# Lab 1 - Data Analytics

## Introduction

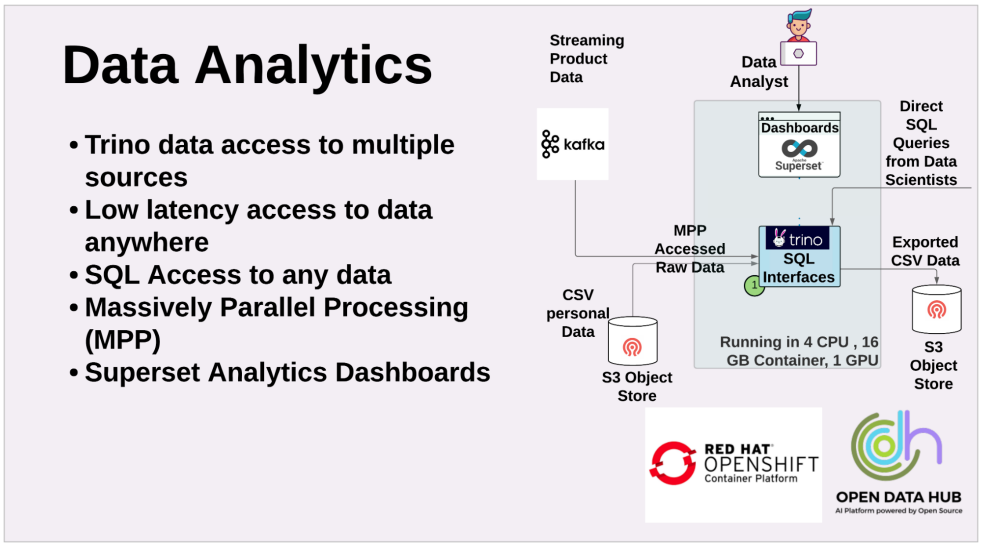
One of the first things your data analysts and data engineers will need to do is analyse the raw data, with a view to preparing and transforming it to a state that will be consumable by AI/ML model algorithms.

In this lab, we're going to use a powerful toolset combining

- an in-memory data analytics engine called Trino. Trino provides high speed access to many different on-premises and cloud based data sources. These include relational and no-SQL databases, object stores over S3 interfaces, Streaming data from Kafka and many more. Trino abstracts the actual underlying data store implementation and provides a uniform ANSI SQL interface, with which to access its many supported data stores.
- a visualization tool called Superset, which will use Trino as the backing data source.

The combination of these two tools will provide powerful data analytics capabilities, critical at this stage in the workflow.

This diagram illustrates what we're implementing:




You can see Trino is an SQL exposing abstraction in front of actual data located in Kafka and S3 Object storage. Superset using this Trino interface to display charts and dashboards.

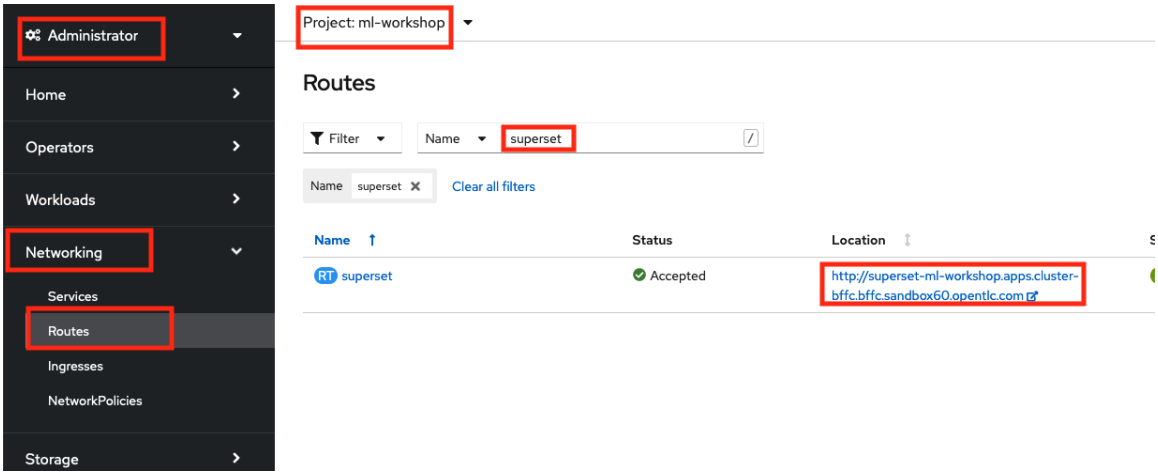
## Instructions for the Trino backed Superset workshop

To save time, the workshop administrators have already made simple connections using Trino to two datasets:

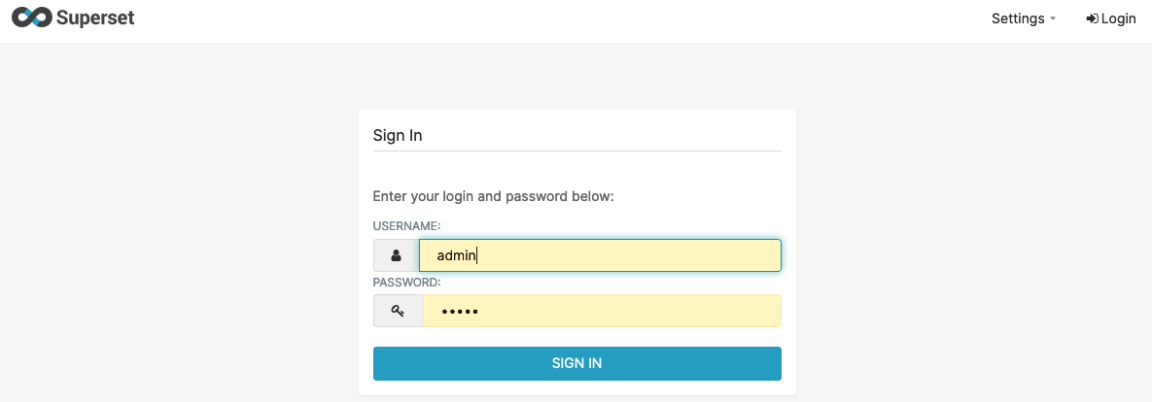
1. To a CSV file over an S3 interface. This CSV file is located in an underlying Object storage implementation called Minio. The file contains demographic type data on our customer data set, data such as gender, whether they have dependents and other demographic features.
2. To Streaming data located in an Apache Kafka store on the OpenShift cluster. This dataset contains product consumption for the same customers as are in the CSV file. Each record is labeled indicating whether that customer churned or not.

