

Advanced Cyberinfrastructure Research & Education Facilitators Virtual Residency: Overview

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Let's Introduce Ourselves!

- Let's go around the room.
- Tell us:
 - your name;
 - your institution;
 - your role at your institution;
 - why you wanted to attend the ACI-REF Virtual Residency;
- What do you hope to get out of this week?





Outline

- This is an experiment!
- Advanced Cyberinfrastructure Research & Education Facilitators
- National Science Foundation's Campus Cyberinfrastructure Programs
- You're Next ...





This is an Experiment!

- Everything about this week is exciting and new.
- Those of you who are new are only the second cohort of what we want to be a national program.
- This means that you're helping us to pioneer a new way of developing the next generation Cyberinfrastructure (CI) workforce.





You Voted with Your Feet

- We thought most of the interest would be in learning how to be a Campus CI Engineer.
- But it turned out that a big chunk of the national need is learning how to help researchers do the computing- and data-intensive parts of their research.
 - 2015: Science DMZ Track: 14% (7 of 50)
 - 2016: Science DMZ Track: 21% (22 of 104)
- Since we do both here, we can teach both here.
 - So we can serve both sides of the national need.





Only You ...



- ... can make this Virtual Residency a success.
 - Ask questions -- the only dumb question is the one you don't ask.
 - Volunteer your ideas and experiences.
 - Ultimately, it's you who will have to be in charge, not us.





Advanced Cyberinfrastructure Research & Education Facilitators





What is an ACI-REF?

- Advanced Cyberinfrastructure Research & Education Facilitator (term coined by Miron Livny)
- Work with users -- researchers and educators -- to help them improve their research and/or education productivity and aspirations using advanced cyberinfrastructure.
- Typically, one or a few ACI-REFs have responsibility for an entire institution, or multiple institutions.
- At some institutions, CI facilitation is part time; at other institutions, it's a full time job. It can come from:
 - faculty or former faculty;
 - postdocs or former postdocs;
 - research staff or former research staff;
 - IT professionals;
 - graduate or undergraduate students.





A Little Background

- In 2013, a team of 13 institutions led by Clemson U submitted an 8-figure proposal on this issue, to provide multiple ACI-REFs at each institution over a 4 year period.



- The proposal also included funding for advanced networking.





OU's Piece

- OU's piece included some extra components:
 - a component about EPSCoR jurisdictions, shared with HI, SC, UT (note that UT is now graduating from EPSCoR);
 - EPSCoR: Experimental Program for the Stimulation of Competitive Research: federal program to promote and increase STEM research in states that get less than 0.75% of federal research funding.
 - NSF, Dept of Energy, Dept of Defense, NASA
 - NIH (known as INBRE)
 - a Virtual Residency to teach how to be an ACI-REF -- **THIS!**





Ah, if only

- Unfortunately, the NSF wasn't able to fully fund that proposal. The team ended up reducing down to 6 institutions for 2 years, and no advanced networking.
- “Phase 1:”
 - Clemson U
 - Harvard U
 - U Hawai'i
 - U Southern California
 - U Utah
 - U Wisconsin
- “Phase 2:”
 - Arizona State U
 - Emory U
 - Ohio Supercomputer Center
 - Stanford U
 - Sunshine State Education & Research Computing Alliance (SSERCA)
 - **U Oklahoma**
 - U Washington





National Science Foundation's Campus Cyberinfrastructure Programs





And then ...

- In 2012-13, the NSF had a program called “Campus Cyberinfrastructure - Networking Infrastructure & Engineering” (CC-NIE).
 - Two subprograms: One for deploying networking equipment, one for innovative networking research.
 - OU, OSU, Oklahoma Innovation Institute, Langston U, OneNet: “OneOklahoma Friction Free Network”
- In 2014, that was followed by “Campus Cyberinfrastructure - Infrastructure, Innovation & Engineering” (CC*IIE).
 - Several new subprograms, including “Campus CI Engineer.”





So ...

