

Massively Threaded Visualization Algorithms for the Next Generation of High Performance Computing

Objective

- Develop readiness for scientific data analysis and visualization at extreme scale.
 - Address challenges of emerging architectures.
- In addition to designing our own algorithms, build a toolkit that enables others to build algorithms.

Technology

- The Dax Toolkit: a visualization toolkit containing a framework that reduces the challenges of writing highly concurrent algorithms.
- Current investment is 3 year project.
- Supports simple porting across CPU and GPU architectures.
- Algorithms written at higher abstraction have performance comparable to alternates written by experts with APIs providing full access to parallel features.

Impact

- Dax applied to analysis of N-body cosmology simulation to identify void, pancake, filament, and clump features.
- Requires expensive operation of finding cells in irregular, self-intersecting mesh.
- Dax demonstrates finding cells while yielding speedups of up to $22 \times$ with multiple cores and $65 \times$ using a GPU.

