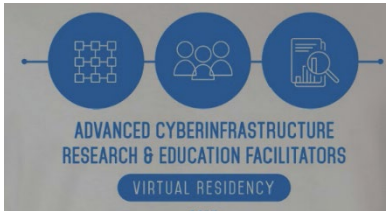

Virtual Residency Introductory/Intermediate/Advanced Workshop: Overview

Henry Neeman, University of Oklahoma
Director, OU Supercomputing Center for Education & Research (OSCER)
Associate Professor, Gallogly College of Engineering
Adjunct Associate Professor, School of Computer Science
XSEDE Campus Engagement Joint Co-Manager
Virtual Residency Introductory/Intermediate/Advanced Workshop 2021
Monday June 7 2021

Workshop Webpage & E-mail

- Workshop webpage:

http://www.oscer.ou.edu/virtualresidency2021/

All materials will be posted here, including slides (if any), links to Google Docs for each session, and links to streaming video recordings of the sessions (afterwards).

- Workshop e-mail address:

virtualresidency2021@gmail.com

If you have questions, sending them to this e-mail address means that they'll get auto-forwarded to Henry.

Zoom Videoconferencing

- Zoom is compatible with Windows, MacOS, Linux, iOS and Android.
- If you can't use the Zoom app, you can use your phone for audio-only (but video+audio is better).
- Slides will be posted on the workshop webpage, but we can't guarantee that they'll always be posted before they're used.
- We hope to be able to post streaming video of all sessions after each session, but we don't know how long the lag will be (probably hours, hopefully by the next day: auto-captioned).
- Please **MUTE YOURSELF** except when you're talking.

http://www.oscer.ou.edu/virtualresidency2021/ virtualresidency2021@gmail.com

Zoom: Video+Audio

- **General**
  - You **MUST** have a Zoom account. You can get a **FREE** Zoom Basic account at: http://zoom.us/
  - In your Zoom account, please use either (a) your full name or (b) your first name and institution, for reporting to the NSF.
  - Be sure to use Zoom version 5.x, **NOT** 4.x nor earlier.
    - There's supposed to be a new version TODAY (Mon June 7).
- **Windows**, **MacOS** or **Linux**:
  - In a web browser, go to the Zoom URL we sent you via e-mail.
  - That will get you a download of the Zoom app for your OS.
- **Android** or **iOS**:
  - Go to your app store and download the FREE Zoom app.
  - Run the Zoom app and go to the meeting ID number in the e-mail.
- Please **MUTE YOURSELF** except when you're talking.

Phone: Audio Only, USA

For audio only via phone, from inside the USA:

- On any USA phone, dial:
  - 646-558-8656 (USA toll)

  OR
  - 408-638-0968 (USA toll)
- Use the meeting ID and numeric password in the e-mail.
- Please e-mail hneeman@ou.edu with your name, institution and phone number, so that we can properly track and report how many people attended from each institution.
- **NOTE**: **NO TOLL FREE** telephone audio-only option for remote attendees inside or outside the USA.
- Please **MUTE YOURSELF** except when you're talking.

http://www.oscer.ou.edu/virtualresidency2021/ virtualresidency2021@gmail.com

Phone: Audio Only, Non-USA

For audio only via phone, from outside the USA:

- Open a web browser and go to:

https://zoom.us/zoomconference?m=GBPzosolPR18D5S7Ig55m6KM95W8UxEF

- Find your country and call that TOLL number (NO toll free).
- Use the meeting ID and numeric password in the e-mail.
- Please e-mail hneeman@ou.edu with your name, institution and phone number, so that we can properly track and report how many people attended from each institution.
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- Please **MUTE YOURSELF** except when you're talking.

http://www.oscer.ou.edu/virtualresidency2021/ virtualresidency2021@gmail.com

Zoom: Camera Off, Mic Muted

- If you're on Zoom, please keep your **CAMERA OFF** except when asking a question:
  - Some of our attendees have limited bandwidth for Zoom, so having extra movement on the screen may slow down or even crash their Zoom connection.
- If you're on Zoom or on the phone, please keep your **MICROPHONE MUTED** except when asking a question.
- Remember, there are lots of you (hundreds total, typically more than a hundred at a time).
- If you forget to mute your camera and/or microphone, we will mute you.
- If you keep turning those back on unnecessarily, we will kick you off.

Outline

- This is an experiment!
- CI Facilitators
- Virtual Residency Background
- National Science Foundation's Campus Cyberinfrastructure Programs
- Why Enterprise IT Approaches to Training Won't Work for CI Professionals
- Virtual Residency
- Virtual Residency Workshop 2021
- You're Next …

This Is an Experiment!

This is an Experiment!

