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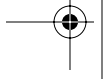
# Preface

## ABOUT THIS BOOK

**L***inux on HP Integrity Servers: System Administration for Itanium-Based Systems* covers the Linux operating system on Itanium<sup>®</sup>-based HP servers, called the Integrity server family, running Red Hat Enterprise Linux (RHEL).

This book starts out with extensive coverage of booting HP Integrity servers. These servers can run multiple operating systems so the boot process is important to understand. The boot process is substantially different than it is on HP Precision Architecture-based systems, called the HP 9000 family. The Extensible Firmware Interface (EFI) is an important part of booting HP Integrity servers, so I spend a significant amount of time on EFI in Chapter 1.

I then cover loading Linux on an HP Integrity server in Chapter 2. The installation is done in console-only mode since you may very well have an HP server without a graphics display on it. The graphics-based installation is nearly identical to that of loading an IA-32 system with Linux, so I didn't want to cover the same information that appears in many other Linux books. To load Linux on an HP Integrity server, you first load the *HP Enablement Kit for Linux*, which is a set of tools that provide a framework for installing, configuring, and recovering a Linux distribution on our Integrity servers. The kit is completely distribution agnostic, meaning that it is





independent of a Linux distribution. For this book, we'll be loading Red Hat Enterprise Linux (RHEL). However, much of the information applies to any Linux distribution that is supported on Integrity servers. The **elilo** program you'll use to bootstrap the Integrity server is provided as part of the *HP Enablement Kit for Linux*.

This book then covers many additional system administration topics in the subsequent chapters.

The versions of Linux that run on Integrity that are used in this book are types of the Red Hat Enterprise Linux (RHEL) family, including versions RHEL 3 and RHEL 2.1. The three members of the RHEL family are Advanced Server, Enterprise Server, and Workstation. The primary difference in these releases, at the time of this writing, has to do with their high-end capabilities. In the examples in this book I use RHEL Advanced Server because it supports greater than two CPUs, a lot of memory, and Itanium-based systems. There are also examples on IA-32 based systems that use other Red Hat releases. There are many Linux background chapters which apply to all Linux systems so the hardware platform, either Integrity servers or IA-32, is not important.

Although the term Itanium is used throughout this book, the current implementation of Itanium is Itanium 2. I just shortened the name to Itanium for easier reading. You may also see the old name of IA-64 appear occasionally in screen shots, but I won't use IA-64 in my text.

Other Linux distributions run on HP Integrity systems such as SUSE LINUX Enterprise Server. I used Red Hat because this release was available at the time I began writing the book and many of my customers were evaluating Integrity servers running Red Hat. In addition to Linux, HP-UX, Windows Server 2003, and OpenVMS run on HP Integrity servers. Some of the book's examples show the boot process in which Linux, Windows, and HP-UX are all loaded on the same HP Integrity server. Different operating systems run in different hard partitions, called Node Partitions (nPartitions or nPars for short) on HP Integrity servers. This capability is new at the time of this writing and will be enhanced dramatically by HP in the coming months and years.

This is the first edition of this book, but to keep up with the many advancements that will take place, you can expect several revisions in the future. I want to receive your feedback on this book and topics that you'd like to see covered in future revisions. Please send your thoughts to me at the following email address:

marty.poniatowski@hp.com





## Linux Components

This how-to book doesn't have a lot of background information in any of the chapters. This book illustrates how to get important tasks done. The next few pages provide some Linux background that covers the structure of Linux. Figure P-1 is a high-level depiction of a Linux system.

