Assignment
Research proposal

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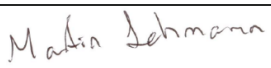
Signature	

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Course code and name	MS401 Master dissertation
Title	Research proposal
Hand out date	January 11, 2016
Due date for submission	January 17, 2016
Number of pages	8
Number of words	1289 (excluding abstract and references)

Research proposal

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Sunday 17th January, 2016

Abstract

There are many strategies for automating deployment in a microservice context, a time-consuming and often error-prone task. The study aims to create a framework for comparing different strategies and performing a comparison of some popular choices.

I propose triangulating two research strategies: a preliminary case study at FINN.no to establish relevance for the industry, and a design & creation project to improve the framework. The case study report, the analysis framework, and the actual comparison will be the key artefacts produced from the study and presented in the Master thesis.

1 Introduction

This document is a proposal for the research project I will conduct for my Master's thesis during the spring of 2016. It begins by listing core aims and objectives for the project in terms of what I seek to deliver. It then suggests a research approach to achieve this goal, and finally presents a brief project plan.

My **overarching research question** is how we can best compare several strategies for automating deployment in an environment with many teams and services, and pick or compose a strategy that suits the context.

My motivation for this project comes from the action design research-like work I completed in the Master programme's practise period module. During this project, I identified automated deployment of microservices as a time-consuming and error-prone task that is often repeated for each new service.

A brief literature search will show that much work has already been done on both automated deployment and microservices individually, such as (Virmani, 2015), (Stolberg, 2009), (Savchenko, Radchenko &

Taipale, 2015), and (Le et al., 2015). However, it appears from the literature review I conducted then that little work is completed on automated deployment in a microservice context. This must be shown explicitly in my thesis.

2 Aim and objectives

As mentioned in the previous section, deployment in a microservice context is a task that is both difficult and time-consuming. My **overall aim** for the research is to help simplify this process through three **key goals**:

1. Providing further insight into how implementation of automated microservice deployment;
2. Creating a framework for analysing different strategies for automated deployment in the future; and
3. Conducting an analysis of a few popular strategies for automated deployment.

In order to reach these goals, my **specific objectives** are:

1. Reviewing the existing literature on deployment automation (in this context commonly referred to as continuous integration or continuous delivery), the microservice architectural style in general, how they can be tied together;
2. Establishing relevance by learning which factors are important to the industry;
3. Developing an initial framework for analysing strategies based on the findings from the literature review (1) and the case study (2);
4. Testing, analysing, and comparing some popular deployment automation strategies using the framework from (3) to simplify picking or composing a strategy and validate and mature the framework.

3 Research approach

I suggest triangulating two research strategies:

1. A case study to establish which factors are important to the industry to supplement the literature review; and
2. A design science research (Vaishnavi & Kuechler Jr., 2015) (specifically, design & creation (Oates, 2006)) project to test various deployment strategies.

3.1 Case study: What is important to FINN.no?

Together with data from a literature review, I will build a first version of a framework for analysing the pros and cons of various strategies. This framework will be the key artefact of this thesis. In order to find which factors are important to the industry, I will conduct a case study at FINN.no. Using interviews and a document analysis for data generation, I will gather data on the company's own analysis of various strategies and how they plan to implement their own. I will interview (at least):

1. Key members of the cloud migration team responsible for implementing containers to understand which efforts are being made;
2. The team lead for one of FINN's teams that has completely deviated from the company's standard way to do deployment;
3. The person(s) responsible for the containerisation in order to uncover why the effort is made and which factors determine which strategy is selected; and
4. A key member of the cloud migration team to polish and verify my findings.

These interviews will provide insight into which strategies are actually being used for automated deployment, and how they are composed. This initial version of the framework then be used to analyse some implementations based on the next step.

All the listed interviews are already agreed upon by FINN.no, so the risk of not being able to gather data is relatively small. Additionally, if it proves unfeasible to gather data required to build a framework, I will simply need to lean more heavily toward my findings during the literature review. Thus, even if this phase should yield few results, the project can continue. The obvious downside of this outcome is that the industry is not necessarily represented strongly in building the framework, which makes it harder to establish a strong relevance.

3.2 Implementation through design science research

In this final phase of the project, I will iteratively improve the analysis framework for analysing deployment automation strategies derived from the literature review and case study.

In order to test strategies, I will need to build some relatively simple microservices that can be used for deployment. I will write these services in a few popular programming languages using frameworks commonly used by the industry to improve the study's generalisability. I expect to use an Infrastructure as a Service[1] such as Amazon Web Services (AWS)[2] to set up a test environment.

