



SCO Technical White Paper
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1 Introducing SCO OpenServer Release 6

SCO OpenServer Release 6 represents the start of a new era for UNIX® systems. UNIX has proven itself as an Internet server standard, delivering the open infrastructure that has helped to make the Internet pervasive. The UNIX operating system is a mature, reliable, scalable, high performance platform for running business critical applications.

SCO has enhanced the SCO OpenServer Release 5 product by incorporating the UnixWare 7 kernel. The rock solid reliability of OpenServer has been combined with the high availability, scalability, and performance of UnixWare to create a single platform that leverages the performance and cost-effectiveness of Intel industry standard hardware.

In addition, our longstanding commitment to backwards compatibility means that legacy binaries from XENIX 386, SCO OpenServer 5 (and SCO UNIX and Open Desktop), and UnixWare will run without modification on SCO OpenServer Release 6.

This white paper inventories the rich technical feature set that is included in SCO OpenServer Release 6.

2 The SCO Story

The SCO Group, Inc. is the leading provider of UNIX business solutions, providing scalability from the thin client to the data center.

Today, there are many different operating system platforms, each with particular strengths and weaknesses. While this allows the integrator or user to adopt, adapt, and tune the environment best suited for the business requirement, it presents an unacceptable burden for ISVs who must port, certify and support their solutions on a large number of platforms. Increasingly, ISVs are restricting the number of operating systems they support, thereby limiting the choice and flexibility of the integrators and the users.

SCO products are designed from the ground up to be easy to install, deploy, and maintain. This is particularly useful for customers or partners who intend to use these products in replicated site environments. Special attention has been given to producing products that can be installed out of the box with minimum hassle. We offer replication kits and services for all of our operating system products. Both character and award-winning graphical administration tools allow our systems to be managed from a variety of clients.

SCO products provide the highest levels of uptime. The entire product line is subjected to a strict Quality Assurance process that is built into the engineering process from start to finish. The result is a product line that provides unparalleled levels of availability and reliability.

Diversity and support for open standards is another hallmark of the SCO product line. Our products have evolved around an open standards model from the moment of conception. The UNIX operating system is the most open, standards-conforming platform available. From Directory Services to Java™ to the Apache web server, SCO solutions incorporate standards that are universally employed across the industry. Our solutions support diversity rather than vendor lock-in and inter-operate well in the diversity of architectures that typifies most organizations.

SCO understands that some of our customers and partners tend to deploy a particular release of our product over a cycle that can last several years. This is typically done when a VAR or systems integrator creates a turnkey solution that is proven and well tested. To help support these types of deployments, SCO provides a full range of technical and professional support services for older products. In addition, new drivers and bug fixes are released not only for our newest products, but also for our products that have been deployed in the field for some time.

SCO support centers are located in North America and Europe, and are staffed by highly skilled technical support engineers. SCO Global Support offers 24x7 enterprise and local language support with a broad portfolio of options customized to meet the needs of partners and end users.

In summary, SCO offers scalable and reliable solutions that are easy to install, deploy, maintain, and support.

3 SCO OpenServer Release 6 - A Look Inside

The SCO OpenServer Release 6 operating system is the most advanced deployment platform for industry standard Intel processor systems. It is the trusted foundation for solutions where proven scalability, reliability and affordability are critical. Whether powering large business critical applications or running a small- to medium-sized-business, SCO OpenServer Release 6 delivers the same scalability and reliability that is synonymous with UNIX Systems. SCO OpenServer Release 6 is offered in two distinct versions and a set of optional products.

Designed from the ground up to support business-critical solutions, SCO OpenServer Release 6 delivers operating system configurations designed to power departmental databases, application servers, intranet servers, and mail and messaging servers.

3.1 What's New in SCO OpenServer Release 6?

Below is a list of some of the key features that are new in SCO OpenServer Release 6.

| Feature | Description |
|-----------------------------------|---|
| Large scale memory | Support for up to 16GB of general purpose memory and 64GB of special-purpose (dedicated) memory. |
| Kernel-level threads | Unlike user-level threads, kernel-level threads can make use of multiple processors. |
| Improved Boot | <ul style="list-style-type: none"> Updated network boot and network install, utilizing PXE technology for media-less installs (available post FCS) Install/boot above the 1024 cylinder/8GB boundary Bootable CD-ROM support changed from floppy-emulation to non-emulation mode |
| Network Storage Device support | Fibre Channel, SAN, and NAS. HP StorageWorks Modular Smart Array (MSA) provides direct attach, small clusters, as well as entry-level and mid-range SAN environments. |
| Improved internal storage support | Including AHCI Serial ATA (SATA) and support for more than two Parallel ATA (PATA) controllers in a system. Serial Attached SCSI (SAS) is supported on HP ProLiant systems. |
| Network Card support | New Gigabit support, better throughput with new stack, support for wireless |
| Optical media writing support | Full support for writing data CDs and DVDs, including internal and external drives (based on Cdrtools-ProDVD 2.01.01) |
| Expanded USB device support | <ul style="list-style-type: none"> USB 2.0 support for EHCI Host Controllers USB 1.1 support for OHCI and UHCI Host Controllers Bootable USB CD-ROM support USB printer support Adobe Flash Player Version 7.0 and the 4Front OSS MPlayer Class Drivers, including Keyboards, Pointing Devices, CD-ROMs, Floppy, and Mass Storage Devices |
| ACPI support | Includes detection of hyper-threaded CPUs |
| New Intel and AMD | Intel Pentium® 4, AMD® Athlon, Athlon XP, Duron , Athlon 64, and |