- More than half of this week is exciting and new.
- Those of you who are new are the 7th cohort of what has become a national program.
- This means that you're helping us to pioneer a new way of developing the next generation Cyberinfrastructure (CI) workforce.

http://www.oscer.ou.edu/virtualresidency2021/ virtualresidency2021@gmail.com

Only You …

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

http://www.oscer.ou.edu/virtualresidency2021/ virtualresidency2021@gmail.com

This Is So New, We Don't Know How to Teach It

- For the Introductory workshop sessions (2015-17, 2019, 2021), we were able to find speakers for most of the topics we covered.
- For Intermediate and Advanced topics, very few of the topics are issues that any of us know enough about to be able to teach to others at the Intermediate or Advanced level.
- So, most of the Intermediate and Advanced sessions are panels – we'll learn from each other!

http://www.oscer.ou.edu/virtualresidency2021/ virtualresidency2021@gmail.com

CI Facilitators

What is a CI Facilitator?

- "Advanced Cyberinfrastructure Research & Education Facilitator" (ACI-REF – term coined by Miron Livny)
- Work with users – researchers and educators – to help them improve their research and/or education productivity and aspirations via advanced Cyberinfrastructure (CI).
- Typically, one or a few CI Facilitators have responsibility for an entire institution, or even multiple institutions.
- At some institutions, CI Facilitation is part time; at others, it's full time. Some CI Facilitators are or used to be:
  - faculty (current or former);
  - postdocs (current or former);
  - research staff (current or former);
  - IT professionals, including from Enterprise IT (current or former);
  - graduate or undergraduate students (current or former).

The Five Facings

- Research-facing (e.g., CI Facilitator)
- System-facing (e.g., cluster sysadmin)
- Data-facing (e.g., Research Data Librarian)
- Software-facing (e.g., Research Software Engineer)
- Stakeholder-facing (e.g., institutional CI leader)

What is a CI Facilitator NOT?

- A CI Facilitator is **NOT NECESSARILY** a computer scientist

(in fact, probably most CI Facilitators come from non-CS disciplines).

- A CI Facilitator is **NOT NECESSARILY** a sysadmin (in fact, probably most CI Facilitators have little or no system-facing role).

What Do CI Facilitators Do? #1

Cyberinfrastructure (CI) Facilitators are CI professionals who work directly with Science, Technology, Engineering and Mathematics (STEM) and non-STEM researchers and scholars (e.g., humanities), to advance the computing-intensive/data-intensive aspects of their research/scholarship/creative activity.

What Do CI Facilitators Do? #2

CI Facilitation amplifies researcher productivity via:

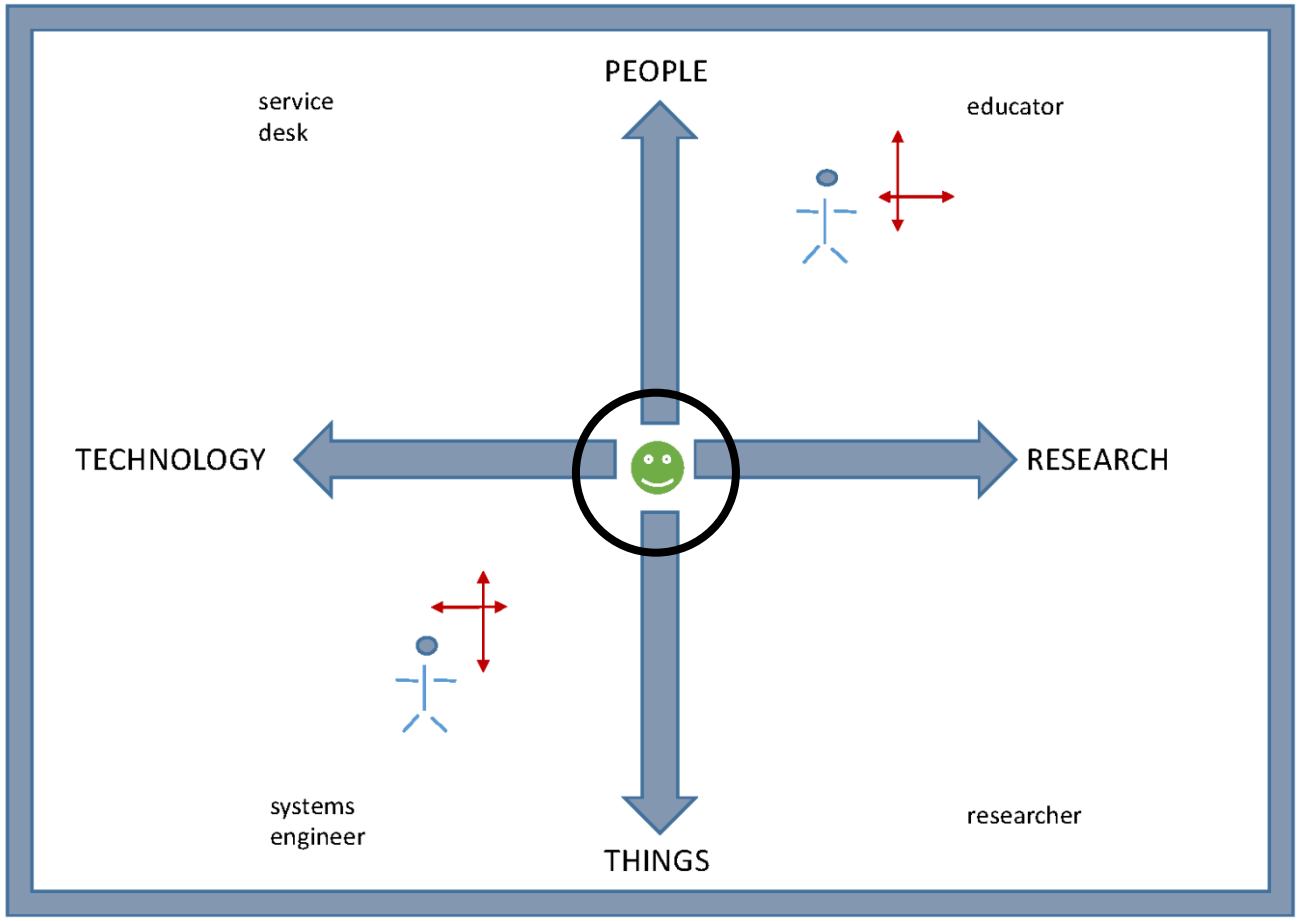
- adapting researcher workflows to CI systems (e.g., supercomputers, clouds, storage) and teaching how to use these systems;
- bridging between researchers and technology experts;
- anticipating new CI needs for emerging research activities (e.g., GPUs for machine learning);
- helping STEM researchers with limited coding experience to design use-case-specific software and to port to advanced architectures;
- teaching research cybersecurity and compliance (e.g., HIPAA for grants);

