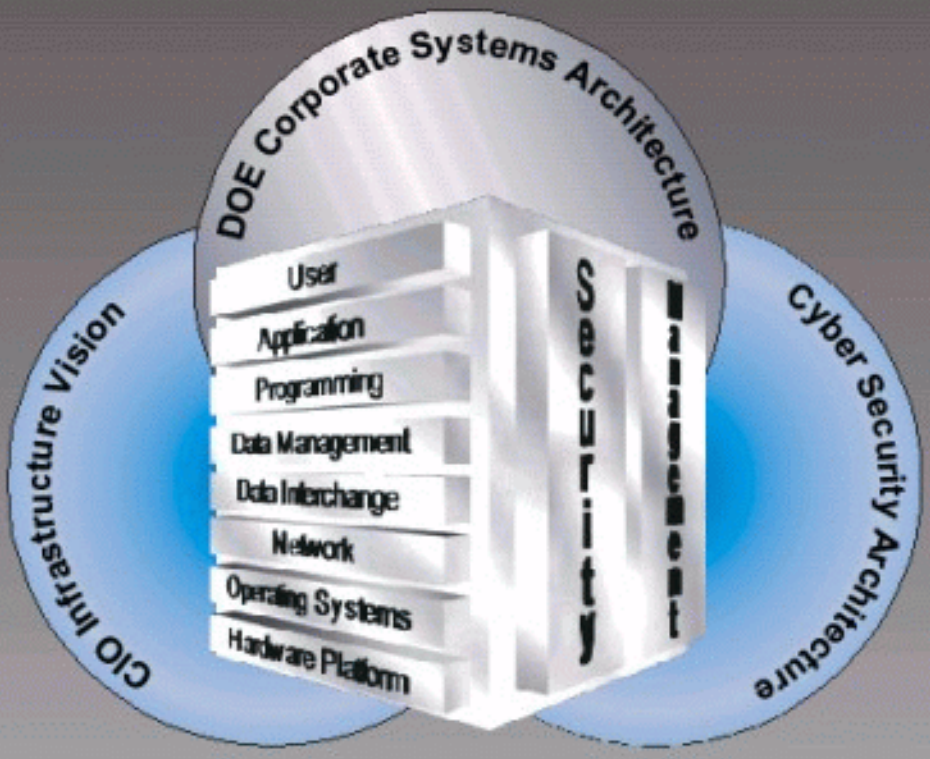
Information Architecture
Profile of Adopted Standards
2000



January 2000

U.S. Department of Energy
Office of the Chief Information Officer

Information Architecture

Profile of Adopted Standards 2000

January 2000

Standards for the New Millennium

U.S. Department of Energy
Office of the Chief Information Officer

Foreword

This document provides guidance and information on standards adopted through the Department of Energy (DOE) *Information Architecture Standards Adoption and Retirement Process*. It updates the September 1997 edition of the DOE *Information Architecture Profile of Adopted Standards* and presents the results of a complete sunset review of the standards in the Profile. The *Information Architecture Profile of Adopted Standards 2000* is to be used by anyone involved in the acquisition, development, or management of new or improved information systems Departmentwide.

The sunset review of the 1997 standards was performed in mid-1999, and the Information Technology (IT) Standards Program received comments on proposed new standards through January 7, 2000. The sunset review involved researching and analyzing existing standards, seeking the advice of subject matter experts, and bringing together Departmentwide points of contact and other interested parties in a November 17, 1999 videoconference for further review and discussion. As a result of the sunset review, the updated Profile contains 125 standards: 21 standards were added; 72 were revised, reaffirmed, or replaced by newer versions; 42 were removed; and 32 remain unchanged. A crosswalk of the standards is shown in Appendix A.

The *Information Architecture Profile of Adopted Standards 2000* reflects Departmentwide consensus on standards supporting the Department's IT infrastructure. In the Federal sector, an Information Technology Architecture (ITA) is required to ensure that investments in information technology directly support mission requirements. Recent revisions to Office of Management and Budget (OMB) Circular A-130, *Management of Federal Information Resources*, strengthen the requirement for Federal Agencies to implement ITAs tied to the capital IT planning and investment process for information resources. Under OMB Circular A-130, a compliant ITA has a Technical Reference Model and a Standards Profile, and standards are enforced consistently throughout the organization.

Standards compliance adds value to IT planning, management, and services. Standards provide the underpinnings that help achieve strategic alignment in the IT planning process; facilitate the evolution of an open, interoperable technical infrastructure; and provide guidance on procurement decisions.

The Web version of the DOE IT Standards Repository, located at *http://www-it.hr.doe.gov/standards/stdrepos.htm*, contains a link to each standard included in this Profile or to the organization that maintains the standard, when one is available.

Acknowledgments

A viable standards program relies on a broad base of participation and expert advice from many sources. The Information Technology (IT) Standards Program maintains contact with official standards bodies to stay informed of changes and relies on the guidance of subject matter experts throughout the Department as well as from other Government and industry groups. The individuals listed below provided information, advice, and comments that contributed to the *Information Architecture Profile of Adopted Standards 2000*.

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I wish to express my appreciation to these individuals for supporting the IT Standards Program.

Carol S. Blackston

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Figures and Appendices

1. Introduction

The Department of Energy (DOE) Information Technology (IT) Standards Program is an important component of the Department's Information Architecture (IA) Program. The DOE IA Program ensures that IT resources are effectively managed and deployed. The IT Standards in this document provide an underpinning for the infrastructures that build the architectures, help create an open environment, and ensure interoperability and accessibility. The standards guide decisions related to IT alignment, planning, and procurement.

Effective IT management is of paramount importance in the Federal sector and within DOE. Office of Management and Budget (OMB) Circular A-130, *Management of Federal Information Resources*, is being revised to strengthen the mandate to link IT investments to capital planning processes and to ensure that Federal Agencies have information technology architectures (ITAs) and IT standards in place to provide a framework for effective IT management. Agencies must create enterprise architectures that describe current and target relationships among business and management processes and IT, and they must define the environment to be created and maintained by managing IT portfolios.

Managing IT portfolios requires a Technical Reference Model (TRM) that identifies and describes the information services (such as databases, networks, etc.) used throughout the Agency, and it defines the set of IT standards that support the services in the TRM. Agencies are expected to adopt standards necessary to support the entire enterprise architecture, and consistently enforce those standards.

The DOE IA Program, which has evolved over the past 6 years, provides the mechanism by which the Department builds IT architectures consistent with the requirements of OMB Circular A-130. The IA Program provides the foundations, baseline analysis, guidance, and vision to guide the Department's architecture initiatives. The DOE IT Standards Program is the mechanism to centrally lead, manage, integrate, and coordinate efforts to identify and implement IT standards to support the information architecture.

The IT standards presented in this document represent a Departmentwide effort and consensus on the standards supporting the Department's TRM. The standards represent the foundation on which ITAs can be constructed to achieve interoperability Departmentwide and extended to business partners, stakeholders, and the public.

Objectives

The objectives of this document are to:

- Help to ensure the Department meets the requirements set forth in OMB Circular A-130, which calls for a viable TRM of services and set of IT standards to support the TRM.

- Provide the management, integration, coordination, and collaboration to ensure Departmentwide participation and consensus in the IT standards adoption and retirement process to maintain a viable set of IT standards.

- Assist managers, planners, IT professionals, those involved with procuring information technology products or services, and other interested parties in making informed judgments when choosing specifications to meet current and planned requirements.

Scope

This *Information Architecture Profile of Adopted Standards 2000* integrates international, National, Federal, industry, and other standards to provide an open systems environment with the functionality necessary to meet the Department's broad range of mission requirements. These standards correspond to the 10 service areas of the TRM.

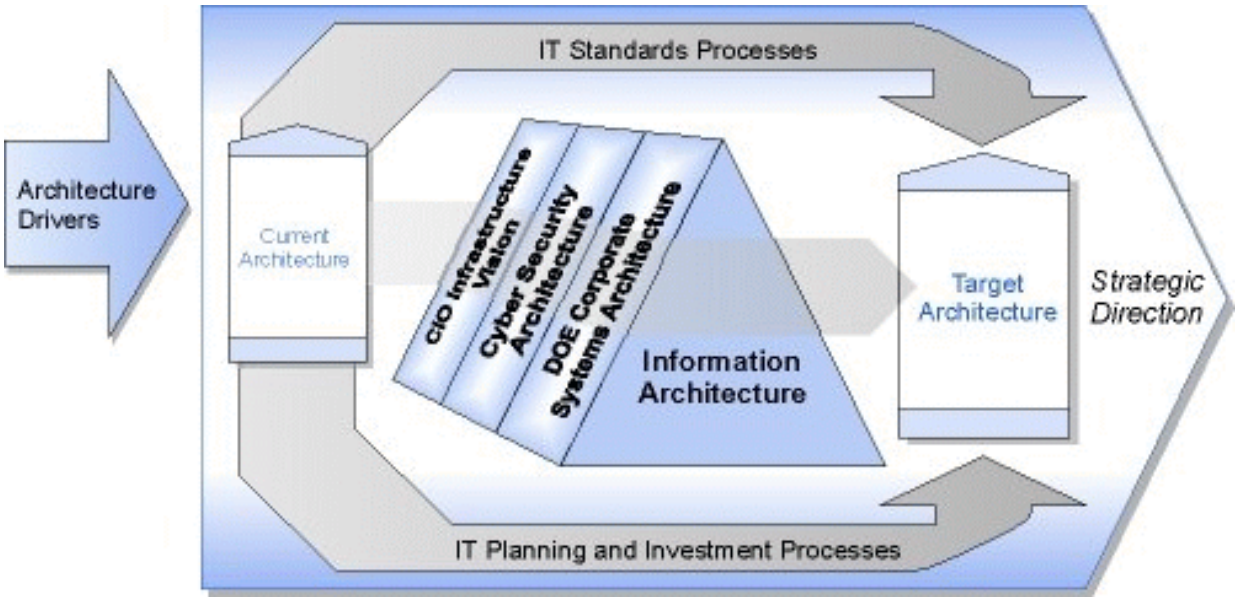
In this document, the standards in each service area represent the results of a Departmentwide sunset review to verify, update, replace, and retire standards. This document will evolve through Departmentwide participation in the ongoing Standards Adoption and Retirement Process. Ongoing adoptions, updates, and retirements of standards listed in this Profile will be reflected in the World Wide Web version of the IT Standards Repository. Refer to Appendix B for an index of standards identified in this document. Additional information, including policy, publications, and the standards repository, is located on the DOE IT Standards Program Web site at the following location: *http://www-it.hr.doe.gov/standards/*.

2. IT Standards in DOE Initiatives

The Department of Energy (DOE) Information Technology (IT) Standards Program tracks standards development, coordinates with subject matter experts, and maintains a future-looking Profile of Adopted Standards. This effort ensures that the Department is aligned with the evolving IT industry, the changing application of IT in the workplace, and Federal and Departmental mandates. Since the previous edition of this document, a number of major initiatives have been reshaping IT practices in the Department. IT standards support these initiatives and also will evolve in response to changes necessary to implement them.

Figure 1 demonstrates the migration from the current to the target architecture by following a unified strategic direction. The architecture drivers (e.g., Clinger-Cohen, Office of Management and Budget (OMB) Circular A-130, and National Technology Transfer and Advancement Act of 1995) provide the impetus for implementing an ITA. To achieve a target environment, the DOE Information Architecture (IA) and IT Standards Programs support specific initiatives, such as the DOE Corporate Systems Architecture, Cyber Security Architecture, and the CIO Infrastructure Vision, as well as transitional processes like IT planning and investments.

Figure 1, Unified Strategic Direction



DOE Corporate Systems Architecture

In 1999, the DOE IA Program conducted an Enterprise Architecture Planning (EAP) (Steven Spewak, Enterprise Architecture, Inc.©) effort–called the Department of Energy Information Architecture Project (DOE-IAP)–to develop an architecture-based strategic IT plan for DOE. The plan, known as the DOE Corporate Systems Architecture, was created via a consensus-based, strategic information planning process with representatives from DOE key business areas. It defines the applications necessary to support DOE business activities within the target environment, thus providing the business drivers required by OMB Circular A-130. The plan also links the technology infrastructure to these applications, ensuring that technology investments are driven by business needs. The technology architecture portion of the strategic information planning process links standards to the technical infrastructures, providing a tool for technologists and planners to maintain architectural integrity, ensure interoperability, and achieve effective capital IT planning and investment.

The technology architecture provides technical direction for the Department by defining the infrastructure of hardware, software, connectivity, and standards necessary to implement the application projects defined by the DOE Corporate Systems Architecture. Building the technology architecture involves intensive research and analysis of each technology present in the scope environment. Each technology is positioned in terms of its marketplace viability and its current implementation and support in the scope DOE environment. The *Information Architecture Profile of Adopted Standards 2000* provides a baseline for linking standards to each of the technologies that shapes the target environment and helps establish technical direction for planning and investment.

The strategic information planning process supports capital IT planning, introducing an orderly, repeatable, architecture-based planning process that better manages IT investments and supports cross-cutting business needs. This planning process provides a means for more effectively linking IT investments to DOE strategic objectives and plans, and provides the architectures, processes, and standards to evolve an aging applications portfolio and diverse technology base into a cohesive, business-justified plan to achieve the target architecture.

Cyber Security Architecture

A number of standards have been added to the *Information Architecture Profile of Adopted Standards 2000*, reflecting the Department's emphasis on cyber security. The Departmentwide cyber security initiative, in partnership with Computer Incident Advisory Capability (CIAC), is implementing security measures to protect systems and Web sites. The DOE cyber security architecture addresses the uniform implementation of computer security at DOE sites by providing a single, coherent, functional cyber security framework to address individual security topics. The cyber security architecture applies to DOE Headquarters and field sites, and includes DOE contractors.

The IT Standards Program Technical Reference Model (TRM) establishes security as a cross-cutting service area, emphasizing that the cyber security architecture permeates all levels of the DOE IT architecture. During the sunset review, a number of security-related standards were proposed to strengthen and expand coverage in this area. Notably, *ISO/IEC 15408:1999, Common Criteria for Information Technology Security Evaluation Version 2.1*, provides the basis for many of the cyber security architecture concepts and a common, world-wide basis for expressing security and assurance requirements.

