



What's New in the Solaris 9 4/04 Operating Environment

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Preface

What's New in the Solaris 9 4/04 Operating Environment describes all features that are in the Solaris™ 9 4/04 release. Chapter 2 provides a list of all enhancements that were made available in the original Solaris 9 release, which was released in May 2002. Chapter 1 summarizes new features that have been added to the Solaris 9 9/02 release and subsequent Solaris 9 releases.

The Solaris operating system runs on the SPARC® platform and certain x86 platforms. The information in this document pertains to all platforms unless otherwise specified in a special chapter, section, note, bulleted item, figure, table, or example.

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Related Books

For further information about the Solaris 9 features that are summarized in this book, refer to the following Sun documentation:

- *Application Packaging Developer's Guide*
- *GNOME 2.0 Desktop Collection* at <http://docs.sun.com>
- *International Language Environments Guide*
- *IP Network Multipathing Administration Guide*
- *IPQoS Administration Guide*
- *IPsec and IKE Administration Guide*
- *IPv6 Administration Guide*
- *Linker and Libraries Guide*

- *Multithreaded Programming Guide*
- *Programming Interfaces Guide*
- *Solaris 9 4/04 Installation Guide*
- *Solaris Common Desktop Environment: User's Guide*
- *Solaris DHCP Service Developer's Guide*
- *Solaris Modular Debugger Guide*
- *Solaris Tunable Parameters Reference Manual*
- *Solaris Volume Manager Administration Guide*
- *Solaris WBEM Developer's Guide*
- *Sun ONE Application Server 7 Collection Update 1 (Solaris Edition)* at <http://docs.sun.com>
- *Sun ONE Message Queue 3.0.1 Administrator's Guide*
- *Sun ONE Message Queue 3.0.1 Developer's Guide*
- *System Administration Guide: Advanced Administration*
- *System Administration Guide: Basic Administration*
- *System Administration Guide: IP Services*
- *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*
- *System Administration Guide: Naming and Directory Services (FNS and NIS+)*
- *System Administration Guide: Resource Management and Network Services*
- *System Administration Guide: Security Services*
- *Writing Device Drivers*

For further information about the Sun Java™ Enterprise System, see *Sun Java Enterprise System 2003Q4* at <http://docs.sun.com>.

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Typographic Conventions

The following table describes the typographic changes 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. machine_name% you have mail.
AaBbCc123	What you type, contrasted with on-screen computer output	machine_name% su Password:
<i>AaBbCc123</i>	Command-line placeholder: replace with a real name or value	To delete a file, type rm <i>filename</i> .
<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 must be <i>root</i> to do this.

Numerals in parentheses next to a command or function name, for example, `ioctl(2)`, indicate the reference manual section number where the manual page (“man page”) for the command or function is located.

Shell Prompts in Command Examples

The following table shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P-2 Shell Prompts

Shell	Prompt
C shell prompt	machine_name%
C shell superuser prompt	machine_name#
Bourne shell and Korn shell prompt	\$
Bourne shell and Korn shell superuser prompt	#

What's New in Solaris 9 Releases

The current Solaris 9 release is the Solaris 9 4/04 release.

This chapter summarizes new and enhanced features in the following Solaris releases:

- “Solaris 9 4/04 Release” on page 17
- “Solaris 9 12/03 Release” on page 18
- “Solaris 9 8/03 Release” on page 18
- “Solaris 9 4/03 Release” on page 19
- “Solaris 9 12/02 Release” on page 19
- “Solaris 9 9/02 Release” on page 20

For a summary of enhancements that were previously made available in the Solaris 9 release (originally distributed in May 2002), see Chapter 2.

An important announcement is also included in this chapter. See “Sun Java Enterprise System Joins Solaris” on page 39. Sun Java™ Enterprise System includes Sun™ Open Net Environment (Sun ONE) products.

Most of the features that are described in this chapter run on both the SPARC platform and certain x86 platforms. Those descriptions that are specific to one platform are labeled as either a SPARC feature or an x86 feature in the description title.

New Features by Solaris Release

This overview lists all the new features that are described in this chapter. This list is sorted by release for your reference. Descriptions of these features are provided in the remaining sections of this chapter.

Solaris 9 4/04 Release

The following features are new in the Solaris 9 4/04 release.

- “Creating RAID-1 Volumes (Mirrors) With Custom JumpStart” on page 21
- “x86: Specifying Boot Properties With `add_install_client` Command” on page 21

- “Top-Down Volume Creation in Solaris Volume Manager” on page 25
- “Code Conversions for Internationalized Domain Name Support” on page 32
- “Standard Type Services Framework” on page 33
- “New and Revised Documentation in the Solaris 9 4/04 Release” on page 35
- “Sun Remote Services Net Connect 3.1” on page 39

The following USB feature descriptions are new or have been revised in the Solaris 9 4/04 release. USB features are available for both the x86 and SPARC platforms in this release.

- “USB Dual Framework” on page 28
- “USB 2.0 Features” on page 28
- “USB 2.0 Device Features and Compatibility Issues” on page 28
- “Solaris Support for USB Devices” on page 30
- “USB Mass Storage Devices” on page 30
- “USB Driver Enhancements” on page 31
- “EHCI and OHCI Drivers” on page 32

Solaris 9 12/03 Release

The following features are new in the Solaris 9 12/03 release.

- “WAN Boot Installation Method” on page 21
- “Signed Packages and Patches” on page 25
- “NIS-to-LDAP Transition Service” on page 26
- “Common Transliteration-based Input Method for All Indian languages” on page 33
- “New and Revised Documentation in the Solaris 9 12/03 Release” on page 35
- “Sun Java Enterprise System Joins Solaris” on page 39
- “Enhancements to the NFS Client” on page 44
- “sadmin Security Level Raised” on page 47
- “Kerberos Enhancements” on page 47
- “Internet Key Exchange (IKE) Key Storage on Sun Crypto Accelerator 4000 Board” on page 47
- “Physical Memory Control Using the Resource Capping Daemon” on page 50
- “SPARC: Locality Groups” on page 51

“Sun ONE Application Server Integration” on page 40 has been revised in the Solaris 9 12/03 release.

Solaris 9 8/03 Release

The following features are new in the Solaris 9 8/03 release.

- “Solaris Live Upgrade 2.1” on page 22
- “Custom JumpStart Installation Method Creates New Boot Environment” on page 22
- “BIND 8.3.3” on page 26
- “Unicode Version 3.2 Support” on page 33
- “New and Revised Documentation in the Solaris 9 8/03 Release” on page 36
- “SPARC: TCP Multidata Transmit” on page 42

- “User Selector for Internet Protocol Quality of Service (IPQoS)” on page 43
- “SPARC: Multiterabyte UFS File Systems” on page 45
- “Auditing Enhancements” on page 48
- “Smart Card Interfaces” on page 51
- “GNOME 2.0 Desktop” on page 56
- “Xscreensaver Program” on page 58
- “Ghostscript 7.05” on page 59

The following features have been revised in the Solaris 9 8/03 release.

- “Sun ONE Message Queue” on page 41
- “Linkers and Libraries Updates” on page 51

Solaris 9 4/03 Release

The following features are new in the Solaris 9 4/03 release.

- “Command-Line Interface Enhancements to the Solaris Product Registry” on page 24
- “SPARC: Multiterabyte Volume Support in Solaris Volume Manager” on page 26
- “Reconfiguration Coordination Manager Support in Solaris Volume Manager” on page 27
- “Solaris Patch Update Feature” on page 27
- “Additional Keyboard Support” on page 34
- “Wubi Input Method” on page 34
- “Input Method Support for Indic” on page 34
- “Seven Additional Indic Scripts for Support in Unicode Locales” on page 35
- “New and Revised Documentation in the Solaris 9 4/03 Release” on page 37
- “New *Solaris WBEM Developer’s Guide*” on page 37
- “Internet Protocol Version 6 (IPv6) 6to4 Router” on page 43
- “SPARC: Multiterabyte Volume Support With EFI Disk Labels” on page 46
- “Internet Key Exchange (IKE) Hardware Acceleration” on page 48
- “Stack Check APIs” on page 52
- “Memory Allocation With `libumem`” on page 52
- “Netscape 7.0” on page 55
- “X Event Interception Extension (XEVIe)” on page 58
- “FreeType 2.1.x” on page 58
- “New Freeware Packages: `libxml2 2.4.16` and `libxslt 1.0.19`” on page 59

The following features have been revised in the Solaris 9 4/03 release.

- “Solaris Flash Archives” on page 22
- “Extended Accounting Subsystem” on page 50
- “Linkers and Libraries Updates” on page 51

Solaris 9 12/02 Release

The following features are new in the Solaris 9 12/02 release.

- “Solaris Flash Archives” on page 22
- “Support for LDAP Version 2 Profiles” on page 24

- “Combine Data Address and Test Address for Single IP Network Multipathing Group” on page 27
- “New and Revised Documentation in the Solaris 9 12/02 Release” on page 38
- “Sun ONE Application Server Integration” on page 40
- “Sun ONE Message Queue” on page 41
- “Hosting Multiple Web Sites on a Single Solaris Machine” on page 43
- “Enhanced `crypt ()` Function” on page 49
- “Password Management Feature in `pam_ldap`” on page 49
- “Pluggable Authentication Module (PAM) Enhancement” on page 49
- “Linkers and Libraries Updates” on page 51
- “Enhanced `crypt ()` Function” on page 53
- “New Flags for `madvise ()` Function” on page 53
- “UFS Logging Performance Enhancements” on page 54
- “Xserver Virtual Screen Enhancement” on page 58
- “Xrender Extension” on page 58
- “ANT 1.4.1 Freeware Package” on page 59

Solaris 9 9/02 Release

The following features are new in the Solaris 9 9/02 release.

- “NIS+-to-LDAP Transition Documentation” on page 38
- “New and Revised Documentation in the Solaris 9 9/02 Release” on page 38
- “Packet Tunneling Over IPv6” on page 43
- “IP Quality of Service” on page 43
- “Routing Information Protocol Version 2 (RIPv2)” on page 44
- “Extended Accounting Subsystem” on page 50
- “Smartcard Middleware APIs” on page 53
- “SPARC: Memory Placement Optimization (MPO)” on page 54
- “SPARC: Dynamic Intimate Shared Memory (DISM) Large-Page Support” on page 55

Installation Enhancements

New installation features in the Solaris 9 4/04 release concern creating RAID-1 volumes with customer JumpStart and specifying boot properties with the `add_install_client` command. Installation features from prior releases include the following.

- “WAN Boot Installation Method” on page 21
- “Solaris Live Upgrade 2.1” on page 22
- “Solaris Flash Archives” on page 22
- “Solaris Flash Differential Archives and Configuration Scripts” on page 23
- “Customizing Content in a Solaris Flash Archive” on page 23
- “Command-Line Interface Enhancements to the Solaris Product Registry” on page 24
- “Support for LDAP Version 2 Profiles” on page 24

Creating RAID-1 Volumes (Mirrors) With Custom JumpStart

This feature is new in the Solaris 9 4/04 release.

The custom JumpStart™ installation method now enables you to create RAID-1 volumes (mirrors) during the installation of the Solaris Operating System. By mirroring file systems, you can protect your system by duplicating data over two physical disks. If one of the mirrored disks fails, the system data is still accessible from the second mirrored disk.

In JumpStart, the following new custom profile keywords and values enable you to create mirrored file systems.

- The new `filesys` keyword value `mirror` creates a mirror. Then you can designate specific slices as single-slice concatenations to attach to the mirror.
- The new `metadb` profile keyword enables you to create the required state database replicas.

For more information, see the *Solaris 9 4/04 Installation Guide*.

x86: Specifying Boot Properties With `add_install_client` Command

This feature is new in the Solaris 9 4/04 release.

The `add_install_client` command now enables you to set boot properties for Solaris x86 clients during a PXE network boot. The `-b` option enables you to perform the following tasks with the `add_install_client` command.

- You can specify an alternate console to use during your network installation.
- You can specify the device to use as the network boot device during the installation.
- You can instruct the client to perform a fully automated custom JumpStart installation.

For more information, see the `install_scripts(1M)` man page, the `eeprom(1M)` man page, and the *Solaris 9 4/04 Installation Guide*.

WAN Boot Installation Method

This feature is new in the Solaris 9 12/03 release.

The Solaris software now enables you to boot and install software over a wide area network (WAN) by using HTTP. The WAN boot installation method enables you to install the Solaris software on systems over a large public network where the network infrastructure might be untrustworthy. You can use WAN boot with new security features to protect data confidentiality and installation image integrity.

The WAN boot installation method enables you to transmit an encrypted Solaris Flash archive over a public network to a remote client. The WAN boot programs then install the client system by performing a custom JumpStart installation. To protect the

integrity of the installation, you can use private keys to authenticate and encrypt data. You can also transmit your installation data and files over a secure HTTP connection by configuring your systems to use digital certificates.

For more information about this feature, see the *Solaris 9 4/04 Installation Guide*.

Solaris Live Upgrade 2.1

This feature is new in the Solaris 9 8/03 release.

Solaris Live Upgrade provides a method of upgrading a system while the system continues to operate. While your current boot environment is running, you can duplicate the boot environment, then upgrade the duplicate. Or, rather than upgrading, you can install a Solaris Flash archive on a boot environment. The original system configuration remains fully functional and unaffected by the upgrade or installation of an archive. When you are ready, you can activate the new boot environment by rebooting the system. If a failure occurs, you have a safety net. You can quickly revert to the original boot environment with a simple reboot. Thus, you eliminate the normal downtime of the test and evaluation process.

New features in Solaris Live Upgrade 2.1 provide the following new functionality.

- Solaris Live Upgrade uses Solaris Volume Manager technology to create a duplicate boot environment that contains file systems with RAID-1 volumes (mirrors). The mirror provides data redundancy for any file systems, including the root (/) file system. With the `lucreate` command, you can create mirrored file systems that contain up to three submirrors.
- With the `lucreate` command, you can now exclude some files and directories that would normally be copied from the original boot environment. If you have excluded a directory, you can also include specified files and subdirectories under that directory.

For further information, see the *Solaris 9 4/04 Installation Guide*.

Custom JumpStart Installation Method Creates New Boot Environment

This feature is new in the Solaris 9 8/03 release.

You can now use the JumpStart installation method to create an empty boot environment when you install the Solaris software. The empty boot environment can then be populated with a Solaris Flash archive for later use.

Solaris Flash Archives

This feature is new in the Solaris 9 12/02 release and has been revised in the Solaris 9 4/03 release.

The Solaris Flash installation feature enables you to use a single reference installation of the Solaris software on a system. This system is called the master system. Then, you can replicate that installation on a number of systems, which are called clone systems. The installation is an initial installation that overwrites all files on the clone system.

Solaris Flash Differential Archives and Configuration Scripts

This feature is new in the Solaris 9 12/02 release and has been revised in the Solaris 9 4/03 release.

The Solaris Flash installation feature provides new enhancements for this Solaris release.

- A Solaris Flash installation can now update a clone system with minor changes. If you have a clone system and want to update it, you can create a differential archive that contains only the differences between two images, the original master image and an updated master image. When you update a clone system with a differential archive, only the files that are specified in the differential archive are changed. The installation is restricted to clone systems that contain software which is consistent with the original master image. You use the custom JumpStart installation method to install a differential archive on a clone system. Or, you can use Solaris Live Upgrade to install a differential archive on a duplicate boot environment.
- Special scripts can now be run for configuration of the master or clone or can be run to validate the archive. These scripts enable you to do the following tasks.
 - Configure applications on clone systems. You can use a custom JumpStart script for some uncomplicated configurations. For more complicated configurations, special configuration file processing might be necessary on the master system or before or after installation on the clone system. Also, local preinstallation and postinstallation scripts can reside on the clone. These scripts can protect local customizations from being overwritten by the Solaris Flash software.
 - Identify nonclonable, host-dependent data that enables you to make the flash archive host independent. Host independence is enabled by modifying such data or excluding the data from the archive. An example of host-dependent data is a log file.
 - Validate software integrity in the archive during creation.
 - Validate the installation on the clone system.

For further information, see the *Solaris 9 4/04 Installation Guide*. This guide also includes information on how to use Solaris Live Upgrade to install a differential archive.

Customizing Content in a Solaris Flash Archive

This feature is new in the Solaris 9 12/02 release and has been revised in the Solaris 9 4/03 release.

The `flarcreate` command is used to create a Solaris Flash archive. In this Solaris release, this command has been updated with new options that increase your flexibility to define archive contents when creating an archive. You now can exclude more than one file or directory. From an excluded directory, you can add back a subdirectory or file. This feature is useful when you want to exclude large data files that you do not want cloned.

For information on how to use these options, see the *Solaris 9 4/04 Installation Guide*.

Note the following name change: Solaris Flash (formerly Web Start Flash).

Command-Line Interface Enhancements to the Solaris Product Registry

This feature is new in the Solaris 9 4/03 release.

The `prodreg` command has been updated to include functionality that is similar to the Solaris Product Registry graphical user interface. You can now use the following `prodreg` subcommands on the command line or in administration scripts to perform a variety of tasks.

- `browse` – The `browse` subcommand enables you to view registered software in a terminal window. By repeating the `browse` subcommand, you can navigate through the directory hierarchy of registered software.
- `info` – The `info` subcommand enables you to view information about registered software. You can use the `info` subcommand to identify the following specifics.
 - Installation location of the software
 - Other software that the specified software requires
 - Other software that depends on the specified software
 - Software that has been damaged by the removal of packages that the software requires
- `unregister` – The `unregister` subcommand removes software installation information from the Solaris Product Registry. If you remove software from your system without properly uninstalling the software from the Registry, you can use the `prodreg unregister` command to clean up the obsolete entries in the Solaris Product Registry.
- `uninstall` – The `uninstall` subcommand enables you to remove registered software from your system by launching that software's uninstall program.

For more information, see the `prodreg(1M)` man page and the *System Administration Guide: Basic Administration*.

Support for LDAP Version 2 Profiles

This feature is new in the Solaris 9 12/02 release.

The Solaris installation programs now support LDAP Version 2 profiles. These profiles enable you to configure your system to use a proxy credential level. During the Solaris Web Start or `suninstall` programs, you can specify the LDAP proxy-bind distinguished name and proxy-bind password. With any installation method, you can preconfigure LDAP before installation by using the `proxy_dn` and `proxy_password` keywords in the `sysidcfg` file.

For information, see the *Solaris 9 4/04 Installation Guide*.

System Administration Tools

Top-down volume creation is a new feature in the Solaris 9 4/04 release. System administration features from prior releases include the following:

- “Signed Packages and Patches” on page 25
- “NIS-to-LDAP Transition Service” on page 26
- “BIND 8.3.3” on page 26
- “SPARC: Multiterabyte Volume Support in Solaris Volume Manager” on page 26
- “Reconfiguration Coordination Manager Support in Solaris Volume Manager” on page 27
- “Solaris Patch Update Feature” on page 27
- “Combine Data Address and Test Address for Single IP Network Multipathing Group” on page 27

Top-Down Volume Creation in Solaris Volume Manager

This feature is new in the Solaris 9 4/04 release.

The top-down volume creation feature of Solaris Volume Manager provides a new command that enables system administrators to quickly and easily create quality of service-based Solaris Volume Manager configurations. Rather than manually partitioning disks, creating stripes, and assembling mirrors, the `metassist` command manages the details and provides functional logical volumes. The volumes are based on the criteria that are specified at the command line or in referenced configuration files.

For further information, see the *Solaris Volume Manager Administration Guide*.

Signed Packages and Patches

This feature is new in the Solaris 9 12/03 release.

This Solaris release enables you to securely download Solaris packages and patches that include a digital signature by using the updated `pkgadd` and `patchadd` commands. A package or a patch with a valid digital signature ensures that the package or patch has not been modified after the signature was applied to the package or patch.

In previous Solaris releases, you could only add signed patches to your system if you used the Solaris patch management tools with PatchPro 2.1.

Additional software management features in this Solaris release include the following:

- You can add a digital signature to a package with the updated `pkgtrans` command. For information about creating a signed package, see the *Application Packaging Developer's Guide*.
- You can download a package or patch from an HTTP or an HTTPS server.

A signed package is identical to an unsigned package except for the signature. The package can be installed, queried, or removed with existing Solaris packaging tools. A signed package is also binary-compatible with an unsigned package.

Before you can add a package or patch with digital signatures to your system, you must set up a keystore with trusted certificates that are used to identify that the digital signature on the package or patch is valid.

For information about setting up the package keystore and adding signed packages or patches to your system, see the “Adding and Removing Signed Packages (Task Map)” in *System Administration Guide: Basic Administration*.

For information about booting and retrieving Solaris installation images from an HTTP or an HTTPS server, see “WAN Boot Installation Method” on page 21.

NIS-to-LDAP Transition Service

This feature is new in the Solaris 9 12/03 release.

The NIS-to-LDAP transition service can be used to enable a network transition from using NIS to using LDAP as the primary naming service. By using this transition service, administrators can utilize the bundled Sun ONE Directory Server, which works with LDAP naming service clients.

For further information, see the *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*.

BIND 8.3.3

This feature is new in the Solaris 9 8/03 release.

For this Solaris release, the version of BIND is 8.3.3. DNS clients can now connect to IPv6 DNS servers by using IPv6 transport.

SPARC: Multiterabyte Volume Support in Solaris Volume Manager

This feature is new in the Solaris 9 4/03 release.

Solaris Volume Manager has been enhanced with multiterabyte volume support. With this support, the Solaris Volume Manager can create, manage, and delete large (>1Tbyte) RAID-0 (stripe), RAID-1 (mirror), RAID-5, and soft partition volumes. In addition, this large volume support enables Solaris Volume Manager to construct volumes on large or EFI-labeled logical unit numbers (LUNs).

