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Highlights of the

FY2001 IT R&D Budget Request

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Breakout of funding by PCA $ in Millions

PCA	FY2000 Enacted	FY2001 Request
HCI & IM	91.6	135.8
LSN	81.2	111.2
HECC R&D	83.8	102.1
HECC Apps & Infrastructure	206.0	285.2
SDP	15.8	39.5
HCSS	9.6	20.5
SEW & Workforce Dev.	28.6	45.3
Total	516.6	739.6

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- 51% of proposed FY2001 increase will support longer-term IT research (3 years out or longer)
- 29% of proposed FY2001 increase will support applications development
- 20% of proposed FY2001 increase will be used to acquire infrastructure

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- IT R&D supports NSF's broad mission to initiate and support:
  - Basic scientific and engineering research
  - Programs to strengthen scientific/engineering research potential and education at all levels
- Advances in IT research will enable *all* science and engineering communities and other sectors to be more productive and examine new, complex problems.
- IT investments will deliver capabilities and tools to benefit people at every level of education.

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- Software Design and Productivity
  - Application-focused software systems for end user programming.
  - “No-surprise” performance-engineered software and infrastructure systems.
  - Hardware/software co-design.
  - Theoretical foundations of on-line decision making.
  - Component-based software systems to address quality and productivity issues.

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- Human Computer Interface and Information Management
  - Technologies for meeting, working, and collaborating online.
  - Assistive technology to make computing accessible to more people.
  - Ubiquitous content infrastructure.
    - Online scientific data.
    - Large-scale scientific data mining research.
    - Seamless retrieval of available information.
  - Content-based information theory.

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- High Confidence Software and Systems
  - Technologies to build, design and analyze IT systems for security, availability, reliability and safety.
  - Verification of system designs.
  - Critical Infrastructure Protection: networking, high performance computing and software research that will enable computer and communications systems to be safer, more reliable, and free from intrusions.

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- Scalable Information Infrastructure (1)
  - Middleware for applications development on high performance networks.
  - Wireless network access with improved data rates and improved interoperability with fixed networks.
  - Broadband Internet access for tetherless devices.
  - Improved network architectures, protocols, monitoring, and management tools and techniques.

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- Scalable Information Infrastructure (2)
  - Understanding, modeling, and predicting network behavior.
  - Extending high performance network connectivity to additional members of the research and education community.
    - Access network technologies that extend reach of high performance network environments to more institutions, such as HBCU's and colleges, and closer to users.
    - Very high performance broadband access networks including optical networks.

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- High End Computing R&D
  - Revolutionary Computing (e.g., Quantum, Neuro-Biological and DNA Information Processing).
  - Advanced Computational Research.
    - Three technical thrusts: visualization, data handling, and parallel numerical algorithms.
    - Large Scientific and Software Data Set Visualization program.
    - Center for Large Data Sets and Analysis.

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- High End Applications in Biology
  - Computational algorithms and functional linkages among diverse databases for functional genomics and modeling.
  - New approaches to visualization of biological data.
  - Scaling algorithms essential for relating, for example, cellular functions to changes in ecosystems.
  - Data models that accommodate high degrees of complexity and ambiguity in biological systems.
  - IT for Biology Program.
    - Investment in areas of biological research poised to benefit from IT research advances, e.g., genomics, protein folding and molecular design.

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- High End Applications in Engineering
  - Simulation of complex molecular phenomena and macroscale systems.
  - Process modeling for the service sector: concurrent product, process and supply chain architectures and other structures; a semantic framework for managing information flow in an enterprise network.
  - Tether-free communications for secure and seamless information transmission and reception, and conduct of work and personal tasks from any location.

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- High End Applications in the Geosciences
  - Enhanced computational models and capacity at the National Center for Atmospheric Research.
  - Expanded capabilities of the Upper Atmospheric Research Collaboratory.
  - Continued development of computational resources to enable analysis and synthesis of data from major global ocean field programs, and develop predictive global- and regional-scale coupled ocean-atmosphere models.
  - Computationally challenging research topics in the Earth sciences including dynamic modeling of Earth system processes and management of very large data sets.

