Strategic Plan for the Computing Division (2007-2011)

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Mission

The Computing Division's mission is to play a full part in the mission of the laboratory and in particular to proudly develop, innovate, and support excellent and forefront computing solutions and services, recognizing the essential role of cooperation and respect in all interactions between ourselves and with the people and organizations that we work with and serve.

Context and Assessment of Current State

The strategic plan for the Computing Division is guided by the strategic directions for the laboratory, as presented by director Pier Oddone, the strategic plans for the field of high energy physics and related disciplines as presented through several official reports including EPP2010, HEPAP and P5 reports, and by existing memoranda of understanding and project commitments.

We are involved in a very broad range of scientific programs of the lab including as scientific collaborators on CDF,D0, MINOS, MiniBoone, Nova, CMS, SDSS, DES, SNAP, US Lattice QCD, ILC projects, COUPP, the CMS center at Fermilab, the Center for Particle Astrophysics and the Accelerator Center.

We are involved in collaborative efforts to provide the innovative and forefront computing solutions needed for the scientific programs through Advanced Computing research programs of work.

We provide services and computing solutions to all the scientific programs of the lab through common solutions and shared scientific computing facilities and services.

We are taking a strong leadership position in the Open Science Grid and we are working to ensure that the wide area networking infrastructure will support a globally distributed computing infrastructure.

We provide expert engineering and software systems solutions for experiments DAQ and control systems and maintain expertise and services for the pool of detector electronics equipment known as PREP. We work on the remote operations center for the LHC and help facilitate access to and monitoring of the accelerator and the CMS detector.

We build and operate innovative and cost effective high performance computing facilities for Lattice QCD scientific research as well as leading the project to build and operate facilities at BNL, Jlab and Fermilab.

We provide tools and assistance to scientific programs to help support collaboration, to enable data analysis, to advise and assist with software and database coding and software infrastructure, to design new detectors and understand old detectors. Much of this is done

through support of tools used widely in our field. However some of these tools involve extensive research efforts by Fermilab scientists and technical staff.

We provide the central IT infrastructure for the laboratory through site networking, site-wide Windows infrastructure, email and helpdesk systems, central web servers and many other IT services and database applications that support the entire laboratory.

We lead the lab in implementing and fully embracing a vigorous and continuous process for computer security.

All of the above efforts are effective and well serving their stakeholders. However technology is evolving rapidly in all aspects of computing and scientific services and solutions must scale with increased demands. Constant evolution of all of the services and revitalizing of expertise is essential for the success in the future.

Systems to plan, track, monitor, assess progress exist and are used throughout the division but all require further evolution to better support planning, operations, quality assurance, monitoring and metrics for our work.

Vision

By 2011 we expect Fermilab Computing Facilities and Fermilab staff working on computing solutions (includes engineering) to continue to excel and be second to none in the high energy physics and astrophysics world.

We expect Run II computing to be in steady stable state focused on analysis of condensed datasets with likely the last major reprocessing of Run II data having been completed in 2010. However we expect Run II experiments to have an option to reprocess data should that be necessary for understanding a discovery or new physics. Grid computing resources at Fermilab and elsewhere would be used for such reprocessing.

We envision fully provisioned CMS computing facilities and services and expect to handle vast amounts of data from the LHC at Fermilab and to support rapid access to and processing of that data for all of US-CMS and for the wider CMS experiment. We expect to be playing a strong role in making Fermilab a welcoming and efficient place to work by supporting the tools and facilities that users need to be productive.

We expect CD to continue to play a strong role in support of the experimental Astrophysics program and we expect CD to be active in both DES and SNAP, and possibly super-CDMS and other experimental astrophysics programs.

We expect to have a continuing role in support of high performance computing for Lattice QCD. With many large supercomputers coming on line in the 2008-2010 timeframe we anticipate developing a clear set of delineating features and goals for high performance computing at Fermilab – not only for Lattice QCD but for other computationally intensive science such as Accelerator modeling and Computational Cosmology.

We expect to see Fermilab playing a leading role in ILC and the strength of the CD in computing, engineering and DAQ being part of the lab's plans for the ILC.

We expect to see fully centralized management of IT infrastructure and services at the lab, encompassing all of the currently disjoint and private IT, telephony and cyber security infrastructure of AD and Business Services and other areas of the lab. We expect to be running an increasing number of powerful systems and services for a larger number of people at the lab and worldwide.

We expect to see Grid Computing and globally distributed computing and services in full production mode, having evolved considerably between 2007 and 2011.

We envision a continuous process of hiring new staff, with an emphasis on hiring junior staff, of training and re-training of existing staff because technology will continue to evolve rapidly and everyone in CD must expect to participate in a continuous process of developing their skills.

We expect to have considerably more scientists as members of CD by 2011, thus strengthening the successful way of working that teams up scientists, engineers, computing professionals and technical and support staff to work together on computing solutions.

We expect to increase our participation in collaborative work with computer scientists, other sciences, university researchers and with NSF and DOE large facilities and to join with NCSA and ANL and others in working together to advance computing and networking support and innovation for our scientific programs.

