

# THE COMPUTING COMMUNITY CONSORTIUM: CATALYZING AND ENABLING COMPUTING RESEARCH

*Gregory Hager*

*Chair*

*Johns Hopkins*

*Ann Drobnis*

*Director*

*Beth Mynatt*

*Vice Chair*

*Georgia Tech*



**CCC**

Computing Community Consortium  
Catalyst

# SOME MOTIVATING QUESTIONS

- How do we energize the community around “big ideas” that will create excitement and energy around computing and computational research?
- How do we shape and articulate our relevance to national priorities?
- How do we communicate these ideas, as a community, to science policy and funding leadership?

# THE COMPUTING COMMUNITY CONSORTIUM

- Established in 2006 as a standing committee of the Computing Research Association
- Funded by NSF under a Cooperative Agreement
  - Second Award began in 2012, recently completed Reverse Site Visit
- Facilitates the development of a bold, multi-themed vision for computing research – and communicates this vision to stakeholders
- Led by a broad-based Council
- Staffed by CRA

# THE CCC COUNCIL – EXECUTIVE COMMITTEE



- Greg Hager, Johns Hopkins Univ. (Chair)
- Beth Mynatt, Georgia Tech (Vice Chair)
- Susan Graham, UC Berkeley (Past Chair)
- Bob Sproull, formerly Sun Labs Oracle
- Liz Bradley, University of Colorado, Boulder
- Mark Hill, University of Wisconsin, Madison
- Ann Drobnis, Director
- Andy Bernat, CRA Executive Director

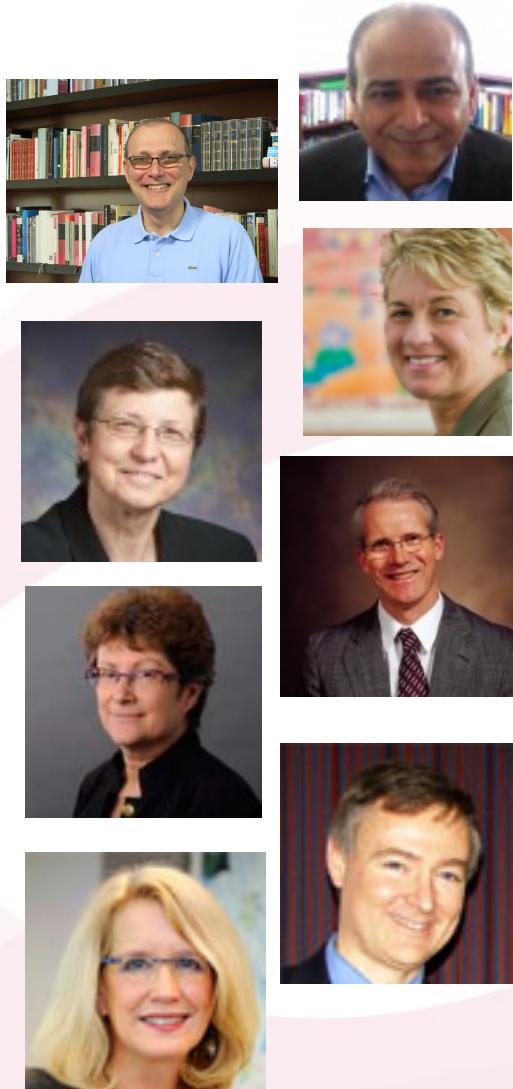


\* Executive Committee  
\*\* 1 year leave



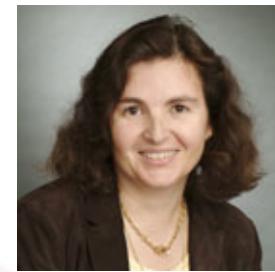
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# THE CCC COUNCIL