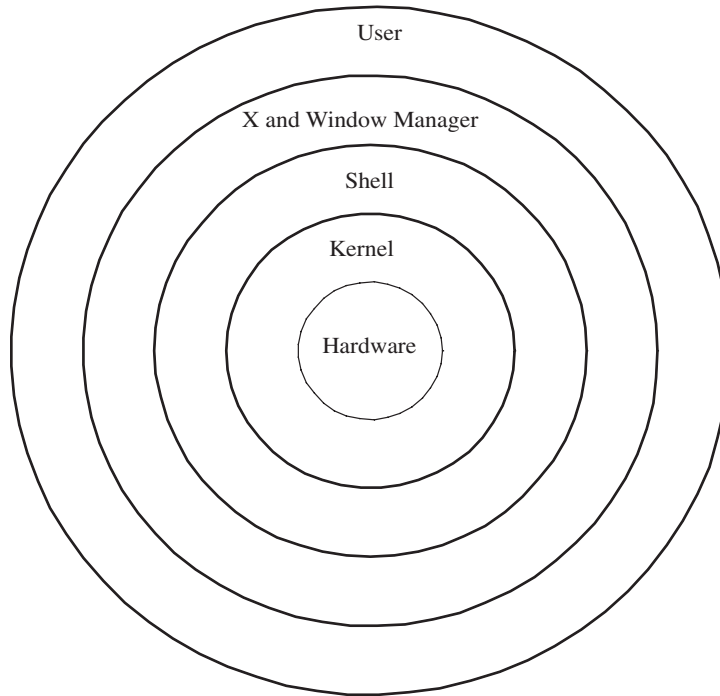


Figure P-1 High-Level Linux System Structure

Before describing this figure, note that everyone has a somewhat different way of viewing the components of Linux. This figure contains the most important components from a user perspective.





At the heart of Figure P-1 is the hardware. Linux, in its many forms, now runs on many different types of hardware. I have melded the Integrity and IA-32 hardware on which Linux runs throughout this book and have pointed out the areas of Red Hat Enterprise Linux (RHEL) that are peculiar to HP Integrity servers.

The next circle from the center of this diagram is the kernel. The kernel performs many functions including management of devices, memory, and processes; scheduling and execution of all commands; and containment of drivers that control system hardware. The kernel is an aspect of the system that system administrators spend a lot of time maintaining. When a new device is configured, a device driver may have to be added to the kernel to support the new device. There is also substantial tuning that can be performed to the kernel to optimize system performance for the application(s) running on the Linux system. Users have only indirect interaction with the kernel through the commands you issue that work their way to the kernel.

The next circle is the shell. The shell takes commands from you and starts the process of executing the commands. In addition to passing commands to more inner layers of the system, the shell also allows you to run commands in the background and run shell programs.

The next circle is the X Window System and the window manager that you run. There is a chapter in the book covering both GNOME and KDE. You usually don't see the graphical user interface as a separate circle in such Linux diagrams, because most of the work done in a graphical user interface works its way down to a shell command. Because many Linux users use a graphical user interface, this warrants its own circle.

The final circle is the user. As a system administrator, you have access to all the components in the diagram.

Another way to view Linux is on a distribution basis. Figure P-1 shows Linux in a generic way. You won't be using a generic Linux: you'll be using a specific distribution, such as Red Hat Enterprise Linux (RHEL) Advanced Server on your HP Integrity servers. Figure P-2 breaks down Linux components in the way in which you'd view them as part of a distribution.