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|--|---|
| Processor support | Opteron® |
| Integrated encryption | The base 56-bit encryption utilities previously available as an add-on package have been integrated into SCO OpenServer Release 6. Support for filesystem encryption has also been added. |
| FAT32 and VFAT | Support for FAT32 and VFAT filesystem types has been added to allow mounting, reading and writing of these DOS filesystems. |
| Updated network protocols and services | New versions of the Apache web server, the Squid proxy server, TCP/IP performance improvements, and the Mozilla 1.7.8 browser. |
| Java 1.4 | Support for Java 2, Standard Edition (J2SE), version 1.4.2 |
| Database support | PostgreSQL and MySQL open source databases are included. |
| Windows application support | Windows XP and Windows 2000 applications can be run on SCO OpenServer Release 6 with MergePro. |

3.2 SCO OpenServer Release 6 Product Editions and Optional Services

SCO OpenServer Release 6 consists of two pre-configured editions and optional products to build and deploy UNIX applications. Whether you are powering a suite of business-critical applications or a small-to- medium-sized business, there is an edition of SCO OpenServer Release 6 to satisfy your requirements. These editions are complemented by a range of optional services and development tools. SCO OpenServer Release 6 Editions include:

- | | |
|---------------------------|--|
| Enterprise Edition | An advanced operating environment suitable for departmental database and application servers typically found in medium- to large-sized business environments. For departmental servers in medium or large organizations to run applications and reliably share business critical information with a wide range of client devices. The Enterprise Edition is licensed for 32 CPUs, ten users, and four gigabytes of memory. |
| Starter Edition | Suitable for small business customers, or as a file and print server, or edge of network server in large accounts. The default configuration is two users, one gigabyte of memory and 32 CPUs. Special additional user (five-user bump packs; normal bumps do not work), and memory licenses. Also upgradeable to Enterprise. |

3.3 Bundled product and support as option

Bundled and optional product support is available with all new system, upgrade, and trade-in licenses. Support bundled with product includes:

- Traditional "Break-fix" support
- Six month contract
- Two Authorized callers
- Phone/fax/email delivery
- Unlimited Service Requests
- Six business hour response time
- Ability to uplift
- Add-on options available

Bundled support is offered per OS installation/server, with registration required to enable the service.

3.4 Enterprise Scalability and Performance

Key to the success of such a computing paradigm is the Reliability, Availability, and Scalability (RAS) of the server platform. SCO OpenServer Release 6 extends the class of systems supported with the incorporation of a number of scalability and availability enhancements that meet the requirements of the most demanding applications and workloads.

3.4.1 Optimized, High Performance Kernel

SCO OpenServer Release 6 is built from the System V Release 5 (SVR5) UNIX kernel. Leveraging more than 25 years of knowledge and experience gained in operating systems development, SVR5 builds upon the inherent strengths of SVR3 and SVR4[®] environments (with which it is fully compliant) for highly reliable enterprise computing. This advanced kernel is fully multi-threaded with fine-grained locking, delivering increased scalability and better real-time performance. Light-weight processes (LWPs) allow parallel execution of multiple threads for the same process, delivering faster response to transaction-based routines such as web servers. The process scheduler allows timesharing and fixed-priority workloads, enabling the system to be used for a variety of applications simultaneously. For example, near real-time process scheduling is particularly important in manufacturing process control, while time-sharing is more typical for business applications (such as databases). Mature SMP technology is built into the kernel that SCO has evolved and perfected over the last decade, yielding an operating system that provides unparalleled levels of scalability. SCO operating systems have been shown to scale well in environments up to 16 processors (with 32 being the maximum). This results in outstanding performance on competitive benchmarks, beating not only other Intel-based operating systems, but RISC-based platforms as well.

Memory allocation for various kernel resources is fully dynamic: the system automatically tunes itself to respond to variations in workloads, and allows flexibility in performance tuning. Kernel modules can be loaded and unloaded dynamically, optimizing the use of available memory and other system resources.

Each of the kernel data structures that keep track of users, groups, processes and devices now use expanded type sizes, yielding a greater number of system-wide UIDs, GIDs, PIDs, devices and inodes. This results in a system that is much more scalable in terms of the users it can support and resources it can provide. The maximum default process size supported is 3.0GB, but by restricting kernel virtual space it can be increased to approximately 3.75GB.

3.4.2 Large Scale Memory

SCO OpenServer Release 6 supports Large Physical Memory (LPM) and can utilize up to **64GB** of physical memory. System memory (RAM) configurations up to 16GB in size are supported for general-purpose workloads. Memory above 16GB can be used as **dedicated memory** that is set aside at system initialization time for use by specific shared memory facilities. SCO OpenServer Release 6 uses the Physical Address Extension (PAE) mode of the Pentium 4 processor when operating with more than 4GB of memory.

3.4.3 Data Storage Features

SCO OpenServer Release 6 supports a number of features that enable reliable, scalable storage solutions.

3.4.3.1 Multipath I/O (MPIO)

MPIO allows multiple Host Bus Adapters (HBAs) to be connected to the same bus and multiported devices. MPIO delivers significant performance benefits using load balancing. Fulfilling I/O requests in a round-robin fashion on each available active I/O path to a disk, it maximizes disk loading while reducing traffic on individual SCSI buses. This also allows multiple systems in a cluster to read and write to all connected disks, thus minimizing bottlenecks for any single system or controller. Systems can be configured for alternate routes to disk storage, protecting against single points of failure in the I/O system. This ensures high availability to the devices when an HBA fails. Upon controller failure, the operating system will redirect I/O through another path to the device.

