

# THE COMPUTING COMMUNITY CONSORTIUM (CCC)

*NSF Presentation  
November 15<sup>th</sup>, 2018*



**CCC**

Computing Community Consortium  
Catalyst

# TALK OUTLINE

1. Big Picture
2. Context, Members, Goals
3. Longitudinal Activities
4. Ongoing Work
5. Discussion

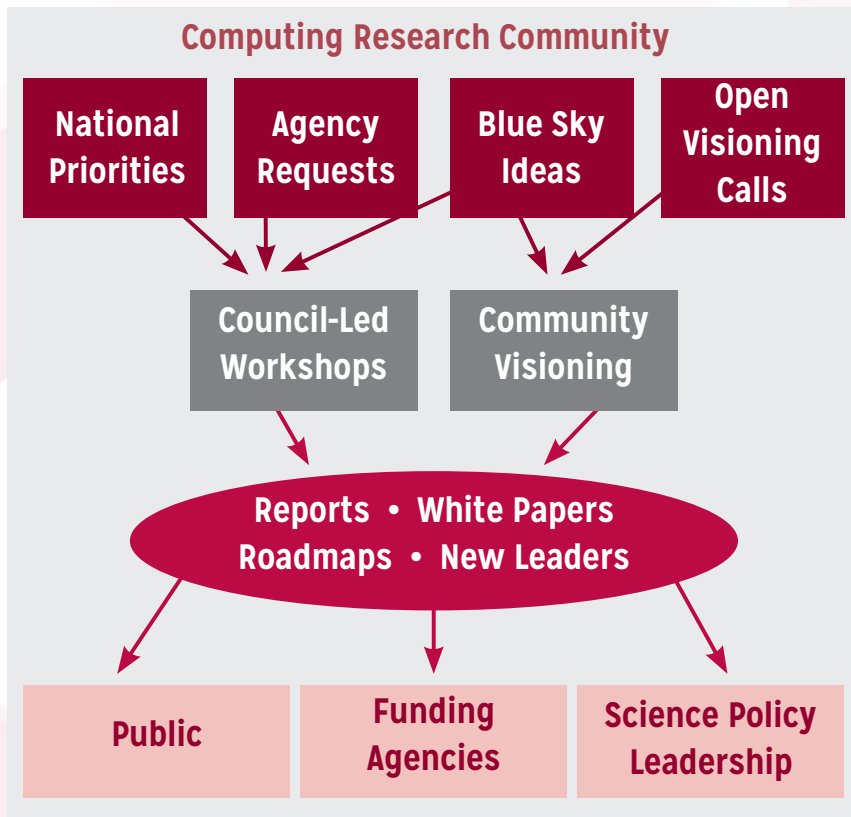


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# COMPUTING COMMUNITY CONSORTIUM

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.



## Who

- Council - 20 members
- CCC/CRA Staff
- Chair, VC, & Director

Inputs: Bottom-up, Internal, & Top-Down

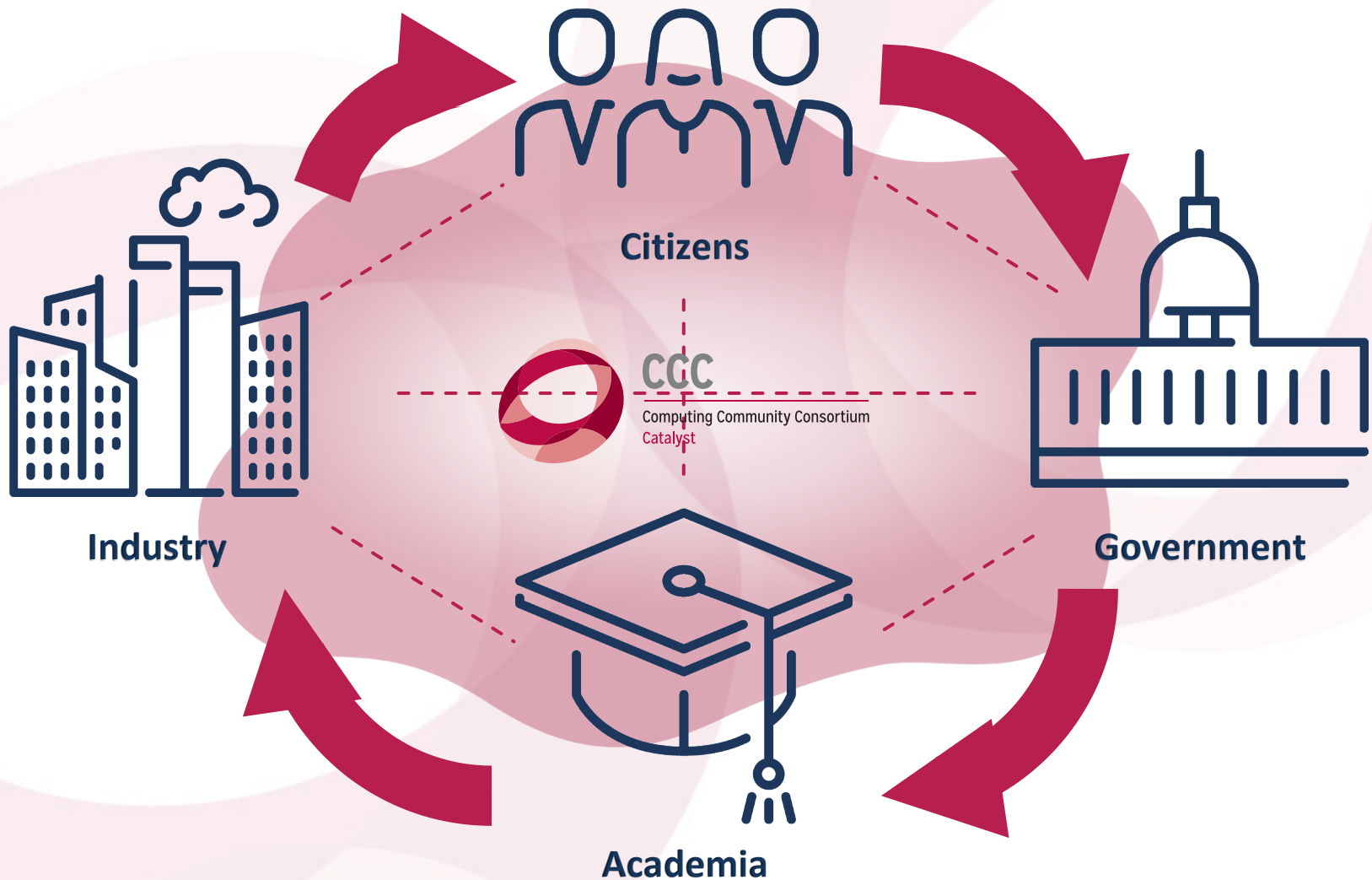
## What:

- Workshops & Conf. Blue Sky Tracks
- Whitepapers & Social Media
- Reports Out (esp. to government)
- Biannual Symposium

## Professional Development

- Early Career Workshops & Participation
- Council Membership
- Leadership w/ Gov't (LISPI)

# CCC: CATALYZING I.T.'S VIRTUOUS CYCLE



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# AN OVERVIEW OF THE COMPUTING COMMUNITY CONSORTIUM

- Established in 2006 as a standing committee of the Computing Research Association (CRA)
- Funded by NSF under a Cooperative Agreement
  - Third award began in April 2018
- 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

