Cyberinfrastructure Workforce: An Emerging Profession

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XSEDE Campus Champions
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Trusted CI

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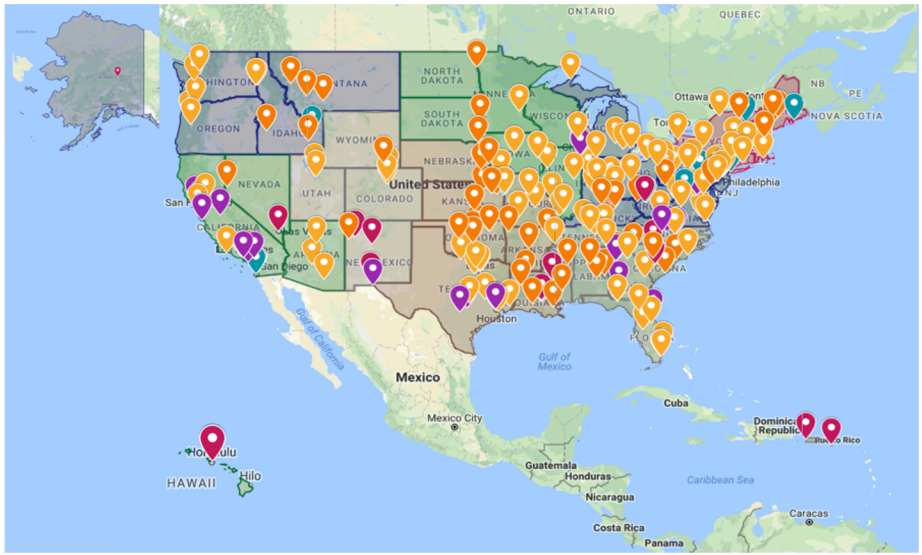
A national community of practice, facilitating computing- and data-intensive research and education



Every US state

Every EPSCoR jurisdiction

https://www.xsede.org/community-engagement/campus-champions

CAMPUS CHAMPIONS

NSF

XSEDE
Extreme Science and Engineering Discovery Environment

Our community of over 700 Campus Champions, at over 300 institutions, **promotes and facilitates the effective participation** of a diverse national community of academic and not-for-profit institutions in the **application of advanced digital resources** and services to accelerate discovery, enhance education, and foster scholarly achievement.

CAMPUS CHAMPIONS

There are over **700** Campus Champions

Including CI organization leaders, faculty, researchers, students, as well as research-enabling and systems professionals

At over **300** academic, non-academic, and not-for-profit research-focused institutions

