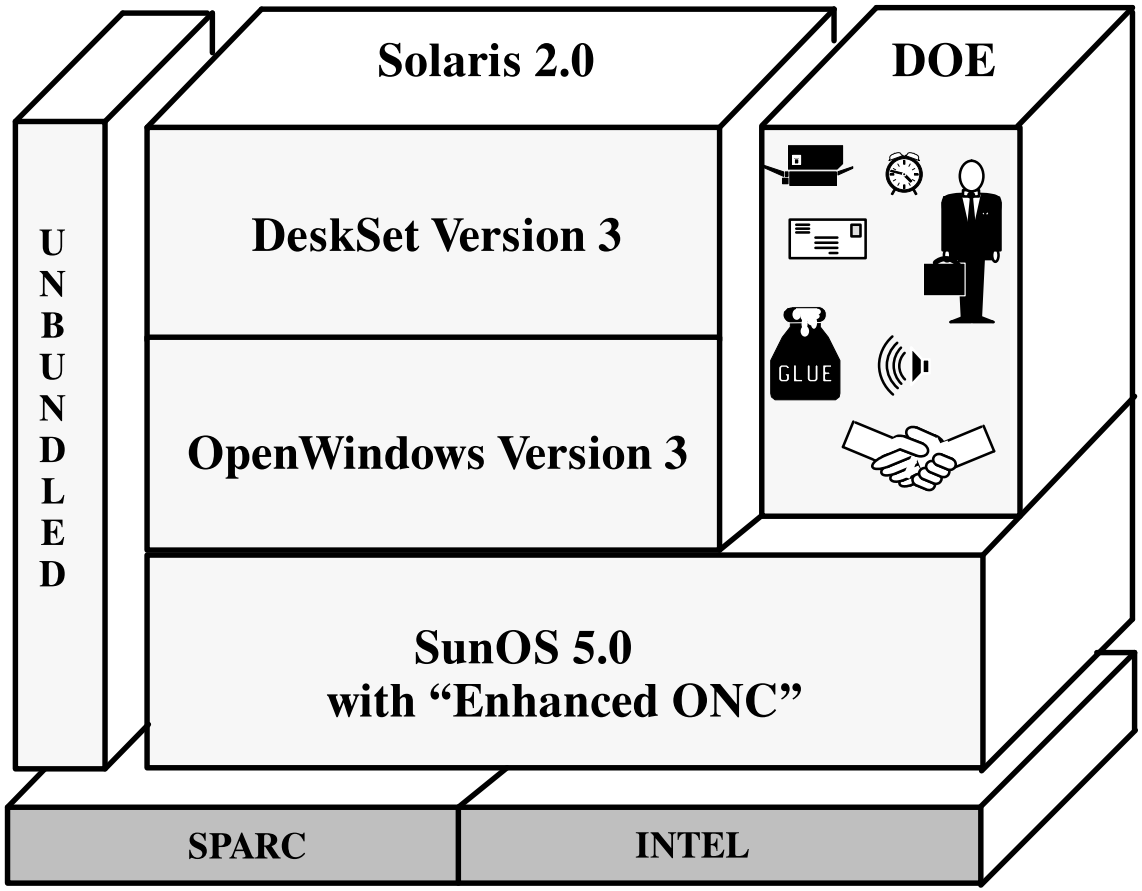
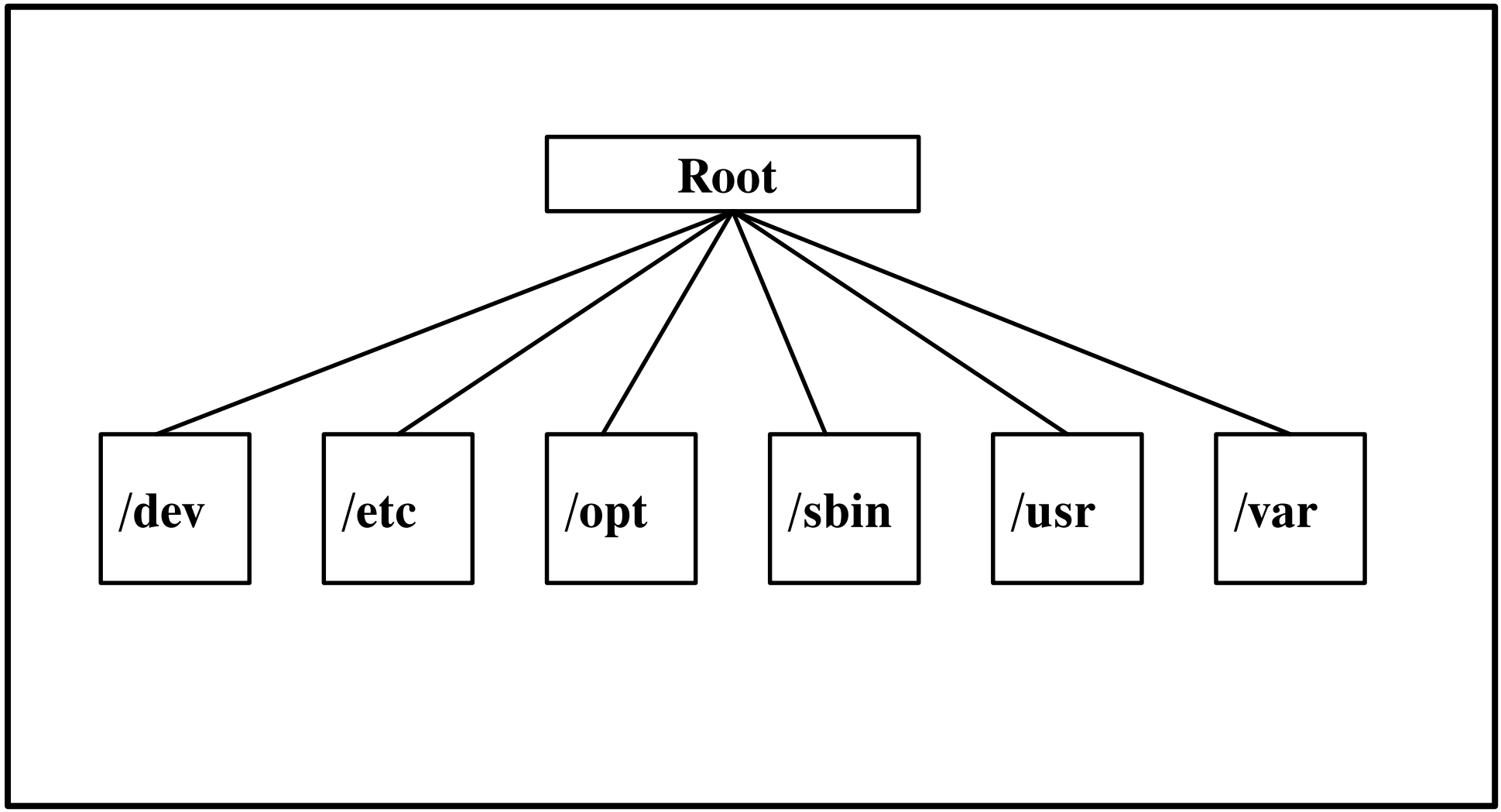
SVr4, SunOS5.0 & Solaris 2.0 Relationship