Solaris Volume Manager large volume support is not available for systems that run a 32-bit Solaris kernel. For example, systems that run the Solaris software (x86 Platform Edition) or the Solaris software with the SPARC 32-bit kernel cannot use large volume support.

For further information, see the *Solaris Volume Manager Administration Guide*.

See also “SPARC: Multiterabyte Volume Support With EFI Disk Labels” on page 46.

Reconfiguration Coordination Manager Support in Solaris Volume Manager

This feature is new in the Solaris 9 4/03 release.

Reconfiguration Coordination Manager (RCM) support adds to Solaris Volume Manager the ability to respond appropriately to dynamic reconfiguration (DR) requests. This addition ensures that removal of devices under Solaris Volume Manager control is blocked with an appropriate warning. This block remains in effect until the devices are no longer in use. This warning prevents system administrators from accidentally removing active volumes from a DR-configured system.

For further information, see the *Solaris Volume Manager Administration Guide*.

Solaris Patch Update Feature

This feature is new in the Solaris 9 4/03 release.

You can use the Update option of the Solaris Management Console’s Patches Tool to analyze, download, and install recommended patches from the SunSolve OnlineSM Web site. Or, the `smpatch update` command can be used for this purpose.

This Solaris update feature was previously only available for systems that run the Solaris 2.6, Solaris 7, or Solaris 8 releases.

You must install the PatchPro 2.1 software on your system before running the update feature. Download the PatchPro 2.1 packages from <http://www.sun.com/PatchPro>. Then follow the instructions to install the software on your system.

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

Combine Data Address and Test Address for Single IP Network Multipathing Group

This feature is new in the Solaris 9 12/02 release.

The use of a dedicated test IP address for failure detection on single-adapter IP network multipathing groups is no longer required. Sometimes, failover is not possible because only one network interface card (NIC) is in an IP network multipathing group. In this situation, you can now combine the test address and the data address. The `in.mpathd` daemon uses a data address to detect failure when a test address is not specified.

For further information on Solaris IP multipathing, see the *IP Network Multipathing Administration Guide*.

Device Management

This section describes device management features that are new or have been revised in the Solaris 9 4/04 release. In this release, USB features are now available for both x86 and SPARC platforms.

USB Dual Framework

This feature description is new in the Solaris 9 4/04 release. This feature is available for x86 and SPARC platforms.

The USBA framework, found in the Solaris 9 12/03 release, was originally developed for USB 1.1 devices. A new framework, called USBA 1.0, was created to meet more demanding requirements of USB 2.0 devices. The framework operates USB 1.1 devices as well. This Solaris release provides both frameworks, as a *dual framework*. The purpose of the dual framework is to facilitate a smoother transition from the original framework to the newer framework. The original USBA framework operates devices connected to a system's USB 1.1 ports, while the new USBA 1.0 framework operates devices connected to a system's USB 2.0 ports.

All Sun motherboard ports are USB 1.1 ports, while most PCI card ports support USB 2.0.

For specific details about how the USB dual framework works, go to <http://www.sun.com/desktop/whitepapers.html>.

For information about USB dual framework compatibility issues with the USB dual framework, see "What's New in USB Devices?" in *System Administration Guide: Basic Administration*.

USB 2.0 Features

The Solaris 9 4/04 release includes the following USB 2.0 features, available for both x86 and SPARC platforms:

- **Better Performance** – Increased data throughput for devices that are attached to USB 2.0 controllers, up to 40 times faster than USB 1.1 devices
You can particularly benefit from the high-speed USB protocol when accessing high-speed mass storage devices, such as DVDs and hard drives.
- **Compatibility** – Backward compatibility with 1.0 and 1.1 devices and drivers so that you can use the same cables, connectors, and software interfaces

For a description of USB devices and terminology, see "Overview of USB Devices" in *System Administration Guide: Basic Administration*.

USB 2.0 Device Features and Compatibility Issues

This feature description is new in the Solaris 9 4/04 release and applies to both x86 and SPARC platforms.

USB 2.0 devices are defined as high-speed devices that follow the USB 2.0 specification. You can refer to the USB 2.0 specification at <http://www.usb.org>.

Some of the USB devices that are supported on SPARC based and x86 based systems in this Solaris release are as follows:

- Mass storage devices – CD-RWs, hard disks, DVD, digital cameras, Zip drives, diskettes, and tape drives
- Keyboard, mouse devices, speakers, and microphones
- Audio devices

For a full listing of USB devices that have been verified on the Solaris release, go to:

http://www.sun.com/io_technologies/USB.html

Additional storage devices might work by modifying the `scsa2usb.conf` file. For more information, see the `scsa2usb(7D)` man page.

Solaris USB 2.0 device support includes the following features:

- Increased USB bus speed from 12 Mbps to 480 Mbps. This increase means devices that support the USB 2.0 specification can run significantly faster than their USB 1.1 counterparts when they are connected to a USB 2.0 port.

A USB 2.0 port is defined as follows:

- A port on a USB 2.0 PCI card
- A port on a USB 2.0 hub that is connected to a USB 2.0 port
- USB 2.0 is Solaris Ready on all PCI-based Sun platforms. An NEC-chip based USB 2.0 PCI card is needed to provide USB 2.0 ports on SPARC platforms, and is recommended for x86 platforms. For a list of USB 2.0 PCI cards that have been verified for the Solaris release, go to http://www.sun.com/io_technologies/USB.html.
- USB 1.1 devices work as they have in the past, even if you have both USB 1.1 and USB 2.0 devices on the same system, with one exception. See note.

Note – USB 1.1 devices cannot operate when connected to a USB 2.0 hub that is connected to a USB 2.0 port.

- While USB 2.0 devices operate on a USB 1.x port, their performance is significantly better when connected to a USB 2.0 port.

For more information about USB 2.0 device support, see the `ehci(7D)` and `usba(7D)` man pages.

For information about USB cables and bus-powered devices, see “About USB in the Solaris Environment” in *System Administration Guide: Basic Administration*.

Solaris Support for USB Devices

This feature description is new in the Solaris 9 4/04 release and is available for x86 and SPARC platforms.

The following table describes Solaris support for USB 1.1 and USB 2.0 devices.

	Solaris 8 HW* Releases	Solaris 9 Releases	Solaris 9 4/04 Release
USB 1.1	SPARC and x86	SPARC and x86	SPARC and x86
USB 2.0	SPARC	N/A	SPARC and x86

Note – Solaris 8 HW does not describe the Solaris 8 releases, but the Solaris 8 Hardware (HW) releases, starting with the Solaris 8 HW 5/03 release. The patch number for the USB dual framework that is found in the Solaris 8 HW 5/03 release is 109896.

For information about USB support on Sun hardware, see “Using USB Devices (Overview/Tasks)” in *System Administration Guide: Basic Administration* .

USB Mass Storage Devices

This feature description has been revised in the Solaris 9 4/04 release. These features are now available for x86 and SPARC platforms.

All USB storage devices are now accessed as removable media devices through volume management. This change has the following advantages:

- USB storage devices with standard MS-DOS or Windows (FAT) file systems are now supported.
- You can use the user-friendly `rmformat` command instead of the `format` command to format and partition all USB storage devices. If you need the functionality of the `format` command, use the `format -e` command.
- You can use the `fdisk` command if you need to do `fdisk`-style partitioning.
- Nonroot users can now access USB storage devices, because the root-privileged `mount` command is no longer needed. The device is automatically mounted by `vold` and is available under the `/rmdisk` directory. If a new device is connected while the system is down, do a reconfiguration boot with the `boot -r` command so that `vold` recognizes the device. Note that `vold` does not automatically recognize a hot-plugged device. If a new device is connected while the system is up, restart `vold`. For more information, refer to the `vold(1M)` and `scsa2usb(7D)` man pages.
- Disks with FAT file systems can be mounted and accessed. For example:

```
mount -F pcfs /dev/dsk/c2t0d0s0:c /mnt
```

- All USB storage devices are now power managed, except for those devices that support LOG SENSE pages. Devices with LOG SENSE pages are usually SCSI drives that are connected through a USB-to-SCSI bridge device. In previous Solaris releases, some USB storage devices were not power managed because they were not recognized as removable media.
- Applications might work differently with USB mass storage devices. Note the following issues when using applications with USB storage devices:
 - Applications might make incorrect assumptions about the size of the media because only smaller devices such as diskettes and Zip drives were removable previously.
 - Requests by applications to eject media on devices where this removal would be inapplicable, such as a hard drive, succeed and do nothing.

To revert to the behavior of previous Solaris releases that did not treat all USB mass storage as removable media devices, update the `/kernel/drv/scsa2usb.conf` file.

For more information about using USB mass storage devices, see the `scsa2usb(7D)` man page.

For information about troubleshooting USB mass storage device problems, see “What’s New in USB Devices?” in *System Administration Guide: Basic Administration*.

USB Driver Enhancements

This section describes USB driver enhancements in the Solaris 9 4/04 release. These enhancements are available for x86 and SPARC platforms.

- **New generic USB driver** – USB 1.0 devices can now be accessed and manipulated by applications that use standard UNIX `read(2)` and `write(2)` system calls, and without writing a special kernel driver. Additional features include the following:
 - Applications have access to raw device data and device status.
 - This driver supports control, bulk, and interrupt (in and out) transfers.

For more information, refer to the `ugen(7D)` man page and the USB DDK at the following Web site:

<http://developers.sun.com/solaris/developer/support/driver/usb.html>

- **Digi Edgeport USB support** – Provides support for several Digi Edgeport USB-to-serial-port converter devices.
 - New devices are accessed as `/dev/term/[0-9]*` and `/dev/cua/[0-9]*`.
 - USB serial ports are usable as any other serial port would be, except that they cannot serve as a local serial console. The fact that their data is run through a USB port is transparent to the user.

For more information, see the `usbser_edge(7D)` man page, or go to <http://www.digi.com> and <http://www.sun.com/io>.

- **Documentation and binary support for user-written kernel and userland drivers**
– A Solaris USB Driver Development Kit (DDK), including documentation, is available. For up-to-date information about USB driver development, including information on the DDK, go to the following Web site:

<http://developers.sun.com/solaris/developer/support/driver/usb.html>

EHCI and OHCI Drivers

This feature description is new in the Solaris 9 4/04 release.

Features of the EHCI driver include the following:

- Compliance with enhanced host controller interface that supports USB 2.0.
- Support for high-speed control, bulk, and interrupt transfers.
- Currently, no support is available for high-speed isochronous or split transactions. For example, you cannot connect USB 1.x devices to a 2.0 hub that is connected to a USB 2.0 port.

If you have both USB 2.0 and USB 1.0 or 1.1 devices on your system, the EHCI and OHCI drivers hand-off device control, depending on the type of device that is connected to the system.

- The USB 2.0 PCI card has one EHCI controller and one or more OHCI controllers.
- A USB 1.1 device is dynamically assigned to the OHCI controller when it is connected.
- A USB 2.0 device is dynamically assigned to the EHCI controller when it is connected.

Language Support Enhancements

The most recent language support enhancements provide code conversions for internationalized domain name support and a standard type services framework. Language support features from prior releases include the following:

- “Common Transliteration-based Input Method for All Indian languages” on page 33
- “Unicode Version 3.2 Support” on page 33
- “Additional Keyboard Support” on page 34
- “Wubi Input Method” on page 34
- “Input Method Support for Indic” on page 34
- “Seven Additional Indic Scripts for Support in Unicode Locales” on page 35

Code Conversions for Internationalized Domain Name Support

This feature is new in the Solaris 9 4/04 release.

Internationalized Domain Name (IDN) enables the use of non-English native language names as host and domain names. To use such non-English host and domain names, application developers must convert the names into ASCII Compatible Encoding (ACE) names in their applications as specified in the RFC 3490. System administrators are also required to use ACE names in system files and applications where the system administration applications do not yet support the IDNs.

This feature aids in the conversion by providing the conversion API with various supported option arguments. Refer to the following man pages for more detail:

- `libidnkit(3LIB)`
- `idn_decodename(3EXT)`
- `idn_decodename2(3EXT)`
- `idn_encodename(3EXT)`
- `iconv_en_US.UTF-8(5)`

Standard Type Services Framework

This feature is new in the Solaris 9 4/04 release.

The Standard Type Services Framework (STSF) is a pluggable, object-based architecture that allows users to access typographically sophisticated text layout and rendering. The pluggable architecture of the framework gives users the ability to use different font rasterization engines and text layout processors to achieve the desired visual representation. The pluggable architecture also manages fonts and enables application-specific fonts to be created. STSF includes both a standalone API and an X server extension to handle rendering on the server side for improved efficiency. STSF is an open source project that is sponsored by Sun Microsystems.

For more information about the project and how to use the API, see <http://stsf.sourceforge.net>.

Common Transliteration-based Input Method for All Indian languages

This feature is new in the Solaris 9 12/03 release.

Users who operate within any Unicode (UTF-8) locale in the Solaris software can now easily and intuitively input characters from Indian regional languages. Users who interact with CDE applications, StarOffice™, or Mozilla can more easily interact with Indian scripts. After selecting the transliteration-based input method (IM), users can type phonetic equivalents of Indian language scripts in English. These equivalents are then displayed in the script that is selected, and are correctly shaped and rendered with the help of an underlying layout and shaper module. As transliteration is the most commonly used input method to input Indian languages, this support can greatly enhance the usability of the eight Indian scripts that are provided in the Solaris software.

Unicode Version 3.2 Support

This feature is new in the Solaris 9 8/03 release.

Solaris Unicode locales now support the Unicode Version 3.2. The Unicode Version 3.2 introduces 1016 new characters. This version also includes both normative changes and informative changes, as described in the *Unicode Standard Annex #28: UNICODE 3.2* at the following Web site:

<http://www.unicode.org/unicode/reports/tr28/>

The UTF-8 character representation has been changed to a more secure form as specified in the Unicode Version 3.2. This feature implements the more secure UTF-8 character representation, form, and byte sequences in UTF-8 related `iconv` code conversions. This feature also implements all OS-level multibyte and wide character functions, such as the following:

- `mbtowc()`
- `wctomb()`
- `mbstowcs()`
- `wcstombs()`
- `mbrtowc()`
- `wcrtomb()`
- `mbsrtowcs()`
- `fgetwc()`
- `mblen()`

Additional Keyboard Support

This feature is new in the Solaris 9 4/03 release.

Software support for three additional keyboards has been added to the Solaris 9 4/03 release: Estonian keyboard Type 6, French-Canadian keyboard Type 6, and Polish programmer's keyboard Type 5. This software support gives users in Canada, Estonia, and Poland greater flexibility for keyboard input. The support modifies standard U.S. keyboard layouts to different language needs.

Refer to the *Solaris 9 4/03 Release Notes* for instructions.

Wubi Input Method

This feature is new in the Solaris 9 4/03 release.

The Wubi input method (IM) is widely used in China. The encoding rule for Wubi IM is based on the radical or stroke shape of Chinese characters. Users can rapidly type Chinese characters through a standard keyboard rather than through slower, phonetic-based input methods.

Input Method Support for Indic

This feature is new in the Solaris 9 4/03 release.

Input support for Indian regional language keyboards has been added to the Solaris software. Indic language users can type Indic language characters by using their preferred keyboard layouts in the Solaris software.

Seven Additional Indic Scripts for Support in Unicode Locales

This feature is new in the Solaris 9 4/03 release.

In addition to the current support for Hindi, the following Indic scripts are supported in this Solaris release:

- Bengali
- Gurmukhi
- Gujarati
- Tamil
- Malayalam
- Telugu
- Kannada

Speakers of these Indian regional languages have language support in the Solaris software for any of the Unicode locale environments that Solaris supports.

Solaris Documentation Changes

The Solaris software includes the following documentation changes.

New and Revised Documentation in the Solaris 9 4/04 Release

The following new and revised documentation is available in the Solaris 9 4/04 release:

- *Solaris 9 4/04 Installation Guide* – See “Creating RAID-1 Volumes (Mirrors) With Custom JumpStart” on page 21.
- *Solaris Volume Manager Administration Guide* – See “Top-Down Volume Creation in Solaris Volume Manager” on page 25.
- *System Administration Guide: Basic Administration* – See the new and revised USB descriptions in “Device Management” on page 28.
- *Linker and Libraries Guide* – See “New Linker and Libraries Features and Updates” in *Linker and Libraries Guide* for the most current updates.

New and Revised Documentation in the Solaris 9 12/03 Release

The following new and revised documentation is available in the Solaris 9 12/03 release:

- *Application Packaging Developer’s Guide* – See “Signed Packages and Patches” on page 25.
- *IPsec and IKE Administration Guide* – See “Internet Key Exchange (IKE) Key Storage on Sun Crypto Accelerator 4000 Board” on page 47.
- *Linker and Libraries Guide*
- *Programming Interfaces Guide* – See “SPARC: Locality Groups” on page 51.
- *Solaris 9 12/03 Installation Guide* – See “WAN Boot Installation Method” on page 21.

- *System Administration Guide: Basic Administration* – See “Signed Packages and Patches” on page 25.
- *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)* – See “NIS-to-LDAP Transition Service” on page 26.
- *System Administration Guide: Resource Management and Network Services* – See “Physical Memory Control Using the Resource Capping Daemon” on page 50.

New and Revised Documentation in the Solaris 9 8/03 Release

The following revised documentation is available in the Solaris 9 8/03 release:

- *System Administration Guide: Security Services* – See “Auditing Enhancements” on page 48.
- *System Administration Guide: Basic Administration* – See “SPARC: Multiterabyte UFS File Systems” on page 45.
- *Solaris 9 Installation Guide* – See “Solaris Live Upgrade 2.1” on page 22.
- *Solaris Tunable Parameters Reference Manual* – See “SPARC: TCP Multidata Transmit” on page 42.
- *Linker and Libraries Guide* – See “Linkers and Libraries Updates” on page 51.

The following new documentation is available in the Solaris 9 8/03 release:

- *Sun ONE Application Server 7 Collection Update 1 (Solaris Edition)* – The collection is available at <http://docs.sun.com>. For a description of the Sun ONE Application Server, see “Sun ONE Application Server Integration” on page 40.
This collection includes extensive Sun ONE Application Server documentation for system administrators and developers. Some of the manuals in this collection have been made available previously. Now they are collected in the *Sun ONE Application Server 7 Collection Update 1 (Solaris Edition)* for your ease of reference.
- *GNOME 2.0 Desktop Collection* – This collection is available at <http://docs.sun.com>. For a description of the GNOME 2.0 desktop, see “GNOME 2.0 Desktop” on page 56.

This new collection includes the following manuals:

- *GNOME 2.0 Desktop User Guide* – Describes the components of the desktop and how to customize preferences.
- *GNOME 2.0 Desktop System Administration Guide* – Provides information on how to administer the GNOME 2.0 desktop on the Solaris 8 release and the Solaris 9 release.
- *GNOME 2.0 Desktop Accessibility Guide* – Describes how to configure, customize, and use the accessibility features that are available for the GNOME 2.0 desktop. Information is provided for the Solaris 8 release and for the Solaris 9 release.
- *GNOME 2.0 Desktop Troubleshooting Guide* – Describes known problems and solutions for the GNOME 2.0 desktop. The guide is relevant for the Solaris 8 release and the Solaris 9 release. The manual also contains advice about how to improve the desktop performance.

New and Revised Documentation in the Solaris 9 4/03 Release

The following revised documentation is available in the Solaris 9 4/03 release:

- *Linker and Libraries Guide* – See “Linkers and Libraries Updates” on page 51.
- *System Administration Guide: Basic Administration* – See “SPARC: Multiterabyte Volume Support With EFI Disk Labels” on page 46 and “Solaris Patch Update Feature” on page 27. Information on managing signed patches has also been expanded in this book. Also, see “Command-Line Interface Enhancements to the Solaris Product Registry” on page 24.
- *IPv6 Administration Guide* – See “Internet Protocol Version 6 (IPv6) 6to4 Router” on page 43.
- *Solaris 9 4/04 Installation Guide* – See “Solaris Flash Archives” on page 22.
- *Solaris Volume Manager Administration Guide* – See “SPARC: Multiterabyte Volume Support in Solaris Volume Manager” on page 26 and “Reconfiguration Coordination Manager Support in Solaris Volume Manager” on page 27.
- *System Administration Guide: Resource Management and Network Services* – See “Extended Accounting Subsystem” on page 50.

The following new documentation is available in the Solaris 9 4/03 release:

- *Solaris WBEM Developer’s Guide* – See “New Solaris WBEM Developer’s Guide” on page 37.
- *IPsec and IKE Administration Guide* – See “Internet Key Exchange (IKE) Hardware Acceleration” on page 48.

New Solaris WBEM Developer’s Guide

This feature is new in the Solaris 9 4/03 release.

The new *Solaris WBEM Developer’s Guide* is a combination of the two books on WBEM that were part of earlier Solaris 9 releases: the *Solaris WBEM SDK Developer’s Guide* and the *Solaris WBEM Services Administration Guide*. This change was made to order sequentially the tasks that are associated with WBEM development and deployment. Other changes are listed here:

- The chapter on SNMP was removed.
- In the chapter on “Using the CIM Object Manager,” the steps for upgrading from a previous Solaris release were changed. The change consisted of removing the suggestion to convert existing CIM Object Manager data from the older format that was used in early WBEM releases. Instead, the new suggestion is to recompile all of the MOF files by using the `mofcomp` command.
- The introductory chapters from the two previous manuals were merged into a single introductory chapter in the *Solaris WBEM Developer’s Guide*.

