Computer and Information Science and Engineering Directorate

National Science Foundation

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Table of Contents

- National Science Foundation (NSF) Overview

- Computer and Information Science and Engineering (CISE) Overview

- Proposal and Funding Statistics

- Highlights & Community Involvement

- Concluding Remarks

National Science Foundation

Overview

NSF in a Nutshell

- Functions as an independent federal agency under the Executive Branch
- Supports basic research, education and research infrastructure
- Utilizes grant mechanism
- Discipline-based structure
         BUT
- Provides/encourages inter-disciplinary opportunities
- Oversight by the National Science Board

$6.85 Billion Request for FY 2009
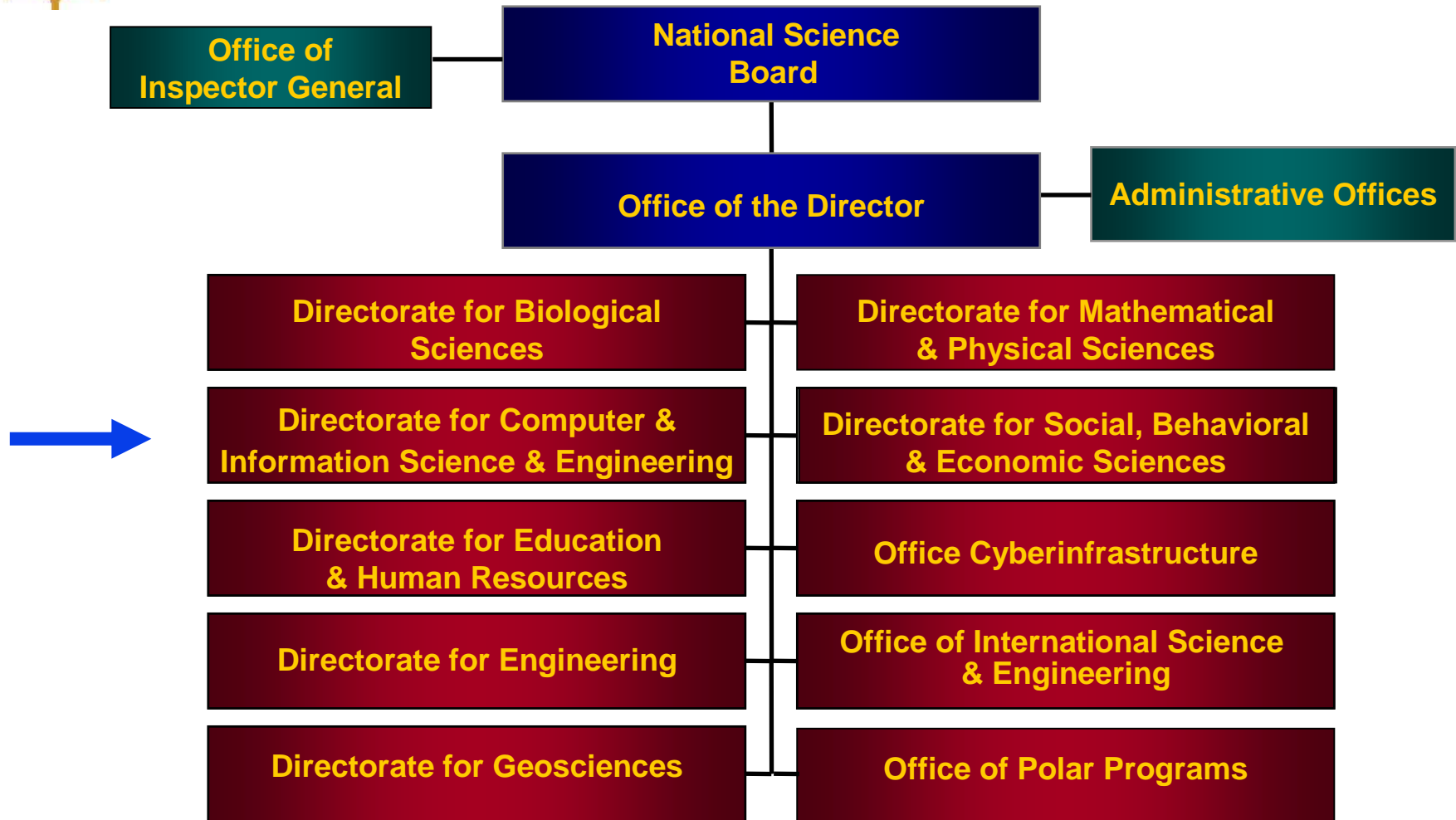
NSF's Origin, Mission and Goal

