# CS3219 Task D: Pub-Sub Messaging

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**GitHub Link**: https://github.com/glatiuden/CS3219-OTOT-TaskD

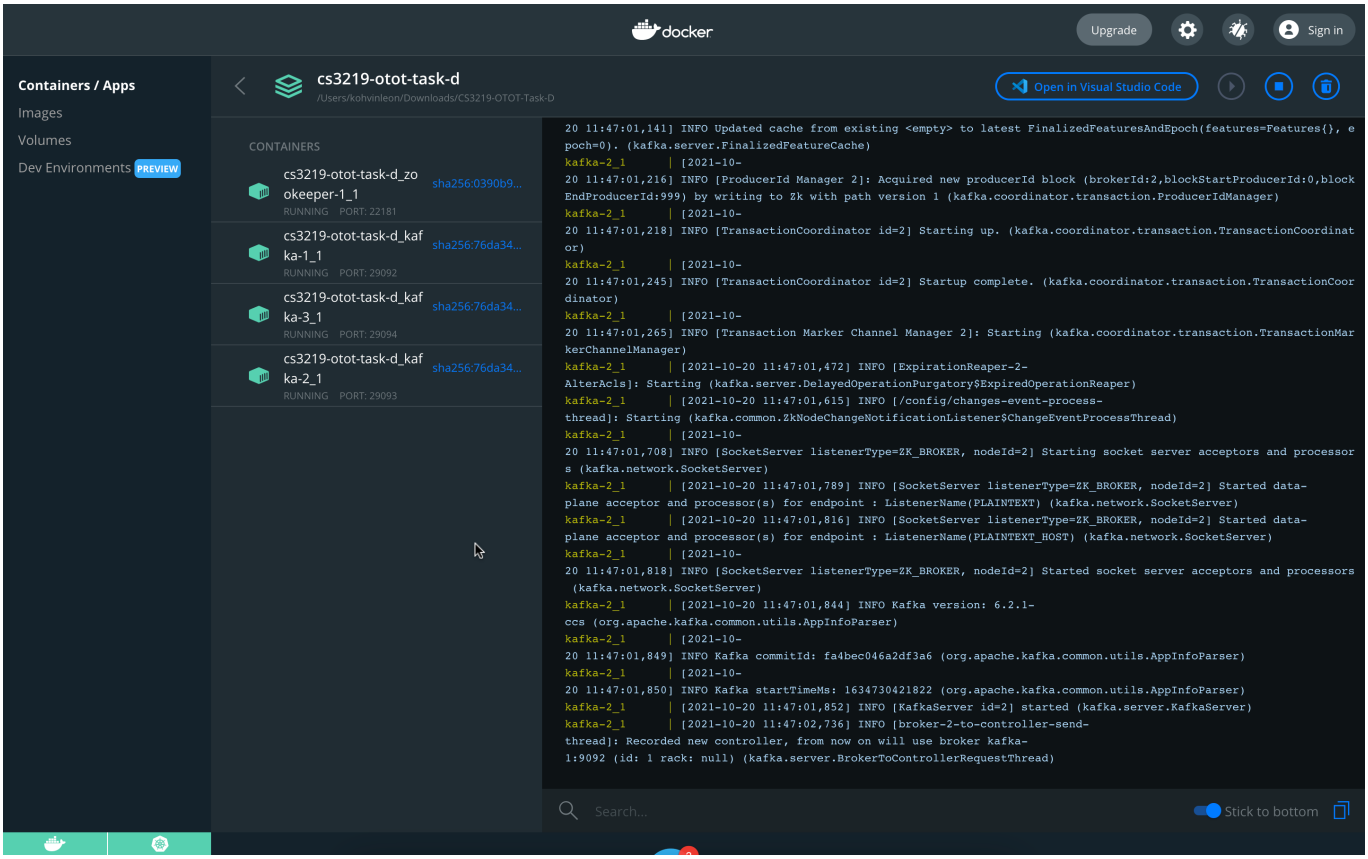
## Set Up Instructions

All the configuration has been set in `docker-compose.yml` in the same directory.

