COMPUTER SYSTEMS LABORATORY

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U.S. DEPARTMENT OF COMMERCE
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DIRECTOR'S FOREWORD

Computing and standards are woven into the structure of our modern society and economy. Two national studies done in 1992, one by the National Research Council (NRC) on computing as a discipline, and one by the Office of Technology Assessment (OTA) on the development of international standards, point up the importance of both computing and standards to our future economic well-being.

Organizations of all sizes depend upon computers to keep records, simulate complex situations, design products, control equipment, and solve computational problems. Computing the Future, the NRC study, cites the exceptional progress that has been made in achieving small, fast, light, and inexpensive components and in advancing computing power and use. Continued progress in computing will depend on addressing structural and funding issues, as well as sustained work in multiple processors, data communications and networking, computer security, software engineering, information storage and management, computer reliability, and user interfaces.

According to the OTA study, Global Standards, Building Blocks for the Future, standards affect our lives in many ways, but the process for setting standards may not work as well as it should. The U.S. has a big stake in the effectiveness of the standards process as more and more industries become dependent on trade, and as organizations become more dependent upon technology. OTA says that there is a clear need to pay greater attention to standards in an information-based global economy.

CSL Activities in 1992

The Computer Systems Laboratory (CSL) at the National Institute of Standards and Technology works at the intersection of computing and standards. We are responsible for developing standards, guidelines, and test methods, and for providing research and technical assistance on computer and related telecommunications systems.

CSL is an active participant in the development of national and international standards, and collaborates with the industry consortia that have formed to promote open systems. CSL encourages the development of off-the-shelf products and services that will serve the needs of users everywhere, not just those in the federal government. This report details selected standards, technical assistance, and research efforts, many of which were carried out in conjunction with industry, users, and other governments.

We were pleased to have contributed to TRIP '92 (Transcontinental Integrated Services Digital Network [ISDN] Project) which marked the start of standard ISDN services across the country. First developed about ten years ago but not widely implemented, ISDN integrates voice, data, and image transmissions over a single user connection using the existing telecommunications infrastructure.
TRIP '92 successfully demonstrated the implementation of national and international standards for ISDN in accordance with specifications developed by Bellcore. Co-sponsors were the Corporation for Open Systems and the North American ISDN Users Forum (NIUF), a consortium that CSL organized under a Cooperative Research and Development Agreement with exchange carriers, interexchange carriers, customer premises equipment suppliers, and users. Nationwide open houses showed ISDN applications, including video conferencing, desktop conferencing, and file and screen sharing, to industry and government organizations.

During the past year, we established a Memorandum of Understanding with the Communications Security Establishment of Canada to cooperate in future projects for computer security systems evaluation, standards development, and validation activities. I believe that both the U.S. and Canadian governments will benefit from the joint development of technical solutions to common information security problems.

Progress was made in the implementation and integration of standards that support the Computer-aided Acquisition and Logistic Support (CALS) project of the Department of Defense (DoD). Applications that meet CALS requirements are becoming commercially available. The CALS project is concerned with the generation, access, management, maintenance, distribution, and use of technical data used for the design, manufacture, and support of complex weapons systems.

The Year Ahead

We will continue to support the development of standards and technology to protect information from unauthorized modification, undetected loss, and unauthorized disclosure. Our cooperative project with the National Security Agency (NSA) is expected to result in a new federal standard for specifying computer security requirements in open systems environments. This work, which draws on the current Trusted Computer System Evaluation Criteria (Orange Book) developed by NSA, will make it easier for users to specify the level of security needed to protect data integrity and confidentiality and to assure system availability.

Several planned standards for cryptography are on our agenda: review of Federal Information Processing Standard (FIPS) 46-1, Data Encryption Standard, for reaffirmation or modification; completion of standards for secure message digests, for digital signatures, and for the implementation of cryptographic modules in computer systems.

The High Performance Computing and Communications Program being coordinated by the Office of Science and Technology Policy will continue to be a priority. Organized as an interagency activity in cooperation with industry and academia, this program addresses national needs for advanced computers, high-capacity and high-speed networks, and electronic data bases.

We expect to complete the Industry/Government Open Systems Specification (IGOSS) which will consolidate user requirements for computer networking products. IGOSS is being developed in conjunction with the Canadian government, the World Federation of MAP/TOP Groups, and the electric power industry and will enable major user groups with significant purchasing power to speak to the vendors with one voice.
Standards and Users

Standards are essential to the computer industry which is dependent on trade. Standards are equally important to users for reducing risks and adapting to technological change. Personal computers, networks, workstations, software packages, and other changes in computing technology have stimulated user requirements for interoperability (ability for heterogeneous systems to interoperate) and portability (ability to move an application from one system to another). Users would not find PCs useful without standards for input/output, removable storage media, control languages, operating systems, subroutines, utilities, software, and printer interconnections.

But standards are not always available to meet user requirements. Because of the rapid pace of technological change, the standards process has become complex, fragmented, and slow. The technology may have changed before a standard is completed, making it too late for implementation in products.

Standards are produced at different levels of abstraction and are difficult for users to integrate into coherent systems. Products implementing abstract standards may be incomplete and require extensive testing to assure interworking with existing products and systems.

Internationally accepted standards are the ultimate goal for both users and vendors. Users must continue to bring their requirements to the attention of vendors and other groups. Users should state their plans for the use of technology and keep informed on the progress of standards development. They should plan for the transition to standards in their systems and adopt policies to buy standards-based products.

Until all of the needed standards are available, users may have to complement the voluntary industry standards with other specifications, market standards, and the work of consortia. Users can develop reference models that establish a context for how different technologies required as part of an open systems environment relate to one another, and profiles that integrate standards and other specifications. Doing this cooperatively with other users can help to form a unified market for standards-based products.

Over the past year, considerable progress has been made in the application of standards and in user awareness of the need for standards to achieve their goals of open computing systems. But there are many challenges ahead to advance the state-of-the-art of computing and to make standards work for the users of computer technology and for the computer industry.

I welcome your comments on our programs and activities which are detailed in this report.

James H. Burrows
Director
Computer Systems Laboratory
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OVERVIEW OF THE COMPUTER SYSTEMS LABORATORY

A major research component of the National Institute of Standards and Technology (NIST), the Computer Systems Laboratory (CSL) supports U.S. industry and government by fostering the development and facilitating the 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.

Support to Government and Industry

In responding to the requirements of government and industry, CSL focuses on the needs of its user constituencies to establish programs and priorities in basic research, the development of standards and test methods, and technical leadership in computer and telecommunications technologies. CSL programs strive to strengthen the competitiveness of U.S. industry in the global marketplace and maintain America’s technical leadership in the vital information processing industries. Government and industry alike benefit from CSL programs which advance the development of open systems, enhance the security of automated information resources, and promote the development and use of high-performance computer and communications capabilities.

Meeting the Challenge of Interoperability

Users have a diversity of requirements which no single vendor can supply. Meeting the various needs of industry and government requires an open systems environment in which hardware, software, and telecommunications products interoperate. Through cooperative efforts 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 the decade advances, more commercial, off-the-shelf products are becoming available to meet user needs to move data, applications, and people skills from one system or environment to another.

Computer Security

As open systems and networks proliferate, users want assurance that valuable information resources are protected from disclosure, destruction, or loss. The Computer Security Act of 1987 strengthened and reaffirmed CSL’s role in protecting vital data in federal computer systems and networks. Our computer security program focuses on the development of standards and guidelines to federal agencies and industry, computer security awareness and training activities for users and managers, publications, conferences, and sponsorship of the Federal Computer Security Program Managers Forum and the Computer System Security and Privacy Advisory Board established by the legislation.
Research and Outreach

CSL's laboratory-based research program supports and complements its standards activities and technical assistance to the public and private sectors. Research endeavors, often in collaboration with industry or in support of other federal agencies, include diverse computer and communications areas such as data management, software engineering, information security, network architectures, and advanced systems such as Integrated Services Digital Network (ISDN). The development of test and measurement methods to evaluate conformance of products to standards remains a significant part of our research program. Six patent applications, currently pending, resulted from CSL research this year. Transferring technology to government and industry completes the research cycle.

Cooperative Ventures

Each year many organizations ask for CSL's advice and assistance in providing technical solutions to complex computer and telecommunications problems. In 1992, we collaborated with 44 government, industry, and academic institutions in formal cooperative research projects. Our ongoing workshop efforts continued, including the Open System Environment (OSE) Implementers' Workshop (OIW), the Applications Portability Profile (APP)/OSE Users' Forum, and the North American ISDN Users' Forum. 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 is organized into five technical 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 1992 included 241 full-time-equivalent employees of which 75% were professional and technical staff and 25% were administrative support personnel. In addition to CSL staff, about 31 research associates, guest scientists, and faculty appointments enhanced our research program.

Funding for CSL programs in FY 1992 consisted of $12.4 million from the NIST Congressional appropriation (STRS), including $.7 million in NIST-supported competency funding and $18.2 million in reimbursable funds, mostly for direct technical assistance from other federal agencies. About 37 organizations in government and industry received reimbursable technical support from CSL in FY 1992. The Department of Defense, the General Services Administration, and the Department of the Treasury are representative of federal agencies that utilized our resources to solve technical problems.
A primary goal of our organization is the sharing of information and technology with government, business, academia, and the public. CSL publishes a variety of documents including 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). A variety of conferences and workshops are sponsored and hosted by CSL throughout the year, and our staff members address many federal and private organizations each year.

CSL maintains four electronic bulletin boards to share information with computer users with dial-up capability. Bulletin boards offer information on computer security, data management, Open System Interconnection (OSI) activities, and Integrated Services Digital Network (ISDN). Instructions for accessing bulletin boards appear in Technology Transfer.