# MAJOR STAKEHOLDERS

- Computing Research Community
  - CRA members
  - CSTB (Computer Science and Telecommunications Board, part of National Research Council)
  - Professional societies
  - Academic units
  - Research labs
- Industry
  - Computing industry, Major users of IT
- Public
- Government



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# GOVERNMENT STAKEHOLDERS

Agencies that are particularly important to us

- NSF – strong ties with CISE
- NIH – growing ties with folks interested in Health IT
- DARPA – ties come and go
- DoE – ties with ASCR; interest in ARPA-E
- NITRD – entre to interagency working groups

Others that are relevant

- NIST
- HHS/ONC
- IARPA
- DoT
- DHS



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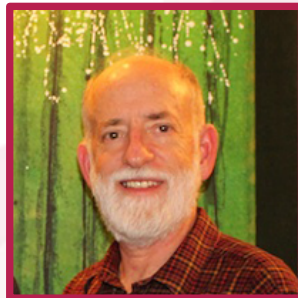
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# THE CCC COUNCIL – EXECUTIVE COMMITTEE



- Members:
  - Mark Hill, University of Wisconsin, Madison (Chair)
  - Liz Bradley, University of Colorado Boulder (Vice Chair)
  - Nadya Bliss, Arizona State University
  - Dan Lopresti, University of Lehigh
  - Beth Mynatt, Georgia Tech (Past Chair)
  - Ben Zorn, Microsoft Research
  - Ann Drobnis, Director
  - Andy Bernat, CRA Executive Director



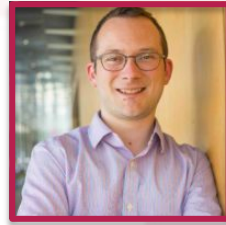
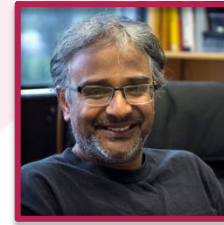
# THE CCC COUNCIL

Chair: Mark Hill

Vice Chair: Liz Bradley

Terms ending June 2021

- Ian Foster, University of Chicago
- Ronitt Rubinfeld, MIT
- Suresh Venkatasubramanian, Utah
- Daniel P. Lopresti, Lehigh University
- David C. Parkes, Harvard
- Shwetak Patel, Univ. Washington



Terms ending June 2020

- Nadya Bliss, Arizona State
- Juliana Freire, NYU
- Keith Marzullo, Maryland
- Greg Morrisett, Cornell
- Jennifer Rexford, Princeton
- Manuela Veloso, Carnegie Mellon
- Ben Zorn, Microsoft Research



Terms ending June 2019

- Sampath Kannan, UPenn
- Maja Mataric, USC
- Elizabeth Mynatt, Georgia Tech
- Nina Mishra, Amazon
- Holly Rushmeier, Yale
- Kevin Fu, Univ. Michigan



# CRA STAFF WITH CCC RESPONSIBILITIES

CCC Director: Ann Drobnis

CCC Deputy Director: TBD

Senior Program Associate: Helen Wright

Program Associate: Khari Douglas

CRA Executive Director: Andy Bernat

Additional CRA Staff:

- Peter Harsha, Director of Government Affairs
- Sandra Corbett
- Sabrina Jacob



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# GOALS FOR CCC

1. **Bring the computing research community together to envision audacious research challenges**, and to articulate concrete pathways to enable pursuit of these challenges.
2. **Communicate** these challenges and opportunities to the broader national community.
3. **Facilitate investment** in these research challenges **by key stakeholders**.
4. **Inculcate** values of **leadership** and service by the computing research community.
5. **Inform and influence early career researchers** to engage in these community-led research challenges.



# DESIRED OUTCOMES

1. **Create broad awareness of the role computing research will play in future science and technology advances** within federal agencies, philanthropic organizations, and industry through concrete examples and products.
2. **Facilitate broad engagement of the computing research community** in identifying and articulating new directions for computing research, in shaping priorities for those new directions, and in responding to existing opportunities in the computing research ecosystem.
3. **Create high-impact tangible resources** that inform stakeholders as to the current and potential impact of computing research.
4. **Sustain the CCC** as a widely accepted catalyst and voice for the computing research community.
5. **Grow leadership and community capacity** to engage in and respond to national science policy needs.

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# ACTIVITIES

## Events for the Community

- Visioning Workshops
- Blue Sky Ideas Conference Tracks

## Aligning with National Priorities

- Short Reports / White Papers
- Task Forces

## Website Features

- CCC Blog (<http://cccblog.org>)
- Great Innovative Ideas

## Leadership Opportunities

- Industry – Academic Collaborations
- Leadership in Science Policy Institute (LiSPI)



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# VISIONING: PROCESSES

- Periodic RFP for community-initiated activities
- Top-down (agency initiated)
- Bottom-up (open call)
- Sideways (council initiated, joint with other agencies,....)
- Average of seven workshops/year over the last three years



Robotic  
Materials



Digital Computing  
Beyond Moore's  
Law



Sociotechnical  
Interventions  
for Health  
Disparity  
Reduction



Sociotechnical  
Cybersecurity



Cybersecurity  
for  
Manufacturers



# VISIONING ACTIVITIES

- Over 45 visioning activities in 11-year history
- Nine since 1 January 2017 ==>
- Research areas include:
  - Smart and Pervasive Health
  - Beyond Moore's Law
  - Robotic Materials
  - Privacy by Design
  - BRAIN Initiative
  - Fairness
  - Personalized Education
- 13 workshop reports and 20 additional white papers released in past four years
- **Over 300 community members annually participate in visioning workshops**

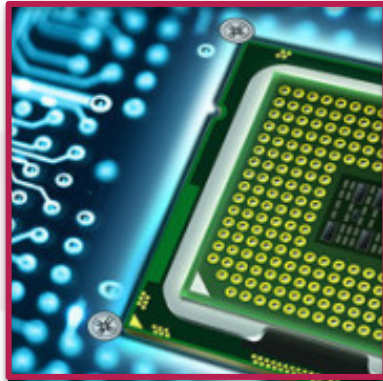
Workshop	Date
Cyber-Social Learning Systems Workshop 3	January 24-25, 2017
Cyber Security for Manufacturers Workshop	March 14-15, 2017
Sociotechnical Cybersecurity Workshop 2	August 8-9, 2017
Fair Representations and Fair Interactive Learning	March 18-19, 2018
Sociotechnical Interventions for Health Disparity Reduction	April 9-10, 2018
Robotic Materials	April 23-24, 2018
Digital Computing Beyond Moore's Law	May 3-4, 2018
Next Steps in Quantum Computing: Computer Science's Role	May 22-23, 2018
Leadership in Embedded Security	August 13, 2018

# AMPLIFICATION



BRAIN Initiative launched in 2013.

CCC co-hosted the Brain Workshop with NSF in 2014.



CCC co-hosted the SA+TS workshop with SRC and NSF in 2013.

Produced Research Needs for Trustworthy, and Reliable Semiconductors Report in 2015.



NSCI announced in July 2015.

CCC produced a series of blog posts on the topic, featuring one from Doug Burger, and the Convergence of Data and Computing task force frequently overlaps with this topic.



Smart and Connected Health Program in NSF and NIH.

CCC has hosted several workshops on related topics, including: Aging in Place (2014), Inclusive Access (2015), and Smart and Pervasive Health (2016).

