Lab 8.4: Kafka and SASL SCRAM

Welcome to the session 8 lab 4. The work for this lab is done in `~/kafka-training/labs/lab8.4`. In this lab, you are going to Kafka SASL SCRAM.

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/lab8.4/solution`

Kafka and SASL SCRAM

Kafka stores SCRAM credentials in Zookeeper. Zookeeper should be on a private network.
Kafka supports only SHA-256 and SHA-512 with a minimum iteration count of 4096.
Strong hash functions, strong passwords, and high iteration counts protect against brute force attacks.
SCRAM only works with SSL/TLS-encryption to prevent wire snooping.

Create SCRAM Users

Create users admin, stocks_consumer, stocks_producer store in ZooKeeper

Create Scram Users

~/kafka-training/labs/lab8.4/bin/create-scram-users.sh

```
#!/usr/bin/env bash
cd ~/kafka-training
SCRAM_CONFIG='SCRAM-SHA-256=[iterations=8192,password=kafka123]'
SCRAM_CONFIG="$SCRAM_CONFIG,SCRAM-SHA-512=[password=kafka123]"

kafka/bin/kafka-configs.sh \
    --alter --add-config "$SCRAM_CONFIG" \
    --entity-type users --entity-name stocks_consumer \
    --bootstrap-server localhost:9092,localhost:9093,localhost:9094 \

kafka/bin/kafka-configs.sh \
    --alter --add-config "$SCRAM_CONFIG" \
    --entity-type users --entity-name stocks_producer \
    --bootstrap-server localhost:9092,localhost:9093,localhost:9094 \

kafka/bin/kafka-configs.sh \
    --alter --add-config "$SCRAM_CONFIG" \
    --entity-type users --entity-name admin \
    --bootstrap-server localhost:9092,localhost:9093,localhost:9094 \
```

ACTION EDIT bin/create-scram-users.sh and follow instructions in file

Kafka Broker JAAS Scram Config

Uses Scram for KafkaServer and Plain for ZooKeeper

~/kafka-training/labs/lab8.4/resources/opt/kafka/conf/security/kafka_broker_jaas.conf

```
KafkaServer {
  org.apache.kafka.common.security.scram.ScramLoginModule required
  username="admin"
  password="kafka123";
};

// 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

Kafka Consumer/Producer JAAS Scram Config

Use Scram as login credentials.

~/kafka-training/labs/lab8.4/resources/opt/kafka/conf/security/kafka_consumer_stocks_jaas.conf

```
KafkaClient {
  org.apache.kafka.common.security.scram.ScramLoginModule required
  username="stocks_consumer"
  password="kafka123";
};
```

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

~/kafka-training/labs/lab8.4/resources/opt/kafka/conf/security/kafka_producer_stocks_jaas.conf

```
KafkaClient {
  org.apache.kafka.common.security.scram.ScramLoginModule required
  username="stocks_producer"
  password="kafka123";
};
```

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

Configure SCRAM in Producer

Configure SCRAM_SHA_256

~/kafka-training/labs/lab8.4/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;
```

```java
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", "SCRAM-SHA-256");

        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

Configure SCRAM in Consumer

Configure SCRAM_SHA_256.

~/kafka-training/labs/lab8.4/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", "SCRAM-SHA-256");

        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

Modify Kafka Brokers Config properties file add SCRAM 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/lab8.4/config/server-0.properties

```
broker.id=0

listeners=PLAINTEXT://localhost:9092,SASL_SSL://localhost:10092
sasl.mechanism.inter.broker.protocol=SCRAM-SHA-256
sasl.enabled.mechanisms=SCRAM-SHA-256


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/lab8.4/config/server-1.properties

```
broker.id=1
listeners=PLAINTEXT://localhost:9093,SASL_SSL://localhost:10093
sasl.mechanism.inter.broker.protocol=SCRAM-SHA-256
sasl.enabled.mechanisms=SCRAM-SHA-256


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/lab8.4/config/server-2.properties

