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

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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*

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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

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What is POSIX?

- Its about *portability*
    - Both programmers and application source code
    - Portability of the OS kernel itself and/or application binary code are <u>not</u> 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

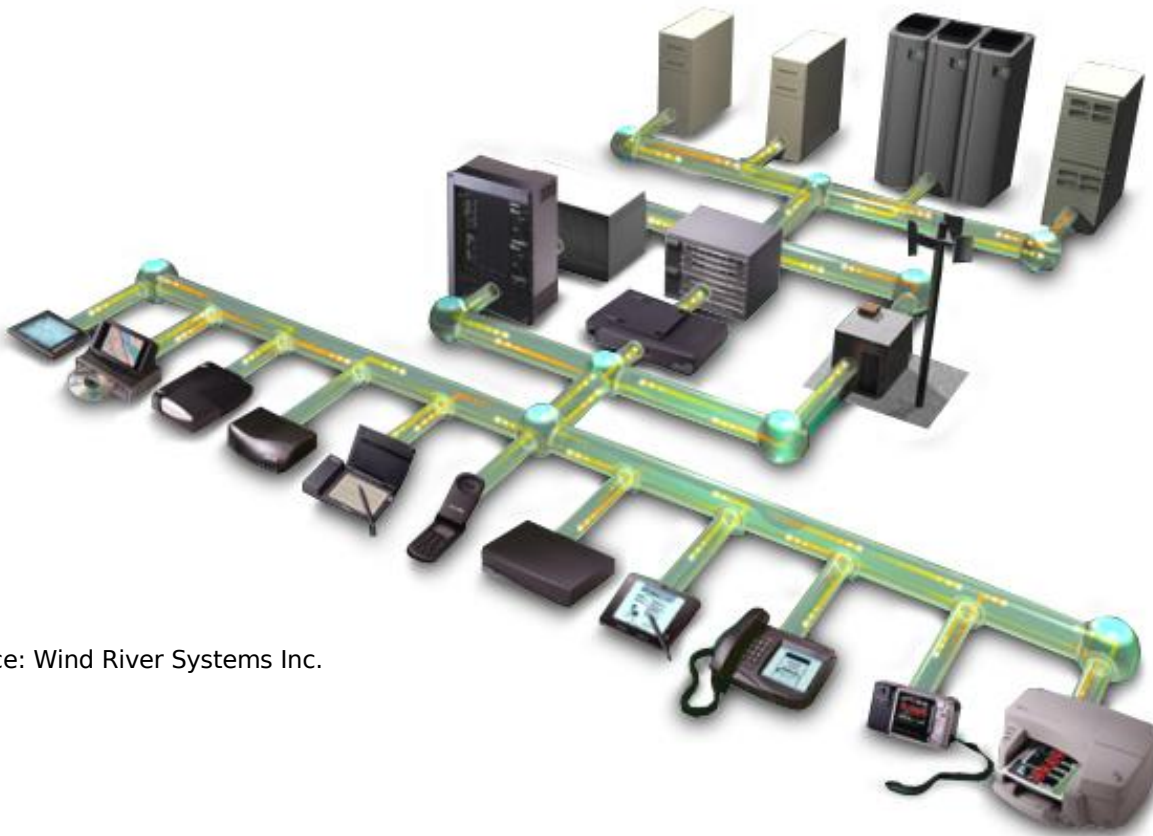THE *Open* GROUP

The Need for Standard APIs

Standardized Functionality
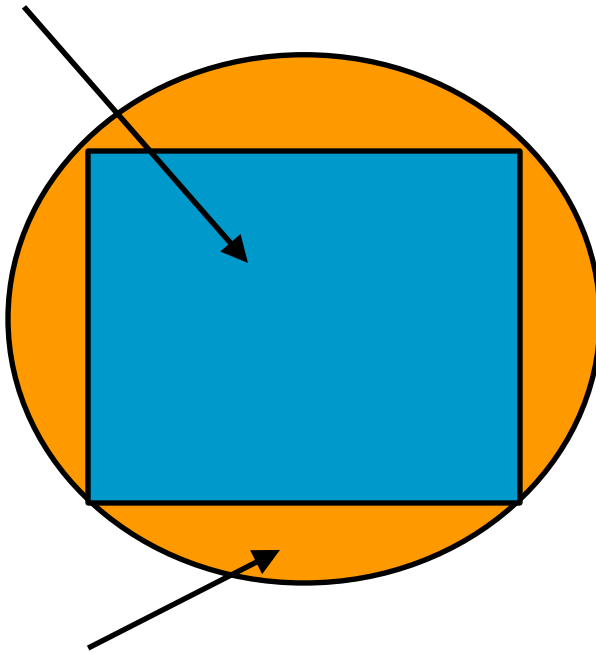
Private Product Specific Functionality

- 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

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Scalable API Portability

Diagram Source: Wind River Systems Inc.

*POSIX APIs support portability across a range of devices*

