ANNUAL REPORT 1993

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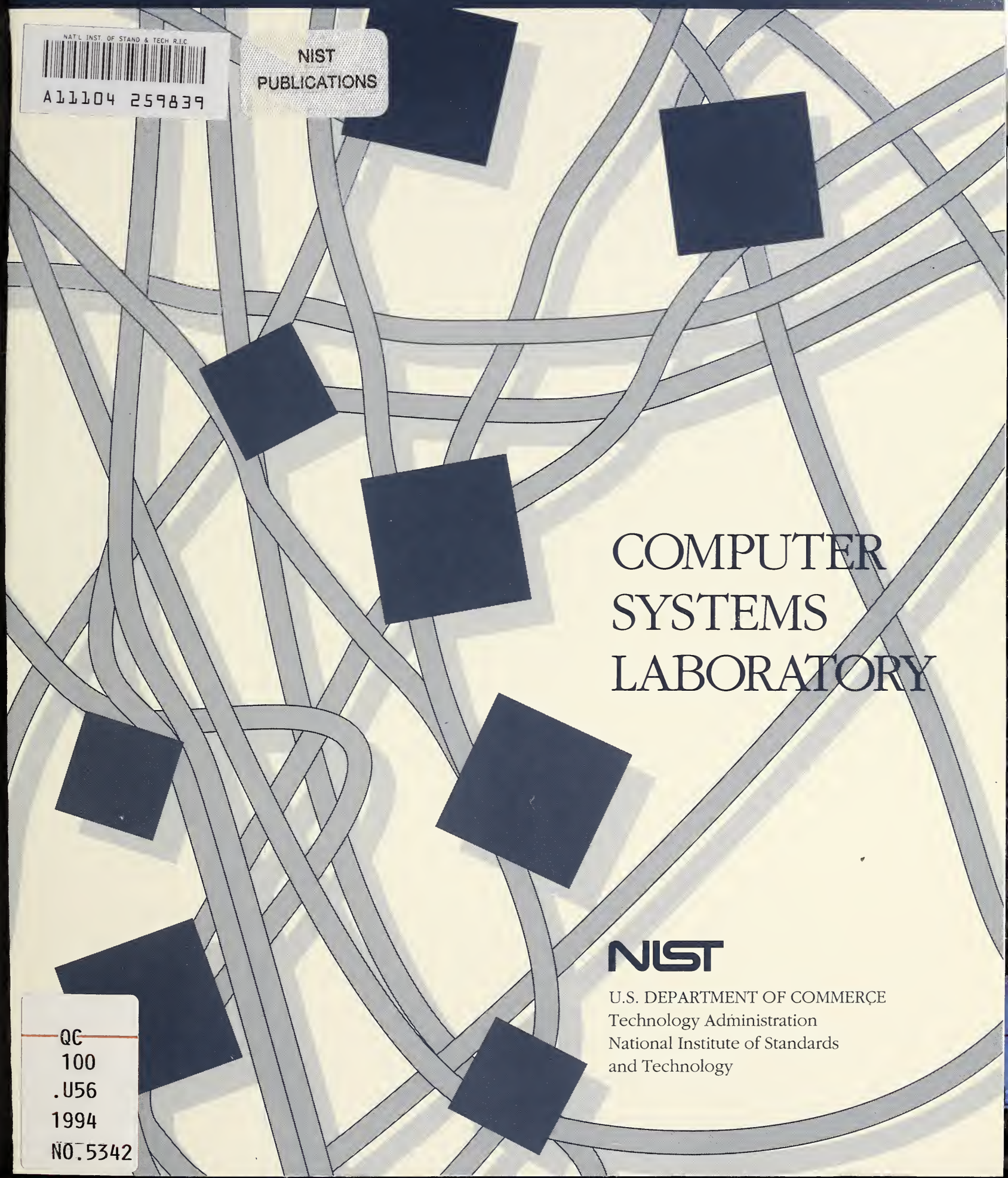

COMPUTER SYSTEMS LABORATORY

NIST

U.S. DEPARTMENT OF COMMERCE
Technology Administration
National Institute of Standards
and Technology

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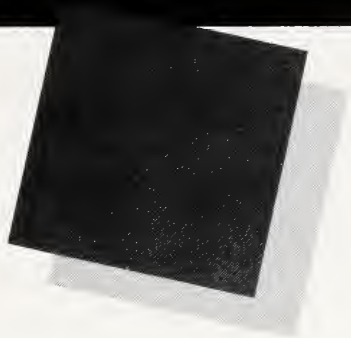

COMPUTER SYSTEMS LABORATORY

February 1994

U.S. DEPARTMENT OF COMMERCE
Ronald H. Brown, Secretary

TECHNOLOGY ADMINISTRATION
Mary L. Good, Under Secretary
for Technology

National Institute of Standards
and Technology
Arati Prabhakar, Director

Computer Systems Laboratory
James H. Burrows, Director

DIRECTOR'S FOREWORD

Two federal government initiatives make information technology an important agent in achieving goals for improved operation of the federal government and a revitalized economy. The first initiative, the planned National Information Infrastructure (NII), is envisioned to be a seamless web of communications, networks, computers, databases and consumer electronics that will put vast amounts of information at users' fingertips. In September 1993, the Administration issued an "Agenda for Action" that outlines a role for the government in promoting the development of the NII in partnership with the private sector, and in ensuring that all Americans have access to the NII.

The NII is expected to make information available to users in the form of video programming, scientific and business databases, images, sound recordings, library archives and other media. Applications and software will enable users to access, manipulate, organize and digest the information. The development of useful, reliable applications is a demanding challenge that NIST and other government organizations share.

The second initiative, the report of the Vice President's National Performance Review (NPR), "Creating a Government That Works Better and Costs Less," calls for expanded use of computer and telecommunications technologies to do new things and to create a government for the future. Applications for electronic benefit transfers, tax filing and reporting, electronic mail and access to information will help to improve the efficiency and easy use of government services, and to develop the government's portion of the NII.

These goals for the NII and the NPR will depend on more than just the availability of the technology. The information must be accessible in a form that is useful. Applications and software will be needed to allow users access to the information. Most important perhaps, people will be key to creating the information, developing the applications, and using the services and facilities.

The NII and NPR give us a vision for using information technology to improve products and services, create new ones, compete more effectively, and empower people to be more creative and efficient.

CSL Activities in 1993

The Computer Systems Laboratory at the National Institute of Standards and Technology works in areas of technology that are essential to both the NII and NPR. Standards, guidelines, research, test methods, technical agreements, advice and assistance are needed to develop interconnected, secure, reliable computer and telecommunications systems, and to accurately transfer information between different systems.

To achieve these goals, we continue to work with users, industry, and other governments, and to support national and international voluntary industry standards development activities. We also have expanded our collaborations with industry organizations and consortia that promote the interoperability of systems, and help the user select technical solutions that will work together.

This annual report details some selected standards, technical assistance and research efforts, many of which were carried out in conjunction with other organizations. Workshops and conferences have been important in creating alliances for working with others in areas from applications portability to wireless

communications to security and display technology. Our Open System Environments (OSE) Implementors' Workshop and the North American ISDN Users' Forum are examples of well-attended and productive activities that support the implementation of standards in commercial products and services.

Our directed research projects in text retrieval methodologies, automated indexing techniques, and automated character recognition, and other areas led to publications, papers, and standard databases that are used by industry in developing commercial products.

Security and reliability of systems are essential for public confidence in information technology. Last year we completed new guidelines and standards for computer security, and advanced the development of international evaluation criteria for specifying the proper level of security needed by users to protect their data, and to assure system availability.

Completed were a standard for secure message digests, the reaffirmation of the Data Encryption Standard for five years, a standard for security requirements for cryptographic modules, and a specification for automating the generation of random pronounceable passwords. Other security efforts were directed toward developing Smartcard technology for authentication of system users, analyzing telecommunications switches for secure operation, assisting government and industry in responding to computer security incidents, and providing guidance on anti-virus tools and secure databases.

The High Performance Computing and Communications Program continued to be a priority. Organized as an interagency activity in cooperation with industry and academe, this program addresses national needs for advanced computers, high-capacity and high-speed networks, and electronic data bases. CSL activities focused on the development and commercialization of technology to measure performance of advanced computer systems.

Numerous standards and guidance projects were concerned with improving the development of standards-based integrated systems for database, graphics, and other applications. A revised version of the Applications Portability Profile (APP) was completed, as were standards for graphics exchange and the user interface to graphics applications. New work was started in prototyping, testing and using electronic data interchange (EDI) applications to lay the foundation for the government's electronic commerce initiatives. We cooperated with industry in developing two standards that adopt widely used information modeling techniques.

Our Plans for 1994

We will be taking a close look at the standards process this year in conjunction with other federal agencies. In October 1993, I named an interagency panel to review open systems network requirements and to recommend policies on the use of networking standards by the federal government. The panel's report will cover policies and alternatives that will best meet the government's near- and long-term needs for networking, and for interoperability between the different network protocol suites. I expect the report to be discussed in 1994 and to be part of a broader review that will be conducted of the government's role in the information system standards process.

Studies such as *Global Standards: Building Blocks for the Future* carried out by the Office of Technology Assessment, and *Crossroads of Information Technology* carried out by the National Research Council have pointed out that the standards process is slow and has not kept up with the rapid changes in information technology. Standards that are developed are complex and allow for multiple options that must be selected by users to achieve interoperable systems.

There are other barriers to national and international connectivity resulting from the division of responsibility for standards development among different regulated and non-regulated standards-making bodies. No single organization is responsible for developing standards for or delivering services for cable TV, mobile, broadcast and wireless communications technologies, all of which are becoming a part of the telecommunications infrastructure.

We want to explore if the government can strengthen the industry-driven process of standards development by participating more actively in private-sector standards-writing bodies and if there are other ways to work more closely with industry to address the technical barriers to interoperability and to the adoption of new technologies. We want to help establish a process for assisting in the determination of the standards needed for the NII, for accelerating the development and implementation of needed standards, and for coordinating policies for standards.

The security of systems and networks will be essential to the success of the NII. Users must be assured of the integrity, confidentiality, and availability of the information that is transmitted over the NII. Business and research are being conducted on a global basis over computer networks, yet many basic safeguards for information and systems are not available, or are not yet endorsed as standards. We realize that there will not be a single security solution for all applications; however, we want the government's solutions to be interoperable with those selected by other communities.

The development of applications for the NII will be a high priority. Manufacturing applications will be the focus of many projects within NIST. We will also support the development of applications for government-wide electronic mail, electronic commerce, and electronic delivery of federal services, all considered essential for an effective modern government by the NPR.

We will be assessing solutions both within and outside the standards-setting machinery, looking for answers that will be appropriate for rapidly moving areas of technology and that will help users make suitable technological selections. We will also explore different ways of working with industry and academia to solve specific problems. We are especially optimistic that cooperative research and development agreements (CRADAs) will be useful and productive in addressing issues such as sharing and exchange of electronic documents.

I look forward to a productive 1994, and I invite your comments and suggestions on our activities.

James H. Burrows
Director
Computer Systems Laboratory

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OVERVIEW OF THE COMPUTER SYSTEMS LABORATORY

Director: James H. Burrows
Associate Director for Computer Security: F. Lynn McNulty
Associate Director for Program Implementation: R.J. Linn
NIST Fellow: Dennis Branstad
Senior Management Advisor: Judith L. Lyons
Program Coordination and Support: Shirley M. Radack
Voluntary Standards Liaison: Michael Hogan

The development of high performance computing and communications networks, the development and promotion of applications such as electronic commerce, and information security and network reliability are all significant issues which must be addressed in building the National Information Infrastructure. This planned network of communications capabilities, computer systems, databases, and information resources will revolutionize the way people live and work in the last half of the 1990s and the next century.

The Computer Systems Laboratory (CSL), a major research component of the National Institute of Standards and Technology (NIST) of the U.S. Department of Commerce, contributes to these national goals through research, technical expertise, and the development of information processing standards, guidelines, and test methods. We support U.S. industry by fostering the development and commercialization of advanced computer and telecommunications technologies. The Brooks Act (Public Law 89-306), the Computer Security Act of 1987 (Public Law 100-235), and the Omnibus Trade and Competitiveness Act of 1988 (Public Law 100-418) mandate CSL's programs and research activities.

The National Information Infrastructure (NII)

CSL is a key player in developing technologies that support interoperability and openness for the NII. We support high performance computing and communications through research and development of advanced technologies, test methods, and standards for high-speed networks and applications, parallel processing, data storage technologies, and software tools. Technology advances help to promote new integrated applications such as electronic commerce, manufacturing, and delivery of government services and information. CSL's computer security program, in effect since the 1970s and reaffirmed by the Computer Security Act of 1987, develops ways to protect the integrity, confidentiality, and availability of valuable information resources in the networked, interoperable computer and communications systems of today and the future.

Meeting Diverse Requirements Through Open Systems

Users have a diversity of requirements which no single vendor can supply. Meeting the diverse needs of government and industry users requires an operating environment in which hardware, software, and telecommunications products interoperate. Through cooperative interactions with industry, users, and voluntary industry standards organizations, CSL supports the development of technology and standards for application portability, interoperability, and computing architectures which support open systems. As a result, more off-the-shelf products are now available commercially to move information, applications, and technical skills among dissimilar computer systems.

Technology Transfer

Often in collaboration with industry or in support of other federal agencies, our laboratory-based research program supports and complements our standards activities and technical assistance functions. Research areas include data management, software engineering, information security, network architectures, and advanced systems technologies. The development of test and measurement methods to evaluate conformance of products to standards remains a significant part of CSL's research program. In 1993 three researchers received a patent for their work in automated character recognition, and six patent applications are currently pending. Technology transfer to federal agencies and industry provides for broad dissemination of new technologies, enhancing gains in U.S. productivity and maintaining competitiveness in the global marketplace.

Interactions are Key

The Cooperative Research and Development Agreement (CRADA) is one of several measures which we use to structure our interactions with federal agencies and industry organizations. In 1993, we collaborated with 42 government, industry, and academic institutions through CRADAs to pursue common goals. Our ongoing workshop efforts continued, including the Open System Environment (OSE) Implementors' Workshop (OIW), the Applications Portability Profile (APP)/OSE Users' Forum, and the North American ISDN Users' Forum (NIUF). We established a new workshop activity in the area of wireless technologies, the Federal Wireless Users' Forum (FWUF). Many other informal interactions with government and industry partners involved the sharing of equipment or expertise. These cooperative arrangements benefit all parties involved and significantly speed the commercialization of new products and emerging technologies.

Organizational Resources

CSL's technical work is accomplished in five divisions: Information Systems Engineering Division, Systems and Software Technology Division, Computer Security Division, Systems and Network Architecture Division, and Advanced Systems Division. Our professional staff consists of computer scientists, computer specialists, electrical and electronics engineers, and mathematicians. Staffing resources in FY 1993 included 251 full-time-equivalent employees of which 75% were professional and technical staff and 25% were administrative support personnel. In addition to CSL staff, about 40 research associates, guest scientists, and faculty appointments enhanced our research program.

Funding for CSL programs in FY 1993 consisted of $13.1 million from the NIST Congressional appropriation (STRS), including $1.0 million in NIST-supported competency funding and $18.5 million in reimbursable funds, mostly from other federal agencies for direct technical assistance. About 41 organizations in government and industry received reimbursable technical support from CSL in FY 1993. See the Technology Transfer section of this report for a complete list of our collaborative interactions.

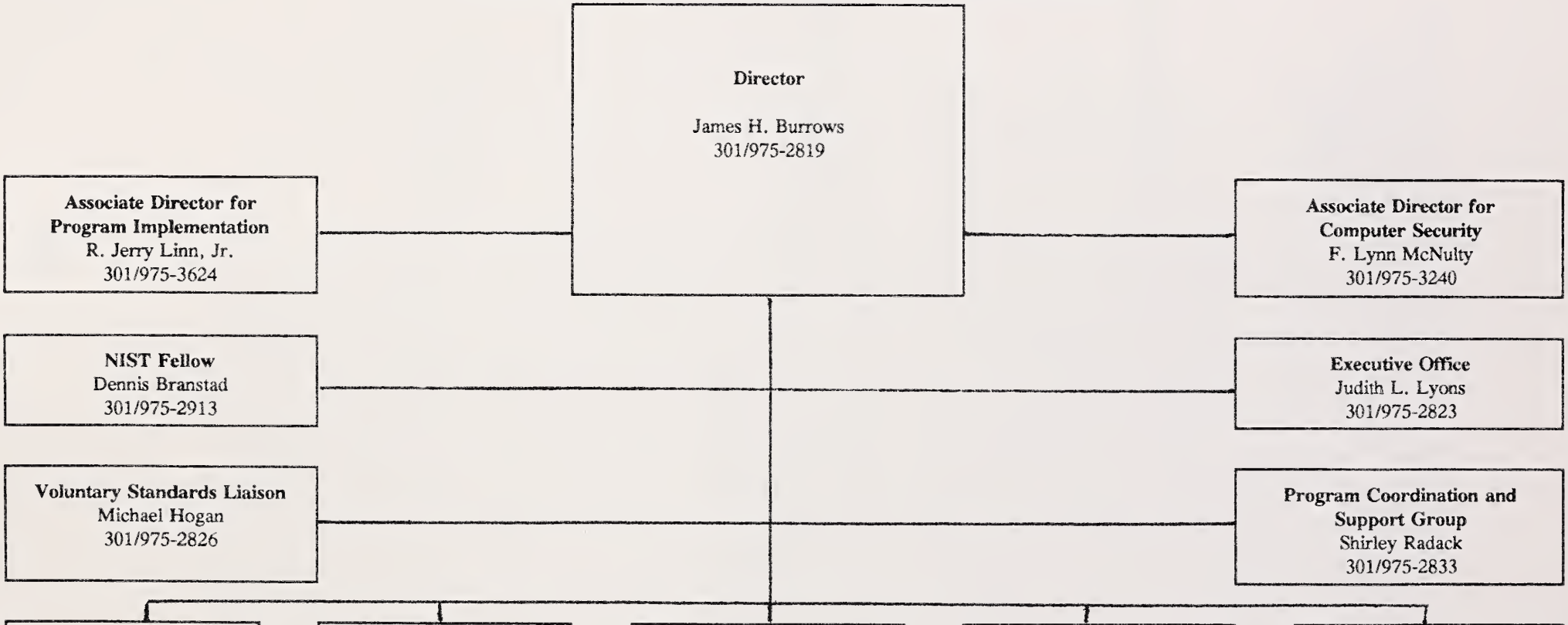
Sharing Information a Priority

Our organization shares information and technology with government, business, academia, and the public through a variety of resources. CSL publishes Federal Information Processing Standards (FIPS) and guidelines; special publications series focusing on computer systems, computer security, and ISDN; technical interagency reports on research and tests; a quarterly "CSL" newsletter; and a CSL bulletin series published about eight times a year on topics of interest to the information systems community. See the Technology Transfer section for a list of FIPS and other publications currently available for sale through the Government Printing Office (GPO) or the National Technical Information Service (NTIS). We also sponsor and host a variety of conferences and workshops throughout the year, and our staff members address many federal and private organizations.

