

Draft Standard for Information Technology— Portable Operating System Interface (POSIX[®])

Prepared by the Austin Group
(<http://www.opengroup.org/austin/>)

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1 / *Technical Standard*

2 **Rationale (Informative)**

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365 IEEE Std 1003.1-200x has been jointly developed by the IEEE and The Open Group. It is both an
366 IEEE standard and an Open Group Technical Standard.

367 **Background**

368 The developers of IEEE Std 1003.1-200x represent a cross-section of hardware manufacturers,
369 vendors of operating systems and other software development tools, software designers,
370 consultants, academics, authors, applications programmers, and others.

371 Conceptually, IEEE Std 1003.1-200x describes a set of fundamental services needed for the
372 efficient construction of application programs. Access to these services has been provided by
373 defining an interface, using the C programming language, a command interpreter, and common
374 utility programs that establish standard semantics and syntax. Since this interface enables
375 application writers to write portable applications—it was developed with that goal in mind—it
376 has been designated POSIX,¹ an acronym for Portable Operating System Interface.

377 Although originated to refer to the original IEEE Std 1003.1-1988, the name POSIX more correctly
378 refers to a *family* of related standards: IEEE Std 1003.*n* and the parts of ISO/IEC 9945. In earlier
379 editions of the IEEE standard, the term POSIX was used as a synonym for IEEE Std 1003.1-1988.
380 A preferred term, POSIX.1, emerged. This maintained the advantages of readability of the
381 symbol “POSIX” without being ambiguous with the POSIX family of standards.

382 **Audience**

383 The intended audience for IEEE Std 1003.1-200x is all persons concerned with an industry-wide
384 standard operating system based on the UNIX system. This includes at least four groups of
385 people:

- 386 1. Persons buying hardware and software systems
- 387 2. Persons managing companies that are deciding on future corporate computing directions
- 388 3. Persons implementing operating systems, and especially
- 389 4. Persons developing applications where portability is an objective

390 **Purpose**

391 Several principles guided the development of IEEE Std 1003.1-200x:

- 392 • **Application-Oriented**

393 The basic goal was to promote portability of application programs across UNIX system
394 environments by developing a clear, consistent, and unambiguous standard for the interface
395 specification of a portable operating system based on the UNIX system documentation.
396 IEEE Std 1003.1-200x codifies the common, existing definition of the UNIX system.

397

398 1. The name POSIX was suggested by Richard Stallman. It is expected to be pronounced *pahz-icks*, as in *positive*, not *poh-six*, or
399 other variations. The pronunciation has been published in an attempt to promulgate a standardized way of referring to a
400 standard operating system interface.

- 401 • Interface, Not Implementation
- 402 IEEE Std 1003.1-200x defines an interface, not an implementation. No distinction is made
- 403 between library functions and system calls; both are referred to as functions. No details of the
- 404 implementation of any function are given (although historical practice is sometimes
- 405 indicated in the RATIONALE section). Symbolic names are given for constants (such as
- 406 signals and error numbers) rather than numbers.
- 407 • Source, Not Object, Portability
- 408 IEEE Std 1003.1-200x has been written so that a program written and translated for execution
- 409 on one conforming implementation may also be translated for execution on another
- 410 conforming implementation. IEEE Std 1003.1-200x does not guarantee that executable (object
- 411 or binary) code will execute under a different conforming implementation than that for
- 412 which it was translated, even if the underlying hardware is identical.
- 413 • The C Language
- 414 The system interfaces and header definitions are written in terms of the standard C language
- 415 as specified in the ISO C standard.
- 416 • No Superuser, No System Administration
- 417 There was no intention to specify all aspects of an operating system. System administration
- 418 facilities and functions are excluded from IEEE Std 1003.1-200x, and functions usable only by
- 419 the superuser have not been included. Still, an implementation of the standard interface may
- 420 also implement features not in IEEE Std 1003.1-200x. IEEE Std 1003.1-200x is also not
- 421 concerned with hardware constraints or system maintenance.
- 422 • Minimal Interface, Minimally Defined
- 423 In keeping with the historical design principles of the UNIX system, the mandatory core
- 424 facilities of IEEE Std 1003.1-200x have been kept as minimal as possible. Additional
- 425 capabilities have been added as optional extensions.
- 426 • Broadly Implementable
- 427 The developers of IEEE Std 1003.1-200x endeavored to make all specified functions
- 428 implementable across a wide range of existing and potential systems, including:
- 429 1. All of the current major systems that are ultimately derived from the original UNIX
- 430 system code (Version 7 or later)
- 431 2. Compatible systems that are not derived from the original UNIX system code
- 432 3. Emulations hosted on entirely different operating systems
- 433 4. Networked systems
- 434 5. Distributed systems
- 435 6. Systems running on a broad range of hardware
- 436 No direct references to this goal appear in IEEE Std 1003.1-200x, but some results of it are
- 437 mentioned in the Rationale (Informative) volume of IEEE Std 1003.1-200x.
- 438 • Minimal Changes to Historical Implementations
- 439 When the original version of IEEE Std 1003.1 was published, there were no known historical
- 440 implementations that did not have to change. However, there was a broad consensus on a set
- 441 of functions, types, definitions, and concepts that formed an interface that was common to
- 442 most historical implementations.

