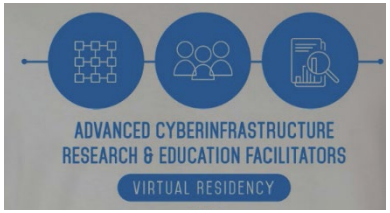


Virtual Residency Introductory/Intermediate Workshop: Overview

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

Virtual Residency Introductory Workshop 2024
Monday June 23 2025

Workshop Webpage & E-mail

- Workshop webpage:

http://www.oscer.ou.edu/virtualresidency2025/

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:

virtualresidency2025@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** and **TURN OFF YOUR CAMERA** except when you're talking.

http://www.oscer.ou.edu/virtualresidency2025/ virtualresidency2025@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.
  - Please **update Zoom** to the most recent stable version.
- **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** and **TURN OFF YOUR CAMERA** except when you're talking.

Phone: Audio Only, USA

For audio only via phone, from inside the USA:

- On any USA phone, dial one of the USA (toll) phone numbers in the logistics e-mail.
- Use the session ID number 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** and **TURN OFF YOUR CAMERA** except when you're talking.

http://www.oscer.ou.edu/virtualresidency2025/ virtualresidency2025@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.
- **NOTE**: **NO TOLL FREE** telephone audio-only option for remote attendees inside or outside the USA.
- Please **MUTE YOURSELF** and **TURN OFF YOUR CAMERA** except when you're talking.

http://www.oscer.ou.edu/virtualresidency2025/ virtualresidency2025@gmail.com

Zoom: Camera Off, Mic Muted

- If you're on Zoom, please keep your **CAMERA OFF EXCEPT** (optionally) when you're 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 you're talking.
- 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 2025
- CCIFTD: Certified CI Facilitator Training & Development
- You're Next …

http://www.oscer.ou.edu/virtualresidency2025/ virtualresidency2025@gmail.com

This Is an Experiment!

This is an Experiment!

- Some of this week's sessions, and some of the material in the longstanding sessions, are exciting and new.
- Those of you who are new are the 11th 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/virtualresidency2025/ virtualresidency2025@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/virtualresidency2025/ virtualresidency2025@gmail.com

CI Facilitators

What Is Cyberinfrastructure?

What is Cyberinfrastructure (CI)? That depends on who you ask:

- Network engineers: CI is the network.
- Supercomputing professionals: CI is supercomputers, plus the network.
- Cybersecurity professionals: Cyberinfrastructure is everything that needs cybersecurity.
- Everyone else: CI is **my** thing, plus supercomputers, plus the network.

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

- Researcher-facing (e.g., CI Facilitator)
- System-facing (e.g., cluster sysadmin, network engineer)
- Data-facing (e.g., Research Data Librarian)
- Software-facing (e.g., Research Software Engineer)
- Strategy/policy-facing (e.g., institutional CI leader)

What is a CI Facilitator NOT?

- A CI Facilitator is **NOT NECESSARILY** a computer scientist – in fact, many (most?) CI Facilitators come from non-CS disciplines.
- A CI Facilitator is **NOT NECESSARILY** a sysadmin – in fact, many CI Facilitators have little or no system-facing role.
- A CI Facilitator is **NOT NECESSARILY** a current or former researcher – though many are.
- A CI Facilitator is **NOT NECESSARILY** an IT professional – in fact, many CI Facilitators aren't IT professionals, though many are.
- A CI Facilitator is **NOT NECESSARILY** an enterprise IT professional, though some are.