In response to computer users with dial-up capability, we maintain three electronic bulletin boards which provide information on computer security, data management, and Integrated Services Digital Network (ISDN). Our Validated Products List is also available on-line. Access instructions for these resources appear in Technology Transfer.

Technical highlights of our five divisions follow.

COMPUTER SYSTEMS LABORATORY



- Data Management Technology
- Computer Graphics
- Knowledge-Based Systems
- Software Standards Validation

- Open Systems Environment
- Software Quality and Assurance
- Office Systems Engineering
- Integrated Software Engineering Environments

- Security Management
- Security Technology
- Network Security Architectures
- Evaluation and Validation Techniques

- Automated Protocol Methods
- Network Applications
- Network Management
- Network Protocols
- Network Architecture

- Image Recognition
- Speech Recognition
- Parallel Processing
- Advanced Communications
- Computer Storage Media
- Distributed Systems

January 1, 1994

INFORMATION SYSTEMS ENGINEERING DIVISION

Chief: David K. Jefferson
Group Managers: Joseph C. Collica, Database & Graphics
Bruce K. Rosen, Data Administration
Mark W. Skall, Graphics Software
L. Arnold Johnson, Software Standards Validation
Shirley M. Hurwitz, Database Languages

Using standards as a tool to integrate business applications which share data electronically is an efficient and cost-effective means of improving business processes. To accomplish this objective for federal and industry organizations, the Information Systems Engineering Division develops standards and provides technical assistance in data management and database languages, data administration, computer graphics, and software standards validation.

Data Management

Under an interagency agreement with the Department of Defense, CSL continued its assistance to the Continuous Acquisition and Life-Cycle Support (CALS) (formerly Computer-aided Acquisition and Logistic Support) project in the application of SQL and other data management standards to CALS requirements. A preliminary report for object management in CALS resulted from these efforts. Support to the Advanced Research Projects Agency (ARPA) for object database technology continued, as well as support to the Department of Commerce (DoC), Office of Financial Management, in their efforts to acquire a centralized financial management system for the agency. A draft report "Open System Environment and Transition Framework for Department of Commerce's Financial Management System" describes this technical assistance.

In cooperation with the Systems and Software Technology Division, researchers completed their fifth year of a project in hypertext/hypermedia. The laboratory-based research is carried out in the Multimedia Systems and Database Laboratories. Through talks, workshops, and publications, project members shared knowledge and experience in the integration of hypertext technology with expert systems, database, graphics, publishing, and other business applications.

Database Languages

Division researchers participated in the development and coordination of a substantial enhancement to Federal Information Processing Standard (FIPS) 127-1, Database Language SQL. Published as FIPS 127-2, the revised standard is for use in federal procurements of relational model database management systems. FIPS 127-2 adds significant new features for schema definition, diagnostics management, integrity constraints, and international character set support, as well as new data types, new table operations, and enhanced data manipulation expressions. A new Information Schema makes all schema data available to applications.

FIPS 127-2 provides for four separate levels of implementation: Entry SQL, Transitional SQL, Intermediate SQL, and Full SQL. Although only Entry SQL is required, initially, for conformance to FIPS 127-2, a higher conformance level may be specified by agencies to meet their specific requirements.

CSL continued to support the implementation of the SQL standard through its conformance testing program. Version 4.0 of the NIST SQL Test Suite became publicly available for general purchase in July 1993. Version 4.0 provides conformance tests for the Entry SQL level of FIPS 127-2. Version 4.0 provides 11 test suite types (interfaces) including Embedded and Module Language tests for Ada, C, COBOL, Fortran, and Pascal plus Interactive SQL tests. Twenty-two SQL Test Suite licenses were added this fiscal year. Since the NIST SQL Test Suite was released, over 140 SQL Test Suite licenses have been purchased for all versions of the test suite.

Data Administration

CSL continued its support to the voluntary standards efforts concerning the Information Resource Dictionary System (IRDS), both at the American National Standards Institute (ANSI) level and the International Organization for Standardization (ISO) level. Both standards organizations have focused their efforts on the development of the next generation IRDS (IRDS2) that would be adopted as a voluntary industry standard.

CSL maintained its leadership roles in the development of IRDS2, including chairmanship of an IRDS technical subcommittee, editorship of the IRDS2 requirements document, and U.S. International Representative to the ISO IRDS committee. Development efforts on IRDS2 focus on utilizing the IRDS as a mechanism to integrate the results produced through the use of Computer-Aided Software Engineering (CASE) tools throughout an application system's life cycle. CSL is concentrating its efforts in coordinating ANSI and ISO development work on IRDS2 so that the final standards specifications are in agreement. Integrating the ongoing national and international voluntary industry standards work in IRDS with the work now underway in the CASE Data Interchange Format (CDIF) standards committee is another area of CSL interest.

Recently approved were two new FIPS for software modeling techniques: FIPS 183, Integration Definition for Function Modeling (IDEFO), and FIPS 184, Integration Definition for Information Modeling (IDEF1X). The FIPS adopt nonproprietary IDEF modeling techniques developed by government and industry for use in the analysis and development of information systems. CSL will continue to work closely with industry to expand the coverage of the IDEF modeling methodologies over a larger portion of the system development life cycle.

CSL maintained working agreements with the Department of Education, the Environmental Protection Agency, the Internal Revenue Service, and DoD in areas such as tool integration, establishment of data administration policy for an organization, and integration of modeling methodologies. In these interactions and others, CSL seeks to ensure that organizations use established standards to integrate applications which share data electronically in an open systems environment.

NIST Special Publication 500-208, Manual for Data Administration, gives guidance to data administrators in developing and implementing a data administration function. CSL once again hosted the annual Data Administration Management Association (DAMA) Symposium sponsored by the DAMA National Capital Region. This year's conference focused on "Business Reengineering: The Competitive Edge."

Computer Graphics

Two FIPS which will have significant impact on federal agencies were developed in FY 1993. FIPS 177, Initial Graphics Exchange Specification (IGES), allows agencies to exchange computer-aided design and computer-aided manufacturing (CAD/CAM) information both within agencies and among different agencies. FIPS 177 helps to ensure that agencies don't get "locked in" to one CAD/CAM system and can generate CAD/CAM data on one system and manipulate it on a different system.

FIPS 128, Computer Graphics Metafile (CGM), was revised and published as FIPS 128-1. The revised standard adds a significant amount of new functionality and adopts the CALS Application Profile (MIL-D-28003A). MIL-D-28003A was originally developed for the DoD community but is being commonly implemented and used in many different applications both within and outside the defense community. Other application profiles may be added to FIPS 128-1 if found to be useful to federal agency applications. A draft revision to FIPS 173, Spatial Data Transfer Standard (SDTS), was developed to add a Topological Vector Profile (TVP) for the transfer of vector data between dissimilar computer systems.

Conformance testing services which continue to operate include the GKS Testing Service, the PHIGS Testing Service, and the CGM File Testing Service. A CGM Generator Testing Service which determines conformance of generators to FIPS 128-1 and to MIL-D-28003A began in FY 1993. A CGM Interpreter Testing Service has been developed and will be beta tested next year. Both CGM generators and interpreters should be validated and certified to ensure a complete and accurate exchange of graphical picture data.

CSL signed a license agreement with the University of Leeds in the United Kingdom which allows CSL to use the University's test suite to perform IGES testing in the United States. The test suite is currently being beta tested. It will be used initially to test for FIPS 177 and will later be enhanced to test for a subset of the CALS IGES specification (MIL-D-28000).

Software Standards Validation

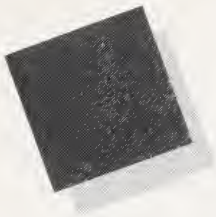
Testing programming language compilers for conformance to FIPS and Federal Information Resources Management Regulations (FIRMR) continues to be an important service. CSL provides validation services for programming languages COBOL (FIPS 21-3), Fortran (FIPS 69-1), Pascal (FIPS 109), Ada (FIPS 119), MUMPS (FIPS 125) and C (FIPS 160). CSL updated and released new test suites for COBOL and C this year.

Twenty-five new Database Language SQL implementations from seven vendors were validated for conformance to FIPS 127-1, resulting in a total of 42 SQL implementations currently validated. During FY 1993, CSL provided programming language and database validation services to 30 private-sector companies and one government agency for a total of 146 validations. The total number of programming and database language processors currently validated as of September 30, 1993, is 511.

The quarterly Validated Products List, a collection of registers listing implementations of FIPS that have been tested for conformance to FIPS, grew substantially during the past year. The VPL now lists over 900 implementations (products) covering FIPS conformance testing programs for programming languages, database, graphics, operating systems, open systems, and computer security. Areas covered in the VPL include six programming languages; database language SQL; graphics; GOSIP; POSIX; and computer security. The publication is available through the National Technical Information Service on a single-issue or subscription basis.

In cooperation with the Department of Veterans Affairs, CSL developed a revision to FIPS 125, MUMPS, which adopts ANSI/MDC 11.1-1990. Approved and republished as FIPS 125-1, the standard promotes the portability of MUMPS programs for use on a variety of computer systems. A test suite for FIPS 125-1 is also being developed and is expected to be released in 1994.

CSL maintained a working agreement with the Department of Defense to advance software reuse technology for improving the production of reliable and affordable software. Focus areas in software reuse are domain analysis methods, software reuse terminology, software reuse metrics, and software reuse incentives.



SYSTEMS AND SOFTWARE TECHNOLOGY DIVISION

Chief: Roger J. Martin
Group Managers: Fritz Schulz, Distributed Systems Engineering
Tom Rhodes, Software Engineering
Lawrence A. Welsch, Office Systems Engineering

The linking of systems and networks to exchange information depends upon the interoperability of distributed systems, the portability of applications, and advanced software components and tools. The Systems and Software Technology Division addresses these and other challenges in distributed systems engineering, software engineering, and office systems engineering.

Open System Environment

CSL published a major revision of its APP Guide, NIST Special Publication 500-210, Application Portability Profile (APP) The U.S. Government's Open System Environment (OSE) Profile/1 Version 2.0. The additional specifications provide guidance on services required to support distributed systems. The APP Guide defines an open system environment (OSE) framework by describing the information technology (IT) services, protocols, interfaces, and data formats needed by the U.S. government to support a broad range of federal applications. In addition to federal agencies, many industry organizations have adopted the recommended specifications in their internal environments to provide better procurement, management, and utilization of IT resources.

The semi-annual APP/OSE Users' Forum provides users, vendors, and implementors with the opportunity to gain information about and respond to CSL proposals regarding the evaluation and adoption of an integrated set of standards to support the APP and OSE. These forums promote interchange on OSE developments in the federal government and provide guidance to federal agencies. The format has been expanded to include mini-workshops which focus on major topics such as OSE Procurement and Security in OSE. Attendance at this forum has doubled in the past year.

Meeting four times in 1993, the OSE Implementors' Workshop (OIW) is a public international technical forum for the development of implementation agreements (profiles) based on emerging international standards and publicly available specifications. This year, the OIW expanded into OSE applications such as electronic commerce, multimedia, and convergence of OSI and TCP/IP network standards. A new process was established to respond to user requirements in creating profiles and a mechanism was developed for the use of public specifications where required formal standards do not exist. NIST Special Publication 500-206, Stable Implementation Agreements for Open Systems Interconnection Protocols, Version 6, Edition 1, contains the agreements approved by the OIW to date. Harmonization of OIW activities with those of other regional workshops continued.

Distributed System Engineering (DSE) Laboratory

The DSE laboratory provides a testbed in which OSE-compliant distributed system technologies can be integrated, evaluated, and assessed in terms of their ability to support application software portability and interoperability. The laboratory provides an infrastructure to allow research and operation of distributed system software, distributed applications, and operation support tools. A plan has been developed to make the DSE laboratory useful to other agencies and organizations in developing their own distributed systems laboratories.

The DSE laboratory program, in conjunction with other agencies and industry, is also developing a Core Distributed Platform Profile (DPP). This profile will establish a procurement and engineering baseline, identifying the minimum requirements for an application platform to qualify for inclusion in a distributed system.

NIST POSIX Conformance Testing

Initiated in May 1991, the NIST POSIX Testing Program expanded to provide testing for the newly adopted revision of Federal Information Processing Standard (FIPS) 151-2, Portable Operating System for Computing Environments (POSIX). POSIX promotes the portability of applications software at the source code level between computer systems from multiple vendors. Each validated product has been tested by an accredited testing laboratory using the NIST POSIX Conformance Test Suite (NIST-PCTS). CSL reviews test results and issues certificates of validation.

Over 125 products have been issued validation certificates for conformance to FIPS 151-1. In September 1993, CSL began issuing certificates for FIPS 151-2. Conformant products are listed in CSL's Validated Products List and are also available on electronic mail file server system. To obtain a copy of these lists, send the e-mail message "send info" to the e-mail address "posix@nist.gov".

An information server has also been established which provides electronic access to APP/OSE Users' Forum and OSE Implementors' Workshop specifications, documents, and schedules, as well as other reports, publications, and draft standards. Services currently available include electronic mail, Internet File Transfer Protocol (FTP), Gopher, and World Wide Web (WWW), and working group forums for conducting technical work on-line. The Infoserver contains a wide range of CSL publications, POSIX validated products lists, and implementation agreements useful for IT vendors and procurers of OSE products.

Integrated Software Engineering Environments (ISEE)

This project seeks to define an open system ISEE which provides software tool integration support, repositories for software development artifacts, and communication facilities. ISEE will include a framework which supports standards-compliant interfaces to a set of necessary services and a set of interchangeable tools. The ISEE program has worked closely with the European Computer Manufacturer's Association (ECMA), the Defense Information Systems Agency (DISA), the Navy's Next Generation Computer Resources (NGCR) program, the Software Engineering Institute, the Institute of Electrical and Electronics Engineers (IEEE), and industry toward this goal. Reference Model for Frameworks of Software Engineering Environments, jointly developed by NIST and ECMA, was published as NIST Special Publication 500-211.

Building upon the proposal to use the PCTE (Portable Common Tool Environment) Standard as an important component of an ISEE framework, CSL has collaborated with DoD and the Object Management Group (OMG) to establish the OMG PCTE Initiative (OPI). This forum examines extensions of the PCTE standard and fosters development of PCTE validation technology. The Division's Software Engineering Environments Laboratory (SEEL) provides a testbed and demonstration laboratory for PCTE and other components of an open, distributed ISEE. The laboratory provides the basis for investigating approaches for tool and repository integration and the guidance needed for developing tool interface standards.

High Integrity Software Assurance

The High Integrity Software Assurance project addresses the production and assurance of software for use in high integrity systems, those that must be trusted to work dependably in some critical function. CSL provides, in cooperation with industry and government, advanced development, analysis, and testing techniques for assurance of software and systems as well as standards and guidance on this subject. NIST Special Publication 500-209, Software Error Analysis, discusses error detection, analysis, resolution, and the use of software metrics and statistical process control techniques for both process and product improvement. GCR 93/626, An International Survey of Industrial Applications of Formal Methods, describes the purpose, approach, analysis and conclusions of 12 case studies of industry's use of formal mathematical methods for defining and verifying software specifications and for program proving.

The High Integrity Software Assurance project, in coordination with the National Science Foundation and the MITRE Corporation, is seeking to establish a Center for High Integrity Software System Assurance. Through this center, CSL will identify research requirements for assurance; coordinate research; and transfer the resulting technology into federal agencies and industry. Various forms of sponsorship, such as funds, guest workers, and CRADAs, are being sought from other agencies and industry. In addition, a demonstration laboratory for methods and tools that support high integrity software assurance is being planned.

Under an interagency agreement with the Nuclear Regulatory Commission, CSL conducted a study of software hazard analysis techniques and the present capability of Computer-Aided Software Engineering (CASE) tools to support development and assurance techniques needed for high integrity software. Work included the definition of a framework of software development and assurance processes essential for high integrity software; an NIST/NRC joint workshop on digital system design issues related to nuclear safety; and workshop proceedings. Extensive work has been conducted in the development and use of a mathematical approach to program analysis called slicing to examine software features.

The High Integrity Systems Lecture Series continued for the third year with national experts addressing topics of total quality management with software quality assurance, software reliability, software process improvement, and reverse engineering. CSL also co-sponsored the Eighth Annual Conference on Computer Assurance, COMPASS '93 which addressed the issues of software safety, process integrity, and computer security.

Telecommunications Security Analysis Center

Secure, dependable telecommunications services are vital to both government and industry. To improve the security and integrity of the U.S. telecommunications infrastructure, CSL is developing the Telecommunications Security Analysis Center (TSAC) to provide advanced analysis and testing techniques for assurance of security, integrity, and reliability in telecommunications systems and software; to conduct evaluation of telecommunications systems and software, including switches and operations support systems that provision, test, administer, and maintain various network elements; and to develop standards and guidance in cooperation with industry. Projects include research in formal methods, feature analysis, and program slicing.

Office Systems Engineering

Activities in office systems engineering focused on developing and implementing computer-based tools to enhance productivity. Since many tools do not work well together, efforts centered on the use of documents to integrate computer-based tools.

In collaboration with the Information Systems Engineering Division, researchers continued a joint project on hypertext and hypermedia technologies. Hypermedia technologies permit the integration of searching, linking, and multimedia presentations using optical storage and networked systems.

Other program activities in office systems engineering included the development of a strategy and testbeds to determine how well documents are interchanged between systems and the initiation of an Open Virtual Reality Testbed for conducting research on the applicability of virtual reality technologies in document information processing.

COMPUTER SECURITY DIVISION

Chief: Stuart W. Katzke
Group Managers: Miles E. Smid, Security Technology
Stuart W. Katzke (Acting), Management & Evaluation
Stuart W. Katzke (Acting), Planning & Assistance
Robert Rosenthal, Protocol Security

With the growth of electronic commerce and the increase use of networks, the need to ensure the security of data and the privacy of information becomes critical. The Computer Security Division provides guidance and technical assistance to government and industry in the protection of unclassified automated information resources.

Electronic Commerce

As a result of a new Memorandum of Understanding with the Department of the Treasury, CSL is developing, prototyping, testing, and implementing computer security standards and procedures to protect sensitive Treasury information from unauthorized access or modification. Areas of cooperation include accreditation and certification of sensitive automated information systems (AIS); risk management; security management guidelines; open systems; LAN security; security architectures; security criteria and evaluation methods; systems integration; and public and private key cryptographic techniques as applied to electronic data interchange (EDI), electronic funds transfer, electronic mail, and other areas.

