NoSQL and Other Database Solutions in AWS

Today’s Takeaways

- DynamoDB
- Redshift
- Elasticache

1 Amazon DynamoDB

Types of Databases

Relational Databases

A relational database is one that stores data in tables.
The relationship between each data point is clear and searching through those relationships is relatively easy.

Name	Dry/Wet Food	Good Boy (Y/N)
Fido	Dry	Y
Rex	Wet	N
Bubbles	Dry	Y
Cujo	Wet	N

Tag #	Height (in)	Weight (lbs)
1573	15	21
2684	9	7
3795	27	130
4806	6	5

Tag #	Name	Breed	Color	Age
1573	Fido	Beagle	Brown/White	1.5
2684	Rex	Pekingese	White	9
3795	Bubbles	Rottweiler	Black	5
4806	Cujo	Chihuahua	Gold	4

Non Relational Databases

A non-relational database is any database that does not use the tabular schema of rows and columns like in relational databases. Rather, its storage model is optimized for the type of data it's storing.

Key	Document
1001	{ "TagID" : 1573 , "Dimensions": [{ "Height" : 15, "Weight" : 21 }], "Name:" Fido }
1002	{ "TagID" : 2684 , "Dimensions": [{ "Height" : 9, "Weight" : 7 }], "Name:" Rex }

DynamoDB

What is DynamoDB?

amazon
DynamoDB

- Amazon DynamoDB is a **NoSQL database** service
- Unlike RDS, you don't need to stick pre-determined schema. Instead of Schema, DynamoDB uses **flexible tables**.
- Amazon DynamoDB is a **fully-managed** database.
- DynamoDB doesn't **have Join function.**

