Advanced Topic Presentation

Amazon DynamoDB

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Agenda

- What is Amazon DynamoDB?
- Key concepts
- Working with DynamoDB
- Some interesting topics

What is Amazon DynamoDB?

- DynamoDB is a hosted **NoSQL database** offered by Amazon Web Services (AWS).
- Amazon DynamoDB is a fully managed database service that provides fast and predictable performance with seamless scalability.

Amazon DynamoDB Vs Amazon RDS

Type of database	Managed relational SQL database	Fully managed key-value and document (NoSQL) database
Availability and durability	RDS synchronously replicates data to a standby instance in a different Availability Zone and will automatically replace the compute instance powering your deployment in the event of a hardware failure	DynamoDb global tables replicate data automatically across 3 availability zones of our choice of AWS regions and automatically scale capacity to accommodate our workloads
Security	Isolate your database in your own virtual network. Integrates with IAM Can configure firewall settings	Integrates with IAM
Scalability and maintenance	1. Limited capacity 2. Require maintenance	1. Supports tables of virtually any size with horizotal scaling 2. No maintenance since DynamoDB is Serverless

From a survey:

- **"Predictable performance and cost"** is the top reason why over **53** developers like Amazon DynamoDB, while over **22** developers mention **"Easy setup, backup, monitoring"** as the leading cause for choosing Amazon RDS for PostgreSQL.
- **Lyft**, **New Relic**, and **Sellsuki** are some of the popular companies that use Amazon DynamoDB, whereas Amazon RDS for PostgreSQL is used by **Instacart**, **Tictail**, and **DSTLD**.
- Amazon DynamoDB has a broader approval, being mentioned in **429** company stacks & **173** developers stacks; compared to Amazon RDS for PostgreSQL, which is listed in **164** company stacks and **27** developer stacks

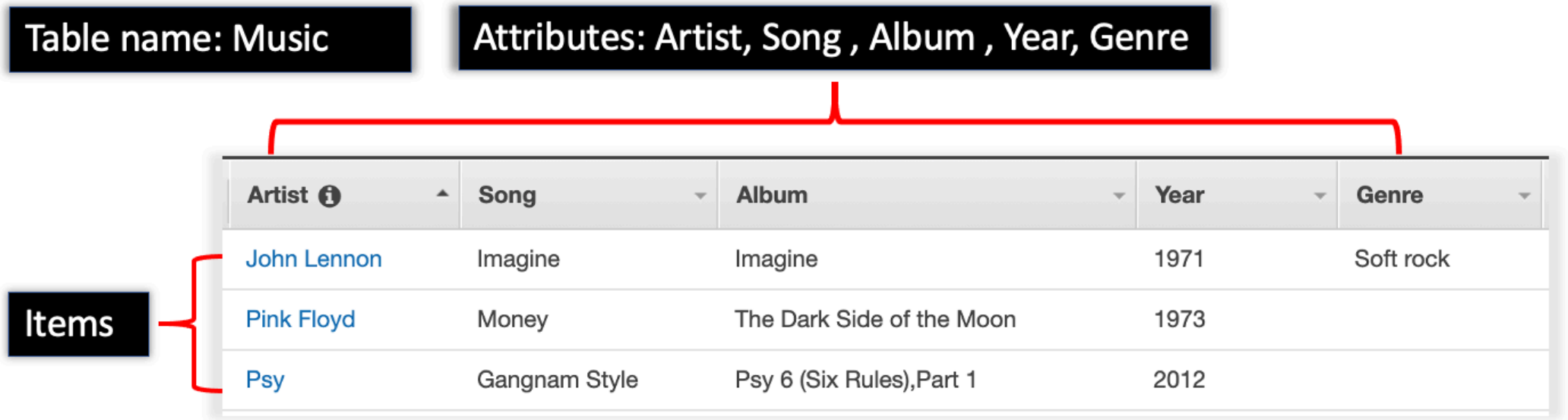
DynamoDB

Key Concepts

- Core Components of DynamoDB
  1. Tables, Items, Attributes
  2. Primary Key
  3. Secondary Indexes
  4. DynamoDB Streams
- Capacity modes
- Data Types
- Read Consistency
- Working with DynamoDB

