

Solaris 2.5 Introduction

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Preface

This manual describes new features of Solaris™ 2.5 UNIX™ System V Release 4 (SVR4).

To help you find additional information quickly, this manual directs you to other sources for details. Use this book primarily as an overview and a pointer.

How This Manual Is Organized

This manual is organized into the following chapters:

- Chapter 1, “Introduction to Solaris 2.5,” provides a brief introduction to Solaris 2.5, and gives a brief overview of Solaris products and the differences between SPARC, x86, and PowerPC systems.
- Chapter 2, “What’s New Quick Reference,” provides tables listing new features with brief descriptions. The tables cover new features for the Solaris 2.5 release and previous releases from Solaris 2.4 back to the Solaris 2.2 release.
- Chapter 3, “What’s New in Solaris 2.5,” provides descriptions of new features added to Solaris 2.5.
- Chapter 4, “Solaris 2.5 Documentation,” describes available Solaris 2.5 printed and AnswerBook™ on-line documentation and lists additional Solaris resource information.

What Typographic Changes and Symbols Mean

Table P-1 describes the type styles and symbols used in this book.

Table P-1 Typographic Conventions

Typeface or Symbol	Meaning	Example
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. system% You have mail.
AaBbCc123	What you type, contrasted with on-screen computer output	<div style="border: 1px solid black; padding: 5px; display: inline-block;">system% su Password:</div>
<i>AaBbCc123</i>	Command-line placeholder: replace with a real name or value	To delete a file, type <code>rm filename</code> .
<i>AaBbCc123</i>	Book titles, new words or terms, or words to be emphasized	Read Chapter 6 in <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be root to do this.

Code samples are included in boxes and may display the following:

C shell prompt	system%
Superuser prompt, C shell	system#
Bourne and Korn shell prompt	\$
Superuser prompt, Bourne and Korn shells	#

Platform-Specific Conventions

The following conventions are used to indicate that a section, note, bullet, table, or figure discussed in text applies only to a specific platform.

Section or Procedure Title

The following symbols are used to indicate that a section or procedure applies only to the named platform.

SPARC Denotes a SPARC platform-specific section or procedure.

x86 Denotes an x86 platform-specific section or procedure.

PowerPC Denotes a PowerPC platform-specific section or procedure.

Notes

The following notations are used to indicate that a section or procedure applies only to the named platform.

For SPARC systems – This note is specific to the SPARC platform.

For x86 systems – This note is specific to the x86 platform.

For PowerPC systems – This note is specific to the PowerPC platform

Bullet Items

The following items are used to indicate that a bullet applies only to the named platform.

- **SPARC:** This bullet is specific to the SPARC platform.
- **x86:** This bullet is specific to the x86 platform.
- **PowerPC:** This bullet is specific to the x86 platform.

Code Samples, Tables, and Figures

The following notations are used to indicate that a code sample, table, or figure applies only to the named platform.

Table 1-1 SPARC: Title Specific to SPARC Platform

Table 1-2 x86: Title Specific to x86 Platform

Table 1-2 PowerPC: Title Specific to x86 Platform

The Solaris 2.5 Software Environment

Solaris 2.5 is a 32-bit operating environment that provides users and system administrators with the following:

- SPARC™, x86, and PowerPC™ system cross-functional compatibility enabling the Solaris 2.5 operating system to run on SPARC as well as Intel 386, 486, Pentium™, and PowerPC hardware
- Industry standards: UNIX System V Release 4 (SVR4) and the ONC family of networking protocols
- OpenWindows™ 3.5 graphical user interface (GUI) in the OPEN LOOK™ Window Manager and DeskSet™ environment or the Common Desktop Environment™ (CDE) 1.0.1 Motif-based GUI

The Solaris 2.5 software environment provides an extensible operating system that is scalable across a wide variety of system configurations: from single standalone systems to enterprise-wide computing environments that run multiple file- and database-servers supporting hundreds, even thousands, of networked systems. This scalability allows you to add servers, systems, software tools, networking, and other features to your system as you need them. From a single system, it is possible to build a full enterprise-wide computing solution.

The Solaris 2.5 software environment is shipped on CDs (compact discs) for SPARC systems. For x86 and PowerPC systems there are both CDs and a boot diskette.

The Solaris 2.5 Products

Solaris 2.5 consists of many related products. These products are licensed as described below. See your specific license for your purchases. Use any of these products to extend and enhance your use of the Solaris 2.5 software environment. These come as separate products for SPARC, x86, or PowerPC systems.

- Solaris 2.5 Desktop—Used to install, configure, and run single-user systems or clients on a network.
- Solaris 2.5 Workgroup Server Light—Used to install, configure, and run the Solaris 2.5 operating environment on a small to mid-range server, serving a small workgroup of networked client systems; includes licensing for a single system.
- Solaris 2.5 Workgroup Server—Used to install, configure, and run the Solaris 2.5 operating environment on a small to mid-range server, serving a small workgroup of networked client systems. Includes additional system administration, networking, on-line tools, and licensing for up to 4 CPU systems.
- Solaris 2.5 Enterprise Server—Used to install, configure, and run the Solaris 2.5 operating environment on large, enterprise-wide server systems that require critical maintenance of databases, file servers, and multi-user applications. Supports multiple CPUs, large numbers of users, and many network nodes. Allows licensing for up to 32 CPU systems.

Other products may be purchased separately, such as

- The Solaris 2.5 Software Developer Kit (SDK)—Provides the software tools, documentation, training, and support needed to develop software applications for the Solaris 2.5 operating environment.
- The Solaris 2.5 Driver Developer Kit (DDK)—Provides the software tools, documentation, training, and support needed to develop device drivers and graphics device handlers for the Solaris 2.5 operating environment

Differences Between SPARC, x86, and PowerPC Systems

Solaris 2.5 software runs on SPARC, x86, and PowerPC systems. In most cases the differences between these environments are minimal. However, a few differences do exist.

x86: Differences

- Many x86 peripherals require manual hardware and software configuration. In general, the variety of hardware is greater with x86, including pointing devices and display devices.
- X86 keyboards do not have meta or L-keys; key sequences are used to provide the same functions.
- X86 systems require a boot diskette (in addition to a local or remote CD-ROM drive) to install.
- Machines that use OpenBoot or OpenFirmware allow the user to specify the boot device, boot file, and options from the command line. X86 platforms use an enhanced secondary boot program containing a command line interpreter to allow boot file and options to be specified.
- X86 hard disks have standard PC `fdisk` partitioning as well as standard Sun label partitioning.

PowerPC: Differences

- PowerPC keyboards do not have meta or L-keys; key sequences are used to provide the same functions.
- PowerPC systems require a boot diskette to install (in addition to a local or remote CD-ROM drive).
- PowerPC hard disks have standard PC `fdisk` partitioning as well as standard Sun label partitioning.