Technical highlights of our five divisions follow.
The Information Systems Engineering Division develops standards and provides technical assistance to government and industry in data administration, data management technology, computer graphics, and software standards validation.

Data Administration

CSL expanded its support to the voluntary standards efforts concerning the Information Resource Dictionary System (IRDS), both at the American National Standards Institute (ANSI) level and at the International Organization for Standardization (ISO) level. The development of the final two modules for the ANSI IRDS was completed this past year, and work is underway on the development of the next generation of the standard, known as IRDS2.

CSL assumed several leadership roles in the development of the new standard, 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 IRDS2 development work so that the final standards specifications are in agreement.

Also initiated was the development of two new Federal Information Processing Standards (FIPS) for activity and data modeling. The FIPS are being developed in conjunction with user groups for the software modeling methodologies.

CSL maintained working agreements with the Department of Education, the Environmental Protection Agency, the Internal Revenue Service, and the Department of Defense (DoD) in areas such as tool integration, establishment of data administration policy for an organization, and integration of modeling methodologies. In all of these interactions, CSL seeks to ensure that organizations take maximum advantage of standards that facilitate open systems environments.

In recognition of significant contributions in data administration, NIST received the first Data Administration Management Association's (DAMA) Company Achievement Award at the annual DAMA Symposium which CSL cosponsors. This year's theme, Data Administration - A Value-Added Service, emphasized the ideas and technologies that deliver clearly visible value to the customers of data administration.
Data Management Technology

Division researchers participated in the development, coordination, and approval of a major extension to national and international standards for Database Language SQL. The extended standard, known as SQL 1992, revises and replaces the two existing 1989 specifications that were adopted as FIPS 127-1, Database Language SQL. Major additions include schema manipulation, which allows a schema definition to be changed; dynamic SQL, which provides facilities for dynamic construction and execution of SQL statements; diagnostics management, which communicates constraint violations and warnings to applications; connection management, which establishes and manages SQL connections; and session management, which sets the attributes of an SQL session. FIPS 127-1 is being revised to incorporate SQL 1992.

In an ongoing effort to help users and vendors determine compliance with FIPS 127-1, Database Language SQL, Version 3.0 of the NIST SQL Test Suite was released in January 1992, and has been used in SQL validations since July 1992. Version 3.0 provides 11 test suite types (interfaces) including embedded and module Language tests for Ada, C, COBOL, FORTRAN, and Pascal plus Interactive SQL tests. Twenty-six SQL Test Suite licenses were added this fiscal year. Since the NIST SQL Test Suite was released, over 120 SQL Test Suite licenses have been purchased for all versions of the test suite. Thirty-two database language processors were validated for conformance to FIPS 127-1 compared to 25 the previous year.

Under an interagency agreement, CSL continued its assistance to the DoD Computer-aided Acquisition and Logistic Support (CALS) project in the application of SQL and other data management standards to CALS requirements. NISTIR 4780, Guide for Specifying and Building CITIS with Data Management Standards, and NISTIR 4902, Database Language SQL: Integrator of CALS Data Repositories, resulted from these efforts. CSL also provided support to the Defense Advanced Research Projects Agency (DARPA) for object database technology.

A research project in hypertext/hypermedia completed its fourth year in collaboration with the Systems and Software Technology Division. 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, and publishing.

Computer Graphics

Developed in cooperation with industry and other federal agencies, especially the Department of the Interior, FIPS 173, Spatial Data Transfer Standard (SDTS), was approved for use by federal agencies. The standard provides specifications for the organization and structure of digital spatial data transfer, definition of spatial features and attributes, and data transfer encoding. FIPS 173 will facilitate the transfer of digital spatial data between dissimilar computer systems.

Also approved was FIPS 177, Initial Graphics Exchange Specification (IGES). The new standard will enable federal agencies to use more effective and productive computer-aided design and computer-aided manufacturing (CAD/CAM) techniques.

Activities in support of conformance testing for graphics standards included:
CSL conducted seven validations and issued seven certificates of conformance for FIPS 120-1, Graphical Kernel System (GKS), to assist federal agencies in acquiring GKS software that conforms to the standard.


A Computer Graphics Metafile (CGM) Testing Service to determine conformance to FIPS 128, CGM, and the CALS Application Profile (MIL-D-28003) was established. CGM Generator Conformance Tests were developed and beta tested. A CGM Generator Testing Service started on November 1, 1992.

As the Registration Authority for ISO Registration of Graphical Items, CSL developed the ISO Register which currently has 16 Linetypes, 25 Escapes, 26 Marker Types, and 4 Generalized Drawing Primitives. To date 14 copies of the ISO Register have been licensed.

Software Standards Validation

Testing programming language compilers for conformance to FIPS continued to be an important service provided by CSL. In addition to existing validation services for programming languages COBOL (FIPS 21-3), FORTRAN (FIPS 69-1), Pascal (FIPS 109), MUMPS (FIPS 125), and Ada (FIPS 119), CSL established a new validation service for the programming language C (FIPS 160). A new publication, NIST Special Publication 500-203, *Conformance Test Specifications for COBOL Intrinsic Function Module*, describes conformance testing for FIPS 21-3, Programming Language COBOL.

FIPS 172, VHSIC Hardware Description Language (VHDL), was approved in 1992 for federal agency use. The new standard promotes the portability of VHDL programs for use on a variety of data processing systems.

During FY 1992, programming and database validation services were provided to 45 private-sector companies and one government agency for a total of 126 validations. The total number of programming and database language processors currently validated as of September 30, 1992, is 397.

CSL expanded its quarterly *Validated Products List*, a collection of registers listing implementations that have been validated for conformance to FIPS. In addition to listing the validated programming language processors for COBOL, FORTRAN, Ada, Pascal, C, MUMPS, and database language SQL, the publication includes lists of validated products for Graphical Kernel System (GKS), Computer Graphics Metafile (CGM), Portable Operating System Interface for Computer Environments (POSIX), Government Open Systems Interconnection Profile (GOSIP), and Computer Security. The publication is now sold through the National Technical Information Service on a single-issue or subscription basis.

To facilitate the worldwide conformance testing effort, CSL sponsored a 6th International Workshop on Harmonizing Conformance Testing of Computer Language Standards. Experts from the United Kingdom, France, Italy, Germany, Japan, and the United States participated in the workshop. The attendees researched common areas of agreement among testing laboratories and certification authorities for harmonizing validation testing activities.
SYSTEMS AND SOFTWARE TECHNOLOGY DIVISION

This division develops standards and provides assistance in software engineering, office systems engineering, and distributed systems engineering to federal agencies and industry organizations. Technical activities during 1992 included the following:

CSL initiated a revision, to be published in 1993, of NIST Special Publication 500-187, Application Portability Profile (APP) The U.S. Government's Open System Environment Profile OSE/1 Version 1.0. Known as the APP Guide, the document defines an open systems 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. For each of seven service areas included in the APP, the guide recommends standards and other specifications for federal agencies to use in developing and acquiring computer systems. The APP Guide also impacted many industry organizations who adopted the recommended specifications in their internal environments to provide better management and control of IT resources.

The APP Guide enables organizations to organize and describe standards and information technology specifications needed for portability of applications software and for development of open systems. The Application Portability Profile/Open Systems Environment (APP/OSE) User's Forum met twice this year to provide a sounding board for users, vendors, and implementors on APP/OSE issues. These forums promote interchange on OSE developments in the federal government and provide guidance to federal agencies.

The NIST POSIX Testing Program

The NIST POSIX Testing Program, initiated in 1991, continued to evaluate products for conformance to FIPS 151-1, Portable Operating System for Computing Environments (POSIX). POSIX facilitates the portability of application software at the source-code level between dissimilar computer systems. Under the testing program, products are tested by one of eight laboratories accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) using the NIST POSIX Conformance Test Suite for FIPS 151-1. CSL reviews test results and issues Certificates of Validation.

Over 80 products have been issued a Certificate of Validation since the program's inception. These products are listed in CSL's quarterly Validated Products List and are also available on an electronic mail file server system. If the e-mail message send register is sent to posix@nist.gov, a current register of accredited testing laboratories and validated NIST POSIX products will be returned via e-mail to the sending e-mail address.

A revision to FIPS 151-1 was proposed. The revision updates the POSIX standard by adopting international voluntary industry specifications. When the new POSIX standard is approved, a testing program similar to the one for FIPS 151-1 will be established for the new FIPS.
**High Integrity Software**

CSL continued its ongoing effort to address the issues in producing software for use in high integrity systems, those systems that must be trusted to work dependably in some critical function. To increase public awareness and share potential solutions, CSL sponsored six lectures in the second year of its Lectures Series on High Integrity Systems. Guest lecturers provided insights on software engineering practices for high integrity software, software error prediction, the industrialization of formal methods, the transfer of software engineering technology, and the management of risk in developing and assuring high integrity software. The lecture series targeted federal and industry managers, technical staff, and users.

Under an interagency agreement with the Nuclear Regulatory Commission, CSL conducted a study of several standards, draft standards, and guidelines addressing high integrity software. The study produced a template of criteria of subjects (e.g., life cycle issues, software engineering practices, required software functionality, software assurance activities, procurement, presentation) for comparing and contrasting the documents. The study concluded that no single document met all the criteria but that a reasonable framework could be developed from these documents. NIST Special Publication (SP) 500-204, *High Integrity Software Standards and Guidelines*, presents the results of the study: a related report, NISTIR 4909, *Software Quality Assurance: Documentation and Reviews*, examines a software quality assurance standard written specifically for the nuclear industry.

CSL cosponsored the Seventh Annual Conference on Computer Assurance, COMPASS '92, an annual event providing a forum for issues of software safety, process integrity, and computer security.

