Amazon Web Services

Data Engineering Immersion Day

Lab 4. AWS Lake Formation

September 2021

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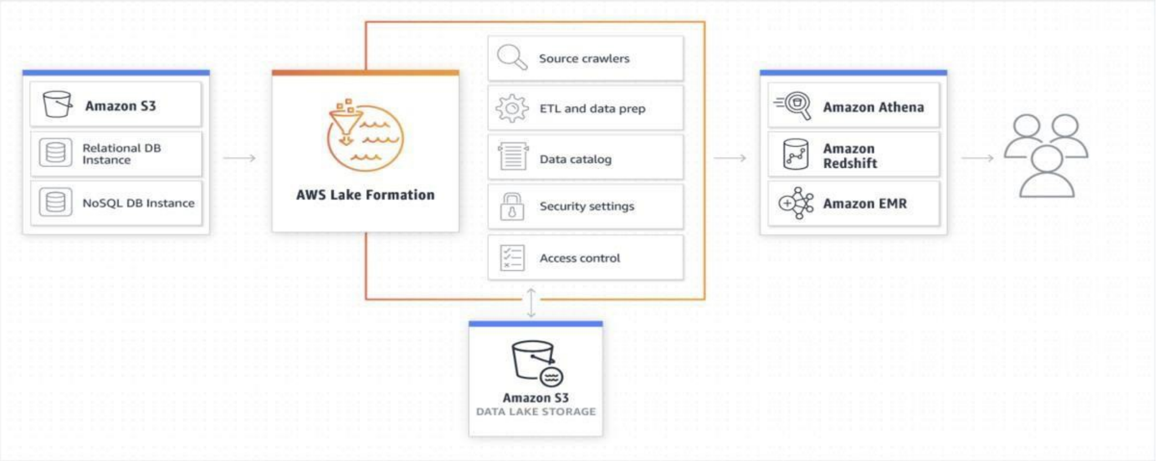
Introduction

This lab will give you an understanding of the AWS Lake Formation – a service that makes it easy to set up a secure data lake, as well as Athena for querying the data you import into your data lake.



Prerequisites

1. Make sure you have the Postgres source database information from your Event host. If you are running the lab outside of AWS hosted event, please find the **DMSInstanceEndpoint** parameter value from **dmslab-instructor** CloudFormation **Outputs** tab.
2. Complete Lab1. Hydrating the Data Lake with DMS or Lab1. Copy Source Data
3. Must completed Part A in Lab2.Transforming the Data with Glue

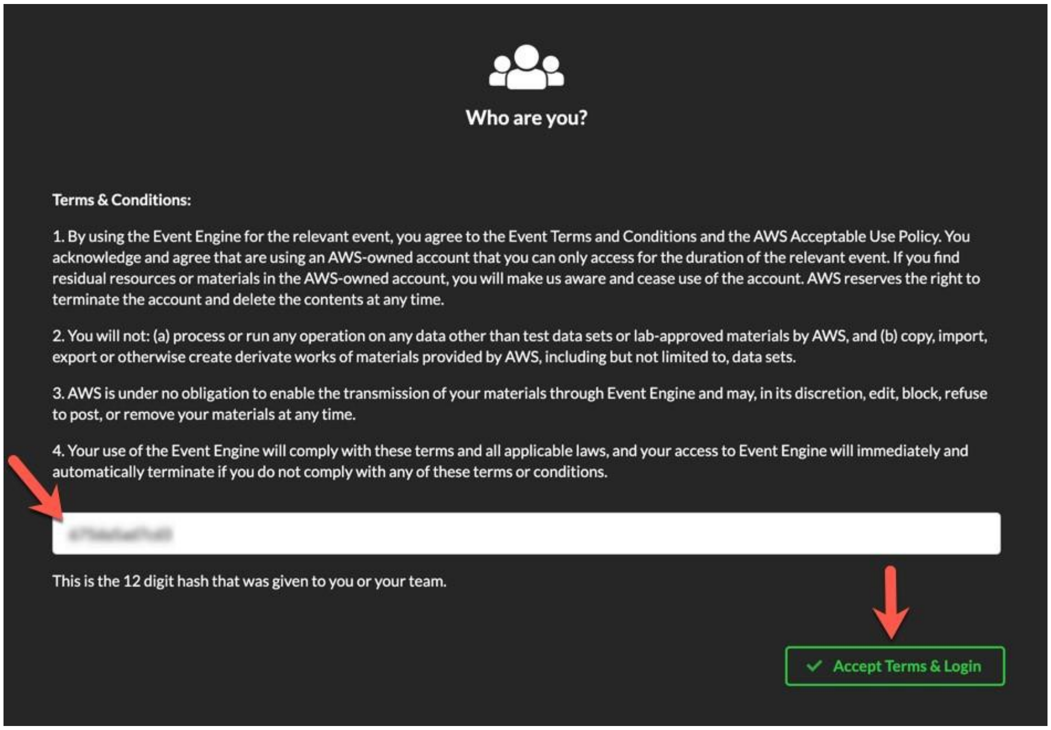
Get Started Using the Lab Environment

Please skip this section if you are running the lab on your own AWS account.

Today, you are attending a formal event and you will have been sent your access details beforehand. If in the future you might want to perform these labs in your own AWS environment by yourself, you can follow instructions on GitHub - https://github.com/awssamples/data-engineering-for-aws-immersion-day.

A 12-character access code (or 'hash') is the access code that grants you permission to use a dedicated AWS account for the purposes of this workshop.

1. Go to https://dashboard.eventengine.run/, enter the access code and click Proceed:



Who are you?

Terms & Conditions:

1. By using the Event Engine for the relevant event, you agree to the Event Terms and Conditions and the AWS Acceptable Use Policy. You acknowledge and agree that are using an AWS-owned account that you can only access for the duration of the relevant event. If you find residual resources or materials in the AWS-owned account, you will make us aware and cease use of the account. AWS reserves the right to terminate the account and delete the contents at any time.

2. You will not: (a) process or run any operation on any data other than test data sets or lab-approved materials by AWS, and (b) copy, import, export or otherwise create derivate works of materials provided by AWS, including but not limited to, data sets.

3. AWS is under no obligation to enable the transmission of your materials through Event Engine and may, in its discretion, edit, block, refuse to post, or remove your materials at any time.

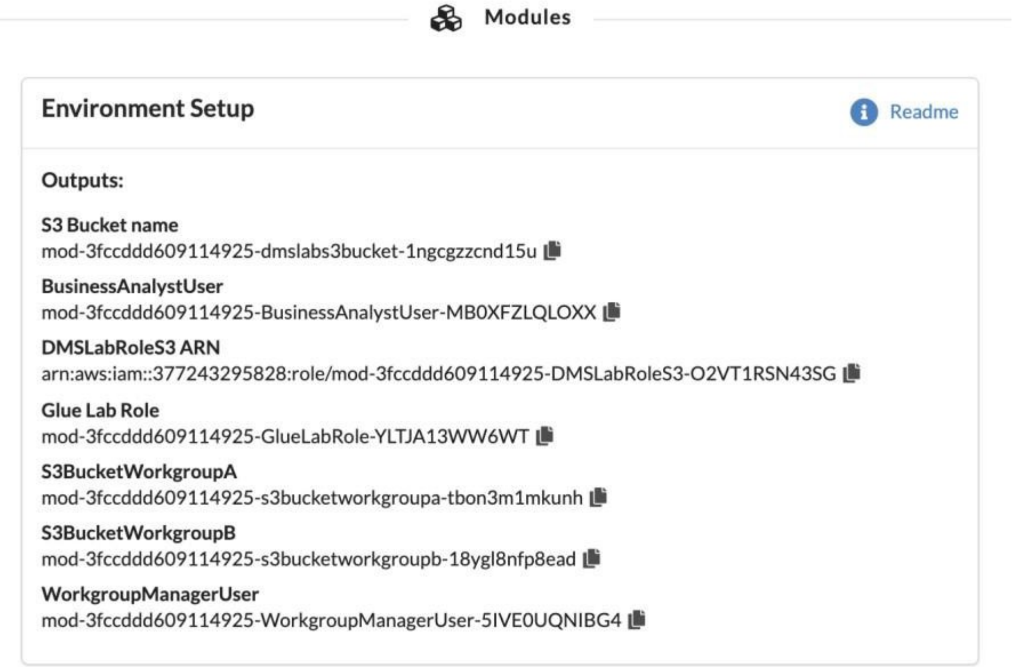
4. Your use of the Event Engine will comply with these terms and all applicable laws, and your access to Event Engine will immediately and automatically terminate if you do not comply with any of these terms or conditions.

[redacted]

This is the 12 digit hash that was given to you or your team.

2. On the Team Dashboard web page, you will see a set of connection strings and parameters that you will need during the labs. Best to save them to a text filelocally, alternatively you can always go to this page to review them. Replace the parameters with the corresponding values from here were indicated in subsequent labs:

   Because you're at a formal event, some AWS resources have been pre-deployed for your convenience, for example:



Environment Setup

Outputs:

S3 Bucket name
mod-3fccddd609114925-dmslabs3bucket-1ngcgzzcnd15u

BusinessAnalystUser
mod-3fccddd609114925-BusinessAnalystUser-MB0XFZLQLOXX

DMSLabRoleS3 ARN
arn:aws:iam::377243295828:role/mod-3fccddd609114925-DMSLabRoleS3-O2VT1RSN43SG

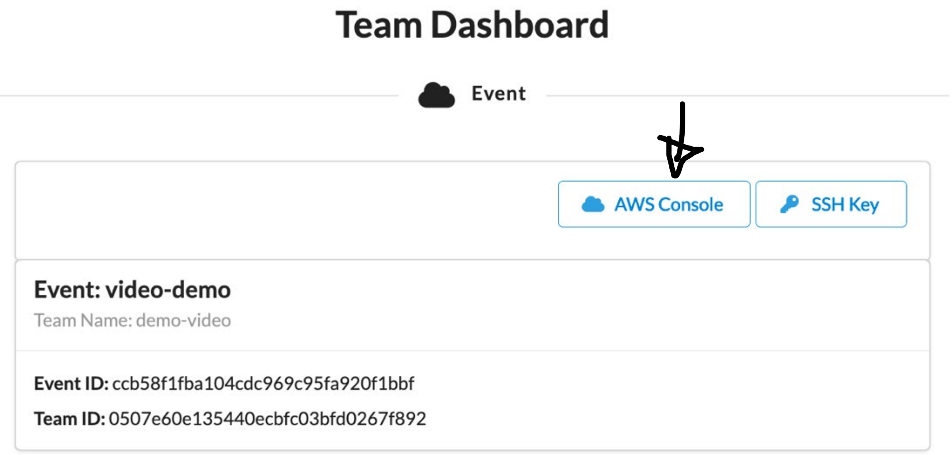
Glue Lab Role
mod-3fccddd609114925-GlueLabRole-YLTJA13WW6WT

S3BucketWorkgroupA
mod-3fccddd609114925-s3bucketworkgroupa-tbon3m1mkunh

S3BucketWorkgroupB
mod-3fccddd609114925-s3bucketworkgroupb-18ygl8nfp8ead

WorkgroupManagerUser
mod-3fccddd609114925-WorkgroupManagerUser-5IVE0UQNIBG4

3. On the Team Dashboard, please click AWS Console to log into the AWS Management Console:



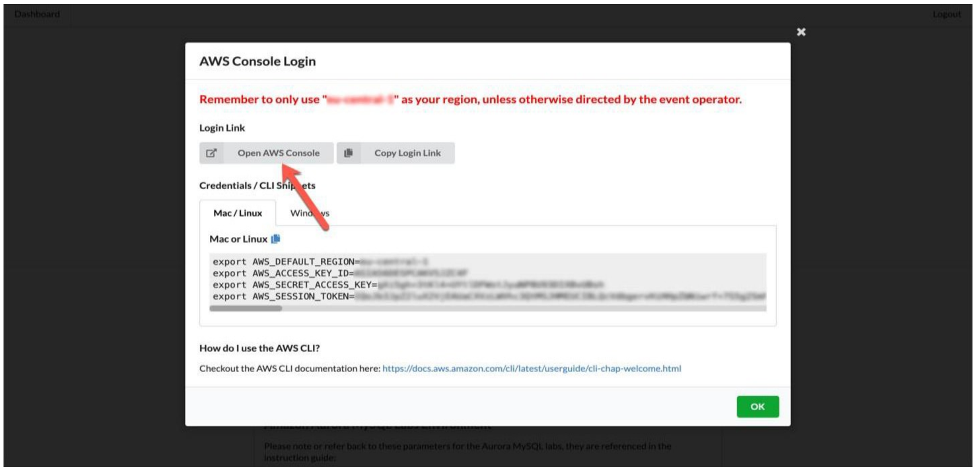
Event: video-demo

Team Name: demo-video

Event ID: ccb58f1fba104cdc969c95fa920f1bbf

Team ID: 0507e60e135440ecbfc03bfd0267f892

4. Click Open Console. For the purposes of this workshop, you will not need to use command line and API access credentials.



AWS Console Login

Remember to only use "[redacted]" as your region, unless otherwise directed by the event operator.

Login Link

Credentials / CLI Snippets

Mac or Linux

```
export AWS_DEFAULT_REGION=[redacted]
export AWS_ACCESS_KEY_ID=[redacted]
export AWS_SECRET_ACCESS_KEY=[redacted]
export AWS_SESSION_TOKEN=[redacted]
```

How do I use the AWS CLI?

Checkout the AWS CLI documentation here: https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-welcome.html

Please note or refer back to these parameters for the Aurora MySQL labs, they are referenced in the instruction guide:

Once you have completed these steps, you can continue with the rest of this lab.

Setup Network Configuration for AWS Glue (for your read)

If you use Amazon Virtual Private Cloud (Amazon VPC) to host your AWS resources, you can establish a private connection between your VPC and AWS Glue. You use this connection to enable AWS Glue to communicate with the resources in your VPC without going through the public internet.

Amazon VPC is an AWS service that you can use to launch AWS resources in a virtual network that you define. With a VPC, you have control over your network settings, such the IP address range, subnets, route tables, and network gateways. To connect your VPC to AWS Glue, you define an interface VPC endpoint for AWS Glue. When you use a VPC interface endpoint, communication between your VPC and AWS Glue is conducted entirely and securely within the AWS network.

