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PERFORMANCE ANALYSIS OF WEB APPLICATIONS
ANALÝZA VÝKONU WEBOVÝCH APLIKACÍ

BACHELOR'S THESIS
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Abstract

Abstrakt

Keywords

Typescript, profiling, Perun, continuous monitoring

Klíčová slova

Typescript, profilovanie, Perun, nepretržié monitorovanie

Reference

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Performance Analysis of Web Applications

Declaration

I hereby declare that this Bachelor's thesis was prepared as an original work by the author under the supervision of Ing. Jiří Pavela. I have listed all the literary sources, publications and other sources, which were used during the preparation of this thesis.

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Tomáš Valent

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Acknowledgements

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Chapter 1

Introduction

Every programmer wants to have his application perfect. We usually encounter many different problems and bugs that are in our way to do so. One of the most common issues is *performance*.

> Performance is part of the non-functional requirements of software. It can be defined as how efficiently a software can accomplish its tasks. A system is never more performative than its slowest part. And that part is what we call a *bottleneck* or *contention*. If you want to improve the performance of your system, you have to improve the performance of the slowest part. As all your processing is queueing in there, the rest of your system hasn't reached its peak yet. [1]

There are a lot of tools that can help us identify performance issues – profilers. Profiling is one of the forms of *dynamic analysis* of the software. I will explain the types of program analysis in more detail in Chapter 2. The main goal of profiling is to identify performance issues such as throughput (either operations or data volume per second), IOPS (input/output operations per second), utilization (how busy a resource is, as a percentage), latency (operation time, as an average or percentile), CPU load and visualize them. Common ways to visualize the results of profiling are graphs and heat maps.

The main objective of this thesis is to develop a new module that will extend the system for versioning performance profiles *Perun*, which is developed by the *VeriFIT* group at the Faculty of Information Technology BUT, by a profiler that can profile web applications programmed in *Typescript*. TypeScript is a free and open-source high-level programming language developed by Microsoft. TypeScript is a syntactic superset of JavaScript which adds static typing. This means that TypeScript adds syntax on top of JavaScript, allowing developers to add types [3]. Unlike JavaScript, TypeScript supports object-oriented programming concepts in the vein of classes, interfaces, and inheritance. [2]

The following chapters will deal with these topics: Introduction of program analysis and profiling in Chapter 2. Introduction of version control system Perun in Chapter 3. Comparison of existing open-source Typescript profilers in Chapter 4. Design of the module in Chapter 5. All information about the implementation are in Chapter 6.

Chapter 2

Performance Analysis

2.1 Static analysis

2.2 Dynamic analysis

2.3 Continuous monitoring

2.4 Web application profiling - TypeScript

Chapter 3

Perun

3.1 Overview

3.2 Architecture

Chapter 4

Existing TypeScript profilers

Chapter 5

Architecture for Profiling

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Chapter 7

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