**Integrated Software Engineering Environments (ISEE)**

CSL continued its series of ISEE workshops to develop a reference model and tool interface specifications for fully integrated software engineering environments which support software products and processes throughout the software life cycle. The workshop works closely with other programs in software engineering environments including those of the European Computer Manufacturers Association (ECMA), the Defense Information Systems Agency (DISA), the Navy’s Next Generation Computer Resources (NGCR), the Defense Advanced Research Project Agency (DARPA), the Ada Joint Program Office (AJPO), the International Workshop on Computer-Aided Software Engineering (IW-CASE), the National Aeronautics and Space Administration (NASA), the Software Engineering Institute (SEI), the Institute of Electrical and Electronics Engineers (IEEE), and industry efforts. CSL and ECMA published a joint NIST SP 500-201, *Reference Model for Frameworks of Software Engineering Environments Technical Report*. CSL will continue the harmonization of joint efforts with ECMA and NGCR to develop a standard ISEE for open systems environments.
Building upon its proposal to use the ECMA PCTE (Portable Common Tool Environment) specification as the basis for development of tool interface specifications in software engineering environments, CSL collaborated with the Office of the Director of Defense Information (DDI), Department of Defense (DoD), and the Object Management Group (OMG) to establish the North American PCTE Initiative (NAPI). This initiative will develop recommendations for extending the tool interface specifications, produce a publicly available reference implementation of PCTE, establish a PCTE validation capability, and support the acquisition of PCTE implementations and PCTE-based products. In addition, CSL is establishing a federated software engineering environment laboratory (SEEL) for laboratory-based investigation of PCTE and its SEE interface specifications to support the NAPI effort.

**Multimedia Systems**

In the Multimedia Systems Laboratory, researchers focused on the interrelation of document standards and their benefits to users.


In collaboration with the Information Systems Engineering Division, research continued on a joint project on hypertext and hypermedia technologies. As part of that effort, the Hypermedia Lecture Series featured five lectures on topics such as the flexible access to multimedia information, models for hypertext, the Chemistry Online Retrieval Experiment (CORE) project at Cornell University, open hyperdocument systems, and performance-based evaluation methods for hypertext. Hypermedia technologies permit the integration of searching, linking, and multimedia presentations using optical storage and networked systems.
COMPUTER SECURITY DIVISION

The Computer Security Division provides guidance and technical assistance to government and industry in the protection of unclassified automated information resources. The Computer Security Act of 1987 strengthened and reaffirmed CSL's mandate to assist federal agencies in the protection of computer systems and networks.

Cryptographic Standards

In April 1992, the Secretary of Commerce approved Federal Information Processing Standard (FIPS) 171, Key Management Using ANSI X9.17, for federal agency use. ANSI X9.17 is a voluntary industry computer security standard that defines procedures for the manual and automated management of the data (e.g., keys and initialization vectors) necessary to establish and maintain cryptographic keying relationships. This data is known as keying material. ANSI X9.17 uses the Data Encryption Standard (DES) to implement key management practices in a variety of operational environments and contains a number of options. FIPS 171 specifies a particular set of these options for the automated distribution of keying material by the federal government using the protocols of ANSI X9.17.

CSL started its third review of the Data Encryption Standard (DES) to determine its adequacy in protecting federal data in the 1990s. FIPS 46-1, DES, was approved for federal agency use in 1977 and was reaffirmed after reviews in 1983 and 1987. The DES specifies a publicly known encryption algorithm which is used with a secret key to provide secure communications.

Assistance to Federal Agencies

In collaboration with the Office of Management and Budget (OMB) and the National Security Agency (NSA), CSL visited 28 federal agencies to increase security awareness among senior managers. These visits showed that agencies are hiring professional staff to address computer security; agencies have implemented numerous management controls to protect automated information; agencies are focusing on contingency and disaster recovery planning; and agencies are conducting periodic security awareness training as mandated by the Computer Security Act. CSL will assist OMB in follow-up visits and provide technical assistance to agencies that have reported computer security as a high-risk area.

CSL maintained working agreements with the Environmental Protection Agency, the Farmers Home Administration, the Nuclear Regulatory Commission, and the National Oceanic and Atmospheric Administration in the areas of policy development and security management and administration.

CSL hosted two workshops and conducted a study to identify what federal agencies need to meet requirements in a wide variety of security and data processing environments. NISTIR 4976, Assessing Federal and Commercial Information Security Needs, presents the results of the study. A second study is in process that will help CSL determine the areas in which federal agencies need additional NIST guidance and standards.

CSL is developing a handbook to assist individuals in protecting their information technology (IT) resources. The handbook will introduce users to the field of IT security, highlighting security controls along with cost considerations and interdependencies.
Work continued on the federal criteria project, a joint effort of CSL and NSA to develop new criteria for trusted systems with capabilities for evaluating security controls, controlling access to services and data, and assuring the availability of data, systems, applications, and services. A draft FIPS is planned for 1993, to be followed by a workshop to consider comments received on the draft.

**Computer Viruses**

CSL continued to conduct research in several facets of the computer virus problem, including virus signatures and the precise identification of viruses. Precise identification is designed to enable effective cataloging and naming of viruses. NIST Special Publication 800-5, *A Guide to the Selection of Anti-Virus Tools and Techniques*, assists federal agencies in the procurement of appropriate anti-virus tools. A second document, NISTIR 4939, *Threat Assessment of Malicious Code and External Attacks*, provides an assessment of these threats on computer systems using commercially available hardware and software.

**Network Security**


Also published was NISTIR 4734, *Foundations of a Security Policy for Use of the National Research and Educational Network*, which explores requirements for a national network security policy and proposes a draft policy for the National Research and Education Network (NREN). This network will link thousands of federal and industry research organizations and academic institutions nationwide.

A FIPS was developed and proposed for Standard Security Label for the Government Open Systems Interconnection Profile (GOSIP). Standard security labels will enable organizations to make access control decisions, to specify protection measures, and to carry out a communications security policy.

Sponsored by the Defense Advanced Research Projects Agency (DARPA), CSL developed an Advanced Smartcard Access Control System (ASACS). Easily carried in a wallet or purse, the smartcard provides users with a secure means for user authentication and for generating and verifying digital signatures. Digital signature technology is a crucial element in the processing of electronic documents, as a replacement for the handwritten signature.

**Vulnerability Testing**

CSL is interested in enhancing the security of today’s systems, as well as improving the security controls of tomorrow. Current security problems often result from misuse rather than weakness of controls. Research in this area resulted in NIST Special Publication 800-6, *Automated Tools for Testing Computer System Vulnerability*. This publication will help system administrators detect vulnerabilities before security is breached.
Computer Security in Federal Procurements

In order to meet federal policies and regulations, federal agencies must include computer security considerations in all phases of information resources management. CSL published NIST Special Publication 800-4, Computer Security Requirements in Federal Procurements, to help agencies include computer security in the acquisition phase of systems development. In general, this process results in less expensive and better security than adding security to operational systems. A related document, NISTIR 4749, Sample Statements of Work for Federal Computer Security Services: For Use In-House or Contracting Out, assists federal agencies and government contractors in the acquisition of computer security services.

Cooperative Interactions

In March 1992, CSL and the Canadian Communications Security Establishment established an Memorandum of Understanding (MOU) to pursue technical cooperation in Information Security (INFOSEC). The MOU provides a framework for the two governments to facilitate the coordination and development of INFOSEC standards and criteria for the protection of sensitive unclassified data.

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.

The Computer System Security and Privacy Advisory Board, established by the Computer Security Act of 1987, met four times in 1992 to discuss significant emerging 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).

Information Exchange

Sharing information with government, industry, and the public remained a high priority. CSL and NSA cosponsored the 15th National Computer Security Conference, in Baltimore, Maryland in October 1992, for about 1,800 participants from government, industry, and foreign countries. The national conference encourages the international exchange of ideas and information concerning information technology security and related standards, criteria, and testing issues. This year's conference theme was Information Systems Security: Building Blocks to the Future.

CSL enhanced its Computer Security Bulletin Board System (BBS) to facilitate dissemination of information on IT security issues, ranging from timely security alerts to CSL security publications. NISTIR 4933, Computer Security Bulletin Board System User's Guide, gives complete information on accessing and using this valuable resource, via a modem or the Internet. In addition, CSL participates in the Network Security Information Exchange (NSIE), which facilitates the exchange of security information on the public switched communications networks.

NISTIR 4846, Computer Security Training and Awareness Course Compendium, was issued to assist federal agencies in locating computer security training resources nationwide.
SYSTEMS AND NETWORK ARCHITECTURE DIVISION

Programs in the Systems and Network Architecture Division address the development and standardization of Open Systems Interconnection (OSI), the development and application of automated protocol methods, and the advancement of technology for integrated, interoperable network management. OSI networks permit equipment and systems from different manufacturers to interoperate.

Open Systems Specifications

CSL has been working with the Canadian government, the World Federation of MAP/TOP Groups, and the electric power industry to develop a common specification for computer networking products that conform to OSI international standards. The resulting Industry/Government Open Systems Specification (IGOSS) is expected to become a single North American OSI specification.

By consolidating the requirements of a large segment of the user community, the IGOSS will enable the major user groups to speak to the vendors with one voice and represents significant purchasing power for OSI systems. Future versions of Federal Information Processing Standard (FIPS) 146-1, Government Open Systems Interconnection Profile (GOSIP), will point to the IGOSS and will specify special federal government requirements and protocol specifications that have not been agreed to by the other IGOSS organizations.

