

Live Demonstration of In Situ Visualization on Accelerator Processors

Objective

- Scientific discovery using 100 petascale to exascale supercomputers requires integrated visualization solutions on new computational hardware.
- Multiple technologies to be implemented and integrated.

Technology

- ParaView: existing HPC visualization infrastructure leveraging VTK over large MPI jobs with user interaction.
- Catalyst: in situ coupling of ParaView to simulations.
- VTK-m: toolkit for the development and distribution of visualization algorithms on multicore and accelerators.
- PyFR: CFD simulation running on 256 GPU devices of Oak Ridge's Titan supercomputer to analyze the turbulence behind a new serrated jet engine nozzle.

Impact

- A demonstration at SC 2015 shows the integration of these 4 key technologies for a live analysis of the simulation.
 - Top right: The pockets of air in the jet wake reduce noise.
 - Direct right: A live interactive visualization of a large simulation running on Titan viewed and controlled on the show floor in Austin.
- The entire process from simulation to analysis to rendering happens locally on the GPUs without memory transfer.
 - As increasing limitations in network, power, and storage limit the movement of data, sharing resources is critical for effective analysis.