What Do CI Facilitators Do? #3

CI Facilitation amplifies researcher productivity via:

- developing strategies for specific use cases;
- teaching data management;
- providing local and national training opportunities (e.g., Software Carpentry workshops for novice CI skills);
- helping researchers evaluate technology solutions;
- recruiting new users and new use cases;
- researcher advocate to central administration;
- preparing CI-focused portions of publications, posters, etc;
- composing CI text for grant proposals.

CI Facilitators: What Qualities?



Neeman/Cuff 2016

Who Cares About CI Facilitators? #1

- Researchers: They find us incredibly helpful!
- National leadership:

The National Cyberinfrastructure Coordination Service Conference report recommends the following:

"Incentivize the development of new/ongoing efforts that bring together CI professionals to learn from one another and generate community efforts to identify and improve leading practices."

https://www.rti.org/publication/national-cyberinfrastructure-coordination-service-conference

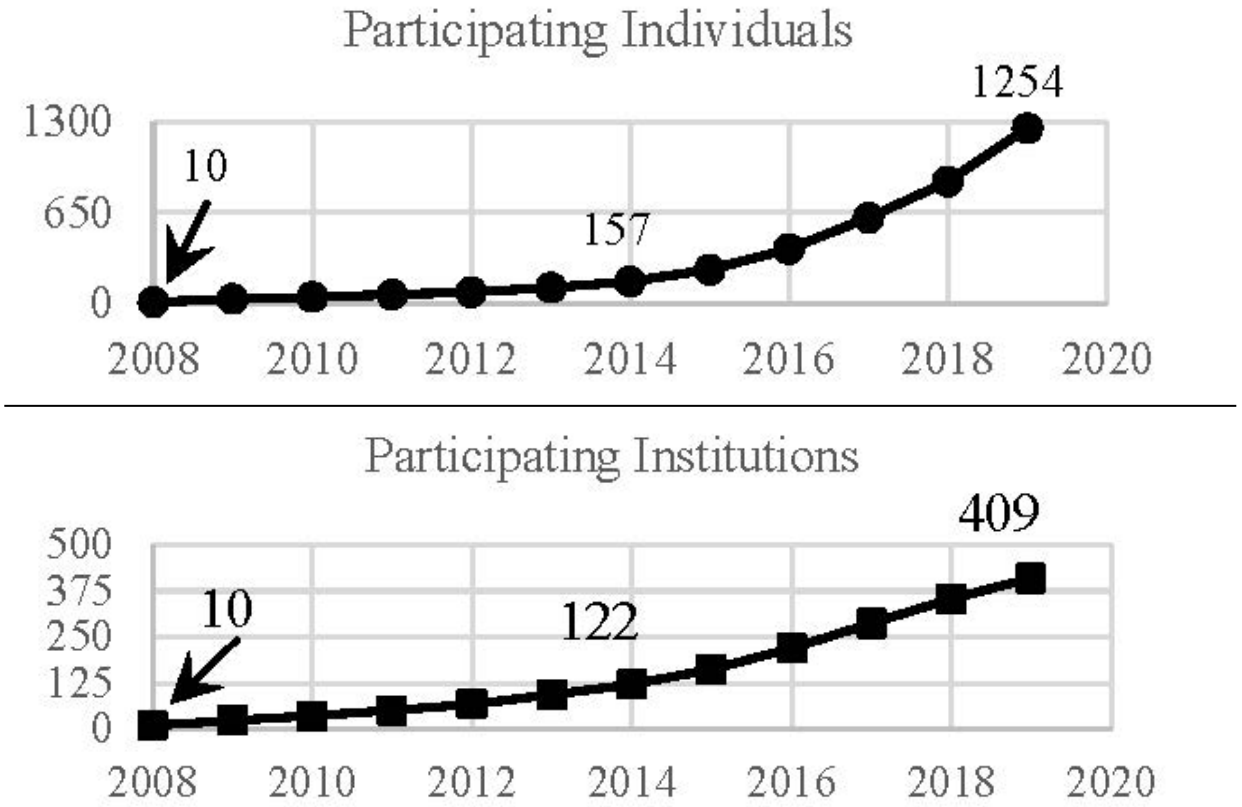
Who Cares About CI Facilitators? #2

Similarly, the National Science Foundation's CI 2030 report states:

- "NSF should develop mechanisms to support teaming of scientists and engineers with ... [CI] professionals to ensure that science and engineering [research] benefits from future advances in ... [CI] ...."
- "The skill and knowledge needed to use ... [CI] is very advanced and beyond the reach of most domain scientists. Professionals with [CI] expertise are in very short supply and there is an increasing need for 'bridge' technologists ... with enough domain expertise to understand research requirements and enough technical [CI] expertise to ... develop/apply the right [CI] solutions. Skills development, reliable funding sources, and rewarding career paths are desperately needed for such individuals."