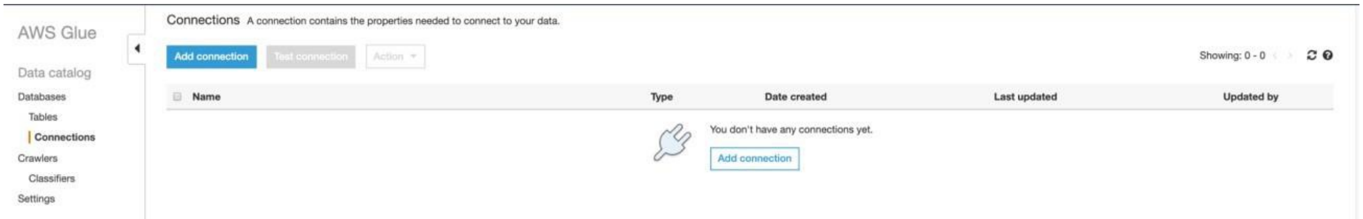
Create an IAM role to use with Lake Formation (for your read)

With AWS Lake Formation, you can import your data using *workflows*. A workflow defines the data source and schedule to import data into your data lake. You can easily define workflows using *blueprints*, or templates, that Lake Formation provides.

When you create a workflow, you must assign it an AWS Identity and Access Management (IAM) role that enables Lake Formation to set up the necessary resources on your behalf to ingest the data. In this lab,
we've pre-created an IAM role for you, called **<random>-LakeFormationWorkflowRole<random>**

Create Glue JDBC connection for RDS

1. Navigate to the AWS Glue console: https://console.aws.amazon.com/glue/home
2. On the AWS Glue menu, select **Connections**.



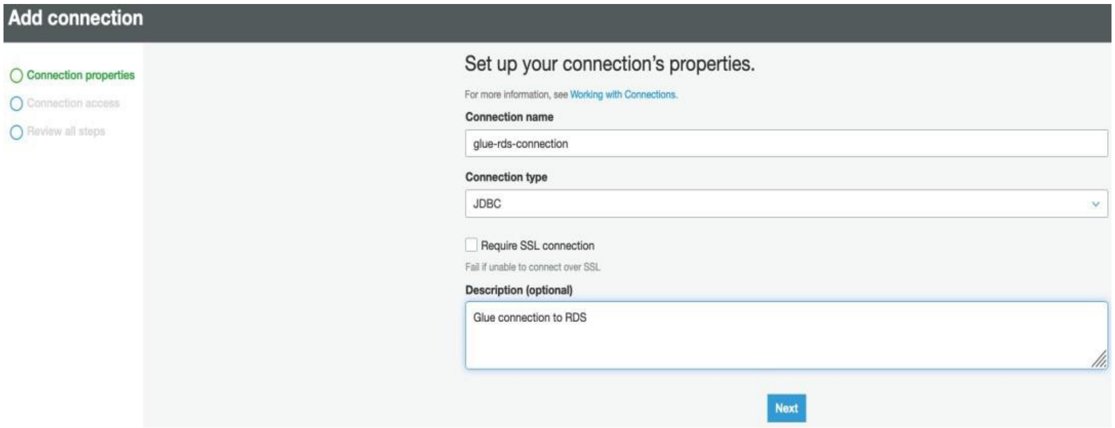
Connections A connection contains the properties needed to connect to your data.

Showing: 0 - 0

Name	Type	Date created	Last updated	Updated by

You don't have any connections yet.

3. Click **Add Connection**.
4. Enter **glue-rds-connection** as the connection name.
5. Choose **JDBC** for connection type.
6. Optionally, enter the description. This should also be descriptive and easilyrecognized and Click **Next**.



Set up your connection's properties.

For more information, see Working with Connections.

Connection name
glue-rds-connection

Connection type
JDBC

□ Require SSL connection
Fail if unable to connect over SSL

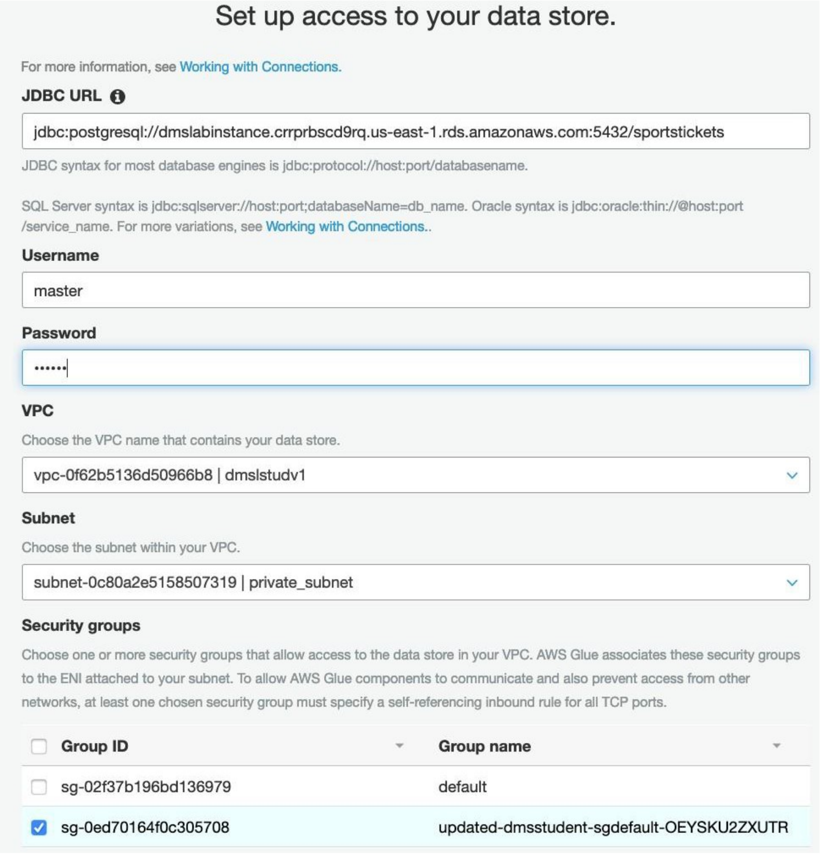
Description (optional)
Glue connection to RDS

7. Input **JDBC URL** with the format of ***jdbc:postgresql://<RDS_Server_Name>:5432/sportstickets***

   a. Get the **Database Endpoint** from your Event Engine Team dashboard.

b. If you are running the lab outside of AWS event, find the **DMSInstanceEndpoint** value on the CloudFormation stack **dmslab-instructor Outputs** tab.

8. Enter **adminuser** as username, **admin123** as **Password**
9. For **VPC**, select the pre-created VPC ending with **dmslstudv1**
10. For **Subnet,** choose one of **private_subnet**
11. Select the **security group** with **sgdefault** in the name.



Set up access to your data store.

For more information, see Working with Connections.

JDBC URL

jdbc:postgresql://dmslabinstance.crrprbscd9rq.us-east-1.rds.amazonaws.com:5432/sportstickets

JDBC syntax for most database engines is jdbc:protocol://host:port/databasename.

SQL Server syntax is jdbc:sqlserver://host:port;databaseName=db_name. Oracle syntax is jdbc:oracle:thin://@host:port /service_name. For more variations, see Working with Connections..

Username

master

Password

••••••

VPC

Choose the VPC name that contains your data store.

vpc-0f62b5136d50966b8 | dmslstudv1

Subnet

Choose the subnet within your VPC.

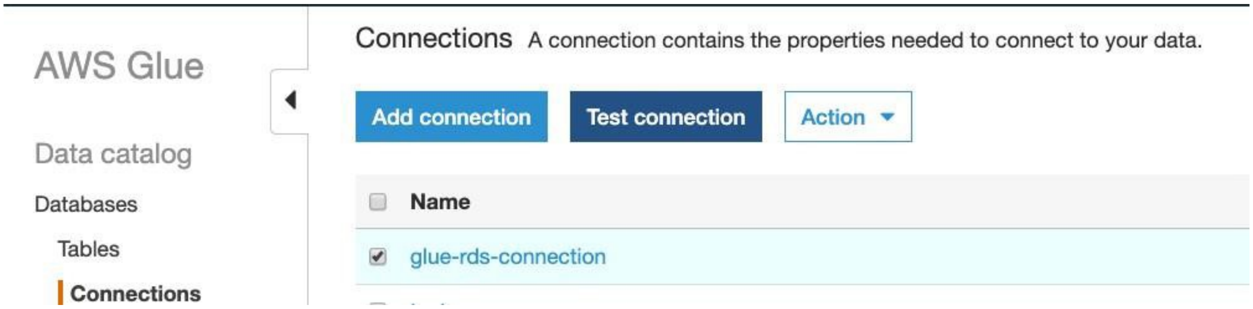
subnet-0c80a2e5158507319 | private_subnet

Security groups

Choose one or more security groups that allow access to the data store in your VPC. AWS Glue associates these security groups to the ENI attached to your subnet. To allow AWS Glue components to communicate and also prevent access from other networks, at least one chosen security group must specify a self-referencing inbound rule for all TCP ports.

□	Group ID	Group name
□	sg-02f37b196bd136979	default
☑	sg-0ed70164f0c305708	updated-dmsstudent-sgdefault-OEYSKU2ZXUTR

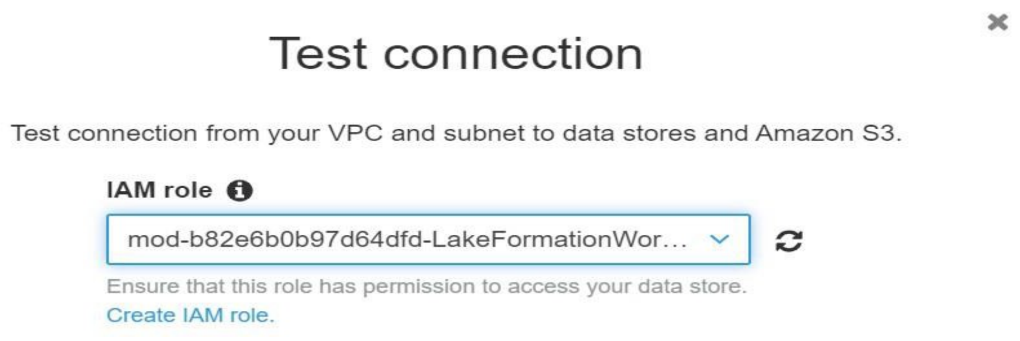
12. Click **Next to** complete the **glue-rds-connection** setup. To test it, select the connection, and choose **Test connection**.



Connections A connection contains the properties needed to connect to your data.

□	Name
☑	glue-rds-connection

13. Choose the pre-created **IAM role** (looks like **<random>-LakeFormationWorkflowRole<random>**), then click **Test Connection.**



Test connection

Test connection from your VPC and subnet to data stores and Amazon S3.

IAM role

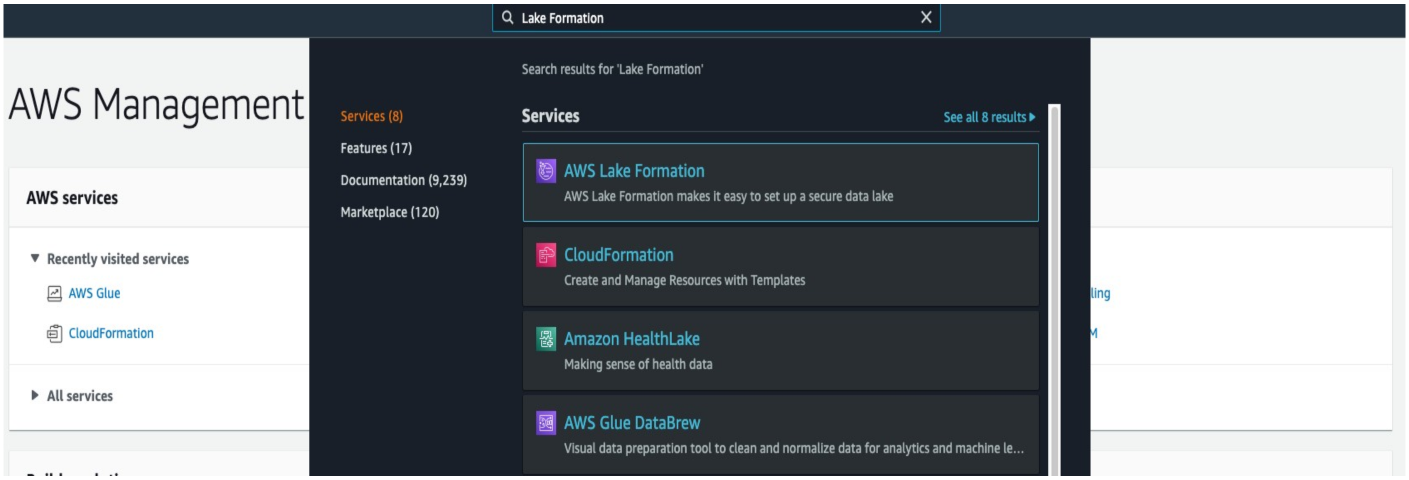
mod-b82e6b0b97d64dfd-LakeFormationWor...

Ensure that this role has permission to access your data store.

Create IAM role.

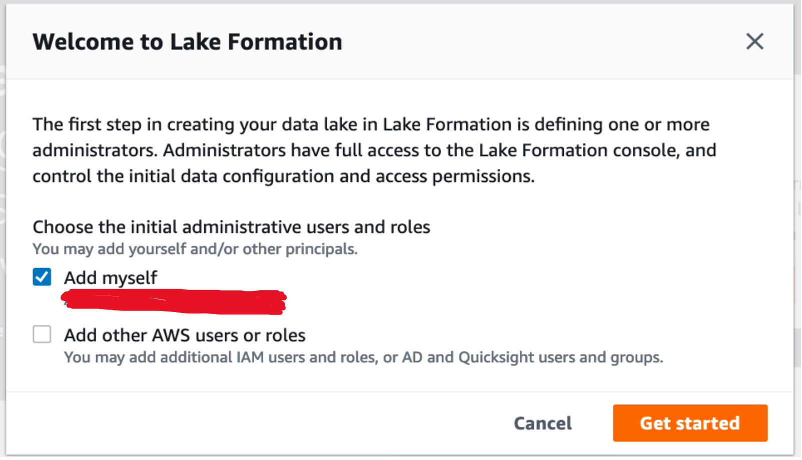
Lake Formation – Add Administrator and start workflows using Blueprints.

