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IEEE P1003.0 Draft 14 – November 1991

POSIX. 14 Multiprocessing profile.

All three types of profiles can be seen in the next section.

Section 7: POSIX SP Profiling Efforts

Responsibility: Wendy Rauch

7.1 Introduction

This section maintains the list of currently known POSIX Standardized Profiles (POSIX SPs). This list is a factual record of which POSIX SPs exist, or are in preparation, together with a summary description of the scope, scenario, and model for each profile. These POSIX SPs might be useful as building blocks for other profiles.

7.1.1 Approved POSIX Standardized Profiles

There are currently no approved POSIX SPs.

7.1.2 POSIX Standardized Profiles In-Progress

The current efforts to develop POSIX SPs are summarized in Table 7-1.

7.2 General Purpose POSIX SPs

7.2.1 POSIX Platform Environment Profile

7.2.1.1 Rationale and Overview

The POSIX Platform Environment Profile, IEEE POSIX.18, is a platform profile based on POSIX.1 {2} and related standards. It defines the functionality and standards needed for a system that is as similar as possible to the traditional UNIX operating system's interactive, multiuser development and run-time environment.

The platform profile is valuable for many users, vendors, programmers, and procurement officers who do not have the time or desire to analyze and specify all the individual interfaces for a system they need. The platform profile obviates this analysis by enabling the users to point to a single document that specifies exactly what they should order to obtain a system that looks like traditional UNIX systems, except that the POSIX platform profile will be totally based on formal

Table 7-1 – POSIX SPs In Progress

Project Name	Taxonomy	Profile Name	Profile Type
IEEE P1003.10		Supercomputing	Application area profile
IEEE P1003.11		Transaction Processing	Application area profile
IEEE P1003.13		Realtime, Multipurpose Systems	Application area profile
IEEE P1003.13		Realtime Embedded Control System	Application area profile
IEEE P1003.13		Realtime Intermediate	Application area profile
IEEE P1003.14		Multiprocessing Application Support	Platform profile
IEEE P1003.18	USI-P001	POSIX Platform Environment Profile	Platform profile

NOTES:

(1) At this time it is not known whether the three realtime profiles will be contained within a single multipart POSIX SP, or separate single-part POSIX SPs.

(2) While the issue of a taxonomy for POSIX SPs has not been decided, a placeholder has been provided and a proposed taxonomical name for one profile has been listed.

standards.

7.2.1.2 Content of the Platform Environment Profile

The POSIX Platform Environment Profile consists of:

— ISO/IEC 9945-1, with a selection of options and definitions of parameters;

— All of the POSIX.2 (Shell and Utilities) and, optionally, POSIX.2a (User Portability Extension); and

— At least one of the following languages: ISO C, Ada, or FORTRAN.

To reflect the goals and intent of the POSIX.18 working group, the POSIX platform profile document also commits to specifying additional specifications in the future, when those specifications are completed and approved as standards. These specifications include system administration, secure/trusted systems extensions, realtime facilities, verification testing facilities, Ada and FORTRAN language bindings, graphical user interfaces, and network interface facilities.

The POSIX platform profile is expected to be the pioneer Application Environment Profile submitted to ISO for international approval. The concept of Application Environment Profiles and Platform Profiles is new. How ISO handles the international standardization of the POSIX platform profile, and the profile issues resolved, will likely set a precedent followed in the development of other profile standards.

7.2.2 Multiprocessing Systems Platform Profiles

7.2.2.1 Rationale and Overview

The POSIX Multiprocessing Systems Profile (IEEE POSIX. 14) is a platform profile. Like the POSIX PEP (POSIX. 18), the Multiprocessing Systems profile defines the functionality, standards, and options within standards that are needed for development and execution on a multiprocessing platform.

The Multiprocessing Systems profile is intended for use by multiprocessor vendors, application developers, users, and system administrators. It is important because it is designed to support portability of multiprocessing applications, as well as users and system administrators in multiprocessing environments.

