POSIX® : Certified by IEEE and The Open Group – a briefing.

The Source for POSIX Certification

http://posixcertified.ieee.org

September 2006.

Acknowledgements: Thanks to Michael Gonzalez for several of the POSIX.13 slides
Agenda

- What is POSIX?
- POSIX 1003.1, 2004 Edition Status
- POSIX 1003.13-2003
  - PSE54 Multipurpose Realtime Product Standard
  - PSE52 Realtime Controller Product Standard
- POSIX: *Certified by IEEE and The Open Group*
- 2006 updates
POSIX® /pahz-icks/

- *POSIX*, pronounced *pahz-icks* as in positive, not *poh-six*, or other variations
- POSIX is a registered trademark of the IEEE
  - Licensed through certification
- An acronym for *Portable Operating System Interface*
POSIX® /pahz-icks/

- POSIX is a family of standards developed by the Portable Applications Standards Committee (PASC) of the IEEE Computer Society

- Main subject areas:
  - System Interfaces (C, Fortran, Ada Bindings)
  - Commands & Utilities
  - Test Methods
What is POSIX?

- It's about *portability*
  - Both programmers and application source code
  - Portability of the OS kernel itself and/or application binary code are *not* objectives

- POSIX is a set of books specifying APIs
  - It is neither a piece of code
  - Nor an operating system
  - It is a rich, proven API
What is an API?

- Application Program Interface
- A written contract between system developers and application developers
- It is not a piece of code, it is a piece of paper defining what the two sets of developers are guaranteed to receive and are in turn responsible for providing
The Need for Standard APIs

- Standardized “square” peg in the round hole
  - “bits where change is not interesting”
  - Where the benefits of commonality outweigh the value of differences
  - Where we can achieve economies of scale, including interoperability
Scalable API Portability

POSIX APIs support portability across a range of devices

POSIX 1003.1, 2004 Edition

- Approved December 6th 2001
- 2004 Edition incorporates two Technical Corrigenda
- Developed by the Austin Group (see later)
- Supersedes all the major POSIX standards except 1003.13 (realtime profiles) and 1003.5 (Ada bindings)
- A combined system interfaces (including all realtime POSIX) and utilities specification as a single 4000 page standard
- The core of DoD’s mandated Joint Technical Architecture (JTA) OS Services, replacing 1003.1-1996 and its amendments
- Technically identical to the Base specifications of the Single UNIX Specification and ISO 9945
The Common Base Specifications

IEEE Std 1003.1,
ISO/IEC 9945

The Open Group Base Specifications Issue 6

The Core of the Single UNIX Specification V3
The Austin Group

- The Austin Group combines the formal standards process of the IEEE and ISO, with the industry standards of The Open Group and the community at large.

- Electronic participation

- Participation in the group is free.

- The final standard in html is available for free download from the world wide web.
Motivation for the Profiles Standard

- The POSIX 1003.1 Standard:
  - Allows writing portable real-time applications
  - Very large: inappropriate for embedded real-time systems

- POSIX.13:
  - Defines four real-time system subsets (profiles)
    - Minimal: Small embedded systems
    - Controller: Industrial controllers
    - Dedicated: Large embedded systems
    - Multi-Purpose: Large general-purpose systems with realtime requirements
  - C and Ada language options
POSIX 1003.13-2003

- Approved December 10\textsuperscript{th} 2003
- A set of POSIX Realtime profiles
- Supersedes POSIX.13-1998 updated to address
  - 1003.1-2001 (which includes all of realtime POSIX)
  - Profiles of all 1003.5-series standards (Ada bindings to POSIX)
  - Field experience with 1003.13-1998
  - Input from the Linux, realtime and/or embedded Linux, and traditional RTOS communities
POSIX 1003.13

- POSIX 1003.13 is a subprofile standard of 1003.1-2001
  - It allows diverse realtime operating systems “clothed” with a runtime library to comply
  - This standardizes the application-to-RTOS API, allowing considerable application code portability between different RTOS offerings, which portability had not been possible in the past
  - RTOS+wrapper offerings can be compared and competed directly
  - There are currently four profiles
POSIX 1003.13 Profiles Overview

- Defines four real-time system subsets (profiles)
  - **Minimal**: Small embedded systems
    - Platform: Small embedded system, with no MMU, no disk, no terminal
    - Model: controller of a “Toaster”
  - **Controller**: Industrial controllers
    - Platform: Special purpose controller, with no MMU, but with a disk containing a simplified file system
    - Model: industrial robot controller
POSIX 1003.13 Profiles Overview

- **Dedicated**: Large embedded systems
  - Platform: Large embedded system with file system on disk, with an MMU; software is complex and requires memory protection and network communications
  - Models: avionics controller, cellular phone cell node