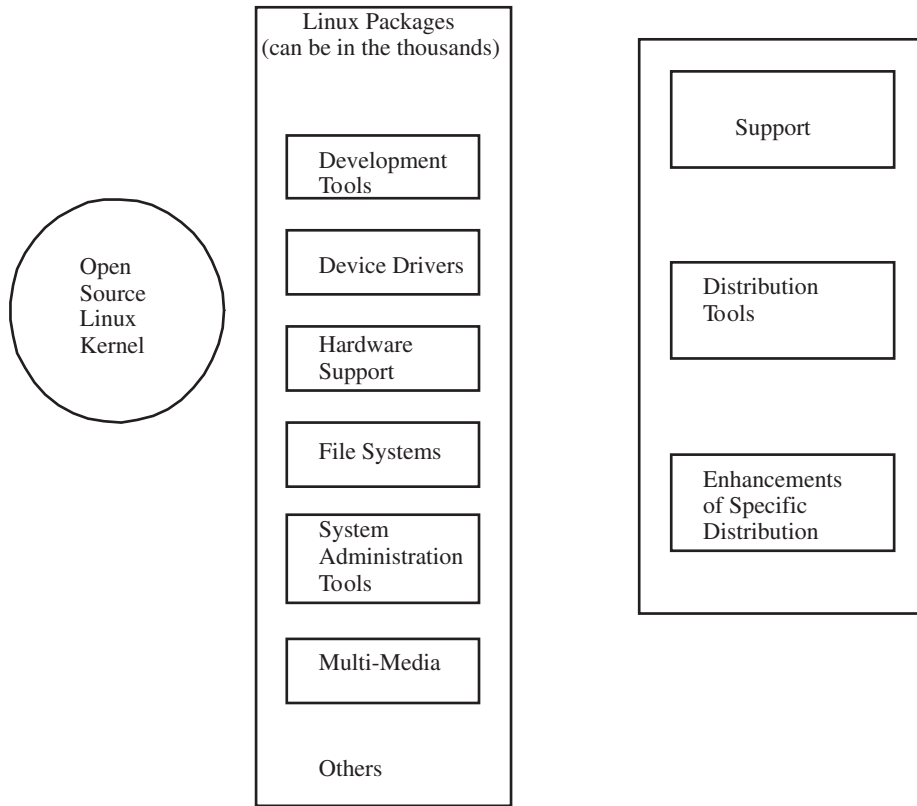


Figure P-2 High-Level Linux Distribution

The high-level depiction of a Linux distribution in Figure P-2 has several components. On the far left is the Linux kernel, which is open-source software and serves as the basis for any Linux distribution. The center components consist of open source modules as well as distribution-specific enhancements. There may be, for instance, open-source system administration tools as well as distribution-specific administration tools that are part of a release. The components on the right are those specific to a distribution, such as the support available.





An additional consideration with Itanium and operating systems is byte ordering. This is often referred to as the endian of an architecture or operating system. Itanium doesn't care about byte ordering and can support both byte ordering methods. Operating systems that store the most significant byte in the leftmost position are big endian. Operating systems that store the most significant byte in the rightmost position are little endian. Linux is a little endian operating system. Linux and Windows are little endian and HP-UX is big endian. All these operating systems run on HP Integrity servers.

Some examples in this book use the "retail" release of Red Hat version 8.x. The "retail" releases of Red Hat, such as 8.x, have been replaced by Fedora. The Fedora Project is a Red Hat-sponsored and community-supported open-source project. Fedora Core 2 is available at the time of this writing.

## Relevant URLs

There are many Web sites that can assist you in your Linux system administration endeavors. I have listed some of the more prominent Linux-related Web sites below as they existed at the time of this writing:

### Extensible Firmware Interface:

<http://www.intel.com/technology/efi>

Technical documentation, including most all HP documents.

Of particular interest at this site are documents on *HP Linux*

*Enablement Kit*, and documents on HP Integrity servers:

<http://www.docs.hp.com>

### Information on Itanium:

<http://www.hp.com/go/itanium>

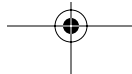
### Information on Integrity servers:

<http://www.hp.com/go/integrity>

### IT Resource Center

(This is essential for every HP-UX administrator):

<http://www.itrc.com>





Linux kernel archive:

*<http://www.kernel.org>*

RPM home page for package management:

*<http://www.rpm.org>*

Red Hat Linux manuals:

*<http://www.redhat.com/docs/manuals/>*

The Linux Documentation Project:

*<http://www.tldp.org>*

GNOME desktop environment site:

*<http://www.gnome.org/>*

Linux on Itanium:

*<http://www.gelato.org>*

An excellent iptables "how to" document:

*<http://www.linuxguruz.org/iptables/howto>*

Software depot home page:

*<http://www.software.hp.com>*

Instant Capacity on Demand (iCOD):

*<http://www.hp.com/go/icod>*

The International Association of HP Computing Professionals:

*<http://www.interex.org>*

Register name servers at:

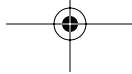
*<http://www.icann.org/registrars/accredited-list.html>*

Information on Perl, including sites to download Perl:

*<http://www.perl.com>*

The Perl Journal:

*<http://www.tpj.com>*





Site devoted to managing and promoting open source:  
*<http://www.opensource.org>*

Linux documentation site:  
*<http://www.linuxdoc.org>*

Office suite software:  
*<http://www.openoffice.org/>*

Web-based management software:  
*<http://www.webmin.com>*

Rute's Linux tutorial:  
*<http://rute.2038bug.com/index.html>*

## Online Manual Pages

Many times in this book, I refer to the online manual pages supplied with Linux. You can get the online manual page for a command by issuing **man** *command\_name*. You can view an online manual page from a specific section by specifying the *section* number. To view the signal man page in section seven, you would issue the following command:

### # man 7 signal

This produces the signal(7) man page. If you were to type just `man signal`, the signal(2) man page would be produced; that is, the man page for signal in section 2 *would be shown*.

