

# **INFO8995 - Fall 2024 - Section 1**

## **Container and Orchestration**

**Final Project Report  
Group 3**

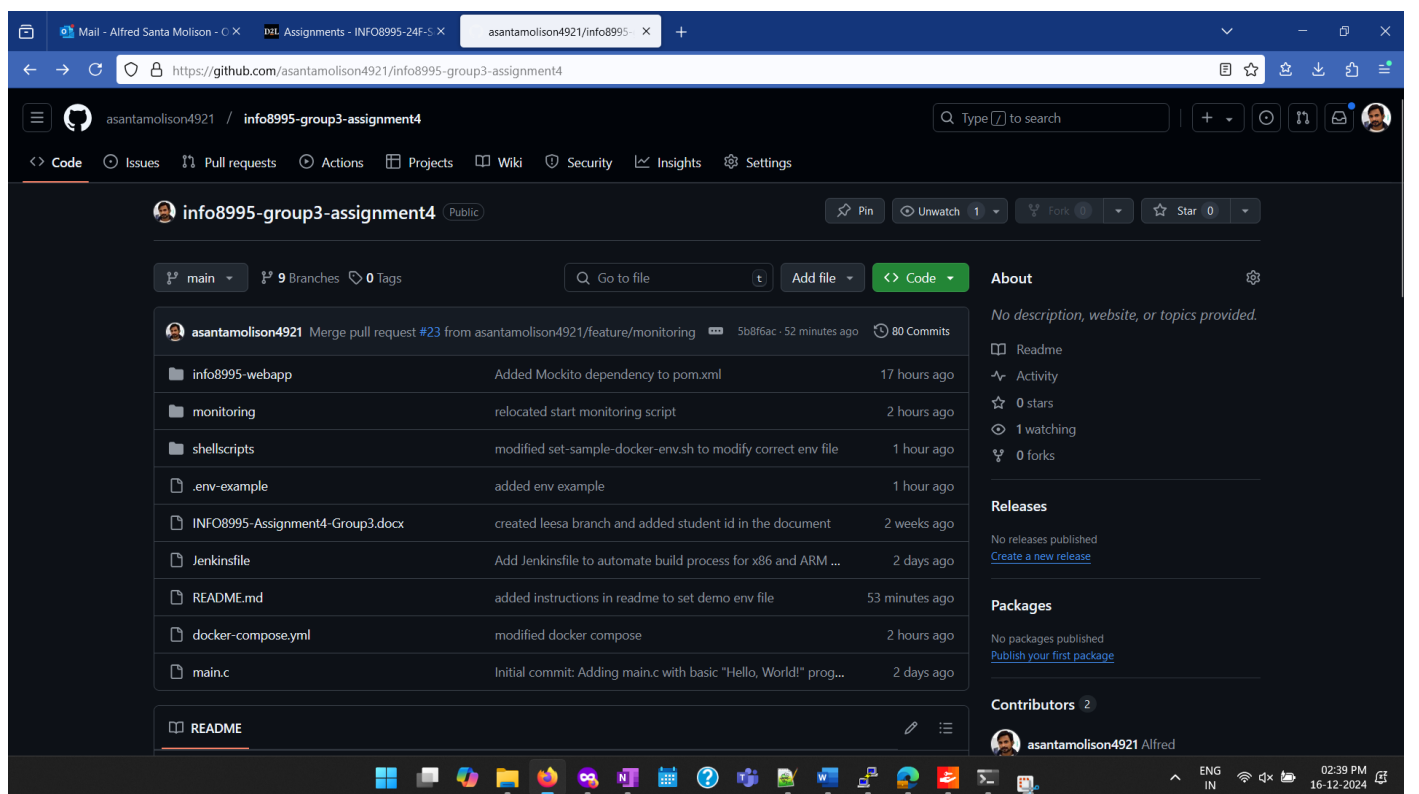
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Due on 15/12/2024

# Introduction

For our group project, we developed a comprehensive application using Docker Compose. Our project includes a Java web application that displays a greeting message, with scripts for building and testing the application. We adhered to industry best practices, including the use of a .env file for environment variables. Our Docker Compose setup features multiple services: a compiler for x86 and ARM binaries, a Jenkins pipeline for continuous integration, a Prometheus service for monitoring, and a Grafana service for visualization. This setup ensures a robust and scalable environment for both development and deployment.

