Chapter 1 Sun Operating System (SunOS)

This chapter briefly describes the Sun Operating System (SunOS) philosophy, porting issues in a UNIX® environment, and future SunOS directions.

1.1 SunOS Overview

SunOS merges AT&T System V and Berkeley 4.2 BSD UNIX

SunOS consists of a merged AT&T System V and 4.2BSD UNIX environment, with features of the new 4.3BSD, (see Figure 1-1.) SunOS is an evolving standard with value-added enhancements in programming languages, window systems, graphics, and networking services. Practical knowledge of the rich tools available under the SunOS helps new and existing customers in choosing the correct path to porting their products to the Sun platform.

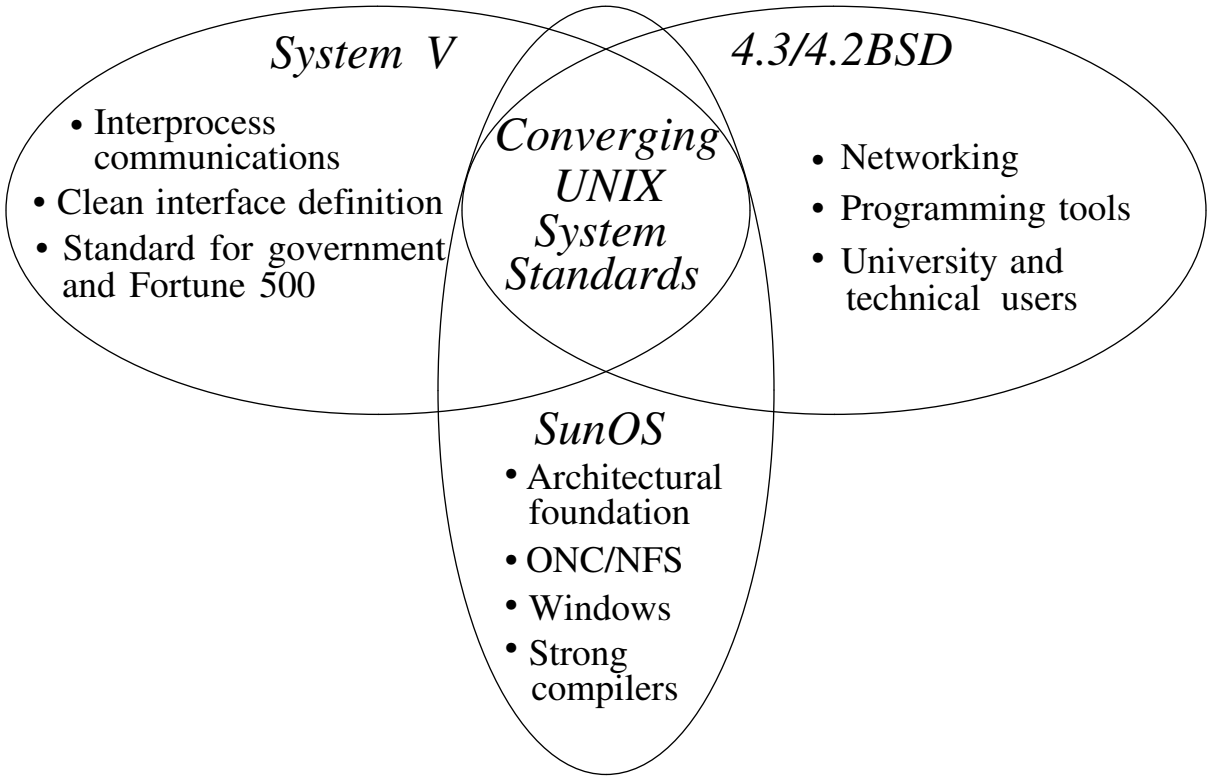

Figure 1-1. Converging UNIX System Standards

More UNIX details are available in *The UNIX System: A Sun Technical Report.*

SunOS provides the software foundation for Sun and third-party applications and works with hardware standards such as the VMEbus, Ethernet®, and popular CPU architectures to provide an integrated workstation environment. (see Figure 1-2.)

Sun Microsystems' current operating system, SunOS 4.0, contains major enhancements in every area of the operating system. Shared libraries, NFS™ diskless support, and the ability to

open up to 64 files per process are just some of the enhancements in this latest version of SunOS. For further information, please refer to *Release Report: SunOS 4.0*.