3.4.3.2 Large Scale Data Storage

The I/O subsystem in SCO OpenServer Release 6 is designed to meet the scalability needs of large SMP machines. It employs the UnixWare Storage Device Interface (SDI), a framework for driver software, for many of the hardware devices on a system. Besides organizing, simplifying, and standardizing the way device drivers are written, SDI also makes it easier to administer a wide variety of devices and interfaces. The system also supports a far greater number of independent disk storage devices than previous releases of OpenServer and other operating systems for Intel architecture servers. By extending the device addressing model, the system provides a potential 2³² unique addresses for controllers, buses, and logical units. SCO OpenServer Release 6 supports the following types of physical mass storage devices:

- Hard disks: high-speed, high-capacity disks available in a variety of types (IDE, SATA, SAS, SCSI, USB) and sizes. SCO OpenServer Release 6 supports both **fixed** and **removable** drives as well as industry standard hardware-RAID systems.
- CD and DVD devices: SCO OpenServer Release 6 supports most disc readers and burners, including those using the IDE, SCSI, USB, or SATA interface.
- Medium Changer devices: sometimes called jukeboxes, they are robotic mechanisms that automate the movement of storage media (whether tape or optical) between storage locations and physical read/write drives. Changer devices are ideal for creating large, centralized, highly scalable storage capacity.

The hardware compatibility list is constantly being updated. For more information please visit:

<http://www.sco.com/chwp>

3.4.3.3 Large Files and Filesystems

SCO OpenServer Release 6 supports a wide range of disk-based filesystem types, one of which supports **64-bit file sizes** (via the **long long** data type):

- VxFS™ (the Veritas filesystem type; provides support for large files, large filesystems and journaling) – used as default
- AFS (Advanced filesystem)
- EAFS (Extended advanced filesystem)
- HTFS (High throughput filesystem)
- S51K (System V 1K filesystem)
- cdfs (CD-ROM filesystem: ISO 9660/High Sierra, RockRidge, and Joliet extensions)
- dosfs (DOS filesystem including FAT 32)
- NFS (Network filesystem)

In addition, the system supports a number of non-disk based (pseudo) filesystems, some of which are mountable and some of which are not mountable. Some of the supported pseudo-filesystems include:

- `proafs` (/proc filesystem) provides access to the state of each active process and LWP (Light Weight Process) in the system
- `profs` (Processor filesystem) provides access to the state of each processor in the system
- `memfs` (Memory filesystem).

The system supports the specifications defined by the **Large File Summit** (LFS), a set of extensions to the **Single UNIX Specification** (SUS) that support 64-bit filesystems on 32-bit systems. The Veritas filesystem (VxFS) supports large files and large filesystems, with maximum file and filesystem sizes up to 1TB. Independent of large filesystem support, each filesystem can support up to four billion files.

3.4.3.4 Filesystem Encryption

Filesystem encryption has been added to the **marry** driver. Using the **marry** command, an empty regular file is associated with a block special device name and encryption is enabled on the file. After a filesystem is created on the block special device and mounted, all data written to the file is encrypted using the 128 bit Advanced Encryption Standard (also known as 128bit AES and the Rijndael block cipher); all data read from the file is decrypted.

3.4.4 Improved network performance

Network performance has been significantly increased with several enhancements:

- Checksum offloading reduces CPU overhead
- MAC header collapsing improves transmit performance
- Driver interface changes to reduce the number of memory allocations for every packet being transferred
- Improvements in transferring packets for across-the-board STREAMS performance enhancement
- Improved timer scheduling
- Global time mutex lock split into multiple locks provides increased scalability for multiple simultaneous connections
- Faster locks and other atomic primitives improves scalability and performance
- File descriptor allocation algorithm improvements for scalability
- Network multi-pathing allows multiple network connections (failover support)

3.4.5 Kernel Debugging Tool (kdb)

As an aid to device driver developers for SCO OpenServer Release 6, the Kernel Debugger, called **kdb** is available for use with both editions. This tool supports debugging device drivers, and can be used to display kernel stack traces and various kernel structures, and allows modification of memory, I/O, and register contents.

3.5 Business Critical Reliability

The core of SCO OpenServer Release 6 leverages over 10 years of field-proven reliability and quality system software deployed in mission critical and business critical environments. SCO publishes Mean Time Between Software Stops (MTBSS) figures for SCO OpenServer Release 6, currently at over 20,000 hours. MTBSS figures have been adopted by leading OEMs as a metric for product reliability. Availability is also measured in the industry by “the 9s” rating. SCO OpenServer Release 6 achieves 99.99% availability – a rate unmatched on commodity hardware.

3.5.1 Hot Swap and Failover

The I/O subsystem of SCO OpenServer Release 6 supports new hardware technologies designed to improve the high-availability and fault-tolerance of the system. DDI8, the device driver subsystem includes support for systems with hot-pluggable storage, allowing drivers to be written so that failed or failing parts can be replaced without having to reconfigure the kernel and without taking the system down. SCO OpenServer Release 6 supports network card failover and hot-swappable SCSI storage devices. The SCSI **hot add** or **hot remove** feature allows for addition or removal of SCSI storage devices (hard disks, tape drives, CD-ROM drives) from a running system. Some uses of the features include:

- Replacing a failed storage device on a system that must maintain high availability
- Moving less frequently used devices (such as tape drives) between systems
- Moving disk drives between systems to allow fast transport of data

Network Card Failover allows networking traffic to be shifted to another configured network adapter card when hardware failures are detected on the original card. The **Network Configuration Manager** can be used to configure a failover device for the primary NIC.

3.6 Advanced Internet Functionality with Java Technology (5.0)

SCO OpenServer Release 6 provides Internet server capabilities with a complete set of features for web serving, including open source technology products such as the Apache Web Server and Squid Proxy Server as well as video and audio support with Adobe Flash Player Version 7.0 and the 4Front OSS MPlayer.

