Performance Evaluation and Analysis Consortium (PEAC) End Station

Presented by

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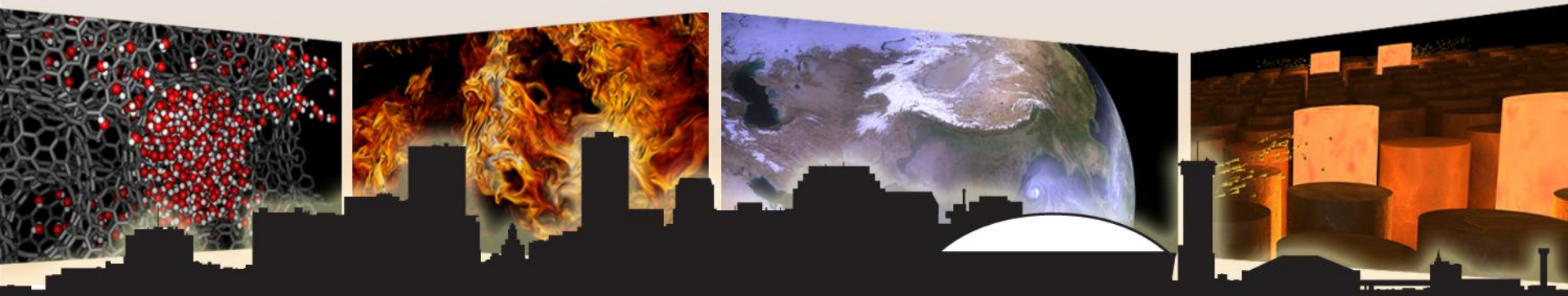


U.S. DEPARTMENT OF ENERGY

OAK RIDGE National Laboratory

Overview

The PEAC End Station provides the performance evaluation and performance tool developer communities access to the Leadership Computing Facility (LCF) systems

Consortium goals	
System evaluation	• Evaluate the performance of LCF systems using standard and custom micro-, kernel, and application benchmarks • Determine efficient usage techniques and identify and characterize system performance issues
Performance tools	• Port performance-related tools and system infrastructure to LCF systems and make them available to Oak Ridge Leadership Computing Facility (OLCF) and Argonne Leadership Class Facility (ALCF) users • Further develop the tools to take into account the scale and unique features of LCF systems
Performance modeling	• Validate the effectiveness of and further develop performance characterization and prediction methodologies for LCF systems

Overview (continued)

Consortium goals (continued)	
Application analysis and optimization	• Analyze and help optimize performance of current and candidate LCF application codes
Performance and application community support	• Provide access to other performance researchers who are interested in contributing to the performance evaluation of the LCF systems or in porting complementary performance tools of use to the OLCF user community • Provide access to application developers who wish to evaluate the performance of their codes on LCF systems

All of this must be accomplished while adhering to the "Golden Rules" of the PEAC community:

- Low visibility (no production runs!)
- Open and fair evaluations
- Timely reporting of results

Status as of September 1, 2010

15 active ALCF users, 52 active OLCF users

Working on

- System performance evaluation (9)
- Application performance analysis and optimization (27)
- Application performance modeling (7)
- Performance tool development (32)
- Performance-related system infrastructure development (12)

many working in multiple areas

Consuming

- XT5: 15,000,000 processor hours out of an allocation of 25,000,000 hours
- BG/P: 4,400,000 processor hours out of an allocation of 8,000,000 hours

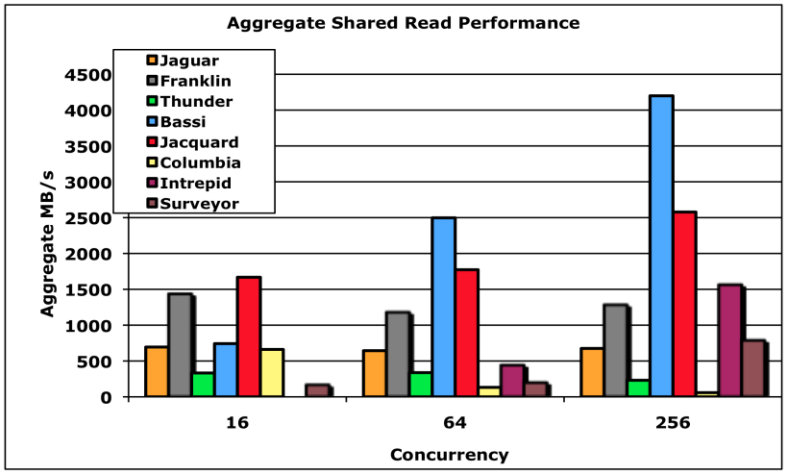
since January 1, 2010

Contributing to (at least)

