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IEEE P1003.0 Draft 14 – November 1991

STANDARDS PROJECT

Draft Guide to the POSIX Open Systems Environment

Sponsor

Technical Committee on Operating Systems and Application Environments
of the
IEEE Computer Society

Abstract: IEEE Std 1003.0-199x presents an overview of open system concepts and their application. Information is provided to persons evaluating systems on the existence of, and interrelationships among, application software standards, with the objective of enabling application portability and system interoperability. A framework is presented that identifies key information system interfaces involved in application portability and system interoperability and describes the services offered across these interfaces. Standards or standards activities associated with the services are identified where they exist, or are in progress. Gaps are identified where POSIX Open System Environment (OSE) requirements are not being addressed currently. Finally, the OSE profile concept is discussed with examples from several application domains.

Keywords: application portability, open system environments, profiles, POSIX

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November 1991 *SH XXXXX*

Editor's Notes

This section will not appear in the final document. It is used for editorial comments concerning this draft.

Comments in italics are not intended to form part of the final guide; they are editor's or coordinator comments for the benefit of reviewers.

This draft uses small numbers in the right margin in lieu of change bars. ‘‘E’’ denotes changes from Draft 13 to Draft 14. I have removed all old diff-marks from Drafts 3 through 13 to facilitate mock ballot review. Purely editorial changes such as grammar, spelling, cross references, or removals of editorial notes are not diff-marked. Unfortunately, it is not possible to accurately diff-mark the figures. Note that an empty line with a diff mark denotes deleted text. There are a large number of these in Draft 14. My convention is that I remove these empty lines in the next draft.

The references to standards and other documents are still awaiting a reasonably stable draft for a massive global update. I expect this may occur after the first round of official IEEE balloting. The ISO and IEEE style is to fully identify such documents in either the Normative Reference clause or the Bibliography; each entry contains the full title, the year of approval, and the current status (draft, CD, DIS, etc.). Elsewhere in the guide, a terse reference to the standard number is followed by the item number in the reference list, such as:

POSIX.1 {2}
ISO/IEC 10646 {B33}

A few titles have been modified in Section 4 to adhere to the template for the services clauses. These mostly affect the Standards, Specifications, and Gaps subclause and they are not diff-marked unless some significant text change accompanies them.

To make draft handling in the meetings easier, each significant clause is set up to print starting on a recto page. This means that there is a larger number of blank pages than in previous drafts (assuming that the copy room handled the print master correctly). Just doing our bit for deforestation . . .

Hal Jespersen

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Online Access

This draft is available in various electronic forms to assist the review process. Our thanks to Andrew Hume of AT&T Bell Laboratories for providing online access facilities. Note that this is a limited experiment in providing online access; future drafts may be provided in other forms, such as diskettes or a bulletin board arrangement, but the instructions shown here are the only methods currently available. Please also observe the additional copyright restrictions that are described in the online files.

Assuming you have access to the Internet, the scenario is approximately

```
ftp research.att.com # research’s IP address is 192.20.225.2
<login as netlib; password is your email address>
cd posix/p1003.0/d14
get toc index
binary
get p11-20.Z
```

The draft is available in several forms. The table of contents can be found in `toc`, pages containing a particular section are stored under the section number, sets of pages are stored in files with names of the form `p`*n*–*m*, and the entire draft is stored in `all`. By default, files are ASCII. A `.ps` suffix indicates PostScript. A `.Z` suffix indicates a `compress`’ed file. The file `index` contains a general description of the files available.

These files are also available via electronic mail by sending a message like

```
echo send 3.4 4.6 6.2 from posix/p1003.0/d14 |
        mail netlib@research.att.com
```

If you use email, you should *not* ask for the compressed version. For a more complete introduction to this form of *netlib*, send the message

```
send help
```

POSIX.0 Change History

This section is provided to track major changes between drafts. Since it was first added in Draft 10, earlier entries have been omitted.

Draft 14 [November 1991] First mock ballot. E

— Software Development clause 4.11 moved to Annex E. E

— *Other Details of Changes to be Provided* E

Draft 13 [September 1991]

— *To Be Provided*

Draft 12 [June 1991]

— Clause 4.9: Separated OLTP model discussion into two parts: the part consistent with the POSIX OSE Model; and the ‘‘real world’’ part dealing with System Integration Interfaces.

— Section 6: Further clarified ‘‘base standard’’ and ‘‘profile’’ definitions. Renamed profile ‘‘types’’.

— *Additional To Be Provided*

Draft 11 [March 1991]

— *To Be Provided*

HLJ : I don't do this automatically because I don't know what issues you consider important. This [very brief] text should be provided by each Section Leader along with the regular submissions. It is meant to provide casual readers of the guide (such as in WG15, where they don't get every draft) with a broad overview of the big changes.

Draft 10 [December 1990]

— *To Be Provided*

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Comments on standards and requests for interpretations should be addressed to:

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Contents

FIGURES

TABLES

Introduction

(This Introduction is not a normative part of P1003.0 Guide to the POSIX Open Systems Environment, but is included for information only.)

