



PREFACE

The book Whether you are an end user, a system administrator, or a little of both, this book explains with step-by-step examples how to get the most out of an Ubuntu Linux system. In 28 chapters, this book takes you from installing an Ubuntu system through understanding its inner workings to setting up secure servers that run on the system.

The audience This book is designed for a wide range of readers. It does not require you to have programming experience, although having some experience using a general-purpose computer, such as a Windows, Macintosh, UNIX, or another Linux system is certainly helpful. This book is appropriate for

- **Students** who are taking a class in which they use Linux
- **Home users** who want to set up and/or run Linux
- **Professionals** who use Linux at work
- **System administrators** who need an understanding of Linux and the tools that are available to them including the `bash` and Perl scripting languages
- **Computer science students** who are studying the Linux operating system
- **Technical executives** who want to get a grounding in Linux

Benefits *A Practical Guide to Ubuntu Linux®*, *Second Edition*, gives you a broad understanding of many facets of Linux, from installing Ubuntu Linux through using and customizing it. No matter what your background, this book provides the knowledge you need to get on with your work. You will come away from this book understanding how to use Linux, and this book will remain a valuable reference for years to come.

xl PREFACE

New in this edition This edition includes

- An all-new chapter on the Perl programming language (Chapter 28; page 997).
- Coverage of LDAP, which has been added to Chapter 21 (page 722).
- Coverage of the `ufw` firewall, which has been added to Chapter 25 (page 834).
- Updated chapters to reflect the Ubuntu 8.04 LTS (Hardy Heron; maintained until 2011) and Ubuntu 8.10 (Intrepid Ibex) releases.
- Four indexes to make it easier to find what you are looking for quickly. These indexes locate tables (page numbers followed by the letter **t**, definitions (italic page numbers), and differentiate between light and comprehensive coverage (light and standard fonts).
 - ◆ The JumpStart index (page 1143) lists all the JumpStart sections in this book. These sections help you set up servers and clients as quickly as possible.
 - ◆ The File Tree index (page 1145) lists, in hierarchical fashion, most files mentioned in this book. These files are also listed in the main index.
 - ◆ The Utility index (page 1149) locates all utilities mentioned in this book. A page number in a **light font** indicates a brief mention of the utility while the regular font indicates more substantial coverage.
 - ◆ The completely revised main index (page 1155) is designed for ease of use.

Overlap If you have read the first edition of *A Practical Guide to Linux® Commands, Editors, and Shell Programming*, you will notice some overlap between that book and the one you are reading now. The first chapter, the chapters on the utilities and the filesystem, the appendix on regular expressions, and the Glossary are very similar in the two books, as are the three chapters on the Bourne Again Shell (`bash`). Chapters that appear in this book but do not appear in *A Practical Guide to Linux® Commands, Editors, and Shell Programming* include Chapters 2 and 3 (installation), Chapters 4 and 8 (Ubuntu Linux and the GUI), Chapter 10 (networking), all of the chapters in Part IV (system administration) and Part V (servers), Chapter 28 (Perl), and Appendix C (security).

Differences While this book explains how to use Linux from a graphical interface and from the command line (a textual interface), *A Practical Guide to Linux® Commands, Editors, and Shell Programming* works exclusively with the command line. It includes full chapters on the `vi` and `emacs` editors, as well as chapters on the `gawk` pattern processing language and the `sed` stream editor. In addition, it has a command reference section that provides extensive examples of the use of more than 80 of the most important Linux utilities. You can use these utilities to solve problems without resorting to programming in C.

THIS BOOK INCLUDES UBUNTU INTREPID IBEX (8.10) ON A LIVE/INSTALL DVD

This book includes a live/install DVD that holds the Intrepid Ibex (8.10) release of Ubuntu Linux. You can use this DVD to run a live Ubuntu session that displays the GNOME desktop without making any changes to your computer: Boot from the DVD, run an Ubuntu live session, and log off. Your system remains untouched: When you reboot, it is exactly as it was before you ran the Ubuntu live session. Alternatively, you can install Ubuntu from the live session. Chapter 2 helps you get ready to install Ubuntu. Chapter 3 provides step-by-step instructions for installing Ubuntu from this DVD. This book guides you through learning about, using, and administering an Ubuntu Linux system.

DVD features The included DVD incorporates all the features of the live/install Desktop CD as well as the Alternate and Server CDs. It also includes all software packages supported by Ubuntu. You can use it to perform a graphical or textual (command line) installation of either a graphical or a textual Ubuntu system. If you do not have an Internet connection, you can use the DVD as a software repository and install any supported software packages from it.

FEATURES OF THIS BOOK

This book is designed and organized so you can get the most out of it in the shortest amount of time. You do not have to read this book straight through in page order. Instead, once you are comfortable using Linux, you can use this book as a reference: Look up a topic of interest in the table of contents or in an index and read about it. Or think of the book as a catalog of Linux topics: Flip through the pages until a topic catches your eye. The book includes many pointers to Web sites where you can get additional information: Consider the Internet an extension of this book.