The Multiprocessing Systems Profile has two major goals. The first one is to make POSIX safe for multiprocessing. This goal requires the POSIX. 14 working group to identify and address the caveats, problems, and failings of POSIX base standards for multiprocessing platforms. Examples of these failings range from reentrant-function problems to potential problems with threads.

The second goal is to make POSIX useful for multiprocessing. This goal requires the POSIX. 14 working group to ensure that POSIX supports the functionality needed by multiprocessing platforms. An example of this is ensuring that POSIX has capabilities to allow vendors to parallelize software functions. In the absence of parallelizing standards, the details of what happens when the same software functions are used on different multiprocessor system vary.

7.2.2.2 Content of the Multiprocessing Systems Profile

The Multiprocessing Systems platform profile identifies standards, options, and gaps in the standards relevant to multiprocessing. It also identifies additional requirements not satisfied by existing standards and, in an informative annex, suggests interfaces to extended services that can satisfy some of these requirements. In addition, the POSIX. 14 Multiprocessing Systems Group will propose changes and amendments to a variety of relevant standards in order to encourage the specifiers of these standards to add functions and options that accommodate multiprocessing requirements.

Standards particularly relevant to the Multiprocessing System Profile include the POSIX Pthreads extension (IEEE POSIX. 4a), the supercomputing batch scheduling standard (IEEE POSIX. 15), and the supercomputing proposed checkpoint and restart facilities (IEEE POSIX. 10). Since checkpoint and restart facilities will be added to the POSIX .1 {2} standard, POSIX .1 {2} is also of concern to the Multiprocessing Profile.

The Multiprocessing Systems profile will specify both general-purpose-computing and multiprocessor-specific standards. General-purpose standards planned or under consideration for the Multiprocessing Systems profile include:

— The IEEE POSIX. 1 core POSIX system, POSIX. 2 POSIX Shell and Utilities, and POSIX. 2a User Portability Extension;

— The IEEE POSIX.4 realtime extension;

— The IEEE POSIX.4a: POSIX Pthreads extension;

— The IEEE POSIX.6 POSIX security standard and POSIX.7 system administration standard;

— The Ada language bindings (IEEE POSIX.5) and FORTRAN language bindings (IEEE POSIX.9) to POSIX;

— The IEEE POSIX.10 Supercomputing Profile, POSIX.11 Transaction Processing Profile, and POSIX.13 Realtime Applications Profiles.

As other standards emerge, they too will be incorporated in the Multiprocessing Systems profile. An annex of this document will deal with, and list, relevant emerging standards to provide an idea of the Multiprocessing Systems profile's direction.

Multiprocessing-specific requirements identified by the POSIX.14 Multiprocessing working group include:

— System administration tools for multiprocessors;

— Parallelizing compilers;

— Explicit parallelism;

— Threads;

— Thread-safe libraries;

— Message-passing IPC;

— Parallel utilities (e.g., `find`, `grep`, `make`, etc.);

— Scheduler controls;

— Processor allocation: mandatory/advisory;

— Processor binding;

— Degree of symmetry: I/O, computation, memory.

Standards will be needed for many of these requirements. Many of these requirements will, therefore, become the subject of a POSIX.14 working group proposal for a new standardized function or an option in other standards.

7.2.3 Supercomputing

7.2.3.1 Rationale and Overview

The Supercomputing Application Environment Profile (IEEE POSIX.10) is a profile designed to support application and programmer portability in POSIX-based supercomputer environments. The profile's goal is to allow supercomputer application code to be ported to other sites, reduce the learning curve of users, and encourage production of timely third-party applications.

The need exists for such a profile because of the differences between supercomputing environments and traditional application environments. One difference is that supercomputing jobs are computationally intensive, very long running, and very demanding of resources. Another is that the cost of the supercomputer CPU and many of its peripheral resources is extremely high.

Ordinary POSIX standards are not applicable in their entirety to supercomputer environments because the traditional UNIX-based POSIX functions are not adequate to meaningfully manage the use of, and accounting for, a supercomputer or its resources. Furthermore, supercomputers need much better tape handling, multiprocessing, and other capabilities than POSIX or UNIX specifications presently support.

