

Scalable Multi-Resolution Streaming for the interactive Analysis of Large Simulation Data Sets

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The conflict

- Very large simulation data sets
 - Too large to be fastly loaded from file system
 - Too large to completely fit into main memory
 - Too large to be fastly processed
- Wishes regarding interactive visualization methods
 - To get a quick survey over simulation results
 - To examine the data interactively

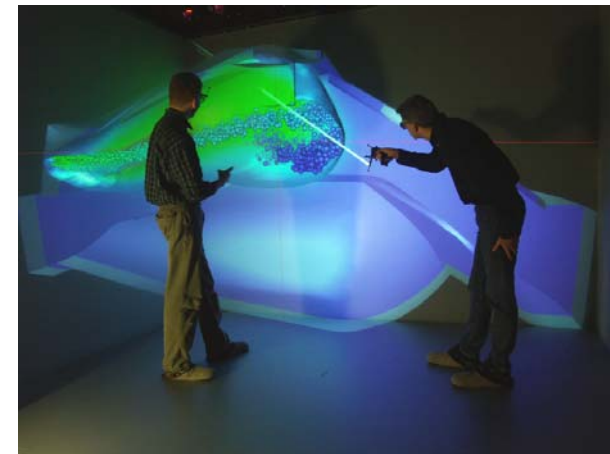


Fig.: Interactive visualization of instationary flow phenomena in an immersive environment



Development of scalable methods

- Data sets
 - Large instationary simulation data sets
 - structured, multi-block, unstructured

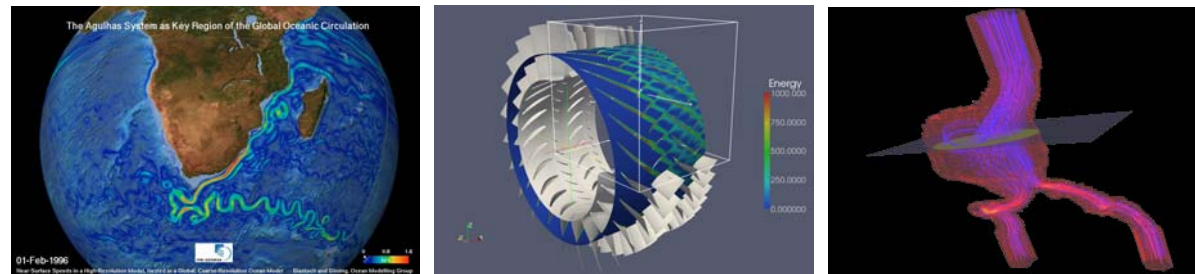


Fig.: Sample data sets (Agulhas, compressor, Aorta aneurysm)

- Computer systems
 - Desktop computers, cluster of workstations, supercomputers
- Visualization
 - From visualization workstation to immersive VR systems



Approaches for solutions

- Multi-resolution data format
 - For storing the data in the file system
 - Fast access to level-of-details and data blocks
 - For the (progressive) streaming through the postprocessing pipeline
- Many-core systems
 - Development of optimized postprocessing algorithms for parallel extraction and MR streaming
- Modern GPU architectures
 - Postprocessing support (GPGPU)
 - High quality presentation of results
 - Methods for interactive visualization

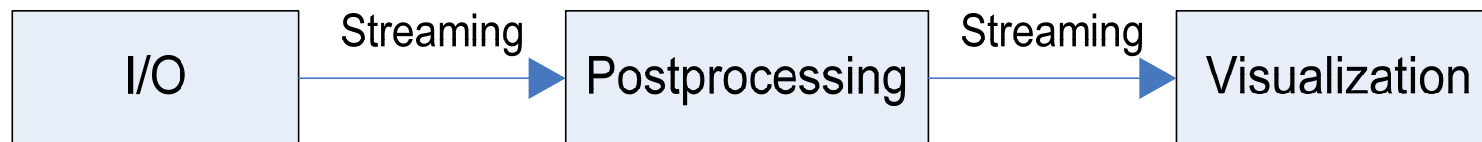


Fig.: Streaming pipeline for the postprocessing of simulation data



Multi-resolution data streaming

- Central objective
 - To provide all segments of the complete postprocessing pipeline permanently with sufficient data
- Interactive analysis
 - To immediately produce first results
 - By permanent MR streaming, to present the visualized results with increasing level-of-detail
- Development of a performance model
 - For the balanced control of the data provision for all segments of the postprocessing pipeline

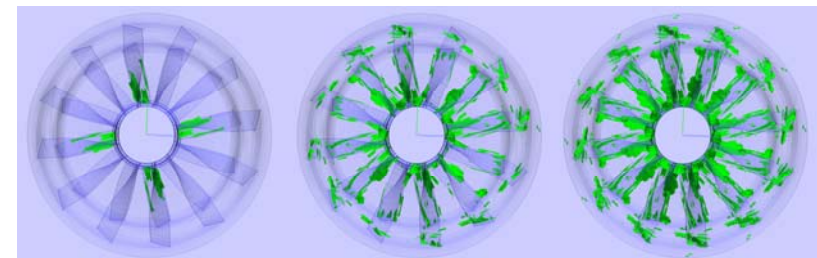


Fig.: MR extraction and streaming of lambda-2 eddies in a propfan data set