

# COMPUTER SYSTEMS LABORATORY COMPUTING AND APPLIED MATHEMATICS LABORATORY

NAT'L INST. OF STAND & TECH R.I.C.



A11104 939081

NIST  
PUBLICATIONS

## TECHNICAL ACCOMPLISHMENTS October 1994 through March 1996

Elizabeth B. Lennon

Supporting  
the U.S.  
Economy

With  
Measurement  
and Standards

For  
Information  
Technology

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

QC  
100  
.U56  
NO. 5854  
1996





# **COMPUTER SYSTEMS LABORATORY COMPUTING AND APPLIED MATHEMATICS LABORATORY**

## **TECHNICAL ACCOMPLISHMENTS**

**October 1994 through March 1996**

**Elizabeth B. Lennon**

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

**NISTIR 5854  
JUNE 1996**



**U.S. DEPARTMENT OF COMMERCE  
Michael Kantor, Secretary  
Technology Administration  
Mary L. Good, Under Secretary for Technology  
National Institute of Standards and Technology  
Arati Prabhakar, Director**



## TABLE OF CONTENTS

Overview of Computer Systems Laboratory and Computing and Applied Mathematics Laboratory	1
Awards and Recognition	3
Industry Interactions	5
Collaboration with Industry, Government, and Academia	14
Cooperative Research and Development Agreements	19
Guest Researchers and Faculty Appointments	21
International Activities	23
Conferences, Workshops, and Lectures	27
Patents	29
Technical Publications	30
Technical Papers	42
Electronic Products	57
Validated Products	62
Technical Inquiries	64



**OVERVIEW OF**  
**COMPUTER SYSTEMS LABORATORY**  
**COMPUTING AND APPLIED MATHEMATICS LABORATORY**

The National Institute of Standards and Technology (NIST) is building a new organization to help developers and users acquire and implement information technology (IT) systems that are secure, interoperable, easily usable, and scalable. In response to the growing need for an advanced infrastructure to support the IT industry, NIST has consolidated the activities of the Computer Systems Laboratory (CSL) and the Computing and Applied Mathematics Laboratory (CAML). While the formal reorganization progresses, CSL/CAML has restructured its organization and redefined its role in delivering products and services to industry and government customers. Dr. Shukri Wakid is Director, CSL, and Acting Director, CAML; Dr. Alvin H. Sher is Acting Deputy Director, CSL, and Deputy Director, CAML.

This publication documents CSL/CAML's technical accomplishments, activities, products, and services to industry and government during FY 1995 and the first half of FY 1996 (October 1994 - March 1996).

**Computer Systems Laboratory**

CSL's programs and activities benefit both users and producers of information technology. Research programs focus on the development of tests and test methods that advance the interoperability of information systems and ease access to information networks. CSL's test methods and tools, measurement techniques, and related standards help to expand opportunities for U.S. industry in the global marketplace.

In the vital area of information security, CSL continues to assist federal agencies in developing effective computer security programs by increasing awareness of the importance of protecting information resources, providing training opportunities, and contributing technical expertise to government and industry.

CSL's research programs focus on advanced network technologies, human/machine interfaces, software diagnostics, visual image processing, text search and retrieval, spoken language technology, parallel processing performance, and computer security.

**CSL Home Page on the World Wide Web**

<http://www.nist.gov/itl/lab/csl.htm>

## **Computing and Applied Mathematics Laboratory**

CAML's work supports U.S. industry, research communities, and the NIST staff through the development of mathematical, statistical, and state-of-the-art scientific computing tools. CAML's mathematicians and statisticians use computer-aided modeling of complex manufacturing processes and statistical methods for improving the quality of products and processes. Industrial experimentation and measurement process evaluation are significant components of CAML's statistical engineering program.

Research activities focus on advanced computer graphics programs that produce visualizations of complex problems; innovative techniques for manipulating and communicating large amounts of data; the construction and analysis of mathematical models for selected applications; the development of algorithms for complex mathematical problems; and the implementation and distribution of mathematical software for high performance computers.

### **CAML Home Page on the World Wide Web**

<http://www.nist.gov/itl/lab/caml.htm>



## AWARDS AND RECOGNITION

### Department of Commerce 1995 Medal Awards

**Cita M. Furlani** received a Silver Medal for the leadership of interagency activities that advance applications of information technology on the National Information Infrastructure (NII).

**Lisa Carnahan** received a Bronze Medal for establishing the FIPS 140-1 validation program whereby accredited laboratories test cryptographic products for conformance to NIST standards.

**Christopher Dabrowski** received a Bronze Medal for technical enhancement of domain analysis and its application to the development of an architecture for the National Information Infrastructure.

**Barbara Guttman** and **Edward Roback** jointly received a Bronze Medal for developing an Information systems Security Handbook which promotes comprehensive, cost-effective security programs in the private and public arenas.

**Shirley Hurwitz** received a Bronze Medal for leadership of NIST/industry programs in database interoperability and the application of distributed database technologies to electronic commerce.

**Stefan D. Leigh** received a Bronze Medal for extraordinary success and dedication in enhancing the effectiveness of statistical collaborations at NIST.

### External Recognition

**Roger J. Martin** received the 1995 Hans Karlsson Award from the IEEE Computer Society for leadership in the timely completion of test methods which assure quality and dependability for the standards customer, completeness for the portable application builder and consensus of the whole community.

**Ronald Boisvert** was appointed to the ACM Publications Board.

**Michael Garris** received the Award for Excellence in Technology Transfer 1996 from the Federal Laboratory Consortium. His software distribution technology is a form-based handprint system for evaluating optical character recognition (OCR). Garris and his associates transferred this state-of-the-art technology in the public domain to numerous industry and government users via a CD-ROM using ISO-9660 format.

**William Mitchell** developed the MGGHAT package for adaptive solution of partial differential equations which was selected as a finalist for SIAM's 1995 Wilkinson Prize for Numerical Software.

**Fernando L. Podio**, High Performance Systems and Services Division, received the 1996 Standards Excellence Award from the Association for Information and Image Management International (AIIM) for outstanding and valuable contributions to industry through his efforts in the AIIM standards program, especially in standards development in the area of mass storage systems, particularly optical disk.

**Keith Eberhardt** was elected Fellow of the American Statistical Association.

**Raghu Kacker** was elected Ordinary Member of the International Statistics Institute.

**Daniel Lozier** was appointed to the Editorial Board of Mathematics of Computation.

**James H. Burrows**, retired CSL Director, received the American National Standards Institute's (ANSI) Howard Coonley Medal for contributions to government and industry in advancing the development and implementation of standards for interoperable, secure and reliable information technology systems.

**F. Lynn McNulty**, retired Associate Director for Computer Security, received a 1995 Federal 100 Award from *Federal Computer Week* for contributions to information security in federal computer systems.

**Thomas C. Bagg** posthumously received the Thomas C. Bagg Lifetime Achievement Award established in his honor for his significant contribution to the AIIM Standards Program. A NIST employee since 1941, Mr. Bagg conducted original research in physics, imaging science, computer systems, document management, micrographics, information retrieval, and electrical engineering for 50 years until his death in 1995.

## INDUSTRY INTERACTIONS

CSL/CAML participates in many consortia and industry interest groups including the following:

### **Air Transport Association (ATA) and Aerospace Industries Association (AIA)**

The ATA and AIA are international nonprofit organizations for the airline industry and aerospace suppliers. The ATA and AIA consist of the major airline companies, aerospace industries, and software and systems suppliers of the commercial aerospace industry. The ATA, AIA, and CSL/CAML are working together to develop a graphics profile and conformance tests methods for the interchange of graphics data within the commercial aerospace industry. The commercial aircraft industry is moving away from paper-based delivery of maintenance data to digital delivery. Conformance testing is critical in ensuring that graphics tools and implementations conform to the ATA profile and ease the transition to digital delivery of data.

### **Asynchronous Transfer Mode (ATM) Forum**

The ATM Forum is an international nonprofit organization which accelerates the use of ATM products and services through a rapid convergence of interoperability specifications. About 170 U.S. telecommunications corporations comprise the ATM Forum membership. Through the forum, CSL/CAML works with Bellcore, test equipment vendors such as Tekelec and Hewlett-Packard, and ATM switch vendors to develop interoperability test specifications and conformance test suites. CSL/CAML also participates in the Signalling and Traffic Management Working Group to develop ATM service protocols. David Su is the CSL/CAML principal.

### **Cross Industry Working Team (XIWT)**

The Cross Industry Working Team (XIWT) is a multi-industry coalition committed to defining the architecture and key technical requirements for a powerful, sustainable national information infrastructure (NII). Members include firms from the computer, networking, telecommunications, publishing and banking sectors, and others with business interests in the NII. NIST is represented on the executive committee by R.J. (Jerry) Linn; other CSL/CAML representatives participate in working groups related to their research and development activities.

### **Digital Audio-Video Interoperability Council (DAVIC)**

The Digital Audio-Visual Interoperability Council (DAVIC) is an international consortium for the emerging digital audio-visual applications and services. The purpose of DAVIC is to identify, select, augment, and develop internationally agreed specifications of open interfaces and protocols that maximize interoperability across countries and applications/services. CSL/CAML has been working with DAVIC members on the interoperability testing of digital video products conforming to DAVIC specifications. These efforts concentrate on the development of conformance test suites and establishment an interoperability testbed where developers could test their products. The CSL/CAML principal is David Su.

### **Electronic Messaging Association (EMA)**

CSL/CAML participated in the activities of this organization in three areas: electronic commerce, electronic mail, and directory services. EMA advances the deployment of these and other technologies throughout government and industry. Industry participants include the Exxon Corporation, MCI Communications Corporation, Hewlett-Packard, GE Information Services, American Express, Lotus Development Corporation, SETA Corporation, AT&T EasyLink Services, Bellcore, Bellsouth Advanced Networks, American Petroleum Institute, The Boeing Company, National Semiconductor, MITRE Corporation, Northern Telecom, Unisys Corporation, Control Data Systems, Inc., Digital Equipment Corporation, and many others. Steve Trus was the contact in FY 1995, at the end of which we concluded our interaction with this group.

### **Information Infrastructure Standards Panel (IISP)**

The Information Infrastructure Standards Panel (IISP) was created by ANSI to identify critical standards requirements for the emerging Global Information Infrastructure (GII). The work of IISP will lead to the creation of standards that will enable the growth of the GII and help bring about interoperability between GII components developed within different industries. As such, the IISP is predominantly made up of representatives from industry. CSL/CAML has contributed to the fulfillment of IISP's mission by devising a conceptual Framework to guide the process of identifying standards requirements and assisting IISP members in the use of this Framework. Christopher Dabrowski is the CSL/CAML contact.

## **Information Infrastructure Task Force (IITF) Committee on Applications and Technology (CAT)**

The CAT, led by NIST Director Arati Prabhakar, is responsible for coordinating the Administration's efforts to develop, demonstrate, and promote applications of information technology in specific application areas. CSL/CAML's Office of Enterprise Integration works with CAT participants in various government agencies and with industry and academia to develop publications, conduct meetings and conferences, distribute both print and electronic information, and respond to queries about the NII and the GII. One resource provided is the NII Virtual Library Home Page found at <http://nii.nist.gov>, co-sponsored with the private sector Council on Competitiveness. Cita Furlani is the CSL/CAML principal.

## **Information Technology Industry Council (ITI)**

CSL/CAML has an informal relationship with the Information Technology Industry Council (ITI). One of ITI's activities is to develop positions on issues in standards, testing, certification and quality assurance. Areas include ergonomics, health, safety and hardware, software and systems functional and performance characteristics. ITI also serves as the secretariat for the American National Standards Institute (ANSI) Accredited Standards Committee X3 (Information Technology) and as U.S. Technical Advisory Group (TAG) administrator for ISO/IEC Joint Technical Committee 1 on Information Technology. The CSL/CAML liaison to ITI is Michael D. Hogan.

## **Institute of Electrical and Electronics Engineers (IEEE)**

The Institute of Electrical and Electronics Engineers, Inc. is the world's largest technical professional society, promoting the development and application of electrotechnology and allied sciences for the benefit of humanity and the advancement of the profession. CSL/CAML maintains close ties with the IEEE to help IEEE identify forward-looking standards efforts and to provide industry input to CSL/CAML's program planning for standards and test activities. IEEE's close ties to industry and to academia help CSL/CAML to understand industry needs and requirements; to know about academic research in areas of interest to NIST; and to communicate about CSL/CAML projects. Daniel R. Benigni currently serves as a member of the IEEE Board of Directors.

