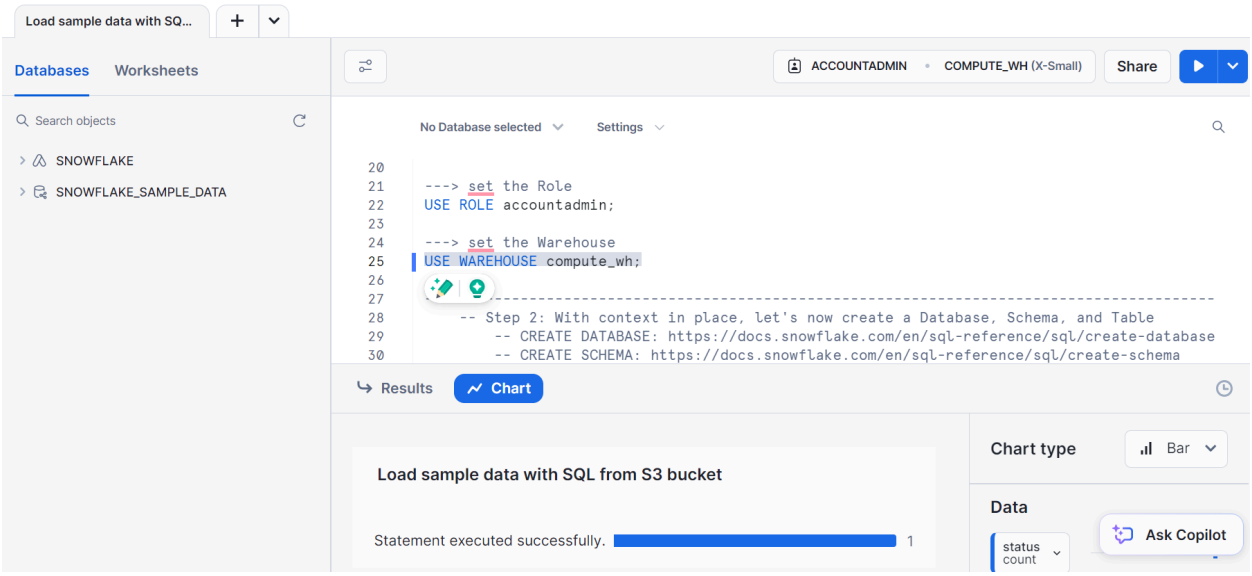
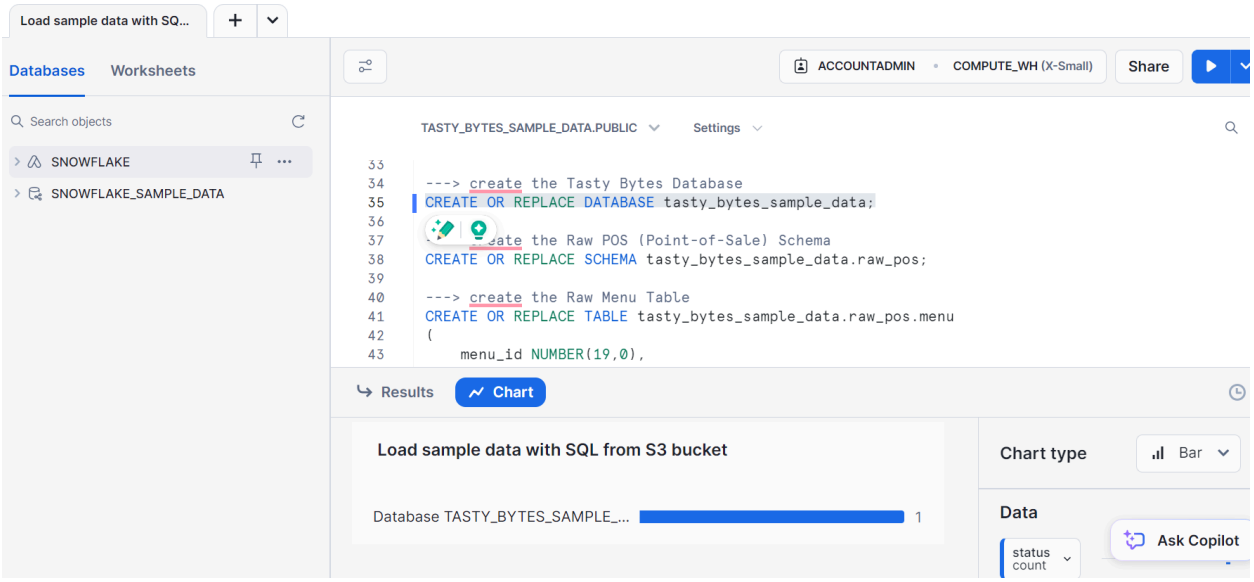
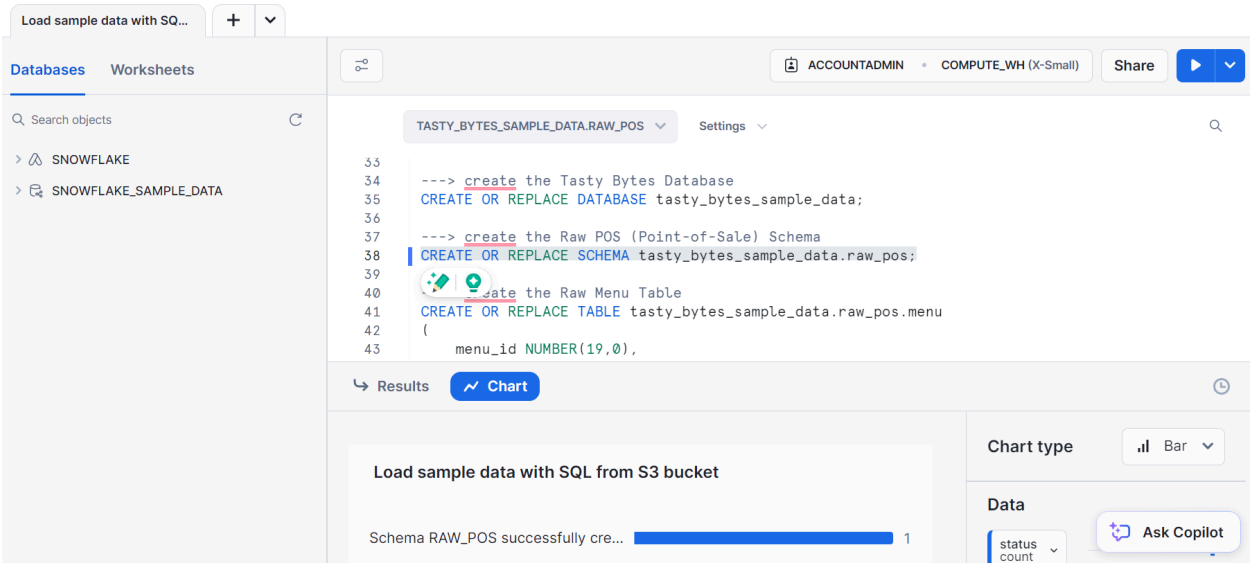
```
/*--
Tasty Bytes is a fictitious, global food truck network, that is on a mission to serve unique food options with high
quality items in a safe, convenient and cost effective way. In order to drive forward on their mission, Tasty Bytes
is beginning to leverage the Snowflake Data Cloud.

Within this Worksheet, we will walk through the end to end process required to load a CSV file containing Menu specific data
that is currently hosted in Blob Storage.
--*/

-----------------------------------------------------------------------------------------
    -- Step 1: To start, let's set the Role and Warehouse context
        -- USE ROLE: https://docs.snowflake.com/en/sql-reference/sql/use-role
        -- USE WAREHOUSE: https://docs.snowflake.com/en/sql-reference/sql/use-warehouse
-----------------------------------------------------------------------------------------

/*--
    - To run a single query, place your cursor in the query editor and select the Run button (⌘-Return).
    - To run the entire worksheet, select 'Run All' from the dropdown next to the Run button (⌘-Shift-Return).
--*/

---> set the Role
USE ROLE accountadmin;

---> set the Warehouse
USE WAREHOUSE compute_wh;

-----------------------------------------------------------------------------------------
    -- Step 2: With context in place, let's now create a Database, Schema, and Table
        -- CREATE DATABASE: https://docs.snowflake.com/en/sql-reference/sql/create-database
        -- CREATE SCHEMA: https://docs.snowflake.com/en/sql-reference/sql/create-schema
        -- CREATE TABLE: https://docs.snowflake.com/en/sql-reference/sql/create-table
-----------------------------------------------------------------------------------------

---> create the Tasty Bytes Database
CREATE OR REPLACE DATABASE tasty_bytes_sample_data;

---> create the Raw POS (Point-of-Sale) Schema
CREATE OR REPLACE SCHEMA tasty_bytes_sample_data.raw_pos;

---> create the Raw Menu Table
CREATE OR REPLACE TABLE tasty_bytes_sample_data.raw_pos.menu
(
    menu_id NUMBER(19,0),
```

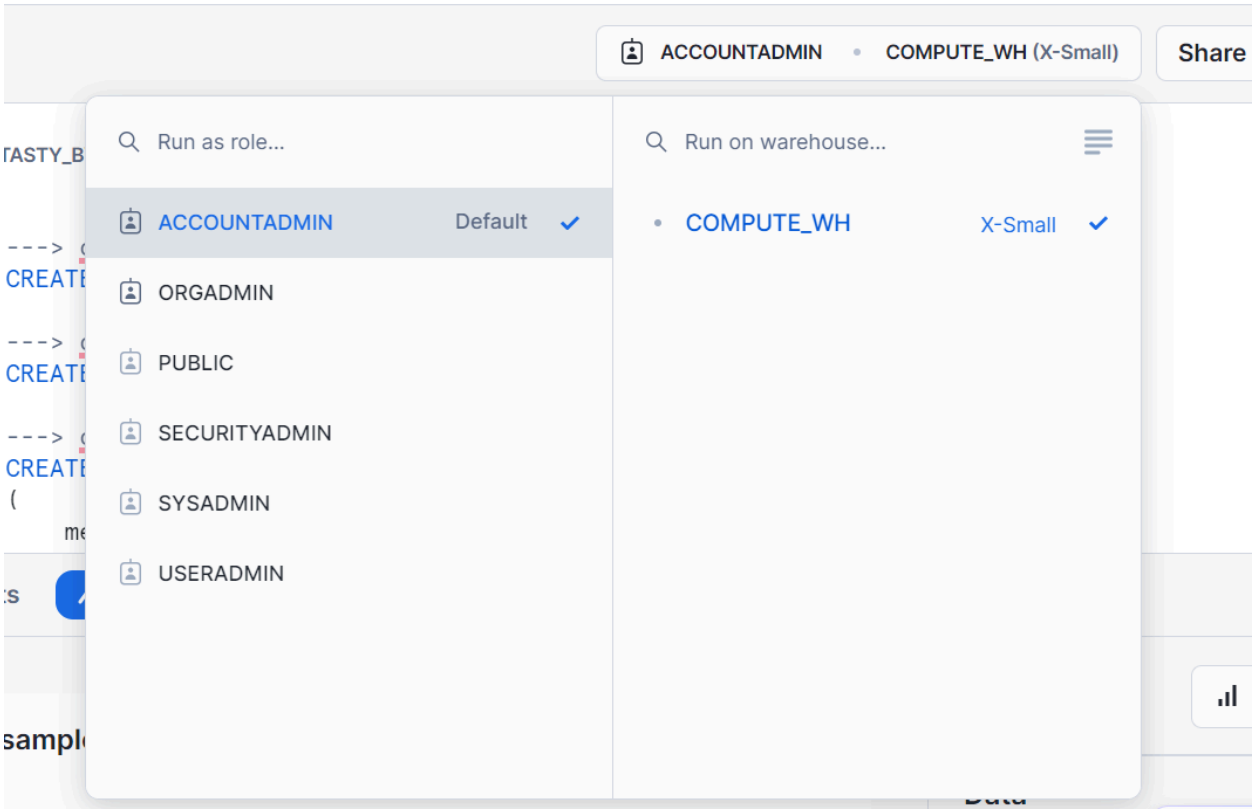
```
    menu_type_id NUMBER(38,0),
    menu_type VARCHAR(16777216),
    truck_brand_name VARCHAR(16777216),
    menu_item_id NUMBER(38,0),
    menu_item_name VARCHAR(16777216),
    item_category VARCHAR(16777216),
    item_subcategory VARCHAR(16777216),
    cost_of_goods_usd NUMBER(38,4),
    sale_price_usd NUMBER(38,4),
    menu_item_health_metrics_obj VARIANT
);

---> confirm the empty Menu table exists
SELECT * FROM tasty_bytes_sample_data.raw_pos.menu;


-----------------------------------------------------------------------------------------
    -- Step 3: To connect to the Blob Storage, let's create a Stage
        -- Creating an S3 Stage:
https://docs.snowflake.com/en/user-guide/data-load-s3-create-stage
-----------------------------------------------------------------------------------------

---> create the Stage referencing the Blob location and CSV File Format
CREATE OR REPLACE STAGE tasty_bytes_sample_data.public.blob_stage
url = 's3://sfquickstarts/tastybytes/'
file_format = (type = csv);

---> query the Stage to find the Menu CSV file
LIST @tasty_bytes_sample_data.public.blob_stage/raw_pos/menu/;


-----------------------------------------------------------------------------------------
    -- Step 4: Now let's Load the Menu CSV file from the Stage
        -- COPY INTO <table>: https://docs.snowflake.com/en/sql-reference/sql/copy-into-table
-----------------------------------------------------------------------------------------

---> copy the Menu file into the Menu table
COPY INTO tasty_bytes_sample_data.raw_pos.menu
FROM @tasty_bytes_sample_data.public.blob_stage/raw_pos/menu/;


-----------------------------------------------------------------------------------------
    -- Step 5: Query the Menu table
        -- SELECT: https://docs.snowflake.com/en/sql-reference/sql/select
        -- TOP <n>: https://docs.snowflake.com/en/sql-reference/constructs/top_n
        -- FLATTEN: https://docs.snowflake.com/en/sql-reference/functions/flatten
-----------------------------------------------------------------------------------------

---> how many rows are in the table?
SELECT COUNT(*) AS row_count FROM tasty_bytes_sample_data.raw_pos.menu;
```

```
---> what do the top 10 rows look like?
SELECT TOP 10 * FROM tasty_bytes_sample_data.raw_pos.menu;

---> what menu items does the Freezing Point brand sell?
SELECT
   menu_item_name
FROM tasty_bytes_sample_data.raw_pos.menu
WHERE truck_brand_name = 'Freezing Point';

---> what is the profit on Mango Sticky Rice?
SELECT
   menu_item_name,
   (sale_price_usd - cost_of_goods_usd) AS profit_usd
FROM tasty_bytes_sample_data.raw_pos.menu
WHERE 1=1
AND truck_brand_name = 'Freezing Point'
AND menu_item_name = 'Mango Sticky Rice';

---> to finish, let's extract the Mango Sticky Rice ingredients from the semi-structured column
SELECT
    m.menu_item_name,
    obj.value:"ingredients"::ARRAY AS ingredients
FROM tasty_bytes_sample_data.raw_pos.menu m,
    LATERAL FLATTEN (input =>
m.menu_item_health_metrics_obj:menu_item_health_metrics) obj
WHERE 1=1
AND truck_brand_name = 'Freezing Point'
AND menu_item_name = 'Mango Sticky Rice';
```

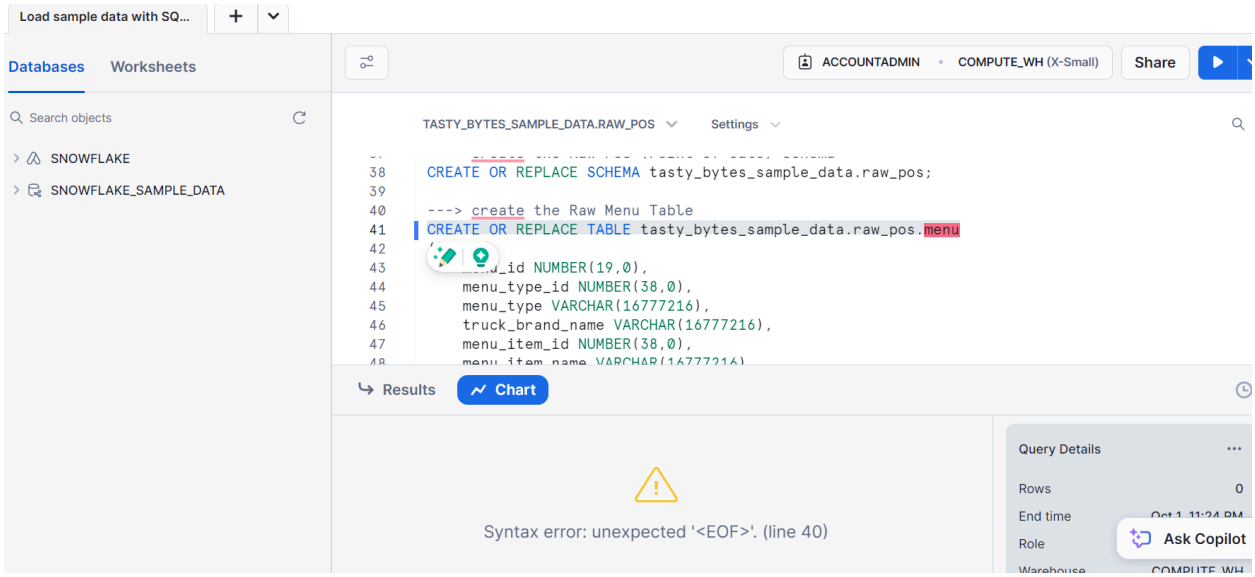



Load sample data with SQ...
Databases
Worksheets
Search objects
SNOWFLAKE
SNOWFLAKE_SAMPLE_DATA
ACCOUNTADMIN
COMPUTE_WH (X-Small)
Share
TASTY_BYTES_SAMPLE_DATA.PUBLIC
Settings
---> create the Tasty Bytes Database
CREATE OR REPLACE DATABASE tasty_bytes_sample_data;
---> create the Raw POS (Point-of-Sale) Schema
CREATE OR REPLACE SCHEMA tasty_bytes_sample_data.raw_pos;
---> create the Raw Menu Table
CREATE OR REPLACE TABLE tasty_bytes_sample_data.raw_pos.menu
(
menu_id NUMBER(19,0),
Results
Chart
Load sample data with SQL from S3 bucket
Database TASTY_BYTES_SAMPLE_...
1
Chart type
Bar
Data
status
count
Ask Copilot


Load sample data with SQ...
Databases
Worksheets
Search objects
SNOWFLAKE
SNOWFLAKE_SAMPLE_DATA
ACCOUNTADMIN
COMPUTE_WH (X-Small)
Share
TASTY_BYTES_SAMPLE_DATA.RAW_POS
Settings
---> create the Tasty Bytes Database
CREATE OR REPLACE DATABASE tasty_bytes_sample_data;
---> create the Raw POS (Point-of-Sale) Schema
CREATE OR REPLACE SCHEMA tasty_bytes_sample_data.raw_pos;
---> create the Raw Menu Table
CREATE OR REPLACE TABLE tasty_bytes_sample_data.raw_pos.menu
(
menu_id NUMBER(19,0),
Results
Chart
Load sample data with SQL from S3 bucket
Schema RAW_POS successfully cre...
1
Chart type
Bar
Data
status
count
Ask Copilot



When there is an error:



Query Results:

Results | Chart

	status
1	Table MENU successfully created.

Rows 1
Query ID 01b76754-0003-42ae-0...
End time Oct 1, 11:26 PM
Scan 0.0
Role ACCOUNTADMIN
Warehouse COMPUTE_WH

Show less | Ask Copilot

```
55
56  ---> confirm the empty Menu table exists
57  SELECT * FROM tasty_bytes_sample_data.raw_pos.menu;
58
```

Results | Chart

MENU_ID	MENU_TYPE_ID	MENU_TYPE	TRUCK_BRAND_NAME
Query produced no results			

Query Details
Query duration 71ms
Rows 0
Query ID 01b76755-0003-42a9-0...

Show more | Ask Copilot

```
65  ---> create the Stage referencing the Blob location and CSV File Format
66  CREATE OR REPLACE STAGE tasty_bytes_sample_data.public.blob_stage
67  url = 's3://sfquickstarts/tastybytes/'
68  file_format = (type = csv);
69
70  ---> query the Stage to find the Menu CSV file
71  LIST @tasty_bytes_sample_data.public.blob_stage/raw_pos/menu/;
72
```

Results | Chart

	status
1	Stage area BLOB_STAGE successfully created.

Query Details
Query duration 289ms
Rows 1
Query ID 01b76756-0003-42b3-...

Show more | Ask Copilot

```
69
70  ---> query the Stage to find the Menu CSV file
71  LIST @tasty_bytes_sample_data.public.blob_stage/raw_pos/menu/;
72
73
74  ----------------------------------------------------------------------------------------------
75      -- Step 4: Now let's Load the Menu CSV file from the Stage
76          -- COPY INTO <table>: https://docs.snowflake.com/en/sql-reference/sql/copy-into-table
```

Results | Chart

	name	size	md5
1	s3://sfquickstarts/tastybytes/raw_pos/menu/menu.csv.gz	3478	9dd9a858e141c2e

Query Details

Query duration 144ms

Rows 1

Query ID 01b76756-0003-44d3-...

Show more | Ask Copilot

```
77  ----------------------------------------------------------------------------------------------
78
79  ---> copy the Menu file into the Menu table
80  COPY INTO tasty_bytes_sample_data.raw_pos.menu
81  FROM @tasty_bytes_sample_data.public.blob_stage/raw_pos/menu/;
82
83
84  ----------------------------------------------------------------------------------------------
```

Results | Chart

	file	status	rows_parsed	rows_loaded	error_limit	errors_seen	first_err
1	s3://sfquickstarts/tastybytes/raw_pos/menu/menu.csv.gz	LOADED	100	100	1	0	null

Query Details

Query duration 1.5s

Rows 1

Query ID 01b76757-0003-44d3-...

Show more | Ask Copilot

```
91  ---> how many rows are in the table?
92  SELECT COUNT(*) AS row_count FROM tasty_bytes_sample_data.raw_pos.menu;
93
94      --> what do the top 10 rows look like?
95  SELECT TOP 10 * FROM tasty_bytes_sample_data.raw_pos.menu;
96
97  ---> what menu items does the Freezing Point brand sell?
98  SELECT
99     menu_item_name
```

Results | Chart

	ROW_COUNT
1	100

```
93
94  ---> what do the top 10 rows look like?
95  SELECT TOP 10 * FROM tasty_bytes_sample_data.raw_pos.menu;
96
```

Results | Chart

	MENU_ID	MENU_TYPE_ID	MENU_TYPE	TRUCK_BRAND_NAME	MENU_ITEM_ID	MENU_ITEM_NAME	ITEM_CATEGORY	ITE
1	10001	1	Ice Cream	Freezing Point	10	Lemonade	Beverage	Cold
2	10002	1	Ice Cream	Freezing Point	11	Sugar Cone	Dessert	Cold
3	10003	1	Ice Cream	Freezing Point	12	Waffle Cone	Dessert	Cold
4	10004	1	Ice Cream	Freezing Point	13	Two Scoop Bowl	Dessert	Cold

Query Details
Query duration 324ms
Rows 10
Query ID 01b76758-0003-42a9-...
Show more | Ask Copilot

```
97  ---> what menu items does the Freezing Point brand sell?
98  SELECT
99     menu_item_name
100 FROM tasty_bytes_sample_data.raw_pos.menu
101 WHERE truck_brand_name = 'Freezing Point';
102
103 ---> what is the profit on Mango Sticky Rice?
104 SELECT
```

Results | Chart

	MENU_ITEM_NAME
1	Lemonade
2	Sugar Cone
3	Waffle Cone
4	Two Scoop Bowl
5	Bottled Water

Query Details
Query duration 395ms
Rows 10
Query ID 01b76759-0003-42b3-...
Show more | Ask Copilot

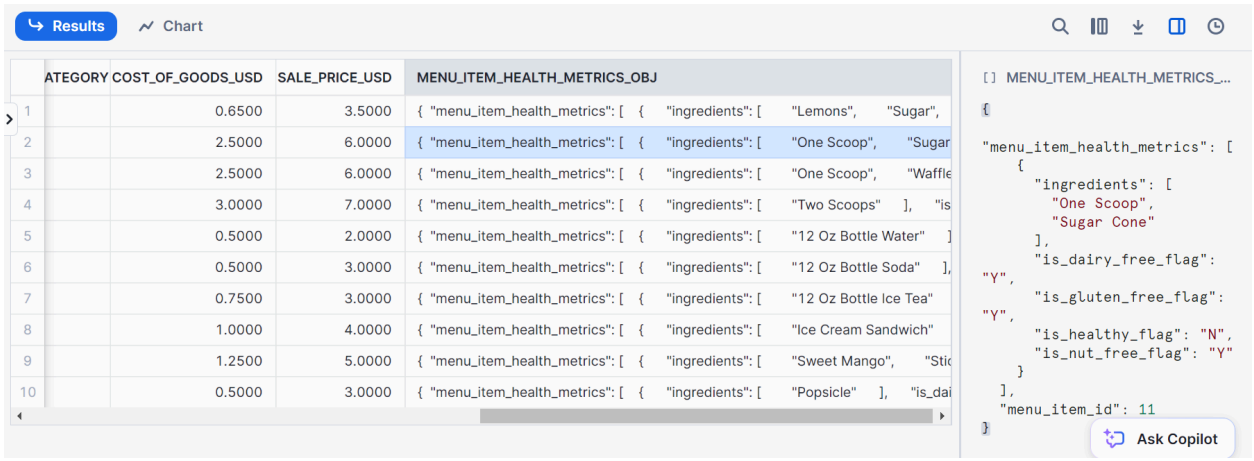
```
103 ---> what is the profit on Mango Sticky Rice?
104 SELECT
105    menu_item_name,
106    (sale_price_usd - cost_of_goods_usd) AS profit_usd
107 FROM tasty_bytes_sample_data.raw_pos.menu
108 WHERE 1=1
109 AND truck_brand_name = 'Freezing Point'
110 AND menu_item_name = 'Mango Sticky Rice';
111
```

Results | Chart

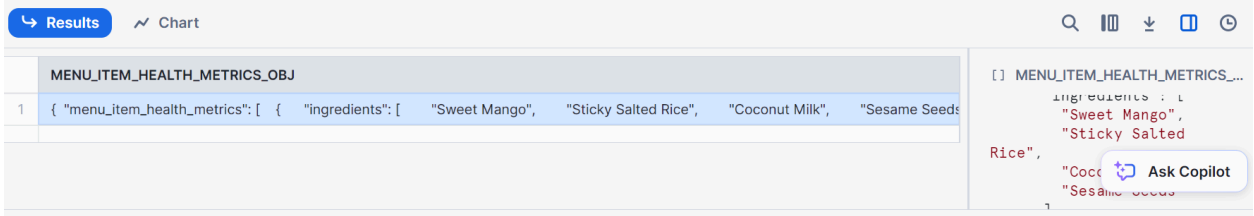
	MENU_ITEM_NAME	PROFIT_USD
1	Mango Sticky Rice	3.7500

Query Details
Query duration 83ms
Rows 1
Query ID 01b7675a-0003-42b3-...
Show more | Ask Copilot

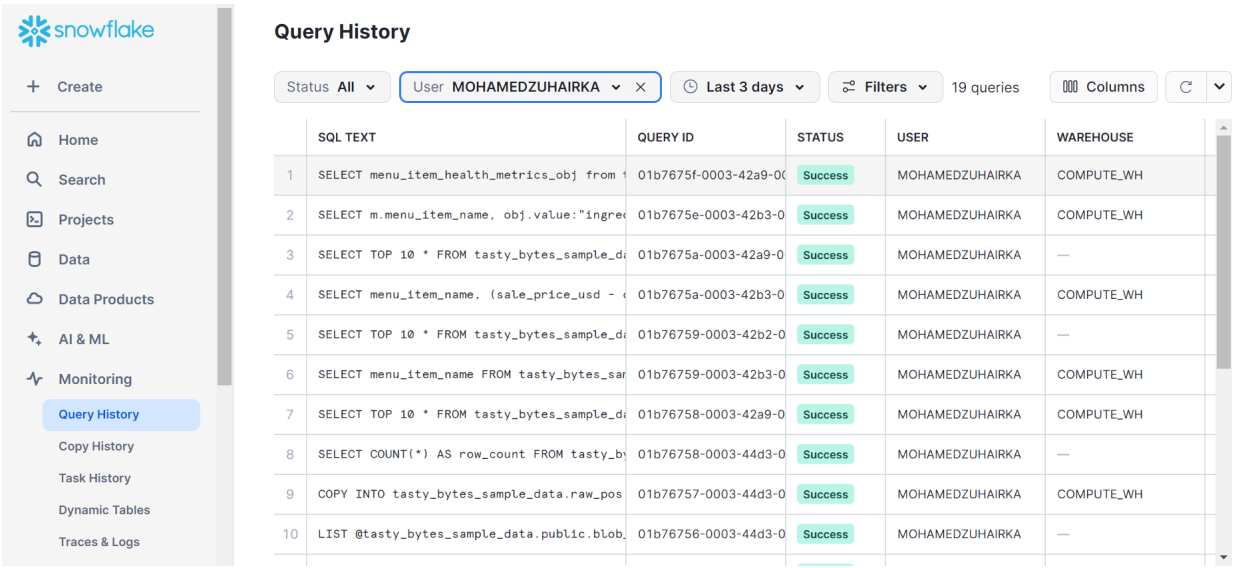
Variant field



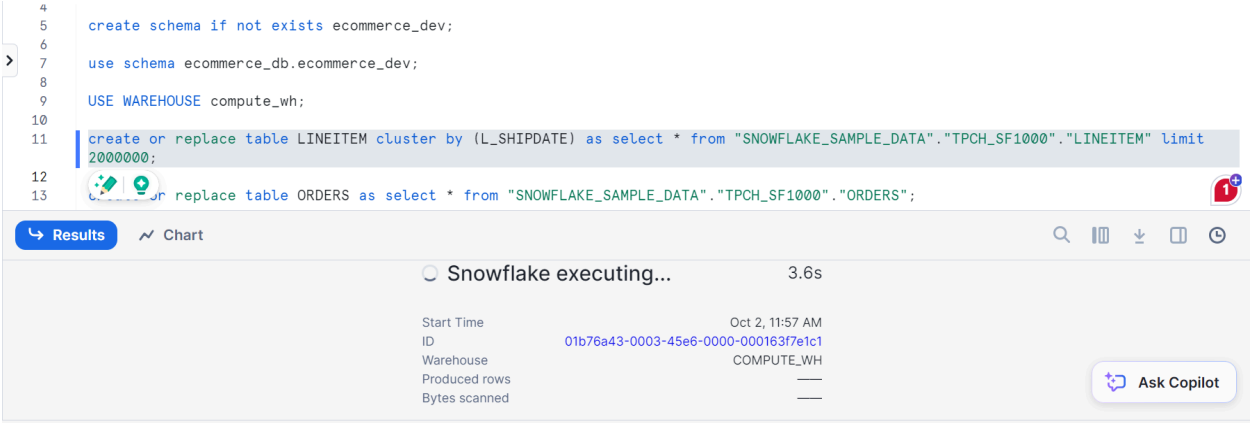

```
111
112 SELECT menu_item_health_metrics_obj
113 from tasty_bytes_sample_data.raw_pos.menu
114 WHERE truck_brand_name = 'Freezing Point'
115 AND menu_item_name = 'Mango Sticky Rice';
116
117 -- To finish, let's extract the Mango Sticky Rice ingredients from the semi-structured column
118 SELECT
119     m.menu_item_name,
```

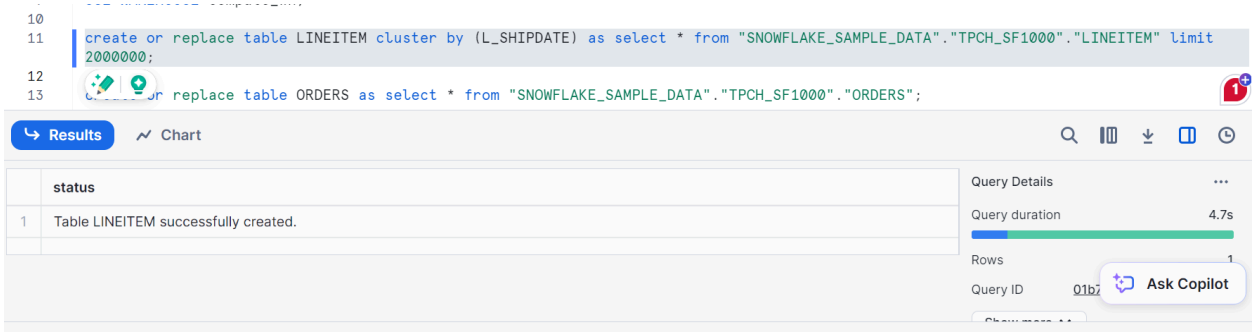



```
113 SELECT
114     m.menu_item_name,
115     obj.value:"ingredients"::ARRAY AS ingredients
116 FROM tasty_bytes_sample_data.raw_pos.menu m,
117     LATERAL FLATTEN (input => m.menu_item_health_metrics_obj:menu_item_health_metrics) obj
118 WHERE 1=1
119 AND truck_brand_name = 'Freezing Point'
120 AND menu_item_name = 'Mango Sticky Rice';
```

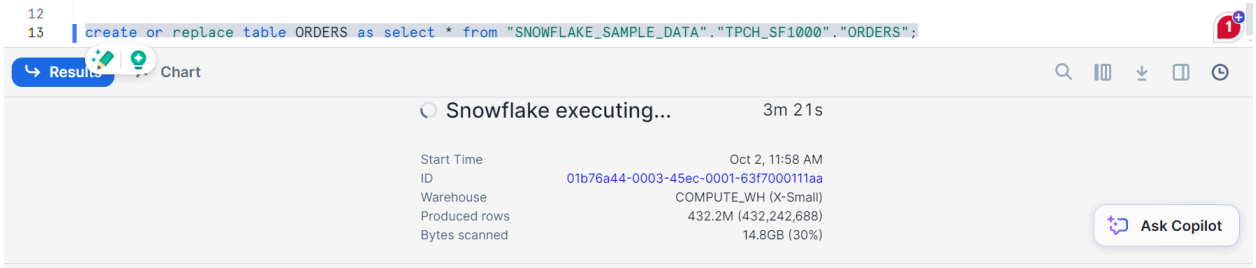


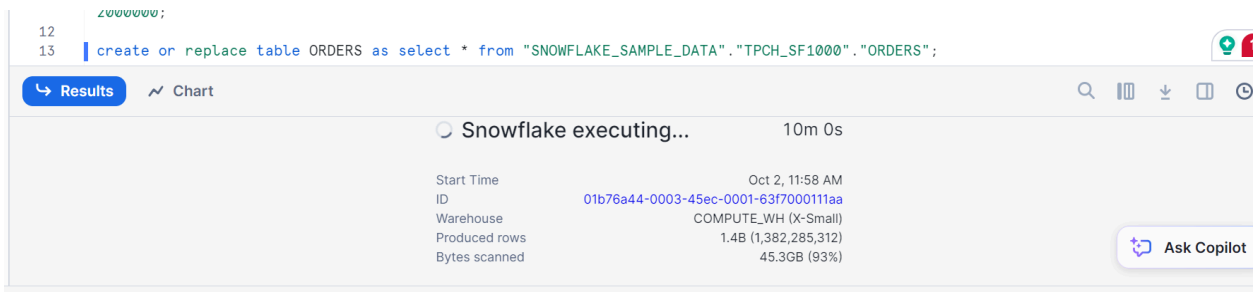

```
USE ROLE accountadmin;

create database if not exists ecommerce_db;

create schema if not exists ecommerce_dev;

use schema ecommerce_db.ecommerce_dev;

USE WAREHOUSE compute_wh;

create or replace table LINEITEM cluster by (L_SHIPDATE) as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" limit 2000000;

create or replace table ORDERS as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."ORDERS";
```

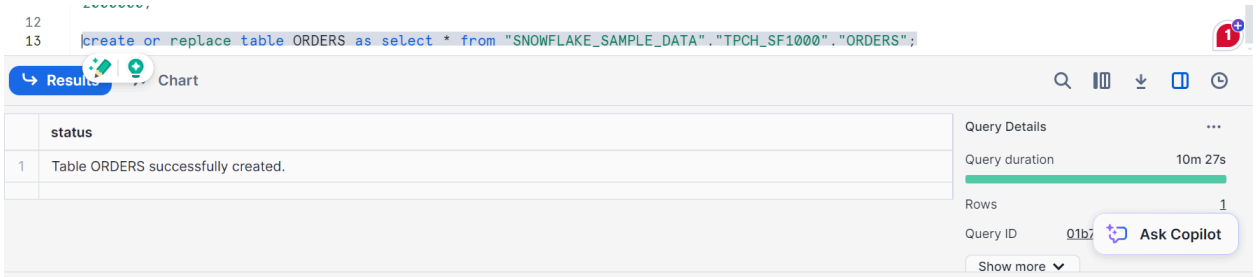


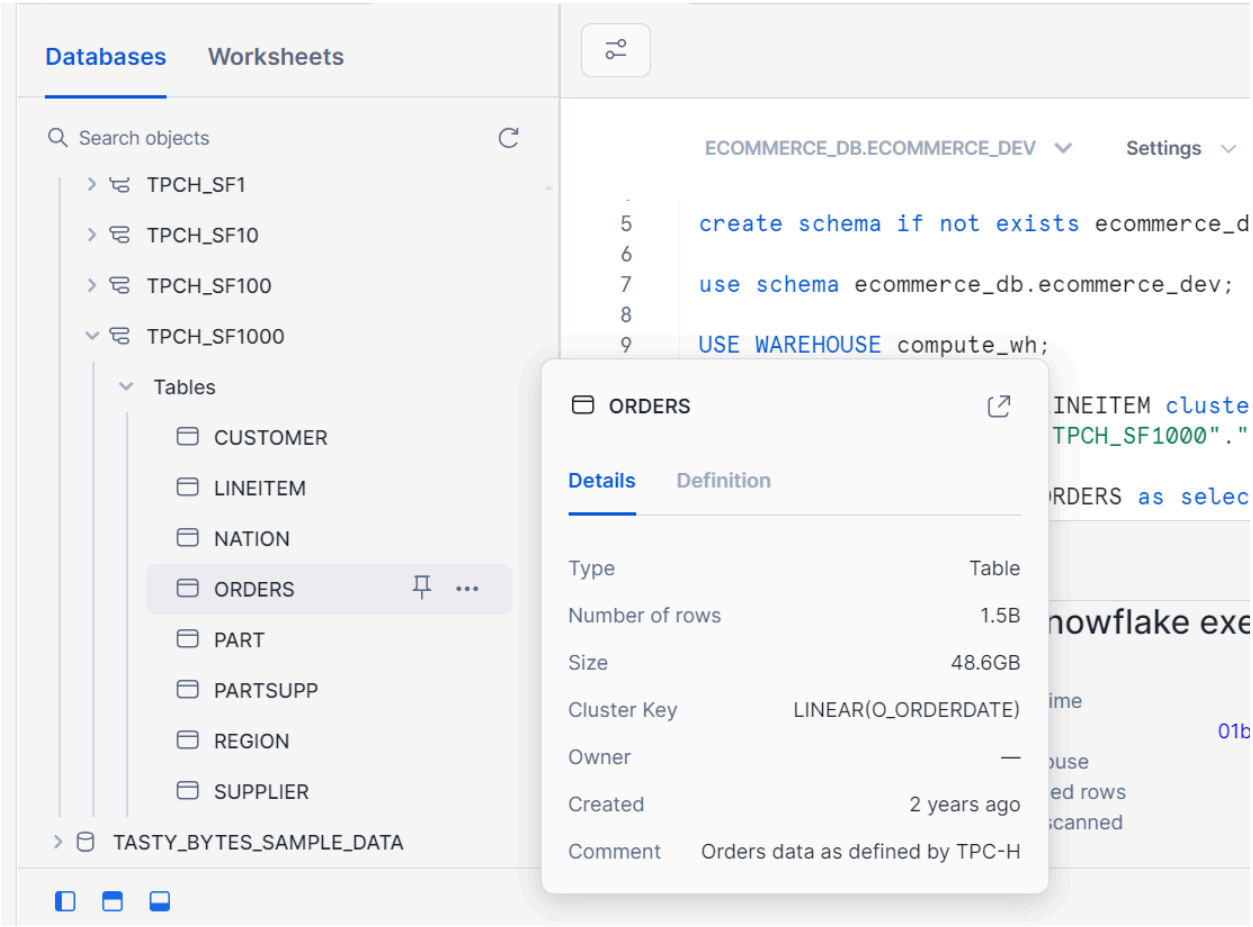

create or replace table LINEITEM cluster by (L_SHIPDATE) as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" limit 2000000;
create or replace table ORDERS as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."ORDERS";
Results
Chart
status
Table LINEITEM successfully created.
Query Details
Query duration
4.7s
Rows
Query ID
Ask Copilot

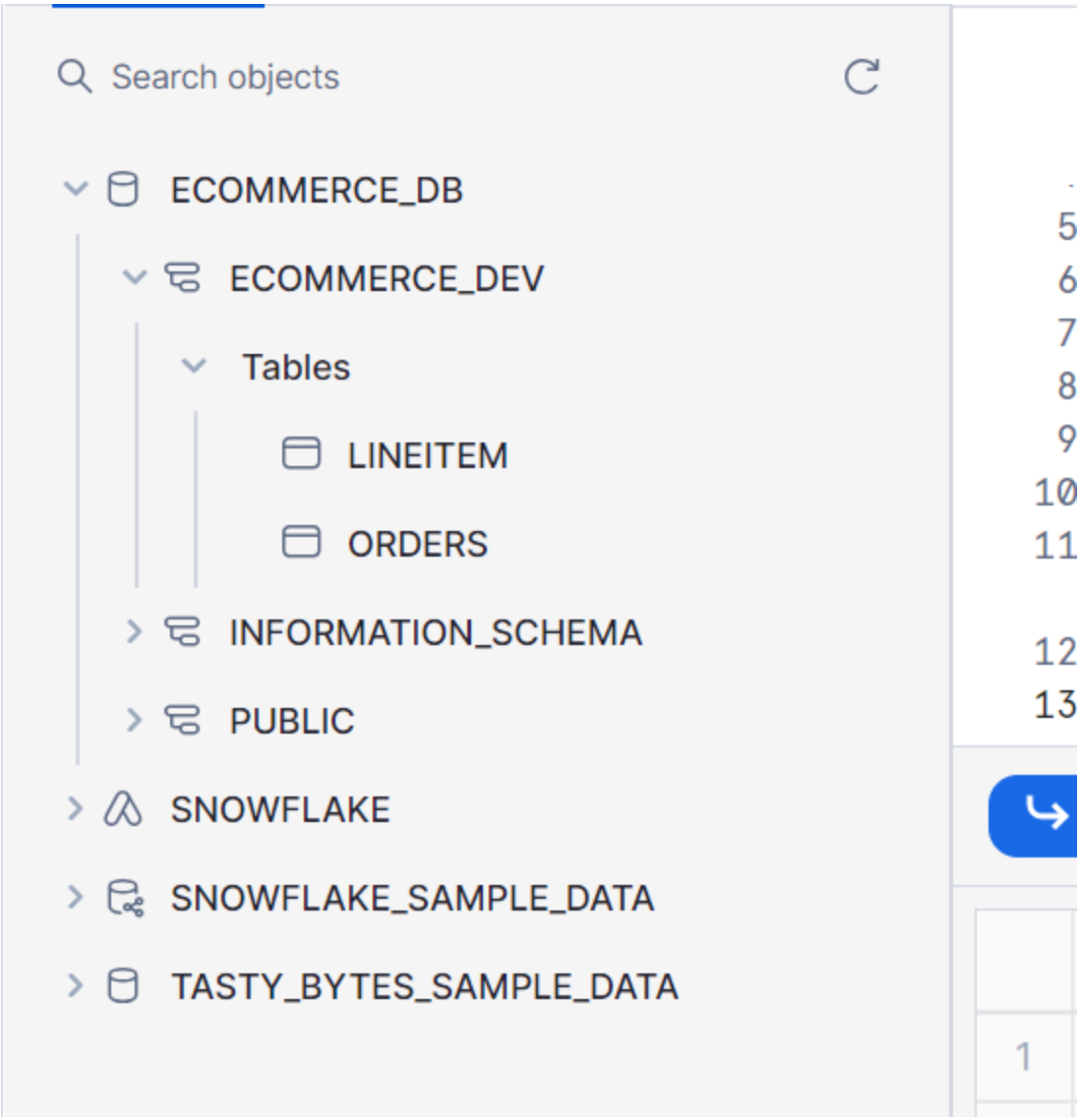

create or replace table ORDERS as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."ORDERS";
Results
Chart
Snowflake executing...
9.7s
Start Time
Oct 2, 11:58 AM
ID
01b76a44-0003-45ec-0001-63f7000111aa
Warehouse
COMPUTE_WH (X-Small)
Produced rows
Bytes scanned
Ask Copilot


create or replace table ORDERS as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."ORDERS";
Chart
Snowflake executing...
3m 21s
Start Time
Oct 2, 11:58 AM
ID
01b76a44-0003-45ec-0001-63f7000111aa
Warehouse
COMPUTE_WH (X-Small)
Produced rows
432.2M (432,242,688)
Bytes scanned
14.8GB (30%)
Ask Copilot


create or replace table ORDERS as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."ORDERS";
Results
Chart
Snowflake executing...
10m 0s
Start Time
Oct 2, 11:58 AM
ID
01b76a44-0003-45ec-0001-63f7000111aa
Warehouse
COMPUTE_WH (X-Small)
Produced rows
1.4B (1,382,285,312)
Bytes scanned
45.3GB (93%)
Ask Copilot


create or replace table ORDERS as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."ORDERS";
Results
Chart
status
Table ORDERS successfully created.
Query Details
Query duration
10m 27s
Rows
Query ID
Show more
Ask Copilot

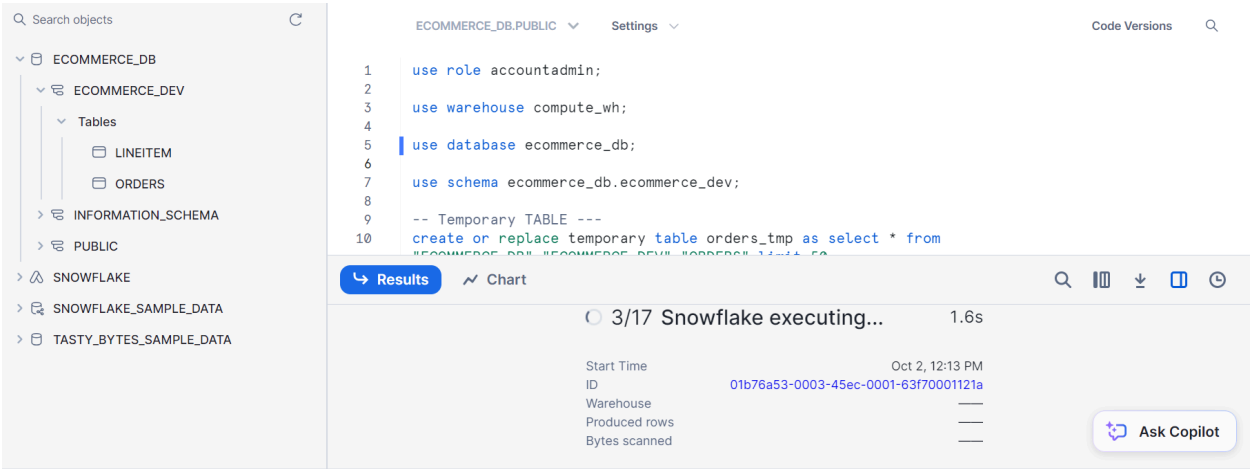

Databases
Worksheets
Search objects
TPCH_SF1
TPCH_SF10
TPCH_SF100
TPCH_SF1000
Tables
CUSTOMER
LINEITEM
NATION
ORDERS
PART
PARTSUPP
REGION
SUPPLIER
TASTY_BYTES_SAMPLE_DATA
ECOMMERCE_DB.ECOMMERCE_DEV
Settings
create schema if not exists ecommerce_d
use schema ecommerce_db.ecommerce_dev;
USE WAREHOUSE compute_wh;
ORDERS
Details
Definition
Type
Table
Number of rows
1.5B
Size
48.6GB
Cluster Key
LINEAR(O_ORDERDATE)
Owner
—
Created
2 years ago
Comment
Orders data as defined by TPC-H

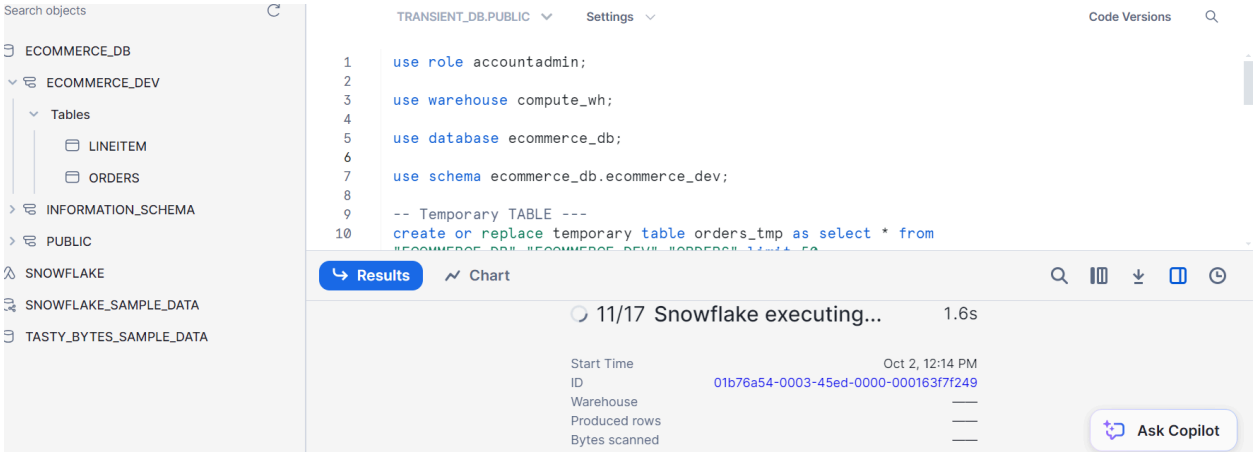


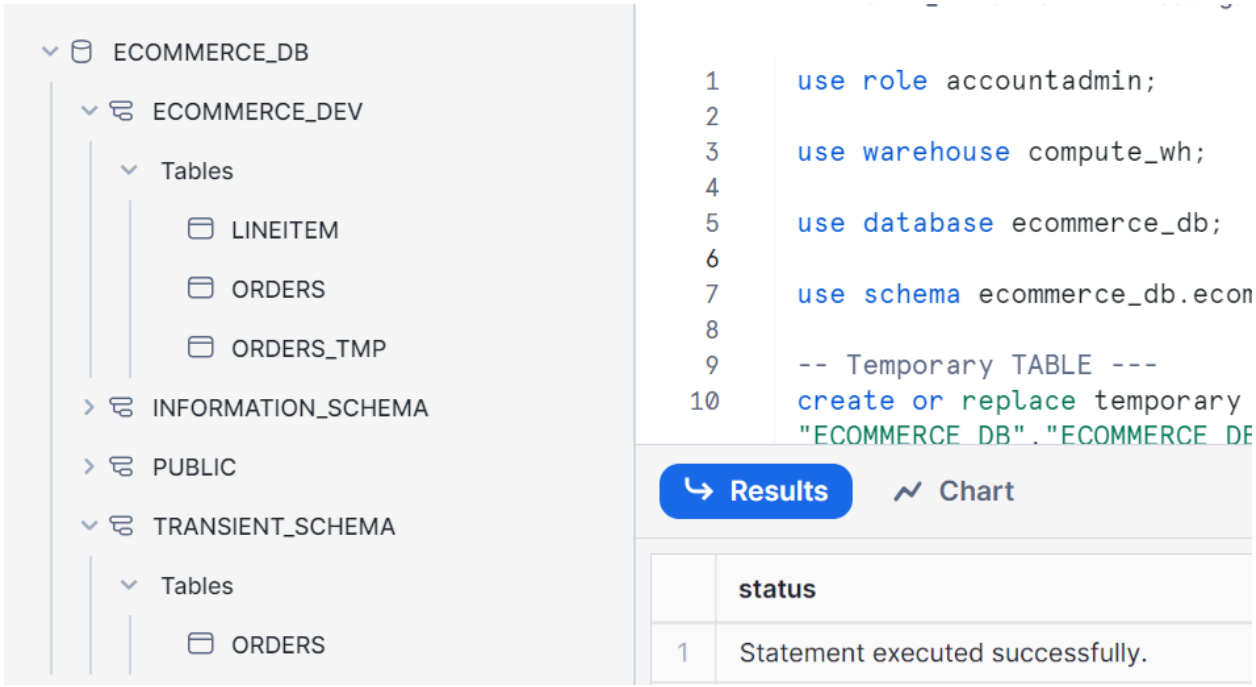

```
use role accountadmin;

use warehouse compute_wh;

use database ecommerce_db;

use schema ecommerce_db.ecommerce_dev;

-- Temporary TABLE ---
create or replace temporary table orders_tmp as select * from
"ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS" limit 50;
```

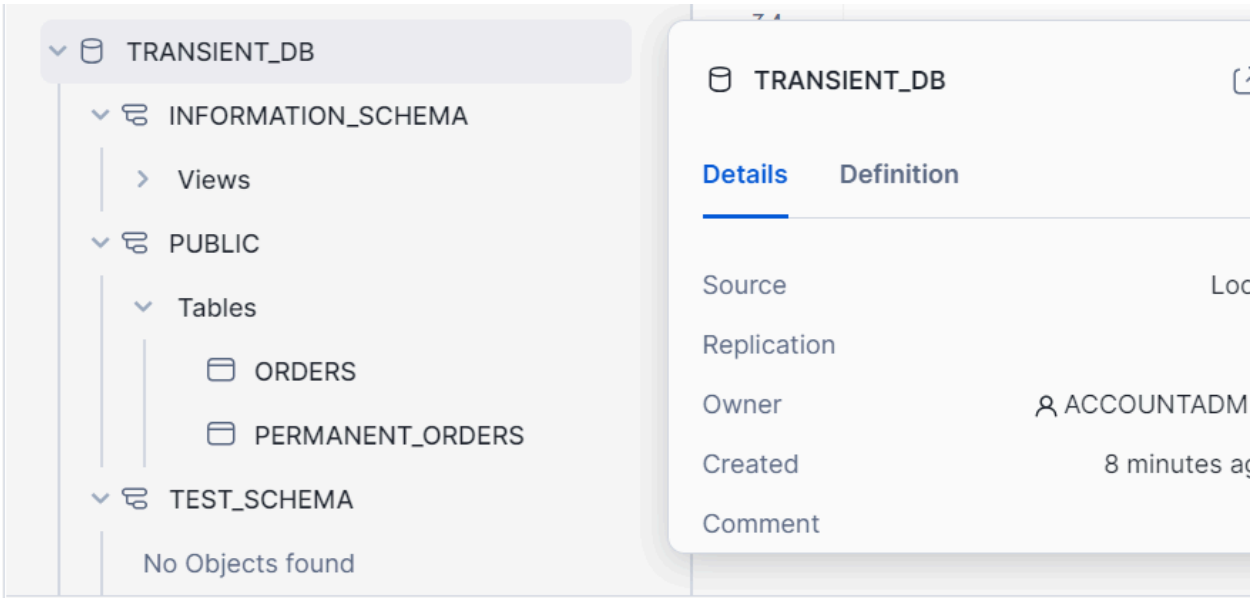
```
-- TRANSIENT TABLE ---
create or replace transient table orders as select * from
"ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS" limit 50;

---- Transient Schema ----
create transient schema transient_schema;
use schema transient_schema;
create or replace table orders as select * from
"ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS" limit 50;


---- Transient Database ----
create transient database transient_db;
create schema test_schema;
use database transient_db;
create or replace table orders as select * from
"ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS" limit 50;



--- Convert Permanent table to transient table -----
create or replace table permanent_orders as select * from
"ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS" limit 50;

create or replace transient table transient_orders as select * from permanent_orders limit 50;

drop table permanent_orders;

ALTER TABLE transient_orders RENAME TO permanent_orders;
```

Run all



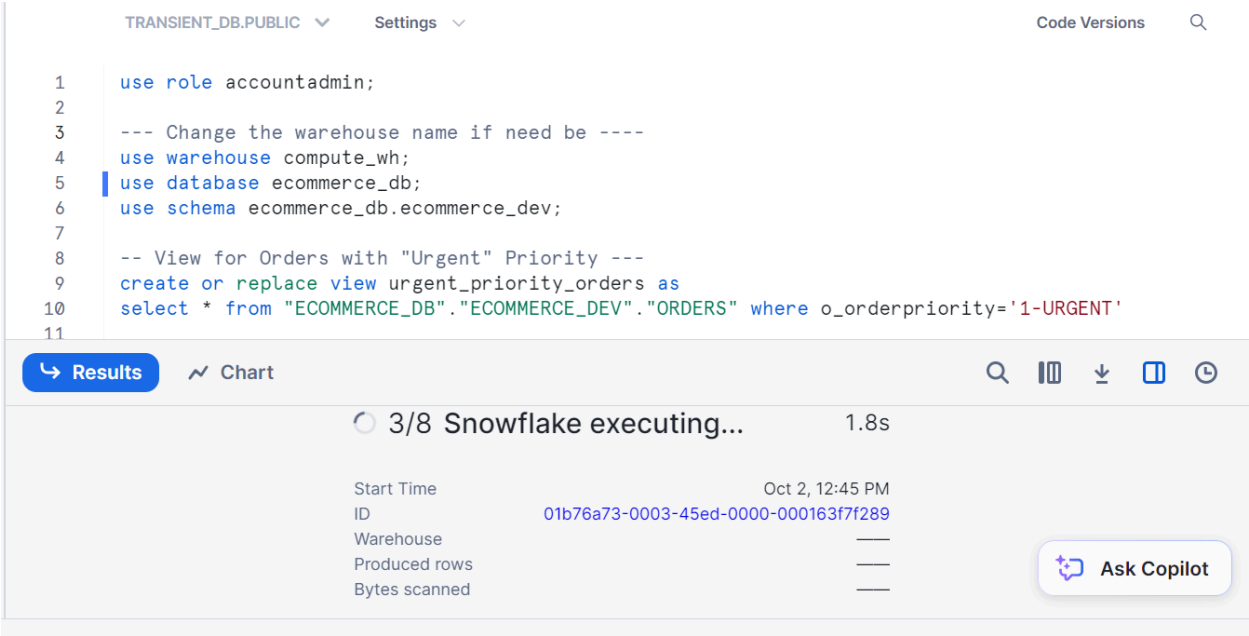

Search objects
ECOMMERCE_DB
ECOMMERCE_DEV
Tables
LINEITEM
ORDERS
INFORMATION_SCHEMA
PUBLIC
SNOWFLAKE
SNOWFLAKE_SAMPLE_DATA
TASTY_BYTES_SAMPLE_DATA
TRANSIENT_DB.PUBLIC
Settings
Code Versions
use role accountadmin;
use warehouse compute_wh;
use database ecommerce_db;
use schema ecommerce_db.ecommerce_dev;
-- Temporary TABLE ---
create or replace temporary table orders_tmp as select * from
Results
Chart
11/17 Snowflake executing...
1.6s
Start Time
Oct 2, 12:14 PM
ID
01b76a54-0003-45ed-0000-000163f7f249
Warehouse
Produced rows
Bytes scanned
Ask Copilot


ECOMMERCE_DB
ECOMMERCE_DEV
Tables
LINEITEM
ORDERS
ORDERS_TMP
INFORMATION_SCHEMA
PUBLIC
TRANSIENT_SCHEMA
Tables
ORDERS
use role accountadmin;
use warehouse compute_wh;
use database ecommerce_db;
use schema ecommerce_db.ecom
-- Temporary TABLE ---
create or replace temporary
"ECOMMERCE_DB"."ECOMMERCE_DE
Results
Chart
status
Statement executed successfully.

