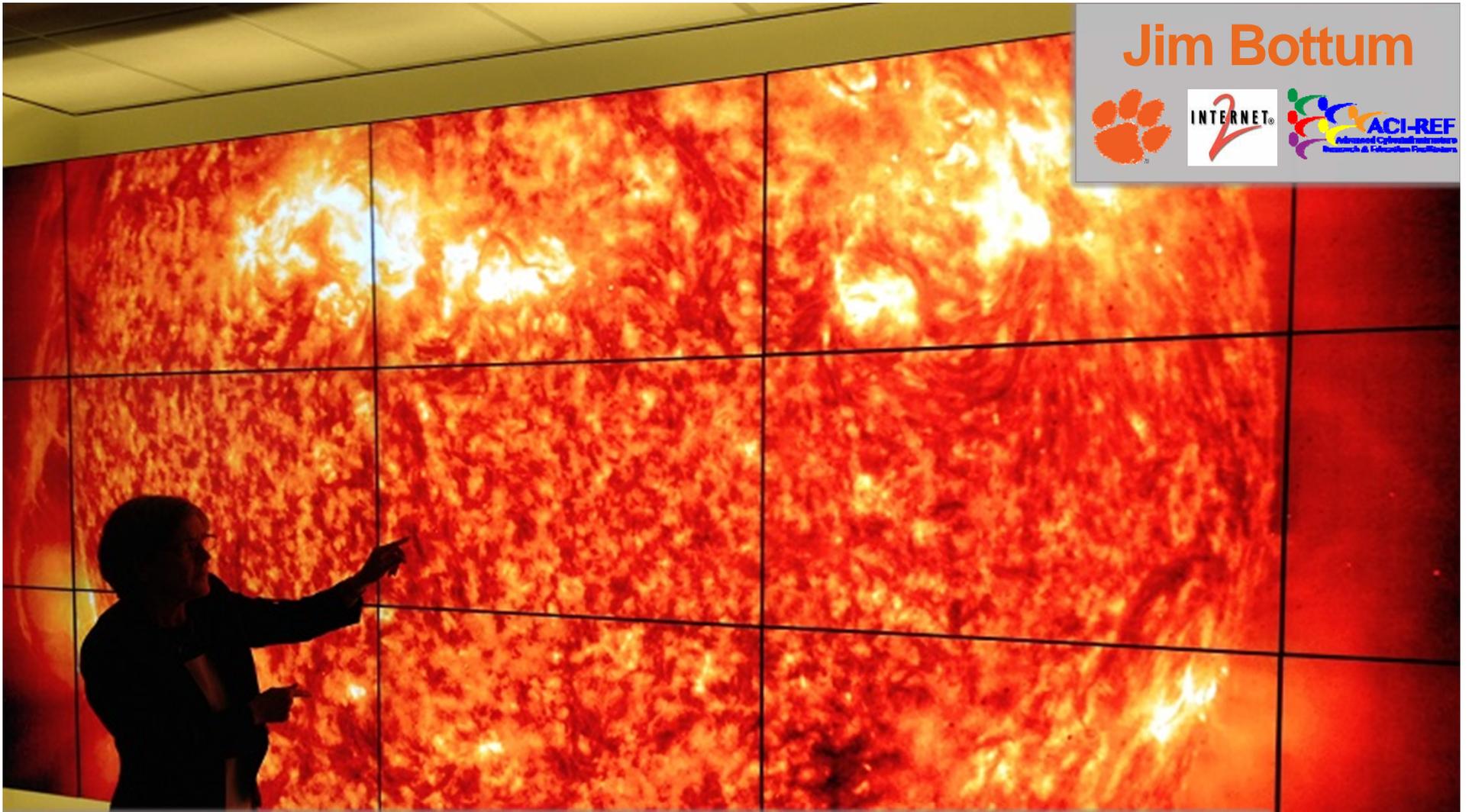


Jim Bottum



Charting the Evolution of Campus Cyberinfrastructure: Where Do We Go From Here?