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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

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The Common *Base* Specifications
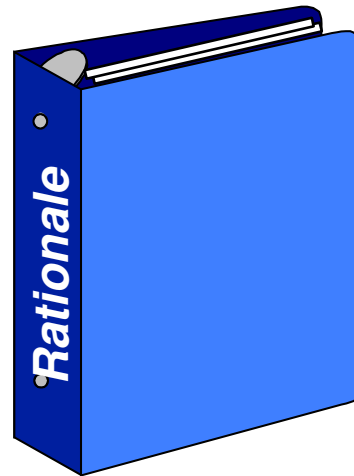
IEEE Std 1003.1,

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.*

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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

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POSIX *1003.13-2003*

- *Approved December 10th 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

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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

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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

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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
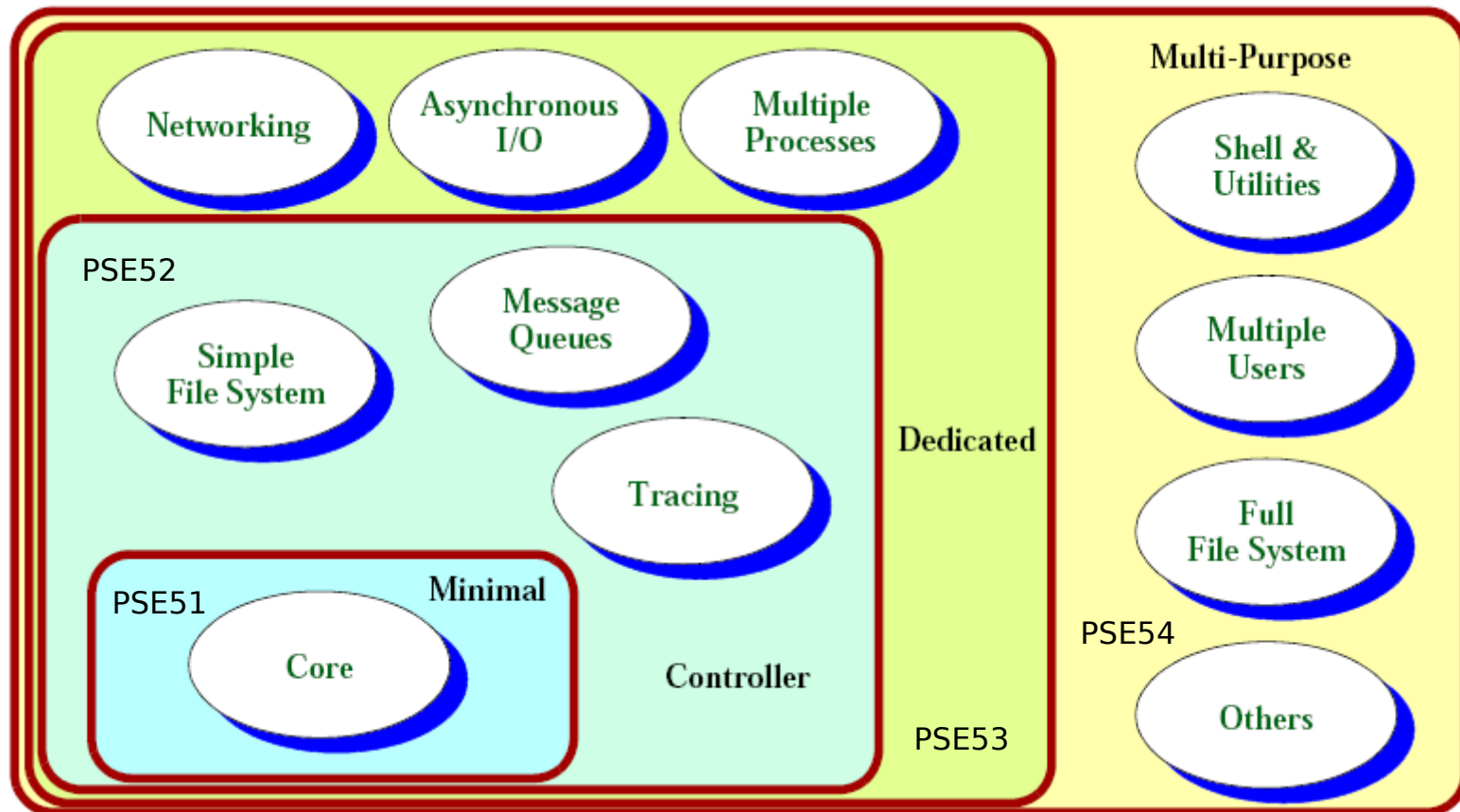
Portable Operating System Interface
IEEE Standard POSIX 1003.13

