

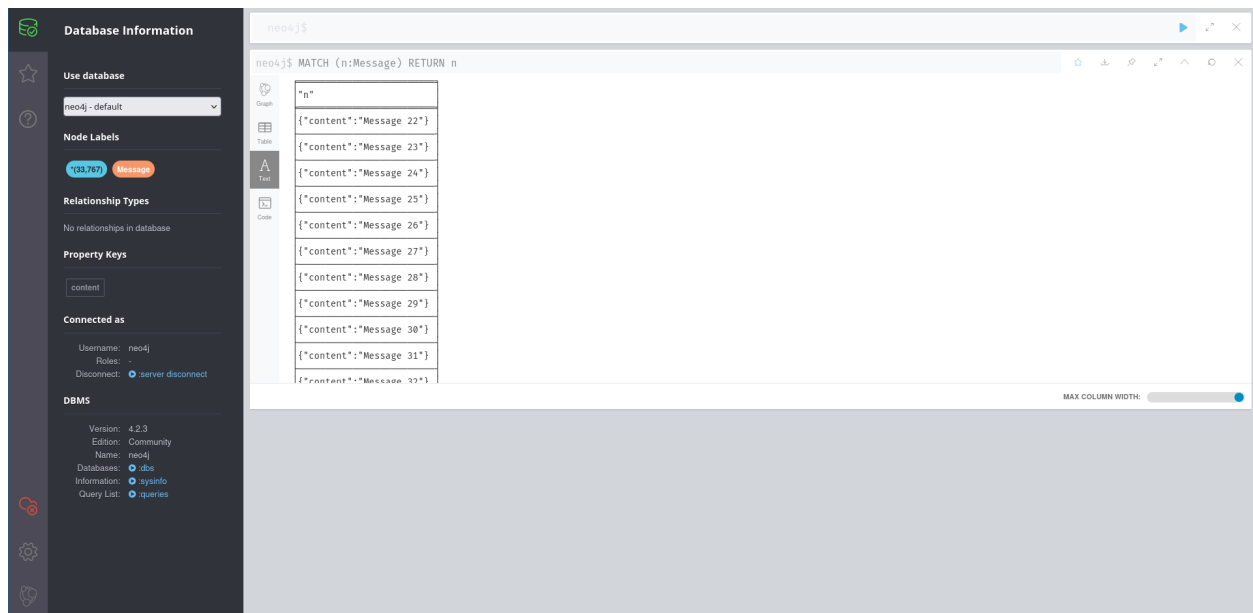
screenshot of running code (question #2):

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS
root@leon-k8s:~# docker ps					
c2cedaaa0e19	lemay-ai-devops-producer_app-1	"python producer_app..."	12 hours ago	Up 9 hours	
7d8c8874a77b	lemay-ai-devops-consumer_app-1	"python consumer_app..."	12 hours ago	Up 9 hours	
57bf395201be	confluentinc/cp-kafka:latest	"/etc/confluent/dock..."	12 hours ago	Up 9 hours	9092/tcp, 0.0.0.0:9093->9093/tcp, :::9093->9093/tcp
962e496c84d6	confluentinc/cp-zookeeper:latest	"/etc/confluent/dock..."	12 hours ago	Up 9 hours	2888/tcp, 0.0.0.0:2181->2181/tcp, :::2181->2181/tcp, 3888/tcp
f91841b1f371	docker.elastic.co/elasticsearch/elasticsearch:7.10.0	"/tini -- /usr/local..."	12 hours ago	Up 9 hours	0.0.0.0:9200->9200/tcp, :::9200->9200/tcp, 9300/tcp
9bbc916cc2d	neo4j:4.2.3	"/sbin/tini -g -- /d..."	12 hours ago	Up 9 hours	0.0.0.0:7474->7474/tcp, :::7474->7474/tcp, 7473/tcp, 0.0.0.0:7687->7687/tcp, :::7687->7687/tcp
77tcp	lemay-ai-devops-neo4j-1				

