

# Overview of NSF ACCI Task Force on Campus Bridging Report

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# The beginnings of all this....

- In early 2009 National Science Foundation's (NSF) Advisory Committee for Cyberinfrastructure (ACCI) charged six different task forces to make strategic recommendations to the NSF in strategic areas of cyberinfrastructure: Campus Bridging; Data; Grand Challenges and Virtual Organizations; High Performance Computing; Software and Tools; and Work Force Development.
- *Cyberinfrastructure consists of computational systems, data and information management, advanced instruments, visualization environments, and people, all linked together by software and advanced networks to improve scholarly productivity and enable knowledge breakthroughs and discoveries not otherwise possible.*
- The goal of campus bridging is to enable the seamlessly integrated use among a scientist or engineer's personal cyberinfrastructure; cyberinfrastructure on the scientist's campus; cyberinfrastructure at other campuses; and cyberinfrastructure at the regional, national, and international levels; as if they were proximate to the scientist. When working within the context of a Virtual Organization (VO), the goal of campus bridging is to make the 'virtual' aspect of the organization irrelevant (or helpful) to the work of the VO.

<http://pti.iu.edu/campusbridging/>

**NSF ACCI Task Force on  
Campus Bridging**

Read current draft of final  
report (1 Mar 2011 v4.1)

