

Linux Kernel Module And Device Driver Development

Talk directly to your system for a faster workflow with automation capability Linux Command Line and Shell Scripting Bible is your essential Linux guide. With detailed instruction and abundant examples, this book teaches you how to bypass the graphical interface and communicate directly with your computer, saving time and expanding capability. This third edition incorporates thirty pages of new functional examples that are fully updated to align with the latest Linux features. Beginning with command line fundamentals, the book moves into shell scripting and shows you the practical application of commands in automating frequently performed functions. This guide includes useful tutorials, and a desk reference value of numerous examples. The Linux command line allows you to type specific shell commands directly into the system to manipulate files and query system resources. Command line statements can be combined into short programs called shell scripts, a practice increasing in popularity due to its usefulness in automation. This book is a complete guide providing detailed instruction and expert advice working within this aspect of Linux. Write simple script utilities to automate tasks Understand the shell, and create shell scripts Produce database, e-mail, and web scripts Study scripting examples ranging from basic to advanced Whether used as a tutorial or as a quick reference, this book contains information that every Linux user should know. Why not learn to use the system to its utmost capability? Linux is a robust system with tremendous potential, and Linux Command Line and Shell Scripting Bible opens the door to new possibilities.

LPI Linux Certification in a Nutshell, Second Edition is an invaluable resource for determining what you need to practice to pass the Linux Professional Institute exams. This book will help you determine when you're ready to take the exams, which are technically challenging and designed to reflect the skills that administrators need in real working environments. As more corporations adopt Linux as the networking backbone for their IT systems, the demand for certified technicians will become even greater. Passing the LPI exams will broaden your career options because the LPI is the most widely known and respected Linux certification program in the world. Linux Journal recognized the LPI as the best Training and Certification Program. The exams were developed by the Linux Professional Institute, an international, volunteer-driven organization with affiliates in a dozen countries. The core LPI exams cover two levels. Level 1 tests a basic knowledge of Linux installation, configuration, and command-line skills. Level 2 goes into much more depth regarding system troubleshooting and network services such as email and the Web. The second edition of LPI Linux Certification in a Nutshell is a thoroughly researched reference to these exams. The book is divided into four parts, one for each of the LPI exams. Each part features not only a summary of the core skills you need, but sample exercises and test questions, along with helpful hints to let you focus your energies. Major topics include: GNU and Unix commands Linux installation and package management Devices, filesystems, and kernel configuration Text editing, processing, and printing The X Window System Networking fundamentals and troubleshooting Security, including intrusion detection, SSH, Kerberos, and more DNS, DHCP, file sharing, and other networking infrastructure Email, FTP, and Web services Praise for the first edition: "Although O'Reilly's Nutshell series are intended as 'Desktop Reference' manuals, I have to recommend this one as a good all-round read; not only as a primer for LPI certification, but as an excellent introductory text on GNU/Linux. In all, this is a valuable addition to O'Reilly's already packed stable of Linux titles and I look forward to more from the author."--First Monday

This IBM® Redbooks® publication provides guidance about how to configure, monitor, and manage your IBM DS8880 storage systems to achieve optimum performance, and it also covers the IBM DS8870 storage system. It describes the DS8880 performance features and characteristics, including hardware-related performance features, synergy items for certain operating systems, and other functions, such as IBM Easy Tier® and the DS8000® I/O Priority Manager. The book also describes specific performance considerations that apply to particular host environments, including database applications. This book also outlines the various tools that are available for monitoring and measuring I/O performance for different server environments, and it describes how to monitor the performance of the entire DS8000 storage system. This book is intended for individuals who want to maximize the performance of their DS8880 and DS8870 storage systems and investigate the planning and monitoring tools that are available. The IBM DS8880 storage system features, as described in this book, are available for the DS8880 model family with R8.0 release bundles (Licensed Machine Code (LMC) level 7.8.0).

To thoroughly understand what makes Linux tick and why it's so efficient, you need to delve deep into the heart of the operating system--into the Linux kernel itself. The kernel is Linux--in the case of the Linux operating system, it's the only bit of software to which the term "Linux" applies. The kernel handles all the requests or completed I/O operations and determines which programs will share its processing time, and in what order. Responsible for the sophisticated memory management of the whole system, the Linux kernel is the force behind the legendary Linux efficiency. The new edition of Understanding the Linux Kernel takes you on a guided tour through the most significant data structures, many algorithms, and programming tricks used in the kernel. Probing beyond the superficial features, the authors offer valuable insights to people who want to know how things really work inside their machine. Relevant segments of code are dissected and discussed line by line. The book covers more than just the functioning of the code, it explains the theoretical underpinnings for why Linux does things the way it does. The new edition of the book has been updated to cover version 2.4 of the kernel, which is quite different from version 2.2: the virtual memory system is entirely new, support for multiprocessor systems is improved, and whole new classes of hardware devices have been added. The authors explore each new feature in detail. Other topics in the book include: Memory management including file buffering, process swapping, and Direct memory Access (DMA) The Virtual Filesystem and the Second Extended Filesystem Process creation and scheduling Signals, interrupts, and the essential interfaces to device drivers Timing Synchronization in the kernel Interprocess Communication (IPC) Program execution Understanding the Linux Kernel, Second Edition will acquaint you with all the inner workings

of Linux, but is more than just an academic exercise. You'll learn what conditions bring out Linux's best performance, and you'll see how it meets the challenge of providing good system response during process scheduling, file access, and memory management in a wide variety of environments. If knowledge is power, then this book will help you make the most of your Linux system.