- **Multi-Purpose**: Large general-purpose systems with realtime requirements
  - Platform: Large real-time system with all the features, including a development environment, network communications, file system on disk, terminal and graphical user interfaces, etc.
  - Model: workstation with realtime requirements:
    - air traffic control systems
    - telemetry systems for Formula One racing cars
POSIX 1003.13 Profiles

Portable Operating System Interface
IEEE  Standard POSIX 1003.13
POSIX 1003.13 Timeline
POSIX® Certified by IEEE and The Open Group

How compliance claims can be proven....
Program Principles

- Clear and well-defined:
  - certification policies
  - processes for achieving and maintaining certification
  - based on industry best practice.
- Certification backed up by conformance testing
Certification Agreement

- Vendor guarantee of conformance to specifications.
  - Vendor 'Warrants & Represents'
- This guarantee ensures that:
  - Products conform to a specification
  - Products remain conformant throughout the life of the product’s registration
  - Any non-conformance will be fixed in a timely manner
Benefits of Certification(1)

- For Procurement:
  - Assurance of POSIX conformance and interoperability
  - Level of assurance matched to the needs of the particular application
Benefits of Certification (2)

- Suppliers can demonstrate and provide objective evidence to their customers that their products are compliant with the industry recognized 2003 edition of IEEE 1003.1 POSIX Standard

- Products that successfully pass all the test suites and obtain a related certification certificate are able to carry the POSIX Certified trademark
Available Certifications

- 1003.1-2003 Base
  - 1003.1-2003 System Interfaces
  - 1003.1-2003 Shell and Utilities
- PSE52 Realtime Controller 1003.13 Product Standard
- PSE54 Multipurpose Realtime 1003.13 Product Standard
1003.1-2003 Base Certification

- Certification for the *Base mandatory* features of POSIX 1003.1
- 1003.1-2003 System Interfaces
  - Mandatory POSIX System Interfaces
  - Tested by VSX-PCTS2003
- 1003.1-2003 Shell and Utilities
  - Mandatory POSIX Shell & Utilities
  - Tested by VSC-PCTS2003
POSIX 1003.1, 2003 Test Suites

**VSX-PCTS 2003**
*System Interfaces & Headers*

**VSXgen** - Generic test suite layer

**Test Environment Toolkit, (TET3.6-lite)**

**VSC-PCTS 2003**
*Shell & Utilities*
POSIX 1003.13 Certification PSE54

- PSE54:2003 Certification
  - Covers in addition to 1003.1 several Realtime options from 1003.1
  - Certification against PSE54 Multipurpose Realtime 1003.13 Product Standard
- Tested by:
  - PSE54-2003 Test Suite
  - VSC-PCTS2003
POSIX 1003.13 PSE54, 2003 Test Suites

VSPSE54:2003
System Interfaces & Headers,
(includes threads and realtime options)

VSC-PCTS 2003
Shell & Utilities
(Includes tests for SDO and UP)

VSXgen - Generic test suite layer

Test Environment Toolkit, (TET3.6-lite)
POSIX 1003.13 Certification PSE52

- PSE52:2003 Certification
  - Certification against PSE52 Realtime Controller 1003.13 Product Standard
  - Tested by:
    - PSE52-2003 Test Suite
POSIX 1003.13 PSE52, 2003 Test Suite

VSPSE52:2003
System Interfaces & Headers,
(base tests plus core threads
and realtime functions)

VSXgen, generic test layer

TETware/RT

Test Architecture Supports
Embedded Target

Figure 2: TETware Realtime Testing Architecture
2006 Updates
POSIX.1/Base Specifications Roadmap

- **2005**
  - ISO C TC2
  - Interpretation Notes to Ed.

- **Jan 2006**
  - Issues Raised in SD/5
  - External Specs Identified

- **July 2006**
  - Revision Underway
  - External Specs Material submitted

- **Dec 2006**

- **2008-**
  - POSIX 1003.1, 200x Edition

Timeline:
- **ISO C TC2**: Issues Raised in SD/5
- **Jan 2006**: External Specs Identified
- **July 2006**: Revision Underway
- **Dec 2006**: Development continues
- **2008-**: Final edition release

Legend:
- Octagons represent key milestones.
- Arrows indicate progression and dependencies.

The roadmap outlines the development phases and timeline for the POSIX.1/Base Specifications, emphasizing key events and milestones from 2005 to 2008.
New Material Submitted

- Open Group Extended API Sets Part 1…4
  - Selected Gnu libc functions
  - Hardened file system related functions
  - Robust Mutexes
  - Thread-aware locale extensions
Changes Anticipated

- Merger of new material
- Revision of the options in the standard
- Changes identified by interpretations and defect reports
POSIX®: Certified by IEEE and The Open Group – a briefing.

The Source for POSIX Certification

http://posixcertified.ieee.org

September 2006.