# Docker Containers

## CMIS 545 - Cloud Computing Architecture

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Section 1

# Just Enough Microservices

# What are Microservices?

- Microservices are

# How do Microservices relate to Containers?

- Containers facilitate the modularized development and deployment of microservices.
- Using one service per container guarantees independence

Section 2

# Containerization

Section 3

# Containers vs Virtual Machines

# Containers vs Virtual Machines

Random explanation xxx

# Differences

- Virtualization
- Containerization
- third bullet
- fourth bullet

Section 4

# Docker

# Definition

Docker is a Platform xxx

Section 5

# Docker Primitives

# Docker Engine

# Docker Image

- We can think of a Docker Image as a stopped Docker Container
- Each element within an image represents an image layer. Layers are then stacked on top of each other and ready to run.
-

# Docker Container

- Containers are the central unit on top of which all Docker is built, and they are better examined practically.

# Docker Compose

Section 6

# Docker Demo

# Graylog App

- Graylog is an open source log management solution for capturing, storing, and analyzing machine data. It needs two dependencies:
  - MongoDB: An open-source, "general purpose, document-based, distributed database"
  - Elasticsearch: An open-source, "powerful analytics engine to explore data easily".

# Docker Run

*~$ docker container run <options> <image>:<tag> <app>*

# Graylog Setup

```
eduardo@eduardo-L380:~$ docker container run --name mongo -d mongo:3
```

```
eduardo@eduardo-L380:~$ docker run --name elasticsearch \
    -e "http.host=0.0.0.0" \
    -e "ES_JAVA_OPTS=-Xms512m -Xmx512m" \
    -d docker.elastic.co/elasticsearch/elasticsearch-oss:6.8.10
```

```
eduardo@eduardo-L380:~$ docker run --name graylog --link mongo --link
elasticsearch \
    -p 9000:9000 -p 12201:12201 -p 1514:1514 -p 5555:5555\
    -e GRAYLOG_HTTP_EXTERNAL_URI="http://127.0.0.1:9000/" \
    -d graylog/graylog:3.3
```