- Terms ending June 2017
  - Lorenzo Alvisi, UT Austin
  - Vasant Honavar, Penn State
  - Jennifer Rexford, Princeton
  - Debra Richardson, UC Irvine
  - Klara Nahrstedt, UIUC
  - Ben Zorn, Microsoft Research
- Terms ending June 2016
  - Randy Bryant, CMU\*\*
  - Limor Fix, formerly Intel
  - Tal Rabin, IBM
  - Daniela Rus, MIT
  - Ross Whitaker, Univ. Utah
- Terms ending June 2015
  - Sue Davidson, Univ. Pennsylvania
  - Joe Evans, Univ. Kansas
  - Ran Libeskind-Hadas, Harvey Mudd College
  - Shashi Shekhar, Univ. Minnesota

\*\* 1 year leave



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# OUR MISSION

The **mission** of Computing Research Association's Computing Community Consortium (CCC) is to:

**catalyze** the computing research community and  
**enable** the pursuit of innovative, high-impact research.

CCC conducts activities that

**strengthen** the research community,  
**articulate** compelling **research visions**, and  
**align** those visions with pressing **national and global challenges**.

CCC **communicates** the importance of those visions to **policymakers**,  
government and **industry stakeholders**, the **public**, and the **research community** itself.

# OUR MISSION

- Catalyze and communicate the excitement of computing research
- Align and articulate our contributions to other fields and to national priorities
- Groom future leadership to help shape science policy

# HOW DO WE DO IT?

- **Community-initiated visioning:**
  - Workshops to discuss “out-of-the-box” ideas
  - Blue Sky Ideas tracks at conferences
- **Outreach to White House, funding agencies:**
  - Outputs of visioning activities
  - Short reports to inform policy makers
  - Task Forces – Health IT, Sustainability IT, Data Analytics



Computing Research That Changed The World

This Week's Highlight:  
Fruit Fly Suggests New  
Solution to Computer  
Networking Problem

LANDMARK CONTRIBUTIONS BY STUDENTS IN COMPUTER SCIENCE  
undergraduate and graduate students that have made truly game-changing contributions in the course of their studies

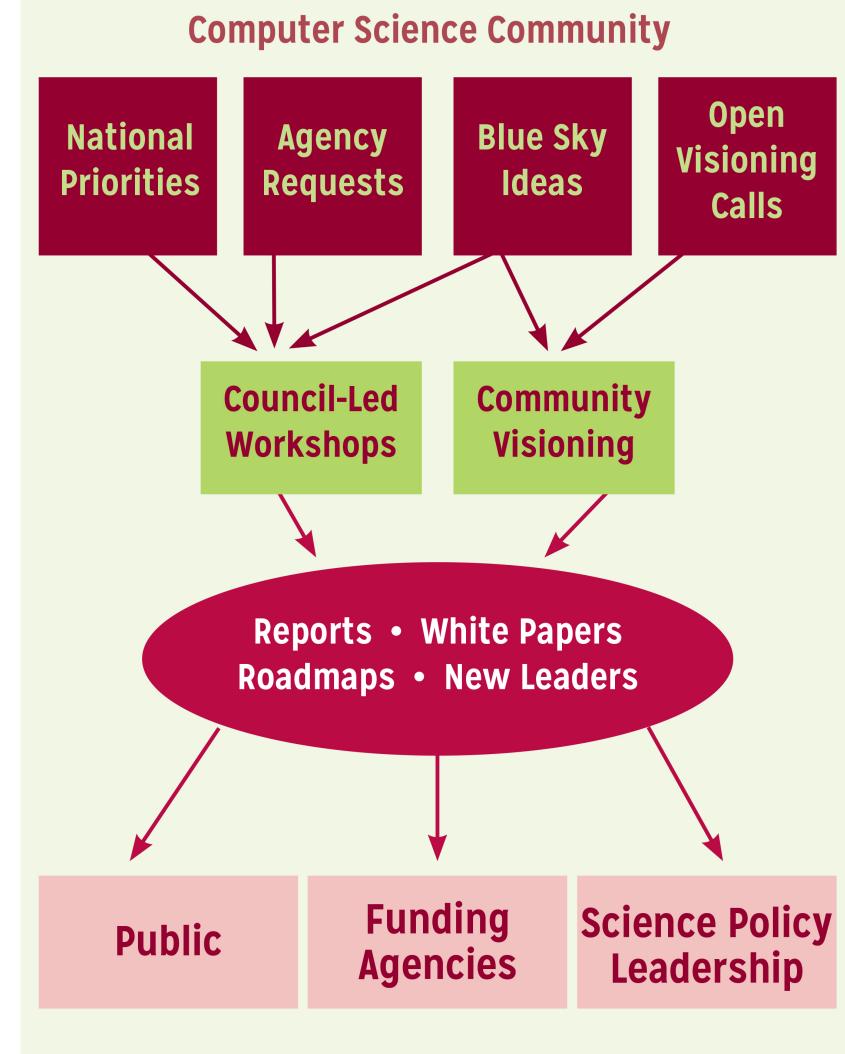
- **Communicating CS Research:**
  - CCC Blog [<http://cccblog.org/>]
  - Computing Research in Action Video Series
  - Research “Highlight of the Week”
  - “The Impact of NITRD” symposium
- **Nurturing the next generation of leaders:**
  - Computing Innovation Fellows Project
  - Leadership in Science Policy Institute

