MASTERING™
SOLARIS™ 8

Barrie Sosinsky
Carol Tanielu

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SOLARIS™ 8

Barrie Sosinsky
and Carol Tanielu

San Francisco • Paris • Düsseldorf • Soest • London
I dedicate this book to my aunt and uncle, Katie and Harry Reif, whose presence will sorely be missed. They left the world a better place than they found it. Their kindness and devotion to their family is a testament to the importance they had in so many lives.

—Barrie Sosinsky

I dedicate this book to Shililo Tipa Tanielu. Alofa ote oe!

—Carol Tanielu
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It is clear from our work on this book that Sybex is a superior publishing house, one that really cares about the quality of its products. The care taken with its projects and the manner in which its authors are treated were evident. It was a pleasure working with Sybex on this book.

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The book you are holding in your hand, Sybex’s *Mastering Solaris 8*, is a beginning-to-intermediate introduction to Sun’s Solaris operating system and its operation and administration. You don’t need to know Solaris to read and understand the material in this book, but it is helpful to have some experience working with computers and networks. In writing this book, we have tried to present common operations that you will perform on Sun workstations and servers in your day-to-day practice. This book contains reference material that you can use in your work going forward. Therefore, we hope that this book will find a place on your desk next to your Sun system.

Although this book was written to be read sequentially, you don’t need to do so to get value out of it. Many of the chapters are written as individual units; for example, Chapter 13, which describes the Solaris Mailer and Calendar utilities, can stand on its own.

What We Cover in This Book

Three different authors contributed to this book, which is divided into four different parts.

Part I: Introduction to Solaris

Barrie Sosinsky starts the book in Chapter 1 by giving a general description of the Solaris 8 operating system. Carol Tanielu continues in Chapter 2 by giving you a detailed overview of the Solaris system architecture. With those two chapters in hand, you should be ready to tackle some of the operational features of the Solaris OS.

If you obtained a Solaris workstation or server directly from Sun, then chances are that you didn’t get the full documentation that describes in detail how to install the operating system. You can also download both the SPARC and Intel x86 versions of Solaris 8, and they don’t come with documentation either. In Chapter 3, Barrie
Sosinsky takes you through an OS installation and highlights the important choices you should be aware of. Chapter 4, “Basic Operations,” was written by Steven Beebe and should prove useful to beginning users.

The introduction of Solaris continues with some detailed technical chapters on the file system (Chapter 5), devices (Chapter 6), and the Solaris desktop (Chapter 7), all of which were contributed by Barrie Sosinsky. The introduction ends with a chapter by Carol Tanielu on security (Chapter 8), which includes a further discussion of file attributes described in Chapter 5.

**Part II: Solaris and the Network**

Solaris is first and foremost a network operating system. That’s why a substantial portion of this book is dedicated to networking and network services. In Chapter 9, Barrie Sosinsky and Carol Tanielu describe some of the networking concepts that you need to know in order to work with servers and other computers on your network. Although printing is sometimes done locally, most often Solaris users print to network printers. That is why in Chapter 10, Barrie Sosinsky provides a description of the Solaris print services and how to configure and use printers. Continuing on in Chapters 11 and 12, Barrie Sosinsky explains how to manage users on a network and how to work with files that are transferred over a network. Chapter 12 also includes descriptions of common utilities, such as those used for compression, encryption, archiving, and backup.

The networking part continues in Chapter 13 with Steven Beebe describing the mail and calendar utilities that are built into Solaris. In Chapter 14, Carol Tanielu describes the networking aspects associated with using the Internet, including protocols, addressing, and browsers and other utilities. Chapter 15 concludes the networking section with Barrie Sosinsky describing memory and process management, both locally and on remote systems.

**Part III: Working with Shells in Solaris**

The third part of this book explains how to manipulate Solaris using commands entered at the command line. Many of the command, preference, and script files in Solaris are text files that can be modified using text editors. Solaris contains a very powerful command structure, and many of the commands and their most powerful options are accessible only through the command line or the prompt. In Chapter 16, Barrie Sosinsky explains how to use the vi editor and other text editors to work with
text files. Carol Tanielu continues in Chapter 17 to explain how shells work, and then in Chapters 18, 19, and 20, she describes the three most important shells that come with Solaris, the Bourne, Korn, and C shells, respectively.

**Part IV: Troubleshooting**

The book ends with Chapter 21 from Steven Beebe describing some of the more common problems that you might encounter working with Solaris, from both a software and a hardware perspective. The chapter also describes an approach to diagnosing system problems that you should find useful, in addition to pointing you to some troubleshooting resources.

