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Saturday, 3rd August 2024

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From 24 Hours to 4: How Serverless Transformed Data Ingestion Pipeline

Mandar Gokhale Avinash Dalvi

“In this talk, we are not going to learn a solution, but we are going to learn a thought process or approach.”

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What’s on the table today ?

- ❑ The Problem
- ❑ Understanding the Complexity
- ❑ Why Serverless?
- ❑ Thought Process & Implementation
- ❑ Measuring Success
- ❑ Lessons Learned
- ❑ Real-World Examples
- ❑ Q&A

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“Every problem has solution; it may sometime just need another perspective.”

- Katherine Russell

Source Data

- CMS managing business critical data
- Provides XML data exports of size ~1GB
- Contains ~200K entries
- Each entry contains large number of deeply nested, cross referencing nodes

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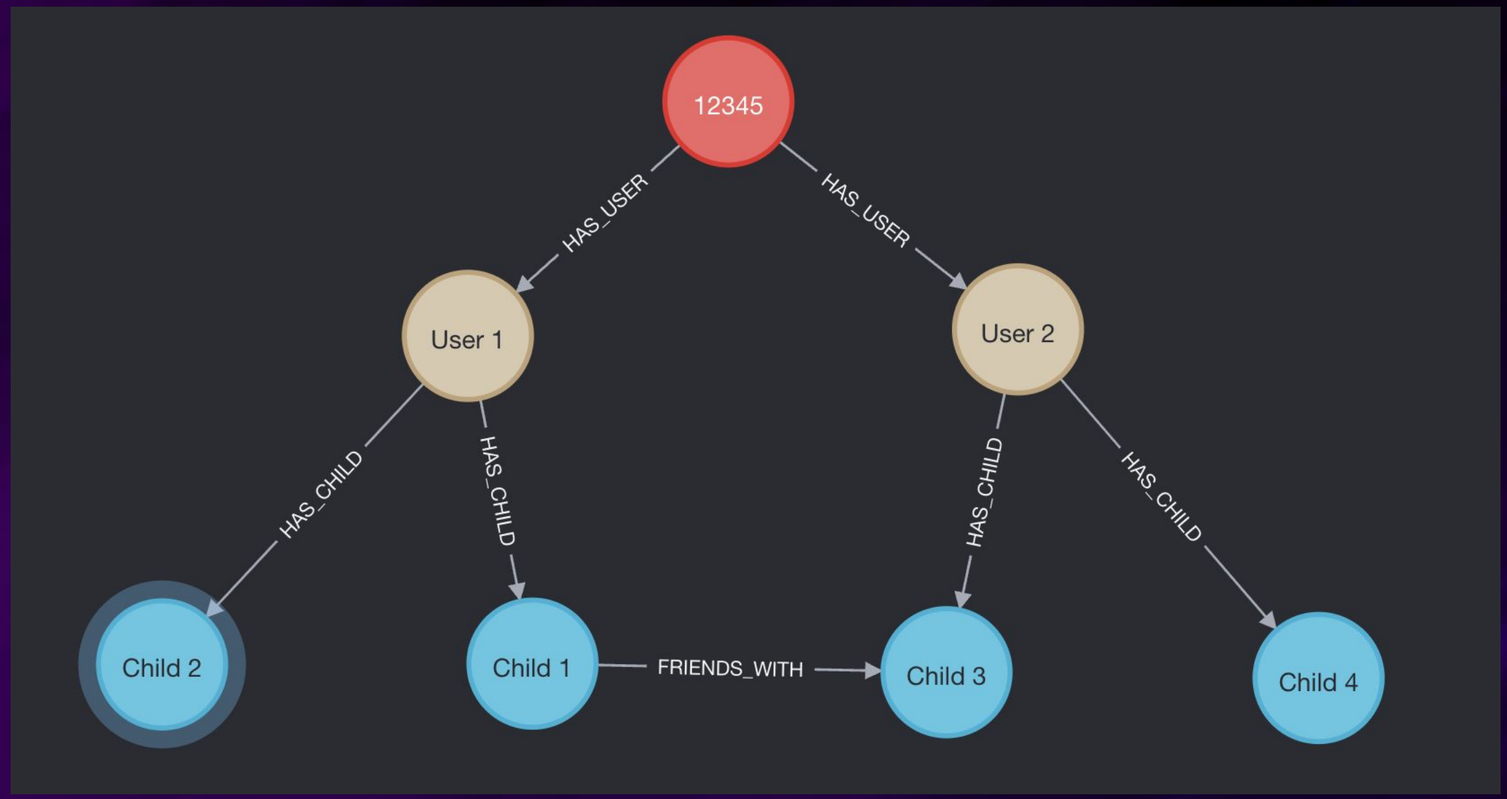
Data Visualization



