Innovative Ideas for Inclusive and Sustainable Cyberinfrastructure
Learning and Workforce Development

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Outlines

OAC LWD Introduction with Program Listing
Which OAC LWD programs serve “Inclusive and Sustainable”?
Where do we see a need to improve it?
How can OAC LWD support community efforts?
Updated
- CyberTraining (Ashok)
- SCIPE (Tom)
- ACCESS (Sharon)
- CSSI (Varun)

New
- CISE-MSI (Sharmistha)
- DESC (Jen)
- Closing (Andrey)
Motivation

• **Advanced CI** has a transformative impact on a variety of scientific research domains
• The research workforce will benefit from innovative disciple-appropriate training and curriculum materials
• There is a need to foster broad adoption of CI resources, tools, and methods by diverse research communities
CyberTraining Solicitation Goals

• **Long-term vision:** Computational and Data-driven Science for All scientists and engineers
  • Prepare, nurture, and grow the scientific research workforce, including students, instructors, and research CI professionals

• Ensure broad adoption of CI tools, methods, and resources

• Integrate CI and CDS&E skills into undergraduate and graduate curricula
  • Address emerging needs and unaddressed bottlenecks through innovative and scalable training
  • Catalyze research with training and educational activities

• **Broaden CI access** and adoption by varied institutions, scientific communities, and underrepresented groups.
## NSF-Wide Participation

<table>
<thead>
<tr>
<th>Directorate</th>
<th>Divisions</th>
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<tbody>
<tr>
<td>CISE</td>
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**OAC contacts:** Ashok Srinivasan and Juan (Jenny) Li
**Project Classes**

- **Pilot:** Exploratory projects, $300K over 2 years

- **Small implementation:** $500K over 4 years

- **Medium implementation:** $1M over 4 years

1. Identify challenges in research workforce development
2. (a) Broaden use of CI resources (b) CI skills training – expected to coordinate with ACCESS (access-ci.org)
3. Scalability and sustainability of the training program
4. Recruitment and evaluation plans
5. Collective impact strategy
6. Fostering a suitable community

At least one option in #2
Programmatic Areas of Interest

• **Common theme:** research and education-related projects in the science/engineering domain

• More effective use of CI to catalyze research advances and address fundamental knowledge gaps

• *See the solicitation for descriptions of each directorate/division’s priorities and interests*

SCIPE

Motivations

• Strengthening ≡ democratizing, connecting, recognizing
• CI ≡ Systems, Software, Data, Services, Networking
• Developers, Users, Admins, Mentors, Computational Scientists
• Ecosystem of interdependencies & interfaces
• Leveraging existing program investments
• Expanding institutional recognition of careers
SCIPE Solicitation Goals

• **Long-term vision**: Research CI ecosystem with a scalable, agile, diverse, and sustainable network of CI Professionals that can ensure broad adoption of advanced CI resources and expert services, including platforms, tools, methods, software, data, and networks for research communities, to catalyze major research advances, and to enhance researchers' abilities to lead the development of new CI.

• **Creation** of science-driven, researcher-facing CIP communities regionally or by disciplines which will collaborate with ACCESS Computational Science Support Network.

• **Democratization** of involvement in the research CI profession.

• **Institutional recognition** of career pathways that embed CI professionals more deeply into the research enterprise.

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<td>TIP</td>
<td>RIE, PFI</td>
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**OAC contacts:** Tom Gulbransen
SCIPE Program Context

**FUNDING**
- Approximately $15M for up to 4 awards
- Support for research CI professionals' services
- Up to 4 FTEs per year for up to 5 years
- NSF directorates co-funding based on relevance: CISE, ENG, GEO, MPS, EHR, SBE, TIP
- Longer term plans requested for sustaining CI professionals

**WHO ARE CIP?**
- Develop, manage, and support effective use of research CI
- Includes scientists, IT professionals, and engineers who research and develop new CI capabilities, approaches, and methods
- Various facings: CI system administrators, CI research staff, research software engineers, data curators, CI facilitators, Computational scientists

**IDEAL FOR PIs WHO ...**
- Want to accelerate the adoption of research CI
- Are ready to connect & coordinate with S&E research communities
- Seek to strengthen & broaden the diversity of the CIP workforce
- Whose institutions will develop sustainable long-term career paths for CIPs
Elements of the CI Ecosystem

- CyberTraining, RCN:CIP, CyberTeams, RCD-Nexus
- SCIPE (examples)
- Domain PIs, AI Institutes, ACCORD
- Gateways, CloudLab, CloudBank
- Pegasus, OnDemand

CI Professionals
S&E Research
HPC Systems
ACCESS Program
Continue & Grow the Coordination Ecosystem via **ACCESS**

- **Allocations**
  - Marketplace and Platform Services (RAMPS)

- **End User Support**
  - Multi-tier Assistance, Training & Computational Help (MATCH)

- **Operations & Integration**
  - Core National Ecosystem for CyberinfraStructure (CONECT)

- **Monitoring & Measurement**
  - Monitoring & Measurement

- **Coordination Office**
  - Open CI Ecosystem to Advance Scientific Discovery (OpenCI)

- **$52.5M Investment over 5 years**
- **70+ Researchers, Staff, Students**
- **75+ Collaborating Institutions**
- **Leverages parallel programs to integrate, innovate, and scale (e.g., CyberTraining, CC*, CSSI)**
- **Details**: [https://go.usa.gov/xu5r9](https://go.usa.gov/xu5r9)
NSF CSSI Program

- Supports the development and deployment of robust, reliable and sustainable data and software cyberinfrastructure
- Brings innovative capabilities towards sustained scientific innovation and discovery
- Provides a cross-directorate opportunity to advance common approaches to sustain and innovate research cyberinfrastructures
## CSSI Award Classes