# WHAT DISTINGUISHERS CCC?

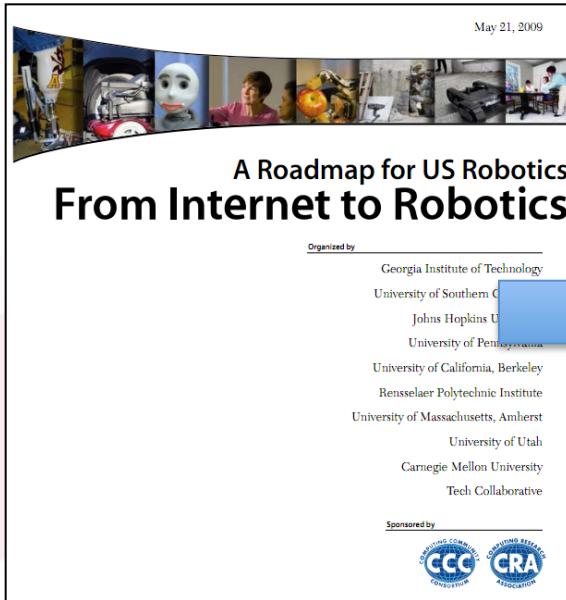
- **Proactive, rapid response**
  - Identify, plan, and execute in a matter of weeks to months
- **Community-based**
  - Find and foster ideas from germination to fruition and beyond
- **Leadership incubator**
  - Everyone is expected to do something!

# VISIONING GOALS

- Communicate the role of CS research to stakeholders
- Develop leadership capacity to help shape science policy



# CATALYZING AND ENABLING: ROBOTICS



May 21, 2009

A Roadmap for US Robotics  
**From Internet to Robotics**

Organized by

- Georgia Institute of Technology
- University of Southern California
- Johns Hopkins University
- University of Pennsylvania
- University of California, Berkeley
- Rensselaer Polytechnic Institute
- University of Massachusetts, Amherst
- University of Utah
- Carnegie Mellon University
- Tech Collaborative

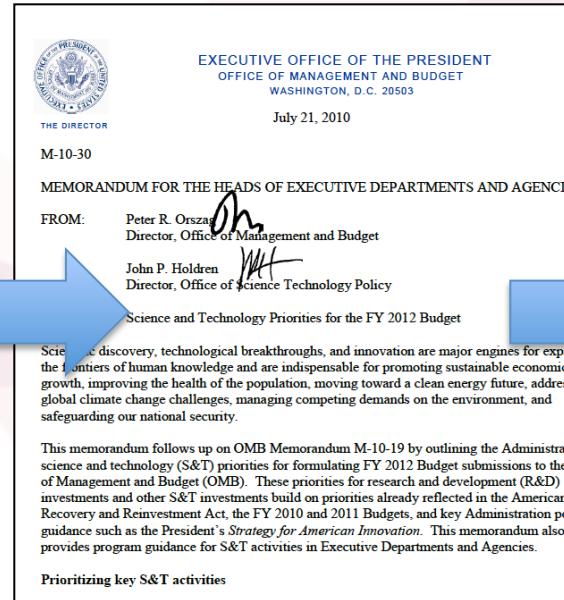
Sponsored by

- Computing Community Consortium (CCC)
- Computing Research Association (CRA)

