

Name and brief description of program:
**The Federal Networking and Information Technology
Research and Development (NITRD) Program**

Contact: National Coordinating Office NITRD: Director Simon Szykman, szykman@nitrd.gov

The NITRD Program is the Nation's primary source of Federally funded revolutionary breakthroughs in advanced information technologies such as computing, networking, and software. A unique collaboration of more than a dozen Federal research and development agencies, the NITRD Program seeks to:

- Provide research and development foundations for assuring continued U.S. technological leadership in advanced networking, computing systems, software, and associated information technologies
- Provide research and development foundations for meeting the needs of the Federal government for advanced networking, computing systems, software, and associated information technologies
- Accelerate development and deployment of these technologies in order to maintain world leadership in science and engineering; enhance national defense and national and homeland security; improve U.S. productivity and competitiveness and promote long-term economic growth; improve the health of the U.S. citizenry; protect the environment; improve education, training, and lifelong learning; and improve the quality of life.

The eight major technical areas of NITRD investments, called Program Component Areas, are:

- **High End Computing (HEC) Infrastructure and Applications (I&A):** Federal activities to provide advanced computing systems, applications software, data management, and HEC R&D infrastructure to meet agency mission needs and to keep the United States at the forefront of 21st century science, engineering, and technology.
- **High End Computing (HEC) Research and Development (R&D):** Hardware and software R&D to enable the effective use of high-end systems to meet Federal agency mission needs, to address many of society's most challenging problems, and to strengthen the Nation's leadership in science, engineering, and technology.
- **Cyber Security and Information Assurance (CSIA):** Research and development to prevent, resist, detect, respond to, and/or recover from actions that compromise or threaten to compromise the availability, integrity, or confidentiality of computer-based systems such as those in critical infrastructures.
- **Human-Computer Interaction and Information Management (HCI&IM):** Activities aimed at increasing the benefit of computer technologies to humans, particularly the science and engineering R&D community. HCI&IM R&D invests in technologies for mapping human knowledge into computing systems, communications networks, and information systems and back to human beings, for human analysis, understanding, and use.
- **Large Scale Networking (LSN):** R&D in leading-edge networking technologies, services, and enhanced performance, including new architectures, optical network testbeds, security, infrastructure, middleware, end-to-end performance measurement, grid and collaboration networking tools and services, and engineering, management, and use of large-scale networks for scientific and applications R&D.
- **High Confidence Software and Systems (HCSS):** R&D to bolster the Nation's capability and capacity for engineering effective and efficient distributed, real-time, IT-centric systems that

are certifiably and inherently dependable, reliable, safe, secure, fault-tolerant, survivable, and trustworthy.

- **Social, Economic, and Workforce Implications of IT and IT Workforce Development (SEW):** R&D investigating the nature and dynamics of IT and its implications for social, economic, and legal systems as well as the interactions between people and IT devices and capabilities; IT workforce development needs; the role of innovative IT applications in education and training; and transfer of networking and IT R&D results to policymaking and IT user communities.
- **Software Design and Productivity (SDP):** R&D leading to fundamental advances in the concepts, methods, techniques, and tools for software design, development, and maintenance that can address the widening gap between the needs of Federal agencies and society for usable and dependable software-based systems, and the ability to produce them in a timely, predictable, and cost-effective manner.

The sections below summarize highlights of NITRD Program R&D activities led by NIH, as well as interagency R&D and coordination activities in which NIH is a partner, for each of the NITRD Program Coordination Areas.

High End Computing (HEC) Infrastructure and Applications (I&A)

(To request information about NIH points of contact for HEC I&A activities, please contact Buff Miner at miner@nitrd.gov.)

- NIH Roadmap National Centers for Biomedical Computing (NCBCs).
- Cancer Imaging and Computational Centers.
- National Library of Medicine information and analysis servers.
- International networks for biomedical data and software sharing.
- Bioinformatics resource centers for emerging and re-emerging infectious disease.
- Proteomics and protein structure initiatives.
- Modeling of infectious disease: NSF providing Extensible Terascale Facility resources and expertise for NIH large-scale Models of Infectious Disease Agents Study (MIDAS).

High End Computing (HEC) Research and Development (R&D)

(To request information about NIH points of contact for HEC R&D activities, please contact Buff Miner at miner@nitrd.gov.)

- NIH participation in technical and planning activities associated with the DARPA High Productivity Computing Systems Program and related workshops including Storage and I/O Workshop to coordinate new HEC University Research Activity, and a HEC Requirements Workshop supporting new NSF HEC initiative (with DARPA and several other agencies).

