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Linux For Embedded And Real Time Applications Third Edition Embedded Technology

There's a great deal of excitement surrounding the use of Linux in embedded systems -- for everything from cell phones to car ABS systems and water-filtration plants -- but not a lot of practical information. Building Embedded Linux Systems offers an in-depth, hard-core guide to putting together embedded systems based on Linux. Updated for the latest version of the Linux kernel,

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this new edition gives you the basics of building embedded Linux systems, along with the configuration, setup, and use of more than 40 different open source and free software packages in common use. The book also looks at the strengths and weaknesses of using Linux in an embedded system, plus a discussion of licensing issues, and an introduction to real-time, with a discussion of real-time options for Linux. This indispensable book features arcane and previously undocumented procedures for:

Building your own GNU development toolchain Using an efficient embedded development framework Selecting, configuring,

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*building, and installing a target-specific kernel
Creating a complete target root filesystem
Setting up, manipulating, and using solid-state storage devices
Installing and configuring a bootloader for the target
Cross-compiling a slew of utilities and packages
Debugging your embedded system using a plethora of tools and techniques
Using the uClibc, BusyBox, U-Boot, OpenSSH, tftpd, tftp, strace, and gdb packages
By presenting how to build the operating system components from pristine sources and how to find more documentation or help, Building Embedded Linux Systems greatly simplifies the task of keeping*

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*complete control over your
embedded operating system.*

*Linux for Embedded and Real-time
Applications Elsevier*

*Leverage the power of Linux to
develop captivating and powerful
embedded Linux projects About
This Book Explore the best
practices for all embedded product
development stages Learn about
the compelling features offered by
the Yocto Project, such as
customization, virtualization, and
many more Minimize project costs
by using open source tools and
programs Who This Book Is For If
you are a developer who wants to
build embedded systems using
Linux, this book is for you. It is the
ideal guide for you if you want to*

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become proficient and broaden your knowledge. A basic understanding of C programming and experience with systems programming is needed. Experienced embedded Yocto developers will find new insight into working methodologies and ARM specific development competence. What You Will Learn Use the Yocto Project in the embedded Linux development process Get familiar with and customize the bootloader for a board Discover more about real-time layer, security, virtualization, CGL, and LSB See development workflows for the U-Boot and the Linux kernel, including debugging and optimization Understand the

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open source licensing requirements and how to comply with them when cohabiting with proprietary programs Optimize your production systems by reducing the size of both the Linux kernel and root filesystems Understand device trees and make changes to accommodate new hardware on your device Design and write multi-threaded applications using POSIX threads Measure real-time latencies and tune the Linux kernel to minimize them In Detail Embedded Linux is a complete Linux distribution employed to operate embedded devices such as smartphones, tablets, PDAs, set-top boxes, and many more. An example of an

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embedded Linux distribution is Android, developed by Google. This learning path starts with the module Learning Embedded Linux Using the Yocto Project. It introduces embedded Linux software and hardware architecture and presents information about the bootloader. You will go through Linux kernel features and source code and get an overview of the Yocto Project components available. The next module Embedded Linux Projects Using Yocto Project Cookbook takes you through the installation of a professional embedded Yocto setup, then advises you on best practices. Finally, it explains how to quickly get hands-on with the

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Freescale ARM ecosystem and community layer using the affordable and open source Wandboard embedded board. Moving ahead, the final module Mastering Embedded Linux Programming takes you through the product cycle and gives you an in-depth description of the components and options that are available at each stage. You will see how functions are split between processes and the usage of POSIX threads. By the end of this learning path, your capabilities will be enhanced to create robust and versatile embedded projects. This Learning Path combines some of the best that Packt has to offer in one

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complete, curated package. It includes content from the following Packt products: Learning Embedded Linux Using the Yocto Project by Alexandru Vaduva Embedded Linux Projects Using Yocto Project Cookbook by Alex Gonzalez Mastering Embedded Linux Programming by Chris Simmonds Style and approach This comprehensive, step-by-step, pragmatic guide enables you to build custom versions of Linux for new embedded systems with examples that are immediately applicable to your embedded developments. Practical examples provide an easy-to-follow way to learn Yocto project development using the best practices and

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working methodologies. Coupled with hints and best practices, this will help you understand embedded Linux better.

