Lab 8.3: Kafka Security SASL PLAIN 

Welcome to the session 8 lab 3. The work for this lab is done in `~/kafka-training/labs/lab8.3`. In this lab, you are going to Kafka SASL PLAIN.

Important!

Run following script first to stop any running kafka/zookeeper process and clear logs.

```
~/kafka-training/kill-clean.sh
```

Note: Lab solution is available in following directory: `~/kafka-training/labs/lab8.3/solution`

Kafka and SASL PLAIN

You should use ***SASL/PLAIN*** with ***SSL*** only as ***transport layer*** to ensure no clear text passwords are not transmitted. The Kafka default implementation of ***SASL/PLAIN*** specifies *usernames* and *passwords* in ***JAAS*** config files.

Create JAAS config for ZooKeeper add admin user

To log into ZooKeeper, you would need user *admin* and and a password (*kafka-123*).
You would configure this via JAAS file called `zookeeper_jass.conf`.
which will live under `/opt/kafka/config/security/zookeeper_jass.conf`.

ZooKeeper JAAS file

~/kafka-training/labs/lab8.3/resources/opt/kafka/conf/security/zookeeper_jaas.conf

```
// Zookeeper server authentication
Server {
  org.apache.kafka.common.security.plain.PlainLoginModule required
  username="admin"
  password="kafka-123"
  user_admin="kafka-123";
};
```

Note we are using PlainLoginModule from Kafka.

ACTION EDIT resources/opt/kafka/conf/security/kafka_broker_jaas.conf and follow instructions in file

Modify ZooKeeper properties file add SASL config

We need ZooKeeper to use `org.apache.zookeeper.server.auth.SASLAuthenticationProvider` as its authProvider. This `authProvider` requires JaaS login via SASL config/zookeeper.properties.

Use Kafka SASLAuthenticationProvider from ZooKeeper

~/kafka-training/labs/lab8.3/config/zookeeper.properties

```
dataDir=/tmp/zookeeper-secure2
clientPort=2181
maxClientCnxns=0
```

```
authProvider.1=org.apache.zookeeper.server.auth.SASLAuthenticationProvider
requireClientAuthScheme=sasl
jaasLoginRenew=3600000
```

Note we are using SASLAuthenticationProvider from Kafka.

ACTION EDIT config/zookeeper.properties and follow instructions in file

Modify ZooKeeper startup script add JAAS config location

We need to copy JAAS config files to `/opt/kafka/config/security`:

```
cd ~/kafka-training/labs/lab8.3/solution
cp -R resources/opt/kafka/conf/security /opt/kafka/conf/
```

Note: You can copy files from `~/kafka-training/labs/lab8.3` folder as well if you have updated the files.

KAFKA_OPTS used by kafka startup scripts to pass extra args to JVM.

Make ZooKeeper use JAAS config file

~/kafka-training/labs/lab8.3/bin/run-zookeeper.sh

```
#!/usr/bin/env bash
CONFIG=`pwd`/config
cd ~/kafka-training

export KAFKA_JAAS_FILE="/opt/kafka/conf/security/zookeeper_jaas.conf"
export KAFKA_OPTS="-Djava.security.auth.login.config=$KAFKA_JAAS_FILE"

## Run ZooKeeper
kafka/bin/zookeeper-server-start.sh \
   "$CONFIG/zookeeper.properties"
```

ACTION EDIT bin/run-zookeeper.sh and follow instructions in file

Create JAAS config for Kafka Brokers add users (admin, consumer, producer)

We will also need a JAAS config file for the broker which will live under `/opt/kafka/conf/security/kafka_broker_jaas.conf`. This JAAS config file will set up users for admin for zookeeper, and for inter-broker communication, as well as set up users for consumers and producers.

JAAS config file for Broker

~/kafka-training/labs/lab8.3/resources/opt/kafka/conf/security/kafka_broker_jaas.conf

```
KafkaServer {
  org.apache.kafka.common.security.plain.PlainLoginModule required
  username="admin"
  password="kafka-123"
  user_admin="kafka-123"
  user_stocks_consumer="consumer123"
  user_stocks_producer="producer123";
```

```
};

// Zookeeper client authentication
Client {
  org.apache.kafka.common.security.plain.PlainLoginModule required
  username="admin"
  password="kafka-123";
};
```

ACTION - EDIT `resources/opt/kafka/conf/security/kafka_broker_jaas.conf` and follow instructions in file

Modify Kafka Brokers Config properties file add SASL config

We will need to edit config files `config/server-0.properties`, `config/server-1.properties`, `config/server-2.properties`.
Enabled ***SASL*** support to use ***PLAIN SASL***.
Inter-broker communication is using ***SASL_SSL*** and config producers and consumers to use ***10092, 10093, 10094*** with ***SASL_SSL*** protocol.