Navigate to the AWS Lake Formation service



Lake Formation
AWS Management
Search results for 'Lake Formation'
Services (8)
Features (17)
Documentation (9,239)
Marketplace (120)
Services
See all 8 results
AWS Lake Formation
AWS Lake Formation makes it easy to set up a secure data lake
CloudFormation
Create and Manage Resources with Templates
Amazon HealthLake
Making sense of health data
AWS Glue DataBrew
Visual data preparation tool to clean and normalize data for analytics and machine le...
AWS services
Recently visited services
AWS Glue
CloudFormation
All services

1. If you are logging into the lake formation console for the first time, you will see the window pop up. In order to do that follow Steps 2 and 3, else skip to Step 4.



Welcome to Lake Formation

The first step in creating your data lake in Lake Formation is defining one or more administrators. Administrators have full access to the Lake Formation console, and control the initial data configuration and access permissions.

Choose the initial administrative users and roles

You may add yourself and/or other principals.

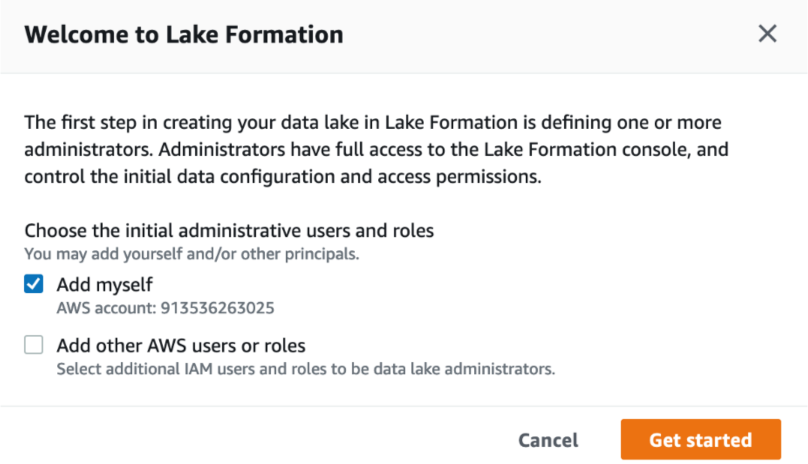
☑ Add myself

[redacted]

☐ Add other AWS users or roles

You may add additional IAM users and roles, or AD and Quicksight users and groups.

2. Add **myself** as the Lake Formation Administrator and Click **Get started**



Welcome to Lake Formation

The first step in creating your data lake in Lake Formation is defining one or more administrators. Administrators have full access to the Lake Formation console, and control the initial data configuration and access permissions.

Choose the initial administrative users and roles

You may add yourself and/or other principals.

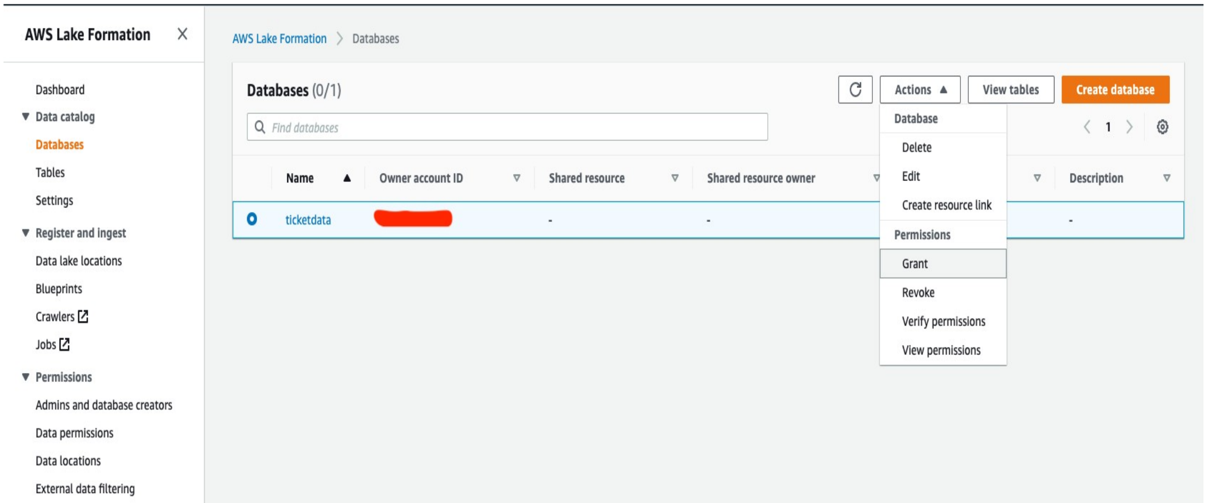
☑ Add myself

AWS account: 913536263025

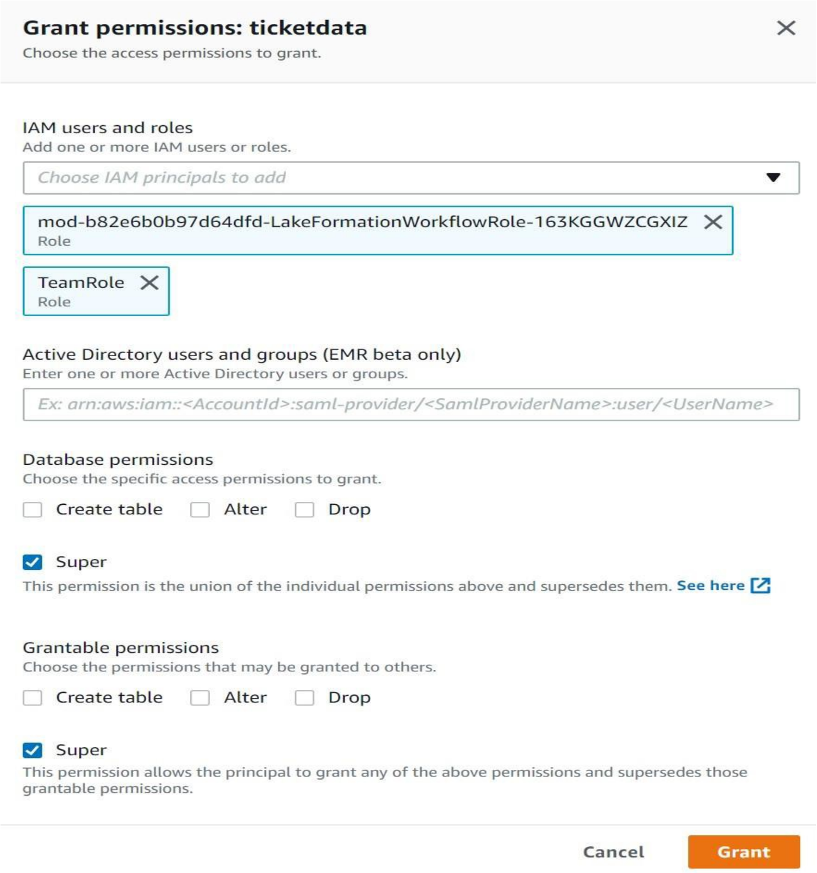
□ Add other AWS users or roles

Select additional IAM users and roles to be data lake administrators.

3. Navigate to **Databases** on left pane. Select **ticketdata** and click on **Actions**, select **Grant** to grant permissions. If you can't see any databases, make sure to complete **Part A of Lab 2. ETL with AWS Glue**



4. Under "**IAM Users and Roles**", select two roles: the Lake Formation role that was precreated: **<random>-LakeFormationWorkflowRole-<random>** and **TeamRole**. Grant **super** permissions for **Database permissions and Grantable permissions.**



Grant permissions: ticketdata ✕

Choose the access permissions to grant.

IAM users and roles

Add one or more IAM users or roles.

Choose IAM principals to add ▼

mod-b82e6b0b97d64dfd-LakeFormationWorkflowRole-163KGGWZCGXIZ ✕
Role

TeamRole ✕
Role

Active Directory users and groups (EMR beta only)

Enter one or more Active Directory users or groups.

Ex: arn:aws:iam::<AccountId>:saml-provider/<SamlProviderName>:user/<UserName>

Database permissions

Choose the specific access permissions to grant.

☐ Create table ☐ Alter ☐ Drop

☑ Super

This permission is the union of the individual permissions above and supersedes them. **See here**

Grantable permissions

Choose the permissions that may be granted to others.

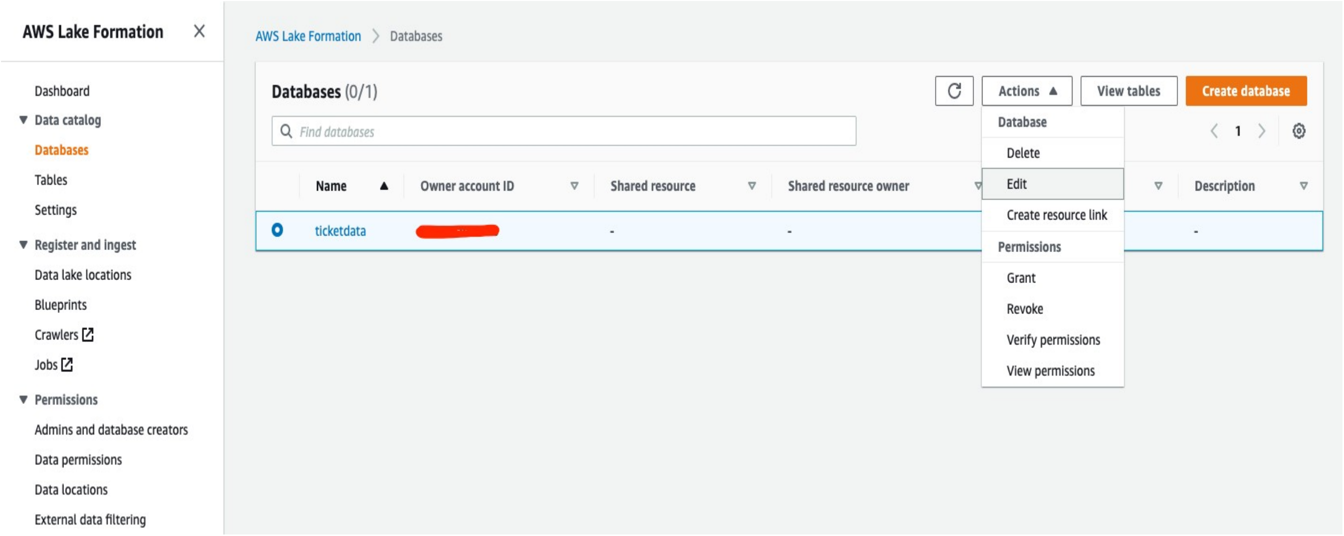
☐ Create table ☐ Alter ☐ Drop

☑ Super

This permission allows the principal to grant any of the above permissions and supersedes those grantable permissions.

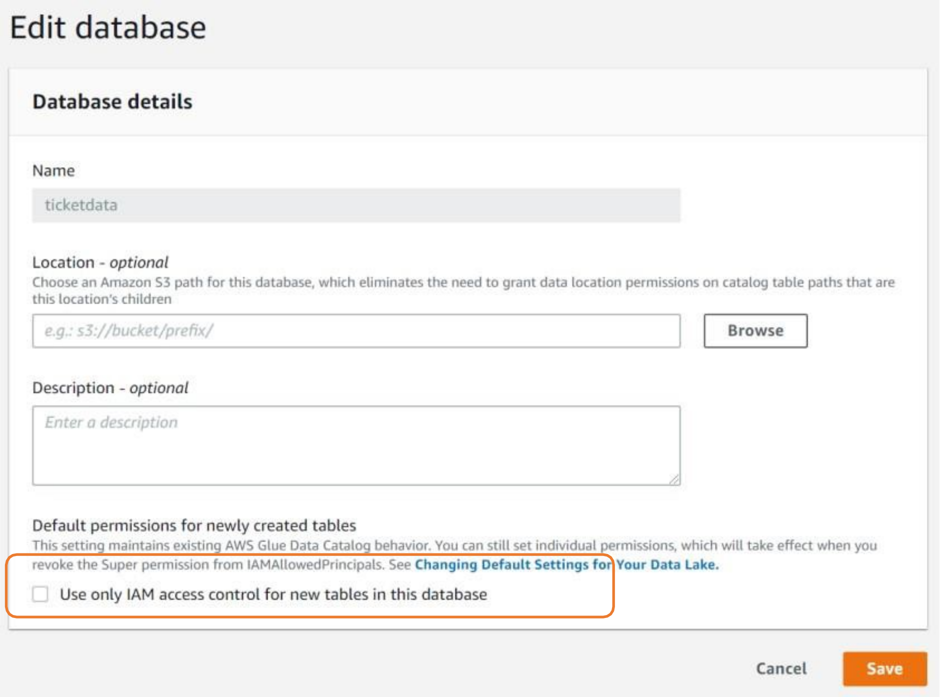
Cancel **Grant**

5. Select **Actions->Edit** on the **ticketdata** database



	Name ▲	Owner account ID	Shared resource	Shared resource owner		Description
●	ticketdata	[redacted]	-	-		-

6. Clear the checkbox **Use only IAM access control** and click **Save**. Changing the default security setting so that access to Data Catalog resources (databases and tables) is managed by Lake Formation permissions.



Edit database

Database details

Name

ticketdata

Location - *optional*

Choose an Amazon S3 path for this database, which eliminates the need to grant data location permissions on catalog table paths that are this location's children

e.g.: s3://bucket/prefix/

Description - *optional*

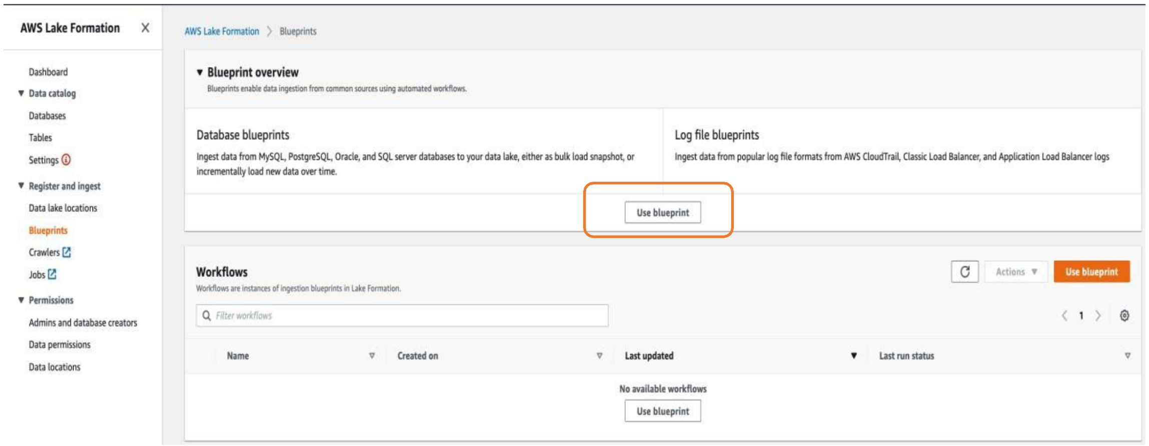
Enter a description

Default permissions for newly created tables

This setting maintains existing AWS Glue Data Catalog behavior. You can still set individual permissions, which will take effect when you revoke the Super permission from IAMAllowedPrincipals. See **Changing Default Settings for Your Data Lake.**

□ Use only IAM access control for new tables in this database

7. On the left pane navigate to **Blueprints** and click **Use blueprints**.



Blueprint overview

Blueprints enable data ingestion from common sources using automated workflows.