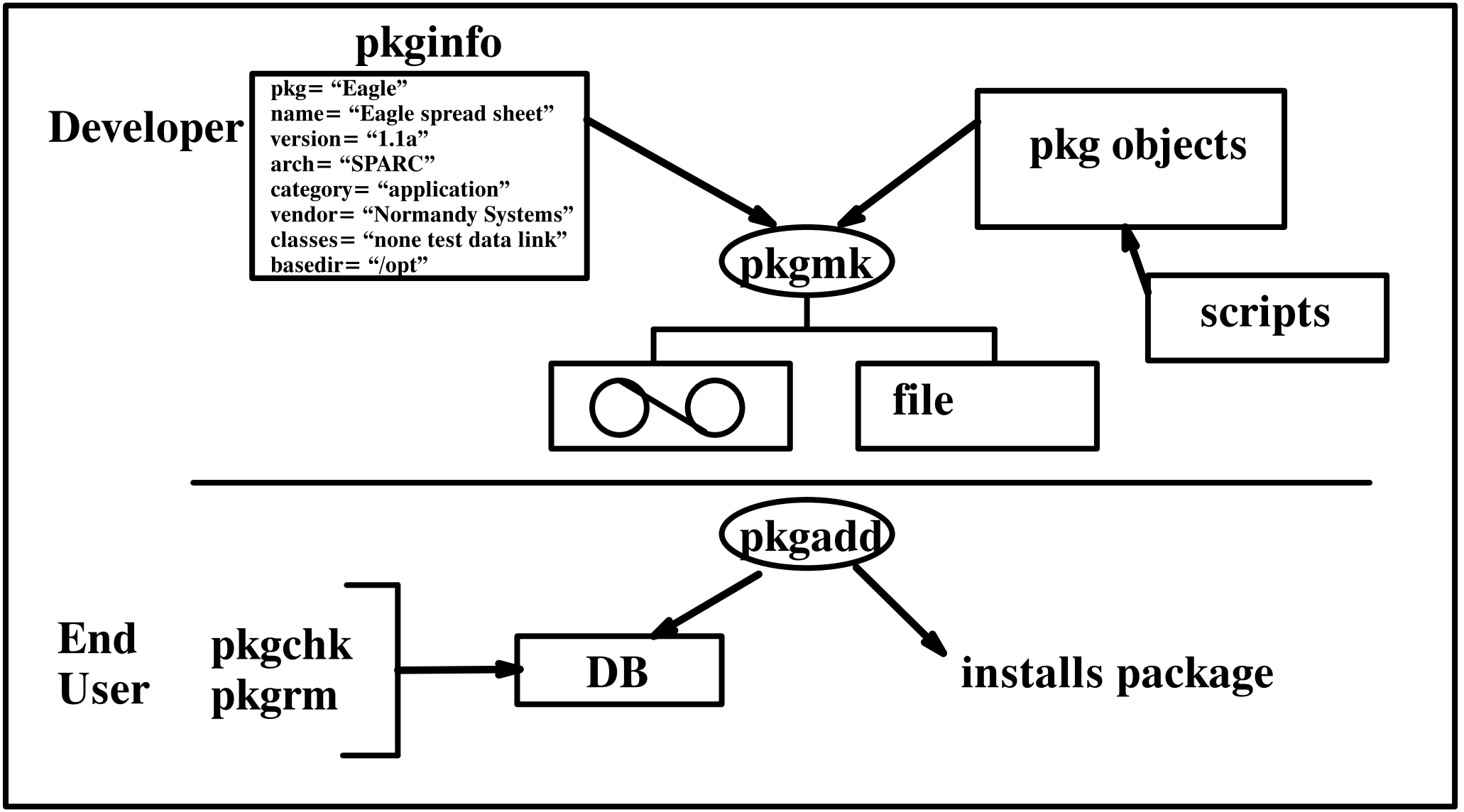


Solaris 2.0: The World's most Powerful and Flexible Distributed Operating Environmentl

Directory Tree



Packaging


pkginfo
pkg= "Eagle"
name= "Eagle spread sheet"
version= "1.1a"
arch= "SPARC"
category= "application"
vendor= "Normandy Systems"
classes= "none test data link"
basedir= "/opt"
Developer
pkg objects
pkgmk
scripts
file
pkgadd
End User
pkgchk
pkgrm
DB
installs package

ls
Internationalization

- 14 Localized keyboards
- Multi−Byte character width libraries (libw)
- Message handling facility (libraries)
- ALE & SV MNLS (EUC − Extended UNIX Code Set)

Shells

- **C−Shell** **csh**
- **Bourne Shell** **sh**
- **Korn Shell** **ksh**
- **Job Control** **jsh**
- **Restricted** **/usr/lib/rsh**
- **Remote Shell** **/usr/bin/rsh**

Security

- Account Resource Management (ARM)
- Automated Security Enhancement Tool (ASET)
- Shadow Password File
- Password Aging
- Disabled Login's
- Account Expiration
- Audit Trail
- crypt & DES
- Other
  - .rhosts
  - restricted shells
  - Secure NFS & RPC

System Administration and Maintenance

- QuickCheck
- Device Management Tools
  - Utilities
- Software Installation Tool

ANSI C Switches on SunOS 4.1.X

- **Xt**
  - **ANSI C plus Sun C Compatibility Extensions *without* semantic changes required by ANSI C.**
  - **Where semantics differ for the same construct the compiler issues warnings and *uses the Sun C interpretation*.**
  - **Default & Recommended mode for SunOS 4.1.1**
- **Xa**
  - **ANSI C plus Sun C Compatibility Extensions *with* semantic changes required by ANSI C**
  - **Where semantics differ for the same construct the compiler issues warnings and *uses the ANSI C interpretation*.**
  - **Use for portability of applications**
- **Xc**
  - **ANSI C Conformance mode without Sun C compatibility extensions**

ANSI C Compiler

- Executable Linking Format (ELF)
- ANSI C features and benefits
  - Standardize existing practices
  - Improved type checking
  - Common front end on SunOS 4.1.X & SunOS 5.0
- BSD Extensions to the library and language
- Dynamic Linking
- Debugging
  - dbx, adb, kadb, truss & cscope
- Compilation switches

  Xt, Xs, Xc

ANSI C Compiler
Unbundled

Window Environment

- OpenWindows Ver. 3.0 Enhancements
  - 24 bit FB support
  - Mouseless operation
  - New drag & drop API
  - Internationalization support
  - Deskset
    - MMMail, AudioTool
    - ToolTalk, & Calendar Manager
- X11 Rel. 4/NeWs
- Application Programmer Interface Toolkits
  - XView
  - OLIT
  - TNT

Window Environment

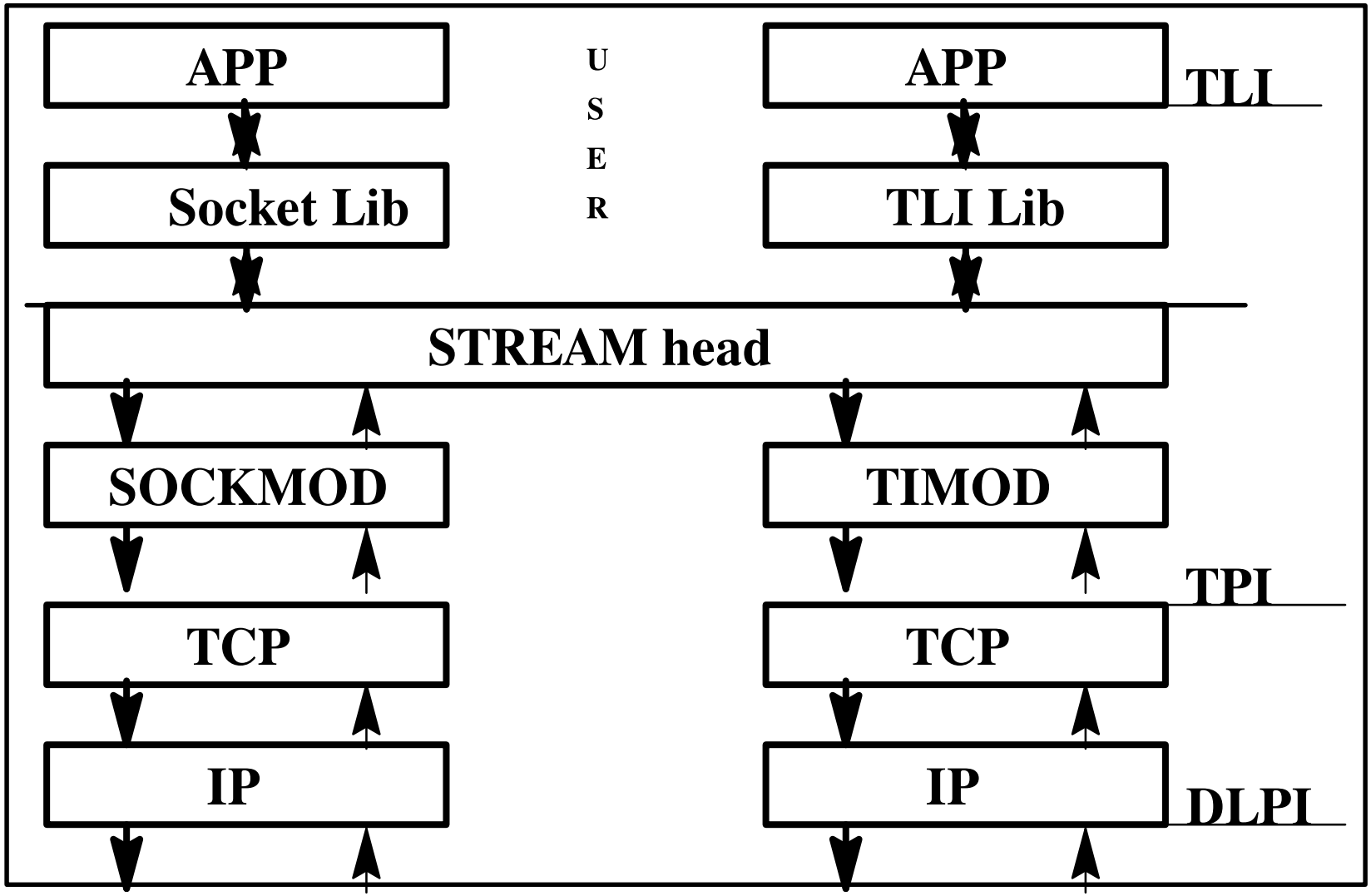
Mixing SunOS 4.X networks with SunOS 5.0

- 5.X Servers will support 4.X clients
  - Diskless
  - Dataless
- Sun's ONC: RPC, XDR, NFS
- Internetworking
- Printers
- NIS
- NIS+
  - NIS+ Server Advantageous (SunOS 5.0 or SunOS 4.1.X)
  - Emulation Mode available