https://www.nsf.gov/cise/oac/ci2030/

Growth in CI Facilitators

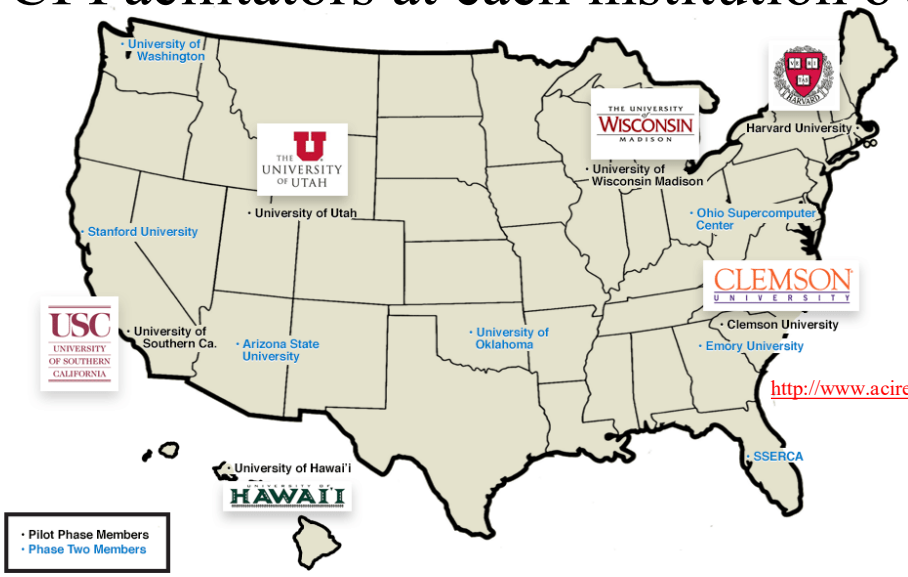


Participating Individuals (top) and Institutions (bottom) in Campus Champions, the Virtual Residency and the CaRCC Researcher-Facing group, 2008-19.

Virtual Residency Background

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 CI Facilitators at each institution over a 4 year period.



http://www.aciref.org/wp-content/uploads/2014/04/map.png

- The proposal also included funding for advanced networking.

OU's Piece

OU's piece included some extra components:

- A Virtual Residency to teach how to be a CI Facilitator – **THIS**!
- A component about EPSCoR jurisdictions, shared with HI, SC and UT (note that UT has now graduated from EPSCoR):
  - EPSCoR: Established (formerly Experimental) Program for the Stimulation of Competitive Research: a 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)

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 Madison

- **NOT** in "Phase 1:"
  - 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."
- Since then, the same program has had various names, but always starting with "Campus Cyberinfrastructure" (CC*).

So …

- In 2014, OU submitted a Campus CI Engineer proposal:
  - "A Model for Advanced Cyberinfrastructure Research and Education Facilitators"
  - $400K
  - Highlighted the relationship between OU and the ACI-REF project.
- We put Clemson's Phase 1 PI on our External Advisory Committee.
- OU was the only institution that was all of:
  - Former ACI-REF Phase 1 (so already involved)
  - EPSCoR (and was to have co-led the ACI-REF EPSCoR thrust)
  - CC* equipment awardee (so needed 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**. …"

[Emphasis added.]

Even More Success!

