Andrew Josey

Base Development

Manager

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The Single UNIX Specification, Version 2

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Agenda

- Open Systems, Portability and the UNIX system
- Formal standards alignment
- Aspen and 64-bit Computing
- Large File Support
- Year 2000 Alignment
- XTI and Sockets update
- POSIX Software Install
- UNIX 98 Brand

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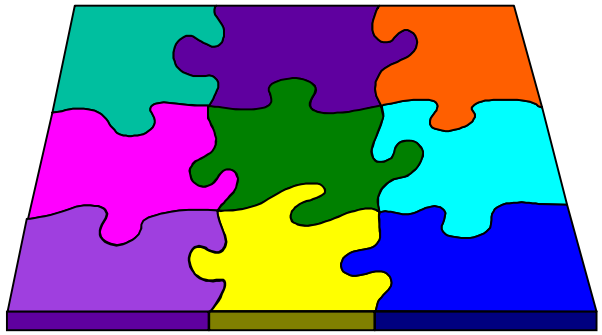
What is an Open System?



An *Open Computer System* is one which is built up from components (products) that adhere to recognized international and industry standards for all interfaces with other components

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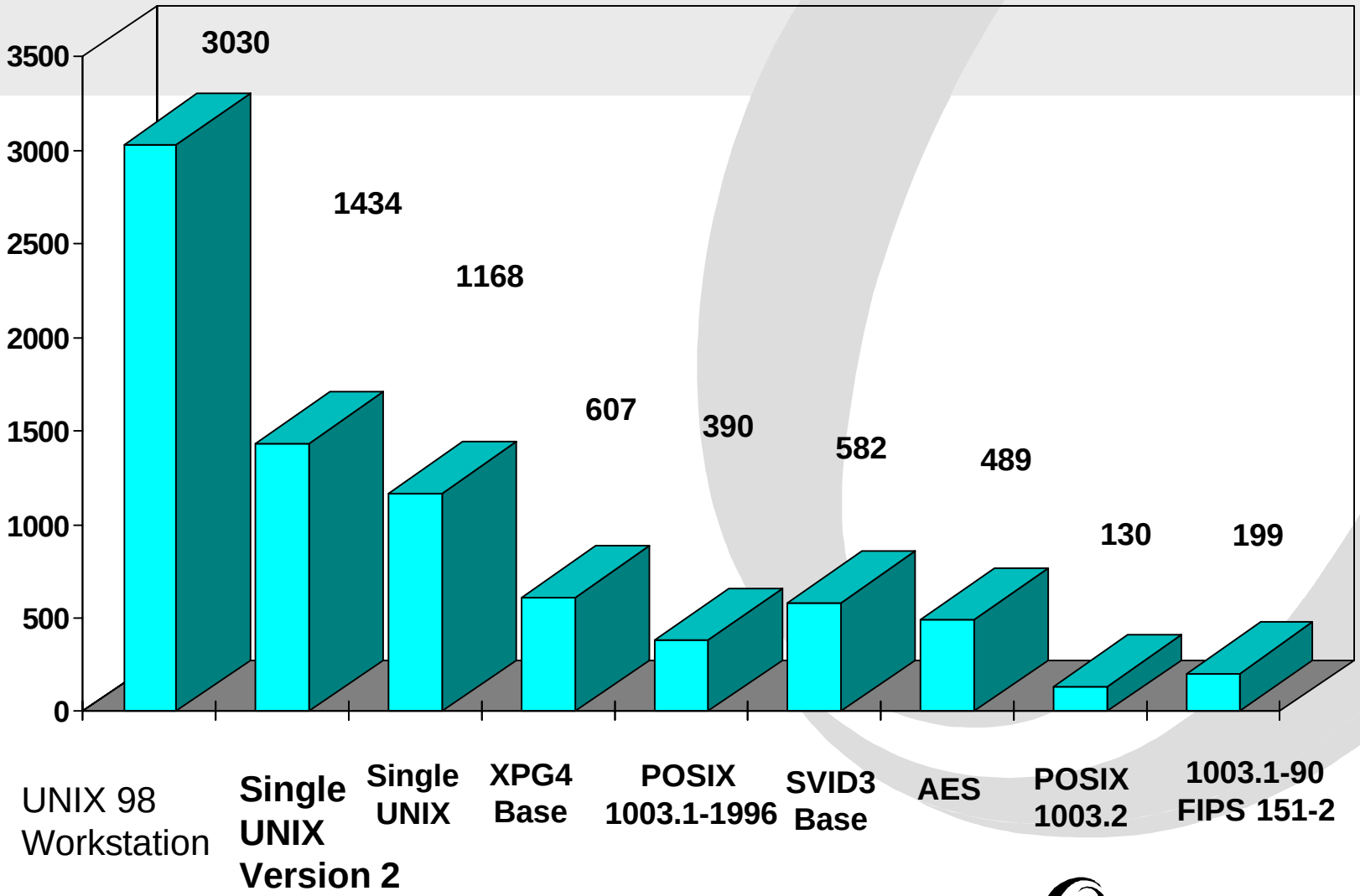
Portability functions