**Conventions Used in This Book**

Some of the material is presented as a set of procedures that you can execute. Care was taken to describe the features not only by name but by feature type. Thus, you will see instances where we say things such as “Select the Open command from the File menu.” Although somewhat pedantic, at least the meaning will be clear.

Commands that you can enter from the command line and paths to files or directories are presented in a different font to distinguish them from the rest of the text. Thus you might see `vi` editor or the `/opt/program1/file1` in the text.

Sections that require lines of code are set apart from the text by a special set of styles. Thus a short script might look something like this:

```
Initiate script
Script step 1
Script step 2
End script
```

Throughout the book you will encounter tips, notes, and warnings. The purpose of these features is common to their purpose in other computer documentation you might read. A tip is something that will help you in your work. A note contains information that is valuable but supplementary to the topic being discussed. And finally, a warning is just that: it warns you of some operation or setting that can get you into trouble if you don’t pay attention.

In all other aspects of writing this book, we endeavored to conform to the conventions used by Sun in its standard documentation.
About the Authors

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PART I

Introduction to Solaris

LEARN TO:

• Understand how Solaris relates to Unix
• Install and use your system
• Use the Solaris desktop
• Work with devices and files
• Customize security features to protect your data
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CHAPTER 1

The Solaris 8 Operating System

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Sun Microsystems (www.sun.com) has been a hot act in the computer business for quite some time now. Sun is one of the few companies that has been able to successfully compete with today’s dominant desktop operating system, Windows, and many of its applications are considered best-of-breed. Unlike Microsoft, Sun is both a hardware company and a software company. Sun sells everything from terminals and workstations to servers, and it sells an operating system and applications that operate on its hardware. This chapter describes one of the most important products Sun distributes, which is the basis for all of the other products, the Solaris operating system.

**Introducing Solaris**

Solaris 8 is the latest edition of Sun’s operating environment. It offers advanced multi-tasking, symmetric multiprocessing, and 64-bit data processing that runs on systems as small as a Sun Blade 100 (Sun’s sub-$1,000 entry desktop system), on Ultra 5 workstations, or on the 64-processor Sun Ultra Enterprise (UE) 10000, a near mainframe-class system. We say “operating environment” because, strictly speaking, Solaris runs on top of the SunOS, which provides kernel-level services. As this book is being written, SunOS is at version 5.8. Sun released its SunOS 4.1.2 operating system bundled with the OpenWindows graphical user interface (GUI) as the Solaris 1.0 package.

On a computer, an operating system is the program that controls the input and output, assigns and manages resources, and schedules tasks. Therefore, any device—be it internal to the computer (such as the CPU, hard drive, memory, and so on) or external (such as your monitor, keyboard, printer, and so on)—is managed by the operating system. Giving commands to the Solaris operating system is as close as you can get to actually controlling the hardware that you work with. Solaris offers the capability to manage your workstation locally as well as the capability to manage remote computers over the network.

**Solaris and Unix**

Solaris/SunOS is Sun’s version of the Unix operating system, based—as you shall see in the next chapter—on the Berkeley Software Distribution (BSD) and AT&T System V. Solaris is specially tweaked for the computers that Sun sells, offering many special features. Solaris is largely compatible with most versions of Unix. It supports the industry standard for Unix, POSIX (Portable Operating System Interface for Computer Environments), which is based on the Unix System V Interface Definition (SVID).
Solaris supports both POSIX.1 and POSIX.2, as well as the X/Open Common Application Environment (CAE), Networking Services Issue 4 (XNET4), and the Portability Guide Issue 4 Version 2 (XPG4v2). Many of these standards, which led to the development of Unix, were the result of efforts initiated by the United States government and military to reduce the cost of supporting multiple computer operating systems with duplicative software and hardware.

Therefore, although there may be some differences—the command syntax, the location of the configuration files, the structure of the file system, the shell or graphical user interface—a person with some Unix experience will likely feel right at home working on the Solaris platform. Often the similarities vastly outweigh the differences, so that the experience that you gain using the Common Desktop Environment (CDE) GUI on Solaris will directly translate to using that GUI on another platform.

Many Solaris shops interoperate with the other vendors’ versions of Unix, some of which (HP-UX, IBM AIX, the open source version Linux, and several other flavors) have significant installed user bases. For this reason, Sun describes its platform as “open” architecture or as based on an “open” standard. This notion of openness relates to Solaris having a level of interoperability that bestows upon Sun’s customers the ability to buy software from many vendors that serve the Unix community and the ability to connect to peripherals designed and built first to work and run on other platforms, such as a Silicon Graphics workstation. For many enterprises, the ability to buy from multiple vendors computer software and hardware that will work with the software and hardware you already have is seen as a form of investment protection that is very desirable.

