Automating API Deployment through CI/CD Pipeline and Infrastructure as a Code

Gazelle Lowcay
Student
Ara Institute of Canterbury
gazelle.lowcay@yahoo.com

Amit Sarkar
(Supervisor)
Ara Institute of Canterbury
amit.sarkar@ara.ac.nz

Mindy Marshall
(Supervisor)
Jade Software Corporation
mmarshall@jadeworld.com

ABSTRACT

To meet the needs of a constantly changing market and balance the diverse demands of consumers, businesses strive to implement agile practices. Today, business innovation is driven by software, but businesses should also ensure that applications are released to market quickly. To reduce the deployment cycle time and improve delivery quality, it is imperative to streamline and automate deployment processes. In this paper, the author will describe how DevOps methods and practices were used to automate an API deployment through the creation and utilisation a Continuous Integration and Continuous Delivery pipeline, enabled by Infrastructure as Code (IaC).

Keywords: DevOps, CI/CD Pipeline, Rules Engine, API, Infrastructure as a Code

1. INTRODUCTION

Jade Software Corporation is an experienced software development company committed to assisting businesses in achieving key goals. By combining people, data, and software, Jade helps businesses to be digitally differentiated by enabling them to engage and retain customers. Jade has been solving complex business problems with experience-driven digital technology since 1978.

Ara Institute of Canterbury is the largest vocational training institution in the South Island of New Zealand. Ara aims to provide practical and hands-on learning experiences, preparing their students to be industry work ready.

The project defined in this paper is a student-driven collaboration project between Jade Software and Ara Institute, Department of Business and Digital Technology.

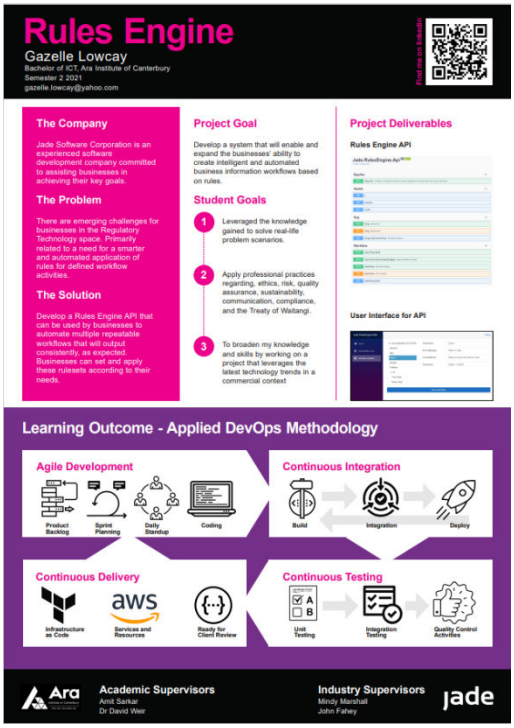

Figure 1 Poster for Rules Engine Project

2. PROJECT DETAILS

The Problem

There is an emerging need for a smarter and automated application of rules occurring in specific workflow activities for businesses in the Regulatory Technology space.

Project Goal

- Expand the businesses' ability to create intelligent and automated business information workflows based on rules.
- Provide a template or a testbed for Jades' future software projects exploring/demonstrating how they can further improve the quality of their deployment and delivery mechanism.

Student Goal

- Apply professional practices regarding, ethics, risk assessment, quality assurance, sustainability, communication, compliance, and the Treaty of Waitangi in a real commercial setting.
- Leverage the skills gained from academic learning, in real-world projects and contribute to their success.

Solution Scope

- Develop a centrally managed and dynamically configurable, rules engine API that will enable automated business processes to consistently work as expected.

METHODOLOGY ADOPTED

For the industry software project with Jade, Agile methodologies were used as the guiding principles in managing the project throughout its life cycle, from the initiation phase to project closure. Also, DevOps was adopted and integrated during the project execution phase.

Agile methods were the preferred project management methodology because they are client delivery focused and because agile philosophy is closely aligned with Jade company culture. DevOps practices were leveraged during the software development process, to increase software quality and speed up Continuous Delivery/Continuous Delivery (CI/CD) production deployment of updates, while ensuring high quality is maintained.

CI/CD PIPELINE

The main goal in implementing DevOps was to achieve Continuous Delivery and implement the CI/CD pipeline by automating steps in the software delivery process from code commit to deployment. Using the pipeline, quality control is enforced via processes such as automated testing for quality assurance. Figure 1. summarises the state of the CI/CD pipeline that was implemented in the author's industry project.

Figure 2. Processes that were automated in the CI/CD pipeline. The tools and platform that was used in these processes are Azure DevOps and Terraform.

Triggers

Pull request is the activity where a team member requests another team member to review their code. This is when a new feature and its associated code is ready to be merged to the source code repository. When a pull request is created, the CI/CD pipeline will be triggered to check the new changes against all the phases and jobs in the pipeline.

Build Process

Software builds are the processes of converting files and other assets into the final form of a finished product. The build may involve assembling source files, compiling them, and packaging them in compressed formats to produce installers. For this project, the build phase also includes other jobs such as logging in to the Amazon Web Service (AWS) and building and pushing a docker image.

A given build process can take several minutes or longer, depending on the scale of the software application. Automating this process saves time and improves productivity. If any failure happens during the build process, all the team members will be notified, allowing them to fix the error right away.

Provisioning Resources

Terraform was used the Infrastructure-as-Code (IaC) tool to automate infrastructure tasks, including automating the provisioning of the cloud resources. Terraform was preferred because it is a cloud-agnostic provisioning tool.

IaC allows users to create, change, and version infrastructure safely and efficiently. The IaC code is checked into a repository. Whenever the CI/CD pipeline runs, IaC runs a validation check on the configuration. If the infrastructure configuration is validated, the IaC processes the configuration file and creates the environment and all its components.

Integration Tests

Continuous testing was implemented by executing automated tests, continuously and repeatedly as part of the deployment pipeline using the pytests testing framework. If the test fails, the build is rejected, and the team member who pushed in the code is notified.

Deploy

If all the phases in the pipeline are passed and error-free, the code will be deployed, and new features and functionality are delivered without interrupting the existing environment.

REFLECTION

Understanding how to set up a CI/CD pipeline and using Terraform tool for IaC has been challenging for the author. Multiple new tools needed to be learned and understood. But once the pipeline was established, and the author had a better understanding of how these tools were used, the author found that it is beneficial in daily work routine.

Automating the deployment process using the CI/CD pipeline helped the development team to be more productive and provided many benefits such as:

- Changes to smaller sections of code are easier and more manageable.
- Fault isolation is quicker and easier.
- Errors are discovered sooner.

By establishing a consistent process and enforcing quality control measures gave the whole team the peace of mind that new features that were added are reliable, excellent quality, and production ready.

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