Petascale Computing Resource Allocations
PRAC – NSF 14-518

Ed Walker, NSF CISE/ACI

March 3, 2016

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Good day. My name is Ed Walker.
I'm the NSF Program Officer managing the program **Petascale Computing Resource Allocations** , or PRAC as we also like to call it.
Thanks for taking the time to join this webcast today.
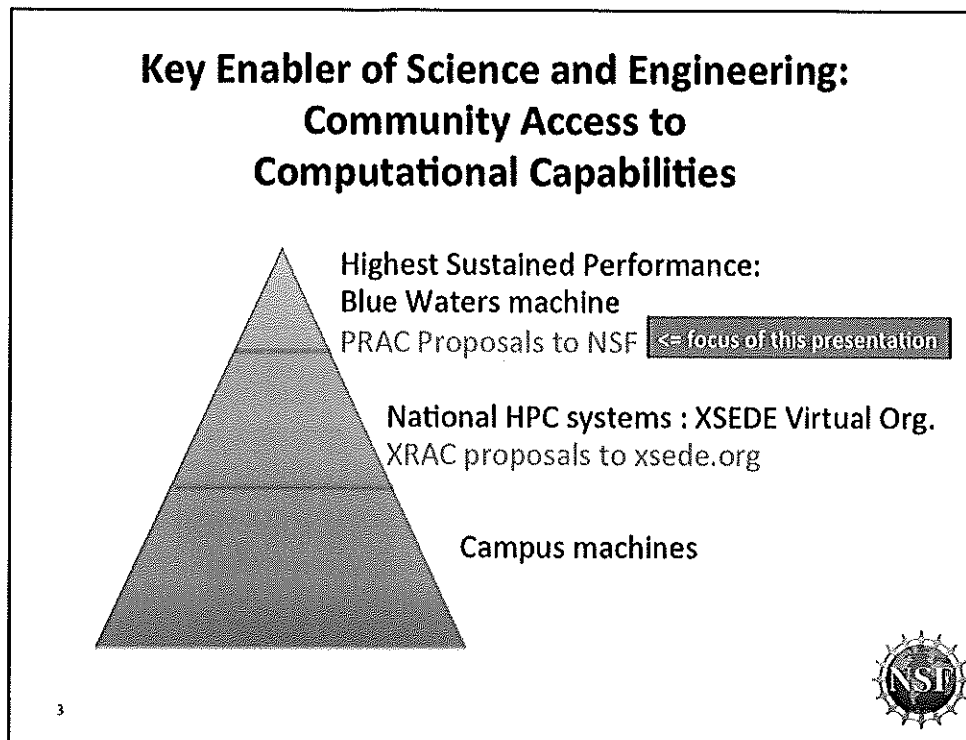
Agenda

- Program description
- FAQs
- Questions and answers

This is how I will be structuring my presentation today.

I will first give a brief overview of the PRAC program, including some of the more important things you need to know about submitting a successful proposal. I will then present answers to some frequently asked questions, and then open the floor for further questions from the audience.

Key Enabler of Science and Engineering:
Community Access to
Computational Capabilities

Highest Sustained Performance:
Blue Waters machine
PRAC Proposals to NSF <= focus of this presentation

National HPC systems : XSEDE Virtual Org.
XRAC proposals to xsede.org

Campus machines

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Here is a big-picture slide showing a version of the Branscomb Pyramid.

At the bottom of the pyramid represents the many campus level systems and clusters supported by NSF and other agencies, including state and local agencies. Typically, local entities allocate compute time of these systems to their local constituency.

Higher up in the pyramid, in the middle tier, NSF also supports HPC systems that enable the vast majority of HPC activities that are not quite in the petascale range, but are still very important to our national scientific computing infrastructure. The allocation of these systems is managed by the XSEDE virtual organization, and that activity is called the XRAC process.

Blue Waters is considered our NSF leadership-class system and it occupies the very top of our pyramid. To obtain computer time on Blue Waters, science teams have to write an NSF PRAC proposal, and these proposals are peer-reviewed by the most rigorous standards. This is because it is an important, and very expensive, national resource, and we want to ensure that it make the highest possible impact to science, and to our broader society.

Our focus in this webcast is on the top tier.

