

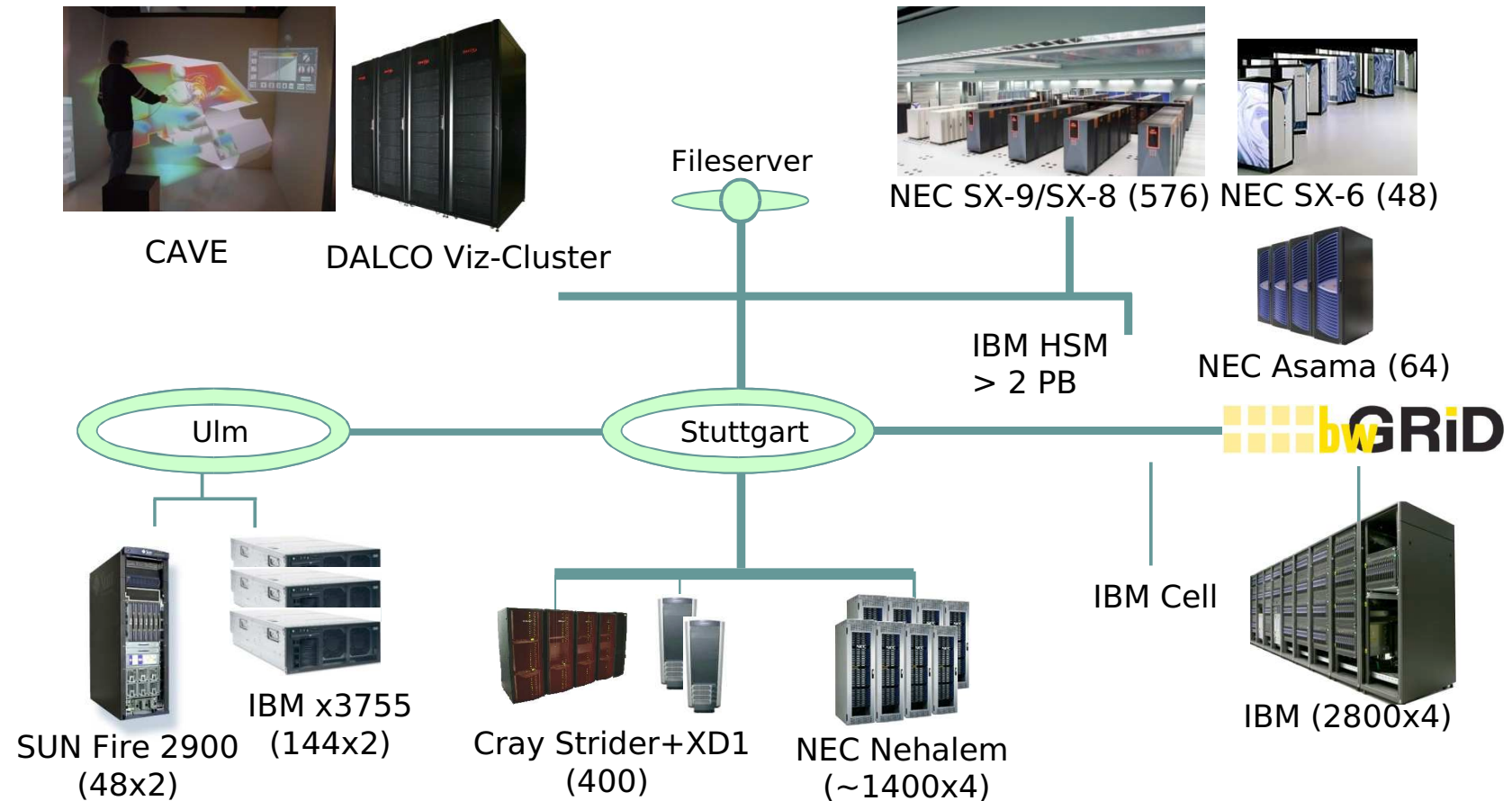
Scientific Engineering Workflows using COVISE