# IMPACT: ARCHITECTURE

<p><b>Workshop on Advancing Computer Architecture Research (ACAR-1)</b></p> <p><b>Failure is not an Option: Popular Parallel Programming</b></p> <p><b>Organizers:</b> Josep Torrellas (University of Illinois) and Mark Oskin (University of Washington).</p> <p><b>Steering Committee:</b> Chita Das (NSF and Pennsylvania State University), William Harrod (DARPA), Mark Hill (University of Wisconsin), James Larus (Microsoft Research), Margaret Martonosi (Princeton University), Jose Moreira (IBM Research), and Kunko Olukotun (Stanford University).</p> <p><b>Written by:</b> Josep Torrellas, Mark Almadena Chichelnikova, Chita Das, Jon Hillier, Sampath Kannan, Krishna Richard Murphy, Onur Mutlu, Satish Anand Sivasubramanian, Kevin Skadron, Karin Strauss, Steven Swanson, and Dean Tuller.</p> <p>Funded by the Computing Research Association's (CRA) Computing Co-Consortium (CCC) as a "visioning exercise" meant to promote forward computing research and then bring these ideas to a funded program.</p> <p>Held on February 21-23, 2010 in San Diego, California Contact: <a href="mailto:torrella@illinois.edu">torrella@illinois.edu</a>; <a href="mailto:oskin@cs.washington.edu">oskin@cs.washington.edu</a> Websites: <a href="http://www.cra.org/ccc/acar.php">http://www.cra.org/ccc/acar.php</a>; <a href="http://iacoma.cs.uiuc.edu/acar/">http://iacoma.cs.uiuc.edu/acar/</a></p> <p>August 2010</p>	<p><b>Workshop on Advancing Computer Architecture Research (ACAR-II)</b></p> <p><b>Laying a New Foundation for IT: Computer Architecture for 2025 and Beyond</b></p> <p><b>Organizers:</b> Mark Oskin (University of Washington) and Josep Torrellas (University of Illinois).</p> <p><b>Steering Committee:</b> Chita Das (Pennsylvania State University), M. D. (University of Wisconsin), James Larus (Microsoft Research), Margaret Martonosi (Princeton University), Jose Moreira (IBM Research), and Kunko Olukotun (Stanford University).</p> <p><b>Written by:</b> Mark Oskin, Josep Torrellas, Chita Das, John Davis, S. D. (University of Wisconsin), James Larus, Margaret Martonosi, Onur Mutlu, Kunko Olukotun, Tim Sherwood, James Smith, David Wood, and others.</p> <p>Funded by the Computer Research Association's (CRA) Computing Co-Consortium (CCC) as a "visioning exercise" meant to promote forward computing research and then bring these ideas to a funded program.</p> <p>Held on September 20-21, 2010 in Seattle, Washington Contact: <a href="mailto:oskin@cs.washington.edu">oskin@cs.washington.edu</a>; <a href="mailto:torrella@illinois.edu">torrella@illinois.edu</a> Website: <a href="http://www.cra.org/acar.php">http://www.cra.org/acar.php</a></p>	<p><b>21<sup>st</sup> Century Computer Architecture</b></p> <p><i>A community white paper</i></p> <p>May 25, 2012</p> <p><b>1. Introduction and Summary</b></p> <p>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" and "blogs" were mostly physical.</p> <p>Importantly, much evidence suggests that ICT innovation is accelerating with many visions moving from science fiction toward reality. Appendix A both touches upon the future and seeks to distill their attributes. Future visions include personalized medicine and drugs to an individual, sophisticated social network analysis of potential terrorist and homeland security, and telepresence to reduce the greenhouse gases spent on travel. Future applications will increasingly require processing on large, heterogeneous "Data", using distributed designs, working within form-factor constraints, and rapid deployment with efficient operation.</p> <p>Two key—but often invisible—enablers of this transformation are computer architecture and computer architecture. See Moore's Law for roughly of computer architectures took these rapid techniques to scale processor performance and mitigate memory system losses. The effect of technology and architecture has provided ICT innovations with exponential growth at near constant cost.</p> <p>Because most technology and computer architecture innovations were (intentionally) higher layers, application and other software developers could reap the benefits of it without engaging in it. Higher performance has both made more computationally applications feasible (e.g., virtual assistants, computer vision) and made less applications easier to develop by enabling higher-level programming abstractions (e.g., languages and reusable components). Improvements in computer system cost 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 line</p> <p><sup>1</sup> FCAST, "Designing a Digital Future: Federally Funded Research and Development Networking and Technology, Dec. 2010 (<a href="http://www.whitehouse.gov/sites/default/files/microsites/efpcast-nrt-report-2010.pdf">http://www.whitehouse.gov/sites/default/files/microsites/efpcast-nrt-report-2010.pdf</a>)</p> <p><sup>2</sup> CCC, "Challenges and Opportunities with Big Data," Feb. 2012 (<a href="http://www.cra.org/ccc/bigdata/whitepaper">http://www.cra.org/ccc/bigdata/whitepaper</a>)</p>	<p><b>Exploiting Parallelism and Scalability (XPS)</b></p> <p><b>PROGRAM SOLICITATION</b> NSF 13-507</p> <p><b>National Science Foundation</b> Directorate for Computer &amp; Information Science &amp; Engineering Division of Computer and Communications Fundamentals Division of Computer and Network Systems Office of Cyberinfrastructure</p> <p><b>Full Proposal Deadline(s)</b> (due by 5 p.m. proposer's local time): February 20, 2013</p> <p><b>IMPORTANT INFORMATION AND REVISION NOTES</b></p> <p>A revised version of the NSF Proposal &amp; Award Policies &amp; Procedures Guide (PAPPG), NSF 13-1, was issued on October 6, 2012 and is effective for proposals submitted on or after, 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 opt to submit prior to January 14, 2013, must also follow the guidelines contained in NSF 13-1.</p> <p>Please be aware that significant changes have been made to the PAPPG to implement revised merit review criteria based on the National Science Board (NSB) report, "Transforming the National Science Foundation: Review and Recommendations." The new merit review criteria have been incorporated into the PAPPG and are effective for proposals submitted on or after January 14, 2013. Changes will affect the project summary and project description sections of proposals. Annual and final reports also will be affected.</p> <p>A by-chapter summary of the other significant changes is provided at the beginning of both the <i>Grant Proposal Guide</i> and the <i>Grant &amp; Award Administration Guide</i>.</p> <p>Please note that this program solicitation may contain supplemental proposal preparation guidance and/or guidance that deviates from the guidelines established in the <i>Grant Proposal Guide</i>.</p> <p><b>SUMMARY OF PROGRAM REQUIREMENTS</b></p> <p><b>General Information</b></p> <p><b>Program Title:</b> Exploiting Parallelism and Scalability (XPS)</p> <p><b>Synopsis of Program:</b> 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 on the cloud. Parallelism has become ubiquitous at many levels. The proliferation of multi- and many-core processors and increasing numbers of interconnected high-performance and data-intensive edge devices, and the data centers serving them, is enabling a new set of global applications with large economic and social impact. At the same time, semiconductor technology is facing fundamental physical limits and single processor performance has plateaued. This means that the ability to achieve predictable performance improvements through "vertical" processor scaling will be difficult.</p> <p>The Exploiting Parallelism and Scalability (XPS) program aims to support groundbreaking research leading to a new era of parallel computing. XPS seeks research in evaluating, and possibly re-designing, the traditional computer hardware and software stack for today's heterogeneous parallel and distributed systems and exploring new holistic approaches to parallelism and scalability. Achieving the needed breakthroughs will require a collaborative effort among researchers representing all areas—from the application layer down to the micro-architecture—and will be built on the strengths and new hardware programs, new architectures, scalable performance and usability need new distinct models and algorithms, programming models and languages, hardware architectures, compilers, operating systems and run-time systems, and exploit domain and application-specific knowledge. Research should also focus on energy- and communication efficiency and on enabling the decision of effort between edge devices and clouds.</p> <p><b>Principal Program Officer(s):</b> Please note that the following information is current at the time of publishing. See program website for any updates to the points of</p>
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2010