7.2.3.2 Content of the Supercomputing Profile

The Supercomputing Application Environment Profile identifies POSIX base standards and other relevant standards that support supercomputing requirements. Where none exist, the POSIX.10 working group will define the functionality itself, or instigate the formation of a new group to define it. In addition, the POSIX.10 working group is taking some of the traditional modifications built to allow UNIX systems to run on supercomputers, and making those modifications both consistent across supercomputers and portable to users, system administrators, and applications.

Base computing standards specified by the supercomputing profile (or planned for specification when the standards are completed) include:

— The IEEE POSIX.1 {2} core POSIX system, POSIX.2 POSIX Shell and Tools, and POSIX.2a User Portability Extensions (and the corresponding FIPS standards);

— The IEEE POSIX.4 realtime work (particularly the use of its asynchronous I/O facility);

— The IEEE POSIX.6 POSIX security standard and POSIX.7 system administration standard;

— Several graphics standards, including ISO GKS, PHIGS, and CGM, ANSI IGES, and the X Consortium's PEX.

— X3H2.6 (also called X11) for windowing;

— Several programming languages, including ISO, ANSI, and the NIST's FIPS for C, FORTRAN-77, Pascal, Ada, Common LISP, and COBOL.

— TCP/IP protocol stacks and network applications (e.g., file transfer and messaging) now and OSI in the long-term;

— The IEEE POSIX.8 Transparent File Access standard for distributed file management;

— The X3T5.5 Remote Procedure Call (RPC).

The nonstandardized and nonavailable supercomputing functions identified in the POSIX. 10 profile include:

— Batch system scheduling, administration, and network definition;

— Checkpoint recovery;

— A resource manager;

— A better tape management facility;

— Better mass storage/archiving facilities.

There are no existing standards for batch scheduling and administration facilities. Batch scheduling and administration extensions to POSIX base standards are currently being defined by the IEEE POSIX. 15 working group—a group spawned by the Supercomputing profile working group.

To meet recovery and archiving requirements, the POSIX. 10 working group defined system interfaces for functions that perform ''checkpoint,'' ''restart,'' and better magnetic tape handling (e.g., to rewind a tape under program control). These interfaces have been submitted to the POSIX. 1 working group for inclusion in the next POSIX .1 {2}revision.

7.2.4 Transaction Processing

7.2.4.1 Rationale and Overview

The Transaction Processing Application Environment Profile (IEEE 1003.11) is intended to support the development of portable online transaction processing (OLTP) applications in POSIX environments. This profile is targeted at application developers and open system services suppliers. It is important because transaction processing is a major area of business for most large computer vendors and it plays a major role in the daily operations of most users. There are currently no existing POSIX functions that specifically address OLTP needs.

7.2.4.2 Content of the Transaction Processing Profile

The Transaction Processing profile's goal is to identify the interfaces and standards relevant to OLTP , and optional functions in existing standards that must be made mandatory for OLTP applications. The profile will specify general-purpose standards, as well as standards unique to OLTP.

The Transaction Processing Profile's specifications include or plan the following generic and transaction processing-specific standards:

— The ISO /IEC 9945-1: 1990 (POSIX 1003.1) core POSIX system interfaces (including required options, minimum values for certain variables, and particular environment variables needed for OLTP applications);

— The IEEE 1003.2 Shell and Utilities' software development utilities option, C language development utilities option, and C language bindings option;

— The IEEE 1003.2 `getconf` utility;

— The realtime files and asynchronous input and output features from the IEEE 1003.4 Realtime POSIX Extensions;

— The IEEE 1003.6 POSIX security standard;

— The ISO/IEC, ANSI, and FIPS C and COBOL programming languages;

— TCP/IP networking in the short term and OSI in the long-term;

— The X3T5.5 Remote Procedure Call (RPC)

— The ISO SQL database language;

— The ISO Distributed Transaction Processing 10026.1, .2, and .3 for communication of transaction information.