FY 16 Solicitation (NSF 14-518)

- Request computing allocations on Blue Waters
- You must demonstrate that
  - You have a breakthrough science or engineering research problem that requires petascale computing capabilities
  - Your code requires and can effectively exploit the capabilities offered by Blue Waters.
- Proposals from or including junior researchers are encouraged
- Next PRAC deadline is April 4, 2016

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That leads us to solicitation 14-518. By submitting proposals to NSF in response to this solicitation, you are requesting resources on Blue Waters. The key to writing a successful proposal for this solicitation are two things.

First, you must demonstrate that you have a very important science or engineering research problem that requires petascale computing capabilities.

Second, you must show that your code will effectively exploit the capabilities offered by Blue Waters. Note that the capabilities include more than just compute power. It is equally important to effectively use the storage, I/O, and networking capabilities of the system. For example, if the proposal's intention is to just run many serial jobs, and not use the high performance networking capabilities of the system, then that proposal MAY not be a good fit for this program. The caveat is that if the proposal demonstrates that it has an important scientific merit, and its proposed computational experiments cannot be done anywhere else accept through the capabilities of Blue Waters, than that is also acceptable.

Note that if you are a junior researcher, you should not feel that you are at a disadvantage. We welcome proposals from PIs or co-PIs who are starting off their career.

The next PRAC deadline is coming up on April 4th, 2016.

Type of Award

- Compute allocation: Up to 2 years
  Represents significant investment of NSF
  $\Rightarrow$rigorous, competitive review of both the science and the suitability for execution on Blue Waters
- Consulting expertise from the Blue Waters team
- Up to $15,000 per year for travel by your team or the Blue Waters team
- 10-15 awards anticipated
- Example of Blue Water projects:
  https://bluewaters.ncsa.illinois.edu/science-teams

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While most NSF awards give you money, PRAC gives you primarily computation time.

Be aware, that Blue Waters represents a big investment by our Nation. Therefore what you get is precious and your proposal will be evaluated as carefully as any other NSF proposal. The review includes both the science and the suitability for execution on the Blue Waters machine.

In addition to computer time, you will also get free consulting by the Blue Waters team if you are awarded. So, you are not entirely on you own in developing and optimizing your computational application.
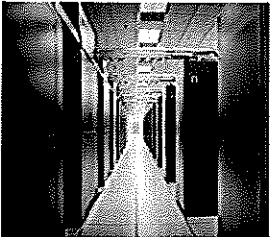
You can also request up to $15K per year of travel support – either for you or for the Blue Waters team to collaborate with you.

Overall, we expect that there will be 10 to 15 awards.

If you like to see example of previously successful allocation requests, please see the following URL for examples: bluewaters dot ncsa dot Illinois dot edu slash science teams.

The Blue Waters Machine

- Petascale system – sustained performance above 1 petaflop/s
- Deployed at the University of Illinois
- Tackle much larger and more complex research challenges than in the past, across a wide spectrum of domains
- Achieve significant impacts by
  - creating new knowledge about the natural world
  - increasing industrial competitiveness
  - improving national security
- **Operational end date: expected early to mid 2018**

Images courtesy of NCSA at the University of Illinois

That completes the overview. Let's now look at Blue Waters in a bit more detail.

Here are some specific features of the machine:

Blue Waters is Cray system with a peak rating of 13 petaflops. The system is designed for sustaining petaflop performance, that is, we expect a single application should be able to compute in the petaflop range.

It is deployed at the University of Illinois in Urbana Champaign, at NCSA. On the slide are pictures of the system and the machine room.

Very broadly, the goal of Blue Waters is to allow researchers to tackle much larger and more complex research challenges, across as wide a spectrum of domains as possible.
The system is also expected to achieve significant impact in creating new knowledge about the natural world, in increasing industrial competitiveness, and/or in improving our national security. Therefore all proposals will be evaluated based on how well it meets this very high standard.

Operationally, Blue Waters entered full-scale operation in 2013. Its end date is expected to be early to mid 2018. Therefore, we will not be allocating requests beyond 2 years.

Here are some architectural features of the system.

Blue Waters has approximately 360,000 cores in total. This is more than any other system in the US, including the DOE leadership class system, Titan.
22,000 of the nodes, called XE nodes, have two 8-core AMD processors each.
There is another set of 4,000 nodes, called XK nodes, with one 8-core processor and a GPU each. The GPUs are NVIDIA G110 Keplers.

Also, Blue Waters has 1.66 petabytes of memory which gives it the largest memory capacity of any HPC system in the world.