Florian Niebling



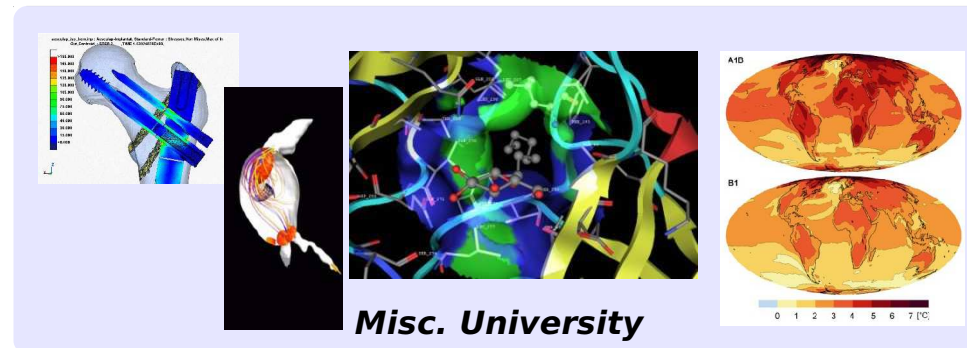
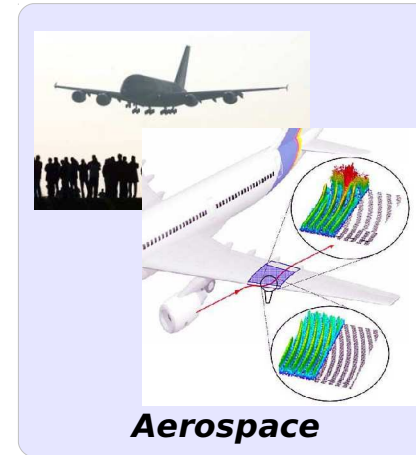
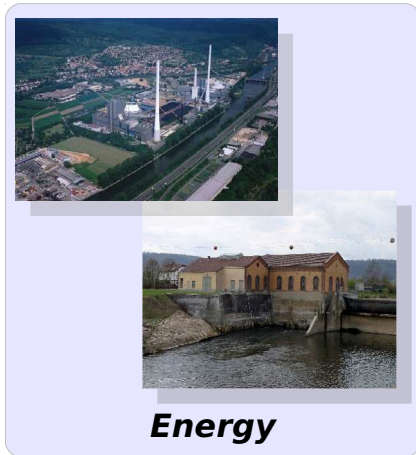