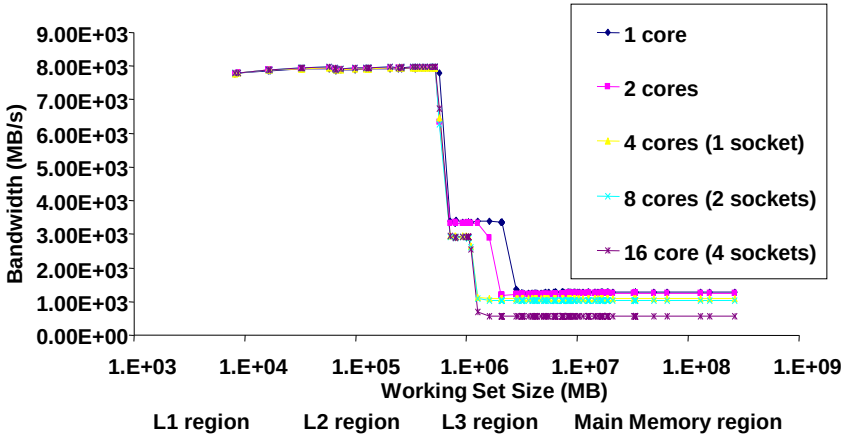
- Two journal articles
- Eight proceedings papers: 2 CUG, 2 ICS, 1 PPoPP, 3 SC10
- More than 20 oral and poster presentations
- Eight code releases
- One Ph.D. dissertation

appearing since January 1, 2010

Subsystem evaluations

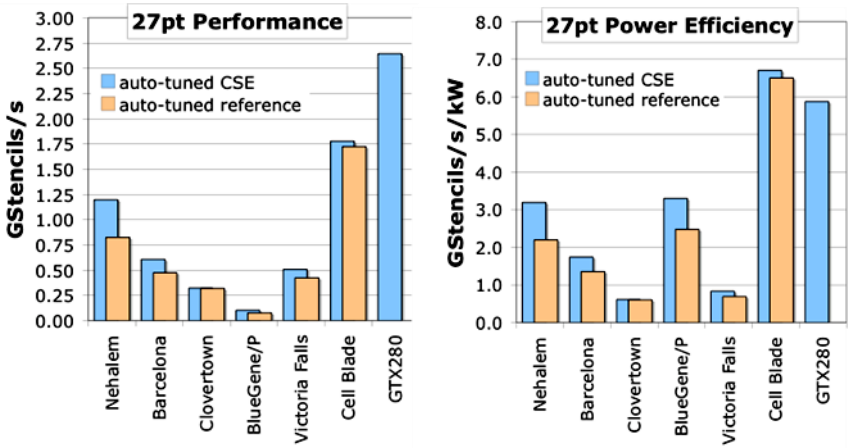


I/O performance characterization [LBL]

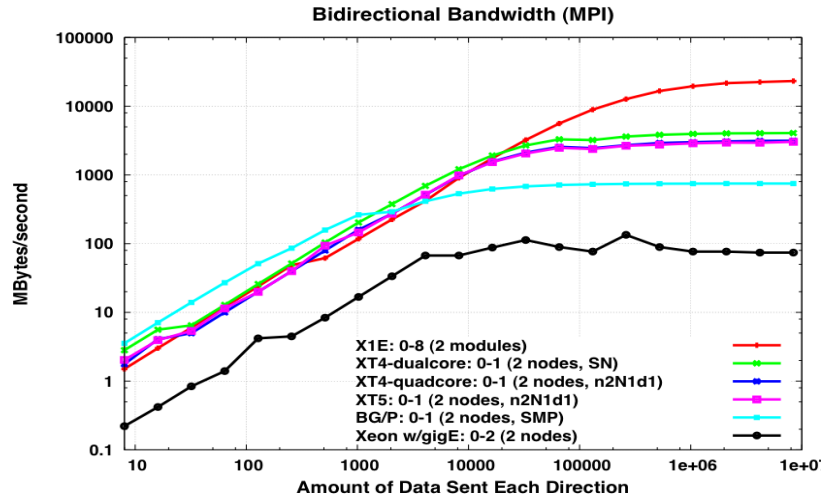


Effect of dual- to quad-core upgrade on memory hierarchy bandwidths [SDSC]