The I/O system is a Lustre file system with a total storage capacity of 26 PB, and an aggregate bandwidth of more than 1 TB/s.

The high speed interconnect is a Cray Gemini 3D Torus.

For more information, visit the URL shown on the slide: bluewaters dot ncsa dot Illinois dot edu slash hardware summary

Development Plan

Several years of preparation may be needed to be ready to exploit a sustained petaflop system.

Present a development plan, such as:
- — Code scalability today
- — Year 1: Optimizations for scalability to part of machine
- — Year 2: Further optimizations for full scalability

The Blue Waters team will provide consultation and support. Indicate in the plan tasks for which you need help

http://bluewaters.ncsa.illinois.edu/contact-us

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Performance optimization of code on Blue Waters is not trivial. Therefore, we expect up to 2 years of preparation for teams to get their code in shape so that it will begin to scale to the degree expected on Blue Waters.

If you have just started developing the computational code, or if you have just started porting a serial code to a parallel machine, it would not be a good idea to write a PRAC proposal. You would use a campus machine, instead, or request an XSEDE allocation.

For computational applications that have already demonstrated high scalability, the Blue Waters team will then help you improve the scalability of your code further. But, you will need to bring in substantial expertise and staff for this job as well.

Your proposal must present a solid plan for your code development on Blue Waters. Your plan may entail the following:
- A description of the current scalability of your code on machines you have used so far
- Your efforts in year 1 and year 2 to apply optimization to achieve scalability across the full system.

The Blue Waters team will assist you in executing this plan. You are encouraged to contact them during your proposal preparation as well.
In the development plan you should indicate topics and tasks for which you need their

Project Description

- Target research problem
- Intellectual merit
- Broader impact
- Description of computational code(s)
- Development plan and source of funding
- Resources required
    - Number and type of compute nodes
    - Memory usage
    - Number and duration of runs for each development phase
    - Total number of node hours, I/O requirements
    - Disclose resources allocated or proposed from other sources

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Now a few more specific tasks for your proposal writing:

There are 6 mandatory sections in the proposal description.

The first three involves explaining your target research problem, followed by the intellectual merit and broader impact of your proposed work. The intellectual merit and broader impact of your proposal will be the scientific progress enabled by your proposed work and how it affects the broader community. These two areas are important in any NSF proposal. PRAC is no exception. Be clear in your intellectual merit and broader impact descriptions.

You will then need to describe your computational code, and any novel computational or data processing approaches you are using. Describe how your code will use the memory hierarchy, the network, etc.

This should then be followed by your development plan (i.e., how you will scale your code to petascale performance on Blue Waters), and the source of research funding that is enabling you to do this work. This is very important: PRAC does NOT provide funding for developing your code. You need to show that you have separate funding for your science and code development.

Finally describe the compute resources you need. They must include a description of

Review Criteria

- **Intellectual Merit** and **Broader Impact**
- Is the proposed computational research leading to breakthrough science and engineering?
- Does it require the capability of a resource such as Blue Waters?

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Finally, to re-iterate its importance, here are the review criteria again in one slide.

Because this is a NSF proposal, the standard NSF review criteria applies: does the proposal have intellectual merit and will it achieve broader impact? Again, these two criteria apply to ANY NSF proposal.

Then there are two solicitation-specific criteria:

1. Is it the proposed computation research/experiment going to lead to breakthroughs in science and engineering?
2. Does the proposed computational activities really require the capabilities of Blue Waters?

FAQ 1

- Q: How can I tell if my proposed work is a good fit for the PRAC program?

- A: A successful PRAC proposal shows that
  - You have a very important science or engineering research problem that requires petascale computing capabilities
  - You have a solid plan to effectively exploit the massive capabilities offered by the Blue Waters machine

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Now I'll answer some frequently asked questions about the PRAC program.

The first one is: "How can I tell if my proposed is a good fit for the PRAC program?"

We have just discussed this. A successful PRAC proposals shows that:
1. You have a science or engineering research problem that requires petascale computing capabilities, and
2. You have a solid plan to effectively exploit the capabilities offered by the Blue Waters machine.

FAQ 2

- Q: If PRAC does not fund the development of the computational application, who does?

- A: You will need to write a proposal to an NSF directorate or another agency that sponsors research in your science domain. Once you get it funded, consider writing a PRAC proposal.

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Another question: If PRAC does not fund the development of my computational application, who does?