What's New Quick Reference



This chapter provides tables summarizing new and enhanced features in Solaris 2.5. For the benefit of users and system administrators updating from earlier Solaris releases, tables are also provided from version 2.4 back to the 2.2 release. For complete descriptions of changes in the Solaris 2.5 release, see Chapter 3, “What’s New in Solaris 2.5.”

New in the Solaris 2.5 Release

Table 2-1 lists the new and enhanced features in the Solaris 2.5 release.

Table 2-1 New Features in Solaris 2.5

Category	Platform Feature Available On			Solaris 2.5 New Features/Changes	Description
	SPARC	x86	Power PC		
Standards	X	X		XCU4 Conformance	Utilities conform to the XCU4 portion of the <i>X/Open Portability Guide</i> , Issue 4 specification from X/Open™.
	X	X	X	POSIX.1c Conformance	Conforms to standards based on draft 10, which defines multi-threading interfaces.

Table 2-1 New Features in Solaris 2.5

Category	Platform Feature Available On			Solaris 2.5 New Features/Changes	Description
	SPARC	x86	Power PC		
Networking	X	X	X	Network File System	Improves NFS™ version 2 and adds version 3. The following features have been added: - Support Access Control Lists - NFS over TCP - Version 3, safe asynchronous writes on a server and has improved performance - NFS Lock Manager - Support for X/Open Federated Naming
	X	X	X	Point-to-Point Protocol	PPP links computers and networks at separate locations using modems and telephone lines. New levels of security added.
	X	X	X	Telnet/telnetd	- Telnet client has been upgraded to the 4.4 BSD version. - rlogind/telnetd, remote login capacity improved.
	X	X	X	Name Service Cache Daemon	Improves responsiveness of name service requests.
Security	X	X	X	NIS+ Security	Password aging enhances system security.
File Systems	X	X	X	UFS Error Recovery	Improved error detection and soft failure modes.
	X	X	X	UFS Filesystem Debugger	Changes to UFS improve operation of fsdb_ufs(1M).
	X	X	X	UFS Access Control Lists	Provides a more precise way of managing file access permissions.
	X	X	X	CacheFS™ Statistics	Improves NFS server performance and scalability by reducing server and network load.
Installation	X	X	X	Service Setup for Clients	The installation program has changed and no longer sets up services for clients. To complete client and network setup, use Solstice's Host Manager.

Table 2-1 New Features in Solaris 2.5

Category	Platform Feature Available On			Solaris 2.5 New Features/Changes	Description
	SPARC	x86	Power PC		
System Administration	X	X	X	System Administration Tools	- Admintool™ now used only for administering local systems.
	X	X			- Solstice™ AdminSuite™ now used for managing systems in a network.
	X	X	X	Proc Tools	New process tools are available in <code>/usr/proc/bin</code> that display highly detailed information about the active processes stored in <code>/proc</code> , the process file system.
OpenWindows	X	X	X	OpenWindows with Kodak Color Management System Calibrator Tool	OpenWindows version 3.5 includes KCMS calibrator tool that provides adjustments for accurate color representation to scanners, color monitors, and other output devices.
Graphics	X			PEX™ 3.0 Runtime Environment	The PEX application programmer interface (API) provides application portability across platforms and 3-D graphics on local and remote displays.
	X	X	X	XGL™ 3.2 Runtime Environment	XGL, a 2-D and 3-D immediate-mode API, provides portability across hardware platforms and optimal performance from graphics acceleration. XGL includes support for raster text, environment and vertex-level texture mapping, 4-component texture mapping, DGA transparent overlay, and triangle list Gcache.
	X	X	X	XIL™ 1.2.1 Runtime Environment	A foundation imaging library, suitable for libraries or applications requiring imaging or digital video, such as document imaging, color prepress, or digital video generation and playback. Version 1.2.1 contains bug fixes and performance enhancements.
Hardware	X	X	X	Enhanced Hardware Support	A wider range of new hardware configurations is supported.
	X	X	X	St Driver	St driver supports tape drive models without waiting for new versions of the binary driver. Supports all tape positioning commands.
	X			Support for SPARCstorage Array™	Installation is improved.

Table 2-1 New Features in Solaris 2.5

Category	Platform Feature Available On			Solaris 2.5 New Features/Changes	Description
	SPARC	x86	Power PC		
Miscellaneous Features	X	X	X	Sendmail	<ul style="list-style-type: none"> - Is now compatible with older sendmail files. - Selects all hosts at a given priority through an MX randomizer. - Support for ESMTP. - Reduces duplicate mail if server fails.
	X	X	X	X/Open Federated Naming Service	FNS combines different naming systems that are regulated under a single interface.
	X	X	X	Nologin	System administrators can warn users about impending down-time with <code>/etc/nologin</code> .
	X	X	X	Font Support	<ul style="list-style-type: none"> - CID fonts provide improved performance for DPS™ clients. - X11 clients can now access fonts rendered by the DPS extension through the XATM interface.
	X			Compatibility	- More Solaris 1 binaries are now able to run on Solaris 2.5.
	X	X	X		- Some shell scripts from 4.x now work under 2.5.
Performance	X	X	X	Time-sharing	Improved performance under time-sharing workloads.
	X	X	X	KAIO	Improves the performance of asynchronous reads or writes for raw devices.

New Features in Previous Solaris Releases

In the Solaris 2.4 Release

Table 2-2 describes new and enhanced features of the previous release, Solaris 2.4.

Table 2-2 New Features in Solaris 2.4

Category	Solaris 2.4 New Features	Description
Installation	Motif™ installation GUI	A new GUI—used to install Solaris software.
OpenWindows	Expanded localization (OpenWindows 3.4)	Added to the operating system are four European languages and four Asian languages, as well as Latin American Spanish and U.S. English, for desktop and workgroup server product configurations.
Graphics	Transparent Overlays	A graphics API that allows temporary graphical imagery in application windows.
	XIL1.2 Imaging Library Runtime Environment	A foundation imaging library, suitable for libraries or applications requiring imaging or digital video, such as document imaging, color prepress, or digital video generation and playback.
	PEX 2.2 Runtime Environment	An API that provides application portability across platforms and 3-D graphics rendering on local and remote displays.
	XGL 3.1 Runtime Environment	A 2-D and 3-D immediate-mode API that provides portability across hardware platforms and optimal performance from graphics acceleration.
	Direct Xlib™ 3.1	A graphics application that uses the new DGA Drawable Interface and supports systems with multiple frame buffers. Provides modified versions of the standard X11 libraries to accelerate Xlib rendering performance.
Hardware	Enhanced hardware support	A wider range of new hardware configurations are supported.

