**UNIVERSITY OF WATERLOO**

**Faculty of Mathematics**

**THE OPTIMAL PERFORMANCE ENGINEERING ROUTINE**

Veeva Systems

Toronto, Ontario

Prepared by

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2B Computer Science

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July 28th, 2016

**MEMORANDUM**

To: Stefan Timofte

From: Gary Lin

Date: July 28th, 2016

Re: Work Report: The Optimal Performance Engineering Routine

As we agreed, I have prepared the enclosed report, “The Optimal Performance Engineering Routine,” for my 2B work report and for the Veeva Toronto Research and Development Teams. This report, the second of four work reports that the Co-operative Education Program requires that I successfully complete as part of my BCS Co-op degree requirements, has not received academic credit.

The Vault Performance team that you lead provides systems performance monitoring, measurements and optimization for both internal software developers and external customers. My job as Intern Performance Engineer required that I develop and execute performance tests, develop data collection/organization scripts and provide overall support for your work. This report is an in-depth study of the optimal schedule for whom and when to develop/execute particular performance tests for a product such as Veeva Vault.

The Faculty of Mathematics requests that you evaluate this report for command of topic and technical content/analysis. Following your assessment, the report, together with your evaluation, will be submitted to the Math Undergrad Office for evaluation on campus by qualified work report markers. The combined marks determine whether the report will receive credit and whether it will be considered for an award.

Thank you for your assistance in preparing this report.

Gary Jiayi Lin (your signature)

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# Executive Summary

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# Introduction

“Problems worthy of attack prove their worth by hitting back” stated Danish scientist, inventor and mathematician Piet Hein, and one would find it difficult to disagree (Hein, 2). Amongst the tens of thousands of problems software engineers face during their careers, performance quality happens to be one of them. It also happens to be one of the most difficult to solve. The struggle to meet software performance targets is never smooth, and often involves remodeling the architecture of at least one major module.

However, there exists ample tools, strategies, methodologies and practices to ensure that software architecture is designed with scalability and responsiveness as core values. This report focuses on determining the optimal types of performance tests to run, when to run them and who to run them. The report also defines and analyses a particular software development cycle that emphasizes assurance of performance quality. This report will analyze the general problem of poor software performance, the effects this problem has on the software industry, various performance engineering practices and the optimal performance-focused development cycle. Perspectives in this report will alternate between reference to the general software industry and the specific work methodologies at Veeva Systems.

# Analysis

## The Problem

When developing software, there really only are two questions of interest. Does this software do what it needs to do? If so, does it do it efficiently? Making software that does exactly what is needed is difficult enough, which is why the majority of efforts and resources are dedicated to ensuring that the answer to the first question is yes. Thus, it is often the case that little or no attention is paid to software performance. However, “poor performance costs the software industry millions of dollars annually in lost revenue, decreased productivity, increased development and hardware costs, and damaged customer relations”, according to Dr. Williams and Dr. Smith (Williams and Smith, 2002).

The deeper trouble is, even if resources are allotted towards performance operations, they rarely yield a notable difference. Once a system has been implemented with a rigid architecture, performance optimizations can do very little, offering only minor changes within individual modules, shaving milliseconds at a time off the total run time. Code optimization on a modular scope offers an extremely low effort to performance improvement ratio. In fact, from personal experience optimizing scripts on a unit to unit basis at Veeva Systems, I can graph with certainty the relation between effort and improvement in performance.

INSERT GRAPH

The difficulty in meeting software performance requirements often stems from early stage design flaws in architecture. These flaws are “introduced in early development, but not discovered until late, when they are more difficult and costly to fix” (Williams and Smith, 2002). Though it may seem natural that investing more into the development phase could reduce performance issues in the long run, it might not be the case. Due to the technical, legal and business complexity of industry-grade software, the end product is almost never an exact manifestation of the original blueprints. Thus, architectural designs rarely accurately forecast future performance issues.

Obviously, software performance issues affect software-as-a-service and software-as-a-product companies. Furthermore, these issues, if persistent in production, would impact the businesses that buy and use these software, resulting in decreased productivity, decreased revenue and increased expenses. It would also imply weaker relations between software providers and their clients.

//TODO: talk about the butterfly effect

//TODO

# References

Hein, Piet. Grooks. N.p.: n.p., 1996. Print.

Williams, Lloyd G., Ph.D., and Connie U. Smith, Ph.D. "Solving Common Java EE Performance

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