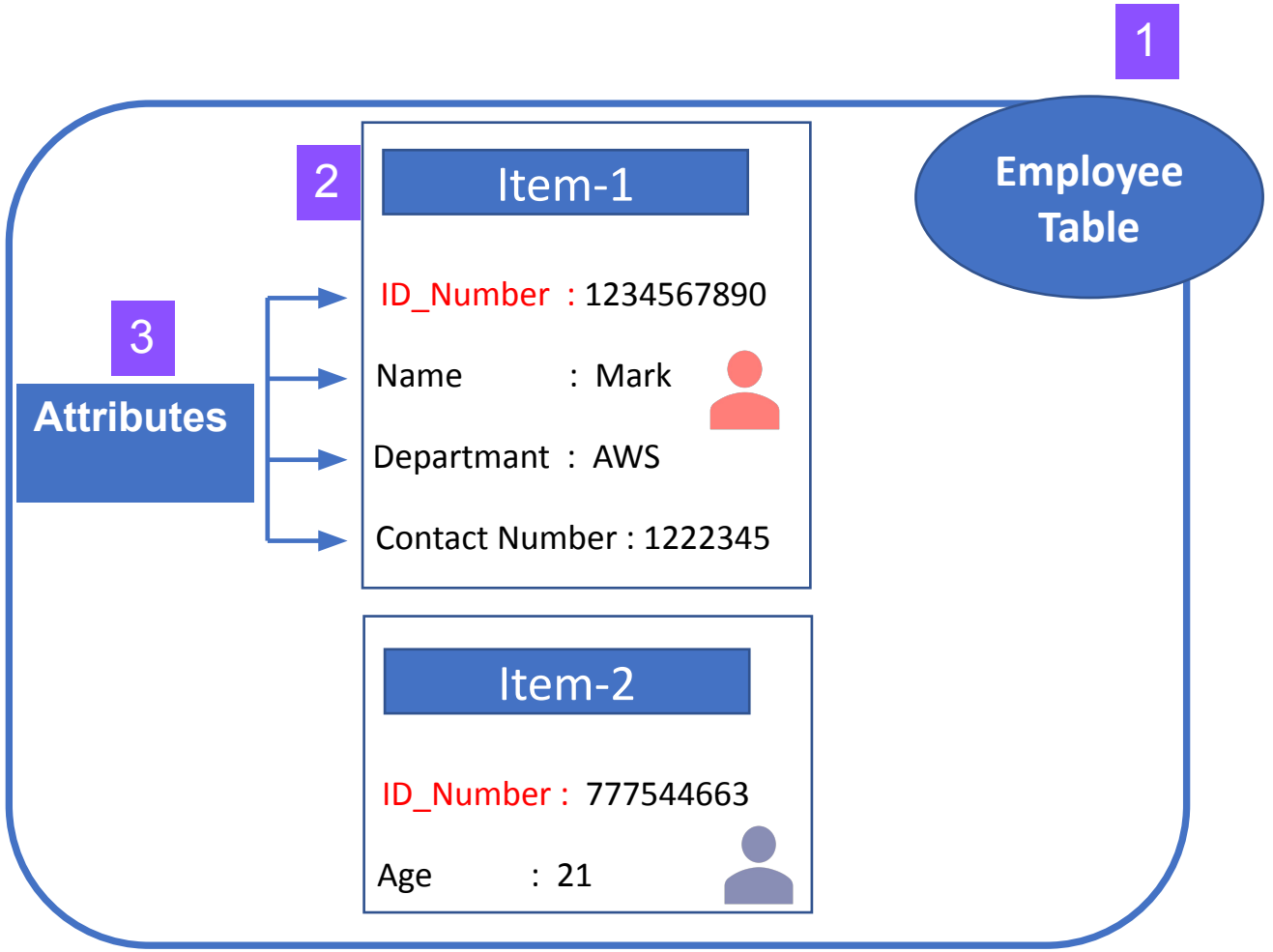
DynamoDB

Structure of DynamoDB?

1- Table is a collection of data.

2- Each table consist of items. In the Picture, **item represents a person**.

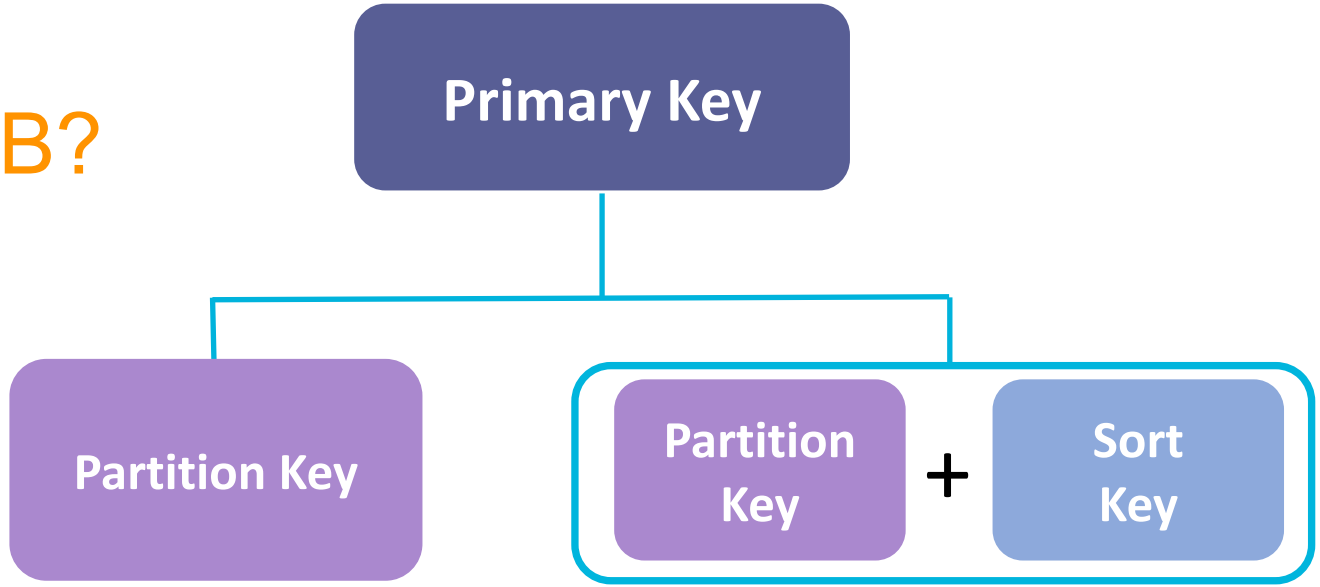
3- Attributes are specific feature of the items.