Service Access Facility

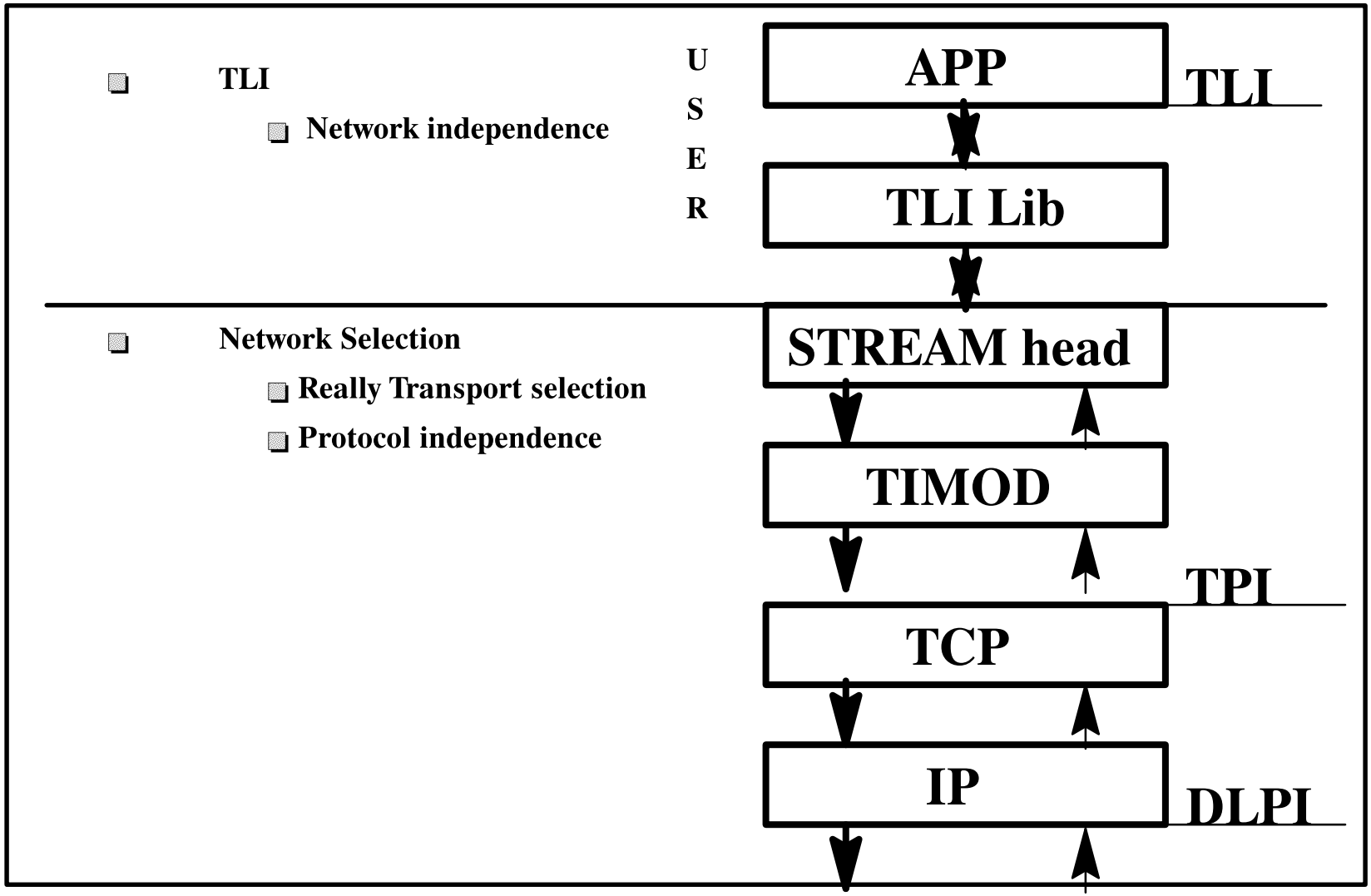
- **Standard interface to handle connection requests**
- **/usr/lib/saf/sac**
- **/usr/lib/saf/ttymon [getty]**
- **generates ttymon & ttylisten**

Posix IEEE 1003.12 Sockets/XTI & STREAMS



Network Selection

- TLI
  - Network independence
- Network Selection
  - Really Transport selection
  - Protocol independence



STREAMS

- **Terminal Subsystem**
- **TTY's & PTY's**
- **Pipes**
- **BSD 4.2 non−block I/O**
- **KMA**
- **Berkeley sockets:**
  - **Supported as libraries on top of STREAMS**

