DPLASMA (Distributed Parallel Linear Algebra Software for Multicore Architectures) is the leading implementation of a dense linear algebra package for distributed heterogeneous systems. Unlike any predecessor, DPLASMA depicts algorithms using data flow principles, as pure data dependencies between BLAS kernels. The resulting dataflow depiction takes advantage of the state-of-the-art distributed runtime, PaRSEC, to achieve portable and sustained performance never seen before on heterogeneous distributed systems.

**USER DEFINED DATA PLACEMENT**

In addition to traditional ScaLAPACK (block-cyclic) data distribution, DPLASMA provides interfaces to define arbitrary data collections with unrestrained distributions. The DPLASMA data flow algorithms transparently operate on local data, or introduce implicit communications to resolve dependencies, removing the burden of initial data re-shuffle, and providing the user a novel approach to address load balance.

**FUNCTIONALITY**

<table>
<thead>
<tr>
<th>Linear Systems of Equations</th>
<th>Cholesky, LU (inc. pivoting, PP), LDL (prototype)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least Squares</td>
<td>QR &amp; LQ</td>
</tr>
<tr>
<td>Symmetric Eigenvalue Problem</td>
<td>Reduction to Band (prototype)</td>
</tr>
<tr>
<td>Level 3 Tile BLAS</td>
<td>GEMM, TRSM, TRMM, HEMM/SYMM, HERK/SYRK, HER2/SYRK</td>
</tr>
<tr>
<td>Auxiliary Subroutines</td>
<td>Matrix generation (PLRTN, PLGHE/PLGSY, PLTMG), Norm computation (LANE, LANHE/LANSY, LANTR), Extra functions (LASET, LACPY, LASCAL, GEAAD, TRADD, PRINT), Generic Map functions</td>
</tr>
</tbody>
</table>

**FEATURES**

- Recursive DAG Instantiation, allowing heterogeneous tile size executions to tune for heterogeneous devices
- Covering four precisions: double real, double complex, single real, single complex (D, Z, S, C)
- Providing ScaLAPACK-compatible interface for matrices in F77 column-major layout
- Supporting: Linux, Windows, Mac OS X, UN*X (depends on MPI, hwloc)

**FUTURE PLANS**

- Fine-grain Composition of Operations
- Two-sided Factorizations
- Distributed Sparse Solver
- More GPU kernels integration
- LU+RBT
- BLR Solver

**ENERGY EFFICIENCY**

Solving Linear Least Square Problem (DGEQRF)

System: Virginia Tech, 32-node, 256-core, Intel Xeon 2.8GHz, 182GB

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

IN COLLABORATION WITH

WITH SUPPORT FROM

SPONSORED BY

National Science Foundation