1. Install Docker; deploy and run applications

1. Install docker

1) Install docker (on ubuntu)
https://www.digitalocean.com/community/tutorials/how-to-install-and-use-docker-on-ubuntu-20-04

2)install docker compose (on ubuntu)
https://www.digitalocean.com/community/tutorials/how-to-install-and-use-docker-compose-on-ubuntu-20-04

3) Setup kafka zookeeper/broker using docker (optional)
 .https://www.conduktor.io/kafka/how-to-start-kafka-using-docker

.create folder ~/docker_kafka and navigate to this folder
.Run following command to download docker-compose yaml files
   git clone https://github.com/conduktor/kafka-stack-docker-compose.git

(We will not use these yaml files. But they can be used for reference)

2. Deploy applications

- .Create folder ~/docker_kafka if not   not existing

- .Deploy following files to ~/docker_kafka:

  docker-compose_kafka.yml (for starting zookeeper and kafka broker)
  docker-compose_kafka-g.yaml (for executing generator application)
  docker-compose_kafka-d.yaml (for executing   detector application)

- .Create folder ~/docker_kafka/generator. Deploy following 3 files created for the generator:
  Dockerfile
  app.py
  requirements.txt

- . Create folder ~/docker_kafka/detector. Deploy following 3 files created for the detector:
  Dockerfile
  app.py
  Requirements.txt

2. Prepare for running applications

1) . Start Kafka zookeeper and broker .

Navigate to folder ~/docker_kafka and run:
$docker-compose -f docker-compose_kafka.yml up

2) Build images

● .Build docker image for the generator
Navigate to folder ~/docker_kafka and run:
docker-compose -f docker-compose-g.yaml build

● .Build docker image for the detector
Navigate to folder ~/docker_kafka and run:
docker-compose -f docker-compose-d.yaml build

3) Create topics

kafka-topics.sh --zookeeper localhost:2181   --topic queueing.transactions   --create
--partitions 1 --replication-factor 1

kafka-topics.sh --zookeeper localhost:2181   --topic legit_topic --create --partitions 1
--replication-factor 1

kafka-topics.sh --zookeeper localhost:2181   --topic fraud_topic   --create --partitions 1
--replication-factor 1

3. Start generator/consumer applications

.Start detector (after start, it will be running and waiting)
docker-compose -f docker-compose-d.yaml up

.Start generator application
docker-compose -f docker-compose-g.yaml up

docker-compose -f docker-compose-d.yaml build

4. Results

Screenshot; The generator generated fake transactions and sent to a topic on the broker:

```
chu@DESKTOP-NV1A4OE:~/docker_kafka$ docker-compose  -f docker-compose-g.yaml up
WARNING: Found orphan containers (kafka1, docker_kafka_detector_1, zoo1) for this project. If you removed or rename
 command with the --remove-orphans flag to clean it up.
Creating docker_kafka_generator_1 ... done
Attaching to docker_kafka_generator_1
generator_1  | queueing.transactions
generator_1  | TRANSACTIONS_TOPIC:queueing.transactions
generator_1  | {'source': 'KOJI2hAK1lzY', 'target': 'EUK4ix2ZjO44', 'amount': 1096.32, 'currency': 'USD'}
generator_1  | {'source': 'bqdJnYXxdLfJ', 'target': 'dL2eEtT55jkj', 'amount': 4283.92, 'currency': 'USD'}
generator_1  | {'source': 'iv7LdmrVqZLM', 'target': 'EBpFZZqMBidd', 'amount': 3865.28, 'currency': 'USD'}
generator_1  | {'source': 'EnvTZ691FMTz', 'target': 'u6k2vwKJ2pwO', 'amount': 9457.61, 'currency': 'USD'}
generator_1  | {'source': '5vHz89NYzE6t', 'target': 'ENbqwaL75KUn', 'amount': 4174.05, 'currency': 'USD'}
generator_1  | {'source': 'sWcCRl8f6Qrr', 'target': 'A8D2yNwRuhLf', 'amount': 4330.49, 'currency': 'USD'}
generator_1  | {'source': 'W4mChVOT7dJF', 'target': 'N8g7HxBonBYl', 'amount': 9725.25, 'currency': 'USD'}
generator_1  | {'source': 'm3mJSzkx3TI5', 'target': 'kF7dToLhX2ZN', 'amount': 3944.95, 'currency': 'USD'}
generator_1  | {'source': 't4JB7RTubWoo', 'target': 'D3mGI1Y3OLnF', 'amount': 1831.75, 'currency': 'USD'}
generator_1  | {'source': '19CJVEpERTst', 'target': 'fPJnIMfj61cd', 'amount': 5529.76, 'currency': 'USD'}
generator_1  | {'source': '8VeTtOfnCBgI', 'target': '1cGYyRR8xnt5', 'amount': 5541.55, 'currency': 'USD'}
generator_1  | {'source': '9hkh0hvu2I18', 'target': 'l1oZTIyL6H1f', 'amount': 3889.89, 'currency': 'USD'}
generator_1  | {'source': 'rd02E5DC1ob5', 'target': 'zwNGnuZY5P1H', 'amount': 498.93, 'currency': 'USD'}
generator_1  | {'source': 'Fv88UuXdtViF', 'target': 'O0cdD5LPuzow', 'amount': 6638.03, 'currency': 'USD'}
generator_1  | {'source': 'FV9aOpgr9dcg', 'target': 'vupJjeoEAd36', 'amount': 1831.21, 'currency': 'USD'}
generator_1  | {'source': 'm8rRHbo8Eete', 'target': 'NchikZ4yqLyd', 'amount': 6312.98, 'currency': 'USD'}
generator_1  | {'source': 'bpIlrSdd6sU3', 'target': 'RCJLZrVZIuRH', 'amount': 8851.07, 'currency': 'USD'}
generator_1  | {'source': 'rfcFbP5JBZUX', 'target': 'J3DuvBpIvptd', 'amount': 7086.68, 'currency': 'USD'}
generator_1  | {'source': 'D2Sghk2b9FeA', 'target': 'WYFUVCnNLRMj', 'amount': 1822.78, 'currency': 'USD'}
generator_1  | {'source': 'qSrtsRKSAC5R', 'target': 'vrWyaQYqc10A', 'amount': 775.93, 'currency': 'USD'}
generator_1  | {'source': 'YCQlB9nQmfzi', 'target': 'NBNcRg6Dq7NZ', 'amount': 4499.98, 'currency': 'USD'}
docker_kafka_generator_1 exited with code 0
```