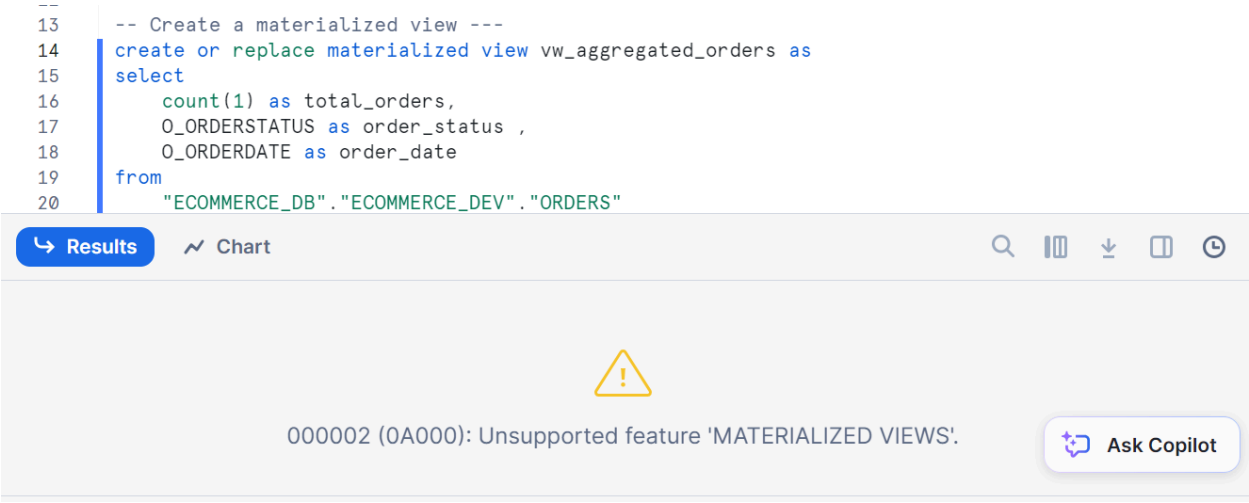



```
use role accountadmin;

--- Change the warehouse name if need be ----
use warehouse compute_wh;
use database ecommerce_db;
use schema ecommerce_db.ecommerce_dev;

-- View for Orders with "Urgent" Priority ---
create or replace view urgent_priority_orders as
select * from "ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS" where
o_orderpriority='1-URGENT';


-- Create a materialized view ---
create or replace materialized view vw_aggregated_orders as
select
    count(1) as total_orders,
    O_ORDERSTATUS as order_status ,
    O_ORDERDATE as order_date
from
    "ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS"
where o_orderpriority='1-URGENT'
group by 2,3;


-- Create a secure materialized view ---
create or replace secure materialized view secure_vw_aggregated_orders as
select
    count(1) as total_orders,
```

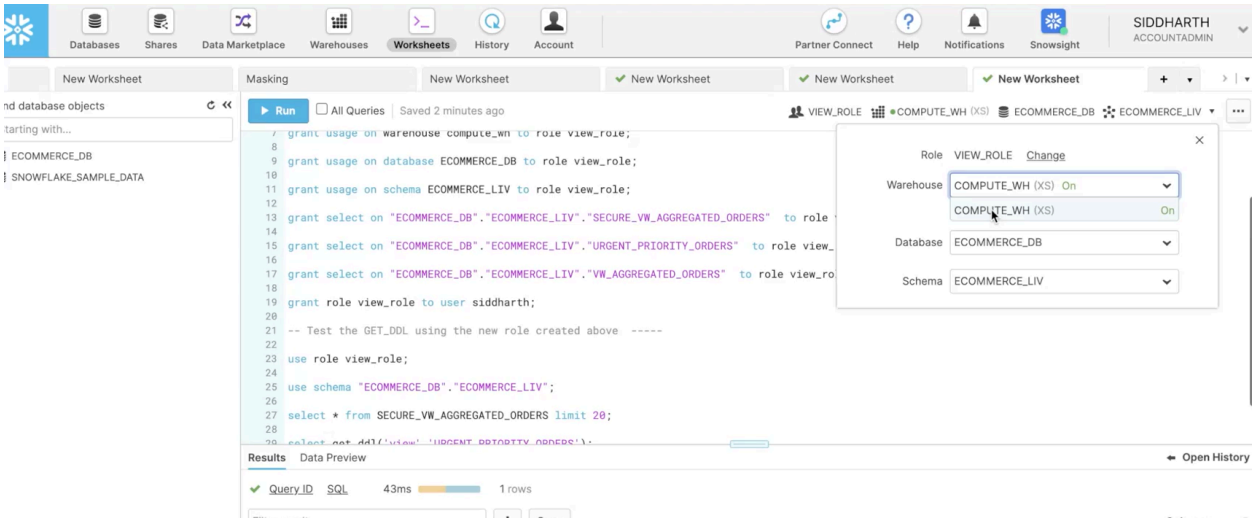
```
    O_ORDERSTATUS as order_status ,
    O_ORDERDATE as order_date
from
    "ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS"
where o_orderpriority='1-URGENT'
group by 2,3;


---- Add a clustering key to the view
ALTER MATERIALIZED VIEW vw_aggregated_orders CLUSTER BY (order_date);
ALTER MATERIALIZED VIEW secure_vw_aggregated_orders CLUSTER BY (order_date);
```



Matrialized view not supported in free version.

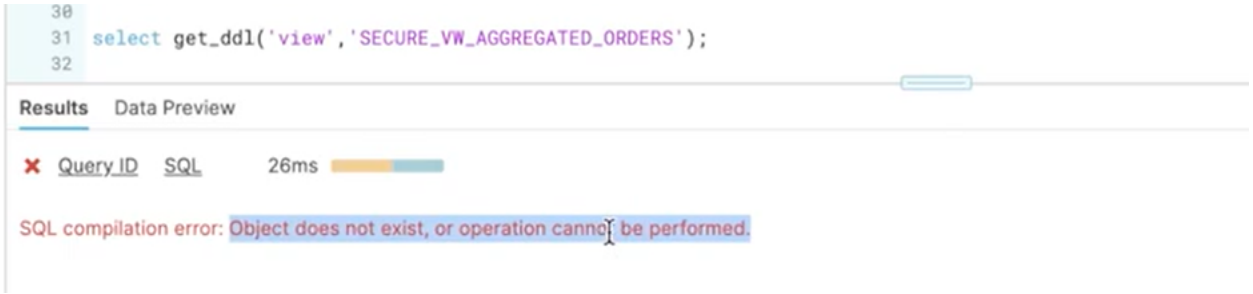


```
use role accountadmin;

use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";

create or replace role view_role;

grant usage on warehouse compute_wh to role view_role;

grant usage on database ECOMMERCE_DB to role view_role;

grant usage on schema ECOMMERCE_DEV to role view_role;

grant select on
"ECOMMERCE_DB"."ECOMMERCE_DEV"."SECURE_VW_AGGREGATED_ORDERS"  to
role view_role;

grant select on
"ECOMMERCE_DB"."ECOMMERCE_DEV"."URGENT_PRIORITY_ORDERS"  to role
view_role;

grant select on "ECOMMERCE_DB"."ECOMMERCE_DEV"."VW_AGGREGATED_ORDERS"
to role view_role;

grant role view_role to user mohamedzuhairka;

-- Test the GET_DDL using the new role created above  -----

use role view_role;

use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";

select * from SECURE_VW_AGGREGATED_ORDERS limit 20;

select get_ddl('view','URGENT_PRIORITY_ORDERS');
select get_ddl('view','SECURE_VW_AGGREGATED_ORDERS');
```



Get DDL of normal view (it allows)

Get DDL of materialized view (it is restricted as it doesn't have access)



Snowflake – Partitions

Table Name : PARTSUPP

Clustering Key

PS_PARTKEY	PS_SUPPKEY	PS_AVAILQTY	PS_SUPPLYCOST	PS_COMMENT
51578321	4078327	2356	23.56	Some text
196736070	2201164	3223	22.72	Some text
116736079	4078327	5543	23.56	Some text
179236090	4078327	1121	17.00	Some text
24236087	7993204	1433	13.88	Some text
49236091	7993204	1222	20.45	Some text
19236090	2201164	3211	24.2	Some text
139877911	2201164	2133	16.89	Some text

Micro-partition-1

PS_PARTKEY	PS_SUPPKEY	PS_AVAILQTY	PS_SUPPLYCOST	PS_COMMENT
51578321	4078327	2356	23.56	Some text
116736079	4078327	5543	23.56	Some text
179236090	4078327	1121	17.00	Some text

Micro-partition-2

PS_PARTKEY	PS_SUPPKEY	PS_AVAILQTY	PS_SUPPLYCOST	PS_COMMENT
196736070	2201164	3223	22.72	Some text
19236090	2201164	3211	24.2	Some text
139877911	2201164	2133	16.89	Some text

Micro-partition-3

PS_PARTKEY	PS_SUPPKEY	PS_AVAILQTY	PS_SUPPLYCOST	PS_COMMENT
24236087	7993204	1433	13.88	Some text
49236091	7993204	1222	20.45	Some text

Snowflake – Partitions

Table Name : PARTSUPP

Micro-partition-1

PS_PARTKEY	51578321	116736079	179236090
PS_SUPPKEY	4078327	4078327	4078327
PS_AVAILQTY	2356	5543	1121
PS_SUPPLYCOST	23.56	21.56	17.00
PS_COMMENT	Some text	Some text	Some text

Micro-partition-2

PS_PARTKEY	51578321	116736079	179236090
PS_SUPPKEY	2201164	2201164	2201164
PS_AVAILQTY	3223	3211	1560
PS_SUPPLYCOST	23.56	21.56	17.00
PS_COMMENT	Some text	Some text	Some text

Micro-partition-3

PS_PARTKEY	51578321	116736079
PS_SUPPKEY	7993204	7993204
PS_AVAILQTY	2356	5543
PS_SUPPLYCOST	23.56	21.56
PS_COMMENT	Some text	Some text

SQL : select ps_partkey,ps_supplycost from partsupp where ps_suppkey='4078327'

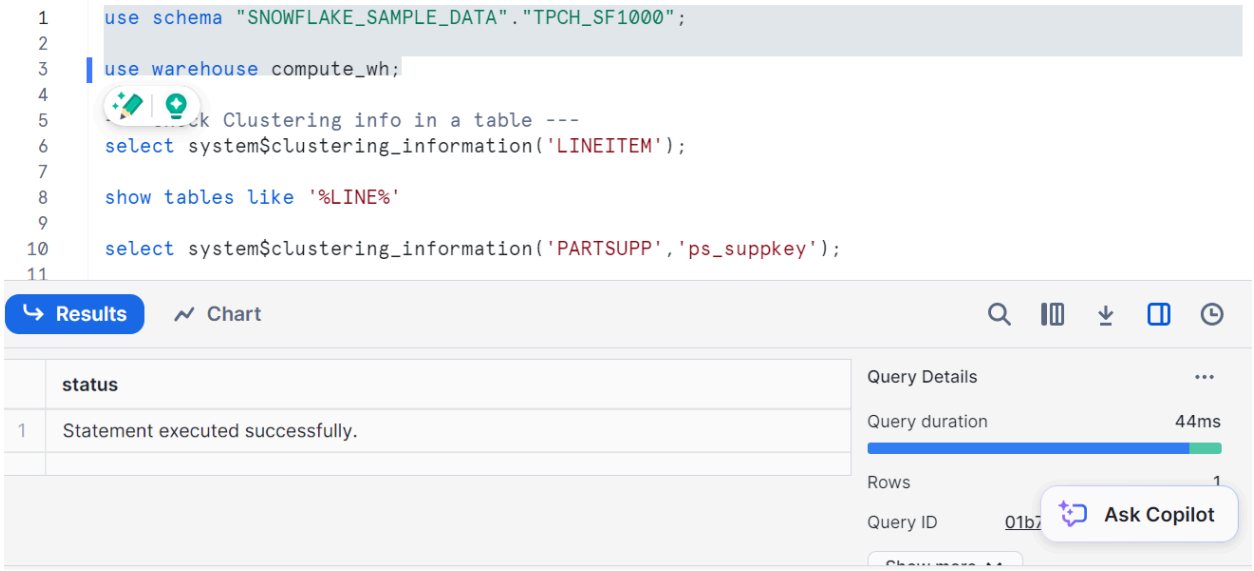
Scanned micro-partition = micro-partition-1

Pruned micro-partitions = micro-partition-2 & 3

```
use role accountadmin;

use schema "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000";

use warehouse compute_wh;

--- Check Clustering info in a table ---
select system$clustering_information('LINEITEM');

show tables like '%LINE%'
```

```
select system$clustering_information('PARTSUPP','ps_suppkey');

--- Check Distinct values before selecting the clustering key ---
select count(1),count(distinct ps_suppkey) from
SNOWFLAKE_SAMPLE_DATA.TPCH_SF1000.PARTSUPP;

-- Clear Cache ---
ALTER SESSION SET USE_CACHED_RESULT = FALSE;


---- Run Sql commands-----

select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" limit 20000;


select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" where
l_shipdate='1998-12-01';


select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" where
l_shipdate in ('1998-12-01','1998-09-20');

select
L_ORDERKEY,L_PARTKEY,L_SUPPKEY
 from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" where l_shipdate in
('1998-12-01','1998-09-20');



-- Change Schema ----

use schema "ECOMMERCE_DB"."ECOMMERCE_LIV";

select system$clustering_information('LINEITEM');

--- Check total number of partitions in the table ----

select * from ORDERS limit 2000;

-- Create a 3XL Warehouse ---
    ALTER WAREHOUSE "ETL_XL"
    SET WAREHOUSE_SIZE = 'XXXLARGE'
    AUTO_SUSPEND = 300
    AUTO_RESUME = TRUE
    MIN_CLUSTER_COUNT = 1
    MAX_CLUSTER_COUNT = 1
    SCALING_POLICY = 'STANDARD' COMMENT = '';
```

```
--- Re-create the table with a clustering key ----
create or replace table LINEITEM cluster by (L_SHIPDATE)
as select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM";


-- Alter Warehouse after the above execution----
    ALTER WAREHOUSE "ETL_XL"
    SET WAREHOUSE_SIZE = 'MEDIUM'
    AUTO_SUSPEND = 300
    AUTO_RESUME = TRUE
    MIN_CLUSTER_COUNT = 1
    MAX_CLUSTER_COUNT = 1
    SCALING_POLICY = 'STANDARD'
    COMMENT = '';


--  Get credit usage from automatic reclustering ---
select *
from table(
        snowflake.information_schema.automatic_clustering_history
        (
            date_range_start=>dateadd(h, -12, current_timestamp)
        )
        );

-- Disable automatic re-clustering ---
alter table LINEITEM suspend recluster;
```



```
--- Check Clustering info in a table ---
select system$clustering_information('LINEITEM');

show tables like '%LINE%'

select system$clustering_information('PARTSUPP', 'ps_suppkey');
```

Results | Chart

SYSTEM$CLUSTERING_INFORMA
1 { "cluster_by_keys" : "LINEAR(L_S

SYSTEM$CLUSTERING_INFORMATION('LINEITEM')


```
{
  "cluster_by_keys" : "LINEAR(L_SHIPDATE)",
  "total_partition_count" : 10336,
  "total_constant_partition_count" : 8349,
  "average_overlaps" : 0.6908,
  "average_depth" : 1.4082,
  "partition_depth_histogram" : {
    "00000" : 0,
    "00001" : 8310,
    "00002" : 599,
    "00003" : 844,
```


Ask Copilot

```
show tables like '%LINE%'

select system$clustering_information('PARTSUPP', 'ps_suppkey');
```

Results | Chart

	bytes	owner	retention_time	automatic_clustering	change_tracking	is_external	enable_sch
1	04640		1	ON	OFF	N	N

is_iceberg A
100% filled

is_dynamic A
100% filled

Ask Copilot

is_immutable A

```
---- Run Sql commands-----

select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" limit 20000;
```

Results | Chart

	L_ORDERKEY	L_PARTKEY	L_SUPPKEY	L_LINENUMBER
19995	1964777602	38802111	6302121	3
19996	1965041024	181420052	6420089	3
19997	1964644802	66995971	6995972	6
19998	1964859428	114664136	9664159	3
19999	1964551111	113147025	3147026	4
20000	1964590273	91503383	1503384	5

Query Details

Query duration 1.8s

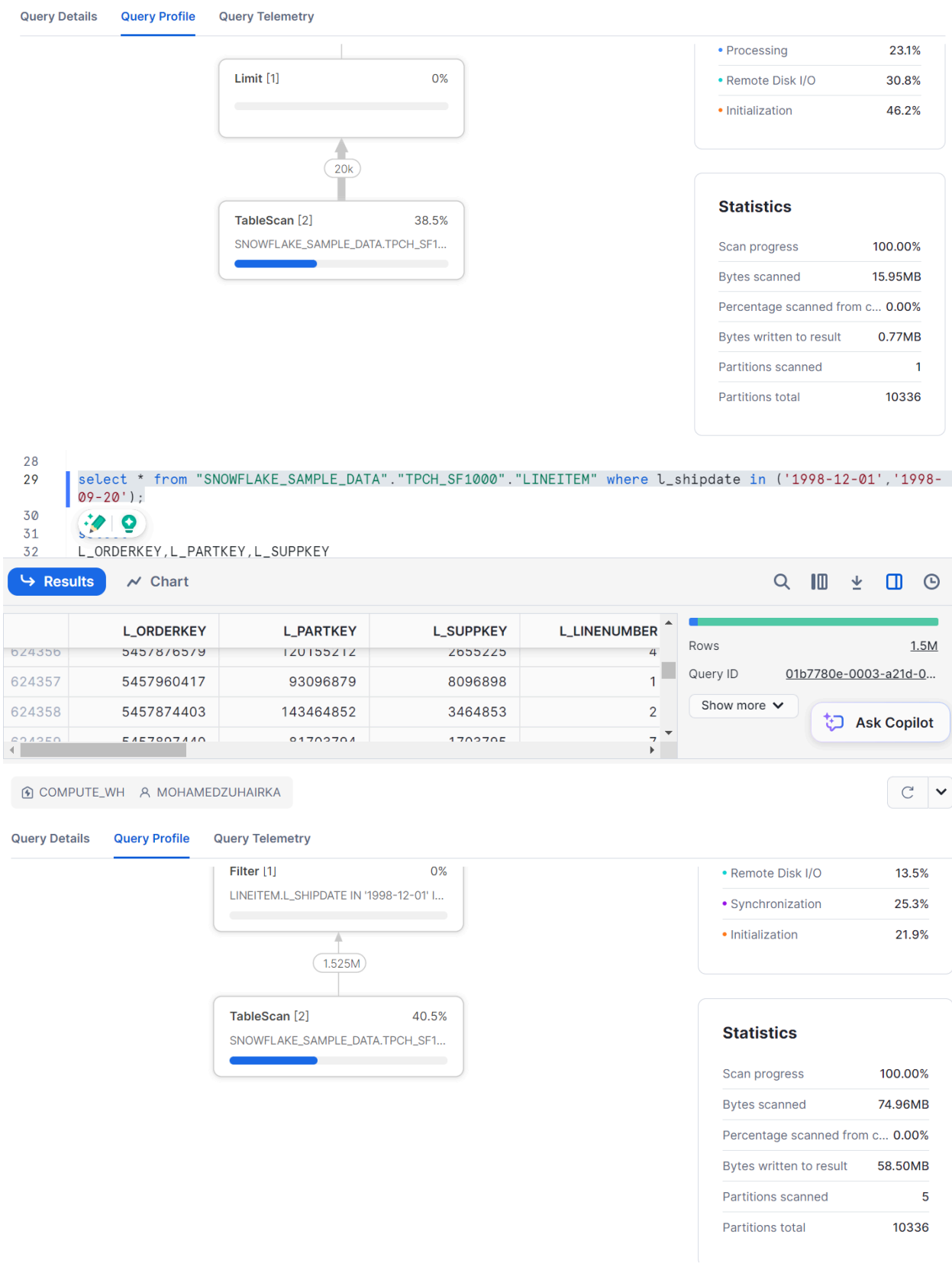
Rows 20K

Query ID 01b77808-0003-a2f5-0...

Show more

L_ORDERKEY

Ask Copilot


Query Details
Query Profile
Query Telemetry
Limit [1] 0%
20k
TableScan [2] 38.5%
SNOWFLAKE_SAMPLE_DATA.TPCH_SF1...
Processing 23.1%
Remote Disk I/O 30.8%
Initialization 46.2%
Statistics
Scan progress 100.00%
Bytes scanned 15.95MB
Percentage scanned from c... 0.00%
Bytes written to result 0.77MB
Partitions scanned 1
Partitions total 10336
28
29
select * from "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" where l_shipdate in ('1998-12-01','1998-09-20');
30
31
32
L_ORDERKEY,L_PARTKEY,L_SUPPKEY
Results
Chart
L_ORDERKEY L_PARTKEY L_SUPPKEY L_LINENUMBER
624357 5457960417 93096879 8096898 1
624358 5457874403 143464852 3464853 2
Rows 1.5M
Query ID 01b7780e-0003-a21d-0...
Show more
Ask Copilot
COMPUTE_WH
MOHAMEDZUHAIRKA
Query Details
Query Profile
Query Telemetry
Filter [1] 0%
LINEITEM.L_SHIPDATE IN '1998-12-01' I...
1.525M
TableScan [2] 40.5%
SNOWFLAKE_SAMPLE_DATA.TPCH_SF1...
Remote Disk I/O 13.5%
Synchronization 25.3%
Initialization 21.9%
Statistics
Scan progress 100.00%
Bytes scanned 74.96MB
Percentage scanned from c... 0.00%
Bytes written to result 58.50MB
Partitions scanned 5
Partitions total 10336

```
10  show tables like '%LINE%'
11
12  select system$clustering_information('PARTSUPP','ps_suppkey');
13
14  --- Check Distinct values before selecting the clustering key ---
```

Results | Chart

	SYSTEM$CLUSTERING_INFORMATIC
1	{ "cluster_by_keys" : "LINEAR(PS_SU

SYSTEM$CLUSTERING_INFORMATION('PARTSUPP','PS_SUPPKEY')

```
{
  "cluster_by_keys" : "LINEAR(PS_SUPPKEY)",
  "notes" : "Clustering key columns contain high cardinality key PS_SUPPKEY
which might result in expensive re-clustering. Consider reducing the
cardinality of clustering keys. Please refer to
https://docs.snowflake.net/manuals/user-guide/tables-clustering-keys.html
for more information.",
  "total_partition_count" : 2315,
  "total_constant_partition_count" : 0,
  "average_overlaps" : 1.8721,
  "average_depth" : 2.0043,
```

Ask Copilot

Here, the cardinality is very high which is not a good thing when talking about clustering.

```
15  select count(1),count(distinct ps_suppkey) from SNOWFLAKE_SAMPLE_DATA.TPCH_SF1000.PARTSUPP;
16
17  Cache ---
```

Results | Chart

	COUNT(1)	COUNT(DISTINCT PS_SUPPKEY)
1	800000000	10000000

Query Details

Query duration 12s

From the above query, we can see that it may create 10 million micro-partitions which is not good.

```
74  select *
75  from table(
76          snowflake.information_schema.automatic_clustering_history
77          (
78              date_range_start=>dateadd(h, -12, current_timestamp)
79          )
80          );
81
82  ble automatic re-clustering ---
83  alter table LINEITEM suspend recluster;
```

Results | Chart

START_TIME	END_TIME	CREDITS_USED	NUM_BYTES_RECLUSTERED

Query produced no results

Query Details

Query duration 537ms

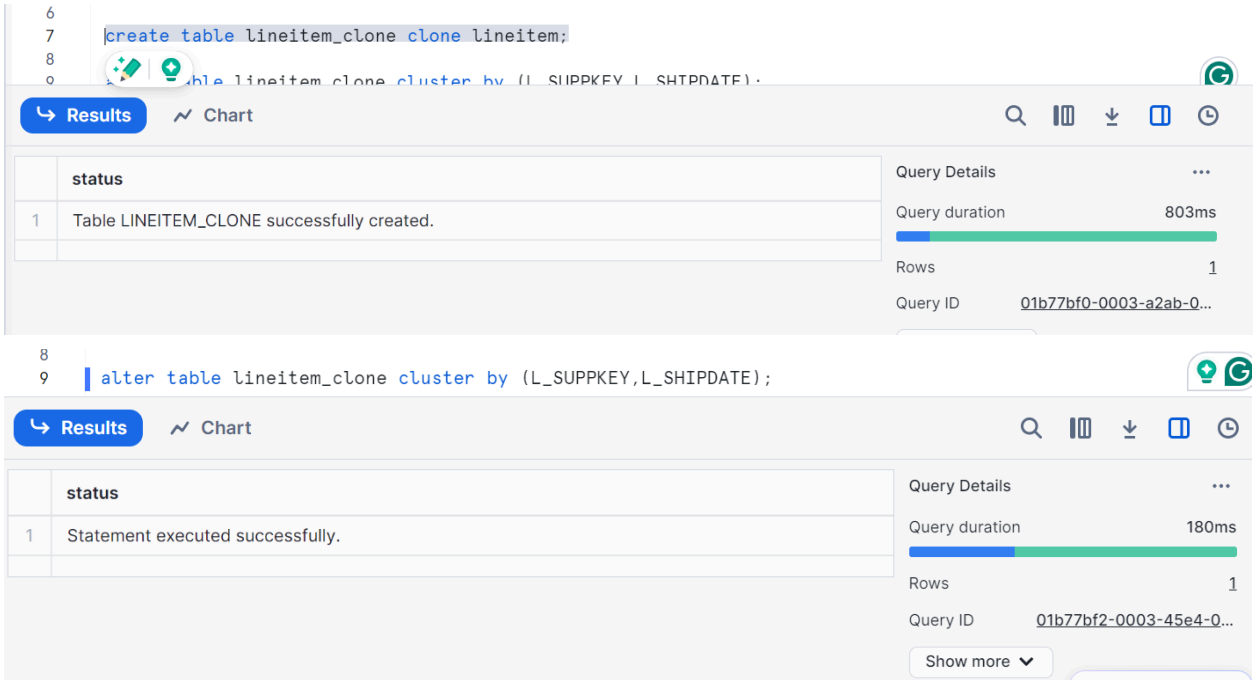
Rows 0

Query ID 01b7

Ask Copilot

```
use role accountadmin;
```

```
use warehouse compute_wh;

use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";

create table lineitem_clone clone lineitem;

alter table lineitem_clone cluster by (L_SUPPKEY,L_SHIPDATE);
```




```
--  Retreive history of all the queries  ----
select * from table(information_schema.query_history()) order by start_time;

select * from table(information_schema.query_history_by_user()) order by start_time;

select * from table(information_schema.query_history_by_warehouse()) order by start_time;


WITH access_history AS (
   SELECT distinct query_id "QUERY_ID"
     ,split(base.value:objectName, '.')[0]::string "DATABASE_NAME"
     ,split(base.value:objectName, '.')[1]::string "SCHEMA_NAME"
     ,split(base.value:objectName, '.')[2]::string "TABLE_NAME"
FROM snowflake.account_usage.access_history
     ,lateral flatten (base_objects_accessed) base
```

```
)
select regexp_replace(replace(replace(query_text,char(10),' '),char(13),' '),'  *',' ') query_text
    ,count(*) query_count
    ,(avg(execution_time) / 1000) / 60 avg_exec_time_mins
    ,avg((nullifzero(PARTITIONS_SCANNED) / nullifzero(PARTITIONS_TOTAL))) * 100
"avg_%_paritions_scanned"
from snowflake.account_usage.query_history qh
 join access_history ah
on qh.query_id = ah.query_id
where to_date(start_time) >= dateadd('months', -1, current_date())
//and ah.database_name = 'snowflake_sample_data'
//and ah.table_name = <TABLE_NAME>
and error_code is null
//and (query_text ilike '%where%' or query_text ilike '%join%')
and warehouse_size is not null
group by 1
//having avg_exec_time_mins > 0.1
order by query_count desc;
```

```
2   --  Retreive history of all the queries  ----
3   select * from table(information_schema.query_history()) order by start_time;
4
5   select * from table(information_schema.query_history_by_user()) order by start_time;
```

Results | Chart

		WAREHOUSE_NAME	WAREHOUSE_SIZE	WAREHOUSE_TYPE	CLUSTER_NUMBER
1	IN	COMPUTE_WH	null	STANDARD	null
2	IN	COMPUTE_WH	X-Small	STANDARD	1
3	IN	COMPUTE_WH	null	STANDARD	null
4	IN	COMPUTE_WH	X-Small	STANDARD	1
5	IN	COMPUTE_WH	X-Small	STANDARD	1
6		null	null	STANDARD	null

QUERY_ID

01b76759-0003-42b2-0000-000163f73025

Ask Copilot

```
5  select * from table(information_schema.query_history_by_user()) order by start_time;
6
7  select * from table(information_schema.query_history_by_warehouse()) order by start_time;
8
```

Results | Chart

		SCHEMA_NAME	QUERY_TYPE	SESSION_ID	USER_NAME
1	IPLE_DATA	RAW_POS	CREATE	5972131845	MOHAMEDZUHAIRKA
2	IPLE_DATA	RAW_POS	LIST_FILES	5972131845	MOHAMEDZUHAIRKA
3	IPLE_DATA	RAW_POS	COPY	5972131845	MOHAMEDZUHAIRKA
4	IPLE_DATA	RAW_POS	SELECT	5972131845	MOHAMEDZUHAIRKA
5	IPLE_DATA	RAW_POS	SELECT	5972131845	MOHAMEDZUHAIRKA
6	IPLE_DATA	RAW_POS	SELECT	5972131845	MOHAMEDZUHAIRKA

Query Details
Query duration 649ms
Rows 100
Query ID 01b77bf8-0003-a2ab-0...
Show more
QUERY_ID
Ask Copilot
100% filled

```
6
7  select * from table(information_schema.query_history_by_warehouse()) order by start_time;
8
9
10 WITH access_history AS (
```

Results | Chart

	QUERY_ID	QUERY_TEXT
1	01b76740-0003-42b5-0000-000163f7a009	USE ROLE accountadmin;
2	01b76741-0003-42b4-0000-000163f72011	USE WAREHOUSE compute_wh;
3	01b76751-0003-42b0-0000-000163f75019	CREATE OR REPLACE DATABASE tasty_bytes_samp
4	01b76751-0003-42ae-0000-000163f78019	CREATE OR REPLACE SCHEMA tasty_bytes_sample
5	01b76752-0003-42b0-0000-000163f75021	CREATE OR REPLACE TABLE tasty_bytes_sample_d
6	01b76754-0003-42ae-0000-000163f78021	CREATE OR REPLACE TABLE tasty_bytes_sample_d

Query Details
Query duration 328ms
Rows 83
Query ID 01b77bfa-0003-45e7-0...
Show more
QUERY_ID
Ask Copilot
100% filled

```
23  join access_history an
24  on qh.query_id = ah.query_id
25  where to_date(start_time) >= dateadd('months', -1, current_date())
26  //and ah.database_name = 'snowflake_sample_data'
27  //and ah.table_name = <TABLE_NAME>
28  and error_code is null
29  //and (query_text ilike '%where%' or query_text ilike '%join%')
30  and warehouse_size is not null
31  group by 1
32  //having avg_exec_time_mins > 0.1
33  order by query_count desc;
```

Results | Chart

QUERY_TEXT	QUERY_COUNT	AVG_EXEC_TIME_MINS	avg_%_paritions_sca

Query produced no results

Query Details
Query duration 2.9s
Rows 0
Query ID 01b7...
Ask Copilot

Caching example:

```
use role accountadmin;

use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";


-- Metadata caching ----
select count(1) from lineitem ;

select min(L_ORDERKEY),max(L_ORDERKEY) from lineitem;


--  Results Data caching : Example Query ----

set current_dt='1994-01-01';
select top 10 * from lineitem;
select
       sum(l_quantity) as sum_qty,
       count(*) as order_count,
       date(l_shipdate) as shipped_date,
       l_shipmode as shipped_mode
 from
       LINEITEM
 where
       shipped_date >= date($current_dt) - 7
 group by
       shipped_date,
       shipped_mode
order by
    shipped_date;


-- Clear Result Cache ---
ALTER SESSION SET USE_CACHED_RESULT = FALSE;


-- Clear Data Cache ---

alter warehouse compute_wh suspend;

alter warehouse compute_wh resume;
```

First time execution:

```
6   -- Metadata caching ----
7   select count(1) from lineitem ;
8
9   select min(L_ORDERKEY),max(L_ORDERKEY) from lineitem;
10
11
```

Results | Chart

	COUNT(1)
1	2000000

Rows 1

Query ID 01b77c07-0003-a21e-0...

Show more

Query - 01b77c07-0003-a21e-0001-63f70001d0e6

/OHAMEDZUHAIRKA

Details | Query Profile | Query Telemetry

METADATA-BASED RESULT [0] 100%


```
6   -- Metadata caching ----
7   select count(1) from lineitem ;
8
9   select min(L_ORDERKEY),max(L_ORDERKEY) from lineitem;
10
11
```

Results | Chart

	COUNT(1)
1	2000000

Rows 1

Query ID 01b77c09-0003-a363-0...

Show more

Query - 01b77c09-0003-a363-0001-63f70001f026

MOHAMEDZUHAIRKA

Query Details | Query Profile | Query Telemetry

QUERY RESULT REUSE [0] 100%

01b77c09-0003-a363-0001-63f70001f...

```
select min(L_ORDERKEY),max(L_ORDERKEY) from lineitem;
```

Results | Chart

	MIN(L_ORDERKEY)	MAX(L_ORDERKEY)
1	7973	5999999523

Query Details

Query duration 172ms

Query - 01b77c0b-0003-45e3-0001-63f700010e22

MOHAMEDZUHAIRKA

Query Details | Query Profile | Query Telemetry

METADATA-BASED RESULT [0] 100%

This results also coming from metadata cache layer.

Lets see the actual query result from disk
First clear query results cache and warehouse cache:

```
-- Clear Data Cache ---

alter warehouse compute_wh suspend;

alter warehouse compute_wh resume;
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 71ms
Rows 1

```
alter warehouse compute_wh resume;
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 55ms
Rows 1

```
-- Clear Result Cache ---
ALTER SESSION SET USE_CACHED_RESULT = FALSE;
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 45ms
Rows 1

```
select
       sum(l_quantity) as sum_qty,
       count(*) as order_count,
       date(l_shipdate) as shipped_date,
       l_shipmode as shipped_mode
 from
       LINEITEM
 where
       shipped_date >= date($current_dt) - 7
 group by
       shipped_date,
```

Results | Chart

	SUM_QTY	ORDER_COUNT	SHIPPED_DATE	SHIPPED_MODE
1	273626.00	10783	1994-03-31	TRUCK
2	279217.00	11022	1994-03-31	REG AIR
3	279541.00	11057	1994-03-31	FOB
4	277205.00	10845	1994-03-31	SHIP

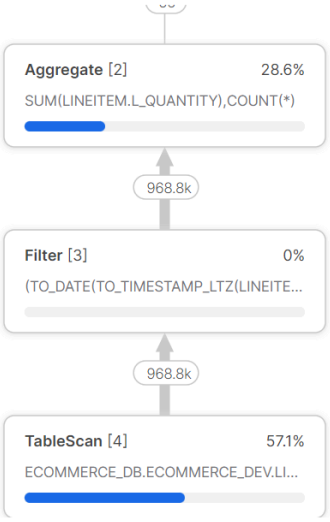
Query Details
Query duration 836ms
Rows 56
Query ID 01b7

Ask Copilot

Query - 01b77c18-0003-a1d1-0001-63f70001b13e

COMPUTE_WH MOHAMEDZUHAIRKA

Query Details | Query Profile | Query Telemetry



Total Execution T... (602ms) 100.0%
- Processing 42.9%
- Remote Disk I/O 42.9%
- Initialization 14.3%

Statistics

Scan progress	100.00%
Bytes scanned	3.42MB
Percentage scanned from c...	0.00%
Partitions scanned	4
Partitions total	8

Reexecute same query:

```
16  select
17        sum(l_quantity) as sum_qty,
18        count(*) as order_count,
19        date(l_shipdate) as shipped_date,
20        l_shipmode as shipped_mode
21   from
22        LINEITEM
23   where
24        shipped_date >= date($current_dt) - 7
25   group by
26        shipped_date,
```

Results | Chart

	SUM_QTY	ORDER_COUNT	SHIPPED_DATE	SHIPPED_MODE
1	273626.00	10783	1994-03-31	TRUCK
2	279217.00	11022	1994-03-31	REG AIR
3	279541.00	11057	1994-03-31	FOB

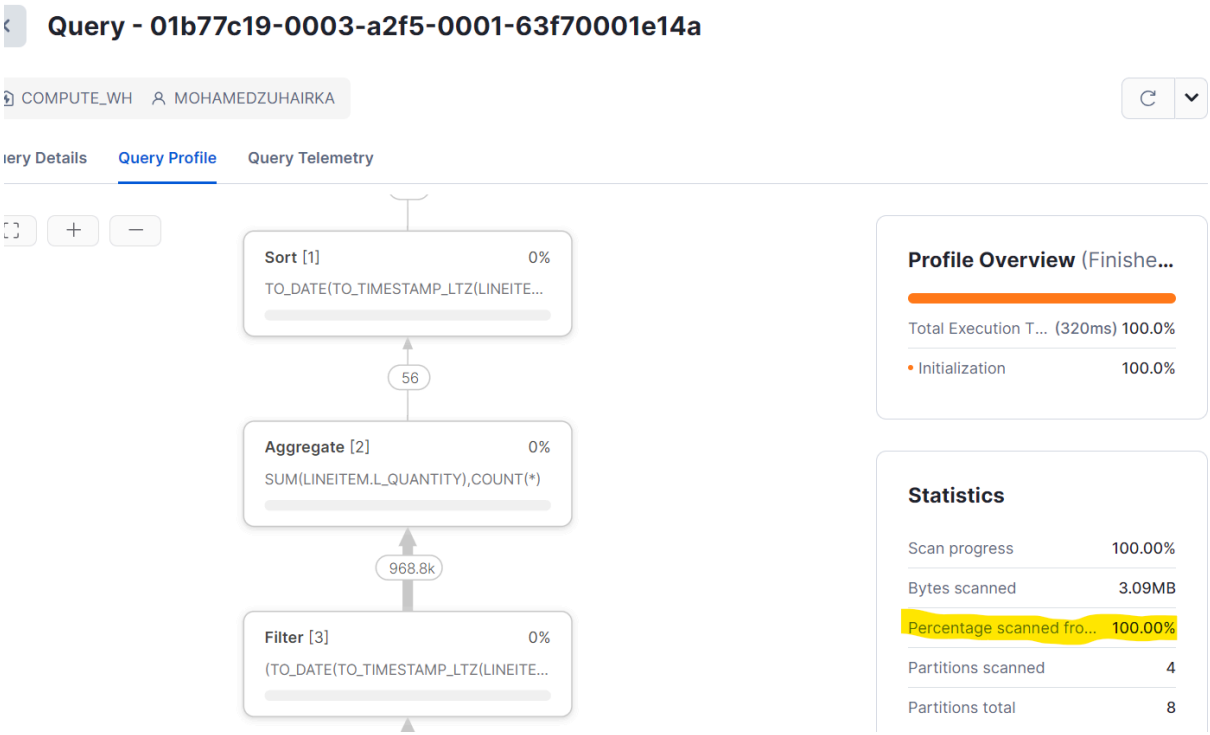
Query Details

Query duration 362ms

Rows 56

Query ID 01b7

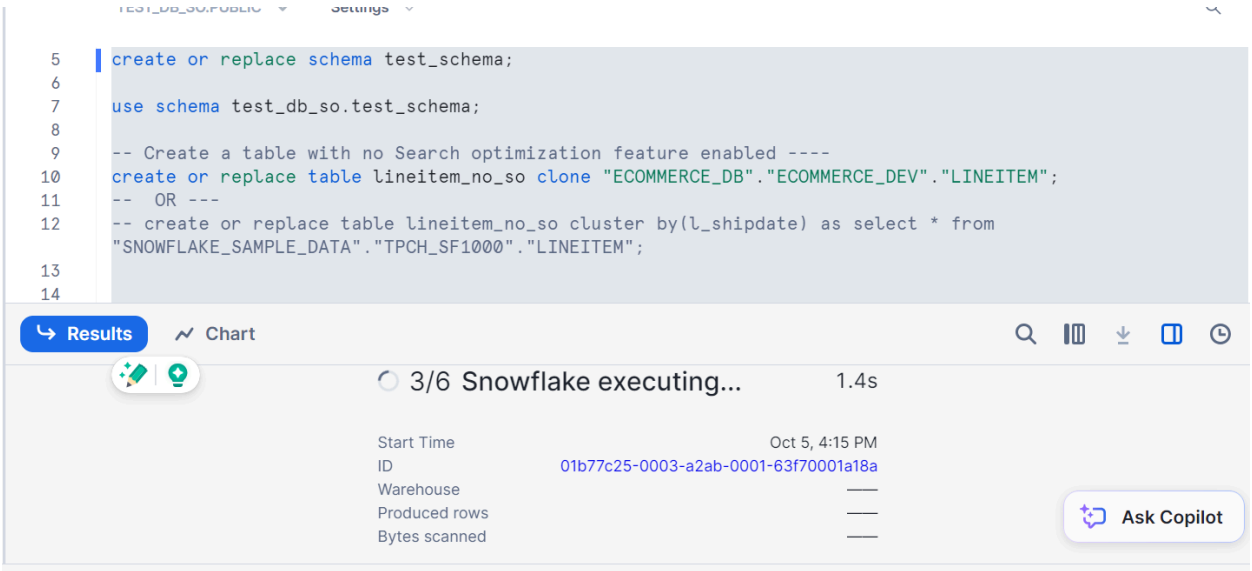
Ask Copilot



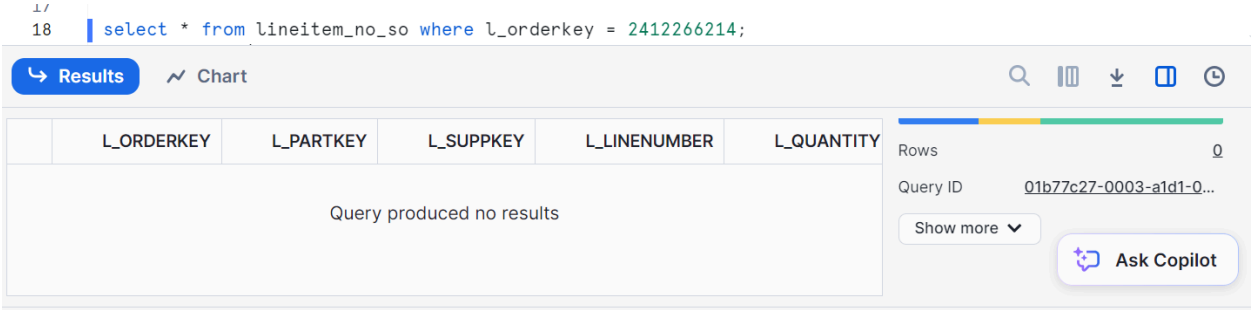
Search Optimization:

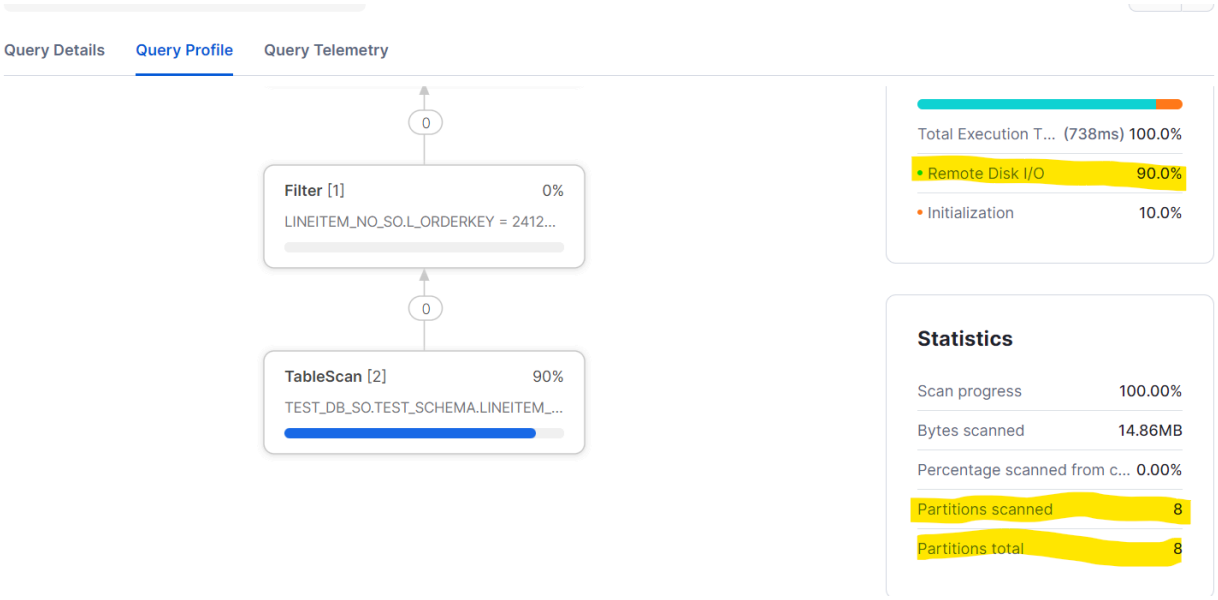
```
use role accountadmin;

create or replace database test_db_so;

create or replace schema test_schema;

use schema test_db_so.test_schema;

-- Create a table with no Search optimization feature enabled ----
create or replace table lineitem_no_so clone
"ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM";
--  OR ---
-- create or replace table lineitem_no_so cluster by(l_shipdate) as select * from
"SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM";


-- Create a table and enable the Search optimization feature ----
create or replace table lineitem_so clone
"ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM";

select * from lineitem_no_so where l_orderkey = 2412266214;
select system$ESTIMATE_SEARCH_OPTIMIZATION_COSTS('lineitem_no_so');
```

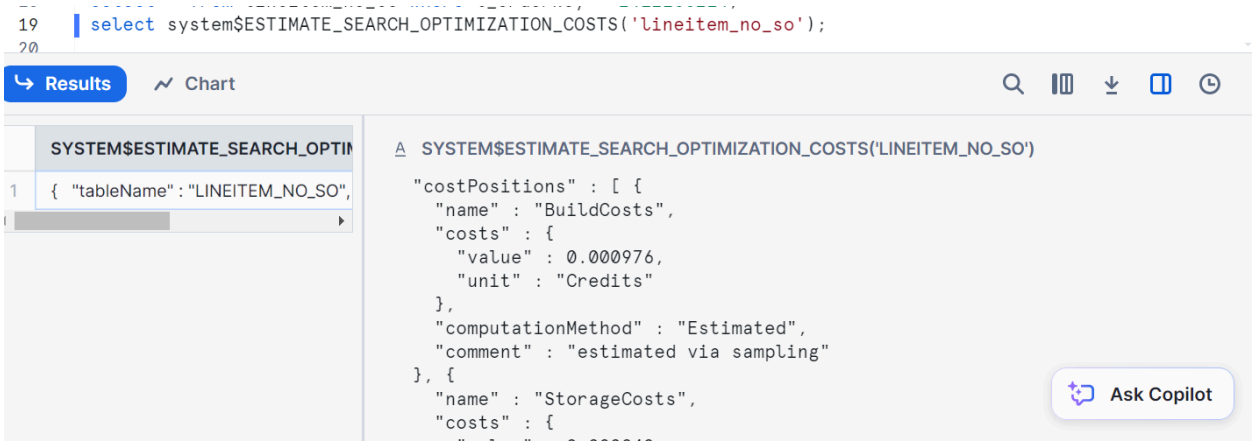
```
alter table lineitem_so add search optimization;
show tables like '%lineitem_so%';