CIO Infrastructure Vision

In September 1999, the Office of the Chief Information Officer (CIO), in collaboration with DOE contractors, developed an infrastructure vision focused on optimizing operating efficiencies, ensuring interoperability, providing seamless user access, and simplifying security compliance. The CIO infrastructure vision initiative includes an IT infrastructure pilot project to improve Departmentwide interoperability and provide economies of scale for IT service procurement. The IT infrastructure pilot initially focuses on Headquarters, covering common desktop services, and defines the target environment, which includes IT platforms, networks, and core system services. The initiative is based on best business practices and future technology trends. While the infrastructure vision is separate from the DOE Corporate Systems Architecture, its scope includes a portion of the strategic information planning environment. The IT Standards Program will coordinate with this initiative to ensure that the best DOEwide standards guidance is developed.

IT standards maximize interoperability and provide guidance for investments made to build the IT infrastructure. As the infrastructure vision matures, the new environment will be standards-based and will define future trends in IT standards throughout the Department. The infrastructure vision initiative draws on a number of service areas from the IT standards TRM. IT standards for Data Interchange, Network, Hardware Platforms, Security, and Management help define the IT projects necessary to achieve the CIO infrastructure vision.

The CIO infrastructure vision calls on contractors to work together to conceptualize and implement cost-effective solutions for DOE. One example is the consolidation of helpdesks into a tiered system designed to optimally respond to user requests. Implementing this approach requires bringing together diverse operating environments and deploying automated call tracking, remote diagnostic software, and followup procedures. IT standards play a key role in equipment and software selection, the acquisition process, and the management and technical support necessary to maintain the environment.

Year 2000

The Year 2000 (Y2K) challenge was a coordinated, Departmentwide effort that conformed to OMB requirements and resulted in a uniform approach to achieving compliance DOEwide and Governmentwide. The previous *Information Architecture Profile of Adopted Standards* and the

IT Standards Repository were available as tools to help planners and technologists meet the Y2K challenge. Specifically, Federal Information Processing Standard 4-2, *Representation of Calendar Date for Information Interchange*, dated November 15, 1998, implements the Federal Government's commitment to use four-digit year elements in information systems.

The Y2K challenge required increased planning and procurement to retire, upgrade, and replace computer systems Departmentwide to achieve Y2K compliance. The resulting system inventories, validation and verification procedures, testing, contingency and continuity plans, drills, documentation, and records management activities afforded planners and technologists the opportunity to create a more standardized systems environment. This environment facilitates system integration and provides a foundation for future IT planning and architecture activities.

IT Standards for the New Computing Model

During the sunset review, subject matter experts identified a number of new standards. These standards subsequently have been adopted and largely reflect the move to a new computing model based on a multi-tier, object-oriented, Web-centric environment with commercial-off-the-shelf software replacing much traditional system development.

The Unified Modeling Language (UML) reflects the need to standardize software design descriptions, particularly object-oriented designs. Java™ 2 and JavaScript have been adopted as broad-based programming languages. Extensible Markup Language (XML), Document Management Alliance (DMA), Internet Inter-Object Request Broker (ORB) Protocol, Java™ Database Connectivity, Open Database Connectivity, SQL Object Language Bindings, and the ISO/IEC Framework for the Specification and Standardization of Data Elements are all new data interchange standards. These new standards reflect the Vice President's initiative to make Government services electronically accessible.

Desktop Standards for Data Interchange

In 1999, establishing standards for desktop software that supports cost savings and data interchange Departmentwide was recognized as beneficial and necessary. The IT Standards Program collaborated with the DOE Information Technology Council (IT Council) to begin defining and implementing a set of Departmentwide desktop standards for data interchange. A proposal was developed and circulated through the Information Architecture Standards Adoption and Retirement Process. The proposal was not implemented as it did not achieve Departmentwide consensus. Many issues were identified but left unresolved. The IT Standards Program is continuing to resolve the issues identified. A Desktop Standards process is being developed by the IT Standards Program in collaboration with the Headquarters Infrastructure Pilot to facilitate the issuance and update of desktop standards guidance as required.

IT Accessibility

Information technology accessibility is becoming increasingly important. The Federal Government has an obligation to develop and deploy IT in a manner that enables full participation in society by people with disabilities (Public Law 105-220, Section 508). Creating an environment that makes Government information accessible to a broad base of individuals is a challenge for Federal Agencies. The U.S. Architectural and Transportation Barriers Compliance Board, also known as the Access Board, is formulating guidance and standards in this area that will become effective in August 2000. Included are new Web page accessibility standards, which mirror the World Wide Web Consortium (W3C) accessibility guidelines. The W3C guidelines make Web content more available to all users, independent of the access device they are using (e.g., desktop browser, voice browser, mobile phone). The guidelines explain how content developers can make multimedia content more accessible to a diverse audience. The W3C *Web Content Accessibility Guidelines 1.0* have been added to the *Information Architecture Profile of Adopted Standards 2000*. The IT Standards Program will continue to monitor the Access Board standards and ensure the Profile supports them.

Energy Star®

Energy Star® is a partnership of DOE, the Environmental Protection Agency, product manufacturers, local utilities, and retailers who are to encourage selecting, where life-cycle cost-effective, Energy Star®-compliant products. Executive Order 13123, *Greening the Government Through Efficient Energy Management*, was issued by the President on June 3, 1999, tasking Federal Agencies to reduce energy use by purchasing Energy Star®-compliant products. In August 1999, the Deputy Secretary of Energy reinforced the Government tasking for Energy Star®-compliant computers in the Department, and so Energy Star® has been added to the Profile.

Conclusions

These initiatives focus on improving IT services, management, and planning. Ultimately, these initiatives and others will create a more interoperable, standards-based IT environment. The *Information Architecture Profile of Adopted Standards 2000* provides guidance on the IT standards to support these initiatives.

3. IT Standards Adoption and Retirement Process

Adoption and retirement of information technology (IT) standards support the evolution of the Department of Energy (DOE) Information Architecture (IA) and provide a process by which standards are continuously refreshed to reflect changes in the Department and the entire IT industry. This process ensures compliance with Office of Management and Budget (OMB) Circular A-130 by maintaining a Profile of adopted standards that accurately represents standards used Departmentwide, and it guarantees viability of the Technical Reference Model. This process is consensus-based with active participation of stakeholders throughout the Department, increasing opportunities for dialogue, collaboration, and understanding. Standards can be proposed by an individual, through the responsible program or site point-of-contact, or by an affinity group formed to support a particular business or technology area. A Proposal Change Request form, used to propose a standard for adoption, change, or retirement, can be submitted electronically at *http://www-it.hr.doe.gov/standards/request.htm*. Refer to Appendix C for a sample of this form.

When a proposed standard is submitted, the DOE IT Standards Program Manager performs a preliminary evaluation to determine if the proposed standard is consistent with IA principles and DOE business needs, and if it meets criteria for scalability, extensibility, portability, and interoperability. The Program Manager also determines interested parties and subject matter experts to participate in the evaluation and adoption process. After the preliminary evaluation, the process proceeds with the following steps.

1. A standard recommended for adoption or retirement is distributed by the DOE IT Standards Program Manager for Departmentwide consideration.

2. Requests for comments are solicited from Headquarters program and site IT Standards points-of-contact and subject matter experts.

3. The IT Standards Program Manager receives comments and forwards a consolidated Departmental response to the originating body. Consensus is implied if comments are not received in the specified time.

4. The originating body provides resolution on the comments to the IT Standards Program Manager.

5. The IT Standards Program Manager distributes the comments resolution to the IT Standards points-of-contact for response and consensus status from their respective sites.

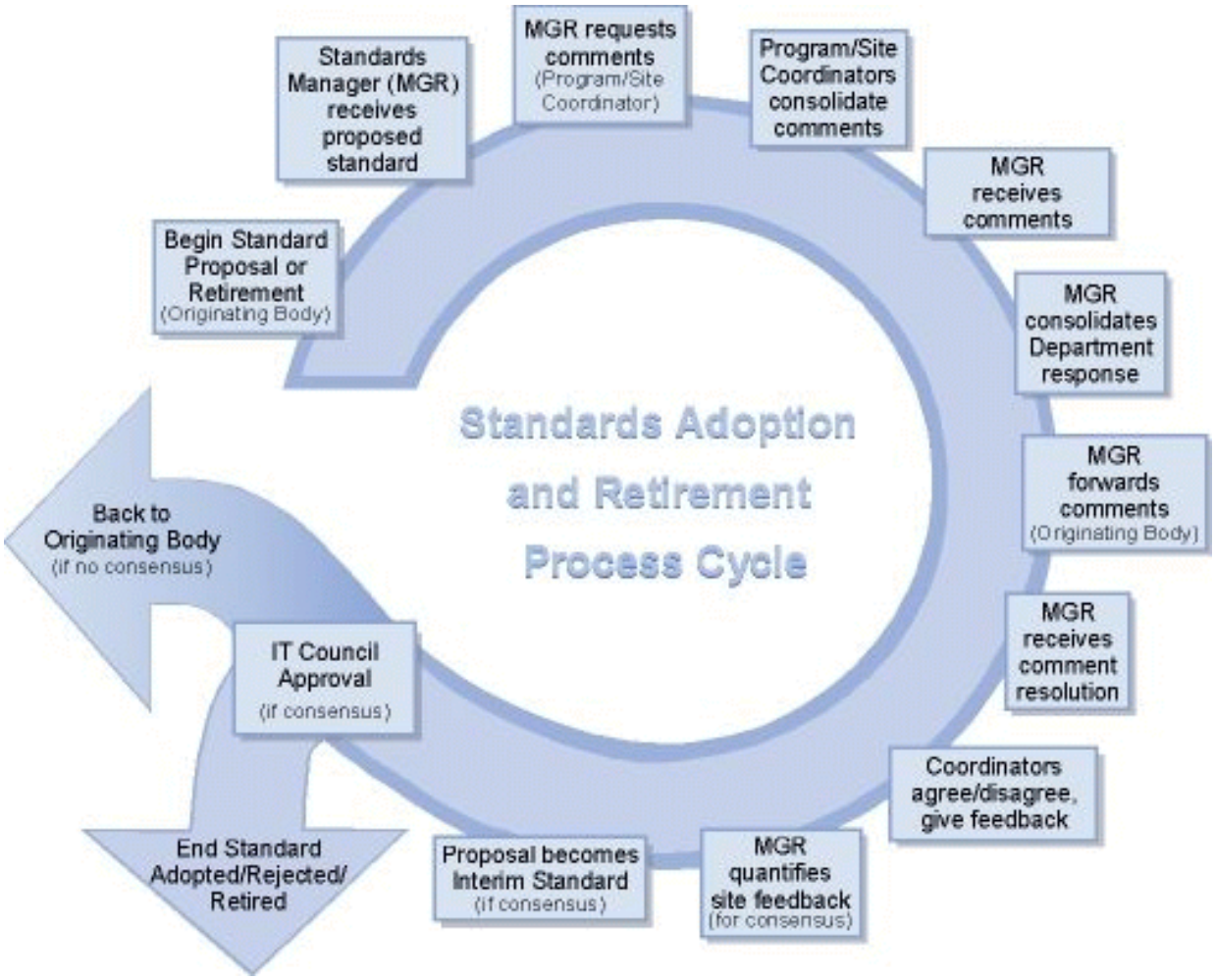
6. If Departmentwide consensus is reached, the standard becomes an interim standard.

7. The interim standard is forwarded to the DOE IT Council for acceptance. The IT Standards Program Manager also coordinates with the Field Management Council.

8. If consensus is not reached, or if the proposed standard is not accepted by the DOE IT Council, the standard is returned to the originating body without approval.

The Standards Adoption and Retirement Process Cycle is depicted below.

Figure 2, Standards Adoption and Retirement Process Cycle



4. IT Standards by Service Areas

Standards Overview

The *Information Architecture Profile of Adopted Standards (2000)* is organized into 10 information technology architecture service areas, reflecting the components of the Technical Reference Model (TRM) necessary to build a complete technical infrastructure. The Profile reflects the standards currently adopted in each of these areas. The Standards Adoption and Retirement Process provides the vehicle for continually refreshing the standards in each service area. The sunset review provides an overall review of standards and an opportunity to set future direction. Service areas can be re-defined as the standards process evolves. The most important consideration is the need to accurately reflect information technology (IT) standards that support current requirements and future trends in defining the Department's IT architecture.

STANDARDS BODIES

Many IT standards described in this document have been issued by official standards bodies, most of which maintain Web sites that provide additional information about activities, events, and other news of interest to the IT community. Following is a list of the standards bodies in this document that maintain Web sites. (Refer to Appendix D for a comprehensive list of abbreviations and acronyms used throughout this document.)

- **ANSI**
  American National Standards Institute
  http://www.ansi.org/default.asp

- **CCITT**
  Comite' Consultatif International de Telegraphique et Telephonique
  (CCITT changed its name to International Telecommunications Union (ITU) in 1993.)
  http://www.itu.int/ITU-T/index.html

- **ECMA**
  European Computer Manufacturers Association
  http://www.ecma.ch/index.htm

- **EIA**
  Electronics Industry Alliance
  http://www.eia.org/

- **FTSC**
  Federal Telecommunications Standards Committee
  http://www.ncs.gov/n6/about/html/ftsc.htm

- **IEC**
  International Electrotechnical Commission
  http://www.iec.ch/

- **IEEE**
  Institute of Electrical and Electronics Engineers, Inc.
  http://standards.ieee.org/

- **IETF**
  Internet Engineering Task Force
  http://www.ietf.org/home.html

- **ISO**
  International Organization for Standardization
  http://www.iso.ch/

- **ITU**
  International Telecommunications Union
  http://www.itu.int/ITU-T/index.html

- **NISO**
  National Information Standards Organization
  http://www.niso.org/

- **NIST**
  National Institute of Standards and Technology
  http://www.nist.gov/

- **OMG**
  Object Management Group
  http://www.omg.org/

- **OSF**
  Open Software Foundation
  (OSF and X/Open have merged to form The Open Group.)
  http://www.opengroup.org

- **TIA**
  Telecommunications Industry Association
  http://www.tiaonline.org/standards