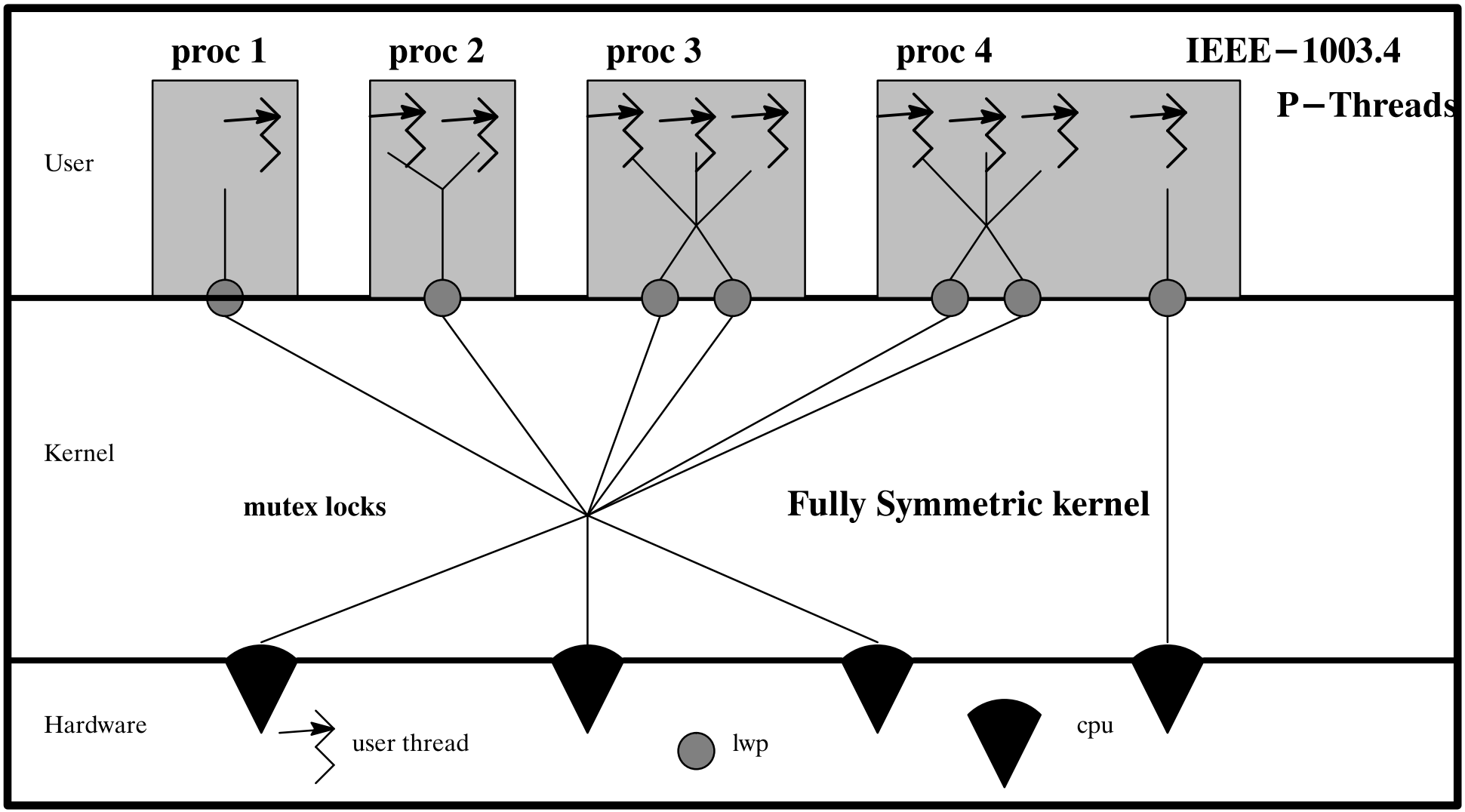
SunOS 5.0 Networking

- **Sockets & STREAMS**
- **TCP/IP (DARPA)**
- **Sun ONC**
  - **RPC**
  - **XDR**
  - **NFS**
- **RFS**
- **BNU**

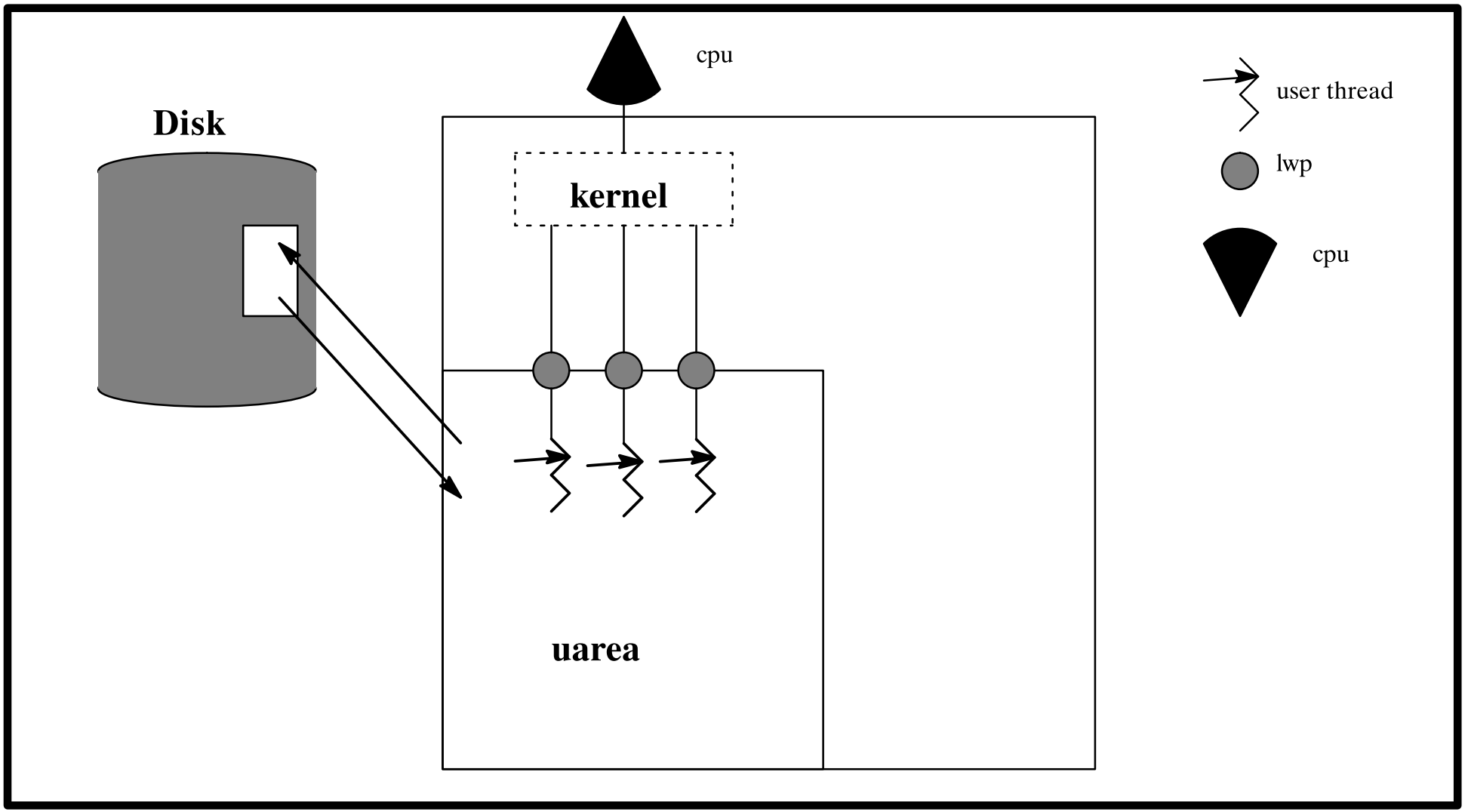
SunOS 5.0 Networking

- **General**
- **STREAMS**
- **TLI & Network Selection**
- **Sockets & STREAMS**
- **Mixing 5.0 Networks with 4.0**

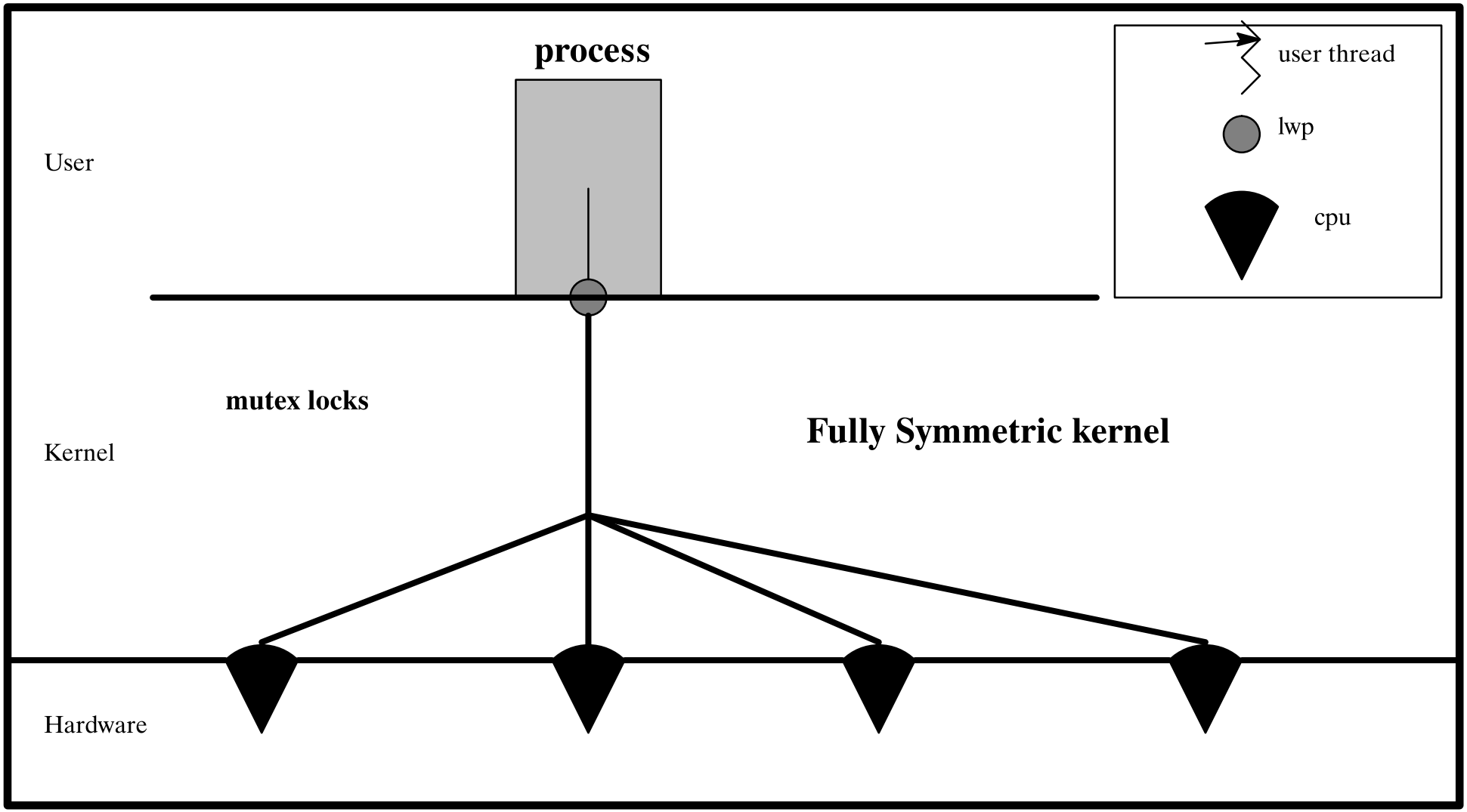
SunOS 5.X Multi−Threaded Kernel User threads, LWP's, IEEE−1003.4 and real−time



SunOS5.X User Threads & LWP's



SunOS 5.0 Multi−Threaded Kernel



SVr4 Real −Time

- Process Classes
  - Time Sharing
  - Real−Time
- Kernel pre−emption points
- User Controlled Process Scheduler
  - priocntl()
- High Resolution timers (uSec resolution)
- Locking Pages into memory
  - memcntl()
  - mlock() & munlock()
- adjtime()

SunOS 5.0 File Systems

- **ufs** **BSD fast file system**
- **rfs** **AT&T remote file system**
- **nfs** **Sun Micro − networked file system**
- **/proc** **address space of running process**
- **specfs** **device files**
- **hsfs** **high sierra file system**
- **tmpfs** **temp file system**
- **fifo** **fifo file system**
- **fd** **file descriptor file system**
- **pcfs** **PC file system**

File System Support

- **Virtual File System (VFS)**
  - **Vnodes (SunOS)**
  - **FSS (SVr3)**
- **Administrative Framework to Support Multiple File System Types**

Memory Management

- **Sun's Virtual Memory**
- **Memory mapped files**
- **Memory locking**
- **Swapping to file**
- **Portability (Hardware Address Translation)**

Expanded Fundamental Types (EFT)

- **16 bits increased to 32bits**
  - **uid**
  - **gid**
  - **pid**

- **Device Drivers:**
  - **Major No.** **8 bits upped to 24 bits**
  - **Minor No.** **8 bits upped to 18 bits**

