

## **Starburst 101: Hands-on Lab**

**Starburst 101 Hands-on Lab**

## Table of Contents

Lab 1: Introduction and setup	2
Part 1: Lab overview	2
Part 2: Create a Starburst Galaxy account	3
Part 3: Housekeeping	7
Lab 2: Connect to data sources	8
Part 1: Create Amazon S3 catalog	8
Part 2: Create Snowflake catalog	12
Part 3: Create a cluster	14
Part 4: Use Schema Discovery to Ingest your Raw Data	16
Lab 3: Build within your data lake	21
Part 1: Validate the Bronze layer	21
Part 2: Create your schema	22
Part 3: Build the Silver layer	24
Step 4: Federate your data	26
Part 4: Build the Gold layer	26
Part 5: Secure access to your Gold layer	31
Lab 4: Create data products	36
Part 1: Execute global search	36
Part 2: Create a data product	39
Part 3: Create tags (Bonus)	44
Appendix: Section A	46

# Starburst 101 Data Engineer/Data Administrator

## Lab 1: Introduction and setup

### Learning objectives

- Describe the lab scenario and goals.
- Demonstrate how to set up a [free Starburst Galaxy account](#).
- Understand how to continue using Starburst Galaxy after the end of the lab.

### Activities

1. Lab overview
2. Create a Starburst Galaxy account
3. Housekeeping items

## Part 1: Lab overview

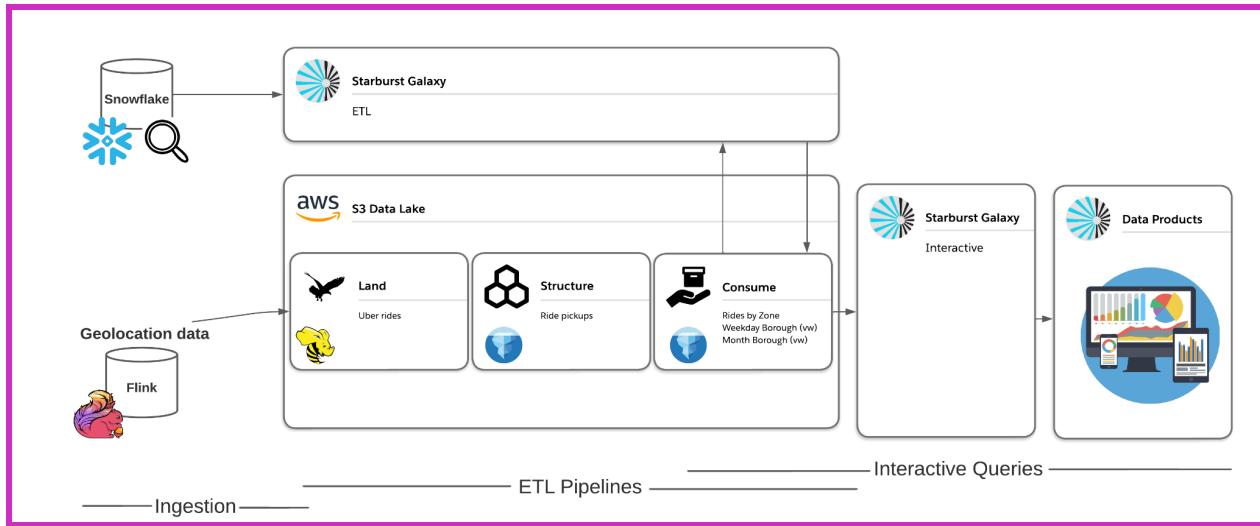
You are a data engineer at Uber. The data science team is running into an issue with not having enough data to train their models. The marketing team doesn't know where to advertise in NYC. You need to help both teams by discovering, transforming, and cleaning the data from multiple sources.

### Step 1 - Purpose of lab

You are a data engineer at Uber. The data science team is running into an issue with not having enough data to train their models. The marketing team doesn't know where to advertise in NYC. You need to help both teams by discovering, transforming, and cleaning the data from multiple sources. You will create a data product for each specific team. This lab uses [Uber pickup data](#) from New York City, January to June 2015 and is ingested into AWS S3. The dataset contains information about each pickup, including pickup\_time, location\_id, dispatching\_base, and affiliated\_base. Because you will be simulating near-real-time pickup information, you will notice many rows. To help manage this, the ingested data is partitioned in AWS S3 by both year and month. Importantly, you do not have any information about the specific location statistics. This is contained in separate snowflake lookup tables. This information is derived from each zone and is recorded by location\_id.

### Step 2 - Description of activities

To make sense of data from multiple sources, you will need to federate across Snowflake and AWS S3. To do this, you will begin by creating a reporting structure in your data lake. You will use Starburst Galaxy to read the data in the Bronze layer, then clean and optimize that data into more performance Parquet files in the Silver layer. In the last step, you will join the Location information from Snowflake with the geolocation pickup information in AWS S3 into a single table that is cleaned and ready to be utilized by our teams. After completing the discovery, location, governance, and query stages, you will end the lab by creating data products, which package the dataset in a curated way for easy consumption.



### Step 3 - Data challenge

This data challenge involves two key missions:

- Create a final table output for our data scientists to run models.
- Answer the following business question from the marketing department. This will be used to plan marketing campaigns that generate more business.
  - **Question:** What is the most popular day of the week for each borough?
  - **Objective:** Plan marketing campaigns for each borough based on popularity.
  - **Approach:** You create a specific view for each borough and day.

## Part 2: Create a Starburst Galaxy account

Now it's time to create a [Starburst Galaxy account](#). If you already have one, you can use that. If not, follow the steps below.

### Step 1 - Create a Starburst Galaxy domain

Navigate to the [Starburst Galaxy homepage](#). Enter your First Name, Last Name, and Email address. Click the **Create Account** button.

First Name \*:

Last Name \*:

Business Email \*:

**Create Account**

By clicking **Create Account**, you agree to Starburst Galaxy's [terms of service](#) and [privacy policy](#).

## Step 2 - Enter your confirmation code

Go to your email inbox and get the code you were just sent from the subject line of the email.

### Confirm your email address

Your confirmation code is below. Enter it in your open browser window and we'll help you get signed in. This code will expire in 24 hours.

129-102

If you didn't request this email, there's nothing to worry about. You can safely ignore it.

Go back to the Starburst Galaxy login, and enter the code. As soon as you type the last digit the verification process will start.

 **Enter your email address**

 **2 Enter the code sent to your email**

We sent a 6-character code to  
[monica.miller+starburst@starburstdata.com](mailto:monica.miller+starburst@starburstdata.com).  
The code expires shortly, so enter it soon.

1    2    9    –    1    0    2



 **3 Choose a domain**

### Step 3 - Choose a domain name

Select a meaningful domain name according to the guidelines provided. Click the **Create account** button.

 **Enter your email address**

 **Enter the code sent to your email**

 **3 Choose a domain**

Select a meaningful domain for your account, this cannot be changed later. Domains can only be 4-32 characters long, must start with a letter, and may only contain letters or numbers.

monicamiller04 



## Step 4 - Create a password

Enter a memorable and meaningful password. Click the **Create account** button.

### Create password for account

Finish creating account for username:  
**monica.miller+starburst@starburstdata.com**

Password must be at least 8 characters long.

Password \*  ..... ... eye

**Create account**

## Step 5 - Answer the entrance survey

Read through the introductory onboarding information. Provide answers accordingly. If you do not know what to answer for a sign-up reason, put **Starburst training or certification**.

### Welcome to Starburst Galaxy!

Tell us a little about yourself so we can help get you started

- What is your main reason for signing up?

Starburst training or certification

- What is your role?

- What are you hoping to achieve with Galaxy?

**Continue**

## Step 6 - Navigate around the UI

Close the in-app product tour as you will go through this throughout the lab.

SQL in the query editor'. Below the list are two buttons: 'Connect your data' (purple) and 'Test sample data' (white). The background shows a snippet of SQL code starting with '6 c.custkey,'." data-bbox="112 130 888 436"/>

```
6 c.custkey,
7 c.last_name,
8
9
10
11
12
13
14
```

Hello! Get started with Galaxy in 3 easy steps:

- Create a catalog to connect your data source
- Attach the catalog to a cluster to enable querying
- Explore your data using [SQL](#) in the query editor

[Connect your data](#) [Test sample data](#)

You will land on the query editor - let the lab take it from here.

## Part 3: Housekeeping

As part of Starburst 101, the credentials for Amazon S3 and Snowflake will be available for one week. It is critical to understand that after 04/26/2024 (April, 26th, 2024), **YOU WILL BE UNABLE TO RUN ANY QUERIES AGAINST THE TWO CATALOGS CREATED IN THIS LAB.**

If you want to continue exploring Starburst Galaxy, here are some other free projects and helpful links you can utilize with your Starburst Galaxy account:

- [Federate multiple data sources tutorial](#)
- [Starburst Academy](#)
  - [Starburst Galaxy courses](#)
  - [Data Foundations courses](#)
  - [Learn SQL courses](#)
  - [Starburst Foundations](#)
- [Starburst Galaxy documentation](#)
- [Near Real-Time Ingestion tutorial](#)

For questions about the lab material, please reach out to monica.miller@starburstdata.com.

## END OF LAB EXERCISE

# Lab 2: Connect to data sources

## Learning objectives

- Describe the process for creating catalogs that connect AWS S3 and Snowflake.
- Demonstrate how to create a cluster in Starburst Galaxy.

