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X3L2 Codes and Character Sets

X3L5 Labels and file Structure

X3L8 Data Representation

Communication

X3S3 Data Communications

Systems Technology

X3T1 Data Encryption

X3T2 Data Interchange

X3T5 Open Systems Interconnection

X3T9 I/O Interface

Text

X3V1 Office and Publishing Systems

For more information, contact CBEMA, c/o X3 Secretariat, 311 First Street NW, Suite 500, Washington, DC 20001-2178, Telephone: (212) 626-5740.

C.3 Related Organizations E

The following organizations are some of the major trade associations, user groups, and professional bodies active in either promoting, implementing, or reviewing information technology standards.

E

CBEMA: Computer and Business Equipment Manufacturers Association

CBEMA is a trade organization whose primary function is to represent large manufacturers of hardware-based information technologies equipment in lobbying about public policy. In addition, it provides education programs, information exchange forums, and deals with the industry's public image.

CBEMA has long had an interest in standards. It serves as the secretariat for X3. It also offers a standards and technology program where its members can exchange information on standards issues and industry standards.

CBEMA's members are mostly large manufacturers because its dues are tied to corporate revenues and structured in a way that makes it too expensive for small companies to join. Members are either American companies or US subsidiaries of non-American companies.

For more information, contact CBEMA, 311 First Street, NW, Suite 500, Washington, DC 20001-2178, Telephone: (202) 626-5740.

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CODASYL : The Conference on Data Systems Languages

The Conference on Data Systems Language (CODASYL) has been active since 1960 in the development of the COBOL language, through its COBOL Committee (CC). Since 1969, it also has been active in the development of a common Data Description Language for defining schemas and subschemas, and in a data manipulation language, through the DBTG Data Base Task Group of the CC. The activities of the CC are documented in the COBOL Journal of Development, which serves as the official COBOL language specification.

In 1969, ANSI (then the United States of America Standards Institute) issued the first COBOL standard. At that time, the X3.4 committee stated that X3.4 recognizes the CODASYL COBOL Committee as the development and maintenance authority for COBOL. In practice, this meant that ANSI agreed not to make any changes to the CODASYL -defined language specification. Although this agreement has been challenged over the years, the CODASYL -ANSI agreement is still strong. As a result, the CODASYL has enormous influence upon the COBOL language.

Toward the end of 1971, a new CODASYL committee was established—the Data Description Language Committee (DDLC). The DDLC was formed to serve the same functions for the schema DDL as the CC does for COBOL. That is, since the schema DDL is a conceptual schema and network-model database language for use with many programming languages, not just COBOL , the DDLC continues the schema DDL development and publishes its own Journal of Development documenting the language's current status.

The COBOL DML and subschema DDL (for defining an external view) of the DBTG are COBOL -specific and have remained part of the CC under the name ''The COBOL Data Base Facility.''

The CODASYL membership is composed of voluntary representatives, mostly from computer manufacturers and users in industry and the US Federal government.

COS : Corporation for Open Systems

COS is a US -based, international, nonprofit association of vendors and users, formed in 1985 to promote and accelerate the adoption of interoperable, multivendor products and services based on OSI and ISDN standards. To accomplish its goals, COS provides a user-vendor forum for the statement of user requirements and the discussion and management of the issues surrounding the deployment of open systems. COS also identifies test requirements, and sponsors test tools development and conformance and interoperability testing to verify that computer products and services conform to OSI or ISDN standards.

COS 's membership consists of more than 60 prominent manufacturer, user, and telecommunication service organizations worldwide. COS cooperates with similar organizations such as SPAG Services in Europe and POSI in Japan. Other key groups in the worldwide promotion, implementation and testing of OSI and ISDN standards are affiliated with COS under its Alliance Associate program.

For further information, contact the Corporation for Open Systems, 1750 Old Meadow Road, Suite 400, McLean, VA 22102-4306, USA , Telephone:

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(703) 883-2700, Fax: (703) 848-8933. In Europe contact Corporation for Open Systems, Avenue des Arts 1-2, bte 11, 1040 Bruxelles, Belgique, Telephone: 32 2 210 08 11, Fax: 32 2 210 08 00.

E

EPRI : Electric Power Research Institute

The Electric Power Research Institute's (EPRI) is an industry association concerned with electric power utilities. Its membership comprises more than 673 publicly and privately owned utilities in the United States. Besides providing a variety of utility-specific services to its membership, EPRI 's latest mission is to facilitate the use of open systems technology in the utility industry.

