

INFORMATION TECHNOLOGY LABORATORY

INFORMATION TECHNOLOGY LABORATORY (89): Develops and demonstrates evaluation techniques, testing methods, and standards to enable U.S. industry to develop usable, reliable, interoperable products for information technology; provides leadership and collaborative research to NIST programs in the areas of mathematics, statistics, and information technology use and services to enable NIST to maintain its status as a world class institution.

INFORMATION TECHNOLOGY LABORATORY OFFICE (890): Responsible for planning, directing, and implementing the scientific, technical, and administrative programs of the Laboratory through scientific, administrative, and support personnel.

OFFICE OF THE ASSOCIATE DIRECTOR FOR COMPUTING (890.01): Plans, coordinates, and assesses all aspects of the development and use of the central computing and communication resources of NIST; maintains a continuing review of computing and communication policy, user requirements, and staff resources to provide NIST programs with effective, high-quality computing and communications; and investigates and assesses innovative technical approaches to improve computing resource utilization.

OFFICE OF THE ASSISTANT DIRECTOR FOR BOULDER (890.02): Serves as the Information Technology Laboratory focal point at Boulder; coordinates with Gaithersburg-based divisions the activities of the Boulder staff; and coordinates Boulder implementations of central support for computing and communications.

OFFICE OF THE ASSOCIATE DIRECTOR FOR FEDERAL AND INDUSTRIAL RELATIONS (890.03): Plans, develops, coordinates, and reviews for quality the accomplishments and priorities of all programs and activities that involve significant interactions with the US industrial community and other federal agencies; assists NIST management at all levels and the technical staff in planning, executing, and delivering the results of technical work; establishes and maintains working relations with companies, industry associations, standards organizations, consortia, and government agencies; develops new activities and programs appropriate to the NIST mission in information technology (IT) fields; fosters determination of required responses to industrial needs in metrology for IT and of the impact of agency output; serves as an information resource on IT activities both within and outside NIST; and represents NIST to specific external organizations as assigned by the Director of NIST.

MATHEMATICAL AND COMPUTATIONAL SCIENCES DIVISION (891): Provides high-quality software and consulting services, performs research, and collaborates in the application of computer science and technology to computational problems in physical sciences and engineering at NIST; develops, installs, uses, and provides information and training in software systems, processors, languages, and algorithms for numerical computation and non-numerical scientific information processing, (including scientific data base management

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systems, advanced graphics and image processing, symbolic algebraic languages, and statistical, mathematical, and modeling languages); evaluates and validates algorithms for numerical calculation; provides, through research and development activities in engineering and applied computer science, new and improved computer communications facilities; and provides consulting and training to assist users in the effective utilization of the computing resources.

MATHEMATICAL MODELING GROUP (891.01): Develops the mathematical and computational tools and algorithms necessary for the fundamental understanding of physical systems and processes as well as advancing computational science; selects projects for their impact on high-tech programs in NIST and its clients, such as crystal growth, alloy solidification, complex multi-phase fluid flow, fracture and deformation, magnetic materials, and image analysis; performs research and maintains expertise in applied mathematics, mathematical and numerical analysis, algorithm design, and large-scale scientific computation on problems of interest to NIST, the Laboratory, and its clients; in collaboration with NIST and outside scientists, develops mathematical models and applies analytical and numerical methods to effect their solution; and consults in the use of advanced mathematical methods for modeling and solving such problems.

MATHEMATICAL SOFTWARE GROUP (891.02): Performs research and maintains expertise in the methodology and application of mathematical algorithms and software in support of computational science; works with NIST, academia, and industry on tools to ensure the performance, usability, reliability, portability, and compatibility of mathematical software via demonstrations, testbeds, prototypes, reference implementations and the wide dissemination of information; supports and advances the NIST scientific computing environment by developing mathematical algorithms of particular concern to NIST programs, implementing them in high-quality software, and consulting and collaborating with NIST scientists in their use; and applies expertise in areas such as high performance computing, computer arithmetic, software design, testing and evaluation methodology, and repository technology, as well as a variety of mathematical subdisciplines such as numerical analysis, special functions, linear algebra, partial differential equations, and symbolic computing.

OPTIMIZATION AND COMPUTATIONAL GEOMETRY GROUP (891.03): Performs research and maintains expertise in the theory, methodology, and application of optimization and computational geometry; develops and analyzes methods for solving various classes of optimization and geometry problems, and implements these algorithms in high-quality mathematical software; and consults and collaborates with NIST colleagues and clients in the use of optimization and computational geometry for solving problems that arise in a variety of science, manufacturing, control, and engineering applications.