High Performance Computing Center Stuttgart



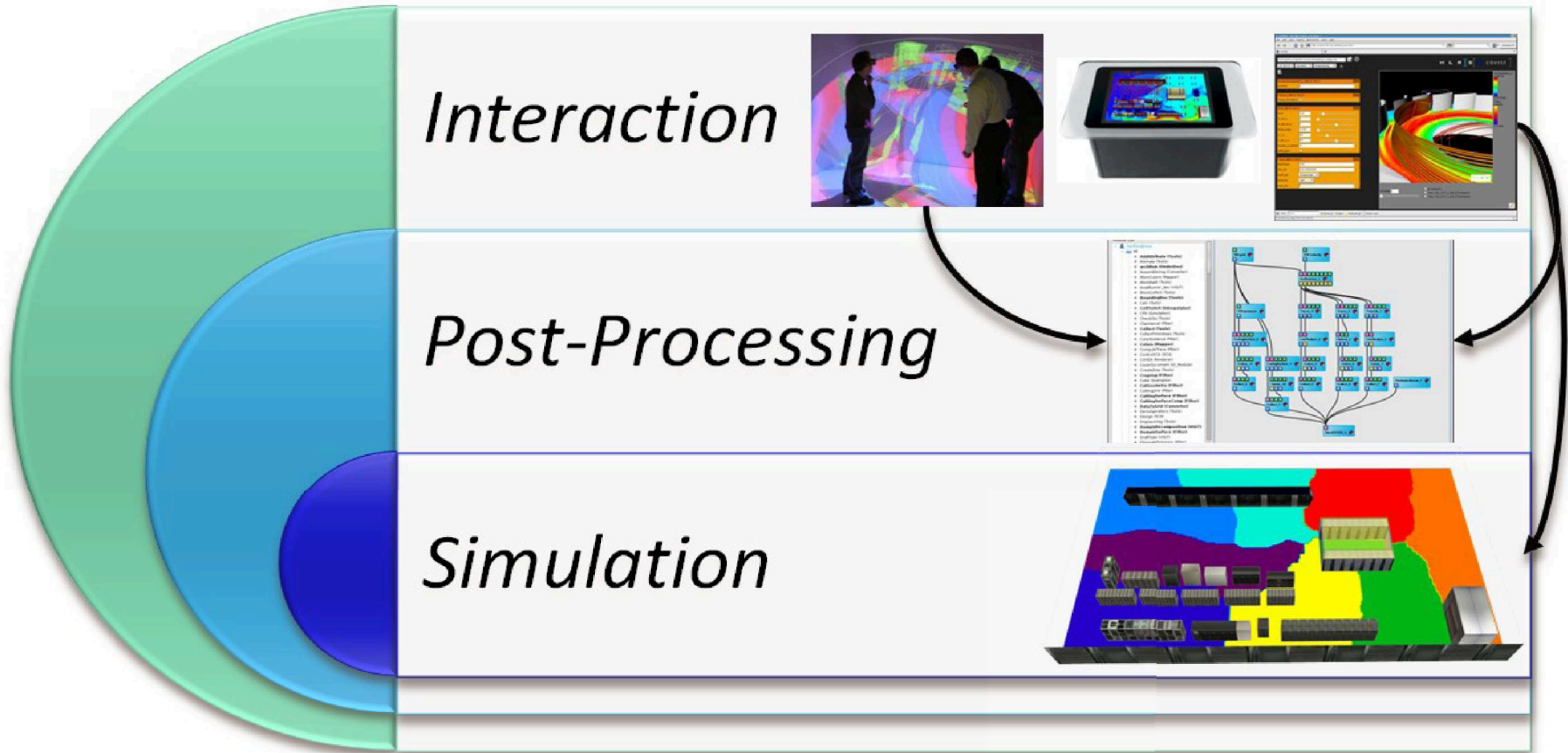


HLRS Users



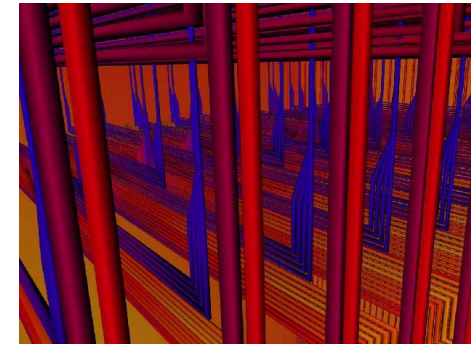
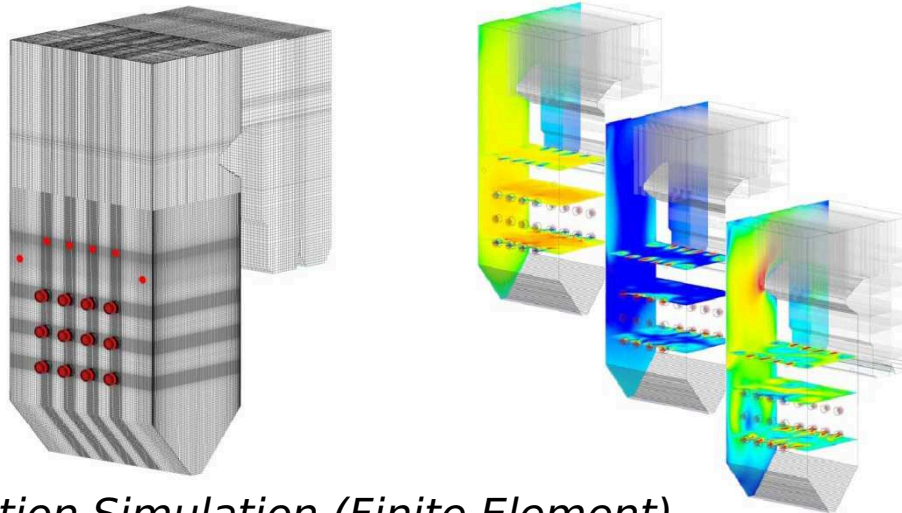