Appendix B contains detailed installation tips for system administrators upgrading from older releases to SunOS 4.0 . Existing customers should read this carefully before installation.

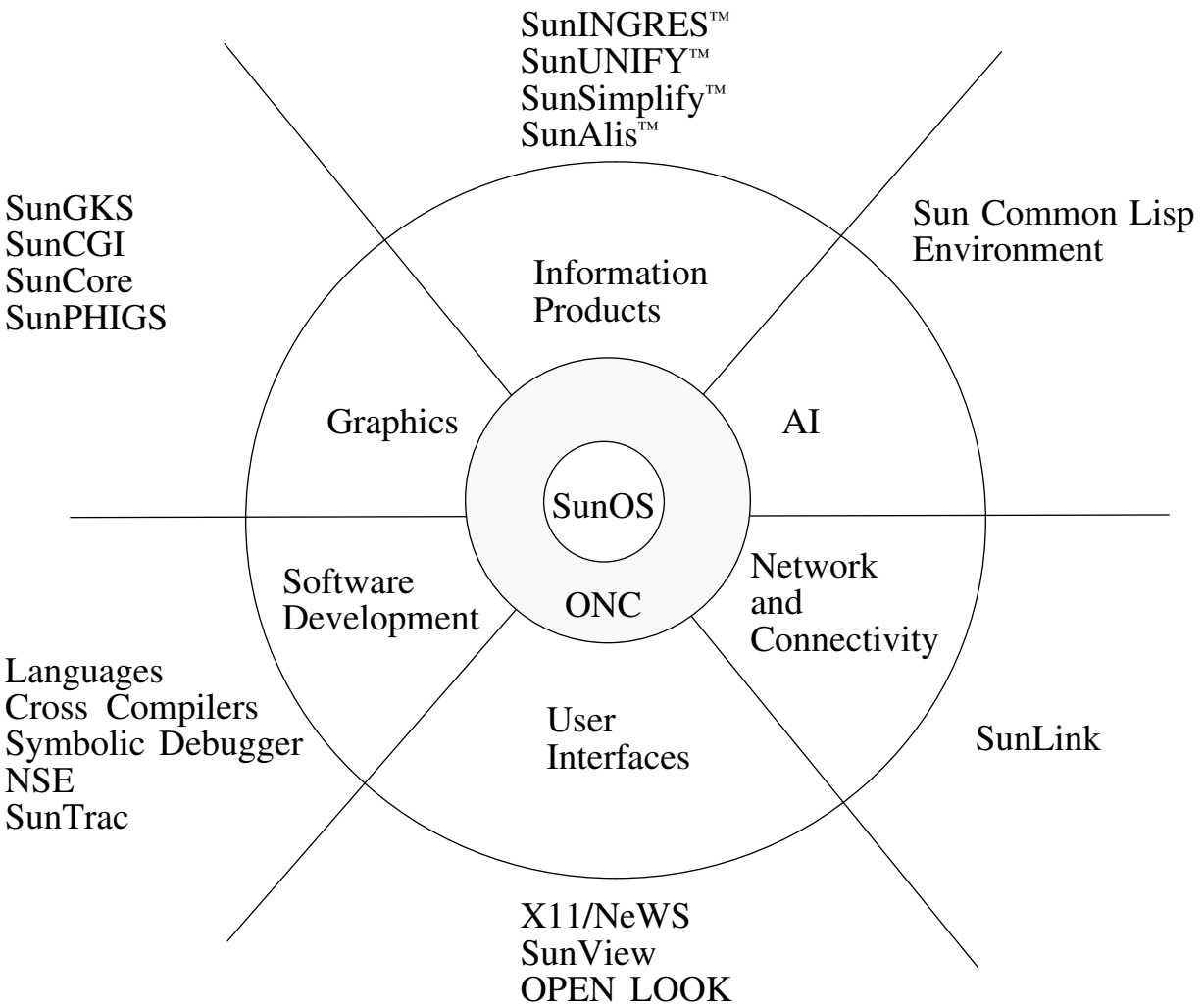

Figure 1-2. SunOS – Open Systems

1.2 UNIX Porting Issues

Porting UNIX applications to another UNIX environment is fairly easy

The UNIX operating system is powerful and is available on many computer architectures from different companies. Many software developers choose UNIX purely for its widespread availability and ease of *porting* their code from one computer to another. Additionally, UNIX has a complete set of software development and debugging tools.