### **International Multimedia Teleconferencing Consortium (IMTC)**

The IMTC is a non-profit corporation founded to promote the creation and adoption of international standards for multipoint document and video teleconferencing. The IMTC and its members promote a "Standards First" initiative to guarantee interworking for all aspects of multimedia teleconferencing. The concentration of this group is on promoting and facilitating the broad use of multimedia teleconferencing based on open standards, including the standards adopted by the ITU. Carol Warnar is the principal CSL/CAML contact for these activities especially as they relates to the use of our laboratory facility for interoperability testing. Jean-Philippe Favreau is also a CSL/CAML representative.

### **Internet Engineering Task Force (IETF)**

CSL/CAML contributes to the technical development of the Internet through its participation in the Internet Engineering Task Force (IETF). The IETF develops standards for internetwork technology and for evolving the Internet Protocol Next Generation (IPng). CSL/CAML contributes in the areas of IPv6, IPv4 security, integrated services, systems management, and routing. Additionally, Doug Montgomery co-chairs the IETF interdomain-system-to-interdomain-system (IS-IS) for IP Internet Working Group. Rob Glenn is the contact for non-security related IPv6 work, and John Wack for IPv6 security and key management.

### **National Industrial Competitiveness Information Technology (NICIT) Working Group**

This body, convened by the Office of Enterprise Integration at the request of DoC Under Secretary of Technology Mary L. Good, is composed of industry groups, consortia, trade associations, and government agencies. The broad goal of the group is to identify the best means for U.S. industry to enhance its competitiveness by effectively utilizing information technology within manufacturing. Cita Furlani is the CSL/CAML principal.

### **National Information Infrastructure Advisory Council (NIIAC)**

The NIIAC was formed to provide guidance to the Secretary of Commerce and the interagency Information Infrastructure Task Force (IITF) on the development of the National Information Infrastructure. The NIIAC was a 37-member advisory panel composed of individuals representing private industry, labor, state and local governments, public interest organizations, academia, and leading experts in NII-related fields. The NIIAC was established in January 1994 and completed its work in February 1996. Cita Furlani was the CSL/CAML principal.

## **National Information Infrastructure (NII) Awards**

Sponsored by over 60 groups from industry, government, and community leaders, the NII Awards recognize innovation and excellence in the use of networked information technology. As the representative of the interagency Information Infrastructure Task Force, CSL/CAML's Office of Enterprise Integration provided guidance to NII Awards organizers during the inaugural campaign in 1994-95 and continues to provide advice and support in 1996. Jashojit Roy is the CSL/CAML contact.

## **National Software Council (NSC)**

Incorporated in April 1995, the NSC is a nonprofit membership organization composed of industry, academia, and government members. Its mission is to ensure that the U.S. software industry continues to make a strong and growing contribution to national economic prosperity. CSL/CAML staff participated in NSC planning meetings over the past two years to define the scope and direction of the organization. As a government affiliate member of NSC, CSL/CAML obtains current information about industry and government technology requirements. Tom Rhodes and Dolores Wallace are the principal contacts with NSC.

## **Network Management Forum (NMF)**

CSL/CAML worked with industry consortia to develop *OMNIPoint* specifications, as defined by the Open Management Roadmap partnership for addressing the full range of network management requirements. Released in Fall 1992, *OMNIPoint* 1 was the first in a series of incremental specifications intended to provide a common approach to the integration and management of diverse technologies. Fran Nielsen serves as Secretary of the User Advisory Council of the *OMNIPoint* and is the CSL/CAML participant in the NMF.

## **NII Testbed Consortium (NIIT)**

NIST holds membership in the NIIT consortium, an industry, government, and academia collaboration to develop an advanced, nationwide information testbed that will deliver applications to solve real-world problems. Application Working Groups include Healthcare, Earth and Environmental Sciences, Electronic Commerce, Astrophysics, and Manufacturing. The NIST Concurrent Engineering project is a five-year project that will use currently available high performance computing and communication (HPCC) technologies to develop a platform capable of demonstrating the practical uses of HPCC technologies in concurrent engineering. CSL/CAML's participation in the consortium ensures that the NIST Concurrent Engineering project will be closely linked with industry efforts to focus on actual industry needs and to ensure maximum benefit from the NIST efforts. Shukri Wakid is the principal NIST participant.

## **Object Management Forum (OMG)**

The OMG is a nonprofit international consortium, based in Framingham, Massachusetts, of over 500 organizations whose mission is to research, develop, and promote the use of object oriented technology for distributed systems development. The membership consists of all the major producers of information technology hardware and software (e.g., IBM, DEC, Sun, Microsoft), large user organizations e.g., Boeing, Bellcore, Merrill Lynch, Citibank, GTE, MCI, British Telecom), government agencies (e.g., NASA, NSA, DISA, NIH), and universities (e.g., MIT, Stanford, University of Illinois, University of Michigan). Over the past year, NIST representatives from CSL/CAML and the Manufacturing Engineering Laboratory attended OMG meetings as part of joint project with DISA and Sematech to develop an open, distributed framework for semiconductor manufacturing. John Barkley is CSL/CAML's technical point of contact in the OMG.

## **Open Software Foundation (OSF)**

CSL/CAML had an informal relationship with the OSF, an international organization dedicated to the development and delivery of an open, portable software environment to which vendors and users have equal input and access. OSF efforts address the need for portability, interoperability, and scalability. The organization made their Distributed Computing Environment (DCE) technology available for use in CSL/CAML's Distributed Systems Engineering laboratory. Fritz Schulz was the principal CSL/CAML participant in interactions with the Open Software Foundation.



### **Society for Enterprise Engineering (formerly the IDEF Users Group)**

In developing the Integration Definition for Function Modeling (IDEFO, FIPS 183) and the Integration Definition for Information Modeling (IDEF1X, FIPS 184) standards, CSL/CAML worked closely with the Society for Enterprise Engineering, a non-profit association established to support users' requirements and provide capabilities of enterprise systems integration methods. The group provides a forum for the interchange of ideas and experiences in the use of integration modeling methods, related software tools and techniques, and the identification of potential solutions that add value and efficiency to business modernization initiatives. CSL/CAML worked closely with industry to expand the coverage of the IDEF modeling technologies over a larger portion of the system development life cycle. Bruce Rosen is the CSL/CAML principal.

### **Society for Information Display (SID)**

This worldwide professional society and forum is committed exclusively to the advancement of information display technologies. Membership in SID entitles CSL/CAML to participate in SID-sponsored symposia, seminars, and access to SID publications. Mark Williamson is the principal contact.

### **Software Engineering Institute (SEI)**

Established by Congress in 1984, the SEI is a research and development center with a broad charter to address the transition of software engineering technology. CSL/CAML established a memorandum of understanding (MOU) with SEI to work collaboratively on software engineering issues of mutual interest. Under this agreement, the Software Engineering Group of the Systems and Software Engineering Division and SEI worked together to address issues and develop standards for integrated software engineering environments. SEI also participated with CSL/CAML in the formation of the Center for High Integrity Software Systems Assurance. Roger Martin serves on SEI's Educational Products Advisory Board with representatives from Texas Instruments, AT&T, Carnegie Mellon University, Rochester Institute of Technology, and the Department of the Army.

### **Software Productivity Consortium (SPC)**

An industry-based consortium founded in 1985, the SPC focuses on advancing the fundamental processes and methods of software and systems engineering technologies for developing high-quality software intensive systems. The SPC provides a forum for CSL/CAML to collaborate with industry, government, and academia on development, application, and exchange of advanced software processes and methods for developing high-quality software systems. The forum allows CSL/CAML to contribute its technical views, program results, and capabilities to various industry sectors and provides a mechanism for technology exchange and further collaboration with industry. Roger Martin and Tom Rhodes represent CSL/CAML in this consortium.

### **Telecommunications Industry Association (TIA)**

The TIA is a major developer of voluntary standards for telecommunications products and the principal U.S. developer for fiber optic standards, building wiring standards, and cellular telephony standards. Over the past 18 months, Bill Burr, who serves as Chairman of the Federal Wireless Policy Committee subcommittee on Privacy and Authentication, has occasionally attended meetings of the TIA TR 46 (committee on Personal Communications Systems) ad hoc on Privacy and Authentication and the TIA TR 45 (committee on cellular telephony) Ad Hoc Authentication Group (AHAG) to reflect federal security concerns about wireless and cellular communications.

### **Video Electronics Standards Association (VESA) Special Interest Group (SIG) on Flat Panel Displays**

CSL/CAML's Workshop on the Computer Interface to Flat Panel Displays, held in San Jose, California, in January 1994, resulted in a consensus to form a VESA SIG to undertake the development of a standard or series of standards for the interface between a flat panel display and its controller. This interface standard will address both active and passive flat panel displays in integrated devices, and will cover both the electrical and the mechanical specifications. As a full member of VESA, CSL/CAML will participate in the technical development of standards and will also develop laboratory implementations of proposed interface architectures and by developing laboratory metrics. The CSL/CAML contact is John Roberts.

## **Virtual Library Consortium**

CSL/CAML created a Virtual Library Consortium of industry and academic participants to pursue joint research and development activities related to virtual libraries. Institutions or agencies that have done or continue to do research and development efforts related to virtual libraries participate in the consortium. In 1995, CSL/CAML met with interested parties who responded to the initial call for participation and determined the applicability of ongoing work in academia and industry to the NIST virtual library project. Lawrence Welsch is the principal contact.

## **X/OPEN**

X/Open provides a forum for vendors to discuss and establish consensus on open system specifications. CSL/CAML has been a member of the X/OPEN User Council for several years. We have also worked closely with them in the development of conformance testing technology for information systems. Roger Martin is the principal most closely involved in this interaction. X/Open is merging with the Open Software Foundation to become the Open Group.

## COLLABORATION WITH INDUSTRY, GOVERNMENT, AND ACADEMIA

CSL/CAML collaborates with many organizations and consortia from industry, academia, government, and foreign countries, including the following:

Agility Forum  
American Apparel Manufacturers Association  
American National Standards Institute (ANSI)  
American Petroleum Institute  
American Society of Manufacturing Engineers  
American Society for Quality Control  
American Statistical Association  
Amoco Corporation  
Apple  
Argonne National Laboratory  
Army Corps of Engineers  
Army Research Office  
Association for Computing Machinery  
AT&T  
Automotive Industry Action Group  
Baltic-American Enterprise Fund  
BBN Systems and Technologies  
BellCore  
Bell Laboratories  
Black & Decker  
Boeing Computer Services  
Booz-Allen Hamilton  
Bureau of the Census  
CALs Industry Steering Committee  
Cambridge University  
Chrysler Corporation  
Citibank  
CMU  
Columbia University  
Comcom  
CommerceNet  
Computer Aided Manufacturing - International Computer and Automated Systems  
Association of the Society of Manufacturing Engineers  
COMSAT  
Consortium for School Networking  
Construction Industry Institute  
Cornell University

Council on Competitiveness  
Cray Research  
Cryenco  
Cubic Defense Systems  
DataBeam  
DataKey  
Defense Advanced Research Projects Agency  
Defense Information Systems Agency  
Department of Agriculture  
Department of the Air Force  
Department of Commerce International Trade Administration  
Department of Commerce National Telecommunications and Information Administration  
Department of Defense  
Department of Education  
Department of Energy (HQ)  
Department of Health and Human Services  
Department of the Navy  
Department of State  
Department of Transportation  
Disney Imagineering  
Dow Chemical  
Dragon Systems  
Dupont  
Electronics Industries Association  
Enterprise Integration Technologies  
Environmental Protection Agency  
European Commission  
Federal Aviation Administration  
Ford Automotive Operations  
Galway and Associates  
GE Information Services  
GEMPLUS Card International  
General Motors Corporation  
George Mason University  
Global Growth Strategies  
Government of Australia  
Government of Canada  
Government of France  
Government of Germany  
Government of Japan  
Government of Italy  
Government of the Netherlands  
Government of New Zealand