With SCO OpenServer Release 6 servers, users have access to industry leading WWW browser technology, including the Mozilla™ 1.7.13 browser and the latest Java technology. Using these, customers can both access information on the World Wide Web or within their Intranet, as well as rapidly create web pages, Java applets, and applications to publish their own information.

3.6.1 Enterprise Class WWW Server – Apache Web Server 1.3.37

Apache is the world's most popular HTTP server. The Apache Web Server for SCO OpenServer Release 6 is based on open source software from the Apache Software Foundation. The key to Apache's attractiveness and popularity lie in its rock-solid reliability, security, outstanding performance, extensibility, its freely distributed source code, active user support, and rich set of features. Apache is built, tested, documented, packaged, and supported for SCO OpenServer Release 6.

Features and benefits include:

- Fully compliant HTTP/1.1 protocol for high performance. HTTP/1.1 features include persistent connections for downloading multiple documents over a single connection and byte ranges that let browsers continue interrupted downloads.
- Cross-platform support
- Highly configurable and extensible with third-party modules
- Customizable via writing "modules" using the Apache module API
- SCOhelp documenting server configuration and use
- Easy installation with SCO OpenServer Release 6
- Includes new versions of PHP (5.2.3) and Perl (5.8.8) scripting languages, and Tomcat Application Server for Java servlets (4.1.31).

3.6.2 Enterprise Class Proxy Server – Squid Proxy Server 2.6.12

The Squid Proxy Server is a full-featured proxy server for caching files and web pages. This server makes HTTP, FTP, and other requests on behalf of a client, and caches the results to serve future requests faster. Squid reduces network bandwidth use and improves performance dramatically. In addition, Squid enhances network security by providing centralized access control and a defined exit point through a firewall.

The Squid Proxy Server is based on Squid open source software and is built, tested, documented, packaged, and supported for SCO OpenServer Release 6. The features and benefits include:

- Proxying and caching of HTTP, FTP, and other URLs.
- Dramatic performance improvement
- Well defined exit point through a firewall
- Centralized access control
- Manageable web usage
- Cache hierarchies for efficient deployment of multiple proxy servers
- Supports all the latest caching protocols including ICP, HTCP and CARP
- Advanced access control of incoming and outgoing traffic
- SNMP Management and status reporting

3.6.3 Java Technology

One of the key technologies that enable server-based computing and diverse client support is Java technology. SCO OpenServer Release 6 includes Java 2, Standard Edition (J2SE), versions 5.0 and 1.4.2 for SCO operating systems. Both of these products are full implementations of The Sun Microsystems, Inc. Java Development Kit. It enables SCO OEMs, ISVs, and developers to develop and run Java applets and applications that conform to the Java Core API. The runtime module includes the Java Virtual Machine (JVM™) and the performance-enhancing HotSpot™ dynamic compilers. The JDK package is installed automatically during Initial System Load (ISL) of the SCO OpenServer Release 6 operating system. SCO will test and provide subsequent versions of Java technology as they become available.

3.6.4 KDE 3.5.6 and X.Org 7.2.0

For those environments that have standardized on the **K Desktop Environment (KDE)**, SCO OpenServer Release 6 includes the KDE Desktop. The traditional xdt3 desktop remains available for those who are interested in running a minimal desktop environment, or want to customize an OSF/Motif® environment based on the **pmwm** window manager. The X11R5 window server has been replaced by **X.Org**, the industry's most current version of the X11R6 standard.

3.7 Graphics and Audio Support

For customers that want to take advantage of the latest video and audio hardware to create a high powered system for graphical applications, SCO OpenServer Release 6 includes new support for graphics adapters and digital audio interface cards. Accelerated Graphics Processor (**AGP**) and PCI Express cards are supported and the X display system uses the graphic acceleration features of these cards. The standard X.Org character-based setup application is invoked by SCOadmin to configure graphics cards.

SCO OpenServer Release 6 supports sound cards based on the AC97 standard.

3.8 Comprehensive Network Interoperability

SCO OpenServer Release 6 contains a rich set of protocols and the latest networking technologies. Existing protocols have been enhanced to conform to the latest standards (RFCs), improve performance, increase the number of concurrent connections, and provide higher network bandwidth and data transfer rates.

3.8.1 Networking Protocols and Services

SCO OpenServer Release 6 includes a **PPP** implementation from Morningstar that provides multilink support, compression, and support for up to 256 concurrent links. This implementation of PPP is compliant with RFC 1332 (Internet Protocol Control Protocol (IPCP)), RFC 1333 (Link Quality Monitoring (LQM)), RFC 1334, (PPP Authentication Protocols), RFC 1548, (Point-to-Point Protocol (PPP)), RFC 1618 (PPP over ISDN), RFC 1962 (Compression Control Protocol (CCP)), and RFC 1990 (Multilink Protocol (MP)).

The latest versions of networking services and utilities have been included, such as Dynamic Host Configuration Protocol (**DHCP**), Address Allocation Services, connection server call filtering, and automatic detection of an incoming PPP connection. SCO DHCP implements both the client and server aspects of the Dynamic Host Configuration Protocol as defined in RFC 1534, RFC 1542, RFC 2131, and RFC 2132.

As networking needs grow or if businesses require Internet connectivity, subnetting and routers become important features. SCO OpenServer Release 6 includes support for key routing protocols, including **OSPFv2**, **RIPv2** and **IGMPv2**. Multi-casting and router discovery are also supported.

Internet Protocol Security (IPsec) is a popular set of protocols used to implement Virtual Private Networks (VPN). In a VPN, a non-secure communication path (such as an internet connection) is used for the transmission of encrypted and authenticated packets between hosts that have been set up to use that path and only provide IPsec packets over the path. A properly configured IPsec facility on the gateways and the various remote systems prevents the kind of security threats inherent in public transmission systems, such as spoofing, masquerading, denial of service, and others.