A Practical Guide to Ubuntu Linux[®], *Second Edition*, is structured with the following features:

- **Optional sections** enable you to read the book at different levels, returning to more difficult material when you are ready to delve into it.
- **Caution boxes** highlight procedures that can easily go wrong, giving you guidance *before* you run into trouble.
- **Tip boxes** highlight ways you can save time by doing something differently or situations when it may be useful or just interesting to have additional information.
- **Security boxes** point out places where you can make a system more secure. The **security appendix** presents a quick background in system security issues.

- Concepts are illustrated by **practical examples** throughout the book.
- **Chapter summaries** review the important points covered in each chapter.
- **Review exercises** are included at the end of each chapter for readers who want to further hone their skills. Answers to even-numbered exercises are available at www.sobell.com.
- The **glossary** defines more than 500 common terms.
- The chapters that cover servers include **JumpStart** sections that get you off to a quick start using clients and setting up servers. Once a server is up and running, you can test and modify its configuration as explained in the rest of each of these chapters.
- This book provides resources for **finding software** on the Internet. It also explains how to **download** and **install** software using Synaptic, aptitude, the GNOME Add/Remove Applications window, and BitTorrent. It details controlling automatic updates using the Update Notifier and the Update Manager window.
- This book describes in detail many important **GNU tools**, including the GNOME desktop, the Nautilus File Browser, the parted and gparted partition editors, the gzip compression utility, and many command-line utilities that come from the GNU project.
- Pointers throughout the text provide help in obtaining **online documentation** from many sources, including the local system, the Ubuntu Web site, and other locations on the Internet.
- Many **useful URLs** point to Web sites where you can obtain software, security programs and information, and more.
- The multiple **comprehensive indexes** help you locate topics quickly and easily.

KEY TOPICS COVERED IN THIS BOOK

This book contains a lot of information. This section distills and summarizes its contents. In addition, “Details” (starting on page xlv) describes what each chapter covers. Finally, the table of contents provides more detail. This book:

- | | |
|--------------|--|
| Installation | <ul style="list-style-type: none">• Describes how to download Ubuntu Linux ISO images from the Internet and burn the Ubuntu live/install Desktop CD, the DVD, or the Ubuntu Alternate or Server installation CD.• Helps you plan the layout of the system’s hard disk. It includes a discussion of partitions, partition tables, and mount points, and assists you in using the ubiquity or gparted graphical partitioner or the Ubuntu textual partitioner to partition the hard disk. |
|--------------|--|

Working with
Ubuntu Linux

System
administration

- Explains how to set up a dual-boot system so you can install Ubuntu Linux on a Windows system and boot either operating system.
- Describes in detail how to install Ubuntu Linux from a live/install Desktop CD or the live/install DVD using the ubiquity graphical installer. It also explains how to use the textual installer found on the Alternate CD, the Server CD, and the DVD. The graphical installer is fast and easy to use. The textual installer gives you more options and works on systems with less RAM (system memory).
- Covers testing an Ubuntu CD/DVD for defects, setting boot command-line parameters (boot options), and creating a RAID array.
- Covers the details of customizing the X.org version of the X Window System using the Screen and Graphics Preferences window.
- Introduces the GNOME desktop (GUI) and explains how to use desktop tools, including the Top and Bottom panels, panel objects, the Main menu, object context menus, the Workspace Switcher, the Nautilus File Browser, and the GNOME terminal emulator.
- Explains how to use the Appearance Preferences window to add and modify themes to customize your desktop to please your senses and help you work more efficiently.
- Details how to set up 3D desktop visual effects that take advantage of Compiz Fusion.
- Covers the Bourne Again Shell (`bash`) in three chapters, including an entire chapter on shell programming that includes many sample shell scripts. These chapters provide clear explanations and extensive examples of how `bash` works both from the command line in day-to-day work and as a programming language to write shell scripts.
- Explains the textual (command-line) interface and introduces more than 30 command-line utilities.
- Presents a tutorial on the `vim` textual editor.
- Covers types of networks, network protocols, and network utilities.
- Explains hostnames, IP addresses, and subnets, and explores how to use `host` and `dig` to look up domain names and IP addresses on the Internet.
- Covers distributed computing and the client/server model.
- Explains how to use ACLs (Access Control Lists) to fine-tune user access permissions.
- Explains how to use the Ubuntu graphical and textual (command-line) tools to configure the display, DNS, NFS, Samba, Apache, a firewall, a network interface, and more. You can also use these tools to add users and manage local and remote printers.