- In 2014, OU submitted a proposal to the Campus CI Engineer subprogram:
 - “A Model for Advanced Cyberinfrastructure Research and Education Facilitators”
 - \$400K
 - Highlights the relationship between OU and the ACI-REF project.
- We have Clemson’s Phase 1 PI on our External Advisory Committee.
- OU is the only institution that is all of:
 - ACI-REF Phase 2 (so already involved)
 - EPSCoR (and was to have co-lead the ACI-REF EPSCoR thrust)
 - CC-NIE awardee (so need a Campus CI Engineer already)





Objectives

- Data-Intensive Research Facilitation: Via Software Defined Networking (SDN) across OFFN, facilitate end-to-end management, by researchers, of high bandwidth/high performance data flows through a distributed hierarchy of open standards tools, providing researchers with a new layer of transparency into network transport at OU, among OneOCII institutions, and with ACI-REF members.
- Oklahoma ACI-REF project: Lead and facilitate adoption of the ACI-REF approach across Oklahoma, leveraging extant and emerging capabilities within OneOCII.
- **National training regime: Provide a “virtual residency” program for Campus CI Engineers and other ACI-REFs, open to not only CC*IIE awardees and ACI-REF members but any institution that needs.**
- Research Experiences for Undergraduates (REU) Sites/Supplements: Foster undergraduate research at OU via a culture of integrating REU sites and supplements into Science, Technology, Engineering & Mathematics (STEM) research, including by all research themes on this proposed CC*IIE project.





Success!

Reviewer comments

- “This energetic, detailed and ambitious proposal from the University of Oklahoma deserves the highest priority for support. ... There are no major weaknesses in the proposal and many strengths. ...”
- “The broader impacts are nicely defined in terms of ... the idea of a residency program A residency program and enhancement of undergraduate research are strong enhancements to the proposal. ...”
- “This is one of the better proposals regarding ... additional outreach via the budgeted virtual residency program. ...”





Even More Success!

From a review from a recently funded proposal that joins the teams of the Clemson-led ACI-REF Phase 1 and OU's Campus CI Engineer grant, regarding Phase 1 broader impacts:

- “The ACI-REF virtual residency held at OU Supercomputing Center may be ... notable ... (the web site's description of the workshop looked outstanding) -- assuming it was available to a broader community and not just the [Phase 1] awardees.”
 - 2015: 49 of 50 participants, from 37 of 38 institutions, were “not just the [Phase 1] awardees.”
 - 2016: 95 of 104 accepted registrants, from 69 of 75 institutions, were “not just the [Phase 1] awardees.”





Virtual Residency





Lots of Interest 2014

- For OU's 2014 Campus CI Engineer proposal, we had 33 institutions in 23 US states and territories that expressed interest in the Virtual Residency workshops, including:
 - 19 institutions in 13 EPSCoR states;
 - 3 Minority Serving Institutions;
 - 7 non-PhD-granting institutions.





Lots of Interest 2015

In 2015:

- We had applications from over 65 people at 50 institutions in 31 US states and territories.
- The final headcount was 50 (28 onsite, 22 remote) from 38 institutions in 29 US states and territories, including:
 - 19 attendees from 14 institutions in 12 EPSCoR states;
 - 5 attendees from 5 Minority Serving Institutions;
 - 5 attendees from 5 non-PhD-granting institutions.





Lots of Interest 2016

In 2016, as of Sat Aug 6:

- Applications: 116 from 80 institutions in 35 US states plus 4 other countries (Canada, India, Nigeria, UK)
- Confirmed registrants: 104 from 74 institutions in 34 US states plus 4 other countries (as above), including:
 - 27 attendees from 21 institutions in 13 EPSCoR states;
 - 10 attendees from 9 minority serving institutions;
 - 13 attendees from 13 non-PhD-granting institutions (including 3 from 3 @ MSIs;
 - 43 registrants onsite, 61 attendees remote;
 - of 2015's 38 institutions, 24 (63%) are registered to return, plus 2 of 2015's attendees who are now at new institutions;
 - 73 registrants are from 47 institutions that have Campus Champions, including 33 Champions.





Agenda

- You've got a copy of the agenda in front of you.
- Everything on it is subject to change without notice:
 - We may drop some of the sessions.
 - We may add sessions that we think are needed.
- You're going to help us learn how to help you learn.





What Are We Here to Accomplish?

- Learn how to work with researchers who are using CI.
 - Learn how to talk to them.
 - Learn how to help them.
- Learn how to contribute to, and ultimately to lead, grant proposals.
 - Some of you already know how to do this, so you'll help us help the rest to learn.
 - Not everyone here will do this for a living, but it'll help you to understand it regardless, because your customers do it.
- Science DMZ Track
 - Learn about Science DMZs, Software Defined Networking etc.
- Computational Science & Engineering Track
 - Get some practice working with researchers.





What Aren't We Trying to Do?