The Transaction Processing profile also identifies extensions needed to existing standards to support distributed transaction processing. Important extensions that need to be defined include those related to the two-phase commit, as well as others related to making RPCs robust.

The P1003.11 working group is working with the ISO RPC Group to add transaction semantics to the Networking working group's RPC specifications. These extensions will be incorporated in the Transaction Processing profile. Plans are also for the 1003.11 profile to draw on the transaction processing work being produced by the X/Open consortium, particularly on the XA interfaces (the interface between a Transaction Manager and a Resource Manager).

7.2.5 Realtime Application Profiles

7.2.5.1 Rationale and Overview

Different types of realtime applications have different characteristics and diverse requirements. For example, embedded systems generally do not need the full functionality of an operating system, nor do they require all the IEEE POSIX.4 realtime extensions. Compliance with the entire realtime standard and/or POSIX operating system interfaces could reduce the embedded system's responsiveness and increase the amount of memory needed for systems that need to be embedded in limited space. High-end realtime systems, on the other hand, have softer realtime requirements. However, they need the full operating system and realtime functionality.

Therefore, the POSIX.13 working group was formed to define profiles for various types of realtime applications. The realtime profiles defined will determine which interfaces must be implemented for a given type of realtime system to claim conformance to the realtime standard.

7.2.5.2 Targeted Realtime Application Profiles

The POSIX.13 working group is defining profiles to address several types of real-time applications. These include:

- Low-end, embedded systems (often known as ''hard'' realtime systems);
- Mid-range realtime systems with medium-level critical realtime constraints;
- High-end realtime systems.

7.2.5.2.1 Embedded Realtime Systems

Embedded realtime systems are typically standalone systems used for robot controllers, automated systems controllers, instrumentation, high-speed data acquisition, satellite subsystem control, flight control, some process control, and some testing. Time-critical responsiveness is a key requirement of embedded systems. In the absence of a standard, the realtime functionality required for embedded systems is generally provided by a proprietary realtime kernel or a simple home-grown monitor using memory mapped I/O.

Since low-end embedded systems need only minimal functionality, the POSIX.13 working group will select a relatively small number of POSIX.4 and POSIX.1 {2} functions that will be required for portable realtime embedded systems. These functions will be selected for several types of embedded applications.

One type of embedded application is a minimal system, usually buried deeply in the overall system electronics. Such minimal applications have no requirements for a file system, multiple processes, or I/O via specific device drivers. The minimal realtime profile, however, will specify the POSIX.4a threads extension to support multiple flows of control.

The second type of embedded application is often used in control systems. Realtime controller applications require a file system and threads, but not multiple processes.

7.2.5.2.2 Mid-Range Realtime Applications

Mid-range or intermediate-level realtime profiles are targeted at compute-oriented applications that are typically used in avionics, radar systems, submarines, and medical imaging equipment, as well as controllers that control a group of robots or a subsystem on the factory floor. These applications tend to run on platforms that are dedicated to a single application set or mission mode.

The design complexity of such dedicated realtime applications varies from simple to complex to accommodate a range of requirements. Such requirements may include sophisticated signal processing capabilities, but do not necessarily include a file system. A profile that satisfies these requirements would likely specify most of the POSIX.4 functionality (except for file system facilities), along with relevant options from the POSIX.4 and POSIX.1 {2} standards and the POSIX.4a threads extension.

7.2.5.2.3 High-End Realtime Applications

High-end realtime applications are applicable to complex, multipurpose realtime systems. Such multipurpose realtime systems typically are used in military command and control, in space station control systems, in systems that control robot or factory subsystems, as the operating system for high-end simulation systems, and at high-functionality realtime application that are paced by operator interaction.

The current realtime, multipurpose profile is geared to full-function realtime systems such as simulation applications and embodies most of the existing practice in the simulator world. Since simulation systems have a greater design complexity than embedded or mid-range systems, and need much greater functionality, the multipurpose realtime profile will most likely require all or most of the POSIX.4 and POSIX.1 {2} standards. This profile does not require threads. It does, however, specify the X11 window system as the basis for a human-computer interface.

