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Master thesis No. 957 Dynamic Assignment Strategies for Edge Computing Tasks in Factory Networks

Methods

Network dimensioning Performance Evaluation

Background

Production in future factories will be more flexible than today. This goal requires the entire factory, including machine tools and robots, to be equipped with more intelligence in terms of a global production strategy. Furthermore, since many robots will move autonomously and machine tools can be repositioned, the factory network **Topics** Communication networks Service platforms



will increasingly rely on the use of wireless connections. As the processing capacity of mobile robots is limited, more complex planning and processing tasks have to be offloaded to edge servers (ES). These ES are placed in the factory network at predefined locations.

Such tasks have to be assigned to an appropriate ES according to an assignment strategy. This strategy has to consider the specific requiremets of each task, e.g. latency and processing effort, as well as the currently available network and ES capacities. Additionally, an assignment strategy may consist of a combination of several sub-components which act on different levels.

- When a new processing task is issued, e.g. if a new device enters the network, a suitable ES has to be found to execute this task. The assignment has to be performed quickly in order to allow the timely execution of the new task and therefore a local assignment algorithm of reduced complexity considering only this task's requirements can be used.
- Since the greedy assignment of single tasks does not consider effects on other/future tasks the system as a whole will eventually be in a state of non-perfect task assignment. Therefore a more complex assignment optimization considering all tasks jointly is performed in regular intervals. Because the execution time of this optimization does not need to be restricted, better assignments can be found.

Task

In this thesis the initial assignment of a task to an ES as well as the optimization of the overall task assignment will be examined. In a frist step, this requires the modelling of the factory network. Meaningful abstractions for the description of the ES and task requirements have to be found. Then different options for the initial assignment of tasks will be compared regarding their scalability and complexity/execution time. For the optimization of the overall task assignment different optimization goals, like load balancing or minimizing the average latency, are possible and will be compared.

Acquired Knowledge and Skills

You will learn to identify a solution approach for a specific problem in literature, to adapt and to implement it. Futhermore you learn about different optimization techniques and heuristic algorithms. You will gain insight into future factory networks and edge computing.