Technical Standard

System Interfaces, Issue 6

The Open Group
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Preface

This document is being jointly developed by the IEEE and The Open Group and is intended to become both IEEE Std. 1003.1-200x and an Open Group Technical Standard, making up the base volumes of the Single UNIX Specification, Version 3.

IEEE Std. 1003.1-200x

IEEE Std. 1003.1-200x defines the Portable Operating System Interface (POSIX) requirements and consists of the following volumes:

- Base Definitions
- Shell and Utilities
- System Interfaces (this volume)

This volume of IEEE Std. 1003.1-200x

The System Interfaces volume of IEEE Std. 1003.1-200x describes the interfaces offered to application programs by POSIX-conformant systems. Readers are expected to be experienced C language programmers, and to be familiar with the Base Definitions volume of IEEE Std. 1003.1-200x.

This volume of IEEE Std. 1003.1-200x is structured as follows:

- Chapter 1 explains the status of this volume of IEEE Std. 1003.1-200x and its relationship to other formal standards.
- Chapter 2 contains important concepts, terms, and caveats relating to the rest of this volume of IEEE Std. 1003.1-200x.
- Chapter 3 defines the functional interfaces to the POSIX-conformant system.

Comprehensive references are available in the index.

Typographical Conventions

The following typographical conventions are used throughout IEEE Std. 1003.1-200x:

- **Bold** font is used in text for options to commands, file names, keywords, type names, data structures, and their members.
- *Italic* strings are used to denote:
  - — Command operands, command option-arguments, or variable names; for example, substitutable argument prototypes
  - — Environment variables, which are also shown in capitals
  - — Utility names
  - — External variables, such as *errno*
  - — Functions; these are shown as follows: *name*( ); names without parentheses are C external variables, C function family names, utility names, command operands, or command option-arguments.

- The font used here is used for the names of constants and literals.
- The notation **<file.h>** indicates a header.
- Names surrounded by braces, for example, {ARG_MAX}, represent symbolic limits or configuration values which may be declared in appropriate headers by means of the C **#define** construct.
- The notation [EABCD] is used to identify an error value EABCD.
- Syntax, code examples, and user input in interactive examples are shown in `fixed width` font. Brackets shown in this font, `[ ]`, are part of the syntax and do *not* indicate optional items. In syntax the | symbol is used to separate alternatives, and ellipses (...) are used to show that additional arguments are optional.
- **`Bold fixed width`** font is used to identify brackets that surround optional items in syntax, **`[ ]`**, and to identify system output in interactive examples.
- Variables within syntax statements are shown in *`italic fixed width`* font.
- Ranges of values are indicated with parentheses or brackets as follows:
  - (*a*,*b*) means the range of all values from *a* to *b*, including neither *a* nor *b*.
  - [*a*,*b*] means the range of all values from *a* to *b*, including *a* and *b*.
  - [*a*,*b*) means the range of all values from *a* to *b*, including *a*, but not *b*.
  - (*a*,*b*] means the range of all values from *a* to *b*, including *b*, but not *a*.
- Shading is used to identify extensions; see Section 1.9.1 (on page 501).

Notes:

1. Symbolic limits are used in this volume of IEEE Std. 1003.1-200x instead of fixed values for portability. The values of most of these constants are defined in the Base Definitions volume of IEEE Std. 1003.1-200x, **<limits.h>** or **<unistd.h>**.
2. The values of errors are defined in the Base Definitions volume of IEEE Std. 1003.1-200x, **<errno.h>**.

Trademarks

Notes to Reviewers

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This list will be revised at a later date.

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Acknowledgements

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The Open Group gratefully acknowledges:

- AT&T for permission to reproduce portions of its copyrighted System V Interface Definition (SVID) and material from the UNIX System V Release 2.0 documentation.
- The ANSI X3J11 Committees.
- The Large File Summit for their work in developing the set of changes to the X/Open Single UNIX Specification to support large files.
- The following individuals for their valuable contribution to the development of IEEE Std. 1003.1-200x:

  TBD

Referenced Documents

Notes to Reviewers

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This list needs further work, and should be kept in sync with the XBD, Chapter 1, Normative References section.

Normative References

The following standards contain provisions which, through references in IEEE Std. 1003.1-200x, constitute provisions of IEEE Std. 1003.1-200x. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this volume of IEEE Std. 1003.1-200x are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ANS X3.9-1978
: (Reaffirmed 1989) American National Standard for Information Systems: Standard X3.9-1978, Programming Language FORTRAN.

ISO / IEC 646: 1991
: ISO / IEC 646: 1991, Information Technology — ISO 7-Bit Coded Character Set for Information Interchange.

  The reference version of the standard contains 95 graphic characters, which are identical to the graphic characters defined in the ASCII coded character set.

