Release H: ksqldb

Introduction

ksqlDB is a database purpose-built to help developers create stream processing applications on top of Apache Kafka.

Setup

The following setup is deigned to work with Strimzi.

Kafka keystore/truststore

Create a strimzi user (ksqldb)

Strimzi User

```
apiVersion: kafka.strimzi.io/v1beta1
kind: KafkaUser
metadata:
  name: ksqldb
  namespace: kafka
  labels:
    strimzi.io/cluster: my-cluster
spec:
  authentication:
    type: tls
```

Generate keystore/truststore secret

generate_stores.sh

```
#!/bin/sh

if [ -z "$1" ]
  then
    echo "No argument supplied"
    exit 1
fi

kafkauser=$1

WORKDIR=$(dirname "$(realpath "$0")")

rm $WORKDIR/ca.crt $WORKDIR/user.crt  $WORKDIR/user.key  $WORKDIR/user-keystore.jks  $WORKDIR/user.p12  $WORKDIR
/user.password  $WORKDIR/user-truststore.jks 2>/dev/null

kubectl delete secret ${kafkauser}-jks -n kafka 2>/dev/null

kubectl get secret my-cluster-cluster-ca-cert -n kafka -o jsonpath='{.data.ca\.crt}' | base64 --decode >
$WORKDIR/ca.crt

kubectl get secret ${kafkauser} -n kafka -o jsonpath='{.data.user\.key}' | base64 --decode > $WORKDIR/user.key

kubectl get secret ${kafkauser} -n kafka -o jsonpath='{.data.user\.crt}' | base64 --decode > $WORKDIR/user.crt

kubectl get secret ${kafkauser} -n kafka -o jsonpath='{.data.user\.p12}' | base64 --decode > $WORKDIR/user.p12

kubectl get secret ${kafkauser} -n kafka -o jsonpath='{.data.user\.password}' | base64 --decode > $WORKDIR/user.
password

export PASSWORD=`cat ${WORKDIR}/user.password`

keytool -import -trustcacerts -file $WORKDIR/ca.crt -keystore $WORKDIR/user-truststore.jks -storepass $PASSWORD
-noprompt

keytool -importkeystore -srckeystore $WORKDIR/user.p12 -srcstorepass ${PASSWORD} -srcstoretype pkcs12 -
destkeystore $WORKDIR/user-keystore.jks -deststorepass ${PASSWORD} -deststoretype jks


kubectl create secret generic ${kafkauser}-jks -n kafka --from-literal=keystore_password=$PASSWORD --from-
file=user-keystore.jks=${WORKDIR}/user-keystore.jks --from-literal=truststore_password=$PASSWORD --from-
file=user-truststore.jks=${WORKDIR}/user-truststore.jks --from-literal=key_password=$PASSWORD
```

Run ./generate_stores.sh ksqldb

This will create a secret called "ksqldb-jks" which contains the keystore and truststore needed to connect to Kafka over SSL.

ksqldb-server

ksqldb-server

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ksqldb-server
  namespace: kafka
spec:
  selector:
    matchLabels:
      app: ksqldb-server
  template:
    metadata:
      labels:
        app: ksqldb-server
        version: v1
```

