The Computing Community Consortium

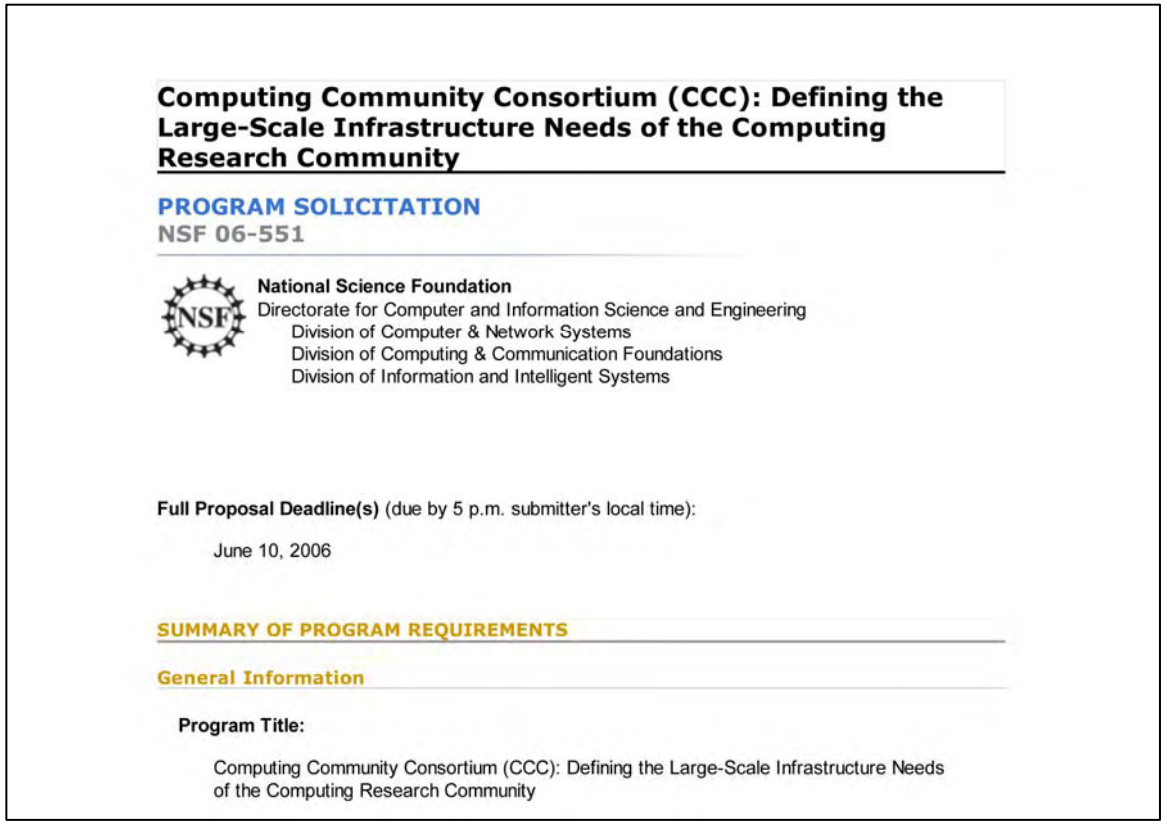
NSF Review

February 16, 2010

Andrew Bernat, CRA Executive Director
Susan Graham, UC Berkeley and CCC Vice Chair
Anita Jones, University of Virginia and CCC Council
Ed Lazowska, University of Washington and CCC Chair
Fred Schneider, Cornell University and CCC Council

Background material

- NSF solicitation



Computing Community Consortium (CCC): Defining the Large-Scale Infrastructure Needs of the Computing Research Community

PROGRAM SOLICITATION
NSF 06-551

National Science Foundation
Directorate for Computer and Information Science and Engineering
Division of Computer & Network Systems
Division of Computing & Communication Foundations
Division of Information and Intelligent Systems

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

June 10, 2006

SUMMARY OF PROGRAM REQUIREMENTS

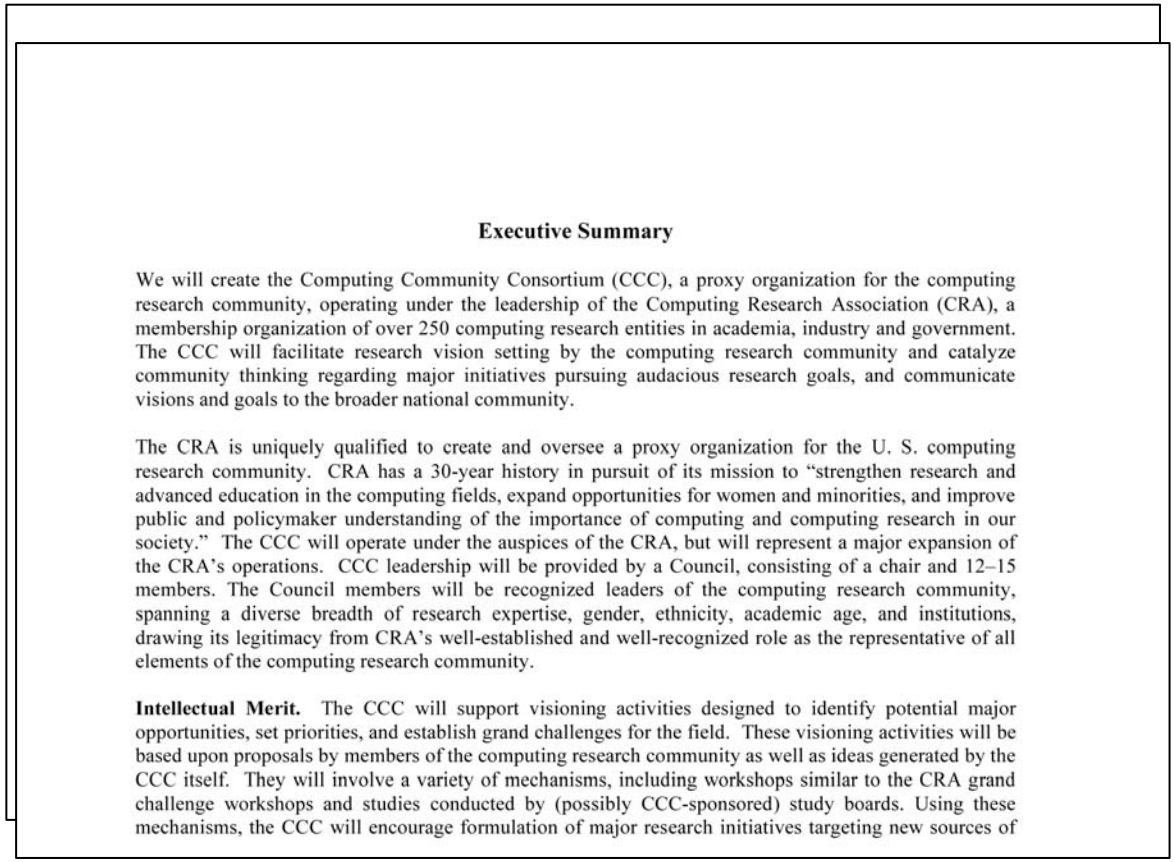
General Information

Program Title:

Computing Community Consortium (CCC): Defining the Large-Scale Infrastructure Needs of the Computing Research Community

Background material

- NSF solicitation
- CRA proposal



Executive Summary

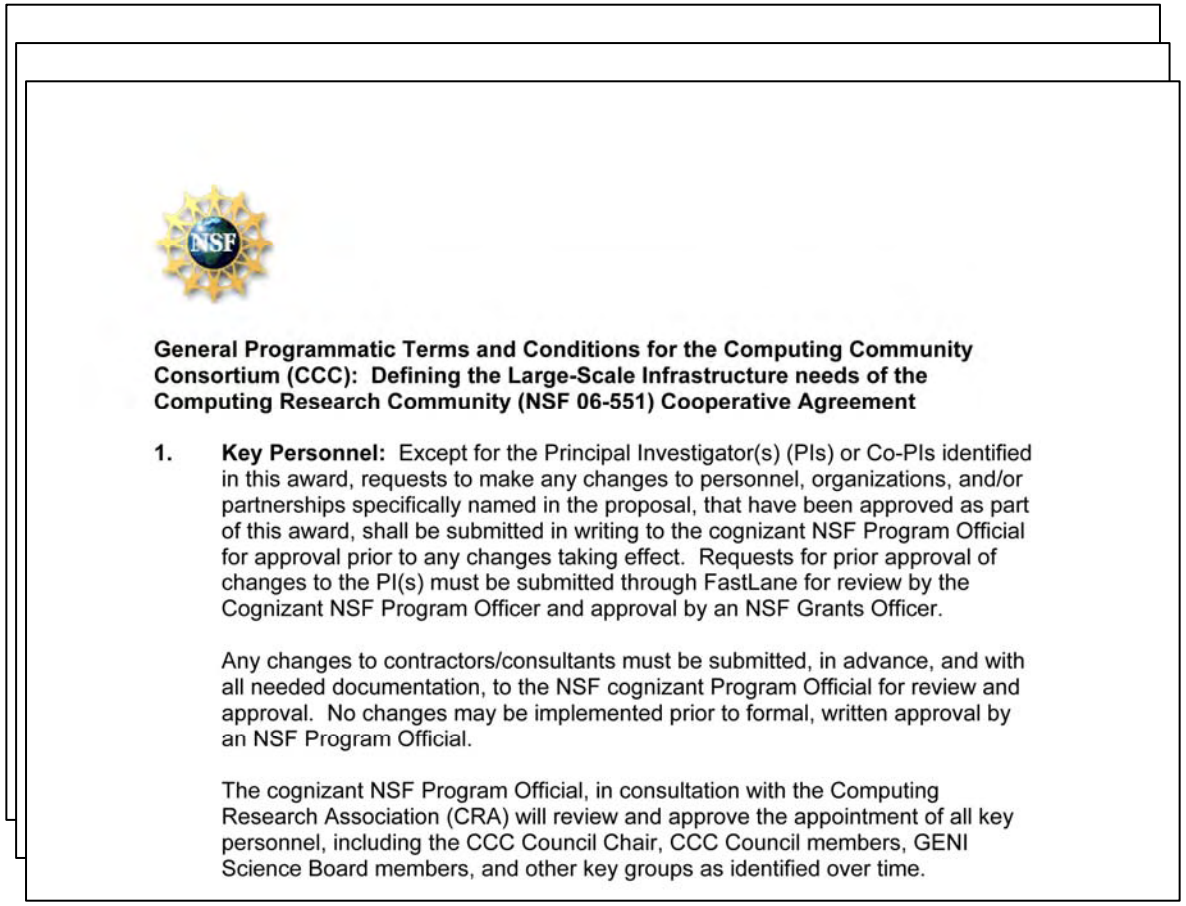
We will create the Computing Community Consortium (CCC), a proxy organization for the computing research community, operating under the leadership of the Computing Research Association (CRA), a membership organization of over 250 computing research entities in academia, industry and government. The CCC will facilitate research vision setting by the computing research community and catalyze community thinking regarding major initiatives pursuing audacious research goals, and communicate visions and goals to the broader national community.

The CRA is uniquely qualified to create and oversee a proxy organization for the U. S. computing research community. CRA has a 30-year history in pursuit of its mission to "strengthen research and advanced education in the computing fields, expand opportunities for women and minorities, and improve public and policymaker understanding of the importance of computing and computing research in our society." The CCC will operate under the auspices of the CRA, but will represent a major expansion of the CRA's operations. CCC leadership will be provided by a Council, consisting of a chair and 12–15 members. The Council members will be recognized leaders of the computing research community, spanning a diverse breadth of research expertise, gender, ethnicity, academic age, and institutions, drawing its legitimacy from CRA's well-established and well-recognized role as the representative of all elements of the computing research community.

Intellectual Merit. The CCC will support visioning activities designed to identify potential major opportunities, set priorities, and establish grand challenges for the field. These visioning activities will be based upon proposals by members of the computing research community as well as ideas generated by the CCC itself. They will involve a variety of mechanisms, including workshops similar to the CRA grand challenge workshops and studies conducted by (possibly CCC-sponsored) study boards. Using these mechanisms, the CCC will encourage formulation of major research initiatives targeting new sources of

Background material

- NSF solicitation
- CRA proposal
- Cooperative agreement



General Programmatic Terms and Conditions for the Computing Community Consortium (CCC): Defining the Large-Scale Infrastructure needs of the Computing Research Community (NSF 06-551) Cooperative Agreement

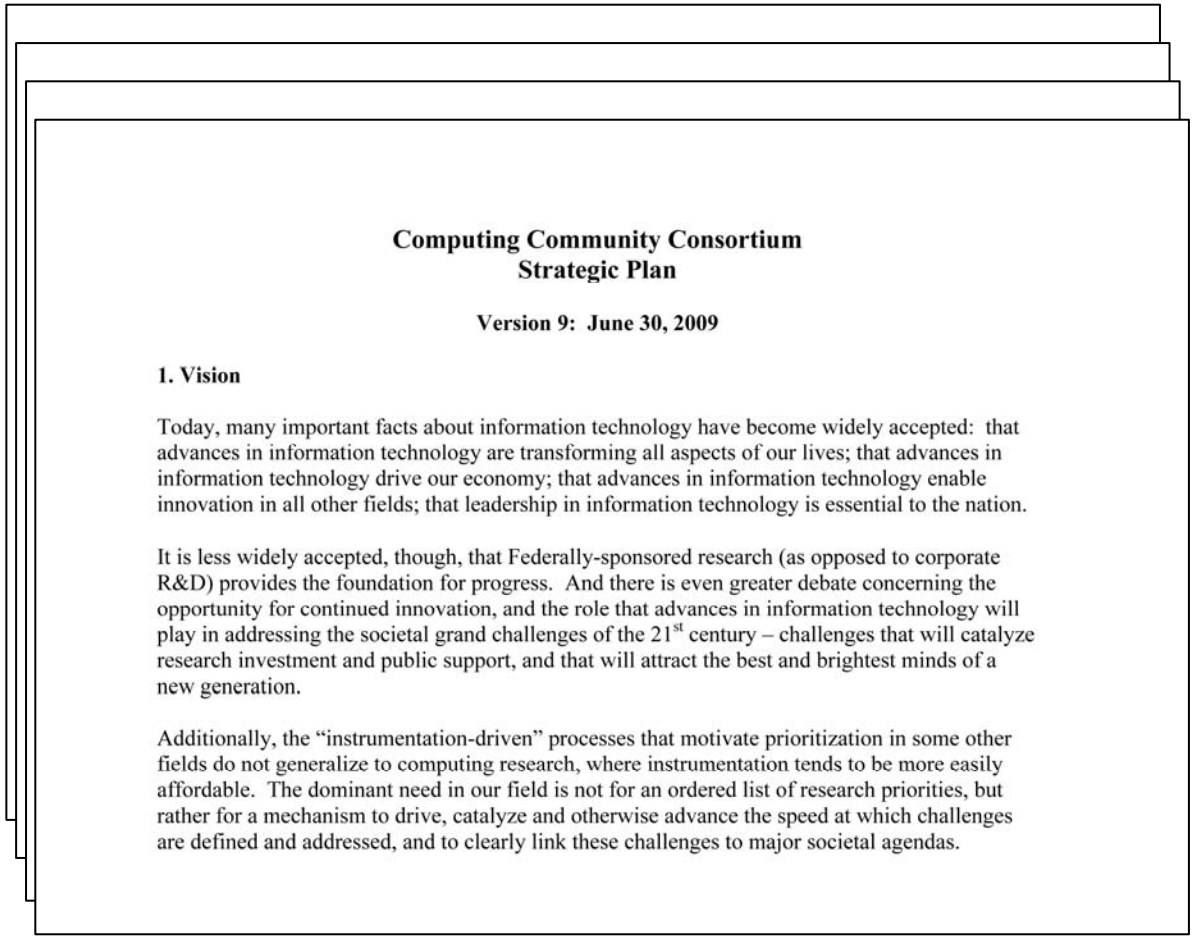
1. **Key Personnel:** Except for the Principal Investigator(s) (PIs) or Co-PIs identified in this award, requests to make any changes to personnel, organizations, and/or partnerships specifically named in the proposal, that have been approved as part of this award, shall be submitted in writing to the cognizant NSF Program Official for approval prior to any changes taking effect. Requests for prior approval of changes to the PI(s) must be submitted through FastLane for review by the Cognizant NSF Program Officer and approval by an NSF Grants Officer.