## Activities

1. Create Amazon S3 catalog
2. Create Snowflake catalog
4. Create a cluster
5. Grant location-based access control

## Part 1: Create Amazon S3 catalog

### Objective

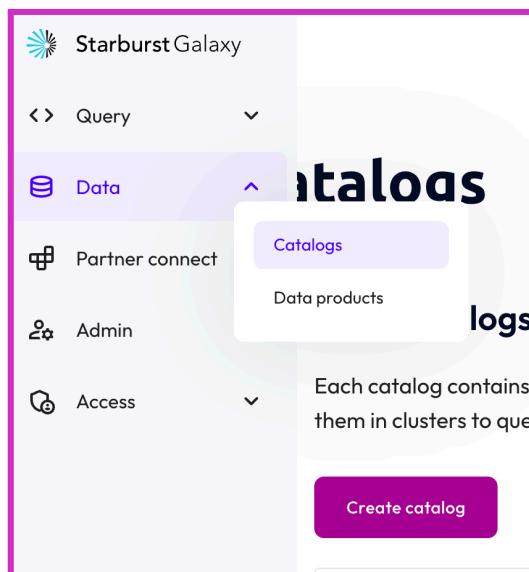
You're going to begin by setting up an AWS S3 catalog in Starburst Galaxy and connect the Uber ride share data.

### Step 1 - Sign in and verify your role

Sign in to Starburst Galaxy. Use the account credentials you previously created. In the upper right corner of the screen, confirm that your role is set as `accountadmin`.

### Step 2 - Create Amazon S3 catalog

Navigate to the **Catalogs** pane on the left-hand side of Starburst Galaxy. Select the **Create catalog** button to create your first catalog.



Select **Amazon S3** as your first data source.

## Select a data source

Each catalog can be configured to access one data source. Once configured, you will add this catalog to a cluster to start querying in Starburst Galaxy.

### Object storage

S3, ADLS, and GCS object storage catalogs support [Iceberg](#), [Hive](#), [Delta Lake](#), and [Hudi](#) tables. Tabular automatically manages Iceberg tables on S3. [Learn about Warp Speed](#) to query S3 at high speed.



Amazon S3



Azure Data Lake Storage



Google Cloud Storage



Tabular

Use the information below to configure your catalog. It will query objects in Amazon S3, specifically the NYC rideshare data in your data lake. Provide the necessary credentials to authenticate the connection.

**Catalog Name:** nyc\_uber\_rides

**Description:** NYC uber ride information for 2015

**Authentication with:** AWS ACCESS KEY (select the radio button AWS access key)

Access Key: AKIAYUW62MUV4S5VAI6D

Secret Key: O0GoTb0Ww3BapKd0NMq1EW6UWrFd8W7QdktGs9gi

**Metastore type:** Starburst Galaxy

**Default S3 bucket name:** starburst101-handsonlab

**Default directory name:** **your-name** (ex: monica-miller)

Allow creating external tables - YES

Allow writing to external tables - YES

**Default table format:** Iceberg

### Metastore configuration

Configure access to the metastore to provide metadata and mapping information about the objects stored in Amazon S3.

Metastore type \*

Starburst Galaxy    AWS Glue    Hive Metastore

Default S3 bucket name \*  
starburst101-handsontlab (?)

Default directory name \*  
monica-miller (?)

Allow creating external tables (?)

Allow writing to external tables (?)

### Default table format

Select the default table format used for creating new tables.  
The catalog will be able to read from any type. [Check out our docs](#) to learn more.

Default table format \*

Iceberg    Hive    Delta Lake

Validate the connection by hitting **Test connection**. Your catalog should return the same message indicating that you can now add the catalog.

### Test connection

Validate that the network configuration allows Starburst Galaxy to connect to the data source.

Detected regions:

- aws US East (Ohio) 

 Hooray! You can now add this catalog to a cluster.

**Test connection**

**Back** **Connect catalog**

Select **Connect catalog**. This will save the credentials for your Amazon S3 catalog.

## Step 3 - Set permissions

Next, accept the default permissions for your catalog by selecting the button **Save access controls**.

**Role-level permissions**

The following roles will be able to read and write data and metadata in this catalog, including creating and deleting schemas and tables. The specific privileges included are detailed in [the documentation](#).

Roles with read and write access  
accountad... 🔒

The following roles will be able to read data and metadata from all schemas and tables within this catalog, as described in [the documentation](#).

Roles with read access  
accountad... 🔒

**Save access controls**

## Step 4 - Skip Add to cluster

Finally, you will be asked if you want to add your newly created catalog to a cluster. Select **Skip**. You will create a cluster later in the lab exercise.

### Add to cluster

Attach your **nyc\_uber\_rides** catalog to a cluster in order to query your data. You may add it to an existing cluster in the same region, or create a new cluster.

**Add to cluster**

Select clusters

+ Create a new cluster

**Skip** **Add to cluster**

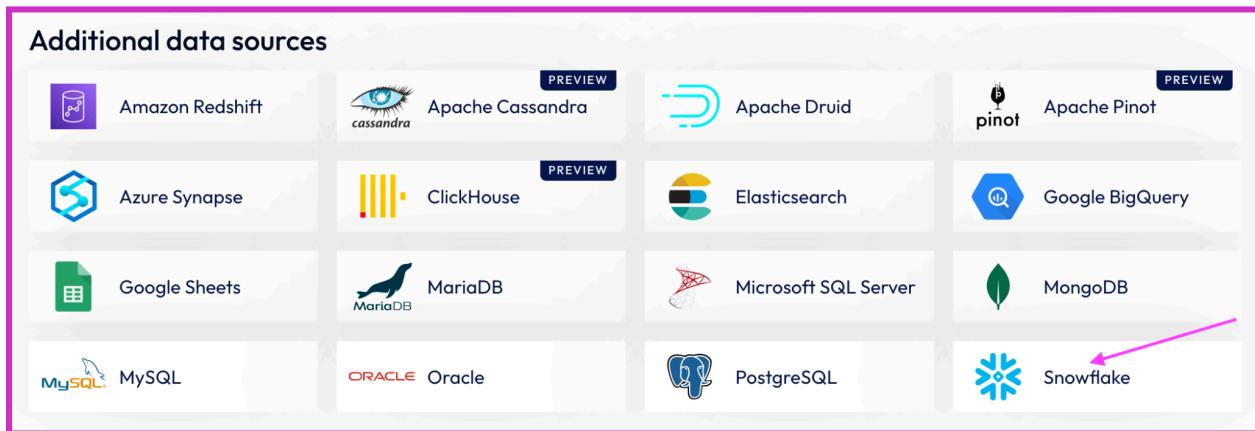
## Part 2: Create Snowflake catalog

### Objective

Now it's time to create a Snowflake catalog alongside your AWS S3 catalog. Later, this will allow us to federate across the two data sources.

### Step 1 - Create Snowflake catalog

From the catalog page, select the **Create catalog** button to create your second catalog. Choose **Snowflake**.



Using the list below as a guide, configure your catalog to query objects in Snowflake, specifically the zone information. Provide the necessary credentials to authenticate the connection.

**Cloud Provider:** AWS

**Catalog Name:** taxi\_zone\_lookup

**Description:** Taxi zone lookup information for NYC

**Snowflake account identifier:** TB03263.us-east-2.aws

**Username:** SB\_GALAXY

**Password:** Pl7n5y&F@ll\$

**Database name:** NYC\_RIDESHARE

**Warehouse name:** SB\_101

**Snowflake role:** STARBURST\_101

**Test** the connection to ensure that the setup is correct.

Select **Connect catalog** to save the credentials for your Snowflake catalog.

## Step 2 - Set permissions

Next, accept the default permissions for your catalog by selecting the button **Save access controls**.

**Role-level permissions**

The following roles will be able to read and write data and metadata in this catalog, including creating and deleting schemas and tables. The specific privileges included are detailed in [the documentation](#).

Roles with read and write access  
accountad... 🔒

Roles with read access  
accountad... 🔒

**Save access controls**

## Step 3 - Skip Add to cluster

Finally, you will be asked if you want to add your newly created catalog to a cluster. Select **Skip**. You will create a cluster later in the lab exercise.

### Add to cluster

Attach your **nyc\_uber\_rides** catalog to a cluster in order to query your data. You may add it to an existing cluster in the same region, or create a new cluster.

**Add to cluster**

Select clusters

+ Create a new cluster

**Skip** **Add to cluster**

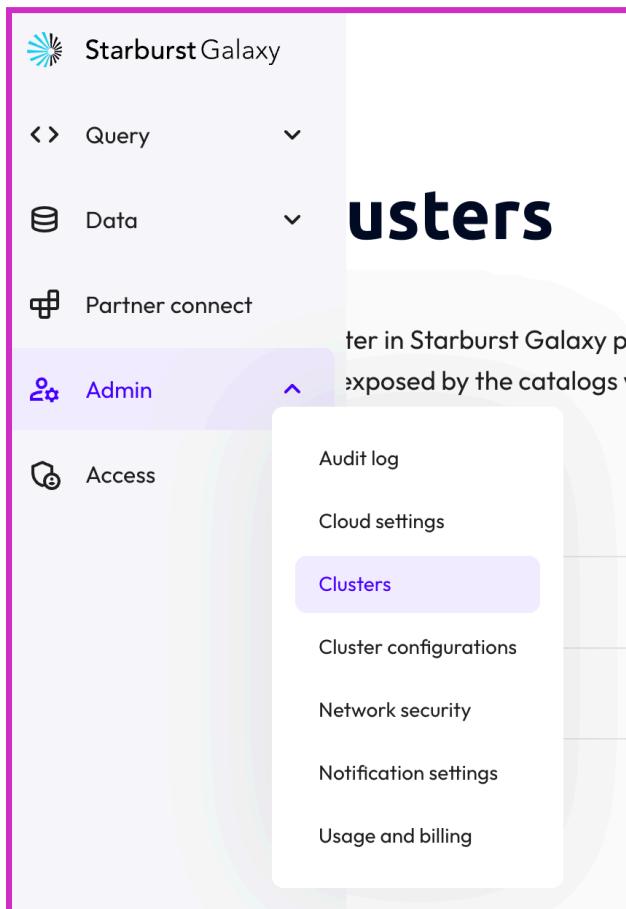
## Part 3: Create a cluster

### Objective

Now it's time to create a cluster to help you execute queries against your catalogs. To federate data from multiple sources, you need to add catalogs to the same cluster.