# Screenshots



The screenshot above shows GitHub repo

```
ubuntu@info8995project: ~/info8995-group3-assignment4
ubuntu@info8995project:~$ git clone git@github.com:asantamolison4921/info8995-group3-assignment4.git
Cloning into 'info8995-group3-assignment4'...
remote: Enumerating objects: 270, done.
remote: Counting objects: 100% (43/43), done.
remote: Compressing objects: 100% (33/33), done.
remote: Total 270 (delta 16), reused 24 (delta 9), pack-reused 227 (from 1)
Receiving objects: 100% (270/270), 84.09 KiB | 1013.00 KiB/s, done.
Resolving deltas: 100% (110/110), done.
ubuntu@info8995project:~$
ubuntu@info8995project:~$ cd info8995-group3-assignment4/
ubuntu@info8995project:~/info8995-group3-assignment4$ ls
docker-compose.yml  INFO8995-Assignment4-Group3.docx  info8995-webapp  Jenkinsfile  main.c  monitoring  README.md  shellscripts
ubuntu@info8995project:~/info8995-group3-assignment4$
```

The screenshot above shows repo has been successfully cloned and files are visible

```
ubuntu@info8995project: ~/info8995-group3-assignment4
ubuntu@info8995project:~/info8995-group3-assignment4$ ./shellscripts/set-sample-docker-env.sh
This script will create a sample .env file to proceed with demo
.env file has been set up successfully.
ubuntu@info8995project:~/info8995-group3-assignment4$
```

Shell script `set-sample-docker-env.sh` completed successfully. A `.env` file is required to handle environment specific configurations and implementation of secret variables. The shell script will rename the env example file and will load it with some dummy data.

The pipeline always has some steps to modify the env file with real parameters.

```
ubuntu@info8995project: ~/info8995-group3-assignment4
ubuntu@info8995project:~/info8995-group3-assignment4$ sudo ./shellscripts/envsetup.sh
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'docker.io' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 108 not upgraded.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'docker-doc' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 108 not upgraded.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'docker-compose' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 108 not upgraded.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'docker-compose-v2' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 108 not upgraded.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'podman-docker' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 108 not upgraded.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'containerd' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 108 not upgraded.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'runc' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 108 not upgraded.
Get:1 file:/cdrom/jammy InRelease
Ign:1 file:/cdrom/jammy InRelease
Get:2 file:/cdrom/jammy Release
Err:2 file:/cdrom/jammy Release
  File not found - /cdrom/dists/jammy/Release (2: No such file or directory)
Hit:3 http://ca.archive.ubuntu.com/ubuntu jammy InRelease
Hit:4 http://ca.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:5 http://ca.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:6 http://ca.archive.ubuntu.com/ubuntu jammy-security InRelease
Hit:7 https://download.docker.com/linux/ubuntu jammy InRelease
Reading package lists... Done
E: The repository 'file:/cdrom/jammy Release' no longer has a Release file.
N: Updating from such a repository can't be done securely, and is therefore disabled by default.
```

