# Computing Community Consortium
# Three Year Strategic Plan

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## 1. Mission

The Computing Community Consortium (CCC) was established in October 2006 through a Cooperative Agreement between the National Science Foundation (NSF) and the Computing Research Association (CRA). Since the beginning, its purpose has been to catalyze the development of bold, far-reaching research visions, and to facilitate the communication of those research visions to stakeholders both within and beyond the computing research ecosystem. This purpose is captured in the CCC mission statement:

> *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.*

Since its founding, the CCC has demonstrated its value in many ways. It has developed a program of visioning workshops, many of which have triggered or supported funding initiatives – for example; the National Robotics Initiative (NRI) began as a CCC vision exercise. It has provided a forum for responding to agency requests for workshops and white papers. It has created new leadership opportunities through the Council itself, as well as via innovative initiatives such as the Leadership in Science Policy Institute (LiSPI). It has supported the research pipeline through efforts such as the Computing Innovation Fellows program.

The CCC is now transitioning from a "start-up" to an established and recognized instrument for the CS research community. In particular, the CCC has established a sustainable organizational structure that is able to continue to support and innovate its core activities while maintaining the agility and proactive pursuit of new ideas that has been its hallmark since it began.

## 2. Goals

The 2011 renewal proposal articulated the following overarching goals for the CCC:

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

The CCC achieves these goals by:

1. Being extremely open and inclusive, so that the CCC becomes widely accepted as a catalyst and voice for the computing research community.
2. Engaging the computing research community through a variety of approaches.
3. Engaging funding agencies.
4. Engaging external communities.

As the CCC has matured, a central, cross-cutting theme within these goals and strategies has been the development of both capability and capacity of the computing research community by: 1) strengthening and expanding the skills and knowledge of individuals within the community), 2) facilitating connections and communication among those individuals and with the broader CSE community, and 3) developing key sub-groups within the CSE research enterprise, for example cadres of new students, postdocs, and policy-savvy leaders who think beyond their own situation to the well-being of the whole community. Both the empowerment of individuals and the facilitation of conversation and communication are implicit in all of our activities.

We have achieved substantial progress on our goals through our prior and ongoing activities. But, we do not intend to sit still – we have several objectives that we will strive to realize in the coming years. We describe these objectives and the associated strategies below.

### 2.1 Establish the CCC as a widely accepted catalyst and voice for the computing research community.

The CCC has worked continuously to establish connections between the computing research field and other fields and their relevant Federal agencies. Almost all of our activities are associated with open calls for participation, they produce community-accessible materials such as white papers published on our web site, and stakeholders are informed proactively through talks, symposia, and the CCC blog. We have engaged other communities through workshops such as *Discovery and Innovation in Health IT, The Role of Information Sciences and Engineering on Sustainability*, and *Spatial Computing*. We engage other committees and organizations such as OSTP, PCAST, CSTB, and NITRD by participating directly and by producing white papers on computer science and engineering (CSE) topics.

*We will seek to broaden our footprint within the CSE community, within industry, and with federal stakeholders to make the CCC the "go to" organization for anyone seeking input or focused attention from the CSE research community.*

- We will promote more proactive outreach and cultivation of federal agencies. For example the Health IT subcommittee, which was put in place two years ago, has visited NIH several times over the past two years. We will promote this type of organized and sustained outreach through CCC subcommittees.

- We will continue to be extremely responsive to requests from the White House and Federal agencies. Ties established in the course of contributing to the PCAST NITRD reports have opened a number of high bandwidth channels to the top policymakers in the Federal government. Not every interaction pays off. But we must be there, for the computing research community and for the nation.

- We will take advantage of our full-time Director based in Washington DC to be present at Washington-based events of relevance to CCC.

- We will promote broader industry dialog with the CSE research community. IT now forms the backbone of our economy, giving CSE research tremendous leverage within numerous industries. We will continue to involve industry on the Council, and will seek to further leverage our industry representatives. CCC industry members have already proposed several means of engagement – e.g. an industry-focused forum for "hard real-world problems in CS" for particular sectors.

- We will work to promote engagement of researchers, leaders, and government representatives from a broad and diverse background. We currently do this by issuing open calls for Council membership and CCC activities, by inviting agency and community representatives to speak at our meetings, and by ensuring balanced representation in all Council activities. We will enhance this outreach by developing a more effective communication strategy, and by maintaining a standing communications committee to

continually improve our effectiveness.