### Step 1 - Navigate to the Clusters pane

To begin, navigate to the Clusters pane on the left-hand side of your Galaxy browser window.



### Step 2 - Create cluster

Select **Create cluster**. Populate the cluster with the information below. Use the check boxes to select the catalogs. When complete, select **Create cluster**.

**Cluster name:** nyc-ride-info

**Catalogs:** nyc\_uber\_rides & taxi\_zone\_lookup

**Cloud provider region:** US East (Ohio)

**Execution mode:** Standard

**Cluster type:** Free (Can upgrade to anything you like if you are just signing up)

**Idle Shutdown time:** 30 Minutes

## Create cluster

**Name and data**

Learn more about [catalogs](#)

Cluster name \*  Must start with a letter and only contain letters, numbers, and hyphens.

Catalogs  Cloud provider region \*

**Query result caching**

Get more information about utilizing [query result set caching](#)

Cache query results for improved query performance

Cache reuse period:  Minutes  Minimum: 5 minutes, Maximum: 12 hours

**Execution mode**

See help on selecting the right [execution mode](#)

Execution mode \*  Standard

**Uptime**

Learn more about [automatic idle shutdown](#)

5 Minutes

**Size**

Get guidance on selecting the right cluster size

Cluster size \*  Set a fixed size or autoscale between min and max workers

0  0

**Access**

Allow users the ability to [query data connected to this cluster](#)

Roles

You will now see your newly created cluster, similar to the image below.

**Clusters**

A cluster in Starburst Galaxy provides the resources to run queries against numerous catalogs. You can access the data exposed by the catalogs with the query editor or other clients.

Name ↑	Status	Quick actions	Execution mode	Enabled	Connect
nyc-ride-info	✓ Running		<input checked="" type="radio"/> Standard	<input checked="" type="checkbox"/>	<input type="button" value="Connection info"/> <input type="button" value="⋮"/>
sample	Suspended	<input type="button" value="Resume"/>	<input checked="" type="radio"/> Standard	<input checked="" type="checkbox"/>	<input type="button" value="Connection info"/> <input type="button" value="⋮"/>

## Part 4: Use Schema Discovery to Ingest your Raw Data

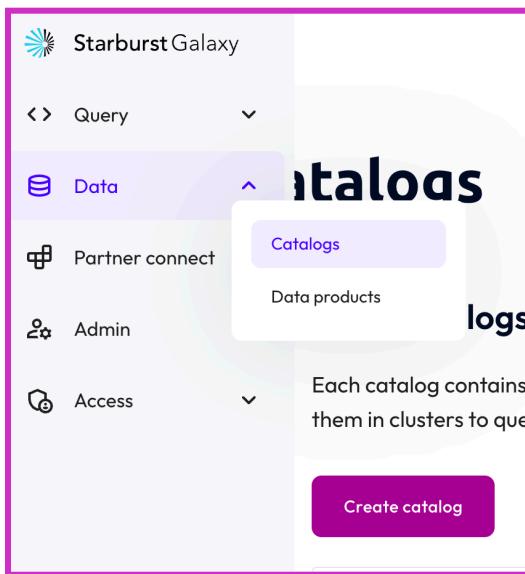
### Objective

One of the most difficult parts of data engineering is discovering where your data lives, or convincing someone to let you view the data so you can accurately build the data pipeline requested by another team. Starburst Galaxy utilizes schema discovery so that you can automatically discover and access the data located in your data lake.

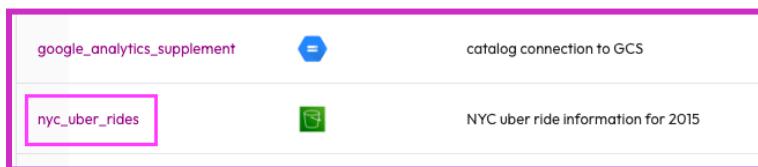
In this section, you will use schema discovery S3 object storage location so that you can execute queries within the data lake. Schema discovery will act as the Bronze layer, our raw data layer that is the first level in our data lake reporting structure.

### Step 1 - Navigate to your newly created AWS catalog

Navigate to the **Catalogs** section on the left-hand side of Starburst Galaxy.



Click on the **nyc\_uber\_rides** catalog to navigate to the catalog metadata page.



The catalog metadata is critical for storing all the information surrounding your data. This information will help you create a well informed, curated data product later in the lab. It is an important data practice to always provide as much information as possible to the data you are discovering, transforming, and curating.

## Step 2 - Run Schema discovery

As part of Gravity, you can see all the metrics, schemas, query history, audit log, privileges, and more within the catalog metadata!

Click on the **Schema discovery** tab. Hit the **Run schema discovery** button.

The screenshot shows the Starburst Galaxy interface with a catalog named 'nyc\_uber\_rides'. The 'Schema discovery' tab is active. In the center, there's an illustration of an astronaut floating in space. Below it, a message asks if you want to search for new schemas. At the bottom right, there's a large purple button labeled 'Run schema discovery'.

The Schema discovery pane lets you examine the metadata of the specified object storage location. Schema discovery is for catalogs in object storage data sources only.

Use schema discovery to identify and register tables or views that are newly added to a known schema location. For example, a logging process might drop a new log file every hour, rolling over from the previous hour's log file. The purpose of schema discovery is to find the newly added files to make sure Starburst Galaxy knows how to query them.

Enter the following information, including the catalog location URI, the default schema name, the type of discovery.

**Catalog location URI:** `s3://starburst101-handsonlab-nyc-uber-rides/year_month/`

**Check the Add location privilege checkbox?** YES

**Default Schema:** `discovered_schema`

**Type of discovery:** Full discovery

## Run discovery

lines or the max files per table.

Catalog location URI \*  
s3://starburst101-hands-on-lab-nyc-uber-rides/year\_month/

This role does not have privileges to access this location. Would you like us to add the missing location privilege for this catalog?

Add location privilege

Default schema \*  
discovered\_schema

**Advanced settings**

Type of discovery

Incremental discovery from last run  Full discovery

Data sample options

Max sample file lines  
10

Max files per table  
5

**Cancel** **Run discovery**

Hit **Run discovery**. Starburst will start scanning for you. Then, it will return code to create your desired schema and table. Notice the 6 partitions that will create the year\_month table in the discovered schema. Select all table and then hit **Create all tables**.

Schema discovery

### Select schemas

Select all or specific schemas or tables to create in your Galaxy account. Learn how to [run schema discovery](#)

**Cancel** **Create all tables**

Schema ↑	Tables	Partitions	Path
<input checked="" type="checkbox"/> discovered_schema	1	6	s3://starburst101-hands-on-lab-nyc-uber-rides
<input checked="" type="checkbox"/>	year_month		s3://starburst101-hands-on-lab-nyc-uber-rides/year_month/

## Lab Guide: Starburst 101 - Data Engineer/Data Administrator (v1.0.0)

Schema discovery has done the heavy lifting so you don't have to spend time trying to investigate what columns exist, or bother your AWS administrator to give you details about the file.

The screenshot shows the 'Log events' section of the Starburst UI. It displays a table of query executions completed successfully. The table has columns for Status, Timestamp, Query text, and Message.

Status	Timestamp	Query text	Message
✓	Feb 20, 2024, 7:41:04 AM	CREATE SCHEMA IF NOT EXISTS "nyc_uber_rides"."discovered_schema" WITH (location = 's3://starburst101-hands-on-lab-nyc-uber-rides')	Created schema: [discovered_schema], with location: [s3://starburst101-hands-on-lab-nyc-uber-rides]
✓	Feb 20, 2024, 7:41:05 AM	CREATE TABLE "nyc_uber_rides"."discovered_schema"."year_month" ( "dispatching_base" varchar, "pickup_date" varchar, ... )	Created table: [year_month], with location: [s3://starburst101-hands-on-lab-nyc-uber-rides]
✓	Feb 20, 2024, 7:41:06 AM	CALL nyc_uber_rides.system.sync_partition_metadata('discovered_schema', ...)	Continuing previous operation

Click on the Query text to view the full queries. Your first query created the desired schema, and the second query created a Hive table. After you are done, Hit **Close**.

You will see a record of schema discovery in the catalog metadata.

The screenshot shows the catalog metadata for 'nyc\_uber\_rides'. It includes a description ('NYC uber ride information for 2015'), tags (0), contacts (0), and owner ('accountadmin'). The 'Schema discovery' tab is selected, showing 1 entry. A table below lists the discovery log, showing a single entry for the schema creation.

Source	Timestamp	Status	Changes	Log
s3://starburst101-hands-on-lab-nyc-uber-rides...	Feb 20, 2024, 7:08:14 AM	✓ applied 1 minute ago	1 new tables	<a href="#">View log</a> <a href="#">Rerun</a>

## Step 3 - Validate schema discovery

Navigate to the **Query editor**.

The screenshot shows the Starburst Galaxy web interface. The top navigation bar has a logo and the text "Starburst Galaxy". Below it, a navigation menu is open, with "Query" selected. Other options in the menu include "Data", "Partner connect", "Admin", and "Access". To the right of the menu, there is a search bar with a placeholder "Select cluster" and a dropdown menu with the same placeholder. The main content area contains a code editor with the following SQL query:

```

1 SELECT * FROM "nyc_uber_rides"
2
3 SHOW CREATE TABLE
4
5 SELECT DISTINCT Cy
6 BY year_month;
7
8 CREATE SCHEMA nyc_

```

If you already have queries, add a new tab using the fuschia plus sign. Change the location drop-downs in the top left hand corner to match the cluster and catalog previously created.

