Realtime POSIX Status

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Changes since October 2003

- The initial reaffirmation IEEE Std 1003.5-1998 (Ada binding to POSIX) ballot closed on 30 April 2004
  - It passed on the first ballot, with 35 eligible voters, 88% return, and 93% affirmative
  - A 10-day recirculation ballot will be required, as there were 2 negative votes, and a batch of existing editorial problems to fix
  - The hope is to get approval at the September 2004 Standards Board meeting
- IEEE Std 1003.13 and 1003.26 are in the IEEE publication edit process
- A new Application-Defined Scheduling proposal and/or draft is expected in October 2004.
The Recent 1003.1 Revision

- The UNIX/POSIX world is unifying, largely driven by the threat of Windows NT/2000/XP
- The result is a single 3,700-page standard (in four large volumes) carrying the badges of all three cooperating standards organizations, IEEE, ISO, and The Open Group
  - The four volumes are *Base Definitions and Headers*, *System Interfaces*, *Shell & Utilities*, and *Rationale* (abbreviated XBD, XSH, XCU, and XRAT respectively)
  - The process took three years, culminating in approval of IEEE Std 1003.1-2001 by TOG, IEEE in 2001, and ISO in 2002, so 1003.1-2001 is now thrice a standard
  - The resulting standard is the core of the US Navy’s “Open Architecture” (OA) effort and DoD’s mandated Joint Technical Architecture (JTA) OS Services, replacing 1003.1-1996 and its amendments
- IEEE Std 1003.1-2001 supersedes all the major POSIX standards except 1003.13 (realtime profiles) and 1003.5 (Ada bindings)
  - Technical Corrigenda #1 (TC1) to 1003.1-2001 was approved in 2002
  - TC2 was approved in 2003, yielding “IEEE Std 1003.1-2003”
Realtime POSIX Roadmap

POSIX.1
Basic UNIX 1988

POSIX.2
Shell&Utilities 1992

POSIX.1b
+Realtime 1993

POSIX.1c
+Threads 1995

POSIX.1d
+Added RT 1999

POSIX.1j
+Added RT 2000

POSIX.1g
+Networking 2000

X/Open
Interfaces

POSIX.5
Ada Binding 1992

POSIX.5b
+Realtime 1996

POSIX.5c
+Networking 1998

POSIX.13
RT Profiles 1998

POSIX.13a
+5th Profile Abandoned

POSIX.13b
+Added RT Abandoned

POSIX.13
Revision 2003

POSIX.1q
+Tracing 2000

TC1 2002
TC2 2003

POSIX.26
Dev Control 2003

POSIX.1g
+Networking 2000

POSIX.13
Revision 2003

POSIX.5g
+Added RT Abandoned
The 1003.13 Revision

• The completion of the 1003.1 Revision required that 1003.13-1998 (123 pages) in turn be revised, as it depended upon the now superseded 1996 version of 1003.1

• The 1003.13 Revision (draft standard called “P1003.13R”) profiles:
  – 1003.1-2001 (which includes all of realtime POSIX) plus TC1, TC2
  – 1003.5c (Ada bindings to POSIX),
  – P1003.26 Device Control (added in ballot),
  – Includes the scopes of amendments P1003.13a and P1003.13b,
  – And reflects field experience with 1003.13-1998

• The initial P1003.13R ballot closed on 10 March 2003
  – It passed on the first ballot, with 43 eligible voters, 88% return, and 86% affirmative. (The requirement is >75% return and >75% affirmative)
  – First and final recirculation ballot closed on 15 September 2003, with 97% affirmative
  – P1003.13R (196 pages) was approved at the December 2003 IEEE Standards Board meeting, yielding IEEE Std 1003.13-2003
P1003.26 – Device Control

• Device Control is a standardized and type-safe version of the traditional ioctl() function
  – Used mainly to control I/O hardware

• P1003.26 will be a free-standing POSIX standard, and will not be an amendment to anything
  – It is however required by 1003.13-2003

• The initial P1003.26 ballot closed on 10 March 2003
  – It passed on the first ballot, with 42 eligible voters, 90% return, 2% abstention, and 89% affirmative. (The requirement is >75% return with >75% affirmative)
  – Second and final recirculation ballot closed on 19 October 2003 with 97% affirmative
  – P1003.26 (45 pages) was approved at the December 2003 IEEE Standards Board meeting, yielding IEEE Std 1003.26-2003
Future Work under Consideration by SSWG-RT

• Interrupt Control
  – An unofficial 54-page draft standard exists
• Application-defined scheduling
  – An unofficial draft standard exists
• Allocation of threads to processors
• Priority inheritance and/or priority ceiling protocol for reader/writer locks
Interrupt Control

• Interrupt Control allows applications to directly handle device interrupt, allowing application-level I/O drivers to be implemented

• An unofficial draft standard now exists, carried over from a prior standards effort
  – Authority to write a standard will be sought

• This would be a free-standing POSIX standard, and would not be an amendment to anything
Some Major POSIX Base Standards 
(now subsumed into 1003.1-2003)

- ISO/IEC 9945-1:1996 (740 pages)
  - This was the basic POSIX standard defining the UNIX programming interface since 1996, being the merger of 1003.1-1988 (the then base standard) with its amendments 1003.1b (realtime), 1003.1c (threads), and 1003.1i (corrigenda).
  - Profiled by IEEE Std 1003.13-1998

- ISO/IEC 9945-2 (~1,400 pages)
  - Shells and Utilities. This was the basic POSIX standard defining the UNIX command line (shell) interface.
Some Major POSIX Realtime Amendment Standards
(now subsumed into 1003.1-2003)

- IEEE Std 1003.1d-1999 (114 pages)
  - Added realtime functions: spawn, the sporadic-server scheduling policy, cpu-time clocks and timers, advisory information, and timeouts.

- IEEE Std 1003.1j-1999 (88 pages)
  - More realtime functions: typed memory, absolute nanosleep, barrier synchronization, reader/writer locks, and spinlocks.

- IEEE Std 1003.1q-2000 (109 pages)
  - Tracing of application calls on the OS, I/O activity, user-defined events, and the like.