New and Revised Documentation in the Solaris 9 12/02 Release

The following revised documentation is available in the Solaris 9 12/02 release:

- *Linker and Libraries Guide* – See “Linkers and Libraries Updates” on page 51.
- *Solaris 9 4/04 Installation Guide* – See “Solaris Flash Archives” on page 22 and “Support for LDAP Version 2 Profiles” on page 24.
- *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)* – See “Enhanced `crypt()` Function” on page 49.
- *System Administration Guide: Security Services* – See “Pluggable Authentication Module (PAM) Enhancement” on page 49.

The following new documentation is available in the Solaris 9 12/02 release:

- *Sun ONE Application Server 7 Getting Started Guide* – See “Sun ONE Application Server Integration” on page 40.
- *Sun ONE Message Queue 3.0.1 Administrator’s Guide* – See “Sun ONE Message Queue” on page 41.
- *IP Network Multipathing Administration Guide* – See “Combine Data Address and Test Address for Single IP Network Multipathing Group” on page 27.

NIS+-to-LDAP Transition Documentation

This feature is new in the Solaris 9 9/02 release.

The “Transitioning From NIS+ to LDAP” appendix has been moved from the *System Administration Guide: Naming and Directory Services (FNS and NIS+)* to the *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*. Additionally, explanations and examples of various components have been added to the LDAP-related chapters in the *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*. No new features, however, are documented.

New and Revised Documentation in the Solaris 9 9/02 Release

The following new documentation is available in the Solaris 9 9/02 release:

- *IPQoS Administration Guide* – See “IP Quality of Service” on page 43 and “Extended Accounting Subsystem” on page 50 for information about the IPQoS feature.
- *IPv6 Administration Guide* – See “Packet Tunneling Over IPv6” on page 43.

The following revised documentation is available in the Solaris 9 9/02 release:

- *System Administration Guide: Resource Management and Network Services* – See “Extended Accounting Subsystem” on page 50.
- *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)* – See “NIS+-to-LDAP Transition Documentation” on page 38.

Additional Software

The Solaris 9 4/04 release includes the new SRS Net Connect 3.1 software on the Extra Value CD.

Sun Remote Services Net Connect 3.1

This feature is now available in the Solaris 9 4/04 release.

SunSM Remote Services (SRS) Net Connect 3.1 is now available on the Solaris 9 Update 6 Extra Value CD. SRS Net Connect 3.1 allows you to self-monitor systems, create performance and trend reports, and receive automatic notifications. These features help you maximize system availability and reliability and manage potential issues.

For information about installation of SRS Net Connect, see the *SunSM Remote Services Net Connect Solaris 9 Update 6 CD Installation and Activation Guide*. This manual is located on the Solaris Software 2 of 2 CD at the following location:

`Solaris_9/ExtraValue/CoBundled/NetConnect_3.1/docs/InstallActivate.pdf`

Sun Java Enterprise System Joins Solaris

Sun JavaTM Enterprise System is new in the Solaris 9 12/03 release.

Solaris software now includes products from the Java Enterprise System that you can choose to install with the Solaris software. Java Enterprise System includes Sun ONE infrastructure and cluster software in one open-network computing package. Java Enterprise System offers enterprises a complete set of services to integrate Web applications, services, and legacy applications. The Java Enterprise System software provides a common user experience. The software includes the same language support, consistent documentation, component standardization, a common installer, and other features that deliver integrated functionality. Java Enterprise System includes the following component products:

Communication and Collaboration Services

- Sun ONE Messaging Server 6.0
- Sun ONE Calendar Server 6.0
- Sun ONE Instant Messaging Server 6.0.1
- Sun ONE Portal Server 6.2, and Secure Remote Access 6.2

Web and Application Services

- Sun ONE Application Server 7.0 PE*
- Sun ONE Application Server 7.0 SE*
- Sun ONE Web Server 6.1
- Sun ONE Message Queue 3.0.1 SP2*

Directory and Identity Services

- Sun ONE Identity Server 6.1
- Sun ONE Directory Server 5.2 Multi-Platform Edition

- Sun ONE Directory Proxy Server 5.2

Availability Services

- Sun Cluster 3.1
- Sun Cluster Agents 3.1 for selected Sun ONE component products

For further information about the Java Enterprise System, see *Sun Java Enterprise System 2003Q4* at <http://docs.sun.com>.

* These products are available within the Solaris operating system. See the following descriptions for further information.

- “Sun ONE Message Queue” on page 41
- “Sun ONE Application Server Integration” on page 40

The Sun ONE Directory Server 5.2 is available as a component product in the Java Enterprise System. The Sun ONE Directory Server 5.1 is available within the Solaris operating system. For further information about the Sun ONE Directory Server 5.1, see “Sun ONE Directory Server” on page 63.

Networking Enhancements

The Solaris software includes the following networking enhancements from prior Solaris 9 releases:

- “Sun ONE Application Server Integration” on page 40
- “Sun ONE Message Queue” on page 41
- “SPARC: TCP Multidata Transmit” on page 42
- “Internet Protocol Version 6 (IPv6) 6to4 Router” on page 43
- “Packet Tunneling Over IPv6” on page 43
- “Hosting Multiple Web Sites on a Single Solaris Machine” on page 43
- “IP Quality of Service” on page 43
- “User Selector for Internet Protocol Quality of Service (IPQoS)” on page 43
- “Routing Information Protocol Version 2 (RIPv2)” on page 44

Sun ONE Application Server Integration

This feature is new for the SPARC platform in the Solaris 9 12/02 release. In the Solaris 9 12/03 release, this feature is also available for the x86 platform.

Sun ONE Application Server 7, Platform Edition (formerly iPlanet™ Application Server) is integrated in the Solaris operating system. The Platform Edition of the Application Server provides the foundation for enterprise-class application services and web services. The server provides a high-performance, small-footprint Java™ 2 Platform, Enterprise Edition (J2EE™). J2EE enables the development, deployment, and management of enterprise applications and web services to a broad range of servers, clients, and devices.

The Sun ONE Application Server provides application portability and fast time to market for new Java and Extensible Markup Language (XML) applications. These new applications are J2EE 1.3 platform compatible. The Application Server enables developers to build applications that are based on JavaServer Pages™ (JSP™), Java Servlet, and Enterprise JavaBeans™ (EJB™) technology. This technology supports a broad range of business requirements from small departmental applications to enterprise-scale, mission-critical services.

Feature highlights include the following:

- Provides integration of the Sun ONE Message Queue and the Hypertext Transfer Protocol (HTTP) server from the Sun ONE Web Server
- Provides scalability with enhanced performance
- Provides comprehensive web services support – Java Web Services, Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL)
- Provides interoperability with the Sun ONE Portal Server 6.0 and Sun ONE Directory Server
- Uses the J2EE Reference Implementation

The following name changes have been made:

- Sun ONE Message Queue (formerly iPlanet Message Queue for Java)
- Sun ONE Web Server (formerly iPlanet Web Server)
- Sun ONE Portal Server (formerly iPlanet Portal Server)
- Sun ONE Directory Server (formerly iPlanet Directory Server)

For further information, see the *Sun ONE Application Server 7 Collection Update 1 (Solaris Edition)*. Further information about this collection is available at “New and Revised Documentation in the Solaris 9 8/03 Release” on page 36. See also http://www.sun.com/software/products/appsrvr/home_appsrvr.html.

For specific licensing terms, refer to the binary code license.

Sun ONE Message Queue

This feature is new for the SPARC platform in the Solaris 9 12/02 release. In the Solaris 9 8/03 release, this feature is also available for the x86 platform.

The Solaris software now supports Java Messaging Service (JMS) applications. This Solaris release uses Sun ONE Message Queue (formerly iPlanet Message Queue for Java) as a JMS provider.

JMS messaging enables applications and application components to exchange messages asynchronously and reliably. Processes that run on different platforms and different operating systems can connect to a common message service to exchange information.

Sun ONE Message Queue, Platform Edition provides a full implementation of the JMS specification. The message queue provides additional features such as the following:

- Centralized administration
- Tunable performance
- Support for the Java Naming and Directory Interface™ (JNDI)
- Support for Simple Object Access Protocol (SOAP) messaging

For further information, see the *Sun ONE Message Queue 3.0.1 Administrator's Guide* and the *Sun ONE Message Queue 3.0.1 Developer's Guide*. For information about Sun ONE Message Queue editions and features, see also the following Web site:

http://www.sun.com/software/products/message_queue/home_message_queue.html

SPARC: TCP Multidata Transmit

This feature is new in the Solaris 9 8/03 release.

Multidata transmit (MDT) enables the network stack to send more than one packet at one time to the network device driver during transmission. Use of this feature reduces the per-packet processing costs by improving the host CPU utilization or network throughput.

The multidata transmit (MDT) feature is only effective for device drivers that support this feature.

The following parameter must be enabled in the `/etc/system` file to use the MDT parameter:

```
set ip:ip_use_dl_cap = 0x1
```

MDT is disabled by default. The TCP/IP stack can be instructed to enable MDT as follows:

```
# ndd -set /dev/ip ip_multidata_outbound 1
```

Review the following cautions before enabling MDT:

- Use of this feature might change the appearance of any packets between the IP layer and the DLPI provider. For example, a third-party STREAMS module might be dynamically inserted between the IP layer and the DLPI provider by using the `ifconfig modinsert` command. This module might not work. The `ifconfig modinsert` command does not “understand” the MDT STREAMS data type.
- Modules might be inserted between the IP and the DLPI provider with the `autopush(1M)` mechanism. These modules might not work as well.
- Keep this feature disabled when a STREAMS module is not MDT aware. For example, the public domain utilities `ipfilter` and CheckPoint Firewall-1 are not MDT aware.

For more information, see the *Solaris Tunable Parameters Reference Manual* and the `ip(7P)` man page.

Internet Protocol Version 6 (IPv6) 6to4 Router

This feature is new in the Solaris 9 4/03 release.

IPv6 networks can now transfer packets over Internet Protocol Version 4 (IPv4) networks by configuring one or more routers to support a 6to4 tunnel. System administrators can use 6to4 tunnels as a transitional method for migrating their networks from IPv4 to IPv6. This feature implements RFCs 3056 and 3068.

For further information on IPv6, see the *IPv6 Administration Guide*.

Packet Tunneling Over IPv6

This feature is new in the Solaris 9 9/02 release.

This feature enables tunneling over IPv6 for both IPv4 over IPv6 tunnels and IPv6 over IPv6 tunnels. IPv4 packets or IPv6 packets can be encapsulated in IPv6 packets.

For more information, see the *IPv6 Administration Guide*.

Hosting Multiple Web Sites on a Single Solaris Machine

This feature is new in the Solaris 9 12/02 release.

The Solaris Network Cache and Accelerator (NCA) kernel module now supports multiple instances of a web server. This support enables you to use a Solaris machine to perform Internet protocol (IP) address-based virtual web hosting. The Solaris software uses a single configuration file, `/etc/nca/ncaport.conf`, to map NCA sockets to IP addresses.

For further information, see the `ncaport.conf(4)` man page.

IP Quality of Service

This feature is new in the Solaris 9 9/02 release.

IP Quality of Service (IPQoS) enables system administrators to provide different levels of network service to customers and to critical applications. By using IPQoS, the administrator can set up service-level agreements. These agreements provide an Internet service provider's (ISP) clients with varying levels of service that are based on a price structure. A company could also use IPQoS to prioritize among applications so that critical applications get a higher quality of service than less critical applications.

For further information, see the *IPQoS Administration Guide*.

User Selector for Internet Protocol Quality of Service (IPQoS)

This feature is new in the Solaris 9 8/03 release.

The Solaris IPQoS feature now includes the user selector, which supplements the existing `uid` selector. The user selector enables you to specify a user name or userID as criteria in a filter clause in the `ipqosconf` file. Previously, the `uid` selector only accepted a userID as a value. The following filter clause from an `ipqosconf` file shows the user selector:

```
filter {
    name myhost;
    user root;
}
```

For information about filters and selectors, refer to the *IPQoS Administration Guide* and the `ipqosconf(1M)` man page.

Routing Information Protocol Version 2 (RIPv2)

This feature is new in the Solaris 9 9/02 release.

Solaris system software now supports Routing Information Protocol Version 2 (RIPv2).

RIPv2 adds Classless Inter-Domain Routing (CIDR) and Variable-Length Subnet Mask (VLSM) extensions to the RIPv1 protocol. Message Digest 5 (MD5) extensions protect routers against intentional misdirection by malicious users. The new `in.routed` implementation also includes a built-in Internet Control Message Protocol (ICMP) Router Discovery (RFC 1256) mechanism.

RIPv2 supports multicast, if the point-to-point links are enabled with multicast. RIPv2 also supports unicast. If you configure a broadcast address by using the `/etc/gateways` file, then RIPv2 supports broadcast.

For information on how to configure RIPv2, see the `in.rdisc(1M)`, `in.routed(1M)`, and `gateways(4)` man pages.

File System Enhancements

The Solaris software now includes the following file system enhancements from prior Solaris 9 releases:

- “Enhancements to the NFS Client” on page 44
- “SPARC: Multiterabyte UFS File Systems” on page 45
- “SPARC: Multiterabyte Volume Support With EFI Disk Labels” on page 46

Enhancements to the NFS Client

This feature is new in the Solaris 9 12/03 release.

The following enhancements have improved the performance of the NFS client:

- Restrictions on wire transfer sizes have been relaxed. Now, the transfer size is based on the capabilities of the underlying transport. For example, the NFS transfer limit for UDP is still 32 Kbytes. However, because TCP is a streaming protocol without the datagram limits of UDP, maximum transfer sizes over TCP have been

increased to 1 Mbyte.

- Previously, all write requests were serialized by both the NFS client and the NFS server. The NFS client has been modified to permit an application to issue concurrent writes, as well as concurrent reads and writes, to a single file. You can enable this functionality on the client by using the `forcedirectio` mount option. When you use this option, you are enabling this functionality for all files within the mounted file system. You could also enable this functionality on a single file on the client by using the `directio()` interface. Note that unless this new functionality has been enabled, writes to files are serialized. Also, if concurrent writes or concurrent reads and writes are occurring, then POSIX semantics are no longer being supported for that file.
- The NFS client no longer uses an excessive number of UDP ports. Previously, NFS transfers over UDP used a separate UDP port for each outstanding request. Now, by default, the NFS client uses only one UDP reserved port. However, this support is configurable. If the use of more simultaneous ports would increase system performance through increased scalability, then the system can be configured to use more ports. This capability also mirrors the NFS-over-TCP support, which has had this kind of configurability since its inception.

SPARC: Multiterabyte UFS File Systems

This feature is new in the Solaris 9 8/03 release.

This Solaris release provides support for multiterabyte UFS file systems on systems that run a 64-bit Solaris kernel. Previously, UFS file systems were limited to approximately 1 terabyte (Tbyte) on both 64-bit systems and 32-bit systems. All UFS file system commands and utilities have been updated to support multiterabyte UFS file systems.

You can initially create a UFS file system that is less than one Tbyte. You can specify that the file system can eventually be grown to a multiterabyte file system by using the `newfs -T` command. This command sets the inode and fragment density to scale appropriately for a multiterabyte file system.

Support for a multiterabyte UFS file system assumes the availability of multiterabyte LUNs. These LUNs are provided as Solaris Volume Manager or Veritas VxVM volumes, or as physical disks that are greater than one Tbyte.

Features of multiterabyte UFS file systems include the following:

- You can create a UFS file system to a maximum of 16 Tbytes in size.
- You can create a file system that is less than 16 Tbytes, which can later be increased in size to a maximum of 16 Tbytes.
- Multiterabyte file systems can be created on physical disks, Solaris Volume Manager's logical volumes, and Veritas's VxVM logical volumes.
- UFS logging is enabled by default on file systems greater than 1 terabyte. Multiterabyte file systems benefit from the performance improvements of having UFS logging enabled. Multiterabyte file systems also benefit from the availability of

logging because the `fsck` command might not have to be run when logging is enabled.

Limitations of multiterabyte UFS file systems include the following:

- You cannot mount a file system that is greater than 1 Tbyte on a system that runs a 32-bit Solaris kernel.
- You cannot boot from a file system that is greater than 1 Tbyte on a system that runs a 64-bit Solaris kernel. This limitation means that you cannot put a root (`/`) file system on a multiterabyte file system.
- There is no support for individual files greater than 1 terabyte.
- The maximum number of files per terabyte of UFS file system is 1 million. This limit is intended to reduce the time it takes to check the file system with the `fsck` command.
- The maximum quota that you can set on a multiterabyte UFS file system is 2 Tbytes of 1024-byte blocks.
- Using the `fsnap` command to create a snapshot of a multiterabyte UFS file system is not currently supported.

For more information, see “What’s New in File Systems in the Solaris 9 Update Releases?” in *System Administration Guide: Basic Administration*.

SPARC: Multiterabyte Volume Support With EFI Disk Labels

This feature is new in the Solaris 9 4/03 release.

This Solaris release provides support for disks that are larger than 1 terabyte (Tbyte) on systems that run a 64-bit Solaris kernel.

The Extensible Firmware Interface (EFI) label provides support for physical disks and virtual disk volumes. The UFS file system is compatible with the EFI disk label, and you can create a UFS file system that is greater than 1 Tbyte. This release also includes updated disk utilities for managing disks that are greater than 1 Tbyte.

The EFI disk label differs from the VTOC disk label in the following ways:

- Support for disks that are greater than 1 Tbyte in size is provided.
- Slices 0–6, where slice 2 is just another slice, are provided.
- Partitions, or slices, cannot overlap with the primary or backup label, nor with any other partitions. The size of the EFI label is usually 34 sectors, so partitions start at sector 34. This feature means that no partition can start at sector zero (0).
- No cylinder, head, or sector information is stored in the label. Sizes are reported in blocks.
- Information that was stored in the alternate cylinders area, the last two cylinders of the disk, is now stored in slice 8.

For more information on using the EFI disk label, see the *System Administration Guide: Basic Administration*. This guide contains important information and restrictions that apply to using the EFI disk label with existing software products.

The Solaris Volume Manager software can also be used to manage disks greater than 1 Tbyte in this Solaris release. See “SPARC: Multiterabyte Volume Support in Solaris Volume Manager” on page 26.

Security Enhancements

The Solaris software includes the following security enhancements from prior Solaris 9 releases:

- “`sadmind` Security Level Raised” on page 47
- “Kerberos Enhancements” on page 47
- “Internet Key Exchange (IKE) Key Storage on Sun Crypto Accelerator 4000 Board” on page 47
- “Internet Key Exchange (IKE) Hardware Acceleration” on page 48
- “Auditing Enhancements” on page 48
- “Smart Card Terminal Interfaces” on page 48
- “Enhanced `crypt()` Function” on page 49
- “Password Management Feature in `pam_ldap`” on page 49
- “Pluggable Authentication Module (PAM) Enhancement” on page 49

`sadmind` Security Level Raised

To improve security with the `sadmind` command, the default security level has been raised to 2 (DES). If you do not require `sadmind`, comment the entry out of the `inetd.conf` file.

For further information, see the `sadmind(1M)` man page.

Kerberos Enhancements

This feature is new in the Solaris 9 12/03 release.

The Solaris Kerberos Key Distribution Center (KDC) is now based on MIT Kerberos version 1.2.1. The KDC now defaults to a btree-based database, which is more reliable than the current hash-based database.

See the `kdc.conf(4)` man page for more information.

Internet Key Exchange (IKE) Key Storage on Sun Crypto Accelerator 4000 Board

This feature is new in the Solaris 9 12/03 release.

IKE runs on IPv6 as well as IPv4 networks. For information on keywords that are specific to the IPv6 implementation, see the `ifconfig(1M)` and `ike.config(4)` man pages.

When a Sun™ Crypto Accelerator 4000 board is attached, IKE can offload computation-intensive operations to the board, thus freeing the operating system for other tasks. IKE can also use the attached board to store public keys, private keys, and public certificates. Key storage on a separate piece of hardware provides additional security.

For further information, see the *IPsec and IKE Administration Guide* and the `ikecert(1M)` man page.

Internet Key Exchange (IKE) Hardware Acceleration

This feature is new in the Solaris 9 4/03 release.

Public key operations in IKE can be accelerated by a Sun Crypto Accelerator 1000 card. The operations are offloaded to the card. The offloading accelerates encryption and reduces demands on operating system resources.

For information about IKE, see the *IPsec and IKE Administration Guide*.

Auditing Enhancements

This feature is new in the Solaris 9 8/03 release.

Enhancements to the audit features in this Solaris release reduce noise in the trail, and enable administrators to use XML scripting to parse the trail. These enhancements include the following:

- Public files are no longer audited for read-only events. The `public` policy flag for the `auditconfig` command controls whether public files are audited. By not auditing public objects, the audit trail is greatly reduced. Attempts to read sensitive files are therefore easier to monitor.
- The `praudit` command has an additional output format, XML. The XML format enables the output to be read in a browser, and provides source for XML scripting for reports. See the `praudit(1M)` man page.
- The default set of audit classes has been restructured. Audit metaclasses provide support for finer-grained audit classes. See the `audit_class(4)` man page.
- The `bsmconv` command no longer disables the use of the Stop-A key. The Stop-A event is now audited to maintain security.

For further information, see the *System Administration Guide: Security Services*.

Smart Card Terminal Interfaces

This feature is new in the Solaris 9 8/03 release.

Solaris smart card interfaces are a set of public interfaces for Smart Card Terminals. See “Smart Card Interfaces” on page 51.

Enhanced `crypt` () Function

This feature is new in the Solaris 9 12/02 release.