~/kafka-training/labs/lab8.3/config/server-0.properties

```
broker.id=0

listeners=PLAINTEXT://localhost:9092,SASL_SSL://localhost:10092
sasl.mechanism.inter.broker.protocol=PLAIN
sasl.enabled.mechanisms=PLAIN


ssl.keystore.location=/opt/kafka/conf/certs/kafka.keystore
ssl.keystore.password=kafka123
ssl.key.password=kafka123
ssl.truststore.location=/opt/kafka/conf/certs/kafka.truststore
ssl.truststore.password=kafka123
ssl.client.auth=required

log.dirs=./logs/kafka-0
default.replication.factor=3
num.partitions=8
min.insync.replicas=2
auto.create.topics.enable=false
broker.rack=us-west2-a
queued.max.requests=1000
auto.leader.rebalance.enable=true
zookeeper.connect=localhost:2181
delete.topic.enable=true
compression.type=producer
message.max.bytes=65536
replica.lag.time.max.ms=5000
num.network.threads=3
num.io.threads=8
socket.send.buffer.bytes=102400
```

```
socket.receive.buffer.bytes=102400
socket.request.max.bytes=104857600
num.recovery.threads.per.data.dir=1
log.retention.hours=168
log.segment.bytes=1073741824
log.retention.check.interval.ms=300000
zookeeper.connection.timeout.ms=6000
```

ACTION - EDIT config/server-0.properties and follow directions

~/kafka-training/labs/lab8.3/config/server-1.properties

```
broker.id=1
listeners=PLAINTEXT://localhost:9093,SASL_SSL://localhost:10093
sasl.mechanism.inter.broker.protocol=PLAIN
sasl.enabled.mechanisms=PLAIN


ssl.keystore.location=/opt/kafka/conf/certs/kafka.keystore
ssl.keystore.password=kafka123
ssl.key.password=kafka123
ssl.truststore.location=/opt/kafka/conf/certs/kafka.truststore
ssl.truststore.password=kafka123
ssl.client.auth=required

log.dirs=./logs/kafka-1
min.insync.replicas=1
auto.create.topics.enable=false
zookeeper.connect=localhost:2181
num.partitions=1
delete.topic.enable=true
broker.rack=rack1
auto.leader.rebalance.enable=true
compression.type=producer
message.max.bytes=65536
replica.lag.time.max.ms=5000
num.network.threads=3
num.io.threads=8
socket.send.buffer.bytes=102400
socket.receive.buffer.bytes=102400
socket.request.max.bytes=104857600
num.recovery.threads.per.data.dir=1
log.retention.hours=168
log.segment.bytes=1073741824
log.retention.check.interval.ms=300000
zookeeper.connection.timeout.ms=6000
```

ACTION - EDIT config/server-1.properties and follow directions

~/kafka-training/labs/lab8.3/config/server-2.properties

```
broker.id=2
```

```
listeners=PLAINTEXT://localhost:9094,SASL_SSL://localhost:10094
sasl.mechanism.inter.broker.protocol=PLAIN
sasl.enabled.mechanisms=PLAIN


ssl.keystore.location=/opt/kafka/conf/certs/kafka.keystore
ssl.keystore.password=kafka123
ssl.key.password=kafka123
ssl.truststore.location=/opt/kafka/conf/certs/kafka.truststore
ssl.truststore.password=kafka123
ssl.client.auth=required

log.dirs=./logs/kafka-2
min.insync.replicas=1
auto.create.topics.enable=true
zookeeper.connect=localhost:2181
num.partitions=1
delete.topic.enable=true
broker.rack=rack2
auto.leader.rebalance.enable=true
compression.type=producer
message.max.bytes=65536
replica.lag.time.max.ms=5000
num.network.threads=3
num.io.threads=8
socket.send.buffer.bytes=102400
socket.receive.buffer.bytes=102400
socket.request.max.bytes=104857600
num.recovery.threads.per.data.dir=1
log.retention.hours=168
log.segment.bytes=1073741824
log.retention.check.interval.ms=300000

zookeeper.connection.timeout.ms=6000
```