CSL's Electronic Certification Project (ECP) captured a 1992 Federal Leadership Award sponsored by Federal Computer Week and the Open Systems Conference Board. This award recognizes federal information systems projects that have helped to improve the government significantly, by tangibly improving the quality of service to the public or by decreasing costs without harming mission effectiveness.

More than 60 federal agencies now use electronic certification in their business applications, including the Department of the Treasury which uses electronic certification to process 19,000 agency payments each month worth about $1.2 billion. The ECP uses computer security standards and advanced technology developed by CSL to provide an electronic signature that identifies the sender of information and that cannot be used by unauthorized individuals. This capability allows federal agencies to completely replace many paper-based systems with automated electronic systems, reducing processing costs and increasing efficiency.

NISTIR 5247, Workshop on Security Procedures for the Interchange of Electronic Documents: Selected Papers and Results, presents the findings of a workshop held in November 1992. Co-sponsored by CSL and the Office of Management and Budget, the workshop focused on the need to devise rules for the use of security procedures in the electronic transmission of documents between organizations. This transmission process, usually utilizing EDI standards, results in reduced paperwork, shorter response time, reduced inventory requirements, and fewer transcription errors. Federal and industry applications include purchasing, regulatory and environmental reporting, customs and tariff filings, benefits management, and claims and disbursement information.

Standards Are Key

The Secretary of Commerce reaffirmed the Data Encryption Algorithm for five years and revised Federal Information Processing Standard (FIPS) 46-1, Data Encryption Standard (DES), to allow for implementation of the algorithm is software, firmware, or hardware. In addition, the revision allows for the use of other cryptographic algorithms for protecting unclassified data provided that these algorithms are approved in FIPS.

Also approved was FIPS 140-1, Security Requirements for Cryptographic Modules, which will enable federal agencies to specify their security requirements for cryptographic modules which can be used to protect unclassified information in a variety of different applications. Developed by a joint government and industry working group, FIPS 140-1 specifies four levels of security which will give agencies flexibility in selecting appropriate and cost-effective security for the various kinds of sensitive information that they process and for different applications and environments.

FIPS 180, Secure Hash Standard, was approved for federal agency use in protecting unclassified information. FIPS 180 specifies a Secure Hash Algorithm (SHA) which can be used to generate a condensed representation of a message called a message digest. Appropriate applications of the SHA include electronic mail, electronic funds transfer, software distribution, and data storage. CSL plans to initiate a SHA validation program in the near future.

Also approved was FIPS 181, Automated Password Generator, which specifies an algorithm for generating pronounceable passwords that can be easily remembered by users but that are less easily compromised than passwords selected by users directly. The standard helps government organizations to improve the administration of their password systems for authenticating users of computer systems and for authorizing access to computer systems.

Digital Signatures

Digital signature technology, which provides a replacement for the handwritten signature, is a crucial element in the processing of electronic transactions. Sponsored by the Advanced Research Projects Agency (ARPA), CSL developed an Advanced Smartcard Access Control System (ASACS) which implements the proposed digital signature standard on a device with the same dimensions as a standard credit card. Easily carried in a wallet or purse, the smartcard provides users with a secure means for generating and verifying digital signatures. Several federal agencies are initiating programs which will take advantage of the technology developed for the ASACS project.

In February 1993, CSL sponsored the Federal Digital Signature Applications Symposium to provide a forum for discussion of common problems and issues in the application of digital signature technology to federal government systems. Also held was a Common Authentication Architecture Workshop focusing on the preliminary assessment of a common authentication architecture standard for the federal government.

NISTIR 5234, Report of the NIST Workshop on Digital Signature Certificate Management, December 10-11, 1992, summarized a workshop which CSL sponsored to review existing and required technologies for digital signature certification authorities and liabilities. A study addressing the "Public Key Infrastructure" and "Federal Certification Authority Liability and Policy" was initiated as a result of this workshop. The anticipated completion date of both reports is February 1994.

Criteria and Evaluation

In collaboration with the National Security Agency (NSA), an agreement was made to develop a Common Criteria (CC) document for trusted computer system technology with the European Community member nations and North America. The results of the work on the Federal Criteria for Information Technology (FC) will be submitted to the six member Editorial Board (EB) consisting of three members from North America and three from Europe. The effort is expected to be completed in the Spring of 1994. Specific technical areas of the CC will be developed by Technical Groups staffed by CSL.

Work continues on the development of the first U.S. commercial evaluation program, Trust Technology Assessment Program. A working group was established consisting of civilian and DoD agencies.

Threats to Computer Systems

Two new CSL publications assist users in the selection of appropriate tools and techniques for protecting computer systems and the information they process. NIST Special Publication 800-5, A Guide to the Selection of Anti-Virus Tools and Techniques, provides criteria for judging the functionality, practicality, and convenience of anti-virus tools. NIST Special Publication 800-6, Automated Tools for Testing Computer System Vulnerability, analyzes factors affecting the security of a computer system.

As a participant in the U.S. Army Computer Vulnerability/Survivability Study Team, CSL assessed the threats to computer systems which use commercially available hardware and software. NISTIR 4939, Threat Assessment of Malicious Code and External Attacks, examines threats from malicious code (viruses and worms) and human threats (hackers).

Also published was NIST Special Publication 800-8, Security Issues in the Database Language SQL. The report examines the security functionality of relational database management systems and compares those functions with the requirements of the SQL specifications.

Network Security

CSL and the National Science Foundation co-sponsored a workshop to address the need for improving the security of the National Science Foundation Network (NSFNET) and the National Research and Education Network (NREN). Workshop participants identified off-the-shelf security technology that could be implemented in the NSFNET, especially to control access to the supercomputers on the network. NISTIR 5232 presents workshop results.

In conjunction with the MITRE Corporation, a working paper entitled "Recommendations for Secure Lower Layer Communications Protocols in U.S. Government OSI Networks" was developed. A second paper, "Conformance Testing of Lower Layer Security Protocol," was presented to a symposium on military communication networks. Other activities included a proposed guideline on telecommunications security and guidance on planning for fiber distributed data interface (FDDI).

Sharing Information

Exchanging information with government, industry, and the public remained a high priority. CSL continued its support of the Forum of Incident Response and Security Teams (FIRST) by serving as the secretariat of FIRST and chairing the FIRST Steering Committee. This collaboration of government and private-sector organizations sharing security incident-related information continues to grow both nationally and internationally.

Established by the Computer Security Act of 1987, the Computer System Security and Privacy Advisory Board met five times in 1993 to discuss significant computer security issues. CSL also hosted six meetings of the Federal Computer Security Program Managers Forum to share experiences and information on mutual problems and possible solutions, and sponsored the annual meeting of the Federal Information Systems Security Educators' Association (FISSEA) in February. Work continued on the development of a handbook to assist individuals in protecting their information resources.

CSL and NSA co-sponsored the 16th National Computer Security Conference, in Baltimore, Maryland, in September 1993, for about 1,800 participants from government, industry, and foreign countries. This year's conference theme was "Information Systems Security: User Choices." The Computer Security Bulletin Board System (BBS) continues to improve access and information resources.

SYSTEMS AND NETWORK ARCHITECTURE DIVISION

Chief: Kevin L. Mills
Acting Chief: Anastase Nakassis
Group Managers: Anastase Nakassis, Automated Protocol Methods
Fran Nielsen, Network Management
Michael L. Ransom, Network Protocols
Steven A. Trus, Network Applications
Gerard F. Mulvenna, Network Architecture

Electronic commerce and the use of electronic data interchange (EDI) in an open systems environment are key goals to making government more efficient and cost-effective. Programs in the Systems and Network Architecture Division include the development of pilot solutions to problems related to electronic commerce and EDI as well as the development and standardization of communication protocols for open systems, security for communications, and the development and application of automated protocol methods.

Open Systems Specifications

CSL has cooperated with the Canadian government, the World Federation of MAP/TOP User Groups, and the electric power industry to develop the Industry/Government Open Systems Specification (IGOSS). The IGOSS is a common specification for computer networking products that conform to the Open Systems Interconnection (OSI) international standards. Version 1 of the IGOSS was completed in late 1993.

To reassess federal requirements for open systems networks, NIST convened an interagency Panel on Federal Internetworking Requirements to recommend policies that will facilitate internetworking and convergence of the Internet and OSI protocol suites. Panel recommendations may be reflected in future versions of the IGOSS or Federal Information Processing Standard (FIPS) 146-1, Government Open Systems Interconnection Profile (GOSIP).

Also developed was a "Department of Defense (DoD) Electronic Mail Security Analysis" document which recommended changes which would integrate DoD security requirements into commercial electronic mail products.

GOSIP Testing Program

To assist federal agencies in procuring products specified by FIPS 146-1, GOSIP Version 2, CSL developed a comprehensive test policy and procedures for testing OSI products. The GOSIP Testing Program is technically supported by the Joint Interoperability Test Center (JITC) of the Department of Defense and is carried out in cooperation with the Open System Environment Implementors' Workshop (OIW). The program provides for demonstration of technical credibility, acceptability to both vendors and users, assurance of interoperability, and provides a basis for international recognition of national testing.

Under this test program, CSL established public registers for GOSIP Abstract Test Suites (ATSs), GOSIP Protocol Information Conformance Statement (PICSs), Validated Means of Testing (MOTs), Interoperability Test Suites, Accredited Conformance Testing Laboratories, Approved Accredited Laboratories for MOT Validation, Conformance Tested GOSIP Products, and Interoperability Testing Services. Of the ATSs for those protocols for which conformance testing is mandatory, approximately 40 MOTs, 16 accredited laboratories, and about 200 products (including derived products) are on the respective registers. CSL has implemented a quality improvement system covering four areas of its GOSIP Testing Program: ATSs, MOTs, Labs, and Test Reports. Currently under development is the testing infrastructure for the IGOSS and planned GOSIP Version 3. CSL has also started a process of harmonization with the Open Systems Testing Consortium in the European Community.

Security Protocols for Open Systems Networks

CSL continued to be instrumental in standardizing lower layer security protocols, as a primary participant in the effort to develop the OSI Network Layer Security Protocol (NLSP), expected to achieve International Standard status in late 1993. In 1993, CSL focused on standardization of OSI upper layer security protocols including Security Association and international editorship for standardized frameworks on integrity and confidentiality. CSL also supports the development of key management standards by providing the international editor for this effort.

Another new area of work is in fostering the development of integrated security protocols that can be used in multiple protocol stacks including OSI and the TCP/IP suites; this work is part of a larger CSL program to promote convergence and facilitate coexistence among protocol stacks.

Protocol Convergence and Coexistence

CSL is playing a leadership role in exploring and documenting combinations of technology derived from Internet and OSI protocol suites. The goal of this work is to promote coexistence of the two suites whenever possible and avoid unnecessary duplication of standardization efforts, with the eventual goal being coexistence.

Researchers are helping to adapt the OSI Connectionless-mode Network Protocol (CLNP) as a proposed solution to the current Internet address depletion problem; this proposed solution is known as TUBA, or TCP and UDP with Bigger Addresses. Activities in this area include authoring several TUBA standardization documents, fostering TUBA deployment through prototyping and demonstrations, and helping to resolve CLNP infrastructure problems associated with coordination of large scale routing.

CSL is also promoting the use of the OSI Network Layer Security Protocol (NLSP) within the Internet protocol stack. CSL efforts in this area include authoring standardization documents and prototyping. The goal is to avoid duplication by using an existing OSI protocol to supply network layer security services within the Internet. The Internet currently has no standard for network layer security.

Another area of work involves promoting convergence of OSI and Internet network management technologies. This work is based on the on-going effort within the International Organization for Standardization (ISO)/International Telecommunication Union-Telecommunication Standardization Sector (ITU-T) and Internet Management Coexistence (IIMC) working group to provide an integrated, unified view of a managed network, despite differences in management protocols and information structure. CSL is working on three related problems: the development of a "proxy" algorithm that allows a Common Management Information Protocol (CMIP) manager to manage resources on existing Simple Network Management Protocol (SNMP) agents; the development of translation procedures to map between various forms of managed object databases; and prototyping security services to provide end-to-end security in support of the proxy translation.

Cooperative Laboratory for OSI Routing Technology

FIPS 146-1, GOSIP, provides the blueprint for federal procurement of multivendor, interoperable computer networking products. Supported by the Department of Energy and the National Science Foundation, CSL developed the Cooperative Laboratory for Routing Technology to establish a collaborative research program with industry, government, and academia. The laboratory provides an open testbed facility for routing products; fosters mature, commercially available routing products; and develops methodologies and prototype tools to support conformance testing, interoperability testing, and product evaluation.

In February 1993, CSL hosted an open laboratory to give vendors an opportunity to demonstrate the use of Frame Relay technology in OSI networks. The objective of the trial was to demonstrate the viability of the use of multi-vendor Frame Relay products to support OSI applications and the integration of Frame Relay into existing OSI networking environments. The successful demonstrations opened the door for inclusion of Frame Relay in the emerging IGOSS.

Electronic Data Interchange

CSL assisted federal agencies in the use of EDI and its integration into open systems. Researchers completed the first phase of a set of EDI tools to assist users in prototyping, testing, and using EDI applications based on standard or non-standard transaction sets. Also a system to transmit EDI transactions over X.400-based electronic mail systems, FTAM-based file transfer systems, and Value-Added Networks was completed. The Department of Defense, the Internal Revenue Service, and the General Services Administration sponsored these projects.

Electronic Commerce Integration Facility

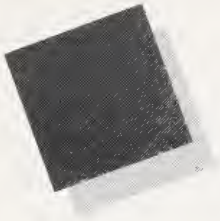
An Electronic Commerce integration facility project was established to promote interoperability of electronic commerce applications; to serve as a technology transfer center for government electronic commerce applications; to assist in the removal of barriers that prevent the use of electronic commerce; and to assist in the advancement of technology required for electronic commerce. To achieve these goals, the integration facility will perform research, development, and testing of electronic commerce applications and infrastructure services; provide liaison services with other groups involved in electronic commerce; and publish documents and provide consulting services related to electronic commerce to federal and industry users.

A cooperative program between government and industry, the integration facility will include a diverse variety of generic national-level electronic commerce problems, such as purchasing, health care, and manufacturing. A portion of the planned purchasing application will be completed in FY 1994.

Network Management

CSL continued the phased development of FIPS 179, Government Network Management Profile (GNMP), and worked with industry consortia to ensure that the developing OMNI*Point* specifications, defined by the Open Management Roadmap partnership, address the full range of network management requirements. Released in Fall 1992, OMNI*Point* 1 is the first in a series of incremental specifications intended to provide a common approach to the integration and management of diverse technologies. To further this process, CSL continued to lead efforts in developing standards and implementors agreements for key areas of network management, including security, performance, and conformance.

CSL was instrumental in harmonizing the network management abstract test suite (ATS) and will continue to lead efforts as the ATS progresses through the standards process. A new area of work involves promoting coexistence and convergence of OSI and Internet management technologies. Another leadership role involves e-mail management and the development of managed objects. Additionally, CSL is translating the existing SNMP MADMAN managed objects, which define e-mail and directory services information, into OSI Guidelines for the Definition of Managed Objects (GDMO) format. This work dovetails with the coexistence work in that it focuses on providing a generic approach to e-mail management, regardless of differing protocols and management models.



ADVANCED SYSTEMS DIVISION

Chief: Shukri A. Wakid
Group Managers: Gordon E. Lyon, Parallel Processing
Dana S. Grubb, Data Storage
Wayne McCoy, Distributed Systems
David S. Pallett, Speech Recognition
Charles L. Wilson, Image Recognition
David H. Su, Advanced Communications (ISDN)

The development of high performance computing and communications systems requires advanced tools and measurement methods. The Advanced Systems Division conducts research and provides reference material in parallel processing, data storage, automated pattern recognition, distributed systems, and Integrated Services Digital Network (ISDN).

Parallel Processing

Work in parallel processing is focused on measurement methods to improve high performance computing. Hardware researchers, in developing low-perturbation data capture hardware for multiple-instruction, multiple-data (MIMD) systems, attained a substantial achievement with the Very Large Scale Integration (VLSI) chip MultiKron. The current version features hybrid event triggering, a bank of counters for accumulating state information and a separate hardware data collection path for time-stamped traces. The technical transfer to Intel of the MultiKron instrumentation chip technology, under the auspices of the Advanced Research Projects Agency (ARPA), brings this effort to a level of accomplishment from which new directions and evaluations are being pursued. An experimenter's toolkit is being developed to simplify MultiKron use by eliminating the custom system integrations now needed.

In conjunction with NIST's Advanced Technology Program (ATP), researchers established a new research program in the important commercial area of integrating flat panel displays into modern computer systems. Since the liquid crystal display (LCD) is the main competitor to the CRT, the effort is initially directed toward LCD. The interface between the graphics controller and the display device (LCD or CRT) is the primary focus of current activities. Aside from laboratory work, the project explored organizing a special interest group with IEEE and SID (Society for Information Display), hosting a workshop to organize now scattered efforts on interfaces, and pursuing joint research on flat panel interfacing issues.

Image Recognition

Researchers Charles L. Wilson, Michael D. Garris, and R. Allen Wilkinson received a U.S. patent for their invention of an application of self-organizing neural network methods to segmentation. In character recognition, segmentation involves separation of character strings into letters. The invention, called Self-Organizing Neural Network Segmentation (SONNS), uses competition between two neural networks to separate a sequence of partial input signals into parts (segments) from different object metaclasses, classes of classes. The invention consists of using two or more subnetworks which compete to define data subsets, such as objects or anti-objects, according to previously learned examples.

Due to the self-organizing nature of the network, the specific characteristics which constitute the subsets of classifications can be specified wholly by examples.

In support of NIST's ATP Neural Network Control Project, CSL contacted industry organizations to evaluate image recognition projects accepted for ATP funding. Project applications included controlling the application of adhesives on rolled surfaces such as tape, controlling the glue curing process on fiber wound composites, and controlling the metal plating of rolled plastic. Techniques developed by CSL for optical character recognition (OCR) are being used to advance neural network control technology.

Researchers provided Standard Reference Materials (SRMs) to industry for several types of magnetic tape media, on a cost-reimbursable basis. See the Electronics Products list in Technology Transfer.

CSL hosted the first Text REtrieval Conference (TREC) in November 1992, followed by the second conference (TREC-2) in September 1993 which attracted a larger attendance and more participating companies. Co-sponsored by CSL and the Advanced Research Projects Agency (ARPA), the conference series encourages research in information retrieval from large text applications by providing a large test collection, uniform scoring procedures, and a forum for organizations interested in comparing their results. Proceedings were published as NIST Special Publication 500-207, The First Text Retrieval Conference (TREC-1); TREC-2 proceedings will be published early in 1994.