Government of Singapore  
Government of the United Kingdom  
Grummond  
Harvard Information Infrastructure Project  
Hewlett-Packard Company  
Highway 1  
Howard University  
Hughes  
I-4  
IBM  
IBM T.J. Watson Research Laboratories  
Industrial Technology Institute  
Institute of Defense Analysis, Center for Computing Sciences  
Institute of Electrical and Electronic Engineers  
Intel Corporation  
Internal Revenue Service  
International Micro Industries  
International Society of Optical Engineering  
ITS  
Japanese Ministry of International Trade and Industry  
Japanese Ministry of Posts and Telecommunications  
JILA  
Kennedy Space Center  
Kodak  
Lawrence Berkeley Laboratory  
Lehigh University  
Loral  
Los Alamos National Laboratory  
Manufacturers' Alliance for Productivity and Innovation  
Massachusetts Institute of Technology  
Massachusetts Software Council  
McCabe & Associates  
MCI  
Micro Networks  
Mitek  
Morino Institute  
Motorola  
National Academy of Sciences  
National Aeronautics and Space Administration  
National Archives and Records Administration  
National Association of Manufacturers  
National Center for Advanced Technologies  
National Center for Manufacturing Sciences

National Coalition for Advanced Manufacturing  
National Communications System  
National Computer Graphics Association  
National Computer Security Association  
National Economic Council  
National Fluid Power Association  
National Initiative for Product Data Exchange  
National Institute of Justice  
National Oceanic and Atmospheric Administration  
National Research Council  
National Retail Federation  
National Science Foundation  
National Security Agency  
National Security Industrial Association  
Naval Research Laboratory  
Nestor  
Newport News Shipbuilding  
NIU Forum  
Novel, Inc.  
Oak Ridge National Laboratory  
Office of Management and Budget  
Office of Science and Technology Policy  
Old Dominion University  
Oracle Corporation  
PDES, Inc.  
Pharmaceutical Research and Manufacturers of America  
PlantStep  
Price Waterhouse  
Purdue University  
Robotic Industries Association  
RST  
Russian Academy of Sciences  
Rutherford Appleton Laboratory  
Sandia National Laboratory  
Scicomp, Inc.  
Scientific Atlanta  
SEMATECH  
Shell Oil  
Society for Industrial and Applied Mathematics (SIAM)  
Social Security Administration  
Society of Manufacturing Engineers  
Sun  
Synergy Group

Telephone Security Group  
Trusted Information Systems  
UK CALS Industry Council  
United Airlines  
University of Maryland  
University of Minnesota  
University of New Hampshire  
University of Pittsburgh  
University of Tennessee at Knoxville  
University of Texas at Austin  
U.S. Naval Academy  
U.S. Product Data Association  
Verity  
VLSI Standards, Inc.  
Washington Statistical Society  
West Publishing Company  
Westinghouse Science and Technology Center  
Wright Patterson Air Force Base  
Xerox  
Yale University



## COOPERATIVE RESEARCH & DEVELOPMENT AGREEMENTS (CRADAs)

In FY 1995 and FY 1996 (through February), CSL/CAML had formal CRADAs with 39 industry, academia, and government organizations to establish partnerships to pursue mutual areas of research. Three additional CRADAs are pending.

<b>Research Partner</b>	<b>Project</b>
ADB, Inc.	Test & Evaluation of "Middleware Implemented According to CORBA Specifications Using an Object DBMS"
Adobe Systems Incorporated	PostScript Language, PDF Format and Acrobat Software Review
COMSAT Corporation	Test and Demonstrate ISDN Protocols and Services
Enterprise Integration Technologies	Develop Software and Services for Electronic Commerce on the Internet
Linguistic Data Consortium	Corpora to Support Human Language Technology Research
MicroFab Technologies	Solder Jet Science and Technology
Washington Software Technologies	Basic Test Suite

The North American ISDN Users' Forum (NIUF) is an industry/government forum established in 1988 to create a strong user voice in the implementation of ISDN applications. CRADA partners are:

- AHK & Associates
- Ameritech Services
- AT&T Bell Laboratories
- Bell Atlantic
- Bell Communications Research
- BellSouth
- Defense Communication Agency
- Electronic Data Systems Corporation
- Fujitsu Networks Industry, Inc.

General DataComm, Inc.  
GTE Southwest Incorporated  
Hayes Microcomputer Products, Inc.  
Intecom, Inc.  
International Business Machines Corporation  
Network Communications Corporation  
North Carolina State University  
Northern Telecom Inc.  
NYNEX  
Open Communications Networks, Inc.  
Presearch, Inc.  
RLR Resources  
Siemens Stromberg-Carlson  
Southwestern Bell Telephone Company  
Symbolic Systems, Inc.  
TASC (The Analytic Sciences Corporation)  
Telamon, Inc.  
Teltone Corporation  
U.S. Air Force (Technology Integration Center)  
U.S. Coast Guard  
U.S. West  
Unisys Corporation  
West Virginia University

## GUEST RESEARCHERS AND FACULTY APPOINTMENTS

In FY 1995 and FY 1996 (through March), CSL/CAML collaborated with **117 guest researchers** from industry, government, academia, and foreign research laboratories including the following:

American National Standards Institute  
Armament Development Authority, Rafael, Israel  
BellSouth Communications Systems  
Bhabha Atomic Research Center, India  
Bundesamt fur Sicherheit in Der Informations Technik  
Centro National de Metrologia, Mexico  
CM Communications  
Convex Computer Corporation  
Cornell University  
Cray Research Incorporated  
Digicon Corporation  
East China University  
Electronics and Telecommunications Research Institute, Korea  
Environmental Protection Agency  
Florida State University  
George Mason University  
George Washington University, Washington, D.C.  
Institute for Defense Analysis  
Institute of Geology, Beijing, People's Republic of China  
Institut National des Telecommunications, France  
Korea Telecom Research Laboratories  
Los Alamos National Laboratories  
Michigan Technological University  
Ministry of Communications, Taiwan  
Ministry of Defense, Israel  
National Aeronautics and Space Administration  
National Computerization Agency  
National Science Foundation, Washington, D.C.  
National Security Agency  
National Research Laboratory (Navy)  
Purdue University  
Quality One Softworks Corporation, Annandale, Virginia  
Rolm Corporation  
Sandia National Laboratories  
Space Science and Technology Center, People's Republic of China  
Syracuse University, Syracuse, New York  
Telecom, Paris, France

Trusted Information Systems, Glenwood, Maryland  
University of Kent at Canterbury  
University of Manchester, United Kingdom  
University of Maryland, College Park, Maryland  
University of Maryland, Baltimore, Maryland  
University of Nancy, France  
University of South Florida  
University of Southern California  
University of Southampton, UK  
University of Texas, Austin  
University of Twente, The Netherlands  
VDG, Inc.

**Faculty Appointments** totaled **33** during FY 1995 and FY 1996 from:

Arizona State University  
Colorado State University  
George Mason University  
Howard University  
Loyola College, Baltimore, Maryland  
Old Dominion University  
Temple University  
University of Colorado  
University of the District of Columbia  
University of Maryland Baltimore County  
University of Maryland College Park  
University of North Carolina  
University of Pittsburgh  
University of Tennessee  
West Virginia University

**Post Doctoral Appointment - 1**

## INTERNATIONAL ACTIVITIES

CSL/CAML's international interactions during FY 1995 and FY 1996 included the following:

### **Collaboration with Electrotechnical Laboratory (ETL), Japan**

As part of an ongoing NIST-ETL study on computer performance, Roldan Pozo spent two weeks as Visiting Scientist at the Electrotechnical Laboratory (ETL) in Tsukuba, Japan in February at the invitation of the Japanese Ministry of International Trade and Industry. Pozo presented four lectures on iterative methods for solving large sparse linear algebraic systems, object-oriented software design for scientific computing, and performance modeling of multifrontal methods for distributed memory architectures. The lectures took place at ETL, Fujitsu Laboratories, the KEK High-Energy Physics Colloquium, and the Performance Measurement Consortium in Tokyo. At Fujitsu, Pozo was given a demonstration of the company's next-generation parallel computers.

### **Collaboration with Russian Academy of Sciences**

As part of an international agreement between CSL/CAML and the Russian Academy which fosters scientific exchanges, Daniel Lozier hosted a six-week visit to NIST in October-November 1995 by Dr. J.M. Rappoport of the Russian Academy. Rappoport has published algorithms and software for special function evaluation, mostly in the Russian literature. During his visit, Dr. Rappoport began a collaboration with CSL/CAML scientists on algorithms for the MacDonal (modified Bessel) functions. These arise as the Kernel of the Kontorovich-Lebedev integral transform, for which little software exists in Western computer libraries.

### **World Summit on Trade Efficiency**

In November 1994, four computer scientists participated in the World Summit on Trade Efficiency as part of the Official U.S. Delegation. CSL/CAML demonstrated a pilot electronic commerce SmartProcurement system jointly developed with the Enterprise Integration Technologies Corporation. The SmartProcurement system is an innovative application of two evolving computer technologies, the WWW and Intelligent Agents, and reduces bid time from vendors to hours instead of days or weeks.

## **Cryptographic Applications Program Interfaces**

In December 1994, CSL/CAML sponsored a workshop to address the growing interest in developing a generic Cryptographic Applications Program Interface (CAPI) and the need for convergence in the development of standards. This work is a collaborative effort with the United Kingdom (UK) Ministry of Defence (MoD), the National Security Agency, several standards organizations, and some commercial vendors. Officials from the UK and Canada shared their experiences with CAPI initiatives in their countries, and all participants agreed to coordinate future activities in this effort. A second meeting was held in March 1996, and periodic information exchanges will continue.

## **International Statistics Institute (ISI)**

Raghu N. Kacker, Statistical Engineering Division, was elected an Ordinary Member of the ISI in 1995. With fewer than 2000 members representing 96 countries, the ISI elects fewer than 100 new members annually.

## **Broadband ISDN**

Through a Memorandum of Understanding, CSL/CAML, the Korean Telcom Research Laboratories (KTRL), and the Electronics and Telecommunications Research Institute (ETRI) are jointly developing abstract conformance test and interoperability test suites for Broadband Integrated Services Digital Network (B-ISDN) protocols. KTRL and ETRI assigned guest scientists to work at NIST in developing the test suites and on research on the B-ISDN call control signalling procedures.

## **Cryptographic Module Validation**

CSL/CAML and the Communications Security Establishment of the Government of Canada collaborated on the development of the Cryptographic Module Validation Program, announced jointly on July 17, 1995. Products validated by this program as conforming to FIPS 140-1, *Security Requirements for Cryptographic Modules*, are accepted for use in both the U.S. and Canada for the protection of sensitive, unclassified information.

## **G-7 Global Information Society Inventory Pilot Project**

Under the coordination of the European Community and Japan, the Global Inventory Project (GIP), one of eleven pilot projects designed to stimulate global applications of information technologies, aims to produce a multimedia inventory of national and international projects, studies, and calls relevant to the promotion and further development of knowledge and understanding of the information society. As the U.S.A.'s point of reference, the Office of Enterprise Integration (OEI) established an entry point for a sampling of current and proposed U.S. information infrastructure projects under ten application areas defined by the G-7 nations. Electronic project submission, as well as access to the resources is available via the U.S. National Information Infrastructure Virtual Library Home Page at URL <http://nii.nist.gov/>.

## **G-7 Pilot Project on Global Electronic Commerce**

Along with Japan and the European Community (EC), the Department of Commerce was designated the lead agency in a G-7 Information Society Pilot Project "Global Marketplace for Small and Medium Enterprises (SMEs)." The SME project seeks to identify the information needs of SMEs, promote SME use of the information infrastructure, and encourage the development and demonstration of electronic marketing, cooperation, and trade. The Department of Commerce and CommerceNet Consortium hosted a G-7 Working Group meeting in San Jose, California, in September 1995, at which CSL/CAML participated in the demonstration of the G-7 "Global Marketplace" server.

## **Worldwide Electronic Commerce: Law, Policy, Security and Controls Conference**

In October 1995, CSL/CAML participated as an affiliated cosponsor of an international conference on issues of electronic commerce and the law. About 300 industry, government, and foreign participants attended. Other cosponsors included the American Bar Association; the Centre for Commercial Law Studies, Queen Mary & Westfield College, UK; EDI Association of the UK; Harvard Law School, International Union of Latin Notaries; International Chamber of Commerce, Paris; Software Publishers Association; United Nations Commission on International Trade Law; and the U.S. Council of International Business.

## **Technical Assistance to Jordan**

As part of the Peace Net effort, three CSL/CAML scientists traveled to Jordan in October 1995 to establish a telecommunications link on the Internet in that country. Oscar Farah, Ken Tice, and Sean Sell set up a demonstration project by assembling a microwave dish with "loose parts" electronics to Internet routers and servers provided by NIST, SUN, and Sprint. The success of the project can be measured by the large amount of e-mail which NIST has received from Jordan since the inception of the Internet capability. Our technical assistance to this effort continues.