ACTION - EDIT config/server-2.properties and follow directions

Modify Kafka Broker startup script add JAAS config location

~/kafka-training/labs/lab8.3/bin/start-1st-server.sh

```
#!/usr/bin/env bash
CONFIG=`pwd`/config
cd ~/kafka-training

export KAFKA_JAAS_FILE="/opt/kafka/conf/security/kafka_broker_jaas.conf"
export KAFKA_OPTS="-Djava.security.auth.login.config=$KAFKA_JAAS_FILE"

## Run Kafka for 1st Server
kafka/bin/kafka-server-start.sh \
   "$CONFIG/server-0.properties"
```

ACTION - EDIT bin/start-1st-server.sh and follow directions

~/kafka-training/labs/lab8.3/bin/start-1st-server.sh

```
#!/usr/bin/env bash
CONFIG=`pwd`/config
cd ~/kafka-training

export KAFKA_JAAS_FILE="/opt/kafka/conf/security/kafka_broker_jaas.conf"
export KAFKA_OPTS="-Djava.security.auth.login.config=$KAFKA_JAAS_FILE"

## Run Kafka for 1st Server
kafka/bin/kafka-server-start.sh \
   "$CONFIG/server-0.properties"
```

ACTION - EDIT bin/start-2nd-server.sh and follow directions

~/kafka-training/labs/lab8.3/bin/start-1st-server.sh

```
#!/usr/bin/env bash
CONFIG=`pwd`/config
cd ~/kafka-training

export KAFKA_JAAS_FILE="/opt/kafka/conf/security/kafka_broker_jaas.conf"
export KAFKA_OPTS="-Djava.security.auth.login.config=$KAFKA_JAAS_FILE"

## Run Kafka for 1st Server
kafka/bin/kafka-server-start.sh \
   "$CONFIG/server-0.properties"
```

ACTION - EDIT bin/start-3rd-server.sh and follow directions

Create JAAS config for Consumer add user

We will need to configure username and password in JAAS file to log into Kafka Brokers.

~/kafka-training/labs/lab8.3/resources/opt/kafka/conf/security/kafka_consumer_stocks_jaas.conf

```
KafkaClient {
  org.apache.kafka.common.security.plain.PlainLoginModule required
  username="stocks_consumer"
  password="consumer123";
};
```

ACTION - EDIT resources/opt/kafka/conf/security/kafka_consumer_stocks_jaas.conf and follow directions

Modify Consumer createConsumer() add SASL config and JAAS config location

~/kafka-training/labs/lab8.3/src/main/java/com/fenago/kafka/consumer/ConsumerUtil.java

```java
package com.fenago.kafka.consumer;

import com.fenago.kafka.model.StockPrice;
import org.apache.kafka.clients.CommonClientConfigs;
import org.apache.kafka.clients.consumer.Consumer;
import org.apache.kafka.clients.consumer.ConsumerConfig;
import org.apache.kafka.clients.consumer.KafkaConsumer;
import org.apache.kafka.common.serialization.StringDeserializer;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;

import java.util.ArrayList;
import java.util.List;
import java.util.Properties;
import java.util.concurrent.ExecutorService;
import java.util.concurrent.TimeUnit;
import java.util.stream.IntStream;

import static java.util.concurrent.Executors.newFixedThreadPool;

public class ConsumerUtil {
    public static final String BROKERS = "localhost:10092,localhost:10093";

    private static Consumer<String, StockPrice> createConsumer(
            final String bootstrapServers, final String clientId ) {

        System.setProperty("java.security.auth.login.config",
                "/opt/kafka/conf/security/kafka_consumer_stocks_jaas.conf");

        final Properties props = new Properties();
        props.put(ConsumerConfig.BOOTSTRAP_SERVERS_CONFIG,
                bootstrapServers);
        props.put(CommonClientConfigs.SECURITY_PROTOCOL_CONFIG, "SASL_SSL");
        props.put("sasl.mechanism", "PLAIN");
        props.put("ssl.keystore.location",
                "/opt/kafka/conf/certs/kafka.keystore");
        props.put("ssl.keystore.password", "kafka123");
        props.put("ssl.truststore.location",
                "/opt/kafka/conf/certs/kafka.truststore");
        props.put("ssl.truststore.password", "kafka123");
        props.put(ConsumerConfig.ENABLE_AUTO_COMMIT_CONFIG, false);
        props.put(ConsumerConfig.CLIENT_ID_CONFIG, clientId);
        props.put(ConsumerConfig.GROUP_ID_CONFIG,
                "StockPriceConsumer");
        props.put(ConsumerConfig.KEY_DESERIALIZER_CLASS_CONFIG,
                StringDeserializer.class.getName());
        props.put(ConsumerConfig.VALUE_DESERIALIZER_CLASS_CONFIG,
                StockDeserializer.class.getName());
        props.put(ConsumerConfig.MAX_POLL_RECORDS_CONFIG, 500);
        return new KafkaConsumer<>(props);
    }
```

```
...
}
```

