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Date : 16th march 2022.

1. Prerequisite

Scenario 1 : Using VM

Refer any tutorial in the web to configure Centos VM using VM Player or Workstation in your laptop.

Start the VM using VM player and Logon to the server using telnet or directly in the VM console. Enter the root credentials to logon.

Scenario 2: Using Docker

All the necessary software should be in the /Software folder. If its not there, ensure to copy it using winscp.exe from the windows desktop to /Software folder. You can create /Software folder using mkdir /Software.

The following instruction will create a network and bind to the container, ckafkao. Replace the -v parameter with any of the folder in your Host machine.

```
#docker network create --driver bridge spark-net
```

```
#docker run --name ckafkao --hostname ckafkao -p 9094:9092 -p 8086:8081 -p  
2184:2181 -p 9031:9021 -p 8098:8088 -i -t --privileged --network spark-net -v  
/Users/henrypotsangbam/Documents/Docker:/opt centos:7 /usr/sbin/init
```

2. Install KSQL DB – 60 Minutes

Prerequisite: Kafka Node installation.

Get standalone ksqlDB

Since ksqlDB runs natively on Apache Kafka®, you'll need to have a Kafka cluster that ksqlDB is configured to use. Use the steps to the right to install the latest release of ksqlDB.

```
# Download the archive and its signature
```

```
curl http://ksqldb-packages.s3.amazonaws.com/archive/0.23/confluent-ksqldb-0.23.1.tar.gz --output  
confluent-ksqldb-0.23.1.tar.gz
```

```
# Extract the tarball to the directory of your choice
```

```
tar -xf confluent-ksqldb-0.23.1.tar.gz -C /opt/
```

```
#mv confluent-ksq* ksqldb
```

Configure ksqlDB server

Ensure your ksqlDB server has network connectivity to Kafka.

4 Kafka – Dev Ops

Edit the highlighted line in `/opt/ksqldb/etc/ksqldb/ksql-server.properties` to match your Kafka hostname and port.

```
#----- Kafka -----
```

```
# The set of Kafka brokers to bootstrap Kafka cluster information from:
```

```
bootstrap.servers=localhost:9092
```

```
# Enable snappy compression for the Kafka producers
```

```
compression.type=snappy
```

Start ksqlDB's server

ksqlDB is packaged with a startup script for development use. We'll use that here.

When you're ready to run it as a service, you'll want to manage ksqlDB with something like `systemd`.

```
#!/opt/ksqldb/bin/ksql-server-start /opt/ksqldb/etc/ksqldb/ksql-server.properties
```

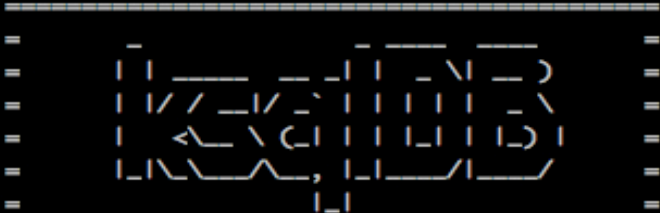
if any issue in start up because of jar.

Download and store the following jar in the mention folder.

```
#cd /opt/ksqldb/share/java/ksqldb
```

```
#wget https://repo1.maven.org/maven2/io/netty/netty-all/4.1.30.Final/netty-all-4.1.30.Final.jar
```

```
[2022-02-15 16:17:02,735] INFO ksqlDB API server listening on http://0.0.0.0:8088 (io.confluent.ksql.rest.server.KsqlRestApplication:405)
```



```

=====
=                                     =
=  -  -  -  -  -  -  -  -  -  -  -  =
=  |  |  |  |  |  |  |  |  |  |  |  =
=  | / \ / \ / \ / \ / \ / \ / \  =
=  | < \ ( \ / \ / \ / \ / \ / \  =
=  | \ / \ / \ / \ / \ / \ / \ / \  =
=  |  |  |  |  |  |  |  |  |  |  |  =
=                                     =
=  The Database purpose-built        =
=  for stream processing apps        =
=====

```

```

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Server 0.23.1 listening on http://0.0.0.0:8088

To access the KSQL CLI, run:
ksql http://0.0.0.0:8088

[2022-02-15 16:17:02,813] INFO Server up and running (io.confluent.ksql.rest.server.KsqlServerMain:92)
[2022-02-15 16:17:07,390] INFO Successfully submitted metrics to Confluent via secure endpoint (io.confluent.support.metrics.submitters.ConfluentSubmitter:146)

```

Start ksqlDB's interactive CLI

ksqlDB runs as a server which clients connect to in order to issue queries.

Run this command to connect to the ksqlDB server and enter an interactive command-line interface (CLI) session.

```
#!/opt/ksqldb/bin/ksql http://0.0.0.0:8088
```

```
[root@kafka0 ksqldb]# /opt/ksqldb/bin/ksql http://0.0.0.0:8088
```

```
=====
=               =
=  | |  _ _ _ _  | |  \ |  _ )  =
=  | | / _ | / _ \ | | | | | _ \ =
=  | | < \ \ ( | | | | | | ) |  =
=  | | \ \ / \ / | | | | | /    =
=               | |    =
=      The Database purpose-built =
=      for stream processing apps  =
=====
```

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CLI v0.23.1, Server v0.23.1 located at http://0.0.0.0:8088

Server Status: RUNNING

Having trouble? Type 'help' (case-insensitive) for a rundown of how things work!

```
ksql> |
```

#show topics;

```
ksql> show topics;
```

Kafka Topic	Partitions	Partition Replicas
default_ksql_processing_log	1	1
test	1	1
topic1	2	1

-----Lab Ends Here -----

4. Installing Confluent Kafka (Local) – 60 Minutes

Demonstrates both the basic and most powerful capabilities of Confluent Platform, including using Control Center for topic management and event stream processing using KSQL. In this quick start you create Apache Kafka® topics, use Kafka Connect to generate mock data to those topics, and create KSQL streaming queries on those topics. You then go to Control Center to monitor and analyze the streaming queries.

You need to install java before installing zookeeper and Kafka.

Installing Java

```
#tar -xvf jdk-8u45-linux-x64.tar.gz -C /opt
```

Set in the path variable and JAVA_HOME

```
[ex:  
export JAVA_HOME=/opt/jdk  
export PATH=$PATH:$JAVA_HOME/bin  
]
```

Include in the profile as follow

```
[root@tos opt]# more ~/.bashrc
# .bashrc

# User specific aliases and functions

alias rm='rm -i'
alias cp='cp -i'
alias mv='mv -i'

export JAVA_HOME=/opt/jdk1.8.0_45

export PATH=$PATH:$JAVA_HOME/bin
# Source global definitions
if [ -f /etc/bashrc ]; then
    . /etc/bashrc
fi
[root@tos opt]#
```

Installing a Kafka Broker

The following example installs Confluence Kafka in /apps.