Discover how to write high-quality character driver code, interface with userspace, work with chip memory, and gain an in-depth understanding of working with hardware interrupts and kernel synchronization

Key Features: Delve into hardware interrupt handling, threaded IRQs, tasklets, softirqs, and understand which to use when Explore powerful techniques to perform user-kernel interfacing, peripheral I/O and use kernel mechanisms Work with key kernel synchronization primitives to solve kernel concurrency issues

Book Description: Linux Kernel Programming Part 2 - Char Device Drivers and Kernel Synchronization is an ideal companion guide to the Linux Kernel Programming book. This book provides a comprehensive introduction for those new to Linux device driver development and will have you up and running with writing misc class character device driver code (on the 5.4 LTS Linux kernel) in next to no time. You'll begin by learning how to write a simple and complete misc class character driver before interfacing your driver with user-mode processes via procfs, sysfs, debugfs, netlink sockets, and ioctl. You'll then find out how to work with hardware I/O memory. The book covers working with hardware interrupts in depth and helps you understand interrupt request (IRQ) allocation, threaded IRQ handlers, tasklets, and softirqs. You'll also explore the practical usage of useful kernel mechanisms, setting up delays, timers, kernel threads, and workqueues. Finally, you'll discover how to deal with the complexity of kernel synchronization with locking technologies (mutexes, spinlocks, and atomic/refcount operators), including more advanced topics such as cache effects, a primer on lock-free techniques, deadlock avoidance (with lockdep), and kernel lock debugging techniques. By the end of this Linux kernel book, you'll have learned the fundamentals of writing Linux character device driver code for real-world projects and products.

What You Will Learn: Get to grips with the basics of the modern Linux Device Model (LDM) Write a simple yet complete misc class character device driver Perform user-kernel interfacing using popular methods Understand and handle hardware interrupts confidently Perform I/O on peripheral hardware chip memory Explore kernel APIs to work with delays, timers, kthreads, and workqueues Understand kernel concurrency issues Work with key kernel synchronization primitives and discover how to detect and avoid deadlock

Who this book is for: An understanding of the topics covered in the Linux Kernel Programming book is highly recommended to make the most of this book. This book is for Linux programmers beginning to find their way with device driver development. Linux device driver developers looking to overcome frequent and common kernel/driver development issues, as well as perform common driver tasks such as user-kernel interfaces, performing peripheral I/O, handling hardware interrupts, and dealing with concurrency will benefit from this book. A basic understanding of Linux kernel internals (and common APIs), kernel module development, and C programming is required.

This new edition of Linux for Embedded and Real-Time Applications provides a practical introduction to the basics and the latest developments in this rapidly evolving technology. Ideal for those new to using Linux in an embedded environment, it takes a hands-on approach and covers key concepts plus specific applications. Key features include:

Substantially updated to focus on a specific ARM-based single board computer (SBC) as a target for embedded application programming Includes an introduction to Android programming

With this book you will learn: The basics of Open Source, Linux and the embedded space How to set up a simple system and tool chain How to use simulation for initial application testing Network, graphics and Android programming How to use some of the many Linux components and tools How to configure and build the Linux kernel, BusyBox and U-Boot bootloader Provides a hands-on introduction for engineers and software developers who need to get up to speed quickly on embedded Linux, its operation and its capabilities – including Android

Updated and changed accompanying tools, with a focus on the author's specially-developed Embedded Linux Learning Kit

LINUX DRIVER DEVELOPMENT FOR EMBEDDED PROCESSORS - SECOND EDITION - The flexibility of Linux embedded, the availability of powerful, energy efficient processors designed for embedded computing and the low cost of new processors are encouraging many industrial companies to come up with new developments based on embedded processors. Current engineers have in their hands powerful tools for developing applications previously unimagined, but they need to understand the countless features that Linux offers today. This book will teach you how to develop device drivers for Device Tree Linux embedded systems. You will learn how to write different types of Linux drivers, as well as the appropriate APIs (Application Program Interfaces) and methods to interface with kernel and user spaces. This is a book is meant to be practical, but also provides an important theoretical base. More than twenty drivers are written and ported to three different processors. You can choose between NXP i.MX7D, Microchip SAMA5D2 and Broadcom BCM2837 processors to develop and test the drivers, whose implementation is described in detail in the practical lab sections of the book. Before you start reading, I encourage you to acquire any of these processor boards whenever you have access to some GPIOs, and at least one SPI and I2C controllers. The hardware configurations of the different evaluation boards used to develop the drivers are explained in detail throughout this book; one of the boards used to implement the drivers is the famous Raspberry PI 3 Model B board. You will learn how to develop drivers, from the simplest ones that do not interact with any external hardware, to drivers that manage different kind of devices: accelerometers, DACs, ADCs, RGB LEDs, Multi-Display LED controllers, I/O expanders, and Buttons. You will also develop DMA drivers, drivers that manage interrupts, and drivers that write/read on the internal registers of the processor to control external devices. To easy the development of some of these drivers, you will use different types of Frameworks: Miscellaneous framework, LED framework, UIO framework, Input framework and the IIO industrial one. This second edition has been updated to the v4.9 LTS kernel. Recently, all the drivers have been ported to the new Microchip SAMA5D27-SOM1 (SAMA5D27 System On Module) using kernel 4.14 LTS and included