Password encryption protects passwords from being read by intruders. Three strong password encryption modules are now available in the software:

- A version of Blowfish that is compatible with Berkeley Software Distribution (BSD) systems
- A version of Message Digest 5 (MD5) that is compatible with BSD and Linux systems
- A stronger version of MD5 that is compatible with other Solaris systems

For information on how to protect your user passwords with these new encryption modules, see the *System Administration Guide: Security Services*. For information on the strength of the modules, see the `crypt_bsdbf(5)`, `crypt_bsdmd5(5)`, and `crypt_sunmd5(5)` man pages.

Password Management Feature in `pam_ldap`

This feature is new in the Solaris 9 12/02 release.

The `pam_ldap` password management feature strengthens the overall security of the LDAP Naming Service when used in conjunction with the Sun ONE Directory Server (formerly iPlanet™ Directory Server). Specifically, the password management feature does the following:

- Allows for tracking password aging and expiration
- Prevents users from choosing trivial or previously used passwords
- Warns users if their passwords are about to expire
- Locks out users after repeated login failures
- Prevents users, other than the authorized system administrator, from deactivating initialized accounts

For further information on Solaris naming and directory services, see the *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*. For information about Solaris security features, see the *System Administration Guide: Security Services*.

Pluggable Authentication Module (PAM) Enhancement

This feature is new in the Solaris 9 12/02 release.

The PAM framework was expanded by including a new control flag. The new control flag provides the ability to skip additional stack processing. This skipping is enabled if the current service module is successful and if no failure occurred on the previous mandatory modules.

For more information about this change, see the *System Administration Guide: Security Services*.

System Resources Enhancements

The Solaris software includes the following system resources enhancements from prior Solaris 9 releases.

Physical Memory Control Using the Resource Capping Daemon

This is a new feature in the Solaris 9 12/03 release.

The resource capping daemon `rcapd` regulates the consumption of physical memory by processes that run in projects that have defined resource caps. Associated utilities provide mechanisms for administering the daemon and reporting related statistics.

For additional information, see “Physical Memory Control Using the Resource Capping Daemon” in *System Administration Guide: Resource Management and Network Services*. See also the man pages `rcapstat(1)`, `rcapadm(1M)`, `project(4)`, and `rcapd(1M)`.

Extended Accounting Subsystem

Extended accounting has been enhanced in the Solaris 9 9/02 release and further revised in the Solaris 9 4/03 release.

In the Solaris 9 9/02 release, you can now use extended accounting processes in conjunction with the flow accounting module for IPQoS. For information about IPQoS, see the *IPQoS Administration Guide*.

For information about the extended accounting feature, see “Extended Accounting” in the *System Administration Guide: Resource Management and Network Services*.

A Perl interface to `libexacct` is available in the Solaris 9 4/03 release. This interface enables you to create Perl scripts that can read the accounting files which are produced by the `exacct` framework. You can also create Perl scripts that write `exacct` files.

The new interface is functionally equivalent to the underlying C API.

You can use the Perl interface to record system resource consumption on a task or process basis. Or, you can record consumption on the basis of selectors provided by the IPQoS `flowacct` module.

For information about the Perl interface to `libexacct`, see “Extended Accounting” in *System Administration Guide: Resource Management and Network Services*.

See also the following man pages:

- `Exacct(3PERL)`
- `Exacct::Catalog(3PERL)`

- `Exacct::File(3PERL)`
- `Exacct::Object(3PERL)`
- `Exacct::Object::Group(3PERL)`
- `Exacct::Object::Item(3PERL)`
- `Kstat(3PERL)`
- `Project(3PERL)`
- `Task(3PERL)`

Development Tool Enhancements

The Solaris software includes the following enhancements, made in prior Solaris 9 releases, for development tools:

- “SPARC: Locality Groups” on page 51
- “Sun ONE Application Server” on page 52
- “Linkers and Libraries Updates” on page 51
- “Smart Card Interfaces” on page 51
- “Stack Check APIs” on page 52
- “Memory Allocation With `libumem`” on page 52
- “Sun ONE Message Queue” on page 52
- “Enhanced `crypt()` Function” on page 53
- “New Flags for `madvise()` Function” on page 53
- “Smartcard Middleware APIs” on page 53

SPARC: Locality Groups

This feature is new in the Solaris 9 12/03 release.

The *Programming Interfaces Guide* now includes a chapter that explains the interfaces that interact with locality groups (`lgroups`). These interfaces can be used to help an application efficiently allocate CPU and memory resources. This capability results in improved performance on some systems.

Linkers and Libraries Updates

This feature is new in the Solaris 9 12/02 release. See “New Linker and Libraries Features and Updates” in *Linker and Libraries Guide* for the most current updates.

The Solaris releases include new linker-editor features such as string table compression, unreferenced section elimination, and unreferenced dependency detection. For the most current list of new linker-editor features in each Solaris release, see “New Linker and Libraries Features and Updates” in the *Linker and Libraries Guide*.

Smart Card Interfaces

This feature is new in the Solaris 9 8/03 release.

Solaris smart card interfaces are a set of public interfaces for Smart Card Terminals. Card terminal vendors can implement these interfaces in a user-level shared library to provide device-level support for their smart card terminals in Solaris. The set of

Solaris smart card terminal interfaces is based on card terminal interfaces that are available as part of the Linux Smartcard framework. Card terminal support libraries from Linux can be ported to Solaris with minimum effort.

Stack Check APIs

This feature is new in the Solaris 9 4/03 release.

Stack Check APIs allow for advanced interaction with stack-checking compiler support. Stack-checking compiler support is available in Forte™ 7.0. These APIs should be used in applications that are compiled with stack checking enabled. These are applications that manage their own stacks or attempt to detect their own stack overflows.

Developers who maintain their own thread library need to use the `setustack` interface to enable consumers of their library to compile with stack checking enabled.

See the `stack_getbounds(3C)`, `stack_setbounds(3C)`, `stack_inbounds(3C)`, and `stack_violation(3C)` man pages.

Memory Allocation With `libumem`

This feature is new in the Solaris 9 4/03 release.

`libumem` is a user-mode (nonkernel mode) memory allocator library. `libumem` has features that enable you to debug memory leaks and other aberrations that involve memory usage.

This feature is used in the same way that a standard application binary interface (ABI) allocator, such as `malloc()`, is used. A user-mode application requests an arbitrary number of bytes of memory. Then a pointer is returned that is loaded with the address of the allocated memory.

For further information, see the `libumem(3LIB)` man page.

A technical white paper about *Solaris Memory Placement Optimization and Sun Fire Servers* is available at the following Web site:

http://www.sun.com/servers/wp/docs/mpo_v7_CUSTOMER.pdf

Sun ONE Application Server

This feature is new for the SPARC platform in the Solaris 9 12/02 release. In the Solaris 9 12/03 release, this feature is also available for the x86 platform. For further information, see “Sun ONE Application Server Integration” on page 40.

Sun ONE Message Queue

The Sun ONE Message Queue is a new feature for the SPARC platform in the Solaris 9 12/02 release. In the Solaris 9 8/03 release, the Sun ONE Message Queue is also available for x86 platforms.

The Solaris 9 12/02 release supports JMS messaging applications. These applications are based on Sun ONE Message Queue, a JMS provider. For further information, see “Sun ONE Message Queue” on page 41.

Enhanced `crypt()` Function

This feature is new in the Solaris 9 12/02 release.

This Solaris release includes new extensions to the `crypt()` function and introduces the `crypt_gensalt()` function. These enhancements allow administrators to change the algorithm that is used to obscure users’ UNIX login passwords.

Modules are included for MD5 and Blowfish. The MD5 modules are at `crypt_sunmd5` and `crypt_bsmd5`. The Blowfish module is at `crypt_bsdbf`.

Developers can create new modules for alternate password-obscuring algorithms. Application developers must use the `crypt_gensalt()` function instead of manually generating the salt string for passing to the `crypt()` function.

Modules for alternate algorithms are specified in the `crypt.conf(4)` file. The `module_path` field specifies the path to the shared library object that implements the two required functions:

- `crypt_gensalt_impl()` – Generates the salt string
- `crypt_genhash_impl()` – Generates the encrypted password

For further information, see the `crypt(3C)` and the `policy.conf(4)` man pages.

New Flags for `madvise()` Function

This feature is new in the Solaris 9 12/02 release.

The `madvise()` function enables the kernel to optimize access to a user-defined region of memory. This Solaris release includes three new flags for the `madvise()` function:

- `MADV_ACCESS_LWP` – Gives a specified lightweight process (LWP) resource allocation priority
- `MADV_ACCESS_MANY` – Specifies an address range that is intensively used by processes across the machine
- `MADV_ACCESS_DEFAULT` – Resets an address range’s access pattern to the system default

For further information on the `madvise()` function, see the `madvise(3C)` man page.

Smartcard Middleware APIs

This feature is new in the Solaris 9 9/02 release.

The Solaris Smartcard framework now provides low-level middleware APIs. These APIs can be used to exchange data with a smart card by using a smart card reader. The APIs can be used in platforms such as the Sun Blade™ and Sun Ray™ systems. Applications that are written in the Java language, or in C, can use these interfaces.

For more information, see the `libsmartcard(3LIB)` man page and the JavaDocs in `/usr/share/javadoc/smartcard`.

System Performance Enhancements

The Solaris software includes the following performance enhancements from prior Solaris 9 releases:

- “UFS Logging Performance Enhancements” on page 54
- “SPARC: Memory Placement Optimization (MPO)” on page 54
- “SPARC: Dynamic Intimate Shared Memory (DISM) Large-Page Support” on page 55

UFS Logging Performance Enhancements

This feature is new in the Solaris 9 12/02 release.

UFS logging enables faster system reboots. Because the file system transactions are already stored, checking the file system is not required if the file system is already consistent.

In addition, the performance of UFS logging improves or exceeds the level of performance of nonlogging file systems in this Solaris release. Results of the Standard Performance Evaluation Corporation system file server (SPECsfs) benchmark show that the performance of NFS-mounted file systems that have logging enabled equals the level of non-UFS logging performance. In some I/O-bound configurations, logging UFS file systems exceed the performance of nonlogging UFS file systems by approximately 25 percent. In other tests, performance of logging UFS file systems is 12 times better than the performance of nonlogging UFS file systems.

For information on how to enable logging on a UFS file system, see the *System Administration Guide: Basic Administration* or the `mount_ufs(1M)` man page.

SPARC: Memory Placement Optimization (MPO)

This feature is new in the Solaris 9 9/02 release.

The Solaris dispatcher and the virtual memory subsystem are enhanced to optimize the time that is required for an application to access memory. This enhancement can automatically improve the performance of many applications. This feature is currently implemented to support specific platforms such as the Sun Fire™ 3800–6800, the Sun Fire 12K, and the Sun Fire 15K.

A technical white paper about *Solaris Memory Placement Optimization and Sun Fire Servers* is available at the following Web site:

http://www.sun.com/servers/wp/docs/mpo_v7_CUSTOMER.pdf

SPARC: Dynamic Intimate Shared Memory (DISM) Large-Page Support

This feature is new in the Solaris 9 9/02 release.

Large-page support is now provided for Dynamic Intimate Shared Memory (DISM). This large-page support can increase the performance of applications that are capable of dynamically adjusting shared memory sizes.

For further information on DISM, see “System Performance Enhancements” on page 80.

Web Browser Enhancements

The Solaris software includes the following browser enhancements from prior Solaris 9 releases.

Netscape 7.0

This feature is new in the Solaris 9 4/03 release.

The Netscape™ 7.0 cross-platform browser integrates features for navigating the Web, communicating with colleagues, participating in discussion groups, and creating dynamic Web pages. The following features are provided in Netscape 7.0.

- Fast and efficient browsing tools
- Integrated mail and instant messaging enhancements
- Faster and streamlined search functions
- Privacy that is more secure
- Enterprise functionality

Netscape 7.0 includes the following highlights.

- Internet Support is provided by the following applications.
 - Netscape Navigator™
 - Netscape Mail
 - Netscape Instant Messenger
 - Netscape Composer
 - Netscape Address Book
 - Additional utilities and plug-ins
- Support for the latest industry standards, including Java technology, IPv6, Platform for Privacy Preferences Project (P3P), XML, Cascading Style Sheets level 1 (CSS1), and data output messaging (DOM) – Enables the creation of a new class of Web applications.
- My Sidebar – Connects users to important information such as breaking news stories, stock portfolios, buddy lists, and auctions.
- Fully customized, integrated search – Helps provide faster access to information, and eliminates waiting to load a search page or open a frame.

- Instant messaging that is integrated with browsing and mail – Increases productivity and enhances your communication with colleagues and friends.
- Themes – Enables users to add personal touches to their browsers. Web sites and businesses can create browsers to their customers' specifications.
- Flexible, modular design – Enhances the user's Web experience and increases productivity.
- Global support for English, European, and Asian languages.
- Integrated Java technology – Delivers cross-platform, seamless access to browser-based applications.

For more information on Netscape 7.0, see the following Web site:

<http://www.sun.com/software/solaris/netscape>

Netscape 6.2.3

This feature is new in the Solaris 9 12/02 release. In the Solaris 9 4/03 release, Netscape 7.0 is provided. See "Netscape 7.0" on page 55.

Desktop Features

The Solaris software includes the following desktop enhancements from prior Solaris 9 releases.

GNOME 2.0 Desktop

This feature is new in the Solaris 9 8/03 release.

The GNOME 2.0 desktop is an advanced, intuitive desktop for the Solaris software. The GNOME 2.0 desktop provides an alternative to the Common Desktop Environment (CDE), which was provided with the Solaris environment through several releases.

The GNOME 2.0 desktop provides a familiar environment that enables users to easily interact with the applications and documents on their desktop. The GNOME 2.0 desktop includes the following features:

- An advanced file manager
- A comprehensive online help system
- Software utilities and accessories
- Panels for launching applications and managing application windows and multiple workspaces

The GNOME 2.0 desktop includes the following important components:

1. Nautilus is an advanced file manager that enables users to organize and locate applications and documents. Nautilus also enables users to view the contents of text and picture files directly in the file manager.

2. The Panel bar on the desktop contains the following:

- Application launchers
- System menus
- Panel drawers (subpanels)
- Applets

Panels provide a quick way to launch applications and view the system status. You can create an unlimited number of panels.

3. Applications support a variety of everyday tasks. Applications in the GNOME 2.0 desktop include the following:

- Text Editor
- Calculator
- Character Map
- Image Viewer
- PostScript™ or PDF Viewer
- Media Player
- Sound Recorder
- Performance Meter
- Print Manager
- Terminal

4. Applets are sets of utilities that run in a panel. Applets in the GNOME 2.0 desktop include the following:

- Clock
- Inbox Monitor
- CD Player
- Volume Control
- Character Palette
- Command Line
- Keyboard Layout Switcher
- Window List
- Workspace Switcher

For further information about the GNOME 2.0 desktop, see the *GNOME 2.0 Desktop Collection*. Further information about this collection is provided in “New and Revised Documentation in the Solaris 9 8/03 Release” on page 36.

X11 Windowing Features

The Solaris software includes the following X11 windowing enhancements from prior Solaris 9 releases.

- “Xscreensaver Program” on page 58
- “X Event Interception Extension (XEIE)” on page 58
- “FreeType 2.1.x” on page 58
- “Xserver Virtual Screen Enhancement” on page 58
- “Xrender Extension” on page 58

Xscreensaver Program

This feature is new in the Solaris 9 8/03 release.

The Xscreensaver program locks your monitor screen after a period of inactivity in order to prevent others from gaining access to your system session. Xscreensaver supports a variety of animation displays that can be used while the screen is locked. This program is used in the GNOME 2.0 desktop.

X Event Interception Extension (XEvIE)

This feature is new in the Solaris 9 4/03 release.

XEvIE is a low-level interface that intercepts all the keyboard and mouse events so that these events can be read, consumed, or modified as needed. This X extension enables better integration of assistive technologies, including those technologies in the GNOME 2.0 desktop.

FreeType 2.1.x

This feature is new in the Solaris 9 4/03 release.

FreeType 2.1.x is an open source library that provides a simple application programming interface (API). This API can access font content in a uniform way, independently of the file format. Additionally, some format-specific APIs can be used to access special data in the font file.

Xserver Virtual Screen Enhancement

This feature is new in the Solaris 9 12/02 release.

The Xserver Virtual Screen enhancement provides accessibility support for the GNOME 2.0 desktop for the Solaris software. This capability enables support of magnification software on systems that have just one frame buffer.

Xrender Extension

This feature is new in the Solaris 9 12/02 release.

The new Xrender feature increases performance for applications, such as the StarOffice software suite, that run on the Solaris software. The Xrender feature provides a modern appearance for these applications. Xrender uses hardware processing for alpha-blending and transparency effects.

Freeware Enhancements

The Solaris release includes the following freeware enhancements from prior Solaris 9 releases.

- “Ghostscript 7.05” on page 59
- “New Freeware Packages: libxml2 2.4.16 and libxslt 1.0.19” on page 59

- “ANT 1.4.1 Freeware Package” on page 59

Note – To view license terms, attribution, and copyright statements for these freeware packages, see the license path included in each of the following descriptions. If the Solaris software has been installed anywhere other than the default, modify the path to access the file at the installed location.

For a list of freeware in the Solaris 9 release, see “Freeware Enhancements” on page 109.

Ghostscript 7.05

This feature is new in the Solaris 9 8/03 release.

The Ghostscript 7.05 freeware package is included in the Solaris release. Ghostscript 7.05 reads PostScript and PDF files, and displays these files on screen or converts the files to a form that is usable by many printers. See the `gs(1)` man page under `/usr/sfw/share/man`.

Note – To view license terms, attribution, and copyright statements for Ghostscript, the license path is `/usr/sfw/share/src/<freeware name>`.

New Freeware Packages: libxml2 2.4.16 and libxslt 1.0.19

This feature is new in the Solaris 9 4/03 release.

The following new freeware packages are new or revised in the Solaris 9 4/03 release:

- libxml2 2.4.16 – A standard for building tag-based structured documents or data
- libxslt 1.0.19 – An XML language to define transformation for XML

Note – To view license terms, attribution, and copyright statements for these packages, the license path is `/usr/share/src/<freeware name>/<filename>`.

ANT 1.4.1 Freeware Package

This feature is new in the Solaris 9 12/02 release.

The following new freeware package is included in the Solaris release: ANT 1.4.1 – This is a Jakarta ANT Java and XML-based build package.

Note – To view license terms, attribution, and copyright statements for ANT, the license path is `/usr/sfw/share/src/<freeware name>`.

Features in the Solaris 9 Release

This chapter summarizes new and enhanced features that are available in the Solaris 9 release, which was originally distributed in May 2002. For a summary of additional enhancements that are available in the Solaris 9 9/02 release and subsequent Solaris 9 releases, see Chapter 1.

Most of the features that are described in this chapter run on both the SPARC platform and certain x86 platforms. Those descriptions that are specific to one platform are labeled as either a SPARC feature or an x86 feature in the description title.

For information about features available in the Solaris 8 release and the Solaris 7 release, see the appendixes provided in *What's New in the Solaris 9 Operating Environment*.

System Resources Enhancements

The Solaris 9 release includes the following system resources enhancements.

Solaris 9 Resource Manager

Solaris 9 Resource Manager provides improvements to the management of system resources. The resource manager features enable system administrators to do the following:

- Allocate computing resources on a system.
- Monitor how these resources are being used so that allocations can be adjusted if necessary.
- Generate extended accounting information on resource usage. This information can be used for capacity planning and billing.

The resource controls framework allows you to set constraints on the system resources that are consumed by processes and tasks. Tasks are collections of processes that are related to a single activity.

Resource pools provide a way to partition system resources, such as processors, and maintain those partitions across reboots. A new fair share scheduler (FSS) has been added that allows the fine-grained sharing of CPU resources on a system.

These features enhance your ability to manage how resources are allocated to applications in a server consolidation environment.

In the Solaris 9 release, the full functionality is administered through a command-line interface. Performance monitoring and the setting of resource controls can also be done through the Solaris Management Console.

For more information on resource management, see the *System Administration Guide: Resource Management and Network Services* and the following man pages:

- `prctl(1)`
- `pooladm(1M)`
- `poolcfg(1M)`
- `rctladm(1M)`
- `project(4)`
- `FSS(7)`

New Fixed-Priority (FX) Scheduling Class

The FX scheduler provides a scheduling policy for processes that require user or application control of scheduling priorities. The priorities of processes that run under FX are fixed. These priorities are not dynamically adjusted by the system. The FX class has the same priority range as the TS, IA, and FSS classes.

For more information on the FX scheduler, see the *Programming Interfaces Guide* and the *Multithreaded Programming Guide*. Also see the `priocntl(1)` and `dispadm(1M)` man pages.

For restrictions on using the FX and FSS schedulers on the same system, see “Fair Share Scheduler” in *System Administration Guide: Resource Management and Network Services*.

New Display Options for the `df`, `du`, and `ls` Commands

The `df`, `du`, and `ls -l` commands have a new `-h` option. This option displays disk usage and file or file system sizes in powers of 1024. This display simplifies interpretation of the output of the `df`, `du`, and `ls -l` commands. The `-h` option provides disk space in Kbytes, Mbytes, Gbytes, or Tbytes if the file or directory size is larger than 1024 bytes.

See the `df(1M)`, `du(1)`, and `ls(1)` man pages for further information.

Improved Process Debugging With the `pargs` and `preap` Commands

Two new commands, `pargs` and `preap`, improve process debugging. Use the `pargs` command to print the arguments and environment variables that are associated with a live process or a core file. Use the `preap` command to remove zombie processes.

See the `preap(1)` man page and the `proc(1)` man page for information on using these commands.

Networking Enhancements

The Solaris 9 release includes the following networking enhancements.