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- High End Applications in Mathematics and the Physical Sciences
  - Algorithm development, statistical analysis, optimization theory, network design, physics of information, under-standing limits to computation, and fundamentals of quantum/optical computing.
  - Ultra-miniature chemical switches, gates, new realizations of electronics, nano-devices and revolutionary computing.
  - Advanced computational methods for chemistry, materials, etc..
  - Integration of computation and measurement for “smart” networked instruments.

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- High End Computing Acquisitions
  - Second 5 teraflop computing system acquired in FY 2001.
  - Terascale Computing System FY 2000 Milestones
    - 12/30/99 Solicitation released for FY 00
    - 04/03/00 Proposals due
    - 06/15/00 Site visits completed
    - 07/15/00 Recommendations and NSB documents prepared
    - 08/03/00 NSB action
    - 09/15/00 First Terascale award in place
    - 02/15/01 System in “user friendly” mode
    - 04/01/01 Sustained demonstrated of an application
  - Terascale FY 2001 Competition
    - 11/01/00 Solicitation released
    - All other dates follow 2 MO earlier than FY 2000 milestones.

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- Social, Economic, and Workforce Implications of IT and Workforce Development (1)
  - Demonstration tests of new Internet-based research techniques, e.g., online interviews and surveys.
  - Research developing and employing digital libraries.
  - Computational social science research to develop new techniques for collecting, archiving and analyzing social-science data.
  - Enhanced support for IT in Advanced Technological Education program
  - Expanded research on social, economic, legal and ethical implications of IT and the digital divide.

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- Social, Economic, and Workforce Implications of IT and Workforce Development (2)
  - Research on reasons for lower participation in IT education and career paths by women and minorities.
  - Research on IT use in educational settings.
  - Research in Interactive Education program.
    - A research base for new means of delivering education to traditional and non-traditional students.
  - College Connections program.
    - Network middleware and connectivity to facilitate access to high bandwidth networks for four-year colleges across the country.

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- Funding Mechanisms (1)
  - Mechanisms used to Accomplish Proposed R&D
    - Managed by CISE Directorate and coordinated by cross-directorate ITR Coordinating Committee
    - Increased emphasis in all areas with a particular increase in scientific research applications of IT
    - One cross-directorate solicitation will be issue
    - Standard NSF merit review process will be employed
    - Review process will be modeled primarily on FY 2000 competition. New in FY 2001, each directorate will take leadership in review of relevant application-driven proposals, with participation from CISE

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- Funding Mechanisms (2)
  - Plans for Funding Types of Centers Recommended by the PITAC
    - NSF will initiate an additional 11 centers focused on major disciplinary science and engineering research challenges.
    - Some centers will develop testbeds and will have significant education, training and outreach components.
    - Some centers may be "virtual" centers that join geographically separate institutions via high performance network links; others may be at a single location.
  - An estimated 100% of funding will go to institutions of higher education.

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- Coordination and Collaboration in IT R&D
  - NSF, a basic research agency, is especially a leader in:
    - Teleimmersion and human computer interaction; assistive technologies; ubiquitous network access; network middleware; interactive educataional technologies; software languages and environments; and SEW aspects of IT.
  - NSF's efforts complement:
    - DoE activity in high performance computing (HPC), NASA activity in synthetic environments, DARPA activity in embedded systems, and NIH activity in digital atlases and HPC.
  - NSF is coordinating efforts with DARPA on embedded systems and digital libraries and with NIH on HPC.
  - NSF recently signed an MOU with NASA on a broad range of research topics, including information science.

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- Expected Congressional Reaction to FY2001 Budget Request
  - NSF expects strong bipartisan Congressional support.
  - PITAC can continue to express support for the IT R&D initiative and to make the case why the initiative is vital to the Nation's continued leadership in IT and consequently it's economic well being.