DevOps Project: CI/CD Pipeline

COMP.SE.140

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Contents

Introduction

The project was made for Tampere Universities course *Continuous Development and Deployment – DevOps* (COMP.SE.140). The idea of the course's final project was to experience with CD pipeline, which was running on Gitlab; The task was to implement automated pipeline which started running when the system noticed a new GIT change in Gitlab repository.

With the help of created CI/CD pipeline the included message queue software project was developed further.

Implementation

The system is using Docker containers. Each part of system has an own container for different ideas. The main two containers include Gitlab web service and Gitlab runner, which is an application for Gitlab CI/CD and which runs jobs in Gitlab's pipeline.

Gitlab needs files for building and testing, so the project includes another project's files. With Gitlab changes are saved with GIT and with pipelines code is built and tested.

The applications what the project is handling on Gitlab is previous exercise which sends messages using RabbitMQ. With RabbitMQ applications could route messages from application to other using message-queues and topics.

Installation

The project includes README.md file which tells step-by-step how to install the Gitlab environment after cloning the repository. It has couple notes about the issues which users could face while installing or setting environment up. More about these issues later in another topic.
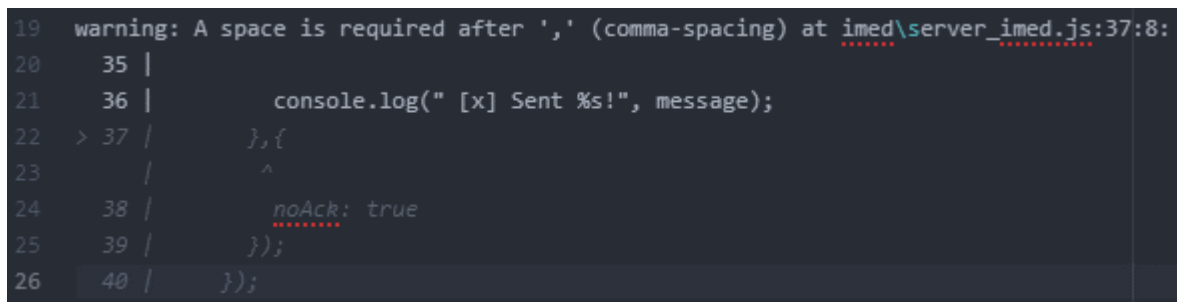
Pipelines

When Gitlab runner detects changes in Gitlab's GIT repository, it launches jobs in pipelines. This setup is made with the file "*.gitlab-ci.yml*". The first pipeline creates a new Docker container with *docker:latest* image and install all necessary packages such as *NodeJS* and *npm.* NodeJS is a JavaScript run-time environment for testing files which are using Mocha test framework and Chai (HTTP integration testing library). NPM is package manager for NodeJS.

After installing it launches four containers for each apps what are stored in GIT repository, waits with using a custom-made script that the software's messages are sent, and after this runs tests.

When the test stage is done, the next stage is executed. It will run a ESLint analyser which goes thru files and detects problems based to ESLint settings. It shows issues on logs such as missing semicolons. The lint-state also creates a report in "tests" folder with name "lint-report.md", but this feature needs more developing.

After all stages are ran, the CI removes all Docker containers which it started.

```
19    warning: A space is required after ',' (comma-spacing) at imed\server_imed.js:37:8:
20      35 |
21      36 |          console.log(" [x] Sent %s!", message);
22    > 37 |        },{
23         |          ^
24      38 |          noAck: true
25      39 |        });
26      40 |      });
```

Figure 1 Screenshot from lint-report.md file showing a warning about missing space (comma-spacing rule)

Tests

```
21  describe("Server", () => {
22    it("should be up and return status 200", () => {
23      expect(res.status).to.equal(200);
24    });
25  });
26
27  describe("HTTP", () => {
28    it("content-type should be text/plain", () => {
29      expect(res).to.have.header("content-type", "text/plain");
30    });
31
32    describe("body text should include Topic 'my.o'", () => {
33      it("for MSG_1", () => {
34        expect(res.text).to.include("Topic my.o MSG_1");
35      });
36      it("for MSG_2", () => {
37        expect(res.text).to.include("Topic my.o MSG_2");
38      });
39      it("for MSG_3", () => {
40        expect(res.text).to.include("Topic my.o MSG_3");
41      });
42    });
```

Figure 2 A part of the testing file

The project includes only one test file for the server software which shows all sent and received messages on RabbitMQ. The test file detects is the web service up and if it is, the other tests will be executed. It checks does the web page return header value 200 and checks does it show correct text.

Problems and issues

Developing the project on Linux OS was not possible because limited storage page on computer which was used. Also, an option to run the environment on virtual machine was also not used because it may reduce the speed of containers running on virtual machine and other containers running in containers (DIND).

Most of the time in this project was used on Gitlab and its pipelines. When multiple other projects were run on the same computer, Windows' stored credentials made impossible to connect or push the newest version of software to local Gitlab. The way how it was resolved was to remove specific GIT credentials from Windows settings.

When project was built and tested in pipelines, the tries faced a couple problems. This happens because Docker containers' network configurations, which I could not set correctly. Sometimes the environment worked, but on other day with the same files and settings something did not work. This happened a few times which made me stuck without knowing where the issue is. On Windows and Docker for Windows, it is not always clear is the newest changes really in use or not. Error such as *"`ERROR: Failed to remove network for build`"* and *"ERROR: Job failed: invalid volume specification`"* was thrown which was fixed with changes, which did not work anymore in another day. I tried to run containers with special flags to build and force recreating, but a couple of times I found out nothing changed when flags were used.

For registering the Gitlab runner application I had to create two registration scripts for Windows and Linux machines. The reason why I had to do for Windows were mounting files correctly and problems with ending lines. If *"docker exec"* command with flag *"—docker-volumes"* was used on Windows, it used Windows

system paths even the string was *""/var/run/docker.sock:/var/run/docker.sock""*. On Linux it would work, but Windows changed the string, so it included C:\ disk's name and other folders in the file path. When the command was run, it tried to find "C:\" from Linux system even the string did not include that or other Windows folder names. To fix this I created another registration script, which does not include "docker exec" command for executing a command in a specific container. I created step-by-steps how the file can be run in specific container.

Line endings were another issue. When the Gitlab runner was registered, it added "\n\r" endings because incorrect file format which Docker image's Alpine Linux distribution incorrectly found. Even the script file was looking okay on main computer and in the Gitlab runner container, it changed endings visible. To fix this I had to edit the registration script so it would not have empty lines or any other slashes.

When containers were set up, Docker found containers which was stored on main computer. Even the docker-container file, which is used to setup and run multiple containers with one command, was run in another container, it still saw these containers which located on main computer. I had to rename container names so that overlapping did not happen. Maybe it is worked how it should.

Conclusion

After facing and solving multiple issues the project did not complete. Faced issues and problems with running DIND and the whole environment took most of the time. The project staid at state where it could not not download a specific docker image because network issues (a guess). Because there was no time left, the application developing did not happen.

I had difficulties with motivation and organizing enough time for university because distance learning. Also, it is been a busy Fall when I had to book an extra course from last year. Also, because the lack of coding routing and skills made developing slower and harder, but I found out I've learned so many new ideas and technic things.

Even the project was too much for me and I gave up once or more times, I wanted to finish this project. I'm aware the project is not enough to pass the course but I'm already prepared for the idea to take the DevOps course again in next time.