- NSF established in 1950 by NSF Act

- Only federal agency authorized to provide funding for research across all science and engineering disciplines

- Mission:

  - To promote the progress of science

  - To advance the national health, prosperity, and welfare

  - To secure the national defense

- NSF's goal is to fund meritorious, high impact science and engineering proposals

NSF Strategic Goals

- Discovery:

  Advancing frontiers of knowledge

- Learning:

  Science and engineering workforce and scientific literacy

- Research Infrastructure:

  Advanced instrumentation and facilities

- Stewardship:

  Supporting excellence in science and engineering research and education

National Science Foundation

Office of Inspector General

National Science Board

Office of the Director

Administrative Offices

Directorate for Biological Sciences

Directorate for Mathematical & Physical Sciences

Directorate for Computer & Information Science & Engineering

Directorate for Social, Behavioral & Economic Sciences

Directorate for Education & Human Resources

Office Cyberinfrastructure

Directorate for Engineering

Office of International Science & Engineering

Directorate for Geosciences

Office of Polar Programs

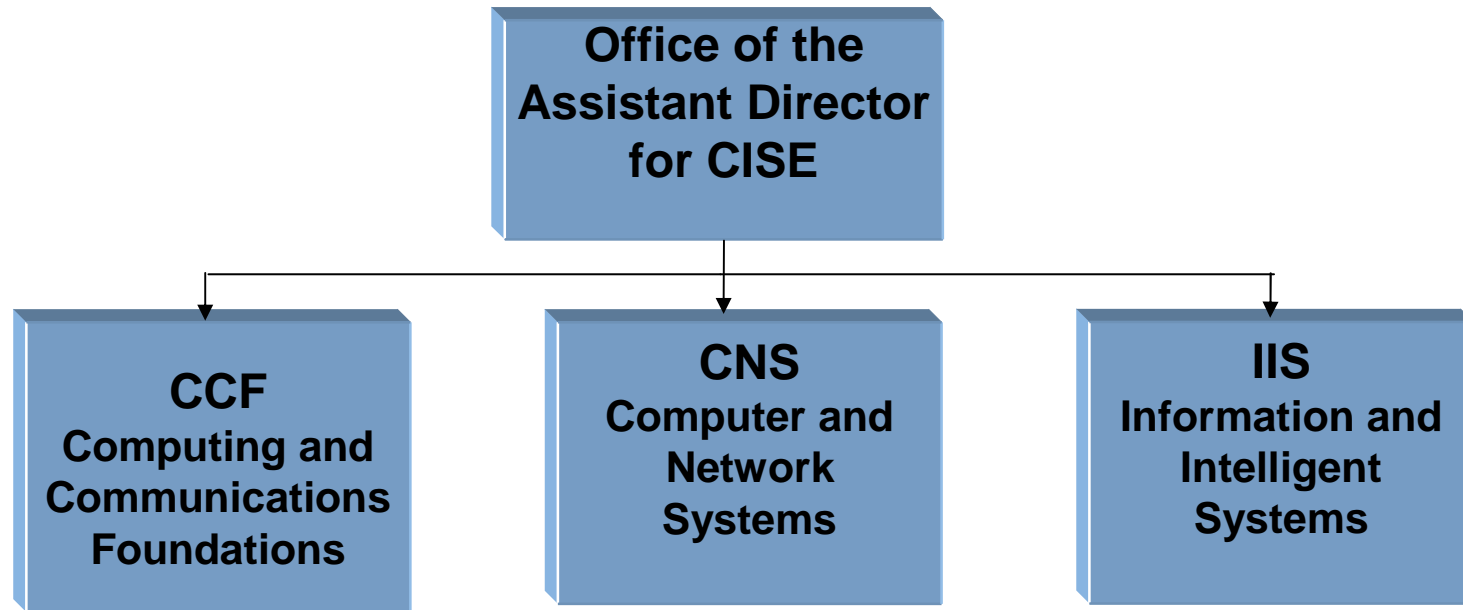# Computer and Information Science and Engineering Directorate