## CONFERENCES, WORKSHOPS, AND LECTURES

CSL/CAML sponsored, cosponsored, and conducted more than 100 conference, workshops, lectures, and training seminars:

### **Annual conferences and ongoing workshops**

COMPASS, Conference on Computer Assurance  
Data Administration Management (DAMA) Symposium  
Federal Information Systems Security Educators Association (FISSEA) Conference  
Federal Wireless User's Forum (FWUF)  
International Conference on Information and Knowledge Management  
Open System Environment (OSE) Implementors' Workshop (OIW)  
OSE Users' Forum  
National Information Systems Security Conference  
North American ISDN Users' Forum  
Text Retrieval Conference (TREC)

### **Specialized workshops**

Healthcare Forum  
Invitational Workshop on Information Technology (IT) Security Techniques and Tools for  
Government Information Technology Services  
Technologies to Improve Your Software  
Training for the Future  
Workshop on Cryptographic Applications Program Interfaces  
Workshop on Experimental Design for Scientists and Engineers  
Workshop on Mugshot and Facial Image Standards  
Workshop on Role-Based Access Control  
Usability Engineering  
Virtual Library Consortium

### **Lectures**

Applied Information Technology Lecture Series  
CAML Laboratory Seminars  
Applied & Computational Mathematics Division Colloquium Series  
Churchill Eisenhart Memorial Lecture  
Digital Video Lecture  
High Integrity Systems Lecture Series  
High Performance Computing Lecture Series  
Statistical Engineering Division Seminars

### **Training courses**

Connecting to the Internet Securely

Eudora Training  
How to Establish an Incident Handling Capability  
Information Systems Security...And You  
Macintosh Users Group  
Programming in Fortran 90  
Introduction to Data Compression  
Introduction to C and C++ for Scientists and Engineers

## PATENTS

CSL/CAML acquired five new patents in FY 1995, bringing the total to eight:

Cryptographic Key Notarization Methods and Apparatus  
Miles Smid and Dennis Branstad  
Issued May 31, 1983

Satellite Controlled Digital Clock System  
Joseph Cateora, Dick Davis, and D. Hanson  
Issued March 29, 1977

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

Automated Recognition of Characters Using Optical Filtering With Positive and Negative Functions Encoding Pattern and Relevance Information  
Charles Wilson  
Issued November 1, 1994

Automated Recognition of Characters Using Optical Filtering With Maximum Uncertainty Minimum Variance (MUMV) Functions  
Charles Wilson and James Blue  
Issued December 6, 1994

Apparatus For Identifying Unknown Words By Comparison to Known Words  
Jon Geist  
Issued February 21, 1995

Procedure for Digital Image Restoration  
Alfred S. Carasso  
Issued May 9, 1995

Aerosol Mass Spectrometer  
Kensei Ehara  
Issued June 27, 1995

## TECHNICAL PUBLICATIONS

In FY 1995 and the first half of FY 1996, CSL/CAML published 100 technical publications which present a broad range of test measurements, metrics, reference data, and research results in information technology.

### CSL Publications (by type of publication, in order of publication date)

#### NIST Computer Systems Technology Series

- 500-220      Guide on Open System Environment (OSE) Procurements  
By Gary Fisher, October 1994
- 500-221      A User Study: Informational Needs of Remote National Archives and Records  
Administration Customers  
By Judi Moline and Steve Otto, November 1994
- 500-222      Glossary of Software Reuse Terms  
By Susan Katz, Christopher Dabrowski, Kathryn Miles, and Margaret Law,  
December 1994
- 500-223      A Framework for the Development and Assurance of High Integrity Software  
By Dolores R. Wallace and Laura M. Ippolito, Dec 1994
- 500-224      Stable Implementation Agreements for Open System Environment, Version 8,  
Edition 1  
December 1994 (supersedes NIST SP 500-214)  
Albert Landberg, Workshop Chairman; Joseph Hungate, Workshop Vice  
Chairman; and Brenda Gray, Workshop Editor, December 1994
- 500-225      Overview of Third Text Retrieval Conference (TREC-3)  
D. K. Harman, Editor, April 1995
- 500-226      Self Monitoring Accounting Systems  
By Roger F. Sies, March 1995
- 500-227      ELECTRONIC ACCESS: BLUEPRINT for the National Archives and Records  
Administration  
By Judi Moline and Steve Otto, April 1995
- 500-228      Guidelines for the Evaluation of X.500 Directory Products  
By John Tebbutt, May 1995

- 500-229      Z39.50 Implementation Experiences  
Paul Over, William E. Moen, Ray Denenberg, and Lennie Stovel, Editors,  
September 1995
- 500-230      Application Portability Profile (APP) The U.S. Government's Open System  
Environment Profile Version 3.0  
By Gary E. Fisher, February 1996
- 500-231      Guidelines for the Evaluation of Electronic Data Interchange Products  
By John J. Garguilo and Paul Markovitz, February 1996
- 500-232      Open System Environment (OSE): Architectural Framework for Information  
Infrastructure  
By Frederick (Fritz) Schulz, December 1995
- 500-233      A Manager's Guide for Monitoring Data Integrity in Financial Systems  
By Roger Sies, February 1996
- 500-234      Reference Information for the Software Verification and Validation Process  
By Dolores R. Wallace, Laura Ippolito, and Barbara Cuthill, April 1996

#### **NIST Computer Security Series**

- 800-10      Keeping Your Site Comfortably Secure: An Introduction to Internet Firewalls  
By John P. Wack and Lisa Carnahan, December 1994
- 800-11      The Impact of the FCC's Open Network Architecture on NS/NP  
Telecommunications Security  
By Karen Olsen and John Tebbutt, February 1995
- 800-12      An Introduction to Computer Security: The NIST Handbook  
By Barbara Guttman and Edward Roback, October 1995
- 800-13      Telecommunications Security Guidelines for Telecommunications Management  
Network  
By J. Kimmins, C.R. Dinkel, and D.L. Walters, October 1995

#### **NIST Special Publication**

- 868      The Information Infrastructure: Reaching Society's Goal  
NIST Office of the Director  
Kathleen Roberts, Editor  
September 1994

## **NIST Federal Implementation Conventions for Electronic Data Interchange Series**

- 881-1 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003040  
Transaction Set 838 Trading Partner Profile (Vendor Registration), Implementation  
Convention  
Jean-Philippe Favreau, Editor, August 1995
- 881-2 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003040  
Transaction Set 838 Trading Partner Profile (Confirmation of Vendor Registration),  
Implementation Convention  
Jean-Philippe Favreau, Editor, August 1995
- 881-3 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003050  
Transaction Set 850, Award Instrument, Implementation Convention  
Jean-Philippe Favreau, Editor, August 1995
- 881-4 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003050  
Transaction Set 860, Modifications to Award Instrument, Implementation Convention  
Jean-Philippe Favreau, Editor, August 1995
- 881-5 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003050  
Transaction Set 865 Purchase Order Change Acknowledgment/Request - Seller Initiated,  
Implementation Convention  
Jean-Philippe Favreau, Editor, February 1996
- 881-6 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003050  
Transaction Set 855 Purchase Order Acknowledgment, Implementation Convention  
Jean-Philippe Favreau, Editor, February 1996
- 881-7 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003050  
Transaction Set 843 Response to Request for Quotation, Implementation Convention  
Jean-Philippe Favreau, Editor, February 1996
- 881-8 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003050  
Transaction Set 840, Request for Quotation, Implementation Convention  
Jean-Philippe Favreau, Editor, February 1996
- 881-9 Federal Implementation Guideline for Electronic Data Interchange, ASC X12 003050  
Transaction Set 836, Procurement Notices, Implementation Convention  
Jean-Philippe Favreau, Editor, February 1996

## Other NIST Publications

- NISTIR 5510      Validated Products List 1994 No. 4  
Judy B. Kailey and Peggy N. Himes, Editors, October 1994
- NISTIR 5522      Information Technology Engineering and Measurement Model: Adding  
lane markings to the information superhighway  
By Marvin Zelkowitz and Barbara Cuthill, November 1994
- NISTIR 5530      Mapping Integration Definition for Information Modeling (IDEF1X)  
Model into CASE Data Interchange Format (CDIF) Transfer File  
By Igor Simakhodskiy, November 1994
- NISTIR 5532      ISDN LAN Bridging  
By Tim Boland, November 1994
- NISTIR 5538      SGML Parser Validation Procedures  
By R.B. Wilson, January 1995
- NISTIR 5540      Multi-Agency Certification and Accreditation (C&A) Process: A Worked  
Example  
By Ellen Flahavin, Annabelle Lee, and Dawn Wolcott, December 1994
- NISTIR 5541      Initial Graphics Exchange Specification (IGES): Procedures for the NIST  
IGES Validation Test Service  
By Jacki A. Schneider and Lynne S. Rosenthal, December 1994
- NISTIR 5542      Binary Decision Clustering for Neural Network Based Optical Character  
Recognition  
By C.L. Wilson, P.J. Grother, and C.S. Barnes, December 1994
- NISTIR 5546      A Perspective on Software Engineering Standards  
By Dolores R. Wallace and Roger J. Martin, December 1994
- NISTIR 5561      ATM Procurement and Usage Guide  
By Tim Boland, December 1994
- NISTIR 5570      An Assessment of the DOD Goal Security Architecture (DGSA) for Non-  
Military Use  
By Arthur E. Oldehoeft, November 1994

- NISTIR 5571      Operating Principles of MultiKron II Performance Instrumentation for MIMD Computers  
By Alan Mink, December 1994
- NISTIR 5576      Computer Systems Laboratory Annual Report 1994  
By Elizabeth Lennon, Shirley Radack, and Ramona Roach, February 1995
- NISTIR 5585      Validated Products List 1995 No. 1 (2 volumes)  
Judy Kailey, Editor, January 1995
- NISTIR 5589      A Study on Hazard Analysis in High Integrity Software Standards and Guidelines  
By Dolores Wallace, January 1995
- NISTIR 5590      Proceedings Report of the International Invitation Workshop on Development Assurance  
By Patricia Toth, January 1995
- NISTIR 5595      Application Software Interface: ISDN Services for an Open Systems Environment  
By Daniel P. Stokesberry, February 1995
- NISTIR 5600      Object-Oriented Technology Research Areas  
By Dolores R. Wallace, January 1995
- NISTIR 5623      An Electronic Implementors' Workshop  
By Ted Landberg, Robert Bagwill, and Brenda Gray, March 1995
- NISTIR 5629      Validated Products List 1995 No. 2 (2 volumes)  
Judy Kailey, Editor, April 1995
- NISTIR 5631      An Analysis of ANSI ASC X12 and UN/EDIFACT Electronic Data Interchange Standards  
By Robert Aronoff and Karen Hsing, April 1995
- NISTIR 5636      Persistent Object Base System Testing and Evaluation  
By Elizabeth N. Fong, April 1995
- NISTIR 5647      PCASYS -- A Pattern-Level Classification Automation System for Fingerprints  
By G.T. Candela, P.J. Grother, C.I. Watson, R.A. Wilkinson, and C.L. Wilson, August 1995



- NISTIR 5652      Operating Principles of the SBus MultiKron Interface Board  
By Alan Mink, George G. Nacht, and John K. Antonishek, May 1995
- NISTIR 5654      Defining Environment Integration Requirements  
By Barbara Cuthill and Marvin Zelkowitz, May 1995
- NIST GCR  
95-670            Standards Policy and Information Infrastructure  
NIST, Science, Technology and Public Policy Program, Harvard  
University, and Technology Policy Working Group, Information  
Infrastructure Task Force, May 1995
- NISTIR 5657      An Introduction to the P1003.1g and CPI-C Network Application  
Programming Interfaces  
By Karen Olsen, May 1995
- NISTIR 5677      Center for High Integrity Software System Assurance-Initial Goals and  
Activities  
By Dolores Wallace and Marvin Zelkowitz, June 1995
- NIST GCR  
95-675            Testability of Object-Oriented Systems  
June 1995
- NISTIR 5687      Method and Evaluation of Character Stroke Preservation on Handprint  
Recognition  
By Michael D. Garris, July 1995
- NISTIR 5691      Unravel: A CASE Tool to Assist Evaluation of High Integrity Software,  
Volume 1 and Volume 2  
By James R. Lyle, Dolores R. Wallace, James R. Graham, Keith B.  
Gallagher, Joseph P. Poole, and David W. Binkley, August 1995
- NISTIR 5693      Validated Products List 1995 No. 3, Vols. 1 and 2  
Judy Kailey, Editor, July 1995
- NISTIR 5695      Improving Neural Network Performance for Character and Fingerprint  
Classification by Altering Network Dynamics  
By Charles L. Wilson, James L. Blue, and Omid M. Omidvar,  
August 1995
- NISTIR 5696      The Effect of Training Dynamics on Neural Network Performance  
By Charles L. Wilson, James L. Blue, and Omid M. Omidvar,  
August 1995