Annex A
(informative)

Considerations for Developers of POSIX SPs

A.1 Introduction

Responsibility: Bob Gambrel

The contents of this Annex are illustrative of rules that might be developed for the submitters of POSIX Standardized Profiles (SPs).

This Annex contains modifications and comments relating to the use of the *TCOS-SSC POSIX Standards Style Guide* {B6} in POSIX SPs.

A.2 Scope

While Section 6 addressed profiles generally, this Annex addresses considerations for developers of formal POSIX Standardized Profiles. It builds directly upon the concepts, principles, and guidance of Section 6.

Note to reviewers: This Annex is not complete, in that more work is required in the domain of POSIX profiles.

Future work in the area of profiling will be done by IEEE and the standards community. This document, and the guidance it provides, will be updated as appropriate. The major areas expected to be addressed are:

- *International standardization considerations*
- *Conformance issues*
- *Taxonomy of POSIX SPs*
- *Registration of POSIX SPs*
- *Delegation of authority to call something a POSIX SP (Note: Currently, this document does not prohibit another group beside IEEE from calling their document a POSIX SP.)*
- *Clarification of base standards referencing issues such as subsetting and the handling of options*
- *Editorial issues such as guidance on the correct level of detail*

— *Additional guidance on referencing base standards and ‘‘standards in progress’’*

A.3 The Role of POSIX SPs

In 6.3.3.5, a classification scheme was given for profiles in which three different ‘‘types’’ were identified. That scheme is based, essentially, on the scope covered by the profile. Another useful classification scheme, based on scope and on who develops the profiles, is presented in this annex.

Figure A-1 shows these classes of profiles and the relationships between them and base standards.

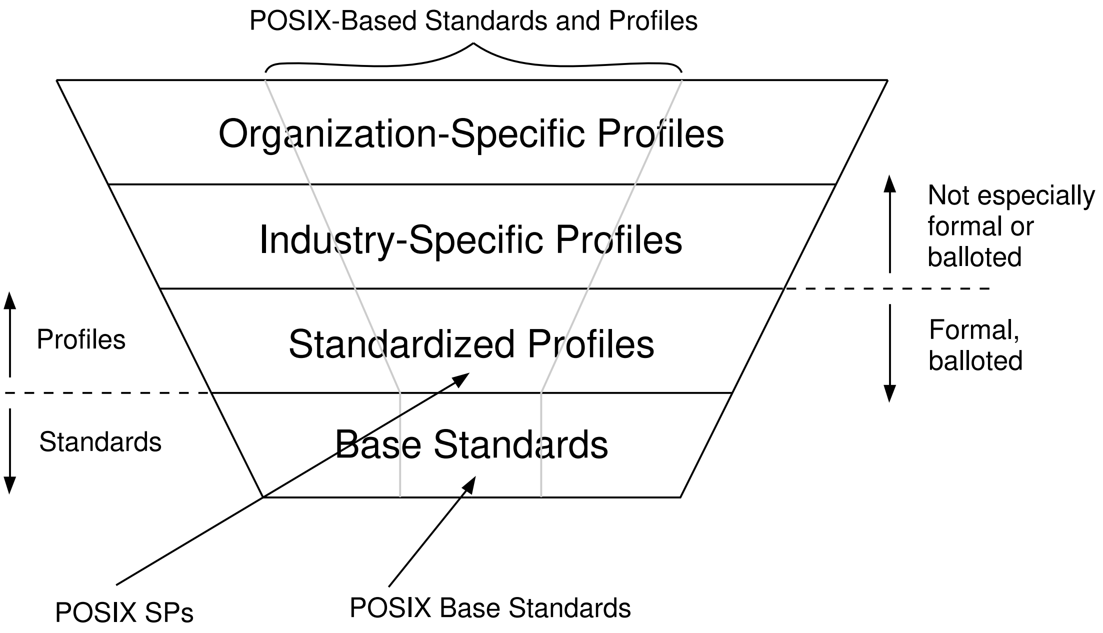

Figure A-1 – Universe of Profiles and Standards

Base standards cover a universe of diverse needs. POSIX base standards (e.g., POSIX.1 {2}, P1003.4, . . .) cover a narrower set of needs related to ‘‘POSIX.’’ In the figure, the POSIX base standards are shown as a small subset of the larger world of base standards.