Simulation / Postprocessing Workflow



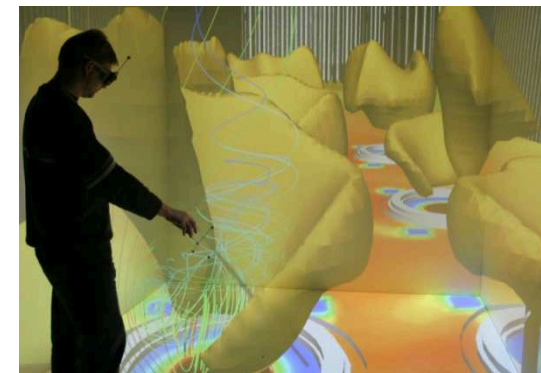


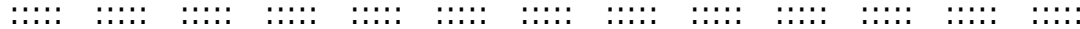
Coal Combustion



Combustion Simulation (Finite Element)

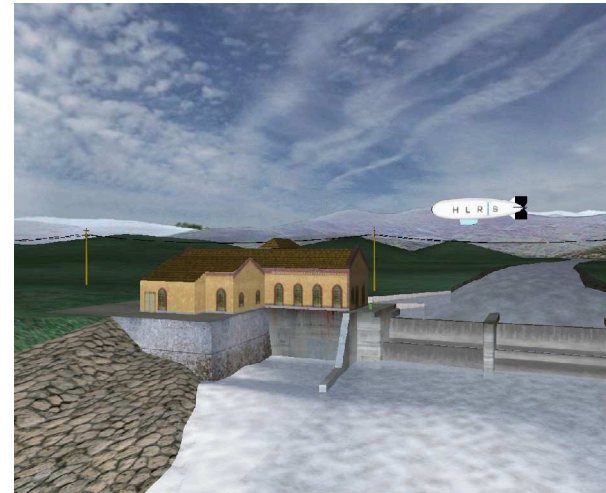
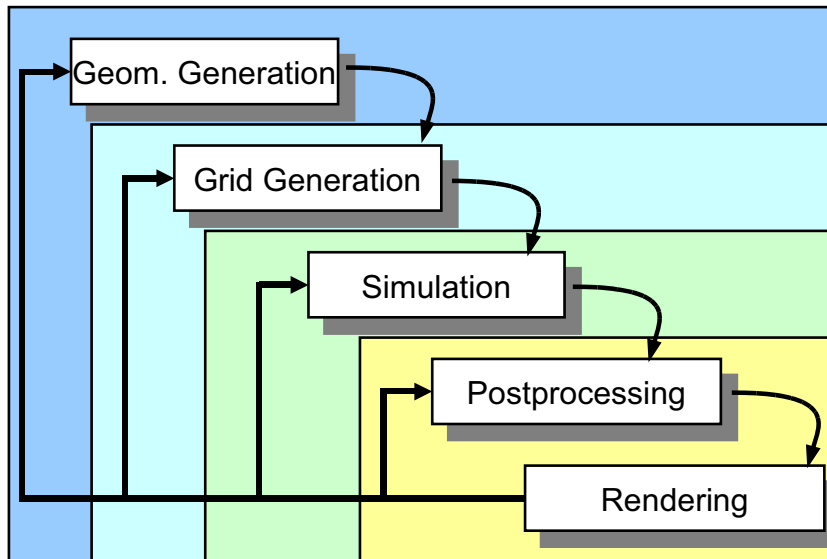
- Computational Grid 8 - 14 mio cells
- Temperature distribution
- Distribution of concentrations
 - O₂, CO, NO_x, Ash, ...
- Particle velocity
- changing properties due to combustion
 - mass, diameter





Virtual Water Power Testbed

- Interactive Design and Simulation
- Collaborative Working
- Integrated Workflow