ISO 4217: 1995
: ISO 4217: 1995, Codes for the Representation of Currencies and Funds.

ISO / IEC 4873: 1991
: ISO / IEC 4873: 1991, Information Technology — ISO 8-Bit Code for Information Interchange — Structure and Rules for Implementation.

ISO 8601: 1988
: ISO 8601: 1988, Data Elements and Interchange Formats — Information Interchange — Representation of Dates and Times.

ISO / IEC 8859-1: 1998
: ISO / IEC 8859-1: 1998, Information Technology — 8-Bit Single-Byte Coded Graphic Character Sets — Part 1: Latin Alphabet No. 1.

  This standard character set comprises 191 graphic characters covering the requirements of most of Western Europe.

ISO 8859-2: 1988
: ISO 8859-2: 1988, Information Processing — 8-bit Single-byte Coded Graphic Character Sets — Part 2: Latin Alphabet No. 2.

ISO C (1999)
: ISO / IEC 9899: 1999, Programming Languages — C.

ISO POSIX-1: 1996
: ISO / IEC 9945-1: 1996, Information Technology — Portable Operating System Interface

(POSIX) — Part 1: System Application Program Interface (API) [C Language] (identical to ANSI/IEEE Std. 1003.1-1996). Incorporating ANSI/IEEE Stds. 1003.1-1990, 1003.1b-1993, 1003.1c-1995, and 1003.1i-1995.

ISO POSIX-2:1993
ISO/IEC 9945-2:1993, Information Technology — Portable Operating System Interface (POSIX) — Part 2: Shell and Utilities (identical to IEEE Std. 1003.2-1992 as amended by IEEE Std. 1003.2a-1992).

ISO/IEC 10646-1:1993
ISO/IEC 10646-1:1993, Information Technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and Basic Multilingual Plane.

ISO/IEC 14519:1999
ISO/IEC 14519:1999, Information Technology — POSIX Ada Language Interfaces — Binding for System Application Program Interface (API) — Realtime Extensions.

Informative References

The following documents are referenced in IEEE Std. 1003.1-200x:

1984 /usr/group Standard
/usr/group Standards Committee, Santa Clara, CA, UniForum 1984.

Almasi and Gottlieb
George S. Almasi and Allan Gottlieb, *Highly Parallel Computing*, The Benjamin/Cummings Publishing Company, Inc., 1989, ISBN: 0-8053-0177-1.

ANSI C
American National Standard for Information Systems: Standard X3.159-1989, Programming Language C.

ANS X3.226-1994
American National Standard for Information Systems: Standard X3.226-1994, Programming Language Common LISP.

Brawer
Steven Brawer, *Introduction to Parallel Programming*, Academic Press, 1989, ISBN: 0-12-128470-0.

DeRemer and Pennello Article
DeRemer, Frank and Pennello, Thomas J., *Efficient Computation of LALR(1) Look-Ahead Sets*, SigPlan Notices, Volume 15, No. 8, August 1979.

Draft ANSI X3J11.1
IEEE Floating Point draft report of ANSI X3J11.1 (NCEG).

FIPS 151-1
Federal Information Procurement Standard (FIPS) 151-1.

FIPS 151-2
Federal Information Procurement Standards (FIPS) 151-2, Portable Operating System Interface (POSIX)—Part 1: System Application Program Interface (API) [C Language].

HP-UX Manual
Hewlett-Packard HP-UX Release 9.0 Reference Manual, Third Edition, August 1992.

IEC 60559:1989
IEC 60559:1989, Binary Floating-Point Arithmetic for Microprocessor Systems (previously designated IEC 559:1989).

IEEE Std. 754-1985
Standard for Binary Floating-Point Arithmetic.

IEEE Std. 854-1987
Standard for Radix-Independent Floating-Point Arithmetic.

IEEE Std. 1003.9-1992
Standard for Information Technology — POSIX FORTRAN 77 Language Interfaces — Part 1: Binding for System Application Program Interface API.

IETF RFC 791
Internet Protocol, Version 4 (IPv4), September 1981.

IETF RFC 819
The Domain Naming Convention for Internet User Applications, Z. Su, J. Postel, August 1982.

IETF RFC 822
Standard for the Format of ARPA Internet Text Messages, D.H. Crocker, August 1982.

IETF RFC 919
Broadcasting Internet Datagrams, J. Mogul, October 1984.

IETF RFC 920
Domain Requirements, J. Postel, J. Reynolds, October 1984.

IETF RFC 921
Domain Name System Implementation Schedule, J. Postel, October 1984.

IETF RFC 922
Broadcasting Internet Datagrams in the Presence of Subnets, J. Mogul, October 1984.