Table 2-2 New Features in Solaris 2.4 (Continued)

Category	Solaris 2.4 New Features	Description
Miscellaneous Features	AccessX™ Enabling Technology	Provides people with disabilities with a variety of keyboard modifications.
	OSF/Motif™ Runtime Environment	Used to run Motif applications.
	ImageTool Enhancements	Functionality enhanced so the user can read Kodak images from a PhotoCD™ disc using Image Tool.

In the Solaris 2.3 Release

Table 2-3 lists the features that were added in the Solaris 2.3 release.

Table 2-3 Features of Solaris 2.3

Category	Solaris 2.3 New Features	Description
Networking	PPP	An asynchronous implementation of the standard data link level point-to-point protocol (PPP), included in the Internet protocol suite, that enables communications links using modems and telephone lines.
	NIS+	Three additional scripts to enable the user to more easily set up a NIS+ domain.
File Systems	Autofs	A new kernel virtual file system that supports automatic mounting of file systems.
	Cache File System (CacheFS)	A nonvolatile caching mechanism to improve performance of certain file systems by utilizing a small, fast, local disk.
System Administration	Serial Port Manager	A tool that enables the user to quickly set up and modify serial port software for terminals and modems.
Graphics	Direct Xlib 3.0	The first release of Direct Xlib to utilize MIT DDX (device-dependent X) loadable modules to perform X11 graphics rendering.
	PEX Runtime Environment (RTE)	An implementation of the MIT PEX specification that is an extension of the X Window System to support 3-D graphics.
	XGL Runtime Environment	A 2-D and 3-D immediate-mode API that provides portability across hardware platforms and optimal performance from graphics acceleration.

In the Solaris 2.2 Release

Table 2-4 lists the features that were added in the Solaris 2.2 release

Table 2-4 Features of Solaris 2.2

Category	Solaris 2.2 New Features	Description
Installation	User Installation Interfaces	User interfaces that make it easy to install and upgrade Solaris.
System Administration	Volume Management	Software that automatically mounts and unmounts CDs and diskettes.
OpenWindows	Enhanced OpenWindows	OpenWindows enhancements include Image Tool, an improved Properties Tool, integrated international capabilities, and many ease-of-use improvements.
Graphics	XIL 1.0 Imaging Library Runtime Environment	Imaging library runtime environment to use with imaging and video applications developed with the XIL 1.0 Imaging Library Software Developer's kit.
	XGL Runtime Environment	A 2-D and 3-D immediate-mode API that provides portability across hardware platforms and optimal performance from graphics acceleration.
Miscellaneous Features	Multithreaded Library Interface	An interface that allows developers access to multithreaded (MT) applications.
	AnswerBook™ Improvements	New AnswerBook administrator's utility, <code>ab_admin(1)</code> , a library-based user interface that allows easy access to AnswerBook sets located over networks.

What's New in Solaris 2.5



This chapter provides brief descriptions of new features, and enhancements to existing features, implemented in the Solaris 2.5 release. For further information on the Solaris documentation and for information on additional resources, see Chapter 4, “Solaris 2.5 Documentation.” The documentation referenced there fully covers new features and tasks.

Standards

Solaris 2.5 conforms to a number of specifications sanctioned by standards bodies. Specifications evolve over time and generally Solaris maintains conformance to specifications from release to release. The following describes conformance changes in Solaris 2.5.

X/Open Commands and Utilities, Issue 4 (XCU4) Conformance

For PowerPC systems – This feature is not available on PowerPC systems at this time.

The utilities delivered with Solaris 2.5 conform to the XCU4 portion of the *X/Open Portability Guide*, Issue 4 specification from X/Open. If the behavior required by XCU4 conflicts with existing Solaris behavior, the original Solaris version is not changed, but a new version that is XCU4 compliant can be found in `/usr/xpg4/bin`. Therefore, when setting the `PATH` (`sh` or `ksh`) or `path` (`csh`) environment variables, `/usr/xpg4/bin` should precede any other directories in which XCU4 utilities are found, such as `/usr/bin`, `/bin`,

`/usr/ucb` and `/usr/ccs/bin` for applications that take advantage of XCU4 features. Note that XCU4 includes all of the utilities in IEEE Std 1003.2-1992 and IEEE Std 1003.2a-1992 (together, commonly called POSIX.2).

An XCU4 compliant implementation must include an ANSI X3.159-1989 (ANSI C Language) standard conforming compilation system and the `cc` and `c89` utilities that are not part of Solaris 2.5.

When Solaris 2.5 is installed with SPARCompiler™ 4.0 on a SPARC based platform, or with ProCompiler™ C 3.0 and patch 102486-02 on an x86 based platform, and the application searches for standard utilities in the directories specified by the output of the `getconf PATH` command in the order specified from left to right, the utilities will behave as specified by POSIX.2.

POSIX Standards Conformance Updated to Include Threads Interfaces

Solaris 2.5 conforms to IEEE Std 1003.1-1990 (System Application Program Interface (API) as amended by IEEE Std 1003.1b-1993 Realtime Extension), IEEE Std 1003.1c-1995 (Threads Extension) and IEEE Std 1003.1i (Technical Corrigenda to Realtime Extension). Users can now write portable multi-threaded applications.

Networking

The Solaris 2.5 release greatly expands network communication features.

Network File System, Versions 2 and 3

The Solaris 2.5 release is the first release that includes Version 3 of the NFS protocol. In addition, improvements have been made to Version 2 for this release. The following features have been added to or improved in the NFS product for 2.5.

- NFS ACL support
- NFS over TCP
- NFS Version 3
- Enhanced network lock manager
- XFN support through the automounter

Support for Access Control Lists

Access Control List (ACL) support has been added to the NFS software for the Solaris 2.5 release. The ACL software provides a more precise way of managing file access permissions. Both local (UFS) and remote (NFS) files can be protected.

NFS over TCP

The NFS software selects TCP as the transport protocol when possible. TCP is a reliable protocol and is much better for WANs. It provides congestion control and error recovery.

NFS Version 3

Version 3 of the NFS protocol is new for the Solaris 2.5 release. The new software provides several new features.

- Version 3 provides for safe asynchronous writes on the server. The new software improves response time, because the client does not have to wait for the server to commit the changes to disk before the operation returns.
- All operations in the NFS Version 3 software bring over the file attributes, which means that the need to do a separate operation to update this data in the cache happens less often. This reduces the number of RPC calls to the server and improves performance.

NFS Lock Manager

The new network lock manager provides improved UNIX record locking and PC file sharing when accessing NFS files. Commands that use record locking, like `ksh` and `mail`, are less likely to hang or have other difficulties with this new software.

Support for X/Open Federated Naming

The new `automountd` supports the X/Open specification for Federated Naming as applied to file systems.

For more information on these topics, see the *NFS Administration Guide*.