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, scholars (e.g., humanities) and creatives (e.g., arts), 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:

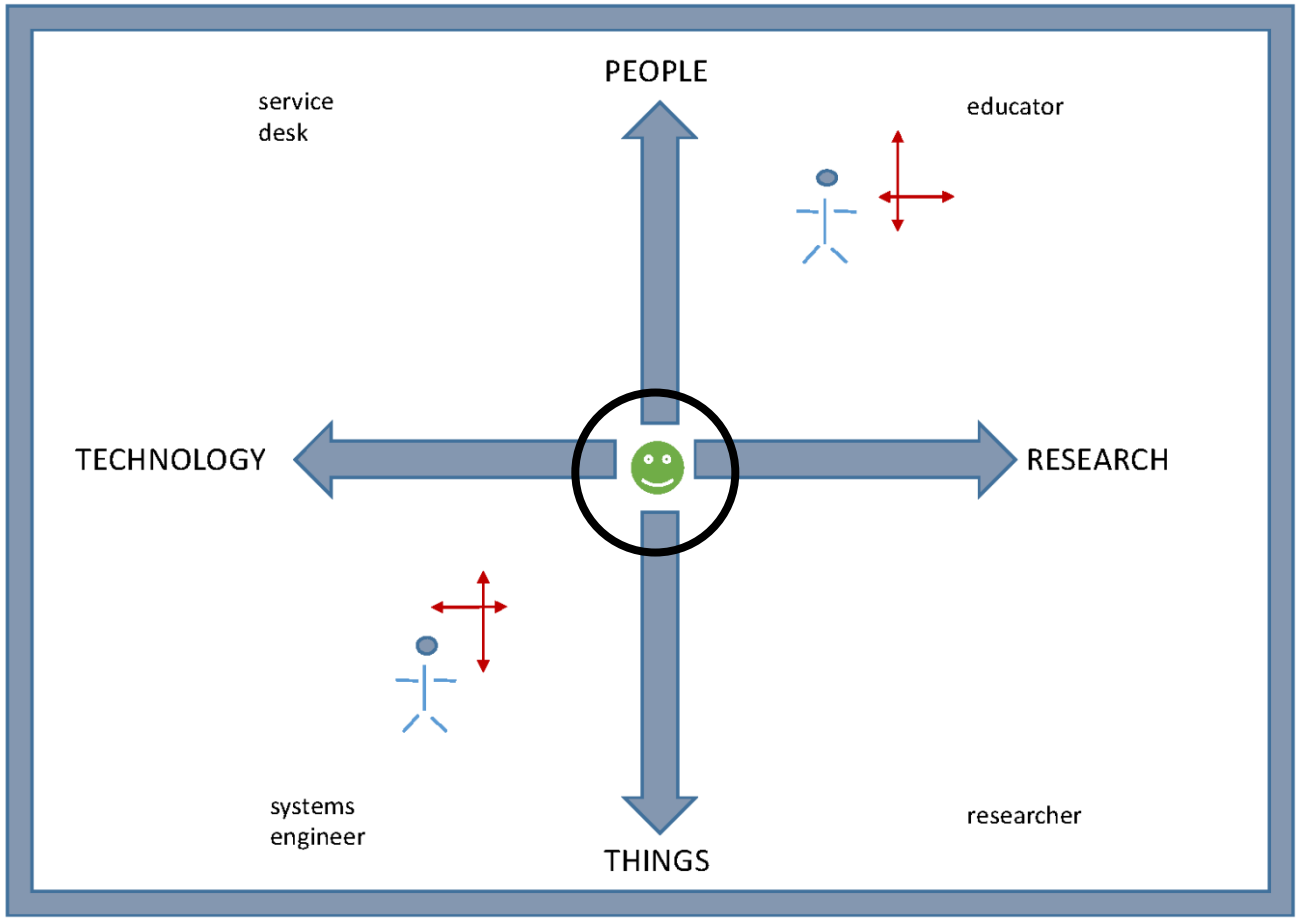
- adapting researcher workflows to CI systems (e.g., supercomputers, clouds, storage) and teaching how to use these systems;
- bridging between researchers and technology experts;
- anticipating new CI needs for emerging research activities (e.g., GPUs for machine learning);
- helping STEM researchers 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 (cont'd):