Submit a comment or  
position paper

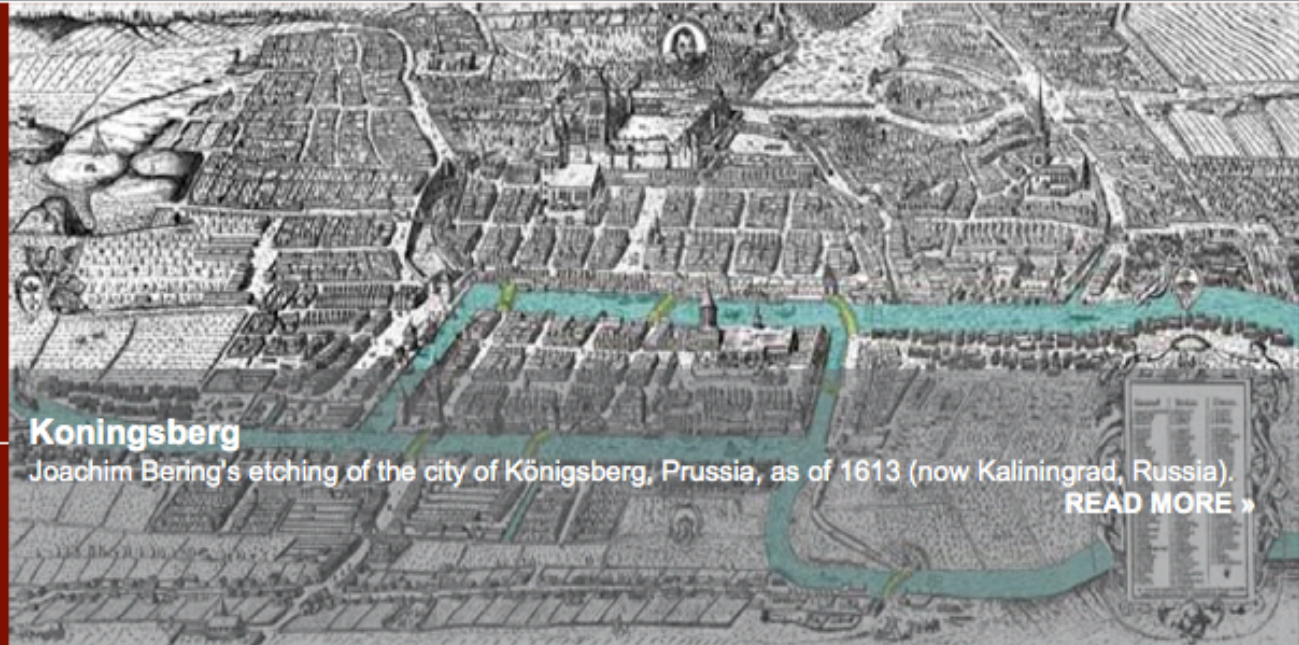
Read submitted position  
papers

**Information about  
NSF-sponsored workshops**

**Campus Bridging:  
Networking &  
Data-centric Challenges  
Workshop**

**Campus Bridging:  
Software & Service  
Issues Workshop**

**Campus Bridging:  
Campus Leadership**



**Campus Bridging community needs assessment**

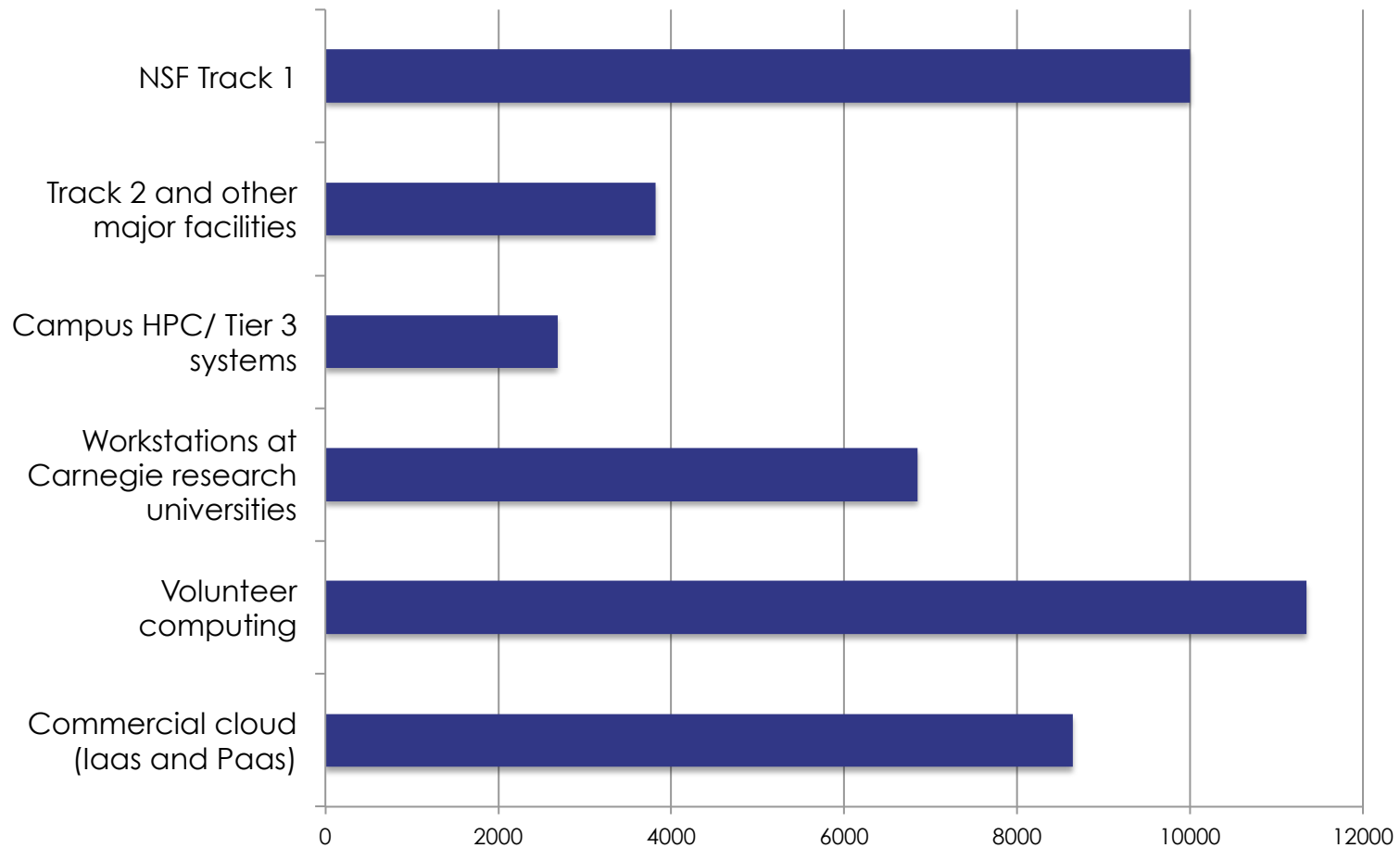
In early 2009 **National Science Foundation's (NSF) Advisory Committee for Cyberinfrastructure (ACCI)** charged six different task forces to make strategic recommendations to the NSF in strategic areas of cyberinfrastructure: Campus Bridging; Data; Grand Challenges and Virtual Organizations; High Performance Computing; Software and Tools; and Work Force