Speech Recognition Group

Working with the ARPA spoken language community since 1984, speech recognition researchers have advanced the state-of-the-art of spoken language processing by the development and use of speech corpora (databases of speech, transcriptions, and related materials) by this research community. These reference corpora are used for system development and test purposes. To date, more than 50 CD-ROMs have been produced to disseminate these speech corpora throughout the world-wide speech research community.

CSL implemented benchmark tests, used to track technology development for several speech technologies, for three ARPA programs in 1992-93. These tests involved a number of research organizations including AT&T Bell Laboratories, BBN, Boston University, Cambridge University (England), CMU, CRIM (Canada), Dragon Systems, INRS (Canada), ITT, CNRS-LIMSI (France), MIT Lincoln Laboratory, MIT Laboratory for Computer Science, Paramax, Philips (Germany), Sanders-Lockheed, and SRI International. Additional tests, including language identification, are planned for future years.

CSL signed a new Cooperative Research and Development Agreement (CRADA) in 1993 with the University of Pennsylvania's Linguistic Data Consortium (LDC). Several of the CSL-produced CD-ROMs incorporate material contributed by Texas Instruments and NYNEX, who are Senior Members of the LDC. Researchers also participated in software sharing efforts involving Cambridge University, MIT Laboratory for Computer Science, and SRI International. CSL's benchmark test scoring software is widely used internationally.

Data Storage Group

Researchers in data storage developed a platform for concurrent engineering using high performance computer and communications technologies. The platform will be used for demonstration to small engineering and manufacturing firms who may want to develop such systems. Research in performance and interoperability of collaborative technologies is planned.

Research continued on data integrity for optical disk and other high density/high bandwidth data storage information systems in support of industry and government, including working with industry to develop national and international standards for data integrity in optical disk-based information system. Also completed was the development of optical disk-based platforms to demonstrate currently available error monitoring and reporting capabilities for 356 mm and 300 mm disks, as well as optical disk-based test equipment for measuring defect distribution in optical disk media.

The Board of Standards Review of the American National Standards Institute (ANSI) approved as an American National Standard ANSI/NIST-CSL 1-1993, Data Format for the Interchange of Fingerprint Information. CSL held three workshops to develop a working draft of the revised standard and then conducted a canvass ballot. Following the successful canvass vote, ANSI approved the standard on November 22, 1993.

Researchers measured system performance and interoperability for imaging on local area networks. Research focused on data compression/decompression techniques, image quality measurement, and workflow techniques for new imaging applications in government and industry. Also completed was the development and integration of a document imaging and workflow prototype for another federal agency. A more advanced prototype for a paperless processing initiative was designed.

CSL collaborated with industry to develop electronic image and records management standards and to provide Standard Reference Materials to industry for several types of magnetic tape media. Another cooperative venture with industry and government involved testing characteristics of CD-ROM and advanced CD recordable media.

Advanced Communications

Providing leadership and expertise for the development of standards, measurement techniques, and conformance tests for high speed communications protocols in support of the national initiative on high performance computing and communications is the goal of this research area. Staff members make contributions to development efforts in high speed networking through research projects which range from theoretical analysis of protocols to actual measurement of network performance.

Support for nationwide ISDN deployment continued through the sponsorship of the North American ISDN Users' Forum (NIUF) which met three times in 1993. Through the NIUF, users of ISDN have the opportunity to work with implementors to assure that users' needs are met in the design process. This is accomplished through the development of applications requirements, implementation agreements, and conformance criteria which provide the detailed technical decisions necessary to satisfy the requirements in an interoperable manner. The NIUF interacts with industry through CRADAs; currently, there

are 35 CRADA signatories. CSL published NIST Special Publication 823-3, North American Integrated Services Digital Network Users' Forum Agreements on ISDN, which compiled the existing NIUF agreements for an ISDN developed and approved in the forum as of October 1991.

FIPS 182, ISDN, was approved for federal agency use. The standard defines the generic protocols necessary to establish transparent ISDN connections among government networks and between government and conformant common carrier networks. Providing a minimal set of bearer services, FIPS 182 is based on national and international standards and on implementation agreements developed by the NIUF.

The development of conformance tests continued to be an important activity, including a ongoing effort at international harmonization of test procedures as a step toward the goal of widespread availability of portable, multi-vendor equipment.

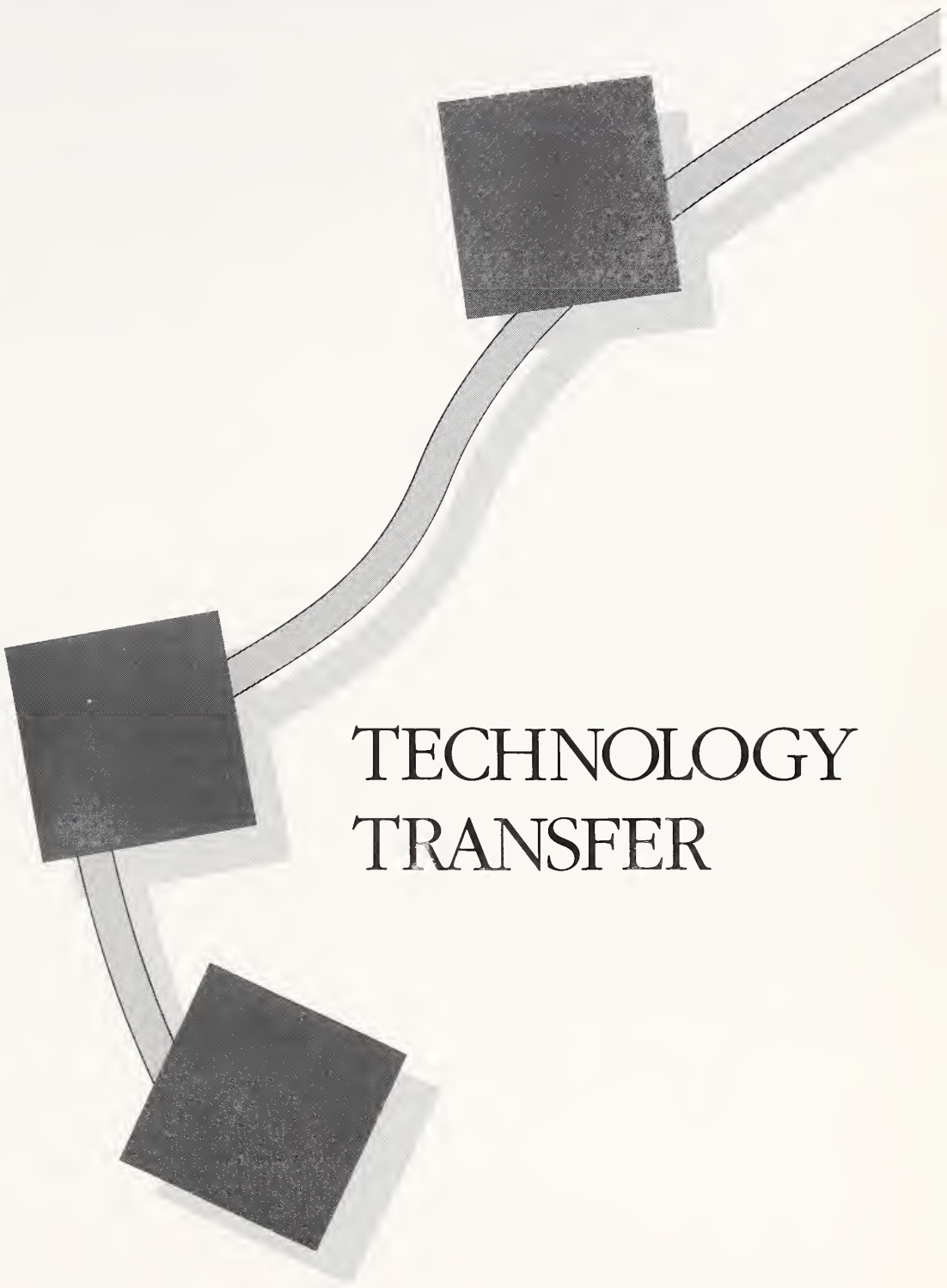
Distributed Systems Group

Researchers focused on performance optimization or enhancements of applications using high speed networks based on wireless and/or wired technologies, including such techniques as compression and encoding. In collaboration with the National Communications System, CSL initiated a new Federal Wireless Users Forum (FWUF), an association of individual federal government wireless telecommunication users. Meeting three times a year, the FWUF identifies the wireless telecommunications needs of federal users and promotes the interoperability of wireless technologies.

Another area of investigation was application and interoperability issues related to applications using Asynchronous Transfer Mode (ATM). Working with the University of Maryland and COMSAT, CSL examined the issues involved in using ATM protocols over a satellite communications link. Also investigated were appropriate compression techniques for use with medical images in ATM-based communications.

Software superdistribution involves freely distributing proprietary software, but collecting fees for usage. A new project sought to establish the technical, business, and legal issues in a superdistribution system based upon ISDN communications and services. With assistance from George Mason University and support from ARPA, CSL is constructing a testbed for exploring various approaches to distribution, protection, and fee recovery.

With the National Telecommunications and Information Administration and other collaborative partners, CSL evaluated the effectiveness and performance of the ISDN over the Advanced Communication Technology Satellite (ACTS) system, in both quantitative and qualitative terms. Researchers completed simulation tests of the effect of ACTS transmission of four ISDN applications: videoconferencing, desktop conferencing, LAN bridging, and large file transfer/image retrieval. Initial simulation tests will be followed by actual satellite testing.



TECHNOLOGY TRANSFER

SELECTED STAFF ACCOMPLISHMENTS

FY 1991 - FY 1993

Department of Commerce awards for major contributions to Department programs were presented to:

Silver Medal

Shukri A. Wakid - 1992

Allen L. Hankinson - 1991

David K. Jefferson - 1991

Bronze Medal

Wayne Jansen - 1993

Douglas C. Montgomery - 1993

Edward Roback - 1993

Dennis Steinaur - 1993

Donna F. Dodson - 1992

Elizabeth N. Fong - 1992

Michael Garris - 1992

David E. Cypher - 1991

Gary E. Fisher - 1991

Irene E. Gilbert - 1991

Recognition from External Organizations

James H. Burrows was named IRM Executive of the Year 1993 by the Federation of Government Information Processing Councils for his contributions to the IRM community in developing and advancing sound IRM standards that enhance the delivery of quality government IRM services to citizens.

A **1992 Federal Leadership Award** was presented to CSL's Electronic Certification Project by *Federal Computer Week* and the Open Systems Conference Board. The project also received the 1993 Outstanding Security Technology Application award from Personal Identification News (PIN) Magazine.

James H. Burrows was awarded the 1991 IRM Leadership Award by the Association for Federal Information Resources Management (AFFIRM).

James H. Burrows received the 1991 Federal Office Systems Exposition (FOSE) Award for leadership in standards development for computing, telecommunications, and computer security.

F. Lynn McNulty, David K. Jefferson, Allen L. Hankinson, Roger J. Martin, and Frederick T. Boland received Federal 100 awards from *Federal Computer Week* for contributions to the federal systems community in 1991.

Roger J. Martin was appointed, in 1993, to the X/Open User Council which provides strategic input to X/OPEN, an international consortium of major computer companies.

Roger J. Martin received the Institute of Electrical and Electronics Engineers (IEEE) Standards Medallion in 1992 for his contributions to the establishment of POSIX test methods as standards worldwide.

Kevin L. Mills received the Interagency Committee on Information Resources Management 1991 Award for Management/Administrative Excellence for effective leadership in the federal systems community in advancing the acceptance of Open Systems Interconnection (OSI) standards.

Kevin L. Mills was elected as a senior member in the Institute of Electrical and Electronics Engineers (IEEE).

Robert Rountree received an Extended Superior Service Award in 1993 from the International Organization for Standardization/International Electrotechnical Committee (ISO/IEC) Joint Technical Committee 1 on Information Technology.

Robert Rosenthal was awarded the 1992 Award for Technical Excellence by the Interagency Committee on Information Resources Management for leadership in the field of local area networks and computer security.

Mark Skall received the 1993 X3 Committee Management Award for his leadership as the former Vice Chair of X3H3, Computer Graphics, and the Document Editor and Rapporteur within JTC1/SC24/WG5, Validation and Registration, from the International Organization for Standardization/International Electrotechnical Committee (ISO/IEC) Joint Technical Committee 1 on Information Technology.

Mark Skall was appointed as the government representative to the National Computer Graphics Association Board of Directors for a three-year term beginning in January 1993.

Miles E. Smid received a 1993 Federal 100 Award given by *Federal Computer Week* and FOSE '93 for exceptional technical competence and leadership in developing solutions for protecting information systems in the federal government.

Dennis D. Steinauer was elected chairman of the Forum of Incident Response and Security Teams (FIRST) for a one-year term beginning August 1992.

Eugene F. Troy received a 1993 Federal 100 Award given by *Federal Computer Week* and FOSE '93 for key contributions in the NIST/NSA joint venture to document computer security requirements for the federal government.

Kamie Roberts received a 1993 Award for Management/Administrative Excellence from the Interagency Committee on Information Resources Management (IAC/IRM) for technical leadership of the Transcontinental Integrated Services Digital Network (ISDN) Project (TRIP '92).

Gordon Lyon was appointed Chairman of the NIST Research Advisory Committee for 1991.

Leonard J. Gallagher received the 1993 X3 Committee Management Award for his national and international work on standards for Database Language SQL from the International Organization for Standardization/International Electrotechnical Committee (ISO/IEC) Joint Technical Committee 1 on Information Technology.

Judith Newton, accepting for NIST, received the 1992 Data Administration Management Association (DAMA) International Company Achievement Award for an outstanding contribution to the direction of the information resource industry.

Henry Tom was appointed, for a two-year term through 1993, as a deputy member to the U.S. Board of Geographic Names. He also served as the government representative on the Board of Directors of the National Computer Graphics Association through December 1992.

PARTICIPATION IN VOLUNTARY STANDARDS ACTIVITIES

CSL staff members participate in more than 85 national and international voluntary standards activities, including the following:

American National Standards Institute (ANSI):
- Information Systems Standards Board (ISSB)
- Information Technology Consultative Committee (ITCC)
- USA Registration Authority Committee

Accredited Standards Committee (ASC):
- T1. Telecommunications
- X3, Information Processing Systems
- X9, Financial Services
- X12, Electronic Data Interchange (EDI)
- IT9, Physical Properties and Permanence of Imaging Media

Institute of Electrical and Electronics Engineers (IEEE):
- IEEE Standards Board and Committees

IEEE Groups for:
- Local Area Networks
- Portable Operating System Interface (POSIX)
- Graphical User Interface
- Software Engineering
- U.S. TAG for JTC 1 SC 7
- U.S. TAG for JTC 1 SC 22 WG 15

International Organization for Standardization (ISO)/ International Electrotechnical Commission (IEC) Joint Technical Committee 1 (JTC 1) on Information Technology

U.S. Technical Advisory Group (TAG) for ISO/IEC JTC 1 (JTC 1 TAG)

International Telecommunication Union - Telecommunication Standardization Sector (ITU-T) Study Groups for:
- Switching and Signaling

U.S. National Committee for ITU-TS:
- Study Group B
- Study Group D

International Organization for Standardization (ISO)

Technical Committees for:

- Industrial Automation
- Micrographics and Optical Memories for Document and Image Recording, Storage and Use

ASC X3 Subgroups for:

- Audio/Picture Coding
- Computer Graphics
- Credit/Identification Cards
- Database
- Data Communications
- Data Interchange
- Data Representation
- Digital Magnetic Tape
- I/O Interface
- Information Resource Dictionary System
- Information Technology Security Techniques
- Open Systems Interconnection
- Operational Management Committee (OMC)
- Optical Digital Data Disks
- Policy and Procedures Committee (PPC)
- Text: Office and Publishing Systems
- U.S. TAG for JTC 1 SC 21
- U.S. TAG for JTC 1 SC 22

ASC X9 Subgroups for:

- Data and Information Security
- Public-Key Cryptography for Financial Institutions
- Security for Financial Systems
- Wholesale Banking

ASC X12 Subgroup for:

- Security

ASC T1 Technical Subcommittee for:

- Services, Architecture and Signaling

JTC 1 TAG Subgroups for:

- Functional Standards
- Procedures

ISO/IEC JTC 1 Subcommittees or Groups for:

- Computer Graphics
- Data Element Principles
- Document Processing and Related Communication
- Flexible Magnetic Media for Digital Data Interchange
- Functional Standardization
- Information Technology Security Techniques
- Interconnection of Information Technology Equipment
- Programming Languages
- Open Systems Interconnection, Data Management, and Open Distributed Processing
- Optical Disk Cartridges for Information Interchange
- POSIX
- Procedures
- Software Engineering
- Telecommunications and Information Exchange Between Systems

European Computer Manufacturers Association (ECMA) Technical Committees or Task Groups for:

- PCTE (Portable Common Tool Environment) TC33/TGEP
- Reference Model for Software Environments TC33/TGRM
- TC-36/TG1 Security Evaluation Criteria

European Workshop on Open Systems (EWOS)

- Expert Group on Open System Environment (OSE)

Association for Information and Image Management (AIIM)

Canadian Committee on Geomatics

Corporation for Open Systems (COS)

Data Administration Management Association Standards and Procedures Subgroup

Federal Interagency Coordinating Committee on Digital Cartography

Federal Open Systems Users Council

Federal Telecommunication Standards Committee

International Association for Identification

Internet Engineering Task Force (IETF)

National Association of State Information Resource Executives (NASIRE)

National Information Standards Organization (NISO)

NIST Open System Environment Implementors' Workshop (OIW)

North American ISDN Users' Forum (NIUF)

North American Open Systems Testing & Certification Policy Council

Open Management Roadmap

U.S. Board on Geographic Names

X/Open Users Council

CSL staff members hold the following leadership positions in the above activities:

X3 and X3 Subgroups

Leonard Gallagher, Intl. Rep.	X3H2, Database
Susan Sherrick, Intl. Rep.	X3H3.7, Validation-Testing-Registration
Bruce Rosen, Intl. Rep.	X3H4, IRDS
Henry Tom, Chair	X3L1, Spatial Data Transfer
Roger Sies, Chair	X3V1.1, User Requirements

JTC 1 TAG Activities

Robert Rountree, Chair	JTC 1 TAG, U.S. Technical Advisory Group for ISO/IEC JTC1

JTC 1 Subcommittees

Dale Walters, Project Editor	JTC 1/SC 6/WG 4 Transport Layer Security
Dale Walters, Project Editor	JTC 1/SC 6/WG 8 Upper Layer Security
Lawrence Welsch, Proj. Editor	JTC 1/SC 18/WG 1 MHMF
Anastase Nakassis, Proj. Ed.	JTC 1/SC 21/WG 1 Confidentiality and Integrity Frameworks
David Jefferson, Rapporteur	JTC 1/SC 21/WG 3 Rapporteur Group on Reference Model of Data Management
Leonard Gallagher, Rapporteur	JTC 1/SC 21/WG 3 Rapporteur Group on Database Languages
C. Michael Chernick, Proj. Ed.	JTC 1/SC 21/WG 4 Performance Management
Roger Martin, Rapporteur	JTC 1/SC 22/WG 15 Rapporteur Group on Conformance Testing
Fritz Schulz, Project Editor	JTC 1 SGFS, TR10003.3
Eugene Troy, Project Editor	JTC 1 27.16.1 General Model for Security Evaluations

IEEE Standards Activities

Fritz Schulz, Editor	P1003.0, POSIX Guide
Anthony Cincotta, Editor	P1003.3, POSIX Test Methods
Roger Martin, Chair	P1003.3.1, POSIX.1 Test Methods
Anthony Cincotta, Editor	P1003.3.1, POSIX.1 Test Methods
John Barkley, Editor	P1003.8, Transparent File Access
Rick Kuhn, Secretary	P1201, Window & Graph. Interfaces
Rick Kuhn, Secretary	P1201.2, Driveability
Steve Trus, Chair	P1224, X-400 API
Anthony Cincotta, Editor	P2003, POSIX Test Methods (rev.)
Mike Rubinfeld, Chair	CDARCH, CD-ROM Architecture
Roger Martin, Chair	PASC Steering Cmte on Conform Tests, Portable Applications Standards Committee
Lawrence Welsch, Sponsor Chair	SCODMMP, Optical Disc and Multimedia Platforms

Others:

James Burrows, Chair	Federal Open Systems Users Council
Mike Hogan, Vice Chair	ANSI Information Systems Standards Board
Tom Bagg, Vice Chair	Image Technology 9 Committee
Dana Grubb, Chair	Workshop on the Electronic Exchange of Fingerprint Images
Fran Nielsen, Secretary	Open Management Roadmap, User Advisory Council
Mike Rubinfeld, Chair	SIGCAT, SIG Standards
Dan Stokesberry, Chair	NIUF
Ted Landberg, Chair	OIW

COLLABORATION WITH GOVERNMENT, INDUSTRY, AND ACADEMIA

In FY 1993, CSL collaborated with many agencies and organizations in government, industry, and academia, some of which supported CSL research through funding or the loan of equipment or software.