Toward this end, EPRI has developed a Utilities Communication Architecture (UCA), which is similar to the National Institute for Standards and Technology's (NIST) Government Open Systems Interconnect Profile (GOSIP) Version 2.0. Much of the UCA was developed by EPRI with the cooperation of Honeywell and Anderson Consulting.

EPRI 's specific open system interests span realtime UNIX , expert systems, and database access using RDA and SQL. Because of the financial structure of the utilities industry, EPRI wants to encourage these and other open systems technologies for equipment with a 12 to 15 year life cycle.

For further information, contact EPRI 's headquarters at 3412 Hillview Avenue, P.O. Box 10412, Palo Alto, CA 94303, Telephone: (415) 934-4212.

ESPRIT (European Strategic Programme for Research and Development in Information Technology)

The European Strategic Programme for Research and development in Information Technology is a European research programme initiative, started in 1982 and sponsored by the Commission of the European Communities. About 227 projects were implemented during the first phase of the project in five major work areas: advanced microelectronics, software engineering and technology, advanced information processing, office automation, and computer integrated manufacturing.

Nearly thirty projects have enabled substantial advances to be made in establishing internationally recognized standards. Examples of the Portable Communications Tool Environment (PCTE) project, the Communication Network for Manufacturing Applications (CNMA) project, and the Herode project, which has prepared an Office Document Architecture standard for adoption as an ISO standard.

The second phase of the Esprit programme will be concerned mainly with three areas—microelectronics and peripheral technologies; the creation of technologies and tools for the design of information processing systems; and enhancing the capacity for using and integrating information technology to extend the scope of its applications.

For further information contact ESPRIT , Director General, DG XIII , CEC , rue de la Loi 200, B-1049 Brussels, Belgium, Telephone: (32 2) 235 11 11, and Telex:

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ETSI : European Telecommunications Standards Institute

The European Telecommunications Standards Institute (ETSI), founded in 1988, is a voluntary standards organization involved in producing the telecommunications standards necessary to achieve a European unified market. ETSI was established outside the CEN /CENELEC framework. ETSI , however, works with CEN , CENELEC , and the European Broadcasting Union (EBU) in areas of mutual interest.

ETSI 's voting membership consists of postal administrations, along with manufacturers and trade associations, in each of the CEPT countries. Membership is not restricted to official representatives of member countries. The United States and US companies have been granted observer status.

Standards approved by ETSI are voluntary standards known as ETS (European Telecommunications Standards). ETSI also conducts prestandardization studies, develops technical reports and guidelines, holds conferences, workshops, seminars, and conducts interviews. ETSI 's interim standards are designated I-ETS.

For further information, contact the European Telecommunications Standards Institute, B.P. No. 52, F-06561 Valbonne CEDEX , France, Telephone: (33 92) 94 42 00, Telex: 470 040 F, and Fax Number: (33 93) 65 47 16.

EWOS : European Workshop for Open Systems

The EWOS is an ongoing regional workshop, formed in 1987, to provide and coordinate European input to the international standard profiles process. It was formed as the result of an initiative of SPAG , in conjunction with CEN /CENELEC. E

EWOS is the focal point in Europe for the study and development of OSI profiles and corresponding conformance test specifications. EWOS documents have only to be submitted to public enquiry by CEN and CENELEC before becoming European E
norms. E

For further information contact European Workshop on Open Systems (EWOS), rue de Brederode 13, B-1000 Brussels, Belgium, Telephone: 32 2 511 74 55.

E

INTAP (Interoperability Technology Association for Information Processing)

The Interoperability Technology Association for Information Processing, in Japan, is a national agency, funded by MITI. It deals with information technology, and specifically OSI products and advanced projects. INTAP is developing and providing conformance testing tools and services in Japan in cooperation with POSI.

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MAP/TOP User Group: (Manufacturing Automation Protocol and Technical and Office Protocol)

The MAP Task Force was formed in 1980 by engineers from seven General Motors (GM) divisions, to identify a common OSI-based networking standard for plant-floor systems. The Task Force grew to include all GM divisions, many other users, and many vendors. Its specifications are known as Manufacturing Automation Protocol (MAP).

The MAP specifications mostly reference OSI standards, but they also draw on ANSI, IEEE, EIA, CCITT, and various industry standards. Where standards do not exist, as in the case of the manufacturing messaging protocol, the MAP Task Force is either defining its own or instigating their formation by industry standards bodies.

In 1984, the MAP Users Group was formed, under the auspices of GM, with the Society of Manufacturing Engineers as its Secretariat. Its objective is to promote knowledge and use of MAP, and to insure input from users.