In Superset, using Trino, we've created two logical SQL tables corresponding underlying data sets as well as Query joining them on customer id.

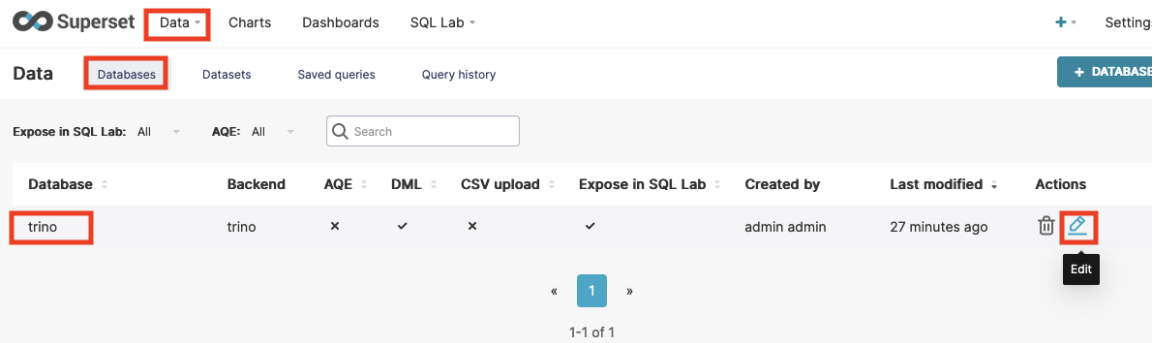
Login to OpenShift using the credentials your administrator gave you. Choose ***Administrator*** from the the dropdown (If it's your first time logging in, ***Developer*** will be selected there) Navigate to Network -> Routes. Ensure the desired project is selected (***ml-workshop*** in my case). Filter on the word Superset and open that route, by clicking on the URL as shown.



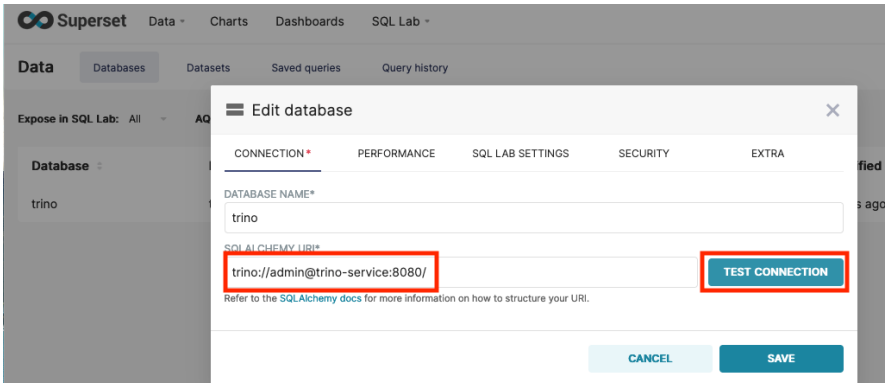
Enter credentials ***admin / admin***.



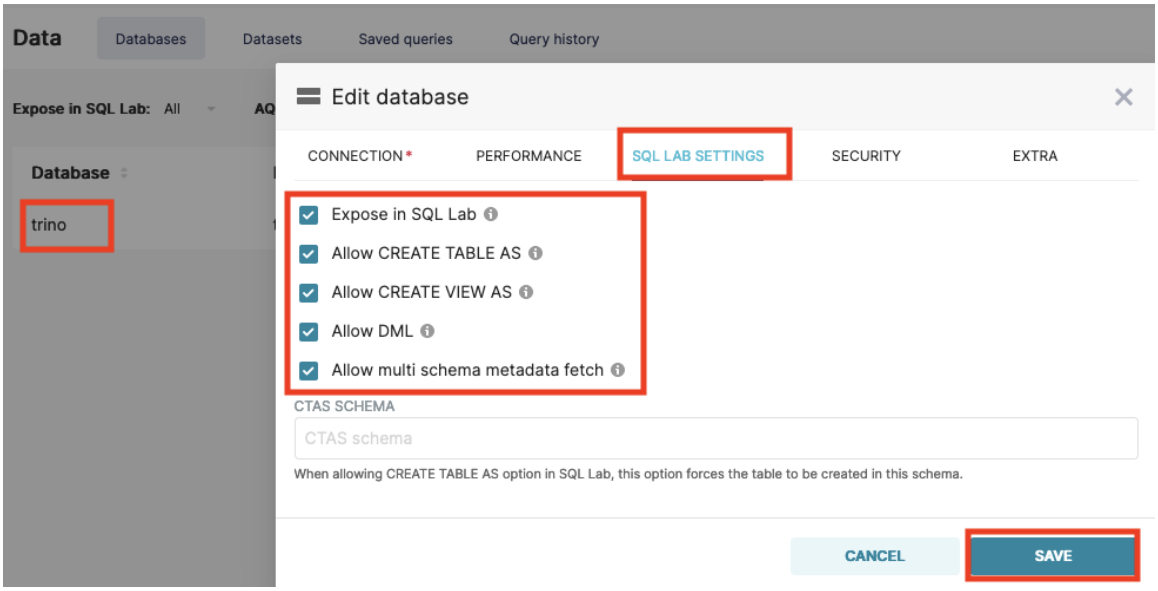

As this is a shared service between all participants, and the setup has already been done by your instructor, we'll just show you the steps we took to connect Superset to Trino & from there to underlying data.
Choose menu item Data -> Databases. Create or Edit the ***trino*** Database