From a review from the Clemson-led Research Coordination Network grant that created the Campus Research Computing Consortium (CaRCC), regarding 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 (**98%**), from 37 of 38 institutions (**97%**), were "not just the [Phase 1] awardees."
  - 2016: 90 of 99 participants (**91%**), from 60 of 66 institutions (**91%**), were "not just the [Phase 1] awardees."
  - 2017: 186 of 196 participants (**95%**), from 128 of 134 institutions (**96%**), were "not just the [Phase 1] awardees."
  - 2018: 210 of 216 participants (**97%**), from 144 of 147 institutions (**98%**), were "not just the [Phase 1] awardees."
  - 2019: 249 of 254 participants (**98%**), from 161 of 164 institutions (**98%**), were "not just the [Phase 1] awardees."
  - 2020: 400 of 430 participants (**93%**), from 219 of 225 institutions (**97%**), were "not just the [Phase 1] awardees."

Why Enterprise IT Approaches to Training Won't Work for CI Professionals

Enterprise IT Training Won't Work

- **Enterprise IT**: Millions of professionals
  - 1970: 450K (0.6% of US civilian workforce)
  - 2014: 4.6M (2.9%) https://www.census.gov/content/dam/Census/library/publications/2016/acs/acs-35.pdf
    - Compound Annual Growth Rate: 5.3% (doubles every 13 years)
  - Degree programs (AS, BS, MS, PhD, certificates)
  - Certifications (e.g., CISSP, RHCE, MCSE, etc)
  - Enormous resources devoted to constantly updating skills
  - **NOTE**: This **DOESN'T** take into account the explosion of data science degree programs in the late 2010s.
- **Research Computing**: Thousands of professionals
  - No degree programs
  - No certifications
  - Minimal resources for updating skills
  - Therefore, informal education is our best bet – like this!

Virtual Residency

Virtual Residency: What?

- We teach pre-service and in-service CI Facilitators how to do (or do better) Research Computing Facilitation.
- But then we have a hidden secret agenda ….

Virtual Residency: How?

- Annual weeklong summer workshop (since 2015)
  - U California System has run its own targeted workshop based on our introductory workshop, in spring 2017 and spring 2018.
- Virtual Residency workshop planning calls
- Annual meeting at the SC supercomputing conference
- 2017-18, 18-19, 19-20, 20-21: Grant Proposal Writing Apprenticeship (2021 proposal still pending)
- 2018-19, 19-20, 20-21: Paper Writing Apprenticeship (PEARC'19 and PEARC'20 papers published, PEARC'21 paper to appear)

Before the Virtual Residency,
no one had ever been dumb enough to try to teach this stuff.

Virtual Residency: Why?

- CI Facilitators have strong experience within their discipline (often non-CS).
- Most CI Facilitators (and other CI pros) haven't been faculty.
- Sometimes little or no research experience (especially for IT staff who have an enterprise IT background).
- Even if strong research background, typically little or no experience with research outside their own discipline.
- When we started the Virtual Residency in 2015, there were no local, regional or national programs to teach people how to be a CI Facilitator.
- In the olden days, you could take your time learning how to do this – but not anymore ….

Virtual Residency: Who?

2015-present: We've already served 965 people from 382 institutions in all 50 US states and 3 US territories, plus 12 other countries on 5 continents, including:

- 58 (15%) Minority Serving Institutions;
- 104 (27%) non-PhD-granting institutions;
- 101 institutions (26%) in 27 of 28 (96%) EPSCoR jurisdictions;
- 254 institutions (66%) are Campus Champion institutions (75% of Campus Champion institutions).

This is for **ALL** Virtual Residency activities, including:

- workshops (including mini-workshops by/for U California);
- conference calls;
- the Grant Proposal Writing Apprenticeship;
- the Paper Writing Apprenticeship.

Virtual Residency: Who's Here?

We can't yet say who's attending this week's workshop, but we can say who's preregistered:

- 538 preregistrants (2020: 582; 2019: 334; 2018: 312; 2017: 257);
- 254 preregistered institutions, from 49 US states, 3 US territories and 12 other countries on 6 continents, including:
  - 29 Minority Serving Institutions (11% of this year's institutions),
  - 48 non-PhD-granting institutions (19%),
  - 62 institutions (24%) in 26 of 28 (89%) EPSCoR jurisdictions.

Why is Helping Researchers Hard?

- **Ubiquity**: Within any discipline, a greater proportion of researchers do computing-intensive and/or data-intensive research now than ever before.
- **Applicability**: More disciplines do computing-intensive and/or data-intensive research now than ever before.
- **System Complexity**: The storage hierarchy is getting deeper (flash, non-volatile RAM etc), and parallelism is getting more hybrid (GPUs etc).
- **Conceptual Distance**: The mental gap from handheld computing to command line/Linux/batch/remote/shared.

But we still only have one hour to teach them how to use CI before they lose interest!