2015 National Science Foundation

NSE CC*NIE/IE/DNI Principal Investigators' Meeting

The CC* Mission

Campuses today face challenges across multiple levels of Cyberinfrastructure (CI), where meeting the needs of scientific research and education goes **far beyond the networking layer** in capacity and services, and extends to computing, data services, secure and trustworthy systems, and **especially human expertise**, collaboration and knowledge sharing.



Why is CC* ___ Important?

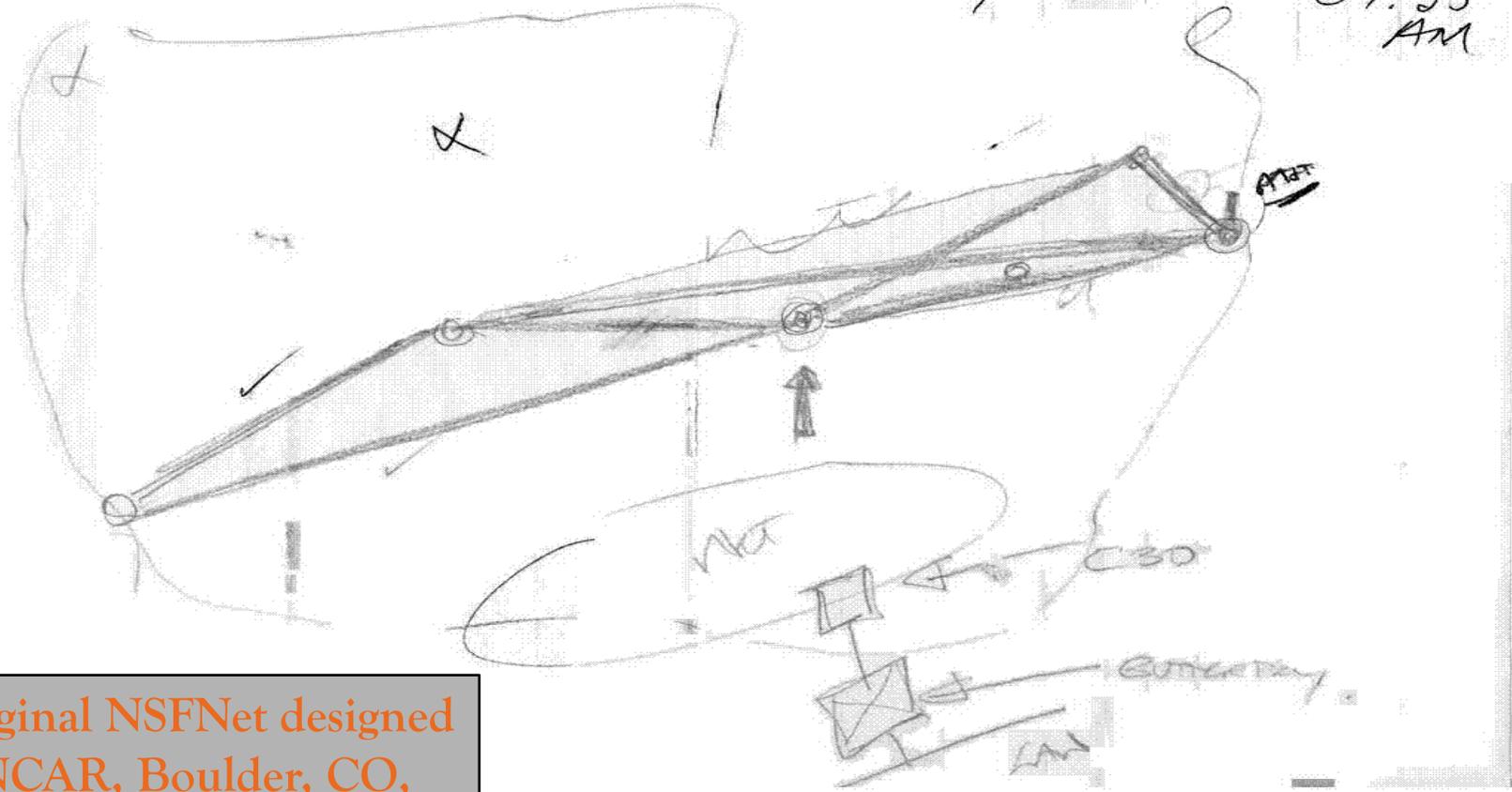
- Pioneers of next generation technology organization
- CC* ___ programs are essential to developing the institutional framework and create the drivers for cyberinfrastructure-enabled research – in terms of both physical and human infrastructure
 - Historical analogy – NSF investments in regional networks.....drove campuses to develop their own infrastructure