   Any changes to contractors/consultants must be submitted, in advance, and with all needed documentation, to the NSF cognizant Program Official for review and approval. No changes may be implemented prior to formal, written approval by an NSF Program Official.

   The cognizant NSF Program Official, in consultation with the Computing Research Association (CRA) will review and approve the appointment of all key personnel, including the CCC Council Chair, CCC Council members, GENI Science Board members, and other key groups as identified over time.

Background material

- NSF solicitation
- CRA proposal
- Cooperative agreement
- Strategic plan



Computing Community Consortium
Strategic Plan

Version 9: June 30, 2009

1. Vision

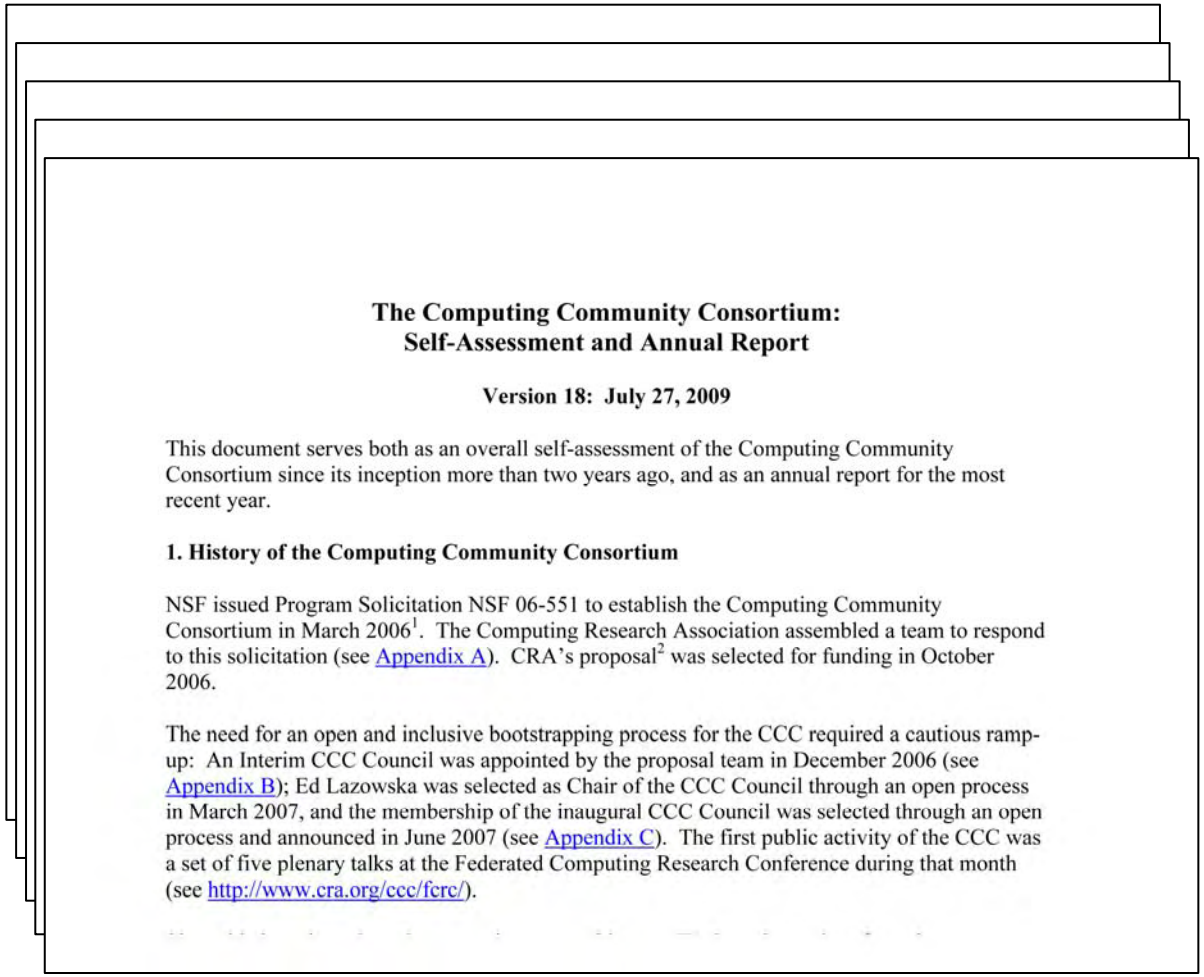
Today, many important facts about information technology have become widely accepted: that advances in information technology are transforming all aspects of our lives; that advances in information technology drive our economy; that advances in information technology enable innovation in all other fields; that leadership in information technology is essential to the nation.

It is less widely accepted, though, that Federally-sponsored research (as opposed to corporate R&D) provides the foundation for progress. And there is even greater debate concerning the opportunity for continued innovation, and the role that advances in information technology will play in addressing the societal grand challenges of the 21st century – challenges that will catalyze research investment and public support, and that will attract the best and brightest minds of a new generation.

Additionally, the "instrumentation-driven" processes that motivate prioritization in some other fields do not generalize to computing research, where instrumentation tends to be more easily affordable. The dominant need in our field is not for an ordered list of research priorities, but rather for a mechanism to drive, catalyze and otherwise advance the speed at which challenges are defined and addressed, and to clearly link these challenges to major societal agendas.

Background material

- NSF solicitation
- CRA proposal
- Cooperative agreement
- Strategic plan
- ★ Self assessment



The Computing Community Consortium:
Self-Assessment and Annual Report

Version 18: July 27, 2009

This document serves both as an overall self-assessment of the Computing Community Consortium since its inception more than two years ago, and as an annual report for the most recent year.

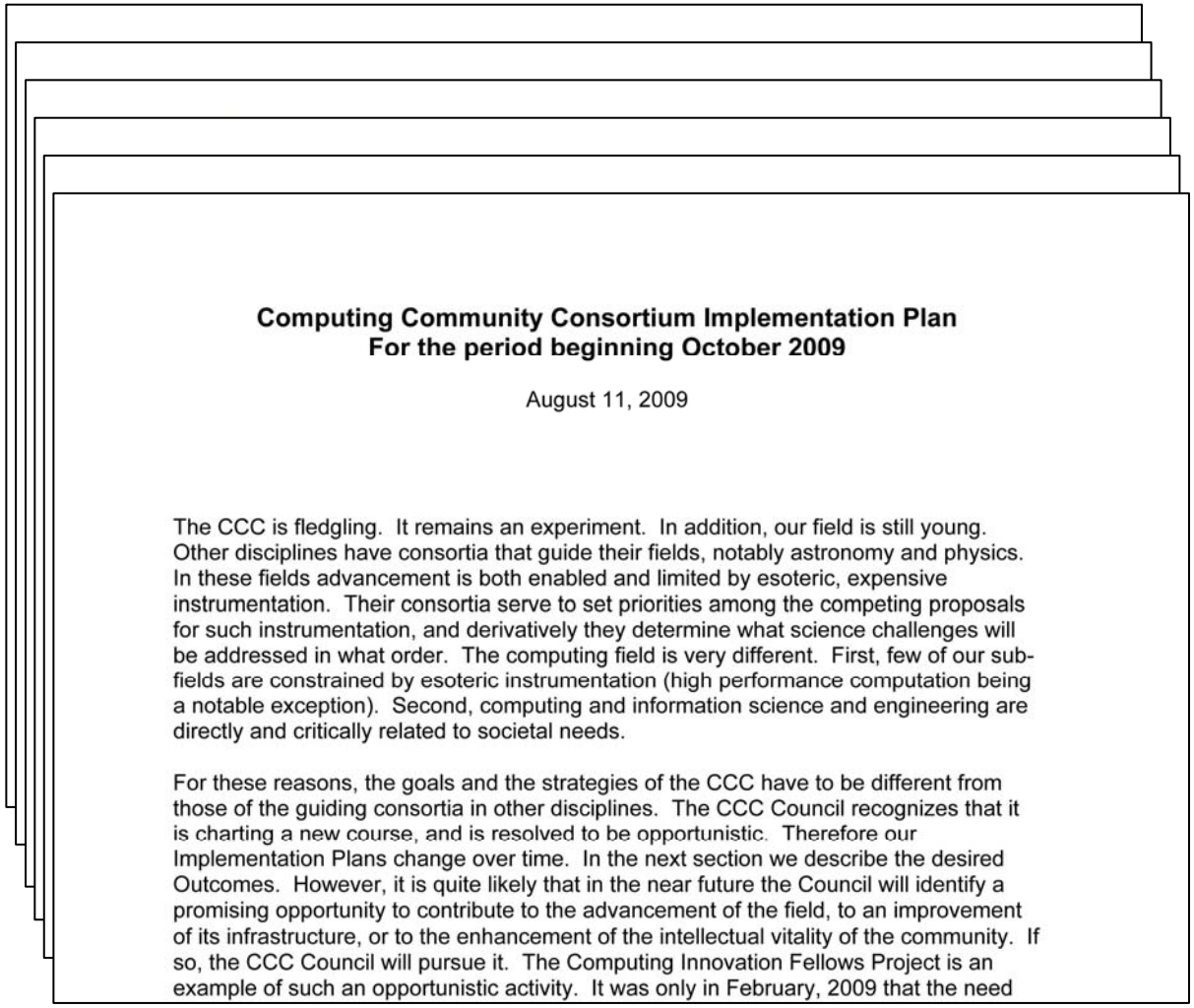
1. History of the Computing Community Consortium

NSF issued Program Solicitation NSF 06-551 to establish the Computing Community Consortium in March 2006[1]. The Computing Research Association assembled a team to respond to this solicitation (see Appendix A). CRA's proposal[2] was selected for funding in October 2006.

The need for an open and inclusive bootstrapping process for the CCC required a cautious ramp-up: An Interim CCC Council was appointed by the proposal team in December 2006 (see Appendix B); Ed Lazowska was selected as Chair of the CCC Council through an open process in March 2007, and the membership of the inaugural CCC Council was selected through an open process and announced in June 2007 (see Appendix C). The first public activity of the CCC was a set of five plenary talks at the Federated Computing Research Conference during that month (see http://www.cra.org/ccc/fcrc/).

Background material

- NSF solicitation
- CRA proposal
- Cooperative agreement
- Strategic plan
- ★ Self assessment
- ★ Implementation plan



Computing Community Consortium Implementation Plan
For the period beginning October 2009

August 11, 2009

The CCC is fledgling. It remains an experiment. In addition, our field is still young. Other disciplines have consortia that guide their fields, notably astronomy and physics. In these fields advancement is both enabled and limited by esoteric, expensive instrumentation. Their consortia serve to set priorities among the competing proposals for such instrumentation, and derivatively they determine what science challenges will be addressed in what order. The computing field is very different. First, few of our sub-fields are constrained by esoteric instrumentation (high performance computation being a notable exception). Second, computing and information science and engineering are directly and critically related to societal needs.

For these reasons, the goals and the strategies of the CCC have to be different from those of the guiding consortia in other disciplines. The CCC Council recognizes that it is charting a new course, and is resolved to be opportunistic. Therefore our Implementation Plans change over time. In the next section we describe the desired Outcomes. However, it is quite likely that in the near future the Council will identify a promising opportunity to contribute to the advancement of the field, to an improvement of its infrastructure, or to the enhancement of the intellectual vitality of the community. If so, the CCC Council will pursue it. The Computing Innovation Fellows Project is an example of such an opportunistic activity. It was only in February, 2009 that the need

Topics for this morning

- Setting the stage
  - Pre-history
  - Major organizational milestones
  - The timing of this review
  - Our own objectives for today
- CCC mission, goals, and strategies
  - CCC mission
  - CCC goals
  - CCC strategies

Topics for this morning

- CCC activities and initiatives
  - Major continuing activities
  - Major special initiatives
  - CCC's diverse roles in community visioning exercises
  - CCC's role in GENI/NetSE
  - CCC: Opportunistic and agile
  - CCC: Directly and broadly engaging the community
- Organization and management
  - CCC structure
  - The CCC Council
  - Selection of Council members
  - Range of Council member activities
  - Erwin Gianchandani's anticipated role

Topics for this morning

- Plans for formal assessment
- Budget
- Analysis, future directions, and open questions
  - Areas of mixed success
  - Clear "to do's"
  - Open questions
  - Measures of success
  - Summary

Topics for this morning

- Setting the stage
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Pre-history

- In the mid-2000's, NSF CISE leaders and computing research community leaders had similar deep concerns:
  - The federal commitment to research in general, and to computing research in particular
  - Public and policymaker perception that computer science is "yesterday's news"
  - Failure to articulate and coalesce around exciting research visions in computer science – research visions that would galvanize the public, policymakers, researchers, and students
  - Need to groom leadership for the field
  - Decrease in student interest
  - GENI Project direction

- This led to:
  - Increased NSF CISE and computing research community focus on these issues
  - Computing Community Consortium solicitation by NSF
  - Eager response by a group of computing research community leaders under the auspices of the Computing Research Association
    - Randy Bryant
    - Susan Graham
    - Anita Jones
    - Dick Karp
    - Ken Kennedy
    - Ed Lazowska
    - Peter Lee
    - Jeff Vitter
- *CCC exists to contribute to addressing the concerns on the previous slide*

Major organizational milestones

- NSF solicitation: March 2006
- CRA proposal: June 2006
- Cooperative agreement: October 2006
- Interim Council appointed: December 2006
- Chair appointed: March 2007
- Council appointed: June 2007
- First Council rotation: January 2009
- Major self-assessment: July 2009
- Second Council rotation: January 2010
- Full-time Director to start: March 2010

The timing of this review

- 40 months (3-1/3 years) from award (October 2006)
- 32 months (2-2/3 years) from effective launch (June 2007)
- It's time for an independent assessment – time for some fresh minds to take a look
  - In general, is this effort worthy of our time, and NSF's money? Is it important to the field?
  - One level down, which goals, strategies, activities, and approaches should we reconsider and/or re-prioritize?

