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Sandia National Laboratories

SDAV Progress Report

Sandia National Laboratories

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VTK-m Update (1)

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- Specialization of explicit cell set with one cell type
- **Threshold algorithm**
- Better worklet 1D/3D index management
- Improved multi-device support
- Improved device adapter selection
- **Support cell-to-point connections in explicit data**
- Work around Thrust bugs
- Writable ArrayHandleTransform
- Fixed performance issue with OpenGL Interop
- **Basic file I/O (legacy VTK format)**

VTK-m Update (2)

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- **Basic streamline support (uniform grids)**
- Improved “scatter” behavior support
  - **Greatly simplified Marching Cubes implementation**
- Improved min/max performance
- Better support for random array access in worklets
- Improve compiler flag management
  - Vectorization flags/CUDA capabilities flags

Intel / VTK-m Design Review

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- During SC arranged a meeting between core VTK-m developers and Intel hardware/software engineers
  - Organized through Jim Jeffers and Ingo Wald
- Intention of meeting to review VTK-m implementation (particularly the scheduling mechanism)
  - An eye toward the Xeon Phi KNL
- A big focus was getting VTK-m code to vectorize
  - Want to vectorize user code without worrying about it
  - Got lots of help from Xinmin Tian and Rakesh Krishnaiyer, two Intel compiler experts
  - With the appropriate pragmas and compiler flags made improvements to the vectorization of VTK-m code
- Intel also interested in our use of TBB features (such as sort)
  - Have been in contact with Alexey Kukanov

IEEE Vis Activities

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- Tutorial: ParaView
- Panel: Color Mapping in Vis: Perspectives on Optimal Solutions
- Co-Chair: Vis Lies 2015

SC Activities

- Tutorial: Large Scale Visualization with ParaView
- Invited talk: “VTK-m: Building a Visualization Toolkit for Massively Threaded Architectures,” Ultrascale Visualization 2015
  - Also gave a similar talk at the Kitware booth
- Aforementioned meeting with Intel

VTK-m Demo at SC

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- Live demo of using VTK-m in situ with PyFR
- Simulation run on Oak Ridge's Titan
  - PyFR with ParaView Catalyst integrated
- Within Catalyst, series of VTK-m algorithms run on data
  - Everything run directly on GPU without pulling memory to CPU
- Live stream to show floor in Austin with runtime controls
- http://m.vtk.org/index.php/SC15_Kitware_Booth_Presentations