**Cluster:** nyc-ride-info

**Catalog:** nyc\_uber\_rides

A screenshot of the Starburst Galaxy interface showing the location dropdowns. The "Cluster" dropdown is set to "nyc-ride-info" and the "Catalog" dropdown is set to "nyc\_uber\_rides". A third dropdown, "Select schema", is also visible.

Run the following query to validate the table you created using schema discovery.

```
SELECT * FROM "nyc_uber_rides"."discovered_schema"."year_month" LIMIT 10;
```

Run a command to view the CREATE TABLE statement:

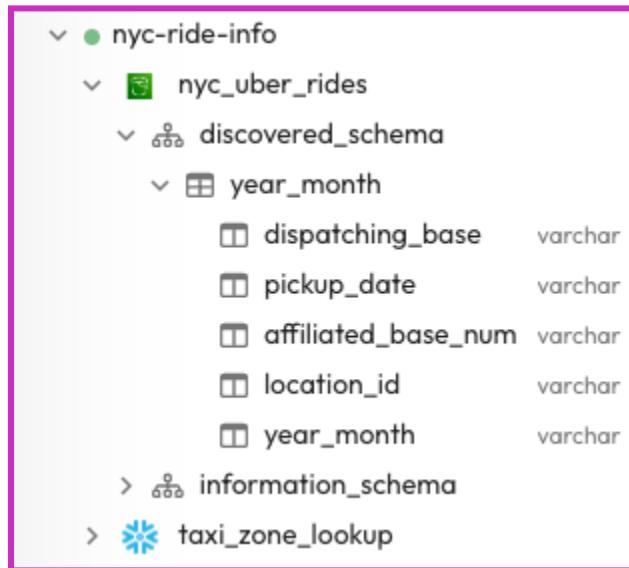
```
SHOW CREATE TABLE discovered_schema.year_month;
```

You should return the same code as run with Schema discovery. Notice that the columns are already utilizing proper data types. Also notice that the table format is HIVE. You will update this as you build your reporting structure in your data lake using Great Lakes connectivity. Recall that the default table format you set for this catalog was Iceberg. However, you are still

able to create a table with the Hive table format due to [Great Lakes connectivity](#) in Starburst Galaxy. Great Lakes connectivity abstracts the details of using different table formats and file types when using certain write access statements for object storage systems.

## Step 4 - Verify schema in catalog

In the catalog explorer, expand the `nyc_uber_rides` catalog to verify your new schema and table are present. There will be other schemas listed.



## END OF LAB EXERCISE

If you are unable to create your schema using schema discovery - refer to appendix section A.

# Lab 3: Build within your data lake

## Learning objectives

- Demonstrate the process needed to run schema discovery to analyze a root object in an object storage location.
- Show how to use open table formats.
- Demonstrate the steps needed to build a reporting structure in your data lake, and secure your team's access.

## Prerequisites

- [Lab 1: Introduction and setup](#)
- [Lab 2: Connect to data sources](#)

## Activities

1. Validate the Bronze layer
2. Create your schema
3. Build the Silver layer
4. Build the Gold layer
5. Secure access to your Gold layer

Now it's time to use both your data sources and create a reporting structure in S3.

- **Bronze layer** - This is the raw data you were ingesting that's landing in S3. Thanks to schema discovery, this layer is already created and all you will need to do is validate.
- **Silver layer** - This is the enriched, cleaned, and cleansed data.
- **Gold layer** - This is the data that is ready to be queried and utilized by an end consumer.

Starburst is special because it allows you to build this reporting structure not just with data that already exists in your data lake, but also with data that exists in other data sources in your orbit - like our Snowflake location data.

## Part 1: Validate the Bronze layer

This layer stores raw data and is the first of the three-part data lake reporting structure. With schema discovery, the heavy lifting for building the Bronze layer is complete. All you need to do in this section is learn some basic information about the data. Run some queries to learn more about the data you will be working with.

```
SELECT * FROM discovered_schema.year_month LIMIT 10;
```

Your table should return records of a similar format as the image below.

dispatching_base	pickup_date	affiliated_base_num	location_id	year_month
BO2682	2015-02-15 20:18:04	BO2682	50	2015-02
BO2682	2015-02-15 20:02:14	BO2682	163	2015-02
BO2682	2015-02-15 16:58:27	BO2682	246	2015-02
BO2682	2015-02-15 04:13:17	BO2682	75	2015-02
BO2682	2015-02-15 21:05:00	BO2682	256	2015-02

Recall that your table has six partitions. It is considered best practice to check that all partitions are visible.

Use the query below to check each partition. It uses the `SELECT DISTINCT` command to validate partitions individually.

```
SELECT DISTINCT (year_month) FROM discovered_schema.year_month ORDER BY year_month;
```

Your result should resemble the output below.

year_month
2015-01
2015-02
2015-03
2015-04
2015-05
2015-06

## Part 2: Create your schema

### Objective

You're going to begin by creating your schema. Schemas control the structure of the data inside them. You will use this to ensure that the rideshare data is structured appropriately.

### Step 1 - Select the rideshare cluster

Navigate to the **Query editor**. Add a new tab using the fuschia plus sign . Validate the location drop-downs in the top left hand corner match the cluster and catalog previously created.

**Cluster:** nyc-ride-info

**Catalog:** nyc\_uber\_rides



### Step 2 - Create lab schema

In the Query editor pane, open a new tab and create a new schema with the following command. Highlight and run the command below. Replace <yourname> with your actual name, or another identifier that you prefer.

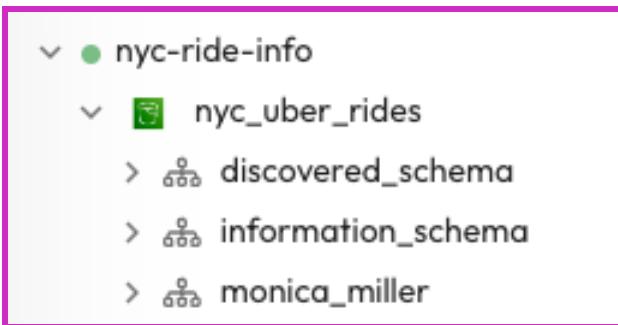
**Note:** Only use lowercase characters and numbers; special characters or spaces are not allowed, so remember to replace the < > characters in the example below. You'll use this throughout the lab, so choose something easy to remember and type.

```
CREATE SCHEMA nyc_uber_rides.<yourname>;
```

### Step 3 - Verify schema in catalog

Once this query is **Finished**, in the catalog explorer, expand the nyc\_uber\_rides catalog to verify your new schema is present and is empty. You should have 3 total schemas listed in your AWS data lake.

**Note:** If you named your schema as `<yourname>`, create the schema again with the instructions above.



#### Step 4 - Select schema after creation

In the top left hand corner, select your schema. Validate the location drop-downs in the top left hand corner match the cluster and catalog previously created.

**Cluster:** nyc-ride-info

**Catalog:** nyc\_uber\_rides

**Schema:** <yourname> (ex: monica\_miller)



### Part 3: Build the Silver layer

#### Objective

Now it's time to build the Silver layer. This is the second of the three data lake reporting structure layers and holds data once it has been transformed.

#### Step 1 - Create the Silver table

The table you just created is not yet fully optimized and transformed. For example, the CSV file format uses the varchar data type as a default for every field, even when it is not accurate. You must build a Silver layer, creating a new table and casting the necessary values into more accurate data types with the Parquet file format and Iceberg table format.

Run the following command to create the Silver layer table. Make sure you are in the schema you just created.

```
CREATE TABLE
ride_pickups (
    dispatching_base varchar,
    pickup_date timestamp (6),
    affiliated_base_num varchar,
    location_id integer,
    year_month varchar
)
WITH
(
    type = 'iceberg',
    format = 'parquet',
    partitioning = array['year_month']
);
```

## Step 2 - Insert data into the Silver table

Once the table is created, you need to insert the data into it. **Note:** You can automate the process in the future using an orchestration tool like Airflow, Prefect, or Dagster.

```
INSERT INTO
ride_pickups
SELECT
dispatching_base,
cast(pickup_date as timestamp (6)),
affiliated_base_num,
cast(location_id as INT),
year_month
FROM
discovered_schema.year_month;
```

You should insert 12205653 rows.

## Step 3 - Validate the Silver table

It is considered best practice to validate that the new table has been created. To do this, run a simple select statement followed by a describe statement.

```
SELECT * FROM ride_pickups LIMIT 10;
DESCRIBE ride_pickups;
```

Column	Type
dispatching_base	varchar
pickup_date	timestamp(6)
affiliated_base_num	varchar
location_id	integer
year_month	varchar

Recall, this table is created as an Iceberg table. Run any of your favorite Iceberg statements to reveal statistics on your newly created table.

```
SELECT * FROM "ride_pickups$snapshots";
SELECT * FROM "ride_pickups$partitions";
SELECT * FROM "ride_pickups$history";
```

If you're looking to learn more about Iceberg, check out this [awesome hands-on Iceberg lab!](#)

## Step 4: Federate your data

Run the following query to federate the data between S3 and Snowflake. You will do this before creating the final table so that you can see Starburst's ability to access data in and around the data lake.

```
SELECT
    p.dispatching_base,
    p.pickup_date,
    p.location_id,
    l.borough,
    l.zone
FROM
    ride_pickups p
INNER JOIN taxi_zone_lookup.taxi_zones.zone_lookup l ON p.location_id
= l.location_id;
```

Here you can see the query output is derived by federating two different data sources: S3 and Snowflake, which is evident by the join in the SQL statement. Anything with the **p**.prefix is pulled from S3, while the **l**.prefix fields are from Snowflake. This is quite impactful to run interactive queries and federate data from multiple different data sources.