Our own objectives for today

- We hope to receive your insights regarding our goals, strategies, activities, and approaches. How can we make CCC even more effective in advancing the computing research field?
- We hope to receive your honest assessment of whether CCC is important to the field – whether it is worth our time, and NSF's money. With appropriate adaptations, does an organization such as CCC have long-term value (beyond the current award)?

Topics for this morning

- Setting the stage
  - Pre-history
  - Major organizational milestones
  - The timing of this review
  - Our own objectives for today
- CCC mission, goals, and strategies
  - CCC mission
  - CCC goals
  - CCC strategies

CCC's evolving mission (from the NSF solicitation)

- "CISE will support the CCC as a community proxy responsible for facilitating the conceptualization and design of promising infrastructure-intensive projects …"
- "One of the first responsibilities of the CCC will be guiding the design of the Global Environment for Networking Innovations (GENI)."

CCC's evolving mission (from the CRA proposal)

- "The CCC is envisioned as a mechanism to promote continued innovation by enhancing the ability of the computing research community to envision and pursue long-term, audacious computing research goals …"
- "… some of these … will … create large-scale, shared research instruments, while others will aim toward more traditional forms of research funding …"
- "One of the first tasks of the CCC will be to assume the role of proxy organization for the Global Environment for Networking Innovations (GENI) Project … providing broad scientific oversight …"

CCC's evolving mission (from the cooperative agreement)

- "The purpose of the Computing Community Consortium (CCC) is to provide a voice for the national computing research community. The CCC will facilitate the development of a bold, multi-themed vision for computing research and education and will communicate that vision to a wide-range of major stakeholders."

CCC mission (from our gut)

- To contribute to addressing an important set of shared concerns for the future of our field:
  - The federal commitment to research in general, and to computing research in particular
  - Public and policymaker perception that computer science is "yesterday's news"
  - Failure to articulate and coalesce around exciting research visions in computer science – research visions that would galvanize the public, policymakers, researchers, and students
  - Need to groom leadership for the field
  - Decrease in student interest
  - GENI Project direction

CCC goals (from CRA proposal and CCC strategic plan)

0. Establish the CCC as a widely accepted catalyst and voice
1. Bring the computing research community together to envision our future research needs and thrusts
2. Communicate these challenges, needs and thrusts to the broader national community
3. Create within the computing research community more audacious thinking
4. See the ideas developed in (1) and (3) turned into funded research programs
5. Increase the excitement within computing research and use that excitement to attract students
6. Inculcate values of leadership and service

BHAG

- Those are Big, Hairy, Audacious Goals
- They capture the mission as expressed in the CRA proposal, in the cooperative agreement, and in our gut
- They are subjective, and long-term
- They are hard to measure, and hard to achieve
- They are what we need to be pursuing

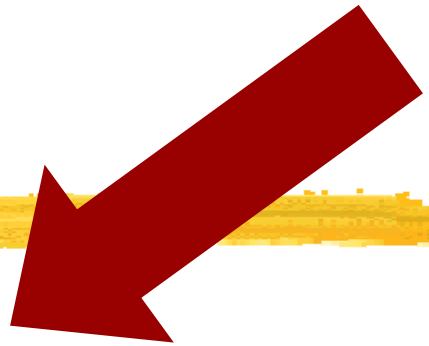
CCC strategies (from CCC strategic plan)

1. Be open and inclusive in launching and operating the CCC
2. Engage the computing research community
3. Engage funding agencies
4. Engage external communities

BS

- Those are Boring Strategies
- Our keys to success are:
  - Be open, inclusive, transparent, and communicative
  - Be proactive
    - Do not wait for ideas to come forward – shake the tree
    - Do not wait for requests for guidance or assistance – volunteer it
    - Do not wait for opportunities to present themselves – create them
  - Be opportunistic
    - When NSF, or DARPA, or the Presidential Transition Team, creates an opening, jump at it
  - Be agile
    - Many of our greatest successes have been things that we had no way to plan for

Topics for this morning



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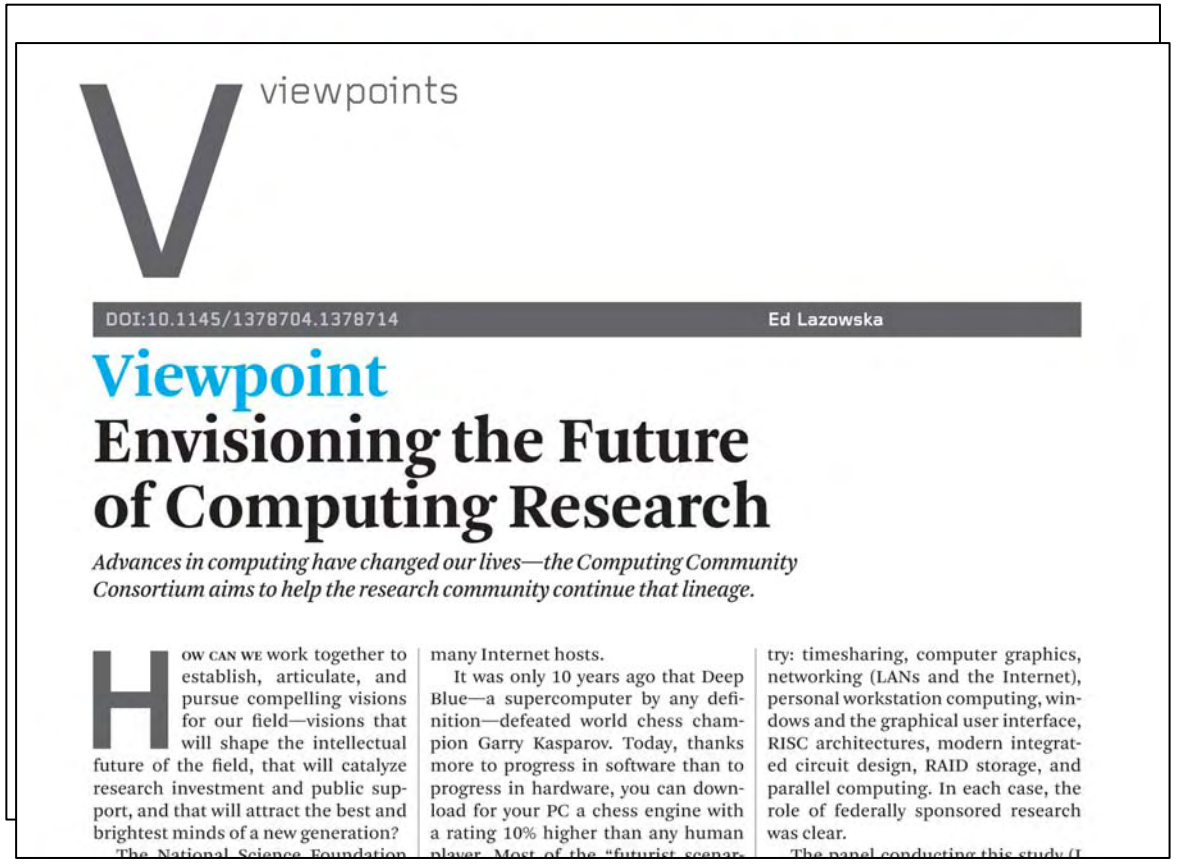
  - Range of Council member activities
  - Erwin Gianchandani's anticipated role

Major continuing activities

- Countless talks
  - Goals 0, 1, 3, 5
  - Strategies 1, 2

Major continuing activities

- Countless talks
- Countless articles
  - Goals 0, 1, 2, 3, 5
  - Strategies 1, 2, 3, 4



viewpoints

DOI:10.1145/1378704.1378714

Ed Lazowska

Viewpoint

Envisioning the Future of Computing Research

Advances in computing have changed our lives—the Computing Community Consortium aims to help the research community continue that lineage.

How can we work together to establish, articulate, and pursue compelling visions for our field—visions that will shape the intellectual future of the field, that will catalyze research investment and public support, and that will attract the best and brightest minds of a new generation?

The National Science Foundation

many Internet hosts.

It was only 10 years ago that Deep Blue—a supercomputer by any definition—defeated world chess champion Garry Kasparov. Today, thanks more to progress in software than to progress in hardware, you can download for your PC a chess engine with a rating 10% higher than any human player. Most of the "futurist scenar-

try: timesharing, computer graphics, networking (LANs and the Internet), personal workstation computing, windows and the graphical user interface, RISC architectures, modern integrated circuit design, RAID storage, and parallel computing. In each case, the role of federally sponsored research was clear.

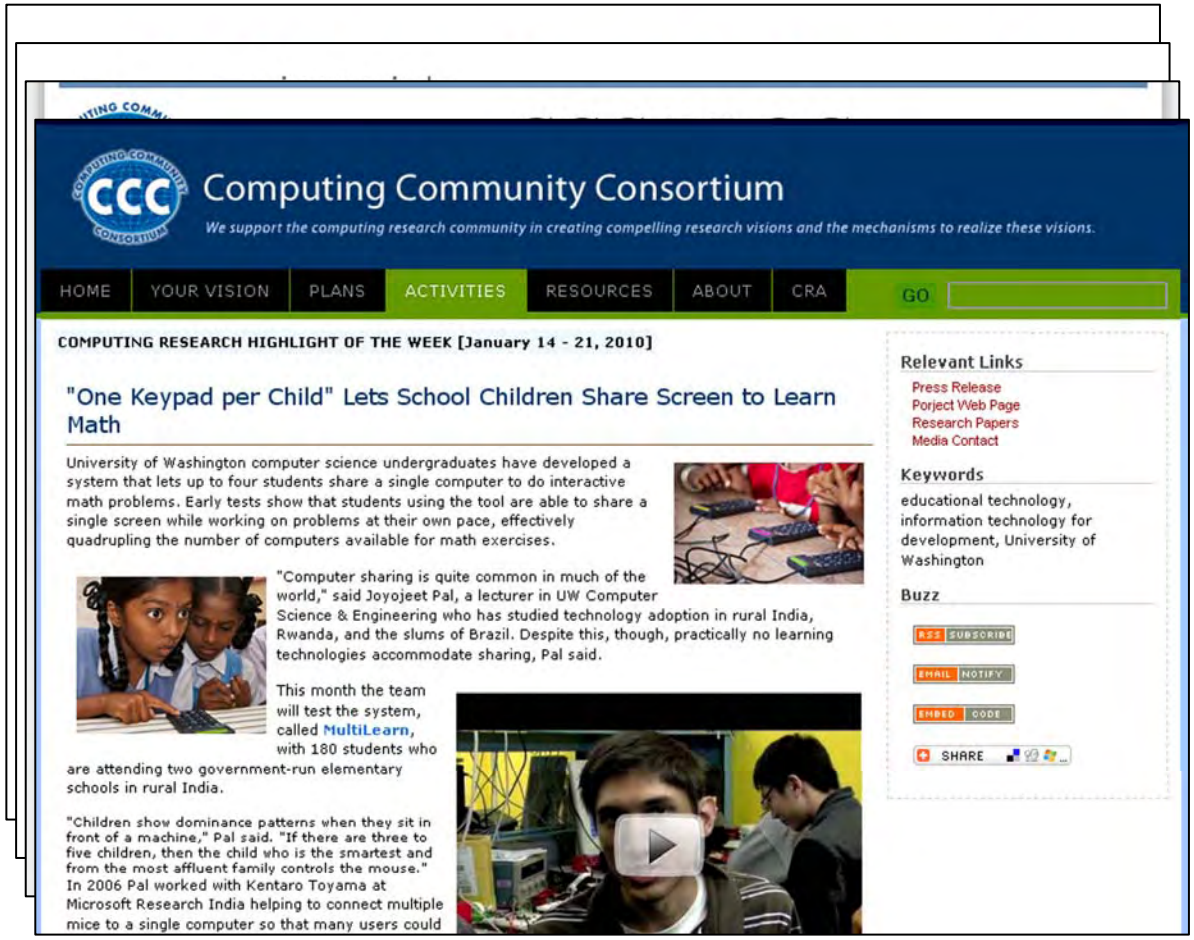
The panel conducting this study (I

Major continuing activities

- Countless talks
- Countless articles
- CCC blog
  - Goals 0, 1, 2, 3, 5, 6
  - Strategies 1, 2

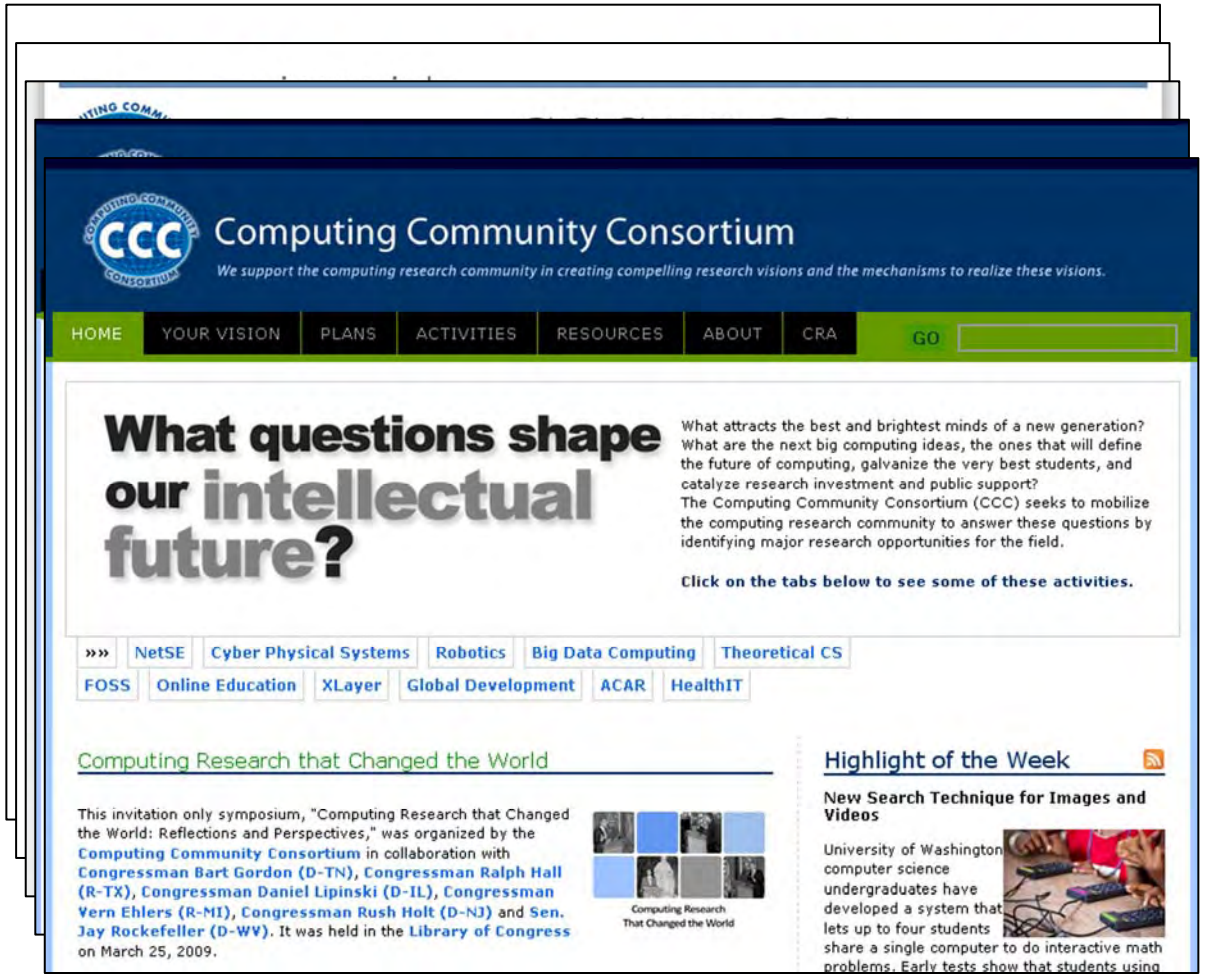
Major continuing activities

- Countless talks
- Countless articles
- CCC blog
- Computing research highlight of the week
  - Goals 0, 1, 2, 3, 5, 6
  - Strategies 1, 2, 4