Existing Data Ingestion Pipeline

- NodeJS based app
- Running on single kubernetes pod
- Using Redis graph database for intermediate results
- Using elasticsearch for final storage

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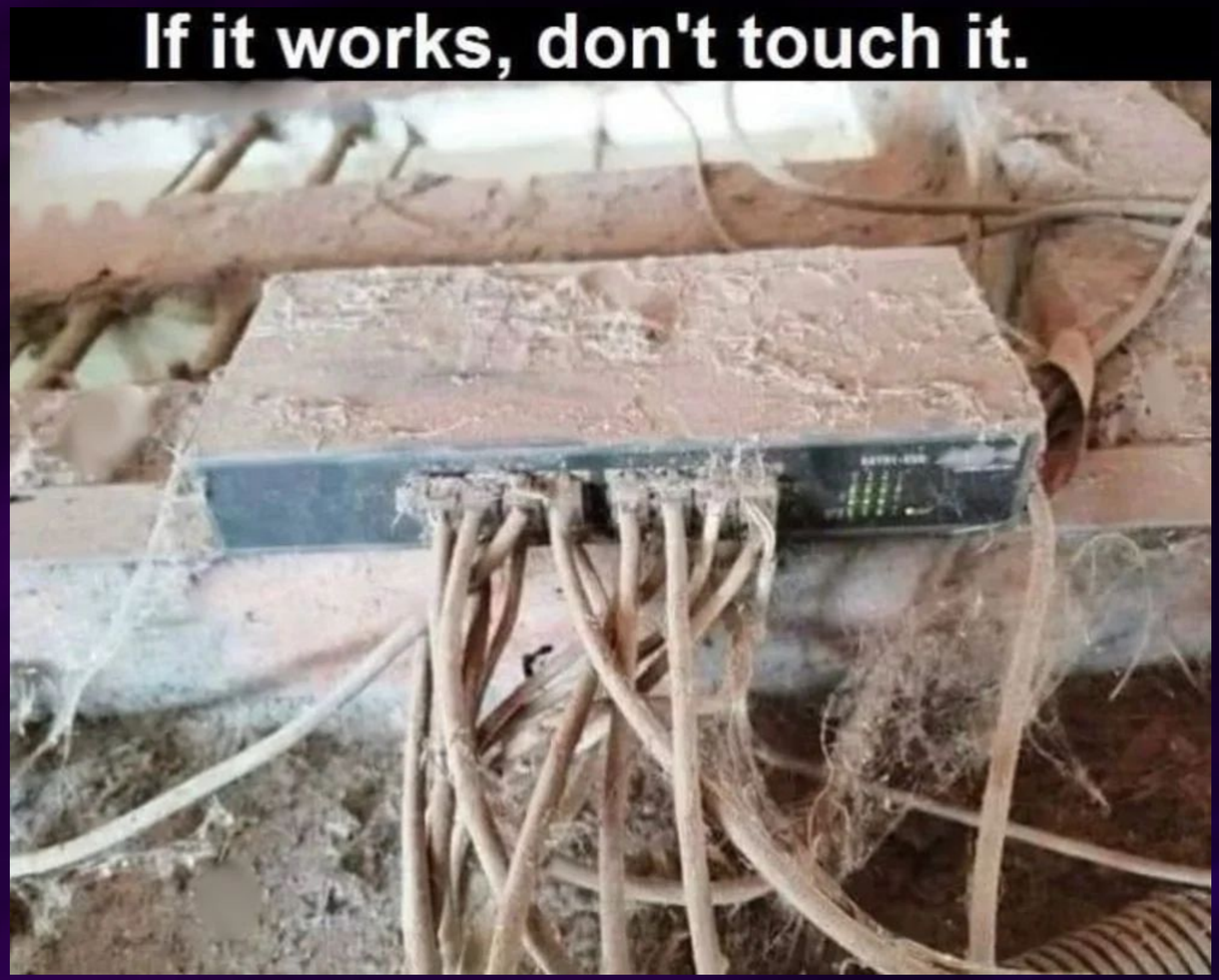