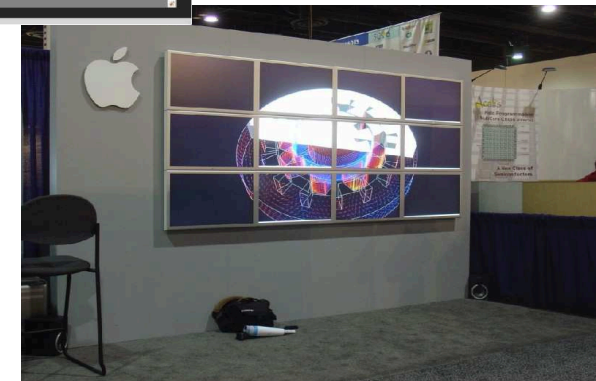
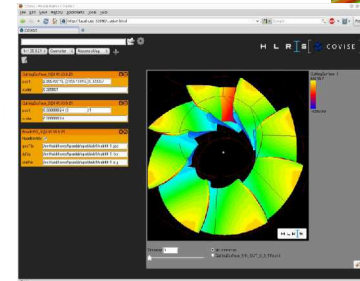
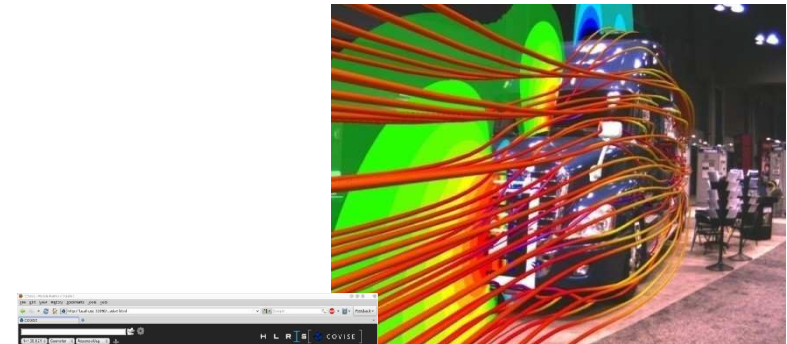


H L R I S

COLlaborative VISualization and SIMulation Environment (COVISE)

The screenshot displays the COVISE software interface. On the left is a 'ModuleList' tree showing a hierarchy of modules like 'Color', 'IO_Module', 'Mapper', 'Renderer', 'Simulation', 'Tools', 'Tracer', and 'VISIT'. The main workspace shows a 3D visualization of a turbine-like structure with colored streamlines. A 'Particle Tracer' parameter table is visible, listing parameters such as 'stepDuration', 'numParticles', 'numSteps', 'loopDetection', 'startStep', 'startpoint1', 'startpoint2', 'normal', 'direction', and 'whatDataOut'. A 'Rendered' window shows a 3D view of the turbine structure with colored streamlines. A 'Colormaps' window shows a color map of the turbine structure. A 'Geometry Objects' window shows a list of objects like 'CropUsg_5_OUT_001', 'CropUsg_6_OUT_001', 'VectorField_2_OUT_001', 'Collect_4_OUT_002', and 'Collect_3_OUT_001'. A 'COVISE Messages' window at the bottom shows log messages for the 'LTracer_2' module, including initialization, startParticles, complete run, traces, output generation, and complete run times.

Name	Appearan	Value
saveSearchFlag		
stepDuration	String	0.01 1
numParticles	String	50 1
numSteps	String	10000 1
loopDetection		
startStep	String	0 1
startpoint1		-9 1 -0.5
startpoint2		-9 -3 -0.5
normal		0 0 -1
direction		1 0 0
whatDataOut	ID	