3.8.2 High Speed LANs and WANs

In addition to support for standard Ethernet and Token Ring networks, SCO OpenServer Release 6 supports deployment of high bandwidth LANs by including drivers for several of the industry's leading **Fast Ethernet**, **FDDI**, **100Mbit Ethernet**, and **Gigabit Ethernet** network cards. . Non-intrusive **network card restart** and **failover** is part of the new high-availability infrastructure that facilitates runtime device maintenance, and supports **hot-pluggable** adapters. This can significantly reduce downtime and also allow planned upgrades to take advantage of new networking cards without bringing down the system.

For customers who need a solution for connecting geographically dispersed servers using WANs, SCO OpenServer Release 6 supports fast modem links, including 56.6KB modems and digital transmission links over **ISDN** that deliver voice and data networking. SCO OpenServer Release 6 also supports Basic Rate Interface (BRI) ISDN service, consisting of two 64K B-channels and one 16K D-channel. This ISDN implementation is based on the CAPI standard and is supported within the MDI Streams architecture.

All network resource-related kernel tunables are now dynamic. As network traffic and usage grows, the system will automatically increase these resource allocations without re-linking the

kernel or rebooting. Any administrator-defined limits can also be changed dynamically using the **Network Manager**.

3.8.3 SNMP and Network Management

The **SNMP** package included in the system provides both agent and management station capabilities. The new SCO OpenServer Release 6 server can be managed by an SNMP Enterprise Management system and can also serve to monitor other nodes within the network. By using the SCO SNMP implementation, a network administrator can gather information such as routing entries, interface status, and protocol statistics.

The SNMP Agent supports IP Forwarding Table MIB (RFC 1354), Ethernet-like Interface Types MIB (RFC1398), IEEE 802.5 Token-Rings MIB (RFC 1231), FDDI MIB (RFC 1512), RIP Version 2 MIB Extension (RFC 1389), OSPF MIB (RFC 1253), BGP MIB (RFC 1269), and SMUX. It also supports all the objects under the SNMP Multiplexing (SMUX) group.

3.9 File and Print Services

3.9.1 UNIX File and Print Sharing

SCO OpenServer Release 6 provides distributed filesystem capabilities via **NFS**[®]. Support for PCNFS clients is built-in, allowing file sharing with other systems and PC clients running PCNFS. NFS in SCO OpenServer Release 6 is based on Version 3. NFS can be configured into the system as a Dynamically Loadable Module (DLM) that can be loaded into and unloaded from the system during runtime.

The default printing subsystem is based on the LP print service and includes support for local, dial-up and networked printers, including HP[®] Network Printers. It provides extensive print job and printer management capabilities, including the ability to control access by user, setting up printer classes and customized printer configurations.

The Common UNIX Printing System (CUPS, version 1.1.21) is now included as an alternate print system that provides generic printer drivers with basic printing functionality. Additional printer support is provided through the ESP Ghostscript, Foomatic, and Gimp-Print packages.

The ESP Ghostscript (7.07.1) and Foomatic packages contain printer drivers and PPD files for many printer types and models. The Foomatic package also includes the **hpijs** driver and PPD files for more than 200 Hewlett-Packard printer models (including DeskJet, OfficeJet, Photosmart, Business Inkjet and some LaserJet models). Foomatic also supports some non-HP printers.

The Gimp-Print package includes drivers and PPD files for many Canon and Epson printers, as well as certain Lexmark and Hewlett-Packard models.

3.9.2 Samba

Samba is open source software that allows UNIX systems to act as file and print servers to Microsoft[®] Windows[®] clients. Samba is a port of the SMB (System Message Block) architecture on non-Microsoft servers. It allows Windows clients to use file and print services on servers that are on a network. There is no need to install additional software on Windows clients to access a Samba server. It is interoperable with existing Microsoft file and print servers Samba software is built, tested, documented, packaged, and fully supported as part of SCO OpenServer Release 6 and replaces the SCO Advanced File and Print Server (AFPS).

3.10 Database Support

PostgreSQL (8.2.3) and MySQL (4.1.10) open source databases are included with SCO OpenServer Release 6 and fully supported by SCO.

3.11 Directory Services

3.11.1 LDAP Directory Server

OpenServer Release 6 supports the **Lightweight Directory Access Protocol (LDAP)**, a means for applications to access directory services. LDAP is a directory service protocol defined in RFC 1777, and runs over TCP/IP. Directory entries represent objects such as people, printers, or documents, and are arranged in a hierarchical (tree-like) structure that can span geographic and/or organizational boundaries. All SCO OpenServer Release 6 Editions include a basic LDAP directory server with support for replicated and distributed directory services.

Applications can query an LDAP directory server using this protocol, however there are ways to have the LDAP server act as a gateway to other directory servers such as NDS. One of the applications that use these capabilities is the mail and messaging system. With the Mozilla mail client, which is LDAP enabled, users can locate email addresses of people within the organization using the LDAP server.

LDAP makes it easy to access the X.500 directory, but still requires a full X.500 service to make data available to the many LDAP clients being developed.

3.12 Mail and Messaging

SCO OpenServer Release 6 administrators can use the SCO embedded mail server included with all Editions. The mail and messaging subsystem included with SCO OpenServer Release 6 represents a vast improvement over previous versions, with significant enhancements in both Mail Transfer Agent (MTA) and Mail User Agent (MUA) technologies.

3.12.1 Mail Transfer Agents

SCO continues to support both the Multi-channel Memorandum Distribution Facility (**MMDF**) and **sendmail** MTAs. Although MMDF is the default agent, Sendmail can be selected during ISL or post-installation.

