REPLACING ScaLAPACK

ScaLAPACK was first released in 1995, 22 years ago. To put it in perspective, this was one year after version 1.0 of the MPI standard was released, and two years before the OpenMP Fortran 1.0 specification was released. The fastest machine on the TOP500 list was the Japanese Numerical Wind Tunnel, with peak performance of 235.8 GFLOPS. This was the year when Microsoft acquired NCSA Mosaic to build the Internet Explorer.

The past two decades witnessed tectonic shifts in the hardware technology, followed by paradigm shifts in the software technology, and a plethora of algorithmic innovation in scientific computing. At the same time, no viable replacement for ScaLAPACK emerged, that would channel this technological progress into a robust software package. SLATE is meant to be this replacement with superior performance and scalability in distributed memory environments with multicore processors and hardware accelerators.

HIGHLIGHTS

Targets Modern Hardware
such as the upcoming CORAL systems, where the number of nodes is large, and each node contains a heavyweight multicore processor and a number of heavyweight hardware accelerators.

Guarantees Portability
by relying on standard computational components (vendor implementations of BLAS and LAPACK), and standard parallel programming technologies (MPI, OpenMP) or portable runtime systems (e.g., PaRSEC).

Provides Scalability
by employing proven techniques of dense linear algebra, such as the 2D block cyclic data distribution, as well as modern parallel programming approaches, such as dynamic scheduling and communication overlapping.

Facilitates Productivity
by relying on the intuitive Single Program Multiple Data (SPMD) programming model and a set of simple abstractions to represent dense matrices and dense matrix operations.

Assures Maintainability
by employing useful facilities of the C++ language, such as templates and overloading of functions and operators, and focusing on minimizing code bloat by relying on compact representations.

SLATE WORKING NOTES
http://www.icl.utk.edu/publications/series/swans

SWAN003 Designing SLATE: Software for Linear Algebra Targeting Exascale
Kurzak, J., P. Wu, M. Gates, I. Yamazaki, P. Luszczek, G. Ragghianti, and J. Dongarra

SWAN002 C++ API for BLAS and LAPACK
Gates, M., P. Luszczek, J. Kurzak, J. Dongarra, K. Arturov, C. Cecka, and C. Freitag


FIND OUT MORE AT http://icl.utk.edu/slate

MAIN ECP WEBSITE
https://exascaleproject.org

BLAS++ REPOSITORY
https://bitbucket.org/icl/blaspp

SLATE REPOSITORY
https://bitbucket.org/icl/slate

LAPACK++ REPOSITORY
https://bitbucket.org/icl/lapackpp

RESEARCHGATE
https://www.researchgate.net/project/ECP-SLATE

SLATE USER GROUP
https://groups.google.com/a/icl.utk.edu/forum/#!forum/slate-user

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