Overview

CISE Budget
and Budget Outlook

- FY 2008 Budget = $535M, $8M increase over FY 2007

- FY 2009 Budget Request = $639M, a 19% increase over FY 2008

- American Competitiveness Initiative calls for NSF funding to double over next 10 years

- America Competes Act authorizes additional NSF funding, setting pace for doubling of the NSF Research and Related Activities account over the next 7 years

NSF provides 87% of all Federal support for basic research in computer science

CISE Organizational Chart and Core Research Programs

Office of the Assistant Director for CISE

CCF
Computing and Communications Foundations

CNS
Computer and Network Systems

IIS
Information and Intelligent Systems

CORE PROGRAMS

- Emerging Models and Technologies for Computation
- Foundations of Computing Processes and Artifacts
- Theoretical Foundations

- Computer Systems Research
- Networking Technology and Systems
- Cyber Trust

- Human-Centered Computing
- Information Integration and Informatics
- Robust Intelligence

~ 70-75% of CISE Budget in these Core Programs

CISE Contributions to NSF's Strategic Goals (1)

- **Discovery: Advance the Frontiers of Computing**
  - Core CISE programs
  - Specialized types of proposals
    - CAREER (for new faculty) – deadline for all core CISE programs in July
    - Research in Undergraduate Institutions (RUI) (for faculty at under institutions) - may be submitted to any CISE program
    - Grant Opportunities for Academic Liaison with Industry (GOALI) – may be submitted to any CISE program
  - Multidisciplinary program solicitations
    - Cyber-Enabled Discovery and Innovation (CDI) – began in FY'08
    - Collaborative Research for Computational Neuroscience (CRCNS)
    - Advanced Learning Technologies (ALT)
  - Center-like programs (funding of several $M/year/project for 5-10 years)
    - Expeditions in Computing
    - Science and Technology Centers
    - Engineering Research Centers

CISE Contributions to NSF's Strategic Goals (2)

- Learning: Build a highly competent and diversified computing workforce for the 21st century
  - CISE-specific
    - CPATHways to Revitalized Education in Computing
    - Broadening Participation in Computing (BPC)
  - NSF-wide programs
    - Research Experiences for Undergrads (REU) Sites and Supplements
    - Integrative Graduate Education & Training (IGERT)
    - Graduate Research Fellowships
    - Scholarships for Service
- Research Infrastructure: Support development and acquisition of research instruments that enable high-quality computing research
  - CISE-specific
    - Computing Research Infrastructure (Core program)
  - NSF-wide program
    - Major Research Instrumentation (MRI)

Cyber-Enabled Discovery and Innovation (CDI)

New in FY 2008

- Create revolutionary science and engineering research outcomes made possible by innovations and advances in computational thinking.

- Seek ambitious, transformative, multidisciplinary research proposals within or across the following thematic areas:
  - From Data to Knowledge
  - Understanding Complexity in Natural, Built, and Social Systems
  - Building Virtual Organizations

Bold Five-Year Initiative

- Deadlines:
  - Letter of Intent Deadline (mandatory)
  - Preliminary Proposal Deadline
  - Full Proposal Deadline

Back to Basics

- CISE is about advancing the computing frontier
- Supporting good ideas submitted by creative people in broad range of academic institutions and organizations.
- It's about "high risk" long term impact.
  - Impact may be far in the future.
  - Impact is long-lasting (it's about new knowledge).
  - Impact can create new economies and change societal behavior.

⊘ Say "No" to incrementalism!

Proposal and Funding Statistics

FY 2007 Proposal Statistics
NSF and CISE

Statistic	NSF	CISE
No. of Proposal Actions	44,593	5,745
No. of Reviews	280,000	24,182
No. of Awards	11,484	1,633
Funding Rate (Research Only)	26% (22%)	28% (24%)