in the GitHub repository of this book; these drivers have been tested in the ATSAM5D27-SOM1-EK1 evaluation platform; the ATSAM5D27-SOM1-EK1 practice lab settings are not described throughout the text of this book, but in a practice labs user guide that can be downloaded from the book's GitHub.

Effectively integrating theory and hands-on practice, Networking Systems Design and Development provides students and IT professionals with the knowledge and skills needed to design, implement, and manage fully functioning network systems using readily available Linux networking tools. Recognizing that most students are beginners in the field of network

Device drivers literally drive everything you're interested in--disks, monitors, keyboards, modems--everything outside the computer chip and memory. And writing device drivers is one of the few areas of programming for the Linux operating system that calls for unique, Linux-specific knowledge. For years now, programmers have relied on the classic Linux Device Drivers from O'Reilly to master this critical subject. Now in its third edition, this bestselling guide provides all the information you'll need to write drivers for a wide range of devices. Over the years the book has helped countless programmers learn: how to support computer peripherals under the Linux operating system how to develop and write software for new hardware under Linux the basics of Linux operation even if they are not expecting to write a driver The new edition of Linux Device Drivers is better than ever. The book covers all the significant changes to Version 2.6 of the Linux kernel, which simplifies many activities, and contains subtle new features that can make a driver both more efficient and more flexible. Readers will find new chapters on important types of drivers not covered previously, such as consoles, USB drivers, and more. Best of all, you don't have to be a kernel hacker to understand and enjoy this book. All you need is an understanding of the C programming language and some background in Unix system calls. And for maximum ease-of-use, the book uses full-featured examples that you can compile and run without special hardware. Today Linux holds fast as the most rapidly growing segment of the computer market and continues to win over enthusiastic adherents in many application areas. With this increasing support, Linux is now absolutely mainstream, and viewed as a solid platform for embedded systems. If you're writing device drivers, you'll want this book. In fact, you'll wonder how drivers are ever written without it.

Easy Linux Device Driver : First Step Towards Device Driver Programming Easy Linux Device Driver book is an easy and friendly way of learning device driver programming . Book contains all latest programs along with output screen screenshots. Highlighting important sections and stepwise approach helps for quick understanding of programming . Book contains Linux installation ,Hello world program up to USB 3.0 ,Display Driver ,PCI device driver programming concepts in stepwise approach. Program gives best understanding of theoretical and practical fundamentals of Linux device driver. Beginners should start learning Linux device driver from this book to become device driver expertise. Topics covered: Introduction of Linux Advantages of Linux History of Linux Architecture of Linux Definitions Ubuntu installation Ubuntu Installation Steps User Interface Difference About KNOPPIX Important links Terminal: Soul of Linux Creating Root account Terminal Commands Virtual Editor Commands Linux Kernel Linux Kernel Internals Kernel Space and User space Device Driver Place of Driver in System Device Driver working Characteristics of Device Driver Module Commands Hello World Program pre-settings Write Program Printk function Makefile Run program Parameter passing Parameter passing program Parameter Array Process related program Process related program Character Device Driver Major and Minor number API to registers a device Program to show device number Character Driver File Operations File operation program. Include .h header Functions in module.h file Important code snippets Summary of file operations PCI Device Driver Direct Memory Access Module Device Table Code for Basic Device Driver Important code snippets USB Device Driver Fundamentals Architecture of USB device driver USB Device Driver program Structure of USB Device Driver Parts of USB end points Important features USB information Driver USB device Driver File Operations Using URB Simple data transfer Program to read and write Important code snippets Gadget Driver Complete USB Device Driver Program Skeleton Driver Program Special USB 3.0 USB 3.0 Port connection Bulk endpoint streaming Stream ID Device Driver Lock Mutual Exclusion Semaphore Spin Lock Display Device Driver Frame buffer concept Framebuffer Data Structure Check and set Parameter Accelerated Method Display Driver summary Memory Allocation Kmalloc Vmalloc Ioremap Interrupt Handling interrupt registration Proc interface Path of interrupt Programming Tips Softirqs, Tasklets, Work Queues I/O Control Introducing ioctl Prototype Stepwise execution of ioctl Sample Device Driver Complete memory Driver Complete Parallel Port Driver Device Driver Debugging Data Display Debugger Graphical Display Debugger Kernel Graphical Debugger Appendix I Exported Symbols Kobjects, Ksets, and Subsystems DMA I/O A complete guide and reference to five major Linux distributions Linux continues to grow in popularity worldwide as a low-cost, reliable operating system for enterprise use. Nine minibooks in this guide cover everything administrators need to know about the five leading versions: Ubuntu, Fedora Core, OpenSUSE, Mint, and Mandriva. The companion DVD includes full Ubuntu installations and ISO images for the other four, saving hours of downloading time. The open source Linux operating system is gaining market share around the world for both desktop and server use; this soup-to-nuts guide covers installation and everything else administrators need to know about Ubuntu, Fedora Core, OpenSUSE, Mint, and Mandriva Nine self-contained minibooks cover Linux basics, desktops, networking, Internet, administration, security, Linux servers, programming, and scripting Updated to cover the newest versions of the five top distributions, with complete installation instructions and a DVD including the full Ubuntu installations and ISO images for the others Linux users and administrators will be able to install and sample five popular Linux flavors with the information in Linux All-in-One For Dummies. Note: CD-ROM/DVD and other supplementary materials are not included as part of eBook file.