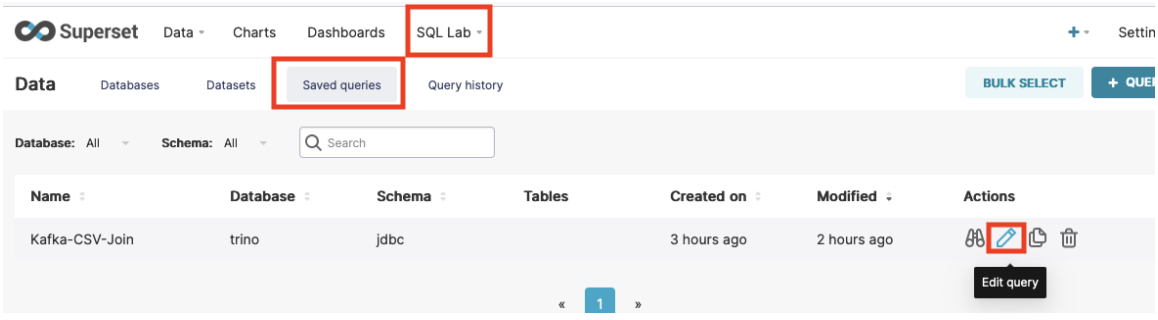

Notice it's simply a matter of adding the URI ***trino://admin@trino-service:8080/*** to connect to Trino as shown. Test the Connection.



Move to the SQL LAB SETTINGS tab and notice we needed full access by selecting the checkboxes.




In Superset, choose SQL LAB -> Saved Queries. Edit the query ***Kafka-CSV-Join*** as shown (though your query may be named differently)

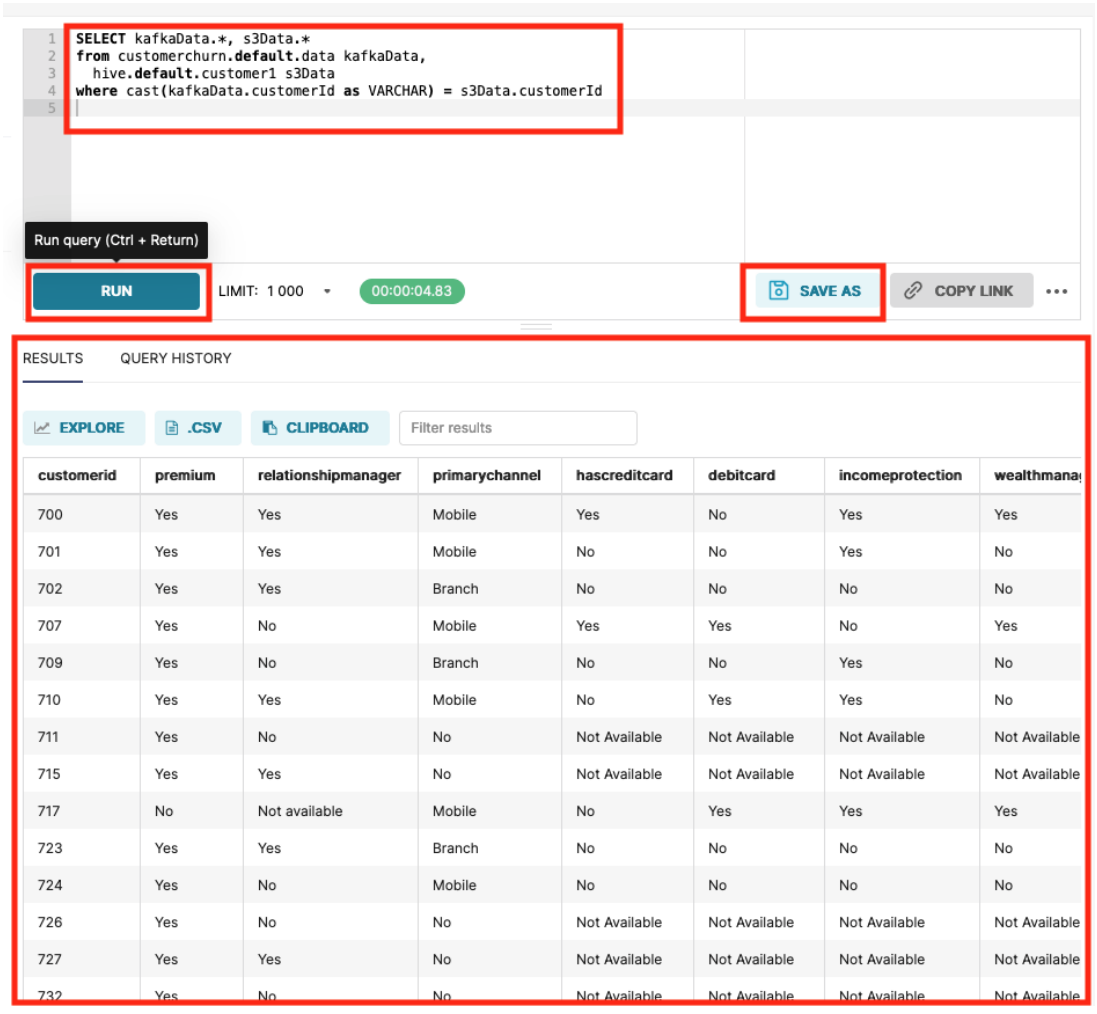



Notice:

Earlier the workshop admin created a virtual '***table'*** (hive.default.customer1) that uses the CSV data in our Minio S3 Object store as it's actual data - located in the bucket ***rawdata***.
We also created second virtual '***table'*** is backed by our Kafka streaming data. In our case this is the customer product consumption data. We also set this up earlier during the workshop provisioning.