```
broker.id=2

listeners=PLAINTEXT://localhost:9094,SASL_SSL://localhost:10094
sasl.mechanism.inter.broker.protocol=SCRAM-SHA-256
sasl.enabled.mechanisms=SCRAM-SHA-256
```

```
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

Run the lab

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

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

```
cd ~/kafka-training/labs/lab8.4/solution
cp -R resources/opt/kafka/conf/security /opt/kafka/conf/
```

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/lab8.4/solution` directory

Terminal 1

```
cd ~/kafka-training/labs/lab8.4/solution
bin/run-zookeeper.sh
```

Terminal 2

```
cd ~/kafka-training/labs/lab8.4/solution
bin/start-1st-server.sh
```

Terminal 3

```
cd ~/kafka-training/labs/lab8.4/solution
bin/start-2nd-server.sh
```

Terminal 4

```
cd ~/kafka-training/labs/lab8.4/solution
bin/start-3rd-server.sh
```

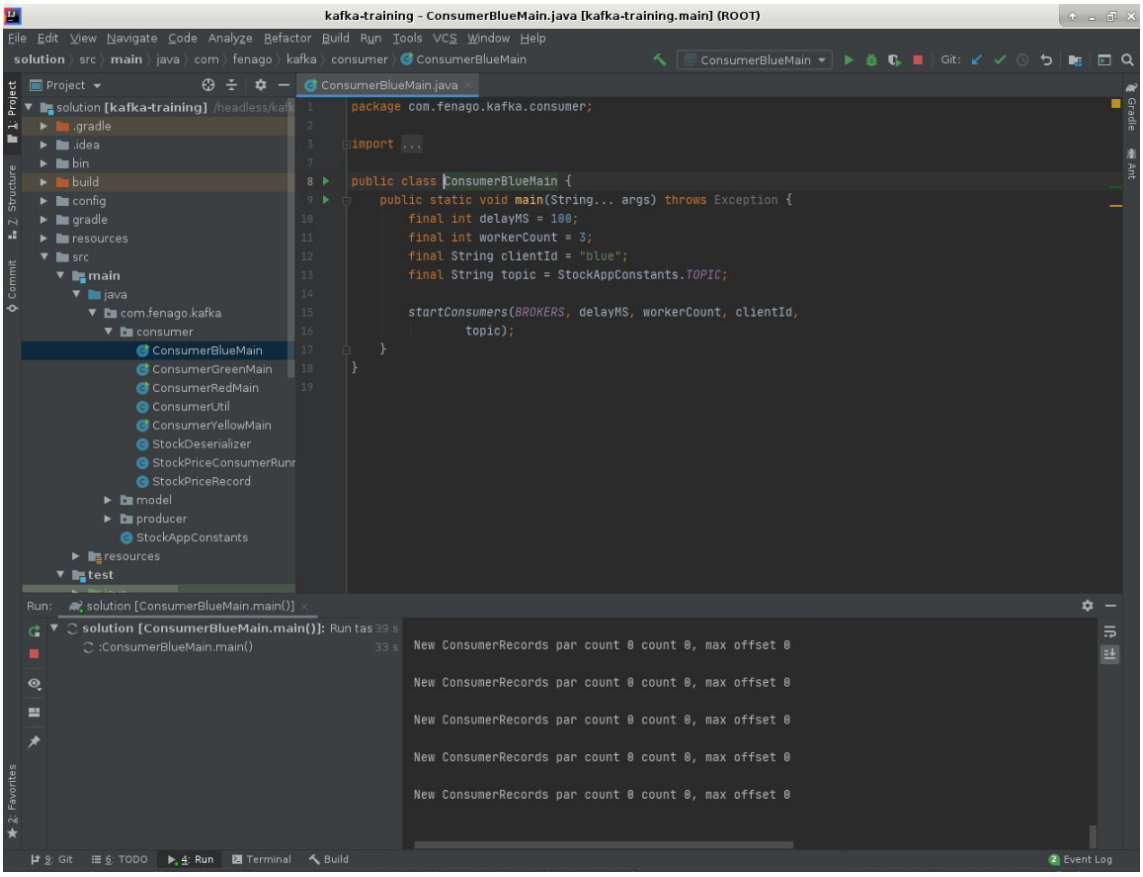
ACTION Run `bin/create-scram-users.sh` script to create scram users.

