Report from the Executive Committee

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USQCD All Hands' Meeting
Fermilab
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Outline

- LQCD Project, 2006-2009
- LQCD-ext Proposal, 2010-2014
- Stimulus Bill Computer
- Incite Grant
- NSF Petascale Computing Resources Proposal
- SciDAC-2 Grant, 2006-2011
- Travel Funds

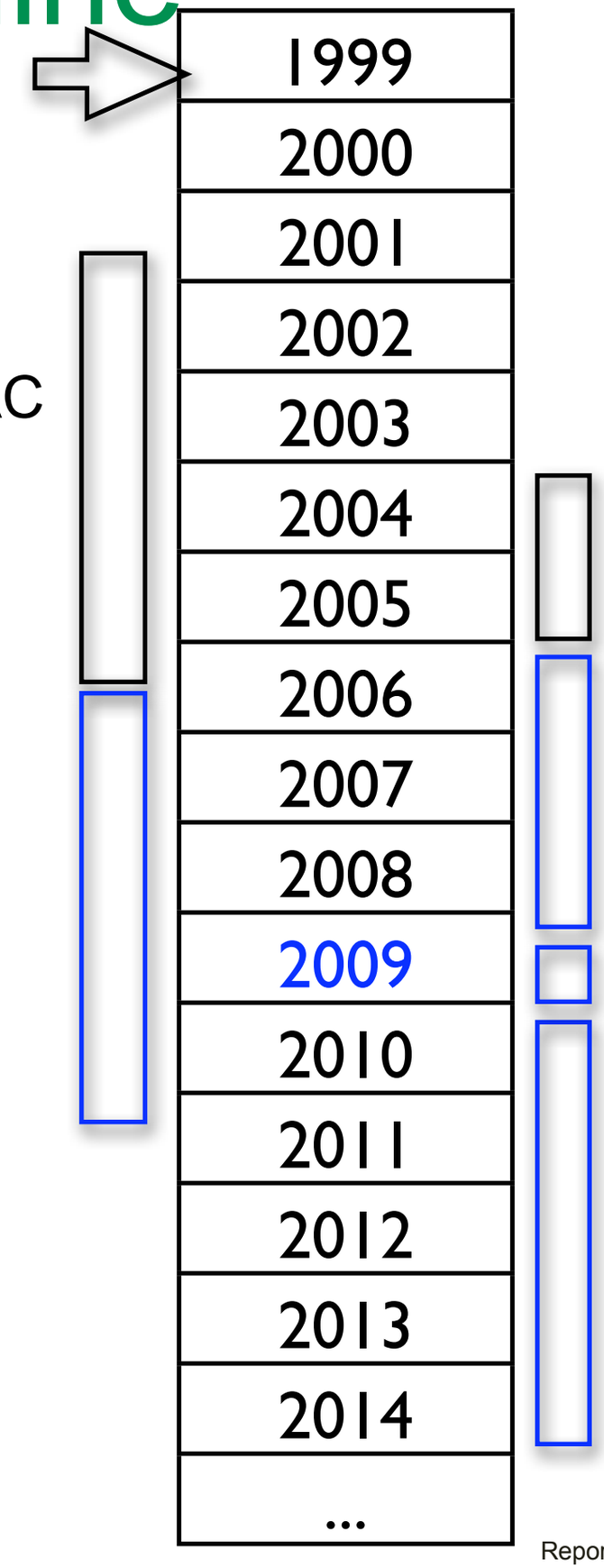
USQCD timeline

USQCD formed.

Software grants

First five-year SciDAC grant for lattice computing R&D.

Second five-year SciDAC grant for R&D.



Hardware grants

Construction of the QCDOC.

LQCD project, first cycle of continuous HEP and NP funding for hardware.

Proposed computer from stimulus bill (ARRA).

Proposed LQCD-ext hardware project for 2010-2014.

The LQCD Project, 2006-2009

- The Lattice QCD Computing Project (LQCD) acquires and operates dedicated computers for the USQCD Collaboration.
  - SciDAC-1 Clusters still in operation.
  - QCDOC.
  - 6n, Kaon, 7n, and JPsi clusters acquired under LQCD.
- LQCD runs through FY 09 (September 30, 2009).
- Final annual review will be on June 4-5, 2009, at Fermilab.

LQCD-ext, 2010-14

- The Executive Committee submitted a white paper to the DOE in April, 2007 proposing a new LQCD Computing Project (LQCD-ext) for the period FY 2010–2014.
- The panel that reviewed LQCD in May 2007 stated:

  "*The resources provided through the LQCD project are crucial for the US lattice QCD community to stay internationally competitive. This will remain true beyond the final year of the LQCD project, 2009, and the committee believes that an increase in computational resources beyond 2009 should be strongly encouraged, building on the success of the 2006–2009 LQCD project*."
- On December 4, 2007 the Executive Committee was invited to submit a written proposal for LQCD-ext with a due date of December 31, 2007.