Database blueprints

Ingest data from MySQL, PostgreSQL, Oracle, and SQL server databases to your data lake, either as bulk load snapshot, or incrementally load new data over time.

Log file blueprints

Ingest data from popular log file formats from AWS CloudTrail, Classic Load Balancer, and Application Load Balancer logs

Workflows

Workflows are instances of ingestion blueprints in Lake Formation.

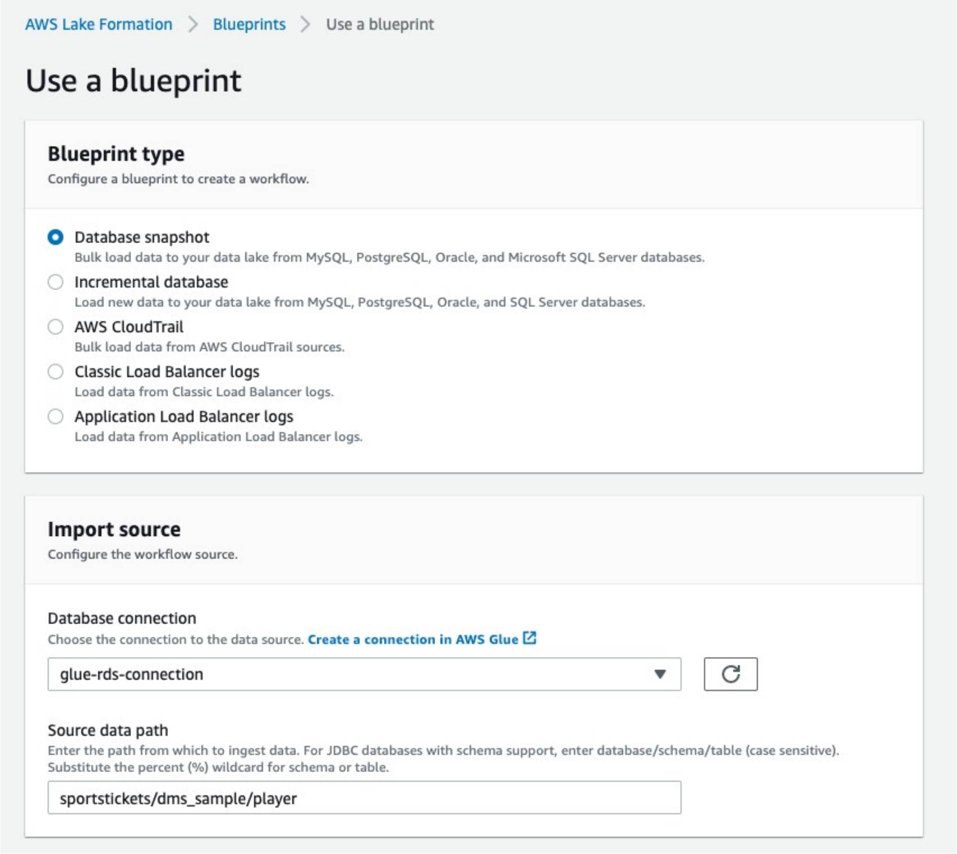
Name	Created on	Last updated	Last run status

No available workflows

- For **Blueprint Type**, select **Database snapshot**
- Under **Import Source**

    a For **Database Connection** choose **glue-rds-connection**

    b For **Source Data Path** enter **sportstickets/dms_sample/player**



AWS Lake Formation > Blueprints > Use a blueprint

Use a blueprint

Blueprint type

Configure a blueprint to create a workflow.

- ● Database snapshot
  Bulk load data to your data lake from MySQL, PostgreSQL, Oracle, and Microsoft SQL Server databases.
- ○ Incremental database
  Load new data to your data lake from MySQL, PostgreSQL, Oracle, and SQL Server databases.
- ○ AWS CloudTrail
  Bulk load data from AWS CloudTrail sources.
- ○ Classic Load Balancer logs
  Load data from Classic Load Balancer logs.
- ○ Application Load Balancer logs
  Load data from Application Load Balancer logs.

Import source

Configure the workflow source.

Database connection

Choose the connection to the data source. Create a connection in AWS Glue

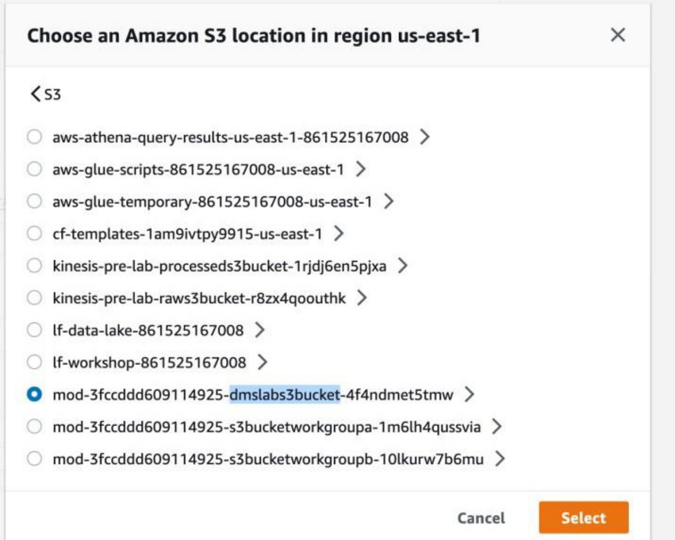
glue-rds-connection

Source data path

Enter the path from which to ingest data. For JDBC databases with schema support, enter database/schema/table (case sensitive). Substitute the percent (%) wildcard for schema or table.

sportstickets/dms_sample/player

- Under **Import Target**
  - i. For **Target Database**, choose **ticketdata**
  - ii. For **Target storage location** browse and select the **xxx-dmslabS3bucket-xxx** created in the previous lab.



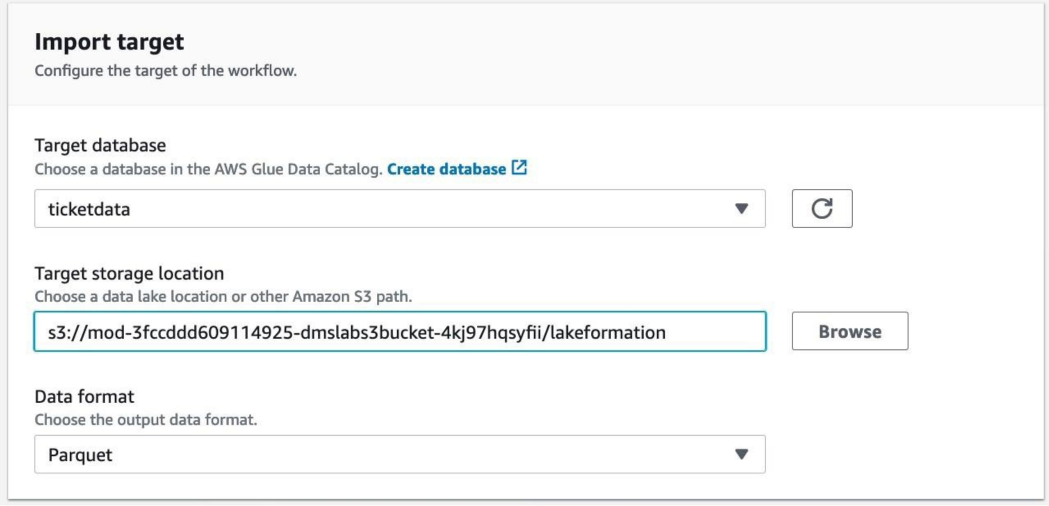
Choose an Amazon S3 location in region us-east-1

< S3

- ○ aws-athena-query-results-us-east-1-861525167008 >
- ○ aws-glue-scripts-861525167008-us-east-1 >
- ○ aws-glue-temporary-861525167008-us-east-1 >
- ○ cf-templates-1am9ivtpy9915-us-east-1 >
- ○ kinesis-pre-lab-processeds3bucket-1rjdj6en5pjxa >
- ○ kinesis-pre-lab-raws3bucket-r8zx4qoouthk >
- ○ lf-data-lake-861525167008 >
- ○ lf-workshop-861525167008 >
- ● mod-3fccddd609114925-dmslabs3bucket-4f4ndmet5tmw >
- ○ mod-3fccddd609114925-s3bucketworkgroupa-1m6lh4qussvia >
- ○ mod-3fccddd609114925-s3bucketworkgroupb-10lkurw7b6mu >

iii. Add **/lakeformation** at the end of the bucket url path, e.g. s3://xxx-dmslabs3bucket-xxx**/lakeformation**

iv. For **Data Format** choose **Parquet**



Import target

Configure the target of the workflow.

Target database

Choose a database in the AWS Glue Data Catalog.

ticketdata

Target storage location

Choose a data lake location or other Amazon S3 path.

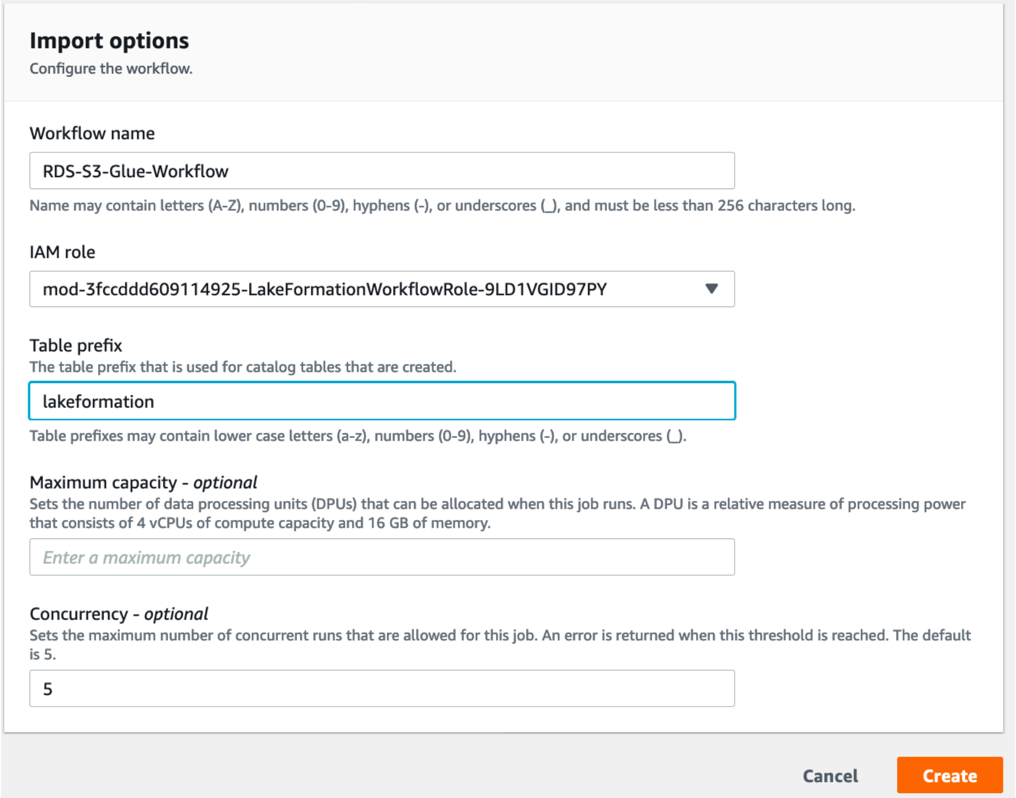
s3://mod-3fccddd609114925-dmslabs3bucket-4kj97hqsyfii/lakeformation

Data format

Choose the output data format.

Parquet

- For **Import Frequency**, Select **Run On Demand**
- For **Import Options**:
  - i Give a Workflow Name **RDS-S3-Glue-Workflow**
  - ii For the **IAM role** contains **LakeFormationWorkflowRole**
  - iii For **Table prefix** type **lakeformation**



Import options

Configure the workflow.

Workflow name

RDS-S3-Glue-Workflow

Name may contain letters (A-Z), numbers (0-9), hyphens (-), or underscores (_), and must be less than 256 characters long.

IAM role

mod-3fccddd609114925-LakeFormationWorkflowRole-9LD1VGID97PY

Table prefix

The table prefix that is used for catalog tables that are created.

lakeformation

Table prefixes may contain lower case letters (a-z), numbers (0-9), hyphens (-), or underscores (_).

Maximum capacity - *optional*

Sets the number of data processing units (DPUs) that can be allocated when this job runs. A DPU is a relative measure of processing power that consists of 4 vCPUs of compute capacity and 16 GB of memory.

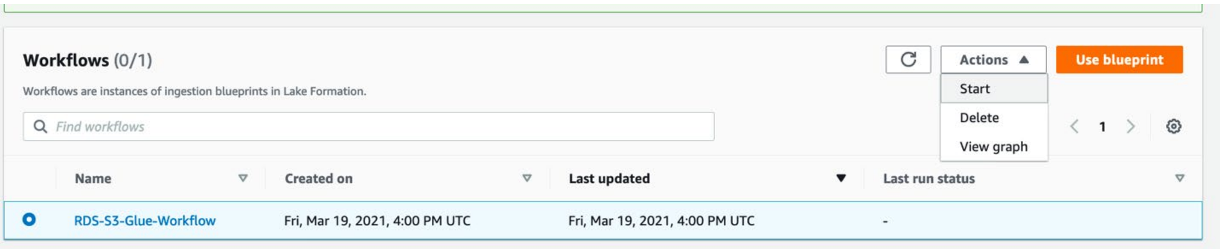
Enter a maximum capacity

Concurrency - *optional*

Sets the maximum number of concurrent runs that are allowed for this job. An error is returned when this threshold is reached. The default is 5.