Unlike RDS, you can enter different attributes for each people.

DynamoDB

Structure of DynamoDB?



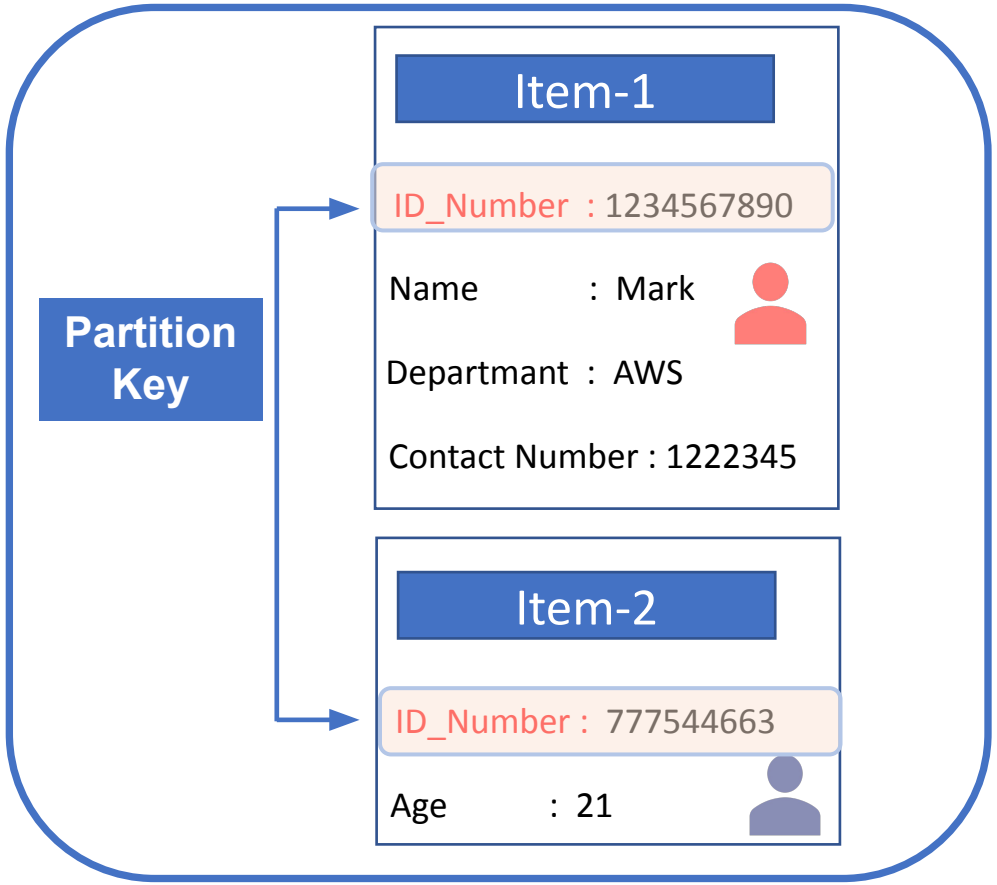
DynamoDB uses **Primary Keys** to **uniquely identify each item** in a table. When you create a table, in addition to the table name, you must specify the primary key of the table.

The sort key is used to sort and order items in a partition. Multiple items with the same partition key value are feasible, but they should have different sort key values. This means you can have multiple items with the same partition keys, but the sort key can not be the same.