- 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

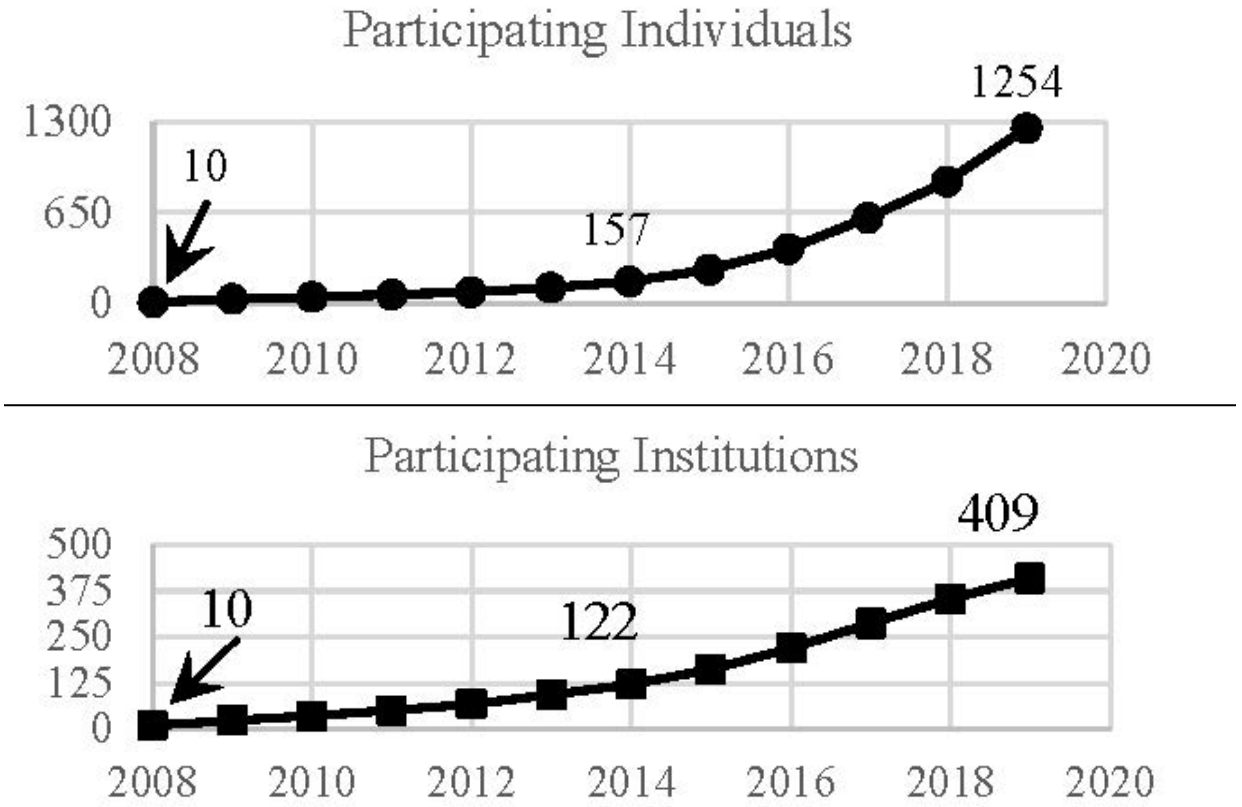
Who Cares About CI Facilitators? #2

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://web.archive.org/web/20240218125959/https://www.nsf.gov/cise/oac/ci2030/