The answer is that you will need to write a proposal to an NSF program or to another agency that sponsors research in your science domain.
Once you get it funded, then you should consider writing a PRAC proposal.

FAQ 3

- Q: Would it be better for me to write an XRAC proposal and send it to xsede.org?

- A: Getting an XSEDE allocation is better if
  - You are only beginning to parallelize your code. Request a startup allocation
  - You don't have funding for developing your application into an efficient parallel code
  - Your code scales well, but does not need the massive capabilities of Blue Waters

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Next question: When is it better to request resources from an XSEDE-allocated machine?

You should request XSEDE instead of Blue Waters resources if you are only beginning to parallelize your code. In this case, request a startup allocation. This is fairly easy.
If you don't have funding for developing your application into an efficient parallel code, you should also consider XSEDE resources or, even, campus machines.
A full XSEDE/XRAC proposal is appropriate if your code scales well, but does not need the massive capabilities of Blue Waters

FAQ 4

- Q: What are the highlights in the recent revision of the solicitation?

- A: The new version revises the previous PRAC in the following ways:
  - All current/pending compute allocations MUST be disclosed in *supplemental documentation*
  - Total requested allocation must be stated in *Project Summary*
  - Restricts allocation request to a maximum of TWO years

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Final question: what are the highlights in the recent revision of the solicitation?

There are 3 major items that were included in this newly revised solicitation. The first is the new requirement that all current compute allocations, as well as requested and pending compute allocations, must be disclosed in a separate supplemental documentation. The second is that the solicitation now requires that the total requested allocation be stated up front in the Project Summary. Finally, the third addition is the added restriction that all allocation request should not exceed a duration of 2 years.
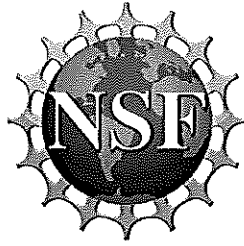
Petascale Computing Resource Allocations (PRAC)

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Thanks for listening to my presentation.

Here is contact information. My email is edwalker@nsf.gov and my phone number is 703 292 4863

And now, let's see if there are additional questions from the audience.

Cybersecurity Innovation for
Cyberinfrastructure (CICI)
NSF 16-533

Anita Nikolich
Program Director, Advanced Cyberinfrastructure
March 3, 2016

Hi. I'm Anita Nikolich

I'm the NSF Program Director managing the cybersecurity program within the Division of Advanced Cyberinfrastructure.

Thanks for taking the time to join this webcast today to learn about the Cybersecurity Innovation for Cyberinfrastructure – or CICI - program, which is only in its second year of existence.

I'll first give a description of the CICI solicitation, which, as I mentioned, is only in its second year of existence. CICI has a particular focus and scope, so I'll go over this in detail. I'll also cover the two areas of interest along with the due dates and specific requirements unique to this solicitation.

I will then open the floor to any questions from the audience. You can pose your questions anytime in the chat box during the presentation, and I will answer them during the Q&A section.

Why Worry about Security in the Scientific Environment?

- ❖ Integrity of data and results
- ❖ Embarrassment, damage to reputation
- ❖ High value assets – understand and manage risk
- ❖ More instruments are network connected
- ❖ *Science is increasingly being conducted using non-traditional instruments: drones, sensors, smartphones, etc*

The question that led to the creation of CICI was "Why Worry about Security in the Scientific Environment"? Some of the answers to that question are listed here.

NSF, and ACI in particular, funds a tremendous amount of cyberinfrastructure to support the scientific community. Although the data that is collected and analyzed is, by and large, open, such data must retain its integrity. In fact, accurate and reproducible results depend on the the integrity of scientific data.

Scientific instruments are also high value assets. Despite the fact that we don't want to encumber scientists in their daily operations, we still want the assets and resulting data to retain its integrity.

As more instruments and sensors are connected to the network and, in many cases, accessible globally, they have become more vulnerable. As such, they are a target for either malicious use or accidental access and/or misconfiguration.