**2.2 Bring the computing research community together to envision our future research needs and thrusts.**

We currently do this through a variety of mechanisms: community visioning activities, sessions at major conferences that explore out-of-the-box research ideas, White Papers, workshops, and our contributions to the 2010 and 2013 PCAST NITRD reports.

*We will continue to support and refine our visioning program, and continue to improve the quality and impact of funded visioning activities.*

- We will issue an annual call for visioning proposals to provide a positive impetus for the community to respond to. As part of this process, we will actively reach out to thought leaders, e.g. PIs of large scale programs and projects, to propose new and exciting directions for CSE research.

- We will identify thought leaders in other communities, e.g. healthcare, manufacturing, or sustainability, and actively solicit ideas and proposals from them.

- We will trace the trajectory of past workshops and develop a "good past practices" document that proposers can use to improve the organization and output of future workshops.

*We will develop a more pro-active stance toward the assessment of the health of the CSE research environment, and develop strategies to address deficiencies as they are discovered.*

- We will consider ways that available data can be mined to detect trends indicative of changes in the health of the community. For example, the continued decline of US-origin graduate students points to a need to enhance the research pipeline within our community. The numbers of responses to calls such as NSF-CRI/MRI are indicators of the needs and adequacy of federal funding for computing infrastructure.

**2.3 Communicate these challenges, needs and thrusts to the broader national community.**

We already work to proactively position computing research to have the highest possible impact on national needs. For example, the white papers, originally thought of as a one-time Presidential transition team activity, have become ongoing activities, with our recent series on the role of data analytics in a wide range of fields. Recent high-level interests in manufacturing and understanding the human

brain are examples of new opportunities to engage in such activities.

*We will work to create mechanisms to identify, understand, and communicate national research needs to the CSE community.*

- We will formalize subcommittees to the CCC Council that will focus on areas such as IT and Health and IT and Sustainability. These subcommittees will be created as we identify specific needs or national trends that deserve greater attention from the computing community. These subcommittees will have the charter of identifying and promoting computing research opportunities and building solid and durable ties to the relevant Federal agencies in each area. Their activities will include educating these communities and agencies about the role of computing research, and educating computing researchers about the opportunities in these fields and about the requirements for successfully working with these agencies.

- We will develop a communications strategy to better promote CCC activities and important CSE-research related news items. For example, the CCC Blog has seen significant growth, but it could do much more. New calls for visioning proposals should take advantage of the connections we have developed in past activities and workshops. New ideas (such as the recent "Computing Research in Action" videos and Research Highlight of the Week) could generate much more visibility for our efforts.

## 2.4 Create within the computing research community more audacious thinking.

We currently promote "audacious thinking" through our organized visioning activities, our "blue sky ideas" sessions at conferences, and our Council-generated white papers. The CCC blog is also used to highlight major computing-related opportunities such as the recent NIH "BD2K" (Big Data to Knowledge) program or computing-related events such as the NITRD symposium.

*We will continue to identify areas where CSE research is under-recognized or under-resourced, and recruit thought leaders to frame new ideas and directions for the community.*

- In cooperation with CRA, we will help to organize sessions at the bi-annual Snowbird Conference that feature new ideas and "out-of-the box" thinking about CSE research.

- We will look for opportunities for engagement in national priorities and will actively promote white paper development, and visioning activities, and community events that identify CSE research directions consonant with

those priorities.

- We will promote road-mapping exercises that seek to envision the impact of advances in specific areas of computing research one to two decades ahead, and to chart a course toward that future for the CSE community.

**2.5 See the ideas developed above turned into funded research programs.**

We have had substantial success in the past in helping to move ideas generated in part or whole through CCC activities into funded programs through collaborations with OSTP and with NSF. We will work to enhance our "follow through" to promote research visions more broadly.

*We will put procedures into place to ensure follow-through on community visioning activities, beyond the completion of a white paper describing the vision, toward a funded research* program.

- We will continue to assign CCC Council "mentors" to every funded activity, and we will create a "shepherding plan" that identifies specific stakeholders that should be made aware of the results.

- We will support, with our staff, the creation of materials for promoting workshops, and we will use our connections and presence in DC to promote visioning outcomes.

- We will cultivate other sources of support for CSE research by taking advantage of visioning workshops to establish connections and trust with federal agencies, foundations, and national laboratories.

- We will also develop and promote  "best practices" ideas and communication mechanisms for industry-related funding for applied research, sponsoring students, and so forth.