Sun ONE Directory Server

Note – The Sun ONE Directory Server 5.1 is available within the Solaris 9 operating system. The Sun ONE Directory Server 5.2 is available as a component product in the Java™ Enterprise System. For further information about the Java Enterprise System, see “Sun Java Enterprise System Joins Solaris” on page 39.

The Solaris 9 release provides an integrated version of the Sun ONE Directory Server (formerly iPlanet Directory Server). This server is a Lightweight Directory Access Protocol (LDAP) directory server. The Sun ONE Directory Server is a powerful, distributed directory server that is designed to manage an enterprise-wide directory of users and resources. This scalable directory service can be used for intranet applications, extranets with trading partners, and e-commerce applications to reach customers over the Internet.

The Directory Server is managed through the Sun ONE Console, the graphical user interface that is provided with the Sun ONE Directory Server. Administrators use the Console to grant access rights, manage databases, configure the directory, and replicate the data to multiple directory servers. Users access the data through any LDAP-enabled client application, such as applications that were developed with the Sun ONE Software Developers Kits (SDKs) for C and the Java programming language.

Configuration for setup of the Sun ONE Directory Server has been simplified by using `idsconfig`. Server and client configuration information is available in the *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*.

See also the iPlanet Directory Server 5.1 Collection (Solaris Edition) at <http://docs.sun.com>. This collection includes the following books:

- *iPlanet Directory Server 5.1 Deployment Guide*
- *iPlanet Directory Server 5.1 Administrator's Guide*
- *iPlanet Directory Server 5.1 Configuration, Command, and File Reference*
- *iPlanet Directory Server 5.1 Schema Reference*

For licensing terms about the Sun ONE Directory Server 5.1, refer to the binary code license.

Note – The following name changes have been made for features in the Sun Open Net Environment (Sun ONE):

- Sun ONE Console (formerly iPlanet Console)
 - Sun ONE Directory Server Application Integration SDK (formerly iPlanet Directory Server Application Integration SDK)
-

Naming Service Support for Lightweight Directory Access Protocol (LDAP)

Naming service support has been enhanced in the Solaris 9 release. Changes include the following:

- Simplified configuration for setup of the Sun ONE Directory Server 5.1 (formerly iPlanet Directory Server 5.1) by using `idsconfig`.
- A more robust security model – Supports strong authentication and TLS-encrypted sessions. A client's proxy credentials are no longer stored in a client's profile on the directory server.
- `ldapaddent` command – Enables you to populate and dump data onto the server.
- Service search descriptors and attribute mapping.
- New profile schemas.

For information on security features in the Solaris 9 release, including the Secure LDAP Client, see “Security Enhancements” on page 82. For further information, see the *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*.

NIS+-to-LDAP Migration Tools

The Solaris 9 release announces end-of-software support for NIS+ and the move to the LDAP-based naming environment. This release includes migration tools to use for migrating from NIS+ to LDAP. For more information on the NIS+ announcement, refer to the following Web site:

<http://www.sun.com/directory/nisplus/transition.html>

A detailed discussion of how to migrate from the NIS+ naming service to LDAP is included in the *System Administration Guide: Naming and Directory Services (FNS and NIS+)*.

Note – In the Solaris 9 9/02 Update release, this “Transitioning From NIS+ to LDAP” appendix moved to the *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*.

IP Security Architecture for IPv6

The IPsec security framework has been enhanced in the Solaris 9 release to enable secure IPv6 datagrams between machines. For the Solaris 9 release, only the use of manual keys is supported when using IPsec for IPv6.

Note – The IPsec security framework for IPv4 was introduced in the Solaris 8 release. The Internet Key Exchange (IKE) Protocol is available for IPv4.

For further information, see “IPsec (Overview)” in *System Administration Guide: IP Services*.

Enhanced `inetd` Command

The `inetd` networking command has been enhanced to support the monitoring and filtering of incoming requests for network services. The server can be configured to log the client host name of incoming requests and thus enhance network security. The `inetd` command uses the same mechanism that is used by the `Tcp-wrappers 7.6` utility. For information about `Tcp-wrappers 7.6`, see “Freeware Enhancements” on page 109.

For further information, see the `inetd(1M)`, `hosts_access(4)`, and `hosts_options(4)` man pages.

Solaris FTP Client

The Solaris FTP client has been enhanced to include support for the following:

- Using passive mode to connect to a remote host from behind a firewall
- Restarting a failed transfer from the beginning of the transfer or from a certain offset
- Setting the TCP window size to enhance the performance of file transfers
- Detecting that the remote system is another UNIX system and setting the default transfer mode appropriately for optimized performance

For information on the `ftp` command, see the `ftp(1)` man page.

Trivial File Transfer Protocols (TFTP) Enhancements

The Solaris TFTP client and server have been enhanced to support TFTP option extensions, negotiations of the blocksize, time-out interval, and transfer size.

For further information, see the `tftp(1)` and `in.tftpd(1M)` man pages. See also the RFCs 2347, 2348, and 2349.

Support for IPv6 Over ATM

Support for using IPv6 over asynchronous transfer mode (ATM) networks as specified by RFC 2492 has been introduced in the Solaris 9 release.

For further information, see the *System Administration Guide: IP Services*.

Enhanced `snoop` Packet Capture

The `snoop` packet capture and display tool has been enhanced to decode and filter both AppleTalk and SCTP packets.

See the `snoop(1M)` man page for further information on this command.

Solaris PPP 4.0

Solaris PPP 4.0 enables a system in one location to communicate over telephone lines or leased communications media with a system at a remote location. This implementation of the Point-to-Point Protocol (PPP) is based on the widely used Australian National University (ANU) PPP. Solaris PPP 4.0 is entirely new for the Solaris operating environment. PPP 4.0 is easily configured through a set of files. PPP 4.0 supports synchronous communications and asynchronous communications. PPP 4.0 provides Password Authentication Protocol (PAP) and Challenge-Handshake Authentication Protocol (CHAP) authentication. Because Solaris PPP 4.0 is highly configurable, customers can easily tailor PPP to fit their remote communications needs. Also provided is the `asppp2pppd` conversion script for migrating from the earlier Solaris PPP (`asppp`) to Solaris PPP 4.0.

PPP 4.0 now includes the PPPoE feature, which enables the use of tunneling with PPP. Support for PPPoE was introduced in the Solaris 8 10/01 release.

For further information, see the PPP section in the *System Administration Guide: Resource Management and Network Services* and the `pppd(1M)` man page.

For information on licensing terms, refer to the incorporated material at the following locations:

```
/var/sadm/pkg/SUNWpppd/install/copyright
```

```
/var/sadm/pkg/SUNWpppdu/install/copyright
```

```
/var/sadm/pkg/SUNWpppg/install/copyright
```

Sun Internet FTP Server

Sun Internet FTP Server™ is fully compatible with the Solaris 8 FTP software. The FTP Server offers new capabilities and new performance improvements for Solaris 9 users.

The Solaris 9 FTP Server is based on WU-ftpd. Originally developed by Washington University, WU-ftpd is widely used for the distribution of bulk data over the Internet. WU-ftpd is the preferred standard for large FTP sites.

Extensions to the Sun RPC Library

The RPC library extensions project extends the Sun ONC+™ RPC library with an asynchronous protocol. Programming interfaces have been added to the Transport Independent Remote Procedure Calls to provide one-way asynchronous messaging and nonblocking I/O.

For further information on ONC+ development, see the *ONC+ Developer's Guide*.

Enhancements to `sendmail`

The following new features are available in `sendmail` version 8.12, which is included in the Solaris 9 operating environment:

- A new configuration file, `submit.cf`
- New command-line options
- New and revised configuration file options
- New defined macros
- New macros that are used to build the configuration file
- New and revised `m4` configuration macros
- New compile flags
- New delivery agent flags
- New queue features
- New uses for LDAP
- A method for identifying IPv6 addresses in configuration
- Changes to `mail.local(1M)`
- Changes to `mailstats(1)`
- Changes to `makemap(1M)`
- A new maintenance utility, `editmap(1M)`

The following details might be of particular interest:

- Per RFC 2476, `sendmail` now listens for submissions on port 587, a feature that was added but not mentioned, in version 8.10.
- Because the `AutoRebuildAliases` option is no longer available, `newaliases` must be run manually now in order for changes to `/etc/mail/aliases` to become effective. Also, because `sendmail` is no longer `setuid root`, only `root` can run `newaliases`.

For further information, see the “Mail Services (Tasks)” in *System Administration Guide: Resource Management and Network Services*. The chapters on mail services provide overview information and procedures for setting up and modifying your mail service. Also provided are procedures for troubleshooting, some background information, and details about the new features.

Note – Version 8.10 of `sendmail` was first made available in the Solaris 8 4/01 operating environment. Version 8.12 of `sendmail` is available in the Solaris 9 operating environment.

Solaris Network Cache and Accelerator (NCA)

The Solaris Network Cache and Accelerator (NCA) has been improved with the addition of a sockets interface to NCA. With minimal modifications, any web server can communicate through the sockets interface. Web servers such as Apache, Sun ONE Web Server (formerly iPlanet Web Server), and Zeus are able to make use of NCA performance by using standard socket library functions. Also, NCA now supports vectored sendfile, which provides support for AF_NCA. Finally, the `ncab2c1f` command has been enhanced. New options enable you to skip records before a selected date and to process a particular number of records when converting log files.

For more information about NCA, see “Managing Web Cache Servers” in *System Administration Guide: Resource Management and Network Services*.

IP Network Multipathing

IP network multipathing provides your system with recovery from single-point failures with network adapters and increased traffic throughput. As of the Solaris 8 10/00 release, the system switches all the network accesses automatically from a failed adapter to an alternate adapter. The alternate adapter must be connected to the same IP link. This process ensures uninterrupted access to the network. When you have multiple network adapters connected to the same IP link, you achieve increased traffic throughput by spreading the traffic across multiple network adapters.

In the Solaris 8 4/01 release, dynamic reconfiguration (DR) uses IP network multipathing to decommission a specific network device. This process has no impact on existing IP users.

The Solaris 8 7/01 release introduced the new IP network multipathing Reboot Safe feature, which saves the IP address in the following conditions. A failed NIC is removed from the system by using dynamic reconfiguration. A reboot occurs prior to reinsertion of a functioning NIC. In these circumstances, the system attempts, but fails, to plumb an interface for the missing NIC. Rather than lose the IP address, the IP network multipathing Reboot Safe feature transfers the IP address to another NIC in the IP network multipathing interface group.

For more information, see “IP Network Multipathing Topics” in *System Administration Guide: IP Services*.

SPARC: IP Network Multipathing DLPI Link-Up and Link-Down Notification Support

Link-down notifications enable the IP multipathing daemon to detect physical link failures faster. When a network interface is started, the IP multipathing daemon attempts to enable link-up and link-down notifications from the network interface driver. A link-down notification is generated when the interface detects the loss of the physical link to the network. A link-up notification is generated when the physical link is restored. The driver must support this feature in order for the notification procedure

to work. The `RUNNING` flag is unset when a link-down notification is received, and set when a link-up notification is received. The IP multipathing daemon uses the `RUNNING` flag to monitor the physical link state.

For more information, see the IP network multipathing chapters in the *System Administration Guide: IP Services*.

Mobile Internet Protocol

Mobile Internet Protocol (Mobile IP) enables the transfer of information to and from mobile computers, such as laptop and wireless communications. The mobile computer can change its location to a foreign network and still access and communicate with and through the mobile computer's home network. The Solaris implementation of Mobile IP supports only IPv4.

As of the Solaris 8 4/01 release, Mobile IP enables system administrators to set up reverse tunnels. A reverse tunnel can be set up from the mobile node's care-of address to the home agent. This reverse tunnel ensures a topologically correct source address for the IP data packet. By using reverse tunnels, system administrators can also assign private addresses to mobile nodes.

For more information on the Mobile Internet Protocol, see "Mobile IP Topics" in *System Administration Guide: IP Services*.

Mobile Internet Protocol (Mobile IP) Agent Advertisements Over Dynamic Interfaces

Dynamically created interfaces are interfaces that are configured after the `mipagent` daemon starts. You can now configure the foreign agent implementation to send advertisements over dynamically created interfaces. You can also enable or disable some unsolicited advertisements over the advertising interfaces.

For more information on Mobile Internet Protocol, see "Mobile IP Topics" in *System Administration Guide: IP Services*.

Berkeley Internet Name Domain

An updated version of Berkeley Internet Name Domain (BIND) has been integrated in the Solaris 9 release. The updated version is BIND version 8.2.4.

BIND functionality includes the following:

- `in.named` configuration options – See the `named.conf(4)` and the `named-bootconf(1M)` man pages.
- Extensions to the `resolver()` (3RESOLV) interface that are safe to use in multithreaded applications.
- The addition of the `ndc` command and the `dnskeygen` command – The `ndc` command is used to start, stop, or reconfigure `in.named`. The `dnskeygen` command is used to create TSIG and DNSSEC keys. See the `dig(1M)` man page for instructions on how to gather information from the DNS servers. See also the

`ndc(1M)` and `dnskeygen(1M)` man pages.

For more information, see the *System Administration Guide: Naming and Directory Services (DNS, NIS, and LDAP)*.

Networking Freeware

See “Freeware Enhancements” on page 109 for information about GNU `wget` 1.6, `Ncftp Client` 3.0.3, and `Samba` 2.2.2 in the Solaris 9 release.

- `Ncftp Client` 3.0.3 uses the File Transfer Protocol (FTP) and is an alternative to the UNIX `ftp` program.
- GNU `wget` 1.6 retrieves files from the Web by using HTTP and FTP.
- `Samba` 2.2.2 is a free SMB and CIFS client and server for UNIX and other operating systems.

System Administration Tools

The Solaris 9 release includes the following system administration enhancements.

Solaris Volume Manager

Solaris Volume Manager provides storage management tools. These tools enable you to create and manage RAID-0, RAID-1, and RAID-5 volumes, as well as transactional (logging) devices and soft partitions. Solaris Volume Manager provides all of the capabilities of Solstice DiskSuite™. Solaris Volume Manager adds the following:

- Soft partitions – Allow numerous partitions on a single drive, thus breaking the 8-slice barrier.
- Device ID support – Preserves the configuration of the Solaris Volume Manager. When you move or rearrange disks, the configuration is still preserved.
- Active monitoring of disks – Detects silent failures.
- Solaris Management Console based interface – Enables you to manage the enhanced storage devices through the same management interface that is used for other Solaris management tasks.
- The WBEM application programming interface (API) for Solaris Volume Manager – Enables standards-based management of Solaris Volume Manager from any compliant tool.

The Solaris 9 release seamlessly supports the upgrade of existing systems that run Solstice DiskSuite (SDS) to the Solaris Volume Manager. This upgrade does not disturb or change the configuration. Upgrades of mirrored root file systems are fully and automatically supported.

For more information, see the *Solaris Volume Manager Administration Guide*.

Unified diff Format

The `diff` and `sccs-sccsdiff` commands have been updated to include support for the GNU-style unified `diff` format. In this format, context lines are only printed once in the listing of differences.

For information on these commands, see the `diff(1)` and `sccs-sccsdiff(1)` man pages.

Generic Log Rotation Facility

A generic log rotation facility is available in the Solaris 9 release. System administrators can use this facility to maintain and rotate system and application log files. For further information, see the `logadm(1M)` and `logadm.conf(4)` man pages.

Solaris Management Console

Solaris Management Console 2.1 is a GUI-based “umbrella application” that serves as the starting point for a variety of management tools. The console comes complete with a default toolbox that contains the following tools:

- System Information – Display read-only data about the host, hardware, and software.
- Log Viewer – View application and command-line messages. Manage log files.
- Processes – View, suspend, resume, and delete processes.
- Performance – Track the usage and consumption of system resources.
- Users – Set up and maintain user accounts, user templates, groups, mailing lists, administrative roles, and rights. Grant or deny rights to users and to administrative roles. These rights control access to applications and tasks.
- Projects – Constrain how resources are allocated, by processes and by tasks that run in the current project.
- Computers and Networks – View and manage computers, networks, and subnetworks.
- Patches – Manage patches on systems that run the Solaris operating environment.
- Scheduled Jobs – Schedule, start, and manage jobs.
- Mounts and Shares – View and manage mounts, shares, and usage information.
- Disks – Create and view disk partitions.
- Enhanced Storage – Create and manage RAID-0, RAID-1, RAID-5, soft partitions, and transactional volumes. RAID-0 volumes include concatenation volumes and stripe volumes. RAID-1 volumes are mirror volumes. The enhanced storage enables the assembly of flexible storage configurations that are resistant to data loss or downtime.
- Serial Ports – Configure and manage existing serial ports.

You can add or delete tools from the default toolbox. You can create a new toolbox to manage a different set of tools by using the console Toolbox Editor.

Diskless clients can also be managed, but only through a command-line interface.

For further information, see the “Solaris Management Console (Overview)” in *System Administration Guide: Basic Administration*.

Patch Manager

Patch Manager manages patches that are created for the Solaris 9 operating environment and compatible releases. You can display installed patches and their properties. You can add patches to one or more systems concurrently. You can remove patches, analyze a system’s patch requirements, and download patches from the SunSolve Online service.

The new `smpatch` command installs patches on a single machine or multiple machines, analyzes patch requirements, and downloads required patches.

See the `smpatch(1M)` man page for further information.

Solaris WBEM Services 2.5

Solaris WBEM Services 2.5 is Sun Microsystems’ implementation of Web-Based Enterprise Management (WBEM). WBEM is a set of management and Internet-related technologies. These technologies are intended to unify the management of enterprise compute environments. Solaris WBEM Services was updated to version 2.5 in the Solaris 9 release.

Further information is provided in “Web-Based Enterprise Management Tools” on page 95.

CIM Object Manager Now Listens to HTTP Port 5988

The CIM Object Manager listens for remote method invocation (RMI) connections on RMI port 5987. And, the Object Manager now listens for XML and HTTP connections on HTTP port 5988. In the Solaris 8 release and Solaris 8 update releases, the CIM Object Manager listened for XML and HTTP connections on default HTTP port 80.

For further information, see the new *Solaris WBEM Developer’s Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer’s Guide*.

SNMP Adapter for WBEM

The SNMP Adapter for WBEM is intended for use by system administrators. This adapter enables Simple Network Management Protocol (SNMP) management applications to access the system management information that is provided by Solaris WBEM Services.

The SNMP Adapter for WBEM is used with the Solstice™ Enterprise Agent (SEA) Master Agent. The adapter maps SNMP requests into equivalent WBEM Common Information Model (CIM) properties or instances.

The SNMP Adapter for WBEM also remaps the response from the CIM Object Manager into an SNMP response, which is returned to the management application.

A mapping file contains the corresponding object identifier (OID), class name, property name, and Abstract Syntax Notation One (ASN.1) type for each object.

For further information on WBEM, see the new *Solaris WBEM Developer's Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SKD Developer's Guide*.

Solaris Product Registry 3.0

The Solaris Product Registry 3.0 includes the following new features:

- The ability to uninstall individual system packages.
- All of the Solaris system products that you installed in their localized version appear in the "System Software Localizations" folder.
- The registry is compatible with more installation wizards.

For further information, see the *System Administration Guide: Basic Administration*.

Modify Software Groups in Solaris Web Start Program

The Solaris Web Start program was updated to enable you to modify the selected Solaris Software Group. You can add or remove software packages.

For further information, see the *System Administration Guide: Basic Administration*.

System Administration Freeware Tools

For information about GNU `grep 2.4.2` and GNU `tar 1.13`, see "Freeware Enhancements" on page 109. GNU `grep 2.4.2` is a pattern matcher. GNU `tar 1.13` is an archiver.

File System Enhancements

The Solaris 9 release includes the following file system enhancements.

Extended File Attributes

The UFS, NFS, and TMPFS file systems have been enhanced to include extended file attributes. Application developers can associate specific attributes to a file. For example, a developer of a file management application for a windowing system might choose to associate a display icon with a file.

Extended attributes are logically represented as files within a hidden directory that is associated with the target file.

You can use the extended file attribute API and a set of shell commands to add and manipulate file system attributes. See the `fsattr(5)`, `openat(2)`, and `runat(1)` man pages for more information.

Many file system commands in Solaris provide an attribute-aware option that you can use to query, copy, modify, or find file attributes. For more information, see the specific file system command in the man pages.

See also the *System Administration Guide: Basic Administration* for more information.

Improved UFS Direct I/O Concurrency

The performance of direct I/O is used by database applications to access unbuffered file-system data. Direct I/O improvements allow concurrent read access and write access to regular UFS files. Previously, an operation that updated file data would lock out all other read or write accesses until the update operation was completed.

See the *System Administration Guide: Basic Administration* and the man page, `mount_ufs(1M)`, for more information.

DNLC Improvements

The directory name look-up cache (DNLC) is enhanced to provide improved performance when you access files in large directories with 1000 or more files.

The DNLC is a general file-system service. DNLC caches the most recently referenced directory names and their associated vnodes. UFS directory entries are stored linearly on disk. This means that locating an entry requires searching each entry for the name. Adding a new entry requires searching the entire directory to ensure the name does not exist. To solve this performance problem, entire directories are cached in memory by the DNLC.

Another feature in this release is that DNLC caches file objects that have been looked up but do not exist. This feature is known as negative caching, and is useful because some applications repeatedly test to check if a file exists.

New tunable parameters are associated with the DNLC improvements. These parameters are set optimally. Do not change the parameters casually.

See the *Solaris Tunable Parameters Reference Manual* for further information.

UFS Snapshots (`fsnap`)

You can use the `fsnap` command to create a snapshot of a file system. A snapshot is a file system's temporary image that is intended for backup operations.

When run, the `fsnap` command creates a virtual device and a backing-store file. You can back up the virtual device, which looks and acts like a real device, with any of the existing Solaris backup commands. The backing-store file is a bitmapped file that contains copies of pre-snapshot data that has been modified since the snapshot was taken.

