
# Virtual Residency Intermediate/Advanced Workshop: Overview

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**Virtual Residency Intermediate/Advanced Workshop 2020**
**Monday June 1 2020**



# Workshop Webpage & E-mail

- Workshop webpage:

http://www.oscer.ou.edu/virtualresidency2020/

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:

virtualresidency2020@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/virtualresidency2020/ virtualresidency2020@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.
- **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.

http://www.oscer.ou.edu/virtualresidency2020/ virtualresidency2020@gmail.com

# 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/virtualresidency2020/ virtualresidency2020@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** except when you're talking.

http://www.oscer.ou.edu/virtualresidency2020/ virtualresidency2020@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!
- Research Computing Facilitators
- National Science Foundation's Campus Cyberinfrastructure Programs
- You're Next …

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# This is an Experiment!

- More than half of this week is exciting and new.
- Those of you who are new are only the 6th 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/virtualresidency2020/ virtualresidency2020@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/virtualresidency2020/ virtualresidency2020@gmail.com

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

- For the Introductory workshops (2015-17, 2019), we were able to find speakers for most of the topics we covered.
- For this combined Intermediate/Advanced workshop, 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!

# Research Computing Facilitators

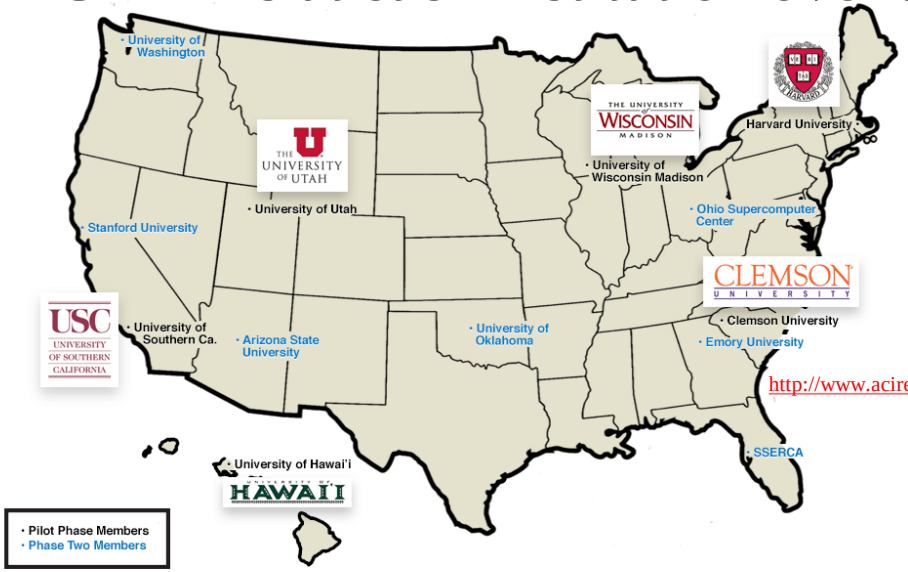



# What is a Research Computing Facilitator?

- "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 Research Computing Facilitators are:
  - faculty or former faculty;
  - postdocs or former postdocs;
  - research staff or former research staff;
  - IT professionals, including from Enterprise IT;
  - 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.




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 Research Computing 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."

# Enterprise IT vs Research Computing: Why Enterprise IT Approaches to Training Won't Work

# Enterprise IT vs Research Computing

**Enterprise IT: HARDENED**

- Secure
- Established technology
- Best practices
- **5 nines**: 99.999% uptime = 5¼ **minutes** of downtime per year

**Research Computing: SQUISHY**

- Fast and flexible (turn on a dime)
- Cutting edge technology (= broken)
- In some cases, no such thing as best practices
- **1½ nines**: 95% uptime = 18¼ **days** of downtime per year
  - This is the NSF's standard, from NSF solicitation 17-558 (Frontera):

"… [$60M NSF-funded] production resources should be unavailable as a result of scheduled and unscheduled maintenance no more than 5% of the time."

