Linux Device Drivers Development Develop Customized Drivers For Embedded Linux

Find solutions to all your problems related to Linux system programming using practical recipes for developing your own system programs Key Features Develop a deeper understanding of how Linux system programming works Gain hands-on experience of working with different Linux projects with the help of practical examples Learn how to develop your own programs for Linux Book Description Linux is the world's most popular open source operating system (OS). Linux System Programming Techniques will enable you to extend the Linux OS with your own system programs and communicate with other programs on the system. The book begins by exploring the Linux filesystem, its basic commands, built-in manual pages, the GNU compiler collection (GCC), and Linux system calls. You'll then discover how to handle errors in your programs and will learn to catch errors and print relevant information about them. The book takes you through multiple recipes on how to read and write files on the system, using both streams and file descriptors. As you advance, you'll delve into forking, creating zombie processes, and daemons, along with recipes on how to handle daemons using systemd. After this, you'll find out how to create shared libraries and start exploring different types of interprocess communication (IPC). In the later chapters, recipes on how to write programs using POSIX threads and how to debug your programs using the GNU debugger (GDB) and Valgrind will also be covered. By the end of this Linux book, you will be able to develop your own system programs for Linux, including daemons, tools, clients, and filters. What you will learn Discover how to write programs for the Linux system using a wide variety of system calls Delve into the working of POSIX functions Understand and use key concepts such as signals, pipes, IPC, and process management Find out how to integrate programs with a Linux system Explore advanced topics such as filesystem operations, creating shared libraries, and debugging your programs Gain an overall understanding of how to debug your programs using Valgrind Who this book is for This book is for anyone who wants to develop system programs for Linux and gain a deeper understanding of the Linux system. The book is beneficial for anyone who is facing issues related to a particular part of Linux system programming and is looking for specific recipes or solutions.

Linux Driver Development with Raspberry Pi - Practical Labs Embedded systems have become an integral part of our daily life. They are deployed in mobile devices, networking infrastructure, home and consumer devices, digital signage, medical imaging, automotive infotainment and many other industrial applications. The use of embedded systems is growing exponentially. Many of these embedded systems are powered by an inexpensive yet powerful system-on-chip (SoC) that is running a Linux operating system. The BCM2837 from Broadcom is one of these SoCs, running quad ARM Cortex A53 cores at 1.2GHz. This is the SoC used in the popular Raspberry Pi 3 boards. This book follows the learning by doing approach, so you will be playing with your Raspberry Pi since the first chapter. Besides the Raspberry Pi board, you will use several low-cost boards to develop the hands-on examples. In the labs, it is described what each step means in detail so that you can use your own hardware components adapting the content of the book to your needs. You will learn how to develop Linux drivers for the Raspberry Pi boards. You will start with the simplest ones that do not interact with any external hardware, then you will develop Linux drivers that manage different kind of devices: Accelerometer, DAC, ADC, RGB LED, Buttons, Joystick controller, Multi-Display LED controller and I/O expanders controlled via I2C and SPI buses. You will also develop DMA drivers, USB device drivers, drivers that manage interrupts and drivers that write and read on the internal registers of the SoC to control its GPIOs. To ease the development of some of these drivers, you will use different types of Linux kernel subsystems: Miscellaneous, LED, UIO, USB, Input and Industrial I/O. More than 30 kernel modules have been written (besides several user applications), which can be downloaded from the book's GitHub repository. This book uses the Long Term Support (LTS) Linux kernel 5.4, which was released on November 2019 and will be maintained until December 2025. The Linux drivers and applications developed in the labs have been ported to three different Raspberry Pi boards: Raspberry Pi 3 Model B, Raspberry Pi 3 Model B+ and Raspberry Pi 4 Model B. This book is a learning tool to start developing drivers without any previous knowledge about this field, so the intention during its writing has been to develop drivers without a high level of complexity that both serve to reinforce the main driver development concepts and can be a starting point to help you to develop your own drivers. And, remember that the best way to develop a driver is not to write it from scratch. You can reuse free code from similar Linux kernel mainline drivers. All the drivers written throughout this book are GPL licensed, so you can modify and redistribute them under the same license.

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 acces 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.

