Pro Ubuntu Server Administration

Sander van Vugt

Apress®

Pro Ubuntu Server Administration

Copyright © 2009 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): 978-1-4302-1622-3

ISBN-13 (electronic): 978-1-4302-1623-0

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.

Lead Editor: Frank Pohlmann
Technical Reviewer: Samuel Cuella
Editorial Board: Clay Andres, Steve Anglin, Mark Beckner, Ewan Buckingham, Tony Campbell, Gary Cornell, Jonathan Gennick, Michelle Lowman, Matthew Moodie, Jeffrey Pepper, Frank Pohlmann, Ben Renow-Clarke, Dominic Shakeshaft, Matt Wade, Tom Welsh
Project Manager: Beth Christmas
Copy Editor: Bill McManus
Associate Production Director: Kari Brooks-Copony
Production Editor: Elizabeth Berry
Compositor: Linda Weidemann
Proofreader: Liz Welch
Indexer: Becky Hornyak
Artist: April Milne
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.

This book is dedicated to Florence.
And the next, and the next, and all of them, always.

Contents at a Glance

Foreword xv
About the Author xvii
About the Technical Reviewer xix
Introduction xxi

CHAPTER 1 Performing an Advanced Ubuntu Server Installation 1
CHAPTER 2 Using Ubuntu Server for System Imaging 29
CHAPTER 3 Performance Monitoring 45
CHAPTER 4 Performance Optimization 83
CHAPTER 5 Advanced File System Management 109
CHAPTER 6 Network Monitoring 131
CHAPTER 7 Creating an Open Source SAN 161
CHAPTER 8 Configuring OpenLDAP 197
CHAPTER 9 Integrating Samba 231
CHAPTER 10 Configuring Ubuntu Server As a Mail Server 249
CHAPTER 11 Managing Ubuntu Server Security 281
CHAPTER 12 Configuring Ubuntu Server As a VPN Server 303
CHAPTER 13 Configuring Kerberos and NTP on Ubuntu Server 321
CHAPTER 14 Ubuntu Server Troubleshooting 343

INDEX 383

Contents

Foreword xv
About the Author xvii
About the Technical Reviewer xix
Introduction xxi

CHAPTER 1 Performing an Advanced Ubuntu Server Installation 1

What's So Special About an Enterprise Installation? 1
Server Hardware 2
Connection to a SAN 2
Authentication Handling 3
Preparing for the Installation in a Network 3
Which RAID? 4
Choosing a File System 5
Installing Ubuntu Server 7
Starting the Installation 8
Creating a Software-Based RAID Solution 9
Creating LVM Logical Volumes on Top of a Software RAID Device 16
Completing the Installation 22
Post-Installation Tasks 24
Setting Up NIC Bonding 24
Setting Up Multipathing 26
Summary 28

CHAPTER 2 Using Ubuntu Server for System Imaging 29

Setting Up a Clonezilla Imaging Server 29
Setting Up Diskless Remote Boot in Linux 30
Installing the DRBL Software 31
Configuring the DRBL Software 32
Setting Up the DHCP Server 33
Completing Clonezilla Configuration 35
Configuring the Clients for Cloning 36
Setting Up the Server for Cloning 37
Cloning the Client 39
Summary 43

CHAPTER 3 Performance Monitoring 45

Interpreting What Your Computer Is Doing: top 45
CPU Monitoring with top 46
CPU Performance Monitoring 48
Memory Monitoring with top 49
Process Monitoring with top 50
Analyzing CPU Performance 51
Finding Memory Problems 57
Monitoring Storage Performance 65
Monitoring Network Performance 72
Performance Baselining 80
Summary 81

CHAPTER 4 Performance Optimization 83

Strategies for Optimizing Performance 83
About /proc and sysctl 83
Applying a Simple Test 85
CPU Tuning 87
Understanding CPU Performance 87
Optimizing CPU Performance 88

Tuning Memory 91
Understanding Memory Performance 91
Optimizing Memory Usage 92
Tuning Storage Performance 96
Understanding Storage Performance 96
Optimizing the I/O Scheduler 97
Optimizing Reads 98
Network Tuning 98
Tuning Kernel Parameters 98
Optimizing TCP/IP 100
Some Hints on Samba and NFS Performance Optimization 105
Generic Network Performance Optimization Tips 106
Summary 107

CHAPTER 5 Advanced File System Management 109

Understanding File Systems 109
Inodes and Directories 110
Superblocks, Inode Bitmaps, and Block Bitmaps 112
Journaling 114
Indexing 115
Optimizing File Systems 116
Optimizing Ext2/Ext3 116
Tuning XFS 124
What About ReiserFS? 128
Summary 130