To run the containers, execute the following command:

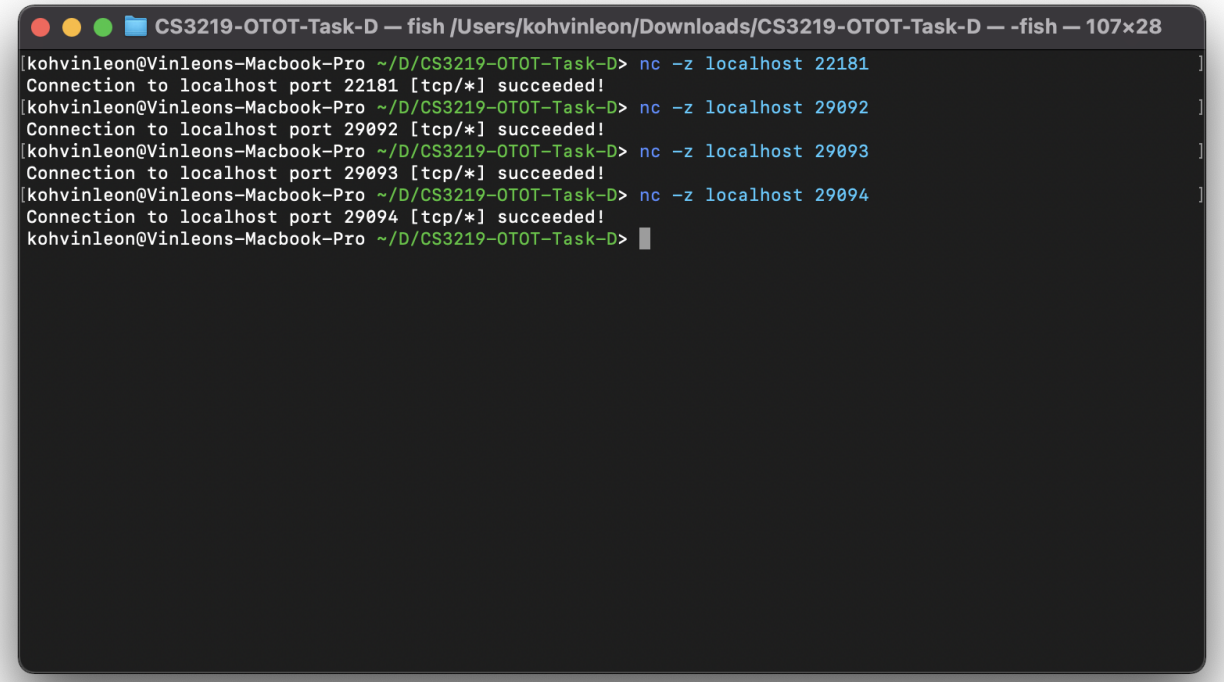
```
docker-compose up -d
```

The four containers (1 Zookeeper & 3 Kafka nodes) should start running.




In addition, we can verify whether are the servers listening to the port by executing:

```
nc -z localhost 22181
nc -z localhost 29092
nc -z localhost 29093
nc -z localhost 29094
```




## Pub/Sub

To start off, we need to create a topic within our Kafka's container. Before we can run any commands in our Kafka container, we need to execute the following command in command prompt/terminal:

```
docker exec -it cs3219-otot-task-d_kafka-1_1 bash
```

Upon executing, your command prompt/terminal should be running bash within the Kafka's container.

**Topic**

We need a topic before we can demonstrate the Pub/Sub messaging capability. We will be creating a topic called `ps-topic` for this demonstration with this command:

```
kafka-topics --create --topic ps-topic --partitions 3 --replication-factor
3 --zookeeper zookeeper-1:2181
```

Your command prompt/terminal should output:

```
Created topic ps-topic.
```

### Producer

Now, we will be entering the producer console.

If you have exited the bash terminal within the Kafka container, please refer to Pub/Sub section on how to connect to the Kafka's container bash terminal.

To enter the producer console, we can execute

```
kafka-console-producer --topic ps-topic --bootstrap-server kafka-1:9092
```

### Consumer

Now, we will be entering the consumer console. For demonstration purpose, please open a separate command prompt/terminal for the following instructions this while maintaining the producer console as connected.