Unix and Solaris have both had a very long development cycle and are considered by the IT community to be mature operating systems. Unix was first developed in the 1970s, and the first versions of Solaris appeared in the mid-1980s. Sun released several versions of the Solaris operating system as first 1.x (then referred to as the SunOS 4.x version) and then 2.x (the SunOS 5.x version) before adopting the use of integers instead of fractions to describe releases. Thus, Solaris releases 2.5.1 and 2.6 were followed by version 7, and now by version 8 (which, depending on how you check the version information, will be called Solaris 7/8, Solaris 2.7/2.8, or SunOS 5.7/5.8).

Although in many cases it ran and continues to run reliably, the hardware for many applications (such as Internet firewalls, mail and news servers, and other applications that ran on Sun SPARC systems) became obsolete with the upgrade from SunOS 4.x to the System V version of the Sun operating system, Sun 5.x. For this reason, the decision to upgrade to later versions of the Solaris operating system was often a difficult one. There are many shops still running Solaris 2.6; even some large enterprise applications run on this version. Typically, it is the desire to run 64-bit applications or the need to use UltraSPARC systems that have spurred companies to upgrade or install Solaris 7 and 8 in their shops.
In fact, there is a high degree of compatibility between Solaris 8 and Solaris 7, as there is between all versions of the SunOS 5.x family of operating systems. On a regular basis (typically quarterly), Sun posts to its Web site what it calls jumbo patches, which allows administrators running versions of Solaris that aren’t the most current version of that release to fix bugs and security holes and maintain compatibility between different versions of the operating system.

The Advantages of Solaris

The reliability of Sun servers running Solaris is one of the reasons that Sun has been able to establish its hardware as the platform of choice on many of the world’s largest Web sites, and particularly on those running database systems that are extremely transaction intensive. Perhaps eight or nine of the world’s ten highest-volume Web sites run on Sun systems. So even desktop users who may not be familiar with Sun or Solaris are using the services of a Sun server every time they log on and work on the Internet. A very significant percentage of the world’s Internet e-mail passes through or originates on Sun servers running sendmail or the Sun Network File System (NFS). As Sun likes to say in its advertisements, “We’re the dot in .com.”

Unlike Microsoft, whose development of Windows started on PCs and was extended through peer-to-peer networking into server-class systems (with the advent of Windows NT), Sun’s intent had always been for the Solaris operating system to be at its heart a network operating system. Until quite recently, it was fair to say that Sun was predominantly a server company, with a strong workstation component in a supporting role. Several things have happened in the recent past to modify this view of Sun’s focus.

First, the development of the browser as a portal on any type of computer system (client) to view information processed on a Web server has led to Sun’s development of the Java programming language (see www.sun.com/java), which is currently distributed under a Sun Community Source License (SPSL, see www.sun.com/981208/scsl). Very significant program development for Java has been done by other companies such as IBM and by the open source community as a whole, all of whom are quite devoted to the use and promulgation of Java as a development platform. Java is now widely used and supported throughout the industry; anything created with the Java programming language can be viewed on any client that has a Java Virtual Machine (JVM) installed. This includes a PC, a Macintosh computer, a network computer, and even new technologies such as Internet screen phones. Sun will apply the Java platform to next-generation telephones, household appliances, TV set-top boxes, smart cards, and so on. With Java, the appeal is that you can develop “write once, run anywhere” applications.
Java runs in a browser on the client side as a Java applet, which is a small, encapsulated, self-running application that is typically downloaded to a client and run when needed, or as JavaScript, which is an offshoot of Java developed by Netscape for use on the Web without a Java compiler. When you visit a Web page that requires the services of that Java applet, the appropriate calls are issued and the applet is invoked. Although Java applets are most typically used in Internet applications through a browser, they can and often do run by themselves. Many companies are programming their utilities as Java applets because of the cross-platform capabilities that they offer. When the information generated by a Java program is required by many computers at once or requires a more powerful processing environment, it is often deployed as a servlet running on a back-end server. Many complex databases, messaging, and other multitiered applications run as servlets.

