

SLA Based Resource Orchestration using UNICORE



Problem

Reliable high-speed networks enable combination of multiple, geographically dispersed compute clusters for distributed high-performance applications like multi-physics simulations, if the following prerequisites are in place:

- High-performance, grid-aware MPI-Implementation
- Dedicated high-bandwidth, low-latency network connection
- Reservation of compute nodes
- Grid middleware for access and orchestration

VIOLA Solution

Enhancement and integration of existing middleware components and development of missing pieces for SLA negotiation and resource orchestration across different administrative domains:

ARGON – Allocation and Reservation in Grid-enabled Optic Networks

- Advance and immediate reservation of OSI layer 2 and 3 network connectivity services with specified QoS
- SOAP-based Web-Service interface for reservation, query of availability information and reservations, binding of additional information

MSS – MetaScheduling Service

- Reservation of resources for a common time period (co-allocation)
- Negotiation with local Resource Management Systems based on GGF draft protocol

UNICORE Integration

- Meta-Job description including network resources through UNICORE client-plugin
- MetaMPICH job startup including binding of MSS run-time information via wrapper scripts

WS-Agreement

- Proposed GGF recommendation for SLA specification resulting from negotiation
- Used as protocol between UNICORE client and MSS

MetaMPICH

- MPI library for efficient communication inside and between multiple clusters
- Multidevice architecture: direct node-to-node communication using different MPICH-communication devices for intra-cluster and inter-cluster communication
- Router-based architecture: inter-cluster communication managed by dedicated router-nodes
- Mixture of multidevice and router configuration for optimal adaptation to environment