<table>
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<th>Project Class</th>
<th>Description</th>
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<tbody>
<tr>
<td>Elements</td>
<td>Small groups that will <strong>create and deploy robust capabilities</strong> for which there is a demonstrated need that will advance one or more significant areas of S&amp;E. (Awards &lt;= $600K, up to 3 years)</td>
</tr>
<tr>
<td>Framework Implementations</td>
<td>Larger, interdisciplinary teams organized around the <strong>development and application of common infrastructure</strong> aimed at solving common research problems faced by NSF researchers in one or more areas of S&amp;E, resulting in a sustainable community framework serving a diverse community or communities. (Awards between $600K - $5 Million, between 3-5 years)</td>
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<td>Transition to Sustainability</td>
<td>Groups who will <strong>execute a well-defined sustainability plan</strong> for existing CI with demonstrated impact in one or more areas of S&amp;E supported by NSF. The sustainability plan should enable new avenues of support for the long-term sustained impact of the CI. (Awards &lt;= $1 Million, up to 2 years)</td>
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NSF Software and Data Infrastructure programs

Core Programs
- CSSI Elements
- CSSI Frameworks

Domain Focused Programs
- GEO OSE
- BIO DBI

Cyber-training
- SCIPE

Training and Workforce-Development Programs
- POSE

Research
- Development
- Sustained Production

Sustained Production
- Cyber-training

CSSI Sustainability
Minority-Serving Institutions Research Expansion Program (CISE-MSI Program)

The goal of the CISE-MSI program is to broaden participation by increasing the number of CISE-funded research projects from MSIs and to develop research capacity toward successful submissions to core CISE programs. MSIs are central to inclusive excellence: they foster innovation, cultivate current and future undergraduate and graduate computer and information science and engineering talent, and bolster long-term U.S. competitiveness.

For the purposes of this solicitation, MSIs include Historically Black Colleges and Universities (HBCUs), Hispanic-Serving Institutions (HSIs), and Tribal College & Universities (TCUs).
• **Thread 1: Research Capacity Building Planning Projects (RCBPP)**
  • Number of awards: Up to 4
  • Project length: Two years
  • Award size: Up to $400,000 \([\text{Last year} - $300.000]\)

• **Thread 2: Demonstration Projects (DP)**
  • Number of awards: Up to 10
  • Project length: Three years
  • Award size: Up to $600,000 \([\text{Last year} - $500.000]\)

• **Thread 3: Research Partnerships Enhancement Projects (RPEP)**
  • Number of awards: 2-3
  • Project length: Up to four years
  • Award size: Up to $1,200,000 \((\text{prior success via collaborative projects})\)

• **Anticipated Total Funding Amount**: $8,000,000
Design for Sustainability in Computing (DESC) Program Motivation

Embodied carbon is the carbon dioxide (CO₂) emissions associated with materials and manufacturing processes.

• Embodied carbon can account for half of the carbon footprint of datacenter class servers

• Embodied carbon can reach 4X the carbon operational footprint of tablets and mobile phones, and 10X of for energy efficient desktops
DESC Program Solicitation

- Environmental impacts of computing technologies extend well beyond operational energy consumption
  - E.g. embodied impacts, greenhouse gas emissions, depletion of rare earth materials, e-waste
  - Problem is exacerbated by proliferation, planned obsolescence, compute intensive applications (AI, blockchain), big data, NextG
- Need fundamentally new & disruptive research in design for sustainability in computing in every layer, and cross-layers, of the computing stack
  - Multiple dimensions (emissions, pollution, renewable versus limited resource usage, embodied costs, supply chain impacts)
  - Full computing spectrum (from HPC to mobile)
  - Full lifecycle (design, manufacturing, operation, & disposal)

This solicitation encourages the submission of novel and high impact proposals to CISE DESC program (NSF 23-532)

Best Practices for Proposal Submissions

• Attend webinars/townhalls/office-hours of the solicitation if available.
• Send questions to PDs in the list.
• Read the solicitation closely. Ensure submission complies with submission rules.
  • There are also many useful examples of topic areas of interest.
• Contact NSF program director with a one-page summary before submission.
• Volunteer for panel reviews.

• During the webinar
  • Type in questions at Q&A
Where Do You See Needs/Gaps?


https://go.usa.gov/xS23W

https://doi.org/10.17226/2558
Thank you!

Join the OAC Mailing List
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• oac-announce-subscribe-request@listserv.nsf.gov

We Want to Hear from you!
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ACCESS, SCIPE
• Ashok Srinivasan
asriniva@nsf.gov
CyberTraining
• Juan Jenny Li
jjli@nsf.gov OAC LWD programs
As there any feedback to the programs?
Which OAC programs do you have questions about?
OAC support community efforts?
Relevant CI-Related Programs

**What will your project focus on?**
- **CSSI**: Develop software or data repository
- **OAC CORE**: Perform research that will enable future CI
- **SCIPE**: Support research that uses CI, foster CIP careers
- **CyberTraining**: Provide training

**What gap will you fill?**
- **CSSI**: Increase community CI for research or education
- **OAC CORE**: Increase knowledge needed for CI
- **SCIPE**: Increase support for CIP career & research by underserved groups
- **CyberTraining**: Increase research workforce to leverage CI

**What will your project deliver?**
- **CSSI**: Community-sustained CI
- **OAC CORE**: Techniques that will enable CI and a CI prototype
- **SCIPE**: Research support in CI, CIP career paths
- **CyberTraining**: Scalable and sustainable training program

Programs have specific purposes, however, are not necessarily mutually exclusive.