Terminal 5

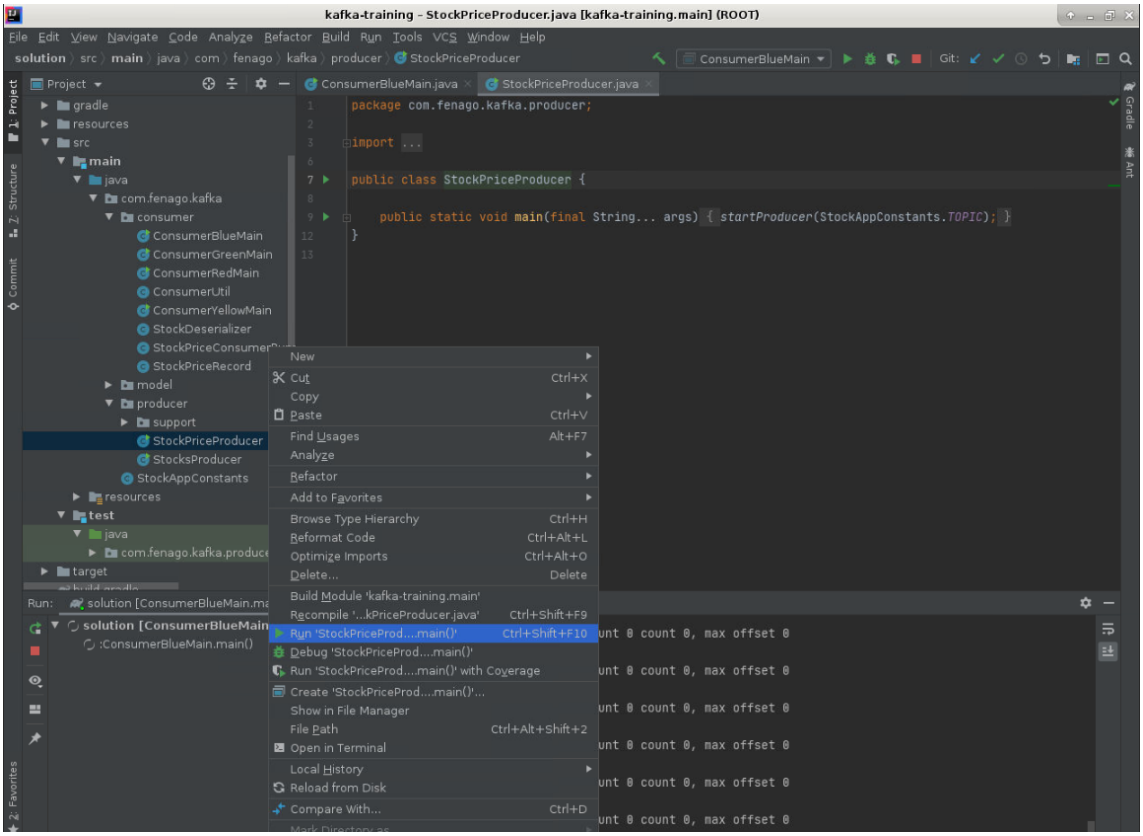
```
cd ~/kafka-training/labs/lab8.4/solution
bin/create-scram-users.sh
```