Installing and Configuring Confluent CLI

Inflate the confluent kafka compress file as shown below:

```
#tar -xvf confluent-5.5.1-2.12.tar -C /apps
```

Rename the folder.

```
#mv /apps/confluent* /apps/confluent
```

Set the environment variable for the Confluent Platform directory (<path-to-confluent>).

```
export CONFLUENT_HOME=/apps/confluent
```

```
(base) [root@tos confluent]# pwd
/apps/confluent
(base) [root@tos confluent]# ls
bin confluent etc legal lib logs README share src
(base) [root@tos confluent]#
```

Set your PATH variable:

```
# vi ~/.bashrc
```

```
export PATH=/apps/confluent/bin:${PATH};
```

```
if [ -f "/apps/anaconda3/etc/profile.d/conda.sh" ]; then
    . "/apps/anaconda3/etc/profile.d/conda.sh"
else
    export PATH="/apps/anaconda3/bin:${PATH}"
fi
fi
unset __conda_setup
# <<< conda initialize <<<

export JAVA_HOME=/apps/jdk
export PATH=$JAVA_HOME/bin:$PATH:$SCALA_HOME/bin
export PATH=/apps/confluent/bin:${PATH};
-- INSERT --
```

After decompressing the file. You should have the following directories:

```
(base) [root@tos confluent]#  
(base) [root@tos confluent]# pwd  
/apps/confluent  
(base) [root@tos confluent]# ls -ltr  
total 16  
drwxr-xr-x.  3 life life   21 Jun  5 10:11 lib  
drwxr-xr-x.  7 life life  106 Jun  5 10:42 share  
drwxr-xr-x. 23 life life 4096 Jun  5 10:42 etc  
drwxr-xr-x.  3 life life 4096 Jun  5 10:42 bin  
drwxr-xr-x.  2 life life  178 Jun  5 11:17 src  
-rw-r--r--.  1 life life  871 Jun  5 11:17 README  
drwxr-xr-x.  2 root root 4096 Jul  7 02:01 logs  
(base) [root@tos confluent]#
```

Install the [Kafka Connect Datagen](#) source connector using the Confluent Hub client. This connector generates mock data for demonstration purposes and is not suitable for production. [Confluent Hub](#) is an online library of pre-packaged and ready-to-install extensions or add-ons for Confluent Platform and Kafka.

```
#confluent-hub install --no-prompt confluentinc/kafka-connect-datagen:latest
```

```
(base) [root@tos ~]# cd /apps
(base) [root@tos apps]# confluent-hub install --no-prompt confluentinc/kafka-connect-datagen:latest
Running in a "--no-prompt" mode
Implicit acceptance of the license below:
Apache License 2.0
https://www.apache.org/licenses/LICENSE-2.0
Downloading component Kafka Connect Datagen 0.1.3, provided by Confluent, Inc. from Confluent Hub and installing into /apps/confluent/share/confluent-hub-components
Adding installation directory to plugin path in the following files:
  /apps/confluent/etc/kafka/connect-distributed.properties
  /apps/confluent/etc/kafka/connect-standalone.properties
  /apps/confluent/etc/schema-registry/connect-avro-distributed.properties
  /apps/confluent/etc/schema-registry/connect-avro-standalone.properties
  /tmp/confluent.8A2Ii7O4/connect/connect.properties

Completed
(base) [root@tos apps]#
```

Start Confluent Platform using the Confluent CLI `confluent local start` command. This command starts all of the Confluent Platform components; including Kafka, ZooKeeper, Schema Registry, HTTP REST Proxy for Kafka, Kafka Connect, KSQL, and Control Center.

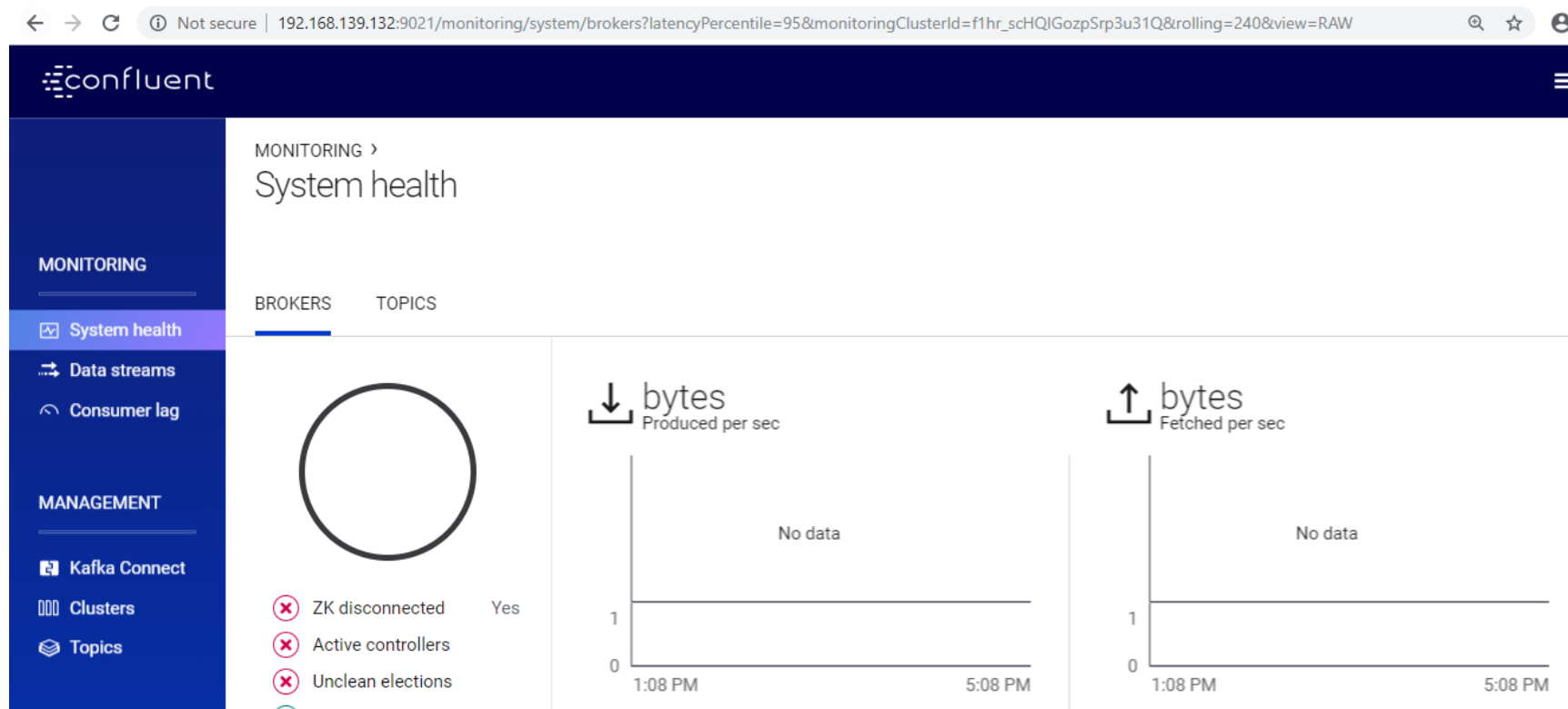
```
#export CONFLUENT_CURRENT=/opt/data/ckafka
```

```
#confluent local services start
```

```
(base) [root@tos bin]# confluent start
This CLI is intended for development only, not for production
https://docs.confluent.io/current/cli/index.html

Using CONFLUENT_CURRENT: /tmp/confluent.8A2Ii704
Starting zookeeper
zookeeper is [UP]
Starting kafka
kafka is [UP]
Starting schema-registry
schema-registry is [UP]
Starting kafka-rest
kafka-rest is [UP]
Starting connect
connect is [UP]
Starting ksql-server
ksql-server is [UP]
Starting control-center
control-center is [UP]
(base) [root@tos bin]#
```

Navigate to the Control Center web interface at <http://localhost:9021/>.