- **US PRO**
  United States Product Data Association
  https://www.uspro.org/

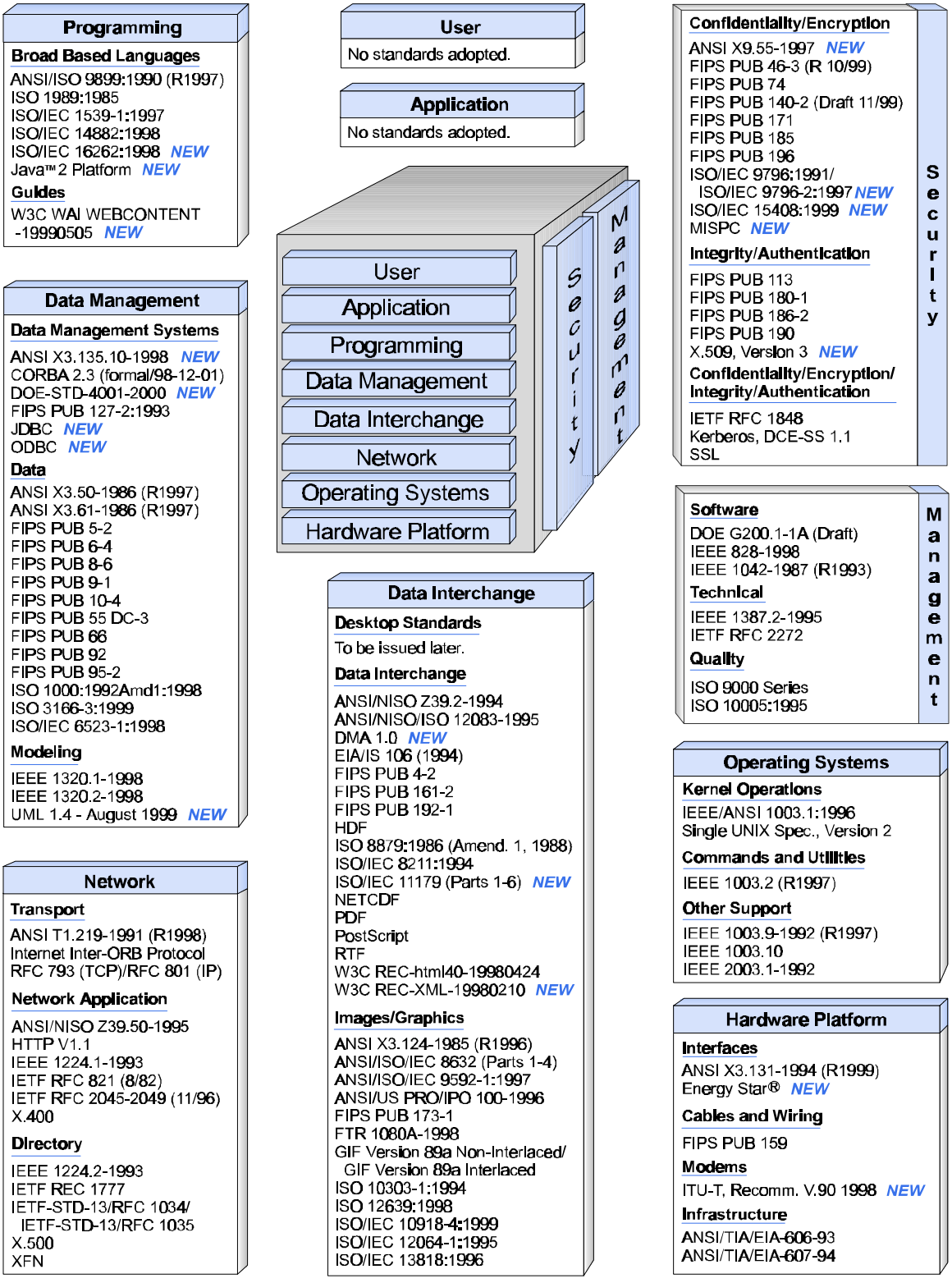
- **W3C**
  World Wide Web Consortium (W3C)
  http://www.w3.org/Overview.html

Service areas and descriptions are listed below.

Service Area	Description
User	Includes the operating system commands, graphical display formats, and other devices that allow a user to interact with and use a computer or program.
Application	Defines the methods by which people access and interact with applications and determines the functionality to be provided by the workstation.
Programming	Provides the languages, tools, and methodologies for developing and maintaining software.
Data Management	Includes procedures, practices, methods, software, data dictionaries, directories, database management systems, and distributed data schemes employed to manage data. Data management activities can be independent of the processes that create or use the data. Data management activities can provide for data to be maintained indefinitely and shared among many processes or systems.
Data Interchange	Supports data exchange between applications on the same or different platforms. Data interchange activities can provide specialized support for information exchange involving data formats, such as text, spreadsheet, desktop publishing, graphics, compression, geospatial, geographical, and scientific.
Network	Provides connectivity and services for data communications, electronic mail, directory, transparent file access and transfer, and remote access and procedures calls. Network services extend throughout the DOE complex and provide communications links with external entities.

Service Area	Description
Operating System	Provides the software environment initially loaded into the computer that manages all the other programs and provides necessary interfaces to other devices while maximizing use of machine resources.
Hardware Platform	Provides the physical layer and infrastructure to support other services.
Security	Is a cross-cutting service area emphasizing that cyber security permeates all levels of the DOE information technology architecture. Security services ensure the secure distribution and integrity of information and protect the computing infrastructure from unauthorized access.
Management	Is a cross-cutting service area that provides technical mechanisms to monitor and control the operation of individual applications, databases, systems, platforms, networks, and user interactions with these components. In addition, software management and quality standards support technical monitoring and control as well as cross-cut the layers of the DOE Information Architecture.

Figure 3, Information Architecture Adopted Standards



USER

Currently, there are no adopted standards in this area.

APPLICATION

Currently, there are no adopted standards in this area.

PROGRAMMING

Broad-Based Languages

ANSI/ISO 9899:1990 (R1997)—C

C is required to support DOE legacy applications (e.g., Classified Document System [CDOCS]) and augment some new application development.

C is a well-established, portable applications development language supported by numerous libraries of routines used by developers. This standard specifies the form and establishes the interpretation of programs written in C. (Replaces FIPS PUB 160.)

ISO 1989:1985—COBOL

COBOL is required to support Departmental Integrated Standardized Core Accounting System (DISCAS), a DOE legacy mainframe application.

COBOL (Common Business Oriented Language), the first widely-used, high-level programming language for business applications, dates back 35 years. While the language has been updated over the years, programs written in COBOL are generally viewed as legacy applications. This standard specifies the form and establishes the interpretation of programs written in COBOL. (Endorsement of ANSI X3.23-1985; replaces FIPS PUB 21-4.)

ISO/IEC 1539-1:1997——FORTRAN

FORTRAN supports legacy applications on the mainframe and has limited use by the DOE scientific community.

FORTRAN (FORmula TRANslation) is a third-generation programming language designed for use by engineers, scientists, mathematicians, and others engaged in scientific computing. FORTRAN's succinct and spartan syntax easily lends itself to creating scientific algorithms. FORTRAN has mostly been replaced by C language. This standard specifies the form and establishes the interpretation of programs written in FORTRAN. (Replaces FIPS PUB 69-1.)

ISO/IEC 14882:1998——C++

C++ supports application interoperability. The DOE Headquarters Controller's Office uses the Consolidated Accounting Investment System, which was written in C++.

C++ is a general purpose development language mostly used in large-scale, commercial software development. C++ is a superset of the C language, updating C with object-oriented features. Java™ is based on C++, but is optimized to distribute program objects in a network, such as the Internet.

NEW! ISO/IEC 16262:1998——JavaScript: ECMAScript Language Specification

JavaScript is an interpreted programming, or script, language used primarily in Web site development. JavaScript allows developers to embed miniature programs, such as a calendar or pop-up windows, into Web pages. It is not related to Java™, but the two languages can be used in concert. JavaScript increases functionality and flexibility in Web development. It is a widely used industry standard.

NEW! Java™ 2 Platform, Standard Edition

Java™ is a programming language expressly designed for use in the distributed environment of the Internet. Java™ is owned by Sun Microsystems, and is a de facto industry standard. Even though some security issues need to be addressed, Java™ can be used to create complete applications that can run on a single computer or be distributed among servers and clients in a network. Java™ can be used in Web page development to build small application modules, called applets, that make it possible for a Web page user to interact with the page. Java™ also supports high-end computing science and engineering applications.

Guides

NEW! W3C WAI WEBCONTENT-19990505—Web Content Accessibility Guidelines 1.0

The U.S. Architectural and Transportation Barriers Compliance Board, also known as the Access Board, has proposed accessibility standards that mirror these guidelines.

The primary goal of the World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI) guidelines is to promote accessibility for disabled and non-disabled users, independent of the access device being used (e.g., desktop browser, voice browser, mobile phone, etc.). The guidelines describe the mechanisms Web content developers (page authors and site designers) or developers of authoring tools can use to promote accessibility of the Web to all users, regardless of the devices being used or constraints affecting performance.

DATA MANAGEMENT

Data Management Systems

NEW! ANSI X3.135.10-1998—SQL Object Language Bindings (SQL/OLB)

Defines SQL object-oriented extensions for Java™, which is one of the Web development tools used at DOE.

Defines extensions of SQL to support embedding SQL statements into programs written in Java™, known as SQL-J. Specifies syntax and semantics of embedding, as well as mechanisms to ensure binary portability of resulting SQL-J applications. Defines object-oriented extensions for Java™. Allows developers to leverage SQL and Java™ to deliver greater functionality.

CORBA 2.3 (formal/98-12-01)—Object Management Group's Common Object Request Broker Architecture

Specifies the standards for object-oriented application development at DOE.

CORBA, developed by a consortium of vendors through the Object Management Group (OMG), is both an architecture and specification that provides the mechanisms by which objects transparently make requests and receive responses as defined by the OMG's Object Request Broker (ORB). The ORB provides interoperability between applications on different machines in heterogeneous distributed environments and seamlessly interconnects multiple object systems. It is the cornerstone of OMG's object management architecture. The CORBA architecture and specification support managing program objects distributed in a network, allowing applications to communicate with each other no matter where they are located or who designed them. CORBA has been sanctioned by the ISO and X/Open as the standard architecture for managing distributed objects. CORBA 2.3 is closely aligned with the feature sets of today's CORBA 2.1 products and reflects improvements to CORBA resulting from the continuing work of the Revision Task Forces. The Open Group has announced that it will soon update its CORBA Brand Program from CORBA 2.1 to CORBA 2.3. CORBA 3.0 implementations are expected to begin to arrive next year.

NEW! DOE-STD-4001-2000——DOE Design Criteria Standard for Electronic Records Management Software Applications, March 2000

Developed by the DOE Office of Information Records and Resource Management.

This standard establishes the recommended method for meeting the functional requirements of the laws and regulations pertaining to managing records using electronic Records Management Application (RMA) software. This standard will be used by DOE elements in the implementation of their records management programs. It describes the minimum records management requirements that must be met in accordance with 44 U.S.C. 2902, reference 1.a and guidance and implementing regulations promulgated by National Archives and Records Administration (NARA). This standard is based on the November 1997 Department of Defense standard DOD 5015.2 STD. It replicates the mandatory portions of the DOD standard to allow the DOD certification process to apply to DOE and to promote a unified Federal standard for RMAs.

FIPS PUB 127-2:1993——Database Language Structured Query Language (SQL)

Programming language used at DOE to access information in SQL-compliant databases, such as Oracle. The Corporate Human Resource Information System (CHRIS) is an example of an application that uses an Oracle database.

Adopts ANSI X3.135-1992 (R1998), which defines the syntactic and semantic rules for database definition and data manipulation in a relational model database management system. Promotes a high degree of interoperability that is independent of vendor products and provides a substantial, upward-compatible enhancement of database language SQL. It includes four levels of conformance: Entry SQL, Transitional SQL, Intermediate SQL, and Full SQL. Conformance to Entry SQL is required in all Federal procurements of SQL products. Conformance to Transitional SQL, Intermediate SQL, or Full SQL are options that may be specified, explicitly, as requirements in a Federal procurement.

NEW! JDBC——Java™ Database Connectivity

Provides a standard Application Program Interface (API) for tool/database developers. Provides the method for connecting Java™ programs to databases. A single program can be written using JDBC API, and it can send SQL statements to the appropriate database. The combination of Java™ and JDBC allows a programmer to write an application once and have it run anywhere, which makes disseminating information easy and economical.

NEW! ODBC——Open Database Connectivity

DOE currently uses the ODBC standard to interface with Oracle, Access, and MS SQL Server.

Based on and closely aligned with the Open Group standard Structured Query Language (SQL) call-level interface, ODBC is an API for accessing a database. It allows programs to use SQL requests to access databases without having to know the proprietary interfaces. ODBC extends the functionality leveraged by programmers by promoting open connectivity to various databases.

Data

Data Standards and Guidelines: Representations and Codes

This series of independent standards and guidelines provides a comprehensive set of data representation for various subjects and a basic layer of consistent coding and representation to facilitate data element formulation. These include representation structure, such as date, and cases that specify enumerated value domains of an element.

Standard	Description
ANSI X3.50-1986 (R1997)	Representations for U.S. Customary, SI, and Other Units to be Used in Systems with Limited Character Sets
ANSI X3.61-1986 (R1997)	Representation of Geographic Point Locations for Information Interchange
FIPS PUB 5-2	Codes for the Identification of the States, the District of Columbia, the Outlying Areas of the United States, and Associated Areas
FIPS PUB 6-4	Counties and Equivalent Entities of the United States, Its Possessions, and Associated Areas

Standard	Description
FIPS PUB 8-6	Metropolitan Areas
FIPS PUB 9-1	Congressional Districts of the United States
FIPS PUB 10-4	Countries, Dependencies, Areas of Special Sovereignty, and Their Principal Administrative Divisions
FIPS PUB 55 DC-3 (Revised in 1998)	Guideline: Codes for Named Populated Places, Primary County Divisions, and other Location Entities of the United States, Puerto Rico, and Outlying Areas
FIPS PUB 66	Standard Industrial Classification (SIC) Codes
FIPS PUB 92	Guidelines for Standard Occupational Classification (SOC) Codes
FIPS PUB 95-2	Codes for the Identification of Federal and Federally Assisted Organizations
ISO 1000:1992 Amd1:1998	SI Units and Recommendations for the Use of their Multiples and of Certain Other Units
ISO 3166-3:1999	Codes for Representation of Names of Countries and Their Subdivisions
ISO/IEC 6523-1:1998	Structure for the Identification of Organizations and Organization Parts–Part 2: Registration of Organization Identification Schemes

Modeling

IEEE 1320.1-1998——IEEE Standard for Functional Modeling Language–Syntax and Semantics for IDEF0

This standard describes the IDEF0X modeling language (semantics and syntax) and associated rules and techniques for developing structured graphical representations of a system or enterprise. Use of this standard permits construction of models comprising system functions (activities, actions, processes, and operations), functional relationships, and data (information or objects). (Replaces FIPS PUB 183.)

IEEE 1320.2-1998——IEEE Standard for Conceptual Modeling Language–Syntax and Semantics for IDEF1X97 (IDEFobject)

This standard describes the IDEF1X modeling language (semantics and syntax) and associated rules and techniques for developing a logical model of data. IDEF1X is used to produce a graphical information model that represents the structure and semantics of information within an environment or system. Use of this standard permits construction of semantic data models that can support management of data as a resource, integration of information systems, and building of computer databases. (Replaces FIPS PUB 184.)