COMPRESSION ALGORITHMS GROUP (891.04): Performs research and maintains expertise in the areas of data representation, data compression, image quality, and error resiliency of compression methods; develops tools for testing and measuring both the performance of compression algorithms and the quality of lossy compressed images and videos; explores models of the human visual system for objective evaluation of image quality and for the design of better compression algorithms; and provides support to clients and to organizational units at NIST involved in data compression.

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ADVANCED NETWORK TECHNOLOGIES DIVISION (892): Works as a partner with suppliers and users of information technology to improve the quality, manageability, reliability, security, and interoperability of networked systems; as part of the nation's metrology laboratory, provides test, measurement, and quality assurance techniques, tools, models, and reference data for emerging network technologies, and develops, demonstrates, and promotes these technologies through reference implementations, testbeds, guidelines, and standards. Technical programs focus on infrastructure and enabling technologies for advanced networks, interoperability among heterogeneous networks, and communication protocols.

HIGH SPEED NETWORK TECHNOLOGIES GROUP (892.01): Works with the communications industry to expedite the development of technologies for high speed networks and to promote the deployment and use of such technologies; emphases of the group include: testing methods and prototype development for high speed network technologies; interoperability among high speed network products; and analysis, simulation, and measurement of the performance characteristics of high speed network technologies.

WIRELESS COMMUNICATION TECHNOLOGIES GROUP (892.02): Investigates performance optimization and enhancements for information technology applications that are carried over wireless communications, especially such digital signal processing techniques as compression and error control encoding and promotes ubiquitous access through interface standardization and security measures; emphases of the group include: measurement methodologies; reference signals; evaluation methodologies; and testing methods and systems.

MULTIMEDIA AND DIGITAL VIDEO TECHNOLOGIES GROUP (892.03): Works with industry to promote the development of cost-effective, interoperable, distributed multimedia applications and to enable the development of digital video technologies for broadcast, interactive television, video-on-demand, and video conferencing; emphases of the group include: measurement techniques for characterization of distributed multimedia technologies and digital video devices and services; techniques for integrating multimedia services with network technologies; and industry-driven standards for multimedia technologies and digital video devices and services.

INTERNETWORKING TECHNOLOGIES GROUP (892.04): Works with industry fora and commercial suppliers to remove barriers to the next generation of secure and reliable internetworking technologies and integrated network services; emphases of the group include: testing methods and reference implementations for next-generation internetworking technologies; interoperability among next-generation internetworking products; and measurement techniques and performance characterizations for network services that integrate voice, video, and data.

COMPUTER SECURITY DIVISION (893): Works with industry and government to establish secure information technology systems by developing methods for protecting the integrity, confidentiality, reliability, and availability of information resources; enables the measurement and improvement of the security of information technology systems and networks; addresses such technical areas as: cryptographic based

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techniques, advanced authentication systems, communications security, public key certificate management, firewall policy and design, incident response, vulnerability analysis, security architectures, and security criteria and metrics; and produces standards, guidelines, prototypes, conformance tests, validated products, assurance metrics, and reference implementations.

SECURITY TECHNOLOGY GROUP (893.01): Works with industry and government to establish secure, interoperable information technology systems and networks by developing cryptographic methods for protecting the integrity, confidentiality, and authenticity of information resources; and addresses such technical areas as: secret and public key cryptographic techniques, advanced authentication systems, cryptographic protocols and interfaces, public key certificate management, smart tokens, cryptographic key escrowing, security architectures, and conformance testing.

SYSTEMS AND NETWORK SECURITY GROUP (893.02): Works with industry and government to establish secure, interoperable information technology systems; researches, develops, and applies current and emerging technology to protect the integrity, confidentiality, reliability, and availability of IT systems; and addresses such technical areas as: advanced countermeasures such as intrusion detection, firewalls, and scanning tools; vulnerability analysis/mitigation, access control, incident response, security criteria/metrics, assurance methods, and internet security.

INFORMATION ACCESS AND USER INTERFACES DIVISION (894): Accelerates the development of technologies that allow intuitive, efficient access, manipulation, and exchange of complex information by facilitating the creation of measurement methods and standards; coordinates and provides evaluation methodologies, test suites and corpora, prototypes, workshops, and standards and guidelines to enable faster transition into the commercial marketplace, in collaboration with industry, academia, and government; and researches technologies such as: the digitization and representation of multimedia data and the use of spoken and written natural language and visual interactive modalities for search and presentation of that information.

SPOKEN NATURAL LANGUAGE PROCESSING GROUP (894.01): Contributes to the advancement of the state-of-the art of spoken language processing (speech recognition and understanding) so that spoken language can reliably serve as an alternative modality for the human-computer interface; develops measurement methods; provides reference materials (speech corpora); coordinates community-wide benchmark tests within the research and development community; and builds prototype systems.