4 meetings during summer 2008

Roadmap published May 2009

*Extensive discussions between visioning leaders & agencies*



EXECUTIVE OFFICE OF THE PRESIDENT  
OFFICE OF MANAGEMENT AND BUDGET  
WASHINGTON, D.C. 20503

July 21, 2010

M-10-30

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: Peter R. Orszag  
Director, Office of Management and Budget

John P. Holdren  
Director, Office of Science and Technology Policy

Science and Technology Priorities for the FY 2012 Budget

This memorandum follows up on OMB Memorandum M-10-19 by outlining the Administration's science and technology (S&T) priorities for formulating FY 2012 Budget submissions to the Office of Management and Budget (OMB). These priorities for research and development (R&D) investments and other S&T investments build on priorities already reflected in the American Recovery and Reinvestment Act, the FY 2010 and 2011 Budgets, and key Administration policy guidance such as the President's *Strategy for American Innovation*. This memorandum also provides program guidance for S&T activities in Executive Departments and Agencies.

Prioritizing key S&T activities

OSTP issues directive to all agencies in summer 2010 to include robotics in FY 12 budgets

Henrik Chistensen  
Georgia Tech

<http://cra.org/ccc>



Office of Science and Technology Po

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## Developing the Next Generation of Robots

Posted by Tom Kalil and Sridhar Kota on June 24, 2011 at 10:14 AM EDT

President Obama is launching the [Advanced Manufacturing Partnership](#), a research initiative that will promote a renaissance of American manufacturing.

One exciting element of the President's Advanced Manufacturing Partnership is the [National Robotics Initiative](#). Robots are working for us every day, in countless ways. At home, at work, and on the battlefield, they are increasingly lifting the burdens of tasks that are dull, dirty, or dangerous.

But they could do even more, and that's what the National Robotics Initiative is all about. So to support that goal, the National Science Foundation, the National Institutes of Health, NASA, and the United States Department of Agriculture are issuing a joint solicitation that will provide up to \$70 million in research funding for next-generation robotics.

The focus of this initiative is on developing robots that work with or beside people to extend our capabilities, taking advantage of the different strengths of humans and robots. In addition to funding the basic research needed for next-generation robotics, the initiative will support applications such as

National Robotics Initiative announced in summer 2011



Computing Community Consortium Catalyst



# CATALYZING AND ENABLING: BIG DATA

**Big-Data Computing: Core breakthroughs in commerce**

Randal E. Bryant  
Carnegie Mellon University

Randy H. Katz  
University of California, Berkeley

Version 8: December 2012

**Motivation: Our Data-Driven World**

Advances in digital sensors, communications, collections of data, capturing information of value society. For example, search engine companies created an entirely new business by capturing the Wide Web and providing it to people in useful ways of data every day and continually add new directions, and image retrieval. The societal benefit having transformed how people find and make use of data computing can and will transform the active medical practitioners, and our nation's defense include:

- Wal-Mart recently contracted with Hewlett Packard capable of storing 4 petabytes (4000 trillion purchase recorded by their point-of-sale terminals) at their 6000 stores worldwide. By applying can detect patterns indicating the effectiveness campaigns, and better manage their inventories
- Many scientific disciplines have become data is really just the largest telescope ever built. The Large Synoptic Survey Telescope (LSST) will scan the sky from a few bytes of image data every day – a data volume Surveys daily! Astronomers will apply massive the origins of our universe. The Large Hadron will revolutionize our understanding of the w terabytes of data per day – 15 petabytes (15 eScience projects are proposed to move from biology to environmental science to oceanography enormous data sets that automated analysis impractical to replicate copies at the sites of pool their resources to construct a large data pool for all of the affiliated scientists.

For the most current version of this essay, as well as related work, see the CCC Big-Data Computing Study Group website.