See the *System Administration Guide: Basic Administration* and the man page, `fsnap(1M)`, for more information.

Updated `mkfs` Command

The `mkfs` command has been updated to improve performance when you create file systems. Improved `mkfs` performance is often 10 times faster than in previous Solaris releases. Performance improvements are seen on systems when you create both large file systems and small file systems. However, the biggest `mkfs` performance improvements occur on systems with high-capacity or high-speed disks.

Installation Enhancements

The Solaris 9 release includes the following installation enhancements.

Solaris Live Upgrade 2.0

Note – Solaris Live Upgrade 2.0 is available in the Solaris 9 operating environment. This description covers version 2.0.

Solaris Live Upgrade 2.1 is now available in the Solaris 9 8/03 Update release. For a description of Solaris Live Upgrade 2.1, see “Solaris Live Upgrade 2.1” on page 22.

Solaris Live Upgrade provides a method of upgrading that substantially reduces the usual service outage that is associated with an operating system upgrade. You can duplicate your current running boot environment, then while the original boot environment continues to run, you can upgrade the duplicate. The duplicate boot environment is then activated to become the active boot environment when the system is rebooted. If a failure occurs, you can quickly fall back to the original boot environment with a simple reboot. This feature eliminates the downtime for the production environment that is associated with a normal test and evaluation process.

In addition to upgrading a boot environment, you can install a Web Start Flash archive on an inactive boot environment. When you reboot the system, the configuration that you installed on an inactive boot environment is active.

The Solaris 9 release includes several Live Upgrade enhancements that apply to the command-line interface only. These enhancements affect the following:

- **Progress Reporting** – When using Solaris Live Upgrade to upgrade or install a Web Start Flash archive, the percentage of the upgrade or install completed is reported.
- **Changes to the `lumount` and `luumount` Commands** – The `lumount` command mounts all the boot environment’s file systems. If you do not explicitly specify a mount point, `lumount` creates a mount point. This mount point uses the boot environment name rather than a random set of numbers, thus preventing a proliferation of mount points. This enhancement makes the `luumount` command easier to use.

The `luumount` command unmounts the boot environment's root file system. The `luumount` command now accepts a mount point as well as the boot environment name. And with the `-f` option, a boot environment's file system can be forcibly unmounted.

See the man pages `lumount(1M)` and `luumount(1M)`.

- **Scheduling Priorities** – Solaris Live Upgrade's main purpose is to minimize production environment downtime while migrating to a new operating system. Some Solaris Live Upgrade operations, such as upgrading and copying file systems, can cause significant load to a system. Solaris Live Upgrade now has the tools to control scheduling by priorities. This feature minimizes performance degradation on the production system. You can change the defaults in the `/etc/default/lu` file.
- **Naming Boot Environments** – Solaris Live Upgrade commands allow long names for boot environments. The commands can now associate a description of any length with a boot environment name.

For further information, see the *Solaris 9 4/04 Installation Guide* or the man page, `ludesc(1M)`.

For further information on Solaris Live Upgrade, see "Solaris Live Upgrade (Topics)" in *Solaris 9 4/04 Installation Guide*.

Note – In the Solaris 9 Update releases, note the following name change:

Solaris Flash (formerly Web Start Flash)

Web Start Flash Installation Feature

The Web Start Flash installation feature enables you to create a single reference installation of the Solaris operating environment on a machine. You can then replicate that installation on several machines.

For further information, see "Solaris Flash Installation Feature (Topics)" in *Solaris 9 4/04 Installation Guide*.

Note – In the Solaris 9 Update releases, note the following name change:

Solaris Flash (formerly Web Start Flash)

Web Start Flash Archive Retrieval Using FTP

The Web Start Flash program has been updated to allow you to retrieve a Web Start Flash archive by using FTP. When installing an archive, you can specify the location of an archive on an FTP server.

For details about how to retrieve an archive from an FTP server, see the *Solaris 9 4/04 Installation Guide*.

Note – In the Solaris 9 Update releases, note the following name change:

Solaris Flash (formerly Web Start Flash)

Minimal Installation

Files that constitute several features in the core software group, or metacluster, are now moved into separate, more logically organized packages. You can optionally exclude these packages from the Solaris operating environment when you install the Solaris software. You can also remove these packages by using the `pkgrm` command after installation. See the `pkgrm(1M)` man page.

Files that constitute the following features are moved into new packages or existing packages:

- Cache file system
- NFS
- Kerberos security
- Distributed file system
- NIS-related
- Network routing daemons
- Remote network `r*` commands
- `telnet` server
- `tftp` server
- Domain name server
- DARPA name server
- Remote procedure call services
- Boot or install server
- `setuid` and `setgid`

x86: PXE Network Boot

The x86 pre-boot execution environment (PXE) enables you to boot a Solaris x86 system directly from the network without using the Solaris boot diskette. The x86 system must support PXE. On a system that supports PXE, enable the system to use PXE by using the system's BIOS setup tool or the network adapter's configuration setup tool. The Solaris boot diskette is available for the systems that do not support this feature.

For further information, see the *Solaris 9 4/04 Installation Guide*.

Longer Package Names

The `pkgmk` utility can now be used to create packages with names up to 32 characters in length. See the `pkgmk(1)` and `pkgadd(1M)` man pages.

Installation From the Solaris DVD

You can now install the Solaris operating environment and additional software from the Solaris DVD. The DVD enables you to perform either a Solaris™ Web Start installation or a custom JumpStart installation. The Solaris DVD includes the Solaris software, ExtraValue software, and the Solaris documentation.

For detailed instructions, see the *Solaris 9 4/04 Installation Guide*.

Solaris Web Start Program Uses `sysidcfg` File

The Solaris Web Start program has been modified to use the `sysidcfg` file to configure system information during an installation or upgrade. Create a `sysidcfg` file with configuration information for your system. With this file in place, the Solaris Web Start program does not prompt you to enter the system information during installation.

For detailed instructions, see the *Solaris 9 4/04 Installation Guide*.

Enhancements to the Solaris Web Start Program

The Solaris Web Start program was updated to enable you to perform the following functions during the Solaris installation or upgrade:

- Select to automatically reboot the system after installation
- Select to automatically eject the CD or DVD after installation
- Select to preserve file systems

For detailed instructions, see the *Solaris 9 4/04 Installation Guide*.

Additions to Time Zone Selections

The number of time zones that are available in the Solaris 9 operating environment has dramatically increased. When you install the Solaris operating environment, you can select time zones by geographic region. The time zone selections in the lists of continents and countries have been expanded.

For detailed instructions, see the *Solaris 9 4/04 Installation Guide*.

Solaris Web Start Wizards SDK 3.0.1

Solaris Web Start Wizards™ SDK simplifies the installation, setup, and administration of native Solaris, Java, and non-Java applications. With Solaris Web Start Wizards software, developers can copackage both Solaris versions and Microsoft Windows versions of their applications. The installation wizard manages the platform specifics.

The Web Start Wizards SDK 3.0.1 is now included with the Solaris 9 release. SDK 3.0.1 can be installed by using the Solaris Web Start program.

New Boot Options for a Custom JumpStart Installation

New options have been added for use with the `boot` command when you perform a custom JumpStart installation.

With the `boot` command, you can specify the location of the configuration files to use to perform the installation. You can specify a path to an HTTP server, an NFS server, or a file that is available on local media. If you do not know the path to the files, you can require that the installation program prompt you for the path. The prompt is displayed after the machine boots and connects to the network.

The `nowin` option enables you to specify that the custom JumpStart program not begin the X program. You do not need to use the X program to perform a custom JumpStart installation. You can shorten the installation time by using the `nowin` option.

For detailed instructions about how to use these new options, refer to “Custom JumpStart Installation (Topics)” in *Solaris 9 4/04 Installation Guide*.

Upgrading Mirrors

The Solaris 9 release now supports operating environment upgrades of root mirrors and metadevices that were created by the Solaris Volume Manager, formerly Solstice DiskSuite. If you are upgrading a system that has a metadevice that was created by the Solaris Volume Manager, you no longer need to edit the system’s `vfstab`. The root mirror is detected, and the operating environment on the mirror is upgraded. This process runs just as in a typical upgrade without metadevices.

Default Routing With System Identification Utilities

The system identification utilities automatically attempt to determine the default router during installation.

For installation information, see the *Solaris 9 4/04 Installation Guide*.

Configuration With System Identification Utilities

During system identification, the system identification utilities can configure systems to be LDAP clients. Prior Solaris releases allowed the configuration of a machine only as an NIS, NIS+, or DNS client.

For installation information, see the *Solaris 9 4/04 Installation Guide*.

Patch Analyzer

The Patch Analyzer is now available when you use the Solaris Web Start program to upgrade to a Solaris Update release. The Patch Analyzer performs an analysis on your system. This analysis determines which patches would be removed or downgraded by an upgrade to a Solaris Update release. You do not need to use the Patch Analyzer when you upgrade to the Solaris 9 release.

For further installation information, see the *Solaris 9 4/04 Installation Guide*.

System Performance Enhancements

The Solaris 9 release includes the following system performance enhancements.

SPARC: Multiple Page Size Support

Multiple Page Size Support (MPSS) allows a program to use any hardware-supported page sizes to access portions of virtual memory. Previously, only 8-KB pages were available on UltraSPARC platforms for a program's stack, heap, or anonymous memory mapped with `mmap()`.

You can use MPSS to run legacy applications with specific memory page size settings where the applications benefit from this sort of performance tuning. The use of larger page sizes might significantly improve the performance of programs that intensively use large amounts of memory.

For more information, see the man pages `pagesize(1)`, `mpss.so.1(1)`, `ppgsz(1)`, and `mmap(2)`.

Improved Multithreading Library

This release includes an improved and faster multithreading library, which was available as the alternate `libthread` in previous Solaris software releases.

For further information, see the *Multithreaded Programming Guide* and the `threads(3THR)` man page.

Solaris Network Cache and Accelerator (NCA)

The Solaris Network Cache and Accelerator (NCA) has been improved with the addition of a sockets interface to NCA. Any web server can, with minimal modifications, communicate with NCA through this sockets interface. See "Networking Enhancements" on page 63.

SPARC: Performance Improvement for Servers

Enhancements have been made to the algorithm that controls virtual pages and physical pages and how the pages are cached. These enhancements deliver increased system performance of around 10% for general user loads in servers.

Dynamic Intimate Shared Memory (DISM)

Dynamic Intimate Shared Memory (DISM) allows a database to dynamically extend or reduce the size of the shared data segment. This feature eliminates the misconfiguration problem and denial-of-service security vulnerability of Intimate Shared Memory (ISM).

The ISM is a shared memory segment that consists of large locked memory pages. The ISM number of locked pages remains constant or unchanged. Dynamic ISM (DISM) is pageable ISM shared memory, where the number of locked pages is variable or changeable. Therefore, the DISM supports releasing or adding more physical memory to the system during dynamic reconfiguration. The size of the DISM can span available physical memory plus disk swap.

See the man page `shmop(2)`.

Note – Large-page support is available for DISM in the Solaris 9 9/02 Update release. For a description of this large-page support, see “SPARC: Dynamic Intimate Shared Memory (DISM) Large-Page Support” on page 55.

Server and Client Management

The Solaris 9 release includes the following enhancements for server and client management.

Dynamic Host Configuration Protocol (DHCP)

The Dynamic Host Configuration Protocol (DHCP) service enables host systems to receive IP addresses and network configuration information. This information is provided at boot time from a network server. The Solaris DHCP service has been enhanced in several ways to enable the service to support larger numbers of clients:

- The Solaris DHCP server now uses multithreading to serve multiple clients simultaneously.
- A new data store that stores data in binary files can support larger numbers of clients with faster access than with the ASCII files and NIS+ data stores.
- Access to NIS+ data storage has been redesigned. The redesign supports server multithreading.
- Data access architecture has been changed to enable third parties to write code modules that enable the DHCP server to use any data service to store DHCP data.

In addition, the Solaris DHCP server now supports dynamic DNS updates. You can enable the DHCP service to update the DNS service with the host names of DHCP clients that request a specific host name.

The Solaris DHCP client can now be configured to request a specific host name.

For more information, see the *System Administration Guide: IP Services*.

Diskless Client Management

Diskless client management is available through the command line. You can manage diskless clients, list OS services for diskless clients, and manage patches on all existing diskless clients.

For information on diskless client management, see “Managing Diskless Clients (Tasks)” in *System Administration Guide: Basic Administration*.

Security Enhancements

The Solaris 9 release includes the following security enhancements.

Internet Key Exchange (IKE) Protocol

Internet Key Exchange (IKE) automates key management for IPsec. IKE replaces manual key assignment and refreshment on an IPv4 network. IKE enables the administrator to manage larger numbers of secure networks.

System administrators use IPsec to set up secure IPv4 networks. The `in.iked` daemon provides key derivation, authentication, and authentication protection at boot time. The daemon is configurable. The administrator sets up the parameters in a configuration file. After the parameters are set up, no manual key refreshment is required.

For further information, see “Internet Key Exchange” in *System Administration Guide: IP Services*.

Solaris Secure Shell

Secure Shell allows a user to securely access a remote host over an unsecured network. Data transfers and interactive user network sessions are protected from eavesdropping, session hijacking, and intermediary attacks. Solaris 9 Secure Shell supports SSHv1 and SSHv2 protocol versions. Strong authentication that uses public-key cryptography is provided. The X Window System and other network services can be tunneled safely over Secure Shell connections for additional protection.

The Secure Shell server, `sshd`, supports the monitoring and filtering of incoming requests for network services. The server can be configured to log the client host name of incoming requests and thus enhance network security. `sshd` uses the same mechanism that is used by the `Tcp-wrappers 7.6` utility that is described in “Freeware Enhancements” on page 109.

For further information, see the `sshd(1M)`, `hosts_access(4)`, and `hosts_options(4)` man pages. See also “Using Solaris Secure Shell (Tasks)” in *System Administration Guide: Security Services*.

Kerberos Key Distribution Center (KDC) and Administration Tools

System administrators can improve system security by using Kerberos V5 authentication, privacy, and integrity. NFS is an example of an application that is secured with Kerberos V5.

The following list highlights the new features of Kerberos V5.

- Kerberos V5 Server – The server includes the following components:

- Principal (user) administration system – Includes a centralized server for local and remote administration of principals and security policies. The system includes both a GUI and a CLI administration tool.
- Key Distribution Center (KDC) – Uses the principal database information that was created by the administration server. Issues tickets for clients.
- Principal database replication system – Duplicates the KDC database to a backup server.
- MIT and Microsoft Windows 2000 password change interoperability – Kerberos V5 passwords can now be changed from a Solaris client to an MIT Kerberos server and Microsoft Windows 2000.
- Tuned DES – Kerberos V5 kernel DES operations have been optimized for the *Sun4u* architecture.
- Kerberos-encrypted communications now supported with the Solaris core – An encryption module that supports Kerberos encrypted-communications is available in the Solaris 9 operating environment. Previously, an encryption module was available only on the Solaris Encryption Kit CD-ROM or through a web download.
- Addressless tickets – System administrators and users can now specify addressless tickets. This ability can be necessary in multihomed and NAT network environments.
- Kerberos V5 PAM module supports password aging – The `pam_krb5` module supports password aging that is set in the KDC for each user principal.

For further information, see “Administering the Kerberos Database” in *System Administration Guide: Security Services*.

Secure LDAP Client

The Solaris 9 release includes new features for LDAP client-based security. A new LDAP library provides for SSL (TLS) and CRAM-MD5 encryption mechanisms. These encryption mechanisms enable customers to deploy methods for encryption over the wire between LDAP clients and the LDAP server.

The Sun ONE Directory Server 5.1 (formerly iPlanet Directory Server 5.1) is the LDAP directory server. For further information on this server, see “Networking Enhancements” on page 63.

Encryption Modules for IPsec and Kerberos

Strong encryption for IPsec and Kerberos is included in the Solaris 9 release. Prior to this release, encryption modules were available only on the Solaris Encryption Kit CD-ROM or through a web download. A number of these algorithms are now in the Solaris 9 operating environment. These algorithms include 56-bit DES privacy support for Kerberos as well as 56-bit DES and 128-bit 3-key Triple-DES support for IPsec.

Note – Support for even stronger encryption is available on the Solaris Encryption Kit CD-ROM or through web download. IPsec supports the 128-bit, 192-bit, or 256-bit Advanced Encryption Standard (AES), and 32-bit to 448-bit Blowfish in 8-bit increments.

For information on IPsec support, see “IPsec (Overview)” in *System Administration Guide: IP Services*. For information on Kerberos support, see “Introduction to SEAM” in *System Administration Guide: Security Services*.

IP Security Architecture for IPv6

The IPsec security framework has been enhanced in the Solaris 9 release to enable secure IPv6 datagrams between machines. For the Solaris 9 release, only the use of manual keys is supported when using IPsec for IPv6.

Note – The IPsec security framework for IPv4 was introduced in the Solaris 8 release. The Internet Key Exchange (IKE) Protocol is available for IPv4.

For further information, see “IPsec (Overview)” in *System Administration Guide: IP Services*.

Role-Based Access Control (RBAC) Enhancements

Role-based access control (RBAC) databases can be managed through the Solaris Management Console graphical interface. Rights can now be assigned by default in the `policy.conf` file. In addition, rights can now contain other rights.

For further information on RBAC, see “Role-Based Access Control (Overview)” in *System Administration Guide: Security Services*. For information about the Solaris Management Console, see “System Administration Tools” on page 70.

Xserver Security Options

New options enable system administrators to allow only encrypted connections to the Solaris X server. For further information, see “Solaris 9 Features for Desktop Users” on page 100.

Generic Security Services Application Programming Interface (GSS-API)

The Generic Security Services Application Programming Interface (GSS-API) is a security framework that enables applications to protect their transmitted data. The GSS-API provides authentication, integrity, and confidentiality services to applications. The interface permits those applications to be entirely generic with

respect to security. The applications do not have to check for the underlying platform, such as the Solaris platform, or security mechanism, such as Kerberos, being used. This means that applications that use the GSS-API can be highly portable.

For more information, see the *GSS-API Programming Guide*.

Additional Security Software

For information about SunScreen™ 3.2, a firewall product, see “Additional Software” on page 107.

See also “Freeware Enhancements” on page 109 for information about the `Tcp-wrappers 7.6` freeware in the Solaris 9 release. `Tcp-wrappers 7.6` are small daemon programs that monitor and filter incoming requests for network services.

Xserver Features

The Solaris 9 release includes the following Solaris X server enhancements.

X11 Support for IPv6 on Solaris

The Solaris X Window System servers and client libraries now support the Internet Protocol Version 6 (IPv6). This support is available in addition to the existing IPv4 support. This feature enables you to use IPv6 addresses and connections when displaying X applications across the network.

Xserver Security Options

New options enable system administrators to control which transport methods are used by the Solaris X server. Administrators who need to secure a host can now disable remote TCP connections directly to the Xserver. At the same time, the administrators can allow encrypted connections to be tunneled through Secure Shell.

See the description of the `-nolisten` option in the `Xserver(1)` man page for further details.

Xsun Keyboard Bell Option

The Xsun server can now be configured to play a tone through an audio device. This option replaces ringing the keyboard bell when a program emits a beep. By using this option, users can customize the volume, pitch, and length of beeps through the `Xset` program or CDE control panel. Users adjust the beep to match their hearing ability and personal preferences.

See the description of the `-audiobell` option in the `Xsun(1)` man page for further details.

Using Xsun Server as a Display-only Device

New options enable the Xsun server to run without a keyboard or a mouse. You can run the Solaris window manager in display-only mode, without a mouse or a keyboard, in the following ways:

- As a display-only device
- As a display with alternative input devices other than a mouse or a keyboard
- Without a display to drive a frame buffer for hardware-accelerated offscreen rendering

See the `Xsun(1)` man page for further information.

Removable Media Management

The Solaris 9 release includes the following enhancements for removable media.

Write CD File Systems With the `cdrw` Command

The `cdrw` command enables you to write CD file systems in ISO 9660 format. You can use Rock Ridge or Joliet extensions on CD-R or CD-RW media devices.

You can use the `cdrw` command to do the following:

- Create data CDs
- Create audio CDs
- Extract audio data from an audio CD
- Copy CDs
- Erase CD-RW media

Go to the following Web site for information on recommended CD-R or CD-RW devices:

http://www.sun.com/io_technologies/ihvindex.html

See the `cdrw(1)` man page for information on using this command.

Improved Removable Media Management

Volume management features have been improved in this release to fully support removable media. This improvement means that the following media are mounted and available for reading on insertion:

- DVD-ROMs
- Iomega and Universal Serial Bus (USB) Zip drives and Jaz drives
- CD-ROMs
- Diskettes

With Common Desktop Environment (CDE) and Solaris command-line enhancements, you can accomplish the following:

- Format, label, and set read or write software protection on removable media with the new `rmformat` command. This command replaces the `fdformat` command for formatting removable media.
- Create and verify a PCFS file system on removable media with the `mkfs_pcfs` and `fsck_pcfs` commands.
- Create an `fdisk` partition and a PCFS file system on removable media on a SPARC™ system to facilitate data transfers to x86 systems.

See the *System Administration Guide: Basic Administration* for information on managing removable media with the command-line interface. See the *Solaris Common Desktop Environment: User's Guide* for information on managing removable media with CDE's File Manager.

Device Management

The Solaris 9 release includes the following enhancements for device management.

SPARC: Sun StorEdge Traffic Manager

The Sun StorEdge™ Traffic Manager feature supports multiple paths for I/O devices such as Fibre Channel-accessible storage. This feature balances the workload across multiple devices. Additionally, the Traffic Manager increases reliability by redirecting requests from a failed interface card or storage device to a card or device that is operational.