We are all part of the same ecosystem and relative to university expenses for technology, we are small; we need to learn how to collaborate and leverage each other



Historical Context – Networks

NSF
56KB MAP
9-17-85
09:35
AM



Original NSFNet designed at NCAR, Boulder, CO, September 17, 1985

Map of United States



Science Engagement on Campuses – how to coordinate and leverage?



CC*__ helps knock down silos – an example

- **Clemson HPC and Open Science Grid HTC**
 - Clemson's Palmetto contributed 300K core hours to the OSG community in 30 day period
 - Two faculty, Alex Feltus (Genomics) and Jerry Tessendorf (Digital Production Arts) used 170K core hours on OSG in one week.
 - Helps us balance our environment and better meet needs of the researchers
- **And this did not happen w/o some pain**



Open Science Grid



Our key challenge: How do campus technology organizations remain relevant, stay or become nimble and do more with less as technologies evolve to cloud-based strategies?



One Campus' Approach

The Center of Excellence in Next Generation Computing & Creativity

- Strengthens coupling of the technology organization to the University's mission.
- IT directions get influenced by faculty insuring alignment with the university's academic and research directions.
- Enables core collaborations and infrastructure leveraging CC* ___ programs and other funded initiatives.

Each Area (3) Led by Faculty Directors

And, don't forget the humanities!

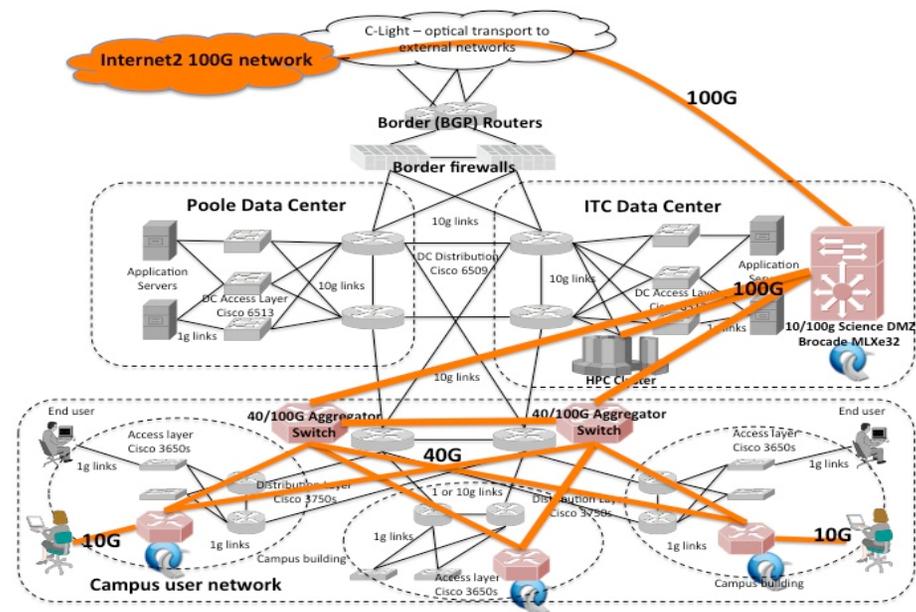


CC* ___ Impacts on One Campus

CC*NIE Integration: Clemson NextNet

2012 – Dr. KC Wang, PI – Elect. & Comp. Engr.