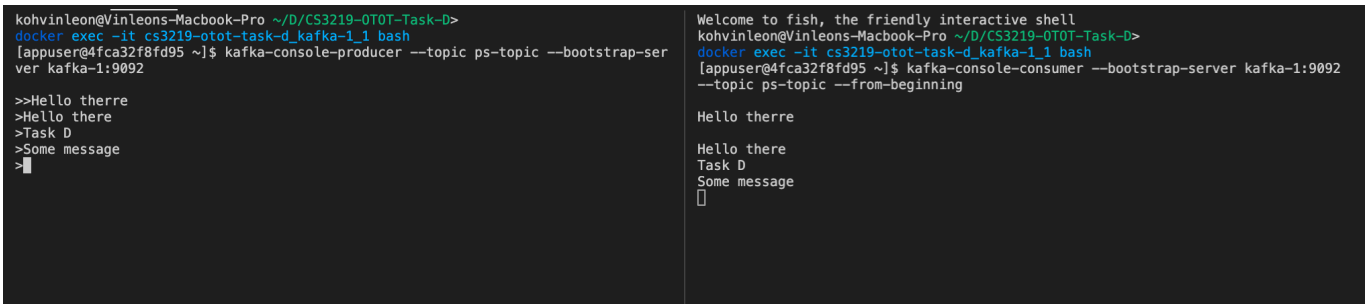
Please refer to Pub/Sub section on how to connect to the Kafka's container bash terminal.

To enter the producer console, we can execute

```
kafka-console-consumer --bootstrap-server kafka-1:9092 --topic ps-topic --
from-beginning
```

### Demonstration

Please ensure you have both Producer and Consumer console running. For the demonstration, you can enter any message in the producer console and it should reflect on the consumer's console instanteously.



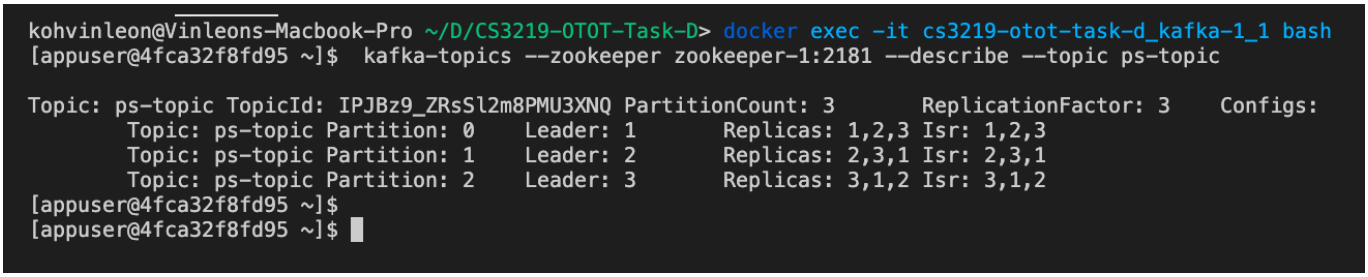
## Successful management of the failure of the master node in the cluster

If you are continuing from the previous section, you may stop either one of the producer or consumer console by pressing `Ctrl + C`, otherwise open a new command prompt/terminal window and follow the instructions here.

Commands to be executed are in the Kafka's container bash terminal otherwise stated.

First, we can view the master (or leader) nodes of each partition to see the before and after. To do this, we can run:

```
kafka-topics --zookeeper zookeeper-1:2181 --describe --topic ps-topic
```