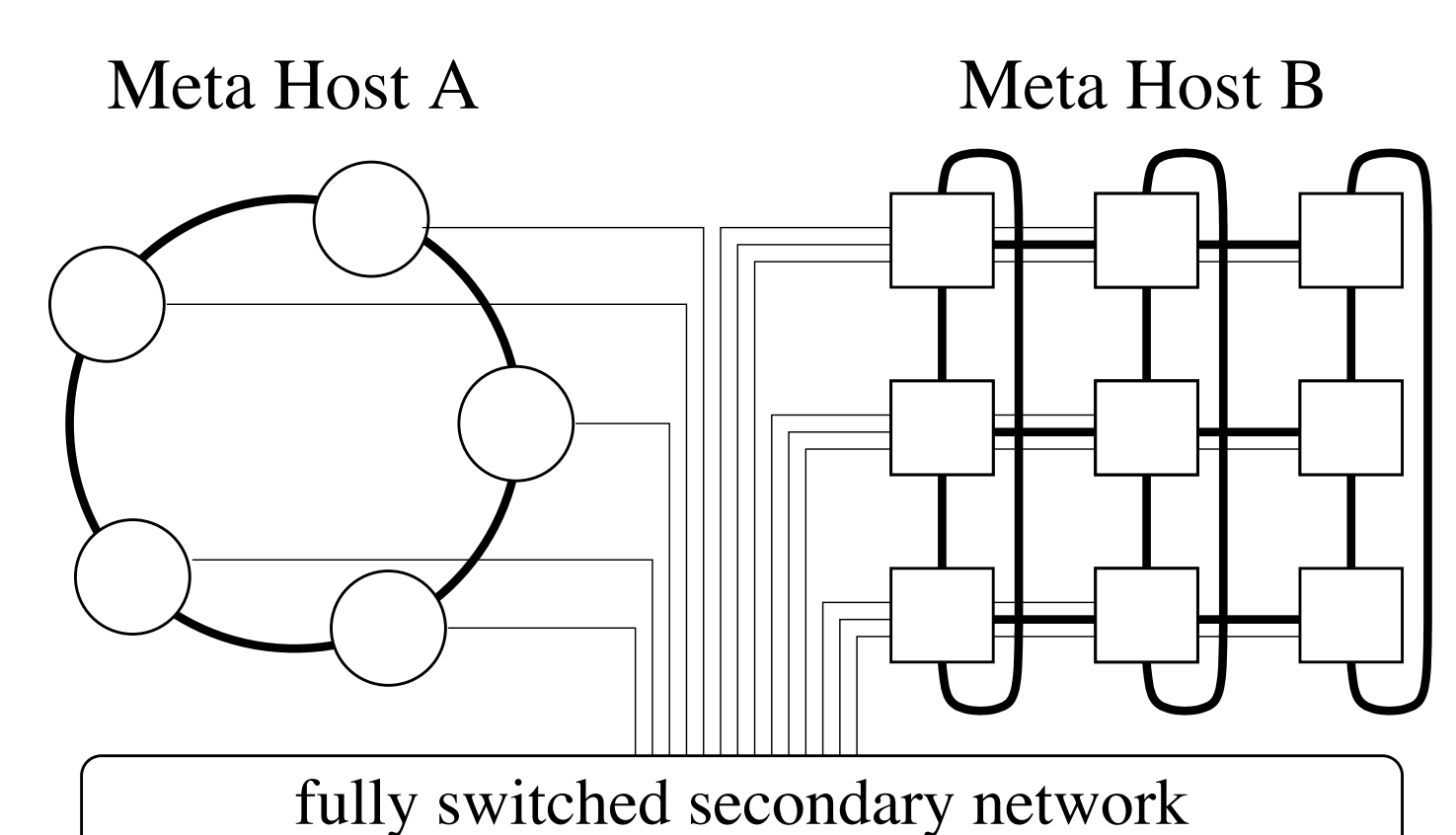
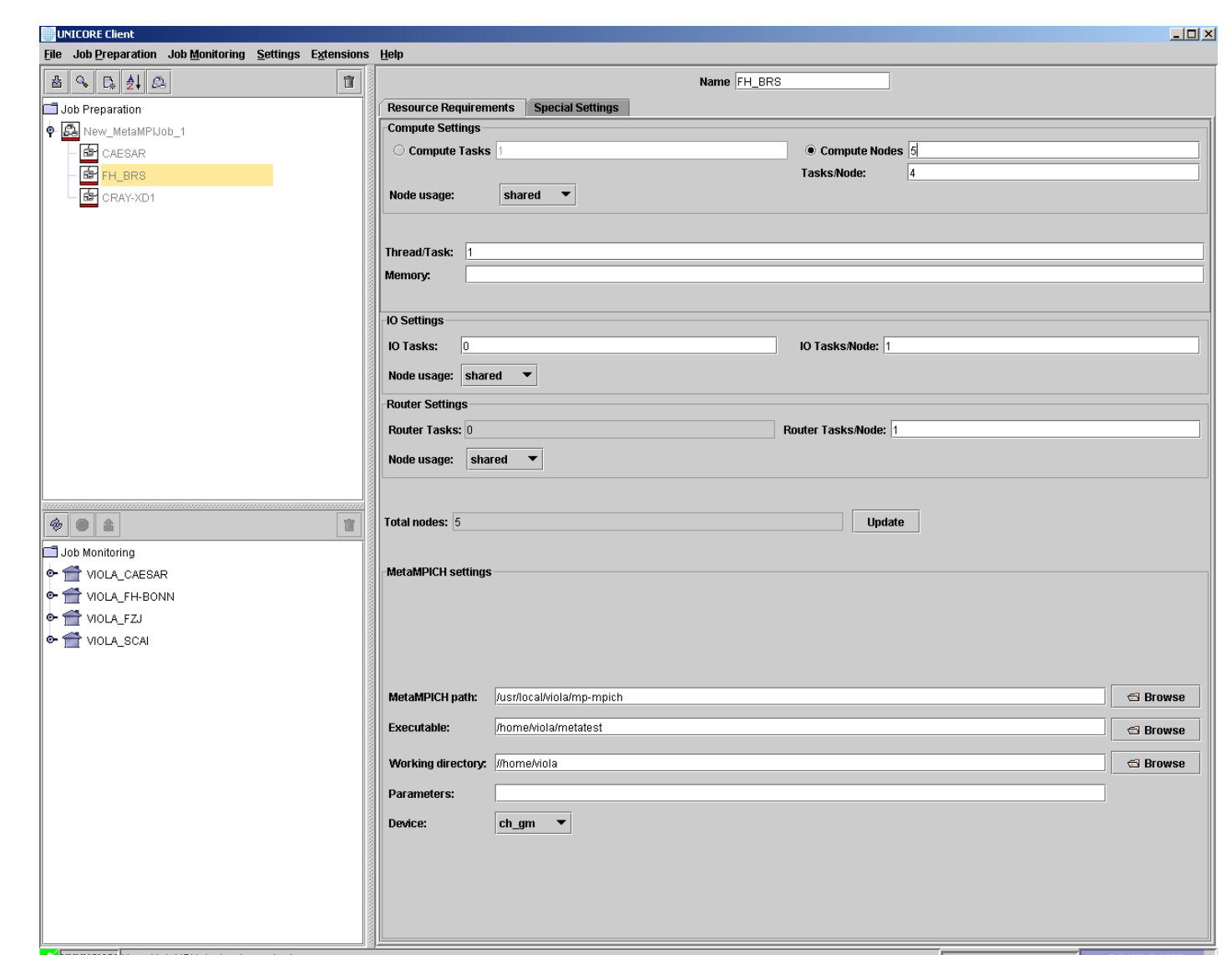
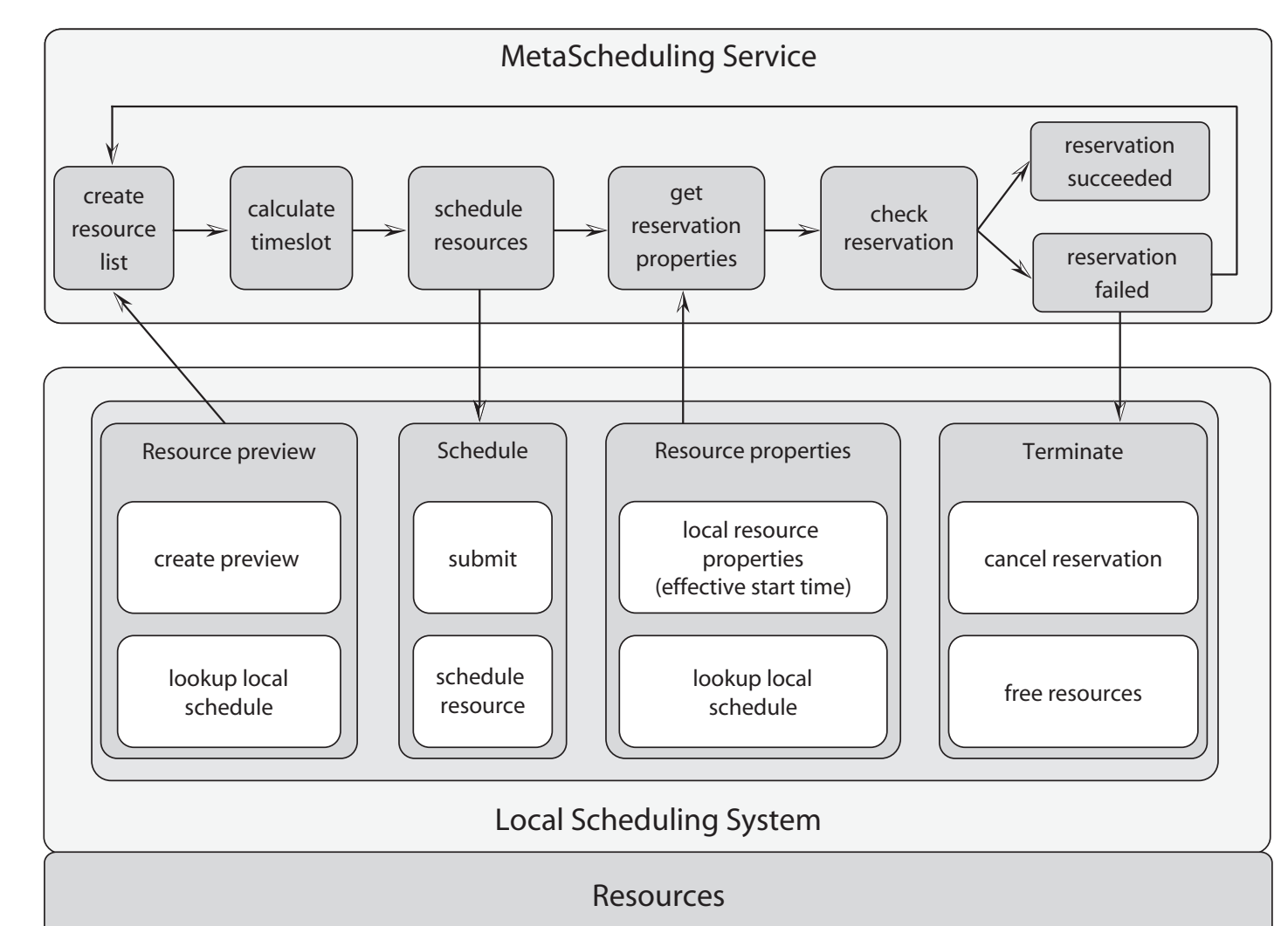
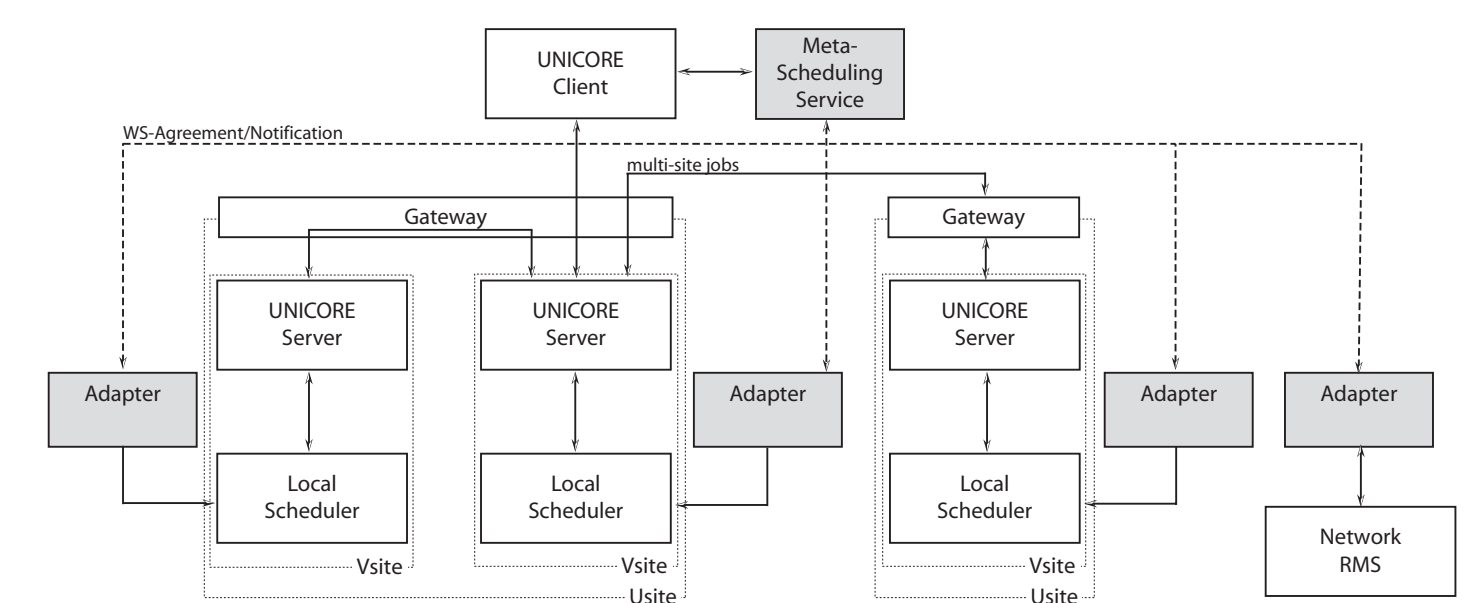
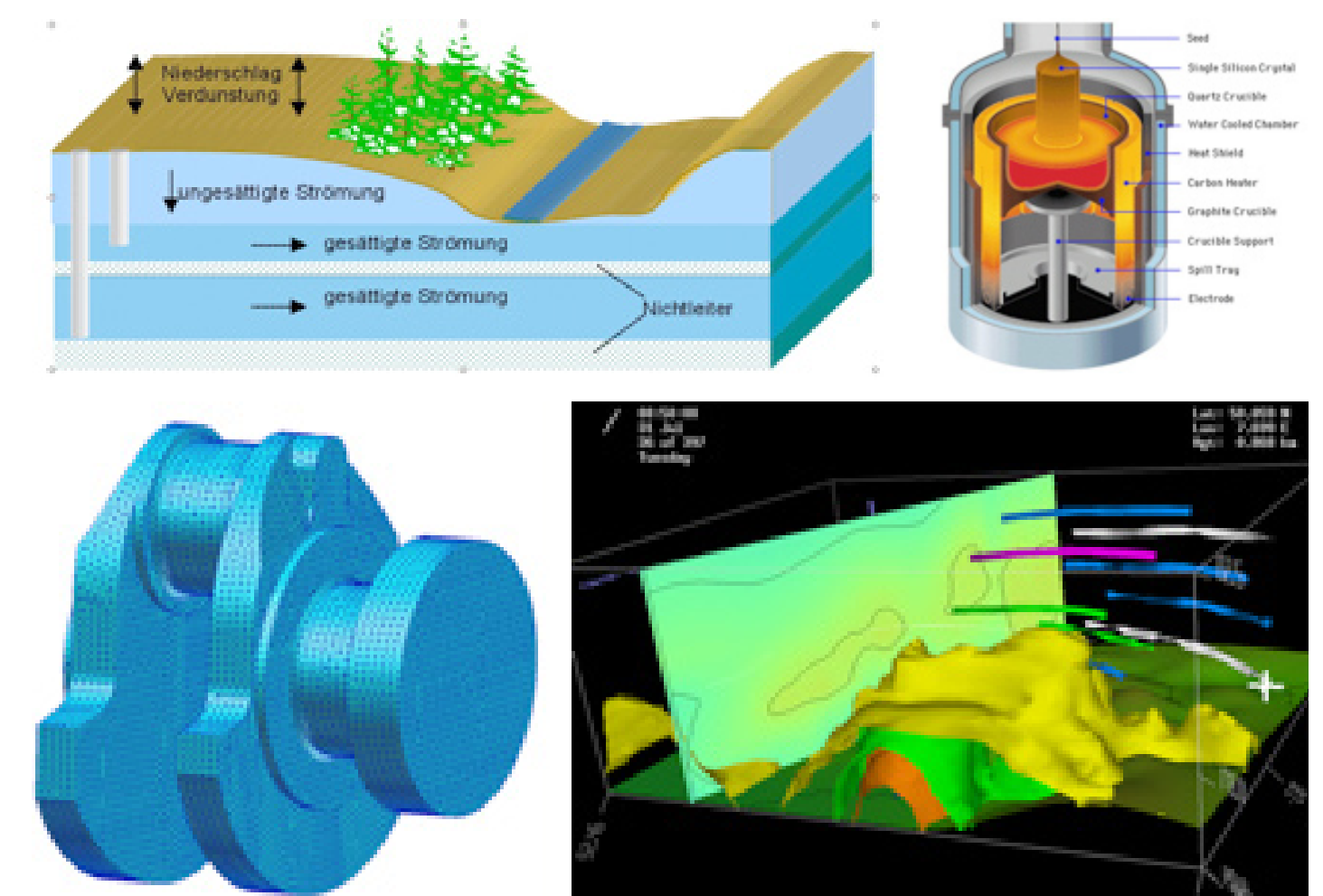
Future Work

In German D-Grid:

- VIOLA testbed infrastructure is made available for D-Grid
- Integration of middleware developments into D-Grid infrastructure and port to Globus Toolkit 4

On European level:

- EU integrated project PHOSPHORUS: extension and adaptation of VIOLA middleware for user-driven bandwidth on demand between different NRENs and GÉANT and resource orchestration on a pan-European scale for single applications or workflows



More information about the VIOLA project:
www.viola-testbed.de

about the MSS and the UNICORE integration:
www.coregrid.net/mambo/images/stories/TechnicalReports/tr-0010.pdf and
www.coregrid.net/mambo/images/stories/TechnicalReports/tr-0025.pdf

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