This book contains the practical labs corresponding to the "Linux Kernel and Driver Development: Training Handouts" book from Bootlin. Get your hands on an embedded board based on an ARM processor (the Beagle Bone Black board), and apply what you learned: write a Device Tree to declare devices connected to your board, configure pin

multiplexing, and implement drivers for I2C and serial devices. You will learn how to manage multiple devices with the same driver, to access and write hardware registers, to allocate memory, to register and manage interrupts, as well as how to debug your code and interpret the kernel error messages. You will also keep an eye on the board and CPU datasheets so that you will always understand the values that you feed to the kernel.

In order to thoroughly understand what makes Linux tick and why it works so well on a wide variety of systems, you need to delve deep into the heart of the kernel. The kernel handles all interactions between the CPU and the external world, and determines which programs will share processor time, in what order. It manages limited memory so well that hundreds of processes can share the system efficiently, and expertly organizes data transfers so that the CPU isn't kept waiting any longer than necessary for the relatively slow disks. The third edition of *Understanding the Linux Kernel* takes you on a guided tour of the most significant data structures, algorithms, and programming tricks used in the kernel. Probing beyond superficial features, the authors offer valuable insights to people who want to know how things really work inside their machine. Important Intel-specific features are discussed. Relevant segments of code are dissected line by line. But the book covers more than just the functioning of the code; it explains the theoretical underpinnings of why Linux does things the way it does. This edition of the book covers Version 2.6, which has seen significant changes to nearly every kernel subsystem, particularly in the areas of memory management and block devices. The book focuses on the following topics: Memory management, including file buffering, process swapping, and Direct memory Access (DMA) The Virtual Filesystem layer and the Second and Third Extended Filesystems Process creation and scheduling Signals, interrupts, and the essential interfaces to device drivers Timing Synchronization within the kernel Interprocess Communication (IPC) Program execution *Understanding the Linux Kernel* will acquaint you with all the inner workings of Linux, but it's more than just an academic exercise. You'll learn what conditions bring out Linux's best performance, and you'll see how it meets the challenge of providing good system response during process scheduling, file access, and memory management in a wide variety of environments. This book will help you make the most of your Linux system.

An annotated guide to program and develop GNU/Linux Embedded systems quickly About This Book Rapidly design and build powerful prototypes for GNU/Linux Embedded systems Become familiar with the workings of GNU/Linux Embedded systems and how to manage its peripherals Write, monitor, and configure applications quickly and effectively, manage an external micro-controller, and use it as co-processor for real-time tasks Who This Book Is For This book targets Embedded System developers and GNU/Linux programmers who would like to program Embedded Systems and perform Embedded development. The book focuses on quick and efficient prototype building. Some experience with hardware and Embedded Systems is assumed, as is having done some previous work on GNU/Linux systems. Knowledge of scripting on GNU/Linux is expected as well. What You Will Learn Use embedded systems to implement your projects Access and manage peripherals for embedded systems Program embedded systems using languages such as C, Python, Bash, and PHP Use a complete distribution, such as Debian or Ubuntu, or an embedded one, such as OpenWrt or Yocto Harness device driver capabilities to optimize device communications Access data through several kinds of devices such as GPIO's, serial ports, PWM, ADC, Ethernet, WiFi, audio, video, I2C, SPI, One Wire, USB and CAN Practical example usage of several devices such as RFID readers, Smart card readers, barcode readers, z-Wave devices, GSM/GPRS modems Usage of several sensors such as light, pressure, moisture, temperature, infrared, power, motion In Detail Embedded computers have become very complex in the last few years and developers need to easily manage them by focusing on how to solve a problem without wasting time in finding supported peripherals or learning how to manage them. The main challenge with experienced embedded programmers and engineers is really how long it takes to turn an idea into reality, and we show you exactly how to do it. This book shows how to interact with external environments through specific peripherals used in the industry. We will use the latest Linux kernel release 4.4.x and Debian/Ubuntu distributions (with embedded distributions like OpenWrt and Yocto). The book will present popular boards in the industry that are user-friendly to base the rest of the projects on - BeagleBone Black, SAMA5D3 Xplained, Wandboard and system-on-chip manufacturers. Readers will be able to take their first steps in programming the embedded platforms, using C, Bash, and Python/PHP languages in order to get access to the external peripherals. More about using and programming device driver and accessing the peripherals will be covered to lay a strong foundation. The readers will learn how to read/write data from/to the external environment by using both C programs or a scripting language (Bash/PHP/Python) and how to configure a device driver for a specific hardware. After finishing this book, the readers will be able to gain a good knowledge level and understanding of writing, configuring, and managing drivers, controlling and monitoring applications with the help of efficient/quick programming and will be able to apply these skills into real-world projects. Style and approach This practical tutorial will get you quickly prototyping embedded systems on GNU/Linux. This book uses a variety of hardware to program the peripherals and build simple prototypes.