Linux Kernel Module Programming Guide is for people who want to write kernel modules. It takes a hands-on approach starting with writing a small "hello, world" program, and quickly moves from there. Far from a boring text on programming, Linux Kernel Module Programming Guide has a lively style that entertains while it educates. An excellent guide for anyone wishing to get started on kernel module programming. *** Money raised from the sale of this book supports the development of free software and documentation.

This book is written for students or professionals who quickly want to learn Linux Kernel programming and device driver development. Each chapter in this book is associated with code samples and code commentary so that the readers may quickly un.

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.

There is nothing like the power of the kernel in Windows - but how do you write kernel drivers to take advantage of that power? This book will show you how.The book describes software kernel drivers programming for Windows. These drivers don't deal with hardware, but rather with the system itself: processes, threads, modules, registry and more. Kernel code can be used for monitoring important events, preventing some from occurring if needed. Various filters can be written that can intercept calls that a driver may be interested in.

"This book is organized around three concepts fundamental to OS construction: virtualization (of CPU and memory), concurrency (locks and condition variables), and persistence (disks, RAIDS, and file systems"--Back cover.

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.

Harness the power of Linux to create versatile and robust embedded solutions Key Features Learn how to develop and configure robust embedded Linux devices Explore the new features of Linux 5.4 and the Yocto Project 3.1 (Dunfell) Discover different ways to debug and profile your code in both user space and the Linux kernel Book Description Embedded Linux runs many of the devices we use every day. From smart TVs and Wi-Fi routers to test equipment and industrial controllers, all of them have Linux at their heart. The Linux OS is one of the foundational technologies comprising the core of the Internet of Things (IoT). This book starts by breaking down the fundamental elements that underpin all embedded Linux projects: the toolchain, the bootloader, the kernel, and the root filesystem. After that, you will learn how to create each of these elements from scratch and automate the process using Buildroot and the Yocto Project. As you progress, the book explains how to implement an effective storage strategy for flash memory chips and install updates to a device remotely once it's deployed. You'll also learn about the key aspects of writing code for embedded Linux, such as how to access hardware from apps, the implications of writing multi-threaded code, and techniques to manage memory in an efficient way. The final chapters demonstrate how to debug your code, whether it resides in apps or in the Linux kernel itself. You'll also cover the different tracers and profilers that are available for Linux so that you can quickly pinpoint any performance bottlenecks in your system. By the end of this Linux book, you'll be able to create efficient and secure embedded devices using Linux. What you will learn Use Buildroot and the Yocto Project to create embedded Linux systems Troubleshoot BitBake build failures and streamline your Yocto development workflow Update IoT devices securely in the field using Mender or balena Prototype peripheral additions by reading schematics, modifying device trees, soldering breakout boards, and probing pins with a logic analyzer Interact with hardware without having to write kernel device drivers Divide your system up into services supervised by BusyBox runit Debug devices remotely using GDB and measure the performance of systems using tools such as perf, ftrace, eBPF, and Callgrind Who this book is for If you're a systems software engineer or system administrator who wants to learn Linux implementation on embedded devices, then this book is for you. Embedded systems engineers accustomed to programming for low-power microcontrollers can use this book to help make the leap to high-speed systems on chips that can run Linux. Anyone responsible for developing new hardware that needs to run Linux will also find this book useful. Basic working knowledge of the POSIX standard, C programming, and shell scripting is assumed.

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

Device drivers make it possible for your software to communicate with your hardware, and because every operating system has specific requirements, driver writing is nontrivial. When developing for FreeBSD, you've probably had to scour the Internet and dig through the kernel sources to figure out how to write the drivers you need. Thankfully, that stops now. In FreeBSD Device Drivers, Joseph Kong will teach you how to master everything from the basics of building and running loadable kernel modules to more complicated topics like thread synchronization. After a crash course in the different FreeBSD driver frameworks, extensive tutorial sections dissect real-world drivers like the parallel port printer driver. You'll learn: –All about Newbus, the infrastructure used by FreeBSD to manage the hardware devices on your system –How to work with ISA, PCI, USB, and other buses –The best ways to control and communicate with the hardware devices from user space –How to use Direct Memory Access (DMA) for maximum system performance –The inner workings of the virtual null modem terminal driver, the USB printer driver, the Intel PCI Gigabit Ethernet adapter driver, and other important drivers –How to use Common Access Method (CAM) to manage host bus adapters (HBAs) Concise descriptions and extensive annotations walk you through the many code examples. Don't waste time searching man pages or digging through the kernel sources to figure out how to make that arcane bit of hardware work with your system. FreeBSD Device Drivers gives you the framework that you need to write any driver you want, now.