Pain Points

- By design pipeline couldn’’t be horizontally scaled to speed up ingestion
- Taking ~24 hrs to finish ingestion
- No observability
- No logic built in to retry in the event of failure
- Uncertainty or delay in content delivery
- Cost

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Objectives for Redesign

Accelerate Data Ingestion

Enhance Observability

Optimize Cost Efficiency

Facilitate easy ingestion retries

Simplify Developer Operations

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Understanding the Complexity

Know your data

- ❑ Format
- ❑ Structure
- ❑ Volume
- ❑ Quality
- ❑ Source
- ❑ Lifecycle

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Scalability Issues

- Resource Allocation
- Load Balancing
- Maintenance Overhead
- Cost Management

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Why Serverless ?

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Ordering Pizzas

- What toppings will be - RAM, Storage etc
- What base will be - Which programming language
- Small/Medium/Large - code size
- Pizza delivery time whether immediate or schedule - execution time

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Why Serverless ?

- Scalability
- Cost Efficiency
- Reduced Operational Complexity
- Faster Time to Market
- Flexibility and Innovation
- Handling Asynchronous Tasks
- Improved Reliability and Security

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Thought Process & Implementation

Our approach

- Lambda for compute & parallel processing
- S3 to store input xml, intermediate xml files and artifacts
- SQS for queueing records & to perform asynchronous processing
- Cloudwatch for logging & monitoring
- Step function for orchestration of lambda functions
- Neo4j for storing the data
- Elasticsearch to store data only needed for search operations