-- Point lookup query ---
select * from lineitem_no_so where l_orderkey='2412266214' limit 10;


 --- Drop search optimization ---
alter table lineitem_so drop search optimization;

-- Clear Result and WH Cache ---
ALTER SESSION SET USE_CACHED_RESULT = FALSE;
alter warehouse prod_xl suspend;
alter warehouse prod_xl resume;
```



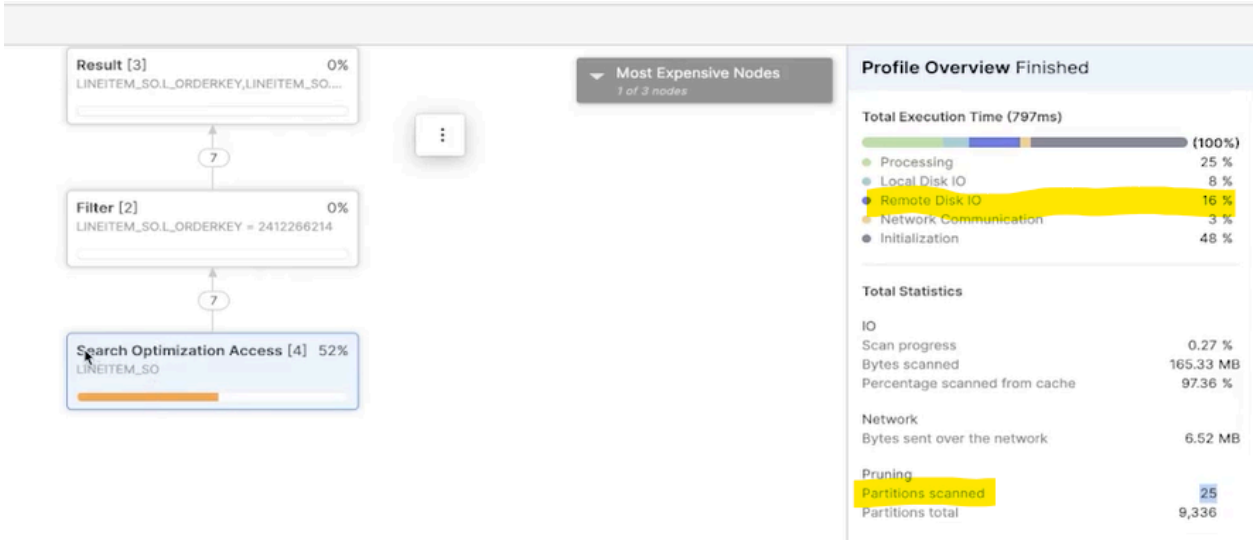
Point lookup query on non-cluster key:







After search optimization enabled:

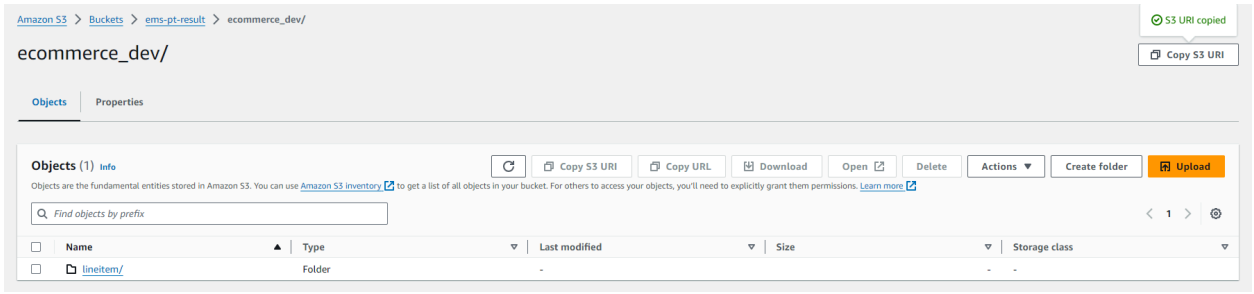


Data ingestion:

Connection setup and load csv file into snowflake:

```
-- Step-1 ---- : Create an IAM Role in AWS

use role accountadmin;

-- STEP-2 : Create an integration object ------
CREATE STORAGE INTEGRATION aws_sf_data
  TYPE = EXTERNAL_STAGE
  STORAGE_PROVIDER = S3
  ENABLED = TRUE
  STORAGE_AWS_ROLE_ARN =
'arn:aws:iam::682470999581:role/aws-saml-bsys-ems-dev-developer'
  STORAGE_ALLOWED_LOCATIONS = ('s3://ems-pt-result/ecommerce_dev/');

desc INTEGRATION aws_sf_data;
```

```
-- Grant usage access to Sysadmin Role ---
grant usage on integration aws_sf_data to role sysadmin;

-- Grant access to Sysadmin Role ---
grant select on all tables in schema "ECOMMERCE_DB"."ECOMMERCE_DEV" to role
sysadmin;

use role sysadmin;

use database ecommerce_db;

create schema ecommerce_dev;

create or replace table lineitem cluster by (L_SHIPDATE) as select * from
"ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM" limit 1;
truncate table lineitem;

CREATE FILE FORMAT csv_load_format
    TYPE = 'CSV'
    COMPRESSION = 'AUTO'
    FIELD_DELIMITER = ','
    RECORD_DELIMITER = '\n'
    SKIP_HEADER =1
    FIELD_OPTIONALLY_ENCLOSED_BY = '\042'
    TRIM_SPACE = FALSE
    ERROR_ON_COLUMN_COUNT_MISMATCH = TRUE
    ESCAPE = 'NONE'
    ESCAPE_UNENCLOSED_FIELD = '\134'
    DATE_FORMAT = 'AUTO'
    TIMESTAMP_FORMAT = 'AUTO';

-- Create a stage for lineitem table  ---
create stage stg_lineitem_csv_dev
storage_integration = aws_sf_data
url = '{your_bucket_name}/ecommerce_dev/lineitem/lineitem_csv/'
file_format = csv_load_format;

list @stg_lineitem_csv_dev;

copy into lineitem from @stg_lineitem_csv_dev ON_ERROR = ABORT_STATEMENT;


-- Validate the data----
select * from lineitem limit 10;
```




```
5   -- STEP-2 : Create an integration object ------
6   CREATE STORAGE INTEGRATION aws_sf_data
7     TYPE = EXTERNAL_STAGE
8     STORAGE_PROVIDER = S3
9     ENABLED = TRUE
10    STORAGE_AWS_ROLE_ARN = 'arn:aws:iam::[redacted]:role/aws-saml-bsys-ems-dev-developer'
11    STORAGE_ALLOWED_LOCATIONS = ('s3://ems-pt-result/ecommerce_dev/');
12
13  desc INTEGRATION aws_sf_data;
```

Results | Chart

	status
1	Integration AWS_SF_DATA successfully created.

Query Details
Query duration 363ms

```
13  desc INTEGRATION aws_sf_data;
14
```

Results | Chart

		property_type	property_value
3	CATIONS	List	s3://ems-pt-result/ecommerce_dev/
4	CATIONS	List	
5	R_ARN	String	arn:aws:iam::180294178125:user/w57r0000-s
6	N	String	arn:aws:iam::[redacted]:role/aws-saml-bsys-ems-dev-developer
7	L_ID	String	JXB38456_SFCRole=5_Wq9S3GUacW7M1WtildaC1IzAdGM=
8		String	

Query Details
Query duration 295ms
Rows 8
Query ID 01b77c5d-0003-a363-0...
Show more
property
Ask Copilot

```
14
15  -- Grant usage access to Sysadmin Role ---
16  grant usage on integration aws_sf_data to role sysadmin;
17
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 82ms
Rows 1
Query ID 01b77c63-0003-45e7-0...

```
use database ecommerce_db;
create schema ecommerce_liv;
-- Grant create stage access to Sysadmin Role ---
grant create stage on schema "ECOMMERCE_DB"."ECOMMERCE_LIV" to role sysadmin;
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 57ms
Rows 1
Query ID 01b77c66-0003-a21d-0...

```
-- Create a file format  ---
CREATE FILE FORMAT csv_load_format
    TYPE = 'CSV'
    COMPRESSION = 'AUTO'
    FIELD_DELIMITER = ','
    RECORD_DELIMITER = '\n'
    SKIP_HEADER =1
    FIELD_OPTIONALLY_ENCLOSED_BY = '\042'
    TRIM_SPACE = FALSE
    ERROR_ON_COLUMN_COUNT_MISMATCH = TRUE
```

Results | Chart

	status
1	File format CSV_LOAD_FORMAT successfully created.

Query Details
Query duration 123ms
Rows 1

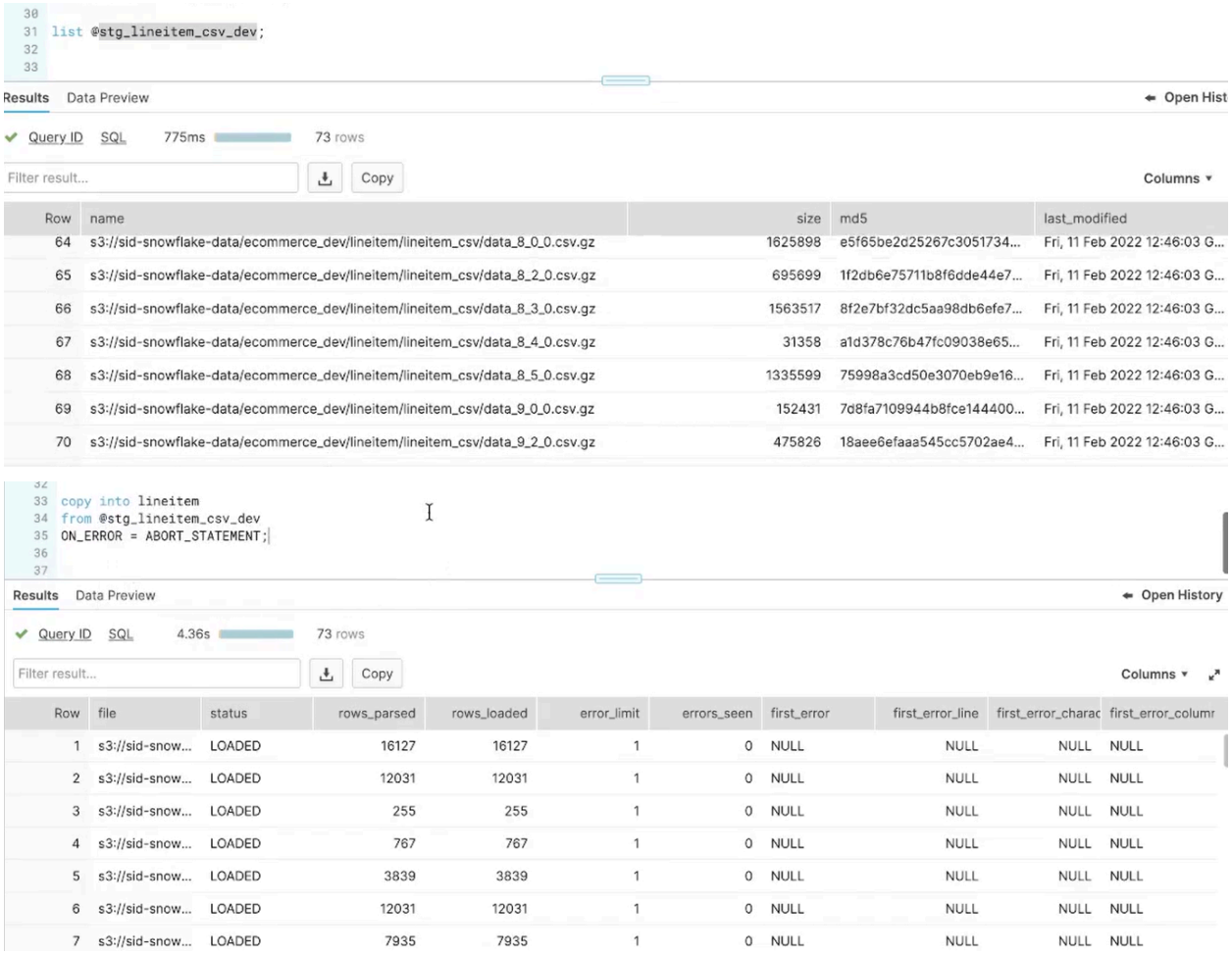
```
-- Create a stage for lineitem table  ---
create stage stg_lineitem_csv_dev
storage_integration = aws_sf_data
url = 's3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_csv/'
file_format = csv_load_format;
```

Results | Data Preview

Query ID SQL 776ms 1 rows

Filter result... Copy

Row	status
1	Stage area STG_LINEITEM_CSV_DEV successfully created.



```
list @stg_lineitem_csv_dev;
```

Results | Data Preview | Open Hist

Query ID | SQL | 775ms | 73 rows

Filter result... | Copy | Columns

Row	name	size	md5	last_modified
64	s3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_csv/data_8_0_0.csv.gz	1625898	e5f65be2d25267c3051734...	Fri, 11 Feb 2022 12:46:03 G...
65	s3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_csv/data_8_2_0.csv.gz	695699	1f2db6e75711b8f6dde44e7...	Fri, 11 Feb 2022 12:46:03 G...
66	s3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_csv/data_8_3_0.csv.gz	1563517	8f2e7bf32dc5aa98db6efe7...	Fri, 11 Feb 2022 12:46:03 G...
67	s3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_csv/data_8_4_0.csv.gz	31358	a1d378c76b47fc09038e65...	Fri, 11 Feb 2022 12:46:03 G...
68	s3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_csv/data_8_5_0.csv.gz	1335599	75998a3cd50e3070eb9e16...	Fri, 11 Feb 2022 12:46:03 G...
69	s3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_csv/data_9_0_0.csv.gz	152431	7d8fa7109944b8fce144400...	Fri, 11 Feb 2022 12:46:03 G...
70	s3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_csv/data_9_2_0.csv.gz	475826	18aee6efaaa545cc5702ae4...	Fri, 11 Feb 2022 12:46:03 G...

```
copy into lineitem
from @stg_lineitem_csv_dev
ON_ERROR = ABORT_STATEMENT;
```

Results | Data Preview | Open History

Query ID | SQL | 4.36s | 73 rows

Filter result... | Copy | Columns

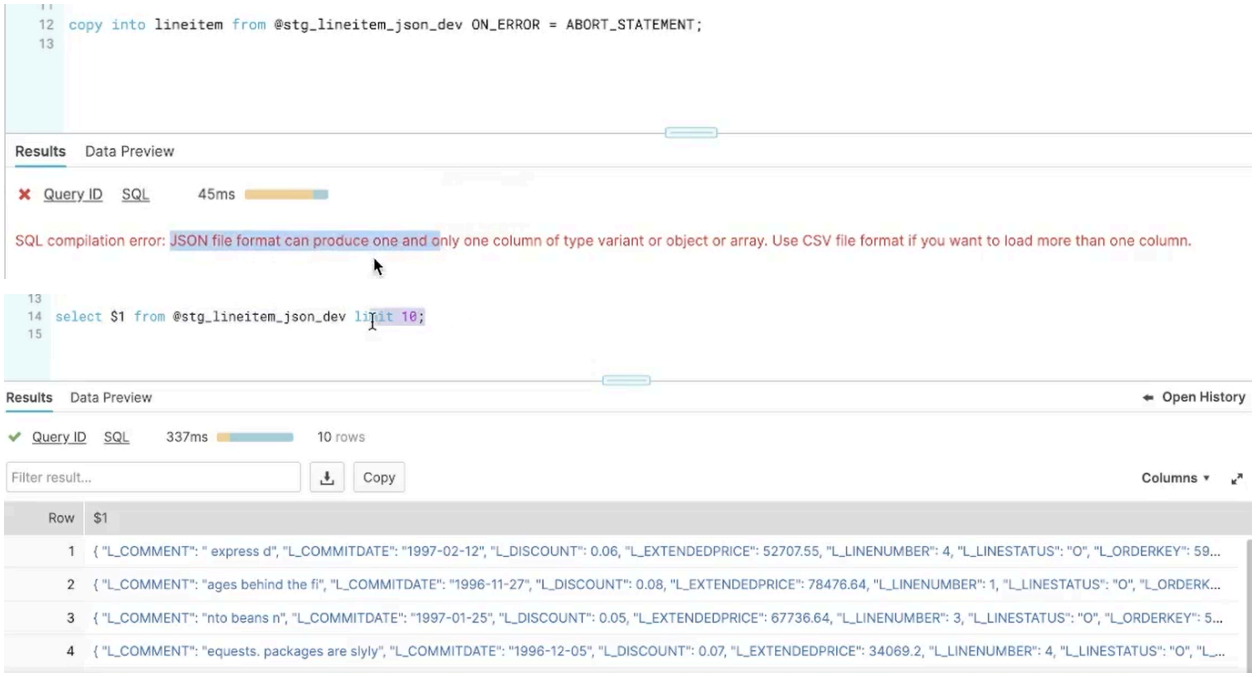
Row	file	status	rows_parsed	rows_loaded	error_limit	errors_seen	first_error	first_error_line	first_error_charac	first_error_columr
1	s3://sid-snow...	LOADED	16127	16127	1	0	NULL	NULL	NULL	NULL
2	s3://sid-snow...	LOADED	12031	12031	1	0	NULL	NULL	NULL	NULL
3	s3://sid-snow...	LOADED	255	255	1	0	NULL	NULL	NULL	NULL
4	s3://sid-snow...	LOADED	767	767	1	0	NULL	NULL	NULL	NULL
5	s3://sid-snow...	LOADED	3839	3839	1	0	NULL	NULL	NULL	NULL
6	s3://sid-snow...	LOADED	12031	12031	1	0	NULL	NULL	NULL	NULL
7	s3://sid-snow...	LOADED	7935	7935	1	0	NULL	NULL	NULL	NULL

Load json file into snowflake:

```
use role sysadmin;

use schema ecommerce_db.ecommerce_liv;

CREATE OR REPLACE FILE FORMAT json_load_format TYPE = 'JSON' ;


-- Create a stage for lineitem table  ---
create stage stg_lineitem_json_dev
storage_integration = aws_sf_data
url = '{your_bucket_name}/ecommerce_dev/lineitem/lineitem_json/'
file_format = json_load_format;

-- List all the files to check before loading ---
list @stg_lineitem_json_dev;
```

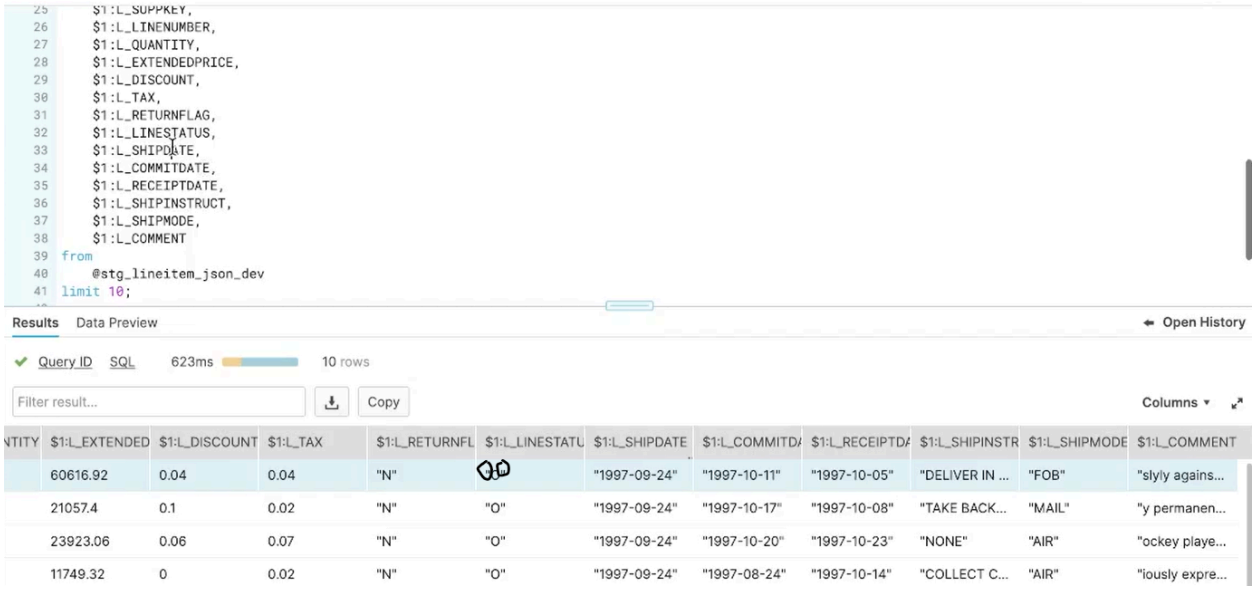
```
-- Select the data directly from staged location to validate the data before loading ---
select $1 from @stg_lineitem_json_dev limit 10;

--- ####First approach#### ---
-- insert into lineitem directly from staged location ---
insert into lineitem
select
    $1:L_ORDERKEY,
    $1:L_PARTKEY,
    $1:L_SUPPKEY,
    $1:L_LINENUMBER,
    $1:L_QUANTITY,
    $1:L_EXTENDEDPRICE,
    $1:L_DISCOUNT,
    $1:L_TAX,
    $1:L_RETURNFLAG::varchar,
    $1:L_LINESTATUS::varchar,
    $1:L_SHIPDATE::varchar,
    $1:L_COMMITDATE::varchar,
    $1:L_RECEIPTDATE::varchar,
    $1:L_SHIPINSTRUCT::varchar,
    $1:L_SHIPMODE::varchar,
    $1:L_COMMENT
from
    @stg_lineitem_json_dev ;
-- limit 10;

truncate table lineitem;

--- ####Second approach#### ---
-- Create a raw table with variant datatype column ---
create table lineitem_raw_json (src variant );

-- Ingest data into the raw table from staged location ---
copy into lineitem_raw_json from @stg_lineitem_json_dev ON_ERROR =
ABORT_STATEMENT;


-- insert into the structured table from raw table ---
insert into lineitem
select
    SRC:L_ORDERKEY,
    SRC:L_PARTKEY,
    SRC:L_SUPPKEY,
    SRC:L_LINENUMBER,
    SRC:L_QUANTITY,
    SRC:L_EXTENDEDPRICE,
    SRC:L_DISCOUNT,
    SRC:L_TAX,
```

```
    SRC:L_RETURNFLAG,
    SRC:L_LINESTATUS,
    SRC:L_SHIPDATE,
    SRC:L_COMMITDATE,
    SRC:L_RECEIPTDATE,
    SRC:L_SHIPINSTRUCT,
    SRC:L_SHIPMODE,
    SRC:L_COMMENT
from
    lineitem_raw_json ;
-- limit 10;
```



Since Json is semi structured, load into structure format may be throw the compilation error.

To load json, first approach, select raw data with key fields from stage and insert into structured table. But the values will be in double quotes.



```
    $1:L_SUPPKEY,
    $1:L_LINENUMBER,
    $1:L_QUANTITY,
    $1:L_EXTENDEDPRICE,
    $1:L_DISCOUNT,
    $1:L_TAX,
    $1:L_RETURNFLAG,
    $1:L_LINESTATUS,
    $1:L_SHIPDATE,
    $1:L_COMMITDATE,
    $1:L_RECEIPTDATE,
    $1:L_SHIPINSTRUCT,
    $1:L_SHIPMODE,
    $1:L_COMMENT
from
    @stg_lineitem_json_dev
limit 10;
```

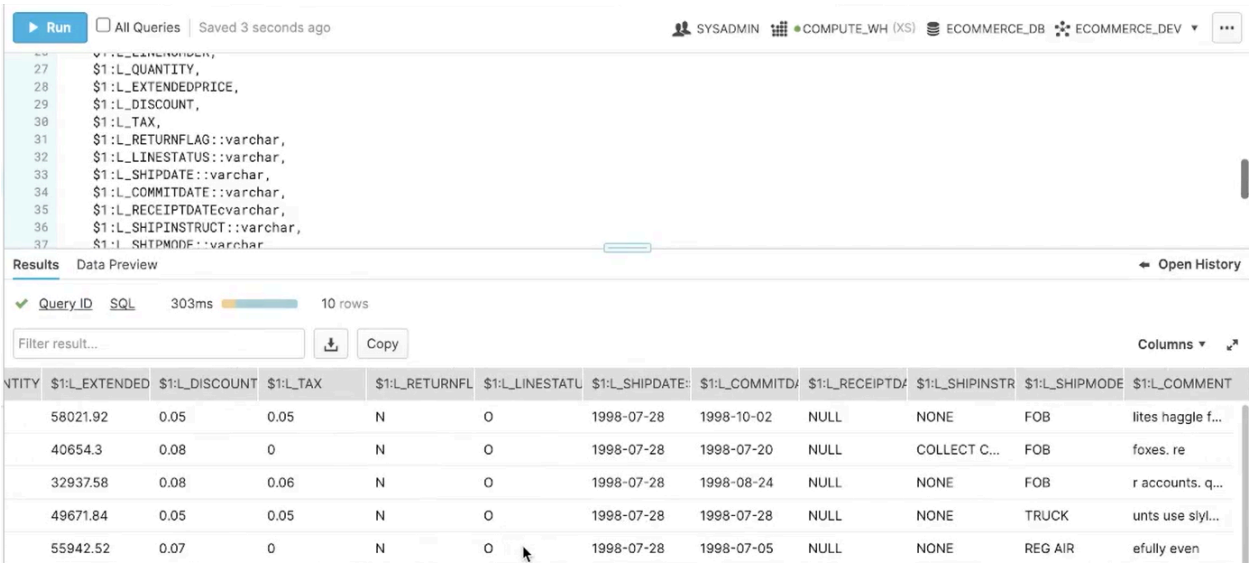
Results | Data Preview | Open History

Query ID | SQL | 623ms | 10 rows

Filter result... | Copy | Columns

NTITY	$1:L_EXTENDED	$1:L_DISCOUNT	$1:L_TAX	$1:L_RETURNFL	$1:L_LINESTATU	$1:L_SHIPDATE	$1:L_COMMITDA	$1:L_RECEIPTDA	$1:L_SHIPINSTR	$1:L_SHIPMODE	$1:L_COMMENT
	60616.92	0.04	0.04	"N"	"O"	"1997-09-24"	"1997-10-11"	"1997-10-05"	"DELIVER IN ...	"FOB"	"slyly agains...
	21057.4	0.1	0.02	"N"	"O"	"1997-09-24"	"1997-10-17"	"1997-10-08"	"TAKE BACK...	"MAIL"	"y permanen...
	23923.06	0.06	0.07	"N"	"O"	"1997-09-24"	"1997-10-20"	"1997-10-23"	"NONE"	"AIR"	"ockey playe...
	11749.32	0	0.02	"N"	"O"	"1997-09-24"	"1997-08-24"	"1997-10-14"	"COLLECT C...	"AIR"	"iously expre...

We can remove it by referring type as varchar:



Run | All Queries | Saved 3 seconds ago | SYSADMIN | COMPUTE_WH (XS) | ECOMMERCE_DB | ECOMMERCE_DEV

```
    $1:L_QUANTITY,
    $1:L_EXTENDEDPRICE,
    $1:L_DISCOUNT,
    $1:L_TAX,
    $1:L_RETURNFLAG::varchar,
    $1:L_LINESTATUS::varchar,
    $1:L_SHIPDATE::varchar,
    $1:L_COMMITDATE::varchar,
    $1:L_RECEIPTDATEcvarchar,
    $1:L_SHIPINSTRUCT::varchar,
    $1:L_SHIPMODE::varchar
```

Results | Data Preview | Open History

Query ID | SQL | 303ms | 10 rows

Filter result... | Copy | Columns

NTITY	$1:L_EXTENDED	$1:L_DISCOUNT	$1:L_TAX	$1:L_RETURNFL	$1:L_LINESTATU	$1:L_SHIPDATE::	$1:L_COMMITDA	$1:L_RECEIPTDA	$1:L_SHIPINSTR	$1:L_SHIPMODE	$1:L_COMMENT
	58021.92	0.05	0.05	N	O	1998-07-28	1998-10-02	NULL	NONE	FOB	lites haggle f...
	40654.3	0.08	0	N	O	1998-07-28	1998-07-20	NULL	COLLECT C...	FOB	foxes. re
	32937.58	0.08	0.06	N	O	1998-07-28	1998-08-24	NULL	NONE	FOB	r accounts. q...
	49671.84	0.05	0.05	N	O	1998-07-28	1998-07-28	NULL	NONE	TRUCK	unts use slyl...
	55942.52	0.07	0	N	O	1998-07-28	1998-07-05	NULL	NONE	REG AIR	efully even

To load json,second approach, first create new table and store the raw data into it. Then from new table, transform it and store it in structured table.

```
15
16 create or replace table lineitem_raw_json (src variant);
17
18
```

Results | Data Preview

Query ID | SQL | 195ms | 1 rows

Filter result... | Copy

Row	status
1	Table LINEITEM_RAW_JSON successfully created.

```
18 copy into lineitem_raw_json from @stg_lineitem_json_dev ON_ERROR = ABORT_STATEMENT;
19
20
21
22
23
24
```

Results | Data Preview | Open History

Query ID | SQL | 6.29s | 128 rows

Filter result... | Copy | Columns

Row	file	status	rows_parsed	rows_loaded	error_limit	errors_seen	first_error	first_error_line	first_error_charac	first_error_columr
1	s3://sid-snow...	LOADED	7936	7936	1	0	NULL	NULL	NULL	NULL
2	s3://sid-snow...	LOADED	7936	7936	1	0	NULL	NULL	NULL	NULL
3	s3://sid-snow...	LOADED	7936	7936	1	0	NULL	NULL	NULL	NULL

```
21
22 select
23     SRC:L_ORDERKEY,
24     SRC:L_PARTKEY,
25     SRC:L_SUPPKEY,
26     SRC:L_LINENUMBER,
27     SRC:L_QUANTITY,
28     SRC:L_EXTENDEDPRICE,
29     SRC:L_DISCOUNT,
30     SRC:L_TAX,
31     SRC:L_RETURNFLAG,
32     SRC:L_LINESTATUS,
33     SRC:L_SHIPDATE,
34     SRC:L_COMMITDATE,
35     SRC:L_RECEIPTDATE,
36     SRC:L_SHIPINSTRUCT,
37     SRC:L_SHIPMODE,
38     SRC:L_COMMENT
```

Results | Data Preview | Open History

Query ID | SQL | 333ms | 10 rows

Filter result... | Copy | Columns

Row	SRC:L_ORDERKE	SRC:L_PARTKEY	SRC:L_SUPPKEY	SRC:L_LINENUM	SRC:L_QUANTIT	SRC:L_EXTENDE	SRC:L_DISCOUN	SRC:L_TAX	SRC:L_RETURNF	SRC:L_LINESTAT	SRC:L_SHIF
1	2844948486	72018843	9518865	1	33	58021.92	0.05	0.05	"N"	"O"	"1998-07
2	5358629669	104881094	7381105	2	38	40654.3	0.08	0	"N"	"O"	"1998-07
3	1547249569	187766210	266229	1	26	32937.58	0.08	0.06	"N"	"O"	"1998-07

```
insert into lineitem
select
    SRC:L_ORDERKEY,
    SRC:L_PARTKEY,
    SRC:L_SUPPKEY,
    SRC:L_LINENUMBER,
    SRC:L_QUANTITY,
    SRC:L_EXTENDEDPRICE,
    SRC:L_DISCOUNT,
    SRC:L_TAX,
    SRC:L_RETURNFLAG,
    SRC:L_LINESTATUS,
    SRC:L_SHIPDATE,
    SRC:L_COMMITDATE,
    SRC:L_RECEIPTDATE,
    SRC:L_SHIPINSTRUCT,
    SRC:L_SHIPMODE,
    SRC:L_COMMENT
```

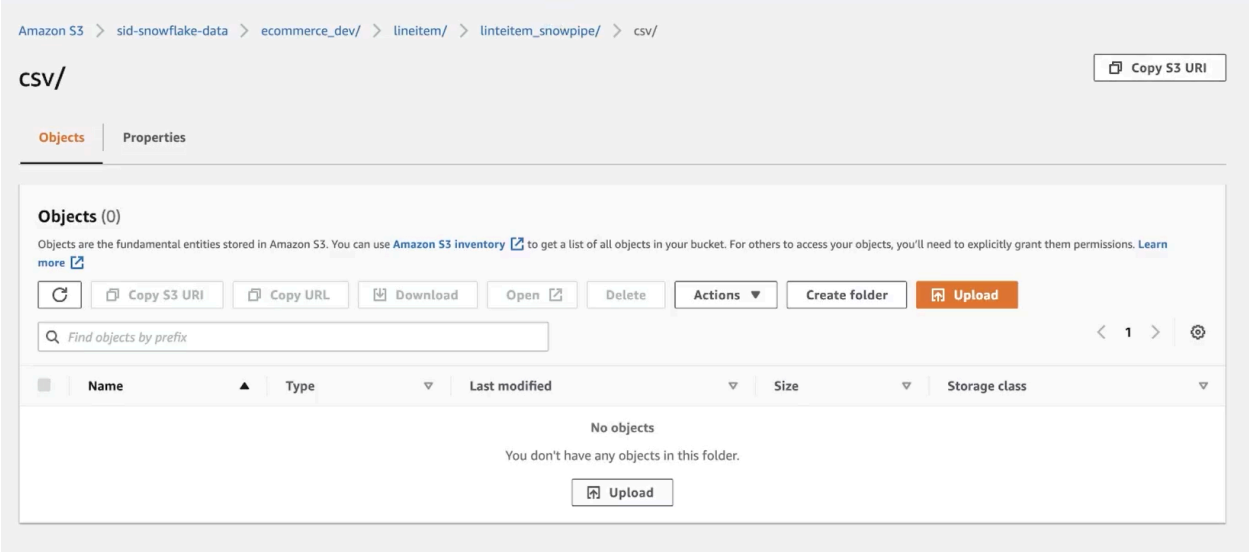
Results | Data Preview | Open History

Query ID | SQL | 556ms | 1 rows

Filter result... | Copy | Columns

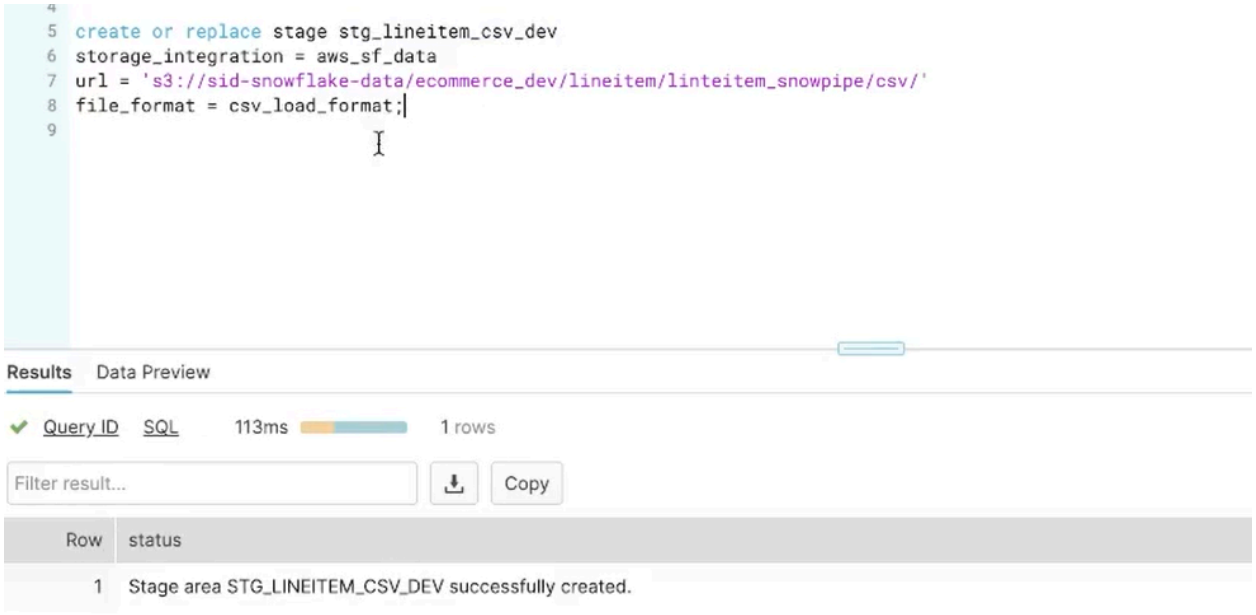
Row	number of rows inserted
1	10

Continuous data ingestion:

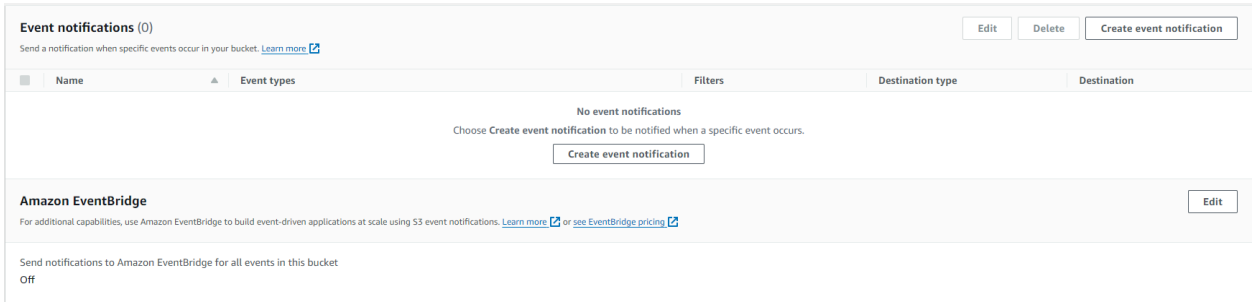



```
use role sysadmin;

use schema ecommerce_db.ecommerce_liv;;

-- Create a stage for lineitem table  ---
create stage stg_lineitem_csv_dev
storage_integration = aws_sf_data
url = '{your_bucket_name}/ecommerce_dev/lineitem/lineitem_csv/'
file_format = csv_load_format;
```

```
list @stg_lineitem_csv_dev;

create or replace pipe lineitem_pipe auto_ingest=true as
copy into lineitem from @stg_lineitem_csv_dev ON_ERROR = continue;

show pipes;

select * from lineitem limit 10;

select * from information_schema.load_history where table_name='LINEITEM' order by
last_load_time desc limit 10;

use role accountadmin;

-- Switch role to accountadmin before running this command --
select *
  from table(information_schema.pipe_usage_history(
    date_range_start=>dateadd('hour',-3,current_timestamp()),
    pipe_name=>'lineitem_pipe'));
```



Then enable event notification in s3 bucket(enable in bucket not in directory)



Create event notification Info

To enable notifications, you must first add a notification configuration that identifies the events you want Amazon S3 to publish and the destinations where you want Amazon S3 to send the notifications.

General configuration

Event name

lineitem_trigger_event

Event name can contain up to 255 characters.

Prefix - *optional*

Limit the notifications to objects with key starting with specified characters.

ecommerce_dev/lineitem/linteitem_snowpipe/csv/

Suffix - *optional*

Limit the notifications to objects with key ending with specified characters.

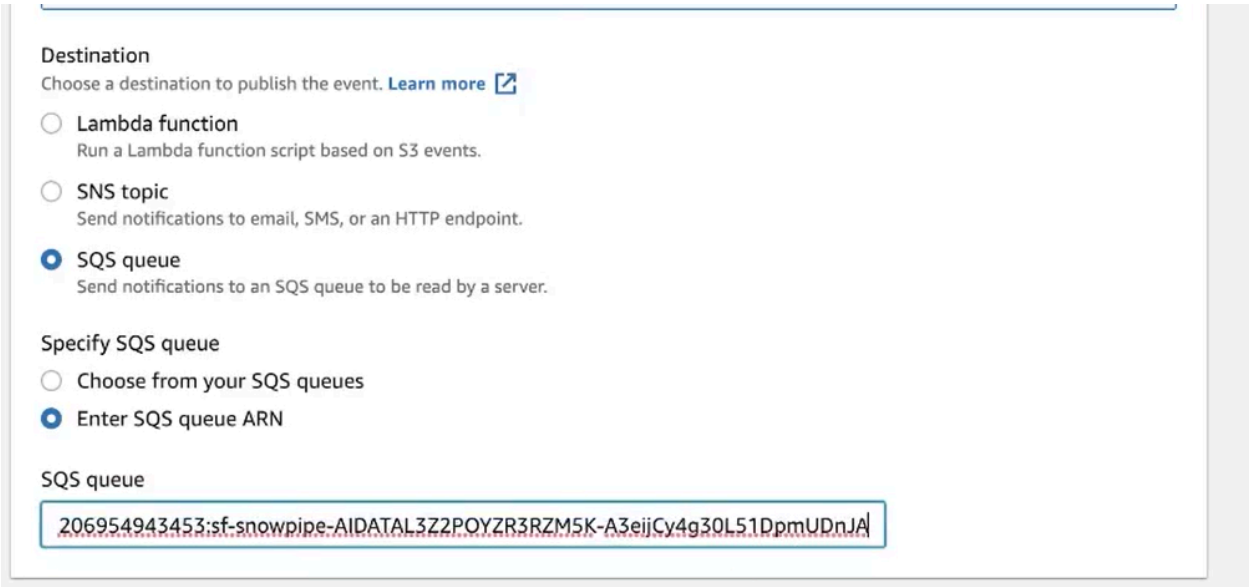
.jpg

Event types

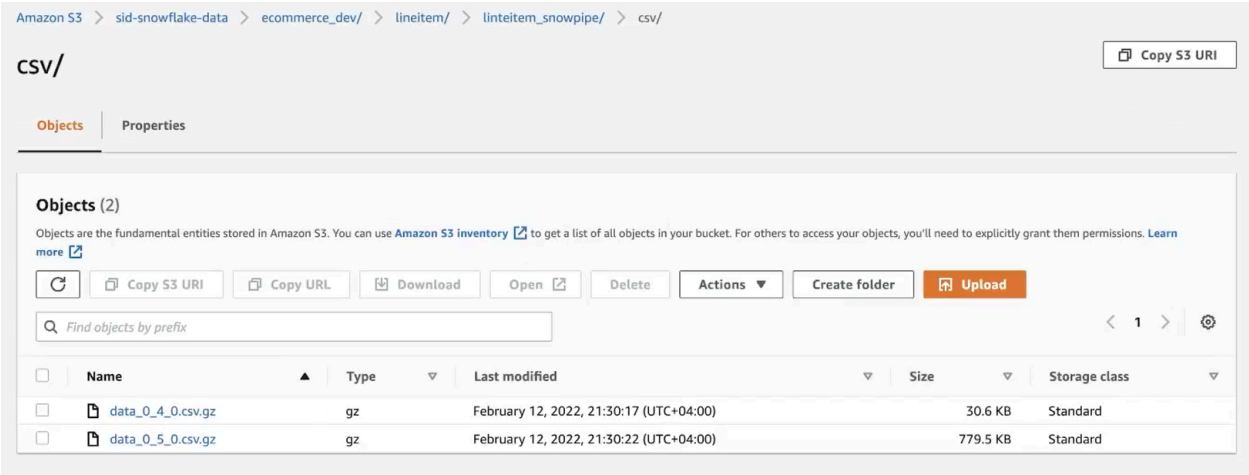
Specify at least one event for which you want to receive notifications. For each group, you can choose an event type for all events, or you can choose one or more individual events.

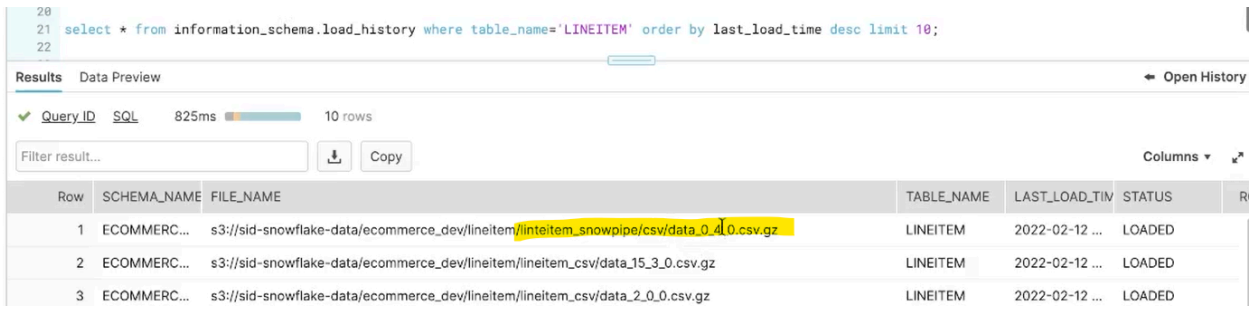
Object creation

- [x] All object create events
  s3:ObjectCreated:*
- [ ] Put
  s3:ObjectCreated:Put
- [ ] Post
  s3:ObjectCreated:Post
- [ ] Copy
  s3:ObjectCreated:Copy
- [ ] Multipart upload completed
  s3:ObjectCreated:CompleteMultipartUpload



Now, upload some files:





Unload/Extract data into S3:

```
use schema "ECOMMERCE_DB"."ECOMMERCE_LIV";

-- Extract/Unload data  ---
copy into s3://sid-snowflake-data/unloaded_data/lineitem/
from
(
  select * from "ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM" limit 100000
)
storage_integration=aws_sf_data
single=false
file_format = csv_load_format;

-- Extract/Unload data using partition by ---
copy into s3://sid-snowflake-data/unloaded_data/lineitem_partitioned/
from
(
  select * from "ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM" limit 100000
)
partition by L_SHIPDATE
storage_integration=aws_sf_data
single=false
file_format = csv_load_format;



copy into s3://sid-snowflake-data/unloaded_data/lineitem_parquet/
from
(
  select * from "ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM"
  limit 1000000
)
storage_integration=aws_sf_data
single=false
file_format = parquet_format;

create or replace file format json_unload_format
type=’json’

copy into s3://sid-snowflake-data/ecommerce_dev/lineitem/lineitem_json/
from
(
  select
  object_construct(
  'L_ORDERKEY',L_ORDERKEY,
  'L_PARTKEY',L_PARTKEY,
  'L_SUPPKEY',L_SUPPKEY,
  'L_LINENUMBER',L_LINENUMBER,
   'L_QUANTITY',L_QUANTITY,
   'L_EXTENDEDPRICE',L_EXTENDEDPRICE,
  'L_DISCOUNT',L_DISCOUNT,
```

```
   'L_TAX',L_TAX,
   'L_RETURNFLAG',L_RETURNFLAG,
   'L_LINESTATUS',L_LINESTATUS,
   'L_SHIPDATE',L_SHIPDATE,
   'L_COMMITDATE',L_COMMITDATE,
   'L_RECEIPTDATE',L_RECEIPTDATE,
   'L_SHIPINSTRUCT',L_SHIPINSTRUCT,
   'L_SHIPMODE',L_SHIPMODE,
   'L_COMMENT',L_COMMENT
  )
  from "ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM"
  limit 1000000
)
storage_integration=aws_sf_data
single=false
file_format = json_unload_format;
```

```
4
5  copy into s3://sid-snowflake-data/unloaded_data/lineitem/
6  from
7  (
8    select * from "ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM" limit 100000
9  )
10 storage_integration=aws_sf_data
11 single=false
12 file_format = csv_load_format;
```

Results | Data Preview | Open History

Query ID | SQL | 438ms | 1 rows

Filter result... | Copy | Columns

Row	rows_unloaded	input_bytes	output_bytes
1	100000	15364609	3960605

Unload by partition key:

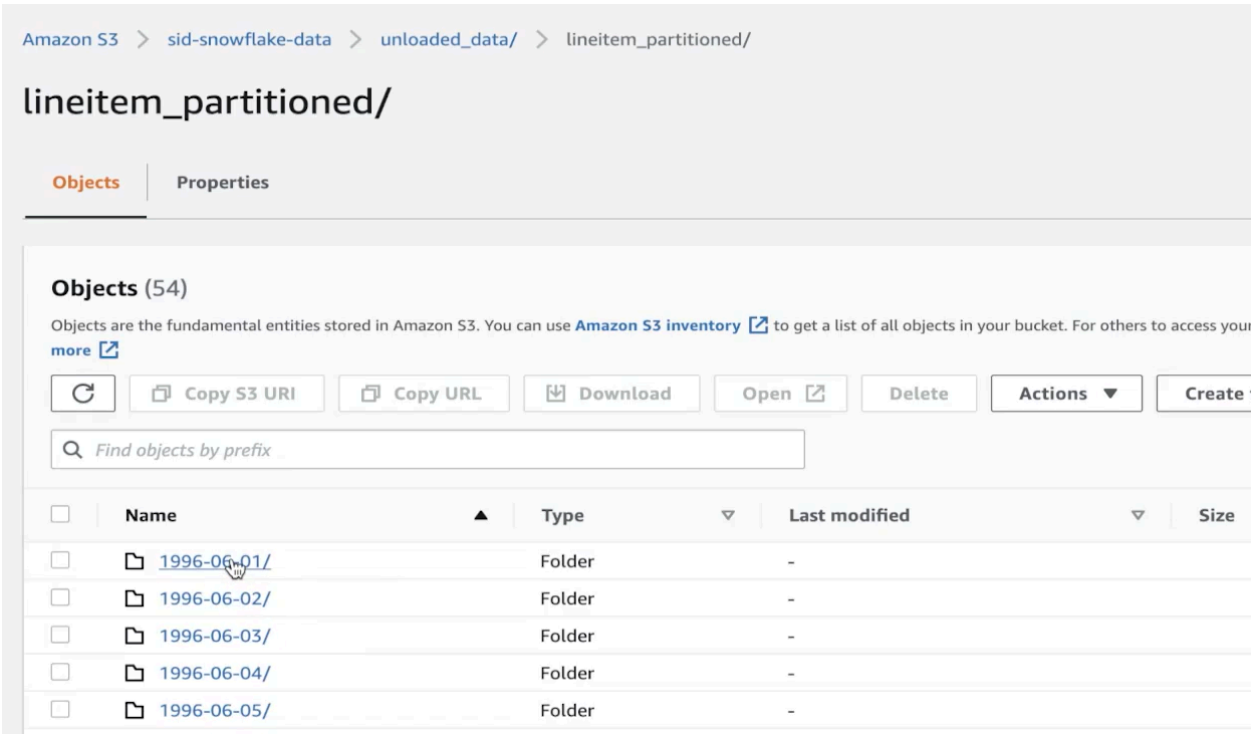
```
13
14 copy into s3://sid-snowflake-data/unloaded_data/lineitem_partitioned/
15 from
16 (
17   select * from "ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM" limit 100000
18 )
19 partition by L_SHIPDATE
20 storage_integration=aws_sf_data
21 single=false
22 file_format = csv_load_format;
```

Results | Data Preview | Open History

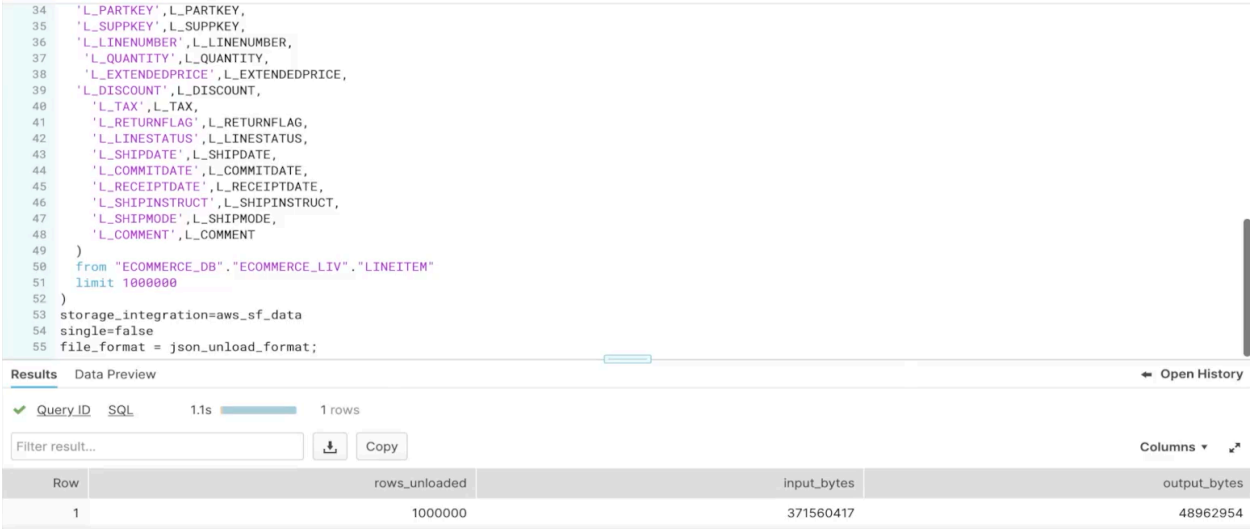
Query ID | SQL | 1.93s | 1 rows

Filter result... | Copy | Columns

Row	rows_unloaded	input_bytes	output_bytes
1	100000	15363678	3980757



Unload into json format:



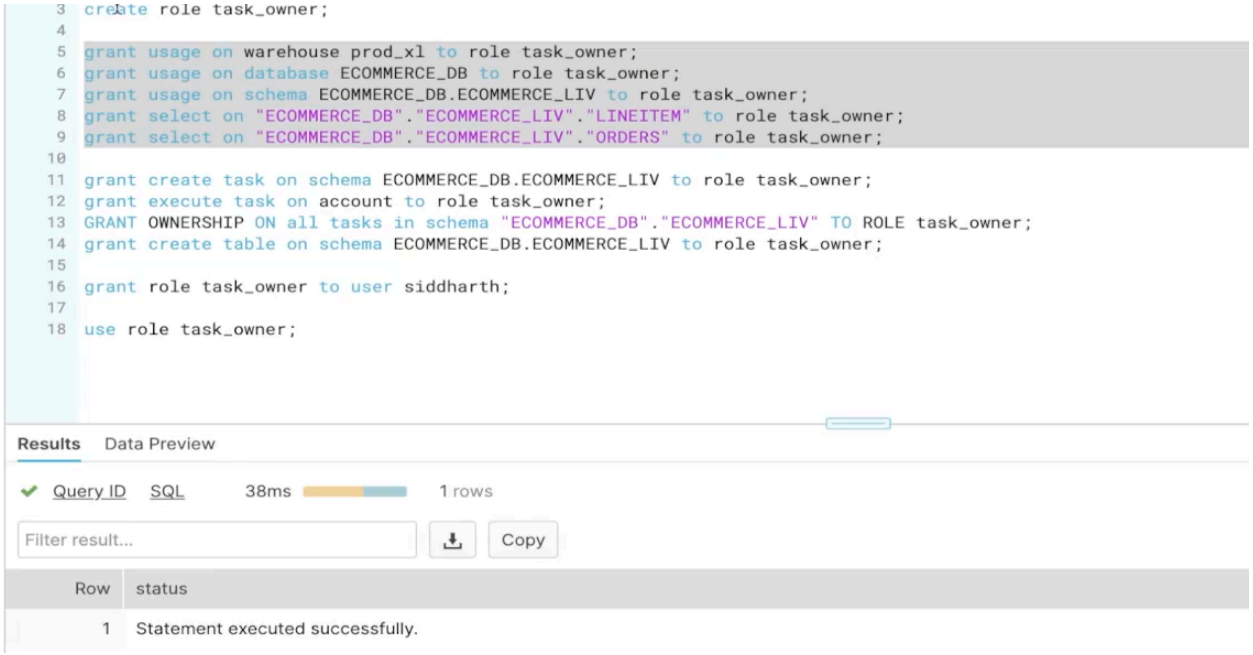
```
  'L_PARTKEY',L_PARTKEY,
  'L_SUPPKEY',L_SUPPKEY,
  'L_LINENUMBER',L_LINENUMBER,
   'L_QUANTITY',L_QUANTITY,
   'L_EXTENDEDPRICE',L_EXTENDEDPRICE,
  'L_DISCOUNT',L_DISCOUNT,
    'L_TAX',L_TAX,
    'L_RETURNFLAG',L_RETURNFLAG,
    'L_LINESTATUS',L_LINESTATUS,
    'L_SHIPDATE',L_SHIPDATE,
    'L_COMMITDATE',L_COMMITDATE,
    'L_RECEIPTDATE',L_RECEIPTDATE,
    'L_SHIPINSTRUCT',L_SHIPINSTRUCT,
    'L_SHIPMODE',L_SHIPMODE,
    'L_COMMENT',L_COMMENT
  )
  from "ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM"
  limit 1000000
)
storage_integration=aws_sf_data
single=false
file_format = json_unload_format;
```

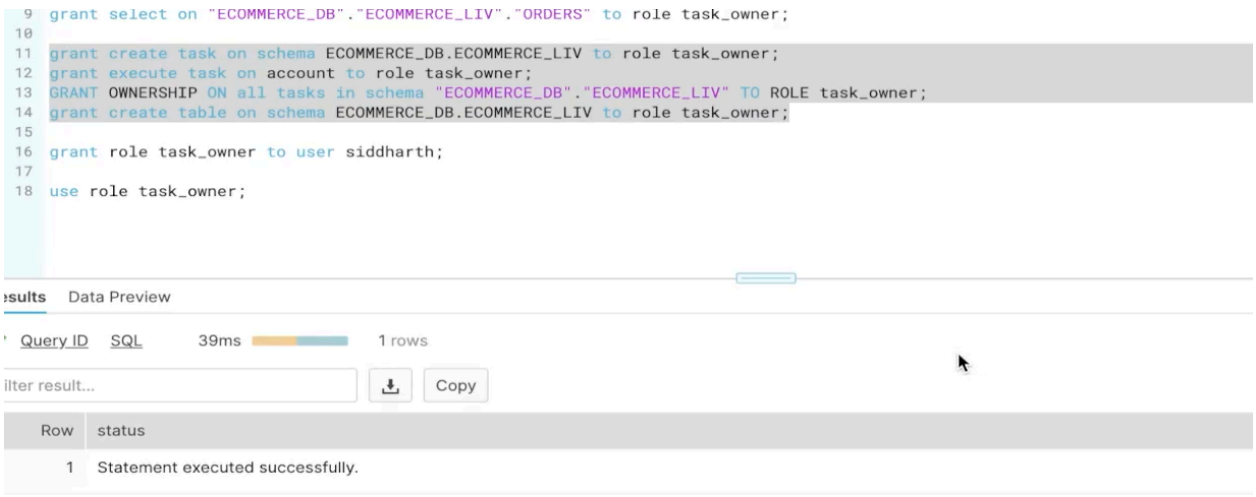

Row	rows_unloaded	input_bytes	output_bytes
1	1000000	371560417	48962954

Tasks:

```
use role accountadmin;
```

```
create role task_owner;

grant usage on warehouse compute_wh to role task_owner;

grant usage on database ECOMMERCE_DB to role task_owner;

grant usage on schema ECOMMERCE_DB.ECOMMERCE_DEV to role task_owner;

grant select on "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM" to role task_owner;
grant select on "ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS" to role task_owner;

grant create task on schema ECOMMERCE_DB.ECOMMERCE_DEV to role task_owner;
grant execute task on account to role task_owner;
GRANT OWNERSHIP ON all tasks in schema "ECOMMERCE_DB"."ECOMMERCE_DEV"
TO ROLE task_owner;
grant create table on schema ECOMMERCE_DB.ECOMMERCE_DEV to role task_owner;

grant role task_owner to user mohamedzuhairka;

use role task_owner;
```






```
use  ecommerce_db.ecommerce_dev;

 --- Create a table to store the results ----
create or replace TABLE DAILY_AGGREGATED_SUMMARY (
	SUM_QTY NUMBER(24,2),
	TOTAL_BASE_PRICE NUMBER(24,2),
	TOTAL_DISCOUNT_PRICE NUMBER(37,4),
	TOTAL_CHARGE NUMBER(38,6),
	ORDER_COUNT NUMBER(18,0),
	SHIPPED_DATE DATE,
	SHIPPED_MODE VARCHAR(10)
);

create or replace TABLE ORDERS_BY_SHIPMODE (
	TOTAL_ORDERS NUMBER(30,0),
	TOTAL_DISCOUNT NUMBER(38,0),
	SHIPPED_DATE DATE,
	SHIPPED_MODE VARCHAR(10)
);

-- Standalone Task -----
create task TSK_DAILY_SALES_SUMMARY
warehouse = prod_xl
schedule = 'using cron 0 8 * * * UTC' as
insert into "ECOMMERCE_DB"."ECOMMERCE_DEV"."DAILY_AGGREGATED_SUMMARY"
select
	sum(l_quantity) as sum_qty,
	sum(l_extendedprice) as total_base_price,
	sum(l_extendedprice * (1-l_discount)) as total_discount_price,
	sum(l_extendedprice * (1-l_discount) * (1+l_tax)) as total_charge,
	count(*) as order_count,
```

```
      date(l_shipdate) as shipped_date,
      l_shipmode as shipped_mode
 from
      "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM"
 where
      shipped_date = '1996-07-17'
 group by
      shipped_date,
      shipped_mode;

show tasks;

alter task DAILY_AGGREGATED_SUMMARY suspend;

-- Dependent Task -----

create task TSK_ORDERS_BY_SHIPMODE
warehouse = prod_xl
AFTER TSK_DAILY_SALES_SUMMARY
insert into "ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS_BY_SHIPMODE"
select
    round(sum(order_count)) as total_orders ,
    round(sum(total_discount_price),0) as total_discount,
    shipped_date,
    shipped_mode
from
    daily_aggregated_summary
group by 3,4

alter task TSK_ORDERS_BY_SHIPMODE resume ;
alter task DAILY_AGGREGATED_SUMMARY resume ;

---- Check Task History ------
use role accountadmin;

select *
  from table(information_schema.task_history(
    scheduled_time_range_start=>dateadd('hour',-1,current_timestamp()),
    result_limit => 10,
    task_name=>'task_name'));
```

```
22 create or replace TABLE DAILY_AGGREGATED_SUMMARY (
23     SUM_QTY NUMBER(24,2),
24     TOTAL_BASE_PRICE NUMBER(24,2),
25     TOTAL_DISCOUNT_PRICE NUMBER(37,4),
26     TOTAL_CHARGE NUMBER(38,6),
27     ORDER_COUNT NUMBER(18,0),
28     SHIPPED_DATE DATE,
29     SHIPPED_MODE VARCHAR(10)
30 );
31
32 create or replace TABLE ORDERS_BY_SHIPMODE (
33     TOTAL_ORDERS NUMBER(30,0),
34     TOTAL_DISCOUNT NUMBER(38,0),
35     SHIPPED_DATE DATE,
36     SHIPPED_MODE VARCHAR(10)
37 );
38
```

Results | Data Preview

✔ Query ID | SQL | 148ms | 1 rows

Filter result... | Copy

Row	status
1	Table DAILY_AGGREGATED_SUMMARY successfully created.

```
31
32 create or replace TABLE ORDERS_BY_SHIPMODE (
33     TOTAL_ORDERS NUMBER(30,0),
34     TOTAL_DISCOUNT NUMBER(38,0),
35     SHIPPED_DATE DATE,
36     SHIPPED_MODE VARCHAR(10)
37 );
38
```

Results | Data Preview

✔ Query ID | SQL | 172ms | 1 rows

Filter result... | Copy

Row	status
1	Table ORDERS_BY_SHIPMODE successfully created.

```
create task TSK_DAILY_SALES_SUMMARY
warehouse = prod_xl
schedule = 'using cron 0 8 * * * UTC' as
insert into "ECOMMERCE_DB"."ECOMMERCE_LIV"."DAILY_AGGREGATED_SUMMARY"
select
       sum(l_quantity) as sum_qty,
       sum(l_extendedprice) as total_base_price,
       sum(l_extendedprice * (1-l_discount)) as total_discount_price,
       sum(l_extendedprice * (1-l_discount) * (1+l_tax)) as total_charge,
       count(*) as order_count,
       date(l_shipdate) as shipped_date,
       l_shipmode as shipped_mode
 from
       "ECOMMERCE_DB"."ECOMMERCE_LIV"."LINEITEM"
 where
       shipped_date = '1996-07-17'
 group by
       shipped_date,
       shipped_mode ;
```

Results | Data Preview

Query ID | SQL | 90ms | 1 rows

Filter result... | Copy

Row	status
1	Task TSK_DAILY_SALES_SUMMARY successfully created.

```
show tasks;
```

Results | Data Preview | Open History

Query ID | SQL | 62ms | 1 rows

Filter result... | Copy | Columns

Row	created_on	name	id	database_name	schema_name	owner	comment	warehouse	schedule	predecessors	state
1	2022-03-19 ...	TSK_DAILY_...	01a30849-2...	ECOMMERC...	ECOMMERC...	TASK_OWNER		PROD_XL	using cron 0...	NULL	suspended

```
alter task TSK_DAILY_SALES_SUMMARY resume;
```

Results | Data Preview

Query ID | SQL | 119ms | 1 rows

Filter result... | Copy

Row	status
1	Statement executed successfully.

To create child task, the parent or root task should be in suspend state.

```
64
65 create task TSK_ORDERS_BY_SHIPMODE
66 warehouse = prod_xl
67 AFTER TSK_DAILY_SALES_SUMMARY as
68 insert into "ECOMMERCE_DB"."ECOMMERCE_LIV"."ORDERS_BY_SHIPMODE"
69 select
70     round(sum(order_count)) as total_orders ,
71     round(sum(total_discount_price),0) as total_discount,
72     shipped_date,
73     shipped_mode
74 from
75     daily_aggregated_summary
76 group by 3,4;
```

Results Data Preview

✖ Query ID SQL 85ms

Unable to update graph with root task ECOMMERCE_DB.ECOMMERCE_LIV.TSK_DAILY_SALES_SUMMARY since that root task is not suspended.

After parent task is suspended

```
65 create task TSK_ORDERS_BY_SHIPMODE
66 warehouse = prod_xl
67 AFTER TSK_DAILY_SALES_SUMMARY as
68 insert into "ECOMMERCE_DB"."ECOMMERCE_LIV"."ORDERS_BY_SHIPMODE"
69 select
70     round(sum(order_count)) as total_orders ,
71     round(sum(total_discount_price),0) as total_discount,
72     shipped_date,
73     shipped_mode
74 from
75     daily_aggregated_summary
76 group by 3,4;
77
```

Results Data Preview

✔ Query ID SQL 78ms 1 rows

Filter result... Copy

Row	status
1	Task TSK_ORDERS_BY_SHIPMODE successfully created.

Filter result... Copy Columns

n	name	id	database_name	schema_name	owner	comment	warehouse	schedule	predecessors	state
..	TSK_DAILY_SALES_SUMMARY	01a30849-2...	ECOMMERC...	ECOMMERC...	TASK_OWNER		PROD_XL	using cron 0...	NULL	suspended
..	TSK_ORDERS_BY_SHIPMODE	01a3084b-2...	ECOMMERC...	ECOMMERC...	TASK_OWNER		PROD_XL	NULL	ECOMMERCE_DB.ECOMMERCE_LIV.TSK_DAILY_SALES_SUMMARY	suspended

To resume the tasks, first resume child task and then parent task. That is the order.

Streams:

```
use role sysadmin;
use database ecommerce_db;

create  or replace schema streams_test;

--- Create a raw table to test the streams  ---
CREATE OR REPLACE TABLE members_raw (
  id number(8) NOT NULL,
  name varchar(255) default NULL,
  fee number(3) NULL
);

--- Create a production table which will consume the streams data  ---
CREATE OR REPLACE TABLE members_prod (
  id number(8) NOT NULL,
  name varchar(255) default NULL,
  fee number(3) NULL
);


--- Create a standard (delta) stream on the raw table :members_raw---
CREATE OR REPLACE STREAM members_std_stream ON TABLE members_raw;

--- Check the streams ----
select * from members_std_stream

--- Check the stream offset ----
SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream') as
members_table_st_offset;

SELECT
to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream')) as
members_table_st_offset;

--- Insert some data into the raw table : members_raw ---

INSERT INTO members_raw (id,name,fee)
VALUES
(1,'Joe',0),
(2,'Jane',0),
(3,'George',0),
(4,'Betty',0),
(5,'Sally',0)


--- Check the streams ----
```

```
select * from members_std_stream

--- Check the stream offset ----
SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream') as
members_table_st_offset;

--- Query the streams data by ingesting the CDC streams data into the production table ----
SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION =
'INSERT';

--- Consume the streams data by ingesting the CDC streams data into the production table :
DML Operation ----
INSERT INTO members_prod(id,name,fee)
SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION =
'INSERT';

--- Check the production table -----
select * from members_prod;


--- Check the offset ----
SELECT
to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream')) as
members_table_st_offset;



--- Insert some more data into the raw table ---
INSERT INTO members_raw (id,name,fee) VALUES (6,'sid',0),(7,'Billy',0),(8,'Katie',0);

--- Check the streams -----
select * from members_std_stream;

--- Update the raw table ----
update members_raw set fee=10 where id=7;


--- Check the streams -----
select * from members_std_stream;

--- Consume the streams ---
INSERT INTO members_prod(id,name,fee) SELECT id, name, fee FROM
members_std_stream WHERE METADATA$ACTION = 'INSERT';


--- Lets update the raw table again ----

update members_raw set fee=20 where id=7;
```

```
--- Consume both (inserts and updates) from the streams ---
merge into members_prod as mp
using (select id,name,fee from members_std_stream mstr where metadata$action='INSERT' )
as mstr
on mp.id = mstr.id
when matched then update set mp.fee = mstr.fee,mp.name = mstr.name
when not matched then insert (id,name,fee) values (mstr.id,mstr.name,cast(mstr.fee as
numeric));
```

```
7  --- Create a raw table to test the streams  ---
8  CREATE OR REPLACE TABLE members_raw (
9    id number(8) NOT NULL,
10   name varchar(255) default NULL,
11   fee number(3) NULL
12 );
13
14 --- Create a production table which will consume the streams data  ---
15 CREATE OR REPLACE TABLE members_prod (
16   id number(8) NOT NULL,
17   name varchar(255) default NULL,
18   fee number(3) NULL
19 );
20
21 --- Create a standard (delta) stream on the raw table :members_raw---
```

Results | Data Preview

✔ Query ID | SQL | 269ms | 1 rows

Filter result... | Copy

Row	status
1	Table MEMBERS_RAW successfully created.

```
13
14 --- Create a production table which will consume the streams data  ---
15 CREATE OR REPLACE TABLE members_prod (
16   id number(8) NOT NULL,
17   name varchar(255) default NULL,
18   fee number(3) NULL
19 );
20
21 --- Create a standard (delta) stream on the raw table :members_raw---
```

Results | Data Preview

✔ Query ID | SQL | 185ms | 1 rows

Filter result... | Copy

Row	status
1	Table MEMBERS_PROD successfully created.

```
21 --- Create a standard (delta) stream on the raw table :members_raw---
22 CREATE OR REPLACE STREAM members_std_stream ON TABLE members_raw;
23
24 --- Check the streams ----
```

Results | Data Preview

Query ID | SQL | 186ms | 1 rows

Filter result... | Copy

Row	status
1	Stream MEMBERS_STD_STREAM successfully created.

```
23
24 --- Check the streams ----
25 select * from members_std_stream;
26
```

Results | Data Preview | Open History

Query ID | SQL | 117ms | 0 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID

```
27 --- Check the stream offset ----
28 SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream') as members_table_st_offset;
29
30 SELECT to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream')) as members_table_st_offset;
31
```

Results | Data Preview

Query ID | SQL | 238ms | 1 rows

Filter result... | Copy

Row	MEMBERS_TABLE_ST_OFFSET
1	0

```
33
34 INSERT INTO members_raw (id,name,fee)
35 VALUES
36 (1,'Joe',0),
37 (2,'Jane',0),
38 (3,'George',0),
39 (4,'Betty',0),
40 (5,'Sally',0);
41
42
43 select * from members_std_stream;
```

Results | Data Preview

Query ID | SQL | 1.43s | 1 rows

Filter result... | Copy

Row
1

```
42 select * from members_std_stream;
43
```

Results | Data Preview | Open History

Query ID | SQL | 501ms | 5 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	1	Joe	0	INSERT	FALSE	4f35e8ddd6b00de924513...
2	2	Jane	0	INSERT	FALSE	26940c421f3574c0c2950...
3	3	George	0	INSERT	FALSE	99670769bf83a71134bb9...
4	4	Betty	0	INSERT	FALSE	74db03241256e49e2fbbd...
5	5	Sally	0	INSERT	FALSE	a03ad26860a644a36828...

```
48 INSERT INTO members_prod(id,name,fee) SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION = 'INSERT';
49
50 select * from members_prod;
```

Results | Data Preview

Query ID | SQL | 541ms | 1 rows

Filter result... | Copy

Row
1

```
49
50 select * from members_prod;
51
52 select * from members_std_stream;
53
```

Results | Data Preview | Open History

Query ID | SQL | 172ms | 5 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE
1	1	Joe	0
2	2	Jane	0
3	3	George	0
4	4	Betty	0
5	5	Sally	0

Once the data has been consumed, it will be removed from streams:

```
51
52 select * from members_std_stream;
53
```

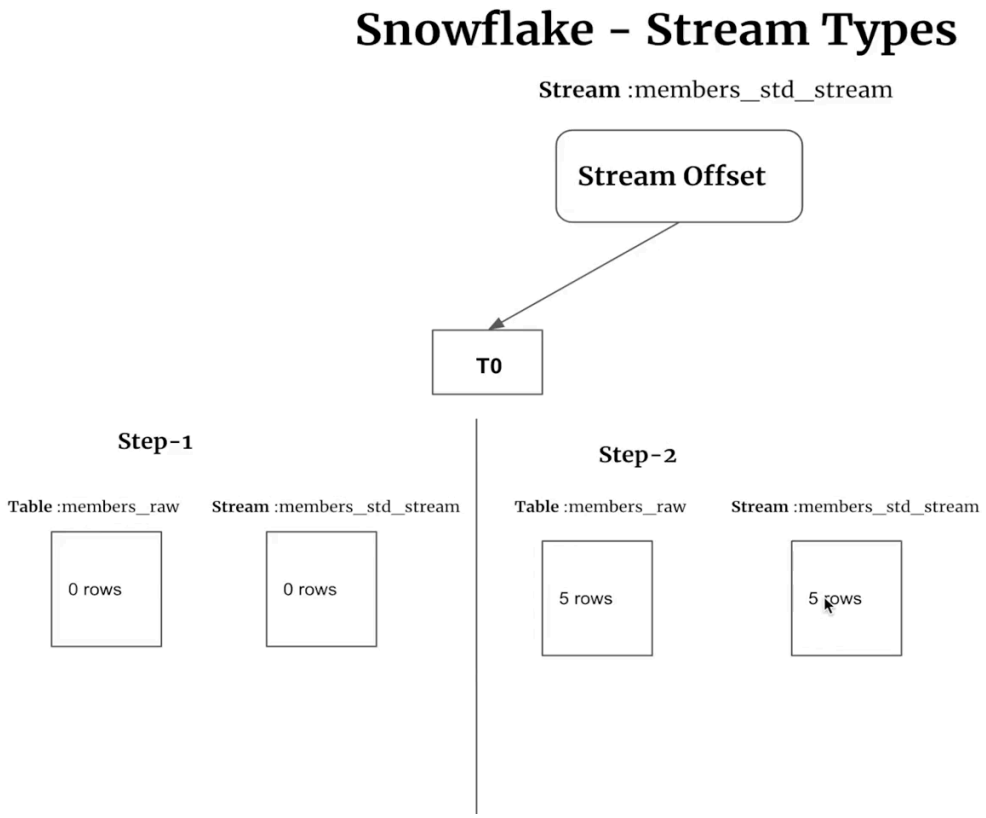
Results | Data Preview | Open History

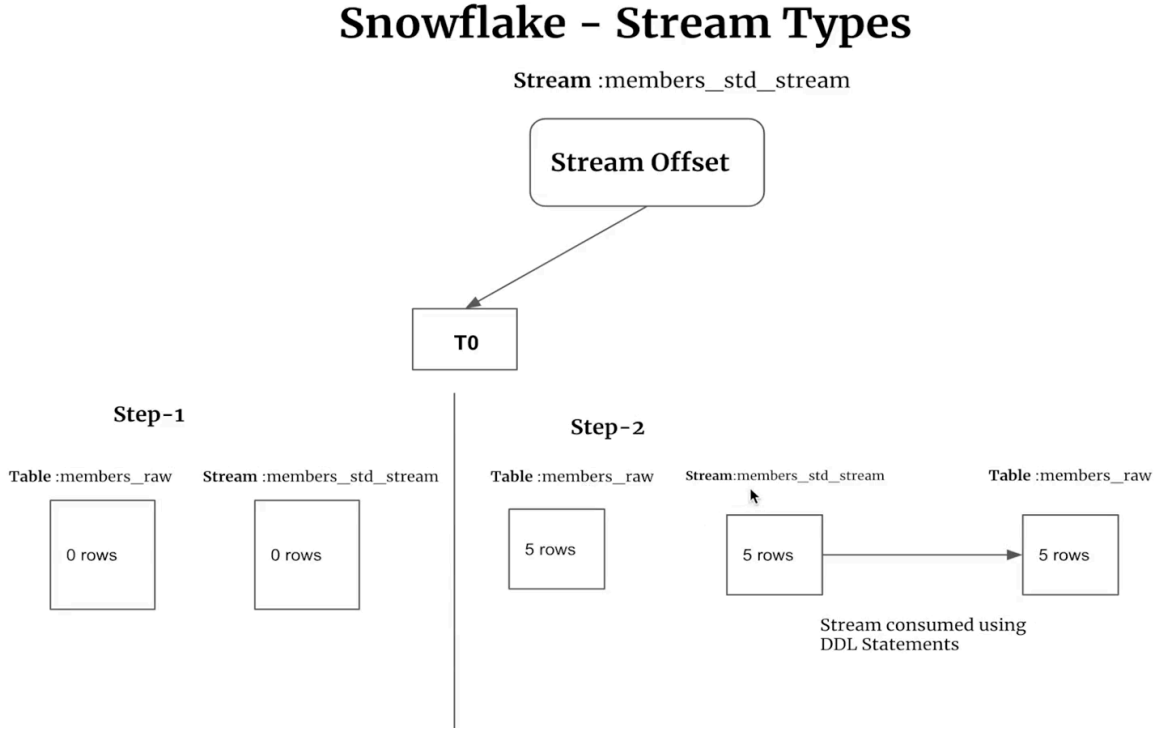
Query ID | SQL | 451ms | 0 rows

Filter result... | Copy | Columns

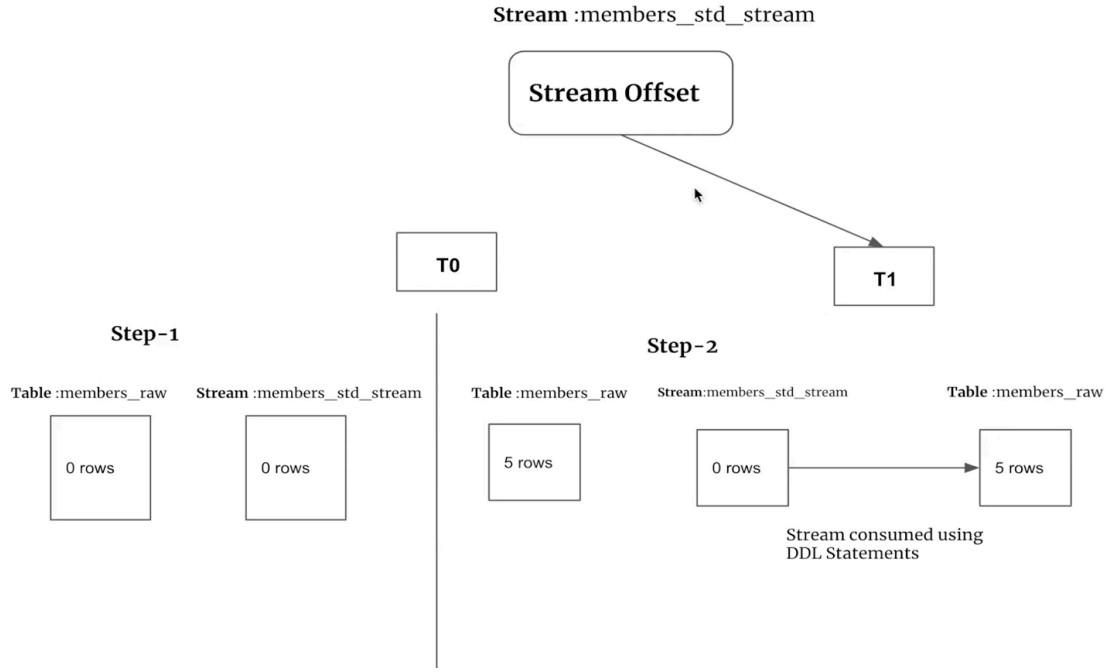
Row	ID	NAME	FEE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID

Behind the action:





Snowflake - Stream Types



T0:

```
27 --- Check the stream offset ----
28 SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream') as members_table_st_offset;
29
30 SELECT to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream')) as members_table_st_offset;
31
```

Results | Data Preview

Query ID | SQL | 238ms | 1 rows

Filter result... | Copy

Row	MEMBERS_TABLE_ST_OFFSET
1	0

T1:

```
54 SELECT to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream')) as members_table_st_offset;
55
56
```

Results | Data Preview | Open History

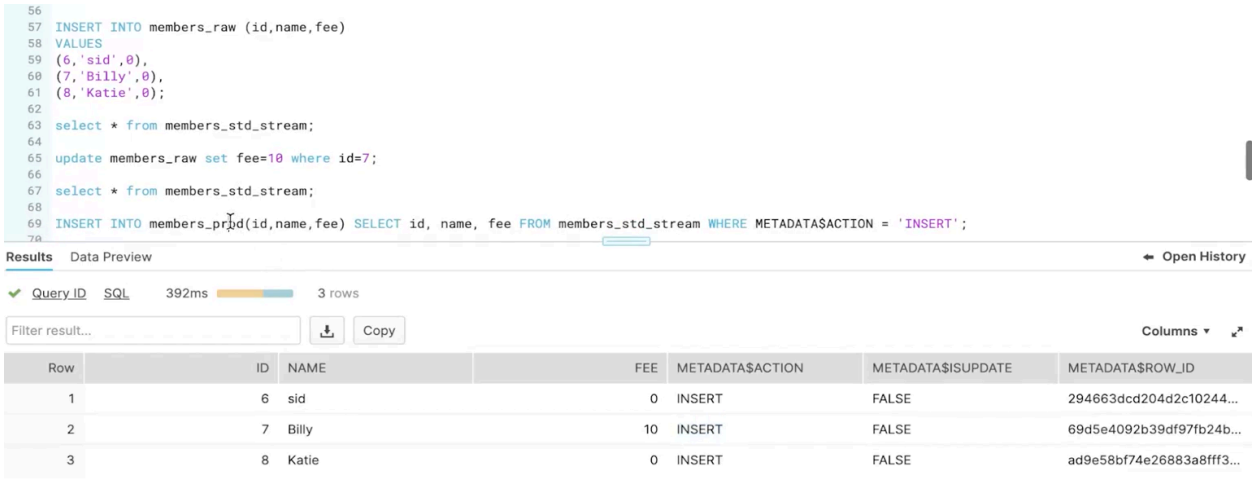
Query ID | SQL | 53ms | 1 rows

Filter result... | Copy | Columns

Row	MEMBERS_TABLE_ST_O
1	2022-03-03 17:48:44.725

Consume model in stream:

Here, we have added three more rows in raw table and update one row. But, when we select the stream, for **ID 7**, it is showing action as **INSERT** instead of **UPDATE**. This is because we haven't consumed the INSERT action from the stream as of now.



```
INSERT INTO members_raw (id,name,fee)
VALUES
(6,'sid',0),
(7,'Billy',0),
(8,'Katie',0);

select * from members_std_stream;

update members_raw set fee=10 where id=7;

select * from members_std_stream;

INSERT INTO members_prod(id,name,fee) SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION = 'INSERT';
```

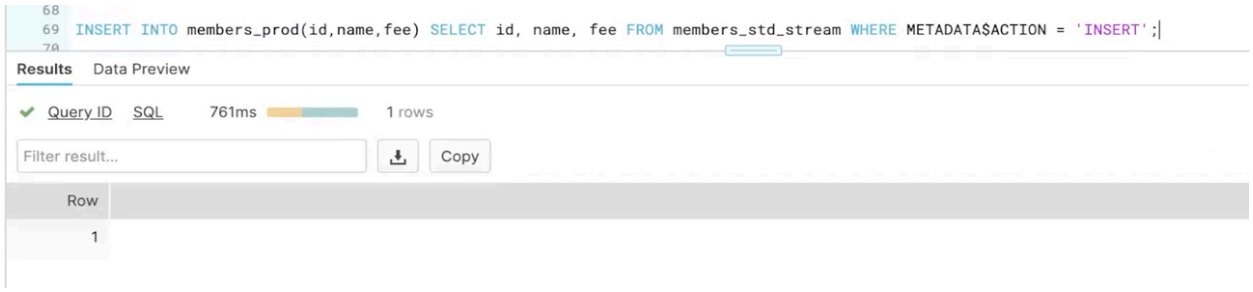
Results | Data Preview | Open History

Query ID | SQL | 392ms | 3 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	6	sid	0	INSERT	FALSE	294663dcd204d2c10244...
2	7	Billy	10	INSERT	FALSE	69d5e4092b39df97fb24b...
3	8	Katie	0	INSERT	FALSE	ad9e58bf74e26883a8fff3...

After we consume the stream records and reupdate the same ID. Then, when we check the stream, we can see the old and new value of same record.



```
INSERT INTO members_prod(id,name,fee) SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION = 'INSERT';
```

Results | Data Preview

Query ID | SQL | 761ms | 1 rows

Filter result... | Copy

Row
1

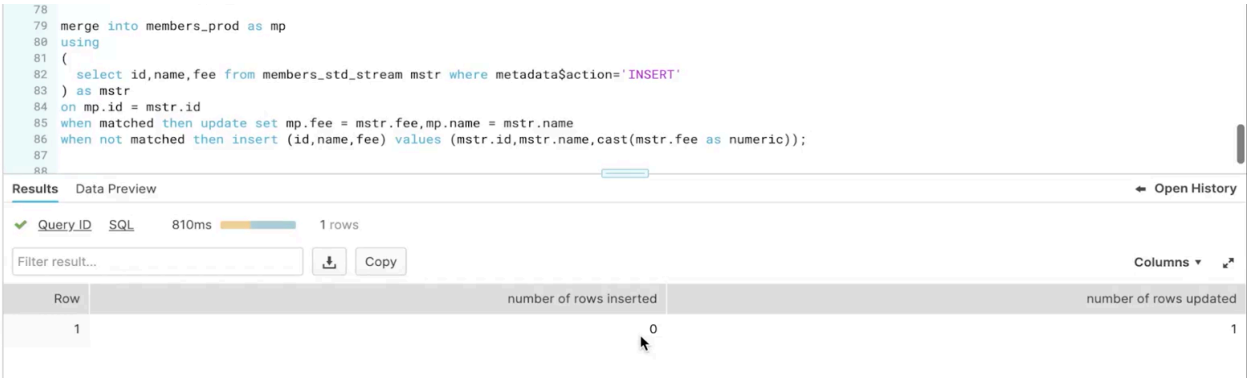
```
update members_raw set fee=20 where id=7;

select * from members_std_stream;

//and metadata$isupdate='TRUE'
```

Results | Data Preview | Open History

Query ID | SQL | 341ms | 2 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	7	Billy	20	INSERT	TRUE	69d5e4092b39df97fb24b...
2	7	Billy	10	DELETE	TRUE	69d5e4092b39df97fb24b...



```
merge into members_prod as mp
using
(
  select id,name,fee from members_std_stream mstr where metadata$action='INSERT'
) as mstr
on mp.id = mstr.id
when matched then update set mp.fee = mstr.fee,mp.name = mstr.name
when not matched then insert (id,name,fee) values (mstr.id,mstr.name,cast(mstr.fee as numeric));
```

Results | Data Preview | Open History

Query ID | SQL | 810ms | 1 rows

Filter result... | Copy | Columns

Row	number of rows inserted	number of rows updated
1	0	1

Append only stream:

```
use role sysadmin;
use database ecommerce_db;

create  or replace schema streams_test;

--- Create a raw table to test the streams  ---
CREATE OR REPLACE TABLE members_raw (
  id number(8) NOT NULL,
  name varchar(255) default NULL,
  fee number(3) NULL
);

--- Create a production table which will consume the streams data  ---
CREATE OR REPLACE TABLE members_prod (
  id number(8) NOT NULL,
  name varchar(255) default NULL,
  fee number(3) NULL
);


--- Create a append-only stream on the raw table :members_raw---
CREATE OR REPLACE STREAM members_append_stream  ON TABLE members_raw
append_only=true;

--- Check the streams ----
select * from members_append_stream

--- Check the stream offset ----
SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_append_stream') as
members_table_st_offset;

SELECT
to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_append_stream'))
as members_table_st_offset;
```

```
--- Insert some data into the raw table : members_raw ---

INSERT INTO members_raw (id,name,fee)
VALUES
(1,'Joe',0),
(2,'Jane',0),
(3,'George',0),
(4,'Betty',0),
(5,'Sally',0)


--- Check the streams ----
select * from members_append_stream

--- Check the stream offset ----
SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream') as
members_table_st_offset;

--- Query the streams data by ingesting the CDC streams data into the production table ----
SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION =
'INSERT';

--- Consume the streams data by ingesting the CDC streams data into the production table :
DML Operation ----
INSERT INTO members_prod(id,name,fee)
SELECT id, name, fee FROM members_std_stream;

--- Check the production table -----
select * from members_prod;


--- Check the offset ----
SELECT
to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream')) as
members_table_st_offset;



--- Insert some more data into the raw table ---
INSERT INTO members_raw (id,name,fee) VALUES (6,'sid',0),(7,'Billy',0),(8,'Katie',0);

--- Check the streams -----
select * from members_std_stream;

--- Update the raw table ----
update members_raw set fee=10 where id=7;


--- Check the streams -----
select * from members_std_stream;
```

```
--- Consume the streams ---
INSERT INTO members_prod(id,name,fee) SELECT id, name, fee FROM
members_std_stream WHERE METADATA$ACTION = 'INSERT';


--- Lets update the raw table again ----

update members_raw set fee=20 where id=7;


--- Consume both (inserts and updates) from the streams ---
merge into members_prod as mp
using (select id,name,fee from members_std_stream mstr where metadata$action='INSERT' )
as mstr
on mp.id = mstr.id
when matched then update set mp.fee = mstr.fee,mp.name = mstr.name
when not matched then insert (id,name,fee) values (mstr.id,mstr.name,cast(mstr.fee as
numeric));
```

```
32
33 INSERT INTO members_raw (id,name,fee)
34 VALUES
35 (1,'Joe',0),
36 (2,'Jane',0),
37 (3,'George',0),
38 (4,'Betty',0),
39 (5,'Sally',0);
40
```

Results | Data Preview

Query ID | SQL | 478ms | 1 rows

Filter result... | Copy

Row
1

```
40
41 select * from members_append_stream;
42
43 SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_append_stream') as members_table_st_offset;
44
45 SELECT id, name, fee FROM members_append_stream WHERE METADATA$ACTION = 'INSERT';
```

Results | Data Preview | Open History

Query ID | SQL | 266ms | 5 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	1	Joe	0	INSERT	FALSE	42e5f5b691fce60baab7cc...
2	2	Jane	0	INSERT	FALSE	1bb7007d37712f8950328...
3	3	George	0	INSERT	FALSE	a903861a242796afb6f440...
4	4	Betty	0	INSERT	FALSE	e06ab53f01186dbe9b493...
5	5	Sally	0	INSERT	FALSE	6620a023cf63ebea29ad1...

```
46
47 INSERT INTO members_prod(id,name,fee) SELECT id, name, fee FROM members_append_stream ;
48
49 select * from members_prod;
50
```

Results | Data Preview

Query ID | SQL | 576ms | 1 rows

Filter result... | Copy

Row
1

```
select * from members_prod;

select * from members_append_stream;

SELECT to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_append_stream')) as members_table_st_offset;
```

Results | Data Preview

Query ID | SQL | 202ms | 5 rows

Filter result... | Copy

Row	ID	NAME
1	1	Joe
2	2	Jane
3	3	George
4	4	Betty
5	5	Sally

```
select * from members_append_stream;

SELECT to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_append_stream')) as members_table_st_offset;
```

Results | Data Preview | Open History

Query ID | SQL | 204ms | 0 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID

```
SELECT to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_append_stream')) as members_table_st_offset;

update members_raw set fee=10 where id=4;
```

Results | Data Preview | Open History

Query ID | SQL | 48ms | 1 rows

Filter result... | Copy | Columns

Row	MEMBERS_TABLE_ST_OFFSET
1	2022-03-04 07:58:05.439

In append-only, streams only capture INSERT actions, so update will not come to streams.

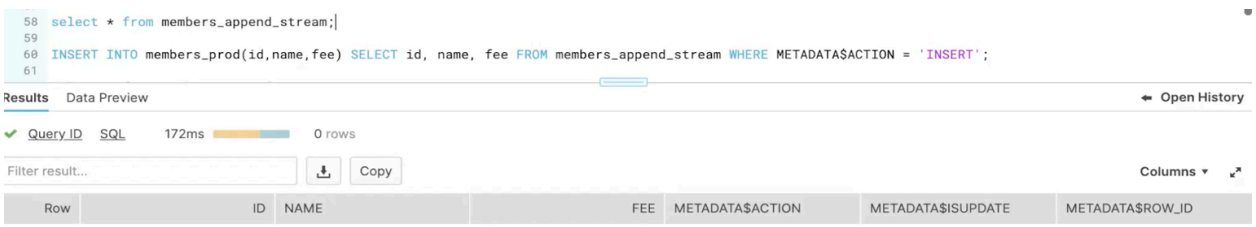
```
update members_raw set fee=10 where id=4;

select * from members_append_stream;

INSERT INTO members_prod(id,name,fee) SELECT id, name, fee FROM members_append_stream WHERE METADATA$ACTION = 'INSERT';
```

Results | Data Preview | Open History

Query ID | SQL | 380ms | 1 rows

Filter result... | Copy | Columns

Row	number of rows updated	number of multi-joined rows updated
1	1	0



Streams in transaction:

```
use role sysadmin;
use database ecommerce_db;

create  or replace schema streams_test;

--- Create a raw table to test the streams  ---
CREATE OR REPLACE TABLE members_raw (
  id number(8) NOT NULL,
  name varchar(255) default NULL,
  fee number(3) NULL,
  member_type varchar(10) not null
);

--- Create a production table which will consume the streams data  ---
CREATE OR REPLACE TABLE members_music_prod (
  id number(8) NOT NULL,
  name varchar(255) default NULL,
  fee number(3) NULL
);

CREATE OR REPLACE TABLE members_games_prod (
  id number(8) NOT NULL,
  name varchar(255) default NULL,
  fee number(3) NULL
);


--- Create a standard (delta) stream on the raw table :members_raw---
CREATE OR REPLACE STREAM members_std_stream ON TABLE members_raw;

--- Check the streams ----
select * from members_std_stream

--- Check the stream offset ----
SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream') as
members_table_st_offset;

SELECT
```

```
to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream')) as
members_table_st_offset;

--- Insert some data into the raw table : members_raw ---

INSERT INTO members_raw (id,name,fee,member_type)
VALUES
(1,'Joe',0,'games'),
(2,'Jane',0,'music'),
(3,'George',0,'games'),
(4,'Betty',0,'games'),
(5,'Sally',0,'music');


--- Check the streams ----
select * from members_std_stream

--- Check the stream offset ----
SELECT SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream') as
members_table_st_offset;

--- Query the streams data by ingesting the CDC streams data into the production table ----
SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION =
'INSERT';

--- Beging the transaction & consume the streams data  ----

begin ;

insert into members_games_prod
SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION =
'INSERT' and member_type='games';

insert into members_music_prod
SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION =
'INSERT' and member_type='music';


commit;

--- Check the production tables -----
select * from members_games_prod;
select * from members_music_prod;


--- Check the offset ----
SELECT
to_timestamp(SYSTEM$STREAM_GET_TABLE_TIMESTAMP('members_std_stream')) as
members_table_st_offset;
```

```
26
27 CREATE OR REPLACE STREAM members_std_stream ON TABLE members_raw;
28
29
30 INSERT INTO members_raw (id,name,fee,member_type)
```

Results | Data Preview

Query ID | SQL | 159ms | 1 rows

Filter result... | Copy

Row	status
1	Stream MEMBERS_STD_STREAM successfully created.

```
30 INSERT INTO members_raw (id,name,fee,member_type)
31 VALUES
32 (1,'Joe',0,'games'),
33 (2,'Jane',0,'music'),
34 (3,'George',0,'games'),
35 (4,'Betty',0,'games'),
36 (5,'Sally',0,'music');
37
38 select * from members_std_stream;
39
40 begin;
```

Results | Data Preview

Query ID | SQL | 1.14s | 1 rows

Filter result... | Copy

Row
1

```
37
38 select * from members_std_stream;
39
40 begin;
41
42 insert into members_games_prod
43 SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION = 'INSERT' and member_type='games';
```

Results | Data Preview | Open History

Query ID | SQL | 519ms | 5 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE	MEMBER_TYPE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	1	Joe	0	games	INSERT	FALSE	c486986981b378410...
2	2	Jane	0	music	INSERT	FALSE	b17f706177dfc3b63d...
3	3	George	0	games	INSERT	FALSE	0ed720b3122ca5c5b...
4	4	Betty	0	games	INSERT	FALSE	25982a442db0934f4...
5	5	Sally	0	music	INSERT	FALSE	420f4e59508191bba6..

```
41
42 insert into members_games_prod
43 SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION = 'INSERT' and member_type='games';
44
45 insert into members_music_prod
46 SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION = 'INSERT' and member_type='music';
```

Results Data Preview

Query ID SQL 779ms 1 rows

Filter result... Copy

Row
1

As we didn't commit the transaction yet, the stream will still be available in the streams.

```
37
38 select * from members_std_stream;
39
40 begin;
41
42 insert into members_games_prod
43 SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION = 'INSERT' and member_type='games';
44
45 insert into members_music_prod
46 SELECT id, name, fee FROM members_std_stream WHERE METADATA$ACTION = 'INSERT' and member_type='music';
47
48 commit;
49
50
```

Results Data Preview Open History

Query ID SQL 258ms 5 rows

Filter result... Copy Columns

Row	ID	NAME	FEE	MEMBER_TYPE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	1	Joe	0	games	INSERT	FALSE	c486986981b378410...
2	2	Jane	0	music	INSERT	FALSE	b17f706177dfc3b63d...
3	3	George	0	games	INSERT	FALSE	0ed720b3122ca5c5b...
4	4	Betty	0	games	INSERT	FALSE	25982a442db0934f4...
5	5	Sally	0	music	INSERT	FALSE	420f4e59508191bba6...

After commit and check, you may see the streams become empty.

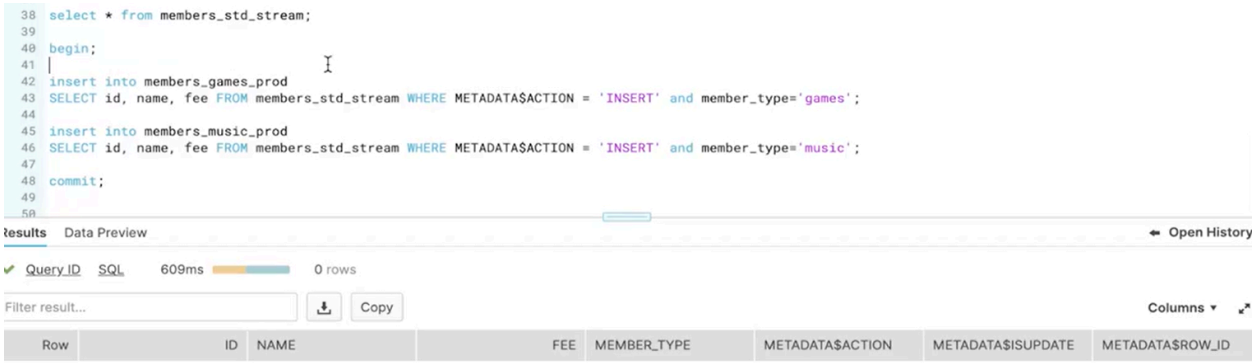
```
47
48 commit;
49
50
```

Results Data Preview

Query ID SQL 421ms 1 rows

Filter result... Copy

Row	status
1	Statement executed successfully.



Note: The normal SQL statements are auto-commit by default.

ChangeTracking:

```
use database ecommerce_db;

create or replace schema streams_test;

CREATE OR REPLACE TABLE members_raw (
  id number(8) NOT NULL,
  name varchar(255) default NULL,
  fee number(3) NULL,
  member_type varchar(10) not null
);

--- Enable change tracking ----
ALTER TABLE members_raw SET CHANGE_TRACKING = TRUE;

SET ts1 = (SELECT CURRENT_TIMESTAMP());

INSERT INTO members_raw (id,name,fee,member_type)
VALUES
(1,'Joe',0,'games'),
(2,'Jane',0,'music'),
(3,'George',0,'games');

update members_raw set fee=20 where id=3;

SELECT * FROM members_raw CHANGES(INFORMATION => default) at(TIMESTAMP
=>$ts1);

SET ts2 = (SELECT CURRENT_TIMESTAMP());

INSERT INTO members_raw (id,name,fee,member_type)
VALUES
```

```
(4,'Betty',0,'games'),
(5,'Sally',0,'music');


SELECT * FROM members_raw CHANGES(INFORMATION => default) at(TIMESTAMP
=>$ts1);

SELECT * FROM members_raw CHANGES(INFORMATION => default) at(TIMESTAMP =>
$ts2);
```

```
11
12 ALTER TABLE members_raw SET CHANGE_TRACKING = TRUE;
13
14 SET ts1 = (SELECT CURRENT_TIMESTAMP());
15
16 INSERT INTO members_raw (id,name,fee,member_type)
```

Results | Data Preview

Query ID | SQL | 185ms | 1 rows

Filter result... | Copy

Row	status
1	Statement executed successfully.

```
13
14 SET ts1 = (SELECT CURRENT_TIMESTAMP());
15
16 INSERT INTO members_raw (id,name,fee,member_type)
```

Results | Data Preview

Query ID | SQL | 38ms | 1 rows

Filter result... | Copy

Row	status
1	Statement executed successfully.

```
15
16 INSERT INTO members_raw (id,name,fee,member_type)
17 VALUES
18 (1,'Joe',0,'games'),
19 (2,'Jane',0,'music'),
20 (3,'George',0,'games');
21
22 update members_raw set fee=20 where id=3;
```

Results Data Preview

Query ID SQL 596ms 1 rows

Filter result... Copy

Row
1

```
22 update members_raw set fee=20 where id=3;
```

Results Data Preview Open History

Query ID SQL 465ms 1 rows

Filter result... Copy Columns

Row	number of rows updated	number of multi-joined rows updated
1	1	0

In the below command, we are saying to select all changes (passing default as a param to information means actions includes both new inserted data and updated.) between the timestamps(ts1 and now).

```
24 SELECT * FROM members_raw CHANGES(INFORMATION => default) at(TIMESTAMP =>$ts1);
```

Results Data Preview Open History

Query ID SQL 3 rows

Filter result... Copy Columns

Row	ID	NAME	FEE	MEMBER_TYPE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	1	Joe	0	games	INSERT	FALSE	5906c9ee8834c4270...
2	2	Jane	0	music	INSERT	FALSE	c82f86ba1993d34118...
3	3	George	20	games	INSERT	FALSE	ce44f9dd68ee4cb47...

To get newly inserted records alone:

```
SELECT * FROM members_raw CHANGES(INFORMATION => append_only) at(TIMESTAMP =>$ts1);


SET ts2 = (SELECT CURRENT_TIMESTAMP());
```

Results | Data Preview | Open History

Query ID | SQL | 188ms | 3 rows

Filter result... | Copy | Columns

Row	ID	NAME	FEE	MEMBER_TYPE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	1	Joe	0	games	INSERT	FALSE	5906c9ee8834c4270...
2	2	Jane	0	music	INSERT	FALSE	c82f86ba1993d34118...
3	3	George	0	games	INSERT	FALSE	ce44f9dd68ee4cb47...

```
SET ts2 = (SELECT CURRENT_TIMESTAMP());

INSERT INTO members_raw (id,name,fee,member_type)
VALUES
(4,'Betty',0,'games')
```

Results | Data Preview

Query ID | SQL | 100ms | 1 rows

Filter result... | Copy

Row	status
1	Statement executed successfully.

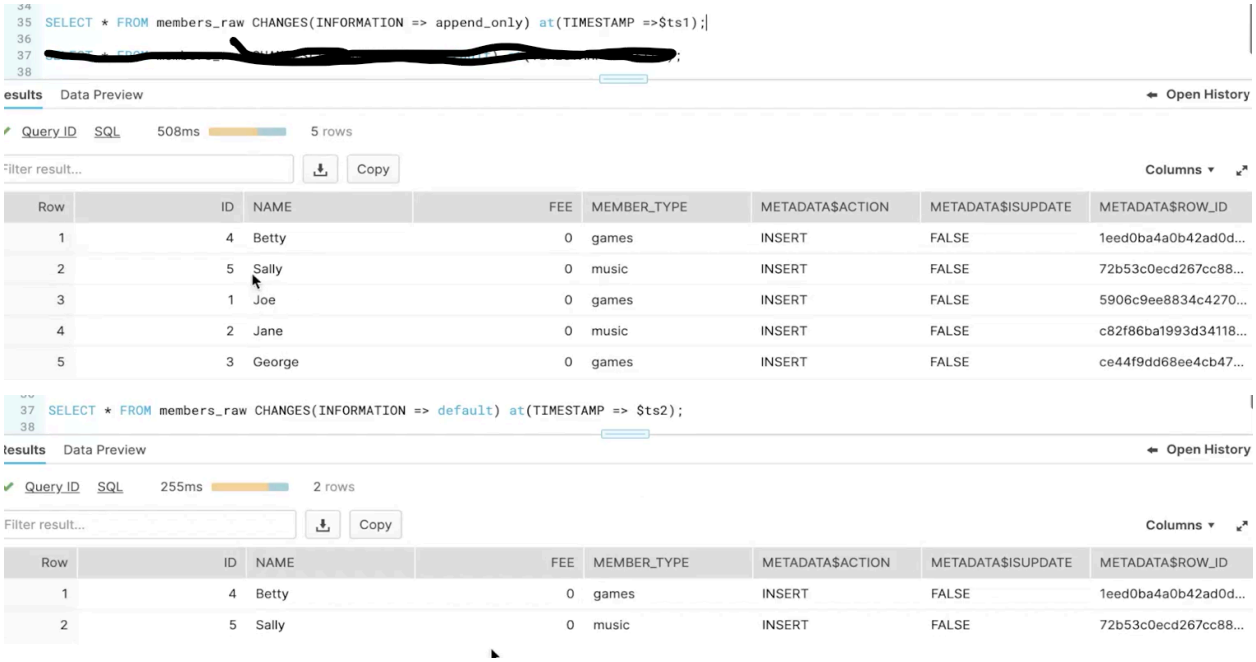
```
INSERT INTO members_raw (id,name,fee,member_type)
VALUES
(4,'Betty',0,'games'),
(5,'Sally',0,'music');
```

Results | Data Preview

Query ID | SQL | 514ms | 1 rows

Filter result... | Copy

Row
1



```
SELECT * FROM members_raw CHANGES(INFORMATION => append_only) at(TIMESTAMP =>$ts1);
```

esults Data Preview — Open History

Query ID SQL 508ms 5 rows

Filter result... Copy Columns

Row	ID	NAME	FEE	MEMBER_TYPE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	4	Betty	0	games	INSERT	FALSE	1eed0ba4a0b42ad0d...
2	5	Sally	0	music	INSERT	FALSE	72b53c0ecd267cc88...
3	1	Joe	0	games	INSERT	FALSE	5906c9ee8834c4270...
4	2	Jane	0	music	INSERT	FALSE	c82f86ba1993d34118...
5	3	George	0	games	INSERT	FALSE	ce44f9dd68ee4cb47...