An increasing trend is that science is now conducted by non-traditional instruments that are not necessarily inside a lab or at a remote site. The use of distributed sensors on smartphones, drones, remote locations and

Cybersecurity Innovation for Cyberinfrastructure (CICI) NSF 16-533

Activities that impact the security of science, engineering and education environments – the scientific workflow
Target community is operational cyberinfrastructure

- Due April 19
- FY16 $7M/7-9 awards
- Limit of 2 proposals per organization
- FY16 Program Areas:
  - Secure and Resilient Architecture ($1M awards/3 year)
  - Regional Cybersecurity Collaboration ($500K awards/2 year)

So this discussion about how to best secure the scientific environment led us to create CICI, our acronym for Cybersecurity Innovation for Cyberinfrastructure. The CICI solicitation is in its second year of existence. To reiterate, our focus is on activities that impact the scientific workflow.

This fiscal year we have roughly 7 million dollars available for CICI, which comprises two program areas, Secure and Resilient Architecture and Regional Cybersecurity Collaboration. The Architecture area has 1 million dollar awards for up to three years. The Regional Cybersecurity area will award five thousand dollar awards for up to two years. Proposals are due on April 19th.

It's important to note that each organization has a limit of two proposals, so it's imperative to coordinate submissions within your organization, as NSF will accept the first two proposals based on the date and time of submission if more than two are submitted by an organization.

CICI Program Areas

❖ **Secure and Resilient Architecture**
  ➤ Creation of a holistic, integrated security environment
  ➤ More secure data transfer
  ➤ Commercial/research secure cloud interoperability
  ➤ Interesting security uses for Software Defined Networking (SDN) and Network Function Virtualization (NFV)

❖ **Regional Cybersecurity Coordination**
  ➤ Share best practices, review security designs
  ➤ Methodologies for collectively mitigating threats such as DDoS
  ➤ Trend analysis and metrics at regional level

I'll go into a little more detail about the two program areas and what NSF is looking for in terms of submissions. The Secure and Resilient Architecture area has a broad scope of interest, with the ultimate goal of a holistic security environment. The solicitation lists several areas of interest but please don't feel like that is a complete nor comprehensive list, just suggestions and starting points to get you thinking about solutions. Some of the areas mentioned are secure and robust data transfer, substantive improvements to cyberinfrastructure services such as DNS and routing, and interesting use cases for Software Defined Networking and Network Function Virtualization. Again, this is not comprehensive.

The Regional Cybersecurity coordination area is focused on harnessing technical and personnel resources within a region in order to effect better security for all participants. As such, one example would be pooling resources to collectively mitigate network threats such as Distributed Denial of Service – DDoS – attacks. Collectively analyzing security trends and attacks within a given region is another example. Finally, sharing resources among participants is one of the best ways to influence the collective security of the research and education enterprise.

CICI Solicitation Specific Review Criteria

- All proposals:
  - Driven by needs of the science and engineering communities
  - Quantitative metrics on success are encouraged
- Secure and Resilient Architecture
  - Technical proofs of concept *encouraged*
  - **MUST** document explicit partnerships or collaborations with domain scientists, research groups or IT Organization
  - **MUST** include a logical and physical Systems Architecture diagram or diagrams as supplementary document
  - **MUST** include a project plan with goals and milestones
- Regional Cybersecurity Collaboration
  - Outcomes assessment/reportable success metrics are *encouraged*
  - **MUST** document explicit partnerships or collaborations with domain scientists, research groups or IT Organization
  - **MUST** include a project plan with goals and milestones

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It's important to note the specific review criteria for CICI, as it differs from more basic research focused security solicitations. All submissions should be driven by science and engineering communities, which is our area of interest. Although security metrics in general are often imperfect and hard to quantify, NSF is encouraging proposers to think about what their metrics of success are for these areas.

NSF strongly encourages proofs of concept in the Secure and Resilient Architecture area. This is the most common question I get from potential submitters. We like to see later stage research implemented by means of a proof of concept. This is why we ask for a systems architecture document in which you explicitly draw out the logical and physical architecture and describe the interrelationships. These are uploaded as supplementary documents. A project plan helps organize your milestones and lets NSF know when you expect the proof of concept to be implemented.

Regional cybersecurity collaboration proposals also need a project plan. And an outcomes assessment planned for the end of the grant is encouraged. Thinking about how success is measured in this area is very important as NSF evaluates the sustainability of this approach to security.

Hello, thank you for your interest in ACI's programs related to learning and workforce development.

I am Sushil Prasad, a recent rotator in charge of the LWD thrust in ACI. I am a Computer Science professor from Georgia State University. My research is in Parallel Processing. However, since 2010, I have been steering a curriculum initiative in parallel and distributed computing with the premise that every undergraduate student in Computer Science or Computer Engineering must acquire certain basic parallel computing skills. This curriculum has had wide adoption including its direct impact on ACM's CS2013 Curricula.