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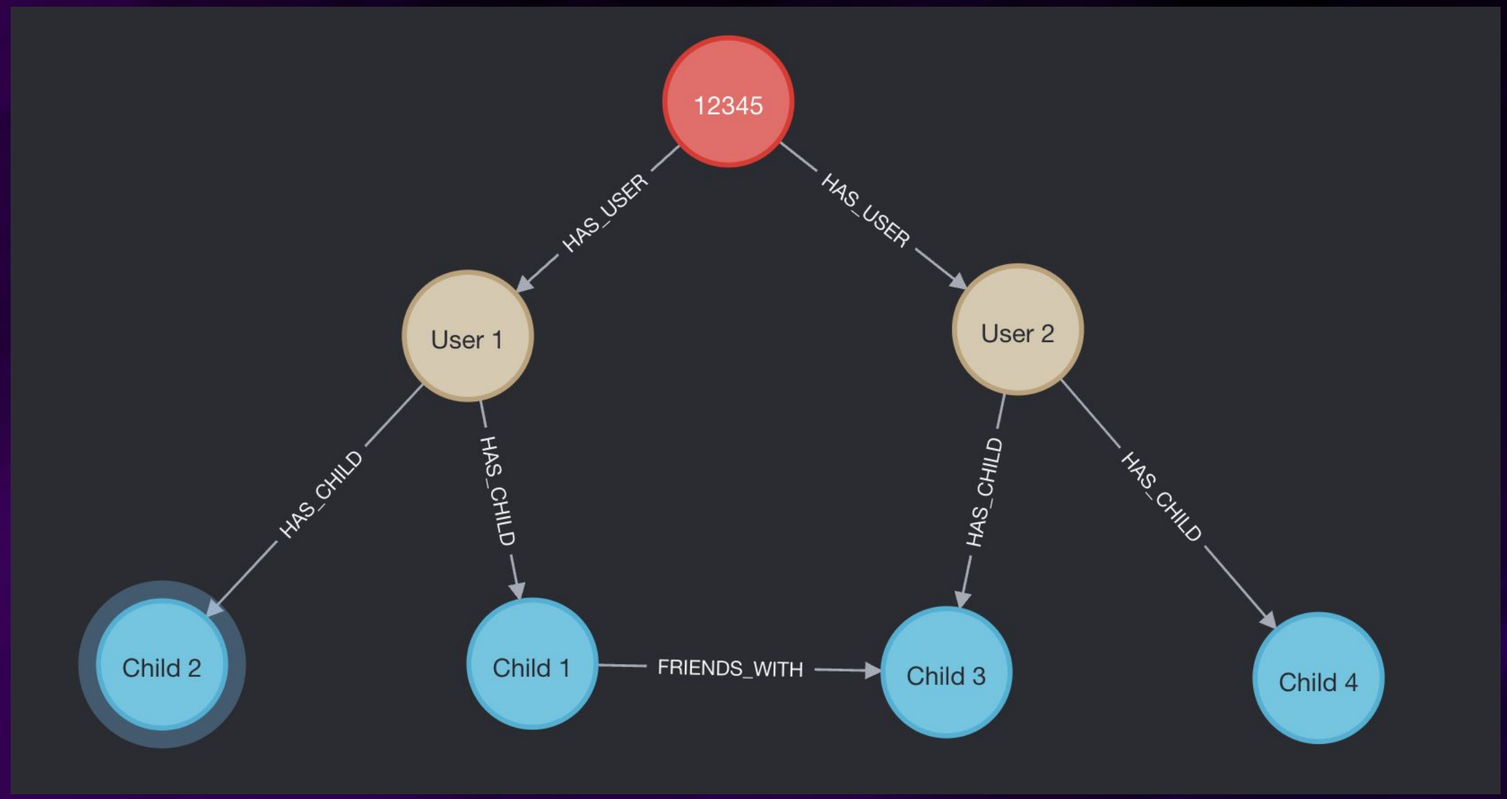
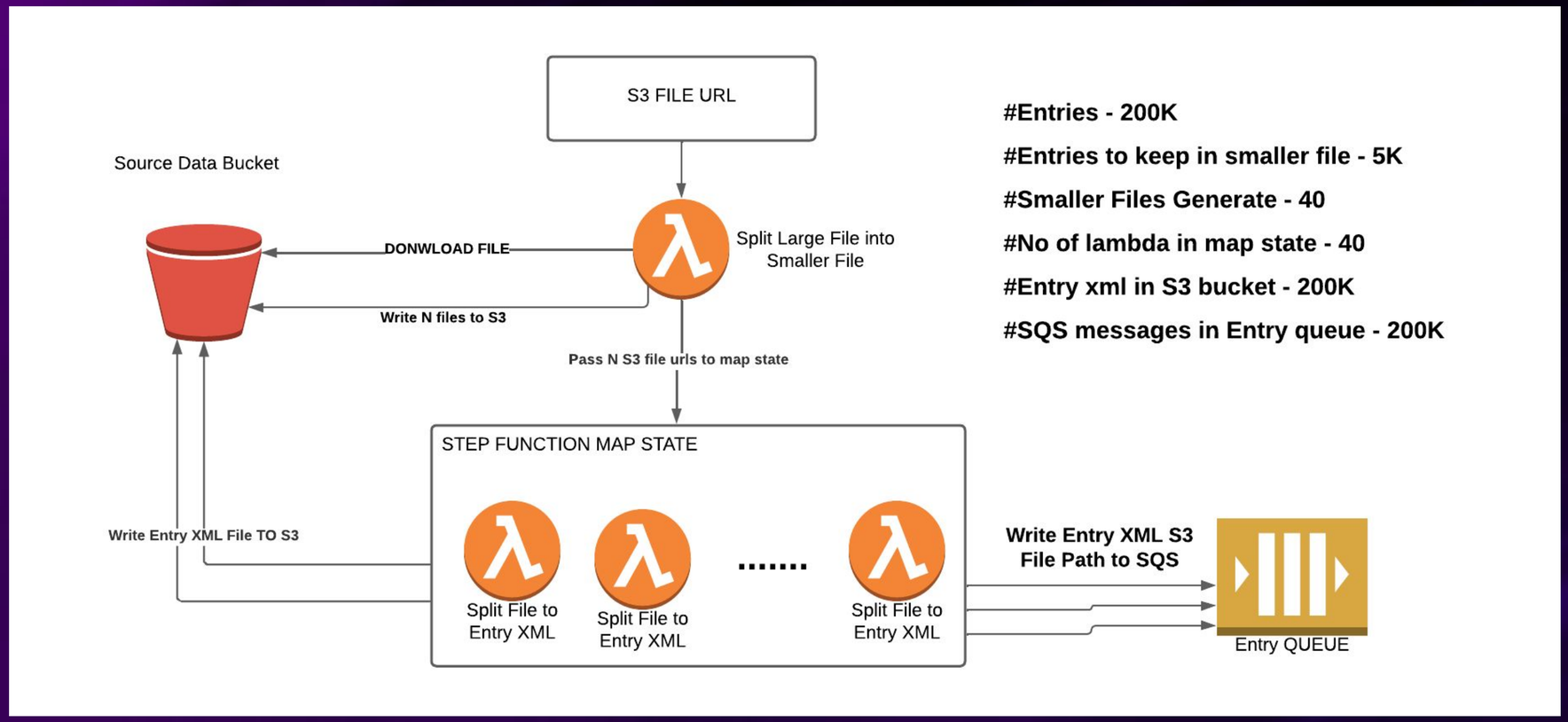


