

Dissertation

# **“A Framework for SLA-aware execution of Grid-based workflows”**

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## **Abstract**

Service Level Agreements (SLAs) are currently one of the major research topics in Grid Computing, as they serve as a foundation for reliable and predictable Grids. SLAs define an explicit statement of expectations and obligations in a business relationship between provider and customer. Thus, SLAs should guarantee the desired and a-priori negotiated Quality of Service (QoS), which is a mandatory prerequisite for the Next Generation Grids. This development is proved by a manifold research work about SLAs and architectures for implementing SLAs in Grid environments. However, this work is mostly related to SLAs for standard, monolithic Grid jobs and neglects the dependencies between different steps of operation.

The complexity of an SLA-specification for workflows grows significantly, as characteristics of correlated sub-jobs, the data transfer phases, the deadline constraints and possible failures have to be considered. Thus, an architect for an SLA-aware workflow implementation needs sophisticated mechanisms for specification and management, sub-job mapping, data transfer optimization and fault reaction.

Therefore, this dissertation presents a system for SLA-aware Grid workflows. The main contributions are an improved specification language for SLA-aware workflows, three mapping and optimization algorithms for sub-job assignment to Grid resources, an error recovery mechanism and a prototype implementation using standard middleware. Experimental measurements prove the quality of the development.

## **Keyword**

Grid Computing, Service Level Agreements, workflow, mapping, scheduling, planning, error recovery, SLA language, SLA negotiation