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XSEDE
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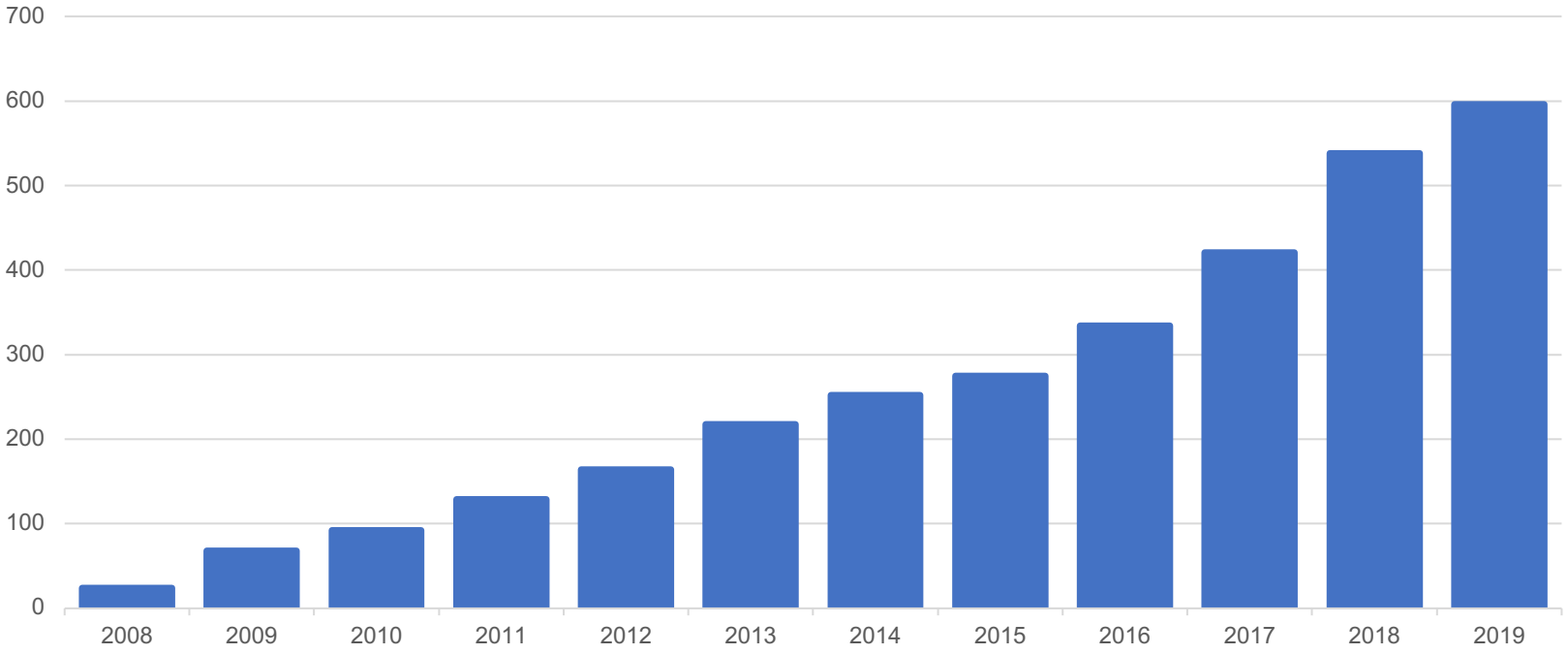
Growth of Champions – an emerging profession



2018 Champion Climate study key findings highlights

- Champions reported high Overall Experience in the program. Newer members expressed **exceptionally high satisfaction** and accounted for more than half of the respondents.
- The Champion community's impact extends beyond individual knowledge and skills improvement to institutionalization of the Champion role, **changes in institutional research computing policy**, and inclusion of Champions in **strategic talent recruitment** for their organizations.
- Some Champions are considering **sustainability following XSEDE**. They would also like to see the program continue to expand beyond advocating for NSF systems to other agencies.
- Respondents from non-research-intensive organizations and members of marginalized groups including women and underrepresented racial/ethnic groups in HPC, report **positive experiences in the organization**.

Meanwhile... In early 2017

pro·fes·sion·al·i·za·tion

/prəˌfeSHənələˈzāSH(ə)n,prəˌfeSHənəˌlīˈzāSH(ə)n/

noun

the action or process of giving an occupation, activity, or group professional qualities, typically by increasing training or raising required qualifications.
"the professionalization of youth sports has turned coaching into an increasingly lucrative profession"

Nicholas Berente, James Howison, Joel Cutcher-Gershenfeld, John L. King, Stephen R. Barley, John Towns, 2017. Professionalization in Cyberinfrastructure (February 15, 2017). Available at SSRN: https://ssrn.com/abstract=3138592 or http://dx.doi.org/10.2139/ssrn.3138592