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POSIX 1003.13 Timeline
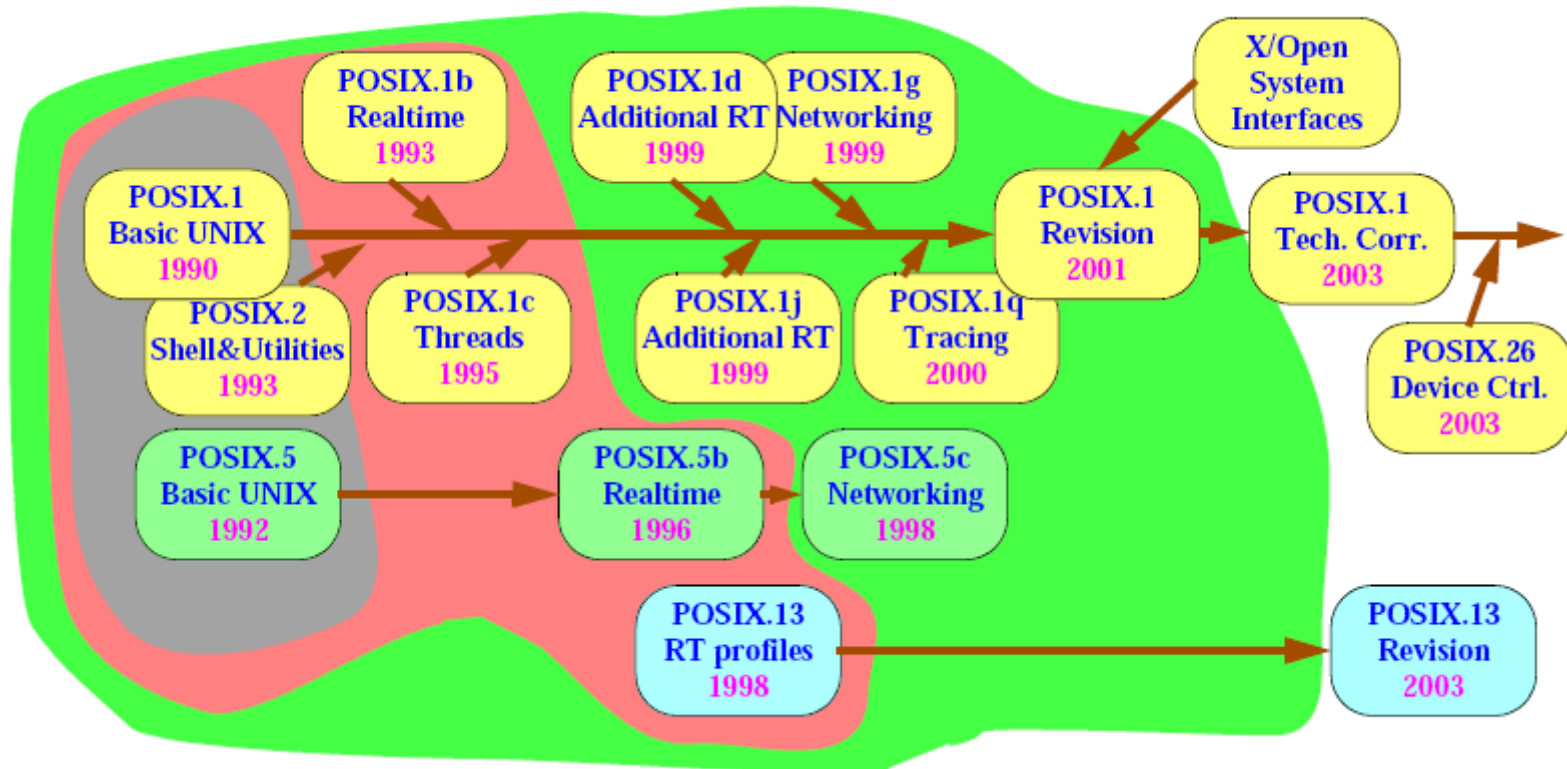
Copyright (c) 2006 The Open Group