Growth in CI Facilitators

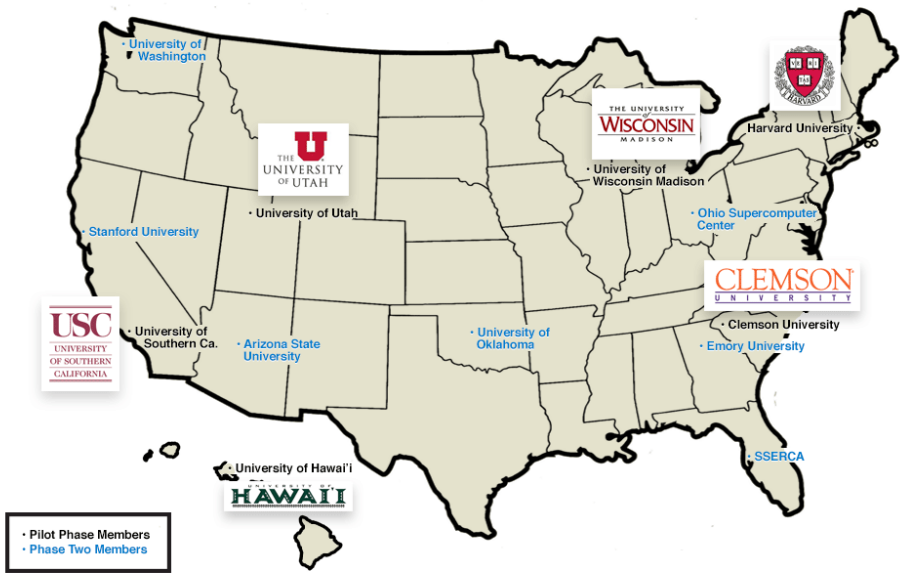


Participating Individuals (top) and Institutions (bottom) in Campus Champions, the Virtual Residency and the CaRCC Researcher-Facing group, 2008-19.

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.



https://web.archive.org/web/20161215164600/https://aciref.org/wp-content/uploads/2015/07/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."
  - 2021: 339 of 347 participants (**98%**), from 187 of 191 institutions (**98%**) were "not just the [Phase 1] awardees."
  - 2022: 336 of 347 participants (**97%**), from 177 of 182 institutions (**97%**) were "not just the [Phase 1] awardees."
  - 2023: 336 of 329 participants (**95%**), from 193 of 197 institutions (**98%**) were "not just the [Phase 1] awardees."
  - 2024: 294 of 315 participants (**93%**), from 162 of 167 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: 0.45M (0.6% of US civilian workforce)
  - 2014: 4.6M (2.9%) https://web.archive.org/web/20250529150234/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 (all but AK, WY).
- **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 (now on hiatus due to getting the grant)
- 2018-19, 19-20, 20-21, 21-22, 22-23: Paper Writing Apprenticeship (PEARC'19, PEARC'20, PEARC'21 papers published)
- 2021-22, 22-23, 23-24, 24-25: Grant Running Apprenticeship (CCIFTD grant)

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 (before this week): We've already served 1759 people from 523 institutions in all 50 US states & 4 US territories, plus 20 other countries on 6 continents, including:

- 144 (28%) non-PhD-granting institutions;
- 126 institutions (24%) in all 28 EPSCoR jurisdictions;
- 286 institutions (55%) are Campus Champion institutions (81% of Campus Champion institutions).

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

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

Virtual Residency: Who's Here?

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

- 464 preregistrants for both the June and August workshops:
  - 380 preregistrants for the June workshop (2024: 334; 2023: 445; 2022: 510; 2021: 538; 2020: 582; 2019: 334; 2018: 312; 2017: 257)
  - 361 preregisterd so far for the August workshop
  - 10 preregistered but didn't mark which workshop(s) they want
- 217 preregistered institutions, from 49 US states & territories and 6 other countries on 4 continents (for both workshops)
  - 198 preregistered institutions for the June workshop
  - Includes 34 new institutions that haven't previously participated!
- Based on past experience, we always expect fewer attendees than preregistrants.

Why is Helping Researchers Hard?

- **Applicability**: More disciplines do computing-intensive and/or data-intensive research now than ever before.
- **Ubiquity**: Within any discipline, a greater proportion of researchers do computing-intensive and/or data-intensive research now than ever before.
- **System Complexity**: The storage hierarchy is getting deeper (flash, High Bandwidth Memory, 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-Campus CI

The fraction of national universities that have on-campus research computing resources:

- 89% (167 of 186) R1s (Carnegie Classification Very High Research Activity);
- 36% (52 of 143) R2s (High Research Activity);
- on the US News rankings of top national universities:
  - 98% (all but 2) of the top 50 institutions;
  - 95% (all but 5) of the top 100;
  - 84% (all but 21) of the top 150;
  - 78% (all but 44) of the top 200.