Screenshot2: The fraud detector receive the the transaction messages from the broker and identify if they are suspicious or not and send messages to fraud_topic/legit_topic on the broker

```
thu@DESKTOP-NV1A4OE:~/docker_kafka$ docker-compose  -f docker-compose-d.yaml up
WARNING: Found orphan containers (kafka1, zoo1) for this project. If you removed or renamed this service in your compose
e-orphans flag to clean it up.
Creating docker_kafka_detector_1 ... done
Attaching to docker_kafka_detector_1
detector_1  |  hello !
detector_1  |  queueing.transactions
detector_1  |  <class 'kafka.consumer.group.KafkaConsumer'>
detector_1  |  fraud_topic {'source': 'KOJI2hAK1lzY', 'target': 'EUK4ix2ZjO44', 'amount': 1096.32, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'bqdJnYXxdLfJ', 'target': 'dL2eEtT55jkj', 'amount': 4283.92, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'iv7LdmrVqZLM', 'target': 'EBpFZZqMBidd', 'amount': 3865.28, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'EnvTZ691FMTz', 'target': 'u6k2vwKJ2pwO', 'amount': 9457.61, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': '5vHz89NYzE6t', 'target': 'ENbqwaL75KUn', 'amount': 4174.05, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'sWcCR18f6Qrr', 'target': 'A8D2yNwRuhLf', 'amount': 4330.49, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'W4mChVOT7dJF', 'target': 'N8g7HxBonBY1', 'amount': 9725.25, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'm3mJSzkx3TI5', 'target': 'kF7dToLhX2ZN', 'amount': 3944.95, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 't4JB7RTubWoo', 'target': 'D3mGI1Y3OLnF', 'amount': 1831.75, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': '19CJVEpERTst', 'target': 'fPJnIMfj61cd', 'amount': 5529.76, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': '8VeTtOfnCBgI', 'target': '1cGYyRR8xnt5', 'amount': 5541.55, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': '9hkh0hvu2I18', 'target': 'l1oZTIyL6H1f', 'amount': 3889.89, 'currency': 'USD'}
detector_1  |  legit_topic {'source': 'rd02E5DC1ob5', 'target': 'zwNGnuZY5P1H', 'amount': 498.93, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'Fv88UuXdtViF', 'target': 'O0cdD5LPuzow', 'amount': 6638.03, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'FV9aOpgr9dcg', 'target': 'vupJjeoEAd36', 'amount': 1831.21, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'm8rRHbo8Eete', 'target': 'NchikZ4yqLyd', 'amount': 6312.98, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'bpI1rSdd6sU3', 'target': 'RCJLZrVZIuRH', 'amount': 8851.07, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'rfcFbP5JBZUX', 'target': 'J3DuvBpIvptd', 'amount': 7086.68, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'D2Sghk2b9FeA', 'target': 'WYFUVCnNLRMj', 'amount': 1822.78, 'currency': 'USD'}
detector_1  |  legit_topic {'source': 'qSrtsRKSAC5R', 'target': 'vrWyaQYqc10A', 'amount': 775.93, 'currency': 'USD'}
detector_1  |  fraud_topic {'source': 'YCQ1B9nQmfzi', 'target': 'NBNcRg6Dq7NZ', 'amount': 4499.98, 'currency': 'USD'}
```