Install a Kafka Connector and Generate Sample Data

In this step, you use Kafka Connect to run a demo source connector called kafka-connect-datagen that creates sample data for the Kafka topics pageviews and users.

Run one instance of the [Kafka Connect Datagen](#) connector to produce Kafka data to the `pageviews` topic in AVRO format.

Management → **Add connector**. Or Connectors → Add Connector

Find the DatagenConnector tile and click **Connect**.

Name the connector `datagen-pageviews`. After naming the connector, new fields appear. Scroll down and specify the following configuration values:

- Tasks max : 1
- In the **Key converter class** field, type `org.apache.kafka.connect.storage.StringConverter`.
- In the **kafka.topic** field, type `pageviews`.
- In the **max.interval** field, type `100`.
- In the **iterations** field, type `1000000000`.
- In the **quickstart** field, type `pageviews`.
-

1. Click **Continue**.

2. Review the connector configuration and click **Launch**.

MANAGEMENT ›

Kafka Connect

Bring data in

Send data out

Search connectors

+ Add connector

Connectors			Details
Status	Name		Active tasks
Running	datagen-pag...	...	1

Run another instance of the [Kafka Connect Datagen](#) connector to produce Kafka data to the `users` topic in AVRO format.

Click **Add connector**.

Find the DatagenConnector tile and click **Connect**.

Name the connector `datagen-users`. After naming the connector, new fields appear. Scroll down and specify the following configuration values:

- Max Task : 1
- In the **Key converter class** field, type `org.apache.kafka.connect.storage.StringConverter`.
- In the **kafka.topic** field, type `users`.
- In the **max.interval** field, type `1000`.
- In the **iterations** field, type `1000000000`.
- In the **quickstart** field, type `users`.
 - Click **Continue**.
 - Review the connector configuration and click **Launch**.

At the end of this.

Kafka Connect

[Bring data in](#)[Send data out](#)[+ Add connector](#)

Connectors

Status

Name

Running

datagen-pag...

...

Running

datagen-users

...

Details

Active tasks

1

1

Verify the messages in the both the topics:

Using the control centers:

Topics -> pageviews -> Messages:

The screenshot displays the Apache Kafka Control Center interface for the 'pageviews' topic. The left sidebar contains navigation links: Cluster overview, Brokers, Topics (highlighted), Connect, ksqlDB, Consumers, Replicators, and Cluster settings. Below these is a 'Health+' section with a 'New' button. The main content area is titled 'pageviews' and has tabs for Overview, Messages (selected), Schema, and Configuration. Under the 'Messages' tab, there are sections for Producers (Bytes in/sec: 2.68K) and Consumers (Bytes out/sec: 522). Below these is a 'Message fields' section listing topic, partition, offset, and timestamp. A 'Produce a new message to this topic' button is located above the message list. The message list shows two messages with details like Partition: 0, Offset: 7086, and Timestamp: 1641706995703. A 'Newest' button is visible next to the first message.

Topics -> Users -> Messages:

Cluster overview

Brokers

Topics

Connect

ksqlDB

Consumers

Replicators

Cluster settings

Health+ New

Overview **Messages** Schema Configuration

Producers

Bytes in/sec 295

Consumers

Bytes out/sec 5

Message fields

- topic
- partition
- offset
- timestamp
- timestampType
- headers
 - key

Filter by keyword

Jump to offset

offset

+ Produce a new message to this topic

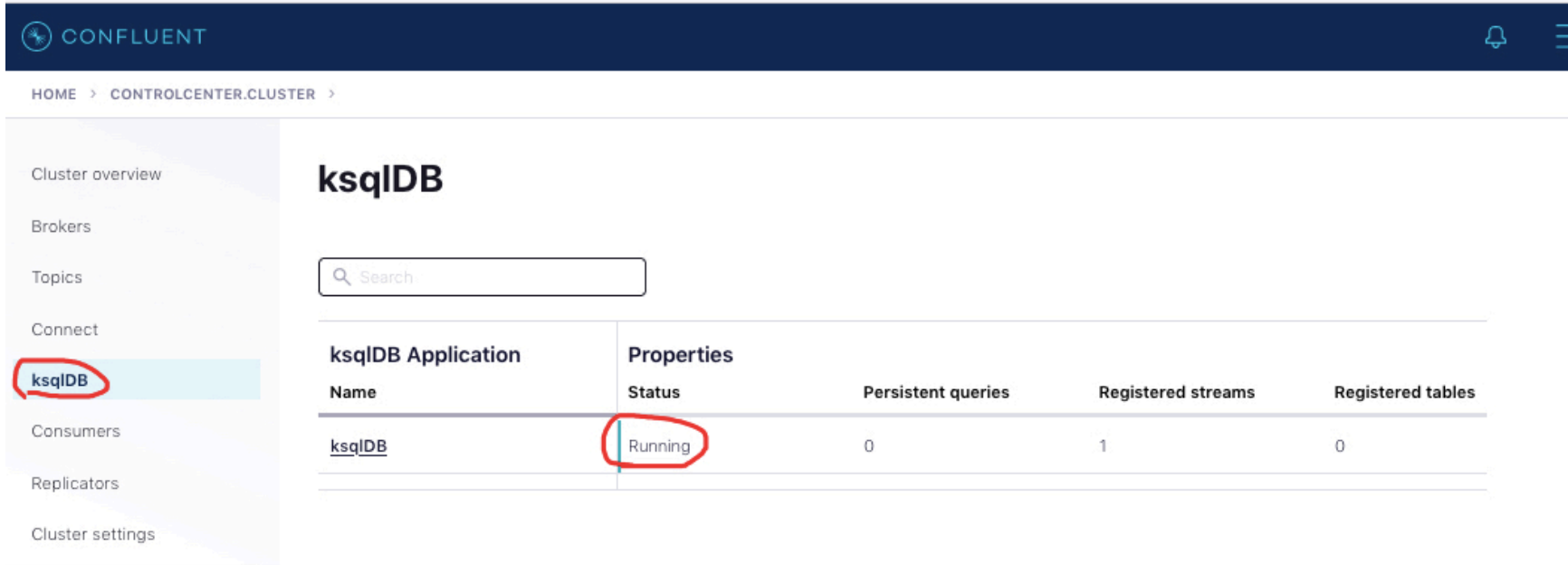
Newest

▼ {"registertime":1505601918721,"userid":"User_8","regionid":"Region_8","gender":"OTHER"}
Partition: 0 Offset: 508 Timestamp: 1641707060914

▼ {"registertime":1512168635241,"userid":"User_2","regionid":"Region_6","gender":"FEMALE"}
Partition: 0 Offset: 507 Timestamp: 1641707060763

▼ {"registertime":1487807651768,"userid":"User_7","regionid":"Region_2","gender":"MALE"}
Partition: 0 Offset: 506 Timestamp: 1641707059920

Ensure that ksql DB services is up.