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Evolving the Single UNIX Specification

- **Objectives**
  - **To evolve the *Single UNIX specification* in line with the needs of the market and evolution of technology**
  - **To learn from the experience of *UNIX 95***
  - **To ensure that *UNIX* remains the platform of choice for enterprise mission-critical systems**
  - **To ensure that *UNIX* remains the platform of choice for high-performance graphical applications**

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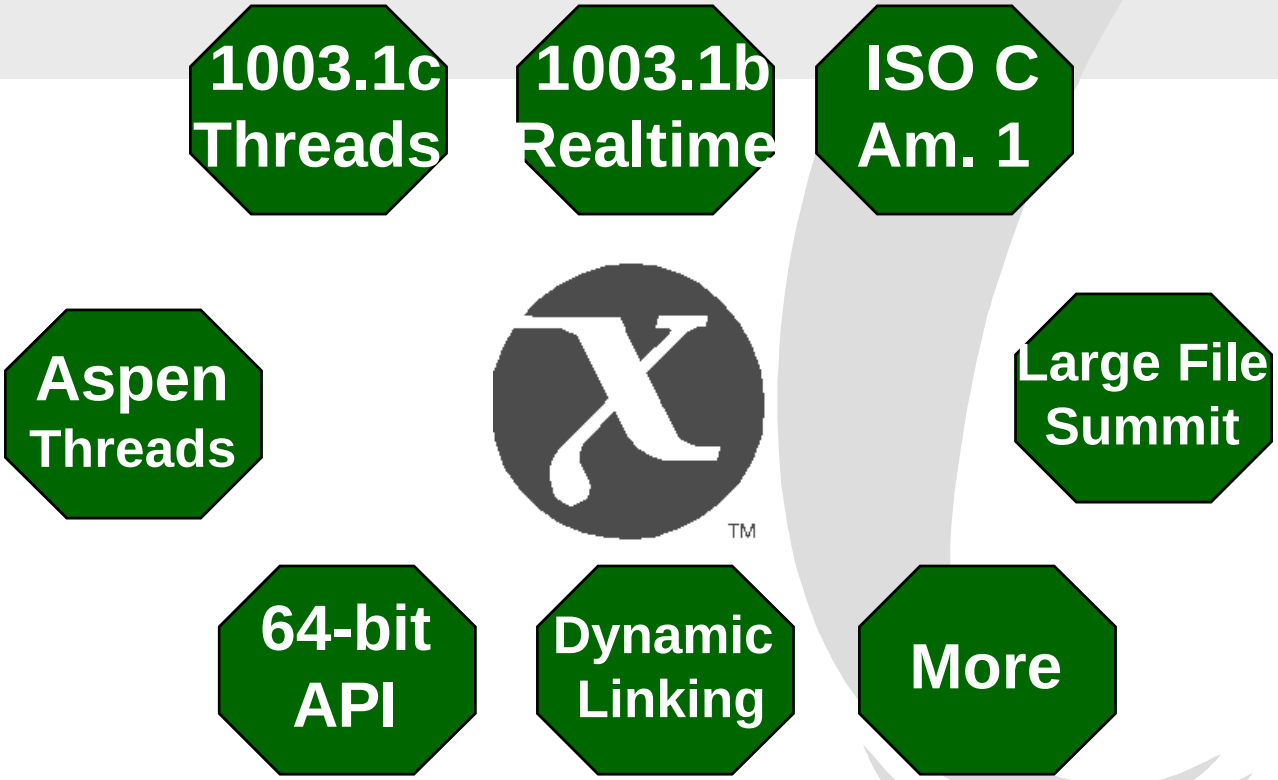
Evolving the Single UNIX Specification and Brand