Point-to-Point Protocol

PPP allows you to link computers and networks at separate locations using modems and telephone lines. New levels of security for PPP use a series of added authentication keywords before allowing transmission over the link.

The first level of authentication, password authentication protocol (PAP), is the least secure. Passwords are sent over the circuit “in the clear” until authentication is acknowledged or the connection terminated.

The second level of security, challenge-handshake authentication protocol (CHAP) periodically verifies the identity of the peer (the other end of the point-to-point link). A challenge message is sent to the peer by the authenticator. The response is checked against a “secret” not sent over the link, and if the values match, authentication is acknowledged. Otherwise the link is terminated. The new features are integrated into the Solaris 2.5 PPP software release.

For more information, see the *TCP/IP and Data Communications Administration Guide*.

Telnet

4.4 BSD-Compatible `telnet/telnetd`

The telnet client has been upgraded to the 4.4 BSD version. The telnet server has been enhanced to support window size, display location, environment variable passing, and the logout option.

See the man pages `telnetd(1M)` and `telnet(1)` for information on new options.

Performance improvement for `rlogind` and `telnetd`

On large servers, remote login capacity may improve by up to a factor of two due to an improved STREAMS architecture, which removes extra data copies present in early Solaris and BSD-derived UNIX systems.

Name Service Cache Daemon

The Name Service cache daemon (`nscd`) provides a local, configurable cache of frequently accessed name service information about hosts, users, and groups. This cache greatly improves the responsiveness of name service requests, particularly if large flat files or slow network naming services are used. The various cache parameters are tunable using a configuration file, `/etc/nscd.conf`.

For more information, see the `nscd` man pages.

Security

The Solaris 2.5 release increases password security.

NIS+ Password Update Daemon

The NIS+ Password Update Daemon supports secure password updates when using NIS+, and allows administrators to enforce password aging. The updates are made without requiring secure RPC credentials for normal users. Password update requests from NIS clients are also supported.

Optional password aging allows system administrators to

- Force a user to choose a new password the next time the user logs in.
- Specify a maximum number of days that a password can be used before it has to be changed.
- Specify a minimum number of days that a password has to be in existence before it can be changed.
- Specify that a warning message be displayed whenever a user logs in, for a specified number of days, before the user's password time limit is reached.
- Specify a maximum number of days that an account can be inactive. If that number of days passes without the user logging in to the account, the user's password is locked.
- Specify an absolute date after which a user's password cannot be used, thus denying the user the ability to log on to the system.

Some of these features were available under previous naming systems (`/etc` files and NIS) but are new to NIS+. Others are new to NIS+ and can only be used under NIS+.

For more information on this topic, see the *NIS+ and FNS Administration Guide*.

File Systems

Improved UFS Error Recovery

UNIX file system (UFS) has improved error detection and soft failure modes in Solaris 2.5. UFS is further enhanced by the automatic repair capabilities available in the Solstice DiskSuite product, packaged separately from Solaris. Error detection, locking, and unmounting are part of the Solaris 2.5 release.

UFS has been enhanced to increase total system availability by recognizing in-core and on-disk file system inconsistencies. It handles these by locking, repairing on-line, and unlocking the file system, rather than panicking the machine. With previous versions of UFS, if a panic occurs due to defective media or other conditions, the operation of the entire system is halted. In Solaris 2.5, only the operations of the processes using the affected file system are affected. All other user operations proceed normally.

If you do not have Solstice DiskSuite, file systems can be configured so that the system fails gracefully when filesystem inconsistencies are detected. You can enable lock-on-panic and manually run `fsck (1M)` to repair the file system. Access to the file system is then re-enabled.

For more information, see the man page `fsck (1M)` and `mount_ufs(1M)`.

Interactive UFS Filesystem Debugger

Improved operation of `fsdb_ufs` a filesystem debugger that allows for the manual repair of a file system after a crash.

For more information, see the man page `fsdb_ufs(1M)`.

UFS Access Control Lists

The ACL software provides a more precise way of managing file access permissions. Both local (UFS) and remote (NFS) files can be protected.

CacheFS Statistics

CacheFS (Cache File System) is a general purpose file system caching mechanism that improves NFS server performance and scalability by reducing server and network load. CacheFS statistics enable you to

- Determine an appropriate cache size
- Observe the performance of the cache

These two pieces of information help you determine the trade-off between your cache size and the desired performance of the cache.

For more information on CacheFS statistics, see the `cachefslog (1m)`, `cachefswssize (1m)`, and `cachefsstat (1m)` man pages. For information on CacheFS, see `cfsadmin`, `mount_cachefs`, and `fsck_cachefs` man pages.

Installation

Service Setup for Clients

The Solaris installation program (interactive and Custom JumpStart) no longer sets up services for clients. During installation, selecting the system type 'OS server' only allocates space for clients; to complete client setup you must use the Solstice AdminSuite Host Manager after Solaris software is installed locally. (Host Manager is part of Solstice AdminSuite which may be packaged with Solaris, depending on the product you've purchased.)

For more information, see the *System Administration Guide, Volume I*.

System Administration

System Administration Tools

The Admintool application has been extensively reworked in the Solaris 2.5 release. There are now separate tools for local and networked system administration.

- Admintool provides system administration for end users on their local systems. Admintool does not update the name service with changes.
- Solstice AdminSuite provides system administration on a network. Solstice AdminSuite updates the name service and is intended for a site that uses name services.

Admintool for Local System Administration

The Admintool application in the Solaris 2.5 software contains system administration tools for end users. It is meant to be used only for *local* (non-networked) system administration. It provides the capability to

- Add, remove, or modify local user accounts
- Add, remove, or modify the local `/etc/groups` file
- Add, remove, or modify hosts in the local `/etc/hosts` file
- Enable or disable access to local or remote printers
- Enable or disable local serial port services
- Add software to or remove software from the local system

For more information, see the *Solaris Advanced User's Guide*.

Solstice AdminSuite 2.1 for Networked System Administration

For PowerPC systems – This feature is not available on PowerPC systems at this time.

The Solstice AdminSuite 2.1 product is a suite of tools and supporting technologies that make it possible for system administrators to effectively manage system information in a network environment.

The Solstice AdminSuite 2.1 tools enable administrators to

- Manage any local or remote system's data from their own system
- Modify system data without “root” privileges using a special administration group
- Centralize system data using one of three name services--NIS, NIS+, or local `/etc` files

The components of the Solstice AdminSuite 2.1 product are

- Solstice AdminSuite 2.1 Tools
- Solstice Print Management 2.1

Solstice AdminSuite Tools

The Solstice AdminSuite 2.1 product provides the following Motif graphical user interface tools:

- Database Manager to update network-related system files such as `auto_home`, `ethers`, `netgroup`, and locale files
- Group Manager to create and manage UNIX groups
- Host Manager to configure system information and add server support for diskless and dataless systems
- Serial Port Manager to configure serial port software for terminals and modems
- User Account Manager to create and manage user accounts
- Printer Manager to install, modify, and delete printer information from the local system or name service. When printers are installed with Printer Manager, they automatically become available to all print clients that are part of a name service. Printer Manager sets up LP print servers to manage printers.
- For more information see, *Solstice AdminSuite 2.1 User's Guide* and *Solstice AdminSuite 2.1 Print Administration Guide*.