Data-Flow oriented Post-Processing

COVISE Modules

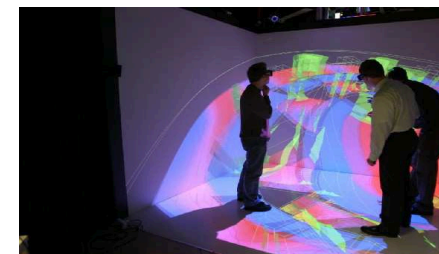
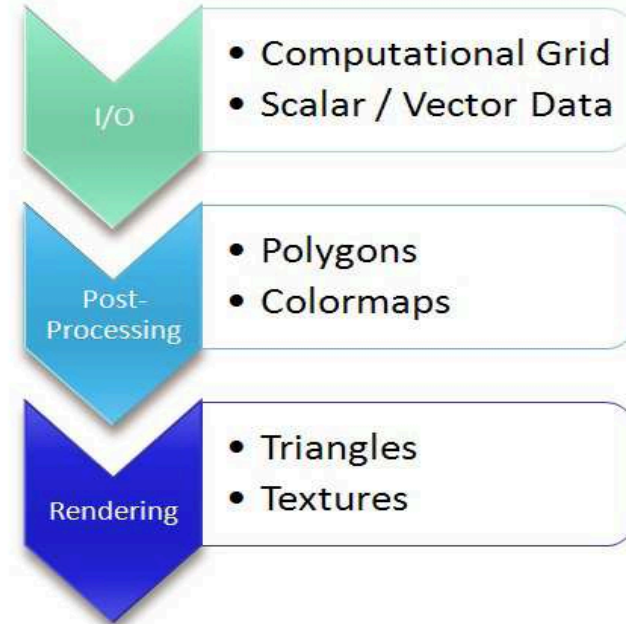
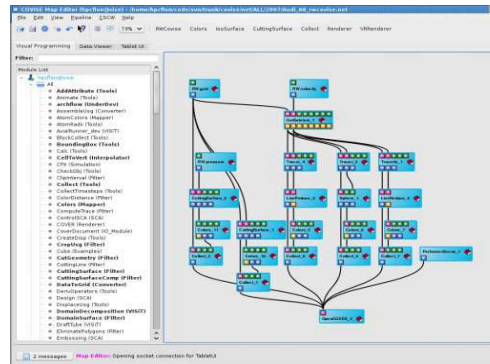
- Read / write /generate data
- Simulation coupling
- Implement algorithms
- Provide different render environments

Data management

- Modules share data objects

Data Flow

- Controller process





Visualization for HPC

- High Performance Computing

- Access to Supercomputing Resources
- Large Datasets
- In-Situ Visualization
- Reduction of size by post-processing
- Simulation Steering

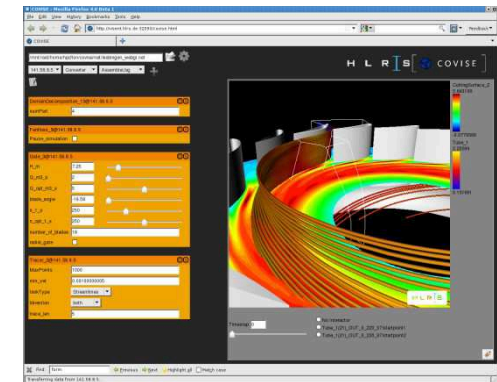
- Client Applications

- COVISE
- WebBrowser

- Plugins (VRML, Java3D, ...)
- Plugin-less (HTML5 WebGL)