More Institutions Have On-Premise CI

The fraction of national universities that have on-premise research computing resources (US News rankings):

- 130 of 131 R1s (Carnegie Classification Very High Research Activity);
- 84 of 135 R2s (High Research Activity);
- 49 of the top 50 institutions;
- 95 of the top 100;
- 132 of the top 150 (88%);
- 159 of the top 200 (80%).

Most Institutions Have Virtual Residents #1

The fraction of US News national universities that have participated in, or are registered to participate in, the Virtual Residency (percentages due to ties in the last position):

- all but one of the top 10 institutions;
- 22 of the top 25 (88%);
- 47 of the top 50 (90%);
- 66 of the top 75 (88%);
- 85 of the top 100 (83%);
- 117 of the top 150 (77%);
- 142 of the top 200 (69%);
- 160 of the top 250 (62%).

https://www.usnews.com/best-colleges/rankings/national-universities

Most Institutions Have Virtual Residents #2

The fraction of R1 and R2 universities that have participated in, or are registered to participate in, the Virtual Residency:

- R1: 124 of 131 (95%);
- R2: 80 of 135 (59%).

Virtual Residency Evaluation

- Last year, for the first time, we did an external evaluation of the Virtual Residency workshop.
  - Georgia Tech Institutional Review Board protocol # H16227, approved 6/30/2016, approved for use at OU by OU's IRB 5/13/2021.
- The evaluation was conducted by the same team that does the evaluation for the XSEDE program, led by Lizanne DeStefano and Lorna Rivera.
- We'll be presenting a paper with the results of the evaluation at PEARC'21.

Workshop 2020 Demographics

- Gender
  - VRP Women: 30%
    - US Population: 51% (VRP = 59% of US population)
    - All Computing/IT Cccupations: 26% (VRP = 115% of CS/IT)
    - SC15-17: 13-14% (VRP = 200+% of recent SC conferences)
- Race/Ethnicity
  - VRP Underrepresented Minorities: 21%
    - US Population: 34% (VRP = 62% of US population)
    - All Computing/IT Occupations: 10% (VRP = 200+% of CS/IT)

https://www.census.gov/quickfacts/fact/table/US/PST045219
https://www.bls.gov/cps/cpsaat11.htm
http://sc16.supercomputing.org/diversity/index.html
https://sc20.supercomputing.org/attend/inclusivity/demographics/

Does the Virtual Residency Work? #1

- The XSEDE evaluation team (Lorna Rivera, Lizanne DeStefano) have done an evaluation of the 2020 workshop.
- Sessions were rated 3.90 - 4.42 on a 1 - 5 scale.
- Effect on underrepresented populations
  - **Underrepresented Minorities**
    - **Experience**: Underrepresented minorities rated their experience as 5% **MORE SUCCESSFUL** than non-URMs rated it (4.76 vs 4.52).
    - **Sessions**: Underrepresented minorities rated 2 sessions 12% **HIGHER** than non-URMs rated them (4.71 vs 4.20, 4.71 vs 4.19).
    - **Google Docs**: Underrepresented minorities rated the Google Docs 13% **MORE USEFUL** than non-URMs rated them (4.58 vs 4.07)
    - No other statistically significant differences found.
  - **Women**
    - **Sessions**: Women rated 1 session 10% **LOWER** than men (3.85 vs 4.27).
    - No other statistically significant differences found.

Does the Virtual Residency Work? #2

- We assume that y'all are plenty busy with other things, so you'd only bother to show up if this were worthwhile.
- As of last week:
  - 299 of 382 Virtual Residency institutions (78%) had participated in multiple Virtual Residency activities;
  - 255 of 382 Virtual Residency institutions (67%) had participated in multiple types of Virtual Residency activities.

The CI Professional Ecosystem

- **Campus Champions**
- Campus Research Computing Consortium (CaRCC)
- Coalition for Academic Scientific Computation
- CyberAmbassadors
- Linux Clusters Institute
- SIGHPC Education Chapter
- The Carpentries
- Science Gateways Community Institute
- UK Research Software Engineer Association
- US Research Software Engineer Association
- US Research Software Sustainability Institute

JOIN THESE!

Ask us for contact info!

Virtual Residency Workshop 2021

2021 Intmd/Adv Workshop Agenda

Mon June 7 2021

- **Talk:** Virtual Residency Intro/Intmd/Adv Workshop 2021 Overview
- **Talk: Introductory:** Effective Communication
- **Talk: Introductory:** Faculty: Tenure, Promotion, Reward System
- **Talk: Introductory:** The CI Milieu: Systems, Service Providers, Technologies

Tue June 8 2010

- **Panel: Introductory:** Cyberinfrastructure User Support
- **Talk/Practicum: Introductory:** How to Do an Intake Interview / Intake Interview Practicum
- **Panel: Intermediate:** Assessing and Anticipating Researcher Needs
- **Panel: Advanced:** Broadening the Constituency via Outreach and Communication

2021 Intmd/Adv Workshop Agenda

Wed June 9 2021

- **Talk: Introductory:** Components of a Research Computing Resource
- **Panel: Intermediate:** Facilitating Cloud Computing
- **Panel: Intermediate:** Deciding Which Technologies to Adopt, and When
- **Lightning Talks: Intermediate:** Research Data Management