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## Estimated Computing Capacity (TFLOPS)

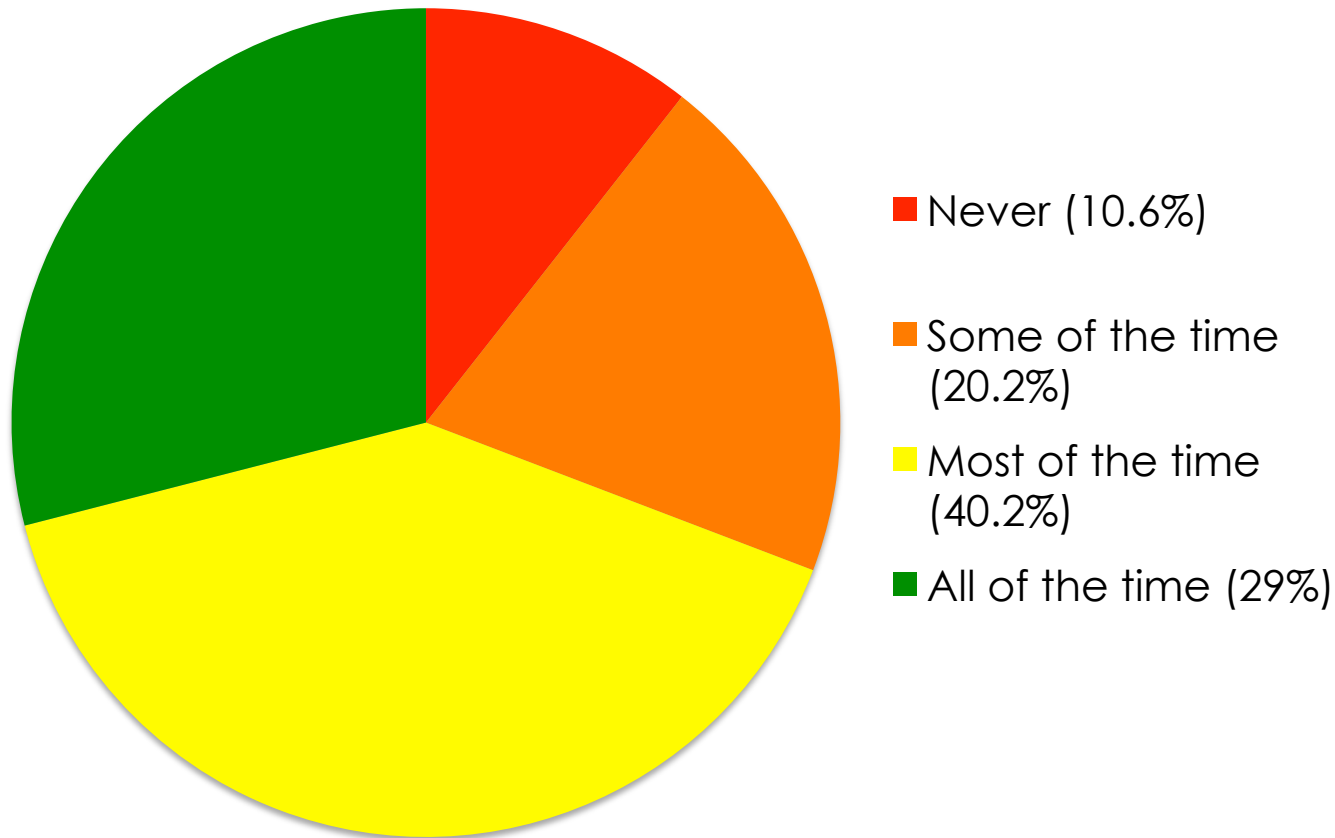


So that anyone may quibble, the data are published: Welch, V., R. Sheppard, M.J. Lingwall and C.A. Stewart. Current structure and past history of US cyberinfrastructure (data set and figures). 2011. Available from: <http://hdl.handle.net/2022/13136>

# Key initial findings

- Finding 1. The cyberinfrastructure environment in the US is now much more complex and varied than the long-useful Branscomb Pyramid. ...This is largely due to the maturity of commercial cloud facilities, volunteer computing....
- Finding 2. The reward system as perceived by individual faculty researchers in science and engineering does not support a focus on Virtual Organizations as an essential organizational feature in scientific and engineering research. It encourages a highly diffuse, uncoordinated cyberinfrastructure that makes sharing and collective investment difficult and does not optimize the effectiveness of CI support for research and development in science and engineering in the United States.
- Finding 3. The US open science and engineering research community is not using the existing cyberinfrastructure as effectively or efficiently as possible, primarily as a result of the current state of cyberinfrastructure software and the resulting barriers of migration among and between the many and varied campus and national cyberinfrastructure facilities.

# Adequacy of Research CI



Stewart, C.A., D.S. Katz, D.L. Hart, D. Lantrip, D.S. McCaulay and R.L. Moore. *Technical Report: Survey of cyberinfrastructure needs and interests of NSF-funded principal investigators*. 2011. Available from: <http://hdl.handle.net/2022/9917>

# Not the biggest surprise this year...

- Finding 4. The existing, aggregate, national cyberinfrastructure is not adequate to meet current or future needs of the US open science and engineering research community.
- Finding 5: A healthy national cyberinfrastructure ecosystem is essential to US science and engineering research and to US global competitiveness in science and technology. Federal R&D funding overall is not sufficient to meet those needs, and the NSF share of this funding is not sufficient to meet even the needs of basic research in those disciplines that the NSF supports.
- *A key point of the entire Task Force's work is that NSF funding alone is insufficient to solve the nation's CI problems but that NSF leadership and use of funding to align expenditures nationally (a la NSFNet) can have tremendous impact on the nation.*