The screenshot shows the Confluent Control Center interface. The left sidebar contains navigation links: Cluster overview, Brokers, Topics, Connect, **ksqlDB** (highlighted with a red circle), Consumers, Replicators, and Cluster settings. The main content area is titled "ksqlDB" and features a search bar. Below the search bar is a table with the following structure:

ksqlDB Application		Properties		
Name	Status	Persistent queries	Registered streams	Registered tables
ksqlDB	Running (circled in red)	0	1	0

If there is any issue, verify the status and configuration as shown below:

#confluent local services status

```
[root@ckafka0 ckafka]# confluent local services status
The local commands are intended for a single-node development environment only,
NOT for production usage. https://docs.confluent.io/current/cli/index.html

Using CONFLUENT_CURRENT: /opt/data/ckafka/confluent.652875
Connect is [UP]
Control Center is [UP]
Kafka is [UP]
Kafka REST is [UP]
ksqlDB Server is [UP]
Schema Registry is [UP]
ZooKeeper is [UP]
[root@ckafka0 ckafka]#
```

If unable to connect in 8088 port. Verify that the KSQL listeners IP and port are specify correctly in the configuration files.

/apps/confluent/etc/ksqldb/ksql-server.properties

listeners=http://localhost:8088 or

listeners=http://0.0.0.0:8088

Restart after any modification.

confluent local services ksql-server status

confluent local services ksql-server stop

confluent local services ksql-server start

confluent local services ksql-server status

After that verify the listening port.

lsof -i:8088

```
[root@ckafka0 ckafka]# lsof -i:8088
COMMAND  PID  USER  FD  TYPE  DEVICE  SIZE/OFF  NODE  NAME
java     1092  root  628u  IPv4  140454      0t0  TCP  localhost:37410->localhost:radan-http (ESTABLISHED)
java     1092  root  634u  IPv4  140457      0t0  TCP  localhost:37414->localhost:radan-http (ESTABLISHED)
java     1092  root  637u  IPv4  145818      0t0  TCP  localhost:37430->localhost:radan-http (ESTABLISHED)
java     1092  root  638u  IPv4  144459      0t0  TCP  localhost:37432->localhost:radan-http (ESTABLISHED)
java     2968  root  502u  IPv4  143524      0t0  TCP  localhost:radan-http (LISTEN)
java     2968  root  506u  IPv4  143555      0t0  TCP  localhost:radan-http->localhost:37430 (ESTABLISHED)
java     2968  root  507u  IPv4  143556      0t0  TCP  localhost:radan-http->localhost:37432 (ESTABLISHED)
java     2968  root  511u  IPv4  143551      0t0  TCP  localhost:radan-http->localhost:37410 (ESTABLISHED)
java     2968  root  512u  IPv4  143552      0t0  TCP  localhost:radan-http->localhost:37414 (ESTABLISHED)
```

It means, the KSQL server is running.

-----Lab Installation completes End here. -----

5. Workflow using KSQL - CLI – 90 Minutes

Following features will be demonstrated.

- Create Topics and Produce Data
- Create and produce data to the Kafka topics pageviews and users.
- Inspect Kafka Topics by Using SHOW and PRINT Statements
- Create a Stream and Table
- Write Queries

This tutorial demonstrates a simple workflow using KSQL to write streaming queries against messages in Kafka.

To get started, you must start a Kafka cluster, including ZooKeeper and a Kafka broker. KSQL will then query messages from this Kafka cluster.

Create Topics and Produce Data

Create and produce data to the Kafka topics `pageviews` and `users`. These steps use the KSQL datagen that is included Confluent Platform (Refer installation of Confluent kafka for data generation only).

1. Create the `pageviews` topic and produce data using the data generator. The following example continuously generates data with a value in DELIMITED format.

Open a terminal and execute the following.

```
ksql-datagen quickstart=pageviews format=json topic=pageviews maxInterval=500
```

```
(base) [root@tos ~]#  
(base) [root@tos ~]#  
(base) [root@tos ~]# ksql-datagen quickstart=pageviews format=delimited topic=pa  
geviews maxInterval=500  
[2019-07-31 21:35:34,823] INFO AvroDataConfig values:  
    schemas.cache.config = 1  
    enhanced.avro.schema.support = false  
    connect.meta.data = true  
(io.confluent.connect.avro.AvroDataConfig:179)  
1 --> ([ 1564589135082 | 'User_3' | 'Page_97' ]) ts:1564589135333  
11 --> ([ 1564589135590 | 'User_7' | 'Page_66' ]) ts:1564589135591  
21 --> ([ 1564589135857 | 'User_1' | 'Page_34' ]) ts:1564589135861  
31 --> ([ 1564589135959 | 'User_6' | 'Page_37' ]) ts:1564589135959  
41 --> ([ 1564589136036 | 'User_6' | 'Page_66' ]) ts:1564589136036  
51 --> ([ 1564589136428 | 'User_2' | 'Page_98' ]) ts:1564589136428  
61 --> ([ 1564589136761 | 'User_9' | 'Page_26' ]) ts:1564589136761
```

2. Produce Kafka data to the `users` topic using the data generator. The following example continuously generates data with a value in JSON format.

Open another terminal.

```
$ ksql-datagen quickstart=users format=json topic=users maxInterval=100
```

Tip

You can also produce Kafka data using the `kafka-console-producer` CLI provided with Confluent Platform.

```
(base) [root@tos ~]#
(base) [root@tos ~]# ksql-datagen quickstart=pageviews format=delimited topic=pa
geviews maxInterval=500
[2019-07-31 21:35:34,823] INFO AvroDataConfig values:
    schemas.cache.config = 1
    enhanced.avro.schema.support = false
    connect.meta.data = true
(io.confluent.connect.avro.AvroDataConfig:179)
1 --> ([ 1564589135082 | 'User_3' | 'Page_97' ]) ts:1564589135333
11 --> ([ 1564589135590 | 'User_7' | 'Page_66' ]) ts:1564589135591
21 --> ([ 1564589135857 | 'User_1' | 'Page_34' ]) ts:1564589135861
31 --> ([ 1564589135959 | 'User_6' | 'Page_37' ]) ts:1564589135959
41 --> ([ 1564589136036 | 'User_6' | 'Page_66' ]) ts:1564589136036
51 --> ([ 1564589136428 | 'User_2' | 'Page_98' ]) ts:1564589136428
61 --> ([ 1564589136761 | 'User_9' | 'Page_26' ]) ts:1564589136761
```

Launch the KSQL CLI

To launch the CLI, run the following command. It will route the CLI logs to the `./ksql_logs` directory, relative to your current directory. By default, the CLI will look for a KSQL Server running at `http://localhost:8088`.

```
$ LOG_DIR=./ksql_logs ksql
```

Important

By default KSQL attempts to store its logs in a directory called `logs` that is relative to the location of the `ksql` executable. For example, if `ksql` is installed at `/usr/local/bin/ksql`,

then it would attempt to store its logs in `/usr/local/logs`. If you are running `ksql` from the default Confluent Platform location, `<path-to-confluent>/bin`, you must override this default behavior by using the `LOG_DIR` variable.