- Made needed networking improvements on campus for faculty members' labs and offices (20+ buildings)
- Prototype (and motivator) for campus upgrade (created a bit of jealousy with regard to buildings being upgraded!)
- Opened **windows of opportunity for collaboration with new faculty areas**



CC* ___ Impacts on One Campus

CC*IIE Identity & Access Management: FeduShare

2014 Dr. Jill Gemmil, Fedushare: A User-Managed Collaboration Framework

- Campus Identity and Access Management (IAM) experts solve research collaboration challenges
- Raise campus IAM experts awareness of national infrastructures (XSEDE, OSG, CloudLab, GENi)
- Uses Shibboleth + InCommon for cases where SSH (non-web) logon is required (HPC logon; moving data/computation into/out of Clouds)
- Project provided solution for native mobile phone authentication



ACI-1440609



CC* ___ Impacts on One Campus

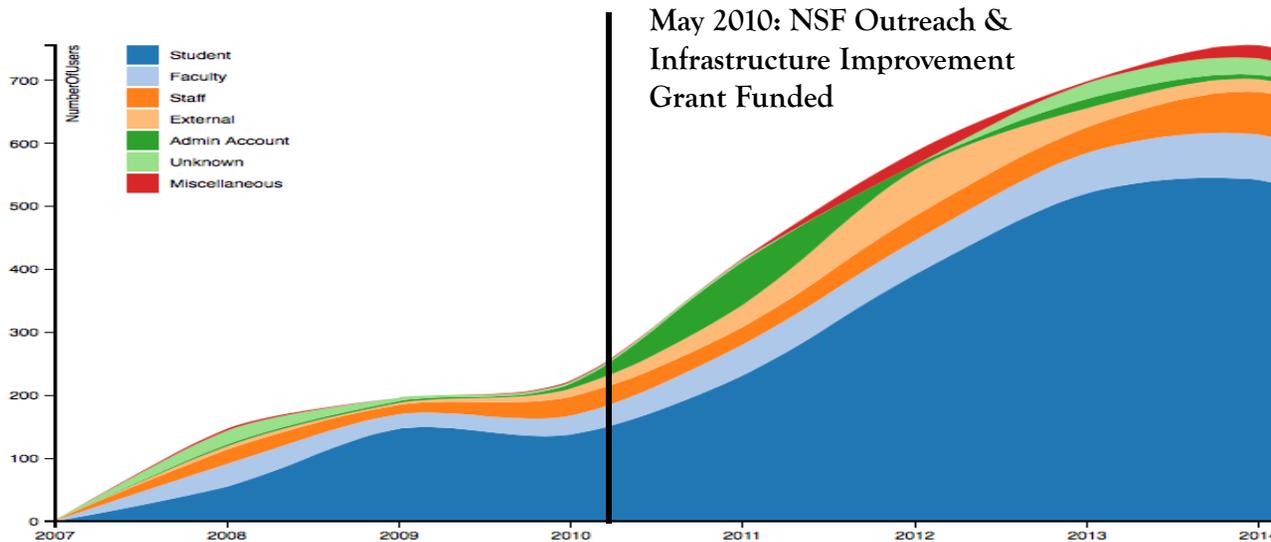
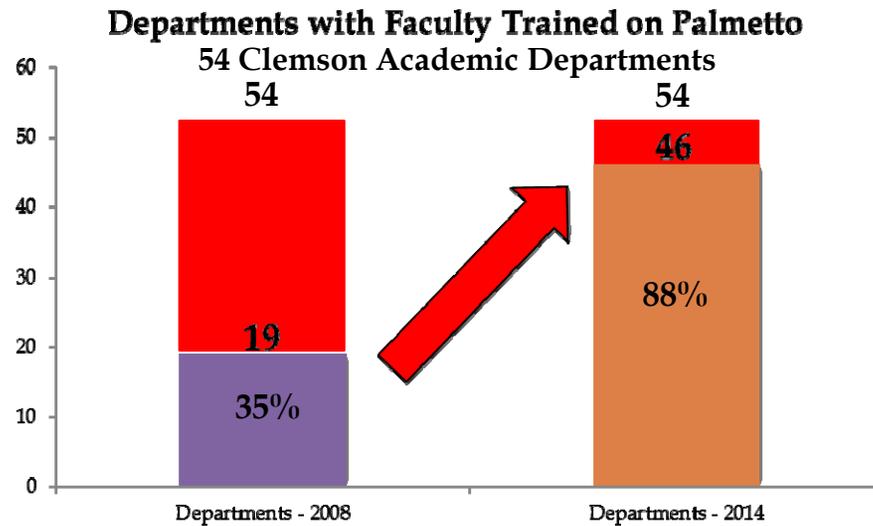
CC*IIE Region: Southern Partnership in Advanced Networking