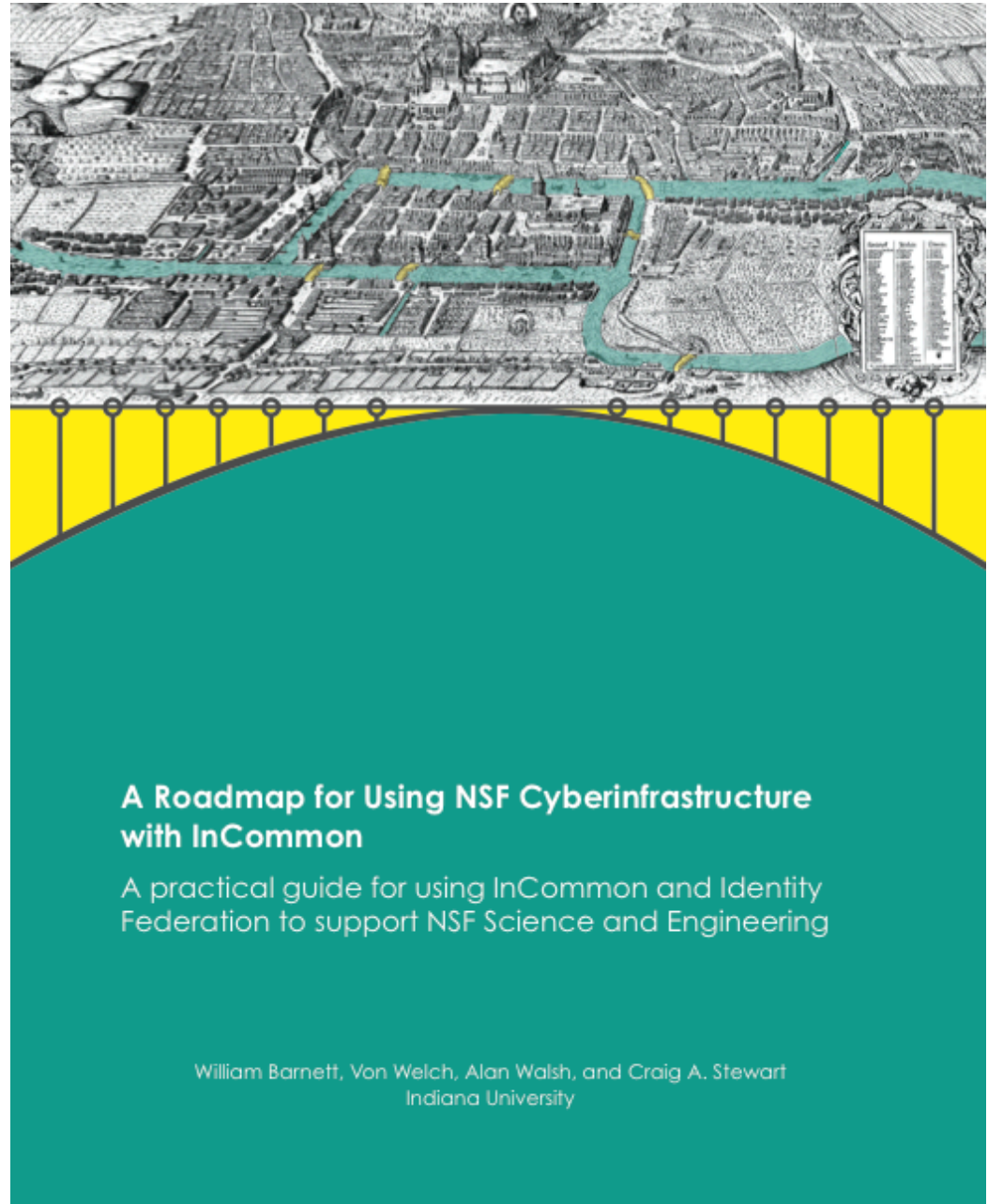
## Nor is this a surprise...

- Finding 6: New instrumentation (including that installed at the campus lab level) is producing volumes of data that cannot be supported by most current campus networking facilities. There is a critical need to restructure and upgrade local campus networks to meet these demands.