Solstice Print Management

The Solstice Print Management software provides tools and technologies that enable system administrators to centralize the administration of printers on a network. It is a complete replacement for the Solaris print software (LP), which requires per-client administration to access remote printers.

Besides the Printer Manager application, the Print Management software also includes the following components:

- **Print Configuration Interface**—Software that makes centralized print administration possible by registering printers with a name service (NIS or NIS+). Print clients don't need to be individually configured to print to remote printers.
- **Print Commands**—Direct replacements for many of the Solaris `lp` print commands. The new commands use the new print configuration interface to send print requests directly to print servers using the BSD protocol, which reduces the resources required on a print client to fill a print request. The number of print problems on print clients is also decreased.

Proc Tools

New process tools are available in `/usr/proc/bin` that display highly detailed information about the active processes stored in `/proc`, the process file system. These thirteen new process tools are similar to some options of the `ps` command, except that the output provided by the new tools is more detailed. For example, the tools can display `fstat` and `fctl` information, working directories, and trees of parent and child processes. Additionally, the tools allow users to stop or resume processes. The `proc(1)` man pages describe these process tools in more detail.

The *System Administration Guide, Volume II* contains information about the `/proc` tools, including some sample procedures explaining how to use them.

The OpenWindows 3.5 Environment

OpenWindows 3.5 provides the same functionality as the 3.4 release, with a few enhancements. The OpenWindows environment provides the following features:

- The OPEN LOOK Window Manager (`olwm`), a client to the X server, manages the following:
 - Window placement
 - Workspace Programs menu
 - Window and icon opening and closing
 - Application starting and exiting

For more information, see the `olwm(1)` man page.

- Internationalization, which enables you to select the local language, time format, and numeric format for the workspace and the DeskSet applications.

If you have a localized version of the Solaris 2.5 release, you can install localization packages that provide support for European or Asian locales.

- The X server, the platform of the OpenWindows environment for window applications.

The X server is a program that is the foundation for the OpenWindows environment. It is the X11R5 sample server with a Display PostScript™ (DPS) imaging system extension. The X server also includes several X extensions, a font server and DPS font enhancements.

- Solaris 2.5 AnswerBook software, a document viewing system for on-line documentation.
- Default key bindings for Motif on Sun.
- An executable, `xmbind` that allows you to change your keybindings without restarting `olwm`.

For more information, see the `xsun(1)`, `Xserver(1)`, and `X11(7)` man pages.

Kodak Color Management System Calibrator Tool

The Kodak Color Management System (KCMS) calibrator tool provides adjustments for accurate color representation to scanners, color monitors, and other output devices. The tool adjusts color by measuring the luminance response of the red, green, and blue phosphors. These measurements are used to create and update profiles that represent valid visuals for the specific frame buffer.

To run the KCMS calibrator tool, you must either have the developer's cluster installed, or install the `SUNWkcs` package. You must also have a hardware calibrator to calibrate your monitor; otherwise you will only be able to view profiles.

For more information, see `kcms_calibrate(1)` man page and the *Solaris Advanced User's Guide*.

Note – KCMS also runs on the co-packaged Common Desktop Environment.

Graphics

The VISUAL™ for Solaris environment includes several graphics and multimedia software foundation libraries. Foundation libraries are the lowest-level device-independent layer of the Solaris software. This level of interface is designed to support a wide variety of common functions. You can build higher-level libraries on top of the foundation libraries, or the foundation libraries can be used directly by a software application. These foundation libraries enable you to create applications that incorporate 2-D and 3-D graphics, imaging, and digital video. The libraries are the XGL graphics library (which serves as a foundation library for Solaris PEX) and XIL imaging library. The Solaris CD contains the PEX, XGL, and XIL runtime libraries.

SPARC: The PEX 3.0 Runtime Environment

The Solaris PEX 3.0 RTE consists of a PEX client-side runtime library (PEXlib) and a PEX server-extension shared-object file (Solaris PEX server). PEXlib is an API to PEX protocol as Xlib is to core X protocol. PEXlib provides application portability across hardware platforms and enables 3D graphics rendering on local and remote displays. The OpenWindows Version 3.5 X11 server automatically loads the PEX shared-object extension when it receives a PEX request from a PEX client.

The PEXlib implementation for Solaris 2.5 is based on *PEXlib - Specification and C Language Binding: Version 5.1*, available from the Massachusetts Institution of Technology (MIT). The PEX server extension is based on *PEX Protocol Specification, Version 5.1*.

Solaris PEX 3.0 RTE is included in the Solaris 2.5 release and should be installed if you are planning to

- Run PEXlib-based graphics client applications
- Display any 3D graphics from client applications that perform rendering on remote displays through the PEX protocol

To install PEX, choose the entire distribution software group when installing Solaris 2.5.

If installing, see *SPARC: Solaris 2.5 Installation Notes* or *x86: Solaris 2.5 Installation Notes* for special instructions.

For more information on PEX, see

- *Solaris PEX Implementation Specification*
- *Solaris PEXlib Reference Manual*
- *CGE PEX 5.1 Portability Guide*

Also, the following books are available at bookstores:

- *PEXlib Programming Manual*, O'Reilly and Associates, Inc.
- *PEXlib Reference Manual*, O'Reilly and Associates, Inc.

The XGL 3.2 Runtime Environment

The XGL library is a 2-D and 3-D immediate-mode API that provides application portability across hardware platforms and enables graphics applications to get optimal performance from graphics accelerators. XGL version 3.2 includes support for raster text, environment and vertex-level texture mapping, 4-component texture mapping, DGA transparent overlay, and triangle list Gcache.

The XGL 3.2 runtime environment (RTE) is included with the Solaris 2.5 release and should be installed if users at your site are running graphics applications. It is not always obvious whether an application requires the XGL RTE; therefore, you should install the XGL RTE if you are installing OpenWindows software, since an application may reference the XGL libraries.

Note – The XGL 3.2 RTE lets you run XGL applications and is delivered with Solaris software. To develop XGL applications, you need the Solaris Software Developer Kit (SDK), a Solaris option that must be purchased separately.

If installing, see *SPARC: Solaris 2.5 Installation Notes* or *x86: Solaris 2.5 Installation Notes* for special instructions.

For more information on XGL, see the *XGL Programmer's Guide* or the *XGL Reference Manual*.