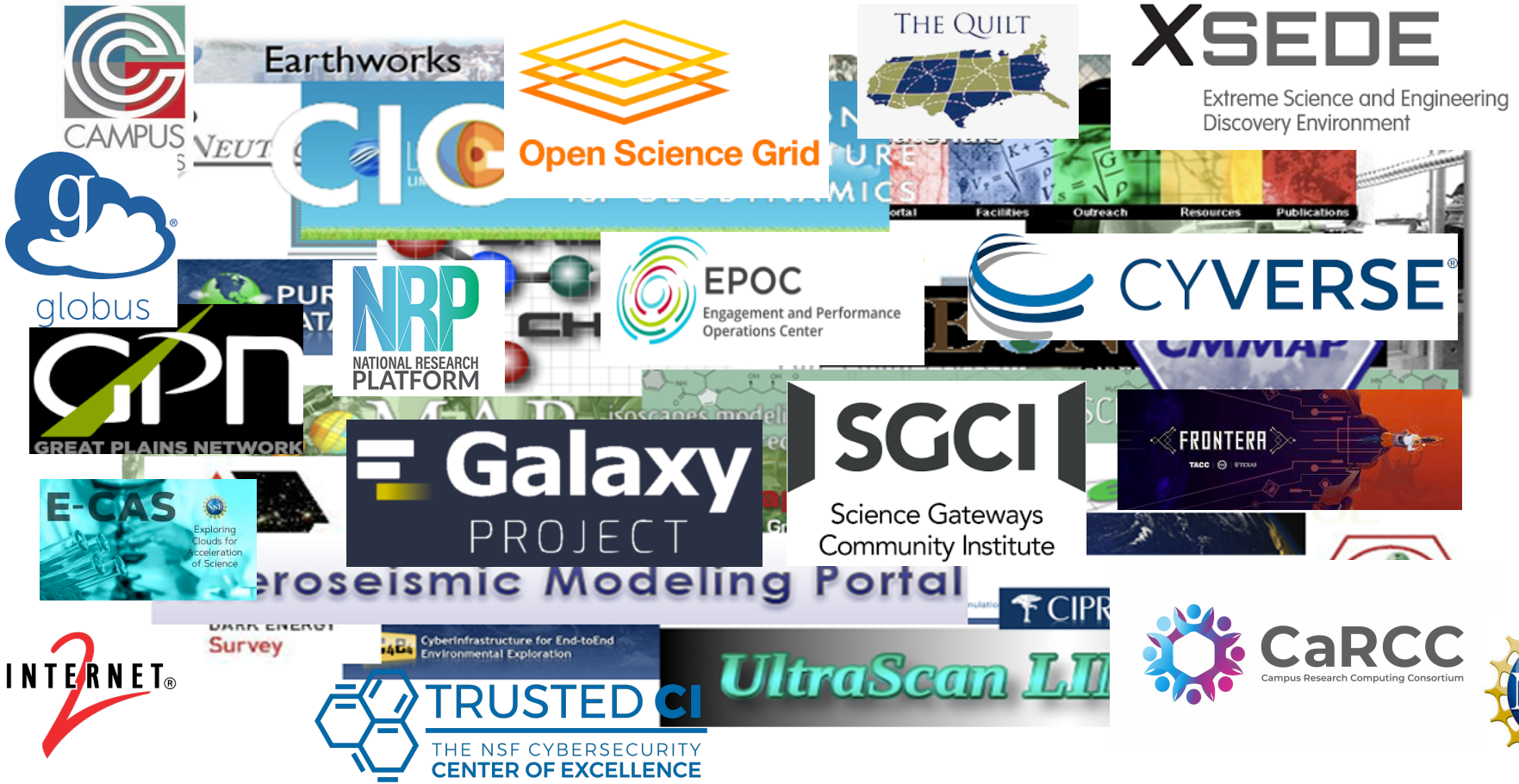
CI Professional Roles: The facings

- **Researcher-facing:** Outreach, education, training, consulting, facilitation, advanced user support, etc. (e.g., CI Facilitator)
- **Systems-facing:** Systems planning, engineering, security, optimization, middleware, virtualization, and cloud, among other topics. (e.g., sysadmin, network engineer)
- **Data-facing:** Data creation; data discovery and collection; data analysis and visualization; research data curation, storage, backup, preservation, and transfer; and research data policy compliance. (e.g., Research Data Librarian)
- **Software-facing:** Software package management, research software development, research software optimization or troubleshooting, workflow engineering, securing access to software, etc. (e.g., Research Software Engineer)
- **Stragey- and Policy-facing:** Institutional alignment, culture for research support, funding, and partnerships and engagement with external communities. (e.g., HPC Center Director)

