SAND2010-7655P

Trilinos Linear and Eigen Solvers Capability Area Update

Trilinos User Group Meeting

Tuesday, November 2nd, 2010

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Outline

- New L&E developers
- Highlights for existing packages
  - Teko
  - Anasazi
  - Belos
- New Packages
  - Ifpack2
  - MueLu

New Developers

- Jeremie Gaidamour (MueLu)
- Axel Gerstenberger (MueLu)
- Mark Hoemmen (Belos, Anasazi, Kokkos)
- Siva Rajamanickan (Amesos2, new Zoltan)

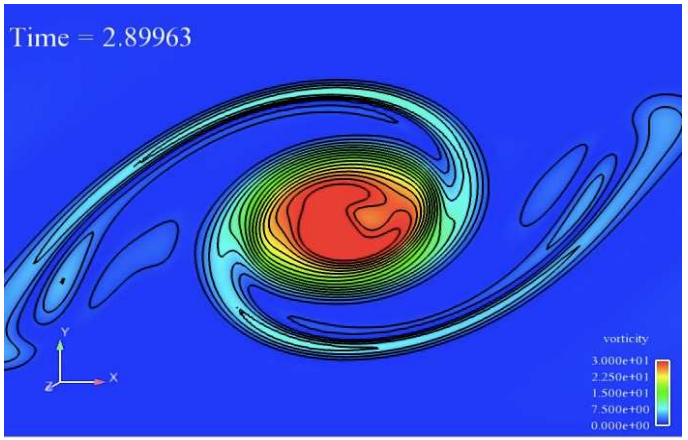
Teko: Segregated Preconditioning

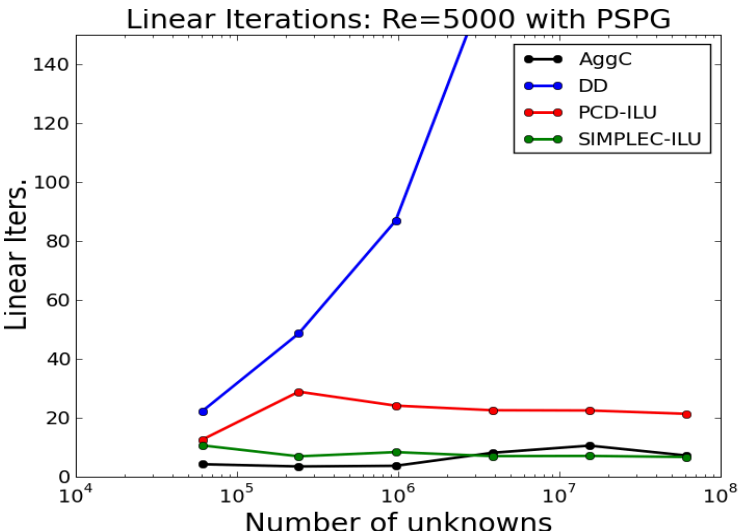
POC: Eric Cyr

Released in Trilinos 10.6. Being used in preconditioner R&D in ocean modeling code. Competitive with black box AMG for NS.

FY11

Continue R&D for multiphysics applications: MHD and drift-diffusion (semi-conductors). Continue development of block smoothing capability.





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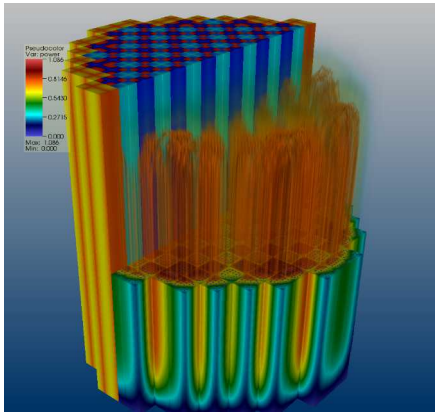
Anasazi – Parallel Eigensolver

POCs: Chris Baker, Heidi Thornquist, Mark Hoemmen

Highlights

- Used in Denovo* neutron transport code. **Impact**: 2x speedup over previous native power iteration on **100K** cores in long-running PWR simulation.
- GPU capable, courtesy of Tpetra
- New orthogonalization manager capabilities
- MultiVecTraits adaptors and tests.



(courtesy of T. Evans, ORNL)

FY11

Expand use of Anasazi in Denovo

*parallel, 3-D, discrete-ordinates (SN) linear transport code (C++, PYTHON,F95) @ ORNL

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Belos – Krylov methods

POCs: Heidi Thornquist, Mike Parks, Mark Hoemmen

Highlights

- New orthogonalization manager capabilities
- Fast and accurate TSQR (Tall Skinny QR) kernel*, with Tpetra adaptor.
- MultiVecTraits adaptors

FY11

- Tests for multiVecTraits adaptors
- Begin using in Denovo

*actually in Kokkos

New Packages Under Development

Ifpack2 – Algebraic Preconditioners

POC: Alan Williams

Highlights

Templated preconditioners compatible with Tpetra objects. Currently provides five types of preconditioners (incomplete factorizations, Chebyshev, SOR)

Thoroughly tested, including unit-tests and example driver that is XML-controlled and can read matrix-market files.

For more details, see Alan's talk @ 2:15pm today.

MueLu – Multigrid Framework

POCs: Jeremie Gaidamour, Jonathan Hu, Ray Tuminaro, Chris Siefert, Axel Gerstenberger

FY10

Complete prototype written as Matlab toolbox (now in copyright process)

FY11

Linear algebra adapters to Epetra, Tpetra

Core smoothed aggregation, energy minimization kernels