # of strongly consistent reads per second
- For items 4kb or smaller
- Items > 4kb require additional read units

- **Write Capacity** - # of writes per second for items <= 1kb
- Items are rounded up to the nearest 1kb

Adding an Item (Mac OS)

```
aws dynamodb put-item \
    --table-name Music \
    --item \
        '{"Artist": {"S": "No One You Know"}, "SongTitle": {"S": "Call Me Today"},
"AlbumTitle": {"S": "Somewhat Famous"}}' \
    --return-consumed-capacity TOTAL
```

Adding an Item (Windows PowerShell)

```
aws dynamodb put-item `
    --table-name Music `
    --item `
        "{\`"Artist\`": {\`"S\`": \`"No One You Know\`"}, \`"SongTitle\`": {\`"S\`": \`"Call Me
Today\`"}, \`"AlbumTitle\`": {\`"S\`": \`"Somewhat Famous\`"}}" `
    --return-consumed-capacity TOTAL
```

Reading an Item (Mac OS)

```
aws dynamodb get-item --consistent-read \
   --table-name Music \
   --key '{ "Artist": {"S": "No One You Know"}, "SongTitle": {"S": "Call Me Today"}}'
```

Querying Dynamo for an Item (Mac OS)

```
aws dynamodb query \
   --table-name Music \
   --key-condition-expression "Artist = :name" \
   --expression-attribute-values  '{":name":{"S":"No One You Know"}}'
```

Reading an Item (Windows PowerShell)

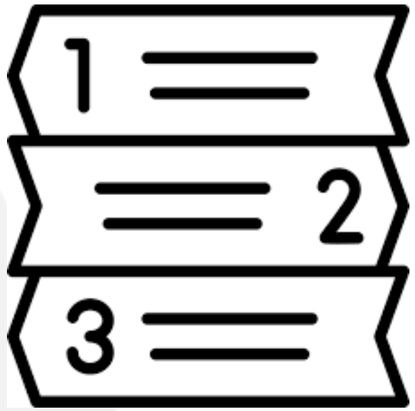
```
aws dynamodb get-item --consistent-read `
    --table-name Music `
    --key "{ \`"Artist\`": {\`"S\`": \`"No One You Know\`"}, \`"SongTitle\`": {\`"S\`": \`"Call Me Today\`"}}”
```

Querying Dynamo for an Item (Windows PowerShell)

```
aws dynamodb query `
 --table-name Music `
  --key-condition-expression "Artist = :name" `
 --expression-attribute-values  "{ \`":name\`":{\`"S\`":\`"No One You Know\`"}}"
```

DynamoDB Global Secondary Index

An index where the partition key and sort key differ from the base table.



Create Global Secondary Index (Mac OS)

```
aws dynamodb update-table \
    --table-name Music \
    --attribute-definitions AttributeName=AlbumTitle,AttributeType=S \
    --global-secondary-index-updates \
       "[{\"Create\":{\"IndexName\": \"AlbumTitle-
index\",\"KeySchema\":[{\"AttributeName\":\"AlbumTitle\",\"KeyType\":\"HASH\"}], \
       \"ProvisionedThroughput\": {\"ReadCapacityUnits\": 10, \"WriteCapacityUnits\": 5
},\"Projection\":{\"ProjectionType\":\"ALL\"}}}]"
```

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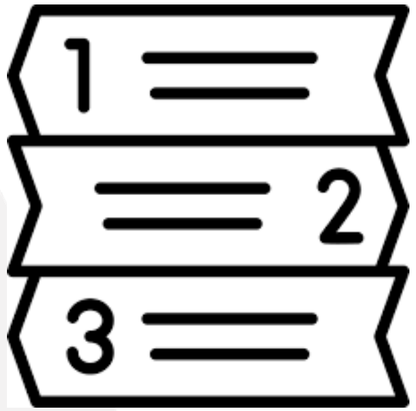

Create Global Secondary Index (PowerShell)

```
aws dynamodb update-table `
    --table-name Music `
    --attribute-definitions AttributeName=AlbumTitle,AttributeType=S `
    --global-secondary-index-updates `
       "[{\`"Create\`":{\`"IndexName\`": \`"AlbumTitle-
index\`",\`"KeySchema\`":[{\`"AttributeName\`":\`"AlbumTitle\`",\`"KeyType\`":\`"HASH\`"
}], `
        \`"ProvisionedThroughput\` ": {\`"ReadCapacityUnits\`": 10,
\`"WriteCapacityUnits\`": 5      },\`"Projection\`":{\`"ProjectionType\`":\`"ALL\`"}}}]"
```

DynamoDB Global Secondary Index

Amazon AWS DotNet SDK

- Provides a client library for DynamoDB (nuget)
  Install-Package AWSSDK.DynamoDBv2

AmazonDynamoDBClient Class
- Provides connectivity to Dynamo
- Used in conjunction with the DynamoDBContext

DynamoDBContext
- Used for create/read/update/delete (CRUD) operations