Embedded Linux provides the reader the information needed to design, develop, and debug an embedded Linux appliance. It explores why Linux is a great choice for an embedded application and what to look for when choosing hardware.

Linux Device Drivers

The Works

Real-Time Embedded Systems

Hardware, Software, and

Interfacing

*Embedded Linux Development
with Yocto Project*

Expand Raspberry Pi capabilities

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with fundamental engineering principles Exploring Raspberry Pi is the innovators guide to bringing Raspberry Pi to life. This book favors engineering principles over a 'recipe' approach to give you the skills you need to design and build your own projects. You'll understand the fundamental principles in a way that transfers to any type of electronics, electronic modules, or external peripherals, using a "learning by doing" approach that caters to both beginners and experts. The book begins with basic Linux and programming skills, and helps you stock your inventory with common parts and supplies. Next, you'll learn how to make parts work together to achieve the goals of your project, no matter what type of

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components you use. The companion website provides a full repository that structures all of the code and scripts, along with links to video tutorials and supplementary content that takes you deeper into your project. The Raspberry Pi's most famous feature is its adaptability. It can be used for thousands of electronic applications, and using the Linux OS expands the functionality even more. This book helps you get the most from your Raspberry Pi, but it also gives you the fundamental engineering skills you need to incorporate any electronics into any project. Develop the Linux and programming skills you need to build basic applications Build your inventory of parts so you can always "make it work" Understand

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interfacing, controlling, and communicating with almost any component Explore advanced applications with video, audio, real-world interactions, and more Be free to adapt and create with Exploring Raspberry Pi. 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 If you're looking for a book that will demystify embedded Linux, then you've come to the right place. Mastering Embedded Linux

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Programming is a fully comprehensive guide that can serve both as means to learn new things or as a handy reference. The first few chapters of this book will break 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 will show you 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

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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

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Mender or balenaPrototype peripheral additions by reading schematics, modifying device trees, soldering breakout boards, and probing pins with a logic analyzerInteract with hardware without having to write kernel device driversDivide your system up into services supervised by BusyBox runitDebug devices remotely using GDB and measure the performance of systems using tools such as perf, ftrace, eBPF, and CallgrindWho this book is for If you're a systems software engineer or system administrator who wants to learn how to implement Linux on embedded devices, then this book is for you. It's also aimed at embedded systems engineers accustomed to programming for low-power microcontrollers, who

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can use this book to help make the leap to high-speed systems on chips that can run Linux. Anyone who develops hardware that needs to run Linux will find something useful in this book – but before you get started, you'll need a solid grasp on POSIX standard, C programming, and shell scripting. Embedded Android is for Developers wanting to create embedded systems based on Android and for those wanting to port Android to new hardware, or creating a custom development environment. Hackers and moders will also find this an indispensable guide to how Android works. This book integrates new ideas and topics from real time systems, embedded systems, and software engineering to give a complete

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picture of the whole process of developing software for real-time embedded applications. You will not only gain a thorough understanding of concepts related to microprocessors, interrupts, and system boot process, appreciating the importance of real-time modeling and scheduling, but you will also learn software engineering practices such as model documentation, model analysis, design patterns, and standard conformance. This book is split into four parts to help you learn the key concept of embedded systems; Part one introduces the development process, and includes two chapters on microprocessors and interrupts---fundamental topics for software engineers; Part two is dedicated to modeling techniques

