SQ500 exam: The efficient and traceable deployment of container software in a large-scale environment

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1 Interest, topic and research question

1.1 Interest

I am interested in Continuous Integration (CI) and Continuous Delivery (CD) strategies in large-scale environments like huge companies – especially in the field of highly available systems.

1.2 Topic

The topic of this paper will be the efficient and traceable deployment of container software in a large-scale environment. This includes several subtopics like fundamentals of software deployment and container software as well as fundamentals of large-scale environments.

In order to structure this topic a little further, there will be three focus (sub-)topics: This first one is about the improvement of quality and quantity of software releases. The second one has a focus on data which will be received through expert and customer surveys. The last one addresses the focus on tools which will be about testing and verifying the used deployment pipeline.

1.3 Research question

The research questions that will be addressed in this paper are a direct consequence of the objective of the work and from the requirements for a process that is as fully automated. The focus lies on the consideration of both disciplines of Business Informatics, namely Computer Science and Economics. However, the larger part of this work will have an Computer Science focus. The following research question will be discussed: Improvement of quality and quantity of software releases: How to improve software quality and reliability by streamlining the software deployment process?

2 Literature overview

First, we have to consider the term of cloud computing which is indeed not uniformly defined. The definition which we consider in this paper is as follows: "cloud computing [sic!] is a kind of computing technique where IT services are provided by massive low-cost computing units connected by IP networks."[QLDG09, p. 627] This leads to broad perspective of what cloud computing really is. In order to understand cloud computing even more, we need to define essential characteristics: "on-demand self-service, broad network access, resource pooling, rapid elasticity, measured service"[CL16, p. 6] as the key features of modern cloud computing.

As continuous deployment is a software deployment practise which "Essentially, [continuous deployment] gives programmers the power to deploy software at will. Continuous deployment has several apparent upsides, the primary one being a shorter time to market. In addition, it allows the release (and removal, if necessary) of new features and modifications with as little overhead as possible."[LMP+15, p. 64] This paradigm has the power to change how the people work together and how the deployment process is created. The culture is describe as DevOps which "integrates the two worlds of development and operations, using automated development, deployment, and infrastructure monitoring. It's an organizational shift in which, instead of distributed siloed [sic!] groups performing functions separately, cross-functional teams work on continuous operational feature deliveries."[EGHS16, p. 94]

The above-mentioned literature describes the influences on the deployment process and thus the need to change from classic old waterfall-like deployment to agile deployment. This new approach of deployment is in need of modern technologies like container platforms. "Virtual machines (VMs) have been the backbone at the infrastructure layer providing virtualized operating systems (OSs). Containers are a similar but more light- weight virtualization concept; they're less resource and time-consuming, thus they've been suggested as a solution for more interoperable application packaging in the cloud."[Pah15, p. 24]

3 Formula and table

Let θ be the parameters of a model and L the loss function. "So the goal is to find the set of weights which minimizes the loss function, averaged over all examples:"[JM14, p. 83] This is equation will be solved with a method called gradient descent.

$$\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \frac{1}{m} \sum_{i=1}^{m} L_{CE}(f(x^{(i)}; \theta), y^{(i)}) \tag{1}$$

Weekday	Temperature
Monday	13.5
Tuesday	18.5

Table 1: Temperature [in Celsius] values for weekdays

In table 1, there is the mean temperature of the week days in April shown.

References

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