# Enterprise IT Example

- On Aug 8 2016, Delta Air Lines experienced a power outage in their Atlanta data center that lasted 5 hours.
  - Cost: $150M ($1M for every 2 minutes of downtime)

https://money.cnn.com/2016/09/07/technology/delta-computer-outage-cost/

# Enterprise vs Research: Incentives

- Suppose payday is tomorrow, and the payroll system goes down tonight.
  - On payday, what happens to the Enterprise IT people who are accountable for the outage?
  - Therefore, what must Enterprise IT people do to stay in business?
- Suppose Research Computing isn't on the cutting edge, and so proposals from the institution are less competitive.
  - Eventually, what will happen to the Research Computing team?
  - Therefore, what must Research Computing people do to stay in business?

# Enterprise vs Research: How to Resolve?

- **Research Computing can afford to make mistakes**:
  A system that's mostly up but crashes occasionally is fine.
  - 1 24-hour day of HPC downtime = 10-100 lost grad student days
    - 1 grad student = ~$59K/yr fully loaded with fringe+tuition+Indirect
      => 100 grad student days = ~$16K productivity loss
      => ~$300-$1600 productivity loss per research group
- **Cost of 5 Nines vs 1½ Nines**: 5-10x, but budgets are fixed –
  so the actual cost is cutting computing-intensive/data-intensive research productivity by 5-10x (i.e., lose 80-90% of productivity).
- **Therefore**: Let the machine go down from time to time,
  as a tradeoff for having more (but less resilient) resources,
  to maximize research productivity per year,
  at the cost of occasional lost days.