Today, I will summarize four key programs that ACI participates in for workforce development pipeline and highlight some aspects for proposal preparation. I will also mention other current opportunities such EAGERs and Workshops.

Education and Workforce as infrastructure
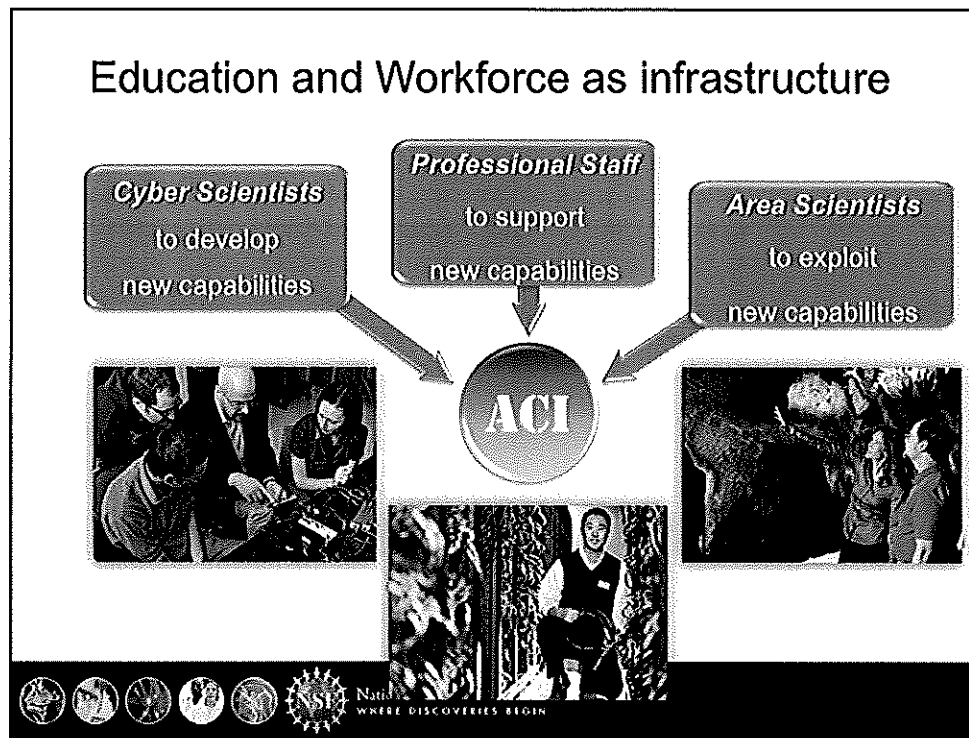
Who are our stakeholders?
We are concerned about all the faculty, students, postdocs, and scientists who help create new cyberinfrastructure related to software, data, hardware, networking and security.

Similarly, we are concerned about all the domain scientists and engineers and their students who employ these cyberinfrastructures for scientific discovery.

We are also concerned about training and career development of the CI professionals who support all the research and the cyberinfrastructures.

LWD: The Career Pipeline

- Goal: Build robust careers paths in Cyber-Infrastructure (CI) and Computational and Data-enabled Science and Engineering (CDSE)
- Techniques: Leverage existing programs for early-stage researchers. Develop new programs in areas of need/challenge

CAREER
CRII
NRT/IGERT
REU

National Science Foundation
WHERE DISCOVERIES BEGIN
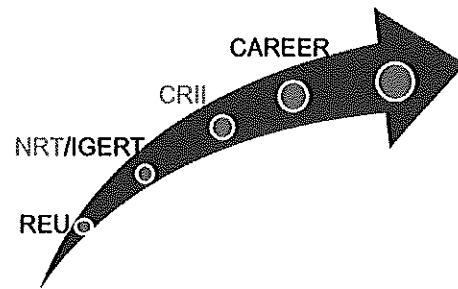
It is good to visualize the career pipeline of young researchers and how ACI supports them at various stages.

Our goal is to build robust careers paths in Cyber-Infrastructure and Computation and Data-enabled Science and Engineering.

Our approach is to leverage the existing programs for early-stage researchers. We also intend to develop new programs in the areas of challenges.