## Part 4: Build the Gold layer

### Objective

Now it's time to construct the last of the three layers of the data lake reporting structure, the Gold layer. This will ready the layer for final consumption by data consumers.

### Step 1 - Create the Gold table

Run the following query to create the Gold table. This constructs a new table from two separate data sources—Amazon S3 and Snowflake.

**Note:** Notice that the weekday and month columns are derived from the pickup\_date column.

```
CREATE TABLE
    rides_by_zone
WITH
    (type = 'iceberg', format = 'parquet') AS
SELECT
    p.dispatching_base,
    p.pickup_date,
    p.location_id,
    date_format(p.pickup_date, '%W') weekday,
    date_format(p.pickup_date, '%M') month,
    l.borough,
    l.zone
FROM
    ride_pickups p
    INNER JOIN taxi_zone_lookup.taxi_zones.zone_lookup l ON
    p.location_id = l.location_id;
```

The results should show 12205653 rows. Run a SELECT statement to validate that the table's values are similar to the image below.

```
SELECT * FROM rides_by_zone LIMIT 10;
```

dispatching_base	pickup_date	location_id	weekday	month	borough
B02764	2015-02-07 18:57:53....	181	Saturday	February	Brooklyn
B02764	2015-02-07 20:39:12....	244	Saturday	February	Manhattan
B02764	2015-02-07 01:42:53....	79	Saturday	February	Manhattan
B02764	2015-02-07 16:46:58....	163	Saturday	February	Manhattan
B02764	2015-02-07 23:02:12....	144	Saturday	February	Manhattan

## Step 2 - Run interactive analytics

Now, you need to derive two different views for the marketing department. Utilize a WITH statement to run a subquery and only select the weekday that is most popular for each borough.

```
WITH
  weekly AS (
    SELECT
      borough,
      weekday,
      COUNT(*) AS total_rides,
      RANK() OVER (PARTITION BY borough ORDER BY COUNT(weekday) DESC)
    ) AS rank_column
  FROM
    rides_by_zone
  GROUP BY
    borough,
    weekday
  ORDER BY
    borough,
    COUNT(*) DESC
  )
SELECT
  borough,
  weekday,
  total_rides
FROM
  weekly
WHERE
  rank_column = 1;
```

borough	weekday	total_rides
Queens	Sunday	192760
Bronx	Saturday	32941
EWR	Thursday	20
Brooklyn	Saturday	408026
Manhattan	Friday	1428080
Staten Island	Saturday	1157
Unknown	Saturday	940

### Step 3 - Create the marketing views

Finally, you need to create a view to make the data visible to the marketing team. Use the SQL statement below.

```
CREATE OR REPLACE VIEW borough_most_pop_weekday_vw AS
WITH
    weekly AS (
        SELECT
            borough,
            weekday,
            COUNT(*) AS total_rides,
            RANK() OVER (PARTITION BY borough ORDER BY COUNT(weekday) DESC
            ) AS rank_column
        FROM
            rides_by_zone
        GROUP BY
            borough,
            weekday
        ORDER BY
            borough,
            COUNT(*) DESC
    )
SELECT
    borough,
    weekday,
    total_rides
FROM
    weekly
WHERE
    rank_column = 1;
```

Run a select statement to validate the view was created properly.

```
SELECT * FROM borough_most_pop_weekday_vw;
```

Following the same logic but with a different level of granularity (monthly), create the second view.

```
CREATE OR REPLACE VIEW borough_most_pop_month_vw AS
WITH
monthly AS (
    SELECT
        borough,
        month,
        COUNT(*) AS total_rides,
        rank() OVER (PARTITION BY borough ORDER BY COUNT(month) DESC
        ) AS rank_column
    FROM
        rides_by_zone
    GROUP BY
        borough,
        month
    ORDER BY
        borough,
        COUNT(*) DESC
)
SELECT
    borough,
    month,
    total_rides
FROM
    monthly
WHERE
    rank_column = 1;
```

Run a select statement to validate the view was created properly. The results should be similar to the image below.

```
SELECT * FROM borough_most_pop_month_vw;
```

## Part 5: Secure access to your Gold layer

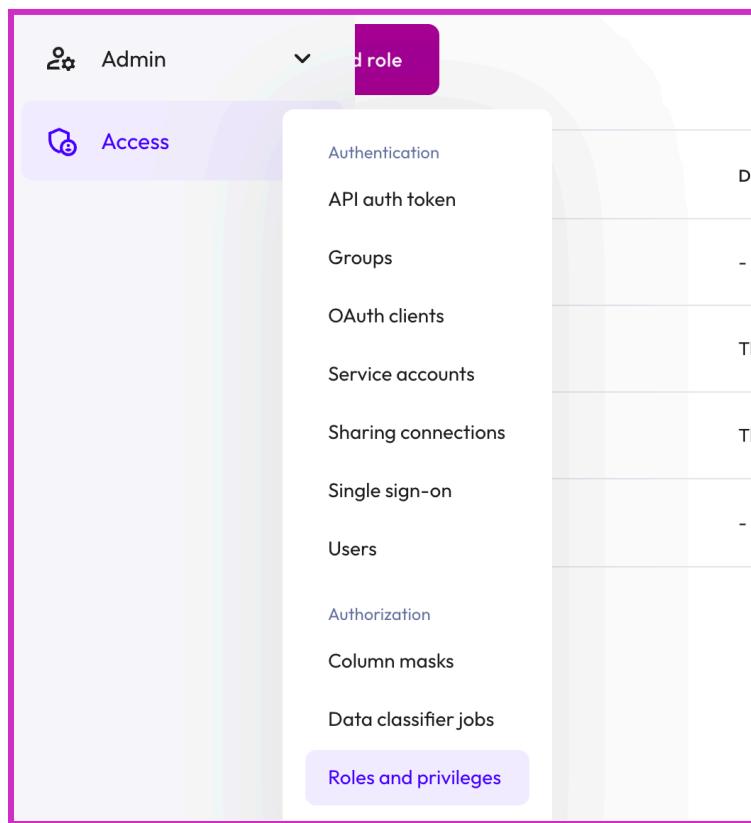
### Objective

The Gold layer has been created. Now it's time to ensure that access to this data is restricted to the appropriate users - this will allow you to create data products for specific groups of users.

### Step 1 - Create a data science role

To appropriately grant access to the Bronze layer, you're going to create a specific role for the data science team. This will grant access to the team members with the appropriate rights, and restrict access for everyone else.

To do this, navigate to the **Roles and privileges** tab.



Select **Add role**. Enter the following information:

**Role name:** data\_science

**Description:** This role is specifically for the data science team to grant view access to raw data for the purpose of building and training models.

**Grant to the creating role?** Yes

The screenshot shows a 'Add a new role' dialog box. The 'Role name \*' field contains 'data\_science'. The 'Description' field contains the text: 'This role is specifically for the data science team to grant view access to raw data for the purpose of building and training models.' A checkbox labeled 'Grant to the creating role?' is checked. At the bottom right are 'Cancel' and 'Add role' buttons.

## Step 2 - Create a marketing role

To restrict access to the Gold layer, you're going to create a specific role for the marketing department. This will restrict access to the data to team members with the appropriate rights, and restrict their access to the two newly created views.

To do this, navigate to the **Roles and privileges** tab. Select **Add role**. Enter the following information:

**Role name:** marketing

**Description:** This role is specifically for the marketing department granting view access to two aggregated views.

**Grant to the creating role?** Yes

### Add a new role

Role name \*  
marketing

Description  
This role is specifically for the marketing department granting select access to two aggregated views.

Grant to the creating role?

**Add role**

You should now have two new roles created for a total of four roles plus any roles previously created.

Roles		
<b>Add role</b>		
Role name ↑	Description	Granted to roles
accountadmin	-	_system
data_science	This role is specifically for the data science t...	accountadmin
marketing	This role is specifically for the marketing de...	accountadmin
public	-	_system

### Step 3 - Assign data science privileges

Next, select the newly created data\_science role. This allows you to assign proper privileges. To do this, navigate to the **Privileges** tab. Select **Add privilege**.

#### What would you like to modify privileges for?

nyc\_uber\_rides.discovered\_schema.year\_month

**Do you want to allow or deny access? Allow**

**Do you want to allow this role to grant to others? No**

**What can they do? Select from table**

Add privileges to data\_science role

Allow this role to access all or specific catalogs, tables, or clusters within your organization. Refer to our detailed documentation on assigning privileges to roles [documentation](#).

Data    Account    Cluster    Location    Function

What would you like to modify privileges for?

Scope: nyc\_uber\_rides.discovered\_schema.year\_month

Do you want to allow or deny access?

Allow     Deny

Do you want to allow this role to grant to others?

Allow role receiving privilege to grant to others

What can they do?

Grant all privileges below

Delete from table     Insert into table

Manage table data observability     Update table rows

Privileges added

Data 1  
nyc\_uber\_rides.discovered\_schema.year\_month  
Allow: Select from table

Account

Cluster

Location

Function

Cancel    Save privileges (1)

Select **Save privileges(1)**.

## Step 4 - Assign marketing privileges

Next, select the newly created marketing role. This allows you to assign proper privileges. To do this, navigate to the **Privileges** tab. Select **Add privilege**.

**What would you like to modify privileges for?**

nyc\_uber\_rides.yourname.borough\_most\_pop\_month\_vw

**Do you want to allow or deny access? Allow**

**Do you want to allow this role to grant to others? No**

**What can they do? Select from table**

Repeat the process for the table borough\_most\_pop\_weekday\_vw.