The envsetup.sh shell script will install all dependencies and will create all directories for the successful build and deployment of the application.

```
ubuntu@info8995project: ~/info8995-group3-assignment4
ubuntu@info8995project:~/info8995-group3-assignment4$ sudo ./shellscripts/startwebapp.sh
[INFO] Scanning for projects...
[INFO] -----< com.example:info8995-webapp >-----
[INFO] Building info8995-webapp 1.0-SNAPSHOT
[INFO] -----[ war ]-----
[INFO] --- maven-clean-plugin:2.5:clean (default-clean) @ info8995-webapp ---
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ info8995-webapp ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/ubuntu/info8995-group3-assignment4/info8995-webapp/src/main/resources
[INFO] --- maven-compiler-plugin:3.1:compile (default-compile) @ info8995-webapp ---
[INFO] Changes detected - recompiling the module!
[WARNING] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[INFO] Compiling 1 source file to /home/ubuntu/info8995-group3-assignment4/info8995-webapp/target/classes
[INFO] --- maven-resources-plugin:2.6:testResources (default-testResources) @ info8995-webapp ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/ubuntu/info8995-group3-assignment4/info8995-webapp/src/test/resources
[INFO] --- maven-compiler-plugin:3.1:testCompile (default-testCompile) @ info8995-webapp ---
[INFO] Changes detected - recompiling the module!
[WARNING] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[INFO] Compiling 1 source file to /home/ubuntu/info8995-group3-assignment4/info8995-webapp/target/test-classes
[INFO] --- maven-surefire-plugin:2.12.4:test (default-test) @ info8995-webapp ---
[INFO] Surefire report directory: /home/ubuntu/info8995-group3-assignment4/info8995-webapp/target/surefire-reports

-----
T E S T S
-----
Running com.example.HelloWorldServletTest
Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 1.414 sec

Results :

Tests run: 1, Failures: 0, Errors: 0, Skipped: 0

[INFO] --- maven-war-plugin:3.3.1:war (default-war) @ info8995-webapp ---
[INFO] Packaging webapp
[INFO] Assembling webapp [info8995-webapp] in [/home/ubuntu/info8995-group3-assignment4/info8995-webapp/target/info8995-webapp-1.0-SNAPSHOT]
[INFO] Processing war project
[INFO] Building war: /home/ubuntu/info8995-group3-assignment4/info8995-webapp/target/info8995-webapp-1.0-SNAPSHOT.war
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
```

The startwebapp.sh script will do the build, test, package, and deployment of the web app docker container. The screenshot also shows test phase.

```
ubuntu@info8995project: ~/info8995-group3-assignment4
[INFO] Building info8995-webapp 1.0-SNAPSHOT
[INFO] -----[ war ]-----
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ info8995-webapp ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/ubuntu/info8995-group3-assignment4/info8995-webapp/src/main/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.1:compile (default-compile) @ info8995-webapp ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- maven-resources-plugin:2.6:testResources (default-testResources) @ info8995-webapp ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/ubuntu/info8995-group3-assignment4/info8995-webapp/src/test/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.1:testCompile (default-testCompile) @ info8995-webapp ---
[INFO] Changes detected - recompiling the module!
[WARNING] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[INFO] Compiling 1 source file to /home/ubuntu/info8995-group3-assignment4/info8995-webapp/target/test-classes
[INFO]
[INFO] --- maven-surefire-plugin:2.12.4:test (default-test) @ info8995-webapp ---
[INFO] Surefire report directory: /home/ubuntu/info8995-group3-assignment4/info8995-webapp/target/surefire-reports

-----
T E S T S
-----
Running com.example.HelloWorldServletTest
Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.992 sec

Results :

Tests run: 1, Failures: 0, Errors: 0, Skipped: 0

[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 2.716 s
[INFO] Finished at: 2024-12-16T19:50:16Z
[INFO] -----
"docker rm" requires at least 1 argument.
See 'docker rm --help'.

Usage:  docker rm [OPTIONS] CONTAINER [CONTAINER...]

Remove one or more containers
(+) Remove 2/2
  * Network info8995-group3-assignment4 default    Created      0.2s
  * Container info8995-webapp-container           Started        0.7s
Go to http://10.173.75.4/info8995-webapp-1.0-SNAPSHOT/hello to see the web app
ubuntu@info8995project:~/info8995-group3-assignment4
```

The above screenshot shows that the container is up and running. Also it shows the url to access the application.

```
ubuntu@info8995project: ~/info8995-group3-assignment4
ubuntu@info8995project:~/info8995-group3-assignment4$ sudo ./shellscripts/start_monitoring.sh
[sudo] password for ubuntu:
./shellscripts/start_monitoring.sh: line 4: cd: ../monitoring: No such file or directory
(+) Pulling 2/2
  * prometheus Pulled      0.5s
  * grafana Pulled        0.5s
(+) Running 2/2
  * Container info8995-group3-assignment4-grafana-1 Started 0.5s
  * Container info8995-group3-assignment4-prometheus-1 Started 0.6s
Grafana is available at http://10.173.75.4:3000
Login with username 'admin' and password 'admin'
ubuntu@info8995project:~/info8995-group3-assignment4$
```

The above screenshot shows that the shell script start\_monitoring.sh executed successfully and that both Prometheus and Grafana containers are running. Also it shows that the url in which Grafana is accessible.