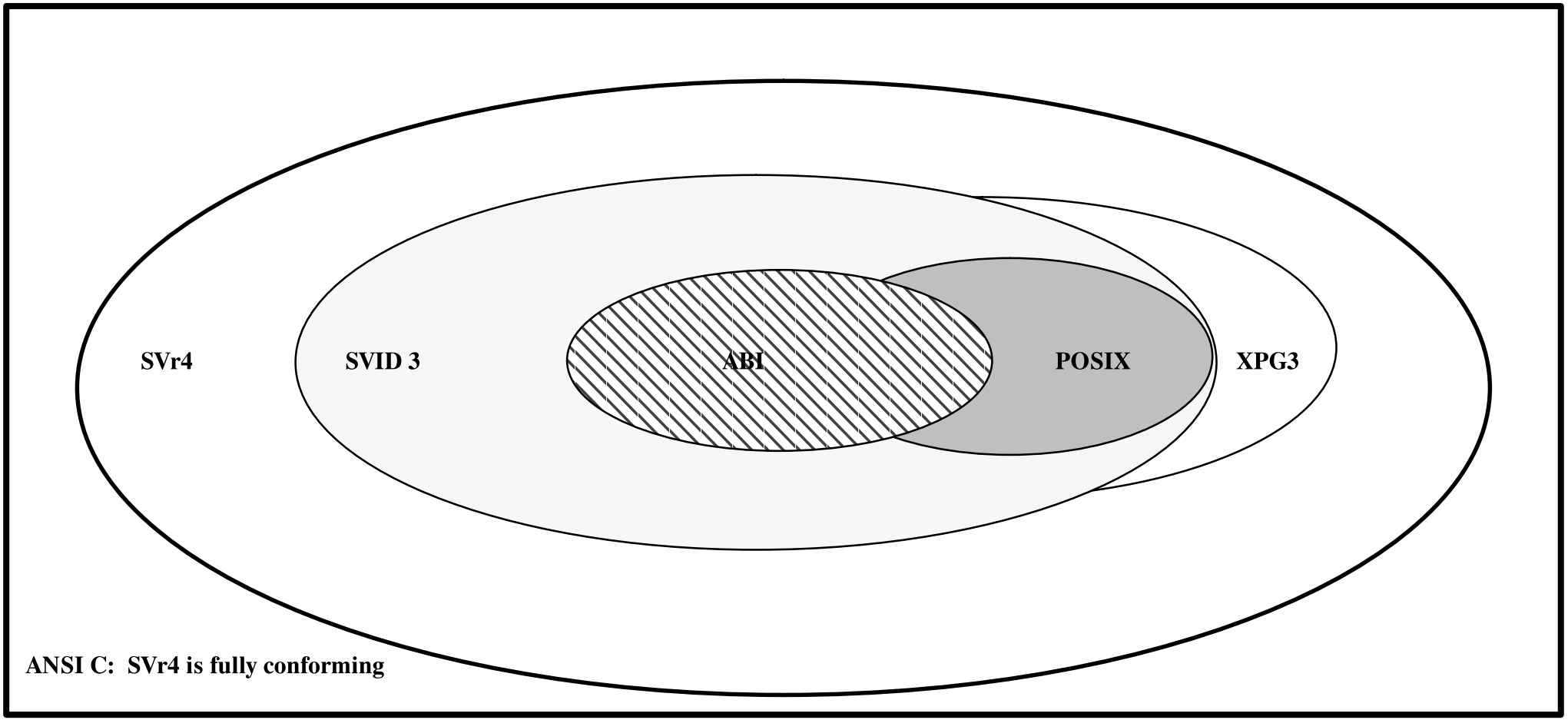
Dynamic Kernel aspects

- **No more limits on number of processes**
- **Classes**
- **Scalability**

Kernel

- **Dynamic aspects**
- **Fundamental Types**
- **Memory Management**
- **File System Support**
- **Real−Time**
- **Device Drivers**

Standards

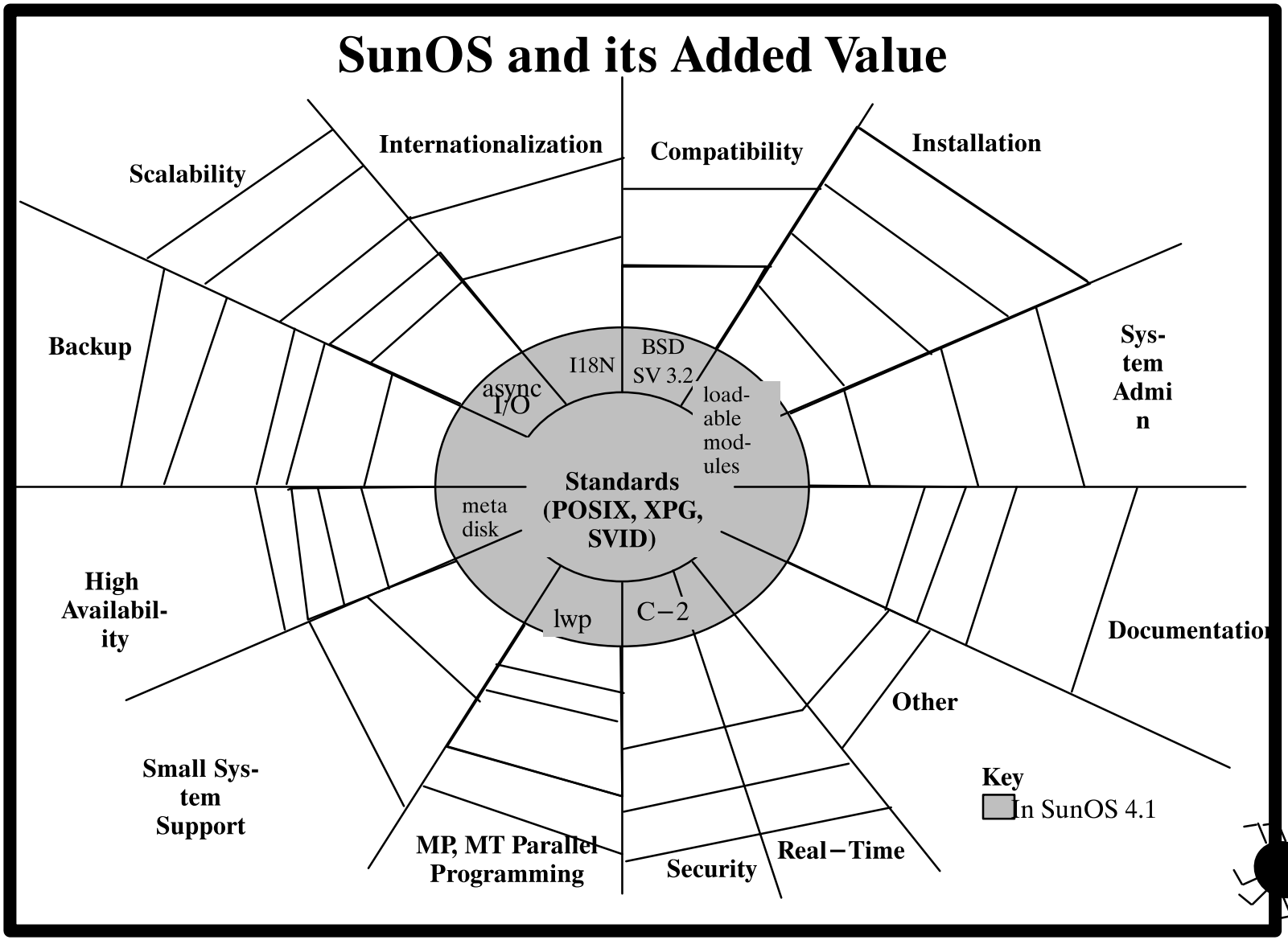


SunOS 5.0

Technical Content

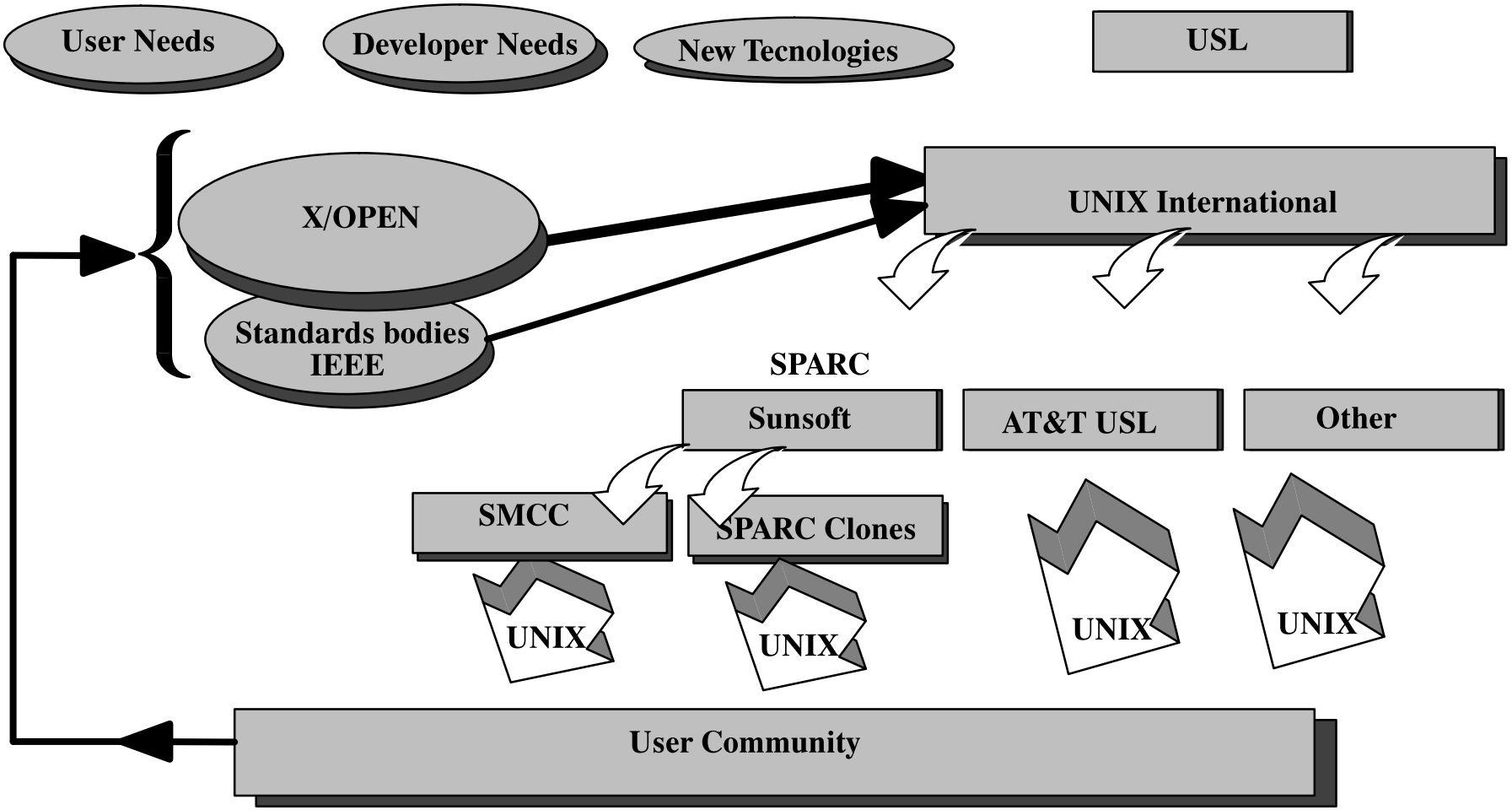
Transition

Compatibility & Migration Information (CMI)