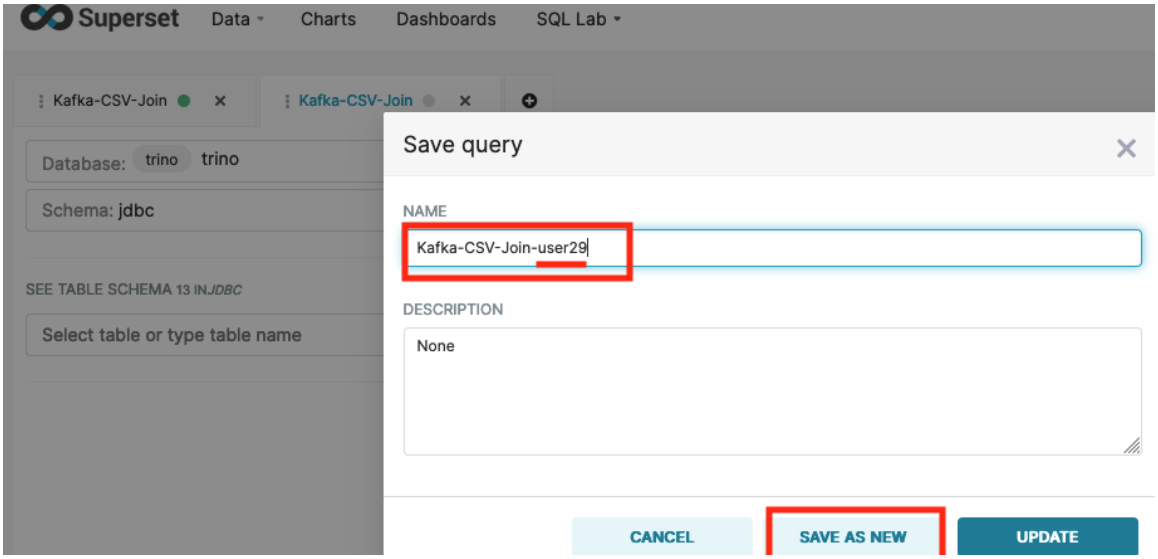
```
SELECT kafkaData.*, s3Data.*
from customerchurn.default.data kafkaData,
        hive.default.customer1 s3Data
where cast(kafkaData.customerId as VARCHAR) = s3Data.customerId
```

Now Trino allows us to create a SQL Join across data that resides in S3 Object storage and Kafka!
Very cool!