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):

- 100% of the Top 25 institutions;
- 98% (all but 1) of the Top 50;
- 88% (all but 12) of the Top 100;
- 82% (all but 27) of the Top 150;
- 75% (all but 50) of the Top 200.

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: 89% (166 of 186);
- R2: 55% (79 of 143).

Virtual Residency Evaluation

- For the 2020 workshop, 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 5/13/2023.
- The evaluation was conducted by the same team that does the evaluation for the XSEDE program, led by Lizanne DeStefano and Lorna Rivera.
- We presented a paper with the results of the evaluation at PEARC'21.

(The XSEDE program was succeeded by the ACCESS program.)

The CI Professional Ecosystem

- Campus Champions
- Campus Research Computing Consortium (CaRCC)
- The Carpentries
- Coalition for Academic Scientific Computation
- CyberAmbassadors
- HPC SysPros
- Linux Clusters Institute
- RCD Nexus
- SIGHPC Education Chapter
- 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 2025

2025 Intro/Intmd Workshop Agenda

Mon June 23 2025

- **Talk:** Virtual Residency Intro/Intmd Workshop 2024 Overview
- **Talk: Intro:** Effective Communication
- **Talk: Intro:** CI User Support
- **Talk: Intro:** The CI Landscape

Tue June 24 2025

- **Panel: Intmd:** Facilitating AI in Academia: Challenges and Opportunities for RCD Professionals
- **Talk/Demonstration: Intro:** How to Do an Intake Interview / Intake Interview Demonstrations
- **Panel: Intmd:** How to Learn and How to Teach Research Computing Resources
- **Talk: Intmd:** Research Networking Overview

2025 Intro Workshop Agenda

Wed June 25 2025

- **Panel: Intmd:** Reducing Barriers to Entry for New Users
- **Talk/Practicum: Intro:** How to Do an Intake Interview / Intake Interviews with Real Researchers
- **Talk: Intro:** CyberAmbassadors: Let's Talk: Communicating That There's a Problem
- **Panel: Intmd:** Research Data Management

Thu June 26 2025

- **Panel: Intmd:** Explaining Complex Technical Topics to Researchers
- **Panel: Intmd:** Beyond the Intake Interview: Building Lasting Collaborations with Researchers
- **Panel: Intmd:** Facilitating Cloud Computing and Explaining Cloud Pros & Cons
- **Panel: Intmd:** Assessing and Anticipating Researcher Needs

2025 Intro Workshop Agenda

Fri June 27 2025

- **Panel: Intmd:**
  Emerging Technologies
- **Roundtable:**
  Stories from the Trenches

Agenda

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

http://www.oscer.ou.edu/virtualresidency2025.php#agenda

69 Presenters from 58 Institutions #1

1. Mark Allen, U Oregon
2. Sean Anderson, Wake Forest U
3. David Apostal, U North Dakota
4. Troy Baer, Ohio Supercomputer Center
5. Daniel Benedict, Texas Tech U
6. Pat Bills, Michigan State U
7. Prentice Bisbal, NSF National Center for Atmospheric Research
8. Caughlin Bohn, U Nebraska Lincoln
9. Phil Bording, Alabama A&M U
10. Paul Brunk, U Georgia
11. Denis Burilkov, GIS CAD AI IT Services
12. Cyd Burrows, U California San Diego
13. Shelton Caruthers, Canon Medical
14. Wallace Chase, U Otago (New Zealand)
15. Tom Cheatham, U Utah
16. Josie Cheng, U Central Oklahoma
17. Sean Cleveland, U Hawai`i
18. Dirk Colbry, Michigan State U
19. Eduardo Colmenares, Midwestern State U
20. Jaime E. Combariza, U Pennsylvania
21. Nick Danes, Colorado School of Mines
22. Jacob Fosso Tande, North Carolina State U
23. Zach Gerstner, Clemson U
24. Forough Ghahramani, NJ Edge
25. Toolika Ghose, U Nevada Las Vegas
26. Uttam Ghosh, Meharry Medical College
27. Clinton Heider, Rice U
28. Jose Hernandez, Florida State U
29. Jackie Huband, U Virginia
30. Manasvita Joshi, Harvard U
31. Peggy Kay, California State U Sacramento
32. Amira Kefi, U Illinois Chicago
33. Mohal Khandelwal, U Colorado Boulder
33. Anna Klimaszewski-Patterson, California State U Sacramento
34. Shubha Kope, Columbia U
35. Claire Kopenhafer, Michigan State U