**What would you like to modify privileges for?**

nyc\_uber\_rides.yourname.borough\_most\_pop\_weekday\_vw

**Do you want to allow or deny access? Allow**

**Do you want to allow this role to grant to others? No**

**What can they do? Select from table**

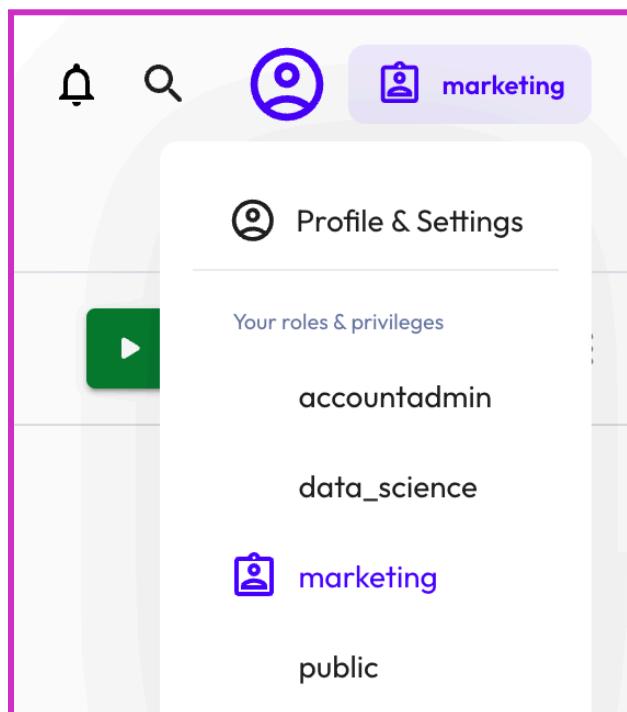
## Add privileges to marketing role

Allow this role to access all or specific catalogs, tables, or clusters within your organization. Refer to our detailed [documentation on assigning privileges to roles](#).

Then hit **Save Privileges(2)**.

### Step 5 - Test your new roles

Now it's time to test that the new roles are working correctly. Navigate back to the **Query editor** and switch to the **marketing** role in the top right-hand corner.



Notice that the marketing role view has fewer capabilities available in the left-hand navigation bar. Also, the cluster explorer shows only two views in the `nyc-ride-info` cluster. This is exactly what you would expect.

- ✓ ● nyc-ride-info
  - ✓ 📄 nyc\_uber\_rides
    - > ⚒ information\_schema
    - ✓ ⚒ monica\_miller
      - > ⚒ borough\_most\_pop\_month\_vw
      - > ⚒ borough\_most\_pop\_weekday\_vw

Run a select statement to validate the newly created role has access to view the tables.

```
SELECT * FROM borough_most_pop_month_vw;
```

Now, try recreating the view using the marketing role. Run the command shared in [Lab 3 Part 4 Step 4](#). This will fail because you have only granted the marketing role select permissions.



Access Denied: Cannot create view nyc\_uber\_rides.monica\_miller.borough\_most\_pop\_month\_vw: Role marketing does not have the privilege CREATE\_TABLE on the schema nyc\_uber\_rides.monica\_miller

Also try accessing the `year_month` table.

```
SELECT * FROM discovered_schema.year_month;
```

Navigate to the **data\_science** role in the upper right hand corner. Test select access for the `year_month` table, and test access for the newly created views.

```
SELECT * FROM discovered_schema.year_month;
```

```
DELETE FROM discovered_schema.year_month WHERE year_month =  
'2015-09';
```

```
SELECT * FROM borough_most_pop_month_vw;
```

Navigate back to the **account\_admin** role.

## END OF LAB EXERCISE

# Lab 4: Create data products

## Learning objectives

- Demonstrate how to execute a global search.
- Demonstrate how to create a data product.
- Demonstrate how to create tags.

## Prerequisites

- [Lab 1: Introduction and setup](#)
- [Lab 2: Connect to data sources](#)
- [Lab 3: Build within your data lake](#)

## Activities

1. Execute global search
2. Create a data science data product
3. Create a marketing data product

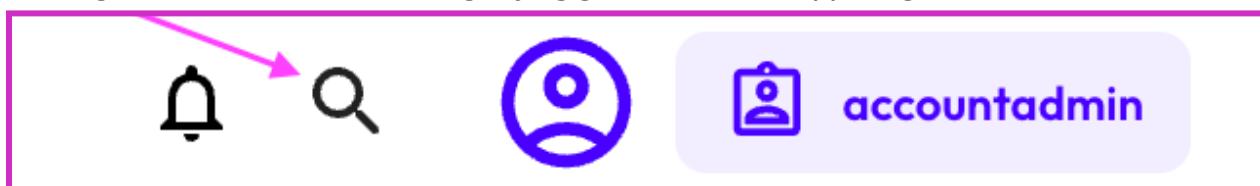
## Part 1: Execute global search

### Objective

Global search lets users find datasets quickly and intuitively. It is a powerful tool that helps keep better track of your data.

### Step 1 - Navigate Starburst UI

To use global search, select the magnifying glass icon in the upper-right corner.



### Step 2 - Execute global search

Enter the word `borough` and select **View all results**.

Starburst Galaxy displays multiple instances matching your search criteria drawn from multiple data sources. Some occur in tables and views you created throughout the lab. Others are simply populated through your catalog connection.

The screenshot shows the Starburst Global Search interface. On the left, there is a sidebar titled "Filter" with sections for "Asset type", "Catalog", "Tags", "Contact", and "Owner". Under "Asset type", "View (2)" is selected. Under "Catalog", "nyc\_uber\_rides (5)" and "taxi\_zone\_lookup (1)" are listed. The main area is titled "Search results" and shows the search term "'borough'" with a pencil icon. It includes a "PREVIEW" button and navigation arrows for "1-6 of 6". Three search results are displayed in cards:

- borough** (document icon) accountadmin No description provided nyc\_uber\_rides / monica\_miller / rides\_by\_zone
- borough** (document icon) accountadmin No description provided nyc\_uber\_rides / monica\_miller / borough\_most\_pop\_month\_vw
- borough** (document icon) accountadmin No description provided

## Step 3 - Filter global search

Global search can also be filtered to help refine your search.

Select the View filter on the left to see how different search criteria impact the results.

This screenshot shows the same Starburst Global Search interface as above, but with a different set of filters applied. The "Asset type" section now has "View (2)" checked and "Column (4)" unchecked. The "Catalog" section now has "nyc\_uber\_rides (5)" checked and "taxi\_zone\_lookup (1)" unchecked. The search results card for "borough" is still visible, showing the same details as before.

## Step 3 - Navigate to your newly created view

Click on the view `borough_most_pop_weekday_vw`. Select **Open Details**.

Search results

'borough'

Order by: Relevance

1-2 of 2

**borough\_most\_pop\_month\_vw**

No description provided

nyc\_uber\_rides / monica\_miller / borough\_most\_pop\_month\_vw

**borough\_most\_pop\_weekday\_vw**

No description provided

nyc\_uber\_rides / monica\_miller / borough\_most\_pop\_weekday\_vw

**borough\_most\_pop\_weekday\_vw**

accountadmin

No contacts assigned

No tags assigned

PREVIEW

LOCATION  
nyc\_uber\_rides / monica\_miller / borough\_most\_p...

DESCRIPTION  
No description provided

OWNER  
accountadmin

CONTACTS  
No contacts assigned

TAGS  
No tags assigned

DETAILS  
Indexed on: Apr 23, 2024  
Created by: accountadmin  
Last indexed on: Apr 23, 2024, 11:39 AM

Here you can see **Column** information, **Metrics**, **Quality**, **Lineage**, **Definition**, **Data preview**, **Query history**, **Audit log**, and **Privileges**. Navigate through each tab.

Catalogs / nyc\_uber\_rides / monica\_miller / borough\_most\_pop\_weekday\_vw

**borough\_most\_pop\_weekday\_vw**

DESCRIPTION  
No description provided.

Tags: 0 | Contacts: 0 | Owner: accountadmin

Columns 3 Metrics Quality Lineage Definition Data preview Query history 2 Audit log Privileges

Refresh Auto tag 3 columns Search columns

Column ↑	Type	Nullable	Default	Tags	Description
borough	varchar	yes	NULL	No tags assigned.	+ No description provided.
total_rides	bigint	yes	NULL	No tags assigned.	+ No description provided.
weekday	varchar	yes	NULL	No tags assigned.	+ No description provided.

This page contains information specific to the `borough_most_pop_weekday_vw` view. If you have extra time, go through the tables and views created and add meaningful descriptions to each table/view and the columns within them.

The screenshot shows the Starburst Data Catalog interface. At the top, there's a header with the schema name 'borough\_most\_pop\_month\_vw'. Below the header, there's a 'DESCRIPTION' section with a note 'No description provided.' and tabs for 'TAGS', 'CONTACTS', and 'OWNER'. The 'OWNER' tab is selected, showing 'accountadmin'. Below the header, there are tabs for 'Columns 3', 'Metrics', 'Quality ●', 'Lineage ●', 'Definition', 'Data preview', 'Query history 2', 'Audit log', and 'Privileges'. Under the 'Columns' tab, there's a table with three rows. The first row has a 'Refresh' button and an 'Auto tag' checkbox. The table has columns for 'Column ↑', 'Type', 'Nullable', 'Default', 'Tags', and 'Description'. The 'Tags' column for each row contains a '+ add tag' button. The descriptions are: 'groups of zones' for 'borough', 'granularity factor' for 'month', and 'aggregate value' for 'total\_rides'. A pink arrow points to the 'Tags' section of the 'month' column.

Navigate to your <yourname> schema in the top left-hand corner.