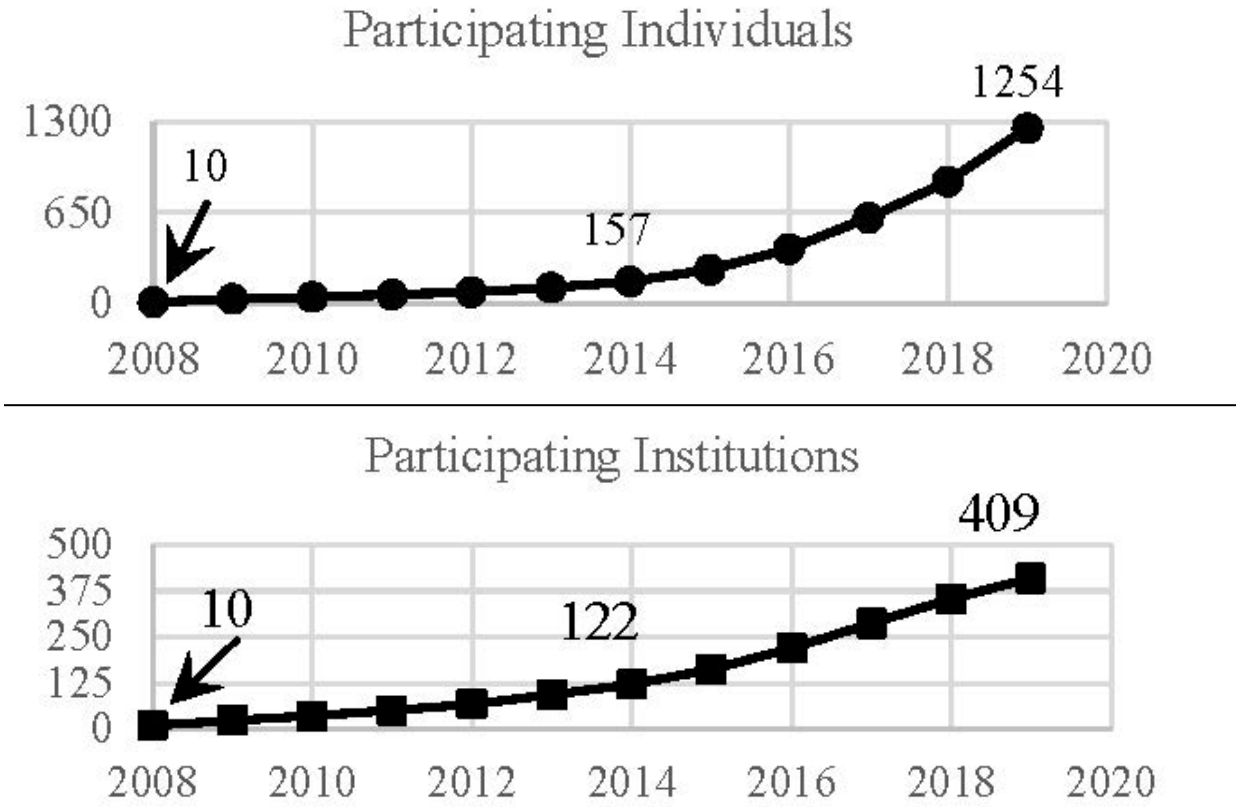
# Research is the Enterprise Testbed

- Research Computing has only limited best practices.
- But, technologies currently being adopted by Research Computing (e.g., Software Defined Networking) are likely to become enterprise requirements in a few to several years.
- So, let Enterprise IT watch Research Computing make mistakes, and use those observations to develop best practices for Enterprise IT.

# 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
  - 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
  - Therefore, informal education is our best bet!

# Growth in CI Facilitators




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

# Current CI Facilitators

Per a survey we did in late 2019/early 2020, there are currently ~1200 CI Facilitators in service at R1s and R2s, which is expected to roughly double in the coming 5 years.

# Virtual Residency




# Virtual Residency: What?

- We teach pre-service and in-service Research Computing 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, 2018 and 2019.
- Virtual Residency workshop planning calls
- Annual meeting at the SC supercomputing conference
- 2017-18, 18-19, 19-20: Grant Proposal Writing Apprenticeship
- 2018-19, 19-20: Paper Writing Apprenticeship
  (PEARC'19 paper published, PEARC'20 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 710 people from 327 institutions in all 50 US states and 3 US territories, plus 8 other countries on 5 continents, including:

- 54 (17%) Minority Serving Institutions;
- 87 (27%) non-PhD-granting institutions;
- 96 institutions (29%) in 27 of 28 (96%) EPSCoR jurisdictions;
- 233 institutions (71%) are Campus Champion institutions (72% 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:

- 582 preregistrants (2019: 334; 2018: 312; 2017: 257);
- 289 preregistered institutions, from **EVERY** US state, 3 US territories and 12 other countries on 6 continents, including:
  - 42 Minority Serving Institutions (15% of this year's institutions),
  - 67 non-PhD-granting institutions (23%),
  - 76 institutions (26%) in 27 of 28 (96%) EPSCoR jurisdictions,
  - 193 Campus Champion institutions (67% of workshop institutions, 59% of Campus Champion institutions).

# 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

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** the top 10 institutions;
- 23 of the top 25 (88%);
- 46 of the top 50 (87%);
- 66 of the top 75 (87%);
- 84 of the top 100 (82%);
- 117 of the top 150 (77%);
- 138 of the top 200 (69%);
- 157 of the top 250 (62%).

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

# Does the Virtual Residency Work?

- 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:
  - 251 of 327 Virtual Residency institutions (77%) had participated in multiple Virtual Residency activities;
  - 224 of 327 Virtual Residency institutions (69%) had participated in multiple types of Virtual Residency activities.
- If we take into account preregistrations:
  - 280 of 327 Virtual Residency institutions (86%) had participated in or signed up for multiple Virtual Residency activities;
  - 235 of 327 Virtual Residency institutions (72%) had participated in or signed up for multiple types of Virtual Residency activities.

# Virtual Residency Evaluation

- This year, for the first time, we'll be doing 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 5/13/2020.
- The evaluation will be conducted by the same team that does the evaluation for the XSEDE program, led by Lizanne DeStefano and Lorna Rivera.
- You'll be contacted about participating.
  - If you're in the EU, we can't have you participate, because of GPDR complexities.
- You **AREN'T** required to participate, and you **WON'T** face any negative consequences if you decline.