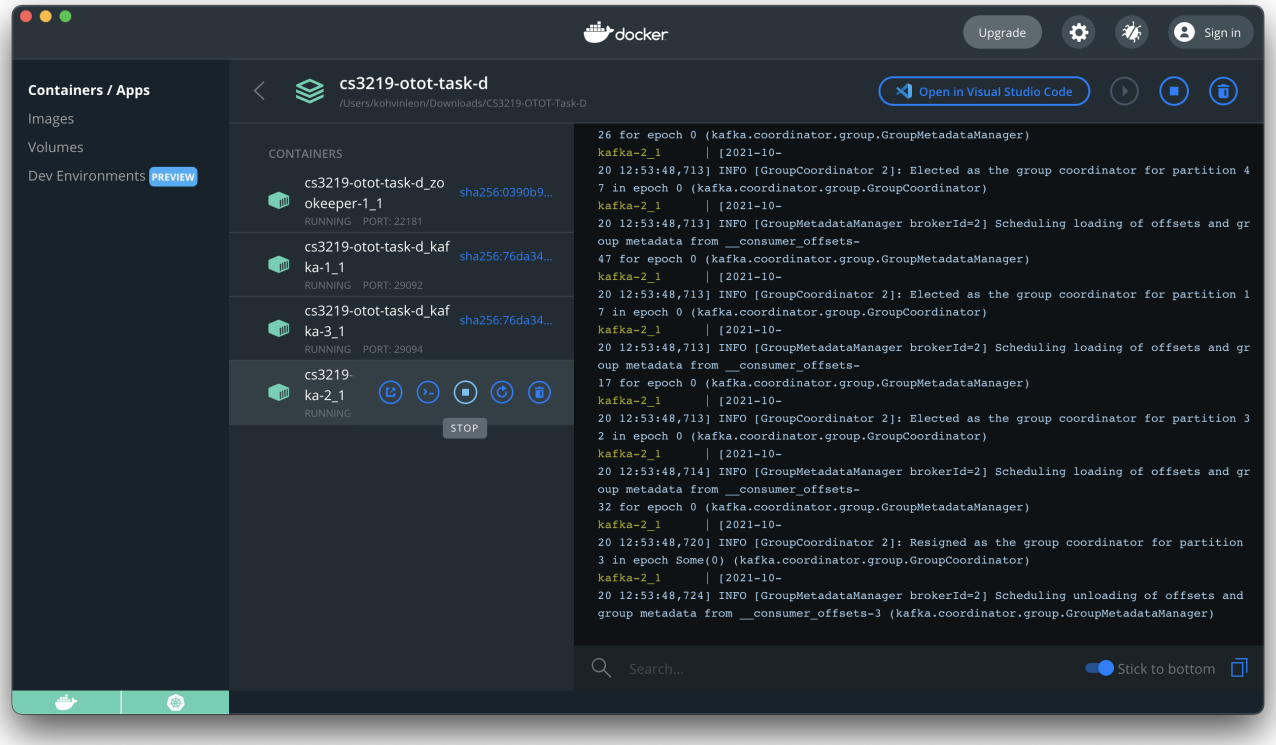



On my machine, node 1 is the master (or leader) for partition 0, node 2 for partition 1 and node 3 for partition 2.

- The master/leader node can vary from machine to machine.

To demonstrate the "failure" event, we will be killing one of the Kafka's node. You may kill any nodes of your choice. For this demonstration, we will be killing node 2, named `cs3219-otot-task-d_kafka-2_1`.

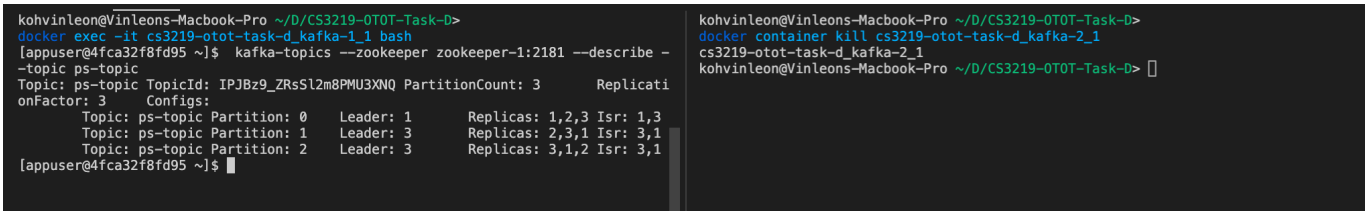
You may kill the node via the Docker Desktop GUI by pressing stop button:




...or open another terminal/command prompt (on your desktop, not in Kafka's container), and execute:

```
docker container kill cs3219-otot-task-d_kafka-2_1
```

Once the node has stop, we can run `kafka-topics --zookeeper zookeeper-1:2181 --describe --topic ps-topic` once again to see which node tookover as master for partition 1.




We can see that node 3 has became the leader for partition 1, successfully taking over as the master node when node 2 was killed.

### References


- https://www.baeldung.com/ops/kafka-docker-setup/
- https://kafka-tutorials.confluent.io/kafka-console-consumer-producer-basics/kafka.html
- https://medium.com/big-data-engineering/hello-kafka-world-the-complete-guide-to-kafka-with-docker-and-python-f788e2588cfc