Beginning Ubuntu LTS Server Administration

From Novice to Professional, Second Edition

Sander van Vugt

Apress®

Beginning Ubuntu LTS Server Administration: From Novice to Professional, Second Edition

Copyright © 2008 by Sander van Vugt

All rights reserved. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage or retrieval system, without the prior written permission of the copyright owner and the publisher.

ISBN-13 (pbk): 978-1-4302-1082-5

ISBN-13 (electronic): 978-1-4302-1081-8

Printed and bound in the United States of America 9 8 7 6 5 4 3 2 1

Trademarked names may appear in this book. Rather than use a trademark symbol with every occurrence of a trademarked name, we use the names only in an editorial fashion and to the benefit of the trademark owner, with no intention of infringement of the trademark.

Java™ and all Java-based marks are trademarks or registered trademarks of Sun Microsystems, Inc., in the US and other countries. Apress, Inc., is not affiliated with Sun Microsystems, Inc., and this book was written without endorsement from Sun Microsystems, Inc.

Lead Editor: Frank Pohlmann
Technical Reviewers: Tim Hall, Samuel Cuella
Editorial Board: Clay Andres, Steve Anglin, Ewan Buckingham, Tony Campbell, Gary Cornell, Jonathan Gennick, Matthew Moodie, Joseph Ottinger, Jeffrey Pepper, Frank Pohlmann, Ben Renow-Clarke, Dominic Shakeshaft, Matt Wade, Tom Welsh
Project Manager: Beth Christmas
Copy Editor: Nancy Sixsmith
Associate Production Director: Kari Brooks-Copony
Production Editor: Liz Berry
Compositor: Dina Quan
Proofreader: Liz Welch
Indexer: Odessa&Cie
Cover Designer: Kurt Krames
Manufacturing Director: Tom Debolski

Distributed to the book trade worldwide by Springer-Verlag New York, Inc., 233 Spring Street, 6th Floor, New York, NY 10013. Phone 1-800-SPRINGER, fax 201-348-4505, e-mail `orders-ny@springer-sbm.com`, or visit `http://www.springeronline.com`.

For information on translations, please contact Apress directly at 2855 Telegraph Avenue, Suite 600, Berkeley, CA 94705. Phone 510-549-5930, fax 510-549-5939, e-mail `info@apress.com`, or visit `http://www.apress.com`.

Apress and friends of ED books may be purchased in bulk for academic, corporate, or promotional use. eBook versions and licenses are also available for most titles. For more information, reference our Special Bulk Sales–eBook Licensing web page at `http://www.apress.com/info/bulksales`.

The information in this book is distributed on an “as is” basis, without warranty. Although every precaution has been taken in the preparation of this work, neither the author(s) nor Apress shall have any liability to any person or entity with respect to any loss or damage caused or alleged to be caused directly or indirectly by the information contained in this work.

The source code for this book is available to readers at `http://www.apress.com`.

This book is dedicated to Florence.

Contents at a Glance

About the Author xv
About the Technical Reviewers xvii
Introduction xix

CHAPTER 1 Installing Ubuntu Server 1
CHAPTER 2 Getting the Most from the Command Line 29
CHAPTER 3 Performing Essential System Administration Tasks 53
CHAPTER 4 Performing File System Management Tasks 83
CHAPTER 5 Configuring Your Server for Security 117
CHAPTER 6 Setting the System to Your Hand 153
CHAPTER 7 Running It Any Way You Like 191
CHAPTER 8 Making a Connection 223
CHAPTER 9 Configuring Network Infrastructure Services 265
CHAPTER 10 Using Ubuntu Server As a File and Print Server 299
CHAPTER 11 Setting Up Web Services 325
CHAPTER 12 Setting Up the Netfilter Firewall with iptables and ufw 351
CHAPTER 13 Multiplying Your Server 363

INDEX 385

Contents

About the Author xv
About the Technical Reviewers xvii
Introduction xix

CHAPTER 1 Installing Ubuntu Server 1

Preparing for the Installation 1
Starting the Ubuntu Server Installation Process 2
Configuring the Server's Hard Drive 8
Completing the Installation 26
Summary 27

