Trilinos Users Group
Data Services Update

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with contributions from

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Erik Boman (Zoltan2 team)

Alan Williams (STK team)

SEACAS / IOSS / Exodus
(POC: Greg Sjaardema)

- New Features
  - Assemblies – hierarchical groups of blocks/sets/assemblies
  - Blobs -- store arbitrarily-sized objects in an exodus file
  - Entity Attributes -- "provenance" or annotation data on entities and fields
  - Aprepro – Arrays, Exodus integration
  - Exodus.py – python3, improved capabilities, testing
- New Integrations – FAODEL, Catalyst2, ADIOS2, TextMesh
- In progress:
  - Discontinuous Galerkin Fields
  - HDF5 VOL
  - Compression (lossy and lossless)
- Others: windows, scalability, code quality

Kokkos Core 3.4
(POC: Christian Trott)

- HIP Backend works in previous release
  - Performance Improvements for HIP backend
- SYCL Backend Almost Feature Complete
  - Trilinos Tpetra and LAMMPS work now
  - Ongoing issues: Fine grained tasking, and arbitrary sized atomics.
- OpenMPTarget Backend Almost Feature Complete
  - OpenMPTarget still has issues with some custom reduction stuff in addition.
- Require CMake 3.16 or newer

See Brian Kelley's talk at 11am:
Trilinos Support on AMD and Intel GPUs

Kokkos Kernels 3.4
(POC: Siva Rajamanickam)

- Added full support for HIP
  - Integration with Trilinos is complete and tested on Spock
- Initial support for SYCL
  - Most features functional (coloring algorithms and some batched algorithm still disabled)
  - Integration in Trilinos has started

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- Improved support for half precision
- ArmPL library support in specific kernels
- Distance 2 Maximal Independent Set (MIS-2)
- Partial coloring as input for coloring algorithms
- Improved two-stage Gauss-Seidel performance (added damping)
- Supernodal SpTRSV improvements (use batched algorithms internally)

Zoltan2
(POC: Erik Boman)

- First multi-GPU graph partitioner for distributed-memory systems: Sphynx
  - Sphynx: Spectral Partitioning for HYbrid aNd aXelarator-based systems
  - Uses several Trilinos packages (Tpetra, Anasazi, Ifpack2, MueLu)
  - Uses Kokkos for performance portability
  - Compared to ParMETIS, Sphynx is faster on irregular graphs and obtains similar quality partitions on regular graphs

- New Multi-GPU graph coloring:
  - Distance-1, Distance-2 and Partial Distance-2 coloring
  - Uses Teuchos::Comm and Kokkos to run with MPI+GPU
  - Zoltan2 TpetraCrsColorer interface accepts Tpetra matrix as input

STK
(POC: Alan Williams)

- GPU: Improving the performance of synchronizing Fields between CPU and GPU memory spaces.
  - Primarily for Sierra SM
- AMD/HIP: stk-mesh unit-tests now build and run on AMD platforms, using ROCM 4.3.
  - Primarily for Exawind
- STK Balance: improving work-flow and performance of Balance and BalanceM2N coming soon.