```
SELECT * FROM members_raw CHANGES(INFORMATION => default) at(TIMESTAMP => $ts2);
```

lesults Data Preview — Open History

Query ID SQL 255ms 2 rows

Filter result... Copy Columns

Row	ID	NAME	FEE	MEMBER_TYPE	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	4	Betty	0	games	INSERT	FALSE	1eed0ba4a0b42ad0d...
2	5	Sally	0	music	INSERT	FALSE	72b53c0ecd267cc88...

Streams Project solution:

Without Snowpipe (manually inserting records to raw table from stage)

```
use role accountadmin;

CREATE OR REPLACE STORAGE INTEGRATION aws_sf_data
  TYPE = EXTERNAL_STAGE
  STORAGE_PROVIDER = S3
  ENABLED = TRUE
  STORAGE_AWS_ROLE_ARN =
'arn:aws:iam::682470999581:role/aws-saml-bsys-ems-dev-developer'
  STORAGE_ALLOWED_LOCATIONS = ('s3://ems-pt-result/ecommerce_dev/');

grant usage on integration aws_sf_data to role sysadmin;

grant execute task on account to role sysadmin;

grant create stage on schema "ECOMMERCE_DB"."ECOMMERCE_DEV" to role sysadmin;

use role sysadmin;

use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";

desc INTEGRATION aws_sf_data;
```

```
CREATE OR REPLACE FILE FORMAT json_load_format TYPE = 'JSON' ;

create or replace stage stg_lineitem_json_dev
storage_integration = aws_sf_data
url = 's3://ems-pt-result/ecommerce_dev/streams_dev/'
file_format = json_load_format;

list @stg_lineitem_json_dev;

create or replace table lineitem_raw_json (src variant );

CREATE OR REPLACE STREAM lineitem_std_stream ON TABLE lineitem_raw_json;


create or replace task lineitem_load_tsk
warehouse = compute_wh
schedule = '1 minute'
when system$stream_has_data('lineitem_std_stream')
as
merge into lineitem as li
using
(
  select
      SRC:L_ORDERKEY as L_ORDERKEY,
      SRC:L_PARTKEY as L_PARTKEY,
      SRC:L_SUPPKEY as L_SUPPKEY,
      SRC:L_LINENUMBER as L_LINENUMBER,
      SRC:L_QUANTITY as L_QUANTITY,
      SRC:L_EXTENDEDPRICE as L_EXTENDEDPRICE,
      SRC:L_DISCOUNT as L_DISCOUNT,
      SRC:L_TAX as L_TAX,
      SRC:L_RETURNFLAG as L_RETURNFLAG,
      SRC:L_LINESTATUS as L_LINESTATUS,
      SRC:L_SHIPDATE as L_SHIPDATE,
      SRC:L_COMMITDATE as L_COMMITDATE,
      SRC:L_RECEIPTDATE as L_RECEIPTDATE,
      SRC:L_SHIPINSTRUCT as L_SHIPINSTRUCT,
      SRC:L_SHIPMODE as L_SHIPMODE,
      SRC:L_COMMENT as L_COMMENT
   from
      lineitem_std_stream
   where metadata$action='INSERT'
) as li_stg
on li.L_ORDERKEY = li_stg.L_ORDERKEY and li.L_PARTKEY = li_stg.L_PARTKEY and
li.L_SUPPKEY = li_stg.L_SUPPKEY
when matched then update
set
   li.L_PARTKEY = li_stg.L_PARTKEY,
   li.L_SUPPKEY = li_stg.L_SUPPKEY,
```

```
    li.L_LINENUMBER = li_stg.L_LINENUMBER,
    li.L_QUANTITY = li_stg.L_QUANTITY,
    li.L_EXTENDEDPRICE = li_stg.L_EXTENDEDPRICE,
    li.L_DISCOUNT = li_stg.L_DISCOUNT,
    li.L_TAX = li_stg.L_TAX,
    li.L_RETURNFLAG = li_stg.L_RETURNFLAG,
    li.L_LINESTATUS = li_stg.L_LINESTATUS,
    li.L_SHIPDATE = li_stg.L_SHIPDATE,
    li.L_COMMITDATE = li_stg.L_COMMITDATE,
    li.L_RECEIPTDATE = li_stg.L_RECEIPTDATE,
    li.L_SHIPINSTRUCT = li_stg.L_SHIPINSTRUCT,
    li.L_SHIPMODE = li_stg.L_SHIPMODE,
    li.L_COMMENT = li_stg.L_COMMENT
when not matched then insert
(
    L_ORDERKEY,
    L_PARTKEY,
    L_SUPPKEY,
    L_LINENUMBER,
    L_QUANTITY,
    L_EXTENDEDPRICE,
    L_DISCOUNT,
    L_TAX,
    L_RETURNFLAG,
    L_LINESTATUS,
    L_SHIPDATE,
    L_COMMITDATE,
    L_RECEIPTDATE,
    L_SHIPINSTRUCT,
    L_SHIPMODE,
    L_COMMENT
)
values
(
    li_stg.L_ORDERKEY,
    li_stg.L_PARTKEY,
    li_stg.L_SUPPKEY,
    li_stg.L_LINENUMBER,
    li_stg.L_QUANTITY,
    li_stg.L_EXTENDEDPRICE,
    li_stg.L_DISCOUNT,
    li_stg.L_TAX,
    li_stg.L_RETURNFLAG,
    li_stg.L_LINESTATUS,
    li_stg.L_SHIPDATE,
    li_stg.L_COMMITDATE,
    li_stg.L_RECEIPTDATE,
    li_stg.L_SHIPINSTRUCT,
    li_stg.L_SHIPMODE,
    li_stg.L_COMMENT
```

```
);

show tasks;

alter task lineitem_load_tsk resume;

copy into lineitem_raw_json from @stg_lineitem_json_dev ON_ERROR =
ABORT_STATEMENT;

select *
  from table(information_schema.task_history(
    scheduled_time_range_start=>dateadd('hour',-1,current_timestamp()),
    result_limit => 100));
```

```
2
3   CREATE OR REPLACE STORAGE INTEGRATION aws_sf_data
4     TYPE = EXTERNAL_STAGE
5     STORAGE_PROVIDER = S3
6     ENABLED = TRUE
7     STORAGE_AWS_ROLE_ARN = 'arn:aws:iam::682470999581:role/aws-saml-bsys-ems-dev-developer'
8     STORAGE_ALLOWED_LOCATIONS = ('s3://ems-pt-result/ecommerce_dev/');
9
10  grant usage on integration aws_sf_data to role sysadmin;
11
```

Results | Chart

	status
1	Integration AWS_SF_DATA successfully created.

Query Details

Query duration 13

```
10  grant usage on integration aws_sf_data to role sysadmin;
11
```

Results | Chart

	status
1	Statement executed successfully.

Query De

Query du

```
12  grant execute task on account to role sysadmin;
13
```

Results | Chart

	status
1	Statement executed successfully.

Query Details

Query duration

```
14  grant create stage on schema "ECOMMERCE_DB"."ECOMMERCE_DEV" to role sysadmin;
15
```

Results | Chart

	status
1	Statement executed successfully.

Query Details

Query duration

```
16  use role sysadmin;
17
```

Results | Chart

	status
1	Statement executed successfully.

Query Deta

Query durat

```
18  use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";
19
```

Results | Chart

	status
1	Statement executed successfully.

Query Details

Query duration

```
20  desc INTEGRATION aws_sf_data;
```

Results | Chart

	property	property_type	property_value
5	STORAGE_AWS_IAM_USER_ARN	String	arn:aws:iam::180294178125:user/w57r00
6	STORAGE_AWS_ROLE_ARN	String	arn:aws:iam::682470999581:role/aws-sam
7	STORAGE_AWS_EXTERNAL_ID	String	JXB38456_SFCRole=5_HZRbs+cZXWLEoA5

Query Details

Query duration

Rows

Query ID 01b7

Add the external id and user arn in role policy.

IAM > Roles > snowflake-aws-role > Edit trust policy

Edit trust policy

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::206954943453:user/hndy-s-eusb7117"
            },
            "Action": "sts:AssumeRole",
            "Condition": {
                "StringEquals": {
                    "sts:ExternalId": "AZ32171_SFCRole=3_/jzjDtdUZ5+GIxI3GWrbZmGYayc="
                }
            }
        }
    ]
}
```

```
CREATE OR REPLACE FILE FORMAT json_load_format TYPE = 'JSON' ;
```

Results | Chart

	status
1	File format JSON_LOAD_FORMAT successfully created.

Query Details

Query duration

```
create or replace stage stg_lineitem_json_dev
storage_integration = aws_sf_data
url = 's3://ems-pt-result/ecommerce_dev/streams_dev/'
file_format = json_load_format;
```

Results | Chart

	status
1	Stage area STG_LINEITEM_JSON_DEV successfully created.

Query Details

Query duration

```
36
37 create or replace task lineitem_load_tsk
38 warehouse = compute_wh
39 schedule = '1 minute'
40 when system$stream_has_data('lineitem_std_stream')
41 as
42 merge into lineitem as li
43 using
44 (
45    select
46         SRC:L_ORDERKEY as L_ORDERKEY,
47         SRC:L_PARTKEY as L_PARTKEY,
48         SRC:L_SUPPKEY as L_SUPPKEY,
49         SRC:L_LINENUMBER as L_LINENUMBER,
50         SRC:L_QUANTITY as L_QUANTITY,
51         SRC:L_EXTENDEDPRICE as L_EXTENDEDPRICE,
52         SRC:L_DISCOUNT as L_DISCOUNT,
53         SRC:L_TAX as L_TAX,
54         SRC:L_RETURNFLAG as L_RETURNFLAG,
```

Results | Data Preview

Query ID | SQL | 101ms | 1 rows

Filter result... | Copy

Row	status
1	Task LINEITEM_LOAD_TSK successfully created.

```
125 alter task lineitem_load_tsk resume;
126
127 copy into lineitem_raw_json from @stg_lineitem_json_dev ON_ERROR = ABORT_STATEMENT;
128
129 select *
130   from table(information_schema.task_history(
131     scheduled_time_range_start=>dateadd('hour',-1,current_timestamp()))
```

Results | Data Preview

Query ID | SQL | 89ms | 1 rows

Filter result... | Copy

Row	status
1	Statement executed successfully.

```
126
127 copy into lineitem_raw_json from @stg_lineitem_json_dev ON_ERROR = ABORT_STATEMENT;
128
129 select * from lineitem_std_stream limit 10;
130
131 select *
132   from table(information_schema.task_history(
133     scheduled_time_range_start=>dateadd('hour',-1,current_timestamp()),
134     result_limit => 100));
135
```

Results | Data Preview | Open Histo

Query ID | SQL | 2s | 1 rows

Filter result... | Copy | Columns

Row	file	status	rows_parsed	rows_loaded	error_limit	errors_seen	first_error	first_error_line	first_error_charac	first_error_col
1	s3://sid-snow...	LOADED	7936	7936	1	0	NULL	NULL	NULL	NULL

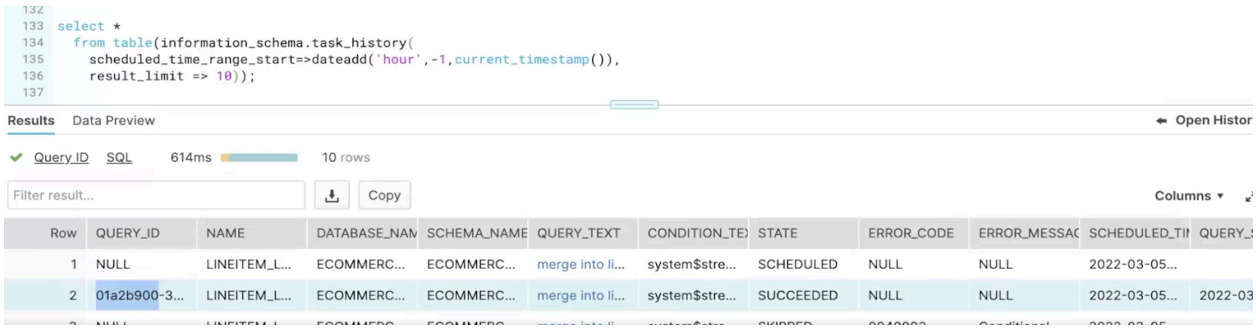
```
select * from lineitem_std_stream limit 10;

select *
  from table(information_schema.task_history(
    scheduled_time_range_start=>dateadd('hour',-1,current_timestamp()),
    result_limit => 100));
```

Results | Data Preview | Open Histor

Query ID | SQL | 137ms | 10 rows

Filter result... | Copy | Columns

Row	SRC	METADATA$ACTION	METADATA$ISUPDATE	METADATA$ROW_ID
1	{"L_COMMENT": " across the busy reque...	INSERT	FALSE	3ca90d48ba01ddee1be388816269bf38b...
2	{"L_COMMENT": "ts; packages haggle fu...	INSERT	FALSE	b2251c198691112d7274a28306bde0f8f7...
3	{"L_COMMENT": "wake slyly permanen", ...	INSERT	FALSE	e53ee75925636ea8cdf492a88ec52cd90...



```
select *
  from table(information_schema.task_history(
    scheduled_time_range_start=>dateadd('hour',-1,current_timestamp()),
    result_limit => 10));
```

Results | Data Preview | Open Histor

Query ID | SQL | 614ms | 10 rows

Filter result... | Copy | Columns

Row	QUERY_ID	NAME	DATABASE_NAM	SCHEMA_NAME	QUERY_TEXT	CONDITION_TE	STATE	ERROR_CODE	ERROR_MESSAG	SCHEDULED_TI	QUERY_
1	NULL	LINEITEM_L...	ECOMMERC...	ECOMMERC...	merge into li...	system$stre...	SCHEDULED	NULL	NULL	2022-03-05...	
2	01a2b900-3...	LINEITEM_L...	ECOMMERC...	ECOMMERC...	merge into li...	system$stre...	SUCCEEDED	NULL	NULL	2022-03-05...	2022-03

With snowpipe(automated inserting records into raw table from stage)

```
create or replace task lineitem_load_tsk
warehouse = compute_wh
schedule = '1 minute'
when system$stream_has_data('lineitem_std_stream')
as
merge into lineitem as li
using
(
  select
      SRC:L_ORDERKEY as L_ORDERKEY,
      SRC:L_PARTKEY as L_PARTKEY,
      SRC:L_SUPPKEY as L_SUPPKEY,
      SRC:L_LINENUMBER as L_LINENUMBER,
      SRC:L_QUANTITY as L_QUANTITY,
      SRC:L_EXTENDEDPRICE as L_EXTENDEDPRICE,
      SRC:L_DISCOUNT as L_DISCOUNT,
      SRC:L_TAX as L_TAX,
      SRC:L_RETURNFLAG as L_RETURNFLAG,
      SRC:L_LINESTATUS as L_LINESTATUS,
      SRC:L_SHIPDATE as L_SHIPDATE,
      SRC:L_COMMITDATE as L_COMMITDATE,
      SRC:L_RECEIPTDATE as L_RECEIPTDATE,
      SRC:L_SHIPINSTRUCT as L_SHIPINSTRUCT,
```

```
      SRC:L_SHIPMODE as L_SHIPMODE,
      SRC:L_COMMENT as L_COMMENT
   from
      lineitem_std_stream
   where metadata$action='INSERT'
) as li_stg
on li.L_ORDERKEY = li_stg.L_ORDERKEY and li.L_PARTKEY = li_stg.L_PARTKEY and
li.L_SUPPKEY = li_stg.L_SUPPKEY
when matched then update
set
   li.L_PARTKEY = li_stg.L_PARTKEY,
   li.L_SUPPKEY = li_stg.L_SUPPKEY,
   li.L_LINENUMBER = li_stg.L_LINENUMBER,
   li.L_QUANTITY = li_stg.L_QUANTITY,
   li.L_EXTENDEDPRICE = li_stg.L_EXTENDEDPRICE,
   li.L_DISCOUNT = li_stg.L_DISCOUNT,
   li.L_TAX = li_stg.L_TAX,
   li.L_RETURNFLAG = li_stg.L_RETURNFLAG,
   li.L_LINESTATUS = li_stg.L_LINESTATUS,
   li.L_SHIPDATE = li_stg.L_SHIPDATE,
   li.L_COMMITDATE = li_stg.L_COMMITDATE,
   li.L_RECEIPTDATE = li_stg.L_RECEIPTDATE,
   li.L_SHIPINSTRUCT = li_stg.L_SHIPINSTRUCT,
   li.L_SHIPMODE = li_stg.L_SHIPMODE,
   li.L_COMMENT = li_stg.L_COMMENT
when not matched then insert
(
   L_ORDERKEY,
   L_PARTKEY,
   L_SUPPKEY,
   L_LINENUMBER,
   L_QUANTITY,
   L_EXTENDEDPRICE,
   L_DISCOUNT,
   L_TAX,
   L_RETURNFLAG,
   L_LINESTATUS,
   L_SHIPDATE,
   L_COMMITDATE,
   L_RECEIPTDATE,
   L_SHIPINSTRUCT,
   L_SHIPMODE,
   L_COMMENT
)
values
(
   li_stg.L_ORDERKEY,
   li_stg.L_PARTKEY,
   li_stg.L_SUPPKEY,
   li_stg.L_LINENUMBER,
```

```
    li_stg.L_QUANTITY,
    li_stg.L_EXTENDEDPRICE,
    li_stg.L_DISCOUNT,
    li_stg.L_TAX,
    li_stg.L_RETURNFLAG,
    li_stg.L_LINESTATUS,
    li_stg.L_SHIPDATE,
    li_stg.L_COMMITDATE,
    li_stg.L_RECEIPTDATE,
    li_stg.L_SHIPINSTRUCT,
    li_stg.L_SHIPMODE,
    li_stg.L_COMMENT
);


show tasks;

alter task lineitem_load_tsk resume;

copy into lineitem_raw_json from @stg_lineitem_json_dev ON_ERROR =
ABORT_STATEMENT;

select *
  from table(information_schema.task_history(
    scheduled_time_range_start=>dateadd('hour',-1,current_timestamp()),
    result_limit => 100));



create or replace pipe lineitem_pipe auto_ingest=true as
copy into lineitem from @stg_lineitem_json_dev ON_ERROR = ABORT_STATEMENT;
```

Create event notification Info

To enable notifications, you must first add a notification configuration that identifies the events you want Amazon S3 to publish and the destinations where you want Amazon S3 to send the notifications.

General configuration

Event name

lineitem_raw_data_notification

Event name can contain up to 255 characters.

Prefix - *optional*

Limit the notifications to objects with key starting with specified characters.

streams_dev/

Suffix - *optional*

Limit the notifications to objects with key ending with specified characters.

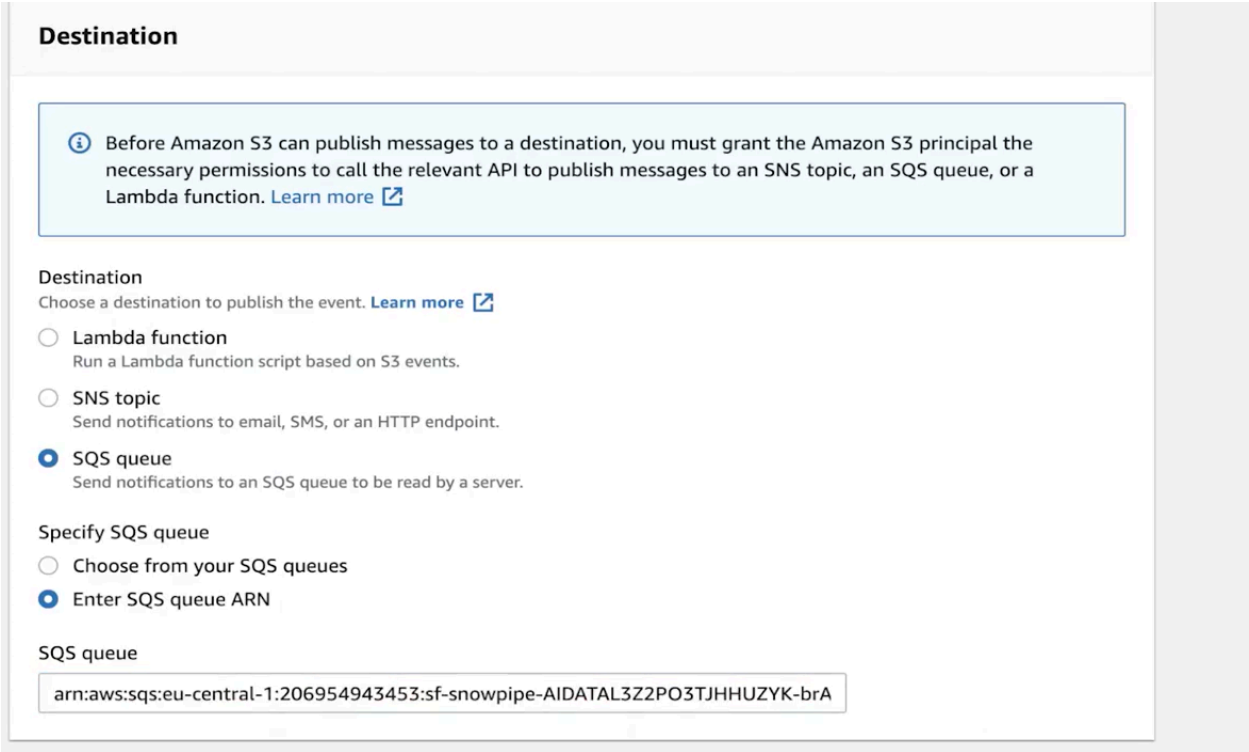
.jpg

Event types

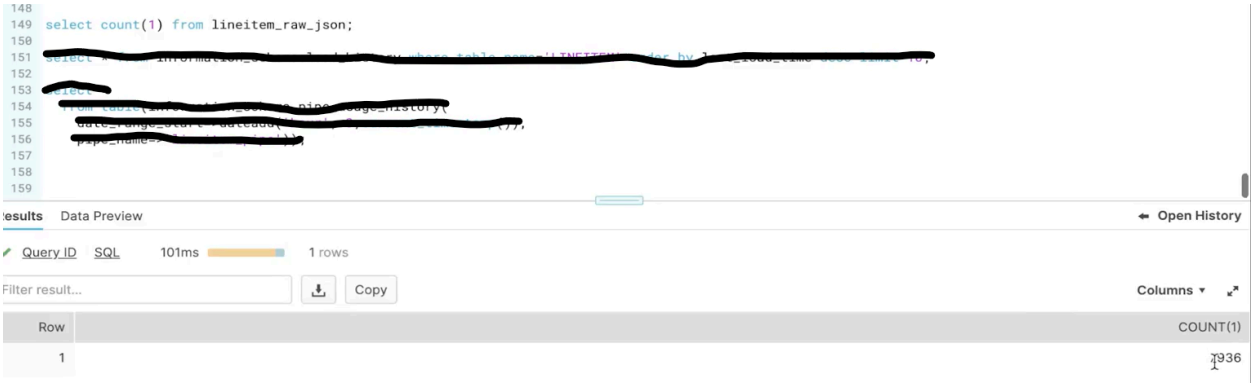
Specify at least one event for which you want to receive notifications. For each group, you can choose an event type for all events, or you can choose one or more individual events.

Object creation

- [x] All object create events
  s3:ObjectCreated:*
- [ ] Put
  s3:ObjectCreated:Put
- [ ] Post
  s3:ObjectCreated:Post
- [ ] Copy
  s3:ObjectCreated:Copy
- [ ] Multipart upload completed
  s3:ObjectCreated:CompleteMultipartUpload



After some json file insertion and few seconds, we can see the records added to raw table.



UDF:

SQL(Scalar/Tabular) UDF:

```
use role accountadmin;
use warehouse compute_wh;
use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";
```

```
-- Simple UDF ----
CREATE or replace FUNCTION sum_values(a number,b number)
  RETURNS number
  LANGUAGE SQL
  AS
  $$
    SELECT a+b as res
  $$;

select sum_values(2,3);

SELECT SUM(l_quantity) as total_quantity_shipped
        FROM "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM"
        where L_SHIPDATE ='1996-02-06' and l_suppkey=2892071;

---Scalar Function to calculate sales quantity by Supplier ---
CREATE or replace FUNCTION sales_qty_by_supplier(ship_date date,supplier_key integer)
  RETURNS NUMERIC(11,2)
  AS
  $$
    SELECT SUM(l_quantity) as total_quantity_shipped
        FROM "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM"
        where L_SHIPDATE =ship_date and l_suppkey=supplier_key
  $$;


--- Use the above Scalar function in a query ----
select sales_qty_by_supplier('1996-02-06',2892071);

select
    sales_qty_by_supplier('1996-02-06',l_suppkey) as supplier_sales,
    l_suppkey
from
    "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM"
where supplier_sales>0;

select
        lt.L_SUPPKEY ,
        sum(L_QUANTITY) as qty_sold
    from
        "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."SUPPLIER" sp
    join
        "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" lt on sp.S_SUPPKEY =
lt.L_SUPPKEY
    where lt.l_shipdate='1997-03-19' and lt.L_SUPPKEY=4072277
    group by 1
    having qty_sold > 0;

--- Tabular UDF ----
```

```
CREATE or replace FUNCTION sales_qty_by_supplier(ship_date varchar,supplier_key
number)
  RETURNS table(supplier_key number,qty_sold number)
  AS
  $$
    select
        lt.L_SUPPKEY ,
        sum(L_QUANTITY) as qty_sold
    from
        "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."SUPPLIER" sp
    join
        "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF10"."LINEITEM" lt on sp.S_SUPPKEY =
lt.L_SUPPKEY
    where lt.l_shipdate=ship_date and lt.L_SUPPKEY=supplier_key
    group by 1
    having qty_sold > 0
  $$;

--   Call the above tabular UDTF ---
select * from table (sales_qty_by_supplier('1996-06-27',23661));
```

```
5   -- Simple UDF ----
6   CREATE or replace FUNCTION sum_values(a number,b number)
7     RETURNS number
8     LANGUAGE SQL
9     AS
10    $$
11      SELECT a+b as res
12    $$;
13
```

Results | Chart

	status
1	Function SUM_VALUES successfully created.

```
13
14  select sum_values(2,3);
15
```

Results | Chart

	SUM_VALUES(2,3)
1	5

```sql
---Scalar Function to calculate sales quantity by Supplier ---
CREATE or replace FUNCTION sales_qty_by_supplier(ship_date date,supplier_key integer)
  RETURNS NUMERIC(11,2)
  AS
  $$
    SELECT SUM(l_quantity) as total_quantity_shipped
        FROM "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM"
        where L_SHIPDATE =ship_date and l_suppkey=supplier_key
  $$;
```

Results | Chart

	status
1	Function SALES_QTY_BY_SUPPLIER successfully created.

Query Details

Query duration

```sql
select sales_qty_by_supplier('1996-02-06',2892071);
```

Results | Chart

	SALES_QTY_BY_SUPPLIER('1996-02-06',2892071)
1	12.00

```sql
select
    sales_qty_by_supplier('1996-02-06',l_suppkey) as supplier_sales,
    l_suppkey
from
    "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM"
where supplier_sales>0;
```

Results | Chart

	SUPPLIER_SALES	L_SUPPKEY
1	22.00	7444146
2	12.00	3313933
3	45.00	2104048
4	31.00	1357672
5	29.00	5654620
6	41.00	7500950
7	4.00	1145891

Query Details

Query duration

Rows

Query ID

Show more

```sql
select
        lt.L_SUPPKEY ,
        sum(L_QUANTITY) as qty_sold
    from
        "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."SUPPLIER" sp
    join
        "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."LINEITEM" lt on sp.S_SUPPKEY = lt.L_SUPPKEY
    where lt.l_shipdate='1997-03-19' and lt.L_SUPPKEY=4072277
    group by 1
    having qty_sold > 0;
```

Results | Chart

	L_SUPPKEY	QTY_SOLD
1	4072277	32.00

Query Details

Query duration

```sql
--- Tabular UDF ----
CREATE or replace FUNCTION sales_qty_by_supplier(ship_date varchar,supplier_key number)
  RETURNS table(supplier_key number,qty_sold number)
  AS
  $$
    select
        lt.L_SUPPKEY ,
        sum(L_QUANTITY) as qty_sold
    from
        "SNOWFLAKE_SAMPLE_DATA"."TPCH_SF1000"."SUPPLIER" sp
    join
```

Results | Chart

	status
1	Function SALES_QTY_BY_SUPPLIER successfully created.

Query Details

Query duration 15

```sql
--   Call the above tabular UDTF ---
select * from table (sales_qty_by_supplier('1996-06-27',23661));
```

Results | Chart

	SUPPLIER_KEY	QTY_SOLD
1	23661	20

Query Details

Query duration 2.2s

Javascript UDF:

```
use role accountadmin;

use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";

CREATE OR REPLACE FUNCTION test_date_js(A string)
RETURNS OBJECT
LANGUAGE JAVASCRIPT
```

```
STRICT
AS
$$
function test_js_func(x)
{
  var now = new Date(x);
  return now
}
return test_js_func(A);
$$;

select test_date_js('2022-02-01');


CREATE OR REPLACE FUNCTION simple_js_func(A float)
  RETURNS OBJECT
  LANGUAGE JAVASCRIPT
  STRICT
AS
$$
function test_function(x){
  var lr = {};
  lr['a'] = x*2;
  lr['b'] = x*3;
  return lr;
  }
  return test_function(A);
$$;

SELECT simple_js_func(2.2);

CREATE OR REPLACE FUNCTION range_to_values(PREFIX VARCHAR, RANGE_START
FLOAT, RANGE_END FLOAT)
    RETURNS TABLE (IP_ADDRESS VARCHAR)
    LANGUAGE JAVASCRIPT
    AS $$
     {
       processRow: function f(row, rowWriter, context)  {
         var suffix = row.RANGE_START;
         while (suffix <= row.RANGE_END)  {
           rowWriter.writeRow( {IP_ADDRESS: row.PREFIX + "." + suffix} );
           suffix = suffix + 1;
           }
         }
     }
     $$;
SELECT * FROM TABLE(range_to_values('192.168.1', 42::FLOAT, 45::FLOAT));
```

```
CREATE OR REPLACE FUNCTION test_date_js(A string)
RETURNS OBJECT
LANGUAGE JAVASCRIPT
STRICT
AS
$$
function test_js_func(x)
{
  var now = new Date(x);
  return now
```

Results | Chart

	status
1	Function TEST_DATE_JS successfully created.

```
select test_date_js('2022-02-01');
```

Results | Chart

	TEST_DATE_JS('2022-02-01')
1	"2022-01-31 16:00:00.000 -0800"

```
CREATE OR REPLACE FUNCTION simple_js_func(A float)
  RETURNS OBJECT
  LANGUAGE JAVASCRIPT
  STRICT
AS
$$
function test_function(x){
  var lr = {};
  lr['a'] = x*2;
  lr['b'] = x*3;
  return lr;
```

Results | Chart

	status
1	Function SIMPLE_JS_FUNC successfully created.

Query Details

Query duration 80ms

```
37  SELECT simple_js_func(2.2);
38
```

Results | Chart

	SIMPLE_JS_FUNC(2.2)
1	{ "a": 4.400000000000000e+00, "b": 6.600000000000001e+00}

Query Details
Query duration 118ms

```
39  CREATE OR REPLACE FUNCTION range_to_values(PREFIX VARCHAR, RANGE_START FLOAT, RANGE_END FLOAT)
40      RETURNS TABLE (IP_ADDRESS VARCHAR)
41      LANGUAGE JAVASCRIPT
42      AS $$
43        {
44          processRow: function f(row, rowWriter, context)  {
45            var suffix = row.RANGE_START;
46            while (suffix <= row.RANGE_END)  {
47              rowWriter.writeRow( {IP_ADDRESS: row.PREFIX + "." + suffix} );
48              suffix = suffix + 1;
```

Results | Chart

	status
1	Function RANGE_TO_VALUES successfully created.

Query Details
Query duration 100ms

```
53  SELECT * FROM TABLE(range_to_values('192.168.1', 42::FLOAT, 45::FLOAT));
```

Results | Chart

	IP_ADDRESS
1	192.168.1.42
2	192.168.1.43
3	192.168.1.44
4	192.168.1.45

Query Details
Query duration 157ms
Rows
Query ID
Ask Copilo

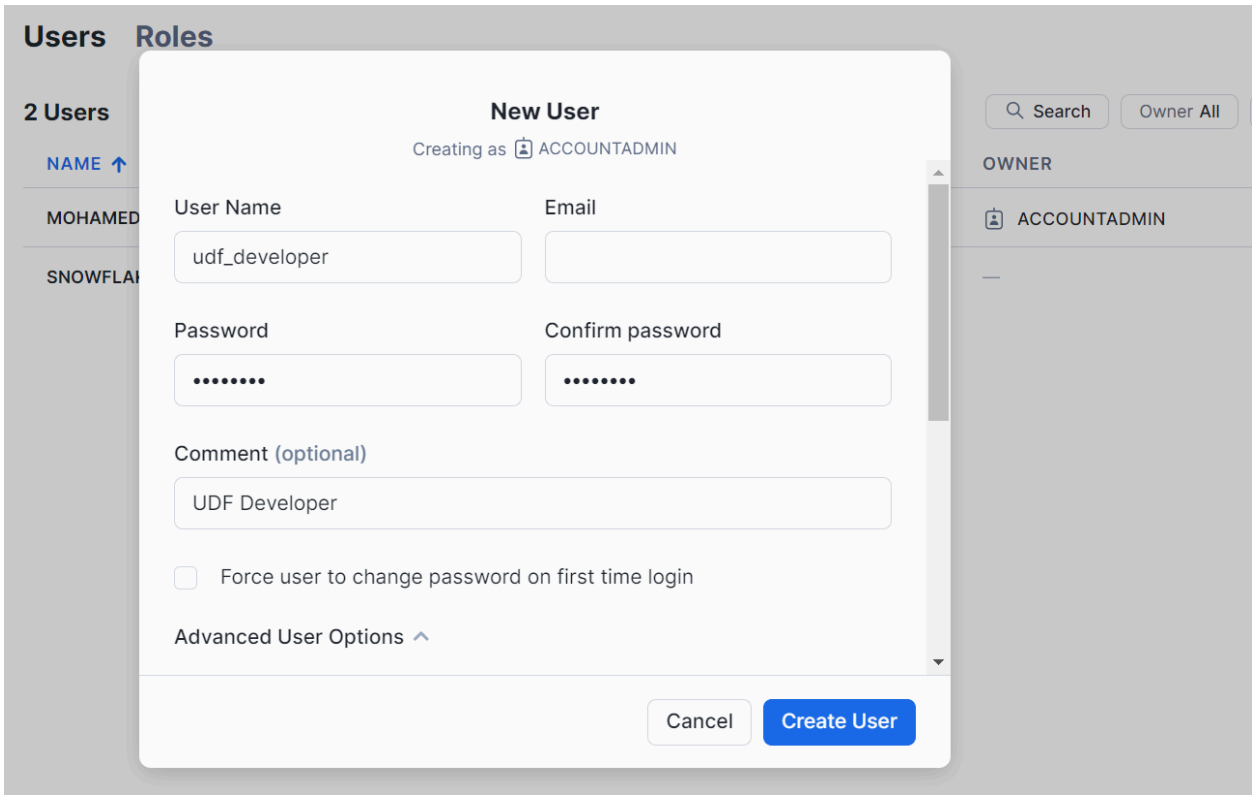
Secure Pushdown filter from exposing data:

```
use role accountadmin;

use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";

create role udf_role;

grant usage on warehouse compute_wh to role udf_role;

grant usage on database ECOMMERCE_DB to role udf_role;

grant usage on schema ECOMMERCE_DEV to role udf_role;

grant select on all tables in schema ECOMMERCE_DEV  to role udf_role;
```

grant all privileges on function sales_qty_by_supplier(date,number) to role udf_role;

grant role udf_role to user udf_developer;

--- By Default User get public role. For this section, we need to avoid that. ---
alter user udf_developer set default_role=udf_role;



```
16
17  grant role udf_role to user udf_developer;
18
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 74ms

```
18
19  --- By Default User get public role. For this section, we need to avoid that. ---
20  alter user udf_developer set default_role=udf_role;
21
```

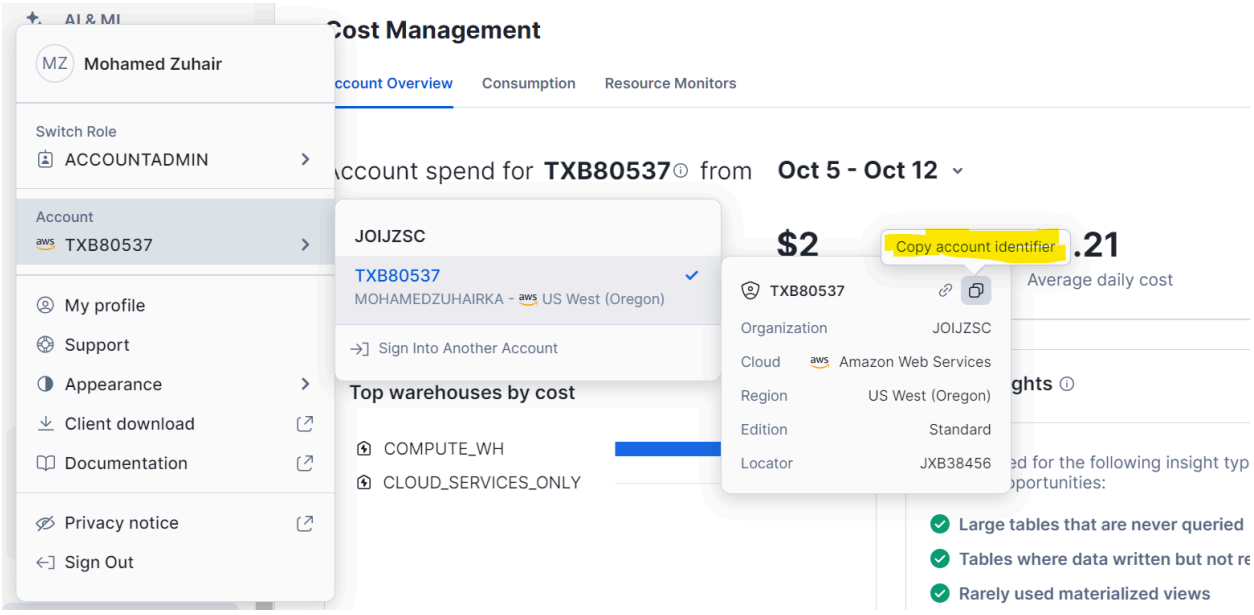
Results | Chart

	status
1	Statement executed successfully.

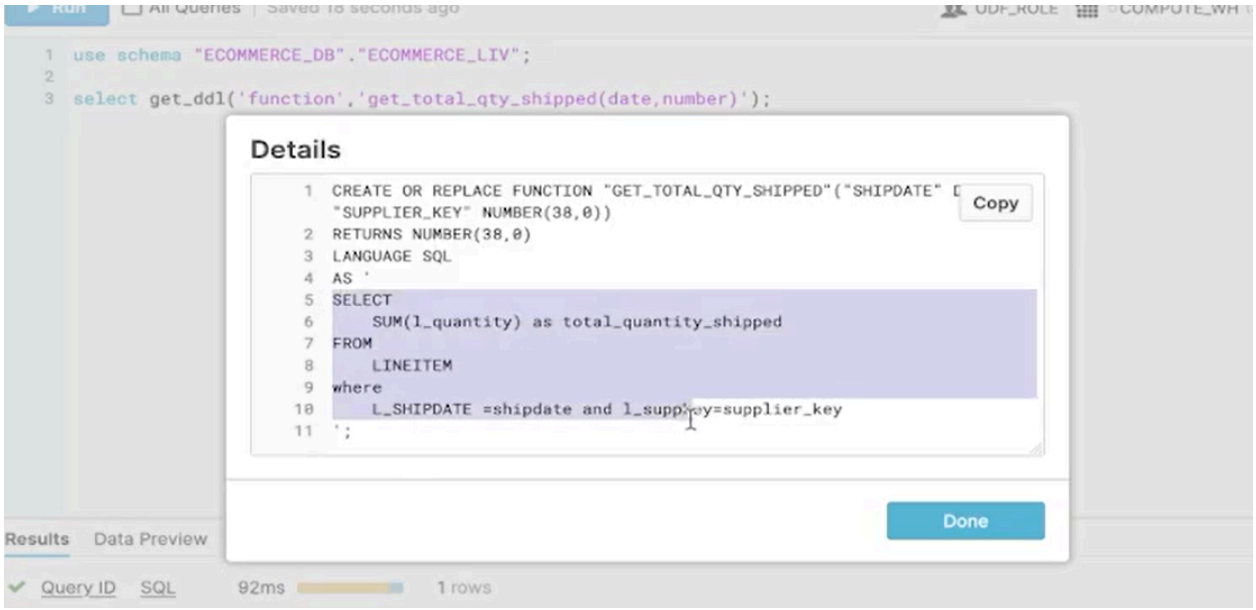
Query Details
Query duration 45ms

Log in to that user:

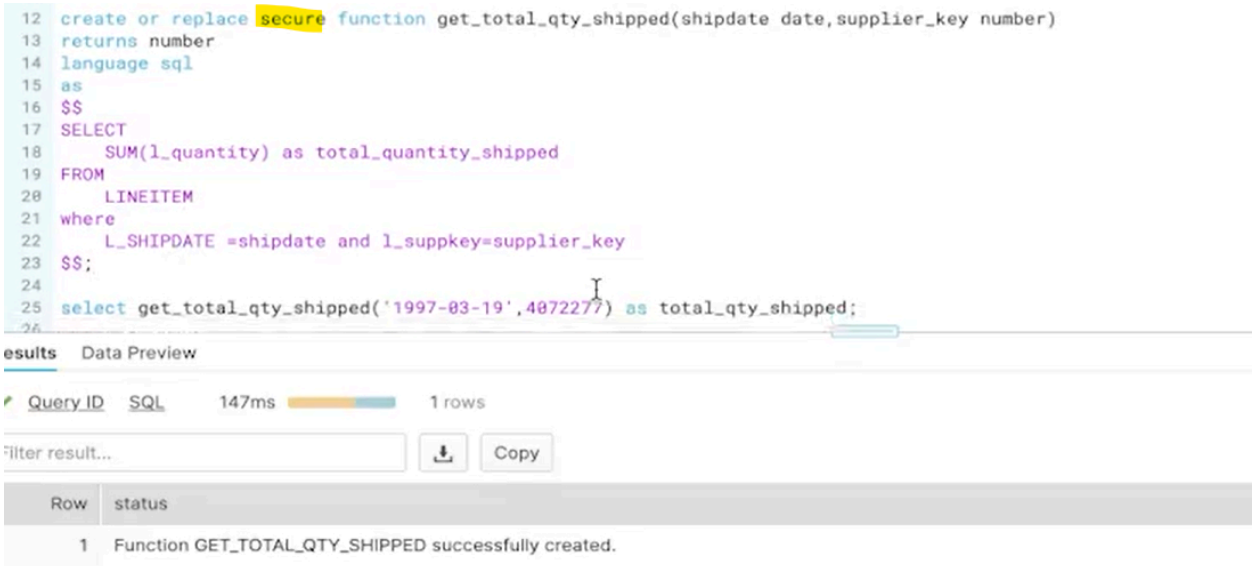
```
-- Test the GET_DDL using the new user account created above  -----
use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";
select get_ddl('function','get_total_qty_shipped(date,number)');
select get_total_qty_shipped('1997-03-19',4072277) as total_qty_shipped;
```



He can able to see the query for the UDF(taken screenshot from tutorial):



To protect that, create UDF with secure keyword:



Now, if that user tries to get_ddl for that UDF, it will throw error.

But he can use the UDF to check the results:

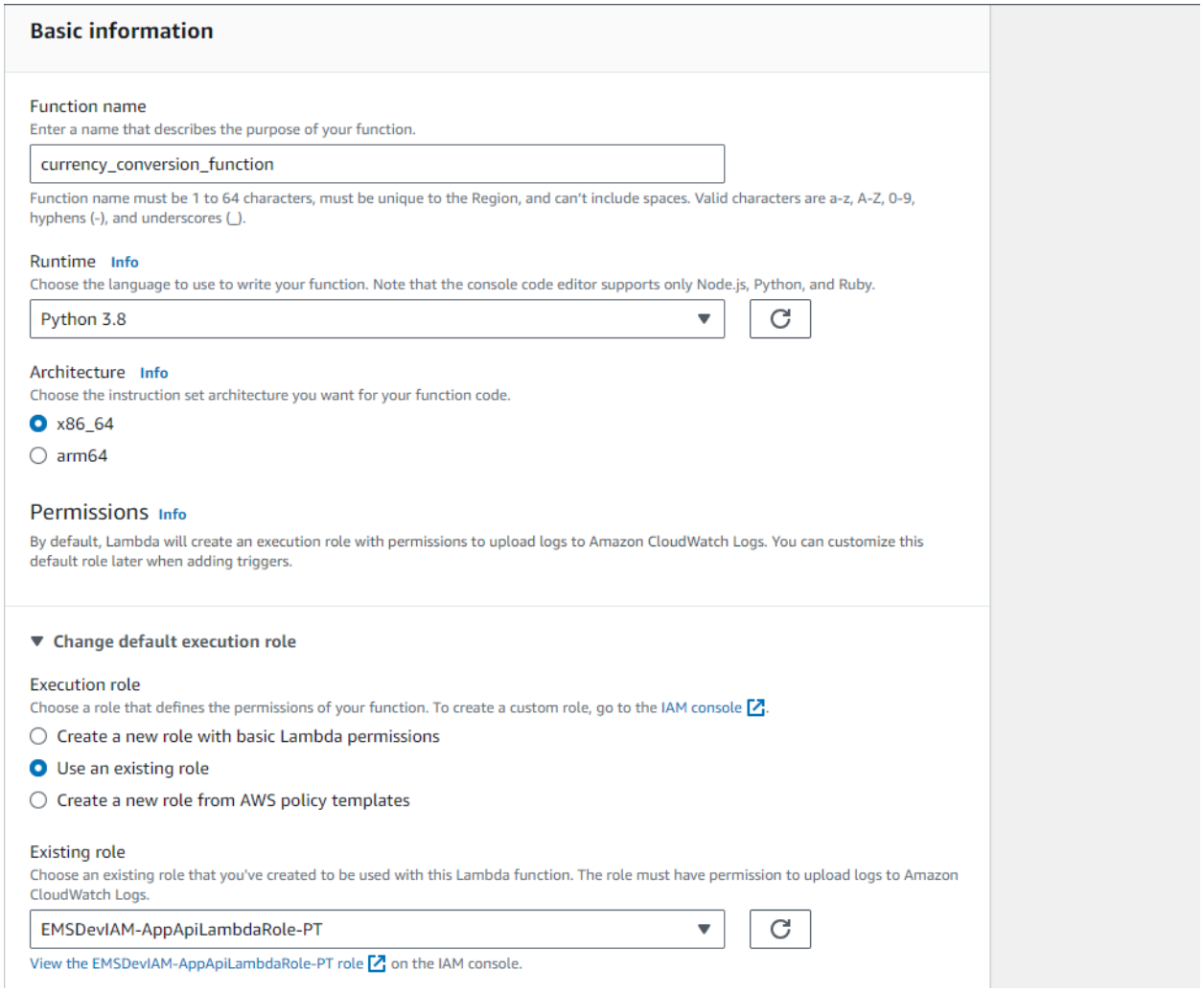
External Function:

Data Format Received by Snowflake

When the remote service finishes processing a batch, the remote service should send data to Snowflake in a format similar to the format of the data sent by Snowflake. The returned value is in JSON format. Here is an example of the data section of such a response:

```
{
    "data":
        [
            [ 0, 1995 ],
            [ 1, 1974 ],
            [ 2, 1983 ],
            [ 3, 2001 ]
        ]
}
```

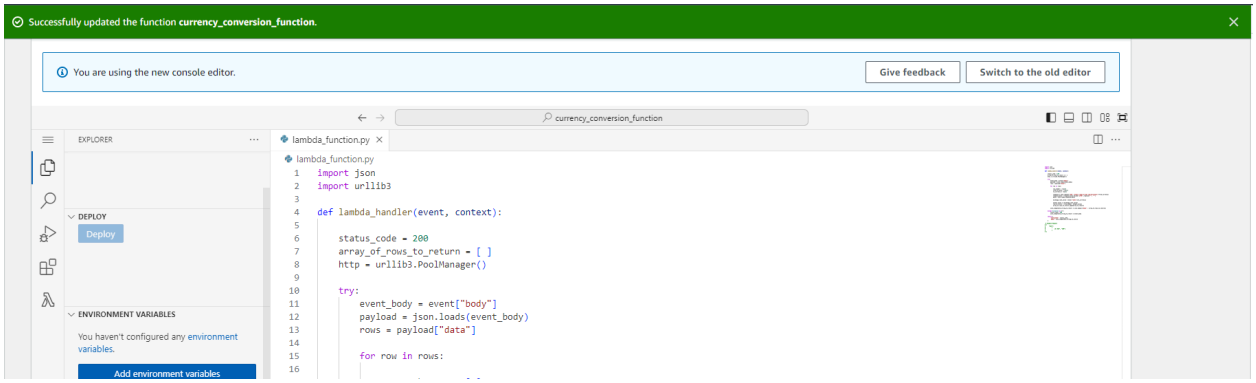
Create lambda function:



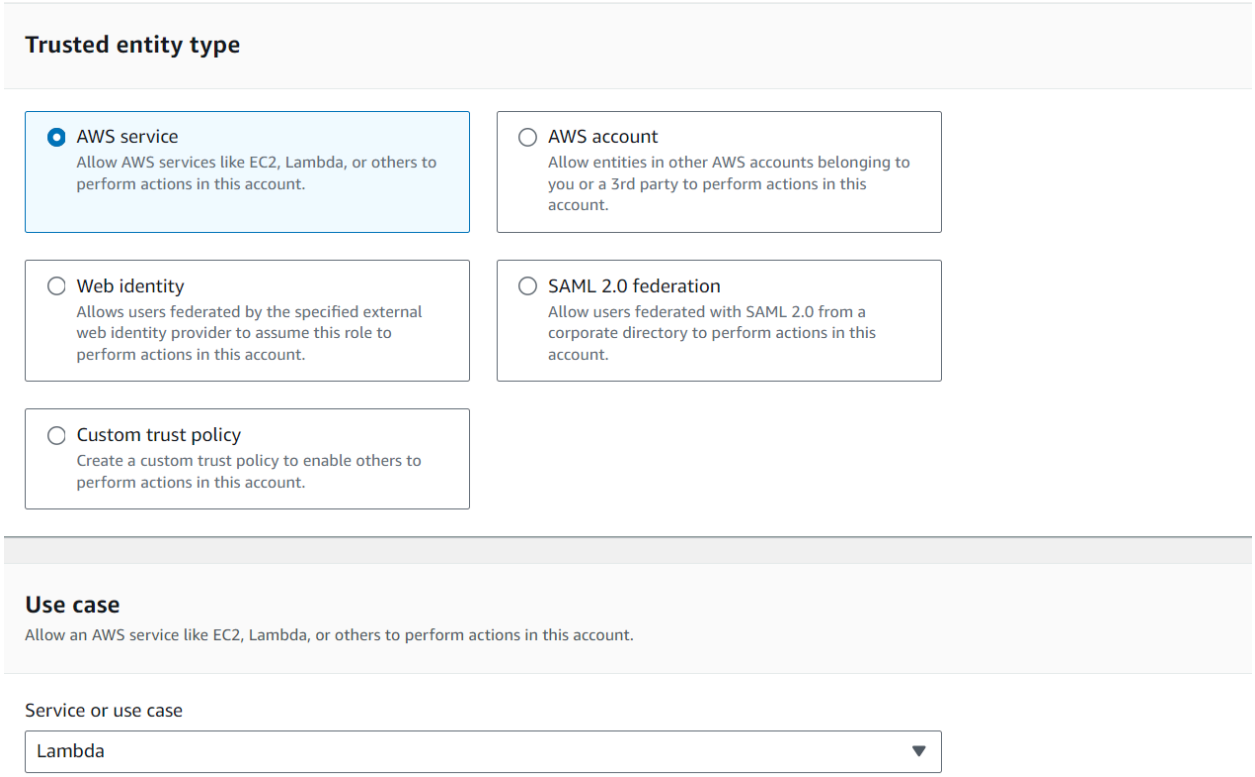
Copy and paste the below code into lambda function:

```
import json
import urllib3

def lambda_handler(event, context):

    status_code = 200
    array_of_rows_to_return = [ ]
    http = urllib3.PoolManager()

    try:
        event_body = event["body"]
        payload = json.loads(event_body)
        rows = payload["data"]

        for row in rows:

            row_number = row[0]
            from_currency = row[1]
            to_currency = row[2]

            response = http.request('GET','https://open.er-api.com/v6/latest/'+from_currency)
            response_data = response.data.decode('utf8').replace("'", '"')
            data = json.loads(response_data)

            exchange_rate_value = data['rates'][to_currency]

            output_value = [exchange_rate_value]
            row_to_return = [row_number, output_value]
            array_of_rows_to_return.append(row_to_return)

        json_compatible_string_to_return = json.dumps({"data" : array_of_rows_to_return})

    except Exception as err:
        status_code = 400
        json_compatible_string_to_return = event_body

    return {
        'statusCode': status_code,
        'body': json_compatible_string_to_return
    }