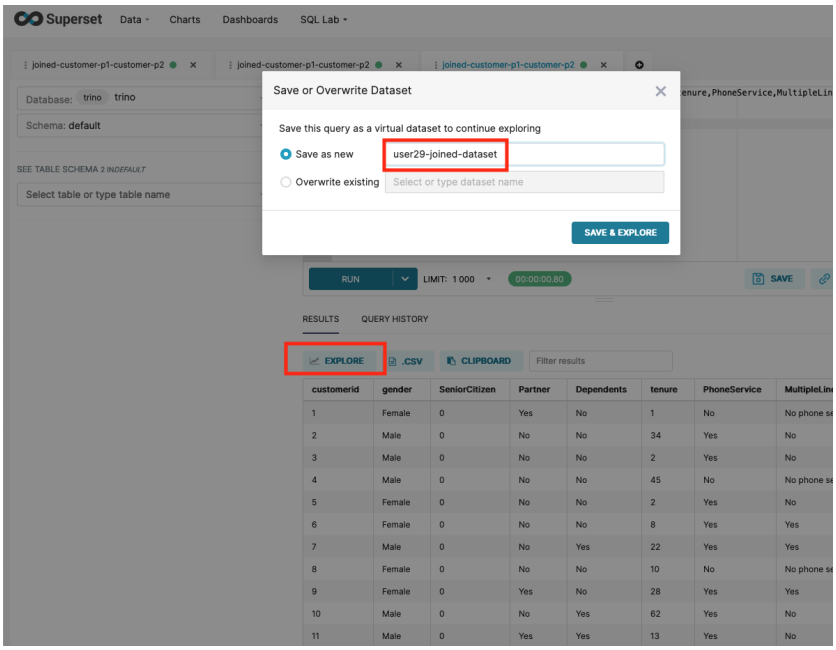


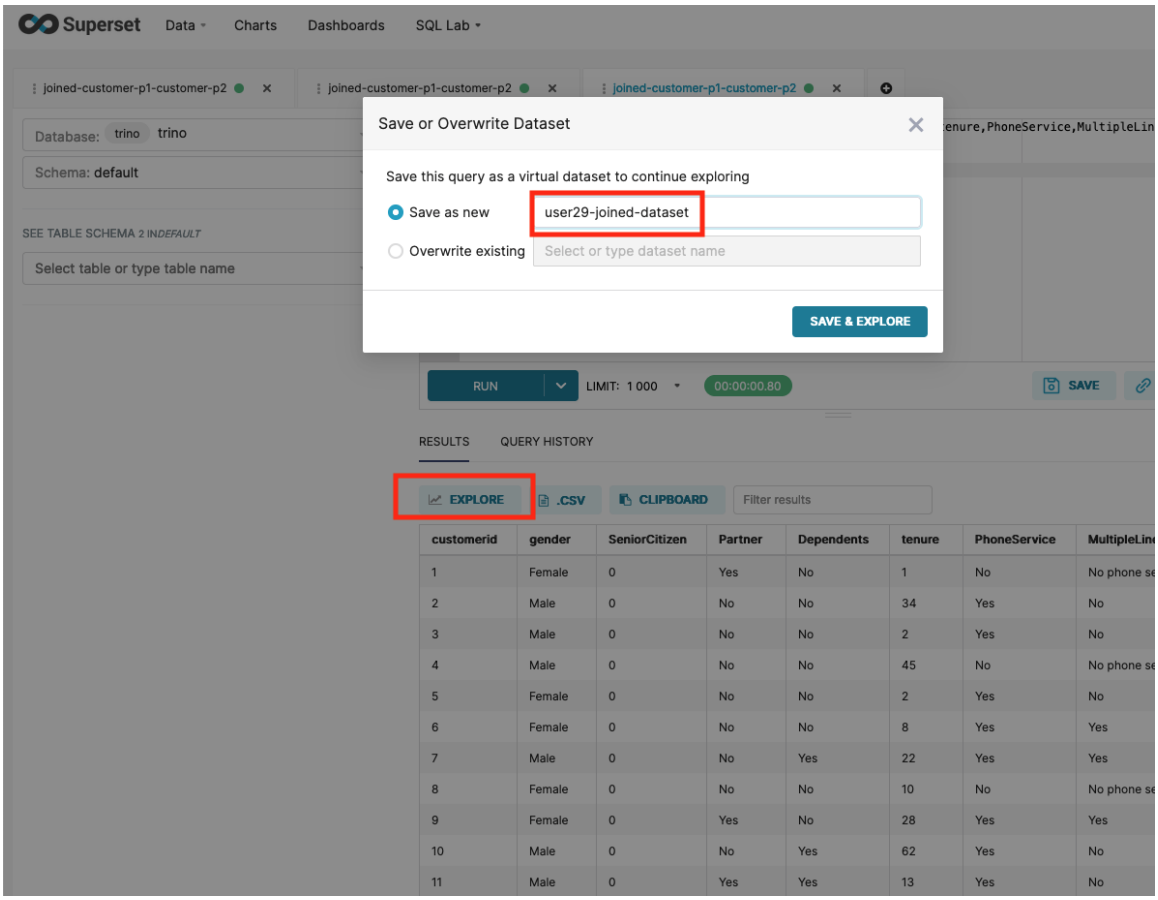

| customerid | premium | relationshipmanager | primarychannel | hascreditcard | debitcard | incomeprotection | wealthmanag |
|---|---|---|---|---|---|---|---|
| 700 | Yes | Yes | Mobile | Yes | No | Yes | Yes |
| 701 | Yes | Yes | Mobile | No | No | Yes | No |
| 702 | Yes | Yes | Branch | No | No | No | No |
| 707 | Yes | No | Mobile | Yes | Yes | No | Yes |
| 709 | Yes | No | Branch | No | No | Yes | No |
| 710 | Yes | Yes | Mobile | No | Yes | Yes | No |
| 711 | Yes | No | No | Not Available | Not Available | Not Available | Not Available |
| 715 | Yes | Yes | No | Not Available | Not Available | Not Available | Not Available |
| 717 | No | Not available | Mobile | No | Yes | Yes | Yes |
| 723 | Yes | Yes | Branch | No | No | No | No |
| 724 | Yes | No | Mobile | No | No | No | No |
| 726 | Yes | No | No | Not Available | Not Available | Not Available | Not Available |
| 727 | Yes | Yes | No | Not Available | Not Available | Not Available | Not Available |
| 732 | Yes | No | No | Not Available | Not Available | Not Available | Not Available |

Click ***Save As*** and ***Save as New.*** Append your username to the name, I was user29.



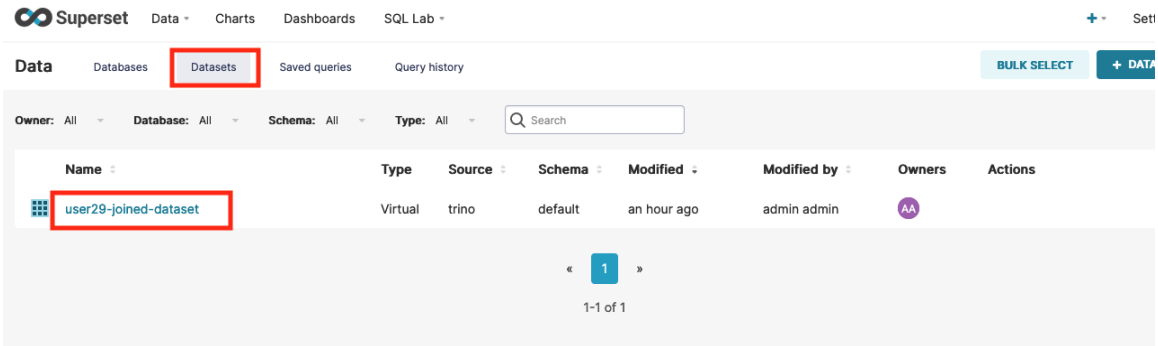

Notice it's a **dataset** comprising demographic customer data joined to product consumption customer data - joined on customer id. Click Explore then Save as a new query in the format ***userXX-joined-dataset***. I was ***user29*** so I saved mine as ***user29-joined-dataset:***



