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Link to GitHub repository: [https://github.com/shawnlsj97/CS3219\\_D](https://github.com/shawnlsj97/CS3219_D)

## Task D

### Pub-Sub messaging system using Apache Kafka

1. Ensure that docker and docker-compose are installed
2. Install kafkacat by running the command: `brew install kafkacat`
3. Edit the `/etc/hosts` file using the command: `sudo nano /etc/hosts`  
Add the following line: `0.0.0.0 kafka1 kafka2 kafka3`

```
##
# Host Database
#
# localhost is used to configure the loopback interface
# when the system is booting. Do not change this entry.
##
127.0.0.1        localhost
255.255.255.255 broadcasthost
::1             localhost
0.0.0.0 kafka1 kafka2 kafka3
# Added by Docker Desktop
# To allow the same kube context to work on the host and the container:
127.0.0.1 kubernetes.docker.internal
# End of section
```

4. In a terminal, clone the repository by running the command: `git clone https://github.com/shawnlsj97/CS3219_D`
5. Navigate to the cloned repository and start the Kafka cluster by running the command: `docker-compose up -d`

```
[shawn@Shawns-iMac files % docker-compose up -d
Docker Compose is now in the Docker CLI, try `docker compose up`

Creating network "files_default" with the default driver
Creating files_zoo2_1 ... done
Creating files_zoo1_1 ... done
Creating files_zoo3_1 ... done
Creating files_kafka1_1 ... done
Creating files_kafka2_1 ... done
Creating files_kafka3_1 ... done
```

6. Verify that the containers are up and running by running the command: `docker-compose ps`

```
[shawn@Shawns-iMac files % docker-compose ps
]

```

Name	Command	State	Ports
files_kafka1_1	/etc/confluent/docker/run	Up	0.0.0.0:9092->9092/tcp, :::9092->9092/tcp
files_kafka2_1	/etc/confluent/docker/run	Up	9092/tcp, 0.0.0.0:9093->9093/tcp, :::9093->9093/tcp
files_kafka3_1	/etc/confluent/docker/run	Up	9092/tcp, 0.0.0.0:9094->9094/tcp, :::9094->9094/tcp
files_zoo1_1	/docker-entrypoint.sh zkSe ...	Up	0.0.0.0:2181->2181/tcp, :::2181->2181/tcp, 2888/tcp, 3888/tcp, 8080/tcp
files_zoo2_1	/docker-entrypoint.sh zkSe ...	Up	2181/tcp, 0.0.0.0:2182->2182/tcp, 2888/tcp, 3888/tcp, 8080/tcp
files_zoo3_1	/docker-entrypoint.sh zkSe ...	Up	2181/tcp, 0.0.0.0:2183->2183/tcp, 2888/tcp, 3888/tcp, 8080/tcp

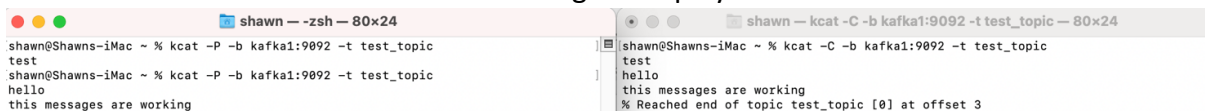
7. In a new terminal, create a producer that connects to the “kafka1” node and publishes messages to “test\_topic” by running the command: `kcat -P -b kafka1:9092 -t test_topic`

Note that you may choose to connect to any of the other Kafka nodes by replacing “kafka1” with “kafka2” or “kafka3” in the above command.

8. In a 3<sup>rd</sup> terminal, create a consumer that connects to the “kafka1” node and subscribes to “test\_topic” by running the command: `kafkacat -C -b kafka1:9092 -t test_topic`

Similar to the previous step, you may choose to connect to any of the other kafka nodes by replacing “kafka1” with “kafka2” or “kafka3” in the above command.

9. Test the pub sub messaging by entering your messages in the producer terminal and hitting enter. When you are done, press `ctrl-D` to send the message to the topic. You should see that the same message is displayed in the consumer terminal.



10. Clean up and stop all containers by running the command in the first terminal: `docker-compose down`

```
[shawn@Shawns-iMac files % docker-compose down]
Stopping files_kafka1_1 ... done
Stopping files_kafka2_1 ... done
Stopping files_kafka3_1 ... done
Stopping files_zoo2_1 ... done
Stopping files_zoo3_1 ... done
Stopping files_zoo1_1 ... done
Removing files_kafka1_1 ... done
Removing files_kafka2_1 ... done
Removing files_kafka3_1 ... done
Removing files_zoo2_1 ... done
Removing files_zoo3_1 ... done
Removing files_zoo1_1 ... done
Removing network files_default
```

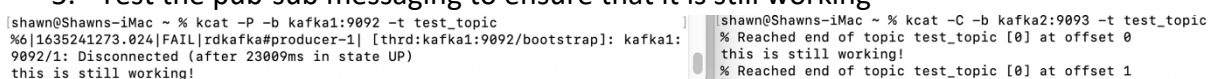
## Management of failure of master node

1. Start the Kafka cluster in a terminal by running the command: `docker-compose up -d`

```
[shawn@Shawns-iMac files % docker-compose up -d]
Docker Compose is now in the Docker CLI, try `docker compose up`

Creating network "files_default" with the default driver
Creating files_zoo2_1 ... done
Creating files_zoo1_1 ... done
Creating files_zoo3_1 ... done
Creating files_kafka1_1 ... done
Creating files_kafka2_1 ... done
Creating files_kafka3_1 ... done
```

2. In a second terminal, create a producer that connects to the “kafka1” node and publishes messages to “test\_topic” by running the command: `kcat -P -b kafka1:9092 -t test_topic`
3. In a 3<sup>rd</sup> terminal, create a consumer that connects to the “kafka2” node and subscribes to “test\_topic” by running the command: `kafkacat -C -b kafka2:9093 -t test_topic`
4. In the first terminal, stop the producer node by running the command: `docker stop CS3219_D_kafka1_1`
5. Test the pub-sub messaging to ensure that it is still working



6. Run the following command to observe the newly appointed controller node: `kcat -L -b kafka2:9093`

```
[shawn@Shawns-iMac files % kcat -L -b kafka2:9093
Metadata for all topics (from broker 2: kafka2:9093/2):
2 brokers:
  broker 2 at kafka2:9093
  broker 3 at kafka3:9094 (controller)
1 topics:
  topic "test_topic" with 1 partitions:
    partition 0, leader 2, _replicas: 2, isrs: 2
```

7. Clean up and stop all containers by running the command in the first terminal:

```
docker-compose down
[shawn@Shawns-iMac files % docker-compose down
Stopping files_kafka1_1 ... done
Stopping files_kafka2_1 ... done
Stopping files_kafka3_1 ... done
Stopping files_zoo2_1 ... done
Stopping files_zoo3_1 ... done
Stopping files_zoo1_1 ... done
Removing files_kafka1_1 ... done
Removing files_kafka2_1 ... done
Removing files_kafka3_1 ... done
Removing files_zoo2_1 ... done
Removing files_zoo3_1 ... done
Removing files_zoo1_1 ... done
Removing network files_default
```

## References

[https://hub.docker.com/\\_/zookeeper](https://hub.docker.com/_/zookeeper)

<https://github.com/wurstmeister/kafka-docker>

<https://docs.confluent.io/3.3.0/app-development/kafkacat-usage.html>