**Figure 1:** Graylog Setup Commands

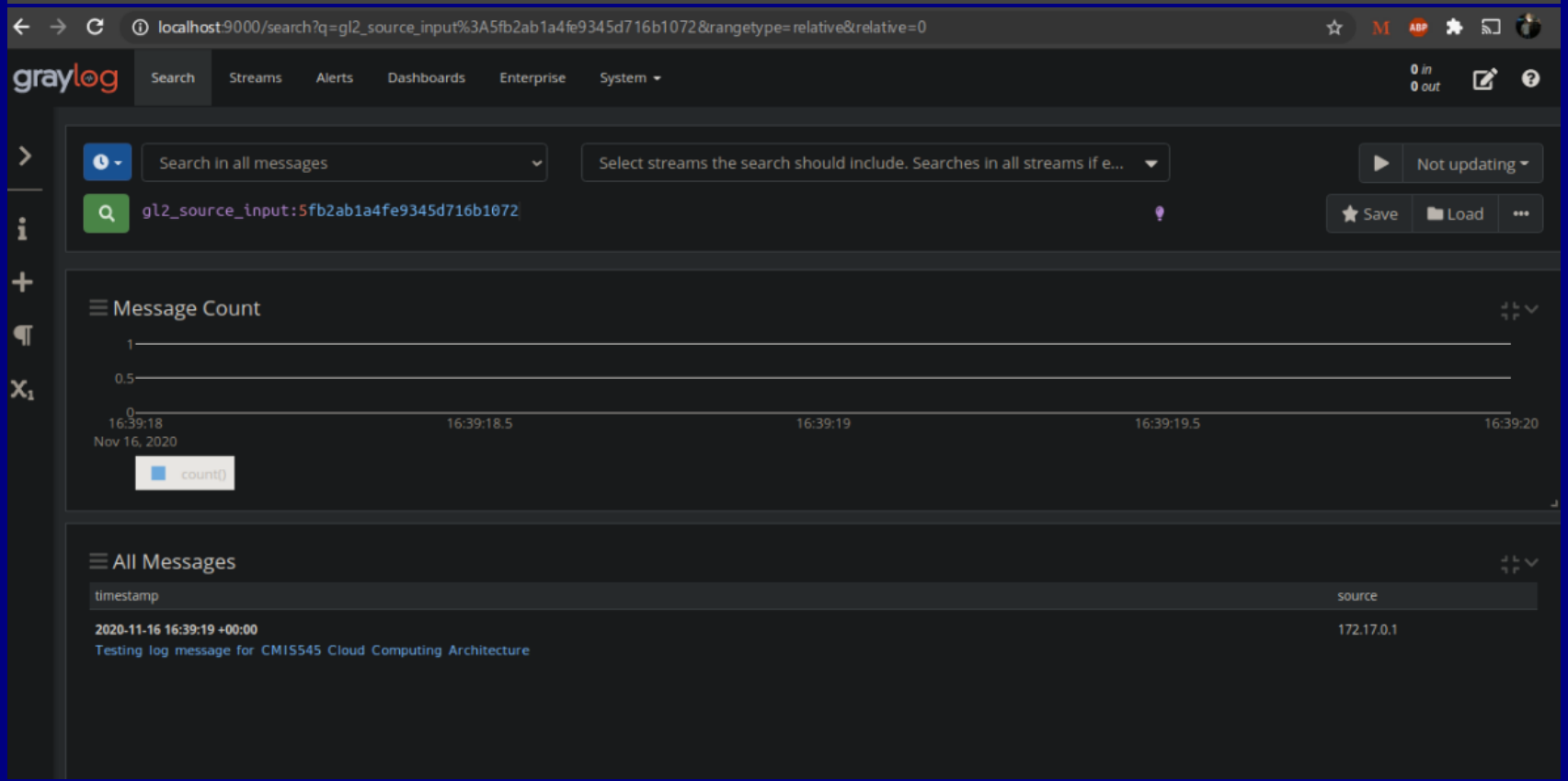
**Note**

In Ubuntu 20.04 LTS stock, installing graylog requires adjusting default virtual memory settings using: *sudo sysctl -w vm.max_map_count=262144*