Over the last few years, Linux has grown both as an operating system and a tool for personal and business use. Simultaneously becoming more user friendly and more powerful as a back-end system, Linux has achieved new plateaus: the newer filesystems have solidified, new commands and tools have appeared and become standard, and the desktop--including new desktop environments--have proved to be viable, stable, and readily accessible to even those who don't consider themselves computer gurus. Whether you're using Linux for personal software projects, for a small office or home office (often termed the SOHO environment), to provide services to a small group of colleagues, or to administer a site responsible for millions of email and web connections each day, you need quick access to information on a wide range of tools. This book covers all aspects of administering and making effective use of Linux systems. Among its topics are booting, package management, and revision control. But foremost in Linux in a Nutshell are the utilities and commands that make Linux one of the most powerful and flexible systems available. Now in its fifth edition, Linux in a Nutshell brings users up-to-date with the current state of Linux. Considered by many to be the most complete and authoritative command reference for Linux available, the book covers all substantial user, programming, administration, and networking commands for the most common Linux distributions. Comprehensive but concise, the fifth edition has been updated to cover new features of major Linux distributions. Configuration information for the rapidly growing commercial network services and community update services is one of the subjects covered for the first time. But that's just the beginning. The book covers editors, shells, and LILO and GRUB boot options. There's also coverage of Apache, Samba, Postfix, sendmail, CVS, Subversion, Emacs, vi, sed, gawk, and much more. Everything that system administrators, developers, and power users need to know about Linux is referenced here, and they will turn to this book again and again.

Learn to develop customized device drivers for your embedded Linux systemAbout 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 LinuxWho This Book Is ForThis 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 driversIn DetailLinux 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 approachA set of engaging examples to develop Linux device drivers

Mac OS X was released in March 2001, but many components, such as Mach and BSD, are considerably older. Understanding the design, implementation, and workings of Mac OS X requires examination of several technologies that differ in their age, origins, philosophies, and roles. Mac OS X Internals: A Systems Approach is the first book that dissects the internals of the system, presenting a detailed picture that grows incrementally as you read. For example, you will learn the roles of the firmware, the bootloader, the Mach and BSD kernel components (including the process, virtual memory, IPC, and file system layers), the object-oriented I/O Kit driver framework, user libraries, and other core pieces of software. You will learn how these pieces connect and work internally, where they originated, and how they evolved. The book also covers several key areas of the Intel-based Macintosh computers. A solid understanding of system internals is immensely useful in design, development, and debugging for programmers of various skill levels. System programmers can use the book as a reference and to construct a better picture of how the core system works. Application programmers can gain a deeper understanding of how their applications interact with the system. System administrators and power users can use the book to harness the power of the rich environment offered by Mac OS X. Finally, members of the Windows, Linux, BSD, and other Unix communities will find the book valuable in comparing and contrasting Mac OS X with their respective systems. Mac OS X Internals focuses on the technical aspects of OS X and is so full of extremely useful information and programming examples that it will definitely become a mandatory tool for every Mac OS X programmer.

Up-to-the-Minute, Complete Guidance for Developing Embedded Solutions with Linux Linux has emerged as today’s #1 operating system for embedded products. Christopher Hallinan’s Embedded Linux Primer has proven itself as the definitive real-world guide to building efficient, high-value, embedded systems with Linux. Now, Hallinan has thoroughly updated this highly praised book for the newest Linux kernels, capabilities, tools, and hardware support, including advanced multicore processors. Drawing on more than a decade of embedded Linux experience, Hallinan helps you rapidly climb the learning curve, whether you’re moving from legacy environments or you’re new to embedded programming. Hallinan addresses today’s most important development challenges and demonstrates how to solve the problems you’re most likely to encounter. You’ll learn how to build a modern, efficient embedded Linux development environment, and then utilize it as productively as possible. Hallinan offers up-to-date guidance on everything from kernel configuration and initialization to bootloaders, device drivers to file systems, and BusyBox utilities to real-time configuration and system analysis. This edition adds entirely new chapters on UDEV, USB, and open source build systems. Tour the typical embedded system and development environment and understand its concepts and components. Understand the Linux kernel and userspace initialization processes. Preview bootloaders, with specific emphasis on U-Boot. Configure the Memory Technology Devices (MTD) subsystem to interface with flash (and other) memory devices. Make the most of BusyBox and latest open source development tools. Learn from expanded and updated coverage of kernel debugging. Build and analyze real-time systems with Linux. Learn to configure device files and driver loading with UDEV. Walk through detailed coverage of the USB subsystem. Introduces the latest open source embedded Linux build systems. Reference appendices include U-Boot and BusyBox commands.