Our current program supports the:
               Undergraduates via REU sites
               Graduate students via NSF Research Traineeship or the NRT program, which is a successor to the IGERT program
               Early faculty via the CAREER program
               - And the earliest of the faculty members through the recent CISE Research Initiation Initiative or the CRII program.

Faculty Early Career Development Program (CAREER - NSF 15-555)

- Most prestigious award supporting junior faculty as a teacher-scholar
  - Outstanding research, education and the integration of education and research
  - Presidential Early Career Awards ...(PECASE) – 20 best
- ACI research focus:
  - Use-inspired and/or applied, multidisciplinary research
  - computation and data-enabled science and engineering
- Min $400K/5 yrs
- Deadlines by directorate: July 2016; *see solicitation for specific dates.*

National Science Foundation
WHERE DISCOVERIES BEGIN

Let us start with the CAREER program. We are working hard to grow this programs, with good successes.

- CAREER is the most prestigious award supporting junior faculty as a teacher-scholar.
-A career proposal need to focus on research, education as well as their integration.
-NSF also chooses the best 20 of its CAREER awardees for the Presidential Early Career Awards the so called PECASE awards.
- It is important to note that the research focus of ACI is use-inspired or applied, possibly multidisciplinary research, not fundamental research, which enables computation and data-enabled science and engineering.

Minimum award for CAREER is $400K for 5 year. The next deadline would be in July.

Faculty Early Career Development Program (CAREER – contd)

- ACI encourages proposals that are either of
  - primary interest to ACI, or
  - secondary interest to ACI (add ACI in Cover Page)
  - Dear Colleague Letter: ACI & Career **(NSF 15-072)**
    http://www.nsf.gov/pubs/2015/nsf15072/nsf15072.jsp
- CAREER program page
  - http://www.nsf.gov/career
- CISE CAREER Proposal Writing Workshop
  - April 4, 2016, Arlington, in-person and online participation
  - http://carch.seas.gwu.edu/cise-career/NSF_2016.html

National Science Foundation
WHERE DISCOVERIES BEGIN

Within the context of the CAREER program, ACI encourages proposals that are either of primary interest to ACI, or of primary interest to another division of NSF, and of secondary interest to ACI. Make sure that your cover page mentions ACI in either case.

- In both cases, proposals should contribute to exploration, experimentation, development, or deployment of cyberinfrastructure related to software, hardware, modeling/simulation, data, networking, security, or policies.

A good resource is a Dear Colleague Letter on ACI & Career program released last year. You should also see the CAREER program page.

If you or a colleague are contemplating submitting a CAREER proposal to ACI, you should participate in the CISE CAREER Proposal Writing Workshop. If you could not register, attend online. This would be held on April 4, 2016 in Arlington.

CISE Research Initiation Initiative
(CRII - NSF 15-569)

- Independent research for faculty or *research scientists* in their first two years (Pre-CAREER)
  - May not have any grant as PI
- ACI research focus:
  - Use-inspired and/or applied multidisciplinary research
  - Computational and data-intensive scientists in addition to computer scientis
- Award ~$175K/ 2 yrs
- Deadline: September 30, 2015

National Science Foundation
WHERE DISCOVERIES BEGIN

The next program is the CISE Research Initiation Initiative program or CRII.

CRII promotes independent research for faculty or research scientists in their first two years. Note that CAREER is only for tenure track faculty. Whereas, the CRII program also supports the research scientists as long the proposer does not have any grant as PI.

Again, remember that ACI's research focus is in Use-inspired and/or applied multidisciplinary research.

ACI invites both the Computational scientists from various domains as well as the computer scientists under this program, even though the program is currently only within CISE.

The Award is up to$175K for 2 yrs. The last year deadline was in September.

**Goals of CISE Research Initiation Initiative
(CRII - contd.)**

- Start a research program and career
  - The PI need not have significant prior research results or maturity
  - Start a path toward research independence
  - Develop collaborations within or across research disciplines
  - Undertake exploratory investigations
  - Acquire and test preliminary data
- Broaden community of researchers
  - Reach underserved sub-communities, under-represented groups, nontraditional institutions

National Science Foundation
WHERE DISCOVERIES BEGIN

Let me highlight a few things to remember when preparing a CRII proposal or advising a young colleague. As the name suggests, the CRII program is to support starting of a research career. The PI does not need to have significant prior research results. On the other hand, PI needs to demonstrate a path toward research independence. This is an opportunity to develop collaborations, undertake exploratory investigations, and acquire and test preliminary data.