In 1985, Boeing sponsored a similar effort to specify common networking protocols, known as the Technical and Office Protocols (TOP), for the engineering and business offices. TOP is largely compatible with MAP, differing only at the lower two layers and the application layer where TOP addresses requirements of the technical and office user, rather than factory users.

Later in 1985, a TOP Users Group was formed. The entire effort became an international effort known as MAP/TOP, and the user group became the MAP/TOP User Group, which meets twice a year.

Today, the MAP/TOP User Group is an independent, self-funded organization that represents thousands of users worldwide, tied together through a worldwide federation of MAP/TOP user groups. Membership is open to either users or companies. The Industry Cooperative Services (ICS) is the worldwide secretariat. The MAP/TOP User Group also is a member of the Corporation for Open Systems (COS) and in North America, COS acts as the MAP/TOP User Group secretariat.

The MAP/TOP User Group is a Requirements Interest Group (RIG) of the Corporation for Open Systems (COS). This means that the MAP/TOP User Group generates requirements that vendors can use to built products. COS serves as the coordinator between users and vendors.

The MAP/TOP Task Force and User Group also is a major contributor of technical and conceptual ideas and specifications to the NIST, COS, and many of the IEEE POSIX Groups.

For further information contact the World Federation of MAP/TOP Users Groups, P.O. Box 1457, Ann Arbor, MI 48106, Telephone: (313) 769-4571, Fax: (313) 769-4064. In North America, also contact the Corporation for Open Systems at 1750 Old Meadow Road, Suite 400, McLean, VA 22102-4306, Telephone: (703) 883-2700, Fax: (703) 848-8933.

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Network Management Forum

A vendor-driven group, the Network Management Forum is chartered to produce a commonly agreed-upon specification subset of ISO's network management protocols and the command sets to implement this subset. The promise of the NMF is that all of the network management products that its members come up with will conform to this common specification.

The NMF itself will produce no products nor will it specify implementations. Rather, the NMF will specify interfaces.

Major vendors belong to the NMF from both the computer and telecommunications industries. The NMF has published Release 1 of its specifications (1990). Member firms are developing products that conform to Release 1.

NMF information may be had from the organization at 40 Morristown Road, Bernardsville, NJ 07924. Telephone: (201) 766-1544.

NPSC: National Protocol Support Center

An Australian organization, the National Protocol Support Center was formed in 1986 as a joint effort between industry and the government. Like SPAG, COS, and POSI, the NPSC is promoting the adoption of OSI standards in information technology products and will be supporting a conformance testing capability in Australia. The Australian government, however, provides approximately 50 percent of the NPSC funding. For further information, contact (contact address and other information TBD).

Object Management Group

Founded in 1989 and headquartered in Framingham, MA, with marketing operations in Boulder, CO, the Object Management Group (OMG) is an international organization of more than 146 systems vendors, software developers and users. The OMG was founded to promote the theory and practice of object management technology in the development of software.

The OMG's goal is to develop a common framework, based on industry-derived guidelines, that is suitable for object-oriented applications. The adoption of this framework will make it possible to develop a heterogeneous applications environment across all major hardware and operating systems.

The OMG members are quick to form a consensus on certain object management issues because they see these issues directly affecting their software sales. For example, the OMG's object request broker design—key software needed to allow disparate open systems to request object services from remote sites—is supported by most major object-oriented software vendors.

Further information is available from the OMG at 492 Old Connecticut Path, Framingham, MA 01701. Telephone: (508) 820-4300.

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OSF : Open Software Foundation

The Open Software Foundation is a nonprofit, international consortium. Its goals include the development of software specifications and test suites for an open computing environment. E

OSF specifications are defined, and software developed, using an open process into which vendors and users have input and access. The resulting AES specifications will be available in the public domain, and the software licensable, to OSF members and nonmembers, under identical terms. Both members and non-members can also submit technologies to the OSF for consideration as an OSF specification and/or offering. OSF's specifications and software will be based on the ISO/IEC 9945-1 core POSIX standard (POSIX.1 {2}), a variety of international, national, and industry standards and other consortia specifications. The remainder of OSF software and specifications will be based on technologies contributed by numerous companies and universities as part of OSF's Request for Technology (RFT) process. E