69 Presenters from 58 Institutions #2

36. David Lockett, Meharry Medical College
37. Tom Marcais, Washington & Lee U
38. Suresh Marru, Georgia Institute of Technology
39. Kristin McLean, Northwestern U
40. Lauren Michael
41. Timothy Middelkoop, Internet2
42. Mariofanna Milanova U Arkansas Little Rock
43. Sasmita Mohapatra, U Texas Dallas
44. Abhishek Mukherjee, New Jersey Institute of Technology
45. Aaron Murrihy, Research and Education Advanced Network New Zealand (REANNZ)
46. Henry Neeman, U Oklahoma
47. Paul Orndorff, U Virginia
48. Brock Palen, U Michigan Ann Arbor
49. Courtney Quarterman, Meharry Medical College
50. Chris Reidy, University of Arizona
51. Mike Renfro, Tennessee Tech U
52. Aldo Romero, West Virginia U
53. Bobby Roybal, U Nevada Las Vegas
54. Zak Sakoglu, U Houston Clear Lake
55. Semir Sarajlic, Vanderbilt U
56. Liwen Shin, U Houston Clear Lake
57. Chris Simmons, Cambridge Computer
58. Jason Simms, Swarthmore College
59. Ana Marija Sokovic, U Illinois Chicago
60. Brad Spitzbart, Harvard U
61. Oleg Starovoytov, Louisiana State U Baton Rouge
62. Dena Strong, U Illinois Urbana-Champaign
63. Ken Taylor, U Illinois Urbana-Champaign
64. Alex Townsend, Florida State U
65. Keith Weber, Idaho State U
66. Jeff Woodford, Missouri Western U
67. Dave Young, Alabama Supercomputer Authority
68. Yue Yu, U California Merced
69. Ying Zhang, U Florida

How Did We Pick the Speakers/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, with few repeaters.
- This included pester emails to all Virtual Residents.

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 only have a few technical sessions.
- 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.

CCIFTD:

Certified CI Facilitator Training & Development

NSF CyberTraining Grant

"CyberTraining: Pilot: A Professional Development and Certification Program for Cyberinfrastructure Facilitators"
NSF OAC-2118193
$299,993
9/1/2021 - 8/31/2024
PI: H. Neeman (U Oklahoma)
Co-PIs: Dana Brunson (Internet2), Dirk Colbry (Michigan State U)
Senior Personnel: Hussein Al-Azzawi (U New Mexico), Izzat Alsmadi (Texas A&M U San Antonio), William Burke (George Washington U), Sangwhan Cha (Harrisburg U of Science & Technology), Patrick Clemins (U Vermont), Galen Collier (Rutgers U), Eduardo Colmenares-Diaz (Midwestern State U), Calvin Frye (Case Western Reserve U), Sandra Gesing (Discovery Partner Institute), Joshua Gyllinsky (U Rhode Island), Anna Klimaszewski-Patterson (California State U Sacramento), Clifford Kravit (UCLA), Scott Lathrop (Shodor), Eileen Lu (USC), Mariofanna Milanova (U Arkansas Little Rock), Arman Pazouki (Northwestern U), Shervin Sammak (U Pittsburgh), Anita Schwartz (U Delaware), Horst Severini (OU), Jifu Tan (Northern Illinois U), Stephen Wheat (Oral Roberts U), Mengjun Xie (U Tennessee Chattanooga)

Professional Development Certification

"Certification: A process, often voluntary, by which individuals who have demonstrated a level of expertise in the profession are identified to the public and other stakeholders by a third party."

https://www.gisci.org/Applicants/AbouttheProgram.aspx

What is CCIFTD?