Work continued to develop implementation agreements for OSI standards. Cosponsored by CSL and the IEEE Computer Society, the Open Systems Environment (OSE) Implementors' Workshop (OIW) met four times in 1992. Attendance at the workshop continued at nearly 300 participants per meeting. Formerly called the OSI Implementors' Workshop, the OIW expanded its charter in June 1992 to include OSE-related topics and changed its name to reflect its new focus. One work item introduced as a result of the expanded charter was the development of Application Programming Interfaces (APIs) which provide a portable interface to OSI networking services. NIST Special Publication 500-202. *Stable Implementation Agreements for Open Systems Interconnection Protocols. Version 5, Edition 1, December 1991.* records stable implementation agreements of OSI protocols developed by organizations that participate in the OIW. Harmonization of OIW activities with those of other regional workshops continued.

Evaluation Guidelines

CSL developed a series of evaluation guidelines for OSI applications to assist users and acquisition authorities in determining the degree to which implementations of those applications meet their specific performance and functional requirements. Evaluation guidelines for the Message Handling Systems (MHS) and the File Transfer, Access and Management (FTAM) applications were issued previously; in 1992, CSL issued NIST Special Publication 500-205, *Guidelines for the Evaluation of Virtual Terminal Implementations.*
GOSIP Testing Program

To assist federal agencies in procuring products specified by FIPS 146-1, GOSIP, CSL developed a comprehensive test policy and procedures for testing OSI products. 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 the testing program, CSL established public registers for:

- GOSIP Abstract Test Suites (ATSs)
- Interoperability Test Suites
- Assessed Means of Testing (MOTs)
- Accredited Test Labs
- GOSIP Reference Implementations
- Conformance Tested GOSIP Products
- Approved Accredited Lab for MOT Qualification
- Interoperability Testing Services

ATSs for those protocols for which conformance testing is mandatory, approximately 30 MOTs, and about 70 OSI registered products (including Derived Products) are on the respective registers. CSL implemented a quality improvement system covering five areas of its GOSIP Testing Program: ATSs, MOTs, Labs, Test Reports, and the vendor Development Process. The GOSIP Testing Program is carried out in cooperation with the OIW, the European Community, and several accreditation bodies in Europe.

OSI Security Protocols

CSL lead the effort in standardizing OSI lower layer security. The Transport Layer Security Protocol (TLSP), for which CSL is the international editor, became an international standard at the International Organization for Standardization (ISO) meeting in July 1992. The Network Layer Security Protocol (NLSP) was elevated to Draft International Status largely through the effort of CSL. Both standards are being introduced into the OIW and will have stable implementation agreements next year. CSL, in cooperation with NSA, is in the process of describing NLSP in a communications protocol specification language called Estelle. In OSI upper layer security, CSL persuaded the international standards community to begin work on a key management standard. CSL believes that this area needs immediate standardization by ISO and offered to be the editor for this new item.

Cooperative Laboratory for OSI Routing Technology

FIPS 146-1, GOSIP, provides the blueprint for federal procurements of multi-vendor, interoperable computer networking products. Supported by the Department of Energy and the National Science Foundation, CSL developed the Cooperative Laboratory for OSI Routing Technology to establish a collaborative research program with industry, government, and academia. The laboratory provides an open testbed facility for OSI routing products, fosters mature, commercially available OSI routing products, and develops methodologies and prototype tools to support conformance testing, interoperability testing, and product evaluation of OSI routing technology.
CSL conducted its second open laboratory in 1992 for interoperability testing among implementations of the OSI Intermediate System to Intermediate System (IS-IS) Intra-domain Routing Exchange Protocol. Implementations from nine vendors were tested for interoperability in a live OSI environment. As part of this effort, CSL is developing conformance testing methodologies and prototype systems for multi-party protocols such as IS-IS. At the February open laboratory, staff demonstrated a prototype Multi-party Conformance Test System for the IS-IS protocol (IS-IS MPCTS) which was exercised against vendor implementations using a sample test suite. The IS-IS test suite has since been expanded to 100 tests which have been successfully run against three vendor implementations.

CSL assisted federal agencies in the use of Electronic Data Interchange (EDI) and the integration of EDI into open systems. Researchers developed software design documents for a set of EDI tools to assist users in prototyping, testing, and using EDI applications based on standard or non-standard transaction sets. Also designed was a system to transmit EDI transactions over X.400-based electronic mail systems, FTAM-based file transfer systems, and Value-Added Networks. Implementations based on these designs are in process. The Department of Defense, the Internal Revenue Service, and the General Services Administration sponsored these projects.

In order to provide leadership to the standardization of an X.400-based electronic mail application program interface (API), CSL chairs the IEEE X.400 API working group. The draft X.400 API standard is in the final phase of balloting and a complete IEEE standard is expected in early 1993.

In December 1992, the Secretary of Commerce approved FIPS 179, Government Network Management Profile (GNMP), for federal agency use. The GNMP specifies the common management information exchange protocol and services, specific management functions and services, and the syntax and semantics of the management information required to support monitoring and control of the network and system components and their resources. The GNMP builds on FIPS 146-1, GOSIP, and includes GOSIP Version 2.0 by reference. The GNMP and GOSIP are interrelated and cross-reference each other as required.

CSL continued to work with industry consortia to bring the GNMP into alignment with the Open Management Roadmap, a worldwide coalition of users and industry addressing the complex problem of interoperable management of heterogeneous systems and networks. The results of the Roadmap activity are agreed specifications, including the GNMP as an example procurement specification. Besides the role of catalyst, CSL is an active partner in the Roadmap, ensuring that federal requirements for interoperable network management are met.
ADVANCED SYSTEMS DIVISION

The Advanced Systems Division conducts research and provides technical assistance to federal agencies and industry organizations in advanced communications such as Integrated Services Digital Network (ISDN), distributed systems, automated recognition, data storage technologies, and parallel processing.

ISDN

CSL continued its support of the North American ISDN Users' Forum (NIUF) to ensure that emerging ISDN applications meet the needs of users. The management of the forum is governed by a Cooperative Research and Development Agreement (CRDA) with industry which now has 36 signatories. The NIUF met three times in 1992 and cosponsored the Transatlantic ISDN Project 1992 (TRIP '92) event in November which celebrated the beginning of a national ISDN network based on uniform implementation of standards. CSL hosted a week-long open house and demonstrated more than 20 ISDN applications including video/multimedia conferencing, LAN-to-LAN bridging, and Group 4 facsimile. Two new documents launched CSL's publication series focusing on ISDN: Special Publication (SP) 823-1, Overview of Integrated Services Digital Network Conformance Testing and SP 823-2, Integrated Services Digital Network Conformance Testing, Layer 1 “Physical Layer, Part 2” Basic Rate Interface, User Side.

Researchers concentrated on the evaluation and development of protocol standards for broadband ISDN (B-ISDN) and high-speed networking, especially control signalling and traffic management, and the development of implementation agreements, testing, and applications for the narrowband ISDN which is being deployed nationwide.

CSL announced a draft Federal Information Processing Standard (FIPS) for ISDN. The FIPS specifies a set of generic protocols for setting up transparent pipes to provide a minimal set of bearer services, and conformance test specifications for these protocols. It is based on ANSI standards and Implementation Agreements produced by the NIUF.

Development of ISDN conformance tests continued as an important activity of CSL. In 1992, CSL led the development of four more test suites within the NIUF for ISDN Layers 1, 2 and 3 protocols. These and other NIUF test suites will provide the conformance test requirements for the proposed FIPS for ISDN. CSL continues to harmonize test suites internationally as a step towards the goals of widespread availability of portable, multi-vendor equipment and mutual recognition of testing for ISDN.

Distributed Systems

Research in distributed systems focused on the technical preparation for TRIP '92. Participating federal agencies included the Internal Revenue Service (IRS), the General Services Administration, the Department of Veterans Affairs, the Department of Energy, and the Departments of the Army and Navy. Many of CSL's CRDA industry partners also took part, through the loan of equipment and services, in the development and demonstration of ISDN applications. ISDN over satellite to Goonhilly, England, was demonstrated through a cooperative arrangement with COMSAT.
CSL developed an Information Systems and Technology Strategy, coordinating the initiatives of the Corporate Information Management (CIM) Office and the Defense Information Systems Agency (DISA) for the Manpower and Personnel Command of the U.S. Navy. Strategy implementation guidance was issued in communications, application development, physical database access, facilities, procurement, decision support, and business improvement. For the IRS, CSL developed an ISDN tutorial and user's guide. an ISDN prototype of Integrated Examination System, and a tutorial on data compression.

For the Department of Veterans Affairs (DVA), projects included the integration of image technology with the DVA hospital system as well as presentations at medical computing conferences and the MUMPS Users Group. Finally, collaboration with the Defense Logistic Agency focused on multimedia on ISDN and video conferencing with an ISDN profile.

Research in distributed systems focused on the development of ISDN Applications profiles, LAN interconnectivity, video conferencing, screen sharing, and image transfer. Other areas included compression techniques and object-based information systems architectures.

In cooperation with the Federal Bureau of Investigation, CSL developed the world's first neural network fingerprint classification system. The system achieves classification accuracy of 95.4 percent with 10 percent rejects and processes a fingerprint in less than three seconds on a massively parallel computer. NISTIR 4880, Massively Parallel Neural Network Fingerprint Classification System, describes the system in detail. In order to test this system, researchers produced Special Database 4, containing 2000 matched 500 by 500 pixel gray level fingerprint images; 61 copies of Special Database 4 have been sold to date.

Researchers also developed a massively parallel character recognition system. The system scans a structured form filled in with hand-print, isolates the entry fields on the form, segments and classifies the hand-printed characters, and returns the hand-printed information on the form as ASCII text. The system integrates traditional image processing techniques with neural network classification techniques on a massively parallel computer to achieve end-to-end throughput of 13 seconds per form (4.3 characters per second). The system significantly improves accuracy and speed, effectively replacing key data entry in existing data capture systems.