At the other end of the spectrum, organization-specific (e.g., company-specific) profiles are large in number and range even more widely in their coverage. (There are many more organizations procuring systems, and effectively writing profiles, than there are committees writing standards.)

Industry-specific profiles are based on specific industry needs. From the point of view of the organization-specific profile writer, industry specific profiles are applicable to many organizations (in the same industry), and hence are possibly not precisely what any specific individual organization needs. They address the broad consensus of the industry, from which there is usually deviation when you look at individual organizations whose needs range further.

Standardized Profiles are formal balloted documents. POSIX SPs are the subset of standardized profiles that pertain to the POSIX base standards. While not limited to just POSIX base standards, POSIX SPs nonetheless provide a distinctly POSIX-oriented view of the base standards.

An organization wishing to procure a ''POSIX'' based system, then, could first develop its own organization-specific profile, which it could base on POSIX-oriented industry-specific profiles (if available), which in turn could be based on POSIX SPs, which of course are based on the various POSIX base standards.

POSIX SPs provide an industry-neutral building block for creating industry specific profiles. The developers of POSIX SPs do not have to have knowledge of any particular industry. They furthermore help ensure coherence among the many base standards referenced, particularly among the various POSIX base standards. As such, probably, most POSIX SPs will be created by the IEEE POSIX working groups meeting concurrently with IEEE POSIX base standards working groups. Meeting concurrently at the same place helps ensure the coherence of the base standards and the harmony among the POSIX SPs.

A.4 Special Rules for POSIX SPs

While no rules have yet been developed by IEEE for POSIX SPs, the remainder of this annex gives examples of what such rules might say and identifies some issues for which rules might be drafted.

The following criteria for calling a profile a POSIX SP were developed according to some general principles that have the aim of giving definite value to the word ''POSIX'' when used with regards to profiles. The general principles are:

(1) There is minimum content. Specifically, a POSIX SP must reference some part of the suite of POSIX base standards. (Which part specifically is contentious.)

(2) The POSIX SP must follow a specific approach to conformance (specifically the P1003.3.1 test methodology.)

(3) The POSIX SP must adhere to the POSIX Reference Model.

(4) There is maximum content; i.e., some consideration must be given to how the POSIX SP goes beyond the POSIX OSE as described in this guide.

(5) Exceptions to the previous principles are expected, requiring a rule-making and enforcement body to make those exception decisions.

POSIX SPs are Standardized Profiles that are related to ''POSIX.'' This subclause specifies the rules that need to be followed that distinguish POSIX SPs from ''Non-POSIX SPs''.

Each POSIX SP is based on, and shall include, one of the following two base standards sets:

(1) POSIX.1 {2} or POSIX.2 (as verified by the P1003.3 methodology), or

(2) A particular subset of POSIX.1 {2} and P1003.4 that is being specified for a Minimal Realtime profile (as verified by the P1003.3 methodology.)

Additionally, each POSIX SP adheres to the structure defined by the POSIX OSE reference model.

An approved POSIX SP shall make reference only to base standards identified in this guide (1003.0) as being part of the POSIX OSE. Two specific exceptions to this general rule are allowed for as described here:

(1) Reference can be made to required base standards that are clearly outside of the scope of the POSIX OSE. Examples of the functionality that may require the use of this expedient are:

— Physical connectors

— Electrical characteristics

— Safety requirements

Such reference to items outside the scope of the POSIX OSE shall be justified on a case-by-case basis. It shall be accompanied by details of the body responsible for the distribution and maintenance of the referenced base standard.