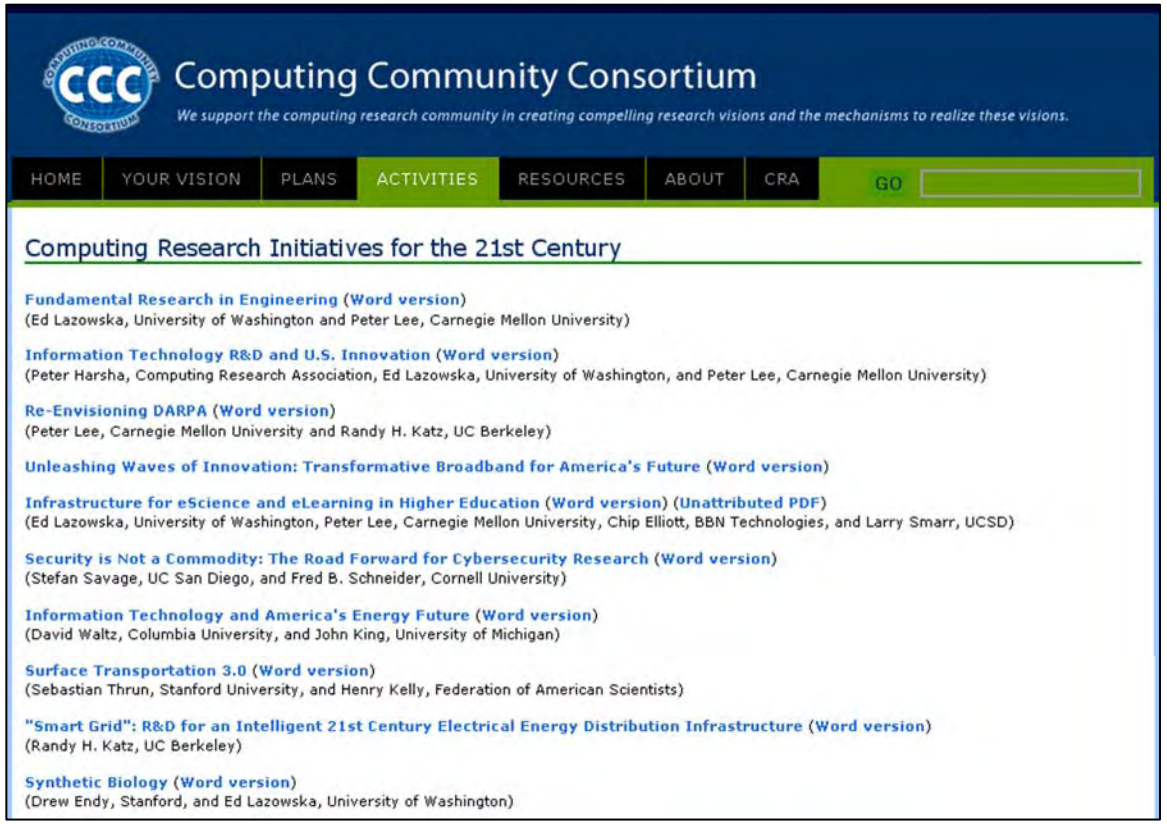
Major continuing activities

- Countless talks
- Countless articles
- CCC blog
- Computing research highlight of the week
- Community visioning exercises
  - Goals 1, 2, 3, 4, 6
  - Strategies 1, 2, 3



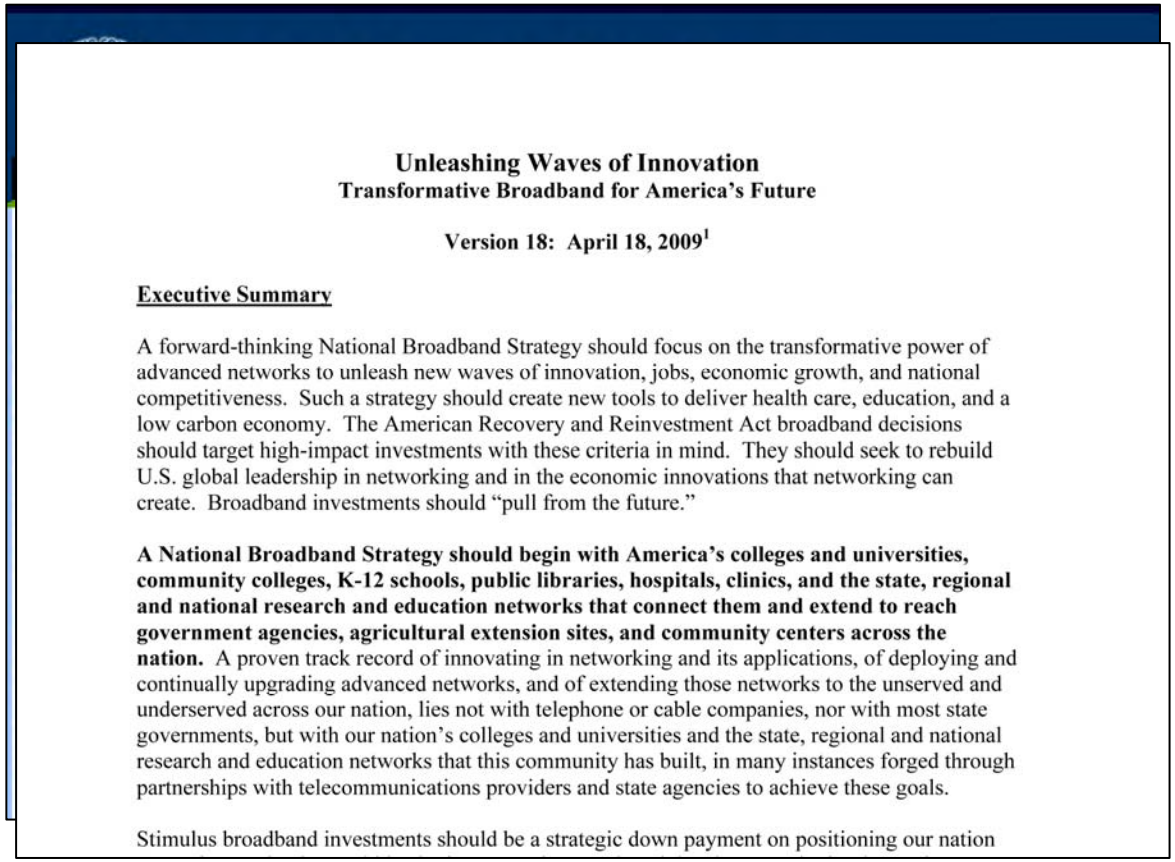
Major special initiatives

- Transition Team white papers
  - Goals 1, 2, 3, 4, 5
  - Strategies 2, 3, 4



Major special initiatives

- Transition Team white papers
  - Unleashing Waves of Innovation



Unleashing Waves of Innovation
Transformative Broadband for America's Future

Version 18: April 18, 2009[1]

Executive Summary

A forward-thinking National Broadband Strategy should focus on the transformative power of advanced networks to unleash new waves of innovation, jobs, economic growth, and national competitiveness. Such a strategy should create new tools to deliver health care, education, and a low carbon economy. The American Recovery and Reinvestment Act broadband decisions should target high-impact investments with these criteria in mind. They should seek to rebuild U.S. global leadership in networking and in the economic innovations that networking can create. Broadband investments should "pull from the future."

A National Broadband Strategy should begin with America's colleges and universities, community colleges, K-12 schools, public libraries, hospitals, clinics, and the state, regional and national research and education networks that connect them and extend to reach government agencies, agricultural extension sites, and community centers across the nation. A proven track record of innovating in networking and its applications, of deploying and continually upgrading advanced networks, and of extending those networks to the unserved and underserved across our nation, lies not with telephone or cable companies, nor with most state governments, but with our nation's colleges and universities and the state, regional and national research and education networks that this community has built, in many instances forged through partnerships with telecommunications providers and state agencies to achieve these goals.

Stimulus broadband investments should be a strategic down payment on positioning our nation

Major special initiatives

- Transition Team white papers
  - Unleashing Waves of Innovation
- Library of Congress Symposium
  - Goals 0, 2, 4, 5
  - Strategies 3, 4

Major special initiatives

- Transition Team white papers
  - Unleashing Waves of Innovation
- Library of Congress Symposium
  - Goals 0, 2, 4, 5
  - Strategies 3, 4

>60,000 video views

Major special initiatives

- Transition Team white papers
  - Unleashing Waves of Innovation
- Library of Congress Symposium
- Computing Innovation Fellows project
  - Goals 0, 1, 5, 6
  - Strategies 1, 2, 3

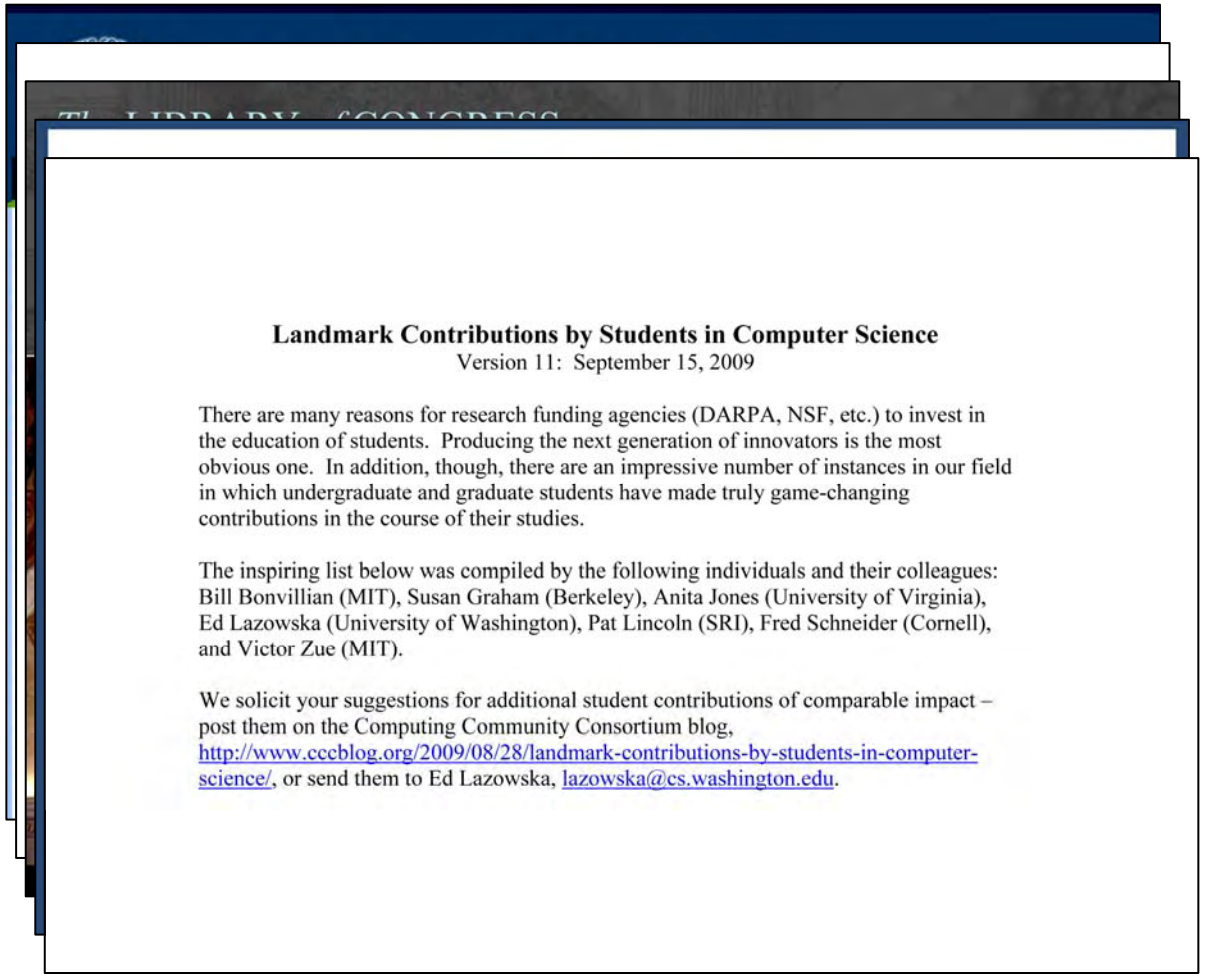
Major special initiatives

- Transition Team white papers
  - Unleashing Waves of Innovation
- Library of Congress Symposium
- Computing Innovation Fellows project
  - Goals 0, 1, 5, 6
  - Strategies 1, 2, 3

1209 mentors
526 applicants

Major special initiatives

- Transition Team white papers
  - Unleashing Waves of Innovation
- Library of Congress Symposium
- Computing Innovation Fellows project
- Landmark Contributions by Students
  - Goals 0, 2, 3, 4, 5
  - Strategies 2, 3