In May 1992, CSL collaborated with the Census Bureau to conduct the first of a planned series of Optical Character Recognition (OCR) Systems Conferences; NISTIR 4912, The First Census Optical Character Recognition Systems Conference, presents details of the conference. Another first was the Text Retrieval Conference (TREC), held in November 1992, which was cosponsored by CSL and the Defense Advanced Research Projects Agency (DARPA). The goal of the conference was to encourage 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. Annual conferences on text retrieval are planned.
Partially sponsored by DARPA, research in speech recognition technology proceeded in collaboration with academia and industry. The use of CD-ROM data storage media in the United States for the exchange of recorded speech databases (corpora) within the speech research community continued to advance. In addition to CD-ROM sets released for DARPA, further releases are planned as reference material for use in speech research. CSL's work on the design and development of test procedures and other materials for the DARPA Spoken Language Systems Program and other Department of Defense speech research programs continued.

**Data Storage**

CSL chairs the Association for Information and Image Management (AIIM) committee C21, Optical Disk Applications, and actively supports the development of standards for media error monitoring, media interchange, test methods, and life expectancy for optical disk systems. Research in data storage technologies for optical disk resulted in NIST Special Publication 500-200, *Testing Methodology to Predict Life Expectancy Values for Optical Disk Media*. This work has contributed to the draft industry standard on life expectancy of CD (compact disk) media. Optical disk research focused on data integrity studies for optical disk media, including monitoring and reporting techniques for error rate and error distribution in optical disk systems. A test platform is being developed. The National Archives and Records Administration, the Social Security Administration, the Federal Bureau of Investigation, and another federal agency partially funded this work.

Another research area focused on magnetic tape media. NIST Special Publication 500-199, *The 3480 Type Tape Cartridge: Potential Data Storage Risks, and Care and Handling Procedures to Minimize Risks*, summarizes techniques for protecting this media. A new Standard Research Material (SRM) was produced and is described in NIST Special Publication 260-118, *Calibration of NIST Standard Reference Material (SRM) 3202 for 18-Track Parallel and 36-Track Parallel Serpentine 12.65 mm, 1491 cpm Magnetic Tape Cartridge*. SRM 3202, *Secondary Standard 12.65 mm Magnetic Tape Cartridge*, was made available for sale. The SRM provides the manufacturers of certain magnetic tape cartridge drives and media with a reference for several magnetic properties including output signal amplitude, typical field, overwrite, and resolution.

The use of imaging technology in a Social Security Administration (SSA) local-area network was prototyped to demonstrate the feasibility of imaging of general correspondence. Another SSA prototype is being developed to replace microfilm records of employee earnings with a computer system. This prototype involves research into indexing methodologies and user interface considerations resulted in the development of an algorithm for approximate match database searching.

CSL hosted a March 1992 workshop on the Electronic Exchange of Fingerprint Images. A major revision of ANSI/NIST/ICST 1-1986, *Data Format for the Interchange of Fingerprint Information*, is in process. The revised standard will be the basis for the exchange of fingerprints between law enforcement agencies throughout the country. Funded by the Federal Bureau of Investigation, research included image data compression and image quality.
Parallel Processing  In 1992, researchers pursued two areas in performance measurement, the first on low-perturbation data capture hardware for parallel systems, the second simplified software approaches to performance improvement. Under DARPA sponsorship, the MultiKron Very Large Scale Integration (VLSI) instrumentation chip was successfully fabricated and the technology transferred to Intel Corporation for their Paragon supercomputer parallel system. NISTIR 4737, Operating Principles of MultiKron Performance Instrumentation for MIMD Computers, describes the single-chip VLSI design, which replaces earlier NIST instrumentation chip sets. A redesign and refabrication of a faster MultiKron version in a smaller-sized VLSI reticle resulted in reduced costs. CSL also designed and implemented a prototype of a local collection network for captured performance data.

On the software side, CSL devised an innovative, portable technique for assaying and improving parallel programs on multiple-instruction, multiple-data (MIMD) systems. The method, which accomplishes important sensitivity analyses of programs, is described in NISTIR 4859, Time-Perturbation Tuning of MIMD Programs. Whereas previous approaches have been approximate and unreliable, the new method yields accurate assays and real improvements. Preliminary results on both shared-memory and distributed-memory systems are promising and have resulted in a patent application.
TECHNOLOGY TRANSFER
SELECTED STAFF ACCOMPLISHMENTS
FY 1989 - FY 1992

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

Shukri A. Wakid - Silver Medal (1992)

Allen L. Hankinson - Silver Medal (1991)


Roger J. Martin - Silver Medal (1989)

Miles E. Smid - Silver Medal (1989)

Donna F. Dodson - Bronze Medal (1992)

Elizabeth N. Fong - Bronze Medal (1992)

Michael Garris - Bronze Medal (1992)

David E. Cypher - Bronze Medal (1991)

Gary E. Fisher - Bronze Medal (1991)

Irene E. Gilbert - Bronze Medal (1991)

Barbara L. Blickenstaff - Bronze Medal (1990)

David R. Kuhn - Bronze Medal (1990)

Charles L. Sheppard - Bronze Medal (1990)


Candice E. Leatherman - Bronze Medal (1989)


Recognition from External Organizations

A 1992 Federal Leadership Award was presented to the NIST Electronic Certification Project by Federal Computer Week and the Open Systems Conference Board.

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.

James H. Burrows received the Distinguished Presidential Rank Award in 1989 for extended exceptional performance in government.


James H. Burrows, Dennis K. Branstad, Kevin L. Mills, and Shukri A. Wakid received Federal 100 awards from Federal Computer Week for significant contributions to the government systems community in 1990.


Allen L. Hankinson received the Distinguished Presidential Rank Award for 1992 for extended exceptional government service.

Allen L. Hankinson was elected to the UniForum Board of Directors for a two-year term beginning July 1, 1991.

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 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.
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.

Roger J. Martin received the Interagency Committee on Information Resources Management Award for Technical Excellence in 1989 for outstanding contributions to the federal information resources management community.

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 the Award for Technical Excellence from the Interagency Committee on Information Resources Management in 1990 for his contributions to the federal information resources management community, particularly in computer security.

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

Robert J. Carpenter, Alan Mink, George Nacht, and John Roberts received the Allen V. Astin Measurement Science Award in 1990 for their contributions to the science of measuring the performance of multiprocessor computer systems.

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

Donna Harman and Gerald Candela received the 1990 R&D 100 Award from Research & Development magazine for a fast information retrieval system. They were also the recipients of the 1991 Journal of the American Society for Information Science (JASIS) Best Paper Award for Retrieving Records from a Gigabyte of Text on a Minicomputer Using Statistical Ranking.

Leonard J. Gallagher received the Interagency Committee on Information Resources Management Award for Technical Excellence in 1989 for outstanding contributions to the federal information resource management community.

Leonard J. Gallagher was selected by the Oracle Corporation in 1990 as the grand prize winner of its Unleash the Genius contest for his implementation of a hypertext query facility.
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.

Edward Roback received an Unsung Hero in Computer Security Award by FedSecurity '91 and Federal Computer Week.

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
  - Futurebus

**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 Telegraph and Telephone Consultative Committee (CCITT):**
- CCITT Study Groups for:
  - Data Communications Networks
  - Switching and Signaling

**U.S. National Committee for CCITT:**
- 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:
   BASIC
   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
   LISP
   Open Distributed Processing
   Open Systems Interconnection
   Optical Digital Data Disks
   Parallel Processing Constructs for High-Level Programming Languages
   Picture Coding
   Secretariat Management Committee (SMC)
   Standards Planning and Requirements Committee (SPARC)
   SPARC Database Systems Study Group
   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:
   EDI
   Functional Standards
   Procedures

ISO/IEC JTC 1 Subcommittees or Groups for:
   Computer Graphics
   Design and Documentation of Computer-Based Information Systems
   Document Processing and Related Communication
   Flexible Magnetic Media for Digital Data Interchange
   Functional Standardization
   Information Retrieval, Transfer and Management for OSI
   Information Technology Security Techniques
   Interconnection of Information Technology Equipment
   Languages
   Optical Disk Cartridges for Information Interchange
   POSIX
   Procedures
   Representation of Data Elements
   Telecommunications and Information Exchange Between Systems

European Computer Manufacturers Association (ECMA) Technical Committees or Task Groups for:
   Lower Four OSI Layers and Local Area Networks
   Magnetic Tapes
   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 Common Application Environments (to be changed to OSE)
   EG-CAE

Association for Information and Image Management (AIIM)

Canadian Committee on Geomatics

Data Administration Management Association Standards and Procedures Subgroup
Federal Interagency Coordinating Committee on Digital Cartography
Federal Telecommunication Standards Committee
International Association for Identification
National Association of State Information Resource Executives (NASIRE)
National Information Standards Organization
NIST Open System Environment Implementors' Workshop (OIW)
North American ISDN Users' Forum (NIUF)
U.S. Board on Geographic Names

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

**X3 and X3 Subgroups**
- Elizabeth Fong, Intl. Rep
- Leonard Gallagher, Intl. Rep
- Mark Skall, Vice Chair
- Susan Sherrick, Intl. Rep
- Bruce Rosen, Intl. Rep
- Roger Sies, Chair
- Judith Newton, Chair
- Henry Tom, Chair

**DBSSG, Database Systems Study Group**
**X3H2, Database**
**X3H3, Computer Graphics**
**X3H3.7, Validation-Testing Registration**
**X3H4, Information Resource & Dictionary**
**X3V1.1 User Requirements**
**X3H4.4, System Administration & Control**
**X3L8.4, Geographical Units**

**JTC 1 TAG Activities**
- Robert Rountree, Chair for IS/IEC JTC 1
- Robert Rountree, Chair

**JTC 1 TAG, U.S. Technical Advisory Group**
**JTC 1 TAG Procedures Group**

**JTC 1 Subcommittees**
- Roger Martin, Rapporteur
- Fritz Schulz, Project Editor
- Eugene Troy, Project Editor
- Lawrence Welsch, Project Editor