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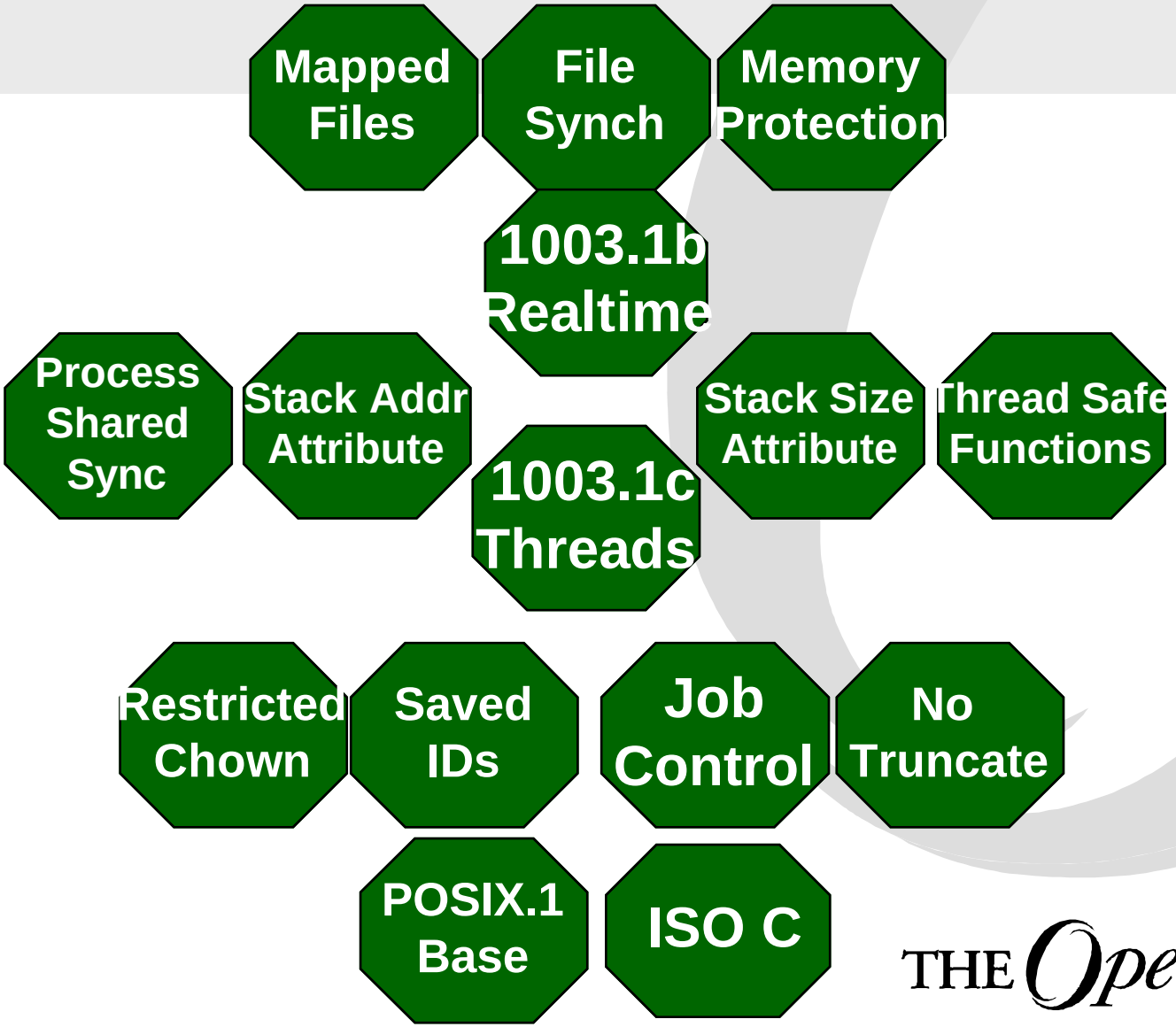
Formal Standards Alignment