# 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!

# 2020 Intmd/Adv Workshop Agenda

Mon June 1 2020

- Virtual Residency Intermediate/Advanced Workshop 2020 Overview
- **Intmd**: Facilitating AI/Machine Learning/Deep Learning
- **Adv**: Things I Wish I'd Known Before I Became a CI Leader*
- **Intmd**: Research Data Management for Big Data

* CI Leadership Academy

Tue June 2 2010

- **Adv**: The CI Funding Landscape: Funding Agency Perspectives*
- **Intmd**: Assessing and Anticipating Researcher Needs
- **Adv**: Perspectives about CI from CIOs & VPRs
- **Intmd/Adv**: Deciding Which Technologies to Adopt, and When

* CI Leadership Academy

# 2020 Intmd/Adv Workshop Agenda

Wed June 3 2020

- **Adv**: Strategic Thinking & Visioning
- **Adv**: Working Effectively with Vendors*
- **Adv**: Teams of CI Professionals: Recruitment & Retention, Management, Team-building, and Motivation
- **Adv**: Building Community

* CI Leadership Academy

Thu June 4 2020

- **Intmd/Adv**: CyberAmbassadors: Leading the Change: Equity and Inclusion; Leading with Principles: Ethics
- **Intmd**: Explaining Complex Technical Topics to Researchers
- **Intmd**: Mapping Research Requirements to Software Tools
- **Intmd**: Research Computing Facilitation for Non-Traditional Disciplines

# 2020 Intmd/Adv Workshop Agenda

Fri June 5 2020

- **Adv**: Sustainability
- **Intmd**: Facilitating Cloud Computing
- **Adv**: Marketing, Communication, Demonstrating Impact/Value
- Stories from the Trenches

# Agenda

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

http://www.oscer.ou.edu/virtualresidency2020.php#agenda

- 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.

# 96 Speakers from 68 Institutions #1

1. Hussein Al-Azzawi, U New Mexico
2. Izzat Alsmadi, Texas A&M U San Antonio
3. Rachana Ananthakrishnan, U Chicago/Globus
4. Jonathan Anderson, U Colorado Boulder
5. Gladys Andino, U Virginia
6. Asher Antao, Clemson U
7. Dustin Atkins, Clemson U
8. Kevin Brandt, South Dakota State U
9. Paul Brenner, U Notre Dame
10. Sharon Broude Geva, U Michigan Ann Arbor
11. Dana Brunson, Internet2
12. Cyd Burrows, U California San Diego
13. Sarvani Chadalapaka, U California Merced
14. Wallace Chase, Research and Education Advanced Network New Zealand (REANNZ)
15. Shafaq Chaudhry, U Central Florida
16. Dave Chin, Drexel U
17. Damian Clarke, Alabama A&M U
18. Pat Clemins, U Vermont
19. Annette Colbert-Black, Visage Productions Inc
20. Dirk Colbry, Michigan State U
21. Galen Collier, Rutgers U
22. Melissa Cragin, U California San Diego
23. Cassian D'Cunha, Florida International U
24. James Deaton, Great Plains Network
25. Shawn Doughty, Tufts U
26. Randy Downer, Colby College
27. Rick Downs, U Virginia
28. Rudi Eigenmann, U Delaware
29. Frank Feagans, U Texas Dallas
30. Jim Ferguson, U Oklahoma
31. Jacob Fosso Tande, U North Carolina Greensboro
32. Richard Galbraith, U Vermont
33. Andrew Gallo, George Washington U
34. Sandra Gesing, U Notre Dame