- Goes into detail about using **sudo** to allow specific users to work with **root** privileges (become Superuser) and customizing the way **sudo** works by editing the **sudoers** configuration file. It also explains how you can unlock the **root** account if necessary.
- Describes how to use the following tools to download and install software to keep a system up-to-date and to install new software:
 - ◆ The **Software Sources** window controls which Ubuntu and third-party software repositories Ubuntu downloads software packages from and whether Ubuntu downloads updates automatically. You can also use this window to cause Ubuntu to download and install security updates automatically.
 - ◆ If you do not have an Internet connection, you can use the **Software Sources** window to set up the DVD included with this book as a software repository. You can then install any software packages that Ubuntu supports from this repository.
 - ◆ Based on how you set up updates in the Software Sources window, the **Update Notifier** pops up on the desktop to let you know when software updates are available. Click the Update Notifier to open the Update Manager window, from which you can download and install updates.
 - ◆ The **Add/Remove Applications** window provides an easy way to select, download, and install a wide range of software packages.
 - ◆ **Synaptic** allows you to search for, install, and remove software packages. It gives you more ways to search for packages than does the Add/Remove Applications window.
 - ◆ **APT** downloads and installs software packages from the Internet (or the included DVD), keeping a system up-to-date and resolving dependencies as it processes the packages. You can use APT from a graphical interface (Synaptic) or from several textual interfaces (e.g., **aptitude** and **apt-get**).
 - ◆ **BitTorrent** is a good choice for distributing large amounts of data such as the Ubuntu installation DVD and CDs. The more people who use BitTorrent to download a file, the faster it works.
- Covers graphical system administration tools, including the many tools available from the GNOME Main menu.
- Explains system operation, including the boot process, **init** scripts, recovery (single-user) and multiuser modes, and steps to take if the system crashes.
- Describes how to use and program the new Upstart **init** daemon, which replaces the System V **init** daemon.

- Describes files, directories, and filesystems, including types of files and filesystems, **fstab** (the filesystem table), and automatically mounted filesystems, and explains how to fine-tune and check the integrity of filesystems.
 - Covers backup utilities, including **tar**, **cpio**, **dump**, and **restore**.
 - Describes compression/archive utilities, including **gzip**, **bzip2**, **compress**, and **zip**.
 - Explains how to customize and build a Linux kernel.
- Security
- Helps you manage basic system security issues using **ssh** (secure shell), **vsftpd** (secure FTP server), Apache (Web server), **iptables** (firewalls), and more.
 - Describes how to use the uncomplicated firewall (**ufw**) to protect the system.
 - Covers using **firestarter** to share an Internet connection over a LAN, run a DHCP server, and set up a basic firewall to protect the system.
 - Provides instructions on using **iptables** to share an Internet connection over a LAN and to build advanced firewalls.
 - Describes how to set up a **chroot** jail to help protect a server system.
 - Explains how to use TCP wrappers to control who can access a server.
- Clients and servers
- Explains how to set up and use the most popular Linux servers, providing a chapter on each: Apache, Samba, OpenSSH, **exim4**, DNS, NFS, FTP, **firestarter** and **iptables**, and NIS/LDAP (all of which are supported by Ubuntu Linux).
 - Describes how to set up a CUPS printer server.
 - Describes how to set up and use a DHCP server either by itself or from **firestarter**.
- Programming
- Provides an all-new chapter explaining the Perl programming language and a full chapter covering shell programming using **bash**, including many examples.

DETAILS

- Chapter 1 **Chapter 1** presents a brief history of Linux and explains some of the features that make it a cutting-edge operating system. The “Conventions Used in This Book” (page 19) section details the typefaces and terminology this book uses.
- Part I Part I, “Installing Ubuntu Linux,” discusses how to install Ubuntu Linux. **Chapter 2** presents an overview of the process of installing Ubuntu Linux, including hardware requirements, downloading and burning a CD or DVD, and planning the layout of the hard disk. **Chapter 3** is a step-by-step guide to installing Ubuntu Linux from a CD or DVD, using the graphical or textual installer. It also shows how to customize your desktop (GUI).

- Part II Part II, “Getting Started with Ubuntu Linux,” familiarizes you with Ubuntu Linux, covering logging in, the GUI, utilities, the filesystem, and the shell. **Chapter 4** introduces desktop features, including the Top and Bottom panels and the Main menu; explains how to use the Nautilus File Browser to manage files, run programs, and connect to FTP and HTTP servers; covers finding documentation, dealing with login problems, and using the window manager; and presents some suggestions on where to find documentation, including manuals, tutorials, software notes, and HOWTOs. **Chapter 5** introduces the shell command-line interface, describes more than 30 useful utilities, and presents a tutorial on the vim text editor. **Chapter 6** discusses the Linux hierarchical filesystem, covering files, filenames, pathnames, working with directories, access permissions, and hard and symbolic links. **Chapter 7** introduces the Bourne Again Shell (bash) and discusses command-line arguments and options, redirecting input to and output from commands, running programs in the background, and using the shell to generate and expand filenames.