- **Builds on the foundation of latest international standards**
  - **mandates POSIX options to form a rich foundation which you can depend on**
- **ISO/IEC 9945-1:1996 (POSIX)**
  - ***Classic* POSIX.1 functionality plus...**
  - **Realtime**
  - **Threads**
- **ISO/IEC 9899:1990/Amendment 1:1995 (MSE)**

Mandated POSIX Options



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Formal Standards Alignment Cont'd

- IEEE Std POSIX.1-1990 ("classic dot one")
  - ISO 9945-1:1990 now superseded by ISO 9945-1:1996
  - All optional features mandated.
  - FIPS 151-2 options mandated (job control and minimum maxima)

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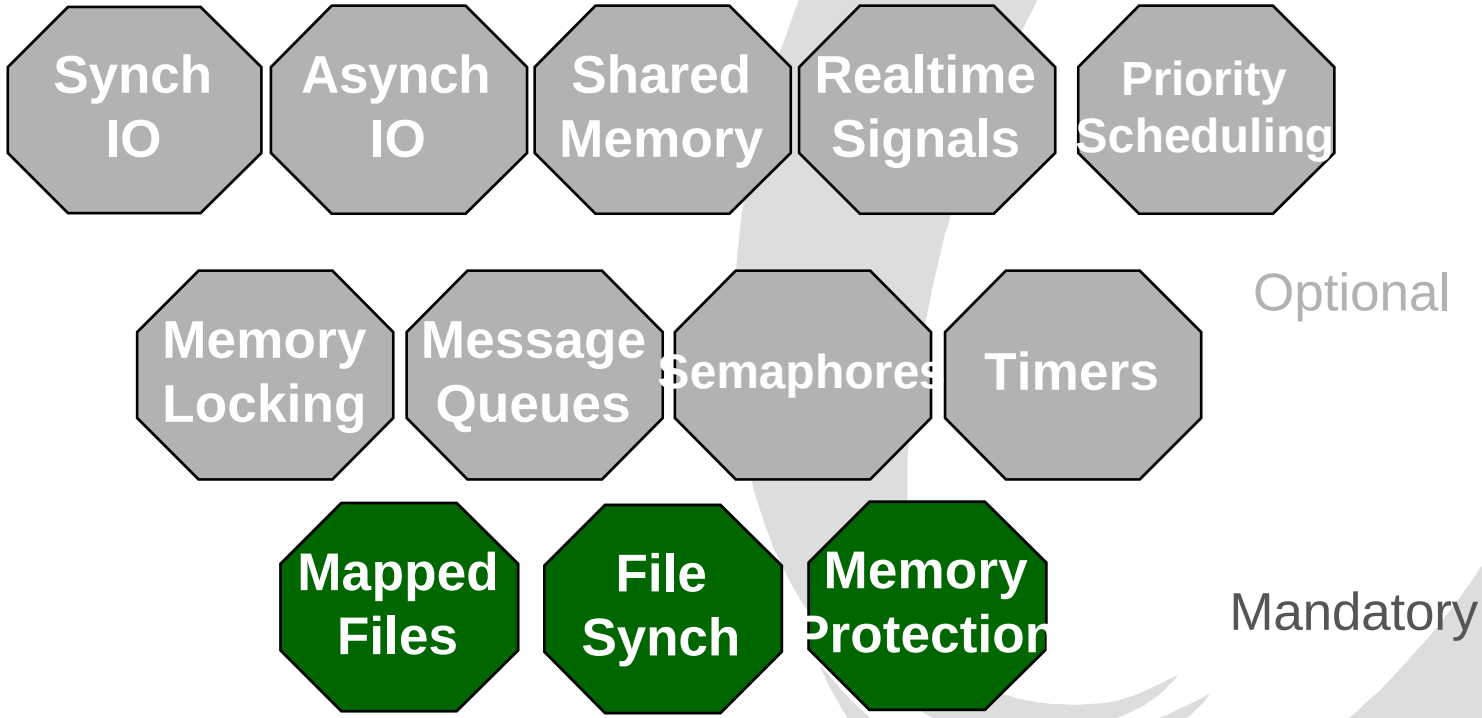
Realtime Processing

- Historically the UNIX operating system has been a general purpose timesharing system
- Todays applications have more stringent performance and robustness requirements
- Require predictable execution characteristics and precise timing.
- The UNIX Realtime extension groups all the POSIX 1003.1b feature groups into a single group, allowing UNIX Realtime systems to reliably contain a cohesive set of Realtime functionality.

