Lab 1: Filtering Real-Time data with Amazon Kinesis Platform

Overview

In this exercise, you will learn how to build a real-time application using the AWS Kinesis platform. As a first step, you'll see how to stream data using Amazon Kinesis, a fully managed cloud-based service for streaming large, distributed data streams in real-time.

To make the exercise more realistic, we will simulate events generated from a game (or IoT device), in this case a stream of events corresponding to the score, game ID, user ID and some data.

We'll create Amazon Kinesis Analytics application to consume data from Amazon Kinesis Stream and write them into an Amazon Firehose for delivery to S3.

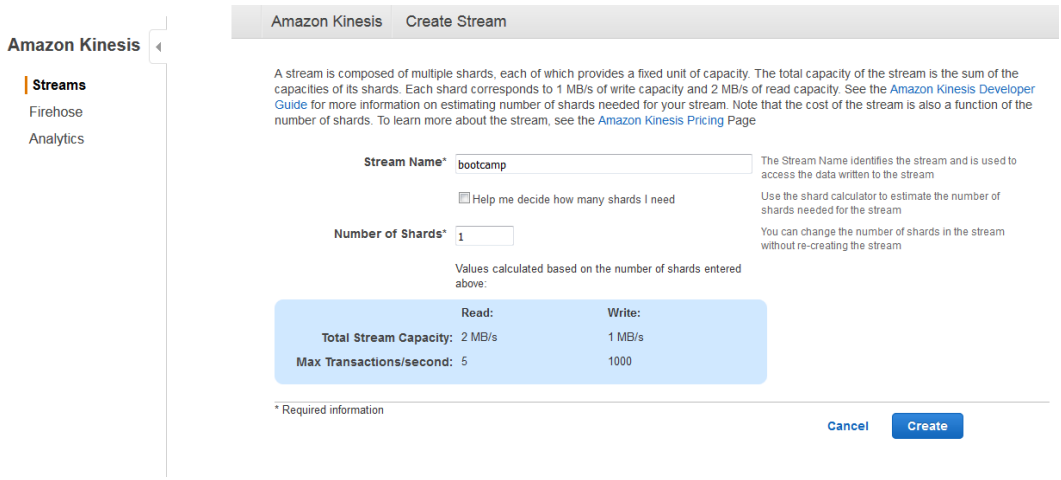
Getting Started

Launch an Amazon Kinesis Stream

First, you will create an Amazon Kinesis stream to capture the incoming game data, consisting of a single shard.

1. **Open the AWS Management Console** by clicking **Open Console**.
2. Choose the Region: **N. Virginia**

3. From the **Services** menu on the AWS Management Console, **select** Amazon **Kinesis Stream.**



4. On the following screen, click **Create Stream**.

5. For **Stream Name,** use **<user>_stream** and input **1** for **Number of Shards**. After that, select **Create** in the lower-right corner of the screen.

6. Verify that your Amazon Kinesis stream is in the **CREATING** Status. After a few moments, the status should transition to **ACTIVE.**

   Click the stream name itself to review the stream summary in the **Stream Details** page. You should see empty Amazon **Cloud Watch** graphs for **Amazon Kinesis**. The red lines preceding the Write Capacity and Read Capacity graphs indicate the maximum provisioned write capacity of 1 MB/sec and read capacity of 2 MB/sec for **Kinesis Stream** with a single shard.

Using Amazon Kinesis Streams

Now we'll write a producer application that simulates mobile application events (Similar example can simulate IoT event as well). It will write records to your **Amazon Kinesis** stream containing the **userID**, **applicationID**, **app score**, **current time**, and some **randomly** generated example **data**.

Producer Application

1. On an EC2 instance or in your local computer with CLI configured, download the shell script **kinesis_client.sh** from https://bit.ly/2zjIbUZ to start writing some records into Amazon Kinesis stream you created earlier.

