This document was typeset using the *LaTeX* document processing system originally developed by Leslie Lamport, based on *TeX* typesetting system created by Donald Knuth. It makes use of the *BibTex* software for reference management and formatting and was edited in the *Overleaf* online editor and in *visual studio code*. The main text is written using the *Computer Modern Roman* font.

The technical part was written in *visual studio code*. The implementation is mainly based on *Kubernetes*, *Docker*, *Containerd* and written in the *Go* programming language.

All source code, including this document, can be found under `https://github.com/jb-ba` and the container images are available under `https://cloud.docker.com/u/jbba/repository/list`.

Title:

Orchestration on the Edge: Exploring Kubernetes for Edge Computing

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Abstract:

By 2025 the vast amount of data will be produced by devices belonging to the Internet of Things (IoT). These devices are integrated into everyday objects and are used to enable new technologies, like autonomous cars and factories. If these devices were to send their data directly to the cloud, it could topple not just individual servers but the entire system. Edge computing is the proposed solution to this problem. Traditionally, the gateways the IoT devices connect to just forwarded their information to a centralized system in the cloud. In edge computing the gateway forms an active part in the data processing pipeline. New system architectures emerged tightly coupling the edge resources to resources in the cloud. But outsourcing business logic on the edge, comes with its challenges. These devices, are notoriously known for bad updates and a vast heterogeneous environment, now need to be standardized and orchestrated.

The purpose of this thesis is to show how Kubernetes, the de-facto standard for cloud orchestration, can help with orchestration and management on the edge. It will explain important resources and concepts in connection to Kubernetes and provide an exemplary implementation of a Kubernetes orchestrate cloud connected edge system.

The thesis finds that Kubernetes on the edge is not yet ready for production purposes, but it is close. Standards for the edge need to be developed and the edge needs to become a first class citizen in the Kubernetes development. New initiatives clearly show that the industry is committed to this goal and that Kubernetes has good chances to become the de-fact standard for edge orchestration.