IEEE Std POSIX.1b-1993 (Realtime)

- An optional feature group. All optional POSIX realtime functionality mandated within the feature group - denoted by *_XOPEN_REALTIME*
- Expected to be used for procurement of Realtime systems
- Adds 52 new functions and 3 new header files
- Some parts already included in the *Single UNIX Specification* as part of the Base: *mmap(), mprotect(), msync(), fsync(), fchmod(), ftruncate(), <sys/mman.h>*

The UNIX Realtime Feature Group



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The Benefits of Threads

- A large benefit to certain classes of applications
  - typically server or parallel processing
- allows significant gains on multiprocessor hardware
- increases application throughput, even on uniprocessor hardware
- efficient within process communication

IEEE Std POSIX.1c-1995 (Pthreads)

- Adds 84 new functions and one header.
- A robust set of threads specific APIs
  - Thread management
  - Thread-specific data
  - Thread cancellation
  - Thread synchronisation
  - Thread execution scheduling
  - Thread synchronisation scheduling

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Pthreads in the Single UNIX Specificaton

- 70 functions and one header mandatory
- 14 optional interfaces covered by the POSIX constants
  - *_POSIX_THREAD_PRIO_INHERIT*
  - *_POSIX_THREAD_PRIO_PROTECT*
  - *_POSIX_THREAD_PRIORITY_SCHEDULING*

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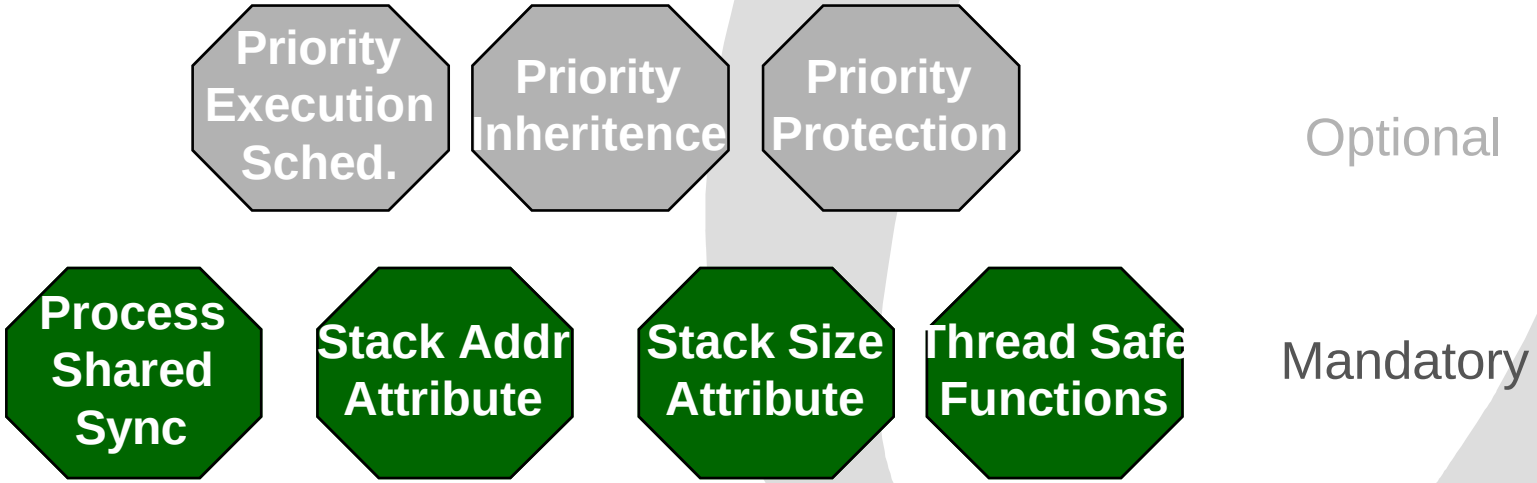
The UNIX Realtime Threads Feature Group