 # Example Request
# {
#     "data":
#         [
#             [0,"USD", "INR"]
#         ]
# }
```

Deploy the function:



Create IAM role:



Leave the “Add permission” tab and click next:

Amazon_EventBridge_Invoke_Ev…	Customer managed	-
AmazonAPIGatewayAdministr…	AWS managed	Provides full access to create/edit/dele…
AmazonAPIGatewayInvokeFul…	AWS managed	Provides full access to invoke APIs in A…
AmazonAPIGatewayPushToCl…	AWS managed	Allows API Gateway to push logs to us…
AmazonAppFlowFullAccess	AWS managed	Provides full access to Amazon AppFlo…
AmazonAppFlowReadOnlyAcc…	AWS managed	Provides read only access to Amazon A…
AmazonAppStreamFullAccess	AWS managed	Provides full access to Amazon AppStr…
AmazonAppStreamPCAAccess	AWS managed	Amazon AppStream 2.0 access to AWS…
AmazonAppStreamReadOnly…	AWS managed	Provides read only access to Amazon A…
AmazonAppStreamServiceAcc…	AWS managed	Default policy for Amazon AppStream …
AmazonAthenaFullAccess	AWS managed	Provide full access to Amazon Athena …

▶ **Set permissions boundary - *optional***

Cancel | Previous | Next

Role details

Role name
Enter a meaningful name to identify this role.

currency_conversion_external_role

Maximum 64 characters. Use alphanumeric and '+=,.@-_' characters.

Description
Add a short explanation for this role.

Allows Lambda functions to call AWS services on your behalf.

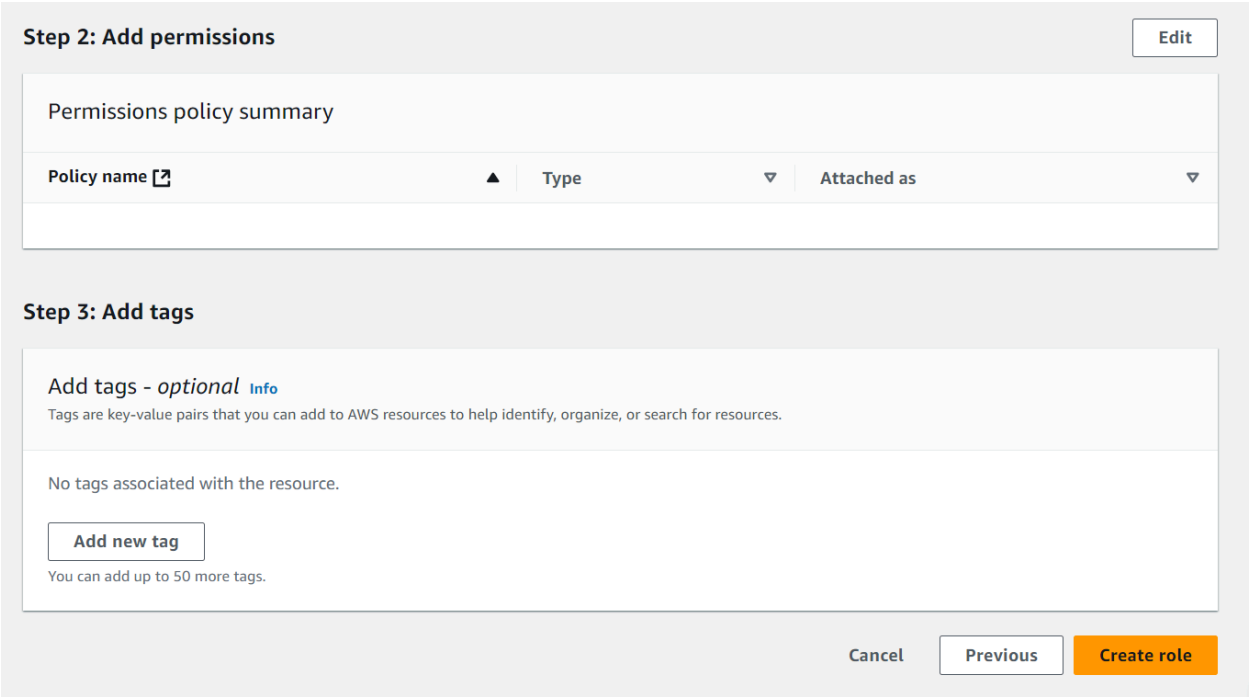
Maximum 1000 characters. Use letters (A-Z and a-z), numbers (0-9), tabs, new lines, or any of the following characters: _+=,. @-/\[{}]!#$%^*();:"' `

Step 1: Select trusted entities

Edit

Trust policy

```
1  {
2      "Version": "2012-10-17",
3      "Statement": [
4          {
5              "Effect": "Allow",
6              "Action": [
7                  "sts:AssumeRole"
```



Create API Gateway:

Choosing Your Endpoint Type: Regional Endpoint vs. Private Endpoint

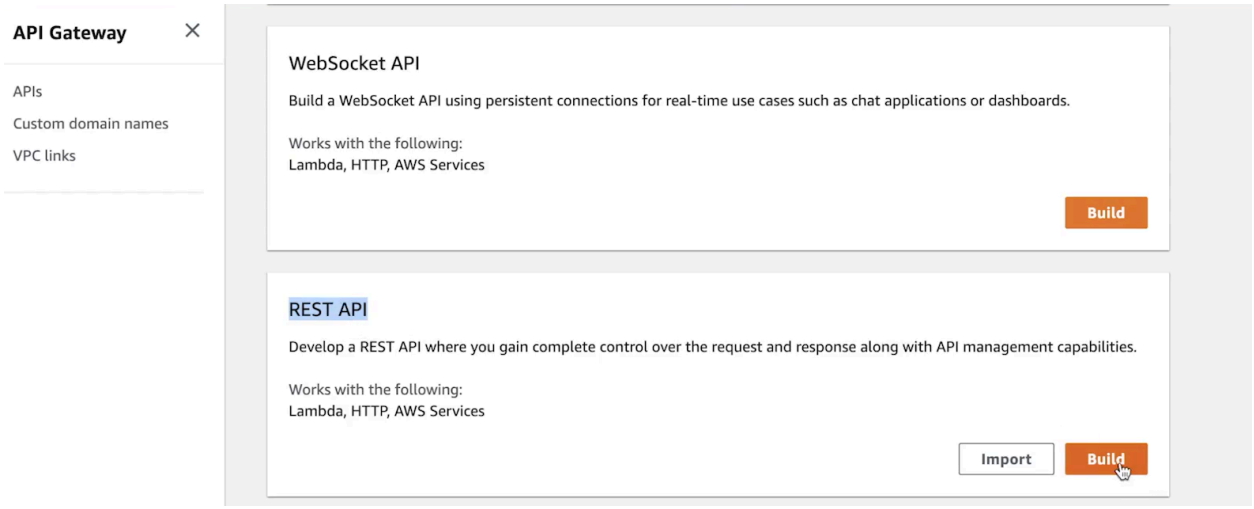
You access a proxy service (such as Amazon API Gateway) via a URI, often referred to as an *endpoint*. The instructions for creating your Amazon API Gateway ask you to choose one of the following types of endpoints:

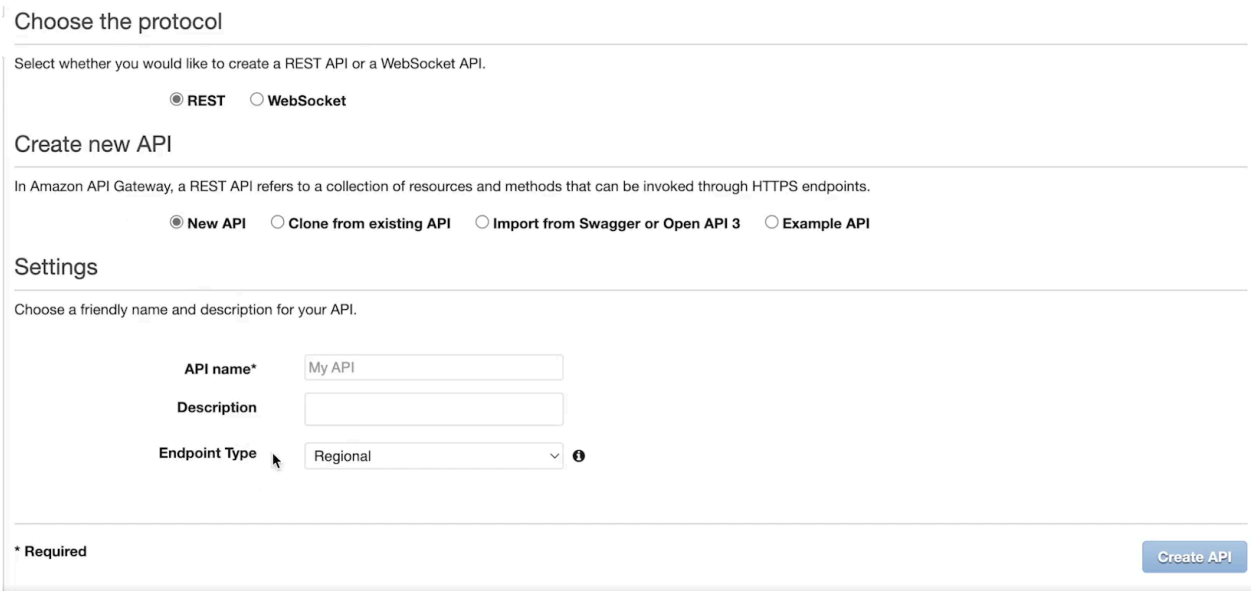
- A regional endpoint.
- A private endpoint.

The following information can help you choose the type of endpoint.

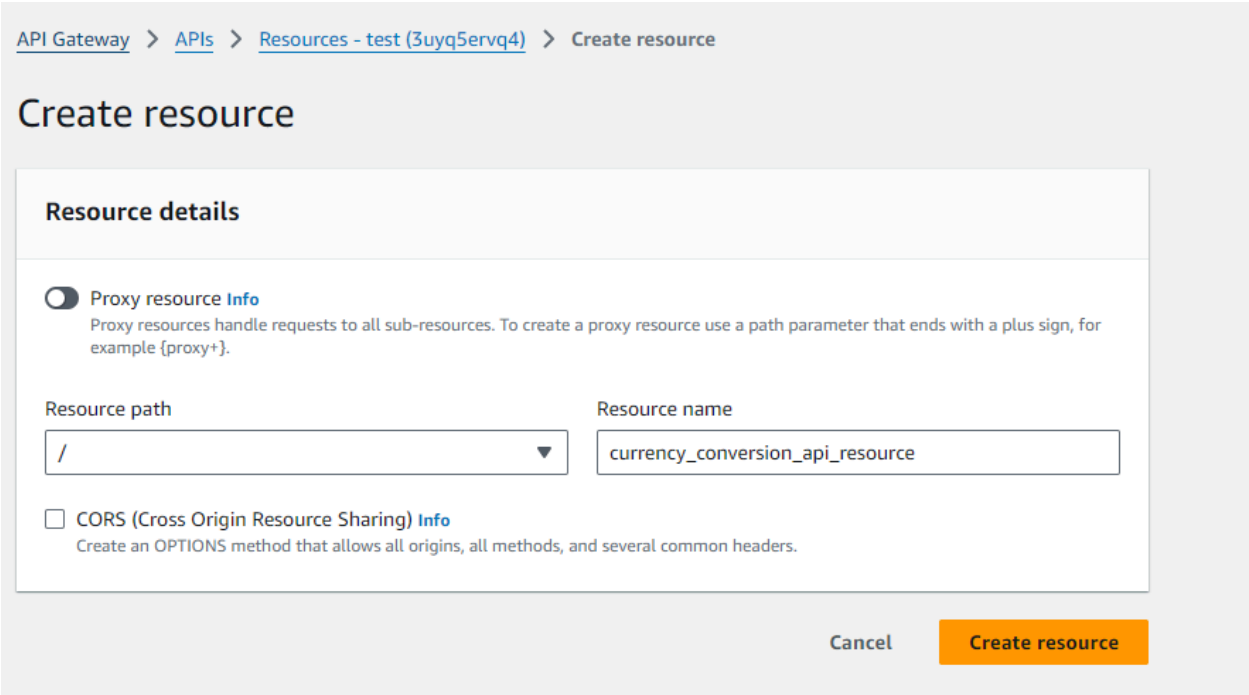
A regional endpoint can be accessed across AWS regions, or even across cloud platforms. Your Snowflake instance, your proxy service, and your remote service can all be in different regions or even on different cloud platforms. For example, a Snowflake instance running on Azure could send requests to an Amazon API Gateway regional endpoint, which in turn could forward data to a remote service running on GCP.

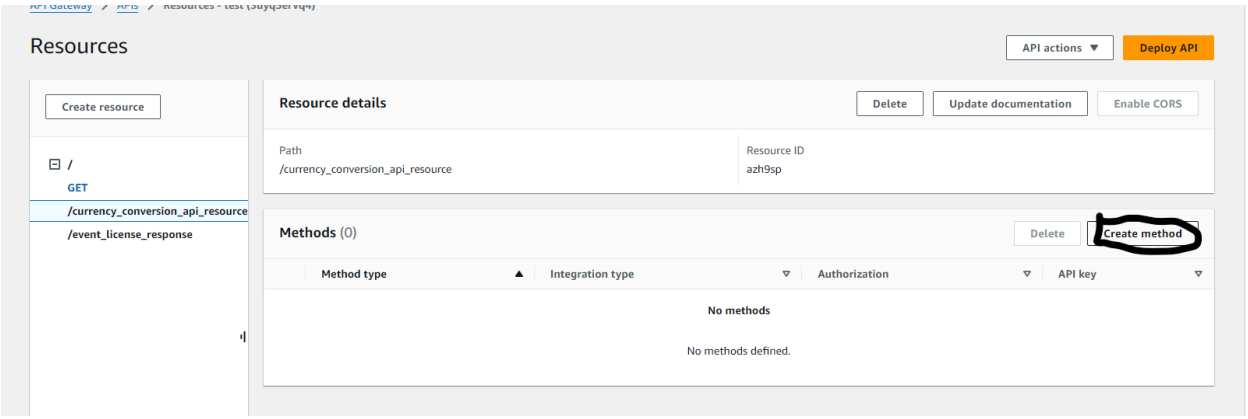
A private endpoint can be configured to allow access only within a region. For example, you can configure a private endpoint to allow access from only a Snowflake VPC (Virtual Private Cloud) in the same AWS region. Communication between a Snowflake VPC and a private endpoint uses AWS PrivateLink.





Once create API gateway, create resource:


API Gateway > APIs > Resources - test (3uyq5ervq4) > Create resource
Create resource
Resource details
Proxy resource Info
Proxy resources handle requests to all sub-resources. To create a proxy resource use a path parameter that ends with a plus sign, for example {proxy+}.
Resource path
/
Resource name
currency_conversion_api_resource
CORS (Cross Origin Resource Sharing) Info
Create an OPTIONS method that allows all origins, all methods, and several common headers.
Cancel
Create resource


Resources
API actions
Deploy API
Create resource
/
GET
/currency_conversion_api_resource
/event_license_response
Resource details
Delete
Update documentation
Enable CORS
Path
/currency_conversion_api_resource
Resource ID
azh9sp
Methods (0)
Delete
Create method
Method type
Integration type
Authorization
API key
No methods
No methods defined.

Create method

Method details

Method type

POST

Integration type

- Lambda function
  Integrate your API with a Lambda function.
- HTTP
  Integrate with an existing HTTP endpoint.
- Mock
  Generate a response based on API Gateway mappings and transformations.
- AWS service
  Integrate with an AWS Service.
- VPC link
  Integrate with a resource that isn't accessible over the public internet.

Lambda proxy integration

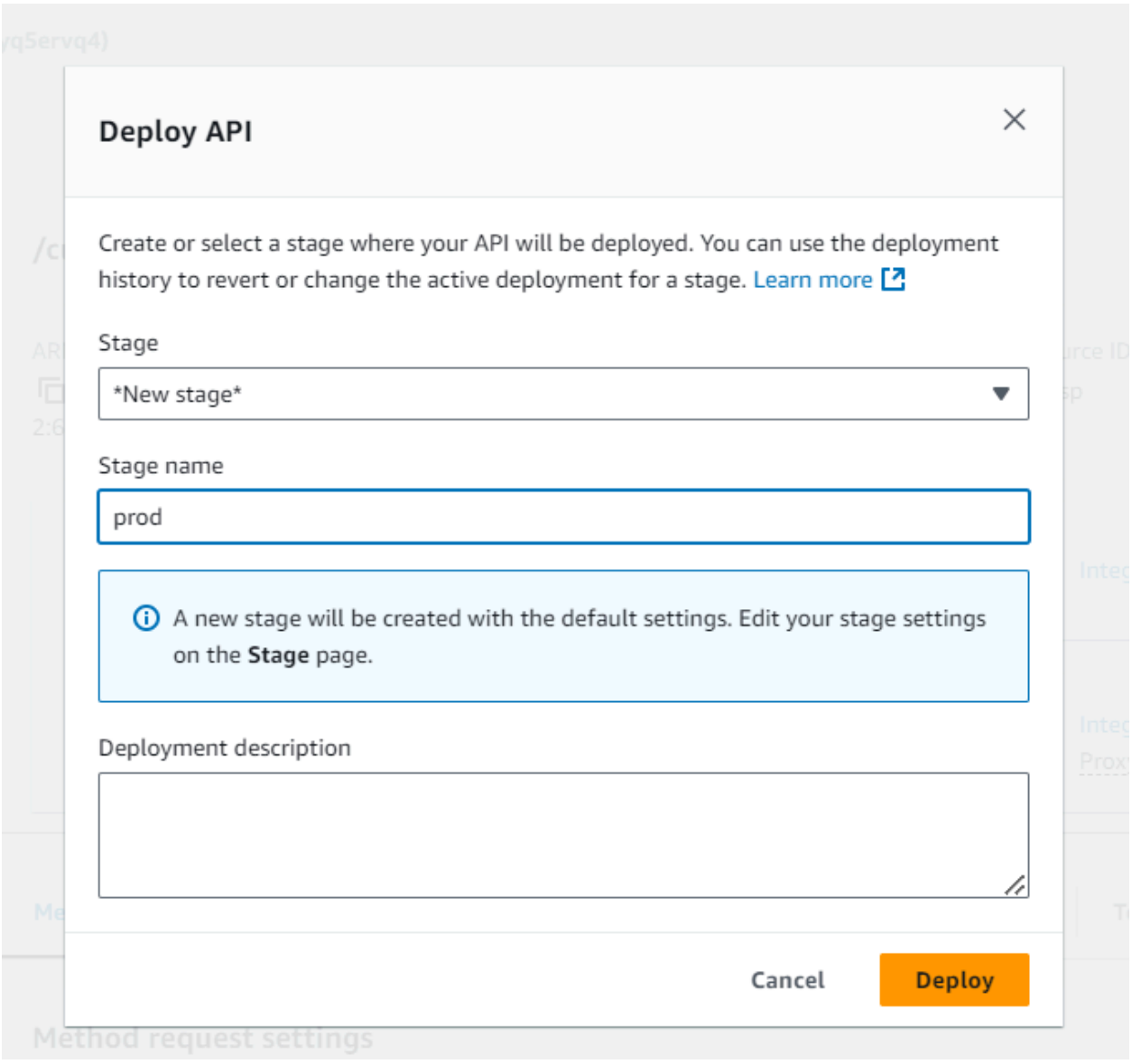
Send the request to your Lambda function as a structured event.

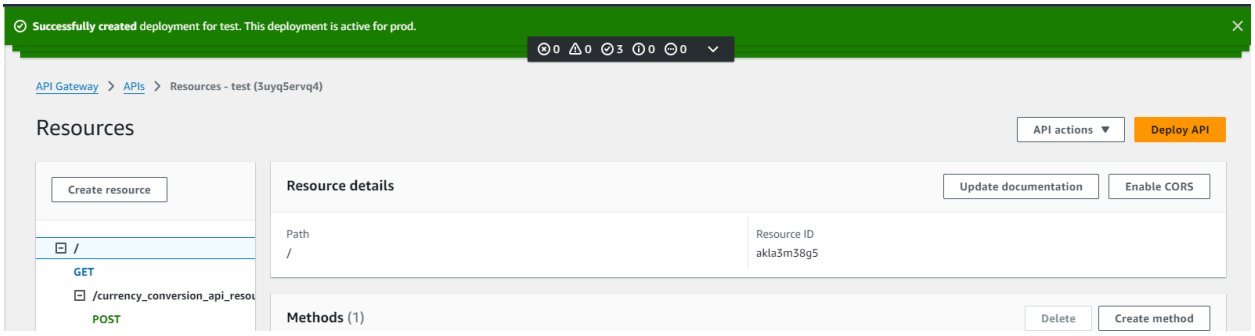
Lambda function

Provide the Lambda function name or alias. You can also provide an ARN from another account.

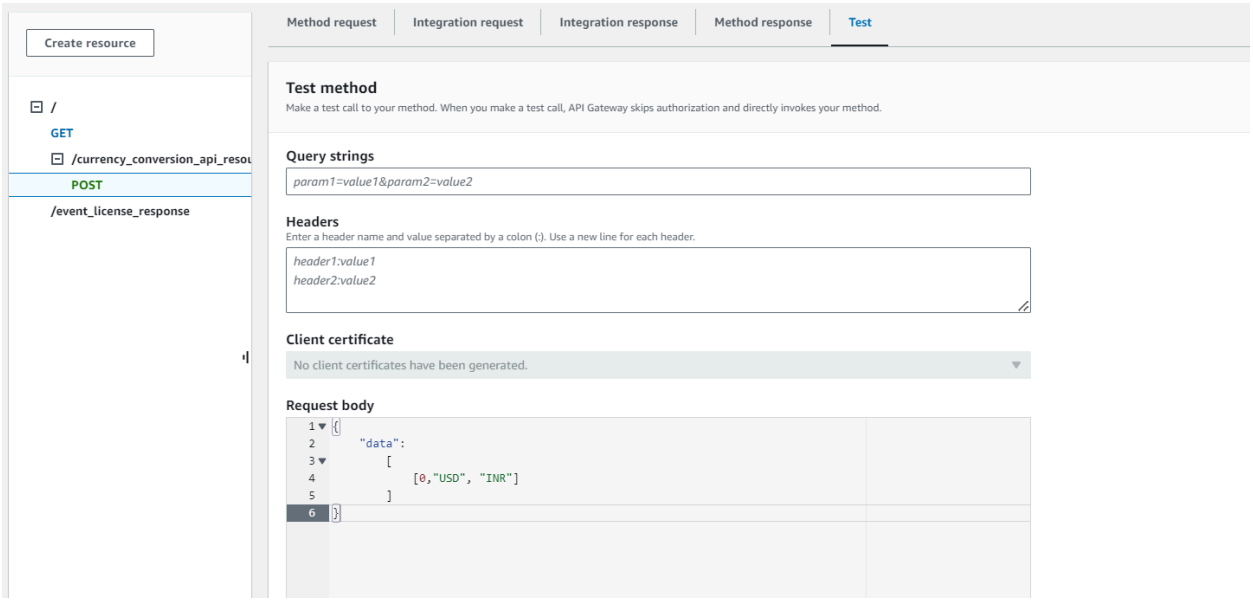
us-west-2 | arn:aws:lambda:us-west-2:682470999581:function:curr

Grant API Gateway permission to invoke your Lambda function. To turn off, update the function's resource policy yourself, or provide an invoke role that API Gateway uses to invoke your function.

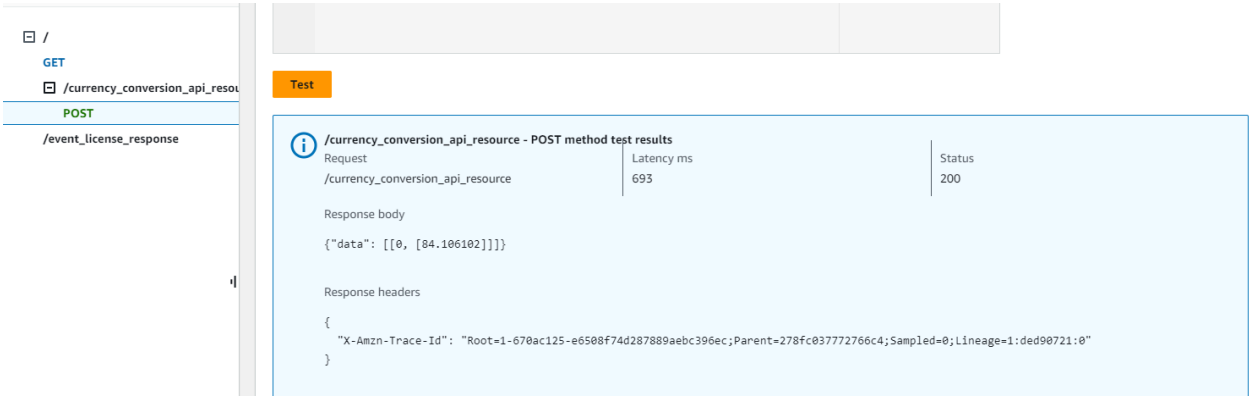

Deploy API
Create or select a stage where your API will be deployed. You can use the deployment history to revert or change the active deployment for a stage. Learn more
Stage
New stage
Stage name
prod
A new stage will be created with the default settings. Edit your stage settings on the Stage page.
Deployment description
Cancel
Deploy


Successfully created deployment for test. This deployment is active for prod.
API Gateway
APIs
Resources - test (3uyq5ervq4)
Resources
API actions
Deploy API
Create resource
Resource details
Update documentation
Enable CORS
Path
/
Resource ID
akla3m38g5
GET
POST
Methods (1)
Delete
Create method

Test API Gateway:

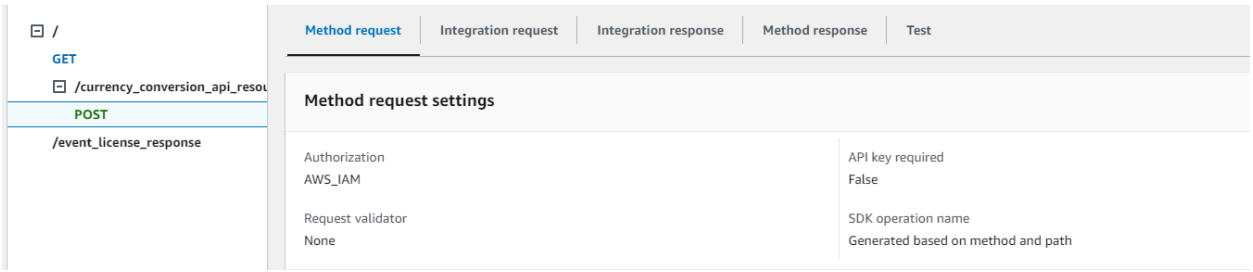


As we expect we get the response,



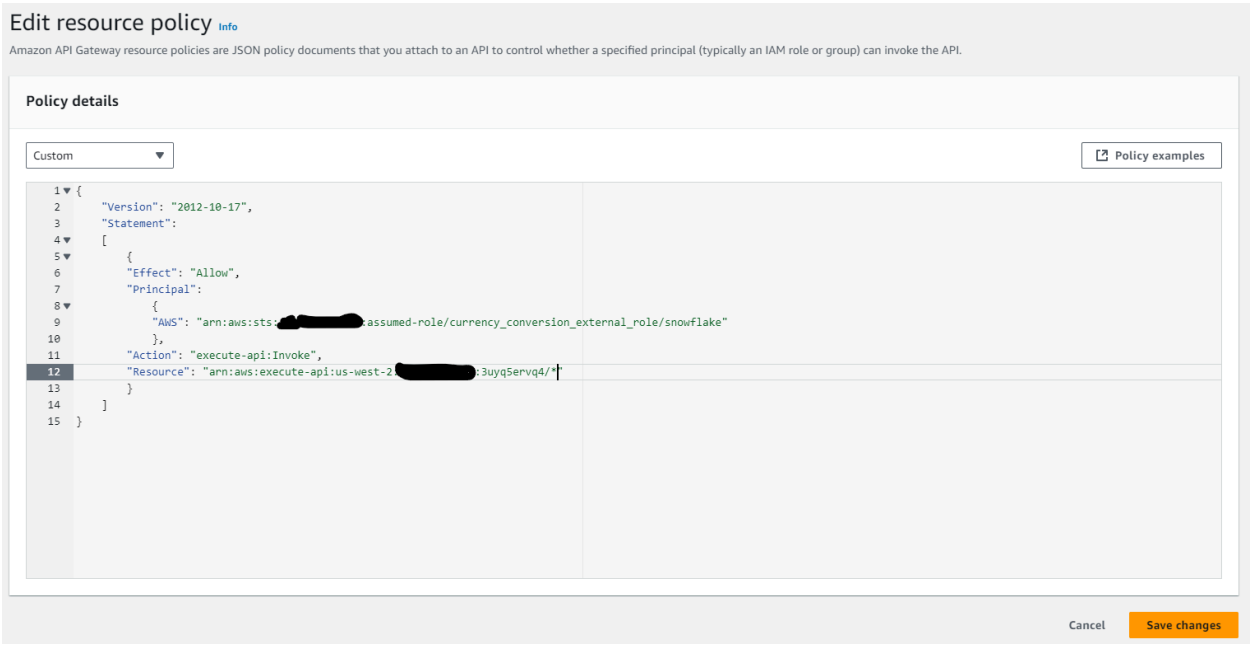
Secure API Gateway:

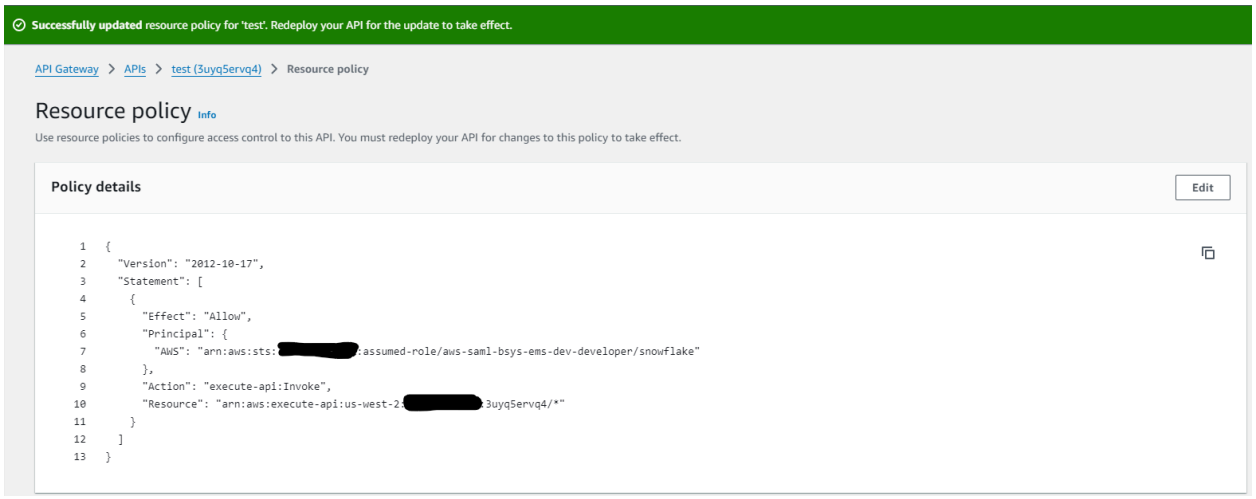
Check the Authorization is chosen as “AWS IAM”:



Then in “Resource Policy” tab, copy and paste below code and update it:

```
{
   "Version": "2012-10-17",
   "Statement":
   [
      {
      "Effect": "Allow",
      "Principal":
         {
         "AWS":
"arn:aws:sts::<12-digit-number>:assumed-role/<external_function_role>/snowflake"
         },
      "Action": "execute-api:Invoke",
      "Resource": "<method_request_ARN>"
      }
   ]
}
```





As said, re-deploy the API.

Snowflake external function:

```
use role accountadmin;

use schema "ECOMMERCE_DB"."ECOMMERCE_DEV";


create or replace api integration currency_conversion_int
  api_provider = aws_api_gateway
  api_aws_role_arn = ''
  api_allowed_prefixes = ('')
  enabled = true;

desc integration currency_conversion_int;

create or replace external function currency_conversion_external_function(from_currency
varchar,to_currency varchar)
    returns variant
    api_integration = external_function_integration
    as '';


select currency_conversion_external_function('USD','EUR')

select currency_conversion_external_function('USD','EUR')[0] as exchange_value;
```

```
create or replace api integration currency_conversion_int
  api_provider = aws_api_gateway
  api_aws_role_arn = 'arn:aws:iam::[redacted]:role/[redacted]'
  api_allowed_prefixes = ('https://3uyq5ervq4.execute-api.us-west-
2.amazonaws.com/prod//currency_conversion_api_resource')
  enabled = true;
```

Results | Chart

	status
1	Integration CURRENCY_CONVERSION_INT successfully created.

Query Details
Query duration 265ms

```
desc integration currency_conversion_int;
```

Results | Chart

	property	property_type	property_value	property_defa
3	API_PROVIDER	String	AWS_API_GATEWAY	
4	API_AWS_IAM_USER_ARN	String	arn:aws:iam::180294178125:user/	
5	API_AWS_ROLE_ARN	String	arn:aws:iam::682470999581:role/a	

Query Details
Query duration 266ms
Rows
Query ID 01b7
Ask Copilo

Then edit trust policy in AWS IAM role:

IAM > Roles > currency_conversion_ext_role > Edit trust policy

Edit trust policy

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam:[redacted]:user/hndy-s-eusb7117"
            },
            "Action": "sts:AssumeRole",
            "Condition": {
                "StringEquals": {
                    "sts:ExternalId": "AZ32171_SFCRole=3_q0KsT0zNTUxGf7/wMLy45r/Imt8="
                }
            }
        }
    ]
}
```

```
14  create or replace external function currency_conversion_external_function(from_currency
    varchar,to_currency varchar)
15      returns variant
16      api_integration = currency_conversion_int
17      as 'https://3uyq5ervq4.execute-api.us-west-2.amazonaws.com/prod//currency_conversion_api_resource';
18
```

Results | Chart

	status
1	Function CURRENCY_CONVERSION_EXTERNAL_FUNCTION successfully created.

Query Details

Query duration 117ms

```
18
19  select currency_conversion_external_function('USD','EUR');
20
21  select currency_conversion_external_function('USD','EUR')[0] as exchange_value;
```

Results | Data Preview

Query ID | SQL | 1.16s | 1 rows

Filter result... | Copy

Row	CURRENCY_CONVERSION_EXTERNAL_FUNCTION('USD','EUR')
1	[0.913]

```
21  select currency_conversion_external_function('USD','EUR')[0] as exchange_value;
22
23
```

Results | Data Preview

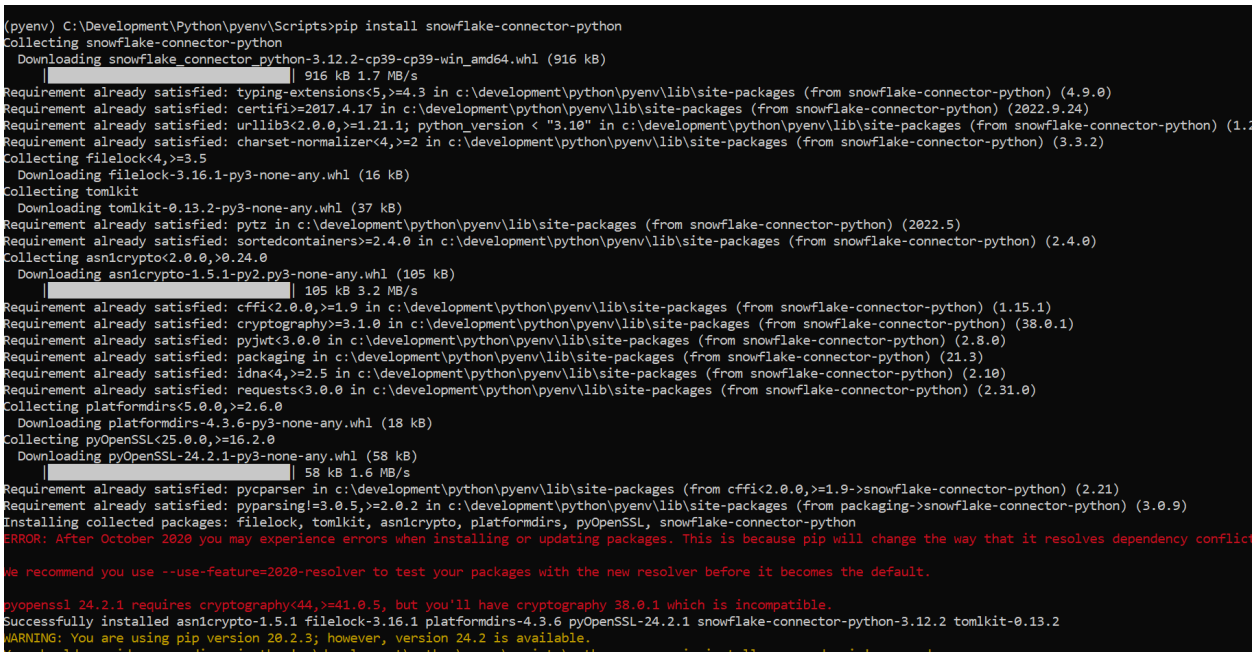
Query ID | SQL | 979ms | 1 rows

Filter result... | Copy

Row	EXCHANGE_VALUE
1	0.913

Snowflake with Python, Pyspark and Airflow:

Connect python with Snowflake locally:



Run the below program in local machine:

```
import snowflake.connector

ctx = snowflake.connector.connect(
    user="",
    password="",
    account="", #Provide Locator ID
    warehouse="compute_wh",
    database="ecommerce_db",
    schema="ECOMMERCE_DEV",
    role='SYSADMIN',
    session_parameters={
        'TIMEZONE': 'UTC',
    }
)

cs = ctx.cursor()
try:
    sql = """select * from LINEITEM  limit 10"""
    cs.execute(sql)
    # one_row = cs.fetchone()
    all_rows = cs.fetchall()
    # print(one_row[0])
    print(all_rows)

finally:
```

```
    cs.close()
ctx.close()
```

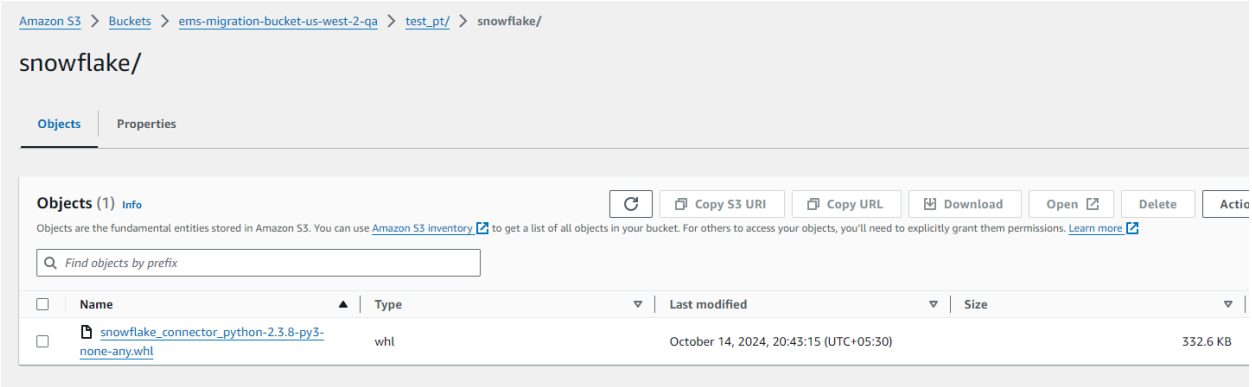
```
(pyenv) C:\Development\Python\DynamoDB\test\UtilityPrograms\Snowflake>py python_snowflake_local.py
[(5698238502, 173336436, 8336471, 4, Decimal('44.00'), Decimal('64405.88'), Decimal('0.08'), Decimal('0.06'), 'N', 'O', datetime.date(1996, 2, 6), datetime.date(1995, 11, 2
3), datetime.date(1996, 2, 27), 'DELIVER IN PERSON', 'FOB', 'l dependencies. deposits haggle across'), (5698474147, 20961814, 3461817, 2, Decimal('41.00'), Decimal('76865.5
7'), Decimal('0.00'), Decimal('0.05'), 'N', 'O', datetime.date(1996, 2, 6), datetime.date(1996, 1, 6), datetime.date(1996, 2, 23), 'DELIVER IN PERSON', 'MAIL', 'ly. ironic
deposits by the fluffily idle'), (5698224512, 12733887, 5233889, 2, Decimal('34.00'), Decimal('65288.50'), Decimal('0.08'), Decimal('0.07'), 'N', 'O', datetime.date(1996, 2
, 6), datetime.date(1995, 12, 8), datetime.date(1996, 3, 5), 'COLLECT COD', 'SHIP', 'e carefully pending accounts boo'), (5698388194, 126980983, 1981008, 3, Decimal('34.00'
), Decimal('69959.76'), Decimal('0.05'), Decimal('0.03'), 'N', 'O', datetime.date(1996, 2, 6), datetime.date(1996, 3, 27), datetime.date(1996, 2, 18), 'COLLECT COD', 'SHIP'
, ' promise blithely unusual sen'), (5698087040, 174543546, 9543581, 1, Decimal('6.00'), Decimal('9484.92'), Decimal('0.00'), Decimal('0.01'), 'N', 'O', datetime.date(1996,
 2, 6), datetime.date(1996, 2, 27), datetime.date(1996, 2, 15), 'NONE', 'SHIP', 'bold, ironi'), (5698072965, 133514607, 1014647, 2, Decimal('21.00'), Decimal('33913.53'), D
ecimal('0.00'), Decimal('0.02'), 'N', 'O', datetime.date(1996, 2, 6), datetime.date(1996, 1, 21), datetime.date(1996, 2, 11), 'TAKE BACK RETURN', 'MAIL', 'uickly special re
qu'), (5861758402, 159854621, 2354637, 5, Decimal('49.00'), Decimal('76813.87'), Decimal('0.00'), Decimal('0.07'), 'N', 'O', datetime.date(1996, 2, 6), datetime.date(1996,
3, 16), datetime.date(1996, 2, 24), 'NONE', 'FOB', 'y slyly bold platelets. regular requests wa'), (5698330791, 104054815, 6554826, 1, Decimal('6.00'), Decimal('10587.66'),
 Decimal('0.09'), Decimal('0.00'), 'N', 'O', datetime.date(1996, 2, 6), datetime.date(1996, 3, 3), datetime.date(1996, 2, 11), 'DELIVER IN PERSON', 'TRUCK', 'the carefully
bold requests. blithe'), (5698370563, 128183562, 3183587, 4, Decimal('2.00'), Decimal('3278.32'), Decimal('0.00'), Decimal('0.08'), 'N', 'O', datetime.date(1996, 2, 6), dat
etime.date(1995, 12, 29), datetime.date(1996, 3, 2), 'COLLECT COD', 'REG AIR', 'kly final packages haggle slyly ev'), (5698146913, 86515792, 9015801, 3, Decimal('40.00'), D
ecimal('72138.80'), Decimal('0.09'), Decimal('0.08'), 'N', 'O', datetime.date(1996, 2, 6), datetime.date(1996, 2, 16), datetime.date(1996, 2, 19), 'NONE', 'TRUCK', 't the f
uriously final plat')]
```

Run python scripts in Glue:

Download whl file from the github repo:

https://github.com/siddd88/snowflake-aws-udemy/blob/main/Section%2010-AWS-Python-SF/whl/snowflake_connector_python-2.3.8-py3-none-any.whl

Add the file in S3:

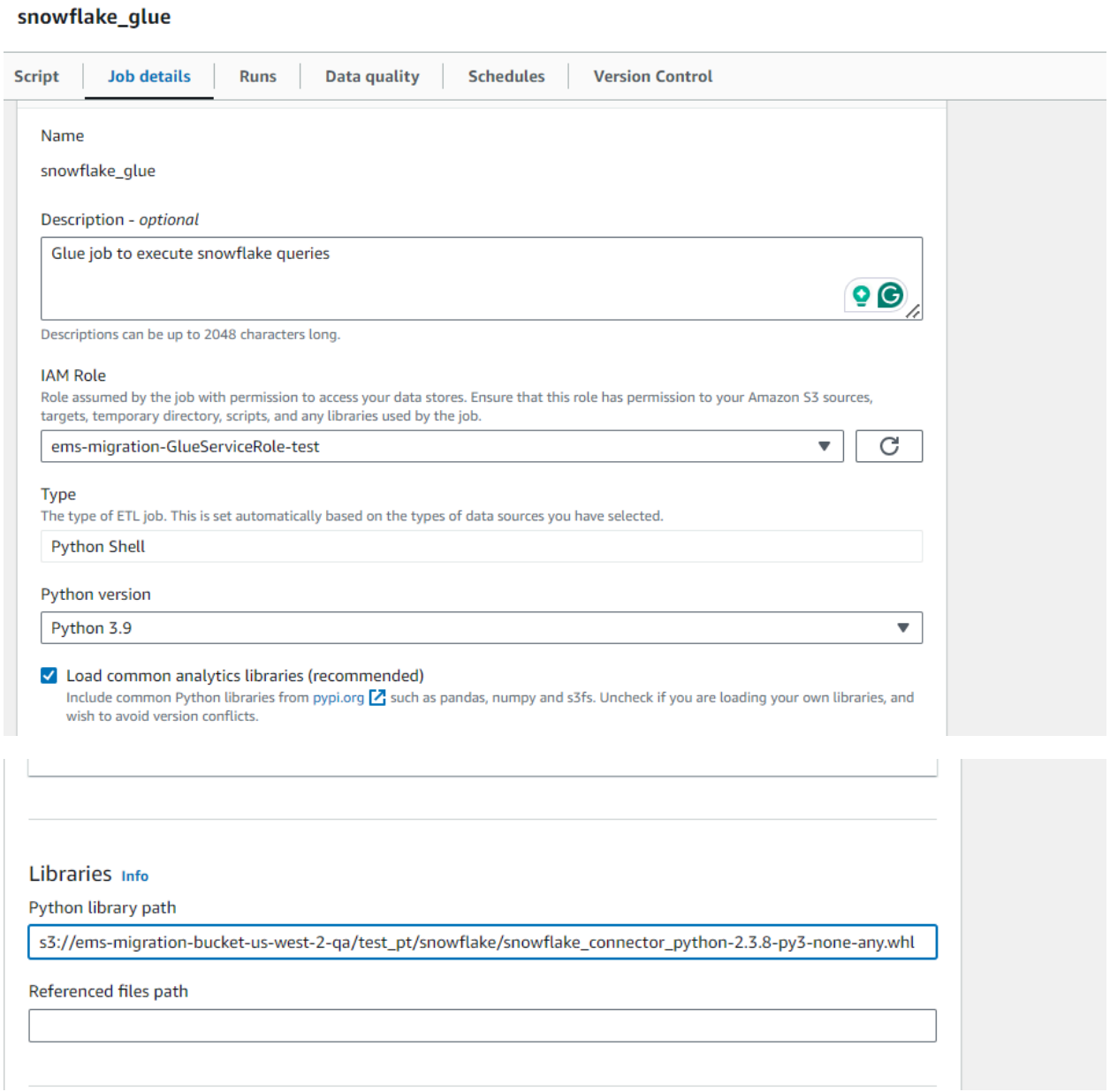


Create Glue Job

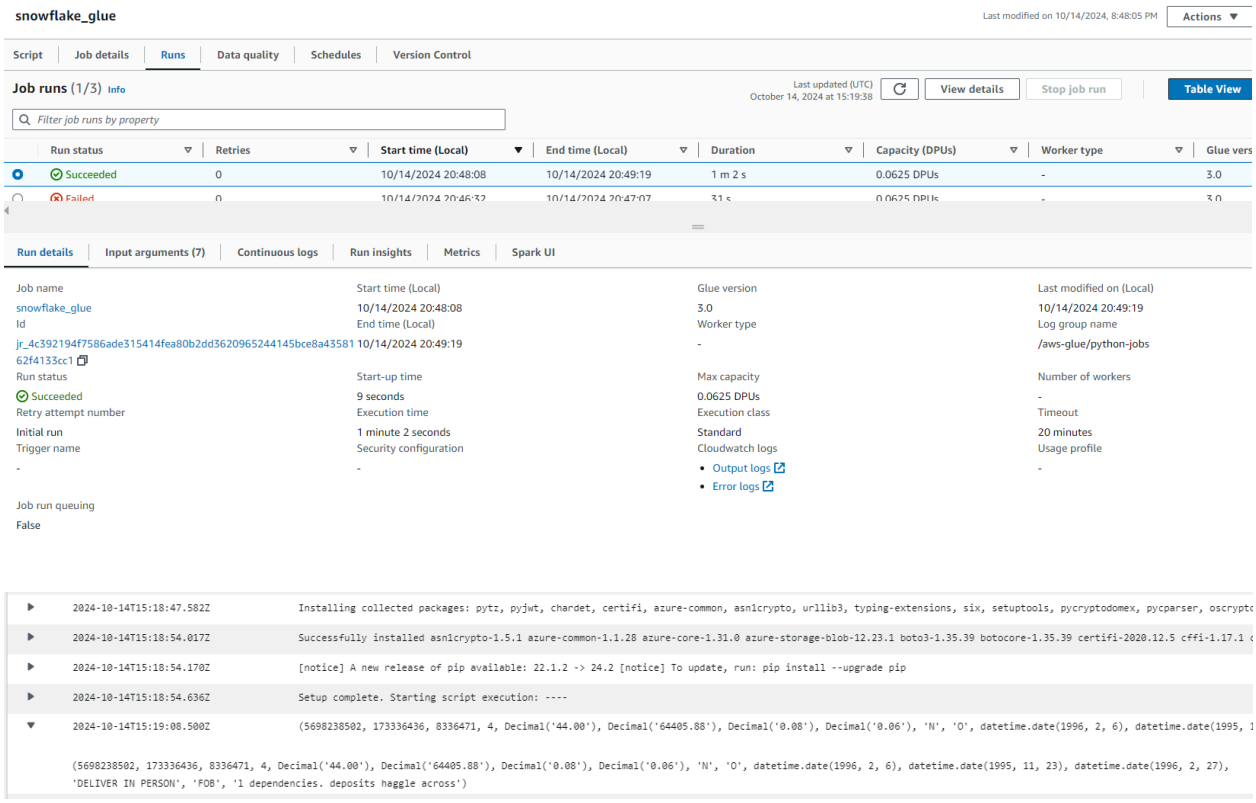
Copy the below code in ETL job:

```
import snowflake.connector
from awsglue.utils import getResolvedOptions
```

```
con = snowflake.connector.connect(
    user="siddharth",
    password="Udemy@123",
    account="az32171.eu-central-1",
    warehouse="compute_wh",
    database="ecommerce_db",
    schema="ECOMMERCE_DEV",
    role='SYSADMIN',
    session_parameters={
        'TIMEZONE': 'UTC',
    }
)

cursor = con.cursor()

sql_query = """
            select * from lineitem limit 100
            """

try :
    cursor.execute(sql_query)
    query_id = cursor.sfqid
    cursor.get_results_from_sfqid(query_id)
    results = cursor.fetchall()
    print(f'{results[0]}')

except Exception as e:
    con.rollback()
    raise e

finally:
    con.close()
```



Once done, save the job and run the job. Once job completed, we can able to see the output in logs.