After KSQL is started, your terminal should resemble this.

```
(base) [root@tos apps]# LOG_DIR=./ksql_logs ksql

=====
=                                     =
=      [//_/_/_/_/_/_/_/_/_/_]      =
=      | / (  \  \  \  \  \  \ |      =
=      | <  \  \  \  \  \  \ |      =
=      | .  \  \  \  \  \  \ |      =
=      | \  \  \  \  \  \  \ |      =
=                                     =
=  Streaming SQL Engine for Apache Kafka®  =
=====

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CLI v5.2.2, Server v5.2.2 located at http://localhost:8088

Having trouble? Type 'help' (case-insensitive) for a rundown of how things work!

ksql> █
```

Inspect Kafka Topics By Using SHOW and PRINT Statements

KSQL enables inspecting Kafka topics and messages in real time.

- Use the `SHOW TOPICS` statement to list the available topics in the Kafka cluster.
- Use the `PRINT` statement to see a topic's messages as they arrive.

In the KSQL CLI, run the following statement:

```
SHOW TOPICS;
```

Your output should resemble:

Kafka Topic	Registered	Partitions	Partition Replicas	Consumers	ConsumerGroups

_confluent-metrics	false	12	1	0	0
_schemas	false	1	1	0	0
pageviews	false	1	1	0	0
users	false	1	1	0	0

Inspect the `users` topic by using the PRINT statement:

```
PRINT 'users';
```

Your output should resemble:

Format:JSON

```
{
  "ROWTIME":1540254230041,
  "ROWKEY":"User_1",
  "registertime":1516754966866,
  "userid":"User_1",
  "regionid":"Region_9",
  "gender":"MALE"
}
```

```
{ "ROWTIME":1540254230081,"ROWKEY":"User_3","registertime":1491558386780,"userid":"User_3","regionid":"Region_2","gender":"MALE"}
{"ROWTIME":1540254230091,"ROWKEY":"User_7","registertime":1514374073235,"userid":"User_7","regionid":"Region_2","gender":"OTHER"}
^C{"ROWTIME":1540254232442,"ROWKEY":"User_4","registertime":1510034151376,"userid":"User_4","regionid":"Region_8","gender":"FEMALE"}
Topic printing ceased
```

Press CTRL+C to stop printing messages.

Inspect the `pageviews` topic by using the PRINT statement:

```
PRINT 'pageviews';
```

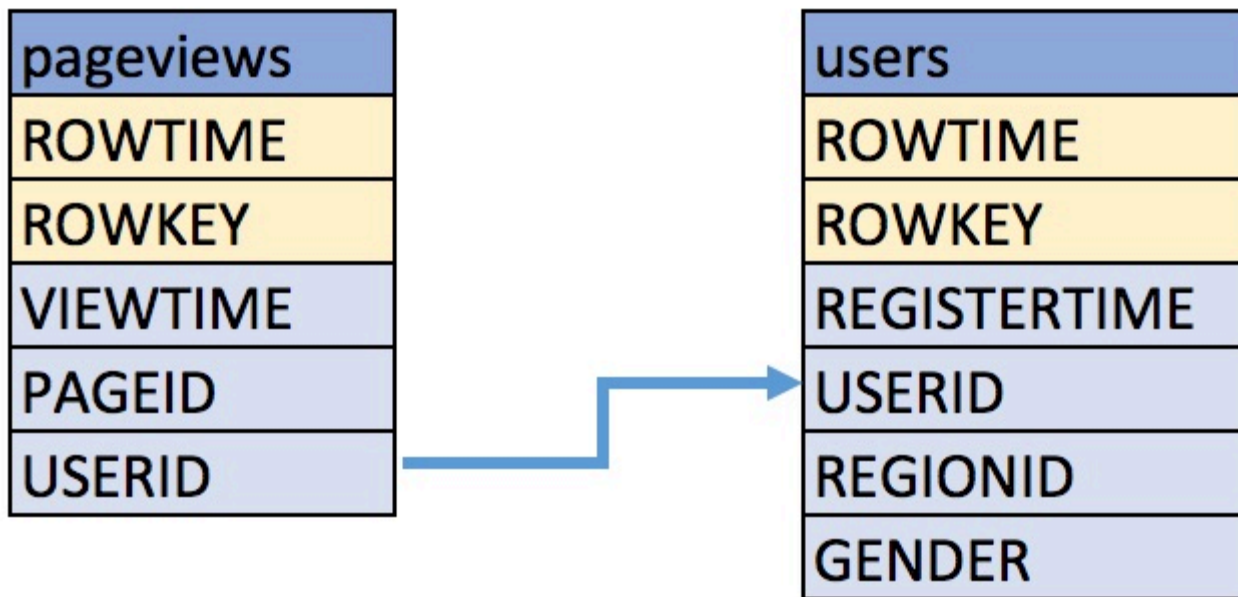
Your output should resemble:

```
Format:STRING
10/23/18 12:24:03 AM UTC , 9461 , 1540254243183,User_9,Page_20
10/23/18 12:24:03 AM UTC , 9471 , 1540254243617,User_7,Page_47
10/23/18 12:24:03 AM UTC , 9481 , 1540254243888,User_4,Page_27
^C10/23/18 12:24:05 AM UTC , 9521 , 1540254245161,User_9,Page_62
Topic printing ceased
ksql>
```

Press CTRL+C to stop printing messages.