Experienced users may want to skim Part II

tip If you have used a UNIX or Linux system before, you may want to skim or skip some or all of the chapters in Part II. Two sections that all readers should take a look at are: “Conventions Used in This Book” (page 19), which explains the typographic and layout conventions used in this book, and “Where to Find Documentation” (page 121), which points out both local and remote sources of Linux and Ubuntu documentation.

- Part III Part III, “Digging into Ubuntu Linux,” goes into more detail about working with the system. **Chapter 8** discusses the GUI (desktop) and includes a section on how to run a graphical program on a remote system and have the display appear locally. The section on GNOME describes several GNOME utilities and goes into more depth about the Nautilus File Browser. **Chapter 9** extends the bash coverage from Chapter 7, explaining how to redirect error output, avoid overwriting files, and work with job control, processes, startup files, important shell builtin commands, parameters, shell variables, and aliases. **Chapter 10** explains networks, network security, and the Internet and discusses types of networks, subnets, protocols, addresses, hostnames, and various network utilities. The section on distributed computing describes the client/server model and some of the servers you can use on a network. Details of setting up and using clients and servers are reserved until Part V.
- Part IV Part IV covers system administration. **Chapter 11** discusses core concepts such as the use of sudo, working with root privileges, system operation, chroot jails, TCP wrappers, general information about how to set up a server, DHCP, and PAM. **Chapter 12** explains the Linux filesystem, going into detail about types of files, including special and device files; the use of fsck to verify the integrity of and repair filesystems; and the use of tune2fs to change filesystem parameters. **Chapter 13** explains how to keep a system up-to-date by downloading software from the Internet and installing it, including examples of using APT programs such as aptitude, apt-get, and apt-cache. It also covers the dpkg software packaging system and the use of some dpkg utilities. Finally, it explains how to use BitTorrent from the command line to download files. **Chapter 14** explains how to set up the CUPS printing

system so you can print on both local and remote systems. **Chapter 15** details customizing and building a Linux kernel. **Chapter 16** covers additional administration tasks, including setting up user accounts, backing up files, scheduling automated tasks, tracking disk usage, and solving general problems. **Chapter 17** explains how to set up a local area network (LAN), including both hardware (including wireless) and software configuration.

Part V Part V goes into detail about setting up and running servers and connecting to them using clients. Where appropriate, these chapters include JumpStart sections that get you off to a quick start in using clients and setting up servers. The chapters in Part V cover the following clients/servers:

- **OpenSSH**—Set up an OpenSSH server and use `ssh`, `scp`, and `sftp` to communicate securely over the Internet.
- **FTP**—Set up a `vsftpd` secure FTP server and use any of several FTP clients to exchange files with the server.
- **Mail**—Configure `exim4` and use Webmail, POP3, or IMAP to retrieve email; use SpamAssassin to combat spam.
- **NIS and LDAP**—Set up NIS to facilitate system administration of a LAN and LDAP to maintain databases.
- **NFS**—Share filesystems between systems on a network.
- **Samba**—Share filesystems and printers between Windows and Linux systems.
- **DNS/BIND**—Set up a domain nameserver to let other systems on the Internet know the names and IP addresses of local systems they may need to contact.
- **firestarter, ufw, and iptables**—Share a single Internet connection between systems on a LAN, run a DHCP server, and set up a firewall to protect local systems.
- **Apache**—Set up an HTTP server that serves Web pages that browsers can display. This chapter includes many suggestions for increasing Apache security.

Part VI Part VI covers two important programming tools that are used extensively in Ubuntu system administration and general-purpose programming. **Chapter 27** continues where Chapter 9 left off, going into greater depth about shell programming using `bash`, with the discussion enhanced by extensive examples. **Chapter 28** introduces the popular, feature-rich Perl programming language, including coverage of regular expressions and file handling.

Part VII Part VII includes appendixes on regular expressions, helpful Web sites, system security, and free software. This part also includes an extensive glossary with more than 500 entries plus the JumpStart index, the File Tree index, the Utility index, and a comprehensive traditional index.

SUPPLEMENTS

The author's home page (www.sobell.com) contains downloadable listings of the longer programs from this book as well as pointers to many interesting and useful Linux sites on the World Wide Web, a list of corrections to the book, answers to even-numbered exercises, and a solicitation for corrections, comments, and suggestions.

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I PREFACE

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I take responsibility for any errors and omissions in this book. If you find one or just have a comment, let me know (mgs@sobell.com) and I will fix it in the next printing. My home page (www.sobell.com) contains a list of errors and credits those who found them. It also offers copies of the longer scripts from the book and pointers to interesting Linux pages on the Internet.

*Mark G. Sobell
San Francisco, California*