NSF and CISE Funding Rate Trends
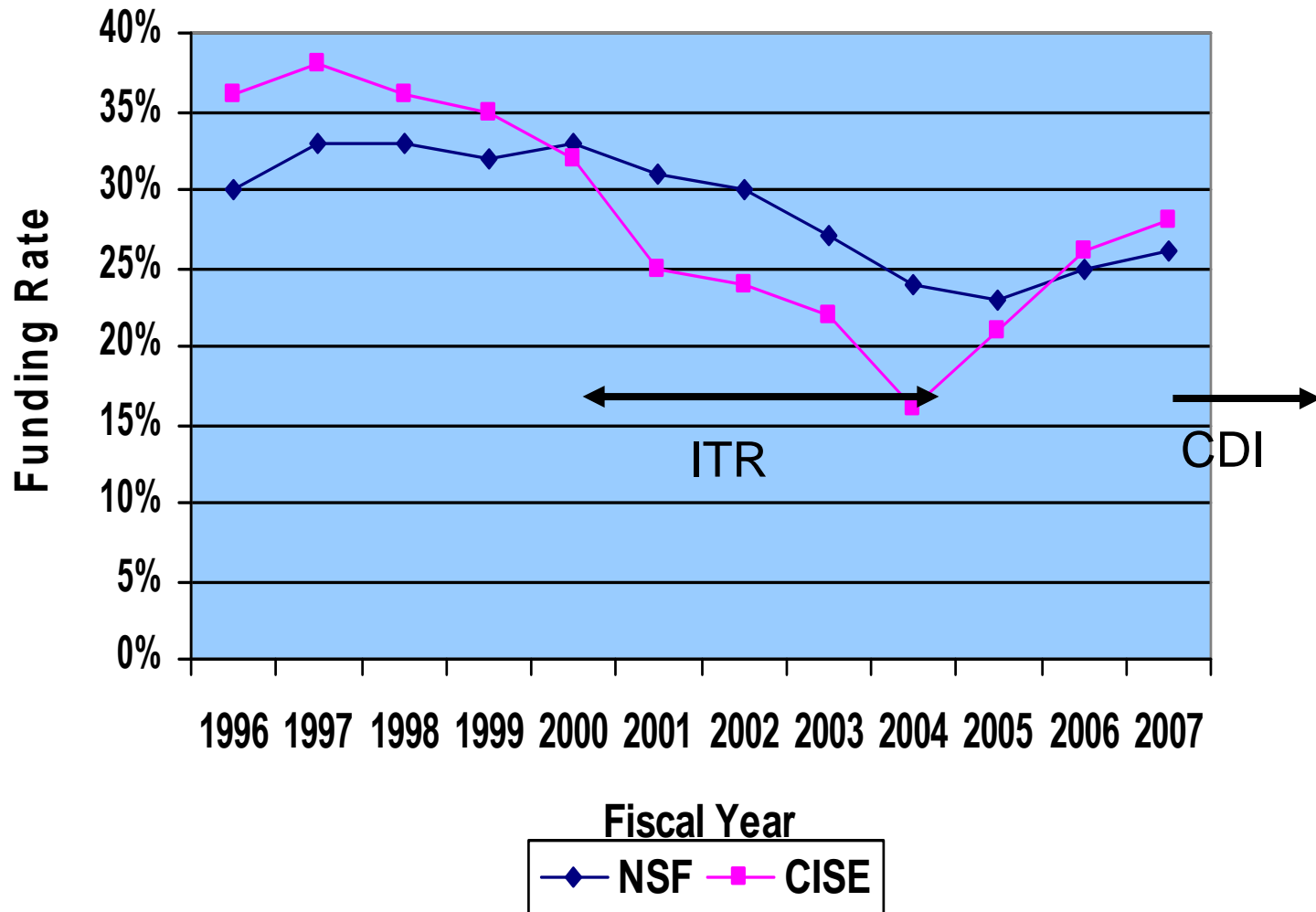
Community Involvement

Highlights

Concluding Remarks

Subscribe to NSF's mailing list

www.nsf.gov

Subscribe to CISE Distribution List

CISE has implemented a mail distribution list to notify the Computer and Information Science and Engineering community of items we think may be of interest. The postings will be infrequent and brief and will typically point to further information on our website. This may duplicate some of the items contained in NSF Custom News Service but will also contain items not always available there:

Announcements, vacancy notices, CISE webcasts of interest, meeting notices and news items.

To subscribe: send a message to: join-cise-announce@lists.nsf.gov with no text in the subject or message body.