Purpose

There are many standards efforts going on throughout the world today. Standards are being developed in many areas of computing technology such as:

- Electrical Connectors
- Disk Interfaces
- Network Interfaces
- Application Program Interfaces

Each standards effort typically addresses a very small portion of the overall needs of an information processing system.

This guide brings together many different standards sufficient to address the scope of an entire information processing system. This combination of standards and specifications that are sufficient to address all of the user requirements of an information processing system is called an Open System Environment. This guide is not a base standard itself; it merely identifies standards that can be used when constructing a complete information processing system. Although this guide is a product of the IEEE POSIX standardization effort, its scope is much broader than the IEEE POSIX standardization efforts. IEEE POSIX is currently developing base standards and standardized profiles focused primarily on application programming interfaces. At the end of the Introduction is a cross reference of the POSIX standardization efforts and where they fit in the POSIX Open System Environment.

User requirements and standards to meet those requirements are continuously expanding. As such, this guide will need regular revision to incorporate new user requirements and the new standards that evolve to meet those user requirements.

It may never be necessary to implement an information processing system that provides every standard in the POSIX Open System Environment. Typically, a subset of the POSIX Open System Environment is sufficient to satisfy the particular user requirements in each situation.

This process of selecting standards for a particular application is called profiling. Recommendations for the production of different types of profiles are included in the guide.

This guide is intended to be used by anyone interested in using standards in an information processing system, including: consumers, systems integrators, application developers, systems providers, and procurement agencies.

Taken as a whole, the guide maps existing and emerging standards onto the general requirements of a complete information processing system. In addition to listing and categorizing existing standards efforts, the guide identifies important requirements that standards efforts have not yet addressed.

The POSIX Open System Environment Reference Model

To describe the POSIX Open System Environment, the guide develops a reference model used to classify information processing standards. The reference model divides standards into two general categories:

Application Program Interface Standards

> These standards affect how application software interacts with the computer system. These standards affect application portability.

Platform External Interface Standards

> These standards affect how an information processing system interacts with its external environment. These standards affect system interoperability, user interface look and feel, and data portability.

These standards are very important because they allow a user to independently procure portions of their information processing systems from multiple vendors according to each user's needs.

In addition to these two interfaces identified in the model, there are other important interface between different computer system components: System Internal Interfaces. These interfaces have no direct impact on the external interface of a system or the application program interface to the system. System Internal Interfaces are beyond the direct scope of this guide because they do not directly impact application portability or system interoperability.

The services provided by the application platform are classified into four major categories:

— System services

— Communications services

— Information services

— Human-computer interaction services

Within these categories, services component areas are identified.

Using the reference model, a general set of requirements for each component area is developed. For each of the requirements existing or emerging standards are identified that address the requirement. If a requirement is not completely met by an existing or emerging standard, this gap in the standards is noted.

Goals

There are three goals of the POSIX OSE: portability, interoperability, and user portability. (While these terms are formally defined later in this guide and within various referenced standards, the following descriptions provide an overview of their meaning.)

Portability

Source Code Portability is accomplished through the use of the respective system/application interface standards and their extensions, thus allowing a user's application to operate on a wide range of systems. It is important to note that the aforementioned phrase ''wide range of systems'' connotes diverse hardware as well as software platforms.

Interoperability

Interoperability is characterized by the cooperative operation of applications resident on dissimilar computer systems. This cooperative operation is illustrated by data and functionality exchange.

User Portability

A consistent user interface allows users to move from system to system and between different applications on the same system with a minimum of retraining.

Benefits

The benefits derived in the use of the POSIX Open System Environment are real and quantifiable.

Simplified Vendor Mixing System Integration

As the standards for system integration and system interoperability are produced and implemented, the users will have the choice of mixing software and equipment from multiple vendors. This will allow users to tailor their information processing system to their particular needs by selecting their hardware based on the application needs rather than its ability to interoperate with their existing equipment.

Efficient Development and Implementation

Normally, systems users and providers have development and implementation activities that utilize personnel possessing skills in a specific computer environment. As a result of this specialization, a change in the target computer environment for a developer requires significant retraining expense. As standards for application portability, system interoperability, and system integration are developed, computer personnel will begin to develop skills in working with these standards. When these standards are widely used there will be large pool of personnel who are familiar with working with the standards.

This will allow a company to hire personnel with existing skills that can be put to use in their operation. In addition, within a company, resources can be redeployed between development efforts with a minimum of retraining.

As the basic interfaces are developed and well defined, higher level standardized interfaces can be developed that add value to the basic interfaces. Using the higher level interfaces may speed development efforts.

Efficient Porting of Applications

The difficulty of moving an application from one hardware/software environment to another is widely known. The porting of an application that uses standards-based interfaces to another system that provides the same standards-based interfaces is considerably simpler than ports involving completely different systems. The amount of system tailoring (i.e., changes to either the operating or application system required to make them work well together) is greatly reduced.