IETF RFC 1034
Domain Names — Concepts and Facilities, P. Mockapetris, November 1987.

IETF RFC 1035
Domain Names — Implementation and Specification, P. Mockapetris, November 1987.

IETF RFC 1123
Requirements for Internet Hosts — Application and Support, R. Braden, October 1989.

IETF RFC 1886
DNS Extensions to Support Internet Protocol, Version 6 (IPv6), C. Huitema, S. Thomson, December 1995.

IETF RFC 2045
Multipurpose Internet Mail Extensions (MIME), Part 1: Format of Internet Message Bodies, N. Freed, N. Borenstein, November 1996.

IETF RFC 2373
Internet Protocol, Version 6 (IPv6) Addressing Architecture, S. Deering, R. Hinden, July 1998.

IETF RFC 2460
Internet Protocol, Version 6 (IPv6), S. Deering, R. Hinden, December 1998.

Internationalisation Guide
Guide, July 1993, Internationalisation Guide, Version 2 (ISBN: 1-859120-02-4, G304), published by The Open Group.

ISO C (1990)
ISO/IEC 9899:1990: Programming Languages — C, including Amendment 1:1995 (E), C Integrity (Multibyte Support Extensions (MSE) for ISO C).

ISO 2375:1985
ISO 2375:1985, Data Processing — Procedure for Registration of Escape Sequences.

ISO/IEC 1539:1990
ISO/IEC 1539:1990, Information Technology — Programming Languages — Fortran (technically identical to the ANSI X3.9-1978 standard [FORTRAN 77]).

ISO/IEC 6429:1992
ISO/IEC 6429:1992, Information Technology — Control Functions for Coded Character Sets.

ISO/IEC 6937:1994
ISO/IEC 6937:1994, Information Technology — Coded Character Set for Text Communication — Latin Alphabet.

ISO 7-bit or 8-bit coded character set for text communication using public communication networks, private communication networks, or interchange media, such as magnetic tapes and discs.

ISO/IEC 8802-3:1996
ISO/IEC 8802-3:1996, Information Technology — Telecommunications and Information Exchange Between Systems — Local and Metropolitan Area Networks — Specific Requirements — Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.

Issue 1
X/Open Portability Guide, July 1985 (ISBN: 0-444-87839-4).

Issue 2
X/Open Portability Guide, January 1987:

- Volume 1: XVS Commands and Utilities (ISBN: 0-444-70174-5)
- Volume 2: XVS System Calls and Libraries (ISBN: 0-444-70175-3)

Issue 3
X/Open Specification, 1988, 1989, February 1992:

- Commands and Utilities, Issue 3 (ISBN: 1-872630-36-7, C211); this specification was formerly X/Open Portability Guide, Issue 3, Volume 1, January 1989, XSI Commands and Utilities (ISBN: 0-13-685835-X, XO/XPG/89/002)
- System Interfaces and Headers, Issue 3 (ISBN: 1-872630-37-5, C212); this specification was formerly X/Open Portability Guide, Issue 3, Volume 2, January 1989, XSI System Interface and Headers (ISBN: 0-13-685843-0, XO/XPG/89/003)
- Curses Interface, Issue 3, contained in Supplementary Definitions, Issue 3 (ISBN: 1-872630-38-3, C213), Chapters 9 to 14 inclusive; this specification was formerly X/Open Portability Guide, Issue 3, Volume 3, January 1989, XSI Supplementary Definitions (ISBN: 0-13-685850-3, XO/XPG/89/004)
- Headers Interface, Issue 3, contained in Supplementary Definitions, Issue 3 (ISBN: 1-872630-38-3, C213), Chapter 19, Cpio and Tar Headers; this specification was formerly X/Open Portability Guide Issue 3, Volume 3, January 1989, XSI Supplementary Definitions (ISBN: 0-13-685850-3, XO/XPG/89/004)

Issue 4

CAE Specification, July 1992, published by The Open Group:

- System Interface Definitions (XBD), Issue 4 (ISBN: 1-872630-46-4, C204)
- Commands and Utilities (XCU), Issue 4 (ISBN: 1-872630-48-0, C203)
- System Interfaces and Headers (XSH), Issue 4 (ISBN: 1-872630-47-2, C202)

Issue 4, Version 2

CAE Specification, August 1994, published by The Open Group:

- System Interface Definitions (XBD), Issue 4, Version 2 (ISBN: 1-85912-036-9, C434)
- Commands and Utilities (XCU), Issue 4, Version 2 (ISBN: 1-85912-034-2, C436)
- System Interfaces and Headers (XSH), Issue 4, Version 2 (ISBN: 1-85912-037-7, C435)

Issue 5

Technical Standard, February 1997, published by The Open Group:

- System Interface Definitions (XBD), Issue 5 (ISBN: 1-85912-186-1, C605)
- Commands and Utilities (XCU), Issue 5 (ISBN: 1-85912-191-8, C604)
- System Interfaces and Headers (XSH), Issue 5 (ISBN: 1-85912-181-0, C606)

Knuth Article

Knuth, Donald E., *On the Translation of Languages from Left to Right*, Information and Control, Volume 8, No. 6, October 1965.