SPARC: Sun Gigaswift Ethernet Driver

As of the Solaris 8 7/01 release, the Solaris operating environment includes support for the Sun™ Gigaswift 1000Base-T Ethernet driver. This product enhances performance of a 1-Gbyte twisted-pair copper Ethernet link.

For further information, see the `ce(7D)` man page.

USB Devices

Note – In the Solaris 9 4/04 release, new and revised USB feature descriptions are provided. See “Device Management” on page 28.

The Solaris operating environment includes support for USB devices such as keyboards, mouse devices, audio devices, mass storage devices, and printers.

Note – These enhancements for USB device support are new for the SPARC platform in the Solaris 9 release. In the Solaris 9 12/02 Update release, these enhancements are now also available for x86 platforms.

Sun Microsystems support for USB devices includes the following:

- Sun Blade 100, Sun Blade 1000, Netra™ X1, Netra T1, and Sun Fire 280R systems support USB devices.
- In the Solaris 9 Update releases, x86 systems support USB devices.
- Sun Ray systems also support USB devices.

For information on using USB devices with a Sun Ray system, see the Sun Ray documentation.

Using USB Mass Storage Devices

Note – In the Solaris 9 4/04 release, new and revised USB feature descriptions are provided. See “Device Management” on page 28.

Many USB mass storage devices are supported in the Solaris environment. Some noncompliant USB devices might work. Follow the information that is provided in the `/kernel/drv/scsa2usb.conf` file to see if a particular device can be supported.

Note – These USB mass storage devices enhancements are new for the SPARC platform in the Solaris 9 release. In the Solaris 9 8/03 Update release, these enhancements are now also available for x86 platforms.

For further information, see the *System Administration Guide: Basic Administration*.

Hot-Plugging USB Devices With the `cfgadm` Command

Note – In the Solaris 9 4/04 release, new and revised USB feature descriptions are provided. See “Device Management” on page 28.

With the `cfgadm` command, you can hot-plug a USB device from a running system without having to shut down the system. You can also use the `cfgadm` command to logically hot-plug a USB device without physically removing the device. This scenario is convenient when you need to reset a USB device from a remote location.

Note – These enhancements for hot-plugging are new for the SPARC platform in the Solaris 9 release. In the Solaris 9 8/03 Update release, these enhancements are now also available for x86 platforms.

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

USB Printer Support

Note – In the Solaris 9 4/04 release, new and revised USB feature descriptions are provided. See “Device Management” on page 28.

You can use Solaris Print Manager to set up a USB printer that is attached to a system with USB ports.

The new logical device names for USB printers are as follows:

```
/dev/printers/[0...N]*
```

Therefore, when you add a USB printer to a printer server, select one of these devices for a USB printer. Select a device under Printer Port on the Add New Attached Printer screen.

Note – These USB printer support enhancements are new for the SPARC platform in the Solaris 9 release. In the Solaris 9 8/03 Update release, these enhancements are now also available for x86 platforms.

For more information on using the Solaris Print Manager to set up printers, see the *System Administration Guide: Advanced Administration*.

The USB printer driver in the Solaris 9 release supports all USB printer-class compliant printers. Check the list of recommended PostScript™ printers in the `usbprn(7D)` man page.

For information and cautions about hot-plugging USB printers, refer to the Notes and Diagnostics sections of the `usbprn(7D)` man page.

Reconfiguration Coordination Manager (RCM)

Dynamic reconfiguration of system resources enables you to reconfigure system components while the system is still running. This feature has been available with the `cfgadm` command since the Solaris 8 release. The Reconfiguration Coordination Manager is the framework that manages the dynamic removal of system components. By using RCM, you can register and release system resources in an orderly manner.

Previously, you had to release resources from applications manually before you could dynamically remove the resource. Or, you could use the `cfgadm` command with the `-f` option to force a reconfiguration operation. This option, however, might leave your applications in an unknown state. Also, the manual release of resources from applications commonly causes errors.

You can use the new RCM script feature to write your own scripts to shut down your applications. You can write scripts to cleanly release the devices from your applications during dynamic reconfiguration. The RCM framework launches a script automatically in response to a reconfiguration request, if the request impacts the resources that are registered by the script.

See the *System Administration Guide: Basic Administration* and the `rcmscript(4)` man page for more information.

mp Program Enhancement

In the `mp(1)` program enhancement, the `mp` command is modified to work as an X Print Server client. Configure an X Print Server to run in the host machine. Then the `mp` command can print output in any Print Description Language that the X Print Server supports. The newly introduced options, `-D` and `-P`, can be used for making `mp` work as an X Print Server client.

For more information, see “Print Filter Enhancement With” in *International Language Environments Guide*.

SPARC: New Dynamic Reconfiguration Error Messages

The dynamic reconfiguration software has been enhanced to improve troubleshooting dynamic reconfiguration problems.

See the *System Administration Guide: Basic Administration* and the `cfgadm(1M)` man page for more information.

Development Tools

The Solaris 9 release includes the following development tool enhancements.

Compatibility of Solaris and Linux Application Programming Interfaces

Some freeware that was available on the Solaris 8 Software Companion CD is now integrated in the Solaris 9 operating environment. As a result, software application developers can now develop and compile their freeware applications more easily in the Solaris operating environment. Freeware libraries include the following:

- `glib`
- `GTK+`
- `Jpeg`
- `libpng`
- `Tcl/Tk`
- `libtif`
- `libxm12`

For further information about freeware that is available on the Solaris media, see “Freeware Enhancements” on page 109.

Choice of XML Output for Live Upgrade Messages

When using Solaris Live Upgrade at the command line, you can now choose XML output with the `-X` option. This option is for use when writing programs or shell scripts that use Solaris Live Upgrade as a tool. The default output is text, but with the `-X` option, XML that is suitable for machine parsing and interpretation is created. The output for the `-X` option is XML for all messages, including error, warning, informational, and general.

See the man page `lucreate(1M)`.

SPARC: Multiple Page Size Support

Multiple Page Size Support (MPSS) allows a program to use any hardware-supported page size to access portions of virtual memory. Previously, only 8-KB pages were available on UltraSPARC platforms for a program's stack, heap, or anonymous memory mapped with the `mmap()` function.

You can tune the performance of large, memory-intensive applications to use any page size. Any page size that is supported by the hardware for stack, heap, or `/dev/zero` private memory mapped with the `mmap()` function can be used. The use of larger page sizes might significantly improve the performance of programs that intensively use large amounts of memory.

For more information, see the man pages for `pagesize(1)`, `mpss.so.1(1)`, `ppgsz(1)`, `memcntl(2)`, `mmap(2)`, and `getpagesizes(3C)`.

Improved Multithreading Library

The Solaris 9 release includes an improved and faster multithreading library. This library was available as the alternate `libthread` in previous Solaris software releases.

For further information, see the *Multithreaded Programming Guide* and the `threads(3THR)` man page.

Perl Version 5.6.1

A new, default version of the Practical Extraction and Report Language (Perl) is available in the Solaris 9 release. The new default version of Perl is version 5.6.1. Also included in the Solaris 9 release is an older Perl version, version 5.005_03. This older version was previously included with the Solaris 8 release.

For further information, see the `perl(1)` man page.

Unified `diff` Format

The `diff` and `sccs-sccsdiff` commands have been updated to include support for the GNU-style unified `diff` format. In this format, context lines are only printed once in the listing of differences.

For information on these commands, see the `diff(1)` and `sccs-sccsdiff(1)` man pages.

Sysevent Framework

The `sysevent` framework enables notification of kernel-level and user-level system events to appropriate applications. Events can include hardware and software state changes, errors, and faults.

Components of the `sysevent` framework include the following:

- `syseventd` daemon
- `syseventadm` command
- Library APIs for event data extraction and `sysevent` subscription
- An interface for driver-level system event, `ddi_log_sysevent`

The `syseventd` daemon is a user-level daemon that accepts delivery of system event buffers from the kernel. After an event buffer has been delivered to `syseventd`, the daemon then attempts to propagate the event to all interested end-event subscribers.

The `syseventadm` command can be used to configure event specifications. These specifications are subsequently used to invoke commands, applications, or scripts in response to a system event.

For information on the `sysevent` kernel and library APIs, see the man pages `syseventadm(1M)`, `syseventconfd(1M)`, and `syseventd(1M)`.

See `ddi_log_sysevent(9F)` for information about driver-level event notification logging.

Kernel Pseudo-Random Number Generator

The Solaris Pseudo-Random Number Generator (PRNG) is available through the `/dev/random` and `/dev/urandom` devices. PRNG provides ISVs with a standard interface to access pseudo-random numbers for cryptographic operations, scientific applications, and simulation tools. The PRNG operates in the Solaris kernel. PRNG protects the contents of the entropy pool. The PRNG gathers entropic data from kernel memory pages and maintains a high level of randomness at all times.

For further information, see the `random(7D)` man page.

SPARC: Application Interface to Remote Shared Memory on Clusters

If you develop applications that extend the use of a Sun Cluster environment, you can benefit from this interface. Using the new Remote Shared Memory (RSM) API, you can program your applications to lower the latency for message passing over high-speed cluster interconnects. Such cluster-aware applications can significantly reduce the time that is required to respond to events in a clustered configuration.

You must have Sun Cluster 3.0 installed. Existing Sun Cluster applications need to be modified to exploit the new interface.

For further information, see the *Programming Interfaces Guide*. Also, the `librsm(3LIB)` man pages and the “Section 3: Extended Library Functions” (3RSM) man pages include references to RSM.

GNU-Compatible Version of the `gettext()` API Functions

The Solaris 9 release provides a GNU-compatible version of the `gettext()` API functions while maintaining backward compatibility with Solaris `gettext()` API functions.

- Existing functions in `libc` now can handle both Solaris and GNU-compatible message files. Existing functions include the following:
 - `gettext()`
 - `dgettext()`
 - `dcgettext()`
 - `textdomain()`
 - `bindtextdomain()`
- New GNU-compatible functions in `libc` can handle GNU-compatible message files. New functions include the following:
 - `ngettext()`
 - `dngettext()`
 - `dcngettext()`
 - `bind_textdomain_codeset()`
- The `msgfmt` and the `gettext` utilities now can handle both Solaris and GNU-compatible message files.

For further information, see the `gettext(3C)` man page.

Extended File Attributes

The UFS, NFS, and TMPFS file systems have been enhanced to include extended file attributes. These attributes enable application developers to associate specific attributes to a file. For example, a developer of a file management application for a windowing system might choose to associate a display icon with a file.

For further information, see “File System Enhancements” on page 73.

New Fixed-Priority (FX) Scheduling Class

The FX scheduler provides a scheduling policy for processes that require user or application control of scheduling priorities. See “System Resources Enhancements” on page 61.

Dynamic Host Configuration Protocol (DHCP)

The Dynamic Host Configuration Protocol (DHCP) service enables host systems to receive IP addresses and network configuration information. This information is received at boot time from a network server. Before the Solaris 8 7/01 release, DHCP

configuration data could only be stored in text files or NIS+. Now, data access in the Solaris DHCP service has been redesigned to use a modular framework. Solaris DHCP provides an API that enables you to write shared objects that support any data storage facility for storing DHCP data.

The *Solaris DHCP Service Developer's Guide* provides an overview of the data access framework that is used by Solaris DHCP. The guide also provides general guidelines for developers. Also included is a listing of the API functions that you can use to write a module to support a new data store.

For further information, see the *Solaris DHCP Service Developer's Guide*.

Solaris Web Start Wizards SDK 3.0.1

Solaris Web Start Wizards simplify the installation, setup, and administration of native Solaris, Java, and non-Java applications. With Web Start Wizards, developers can copackage both Solaris and Microsoft Windows versions of their applications. The installation wizard manages the platform specifics.

The Web Start Wizards SDK 3.0.1 is now included with the Solaris 9 release. SDK 3.0.1 can be installed by using the Solaris Web Start installation program.

Modular Debugger (mdb)

The `mdb` utility is an extensible utility for low-level debugging and editing of the live operating system. The utility can also debug system crash dumps, user processes, user process core dumps, and object files. In the Solaris 9 release, `mdb` provides new symbolic debugging support for the Solaris kernel and new kernel debugger commands. The `mdb` utility also provides new features for the examination and control of live running user processes, and the ability to examine raw disk files and devices.

The *Solaris Modular Debugger Guide* and the `mdb(1)` man page provide more information.

Audio Enhancements

New audio directories have been added to the Solaris 9 operating environment. The `/usr/include/audio` directory is a new directory for applications' audio header files. The audio file format has a new header file, `/usr/include/audio/au.h`, and man page, `au(4)`.

The `/usr/share/audio` directory is a new depository for miscellaneous audio files. The audio files from the `/usr/demo/SOUND/sounds` directory have been moved here. A symbolic link from `/usr/demo/SOUNDS/sounds` to `/usr/share/audio/samples/au` has been created. This link enables current applications and current scripts to run without failure.

Numerous bug fixes have been made to the audio kernel modules to improve reliability.

For further information, see the *System Administration Guide: Basic Administration*.

Vectored System Call: `sendfile()`

The vectored system call, `sendfile()`, enables better performance for sending data from application buffers or files. For example, in web performance, a web server can construct an HTTP response in a single system call. This HTTP response includes header, data, and trailer as well as server-side includes. This feature provides optimal performance with the Solaris Network Cache and Accelerator (NCA). The `sendfile()` system call enables the return of multiple chunks, which might come from various files, for the response.

For further information, see the `sendfilev(3EXT)` and `sendfile(3EXT)` man pages.

Verify File Conformance With the `appcert` Utility

The `appcert` utility verifies an object file's conformance to the Solaris ABI. Conforming to the Solaris ABI greatly increases an application's probable compatibility with future releases of Solaris software.

For more information, see "Using `appcert`" in the *Programming Interfaces Guide*.

Generic Security Services Application Programming Interface (GSS-API)

The Generic Security Services Application Programming Interface (GSS-API) is a security framework that enables applications to protect their transmitted data.

See "Security Enhancements" on page 82.

Web-Based Enterprise Management Tools

The Solaris 9 release includes the following enhancements for web-based enterprise management.

Solaris WBEM Services 2.5

Solaris WBEM Services 2.5 is Sun Microsystems' implementation of Web-Based Enterprise Management (WBEM). WBEM is a set of management and Internet-related technologies. These technologies are intended to unify the management of enterprise computing environments. Developed by the Distributed Management Task Force (DMTF), WBEM enables organizations to deliver an integrated set of standards-based management tools. These tools support and promote World Wide Web technology. Solaris WBEM Services was updated to version 2.5 in the Solaris 9 release.

For further information about WBEM, see the new *Solaris WBEM Developer's Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer's Guide*.

New WBEM Batching API Added

The Java Web-Based Enterprise Management (WBEM) client application programming interface (API) now supports the batching of multiple Common Interface Model (CIM) operations by a client into a single “request and response.” The CIM Object Manager now accepts and services these batched requests as well. This facility is defined in the Distributed Management Task Force (DMTF) Specification for CIM Operations Over HTTP.

The number of remote calls that a client needs to make is consequently reduced.

For further information about WBEM, see the new *Solaris WBEM Developer’s Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer’s Guide*.

WBEM CIM WorkShop Enhanced

CIM WorkShop provides a graphical user interface for the WBEM development tool. CIM WorkShop can be used by instrumentation, system, and network application developers. These developers can view and create WBEM classes and WBEM instances through CIM WorkShop.

In CIM WorkShop, you can do following:

- View and select namespaces
- Add and delete namespaces
- View, create, modify, and delete classes
- Add and delete properties, qualifiers, and methods to new classes
- View, create, and delete instances
- View, modify, and delete instance values
- Traverse associations
- Execute methods
- Display contextual help

Enhancements and new features that are available in CIM Workshop include the following:

- Updated and corrected contextual help.
- Ability to traverse associations.
- Ability to subscribe to and display information about events for a selected class, thus enabling you to debug applications that use events more easily. You can use this new feature only when you select the RMI protocol.
- Ability to submit WBEM Query Language (WQL) queries that search for and display WBEM information.

For further information about WBEM, see the new *Solaris WBEM Developer’s Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer’s Guide*.

Support for WBEM Process Indication (Extrinsic) Events Added

Currently, WBEM event services enable client applications to asynchronously receive indications when conditions of interest are met. However, the only supported indications belong to the class life cycle indications. Life cycle indications denote the modification, the creation, and the deletion of an instance.

While this class of indications is very flexible and wide ranging, instrumentation might need to publish indications that do not fall into this category. Given this requirement, the DMTF introduced the process indication hierarchy as an extension to the current indication hierarchy. The process indications for WBEM services now handle this extended hierarchy.

Process indications for WBEM services is Sun Microsystems' implementation of the process indication portion of the event model. The process indication class is the superclass of all indications that are published by instrumentation. This superclass also includes the life cycle indications.

The process of subscribing to process indications is the same as the process of subscribing to life cycle indications.

For further information about WBEM, see the new *Solaris WBEM Developer's Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer's Guide*.

WBEM `mofcomp` Command Enhanced

The Managed Object Format (MOF) compiler (`mofcomp`) now allows you to specify a namespace on the command line. If the namespace does not exist, it is created.

In addition, the MOF Compiler now generates Java interface and class source files. This feature enables you to use standard Java interfaces rather than CIM constructs and CIM object model application programming interfaces (APIs).

For each `CIMClass`, an interface and a class file are generated. The interface is generated to enable you to create different implementations while maintaining interoperability.

For further information about WBEM, see the new *Solaris WBEM Developer's Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer's Guide*.

Sample Programs Are Added for New Java WBEM SDK

The Java WBEM Software Developer's Kit (SDK) now includes a new sample Java applet and sample programs. The Java applet and sample programs are installed in `/usr/demo/wbem`.

The Java WBEM SDK sample programs show you how to use events, queries, and batching. You can use these samples as a basis for developing your own programs.

For further information about WBEM, see the new *Solaris WBEM Developer's Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer's Guide*.

Solaris WBEM Software Developer's Kit

The Solaris Web-Based Enterprise Management (WBEM) Software Developer's Kit (SDK) includes APIs that developers use to create applications. Based on WBEM, these applications can access data and manage resources in the Solaris operating environment. The Solaris WBEM SDK also includes CIM WorkShop. The CIM WorkShop is a Java application that developers can use to create WBEM applications. With the CIM WorkShop, developers can view the sample WBEM client and provider programs that are included with the software.

For further information about WBEM, see the new *Solaris WBEM Developer's Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer's Guide*.

New Solaris Providers

The new Solaris Providers enable developers to create software that gets and sets information about managed devices in a Common Information Model (CIM) environment. A Solaris Provider provides the CIM Object Manager with instances of managed resources in the Solaris operating environment.

Five new Solaris Providers are available in the Solaris 9 software:

- WBEM Performance Monitor for Solaris devices and systems – Provides a variety of statistical information about a system on which the Solaris operating environment is running.
- WBEM Product Registry – Provides the ability to add, delete, or modify new or existing products that are installed on a system.
- WBEM SNMP Provider – Enables WBEM services to deliver information by means of the Simple Network Management Protocol (SNMP), a protocol of the Internet reference model that is used for network management.
- WBEM EEPROM Provider – Enables the display and modification of configuration information in the EEPROM.
- Provider for WBEM System Availability – Provides reboot information about a system. This information enables applications to compute the percentage of time that a system has been up and running. This provider also supplies reasons why a system failed:
 - System panic occurred
 - System halted by a user
 - System shut down by a user

For further information about WBEM, see the new *Solaris WBEM Developer's Guide*, which has replaced the *Solaris WBEM Services Administration Guide* and the *Solaris WBEM SDK Developer's Guide*.

Writing Device Drivers

The Solaris 9 release includes the following enhancements for writing device drivers.

Frame Buffer Power Management

Some devices, such as certain tape drives and frame buffers, should not lose power, even in a power cycle, when their drivers are detached. A new interface, `ddi_removing_power`, checks whether a device loses power as a result of a suspend operation. A new property, `no-involuntary-power-cycles`, can be specified to ensure that the device is not powered down unintentionally.

For more information, see the `ddi_removing_power(9F)` and `no-involuntary-power-cycles(9P)` man pages.

SPARC: Sun StorEdge Traffic Manager

The Sun StorEdge™ Traffic Manager supports multiple paths for I/O devices such as Fibre Channel-accessible storage. This feature balances the workload across multiple devices. The Traffic Manager increases reliability by redirecting requests from a failed interface card or storage device to a card or device that is operational.

SPARC: Driver Fault Injector Harness

The driver fault injector harness is a Solaris device driver development tool. The harness injects a wide range of simulated hardware faults when the driver under development accesses its hardware. The harness tests the impact of the test fault conditions on a SPARC based device driver.

For more information, see the man pages `th_define(1M)` and `th_manage(1M)`.

Generic LAN Driver

Driver developers can use the Generic LAN Driver (GLD). The GLD implements much of the STREAMS and Data Link Provider Interface (DLPI) functionality for a Solaris network driver. Until the Solaris 8 10/00 release, the GLD module was available only for Solaris *x86 Platform Edition* network drivers. Now, GLD is available for Solaris *SPARC Platform Edition* network drivers.

For more information, see “Drivers for Network Devices” in *Writing Device Drivers*.

Java Releases

The Solaris 9 release includes the following Java enhancements.

JavaHelp v. 1.1.2

JavaHelp™ v. 1.1.2 is a full-featured, platform-independent, extensible help system. This system enables developers and authors to incorporate online help in applets, components, applications, operating systems, and devices. For more information, refer to the following Web site:

<http://java.sun.com/products>

Java 2 SDK, Standard Edition v. 1.4.0

The Java 2 SDK Standard Edition v. 1.4.0, J2SE™ 1.4.0, is an upgrade release for Java 2 SDK, Standard Edition. The upgrade release includes new platform features, new tools, and utilities.