CHAPTER 6 Network Monitoring 131

Starting with Nagios 131
Configuring Nagios 135
Location of the Configuration Files 135
The Master Configuration File: nagios.cfg 136
Creating Essential Nagios Configuration Files 138

Installing NRPE 152
Configuring NRPE on the Monitored Server 152
Configuring the Nagios Server to Use NRPE 154
Managing Nagios 155
Summary 159

CHAPTER 7 Creating an Open Source SAN 161

Preparing Your Open Source SAN 163
Hardware Requirements 163
Installing Required Software 163
Setting Up the Distributed Replicated Block Device 164
Accessing the SAN with iSCSI 169
Configuring the iSCSI Target 169
Configuring the iSCSI Initiator 173
Setting Up Heartbeat 175
Setting Up the Base Cluster from /etc/ha.d/ha.cf 175
Configuring Cluster Resources 180
Backing Up the Cluster Configuration 187
Configuring STONITH 191
Heartbeat Beyond the Open Source SAN 194
Summary 195

CHAPTER 8 Configuring OpenLDAP 197

Using the LDAP Directory 197
Introducing OpenLDAP 201
Configuring OpenLDAP 202
Installing OpenLDAP 202
Configuring the Server 203
Adding Information to the LDAP Database 215
Using ldapsearch to Verify Your Configuration 217

Using LDAP Management Commands 220
Modifying Entries in the LDAP Database 221
Deleting Entries from the LDAP Database 222
Changing a Password 222
Logging In to an LDAP Server 223
Configuring PAM for LDAP Authentication 223
Setting Up nsswitch.conf to Find LDAP Services 228
Testing LDAP Client Connectivity 230
Summary 230

CHAPTER 9 **Integrating Samba** 231

Setting Up Samba the Easy Way 231
Creating a Local Directory to Share 232
Applying Permissions to the Local Directory 232
Defining the Share 232
Creating a Samba User Account 235
Testing Access to the Share 235
Integrating Samba with LDAP 236
Preparing Samba to Talk to LDAP 236
Preparing LDAP to Work with Samba 237
Telling Samba to Use LDAP 238
Using Samba As a Primary Domain Controller 241
Changing the Samba Configuration File 241
Creating Workstation Accounts 243
Integrating Samba in Active Directory 244
Making Samba a Member of the Active Directory Domain 244
Using Kerberos to Make Samba a Member of Active Directory . . . 245
Authenticating Linux Users on Windows with Winbind 245
Summary 247

CHAPTER 10 Configuring Ubuntu Server As a Mail Server 249

Understanding the Components of a Mail Solution 249
Configuring the Postfix MTA 250
Handling Inbound and Outbound Mail 251
Installing Postfix and Configuring the Initial Settings 256
Configuring Postfix Further 257
Managing Postfix Components 262
Configuring the Master Daemon 263
Configuring Global Settings 264
Configuring a Simple Postfix Mail Server 267
Tuning Postfix with Lookup Tables 269
Using Postfix Management Tools 273
Receiving E-mail Using IMAP or POP3 274
Fetching E-mail Using Cyrus IMAPd 275
Filtering Incoming E-mail with procmail 278
Getting E-mail with POP3 Using Qpopper 279
Summary 280

CHAPTER 11 Managing Ubuntu Server Security 281

Managing Cryptography 281
Introduction to SSL 282
Public and Private Keys 282
The Need for a Certificate Authority 283
Creating a Certificate Authority and Server Certificates 284
Securing Applications with AppArmor 290
AppArmor Components 290
Installing and Starting AppArmor 293
Creating and Managing AppArmor Profiles 294
Updating a Profile 299
Monitoring AppArmor's Status 299
Summary 302

CHAPTER 12 Configuring Ubuntu Server As a VPN Server 303

Installing and Configuring OpenVPN 303
VPN Networking 304
Generating Certificates 305
Configuring the VPN Server 313
Configuring a Linux VPN Client 316
Configuring Windows Clients 320
Summary 320

CHAPTER 13 Configuring Kerberos and NTP on Ubuntu Server 321

Configuring an NTP Time Server 321
How NTP Works 322
Customizing Your NTP Server 327
Understanding Kerberos 329
Installing and Configuring Kerberos 330
Configuring the Kerberos Server 332
Configuring Generic Kerberos Settings 332
Configuring the KDC Settings 335
Configuring the Kerberos Client 339
Configuring Simple Kerberos Applications 339
Logging In with Kerberos 340
Summary 341