```
    spec:
      containers:
      - name: ksqldb-server
        image: confluentinc/ksqldb-server:0.28.2
        imagePullPolicy: IfNotPresent
        env:
        - name: KEYSTORE_PASSWORD
          valueFrom:
            secretKeyRef:
              name: ksqldb-jks
              key: keystore_password
        - name: TRUSTSTORE_PASSWORD
          valueFrom:
            secretKeyRef:
              name: ksqldb-jks
              key: truststore_password
        - name: KEY_PASSWORD
          valueFrom:
            secretKeyRef:
              name: ksqldb-jks
              key: key_password
        - name: KSQL_BOOTSTRAP_SERVERS
          value: my-cluster-kafka-bootstrap.kafka:9093
        - name: KSQL_LISTENERS
          value: http://0.0.0.0:8088
        - name: KSQL_KSQL_SERVICE_ID
          value: ksql_service_2_
        - name: KSQL_SECURITY_PROTOCOL
          value: SSL
        - name: KSQL_OPTS
          value: "-Dssl.keystore.location=/var/private/ssl/user-keystore.jks -Dssl.keystore.
password=$(KEYSTORE_PASSWORD) -Dssl.key.password=$(KEY_PASSWORD) -Dssl.truststore.location=/var/private/ssl
/user-truststore.jks -Dssl.truststore.password=$(TRUSTSTORE_PASSWORD) -Dlisteners=http://0.0.0.0:8088/"
        - name: KSQL_KSQL_EXTENSION_DIR
          value: /opt/ksqldb-udfs
        volumeMounts:
        - name: jks
          mountPath: /var/private/ssl
          readOnly: true
      volumes:
      - name: jks
        secret:
          secretName: ksqldb-jks
---
apiVersion: v1
kind: Service
metadata:
  name: ksqldb-server
  namespace: kafka
  labels:
    app: ksqldb-server
    service: ksqldb-server
spec:
  type: LoadBalancer
  selector:
    app: ksqldb-server
  ports:
  - port: 8088
    name: http-80
```

The above YAML file deploys the ksqldb server to your cluster.

It has been configured to connect to your kafka cluster over SSL using the "ksqldb-jks" secret created in the previous step.

ksqldb-cli

ksqldb-cli

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ksqldb-cli
  namespace: kafka
spec:
  selector:
    matchLabels:
      app: ksqldb-cli
  template:
    metadata:
      labels:
        app: ksqldb-cli
        version: v1
    spec:
      containers:
      - name: ksqldb-cli
        image: confluentinc/ksqldb-cli:0.28.2
        imagePullPolicy: IfNotPresent
        env:
        - name: KEYSTORE_PASSWORD
          valueFrom:
            secretKeyRef:
              name: ksqldb-jks
              key: keystore_password
        - name: TRUSTSTORE_PASSWORD
          valueFrom:
            secretKeyRef:
              name: ksqldb-jks
              key: truststore_password
          valueFrom:
            secretKeyRef:
              name: ksqldb-jks
              key: key_password
        - name: KSQL_BOOTSTRAP_SERVERS
          value: my-cluster-kafka-bootstrap.kafka:9093
        - name: KSQL_SECURITY_PROTOCOL
          value: SSL
        - name: KSQL_OPTS
          value: "-Dssl.keystore.location=/var/private/ssl/user-keystore.jks -Dssl.keystore.
password=$(KEYSTORE_PASSWORD) -Dssl.key.password=$(KEY_PASSWORD) -Dssl.truststore.location=/var/private/ssl
/user-truststore.jks -Dssl.truststore.password=$(TRUSTSTORE_PASSWORD) -Dlisteners=http://0.0.0.0:8088/"
        volumeMounts:
        - name: jks
          mountPath: /var/private/ssl
          readOnly: true
      volumes:
      - name: jks
        secret:
          secretName: ksqldb-jks
```

We can then connect to the ksqldb-server through the client.

kubectl exec -it <ksqldb-cli-POD-NAME> -n kafka -- ksql http://ksqldb-server:8088

The client can be used to create streams, tables and run queries.

Steams

pms stream

```
        CREATE STREAM IF NOT EXISTS PMS_STREAM (
                      event STRUCT<
                        commonEventHeader STRUCT<domain VARCHAR,
                                                 eventName VARCHAR,
                                                 sourceName VARCHAR,
                                                 reportingEntityName VARCHAR,
                                                 startEpochMicrosec BIGINT,
                                                 lastEpochMicrosec BIGINT,
                                                 timeZoneOffset VARCHAR>,
                        perf3gppFields STRUCT<perf3gppFieldsVersion VARCHAR,
                                              measDataCollection STRUCT<granularityPeriod INT,
                                                                        measuredEntityUserName   VARCHAR,
                                                                        measuredEntityDn VARCHAR,
                                                                        measuredEntitySoftwareVersion VARCHAR,
                                                                        measInfoList ARRAY<STRUCT<
                                                                         measInfoId STRUCT<sMeasInfoId VARCHAR>,
                                                                         measTypes STRUCT<
                                                                           sMeasTypesList ARRAY<VARCHAR>>,
                                                                         measValuesList ARRAY<STRUCT<
                                                                            measObjInstId VARCHAR,
                                                                            suspectFlag VARCHAR,
                                                                            measResults ARRAY<
                                                                                        STRUCT<p INT, "+
                                                                                               sValue
VARCHAR>>>>>>>>>)
                                                 WITH (KAFKA_TOPIC='pms',
                                                       VALUE_FORMAT='JSON',
                                                        PARTITIONS = 1);
```