- On the Computational & Data-enabled Science & Engineering track, we **AREN'T** trying to teach you a lot of technical content.
 - You can learn that from other sources.
- Instead, our goal is to teach you the **PROFESSION** of CI facilitation.





What Are We Really Here For?

- We're really here to prepare for an upcoming transition to:
 - more need for this kind of skilled workforce, but
 - fewer people who know how to do it, with
 - no mechanism to prepare a sufficiently large cohort.
- Some of us here already know how to do this.
 - But it took a very long time to learn on our own.
 - To keep up with demand, the community needs us to streamline the process so that new CI facilitators can become fully productive quickly.
- You're the leaders of tomorrow.





You're Next ...



<http://freapp.us/apps/android/com.im.uncle.sam/>





A Growing Need, a Growing Breed

- The Coalition for Academic Scientific Computation (CASC) is a group of most of the mid-to-large academic and government CI centers in the US.
- When OU joined CASC in 2004, there were roughly 35 member institutions.
- Now there are ~85.
- So the growth has been significant.
- There are a total of 329 institutions that have a Carnegie classification of “doctoral.”
- So the growth potential is substantial.





Get Ready to Be in Charge

- Baby Boomers: born 1946-1964 (ages 52-71)
- Generation X: 1965-1984 (ages 32-51)
- Millennials: roughly ages 12-32

“Roughly 10,000 Baby Boomers will turn 65 today, and about 10,000 more will cross that threshold every day for the next 19 years.” -- Pew Research Center, 2010 <http://www.pewresearch.org/daily-number/baby-boomers-retire/>

Who do you think is going to have to take up the mantle they're currently carrying?





Why ACI-REF is the Best Job Ever

Every day, you get to see how the work you do helps other people to be successful.





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 - Grant No. OCI-1126330, “Acquisition of a High Performance Compute Cluster for Multidisciplinary Research”
 - Grant No. ACI- 1229107, “Acquisition of a High Performance Computing Cluster for Research and Education”
 - Grant No. EPS-1301789, “Adapting Socio-ecological Systems to Increased Climate Variability”
 - Grant No. ACI-1341028, “OneOklahoma Friction Free Network”
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 - Grant No. ACI-1440774, “ENabling CyberInfrastructure via Training and Engagement”
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 - Grant No. ?, “DURIP-ARO: Heterogeneous Cluster for Cyber-Physical System Security Analytics,” TU, \$200K
 - Grant No. CNS-1531270, “MRI: Development of Heterogeneous Cluster for Cyber-Physical System Hybrid Analytics,” TU, \$180K
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- Dell provided seed systems for the OU Research Cloud (“OURcloud”) and the OU Science DMZ.





OK Supercomputing Symposium 2016



2003 Keynote:
Peter Freeman
NSF
Comp & Info Sci & Engr
Assistant Director



2004 Keynote:
Sangtae Kim
NSF Shared
Cyberinfrastructure
Division Director



2005 Keynote:
Walt Brooks
NASA Advanced
Supercomputing
Division Director



2006 Keynote:
Dan Atkins
Head of NSF's
Office of
Cyberinfrastructure



2007 Keynote:
Jay Boisseau
Director
Texas Advanced
Computing Center
U. Texas Austin



2008 Keynote:
José Muñoz
Deputy Office Dir
Sr Sci Advisor
NSF Office of
Cyberinfrastructure



2009 Keynote:
Douglass Post
Chief Scientist
US Dept of Defense
HPC Modernization
Program



2010 Keynote
Horst Simon
Deputy Director
Lawrence Berkeley
Nat'l Laboratory



2011 Keynote
Barry Schneider
Program Manager
National Science
Foundation



2012 Keynote
Thom Dunning
Director
National Center for
Supercomputing
Applications



2013 Keynote:
John Shalf
Dept Head CS
Lawrence
Berkeley Nat'l Lab
CTO, NERSC



2014 Keynote:
Irene Qualters
Division Dir
Advanced
Cyberinfrastructure
Division, NSF



2015 Keynote:
Jim Kurose
Asst Director
Comp & Info Sci &
Engr Directorate,
NSF



2016 Keynote:
Dan Stanzione
Exec Director
Texas Advanced
Computing Center
U. Texas Austin

FREE!
Wed Sep 21 2016
@ OU

Reception/Poster Session
Tue Sep 20 2015 @ OU
Symposium
Wed Sep 21 2015 @ OU



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Thanks for your
attention!



Questions?

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