Pro Linux Kernel Module Programming is your step-by-step guide to developing, debugging, and testing Linux Kernel Modules (LKMs) with ease. As LKMs and the applications that use them become more widely used, there are an increasing number of system software developers who wish to become involved in the development and maintenance of Linux-based systems. Some of these engineers are motivated purely by personal interest; some work for Linux companies, some work for hardware manufacturers, and some are involved with in-house development projects. However, all face a common problem: the learning curve for the kernel module is getting longer and steeper. The system is becoming increasingly complex, and it is very large. This is where *Pro Linux Kernel Module Programming* comes in. This book takes you from downloading Linux kernel all the way to extending it by writing your own modules, and everything in between. Discover common errors people make, and best practices you can follow. Written in a free-flowing

fashion, and explaining concepts first with lots of examples, you will learn the relevant kernel data structures, and the actual implementation. You will understand kernel module development, for example: device types, kernel development process, kernel objects, kernel interfaces; which will help you to understand why and how module works. You will then move onto developing LKMs with ease. Understand and demystify LKMs today using Pro Linux Kernel Module Programming. What you'll learn How Linux Kernel Modules (LKMs) work How to develop LKMs How to debug LKMs How to test LKMs Who this book is for As the Linux kernel and the applications that use it become more widely used, there are increasing number of system software developers who wish to become involved in the development and maintenance of Linux based systems. Some of these engineers are motivated purely by personal interest; some work for Linux companies, some work for hardware manufacturers, and some are involved with in-house development projects. This book is for anyone who wants to develop Linux kernel modules in any setting.

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Describes the basic features of Fedora and offers instructions concerning its use, administration, network and server set-up, and its compatibility with new technology.

Linux Kernel Development details the design and implementation of the Linux kernel, presenting the content in a manner that is beneficial to those writing and developing kernel code, as well as to programmers seeking to better understand the operating system and become more efficient and productive in their coding. The book details the major subsystems and features of the Linux kernel, including its design, implementation, and interfaces. It covers the Linux kernel with both a practical and theoretical eye, which should appeal to readers with a variety of interests and needs. The author, a core kernel developer, shares valuable knowledge and experience on the 2.6 Linux kernel. Specific topics covered include process management, scheduling, time management and timers, the system call interface, memory addressing, memory management, the page cache, the VFS, kernel synchronization, portability concerns, and debugging techniques. This book covers the most interesting features of the Linux 2.6 kernel, including the CFS scheduler, preemptive kernel, block I/O layer, and I/O schedulers. The third edition of Linux Kernel Development includes new and updated material throughout the book: An all-new chapter on kernel data structures Details on interrupt handlers and bottom halves Extended coverage of virtual memory and memory allocation Tips on debugging the Linux kernel In-depth coverage of kernel synchronization and locking Useful insight into submitting kernel patches and working with the Linux kernel community

DKMS – a useful tool for those who with each kernel change compiled new modules for supporting their devices. The DKMS program is a mechanism of scripts enabling automation of compilation of external modules added to the kernel. Without this mechanism the administrator after each kernel change was forced to recompile the modules responsible for supporting their devices. This situation took place while creating drivers for graphic cards or external tests of the iptables firewall. The micro-course describes how to install the DKMS system in your own system and what the procedures of managing module compilation are.

Learn how to write high-quality kernel module code, solve common Linux kernel programming issues, and understand the fundamentals of Linux kernel internals Key Features Discover how to write kernel code using the Loadable Kernel Module framework Explore industry-grade techniques to perform efficient memory allocation and data synchronization within the kernel Understand the essentials of key internals topics such as kernel architecture, memory management, CPU scheduling, and kernel synchronization Book Description Linux Kernel Programming is a comprehensive introduction for those new to Linux kernel and module development. This easy-to-follow guide will have you up and running with writing kernel code in next-to-no time. This book uses the latest 5.4 Long-Term Support (LTS) Linux kernel, which will be maintained from November 2019 through to December 2025. By working with the 5.4 LTS kernel throughout the book, you can be confident that your knowledge will continue to be valid for years to come. This Linux book begins by showing you how to build the kernel from the source. Next, you'll learn how to write your first kernel module using the powerful Loadable Kernel Module (LKM) framework. The book then covers key kernel internals topics including Linux kernel architecture, memory management, and CPU scheduling. Next, you'll delve into the fairly complex topic of concurrency within the kernel, understand the issues it can cause, and learn how they can be addressed with various locking technologies (mutexes, spinlocks, atomic, and refcount operators). You'll also benefit from more advanced material on cache effects, a primer on lock-free techniques within the kernel, deadlock avoidance (with lockdep), and kernel lock debugging techniques. By the end of this kernel book, you'll have a detailed understanding of the fundamentals of writing Linux kernel module code for real-world projects and products. What you will learn Write high-quality modular kernel code (LKM framework) for 5.x kernels Configure and build a kernel from source Explore the Linux kernel architecture Get to grips with key internals regarding memory management within the kernel Understand and work with various dynamic kernel memory alloc/dealloc APIs Discover key internals aspects regarding CPU scheduling within the kernel Gain an understanding of kernel concurrency issues Find out how to work with key kernel synchronization primitives Who this book is for This book is for Linux programmers beginning to find their way with Linux kernel development. Linux kernel and driver developers looking to overcome frequent and common kernel development issues, as well as understand kernel internals, will benefit from this book. A basic understanding of Linux CLI and C programming is required.