2. On the downloaded script kinesis_client.sh you should replace your stream name the section in yellow <user>_stream with your kinesis stream name –i.e. user1_stream.

```
#!/bin/sh

while true

do

  eventTime=$(date +"%Y-%m-%d-%T")

  userId=$(( ( RANDOM % 50 )  + 1 ))

  appId=$(( ( RANDOM % 100 )  + 1 ))

  appScore=$(( ( RANDOM % 100 )  + 1 ))

  appData=SomeTestData

  echo "$eventTime,$userId,$appId,$appScore,$appData"

  aws kinesis put-record --stream-name <user>_stream –data
"$eventTime,$userId,$appId,$appScore,$appData"$'\n' --partition-key $appId --region
us-east-1
done
```

3. Give execution permissions and run script by executing the following commands in your terminal:

   chmod 700 kinesis_client.sh

   ./kinesis_client.sh

If you got an access denied error on the Put Record your EC2 instance probably do not have Kinesis permission for your user. Go back to IAM and add it.

Keep the script running until the end of this lab.

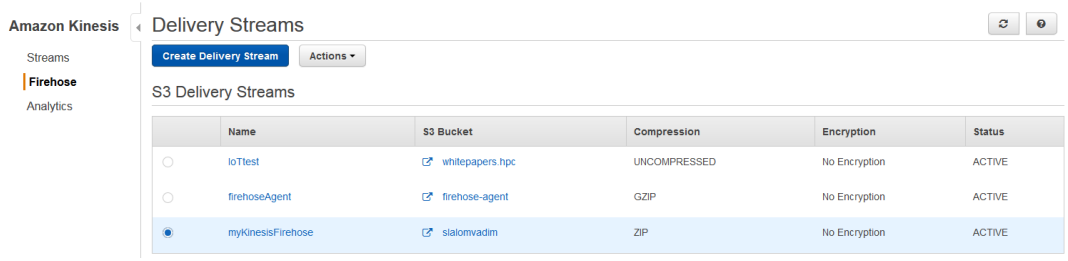
In the AWS Management Console, return to the Amazon Kinesis section as described in steps 1 and 2. Click the stream **Kinesis Stream**. Under **Monitoring**, observe the PUT metrics associated with your stream. It takes a few minutes for **Cloud Watch** to show up metrics.

Setup up an Amazon Kinesis firehose with delivery to Amazon S3

1. **Navigate to the AWS Management Console and** from the **Services** menu on the AWS Management Console, **select Kinesis.**

Ensure that you're using **US East (N. Virginia)** as your region.

2. On the following screen select Kinesis Firehose, and click on **Create Delivery Stream**.



3. Delivery Stream Name: **<user>_firehose_stream**
4. Choose Source: **Kinsesis Stream**
5. Kinesis stream: **<user>_stream**
6. Click **Next**
7. Transform Records with Lambda: **Disabled**

   Note: You can invoke a Lambda function to perform transformations on each stream processed.

8. Click **Next**
9. Destination: **Amazon S3**

   Note: Kinesis Firehose allows S3, Redshift and Elastic Search as possible destinations.

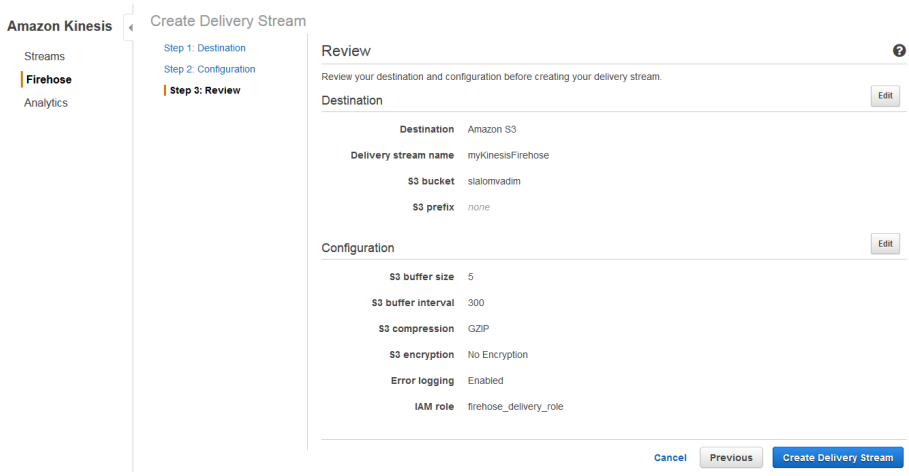
10. S3 Bucket: **Create New**
11. S3 bucket name: **<user>-bigdata-day**
12. Region: **US East (N. Virginia)**
13. Create S3 Bucket
14. Prefix: **stream**
15. Click **Next**
16. In the Configuration page and provide Buffer size "**5**" and Buffer interval "**60**".
17. S3 compression: **Gzip**
18. S3 encryption: **Disabled**