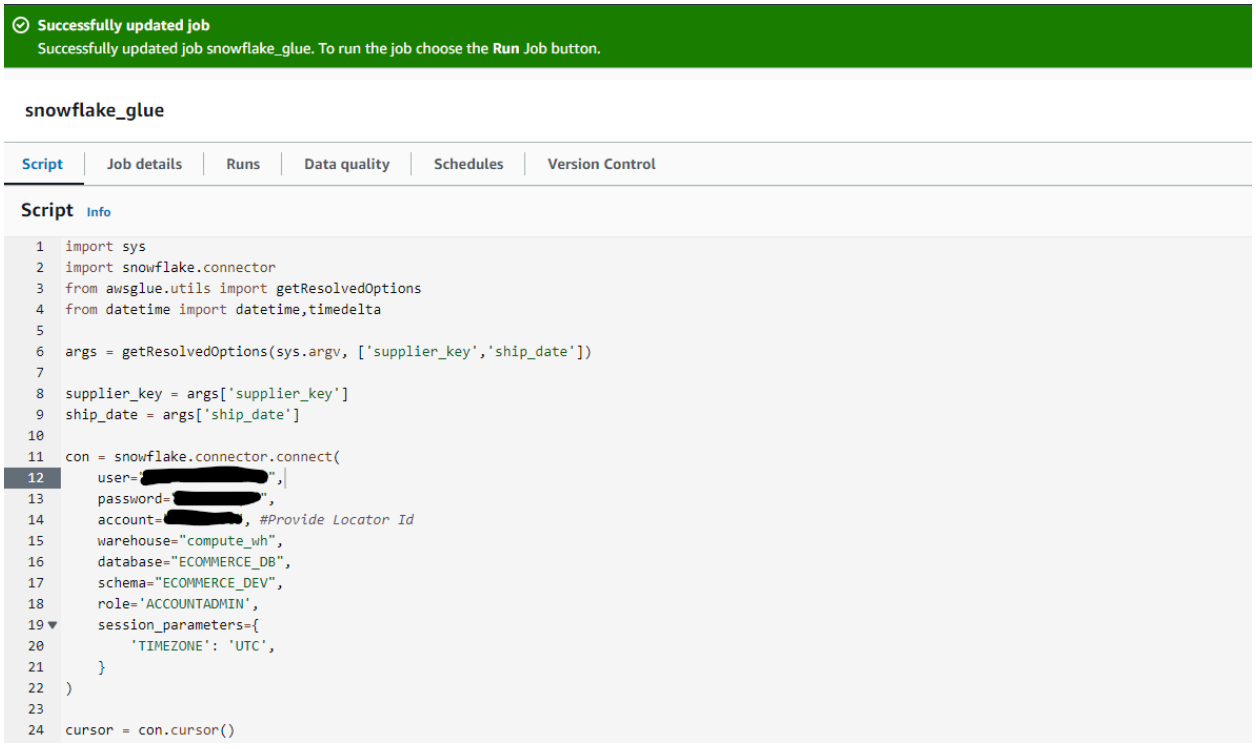


Run job with params:

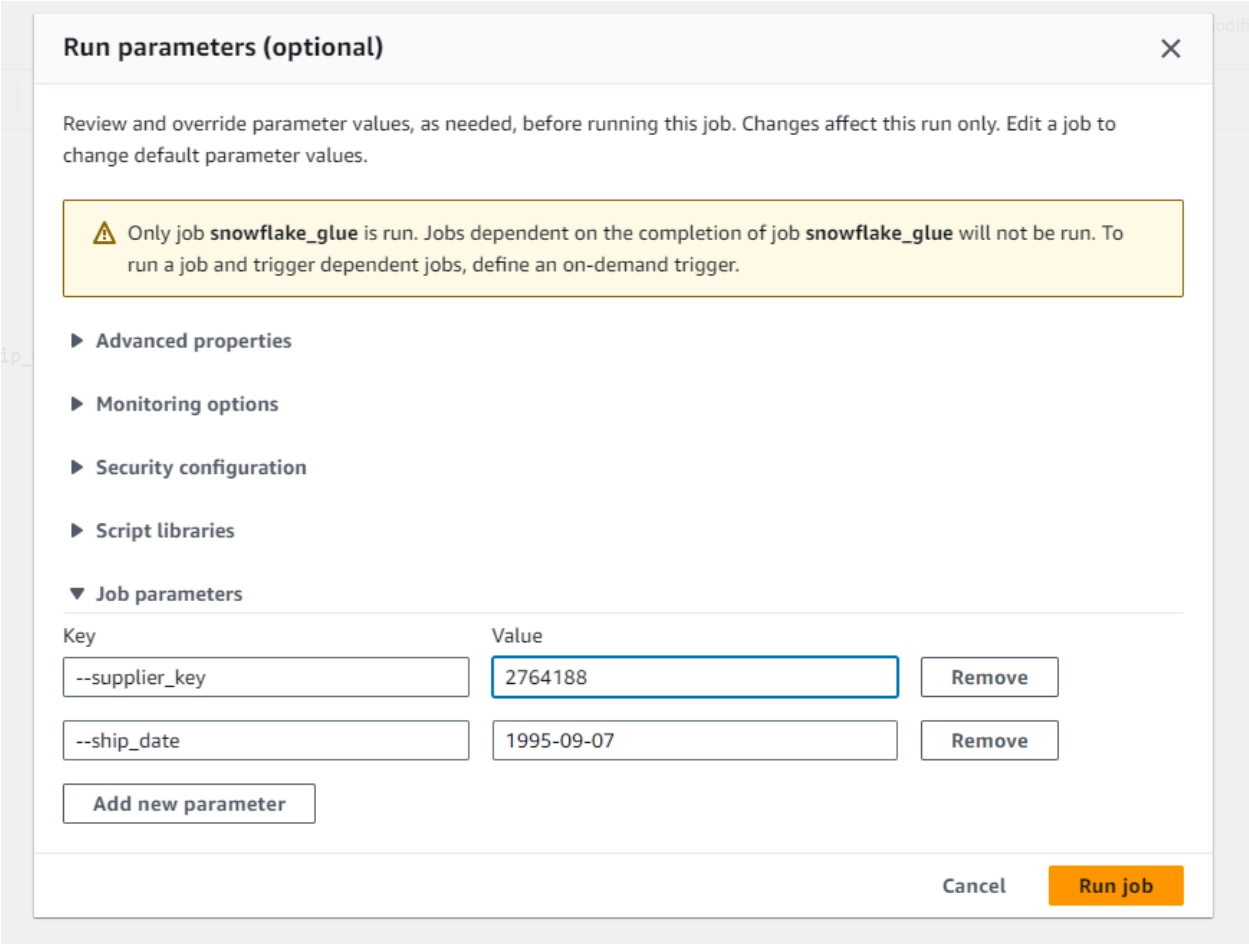
Copy below code and update the credentials to connect to snowflake:

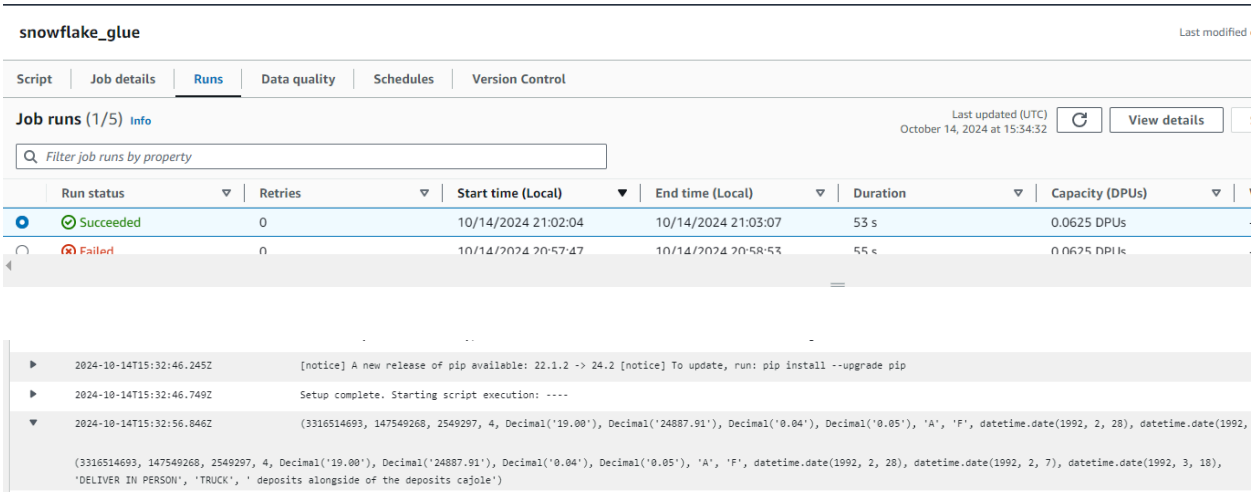
```
import sys
import snowflake.connector
from awsglue.utils import getResolvedOptions
from datetime import datetime,timedelta

args = getResolvedOptions(sys.argv, ['supplier_key','ship_date'])

supplier_key = args['supplier_key']
ship_date = args['ship_date']

con = snowflake.connector.connect(
    user="",
    password="",
    account="",
    warehouse="compute_wh",
    database="ecommerce_db",
    schema="ECOMMERCE_DEV",
    role='SYSADMIN',
    session_parameters={
        'TIMEZONE': 'UTC',
    }
```

```
)

cursor = con.cursor()

sql_query = """
        select
        *
        from lineitem
        where l_shipdate='{0}' and l_suppkey='{1}'
        """.format(ship_date,supplier_key)

try :
    cursor.execute(sql_query)
    query_id = cursor.sfqid
    cursor.get_results_from_sfqid(query_id)
    results = cursor.fetchall()
    print(f'{results[0]}')

except Exception as e:
    con.rollback()
    raise e

finally:
    con.close()
```



Now pass the params and run the job:





Run snowflake query with pandas:

Copy below code and fill the connection configuration. Run the job.

```
import pandas as pd
import sys
import snowflake.connector
# from awsglue.utils import getResolvedOptions

conn = snowflake.connector.connect(
    user="",
    password="",
    account="",
    warehouse="compute_wh",
    database="ecommerce_db",
    schema="ECOMMERCE_DEV",
    role='SYSADMIN',
    session_parameters={
        'TIMEZONE': 'UTC',
    }
)

try:
    sql = """
        select * from lineitem limit 10
    """
    data_agg = pd.read_sql(sql, conn)
    print(data_agg.head())
finally:
    conn.close()
```

snowflake_glue

Script | Job details | Runs | Data quality | Schedules | Version Control

Script Info

```
1  import pandas as pd
2  import sys
3  import snowflake.connector
4  from awsglue.utils import getResolvedOptions
5
6  con = snowflake.connector.connect(
7      user="[redacted]",
8      password="[redacted]",
9      account="[redacted]", #Provide Locator Id
10     warehouse="compute_wh",
11     database="ECOMMERCE_DB",
12     schema="ECOMMERCE_DEV",
13     role='ACCOUNTADMIN',
14     session_parameters={
15         'TIMEZONE': 'UTC',
16     }
17 )
18
19 try:
20     sql = """
21         select * from lineitem limit 10
22     """
23     data_agg = pd.read_sql(sql, con)
24     print(data_agg.head())
25 finally:
26     con.close()
```

snowflake_glue

Script | Job details | Runs | Data quality | Schedules | Version Control

Job runs (1/8) Info

Last updated (UTC)
October 14, 2024 at 15:41:20

View detai

Filter job runs by property

Run status	Retries	Start time (Local)	End time (Local)	Duration	Capacity (DPUs)
Succeeded	0	10/14/2024 21:10:37	10/14/2024 21:11:16	33 s	0.0625 DPUs
Failed	0	10/14/2024 21:09:07	10/14/2024 21:10:06	51 s	0.0625 DPUs

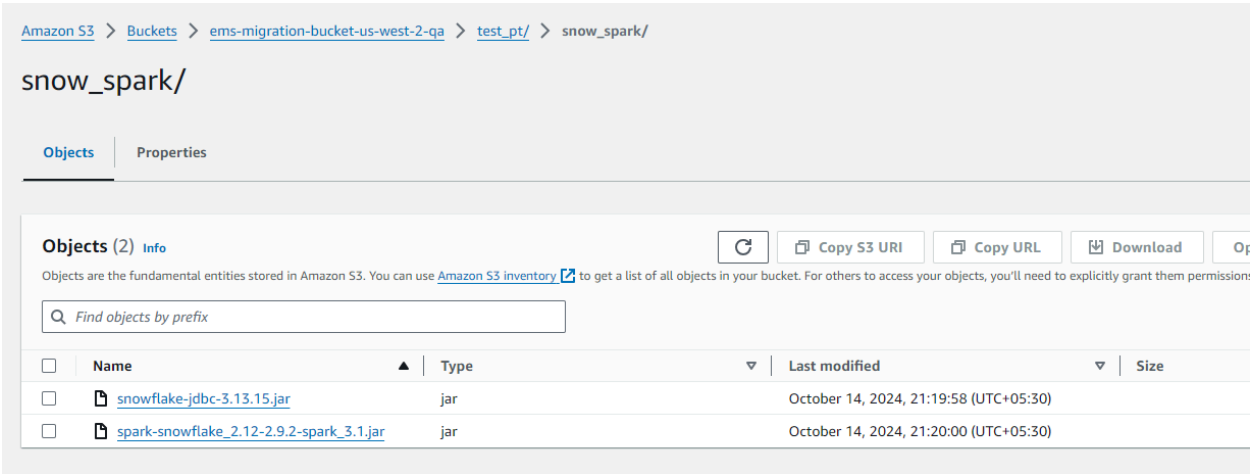
Run details | Input arguments (7) | Continuous logs | Run insights | Metrics | Spark UI

Job name	Start time (Local)	Glue version
snowflake_glue	10/14/2024 21:10:37	3.0
Id	End time (Local)	Worker type
jr_0e73576a3f9cd04a1667c84d1a97925a6a1f08cc53261ef204755a737aa4bb17	10/14/2024 21:11:16	-
Run status	Start-up time	Max capacity
Succeeded	5 seconds	0.0625 DPUs
Retry attempt number	Execution time	Execution class
Initial run	33 seconds	Standard
Trigger name	Security configuration	Cloudwatch logs
-	-	• Output logs • Error logs
Job run queuing		
False		

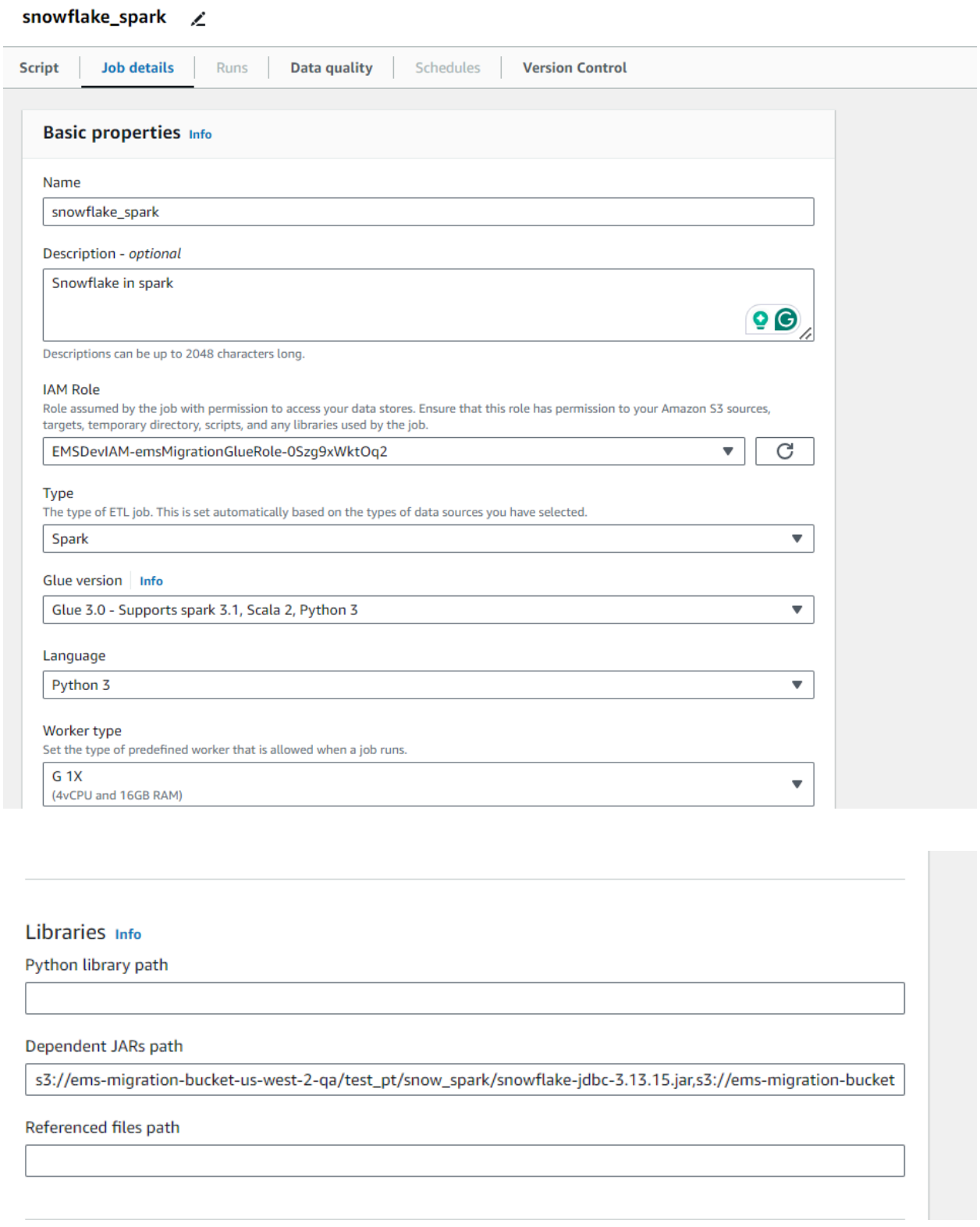
Run pyspark in Glue:

Download the jar files from github repo:
https://github.com/siddd88/snowflake-aws-udemy/blob/main/Section%2010-AWS-Python-SF/spark-jars/Jar-Archive.zip

Upload in s3 bucket:



Create spark job:

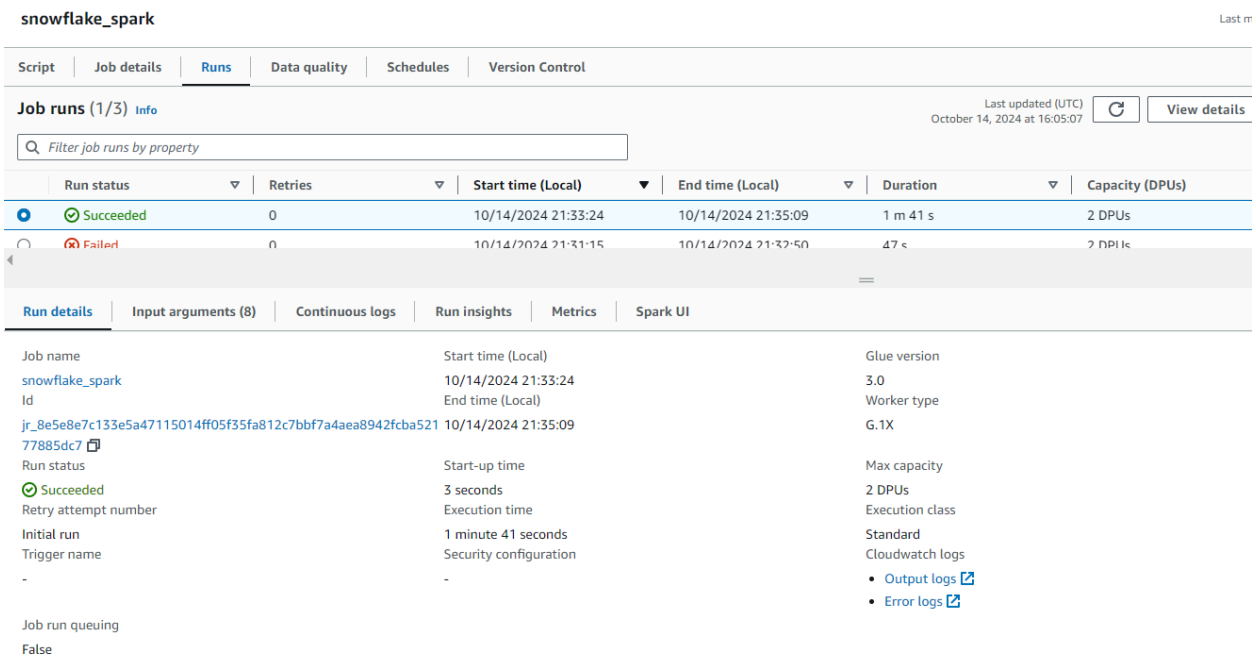


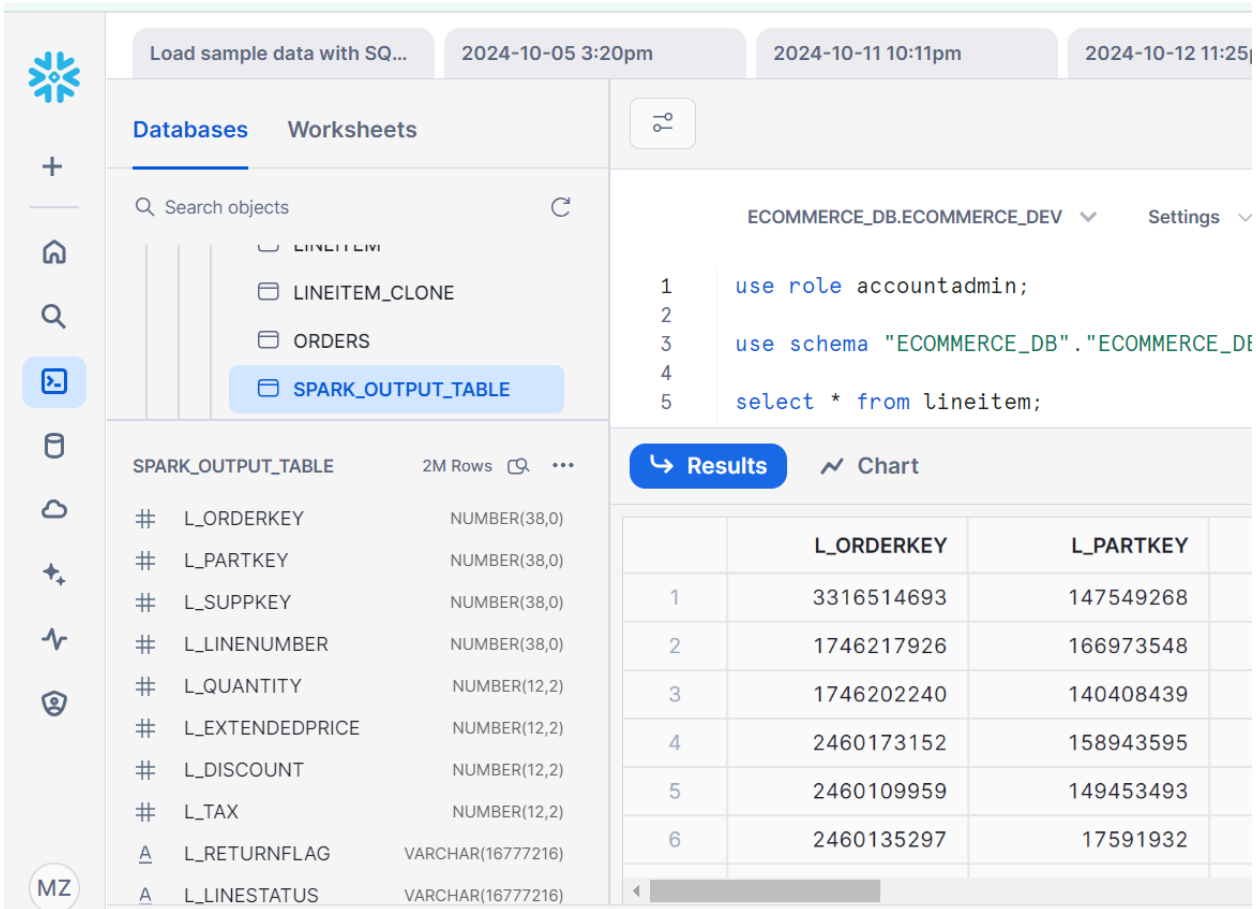
Copy the below code and paste it. Run the job.

```
from pyspark.sql import SparkSession
```

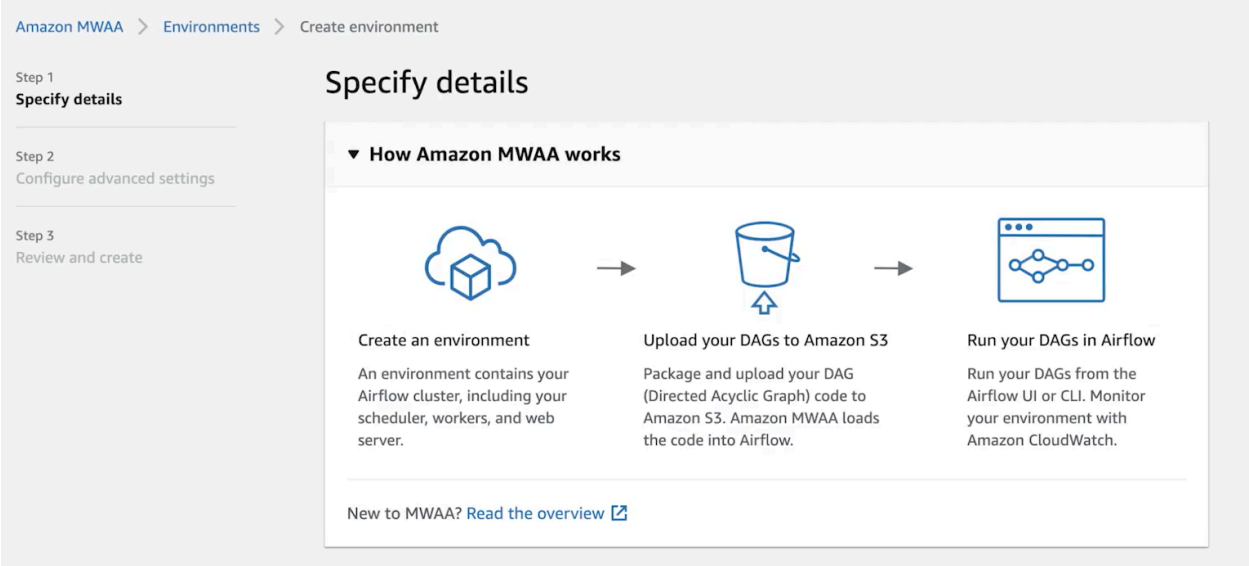
```
from pyspark import SparkContext

spark = SparkSession \
        .builder \
        .appName("Glue-pyspark-test") \
        .getOrCreate()

SNOWFLAKE_SOURCE_NAME = "net.snowflake.spark.snowflake"
snowflake_database="ECOMMERCE_DB"
snowflake_schema="ECOMMERCE_DEV"
source_table_name="LINEITEM"

snowflake_options = {
    "sfUrl":"",
    "sfUser": "",
    "sfPassword": "",
    "sfDatabase": snowflake_database,
    "sfSchema": snowflake_schema,
    "sfWarehouse": "COMPUTE_WH"
}

df = spark.read \
    .format(SNOWFLAKE_SOURCE_NAME) \
    .options(**snowflake_options) \
    .option("dbtable",source_table_name) \
    .option("autopushdown", "on") \
    .load()


df.write.format("snowflake") \
    .options(**snowflake_options) \
    .option("dbtable","spark_output_table").mode("overwrite") \
    .save()


#
s3://sf-glue-jobs/jars/snowflake-jdbc-3.13.15.jar,s3://sf-glue-jobs/jars/spark-snowflake_2.12-2.
9.2-spark_3.1.jar
```

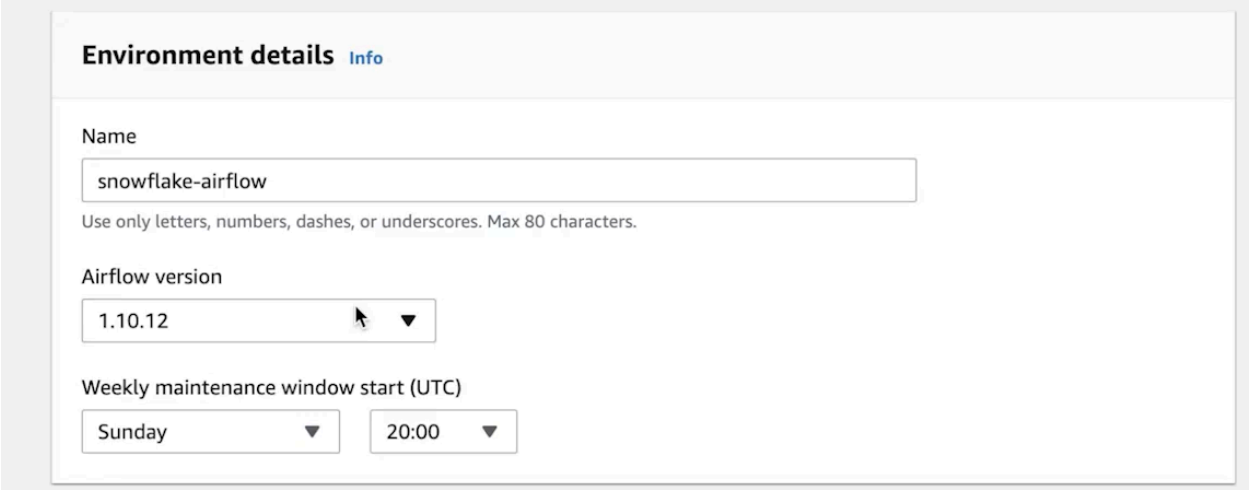
After execution, we can see a new table in snowflake.


snowflake_spark
Script
Job details
Runs
Data quality
Schedules
Version Control
Job runs (1/3) Info
Last updated (UTC)
October 14, 2024 at 16:05:07
View details
Filter job runs by property
Run status
Retries
Start time (Local)
End time (Local)
Duration
Capacity (DPUs)
Succeeded
0
10/14/2024 21:33:24
10/14/2024 21:35:09
1 m 41 s
2 DPUs
Failed
0
10/14/2024 21:31:15
10/14/2024 21:32:50
47 s
2 DPUs
Run details
Input arguments (8)
Continuous logs
Run insights
Metrics
Spark UI
Job name
snowflake_spark
Id
jr_8e5e8e7c133e5a47115014ff05f35fa812c7bbf7a4aea8942fcba52177885dc7
Run status
Succeeded
Retry attempt number
Initial run
Trigger name
-
Start time (Local)
10/14/2024 21:33:24
End time (Local)
10/14/2024 21:35:09
Start-up time
3 seconds
Execution time
1 minute 41 seconds
Security configuration
-
Glue version
3.0
Worker type
G.1X
Max capacity
2 DPUs
Execution class
Standard
Cloudwatch logs
Output logs
Error logs
Job run queuing
False

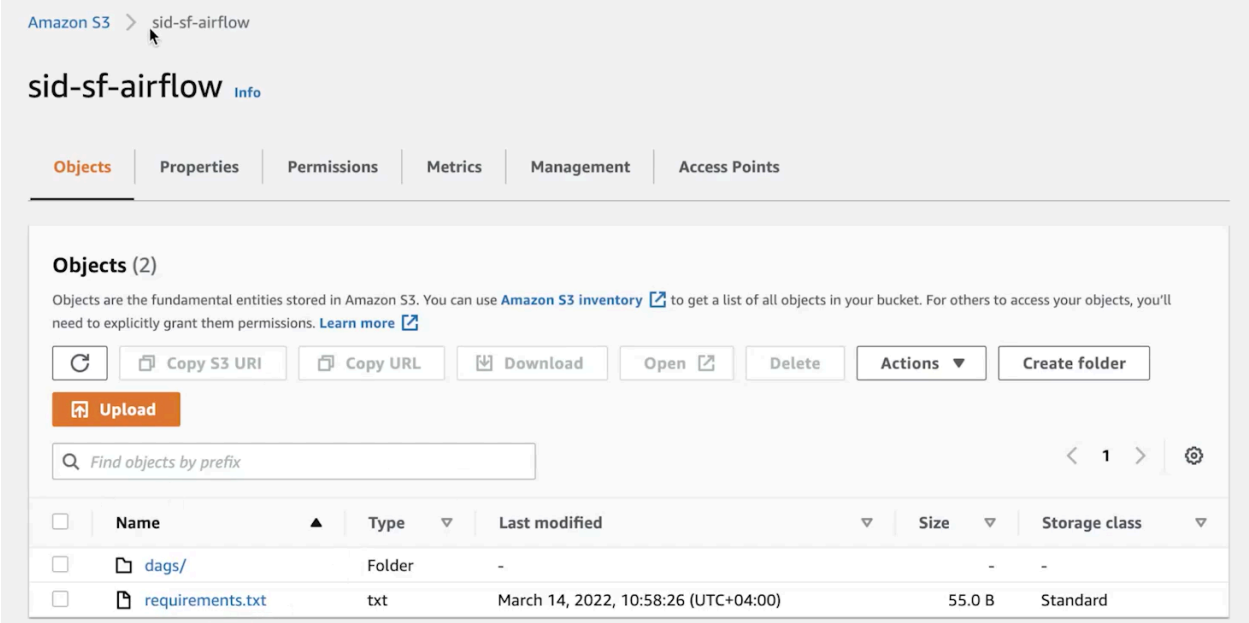

Load sample data with SQ...
2024-10-05 3:20pm
2024-10-11 10:11pm
2024-10-12 11:25
Databases
Worksheets
Search objects
LINEITEM_CLONE
ORDERS
SPARK_OUTPUT_TABLE
SPARK_OUTPUT_TABLE
2M Rows
L_ORDERKEY NUMBER(38,0)
L_PARTKEY NUMBER(38,0)
L_SUPPKEY NUMBER(38,0)
L_LINENUMBER NUMBER(38,0)
L_QUANTITY NUMBER(12,2)
L_EXTENDEDPRICE NUMBER(12,2)
L_DISCOUNT NUMBER(12,2)
L_TAX NUMBER(12,2)
L_RETURNFLAG VARCHAR(16777216)
L_LINESTATUS VARCHAR(16777216)
MZ
ECOMMERCE_DB.ECOMMERCE_DEV
Settings
1 use role accountadmin;
2
3 use schema "ECOMMERCE_DB"."ECOMMERCE_DE
4
5 select * from lineitem;
Results
Chart
L_ORDERKEY
L_PARTKEY
1 3316514693 147549268
2 1746217926 166973548
3 1746202240 140408439
4 2460173152 158943595
5 2460109959 149453493
6 2460135297 17591932

Managed Airflow cluster on AWS:



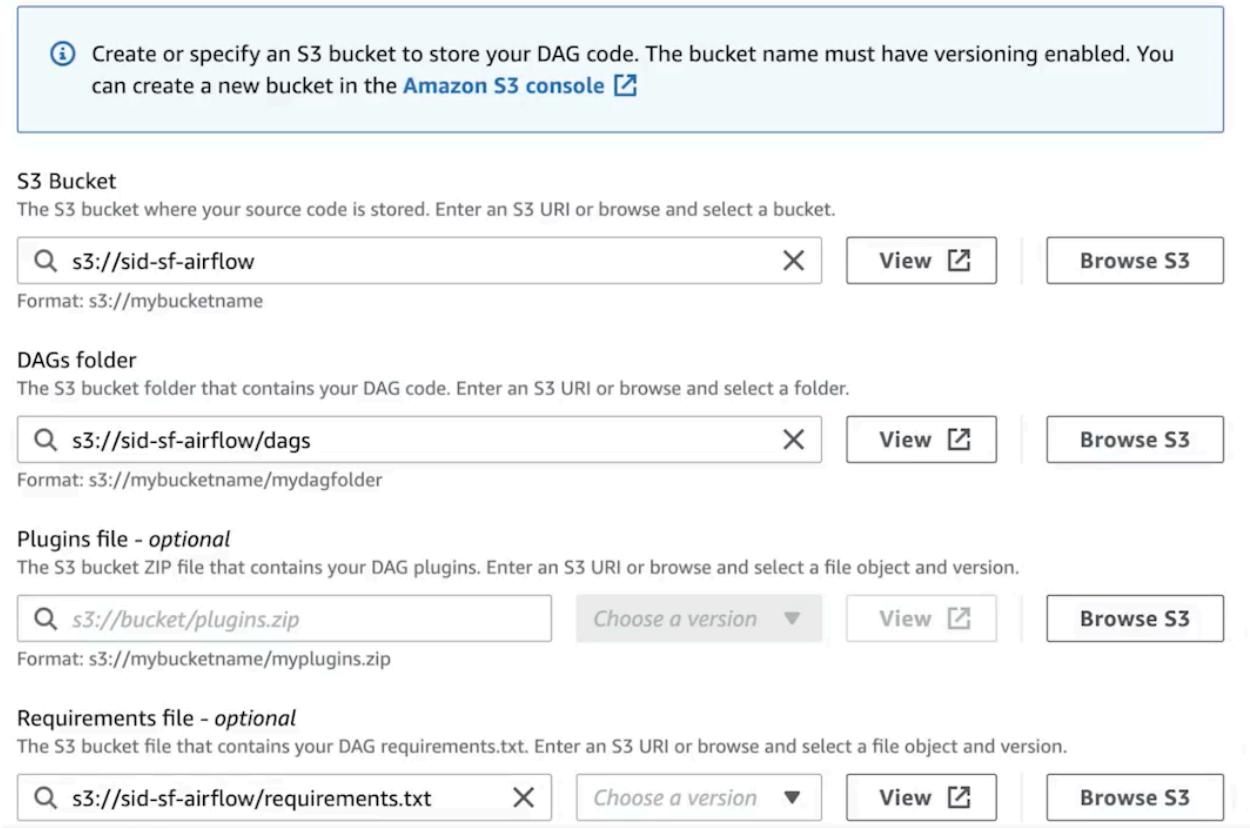


Create new s3 bucket for airflow dags and put requirement.txt in root folder:

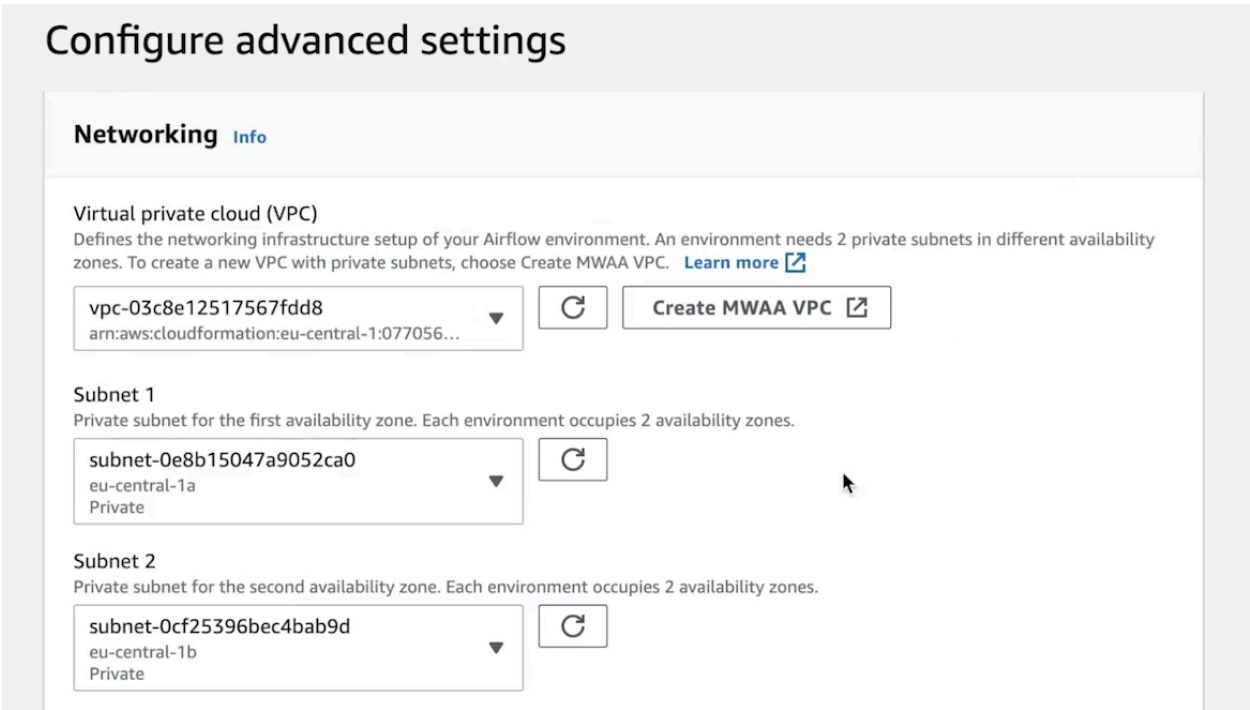


Requirement.txt

```
snowflake-connector-python==2.5.1
```



Create MWAA VPC and provide that:



Environment class Info

Each Amazon MWAA environment includes the scheduler, web server, and 1 worker. Workers auto-scale up and down according to system load. You can monitor the load on your environment and modify its class at any time.

	DAG capacity*	Scheduler CPU	Worker CPU	Web server CPU
(•) mw1.small	Up to 50	1 vCPU	1 vCPU	0.5 vCPU
( ) mw1.medium	Up to 250	2 vCPU	2 vCPU	1 vCPU
( ) mw1.large	Up to 1000	4 vCPU	4 vCPU	2 vCPU

*under typical usage

Maximum worker count

The maximum number of workers your environment is permitted to scale up to.

10

Must be between 1 and 25

Minimum worker count

The minimum number of workers always present in your environment.

1

Must be less than or equal to maximum workers. Minimum 1 worker

Amazon MWAA > Environments

Airflow environments

Next steps

While you wait for your environment to be created, learn about how to access the Airflow UI and work with your DAGs.

Learn more

Environments (2)

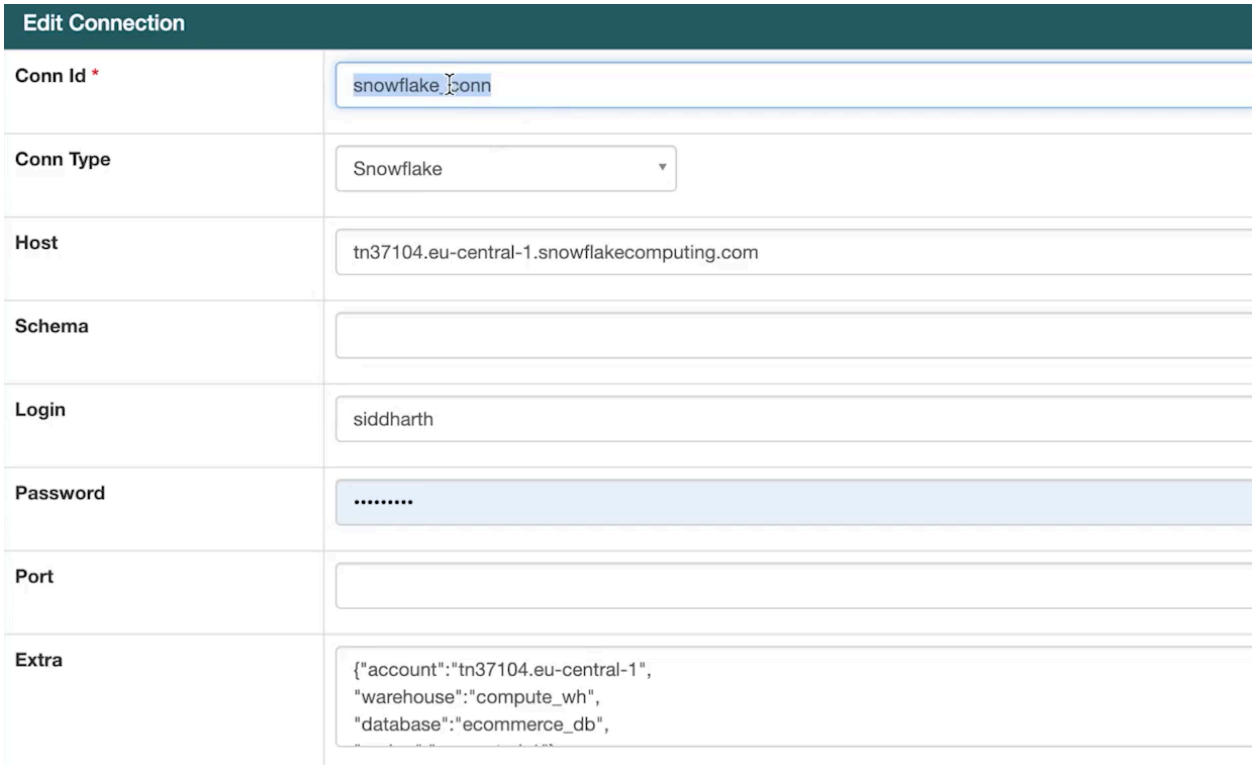
Edit | Delete | Actions | Create environment

Find environments

1

Name	Status	Created date	Airflow version	Airflow UI
snowflake-airflow	Creating	Mar 14, 2022 22:37:04 (UTC+04:00)	1.10.12	Open Airflow UI

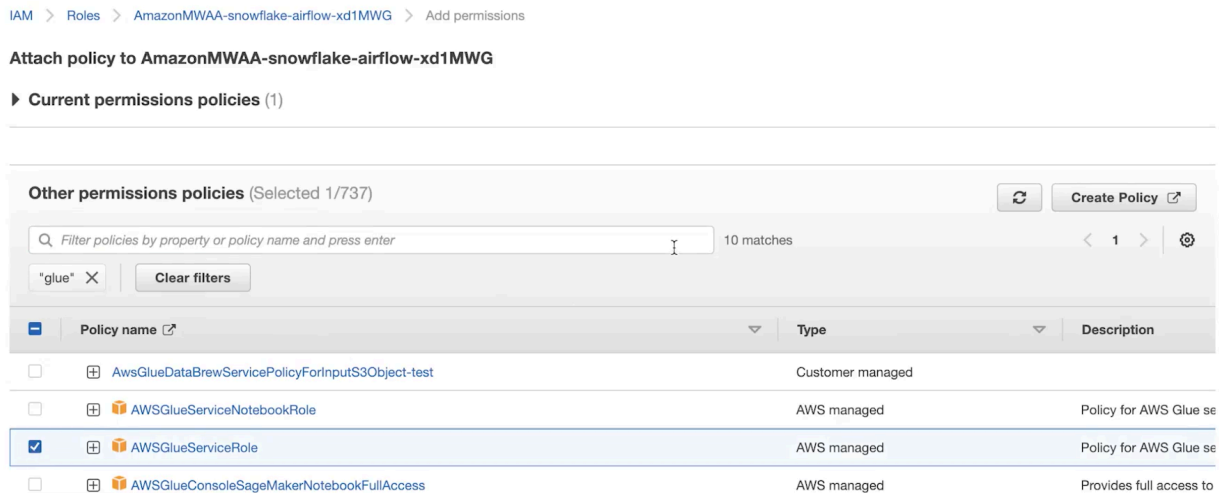
Then open Airflow UI and add new connection for snowflake:



In this tutorial, what has been done:

- **Load data from S3 to Snowflake**
- **Trigger AWS glue**
- **Execute both the above tasks in parallel**

To trigger AWS glue, please add permissions to trigger from AWS Airflow

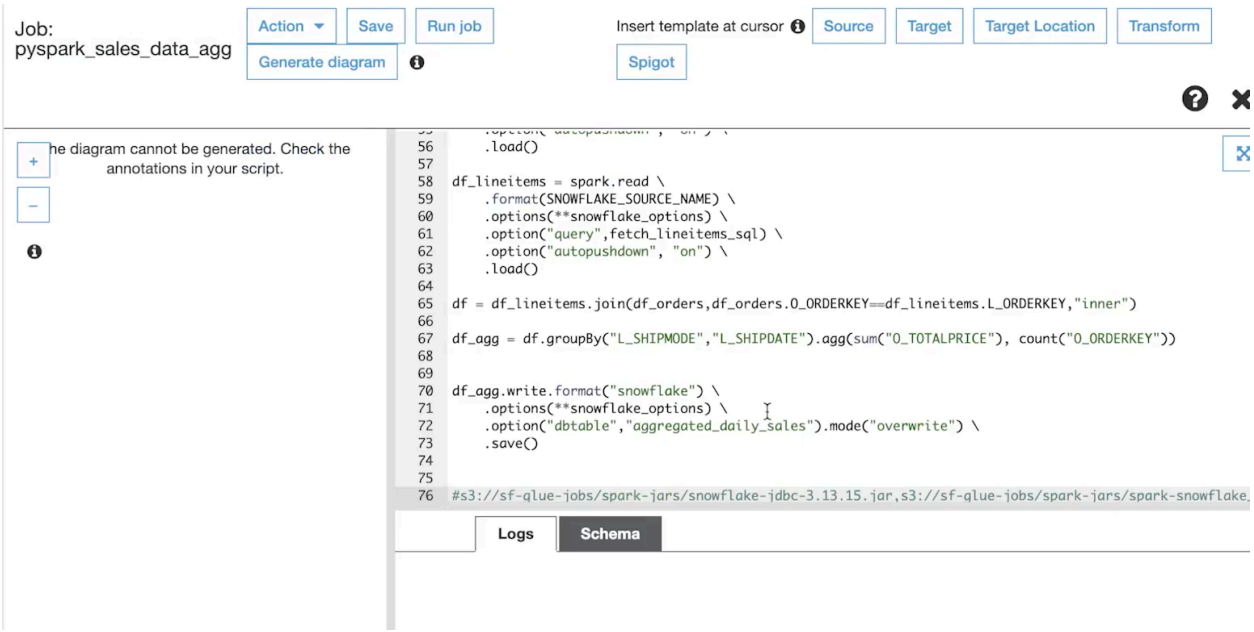


Create Glue job:

Copy and paste the code into AWS Glue:

```
from pyspark.sql import SparkSession
from pyspark import SparkContext
from pyspark.sql.functions import count, avg,sum

spark = SparkSession \
        .builder \
        .appName("Glue-pyspark-test") \
        .getOrCreate()

SNOWFLAKE_SOURCE_NAME = "net.snowflake.spark.snowflake"
snowflake_database="ECOMMERCE_DB"
snowflake_schema="ECOMMERCE_DEV"
source_table_name="ORDERS"

snowflake_options = {
    "sfUrl":"https://myorganization-myaccount.snowflakecomputing.com/",
    "sfUser": "mohamedzuhairka",
    "sfPassword": "",
    "sfDatabase": snowflake_database,
    "sfSchema": snowflake_schema,
    "sfWarehouse": "COMPUTE_WH"
}

# df = spark.read \
#     .format(SNOWFLAKE_SOURCE_NAME) \
#     .options(**snowflake_options) \
#     .option("dbtable",source_table_name) \
#     .option("autopushdown", "on") \
#     .load()


fetch_orderes_sql = """
    select
    O_ORDERKEY,
    O_CUSTKEY,
    O_ORDERSTATUS,
    O_TOTALPRICE,
    O_ORDERDATE
    from orders
"""

fetch_lineitems_sql = """
    select
        L_ORDERKEY,
        L_SHIPDATE,
        L_SHIPMODE
```

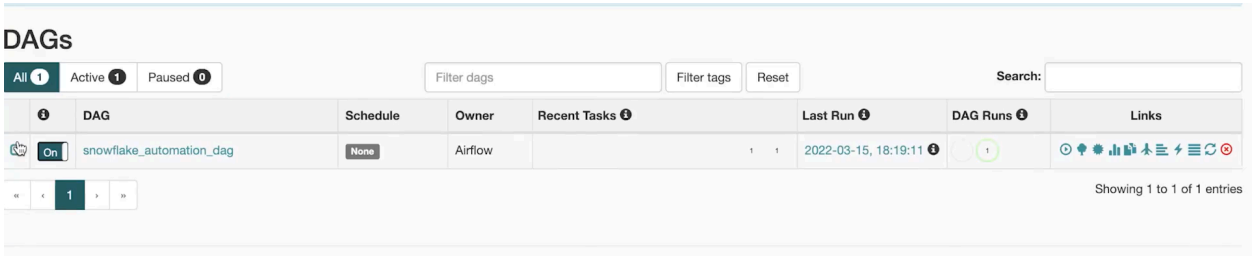
```
    from LINEITEM
    where L_SHIPDATE = '1996-02-13'
"""

df_orders = spark.read \
    .format(SNOWFLAKE_SOURCE_NAME) \
    .options(**snowflake_options) \
    .option("query",fetch_orderes_sql) \
    .option("autopushdown", "on") \
    .load()

df_lineitems = spark.read \
    .format(SNOWFLAKE_SOURCE_NAME) \
    .options(**snowflake_options) \
    .option("query",fetch_lineitems_sql) \
    .option("autopushdown", "on") \
    .load()

df =
df_lineitems.join(df_orders,df_orders.O_ORDERKEY==df_lineitems.L_ORDERKEY,"inner")

df_agg = df.groupBy("L_SHIPMODE","L_SHIPDATE").agg(sum("O_TOTALPRICE"),
count("O_ORDERKEY"))


df_agg.write.format("snowflake") \
    .options(**snowflake_options) \
    .option("dbtable","aggregated_daily_sales").mode("overwrite") \
    .save()


#s3://sf-glue-jobs/spark-jars/snowflake-jdbc-3.13.15.jar,s3://sf-glue-jobs/spark-jars/spark-snow
flake_2.12-2.9.2-spark_3.1.jar
```

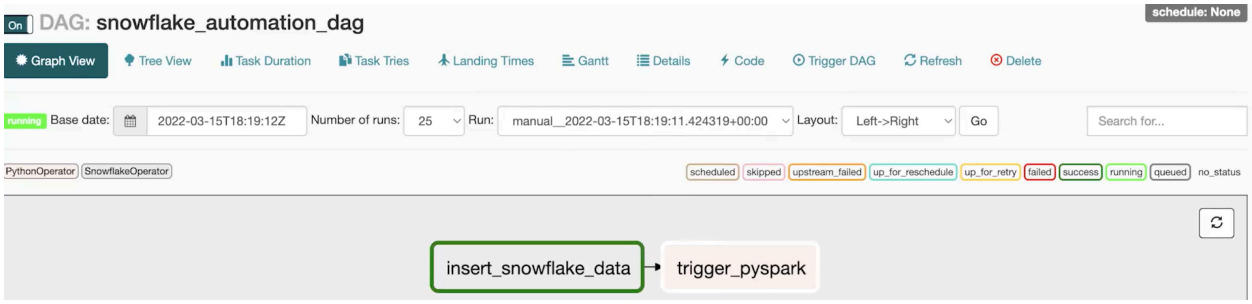


Create a DAG:

```
import logging
import airflow
from airflow import DAG
from airflow.operators.python_operator import PythonOperator
import boto3
from airflow.contrib.operators.snowflake_operator import SnowflakeOperator
from airflow.contrib.hooks.snowflake_hook import SnowflakeHook
from datetime import datetime, timedelta
from botocore.exceptions import ClientError

logging.basicConfig(level=logging.INFO)
logger = logging.getLogger(__name__)

client = boto3.client('glue',region_name='eu-central-1')

args = {"owner": "Airflow", "start_date": airflow.utils.dates.days_ago(2)}

dag = DAG(
   dag_id="snowflake_automation_dag", default_args=args, schedule_interval=None
)

snowflake_query = [
       """
           use role sysadmin;
       """,
       """
           use schema "ECOMMERCE_DB"."ECOMMERCE_LIV";
```

```
        """,
            """copy into lineitem
            from @stg_lineitem_csv_dev
            file_format = csv_load_format
            ON_ERROR = ABORT_STATEMENT;
           """
]

def execute_job(**kwargs) :
    status = client.start_job_run(JobName = "pyspark_sales_data_agg")
    logging.info("GLUE Job Status: %s  Execution Time:
%s",status['JobRun']['JobRunState'],status['JobRun']['ExecutionTime'])

    while True:
        try:
            status = client.get_job_run(JobName=kwargs['glueJobName'],
RunId=status['JobRunId'])
            if status['JobRun']['JobRunState'] == 'SUCCEEDED':
                break

        except ClientError as e:
            logging.info(e)

with dag:

    copy_data = SnowflakeOperator(
        task_id="insert_snowflake_data",
        sql=snowflake_query ,
        snowflake_conn_id="snowflake_conn"
    )


glue_task=PythonOperator(task_id="trigger_pyspark",python_callable=execute_job,execution
_timeout=timedelta(minutes=15))


copy_data >> glue_task
```





Snowflake-Kafka Integration:

Download and install kafka:

Download kafka: https://kafka.apache.org/downloads

3.7.1

- Released Jun 28, 2024
- Release Notes
- Docker image: apache/kafka:3.7.1.
- Source download: kafka-3.7.1-src.tgz (asc, sha512)
- Binary downloads:
  - Scala 2.12 kafka_2.12-3.7.1.tgz (asc, sha512)
  - Scala 2.13 - kafka_2.13-3.7.1.tgz (asc, sha512)

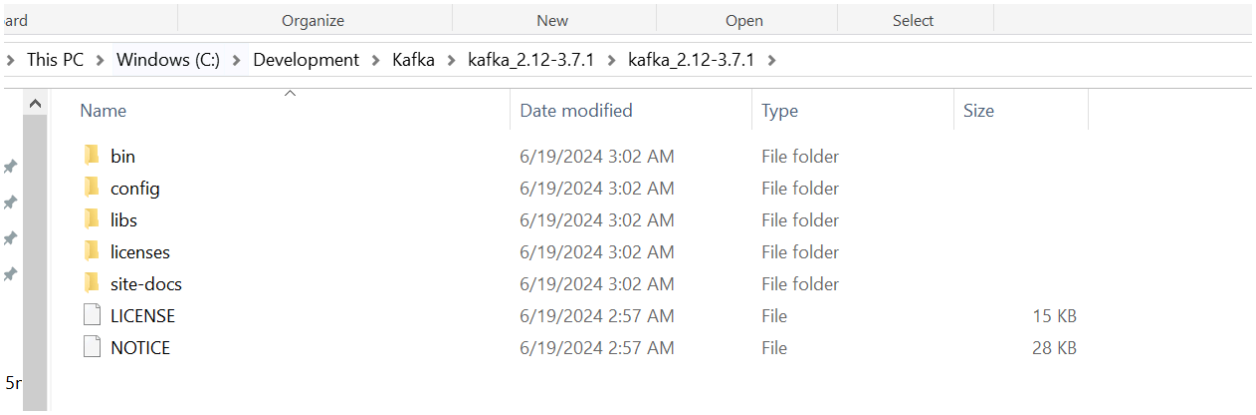
We build for multiple versions of Scala. This only matters if you are using Scal
Otherwise any version should work (2.13 is recommended).