The XIL 1.2.1 Runtime Environment

The XIL is an imaging library that provides a basic set of functions for imaging and video applications. The library provides a strategy for low-level software interfaces (foundation libraries) and enables APIs and API developers to port their code to these foundation libraries.

The Solaris 2.5 operating environment provides an improved version of the XIL library. Version 1.2.1 contains bug fixes and performance enhancements.

Enhanced Hardware Support

New Configurations

A wider range of new hardware configurations is supported. For SPARC systems, refer to *SPARC: Installing Solaris Software* and any additional information supplied by the manufacturer of your hardware. For x86 systems, refer to *Solaris 2.5 x86 Hardware Compatibility List* for details.

St Driver Supports Compatibility

Using the st driver, the system administrator now has the ability to add support for additional and future tape drive models without waiting for new versions of the binary driver. The st model is “user extensible” using a configuration file called `/kernel/drv/st.conf`.

The st driver also supports all tape positioning commands, and other control features needed for commercial backup software such as Legato Networker.

For SPARC systems – St support is not new in Solaris 2.5.

For more information on this feature, see the *x86 Device Configuration Guide*

SPARC: Support for SPARCstorage Array

The SPARCstorage™ Array is a data-storage system that provides increased storage capacity, high performance, high availability, and manageability to various SPARCstation™, SPARCserver™, SPARCcenter™, and SPARCcluster™ systems.

In Solaris 2.5, installation is improved. You can install the Solaris 2.5 software environment either as a new installation or as an upgrade on systems so that the SPARCstorage Array is the boot device.

For more information, see the *SMCC SPARC Hardware Platform Guide Solaris 2.5*.

Miscellaneous Features

Generic features add to the list of enhancements implemented within Solaris 2.5.

Sendmail

The implementation of sendmail delivered in Solaris 2.5 includes several enhancements.

- Compatible with older SunOS or BSD V5 sendmail configuration files
- Enables all hosts at a given priority to be selected through an MX randomizer
- Support for ESMTP is allowed if requested by a peer
- Improved checkpointing during the delivery of mail, which reduces the amount of duplicate mail generated if a server fails

For more information on this topic, see the *Mail Administration Guide*.

X/Open Federated Naming Service

FNS provides support for flexible composition of different, autonomous naming systems into a single service, accessible using a single, simple naming system interface. FNS facilitates naming methods by encouraging the use of common naming policies. These interfaces and policies are used and shared by systems and applications, such as the file service and print service, to provide a view of the global and enterprise-wide namespaces in the Solaris environment.

The FNS includes:

- The FNS core technology
- Federated DNS
- Federated X.500

- FNS-based file naming
- FNS-based printer naming

For more information on this topic, see the *Federated Naming Service Guide*.

Nologin

System administrators can warn users about impending down-time when they have created an `/etc/nologin` file. If the file `/etc/nologin` exists, `login` prints the file's contents on the user's terminal and then exits. This is used by `shutdown (1m)` to stop logins when the system is about to go down.

Font Support

CID Fonts

Character Identification (CID) fonts are native support for Adobe's CID font format. CID fonts were designed for large character set fonts. Use CID fonts to improve performance over Type 0 (composite) fonts. CID fonts are available for Display PostScript System (DPS) clients only.

See the Adobe Technical Note #5092 (CID-Keyed Font File Format Overview) for more information.

XATM 3.0

The X Adobe Type Manager (XATM) interface allows X11 clients to access fonts such as Type 1 that are rendered by the DPS extension. Previous versions of XATM only allowed X11 clients to use Type 1 fonts. This version of XATM calls the PostScript interpreter directly to do font rasterization. This means that X11 clients can now use fonts that XDPS can handle, including Type 3, Type 0 (composite), and CID fonts.

Compatibility

SPARC: Binary Compatibility

More Solaris 1 binaries are now able to run on Solaris 2.5. This allows even more Solaris 1 applications to run without porting or recompiling.

Shell Script Compatibility

Some shell scripts from 4.x now work under 2.5. Some common utilities have been moved back to `/usr/bin` to allow old shell scripts to work unmodified, for example, `/bin/hostname`.

Performance

Time-Sharing

Performance work in Solaris 2.5 focused on improving the performance of the system under time-sharing workloads. As a result, many more users can now be supported on large machine configurations. NFS and desktop performance has improved significantly over previous releases.

KAIO

Kernel Asynchronous Input/Output (KAIO) is an implementation technique that improves the performance of asynchronous reads or writes for raw devices. The `libaio` implementation automatically uses this faster KAIO solution whenever possible. Any application that is already doing asynch IO to raw files will now automatically benefit by this improvement to `libaio`.

Solaris 2.5 Documentation



When you purchase the SunSoft Solaris 2.5 product, you receive a documentation set that may include:

- Printed documents that cover installation, configuration, and last-minute release information
- On-line ASCII files with additional release information
- On-line AnswerBook documents containing the full documentation set for the product

Complete sets of printed documents can be purchased separately. Refer to the *Documentation Order Card* that comes with the product.

About Printed Documents

Printed documents found in your product box cover Solaris 2.5 installation, configuration, and last-minute release information.

Note – You may not have printed documents if your software was preinstalled. Other products, packaged with Solaris, may include printed documentation but are not described here.

About SUNWrdm Package Release Documents

Release documents are on-line files on the Solaris CD in the SUNWrdm package. The file contains bugs, news, patches, device driver updates, and product end-of-life statements. The package should be installed on a client (desktop) and on a network server so it can be accessed. Package installation instructions are included in *SPARC: Solaris 2.5 Installation Notes*, *x86: Solaris 2.5 Installation Notes*, or *PowerPC: Solaris 2.5 Installation Notes*. Last minute bugs and release information received too late to be included on the CD are also documented in the *SPARC: Solaris 2.5 Installation Notes*, *x86: Solaris 2.5 Installation Notes*, or *PowerPC: Solaris 2.5 Installation Notes*.

About On-line AnswerBook Documentation

An AnswerBook set is a collection of documents that can be viewed on-line. AnswerBook sets can be shared by users across a network through a library-based user interface. This on-line library for users is supported by centralized administrative procedures using the utility `ab_admin(1)`. When properly configured, AnswerBooks on a network are like books in a library that users can browse, search, bookmark, and print.

To support the library feature, an AnswerBook start-up script, delivered as part of the OpenWindows package, replaces all AnswerBook start-up scripts from previous releases. In addition, installers and administrators of AnswerBook must take some steps to make AnswerBook sets—new and old—available to users. These procedures are discussed in detail in *System Administration Guide, Volume I*.

To Install and Use the Solaris Desktop Product

The Solaris 2.5 Desktop CDs contain on-line release information and the User AnswerBook. To install and use the Solaris Desktop, refer to the following lists of documentation.