NATURAL LANGUAGE PROCESSING AND INFORMATION RETRIEVAL GROUP (894.02): Works with industry, academia, and other government agencies to promote the use of more effective and efficient techniques for manipulating (largely) unstructured textual information, especially the browsing, searching, and presentation of that information.

VISUAL IMAGE PROCESSING GROUP (894.03): Works to support the technology of image recognition in government and industry by developing new image recognition methods, developing techniques for the evaluation of existing methods, and providing technology transfer to the commercial imaging and document conversion industry; and explores new work in face recognition, fingerprint classification, commercial areas of OCR, and visual aspects of document processing.

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VISUALIZATION AND VIRTUAL REALITY GROUP (894.04): Conducts research in visualization, virtual environments, and related human computer interaction technologies to demonstrate the utility and feasibility of visual displays of information to industry and government; works to ensure that technology advances in three-dimensional information visualization and data exploration can be used effectively for the access, manipulation, and exchange of complex information; develops evaluation methodologies and reference sets and builds visualization reference systems for application areas such as manufacturing and information retrieval; and collaborates with others to illustrate and assess the effectiveness of the test and evaluation methods.

HIGH PERFORMANCE SYSTEMS AND SERVICES DIVISION (895): Enables effective application of high performance computing and communications systems (HPCS) in support of NIST and its interactions with industry, academia, the federal government, and the public by: (1) providing and managing state-of-the-art facilities which integrate and support an enterprise-wide heterogeneous information technology environment for NIST; (2) serving as a responsive, effective mission-critical resource spanning computational, communication, mass storage, security, archival, and visualization and graphics services; (3) serving as a testbed for R&D in high-performance computing and information technologies, and gaining experience in the deployment of these technologies and assessing their functional capabilities, interoperability, and operational characteristics; and (4) conducting research, development, and evaluation of innovative measurement and test methods, system architectures and software technologies for improved scalability, functionality, flexibility, reliability and economy of HPCS.

SCALABLE PARALLEL SYSTEMS AND APPLICATIONS GROUP (895.01): Develops innovative computer measurement methods implemented in software or hardware to improve understanding and promote the effectiveness of: (1) scalable parallel systems including tightly-coupled clusters with high-capacity network links such as asynchronous transfer mode (ATM) and (2) scalable interoperable input/output systems including optimization of system architectures; performs work involving bus and message-passing interfaces, very large scale integration (VLSI) development, statistical experiment design and representative applications, and the study of high density data storage systems and advanced display techniques; develops and maintains a productive environment for parallel processing and consults on scientific parallel applications; supports scientific applications and software for the distributed systems and the central computers, including training, updating of software and consulting on the use of software packages; supports visualization and graphics for both scientific and administrative tasks; and operates the Visualization Laboratory and video production facility and maintains a laboratory for investigation, modeling, and quick prototyping of new input/output technologies.

HIGH PERFORMANCE SYSTEMS USAGE GROUP (895.02): Manages all aspects of computing, storage, information systems, and associated infrastructure that the Laboratory provides in support of NIST programs; monitors security, performance, and workload for achieving maximum effective use of installed systems; and tracks emerging technology of high-performance systems to ensure that new technology is introduced that is the best possible match to NIST requirements.

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NETWORK AND TELECOMMUNICATIONS SYSTEMS GROUP (895.03): Manages all aspects of the network and telecommunication systems and services that the Laboratory provides in support of NIST programs; monitors security, performance, and workload to ensure maximum effective use of installed systems; and tracks emerging network and telecommunications technology to ensure that new technology and services are introduced that are the best possible match to NIST requirements.

DISTRIBUTED COMPUTING AND INFORMATION SERVICES DIVISION (896): Provides the information technology resources, supporting infrastructure, applied research, and assistance to NIST staff, collaborators, and clients in the conduct of NIST's scientific, engineering and administrative applications and in the dissemination of information, including: (1) an easy-to-use, robust, secure, distributed heterogeneous environment with support for desktop systems and workstations, network capabilities, information services, and access to external and mobile users; (2) common computing environments, information access tools, software development tools, and specialized applications software; (3) site-wide hardware maintenance for standardized desktop systems and workstations and site-wide software licensing, maintenance, and repositories for standardized platforms and applications; and (4) large scale testbeds, advanced prototypes and reliable systems as part of the continuous improvement in scope and quality of service.