“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

Linux Device Drivers DevelopmentDevelop customized drivers for embedded LinuxPackt Publishing Ltd

Explore Implementation of core kernel subsystems About This Book Master the design, components, and structures of core kernel subsystems Explore kernel programming interfaces and related algorithms under the hood Completely updated material for the 4.12.10 kernel Who This Book Is For If you are a kernel programmer with a knowledge of kernel APIs and are looking to build a comprehensive understanding, and eager to explore the implementation, of kernel subsystems, this book is for you. It sets out to unravel the underlying details of kernel APIs and data structures, piercing through the complex kernel layers and gives you the edge you need to take your skills to the next level. What You Will Learn Comprehend processes and fles—the core abstraction mechanisms of the Linux kernel that promote effective simplification and dynamism Decipher process scheduling and understand effective capacity utilization under general and real-time dispositions Simplify and learn more about process communication techniques through signals and IPC mechanisms Capture the rudiments of memory by grasping the key concepts and principles of physical and virtual memory management Take a sharp and precise look at all the key aspects of interrupt management and the clock subsystem Understand concurrent execution on SMP platforms through kernel synchronization and locking techniques In Detail Mastering Linux Kernel Development looks at the Linux kernel, its internal arrangement and design, and various core subsystems, helping you to gain significant understanding of this open source marvel. You will look at how the Linux kernel, which possesses a kind of collective intelligence thanks to its scores of contributors, remains so elegant owing to its great design. This book also looks at all the key kernel code, core data structures, functions, and macros, giving you a comprehensive foundation of the implementation details of the kernel's core services and mechanisms. You will also look at the Linux kernel as well-designed software, which gives us insights into software design in general that are easily scalable yet fundamentally strong and safe. By the end of this book, you will have considerable understanding of and appreciation for the Linux kernel. Style and approach Each chapter begins with the basic conceptual know-how for a subsystem and extends into the details of its implementation. We use appropriate code excerpts of critical routines and data structures for subsystems.

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 Definations 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 Importent 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

Since the introduction of Linix version 1.2 in March 1995, a worldwide community has evolved from programmers who were attracted by the reliability and flexibility of this completely free operating system. Now at version 2.0, Linux is no longer simply the operating system of choice for hackers, but is being successfully employed in commercial software development, by

Internet providers and in research and teaching. This book is written for anybody who wants to learn more about Linux. It explains the inner mechanisms of Linux from process scheduling to memory management and file systems, and will tell you all you need to know about the structure of the kernel, the heart of the Linux operating system. This New Edition: has been thoroughly updated throughout to cover Linux 2.0 shows you how the Linux operating system actually works so that you can start to program the Linux kernel for yourself introduces the kernel sources and describes basic algorithms and data structures, such as scheduling and task structure helps you to understand file systems, networking, and how systems boot The accompanying CD-ROM contains Slackware distribution 3.1 together with its complete source code, the Linux kernel sources up to version 2.0.27, the PC speaker driver, and a wealth of documentation. 0201331438B04062001