Federal Agencies

Department of Defense
- Advanced Research Projects Agency
- Air Force, Kelly Air Force Base
- Air Force, Wright Patterson Air Force Base
- Army Corps of Engineers
- Army, Ft. Belvoir, Virginia
- Army, Ft. Huachuca, Arizona
- Army Personnel Information Systems Command
- Army Research Office
- Computer-aided Acquisition and Logistics Support (CALS)
- Defense Information Systems Agency
- Department of the Air Force
- Department of the Army
- Department of the Navy
- Joint Interoperability Test Center
- National Security Agency
- Naval Research Laboratory
- Navy Next Generation Computer Resources
- Office of the Secretary of Defense

Department of Agriculture
Department of Commerce (DoC), Bureau of the Census
DoC National Telecommunications and Information Administration
DoC National Oceanic and Atmospheric Administration
DoC Office of Financial Management
DoC Patent and Trademark Office
Department of Education
Department of Energy, Lawrence Livermore National Laboratory
Department of Energy, Oak Ridge National Laboratory
Department of Health and Human Services
Department of Interior, U.S. Geological Survey
Department of Justice, Federal Bureau of Investigation
Department of State
Department of the Treasury
Department of the Treasury, Internal Revenue Service
Department of Veterans Affairs
Environmental Protection Agency
General Services Administration
National Aeronautics and Space Administration

Federal Agencies (continued)

National Science Foundation
Nuclear Regulatory Commission
U.S. Postal Service

Industry

Ameritech Services
Apple Computer Company
AT&T Bell Laboratories
AT&T Network Services
BBN
Bell Atlantic
Bellcore
Bell Northern INRS, Montreal, Canada
Boeing
Cellular One
CLC Associates
3COM
Computer Sciences Corporation
Combinet
COMSAT Corporation
Connective Strategies, Inc.
CTA, Inc.
DGM&S
Digital Equipment Corporation
Dragon Systems
Eastman Kodak Company
Fujitsu Networks Industry
Gandalf
GTE
Harris Corporation
Hercules
Honeywell
Hughes Aircraft Company
IBM Corporation
Idacom Hewlett-Packard, Canada
Informix
InterDigital Corporation
InterNex
Intel Corporation
Intelsat
ITT

Industry (continued)

McCaw Cellular Communications
MCI
MITRE Corporation
Motorola
NCR
NEC America
Network Express
Nortel Federal Systems
Northern Telecom, Inc.
NYNEX
Oracle
Paramax
Philips (Germany)
PictureTel
Ram Mobile Data
Sanders-Lockheed
Sheldahl
Silicon Graphics
Sprint International
SRI International
Sun Microsystems
Tekelec
Teleos Communications, Inc.
Texas Instruments
Xyplex, Inc.

Academia

Boston University
Cambridge University, U.K.
Carnegie-Mellon University
Carnegie-Mellon University, Software Engineering Institute
Centre de Recherche Informatique de Montreal (CRIM), University of Montreal
George Mason University
Massachusetts Institute of Technology
University of Leeds, U.K.
University of Maryland
University of Pennsylvania, Linguistic Data Consortium

Other

Canadian Government
Centre National de la Recherche Scientifique (CNRS), Paris (French Government)
Laboratoire d'Informatique pour la Mecanique et les Sciences de L'Ingenieur (LIMSI), Paris (French Government)

COOPERATIVE RESEARCH & DEVELOPMENT AGREEMENTS (CRDAs)

FY 1993

RESEARCH PARTNER	*PROJECT*
Integrated Services Digital Network (ISDN)	
American Computer & Electronics Corporation	North American ISDN Users' Forum (NIUF)
Ameritech Services	NIUF
Ascom Timeplex	NIUF
AT&T	NIUF
Baxter Healthcare Corporation	NIUF
Bell Atlantic	NIUF
Bell Communications Research	NIUF
Boeing Computer Support Services, Inc.	NIUF
Defense Information Systems Agency	NIUF
Department of Defense	NIUF
Department of the Navy	NIUF
Eastman Kodak Company	NIUF
Electronic Data Systems Corporation	NIUF
First Chicago Corporation	NIUF
Fujitsu Networks Industry, Inc.	NIUF
General DataComm, Inc.	NIUF
Gtech Corporation	NIUF
Hayes Microcomputer Products, Inc.	NIUF
IBM Corporation	NIUF
InteCom, Inc.	NIUF
Mitel Corporation	NIUF
National Aeronautics and Space Administration (NASA)	NIUF
National Information Technology Center	NIUF
Network Communications Corporation	NIUF
North Carolina State University	NIUF
Northern Telecom, Inc.	NIUF
NYNEX - Telesector Resources Group	NIUF

RESEARCH PARTNER	*PROJECT*
Siemens Stromberg-Carlson	NIUF
Southwestern Bell Telephone Company	NIUF
TASC (The Analytical Sciences Corp.)	NIUF
Telebyte Technology, Inc	NIUF
Teleos Communications, Inc.	NIUF
University of Michigan	NIUF
U.S. Air Force, Technology Integration Center	NIUF
U S WEST	NIUF
West Virginia University	NIUF
COMSAT Corporation	Test and Demonstrate ISDN Protocols and Services
Datacom, Inc.	EDI and ISDN
Tekelec, Inc.	ISDN and X-25 Conformance Test
Network Interoperability	
Extension Technology Group	Development of Interoperability of LAN-ISDN Bridges/Routers
Jersey City State College	Development of Interoperability of LAN-ISDN Bridges/Routers
Network Express	Development of Interoperability
Software Standards Validation	
Washington Software Technologies, Inc.	Basic Test Suite
Speech Recognition Research	
Linguistic Data Consortium	Corpora to Support Human Language Technology Research

GUEST RESEARCHERS

FY 1993

Guest Scientists and Research Associates **40**

Organizations represented include:

Armament Development Authority, Rafael, Israel
Bellcore, Livingston, New Jersey
Defense Information Systems Agency, Arlington, Virginia
Ecole Normale Superieure, France
George Washington University, Washington, D.C.
Imperial College of Science and Technology, United Kingdom
Institute of Geology, Beijing, People's Republic of China
Institut d'Informatique d'Enterprise, France
Institut National Des Telecommunications, France
Ministry of Communications, Taiwan
National Science Foundation, Washington, D.C.
Northeast University of Technology, People's Republic of China
Quality One Softworks Corporation, Annandale, Virginia
Space Science and Technology Center, People's Republic of China
Syracuse University, Syracuse, New York
Telecommunications Laboratory, Taiwan
Telecom, Paris, France
University of Maryland, Baltimore, Maryland
University of Twente, The Netherlands
Washington Software Technologies Inc., Annandale, Virginia

Faculty Appointments **10**

Iowa State University
University of the District of Columbia
University of Maryland
University of Pittsburgh

PATENTS

FY 1993

Approved

1. Object/Anti-Object Neural Network Segmentation, Charles Wilson, Michael Garris, and R. Wilkinson, issued September 14, 1993

Pending

1. (CURL) Correlated Run Length Algorithm for Detecting Form Structure Within Digitized Documents, Michael Garris

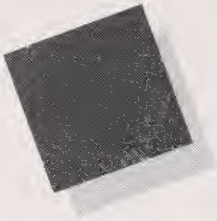
2. Synthetic Perturbation Tuning of Computer Programs, Gordon Lyon

3. Multiple Memory Self-Organizing Pattern Recognition Network, Charles Wilson

4. Automated Recognition of Characters Using Optical Filtering with Positive and Negative Functions Encoding Pattern and Relevance Information, Charles Wilson

5. Automated Recognition of Characters Using Optical Filtering with Maximum Uncertainty - Minimum Variance (MUMV) Functions, Charles Wilson and James Blue

6. Object/Anti-Object Neural Network Segmentation, Charles Wilson and O. Omidvar



NIST PUBLICATIONS

NIST COMPUTER SYSTEMS TECHNOLOGY SERIES FY 1991 - FY 1993

NIST SPEC. PUB. TITLE

500-183 *Stable Implementation Agreements for Open System Interconnection Protocols, Version 4, Edition 1, December 1990*
Tim Boland, Workshop Chairman
December 1990 PB92-126408 $35.00

500-184 *Functional Benchmarks for Fourth Generation Languages*
By Martha M. Gray and Gary E. Fisher
March 1991 SN003-003-03071-6 $3.25

500-185 *Guide to Design, Implementation and Management of Distributed Databases*
By Elizabeth N. Fong, Charles L. Sheppard, and Kathryn A. Harvill
February 1991 SN003-003-03076-7 $3.50

500-186 *Issues in Transparent File Access*
By Karen Olsen and John Barkley
April 1991 PB91-187831 $19.00

500-187 *Application Portability Profile (APP) The U.S. Government's Open System Environment Profile OSE/1 Version 1.0*
April 1991 PB91-201004 $19.00

500-188 *Guide to Expert System Building Tools for Microcomputers*
By Christopher E. Dabrowski and Elizabeth N. Fong
July 1991 SN003-003-03088-1 $8.50

500-189 *Security in ISDN*
By William E. Burr
September 1991 SN003-003-03112-7 $4.25

500-190 *Proceedings of the Workshop on High Integrity Software; Gaithersburg, MD; Jan. 22-23, 1991*
By Dolores R. Wallace, D. Richard Kuhn, and John C. Cherniavsky
August 1991 SN003-003-03108-9 $5.50

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

NIST SPEC.PUB. TITLE

500-191 *Test Methods for Optical Disk Media Characteristics (for 356 mm Ruggedized Magneto-optic Media)*
By Fernando Podio
September 1991 PB92-116409 $19.00

500-192 *Government Open Systems Interconnection Profile Users' Guide, Version 2*
By Tim Boland
October 1991 SN003-003-03119-4 $9.50

500-193 *Software Reengineering: A Case Study and Lessons Learned*
By Mary K. Ruhl and Mary T. Gunn
September 1991 SN003-003-03100-3 $2.25

500-194 *ISDN Conformance Testing, Layer 1—Physical Layer, Part 1—Basic Rate S/T Interface, User Side*
Shukri A. Wakid and Kathleen M. Roberts, Editors
September 1991 PB92-102201 $19.00

500-195 *North American ISDN Users' Forum Agreements on Integrated Services Digital Network*
Shukri A. Wakid and Kathleen M. Roberts, Editors
September 1991 PB92-102219 $26.00

500-196 *Guidelines for the Evaluation of File Transfer, Access and Management Implementations*
By Paul Markovitz, Steven A. Trus, and Curtis Royster
October 1991 SN003-003-03120-8 $5.50

500-197 *Guide to Schema and Schema Extensibility*
By Bruce K. Rosen and Isabella des Fontaines
November 1991 SN003-003-03126-7 $2.25

500-198 *Monitoring and Reporting Techniques for Error Rate and Error Distribution in Optical Disk Systems*
By Fernando L. Podio
October 1991 SN003-003-03125-9 $5.00

500-199 *The 3480 Type Tape Cartridge: Potential Data Storage Risks, and Care and Handling Procedures to Minimize Risks*
By Mark Williamson
November 1991 SN003-003-03127-5 $3.50
December 1991 SN003-003-03135-6 $5.50

SN numbers - stocked by GPO
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NIST SPEC.PUB. TITLE

500-200 *Development of a Testing Methodology to Predict Optical Disk Life Expectancy Values*
By Fernando L. Podio
December 1991 SN003-003-03134-8 $5.00

500-201 *Reference Model for Frameworks of Software Engineering Environments*
Prepared Jointly by NIST and the European Computer Manufacturers Association (ECMA)
December 1991 SN003-003-03135-6 $5.50

500-202 *Stable Implementation Agreements for Open Systems Interconnection Protocols, Version 5, Edition 1, December 1991*
December 1991 SN903-015-00000-4 $59.00 subscription

500-203 *Conformance Test Specifications for COBOL Intrinsic Function Module*
By Carmelo Montanez-Rivera and L. Arnold Johnson
July 1992 SN003-003-03172-1 $6.50

500-204 *High Integrity Software Standards and Guidelines*
By Dolores R. Wallace, Laura M. Ippolito, and D. Richard Kuhn
September 1992 SN003-003-03171-2 $6.50

500-205 *Guidelines for the Evaluation of Virtual Terminal Implementations*
By Carol A. Edgar
November 1992 SN003-003-03189-5 $3.75

500-206 *Stable Implementation Agreements for Open Systems Interconnection Protocols, Version 6, Edition 1, December 1992*
Tim Boland, Workshop Chairman; Brenda Gray, Workshop Editor
December 1992 SN903-015-00013-6 $109.00 domestic
Available by subscription. $136.25 foreign

500-207 *The First Text Retrieval Conference (TREC-1)*
By Donna K. Harman
November 1992 SN003-003-03207-7 $29.00

500-208 *Manual for Data Administration*
Judith J. Newton and Daniel C. Wahl, Editors
March 1993 PB93-182053 $27.00

500-209 *Software Error Analysis*
By Wendy W. Peng and Dolores R. Wallace
March 1993 SN003-003-03212-3 $7.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

NIST SPEC.PUB.	TITLE
500-210	*Application Portability Profile, The U.S. Government's Open System Environment Profile OSE/1 Version 2.0* June 1993 SN003-003-03222-1 $6.50
500-211	*Reference Model for Frameworks of Software Engineering Environments* Prepared jointly by NIST and the European Computer Manufacturers Association (ECMA) August 1993 SN003-003-03227-1 $7.50

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

NIST COMPUTER SECURITY SERIES
FY 1991 - FY 1993

NIST SPEC.PUB. TITLE

800-1 *Computer Security in the 1980s: Selected Bibliography*
Rein Turn, Compiler, and Lawrence E. Bassham, Editor
December 1990 SN003-003-03060-1 $11.00

800-2 *Public-Key Cryptography*
By James Nechvatal
April 1991 SN003-003-03078-3 $9.00

800-3 *Establishing a Computer Security Incident Response Capability (CSIRC)*
By John P. Wack
November 1991 SN003-003-03121-6 $3.00

800-4 *Computer Security Considerations in Federal Procurements: A Guide for Procurement Initiators, Contracting Officers, and Computer Security Officials*
By Barbara Guttman
March 1992 SN003-003-03147-0 $6.00

800-5 *A Guide to the Selection of Anti-Virus Tools and Techniques*
By W. Timothy Polk and Lawrence E. Bassham
December 1992 SN003-003-03188-7 $3.75

800-6 *Automated Tools for Testing Computer System Vulnerability*
By W. Timothy Polk
December 1992 SN003-003-03187-9 $3.25

800-8 *Security Issues in the Database Language SQL*
By W. Timothy Polk and Lawrence E. Bassham
August 1993 SN003-003-03225-5 $3.25

SN numbers - stocked by GPO
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NIST INTEGRATED SERVICES DIGITAL NETWORK TECHNOLOGY SERIES FY 1992 - FY 1993

NIST SPEC.PUB. TITLE

823-1 *Overview of Integrated Services Digital Network Conformance Testing*
By Leslie A. Collica, Kathleen M. Roberts, and David Su
March 1992 SN003-003-03142-9 $1.75

823-2 *Integrated Services Digital Network Conformance Testing, Layer 1 — Physical Layer, Part 2 — Basic Rate U Interface, User Side*
Daniel P. Stokesberry and Kathleen M. Roberts, Editors
March 1992 SN003-003-03143-7 $5.00

823-3 *North American Integrated Services Digital Network Users' Forum Agreements on ISDN*
Daniel P. Stokesberry, Kathleen M. Roberts, and Tish Antonishek, Editors
January 1993 SN003-003-03197-6 $14.00

823-4 *Integrated Services Digital Network Conformance Testing, Layer 2—Data Link Layer (LAPD), Part 1—Basic Rate Interface, User Side*
Daniel P. Stokesberry, Leslie Collica, and Kathleen M. Roberts, Editors
September 1993 SN003-003-03221-2 $49.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

CSL BULLETINS
FY 1990 - FY 1993

Wack, J; Kurzban, S.; **Computer Virus Attacks.** August 1990.

Roback, E.; **Computer Security Roles of NIST and NSA.** February 1991.