19. Error logging: **Enabled**

20. In the configuration page, under IAM role, create new. Let the wizard create a new IAM Role with name **<user>_firehose_delivery_role.**

21. Click **Allow**

22. After that, select **Next** in the lower-right corner of the screen to go to the Review page. Verify the details on the Review page, and click on "**Create Delivery Stream**".



23. Verify that your Amazon Kinesis Firehose delivery stream is in the **CREATING** Status. After a few moments, the status should transition to **ACTIVE.**

Kinesis Firehose will read the streaming data being stored in the **Kinesis stream** and will deliver it into **S3** in files based on batches of either **5MB** or **60secs**. After some minutes, you can check in the **S3** buket **<user>-bigdata-day** that the files are being created. If you have a look at the produced files in **S3**, you will see that are **csv** files compressed in .**gz** format with the information inserted by the simulator script running into our **EC2** instance into the **Kinesis stream**.

We are going to use **Kinesis Analytics** to run queries in real time on the received streaming data.

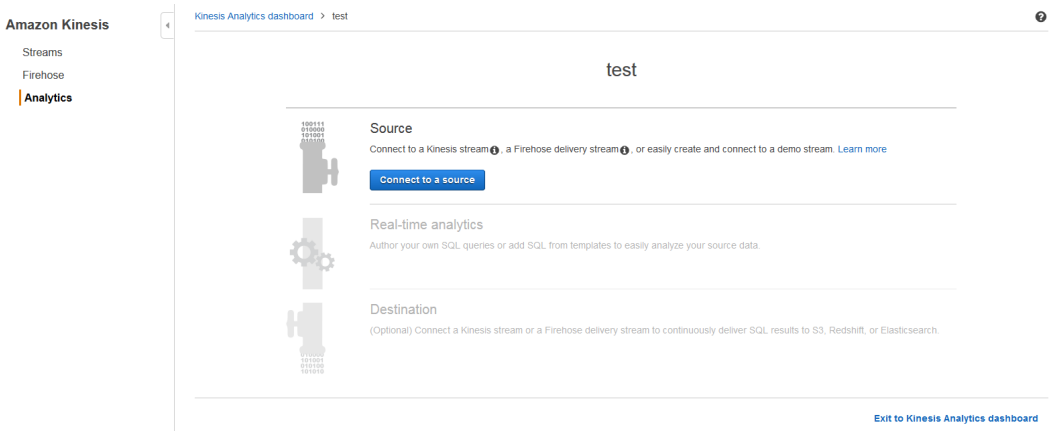
Setup up an Amazon Kinesis Analytics application.