NEW! UML 1.4 - August 1999——Unified Modeling Language

UML is a rigorous modeling language that standardizes the description of software designs, particularly Object-Oriented designs. The emergence of UML represents a significant development in object technology. UML merges the notations used by the three most popular analysis and design methodologies–Booch, Object-Oriented Software Engineering (OOSE) (use case), and Object Modeling Techniques (OMT)–to produce a single, universal modeling language that can be used with any methodology.

DATA INTERCHANGE

Desktop Standards

Standards guidance in this area has not been issued, but a detailed DOE desktop software profile is being developed as guidance and will be issued at a later time. Categories of desktop commercial-off-the-shelf software to be addressed include: word processing, spreadsheet, presentation/graphics, electronic mail and messaging, Web browser, database management system, electronic records management, calendaring/scheduling, and project management.

Data Interchange

ANSI/NISO Z39.2-1994——Information Interchange Format

Specifies the requirements for a generalized interchange format to accommodate data describing all forms of material. This format includes generalized structure designed specifically for exchange of data between processing systems, but not necessarily for use as a processing format within systems. It can be used to communicate records in any media. (Updates ANSI Z39.2-1985.)

ANSI/NISO/ISO 12083-1995——Electronic Manuscript Preparation and Markup

Specifies four document type definitions (DTDs) based on the Standard Generalized Markup Language (SGML) for books, serials, articles, and mathematics. Includes text preparation instructions for the near-automatic conversion to grade-2 Braille and for publication in large-print and computer voice editions. (Updates ANSI Z39.59-1988.)

NEW! DMA 1.0——Document Management Alliance (DMA)

DMA defines interoperability standards for document management products. The DMA specification allows document management systems from different vendors to interoperate. DMA provides uniformity of access so a user need only learn a single application to access all documents in the enterprise. Provides a rich set of capabilities: mechanism for automatically locating repositories; capability for mapping common attributes across repositories; ability to browse across document management systems using Internet browsers; ability to manage multiple renditions of a document; automatic discovery of document classes, properties, and search operators; and ability to search across multiple repositories simultaneously then merge the search results.

EIA/IS 106 (1994)——CASE Data Interchange Format

Assists vendors and users of Computer Aided Software Engineering (CASE) tools in developing mechanisms for interchanging information between CASE tools. This standard describes the architecture and provides an overview of the current standards that form the CDIF family of standards. (Updates EIA/CDIF PN-30.)

FIPS PUB 4-2——Representation of Calendar Date for Information Interchange

Implements the Federal Government's commitment to use four-digit year elements in its information technology systems.

This standard provides a consistent way to represent calendar dates to facilitate interchange of data among information systems. Adopts ANSI X3.30-1997: Representation of Date for Information Interchange. (Updates FIPS PUB 4-1.)

FIPS PUB 161-2——Electronic Data Interchange (EDI)

The DOE electronic commerce initiative follows this standard.

EDI provides a standard format for exchanging business data, allowing application-to-application transfer of purchase orders, invoices, shipping notices, and other frequently used business documents. With specific conditions, this FIPS adopts the ANSI X.12, UN/EDIFACT, and HL7 families of standards. Use of this standard is required for Federal implementation of EDI systems. It provides guidance to Agencies on the selection of X.12 and UN/EDIFACT standards and Federal implementation conventions.

FIPS PUB 192-1——Application Profile for the Government Information Locator Service (GILS)

The GILS Profile enables GILS-aware client systems to interconnect and interoperate with any GILS-compliant server. The GILS Profile is based primarily on ISO 23950, presently equivalent to the ANSI/NISO Z39.50-1995/Version 2. The objectives of the GILS application profile are to: 1) enable users to identify, locate, and access or acquire publicly available Federal information resources, including electronic information resources; 2) provide a uniform approach to providing information

locator services to the public; and 3) enable every Agency to establish standards-based, network-accessible locator records. This standard is recommended for use by Federal Agencies in the development of information locators. It is required for use by Federal Agencies in those information locators that are established and maintained as part of GILS pursuant to the requirements of 44 U.S.C. 3511 and other applicable law, regulation, and policy. (Supersedes FIPS PUB 192.)

HDF—Hierarchical Data Format

HDF, a de facto standard, provides a multi-object file format used for transferring various data types between machines and operating systems. At its lowest level, HDF is a physical file format for storing scientific data. At its highest level, HDF is a collection of utilities and applications for manipulating, viewing, and analyzing data in HDF files. It is a software library that provides high-level APIs and a low-level data interface.

ISO 8879:1986 (Amendment 1 1988)—Standard Generalized Markup Language (SGML)

At DOE, the Office of Scientific and Technical Information (OSTI) has designated SGML as an acceptable format for electronic document submission through 2004.

The SGML standard defines a neutral format used to describe information structures of considerable complexity. With SGML, a document's structural and other semantic elements can be described without reference to how these elements are displayed. Document display varies depending on the output medium and style preferences. Advantages of SGML documents are: greater stability because they are created in terms of document structure rather than appearance characteristics (which can change over time); increased portability; and print medium documents can easily be re-adapted for other media, such as the computer display screen. HTML is an example of an SGML-based language.

ISO/IEC 8211:1994——Specification for a Data Descriptive File (DDF) for Information Interchange

DDF specifies media- and system-independent file and record formats for information interchange between computer systems. It provides a mechanism to easily transport data structures from one computer system to another with the capability to restructure data. (Updates ANSI/ISO 8211:1985.)

NEW! ISO/IEC 11179 (1-6)——Specification and Standardization of Data Elements

Part 1: Framework for Specification and Standardization of Data Elements (1998)
Part 2: Classification for Data Elements (1996)
Part 3: Basic Attributes of Data Elements (1994)
Part 4: Rules and Guidelines for Formulation of Data Definitions (1995)
Part 5: Naming and Identification Principles for Data Elements (1995)
Part 6: Registration of Data Elements (1997)

These standards develop specifications for encoding metadata transferred to and from data registries. This family of standards specifies extensible markup language (XML) encoding, allows accessibility to data registries and increased interoperability, and facilitates use of standard data elements in data interchange on the Web.

NETCDF——Network Common Data Form

NETCDF, a de facto standard, provides a machine-independent format for representing scientific data and a data abstraction for storing and retrieving multi-dimensional data distributed as a software library. It interprets data as a collection of self-describing, network transparent objects that can be accessed through a simple interface. NETCDF was developed for data storage and exchange in the space and earth science communities. It is widely used in atmospheric sciences and oceanography.

PDF——Portable Document Format

PDF files are currently used by several DOE Web pages (e.g., the CIO Web page), and to send e-mail file attachments that contain graphics. OSTI has designated PDF as an acceptable format for electronic document submission through 2004.

PDF, a de facto standard, captures the elements of a printed document as an electronic image that can be viewed, navigated, printed, or sent via e-mail. PDF files preserve the original graphic appearance online of documents, such as brochures or magazine articles. PDF files are created using Adobe Acrobat or similar products. An Adobe Acrobat reader is necessary to view PDF files.

PostScript——Adobe PostScript 3, 1999

OSTI has designated PostScript as an acceptable format for electronic document submission through 2004.

PostScript, a de facto standard, is a programming language that describes the appearance of a printed page to a black-and-white or color printer or other output device, such as an image setter, slide recorder, or screen display. PostScript handles industry-standard, scalable typefaces in the Type 1 and TrueType font formats. All major printer manufacturers make printers that contain or can be loaded with PostScript software. PostScript runs on all major operating systems. It was developed by Adobe in 1985 and has become an industry standard for printing and imaging.

RTF——Rich Text Format

RTF, a de facto standard, is a desktop file format that permits exchange of text files between different word processors in different operating systems. For example, a file created in Microsoft Word 97 in Windows 95 saved as an RTF file can be opened and read by someone using WordPerfect 6.0 in Windows 3.1. RTF specifies details of the ASCII representation required for most low-level functions in word processing software. Information about fonts, page layout, and document management can be stored as part of the header information for each RTF file.

W3C REC-html40-19980424——Hypertext Markup Language (HTML) 4.0

HTML is widely used in the Department's Web development community. OSTI has designated HTML as an acceptable format for electronic document submission through 2004.

HTML is the publishing language for the Web. In addition to the text, multimedia, and hyperlink features of the previous version of HTML, 4.0 supports more multimedia options, scripting languages, style sheets, better printing facilities, and makes documents more accessible to users with disabilities. It also includes internationalization of documents, with the goal of making the Web world wide.

NEW! W3C REC-XML-19980210——Extensible Markup Language (XML)

OSTI has designated XML as an acceptable format for electronic document submission through 2004. The Los Alamos National Laboratory (LANL) is using XML to help researchers manage large amounts of data and information for scientific simulations with varying formats and naming conventions.

XML, a subset of SGML, is a standard markup language for documents. It enables generic SGML to be served, received, and processed on the Web similar to HTML. XML has the potential to change a document from a static file into a repository of information that can be displayed and manipulated differently. XML helps manage criteria for displaying pages. It provides a mechanism for validating digital signatures, sharing data across systems, and processing data for other applications. XML has the potential to be of enormous benefit to publishers, Web developers, and e-commerce entrepreneurs. The Federal CIO Council is exploring how XML might be used in the Government for records management, data exchange, and Government forms.

Images/Graphics

ANSI X3.124-1985 (R1996)——Graphical Kernel System (GKS) Functional Description

GKS promotes portability of graphics applications programs between installations, supporting the easy interchange of graphics data. Specifies a set of functions for computer graphics programming. GKS is a basic graphics system for applications that produce computer-generated, two-dimensional pictures, online graphics, or raster graphics output devices. It supports operator input and interaction by supplying basic functions for graphical input and picture segmentation and allows storage and dynamic modification of pictures. (Includes ANSI X3.124-1-1985; replaces FIPS PUB 120-1.)

ANSI/ISO/IEC 8632——Computer Graphics–Metafile for the Storage and Transfer of Picture Description Information Parts 1-4

Part 1: Functional Specification
Part 2: Character Encoding
Part 3: Binary Encoding
Part 4: Clear Text Encoding
Amendment 1: Rules for Profiles (Parts 1-4)
Amendment 2: Application Structuring Extensions (Parts 1-4)

This graphics data interchange standard defines a neutral computer interpretable representation of two-dimensional (2-D) graphical (pictorial) information in a manner that is independent of any particular application or system. The purpose of the standard is to facilitate the storage and retrieval of graphical information between applications, software systems, and/or devices. A computer graphics metafile can contain vector graphics, raster graphics, and text. (Replaces FIPS PUB 128-2.)

ANSI/ISO/IEC 9592-1:1997——Programmer's Hierarchical Interactive Graphics System (PHIGS) - Part 1: Functional Description

PHIGS is a programming interface used to develop two-dimensional (2-D) and three-dimensional (3-D) graphics applications. It specifies control and data interchange between an application program and its graphic support system. PHIGS provides a set of functions and programming language bindings (or toolbox package) for definition, display, and modification of 2-D or 3-D graphical data. This standard supports highly interactive processing and geometric articulation, multi-level or hierarchical graphics data, and rapid modification of graphics data and graphical data relationships. (Replaces FIPS PUB 153-1.)

ANSI/US PRO/IPO 100-1996——Initial Graphics Exchange Specification (IGES)

IGES enables computer-aided design/computer-aided manufacturing (CAD/CAM) equipment to exchange product definition data throughout the life cycle of a given product. It allows digital exchange of product definition data in various forms (e.g., illustrations, two-dimensional drawings, three-dimensional edge-vertex models, surface models, solid models, and complete product models) independent of a particular CAD/CAM system. (Replaces FIPS PUB 177-1.)

FIPS PUB 173-1——Spatial Data Transfer Standard (SDTS) (DOI/USGS Specifications)

SDTS is used in the National Spatial Data Infrastructure being developed by the Federal Geographic Data Committee (FGDC), of which DOE is a member.

SDTS promotes and facilitates transfer of digital spatial data between dissimilar computer systems. It specifies a set of spatial objects and relationships that define the organization, structure, and definition of spatial features and attributes for digital spatial data transfer. The transferred objects represent real world spatial entities. The transfer model facilitates conversion of user-defined data to standardized sets of objects, relationships, and information.

FTR 1080A-1998——Video Teleconferencing Services at 56 to 1920 kbit/s

DOE videoconferencing services follow this standard.

This Federal Telecommunications Recommendation, developed by the Federal Telecommunications Standards Committee (FTSC), defines specifications for video teleconferencing and video telephony systems. It ensures interoperability among Federal video teleconferencing and videophone systems employing codecs at rates between 56 and 1920 kbit/s, and is mandatory only for audiovisual systems operating at these rates. It is used by all Federal Agencies to design and procure video teleconferencing and videophone systems. Adopts International Telecommunications Union (ITU-T) Recommendations H.221, H.230, H.231, H.233, H.234, H.242, H.243, H.244, H.261, and H.320. (Replaces FIPS PUB 178.)

GIF Version 89a Non Interlaced/GIF Version 89a Interlaced

The GIF format is used extensively in the DOE Web development environment.

Graphical Interface Format (GIF 89a) Lempel-Ziv Welch (LZW) provides a format for encoding graphic images into bits for display on a computer screen. One of the most important advantages of the newer format is the ability to create an animated image, which is a single file that contains a set of images presented in a specified order. GIF compresses the image, making it easier to transmit and download. (Updates GIF Version 87, May 1987.)

ISO 10303-1:1994——Product Data Representation and Exchange—Part 1: Overview and Fundamental Principles

ISO 10303 is an extensive family of standards under the auspices of ISO Technical Committee 194 for Industrial Automation Systems and Integration. These standards cover standardization in the field of industrial automation and integration concerning discrete part manufacturing and encompass application of multiple technologies (e.g., information systems, machines and equipment, and telecommunications). The Product Data Exchange uses the Standard for Exchange of Product Model Data. This family of standards enables product developers to define, access, and exchange product information electronically to improve product quality and lower costs.

ISO 12639:1998——Tagged Image File Format for Image Technology (TIFF/IT)

Used by the DOE information bridge for data exchange and by OSTI for representing scientific and technical data.

TIFF/IT is a common format for exchanging raster (bitmapped) images between application programs, including those used for scanning images. TIFF/IT files are used in desktop publishing, faxing, 3-D applications, and medical imaging. The TIFF/IT format was developed in 1986 by an industry committee chaired by the Aldus Corporation (now part of Adobe Software). TIFF/IT files can be in any of several classes, including gray scale, color palette, or RGB full color, and TIFF/IT files can include files with JPEG, LZW, or ITU-T Group 4 standard run-length compression.