OSF active-participation membership is open to user organizations, computer hardware and software suppliers, government agencies, educational institutions, and other interested organizations worldwide. For further information, contact OSF at Eleven Cambridge Center, Cambridge, MA, Telephone: (617) 621-8700. Alternatively, contact European headquarters at Open Software Foundation/Europe, Stefan-George-Ring 29, 8000 Munich 81, Germany, Telephone: (49 89) 930 920, or Open Software Foundation/Japan, ABS Building, 2-4-16 Kudan Minami, Chiyoda-Ku, Tokyo 102, Japan, (81 3) 3 221 9770. E

Petrotechnical Open Software Corporation E

Founded in October, 1990, the Petrotechnical Open Software Corporation (POSC) was started by BP Exploration, Chevron, Elf Aquitane, Mobil and Texaco to facilitate the development of integrated computing technology for the exploration and production (E & P) segment of the international petroleum industry. Today, membership is open to all entities interested in the E & P industry. These members include other petroleum companies, E & P service companies, software vendors, computer manufacturers, and research institutes. E

POSC's primary mission is the development of an industry-standard, open systems-based, software integration profile for E & P applications. This platform will be the interface between petrochemical software applications, database management systems, workstations and users. POSC activities focus on the development of an integrated E & P data model, a common look and feel user front-end, and a set of test suites enabling developers to evaluate their offerings against selected industry standards.

POSC is moving quickly and has sent out two public requests for inputs in several technical areas. Project teams for base standards, the E & P data model, and data access are in place. Staffing is in progress for other projects and special interest groups have been formed. POSC offerings will be released to industry for production over the next few years.

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762 POSC is headquartered in Houston, TX at 10777 Westheimer, Suite 275, Houston,
763 77042. Telephone: (713) 784-1880.

764 **POSI : Promoting Conference for OSI**

765 The Promoting Conference for OSI was formed in Japan in November 1985 by six
766 major computer manufacturers and the Nippon Telephone and Telegraph Cor-
767 poration. Its raison d'etre is to promote the adoption of OSI standards by
768 cooperating with other international groups that have the same objective, such as
769 the European-based SPAG and the US-based COS. But conformance testing in
770 Japan is being developed and will be provided by the INTAP.

771 For further information, contact (contact information TBD).

772 **SPAG : Standards Promotion and Application Group**

773 The Standards Promotion and Application Group (SPAG), founded in 1983, is a
774 nonprofit, international research and development consortium of about 65 infor-
775 mation technology manufacturers and users. In 1986, it became a company
776 registered under Belgian law as SPAG Services s.a. SPAG's goals are to promote
777 multivendor, interoperable products based on international standards, particu-
778 larly OSI, and to keep its members informed about the latest developments in
779 functional standards and conformance testing of products.

780 To achieve its goals, SPAG plays a leading role in the European Workshop on
781 Open Systems (EWOS), publishes the Guide to the Use of Standards (GUS) regu-
782 larly, and participates in the development of International Standard Profiles
783 (ISPs). SPAG is particularly active in the development and marketing of test tools
784 for manufacturing applications. Through its SPAG-CCT efforts, (a collaboration of
785 European organizations) which arose out of the ESPRIT Project 955, SPAG is
786 developing, and will be providing, conformance test tools for testing MAP/TOP 3.0,
787 and conformance testing services to industry.

788 SPAG also is working within Europe to implement the certification infrastructure
789 for OSI products, and is involved in a number of Conformance Test Services (CTS)
790 projects within the Commission of European Communities (CEC). In addition,
791 SPAG is active in Telecommunications areas and is leading a consortium develop-
792 ing verification services for the Broadband Networks project RACE.

793 Twelve shareholder companies make up SPAG's board of directors. The original
794 founding companies—Bull, ICL, Nixdorf, Olivetti, Philips, Siemens, and STET—
795 occupy seven seats on SPAG's twelve member board. The shareholder member-
796 ship was subsequently expanded to include Alcatel, British Telecom, Digital
797 Equipment Corp., Hewlett-Packard, and IBM, who occupy the five remaining
798 board seats.

799 SPAG has close working relationships with its counterparts in North America
800 (COS) and the Far East (POSI).

801 For further information, contact Graham Knight, at SPAG Services s.a., Stan-
802 dards Promotion and Application Group (SPAG), Avenue des Arts, 1-2 bte 11, 1040
803 Brussels, Belgium, Telephone: 32 2 210 08 11, Fax 32 2 210 08 00.

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SQL Access Group

The SQL Access Group is a vendor group formed by a number of people in the ISO Remote Data Access (RDA) Group.