ACTION - EDIT src/main/java/com/fenago/kafka/consumer/ConsumerUtil.java and follow directions

Create JAAS config for Producer add user

We will need to configure username and password in JAAS file to log into Kafka Brokers.

~/kafka-training/labs/lab8.3/resources/opt/kafka/conf/security/kafka_producer_stocks_jaas.conf

```
KafkaClient {
  org.apache.kafka.common.security.plain.PlainLoginModule required
  username="stocks_producer"
  password="producer123";
};
```

ACTION - EDIT resources/opt/kafka/conf/security/kafka_producer_stocks_jaas.conf and follow directions

Modify Producer createProducer() add SASL config and JAAS config location

~/kafka-training/labs/lab8.3/src/main/java/com/fenago/kafka/producer/support/StockPriceProducerUtils.java

```
package com.fenago.kafka.producer.support;

import com.fenago.kafka.model.StockPrice;
import io.advantageous.boon.core.Lists;
import org.apache.kafka.clients.CommonClientConfigs;
import org.apache.kafka.clients.producer.KafkaProducer;
import org.apache.kafka.clients.producer.Producer;
import org.apache.kafka.clients.producer.ProducerConfig;
import org.apache.kafka.common.serialization.StringSerializer;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;

import java.util.List;
import java.util.Properties;
import java.util.concurrent.ExecutorService;
import java.util.concurrent.Executors;
import java.util.concurrent.TimeUnit;

public class StockPriceProducerUtils {

    private static Producer<String, StockPrice> createProducer() {

        System.setProperty("java.security.auth.login.config",
                "/opt/kafka/conf/security/kafka_producer_stocks_jaas.conf");

        final Properties props = new Properties();
```

```
        props.put(ProducerConfig.BOOTSTRAP_SERVERS_CONFIG,
                "localhost:10092,localhost:10093");
        props.put(CommonClientConfigs.SECURITY_PROTOCOL_CONFIG, "SASL_SSL");
        props.put("sasl.mechanism", "PLAIN");

        props.put("ssl.keystore.location",
                "/opt/kafka/conf/certs/kafka.keystore");
        props.put("ssl.keystore.password", "kafka123");
        props.put("ssl.truststore.location",
                "/opt/kafka/conf/certs/kafka.truststore");
        props.put("ssl.truststore.password", "kafka123");

        props.put(ProducerConfig.CLIENT_ID_CONFIG, "StockPriceProducerUtils");
        props.put(ProducerConfig.KEY_SERIALIZER_CLASS_CONFIG,
                StringSerializer.class.getName());
        props.put(ProducerConfig.VALUE_SERIALIZER_CLASS_CONFIG,
                StockPriceSerializer.class.getName());
        props.put(ProducerConfig.LINGER_MS_CONFIG, 100);
        props.put(ProducerConfig.BATCH_SIZE_CONFIG, 16_384 * 4);
        props.put(ProducerConfig.COMPRESSION_TYPE_CONFIG, "snappy");
        return new KafkaProducer<>(props);
    }
...
}
```

ACTION - EDIT src/main/java/com/fenago/kafka/producer/support/StockPriceProducerUtils.java and follow directions

ACTION - COPY JAAS files `cp -R resources/opt/kafka/conf/security /opt/kafka/conf/`

Run the lab

Note: Make sure that you have completed lab `8.1` first.

ACTION - RUN ZooKeeper and three Kafka Brokers (scripts are under bin for ZooKeeper and Kafka Brokers).