A merge of Technology & Standards making SVr4 and SunOS5.0 the Operating System of the 90's

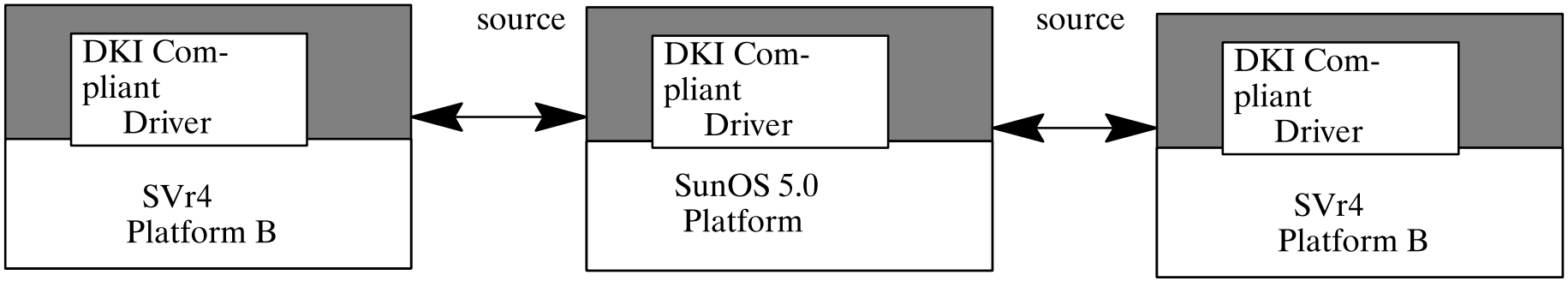
UNIX International



Device Drivers

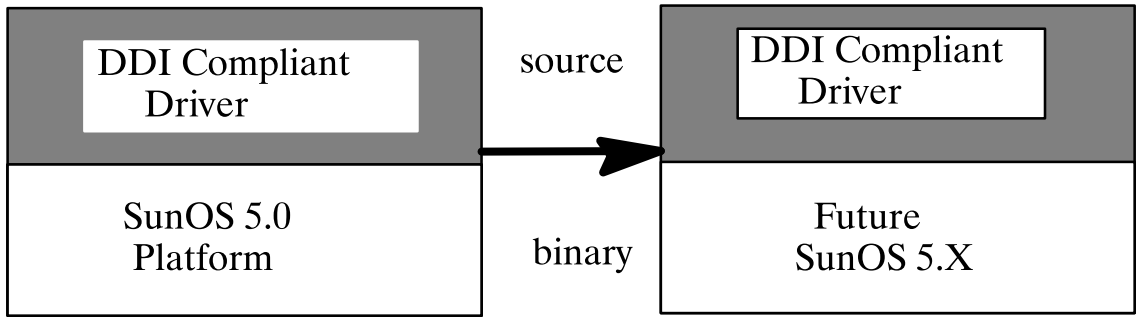
Driver Kernel interface (DKI)

- **Source compatibility between different SVr4 implementations**



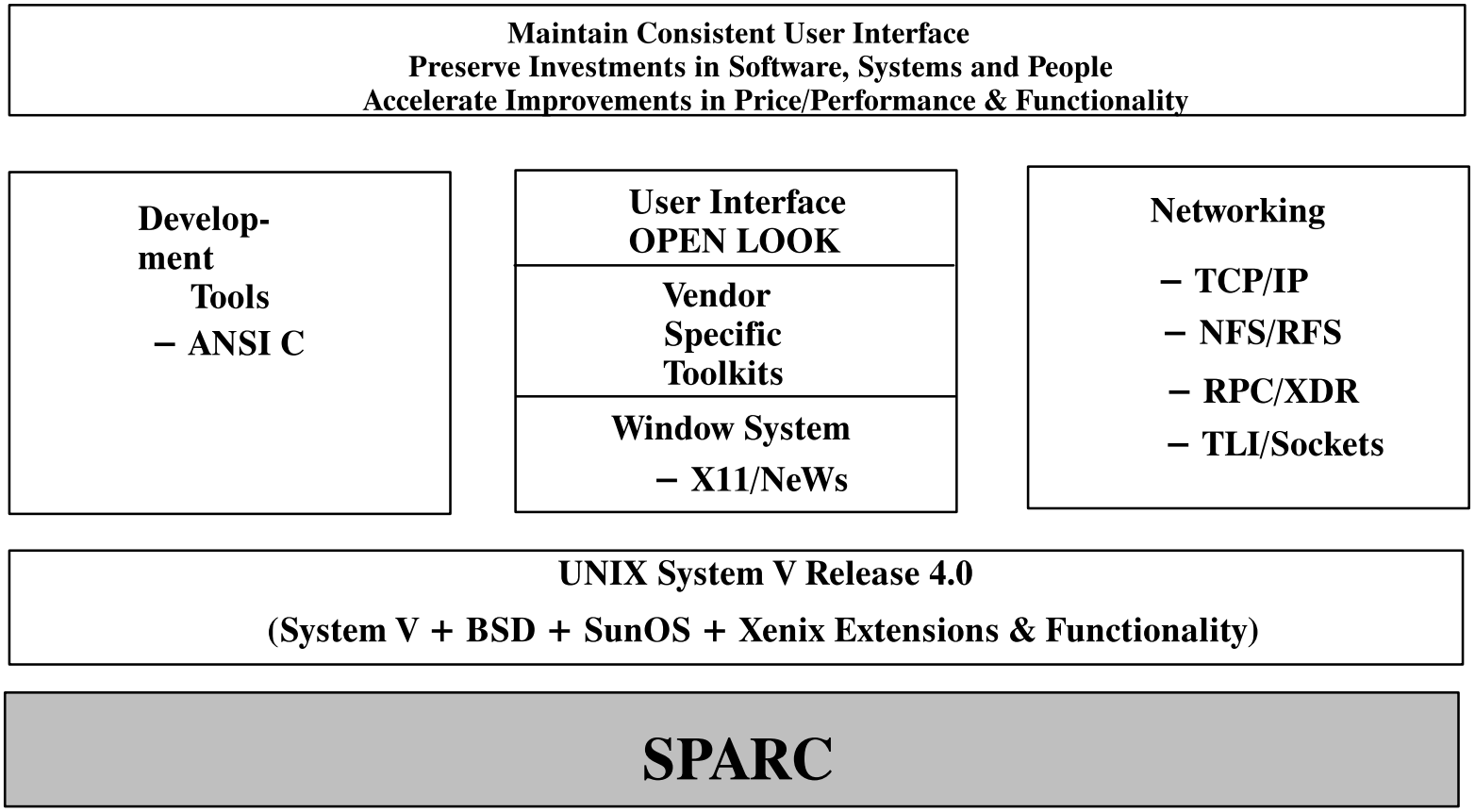
Device Driver Interface (DDI)