Installing a Local Client

SPARC: Installation

- *SPARC: Installing Solaris Software on the Desktop*

Provides step-by-step instructions for booting and installing Solaris software on local clients.

- *SPARC: Solaris 2.5 Installation Notes*

Provides additional last-minute information needed to install the Solaris software, and last minute bugs and other release information.

- Any additional installation documentation provided by your SPARC hardware manufacturer.

x86: Installation

- *x86: Installing Solaris Software on the Desktop*

Provides step-by-step instructions for booting and installing Solaris software on local clients.

- *x86: Solaris 2.5 Installation Notes*

Provides additional last-minute information needed to install the Solaris software and last minute bugs and other release information.

- *x86 Device Configuration Guide*

Describes the parameters of x86 devices and provides for planning and recording of specific device information. Provides a strategy for setting component parameters to prevent conflicts.

- *Solaris 2.5 x86 Hardware Compatibility List*

Provides information about general x86 hardware requirements, supported x86 hardware, and tested x86 system platforms.

PowerPC: Installation

- *Solaris 2.5 PowerPC Edition: Installing on the Desktop*

Provides step-by-step instructions for booting and installing Solaris software on standalone networked and non-networked systems.

- *Solaris 2.5 PowerPC Edition: Installation Notes*

Provides additional last-minute information needed to install the Solaris software and last minute bugs and other release information.

- *Solaris 2.5 PowerPC Edition: Hardware Compatibility List*

Lists the hardware platforms and peripherals supported by the Solaris 2.5 system (PowerPC Edition).

Using the Desktop

Solaris 2.5 User AnswerBook

The *Solaris 2.5 User AnswerBook* contains basic manuals for all Solaris users. It provides information on new features in Solaris, basic information needed to run the desktop environment, and basic SunOS commands. To install the User AnswerBook, choose the Entire Distribution software group during client installation.

The following AnswerBook on-line documents are provided in the *Solaris 2.5 User AnswerBook*:

- *Solaris 2.5 Introduction*

Describes the Solaris computing environment and details new features.

- *Solaris User's Guide*

Provides a detailed description of the applications that constitute the DeskSet environment: File Manager, Mail Tool, Calendar Manager, Text Editor, Workspace Properties, Shell Tool, Command Tool, Console, Clock, Calculator, Performance Meter, Print Tool, Tape Tool, Snapshot, AudioTool, ImageTool, Icon Editor, and Binder.

- *Solaris Advanced User's Guide*

Explains how to carry out command-line operations, such as using basic SunOS commands, using the `vi` editor, using printers and `mailx`, and customizing the work environment.

- Solaris Help Handbooks (on-line only)

Describes how to do basic tasks using DeskSet applications. To view the handbooks, choose Help from the OpenWindows Workspace menu.

Printed Documents

- *Deskset Quick Reference*

Describes how to perform common tasks using Calendar Manager, File Manager, Mail Tool, and Text Editor. Also includes information on using these tools together.

SUNWrdm on-line package

Covers bugs and issues, late-breaking news, patches, x86 device driver updates, or product features that are no longer supported (end-of-life).

To Install and Administer Solaris Servers and Networks

To install and administer servers and networks, refer to the following documentation.

Installing Servers on a Network

To install servers on a network, use the following Solaris documents.

SPARC: Installation

- *SPARC: Installing Solaris Software*

Provides step-by-step instructions for booting and installing Solaris software on networked systems.

- *SPARC: Solaris 2.5 Installation Notes*

Provides additional last-minute information needed to install the Solaris software, along with last minute bugs and other release information.

- *System Administration Guide, Volume I*

Provides conceptual information and step-by-step instructions for adding diskless and dataless client support to a server with Host Manager, a Solstice AdminSuite application.

- *Software and AnswerBook Installation*

Describes how to install software and AnswerBooks on a system.

- Any additional installation documentation provided by your SPARC hardware manufacturer.

x86: Installation

- *x86: Installing Solaris Software*

Provides step-by-step instructions for booting and installing Solaris software on networked systems.

- *x86: Solaris 2.5 Installation Notes*

Provides additional last-minute information needed to install the Solaris software on a desktop machine, along with last minute bugs and other release information.

- *System Administration Guide, Volume I*

Provides conceptual information and step-by-step instructions for adding diskless and dataless client support to a server with Host Manager, a Solstice AdminSuite application.

- *x86 Device Configuration Guide*

Describes the parameters of x86 devices and encourages methodical planning and recording of specific device information. Provides a strategy for setting component parameters to prevent conflicts.

- *Solaris 2.5 x86 Hardware Compatibility List*

Provides information about general x86 hardware requirements, supported x86 hardware, and tested x86 system platforms.

Administering a Network

To administer a network, use the following Solaris documents.

System Administration AnswerBook

The following *Solaris 2.5 System Administrator AnswerBook* on-line documents are provided on the System Administration AnswerBook CD.

- *SPARC: Installing Solaris Software and x86: Installing Solaris Software*

Provides step-by-step instructions for booting and installing Solaris software on networked and non-networked systems.

- *System Administration Guide, Volume I*

Is part of a two-volume set that covers a significant part of the Solaris™ system administration information. It includes both SPARC and x86 information and describes how to use the tools in the Solstice™ System Management Base to perform many system administration tasks.

Provides overview and task information about

- Managing removable media (CDs, diskettes, PCMCIAAs), clients, file systems, software (packages, patches, AnswerBook), users and groups, and disks tape devices.
- Backing up and restoring data.
- Halting and booting.

- *System Administration Guide, Volume II*

Is part of a two-volume set that covers a significant part of the Solaris system administration information. It includes both SPARC and x86 information and describes how to use the tools in the Solstice System Management Base to perform many system administration tasks.

Provides overview and task information about

- Managing printers, system resources (accounting, crash dumps, disk use and quotas, crontabs, system information), terminals and modems, system security
- Monitoring system performance
- Working with remote systems

- *Mail Administration Guide*

Presents the concepts and procedures required to establish and maintain electronic mail services. Special focus is given to the configuration files needed for `sendmail`.

- *NIS+ and FNS Administration Guide*

Presents tasks for setting up and administering the Network Information Service Plus (NIS+) and the Domain Name Service (DNS).

- *NIS+ and DNS Setup and Configuration Guide*

Describes how to use the Network Information Service Plus (NIS+) scripts to quickly set up a NIS+ domain.

- *NIS+ Transition Guide*

Describes how to convert a site running the NIS name service to one running NIS+.

- *NFS Administration Guide*

Presents the administrative tasks required for the successful operation of the SunSoft™ NFS distributed computing file system. Also included in this manual is how to set up and use autofs (formerly the automounter) to automatically mount and unmount NFS file systems.