1. **Navigate to the AWS Management Console and** from the **Services** menu on the AWS Management Console, **select** Amazon **Kinesis Analytics.**

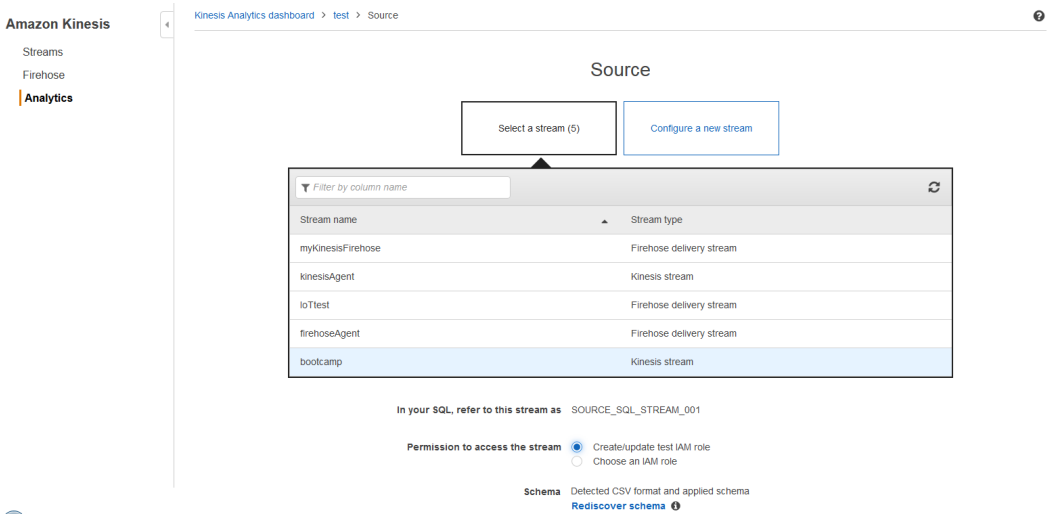
   Ensure that you're using **US East (N. Virginia)** as your region.

2. On the following screen select Amazon Kinesis Analytics, and click on **Create new application**. Give it a name: **<user>_kinesis_analytics.**

3. Choose "**Connect to a source**"

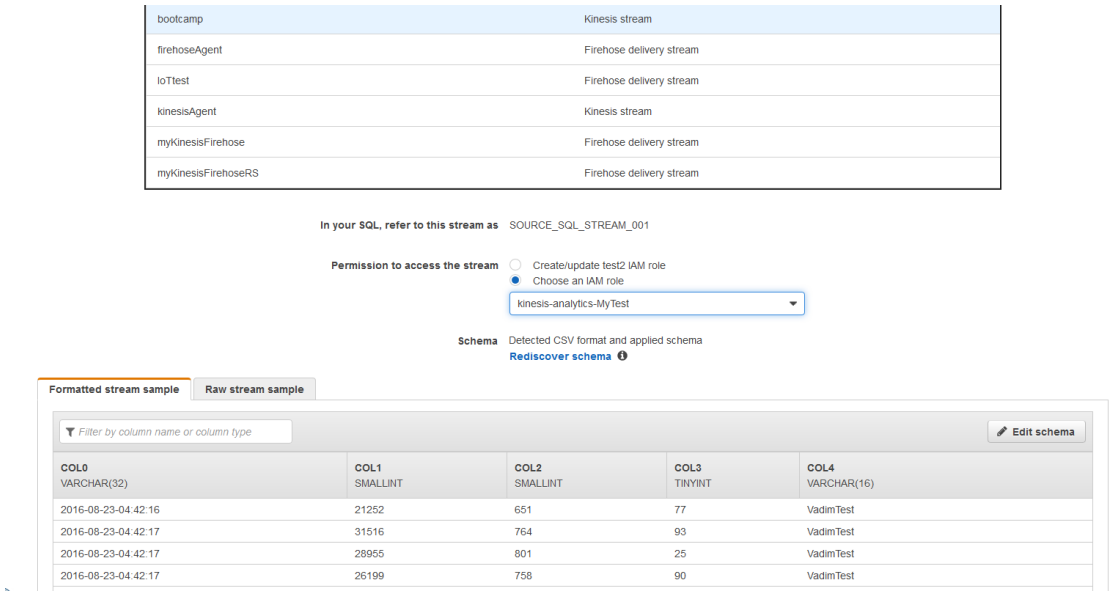


4. Select "**<user>_stream**" Kinesis Stream created in previous exercise. You will have to "Create/update IAM role" to access the stream.