For full details on these enhancements, see the J2SE 1.4.0 platform documentation at the following Web site:

<http://java.sun.com/j2se/1.4/docs/relnotes/features.html>

JSP 1.2 and Java Servlet 2.3 Support in Apache Web Server

Jakarta Tomcat 4.0.1 and a `mod_jserv` module have been added to the Apache Web server. This server now supports JavaServer Pages, JSP Version 1.2, and Java Servlets Version 2.3.

The following files are stored in `/etc/apache`:

- `tomcat.conf`
- `README.Solaris`
- `zone.properties`
- `jserv.properties`
- `jserv.conf`

See the `README.Solaris` file for information on enabling Tomcat support. For configuration information, see also

<http://jakarta.apache.org/tomcat/tomcat-4.0-doc/index.html>.

Tomcat and the `mod_jserv` module, like the rest of Apache software, is open source code that is maintained by a group external to Sun. This group seeks to maintain compatibility with previous releases.

Solaris 9 Features for Desktop Users

The Solaris 9 release includes the following desktop enhancements.

Xterm Terminal Emulator Support for Multibyte Character Set

The Xterm terminal emulator now supports multibyte character sets. This feature enables the use of Xterm windows in UTF-8 and other multibyte locales. The Xterm command line and resources incorporate new options to specify X font sets.

See the `Xterm` man page for further information.

Graphical Workspace Manager

Graphical Workspace Manager provides the following:

- A graphical representation of all workspaces

- The ability to navigate across different workspaces with the press of a button
- The ability to drag and drop applications across different workspaces

You are no longer limited to viewing nine workspaces. Additionally, the dialog box for Graphical Workspace Manager Options has been added to provide a number of additional display options.

For more information, see “Graphical Workspace Manager” in *Solaris Common Desktop Environment: User’s Guide*.

Workspace Manager

The Workspace Manager provides a graphical user interface (GUI) for controlling behavior and the number of workspaces. You can add and delete workspaces by using a slider. You can also display the Graphical Workspace Manager in the Workspace Switch Area of the Front Panel.

For more information, see “Workspace Manager” in *Solaris Common Desktop Environment: User’s Guide*.

Window List

The Window List provides a list of currently running applications. The Window List enables you, with the click of a mouse button, to locate any application, even applications in workspaces other than the current workspace. The Window List also provides the ability to perform window actions on a selected group of applications. You can choose to display or not display the Workspace column.

For more information, see “Window List” in *Solaris Common Desktop Environment: User’s Guide*.

Energy Star Standards

X11R6.4 standards have been enhanced with Frame Buffer Power Management (FBPM), an extension to the Display Power Management System (DPMS). This enhancement is added to fulfill the U.S. government’s requirements for the Energy Star program. This feature only works on Energy Star-compliant hardware.

Print Format for Non-ISO-1 Files

By default, the `dt1p` command uses the `mp` command before sending the output to the `lp` command. This feature enables many of the non-ISO-1 standard text files to be correctly printed in CDE. The same filtering effect is also applied in the printing of `dtmail` mail messages.

For further information, see the `mp(1)` man page.

Adding Multiple Files to Emails

This feature enables you to keep the insert_tag “Mailer - Attachment - Add” dialog box open. You can then add two or more files to an email. The need to repeatedly select Add Files from the Attachment menu is eliminated.

For more information on the Mailer, see “Using Mailer” in *Solaris Common Desktop Environment: User’s Guide*.

Removable Media Manager

Removable Media Manager centralizes access to removable devices in one window. You can format, query properties, view directory structures, and where applicable, protect and slice media. See “Removable Media Management” on page 86.

See also “Using Removable Media Manager” in *Solaris Common Desktop Environment: User’s Guide*.

Audio Enhancements

Audio directories have been added to the Solaris 9 operating environment. The `/usr/include/audio` directory is a new directory for applications’ audio header files. The audio file format has a new header file, `/usr/include/audio/au.h`, and man page, `au(4)`.

The `/usr/share/audio` directory is a new depository for miscellaneous audio files. The audio files from the `/usr/demo/SOUND/sounds` directory have been moved here. A symbolic link from `/usr/demo/SOUNDS/sounds` to `/usr/share/audio/samples/au` has been created. This link enables applications and scripts that already exist to run without failure.

Numerous bug fixes have been made to the audio kernel modules to improve reliability.

For further information, see the *System Administration Guide: Basic Administration*.

Desktop Freeware

See “Freeware Enhancements” on page 109 for information about GNU `grep 2.4.2`, GNU `tar 1.13`, GNU `wget 1.6`, and `Ncftp Client 3.0.3` in the Solaris 9 release.

- GNU `grep 2.4.2` is a pattern matcher.
- GNU `tar 1.13` is an archiver.
- GNU `wget 1.6` retrieves files from the Web by using HTTP and FTP.
- `Ncftp Client 3.0.3` uses the File Transfer Protocol. This utility is an alternative to the UNIX `ftp` program.

Solaris 9 Language Support

The Solaris 9 operating environment now includes support for 162 locale environments that cover 39 languages. These environments are provided on the Solaris 9 DVD, the Solaris 9 Software CDs, and the Solaris 9 Languages CD. The following section provides information on language support features.

For further information, see the *International Language Environments Guide*.

Improved Data Interoperability

Data interoperability with non-Solaris environments has been improved in the Solaris 9 release. Additions include new `iconv` utilities for data conversion between UTF-8 and the following native encodings: HKSCS, GB18030, ISO 8859-11, and Hindi. Additionally, Japanese language support has been expanded through `iconv` modules. These modules convert between Solaris Japanese locale codesets and Japanese mainframe codesets from Fujitsu, Hitachi, and NEC.

For further information on language support in the Solaris 9 release, see the *International Language Environments Guide*.

New TrueType Fonts

The new TrueType fonts provide a common appearance between the codesets and offer support for the same typefaces across the codesets. The TrueType fonts are common to all European locales. Each Asian locale has its own TrueType fonts file.

For further information, see the *International Language Environments Guide*.

Expanded Unicode Support

The Solaris 9 release offers broader support for Unicode. Additions include new Unicode (UTF-8) locales for Thailand, India, Hong Kong, Turkey, Egypt, Brazil, Finland, and Belgium-Walloon.

For further information about Unicode support in the Solaris 9 release, see the *International Language Environments Guide*.

Print Filter Enhancement—the `mp` Program

The `mp` program accepts international text files from various Solaris locales. The program produces output for the specified locale. Because the complex text layout (CTL) is supported in the `mp` program, the output contains proper text layout, such as bidirectional text rendering and shaping. Depending on the `mp` system font configuration for each locale, the PostScript output file can contain glyph images from Solaris system-resident scalable or bitmap fonts.

For more information, see “Print Filter Enhancement With” in *International Language Environments Guide*.

New `iconv` Modules

`iconv` modules enable conversion between native encoded data and Unicode. The following new `iconv` modules have been added to support new character sets:

- UTF-8 <---> HKSCS
- UTF-8 <---> GB18030
- UTF-8 <---> ISO8859-11
- UTF-8 <---> Hindi

Enhanced Conversion of Dtpad File Open/Save Codeset

Enhancements include the addition of an “encoding” option to the File Open/Save dialog box. This option supports file encoding changes with the `iconv` utility. This option enables users to open or save files in various encodings, such as UTF-8 and UTF-16.

See the `iconv(3C)` man page.

Support for the New Chinese GB18030-2000 Character Set

The Solaris platform enables input, display, and print for the entire GB18030-2000 character set, including nearly 30,000 characters. Any application that runs on the Solaris platform can thus benefit from a wider set of Chinese characters. These glyphs are primarily Han characters, but the encoding also includes glyphs for minority languages such as Tibetan, Wei, Yi, and Mongolian.

GB18030-2000 support in the Solaris 9 release also includes backward compatibility to previous Chinese codesets, GBK, and GB2312. Conversion to other codesets such as Unicode is also included. Solaris developers do not need to change their procedures to access this new encoding support. Standard toolkits can use the new support.

For Java applications that need GB18030-2000 support, review J2SE at the following Web site:

<http://java.sun.com/j2se/1.4>

New `zh_CN.GB18030` Locale Enhanced From `zh_CN.GBK`

This new `zh_CN.GB18030` locale is provided to support the new GB18030 standard encoding. This encoding is required by a law that the Chinese government has enacted.

New Chinese and Korean Collation Locales

Collation locales provide different collation options to users, such as stroke count and radical, phonetic, and dictionary options.

Wordbreaker Modules for Thai

The wordbreaker module is used to correctly break the Thai text into proper paragraphs, sentences, and words within Motif.

New Asian UTF-8 (Unicode) Locales

The File System Safe Universal Transformation Format, or UTF-8, is an encoding that is defined by X/Open[®] as a multibyte representation of Unicode. UTF-8 encompasses almost all of the characters for traditional single-byte and multibyte locales for European and Asian languages for Solaris locales.

- `th_TH.UTF-8` locale is the Unicode locale for Thailand.
- `hi_IN.UTF-8` locale is the Unicode locale for India.
- `zh_HK.UTF-8` locale is the Unicode locale for Hong Kong, China.

New Thai Input Method

The new Thai input method supports the Thai input sequence checking, as defined in TIS 1566-2541 “Thai input/output methods for computer” standard (or “WTT”) by the Thai Industrial Standards Institute. The input sequence checking has 3 levels: level 0 (passthrough), level 1 (basic check), and level 2 (strict).

New Chinese Input Methods

More popular, powerful input methods (IM) in the Traditional Chinese and Simplified Chinese locales have been added for new character sets and new locales:

- New Chuyin IM for Traditional Chinese locales
- Cantonese IM for all Chinese locales
- English-Chinese IM for all Chinese locales

New Auxiliary Window for Chinese Input Methods

The Auxiliary window provides a user interface (UI) for input methods. The UI is “friendly” and extensible for all Chinese locales. New functions that are supported by the auxiliary window are as follows:

- Input method switching
- Input method properties configuration
- Look-up tables for GB2312, GBK, GB18030, HKSCS, CNS, Big-5, and Unicode character sets
- Code table management tool
- A visual keyboard

New `zh_HK.BIG5HK` Locale to Support HKSCS for Hong Kong, China

The new `zh_HK.BIG5HK` locale is provided to support the Hong Kong Supplementary Character Set (HKSCS). The HKSCS is a supplementary character set of the Big-5 and ISO 10646 coding schemes. HKSCS contains Chinese characters that are needed in Chinese computing in Hong Kong. However, these characters are not contained in either the Big-5 or ISO 10646 standard character sets.

Additional Japanese `iconv` Modules

Additional Japanese language support includes `iconv` code conversions between Solaris Japanese locale codesets and Japanese mainframe codesets. Japanese locale codesets include `euJP`, `PCK`, and `UTF-8`. Japanese mainframe codesets include Fujitsu `JEF`, Hitachi `KEIS`, and NEC `JIPS`.

New European and Middle Eastern Keyboard Support

The Solaris 9 release has added Sun I/O keyboard support for `TurkeyQ`, `TurkeyF`, and Arabic. Also, support is added for the Sun Ray USB keyboard for `TurkeyQ`, `TurkeyF`, Belgian, and Arabic.

For further information, see the *International Language Environments Guide*.

New Unicode (UTF-8) Locales for Europe and the Middle East

For the Solaris 8 10/00 release, Russian, Polish, and two new locales for Catalan were added to the European and Middle Eastern locales. For the Solaris 8 4/01 release, two additional languages, Turkish UTF-8 Codeset and Russian UTF-8 Codeset, were added.

In the Solaris 9 release, European and Middle Eastern language support also includes the addition of UTF-8 locales for Turkey, Egypt, Brazil, Finland, and Belgium-Walloon.

The locale names are as follows:

- `ca_ES.ISO8859-1` locale is a Unicode locale for Spain (Catalan).
- `ca_ES.ISO8859-15` locale is an additional Unicode locale for Spain (Catalan).
- `pl_PL.UTF-8` locale is the Unicode locale for Poland.
- `ru_RU.UTF-8` locale is the Unicode locale for Russia.
- `tr_TR.UTF-8` locale is the Unicode locale for Turkey.
- `ar_EG.UTF-8` locale is the Unicode locale for Egypt.
- `pt_BR.UTF-8` locale is the Unicode locale for Brazil.
- `fi_FI.UTF-8` locale is the Unicode locale for Finland.
- `fr_BE.UTF-8` locale is the Unicode locale for Belgium-Walloon.

Euro Default Currency Support

The following locales have changed from their national currency unit (NCU) to the euro currency glyph:

- `ca_ES.ISO8859-15` (Spain)
- `de_AT.ISO8859-15` (Austria)
- `de_DE.ISO8859-15` (Germany)
- `de_DE.UTF-8` (Germany)
- `en_IE.ISO8859-15` (Ireland)
- `es_ES.ISO8859-15` (Spain)
- `es_ES.UTF-8` (Spain)
- `fr_BE.ISO8859-15` (Belgium)
- `fr_BE.UTF-8` (Belgium)

- `fi_FI.ISO8859-15` (Finland)
- `fi_FI.UTF-8` (Finland)
- `fr_FR.ISO8859-15` (France)
- `fr_FR.UTF-8` (France)
- `it_IT.ISO8859-15` (Italy)
- `it_IT.UTF-8` (Italy)
- `nl_BE.ISO8859-15` (Belgium)
- `nl_NL.ISO8859-15` (Netherlands)
- `pt_PT.ISO8859-15` (Portugal)

Additional Software

The Solaris 9 release includes the following additional software enhancements.

ExtraValue Directory

The Solaris 9 software release includes an ExtraValue directory that contains two subdirectories, CoBundled and Early Access. The CoBundled directory contains software that previously shipped separately, such as SunScreen 3.2 and Web Start Wizards SDK 3.0.1. The Early Access directory contains preliminary evaluation software, such as Netscape 6.2.1.

Note – In the Solaris 9 9/02 Update release, Netscape 6.2.3 is located in the CoBundled directory.

In the Solaris 9 12/02 Update release, Netscape 6.2.3 is included in the Solaris operating environment. In the Solaris 9 4/03 release, Netscape 7.0 is provided. See “Netscape 7.0” on page 55.

The CoBundled and Early Access directories are in the Solaris_9 directory at `Solaris_9/ExtraValue/EarlyAccess` and `Solaris_9/ExtraValue/CoBundled`. The directories are located on the Solaris 9 DVD and the Solaris Software 2 of 2 CD.

For further information about Web Start Wizards, see “Installation Enhancements” on page 75.

SunScreen 3.2

SunScreen 3.2 is a stateful, dynamic, packet-filtering firewall that offers high-speed protection to your Solaris server. Some of the features of SunScreen 3.2 are as follows:

- 130 multithreaded stateful packet filters
- Network address translation
- IKE VPN client support, IPsec, and Simple Key management for Internet Protocol (SKIP)

- Ordered rule sets
- Multiple firewall management
- A Java applet GUI
- Complete command-line control

SunScreen 3.2 offers stealth mode, operating without any visible IP address. SunScreen also offers a traditional routing mode, with each interface protecting individual subnets. Customers should deploy firewalls in multiple points throughout their network architecture, including individual hosts and servers.

Netscape 6.2.1 for the Solaris Operating Environment

Note – Netscape 6.2.1, as described in this section, is available in the Solaris 9 operating environment. New versions of Netscape are now available. In the Solaris 9 12/02 Update release, Netscape™ 6.2.3 is included in the Solaris operating environment. In the Solaris 9 4/03 Update release, Netscape 7.0 is provided. See the “Netscape 7.0 for the Solaris Operating Environment” for the most current Netscape description.

Netscape 6.2.1 Enterprise, the most customizable, convenient, and connected browser, is available in the Early Access directory for the Solaris 9 release. In addition, Netscape 6.2.1 is available for the Solaris 7 and Solaris 8 operating environments. Netscape 6.2.1 is the first Internet software to seamlessly integrate browsing, email, and instant messaging.

Netscape 6.2.1 includes the following new features:

- Improvements to installation and ease of use
- More industry standards – Including XML, LDAP, Document Object Model (DOM), and Cascading Style Sheets level 1 (CSS1)
- My Sidebar feature – For quick retrieval of important information
- Advanced search capabilities
- Real-time messaging – Integrated with browsing and mail
- Options for personalization
- The following software:
 - The latest Java virtual machine
 - A new Netscape Java Plug-in
 - Java extensions and APIs
 - A cross-platform, Java technology-based XPCOM component that delivers reliable interoperability

Note – In the Solaris 9 9/02 Update release, Netscape is located in the CoBundled directory. Netscape 6.2.3 is provided in this release. In the Solaris 9 12/02 Update release, Netscape 6.2.3 is included in the Solaris operating environment.

Further information is available at <http://www.sun.com/solaris/netscape>.

Freeware Enhancements

The Solaris 9 release includes the following freeware enhancements.

Updated Freeware Packages

Several freeware tools and libraries are included in the Solaris 9 release. The following freeware packages have been updated for the Solaris 9 release:

Note – To view license terms, attribution, and copyright statements for freeware in this list, the default license path is `/usr/share/src/<freeware name>`. If the Solaris operating environment has been installed anywhere other than the default, modify the given path to access the file at the installed location.

- Apache 1.3.20 – UNIX-based HTTP server
- bash 2.05 – Sh-compatible command language interpreter
- bzip2 1.0.1 – Block-sorting file compressor
- gzip 1.3 – GNU Zip compression utility
- less 358 – A pager, similar to the more command
- mkisofs 1.13 – A utility that builds a CD image by using an ISO 9660 file system
- tcsh 6.0.10 – C shell with file-name completion and command-line editing
- zip 2.3 – Compression and file-packaging utility
- zsh 3.0.8 – Command interpreter (shell) usable as an interactive login shell and as a shell script command processor

Freeware Libraries

The following libraries have also been included in the Solaris 9 release:

Note – To view license terms, attribution, and copyright statements for the freeware libraries in this list, the default license path is `/usr/sfw/share/src/<freeware name>`. If the Solaris operating environment has been installed anywhere other than the default, modify the given path to access the file at the installed location.

- `Glib 1.2.10` – A library of useful data types, macros, type conversions, string utilities, and a lexical scanner.
- `GTK+ 1.2.10` – The GIMP toolkit. A set of libraries that can be used to create graphical user interfaces.
- `Jpeg 6b` – Standardized compression software for full-color and gray-scale images.
- `Libpng 1.0.10` – PNG reference library. PNG is a format for storing images. This format is designed to be the successor to the GIF format and, to some extent, the more complex TIFF format.
- `Tcl/tk 8.33` – TCL-TK GUI Toolkit is an Xq toolkit that is implemented with the Tcl scripting language.
- `Libtiff 3.55` – Provides support for reading and writing TIFF and a small collection of tools for doing simple manipulations of TIFF images.
- `Libxml2 2.3.6` – A C library that provides Extensible Markup Language (XML) support. XML is the universal format for structured documents and data on the web.

Freeware Commands and Utilities

The following commands and utilities have also been included in the Solaris 9 release:

Note – To view license terms, attribution, and copyright statements for the freeware commands and utilities in this list, the default license path is `/usr/sfw/share/src/<freeware name>`. If the Solaris operating environment has been installed anywhere other than the default, modify the given path to access the file at the installed location.

- `Gnu Grep 2.4.2` – A pattern matcher that is twice as fast as the standard UNIX `egrep` utility.
- `Gnu Tar 1.13` – An archiver that includes multivolume support, the ability to archive sparse files, automatic archive compression and decompression, remote archives, and other special features.
- `Ncftp Client 3.0.3` – A free set of programs that use the File Transfer Protocol. This set is an alternative to the standard `ftp` program that comes with UNIX systems.
- `Samba 2.2.2` – The free SMB and CIFS client and server for UNIX and other operating systems. SMB and CIFS are protocols by which many PC-related machines share files, printers, and other information.
- `Tcp-wrappers 7.6` – Small daemon programs that monitor and filter incoming requests for network services. These programs log the client host name of incoming requests and thus enhance network security.
- `Gnu Wget 1.6` – A free network utility to retrieve files from the Web by using HTTP and FTP, the two most widely used Internet protocols.

Companion CD

The Solaris 9 media includes a Companion CD. The following list summarizes the supplemental software that is provided on the Companion CD.

The software products that are offered on the Companion CD are revised for Solaris 9 Update releases. To view a current supplemental software list and download the software, see <http://www.sun.com/software/solaris/freeware.html>.

Accessibility Software – For special needs users, Open Source assistive software such as Emacspeak, the W3 browser, and UnWindows.

Administration Tools – System administration tools, such as `etherreal`, `sudo`, and `rpm`.

Web Infrastructure Software – Server software (daemons) for hosting web and Internet services.

Desktop Environment and X Window Managers – Software that provides the graphical user interface for launching applications, file management, drag-and-drop icons, and so on. Several Window Manager packages are included as well as the K-Desktop Environment.

Desktop Applications – Graphical desktop applications, including productivity and multimedia software.

Command-line Tools and Utilities – Command-line utilities and tools such as the `*utils` packages from the GNU project.

Editors – Applications that are used for writing text documents and software programs.

Security Tools – Tools for system and network security monitoring and detection, such as `snort`, `nmap`, and `tcpdump`.

Messaging Software – Client-side applications and tools for email, WWW, news, and chat.

Languages – The `gcc` compiler and several high-level (scripting) programming languages.

Developer Libraries – Collections of libraries with software routines for developers.

Developer Tools – Tools for software developers, such as `autoconf`, `automake`, and `cvs`.

