Abstract

In our research group, we investigate the engineering of complex distributed applications that are characterized by a high degree of dynamism and change in either the system or its environment. In particular, we study multi-agent systems to design such applications. A multi-agent system is in essence a system that is structured as a set of autonomous, reflective software components (agents) that are capable to flexibly adapt their behavior to changing operating conditions. Control in multi-agent systems is decentralized: agents have only limited knowledge and control over the system as a whole. To achieve the overall system functionalities and qualities, agents have to interact and coordinate their behavior.

Since multi-agent systems are characterized by specific structures yielding particular quality attributes while imposing certain tradeoffs, a primary focus of our research is on software architecture of multi-agent systems. Specific topics of our research include dynamic software architectures, middleware support for self-management, architectural descriptions and architectural description languages for decentralized systems, and evaluation of decentralized architectures.

Our research is application-driven. The main application domains in which we apply our research are automated logistic services and intelligent traffic systems. Some other domains of interest are: supply chain management, inland shipping, and e-health.

In this talk, we give an overview of our research on decentralized software architectures of multi-agent systems. We use examples from different applications we have developed as illustration.