2010

2012

2013



Josep Torrellas  
UIUC



Mark Oskin  
Washington



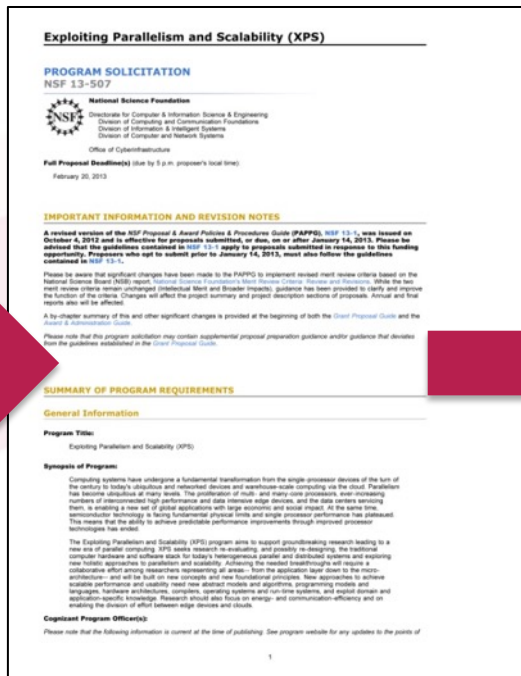
Mark Hill  
Wisconsin



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# IMPACT: ARCHITECTURE



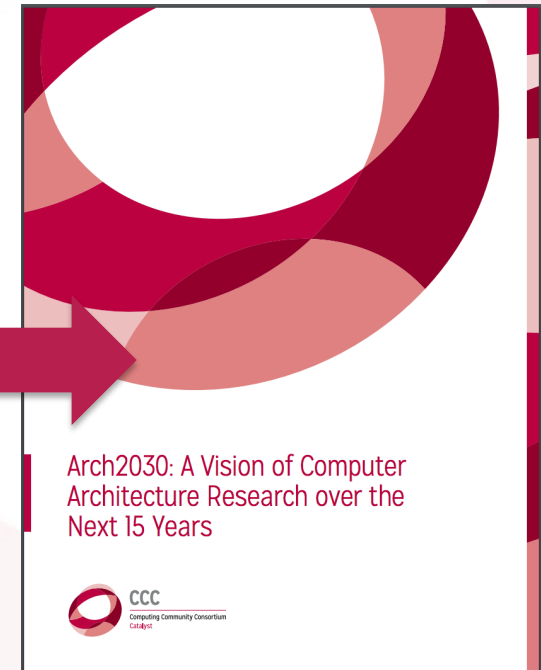
2013

## Architecture 2030 Workshop @ ISCA 2016

CCC report out: Read the final report [here](#).

Video recordings: Watch the video recordings [here](#).

2016



2016



Luis Ceze  
Washington



Tom Wenisch  
Michigan

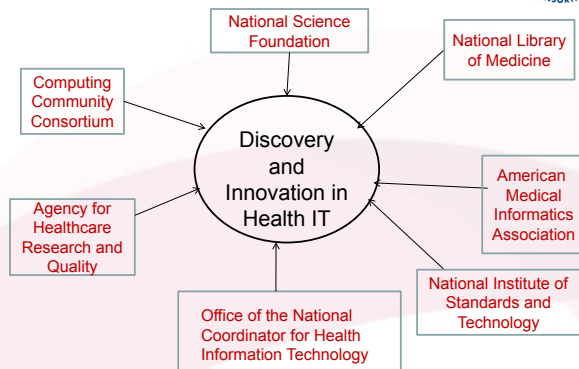


Mark Hill  
Wisconsin



# IMPACT: HEALTH IT

## October 2009 Workshop



**National Science Foundation**  
WHERE DISCOVERIES BEGIN

**Directorate for Computer & Information Science & Engineering**

## **SMART HEALTH AND WELLBEING (SHW)**

### **CONTACTS**

See program guidelines for contact information.

### **SYNOPSIS**

## **Smart and Connected Health (SCH)**

### **PROGRAM SOLICITATION**

**NSF 13-543**

### **REPLACES DOCUMENT(S):**

**NSF 12-512**



**National Science Foundation**

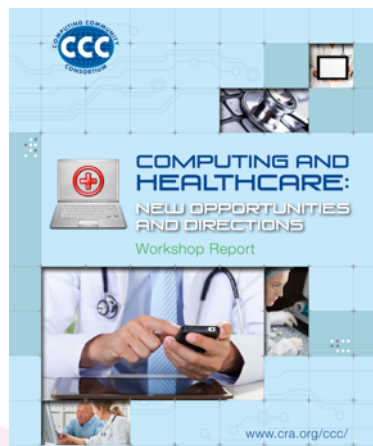
Directorate for Computer & Information Science & Engineering  
Division of Computing and Communication Foundations  
Division of Computer and Network Systems  
Division of Information & Intelligent Systems