- 2014 – Dr. Barr von Oehsen, PI – IT & Elect. & Comp. Engr.
 - Project building a regional community of practitioners across the South that supports next-generation networking
 - Partnership between Clemson University, South Carolina State University, Georgia State University, and the University of Georgia
 - Facilitated through a program of workshops, the first of which hosted over **50** participants from **28** campuses and other organizations for its first workshop in Atlanta, GA in Spring 2015
 - Facilitated regional partnerships resulting in a **\$4M+** MRI submission to acquire a regional computational resource



And the workload is going to grow..

Clemson
May 2010 –
first Clemson
“facilitator”
funded



Joining campus efforts – ACI-REF

\$5.3M NSF Award



PI: Jim Bottum, **Clemson**

Project Leadership:

- James Cuff, **Harvard** (PI Chair)
- Maureen Dougherty, **USC**
- Gwen Jacobs, **Hawaii**
- Paul Wilson, **Wisconsin**
- Tom Cheatham, **Utah**
- Barr von Oehsen, **Clemson**

Facilitator Lead: Bob Freeman, **Harvard**

Chief Scientist: Miron Livny, **Wisconsin**



Transforming the workflow – CI Engineer*



27.8X Faster Transfer from NCBI to Clemson Cluster!

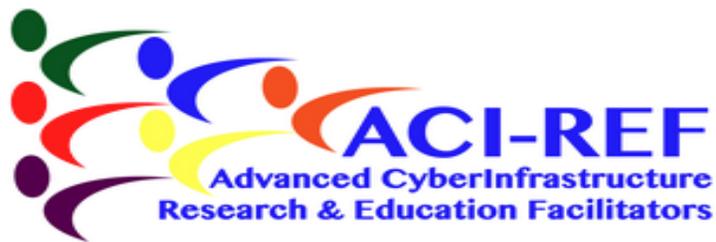
The significance of the speed up (which is looking more like 75-100X by the way) is that I can...

- A) SCALE UP EXPERIMENTS by using more input data since I can get the data quickly.
- B) MINIMIZE LOCAL STORAGE of huge files because they enter workflows and then get deleted. I can just download them again if I screwed up my experiment.

-Alex Feltus, Associate Professor – Genomics (Clemson University)