3.12.2 Multi-Homed Sendmail Mail Services

Sendmail 8 (version 8.13.8) is the alternative MTA for SCO OpenServer. It handles the transport of messages to and from your system and supports local, networked (SMTP), and dial-out (UUCP) mail delivery. The server also supports **multi-homing**, which means that it can function as a mail gateway to other servers on the network. Multi-homing enables you to set up **multiple virtual domains** on your system, so that (for example) you can host several companies or departments (and their associated email addresses) on a single mail server.

3.12.3 Scalable Message Store

A key feature of SCO OpenServer Release 6 is *scalable message store*. This message store, used by both **sendmail** and mail user agents, results in higher overall performance of the mail system and enables a single server to support a far greater number of mail clients. Other improvements include support for RFC1123 v8, support for extended SMTP as defined in RFC 1651, RFC 1653, and some support for RFC 1652.

The message store also adds performance and scalability to the POP and IMAP servers.

3.12.4 Remote Mail Access and Multimedia Messages

Users have a wide range of character, graphical, and browser-based MUAs, all with the ability to send and receive “rich” data via support for MIME attachments. **Mozilla Mail™** and **KDE Kmail** are supplied as the standard mail agents and readers, along with the command line **mail/mailx** utilities.

The leading mail access protocols, **IMAP4** and **POP3**, are supported for client connectivity. This enables remote and mobile users to easily read mail from Windows laptops and remote desktops.

3.13 Remote Administration and Systems Management

System administration facilities are based on SCOadmin, an object-oriented framework written in SCO Visual Tcl™. SCO Visual Tcl can be rendered on a character-based display or graphically on an X Windows display, allowing the system to be easily administered from character-based or graphical clients.

3.13.1 Graphical Managers

SCOadmin includes over 30 graphical managers to easily configure and manage various subsystems as well as system resources and services. For example, using the Filesystem Manager, an administrator can add a new filesystem, establish it as a shared resource and view the mount status via an easy-to-use interface.

3.13.2 Enhanced Event Logging System

The Enhanced Event Logging System (EELS) provides an infrastructure to centralize the logging, management, and reporting of standard UNIX logging systems such as **syslog** and the auditing subsystem. The system conforms to the Open Group XDAS specification (X/Open Distributed Specification) and offers unparalleled logging and log management services. The infrastructure provides:

- A rich set of APIs for logging both kernel and user-level events
- Database query tools for powerful report generation capability
- Fine-grained control of what events should be logged
- An alert mechanism that enables rapid action to be taken when a specific event occurs

EELS provides this centralized mechanism by intercepting logging information from multiple sources and storing it in one or more databases. EELS analysis tools can then query these databases. In addition, the scripting and alarm generation facilities allow a high degree of control over what action should be taken when particular events occur. For instance, if a user fails more than once to **telnet** into a system, a script could send e-mail to an administrator or even alert them via pager or phone. Alternatively, an SNMP trap could be sent to a management station.

3.13.3 System Analysis and Performance Monitoring Tools

SCO OpenServer Release 6 also provides the **real-time performance monitor (rtpm)**, an interactive and screen-based utility that provides real-time display of performance metrics. You can also **log system activity** for capacity planning or performance analysis. This data can be accessed on a special request basis using the **sar** command, or saved automatically on a routine basis using the **sadc** tool. SCO OpenServer Release 6 also supports **kernel profiling**, a mechanism that allows you to determine where the operating system is spending its time during operation.

Source-level instrumentation for runtime events, including DEBUG assertions, memory leaks, memory corruption, lock hierarchy checking and lock statistics is also available. This enables a

system administrator to obtain more diagnostic information on what is happening in the kernel while troubleshooting software problems. The **crash** command includes a batch mode for generating dump summaries, selective dumping, generic storage dumping, and support for large physical memory. The **dump** command can dump memory selectively for kernel mapped pages and to multiple devices if required. (This is especially useful in large-scale systems with large RAM configurations.)

3.14 Security

SCO OpenServer Release 6 includes extremely robust security services for all aspects of the operating environment. It is designed to be C2-certifiable and includes certain B2 extensions (principally, the addition of administrative roles) to meet the most demanding government and enterprise system security requirements.

3.14.1 Pre-defined Security Levels

Setting up security is as easy as choosing among several profiles. A security profile is a set of pre-configured values for parameters that control the security behavior of your system, such as how long passwords are valid, or what privileges are assigned to users. Administrators can select profiles using the SCOadmin **Security Profile Manager**. Pre-configured levels include:

- *High*: for systems containing confidential information and accessed by many users
- *Improved*: systems accessed by groups of users who can share information
- *Traditional*: compatible with other UNIX systems
- *Low*: recommended only for systems that are not publicly accessible and those with a small number of users

The administrator can also alter individual security parameters.

3.15 Access Control

SCO OpenServer Release 6 provides a secure operating environment by means of these key features:

- Identification and authentication
- Least privilege/trusted facility administration
- Network access controls
- Auditing
- Secureware Trusted Computing Base (TCB)

The Secureware tools maintain a database of users and the commands they are allowed to execute. This eliminates the need to place fixed privileges on a command and allows privileges to be assigned on a per-user basis. A trusted system can define administrative roles for selected system administrators. A different administrator may fill each role. This division of administrative duties into separate roles reduces the chances for misuse of administrative privileges.

3.15.1 Internet and Intranet Security

For added remote access security, the system contains **IP packet filtering** functionality. IP packet filtering is supported over PPP for remote connectivity and MDI/DDI drivers for LANs. Configuring a packet filter on Internet gateway(s) to control the types of packets in and out of a site's networks significantly increases protection against unauthorized access. The packet-filtering framework is the foundation for more comprehensive and specific security services like firewalls and E-Commerce packages. Account management commands conform to POSIX 1387.3.