- NISTIR 5703      The NIST ATM Network Simulator -- Operation and Programming,  
Version 1.0  
By N. Golmie, A. Koenig, and D. Su, August 1995
- NISTIR 5708      Electronic Access to Standards on the Information Highway  
By Sharon J. Laskowski and Venkata V. Ramayya, August 1995
- NISTIR 5719      Mapping Integration Definition for Function Modeling (IDEFO) Model  
into CASE Data Interchange Format (CDIF) Transfer File  
By Igor Simakhodskiy, September 1995
- NISTIR 5731      Validated Products List 1995 No. 4  
L. Arnold Johnson and Peggy N. Himes, Editors, October 1995
- NISTIR 5735      Distributed Systems: Survey of Open Management Approaches  
By Joseph Hungate and Geraldina Fernandes, September 1995
- NISTIR 5736      Comparison of POSIX Open System Environment (OSE) and Open  
Distributed Processing (ODP) Reference Models  
By Geraldina Fernandes and Joseph Hungate, November 1995
- NISTIR 5737      A Method to Determine a Basis Set of Paths to Perform Program Testing  
By Joseph Poole, November 1995
- NISTIR 5740      Virtual Environments for Health Care  
By Judi Moline, November 1995
- NISTIR 5743      Operating Principles of MultiKron Virtual Counter Performance  
Instrumentation for MIMD Computers  
By Alan Mink, November 1995
- NISTIR 5757      Sharing Information Via the Internet - An Infoserver Case Study  
By Robert H. Bagwill, November 1995
- NISTIR 5762      Standard Generalized Markup Language Test Suite Evaluation Report  
By Craig S. Russell, November 1995
- NISTIR 5771      STandard for the Exchange of Product model data (STEP): Procedures  
for NIST STEP Validation  
By Lynne S. Rosenthal, November 1995
- NISTIR 5788      Public Key Infrastructure Invitational Workshop September 28, 1995,  
MITRE Corporation, McLean, Virginia

William E. Burr, Editor, November 1995

- NISTIR 5789      Using S-Check Alpha Release 1.0  
By Robert Snelick, Nathalie Drouin, and John Antonishek  
February 1996
- NISTIR 5793      Data Communications Strategy  
By Jerry Mulvenna and Tim Boland, January 1996
- NISTIR 5799      Application of the Pointer State Subgraph to Static Program Slicing  
By David W. Binkley and James R. Lyle, March 1996

## **CSL Bulletins**

Available via the WWW, email, and paper form to about 4,000 subscribers, CSL Bulletins address topics of significant interest to the information systems community. Twenty-nine bulletins are currently available, including the following published in FY 1995 and FY 1996:

**Digital Signature Standard**, Donna Dodson, Edward Roback, and Elizabeth Lennon, November 1994

**The Data Encryption Standard: An Update**, Shirley Radack (editor), February 1995

**Acquiring and Using Asynchronous Transfer Mode in the Workplace**, Frederick Boland, March 1995

**Standards for Open Systems: More Flexibility for Federal Users**, Shirley Radack, May 1995

**FIPS 140-1: A Framework for Cryptographic Standards**, Lisa Carnahan, August 1995

**Preparing for Contingencies and Disasters**, Barbara Guttman and Elizabeth Lennon, September 1995

**An Introduction to Role-Based Access Control**, David Ferraiolo, John Barkley, and Shirley Radack, December 1995

**Human/Computer Interface Security Issues**, Robert Bagwill, February 1996

**Millennium Rollover: The Year 2000 Problem**, Gary Fisher and Elizabeth Lennon (editor), March 1996

**Guidance on the Selection of Low Level Assurance Evaluated Products**, Eugene Troy, April 1996

**CAML Publications** (by type of publication, in order of publication date)

**NIST Standard Reference Materials Series**

260            Statistical Aspects of the Certification of Chemical Batch SRMs  
By S.B. Schiller

**NIST HB**     DATAPLOT Reference Manual, Volume I: Commands; Volume II: LET  
Subcommands and Library Functions

**Other NIST Publications**

NISTIR 85-3273-10    Energy Prices and Discount Factors for Life-Cycle Cost Analysis 1996:  
Annual Supplement to NIST Handbook 135 and Special Publication 709  
By S.R. Petersen, October 1995

NISTIR 4942-3        Present Worth Factors for Life-Cycle Cost Studies in the Department of  
Defense [1996]  
By S.R. Petersen, October 1995

NISTIR 5185-2        BLCC The NIST Building Life-Cycle Cost Program, Version 4.21, User's  
Guide and Reference Manual  
By S.R. Petersen, January 1995

NISTIR 5185-3        BLCC The NIST Building Life-Cycle Cost Program, Version 4.3, User's  
Guide and Reference Manual  
By S.R. Petersen, October 1995

NISTIR 5505          A  $\{x_i\}$ -Vector Formulation of Anisotropic Phase-Field Models: 3-D  
Asymptotics  
By A.A. Wheeler and G.B. McFadden, October 1994

NISTIR 5506          The Maximal Accuracy Rate Algorithm for Sequence Alignment and  
Comparison  
By S.A. Janet, December 1994

NISTIR 5508          Air Pollutant Emission Factors for Federal Energy Conservation Projects  
By S.R. Petersen

NISTIR 5528          Finite Element Analysis of Advanced Technology Laboratories [ATL]  
Isolation Slab Conditioning System  
By J.T. Fong and S.J. Treado, November 1994

- NISTIR 5534      An Integral Model of Gravity Currents  
By R.G. Rehm, H.R. Baum, and K.B. McGrattan
- NISTIR 5537      Sequential Quadratic Programming  
By P.T. Boggs and J.W. Tolle
- NISTIR 5554      ALARM 1.0 --Decision Support Software for Cost-Effective Compliance  
with Fire Safety Codes  
By S.F. Weber, B.C. Lippiatt, and B.E. Harper
- NISTIR 5557      Lubrication Theory for Reactive Spreading of a Thin Drop  
By R.J. Braun, B.T. Murray, W.J. Boettinger, and G. B. McFadden,  
December 1994
- NISTIR 5569      The MasPar MP-1 as a Computer Arithmetic Laboratory  
By M.A. Anuta, D.W. Lozier, and P.R. Turner, January 1995
- NISTIR 5573      Agile Manufacturing from a Statistical Perspective  
By R.G. Easterling, October 1995
- NISTIR 5596      Inserting Line Segments into Triangulations and Tetrahedralizations  
By J. Bernal, March 1995
- NISTIR 5618      An Expression Formatter for MACSYMA  
By B.R. Miller, July 1995
- NISTIR 5624      The National Institute of Standards and Technology Parallel Applications  
Development Environment User's Manual  
By J. Devaney, R. Lipman, M. Lo, W.F. Mitchell, M.A. Edwards, J.  
Turner, and C.W. Clark
- NISTIR 5641      Anisotropy of Interfaces in an Ordered Alloy: A Multiple-Order Parameter  
Model  
By R.J. Braun, J.W. Cahn, G.B. McFadden, and A.A. Wheeler, April 1995
- NISTIR 5646      The Parallel Applications Development Environment [PADE]  
By J. Devaney, R. Lipman, M. Lo, and W.F. Mitchell
- NISTIR 5660      Parallel and Serial Implementations of SLI Arithmetic  
By D.W. Lozier, and P.R. Turner, June 1995
- NISTIR 5724      Error-Bounding in Level-Index Computer Arithmetic  
By D.W. Lozier and P.R. Turner, October 1995



## TECHNICAL PAPERS

In FY 1995 and FY 1996 (through March), CSL/CAML published more than 135 technical papers in journals, proceedings, book chapters, and other media including the World Wide Web (WWW):

### CSL Papers

#### 1994

Gilbert, D.; **16th National Computer Security Conference**. NIST Journal of Research, September/October 1994.

Flater, David; Yesha, Yelena; **Coping with Different Retrieval Standards in Next Generation Networks**. Proceedings of the 7th International Conference on Parallel and Distributed Computer Systems, Las Vegas, October 6-8, 1994.

Jansen, Wayne A.; **A Taxonomy for Security Standards**. National Computer Security Conference Proceedings, October 1994.

Ressler, Sandy; **Approaches Using Virtual Environments with Mosaic**. Proceedings of the Second International WWW'94 Conference on Mosaic and the WEB, October 1994.

Wallace, D.R.; Lyle, J.R.; Graham, J.R.; Gallagher, K.B.; Binkley, D.W.; Poole, J.P.; **A CASE Tool to Evaluate Functional Diversity in Safety System Software**. Letter Report to U.S. Nuclear Regulatory Commission, October 1994.

Harman, D.K.; **Analysis of Data from the Second Text Retrieval Conference (TREC-2)**. Intelligent Multimedia Information Retrieval Systems and Management Conference, Rockefeller University, New York, October 1994.

Freimer, R.; Khuller, S.; Mitchell, J.S.B; Piatko, Christine D.; Romanik, K.; Sovaine, D.; **Localizing an Object with Finger Probes**. Proceedings of the Vision Geometry III Conference, October 1994.

Hou, Luoming; Favreau, Jean-Philippe; Tang, Debra; **Implementation of TTCN Operation Semantics in Estelle**. Proceedings of the 7th International Workshop on Protocol Test Systems, Tokyo, Japan, November 8-10, 1994.

Williamson, M.P.; **Flat Panel Display Interface Standards**. Electronic Design, November 21, 1994.



Flater, David; Yesha, Yelena; **The Role of the Database Community in the National Information Infrastructure.** Proceedings of the International Conference on Information and Knowledge Management, November 29-December 2, 1994.

Wilson, C.L.; Omidvar, O.M.; **Information Content in Neural Network Optimization.** Journal of Connection Science, Vol. 6, No. 1, 1994.

Newton, J.; **Data Administration Management Association Symposium.** NIST Journal of Research, November/December 1994.

Ippolito, L.M.; Wallace, D.R.; Lennon, E.B.; **COMPASS '94.** NIST Journal of Research, November/December 1994.

Lennon, Elizabeth B.; **North American Integrated Services Digital Network (ISDN) User's Forum (NIUF).** NIST Journal of Research, November/December 1994.

Favreau, Jean-Philippe; **EDI Federal Implementation Convention Registry.** CALS Exposition International '94. Long Beach, California, December 5-8, 1994.

Watson, C.I.; **NIST Special Database 18 Mugshot Identification Data Fronts and Profiles.** NIST NSRDS Special Database 18, December 1994.

Kemmerer, Sharon J.; **Commercial CALS...and its Application.** Proceedings of the CALS Europe '94 Conference, Fall 1994.

Romanik, K; Freimer, R.; Khuller, S.; Mitchell, J.S.B.; Piatko, C.; Souvaine, D.; **Localizing an Object with Finger Probes.** Proceedings of SPIE Vision Geometry III Conference, 1994.

Clapp, J.A.; Stanten, S.F.; Peng, W.W.; Wallace, D.R.; Cerino, D.A.; Dziegiel, R.J.; **Software Quality Control, Error Analysis, and Testing.** Advanced Computing and Telecommunications Series, Noyes Data Corporation, 1994. Reprint of NIST SP 500-209, **Software Error Analysis**, by Wendy Peng and Dolores Wallace.

Radack, Shirley M.; **The National Information Infrastructure: Requirements for Frameworks, Standards and Research.** The Council of Federal Data Center Directors. Council of Federal Data Center Directors Annual Conference, December 1994.

Dabrowski, C.; Majurski, W.; McCoy, W.; Wakid, S.; **Modeling NII Services to Identify Future Needs for Standards and Interoperability.** ACM StandardView, December 1994.

Radack, Shirley M.; **Digital Signature Standard: An Update of Implementation, Technical, and Patent Issues.** Federation Facts, Federation of Government Information Processing Councils, Winter 1994.

## 1995

Fong, E.; Hurwitz, S.; Yesha, Y.; **Third International Conference on Information and Knowledge Management (CIKM-94).** NIST Journal of Research, January/February 1995.