**2.6 Increase the excitement within computing research and use that excitement to attract students**.

Through CS-URGE, we have promoted CSE research to undergraduates. The Computing Innovation (CI) Fellows program helped to ensure that a generation of graduating students was not lost to research during the economic downturn. We have also undertaken pilot efforts, such as our research highlights, to publicize CSE research to undergraduates.

*We will create active information channels that are specifically targeted to prospective CSE graduate students and to PhDs considering research careers, and to create a sustainable organization to populate that channel.*

- We are launching an experiment with micro-grants to members of the community (at all levels, i.e., faculty, graduate students, undergraduates) for producing short compelling videos of computing research that we will then distribute broadly; we don't expect every one of these videos to amass wide viewership, but even having a small percentage of the videos going viral has the potential to markedly advance the perception of computing research among members of the public, including, importantly, prospective computer science students.

- We are holding the second CI Fellows workshop in the coming months. We will continue to seek opportunities like this to convene junior members of our community, and to create opportunities for them to communicate with one another, and to provide a source of inspiration and mentorship to future generations of CSE researchers.

- We will coordinate with other efforts within CRA and beyond to minimize duplication of effort and maximize our impact in this important area.

## 2.7 Inculcate values of leadership and service

We promote leadership development within the computing research community in a number of ways. We provide mentoring for those who lead our community visioning activities. We have already begun inviting successful leaders of these activities to join the CCC Council and will expand this effort. We have supported two instances of the two-day Leadership in Science Policy Institute (LiSPI) and are likewise targeting LISPI participants for additional leadership roles.

*We will continue to groom CSE representatives for leadership positions in academic, government, and industry committees and organizations to ensure knowledgeable and energetic representation of the current and potential impact of CSE research.*

- Inspired by the NAE *Frontiers of Engineering* program, we will work to support events that bring together visionary early and mid-career researchers from across the full breadth of the field, to establish connections, to envision the future, and to groom leaders. We will strive to make this, or something similar, a regular event. We will work to make some portion of the event open to the broader community, to federal representatives and funding agencies, and other stakeholders.

- The Leadership in Science Policy Institute (LiSPI) has been highly successful and we will continue to support it. These activities, together with our visioning workshops, provide us with a natural vetting ground for current and future science leadership. We will proactively recruit from this pool for CCC membership, and we will also reach out to this pool when agency

opportunities (NSF PD/DD, NIH PD, OSTP, DARPA PM) become available.

- We are considering a workshop analogous to the Leadership in Science Policy Institute described above, but focused on communicating computing research to the news media and the general public; prior NSF- AAAS joint workshops on this topic serve as a model.

## 3. The CCC's Role in Strengthening the Computing Community

As the Council activities have matured, we have increasingly pursued CCC objectives in a way that educates and empowers individuals in the community. We do so in a number of ways.

- The Council, itself is diverse with respect to subfield, age, nature of institution, gender, etc.; through regular rotation of Council members there is renewal and also growth in the number of individuals with the seasoning that service on the CCC Council provides. Our "graduates" are growing in number and provide a talent pool.

- In pursuing visioning activities the Council always provides written feedback, from multiple reviewers, to the authors of a visioning proposal.  One member of the CCC Council shepherds each visioning proposal that appears to have any chance to achieve funding.  For strong proposals the shepherd acts as an advisor in the implementation of the visioning activity. For weak proposals the shepherd advises and guides the authors in proposal revision. In effect, the Council shepherd acts as a mentor to a mid-level to senior researcher, and hopefully expands that person's thinking.

- In the economic downturn, the CCC Council, with NSF's support, created the CIFellows program.  A key element of the program was that each proposal from a candidate Fellow included statements from several proposed mentors which described how they were going to mentor and support the Fellow. The awards materially depended upon the quality of the proposed mentoring activity.  Emphasis on mentoring plans, and later their execution, meant that this computing community developed more *capacity* for quality mentoring. An immediate follow-on of the CIFellows competition was the creation of a document posted on the CRA website describing best practices for supporting postdocs[1].   In a further effort to advance the capacity of the research community to nurture postdocs, we have sponsored a competition to award funds to universities who propose to tailor support for best practices to their situation and to implement those best practices.

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[1] www.cra.org/resources/bp-
view/best_practices_memo_computer_science_postdocs_best_practices/

- The Leadership in Science Policy Institute activity described earlier is conducted to build capacity in the community to act on the science and policy stage, particularly in the federal venue. The knowledge about federal science policy, and strategies for interacting with federal funding agencies, Congress and the White House expand the perspective of participants and prepare them to be more effective acting at the national level.