ISO/IEC 10918-4:1999——Joint Photographic Experts Group (JPEG)

JPEG is an image format used in the DOE Web development community; it is also used to prepare publications.

JPEG is a graphic file format that provides digital compression and coding of continuous tone still images. JPEG images can be created in a range of resolutions by specifying the image quality. Since the highest quality results in the largest file, trade-offs are made between image quality and file size. The JPEG scheme includes 29 distinct coding processes. It is supported by the Web protocol, usually with the file suffix of .jpg. The Still Picture Interchange File Format (SPIFF) can be used with JPEG to provide for interchange of compressed image files between different application environments. (Replaces IS 10918:1992.)

ISO/IEC 12064-1:1995——Open Document Format: Image Applications, Simple Document Structure: Raster Graphics Content Architecture

This standard facilitates raster document interchange among different raster graphics applications by specifying constraints on document structure and content. It is applicable to compound or multimedia documents that incorporate several types of content, such as character text, graphics, sound, and images. (Replaces FIPS PUB 194.)

ISO/IEC 13818:1996——General Coding of Moving Pictures and Associated Audio Information, Version 2 (MPEG)

Developed by the Moving Pictures Experts Group (MPEG), MPEG standards are evolving for video and audio compression. MPEG provides a compressed moving image file that can be used in interchange. MPEG-1 and MPEG-2 define techniques for compressing digital video by factors varying from 25:1 to 50:1. (Updates ANSI/ISO IS11172:1992.)

Transport

ANSI T1.219-1991 (R1998)—Telecommunications - Integrated Services Digital Network Management - Overview and Principles

Even though ISDN will be overtaken by Internet Protocol (IP) in the coming years, today it is still relevant to DOE for video services.

Provides an overview and general discussion of the models, terminology, and principles used to define needed management functionality in customer and network equipment for Integrated Services Digital Network (ISDN) operations. (Replaces FIPS PUB 182.)

NEW! Internet Inter-ORB Protocol (IIOP)

DOE requires object-oriented middleware to develop multi-tiered, Web-based applications.

IIOP is an object-oriented protocol for middleware that makes it possible for distributed programs written in different programming languages to communicate over the Internet. It is a critical part of the industry standard Common Object Request Broker Architecture (CORBA) and facilitates open communication and data exchange.

TCP/IP RFC 793 (TCP) RFC 801 (IP Version 4)—Transmission Control Protocol/Internet Protocol (TCP/IP)

TCP/IP is the protocol used to support DOE Internet connectivity.

TCP/IP, a two-layered program, provides for a reliable, connection-oriented, end-to-end transport service on top of an unreliable network. The higher layer, TCP, manages the assembling of a message or file into smaller packets for transmission over the Internet and receipt by a TCP layer that reassembles the packets into the original message. The lower layer, IP, handles the address portion of each packet so that it reaches the correct destination. TCP/IP is the only widespread, non-proprietary transport protocol standard. It supports File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP), and TELNET (remote login). TCP/IP is supported by almost every communications products vendor.

Network Application

ANSI/NISO Z39.50-1995——Information Retrieval (Z39.50) Application Service Definition and Protocol Specification

This network protocol is used in Government Information Locator Service (GILS) and Federal Geographic Data Committee standards.

This standard specifies a client/server-based protocol for information retrieval. It also specifies procedures and structures for a user to search a database provided by a server, retrieve database records identified by a search, scan a term list, and sort a result set. It also specifies access control, resource control, extended services, and a help facility. The protocol addresses communications between the user and server, which can reside on different computers. It does not address interaction between the user and the end-user. It is fully operational over the Internet.

HTTP V1.1——Hypertext Transfer Protocol (HTTP) Version 1.1

W3C has worked with the Internet Engineering Task Force (IETF) to develop a number of refinements to HTTP, culminating in a new specification. HTTP V1.1 is designed to speed up Web page delivery to the browser and reduce Web traffic. The three main features of HTTP V1.1 are support for virtual hosting, efficient handling of information requests, and efficient caching.

IEEE 1224.1-1993——Information Technology X.400-Based Electronic Messaging Application Program Interfaces (API) Language Independent

This standard will be retained in the Profile until X.400, which has limited use in the Department, is retired.

Defines APIs to X.400-based electronic messaging services in terms independent of any particular programming language. An X.400 gateway API divides a message transfer agent into two software components: a messaging system gateway and an X.400 gateway service.
This standard, and the language bindings derived from it, are intended to be used in conjunction with IEEE Standard 1224-1993, which provides a general-purpose API for the creation, examination, modification, and deletion of open system interconnection (OSI) information objects.

IETF RFC 821 (August 1982)——Simple Mail Transfer Protocol (SMTP)

All DOE sites use SMTP, which is widely supported by communications products vendors.

SMTP is a reliable and efficient TCP/IP protocol for sending and receiving e-mail. It specifies how two systems interact and the message format used to control the transfer of electronic mail. SMTP is limited in its ability to queue messages at the receiving end. Therefore, it typically is used with one of two other protocols, Post Office Protocol 3 (POP3) or Internet Message Access Protocol (IMAP), which permits users to save messages in a server mailbox and download them.

IETF RFC 2045-2049 (11/96)——Multipurpose Internet Mail Extensions (MIME) - Parts 1-5

RFC 2045: Format of Internet Message Bodies
RFC 2046: Media Types
RFC 2047: Message Header Extensions for Non-ASCII Text
RFC 2048: Registration Procedures
RFC 2049: Conformance Criteria and Examples

MIME is an extension of the original Internet e-mail protocol, SMTP, which was designed to support ASCII data. MIME supports the exchange of various kinds of data files (e.g., audio, video, and images) on the Internet. MIME originated as IETF STD 11, RFC 822, *Standard For The Format of ARPA Internet Text Messages*, August 13, 1982. MIME, as it is used today, is covered by IETF RFC 2045-2049. RFC 2045 specifies the various headers used to describe the structure of MIME messages. RFC 2046 defines the general structure of the MIME media typing system and an initial set of media types. RFC 2047 describes extensions to RFC 822 to allow non-U.S.-ASCII text data in Internet mail header fields. RFC 2048 specifies various Internet Assigned Numbers Authority (IANA) registration procedures for MIME-related facilities. RFC 2049 describes MIME conformance criteria and provides some illustrative examples of MIME message formats, acknowledgments, and the bibliography.

X.400——X.400 Message Handling Services

X.400 largely has been replaced by SMTP, but is still used in DOE.

X.400, the international standard for message handling systems, is based on an ITU-T recommendation. This standard provides specifications for message handling systems and service overviews. X.400 provides a standard e-mail architecture that allows people and applications to exchange messages, documents, and files between different computer models.

Directory

IEEE 1224.2-1993——Information Technology Directory Services Application Programming Interfaces (API) Language Independent

Defines API to OSI directory services in terms that are independent of any particular programming language. The interface supports applications portability at the source-code level and is intended to be used by applications developers and directory service implementors. In 1995, the Portable Applications Standards Committee of the IEEE Computer Society conducted a series of analyses of various problems encountered by users of this standard and IEEE Standard 1327.2-1993, *IEEE Standard for Information Technology - Directory Services C Language Interfaces - Binding for Application Program Interface (API)*. The intent is to give the directory services community reasonable ways of interpreting unclear portions of these standards.

IETF RFC 1777——Lightweight Directory Access Protocol (LDAP), Version 3, 1997

Provides access to the X.500 directory while not incurring the resource requirements of the full X.500 DAP. This protocol is specifically targeted for simple management and browser applications that provide read/write interactive access to the X.500 directory, and is intended to be a complement to DAP.

IETF STD-13/RFC 1034——Domain Names - Concepts and Facilities;
IETF STD-13/RFC 1035——Domain Names - Implementation and Specification

DNS is used at DOE by every computer connected to the local area network (LAN).

IETF RFC 1034 is an introduction to the Domain Name System (DNS). It introduces domain style names, their use for Internet mail and host address support, and the protocols and servers used to implement domain name facilities. It omits detail that can be found in a companion document, RFC 1035, which describes details of the domain system and protocol. DNS is a mixture of functions and data types that are an official protocol, and functions and data types that are still experimental. The official protocol parts include standard queries, responses, and Internet host addresses. Domain names provide a mechanism for naming resources so they can be used in different hosts, networks, protocol families, Internets, and administrative organizations.

X.500——Recommendation X.500 (08/97)–Open Systems Interconnection–The Directory: Overview of Concepts, Models, and Services

Two of the largest directory service providers are InterNIC, which supervises domain name registration in the U.S., and ESnet, which maintains X.500 data for the DOE national laboratories.

Developed by ITU-T, X.500 Directory Service is a family of standards used to develop an electronic directory of people in an organization so it can be part of a global directory available to anyone with Internet access. X.500 directory is organized under a common root directory in a tree hierarchy of country, organization, organizational unit, and person. The global expansion of the Internet has highlighted the need for a universal directory service that is both distributed and vendor independent. The X.500 directory access protocol (DAP) provides rich capabilities for distribution, replication, security, and management. X.500 directories are being driven by the widespread use of X.509 certificates in the banking, electronic commerce, and military communities.

XFN——Open Group Technical Standard C403 - X/Open Federated Naming: The XFN Specification

X/Open Federated Naming (XFN) common application environment specification defines the model of a federated naming service together with associated programmatic interface and specifies the naming policies to be used in conjunction with this service. Collectively, these definitions are called the XFN specification.

OPERATING SYSTEMS

Kernel Operations

IEEE/ANSI 1003.1:1996——Portable Operating System Interface (POSIX®) - System Application Program Interface - C Language

Defines a C language source interface to an operating system environment. System application program interfaces provide low-level services necessary to create and manage processes, execute programs, define and communicate signals, define and process system clock operations, manage files and directories, and control input/output processing to and from external devices. IEEE is the official validation service for NIST POSIX®. (Replaces FIPS PUB 151-2.)

NEW! Single UNIX Specification, Version 2

This specification defines UNIX for operating system vendors and application developers. The X/Open UNIX brand specifies that a vendor's product conforms to the Single UNIX Specification. Organizations are guaranteed seamless interoperability from one UNIX operating system to another by developing or purchasing applications that use the interfaces in the Single UNIX Specification.

Commands and Utilities

IEEE 1003.2 (R1997)—Portable Operating System Interface (POSIX®) Part 2: Shell and Utilities

This standard defines a command language interpreter and set of utility programs under the POSIX® series of specifications. It addresses how the user can interact with the operating system and uses a standard portable system interface design. This standard promotes portability of computer application programs at the source code level. (Replaces FIPS PUB 189.)

Other Support

IEEE 1003.9-1992 (R1997)—POSIX® FORTRAN 77 Language Interface - Part 1: Binding for System Application Program Interface (API)

Provides interfaces to the POSIX® (IEEE/ANSI 1003.1-1996) system services via a FORTRAN 77 language interface. This standard describes terminology and general requirements, processes, input and output primitives, process environment, files and directories, device- and class-specific functions, FORTRAN 77 language library, and system databases.

IEEE 1003.10—POSIX®-Based Supercomputing Applications Environment Profile

This standard is related to the POSIX® series of standards for applications and user interfaces to open systems. It specifies the set of standards and the requirements needed for portability of supercomputing applications for users and system administrators.

IEEE 2003.1-1992——Test Methods for Measuring Conformance to POSIX® - Part 1: System Interfaces

This standard is primarily for POSIX® test suite providers and implementors. It specifies those aspects of POSIX® to be verified by conformance test methods. Test requirements consist of a POSIX®-ordered list of assertions defining those aspects of POSIX® to be tested and the associated methods to be used to perform those tests.

HARDWARE PLATFORM

Interfaces

ANSI X3.131-1994 (R1999)——Small Computer Systems Interface-2 (SCSI-2)

SCSI is the set of standard electronic interfaces used at DOE that enables personal computers to communicate with peripheral hardware, such as disk, tape, CD-ROM drives, printers, and scanners.

SCSI-2 defines an input/output bus for interconnecting computers and peripheral devices. It also defines extensions to the SCSI-1, X3.131-1986, and provides more complete standardization of the previously defined command sets. Includes the necessary specification of the mechanical, electrical, and functional characteristics of the interface to enable interoperability of devices meeting the standard. (Updates ANSI X3.131-1990.)

NEW! Energy Star®

Executive Order 13123 dated June 1999 tasks Agencies to select Energy Star® products where life-cycle cost-effective.

To promote Federal leadership in energy management, Executive Order 13123 (*Greening the Government Through Efficient Energy Management*) was issued. Energy Star® is a partnership between DOE, the Environmental Protection Agency, product manufacturers, local utilities, and retailers. Partners encourage use of Energy Star®-efficient computers and other related equipment (e.g., monitors, printers, scanners, fax machines, and copiers). An Energy Star®-compliant computer meets EPA and DOE energy efficiency criteria. IT Standards Program research revealed that NT-based computer systems do not comply with Energy Star®.

Cables and Wiring

FIPS PUB 159—Detail Specification for 62.5μ Core Diameter/125μ Cladding Diameter Class IA Multimode Graded-Index Optical Waveguide Fibers

Physical specifications for fiber optic cable used on DOE LANs.

Defines the optical, geometrical, environmental, and mechanical specifications for glass (EIA/TIA-458-A-1984 Class IA) multimode optical waveguide fibers. Provides minimum acceptable values for characteristics and also references applicable industry standards for their measurement. Used by Federal Agencies in planning, designing, and procuring (including lease and purchase) of new communication systems that use multimode optical fiber. Primary applications include, but are not limited to, on-premises inter- and intra-building systems. This includes wiring of new buildings and upgrading existing ones.

Modems

NEW! ITU-T, Recommendation V.90 1998—Digital and Analog Modems Pair Used on the Public Switched Telephone Network

This recommendation specifies the operation of digital and analog modem pairs used on the public switched telephone network at rates of up to 56,000 bits per second (bit/s) downstream, and up to 33,600 bit/s upstream. This standard specifies terms of coding, start-up signals and sequences, operating procedures, and Data Terminal Equipment-Data Communications Equipment interface functionalities.

Infrastructure

ANSI/TIA/EIA-606-93——Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

The purpose of this standard is to provide a uniform administration scheme that is independent of applications, which can change several times throughout the life of a building. This standard establishes guidelines for owners, end users, manufacturers, consultants, contractors, designers, installers, and facilities administrators involved in the administration of the telecommunications infrastructure or related administration system. (Replaces FIPS PUB 187.)