5

8. Leave other options as default, click **Create**, and wait for the console to report that the workflow was successfully created.
9. Once the blueprint gets created, select it and click **Action -> Start.** There may be a delay of 5-10 seconds for the blueprint showing up. You may have to **hit refresh** button.

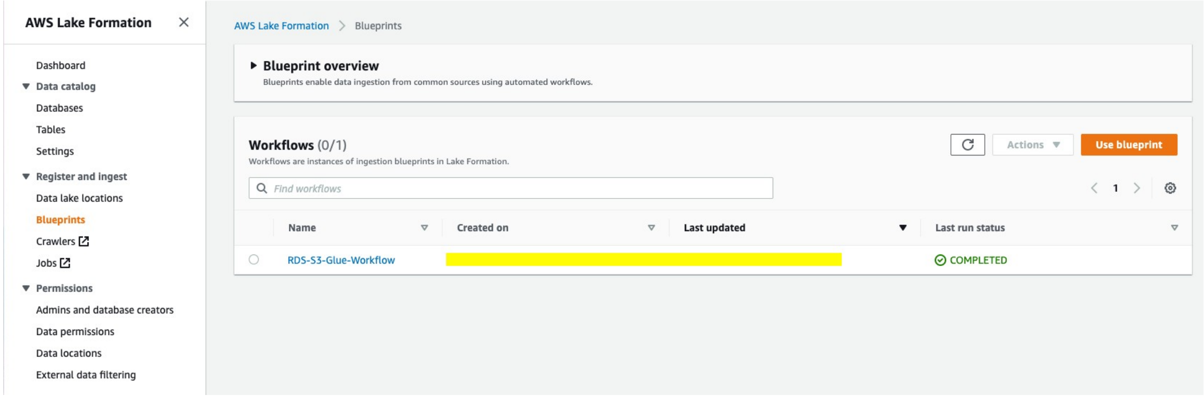


Workflows (0/1)

Workflows are instances of ingestion blueprints in Lake Formation.

	Name	Created on	Last updated	Last run status
●	RDS-S3-Glue-Workflow	Fri, Mar 19, 2021, 4:00 PM UTC	Fri, Mar 19, 2021, 4:00 PM UTC	-

10. Once the workflow starts executing, you will see the status changes from **running -> discovering** ->**importing ->Completed**



Blueprint overview

Blueprints enable data ingestion from common sources using automated workflows.

Workflows (0/1)

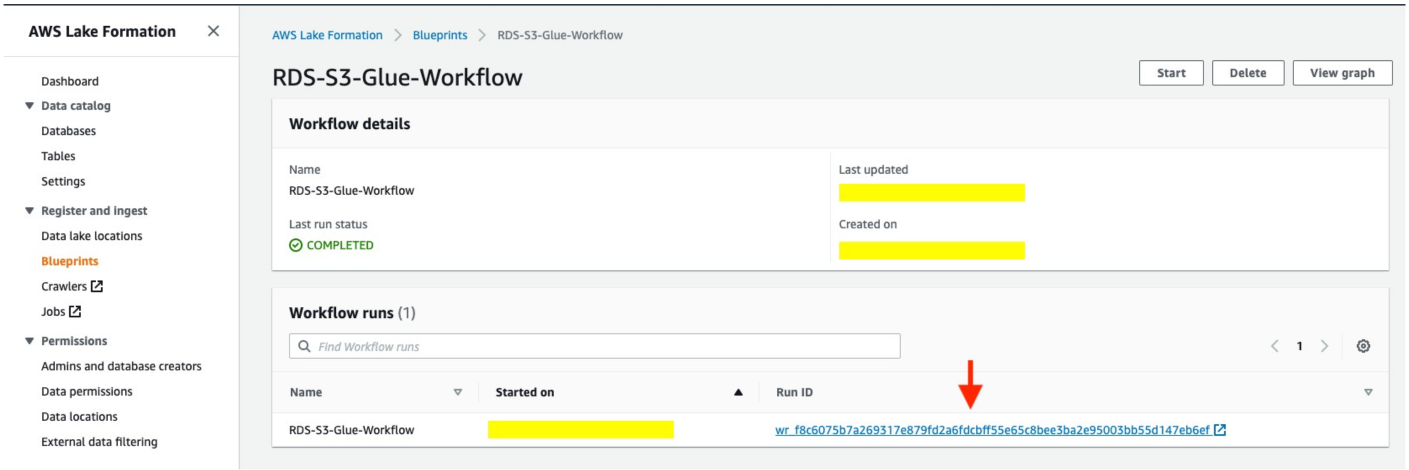
Workflows are instances of ingestion blueprints in Lake Formation.

	Name	Created on	Last updated	Last run status
○	RDS-S3-Glue-Workflow	[redacted]		✓ COMPLETED

Explore the Underlying Components of a Blueprint

The Lake Formation blueprint creates a Glue Workflow under the hood which contains Glue ETL jobs – both python shell and pyspark, Glue crawlers and triggers. It will take somewhere between 20-30 mins to finish its first execution. In the meantime, let us drill down to see what it creates for us;

1. On the **Lake Formation console**, in the navigation pane, choose **Blueprints**
2. In the **Workflow section**, click on the **Workflow name**. This will direct you to the Workflow run page. Click on the **Run Id.**



RDS-S3-Glue-Workflow

Workflow details

Name: RDS-S3-Glue-Workflow

Last updated: [redacted]

Last run status: ✓ COMPLETED

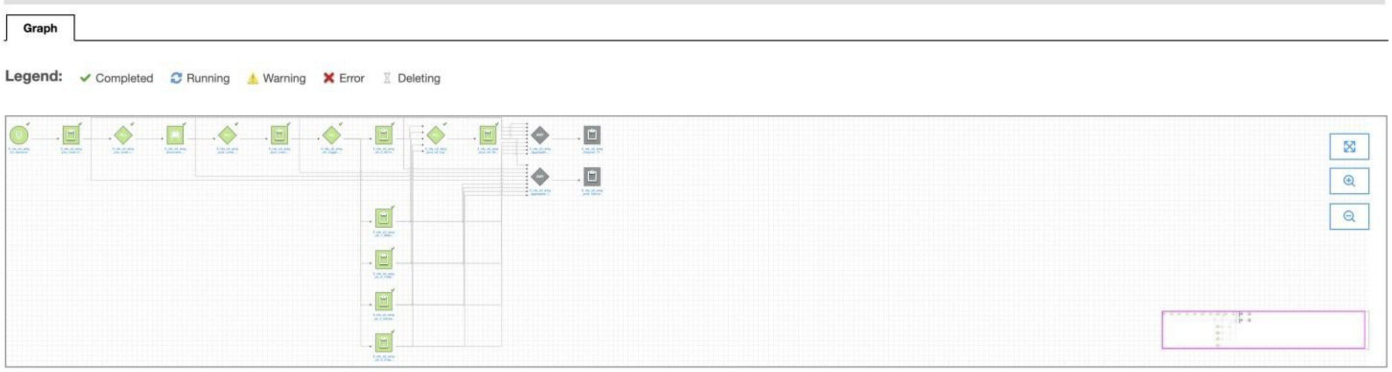
Created on: [redacted]

Workflow runs (1)

Name	Started on	Run ID
RDS-S3-Glue-Workflow	[redacted]	wr_f8c6075b7a269317e879fd2a6fdcbff55e65c8bee3ba2e95003bb55d147eb6ef

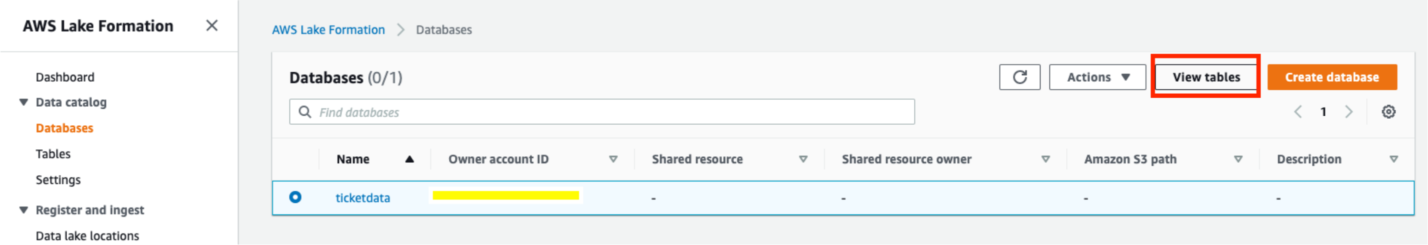
3. Here you can see the graphical representation of the Glue workflow built by Lake Formation blueprint. Highlighting and clicking on individual components will display the details of those components (name, description, job run id, start time, execution time)
4. To understand what all Glue Jobs got created as a part of this workflow, in the navigation pane, click on **Jobs**.

5. Every job comes with history, details, script and metrics tab. Review each ofthese tabs for any of the python shell or pyspark jobs.



Explore workflow results in Athena

1. Navigate to the **Lake Formation** Console:
2. Navigate to **Databases** on the left panel and select **ticketdata**
3. Click on **View tables**

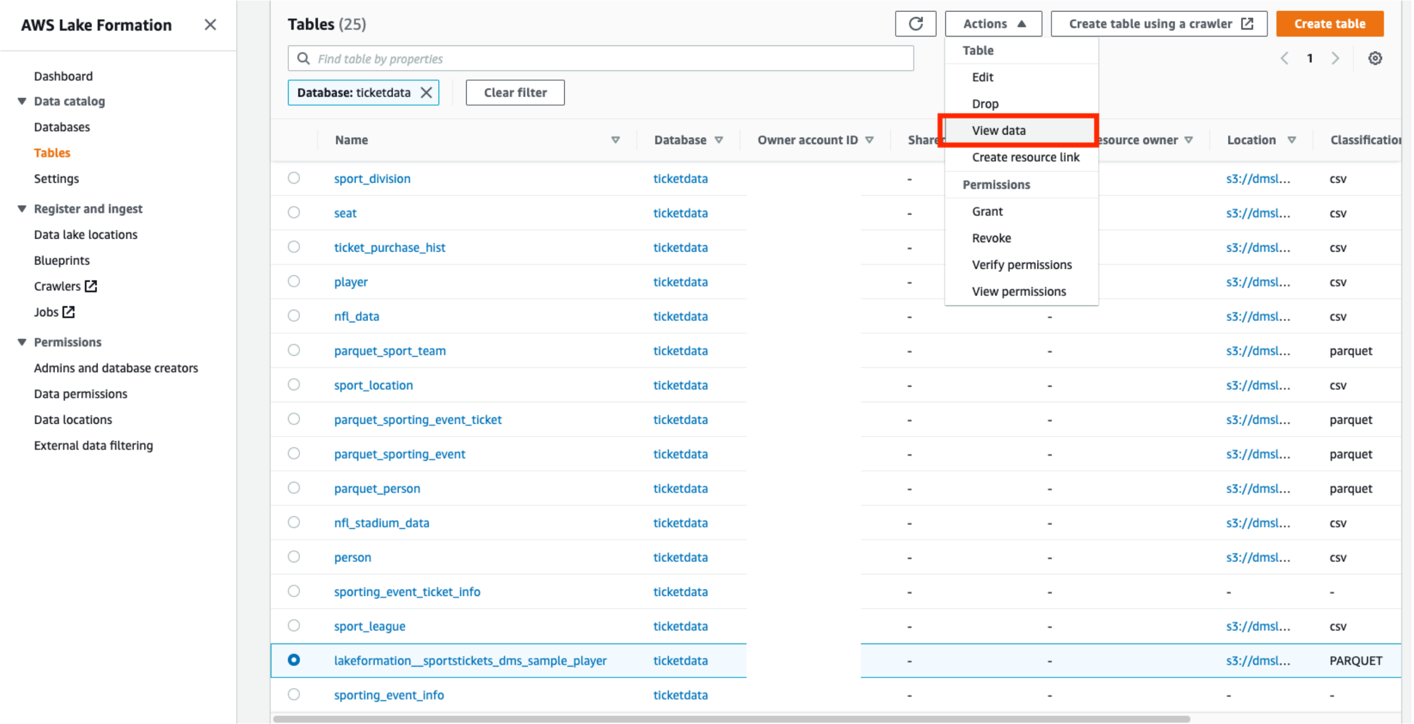


Databases (0/1)

	Name	Owner account ID	Shared resource	Shared resource owner	Amazon S3 path	Description
●	ticketdata	[redacted]	-	-	-	-

4. Select table **lakeformation_sportstickets_dms_sample_player**. As per our configuration above, Lake Formation tables were prefixed with**lakeformation_**

5. And Click **Action** -> **View Data**

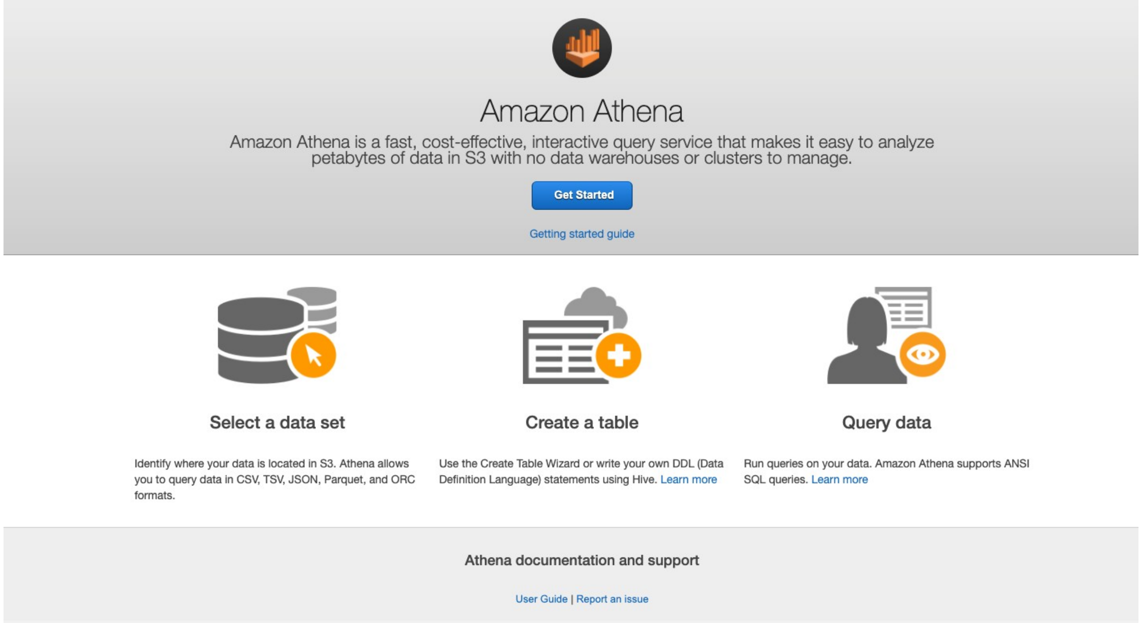


Tables (25)