(2) Reference can be made to required base standards that are being proposed for inclusion in a future version of the guide. Examples of this would be specification of a later version of a base standard that is already included within the POSIX OSE, or of an additional programming language base standard, not yet included within the POSIX OSE.

In such cases, the POSIX SP should be identified as a POSIX Preliminary SP and the specific references should be clearly noted and justified on a case by case basis.

A POSIX Preliminary Standardized Profile (POSIX Preliminary SP) is a POSIX SP that satisfies all requirements of a POSIX SP except that it is not a subset of the POSIX OSE. [It therefore contains at least one standard or profile that is outside the POSIX OSE. It is expected that application would be made to POSIX.0 to include the standard(s) or profile(s) in the POSIX OSE.]

A further restriction of POSIX SPs is the necessity to (normatively) reference only standards that are recognized by the IEEE. This is limited to IEEE and ISO standards.

Approval of a POSIX SP shall not change the status of any documents referenced by it.

The development of a POSIX SP may indicate the need to modify or to add to the requirements specified in a base standard. In this case, it is necessary for the POSIX SP developer to liaise with the body responsible for that base standard so that the required changes may be made through established methods such as defect reporting, amendment procedures, or the introduction of new work.

A.5 Other Issues

A significant number of issues remain to be addressed concerning the management of POSIX SP development. Some of the issues and the concerns are summarized here.

Coherence

The insurance of coherence among the many base standards referenced by a profile has been found by profile writers to be an onerous task. The profile writer's burden could be eased significantly if base standards writers address coherence at the outset. Specifically, all the P1003.x base standards should be developed to maximize their coherence. This is seen as a management issue for TCOS-SEC, the sponsoring body of the P1003.x standards.

Conformance

The development of conformance statements and test methods for profiles is a significant challenge for profile writers. The challenge is most acute in the area of conformance of standards that are being developed outside of P1003. A premise for the profile writing rules associated with conformance must be that the profile writers are not really experts in the referenced standards. Profile writers (especially at this early period in their development) must not be overburdened with untested conformance writing rules. A possible solution is to create a new project under the auspices of P1003.3 to actually generate new test methods and actually write the necessary assertions for the first profile. (This approach was used also for the initial POSIX base standard.)

Base Standards Working Groups

Because profile writers are in some sense the customers of base standards, it is important for base standards writers to address with priority and urgency the gaps identified in the development of POSIX SPs.

Scope and Number of POSIX SPs

How many different POSIX SPs are appropriate and how broadly ranging should be their scope? Should POSIX SPs be rather narrowly focused, spanning just a few base standards, or should they address a large number of base standards?

Issues Pertaining to Referencing Base Standards

Many practical writing issues pertain to referencing, for instance, parts of base standards. This includes not only referencing options, but even the concept of subsetting, or reducing the functionality of a base standard. Also an issue is how to reference multiple versions of the same standard (e.g., two different COBOL standards.)

POSIX SP Procedures and Rules

What does it mean to be a POSIX SP? Rule making for use of the word 'POSIX'' must address criteria for such use. Also, many issues remain to be resolved in the area of ballot procedures. Should IEEE delegate to others the ability to develop POSIX SPs? If so, should IEEE maintain a registry of such efforts?

A.6 Conformance to a POSIX SP

A POSIX SP must address test methods for itself. In the simplest case, testing the base standards referenced is sufficient. In more complex cases, additional test methods will be necessary. In the worst case (if a base standard is subsetted, for example), the test methods for the base standards may have to be rewritten or expanded within the POSIX SP.

At the same time, P1003.3 will have to consider revisions to the *Test Methods for Measuring Conformance to POSIX* to address test methods for POSIX SPs (e.g., additional assertion types, minimum requirements for testing POSIX SPs, . . .)

A.7 Structure of Documentation for POSIX SPs

This clause gives specific format and content requirements to profile writers who are developing POSIX SPs.