Create a Stream and Table

These examples query messages from Kafka topics called `pageviews` and `users` using the following schemas:



1. Create a stream, named `pageviews_original`, from the `pageviews` Kafka topic, specifying the `value_format` of `DELIMITED`.


```
CREATE STREAM pageviews_original (viewtime bigint, userid varchar, pageid varchar) WITH  
ITH  
(kafka_topic='pageviews', value_format='JSON');
```

Your output should resemble:

```
ksql> CREATE STREAM pageviews_original (viewtime bigint, userid varchar, pageid varchar) WITH  
>(kafka_topic='pageviews', value_format='DELIMITED');  
>  
  
Message  
-----  
Stream created  
-----  
ksql> █
```

Tip

You can run `DESCRIBE pageviews_original;` to see the schema for the stream. Notice that KSQL created two additional columns, named `ROWTIME`, which corresponds with the Kafka message timestamp, and `ROWKEY`, which corresponds with the Kafka message key.

```
ksql> DESCRIBE pageviews_original;

Name          : PAGEVIEWS_ORIGINAL
Field  | Type
-----|-----
ROWTIME | BIGINT      (system)
ROWKEY  | VARCHAR(STRING) (system)
VIEWTIME | BIGINT
USERID  | VARCHAR(STRING)
PAGEID  | VARCHAR(STRING)
-----|-----

For runtime statistics and query details run: DESCRIBE EXTENDED <Stream,Table>;
ksql>
```

2. Create a table, named `users_original`, from the `users` Kafka topic, specifying the `value_format` of `JSON`.

```
CREATE TABLE users_original (registertime BIGINT, gender VARCHAR, regionid VARCHAR,
userid VARCHAR PRIMARY KEY) WITH
(kafka_topic='users', value_format='JSON');
```

Your output should resemble:

Message

Table created

Tip

You can run `DESCRIBE users_original;` to see the schema for the Table.

3. Optional: Show all streams and tables.

```
ksql> SHOW STREAMS;
```

Stream Name	Kafka Topic	Format
PAGEVIEWS_ORIGINAL	pageviews	DELIMITED

```
ksql> SHOW TABLES;
```

Table Name	Kafka Topic	Format	Windowed
USERS_ORIGINAL	users	JSON	false

Write Queries

```
#SET 'auto.offset.reset'='earliest';
```

These examples write queries using KSQL.

Note: By default KSQL reads the topics for streams and tables from the latest offset.

1. Use **SELECT** to create a query that returns data from a STREAM. This query includes the **LIMIT** keyword to limit the number of rows returned in the query result. Note that exact data output may vary because of the randomness of the data generation.

```
SELECT pageid FROM pageviews_original EMIT changes LIMIT 3;
```

Your output should resemble:

```
Table Name      | Kafka Topic | Key Format | Value Format | Windowed
-----
USERS_ORIGINAL | users      | KAFKA     | JSON       | false
-----
ksql> SET 'auto.offset.reset'='earliest';
Successfully changed local property 'auto.offset.reset' to 'earliest'. Use the UNSET command to revert your change.
ksql> SELECT pageid FROM pageviews_original EMIT changes LIMIT 3;
>
+-----+
|PAGEID|
+-----+
|Page_65|
|Page_71|
|Page_28|
Limit Reached
Query terminated
ksql> █
```

2. Create a persistent query by using the `CREATE STREAM` keywords to precede the `SELECT` statement. The results from this query are written to the `PAGEVIEWS_ENRICHED` Kafka topic. The following query enriches the `pageviews_original` STREAM by doing a `LEFT JOIN` with the `users_original` TABLE on the user ID.

```
CREATE STREAM pageviews_enriched AS
SELECT users_original.userid AS userid, pageid, regionid, gender
FROM pageviews_original
JOIN users_original
  ON pageviews_original.userid = users_original.userid
Emit changes;
```

Your output should resemble:

```
ksql> CREATE STREAM pageviews_enriched AS
>SELECT users_original.userid AS userid, pageid, regionid, gender
>FROM pageviews_original
>JOIN users_original
> ON pageviews_original.userid = users_original.userid
>Emit changes;
>
```

Message

Executing statement

```
ksql> DESCRIBE pageviews_enriched;
```

Name : PAGEVIEWS_ENRICHED

Field	Type
-------	------

USERID	VARCHAR(String) (key)
--------	-----------------------

PAGEID	VARCHAR(String)
--------	-----------------

REGIONID	VARCHAR(String)
----------	-----------------

GENDER	VARCHAR(String)
--------	-----------------

For runtime statistics and query details run: DESCRIBE <Stream,Table> EXTENDED;

```
ksql> █
```

Tip

You can run `DESCRIBE pageviews_enriched;` to describe the stream.

3. Use `SELECT` to view query results as they come in. To stop viewing the query results, press `<ctrl-c>`. This stops printing to the console but it does not terminate the actual query. The query continues to run in the underlying KSQL application.

```
SELECT * FROM pageviews_enriched Emit Changes;
```

Your output should resemble:

```
|User_9          |Page_92          |Region_2          |MALE          |
|User_2          |Page_66          |Region_6          |MALE          |
|User_3          |Page_10          |Region_7          |MALE          |
|User_5          |Page_30          |Region_3          |OTHER         |
|User_2          |Page_85          |Region_6          |MALE          |
|User_1          |Page_46          |Region_7          |OTHER         |
|User_6          |Page_56          |Region_3          |FEMALE        |
|User_8          |Page_13          |Region_2          |MALE          |
|User_4          |Page_19          |Region_4          |FEMALE        |
|User_3          |Page_44          |Region_7          |MALE          |
|User_8          |Page_57          |Region_2          |MALE          |
|User_8          |Page_39          |Region_2          |MALE          |
|User_9          |Page_15          |Region_2          |MALE          |
|User_9          |Page_71          |Region_2          |MALE          |
|User_7          |Page_69          |Region_8          |MALE          |
```

4. Create a new persistent query where a condition limits the streams content, using `WHERE`. Results from this query are written to a Kafka topic called `PAGEVIEWS_FEMALE`.

```
CREATE STREAM pageviews_female AS
SELECT * FROM pageviews_enriched
WHERE gender = 'FEMALE';
```

Your output should resemble:

Message

Stream created **and** running

Tip

You can run `DESCRIBE pageviews_female;` to describe the stream.

5. Create a new persistent query where another condition is met, using `LIKE`. Results from this query are written to the `pageviews_enriched_r8_r9` Kafka topic.

```
CREATE STREAM pageviews_female_like_89
WITH (kafka_topic='pageviews_enriched_r8_r9') AS
SELECT * FROM pageviews_female
WHERE regionid LIKE '%_8' OR regionid LIKE '%_9';
```

Your output should resemble:

Message

Stream created **and** running

6. Verify the above 2 streams:

select * from PAGEVIEWS_FEMALE_LIKE_89 emit changes limit 6;

select * from PAGEVIEWS_FEMALE emit changes limit 3;

```
ksql> select * from PAGEVIEWS_FEMALE_LIKE_89 emit changes limit 6;
```

USERID	PAGEID	REGIONID	GENDER
User_9	Page_15	Region_9	FEMALE
User_9	Page_17	Region_8	FEMALE
User_9	Page_66	Region_8	FEMALE
User_9	Page_62	Region_8	FEMALE
User_9	Page_71	Region_8	FEMALE
User_6	Page_31	Region_8	FEMALE

Limit Reached
Query terminated

```
ksql> select * from PAGEVIEWS_FEMALE emit changes limit 3;
```

USERID	PAGEID	REGIONID	GENDER
User_1	Page_30	Region_8	FEMALE
User_3	Page_23	Region_6	FEMALE
User_1	Page_81	Region_8	FEMALE

Limit Reached
Query terminated

```
ksql>
```

7. Create a new persistent query that counts the pageviews for each region combination in a **tumbling window** of 30 seconds when the count is greater than one. Results from this query are written to the **PAGEVIEWS_REGIONS** Kafka topic in the Avro format. **KSQL will register the Avro schema with the configured Schema Registry** when it writes the first message to the **PAGEVIEWS_REGIONS** topic.

```
CREATE TABLE pageviews_regions
WITH (
  KAFKA_TOPIC = 'pageviews_regions',VALUE_FORMAT='AVRO'
) AS
SELECT regionid , COUNT(*) AS numusers
FROM pageviews_enriched
  WINDOW TUMBLING (size 30 second)
GROUP BY regionid
HAVING COUNT(*) > 1 emit changes;
```

Your output should resemble:

Message

Table created **and** running

Tip

You can run `DESCRIBE pageviews_regions;` to describe the table.