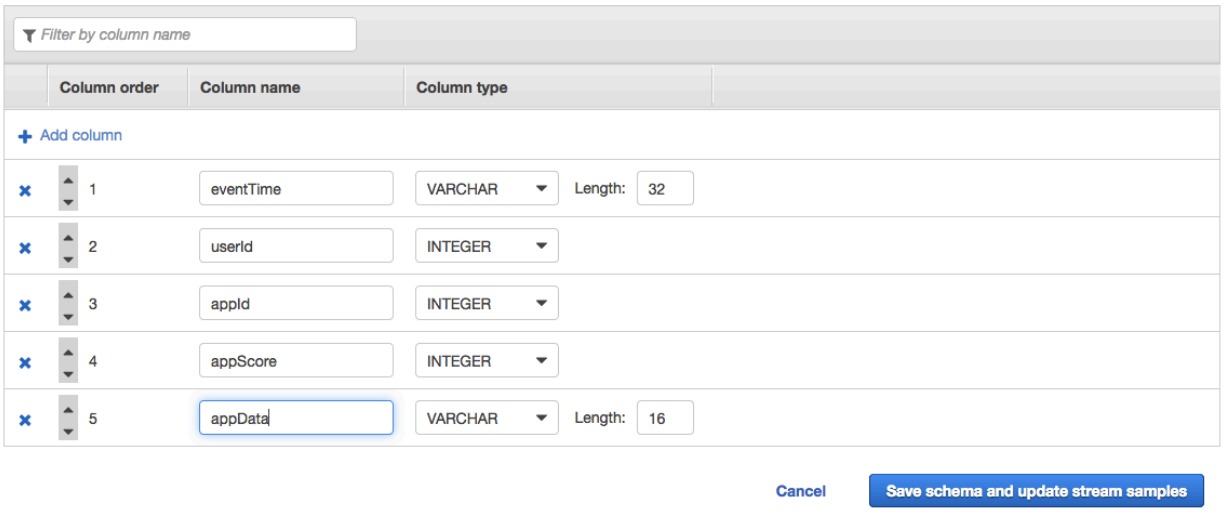


5. Click on **Discover Schema.** Analytics calls the DiscoverInputSchema API action, which infers a schema by sampling records from your selected input data stream. You can see the applied schema on your data in the formatted sample shown in the browser, as well as

the original sample taken from the raw stream. You can then edit the schema to fine tune it to your needs.



6. Click on **Edit Schema** and name the columns as shown in the following picture:

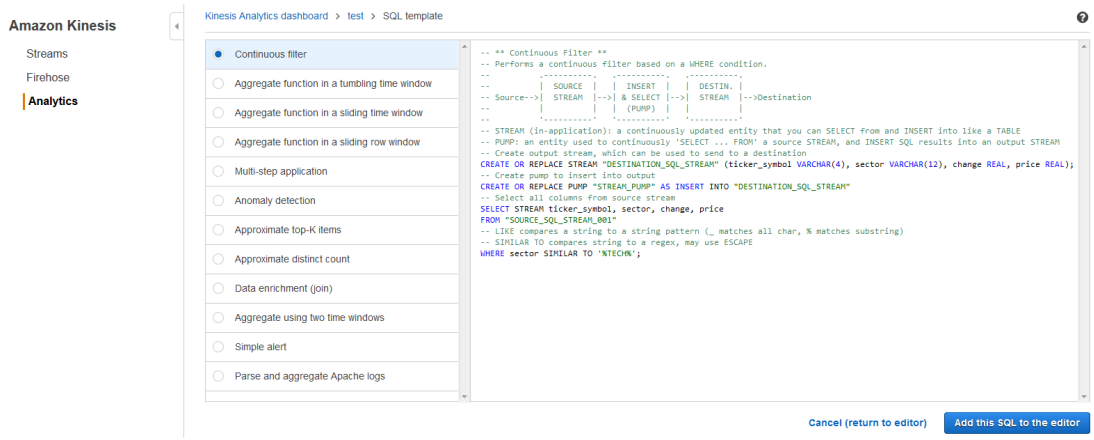


Click **Save schema and update stream samples**. It will take a couple of minutes to restart the application.