Porting C source code from one UNIX system to another should be a straightforward task. Fortunately, UNIX has tools, such as lint(1V), to assist in developing portable C code. Lint detects bugs, non-portable code, or wasted resources. Lint also checks a program more strictly than the C compiler does. Lint simplifies porting source code from one UNIX system to another. Sun's lint is more strict than similar tools and allows easier migration to Reduced Instruction Set Computer (RISC) processors.

Sun Fortran implements features that facilitate porting between VAX®/VMS® and Sun systems. VMS dependent system calls require recoding to UNIX system calls. For more information on these and other programming language porting issues, refer to Chapter 3*, Programming Languages.*

Vendors who write programs under UNIX often use machine specific software libraries. This design hinders ports that would have been trivial had the original design incorporated *standardized* software packages (e.g., libraries of routines that are available across other UNIX platforms). Software developers interested in writing portable code are therefore encouraged to choose software standards in their design.

1.3 Heterogeneous Environment

Writing portable code is a primary factor for compatibility in a heterogeneous environment

With Sun's multiple instruction set architecture, writing portable code is a primary factor allowing software to run unchanged throughout Sun's product line. Two issues, when addressed properly, allow source code to make the transition smoothly within a heterogeneous environment.

First, portable software should not depend on byte ordering within a word. Software developers may attempt to increase efficiency within various routines by packing bytes into words, then transferring these words to other routines or writing them out to disk in binary format. While this works properly with similar CPUs, it does not allow this data to be shared over a network of heterogeneous computers.

Second, programmers should be aware that data alignment differs between CPU types. This issue often arises when you port programs or write C data structures to disk. Extra padding between structure elements on a RISC machine make this technique incompatible across different CPUs.

Developers are encouraged to address these issues by transferring binary data in an intermediate standard format called eXternal Data Representation (XDR). For further details, refer to the XDR section of Chapter 2.

1.4 Future Directions

Unified UNIX: System V Release 4.0

AT&T and Sun Microsystems, with other UNIX vendors, are in the process of establishing the unified UNIX standard definition, called System V Release 4.0. The standard addresses several issues that affect new ports to these platforms. The first issue concerns the *tools and services* available to users of the unified UNIX. It consists of a true merge of System V and 4.3/4.2BSD UNIX definitions. The second issue addresses the Application Programming Interface (API), which defines the *source code* interface to library routines. Finally, the Applications Binary Interface (ABI) defines the *binary* standard that allows executable code to run unchanged on different platforms that share the same CPU architecture. ABIs will initially be defined for 80386, Scalable Processor ARChitecture (SPARC™), and MIPS processors. The API enables portability across UNIX platforms with no more than a recompilation. ABIs encourage the emergence of "shrink-wrapped" software.

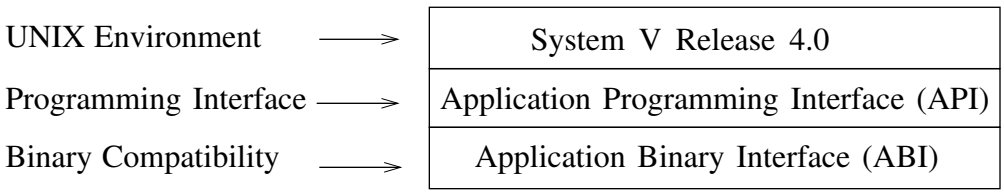

Figure 1-3. SunOS Future Directions

As UNIX continues to evolve, so will SunOS. A future system could support concurrent, multiprocessing, and fault-tolerant hardware architectures and allow commercial extensions such as transaction processing and file mirroring. Integral support for very large multi-user systems with extensive databases is also on the horizon. Security conscious users will have better options with a secure SunOS. As UNIX enters the mainstream in commercial, educational, and governmental arenas, Sun will offer refined ease-of-use features for both the user and the system administrator. For international users, advanced technologies that accommodate demanding character sets will be present in the multilingual UNIX of the future. Sun supports evolving UNIX standards via corporate participation in POSIX, X/OPEN, and other groups committed to furthering the original intent of an open operating system. Sun will preserve the base programming interfaces of today, which will provide implementation flexibility for a single, multivendor, UNIX standard for the 1990s.