# 96 Speakers from 68 Institutions #2

35. Josh Gyllinsky, U Rhode Island
36. Scott Hampton, U Notre Dame
37. Yvonne Harris, California State U Sacramento
38. Mark Hart, U Illinois Urbana-Champaign
39. Laura Herriott, U Illinois Urbana-Champaign
40. Joe Johnson, U Wisconsin Madison
41. Alper Kinaci, Northwestern U
42. Gretta Kellogg, Pennsylvania State U
43. Fahad Khan, U Central Florida
44. Christine Kirkpatrick, U California San Diego
45. Josh Kissee, Texas A&M U College Station
46. Anna Klimaszewski-Patterson, California State U Sacramento
47. Jim Kurose, U Massachusetts Amherst
48. Amy Latessa, U Cincinnati
49. Scott Lathrop, Shodor
50. Sam Levis, SLevis Consulting LLC
51. Evan Linde, Oklahoma State U
52. Prasad Maddumage, Florida State U
53. Tobin Magle, U Wisconsin Madison
54. Diego Menéndez, Pennsylvania State U
55. Tim Middelkoop, U Missouri Columbia
56. Fanny Milanova, U Arkansas Little Rock
57. Peter Mills, Washington State U
58. Claire Mizumoto, U California San Diego
59. Mahmood Mohammadi Shad, Harvard U
60. Kyle Monahan, Tufts U
61. William Stonewall Monroe, U Alabama Birmingham
62. Henry Neeman, U Oklahoma
63. Amy Neeser, U California Berkeley
64. Kinnothan Nelson, U Michigan Ann Arbor
65. Fitz Nembhard, Florida Institute of Technology
66. Mike Norman, U California San Diego
67. Ed Pearson, Alabama A&M U
68. Anchalee Phataralaoha, U Florida

# 96 Speakers from 68 Institutions #3

69. Sai Pinnepalli, Louisiana State U
70. Todd Price, Pennsylvania State U
71. Irene Qualters, Los Alamos National Laboratory
72. Chris Reidy, Arizona State U
73. Zak Sakoglu, U Houston Clear Lake
74. Barry Schneider, National Institute for Standards & Technology
75. Anita Schwartz, U Delaware
76. Horst Severini, U Oklahoma
77. Asya Shklyar, Pomona College
78. Ric Simmons, Louisiana State U
79. Jason Simms, Lafayette College
80. Justin Sipher, Justin Sipher Consulting LLC
81. Preston Smith, Purdue U
82. Dan Stanzione, U Texas Austin
83. Sarah Stevens, U Wisconsin Madison
84. Dena Strong, U Illinois Urbana-Champaign
85. Annamaria Szakonyi, Saint Louis U
86. Mohammed Tanash, Kansas State U
87. Kelli Trosvig, Internet2
88. Scott Turnbull, U Vermont
89. Scott Valcourt, U New Hampshire
90. Dan Voss, Beaumont Health System
91. Brian Voss, Brian D. Voss and Associates LLC
92. Jason Wells, Bentley U
93. James Wix, Research and Education Advanced Network New Zealand (REANNZ)
94. Scott Yockel, Harvard U
95. Jeff Zais, New Zealand eScience Infrastructure
96. Joel Zysman, U Miami

# How Did We Pick These Topics?

- We started with the topics covered in the Virtual Residency 2018 Intermediate/Advanced workshop.
- We polled the Virtual Residents about how to prioritize those topics, plus we gave them a chance to list new topics.
- That gave us a sense of the top nine old topics.
- We then took the new topics listed in the first poll, and polled the Virtual Residents about how to prioritize those new topics.
- That gave us a sense of the top nine new 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.
- We also invited participants in the CI Leadership Academy to be panelists for those sessions.
  - This was what we promised to our NSF program officer to get approval to spend the unspent funds from that workshop grant on this workshop.
  - Of course, those expenditures are now deferred until summer 2021, because COVID-19 forced us to go 100% remote.

# Why Are Most Sessions Panels?

- We've known since 2018 (when we first tried Intermediate and Advanced level content) that, for most topics at this level, 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.

# How Did We Pick the Order?

- We did a big Doodle poll of all the panelists' and moderators' availability.
- I then spent an entire day figuring out a schedule that would put almost everyone in a timeslot they were available for.
  - We had two exceptions, but both were able to shift other meetings so that they could be available during their session's timeslot.
  - This was really hard work, which is why I put it off for so long ….

# 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 Research Software Engineer Association
- US Research Software Engineer Association
- US Research Software Sustainability Institute

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 55-74)
- Generation X: 1965-1984 (ages 35-54)
- Millenials: roughly ages 15-35

"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 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, 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*****, to appear.**
- **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**

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# Thanks for your attention!

# Questions?

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