Also, see `/usr/share/doc` where most Linx documentation is kept. `/usr/share/doc/<pkg-name>` contains information about packages.





## Acknowledgments

There were too many people involved in helping me with this book to list each and every one. I have, therefore, decided to formally thank those who wrote sections of this book and those who took time to review it. I'm still not sure whether it takes more time to write something or review something that has been written to ensure it is correct.

### Stephen Geary

Stephen is the executive champion and sponsor of this book and played an active role in getting it published.

Stephen Geary, Director, Worldwide Linux R&D, is responsible for overseeing HP's Linux technical strategy, Linux support for HP's Integrity Servers, integrated Linux-based solutions for various markets, and HP's Open Source Program Office. Stephen also has direct responsibility in developing HP's overall Linux and Open Source strategies. Stephen has active roles with the Open Source Development Lab (OSDL) and the Linux Standards Base (LSB). Steve chairs the Data Center Linux Steering Group and is a member of the Carrier Grade Steering Group for the Carrier Grade Linux effort.

Stephen has been with HP for 15 years working in various capacities tied to either HP-UX or Linux. Prior to working for HP, Stephen worked for General Motors as a Fuel Systems Engineer in Flint, Michigan. He holds two bachelor's degrees: a bachelor's degree in mechanical engineering from Michigan Technological University and a bachelor's degree in computer science from Colorado State University, Fort Collins, Colorado.

### The Author - Marty Poniatowski

Marty has been a Solution Architect with Hewlett-Packard Company for 17 years in the New York area. He has worked with hundreds of Hewlett-Packard customers in many industries, including Internet startups, financial services, and manufacturing.

Marty has been widely published in computer-industry trade publications. He has published over 50 articles on various computer-related topics. In addition to this book, he is the author of 13 other Prentice Hall books. *Marty holds an M.S. in Information Systems from Polytechnic University (Brooklyn, NY), an M.S. in Management from the University of Bridgeport (Bridgeport, CT), and a B.S. in Electrical Engineering from Roger Williams University (Bristol, RI).*

Before joining Hewlett-Packard Marty was the manager of a design group at startup Canaan Computer Corporation. His first position was as an Electrical Design Engineer on military computer systems at United Technologies Corporation performing both integrated circuit and board-level design.





## Phil Anderson

Phil assisted with many facets of publishing this book including lining up expert Linux on Integrity reviewers. This book would not have been published without Phil's involvement.

Phil has been with HP since 2001. Prior to HP, Phil's career spanned from software development to product management at AT&T Bell Laboratories, Citigroup, and an internet startup company. Since joining HP, Phil has focused on business planning and product marketing of Linux on Itanium-based HP platforms. He is currently part of the worldwide marketing team for Linux on the HP Integrity server family.

## Glen Foster

Glen reviewed every chapter of this book to ensure that all the Linux on Integrity server information is correct. Glen spent a tremendous amount of time reviewing this book, and it could not have been published if it weren't for his herculean effort.

Glen came back to HP just prior to the 2002 merger vote that eventually combined Hewlett-Packard and Compaq Computer Corp. into the industry-leading company it is today. Before his return to HP, Glen was most recently the Director of Quality Assurance for Red Hat, Inc., and prior to that, Director of Quality Assurance for Softway Systems, Inc. Glen is now the lead of the QA department of the Linux and Open Source Lab, concentrating on Integrity hardware and firmware and making Linux distributions a safer and more cost-effective offering for HP's customers.

## Elizabeth Zinkann

Elizabeth reviewed all the chapters in this book.