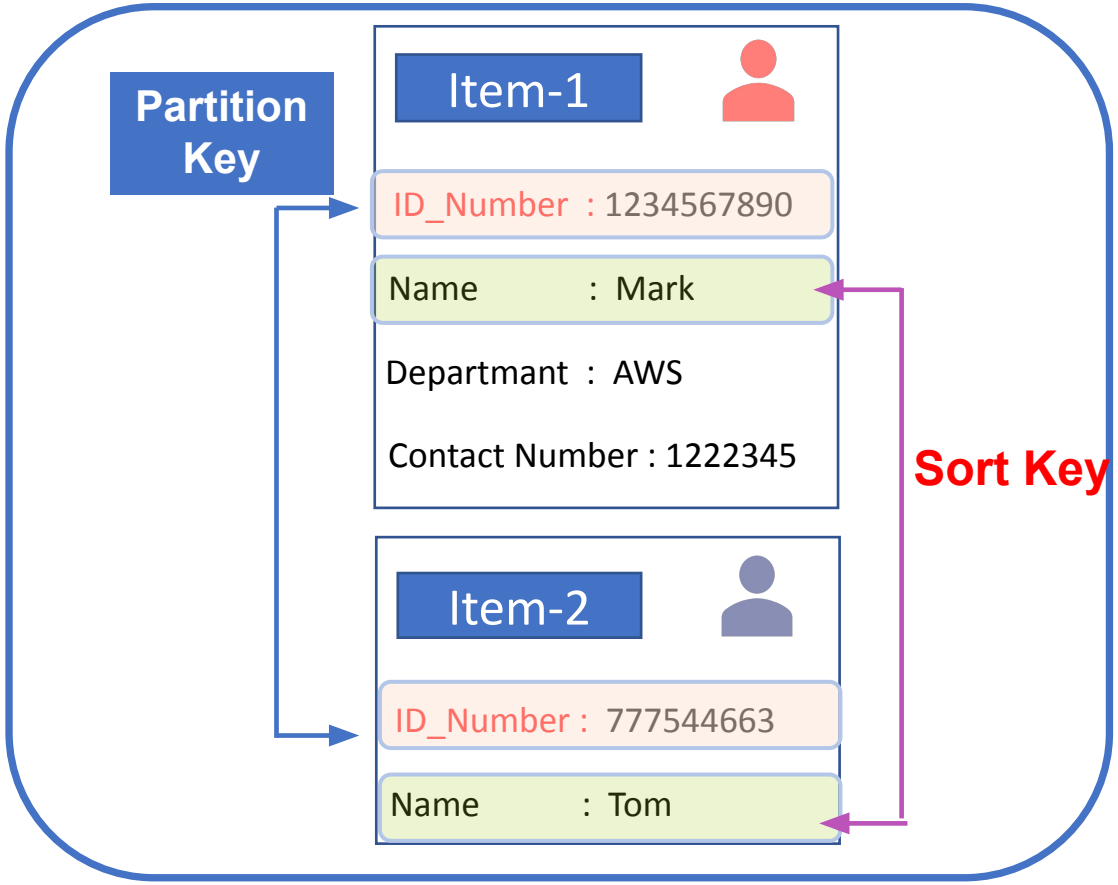
There are two different kinds of Primary Key model : **Partition Key** and **Partition Key & Sort Key**.

DynamoDB

Structure of DynamoDB?



Partition Key



Partition Key&Sort Key

DynamoDB Components

Capacity Modes

Eventually Consistent Reads

- When you read data from a DynamoDB table, the response might not reflect the results of a recently completed write operation. The response might include some stale(not updated) data.
- If you repeat your read request after a short time, the response should return the latest data.

Strongly Consistent Reads

- When you request a strongly consistent read, DynamoDB returns a response with the most up-to-date data, reflecting the updates from all prior write operations that were successful.