# Strategic Recommendations to NSF, part 1

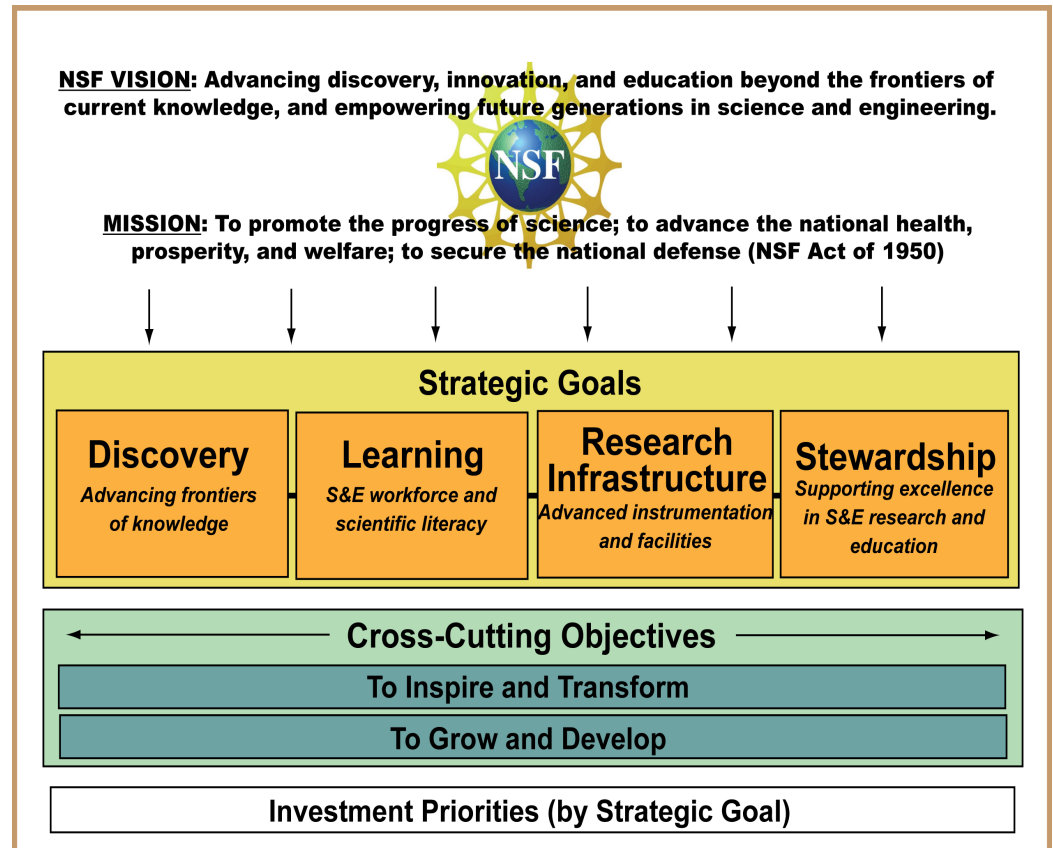
Strategic Recommendation to the NSF #1: As part of a strategy of coherence between NSF and campus CI and reducing reimplementation of multiple authentication systems, the NSF should encourage the use of the InCommon Federation global federated system by using it in the services it deploys and supports, unless there are specific technical or risk management barriers.



# Cyberinfrastructure is Infrastructure

Strategic  
Recommendation to the  
NSF #2: NSF must lead  
the community in  
establishing a blueprint  
for a National CI

*Specific suggestions on  
how to do this, rather  
than what to do  
specifically, made in  
report*



National Science Foundation. *Investing in America's Future: Strategic Plan FY 2006-2011*. September 2006. Available from: <http://www.nsf.gov/pubs/2006/nsf0648/nsf0648.jsp>

# Strategic Recommendations to NSF, part 2

- Strategic Recommendation to the NSF #3: The NSF should create a new program funding high-speed (currently 10 Gbps) connections from campuses to the nearest landing point for a national network backbone. ...
- Strategic Recommendation to the NSF #4: The NSF should fund national facilities for at least short-term storage and management of data to support collaboration, scientific workflows, and remote visualization; management tools should include support for provenance and metadata. ...
- Strategic Recommendation to the NSF #5: The NSF should continue research, development, and delivery of new networking technologies....
- Strategic Recommendation to the NSF #6: The NSF should fund activities that support the evolution and maturation of cyberinfrastructure through careful analyses of needs (in advance of creating new CI facilities) and outcomes (during and after the use of CI facilities).. ... All studies of CI needs and outcome, including ongoing studies of existing CI facilities, should be published in the open, refereed, scholarly literature.

# Tactical Recommendations to NSF

- Tactical Recommendation to the NSF #1: The NSF should fund the TeraGrid eXtreme Digital program, as currently called for in existing solicitations, and should continue to fund and invest in the Open Science Grid.
- Tactical recommendation to the NSF #2: The NSF should commission a study of current reward structures and recommendations about the reward structure – particularly as regards promotion and tenure for faculty – that would better align reward structures as perceived by individual faculty members with the type of large, collaborative virtual organizations that the NSF asserts are required for successful approaches to pressing, large scale scientific problems and transformative research.
- Tactical Recommendation to the NSF #3: The NSF should support joint efforts with organizations such as the Association for Computing Machinery (ACM), the IEEE Computer Society, and/or Computing Research Association (CRA), to develop and maintain curriculum materials for undergraduate education in computer science and **computational and data-enabled science and engineering**.\*