Core Components of DynamoDB

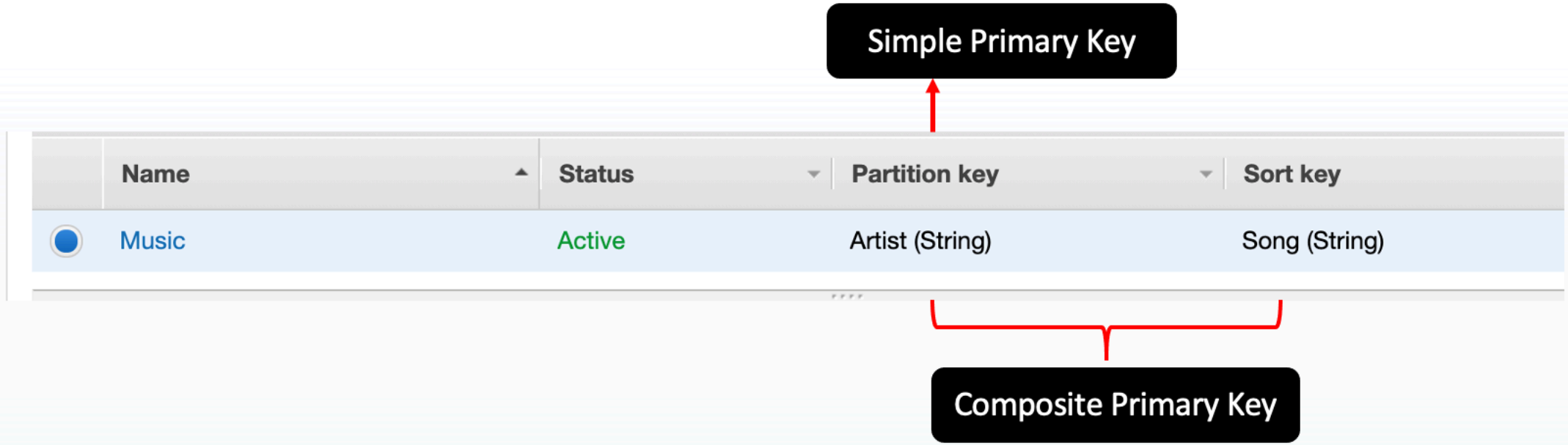
- Tables, Items, Attributes



Artist	Song	Album	Year	Genre
John Lennon	Imagine	Imagine	1971	Soft rock
Pink Floyd	Money	The Dark Side of the Moon	1973	
Psy	Gangnam Style	Psy 6 (Six Rules),Part 1	2012	

Core Components of DynamoDB

- Primary Key



DynamoDB

Workbench | AWS Management Console

console.aws.amazon.com/console/home?region=us-east-1

aws | Services | vocstartsoft/user884596=jsalunkh@syr.edu @ 7457-9500-9664 | N. Virginia | Support

AWS Management Console

AWS services

Find Services
You can enter names, keywords or acronyms.

Example: Relational Database Service, database, RDS

Recently visited services

- DynamoDB
- Simple Email Service
- IAM
- API Gateway
- Elastic Beanstalk
- CodeDeploy
- Lambda
- EC2
- RDS
- Serverless Application Repository
- S3

All services

Build a solution

Get started with simple wizards and automated workflows.

Launch a virtual machine | Build a web app | Build using virtual servers

Stay connected to your AWS resources on-the-go

Download the AWS Console Mobile App to your iOS or Android mobile device. Learn more

Explore AWS

Move to Managed File Storage

Reduce complexity, overhead, and cost by moving to fully managed storage.
Learn more

AWS Certification

Explore the resources available to help you prepare for your AWS Certification.
Learn more

RDS Read Replicas

Achieve scale and low-latency for read-heavy workloads with RDS Read Replicas.