What is a CI Facilitator? (Researcher-facing role)

- “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 using advanced cyberinfrastructure.
- Typically, one or a few Facilitators have responsibility for an entire institution, or multiple institutions.
- Some Cyberinfrastructure (CI) Facilitators are:
  - faculty or former faculty;
  - postdocs or former postdocs;
  - research staff or former research staff;
  - IT professionals;
  - graduate or undergraduate students.

CI is Complicated, Diverse, & Rapidly Changing



Virtual Residency

- A program to teach people how to be research computing facilitators, and ultimately to be institutional CI leaders.
- Workshops: Introductory 2015, 2016, 2017; Intermediate/Advanced 2018, 2020; Introductory/Intermediate 2019
- Regular conference calls
- Grant Proposal Writing Apprenticeship (2017-18, 2018-19, 2019-20)
- Paper Writing Apprenticeship (2018-19, 2019-20: PEARC'19, PEARC'20 papers)
- Lead by Henry Neeman at OU, funded through a variety of NSF grants (CC*, XSEDE/Champions, CaRCC)
- Attendees: 924 from 370 institutions, including 74% of CC institutions

Campus **R**esearch **C**omputing **C**onsortium

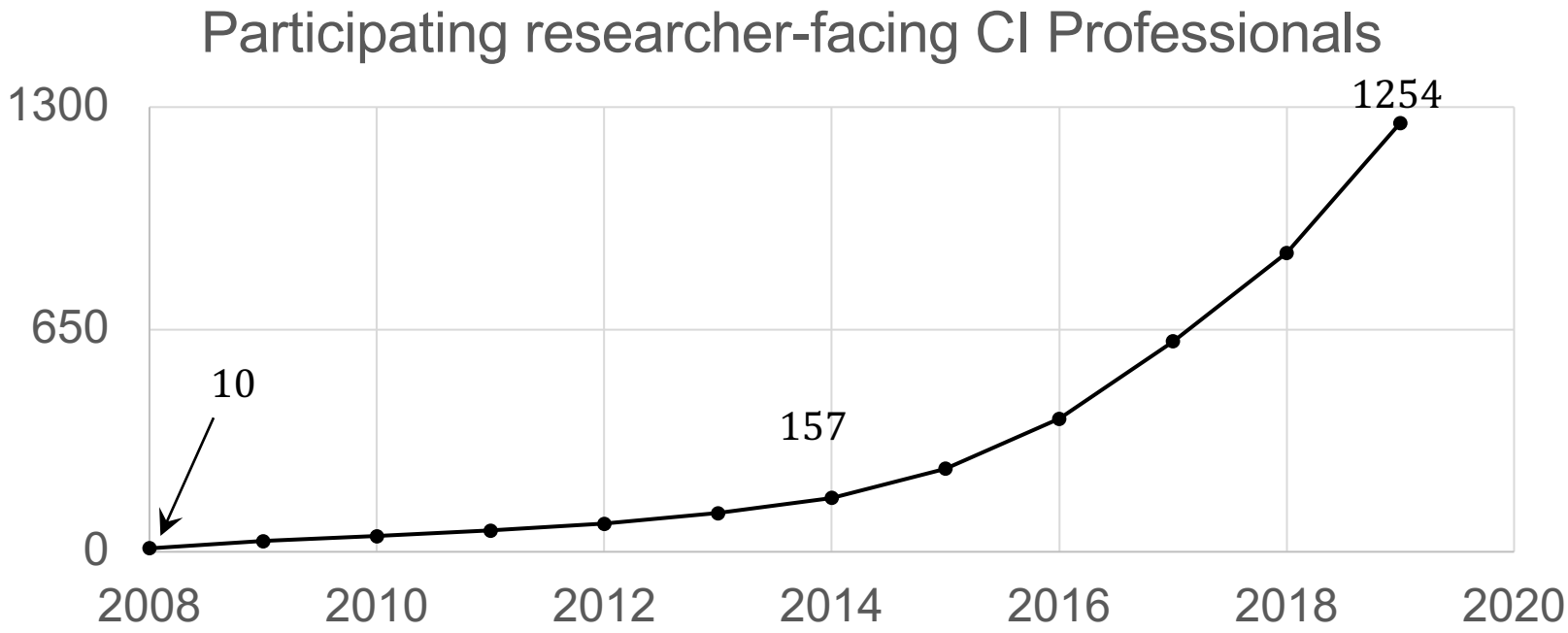
An organization of dedicated professionals developing, advocating for, and advancing campus Research IT and associated professions (think research computing & data).