KornShell

Bolsky, Morris I. and Korn, David G., *The New KornShell Command and Programming Language*, March 1995, Prentice Hall.

MSE working draft

Working draft of ISO/IEC 9899:1990/Add3:draft, Addendum 3 — Multibyte Support Extensions (MSE) as documented in the ISO Working Paper SC22/WG14/N205 dated 31 March 1992.

POSIX.1:1988

IEEE Std. 1003.1-1988, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) [C Language].

POSIX.1:1990

IEEE Std. 1003.1-1990, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) [C Language].

POSIX.1a:2000

IEEE Std. 1003.1a-2000, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) — Amendment ????: TITLE?? [C Language].

POSIX.1d:1999

IEEE Std. 1003.1d-1999, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) — Amendment ????: Additional Realtime Extensions [C Language].

POSIX.1g:2000

IEEE Std. 1003.1g-2000, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) — Amendment ????: Protocol-Independent Interfaces (PII).

POSIX.1j: 2000
IEEE Std. 1003.1j-2000, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) — Amendment ????: Advanced Realtime Extensions [C Language].

POSIX.1q: 2000
IEEE Std. 1003.1q-2000, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) — Amendment ????: Tracing [C Language].

POSIX.2: 1992
IEEE Std. 1003.2-1992, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 2: Shell and Utilities.

POSIX.2b:-2000
IEEE Std. 1003.2b: 2000, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 2: Shell and Utilities — Amendment ???: TITLE??.

POSIX.2d:-1994
IEEE Std. 1003.2d: 1994, Standard for Information Technology — Portable Operating System Interface (POSIX) — Part 2: Shell and Utilities — Amendment 1: Batch Environment.

Sarwate Article
Sarwate, Dilip V., *Computation of Cyclic Redundancy Checks via Table Lookup*, Communications of the ACM, Volume 30, No. 8, August 1988.

SVID, Issue 1
American Telephone and Telegraph Company, System V Interface Definition (SVID), Issue 1; Morristown, NJ, UNIX Press, 1985.

SVID, Issue 2
American Telephone and Telegraph Company, System V Interface Definition (SVID), Issue 2; Morristown, NJ, UNIX Press, 1986.

SVID, Issue 3
American Telephone and Telegraph Company, System V Interface Definition (SVID), Issue 3; Morristown, NJ, UNIX Press, 1989.

The AWK Programming Language
Aho, Alfred V., Kernighan, Brian W., and Weinberger, Peter J., *The AWK Programming Language*, Reading, MA, Addison-Wesley 1988.

XNS, Issue 4
CAE Specification, August 1994, Networking Services, Issue 4 (ISBN: 1-85912-049-0, C438), published by The Open Group.

XNS, Issue 5
CAE Specification, February 1997, Networking Services, Issue 5 (ISBN: 1-85912-165-9, C523), published by The Open Group.

XNS, Issue 5.2
Technical Standard, January 2000, Networking Services (XNS), Issue 5.2 (ISBN: 1-85912-241-8, C808), published by The Open Group.

X/Open Curses, Issue 4, Version 2
CAE Specification, May 1996, X/Open Curses, Issue 4, Version 2 (ISBN: 1-85912-171-3, C610), published by The Open Group.

UTF-8

ISO/IEC 10646-1:1993/Amendment 2:1996, UCS Transformation Format 8 (UTF-8).

Yacc: Yet Another Compiler Compiler

REFERENCE NEEDED.

Parts of the following documents were used to create the base documents for IEEE Std. 1003.1-200x:

AIX 3.2 Manual

AIX Version 3.2 For RISC System/6000, Technical Reference: Base Operating System And Extensions, 1990, 1992 (Part No. SC23-2382-00).

OSF/1

OSF/1 Programmer's Reference, Release 1.2 (ISBN: 0-13-020579-6).

OSF AES

Application Environment Specification (AES) Operating System Programming Interfaces Volume, Revision A (ISBN: 0-13-043522-8).

System V Release 2.0

— UNIX System V Release 2.0 Programmer's Reference Manual (April 1984 - Issue 2).

— UNIX System V Release 2.0 Programming Guide (April 1984 - Issue 2).

System V Release 4.2

Operating System API Reference, UNIX® SVR4.2 (1992) (ISBN: 0-13-017658-3).