

# Performance of Sparse Direct Solve for Manycore Architecture

This paper describes objective technical results and analysis. Any subjective views or opinions that might be expressed in the paper do not necessarily represent the views of the U.S. Department of Energy or the United States Government.

- important kernel in many applications, but challenging to parallelize
  - Sparsity structure may limit the parallel scalability
- each process uses sparse direct solve
  - SIERRA-Structural Dynamics (SIERRA-SD):** distributed domain-decomposition based linear solver uses a **local** direct solver and applies SpTRSV  $\sim 10^4$  times for each factorization
- study two algorithmic variants
  - Supernode block** based level-set scheduling to exploits hierarchical parallelism
    - all the leaf-supernodes in parallel
    - threaded kernels on each block column
  - Partitioned inverse** transform SpTRSV into a sequence of SpMV
- Kokkos & Kokkos-kernels**
  - Portable to different manycore architectures
  - Some more details in the paper