A.7.1 Principles

The requirements for content and format of POSIX SPs are based on the following principles:

(1) Profiles shall be directly related to base standards and conformance to profiles shall imply conformance to base standards.

(2) POSIX SPs shall follow the rules for drafting and presentation of POSIX SPs detailed here.

(3) POSIX SPs are intended to be concise documents that do not repeat the text of the base standards.

(4) Profiles making identical use of particular base documents shall be consistent, down to the level of identical wording in the POSIX SPs for identical requirements.

A.7.2 Multipart POSIX SPs

Many profiles will be documented and published as individual POSIX SPs. However, where close relationships exist between two or more profiles, a more appropriate technique can be used.

Common text between related profiles is essential to ensure consistency, portability, and interworking, to avoid unnecessary duplication of text, and to aid writers and reviewers of POSIX SPs.

A *single-part POSIX SP* shall not contain the definition of more than one profile.

The following rules apply to *multipart POSIX SPs*:

(1) A multipart POSIX SP shall contain the definition of a complete profile or of a related set of profiles.

(2) A part of a multipart POSIX SP may contain a section of the definition of one or more profiles.

(3) Where a multipart POSIX SP includes more than one profile, the part structure shall permit each profile to be the subject of a separate ballot; i.e., its constituent profiles shall be clearly identifiable, and the multipart structure shall ensure that this can be accomplished.

(4) Wherever possible, the references made from one part to another should be to complete parts. However, controlled use of one-way references to sections of other parts is permitted in order to obtain a reasonable multipart structure.

Because there may also be potential disadvantages from overuse of the multipart POSIX SP capability, such as difficulties in gaining approval for a complex linked set of parts, or reduction of the content of a part to a small amount of text, considerable care should be taken with its use.

NOTES:

(1) When a section of text appears in several profiles, possibilities exist for sharing the corresponding code (etc.) for the implementation of several profiles, and the tests applicable to the use of the referenced base standards will be applicable to the testing of several profiles.

(2) It follows that it is in the interest of the implementors to promote the identification of common sections of text as parts of POSIX SPs, but even more to promote, in future standardization and profile work, the use of already defined parts of POSIX SPs, so that profiles fall into a few ‘‘common molds.’’ In particular, this allows implementation of a part of a POSIX SP with confidence that it may be used in the implementation of profiles as yet undefined, so that products are open to future development.

(3) Possibilities exist for a complete profile to be referenced from within the definition of another profile.

A.8 Rules for Drafting and Presentation of POSIX SPs

Throughout this Annex, which is concerned with documentation content and layout, reference is made to POSIX SPs. A POSIX SP, or part thereof, may contain a whole profile definition or part of one or more profile definitions. The wording of the Annex assumes that it is describing an undivided POSIX SP that defines one profile in its entirety. Its application to the other cases is easily deduced. Note, however, that each part of a Multipart POSIX SP shall use the same format as far as appropriate.

A.8.1 General Arrangement

The elements that together form a POSIX SP are classified into three groups:

(1) Preliminary elements are those elements that identify the POSIX SP, introduce its content, and explain its background, its development, and its relationship with other standards and POSIX SPs.

(2) Normative elements are those elements setting out the provisions with which it is necessary to comply in order to be able to claim conformity with the POSIX SP.

(3) Supplementary elements are those elements that provide additional information intended to assist the understanding or use of the POSIX SP.

These groups of elements are described in the following clauses.

A.8.2 Preliminary Elements

A.8.2.1 Foreword

The foreword shall appear in every POSIX SP. It consists of a general part giving information relating to the organization responsible and a specific part giving as many of the following as are appropriate:

- An identification of the organization or committee that prepared the POSIX SP; information regarding the approval of the POSIX SP
- A statement that the POSIX SP cancels or replaces other documents in whole or in part
- A statement of significant technical changes from the previous edition
- A statement of which annexes are normative and which are informative

A.8.2.2 Introduction

The introduction shall appear in every POSIX SP. It gives specific information about the process used to draft the POSIX SP and about the degree of international harmonization that it has received.