# Testing Graylog

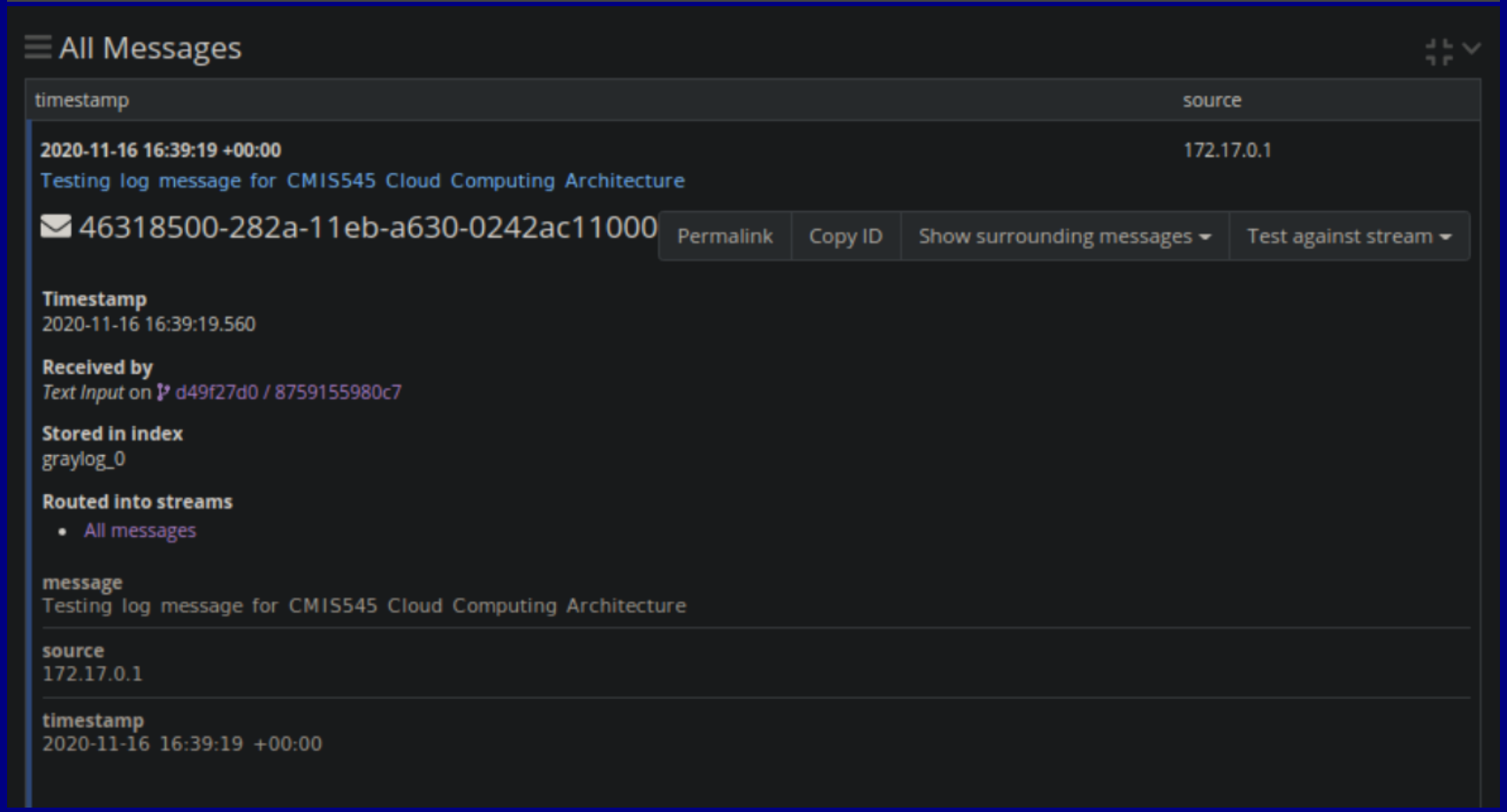
```
eduardo@eduardo-L380:~$ docker container ls
```

| CONTAINER ID | IMAGE | CREATED | STATUS | NAMES |
|---|---|---|---|---|
| 1de8801d699f | graylog/graylog:3.3 | 4 seconds ago | Up 3 seconds (health: starting) | graylog |
| 76b0e75fb7be | ./elasticsearch/ | 22 seconds ago | Up 21 seconds | elasticsearch |
| 229f3aebfe56 | mongo:3 | 27 seconds ago | Up 26 seconds | mongo |



# Further Testing

```
eduardo@eduardo-L380:~$ echo 'Testing log message for CMIS545 Cloud
Computing Architecture' | nc localhost 5555
```



# Killing the Application // Stoping and Removing Containers??

```
eduardo@eduardo-L380:~$ docker container stop mongo
```

```
eduardo@eduardo-L380:~$ docker container ls -a
CONTAINER ID   IMAGE                  CREATED          STATUS                      NAMES
1de8801d699f   graylog/graylog:3.3    2 minutes ago    Up 2 minutes (healthy)      graylog
76b0e75fb7be   ./elasticsearch/       53 seconds ago   Up 52 seconds               elasticsearch
229f3aebfe56   mongo:3                2 minutes ago    Exited(0) 5 seconds ago     mongo
```

**Figure 2:** Stoping Single Container

```
eduardo@eduardo-L380:~$ docker container stop mongo elasticsearch graylog

eduardo@eduardo-L380:~$ docker container rm mongo elasticsearch graylog
```

**Figure 3:** Stopping and Removing all Containers

# Further Container Commands[1]

| Command | Description |
|---|---|
| *docker container prune* | Remove all stopped containers |
| *docker container start* | Start one or more stopped containers |
| *docker container diff* | Inspect file or directory changes |
| *docker container exec* | Run a command in a running container |
| *docker container export* | Export a container's filesystem as a tar |
| *docker container inspect* | Display detailed information |
| *docker container kill* | Kill one or more running containers |
| *docker container logs* | Fetch the logs of a container |

[1]

Documentation: https://docs.docker.com/engine/reference/commandline/container_run/