**CCC Computing Community Consortium**  
We support the computing research community in creating the next generation of computing technologies and applications.

**Spatial Computing** | **Disaster Management** | **SEE'S IT**

**Learning Tech** | **Open Source** | **Cyber Physical Systems**

You are here: [CCC Home](#) | [Activities](#) | [Enabled Computing Activities](#) | [Big-Data Computing Study Group](#)

*A Series on Data Analytics: From Data to Knowledge*

**From Data to Knowledge to Action: A Global Enabler for the Future** [PDF | Word]  
Eric Horwitz, Microsoft Research and Tom Mitchell, Carnegie Mellon University

**Enabling Evidence-Based Healthcare** [PDF | Word]  
Eric Horwitz, Microsoft Research

**Enabling an Initiative in "New Biology"** [PDF | Word]  
Chase Hensel, Computing Research Association and Erwin P. Gianchandani, Computing Research Association

**Enabling 21st Century Discovery in Science and Engineering** [PDF | Word]  
Randal E. Bryant, Carnegie Mellon University and Ed Lazowska, University of Washington

**Enabling Advanced Intelligence and Decision-Making for Applications** [PDF | Word]  
Randal E. Bryant, Carnegie Mellon University, Jaime G. Carbonell, University of Pennsylvania, and Tom Mitchell, Carnegie Mellon University

**Enabling a Revolution in New Transportation** [PDF | Word]  
Sebastian Thrun, Stanford University, Chase Hensel, Computing Research Association

**Enabling Personalized Education** [PDF | Word]  
Beverly Park Woolf, University of Massachusetts-Amherst, Ryan Williams, University of Massachusetts-Amherst, and Raja Giridharan, Computing Research Association

**Enabling the Smart Grid** [PDF | Word]  
Randal E. Bryant, Carnegie Mellon University, Randy H. Katz, University of California, Berkeley, and Erwin P. Gianchandani, Computing Research Association

**Challenges and Opportunities with Big Data** [PDF]  
A community white paper developed by leading researchers and practitioners in the field.

**Office of Science and Technology Policy Executive Office of the President**  
New Executive Office Building Washington, DC 20502

**FOR IMMEDIATE RELEASE**  
March 29, 2012

Contact: Rick Weiss 202 456-6037 [rweiss@ostp.eop.gov](mailto:rweiss@ostp.eop.gov)  
Lisa-Joy Zgorski 703 292-8311 [ljzgorski@ostp.eop.gov](mailto:ljzgorski@ostp.eop.gov)

**OBAMA ADMINISTRATION UNVEILS "BIG DATA" INITIATIVE: ANNOUNCES \$200 MILLION IN NEW R&D INVESTMENTS**

Aiming to make the most of the fast-growing volume of digital data, the Obama Administration today announced a "Big Data Research and Development Initiative." By improving our ability to extract knowledge and insights from large and complex collections of digital data, the initiative promises to help solve some the Nation's most pressing challenges.

To launch the initiative, six Federal departments and agencies today announced more than \$200 million in new commitments that, together, promise to greatly improve the tools and techniques needed to access, organize, and glean discoveries from huge volumes of digital data.

"In the same way that past Federal investments in information-technology R&D led to dramatic advances in supercomputing and the creation of the Internet, the initiative we are launching today promises to transform our ability to use Big Data for scientific discovery, environmental and biomedical research, education, and national security," said Dr. John P. Holdren, Assistant to the President and Director of the White House Office of Science and Technology Policy.

To make the most of this opportunity, the White House Office of Science and Technology Policy (OSTP)—in concert with several Federal departments and agencies—created the Big Data Research and Development Initiative to:

- Advance state-of-the-art core technologies needed to collect, store, preserve, manage, analyze, and share huge quantities of data.
- Harness these technologies to accelerate the pace of discovery in science and engineering, strengthen our national security, and transform teaching and learning; and
- Expand the workforce needed to develop and use Big Data technologies.