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ISO C Alignment

- **ISO C Amendment 1:1995 (Multibyte Support)**
  - **Further enhances internationalised applications support**
  - **XSH Issue 4 aligned with a previous draft of the MSE**
  - **Adds 26 new functions and 2 new header files**
  - **Some XSH Issue 4 V2 interfaces modified for alignment with final MSE:**
    - **prototype changes: *putwc(), wcsftime(), wcstok()***

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The Aspen Project

- The move to 64-bit computing, built on Single UNIX Specification momentum
- Agreement on a 64-bit C data model
- Threads extensions
- Dynamic Linking extensions
- New commands

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64-Bit Summary

- Agreement on a 64-bit specification
  - LP64 Data Model
  - Single UNIX Specification (API) for 64-bit applications
- Formal handoff of 64-bit specification to The Open Group

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LP64 Data Model

- Defines 64-bit C data types:
  - Longs, Pointers are 64-bits in length ; Integers remain 32-bits in length
- Benefits
  - Provides optimal balance between exploiting 64-bit performance and overall system size and efficiency
  - Enables developers to protect their investment in existing 32-bit and 64-bit applications

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Single UNIX Specification for 64-Bit

- Removed 32-bit dependencies in the single UNIX specification
  - Becomes a data size-neutral API
  - Only a small number of changes required
    - new types added for file block counts, file system block counts and file serial numbers
    - new types within structures used in *<sys/stat.h>*, *<sys/statvfs.h>* and *<sys/time.h>*

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Benefits of Data Size Neutrality

- Enables cost-effective development of new applications for 32-bit and 64-bit computing environments
- Lowers the cost of porting existing 32-bit applications to 64-bit computing environments

Extended Functionality Agreed

- POSIX Thread Extensions
  - Extensively used by middleware
- Dynamic Linking Interfaces
  - Support for emerging class of extensible self-configuring applications
- Utility Interfaces
  - 5 common sysadmin related utilities added

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Aspen Threads

- Many vendors found that *Pthreads* was not complete in solving all requirements
- Several extensions have appeared in the industry
  - UI Threads, DCE threads
- The Aspen Project formed a subgroup to standardize the UNIX threads extensions
- Based on DCE threads, and work done at Sun, HP and Digital.

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Aspen Threads (Cont'd)

- A superset of *Pthreads*
- Set and get level of thread concurrency
- Reader/writer locks, allowing simultaneous read-only access to data
- Extended mutex attribute types and locks
- Extended scheduling policies
- Set guard size for stacks.
- 17 new functions

Dynamic Linking Extension

- A set of 4 functions and one header file to provide a portable API for manipulation of shared objects
- Based on the *dl* functions from SVR4
  - *dlopen(), dlclose(), dlsym(), dlerror()*

Dynamic Linking Benefits

- Provides several benefits for application developers
  - ability to share code across many applications, saves disk and memory
  - allows the implementation of services to be hidden from applications
  - allows re-implementation of services, or multiple implementations selectable at runtime

Aspen Commands

- 5 new utilities included in XCU
- Criteria for inclusion,
  - common usage on UNIX operating systems
  - related to existing UNIX system interfaces
- *fuser, ipcrm, ipcs, link, unlink*

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Large File Support

- The *Single UNIX Specification* has been updated to support large files with unlimited file offsets.
- Based on the 20 March 1996 submission from the *Large File Summit*
  - an industry initiative to produce a common specification for support of files bigger than the current limit of 2GB on existing 32 bit systems
  - *http://www.sas.com/standards/large.file*

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Large File Support (Cont'd)

- Addition error semantics added to 63 functions
- 2 new functions added, *ftello()*, *fseeko()*
- Requirements placed on 27 commands to correctly handle large files

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Year 2000 Alignment

- **The *Single UNIX Specification* has been reviewed for Year 2000 alignment**
- **A white paper has been produced for existing users giving practical advice for users *http://www.opengroup.org/public/tech/base/year2000.html***

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Year 2000 Alignment (Cont'd)