- **Binary and source compatibility between successive SunOS releases**



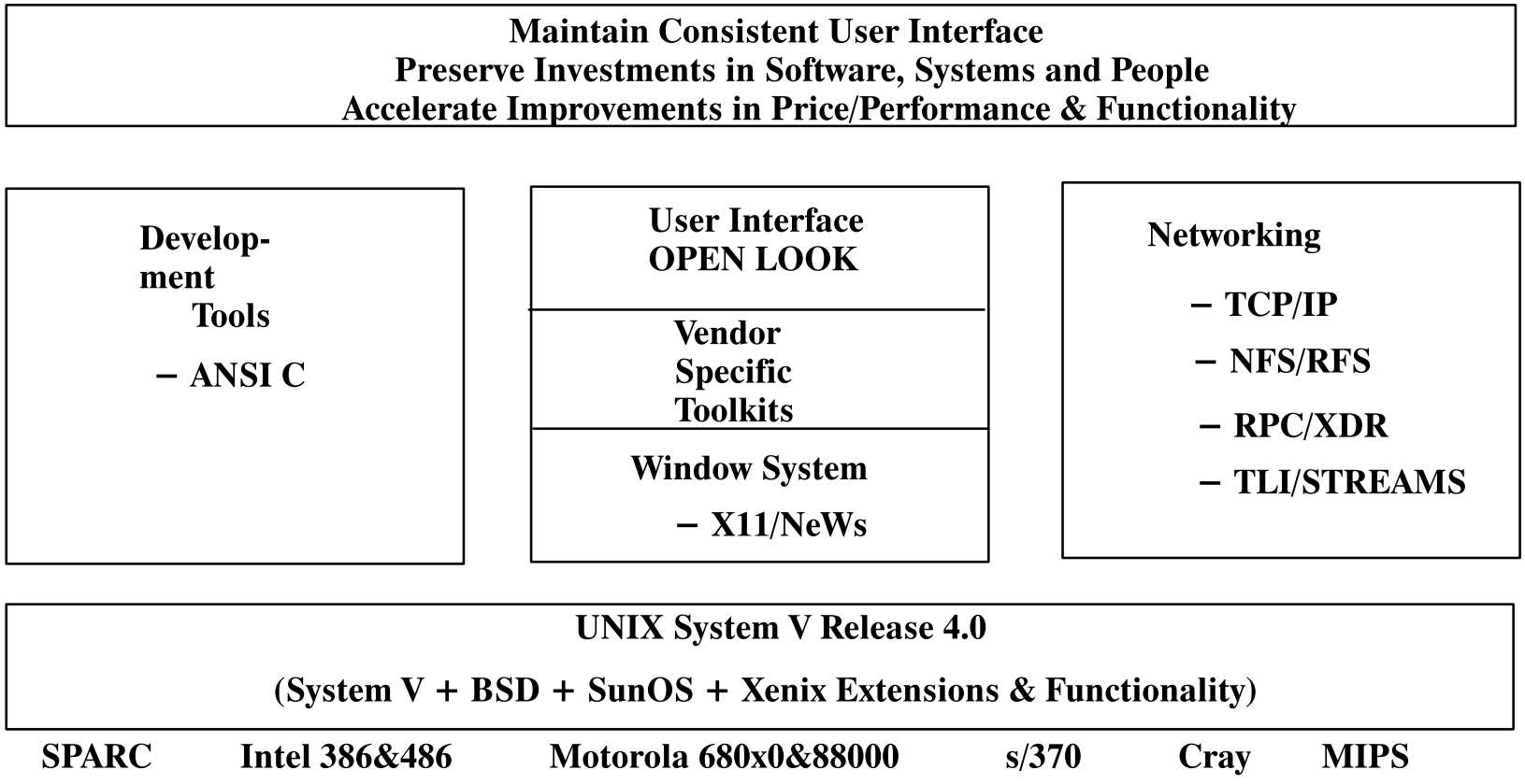
Standards
Application Binary Interface – ABI

Binary Compatibility of Applications across SPARC™ Platforms



Standards
Unix® System V Release 4.0
Application Programming Interface

Applications Portable across Multiple Architectures



Processor Specific ABI

- Machine Interface
- Data Representation
- Function Call Sequence
- OS Interface (address space, page size, etc...)
- Coding Examples
- Dynamic Linking Tables
- System Data Interfaces (Header Files)

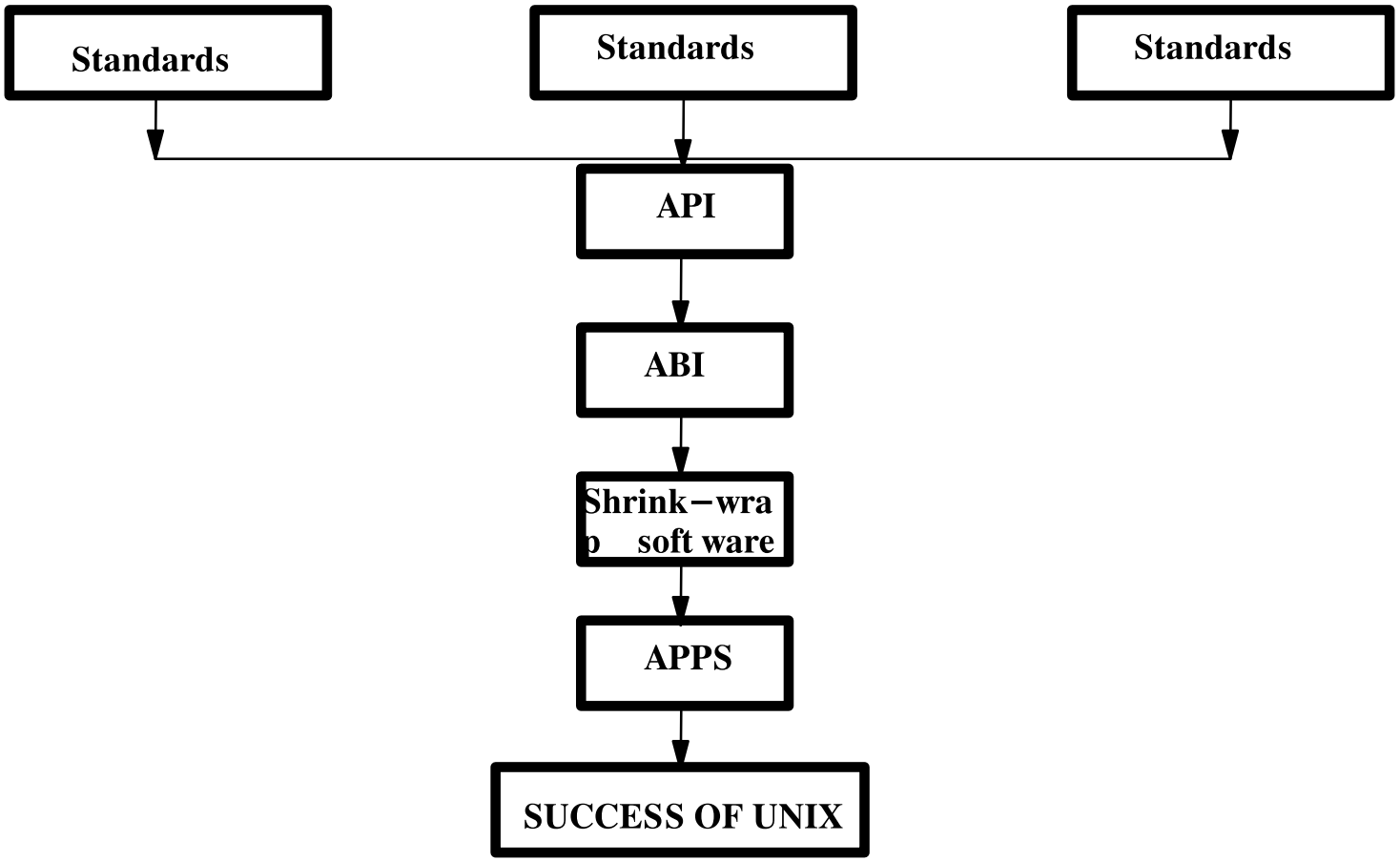
Generic ABI

- SW installation & packaging media
- Commands
- File System Structure
- File Formats
- Object File Format
- Libraries (system, C, network, RPC, etc.)
- Applications Environment
- Window System (Optional)

ABI

- Specification defines the Source & Binary Interface
- Available for several major architectures
  - SPARC, Intel x86, Motorola 680x0 & 88000, MIPS, etc
- Based on X11, POSIX−1003.1, ANSI C & X/Open XPG3
- ABI's are completely defined & test suites available
- ABI is defined in terms of dynamic linking
- ABI has two parts
  - Generic
  - Processor Specific