\*Emphasis result of ACCI recommendation endorsed by Arden Bement, Director, NSF

# Strategic Recommendations to university leaders and the US higher education community

- Strategic Recommendation to university leaders and the US higher education community #1: Institutions of higher education should lead efforts to fund and invest in university-specific, state-centric, and regional cyberinfrastructure to create local benefits (in research accomplishment and local economic development) and to aid the global competitiveness of the US and thus the long-term welfare of US citizens.
- Strategic Recommendation to university leaders and the US higher education community #2: Every institution of higher education should have a plan, developed and endorsed at the highest level of its governance, for the establishment of a coherent cyberinfrastructure. ...
- Strategic Recommendation to university leaders and the US higher education community #3: Institutions of higher education should adopt criteria for tenure and promotion that reward the range of contributions involved in the production of digital artifacts of scholarship. ...

# Tactical Recommendations to university leaders and the US higher education community

- Tactical recommendation to university leaders and the US higher education community #1: Institutions of higher education should continue to press publishers to adopt a strategy of enabling multiple 'primary authors' on research papers particularly so that computer, computational, and informatics scholars can contribute to larger collaborative projects while still being rewarded as primary authors.
- Tactical recommendation to university leaders and the US higher education community #2: US colleges and universities should systematically consider inclusion of some costs for research cyberinfrastructure in negotiation of facilities and administration rates. When this is done, the best use of facilities and administration income associated with grant awards to universities will be to use it strategically within the context of a campus cyberinfrastructure plan.

Survey of CASC Members: Are costs for research cyberinfrastructure (other than federally-funded facilities and budgeted match for those facilities) included in your institutions costs that form the basis for negotiating facilities and administration rates associated with grant budgets?

Number of respondents	Percent of respondents	Response
13	38.2%	not at all
15	44.1%	some costs are included, but well less (less than 80%) of the full costs to the University or College
6	17.6%	most (at least 80%) or all of such costs are included



# Strategic Recommendation to Commercial Cloud/IaaS providers

- Commercial Cloud/IaaS providers must work with the US open research community, particularly the community of NSF-funded researchers, to reduce barriers to use of such facilities by the US open research community. Such barriers include technical issues such as the quality of connectivity between the R&E and commercial sectors, business model issues such as transport costs, and policy issues such as the control of geographic location of data for privacy, national security or intellectual property reasons.
- *Note that IaaS providers HAVE changed licensing terms during course of the task force's work*




## Closing thoughts

- “Transformative research involves ideas, discoveries, or tools that radically change our understanding of an important existing scientific or engineering concept or educational practice or leads to the creation of a new paradigm or field of science, engineering, or education. Such research challenges current understanding or provides pathways to new frontiers.”
- Scientific debates have now more importance than ever before for the US and global societies. ... It is thus a critical responsibility of the scientific community to as best possible apply the cyberinfrastructure we have and develop new cyberinfrastructure that aids transformative research, enabling understanding of the world around us and the impact on it of our activities. ... These tasks are definitely not the low hanging fruit – but they may be the most important and best fruit and thus should be our focus as a community.

## List of work products in addition to task force report (available from IU ScholarWorks and for larger pieces Amazon CreateSpace)

- Report on Campus Bridging Technologies Workshop: Networking and Data Centric Issues.
- Report on Campus Bridging Technologies Workshop: Campus Bridging Software and Software Service Issues.
  - <http://hdl.handle.net/2022/13070>
- Report on Campus Leadership Engagement in Building a Coherent Campus Cyberinfrastructure.
- A Roadmap for Using NSF Cyberinfrastructure with InCommon
  - <http://www.incommonfederation.org/cyberroadmap.html>
- A Roadmap for Using NSF Cyberinfrastructure with InCommon: Abbreviated Version