Radack, S.; **The GOSIP Testing Program.** May 1991.

Saltman, R.; **Security Issues in the Use of Electronic Data Interchange.** June 1991.

Boland, T.; **File Transfer, Access and Management.** July 1991.

Lennon, E.; **The NIST POSIX Testing Program.** October 1991.

Dray, J.; **Advanced Authentication Technology.** November 1991.

Wack, J.; **Establishing a Computer Security Incident Response Capability.** February 1992.

Branstad, D.; **An Introduction to Secure Telephone Terminals.** March 1992.

Mills, K.; Radack, S.; **TCP/IP or OSI? Choosing a Strategy for Open Systems.** June 1992.

Roback, E.; **Disposition of Sensitive Automated Information.** October 1992.

Roback, E.; **Sensitivity of Information.** November 1992.

Radack, S.; **Using Information Technology Standards in Federal Acquisitions.** December 1992.

Dodson, D.; Roback, E.; **Digital Signature Standard.** January 1993.

Radack, S.; **Guidance on the Legality of Keystroke Monitoring.** March 1993.

Skall, M.; Rosenthal, L.; **NIST Computer Graphics Program.** April 1993.

Roback, E.; Guttman, B.; **Security Issues in Public Access Systems.** May 1993.

Wack, J.; **Connecting to the Internet: Security Considerations**. July 1993.

Guttman, B.; Roback, E.; **Security Program Management.** August 1993.

Roback, E.; Guttman, B.; **People: An Important Asset in Computer Security.** October 1993.

OTHER NIST PUBLICATIONS FY 1991 - FY 1993

PUB. NUMBER TITLE

NISTIR 4418 *State Occupancy Information for Performance Comparisons*
By Gordon Lyon
October 1990 PB91-112879 $15.00

NISTIR 4432 *Status of PDES-Related Activities (Standards & Testing)*
By Cita Furlani, Joan Wellington, and Sharon Kemmerer
October 1990 PB91-112888 $15.00

NISTIR 4435 *FTAM Interoperability Test*
By Carol Edgar
August 1990 PB91-107565 $23.00

NISTIR 4448 *Working Implementation Agreements for Open Systems Interconnection Protocols—November 1990*
Tim Boland, Editor
November 1990 PB91-144444 $60.00

NISTIR 4451 *U.S. Department of Commerce Methodology for Certifying Sensitive Computer Applications*
Edward Roback, NIST Coordinator
November 1990 PB91-120162 $17.00

NISTIR 4452 *Message Handling Systems Interoperability Tests*
By Carol Edgar
October 1990 PB91-112789 $17.00

NISTIR 4453 *SRI International Improving the Security of Your UNIX System*
Edward Roback, NIST Coordinator
November 1990 PB91-120121 $17.00

NISTIR 4484 *Multimedia Courseware in an Open Systems Environment: A Federal Strategy*
By Judi Moline, Allen L. Hankinson, and Lawrence A. Welsch
December 1990 PB91-143362 $17.00

NISTIR 4488 *Proceedings of the Object-Oriented Database Task Group Workshop; Tuesday, October 23, 1990, Chateau Laurier Hotel, Ottawa, Canada*
Elizabeth N. Fong, Editor
January 1991 PB91-157198 $23.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PUB. NUMBER	TITLE

NISTIR 4494 *SQL3 Support for CALS Applications*
By Leonard Gallagher
December 1990 PB91-167262 $15.00

NISTIR 4503 *Proceedings of the Object-Oriented Database Task Group Workshop, Tuesday, May 22, 1990, Atlantic City, NJ*
By Elizabeth N. Fong
February 1991 PB91-159723 $39.00

NISTIR 4507 *Working Implementation Agreements for Open Systems Interconnection Protocols (December 1990)*
Tim Boland, Editor
March 1991 PB92-126523 $43.00

NISTIR 4518 *National Aeronautics and Space Administration's (NASA) Automated Information Security Handbook*
Edward Roback, NIST Coordinator
March 1991 PB91-187781 $23.00

NISTIR 4524 *Raster Graphics Conformance Testing*
By Frankie E. Spielman
February 1991 PB91-167296 $17.00

NISTIR 4530 *Validation of an OSI Transport Class 4 Simulator*
By Okhee Kim, Sharon Heatley, and Bob Bishop
May 1991 PB91-187724 $15.00

NISTIR 4545 *Computer Security: Selected Articles*
Marianne Swanson and Elizabeth B. Lennon, Editors
April 1991 PB91-187740 $15.00

NISTIR 4547 *A Standardized General Markup Language Encoding of the Office Document Architecture Document Application Profile*
By Ronald B. Wilson
April 1991 PB91-184812 $15.00

NISTIR 4560 *Government Document Processing Requirements Report*
By Roger F. Sies
April 1991 PB91-187773 $15.00

NISTIR 4567 *Titled Raster Graphics and MIL-R-28002A: A Tutorial and Implementation Guide*
By Frankie E. Spielman and Louis H. Sharpe, II
April 1991 PB91-187708 $23.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PUB. NUMBER	TITLE

NISTIR 4579 *NIST Support for the Computer-Aided Acquisition and Logistic Support (CALS) Program in the Area of Graphics Standards, Calendar Year 1990*
By Daniel Benigni
May 1991 PB91-194506 $39.00

NISTIR 4594 *GOSIP Conformance and Interoperation Testing and Registration*
Nightingale, J.S.
March 1991 PB92-108943 $26.00

NISTIR 4607 *Network Registration Service User's Guide*
By Carol Edgar
Available from OSINET Corporation, (703) 883-2797

NISTIR 4608 *Electronic Data Interchange in Message Handling Systems*
By Paul Markovitz
June 1991 PB91-216622 $15.00

NISTIR 4609 *NIST Support of the CALS Program: 1990 Synopsis*
By Sharon J. Kemmerer
June 1991 PB91-193821 $15.00

NISTIR 4614 *Standard Security Label for GOSIP, An Invitational Workshop*
By Noel Nazario
June 1991 PB91-216671 $23.00

NISTIR 4630 *Performance Evaluation of Hypercube Applications: Using a Global Clock and Time Dilation*
By Robert D. Snelick
July 1991 PB91-222588 $15.00

NISTIR 4636 *U.S. Dept. of Health and Human Services Automated Information Systems Security Program Handbook*
Edward Roback, NIST Coordinator
July 1991 PB91-222638 $23.00

NISTIR 4637 *Computer Implementation of a Discrete Set Algebra*
By Leonard Gallagher
July 1991 PB91-231571 $15.00

NISTIR 4641 *Development Plan STEP Conformance Testing Service*
By Sharon J. Kemmerer
August 1991 PB92-191238 $17.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PUB. NUMBER TITLE

NISTIR 4651 *Government Network Management Profile (GNMP): Public Review Version*
By R. Aronoff, K. Brady, M. Chernick, J. Fox, K. Hsing, K. Mills, and F. Nielsen
January 1992 PB92-149871 $19.00

NISTIR 4654 *Development of an Optical Disk System for the Automated Retrieval of EASEAR Records*
By Natalie Willman
August 1991 PB92-108943 $26.00

NISTIR 4655 *User's Manual for the NIST TTCN Translator Version 3.0*
By David H. Su
August 1991 PB92-172493 $17.00

NISTIR 4656 *Proceedings of the Forum on Standards for High Integrity Software*
By Dolores R. Wallace, Michael Brown, and Archibald McKinlay VI
September 1991 PB92-112267 $19.00

NISTIR 4659 *Glossary of Computer Security Terminology*
Edward Roback, NIST Coordinator
September 1991 PB92-112259 $26.00

NISTIR 4667 *Computer Security Bulletin Board System User's Guide*
By Mark Skandera and Marianne Swanson
September 1991 PB92-112390 $17.00

NISTIR 4668 *The OSINET Testing and Registration [T&R] Service Functional Specification*
By Carol Edgar and Alper Kerman
Available from OSINET Corporation, (703) 883-2797

NISTIR 4681 *On the Interchangeability of SGML and ODA*
By Charles K. Nicholas and Lawrence A. Welsch
January 1992 PB92-149830 $17.00

NISTIR 4688 *Prototyping the IRDS: An Airport Application*
By Anthony P. Sani and Henry Tom
October 1991 PB92-112580 $26.00

NISTIR 4703 *Technology Integration Workshop: Selected Papers*
Henry Tom, Editor
October 1991 PB92-158278 $26.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PUB. NUMBER	TITLE

NISTIR 4734 *Foundations of a Security Policy for Use of the National Research and Educational Network*
By Arthur E. Oldehoeft
February 1992 PB92-172030 $19.00

NISTIR 4737 *Operating Principles of MULTIKRON Performance Instrumentation for MIMD Computers*
By Alan Mink and Robert J. Carpenter
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Sharon J. Kemmerer, Editor
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Dennis M. Gilbert, Project Leader
Nickilyn Lynch, Editor
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By M.D. Garris, C.L. Wilson, J.L. Blue, G.T. Candela, P. Grother, S. Janet, and R.A. Wilkinson
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NISTIR 4912 *The First Census Optical Character Recognition Systems Conference*
By R. Wilkinson, J. Geist, S. Janet, P. Grother, C. Burges, R. Creecy, B. Hammond, J. Hull, N. Larsen, T. Vogl, and C. Wilson
August 1992 PB92-238542 $44.50

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By R. Allen Wilkinson and Michael D. Garris
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NISTIR 4934 *Protocol Implementation Conformance Statement (PICS) Proforma for the SDNS Security Protocol at Layer 4 (SP4)*
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PUB. NUMBER TITLE

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By Lawrence E. Bassham and W. Timothy Polk
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October 1992 PB93-125029 $27.00

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By Michael D. Garris and Stanley A. Janet
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By Yoon D. Chang and David H. Su
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By Frankie E. Spielman and Louis H. Sharpe, II
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NIST GCR 93/626	*An International Survey of Industrial Applications of Formal Methods Volume 1, Purpose, Approach, Analysis, and Conclusions; Volume 2, Case Studies* By Dan Craigen, Susan Gerhart, and Ted Ralston March 1993 PB93-178556(vol.1) $27.00 PB93-178564(vol.2) $27.00
NISTIR 5153	*Minimum Security Requirements for Multi-User Operating Systems* By D.R. Ferraiolo, N. Lynch, P.R. Toth, D. Chizmadia, M. Ressler, Medlock, R. and S. Weinberg March 1993 PB93-185999 $17.50
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NISTIR 5173 *NIST Scoring Package Certification Procedures in Conjunction with NIST Special Databases 2 and 6*
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By Omid M. Omidvar and Charles L. Wilson
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NISTIR 5180 *Dictionary Production for Census Form Conference*
By R. Allen Wilkinson
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NISTIR 5191 *Computer Graphics Metafile (CGM) Test Requirements Document (Update)*
By Lynne S. Rosenthal
April 1993 PB93-198273 $19.50

NISTIR 5209 *Comparison of Handprinted Digit Classifiers*
By Patrick J. Grother and Gerald T. Candela
June 1993 PB94-118213 $17.50

NISTIR 5214 *Introduction to Traffic Management for Broadband ISDN*
By Y.D. Chang, D.H. Su, and S.A. Wakid
December 1993

NISTIR 5220 *Validated Products List 1993 No. 3*
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Judy B. Kailey, Editor
July 1993 PB93-937303 $27.00

NISTIR 5232 *Report of the NSF/NIST Workshop on NSFNET/NREN Security*
By Arthur E. Oldehoeft
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By Alan Mink, John W. Roberts, and John K. Antonishek
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Dennis K. Branstad, Editor
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NISTIR 5258	*Towards SQL Database Language Extensions for Geographic Information Systems* Vincent B. Robinson and Henry Tom, Editors August 1993 PB94-101847 $27.00
NIST/GCR 93-635	Private Branch Exchange (PBX) Security Guideline September 1993 PB94-100880 $19.50
NISTIR 5274	Validated Products List 1993 No. 4 (supersedes NISTIR 5220) Judy B. Kailey, Editor October 1993 PB93-937304 $27.00
NISTIR 5287	1978 Fortran Compiler Validation System User's Guide, Version 2.1 Software Systems Validation Group August 1993 PB94-118460 $27.00

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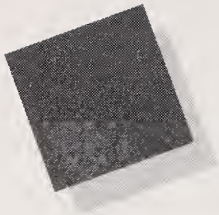


PAPERS

October 1992 Through December 1993

Bassham III, Lawrence E.; Polk, W. Timothy; **Precise Identification of Computer Viruses.** Proceedings of the 15th National Computer Security Conference. October 13-16, 1992.

Patent; Tian J.; Zelkowitz, Marvin; **An Improved Classification Tree Analysis of High Cost Modules Based Upon an Axiomatic Definition of Complexity.** IEEE 3rd International Symposium on Software Reliability Engineering, Research Triangle Park, NC. October 1992.

Moline, Judi; **Towards Open Multimedia Systems for Museum Objects and Their Documentation.** Spectra 1992.

Boland, Frederick T.; **Working Implementation Agreements for Open Systems Environment Implementors' Workshop.** Output from December 1992 Workshop.

Bassham III, Lawrence E.; Polk, W. Timothy; **A Proposal for the Precise Identification of Computer Viruses.** Proceedings at the Third Conference of the European Institute of Computer Anti-Virus Researchers. December 1992.

Geist, Jon; Wilkinson, R. Allen; **OCR Error Versus Rejection Rate for Isolated Handprint.** IS&T/SPI 1993 Symposium on Electronic Imaging. December 1992.

Burr, William E.; Brandstad, Dennis K.; **Security of the Integrated Service Digital Network, Handbook of Information Security Management,** Ruthberg, Zella G.; Tipton, Harold; Editors. Auerback Publications. 1993.

Watson, Craig I.; **NIST Special Database 9: Mated Fingerprint Card Pairs, Volumes 1-5.** February 1993.

Landberg, Theodore; **Stable Implementation Agreements for Open Systems Environment Implementors' Workshop.** Output from March 1993 Workshop.

Pallett, David S; Fiscus, Jonathan; Fisher, Gary E.; Fisher, William M.; and Garofolo, John S.; **Benchmark Tests for the DARPA Spoken Language Program.** Proceedings of Human Language Technology Workshop, Morgan Kaufmann Publishers. March 1993.

Ferraiolo, David F.; Gilbert, Dennis M.; Lynch, Nickilyn; **Assessing Federal and Commercial Information Security Needs.** Proceedings of the 16th International Computer Security Virus Conference and Exposition, New York City, NY. March 1993.

Lennon, Elizabeth B.; **North American Integrated Services Digital Network (ISDN) Users' Forum (NIUF), October 26-30, 1992.** NIST Journal of Research. March/April 1993.

Linn, Richard J.; **Copyright and Information Services in the Context of the NREN.** Proceedings of Conference on Technological Strategies for Protecting Property in the Networked Multimedia Environment, JFK School of Government, Cambridge, MA. April 1993.

Omidvar, Omid; Wilson, Charles L.; **Optimization of ART Network with Boltzmann Machine.** Proceedings of SPIE Intelligent Information Systems, Orlando, FL. April 1993.

Zelkowitz, Marvin V.; **Use of an Environment Classification Model.** Proceedings of ACM/IEEE 15th International Conference On Software Engineering, Baltimore, MD. May 1993.

Wallace, Dolores R.; **Verification and Validation of Engineered Software.** DAMA Symposium: Standards for Reengineering, Gaithersburg, MD. May 1993.

Wakid, Shukri; Stokesberry, Daniel; **ISDN in North America; IEEE Communications Magazine.** May 1993.

Bagg, Thomas C.; **The Dilemma - Preservation Versus Access.** The Library of Congress Round Table on Preservation Research and Development, Library of Congress. June 1993.

Burrows, James H.; Radack, Shirley M.; **Information Technology Standards in a Changing World: The Role of the Users.** Workshop on Economic Dimension of IT Standards; Tokyo, Japan.

Rosenthal, Robert; **Recommendations for Secure Lower Layer Communications Protocols in U.S. Government OSI Networks.** MITRE Working Paper. June 1993.

Gallagher, Keith; Lyle, James R.; **Software Safety and Program Slicing.** Proceedings of COMPASS '93, IEEE. June 1993.

Jansen, Wayne A.; **Conformance Testing of Lower Layer Security Protocol.** Symposium on Military Communications Network, The Hague, Netherlands. June 1993.

Nazario; Noel A.; **Standard Security Labels for Open Systems Communications.** Technical paper for NATO Symposium on Communications and Information System Security. June 1993.

Geist, Jon C.; Wilkinson, R. Allen; **Half-Integral Constant Voltage Steps in High-T^dc^ Grain Boundary Junctions.** Applied Physics Letters.

Radack, Shirley M.; **Industry/Government Open Systems Specification: The Development of GOSIP Version 3.** Federation Facts, Federation of Government Information Processing Councils.

Wilson, Charles L.; **A New Self-Organizing Neural Network Character Recognition Using Adaptive Filtering and Feature Extraction.** Progress in Neural Networks, 1993.

Fisher, William M.; Fiscus, Jonathan G.; **Better Alignment Procedures for Speech Recognition Evaluation.** International Conference on Acoustics, Speech and Signal Processing, IEEE. 1993.

Wallace, Dolores. R.; Lennon, Elizabeth B.; **COMPASS '93 Eighth Annual Conference on Computer Assurance.** NIST Journal of Research. July/August 1993.

Favreau, Jean-Philippe; **ISO 9000 Tutorial,** August 1993.

Kuhn, Richard; Edfors, Patricia; Howard, Victoria; Caputo, Chuck; Phillips, Ted; **Improving Public Switched Network Security in an Open Environment.** IEEE Computer. August 1993.

Yesha, Yelena; **An Information Retrieval System for Network Resources.** Proceedings of International Workshop on Next Generation Information Technologies and Systems. August 1993.

Wakid, Shukri; Cypher, David; **Standardization for ATM and Related B-ISDN Technologies.** ACM-Standard View. September 1993.

Cavalli, A.R.; Favreau, Jean-Philippe; Phalippou, M.; **Formal Methods in Conformance Testing: Results and Perspectives.** Proceedings of the 6th International Workshop on Protocol Test Systems, Pau, France. September 1993.

Ferraiolo, David F; Gilbert, Dennis M.; Lynch, Nickilyn; **An Examination of Federal and Commercial Access Control Policy Needs.** Proceedings of the 16th National Computer Security Conference, Baltimore, MD. September 1993.

Jansen, Wayne A.; **SDNS Security Management, 16th National Computer Security Conference, Baltimore, MD.** September 1993.

Jansen, Wayne A.; Walters, Dale L.; **Choosing Among Standards for Lower Layer Security Protocols.** Proceedings of the 16th National Computer Security Conference, Baltimore, MD. September 1993.