The SQL Access Group's charter is several fold. First, the Group is chartered to define a common subset of SQL functions to reconcile the many SQLs that exist. E
The specifications will include an SQL data format, as well as protocols for moving data within a multivendor SQL environment. Also included will be specifications for an enhanced SQL programming interface that will let developers write a single application that can access a variety of SQL databases. These SQL Access specifications are scheduled to be published in late 1991.

The SQL Access Group's second charter is to accelerate the work of the RDA group. Third, the SQL Access Group is working on putting more distributed functionality into RDA. Toward this end, each thing accomplished by the SQL Access group is fed back into the RDA group.

For further information, contact the SQL Access Group at (Address TBD).

UniForum E

UniForum is a nonprofit international association of open systems professionals. E
Founded in 1980 as /usr/group, the association has, through its standards com- E
mittees and technical committees, provided contributions to various standards E
and continues to be involved in the formal standards development process. The E
specifications and standards to which UniForum has contributed include: E

- The 1984 /usr/group Standard was contributed as a base document for the E
  IEEE P1003.1 work. E
- The UniForum Technical Committee on Real Time meets jointly with the E
  IEEE P1003.4 working group, working on the emerging POSIX realtime E
  standards. E
- The UniForum Technical Committee on Supercomputing evolved into the E
  IEEE P1003.10 working group. E
- The UniForum Technical Committee on Transaction Processing evolved E
  into the IEEE P1003.11 working group. E
- The UniForum Technical Committee on Internationalization has contri- E
  buted specifications to the IEEE P1003.1 and P1003.2 working groups and E
  the ANSI X3J11 standard C committee and continues to be a technical E
  resource for both formal and informal standards development bodies. E

UNIX International/ UNIX System Laboratories E

UNIX International (UI) is a nonprofit industry organization formed to represent E
hardware manufacturers, system integrators, independent software vendors, value-added resellers, end-users, government agencies worldwide, industry standards bodies, and academic and research institutions who want to direct the evolution of System V UNIX and its corresponding specification, the *System V* E

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Interface Definition (SVID). It has since expanded its scope to provide a framework for UNIX-based open systems work in the areas of desktop computing, corporate hub computing, distributed computing, and an enterprise-wide framework known as ''Atlas.'' E

Unlike X/Open, OSF, AT&T, and the IEEE, UI does not produce specifications, software, or standards. Its functions range from specifying technical and timing requirements for future System V versions and making suggestions about specific function designs to influencing AT&T UNIX licensing policies.

Using its ''one-member, one-vote'' approach, UI members formulate a consensus regarding the requirements and technical specifications for new System V UNIX versions. UI delivers its requirements to UNIX System Laboratories (USL), the AT&T spinoff that develops, distributed, and licenses UNIX. UI is USL's primary input source on technical requirements, conformance, and timing of releases. USL is committed to implement software to satisfy UI's requirements, unless there is a reason not to.

E

For further information, contact UNIX International, Waterview Boulevard, Parsippany, NJ 07054, (201) 263-8400 or (800) 848-6495. In Europe, contact UNIX International, Avenue de Beautieu 25, 1160 Brussels, Belgium, (32-2-672-3700). In the Asian Pacific region, contact Karufuru-Kanda Bldg. 8F, 1-2-1 Kanda Suda-cho, Chiyoda-du Tokyo 101, Japan, (81) 3-5256-6959.

User Alliance for Open Systems

The User Alliance for Open Systems was formed from two informal organizations (the Atlanta 17 and the Houston 30). The Alliance is currently a Requirements Interest Group (RIG) of the Corporation for Open Systems International (COS).

The Alliance is dedicated to overcoming barriers to open systems and speeding the development and deployment of open systems products. It intends to act as a catalyst toward the development and use of open systems. It will develop no specifications or products. Rather, the Alliance will create and support processes to influence and accelerate the availability of open systems technology (e.g., a repository of information about the cost benefits of open systems).

In 1990 the organization began its work by identifying barriers to open systems and global actions to eliminate those barriers. In 1991 the organization intends to start bringing resources to bear to achieve its goals. The Alliance has had one formal meeting (Dallas, March 1991) and will have its second formal meeting in McLean, Virginia in Nov. 1992. Alliance committee work is ongoing throughout this period with three major subgroups in the formative stages.

For further information, contact the Corporation for Open Systems, 1750 Old Meadow Road, Suite 400, McLean, VA 22102-4306, Telephone: (703) 883-2700.

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X.400 API Association

The X.400 API (Application Programming Interface) Association is an industry association formed initially to bring X.400 messaging into the PC LAN world. There are more than twenty companies in the association, and they include most of the current X.400 players.