2008

2008

2010

2012



<http://cra.org/ccc>



# CATALYZING AND ENABLING: ARCHITECTURE

## Workshop on Advancing Computer Architecture Research (ACAR-I)

### Failure is not an Option: Popular Parallel Programming

**Organizers:** Josep Torrellas (University of Illinois) and Mark Oskin (University of Washington).

**Steering Committee:** Chita Das (NSF and Pennsylvania State University), William Harrod (DARPA), Mark Hill (University of Wisconsin), James La (Microsoft Research), Margaret Martonosi (Princeton University), Jose Moreira (IBM Research), and Kunle Olukotun (Stanford University).

**Written by:** Josep Torrellas, Mark Almadena Citchelkanova, Chita Das, Jon Hiller, Sampath Kannan, Krish Richard Murphy, Omur Mutlu, Satis Anand Sivasubramanian, Kevin Sklairton, Karin Strauss, Steven Swanson, Dean Tullsen.

Funded by the Computing Research Association's (CRA) Computing Co-Consortium (CCC) as a "visioning exercise" meant to promote forward thinking research and then bring these ideas to a funded program.

Held on February 21-23, 2010 in San Diego, California  
Contact: torrella@illinois.edu, oskin@cs.washington.edu  
Website: <http://www.cra.org/ccc/acar.php>

August 2010

2010



Josep Torrellas  
UIUC

## Workshop on Advancing Computer Architecture Research (ACAR-II)

### Laying a New Foundation for IT: Computer Architecture for 2025 and Beyond

**Organizers:** Mark Oskin (University of Washington) and Josep Torrella (University of Illinois).

**Steering Committee:** Chita Das (Pennsylvania State University), Mark Hill (University of Wisconsin), James Larus (Microsoft Research), Margaret Martonosi (Princeton University), Jose Moreira (IBM Research), and Kunle Olukotun (Stanford University).

**Written by:** Mark Oskin, Josep Torrella, Chita Das, John Davis, San Dwarkadas, Lieven Eeckhout, Bill Feiereisen, Daniel Jimenez, Mark Martha Kim, James Larus, Margaret Martonosi, Onur Mutlu, Kunle Olukotun, Andrew Putnam, Tim Sherwood, James Smith, David Wood, Craig

Funded by the Computer Research Consortium (CCC) as a "visioning exercise" meant to promote forward thinking research and then bring these ideas to a funded program.

Held on September 20-21, 2010 in Seattle, Washington  
Contact: oskin@cs.washington.edu; torrella@illinois.edu  
Website: <http://www.cra.org/acar.php>

2010



Mark Oskin  
Washington

## 21<sup>st</sup> Century Computer Architecture

A community white paper  
May 25, 2012

### 1. Introduction and Summary

Information and communication technology (ICT) is transforming our world healthcare, education, science, commerce, government, defense, and entertainment to remember that 20 years ago the first step in information search involved a trip to 10 years ago social networks were mostly physical, and 5 years ago "tweets" cartoon characters.

Information and communication technologies have been revolutionizing with many visions moving from science fiction toward reality. Appendix A both highlights the need and seeks to distill their attributes. Future visions include personalized medicine to and drugs to an individual, sophisticated social network analysis of potential terrorist and homeland security, and telepresence to reduce the greenhouse gases spent ("Future Visions"). Future visions also include real-time processing on large, heterogeneous Data<sup>1</sup> using distributed designs, working within form-factor constraints, and deployment with efficient operation.

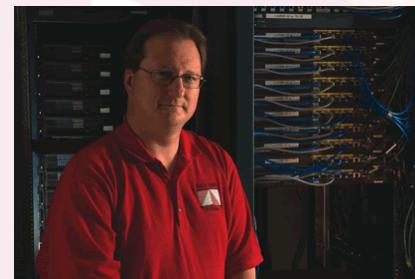
Two key—but often invisible—enablers of technology and computer architecture. Semiconductor technology (Moore's Law) for roughly constant cost. Computer architects took these rapid technological advances and provided the needed performance and mitigate memory system losses effect of technology and architecture has provided ICT innovators with exponentially growth at near constant cost.