Directorate for Engineering

Directorate for Social, Behavioral & Economic Sciences



**National Institutes of Health**



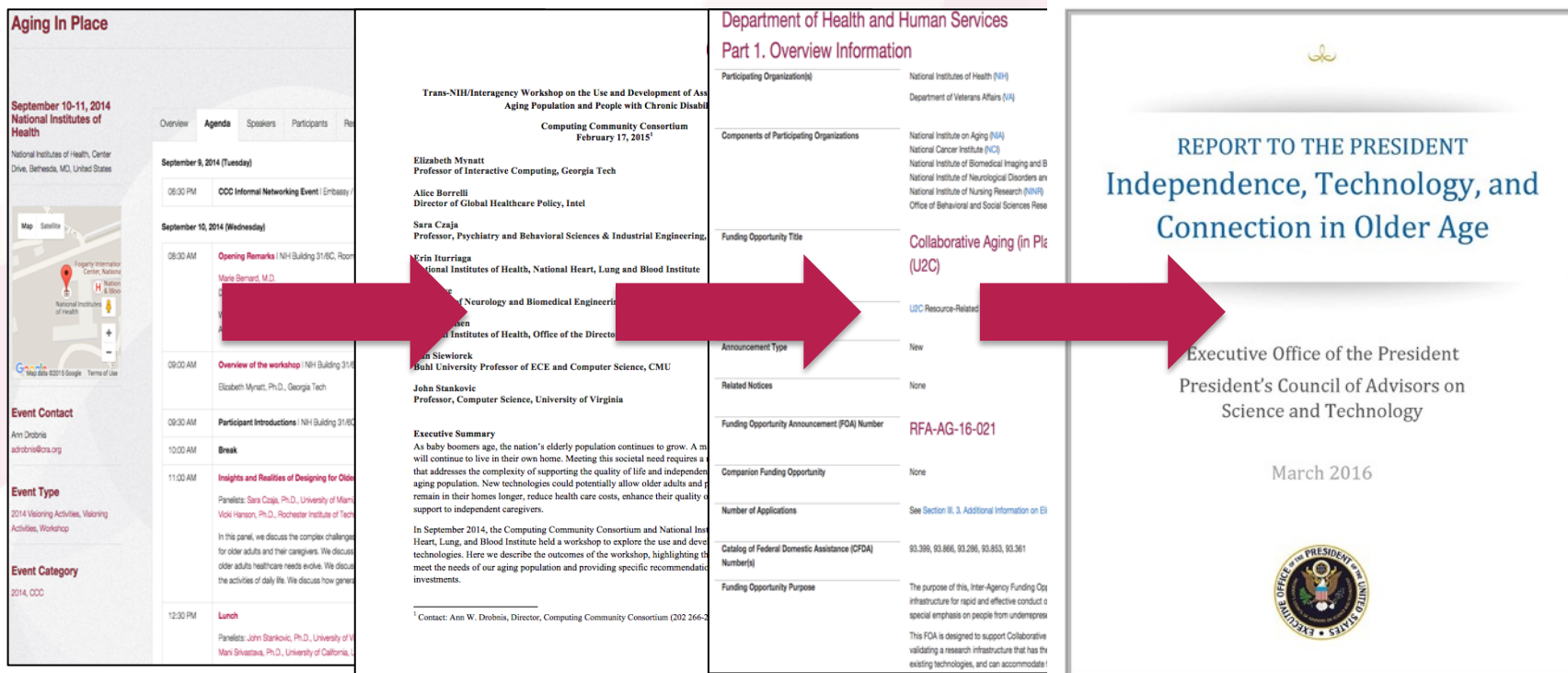
## October 2012 Workshop



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# IMPACT: AGING IN PLACE



Joint NIH/CCC  
Meeting  
September  
2014

Produced  
Workshop  
Report  
February  
2015

NIH released  
new RFP  
informed by  
AIP Workshop  
October 2015

PCAST Report  
March 2016



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# BLUE SKY

**Goal** - Help conferences reach out beyond the usual research papers. Papers are opened ended and possibly “outrageous” or “wacky.”

- 17 different tracks at ten different conferences in the last four years
- On average, 13 papers submitted per track at a conference
- Winners are asked to submit Great Innovative Ideas



Past CCC Chair Gregory Hager with AAAI-16 Blue Sky award winner Francesca Rossi



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# METHODS OF COMMUNICATING: CURRENT

- Workshop Reports
- White Papers
  - CCC works with the community to produce timely white papers that inform policymakers about pressing issues and national priorities
- CCC Blog
  - Provides a continuous stream of information about advances in computing research
  - Opportunities for community to get involved
- Great Innovative Ideas
  - A way to showcase the exciting new research and ideas generated by the computing community
- Special Events
  - CCC Symposium
  - CRA Snowbird



Computing  
Research  
2017



AI for Social Good  
2016



# NURTURING NEXT GENERATION OF LEADERS

**Grow leadership and community capacity** to engage in and respond to national science policy needs and identify new directions for computing research.

## Leadership in Science Policy Institute

- Educates and trains computing researchers on how science policy in the U.S. is formulated and how to advocate for computing research
- Co-sponsored by CRA's Government Affairs Committee

## Industry – Academic Collaborations

- CCC collaborated with Big Data Regional Hubs
- Activities to enhance the research of early career faculty

## Postdoc Best Practices

- Program to study institutional support structures for postdocs
- 3 programs: University of Washington, NY ASCENT, Arizona

## Computing Innovation Fellows (CIFellows) Project

- Rapidly created the CI Fellows program to preserve human capital when faculty positions became scarce with the financial crisis

# INDUSTRY – ACADEMIC COLLABORATIONS

## With NSF Big Data Regional Innovation Hubs

- *Northeast:* Young Innovator Internships, Knowledge Exchange Lecture Series, Data Science Best Practices Workshop
- *South:* Data Start Internships, PEPI Early Career Exchange Visits
- *Midwest:* Early Career Big Data Summit, Data Quality and Informal Data-An Oxymoron Workshop, Travel Grants
- *West:* Collaboratory Faire, Workshop on Data Hackathon Best Practices, Tools of the Data Journalism Trade Workshop



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# CCC WORKING GROUPS & TASK FORCES

Goal is for CCC to be **engaged in ongoing activities** around these topics, to **identify needs and opportunities** in each topic area, and to **take actions** (generating white papers, convening a workshop, publicizing information, etc.) that have the possibility of “moving the needle” for these topics.

Task forces, which include Council members and others from the community, meet on a regular basis and report at every Council meeting.

These provide a key mechanism to enable parallelism and expand CCC’s reach

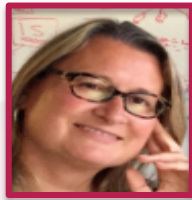
- Pioneered a few years ago
- Includes some non-CCC members
- Five task forces in 2017-18 → six task forces + two working groups in 2018-19
- Expect smaller task forces to increase participant engagement

# ARTIFICIAL INTELLIGENCE ROADMAP WORKING GROUP

**Chairs:** Yolanda Gil and Bart Selman

**Yolanda Gil**

University of  
Southern  
California



**Bart Selman**

Cornell  
University



**Context:**

- NSF & others encouraged on tight timetable
- Like Robotics Roadmap, but industry all over ML

**Current Members:**

**Liz Bradley**

University of  
Colorado,  
Boulder



**Maja Matarić**

University of  
Southern  
California



**Nina Mishra**

Amazon



**David Parkes**

Harvard  
University



**Recent Activities:**

- **WS #1-Integrated Intelligence**  
Marie desJardins (Simmons) & Ken Forbus (Northwestern University)

**Upcoming Activities:**

- **WS #2- Interaction**  
Kathy McKeown (Columbia University) & Dan Weld (University of Washington)
- **WS #3- Learning and Robotics**  
Fei Fei Li (Stanford) & Tom Dietterich (Oregon State)

# INDUSTRY WORKING GROUP: TRANSPORTATION / AUTONOMOUS VEHICLES

**Chair:** Ben Zorn

**Ben Zorn**  
Microsoft  
Research



## Current Members:

**Shwetak  
Patel**

University of  
Washington



**Jennifer  
Rexford**

Princeton  
University



**Greg  
Morrisett**  
Cornell  
University



## Context:

- University/industry interaction is crucial, CCC round-table in 2015
- Questions: Is this interaction changing? If so, how?
- Approach: Consider one vertical closely this year – Autonomous Vehicles / Transportation
- Learn & move forward next year

## Recent Activities:

- Ongoing discussions with academics, industry (nuTonomy), DoT FHWA

## Upcoming Activities:

- Preparing preliminary white paper
- Possible workshop in Spring

# CYBERSECURITY AND CYBERCRIME TASK FORCE

**Chairs:** Kevin Fu and Keith Marzullo

**Kevin Fu**  
University of  
Michigan



**Keith Marzullo**  
University of  
Maryland



**Current Members:**

**Nadya  
Bliss**  
Arizona  
State  
University



**Daniel  
Lopresti**  
Lehigh  
University



**White Papers:**

- *Safety, Security, and Privacy Threats Posed by Accelerating Trends in IoT*
- *System Computing Challenges in the IoT*