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

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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

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Benefits of Certification(1)

❑ For Procurement:

- ▪ Assurance of POSIX conformance and interoperability
- ▪ Level of assurance matched to the needs of the particular application

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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

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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

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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

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POSIX 1003.1, 2003 Test Suites

VSX-PCTS 2003

System Interfaces & Headers

VSC-PCTS 2003

Shell & Utilities

VSXgen - Generic test suite layer

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

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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

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POSIX 1003.13 PSE54 , 2003 Test Suites

VSPSE54:2003

*System Interfaces & Headers,
(includes threads and realtime
options)*

VSXgen - Generic test suite layer

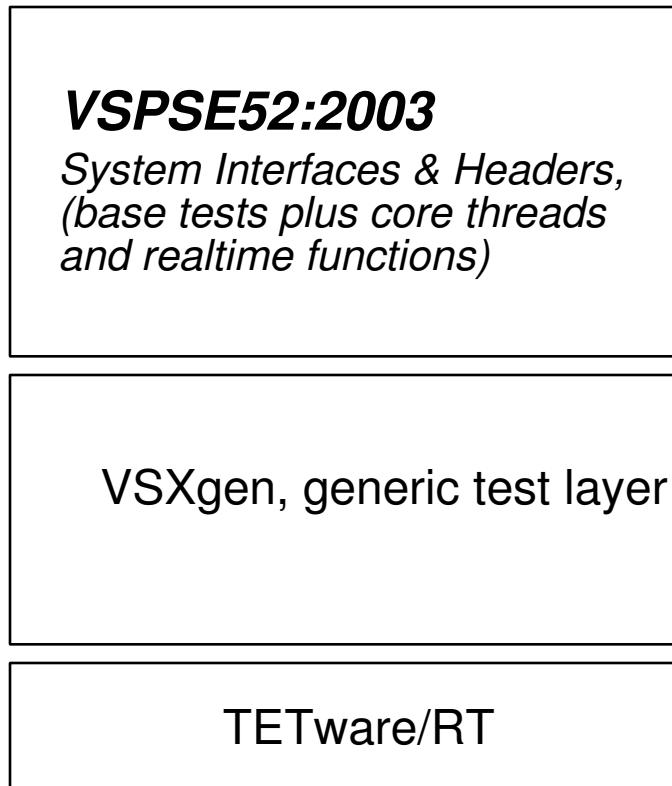Test Environment
Toolkit, (*TET3.6-lite*)