So Where do all these Standards really lead



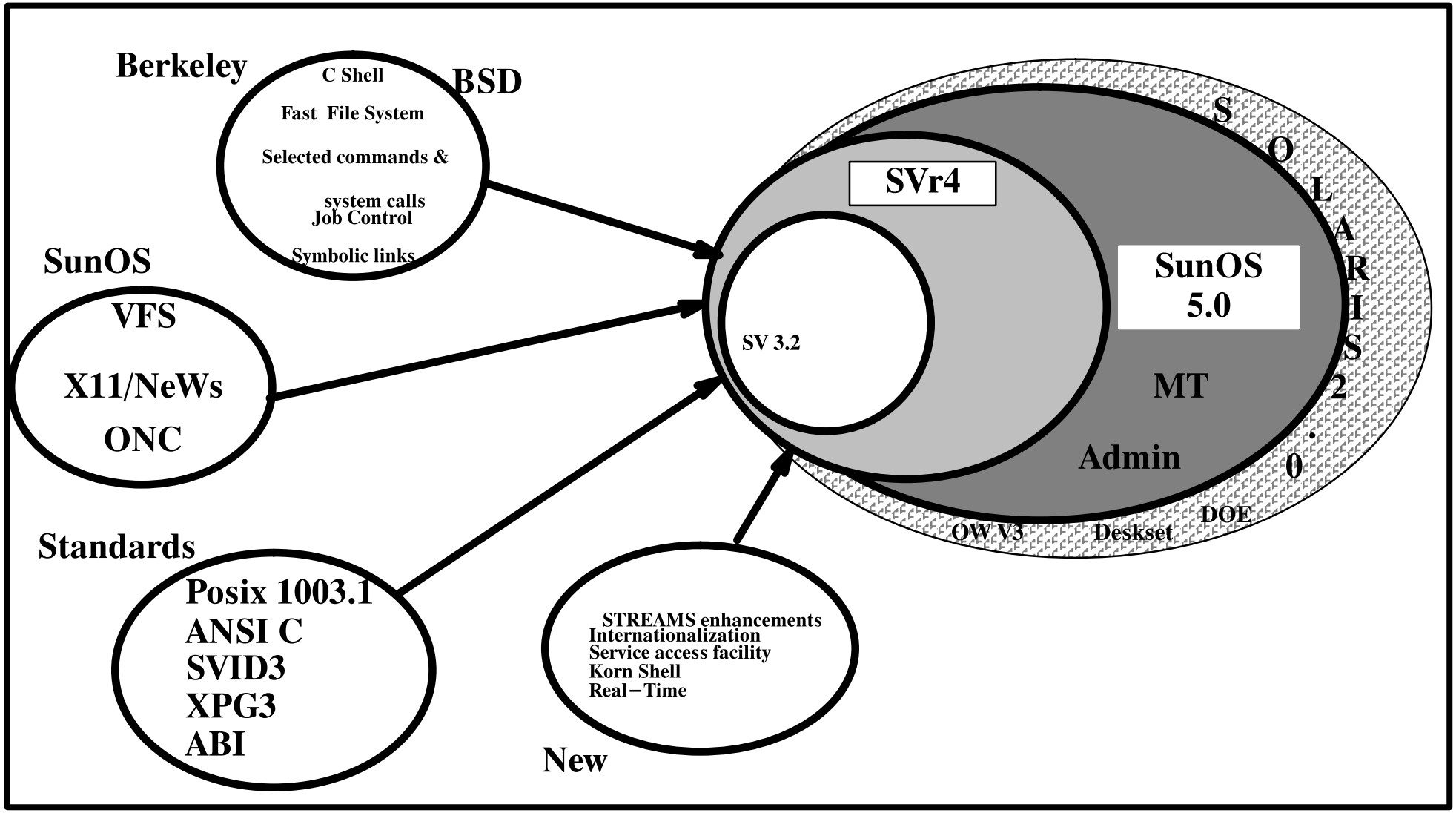
The Unification of UNIX

UNIX System V Release 4.0 (SVr4)

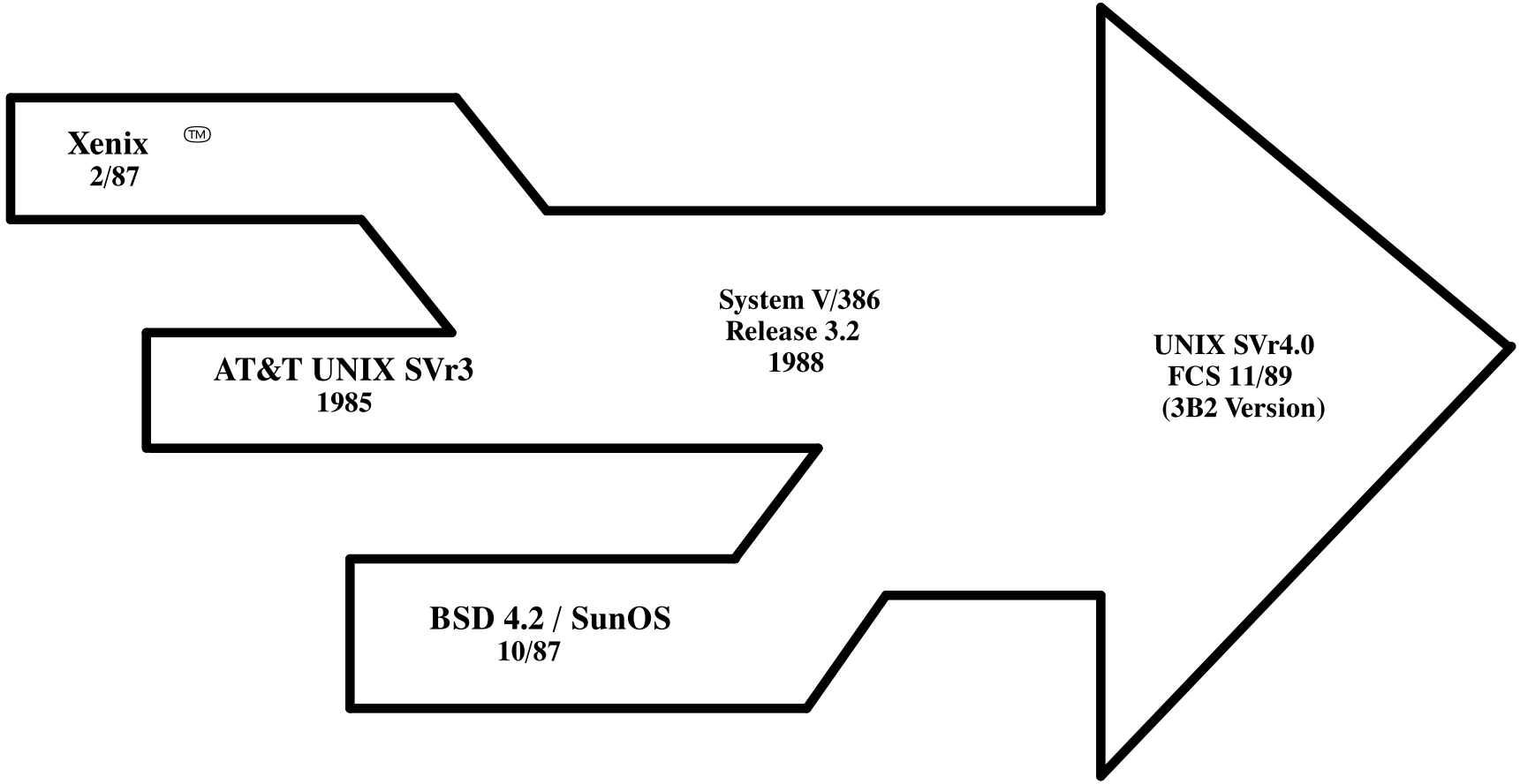
"SVr4 represents the most significant milestone in the history of the open systems market. SVr4 unifies the three major UNIX system variants, providing upward compatibility for more than 80% of current UNIX system installations and for over fifteen thousand application packages. SVr4 is the foundation for open systems in the 1990s and the only system compliant with X/Open's XPG3™ portability guide. SVr4 creates a more modular and maintainable UNIX system by defining standard kernel interfaces and enable Application Binary Interfaces (ABI's). ABI's enable 'shrink−wrapped' software, allowing for greater portability and more efficient distribution of applications for UNIX systems."

UNIX INTERNATIONAL

SunOS 5.0


Berkeley
BSD
C Shell
Fast File System
Selected commands &
system calls
Job Control
Symbolic links
SunOS
VFS
X11/NeWs
ONC
Standards
Posix 1003.1
ANSI C
SVID3
XPG3
ABI
New
STREAMS enhancements
Internationalization
Service access facility
Korn Shell
Real−Time
SV 3.2
SVr4
SunOS
5.0
MT
Admin
OW V3
Deskset
DOE
SOLARIS 2.0

The Unification of Unix



Why Unify UNIX

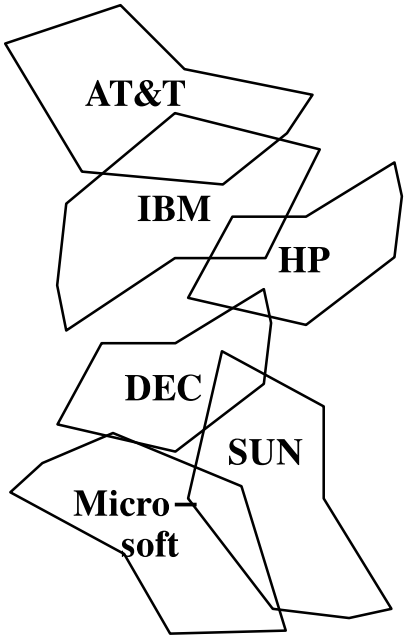
- **Fragmentation of UNIX**
  - **AT&T SYS V**
  - **Berkley**
  - **SunOS**
  - **Xenix**

- **Industry Standards**
  - **Portability:** **Application can be used on many vendors' systems**
  - **Availability:** **Large body of software available from many ISV's**
  - **Interoperability:** **Different vendors' systems work together**
  - **Scalability:** **Same environment on PC' to supercomputers**

Unification leads to shrink wrapped software

COMPUTING IN THE 80's

OPEN APPLICATION ARCHITECTURES



UNIX:

- Many OS Versions
- Many filesystems
- Many Window Mgrs.
- Many Architectures
- No Binary Standards

PM	LAN MGR	DOS OS/2	ABI	8086/ 80286

IBM Microsoft Intel

CLOSED/PROPRIETARY

Apple Look	Apple Talk	MAC OS	ABI	680X0

Apple

S	PM?
A	SNA
A	MVS/ VM
?	ABI
?	370

IBM

DEC Windows / X11	DEC NET	VMS	ABI	VAX

DEC

Sun Microsystems, Inc.

Solaris 2.0

General Overview

Norman Eaglestone

Systems for Open Computing