“Probably the most wide ranging and complete Linux device driver book I’ve read.” --Alan Cox, Linux Guru and Key Kernel Developer “Very comprehensive and detailed, covering almost every single Linux device driver type.” --Theodore Ts’o, First Linux Kernel Developer in North America and Chief Platform Strategist of the Linux Foundation The Most Practical Guide to Writing Linux Device Drivers Linux now offers an exceptionally robust environment for driver development: with today’s kernels, what once required years of development time can be accomplished in days. In this practical, example-driven book, one of the world’s most experienced Linux driver developers systematically demonstrates how to develop reliable Linux drivers for virtually any device. Essential Linux Device Drivers is for any programmer with a working knowledge of operating systems and C, including programmers who have never written drivers before. Sreekrishnan Venkateswaran focuses on the essentials, bringing together all the concepts and techniques you need, while avoiding topics that only matter in highly specialized situations. Venkateswaran begins by reviewing the Linux 2.6 kernel capabilities that are most relevant to driver developers. He introduces simple device classes; then turns to serial buses

such as I2C and SPI; external buses such as PCMCIA, PCI, and USB; video, audio, block, network, and wireless device drivers; user-space drivers; and drivers for embedded Linux—one of today's fastest growing areas of Linux development. For each, Venkateswaran explains the technology, inspects relevant kernel source files, and walks through developing a complete example. • Addresses drivers discussed in no other book, including drivers for I2C, video, sound, PCMCIA, and different types of flash memory • Demystifies essential kernel services and facilities, including kernel threads and helper interfaces • Teaches polling, asynchronous notification, and I/O control • Introduces the Inter-Integrated Circuit Protocol for embedded Linux drivers • Covers multimedia device drivers using the Linux-Video subsystem and Linux-Audio framework • Shows how Linux implements support for wireless technologies such as Bluetooth, Infrared, WiFi, and cellular networking • Describes the entire driver development lifecycle, through debugging and maintenance • Includes reference appendixes covering Linux assembly, BIOS calls, and Seq files

Provides information on using the Linux operating system, covering such topics as the desktop, networking, Internet servers, administration, security, and programming.

This IBM® Redbooks® publication provides an introduction to PowerVMTM virtualization technologies on Power System servers. PowerVM is a combination of hardware, firmware, and software that provides CPU, network, and disk virtualization. These are the main virtualization technologies: POWER7, POWER6, and POWER5 hardware POWER Hypervisor Virtual I/O Server Though the PowerVM brand includes partitioning, management software, and other offerings, this publication focuses on the virtualization technologies that are part of the PowerVM Standard and Enterprise Editions. This publication is also designed to be an introduction guide for system administrators, providing instructions for these tasks: Configuration and creation of partitions and resources on the HMC Installation and configuration of the Virtual I/O Server Creation and installation of virtualized partitions Examples using AIX, IBM i, and Linux This edition has been updated with the latest updates available and an improved content organization.

A guide to using Linux on embedded platforms for interfacing to the real world. "Embedded Linux" is one of the first books available that teaches readers development and implementation of interfacing applications on an Embedded Linux platform.

