Status of the US LQCD Infrastructure Project

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Overview

- SciDAC-2 Grant

- The LQCD Computing Project

- DOE Leadership Class Computers

- LQCD Computing Project for 2010 and Beyond

- New Web Pages and Travel Funds

SciDAC-2 Grant

- Funding of approximately $2.2M per year for 4.5 years: September 15, 2006 to March 15, 2011.

- Participation by three national laboratories and ten universities.

- Grant supports software development, but not hardware research and development.

- Viewgraphs from the kickoff workshop can be found at *http://super.bu.edu/~brower/workshop*.

Major Components of SciDAC-2 Software

- Machine specific optimization

  - BlueGene
  - Cray
  - Multi-core processors

- Infrastructure for physics applications

  - Building blocks for inclusion in applications codes
  - Performance analysis and visualization tools
  - Software for the automation of physics workflow
  - Software for the managing of large clusters

- Uniform computing environment for USQCD resources

Lattice QCD Computing Project

- Objectives
  - Acquire the most capable and cost-effective hardware for lattice QCD on a yearly basis
  - Operate the SciDAC Prototype clusters, QCDOC and hardware acquired in the Project

- Hardware Facilities
  - SciDAC Prototype Clusters – 1.7 Tflop/s
  - QCDOC – 4.2 Tflop/s
  - JLab 6n Cluster – 0.6 Tflop/s
  - FNAL Kaon Cluster – 2.1 Tflop/s
  - JLab 7n Cluster – Spring, 2007
  - FNAL Cluster – Combines 2008-2009 Hardware Funds

Lattice QCD Computing Project

- Project Management
  - Don Holmgren has stepped down as Project Manger after getting the project off to an extraordinary start.
  - Bill Boroski has become Project Manager.
  - We are greatly indebted to both!

DOE Leadership Class Computers

- Argonne National Laboratory

  - 100 TF (Peak) IBM BlueGene/P in the summer or fall of 2007.
  - 250–500 TF (Peak) IBM BlueGene/P by the end of FY 2008.
  - 1000 TF (Peak) IBM BlueGene/P by the end of FY 2009.

- Oak Ridge National Laboratory

  - 100 TF (Peak) Cray XT4 in operation.
  - 250 TF (Peak) Cray XT4 by the end of FY 2007.
  - 1000 TF (Peak) System by the end of FY 2008.

Leadership Class Computers: Early User Program

- Purposes of the Program
  - Help break in new computers.
  - Develop and test efficient codes.
  - Create early scientific successes to help justify further investments.
- USQCD is expected to be one of the four early users of the ANL BlueGene/P.

Leadership Class Computers: Incite Program

- The bulk of resources on leadership class computers will be allocated through proposals to the DOE's Incite Program.

- The Executive Committee has been strongly encouraged to submit a single USQCD proposal on behalf of the entire collaboration.

- A USQCD proposal to generate anisotropic clover configurations was allocated 10M core-hours on the ORNL Cray XT4.

- The Executive Committee asked the Scientific Program Committee to develop a process for generating proposals on short notice that are guided by the priorities of the collaboration.

Plans for 2010–2014

- Exciting scientific opportunities and the success of the current LQCD Computing Project justify continued DOE investment in LQCD hardware.

- The Executive Committee proposes a roughly equal mix of flops from Leadership Class Computers and dedicated computers.

  - Leadership class computers would be used primarily for configuration generation and the largest analysis projects.
  - Dedicated computers would be used primarily for analysis projects.
  - There has been a trend to increased number and size of analysis projects as more realistic configurations have become available.

Leadership Class Computers: 2010–2014

- We hope to obtain 10% of the resources available on leadership class computers.

- Under conservative assumptions, an allocation of 10% of the leadership class computers would yield a throughput of at least 33 TF in 2010 growing to 208 TF in 2014.

  - Assume 1,375 TF (peak) by the end FY 2008 as indicated in the President's budget, and Moore's law increases thereafter.

  - Assume we obtain at least 15% of peak.

Dedicated Computers: 2010–2014

- Each year we propose to acquire the hardware that best advances the collaboration's science.

- Using projections based on clusters built to date, a hardware budget of $3M per year would yield a dedicated computer throughput of 34 TF in 2010 growing to 256 TF in 2014.

- An operations budget of $1.46M would be required in FY 2010, which would grow by 4% per year to take into account cost of living increases.

- The FY 2007 hardware and operations budgets are approximately $1.5M and $1.0M respectively.

Proposed Throughput by Fiscal Year

Fiscal Year	Dedicated Hardware (Teraflop/s)	Leadership Class (Teraflop/s)
2010	34	33
2011	61	52
2012	100	82
2013	161	131
2014	256	208

Whitepapers

- A draft of the plan, as well drafts of whitepapers describing major scientific opportunities we expect to be addressed under it, will be available on the USQCD password protected web page shortly.

- Input regarding these drafts would be greatly appreciated.

New Web Pages and Travel Funds

- There is a new set of USQCD web pages.

  - The home page is *http://www.usqcd.org*.
  - Paul Mackenzie is the web master.
  - Please send suggestions to Paul.

- A limited amount of travel support is available.

  - Support for travel related to USQCD projects.
  - Support for travel to attend meetings related to USQCD activities.
  - Highest priority is given to junior members of USQCD and to institutions that do not receive SciDAC-2 funding.
  - Contact Bob Sugar for availability of funds.