Among its activities, the X.400 API Association developed an X.400 Application Programming Interface specification in conjunction with X/Open. These interfaces, completed in September 1990, are jointly owned by the X.400 API Association and X/Open. The two organizations contributed these interface specifications to the P1224 Group to use as a basis for the P1224 standard.

For further information contact (Address and other contact information: TBD)

X/Open

X/Open is an independent, nonprofit consortium formed in 1984. Its goals are to E
determine user and market requirements and to specify a complete, source-level- E
portable application environment and test suites. Although its members were ini- E
tially vendors, X/Open's membership now encompasses users, system integrators, value-added resellers, government agencies worldwide, other industry-standards groups, and academic and research institutions.

E

The X/Open environment includes specifications for an operating system interface, networking, data management, programming languages, floppy disk formats, internationalization, and distributed transaction processing. The X/Open Group does not normally define standards for these areas. Instead, it chooses from existing and emerging standards. An X/Open market research program and E
open user requirements congress identify and prioritize user and market require- E
ments, based on input solicited from users. These prioritized requirements are E
published in a document known as the *Open Systems Directive* . These prioritized E
requirements also help drive the X/Open specification process. The X/Open E
specifications are published in a series of books known as the X/Open Portability E
Guide. E

The X/Open environment is based on the ISO/IEC 9945-1 core POSIX (POSIX.1 {2}) E
standard, parts of AT&T's System V Interface Definition (SVID), and formal inter- E
national standards that are already accepted or likely to be accepted. However, to rapidly get standards into the field for practical use, where no formal standards exist, X/Open specifies industry standards and widely-accepted de facto standards (including some based on real-world products that have achieved consensus in the marketplace). In some instances where neither formal nor de facto specifications exist but there is a strong need for standards (e.g., internationalization and transaction processing), X/Open has itself defined specifications.

E

For further information, contact X/Open Company Ltd. at Apex Plaza, Forbury Road, Reading, Berkshire, RG1 1AX, UK, Telephone: 44 734 508 311. In the US, contact X/Open at 1010 El Camino Real, Menlo Park, CA 94025, Telephone:

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Annex D
(informative)

Electronic-Mail

Responsibility: Kevin Lewis

The following table lists currently-known e-mail addresses for active working group members. To correct your entry, send e-mail directly to Hal Jespersen, listed below.

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Howard Michel	USAF	michelhe@hqafsc-vax.af.mil		E
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Annex E
(inform ative)

Additional Material

E.1 Software Development Environments

Responsibility: Don Folland

E.1.1 Overview and Rationale

Software Development Environments are dealt with as a particular application area needing special attention for the following reasons:

— The domain of Software Development Environments is one of prime importance. Software development is a major area of expenditure for government and large commercial organizations.

— The need for standardization is being driven not only by the SDE vendors and users, but also by the Independent tool developers who want to get their tool products on as many vendor platforms as possible.

— The SDE domain calls not only for portability, but also for particular integration and interoperability requirements.

— The domain is primarily of interest to that user community that has large complex software development requirements, but it is also of interest to all application areas as software development is an enabling technology for all applications.

Software engineers seek more powerful assistance to improve productivity and quality in the software development process. Considered opinion currently favors Project Support Environments (PSE) underpinned in such a way that the facilities are capable of being implemented on different machines. A PSE needs a base holding information such as specifications, designs, code, schedules, configuration plans, tests, etc., to support the developers. The interface between the base and the tools must ensure portability of the tools. Again, these tools will be supported by relevant language standards.

Certain design methodologies themselves have been modeled formally to establish their degree of rigor and self-consistency. Function Point Analysis is one method of measuring software systems and computing productivity that is increasing in use. It measures inputs, outputs, and entities accessed to determine transaction

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size; it gauges technical complexity by reference to 19 characteristics. These are combined to give a measure of systems size. Productivity is the ratio of system size in function points to the effort required to produce or maintain the system.

Generally, software support for the development process is in its infancy and effective metrics have not yet been developed.

E.1.2 Scope

The problem domain is complex software development, from the generation of an idea to the delivery and ongoing support of a solution product set.