Over 30 recipes to develop custom drivers for your embedded Linux applications. Key Features Use Kernel facilities to develop powerful drivers Via a practical approach, learn core concepts of developing device drivers Program a custom character device to get access to kernel internals Book Description Linux is a unified kernel that is widely used to develop embedded systems. As Linux has turned out to be one of the most popular operating systems used, the interest in developing proprietary device drivers has also increased. Device drivers play a critical role in how the system performs and ensures that the device works in the manner intended. By offering several examples on the development of character devices and how to use other kernel internals, such as interrupts, kernel timers, and wait queue, as well as how to manage a device tree, you will be able to add proper management for custom peripherals to your embedded system. You will begin by installing the Linux kernel and then configuring it. Once you have installed the system, you will learn to use the different kernel features and the character drivers. You will also cover interrupts in-depth and how you can manage them. Later, you will get into the kernel internals required for developing applications. Next, you will implement advanced character drivers and also become an expert in writing important Linux device drivers. By the end of the book, you will be able to easily write a custom character driver and kernel code as per your requirements. What you will learn Become familiar with the latest kernel releases (4.19+/5.x) running on the ESPRESSObin devkit, an ARM 64-bit machine Download, configure, modify, and build kernel sources Add and remove a device driver or a module from the kernel Master kernel programming Understand how to implement character drivers to manage different kinds of computer peripherals Become well versed with kernel helper functions and objects that can be used to build kernel applications Acquire a knowledge of in-depth concepts to manage custom hardware with Linux from both the kernel and user space Who this book is for This book will help anyone who wants to develop their own Linux device drivers for embedded systems. Having basic hand-on with Linux operating system and embedded concepts is necessary.

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

In-depth instruction and practical techniques for buildingwith the BeagleBone embedded Linux platform Exploring BeagleBone is a hands-on guide to bringinggadgets, gizmos, and robots to life using the popular BeagleBoneembedded Linux platform. Comprehensive content and deep detailprovide more than just a BeagleBone instructionmanual—you'll also learn the underlying engineeringtechniques that will allow you to create your own projects. Thebook begins with a foundational primer on essential skills, andthen gradually moves into communication, control, and advancedapplications using C/C++, allowing you to learn at your own pace.In addition, the book's companion website featuresinstructional videos, source code, discussion forums, and more, toensure that you have everything you need. The BeagleBone's small size, high performance, low cost,and extreme adaptability have made it a favorite developmentplatform, and the Linux software base allows for complex yetflexible functionality. The BeagleBone has applications in smartbuildings, robot control, environmental sensing, to name a few;and, expansion boards and peripherals dramatically increase thepossibilities. Exploring BeagleBone provides areader-friendly guide to the device, including a crash coursein computer engineering. While following step by step, you can: Get up to speed on embedded Linux, electronics, andprogramming Master interfacing electronic circuits, buses and modules, withpractical examples Explore the Internet-connected BeagleBone and the BeagleBonewith a display Apply the BeagleBone to sensing applications, including videoand sound Explore the BeagleBone's Programmable Real-TimeControllers Hands-on learning helps ensure that your new skills stay withyou, allowing you to design with electronics, modules, orperipherals even beyond the BeagleBone. Insightful guidance andonline peer support help you transition from beginner to expert asyou master the techniques presented in Exploring BeagleBone,the practical handbook for the popular computing platform.

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.

In this book, Dr. Billings shares the "secret sauce" which has made the Acellus Learning System a game changer for thousands of schools coast-to-coast.Acellus makes a science of the learning process. It contains tools to recover discouraged studentsand to accelerate the learning process.In these pages, the author shares the tools, the techniques, and the magic of Acellus that is changingeducation, discussing important aspects of the system: - What is Acellus? - How does it work? - What happens when a student gets stuck?- How does Acellus accelerate the learning process?Dr. Maria Sanchez, Chairman International Academy of Science

UNIX, UNIX LINUX & UNIX TCL/TK. Write software that makes the most effective use of the Linux system, including the kernel and core system libraries. The majority of both Unix and Linux code is still written at the system level, and this book helps you focus on everything above the kernel, where applications such as Apache, bash, cp, vim, Emacs, gcc, gdb, glibc, ls, mv, and X exist. Written primarily for engineers looking to program at the low level, this updated edition of Linux System Programming gives you an understanding of core internals that makes for better code, no matter where it appears in the stack. -- Provided by publisher.