Landmark Contributions by Students in Computer Science

Version 11: September 15, 2009

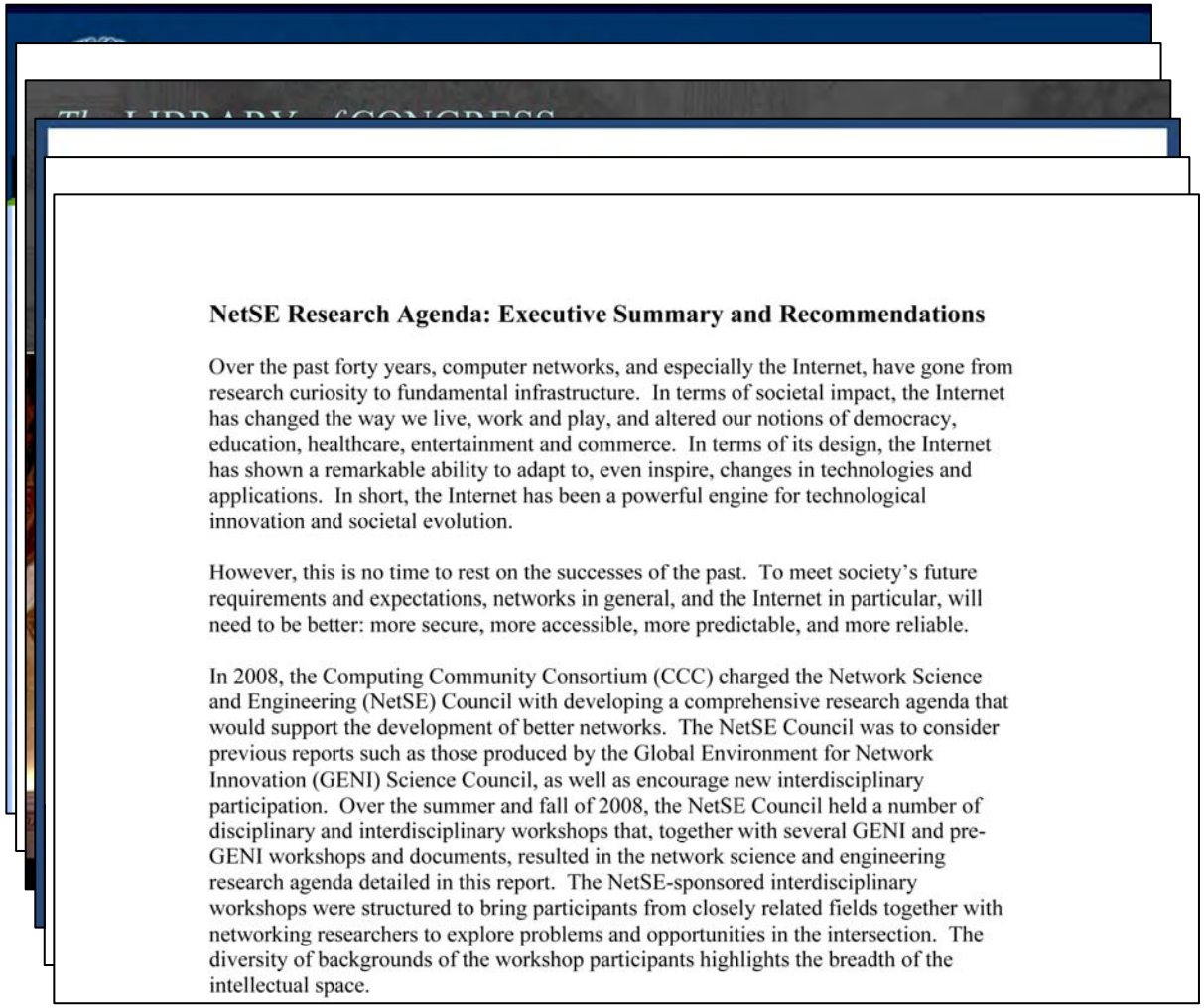
There are many reasons for research funding agencies (DARPA, NSF, etc.) to invest in the education of students. Producing the next generation of innovators is the most obvious one. In addition, though, there are an impressive number of instances in our field in which undergraduate and graduate students have made truly game-changing contributions in the course of their studies.

The inspiring list below was compiled by the following individuals and their colleagues: Bill Bonvillian (MIT), Susan Graham (Berkeley), Anita Jones (University of Virginia), Ed Lazowska (University of Washington), Pat Lincoln (SRI), Fred Schneider (Cornell), and Victor Zue (MIT).

We solicit your suggestions for additional student contributions of comparable impact – post them on the Computing Community Consortium blog, http://www.cccblog.org/2009/08/28/landmark-contributions-by-students-in-computer-science/, or send them to Ed Lazowska, lazowska@cs.washington.edu.

Major special initiatives

- Transition Team white papers
  - Unleashing Waves of Innovation
- Library of Congress Symposium
- Computing Innovation Fellows project
- Landmark Contributions by Students
- NetSE Research Agenda
  - Goals 0, 1, 2, 3, 4, 6
  - Strategies 2, 3



NetSE Research Agenda: Executive Summary and Recommendations

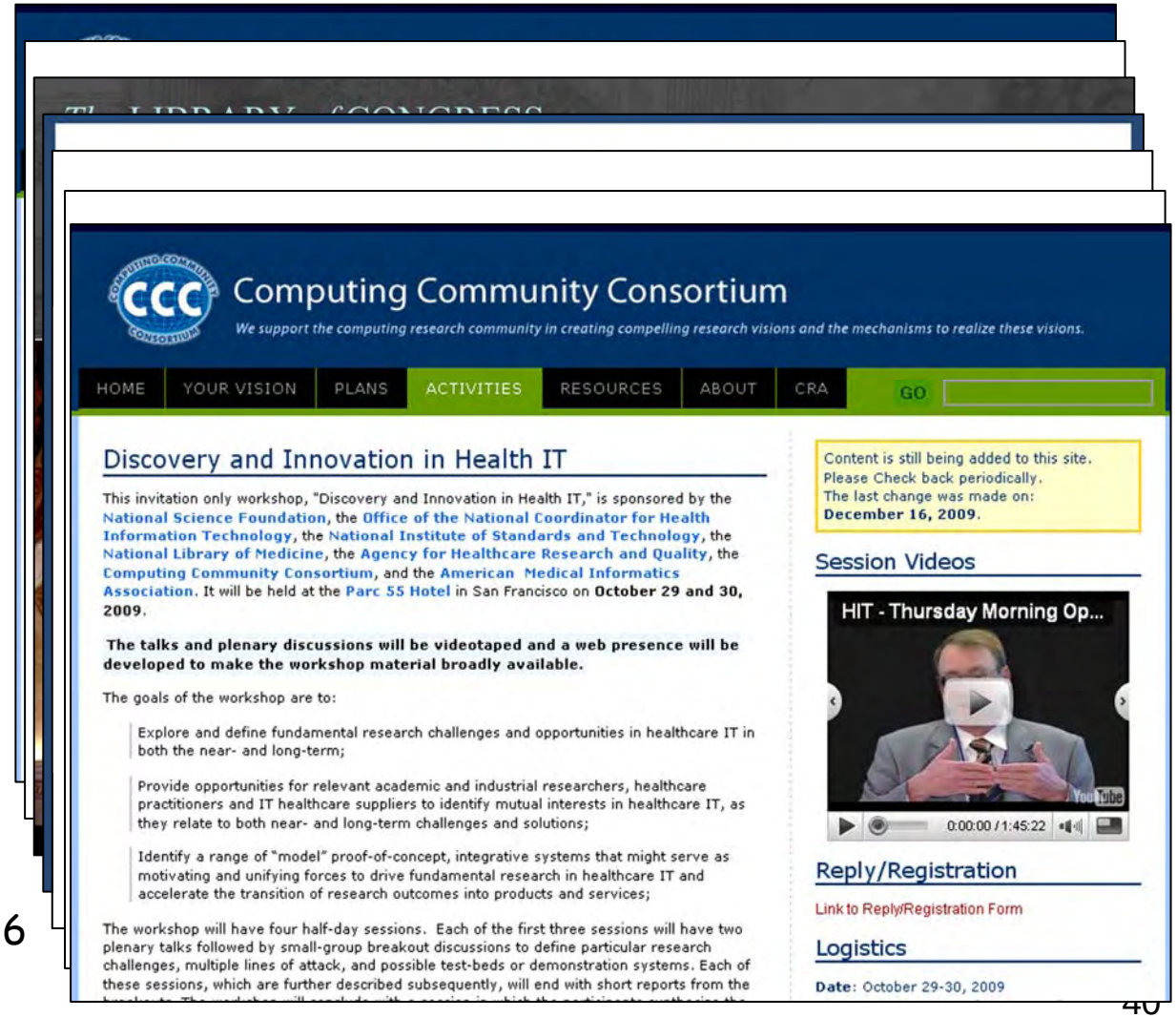
Over the past forty years, computer networks, and especially the Internet, have gone from research curiosity to fundamental infrastructure. In terms of societal impact, the Internet has changed the way we live, work and play, and altered our notions of democracy, education, healthcare, entertainment and commerce. In terms of its design, the Internet has shown a remarkable ability to adapt to, even inspire, changes in technologies and applications. In short, the Internet has been a powerful engine for technological innovation and societal evolution.

However, this is no time to rest on the successes of the past. To meet society's future requirements and expectations, networks in general, and the Internet in particular, will need to be better: more secure, more accessible, more predictable, and more reliable.

In 2008, the Computing Community Consortium (CCC) charged the Network Science and Engineering (NetSE) Council with developing a comprehensive research agenda that would support the development of better networks. The NetSE Council was to consider previous reports such as those produced by the Global Environment for Network Innovation (GENI) Science Council, as well as encourage new interdisciplinary participation. Over the summer and fall of 2008, the NetSE Council held a number of disciplinary and interdisciplinary workshops that, together with several GENI and pre-GENI workshops and documents, resulted in the network science and engineering research agenda detailed in this report. The NetSE-sponsored interdisciplinary workshops were structured to bring participants from closely related fields together with networking researchers to explore problems and opportunities in the intersection. The diversity of backgrounds of the workshop participants highlights the breadth of the intellectual space.

Major special initiatives

- Transition Team white papers
  - Unleashing Waves of Innovation
- Library of Congress Symposium
- Computing Innovation Fellows project
- Landmark Contributions by Students
- NetSE Research Agenda
- Health IT
  - Goals 0, 1, 2, 3, 4, 5, 6
  - Strategies 1, 2, 3, 4



CCC's diverse roles in community visioning exercises

- There have been 12 thus far
  - NetSE
  - Theoretical CS
  - Big Data Computing
  - Robotics
  - Cyber-Physical Systems
  - Global Development
  - Free and Open Source Software
  - Online Education
  - Cross-Layer Reliability
  - Health IT
  - Architecture
  - Interactive Technologies
- Later today you will speak with
  - Tapan Parikh, Global Development
  - Andre DeHon, Cross Layer Reliability
  - Henrik Christensen, Robotics

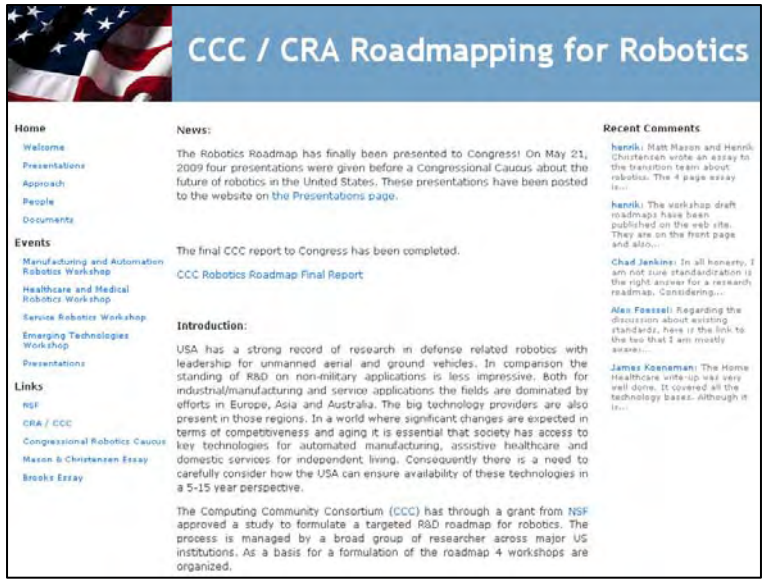
- We play multiple roles at each of several stages
  - In the initiation of activities
  - In the shaping of activities
  - In helping activities deliver value to the community

- Role in the initiation of activities
  - Sometimes embrace an ongoing activity that's in good hands – Cyber Physical Systems
  - Sometimes launch an activity at agency request – Health IT
  - Sometimes respond to a community-initiated proposal – Robotics
  - Sometimes solicit a proposal from an appropriate team – Global Development
- Role in the shaping of activities
  - Sometimes take charge – Health IT
  - Sometimes iterate multiple times in shaping a proposal and a leadership team – Online Education
  - Sometimes a smaller role – Robotics

- Role in helping activities deliver value – we need greater focus here
  - Example: Big Data
    - Coalesced a Hadoop community through the Hadoop Summit
    - Coalesced a research community through the Data-Intensive Computing Symposium
    - Google/IBM Academic Datacenter
    - DISC in Education Workshop
    - HP/Intel/Yahoo! Cloud Computing Test Bed
    - NSF CluE program
    - NSF Data-intensive Computing program
    - Microsoft/NSF announcement

- Example: Cyber Physical Systems
  - Helped build bridges to industry: "New Forms of Industry-Academy Partnership in CPS Research" workshop
  - Helped build bridges to non-NSF funding agencies: CPS in DDR&E's MURI program and DARPA TTO META program
  - Helping support the formation of the CPS community's "Virtual Organization"

- Example: Robotics
  - 4 workshops, >100 participants, synthesis
  - Roadmap (http://www.us-robotics.us)
  - 3 meetings with the Congressional Caucus (arranged by CMU)
  - OSTP meeting with 40 program managers from 18 agencies
  - Emergence of Henrik Christensen as a savvy leader of the field



- Responsiveness
  - In every instance, we have delivered feedback within a few weeks of receipt
  - In several instances, we have delivered a positive decision within a week of receipt
- Mentoring
  - 20 proposals received
    - 6 supported quickly – with substantive feedback, but essentially as proposed
    - 6 supported after significant shaping/mentoring
    - 7 not supported
      - Sometimes after very significant attempts at shaping/mentoring
    - 1 in the pipeline

- Important outcomes
  - Establishing new directions
  - Building research communities
  - Building industry connections
  - Building funding agency connections
  - Building Congressional connections
  - Energizing and stimulating the field
  - Grooming future leaders of the field
- *These are long-term investments*

CCC's role in GENI/NetSE

- Over-arching role was to assist NSF in:
  - Freeing GENI from MREFC constraints
  - Providing a NetSE framework within which GENI, along with other networking research initiatives, could flourish
  - Assisting the GPO in communicating "the new GENI" to the broad computing research community
- Activities included:
  - GENI Community Advisory Board
  - GENI Science Council
  - NetSE Council
  - Five workshops on various dimensions of NetSE
  - NetSE Research Agenda
  - Infinite proselytizing and ruffled-feather-smoothing