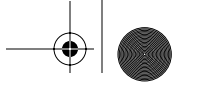
Elizabeth is a Contributing Editor and Review Columnist for *Sys Admin Magazine*, *The Journal for UNIX System Administrators*. Her articles have also appeared in *Performance Computing*, *Linux Magazine*, and *Network Administrator*. As an independent computer consultant, she has built Linux servers, maintained computers utilizing Linux, Solaris, Macintosh, and Windows environments, and taught UNIX, shell programming, and Internet essentials. In a former life, she also programmed communications features for both domestic and international databases at AT&T Network Systems.

## Steven M. Wolff

Steven supplied the valuable command summaries that appear in Chapter 1.

Steven came to HP as a result of HP's acquisition of Convex in 1995. At Convex, he was a customer engineer supporting European customers mainly in Athens, Greece. After joining HP, he worked in Worldwide Technical Expert Center (WTEC) HW supporting the V-Class and then in Event Management Labs (EML) labs authoring the Superdome Level 300 Hardware course. He is currently in the Mission Critical Solution Center Organization working for the Superdome Support Team supporting North American Superdome Customers. Steven is also a HPUX Certified System Administrator.





## Bill Garcia

Bill Garcia was a user of Linux several years ago, well before the operating system was popular. Bill provided me with expert assistance when writing this book, as well as access to the Integrity servers in his lab.

Bill is a Member of HP Partner Technical Services Organization, assisting Independent Software Vendors (ISVs) certify their applications on Integrity servers. In this role, Bill manages a lab with many Integrity servers and works directly with ISVs. Bill has held numerous positions in his many years with Hewlett Packard.

## Ranald Adams

Ranald is a long-time Linux user and one of the first technical experts in the field to run Linux on Integrity systems and helped with the development of this book.

Ranald is a Solution Architect at Hewlett-Packard in the Microsoft Partner Organization, where he concentrates on providing Microsoft-based solutions for HP customers, primarily on HP Integrity servers. Prior to his life at Hewlett-Packard, Ranald was a Designer, Engineer, and Senior IT Manager in the Music, Entertainment, New Media and DotCom industries where he worked both sides of the fence - creating content and implementing business infrastructure to support and deliver it - using most of the major OS and hardware platforms. Ranald has been using Linux, OpenBSD, and other Open Source solutions since 1993 to solve real-world problems in the environments for which he is responsible.

## Brian Allen

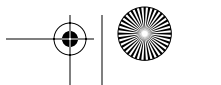
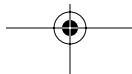
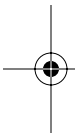
Brian was one of the original HP Solution Architects in the field to work with Linux on Integrity servers and provided assistance in creating this book.

Brian joined HP directly from college in 1979 as a Customer Engineer supporting large business computer customers in the Northeast. Over the years, Brian had many roles at HP including an Area Technical Support Engineer, factory-based Software Support Engineer, and Senior Technical Consultant in HP's Professional Services Organization. This range of experience is one of Brian's greatest assets that customers continue to benefit from in his current roles as a Solution Architect for HP's Corporate Financial Accounts program.

## Marty Paul

Marty Paul contributed to and reviewed several chapters in this book.

Marty is a Senior System Analyst in the Engineering and Deployment Services Group of Pitney Bowes in Danbury, CT. He has worked with nearly all HP hardware, including HP Superdome systems running hard and virtual partitions. He is now testing HP Integrity servers running Linux, Windows, and HP-UX. Marty has been in the IT industry for 20 years and has supported a number of systems, including six years as an HP-UX expert.





## Reviewers and Contributors

In all, there were about 25 reviewers of this book. I'm not sure what makes someone agree to review a book. You don't get the glory of a contributing author, but it is just as much work. I would like to thank the many people who devoted a substantial amount of time to reviewing this book to ensure that I included topics important to new system administrators and covered those topics accurately. In particular, I would like to thank Bradley Chapple and Adam Schwartz of HP for their review and assistance with the EFI- related material. I also want to thank Steve Stichler and his team for contributing information on MC/ServiceGuard for Linux and for reviewing the MC/ServiceGuard portion of this book.