If you no longer wish to be included on the distribution list, you can elect to be removed from the list at any time. Instructions for unsubscribing will be included at the end of each list message.

http://www.nsf.gov/cise/news/mail_lists.jsp

Get Involved

- Send your best ideas to NSF: consistent with program focus and goals
- Volunteer to be a reviewer and panelist
- Get to know your Program Directors

- Keep us informed of your accomplishments

- Work within your institutions to support collaborative, interdisciplinary research

- Call our attention to things that need improvement

- Suggest transition strategies from basic research to prototyping and production

- Plan to serve as a program officer ("rotator") or division director

- Consider participating in the Computing Community Consortium
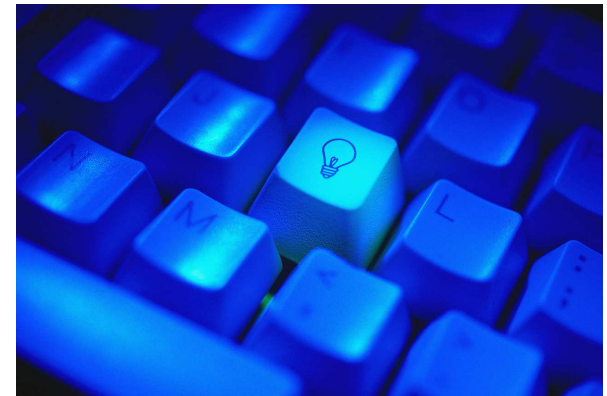
Highlights

- Succinct, interesting vignettes
  - Show a result, not an expense
  - Layman's language
  - Graphics if possible

- NSF shares Highlights publicly
  - Budget requests
  - Performance reports
  - Public relations

- Convince the US public that research is worth paying for
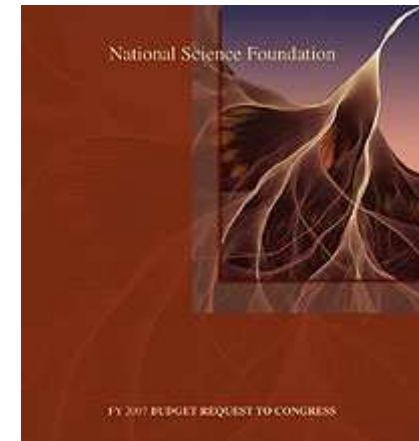
Concluding Remarks

- CISE-funded research and education outcomes *essential* to national competitiveness

- Focus on grand vision, big ideas

- Seeking potentially transformative research
  - Fundamental questions in computing
  - Potential for significant, enduring impact
  - Plausible, but high risk projects
  - Balance

- Multi-disciplinary, NSF-wide investments such as CDI

"To keep America competitive into the future, we must trust in the skill of our scientists and engineers and empower them to pursue the breakthroughs of tomorrow."

– President Bush, January 28, 2008

Additional Slides

CISE Mission

- To promote understanding of the principles and uses of advanced computing, communications, and information systems in service to society

- To enable the United States to remain competitive in computing, communications, and information science and engineering

- To contribute to universal, transparent and affordable participation in all information-based society

NSF provides 87% of all Federal support for computer science research

Core Program Solicitations

- Have recurring annual deadlines

- Foci:
  - Particular scientific fields or subfields within computing and information

  - Variety of project modalities (e.g., team awards of larger funding levels and longer durations)

Computing and Communications Foundation (CCF)

- Supports research and education activities that explore the foundations of computing and communication devices and their usage.

- Seeks advances in computing and communication theory, algorithms for computer and computational sciences, and architecture and design of computers and software.

- Investigates revolutionary computing paradigms based on emerging scientific ideas

- Integrates research and education activities to prepare future generations of computer science and engineering workers.

- Organized into three clusters:
  - Emerging Models and Technologies
  - Foundations of Computing Processes and Artifacts
  - Theoretical Foundations

CCF: Emerging Models and Technologies

- Frameworks and foundations for novel computing models that will lead to better computing and communication systems, including, for example:
    - Modeling and simulation of bio-systems
    - Design of bio-inspired computing models for solving complex problems
    - Investigation of various aspects of quantum-based approaches to processing information
    - Nanoscale science and engineering approaches

- Proposal Deadline: March 13, 2008

CCF: Foundations of Computing Processes & Artifacts

- Transformative research to advance at a fundamental level the design, verification, evaluation, utilization, and understanding of computing and communication systems.

- Projects may focus on processes, such as design methods for hardware or software, especially programming models for parallel computing.

- Projects may also focus on artifacts, such as new tools for validation of a system design, new languages, or new techniques for graphics, visualization, and animation.

- Proposal Deadline: December 7, 2007

CCF: Theoretical Foundations

- Funds basic research on algorithms, complexity, and theory that enables scientific advances in and reveals the potential limitations of:

  $\longrightarrow$
  - Computation
  - Communications
  - Signal Processing
  - Numerical computing and optimization
  - Symbolic and algebraic computation

- Promotes the applications of these insights to other areas of science and engineering.

