

Technische Hochschule Ingolstadt

Specialist area Computer Science

Bachelor's course Computer Science

Bachelor's thesis

Subject: Conception, implementation and evaluation of a highly scalable and highly available Kubernetes-based SaaS platform on Kubernetes Control Plane (KCP)

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Abstract

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1 Introduction

1.1 Problem Statement and Motivation

1.2 Objectives and Scope

1.3 Structure of the Thesis

2 Fundamentals

2.1 Kubernetes and Multi-Tenancy

2.2 Kubernetes Control Plane (KCP)

2.3 SaaS Architecture and Automation

3 State of the Art and Related Work

3.1 Zero-Downtime Deployment Strategies

3.2 Kubernetes Scaling Methods

3.3 Multi-Tenancy Concepts in the Cloud

4 Conceptual Design

4.1 System Requirements

4.2 Architecture Design with KCP for SaaS

4.3 Automated Deployment Strategies

5 Prototypical Implementation

5.1 Infrastructure with KCP

5.2 Tenant Provisioning (Automation, Multi-Tenancy)

5.3 Scaling Mechanisms (Horizontal Pod Autoscaler)

5.4 Monitoring and Logging (Prometheus, Grafana)

6 Evaluation

6.1 Performance Measurements (Downtime, Latency, Scaling)

6.2 Scaling Scenarios & Optimizations

6.3 Discussion of Results

6.4 Related Work

7 Conclusion and Outlook

7.1 Summary

7.2 Research Contribution

Appendix