Feedback | English (US)

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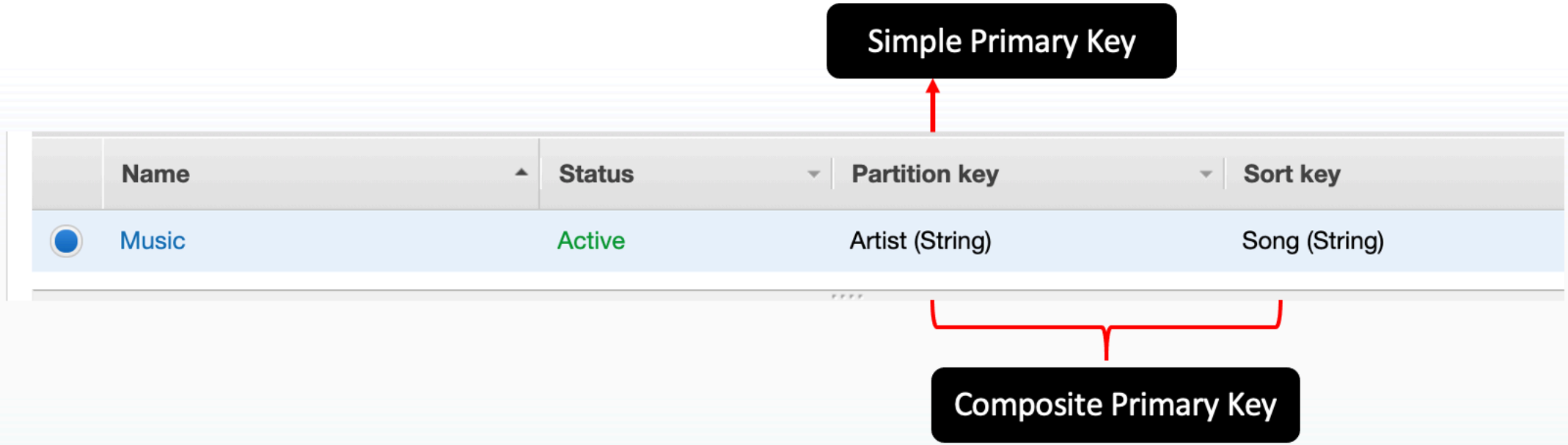
Core Components of DynamoDB

- Primary Key



DynamoDB

Core Components of DynamoDB

- Secondary indexes

Local secondary index :
A local secondary index uses the same partition key as the underlying table but a different sort key.

Global secondary index:
A global secondary index can define an entirely different primary key for a table.

DynamoDB
Dashboard
Tables
Backups
Reserved capacity
Preferences

DAX
Dashboard
Clusters
Subnet groups
Parameter groups
Events

Create table | Delete table

Filter by table name

Choose a table ... | Actions

Name
Music

Music Close

Overview | Items | Metrics | Alarms | Capacity | Indexes | Global Tables | Backups | More