Catalogs /  nyc\_uber\_rides / monica\_miller / borough\_most\_pop\_weekday\_vw

The information for the entire schema is available to you, including **Tables**, **Views**, **Metrics**, **Definition**, **Query history**, and **Privileges**. Navigate through each tab to see the available features.

## Part 2: Create your data products

### Objective

Now it's time to create a data product using your datasets. Data products curate data in a way that makes it more accessible and useful, and can be shared across teams.

### Step 1 - Enter additional information

Make sure you are in your schema as mentioned in the previous step. Before creating a data product, enter some information into your catalog.

Select **Show details** on the right hand side. Edit the following information:

**Description:** This is the data evaluating 2015 uber rides in NYC.

**Links:** Text to display: Data source information

Link URL:

[https://www.kaggle.com/datasets/fivethirtyeight/uber-pickups-in-new-york-city?select=\\_other-FHV-services\\_jan-aug-2015.csv](https://www.kaggle.com/datasets/fivethirtyeight/uber-pickups-in-new-york-city?select=_other-FHV-services_jan-aug-2015.csv)

**Contacts:** yourname

This screenshot shows the schema details page for a schema named "monica\_miller". The top section displays basic information: Description ("This is the data evaluating 2015 uber rides in NYC."), Tags (0), Links (1), Contacts (1), and Owner ("accountadmin"). Below this, there are five edit fields for Description, Tags, Links, Contacts, and Owner, each with a pencil icon for editing.

## Step 2 - Promote your data product

Navigate back to your schema and select **Promote to data product**.

A modal dialog titled "Promote to data product" is shown over the schema details page. It contains the schema name "monica\_miller" and a "Show details" button. The schema's description, tags, links, contacts, and owner are listed again. A pink arrow points from the "Promote to data product" button on the schema details page to this modal.

Import all the information you've already added to the schema. Select **Import**.

A modal dialog titled "Import monica\_miller metadata?" asks if you want to import the schema's metadata. It lists three options: Description, Links, and Contacts, all of which are checked with blue checkmarks. At the bottom are "Skip" and "Import" buttons.

Add a descriptive name like **NYC-2015-uber-rides-aggregate**. The summary has already been populated based on the information you added to the schema.

Add the following description:

*Use this data product to plan marketing campaigns around geo-location based on borough.*

- **Question:** What is the most popular day of the week for each borough?
- **Objective:** Plan marketing campaigns for each borough based on popularity.
- **Approach:** You create a specific view for each borough and day.

Select the **nyc-ride-info** cluster as the default cluster. Your contacts and supporting information have been automatically populated.

Select **Promote to data product**.

Default cluster  
Select cluster  
nyc-ride-info

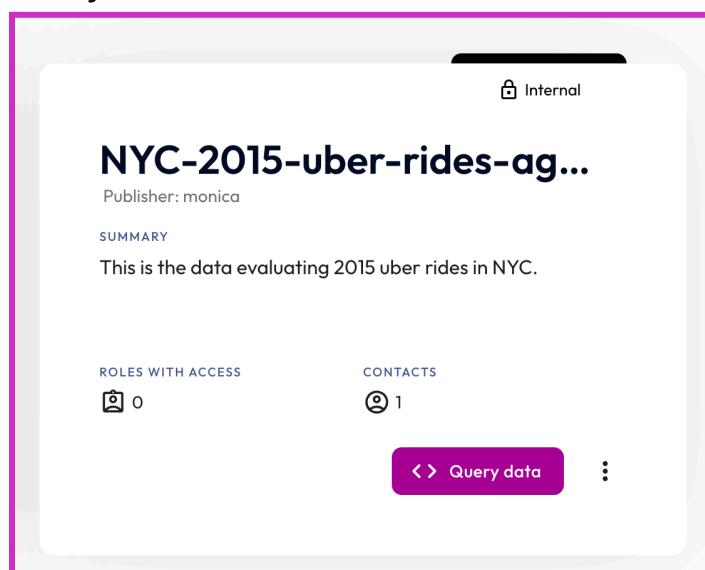
Supporting information  
These links can be added and edited for the data product. They will not affect the schema links.  
Text to display \* Link URL \*  
Data source information https://www.kaggle.com/datasets/fivethirtyeight/uber-pickup

+ Add link

Contacts  
monidd4@gmail.com  
Contacts \*

Cancel Promote to Data Product

Congratulations! You have created and promoted your first data product. Navigate to the Data products tab to view your work.



## Step 3 - Create a data product for the data scientists

Use global search to navigate to the Bronze layer- the schema known as **discovered\_schema**. Click on the returned schema.

The screenshot shows the Starburst Data Catalog interface. At the top, there are navigation links: Catalogs, nyc\_uber\_rides, and discovered\_schema. Below this, the title 'discovered\_schema' is displayed with a 'Promote to data product' button and a 'Show details' link. A 'DESCRIPTION' section indicates 'No description provided.' Below this are tabs for Tables (1), Views, Metrics, Definition, Query history, Audit log, and Privileges. Under the Tables tab, there are buttons for Refresh and Auto tag, and a search bar for tables. A table listing is shown with one entry: 'Table ↑ year\_month'. To the right of the table, there are sections for Tags (No tags assigned) and Clusters. At the bottom right of the interface, there is a 'Clusters' section.

## Step 4 - Enter additional information

Make sure you are in your schema as mentioned in the previous step. Before creating a data product, enter some information into your catalog.

Select **Show details** on the right hand side.

Edit the following information:

**Description:** This is the Bronze layer for the 2015 uber rides in NYC data pipeline.

**Links:** Text to display: Data source information

Link URL:

[https://www.kaggle.com/datasets/fivethirtyeight/uber-pickups-in-new-york-city?select=other-FHV-services\\_jan-aug-2015.csv](https://www.kaggle.com/datasets/fivethirtyeight/uber-pickups-in-new-york-city?select=other-FHV-services_jan-aug-2015.csv)

**Contacts:** yourname

The screenshot shows the 'discovered\_schema' dataset in the Starburst Data Catalog. The top navigation bar has a 'Discover' tab selected. The main card displays the dataset name 'discovered\_schema' with a 'Promote to data product' button and a three-dot menu icon. Below the card, there's a 'Hide details' link. The dataset details are organized into sections: DESCRIPTION, TAGS, LINKS, CONTACTS, and OWNER. The DESCRIPTION section contains the text 'This is the land layer for the 2015 uber rides in NYC data pipeline.' The TAGS section shows 0 tags added. The LINKS section shows 1 link to 'Data source information'. The CONTACTS section lists 'monica.miller@starburstdata.com'. The OWNER section is set to 'accountadmin'. Each section has an edit icon (pencil) to its right.

Next, click the **Promote to data product** button. Import the metadata.

Add a descriptive name like **NYC-2015-uber-rides-bronze-layer**. The summary has already been populated based on the information you added to the schema.

Add the following description:

*Use this data product to build and train models for the data science team around geo-location based on borough. Utilized by the data\_science role. Built for specific investigation.*

Select the **nyc-ride-info** cluster as the default cluster. Your contacts and supporting information have been automatically populated.

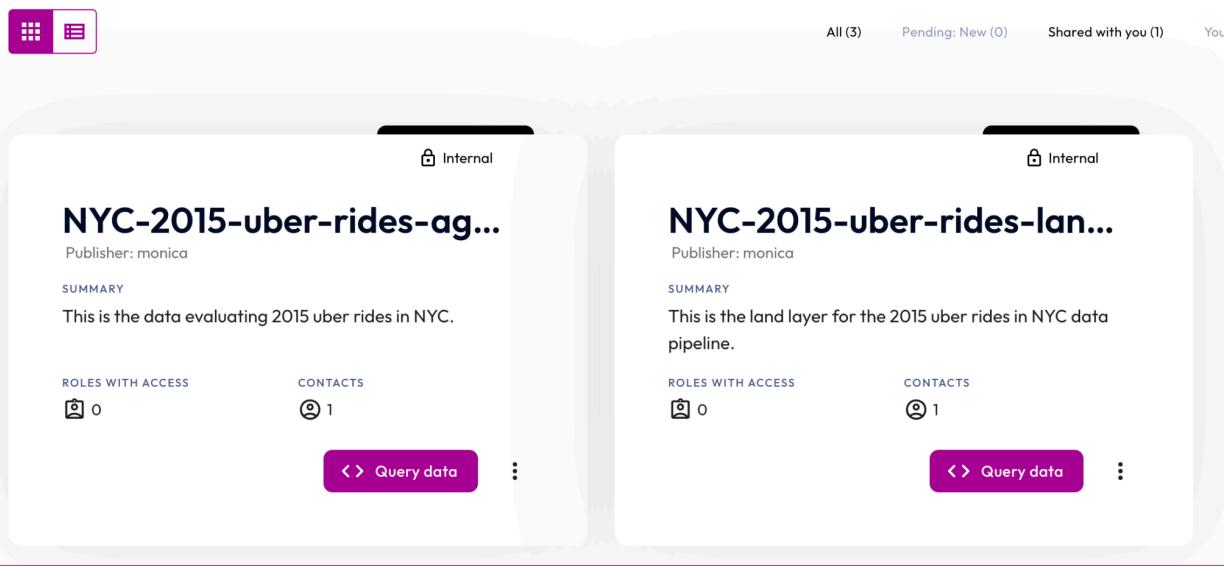
Select **Promote to data product**.

Hooray! Now you should be able to see two different data products in the **accountadmin** role.

## Data products

View and use curated data sets from your organization. To create a new data product, navigate to a schema in a [catalog](#) and promote to data product.