7. Go to **Kinesis Analytics applications -> <user>_kinesis_analytics** on top of the window and go to the **Real-Time analytics** section. Click on **Go to SQL Editor**. This SQL editor is the development environment for **Amazon Kinesis Analytics**. On the top portion of the screen, there is a text editor with syntax highlighting and intelligent auto-complete, as well as a number of SQL templates to help you get started. On the bottom portion of the screen, there is an area for you to explore your source data, your intermediate SQL results,

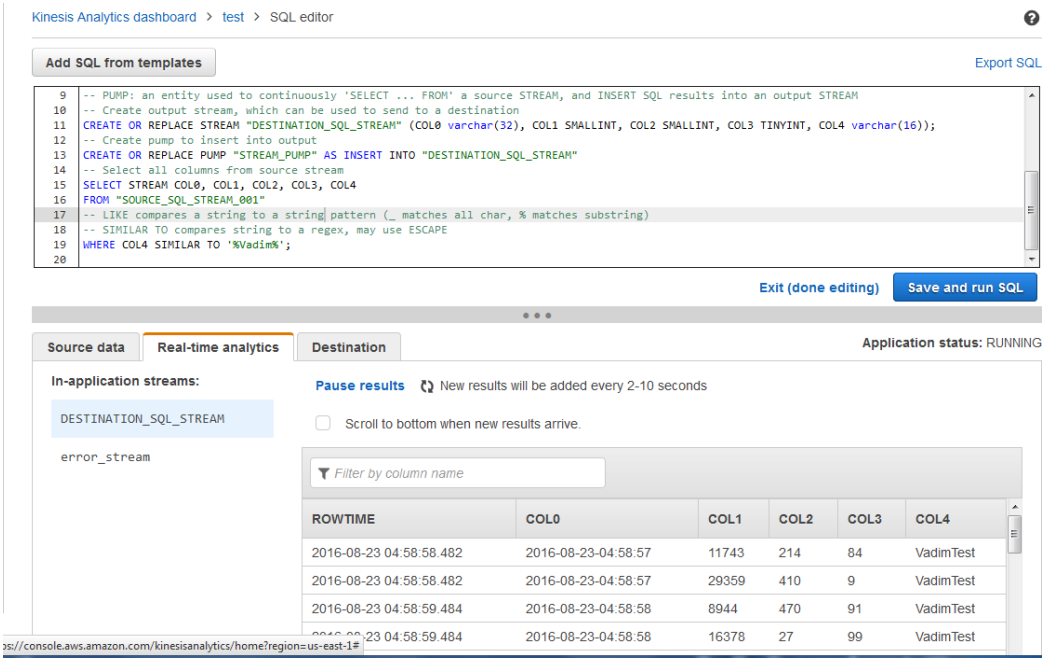
and the data you are writing to your destinations. You can view the entire flow of your application here, end-to-end.

8. **"Add SQL Template"** on the top left and pick up "**Continuous filter**". Click on **Add this SQL to the editor**.



9. Replace (copy & paste) the template with the test query that you can download from https://bit.ly/2A6SXgV

10. The SELECT statement in this SQL template performs a count over a 10-second tumbling window. A window is used to group rows together relative to the current row that the **Amazon Kinesis Analytics** application is processing. Choose **Save and run SQL**.



