



FINAL PROJECT

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Abstract:

We were planning to make a web app and test it. We wanted to do this via Continuous integration and Containerization. We already learned some solutions like TravisCI and Docker. We needed to use a web framework. We chose Flask. For testing we prefer to use the Selenium Web driver. Selenium Technology made our test more understandable and visual. We covered how to use pipelines between Github-TravisCI -DockerHub. The documentation will be about these technologies.

Motivation and introduction to the topic of the project.

We chose to do a web calculator as a group to take a step in growing in the development skills, starting from developing things which are applicable and used in our daily life. DevOps culture helps us in deployment of web applications, testing and integration. By the use of technologies and platforms that we have seen and have been continued using.

We have used Git as a version control system that lets us manage and keep track of our source code history so GitHub helped us to manage the repository. By the use of those technologies, it helped us to keep track of our coding and working together as a team.

History of the technology, mention related technologies

According to The earliest known work on **continuous integration** was the Infuse environment developed by G. E. Kaiser, D. E. Perry, and W. M. Schell. So, the continuous integration (CI) is the practice of merging all developers' working copies to a shared mainline several times a day. (Wikipedia, 2011)

Docker Inc. was founded by Kamel Founadi, Solomon Hykes, and Sebastien Pahl during the Y Combinator Summer 2010 startup incubator group and launched in 2011. Docker debuted to the public in Santa Clara at PyCon in 2013. It was released as open-source in March 2013. Later in 2017, Docker created the Moby project for open research and development. (Docker (software), 2021)

At this time, it used LXC as its default execution environment. One year later, with the release of version 0.9, Docker replaced LXC with its own component, lib container, which was written in the Go programming language.

Introduction of what the prototype is able to do

Project runs on Flask Web Framework; it renders and returns our html template. We used Selenium web driver and Unit test technologies to test our web calculator project. We were looking for a company for CI/CD. We tried firstly on CircleCI but it required a Pro version then we moved to Travis CI. Automation starts to push the project to GitHub, Travis CI pipeline pulls our project and starts to install pre-required software in .yaml

file like focal, docker, xvfb etc. after installation it runs docker and builds the project in docker container then runs the project. Next step is testing the containerized app via Selenium web driver. Selenium tests all test cases, after a successful pass. Travis forwards commands to `deploy_docherhub.sh` file then container push to docker Hub.

Introduction of the technology. What is the technology about, what kind of problems are trying to solve and how it solves them.

Flask

Flask is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. It has no database abstraction layer, form validation, or any other components where pre-existing third-party libraries provide common functions. However, Flask supports extensions that can add application features as if they were implemented in Flask itself. Extensions exist for object-relational mappers, form validation, upload handling, various open authentication technologies and several common framework related tools. (SEMIK, n.d.)

Selenium

Selenium is a portable framework for testing web applications. Selenium provides a playback tool for authoring functional tests without the need to learn a test scripting language (Selenium IDE). It also provides a test domain-specific language (Selenese) to write tests in a number of popular programming languages, including C#, Groovy, Java, Perl, PHP, Python, Ruby and Scala. The tests can then run against most modern web browsers. Selenium runs on Windows, Linux, and macOS. It is open-source software released under the Apache License 2.0. (Selenium (software), 2021)

Selenium WebDriver

Selenium WebDriver is the successor to Selenium RC. Selenium WebDriver accepts commands (sent in Selenese, or via a Client API) and sends them to a browser. This is implemented through a browser-specific browser driver, which sends commands to a browser and retrieves results. Most browser drivers actually launch and access a browser application

(such as Firefox, Google Chrome, Internet Explorer, Safari, or Microsoft Edge); there is also an HTML Unit browser driver, which simulates a browser using the headless browser HTML Unit.

Docker

Docker is a set of platforms as a service (PaaS) product that use OS-level virtualization to deliver software in packages called containers. Docker technology solves problems like missing or incorrect application dependencies such as libraries, interpreters, code/binaries, users; Example: running a Python or Java application with the right interpreter/VM or an 'legacy' third party application that relies on an old glibc.

Furthermore, Docker also solves conflicts between programs running on the same computer such as library dependencies or ports; Example: multiple ruby programs fighting over gems or trying to use port 80. Last but not least, Docker helps in limiting the number of resources such as CPU and memory an application can use; Example: containing a runaway program that consumes all the memory on the machine every once in a while, (this is not fine). (Docker (software), 2021)

Travis CI

Travis CI was the first CI service which provided services to open-source projects for free, however free open-source plans were removed at the end of 2020.

Travis Pro provides custom deployments of a proprietary version on the customer's own hardware. The source is technically free software and available piecemeal on GitHub under permissive licenses.

Travis CI is configured by adding a file named it travis.yml, which is a YAML format text file, to the root directory of the repository. This file specifies the programming language used, the desired building and testing environment (including dependencies which must be installed before the software can be built and tested), and various other parameters. (Travis CI, 2021)

Another relevant information about the technology that the student considers

Unit testing

Under our consideration we think unit testing is relevant information. In summary unit testing is a software testing method by which individual units of source code—sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures—are tested to determine whether they are fit for use.

We learned that Unit tests are typically automated tests written and run by software developers to ensure that a section of an application (known as the "unit") meets its design and behaves as intended. (Unit testing, 2021)

Pros and Cons

Pros of Flask

Higher flexibility, higher compatibility with latest technologies, high scalability for simple applications, technical experimentation, customization, slightly higher framework performance, easier to use for simple cases and smaller size of the code base.

Cons of Flask

More potential for security risks, slower MVP development in most cases, more complex tech stack, higher maintenance costs for more complex systems, more complicated maintenance for larger implementations.

Pros of Selenium

It acts like a Normal user, performs and records operations accordingly. Selenium is open source, it works on many platforms (Windows, Linux, IOS) without any problems. It is more preferred than other testing tools thanks to its multi-language support and platform support. (UFT, QTP)

Cons of Selenium

It has insufficient development for objects to be found. Objects with dynamic properties often fail. It is only available as an add-on for Firefox and Chrome.

Pros of Docker

Docker is fast, and well documented. It has public container registries.

Cons of Docker

Docker storage is still hard, it has poor monitoring and it's docker is platform-dependent, It supports Windows Mac OS X and Linux.

Pros of Travis CI

It is very simple to configure a range of environment versions and settings in a simple YAML file. It integrates very well with GitHub, Bitbucket, or a private Gilt repo.

The Travis CI portal shows you your history and console logs. Everything is presented in a very clear and intuitive interface.

Cons of Travis CI

Using Travis CI outside of GitHub isn't as user friendly as with GitHub. Builds sometimes take more time than they should because the images are bloated. Relatively slow.

Conclusion

The project runs flawlessly on Flask, after a push on GitHub, Travis CI passes every step Travis builds and runs the project then pushes the project to docker hub.

Our learning curve started with Flask. We made an Html template implementing CSS and javascript codes. It was running well on a local machine. We containerized and ran it in Docker. Our big step in this project is writing the .yaml file for Travis. We made a .yaml file unique for our project.

Official Documentation was good for every technology, also the community is really big. We were able to find every solution to problems.

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