Finite difference Laplacian stencil benchmark



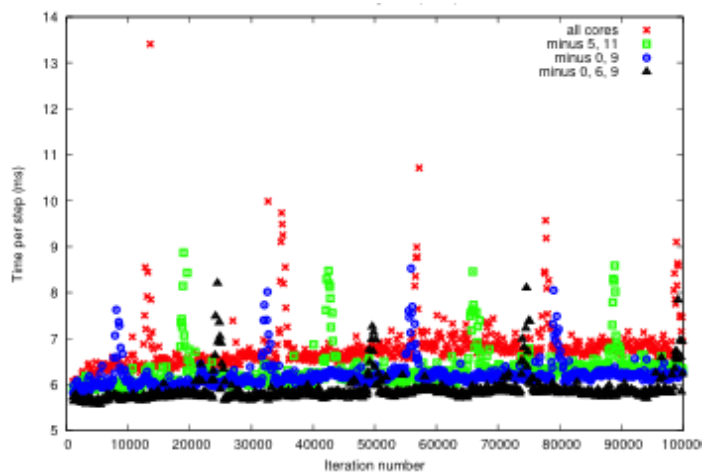
Performance impact of auto-tuning [LBL]



MPI performance evaluation [ORNL]

Application analyses and benchmarks

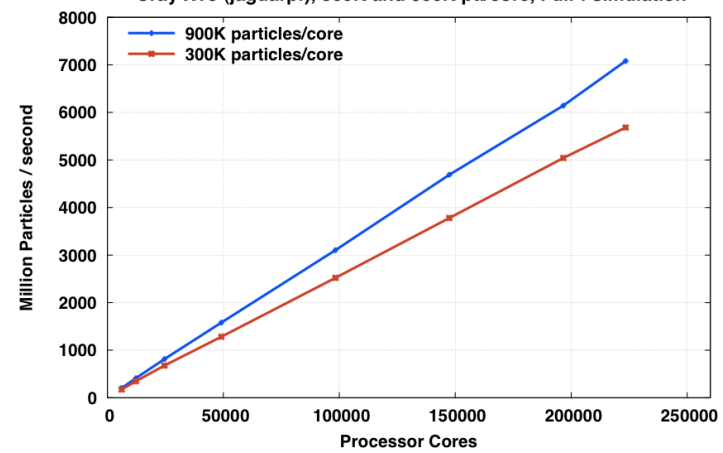
NAMD on Cray XT5 (IAPP)



Measuring impact of system noise [UIUC]

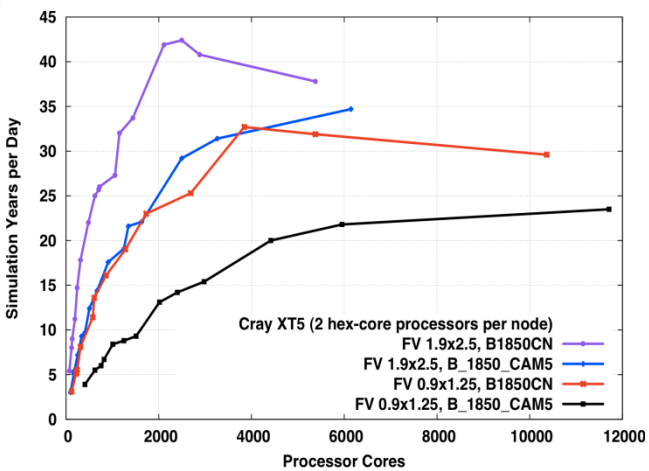
XGC1 performance on 3mm ITER grid

Cray XT5 (jaguarpf), 300K and 900K ptl/core, Full-f simulation



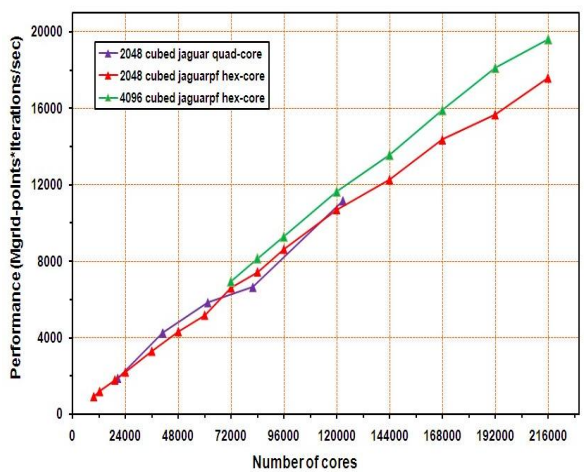
Full system XGC1 weak scaling [ORNL]

