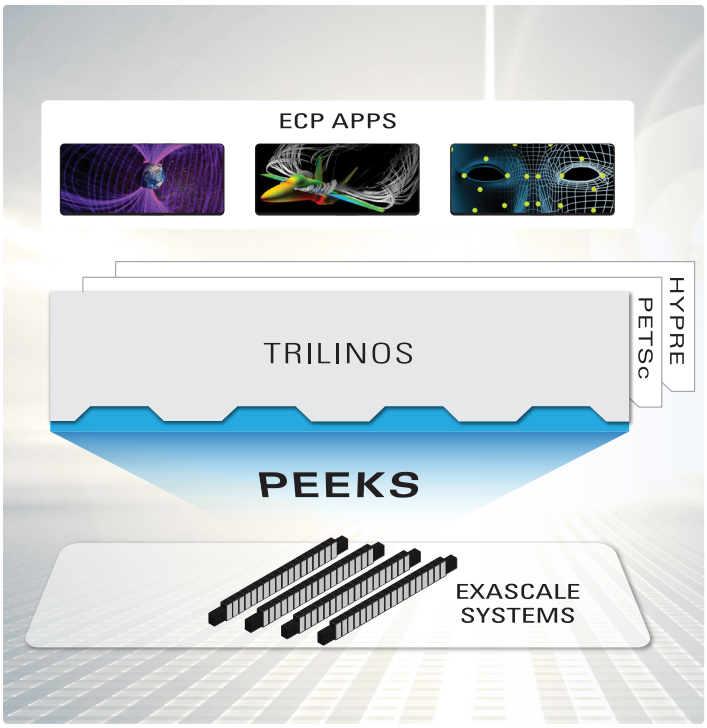
PEEKS

ADVANCING THE CAPABILITIES OF THE ECP SOFTWARE STACK



Many large-scale applications of interest to the DOE and the broader community rely heavily upon preconditioned iterative solvers for large linear systems. In order for these solvers to exploit current and future leadership-class supercomputers, both the solver algorithms and implementations must be redesigned to address emerging challenges. These challenges include extreme concurrency, complex memory hierarchies, costly data movement, and heterogeneous node architectures.

The PEEKS project is a focused team effort to advance the capabilities of the ECP software stack by making the new scalable algorithms accessible within the Trilinos ecosystem. Targeting exascale-enabled Krylov solvers, incomplete factorization routines and parallel preconditioning techniques will ensure successful delivery of scalable Krylov solvers in robust production-quality software that can be relied upon by ECP application projects. We will produce modular, compatible interfaces, supporting easy interchangeability between solver modules, including custom-designed functionality, and the ability to respond to future software and hardware trends.

In order to develop the interfaces for PEEKS algorithms, we plan to collaborate with other ECP projects, including the xSDK and SLATE projects, as well as application scientists.

PUBLICATIONS

Anzt, H., E. Boman, J. Dongarra, G. Flegar, M. Gates, M. Heroux, M. Hoemmen, J. Kurzak, P. Luszczek, S. Rajamanickam, et al., **"MAGMA-sparse Interface Design Whitepaper,"** *Innovative Computing Laboratory Technical Report*, no. ICL-UT-17-05, September 2017.

Anzt, H., Yamazaki, I, M. Hoemmen, E. Boman, and J. Dongarra, **"Solver Interface & Performance on Cori,"** *Innovative Computing Laboratory Technical Report*, no. ICL-UT-18-05, University of Tennessee, June 2018.

Yamazaki, I., M. Hoemmen, P. Luszczek, and J. Dongarra, **"Improving performance of GMRES by reducing communication and pipelining global collectives,"** *Proceedings of The 18th IEEE International Workshop on Parallel and Distributed Scientific and Engineering Computing (PDSEC 2017)*, Orlando, FL, June 2017.

EXASCALE COMPUTING PROJECT

PEEKS is part of ICL's involvment in the Exascale Computing Project (ECP). The ECP was established with the goals of maximizing the benefits of high-performance computing (HPC) for the United States and accelerating the development of a capable exascale computing ecosystem. Exascale refers to computing systems at least 50 times faster than the nation's most powerful supercomputers in use today.

FIND OUT MORE AT **https://exascaleproject.org**

FIND OUT MORE AT **http://icl.utk.edu/peeks**

MAGMA WEBSITE
http://icl.utk.edu/magma

THE TRILINOS PROJECT
https://trilinos.org/

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