pms transform1

```
CREATE STREAM IF NOT EXISTS pms_stream_transform1 AS
select event->commonEventHeader->domain as domain,
event->commonEventHeader->eventName as eventName,
event->commonEventHeader->sourceName as sourceName,
event->commonEventHeader->startEpochMicrosec as startEpochMicrosec,
event->commonEventHeader->lastEpochMicrosec as lastEpochMicrosec,
event->perf3gppFields->perf3gppFieldsVersion as perf3gppFieldsVersion,
event->perf3gppFields->measDataCollection->granularityPeriod as granularityPeriod,
event->perf3gppFields->measDataCollection->measuredEntityUserName as measuredEntityUserName,
event->perf3gppFields->measDataCollection->measuredEntityDn as measuredEntityDn,
EXPLODE(event->perf3gppFields->measDataCollection->measInfoList)->measTypes->sMeasTypesList as sMeasTypesList,
EXPLODE(event->perf3gppFields->measDataCollection->measInfoList)->measValuesList as measValuesList
from pms_stream EMIT CHANGES;
```

pms transform2

```
CREATE STREAM IF NOT EXISTS pms_stream_transform2 AS
select measuredEntityDn, measuredEntityUserName, sMeasTypesList,
explode(measValuesList)->measObjInstId  as measObjInstId,
explode(measValuesList)->measResults as measResults
from pms_stream_transform1 EMIT CHANGES;
```

pms transform3

```
CREATE STREAM IF NOT EXISTS pms_stream_transform3 AS
select measuredEntityDn, measuredEntityUserName, explode(sMeasTypesList) as sMeasType,
measObjInstId, explode(measResults)->sValue as sValue from pms_stream_transform2;
```

pms transform4

```
CREATE STREAM IF NOT EXISTS pms_stream_transform4 AS
select measuredEntityDn + measObjInstId + sMeasType AS MY_COMPOSITE_KEY,
measuredEntityDn, measuredEntityUserName, sMeasType, measObjInstId, sValue
from pms_stream_transform3;
```

pms transform5

```
CREATE STREAM IF NOT EXISTS pms_stream_transform5 AS
select MY_COMPOSITE_KEY, measuredEntityDn, measuredEntityUserName, sMeasType, measObjInstId, sValue
from pms_stream_transform4 partition by MY_COMPOSITE_KEY;
```

Tables

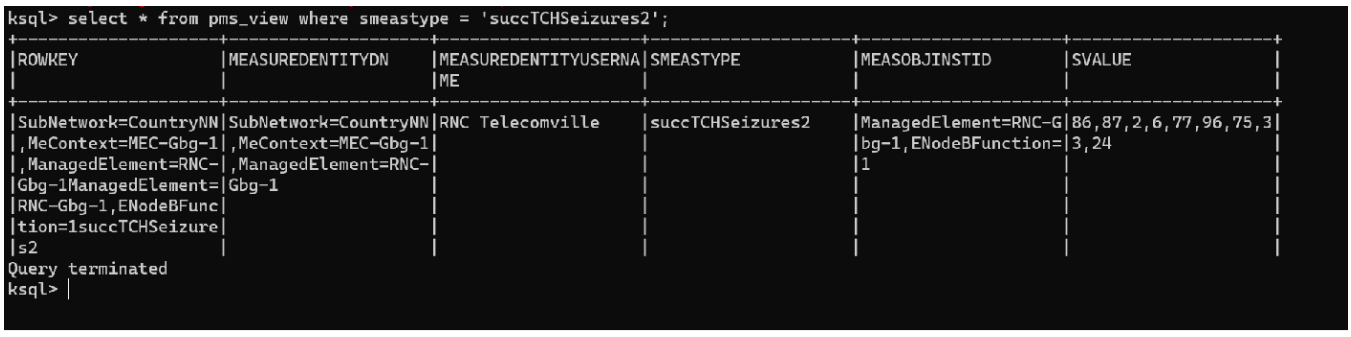
pms table

```
CREATE TABLE IF NOT EXISTS PMS_TABLE (ROWKEY VARCHAR PRIMARY KEY,
                measuredEntityDn VARCHAR,
                measuredEntityUserName VARCHAR,
                sMeasType VARCHAR,
                measObjInstId VARCHAR,
                sValue VARCHAR
                )             WITH (KAFKA_TOPIC='PMS_STREAM_TRANSFORM5', VALUE_FORMAT='JSON', PARTITIONS = 1);
```

pms view

```
CREATE OR REPLACE table pms_view as select * from PMS_TABLE EMIT CHANGES;
```

Queries



Links

ksqldb

How to create a user-defined function

Scalar functions

Table Functions

Cleaning messy sensor data in Kafka with ksqlDB