# http://www.nsf.gov/od/oci/taskforces/

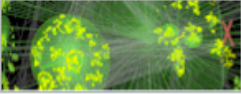


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## ACCI - Task Forces

In 2009 the NSF-wide Advisory Committee for Cyberinfrastructure (ACCI) established six task forces to investigate long term cyberinfrastructure issues:

- Campus Bridging
- Cyberlearning and Workforce Development
- Data and Visualization
- Grand Challenges
- High Performance Computing
- Software for Science and Engineering

These task forces were each led by ACCI members and their membership included a cross section of members from both academic and industrial communities. Over a two year period the task forces gathered broad community input via open workshops and meetings, solicitation of white papers, and other outreach efforts. Each task force subsequently discussed and generated a final report containing recommendations and ideas for advancing cyberinfrastructure in support of NSF research.

The recommendations of each task force were discussed in depth during the December 2010 ACCI meeting, and the below final reports generated by the task forces will be submitted to the ACCI for approval in their April 2011 meeting.

 <p>National Science Foundation Advisory Committee for Cyberinfrastructure Task Force on Campus Bridging Final Report, March 2011</p>	 <p>National Science Foundation Advisory Committee for Cyberinfrastructure Task Force on Cyberlearning and Workforce Development Final Report, March 2011</p>	 <p>National Science Foundation Advisory Committee for Cyberinfrastructure Task Force on Data and Visualization Final Report, March 2011</p>
<b>Campus Bridging</b>	<b>Cyberlearning &amp; Workforce Development</b>	<b>Data &amp; Visualization</b>
 <p>National Science Foundation Advisory Committee for Cyberinfrastructure Task Force on Grand Challenges Final Report, March 2011</p>	 <p>National Science Foundation Advisory Committee for Cyberinfrastructure Task Force on High Performance Computing Final Report, March 2011</p>	 <p>National Science Foundation Advisory Committee for Cyberinfrastructure Task Force on Software for Science and Engineering Final Report, March 2011</p>
<b>Grand Challenges</b>	<b>HPC</b>	<b>Software for Science &amp; Engineering</b>

### Proposals and Awards

- Proposal and Award Policies and Procedures Guide
- Introduction
- Proposal Preparation and Submission
  - Grant Proposal Guide
  - Grants.gov Application Guide
- Award and Administration
  - Award and Administration Guide
- Award Conditions
- Other Types of Proposals
- Merit Review
- NSF Outreach
- Policy Office

Additional OCI Resources

# Thanks

- Guy Almes, Von Welch, Patrick Dreher, Jim Pepin, Dave Jent, Stan Ahalt, Bill Barnett, Therese Miller, Malinda Lingwall, Maria Morris
- Gabrielle Allen, Jennifer Schopf, Ed Seidel, all of the NSF program officers involved. (Anyone who is happy that there are less than 87 recommendations owe Jennifer a special thanks ☺; I owe Gabrielle special thanks for special effort on publication matters generally)
- All of the CASC members who have participated in this in any way
- All of the IU Research Technologies and Pervasive Technology Institute staff who have contributed to this entire 2+ year process
- Special thanks to CASC members who have participated in one of n information gathering exercises (where n is large)
- NSF for funding support (Awards [040777](#), [1059812](#), [0948142](#), [1002526](#), [0829462](#))
- Lilly Endowment and the Indiana University Pervasive Technology Institute
- Any opinions presented here are those of the presenter or collective opinions of members of the Task Force on Campus Bridging and do not necessarily represent the opinions of the National Science Foundation or any other funding agencies

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- Please cite as: Stewart, C.A. and V. Welch. *Overview of NSF ACCI Task Force on Campus Bridging Report*. (Presentation) Coalition for Academic Scientific Computation Meeting (Arlington, VA, 16 Mar, 2011). Available from: <http://hdl.handle.net/2022/13421>
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- This talk was also given at IU, at a PTI Major Project Review, 3 March 2011, and CASC, 16 March 2011.