CHAPTER 2 Getting the Most from the Command Line 29

Working As root? 29
Working with the Shell 30
Using Bash to Best Effect 30
Managing Bash with Key Sequences 33
Performing Basic File System Management Tasks 34
Working with Directories 34
Working with Files 35
Viewing the Content of Text Files 37
Finding Files That Contain Specific Text 39
Creating Empty Files 41
Piping and Redirection 41
Piping 41
Redirection 42
Finding Files 44
Working with an Editor 45
Vi Modes 46
Saving and Quitting 46
Cut, Copy, and Paste 47
Deleting Text 47

Getting Help 47
Using man to Get Help 48
Using the --help Option 50
Getting Information on Installed Packages 50
Summary 51

CHAPTER 3 Performing Essential System Administration Tasks 53

Software Management 53
Software Repositories and Package Databases 54
Package Management Utilities 55
Understanding apt 56
Installing Software from Tarballs 63
Configuring a Graphical User Interface 64
Creating Backups 69
Making File Backups with tar 69
Making Device Backups Using dd 72
Configuring Logging 73
Configuring syslog 74
Logging in Other Ways 78
Rotating Log Files 79
Summary 81

CHAPTER 4 Performing File System Management Tasks 83

Mounting Disks 83
Using the mount Command 83
Unmounting Devices 88
Automating Mounts with /etc/fstab 89
Checking File System Integrity 92
Working with Links 93
Why Use Links? 93
Working with Symbolic Links 93
Working with Hard Links 96
Configuring Storage 96
Comparing File Systems 96
Creating File Systems 105
Working with Logical Volumes 108
Doing Magic on Your File Systems with dd 113
Summary 116

CHAPTER 5 Configuring Your Server for Security 117

Setting Up User Accounts. 117
Commands for User Management 117
Managing Passwords 120
Modifying and Deleting User Accounts 122
Behind the Commands: Configuration Files 122
Creating Groups. 126
Commands for Group Management 127
Behind the Commands: /etc/group. 127
Using Group Passwords 128
Managing the User's Shell Environment 128
Configuring Permissions 129
Read, Write, and Execute: The Three Basic Linux Permissions . . . 129
Permissions and the Concept of Ownership 130
Working with Advanced Linux Permissions 132
Setting Permissions. 134
Using umask to Set Default Permissions for New Files 136
Working with Access Control Lists 136
Preparing the File System for ACLs 137
ACL Limitations 140
Applying File Attributes. 140
Apply Quota to Allow a Maximum Amount of Files 142
Installing the Quota Software. 142
Preparing the File System for Quota. 142
Initializing Quota. 143
Setting Quota for Users and Groups 143
Understanding Pluggable Authentication Modules 144
Creating a Default Security Policy. 146
Discovering PAM Modules 147
Configuring Administrator Tasks with sudo 150
Summary. 152

CHAPTER 6 Setting the System to Your Hand 153

Process Monitoring and Management. 153
Different Kinds of Processes 153
Foreground and Background 154
Managing Processes. 156
Other Tools to Monitor System Activity 160
Setting Process Priority. 163

Executing Processes Automatically 163
Configuring cron 164
Executing Once with at 166
Tuning the Boot Procedure 166
Managing the GRUB Boot Loader 167
The GRUB Configuration File 167
Installing GRUB 170
Working with the GRUB Boot Menu 171
Upstart 172
Runlevels 174
Making Service Management Easier 175
Managing Hardware 176
Kernel Management 177
Installing Your Own Custom Kernel 183
Hardware Management with udev 186
Summary 190

CHAPTER 7 Running It Any Way You Like 191

Before You Even Start 191
To Script or Not to Script? 191
What Shell? 192
Basic Elements of a Shell Script 193
Making It Executable 194
Making a Script Interactive 196
Working with Arguments 197
Working with Variables 200
Command Substitution 200
Changing Variables 201
Substitution Operators 201
Pattern-Matching Operators 203
Performing Calculations in Scripts 205
Using Flow Control 209
Using if...then...else 210
Case 213
Using while 214
Using until 215
Using for 216

Using a Stream Editor 217
Working with Functions 218
A Complex Scripting Example 219
Summary 221