**Recent Activities:**

- *Sociotechnical Cybersecurity workshop series (2016-2017)*
- *Leadership in Embedded Security Workshop (2018)*

**Upcoming Activities:**

- Developing partnerships for UN workshops and followup on application of AI to fight against human trafficking (CCC, UNU Delta 8.7, Alan Turning Institute, Tech Against Trafficking)



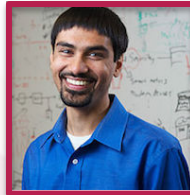
# HEALTH AND HUMAN COMPUTER INTERACTION TASK FORCE

**Chair:** Maja Matarić and Shwetak Patel

**Maja Matarić**  
University of  
Southern  
California



**Shwetak Patel**  
University of  
Washington



## Current Members:

**Keith  
Marzullo**  
University  
of Maryland



**Beth  
Mynatt**  
Georgia  
Tech



**Holly  
Rushmeier**  
Yale



**Nina Mishra**  
Amazon



## Recent Activities:

- Response to NITRD draft Federal Health Information Technology Research and Development Strategic Framework

## Upcoming Activities:

- Working on content creation for training (future of work)
- Developing potential workshops such as opioid abuse and eldercare

## White Papers:

- *Information Technology Research Challenges for Healthcare: From Discovery to Delivery*
- *Trans-NIH/Interagency Workshop on the Use and Development of Assistive Technology for the Aging Population and People with Chronic Disabilities*



# INFORMATION INTEGRITY AND PROVENANCE TASK FORCE

**Chairs:** Nadya Bliss and Juliana Freire

**Nadya Bliss**  
Arizona State  
University



**Juliana Freire**  
New York  
University



**Recent Activities:**

- New Task Force!

**Upcoming Activities:**

- Charting the research agenda for this area

**Current Members:**

**Beth Mynatt**  
Georgia Institute  
of Technology



**Greg Morrisett**  
Cornell  
University



**Keith Marzullo**  
University of  
Maryland



# INTELLIGENT INFRASTRUCTURE TASK FORCE

**Chair:** Dan Lopresti and Beth Mynatt

**Dan Lopresti**  
Lehigh  
University



**Beth Mynatt**  
Georgia Tech



## Current Members:

**Michael Dunaway**  
University of  
Louisiana at  
Lafayette



**Henning  
Schulzrinne**  
Columbia  
University



**Ben Zorn**  
Microsoft  
Research



## Recent Activities:

- *Intelligent Infrastructure white paper series (2017)*

## Upcoming Activities:

- Collaboration with the NIST GCTC Meeting at the end of October, 2018
- Likely joint workshop between CCC and NIST GCTC Public Safety SuperCluster in Spring
- Companion CCC whitepaper to NIST GCTC Public Safety Blueprint for 2019

# FAIRNESS AND ACCOUNTABILITY TASK FORCE

**Chairs:** Liz Bradley and Sampath Kannan

**Liz Bradley**  
University of  
Colorado,  
Boulder



**Sampath  
Kannan**  
University of  
Pennsylvania



## **Recent Activities:**

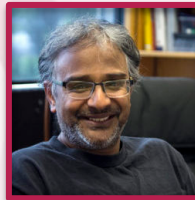
- March 2018 workshop on Fairness; draft report in preparation for CACM

## **Current Members:**

**Ronitt  
Rubinfeld**  
MIT



**Suresh  
Venkatasubramanian**  
University of Utah



## **Upcoming Activities:**

- Planning a workshop on Economics and Fairness
- Support of and input to the AI Roadmapping working group

**David Parkes**  
Harvard  
University



## **White Papers:**

- *Big Data, Data Science, and Civil Rights*
- *Privacy-Preserving Data Analysis for the Federal Statistical Agencies*
- *Towards a Privacy Research Roadmap for the Computing Community*

# SYSTEMS AND ARCHITECTURE TASK FORCE

**Chairs:** Mark Hill and Jen Rexford

**Mark Hill**  
University of  
Wisconsin,  
Madison



**Jennifer  
Rexford**  
Princeton  
University



## Recent Activities:

- Two workshops (*Next Steps in Quantum Computing: Computer Science's Role* and *Digital Computing Beyond Moore's Law*) completed in Spring 2018

## Current Members:

**Tom Conte**  
Georgia Tech



**Juliana Freire**  
New York  
University



**Ian Foster**  
Argonne  
National  
Lab



## Upcoming Activities:

- Thermodynamic Computing Workshop: January, 2019
- Deploying Post-Quantum Crypto systems Workshop
- Talking about four possible new areas for a workshop (such as self driving systems or distributed databases)

## White Papers:

- *The Opportunities and Challenges for Next Generation Computing*
- *Challenges to Keeping the Computing Industry Centered in the US*

# **CCC Visioning Workshop: Next Steps in Quantum Computing: Computer Science's Role**

Prof. Margaret Martonosi  
Dept. of Computer Science  
Princeton University

Dr. Martin Roetteler  
Microsoft Research



# Workshop Intro

## ■ Who?

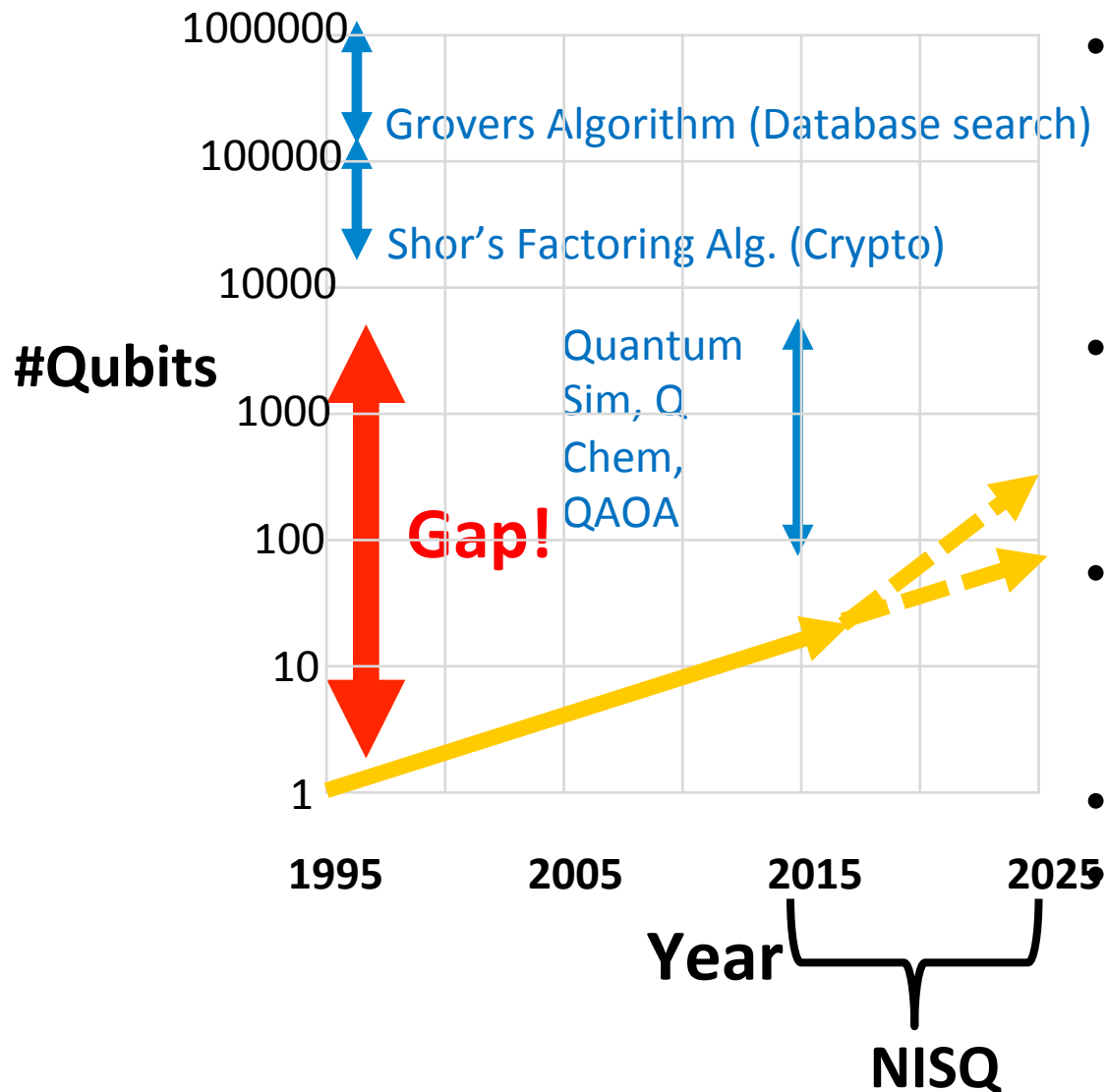
- 55 participants
- QC researchers + CS researchers curious about QC + other
- Math, Physics, Computer hardware and software, Algorithms, ...
- Academia, Industry, govt agencies, ...