- Certified Cyberinfrastructure Facilitator Training and Development (CCIFTD, pronounced “sifted”).
  - 1st (non-sponsored) link on Google!
  - **NOT THIS**: “Canadian Centre for International Fisheries Training and Development”
- First-of-its-kind, **non-matriculated** certification of professional development (**informal education**).
  - **NOT** a matriculated graduate/undergraduate certificate
  - **NOT** a certificate of participation – exams!
- **Badges**: training module, exam, scoring rubric
- **Certification** comes from specific collections of badges.

Why Not a Degree or Grad Certificate?

- We expect a few thousand CI Facilitators:
  not enough to justify creating a degree or certificate program
  at any of the 186 R1s or 143 R2s.
- Most people have never heard of CI Facilitation, so
  even if there were a degree program, uptake would be low.
  - **Unhappy example**: Texas State Technical College had
    an HPC sysadmin Associates degree for a few years,
    but no one knew what HPC was, so they switched it to Cloud,
    because people have heard of Cloud – and even that's gone now.

Objectives

- **From the perspective of CI Facilitators**:
  - Provide both training and proof of mastery in skills that are mission critical to CI Facilitation.
  - Cultivate and expand the CI Facilitators community.
- **From the perspective of CI centers**:
  Increase uptake of CI Facilitation services, and therefore of CI.
- **From the perspective of STEM researchers**:
  Increase computing/data-intensive STEM research productivity, by applying CI expertise that many STEM researchers lack.

Method

1. **Determine the skills** that are most valuable for CI Facilitation, by surveying (i) experienced CI Facilitators, (ii) CI organization directors and (iii) STEM researchers who use CI.
2. **Develop**, for each such skill, (a) a training mechanism, (b) an examination instrument and (c) a scoring rubric, via (i) pilot testing at Virtual Residency workshops and (ii) online resources.
3. **Construct certification pathways** – subsets of badges that, collectively, merit certification.
4. **Test badging methods**, leveraging Virtual Residency Program workshops and online materials.
5. **Evaluate** the success of the CCIFTD program, both formatively and summatively.

Challenges for Certification

1. What **skills** do CI Facilitators need?
2. How do CI Facilitators build **credibility** with their researchers and institutions?
3. How can we **train enough CI Facilitators** to be able to meet this burgeoning national need?
4. How confident can we be that our approach to preparing CI Facilitators is **effective**?
5. How do we **sustain** this approach beyond the near term?

NOT COVERED by this Pilot Project:

6. How do we expand to multiple levels of certification?
7. How do we expand to meet the much larger needs of industry?

CCIFTD Badges THIS WEEK!

- This week, CCIFTD will provide more badges!
- Specifically, for the Intake Interview Practicum session on Wed, we've arranged to have several badge judges.
  - You don't have to do anything to earn the badge except show up and do your best!
    - Not everyone will earn the badge, but many will – for FREE!

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 a grownup 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)
- The Carpentries
- Coalition for Academic Scientific Computation
- CyberAmbassadors
- HPC SysPros
- Linux Clusters Institute
- RCD Nexus
- SIGHPC Education Chapter
- 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 – Henry examples:

2. Make good things better – Henry examples:

Ways You Can Make Your Mark

1. Invent good things – Henry examples:
   a. Supercomputing in Plain English
   b. OneOklahoma Cyberinfrastructure Initiative (OneOCII)
      i. Oklahoma Optical Initiative
      ii. OneOklahoma Friction Free Network (OFFN)
   c. PetaStore/OURRstore business model
   d. Virtual Residency
      i. Grant Proposal Writing Apprenticeship
      ii. Paper Writing Apprenticeship
      iii. Grant Running Apprenticeship
   e. Becoming an Institutional CI Leader
   f. CI Leadership Academy
   g. CCIFTD
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 105.
- So the growth has been significant.
- But, there are a total of 332 R1 and R2 institutions.
- So the growth potential is substantial.