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for real-time systems; Part three looks at the design of software architectures and Part four covers software implementations, with a focus on POSIX-compliant operating systems. With this book you will learn: The pros and cons of different architectures for embedded systems POSIX real-time extensions, and how to develop POSIX-compliant real time applications How to use real-time UML to document system designs with timing constraints The challenges and concepts related to cross-development Multitasking design and inter-task communication techniques (shared memory objects, message queues, pipes, signals) How to use kernel objects (e.g. Semaphores, Mutex, Condition variables) to address

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resource sharing issues in RTOS applications The philosophy underpinning the notion of "resource manager" and how to implement a virtual file system using a resource manager The key principles of real-time scheduling and several key algorithms Coverage of the latest UML standard (UML 2.4) Over 20 design patterns which represent the best practices for reuse in a wide range of real-time embedded systems Example codes which have been tested in QNX---a real-time operating system widely adopted in industry

Real-Time Embedded Components and Systems with Linux and RTOS
Embedded Android
Linux: Embedded Development
With C and GNU Development Tools

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Embedded and Real-Time Operating
Systems
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Authored by two of the leading authorities in the field, this guide offers readers the knowledge and skills needed to achieve proficiency with embedded software.

'... a very good balance between the theory and practice of real-time embedded system designs.' —Jun-

*ichiro itojun Hagino, Ph.D.,
Research Laboratory, Internet
Initiative Japan Inc., IETF IPv6
Operations Working Group (v6ops)
co-chair 'A cl*

*Build Complete Embedded Linux
Systems Quickly and Reliably
Developers are increasingly
integrating Linux into their*

embedded systems: It supports virtually all hardware architectures and many peripherals, scales well, offers full source code, and requires no royalties. The Yocto Project makes it much easier to customize Linux for embedded systems. If you're a developer with working knowledge of Linux, Embedded Linux Systems with the Yocto Project™ will help you make the most of it. An indispensable companion to the official documentation, this guide starts by offering a solid grounding in the embedded Linux landscape and the challenges of creating custom distributions for embedded systems. You'll master the Yocto Project's

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toolbox hands-on, by working through the entire development lifecycle with a variety of real-life examples that you can incorporate into your own projects. Author Rudolf Streif offers deep insight into Yocto Project's build system and engine, and addresses advanced topics ranging from board support to compliance management. You'll learn how to Overcome key challenges of creating custom embedded distributions Jumpstart and iterate OS stack builds with the OpenEmbedded Build System Master build workflow, architecture, and the BitBake Build Engine Quickly troubleshoot build problems Customize new distros

with built-in blueprints or from scratch Use BitBake recipes to create new software packages Build kernels, set configurations, and apply patches Support diverse CPU architectures and systems Create Board Support Packages (BSP) for hardware-specific adaptations Provide Application Development Toolkits (ADT) for round-trip development Remotely run and debug applications on actual hardware targets Ensure open-source license compliance Scale team-based projects with Toaster, Build History, Source Mirrors, and Autobuilder 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*

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*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*

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powerful tools such as `perf`, `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 interconnected 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

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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

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implementation.

*GNU/Linux Rapid Embedded
Programming*

*A Practical Real-World Approach
Embedded Linux Primer*

Embedded Software

*Create fast and reliable embedded
solutions with Linux 5.4 and the
Yocto Project 3.1 (Dunfell)*

In-depth instruction and practical techniques for building with the BeagleBone embedded Linux platform Exploring BeagleBone is a hands-on guide to bringing gadgets, gizmos, and robots to life using the popular BeagleBone embedded Linux platform. Comprehensive content and deep detail provide more

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than just a BeagleBone instruction manual—you'll also learn the underlying engineering techniques that will allow you to create your own projects. The book begins with a foundational primer on essential skills, and then gradually moves into communication, control, and advanced applications using C/C++, allowing you to learn at your own pace. In addition, the book's companion website features instructional videos, source code, discussion forums, and more, to ensure that you have everything you need. The BeagleBone's small size, high performance, low cost, and

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extreme adaptability have made it a favorite development platform, and the Linux software base allows for complex yet flexible functionality. The BeagleBone has applications in smart buildings, robot control, environmental sensing, to name a few; and, expansion boards and peripherals dramatically increase the possibilities.