Create item | Actions

Scan: [Table] Music: Artist, Song — Viewing 1 to 4 items

Scan | [Table] Music: Artist, Song

Add filter

Start search

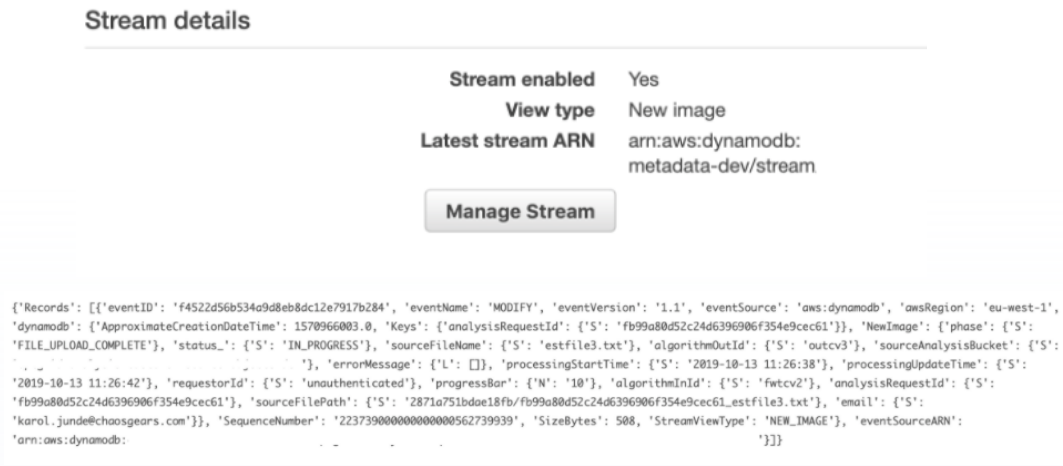
Artist	Song	Album	Year	Genre
John Lenon	Imagine	Imagine	1971	Soft rock
Justin Bieber	Habitual		2020	Pop music
Lady Gaga	Shadows	A star is born	2018	Pop music
Pink Floyd	Money	The Dark Side of the Moon	1971	

Core Components of DynamoDB

- DynamoDB Streams

  Captures changes to items stored in a DynamoDB table, at the point in time when such changes occur.

  - Ordered, sequence of events in the stream reflects the actual sequence of operations in the table
  - Enabling a stream using Manage Stream
  - Subject to a 24-hour lifetime
  - No mechanism for manually deleting an existing stream
  - A *stream record* contains information about a data modification to a single item in a DynamoDB table
  - Back up, or otherwise process, items that are deleted by Time to Live (TTL) by enabling Amazon DynamoDB Streams on the table