Ruhl, M.K.; Antonishek, T.; **Federal Wireless Users' Forum Workshop.** NIST Journal of Research, January/February 1995.

Hungate, J.; **Application Portability Profile and Open System Environment Users' Forum.** NIST Journal of Research, January/February 1995.

Pallett, D.S.; Fiscus, J.G.; Fisher, W.M.; Garofolo, J.S.; Lund, B.A.; Martin, A.; Przybocki, M.A.; **1994 Benchmark Tests for the ARPA Spoken Language Program.** Proceedings of the ARPA Spoken Language Systems Technology Workshop, January 1995.

Fisher, W.M.; Fiscus, J.G.; Martin, A.; Pallett, D.S.; Przybocki, M.A.; **Further Studies in Phonological Scoring.** Proceedings of the ARPA Spoken Language Systems Technology Workshop, January 1995.

Wilson, C.L.; Wilkinson, R.A.; Garris, M.D.; **Self-Organizing Neural Network Character Recognition Using Adaptive Filtering and Feature Extraction.** Progress in Neural Networks, Vol. 3, pp. 295-313, 1995.

Lund, B.A.; Fisher, W.M.; Garofolo, J.S.; Pallett, D.S.; Przybocki, M.A.; Wilkinson, R.A.; **A Spoken Natural Language Interface to Libraries.** Proceedings of the ARPA Spoken Language Systems Technology Workshop, January 1995.

Ressler, S.P.; **Network-Based Documents.** OII Management Handbook, January 1995.

Garris, Michael D.; Blue, James L.; Candela, Gerald T.; Dimmick, Darrin L.; Geist, John; Grother, Patrick J.; Janet, Stanley A.; Wilson, Charles L.; **Public Domain OCR.** IS&T/SPIE's Symposium on Electronic Imaging: Science and Technology Conference on Document Recognition Technologies, February 1995.

Tom, Henry; **The Geographic Information Systems (GIS) Standards Infrastructure, Standard View.** ACM Perspectives on Standardization, February 1995.

Chang, Yoon; Su, David; Van der Horst, Allard; Wakid, Shukri A.; **An ATM Protocol for Local Access and Control of Internal/External Traffic.** The 14th IEEE International Phoenix Conference on Computers and Communication, Phoenix, AZ, March 1995.

Benmohamed, L.; Su, D.H.; **Analysis of the Rate-Based Traffic Management Proposal for ATM Networks.** Third International Conference on Telecommunication Systems Modelling and Analysis, Nashville, TN, March 1995.

Cugini, J.V.; **Visualization and Standards.** Proceedings of 11th Annual Symposium on Review of Progress in Applied Computational Electromagnetics, 1995.

Podio, F.L.; **Optical Storage Media Data Integrity Studies.** Proceedings of NASA/GSFC Conference on Mass Storage Systems and Technologies, 1995.

Garris, M.D.; **Evaluating Spatial Correspondence of Zones in Document Recognition Systems.** Proceedings of IEEE Signal Processing Society International Conference, 1995.

Landberg, T.; **Draft Working Implementation Agreements for Open Systems Interconnection Protocols.** Change pages to Draft Working Document, March 1995.

Ressler, S.; **Open Virtual Reality Testbed Activities.** Proceedings of UVA-NASA Workshop on Human-Computer Interaction and Virtual Environments, April 1995.

Harman, D.; **The TREC Conferences.** Proceedings of Hypertext-Information Retrieval-Multimedia Conference, Germany, April 1995.

Gilbert, D.; **17th National Computer Security Conference.** NIST Journal of Research, May/June 1995.

Rogers, W.; Candela, G.; Harman, D.; **Space and Time Optimizations for Indexing in Information Retrieval.** Proceedings of 4th Annual Symposium on Document Analysis and Information Retrieval, 1995.

Ressler, S.; **Using Window System Menus with NCSA Mosaic.** Contribution to Internet User Tools, 1995.

Wilson, C.L.; Blue, J.L.; Omidvar, O.M.; **Improving Neural Network Performance for Character and Fingerprint Classification by Altering Network Dynamics.** World Congress on Neural Networks, Washington, DC, July 1995.

Hungate, J.; **Stable Implementation Agreements for Open Systems Environment Protocols -- Version 8, Edition 1 [SP 500-221].** Change pages from March 1995 OIW, May 1995.

Barkley, J.F.; **Application Engineering in Health Care**. Proceedings of the Second Annual CHIN Summit, June 1995.

Garris, M.D.; Blue, J.L.; Candela, G.T.; Dimmick, D.L.; Geist, J.; Grother, P.J.; Janet, S.A.; Wilson, C.L.; **Off-Line Handwriting Recognition from Forms**. Proceedings of 1995 IEEE International Conference on Systems, Man, and Cybernetics.

Chang, Y.D.; Golmie, N.T.; Su, D.H.; **A Rate Based Flow Control Switch Design for ABR Service in an ATM Network**. Proceedings of the Twelfth International Conference on Computer Communication (ICCC'95), August 1995.

Hungate, J.; **Working Implementation Agreements for Open Systems Environment Protocols**. Change pages to Draft Working Document. Output from the June '95 OIW, August 1995.

Cypher, D.; Wakid, S.; Bose, J.; Vaman, D.; **Error Protecting Characteristics of CDMA and Impacts of Speech**. Proceedings of 3rd IEEE Workshop on Architecture and Implementation of High Performance Communications Subsystems [HPCS '95], Mystic, CT, August 1995.

Chang, Y.C.; Golmie, N.T.; Su, D.H.; **Study of Interoperability Between EFCI and ER Switch Mechanisms for ABR Traffic in an ATM Network**. Proceedings of 4th International Conference on Computer Communications and Networks [ICCCN95], Las Vegas, NV, September 1995.

Cugini, Janet A.; **The Common Criteria: On the Road to International Harmonization**. Computer Standards and Interfaces, Vol 17, No. 4, pp. 315-320, September 1995.

Danner, Bonnie P.; Ippolito, Laura M.; Wallace, Dolores R.; **COMPASS '95 Tenth Annual Conference on Computer Assurance**. NIST Journal of Research, September/October 1995.

Radack, S.M.; **Security and the Internet: The Use of Firewalls**. Federation Facts, published by the Federation of Government Information Processing Councils, Fall 1995.

Saltman, R.G.; **Electronic Data Interchange and Small- and Medium-Sized Enterprises**. Internal paper, Fall 1995.

Laskowski, S.J.; Ramayya, V.V.; **Electronic Access to Standards on the Information Highway**. World Standards Day Paper Competition, October 1995.

Perine, L.A.; **In Pursuit of an Optimum: A Conceptual Model for Examining Public Sector Policy Support of Interoperability**. Conference on the Interoperability and the Economics of Information Infrastructure, 1995.

Cugini, J.; Dobry, R.; Gligor, V.; Mayfield, T.; **Functional Security Criteria for Distributed Systems**. Proceedings of the 18th National Information Systems Security Conference, October 1995.

Gilbert, D.; **17th National Computer Security Conference, Baltimore, MD October 11-14, 1994**. Proceedings of the 18th National Information Systems Security Conference, October 1995.

Radack, S.M.; **Protecting Information in Systems and Networks: An Update on Cryptography Standards**. Federal Data Center Issues 1995: A View to the Future; Federal 1995 Information Processing Conference.

Carnahan, L.J.; **Developing Federal Standards and Accreditations for Data Protection Products**. SPIE/IEEE Photonics East '95 Symposium and SPIE-International Society for Optical Engineering, 1995.

Garris, M.D.; Grother, P.J.; **Generalized Form Registration Using Structure-Based Techniques**. Proceedings of 5th Symposium on Document Analysis and Information Retrieval, 1995.

Wallace, D.R.; Zelkowitz, M.; **Center for High Integrity Software System Assurance**. Proceedings of 2nd IFAC Workshop on Safety and Reliability, Daytona Beach, FL, November 1995.

Ferraiolo, D.; Cugini, J.; Kuhn, D.R.; **RBAC: Features and Motivations**. Proceedings of the 11th Annual Computer Security Applications Conference, December 1995.

Barkley, J.F.; **Implementing Role Based Access Control Using Object Technology**. Proceedings of the First ACM Workshop on Role Based Access Control, December 1995.

## **1996**

Mills, Kevin L.; **An Experimental Evaluation of Specification Techniques for Improving Functional Testing**. Journal of Software and Systems, January 1996.

Wilson, C.L.; Blue, J.L.; Omidvar, O.M.; **Neurodynamics of Learning and Its Effect on Network Performance**. Journal of Electronic Imaging, 1996.

Harman, D.; **Lab Report Special Section: Natural Language Processing and Information Retrieval Group, Information Access and User Interfaces Division, NIST**. SIGIR Forum.

Binkley, D.W.; Lyle, J.R.; **Application of the Pointer State Subgraph to Static Program Slicing**. Submitted to the Journal of Systems and Software.

Radack, S.M.; **Role of the Information Technology Laboratory of the National Institute of Standards and Technology in the Development of Standards.** Internal paper. January 1996.

Golmie, Nada; Su, David; **Analysis of the Rate-Based Flow Control Mechanism for Available Bit Rate Traffic in ATM Networks.** Proceedings of the International Conference on Optical Communications & Networks, Paris, France, February 1996.

Wilson, C.L.; Grother, P.J.; Barnes, C.S.; **Binary Decision Clustering for Neural Network Based OCR.** Pattern Recognition, Vol. 29, Issue 3, pp. 425-437, March 1996.

Lyle, J.R.; Wallace, D.R.; **Using a Program Slicing CASE Tool for Evaluating High Integrity Software Systems.** Published on WWW.

Kalisman, A.; McCoy, W.H.; **Video Compression Using a Wavelet Transform for Noisy Channels.** ACM Wireless Networks (special issue), 1996.

Oberndorf, P.A.; Cuthill, B.B.; **Experiences in Environment Integration with Standards.** Proceedings of Software Technology Conference, Salt Lake City, UT, April 1996.

Linn, R.J.; **Using Technology to Manage and Protect Intellectual Property.** Proceedings of IMA/Copyright Office Forum [Journal of IMA], 1996.

Nielsen, F.H.; **Human Behavior -- Another Dimension of Standards-Setting.** ACM StandardView, March 1996.

Beltracchi, L.; Lyle, J.R.; Wallace, D.R.; **Using a Program Slicing CASE Tool for Evaluating High Integrity Software Systems.** Proceedings of American Nuclear Society Meeting on Nuclear Plant Instrumentation, Penn State University, May 1996.

Hecht, H.H.; Wallace, D.; **Project Data to Support High Integrity Software Methods.** Published on WWW. Also in Proceedings of American Nuclear Society Meeting on Nuclear Plant Instrumentation, Penn State University, May 1996.

Mills, K.L.; **A Knowledge-Based Approach for Automating a Design Method for Concurrent and Real-Time Systems.** Proceedings of SEKE '96, Arizona State University, June 1996.

Wilson, C.L.; Blue, J.L., Omidvar, O.M.; **The Effect of Training Dynamics on Neural Network Performance.** To be published in Neural Networks in 1996.

Yesha, Y.; **Parameter Replacement for CELP Coded Speech in Land Mobile Radio.** ACM Wireless Networks Journal.

Fisher, G.E.; **CSL View of Applications Portability, Scalability, and Interoperability.** ACM StandardView, to be published Summer 1996.

Saltman, R.G.; **Ready for EDI.** Info Security News, May/June 1996.

Mills, Kevin L.; **A Knowledge-Based Approach for Automating a Design Method for Concurrent and Real-Time Systems.** Proceedings of the 8th International Conference on Software Engineering and Knowledge Engineering, pp. 529-536, June 10-12, 1996.

Wallace, Dolores R.; Ippolito, Laura M.; **Software Verification and Validation,** pp. 22-30 of NIST SP 223, to be reprinted in The Journal of the Quality Assurance Institute, October 1996.

Grother, P.J.; Candela, G.T.; Blue, J.L.; **Fast Implementations of Nearest Neighbor Classifiers.** Pattern Recognition, to be published in Fall 1996.

Flater, D.W.; **Generalized Message Passing in a Virtual Reality Application.** Journal of Object-Oriented Programming, to be published in 1996.

## CAML Papers

1994

Boisvert, R.F.; **The Architecture of an Intelligent Virtual Mathematical software Repository.** Mathematics and Computers in Simulation, Vol. 36, pp. 269-279, 1994.

Boisvert, R.F.; **NIST's GAMS: A "Card Catalog" for the Computer User.** SIAM News, Vol. 27, No. 8, p. 1, October 1994.