## ■ Overall Goal:

- Envisioning the research future of QC, with particular focus on **Computer Science** role



# QC: Current State



- Noisy Intermediate-Scale Quantum (NISQ)
    - Preskill, Jan 2018
    - 10-1000 qubits
  - Large enough to support interesting experiments
  - Too small for known algorithms with exponential speedup
  - Too small for ECC
- Current: 10-50 qubits at 1% error per gate



# Approach

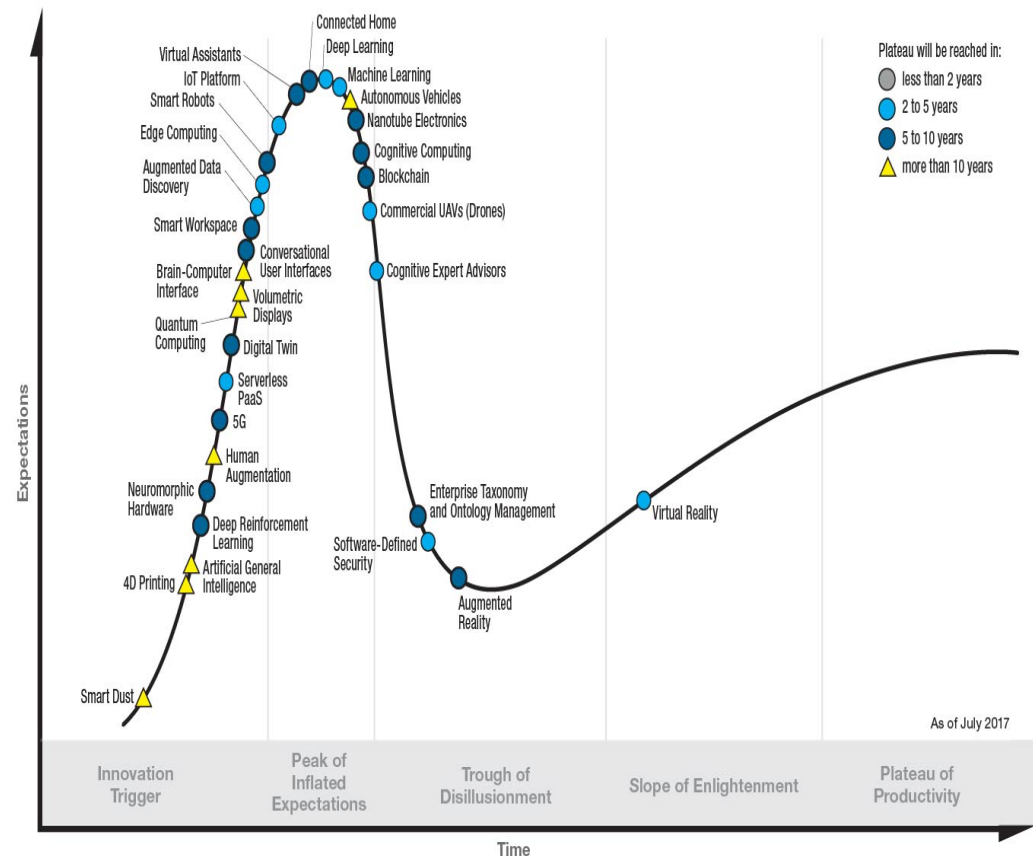
- 4 topic areas: Algorithms, Technologies, Toolchains/Programming, Architecture
- For each topic area: 2 broad vision talks + group discussion + breakout + report-back
- For each breakout:
  - What do you think are the current major breakthroughs that didn't get mentioned during those talks?
  - What do you think has to happen in these areas for quantum computing to become viable in N years (10 or 20)?
  - How can computer scientists play a role?





- Opportunity vs. Hype: Positivity about the technology opportunities, balanced with a desire to avoid excessive hype.

## Gartner Hype Cycle for Emerging Technologies, 2017



[gartner.com/SmarterWithGartner](https://gartner.com/SmarterWithGartner)