Thu June 10 2021

- **Panel: Intermediate:** Facilitating AI/Machine Learning/Deep Learning
- **Panel: Advanced:** Ethics & Privacy in Advanced Research Computing
- **Panel: Advanced:** Low Cost Solutions for Research Computing Hardware and Maximizing Value from Acquisitions
- **Talk: Advanced:** Research Computing and Data Professionals Job Elements and Career Guide

2021 Intmd/Adv Workshop Agenda

Fri June 11 2021

- **Panel: Advanced:**
  Teams of CI Professionals:
  Recruitment & Retention,
  Management, Team-building,
  and Motivation
- **Panel: Advanced:** Strategic
  Thinking & Visioning
- **Panel: Advanced:**
  The CI Funding Landscape
- **Roundtable:**
  Stories from the Trenches

Agenda

- You can get a copy of the agenda in your web browser:

http://www.oscer.ou.edu/virtualresidency2021.php#agenda

78 Presenters from 59 Institutions #1

1. Hussein Al-Azzawi, U New Mexico
2. Heather Amato, U California Berkeley
3. Gladys Andino, U Virginia
4. David Apostal, U North Dakota
5. Jim Basney, TrustedCI / U Illinois Urbana-Champaign
6. Tanya Berger-Wolf, The Ohio State U
7. Aaron Bergstrom, U North Dakota
8. Marisa Brazil, Arizona State U
9. Adam Caprez, U Nebraska Lincoln
10. David Chaffin, U Arkansas Fayetteville
11. Wallace Chase, U Otago
12. Tom Cheatham, U Utah
13. Chuming Chen, U Delaware
14. Sean Cleveland, U Hawaii Manoa
15. Dirk Colbry, Michigan State U
16. Ian Cosden, Princeton U
17. Melissa Cragin, U California San Diego/San Diego Supercomputer Center
18. Allissa Dillman, National Institutes of Health
19. Rob Fatland, U Washington
20. Hal Finkel, US Department of Energy Office of Science
21. Jacob Fosso Tande, U North Carolina Greensboro
22. Emelie Fuchs, U Nebraska Lincoln
23. Sandra Gesing, U Notre Dame
24. Josh Gyllinsky, U Rhode Island
25. Scott Hampton, U Notre Dame
26. Douglas Jennewein, Arizona State U
27. Alper Kinaci, Northwestern U
28. Shelley Knuth, U Colorado Boulder
29. Ann Kovalchick, U California Merced
30. Chris Lalande, U Wisconsin Madison
31. Prasad Maddumage, Florida State U
32. Tobin Magle, U Wisconsin Madison
33. Christina Maimone, Northwestern U
34. Sridhar Malkaram, West Virgina State U

78 Presenters from 59 Institutions #2

35. Bruce Mason, U Oklahoma
36. Kiran Mhatre, Harvard U
37. Tim Middelkoop, Internet2
38. Mariofanna (Fanny) Milanova, U Arkansas Little Rock
39. Claire Mizumoto, U California San Diego
40. Kyle Monahan, Tufts U
41. Mahmood Mohammadi Shad, Harvard U
42. John Mulligan, Rice U
43. Deveeshree (Devee) Nayak, U Washington Tacoma
44. Henry Neeman, U Oklahoma
45. Amy Neeser, U California Berkeley
46. Janna Nugent, Northwestern U
47. Dain Overstreet, Georgia Southern U
48. Dylan Perkins, U Wyoming
49. Anchalee Phataralaoha, U Florida
50. Mark Potkewitz, Ulster U
51. Line Pouchard, Brookhaven National Lab
52. Ananya Ravipati, Internet2
53. Mike Renfro, Tennessee Tech U
54. Kendall Roark, Purdue U
55. Christine Roberts, U Missouri Columbia
56. Annelie Rugg, U California Los Angeles
57. H. Birali Runesha, U Chicago
58. Gowtham S, Michigan Tech U
59. Jim Samuel, U Charleston
60. Anita Schwartz, U Delaware
61. Amit Sharma, Wright State U
62. Karsten Siller, U Virginia
63. Tomekia Simeon, Dillard U
64. Chris Simmons, U Texas Dallas
65. Dane Skow, North Dakota State U
66. Dhaval Solanki, U Rhode Island
67. Julia Stoyanovich, New York U
68. Shawn Strande, U California San Diego/San Diego Supercomputer Center
69. Dena Strong, U Illinois Urbana-Champaign

78 Presenters from 59 Institutions #3

69. Alan Sussman, National Science Foundation
70. Mohammed Tanash, U Nebraska Lincoln
71. Dave Turner, Kansas State U
72. Scott Valcourt, Northeastern U
73. Vas Vasiliadis, Globus
74. J. Barr von Oehsen, Rutgers U
75. Jason Wells, Bentley U
76. Scott Yockel, Harvard U
77. Ying Zhang, U Florida

How Did We Pick These Topics?