Get Ready to Be in Charge

- Baby Boomers: born 1946-1964 (ages 61-79)
- Generation X: born 1965-1980 (ages 45-60)
- Millennials: born 1981-1996 (ages 29-44)
- Generation Z: born 1997-2012 (ages 13-28)
- Generation Alpha: born 2013-2023 (ages 0-12)

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.

Bibliography

- **H. Neeman, L. Rivera, L. DeStefano, H. Al-Azzawi, D. Brunson, P. J. Clemins, D. Colbry, C. Frye, S. Gesing, J. V. Gyllinsky, A. Klimaszewski-Patterson, A. Phataralaoha, T. Price, M. Tanash and D. Voss, 2021: "An Evaluation of Cyberinfrastructure Facilitators Skills Training in the Virtual Residency Program." *Proc. PEARC'21*. DOI: 10.1145/3437359.3465560**
- **H. Neeman, D. Akin, H. Al-Azzawi, K. L. Brandt, J. Brooks Kieffer, D. Brunson, D. Colbry, S. Gesing, A. Klimaszewski-Patterson, C. Mizumoto, J. A. Pine-Thomas, A. Z. Schwartz, H. Severini, D. Voss and M. Tanash, 2020: "Cyberinfrastructure Facilitation Skills Training via the Virtual Residency Program." *Proc. PEARC'20*, 421-428. DOI: 10.1145/3311790.3396629**
- **H. Neeman, H. M. Al-Azzawi, D. Brunson, W. Burke, D. Colbry, J. T. Falgout, J. W. Ferguson, S. Gesing, J. Gyllinsky, C. S. Simmons, J. L. Simms, M. Tanash, D. Voss, J. Wells and S. Yockel, 2019: "Cultivating the Cyberinfrastructure Workforce via an Intermediate/Advanced Virtual Residency Workshop." *Proc. PEARC'19*, article 79. DOI: 10.1145/3332186.3332204**
- H. Neeman, H. M. Al-Azzawi, A. Bergstrom, Z. K. Braiterman, D. Brunson, D. Colbry, E. Colmenares, A. N. Fuller, S. Gesing, M. Kalyvaki, C. Mizumoto, J. Park, A. Z. Schwartz, J. L. Simms and R. Vania, 2018: "Progress Update on the Development and Implementation of the Advanced Cyberinfrastructure Research & Education Facilitators Virtual Residency Program." *Proc. PEARC'18*, paper 71. DOI: 10.1145/3219104.3219117
- H. Neeman, A. Bergstrom, D. Brunson, C. Ganote, Z. Gray, B. Guilfoos, R. Kalescky, E. Lemley, B. G. Moore, S. K. Ramadugu, A. Romanella, J. Rush, A. H. Sherman, B. Stengel and D. Voss, 2016: "The Advanced Cyberinfrastructure Research and Education Facilitators Virtual Residency: Toward a National Cyberinfrastructure Workforce." *Proc. XSEDE'16*, article 57. DOI: 10.1145/2949550.2949584

Purple bold = Paper Writing Apprenticeship

Acknowledgements

Portions of this material are based upon work supported by the National Science Foundation and the Department of Defense under the following grants:

- NSF Grant No. 1440783, "A Model for Advanced Cyberinfrastructure Research and Education Facilitators"
- NSF Grant No. 1546711, "EAGER: Fact-Gathering and Planning for a National-Scale Cyberpractitioner Program," Internet2, $41K
- NSF Grant No. 1620695, "RCN: Advancing Research and Education Through a National Network of Campus Research Computing, Infrastructures – The CaRC Consortium, " Clemson U, $748K
- NSF Grant No. 1548562, "XSEDE 2.0: Integrating, Enabling and Enhancing National Cyberinfrastructure with Expanding Community Involvement," U Illinois Urbana-Champaign, $110M
- NSF Grant No. 1649475, "Cyberinfrastructure Leadership Academy," U Oklahoma, $49K
- NSF Grant No. 2118193, "CyberTraining: Pilot: A Professional Development and Certification Program for Cyberinfrastructure Facilitators, U Oklahoma, $300K

Thanks for your attention!

Questions?

hneeman@ou.edu