**VSC-PCTS
2003**

*Shell
& Utilities
(Includes
tests for SDO
and UP)*

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POSIX 1003.13 Certification PSE52

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

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POSIX 1003.13 PSE52 , 2003 Test Suite
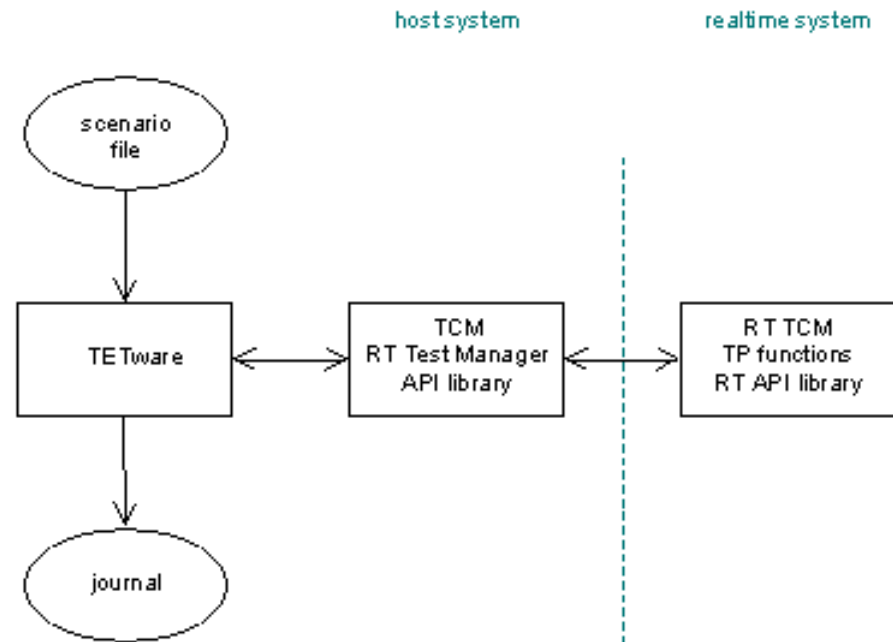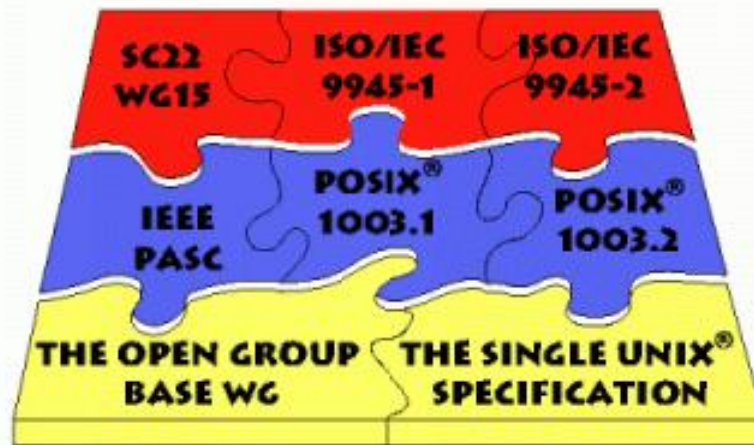
Test Architecture Supports Embedded Target

VSPSE52:2003

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

VSXgen, generic test layer

TETware/RT

Figure 2: TETware Realtime Testing Architecture

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2006 Updates

POSIX.1/Base Specifications Roadmap

2005

Jan 2006

July 2006

Dec 2006

2008-

Interpretation Notes to Ed.