- **Use of two digit dates "86" instead of "1986"**
- **Some APIs and utilities within the *Single UNIX Specification* can use two digit notation**
  - ***getdate()*, *strptime()***
  - ***date*, *prs*, *get***
- **The *Single UNIX Specification* adds century handling and rules for interpretation of two digit dates when an ambiguity exists**

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XTI and Sockets Update

- ***Networking Services Issue 5***
- **n-bit cleanup for XTI and Sockets , the removal of implicit data length assumptions**
- **Threads-aware**
- ***Scatter/gather* functionality added**
- **XTI specified over IPX/SPX**
- **Sockets and XTI specified over ATM**
- **Effort underway to harmonize with P1003.1g**

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POSIX Software Install

- *IEEE Std 1387.2-1995*
- A set of software packaging and administration utilities
- Allows an administrator a consistent way to distribute and install software packages
- Allows developers to rely on standard facilities, rather than developing their own install method

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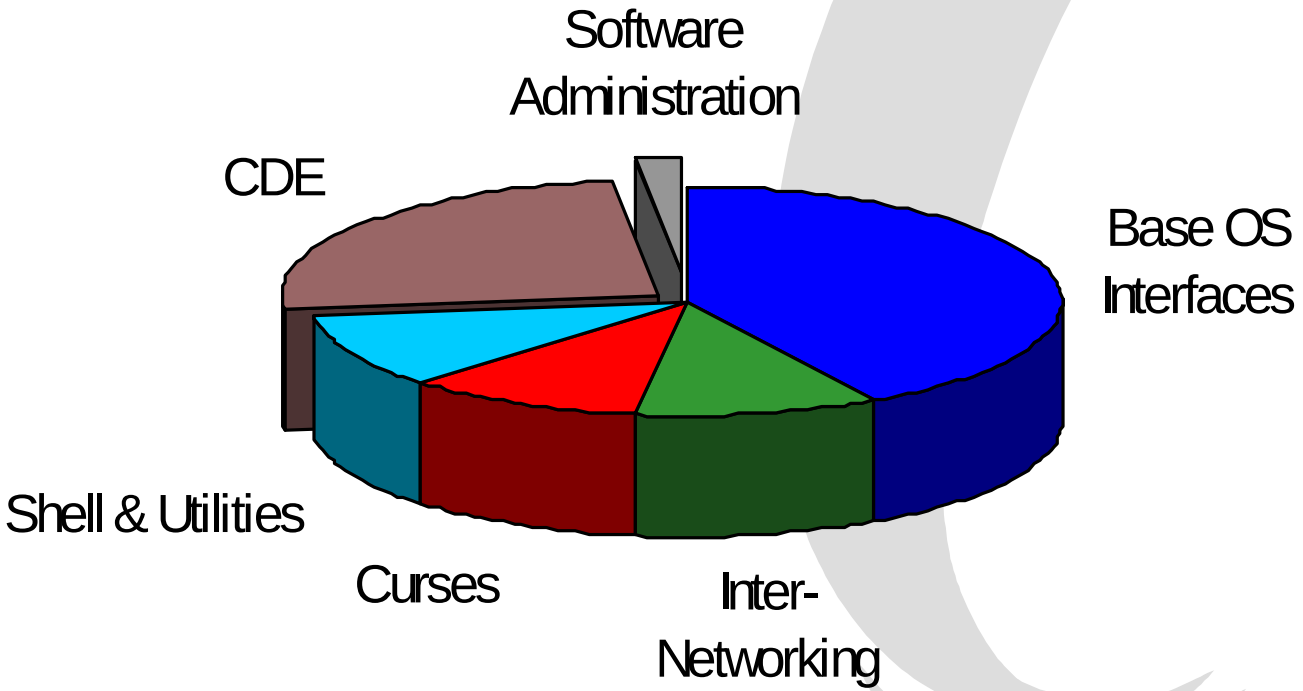
UNIX 98



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Further Information

- **World Wide Web**
  - ***http://www.opengroup.org/unix/***
- ***Go Solo 2 - The Authorized Guide to Version 2 of the Single UNIX Specification***
  - **500+ pages**
  - **CD-ROM with the full 3000 page Specification in HTML and PDF.**
  - **$65 from Prentice Hall**

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