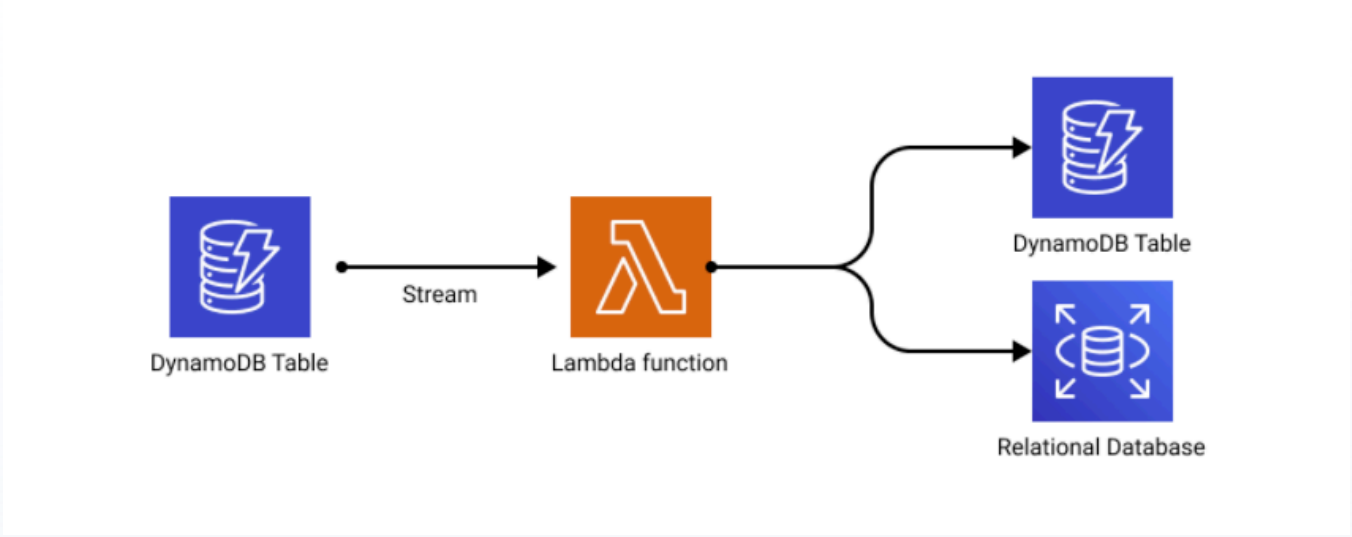


DynamoDB

Core Components of DynamoDB

- DynamoDB Streams use-cases

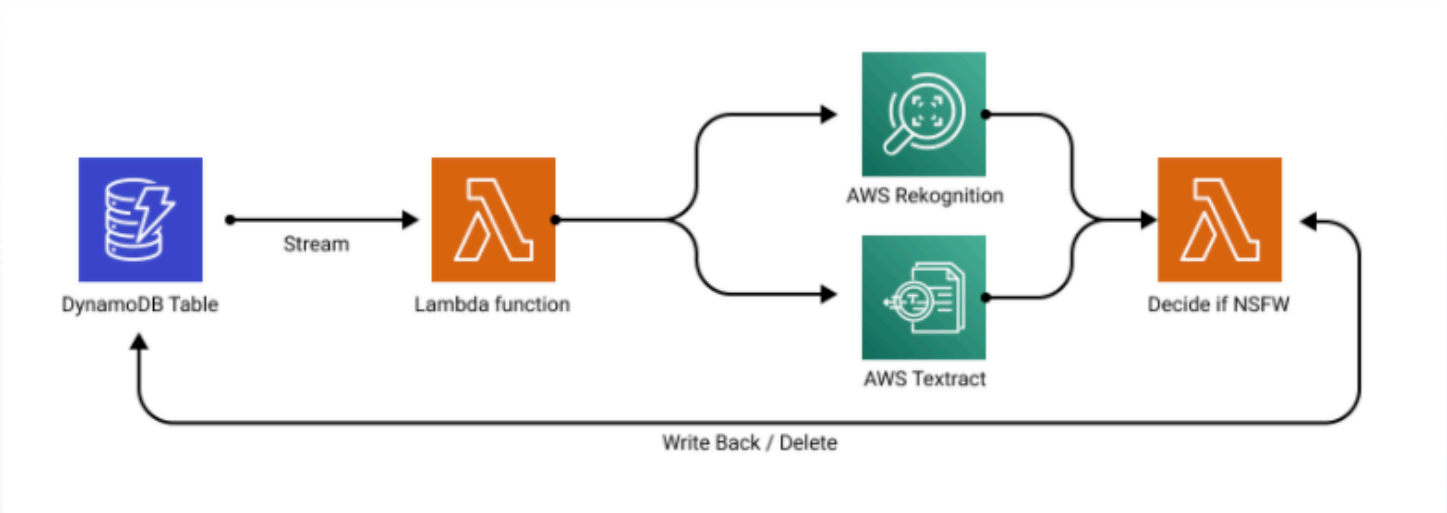
1. Data Replication



Core Components of DynamoDB

- DynamoDB Streams use-cases

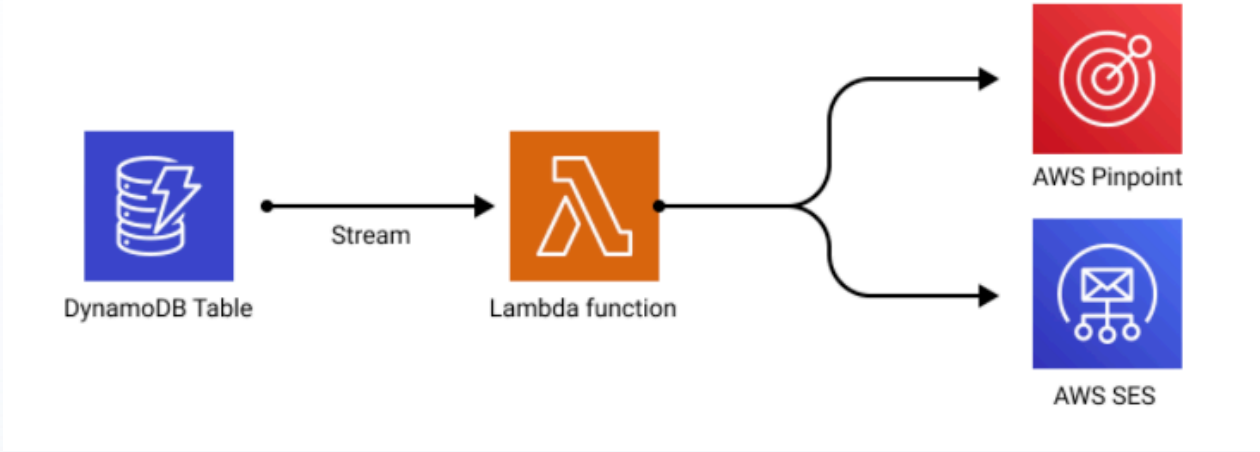
2. Content Moderation



Core Components of DynamoDB

- DynamoDB Streams use-cases

3. Notifications and sending e-mails



Core Components of DynamoDB

- DynamoDB Streams use-cases

4. Search

Capacity Modes

- Read and write capacity
- Provisioned Capacity
- Reserved Capacity
- Adaptive Capacity
- Burst Capacity
- On-demand Capacity

Data Types

Scalar Type

Number, String, Binary, Boolean, Null

Document Type

List, Map

Set Type

String set, Number set, Binary set

Read Consistency

Eventually Consistent Reads | **Strongly Consistent Reads**

	Eventual Consistency	Strong consistency
Consistency	Propagation of latest update might take a few ms longer. It is possible to miss the latest update	You always read the latest update
Performance	Fastest possible reads	Slower than eventually consistent reads
Cost	Cheapest possible reads. Two eventually consistent reads cost 1 RCU	Twice as expensive as eventually consistent reads. Each strongly consistent read cost 1 RCU

Working with DynamoDB

- Create a table
- Adding an item
- Adding second item
- Scan data
- Query data

Workbench | DynamoDB · AWS Console

console.aws.amazon.com/dynamodb/home?region=us-east-1#tables:selected=Music;tab=items

aws Services vocstartsoft/user884596=jsalunkh@syr.edu @ 7457-9500-9664 N. Virginia Support

DynamoDB
- Dashboard
- Tables
- Backups
- Reserved capacity
- Preferences

DAX
- Dashboard
- Clusters
- Subnet groups
- Parameter groups
- Events

Create table | Delete table

Filter by table name

Choose a table ... | Actions

Name
Music

Music Close

Overview | Items | Metrics | Alarms | Capacity | Indexes | Global Tables | Backups | More