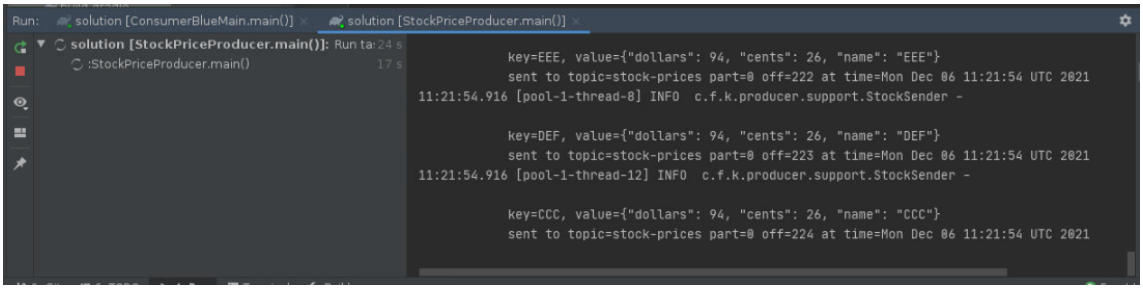
```
bash-4.2# cd ~/kafka-training/labs/lab8.4/solution
bash-4.2# bin/create-scram-users.sh
Completed updating config for user stocks_consumer.
Completed updating config for user stocks_producer.
Completed updating config for user admin.
bash-4.2#
```

ACTION - RUN ConsumerBlueMain from the IDE

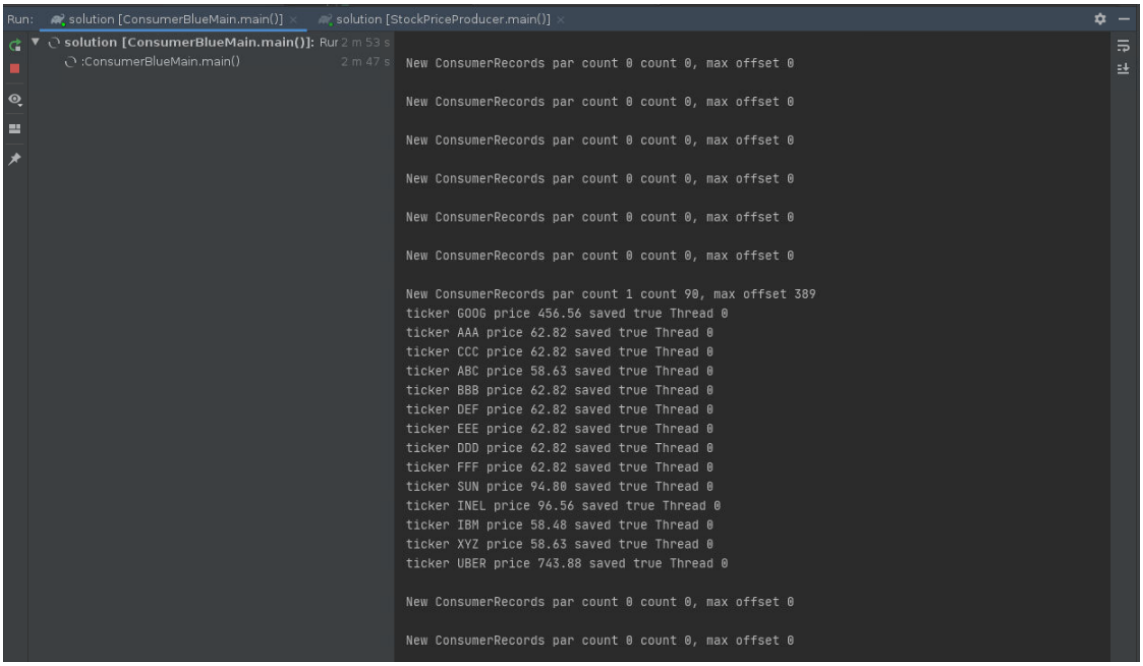


ACTION - RUN StockPriceProducer from the IDE





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



ProTip Scroll up to view complete consumer output.

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 SCRAM auth.