Singpurwalla, N.; Wilson, S.P.; Fuller, E.; Eberhardt, K.; **Statistical Aspects of Failure Processes in Ceramics.** Proceedings of the 5th Valencia Conference in Bayesian Statistics, Alicante Beach, Spain, June 5-9, 1994.

Boisvert, R.F.; **A Web Gateway to a Virtual Mathematical Software Repository.** Proceedings of the 2nd International Conference on Mosaic and the WEB, Chicago, IL, October 1994.

Dobrow, R.P.; **On the Distribution of Distances in Recursive Trees.** Journal of Applied Probability or Random Structures and Algorithms.

Wheeler, A.A.; McFadden, G.B.; **A  $\{\xi\}$ -Vector Formulation of Anisotropic Phase-Field Models: 3-D Asymptotics.** European Journal of Applied Mathematics.

Vangel, M.G.; **ANOVA Estimates of Variance Components for a Class of Mixed Models.** Proceedings of the American Statistical Association; August 14-18, 1994, Toronto, Canada.

Pozo, R.; Remington, K.; **Performance Characteristics of Fast Elliptic Solvers on Parallel Platforms.** Proceedings of the 1st European PVM Users Group Meeting; Rome, Italy, October 1994.

Frank, D.E.; Eberhardt, K.R.; **Test for Armor-Piercing Handgun Ammunition.** Memo Report to National Institute of Justice, November 17, 1994.

1995

Devaney, J.E.; **A Machine Learning and Equation Signature Approach to Equation Discovery.** Proceedings of the American Association for Artificial Intelligence Symposium, Stanford University, CA, April 1995.

Boggs, P.T.; Tolle, J.W.; **Sequential Quadratic Programming.** Acta Numerica, 1995.



- Elipe, A.; Miller, B.; Vallejo, M.; **Bifurcations in a Non-Symmetric Cubic Potential.** Astronomy and Astrophysics, 1995.
- Lobo, C.; Guthrie, W.F.; Kacker, R.; **A Study of the Reuse of Plastic Concrete Using Extended Set-Retarding Admixtures.** NIST Journal of Research, September/October 1995.
- Liggett, W.S.; **Functional Errors-in-Variables Models in Measurement Optimization Experiments.** Proceedings of the 1994 ASA Conference on Physical and Engineering Sciences, Spring 1995.
- Vangel, M.G.; **One-Sided Beta-Content Tolerance Intervals for Mixed Models.** Proceedings of Spring Research Conference on Statistics in Industry and Technology, Chapel Hill, NC, June 13-15, 1994, June 1995.
- Braun, R.J.; Murray, B.T.; Boettinger, W.J.; McFadden, G.B.; **Lubrication Theory for Reactive Spreading of a Thin Drop.** Phys. Fluids, Vol. 7, No. 8, pp. 1797-1810, August 1995.
- Joshi, G.A.; Pandit, S.M.; Fu, J.; **Vibration Signature Analysis of AFM Images.** Proceedings of the North American Manufacturing Research Conference, Houghton, MI, May 1995.
- Anuta, M.A.; Lozier, D.W.; Turner, P.R.; **The MasPar MP-1 as a Computer Arithmetic Laboratory.** NIST Journal of Research, Vol. 101, No. 2, pp. 165-174, 1996.
- Hunt, F.Y.; Douglas, J.F.; Bernal, J.; **Probabilistic Computation of Poiseuille Flow Velocity Fields.** Journal of Mathematical Physics, Vol. 36, No. 5, pp. 2386-2401, May 1995.
- Beichl, I.; Blue, J.L.; Teng, Y.A.; **Parallel Monte Carlo Simulation of MBE Growth.** Proceedings of the International Parallel Processing Symposium, 1995.
- Cameron, J.M.; Rosenblatt, J.R.; **Churchill Eisenhart, 1913-1994.** The American Statistician, Vol. 49, No. 3, pp. 243-244, August 1995.
- Rehm, R.G.; Cassel, K.W.; McGratten, K.B.; Baum, H.R.; **Gravity-Current Transport in Building Fires.** Proceedings of the 8th International Symposium on Transport Phenomena in Combustion, San Francisco, CA, July 1995.
- Coakley, K.J.; Downing, R.G.; Lamaze, G.; **Modeling Detector Response for Neutron Depth Profiling.** Nuclear Instruments and Methods in Physics Research, sect. A., Vol. A366, pp. 137-144, 1995.
- Devaney, J.E.; **Discovering Equations in Data.** 1995 High Performance Computing Symposium, 1995 Simulation Multi-Conference, Phoenix, AZ, April 9-13, 1995.

Dobrow, R.P.; Fill, J.A.; **Multiway Trees of Maximum and Minimum Probability Under the Random Permutation Model**. *Combinatorics, Probability, and Computing*.

Cassel, K.W.; Rehm, R.G.; **The Unsteady Mixed-Convection Boundary Layer Induced by a Vortex**. *Proceedings of the 8th International Symposium on Transport Phenomena in Combustion, San Francisco, CA, July 1995*.

Sivathanu, Y.R.; Hamins, A.; Hagwood, C.; Kashiwagi, T.; **Tomographic Reconstruction of the Local PDFs of Soot Volume Fraction and Temperature**. *Proceedings of the Combustion Institute Conference, San Antonio, TX, April 1995*.

Sivathanu, U.R.; Hagwood, C.; Simiu, E.; **Exits in Multistable Systems Excited by Coin-Toss Square Wave Dichotomous Noise**. *Physical Review E*, Vol. 52, pp. 4669-4675, November 1995.

Boisvert, R.; Browne, S.; Dongarra, J.; Grosse, E.; **Digital Software and Data Repositories for Support of Scientific Computing**. *Advances in Digital Libraries, Springer-Verlag, New York, NY, pp. 61-72, 1995*.

Goldstein, R.E.; Langer, S.A.; **Nonlinear Dynamics of Stiff Polymers**. *Physical Review*, 1995.

Coffey, S.L.; Deprit, A.; Deprit, E.; **Frozen Orbits for Satellites Close to an Earth-Like Planet**. *Celestial Mechanics and Dynamical Astronomy*, Vol. 59, pp. 37-72.

Vangel, M.G.; Anderson, D.M.; **Richardson's Algorithm and the Approximate Solution of Singular and Inconsistent Matrix Equations**. *SIAM Journal on Matrix Analysis and Applications*.

Burns, T.J.; Davis, R.W.; Moore, E.F.; **Dynamical Systems Approach to Particle Transport Modeling in Dilute Gas-Particle Flows with Application to a Chemical Vapor Deposition Reactor**. *Journal of Computational Physics*.

Kacker, R.; Zhang, N.F.; Hagwood, C.; **Economic Checking Interval and Control Limits**. *Proceedings of the NCSL, Dallas, TX, July 1995*.

Rushmeier, H.E.; Ward, G.J.; **Lighting, Simulation and Photography: Data, Ideas, and Questions**. *Proceedings of Right Light III, 1995*.

Fill, J.A.; Dobrow, R.P.; **The Number of m-ary Search Trees on n Keys**. *Combinatorics, Probability, and Computing*.

Hagwood, R.C.; **Technometrics Book Review of Mathematical Analysis of Spectral Orthogonality by John J. Kalivas and Patrick M. Lang**. *Technometrics Book Review*, 1995.

- Lozier, D.W.; Turner, P.R.; **Parallel and Serial Implementations of SLI Arithmetic.** Theoretical Computer Science.
- Nimeroff, J.; Dorsey, J.; Rushmeier, H.; **A Framework for Global Illumination in Animated Environments.** Proceedings of the 1995 Eurographics Rendering Workshop.
- Kacker, R.; Zhang, N.F.; Hagwood, C.; **Real Time Control of Measurement Uncertainty.** Metrologia.
- Rushmeier, H.E.; Ward, G.J.; Piatko, C.; Sanders, P.; Rust, B.; **Synthetic Images: Some Ideas About Metrics.** Proceedings of the 1995 Eurographics Rendering Workshop.
- Devaney, J.E.; **Experience with MPI: 'Converting pvmmake to mpimake under LAM' and 'MPI and Parallel Genetic Programming.'** Abstract for MPI Developers Conference, Notre Dame, IN, June 1995.
- Deprit, A.; **L'algebre Symbolique en Mecanique Celeste.** Proceedings of the International Astronomical Union Symposium #172.
- Carasso, A.S.; **Error Bounds in Non-Smooth Image Deblurring.** Accepted for publication in SIAM Journal on Mathematical Analysis.
- Ehara, K.; Hagwood, C.R.; Coakley, K.J.; **Novel Method to Classify Aerosol Particles According to Their Mass-to-Charge Ratio -- Aerosol Particle Mass Analyzer.** Journal of Aerosol Science, Vol. 27, No. 2, pp. 217-234, 1996.
- Boggs, P.T.; Tolle, J.W.; Kearsley, A.J.; **On the Convergence of a Trust Region SQP Algorithm for Nonlinearly Constrained Optimization Problems.** Proceeding of the 17th Conference on System Modelling and Optimization, Prague, Czech Republic, July 1995.
- Lozier, D.W.; Turner, P.R.; **Error-Bounding in Level-Index Computer Arithmetic.** Proceedings of the IMACS-GAMM International Symposium on Numerical Methods and Error-Bounds.
- Vangel, M.G.; **One-Sided {Beta}-Content Tolerance Limits for Mixed Models with Two Components of Variance,** Error-Bounds Technometrics.
- Lozier, D.W.; **Eugene Fiume, An Introduction to Scientific, Symbolic, and Graphical Computation.** Book Review for Mathematics of Computation.
- Zhang, N.F.; **Process Capability Index  $C^{dP}$  for Stationary Processes.** Journal of Quality Technology.

Braun, R.J.; Cahn, J.W.; McFadden, G.B.; Wheeler, A.A.; **Anisotropy of Interfaces in an Ordered Alloy: A Multiple-Order Parameter Model.** Philosophical Transactions of the Royal Society, Series A.

van Vaerenbergh, S.; Coriell, S.R.; McFadden, G.B.; Murray, B.T.; and Legros, J.C.; **Modification of Morphological Stability Threshold by Soret Diffusion.** Journal of Crystal Growth 147 (1995), pp. 207-214.

Blue, J.L.; Beichl, I.; Sullivan, F.E.; **Faster Monte Carlo Simulations.** Physical Review E, 1995.

Alpert, B.; **High-Order Quadratures for Integral Operators with Singular Kernels.** Journal of Computational and Applied Mathematics 60, pp. 367-378, 1995.

Anderson, D.M.; Worster, M.G.; **Weakly-Nonlinear Analysis of Convection in a Mushy Layer During the Solidification of Binary Alloys.** Journal of Fluid Mechanics 302, pp. 307-331, 1995.

Skeldon, A.C.; McFadden, G.B.; Impey, M.D.; Riley, D.S.; Cliff, K.A.; Wheeler, A.A.; David, S.H.; **On Long-Wave Morphological Instabilities in Directional Solidification.** IMA Journal of Applied Mathematics 6, p. 639, 1995.

Sekerka, R.F.; Coriell, S.R.; McFadden, G.B.; **Stagnant Film Model of the Effect of Natural Convection on the Dendrite Operating State.** Journal of Crystal Growth, 154, p. 370, 1995.

Murray, B.; Wheller, A.; Glicksman, M.E.; **Simulations of Experimentally Observed Dendritic Growth Behavior using a Phase-Field Model.** Journal of Crystal Growth, 154, pp. 386-400, 1995.

## 1996

Orlandini, E.; Stella, A.L.; Einstein, T.L.; Tesi, M.C.; Beichl, I.; Sullivan, F.; **Bending Rigidity Driving Transitions and Crumpling Point Scaling of Lattice Vesicles.** Physical Review, 1996.

Anderson, D.; Worster, M.G.; **A New Oscillatory Instability in a Mushy Layer During the Solidification of Binary Alloy.** Journal of Fluid Mechanics 307, pp. 245-267, 1996.

Liggett, W.S.; **Measurement for Experimentation.** To be published as book chapter in Statistics for Quality.

Hagwood, C.; Levenson, M.; Sivathanu, Y.; **Computer Intensive Statistics Using Recursive Discrete Probability Functions.** To be published in Journal of the American Statistical Association.

Wheeler, A.; McFadden, G.; Boettinger, W.; **Phase-Field Model of a Eutectic Alloy.** Proceedings of the Royal Society of London, Series A 452, pp. 495-525, 1996.