Because most technology and computer architecture innovations were (intentionally) higher layers, application and other software developers could reap the benefits of them without engaging in it. Higher performance has both made more computationally applications feasible (e.g., virtual assistants, computer vision) and made less application specific to hardware environments higher-level programming abstractions (e.g., languages and reusable components). Improvements in computer system cost-efficiency enabled value creation that could never have been imagined by the field's four distributed web search sufficiently inexpensive so as to be covered by advertising link

<sup>1</sup> PCAST, "Designing a Digital Future: Federally Funded Research and Development Networking and Information Technology," Dec. 2010 (<http://www.whitehouse.gov/sites/default/files/microsites/pcast/ndit-report-2010.pdf>)

<sup>2</sup> CCC, "Challenges and Opportunities with Big Data," Feb. 2012 (<http://ccc.org/docs/int/bigdatawhitepaper.pdf>)

2012



Mark Hill  
Wisconsin

## Exploiting Parallelism and Scalability (XPS)

### PROGRAM SOLICITATION NSF 13-507

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

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time)  
February 20, 2013

### IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the 2012 Program & Award Policies & Procedures Guide (PAPPG), NSF 13-1, was issued on October 4, 2012 and is effective for proposals submitted, or due, on or after January 14, 2013. Please be advised that the guidelines contained in NSF 13-1 apply to proposals submitted in response to this funding opportunity. Proposers who submit a proposal prior to January 14, 2013, after the revised PAPPG is issued, will be required to follow the provisions contained in NSF 13-1.

Please be aware that minor changes have been made to the PAPPG to implement revised merit review criteria based on the National Performance Review (NPR) report, *Reviewing for Efficiency and Better Results: Review and Re-think*. While the two merit review criteria remain unchanged (Intellectual Merit and Broader Impacts), guidance has been provided to clarify and improve the review process. These changes will affect the project summary and project description sections of proposals. Award and final reports also will be affected.

A brief chapter summary of this and other significant changes is provided at the beginning of both the *Grant Proposal Guide* and the *Program & Award Policies & Procedures Guide*.

Please note that this program solicitation may contain supplemental proposal preparation guidance and/or guidance that deviates from the guidelines established in the *Grant Proposal Guide*.

### SUMMARY OF PROGRAM REQUIREMENTS

#### General Information

Program Title:  
Exploiting Parallelism and Scalability (XPS)

#### Synopsis of Program:

Computing systems have undergone a fundamental transformation from the single-processor devices of the turn of the century to today's ubiquitous and networked devices and warehouse-scale computing via the cloud. Parallelism has become the dominant paradigm for computation, and the number of cores per chip has increased by several orders of magnitude. The number of interconnected high performance and data intensive edge devices, and the data centers servicing them, are increasing rapidly. The need for parallel and distributed systems and algorithms to support this growth in parallelism and heterogeneity is clear. The need for new semiconductor technology is facing fundamental physical limits and single processor performance has plateaued. The need for new parallel and distributed system architectures and algorithms to support this growth in parallelism and heterogeneity is clear.

The Exploiting Parallelism and Scalability (XPS) program aims to support groundbreaking research leading to a new generation of computing XPS, parallel processing systems, and parallel re-designing the traditional computer hardware and software stack for today's heterogeneous parallel and distributed systems and exploring new approaches to support the needs of the future. This program is intended to support a broad-based, interdisciplinary effort among researchers representing all areas – from the application layer down to the micro-architectural level – to develop the next generation of parallel and distributed systems and algorithms. The need for scalable performance and quality need new algorithmic models and algorithms, programming models and languages, and system architectures. The need for new interconnection technologies, such as optical interconnects and application-specific knowledge. Research should also focus on energy- and communication-efficiency and on improving the performance and reliability between edge devices and clouds.

#### Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

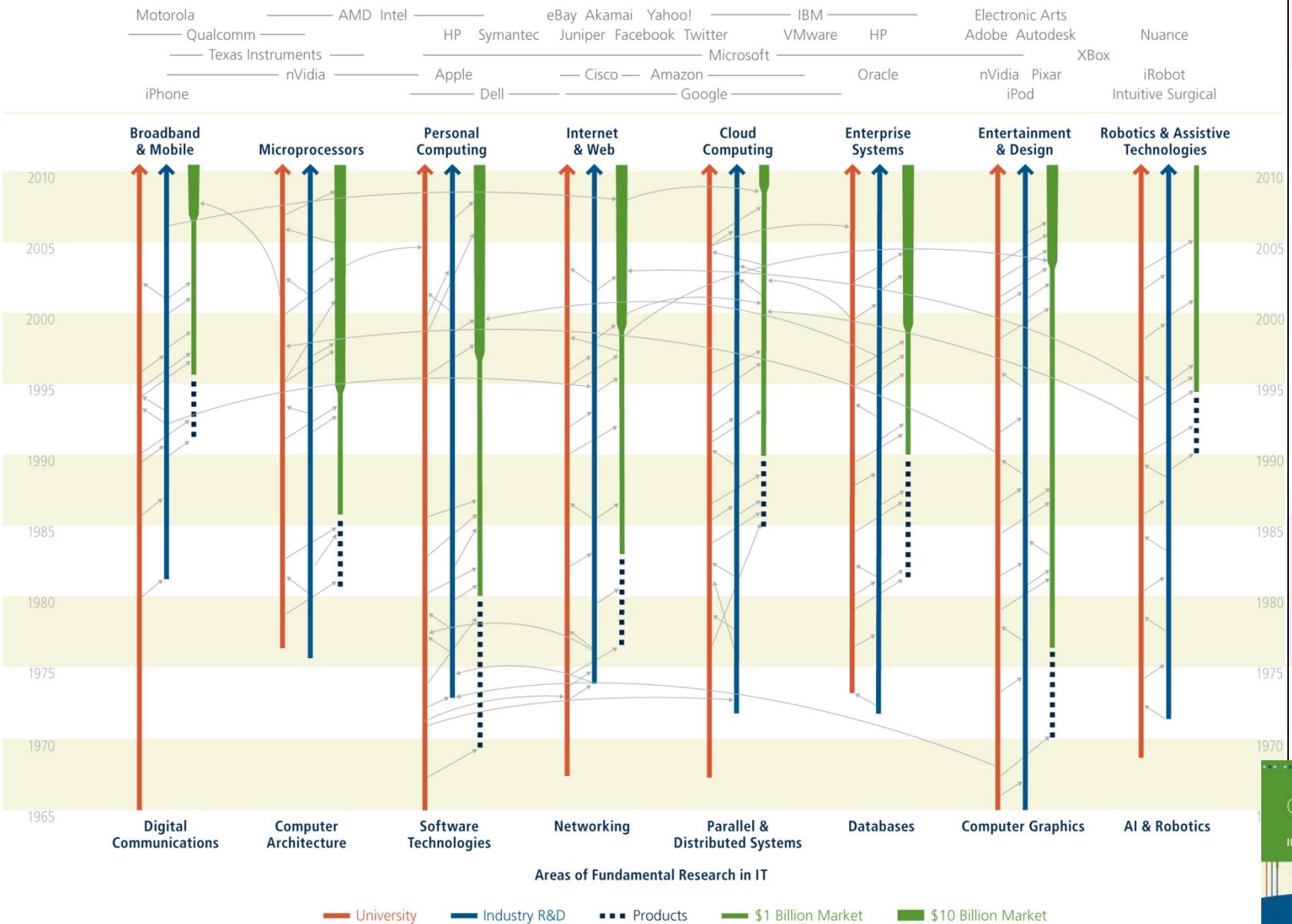
2013



<http://cra.org/ccc>



# IT Sectors With Large Economic Impact



PCAST NITRD 2013 Report to President and Congress



Continuing  
**Innovation**  
IN INFORMATION TECHNOLOGY

NATIONAL INSTITUTE OF TECHNOLOGY AND DESIGN

# CCC: CATALYZING AND ENABLING COMPUTING RESEARCH

*Gregory D. Hager*

*CCC Chair*

*Johns Hopkins University*