**JTC 1/SC 22/WG 15 Rapporteur Group on Conformance Testing**
**JTC 1 SGFS, TR10003.3**
**JTC 1 27.16.1 General Model for Security Evaluations**
**SC 18 WG 1-MHMF**
**IEEE Standards Activities**

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<tr>
<th>Name</th>
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<tr>
<td>Al Hankinson</td>
<td>Chair</td>
<td>P1003.0, POSIX Guide</td>
</tr>
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<td>Fritz Schulz</td>
<td>Editor</td>
<td>P1003.0, POSIX Guide</td>
</tr>
<tr>
<td>Roger Martin</td>
<td>Chair &amp; Technical Reviewer</td>
<td>P1003.3.1, POSIX.1 Test Methods, P1003.3.1, POSIX.1 Test Methods</td>
</tr>
<tr>
<td>Anthony Cincotta</td>
<td>Editor &amp; Technical Reviewer</td>
<td></td>
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<tr>
<td>Dennis Steinauer</td>
<td>Chair</td>
<td>P1003.6, POSIX Security</td>
</tr>
<tr>
<td>John Barkley</td>
<td>Editor</td>
<td>P1003.8, Transparent File Access</td>
</tr>
<tr>
<td>Rick Kuhn</td>
<td>Secretary</td>
<td>P1201, Window &amp; Graphic Interfaces</td>
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<tr>
<td>Rick Kuhn</td>
<td>Secretary</td>
<td>P1201.2, Driveability</td>
</tr>
<tr>
<td>Steve Trus</td>
<td>Chair</td>
<td>P1224, X-400 Appli. Prog. Interface</td>
</tr>
<tr>
<td>Roger Martin</td>
<td>Chair</td>
<td>TCOS Steering Committee on Conformance Tests, Technical Committee on Operating Systems</td>
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<tr>
<td>Lawrence Welsch</td>
<td>Sponsor</td>
<td>IEEE SC MMOD</td>
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<td>Mike Rubinfeld</td>
<td>Chair</td>
<td>CD-ROM Architectures</td>
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**Others:**

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<th>Name</th>
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<tbody>
<tr>
<td>Mike Hogan</td>
<td>Vice Chair</td>
<td>American National Standards Institute, Information Systems Standards Board</td>
</tr>
<tr>
<td>Tom Bagg</td>
<td>Vice Chair</td>
<td>Image Technology 9 Committee</td>
</tr>
<tr>
<td>Dana Grubb</td>
<td>Chair</td>
<td>Workshop on the Electronic Exchange of Fingerprint Images</td>
</tr>
<tr>
<td>Mike Rubinfeld</td>
<td>Chair</td>
<td>SIGCAT, SIG Standards</td>
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</table>
COLLABORATION WITH GOVERNMENT, INDUSTRY, AND ACADEMIA

In 1992, CSL collaborated with the following agencies 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
   Ada Joint Program Office
   Air Force Cryptologic Support Center
   Air Force, Scott Air Force Base, Illinois
   Army Corps
   Army, Ft. Belvoir, Virginia
   Army, Ft. Huachuca, Arizona
   Army Personnel Command Center
   Army Vulnerability Assessment Lab
   Computer-aided Acquisition and Logistics Support (CALS)
   Corporate Information Management Office
   Defense Advanced Research Projects Agency
   Defense Information Systems Agency
   Defense Logistics Agency
   Department of the Air Force
   Department of the Army
   Department of the Navy
   National Security Agency
   Naval Weapons Center, China Lake, California
   Navy Human Resources Office
   Navy Next Generation Computer Resources
   Office of the Director of Defense Information
   Strategic Defense Initiative Organization
   Department of Commerce, Bureau of the Census
   Department of Commerce, Office of Financial Management
   Department of Education
   Department of Energy
   Department of Energy, Lawrence Livermore National Laboratory
   Department of Health and Human Services
   Department of Justice, Federal Bureau of Investigation
   Department of the Treasury
   Department of the Treasury, Internal Revenue Service
   Department of Veterans Affairs
   Environmental Protection Agency
   Federal Emergency Management Agency
   General Services Administration
Federal Agencies (continued)

National Aeronautics and Space Administration
National Archives and Records Administration
National Oceanic and Atmospheric Administration
National Science Foundation
Nuclear Regulatory Commission
Office of Management and Budget
President's Council on Integrity and Efficiency
Securities and Exchange Commission
Social Security Administration
U.S. Geological Survey

Industry

American Computer & Electronics Corporation
Ameritech Services
Apple Computer
ARINC
AT&T Bell Laboratories
AT&T Network Services
Baxter Healthcare Corporation
Bell Atlantic
Bell Communications Research
Bellcore
Bell Northern INRS, Montreal, Canada
Boeing Computer Support Services, Inc.
Bolt, Beranek and Newman
Cascade Communications
Cisco
CLC Associates
3COM
Combinet
COMSAT
Connective Strategies
Convex
Digital Equipment Corporation
Digitech Industries
Eastman Kodak Company
Electronic Data Systems Corporation
FastComm Communications
FiberCom
First Chicago Corporation
Fujitsu Networks Industry, Inc.
General DataComm, Inc.
Hayes Microcomputer Products, Inc.
Industry (continued)

Hewlett-Packard
Hughes Aircraft Company
IBM Corporation
Idacom Hewlett-Packard, Canada
InteCom, Inc.
Intel Corporation
ISDN Systems Corporation
MCI
Mitel Corporation
MITRE
NCR
NEC America
Netrix Corporation
Network Express
Network General
Nortel Federal Systems
Northern Telecom, Inc.
Novell
NYNEX-Telesector Resources Group
OSI, Inc.
Pacific Bell
Paramax
Phased Networks
PictureTel
Proteon
RACAL Guardata
Raynor Associates, Inc.
Retix
Rockwell International Corporation
Siemens Stromberg-Carlson
Southwestern Bell Telephone Company
Sprint International
SRI International
StrataCom Federal Systems
Sun Microsystems
TASC
Telebyte Technology, Inc.
Tekelec
Teleos Communications, Inc.
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University of Maryland
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University of Toronto

Other

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Laboratoire d'Informatique pour la Mecanique et les Sciences de L'Ingenieur (LIMSI), Paris (French Government)
## COOPERATIVE RESEARCH & DEVELOPMENT AGREEMENTS (CRDAs)

**FY 1992**

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**Integrated Services Digital Network (ISDN)**
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- Ameritech Services
- AT&T
- Baxter Healthcare Corporation
- Bell Atlantic
- Bell Communications Research
- Boeing Computer Support Services, Inc.
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- National Aeronautics and Space Administration (NASA)
- North Carolina State University
- Northern Telecom, Inc.
- NYNEX - Telesector Resources Group
- Pacific Bell
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### PROJECT

- Basic Test Suite
- North American ISDN Users' Forum (NIUF)
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<td>January 1991</td>
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By Leonard Gallagher
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By Elizabeth N. Fong
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By Frankie E. Spielman
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By Okhee Kim, Sharon Heatley, and Bob Bishop
May 1991  PB91-187724  $15.00

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Marianne Swanson and Elizabeth B. Lennon, Editors
April 1991  PB91-187740  $15.00

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<td>By C.L. Wilson, G. Candela, P.J. Grother, C.I. Watson, and R.A. Wilkinson</td>
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<td><em>Using Self-Organizing Recognition as a Mechanism for Rejecting Segmentation Errors</em></td>
<td>By R. Allen Wilkinson, Michael D. Garris, and Charles L. Wilson</td>
<td>October 1992</td>
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<td><em>A Study of OSI Key Management</em></td>
<td>Roberto Zamparo</td>
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<td><em>OCR Error Rate Versus Rejection Rate for Isolated Handprint Characters</em></td>
<td>Jon Geist and R. Allen Wilkinson</td>
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<td><em>Effectiveness of Feature and Classifier Algorithms in Character Recognition Systems</em></td>
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OCTOBER 1991 THROUGH DECEMBER 1992


Tang, Debra; Liu, Jinsheng; Favreau, Jean-Philippe: **The IS-IS Multi-Party Conformance Test System.** The 5th International Workshop on Protocol Test Systems. Montreal, Canada.

Ruhl, Mary K.; Gunn, Mary T.: **Letter to the Editor of Computerworld.** March 10, 1992.


Wilson, Charles L.; Candela, Gerald; Grother, Patrick J.; Watson, Craig I.; Wilkinson, R. Allen; **Massively Parallel Neural Network Fingerprint Classification System.** Journal of Artificial Neural Networks. 1992.


Radack, Shirley M.; *Information Technology Standards in Federal Acquisitions.* Federal Data Center Issues - A View to the Future, to be published by the Council of Federal Data Center Directors.

Wallace, Dolores; Ippolito, Laura; Kuhn, D. Richard; Beltracchi, Leo; *Standards for High Integrity Software.* 20th Water Reactor Safety Information Meeting. October 21-23, 1992.