LQCD-ext, 2010-14

- A panel of high energy and nuclear physicists, and computer scientists reviewed the proposal on January 30 and 31, 2008. It strongly supported funding the proposal at the requested level.
- A presentation on recent progress in lattice gauge theory was made to HEPAP on February 15, 2008. HEPAP members made very strong statements regarding the importance of research in our field.
- In December, 2008, the extension project obtained CD0 approval from DoE (acceptance of scientific need).
- On April 20, 2009, the project had a CD1 review (preliminary cost and schedule baseline). Approval hoped for soon, after revision of some documents.
- Combined CD2/CD3 expected late summer (official baselines and permission to start spending money).

LQCD-ext Proposal

- Areas of scientific emphasis
  - Fundamental parameters of the Standard Model, and precision tests of it.
  - The spectrum, internal structure and interactions of hadrons.
  - Strongly interacting matter under extreme conditions of temperature and density.
  - Theories for physics beyond the Standard Model.
- The proposal cites a need to access the DOE's leadership class computers and to acquire and operate dedicated hardware.
- The proposal requests a fixed hardware budget of $3.0M per year, and an operations budget that star ts at $1.45M in 2010 and grows by 4% per year.
  - We have been led to expect ~$17M-$18M from this proposal.

Stimulus bill (ARRA) computer

- Separate project from LQCD-ext; resources to be managed as a coherent whole.
- Proposed for ~$4.9 M, around 16 TF, to be installed at JLab this year.
- Combined projects around $22M, as we originally proposed.
- (Compared with ~$10M for LQCD Project.)

Hardware goals by fiscal year

Fiscal Year	Dedicated Hardware (Tflop–Years)	Leadership Class Computers (Tflop–Years)
2010	35	30
2011	60	50
2012	100	80
2013	160	130
2014	255	210
Total	610	500

1 Tflop-year = 3.5 M 6n node-hours

Computing resources from the use of dedicated hardware (column 2) and leadership class computers (column 3) needed to carry out our scientific program by fiscal year. Computing resources are given in Tflop–Years, where one Tflop–Year is the number of floating point operations produced in a year by a computer sustaining one teraflop/s.

Goals envisioned in the LQCD-ext proposal.

USQCD Incite Award

- Time on the DOE's leadership class computers, the Cray XT4 at ORNL and the BlueGene/P at ANL, is allocated through the Incite Program. USQCD has received a three year grant from the Incite Program beginning January 1, 2008. Ours is the largest allocation for 2009. It consists of:
  - 67 M core-hours on the ANL BlueGene/P,
  - 20 M core-hours on the ORNL Cray XT4.
- In 2009 the Cray is being used to generate anisotropic–Clover gauge configurations. The BG/P is being used to generate Asqtad and DWF gauge configurations and to do analysis on those configurations.

USQCD Incite Award

- Specific allocations are made on a yearly basis, and there is an opportunity to change scientific priorities each year within the framework of the proposal.
- The Scientific Program Committee, which reviewed and approved the proposal, will advise the Executive Committee on priorities each year.

Incite Early Science Periods

- At ALCF in 2008, USQCD was one of first projects ready to go, only one with three-year program mapped out.
  - Three-year program of asqtad ensemble generation was accomplished in one year. We used ~300 M core-hours, mostly of Early Science time, ~1/3 of BG/P cycles in 2008.
  - Thanks James Osborn and Software Committee.
- At ALCF in 2009, we have access to a low priority queue instead of an ES grant. From 1/1-5/10/09, USQCD has run 63 M core-hours here.
  - We need to make sure we use up our regular grant, according to James.
- At ORNL in 2009, we received a Director's Discretionary award of 2.5 M core-hours.

Current hardware resources

Source	Facility		Allocation year	Time (M 6n node-hours)				
USQCD	BNL	QCDOC	1/7/09-1/7/10	10.8				
dedicated								
hardware	FNAL	Pion		2.5				
		Kaon		7.6				
		JPsi		24.9				
		FY10, projected			*41.0 x fraction of year*			
	JLab	6n		1.8				
		7n		8.8				
		ARRA, projected			*47.0 x fraction of year*			
	USQCD total			56.4				
Leadership class	ALCF	BG/P Incite	1/1/09-1/1/10				67 M core-hour	1 ch = 0.27 6n hr
		BG/P low priority						
	Oak Ridge	XT4 Incite					20 M core-hour	1 ch=0.56 6n hr
		XT5 (ES)					2.5 M core-hour	
	1 TF yr = 3.5 M 6n node-hours							

