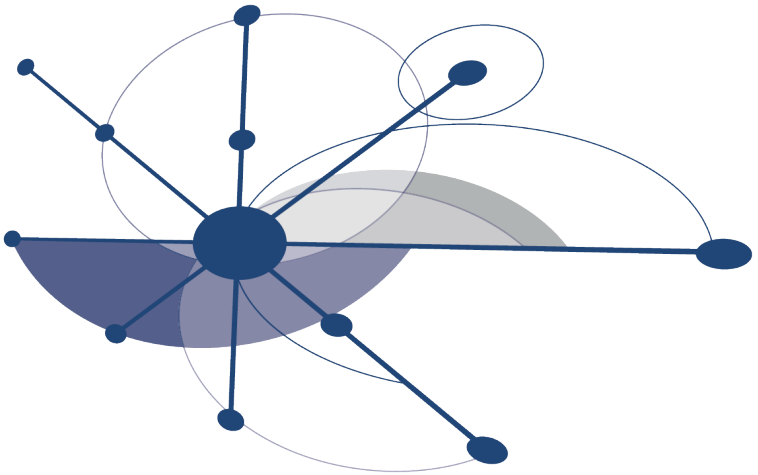
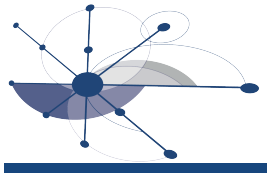


Center for Scalable Application Development Software: Center Overview

John Mellor-Crummey (Rice)

SciDAC
Scientific Discovery through Advanced Computing



Project Co-PIs and Senior Personnel

John Mellor-Crummey, Keith Cooper

Peter Beckman, Ewing Lusk

Jack Dongarra

Bart Miller

Katherine Yelick

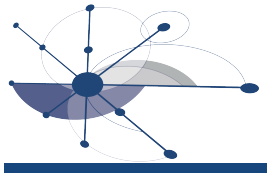
SciDAC Program

- Portfolio of coordinated research to exploit the capabilities of emerging petascale platforms for computational science

- Research projects respond to
  - extraordinary difficulties of realizing sustained peak performance for scientific applications that require petascale computation
  - need for collaborative software environments that combine distributed resources and expertise to address complex questions

SciDAC-2 Mission

- Develop comprehensive scientific computing software infrastructure to enable petascale science
- Develop new generation of data management and knowledge discovery tools for large data sets



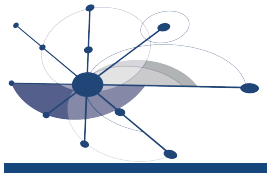
Goals

- Conduct research leading to the design and construction of software tools and systems to help applications scale to the petascale
  - focus on DOE Leadership Class Facilities and parallel systems composed of multicore processors
  - promote application-driven software systems research
  - promote research collaborations with DOE labs and centers, NSF (Teragrid), and industry (systems and software vendors)
- Catalyze activities within the CS community that will lead to visionary new ideas for application development support software
  - work with system vendors, application developers and library designers
  - promote community vision building through summer workshops
- Foster development of new tools by the CS community through support of common software infrastructure and standards

Scalable Application Development Software?

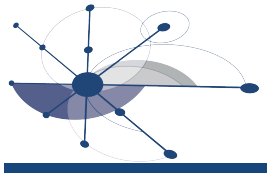
Software that helps applications scale in three different dimensions

- Scale from simple high-productivity languages on a laptop to efficient applications on high-end, single-processor workstations
- Scale from small numbers of processors to full machines consisting of thousands of processors with minimal loss of efficiency
- Scale from a single abstract program representation to tuned implementations for many different high-end machines and heterogeneous processors with minimal programming effort



A Refined Vision

- Provide open source software systems, tools, and components that address a spectrum of needs
  - directly usable by application experts
  - support development of enabling technologies by the CS community
- Target architectures of critical interest to DOE
  - Cray XT
  - Blue Gene/P
  - multicore processors in general
- Engage DOE application teams and vendors
- Engage the research community in SciDAC challenges



CScADS Research and Development

Vertical integration across the petascale software stack

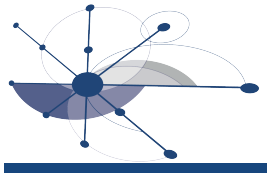
- System software for leadership computing platforms
- Communication libraries
- Math libraries
- Open source compilers
- Performance tool infrastructure
- Performance tools
- Application engagement: analysis and tuning

Community Engagement

CScADS Summer Workshop Series

- Goals
  - identify challenges and open problems for leadership computing
  - brainstorm on promising approaches
  - foster collaborations between computer and application scientists
  - engage the broader community of enabling technology researchers
- Workshops to engage SciDAC and INCITE application teams
  - Leadership class machines, petascale applications, and performance
  - Scientific data analysis and visualization for petascale computing
- Workshops to foster development of enabling technologies
  - Autotuning for petascale systems
  - Performance tools for petascale computing
  - Libraries and algorithms for petascale applications

2009 Workshops at Granlibakken

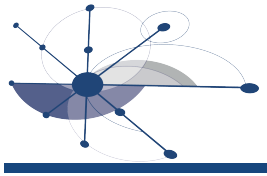


Metrics for Success

- How well are the Summer Institute workshops functioning as a mechanism for two-way exchange of information?
  - as a way of familiarizing consumers with new developments
  - as a driver for change in the research and development plans
- How effectively is the research adapting to the needs of the community while keeping quality at the highest possible level?
- How effectively is the research effort directly interacting with application teams to understand their problems and using solution strategies to influence future directions?
- How effectively is the infrastructure development effort supporting the entire HPC software research community, both within and outside the center?
- How effective is the center at spinning out intermediate results as prototype tools and software for end users and at influencing commercial software products?

Charge Questions

- Scientific and/or technical merit of the project
- Appropriateness of the proposed methods or approach
- Performance under existing award
- Competency of the investigators personnel
- Adequacy of the project resources
- Reasonableness and appropriateness of the budget and work plan



Schedule

9:00 - 9:10	Introduction	John Mellor-Crummey
9:10 - 9:30	System software	Pete Beckman
9:30 - 10:10	Libraries and compilers	Kathy Yelick
10:10 - 10:20	Break	
10:20 - 11:10	Performance tools	Bart Miller, John Mellor-Crummey, Rusty Lusk
11:10 - 11:40	Application engagement	Rusty Lusk, Gabriel Marin
11:40 - 12:00	Summary and plans	John Mellor-Crummey