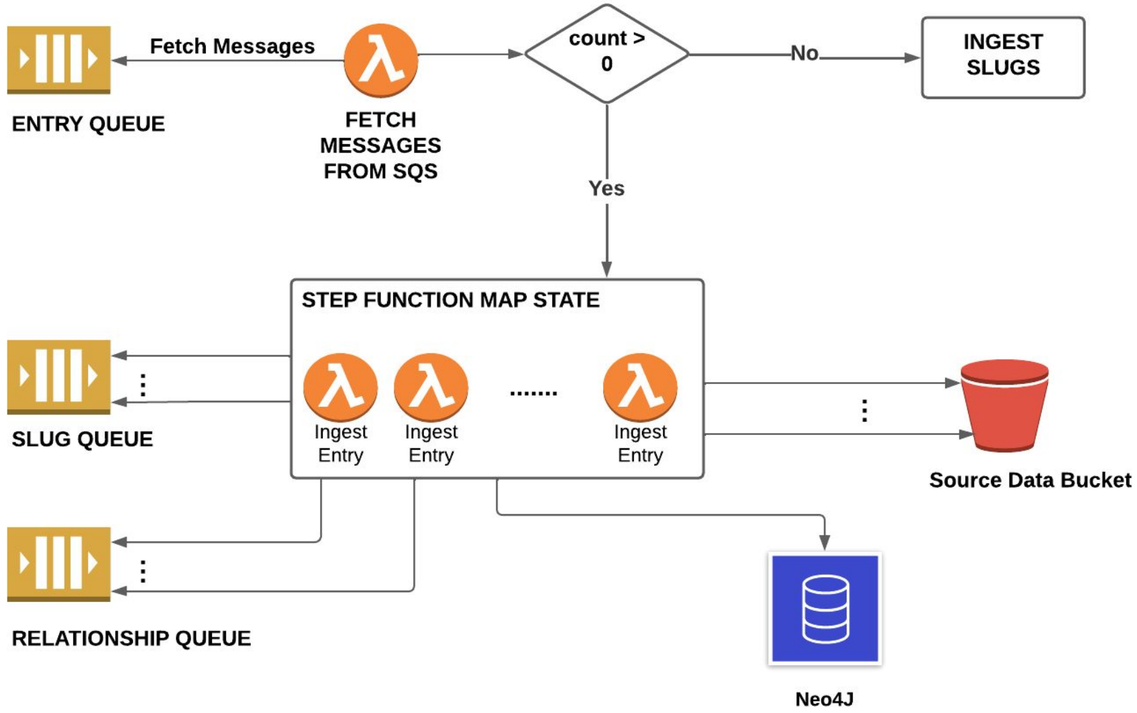
Implementation Steps

- ❑ Split source xml to individual entry xml files
- ❑ Ingest entries
- ❑ Ingest slugs
- ❑ Ingest relationships
- ❑ Generate artifacts