Cyber Security and Information Assurance (CSIA):

(To request information about NIH points of contact for CSIA activities, please contact Alan Inouye at inouye@nitrd.gov.)

- NIH work in cyber security and information assurance R&D is aimed at supporting the mission of the Institutes, with an emphasis on continuing the development of the security infrastructure to support distributed multi-organization federated data and computation, including fine-grained access control for biomedical information.

Human-Computer Interaction and Information Management (HCI&IM)

(To request information about NIH points of contact for HCI&IM activities, please contact Frankie King at king@nitrd.gov.)

- NIH participation in activities associated with the Remote Sensing Information Gateway: Global Earth Observation Systems of Systems (GEOSS) demonstration project to share and integrate Earth observational data with initial applications to support air quality goals (with EPA, NASA, and NOAA).
- NIH efforts for Drug information and standards: Build system to obtain drug information with standardized definitions and in standardized formats from manufacturers, approve and transmit the information to Federal Web sites, including mapping clinical vocabularies and coding systems to clinical reference terminology adopted by HHS, VA, and DoD, and metadata registry of data standards terms (with AHRQ, NIH, NIST, FDA, HHS (CMS), and other agencies).
- NIH planning for collaboration to include workshop(s) and eventual joint program in health informatics (with NSF).
- NIH work on curation and analysis of massive biomedical and clinical research data collections; tools to manage and use new databases; tools for building, integrating ontologies; software tools for visualizing complex datasets; curation tools; building nationwide support for standard vocabularies; and information integration.

Large Scale Networking (LSN)

(To request information about NIH points of contact for LSN activities, please contact Grant Miller at miller@nitrd.gov.)

- NIH participation on LSN Joint Engineering Team (JET) (with participation from numerous Federal agencies, universities and other academic research organizations, national labs, supercomputing centers, and vendors) focuses on various activities associated with advanced networks and networking testbeds, sharing of tools, data, best practices, and international coordination.
- NIH participation on LSN Middleware and Grid Infrastructure Coordination (MAGIC) Team (with participation from numerous Federal agencies, universities and other academic research organizations, national labs, supercomputing centers, and vendors) focuses on middleware and grid tools and services; applications; coordinated certificate authorities for security and privacy; collaboration infrastructure; standards development; and international coordination.
- NIH R&D on data and computational grids in support of biomedical research, including Biomedical Informatics Research Network (BIRN) and cancer Biomedical Informatics Grid; focus on quality of service, security, medical data privacy, network management, and collaborative infrastructure technologies.

High Confidence Software and Systems (HCSS)

(To request information about NIH points of contact for HCSS activities, please contact Frankie King at king@nitrd.gov.)

- NIH participation on development of open-source software for high-confidence medical devices, exploring future directions and practices for certification (with NSF, FDA, and other agencies).

Social, Economic, and Workforce Implications of IT and IT Workforce Development (SEW)

(To request information about NIH points of contact for SEW activities, please contact Martha Matzke at matzke@nitrd.gov.)

- NIH: Graduate and postdoctoral fellowship programs in bioinformatics.

Software Design and Productivity (SDP)

(To request information about NIH points of contact for SDP activities, please contact Buff Miner at miner@nitrd.gov.)

- NIH work on biomedical modeling tools: Development and dissemination of tools to enhance computational modeling of biological, biomedical, and behavioral sciences at scales ranging from the molecular to large populations (with NSF).
- NIH collaborative research in computational neuroscience: Providing a theoretical foundation and technological approaches for enhancing understanding of nervous system function through analytical and modeling tools that describe, traverse, and integrate different organizational levels and span broad temporal and spatial scales and multiple levels of abstraction (with NSF).
- NIH participation in Dynamic Data-Driven Applications Systems (DDDAS): Developing ability to dynamically incorporate additional data into executing applications and enable applications to dynamically steer the measurement process, creating new capabilities in a wide range of science and engineering areas (with NSF and NOAA).
- NIH contributions to interoperable biology databases: Developing data standards and ensuring interoperability of Internet-based databases important to biotechnology, with emphasis on structural biology (with DOE Office of Science, NIST, and NSF).
- Additional NIH activities include:
 - National Centers for Biomedical Computing (NCBCs) aimed at development, dissemination, and training of users of biomedical computing tools and user environments.
 - Creation and dissemination of curriculum materials to embed quantitative tools in undergraduate biology education.
 - Cancer imaging and computational centers.
 - Modeling of infectious disease and bioinformatics resource centers for emerging and re-emerging infectious disease.
 - Proteomics and protein structure initiatives.
 - Interagency activities in multiscale modeling in biomedical, biological, and behavioral systems.
 - Individual grants in such topics as simulation, informatics, and imaging tools.