CHAPTER 8 Making a Connection 223

Configuring the Network Card 223
Using ifup, ifdown, and Related Tools 225
Using ifconfig 225
Using the ip Tool 228
Managing IPv6 231
Managing Routes 234
Configuring the DNS Resolver 235
Configuring Network Card Properties with the ethtool Command 237
Troubleshooting Network Connections 240
Testing Connectivity 240
Testing Routability 242
Testing Availability of Services 243
Monitoring the Network Interface 247
Monitoring Network Traffic 250
Connecting Remotely with SSH 252
Working with Public/Private Key Pairs 253
Working with Secure Shell 254
Configuring SSH 255
Using Key-Based Authentication 257
A Short Introduction to Cryptography 257
Using Public/Private Key–Based Authentication in an SSH Environment 258
Setting Up SSH for Key-Based Authentication 259
Caching Keys with ssh-agent 260
Tunneling Traffic with SSH 261
X Forwarding 261
Generic TCP Port Forwarding 262
Summary 263

CHAPTER 9 Configuring Network Infrastructure Services 265

Configuring DNS 265
Methods of Name Resolution 265
Structure of the DNS Hierarchy 267
Introducing Forward and Reverse DNS 271
Configuring DNS 271
Configuring Reversed Lookup 277
Testing Your Name Server 278
Configuring DHCP 279
Understanding the DHCP Protocol 279
Creating the DHCP Server Configuration 280
The DHCP Process 280
The /etc/dhcp/dhcpd.conf Configuration File 280
Advanced DHCP Configuration Options 283
The DHCP Relay Agent 286
Configuring NTP 286
How NTP Works 287
Configuring a Stand-Alone NTP Time Server 288
Pulling or Pushing the Time 289
Configuring an NTP Client 289
Checking NTP Synchronization Status 290
Customizing Your NTP Server 291
Applying NTP Security 292
Starting Services with xinetd 292
Setting up xinetd by Hand 293
Tuning Access to Services with TCP Wrapper 294
Summary 297

CHAPTER 10 Using Ubuntu Server As a File and Print Server 299

Setting Up a CUPS Print Server 299
Adding Printers 299
Sharing Printers 302
Managing Printers 303
Accessing CUPS Printers 304
Sharing Files with NFS 305
Using the NFS Server 306
Understanding How the NFS Works 306
Configuring an NFS Server 308

Configuring an NFS Client 310
Monitoring the NFS Server 311
Sharing Files with Samba 311
Samba Server Possibilities and Impossibilities 312
Configuring the Samba Server 312
Integrating CUPS with Samba 317
Setting Up Samba As a Domain Controller 319
Client Access to the Samba Server 321
Summary 323

CHAPTER 11 Setting Up Web Services 325

Setting Up Apache 325
Apache Components 326
Starting, Stopping, and Testing the Apache Web Server 326
Exploring the Configuration Files 328
The Structure of the Apache Configuration Files 329
Checking the Configuration 330
Working with Virtual Hosts 332
Configuring Virtual Hosts 332
Managing Access to the Web Server 333
Configuring Host-Based Access Restrictions 334
Configuring User-Based Access Restrictions 335
Enabling HTTPS 336
Creating a Self-Signed Certificate 337
Configuring Apache to Use the Self-Signed Certificate 338
Some Words on Apache Performance Tuning 339
Using PHP 340
Setting Up MySQL 341
Setting the MySQL Root Password 342
Creating a MySQL Database 342
Configuring a Squid Proxy Server 342
Installing a Squid Proxy Cache 343
Configuring Squid Access Control Policies 343
Configuring User Authentication 345
Setting Up FTP 347
Configuring the pure-ftpd Server 347
Summary 349

CHAPTER 12 Setting Up the Netfilter Firewall with iptables and ufw 351

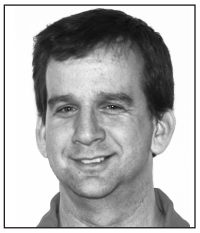
Netfilter Building Blocks 352
Using iptables to Create a Firewall 353
Firewall Management Made Easy: Uncomplicated Firewall 360
Summary 361

CHAPTER 13 Multiplying Your Server 363

Understanding Virtualization 363
Virtualization Solutions 363
Approaches to Virtualization 365
Installing Virtual Machines with KVM 366
Preparing Your Server for KVM Virtualization: Networking 367
Setting Up KVM on Ubuntu Server 367
Installing Windows As a Guest Operating System on KVM 368
Installing Ubuntu Server As a Guest Operating System on KVM 370
Managing Virtual Machines with Virtual Manager 370
Managing Virtual Machines with libvirt Tools 374
Installing Virtual Machines Using Xen 376
Setting Up Xen on Ubuntu Server 377
Installing Windows as a Guest Operating System on Xen 379
Installing Ubuntu Server As a Guest Operating System on Xen 381
Using Xen Management Commands 382
Ubuntu Server in a VMware Environment 383
Ubuntu JeOS 383
Summary 384