DynamoDB RCU

- Read Capacity tells us how much data can be read from a DynamoDB table. Read Capacity is measured in RCUs.
- RCU or "Read capacity unit" represents one strongly consistent read per second of an item upto 4 kb or one eventually consistent reads per second for an item up to 8 KB in size.

DynamoDB Write Capacity

- DynamoDB Write Capacity tells us how much data can be written to a DynamoDB table. Write Capacity is measured in WCUs.
- WCU or "Write Capacity Unit" represents one write per second, for an item up to 1 KB in size.

DynamoDB Components

Secondary Indexes

- In a relational database, an index is a data structure that lets you perform fast queries on different columns in a table. You can use the CREATE INDEX SQL statement to add an index to an existing table, specifying the columns to be indexed.
- You can create one or more secondary indexes on a dynamodb table. A *secondary index* lets you query the data in the table using an alternate key, in addition to queries against the primary key. DynamoDB doesn't require that you use indexes, but they give your applications more flexibility when querying your data.
- After you create a secondary index on a table, you can read data from the index in much the same way as you do from the table.

DynamoDB supports two kinds of indexes:

- Global secondary index – An index with a partition key and sort key that can be different from those on the table.
- Local secondary index – An index that has the same partition key as the table, but a different sort key.

Each table in DynamoDB has a quota of 20 global secondary indexes (default quota) and 5 local secondary indexes.

DynamoDB Streams

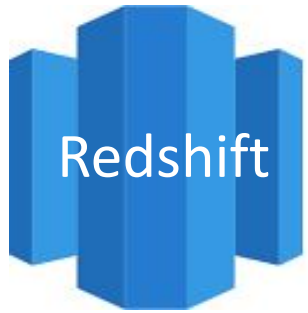
DynamoDB Streams is an optional feature that captures data modification events in DynamoDB tables. The data about these events appear in the stream in near-real time, and in the order that the events occurred.

Each event is represented by a *stream record*. If you enable a stream on a table, DynamoDB Streams writes a stream record whenever one of the following events occurs:

- A new item is added to the table: The stream captures an image of the entire item, including all of its attributes.
- An item is updated: The stream captures the "before" and "after" image of any attributes that were modified in the item.
- An item is deleted from the table: The stream captures an image of the entire item before it was deleted.

2 Amazon Redshift

Amazon Redshift

Database	Data Warehouse
	
OLTP (Online Transaction Processing)	OLAP (Online Analytical Processing)
Used for data storing and managing	Used for data analyzing

- Since the analyzing process causes an extra workload on database we prefer to use data warehouse
- Amazon Redshift is a fully managed, cloud-based, petabyte-scale data warehouse service by Amazon Web Services (AWS).
- Amazon Redshift is an efficient solution to collect and store all your data to analyze.

3 AWS Elasticache

AWS Elasticache

Redis   Memcached

- Elasticache is an **In-Memory Cache service of AWS.**
- In-Memory Cache is a **temporary and fast** storage component. These components are used to reduce the workload of the main data storage device such as a database.
- AWS offers Redis and Memcached in-memory cache option which are popular in market.

AWS Elasticache

Before Elasticache

After Elasticache - First Query

After Elasticache - Second Query

Redis Vs Memcached

Redis			Memcached
Sub-millisecond latency	+	+	Sub-millisecond latency
User friendly syntax	+	+	User friendly syntax
It supports many different programming languages C, C++, java, python, etc.	+	+	It supports many different programming languages C, C++, java, python, etc.
Redis supports strings ,lists, sets, sorted sets, hashes, bit arrays, and hyperloglogs	+	-	Memcached supports only strings
It doesn't support multithreaded architecture	-	+	It supports multithreaded architecture. It means that it has multiple processing cores. This allows you to handle multiple operation.
It supports Snapshot	+	-	It doesn't support Snapshot
It supports Replica	+	-	It doesn't support Replica

DynamoDB

Let's get our hands dirty!

- Create a DynamoDB table

THANKS!

Any questions?

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