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

Writing Linux Device Drivers is designed to show experienced programmers how to develop device drivers for Linux systems, and give them a basic understanding and familiarity with the Linux kernel. Upon mastering this material, you will be familiar with the different kinds of device drivers used under Linux, and know the appropriate API's through which devices (both hard and soft) interface with the kernel. The purpose is to get you into coding as quickly as possible. Thus we'll tell you early on how to dynamically allocate memory in the simplest way, so you can actually write code, and then later cover the subject more thoroughly. Each section has exercises, most of which involve writing code, designed to help you gain familiarity with programming for the Linux kernel. Solutions are provided. We are not aiming for an expert audience, but instead for a competent and motivated one.

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.

Master the techniques needed to build great, efficient embedded devices on Linux About This Book Discover how to build and configure reliable embedded Linux devices This book has been updated to include Linux 4.9 and Yocto Project 2.2 (Morty) This comprehensive guide covers the remote update of devices in the field and power management Who This Book Is For If you are an engineer who wishes to understand and use Linux in embedded devices, this book is for you. It is also for Linux developers and system programmers who are familiar with embedded systems and want to learn and program the best in class devices. It is appropriate for students studying embedded techniques, for developers implementing embedded Linux devices, and engineers supporting existing Linux devices. What You Will Learn Evaluate the Board Support Packages offered by most manufacturers of a system on chip or embedded module Use Buildroot and the Yocto Project to create embedded Linux systems quickly and efficiently Update IoT devices in the field without compromising security Reduce the power budget of devices to make batteries last longer Interact with the hardware without having to write kernel device drivers Debug devices remotely using GDB, and see how to measure the performance of the systems using powerful tools such as perk, ftrace, and valgrind Find out how to configure Linux as a real-time operating system In Detail Embedded Linux runs many of the devices we use every day, from smart TVs to WiFi routers, test equipment to industrial controllers - all of them have Linux at their heart. Linux is a core technology in the implementation of the inter-connected world of the Internet of Things. The comprehensive guide shows you the technologies and techniques required to build Linux into embedded systems. You will begin by learning about the fundamental elements that underpin all embedded Linux projects: the toolchain, the bootloader, the kernel, and the root filesystem. You'll see how to create each of these elements from scratch, and how to automate the process using Buildroot and the Yocto Project. Moving on, you'll find out how to implement an effective storage strategy for flash memory chips, and how to install updates to the device remotely once it is deployed. You'll also get to know the key aspects of writing code for embedded Linux, such as how to access hardware from applications, the implications of writing multi-threaded code, and techniques to manage memory in an efficient way. The final chapters show you how to debug your code, both in applications and in the Linux kernel, and how to profile the system so that you can look out for performance bottlenecks. By the end of the book, you will have a complete overview of the steps required to create a successful embedded Linux system. Style and approach This book is an easy-to-follow and pragmatic guide with in-depth analysis of the implementation of embedded devices. It follows the life cycle of a project from inception through to completion, at each stage giving both the theory that underlies the topic and practical step-by-step walkthroughs of an example implementation.

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.

During the summer of 1966, Richard Franklin Speck, a twenty-two year old Ordinary Seaman, waiting for a berth aboard a merchant ship, murdered eight student nurses inside a townhouse in South Chicago, shocking the surrounding hardworking, religious community to its very core. Twenty years later, Carly Rocket and her business partner, Mike Holtzer, find themselves inside Stateville Correctional Facility hired to cast extras for a Hollywood movie. Unbeknownst to Carly, Speck is one of Stateville's inmates. His infamous murders took place only blocks from her childhood home leaving her with deep emotional scars. Discovering that Speck is enjoying his life behind bars, Carly is outraged and conspires with a guard to make a video tape of Speck's uninhibited life in an attempt to change prison regulations. But it backfires, and suddenly Carly finds herself in danger of becoming Speck's ninth victim.

Modern Operating Systems, Fourth Edition, is intended for introductory courses in Operating Systems in Computer Science, Computer Engineering, and Electrical Engineering programs. It also serves as a useful reference for OS professionals ¿ The widely anticipated revision of this worldwide best-seller incorporates the latest developments in operating systems (OS) technologies. The Fourth Edition includes up-to-date materials on relevant¿OS. Tanenbaum also provides information on current research based on his experience as an operating systems researcher. ¿ Modern Operating Systems, Third Editionwas the recipient of the 2010 McGuffey Longevity Award. The McGuffey Longevity Award recognizes textbooks whose excellence has been demonstrated over time.¿http://taaonline.net/index.html ¿¿ Teaching and Learning Experience This program will provide a better teaching and learning experience–for you and your students. It will help: ¿ Provide Practical Detail on the Big Picture Concepts: A clear and entertaining writing style outlines the concepts every OS designer needs to master. Keep Your Course Current: This edition includes information on the latest OS technologies and developments Enhance Learning with Student and Instructor Resources: Students will gain hands-on experience using the simulation exercises and lab experiments.