- Status:
  - GENI – an entirely new concept with the same name – is thriving, under the extraordinary leadership of Chip Elliott and the GPO
  - The computing research community is beginning to understand its role
  - Other research communities related to networking have coalesced

CCC: Opportunistic and agile (White papers for the Presidential Transition Team)

- Sensed and seized the opportunity to influence federal science policy through the Presidential Transition Team
  - 19 papers produced in late 2008 and early 2009
  - 30 separate authors
  - Many highly influential
    - Re-Envisioning DARPA – Peter Lee, Randy Katz
    - Infrastructure for eScience and eLearning / Unleashing Waves of Innovation – Ed Lazowska, Peter Lee, Chip Elliott, Larry Smarr
    - Security is Not a Commodity – Stefan Savage, Fred Schneider
    - Synthetic Biology – Drew Endy, Ed Lazowska
    - Big-Data Computing – Randy Bryant, Randy Katz, Ed Lazowska
    - The Ocean Observatories Initiative – John Delaney, John Orcutt, Robert Weller
    - Cyber-Physical Systems – Janos Sztipanovits, Jack Stankovic

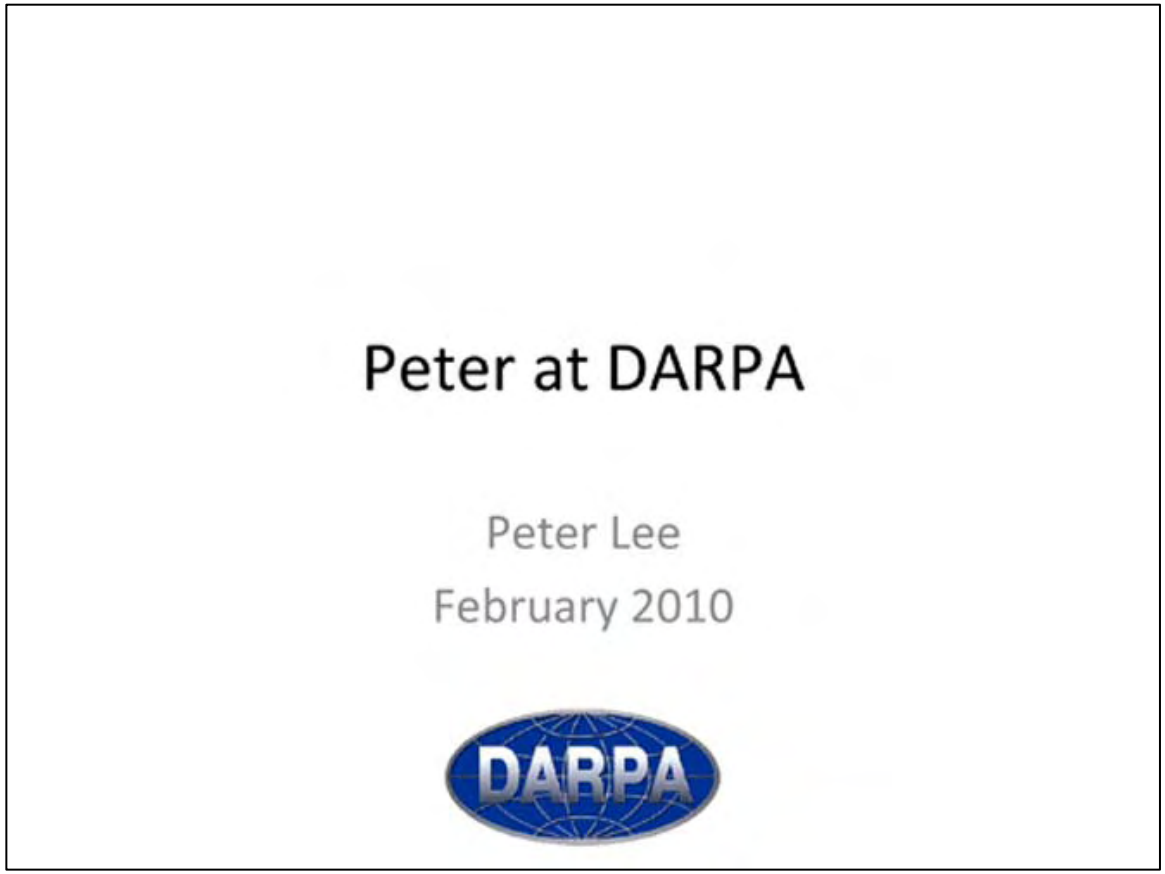
- Others point in important directions
  - Information Technology and America's Energy Future – David Waltz, John King
  - Surface Transportation 3.0 – Sebastian Thrun, Henry Kelly
  - Smart Grid – Randy Katz
  - Innovation in Networking – Nick McKeown, Guru Parulkar, Jen Rexford
  - Robotics – Rod Brooks
  - Quality of Life Technology – Howard Wactlar, Takeo Kanade
  - P4 Medicine – Lee Hood, David Galas
  - Quantum Computing – Scott Aaronson, Dave Bacon
  - Computer Architecture – Dave Patterson

- Example:

  Re-Envisioning
  DARPA

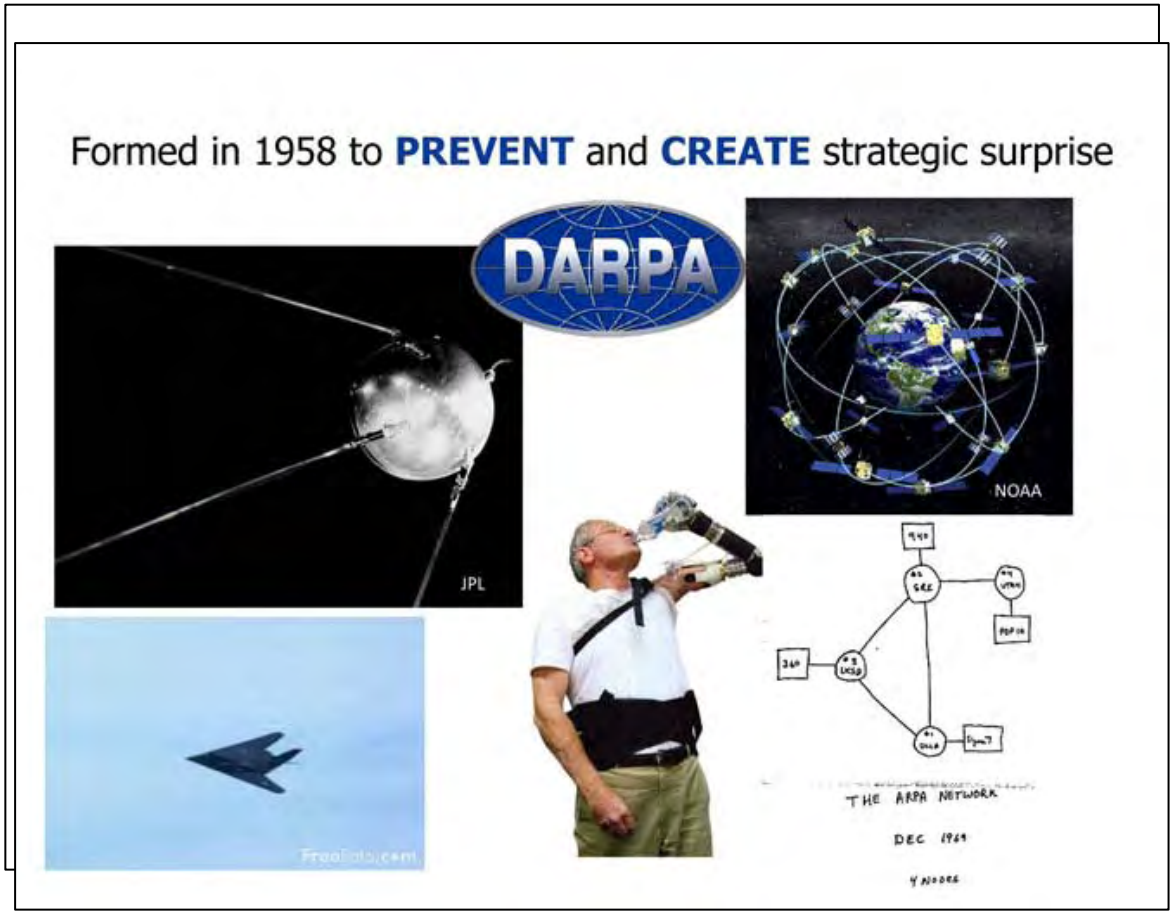
- Example:

  Re-Envisioning DARPA



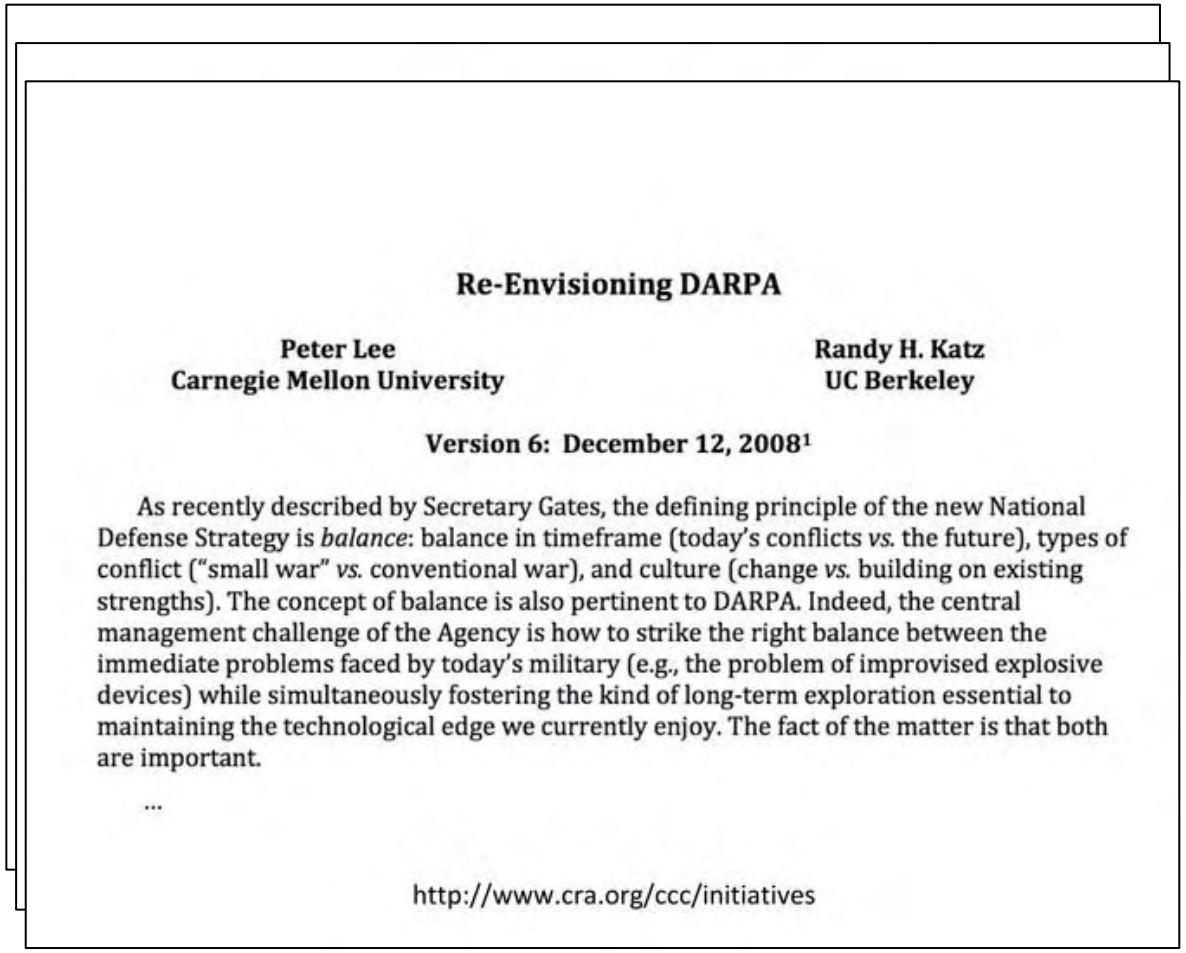
- Example:

  Re-Envisioning DARPA



- Example:

  Re-Envisioning DARPA



Re-Envisioning DARPA

Peter Lee
Carnegie Mellon University

Randy H. Katz
UC Berkeley

Version 6: December 12, 2008[1]

As recently described by Secretary Gates, the defining principle of the new National Defense Strategy is *balance*: balance in timeframe (today's conflicts *vs.* the future), types of conflict ("small war" *vs.* conventional war), and culture (change *vs.* building on existing strengths). The concept of balance is also pertinent to DARPA. Indeed, the central management challenge of the Agency is how to strike the right balance between the immediate problems faced by today's military (e.g., the problem of improvised explosive devices) while simultaneously fostering the kind of long-term exploration essential to maintaining the technological edge we currently enjoy. The fact of the matter is that both are important.

...