CESM (Community Earth System Model)



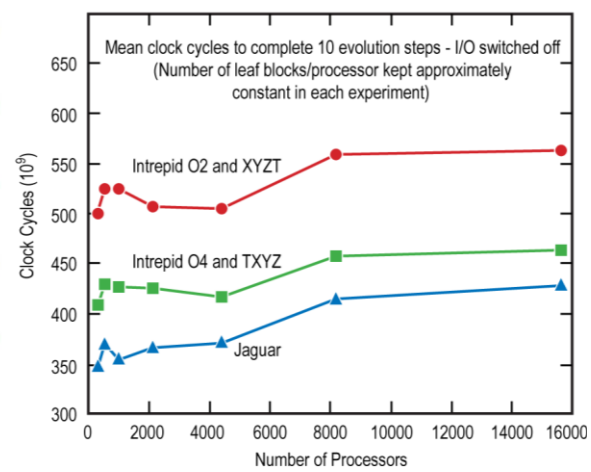
CESM strong scaling [ORNL]

SBLI (Shock/Boundary Layer Interaction code)



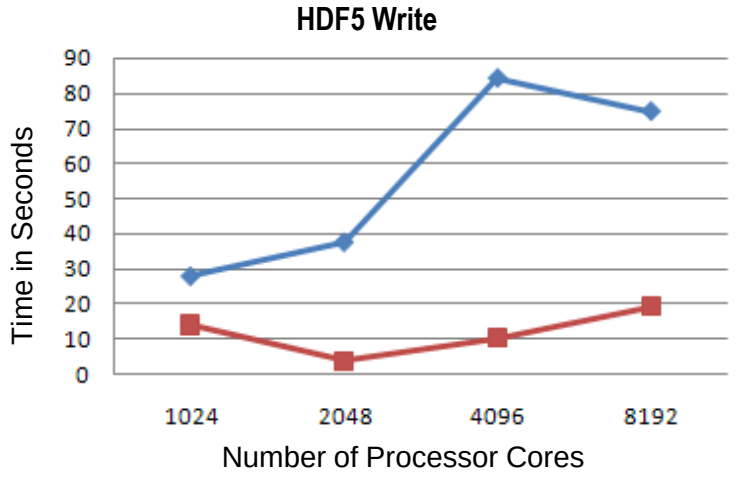
SBLI strong scaling [Daresbury]

FLASH normalized weak scaling

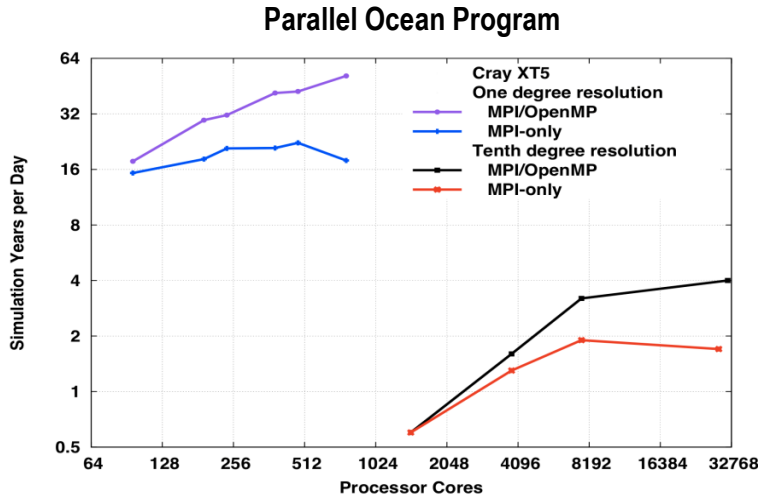


[Univ. of Chicago]