Note: Do not run scripts inside `bin` directory. Run scripts from `~/kafka-training/labs/lab8.3/solution` directory

Terminal 1

```
cd ~/kafka-training/labs/lab8.3/solution
bin/run-zookeeper.sh
```

Terminal 2

```
cd ~/kafka-training/labs/lab8.3/solution
bin/start-1st-server.sh
```

Terminal 3

```
cd ~/kafka-training/labs/lab8.3/solution
bin/start-2nd-server.sh
```

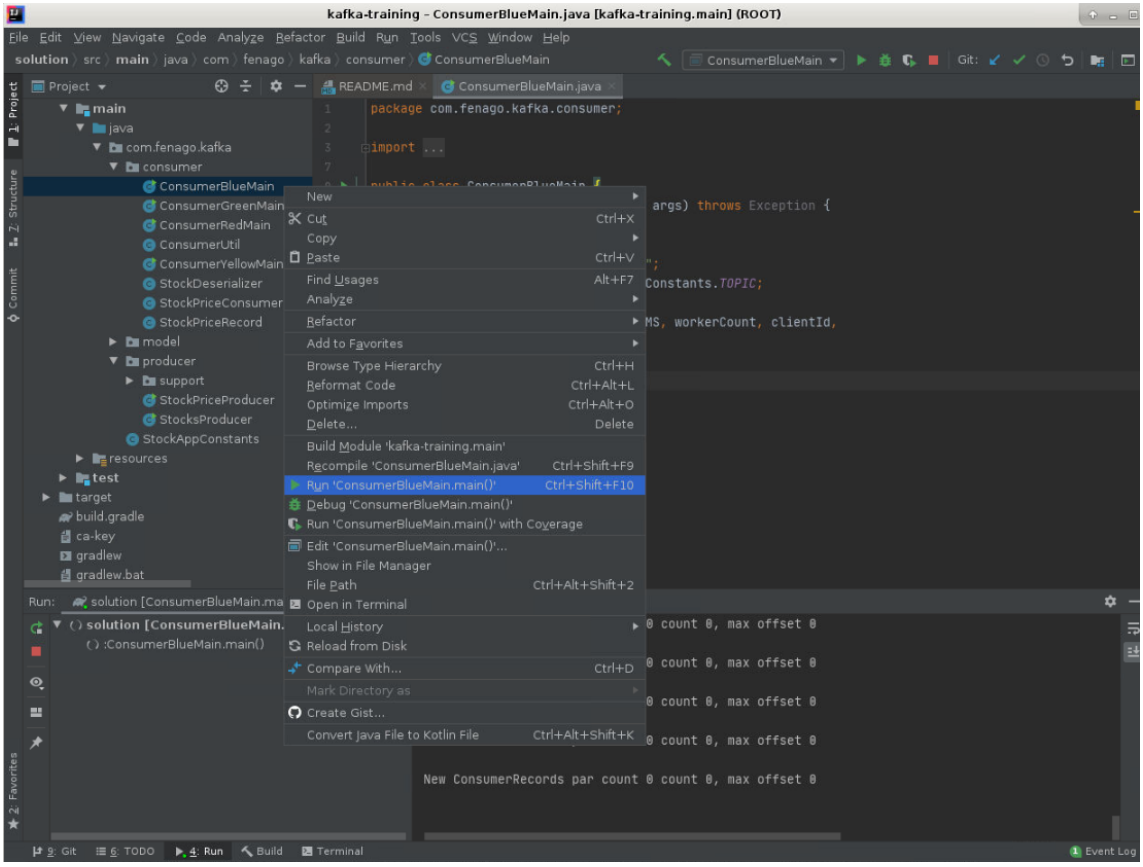
Terminal 4

```
cd ~/kafka-training/labs/lab8.3/solution
bin/start-3rd-server.sh
```