8. Optional: View results from the above queries using `SELECT`.

`SELECT regionid, numusers FROM pageviews_regions emit changes LIMIT 5;`

Your output should resemble:

```
ksql> SELECT regionid, numusers FROM pageviews_regions emit changes LIMIT 5;
+-----+-----+
|REGIONID|NUMUSERS|
+-----+-----+
|Region_2|221     |
|Region_3|6169    |
|Region_5|10659   |
|Region_2|11476   |
|Region_9|2259    |
Limit Reached
Query terminated
```

9. Optional: Show all persistent queries.

SHOW QUERIES;

Your output should resemble:

Query ID	Kafka Topic	Query String
-----	-----	-----
-----	-----	-----
-----	-----	-----
CSAS_PAGEVIEWS_FEMALE_1	PAGEVIEWS_FEMALE	CREATE STREAM pageviews_female AS SELECT * FROM pageviews_enriched WHERE gender = 'FEMALE';
CTAS_PAGEVIEWS_REGIONS_3	PAGEVIEWS_REGIONS	CREATE TABLE pageviews_regions WITH (VALUE_FORMAT='avro') AS SELECT gender, regionid, COUNT(*) AS numusers FROM pageviews_enriched WINDOW TUMBLING (size 30 second) GROUP BY gender, regionid HAVING COUNT(*) > 1;
CSAS_PAGEVIEWS_FEMALE_LIKE_89_2	PAGEVIEWS_FEMALE_LIKE_89	CREATE STREAM pageviews_female_like_89 WITH (kafka_topic='pageviews_enriched_r8_r9') AS SELECT * FROM pageviews_female WHERE regionid LIKE '%_8' OR regionid LIKE '%_9';
CSAS_PAGEVIEWS_ENRICHED_0	PAGEVIEWS_ENRICHED	CREATE STREAM pageviews_enriched AS SELECT users_original.userid AS userid, pageid, regionid, gender FROM pageviews_original LEFT JOIN users_original ON pageviews_original.userid = users_original.userid;

```
-----
-----
-----
-----
```

For detailed information on a Query run: EXPLAIN <Query ID>;

10. Optional: Examine query run-time metrics and details. Observe that information including the target Kafka topic is available, as well as throughput figures for the messages being processed.

DESCRIBE PAGEVIEWS_REGIONS EXTENDED;

Your output should resemble:

```
Name       : PAGEVIEWS_REGIONS
Type        : TABLE
Key field   : KSQL_INTERNAL_COL_o|+|KSQL_INTERNAL_COL_1
Key format  : STRING
Timestamp field : Not set - using <ROWTIME>
Value format : AVRO
Kafka topic  : PAGEVIEWS_REGIONS (partitions: 4, replication: 1)
```

Field | Type

```
-----
ROWTIME | BIGINT      (system)
ROWKEY  | VARCHAR(STRING) (system)
```

```
GENDER | VARCHAR(STRING)
REGIONID | VARCHAR(STRING)
NUMUSERS | BIGINT
```

Queries that write into this TABLE

```
CTAS_PAGEVIEWS_REGIONS_3 : CREATE TABLE pageviews_regions WITH (value_format='avro') AS
SELECT gender, regionid , COUNT(*) AS numusers FROM
pageviews_enriched WINDOW TUMBLING (size 30 second) GROUP BY gender,
regionid HAVING COUNT(*) > 1;
```

For query topology **and** execution plan please run: EXPLAIN <QueryId>

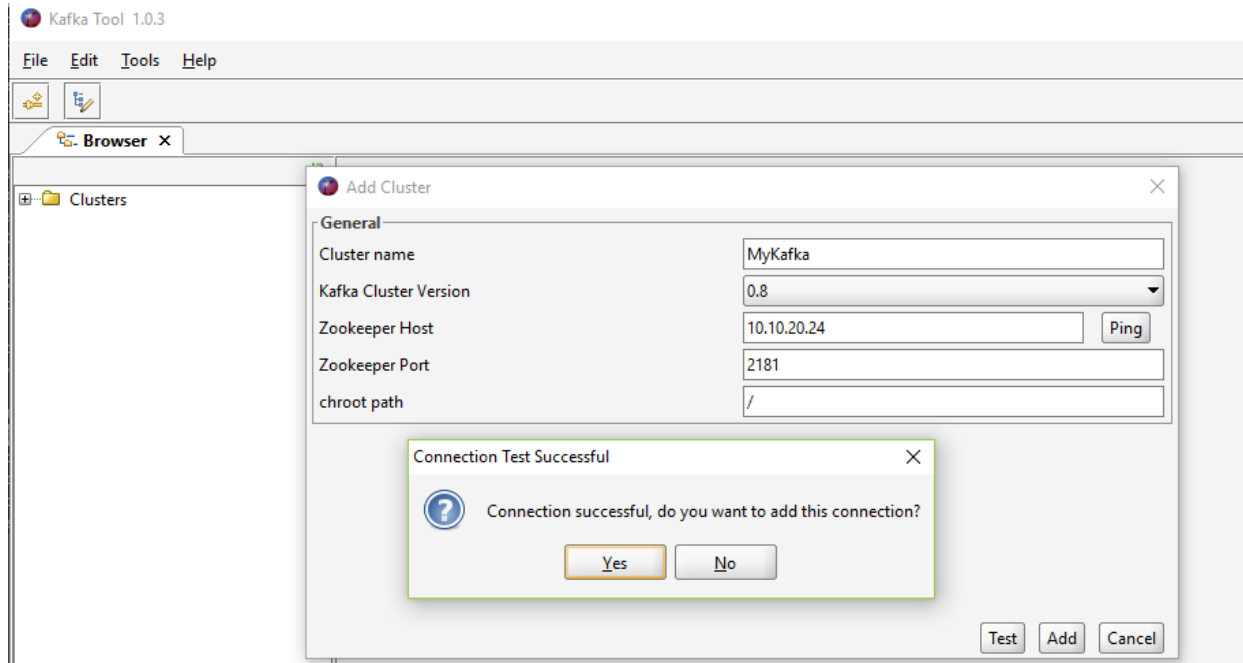
Local runtime statistics

```
messages-per-sec: 3.06 total-messages: 1827 last-message: 7/19/18 4:17:55 PM
UTC
failed-messages: 0 failed-messages-per-sec: 0 last-failed: n/a
(Statistics of the local KSQL server interaction with the Kafka topic PAGEVIEWS_REGIONS)
ksql>
```

https://ksqldb.io/quickstart.html?_ga=2.53841192.1438767497.1642131382-2002989446.1641377120&_gac=1.255954681.1642171371.CjwKCAiA24SPBhBoEiwAjBgkhg1qFCOJ-Ohq2cWlGrT9c3232dWfPKKpOG6zXpZrNXjqUelgasqp5BoCTEoQAvD_BwE