Saltman; Roy G.; **An Integrity Model is Needed for Computerized Voting and Similar Systems.** 16th National Computer Security Conference, Baltimore, MD. September 1993.

Cuthill, Barbara; **Object-Oriented Design for Safety Critical Systems.** Digital Systems Reliability of Nuclear Safety Workshop. September 1993.

Landberg, Theodore; **Working Implementation Agreements for Open Systems Interconnection Protocols.** Output from September 1993 OIW Workshop.

Lennon, Elizabeth B.; **Special Edition CSL Bulletin for the Automotive Suppliers Excellence Conference, Greenville, SC.** September 1993.

Brown, A; Carney, D; Oberndoft, P; and Zelkowitz, Marvin; **A Project Support Environment Reference Model.** Tri Ada Conference, Seattle, Washington. September 1993.

Lennon, Elizabeth B.; **North American Integrated Services Digital Network (ISDN) Users' Forum (NIUF), June 22-25, 1993.** NIST Journal of Research. September/October 1993.

Polk, W. Timothy; **Approximating Clark-Wilson, Access Triples with Basic UNIX Controls.** Proceedings of the USENIX UNIX Security Symposium IV. October 1993.

Chang, Yoon; Su, David H.; Wakid, Shukri; Qian, X.; Vaman. **The Generic Flow Control (GFC) Protocol, A Performance Assessment.** Conference on Network Protocols. IEEE Transactions. October 1993.

Wilson, Charles L.; Omidvar, Omid; **Information Content in Neural Net Optimization.** Journal of Connection Science. 1993.

Branstad, Dennis K.; **Foreword to Book, Computer Communications Security: Principles, Standard Protocols and Techniques.**

Wallace, Dolores R.; Lyle, James R.; Ippolito, Laura; Gallagher, Keith B.; **Accessing Functional Diversity by Program Slicing.** Proceedings of 21st Water Reactor Safety Information Meeting. October 1993.

Li, N.R;. and Zelkowitz, Marvin; **An Information Model for Use in Software Management Estimation and Prediction.** 2nd International Conference on Information and Knowledge Engineering, Washington, D.C. November 1993.

Favreau, Jean-Philippe; **ISO/IEC Workshop on Worldwide Recognition of OSI Test Results; Regional Progress - North America.** Proceedings of J1TCLC Meeting. November 1993.

Nightingale, Stephen J.; **Registration: Practice and Pitfalls.** Proceedings of the Second Workshop on Worldwide Registration of OSI Test Results, Brussels, Belgium. November 1993.

Flater, David W.; Yesha, Yelena; **Towards Flexible Distributed Information Retrieval.** Lecture Notes in Computer Science, Springer-Verlag, Publisher. 1993.

Saltman, Roy G.; **Planning the Infrastructure for Global Electronic Commerce.** Journal of Electronic Data Interchange.

Burrows, James H.; Radack, Shirley M.; **Information Technology Standards in a Changing World: The Role of the Users.** World Computer Law Congress.

Binkley, Dave; **Slicing in the Presence of Parameter Aliasing.** Proceedings of the 3rd Annual Software Engineering Research Forum, Orlando, FL. November 1993.

Lyle, James R.; **Program Slicing in the Presence of Pointers.** Proceedings of the 3rd Annual Software Engineering Research Forum, Orlando, FL. November 1993.

Wardle, Caroline E.; Wallace, Dolores R.; **SQA and TQM in Software Quality Improvement.** Proceedings of the 3rd Annual Software Engineering Research Forum, Orlando, FL. November 1993.

Radack, Shirley M.; **Computer Networks: Challenges for the 1990's Federal Data Center Issues.** A View to the Future. Federal Data Center Directors Annual Conference. November 1993.

Radack, Shirley M.; **Federal Information Processing Standards: What's New.** Federation Facts, Federation of Government Information Processing Councils.

Rosenthal, Lynne, S.; Skall, Mark, W.; **CGM Conformance Testing Basics - Why and How.** CALS Journal. Winter 1993.

Arkin, E.M.; Goodrich, G.T.; Mitchell, J.S.B.; Mount, D.; Piatko, Christine D.; Skiena, S.S.; **Point Probe Decision Trees for Geometric Concept Classes.** Workshop on Algorithms and Data Structures Vol 709 of Lecture Notes in Computer Science. Springer Verlag, Publisher. 1993.

Wilson, Charles L.; **Evaluation of Character Recognition Systems.** Proceedings of IEEE Workshop on Neural Network for Signal Processing III. 1993.

Blue, James L., Candela, Gerald; Grother, Patrick J.; Chellappa, Ramalingam; and Wilson, Charles L.; **Evaluation of Pattern Classifiers for Fingerprint and OCR Applications.** 1993.

Newton, Judith J; **Data Administration Management Association Symposium, May 11-12, 1993, NIST, Gaithersburg, MD.** NIST Journal of Research, November/December 1993.

Jansen, Wayne; **A Second Look at the SDNS Key Management Protocol.** Proceedings of the 9th Annual Computer Security Applications Conference. December 1993.

Zelkowitz, Marvin; **The Role of Verification in the Software Specification Process; Advances in Computers.** 1993.

Gostin, L.; Turek-Brezina, J.; Powers, M.; Kozloff, R.; Faden, R.; Steinauer, D.; **Privacy and Security of Personal Information in a New Health Care System.** Journal of the American Medical Association.

CONFERENCES AND WORKSHOPS

October 1992 - December 1993

1992

October 9	Lecture Series on High Integrity Systems
October 13-16	15th National Computer Security Conference (cosponsored by National Computer Security Center [NCSC])
October 26-30	North American ISDN Users' Forum (NIUF)
November 4-6	First Text Retrieval Conference (TREC) (cosponsored by Defense Advanced Research Project Agency [DARPA])
November 9	NIST Integrated Software Engineering Environments (ISEE) Users' Forum
November 10	Applications Portability Profile/Open Systems Environment (APP/OSE) Users' Forum
November 16-20	Transcontinental ISDN Project '92 (TRIP '92) (cosponsored by Corporation for Open Systems)
November 30	Computer Security Day
December 1	Lecture Series on High Integrity Systems
December 7	GOSIP Procurement Symposium
December 10-11	Workshop on High Integrity Software
December 14-18	OSE Implementors' Workshop (OIW) (cosponsored by the IEEE Computer Society)

1993

February 8-12	NIUF
February 17-18	Symposium on Digital Signature Applications
February 23	Software Producibility MODIL Workshop
February 23-24	Federal Information Systems Security Educators' Association (FISSEA)
February 25	Lecture Series on High Integrity Systems
March 8-12	OIW (cosponsored by the IEEE Computer Society)
April 13	DARPA Spoken Language Technology and Applications Day
April 19-21	Sigcat '93 National Conference on CD-ROM

1993

April 28	Lecture Series on High Integrity Systems
May 11-12	6th Annual Data Administration Management Management Association (DAMA) Symposium
May 17-19	Federal Wireless Users Forum (FWUF) (cosponsored by National Communications System)
May 25-26	APP/OSE Users' Forum
June 7-11	OIW (co-sponsored by IEEE Computer Society)
June 14-17	COMPASS '93 8th Annual Conference on Computer Assurance (cosponsored by IEEE and the IEEE Aerospace and Electronic Systems Society)
June 21-25	NIUF
July 20-21	Workshop on Information Technology Security Training and Professional Development (cosponsored by Federal Computer Security Program Managers' Forum; FISSEA; International Information Systems Security Certification Consortium; and the National Security Agency)
August 17-18	Nuclear Industry Symposium
August 26	MODIL Workshop on Incentives
August 30 Sept 1	Text Retrieval Conference (TREC2) (cosponsored by DARPA)
September 13-14	Digital Systems Reliability and Nuclear Safety Workshop (cosponsored by Nuclear Regulatory Commission)
September 13-17	OIW (cosponsored by IEEE Computer Society)
September 20-23	16th National Computer Security Conference (cosponsored by NCSC)
September 27-29	FWUF (cosponsored by National Communications System)
October 18-22	NIUF
October 29	Lecture Series on High Integrity Systems
November 16-17	APP/OSE Users' Forum
November 30	Computer Security Day
December 6-10	OIW (cosponsored by the IEEE Computer Society)
December 16	Lecture Series on High Integrity Systems

PLANNED CONFERENCES AND WORKSHOPS

1994

January 12-13	NIST Workshop on the Computer Interface to Flat Panel Displays
January 18-20	FWUF (cosponsored by National Communications System)
February 7-11	NIUF
February 22-23	FISSEA
March 8	Lecture Series on High Integrity Systems
March 14-18	OIW (cosponsored by the IEEE Computer Society)
May 9-10	7th Annual DAMA Symposium
May 10	Lecture Series on High Integrity Systems
May 11-12	APP/OSE Users' Forum
June 7-9	FWUF (cosponsored by National Communications System)
June 13-17	OIW (cosponsored by the IEEE Computer Society)
June 20 - 24	NIUF
June 27-July 1	COMPASS '94 (cosponsored by IEEE and the IEEE Aerospace and Electronic Systems Society)
September 12-16	OIW (cosponsored by the IEEE Computer Society)
September 26-28	FWUF (cosponsored by National Communications System)
October 3-7	NIUF
November 15-16	APP/OSE Users' Forum
December 12-16	OIW (cosponsored by the IEEE Computer Society)

TALKS

During the past year, CSL staff members presented papers and gave talks to a large number of external organizations, including the following:

Advanced Research Projects Agency (ARPA)
Aerospace Industry Association
Air Force Brilliant Eyes Technology Conference
American National Standards Institute (ANSI)
American Bar Association
American Society for Industrial Security
America's Telecommunications Standards Symposium
Armed Forces Communications and Electronics Association (AFCEA)
Association for Computing Machinery (ACM)

Bell Atlantic
Bureau of Census

Canadian Communications Security Establishment
Canadian GTA, Government Telecommunications Agency
CIKM-93 2nd International Conference on Information and Knowledge Management
Computer-aided Acquisition and Logistic Support (CALS) EXPO '93
Computer and Business Equipment Manufacturers Association (CBEMA)
Computer Integrated Manufacturing Conference
Council of Federal Data Center Directors
CRYPTO '93

Data Administration Management Association (DAMA)
Data Interchange Standards Association
Data Processing Management Association
Defense Information Systems Agency (DISA)
Department of Defense
Department of Education
Department of Energy
Department of Justice
Department of the Treasury
Department of Veterans Affairs
Dynacorp Meridian

EDI and Government Computer News Conference
Electronic Data Interchange National Conference
European ISDN Users' Forum

Federal Aviation Administration
Federal Bureau of Investigation
Federal Government Industry Policy Council
Federal Information Systems Security Educators' Association (FISSEA)
Federal Networking Council
Federal Wireless Users' Forum (FWUF)
Federation of Government Information Processing Councils

Fingerprint Image Analysis Workshop
Frederick County Board of Education

Geographic Information & Spatial Data Exposition (GISDEX)
George Washington University
Goethe University Medical Center, Frankfurt on Main, Germany
Government Users' ISDN Security Conference

Hewlett-Packard

Information Systems Security Association
Institute of Supercomputing Research of Japan
Institute of Electrical and Electronics Engineers (IEEE)
Integration Definition (IDEF) Language Users' Group
Interagency Working Group on Management of Data for Global Change
Intergovernmental Council of Information Processors
Internal Revenue Service (IRS)
International Conference on Parallel Processing
International Data Administration Symposium
International Security Symposium
International SIGIR Conference
INTEROP '93

Johns Hopkins University

LASERS and Electro-Optics Society (LEOS)
Library of Congress
Los Alamos National Laboratory - Workshop on Parallel Computers

MITRE Corporation
Mumps Users' Group

National Aeronautics and Space Administration
National Communications System
National Computer Center
National Engineering Consortium
National On-Line Conference
National Computer Security Conference
NATO Conference on Affordable Communications and Information Systems Security
NCR Corporation

North American ISDN Users' Forum (NIUF)
Northeastern University
Nuclear Regulatory Commission

Office of Technology Assessment
Open Systems Environment (OSE) Implementors' Workshop (OIW)
Overseas Security Advisory Council

Paramax Systems Corporation
Patent and Trademark Office (PTO)

Research Institute of Telecommunications Transmission, China

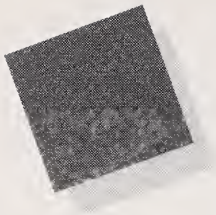
Social Security Administration (SSA)
Software Engineering Institute
Smithsonian Seminar on Scientific Imaging
SQL Access Group
Symposium on Computer Applications in Medical Care (SCAMC '93)
Symposium on Military Communication Networks

Texas Instrument Corporation
Text REtrieval Conferences (TREC and TREC-2)

United States Customs Service
University of Maryland
University of Pittsburgh

Washington Area ISDN User Group
World Bank

X/OPEN



ELECTRONIC PRODUCTS

Standard Reference Databases Developed by CSL

NIST Special Databases

1. NIST Binary Images of Printed Digits, Alphas, and Text
2. NIST Structured Forms Reference Set of Binary Images (SFRS)
3. NIST Binary Images of Handwritten Segmented Characters
4. NIST 8-Bit Gray Scale Images of Fingerprint Image Groups
5. IVTANTHERMO PC
6. NIST Structured Forms Reference Set of Binary Images II (SFRS2)
7. NIST Test Data 1: Binary Images of Handprinted Segmented Characters (TSTI)
8. NIST Machine-Print Database of Gray Scale and Binary Images (MPDB)
9. NIST Mated Fingerprint Card Pairs (Volumes 1-5)
10. Supplemental Fingerprint Card Data (SFCD) for NIST Special Database 9
11. Mated Fingerprint Card Pairs 2 (MFCP2)

NIST Special Software

NIST Scoring Package Release 1.0

Standard Reference Materials (SRMs) Developed by CSL

SRM Number	Description
3200	Magnetic Tape-Reel
3201	Sec. Std. Mag. Tape Cartridge
3202	Sec. Std. Mag. Tape (12.65mm)
3203	Magnetic Tape
3204	Magnetic Tape
3217	Mag Tape Cart Hi Density
9529	Flexible Disk 90

ELECTRONIC BULLETIN BOARDS

CSL operates three electronic bulletin boards for information exchange:

Information about computer security	(301) 948-5717
9600 baud only	(301) 948-5140

or type 'telnet cs-bbs.nist.gov' or 'telnet 129.6.54.30'. To download files, type 'ftp csrc.nist.gov' or 'ftp 129.6.54.11'. Log in to account **anonymous**, using your Internet address as the password. BBS files are located in directory **bbs**.

or type 'telnet gopher.nist.gov' or 'telnet 129.6.2.2'

Information about data management activities and applications	(301) 948-2048 and 948-2059
Information about the North American Integrated Services Digital Network (ISDN) Users' Forum (NIUF)	(301) 869-7281

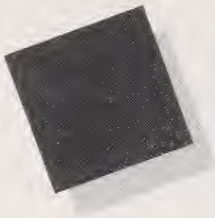
or telnet to 129.6.53.11 on the ARPANET/DDN.

Users can reach the bulletin boards by dialing the numbers listed above. Terminals should have the following capabilities:

ASCII, 300, 1200, or 2400 baud (9600 baud available for computer security bulletin board only), 8 bits with no parity or 7 bits with even parity, 1 stop bit.

If a connection is not established at the end of two rings or if the line is busy, hang up and try again.

After "CONNECT," strike the carriage return twice and the system will be accessed. The system will now guide you through the bulletin board by asking key questions and providing helpful menus.



ACCESSING INFORMATION ON VALIDATED PRODUCTS

CSL publishes a *Validated Products List* (VPL), a collection of registers describing implementations of Federal Information Processing Standards (FIPS) that have been validated for conformance to FIPS. Updated quarterly, the list also contains information about the organizations, test methods, and procedures that support the validation programs.

The VPL contains conformance testing information for the following information technology standards: Programming Languages COBOL, Fortran, Ada, Pascal, C, and MUMPS; Database Language SQL; Graphics; GOSIP; POSIX; and Computer Security. Entries in the printed VPL are contained in WordPerfect, Version 5.1 files.

To access the VPL via the Internet:

Type: ftp speckle.ncsl.nist.gov (internet address is 129.6.59.2)
Login as user ftp
Type your e-mail address as the password
Type: cd pub/vpl
Type: binary
Type: dir

USER GROUPS SPONSORED BY CSL

The **Open System Environment (OSE) Implementors' Workshop (OIW)**, co-sponsored by the IEEE Computer Society, meets four times a year to discuss detailed implementation specifications for OSE standards.

CONTACT: Albert Landberg
B-266 Technology Building
National Institute of Standards and Technology
Gaithersburg, MD 20899-0001
Telephone: (301) 975-2245
E-mail: landberg@micf.nist.gov

The joint **ISDN Users' Workshop and ISDN Implementors' Workshop of the North American ISDN Users' Forum (NIUF)** meets three times a year to address application requirements and to develop application profiles for ISDN products and services.

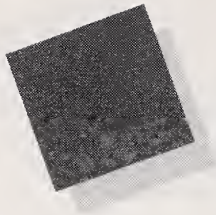
CONTACT: Dawn Hoffman
B-364 Materials Building
National Institute of Standards and Technology
Gaithersburg, MD 20899-0001
Telephone: (301) 975-2937
E-mail: dawn@isdn.ncsl.nist.gov

The **Applications Portability Profile/Open System Environment (APP/OSE) Users' Forum** meets twice a year to identify federal requirements and to discuss the development of an architectural approach to applications portability in an open system environment.

CONTACT: Joe Hungate
B-266 Technology Building
National Institute of Standards and Technology
Gaithersburg, MD 20899-0001
Telephone: (301) 975-3368
E-mail: hungate@swe.ncsl.nist.gov

The **Federal Wireless Users' Forum**, co-sponsored by the National Communications System, meets three a year to provide information on wireless technology and capabilities, to identify the needs of federal users, and to address wireless communications issues.