Create item | Actions

Scan: [Table] Music: Artist, Song — Viewing 0 to 0 items

Scan | [Table] Music: Artist, Song

Add filter

Start search

Artist	Song

An item consists of one or more attributes. Each attribute consists of a name, a data type, and a value. When you read or write an item, the only attributes that are required are those that make up the primary key. More info

Pricing Example

- Let's estimate the total cost for a hypothetical application. We'll make the following assumptions:
- The application has 10,000 monthly active users.
- On average, each user causes 10,000 DynamoDB reads per month and 5,000 DynamoDB writes per month.
  - 10,000 users x 10,000 reads = 10,000,000 reads per month
  - 10M reads/month x $0.25/1M reads = $2.5/month
  - 10,000 users x 5,000 writes = 5,000,000 writes per month
  - 5M writes/month x $1.25/1M writes = $6.25/month
- Your database is 100GB is size, and every month it grows by 10GB.
  - The first 25GB are free; for billing purposes the average database size will be 105GB in the first month.
  - You will be charged for 80GB of storage at $0.25/GB-month, so $20/month.
  - The continuous backup for a 105GB database is charged at $0.2/GB-month, so $21/month.
- The storage, the backups, and the read/write operations will be the bulk of your expense if you use a single-region DynamoDB setup. Adding in the data transfer costs and the backups, the total comes to about $50/month.
- Adding Global Tables multi-region replication into another AWS region would roughly double the total cost. The replica's writes and its extra storage space will cost about $40 in our use case: $10/month for the replica's writes, $26/month in additional storage space, and the rest in data transfer costs. The total cost for the entire table, then, would be around $90/month.

THANK YOU

Questions?