- *TCP/IP and Data Communications Administration Guide*

Contains procedures and conceptual information for network administration using the Solaris implementation of the TCP/IP protocol suite. Explains how to set up a local area network, administer its activities, transfer files across distant networks using UUCP, and expand an internetwork using PPP or routers.

- *Solaris 1.x to 2.x Transition Guide*

Describes what has changed in the Solaris environment for users, system administrators, and developers familiar with the SunOS 4.x release. Also evaluates the availability of all SunOS 4.x interfaces and describes corresponding Solaris features.

- *Binary Compatibility Guide*

The Solaris Binary Compatibility Package is a SunOS 4.1.x emulator that allows most 4.x applications to run on Solaris 2.5. The Guide describes how to use the BCP and provides restrictions on its use.

- *Direct Xlib User's Guide*

Describes the installation and use of the Direct Xlib end-user product. The Direct Xlib product provides enhanced graphics performance for graphics-intensive Xlib applications.

- *OpenBoot 3.x Command Reference Manual*

Describes how to use systems that implement firmware that responds as specified by IEEE 1275-1994. Discusses how to use OpenBoot 3.x to configure and debug systems.

- *OpenBoot 2.x Command Reference Manual*

Describes the OpenBoot 2.x firmware that is part of the boot PROM in Sun systems. Discusses how to use OpenBoot 2.x to configure and debug systems.

- *SunSHIELD Basic Security Module Guide*

Gives installation and administration instructions for the Solaris SHIELD™ Basic Security Module (BSM). The BSM provides security auditing and a device allocation mechanism defined as C2 Class in the Trusted Computer System Evaluation Criteria.

- *Solaris Common Messages and Troubleshooting Guide*

Explains the causes of and resolutions for some of the more common error messages in the Solaris system.

- *Index to System and Network Administration Documentation*

Is a master index to System and Network Administration documentation. It is a compilation of the indexes from the User and System Administration AnswerBooks. You can navigate to source material in the documentation by clicking on a reference locator in the master index. See the index for a complete list of the manual titles included.

Reference Manual AnswerBook Documents

The following Solaris 2.5 Reference Manual AnswerBook on-line documents are provided on the System Administration AnswerBook CD.

- *SunOS Reference Manual* contains SunOS manual pages, organized by section:

- *man Pages(1): User Commands*
- *man Pages(1M): System Administration Commands*
- *man Pages(2): System Calls*
- *man Pages(3): Library Routines*
- *man Pages(4): File Formats*

- *man Pages(5): Headers, Tables and Macros*
- *man Pages(6): Demos*
- *man Pages(7): Device & Network Interfaces*
- *man Pages(9): DDI and DKI Overview*
- *man Pages(9E): DDI and DKI Driver Entry Points*
- *man Pages(9F): DDI and DKI Kernel Functions*
- *man Pages(9S): DDI and DKI Data Structures*
- *OpenWindows Desktop Reference Manual* contains OpenWindows manual pages, organized by section:
 - *man Pages(1): User Commands*
 - *man Pages(1M): System Administration Commands*
 - *man Pages(2): System Calls*
 - *man Pages(3): Library Routines*
 - *man Pages(4): File Formats*
 - *man Pages(5): Headers, Tables and Macros*
 - *man Pages(6): Demos*
 - *man Pages(7): Device & Network Interfaces*
 - *man Pages(9): DDI and DKI Overview*
 - *man Pages(9E): DDI and DKI Driver Entry Points*
 - *man Pages(9F): DDI and DKI Kernel Functions*
 - *man Pages(9S): DDI and DKI Data Structures*
- *Solaris X Window System Reference Manual* contains X Windows manual pages, organized by section:
 - *man Pages(1): User Commands*
 - *man Pages(1M): System Administration Commands*
 - *man Pages(2): System Calls*
 - *man Pages(3): Library Routines*
 - *man Pages(4): File Formats*
 - *man Pages(5): Headers, Tables and Macros*
 - *man Pages(6): Demos*
 - *man Pages(7): Device & Network Interfaces*
 - *man Pages(9): DDI and DKI Overview*
 - *man Pages(9E): DDI and DKI Driver Entry Points*
 - *man Pages(9F): DDI and DKI Kernel Functions*
 - *man Pages(9S): DDI and DKI Data Structures*

Printed Documents

- *OpenBoot 3.x Quick Reference Card*
Contains tables of OpenBoot 3.x commands.
- *OpenBoot 2.x Quick Reference Card*
Contains tables of OpenBoot 2.x commands.

SUNWrdm on-line package

Covers bugs and issues, late-breaking news, patches, x86 device driver updates, or product features that are no longer supported (end-of-life).

To Develop Software and Device Drivers

Software and device driver developers can extend the Solaris product for their needs by purchasing additional Solaris products and documentation.

For more detailed information about the Solaris Software Developer Kit, see the *Solaris 2.5 Software Developer Kit Introduction*. For more detailed information about the Solaris Driver Developer Kit, see the *Solaris 2.5 Driver Developer Kit Introduction*.

Software Developers

The following AnswerBook on-line documentation is provided for the software developer:

- *Solaris 2.5 Software Developer AnswerBook*
- *Solaris XIL 1.2 AnswerBook*
- *Solaris XGL 3.2 AnswerBook*
- *PEX AnswerBook*
- *KCMS AnswerBook*
- *Solaris 2.5 Reference Manual AnswerBook*
- *Solaris 2.5 Supplemental Developer AnswerBook*
- *OpenWindows Developer Guide AnswerBook*

Software developers also receive the Motif Developer Set, which contains on-line PostScript files.

Printed documentation for the Software Developer Kit includes the *Solaris 2.5 Software Developer Kit Introduction* and the *Solaris 2.5 Software Developer Kit Installation Guide*.

Driver Developers

The following AnswerBook on-line documentation is provided for driver developers:

- *Solaris 2.5 Driver Developer AnswerBook*
- *Solaris 2.5 Reference Manual AnswerBook*
- *Solaris 2.5 Supplemental Developer AnswerBook*

Printed documentation for the Driver Developers Kit includes the *Solaris 2.5 Driver Developer Kit Introduction* and *Solaris 2.5 Driver Developer Kit Installation Guide*.

Additional Information

Additional sources of information about Solaris 2.5 products and technologies are available. The following is a brief list of places to look for assistance, information, and support in working with Solaris 2.5.

- SunSoft™ Press—Publishes third party books about Solaris topics.
- SunExpress™—A quick-delivery customer distribution channel for Sun Microsystems, Inc. (SMI) software, peripherals, documentation, hardware accessories, and (some) third party software.
- SunSoft Customer Support—A SunSoft group set up to assist customers.
- SunSoft Customer Education—A SunSoft group that provides Solaris and application training to SunSoft customers and users.
- SMI Customer Education—An SMI group that provides Solaris and application training to SMI customers.

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