Split Source File



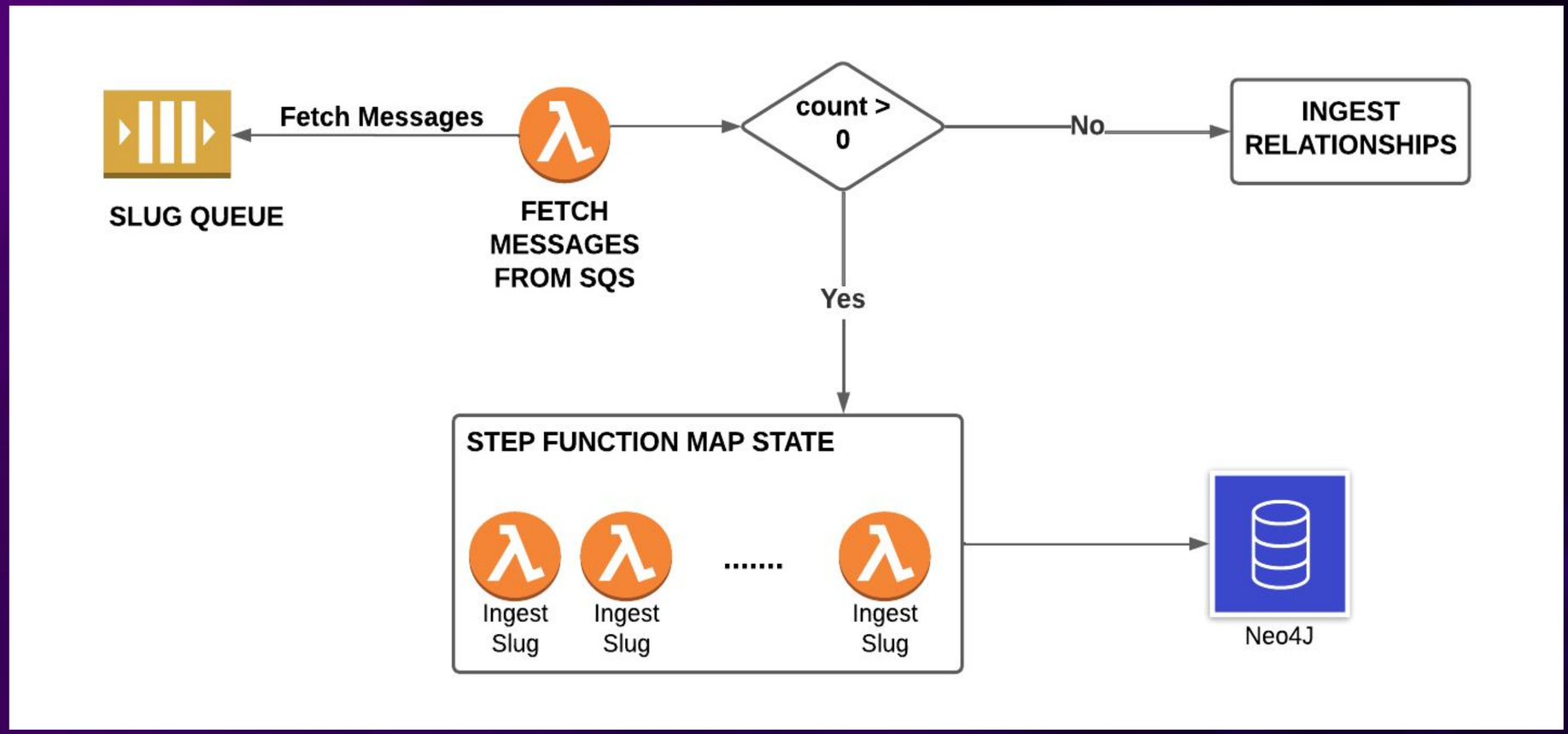
Ingest Entries



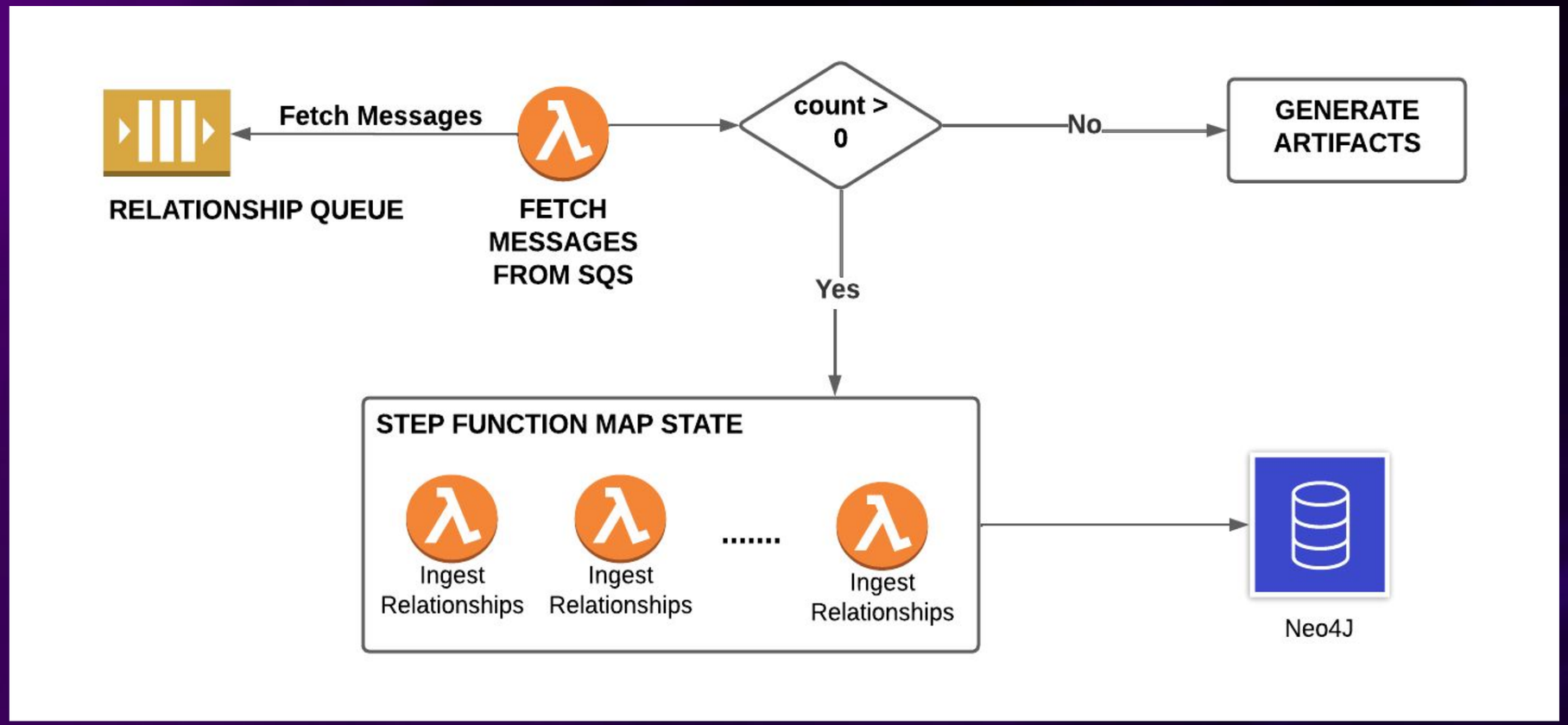
Approach 1 -
1 Receive Message call = max 10 messages
Run 10 lambda in parallel
Ingest 10 entries in one run
200K/ 10 = 20000 loops needed