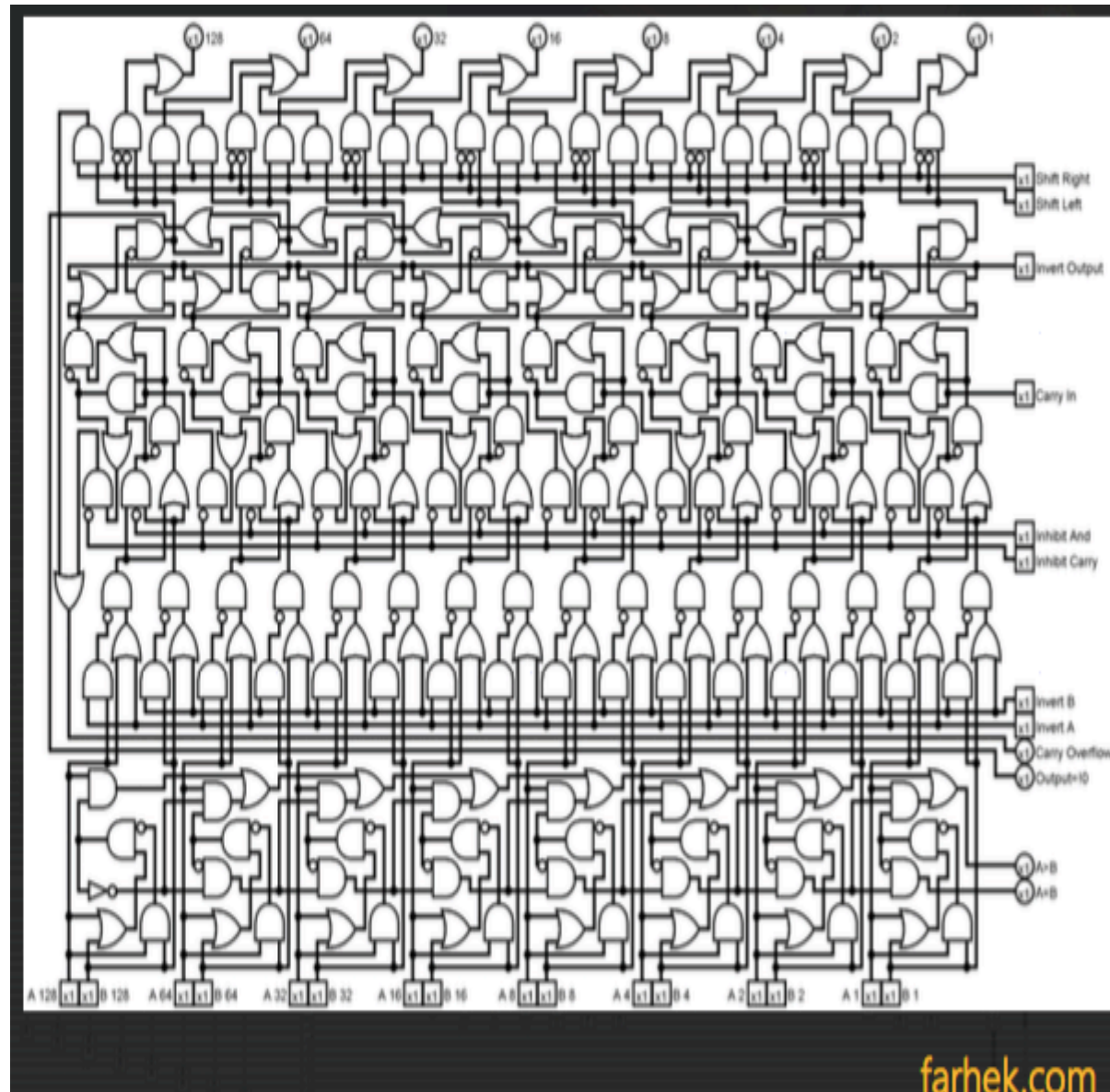
Source: Gartner (July 2017)  
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Gartner

# Takeaways

- (Efficient)  
Abstraction:  
Must mitigate  
systems  
complexity while  
still allowing  
information flow  
algorithms  $\leftrightarrow$   
devices

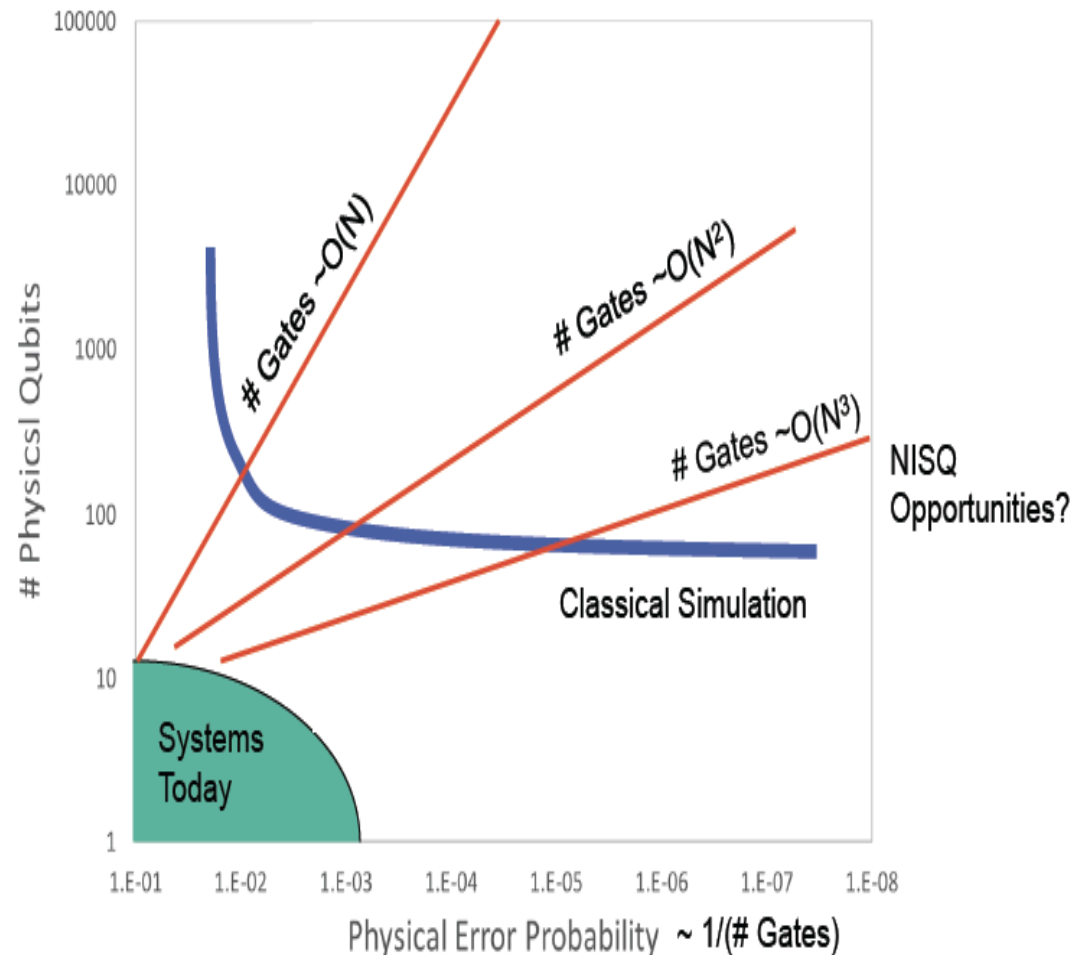
$$a + b$$



# Takeaways

- Roadmap: Great sense of value in collaborating on a technology maturation roadmap, much like Moore's Law articulated a scaling vision for semiconductors.

- -> Note: This is not about exponential scaling. But rather about a plan for how to value qubit counts, vs. precision, vs. coherence interval, etc.



# HOW CAN YOU GET INVOLVED?

- Reach out to the CCC with your ideas!
  - Email Ann ([adrobnis@cra.org](mailto:adrobnis@cra.org))
  - Come to a CCC visioning workshop  
(See upcoming events: <https://cra.org/ccc/events/>)
  - Come to a CCC council meeting
- Tell your community about CCC!
  - RFP posted at the beginning of each year, please share
  - Have a colleague who you would recommend for a visioning workshop? Let Ann know!
  - Read and share our blog (<http://www.cccblog.org>)



**CCC**

Computing Community Consortium  
Catalyst

# COMPUTING COMMUNITY CONSORTIUM

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.



## Who

- Council - 20 members
- Chair, VC, & Director
- CCC/CRA Staff

Inputs: Bottom-up, Internal, & Top-Down

## What:

- Workshops & Conf. Blue Sky Tracks
- Whitepapers & Social Media
- Reports Out (esp. to government)
- Biannual Symposium in DC

## Talent Development

- Early Career Workshops & Participation
- Council Membership
- Leadership w/ Gov't (LISPI)