Liggett, W.S.; Inn, K.G.W.; **Pilot Studies for Improving Sampling Protocols.** To be published in Principles of Environmental Sampling (Second Edition).

Zhang, N.F.; **Statistical Control Charts for Stationary Process Data.** To be published in Technometrics.

Coriell, S.R.; Murray, B.T.; Chernov, A.A.; McFadden, G.B.; **Effects of Shear Flow and Anisotropic Kinetics on the Morphological Stability of a Binary Alloy.** Met. Mater. Trans., 27A, pp. 687-694, 1996.

Warren, J.A.; Murray, B.T.; **Ostwald Ripening and Coalescence of a Binary Alloy in Two Dimensions using a Phase-Field Model.** Modeling and Simulation in Materials Science, 4, pp. 1-15, 1996.

Zhang, N.F.; Postek, M.T.; Larrabee, R.D.; Carroll, L.; Keery, W.J.; **A New Algorithm for the Measurement of Pitch in Metrology Instruments.** Proceedings of SPIE 1996 International Symposium on Microlithography, Santa Clara, CA.

Rust, B.W.; Crosby, F.J.; **Global Temperatures, Gaia, and Fossil Fuel Production.** To be submitted to Global Change Biology, 1996.

Holland, M.; Williams, J.; Coakley, K.; Cooper, J.; **Trajectory Simulation of Kinetic Equations for Classical Systems.** Quantum Optics.

Rice, J.R.; Boisvert, R.F.; **Summary Report on a Workshop: Scalable Scientific Software Libraries and Problem solving Environments.** IEEE Computational Science and Engineering.

Anuta, M.M.; Lozier, D.W.; Schabanel, N.; Turner, P.R.; **Basic Linear Algebra Operations in SLI Arithmetic.** Proceedings of the Euro-Par 96, Lyon, France, August 27-29, 1996. [Springer-Verlag Lecture Notes in Computer Science]

Beichl, I.; Sullivan, F.; **Tree-Lookup for Partial Sums or: How Can I Find This Stuff Quickly?** IEEE Computational Science and Engineering, Vol. 3, No. 1, pp. 13-15, 1996.

Olsen, A.R.; Sedransk, J.; Edwards, D.; Gotway, C.; Liggett, W.; Rathbun, S.; Reckhow, K.; Young, L.; **Statistical Issues for Monitoring Ecological and Natural Resources in the United States**. To be published in Environmental Monitoring and Assessment.

Saunders, B.V.; **A Boundary Fitted Grid Generation System for Interface Tracking**. Proceedings of the Fifth International Conference on Numerical Grid Generation in Computational Fluid Dynamics and Related Fields, Starkville, MS, March 31-April 5, 1996.

Wheeler, A.A.; McFadden, G.B.; **On the Notion of a  $\{\mathbf{x}_i\}$ -Vector and a Stress Tensor for a General Class of Anisotropic Diffuse Interface Models**. Proceedings of the Royal Society of London, Series A.

Lozier, D.; **Software Needs in Special Functions**. Journal of Computational and Applied Mathematics, 1996.

Boisvert, R.F.; Pozo, R.; Remington, K.R.; Barrett, R.; Dongarra, J.; **Matrix Market: A Web Resource for Test Matrix Collections**. Proceedings of the IFIP WGZ.5 Conference on the Quality of Numerical Software, 1996.

Pozo, R.; **Library Designs for Generic C++ Sparse Matrix Computations of Iterative Methods**. Proceedings of the Copper Mountain Conference on Iterative Methods, April 1996.

## ELECTRONIC PRODUCTS

CSL/CAML has made available more than 50 reference databases, reference materials, CD-ROMs, and optical discs for use by industry, academia, and research communities.

The **Guide to Available Mathematical Software (GAMS)** continues to grow in usage as a mechanism for disseminating information about mathematical software that can be used in scientific and engineering applications. GAMS helps scientists and engineers locate and use nearly 10,000 reusable problem-solving modules from currently available mathematical software packages.

Since it was made available on the World Wide Web (<http://math.nist.gov/gams/>) in April 1994, GAMS has received more than 2,000,000 inquiries. It has been awarded the highest 4-star rating by the McKinley Internet Directory, a commercial enterprise that rates Web pages for coverage, organization, ease of use, and currency.

### Standard Reference Databases

#### NIST Special Databases

Special Database 1

NIST Binary Images of Printed Digits, Alphas, and Text

Special Database 2

NIST Structured Forms Reference Set of Binary Images (SFRS)

Special Database 4

NIST 8-Bit Gray Scale Images of Fingerprint Image Groups

Special Database 6

NIST Structured Forms Reference Set of Binary Images II

Special Database 8

NIST Machine-Print Database of Gray Scale and Binary Images

Special Database 9

NIST 8-Bit Gray Scale Images of Mated Fingerprint Card Pairs (Volumes 1-5)

Special Database 10

NIST Supplemental Fingerprint Card Data

Special Database 11

NIST Census Miniform Training Database I: Binary Images from Microfilm

Special Database 12  
NIST Census Miniform Training Database 2: Binary Images from Paper and Microfilm

Special Database 13  
NIST Census Miniform Test Database: Binary Images from Paper and Microfilm

Special Database 14  
NIST Mated Fingerprint Card Pairs 2

Special Database 18  
NIST Mugshot Identification Database (MID)

Special Database 19  
NIST Handprinted Forms and Characters Database

Special Database 20  
NIST Scientific and Technical Document Database

Special Software 1  
NIST Scoring Package Release 1.0

### **Standard Reference Materials**

#### **SRM Number    Description**

3200    Magnetic Tape Cartridge

3201    Magnetic Tape Cartridge

3202    Magnetic Tape Cartridge

3203    Magnetic Tape Cartridge

3204    Magnetic Tape Cartridge

3217    Magnetic Tape Cartridge

9529    Flexible Disk 90



## **CD-ROMs**

NIST Special Publication 500-224, Stable Implementation Agreements for Open System Environment, Version 8, Edition 1, December 1994.

Public Domain OCR NIST Form-Based Handprint Recognition System. Evaluates optical character recognition (OCR).

Public Domain PCASYS NIST Pattern-Level Classification Automation System for Fingerprints. Automatic fingerprint classification software.

TIPSTER Volume 1 and Volume 2. The document part of a test corpus to support research in text retrieval.

TIPSTER Volume 3. Contains SGML-formatted text for text retrieval research.

## **Speech Corpora CD-ROMs**

Darpa Air Travel Information System (ATISO) Read Versions of Spontaneous Data and Adaption Data, November 1990, NIST Speech Disc 5-2.1 (1 disc).

Darpa Air Travel Information System (ATISO) Speaker-Dependent Training Data, December 1990 and September 1991, NIST Speech Discs 5-3.1 - 5-6.1 (4 discs).

Darpa Air Travel Information System (ATISO) Spontaneous Speech Pilot Corpus and Relational Database, November 1990, NIST Speech Disc 5-1.1 (1 disc).

Darpa Resource Management Continuous Speech Database (RM1) Speaker-Dependent Training Data, September 1989, NIST Speech Discs 2-1.1 and 2-2.1 (2 discs).

Darpa Resource Management Continuous Speech Database (RM1) Speaker-Dependent Training Data, November 1989, NIST Speech Disc 2-3.1 (1 disc).

Darpa Resource Management Continuous Speech Database (RM1) Development Test and Evaluation Test Data and Scoring Software, August 1992, NIST Speech Disc 2-4.2 (1 disc).

Darpa Extended Resource Management Continuous Speech Speaker-Dependent Corpus (RM2), September 1990, NIST Speech Discs 3-1.1 and 3-2.2 (2 discs).

Darpa Acoustic-Phonetic Continuous Speech Corpus (TIMIT), October 1990, NIST Speech Disc 1-1.1 (1 disc).

B&K TIMIT, TIMIT Acoustic-Phonetic Continuous Speech Corpus, Breul and Kjaer Microphone Recordings, August 1995, NIST Speech Disc 21-1.1 (1 disc).

NYNEX Telephone Network Acoustic-Phonetic Continuous Speech Corpus (NTIMIT), August 1992 (2 discs).

Road Rally Conversational Speech Corpora (RDRALLY), September 1991, NIST Speech Disc 6-1.1 (1 disc).

Texas Instruments-Developed 46-Word Speaker-Dependent Isolated Word Corpus (TI46), September 1991, NIST Speech Disc 7-1.1 (1 disc).

Texas Instruments-Developed Studio Quality Speaker-Independent Connected-Digit Corpus (TIDIGITS), February 1991, NIST Speech Discs 4-1.1 - 4-3.1 (3 discs).

Frontiers in Speech Processing: Robust Speech Analysis '93, September 1993, NIST Speech Disc 15-1.1 (1 disc).

Frontiers in Speech Processing: Robust Speech Analysis '94, August 1995, NIST Speech Disc 24-1.1 (1 disc).

ARPA Continuous Speech Recognition Pilot Corpus (WSJ0), February 1994, NIST Speech Discs 11-1.1 - 11.12.1 (12 discs).

ARPA Continuous Speech Recognition Corpus (WSJ1), August 1993, NIST Speech Discs 13-1.1 - 13-34.1 (34 discs).

ARPA Continuous Speech Recognition Corpus North American Business News (CSRNAB1) 1994 Hub and Spoke Development Test Data, August 1994, NIST Speech Discs 23-1.1, 23-3.1 (3 discs).

ARPA Continuous Speech Recognition Corpus North American Business News (CSRNAB1) November 1994 Hub and Spoke Evaluation Test Data, February 1995, NIST Speech Disc 25-1.1 (1 disc).

DARPA Multi-Site Air Travel Information System (ATIS2) Corpora, October 1993, NIST Speech Discs 12-1.1 - 12.4.1 (4 discs).

ARPA Multi-Site Air Travel Information System (ATIS3), February 1994, NIST Speech Discs 17-1.1 - 17.5.1 (5 discs).

ARPA Air Traffic Control Corpus (ATC0), February 1994, NIST Speech Discs 16-1.1 - 16-8.1 (8 discs).

DARPA Switchboard Corpus, Recorded Telephone Conversations, October 1992, NIST Speech Discs 9-1.1, 9-3.1 - 9-29.1 (28 discs).

Switchboard Corpus Excerpts, Credit Card Conversations, May 1992, NIST Speech Disc 8-1.2 (1 disc).

ARPA SPIDRE Speaker Identification Research (SPIDRE0) Corpus, April 1994, NIST Speech Discs 18-1.1 - 18-2.1 (2 discs).

## VALIDATED PRODUCTS

In FY 1995 and the first half of FY 1996, CSL/CAML conducted 276 programming and database language validations (includes Ada, C, COBOL, Fortran, Pascal, and SQL), as well as CGM validations, at the following companies:

AT&T Global Information Systems  
Canon U.S.A.  
Computer Associates International, Inc.  
Concurrent Computer Corporation  
Convex Computer Corporation  
Cray Research, Inc.  
DDC-International  
Digital Equipment Corporation  
Electronic Data Systems Corp.  
Henderson Software  
Hewlett-Packard Company  
IBM Corporation  
IBM Canada Ltd.  
Informix Software, Inc.  
Intergraph Corporation  
Larson Technology Software  
Liant Software Corporation  
Micro Focus Corporation  
Microsoft Corporation  
Modular Computer Systems, Inc.  
Oracle Corporation  
Pyramid Technology Corporation  
Rational Software  
SCO Canada, Inc.  
Sequent Computer Systems, Inc.  
Silicon Graphics Computer Systems,  
Software AG  
Sun Microsystems, Inc.  
Sybase, Inc.  
Tandem Computers, Inc.  
Tisoft, Inc.  
UNISYS Corporation  
Zeh Graphic Systems

Now available online, CSL/CAML's *Validated Products List (VPL)* currently lists over 950 implementations (products) covering Federal Information Processing Standard (FIPS)

conformance testing programs for programming languages, database, graphics, operating systems, open systems, and computer security. It provides the point of contact, testing procedures, test suite sources, testing laboratory sources, and the list of validated products. The online VPL provides links to the associated online test reports where available. The URL address is:

<ftp://speckle.ncsl.nist.gov/vpl/intro.htm>

## **TECHNICAL INQUIRIES FORWARDED BY THE NTTC**

In calendar year 1995, the National Technical Transfer Center (NTTC) forwarded to CSL/CAML the highest number of technical inquiries of the total of 333 inquiries forward to NIST. CSL/CAML received 56 referrals.