SCO OpenServer Release 6 features a new version of **ipfilter**, which includes such enhancements as fine-grained file locking (improves firewall performance) and support for IP address translation for non session-tracking TCP or UDP rules (provides network address translation NAT and redirection capability).

Additional security features are provided using open source secure shell (OpenSSH 4.6p1) utilities and the **Secure Sockets Layer** (SSL 0.9.8) protocol built into the Mozilla browser and the Apache Web Server. These features protect Internet communications with:

- Server authentication
- Privacy using encryption
- Data integrity

3.16 Comprehensive Standards Support

With SCO OpenServer Release 6, SCO has implemented the most comprehensive set of open system standards with the latest Internet, Java, messaging, and directory standards. Supported binary standards include:

- UNIX 95, XPG4
- SV ABI, iABI, iABI+
- iBCS2
- COFF
- ELF
- ICCCM
- SCO DDI

Other source standards include:

- POSIX.1, POSIX.2
- ISO 9945-1:1990
- IEEE Std 1003.1:1990
- ISO 9945-2:1992
- SVID3
- FIPS 151-2
- ISO/IEC 9899:1990
- XBSS
- NCSC C2

Supported Networking standards include:

- TCPIPv6 APIs
- SMTP
- ISDN support
- DHCP Server
- LDAP
- IMAP4
- POP3
- MIME
- HTTP 1.1
- SNMP v1
- IPSec

In addition to standards support, SCO OpenServer Release 6 provides binary compatibility with the following:

- SCO UnixWare Release 2.1 binaries
- SCO OpenServer Release 5 binaries
- SCO XENIX 386 and SCO UNIX binaries
- UnixWare 7 binaries
- **pkgadd** and **custom** formats

3.17 Localization

SCO OpenServer is internationalized for 8-bit languages in the majority of the software components. It also provides French and German message catalogs and resource files for these components, as well French and German documentation for the runtime system.

3.18 Software Installation and Management

The graphical **custom** installer allows installation of system software, patches and applications in an interactive mode. The system also allows you to spool packages for installation at a later date. Packages and sets can be installed from CD-ROM, cartridge tape, disk, or over a network. SCO OpenServer Release 6 also supports the standard UNIX system installation utility, **pkgadd**. Widely used in SVR4-based UNIX systems (including Solaris®), **pkgadd** enables both interactive and non-interactive installation modes. The system also provides utilities to install software designed for other UNIX systems that require the use of tools such as **cpio** and **tar**.

3.18.1 Remote Installation

Network installation is particularly useful if you must install the same packages on many machines or if your network includes multiple sites. Network installation removes the need to transport media from site to site. The PXEBOOT facility allows the entire SCO OpenServer Release 6 system to be installed over the network without using boot media.

While SCO OpenServer Release 6 provides the ability to install from the network, it does not include the boot images necessary for a network install of the operating system. The boot images will be provided for download shortly after SCO OpenServer Release 6 is released. Please see the following URL for more information:

<http://www.sco.com/support/docs/openserver>

3.18.2 Centralized “Install Server”

An install server allows you to “stage” software so that other systems in your network can use it to perform a network installation of the operating system or of specific packages. An install server is an SCO OpenServer Release 6 server that has been configured to provide software products and packages to other systems on the network. Once an install server has been configured, subsequent software installation on additional machines can be performed over the network.

3.18.3 Bootable CD-ROM support

SCO OpenServer Release 6 allows you to boot directly from CD-ROM. Bootable CD-ROM support uses the “El Torito” extension of the ISO 9660 standard and identifies a boot file on the CD-ROM to load the file and boot the system.

3.19 SCO OpenServer Release 5 Migration

SCO has created an *Upgrade Guide* to help organizations migrate their systems from previous SCO OpenServer releases. The guide is available for download at:

<http://www.sco.com/support/docs/openserver>

Topics include:

- Restoring backups from SCO OpenServer Release 5 to SCO OpenServer Release 6
- Migrating accounts with the **ap** (account profile) command
- Preserving network settings and how to upgrade them to SCO OpenServer Release 6
- A summary of subsystem and command differences

4 SCO OpenServer Release 6 Development System

A number of development environments are available for developing software for SCO OpenServer Release 6.

C and C++ compilers are available and can operate in modes appropriate to the technological heritage of SCO OpenServer Release 6: UnixWare and SCO OpenServer.

For Java development, SCO provides the Java Development Kit (JDK).

SCO publishes information for developers at the SCO Developer Network home page:

<http://www.sco.com/developers>

You should check this page for updated information, new tricks, links to important news groups, and so forth. Anyone who is developing software for SCO platforms is encouraged to join the SCO Developer Network.

4.1 Single Certification

The convergence of the UnixWare and SCO OpenServer platforms is intended to preserve the investment developers have made in applications and device drivers. Existing binary UnixWare 7.1.x applications will run on UnixWare 7.1.4 and later releases and existing binary OpenServer applications will run on SCO OpenServer Release 6. In addition, applications certified to UnixWare 7.1.x or later will also run on OpenServer Release 6.

4.2 C and C++ compilers

The SCO OpenServer Release 6 Development System includes both C and C++ compilers. Both compilers conform to the same standards, are robust, and generate high-performance IA-32 machine code. The compilers include a standard set of command-line tools (including profilers and memory analyzers), and both can be used with the graphical SCO OpenServer Release 6 Development System debugger.

The compilers can operate in two modes: UDK or OSR. These modes exist due to the dual nature of SCO OpenServer Release 6, which includes UNIX System V Release 5 (SVR5) kernel technology with modern features such as threads and large file support.