Kafka 3.7.1 includes a significant number of new features and fixes. For more inf
Notes.

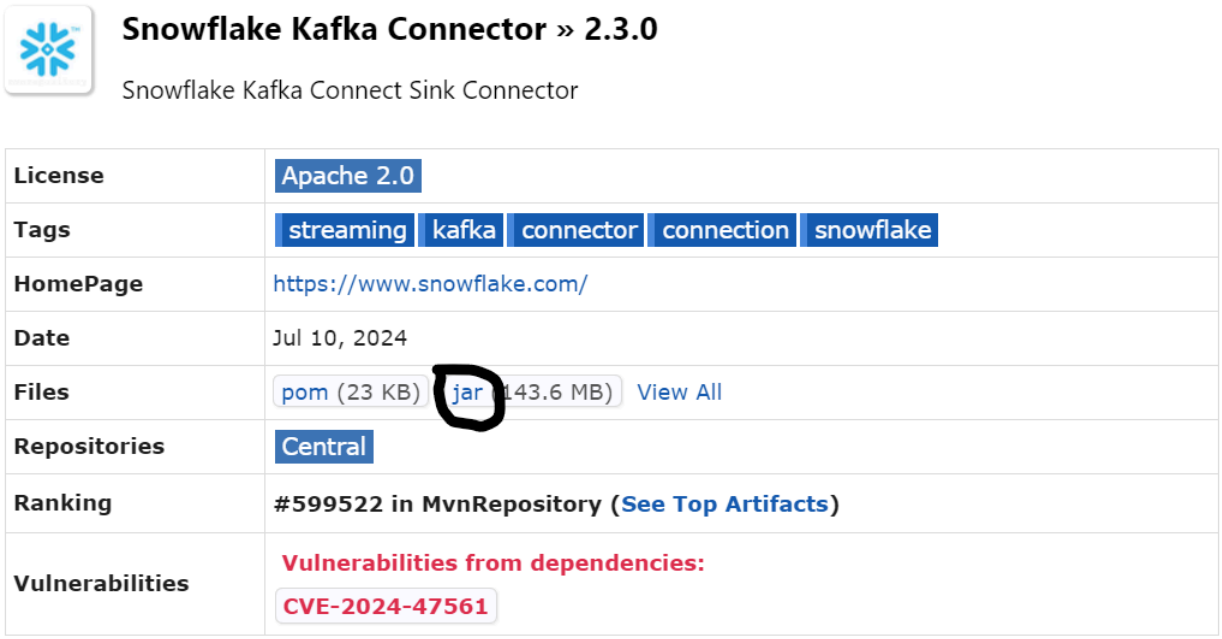
Extract the TGZ File:

- Right-click the `.tgz` file.
- Hover over the **7-Zip** option in the context menu.
- Choose **Extract Here** to extract in the current folder or **Extract to [folder]** to extract in a subfolder.

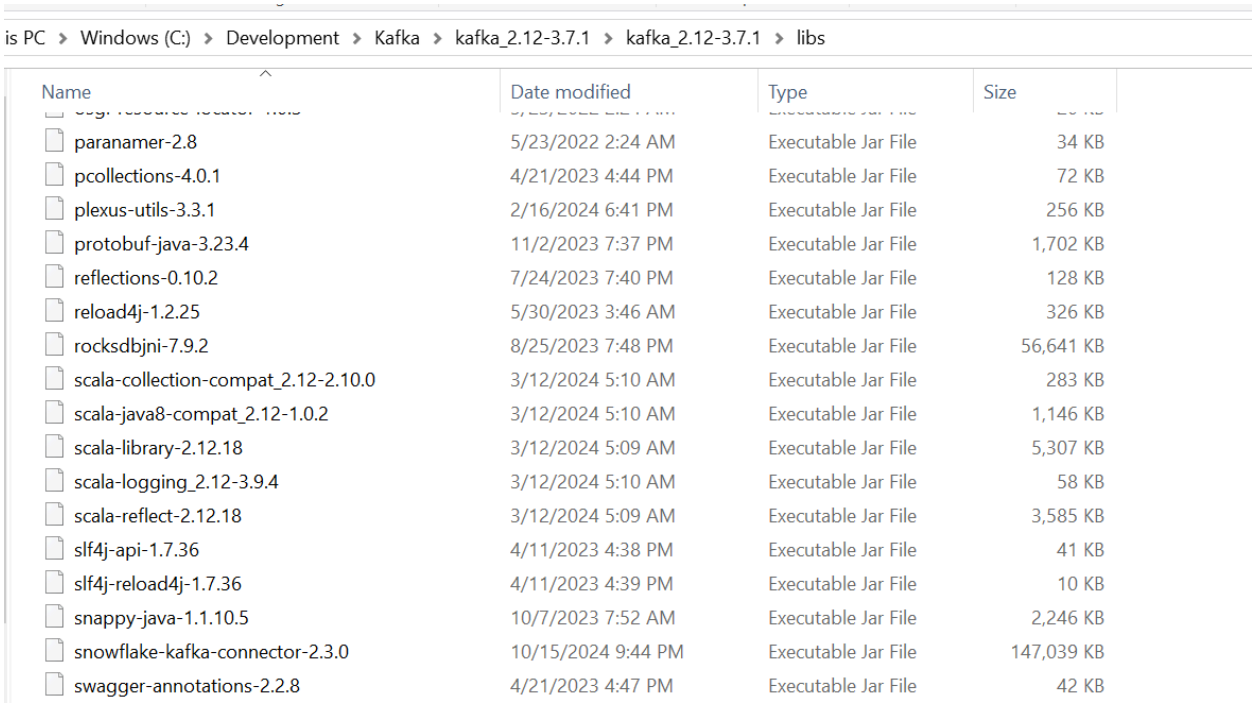
This will first extract the `.tar` file inside the `.tgz`, and then you can extract the `.tar` file again the same way to get its contents.



Download snowflake kafka connector:
https://mvnrepository.com/artifact/com.snowflake/snowflake-kafka-connector



Add the jar under /libs folder:



Follow these steps to complete kafka setup:
https://www.geeksforgeeks.org/how-to-install-and-run-apache-kafka-on-windows/

Setup kafka in local system:

Execute the commands:

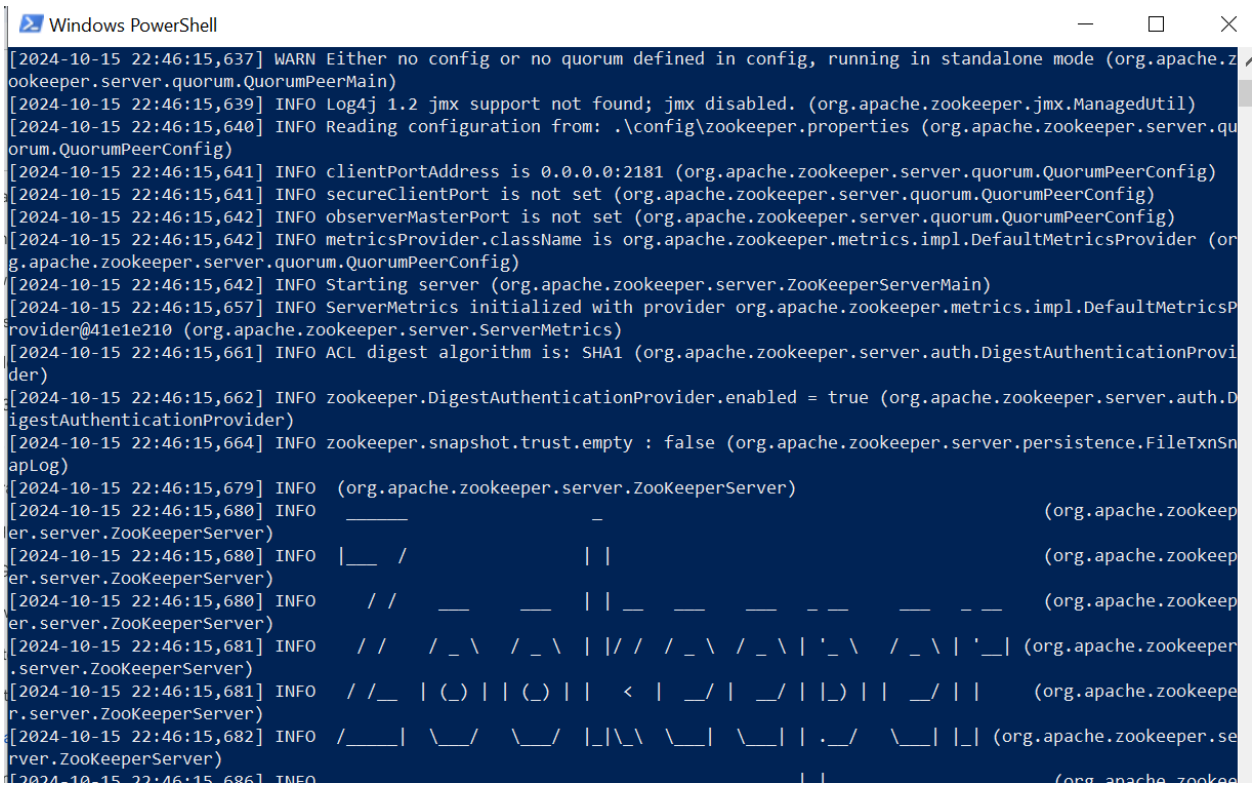
```
# Kafka steps

Step-1 - .\bin\windows\zookeeper-server-start.bat .\config\zookeeper.properties
Step-2 - .\bin\windows\kafka-server-start.bat .\config\server.properties
Step-3 - .\bin\windows\kafka-topics.bat --create --topic sales-data --bootstrap-server
localhost:9092

#  Delete a topic
 - .\bin\windows\kafka-topics.bat --bootstrap-server localhost:9092 --delete --topic test-data

 #  list all topics
 - .\bin\windows\kafka-topics.bat --list --bootstrap-server localhost:9092

Step-4 - .\bin\windows\kafka-console-consumer.bat --topic sales-data --from-beginning
--bootstrap-server localhost:9092
```

Step-5 .\bin\windows\connect-standalone.bat .\config\connect-standalone.properties .\config\SF_connect.properties

You may face the problem like below in command prompt:

```
C:\Development\Kafka\kafka_2.12-3.7.1\kafka_2.12-3.7.1>.\bin\windows\zookeeper-server-start.bat .\config\zookeeper.prope
rties
The input line is too long.
The syntax of the command is incorrect.
```

Try moving the Kafka folder to a location with a shorter path, such as `C:\kafka`. Then, execute the command in powershell instead of cmd.



Copy the below python program and run it.

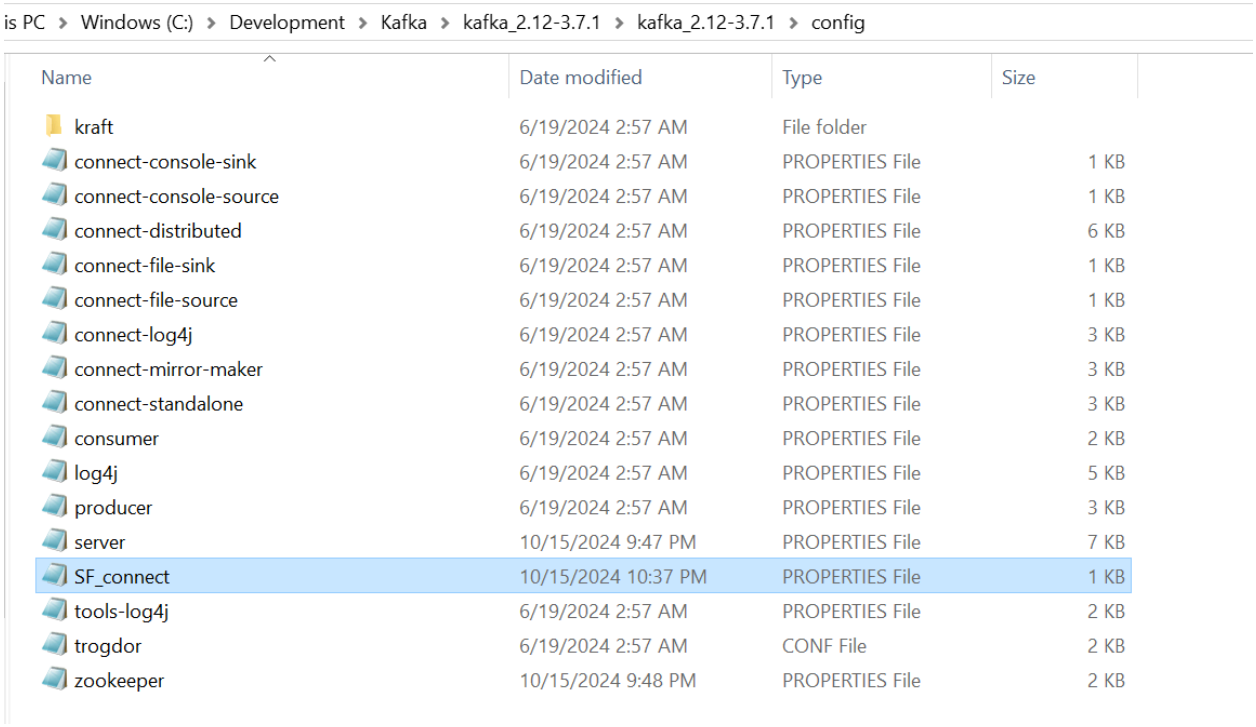
```
import pandas as pd
import random
from faker import Faker
from random import randrange
from datetime import datetime
from time import sleep
from json import dumps
from kafka import KafkaProducer
```

```
nr_of_customers = 100

fake = Faker('de_DE')

customers = dict()

topic_name='sales-data'

producer = KafkaProducer(bootstrap_servers=['localhost:9092'],value_serializer=lambda x:
dumps(x).encode('utf-8'))

for customers_id in range(nr_of_customers):

    # Create transaction date
    d1 = datetime.strptime(f'1/1/2021', '%m/%d/%Y')
    d2 = datetime.strptime(f'8/10/2021', '%m/%d/%Y')
    transaction_date = fake.date_between(d1, d2)

    #create customer's name
    name = fake.name()

    # Create gender
    gender = random.choice(["M", "F"])

    # Create email
    email = fake.ascii_email()

    #Create city
    city = fake.city()

    #create product ID in 8-digit barcode
    product_id = fake.ean(length=8)

    #create amount spent
    amount_spent = fake.pyfloat(right_digits=2, positive=True, min_value=1, max_value=100)

    customers={
            'transaction_date':str(transaction_date) ,
            'name':name,'gender':gender,'city':city,
            'email':email,'product_id':product_id,
            'amount_spent':amount_spent
            }
    print(customers)

    producer.send(topic_name, value=dumps(customers))
    sleep(5)
```

Kafka Snowflake integration:

Copy the below file and place it inside the config folder as “SF_connect.properties”

```
connector.class=com.snowflake.kafka.connector.SnowflakeSinkConnector
tasks.max=8
topics=fake-data
snowflake.topic2table.map=fake-data:sales_data
buffer.count.records=10000
buffer.flush.time=60
buffer.size.bytes=5000000
snowflake.url.name=
snowflake.user.name=mohamedzuhairka
snowflake.private.key=
snowflake.database.name=ecommerce_db
snowflake.schema.name=kafka_liv_schema
key.converter=com.snowflake.kafka.connector.records.SnowflakeJsonConverter
value.converter=com.snowflake.kafka.connector.records.SnowflakeJsonConverter
name=fakedata_kafka_test
```



The below three properties will decide the frequency at which data will be inserted into snowflake:
buffer.count.records=10000
buffer.flush.time=60
buffer.size.bytes=5000000

If any one of the condition is met, then it will insert the records into snowflake.

Also, in connect-standalone.properties file, provide the pluginpath to the libs folder.

```
# Set to a list of filesystem paths separated by commas (,) to enable class loading isolation for plugins
# (connectors, converters, transformations). The list should consist of top level directories that include
# any combination of:
# a) directories immediately containing jars with plugins and their dependencies
# b) uber-jars with plugins and their dependencies
# c) directories immediately containing the package directory structure of classes of plugins and their dependencies
# Note: symlinks will be followed to discover dependencies or plugins.
# Examples:
# plugin.path=/usr/local/share/java,/usr/local/share/kafka/plugins,/opt/connectors,
#plugin.path=C:/Development/Kafka/libs/
```

Create encryption key for connection:

Download openssl and execute the commands

```
# Create an unencrypted private key
openssl genrsa -out rsa_key.pem 2048
```

```
# Create a public key referencing the above private key
openssl rsa -in rsa_key.pem -pubout -out rsa_key.pub
```

```
siddharthraghunath@siddharths-MBP kafka_2.12-3.1.0 % openssl genrsa -out rsa_key.pem 2048
Generating RSA private key, 2048 bit long modulus
.....................................................................+++
.....+++
e is 65537 (0x10001)
siddharthraghunath@siddharths-MBP kafka_2.12-3.1.0 %
```

```
siddharthraghunath@siddharths-MBP kafka_2.12-3.1.0 % ls -l
total 96
-rw-r--r--@   1 siddharthraghunath  staff  14536 Jan 12 13:01 LICENSE
-rw-r--r--@   1 siddharthraghunath  staff  28184 Jan 12 13:01 NOTICE
drwxr-xr-x@  40 siddharthraghunath  staff   1280 Jan 12 13:04 bin
drwxr-xr-x@  23 siddharthraghunath  staff    736 Mar 13 16:17 config
drwxr-xr-x@ 105 siddharthraghunath  staff   3360 Feb  7 23:17 libs
drwxr-xr-x@  12 siddharthraghunath  staff    384 Jan 12 13:04 licenses
drwxr-xr-x  146 siddharthraghunath  staff   4672 Mar 13 16:03 logs
-rw-r--r--    1 siddharthraghunath  staff   1675 Mar 13 19:29 rsa_key.pem
drwxr-xr-x@   3 siddharthraghunath  staff     96 Jan 12 13:04 site-docs
siddharthraghunath@siddharths-MBP kafka_2.12-3.1.0 %
```

```
siddharthraghunath@siddharths-MBP kafka_2.12-3.1.0 % openssl rsa -in rsa_key.pem -pubout -out rsa_key.pub
writing RSA key
siddharthraghunath@siddharths-MBP kafka_2.12-3.1.0 % ls -l
total 104
-rw-r--r--@   1 siddharthraghunath  staff  14536 Jan 12 13:01 LICENSE
-rw-r--r--@   1 siddharthraghunath  staff  28184 Jan 12 13:01 NOTICE
drwxr-xr-x@  40 siddharthraghunath  staff   1280 Jan 12 13:04 bin
drwxr-xr-x@  23 siddharthraghunath  staff    736 Mar 13 16:17 config
drwxr-xr-x@ 105 siddharthraghunath  staff   3360 Feb  7 23:17 libs
drwxr-xr-x@  12 siddharthraghunath  staff    384 Jan 12 13:04 licenses
drwxr-xr-x  146 siddharthraghunath  staff   4672 Mar 13 16:03 logs
-rw-r--r--    1 siddharthraghunath  staff   1675 Mar 13 19:29 rsa_key.pem
-rw-r--r--    1 siddharthraghunath  staff    451 Mar 13 19:29 rsa_key.pub
drwxr-xr-x@   3 siddharthraghunath  staff     96 Jan 12 13:04 site-docs
siddharthraghunath@siddharths-MBP kafka_2.12-3.1.0 %
```

Copy paste the private key in SF_connect.properties (add backlash at every line)

Users > siddharthraghunath > Documents > kafka-snowflake > kafka_2.12-3.1.0 > config > SF_connect.properties

```
buffer.size.bytes=5000000
snowflake.url.name=az32171.eu-central-1.snowflakecomputing.com
snowflake.user.name=siddharth
snowflake.private.key=MIIEowIBAAKCAQEA7c9HXV+qRQD3uB1RiJQ1BYaKFTLyb/eUCGkXpqhp/4/B0Qqy\
YErXL9hqvWR13c1Oy0QChyKhWlq2ZJRKAyBTQu33KKBXfB2qRLwuoMgqI3moiml0\
NgdY1ebj2t5Ec+P+ePY7z5eTH6ODGEqO4khS71mppZ7fq92dGdEEvuPsxNTIYvHy\
qRiq8DEbjS8sxYtUFzj1mzzYqGJZQ6WTdU86eeFQGdDcVQDsEV1mQuFwnqsENjbR\
ZzOSzsH0KPDpipuBogjWgSP/XcF7FUXuS+3P2EVqSAF29WBeVseYcTJCj15W1/L5\
+1ZcuZ+qRgojsPM885YWjPq7Zi4qZAREX3txWQIDAQABAoIBAQCyN3aJ+VmHIPSE\
XCRwMHGT1IHC5U1er7GWo/t/gBL/3OIpINUQ6MVfK9bCXHkgYe480pj6YO9+4SBz\
O9ZDhYQgUmm5XoBxmWGy5Twkbh12PIQcRm861kKy+rejnJK8Lw7T4+Rq7HLrcQSb\
vbRazEyq5w0F+4wwJoLHiCcAT5tu3X4E8pA+0XCyCOjc5p4Fbjtm+/sISqcdFNlN\
uScUdY1vzuy2/rn2sln4Egbf0lVv0mY6BlwmHVgWbUYXW4D4Op14v68pvXEzWDg0\
PEtV5lRMN7IBM6w6n/wQ4i3w2w7xOfWZSeKcbTUO0h9XhIdUFnYGAmvf1hNsM7wU\
qsvylaUBAoGBAPcyYq7HHgezMVcuGXVfW00mq3Xc2Uf+yoSTImQWt8FdTCtiGSAa\
```

Update the public key in snowflake user:

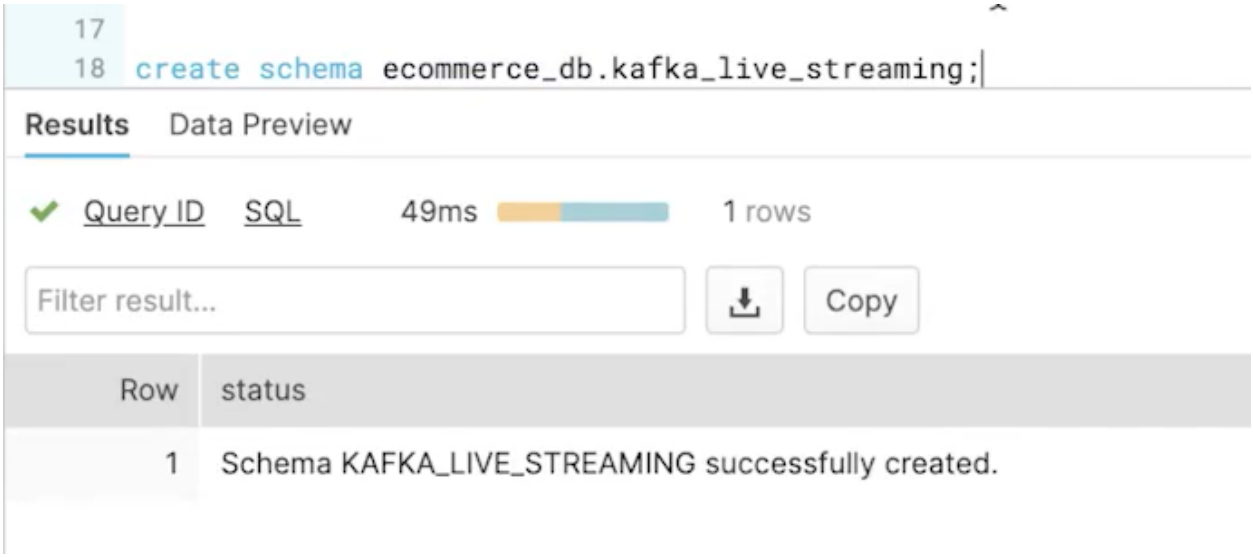
```
use schema ecommerce_db.ecommerce_dev;

alter user siddharth set RSA_PUBLIC_KEY='MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEA7c9HXV+qRQD3uB1RiJQ1
BYaKFTLyb/eUCGkXpqhp/4/B0QqyYErXL9hqvWR13c1Oy0QChyKhWlq2ZJRKAyBT
Qu33KKBXfB2qRLwuoMgqI3moiml0NgdY1ebj2t5Ec+P+ePY7z5eTH6ODGEqO4khS
71mppZ7fq92dGdEEvuPsxNTIYvHyqRiq8DEbjS8sxYtUFzj1mzzYqGJZQ6WTdU86
eeFQGdDcVQDsEV1mQuFwnqsENjbRZzOSzsH0KPDpipuBogjWgSP/XcF7FUXuS+3P
2EVqSAF29WBeVseYcTJCj15W1/L5+1ZcuZ+qRgojsPM885YWjPq7Zi4qZAREX3tx
WQIDAQAB';

desc user siddharth;
```

Stream data in action:

Run the below commands:

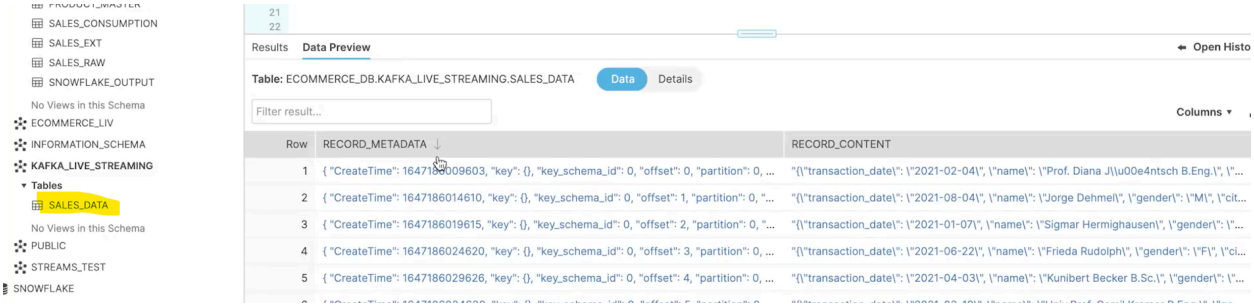
```
# Kafka steps

Step-1 - .\bin\windows\zookeeper-server-start.bat .\config\zookeeper.properties
Step-2 - .\bin\windows\kafka-server-start.bat .\config\server.properties
Step-3 - .\bin\windows\kafka-topics.bat --create --topic sales-data --bootstrap-server
localhost:9092

Step-4 - .\bin\windows\kafka-console-consumer.bat --topic sales-data --from-beginning
--bootstrap-server localhost:9092

Step-5 py fake_data.py

Step-6  .\bin\windows\connect-standalone.bat .\config\connect-standalone.properties
.\config\SF_connect.properties
```

Make sure to create database and schema in snowflake. (As provided names in "**SF_connect.properties**".

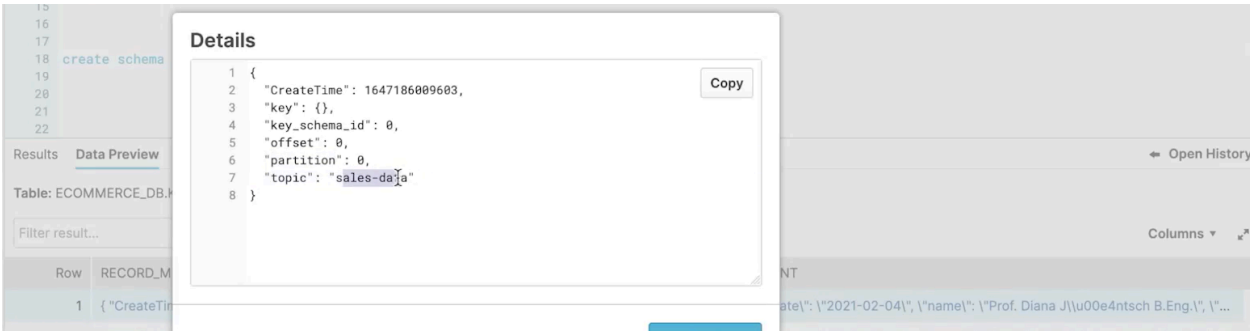


Start the python program(located under (Setup Kafka in local systems) to write data in topics:

After start the connection, once any **three condition** met, it will flush the data into snowflake. And you can see the records in snowflake.



Record metadata:



Time Travel:

```
use role accountadmin;

Use database ECOMMERCE_DB;

Use SCHEMA ECOMMERCE_DEV;

SHOW TABLES;

alter table "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM" set
data_retention_time_in_days=90;

ALTER database ECOMMERCE_DB set data_retention_time_in_days=1;

ALTER schema ECOMMERCE_DB.ECOMMERCE_LIV set data_retention_time_in_days=1;

create table lineitem_test as select * from LINEITEM limit 10;

SELECT * FROM LINEITEM before(timestamp => '2024-10-17 11:00:56.786'::timestamp) limit
10;

SELECT * FROM LINEITEM at(timestamp => '2024-10-17 11:00:56.786'::timestamp) limit 10;

CREATE TABLE LINEITEM_restored CLONE LINEITEM at(timestamp => '2024-10-18
11:00:56.786'::timestamp);

create database testing_db;

alter database testing_db set data_retention_time_in_days=0;

drop database testing_db;

undrop database testing_db;
```

```
create database testing_db;

alter database testing_db set data_retention_time_in_days=1;

drop database testing_db;

undrop database testing_db;
```

```
3  SHOW TABLES;
4
5  alter table "ECOMMERCE_DB"."ECOMMERCE_DEV"."LINEITEM" set data_retention_time_in_days=90;
```

Results | Chart

	created_on	name	database_name
1	2024-10-01 23:27:28.302 -0700	LINEITEM	ECOMMERCE_DB
2	2024-10-05 02:52:12.794 -0700	LINEITEM_CLONE	ECOMMERCE_DB
3	2024-10-01 23:43:52.119 -0700	ORDERS	ECOMMERCE_DB
4	2024-10-14 09:04:47.104 -0700	SPARK_OUTPUT_TABLE	ECOMMERCE_DB
5	2024-10-11 11:20:15.596 -0700	SUPPLIER	ECOMMERCE_DB
6	2024-10-01 23:44:00.010 -0700	ORDERS	ECOMMERCE_DB

Query Details
Query duration 787ms
Rows 93
Query ID 01b7ca1d-0003-ecdc-0...
Show more
created_on Ask Copilo

90 days retention period is for Snowflake enterprise edition.

database_name	schema_name	kind	comment	cluster_by	rows	bytes	owner	rete	automatic_clust	change_tracking	sea
ECOMMERC...	ECOMMERC...	TABLE		LINEAR(L_S...	154616896	4035046912	SYSADMIN	90	ON	OFF	OFI
ECOMMERC...	ECOMMERC...	TABLE			1500000000	41566244864	SYSADMIN	1	OFF	OFF	OFI

```
7  ALTER database ECOMMERCE_DB set data_retention_time_in_days=1;
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 34ms
Rows 1

```
8
9  ALTER schema ECOMMERCE_DB.ECOMMERCE_LIV set data_retention_time_in_days=1;
10
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 65ms
Rows 1

```
15  create table lineitem_test as select * from LINEITEM limit 10;
```

Results | Chart

	status
1	Table LINEITEM_TEST successfully created.

Query Details

Query duration 2.0s

Rows 1

Query ID 01b7ca23-0004-039e-0...

```
17  SELECT * FROM LINEITEM before(timestamp => '2024-10-18 11:00:56.786'::timestamp) limit 10;
18
```

Results | Chart

	L_ORDERKEY	L_PARTKEY	L_SUPPKEY	L_LINENUMBER	L_QUANTITY	L_E
1	5698238502	173336436	8336471	4	44.00	
2	5698474147	20961814	3461817	2	41.00	
3	5698224512	12733887	5233889	2	34.00	
4	5698388194	126980983	1981008	3	34.00	
5	5698087040	174543546	9543581	1	6.00	
6	5698072965	133514607	1014647	2	21.00	

Query Details

Query duration 78ms

Rows 10

Query ID 01b7ca24-0004-039e-0...

Show more

L_ORDERKEY Ask Copilo

```
17  SELECT * FROM LINEITEM before(timestamp => '2024-10-17 11:00:56.786'::timestamp) limit 10;
18
```

Results | Chart

Time travel data is not available for table LINEITEM. The requested time is either beyond the allowed time travel period or before the object creation time.

```
18
19  SELECT * FROM LINEITEM at(timestamp => '2024-10-18 11:00:56.786'::timestamp) limit 10;
```

Results | Chart

	L_ORDERKEY	L_PARTKEY	L_SUPPKEY	L_LINENUMBER	L_QUANTITY	L_E
1	5698238502	173336436	8336471	4	44.00	
2	5698474147	20961814	3461817	2	41.00	
3	5698224512	12733887	5233889	2	34.00	
4	5698388194	126980983	1981008	3	34.00	
5	5698087040	174543546	9543581	1	6.00	
6	5698072965	133514607	1014647	2	21.00	

Query Details

Query duration 364ms

Rows 10

Query ID 01b7ca25-0003-ecdc-0...

Show more

L_ORDERKEY Ask Copilo

```
18
19  SELECT * FROM LINEITEM at(timestamp => '2024-10-17 11:00:56.786'::timestamp) limit 10;
```

Results | Chart

Time travel data is not available for table LINEITEM. The requested time is either beyond the allowed time travel period or before the object creation time.

```
21  CREATE TABLE LINEITEM_restored CLONE LINEITEM at(timestamp => '2024-10-18
    11:00:56.786'::timestamp);
22
```

Results | Chart

	status
1	Table LINEITEM_RESTORED successfully created.

Query Details

Query duration 716ms

Rows 1

```
22
23  create database testing_db;
24
```

Results | Chart

	status
1	Database TESTING_DB successfully created.

Query Details

Query duration 172ms

Rows 1

```
25  alter database testing_db set data_retention_time_in_days=0;
26
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 53ms
Rows 1

```
27  drop database testing_db;
```

Results | Chart

	status
1	TESTING_DB successfully dropped.

Query Details
Query duration 68ms
Rows 1

```
29  undrop database testing_db;
```

Results | Chart

Database TESTING_DB did not exist or was purged.

```
23  create database testing_db;
24
```

Results | Chart

	status
1	Database TESTING_DB successfully created.

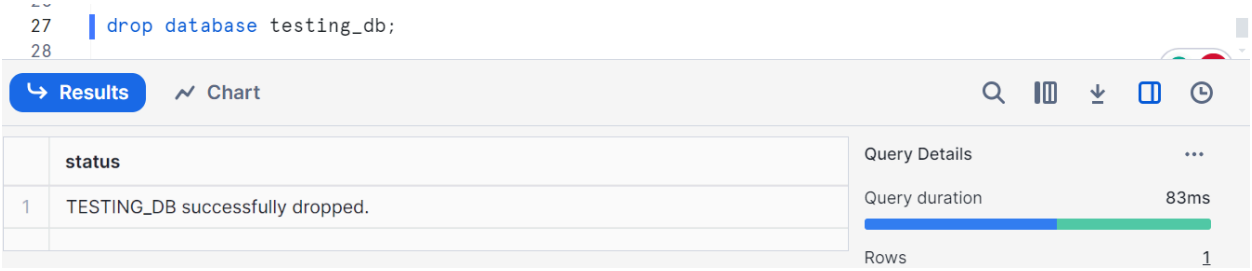
Query Details
Query duration 210ms
Rows 1

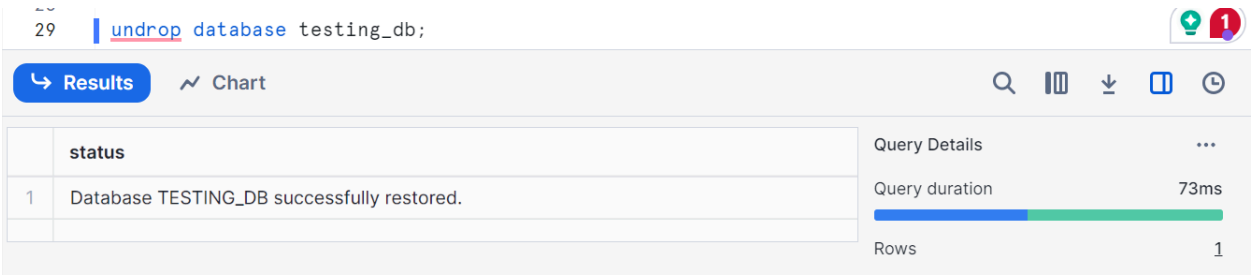
```
25  alter database testing_db set data_retention_time_in_days=1;
```

Results | Chart

	status
1	Statement executed successfully.

Query Details
Query duration 92ms
Rows 1

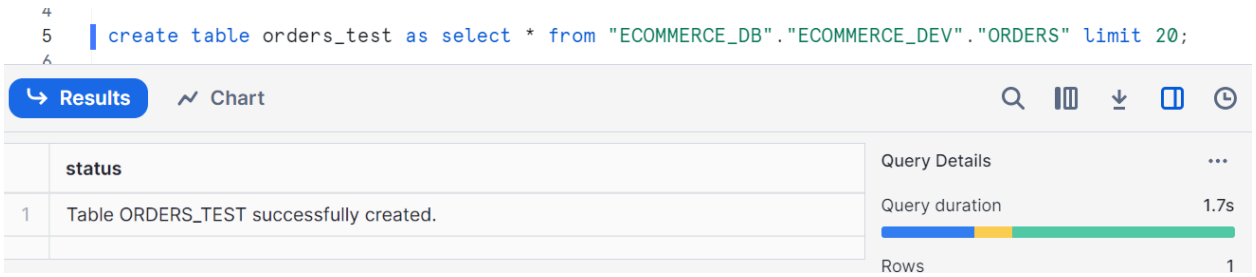


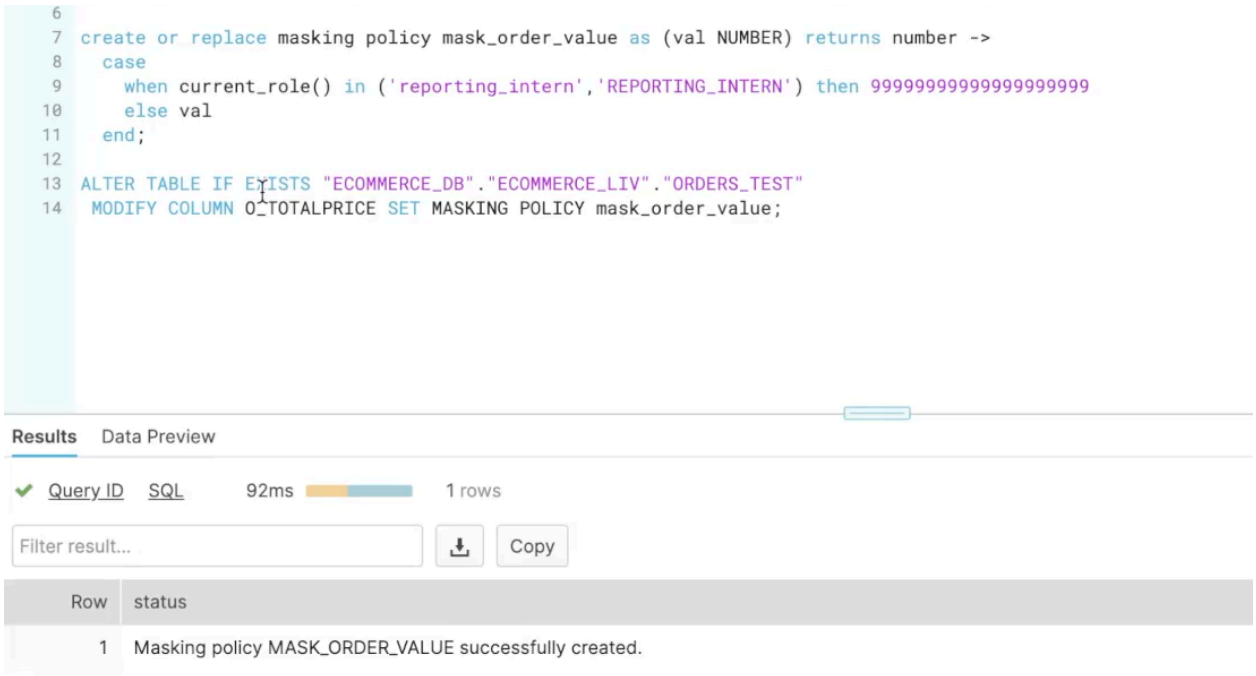


Masking Policy:

```
use role accountadmin;

use "ECOMMERCE_DB"."ECOMMERCE_DEV";

create table orders_test as select * from
"ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS" limit 20;

create or replace masking policy mask_order_value as (val NUMBER) returns number ->
  case
    when current_role() in ('reporting_intern','REPORTING_INTERN') then
9999999999999999999
    else val
  end;

ALTER TABLE IF EXISTS "ECOMMERCE_DB"."ECOMMERCE_DEV"."ORDERS_TEST"
 MODIFY COLUMN O_TOTALPRICE SET MASKING POLICY mask_order_value;

------ Create Role for Column-Level Access Policy - Data Masking --------

create or replace role reporting_intern;
grant usage on warehouse compute_wh to role reporting_intern;
grant usage on database ECOMMERCE_DB to role reporting_intern;
grant usage on schema ECOMMERCE_DB.ECOMMERCE_DEV to role reporting_intern;
grant select on ECOMMERCE_DB.ECOMMERCE_DEV.orders_test to role reporting_intern;
grant role reporting_intern to user siddharth;
```

```
---- Switch the role -------
use role reporting_intern;
use warehouse compute_wh;
---- Test the column level masking policy -------
select * from ECOMMERCE_DB.ECOMMERCE_DEV.orders_test;

----- Remove Column Level Masking  -------

use role accountadmin;
ALTER TABLE orders_test  MODIFY COLUMN O_TOTALPRICE UNSET MASKING POLICY
```





```
12
13 ALTER TABLE IF EXISTS "ECOMMERCE_DB"."ECOMMERCE_LIV"."ORDERS_TEST"
14  MODIFY COLUMN O_TOTALPRICE SET MASKING POLICY mask_order_value;
```

Results Data Preview

Query ID SQL 77ms 1 rows

Filter result... Copy

Row	status
1	Statement executed successfully.

```
18
19 create or replace role reporting_intern;
20
21 grant usage on warehouse prod_xl to role reporting_intern;
22 grant usage on database ECOMMERCE_DB to role reporting_intern;
23 grant usage on schema ECOMMERCE_DB.ECOMMERCE_LIV to role reporting_intern;
24 grant select on ECOMMERCE_DB.ECOMMERCE_LIV.orders_test to role reporting_intern;
25 grant role reporting_intern to user siddharth;
26
27 ---- Switch the role -------
28 use role reporting_intern;
29 use warehouse prod_xl;
30 ---- Test the column level masking policy -------
31 select * from ECOMMERCE_DB.ECOMMERCE_LIV.orders_test;
```

Results Data Preview

Query ID SQL 45ms 1 rows

Filter result... Copy

Row	status
1	Statement executed successfully.

```
32
33 select * from ECOMMERCE_DB.ECOMMERCE_LIV.orders_test;
```

Results Data Preview Open History

Query ID SQL 647ms 20 rows

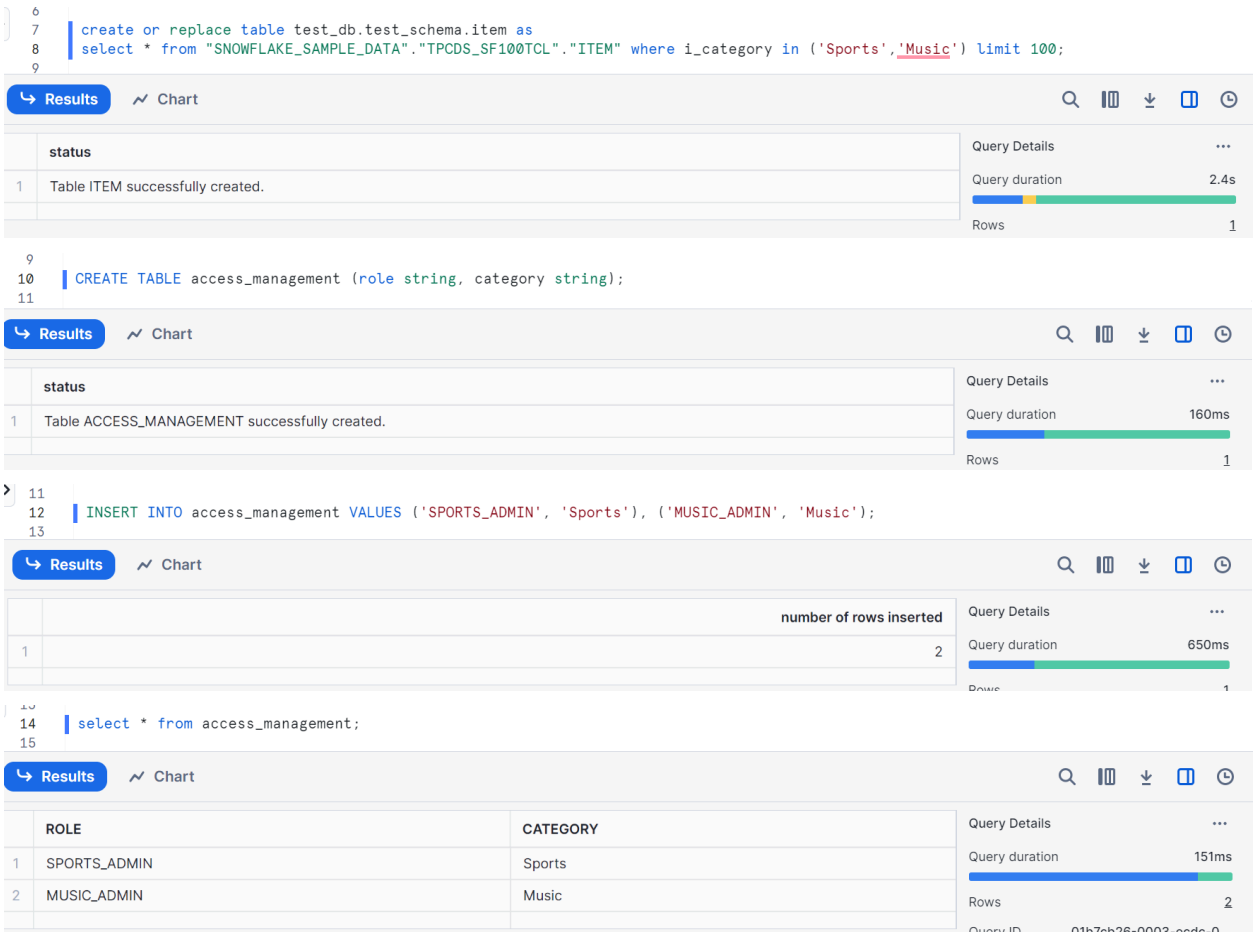
Filter result... Copy Columns

Row	O_ORDERKEY	O_CUSTKEY	O_ORDERSTATUS	O_TOTALPRICE	O_ORDERDATE	O_ORDERPRIORIT	O_CLERK	O_SHIPPRIORITY	O_COMMENT
1	751786246	119293057	O	99999999999999999999.00	1997-07-23	5-LOW	Clerk#00025...	0	furiously abov...
2	2515452133	17075774	O	99999999999999999999.00	1997-07-23	3-MEDIUM	Clerk#00042...	0	y. bold pinto b...
3	750374880	139728394	O	99999999999999999999.00	1997-07-23	5-LOW	Clerk#000199...	0	e final, bold p...
4	2515084836	53753054	O	99999999999999999999.00	1997-07-23	1-URGENT	Clerk#00037...	0	structions. furi...
5	750743682	148530434	O	99999999999999999999.00	1997-07-23	5-LOW	Clerk#00098...	0	according to t...

Row level access policy:

```
use role accountadmin;

create database test_db;

create schema test_schema;

create or replace table test_db.test_schema.item as
select * from "SNOWFLAKE_SAMPLE_DATA"."TPCDS_SF100TCL"."ITEM" where i_category
in ('Sports','Music') limit 100;

CREATE TABLE access_management (role string, category string);

INSERT INTO access_management VALUES ('SPORTS_ADMIN', 'Sports'),
('MUSIC_ADMIN', 'Music');

select * from access_management;

SELECT 1 FROM access_management
  WHERE category = 'Sports'
  AND role = 'SPORTS_ADMIN';

CREATE or replace ROW ACCESS POLICY category_level_access AS
(category_filter VARCHAR) RETURNS BOOLEAN ->
CURRENT_ROLE() = 'ACCOUNTADMIN'
OR EXISTS
(
  SELECT 1 FROM access_management
  WHERE category = category_filter
  AND role = CURRENT_ROLE()
);


ALTER TABLE item ADD ROW ACCESS POLICY category_level_access ON (i_category);

select * from item;

use role accountadmin;

create role SPORTS_ADMIN;

grant usage on warehouse compute_wh to role SPORTS_ADMIN;

grant usage on database TEST_DB to role SPORTS_ADMIN;

grant usage on schema TEST_DB.TEST_SCHEMA to role SPORTS_ADMIN;
```

```
grant select on TEST_DB.TEST_SCHEMA.ITEM to role SPORTS_ADMIN;

grant role SPORTS_ADMIN to user siddharth;

---- Switch the role -------
use role SPORTS_ADMIN;
use warehouse compute_wh;
---- Test the Row Level Access Policy -------
select * from TEST_DB.TEST_SCHEMA.ITEM ;
```



```
create or replace table test_db.test_schema.item as
select * from "SNOWFLAKE_SAMPLE_DATA"."TPCDS_SF100TCL"."ITEM" where i_category in ('Sports','Music') limit 100;
```

Results | Chart

	status
1	Table ITEM successfully created.

Query Details
Query duration 2.4s
Rows 1

```
CREATE TABLE access_management (role string, category string);
```

Results | Chart

	status
1	Table ACCESS_MANAGEMENT successfully created.

Query Details
Query duration 160ms
Rows 1

```
INSERT INTO access_management VALUES ('SPORTS_ADMIN', 'Sports'), ('MUSIC_ADMIN', 'Music');
```

Results | Chart

	number of rows inserted
1	2

Query Details
Query duration 650ms

```
select * from access_management;
```

Results | Chart

	ROLE	CATEGORY
1	SPORTS_ADMIN	Sports
2	MUSIC_ADMIN	Music

Query Details
Query duration 151ms
Rows 2

```
17 CREATE or replace ROW ACCESS POLICY category_level_access AS
18 (category_filter VARCHAR) RETURNS BOOLEAN ->
19 CURRENT_ROLE() = 'ACCOUNTADMIN'
20 OR EXISTS
21 (
22   SELECT 1 FROM access_management
23   WHERE category = category_filter
24   AND role = CURRENT_ROLE()
25 );
26
27 ALTER TABLE item ADD ROW ACCESS POLICY category_level_access ON (i_category);
28
29 select * from item;
30
```

esults Data Preview

Query ID SQL 49ms 1 rows

Filter result... Copy

Row	status
1	Row access policy 'CATEGORY_LEVEL_ACCESS' is successfully created.

```
27 ALTER TABLE item ADD ROW ACCESS POLICY category_level_access ON (i_category);
28
29 select * from item;
30
```

Results Data Preview

Query ID SQL 91ms 1 rows

Filter result... Copy

Row	status
1	Statement executed successfully.

```
29 select count(1) from item;
30
```

esults Data Preview Open History

Query ID SQL 190ms 1 rows

Filter result... Copy Columns

Row	COUNT(1)
1	100