Allocations and Scientific Priorities

- The Scientific Program Committee (SPC) allocates all USQCD computing resources.
- It is the responsibility of the Executive Committee, in consultation with the SPC and the community, to put forward compelling physics programs in proposals.
- It is the responsibility of the SPC to accomplish the goals of a given proposal, bearing in mind the goals of the funders.
  - E.g., charge number 1 to the June 4-5, 2009 LQCD annual review panel is to evaluate:
    "The continued significance and relevance of the LQCD project, with an emphasis on its impact on the experimental programs supported by the Offices of High Energy and Nuclear Physics of the DOE;"

Allocations and Scientific Priorities

- A new Incite proposal will be submitted next year. In this and future proposals, the Executive Committee will consult with the SPC and the community to create a compelling program of physics for the proposal.
- USQCD does not apply as a collaboration for resources at NERSC or on NSF supercomputers less powerful than Blue Waters. Of course, sub-groups within USQCD can and do apply for these resources.

NSF PRAC Proposal

- The NSF has announced that it will acquire an IBM computer, Blue Waters, capable of sustaining in excess of one petaflop/s on a wide range of applications. Blue Waters will be located at NCSA, and is expected to become available for use in 2011.
- Very little information regarding Blue Waters is publicly available. It is known that:
  - It is based on Power7 processors.
  - It will have more than 200,000 cores.
  - The interconnect fabric will feature significantly reduced latency and increased bandwidth. (But the NSF does not state what Blue Water's interconnect is being compare to!)
  - Achieving 1.0 delivered petaflop on lattice code is part of its acceptance tests.

NSF PRAC Proposal

- USQCD has submitted a proposal to Petascale Computing Resource Allocations (PRAC). We requested:
  - Travel funds to be used in the development and optimization of software for Blue Waters.
  - Early access to information regarding Blue Waters' architecture.
  - An early allocation of time on Blue Waters.
- The USQCD proposal has received a grant of $40,000 for travel associated with code development.
- Nondisclosure agreements are still being negotiated between NCSA and the universities.
- Nothing is known as of now about how the NSF intends to allocate Blue Waters.
  - As we learn more, we'll have to figure out how to apply in a way that maximizes our physics goals.

SciDAC-2 Grant

- Grant runs from 2006-2011. On January 8-9, 2009, we received a favorable mid-term review.
- We received $2,289,000 this year, and we are getting a small cost-of-living increase every year.
- Recent efforts have focused on USQCD codes for the BlueGene/P and Cray XTs as well as new software tools for workflow, visualization and methods to meet the challenges of many-core hardware and multi-level algorithms. Rich Brower will give an overview of these activities for the Software Committee.
- Grant ends in 2011.
  - SciDAC-3 is being considered at DoE. SciDAC funds essential USQCD work (e.g., getting BG/P and XT5 code ready for prime-time). Follow-ons to this work would have to be funded from other sources if SciDAC is not continued.

SciDAC-2 Grant

Table of Revised Budgets for SciDAC Proposal

National Computational Infrastructure for Lattice Gauge Theory

Table 1 below shows the total budget for each participating institution in each of the five years of the proposed grant. Note that all funds for hardware research and development have been eliminated. The FY2006 budgets cover the six month period between September 15, 2006 and March 14, 2007. All other budgets are for twelve month periods.

Institution	FY06	FY07	FY08	FY09	FY10
BNL	218	362	378	390	406
FNAL	249	442	456	472	485
JLab	258	458	472	484	497
Boston U.	88	183	191	198	206
DePaul U.	32	66	68	70	72
IIT	15	30	30	30	30
Indiana U.	25	51	52	54	55
MIT	113	235	244	254	264
U. Arizona	25	51	53	54	55
U. North Carolina	55	113	116	119	122
UC Santa Barbara	15	30	30	30	30
U. Utah	27	55	56	58	60
Vanderbilt U.	37	75	76	76	77
Total	1,157	2,151	2,222	2,289	2,359

Table 1: Institution and Total Budgets in $1,000

Travel Funds

- As was indicated at last year's All-hands Meeting, limited travel funds are available for use by USQCD members.
- Those wishing to make use of these funds should send email to mackenzie@fnal.gov.
- Highest priority will be given to junior members of USQCD.

Travel Funds

- The Executive Committee believes that travel funds should be used for activities that directly address or report on USQCD activities. Some examples are:
  - Attending a topical workshop to report on results obtained with USQCD computing resources.
  - Attending a USQCD sponsored conference or summer school.
  - Representing USQCD at an ILDG meeting.
  - Traveling to another USQCD institution to work on SciDAC software or USQCD hardware.
- We cannot afford to support travel to Lattice Meetings, or to meetings of sub-groups within USQCD.