443 The adoption of the 1988 and 1990 IEEE interface standards, the 1992 common standards, the
444 various Open Group (formerly X/Open) versions, and the subsequent revisions and addenda
445 to all of them have consolidated this consensus, and this revision reflects the significantly
446 increased level of consensus arrived at since the original versions. The earlier standards and
447 their modifications specified a number of areas where consensus had not been reached
448 before, and these are now reflected in this revision. The authors of the original versions tried,
449 as much as possible, to follow the principles below when creating new specifications:

- 450 1. By standardizing an interface like one in an historical implementation; for example,
451 directories
- 452 2. By specifying an interface that is readily implementable in terms of, and backwards
453 compatible with, historical implementations, such as the extended *tar* format defined in
454 the *pax* utility
- 455 3. By specifying an interface that, when added to an historical implementation, will not
456 conflict with it; for example, the *sigaction()* function

457 This revision tries to minimize the number of changes required to implementations which
458 conform to the earlier versions of the approved standards to bring them into conformance
459 with the current standard. Specifically, the scope of this work excluded doing any “new”
460 work, but rather collecting into a single document what had been spread across a number of
461 documents, and presenting it in what had been proven in practice to be a more effective way.
462 Some changes to prior conforming implementations were unavoidable, primarily as a
463 consequence of resolving conflicts found in prior revisions, or which became apparent when
464 bringing the various pieces together.

465 However, since it references the 1999 versions of the ISO C standard, and no longer supports
466 “Common Usage C”, there are a number of unavoidable changes. Applications portability is
467 similarly affected.

468 IEEE Std 1003.1-200x is specifically not a codification of a particular vendor’s product.

469 It should be noted that implementations will have different kinds of extensions. Some will
470 reflect “historical usage” and will be preserved for execution of pre-existing applications.
471 These functions should be considered “obsolescent” and the standard functions used for
472 new applications. Some extensions will represent functions beyond the scope of
473 IEEE Std 1003.1-200x. These need to be used with careful management to be able to adapt to
474 future IEEE Std 1003.1-200x extensions and/or port to implementations that provide these
475 services in a different manner.

476 • Minimal Changes to Existing Application Code

477 A goal of IEEE Std 1003.1-200x was to minimize additional work for the developers of
478 applications. However, because every known historical implementation will have to change
479 at least slightly to conform, some applications will have to change.

480 **General**

481 This Rationale (Informative) volume of IEEE Std 1003.1-200x is being published to assist in the
482 process of review. It contains historical information concerning the contents of
483 IEEE Std 1003.1-200x and why features were included or discarded by the standard developers.
484 It also contains notes of interest to application programmers on recommended programming
485 practices, emphasizing the consequences of some aspects of IEEE Std 1003.1-200x that may not
486 be immediately apparent.

487 **Development of IEEE Std 1003.1-200x**

488 This portion of the Rationale (Informative) volume of IEEE Std 1003.1-200x outlines the
489 organizations and documents involved in developing IEEE Std 1003.1-200x.

490 This revision was developed by a joint working group known as the Austin Common Standards
491 Revision Group, or *Austin Group* for short. This joint technical working group was convened in
492 late 1998 to consider the matter of a common revision of ISO/IEC 9945-1 (POSIX.1),
493 ISO/IEC 9945-2 (POSIX.2), IEEE Std 1003.1, IEEE Std 1003.2, and appropriate parts of the Single
494 UNIX Specification. The approach to specification development was to *write once, adopt*
495 *everywhere*, with the deliverables being a single set of specifications that carry both the IEEE
496 POSIX designation and The Open Group's Technical Standard designation, and, if adopted, an
497 ISO/IEC designation.