Application porting and optimization

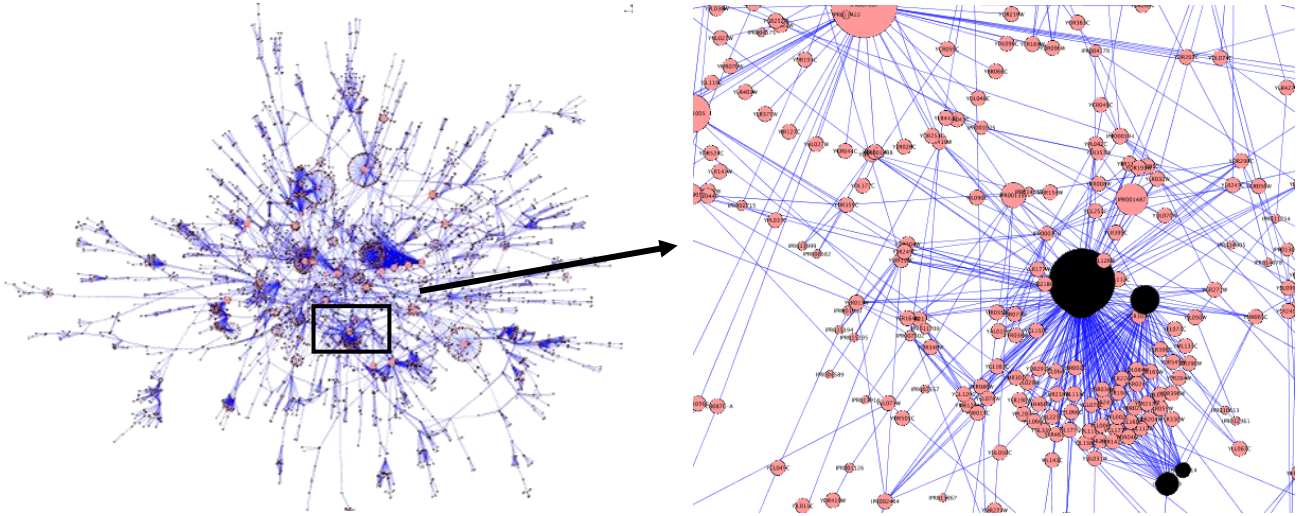


I/O optimization in PFLOTRAN [NCSU]



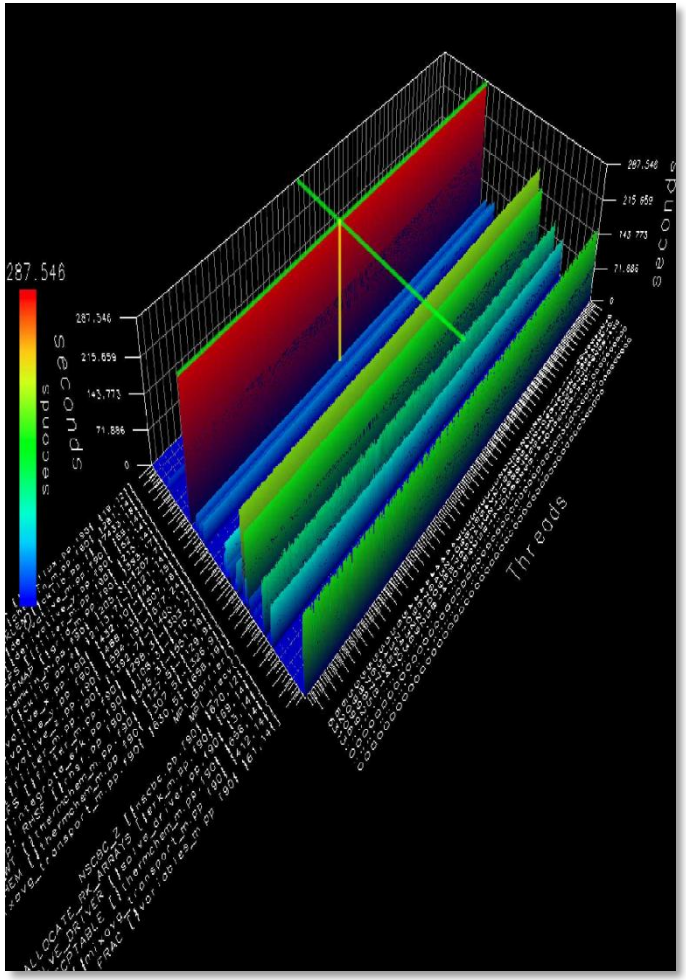
Parallel algorithm optimization [ORNL]

