

**Doktorandenkolloquium mit
Johannes Köstler
(Betreuer: Prof. Dr. Hans P. Reiser)
am Mittwoch, 18. Mai 2022 ab 14:00 Uhr
im Raum 242, IM, Innstr. 33 oder per Zoom**

**Towards Autonomous Replicated State Machines
Improving Performance and Resilience of State Machine Replication
Through Self-Adaption**

State machine replication is a generic middleware abstraction that provides arbitrary services with fault and intrusion tolerance. Despite its obvious advantages, a widespread adaption is still hindered by its resource-intensive communication primitives and complex subprotocols. The efficiency and performance of the middleware is heavily influenced by service characteristics, usage patterns and environmental conditions, which are hard to predict at startup time and are subject to frequent changes during runtime. In order to relieve the service operator from the complex configuration burden and to adapt to dynamic changes, we envision an autonomous self-aware and self-adapting replicated state machine, which continuously optimizes the execution performance and improves the system resilience.

Therefore, this presentation introduces a generic self-optimization architecture for replicated state machines and explores several performance and security optimizations. The main challenges originate from the system model, which assumes a strong Byzantine attacker and only partial synchrony. After introducing the optimization framework, several optimizations are presented. The performance optimizations include a vertical scaling approach to optimize system throughput as well as a dynamic replica relocation strategy to improve request latency in wide area networks, while the security optimizations include countermeasures against performance attacks and recovery from ongoing attacks.

Keywords: distributed systems, state machine replication, byzantine fault tolerance, self-awareness, self-adaption