Exploring BeagleBone provides a reader-friendly guide to the device, including a crash course in computer engineering. While following step by step, you can:
Get up to speed on embedded Linux, electronics, and programming Master interfacing

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electronic circuits, buses and modules, with practical examples Explore the Internet-connected BeagleBone and the BeagleBone with a display Apply the BeagleBone to sensing applications, including video and sound Explore the BeagleBone's Programmable Real-Time Controllers Hands-on learning helps ensure that your new skills stay with you, allowing you to design with electronics, modules, or peripherals even beyond the BeagleBone. Insightful guidance and online peer support help you transition from beginner to expert as you master the techniques presented in Exploring

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BeagleBone, the practical handbook for the popular computing platform.

Build a strong foundation in designing and implementing real-time systems with the help of practical examples

Key Features

- Get up and running with the fundamentals of RTOS and apply them on STM32
- Enhance your programming skills to design and build real-world embedded systems
- Get to grips with advanced techniques for implementing embedded systems

Book Description A real-time operating system (RTOS) is used to develop systems that respond to events within strict

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timelines. Real-time embedded systems have applications in various industries, from automotive and aerospace through to laboratory test equipment and consumer electronics. These systems provide consistent and reliable timing and are designed to run without intervention for years. This microcontrollers book starts by introducing you to the concept of RTOS and compares some other alternative methods for achieving real-time performance. Once you've understood the fundamentals, such as tasks, queues, mutexes, and semaphores, you'll learn what to

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look for when selecting a microcontroller and development environment. By working through examples that use an STM32F7 Nucleo board, the STM32CubeIDE, and SEGGER debug tools, including SEGGER J-Link, Ozone, and SystemView, you'll gain an understanding of preemptive scheduling policies and task communication. The book will then help you develop highly efficient low-level drivers and analyze their real-time performance and CPU utilization. Finally, you'll cover tips for troubleshooting and be able to take your new-found skills to the next level. By the end of this

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book, you'll have built on your embedded system skills and will be able to create real-time systems using microcontrollers and FreeRTOS. What you will learn Understand when to use an RTOS for a project Explore RTOS concepts such as tasks, mutexes, semaphores, and queues Discover different microcontroller units (MCUs) and choose the best one for your project Evaluate and select the best IDE and middleware stack for your project Use professional-grade tools for analyzing and debugging your application Get FreeRTOS-based applications up and running on an STM32

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board Who this book is for This book is for embedded engineers, students, or anyone interested in learning the complete RTOS feature set with embedded devices. A basic understanding of the C programming language and embedded systems or microcontrollers will be helpful. 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.

This book offers readers an idea

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of what embedded Linux software and hardware architecture looks like, cross-compiling, and also presents information about the bootloader and how it can be built for a specific board. This book will go through Linux kernel features and source code, present information on how to build a kernel source, modules, and the Linux root filesystem. You'll be given an overview of the available Yocto Project components, how to set up Yocto Project Eclipse IDE, and how to use tools such as Wic and Swabber that are still under development. It will present the

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meta-realtime layer and the newly created meta-cgl layer, its purpose, and how it can add value to poky.

Building real-time embedded systems using FreeRTOS, STM32 MCUs, and SEGGER debug tools

Embedded Operating Systems
Pro Linux Embedded Systems
Exploring Raspberry Pi
Concepts, Techniques, Tricks, and Traps

As the embedded world expands, developers must have a strong grasp of many complex topics in order to make faster, more efficient and more powerful microprocessors to meet the public's growing demand.