- Different Rendering environments

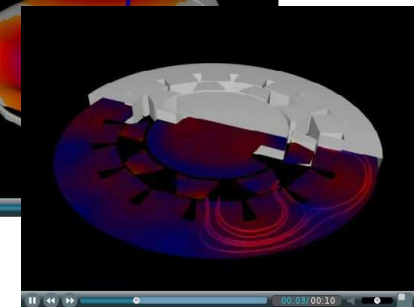
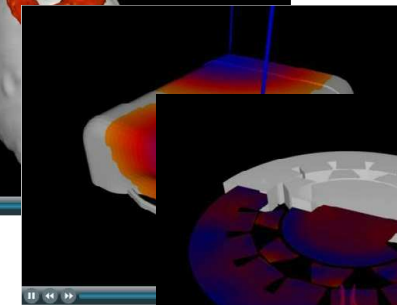
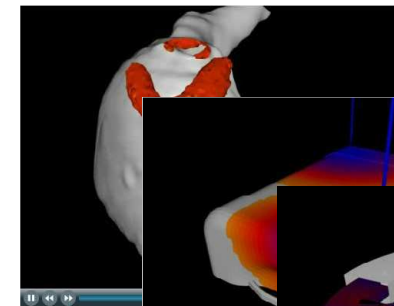
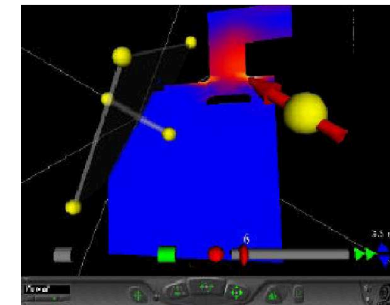
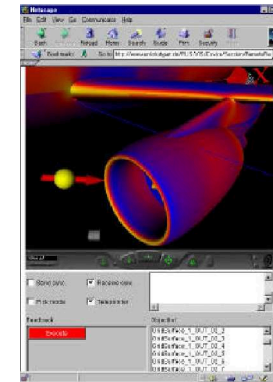
- VR/CAVE
- Desktop
- Mobile
- Web

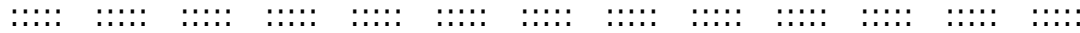




COVISE Web Applications

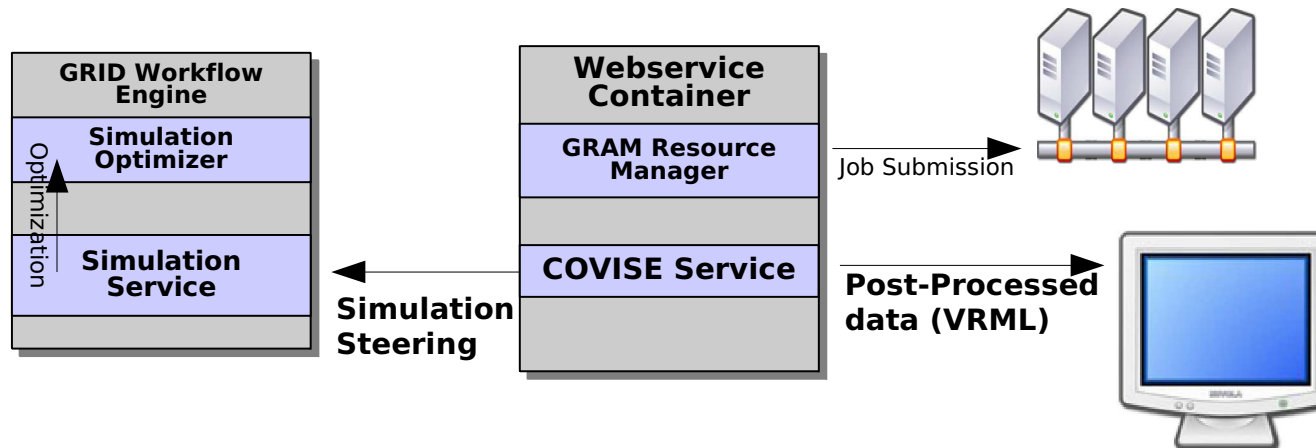
- VRML Export
 - Coupling to COVISE via Java / CORBA
 - VRML elements are updated on change
 - Interactive post-processing
 - Synchronization between multiple webclients
- Software-based image rendering
 - Gelato
 - Renderman





