

Realtime POSIX Status

4 February 2004

Joe Gwinn

gwinn@raytheon.com

978-440-3330

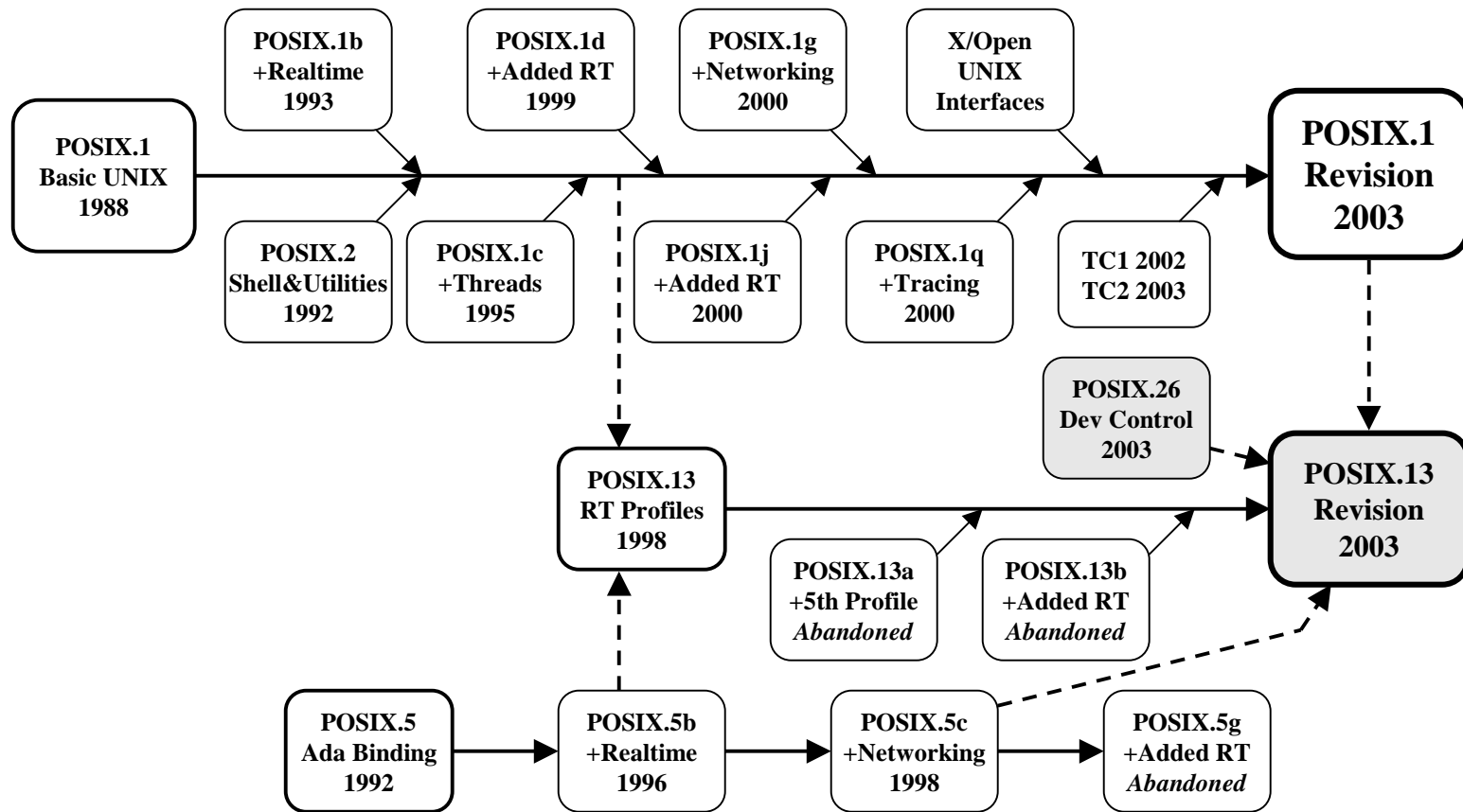
Changes since October 2003

- At the December 2003 meeting of the IEEE Standards Board, the following standards were approved:
 - Technical Corrigenda #2 to IEEE Std 1003.1-2001
 - IEEE Std 1003.13-2003
 - IEEE Std 1003.26-2003

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



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of the 1003.1 Revision required that 1003.13-1998 (123 pages) in turn be revised, as it depended upon the now superseded 1996 version of 1003.1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 $\geq 75\%$ return and $\geq 75\%$ 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 $\geq 75\%$ return with $\geq 75\%$ 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.