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Embedded Software: The Works covers all the key subjects embedded engineers need to understand in order to succeed, including Design and Development, Programming, Languages including C/C++, and UML, Real Time Operating Systems Considerations, Networking, and much more. New material on Linux, Android, and multi-core gives engineers the up-to-date practical know-how they need in order to succeed. Colin Walls draws upon his experience and insights from working in the industry, and covers the complete cycle of embedded software development: its design, development, management,

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debugging procedures, licensing, and reuse. For those new to the field, or for experienced engineers looking to expand their skills, Walls provides the reader with detailed tips and techniques, and rigorous explanations of technologies. Key features include: New chapters on Linux, Android, and multi-core - the cutting edge of embedded software development! Introductory roadmap guides readers through the book, providing a route through the separate chapters and showing how they are linked About the Author Colin Walls has over twenty-five years experience in the electronics industry, largely dedicated to embedded software. A frequent

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presenter at conferences and seminars and author of numerous technical articles and two books on embedded software, he is a member of the marketing team of the Mentor Graphics Embedded Software Division. He writes a regular blog on the Mentor website (blogs.mentor.com/colinwalls). New chapters on Linux, Android, and multi-core - the cutting edge of embedded software development!

Introductory roadmap guides readers through the book, providing a route through the separate chapters and showing how they are linked

**LINUX DRIVER DEVELOPMENT
FOR EMBEDDED PROCESSORS
- SECOND EDITION - The**

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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

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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.

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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

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devices. To ease 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

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described throughout the text of this book, but in a practice labs user guide that can be downloaded from the book's GitHub.

In-depth instruction and practical techniques for building with the BeagleBone embedded Linux platform Exploring BeagleBone is a hands-on guide to bringing gadgets, gizmos, and robots to life using the popular BeagleBone embedded Linux platform. Comprehensive content and deep detail provide more than just a BeagleBone instruction manual—you'll also learn the underlying engineering techniques that will allow you to create your own projects. The book begins with a

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foundational primer on essential skills, and then gradually moves into communication, control, and advanced applications using C/C++, allowing you to learn at your own pace. In addition, the book's companion website features instructional videos, source code, discussion forums, and more, to ensure that you have everything you need. The BeagleBone's small size, high performance, low cost, and extreme adaptability have made it a favorite development platform, and the Linux software base allows for complex yet flexible functionality. The BeagleBone has applications in smart buildings, robot control, environmental sensing, to name a

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few;and, expansion boards and peripherals dramatically increase the possibilities. Exploring BeagleBone provides a reader-friendly guide to the device, including a crash course in computer engineering. While following step by step, you can: Get up to speed on embedded Linux, electronics, and programming Master interfacing electronic circuits, buses and modules, with practical examples Explore the Internet-connected BeagleBone and the BeagleBone with a display Apply the BeagleBone to sensing applications, including video and sound Explore the BeagleBone's Programmable Real-Time Controllers Hands-on

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learning helps ensure that your new skills stay with you, allowing you to design with electronics, modules, or peripherals even beyond the BeagleBone. Insightful guidance and online peer support help you transition from beginner to expert as you master the techniques presented in Exploring BeagleBone, the practical handbook for the popular computing platform. Based upon the authors' experience in designing and deploying an embedded Linux system with a variety of applications, Embedded Linux System Design and Development contains a full embedded Linux system development roadmap for systems

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architects and software programmers. Explaining the issues that arise out of the use of Linux in embedded systems, the book facilitates movement to embedded Linux from traditional real-time operating systems, and describes the system design model containing embedded Linux. This book delivers practical solutions for writing, debugging, and profiling applications and drivers in embedded Linux, and for understanding Linux BSP architecture. It enables you to understand: various drivers such as serial, I2C and USB gadgets; uClinux architecture and its programming model; and the

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embedded Linux graphics
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subsystem. The text also promotes learning of methods to reduce system boot time, optimize memory and storage, and find memory leaks and corruption in applications. This volume benefits IT managers in planning to choose an embedded Linux distribution and in creating a roadmap for OS transition. It also describes the application of the Linux licensing model in commercial products.