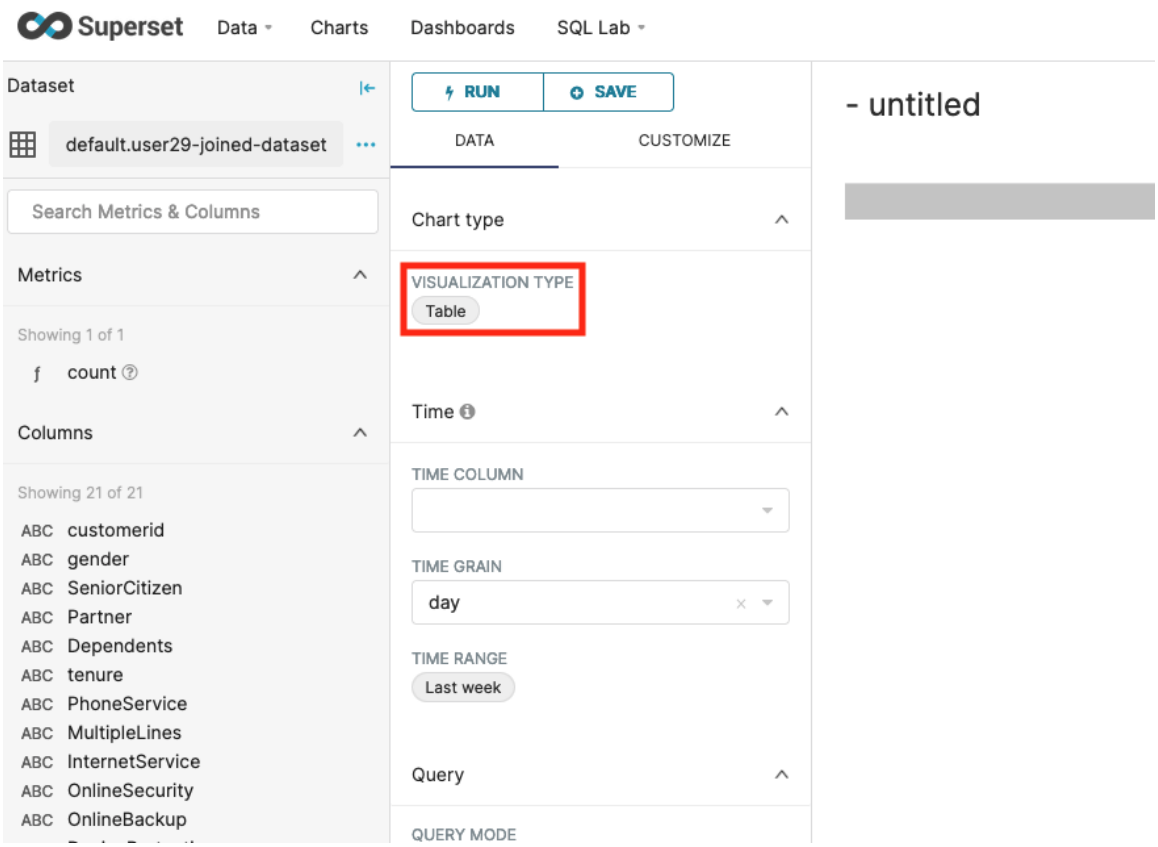



**You may see an error being reported. This is a small bug. The dataset has most likely been created. Proceed to the next step.**

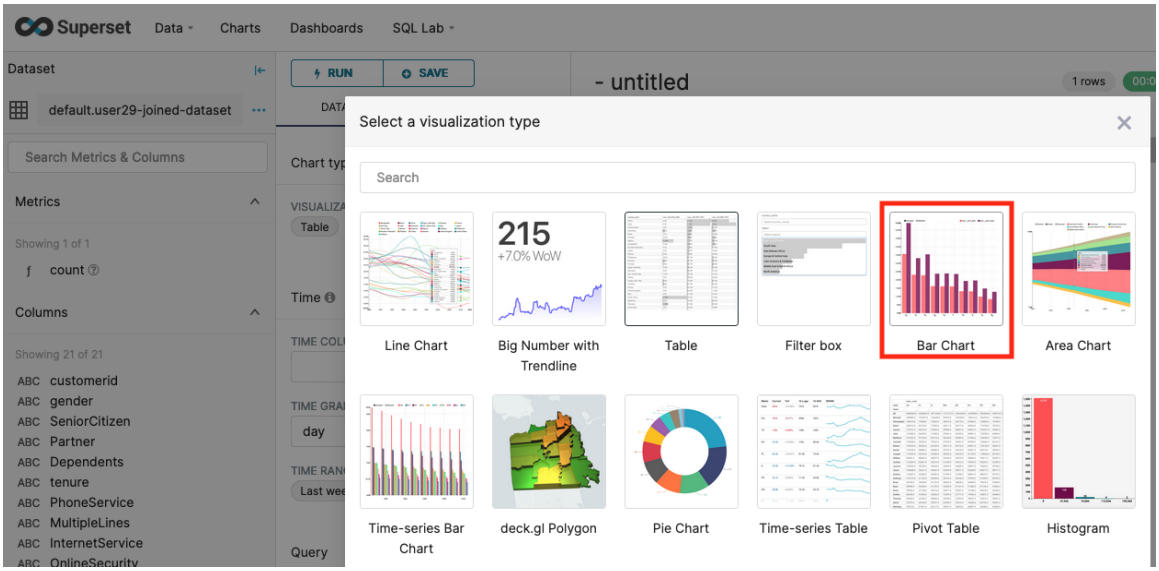
Move to DataSets, find your new dataset - then click it to open it:



By default ***Table*** Visualisation Type is selected

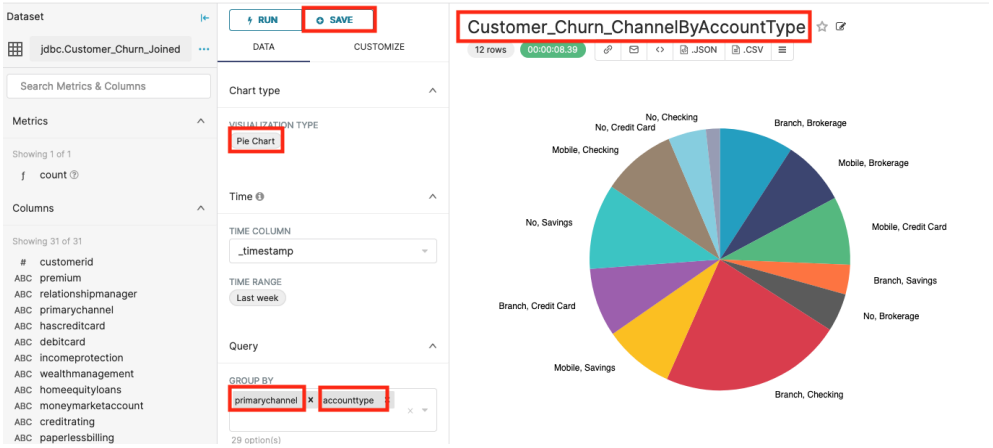


Click Table. You have a large number of Visualization Types to choose from. Choose Bar Chart by clicking on it:

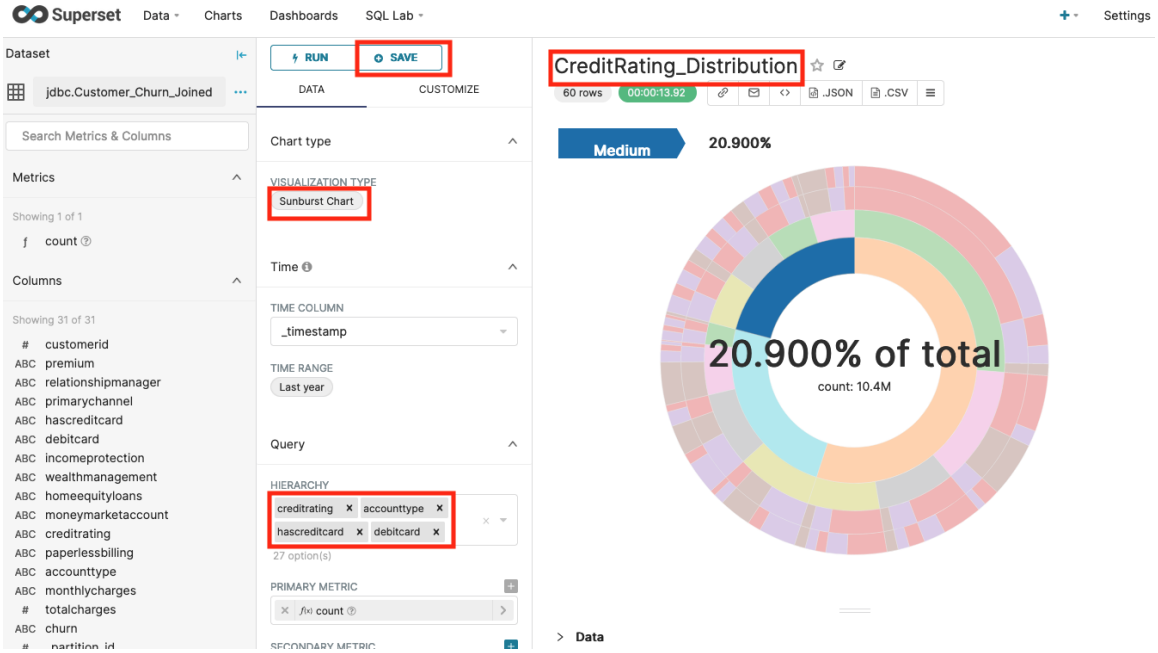


You can now start visualising and understanding your data. For our purposes, we'll create a nice bar chart representation of the entire dataset, of the count of the different categories of *primary channel - Branch, Mobile or No* primary channel.
Select ***Count*** under ***Metrics*** and select *PrimaryChannel* under ***Series***. Name the chart something (in my case ***Customer_Churn_By_PrimaryChannel***) and save it. (you may need to remove the Time Range - ***last week*** in the screenshot)
Then Run Query
This is very useful to understand the data.

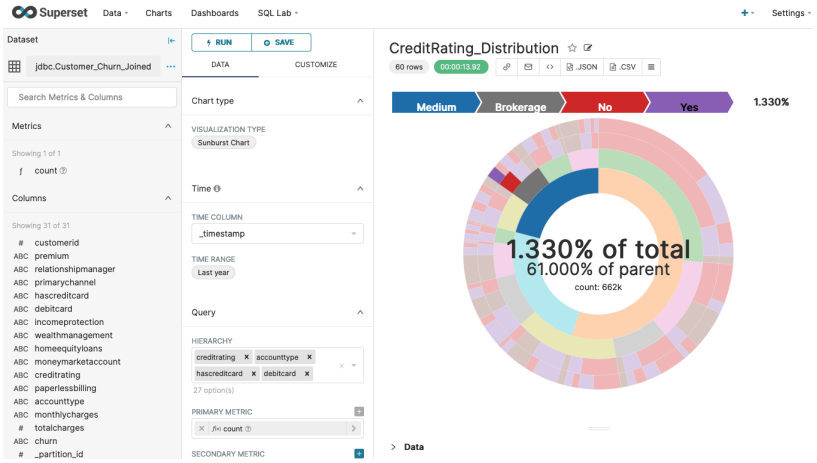
Now let's create a Pie Chart - and add another dimension - *account type*. If you now choose Pie Chart (where you previously chose Bar Chart) - and run the query again, it's that easy to get a new view type with this extra dimension. Again name (*Count_ChannelByAccountType*) and save the file:



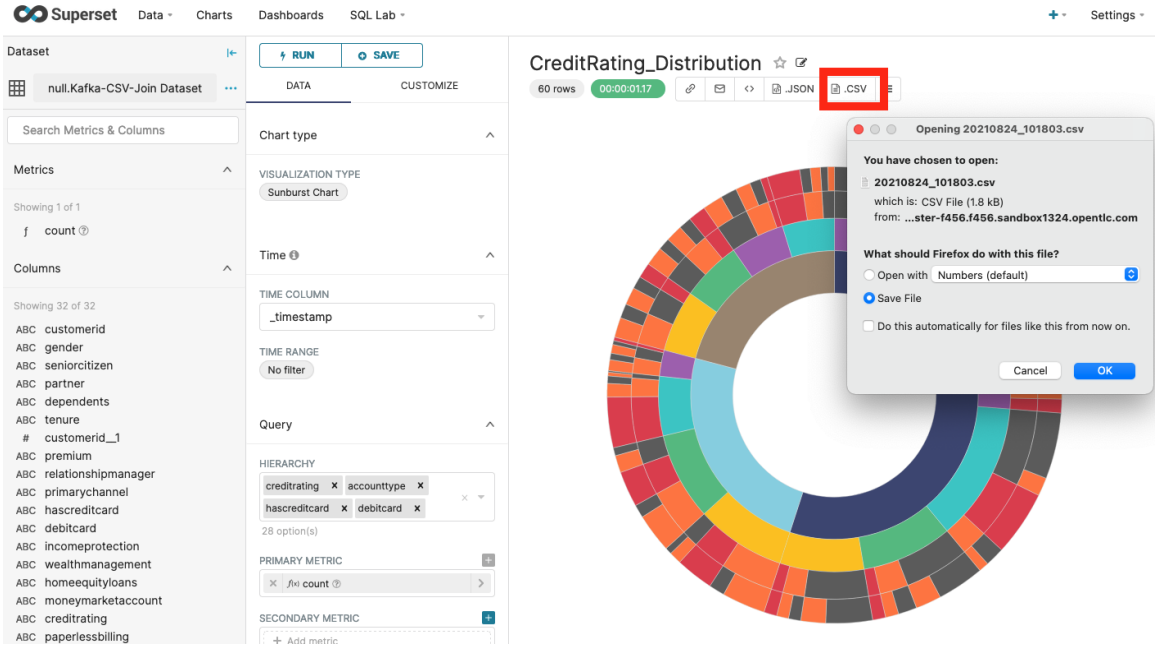

Next, we're going to showcase another unusual though informative visualization - the Sunburst Chart. It allows you to visualise splits of your data with varying degrees of granularity - on the same chart. Make the selection as follows and save the chart (in my case *CreditRating_Distribution*). If you hover over the inner circle, the breakdown according to the first hierarchical element is shown, in my case *medium* credit rating.



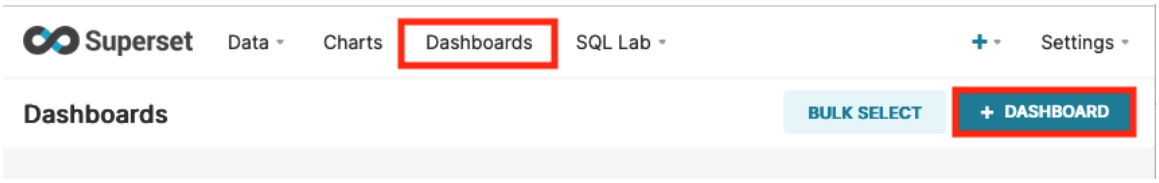
You can see, you can also further refine, by hovering out towards over the outer circle - giving a very fine grained breakdown - according to the 4 hierarchies:



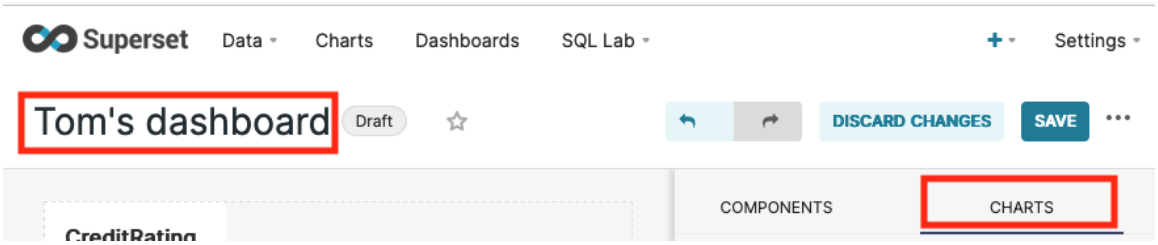

And any of these datasets can be easily exported to JSON or CSV - as shown below. Then fed for example to an AI model training use case.



Finally we're going to show you how to create a dashboard - to which we can add previously saved charts. Choose Dashboards -> Add Dashboard as shown:




Name it and choose the Charts tab:




You can simply drag your charts from the right over to the display panel on the left as shown. You can also make them dynamic by choosing a refresh interval. Very cool!


Feel free to continue to experiment different ways of accessing and visualising the underlying data.

When you're finished, move to the next lab: [Lab 2 - Data Engineer prepares data](#).