The Gospel According to Mamma is a collection of twenty-one extraordinary lessons the author learned from her charming and captivating mamma. These “mamma teachings” are packed with sassy inspiration, practical insights and real-life anecdotes. Leaving Georgia with her mamma late one September night when her daddy was en route to end their lives marked the beginning of a lifetime of instruction. How to maintain faith in God and yourself, love the hell out of folks and be happy when there's no obvious reason to be are just a few of the messages you'll find in this book. PRAISE FOR THE GOSPEL ACCORDING TO MAMMA “Annette’s first book is a winner! She picked the perfect subject – her irrepressibly joyous mother, who has given her daughter important and inspiring words of wisdom to cherish. If you yearn to help your daughter navigate life experiences with assurance and spunk, give her The Gospel According to Mamma.” —Mary Jo Beebe, coauthor of Jesus’ Healings and New Testament Healings “If only there were more mothers like Annette Bridges’ mamma: always encouraging, always believing the best of her children, a ‘steel magnolia’ whose motherly advice is based on the Bible and common sense. Remembering events in her own past, Annette gives us 21 valuable life lessons based on the wisdom of her indefatigable Southern mamma.”–Renee Corley, former editor at UPI’s religionandspirituality.com “Once you get to the end of reading about Mamma and her wonderful lessons, you will walk away a little wiser. Annette puts life in perspective. She lives a fulfilling life, just as her Mamma taught her. Whether to find your faith, believe in your self or master the ability to see the good in others, Mamma lessons help you find the positive. There is much to learn from these strong and inspiring women.” —SingleMom.com “A look into the heart and soul of Annette Bridges. It could be anyone’s story, but it couldn’t be told any better.” —Bob Belcher, Managing Editor, Corsicana Daily Sun “For anyone who has ever had a mother (and you know who you are), synthesizing that experience can leave many of us speechless. It is ‘good news’ that Annette Bridges is at no loss for words. She liberally shares her mom’s gospel in deep drafts of down-to-earth good sense and faith, liberally laced with Southern humor.” —Susan J. Cobb, author of Virgin Territory: How I Found My Inner Guadalupe “Irresistibly heartfelt. Perfect for all mothers and daughters, past, present and future!” —Jennifer Bridges, author’s daughter and Ph.D. student “I have been hearing stories about Nellie, Annette’s Mamma for the last 25 years. Annette makes you feel like you are sitting down with her in her ranch house or on that beach she talks about going to while she shares her Mamma with you from her perspective, with the insights she has gained over her lifetime. I hope you enjoy getting to know Nellie and Annette, 2 Georgia peaches transplanted to Texas. I love the way Annette brings the Bible into her daily life and shares it with us so that we can feel the love of God that is so present today in her life and illustrates how the Bible can show us how to go in ours. Way to go Girlfriend… you finally did it! You wrote a book and it’s a winner! I can’t wait to share this with my family and friends!” —Kathy Glover, friend to both Annette and her mamma

Provides a definitive resource for those who want to support computer peripherals under the Linux operating system, explaining how to write a driver for a broad spectrum of devices, including character devices, network interfaces, and block devices. Original. (Intermediate).

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 ATSAMA5D27-SOM1-EK1 evaluation platform; the ATSAMA5D27-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.
Nwely updated to include new calls and techniques introduced in Versions 2.2 and 2.4 of the Linux kernel, a definitive resource for those who want to support computer peripherals under the Linux operating system explains how to write a driver for a broad spectrum of devices, including character devices, network interfaces, and block devices. Original. (Intermediate)
This book follows on from Linux Kernel Programming, helping you explore the Linux character device driver framework and enables you to write 'misc' class drivers. You'll learn how to efficiently interface with user apps, perform I/O on hardware memory, handle hardware interrupts, and leverage kernel delays, timers, kthreads, and workqueues.