As the need and opportunity arises in support of our goals, we will continue to lead the community in developing capability and capacity through activities such as those described above. Some examples include:

1. Continuing to create opportunities for young researchers to participate in wider activities, without diverting them from their primary responsibility to establish themselves as researchers and educators.

2. Creating opportunities that give established CSE researchers the experience skills that will allow them to engage with research programs in other disciplines.

3. Continuing to encourage engagement with policy, through mechanisms such as LISPI.

As in all of our other activities, we expect the ways that we engage individuals and develop the community will evolve with time and with the continuing evolution of the council itself.

## 4. Management

The hallmark of the CCC has been its agility and focus – the ability to bring together a group of people quickly to address problems, needs, and issues as they arise. But, we know our aspirations, captured in the goals above, are ambitious. To maintain our pro-active stance, we recognize that we must develop the organization to distribute responsibility and empower its members.

Over the past year, the CCC has created and implemented a new leadership strategy and a leadership transition plan. A key element of this plan has been the creation of an executive committee that has a weekly phone call to provide a forum for monitoring ongoing activities and to address issues as they arise. This committee, which includes the Chair and Vice-Chair and three rotating council members, provides an ongoing source of oversight and advice. The executive committee also holds bi-weekly phone conferences with NSF to gain advice and oversight, as our cooperative agreement requires.

The engagement of Council members will be encouraged in several ways:

- An annual half day on-boarding session for new Council members
- Bi-weekly one-hour teleconferences.
- Thrice-annual full-day meetings for longer-range planning.
- Assignment of specific major responsibilities – leadership of significant CCC initiatives, such as the visioning activity process.
- Serving on subcommittees that address our major strategic objectives.
- Assignment of specific short-term responsibilities – such as serving as the liaison to a specific visioning activity.

It is important to acknowledge that the need for openness and inclusiveness -- for breadth of participation – can be at odds with the goal of having every Council member be an equal and active contributor. Similarly, the need for our visioning exercises to be open and inclusive means that we cannot guarantee that all will be successful, although we certainly take it as our obligation to do everything reasonable to help each activity succeed.

## 5. Assessment

Assessment of the CCC's activities is challenging. Some activities have immediate and tangible outcomes – e.g. the National Robotics Initiative or the *Frontiers of Computing* event. Others are more strategic in nature. For example, leadership development through LiSPI, our conference tracks, our white papers, and the many talks and meetings we hold all contribute to our success, but their real impact may only become known years down the road. Nonetheless there are measures that we can use to assess the success of our work, for example:

- An awareness of the CCC Council as measured, e.g. by the number of applicants for the open CCC call for membership.
- The relevance of the CCC within the research community as measured, e.g. by the readership of the CCC Blog.
- The community's assessment of our potential to have impact as measured, e.g. by the response to our calls for proposals.
- The awareness of CCC within the stakeholders as measured by, e.g. the number of requests for CCC to undertake an activity, give a presentation, or be part of an event.
- The quality of CCC events as measured by e.g. visioning activity participation.
- Our agility as measured e.g. by the new mechanisms that we create in response to a CSE community need.
- Our impact as measured, e.g. by funded programs that are related to CCC visioning activities.
- Our effectiveness at grooming leadership as measured, e.g., by the number of former CCC members or activity leaders that take part in service or leadership roles within the CSE community.
- Our ability to appeal broadly as measured, e.g. by the diversity of participation in CCC activities.

We will make every effort to capture such measures and will strive to use them whenever possible to characterize the impact of CCC activities

## 6. Summary

Six years ago, the Computing Community Consortium was a "grand experiment." This experiment has been a remarkable success. It has had impact well beyond our wildest imagination by creating a recognized focus point for the vision, energy and creativity of the CSE research community. More importantly, the CCC has impacted the lives of innumerable members of the research community in ways that will only become apparent in the fullness of time.

We will not sit still – we will strive to do more. We must continue to plant the seeds of success today to ensure the fruits of those successes for tomorrow. This document sets out goals and strategies that will not only allow us to continue on the path set out by the strong and committed leadership of the past, but will also promote new thinking, new ideas, and new aspirations. By maintaining agility, speed and flexibility, we will evolve and adapt with the community, and in doing so ensure the continued renewal, growth, and vitality of the field.