COVISE as a Service

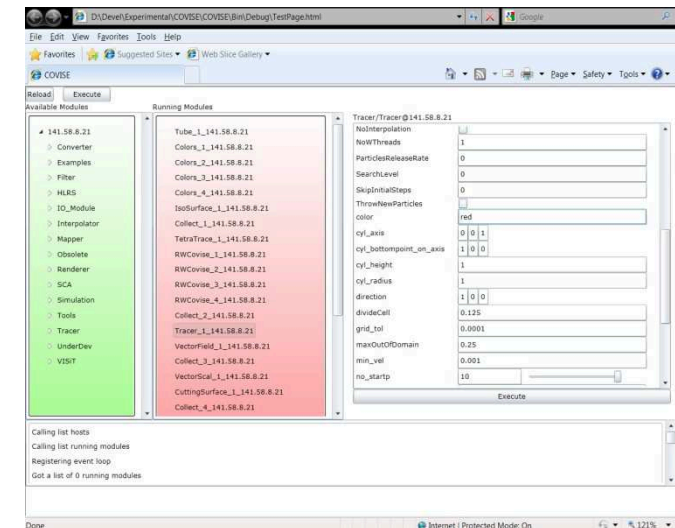
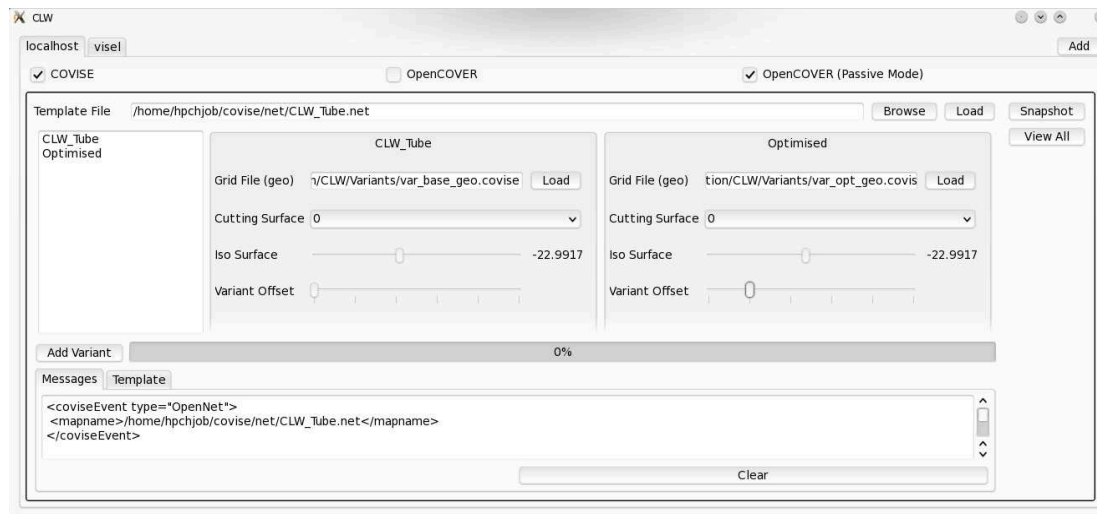
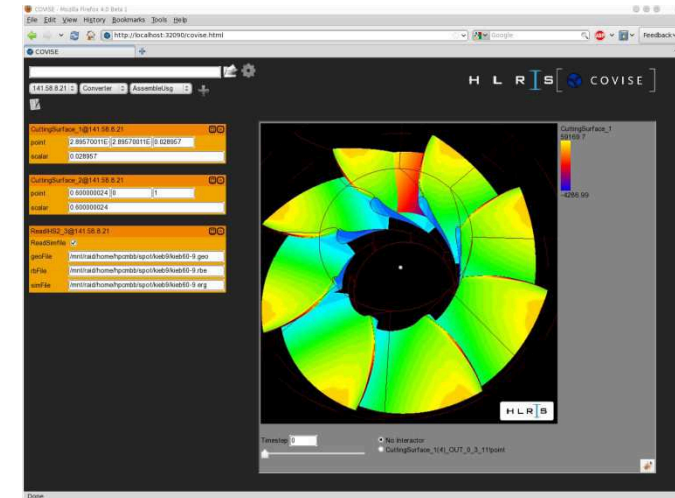
- GRID Simulation Workflows (GT4)
 - Web Portal Integration
- Use distributed computing resources
 - Automatic Simulation Optimization
 - COVISE Post-Processing Service
 - Post-Processing results as VRML files





COVISE WebService Interface

- Standard conformant networked API
- Can be used to support a multitude of user interfaces
- Includes a ready to use Browser based user interface





WebGL Integration