CONFERENCES AND WORKSHOPS

October 1991 - December 1992

1991

October 1-4  North American ISDN Users' Forum (NIUF)
October 1-4  14th National Computer Security Conference (cosponsored by the National Computer Security Center [NCSC])
October 11  Lecture Series on High Integrity Systems
October 11  Lecture on Object-Oriented Databases
November 8  Lecture Series on High Integrity Systems
November 8  Lecture Series on Hypermedia
November 12  Applications Portability Profile/Open System Environment (APP/OSE) Users' Forum
November 18  Computer Security Awareness Seminar
December 2  Computer Security Day
December 3  Lecture Series on High Integrity Systems
December 9-13 OSI Implementors' Workshop (OIW) (cosponsored by the Institute of Electrical and Electronics Engineers [IEEE] Computer Society)

1992

January 24  Lecture Series on Hypermedia
February 14  Lecture Series on High Integrity Systems
February 18  Object Technology Lecture
February 18-21  Spatial Data Transfer Standard Workshop
March 6  Lecture Series on Hypermedia
March 9-13  OIW (cosponsored by IEEE Computer Society)
April 3  Lecture Series on High Integrity Systems
April 10  Lecture Series on Hypermedia
April 27-29  CD-ROM Technical Conference
May 11  Object Technology Lecture
May 12-13  5th Annual Data Administration Management Association (DAMA) Symposium
May 14  APP/OSE Users' Forum
May 15  Lecture Series on Hypermedia
May 18  Lecture Series on High Integrity Systems
May 18-22  NIST Integrated Software Engineering Environment (ISEE) Users' Forum
May 27-29  First Optical Character Recognition (OCR) Systems Conference (cosponsored by Bureau of the Census)
June 2-5  NIUF
June 8-12  OIW (cosponsored by IEEE Computer Society) (note name changes to Open Systems Environment Implementors Workshop [OIW])
June 15-18  COMPASS '92 7th Annual Conference on Computer Assurance (cosponsored by the IEEE National Capital Area Council and the IEEE Aerospace and Electronics Systems Society)
June 19  Software Producibility MODIL Workshop on Reuse
June 23-26  Department of Defense Electronic Data Interchange Conference (cosponsored by the Office of the Asst. Secretary of Defense Production and Logistics)
August 7  Software Producibility MODIL Workshop
September 21-25  OIW (cosponsored by IEEE Computer Society)
September 28  Software Producibility MODIL Workshop
October 9  Lecture Series on High Integrity Systems
October 13-16  15th National Computer Security Conference (cosponsored by NCSC)
October 27-30  NIUF
November 4-6  First Text Retrieval Conference (TREC) (cosponsored by Defense Advanced Research Project Agency [DARPA])
November 9  ISEE Users' Forum
November 10  APP/OSE Users' Forum

November 16-20  Transcontinental ISDN Project '92 - (cosponsored by NIUF and 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  OIW (cosponsored by IEEE Computer Society)
PLANNED CONFERENCES AND WORKSHOPS

1993

February 8-12  NIUF

February 17-18  Federal Digital Signature Applications Symposium


February 25  Lecture Series on High Integrity Systems

March 8-12  OIW (cosponsored by IEEE Computer Society)

May 11-12  6th Annual DAMA Symposium

May 25-26  APP/OSE Users’ Forum

June 7-11  OIW (cosponsored by IEEE Computer Society)

June 14-17  COMPASS ’93, 8th Annual Conference on Computer Assurance (cosponsored by the IEEE National Capital Area Council and the IEEE Aerospace and Electronics Systems Society)

June 21-25  NIUF

August 30  Text Retrieval Conference (TREC)

September 13-17  OIW (cosponsored by IEEE Computer Society)

September 20-24  16th National Computer Security Conference (cosponsored by NCSC)

October 18-22  NIUF

November 17-18  APP/OSE Users’ Forum

December 6-10  (OIW) (cosponsored by 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:

Air Force Cryptologic Support Center
American Bar Association
American National Standards Institute (ANSI)
American Society for Industrial Security
Americas Telecommunications Standards Symposium
Anti-Virus Product Developers' Conference
Applications Portability Profile/Open Systems Environment (APP/OSE) Users' Forums
Armed Forces Communication and Electronics Association (AFCEA)
Association for Computing Machinery (ACM)
Association for Federal Information Resources Management (AFFIRM)
AT&T Bell Laboratories

Bell Atlantic
Bureau of Census

CALS/CE Expo '92 Industry Steering Group
Canadian Communications Security Establishment
Carnegie-Mellon University
Carnegie Institute of Washington
COMPASS '92 Annual Conference on Computer Assurance
Computer-aided Acquisition and Logistic Support (CALS) EXPO '92
Computer Security Institute
Computer Integrated Manufacturing Conference
Corporation for Open Systems

Data Administration Management Association (DAMA)
Data Interchange Standards Association
Data Processing Management Association
Defense Advanced Research Project Agency (DARPA)
Delft University, Delft, The Netherlands
Department of Commerce (DoC)
Department of Defense
Department of Energy
Department of Justice
Department of Veterans Affairs
DoC Telecommunications Coordinating Committee
DoD Information Management Directorate Computer Security Conference '92
Eastman Kodak
EDI and Government Computer News Conference
Electronic Data Interchange National Conference
Enterprise Networking Event '92
Environmental Protection Agency
European ISDN Users' Forum

Federal Bureau of Investigation
Federal Computer Security Program Managers' Forum
Federation of Government Information Processing Councils
Fingerprint Image Analysis Workshop
Fourth Workshop on Computer Security Incident Handling
FTS 2000 Interagency Management Council

George Washington University
Geographic Information & Spatial Data Exposition (GISDEX)
GOSIP Security Profiles, Interop 92 Conference
Government Users' ISDN Security Conference

Hewlett-Packard
Honeywell Federal Systems Division

Information Systems Security Association (ISSA) '92
INFORUM
Independent Telephone Pioneers Association
Institute for Supercomputing Research of Japan
Institute of Electrical and Electronics Engineers (IEEE)
Institute of Engineers, Australia Conference
Institut National de Telecommunications, Evry, France
Interagency Working Group on Management of Data for Global Change
Internal Revenue Service
International Conference on R&D in Information Retrieval
International Data Administration Symposium
International Joint Conference on Neural Networks '92
International Neural Network Society
International Workshop on Harmonizing Conformance Testing of Programming Languages, Milano, Italy
INTEROP '92, Washington, DC
International Conference on the Applications of Standards for Open Systems, Paris, France

Johns Hopkins University

Library of Congress, Washington, DC

MITRE Corporation
National Aeronautics and Space Administration
National Archives and Records Administration
National Association of State Election Directors
National Communications Forum, Chicago
National Computer Graphics Association
National Computer Security Center
National Computer Security Conferences
National Contract Management Association
National Endowment for the Humanities
National Science Foundation
National Security Agency
National Security Industrial Association
Naval Surface Warfare Center
Network Security Information Exchange

North American Integrated Services Digital Network Users' Forum (NIUF)
Northern Telecom
Nuclear Regulatory Commission

Office of Management and Budget
Ohio Supercomputing Research Center
Oklahoma Gas and Electric Company
Open Software Foundation
Open System Environment (OSE) Implementors Workshop (OfW)
Overseas Security Advisory Council

Presidential Council on Integrity and Efficiency

Quality Assurance Institute

Royal School of Librarianship, Copenhagen, Denmark

Second National Conference on Optical Storage Laws and Regulations
SecurTech '92 Conference
Securities and Exchange Commission
Smithsonian Seminar on Scientific Imaging
Society of Manufacturing Engineers
Software AG Federal Industry Group
Software Engineering Institute
Software Engineering & Its Applications, Toulouse '92
Standards for Computer Integrated Manufacturing Conference
Sun Microsystems
Symposium on High-Speed Telecommunications and Integrated Hospital Imagery
Tenth International IFIP WG 6.1 Symposium on Protocol Specifications, Testing, and Verification
Third Annual Workshop on Very High Speed Networks
TRIP '92 Washington Event
Trusted Information Systems

Unigraphics Users Group
University of Arizona
University International Processing, Zurich, Switzerland
University of Maryland
UNIX International
URISA Urban & Regional Information Systems Association
U.S. Army Computer Vulnerability/Survivability Study Team
USDA Information Resource Management Conference

X/OPEN
ELECTRONIC BULLETIN BOARDS

CSL operates three electronic bulletin boards for information exchange:

- Information about computer security
  - 9600 baud only
  - (301) 948-5717
- Information about data management activities and applications
  - (301) 948-2048
  - and 948-2059
- Information about the North American Integrated Services Digital Network Users’ Forum (NIUF)
  - (301) 869-7281

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) meets four times a year to discuss detailed implementation specifications for OSE standards.

CONTACT:  
Tim Boland  
B-217 Technology Building  
National Institute of Standards and Technology  
Gaithersburg, MD 20899  
Telephone: (301) 975-3608

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  
Telephone: (301) 975-2937

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  
Telephone: (301) 975-3368
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<th>FIPS NO.</th>
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| 112     | (5)S     | Password Usage  
85 May 30 |                |
| 113     | (5)S     | Computer Data Authentication  
85 May 30 |                |
| 114     |          | WITHDRAWN | 1              |
| 115     |          | WITHDRAWN | 1              |
| 116     |          | WITHDRAWN | 1              |
| 117     |          | WITHDRAWN | 1              |
| 118     |          | WITHDRAWN | 1              |
85 Nov 08 | 1              |
| 120-1   | (3)S     | Graphical Kernel System (GKS) (ANSI X3.124-1985,  
91 Jan 08 | 1              |
| 121     | (2&3)S   | Videotext/Teletext Presentation Level Protocol Syntax (North American PLPS)  
86 May 06 |                |
| 122     | (8)T     | Conformance Tests for FIPS PUB 100 Version of CCITT 1980 Recommendation X.25, etc.  
86 May 28 |                |
86 Sept 19 |                |
| 124     | (3)G     | Guideline on Functional Specifications for Database Management Systems  
86 Sept 30 |                |