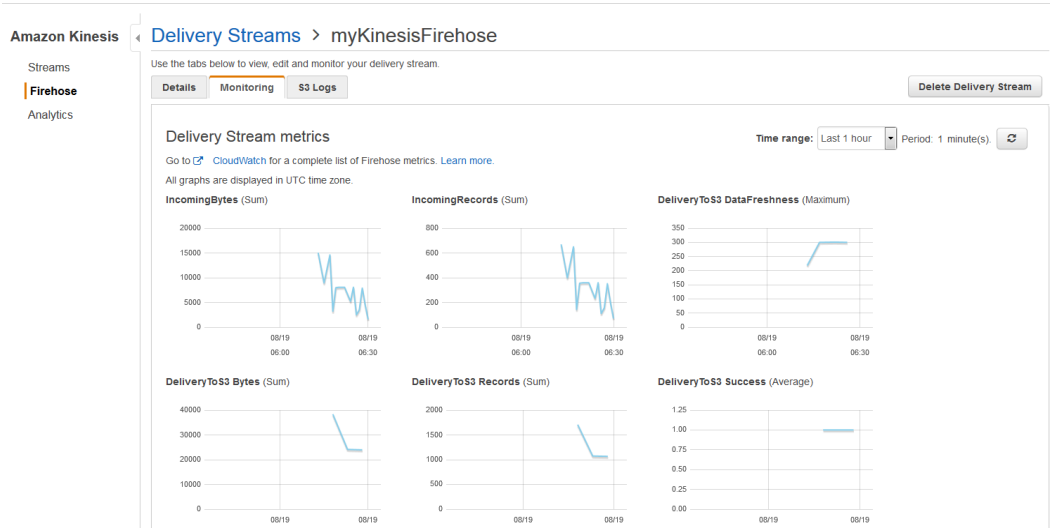
In the source data tab, you can see the streaming data being read from the Kinesis stream (**SOURCE_SQL_STREAM_001**).

In the Real-time analytics tab, you can see the results of our query, which counts how many requests are received from a specific user in 10secs interval.

In the destination tab, we could click on **Connect to Destination.** We are going to configure a new Firehose stream to store the results of our query in **S3**

11. Click **Add Destination**
12. Select **Kinesis Firehose** and click on **Create New**
13. You are redirected to the **Kinesis Firehose** web page. Click on **Create Delivery Streams**.
14. Name your firehose stream: **<user>_firehose_analytics**
15. Source: **Direct PUT or other sources**.
16. Click **Next**
17. Record transformation: **Disabled**.
18. Click **Next**
19. Destination: **S3**
20. S3 bucket: **<user>-bigdata-day**
21. Prefix: **analytics**
22. Click: **Next**
23. Buffer size: **5 MB**
24. Buffer Interval: **60 seconds**
25. S3 compression: **Gzip**
26. S3 encryption: **Disabled**
27. IAM Role: Choose the role created before: **<user>_firehose_delivery_role**.
28. Policy Name: Choose: **oneClick_firehose_delivery_role**
29. Click **Allow**. Click **Next**
30. **Create Delivery Stream.**
31. Go back to the **Kinesis Analytics** section. Expand your **Kinesis Analytics** app **<user>_kinesis_analytics** and click on **Application Details**.
32. Click Destination -> **Connect to a destination**.
33. Select **Kinesis Firehose delivery Stream -> <user>_firehose_analytics**
34. Select for Connect in-application stream: **Choose an existing in-application stream ->DESTINATION_SQL_STREAM**
35. Output format: **CSV**
36. Permission to access the stream -> **Select a IAM role** that Kinesis Analytics can assume. Choose an existing Kinesis Analytics role.
37. Click **Save and Continue**.

38. In a few minutes check that **Firehose** start picking up data and storing them on **S3**



39. Congratulations, you just wrote your first SQL query on streaming data and saved result on S3 !!!

40. You can check the contents of the S3 bucket: **<user>-bigdata-day**. You should see files been created under **analytics<YEAR> (results of Kinesis Analytics queries)** and **streams<YEAR> (data streamed into the Kinesis stream)** directories.

41. Use **CTRL-Z** to exit the script on your **EC2** instance. Do not delete the created resources since we will use some in next labs.