Stakeholders

The stakeholders are the funding agencies (DOE and NSF), the lab management, divisions and sections, and the broad lab user community, the many scientific collaborations that we work with, the consortia we belong to (such as the Open Science Grid and the National Lattice QCD project), the multidisciplinary projects that we participate in (such as SciDAC projects), the other collaborative endeavors that we undertake with ANL, DESY, CERN, University of Chicago, University of Wisconsin and others, and finally the members of the CD.

Goals and Objectives

1. Provide excellent, secure, and, where necessary, innovative computing solutions to support the scientific program of the lab.
    a) Provide stability and support for the computing and core software systems to help maintain scientific productivity of the Run II, Experimental Astrophysics and Neutrino programs. Provide help to the smaller experiment and testbeam efforts of the lab, as resources permit.

   b) Ensure that the CMS Computing Facilities at Fermilab are 2nd to none and that they fully support the LPC at Fermilab and all of the U.S. Tier 2 facilities in enabling rapid scientific results from CMS.
   c) Participate in the scientific and technical specifications of future scientific programs bringing CD experience and computing expertise. Play a useful and important role in helping the lab to capture the ILC, possibly leading in some areas where we have expertise and experience.
2. Selectively carry out scientific computing research in areas where innovation and new ideas might lead to significant gains in functionality, cost, performance or efficiency in computing solutions.
3. Develop secure, efficient and cost-effective IT infrastructure and applications to support overall lab operations.
4. Create a stimulating and rewarding working environment for talented scientists, computing professionals, engineers, technical and administrative staff. Support and encourage our scientists to participate in the scientific program of the lab.
5. Further develop and integrate our management/measurement/planning/analysis processes and information systems to help us plan, execute and measure our work and progress on all of the above goals.

Strategies

1. Provision the underlying facility and networking infrastructure to support the above goals.
2. Continue to encourage the use of common and shared computing solutions.
3. Nimbly adjust over time the balance of effort on the current scientific program (2007), the LHC programs and the ILC and future programs.
4. Ensure that all staff are given access to training, tools and incentives to develop professionally in a way that is aligned with the lab's scientific program needs. Increase the amount of yearly job-specific and/or management training that each person in CD receives until it closely matches industry norms.
5. Improve communication and collaboration within and outside CD. Use tools such as strategic plans, structured meetings, status reports, quarterly reports, and technical seminars, communication forums and division newsletter.
6. Ensure every scientist has an active scientific mentor within or outside of CD.
7. Work closely with stakeholders and potential collaborators to identify target areas for innovation and target areas for competitive proposals for funding.
8. Increase visibility and acceptance of our work (both R&D work and production solutions) by attendance at conferences, workshops and other forums.
9. Increase usefulness and acceptance of our work by ensuring that training and education of users, as well as well-written and maintained documentation is an integral part of our services and deliverables to our stakeholders.
10. Continue to invest in working with Office of Science and DOE-CIO to protect the lab from over-restrictive policies and practices with respect to travel, foreign nationals, cyber security, PII, HSPD-12, and more that could limit our work and constrain our ability to collaborate globally.

Resource Needs

The process of planning for facility infrastructure and network infrastructure is a continuous one and must be re-evaluated every year as technology changes and as the requirements of the scientific programs evolve or become better understood. Since the Run II experiments will still be extracting physics results from their data and the LHC experiments will be in full operations by 2011 no ramp-down in human resources can be envisaged. In fact, in the period from 2008 to 2009 a significant ramp-up in human resources will be needed to make progress towards the vision outlined above and to meet the goals. If members of CD become deeply involved in ILC detector work, as well as ILC control system and accelerator work, an increased ramp-up in human resources will be needed, including possibly in the engineering area.

Progress Indicators

1) Reviews of scientific programs productivity, satisfaction and future needs
2) Number of and budget of innovative programs of work – maintain at or above current level.
3) Cyber security performance measures
4) Data storage, caching, data delivery and network performance measures
5) Reviews of quality and timeliness of hardware, software and integrated systems development projects
6) Number of scientists in leadership positions in scientific collaborations and fraction of time scientists are able to spend on research activities.
7) Number of publications that our scientists are principle or influential author on
8) Feedback from staff on the environment in CD and on their morale (survey)
9) Number of projects and activities with structured programs of work and milestones increases by 10% each year
10) Increased training of staff linearly between 2006-2011 to reach industry norms
11) Decrease in number of systems and services that are not centrally supported – by at least 10% per year.

Additional Information

Our values will be, as stated in our mission statement, to put great emphasis in working collaboratively with others and in taking pride in our work. Everyone in CD will make it their personal concern to ensure that they and our entire organization work safely. No-one will take unnecessary risks or cut corners on processes and everyone will maintain awareness that an accident or incident can not only result in personal injury or damage to property, but also have far reaching consequences for the lab.

The strategic plan of the computing division is designed to accept that there may be unforeseen changes in schedule, funding or other resources and certainly unexpected changes in technology. The most important factors that will allow us to respond to such changes are a) the agility of a well trained staff b) strong collaborations and ties with people outside of the lab c) a good planning, tracking and management process that allows us to fully understand how our resources are being deployed at all times.