----- Lab Ends Here -----

6. Kafkatools



7. Errors

I. LEADER_NOT_AVAILABLE

{test=LEADER_NOT_AVAILABLE} (org.apache.kafka.clients.NetworkClient)

```
[2018-05-15 23:46:40,132] WARN [Producer clientId=console-producer] Error while
fetching metadata with correlation id 14 : {test=LEADER_NOT_AVAILABLE} (org.apac
he.kafka.clients.NetworkClient)
[2018-05-15 23:46:40,266] WARN [Producer clientId=console-producer] Error while
fetching metadata with correlation id 15 : {test=LEADER_NOT_AVAILABLE} (org.apac
he.kafka.clients.NetworkClient)
^C[2018-05-15 23:46:40,394] WARN [Producer clientId=console-producer] Error whil
e fetching metadata with correlation id 16 : {test=LEADER_NOT_AVAILABLE} (org.ap
ache.kafka.clients.NetworkClient)
[root@tos opt]# {test=LEADER_NOT_AVAILABLE} (org.apache.kafka.clients.NetworkCl
ient)
bash: syntax error near unexpected token `org.apache.kafka.clients.NetworkClient'
```

Solutions: /opt/kafka/config/server.properties

Update the following information.

```
# it uses the value for "listeners" if configured. Otherwise, it will use the v
alue
# returned from java.net.InetAddress.getCanonicalHostName().
advertised.listeners=PLAINTEXT://localhost:9092
# More listener names to security protocols, the default is for them to be the s
```

java.util.concurrent.ExecutionException:

org.apache.kafka.common.errors.TimeoutException: Expiring 1 record(s) for my-kafka-topic-6: 30037 ms has passed since batch creation plus linger time

```
    at
org.apache.kafka.clients.producer.internals.FutureRecordMetadata.valueOrError(FutureRecordMetadata.java:94)

    at
org.apache.kafka.clients.producer.internals.FutureRecordMetadata.get(FutureRecordMetadata.java:64)

    at
org.apache.kafka.clients.producer.internals.FutureRecordMetadata.get(FutureRecordMetadata.java:29)

    at com.tos.kafka.MyKafkaProducer.runProducer(MyKafkaProducer.java:97)

    at com.tos.kafka.MyKafkaProducer.main(MyKafkaProducer.java:18)
```

Caused by: org.apache.kafka.common.errors.TimeoutException: Expiring 1 record(s) for my-kafka-topic-6: 30037 ms has passed since batch creation plus linger time.

Solution:

Update the following in all the server properties: /opt/kafka/config/server.properties

```
# listeners = PLAINTEXT://your.host.name:9092
listeners=PLAINTEXT://tos.master.com:9093

# Hostname and port the broker will advertise to producers and consumers. If not
# set,
# it uses the value for "listeners" if configured. Otherwise, it will use the v
# alue
# returned from java.net.InetAddress.getCanonicalHostName().
advertised.listeners=PLAINTEXT://tos.master.com:9093

# Maps listener names to security protocols, the default is for them to be the s
# ame. See the config documentation for more details
listener.security.protocol.map=PLAINTEXT:PLAINTEXT,SSL:SSL,SASL_PLAINTEXT:SASL_
PLAINTEXT,SASL_SSL:SASL_SSL
```

Its should be updated with your hostname and restart the broker

Changes in the following file, if the hostname is to be changed.

//kafka/ Server.properties and control center

/apps/confluent/etc/confluent-control-center/control-center-dev.properties

/apps/confluent/etc/ksql/ksql-server.properties

/tmp/confluent.8A2Ii7O4/connect/connect.properties

Update localhost to resolve to the ip in /etc/hosts.

In case the hostname doesn't started, updated with ip address and restart the broker.

8. Annexure Code:

II. DumplogSegment

```
/opt/kafka/bin/kafka-run-class.sh kafka.tools.DumpLogSegments --deep-iteration --print-data-log --files \
```

```
/tmp/kafka-logs/my-kafka-connect-o/ooooooooooooooooooooo.log | head -n 4
```

```

[root@tos test-topic-0]# more 00000000000000000000000000000000.log
[root@tos test-topic-0]# cd ../
[root@tos kafka-logs]# cd my-kafka-connect-0/
[root@tos my-kafka-connect-0]# ls
00000000000000000000000000000000.index      0000000000000000000000000000000011.snapshot
00000000000000000000000000000000.log        leader-epoch-checkpoint
00000000000000000000000000000000.timeindex
[root@tos my-kafka-connect-0]# more *log
\██████████afka Connector.--More--(53%)

[root@tos my-kafka-connect-0]# pwd
/tmp/kafka-logs/my-kafka-connect-0
[root@tos my-kafka-connect-0]# /opt/kafka/bin/kafka-run-class.sh kafka.tools.DumpLogSegments --deep-iteration --print-data-log --files \
> /tmp/kafka-logs/my-kafka-connect-0/00000000000000000000000000000000.log | head -n 4
Dumping /tmp/kafka-logs/my-kafka-connect-0/00000000000000000000000000000000.log
Starting offset: 0
offset: 0 position: 0 CreateTime: 1530552634675 isValid: true keysize: -1 value size: 31 magic: 2 compresscodec: NONE producerId: -1 producerEpoch: -1 sequence: -1 isTransactional: false headerKeys: [] payload: This Message is from Test File
.
offset: 1 position: 0 CreateTime: 1530552634677 isValid: true keysize: -1 value size: 43 magic: 2 compresscodec: NONE producerId: -1 producerEpoch: -1 sequence: -1 isTransactional: false headerKeys: [] payload: It will be consumed by the Kafka Connector.
[root@tos my-kafka-connect-0]#

```

III. Resources

<https://docs.confluent.io/current/ksql/docs/tutorials/examples.html#ksql-examples>

<https://developer.ibm.com/hadoop/2017/04/10/kafka-security-mechanism-saslplain/>

<https://sharebigdata.wordpress.com/2018/01/21/implementing-sasl-plain/>

<https://developer.ibm.com/code/howtos/kafka-authn-authz>

<https://github.com/confluentinc/kafka-streams-examples/tree/4.1.x/>

<https://github.com/spring-cloud/spring-cloud-stream-samples/blob/master/kafka-streams-samples/kafka-streams-table-join/src/main/java/kafka/streams/table/join/KafkaStreamsTableJoin.java>