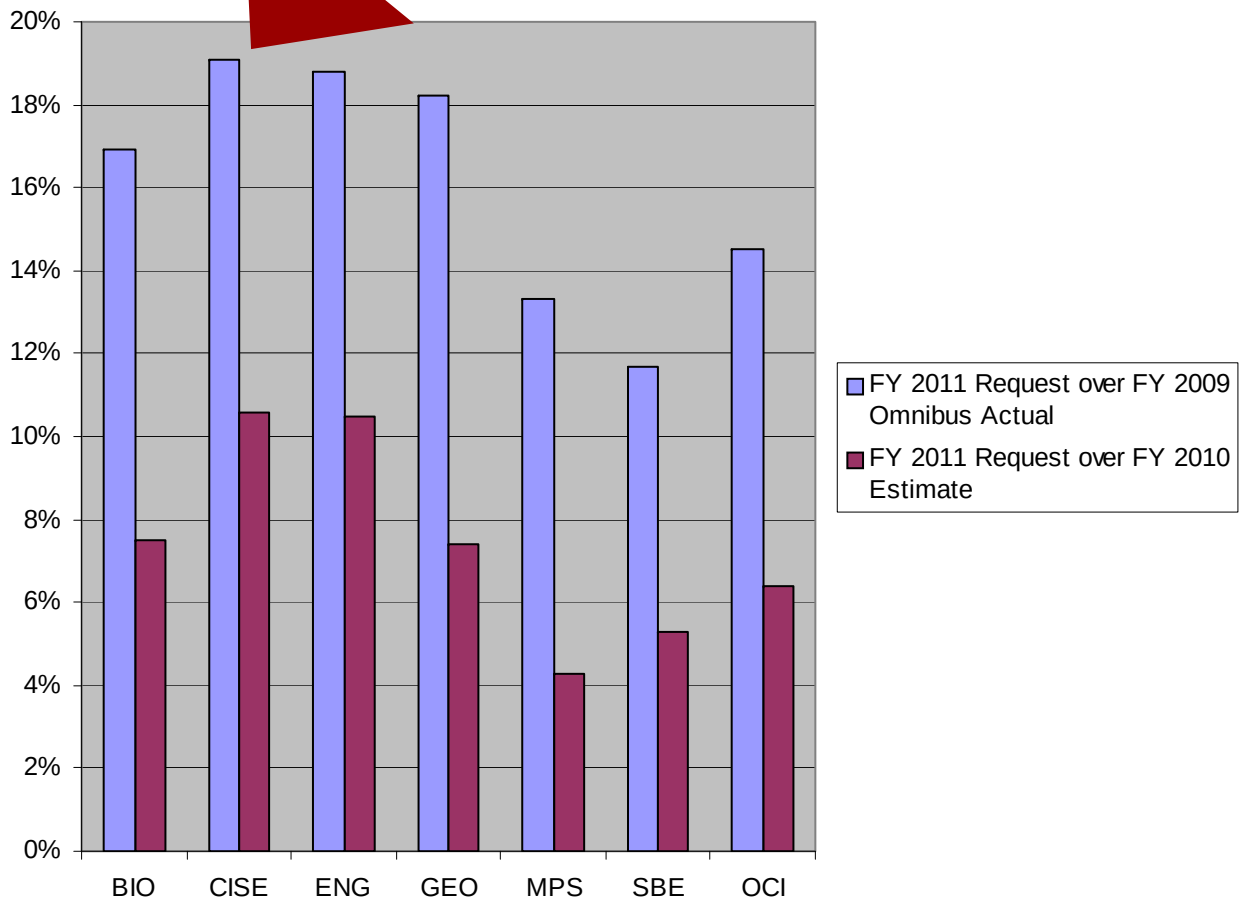
http://www.cra.org/ccc/initiatives

- Example:

  Re-Envisioning DARPA

- More broadly:

  The white papers certainly played at least some role in CISE's success in the FY 2011 budget request



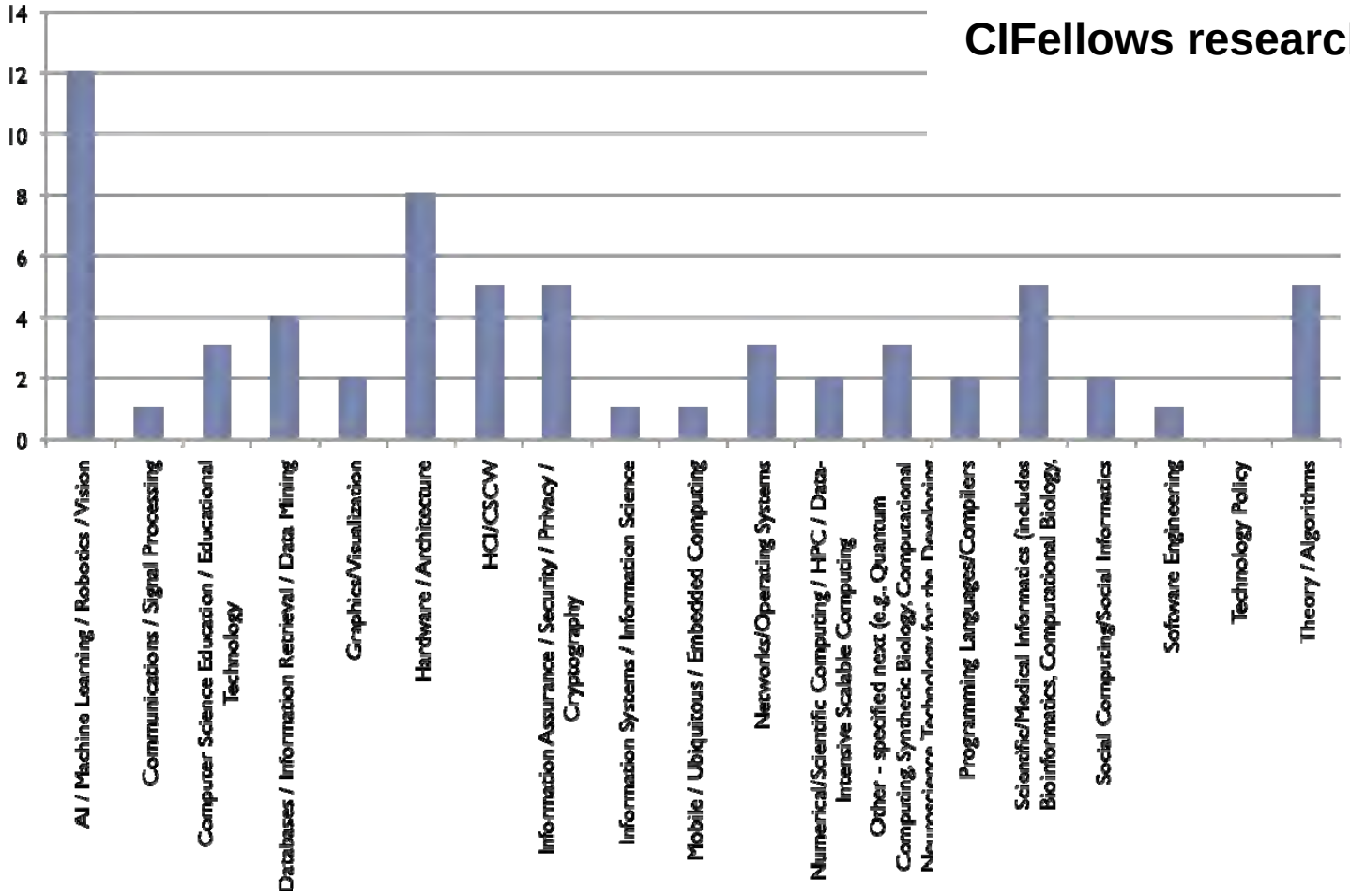
- Our ability to provide "on demand" resources to policy makers – which involves a great deal of anticipation on our part ("speculative execution") – is critical, since so many of the new administration's initiatives will critically depend on advances in computing

CCC: Opportunistic and agile (the Computing Innovation Fellows project)

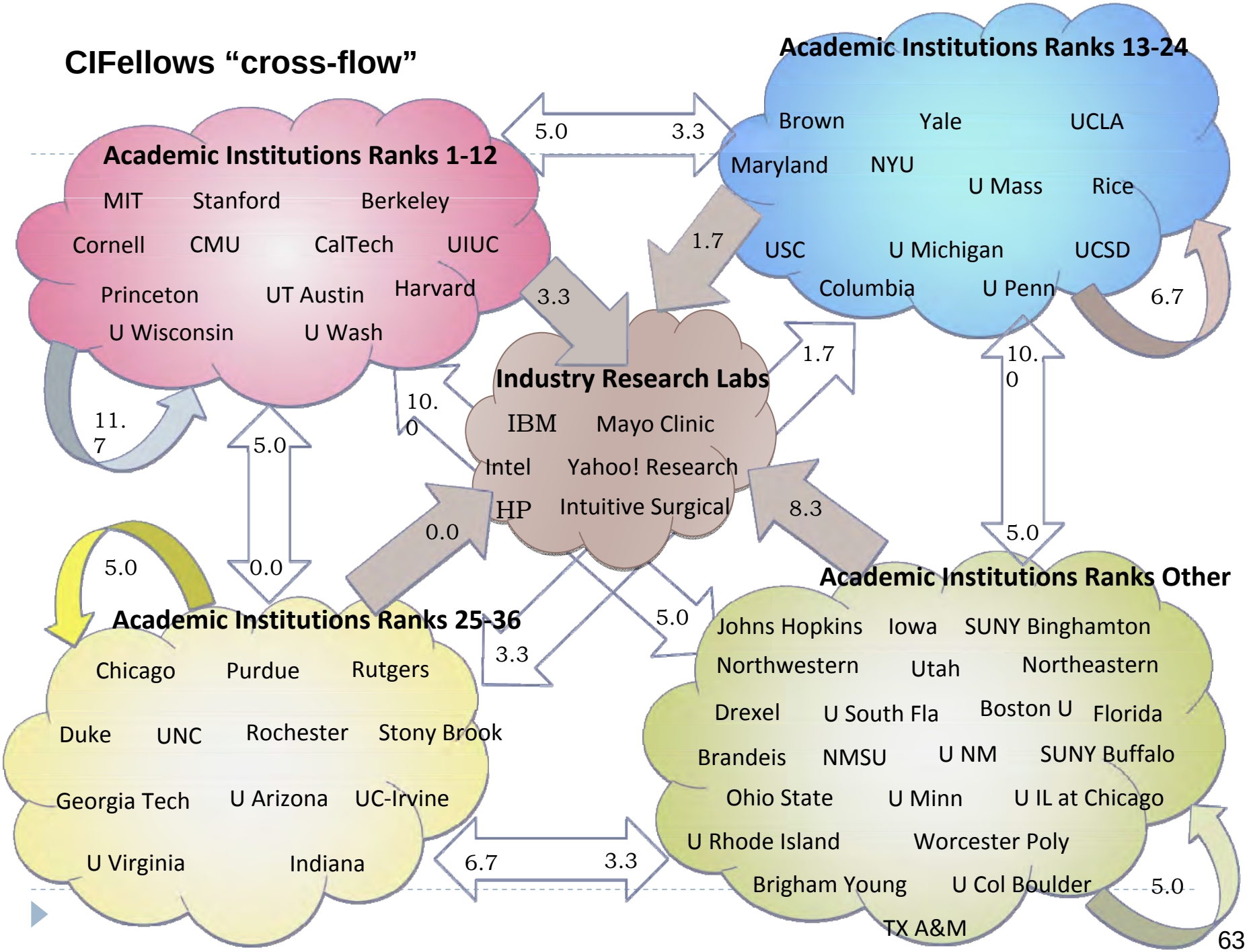
- Sensed the need for a postdoc program to respond to economic conditions – preserve the people pipeline
- Envisioned a highly innovative approach that would strengthen the field in novel ways
- In partnership with NSF, drove it forward in record time
  - January 2009: idea conceived
  - February 2009: NSF consulted
  - March 2009: proposal submitted
  - April 2009: procedures devised; website built
  - May 2009: award formalized; mentor and fellow application websites go live
  - June 2009: 1209 prospective mentors register; 526 prospective fellows apply, proposing 929 fellow/mentor pairings; selection committee members evaluate applications
  - July 2009: selection committee meets; steering committee meets; 60 awardees selected and notified
  - August 2009: awards negotiated with host institutions
  - September 2009: public announcement; fellowships commence

- Innovative aspects
  - Awards made to fellow/mentor pairs
  - "Max 2" rule – building lasting bridges
  - Discussion ordering during each phase of holistic review
    - "Target attributes" – gender, citizenship, ethnicity
- The CI Fellows
  - 60 awardees
    - 40% women
    - 12% African American, Hispanic American, or Native American
    - 75% US citizens or permanent residents
  - 43 distinct Ph.D. institutions
  - 48 distinct mentoring institutions
    - 85% academic, 15% industrial
  - 28% within academic group; 58% cross academic group; 13% to industry

CIFellows research areas



CIFellows "cross-flow"



CCC: Opportunistic and agile

- We are both proactive and responsive
- We go where the need/opportunity is
  - GENI/NetSE
  - Transition Team white papers
  - Library of Congress Symposium
  - Computing Innovation Fellows project
  - Landmark Contributions by Students
  - Discovery and Innovation in Health IT

CCC: Directly and broadly engaging the community

	Participants	Institutions
Community Visioning Activities		
Health IT	121	102
NetSE	109	44
Cyber-Physical Systems	100	47
Robotics	141	79
Big Data Computing	81	46
Theoretical CS	39	26
Online Education	55	30
Free and Open Source Software	42	35
Cross Layer Reliability	121	45
Global Development	56	37
Advancing Computer Architecture Research (new)	3	3
Interactive Technologies (new)	4	4
Select Other Activities		
Library of Congress Symposium	128	71
CCC Council	27	25
CS Outside the Box	48	37
Transition Team White Paper authors	30	19
CIFellows		
Selection Committee and Steering Committee	36	28
Applicants	526	145
Prospective Mentors	1209	198

Topics for this morning

- CCC activities and initiatives
  - Major continuing activities
  - Major special initiatives
  - CCC's diverse roles in community visioning exercises
  - CCC's role in GENI/NetSE
  - CCC: Opportunistic and agile
  - CCC: Directly and broadly engaging the community
- Organization and management
  - CCC structure
  - The CCC Council
  - Selection of Council members
  - Range of Council member activities
  - Erwin Gianchandani's anticipated role

CCC structure

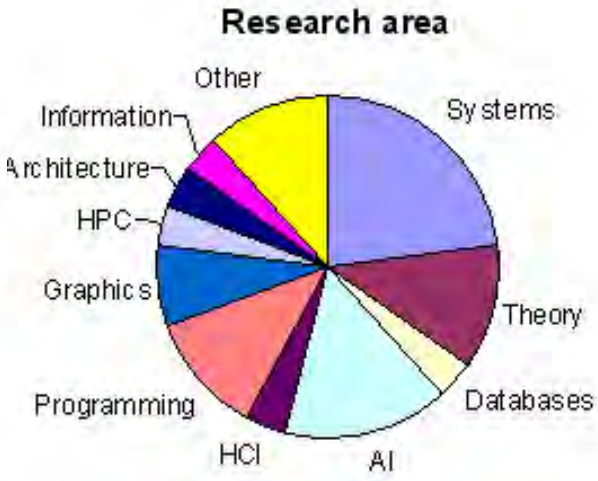
- CCC is a "standing committee" of CRA
  - Analogous to CRA-W
- Operates under a cooperative agreement with NSF
  - Frequent interactions with NSF staff
- Chair: Ed Lazowska (roughly 1/3 time)
- Vice Chair: Susan Graham
  - Must be formalized and budgeted
- Director: Andy Bernat -> Erwin Gianchandani
  - A necessary increase from 25% to 100% FTE
- 18-member Council (3-year staggered terms) chosen through an open process administered by the CRA Board Chair

The CCC Council – broad representation

- Chair
  - Ed Lazowska
- Terms ending 2013
  - Randy Bryant
  - Lance Fortnow
  - Hank Korth
  - Eric Horvitz
  - Beth Mynatt
  - Fred Schneider
  - Margo Seltzer
- Terms ending 2012
  - Stephanie Forrest
  - Chris Johnson
  - Anita Jones
  - M. Frans Kaashoek
  - Ran Libeskind-Hadas
  - Robin Murphy
- Terms ending 2011
  - Bill Feiereisen
  - Susan Graham (v ch)
  - Dave Kaeli
  - John King
  - Bob Sproull
- Ex Officio
  - Andy Bernat
- Rotated off
  - Dick Karp, 2010
  - Andrew McCallum, 2010
  - Dave Waltz, 2010
  - Greg Andrews, 2009
  - Peter Lee, 2009
  - Karen Sutherland, 2009