Approach 2 -
1 Receive Message call = max 10 messages
Fetch 10 * 10 = 100 Messages from SQS
Run 100 lambda in parallel
Ingest 100 entries in one run
200k/100 = 2000 loops needed

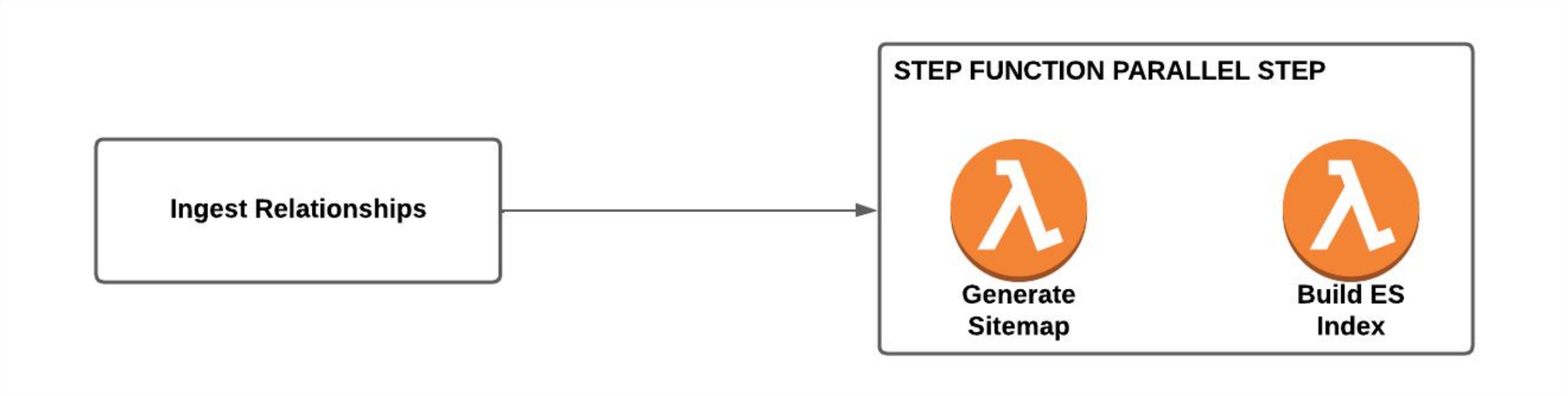
Ingest Slugs



Ingest Relationships



Generate Artifacts



Measuring Success

- Ingestion time reduced from ~24hrs to ~4hrs
- Use of step function provided visual workflow
- Enhanced debugging due to in built observability
- Step function provided ability redrive / retry the ingestion
- Self serving, improved Quality of life (QoL)
- Reduced cost

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Lessons Learned

Listen: Know Your Limits

- SQS message size - 256KB
- Step function data transfer limit between states - 256KB
- DB connection pool limit
- Step function maximum events limit in single run - 25000

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Learn: Use Batch Processing

- ❏ Fit more records to process in single SQS message
- ❏ Write data to DB in batches
- ❏ Drop your indexes while performing large data writes

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Improve

- Use child workflows to avoid reaching step function events limit of 25000
- Store pointers to the data in SQS instead of actual data

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Real World Applications

- Financial report processing
- Customer data processing
- Data migration
- Log processing

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Q/A

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