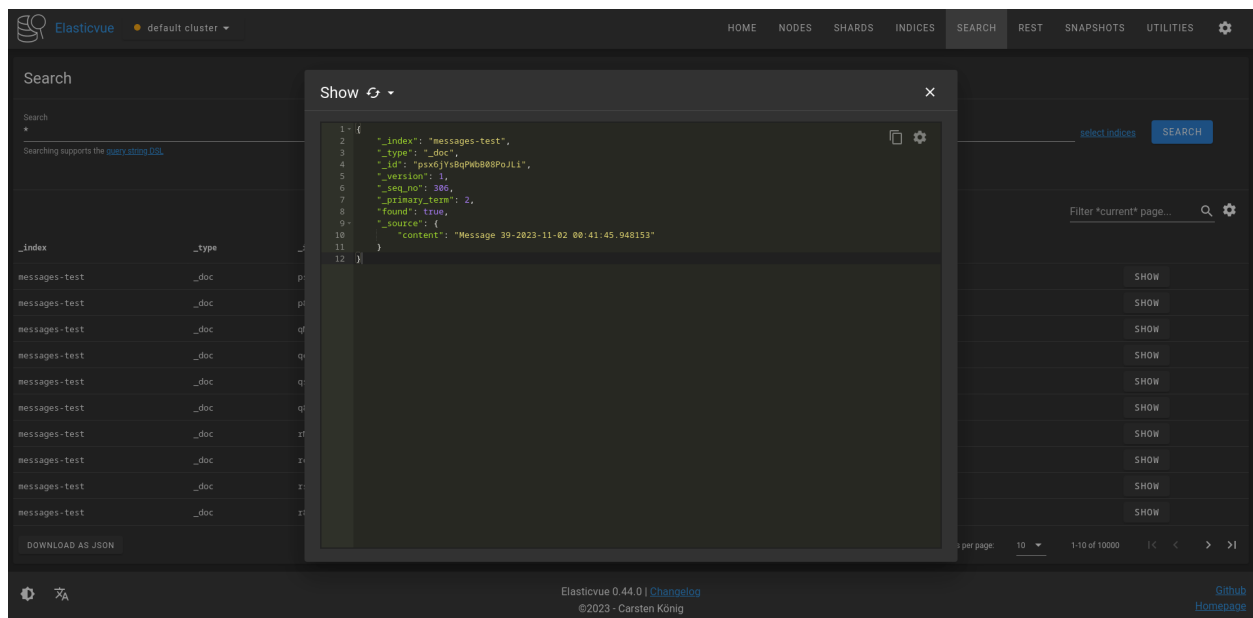
screenshot of messages between components (question #3):

```
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32564'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32564
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.028s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32565'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32565
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.031s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32566'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32566
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.019s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32567'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32567
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.017s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32568'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32568
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.048s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32569'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32569
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.026s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32570'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32570
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.037s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32571'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32571
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.027s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32572'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32572
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.020s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32573'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32573
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.028s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32574'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32574
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.069s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 32575'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 32575
lemay-ai-devops-producer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.028s]
```

screenshot of data in neo4j (question #4):



screenshot of elasticsearch index, using elasticvue GUI (question #5):



“Explain what this code does” (question #6):

This project contains a producer, and a consumer. The producer sends one message every second, with an incrementing counter (the first message is “Message 0”, the next is “Message 1”, and so on). Each message is sent through Kafka, on a topic called “test-topic”. The consumer listens for messages sent on this topic; it inserts each message it receives into elasticsearch and into neo4j.

screenshot of logs from running containers (question #7 part 1):

```
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.036s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1270'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1270
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.036s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1271'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1271
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.033s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1272'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1272
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.033s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1273'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1273
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.027s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1274'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1274
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.031s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1275'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1275
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.034s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1276'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1276
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.030s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1277'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1277
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.041s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1278'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1278
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.028s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1279'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1279
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.032s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1280'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1280
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.031s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1281'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1281
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.034s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1282'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1282
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.051s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1283'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1283
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.031s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1284'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1284
lemay-ai-devops-consumer_app-1 | INFO:elasticsearch:POST http://elasticsearch:9200/messages-test/_doc [status:201 request:0.033s]
lemay-ai-devops-producer_app-1 | INFO:root:Sent message: b'Message 1285'
lemay-ai-devops-consumer_app-1 | INFO:root:Received message: Message 1285
```

“Explain how you would use these messages to debug the project/pipeline” (question #7 part 2):

I would write the log output to a file (e.g. “docker compose logs > logs.txt”) and examine that file for any unexpected or suspect log output (e.g. errors, failures, warnings). Based on what I find, I would formulate a tentative hypothesis as to the root cause of the issue(s), then attempt to prove or disprove that hypothesis through further debugging and experimentation. I would repeat as necessary until I correctly identify the issue, and would then proceed to work on a solution.

“Describe how to change the docker-compose for this project into a Kubernetes deployment, and service for each component” (question #8):

My approach would be to use kubernetes' kompose tool for converting docker-compose files into kubernetes configs. After installing kompose and running `kompose convert`, we'll also need to make a few more modifications to get everything to work:

- Use the provided Dockerfiles for producer and consumer to build their images, and push them to a local image registry. We'll refer to those images from the producer and consumer's respective deployment.yaml files.
- Set up routing to expose some of neo4j's ports, so that we can access its web GUI.