The second interesting recent development has come to pass as a result of the rising popularity of Linux. The Linux platform is an open source development version of Unix, and Linux has established itself as a widely used desktop, workstation, and low-end server environment that competes with Sun Solaris and products offered by other Unix vendors. To counteract Linux’s popularity, in part, Sun decided to offer a free version of Solaris 8 for both the SPARC and Intel x86 computer platforms. You can download these applications from the Sun Web site by going to the Solaris home page and clicking the Solaris button near the title bar. That button takes you to a page where you can begin the registration process to download the operating system. It’s faster to start, though, to obtain the software at the following pages:

- [www.sun.com/solaris/binaries/](http://www.sun.com/solaris/binaries/) (for the SPARC version of Solaris)

If you have a slow Internet connection, you can order the CD and documentation set from Sun directly for $75, but all of the software you need to get a Sun workstation up and running on an unlimited number of computers with a capacity of eight or fewer CPUs is available to you on the Sun Web site. Therefore, if you have a Windows server or SCO OpenServer deployed in your enterprise, you can switch these Intel servers over to Solaris for free.

The popularity of Linux as a desktop alternative to Microsoft Windows and to the Apple Macintosh has caught many in the industry by surprise. Linux had already achieved a following as a small Web server platform and as a desktop environment through the deployment of programs like GNOME, and it even has productivity applications like StarOffice that run on it. There are rumors in the industry that Sun may one day offer a version of GNOME as a regular part of Solaris should that environment become standardized, but it’s unclear at the moment when that might happen. The push for Unix on the desktop has been enhanced by Apple Computer’s new
OS X, which is based on the BSD distribution of Unix (like Solaris 1.x is) with a new
graphical interface developed by Apple. Work by Sun, Apple, and many other devel-
opers is showing that you don’t have to use Windows; there are alternatives.

The StarOffice suite is an alternative to and compatible with the widely used
Microsoft Office, and its developing popularity had suggested to many that desktop
Unix might have a future. StarOffice contains the following components:

- StarOffice Write, a word processor
- StarOffice Calc, a spreadsheet
- StarOffice Impress, a presentation package
- StarOffice Base, a database
- StarOffice Schedule, an organizer
- StarOffice Mail, a mailing program
- StarOffice Discussion, a newsreader for Internet newsgroups

StarOffice successfully re-creates much of Microsoft Office’s more commonly used
functionality, and it can read and write to native Microsoft Office files. In 1999, a year
before Sun released Solaris 8, Sun purchased StarOffice and released it as free software
to run on the Solaris platform as well as the other platforms that StarOffice runs on.
Today, Sun develops StarOffice in concert with the open source community, making
its source code freely available under the GNU General Public License (GPL), the
GNU Limited General Public License (GLPL), and the Sun Industry Standards Source
License (SISSL) under the name OpenOffice, which can be seen at www.openoffice.org.
Developing StarOffice with the open source community also expands the platform
support for StarOffice.

Version 5.2 of StarOffice may be downloaded from the Sun Web site at www.sun.com/
staroffice/ in any one of the following languages: Danish, Dutch, English, French,
German, Italian, Polish, Portuguese, Russian, Spanish, and Swedish. It is offered for
the following four platforms:

- Solaris on SPARC
- Solaris on Intel (x86)
- Linux (x86)
- Windows (NT/9x)

The fact that you can download and install these different versions of StarOffice
means that you can seamlessly share StarOffice files created on any one of those plat-
forms with the version of StarOffice running on any of the others. Today, StarOffice is
loaded on all Sun workstations and is part of the Solaris standard distribution. Many
examples in this book of Solaris functionality are shown using one component or another of StarOffice.

What’s New in Solaris 8?

There are many new networking and administration features included with Solaris 8 that weren’t in the previous version of Solaris, version 7. Additions have been made to both the client and server versions of Solaris, and only some of the larger additions and modifications can be noted here in this short section. The following system functions were added to Solaris 8:

- Automated Dynamic Reconfiguration and the Reconfiguration Coordination Manager
- Better crash dump analysis
- Enhanced DHCP
- IEEE 1394 support
- IPSec for IPv4 and IPv6
- IPv6 support
- Java 2 SDK
- LDAP
- Network installs using DHCP
- Perl version 5.005_03
- Role-based access control
- Sendmail 8.9.3

On the client side, the biggest addition to the standard distribution of Solaris 8 (as noted in the preceding section) was StarOffice. Additionally, Solaris 8 added better multimedia support, musical instrument digital interface (MIDI) audio, and streaming media support for several formats. Out of the box there is some support for data communication with mobile devices like the Palm Pilot Personal Data Assistant (PDA).

Sun added many more components to the Solaris 8 distribution as additional CDs in the box. In addition to the StarOffice disc, you will find an administration software disc that installs the components found on the BigAdmin Web site, as well as the Solaris Software Companion CD. There are many GNU utilities found on the Software Companion and a wide array of third-party software that you would typically tend to download from an Internet site.