CONTACT: Tish Antonishek
A-216 Technology Building
National Institute of Standards and Technology
Gaithersburg, MD 20899-0001
Telephone: (301) 975-2922
E-mail: tish@dsys.ncsl.nist.gov



FIPS PUBLICATIONS LIST BY FIPS NUMBER

1993 December

FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
0	(1)P	General Description of FIPS Register 68 Nov 01	
1-2	(2&3)S	Code for Information Interchange, Its Representations, Subsets, and Extension (ANSI X3.4-1986R92, X3.41-1990, X3,41-1990) 84 Nov 14	1
2-1	(2)S	Perforated Tape Code for Information Interchange (ANSI X3.6-1965/R1965/R1983 & R1991) 84 Nov 14	
3-1		WITHDRAWN	1
4-1	(4)S	Representation for Calendar Date and Ordinal Date for Information Interchange (ANSI X3.30-1985/R1991) 88 Jan 27	
5-2	(4)S	Codes for the Identification of the States, the District of Columbia and the Outlying Areas of the United States, and Associated Areas 87 May 28	1
6-4	(4)S	Counties and Equivalent Entities of the United States, Its Possessions, and Associated Areas 90 Aug 31	2
7		WITHDRAWN	1
8-5	(4)S	Metropolitan Statistical Areas (MSAs) (Including CMSAs, PMSAs, and NECMAs) 84 Oct 31	6
9-1	(4)S	Congressional Districts of the U.S. 90 Nov 30	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
10-3	(4)S	Countries, Dependencies, Areas of Special Sovereignty, and their Principal Admin. Divs. 84 Feb 09	15
11-3	(3)G	Guideline: American National Dictionary for Inform. Systems (ANSI X3.172-1990 & X3.172A-1992) 91 Feb 01	1
12-2		WITHDRAWN	1
13	(2)S	Rectangular Holes in Twelve-Row Punched Cards (ANSI X3.21-1967/R1980 & R1991) 71 Oct 01	
14-1	(2)S	Hollerith Punched Card Code (ANSI X3.26-1980/R1991) 80 Dec 24	
15		WITHDRAWN	1
16-1	(7)S	Bit Sequencing of Code for Information Interchange in Serial-By-Bit Data Transmission (ANSI X3.15-1976/R1983 & R1990) 77 Sept 01	
17-1	(7)S	Character Structure and Char. Parity Sense for Serial-By-Bit Data Communication in the Code for Inform. Interchg. (ANSI X3.16-1976/R1983 & R1990) 77 Sept 01	
18-1	(6)S	WITHDRAWN	1
19-2	(4)G	Catalog of Widely Used Code Sets 92 July 01	
20		WITHDRAWN	1
21-3	(3)S	COBOL (ANSI X3.23-1985 & X3.23A-1989) 90 Jan 12	2

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
22-1	(7)S	Synchronous Signaling Rates Between Data Terminal and Data Communication Equip. (ANSI X3.1-1976) 77 Sept 01	
23		WITHDRAWN	1
24		WITHDRAWN	1
25		WITHDRAWN	1
26	(2)S	One-Inch Perforated Paper Tape for Information Interchange (ANSI X3.18-1967/R1974, R1982, & R1990) 73 June 30	
27	(2)S	Take-Up Reels for One-Inch Perforated Tape for Information Interchg. (ANSI X3.20-1967/R1982 & R1990) 73 June 30	
28		WITHDRAWN	2
29-3	(1&3)P	Interpretation Procedures for Federal Information Processing Standards for Software 92 Oct 29	
*30		WITHDRAWN	1
31	(5)G	Guidelines for Automatic Data Processing Physical Security and Risk Management 74 June	
32-1	(2)S	Character Sets for Optical Char. Recognition (OCR) (ANSI X3.2-1970/R1976, X3.17-1981/R1989, X3.49-1975/R1982 & R1989) 82 June 25	
33-1	(2)S	Character Set for Handprinting (ANSI X.3.45-1982/R1989) 84 Nov 05	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
34	(1)P	Guide for the Use of International System of Units (SI) in Federal Information Processing Standards Publications 75 Jan 01	
35		WITHDRAWN	1
36		WITHDRAWN	1
37		WITHDRAWN	1
38	(3)G	Guidelines for Documentation of Computer Programs and Automated Data Systems 76 Feb 15	
39		WITHDRAWN	1
40	(2)G	Guideline for Optical Character Recognition Forms 76 May 01	
41	(5)G	Computer Security Guidelines for Implementing the Privacy Act of 1974 75 May 30	
42-1	(6)G	Guidelines for Benchmarking ADP Systems in the Competitive Procurement Environment 77 May 15	
43		WITHDRAWN	1
44		WITHDRAWN	1
45	(4)G	Guide for the Development, Implementation & Maintenance of Standards for the Representation of Computer Processed Data Elements 76 Sept 30	
*46-2	(5)S	Data Encryption Standard 93 Dec 30	
47		WITHDRAWN	1

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
48	(5)G	Guidelines on Evaluation of Techniques for Automated Personal Identification 77 Apr 01	
49	(6)G	Guideline on Computer Performance Management: An Introduction 77 May 01	
50		WITHDRAWN	1
51		WITHDRAWN	1
52		WITHDRAWN	1
*53		WITHDRAWN	1
54-1	(2)S	Computer Output Microform (COM) Formats and Reduction Ratios, 16 mm and 105 mm (ANSI/AIIM MS5-1991 & MS14-1988) 91 Jan 15	
55DC-4	(4)G	Guideline: Codes for Named Populated Places Primary County Divisions, and Other Locational Entities of the United States and Outlying Areas 87 Jan 16	1
55-2	(4)G	Same as 55DC except without codes 87 Feb 03	1
56	(6)G	Guideline for Managing Multivendor Plug-Compatible ADP Systems 78 Sept 15	
57	(6)G	Guidelines for the Measurement of Interactive Computer Service Response Time and Turnaround Time 78 Aug 01	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
58-1	(4)S	Representations of Local Time of the Day for Information Interchange (ANSI X3.43-1986) 88 Jan 27	
59	(4)S	Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange (ANSI X3.51-1975) 79 Feb 01	
60-2		WITHDRAWN	3
61-1		WITHDRAWN	2
62		WITHDRAWN	3
63-1		WITHDRAWN	2
63-1	Supplement	WITHDRAWN	2
64	(3)G	Guidelines for Documentation of Computer Programs and Automated Data Systems for the Initiation Phase 79 Aug 01	
65	(5)G	Guideline for Automatic Data Processing Risk Analysis 79 Aug 01	
66	(4)S	Standard Industrial Classification (SIC) Codes 79 Aug 15	2
67	(2)G	Guideline for Selection of Data Entry Equipment 79 Sept 30	
68-2	(3)S	BASIC (ANSI X3.113-1987) 87 Aug 28	
69-1	(3)S	FORTRAN (ANSI X3.9-1978/R1989) 85 Dec 24	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
70-1	(4)S	Representation of Geographic Point Locations for Information Interchange (ANSI X3.61-1986) 86 Nov 14	
71	(7)S	Advanced Data Communications Control Procedures (ADCCP) (ANSI X3.66-1979/R1990) 80 May 14	1
72	(6)G	Guidelines for Measurement of Remote Batch Computer Service 80 May 01	
73	(5)G	Guidelines for Security of Computer Applications 80 June 30	
74	(5)G	Guidelines for Implementing and Using the NBS Data Encryption Standard 81 Apr 01	
75	(6)G	Guideline on Constructing Benchmarks for ADP System Acquisitions 80 Sept 18	
76	(3)G	Guideline for Planning and Using a Data Dictionary System 80 Aug 20	
77	(3)G	Guideline for Planning and Management of Database Applications 80 Sept 01	
78	(7)G	Guideline for Implementing Advanced Data Communication Control Procedures (ADCCP) 80 Sept 26	
79		WITHDRAWN	1
80		WITHDRAWN	1

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
81	(5)S	DES Modes of Operation 80 Dec 02	1
82	(2)G	Guideline for Inspection and Quality Control for Alphanumeric Computer-Output Microforms (ANSI/AIIM MSI-1980) 80 Sept 26	
83	(5)G	Guideline on User Authentication Techniques for Computer Network Access Control 80 Sept 29	
84	(2)S	Microfilm Readers (ANSI/AIIM (NMA) MS20-1979) 80 Oct 31	
85	(2)S	Optical Character Recognition (OCR) (ANSI X3.86-1980/R1987) 80 Nov 07	
86	(2)S	Additional Controls for Use with Amer. Natl. Std. Code for Inform. Interchg. (ANSI X3.64-1979/R1990) 81 Jan 29	2
87	(5)G	Guidelines for ADP Contingency Planning 81 Mar 27	
88	(3)G	Guideline on Integrity Assurance and Control in Database Administration 81 Aug 14	
89	(2)S	Optical Character Recognition (OCR) Character Positioning (ANSI X3.93M-1981/R1989) 81 Sept 04	
90	(2)G	Guideline for Optical Character Recognition (OCR) Print Quality (ANSI X3.99/R1991) 83 Sept 29	
91		WITHDRAWN	1

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
92	(4)G	Guideline for Standard Occupational Classification (SOC) Codes 83 Feb 24	
93		WITHDRAWN	1
94	(2)G	Guideline on Electrical Power for ADP Installations 83 Sept 21	
*95-1	(4)S	Codes for the Identification of Federal and Federally Assisted Organizations 93 Jan 04	
96	(6)G	Guideline for Developing and Implementing a Charging System for Data Processing Services 82 Dec 06	
97		WITHDRAWN	2
98		WITHDRAWN	2
99	(3)G	Guideline: A Framework for the Evaluation and Comparison of Software Development Tools 83 Mar 31	
100-1	(7)S	Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Operation with Packet-Switched Data Networks (PSDN), or Between Two DTEs, by Dedicated Circuit (ANSI X3.100-1989) 91 Mar 20	
101	(3)G	Guideline for Lifecycle Validation, Verification, and Testing of Computer Software 83 June 06	
102	(5)G	Guideline for Computer Security Certification and Accreditation 83 Sept 27	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
103	(4)S	Codes for the Identification of Hydrologic Units in the United States and the Caribbean Outlying Areas (USGS/CIRCULAR #878-A & ANSI X3.145-1986) 83 Nov 15	1
104-1	(4)S	ANS Codes for the Representation of Names of Countries, Dependencies, and Areas of Special Sovereignty for Information Interchange 86 May 12	1
105	(3)G	Guideline for Software Documentation Management 84 June 06	
106	(3)G	Guideline on Software Maintenance 84 June 15	
107	(2&3)S	Local Area Networks: Baseband Carrier Sense Multiple Access with Collision Detection Access Method and Physical Layer Specifications and Link Layer Protocol (ANSI/IEEE 802.2 & 802.3) 84 Oct 31	
108	(2)S	Alphanumeric Computer Output Microform Quality Test Slide (AIIM MS28-1983) 84 Nov 05	
109	(3)S	Pascal (ANSI/IEEE 770X3.97-1983/R1990) 85 Jan 16	
110	(3)G	Guideline for Choosing a Data Management Approach 84 Dec 11	
111		WITHDRAWN	2
112	(5)S	Password Usage 85 May 30	
113	(5)S	Computer Data Authentication 85 May 30	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
114		WITHDRAWN	1
115		WITHDRAWN	1
116		WITHDRAWN	1
117		WITHDRAWN	1
118		WITHDRAWN	1
119	(3)S	Ada (ANSI/MIL-STD-1815A-1983) 85 Nov 08	1
120-1	(3)S	Graphical Kernel System (GKS) (ANSI X3.124-1985, X3.124.1-1985, X3.124.2-1988, X3.124.3-1989) 91 Jan 08	
121	(2&3)S	Videotext/Teletext Presentation Level Protocol Syntax (North American PLPS) (ANSI X3.110-1983(R1991)/CS T500-1983) 86 May 06	
122		WITHDRAWN	1
123	(3)S	Specification for a Data Descriptive File for Information Interchange (DDF) (ANSI/ISO 8211-1985/R1992) 86 Sept 19	
124	(3)G	Guideline on Functional Specifications for Database Management Systems 86 Sept 30	
*125-1	(3)S	MUMPS (ANSI/MDC X11.1-1990) 93 June 10	
126	(3)S	Database Language NDL (ANSI X3.133-1986) 87 Mar 10	
*127-2	(3)S	Database Language SQL (ANSI X3.135-1992) 93 June 02	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
*128-1	(3)S	Computer Graphics Metafile (CGM) (ANSI/ISO 8632.1-4:1992 & MIL-D-28003A) 93 May 11	
129	(2)S	Optical Character Recognition (OCR) - Dot Matrix Character Sets for OCR-MA (ANSI X3.111-1986) 87 May 06	
130		WITHDRAWN	2
131		WITHDRAWN	2
132	(3)G	Guideline for Software Verification and Validation Plans (ANSI/IEEE 1012-1986) 87 Nov 19	
133		WITHDRAWN	1
134-1		WITHDRAWN	1
135		WITHDRAWN	1
136		WITHDRAWN	1
137	(7)S	Analog to Digital Conversion of Voice by 2,400 Bit/Second Linear Predictive Coding 84 Nov 28	
138	(7)S	Electrical Characteristics of Balanced Voltage Digital Interface Circuits 75 Sept 24	
139	(7)S	Interoperability and Security Requirements for Use of the Data Encryption Standard in the Physical Layer of Data Communications 83 Aug 03	
140	(7)S	General Security Requirements for Equipment Using the Data Encryption Standard 82 Apr 14	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
141	(7)S	Interoperability and Security Requirements for Use of the Data Encryption Standard with CCITT Group 3 Facsimile Equipment 85 Apr 04	
142	(7)S	Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits 80 Jan 31	
143	(7)S	General Purpose 37-Position and 9-Position Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment (EIA-RS-449) 85 June 10	
144	(7)S	Data Communication Systems and Services User-Oriented Performance Parameters (ANSI X3.102-1983/R1990) 85 May 28	
145		WITHDRAWN	1
146-1	(2&3)S	Government Open Systems Interconnection Profile (GOSIP) 91 Apr 03	1
147	(7)S	Group 3 Facsimile Apparatus for Document Transmission 81 Aug 19	
148	(7)S	Procedures for Document Facsimile Transmission (EIA-RS-466) 82 Apr 14	
149	(7)S	General Aspects of Group 4 Facsimile Apparatus (EIA-536-1988) 88 Nov 04	
150	(7)S	Facsimile Coding Schemes and Coding Control Functions for Group 4 Facsimile Apparatus (EIA-538-1988) 88 Nov 04	

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*151-2	(3)S	Portable Operating System Interface (POSIX) - System Application Program Interface [C Language] (ISO/IEC 9945-1:1990) 93 May 12	
152	(3)S	Standard Generalized Markup Language (SGML) (ISO 8879-1986) 88 Sept 26	
153	(3)S	Programmer's Hierarchical Interactive Graphics System (ANSI/ISO 9592.1.2.3:1989, ISO/IEC 9593.1:1990, ANSI/ISO 9593.3:1990 & 9593.4:1991) 88 Oct 14	2
154	(7)S	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment (EIA-530-1987) 88 Nov 04	
155	(7)S	Data Communication Systems and Services User-Oriented Performance Measurement Methods (ANSI X3.141-1987) 88 Nov 04	
156	(3)S	Information Resource Dictionary System (IRDS) (ANSI X3.138-1988 & X3.138A-1991)) 89 Apr 05	1
157	(2)G	Guideline for Quality Control of Image Scanners (ANSI/AIIM MS44-1988) 89 Sept 13	
*158-1	(3)S	The User Interface Component of the Applications Portability Profile (MIT X Version 11, Release 5) 93 Oct 08	
159	(7)S	Detail Specification for 62.5um Core Diameter/125-um Cladding Diameter Class Ia Multimode, Graded-Index Optical Waveguide Fibers (ANSI/EIA/TIA-492AAAA-1989) 90 Dec 27	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
160	(3)S	C (ANSI/ISO 9899:1992) 91 Mar 13	1
*161-1	(3)S	Electronic Data Interchange (EDI) 93 Apr 19	
162	(7)S	1,200 Bits Per Second Two-wire Duplex Modems for Data Communications Use on Telephone-Type Circuits 92 Apr 02 (Supersedes FIPS PUB 136/Former Federal Standard 1008)	
163	(7)S	2,400 Bits Per Second Two-Wire Duplex Modems for Data Communications Use on Telephone-Type Circuits 92 Apr 02 (Supersedes FIPS PUB 133/Former Federal Standard 1005A)	
164	(7)S	2,400 Bits Per Second Four-Wire Duplex and Two-Wire Half-Duplex Modems for Data Communications Use on Telephone-Type Circuits 92 Apr 02 (Supersedes FIPS PUB 133/Former Federal Standard 1005A)	
165	(7)S	4,800 Bits Per Second Four-Wire Duplex and Two-Wire Half-Duplex Modems for Data Communications Use on Telephone-Type Circuits 92 Apr 02 (Supersedes FIPS PUB 134-1/Former Federal Standard 1006A)	
166	(7)S	4,800 and 9,600 Bits Per Second Two-wire Duplex Modems for Data Communications Use on Telephone-Type Circuits 92 Apr 02 (Supersedes FIPS PUB 134-1/Former Federal Standard 1006A)	
167	(7)S	9,600 Bits Per Second Four-Wire Duplex Modems for Data Communications Use on Telephone-Type Circuits 92 Apr 02 (Supersedes FIPS PUB 135/Former Federal Standard 1007)	

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168	(7)S	12,000 and 14,400 Bits Per Second Four-Wire Duplex Modems for Data Communications Use on Telephone-Type Circuits 92 Apr 02	
169	(7)S	Error Correction in Modems Employing Asynchronous-To-Synchronous Conversion 92 Apr 02	
170	(7)S	Data Compression in Modems Employing CCITT Recommendation V.42 Error Correction 92 Apr 02	
171	(5)S	Key Management Using ANSI X9.17 (ANSI X9.17-1985) 92 Apr 27	
172	(3)S	VHSIC Hardware Description Language (VHDL) (ANSI/IEEE 1076-1987) 92 June 29	
173	(3)S	Spatial Data Transfer Standard (SDTS) (DOI/USGS Specs.) 92 August 28	
174	(7)S	Federal Building Telecommunications Wiring Standard (ANSI/EIA/TIA-568-1991) 92 August 21	
175	(7)S	Federal Building Standard for Telecommunications Pathways and Spaces (ANSI/EIA/TIA-569-1990) 92 Aug 21	
176	(7)S	Residential and Light Commercial Telecommunications Wiring Standard (ANSI/EIA/TIA-570-1991) 92 Aug 21	
177	(3)S	Initial Graphics Exchange Specification (IGES) (ASME/ANSI Y14.26M-1989) 92 Nov 30	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
178	(7)S	Video Teleconferencing Services at 56 to 1,920 kb/s (CCITT Series H Recommendations H.221;230;242;261;320 - 1990) 92 Dec 21	
179	(2&3)S	Government Network Management Profile (GNMP) 92 Dec 14	
*180	(5)S	Secure Hash Standard (SHS) 93 May 11	
*181	(5)S	Automated Password Generator (APG) 93 Oct 5	
*182	(7)S	Integrated Services Digital Network (ISDN) 93 Oct 5	
*183	(3)S	Integration Definition for Function Modeling (IDEFO) 93 Dec 21	
*184	(3)S	Integration Definition for Information Modeling (IDEF1X) 93 Dec 21	

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