More partnering is needed to help
bring us together



Extreme Science and Engineering
Discovery Environment

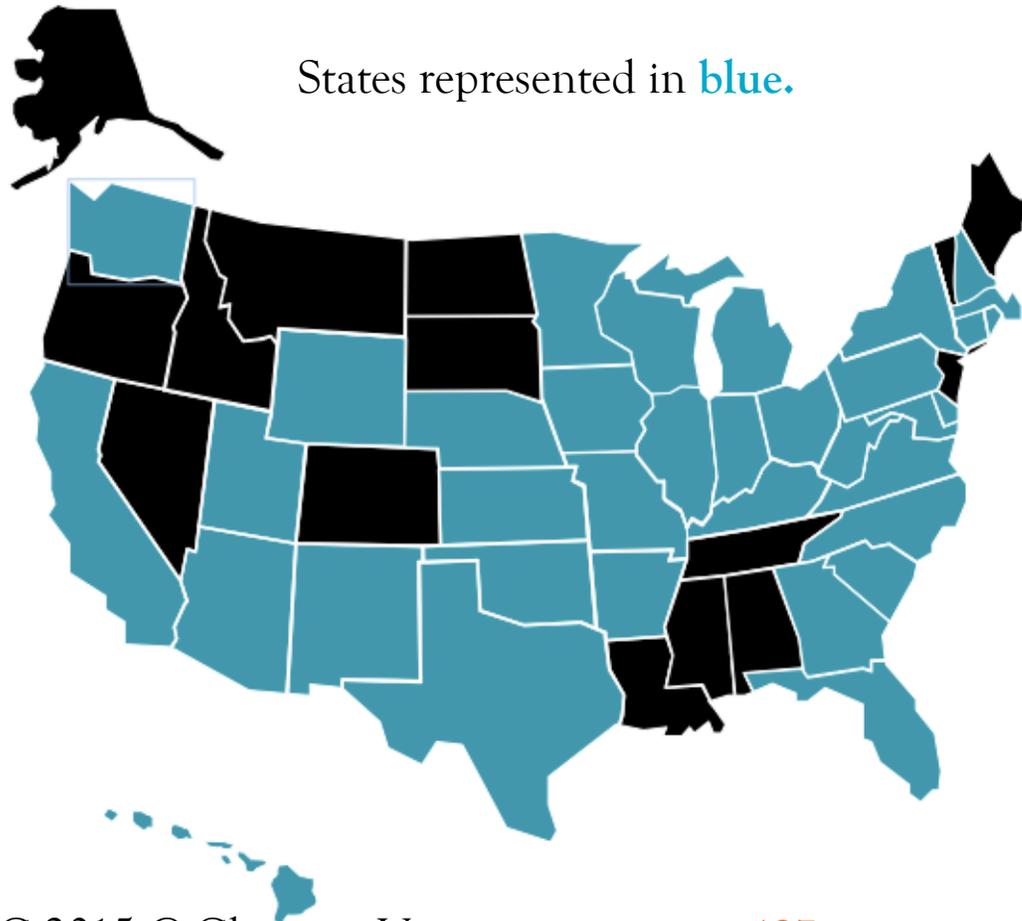


Open Science Grid

ADVANCING RESEARCH COMPUTING ON CAMPUSES:
BEST PRACTICES WORKSHOP



States at ARCC 2015 (second annual)



ARCC 2015 @ Clemson University saw over **197** participants representing over **97** different facilities, organizations, companies, and institutions. <http://citi.clemson.edu/arcc/>



Need to formalize a profession?



From the Atkins Report*

“A new interdisciplinary work force – The need for **a new workforce** - a **new flavor of mixed science and technology professional** – is emerging. These individuals have expertise in a particular domain science area, as well as considerable expertise in computer science and mathematics. Also needed in this interdisciplinary mix are **professionals who are trained to understand and address the human factors dimensions** of working across disciplines, cultures, and institutions using technology-mediated collaboration tools.”

A New Profession?

* *Revolutionizing Science and Engineering Through Cyberinfrastructure*: Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure, January 2003



Cyberpractitioner?

- The future of IT organizations depends upon all of you and leveraging your expertise to contribute to the mission of your institutions.
- Technologies are ‘merging’ – it’s the people and their delivery of value as a strategic partner to the research and academic process that will matter for the future.

Cyberpractitioners: A New Discipline?

- **Workshop Proposal: The Cyberpractitioner Project**
- **Principals:** Steve Wolff, Jim Bottum, Dustin Atkins
- **Purpose:** To explore the formalization of the *cyberpractitioner* profession and engage the community at large in developing workforce development, training, and outreach programs.
- **Impetus:** Facilitators and other *cyberpractitioners* are not part of a recognized profession
 - Do not generally appear in university HR structures or job family systems
 - Research computing is often supported by departments or at least outside of the mainstream IT organization



The National Strategic Computing Initiative



Office of Science and
Technology Policy

September 2015



Discussion