- We started with the topics covered in past Virtual Residency Introductory, Intermediate and Advanced workshops.
- We selected Introductory topics that we felt were crucial.
- We polled the Virtual Residents about how to prioritize the Intermediate and Advanced topics, plus we gave them a chance to list new topics.
- That gave us a sense of the top Intermediate and Advanced topics.
- We have 20 timeslots, with this talk in the first slot and "Stories from the Trenches" in the final slot.

How Did We Pick the Panelists?

- The biggest complaint from previous years was that we had the same few presenters over and over.
- We wheedled and begged and pleaded until we got enough presenters for each session (including moderators), with few repeaters.
- This included repeated pester e-mails to all Virtual Residents.

Why Are Most Sessions Panels?

- We've known since 2018 (when we first tried Intermediate and Advanced level content) that, for most topics at these levels, it's very challenging to find a single speaker who can fill 75 minutes.
- Instead, we try to get several speakers, so the options are panels or lightning talks.
- We wheedled and begged and pleaded until we got enough presenters for each session (including moderators).
- We then asked each session's presenters to choose between a panel or lightning talks.
  - Almost every session team chose to do a panel.

What Are We Here to Accomplish?

- Learn how to work with researchers who are using CI.
  - Learn how to find them.
  - Learn how to help them.
- Learn how to be institutional CI leaders.
- Start thinking about becoming national CI leaders.

What Aren't, and Are, We Trying to Do?

- We **AREN'T** trying to teach you a lot of ~~technical content~~.
  - You can learn that from other sources.
- We **ARE** trying to teach you the **PROFESSION** of CI facilitation and CI leadership.

What's Our Hidden Secret Agenda?

- The real goal is 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 the participants already knew how to do this.
  - But it took a very long time to learn on their own.
  - To keep up with demand, the community needs us to streamline the process so that new facilitators can become fully productive quickly.
- These are the CI leaders of tomorrow.

You're Next …

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

Why Be an Institutional CI Leader?

- Good, warmhearted, virtuous reasons:
  - You have good ideas based on experience and observation, which if implemented would tremendously help your institution's researchers!
  - You love helping researchers use computing to improve their research! (If you didn't, you never would have taken this job.)
  - You know that your administration needs help understanding research computing, and you're great at that!
- Wicked, selfish, mercenary reasons:
  - Better pay.
  - Higher job security.
    - These are because, at any institution, the fraction of employees who are willing to be the grownup in the room is always low.

Why Be a National CI Leader?

- Good, warmhearted, virtuous reasons:
  - The national community would benefit from your keen insights!
  - You'll have a chance to influence the course of research history!
- Wicked, selfish, mercenary reasons:
  - Getting noticed by other national leaders will advance your career.

The CI Professional Ecosystem

- **Campus Champions**
- Campus Research Computing Consortium (CaRCC)
- Coalition for Academic Scientific Computation
- CyberAmbassadors
- Linux Clusters Institute
- SIGHPC Education Chapter
- The Carpentries
- Science Gateways Community Institute
- UK Society of Research Software Engineering
- US Research Software Engineer Association
- US Research Software Sustainability Institute
- Virtual Residency

JOIN THESE!

Ask us for contact info!

Imposter Syndrome?

- Do you ever feel like an imposter, and worry that someone is going to find out that you really don't know what you're doing?
- If so, good, that makes you normal.
  - (Me too.)

Ways You Can Make Your Mark

1. Invent good things.

2. Make good things better.

Ways You Can Make Your Mark

1. Invent good things – Henry examples:
   a. Supercomputing in Plain English
   b. OneOklahoma Cyberinfrastructure Initiative (OneOCII)
   c. PetaStore/OURRstore business model
   d. Virtual Residency
      i. Grant Proposal Writing Apprenticeship
      ii. Paper Writing Apprenticeship
   e. CI Leadership Academy
2. Make good things better – Henry examples:
   a. National Computational Science Institute's Parallel Computing workshops
   b. SC Education Program
   c. Campus Champions (much more Dana & leadership than me)

A Growing Need, a Growing Breed

- The Coalition for Academic Scientific Computation (CASC) is a group of many 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 93.
- So the growth has been significant.
- But, there are a total of 266 R1 and R2 institutions.
- So the growth potential is substantial.

Get Ready to Be in Charge

- Baby Boomers: born 1946-1964 (ages 57-75)
- Generation X: 1965-1980 (ages 41-56)
- Millennials: 1981-96 (ages 25-40)
- Generation Z: 1997-2012 (ages 9-24)
- Generation Alpha: 2013-2021 (ages 0-8)

https://en.wikipedia.org/wiki/Generation_Z

"... [E]very day for the next 19 years, 10,000 baby boomers will reach age 65 ...." – 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 This 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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Purple bold = Paper Writing Apprenticeship

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Thanks for your attention!

Questions?

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