External Specs Identified

External Specs Material submitted

Revision Underway

POSIX 1003.1, 200x Edition

ISO C TC2

Issues Raised in SD/5
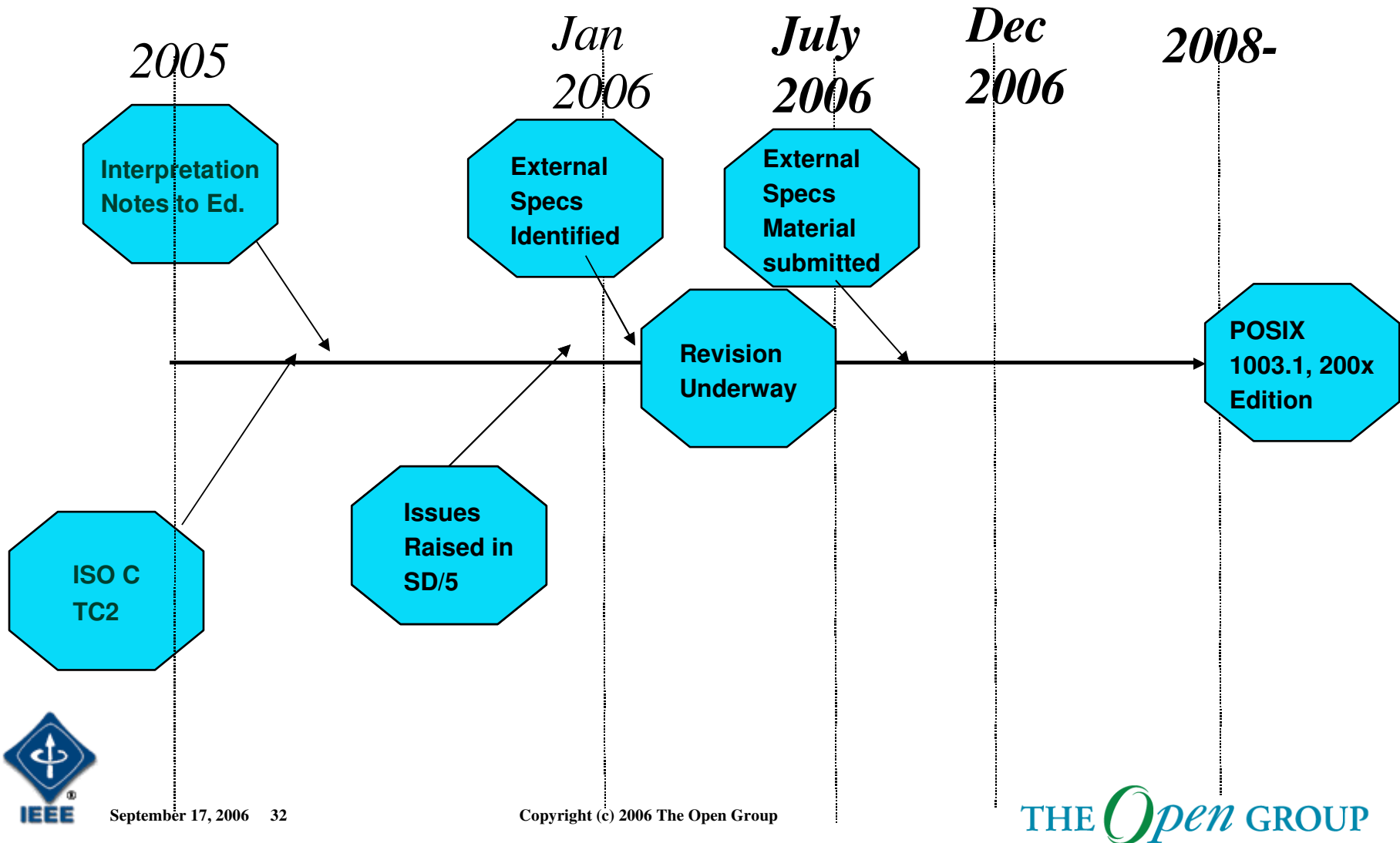
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New Material Submitted

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

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Changes Anticipated

- Merger of new material

- Revision of the options in the standard

- Changes identified by interpretations and defect reports

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September 2006.

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