	Name	Database	Owner account ID	Share	esource owner	Location	Classificatio
○	sport_division	ticketdata		-		s3://dmsl...	csv
○	seat	ticketdata		-		s3://dmsl...	csv
○	ticket_purchase_hist	ticketdata		-		s3://dmsl...	csv
○	player	ticketdata		-		s3://dmsl...	csv
○	nfl_data	ticketdata		-	-	s3://dmsl...	csv
○	parquet_sport_team	ticketdata		-	-	s3://dmsl...	parquet
○	sport_location	ticketdata		-	-	s3://dmsl...	csv
○	parquet_sporting_event_ticket	ticketdata		-	-	s3://dmsl...	parquet
○	parquet_sporting_event	ticketdata		-	-	s3://dmsl...	parquet
○	parquet_person	ticketdata		-	-	s3://dmsl...	parquet
○	nfl_stadium_data	ticketdata		-	-	s3://dmsl...	csv
○	person	ticketdata		-	-	s3://dmsl...	csv
○	sporting_event_ticket_info	ticketdata		-	-	-	-
○	sport_league	ticketdata		-	-	s3://dmsl...	csv
●	lakeformation__sportstickets_dms_sample_player	ticketdata		-	-	s3://dmsl...	PARQUET
○	sporting_event_info	ticketdata		-	-	-	-

This will now take you to **Athena** console.

If you see a “Get Started” page, it’s because it’s the first time we’re using Athena in this AWS Account. To proceed, click **Get Started**



Amazon Athena

Amazon Athena is a fast, cost-effective, interactive query service that makes it easy to analyze petabytes of data in S3 with no data warehouses or clusters to manage.

Select a data set

Identify where your data is located in S3. Athena allows you to query data in CSV, TSV, JSON, Parquet, and ORC formats.

Create a table

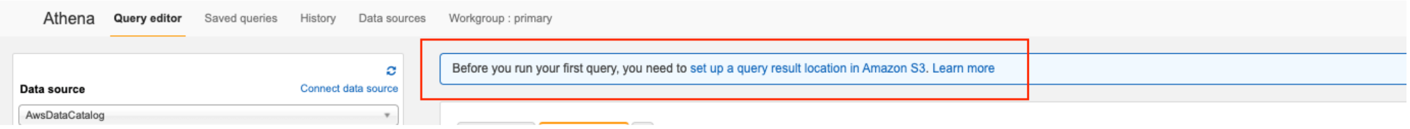
Use the Create Table Wizard or write your own DDL (Data Definition Language) statements using Hive. Learn more

Query data

Run queries on your data. Amazon Athena supports ANSI SQL queries. Learn more

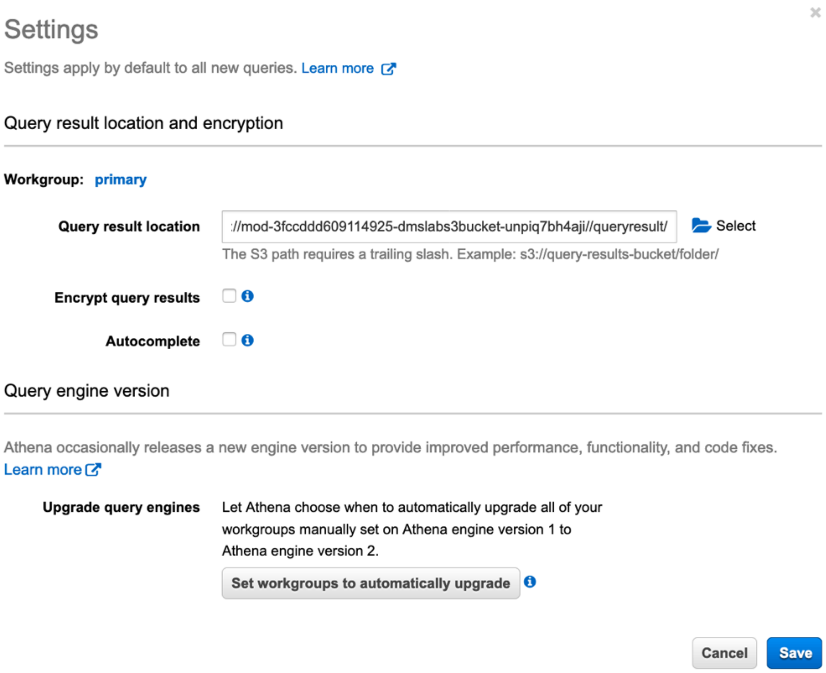
Athena documentation and support

Then click **set up a query result location in Amazon S3** at the top



Before you run your first query, you need to set up a query result location in Amazon S3. Learn more

In the pop-up window in the **Query result location** field, enter your s3 bucket location followed by /, so that it looks like **s3://xxx-dmslabs3bucket-xxx/queryresult/** and click **Save**



Settings

Settings apply by default to all new queries. Learn more

Query result location and encryption

Workgroup: primary

Query result location ://mod-3fccddd609114925-dmslabs3bucket-unpiq7bh4aji//queryresult/

The S3 path requires a trailing slash. Example: s3://query-results-bucket/folder/

Encrypt query results □

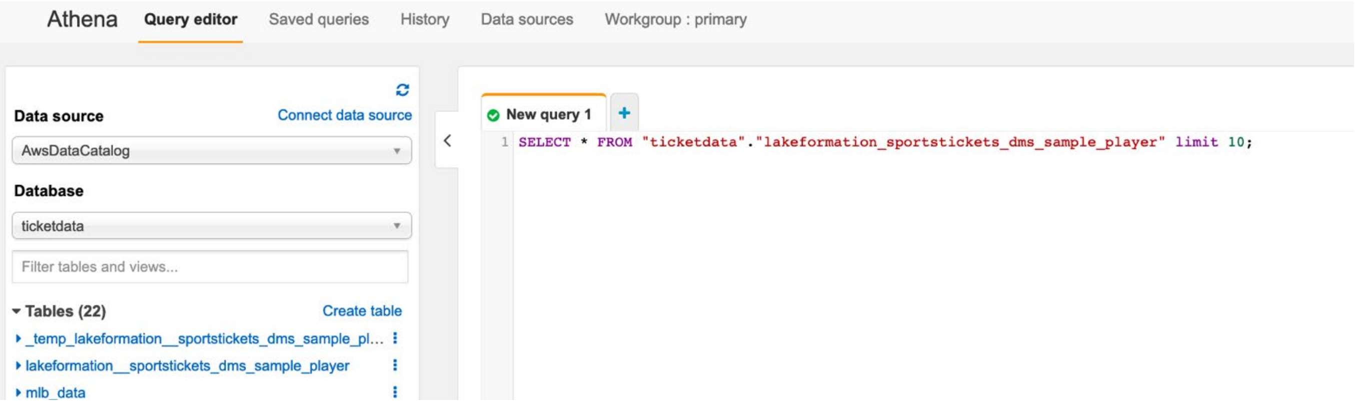
Autocomplete □

Query engine version

Athena occasionally releases a new engine version to provide improved performance, functionality, and code fixes. Learn more

Upgrade query engines Let Athena choose when to automatically upgrade all of your workgroups manually set on Athena engine version 1 to Athena engine version 2.

On Athena Console, you can run some queries using query editor:



```
SELECT * FROM "ticketdata"."lakeformation_sportstickets_dms_sample_player" limit 10;
```

To select some rows from the table, try running:

SELECT * FROM "ticketdata"."lakeformation_sportstickets_dms_sample_player" limit 10;

To get a row count, run:

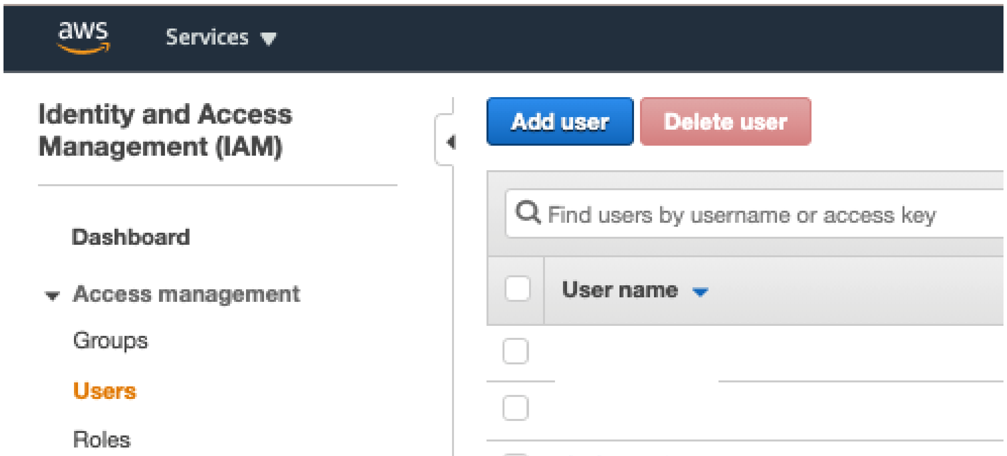
SELECT count(*) as recordcount FROM "ticketdata"."lakeformation_sportstickets_dms_sample_player" limit 10;

Congratulations!!! You have completed lake formation lab. To explore more fine grain data lake security feature, continue to next section.

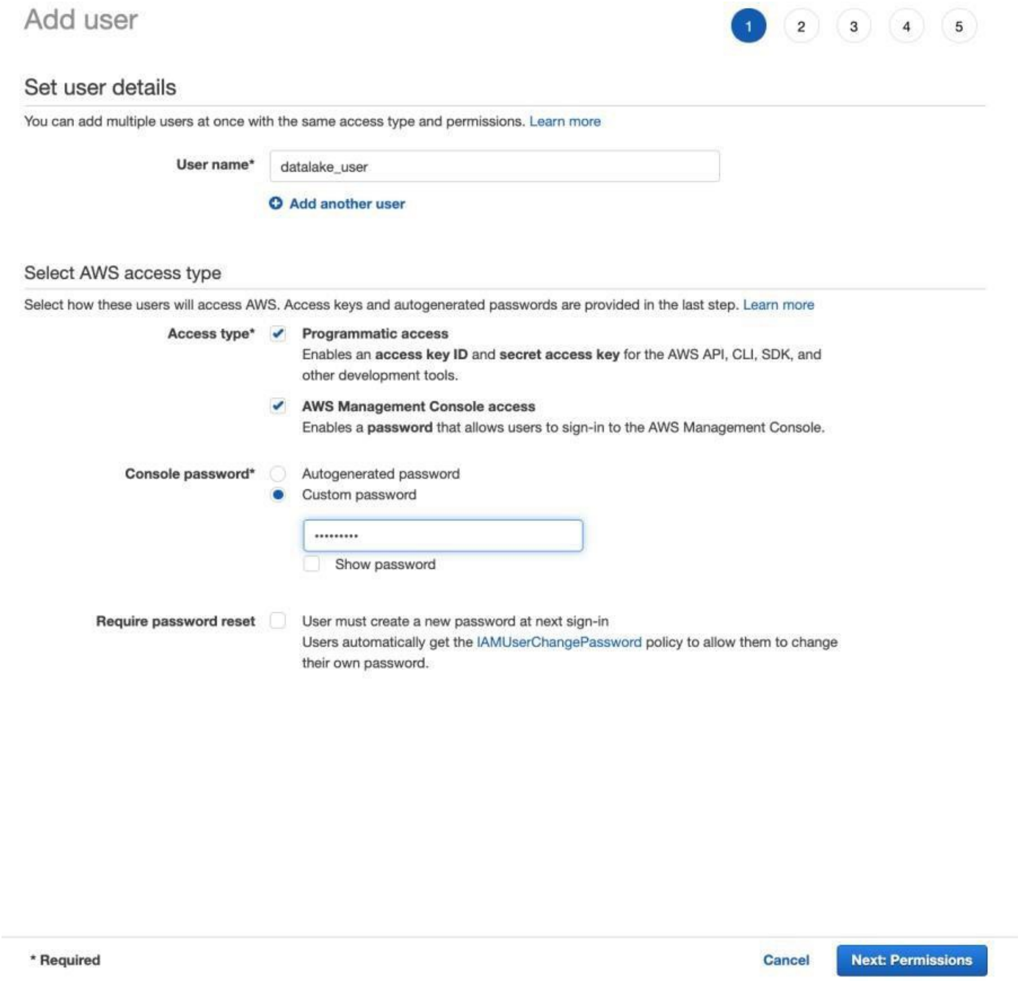
[Optional] Grant fine grain access controls to Data Lake user

Before we start the querying the data, let us create an IAM User **datalake_user** and grant column level access on the table created by the Lake formation workflow above, to **datalake_user.**

1. Navigate to **IAM Console** and click on **Add User**.



2. Create a user named **datalake_user** and give it a password: **Admin123!**



Add user

Set user details

You can add multiple users at once with the same access type and permissions. Learn more

User name* datalake_user

Select AWS access type

Select how these users will access AWS. Access keys and autogenerated passwords are provided in the last step. Learn more

Access type* ☑ **Programmatic access**
Enables an **access key ID** and **secret access key** for the AWS API, CLI, SDK, and other development tools.

☑ **AWS Management Console access**
Enables a **password** that allows users to sign-in to the AWS Management Console.