Tools and Techniques for Building
with Embedded Linux

Embedded Linux

Linux Driver Development for
Embedded Processors - Second
Edition

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Building Embedded Linux Systems
Mastering Embedded Linux

Programming-Second Edition

*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*

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are an engineer who
Embedded Technology

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

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*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*

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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 systemIn DetailEmbedded 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

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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

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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.

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*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.
This easy-to-follow
textbook/reference
guides the reader

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through the creation of a fully functional embedded operating system, from its source code, in order to develop a deeper understanding of each component and how they work together. The text describes in detail the procedure for building the bootloader, kernel, filesystem, shared libraries, start-up scripts, configuration files and system utilities, to produce a GNU/Linux operating system. This fully

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updated second edition
also includes new

material on virtual
machine technologies
such as VirtualBox,
Vagrant and the Linux
container system Docker.

Topics and features:
presents an overview of
the GNU/Linux system,
introducing the
components of the
system, and covering
aspects of process
management, input/output
and environment;
discusses containers and
the underlying kernel
technology upon which

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*they are based; provides
a detailed examination
of the GNU/Linux
filesystem; explains how
to build an embedded
system under a virtual
machine, and how to
build an embedded system
to run natively on an
actual
processor; introduces the
concept of the compiler
toolchain, and reviews
the platforms BeagleBone
and Raspberry Pi;
describes how to build
firmware images for
devices running the
Openwrt operating*

system. The hands-on nature and clearly structured approach of this textbook will appeal strongly to practically minded undergraduate and graduate level students, as well as to industry professionals involved in this area.

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

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new edition of
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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

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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.

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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

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*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

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*this book will help you
make the most of your
Linux system.*

*Turn your ideas into
reality by programming
and building embedded
systems quickly*
About
This Book* *Design and
build powerful rapid
prototypes for GNU/Linux
Embedded systems**
*Address complex industry
problems and program
complete projects to
acquire competence with
the workings of embedded
systems* Write, monitor,
and configure
applications quickly and*

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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 effectively program Embedded Systems and perform Embedded development. The book focuses to help rapidly build prototypes in a proficient manner. Some experience of hardware and Embedded Systems is assumed with exposure

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working on GNU/Linux
Embedded Technology

systems. Knowledge of
scripting on GNU/Linux
is expected. What You
Will Learn* Use embedded
systems to implement
real-world projects*
Learn to access and
manage peripherals for
embedded systems*
Program embedded systems
using languages such as
C, Python, BASH, PHP*
Using a complete
distribution like
Debian/Ubuntu or an
embedded one like
OpenWRT or Yocto*
Harness device driver

capabilities to optimize
device communications*

Using and accessing data
through several kinds of
devices such as analog,
networking , multimedia,
and several reader

devices such as RTC,
RFID, Smart Cards and z-
Wave* Managing an

external micro-
controller for time
critical tasksIn

DetailEmbedded computers
have become very complex
in the last few years,
and developers need to
easily manage embedded
computer projects by

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focusing on how to solve a problem. They should not be wasting time in finding supported peripherals or learning how to manage them. This book shows you how to interact with external environments through specific peripherals used in the industry. We will use the latest Linux kernel release 4.x and Debian/Ubuntu distributions (with embedded distributions such as OpenWRT and Yocto). This book presents popular boards

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in the industry that are user-friendly, such as Beaglebone Black, Atmel Xplained, Wandboard, and system-on-chip manufacturers, and provides projects based on them. You will take your first steps in programming the embedded platforms using the C, Bash, and Python/PHP languages in order to get access to the external peripherals. We'll lay a strong foundation for using embedded systems quickly by covering the

driver and accessing the peripherals. You will learn how to read/write data from/to the external environment by using C programs or a scripting language (such as Bash/PHP/Python) and see how to configure a device driver for specific hardware. The final chapter explains how to use a microcontroller board based on the most used microcontroller to implement real-time or specific tasks that are

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normally not carried out
Embedded Technology
on the GNU/Linux system

. After finishing this
book, you will be
capable of applying
these skills in real-
world projects.