The first major revision of the framework will come from implementing and testing a strategy close to the one FINN is committed to. This test will likely raise several new concerns to include in the framework, as the issues must be explicitly addressed. The implementation of a few other strategies will both help improve the analysis framework and provide data that can help practitioners select a strategy that suits them. Practitioners can even compose their own strategies and compare them using the framework.

I will iteratively add to the total number of strategies I test; if I am able to implement and test a first strategy, this phase will already have yielded useful results. Given the time schedule presented in the next section, this should not be a high risk. However, the study's validity and generalisability are highly dependent on more than one implemented and evaluated strategy, as the key artefact from this phase is a comparison of various strategies.

4 Project plan

Figure 4 presents a Gantt diagram-like overview of the project's key milestones and my other activities for the semester with rough dates.

[1] A service where the hardware and network are abstracted away, but one receives access directly to the operating system(s).

[2] https://aws.amazon.com/

Milestone	Delivery	Partly busy	No work	Free time	
Meeting	Informal delivery				
(week of)	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
11/01/2016	Hello, thesis			FINN initial	Status + "research proposal"
18/01/2016	Lecture		Interview guide	Status	FINN Reise and Cloud-IO
25/01/2016	Lecture				Validated topic and started framework
01/02/2016	Lecture				
08/02/2016	Lecture				
15/02/2016	Lecture				
22/02/2016					Finished case study and first version of framework
29/02/2016	Lecture + PJ3100				PJ3100
07/03/2016	Oral status report + lecture				PJ3100
14/03/2016	Lecture				
21/03/2016			The Gathering	The Gathering	The Gathering
28/03/2016	Easter Monday				One strategy tested
04/04/2016					
11/04/2016	Lecture				All strategies implemented & tested
18/04/2016	Lecture + PJ3100				PJ3100
25/04/2016	Lecture				Thesis draft + PJ3100
02/05/2016	Lecture				
09/05/2016					Complete thesis ready for final polish
16/05/2016	Delivered thesis	May 17th			
23/05/2016	Deadline				

Figure 1: Plan with dates

The key points are as follows:

1. The preliminary case study and the initial version of the analysis framework derived from a literature review and the case study should be completed by the end of February.
2. The test infrastructure and services, as well as the first deployment automation strategy should be implemented and tested by the end of March.
3. All 3–4 strategies should be implemented, tested, and compared mid-April.
4. The first complete draft of the thesis should be ready by the end of April.
5. The thesis should be polished and almost ready for delivery mid-May.

The plan is intentionally very rough, and is only meant to be a brief overview. The document is live, and will be altered and updated as milestones are met earlier or later than expected. As touched upon

in section 3.2, my plan for implementation work and comparison takes into account the possibility of only being able to test one or two strategies by working iteratively.

4.1 Risk analysis

Figure 4.1 presents an initial risk analysis for the project. Risks are ordered by risk points determined by probability (0-1) * consequence (0-10). Each risk has associated proactive and reactive steps.

	A	B	C	D	E	F
1	**Name**	**Probability (0-1)**	**Consequence (0-10)**	**Risk points (0-10)**	**Proactive steps**	**Reactive steps**
2	Lost source code	0.01	2	0.02	Track data with Git, mirrored to GitHub; Reuse as much as possible	There should not be much important and difficult code, so write it again
3	Lost thesis	0.02	9	0.18	Thesis tracked by Git, mirrored to GitHub; All work backed up to Dropbox	Retrieve drafts from emails and deliveries; Type it up again
4	No interesting data from case study	0.08	3	0.24	Preliminary meetings; Prepare interview guides properly; Talk to many people	Lean more heavily on literature review than case study
5	Lost data	0.05	8	0.4	Take pictures of analogue forms as soon as possible; digitise data as soon as possible; track data with Git, mirrored to GitHub; back up to Dropbox &/ Google Drive	Type up any data that can be recollected; If necessary, perform new interviews and "experiments"
6	Time for testing only one strategy	0.1	5	0.5	Work iteratively; plan implementation; encourage reuse	Sell the phase as a test of the framework, rather than a comparison of strategies.

Figure 2: Risk analysis by risk points (R = P * C)

I have tried to keep the plan as practical as possible. As new risks are discovered, the document[3] will be updated.

5 Potential titles

So far, I only have one potential title. Suggestions will be kept in and added to a live document during the writing process.

- A comparison of automated deployment strategies

[3] Live version available at https://docs.google.com/spreadsheets/d/1ugcNV14-5exXiV5IFfFDR11uEIXZbvikrce4JsCb71U/edit?usp=sharing

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