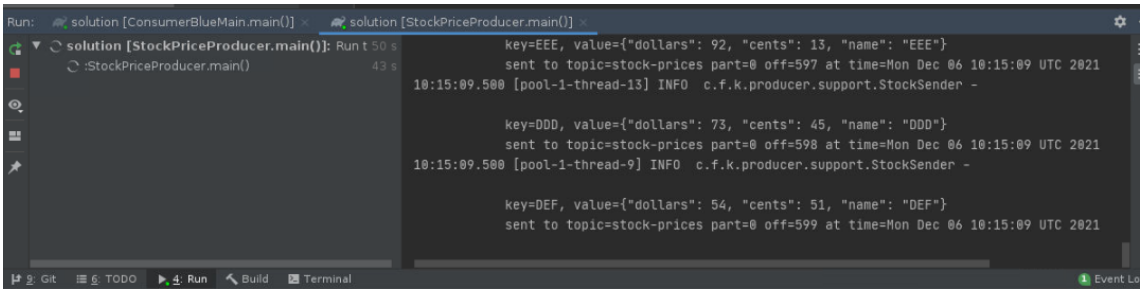
```
[2021-12-06 10:04:09,458] INFO Successfully authenticated client: authenticationID=admin;  authorizationID=admin. (org.apache.
zookeeper.server.auth.SaslServerCallbackHandler)
[2021-12-06 10:04:09,459] INFO Setting authorizedID: admin (org.apache.zookeeper.server.auth.SaslServerCallbackHandler)
[2021-12-06 10:04:09,459] INFO adding SASL authorization for authorizationID: admin (org.apache.zookeeper.server.ZooKeeperServ
er)
[2021-12-06 10:08:14,651] INFO Successfully authenticated client: authenticationID=admin;  authorizationID=admin. (org.apache.
zookeeper.server.auth.SaslServerCallbackHandler)
[2021-12-06 10:08:14,651] INFO Setting authorizedID: admin (org.apache.zookeeper.server.auth.SaslServerCallbackHandler)
[2021-12-06 10:08:14,651] INFO adding SASL authorization for authorizationID: admin (org.apache.zookeeper.server.ZooKeeperServ
er)
[2021-12-06 10:08:33,136] INFO Successfully authenticated client: authenticationID=admin;  authorizationID=admin. (org.apache.
zookeeper.server.auth.SaslServerCallbackHandler)
[2021-12-06 10:08:33,136] INFO Setting authorizedID: admin (org.apache.zookeeper.server.auth.SaslServerCallbackHandler)
[2021-12-06 10:08:33,136] INFO adding SASL authorization for authorizationID: admin (org.apache.zookeeper.server.ZooKeeperServ
er)
```

Protip: You should get above logs in zookeeper console after starting kafka servers.

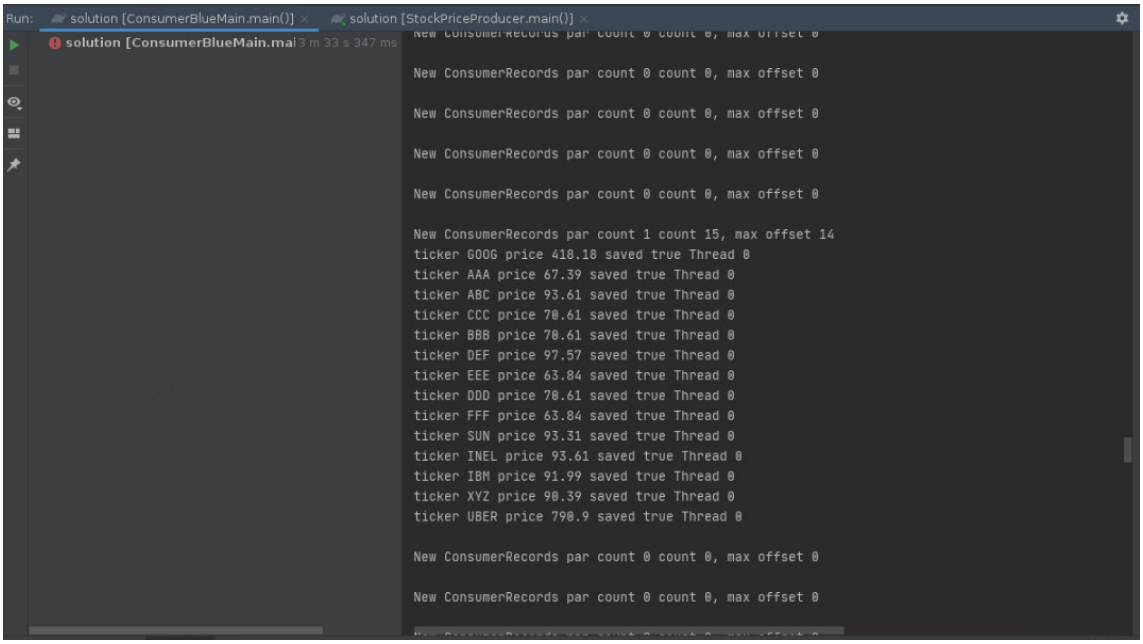
ACTION - RUN ConsumerBlueMain from the IDE



ACTION - RUN StockPriceProducer from the IDE



Wait for some time and verify that messages are logged in consumer console



Expected results

You should be able to send records from the producer to the broker and read records from the consumer to the broker using SASL PLAIN auth.