ANSI/TIA/EIA-607-94——Commercial Building Grounding and Bonding Requirements for Telecommunications

This standard can be utilized with or without prior knowledge of the telecommunications systems installed in the building. This standard supports a multi-vendor, multi-product environment, as well as the grounding practices for various systems that may be installed on customer premises. It will be useful to manufacturers of telecommunications equipment, purchasers, installers, or operators of equipment and devices for specifying the exact interface points between the building grounding systems and the telecommunications equipment grounding configuration, and building grounding configurations needed to support this equipment. It will also help building owners and developers who want to build an advanced technology structure that is compatible with modern telecommunications equipment. (Replaces FIPS PUB 195.)

SECURITY

Confidentiality/Encryption

NEW! ANSI X9.55-1997——Public Key Cryptography for the Financial Services Industry; Extensions to Public Key Certificates and Certificate Revocation Lists

Supports the implementation of digital signature and authentication at DOE.

Specifies extensions to the definitions of public key certificates and certificate revocation lists. As standards for public key certificates evolve, this standard extends the certificate with provisions to facilitate explicit management of certificates, certification paths, security policies, and transfer-of-trust so that non-hierarchical infrastructures are practical and manageable. Provides extensions of the authentication and data encryption specifications.

FIPS PUB 46-3 (Reaffirmed October 25, 1999)——Data Encryption Standard (DES)

On October 25, 1999, the Secretary of Commerce approved FIPS 46-3, which is effective March 25, 2000.

This standard specifies two FIPS-approved cryptographic algorithms, the Data Encryption Standard (DES) and the Triple Data Encryption Algorithm (TDEA) required by FIPS 140-1. When used with ANSI X9.52, this FIPS provides a complete description of the mathematical algorithms for encrypting (cryptographically protecting) and decrypting (returning to original form) binary coded information. Cryptography is used to protect data while it is being communicated or stored in a medium vulnerable to theft. DES is available for use by Federal Agencies within the context of a total security program consisting of physical security procedures, good information management practices, and computer system/network access controls. (Supersedes FIPS 46-2 in its entirety.)

FIPS PUB 74——Guidelines for Implementing and Using the NBS Encryption Standard

Supports the implementation of data encryption at DOE.

This standard defines four modes of operation for DES that can be used in a wide variety of applications. The modes specify how data will be encrypted and decrypted. It has been adopted as a voluntary industry standard, ANSI X3.106-1983.

FIPS PUB 140-2 (Draft 11/99)——Security Requirements for Cryptographic Modules

Supports DOE digital signature implementation.

Specifies security requirements to be satisfied by a cryptographic module used within a security system protecting sensitive information. The standard provides four increasing, qualitative levels of security intended to cover the wide range of potential applications and environments. The security requirements cover areas related to secure design and implementation of a cryptographic module, including cryptographic module specification and interfaces; roles, services, and authentication; finite state machine model; physical and operating system security; cryptographic key management; electromagnetic interference/electromagnetic compatibility; self-tests; design assurance; and mitigation of attacks. (This standard will supersede FIPS 140-1 in its entirety.)

FIPS PUB 171——Key Management Using ANSI X9.17

Supports DOE digital signature implementation.

ANSI X9.17 defines procedures for manual and automated management of keying materials and contains a number of options for use by Federal Agencies. Systems built to conform to all options of ANSI X9.17 are usually complex and expensive. The options specified in this standard allow development of cost-effective systems that will, in addition, increase interoperability.

FIPS PUB 185——Escrowed Encryption Standard (EES)

Specifies an encryption/decryption algorithm and a Law Enforcement Access Field (LEAF) creation method that can be implemented in electronic devices and used for protecting Government telecommunications. The algorithm and the LEAF creation method are classified and referenced, but not specified, in the standard. Electronic devices implementing this standard can be designed into cryptographic modules that are integrated into data security products and systems for use in data security applications. LEAF is used in a key escrow system that provides for decryption of telecommunications when access is lawfully authorized.

FIPS PUB 196——Entity Authentication Using Public Key Cryptography

Supports implementation of digital signature and authentication at DOE.

Specifies two challenge-response protocols by which entities in a computer system can authenticate identities to each other. These can be used during session initiation and whenever entity authentication is necessary. Depending on which protocol is implemented, either one or both entities can be authenticated. The protocols are derived from an international standard for entity authentication based on public key cryptography, which uses digital signatures and random number challenges. The authentication protocols described in the standard can be implemented in software, firmware, hardware, or any combination thereof.

NEW! ISO/IEC 9796:1991——Digital Signature Scheme Giving Message Recovery/ ISO/IEC 9796-2:1997——Digital Signature Scheme Giving Message Recovery, Part 2: Mechanism Using a Hash Function

Supports DOE digital signature implementation.

These standards are designed to protect small quantities of data, such as cryptographic keys and the results of hashing longer messages. They specify a digital signature scheme giving message recovery for messages of limited length using a public key system.

NEW! ISO/IEC 15408:1999——Common Criteria for Information Technology Security Evaluation Version 2.1

Used as the basis to evaluate security functions of IT products and systems at DOE.

Provides a common, world-wide catalog of elementary security functionality and assurance requirements, which can be selected, extracted, further refined, and packaged in two standardized constructs, protection profiles, and security targets. Assurance requirements incorporated into these constructs are defined and cataloged in seven increasing levels of assurance (from low evaluation assurance to a high evaluation assurance). Provides a comprehensive, rigorous language and flexible method for specifying a common set of security requirements for products and systems.

NEW! MISPC—Minimum Interoperability Specification for Public Key Infrastructure Components, Version 1

MISPC will be the basis for a NIST reference implementation and an initial root certificate authority for the Federal Public Key Infrastructure (PKI).

Provides interoperability between public key infrastructure components from different vendors. NIST developed the MISPC with the assistance of 10 Cooperative Research and Development Agreement partners: AT&T, Bolt, Beranek, and Newman, Inc., Certicom, Cylink, DynCorp, IRE, Motorola, Nortel (Entrust), Spyrus, and Verisign. The specification includes certificate and certificate revocation list profiles, message formats, and basic transactions for a PKI issuing signature certificates. It also includes support for multiple signature algorithms and transactions to support a broad range of security policies.

Integrity/Authentication

FIPS PUB 113—Computer Data Authentication

Provides enhanced data integrity by specifying a Data Authentication Algorithm (DAA) that, when applied to computer data, automatically and accurately detects unauthorized modification, both intentional and accidental. Based on FIPS PUB 46, which has been revised to 46-3, this standard is compatible with requirements adopted by the Treasury Department and banking community to protect funds transfer transactions.

FIPS PUB 180-1—Secure Hash Standard

Supports DOE digital signature implementation.

This standard specifies a Secure Hash Algorithm (SHA-1), which can be used to generate a condensed representation of a message or data file called a message digest. SHA-1 is required for use with the Digital Signature Algorithm (DSA) as specified in the Digital Signature Standard (DSS), and whenever a secure hash algorithm is required for Federal applications. It is applicable to all Federal Agencies who have to protect unclassified information. SHA-1 is used by the transmitter and intended receiver of a message in computing and verifying a digital signature.

FIPS PUB 186-2——Digital Signature Standard (DSS)

On January 27, 2000, the Secretary of Commerce approved FIPS 186-2, Digital Signature Standard (DSS).

This standard enables Federal Agencies to use the DSA, originally the only approved technique for digital signatures, as well as two new ANSI standards developed for the financial community. These new standards are ANSI X9.62, Elliptic Curve Digital Signature Algorithm (ECDSA), and ANSI X9.31, Digital Signature Using Reversible Public Key Cryptography, which included the Rivest-Shamir-Adelman (RSA) digital signature technique. This standard becomes effective June 27, 2000. An 18-month transition period from the date of approval is provided to enable all Federal Agencies to develop plans for the acquisition of equipment that implements the digital signature techniques adopted by FIPS 186-2. After the transition period, only equipment that implements FIPS 186-2 endorsed techniques should be acquired. (Updates FIPS 186.)

FIPS PUB 190——Guideline for the Use of Advanced Authentication Technology Alternatives

This guideline describes the primary alternative methods for verifying identities of computer system users and provides recommendations to Federal Agencies for acquisition and use of technology that supports these methods. Password-only authentication often cannot provide an adequate level of protection; therefore, stronger authentication techniques become increasingly important in an open systems environment. Modern technology has produced authentication tokens and biometric devices that are reliable, practical, and cost-effective. Passwords, tokens, and biometrics can be used in various combinations to provide greater assurance than can be attained with passwords alone.

NEW! X.509 Version 3——The Directory: Authentication Framework

ITU-T Recommendation X.509, which has been implemented as a de facto standard, defines a framework for providing authentication under a central control paradigm represented by a directory. It describes two levels of authentication: simple authentication, using a password as a verification of claimed identity; and strong authentication, involving credentials formed by using cryptographic techniques. X.509 focuses on defining a mechanism by which information can be made available in a secure way to a third party. Version 3 adds an extensibility mechanism to the original X.509 certificate format. Extensions can be defined in standards or by user communities.

Confidentiality/Encryption and Integrity/Authentication

IETF RFC 1848——MIME Object Security Services (MOSS)

Supports DOE digital signature implementation.

The MOSS protocol uses the multipart/signed and multipart/encrypted framework to apply digital signature and encryption services to MIME objects. Asymmetric (public key) cryptography is used to support digital signature service and encryption key management. Symmetric (private key) cryptography is used to support encryption service. The procedures are intended to be compatible with a wide range of public key management approaches, including both ad hoc and certificate-based schemes.

Kerberos, DCE-SS 1.1—Kerberos Network Authentication Service (V5) Generic Security Service API (GSSAPI)

The Accelerated Strategic Computing Initiative (ASCI), a multi-laboratory program that uses computer simulations to ensure the safety, reliability, and performance of the DOE nuclear weapons stockpile, relies on a sophisticated file system based on DCE/Kerberos security services.

Kerberos was created by the Massachusetts Institute of Technology (MIT) as a solution for user network security issues. It uses strong cryptography so that a user can prove identity to a server and vice versa across an un-secure network connection. After a user and server have used Kerberos to prove their identities, the communications can also be encrypted to assure privacy and data integrity. A Generic Security Service API (GSSAPI), which is defined in IETF RFC-1508, provides generic security services to users, supported with a range of underlying mechanisms and technologies that allow source-level portability of applications to different environments (e.g., a common core of security services).

SSL—Secure Sockets Layer

Supports DOE digital signature implementation and data encryption.

SSL is an open protocol for securing data communications across computer networks. SSL incorporates RSA data security technology and provides a straightforward method for adding strong security to existing applications and network infrastructures. SSL is application protocol-independent and provides encryption, which creates a secure channel to prevent others from tapping into the network; authentication, which uses certificates and digital signatures to verify the identity of parties in information exchanges and transactions; and message integrity, which ensures that messages cannot be altered en route. (Replaces Secure Hypertext Transfer Protocol [S-HTTP].)

MANAGEMENT

Software

DOE G 200.1-1A (Draft)——Department of Energy Software Engineering Methodology (SEM), Version 2 (1999)

SEM promotes development of reliable, cost-effective, computer-based software products while making efficient use of resources.

Developed by DOE, this process-oriented methodology is to be used by individuals, project teams, and managers as guidance for software engineering, project management, and quality assurance practices and procedures within the DOE environment. SEM facilitates software interoperability and reuse, and it encompasses all aspects of the software life cycle from project planning through production and maintenance. SEM is derived from the principles and standards advocated by software quality leaders, such as the IEEE and the Carnegie-Mellon Software Engineering Institute. (Replaces DOE G 200.1-1.)

IEEE 828-1998——IEEE Standard for Software Configuration Management Plans

This standard establishes minimum required contents of a software configuration management plan and defines specific activities to be addressed. (Updates ANSI/IEEE 828-1990.)

IEEE 1042-1987 (R1993)——Guide to Software Configuration Management

This standard discusses context, process, implementation, tools, techniques, supplier control, records management, and planning methodologies for software configuration management and how these components are expressed in software configuration management plans. Software developers use this standard to determine how configuration management is used to support the software engineering process. (Replaces ANSI/IEEE 1042-1987.)

Technical

IEEE 1387.2-1995——Portable Operating System Interface (POSIX®) System Administration–Part 2: Software Administration

This is part of the POSIX® series of standards for applications and user interfaces to open systems. It defines a software packaging layout, a set of information maintained about software, and a set of utility programs to manipulate that software and information.

IETF RFC 2272——Simple Network Management Protocol V.3 (SNMP)

SNMP is the protocol governing network management and monitoring network devices and their functions. SNMP is associated with TCP/IP, but it is not necessarily limited to TCP/IP networks. SNMP manages and controls IP gateways and the networks where they are attached. It uses IP directly, bypassing the masking effects of TCP error correction. It directly accesses IP datagrams on a network that may be operating abnormally, thus requiring management. SNMP defines a set of variables that the gateway must store and specifies control operations on the gateway.

Quality

ISO 9000——Quality Management and Quality Assurance Standards - Guidelines for Selection and Use

The ISO 9000 standards represent an international consensus on the essential features of a quality system to ensure the effective operation of a business, whether a manufacturer or service provider, or other type of organization either in the public or private sector. The standards facilitate improvement in performance, quality, customer satisfaction, and market access for manufacturing and service organizations, regardless of size. As part of the ISO 5-year review cycle, the 1994 versions of the ISO 9000 family of standards are currently being revised by ISO Technical Committee 176 for publication in the year 2000. The current ISO 9000 family of standards will be consolidated to only three quality management systems (QMS) standards.

Standard	Description
ISO 9000:2000 (QMS - Fundamentals and Vocabulary)	QMS fundamentals and vocabulary.
ISO 9001:2000 (QMS - Requirements)	There will only be one QMS requirement standard–ISO 9001, which will replace the current ISO 9001, 9002, and 9003. The new ISO 9001 is based on a process model using eight quality management principles that facilitate an evolution toward business excellence and emphasize customer satisfaction.
ISO 9004:2000 (QMS - Guidance for Performance Improvement)	ISO 9004 will drive organizations toward business performance improvement and form a consistent pair with ISO 9001 with the same sequence and numbering. ISO 9004 uses the same process model and quality management principles as ISO 9001, but it emphasizes meeting the needs of other interested parties through sustained customer satisfaction.

Until the latter part of 2000 when the new ISO standards take effect, the following ISO 9000 standards should be used.