Processing of genomes into domain maps: need improved load balancing that takes into account scale-free nature of the graphs [RENCI, NCSA]

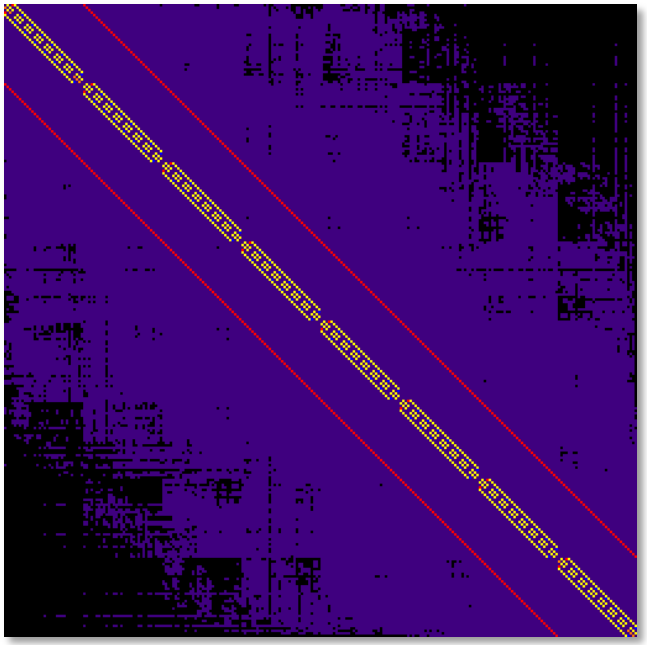


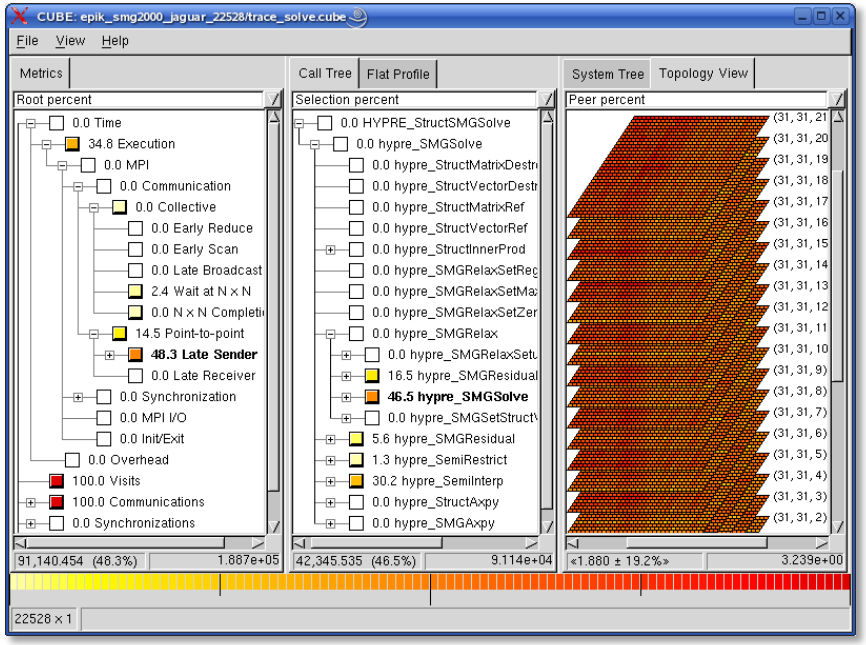
Tool development

TAU graphical display of profile data by thread (Univ. Oregon)



