The NSF Blue Ribbon Advisory Panel on Cyberinfrastructure: Findings, Recommendations and Status

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Cyberinfrastructure-enabled....

Virtual teams, communities, organizations, knowledge environments/ecologies

Cyber-infrastructure: Equipment, Software, People, Institutions

Computation, Storage, Communication and Interface Technologies
Converging Streams of Activity

Collaboratories

GRIDS (broadly defined)

E-science

Science-driven pilots (not using above labels)

Semantic Web?

ITFRU
Cyberscience
Research in the Age of the Internet

Michael Nentwich

Austrian Academy of Sciences Press
Enabling and Motivating a CI Initiative

- ASC PACI's
- Pittsburgh TSC
- Distributed Terascale Facility
- Some ITR Projects
- Digital Library Initiatives
- Networking Initiatives
- Middleware Initiatives
- Other CISE Research
- Collaboratories
- Scientific Data Collection/Curation
- Initiatives in non-CISE Directorates
- NSB Research Infrastructure Review
- Initiatives in DOE, NIH, DOD, NASA, ...
- International Initiatives: UK e-science, Earth Simulator, EU Grid & 6th Framework
Input to Panel

- 62 presentations at invitational public testimony sessions
- 700 responses to a community-wide survey
- Review of dozens of prior relevant reports; scores of unsolicited emails and phone calls
- 250 pages of written critique from 60 reviewers of an early draft of this report
- Hundreds of hours of deliberation and discussion between Panel members
- The members of the Panel have backgrounds in areas widely relevant to creating, managing, and using advanced cyberinfrastructure.
Cyberinfrastructure

Intra and Inter Ecologies

Community-Specific Knowledge Environments for Research and Education (collaboratory, co-laboratory, grid community, e-science community, virtual community)

Customization for discipline- and project-specific applications

<table>
<thead>
<tr>
<th>High performance computation services</th>
<th>Data, information, knowledge management services</th>
<th>Observation, measurement, fabrication services</th>
<th>Interfaces, visualization services</th>
<th>Collaboration services</th>
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Networking, Operating Systems, Middleware

Base Technology: computation, storage, communication

= cyberinfrastructure: hardware, software, services, personnel, organizations
Dimensions of CI Research

![Diagram showing dimensions of CI research with axes for technology capacity, functional comprehensiveness, and usefulness. The diagram highlights the concept of ACP and adaptiveness through dynamic reconfiguration.](image-url)
Cyberinfrastructure is a First-Class Tool for Science
Computational

- Capability not just capacity: technology, policy, tools.
- Still need some center-based leading-edge, super computers.
- On-demand supercomputer, not just batch.
Shared Opportunity and Responsibility

- All NSF communities
- Multi-agency
- Industry
- International
Bottom-line: Leadership for an Advanced Cyberinfrastructure Program

• NSF has an opportunity to provide leadership for the Nation in an initiative to revolutionize science and engineering research capitalizing on cyberinfrastructure opportunities.
  - A nascent revolution has begun. Demand is here and growing. The time is now (opportunities & opportunity costs.)
  - Many prior investments (projects, initiatives, centers) are a key resource to build upon.
  - Now need sanction, leadership and empowerment through significant new funding and effective coordination.
  - Need very broad (synergistic) participation by many communities with complementary needs and expertise.
  - Need appropriate leadership and management structure.
  - Need incremental funding of $1B/year (continuing).
# Budget Recommendation Overview
*(Incremental, Recurring)*

<table>
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<tr>
<th>Description</th>
<th>Amount</th>
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<tr>
<td>Fundamental research to advance CI</td>
<td>$60M</td>
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<tr>
<td>Application of CI to advance S&amp;E research</td>
<td>$200M</td>
</tr>
<tr>
<td>Provision &amp; operational CI</td>
<td>$660M</td>
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<tr>
<td>Information and data repositories</td>
<td>$200M</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$1020M</strong></td>
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NOT Business as Usual for NSF nor It’s Usual Research Community

• Scale
• Duration, Persistence
• Complexity (technical, managerial)
• Richness and Diversity of Partnerships
• Gaps, Chasms
• Recommend a cross Foundation Office of Advance Cyberinfrastructure with authority and resources.
Since Report was Released (1)

- 100,000+ downloads & printed copies, worldwide
- Basis for much discussion, workshops etc. in NSF community.
- Influence on UK e-science program.
- Promoting study of CI for humanities.
- Lots of positive comments.
- AD for CISE given overall responsibility.
- Reorg of CISE to create Division of Shared Cyberinfrastructure. Searching for Director
Since Report was Released (2)

• Cross Foundation CI Working Group in place.
• Some new money requested for CI in 2005 year. Amount not public but very small compared to scale of recommendation.
• Outside consultants added to help design a CI program.
• Exploration of international cooperation.
• Some discussion starting around industrial participation and linkage to industrial-economic innovation.
• Developing countries, e.g. South Africa exploring CI in their context.
Discussion, Questions

• How can UCAID-Internet 2 help make an ACP real?

• How can UCAID-Internet 2 be a leading participant in an ACP.

• What should industry be doing to help create and/or participate in an ACP?