*Understanding the Linux
Kernel*

*A Practical Approach
Linux for Embedded and
Real-time Applications
Porting, Extending, and
Customizing*

*Interfacing to the Real
World with Embedded
Linux*

*Linux for Embedded and Real-
Time Applications, Fourth Edition,*

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Applications, Third Edition
Embedded Technology
provides a practical introduction to the basics, covering the latest developments in this rapidly evolving technology. Ideal for those new to the use of Linux in an embedded environment, the book takes a hands-on approach that covers key concepts of building applications in a cross-development environment. Hands-on exercises focus on the popular open source BeagleBone Black board. New content includes graphical programming with QT as well as expanded and updated material on projects such as Eclipse, BusyBox – configuring and building, the U-Boot bootloader – what it is, how it works, configuring and building, and new coverage of the Root file system and the latest updates on

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the Linux kernel.. Provides a hands-on introduction for engineers and software developers who need to get up to speed quickly on embedded Linux, its operation and capabilities Covers the popular open source target boards, the BeagleBone and BeagleBone Black Includes new and updated material that focuses on BusyBox, U-Boot bootloader and graphical programming with QT This book is intended to provide a senior undergraduate or graduate student in electrical engineering or computer science with a balance of fundamental theory, review of industry practice, and hands-on experience to prepare for a career in the real-time embedded system industries. It is

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also intended to provide the practicing engineer with the necessary background to apply real-time theory to the design of embedded components and systems. Typical industries include aerospace, medical diagnostic and therapeutic systems, telecommunications, automotive, robotics, industrial process control, media systems, computer gaming, and electronic entertainment, as well as multimedia applications for general-purpose computing. This updated edition adds three new chapters focused on key technology advancements in embedded systems and with wider coverage of real-time architectures. The overall focus remains the RTOS (Real-Time

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Operating System), but use of Linux for soft real-time, hybrid FPGA (Field Programmable Gate Array) architectures and advancements in multi-core system-on-chip (SoC), as well as software strategies for asymmetric and symmetric multiprocessing (AMP and SMP) relevant to real-time embedded systems, have been added. Companion files are provided with numerous project videos, resources, applications, and figures from the book. Instructors' resources are available upon adoption. FEATURES:

- Provides a comprehensive, up to date, and accessible presentation of embedded systems without sacrificing theoretical foundations*
- Features the RTOS (Real-Time*

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Applications, Third Edition, Operating System), but use of Embedded Technology, Linux for soft real-time, hybrid FPGA architectures and advancements in multi-core system-on-chip is included • Discusses an overview of RTOS advancements, including AMP and SMP configurations, with a discussion of future directions for RTOS use in multi-core architectures, such as SoC • Detailed applications coverage including robotics, computer vision, and continuous media • Includes a companion disc (4GB) with numerous videos, resources, projects, examples, and figures from the book • Provides several instructors' resources, including lecture notes, Microsoft PP slides, etc.

Up-to-the-Minute, Complete

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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

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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

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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-

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Applications, Third Edition, Boot and BusyBox commands. Embedded Technology.

Jump into the world of Near Field Communications (NFC), the fast-growing technology that lets devices in close proximity exchange data, using radio signals. With lots of examples, sample code, exercises, and step-by-step projects, this hands-on guide shows you how to build NFC applications for Android, the Arduino microcontroller, and embedded Linux devices. You'll learn how to write apps using the NFC Data Exchange Format (NDEF) in PhoneGap, Arduino, and node.js that help devices read messages from passive NFC tags and exchange data with other NFC-enabled devices. If you know HTML and JavaScript, you're ready to start with NFC. Dig into

