Ingesting Game Telemetry in near Real-time dynamically into Redshift with Airflow

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About Me

Karthik Kadiyam

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Lead Big Data Engineer @ WB Games Analytics

Hobbies : Video games, Basketball and Cricket
Data Landscape Requirements

50+
Game/Environments

GBs
Data daily

Faster Data Availability
Game Dev/Analyst/Data Scientist
Game Telemetry Data Pipeline

- **Game Clients**
- **Event Avro**
- **Event Ingestion Service**
  - **Schema Service**
- **kafka**
- **Micro Batch**
- **Apache Spark**
  - **Data Loader**
- **Amazon EMR**
  - **Data Files**
  - **Amazon S3**
- **Amazon Redshift**

**Data Flow**

**Invocation**
Ingesting data into Redshift

● What is a Copy command in Redshift?

● S3 Copy command syntax:

```sql
COPY table1
(column1, column2, etc.)
FROM 's3://demobucket/table1/datafile_1.txt'
IAM_ROLE 'arn:aws:iam:::role/
REGION 'us-west-2';
```

● S3 manifest

's3://demobucket/table1/datafiles.manifest'

● S3 Prefix:

's3://demobucket/table1/datafile_'
Challenges

- Data loading delays into Data Warehouse
- Heavy Operational overhead
- Data Quality Issues
Data Ingestion Into Redshift using Airflow
Features

- Faster data backfills when data delayed in Redshift
- Data quality and Observability
- Unified framework for Redshift data loading
Why Airflow?

- Scheduler based Dag workflow
- Flexible API to design Idempotent task in Dag
- Highly Scalable
- Built-in Features (Web UI, Variables, Connections, Retry, Alerting)
- Easy integration with external services (AWS, Datadog)
Redshift Loader Components

- **Consumer**: Captures S3 metadata for the s3 files and adds it to metadata audit tracking table.

- **Controller**: Pulls Metadata from audit. Dynamically generates copy commands for each table version and sends it to Connector via Xcom variable. In manifest scenario it saves the manifest file in s3.

- **Connector**: Connects to Redshift and executes Copy command statement.
Data Loading Scenarios

- **Scenario 1**: No resource constrains on Redshift. Default copy command execution.

- **Scenario 2**: Redshift is under heavy query workloads or maintainence and data is not loading for more than an hour. We let the current batch complete and in the next batch collect all the s3 files and create a manifest file. Execute single Copy command with S3 manifest specified.
Declarative Dag Deployment on Airflow

Easy Onboarding New Game:

- Create a Json variable with name as `<gameName>-<environment>-<eventType>.conf`

```json
{
    "schedule": "/5 * * * *
    "daysback": 1,
    "redshifthostnane": "xxxxxxxxxxxxx",
    "connectorqueuecount": 4,
    "batchwindow": 30,
    "manifestmin": 3,
    "exclude.tables": "table1,table4",
    "email": "xxxxxxxxxx",
    "batchsize": 1,
    "retry": 2
}
```
Declarative Dag Deployment on Airflow
Review

- Data loading delays into Data Warehouse.
- Heavy Operational overhead
- Data Quality Issues

- Dynamic data loading from Airflow Dag by switch between manifest /prefix / full path of s3 in Copy command.
- Unified framework for data loading via Airflow Dags on a multi-tenant Airflow Celery Cluster with custom metric insights.
- Idempotent tasks in Airflow and maintain transactional audit.
We are hiring!

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Questions?