Appendix Answers to Review Questions -- Chapter 1: Starting a System -- Chapter 2: Maintaining the System -- Chapter 3: Mastering the Kernel -- Chapter 4: Managing the Filesystem -- Chapter 5: Administering Advanced Storage Devices -- Chapter 6: Navigating Network Services -- Chapter 7: Organizing Email Services -- Chapter 8: Directing DNS -- Chapter 9: Offering Web Services -- Chapter 10: Sharing Files -- Chapter 11: Managing Network Clients -- Chapter 12: Setting Up System Security -- Advert -- EULA
Linux kernel based Operating systems (OS) are widely used in the world. About more than 90% of the most powerful supercomputer are based on that. There is an increasing opportunity to use Linux in enterprise systems, where the users expect very high reliability. To achieve the need of the time it is important to test how Linux kernel module behaves in a fault situation. To test that various scientist has tried to inject fault by creating an artificial environment by different techniques. Fault injection is an important application area for Linux kernel module. The main purpose is to see the behavior of kernel component under abnormal situations. In this thesis, we have analyzed various fault injection frameworks over Linux kernel. Frameworks used in these experiments were LTP, KEDR, LFI and SCSI for injecting various fault types on Linux kernel module and to justify the Linux kernel behavior under the faulty kernel. Most of the framework used in these experiments were concatenating with kernel fault injection framework (LFI) as provided by Linux version 2.6.20. Each framework has its own specialty with respect to fault type and behavior while injecting a fault on Linux kernel. For LTP (Linux Testing Project) we performed three tests under the faulty kernel, probability percentage and numbers of loops varied each time. Firstly, I test the mm (memory management) it runs successfully under the faulty kernel without any error message or failure. But in the case of dma-threat-dio under the faulty kernel which got failed. Out of 49, only 7 tests get passed and 42 were failed (85.7% failure occur). In third test mmap stress (memory mappings stress) under the faulty kernel also get failed. Memory mapping stress 04 failed completely but memory mapping stress 02 give a warning message. KEDR tool was used to study fault simulation and detection of memory leaks over built in the module (Kedr-sample-target) and custom kernel module (Example LKM). Results of fault simulation were same for both modules "cannot allocate memory" and for device drivers (cfake0/cafake1) Fault simulation result was same for both modules "bad address". Detection memory leaks result varied for each module, for kedr sample target "allocation 3 and possible leak 2" but for custom kernel module Example LKM "allocation 2 possible leak 0". These results were further verified under the debugfs directory (sys/kernel/debug/kedr-fault-simulation/cat last fault). SCSI tool was used to inject fault under the RAID1, the mdadm approach was used to create RAID1. It consists of sdc and sdb hard disk. The type of fault chooses to inject was "read correctable error". Once the fault has been injected successfully over the dev/md127 device it shows "SCSI-decide-decomposition major=8 minor=16 scmd=4122759912" in the middle of SCSI script after reading it from syslog. Once a fault is injected, the sdb will be recovered because the fault-injected sdb was corrected and md127 also get recovered automatically due to its association with sdb.**KEYWORDS:** Custom kernel modules; Device Drivers; Fault simulation; KEDR; Linux; LTP; LFI; Memory leak; SCSI Fault Injector.

Master the art of developing customized device drivers for your embedded Linux systems Key Features Stay up to date with the Linux PCI, ASoC, and V4L2 subsystems and write device drivers for them Get to grips with the Linux kernel power management infrastructure Adopt a practical approach to customizing your Linux environment using best practices Book Description Linux is one of the fastest-growing operating systems around the world, and in the last few years, the Linux kernel has evolved significantly to support a wide variety of embedded devices with its improved subsystems and a range of new features. With this book, you'll find out how you can enhance your skills to write custom device drivers for your Linux operating system. Mastering Linux Device Driver Development provides complete coverage of kernel topics, including video and audio frameworks, that usually go unaddressed. You'll work with some of the most complex and impactful Linux kernel frameworks, such as PCI, ALSA for SoC, and Video4Linux2, and discover

expert tips and best practices along the way. In addition to this, you'll understand how to make the most of frameworks such as NVMEM and Watchdog. Once you've got to grips with Linux kernel helpers, you'll advance to working with special device types such as Multi-Function Devices (MFD) followed by video and audio device drivers. By the end of this book, you'll be able to write feature-rich device drivers and integrate them with some of the most complex Linux kernel frameworks, including V4L2 and ALSA for SoC. What you will learn Explore and adopt Linux kernel helpers for locking, work deferral, and interrupt management Understand the Regmap subsystem to manage memory accesses and work with the IRQ subsystem Get to grips with the PCI subsystem and write reliable drivers for PCI devices Write full multimedia device drivers using ALSA SoC and the V4L2 framework Build power-aware device drivers using the kernel power management framework Find out how to get the most out of miscellaneous kernel subsystems such as NVMEM and Watchdog Who this book is for This book is for embedded developers, Linux system engineers, and system programmers who want to explore Linux kernel frameworks and subsystems. C programming skills and a basic understanding of driver development are necessary to get started with this book.

Open Source has become a buzzword synonymous with growth and change in computing. This book examines the Open Source movement, what's worked and why, and explains the technology to the mainstream investor and manager looking to replicate the successes of the Open Source movement.

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The bestselling study guide for the popular Linux Professional Institute Certification Level 1 (LPIC-1). The updated fifth edition of LPIC-1: Linux Professional Institute Certification Study Guide is a comprehensive, one-volume resource that covers 100% of all exam objectives. Building on the proven Sybex Study Guide approach, this essential resource offers a comprehensive suite of study and learning tools such as assessment tests, hands-on exercises, chapter review questions, and practical, real-world examples. This book, completely updated to reflect the latest 101-500 and 102-500 exams, contains clear, concise, and user-friendly information on all of the Linux administration topics you will encounter on test day. Key exam topics include system architecture, Linux installation and package management, GNU and UNIX commands, user interfaces and desktops, essential system services, network and server security, and many more. Linux Servers currently have a 20% market share which continues to grow. The Linux OS market saw a 75% increase from last year and is the third leading OS, behind Windows and MacOS. There has never been a better time to expand your skills, broaden your knowledge, and earn certification from the Linux Professional Institute. A must-have guide for anyone preparing for the 101-500 and 102-500 exams, this study guide enables you to: Assess your performance on practice exams to determine what areas need extra study Understand and retain vital exam topics such as administrative tasks, network configuration, booting Linux, working with filesystems, writing scripts, and using databases Gain insights and tips from two of the industry's most highly respected instructors, consultants, and authors Access Sybex interactive tools that include electronic flashcards, an online test bank, customizable practice exams, bonus chapter review questions, and a searchable PDF glossary of key terms LPIC-1: Linux Professional Institute Certification Study Guide is ideal for network and system administrators studying for the LPIC-1 exams, either for the first time or for the purpose of renewing their certifications.