CRII also aims to broaden the community of researchers, with an eye toward reaching out to underserved communities, under-represented groups, and nontraditional institutions.

**Research Experiences for Undergraduates
(REU - NSF 13-542)**

- Active research participation by undergraduate students
- *REU Sites* are based on independent proposals
  - *REU Supplements:* component of new or continuing proposals
- Deadline: August 26, 2015
- ACI 2015: up to $360K/3yr;

National Science Foundation
WHERE DISCOVERIES BEGIN
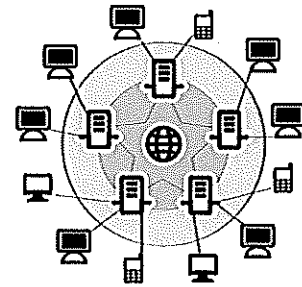
Now let us look at the REU site program that ACI also participates in. This program is an important component of research training of undergraduates in computational science and engineering. ACI has been strongly emphasizing this lately and the program has been growing.

The REU site is for active research participation by undergraduate students, usually during 10 weeks of summer.

The REU Sites are based on independent proposals whereas *REU Supplements can be proposed as a* component of new or continuing proposals.

The 2015 deadline was in August. ACI funds up to $360K for 3yr to host 10 students.

Research Experiences for Undergraduates (REU – Contd.)

School hosts summer cohort for undergrad research

- Coherent intellectual focus to research topics
- At least half the students are from institutions other than the host institution
- At least half from schools with limited research potential
- Research mentoring and support
- Social activities
- Professional development, grad school prep

National Science Foundation
WHERE DISCOVERIES BEGIN

A good REU site proposal should ensure that there is a coherent intellectual focus to research topics for the students, and they are not just a collection of what faculty can easily put together.

-The site should have at least half the students from institutions other than the host institution; likewise, at least half should be from schools with limited research opportunities.

In addition to research, the REU site also needs to address varied enriching experiences including mentoring, social activities, professional development, and graduate school preparation.

**NSF Research Training
(NRT - NSF 15542)**

- To encourage the development and implementation of potentially transformative models for STEM graduate education training
- Data-enabled Science and Engineering (DESE)
  - Understanding the Brain (UtB) + Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS)
- Award $3M/4-5yrs
- Deadlines:
  - Mandatory letters of intent: Dec-2015
  - Feb-2016 deadline

National Science Foundation
WHERE DISCOVERIES BEGIN

The NRT proposals just came in February, but I want to briefly mention it.

The NRT program is to encourage the development and implementation of potentially transformative models for STEM graduate education training. The last round had three focus areas including Data-enabled Science and Engineering (DESE), Understanding the Brain (UtB), and Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS).

It is one of the larger awards funding up to $3M for 4-5yrs. We introduced mandatory letters of intent in the last round.

Other LWD Opportunities within ACI

- EAGERs, Workshops, RCNs
  - Seed Exploration of Informal/Formal Training and Education, Broadening Participation
  - Students, Post-Docs, Faculty, CI Professionals
- Fellowships (e.g., Blue Waters, XSEDE Scholars)
- STEM+C at K-12 level
- Student Travel Grants
- *Discuss with me and other ACI Program Officers*

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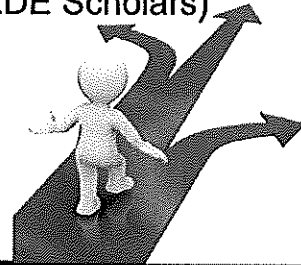
In addition to the regular programs, let me emphasize that I am looking for exciting ideas toward EAGERs, Workshops, and RCNs which can seed longer term activities, create roadmaps, or help coalesce the community around critical goals. These can be in the broad areas of Informal or Formal Training and Education needs of all our constituency including undergraduate and graduate students, post docs, faculty, instructors, research scientists and the CI professionals. Broadening participation is a key goal.

There are also miscellaneous opportunities including graduate student fellowships, and support for student travel to conferences. We also participate in the STEM+C program which supports projects at the K-12 level.

Thank you!

Questions Now: sprasad@nsf.gov

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This complete my slide presentation. Please note that these slides and the transcript for this webcast as well as an audio recording will be available at www.nsf.gov/events.

Now, I welcome your questions. Please email to sprasad@nsf.gov.

Thank you!