It is important to note that while standards-based systems enable applications to be ported between different systems, the standards do not guarantee that an application will be portable. Applications still must be properly engineered to ensure application portability.

Broadened Basis for Computer System Procurement Decisions

Computer users can now select and match hardware and software components from potentially different suppliers to fulfill an application requirement. This in turn allows decisions regarding computer systems procurements to be based less upon constraints imposed by incumbent vendors' products. The basis for competition will refocus on such factors as price, quality, value-added features, performance, and support. The stimulation of competition will benefit providers and users.

Related Standards Activities

The Standards Subcommittee of the IEEE Technical Committee on Operating Systems and Application Environments has authorized other standards activities that are related to the content of this guide.

The following table summarizes the current POSIX standardization efforts [1] and how they fit into this guide:

Project	Standard/Profile	Clause
P1003.1	System Interfaces	4.2
P1003.2	Shell and Utilities	4.9
P1003.3	Test Methods	
P1003.4	Realtime	4.2
P1003.5	Ada Bindings	4.2
P1003.6	Security	5.2
P1003.7	System Administration	5.3
P1003.8	Transparent File Access	4.3
P1003.9	Fortran Bindings	4.2
P1003.10	Supercomputing Profile	7.2
P1003.11	Transaction Processing Profile	7.2
P1003.12	Protocol-Independent Network Specification	4.3
P1003.13	Realtime Profile	7.2
P1003.14	Multiprocessing Profile	7.2
P1003.15	Batch System	4.9
P1003.16	C-Language Bindings	4.2
P1003.17	Directory/Name Services	4.3
P1003.18	POSIX Platform Profile	7.2
P1201.1	Human-Computer Interfaces	4.6
P1201.2	User Interface Drivability	4.6
P1224	X.400 API	4.3
P1237	RPC	4.3
P1238.0	FTAM API	4.3
P1238.1	OSI Networking API	4.3

Most of these efforts are in the areas of API standards and standardized profiles.

Extensions are approved as ‘‘amendments’’ or ‘‘revisions’’ to this document, following the IEEE and ISO/IEC Procedures.

Approved amendments are published separately until the full document is reprinted and such amendments are incorporated in their proper positions.

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1) A *Standards Status Report* that lists all current IEEE Computer Society standards projects is available from the IEEE Computer Society, 1730 Massachusetts Avenue NW, Washington, DC 20036-1903; Telephone: +1 202 371-0101; FAX: +1 202 728-9614. Working drafts of POSIX standards under development are also available from this office.

If you have interest in participating in the TCOS working groups addressing these issues, please send your name, address, and phone number to the Secretary, IEEE Standards Board, Institute of Electrical and Electronics Engineers, Inc., P.O. Box 1331, 445 Hoes Lane, Piscataway, NJ 08855-1331, and ask to have this forwarded to the chairperson of the appropriate TCOS working group. If you have interest in participating in this work at the international level, contact your ISO/IEC national body.

P1003.0 was prepared by the 1003.0 working group, sponsored by the Technical Committee on Operating Systems and Application Environments of the IEEE Computer Society. At the time this standard was approved, the membership of the 1003.0 working group was as follows:

Technical Committee on Operating Systems and Application Environments (TCOS)

Chair: Jehan-François Pâris

TCOS Standards Subcommittee

Chair:	Jim Isaak
Vice Chairs:	Ralph Barker
	Robert Bismuth
	Hal Jespersen
	Lorraine Kevra
	Pete Meier
Treasurer:	Quin Hahn
Secretary:	Shane McCarron

1003.0 Working Group Officials

Chair:	Allen Hankinson
Vice Chair:	Kevin Lewis
Document Editor:	Hal Jespersen (sponsored by Mike Lambert)
Technical Editor:	Fritz Schulz
Secretary:	Charles Severance

Working Group

<Name to be provided> *<Name to be provided>* *<Name to be provided>*

The following persons were members of the 1003.0 Balloting Group that approved the standard for submission to the IEEE Standards Board:

<Name > <Institution> Institutional Representative

<Name to be provided> *<Name to be provided>* *<Name to be provided>*

When the IEEE Standards Board approved this standard on *<date to be provided>* , it had the following membership:

(to be pasted in by IEEE)

Guide to the POSIX Open Systems Environment

Section 1: General

Responsibility: Kevin Lewis

1.1 Scope

This guide identifies parameters for an open system environment using the POSIX operating system/application interface as the platform. These parameters are determined in three basic ways:

(1) By specifying building blocks identified as components

Currently these components are: system services, networking, human/computer interaction (HCI), graphics, system security and privacy, database, data interchange, and language requirements. This guide identifies the standards required within each component to achieve the goals of a POSIX open system.

(2) By identifying intra- and intercomponent issues

These issues involve the relationships that should exist between and among the different components. It is in the attempt to lay out and address these relationships that the concept of profiles (see 2.2.2 and Section 6) arises.

(3) By identifying voids