Provides information on writing a driver in Linux, covering such topics as character devices, network interfaces, driver debugging, concurrency, and interrupts.

Presents an overview of kernel configuration and building for version 2.6 of the Linux kernel.

Featuring the latest changes in Fedora Core, this book offers valuable new secrets for Fedora users, including yum, mail filtering with SpamAssassin, mandatory access control with Security Enhanced Linux (SELinux), and improved device handling with udev Demonstrates how to use Linux for real-world tasks, from learning UNIX commands to setting up a secure Java-capable Web server for a business Because Fedora Core updates occur frequently, the book contains a helpful appendix with instructions on how to download and install the latest release of Fedora Core The DVD contains the Fedora distribution as well as all binary code packages and source code

Linux continues to grow as an operating system of choice in many embedded systems such as networking, wireless, and base stations. In this chapter we look at possible uses of Linux in embedded systems. The chapter covers getting a Linux kernel set up, getting started with creating your Linux baseline, and the initial steps of getting an application running on the platform. If you haven't used Linux for an embedded system before, this chapter will cover all of the basic steps to get you going!

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Achieve Linux system administration mastery with time-tested and proven techniques In Mastering Linux System Administration, Linux experts and system administrators Christine Bresnahan and Richard Blum deliver a comprehensive roadmap to go from Linux beginner to expert Linux system administrator with a learning-by-doing approach. Organized by do-it-yourself tasks, the book includes instructor materials like a sample syllabus, additional review questions, and slide decks. Amongst the practical applications of the Linux operating system included within, you'll find detailed and easy-to-follow instruction on: Installing Linux servers, understanding the boot and initialization processes, managing hardware, and working with networks Accessing the Linux command line, working with the virtual directory structure, and creating shell scripts to automate administrative tasks Managing Linux user accounts, system security, web and database servers, and virtualization environments Perfect for entry-level Linux system administrators, as well as system administrators familiar with Windows, Mac, NetWare, or other UNIX systems, Mastering Linux System Administration is a must-read guide to manage and secure Linux servers.

Learn to develop customized device drivers for your embedded Linux system About This Book* Learn to develop customized Linux device drivers* Learn the core concepts of device drivers such as memory management, kernel caching, advanced IRQ management, and so on.* Practical experience on the embedded side of Linux Who This Book Is For This book will help anyone who wants to get started with developing their own Linux device drivers for embedded systems. Embedded Linux users will benefit highly from this book. This book covers all about device driver development, from char drivers to network device drivers to memory management. What You Will Learn* Use kernel facilities to develop powerful drivers* Develop drivers for widely used I2C and SPI devices and use the regmap API* Write and support devicetree from within your drivers* Program advanced drivers for network and frame buffer devices* Delve into the Linux irqdomain API and write interrupt controller drivers* Enhance your skills with

regulator and PWM frameworks* Develop measurement system drivers with IIO framework* Get the best from memory management and the DMA subsystem* Access and manage GPIO subsystems and develop GPIO controller drivers
In Detail Linux kernel is a complex, portable, modular and widely used piece of software, running on around 80% of servers and embedded systems in more than half of devices throughout the World. Device drivers play a critical role in how well a Linux system performs. As Linux has turned out to be one of the most popular operating systems used, the interest in developing proprietary device drivers is also increasing steadily. This book will initially help you understand the basics of drivers as well as prepare for the long journey through the Linux Kernel. This book then covers drivers development based on various Linux subsystems such as memory management, PWM, RTC, IIO, IRQ management, and so on. The book also offers a practical approach on direct memory access and network device drivers. By the end of this book, you will be comfortable with the concept of device driver development and will be in a position to write any device driver from scratch using the latest kernel version (v4.13 at the time of writing this book).
Style and approach A set of engaging examples to develop Linux device drivers

Guide to Linux Networking and Security is a hands-on, practical guide that can be used to master Linux networking and security, in preparation for the Linux certification exams from SAIR/GNU and LPI. This book begins by introducing networking technologies and protocols, then moves into configuring a Linux network using a variety of command line and graphical utilities. Specific protocols and applications are covered in the networking chapters, including the r-utilities, NFS, Samba, and FTP, plus business-critical services such as e-mail, Web, and DNS. The second half of this book includes a discussion of security in the context of protecting business assets and user privacy, with emphasis on system administrator ethics. Cryptography and encrypted protocols lay a foundation for discussion of specific Linux security tools, including PAM, sudo, and GPG. User, file, and network security are covered. The network security discussion includes firewalls, VPNs, and utilities such as nmap, ethereal, and the SAINT profiling tool. Throughout, the book provides examples of sample commands and output, plus screen shots of related graphical utilities.

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