Thus, an SDE may include some or all of the following:

(1) Software Development Life Cycle
  (a) Requirements analysis
  (b) Logical design
  (c) Physical design
  (d) Functional and interface specification
(2) Activity support
  (a) Prototyping
  (b) Program development and testing
  (c) Quality assurance and regression testing
  (d) Generation of user documentation
  (e) User training
  (f) Problem report tracking and maintenance
  (g) Maintenance and tracking of schedules
(3) Configuration Management
  (a) Automatic version management
  (b) Integrity management
  (c) Traceability
(4) Project Management
(5) Data Administration
  (a) Access control

In the context of developing software for a POSIX Open System Environment, design will take account of portability and interoperability requirements. The SDE tools themselves should be portable. The software development activities may be provided with a large set of tools and applications. The SDE must provide the necessary support for the integration of all of these tools.

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E.1.3 Reference Model

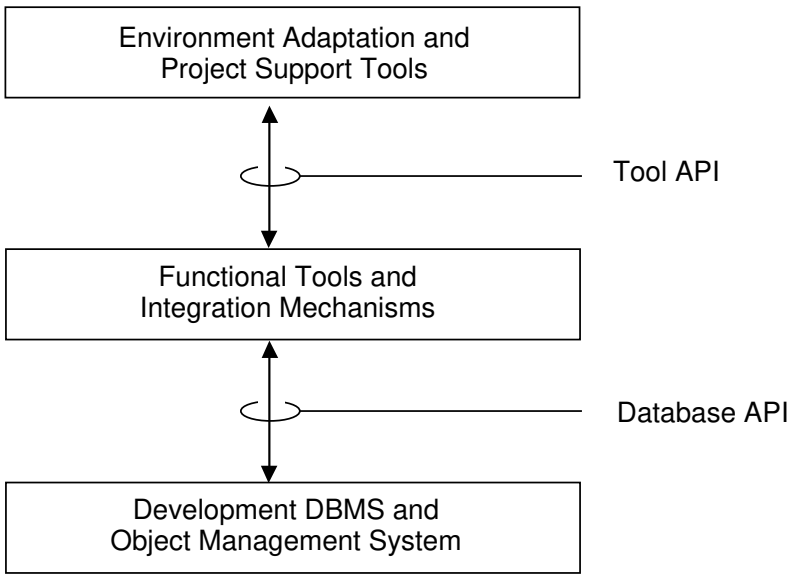

Figure E-1 – Software Development Model

In this clause the conceptual view of software development is related to the POSIX Reference Model (Figure 3-1). The software developer's view is shown in Figure E-1. The tools used to develop software can be viewed as applications in their own right in the context of the POSIX Reference Model, requiring the same services from the platform as for Database Management.

In the Software Development Model, the Environment Adaptation and Project Support Tools ''layer'' provides the essential link between the programmer, designer or analyst, the design method, and the development infrastructure. At this level are provided the tools and applications that are unique to the project or methodology; e.g., project management workbench. It requires support from a consistent human-computer interface to the Functional Tools.

The Functional Tools and Integration Mechanisms embrace the essential tool set to enable software developers to build software. It includes simple tools such as editors, tools for tool-building, and integration mechanisms. There will be tools for Configuration Management, Version Management, and System Administration. It is not within the scope of this guide to discuss these in detail.

The whole software development environment is underpinned by essential management systems, such as object management system, a data dictionary, a user interface management system, and environment management. A database will frequently be established to hold specifications, designs, configuration plans, etc.

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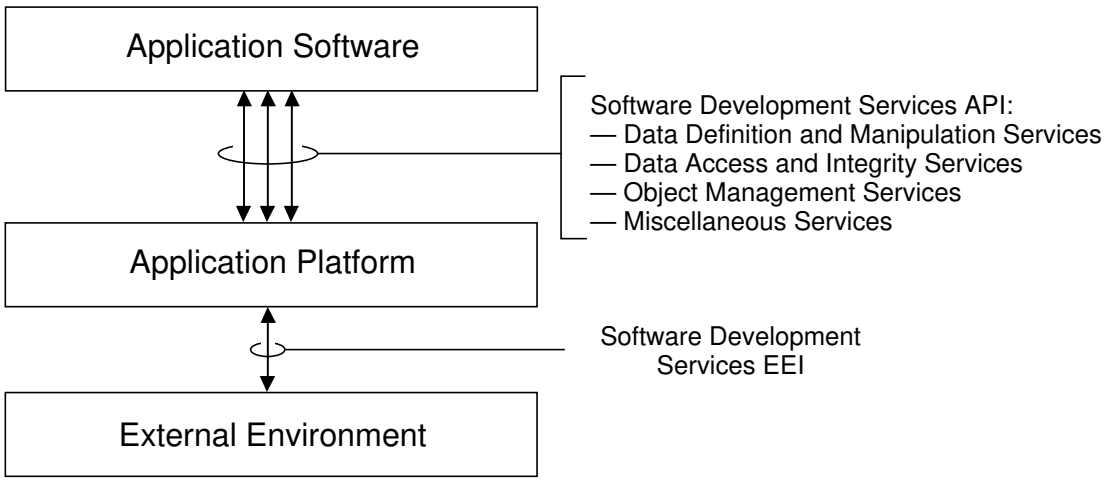