*Approved in 1992*


S-Standard  G-Guideline  P-Program  Information Document  T-Conformance Tests
<table>
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<td>125</td>
<td>(3)S</td>
<td>MUMPS (ANSI/MDC X11.1-1984) 86 Nov 04</td>
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<td>126</td>
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<td>Database Language NDL (ANSI X3.133-1986) 87 Mar 10</td>
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<td>Database Language SQL (ANSI X3.135-1989 &amp; X3.168-1989) 90 Feb 02</td>
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<td>129</td>
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<td>Optical Character Recognition (OCR) - Dot Matrix Character Sets for OCR-MA (ANSI X3.111-1986) 87 May 06</td>
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<td>130</td>
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<td>Guideline for Software Verification and Validation Plans (ANSI/IEEE 1012-1986) 87 Nov 19</td>
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<td>137</td>
<td>(7)S</td>
<td>Analog to Digital Conversion of Voice by 2,400 Bit/Second Linear Predictive Coding 84 Nov 28</td>
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<td>138</td>
<td>(7)S</td>
<td>Electrical Characteristics of Balanced Voltage Digital Interface Circuits 75 Sept 24</td>
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<td>Interoperability and Security Requirements for Use of the Data Encryption Standard in the Physical Layer of Data Communications 83 Aug 03</td>
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<td>140</td>
<td>(7)S</td>
<td>General Security Requirements for Equipment Using the Data Encryption Standard 82 Apr 14</td>
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<td>141</td>
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<td>Interoperability and Security Requirements for Use of the Data Encryption Standard with CCITT Group 3 Facsimile Equipment 85 Apr 04</td>
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<td>142</td>
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<td>Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits 80 Jan 31</td>
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<td>143</td>
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<td>General Purpose 37-Position and 9-Position Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment (EIA-RS-449) 85 June 10</td>
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<td>(2&amp;3)S</td>
<td>Government Open Systems Interconnection Profile (GOSIP) 91 Apr 03</td>
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<td>Group 3 Facsimile Apparatus for Document Transmission 81 Aug 19</td>
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<td>148</td>
<td>(7)S</td>
<td>Procedures for Document Facsimile Transmission (EIA-RS-466) 82 Apr 14</td>
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<td>149</td>
<td>(7)S</td>
<td>General Aspects of Group 4 Facsimile Apparatus (EIA-536-1988) 88 Nov 04</td>
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<td>150</td>
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<td>Facsimile Coding Schemes and Coding Control Functions for Group 4 Facsimile Apparatus (EIA-538-1988) 88 Nov 04</td>
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<td>152</td>
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<td>Standard Generalized Markup Language (SGML) (ISO 8879-1986) 88 Sept 26</td>
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<td>High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment (EIA-530-1987) 88 Nov 04</td>
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<td>156</td>
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<td>Information Resource Dictionary System (IRDS) (ANSI X3.138-1988) 89 Apr 05</td>
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<td>157</td>
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<td>158</td>
<td>(3)S</td>
<td>The User Interface Component of the Applications Portability Profile (MIT X Version 11, Release 3) 90 May 29</td>
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<td>159</td>
<td>(7)S</td>
<td>Detail Specification for 62.5um Core Diameter/125-um Cladding Diameter Class la Multimode, Graded-Index Optical Waveguide Fibers (ANSI/EIA/TIA-492AAAA-1989)</td>
<td>90 Dec 27</td>
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<td>160</td>
<td>(3)S</td>
<td>C (ANSI X3.159-1989)</td>
<td>91 Mar 13</td>
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<td>161</td>
<td>(3)S</td>
<td>Electronic Data Interchange (EDI)</td>
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<td>*162</td>
<td>(7)S</td>
<td>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)</td>
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<td>*163</td>
<td>(7)S</td>
<td>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)</td>
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<td>*164</td>
<td>(7)S</td>
<td>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)</td>
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<td>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)</td>
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<td>*166</td>
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<td>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)</td>
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<td>12,000 and 14,400 Bits Per Second Four-Wire Duplex Modems for Data Communications Use on Telephone-Type Circuits 92 Apr 02</td>
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<td>Error Correction in Modems Employing Asynchronous-To-Synchronous Conversion 92 Apr 02</td>
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<td>Data Compression in Modems Employing CCITT Recommendation V.42 Error Correction 92 Apr 02</td>
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<td>VHSIC Hardware Description Language (VHDL) (ANSI/IEEE 1076-1987) 92 June 29</td>
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<td>Spatial Data Transfer Standard (SDTS) (DOI/USGS Specs.) 92 August 28</td>
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<td>Federal Building Standard for Telecommunications Pathways and Spaces (ANSI/EIA/TIA-569-1990) 92 Aug 21</td>
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<td>*178</td>
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<td>Video Teleconferencing Services at 56 to 1,920 kb/s (CCITT Series H Recommendations H.221;23;242;261;320 - 1990)</td>
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<td>Government Network Management Profile (GNMP)</td>
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S-Standard G-Guideline P-Program Information Document T-Conformance Tests
Superintendent of Documents Publications Order Form

Order Processing Code:
* 7058

Please Type or Print (Form is aligned for typewriter use.)

To fax your orders (202) 512-2250

Prices include regular domestic postage and handling and are subject to change. International customers please add 25%.

<table>
<thead>
<tr>
<th>Qty.</th>
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Total

(Company or Personal Name) (Please type or print)

(Additional address/attention line)

(Street address)

(City, State, ZIP Code)

(Daytime phone including area code)

(Purchase Order No.)

May we make your name/address available to other mailers? YES NO

Please Choose Method of Payment:

☐ Check Payable to the Superintendent of Documents
☐ GPO Deposit Account    ☐ VISA or MasterCard Account

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐  (Credit card expiration date)  Thank you for your order!

(Authorizing Signature)  (3/93)

Mail To: New Orders, Superintendent of Documents
        P.O. Box 371954, Pittsburgh, PA 15250-7954
# NTIS ORDER FORM

**U.S. DEPARTMENT OF COMMERCE**  
National Technical Information Service  
SPRINGFIELD, VA 22161

### TELEPHONE ORDERS
Call (703) 487-4650  
FAX Your Order (703) 321-8547  
TELEX 89-9405  
Subscriptions: (703) 487-4630  
(See reverse side for RUSH and EXPRESS ordering options)

- **HANDLING FEE:** A handling fee is required for each order except Express, Rush, Subscription, QuikSERVICE, or Pickup orders.
- **SHIPPING:**  
  - **U.S.:** Printed reports and microfiche copies are shipped First Class Mail or equivalent.  
  - **FOREIGN:** Regular service. Printed reports and microfiche copies are shipped surface mail.  
    - Air Mail service to Canada and Mexico: add $3.50 per printed report; 75¢ per microfiche copy.  
    - Air Mail service to all other addresses: add $7.50 per printed report; $1 per microfiche copy.  
  
Subscriptions and standing orders are sent surface mail; contact NTIS for Air Mail rates.

### 1 Address Information

<table>
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<th>PURCHASER:</th>
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<td>First Initial</td>
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<td>Title</td>
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<td>Company/Organization</td>
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<td>City/State/ZIP</td>
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<td>Telephone number</td>
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**DTIC Users Code:**  
**Contract No.:**  
**SHIP TO (Enter ONLY if different from purchaser):**

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<th>First Initial</th>
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<td>Telephone number</td>
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### 2 Method of Payment

- Charge my NTIS Deposit Account ____________  
- Check/Money order enclosed for $_________  
- Charge my Amer. Express  
- VISA  
- MasterCard  
- Purchase order  
- ADD $7.50 per order†

Account No. ____________  
Exp. ____________  
Purchase Order No. ____________  
Signature: __________________________  
(Required to validate all orders)

### 3 Order Selection

(For computer products, see reverse)

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OVER—Order continued on reverse

†Purchase Order Service: There is a $7.50 charge for this service. It is restricted to U.S. addresses. There is no additional charge for subscription orders. A late payment charge will be applied to all billings more than 30 days overdue.

††Customer Routing Code: NTIS can label each item for routing within your organization. If you want this service, put your routing code in this box.

NTIS does not permit return of items for credit or refund. A replacement will be provided if an error is made in filling your order, if the item was received in damaged condition, or if the item is defective.

**SUBTOTAL From Other Side**

<table>
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**GRAND TOTAL**

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**PR-OFA**  
1200-90
### 3 Order Selection (Cont.)

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Enter the NTIS order number(s) (Ordering by title only will delay your order)

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19. 

Subtotal

ENTER this amount on the other side of this form.

### 4 Computer Products

If you have questions about a computer product, please call the Federal Computer Products Center at (703) 487-4763.

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Enter the NTIS order number(s) (Ordering by title only will delay your order)

20. 
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22. 
23. 

All magnetic tapes are sent air mail or equivalent service to both U.S. and foreign addresses.

Subtotal

ENTER this amount on the other side of this form.

### SPECIAL RUSH and EXPRESS ORDERING OPTIONS

**Telephone:** (800) 336-4700
in Virginia call: (703) 487-4700

**RUSH SERVICE**—Orders are processed within 24 hours and sent First Class or equivalent. U.S., Canada, and Mexico, add $12 per item, other countries add $14.50 per item (Air Mail postage additional, see other side).

**EXPRESS SERVICE**—Orders are processed within 24 hours AND delivered by overnight courier. Available to U.S. addresses only, add $22 per item.
The Computer Systems Laboratory Annual Report - 1992 describes the annual computer
and related telecommunications activities and accomplishments of the Laboratory. Following
the Director's Foreword, an overview of the Laboratory is presented, including a current
CSL Organization Chart. Overviews of CSL's five technical divisions are featured next,
followed by a section on Technology Transfer which details the vehicles CSL uses to dis-
seminate research and information to the public and technical communities. A list of
Federal Information Processing Standards (FIPS) and FIPS order information conclude the
annual report.

KEY WORDS (MAXIMUM 9 KEY WORDS; 25 CHARACTERS AND SPACES EACH; ALPHABETICAL ORDER; CAPITALIZE ONLY PROPER NAMES)
annual report; Computer Systems Laboratory (CSL); computers; computer standards; Federal
Information Processing Standards (FIPS); telecommunications; telecommunication standards.