Console password* ○ Autogenerated password
● Custom password

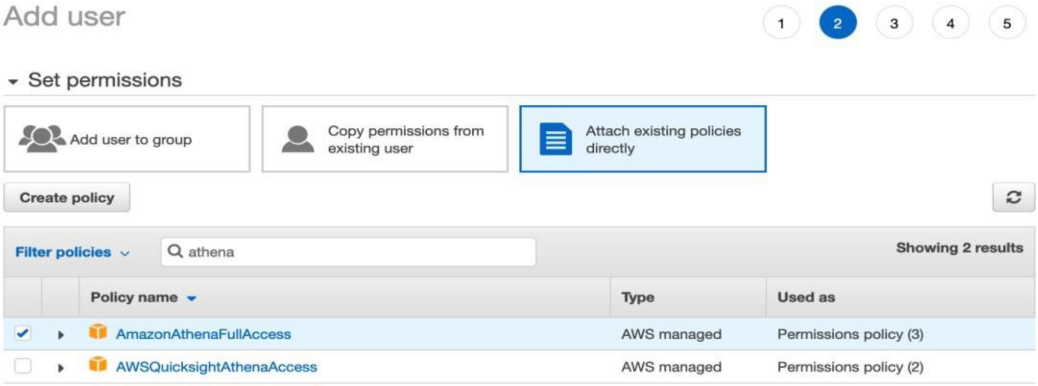
•••••••••

□ Show password

Require password reset □ User must create a new password at next sign-in
Users automatically get the IAMUserChangePassword policy to allow them to change their own password.

* Required

3. Next click on **Permissions**
4. Choose **Attach existing policies directly** and search for **AthenaFullAccess**



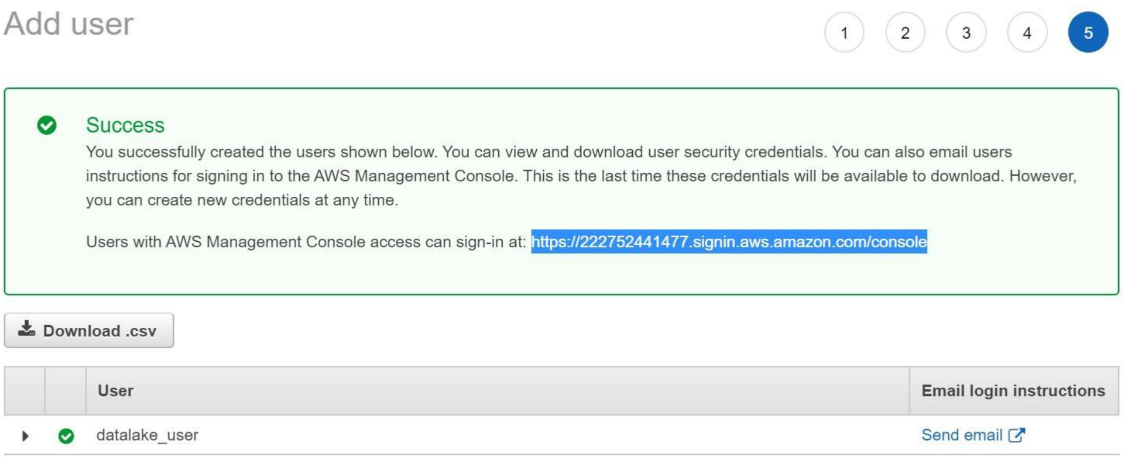
Add user

athena

Showing 2 results

		Policy name	Type	Used as
☑	▸	AmazonAthenaFullAccess	AWS managed	Permissions policy (3)
□	▸	AWSQuicksightAthenaAccess	AWS managed	Permissions policy (2)

5. Keep navigating to the next steps until reached the end. Review the details and click on "**Create User**".
6. On the final screen, write down the sign-in link and hit **Close**



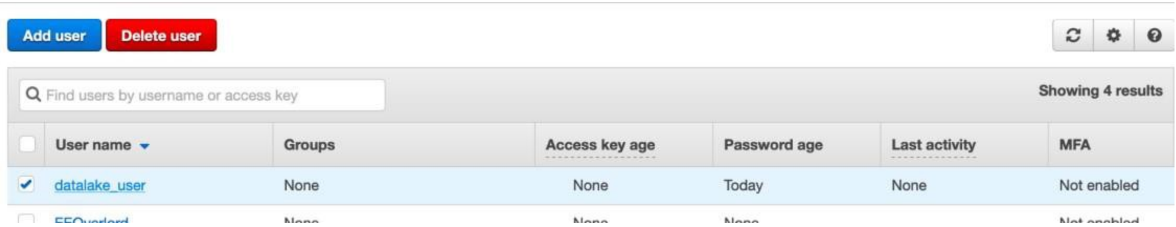
Success

You successfully created the users shown below. You can view and download user security credentials. You can also email users instructions for signing in to the AWS Management Console. This is the last time these credentials will be available to download. However, you can create new credentials at any time.

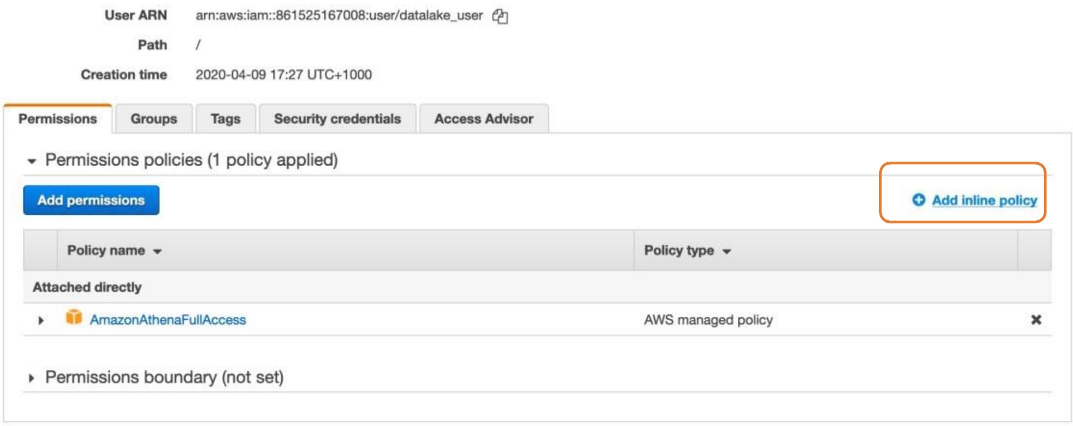
Users with AWS Management Console access can sign-in at: https://222752441477.signin.aws.amazon.com/console

		User	Email login instructions
▸	✓	datalake_user	Send email

7. Click on the **datalake_user** user, and **add inline policy** and switch to the **JSON** tab



	User name	Groups	Access key age	Password age	Last activity	MFA
☑	datalake_user	None	None	Today	None	Not enabled
□	EEOverlord	None	None	None		Not enabled


User ARN arn:aws:iam::861525167008:user/datalake_user

Path /

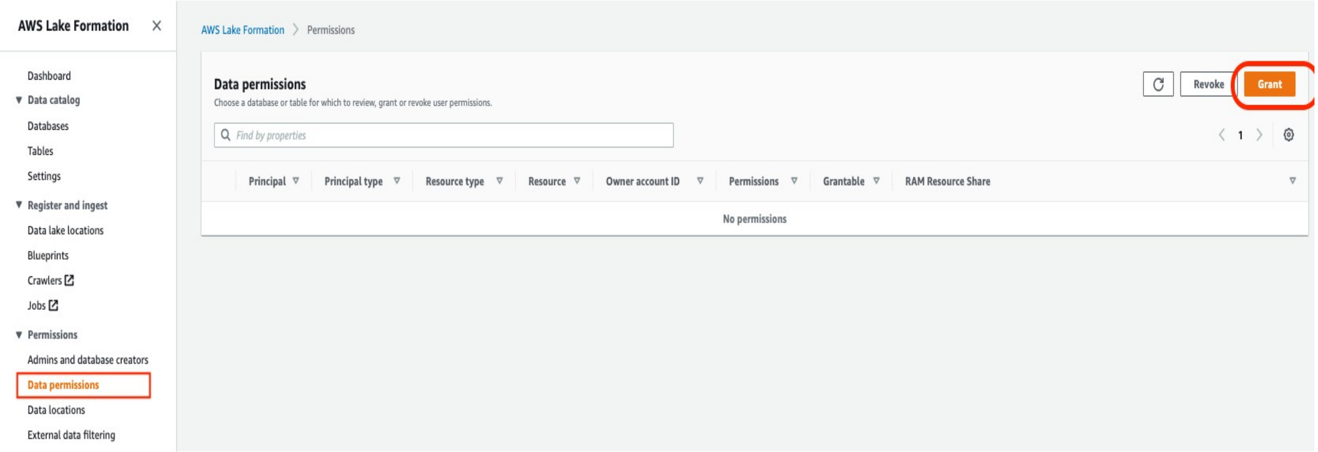
Creation time 2020-04-09 17:27 UTC+1000

Policy name	Policy type
Attached directly	
AmazonAthenaFullAccess	AWS managed policy

Use the following json snippet replacing <your_dmslabs3bucket_unique_name> with the name of your dmslabs3bucket, e.g. **mod-08b80667356c4f8a- dmslabs3bucketnh54wqg771lk**