CHAPTER 14 Ubuntu Server Troubleshooting 343

Identifying the Problem 344
Troubleshooting Tools 351
Working with init=/bin/bash 351
Rescue a Broken System 353
Working with a Knoppix Rescue CD 357

Common Problems and How to Fix Them 360
Grub Errors 361
No Master Boot Record 364
Partition Problems 365
LVM Logical Volume Problems 368
Kernel Problems 375
File System Problems 378
Lost Administrator Password 380
Summary 381

INDEX 383

Foreword

Several months ago, we received a post to the `ubuntu-server` mailing list from Sander van Vugt. Sander explained that he was writing an advanced book on Ubuntu Server administration, as well as a second edition of his *Beginning Ubuntu Server Administration*. Sander solicited ideas and asked for feedback. Though several books have been published on Ubuntu Server Edition, this is the first time, to my knowledge, that feedback has been sought from the Ubuntu Server community. We are grateful for the chance to help, and some of the suggestions made by Ubuntu Server Edition's developers and users appear in the pages of this book.

This book covers Ubuntu 8.04 LTS Server Edition, sometimes referred to by its codename "Hardy Heron." Ubuntu releases an LTS (Long Term Support) edition about every two years. The LTS designation indicates that this release will be maintained and supported for five years by Canonical Ltd., the commercial sponsor of Ubuntu. By focusing on the LTS edition, Sander ensures that this book will be a useful addition to your library.

I am thankful to Sander for writing a book targeted at professional administrators. I think that it comes at a perfect time for Ubuntu Server Edition. We worked hard to make Ubuntu 8.04 our most enterprise-ready version yet, and this book is targeted at the enterprise administrators who need to know about Ubuntu Server's advanced features. Among the new and updated features are the following:

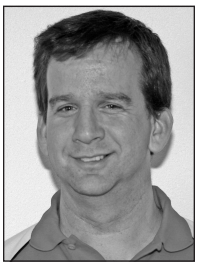
- Integrated host firewalling to protect Internet-facing servers
- Added AppArmor policies and increased kernel hardening
- Increased range of storage capabilities, including iSCSI and DRBD
- Sun's OpenJDK, new to Ubuntu Server in the Ubuntu 8.04 distribution
- Active Directory integration, provided by Likewise Open
- Added KVM virtualization support

I think the fact that this book is focused on the enterprise users, that it covers the LTS edition, and that Sander asked for Ubuntu Server community feedback all add up to making this a good book. I hope that it is useful to you, and helps you in your adoption of Ubuntu Server Edition.

One last word about the Ubuntu Server community. Though Ubuntu has a corporate sponsor, a large portion of the work is done by the community. Who is the community? Anyone who submits a bug report, helps package applications, writes documentation, answers questions from other users on the mailing list or IRC, or helps testing. We would love for you to get involved and help us make Ubuntu Server even better than it is now. I encourage you to visit `https://wiki.ubuntu.com/ServerTeam/` for more information.

Rick Clark
Engineering Manager, Ubuntu Server Edition

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) and *Beginning Ubuntu Server Administration* (Apress, 2008).

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 e-mail at `mail@sandervanvugt.com`.

About the Technical Reviewer

SAMUEL CUELLA, born in 1985, currently is an IT student and 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. He is a Novell Certified Linux Professional (CLP).

Introduction

This book is about advanced Ubuntu Server administration. In this book you will read about topics that normally are of interest to experienced administrators. The typical reader of this book will already know how to handle basic tasks such as managing files, users, permissions, and services such as Apache and Samba.

I have written this book around some major themes. First of them is administering Ubuntu Server in the data center. This theme covers typical issues that you'll encounter only when installing Ubuntu Server in an enterprise environment, such as connecting the server to the SAN or configuring Ubuntu Server as a Clonezilla imaging server. You'll also learn how to set up high availability for services running on Ubuntu Server.

The second major theme is performance and troubleshooting. There is a chapter about performance monitoring and analysis, which is followed by a chapter about performance optimization. You'll also find a chapter about file system monitoring and optimization. The last chapter in the book provides extensive coverage of Ubuntu Server troubleshooting.

The next theme comprises advanced options offered by network services. You'll learn how to set up an OpenLDAP Directory server, how to connect your Samba server to that Directory server, and how to configure Ubuntu Server as a mail server.

The last theme is security. This starts with an introduction to OpenSSL and the configuration of a certificate authority. The chapter on OpenVPN delves further into the topic of certificates, and the chapter on Kerberos shows how you can use Kerberos to set up secure authentication for different services. You'll also find some in-depth information about the configuration of AppArmor to protect your applications.

I hope that this book meets your requirements and that you enjoy reading it as much as I have enjoyed writing it!