498 The base document for the revision was The Open Group's Base volumes of its Single UNIX
499 Specification, Version 2. These were selected since they were a superset of the existing POSIX.1
500 and POSIX.2 specifications and had some organizational aspects that would benefit the audience
501 for the new revision.

502 **Organization of the Rationale**

503 Within the Rationale (Informative) volume of IEEE Std 1003.1-200x, the following terms are
504 used:

505 **base standard**

506 The portions of IEEE Std 1003.1-200x that are not optional, equivalent to the definitions of
507 *classic* POSIX.1 and POSIX.2.

508 **XSI extension**

509 The portions of IEEE Std 1003.1-200x addressing the extension added for support of the
510 Single UNIX Specification.

511 **standard developers**

512 The individuals and companies in the development organizations responsible for
513 IEEE Std 1003.1-200x: the IEEE P1003.1 working groups, The Open Group Base working
514 group, advised by the hundreds of individual technical experts who balloted the draft
515 standards within the Austin Group, and the member bodies and technical experts of
516 ISO/IEC JTC 1/SC22/WG15.

517 The remainder of the Rationale (Informative) volume of IEEE Std 1003.1-200x is organized in
518 parallel to the normative volumes of IEEE Std 1003.1-200x, with a separate part for each of the
519 three normative volumes.

520 **Organization of This Document**

521 IEEE Std 1003.1-200x is organized into sections. Some of these, such as the Scope, are mandated
522 by ISO/IEC, the IEEE, and other standards bodies. Due to the size of the overall document,
523 IEEE Std 1003.1-200x has been divided logically into three normative volumes, for the
524 convenience of the standards developers and others. The alphabetical ordering of the large
525 sections including system interfaces and utilities was to make it easier for the documents to be
526 used as reference documents.

527 The three volumes are as follows:

- 528 • Base Definitions

529 This volume of IEEE Std 1003.1-200x is organized in chapters as follows:

Introduction

- 530 — Introduction (including Scope and Normative References)
- 531 — Conformance
- 532 — Definitions
- 533 — General Concepts
- 534 — File Format Notation
- 535 — Character Set
- 536 — Locale
- 537 — Environment Variables
- 538 — Regular Expressions
- 539 — Directory Structure and Devices
- 540 — General Terminal Interface
- 541 — Utility Conventions
- 542 — Headers (organized alphabetically)

543 The presence of this volume of IEEE Std 1003.1-200x reduces duplication in the other
544 volumes and ensures consistency of use of terminology. Where terminology and definitions
545 common to both the System Interfaces volume of IEEE Std 1003.1-200x and Shell and Utilities
546 volume of IEEE Std 1003.1-200x occurs, then additions have been made to this volume of
547 IEEE Std 1003.1-200x.

- 548 • System Interfaces

549 This volume of IEEE Std 1003.1-200x is organized as follows:

- 550 — Introduction
- 551 — General Information
- 552 — System Interfaces (organized alphabetically)

- 553 • Shell and Utilities

554 This volume of IEEE Std 1003.1-200x is organized as follows:

- 555 — Introduction
- 556 — Shell Command Language
- 557 — Batch Environment Services
- 558 — Utilities (organized alphabetically)

559 Abbreviations

560 POSIX.0

561 Although this term is not used in the normative text of IEEE Std 1003.1-200x, it is used in the
562 Rationale (Informative) volume of IEEE Std 1003.1-200x to refer to IEEE Std 1003.0-1995.

563 POSIX.1b

564 Although this term is not used in the normative text of IEEE Std 1003.1-200x, it is used in the
565 Rationale (Informative) volume of IEEE Std 1003.1-200x to refer to the elements of the
566 POSIX Realtime Extension amendment. (This was earlier referred to as POSIX.4 during the
567 standard development process.)

568
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570
571
572

POSIX.1c

Although this term is not used in the normative text of IEEE Std 1003.1-200x, it is used in the Rationale (Informative) volume of IEEE Std 1003.1-200x to refer to the POSIX Threads Extension amendment. (This was earlier referred to as POSIX.4a during the standard development process.)

|

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597 **Austin Group Common Standards Committee**

598 At the time IEEE Std 1003.1-200x was approved, the membership was as follows:

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600 Andrew Josey

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