Learn more about [data products](#)



### Step 5 - Utilize access control alongside your data products

Starburst Galaxy provides built-in access control using customizable levels of granularity. You can control this feature using both role-based access control (RBAC) and attribute-based access control (ABAC). Starburst Galaxy's built-in access control allows you to define multiple users, roles, groups, privileges, and policies. These access options encourage businesses to create security policies that make sense for their organization. Explore the different data products permissions for the three roles: **accountadmin**, **data\_science**, **marketing**.

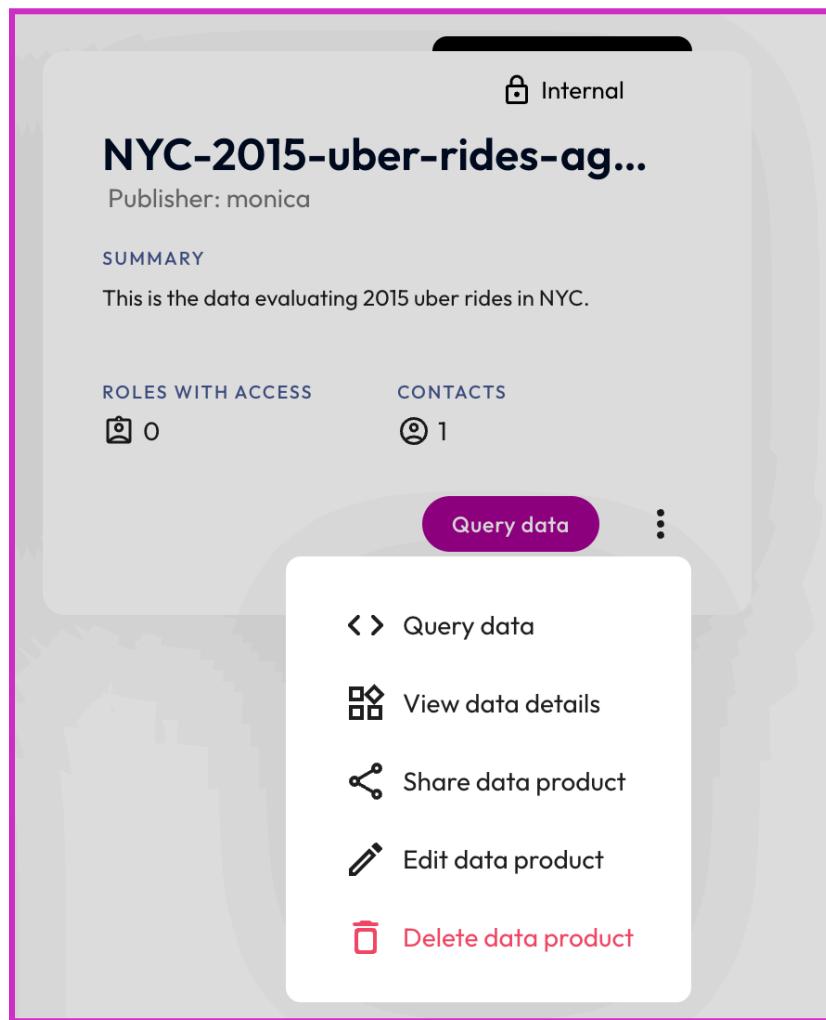
Switch to the marketing role and view the data products screen. Notice how only one data product is viewable.

The screenshot shows the Starburst Data Catalog interface. At the top, there are navigation icons for file operations, search, user profile, and a filter for the 'marketing' team. The main title is 'Data products'. Below it, a sub-instruction reads: 'View and use curated data sets from your organization. To create a new data product, navigate to a schema in a catalog and promote to data product.' A link to 'Learn more about data products' is provided. The interface includes a search bar and filters for 'All (1)', 'Pending: New (0)', 'Shared with you (0)', 'Your shared data products (0)', and 'Not shared (1)'. A large preview card for a data product titled 'NYC-2015-uber-rides-agg...' is displayed, showing it's internal, published by 'monica', and describes it as 'This is the data evaluating 2015 uber rides in NYC.' It shows 0 roles with access and 1 contact. A 'Query data' button is at the bottom.

Now, switch to the `data_science` role. The `data_science` role also has only one viewable data product, notice it is a different data product than the marketing team.

The screenshot shows the Starburst Data Catalog interface, similar to the previous one but with a different user role. At the top, there are navigation icons for file operations, search, user profile, and a filter for the 'data\_science' team. The main title is 'Data products'. Below it, a sub-instruction reads: 'View and use curated data sets from your organization. To create a new data product, navigate to a schema in a catalog and promote to data product.' A link to 'Learn more about data products' is provided. The interface includes a search bar and filters for 'All (1)', 'Pending: New (0)', 'Shared with you (0)', 'Your shared data products (0)', and 'Not shared (1)'. A large preview card for a data product titled 'NYC-2015-uber-rides-lan...' is displayed, showing it's internal, published by 'monica', and describes it as 'This is the land layer for the 2015 uber rides in NYC data pipeline.' It shows 0 roles with access and 1 contact. A 'Query data' button is at the bottom.

Now, dive into the data products as an accountadmin and as each role to view the differences. Go back to the **accountadmin** role and view the **NYC-2015-uber-rides-aggregate** data product by clicking the three dots and selecting **View data details**.



The **accountadmin** role shows two tables and two views that create the data product.

Catalogs | nyc\_uber\_rides | monica\_miller

## NYC-2015-uber-rides-aggregate (monica\_miller)

Show details

DESCRIPTION	TAGS	LINKS	CONTACTS	OWNER
This is the data evaluating 2015 uber rides in NYC.	0	1	1	accountadmin

Tables 2 Views 2 Metrics Definition Query history 15 Audit log Privileges

Refresh Auto tag 2 tables Search tables

Table ↑	Tags
ride_pickups	No tags assigned.
rides_by_zone	No tags assigned.

Switch to the marketing role next. Now, you will only see two views.

Catalogs | nyc\_uber\_rides | monica\_miller

## NYC-2015-uber-rides-aggregate (monica\_miller)

Show details

DESCRIPTION	TAGS	LINKS	CONTACTS	OWNER
This is the data evaluating 2015 uber rides in NYC.	0	1	1	accountadmin

Tables Views 2 Metrics Definition Query history 15

Refresh



There aren't any tables in this schema

Finally, try the `data_science` role. You will see you cannot view the metadata information.

The screenshot shows a user interface for managing data catalogs. At the top, there's a navigation bar with 'Catalogs' and a green square icon followed by the catalog name 'nyc\_uber\_rides'. To the right of the catalog name is the user 'monica\_miller'. Below this, a red-bordered message box contains the text 'Operation not allowed: GET\_SCHEMA\_METADATA' next to a warning icon (an exclamation mark inside a circle). The rest of the interface is mostly blank white space.

This is an example of how RBAC and data products can work together to provide a granulated data management solution. For another example of an RBAC application, [watch this video](#).

## Appendix: Section A

If you are unable to create your Bronze layer with schema discovery, utilize the code below. This will create the `discovered_schema` and the `year_month` table manually.

### Step 1 - Select the rideshare cluster

Navigate to the **Query editor**. Add a new tab using the fuschia plus sign . Validate the location drop-downs in the top left hand corner match the cluster and catalog previously created.

**Cluster:** nyc-ride-info

**Catalog:** nyc\_uber\_rides



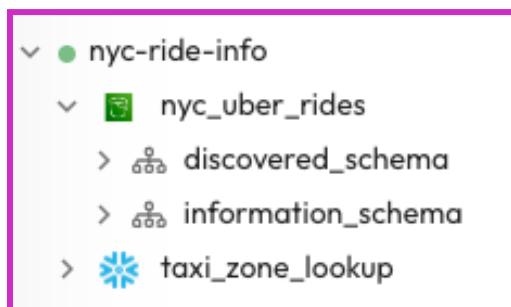
### Step 2 - Create lab schema

In the Query editor pane, open a new tab and create a new schema with the following command.

```
CREATE SCHEMA nyc_uber_rides.discovered_schema;
```

### Step 3 - Verify schema in catalog

Once this query is **Finished**, in the catalog explorer, expand the `nyc_uber_rides` catalog to verify your new schema is present and is empty. There will be other schemas listed.



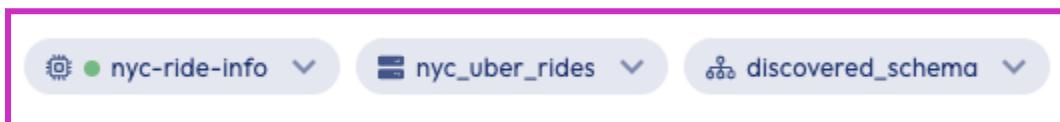
### Step 4 - Select schema after creation

In the top left hand corner, select your schema. Validate the location drop-downs in the top left hand corner match the cluster and catalog previously created.

**Cluster:** nyc-ride-info

**Catalog:** nyc\_uber\_rides

**Schema:** discovered\_schema



## Step 2 - Create the external table

Run the following command to create an external table from the rideshare data stored in the data lake.

This table is partitioned by year\_month with a retention period of six months.

```
CREATE TABLE year_month (
    dispatching_base varchar,
    pickup_date varchar,
    affiliated_base_num varchar,
    location_id varchar,
    year_month varchar
)
WITH
(
    format = 'csv',
    type = 'hive',
    external_location =
's3://starburst101-hands-on-lab-nyc-uber-rides/year_month',
    skip_header_line_count = 1,
    partitioned_by = array['year_month']
);
```

Recall that the default table format you set for this catalog was Iceberg. However, you are still able to create a table with the Hive table format due to [Great Lakes connectivity](#) in Starburst Galaxy. Great Lakes connectivity abstracts the details of using different table formats and file types when using certain write access statements for object storage systems.

Since you are using Starburst Galaxy's metastore, run the following command to sync the metadata.

```
call system.sync_partition_metadata('discovered_schema',
'year_month', 'ADD');
```