- Supports Scientific Foundations for Internet's Next Generation (SING) merges elements of the theoretical foundations of computing, communications, signal processing, and network science into a foundation for a clean-slate redesign of the Internet

- Proposal Deadline: March 19, 2008

Computer and Network Systems Division (CNS)

- Supports research and education activities that invent new computing and networking technologies and that explore new ways to make use of existing technologies.

- Seeks to develop a better understanding of the fundamental properties of computer and network systems

- Seeks to create better abstractions and tools for designing, building, analyzing, and measuring future systems.

- Supports the computing infrastructure that is required for experimental computer science.

- Organized into four clusters:
  - Computer Systems Research
  - Cyber Trust
  - Networking Technology and Systems
  - Education and Workforce

CNS: Computer Systems Research

- Funds research that has potential to augment our fundamental understanding of large and complex systems leading to major advances in:

Cross-system integration

Design for dependability & resiliency under uncertainty

Flexible assured system composition

Networked sensing & control

Real-time and pervasive computing

Service architectures & abstractions

Storage and file systems

System modeling & simulation

Systems software

Virtualization

- Proposal Deadline: November 14, 2008

CNS: Cyber Trust

- Supports research leading to computer-based systems and networks that:
  - Function as intended, especially in the face of cyber attack
  - Process, store and communicate sensitive information according to specified policies
  - Reflect privacy concerns of citizens

- Fund proposals that address any aspect of security, privacy, dependability, reliability and safety of systems and networks

- Proposal Deadline: March 24, 2008

CNS: Networking Technology and Systems

- Funds forward-looking, basic and experimental research to increase our understanding of:
  - How complex, dynamic networks behave
  - How they can be designed to deliver sustainable end-to-end performance and services
  - How they can be managed and controlled to rapidly adapt to changes with high degree of reliability and minimal service disruption

- Supports evolutionary proposals - focus on radical approaches to address challenges of current Internet

- Supports revolutionary, clean-slate proposals - create a future Internet [Future INternet Design (FIND) projects]

- Proposal Deadline: March 25, 2008

Information and Intelligent Systems Division (IIS) Mission

- Supports science and engineering research and education projects that:
  - Develop new knowledge about the integration and co-evolution of social and technical systems
  - Increase the capabilities of human beings and machines to create, discover and reason with knowledge by advancing the ability to represent, collect, store, organize, visualize and communicate about data and information
  - Advance the state-of-the-art in the application of Information Technology (IT) to science and engineering problems
  - Advance knowledge about how computational systems can perform tasks autonomously, robustly, and flexibly

- Organized into three clusters:
  - Advancing Human-Centered Computing
  - Information Integration and Informatics
  - Robust Intelligence

Information and Intelligent Systems Division (IIS)

- Single yearly solicitation that funds core activities in all three programmatic areas

- Proposal Deadlines:
  - October 23, 2007 (Medium)
  - November 19, 2007 (Large)
  - December 10, 2007 (Small)
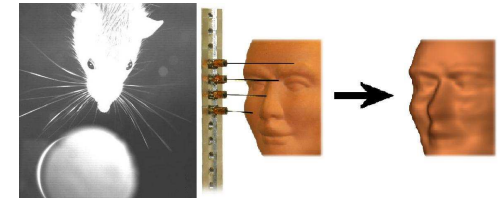
IIS: Information Integration and Informatics

- Focuses on processes and technologies for:

  Creating, storing, querying, representing, organizing, integrating, updating, analyzing, preserving, protecting, and interacting with digital content

- Supports research scales ranging from individuals to globally-distributed dynamic networked repository systems

IIS: Robust Intelligence

- Encompasses computational understanding and modeling of the many human and animal capabilities that demonstrate intelligence and adaptability in unstructured and uncertain environments

- Includes research in robotics, speech, vision, natural language processing, and other areas of artificial intelligence

Special Emphasis Programs

- Creative IT
- Software for Complex Systems

Continuing Programs

- Collaborative Research in Computational Neuroscience
- Community-Based Data Interoperability Networks
- High End Computing University Research Activity
- Mathematical Sciences: Innovations at the Interface with Computer Sciences
- Sustainable Digital Data Preservation and Access Network Partners (DataNet)

Funding Rates for All CISE Proposals