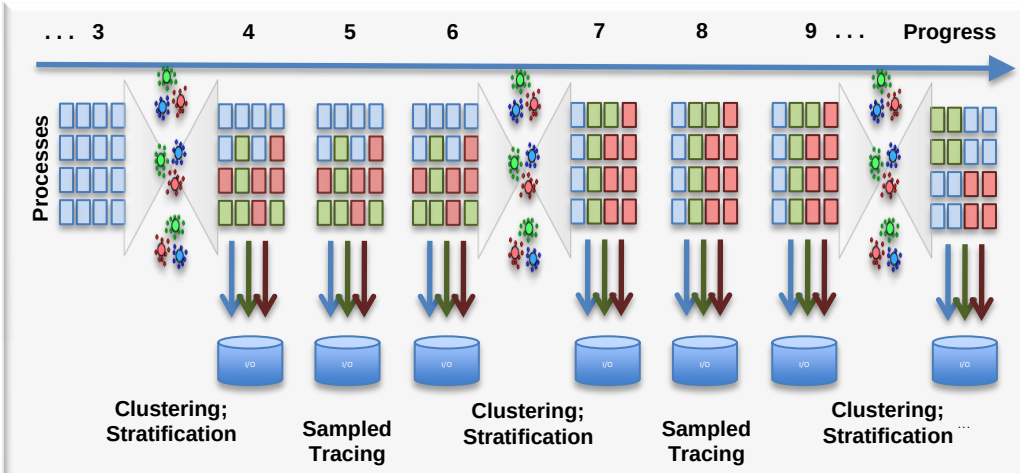
Visualization of point-to-point communication topology collected with mpiP (LLNL, ORNL)



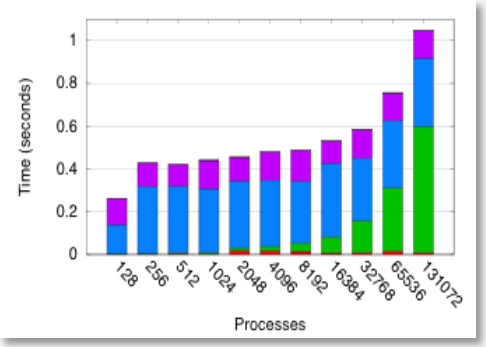


SCALASCA trace-based performance analysis (FZ-Jülich, Univ. Tenn.)

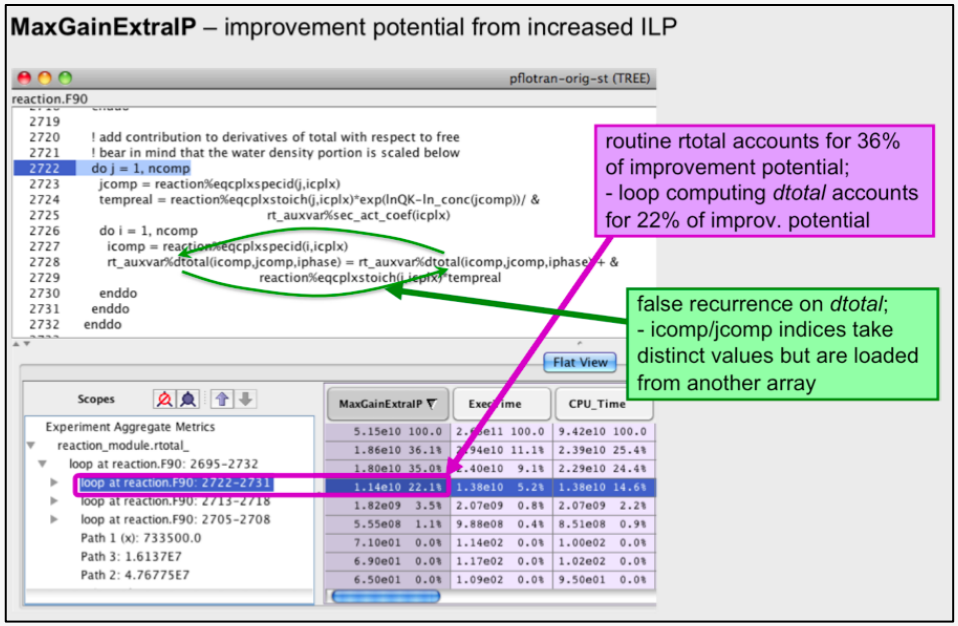
Tool development



Using Clustering Algorithm with Parallel Extensions to K-Medoids (CAPEK) to adaptively sample performance traces (improving performance tracing at scale) [LLNL, RENCI, Microsoft]



Using performance modeling to predict where performance optimization might be most effective [SDSC, ORNL]



Co-principal investigators

University of Illinois at Urbana-Champaign	Lawrence Berkeley National Laboratory	Lawrence Livermore National Laboratory	Oak Ridge National Laboratory	Rice University	University of California–Berkeley and NERSC
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