Current focus areas include:

- People Network - year-round virtual conference, & calls on YouTube CaRCC Channel
  - **Researcher-Facing:** Consulting/facilitation, outreach, education/training, increasing communications & collaborations, RC tech, etc
  - **Systems-Facing:** Systems planning, engineering, security, optimization, middleware, virtualization, and cloud, among other topics.
  - **Data-Facing**: Data management, publishing/sharing, data science, data viz, workflows, transfer and networks, & other topics.
  - **Emerging Centers:** Support for smaller or developing research computing and data centers
- Professionalization and workforce development
  - RC & Data professionals Job Elements & Career Framework product
- Connecting the broader Research IT Ecosystem
  - 2018 Ecosystem workshop, follow-on participants catalog, and submitted PEARC paper
- Developing a common Capabilities Model for Research Computing and Data
  - Capabilities Model Introduction, Guide, and Assessment Tool with Internet2 & EDUCAUSE

https://carcc.org/about/

Campus Champions and/or Virtual Residency and/or CaRCC Researcher-Facing Track, 2008-19.



Why Professionalize Research Computing and Data?

To address several national, organizational, and occupational challenges:

- National shortage of Research Computing & Data personnel
- High employee turnover
- Occupational distinction from
  1. Administrative/Enterprise IT
  2. Researchers in other disciplines
- Precarious employment and careers

*See Berente, Nicholas, et al., Professionalization in Cyberinfrastructure (February 15, 2017).

CaRCC Professionalization workshop (March 2018)

Themes:

Co-Creation (partnering with researchers): Research computing and data professionals are co-creating methods and software models;

Career Paths are incomplete in most organizations;

Digital: The exponential growth of digital technologies underlies work;

Status: Work held in high regard by faculty; but differences between these professionals and principle investigators.

Terminology: "cyberinfrastructure for research" distinct from but connected to the work of "information technology" professionals.

Products: Job Families Guide and HR matrix available at https://carcc.org/products

Co-chairs: Patrick Schmitz, Scott Yockel. https://carcc.org/rcd-professionalization/

Research Computing and Data Professionals

Job Elements and Career Guide

Researcher Facing Roles

- Job Elements
- Education, Experience, and Skills
- Professional Development and Career Opportunities

System Facing Roles

- Job Elements
- Education, Experience, and Skills
- Professional Development and Career Opportunities

Software/Data Facing Roles

- Job Elements
- Education, Experience, and Skills
- Professional Development and Career Opportunities

Sponsor/Stakeholder Facing Roles

- Job Elements
- Education, Experience, and Skills
- Professional Development and Career Opportunities

Contributors

CaRCC CI Professionalization January 2018 Workshop Participants and Members of the CaRCC CI Professionalization Working Group