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "s3:Put*",
        "s3:Get*",
        "s3:List*"
      ],
      "Resource": [
        "arn:aws:s3:::<your_dmslabs3bucket_unique_name>/*"
      ]
    }
  ]
}
```

8. Give a name **athena_access** to the policy, then **Create Policy**. IAM user with required policies have been created.
9. Next, Navigate to **Lake Formation console**, under **Permissions** choose **Data permissions**.
10. Choose **Grant**, and in the **Grant permissions** dialog box, do the following:

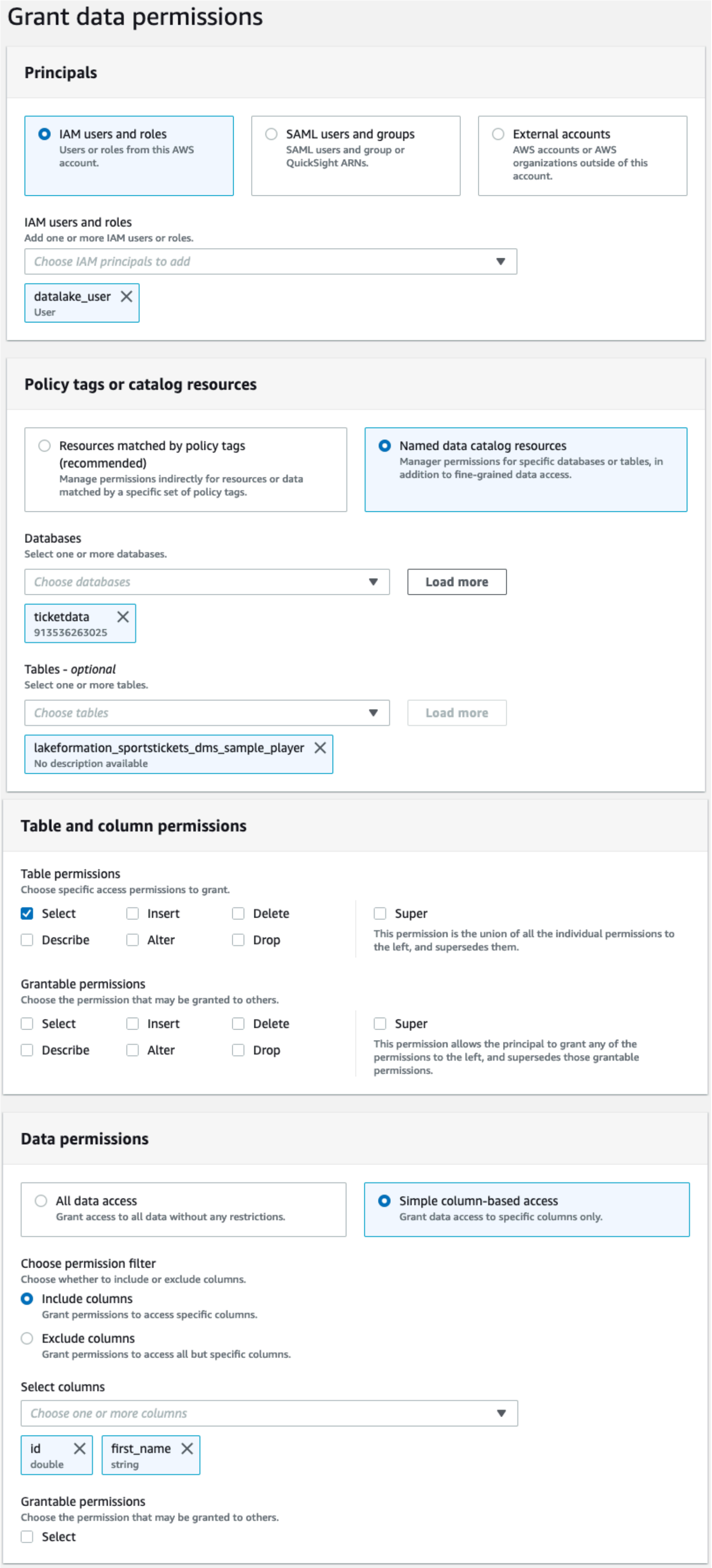


Data permissions

Choose a database or table for which to review, grant or revoke user permissions.

Principal	Principal type	Resource type	Resource	Owner account ID	Permissions	Grantable	RAM Resource Share
No permissions							

11. Once the **Grant permissions** window opens up:
    a. For **IAM user and roles**, choose **datalake_user.**
    b. Under **Policy tags or catalog resources**, choose **Named data catalog resources**
    c. For **Database**, choose **ticketdata**
    d. The **Table** list populates.
    e. For **Table**, choose **lakeformation_sportstickets_dms_sample_player**.
    f. For Columns, select **Include Columns** and choose **id**, **first_name**
    g. For **Table permissions**, choose **Select**.
    h. Under Data Permissions, choose **Simple column-based access** and select columns **id** and **first_name** to be included.
    i. Choose **Grant**



Grant data permissions

Principals

● IAM users and roles
Users or roles from this AWS account.

○ SAML users and groups
SAML users and group or QuickSight ARNs.

○ External accounts
AWS accounts or AWS organizations outside of this account.

IAM users and roles
Add one or more IAM users or roles.

Choose IAM principals to add

datalake_user ✕
User

Policy tags or catalog resources

○ Resources matched by policy tags (recommended)
Manage permissions indirectly for resources or data matched by a specific set of policy tags.

● Named data catalog resources
Manager permissions for specific databases or tables, in addition to fine-grained data access.

Databases
Select one or more databases.

Choose databases Load more

ticketdata ✕
913536263025

Tables - *optional*
Select one or more tables.

Choose tables Load more

lakeformation_sportstickets_dms_sample_player ✕
No description available

Table and column permissions

Table permissions
Choose specific access permissions to grant.

☑ Select ☐ Insert ☐ Delete
☐ Describe ☐ Alter ☐ Drop

☐ Super
This permission is the union of all the individual permissions to the left, and supersedes them.

Grantable permissions
Choose the permission that may be granted to others.

☐ Select ☐ Insert ☐ Delete
☐ Describe ☐ Alter ☐ Drop

☐ Super
This permission allows the principal to grant any of the permissions to the left, and supersedes those grantable permissions.

Data permissions

○ All data access
Grant access to all data without any restrictions.

● Simple column-based access
Grant data access to specific columns only.

Choose permission filter
Choose whether to include or exclude columns.

● Include columns
Grant permissions to access specific columns.

○ Exclude columns
Grant permissions to access all but specific columns.

Select columns

Choose one or more columns

id ✕
double

first_name ✕
string

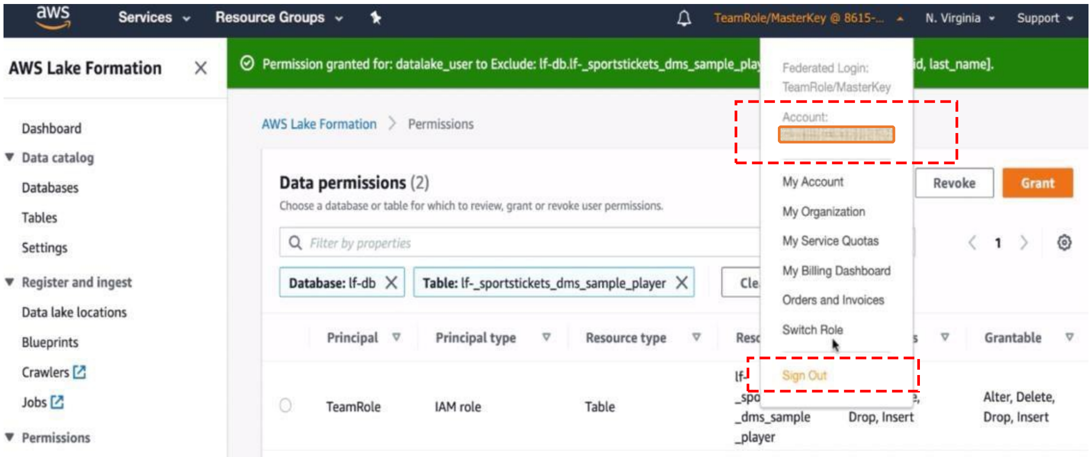
Grantable permissions
Choose the permission that may be granted to others.

☐ Select

[Optional] Verify data permissions using Athena

Using Athena, let us now explore the data set as the **datalake_user**.

Sign out your AWS Account. Before doing that, write down your **Account ID**.



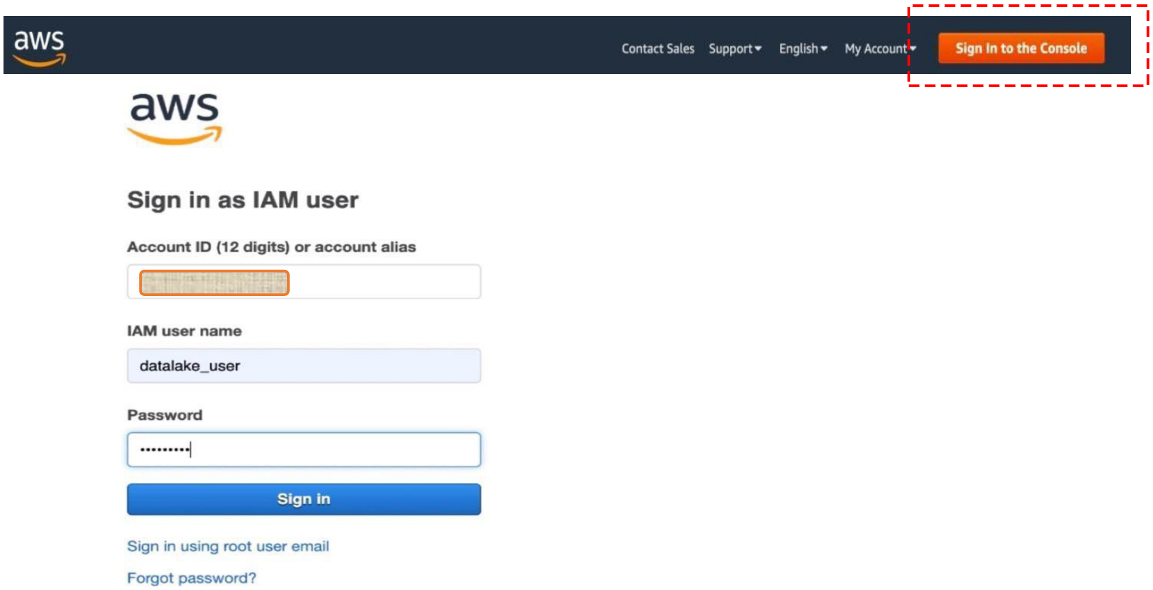
Permission granted for: datalake_user to Exclude: lf-db.lf-_sportstickets_dms_sample_pla id, last_name].

Federated Login: TeamRole/MasterKey

Account: [redacted]

Principal	Principal type	Resource type	Resc	s	Grantable
TeamRole	IAM role	Table	lf-_spo_dms_sample_player	Drop, Insert	Alter, Delete, Drop, Insert

On the same web page, sign back in as the IAM user **datalake_user**, using **Admin123!** as password. Note: remove *hyphens* '-' from your Account ID

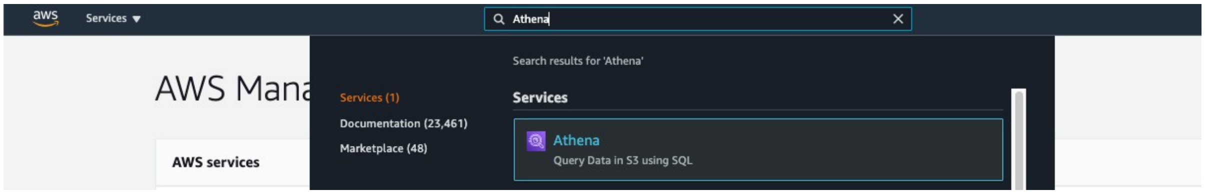


Account ID (12 digits) or account alias: [redacted]

IAM user name: datalake_user

Password: ••••••••

1. Make sure to change the region to **the appropriate AWS region**
2. Navigate to **Athena console**



Athena

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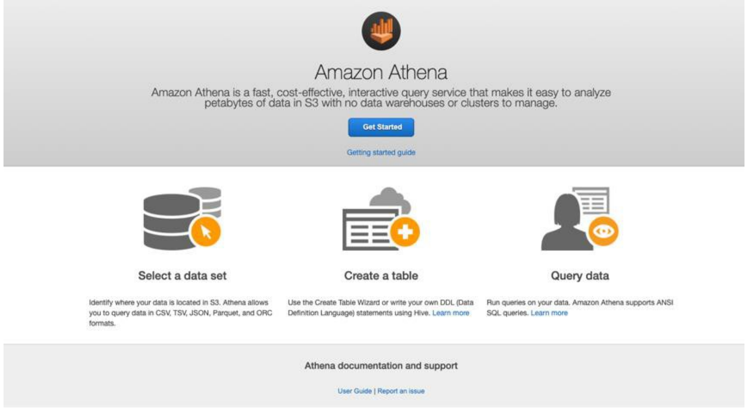

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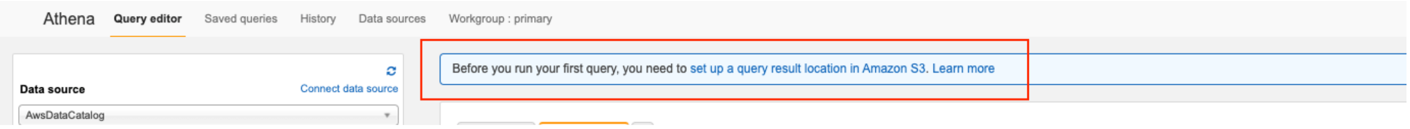
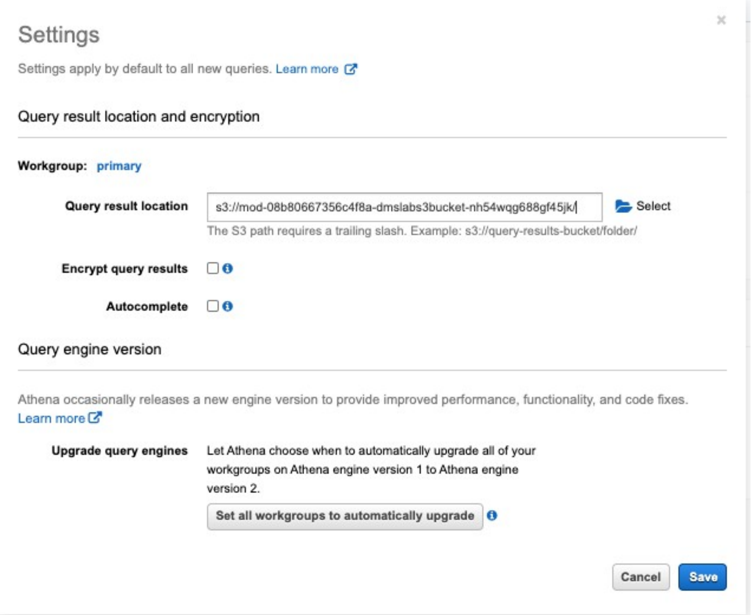
Then click **set up a query result location in Amazon S3** at the top.



Data source: AwsDataCatalog

Before you run your first query, you need to set up a query result location in Amazon S3. Learn more

In the pop-up window, enter your s3 bucket location followed by '**/**' in the **Query result location** box. It looks like **s3://xxx-dmslabs3bucket-xxx/** and click **Save**



Settings

Settings apply by default to all new queries. Learn more

Query result location and encryption

Workgroup: primary

Query result location: s3://mod-08b80667356c4f8a-dmslabs3bucket-nh54wqg688gf45jk/

The S3 path requires a trailing slash. Example: s3://query-results-bucket/folder/

Encrypt query results ☐

Autocomplete ☐

Query engine version

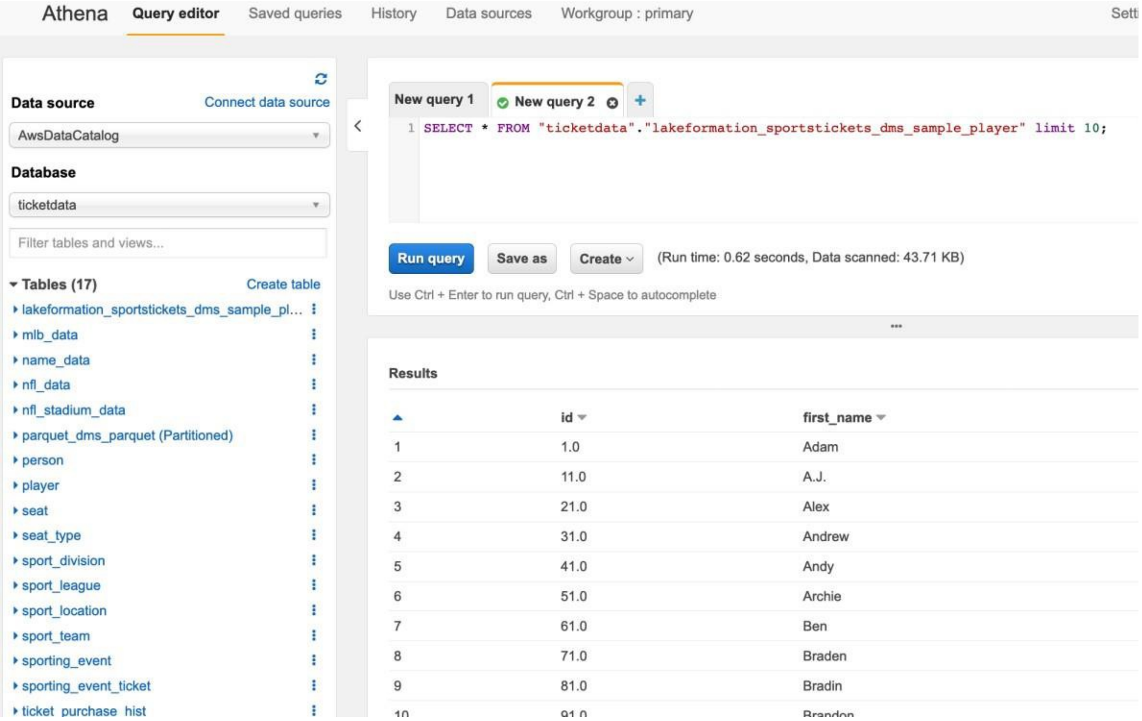
Athena occasionally releases a new engine version to provide improved performance, functionality, and code fixes. Learn more

Upgrade query engines: Let Athena choose when to automatically upgrade all of your workgroups on Athena engine version 1 to Athena engine version 2.

4. Next, ensure database **ticketdata** is selected.
5. Now run a select query:

```
SELECT * FROM "ticketdata"."lakeformation_sportstickets_dms_sample_player" limit 10;
```

6. You will notice that the **datalake_user** can **only see** the columns **id, first_name** in the 'select *' query result. The datalake_user cannot see **last_name**, **sports_team_id**, **full_name** columns in the table**.**



Data source: AwsDataCatalog

Database: ticketdata

```
SELECT * FROM "ticketdata"."lakeformation_sportstickets_dms_sample_player" limit 10;
```

(Run time: 0.62 seconds, Data scanned: 43.71 KB)

Results

	id	first_name
1	1.0	Adam
2	11.0	A.J.
3	21.0	Alex
4	31.0	Andrew
5	41.0	Andy
6	51.0	Archie
7	61.0	Ben
8	71.0	Braden
9	81.0	Bradin
10	91.0	Brandon

This explains that using AWS Lake Formation, you can provide granular access at table and column level to IAM users.

Congratulations!! You have successfully completed this lab!