Accordingly, SCO OpenServer Release 6 can run both SVR5 applications as well as traditional SCO OpenServer 5 applications.

The C compiler (**cc** command), the C++ compiler (**CC** command), and a few other development tools have a **-K** option to set the mode, with **udk** and **osr** being the allowed values. For more information on application portability, visit the SCO website at:

<http://www.sco.com/support/docs/openserver>

4.3 Java Development Kit (JDK)

The Java 2 Standard Edition Software Development Kit is pre-installed on all SCO OpenServer Release 6 systems in the directory */usr/java/*. Documentation describing its use is found in the Release Notes at */usr/java/ReleaseNotes.html*.

If your application is 100% Java and already exists on another platform, you may not need to modify the code to run on SCO OpenServer Release 6.

4.4 Other languages

Development tools for other languages such as FORTRAN, COBOL, and Ada, as well as fourth-generation languages associated with databases and scripting languages, are provided by third-party vendors for SCO platforms. The GNU g77 FORTRAN compiler is provided as part of the GNU Development Tools, which will be available for SCO OpenServer Release 6 soon after FCS. Additional open source solutions are also available, such as the GNU-based GNAT Ada 95 compiler.

4.4.1 Older Platforms

There are some older SCO operating systems that pre-date SCO OpenServer and UnixWare 7, such as SCO UnixWare 2, SCO UNIX, and XENIX. These older operating systems are no longer supported by SCO, and we recommend that you upgrade your platform and your development tools to currently supported SCO products, if possible.

5 Add-on, Optional Services

In addition to the rich set of features included in SCO OpenServer Release 6, SCO provides a series of add-on, optional software packages that extend or enhance the capabilities of the system for specific solutions. The sections that follow briefly describe these services.

5.1 Scalability Services

5.1.1 SCO OpenServer Release 6 Processor Upgrades

SCO OpenServer Release 6 is designed to support up to 32 CPUs in a symmetrical multiprocessor system. This enables the operating system that uses multiple CPUs to execute more than one process simultaneously. SCO OpenServer Release 6 Editions are now licensed for 32 logical CPUs and therefore additional processor upgrade licenses are no longer needed.

5.1.2 SCO OpenServer Release 6 Maximum Memory Licenses

The Enterprise and Starter Editions (which include support for 1 and 4 gigabytes of memory, respectively) can be upgraded to support up to 64GB of main memory. The following non-additive licenses are offered to extend the total supported main memory size:

- Up to 4 Gigabyte Maximum Memory License (Starter only)
- Up to 8 Gigabyte Maximum Memory License
- Up to 16 Gigabyte Maximum Memory License
- Up to 32 Gigabyte Maximum Memory License
- Up to 64 Gigabyte Maximum Memory License

5.1.3 SCO OpenServer Release 6 User Licenses

The number of users can be increased on the Enterprise Edition by purchasing additional user licenses in increments of 10, 25, 100, or 500 users. These are additive licenses. A special 5-user license is available for the Starter Edition.

5.2 Windows and DOS Application Services – MergePro

The latest release of the Merge product family, MergePro, delivers the ability to run Windows 2000 and Windows XP applications simultaneously with business critical UNIX applications on a single SCO OpenServer Release 6 server. A common filesystem allows Windows and UNIX system users to share data. Windows and UNIX system users simultaneously share printers and other standard PC peripherals. MergePro provides access to thousands of off-the-shelf Windows applications along with UNIX applications.

6 Hardware Requirements

The hardware necessary for installation of SCO OpenServer Release 6 varies depending on the installation options chosen. The sections that follow describe the minimum requirements.

6.1 Processor

SCO OpenServer Release 6 requires an Intel® Celeron®, Pentium®, Pentium II, Pentium III, Pentium 4, or Xeon™ microprocessor, or a microprocessor that is 100% compatible (such as the AMD Athlon™, Athlon 64, Duron™, Sempron, or Opteron™ processor). 64-bit processors are only supported in 32-bit mode. Pentium 4 is recommended.

6.2 Memory

Minimum: 64MB of Random Access Memory (RAM) is required. For running graphically-intensive applications like Java or KDE, a minimum of 128 MB of RAM is required.

Recommended: 256MB. For optimal performance of the system when running graphically-intensive applications like Java or KDE, 512MB of RAM is recommended.

Maximum: 64GB

6.3 Disk space

Minimum: To install all packages included in the media kit, 4GB of disk space is required. Small footprint installations can run on partitions as small as 1GB.

Recommended: 8GB

Maximum: 1TB (per disk)

6.4 HBA

At least one Host Bus Adapter (HBA) is required, and up to 32 HBAs are supported by default. Additional HBAs, up to a maximum of 1024, can be added; however, the driver for any HBA added above 32 must support such a configuration.

Minimum: IDE

Recommended: SCSI, SATA, or SAS

Maximum: HBA Dependent

6.5 Mouse

A serial, USB, or PS/2-compatible mouse is highly recommended for easy navigation of the graphical desktop interface.

6.6 Video

An SVGA monitor and video adapter with a resolution of at least 1024x768 is required to run the graphical desktop. The graphics adapter used during a fresh installation must have an IBM VGA compatible mode.

6.7 NIC

A Network Interface Card (NIC) is only required for installation if you are performing a Network Install (not currently supported). At least one NIC is required for networking; up to 4 NICs of the same manufacturer and model can be connected at one time.

6.8 Media Devices

A CD-ROM drive is required for installation from the SCO OpenServer Release 6 CD-ROMs. A 3.5-inch diskette drive is required if you need to install vendor-supplied software (such as device drivers) from diskettes.

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