INDEX 385

About the Author



SANDER VAN VUGT is an independent trainer and consultant who lives in the Netherlands and works in the extended EMEA (Europe, Middle East, and Africa) area. He specializes in Linux high availability, storage solutions, and performance problems; and has successfully implemented Linux clusters across the globe. Sander has written several books about Linux-related subjects, including *The Definitive Guide to SUSE Linux Enterprise Server* (Apress, 2006).

Sander's articles can be found on several international web sites and in magazines such as *SearchEnterpriseLinux.com, Linux Journal*, and *Linux Magazine*. He works as a volunteer for the Linux Professional Institute (LPI), contributing topics for different certification levels. Most important, Sander is the father of Alex and Franck, and is the loving husband of Florence.

For more information, consult Sander's web site: `www.sandervanvugt.com`. Sander can be reached by email at `mail@sandervanvugt.com`.

About the Technical Reviewers

SAMUEL CUELLA was born in 1985. He is currently an IT student and also works as a Linux/Solaris trainer. Samuel taught the complete Mandriva certification program in China (JUST University) and also teaches Linux for LPI certification training.

TIM HALL currently provides front-line support for 64 Studio. He has also written newbie tutorials for *Linux User & Developer* magazine in between more mundane system admin and web authoring jobs. Tim has released albums and performed as a musician and songwriter, both solo and in collaboration with other artists. He has been further honored as the holder of the Bardic chair of Glastonbury between 2005 and 2007.

Introduction

Beginning Ubuntu LTS Server Administration: From Novice to Professional, Second Edition provides a complete introduction to Ubuntu Server. I wrote it for people who are new to Ubuntu Server administration but have a solid foundation in IT. The target readers are Windows administrators as well as people who are used to managing other flavors of Linux (or UNIX). It was the goal of this book to give a no-nonsense introduction to working with Ubuntu Server, so it provides all the basics that are needed to get you going. It also includes many useful tips that help you do your work in a more efficient manner.

Many books about Ubuntu are presently available, but you can't do Ubuntu Server justice by covering both the desktop and the server version in one book. The needs of a server administrator are vastly different from the needs of a desktop administrator. So I chose an approach that makes sense for the server administrator, and all topics are selected and organized to make sense for your day-to-day work as a server administrator.

Who This Book Is For

This book is written for Linux administrators, whether novice or experienced, who are looking for a quick, thorough, and authoritative introduction to daily Ubuntu Server management.

How This Book Is Structured

The book starts by describing Ubuntu Server, with a special focus on storage configuration, which is an especially important concern when dealing with server environments. You'll then find a quick introduction to driving Ubuntu Server from the command line, in case you haven't done this before. The third chapter tackles some of the common generic tasks of a server administrator, including managing software packages and configuring a graphical user interface. Next are chapters about file system management, Ubuntu Server security, managing processes, and the boot procedure. The last chapter, which deals with stand-alone server functionality, explains Bash shell scripting—in fewer than 30 pages, you'll learn everything you ever need to know about this complex topic.

The second part of the book teaches you all about network services. First, you'll learn how to configure and troubleshoot a network interface. Next, you'll read how to set up infrastructure services such as time services, name services, and DHCP. The following chapters discuss managing file services, the Apache web server (including performance tuning hints and a section on virtual hosts), and related packages such as MySQL. Finally, the last chapter provides an overview of the approaches to running virtualization on Ubuntu Server.

Prerequisites

To get the most out of this book, you should have a computer that you can use to install Ubuntu Server. Any Pentium-based system with 128 MB of RAM and a hard disk with at least 2 GB of free space will do fine. You also need the Ubuntu Server software, which you can download from `www.ubuntu.com`. Apart from these simple elements, there are no further prerequisites. This book assumes no preliminary knowledge of Linux or Ubuntu.

Downloading the Code

The source code for this book is available at `www.apress.com` in the Downloads section of this book's home page. Please feel free to visit the Apress web site and download all the code there. You can also check for errata and find related Apress titles.

Contacting the Author

The author can be reached via his web site (`www.sandervanvugt.com`) and by mail at `mail@sandervanvugt.com`.