Standard	Description
ISO 9000-1:1994 - Quality Management (QM) and Quality Assurance (QA) Standards - Part 1: Guidelines for Selection and Use	Introduces the ISO 9000 series, explains fundamental quality concepts, and is a road map for the entire series. It defines key terms and provides guidance on selecting, using, and tailoring ISO 9001, 9002, and 9003 for external quality assurance purposes, and for using ISO 9004-1 for internal quality management. ISO 9001 sets the requirements for an organization whose business processes range from design and development to production, installation, and servicing.
ISO 9000-2:1993 - QM and QA Standards - Part 2: Generic Guidelines for the Application of ISO 9001, 9002, and 9003	Assists in interpreting and applying ISO 9001, 9002, and 9003. For an organization that does not perform design and development, ISO 9002 is the appropriate standard, since it does not include the design control requirements of ISO 9001. Otherwise, its requirements are identical.
ISO 9000-3:1991 - QM and QA Standards - Part 3: Guidelines for the Application of ISO 9001 to development, supply, installation, and maintenance of computer software	Provides specific interpretation of the requirements of ISO 9001 for computer software development applications. ISO 9003 is the appropriate standard for an organization whose business processes do not include design control, process control, purchasing, or servicing, and that uses inspection and testing to ensure that final products and services meet specified requirements.
ISO 9000-4:1993 - QM and QA Standards - Part 4: Guide to Dependability Program Management	Provides guidance on how to plan, organize, and control resources to produce reliable and maintainable products. Also, provides guidance on dependability of program management. Focuses on the reliability, maintainability, and availability characteristics of products, such as transportation, electricity, telecommunications, and information services.

Standard	Description
ISO 9001:1994 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing	This is the most comprehensive conformance standard that includes all elements listed in ISO 9002 and 9003. This requirement standard is used by organizations desiring to demonstrate the capability for design/development of products or services, as well as for production, installation, and servicing.
ISO 9002:1994 - Quality Systems - Model for Quality Assurance in Production, Installation, and Servicing	This standard is used by organizations that are not responsible for design/development of products or services, but that want to demonstrate the capability to produce, install, and service. It is identical to ISO 9001, except for the design control requirement.
ISO 9003:1994 - Quality Systems - Model for Quality Assurance in Final Inspection and Test	Provides guidance to supplier organizations that produce software or products that include a software element. The primary rationale for this standard is that software development, supply, and maintenance–unlike other manufacturing processes–do not have a distinct manufacturing phase. The key process is the design phase. Offers suggestions regarding appropriate controls and methods that apply to the design phase. Organizations use this requirement standard when they need to demonstrate the capability to control a product or service by final inspection and test.
ISO 9004-1:1994 - Quality Management and Quality System Elements - Part 1: Guidelines	This is not a requirement standard, but it provides guidelines to implement a quality system focusing on an organization and its customer needs. Provides guidance to organizations for internal quality management without regard to external contractual requirements. It examines, in detail, most of the quality system elements contained in ISO 9001, 9002, and 9003. It can help determine the extent that each quality system applies to an organization.
ISO 9004-2:1991 - Quality Management and Quality System Elements - Part 2: Guidelines for Services	Provides guidance for establishing and implementing a quality system for services. This standard is similar to ISO 9004-1, but the guidelines are designed with special regard to the conditions applicable to the service sector. Directed to organizations that provide services or whose products include a service component. Takes into account factors that can differ from a product offering, such as customer interaction and assessment.
ISO 9004-3:1993 - Quality Management and Quality System Elements - Part 3: Guidelines for Processed Materials	This standard provides quality management guidelines applicable for producers of processed materials (e.g., solids, liquids, or gases delivered in pipelines, drums, tanks, or cans), which are typically provided in bulk. Outlines the importance of statistical sampling and evaluation procedures and their application to in-process controls and final product specifications.

Standard	Description
ISO 9004-4:1993 - Quality Management and Quality System Elements - Part 4: Guidelines for Quality Improvement	Provides guidelines for implementing continuous quality improvement in an organization using tools and techniques based on data collection and analysis. The standard notes that motivation for quality improvement comes from the need to provide increased value and satisfaction to customers. Organizations should be aware of how each process can be performed more effectively and efficiently.

ISO 10005:1995——Quality Management - Guidelines for Quality Plans

This standard provides guidance for preparing quality plans for control of specific products, projects, or contracts. It provides guidelines to assist suppliers in preparation, review, acceptance, and revision of quality plans, which are supplemental to the generic quality system documentation used for a particular product, project, or contract. Monitors and assesses adherence to the quality requirements. These guidelines are not intended to be used as a checklist for compliance with requirements. A quality plan is used where a documented quality system does not exist.

5. Vision for the New Millennium

As the demand for new information technology increases, so must the pace for standardizing these technologies. Successful standards result in compatible, interoperable, and integrated systems to support operations throughout the Department of Energy (DOE) complex. In order to achieve this goal, the Information Technology (IT) Standards Program must bring together standards applicable to DOE from many sources and serve as a mechanism connecting those who seek standards to those who make them.

Office of Management and Budget (OMB) Circular A-130 requires that technology justify business needs. The objective, now and in the long-term, of the IT Standards Program is to provide standards for an information architecture that can accommodate the widest possible range of missions and scenarios by allowing users to enter the infrastructure at any time, any place, while protecting the privacy of individuals. Communications among DOE, other Government Agencies, standards bodies, and the public are vital to the successful implementation and application of IT standards.

The Profile specifies the set of voluntary IT standards for enterprisewide interoperability. These standards are categorized into service areas that align with the Technical Reference Model as specified by OMB Circular A-130. This Profile provides guidance on the use of each standard. As the Departmental information architecture evolves, the IT Standards Program will continue to respond as follows.

- ❑ Facilitate the Departmentwide use of IT standards
- ❑ Provide mechanisms for tracking, adopting, and promulgating emerging IT standards to be included in future versions of the Profile
- ❑ Conduct sunset reviews to continually refresh standards
- ❑ Automate DOE IT standards processes, to the extent possible, to expedite coordination and distribution of standards and guidance
- ❑ Foster DOE participation in voluntary standards bodies

The *Information Architecture Profile of Adopted Standards 2000* is intended to be a dynamic document that becomes a valuable and integral tool for adopting and implementing new standards.

Appendix A

Standards Crosswalk

STANDARDS CROSSWALK

This crosswalk notes where standards listed in the *Information Architecture Profile of Adopted Standards 2000* have been added, revised, replaced, or removed since the previous edition of the Profile was published. It also notes where standards have not changed. As a result of the sunset review, 42 standards were removed from the profile and 21 new standards were added. Revisions, replacements, and reaffirmations to 72 standards were noted, while 32 standards were unchanged. The revised Profile contains 125 standards, but because of the rapid evolution of information technology and its corresponding standards, this should not be viewed as a static number.

The National Institute of Standards and Technology (NIST) and the International Organization for Standardization (ISO) have made significant changes to a number of standards that affect the Profile. Effective November 18, 1998, NIST withdrew 16 Federal Information Processing Standards (FIPS), with an anticipated withdrawal of 33 more FIPS in February 2000, because they were obsolete or had not been updated to adopt current voluntary industry standards. Federal Agencies and departments are directed by the National Technology Transfer and Advancement Act of 1995, Public Law 104-113, to use technical standards developed by voluntary consensus standards bodies rather than develop new standards. Consequently, FIPS that duplicate voluntary industry standards are no longer needed. The revised Profile reflects these changes.

ISO Technical Committee 176 is making major revisions to the 1994 ISO 9000 family of standards, which is a set of international quality management standards and guidelines to be published in 2000. ISO protocols require that standards be reviewed at least every 5 years to determine whether they should be confirmed, revised, or withdrawn; the revised Profile notes these projected changes.

STANDARDS ADDED TO THE PROFILE

- ANSI X3.135.10-1998——SQL Object Language Bindings (SQL/OLB)
- ANSI X9.55-1997——Public Key Cryptography for the Financial Services Industry; Extensions to Public Key Certificates and Certificate Revocation Lists
- Desktop Standards for Data Interchange (guidance to be provided)
- DOE-STD-4001-2000——DOE Design Criteria Standard for Electronic Records Management Software Applications, March 2000
- DMA 1.0——Document Management Alliance (DMA)
- Energy Star®
- Internet Inter-ORB Protocol (IIOP)
- ISO/IEC 9796:1991——Digital Signature Scheme Giving Message Recovery/ ISO/IEC 9796-2:1997——Digital Signature Scheme Giving Message Recovery, Part 2: Mechanism Using a Hash Function
- ISO/IEC 11179 (1-6)——Specification and Standardization of Data Elements
- ISO/IEC 15408:1999——Common Criteria for Information Technology Security Evaluation Version 2.1
- ISO/IEC 16262:1998——JavaScript: ECMAScript Language Specification
- ITU-T, Recommendation V.90, 1998——Digital and Analog Modems Pair Used on the Public Switched Telephone Network
- Java™ 2 Platform, Standard Edition
- JDBC——Java™ Database Connectivity
- MISPC——Minimum Interoperability Specification for Public Key Infrastructure Components, Version 1
- ODBC——Open Database Connectivity
- Single UNIX Specification, Version 2

STANDARDS ADDED TO THE PROFILE (CONTINUED)

- UML 1.4-August 1999——Unified Modeling Language
- W3C REC-XML-19980210——Extensible Markup Language (XML)
- W3C WAI WEBCONTENT-19990505——Web Content Accessibility Guidelines 1.0
- X.509 Version 3——The Directory: Authentication Framework

STANDARDS REVISED, REPLACED, OR REAFFIRMED

- ANSI X3.50-1986, Representations for U.S. Customary, SI, and Other Units to be Used in Systems with Limited Character Sets, **Reaffirmed in 1997**
- ANSI X3.61, Representation of Geographic Point Locations for Information Interchange, **Reaffirmed in 1997**
- ANSI/X3.131-1990, Small Computer Systems Interface-2 (SCSI-2), **Revised to ANSI X3.131-1994 (R1999)**
- ANSI Z39.2-1985, Bibliographic Information Interchange, **Revised to ANSI/NISO Z39.2-1994**
- ANSI Z39.59-1988, Electronic Manuscript Preparation and Markup, **Revised to ANSI/NISO/ISO 12083-1995**
- ANSI/IEEE 828-1990, Standard for Software Configuration Management Plans, **Revised to IEEE 828-1998**
- ANSI/IEEE 1042-1987, Guide to Software Configuration Management, **Revised to IEEE 1042-1987 (R1993)**
- ANSI/ISO 8211-1985, Specification for Data Descriptive File for Information Interchange, **Revised to ISO/IEC 8211:1994**
- ANSI/ISO IS11172:1992, Moving Pictures Experts Group (MPEG), **Revised to ISO/IEC 13818:1996**
- C++ Programming Language, **Revised to ISO/IEC 14882:1998**

STANDARDS REVISED, REPLACED, OR REAFFIRMED (CONTINUED)

- CORBA, Object Management Group's Common Object Request Broker Architecture, **Revised to CORBA 2.3 (formal/98-12-01)**
- DOE Software Engineering Methodology (SEM), **Revised to DOE G 200.1-1A (Draft), Version 2 (1999)**
- EIA/CDIF PN-30, CASE Data Interchange Format, **Revised to EIA/IS 106 (1994)**
- FIPS PUB 4-1, Representation of Calendar Date for Information Interchange, **Revised to FIPS PUB 4-2**
- FIPS PUB 21-4, COBOL, **Replaced with ISO 1989:1985 (endorsement of ANSI X3.23-1985)**
- FIPS PUB 46-2, Data Encryption Standard, **Reaffirmed as FIPS PUB 46-3 (October 25, 1999)**
- FIPS PUB 55 DC-3, Guideline: Codes for Named Populated Places, Primary County Divisions, and other Location Entities of the United States, Puerto Rico, and Outlying Areas, **Revised in 1998 to include an online index to codes**
- FIPS PUB 69-1, FORTRAN, **Replaced by ISO/IEC 1539-1:1997**
- FIPS PUB 95-1, Codes for the Identification of Federal and Federally Assisted Organizations, **Revised to FIPS PUB 95-2**
- FIPS PUB 120-1, Graphical Kernel System, **Replaced by ANSI X3.124-1985 (R1996)**
- FIPS PUB 128-2, Computer Graphics Metafile, **Replaced by ANSI/ISO/IEC 8632 (Parts 1-4)**
- FIPS PUB 140-1, Security Requirements for Cryptographic Modules, **Replaced by FIPS PUB 140-2 (Draft 11/99)**
- FIPS PUB 151-2, POSIX® System API [C Language], **Replaced by IEEE/ANSI 1003.1:1996**
- FIPS PUB 153-1, Programmer's Hierarchical Interactive Graphics System (PHIGS), **Replaced by ANSI/ISO/IEC 9592-1:1997**
- FIPS PUB 160, C, **Replaced by ANSI/ISO 9899:1990 (R1997)**

STANDARDS REVISED, REPLACED, OR REAFFIRMED (CONTINUED)

- FIPS PUB 177-1, Initial Graphics Exchange Specification (IGES), **Replaced by ANSI/US PRO/IPO 100-1996**
- FIPS PUB 178, Video Teleconferencing Services at 56 to 1920 kbit/s, **Replaced by FTR 1080A-1998**
- FIPS PUB 182, Integrated Services Digital Network Management (ISDN), **Replaced by ANSI T1.219-1991 (R1998)**
- FIPS PUB 183, Standard for Functional Modeling Language, **Replaced by IEEE 1320.1-1998**
- FIPS PUB 184, Standard for Conceptual Modeling Language, **Replaced by IEEE 1320.2-1998**
- FIPS PUB 186, Digital Signature Standard, **Replaced by FIPS PUB 186-2**
- FIPS PUB 187, Administration Standard for the Telecommunications Infrastructure of Federal Buildings, **Replaced by ANSI/TIA/EIA-606-93**
- FIPS PUB 189, POSIX® Part 2, Shell and Utilities, **Replaced by IEEE 1003.2 (R1997)**
- FIPS PUB 192, Application Profile for GILS, **Revised to FIPS PUB 192-1**
- FIPS PUB 194, Open Document Architecture Raster Document Application Profile, **Replaced by ISO/IEC 12064-1:1995**
- FIPS PUB 195, Federal Building Grounding and Bonding Requirements for Telecommunications, **Replaced by ANSI/TIA/EIA-607-94**
- GIF, Graphical Interface Format (GIF) (LZW), **Revised to GIF Version 89a Non Interlaced/GIF Version 89a Interlaced**
- HTML, Hypertext Markup Language, **Revised to W3C REC-html40-19980424**
- HTTP, Hypertext Transfer Protocol, **Revised to HTTP V1.1**
- IEEE 1003.9, FORTRAN Language Bindings to POSIX®, **Revised to IEEE 1003.9-1992 (R1997)**
- IEEE 1387, POSIX® System Administration, **Revised to IEEE 1387.2-1995**