DISTRIBUTED PROCESSING AND OPERATING SYSTEMS SUPPORT GROUP (896.01): Implements and supports distributed processing for UNIX systems, which includes designing an easy to use robust, secure heterogeneous environment; supports network interface software, selected applications such as E-mail, core utilities and system security; and consults on operating systems and core software for the NIST environment.

INFORMATION PROCESSING SUPPORT GROUP (896.02): Designs, implements, and maintains NIST's automated information processing systems, which includes: designing, implementing, and maintaining NIST's World Wide Web, electronic commerce, and information delivery systems; consults and conducts training on information delivery services; and designs, implements, and supports the Office of the Future technology.

ADMINISTRATIVE COMPUTING SUPPORT GROUP (896.03): Supports administrative application software and systems for various computer platforms; provides training to and consults with administrative users; and designs and implements new administrative systems.

PC SUPPORT GROUP (896.04): Provides hardware and software support for IBM-compatible PCs (personal computers) to NIST staff, collaborators, and clients; provides maintenance of the current NIST inventory of PCs; tests and recommends software and hardware upgrades; and ensures interoperability of system hardware and software.

SOFTWARE DIAGNOSTICS AND CONFORMANCE TESTING DIVISION (897): Develops software testing tools and methods that improve quality, conformance to standards, and correctness; participates with industry in the development of forward-looking standards; and leads efforts for conformance testing, even at the early development stage of standards.

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SOFTWARE QUALITY GROUP (897.01): Develops tools, methods, and related models for the tracing of software processes to variables and related resource utilizations, thus helping industry with improving the quality of software development and maintenance; and explores new work in semantic correctness, formal methods techniques, performance assessment, and benchmarking.

CONFORMANCE TESTING GROUP (897.02): Develops conformance testing scenarios, testing procedures and test suites, and related methods to help industry, the user community, and various testing laboratories with testing conformance to standards; and participates, as appropriate, with the standards making bodies to capture and incorporate the conformance criteria as early as possible.

SOFTWARE STANDARDS GROUP (897.03): Provides technical contributions to very selected and forward looking standards through the appropriate standards making bodies; addresses the various bindings and integration mechanisms necessary to promote and make usable some pivotal standards as per specific application domains; represents the federal user community interests as per appropriate Congressional Acts; and serves as the Laboratory liaison with appropriate standards committees.

STATISTICAL ENGINEERING DIVISION (898): Advances the state of information technology through collaborations in NIST measurement science and technology research programs to support U.S. industry, via design of experiments, statistical modeling, and analysis and interpretation of experimental data; participates in the Laboratory's interdisciplinary research and development teams to promote better use of information technology throughout NIST and into industry; contributes to the development of appropriate statistical methodology, building on a foundation of research in probability and mathematical statistics; provides leadership and computational tools to facilitate the implementation of modern statistical design, analysis, and process control procedures; and contributes to NIST outreach to industry through workshops, conference presentations, technical publications and handbooks, and design and analysis of interlaboratory experiments.

MEASUREMENT PROCESS EVALUATION GROUP (898.01): Advances information technology through the development and implementation of statistical tools and techniques to test methods and measurement results, such as: collaborates with NIST scientists and industrial partners in the development of test methods and the evaluation of their uncertainties; identifies and reduces error in measurement results; designs experiments that (1) assure parsimonious use of experimental resources for disseminating measurement units and (2) produce data appropriate for estimating the effect of multiple sources of error in measurement processes; develops and implements techniques for the assessment of uncertainties associated with measurement results in metrics appropriate to users' needs; develops and implements statistical procedures for assuring the quality of NIST measurement results; presents workshops and materials on statistical design, analysis, and evaluation of uncertainty of measurement results specifically tailored to industrial laboratories; and develops and distributes unique statistical and graphical software for implementation of innovative, exploratory and experimental test methods.

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STATISTICAL MODELING AND ANALYSIS GROUP (898.02): Advances information technology through the research and application of statistical modeling and analysis such as: researches and applies fundamental probability theory to basic and applied NIST and industrial research; adapts, extends, and applies modern statistical methodology to relevant applications in measurement science; develops and evaluates relevant model fitting procedures in light of underlying distribution theory and industrial practicality; collaborates with scientists and engineers in all NIST laboratories and among industrial partners to research, develop, and plan efficient experiments for maximum gain of information and minimum expenditure of resources; collaborates in the execution of experiments to ensure consistency with experimental protocol; carries out data analyses consistent with state-of-the-art technology, statistical methodology, and underlying distribution theory; provides education and training in the theory and application of fundamental experimental statistical concepts; and develops and disseminates NIST/industry accessible standard reference data sets and experimental designs for user-driven evaluation of design and analysis software.