Gender
Female
Male


Institution type
Industry
First 12
Undergrad
Second 12
Other
Third 12


Research area
Other
Systems
Information
Architecture
HPC
Graphics
Theory
Programming
Databases
HCI
AI

Selection of Council members

- Widely-advertised open nomination process
  - "What the CCC Council needs is not famous people with lots of awards, but people with ideas, judgment, and the willingness to work"
- Top candidates identified by a selection committee appointed by CRA
  - Careful consideration of overall Council composition
- Interaction with CCC leadership as a backup check
- Slate presented to NSF
- Candidates recruited
  - We can recall only one turndown in three rounds of populating the Council, plus one round of populating the Interim Council that preceded it

Range of Council member activities

- Major
  - Create and run the community-initiated visioning activities program (Greg Andrews, transitioned to Fred Schneider)
  - Envision and create the Computing Innovation Fellows project (Peter Lee, transitioned to Greg Andrews)
  - Coordinate the *Discovery and Innovation in Health IT* workshop (Susan Graham)
- Intermediate
  - Oversee the Computing Research Blog (Ran Libeskind-Hadas)
  - Serve as CCC liaison to specific community-initiated visioning activities, ensuring that commitments are met, and that value is delivered to the computing research community (Anita Jones, Beth Mynatt, Dick Karp, John King, Dave Kaeli, Bill Feiereisen)

- *Ongoing*
  - Review and shape community-initiated visioning proposals
  - Shape overall strategy in bi-weekly conference calls and quarterly in-person meetings
  - Answer the call for special initiatives (e.g., Peter Lee, Fred Schneider, David Waltz, John King, Randy Bryant, and Anita Jones are among those who made significant contributions to the Transition Team white papers)

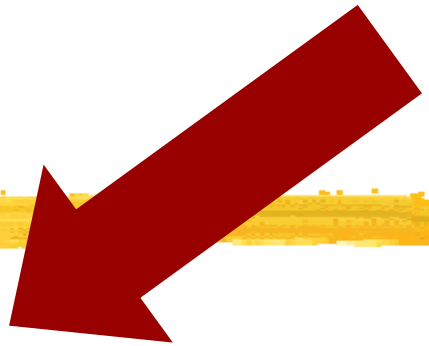
Erwin Gianchandani's anticipated role

- In the beginning, we were "finding our way" – shaping the organization
  - Extensive involvement of the Chair, Vice Chair, and Council in all decisions seemed appropriate
  - Not clear what the duties of a Director would be
- Andy Bernat agreed to take on CCC duties in addition to his CRA duties

- In time, it became clear that we needed a full-time staff director, and it became clear what such a person could bring to the organization
  - Routine activities: Ensure that the CCC Blog, the Computing Research Highlight of the Week, the CCC website, etc., all advance appropriately
  - Organizational leadership activities: Drive the planning of agendas for conference calls and face-to-face meetings; serve as primary NSF liaison; engage with visioning exercises to help ensure that they deliver value; drive dissemination strategy; focus on increased engagement of Council members
  - Field leadership activities: Become a bridge between the computing research community and funding agencies, just as Peter Harsha is a bridge between the computing research community and federal policymakers

- Over the summer, we advertised for a Director
  - Four strong candidates
  - Recruited our first choice, Erwin Gianchandani
    - B.S. in Computer Science, Ph.D. in Bioengineering from UVa
    - Currently AAAS Fellow in NSF CISE
    - Will start with CCC in March
- This will help to address the "succession" issue

Topics for this morning



- Plans for formal assessment
- Budget
- Analysis, future directions, and open questions
  - Areas of mixed success
  - Clear "to do's"
  - Open questions
  - Measures of success
  - Summary

Plans for formal assessment

- Committed to a rigorous assessment of the impact of both CCC and CIFellows
- Cast a wide net for potential evaluators
- Spoke with 4 who were suggested; checked with several others by email
- Two were encouraged to submit "concept papers" and rough budgets
  - Julie Foertsch, formerly Director of the LEAD Center at the University of Wisconsin, now an independent evaluator affiliated with the University of Wisconsin School of Medicine and Public Health
  - SRI International

- The SRI "concept paper" was far stronger
- Have contracted with SRI for a February start
  - Dr. Jeffrey Alexander, Senior Science and Technology Policy Analyst – project director
  - Dr. David Roessner, Associate Director of the Science and Technology Policy Program at SRI and Professor of Public Policy Emeritus at the Georgia Institute of Technology – project consultant
  - Lori Thurgood, Senior Research Analyst – project analyst
- SRI will assess both CCC and CIFellows

Topics for this morning

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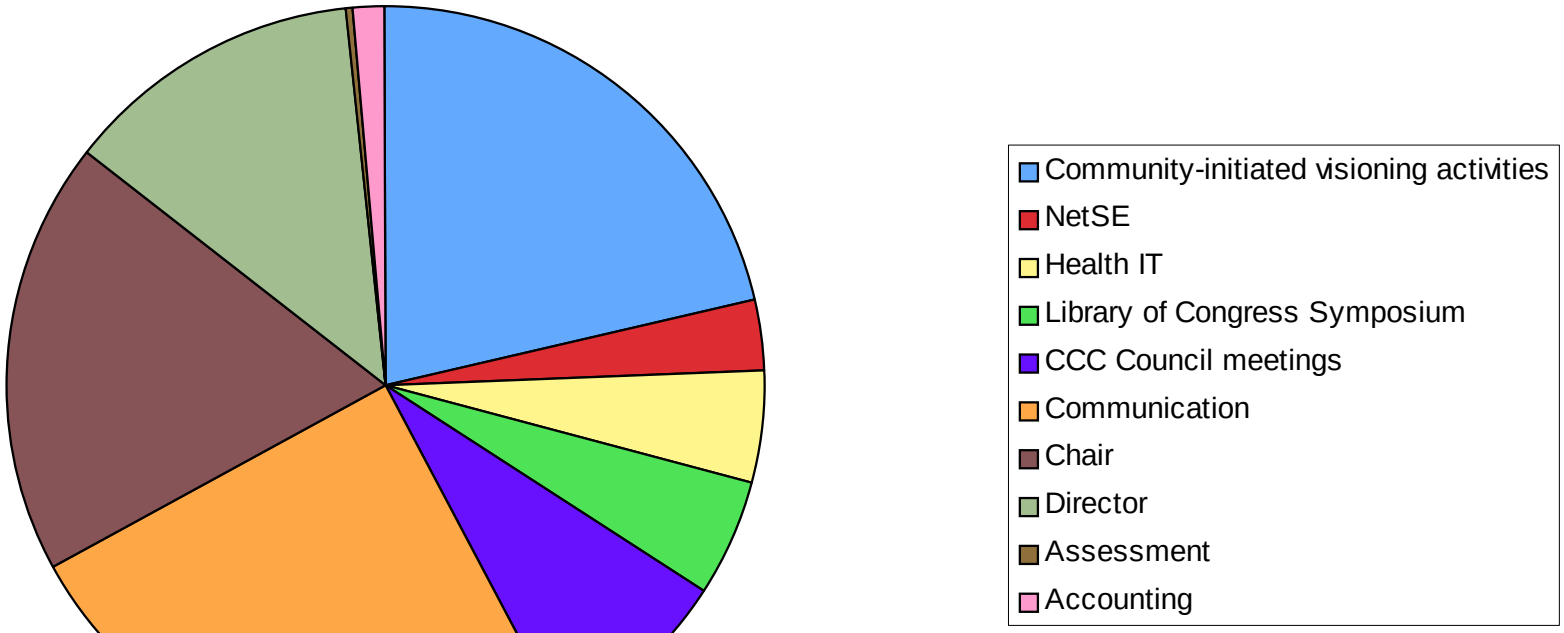
CCC budget

- Envisioned as a 3-year, $6 million cooperative agreement
- Expended $2.5 million through December 2009 (3-1/4 or 2-1/2 years in, depending on how you count)
- Anticipate expending an additional $1 million through September 2010 (4 or 3-1/3 years in, depending on how you count)

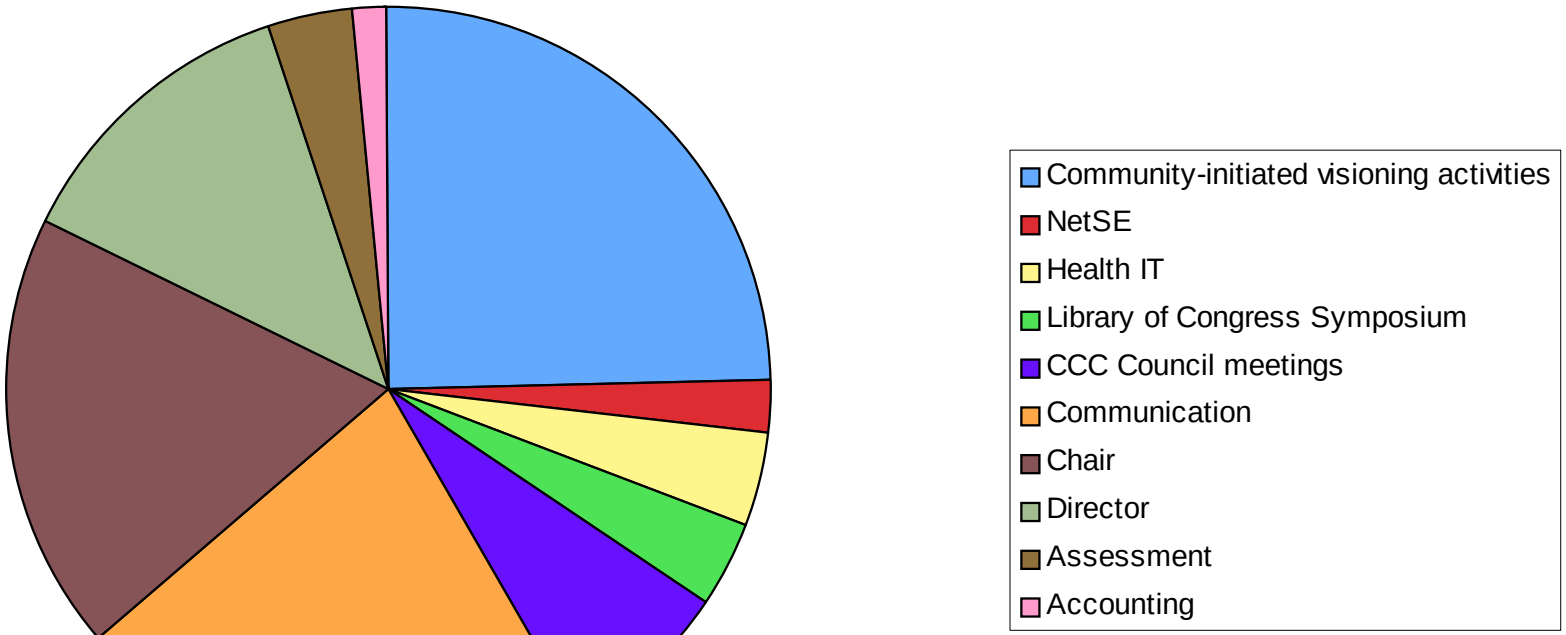
CCC Expenditures through December 2009 -- $2.5M

(pie chart shows direct costs only)



CCC Expenditures through September 2010 (projected) -- $3.5M

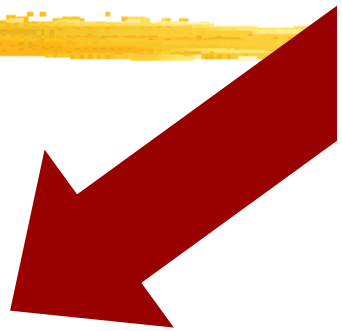
(pie chart shows direct costs only)



- Staffing shared with CRA
  - Andy Bernat – 25%, Director
  - Peter Harsha – 23%, policymaker liaison (e.g., for Library of Congress Symposium) and communication
  - Melissa Norr – 17%, policymaker liaison (similar)
  - Kapil Patnaik – 18%, web and computing infrastructure for communication
  - Patrick Krason – 11%, accounting
  - Jean Smith – 1%, communication
  - Xenophon – communication consultant

- Clear needs
  - Move from 25% to 100% staff director
  - Formalize and budget Vice Chair position
  - Invest more in dissemination/communication

Topics for this morning



- Plans for formal assessment
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  - Summary

Analysis, future directions, and open questions

- We've talked a lot about what we've accomplished, and what has worked
  - Our biggest wins: field-wide initiatives (e.g., CIFellows) and providing expertise to policymakers on demand (white papers)
- What haven't we accomplished, and what hasn't worked?
- What are the clear "to do's"?
- What are the open questions?
- What are the measures of success?

Areas of mixed success

- The community visioning exercises are a mixed bag
  - Some have led to, or contributed to, significant new programs or new directions
    - Big Data, Robotics, Cyber-Physical Systems, Health IT
  - Some have helped new leaders to emerge
    - Robotics
  - Some are mid-course and promising
    - Cross Layer Reliability, Interactive Technology, Global Development
  - Some, while promising, have required major CCC effort
    - NetSE, Advancing Architecture, Free and Open Source Software, Online Education
  - Some have flopped
    - Theoretical Computer Science

- There are important reasons for CCC to be in this business (vs. no one, or some federal agency, or "insiders")
  - The process energizes/stimulates the community
  - The process empowers individuals – grooms leaders
  - We provide extensive mentoring (which also grooms leaders)
  - We own the IP – can shop it around to various agencies
  - We can utilize it for "lobbying"
  - We can move fast – respond to opportunities
  - We can be directive
  - Contributes to creating an "outward-looking" mentality for the field

Clear "to do's"

- Take advantage of Peter Lee and Regina Dugan to re-build the community's relationship with DARPA
- Establish the role of computing research in biomedicine and health care; strengthen ties to NIH/HHS
- Establish the role of computing research in the nation's energy future; strengthen ties to DoE
- Identify younger thought leaders and recruit them to the CCC Council and other CCC activities
- Provide more comprehensive guidance and follow-through for community visioning exercises
- Increase focus on dissemination/communication

Open questions

- What should our role be in international activities?
- What should our role be in education?
- Should there be annual "broad dissemination" activities (a range of activities, analogous to the Library of Congress Symposium)?
- Are there alternatives to the current community visioning process for engaging the broad community in envisioning the future of the field?
- Are there better ways to surface truly revolutionary ideas?

Measures of success (from our Implementation Plan)

- Multi-agency understanding of the role computing research must play in addressing national priorities
- Clear actionable roadmaps for visionary research
- New programs for computing research funded in multiple agencies
- Societal understanding of the foundational impact of computing research
- Emergence of a new generation of leaders

Summary

- We feel that we have delivered
- Not always in ways that were anticipated
- CCC is a long-term, institutional enterprise – not a project or a program
  - Done right, it will provide an authoritative mechanism to channel energy in the field
  - Secondary effects (e.g., development of leadership, broadening and lengthening of vision) are important
- The various CCC roles cannot be filled by NSF, CSTB, the CISE AC, PITAC (RIP) …
- We are eager for your guidance