STANDARDS REVISED, REPLACED, OR REAFFIRMED (CONTINUED)

- Internet Domain Name System (DNS), **Revised to IETF STD-13/RFC 1034; IETF STD-13/RFC 1035**
- IS 10918:1992, Joint Photographic Experts Group (JPEG), **Revised to ISO/IEC 10918-4:1999**
- ISO 1000:1992, SI Units and Recommendations for the Use of their Multiples and of Certain Other Units, **Revised to ISO 1000:1992 Amd1:1998**
- ISO 3166:1988, Codes for Representation of Names of Countries and Their Subdivisions, **Revised to ISO 3166-3:1999**
- ISO 8879:1986, Standard Generalized Markup Language (SGML), **Revised to include Amendment 1 1988**
- ISO 9000 Quality Management and Quality Assurance Standards - Guidelines for Selection and Use, **Profile reflects forthcoming ISO changes**
- ISO 10303 Standard for the Exchange of Product (STEP) Model Data, **Incorporated with ISO 10303-1:1994**
- ISO/IEC 6523:1984. Structure for the Identification of Organizations and Organization Parts–Part 2: Registration of Organization Identification Schemes, **Revised to ISO/IEC 6523-1:1998**
- LDAP, Lightweight Directory Access Protocol (LDAP), Version 3, 1997, **Revised to IETF RFC 1777**
- MIME, Multipurpose Internet Mail Extensions, Parts 1-5, **Revised to IETF RFC 2045-2049 (11/96)**
- MIME Object Security Services (MOSS), **Revised to IETF RFC 1848**
- PostScript, **Revised to Adobe Postscript 3, 1999**
- SMTP, Simple Mail Transfer Protocol, **Revised to IETF RFC 821 (August 1982)**
- SNMP, Simple Network Management Protocol, **Revised to IETF RFC 2272**
- Tagged Image File Format (TIFF), **Revised to ISO 12639:1998**

STANDARDS REVISED, REPLACED, OR REAFFIRMED (CONTINUED)

- Transmission Control Protocol/Internet Protocol (TCP/IP), **Revised to TCP/IP RFC 793 (TCP), RFC 801 (IP Version 4)**
- X.500 IT Open Systems Interconnection - Directory, **Revised to Recommendation X.500 (08/97)**

STANDARDS REMOVED FROM THE PROFILE

- ANSI X3.51-1994, Information Systems Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange
- FIPS PUB 141, Interoperability and Security Requirements for Use of the Data Encryption Standard with ITU-T (formerly CCITT) Group 3 Facsimile Equipment
- FIPS PUB 146-2, Profiles for Open Systems Internetworking Technologies (POSIT)
- FIPS PUB 154, High Speed 25-position Interface for DTE and DCE
- FIPS PUB 168, 12,000 and 14,000 BPS Four-Wire Duplex Modems
- FIPS PUB 169, Error Correction in Modems Employing Asynchronous-To-Synchronous Conversion
- FIPS PUB 170, Data Compression in Modems Employing ITU-T (formerly CCITT) Rec. V.42
- FIPS PUB 175, Federal Building Standard for Telecommunications Wiring
- FIPS PUB 176, Residential and Light Commercial Telecommunications Wiring Standard
- FIPS PUB 179-1, Government Network Management Profile
- FIPS PUB 193, SQL Environments
- IEEE 771-1989, Programmed Inquiry Learning or Teaching (PILOT)
- IEEE 1003.1b-1993, POSIX® Part 1: System API Amendment: Realtime Extension© Language)
- IEEE 1003.1e, POSIX® Security Extensions

STANDARDS REMOVED FROM THE PROFILE (CONTINUED)

- IEEE 1003.2c, POSIX® Security Extensions
- IEEE 1003.3, Test Methods for Measuring Conformance to POSIX®
- IEEE 1003.6, Security Interface Standards for POSIX®
- IEEE 1003.13, Standardized Environment Profile - POSIX® Realtime Application Support
- IEEE 1003.14, Standardized Environment Profile - POSIX® Multiprocessing Support
- IEEE 1003.15, POSIX® Batch Environment Amendments
- IEEE 1003.18, POSIX® Platform Environment Profile
- IEEE 1003.21, POSIX® Part 1, System API Amendment: Realtime Distributed Systems Communications
- IEEE 1003.22, Guide to POSIX® Open Systems Environment - A Security Framework
- IEEE 1295-1993, X Window System - Modular Toolkit Environment
- IEEE 1387.3, User and Group Account Administration
- IEEE 1387.4, Print Administration
- IEEE P1003.1c, Draft Standard For Threads Interface to POSIX®
- International Data Encryption Algorithm (IDEA)
- ISO 19927:1990, Information Resource Dictionary System Framework
- ISO/JTC/SC21, Conceptual Schema Modeling Facility
- ISO/IEC 9579-1:1993, Remote Database Access
- ISO/IEC 10036, Font Information Interchange
- ISO/IEC 13719-1, Portable Common Tool Environment API
- ISO/IEC/DIS 10180, Standard Page Description Language

STANDARDS REMOVED FROM THE PROFILE (CONTINUED)

- NIAM, Natural Language Information Analysis Method
- Object Management Group Models, being replaced by the Object Management Architecture Guide, which is currently under revision and not yet available
- Open Management Interoperability Points
- Pretty Good Privacy
- Privacy Enhanced Mail
- RSA Public Key Cryptography
- S-HTTP, Secure Hypertext Transfer Protocol
- X Window System

STANDARDS UNCHANGED

- ANSI/NISO Z39.50-1995——Information Retrieval (Z39.50) Application Service Definition and Protocol Specification
- FIPS PUB 5-2——Codes for the Identification of the States, the District of Columbia, the Outlying Areas of the United States, and Associated Areas
- FIPS PUB 6-4——Counties and Equivalent Entities of the United States, Its Possessions, and Associated Areas
- FIPS PUB 8-6——Metropolitan Areas
- FIPS PUB 9-1——Congressional Districts of the United States
- FIPS PUB 10-4——Countries, Dependencies, Areas of Special Sovereignty, and Their Principal Administrative Divisions
- FIPS PUB 66——Standard Industrial Classification (SIC) Codes
- FIPS PUB 74——Guidelines for Implementing and Using the NBS Encryption Standard
- FIPS PUB 92——Guidelines for Standard Occupational Classification (SOC) Codes

STANDARDS UNCHANGED (CONTINUED)

- FIPS PUB 113——Computer Data Authentication
- FIPS PUB 127-2:1993——Database Language Structured Query Language (SQL)
- FIPS PUB 159——Detail Specification for 62.5μ Core Diameter/125μ Cladding Diameter Class IA Multimode Graded-Index Optical Waveguard Fibers
- FIPS PUB 161-2——Electronic Data Interchange (EDI)
- FIPS PUB 171——Key Management Using ANSI X9.17
- FIPS PUB 173-1——Spatial Data Transfer Standard (SDTS) (DOI/USGS Specifications)
- FIPS PUB 180-1——Secure Hash Standard
- FIPS PUB 185——Escrowed Encryption Standard (EES)
- FIPS PUB 190——Guideline for the Use of Advanced Authentication Technology Alternatives
- FIPS PUB 196——Entity Authentication Using Public Key Cryptography
- HDF——Hierarchical Data Format
- IEEE 1003.10——POSIX®-Based Supercomputing Applications Environment Profile
- IEEE 1224.1-1993——Information Technology X.400-Based Electronic Messaging Application Program Interfaces (API) Language Independent
- IEEE 1224.2-1993——Information Technology Directory Services Application Programming Interfaces (API) Language Independent
- IEEE 2003.1-1992——Test Methods for Measuring Conformance to POSIX® - Part 1: System Interfaces
- ISO 10005:1995——Quality Management - Guidelines for Quality Plans
- Kerberos, DCE-SS 1.1——Kerberos Network Authentication Service (V5) Generic Security Service API (GSSAPI)
- NETCDF——Network Common Data Form

STANDARDS UNCHANGED (CONTINUED)

- PDF—–Portable Document Format
- RTF—–Rich Text Format
- SSL—–Secure Sockets Layer
- X.400—–X.400 Message Handling Services
- XFN—–Open Group Technical Standard C403 - X/Open Federated Naming: The XFN Specification

Appendix B

Index of Adopted Standards

INDEX OF ADOPTED STANDARDS

Appendix C

Proposal Change Request Form

PROPOSAL CHANGE REQUEST FORM

DOE Information Architecture - Profile of Adopted Standards

PROPOSAL CHANGE REQUEST

Requesting Organization

POC

Phone Fax

E-Mail

Type of Change to Standard:

● Update Existing Standard ○ Retire Standard ○ Add New Standard ○ Other

Description:

Rationale:

Benefits:

Reason for Change Request:

Send form to Carol Blackston, 301-903-4294 Clear form and start over

This form is available to be submitted electronically at: http://www-it.hr.doe.gov/standards/request.htm.

Appendix D

Abbreviations and Acronyms

ABBREVIATIONS AND ACRONYMS

ANSI . . . . . American National Standards Institute
API . . . . . Application Program Interface
ARPA . . . . . Advanced Research Projects Agency
ASCII . . . . . American Standard Code for Information Interchange

CAD . . . . . Computer-Aided Design
CAE . . . . . Common Applications Environment
CAM . . . . . Computer-Aided Manufacturing
CASE . . . . . Computer-Aided Software Engineering
CCITT . . . . . Comite' Consultatif International de Telegraphique et Telephonique
CDIF . . . . . CASE Data Interchange Format
CGM . . . . . Computer Graphics Metafile
COBOL . . . . . Common Business Oriented Language
CORBA . . . . . Common Object Request Broker Architecture

DAA . . . . . Data Authentication Algorithm
DCE . . . . . Distributed Computing Environment
DDF . . . . . Data Descriptive File
DES . . . . . Data Encryption Standard
DMA . . . . . Document Management Alliance
DNS . . . . . Domain Name System
DSA . . . . . Digital Signature Algorithm
DSS . . . . . Digital Signature Standard
DTD . . . . . Document Type Definition
DTE . . . . . Data Terminal Equipment

ECMA . . . . . European Computer Manufacturers Association
EDI . . . . . Electronic Data Interchange
EIA . . . . . Electronics Industry Association
EMPM . . . . . Electronic Manuscript Preparation and Markup

FIPS . . . . . Federal Information Processing Standards
FORTRAN . . . . . FORmula TRANslation
FTR . . . . . Federal Telecommunications Recommendation
FTSC . . . . . Federal Telecommunications Standards Committee

GIF . . . . . Graphical Interface Format
GILS . . . . . Government Information Locator Service
GIS . . . . . Geographic Information System
GKS . . . . . Graphical Kernel System
GSSAPI . . . . . Generic Security Service API

HDF . . . . . Hierarchical Data Format

HTML . . . . . Hypertext Markup Language
HTTP . . . . . Hypertext Transfer Protocol

IDEF0 . . . . . Integration Definition for Function Modeling
IDEF1X . . . . . Integration Definition for Information Modeling
IEC . . . . . International Electrotechnical Commission
IEEE . . . . . Institute of Electrical and Electronics Engineers, Inc.
IETF . . . . . Internet Engineering Task Force
IGES . . . . . Initial Graphics Exchange Specification
IIOP . . . . . Internet Inter-ORB Protocol
IMAP . . . . . Internet Message Access Protocol
IP . . . . . Internet Protocol
IS . . . . . Information System
ISDN . . . . . Integrated Services Digital Network
ISO . . . . . International Organization for Standardization
IT . . . . . Information Technology
ITA . . . . . Information Technology Architecture
ITU . . . . . International Telecommunications Union

JDBC . . . . . Java™ Database Connectivity
JPEG . . . . . Joint Photographic Experts Group
JTC . . . . . Joint Technical Committee

LAN . . . . . Local Area Network
LDAP . . . . . Lightweight Directory Access Protocol
LEAF . . . . . Law Enforcement Access Field
LZW . . . . . Lempel-Ziv Welch

MARC . . . . . Machine-Readable Catalog
MIME . . . . . Multipurpose Internet Mail Extensions
MOSS . . . . . MIME Object Security Services
MPEG . . . . . Moving Pictures Experts Group

NARA . . . . . National Archives and Records Administration
NETCDF . . . . . Network Common Data Form
NISO . . . . . National Information Standards Organization
NIST . . . . . National Institute of Standards and Technology

ODA . . . . . Open Document Architecture
ODBC . . . . . Open Database Connectivity
OLB . . . . . Object Language Binding
OMG . . . . . Object Management Group
OMT . . . . . Object Modeling Techniques
OO . . . . . Object-Oriented

OOSE . . . . . Object-Oriented Software Engineering
OSF . . . . . Open Software Foundation
OSI . . . . . Open Systems Interconnection
OSTI . . . . . Office of Scientific and Technical Information

PDES . . . . . Product Data Exchange Using STEP
PDF . . . . . Portable Document Format
PHIGS . . . . . Programmer's Hierarchical Interactive Graphics System
PKI . . . . . Public Key Infrastructure
POP3 . . . . . Post Office Protocol 3
POSIX® . . . . . Portable Operating Systems Interface
PSTN . . . . . Public Switched Telephone Network

RPC . . . . . Remote Procedure Call
RSA . . . . . Rivest-Shamir-Adelman
RTF . . . . . Rich Text Format

SCSI . . . . . Small Computer Systems Interface
SDTS . . . . . Spatial Data Transfer Specification
SGML . . . . . Standard Generalized Markup Language
SHA-1 . . . . . Secure Hash Algorithm
SI . . . . . International System of Units
SIC . . . . . Standard Industrial Classification
SOC . . . . . Standard Occupational Classification
SMTP . . . . . Simple Mail Transfer Protocol
SNMP . . . . . Simple Network Management Protocol
SQL . . . . . Structured Query Language
SQL-J . . . . . Structured Query Language - Java™
SSL . . . . . Secure Sockets Layer
STEP . . . . . Standard for the Exchange of Product Model Data

TCP . . . . . Transmission Control Protocol
TDEA . . . . . Triple Data Encryption Algorithm
TIA . . . . . Telecommunications Industry Association
TIFF . . . . . Tagged Image File Format

UML . . . . . Unified Modeling Language
UN/EDIFACT . . . . . United Nations EDI for Administration, Commerce, and Transport
US PRO . . . . . United States Product Data Association

W3C . . . . . World Wide Web Consortium
WWW . . . . . World Wide Web

XDS/XOM . . . . . X/Open Directory Service X/Open OSI Abstract Data Manipulation
XFN . . . . . X/Open Federated Naming
XML . . . . . Extensible Markup Language