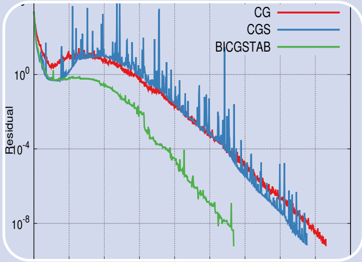
If necessary, programmer should control whether task particles_pushall executes on the same compute unit during failure recovery

Programming Models & Runtimes

- Enhance and prepare for exascale the widely used MPI and OpenMP programming models (hybrid programming models, deep memory copies)
- Develop performance portability tools (Kokkos and Raja)
- Support alternate models for potential benefits and risk mitigation: PGAS (UPC++/GASNet), task-based models (Legion, PaRSEC)
- Libraries for deep memory hierarchy and power management

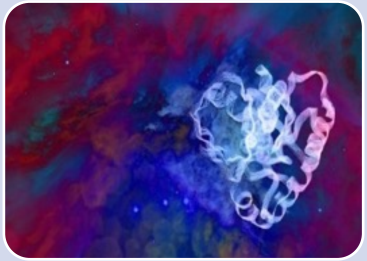


Development Tools

- Continued, multifaceted capabilities in portable, open-source LLVM compiler ecosystem to support expected ECP architectures, including support for F18
- Performance analysis tools that accommodate new architectures, programming models (PAPI, Tau)

Math Libraries

- Linear algebra, iterative linear solvers, direct linear solvers, integrators and nonlinear solvers, optimization, FFTs
- Performance on new node architectures; extreme strong scalability
- Advanced algorithms for multi-physics, multiscale simulation and outer-loop analysis
- Increasing quality, interoperability, complementarity of math libraries



Data and Visualization

- I/O via the HDF5 API
- Insightful, memory-efficient in-situ visualization and analysis – data reduction via scientific data compression
- Checkpoint restart

E4S

Software Ecosystem

- Develop features in Spack necessary to support all ST products in E4S and the AD projects that adopt it
- Develop Spack stacks for reproducible turnkey deployment of large collections of software
- Optimize and ensure interoperability of containers on HPC systems
- Regular E4S releases of the ST software stack and SDKs with regular integration of new ST products

NNSA
National Nuclear Security Administration

NNSA ST

- Open source NNSA Software projects
- Projects that have both mission role and open science role
- Major technical areas: new programming abstractions, math libraries, data and viz libraries
- Cover most ST technology areas
- Subject to the same planning, reporting, and review processes