Researcher Facing Job Elements

Engage researchers as a partner to co-create and co-learn research activities and relevant advanced computing capabilities to provide possible solutions to facilitate and/or transform research, involving any of the following:

- Providing user services including help, account management, and information on available services, advanced support and training
- Creating and maintaining user documentation on relevant topics
- Making resource and compliance recommendations
- Managing the software and application stack (at some level)
- Assessing workflows
- Advocating for the value and impact of research computing to sponsor/stakeholder, administration, departments and colleges
- Participating in pilots, proofs-of-concept from a researcher on behalf of the research community (testing new capabilities, ease of use)
- Tracking usage and performance to guide researcher engagement
- Leading or consulting on data management, data processing, and analytics
- Supporting grant proposal preparation (writing, guidance, boilerplate verbiage, cost of services, summarize available facilities, letters of support)
- Participating in funded research activities either collaboratively or independently as a PI, co-PI, senior personnel, or technical professional

Job Function: Information Technology / Research Technology

Job Family: Cyberinfrastructure / Research Computing / Research IT ***

Job Series Role: CI Facilitation Professional / Research Education and Facilitation (REF)

Business Title(s): (e.g. CI Support Specialist)	**Business Title(s): (e.g. CI Facilitator, CI Consultant)**	**Business Title(s): (e.g. Sr. CI F**
Job Title: Facilitation Professional I	**Job Title: Facilitation Professional II**	**Job Title: Facilitation Professi**
Job Code:	**Job Code:**	**Job Code:**
Grade Level: 1 Exemption: Exempt	**Grade Level: 2 Exemption: Exempt**	**Grade Level: 3 Exemption: Ex**
Effective/Revision Date: April 2019	**Effective/Revision Date: April 2019**	**Effective/Revision Date: April**
Job Summary	**Job Summary**	**Job Summary**
Assist researchers in the onboarding of state-of-the-art CI systems, tools, and software to enable research productivity.	Engage researchers in the use of a broad set of state-of-the-art CI systems, tools, and software to enable research productivity. Partner with researchers to co-create and co-learn relevant computing and data capabilities	Advise researchers in the best u systems, tools, and software to researchers to co-create and co advanced computing and data c
Core Duties	**Core Duties**	**Core Duties**
Researcher Engagement: - Regularly assist a broad set of researchers through support requests (i.e. email, ticketing systems, chats). - Help with routine issues in using CI systems. **Solutions Development:** - Provide the onboarding of state-of-the-art CI systems, tools, and software to enable research productivity. - Occasionally provide solutions to researchers that facilitate and/or enables research.	**Researcher Engagement:** - Regularly engage a broad set of researchers through support requests (i.e. email, ticketing systems, chats) and in person consultations during office hours. **Solutions Development:** - Help facilitate the design and debugging of research workflows along side researchers. **Partnership/Collaboration:** - Connect and coordinate interactions between researchers and technology	**Researcher Engagement:** - Regularly advise a broad set o email, ticketing systems, chats) hours. - Build deep understanding with engagements. **Solutions Development:** - Facilitate the design, debuggin research workflows along side r

Next steps for the Job Family Matrix

- Accelerate the adoption
- Deploy an annual census across positions
- Develop a model of Career Arcs
- Curate and develop resources for training and workforce development of RCD professionals and students
- Provide ongoing leading practices in RCD support

Observations

The good:

- CI personnel recognized as essential to the research endeavor.
- Many communities of practice.

Needs improvement:

- Thinking about capacity vs capability.
- Sustainability.
- The pipeline.
- Limited perspectives.
- Diversity, equity, and inclusion - we need ALL the potential workforce.
- And more...

What does success look like?

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- Grant No. OAC-1920430, “CICI: CCoE: Trusted CI: Advancing Trustworthy Science”
- Grant No. ACI-1649475, “Cyberinfrastructure Leadership Academy”

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Thank You!

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