Figure E-2 – Software Development Reference Model

In the POSIX Open System Environment, the software development model can be incorporated into the POSIX Reference Model as in Figure E-2. The model shows that the tools and services required by the software developer are part of the POSIX Open System Environment and are available through the POSIX OSE API.

E.1.4 Services Requirements

Software developers, i.e., designers, analysts, and programmers, use software applications to facilitate the complex task of software development. A tool will require services from the application platform and will frequently require support from another application in the application set. There are many possible implementations of tool sets. Descriptions of these are beyond the scope of this guide.

E.1.4.1 Application Program Interface Services

The services required at the API are essentially similar to those described for Database Management in 4.4.4.1; i.e., Data Definition and Manipulation, Data Access, Data Integrity, and such Miscellaneous Services as Data Dictionary.

E.1.4.2 External Environment Interface Services

A consistent human-computer interface to the tool set is required. Some of the programmer's tool set will be explicitly focused on windowing services (such as 4.7 and 4.8) and provide assistance to develop software with improved usability.

Resource data formats must be specified in order to ensure effective information interchange [for example, CASE Data Interchange Format (CDIF)], for which standards are currently under development under the aegis of the CDIF Technical

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Committee (see also E.1.5.2 and 4.5).

Protocol services are required for the transport of data (see 4.3).

E.1.4.3 Interapplication Software Entity Services

Many of the tools depend for interface between one another upon the data dictionary/repository, which is a key software component and which may conceptually be regarded as part of the Applications Platform. Included in this category will be utilities for servicing the DBMS, such as recovery, reorganization, and restructure:

— Object management system

— User interface management system

— Database management system

— Transaction processing management system

Details of these management systems may be recorded in the data dictionary/repository.

E.1.4.4 Software Development Resource Management Services

These services are generally not visible to the programmer or software developer at the Tools API, usually being provided by the tool building and other software development utilities.

E.1.5 Standards, Specifications, and Gaps

This subclause describes current accepted standards that are relevant to this area in addition to the language standards in 4.1.5 and the database standards in 4.4.5.

E.1.5.1 Current Standards

This subclause briefly identifies the current standards in this area.

The following provides place holders for further text to be inserted – assistance required please.

E.1.5.1.1 International Standards

Labeling and File Structure of Magnetic Media

The following standards refer to the labeling of magnetic media and for the file structure on such media to facilitate information interchange:

Labeling of magnetic tape	ISO 1001
Labeling of cassette and cartridge	ISO 4341

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Table E-1 – Software Development Standards

Service	Specification	Subclause
Miscellaneous Services:		
Labeling of magnetic tape	ISO 1001	4.11.5.?
Labeling of cassette and cartridge	ISO 4341	4.11.5.?
Labeling of flexible disks	ISO 7665	4.11.5.?
Volume and file structure for flexible disks	ISO 9293	4.11.5.?
Volume and file structure for CD-ROM	ISO 9660	4.11.5.?
Documentation symbols and flowchart conventions	ISO 5807	4.11.5.?
Documentation of applications	ISO 6592	4.11.5.?
Program flow for sequential files	ISO 6593	4.11.5.?
Data descriptive file for information interchange	ISO 8211	4.11.5.?
Program constructs and conventions	ISO 8631	4.11.5.?
User documentation	ISO 9127	4.11.5.?

Labeling of flexible disks	ISO 7665
Volume and file structure for flexible disks	ISO 9293
Volume and file structure for CD-ROM	ISO 9660
Data descriptive file for information interchange	ISO 8211

The above-mentioned standards might be more suitably called out in Richard Scott's section 4.5.

Software Documentation

There are several standards dealing with documentation to assist with the task of software development, and therefore potentially facilitating programmer and designer portability, as well as user documentation.

Documentation symbols and conventions for data, program and system flowcharts, program network charts, and system resources charts	ISO 5807
Guidelines for the documentation of computer-based application systems	ISO 6592
Program flow for processing sequential files in terms of record groups	ISO 6593
Program constructs and conventions for their representation	ISO 8631
User documentation and cover information for consumer software packages	ISO 9127

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