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NFC's architecture, and learn how it's related to RFID Write sample apps for Android with PhoneGap and its NFC plugin Dive into NDEF: examine existing tag-writer apps and build your own Listen for and filter NDEF messages, using PhoneGap event listeners Build a full Android app to control lights and music in your home Create a hotel registration app with Arduino, from check-in to door lock Write peer-to-peer NFC messages between two Android devices Explore embedded Linux applications, using examples on Raspberry Pi and BeagleBone Design Principles and Engineering Practices Near Field Communication with Arduino, Android, and PhoneGap Development Best Practices for

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the Internet of Things
Exploring BeagleBone

*Embedded Linux Development
Using Eclipse*

Embedded Firmware Solutions is the perfect introduction and daily-use field guide--for the thousands of firmware designers, hardware engineers, architects, managers, and developers--to Intel's new firmware direction (including Quark coverage), showing how to integrate Intel® Architecture designs into their plans. Featuring hands-on examples and exercises using Open Source codebases, like Coreboot and EFI Development Kit (tianocore) and Chromebook,

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this is the first book that combines a timely and thorough overview of firmware solutions for the rapidly evolving embedded ecosystem with in-depth coverage of requirements and optimization.

A practical tutorial guide which introduces you to the basics of Yocto Project, and also helps you with its real hardware use to boost your Embedded Linux-based project. If you are an embedded systems enthusiast and willing to learn about compelling features offered by the Yocto Project, then this book is for you. With prior experience in the embedded Linux domain,

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you can make the most of this book to efficiently create custom Linux-based systems.

From the Foreword: "...the presentation of real-time scheduling is probably the best in terms of clarity I have ever read in the professional literature. Easy to understand, which is important for busy professionals keen to acquire (or refresh) new knowledge without being bogged down in a convoluted narrative and an excessive detail overload. The authors managed to largely avoid theoretical-only presentation of the subject, which frequently affects books

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on operating systems. ... an indispensable [resource] to gain a thorough understanding of the real-time systems from the operating systems perspective, and to stay up to date with the recent trends and actual developments of the open-source real-time operating systems." –Richard Zurawski, ISA Group, San Francisco, California, USA Real-time embedded systems are integral to the global technological and social space, but references still rarely offer professionals the sufficient mix of theory and practical examples required to meet intensive economic, safety,

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and other demands on system development. Similarly, instructors have lacked a resource to help students fully understand the field. The information was out there, though often at the abstract level, fragmented and scattered throughout literature from different engineering disciplines and computing sciences. Accounting for readers' varying practical needs and experience levels, Real Time Embedded Systems: Open-Source Operating Systems Perspective offers a holistic overview from the operating-systems perspective. It provides a long-

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awaited reference on real-time operating systems and their almost boundless application potential in the embedded system domain. Balancing the already abundant coverage of operating systems with the largely ignored real-time aspects, or "physicality," the authors analyze several realistic case studies to introduce vital theoretical material. They also discuss popular open-source operating systems—Linux and FreRTOS, in particular—to help embedded-system designers identify the benefits and weaknesses in deciding whether or not to adopt more traditional,

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less powerful, techniques for a project.

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

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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

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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,

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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

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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

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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

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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.

Learn to Develop Linux
Embedded Drivers with Kernel 4.
9 LTS

Open-Source Operating Systems
Perspective

Embedded Linux System Design
and Development

A Practical, Real-World
Approach, Second Edition

Learning Embedded Linux Using
the Yocto Project

**Provides information on
writing a driver in Linux,**

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covering such topics as character devices, network interfaces, driver debugging, concurrency, and interrupts.

Linux® is being adopted by an increasing number of embedded systems developers, who have been won over by its sophisticated scheduling and networking, its cost-free license, its open development model, and the support offered by rich and powerful programming tools. While there is a great deal of hype surrounding the use of Linux in embedded systems,

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there is not a lot of practical information. Building Embedded Linux Systems is the first in-depth, hard-core guide to putting together an embedded system based on the Linux kernel. This indispensable book features arcane and previously undocumented procedures for: Building your own GNU development toolchain Using an efficient embedded development framework Selecting, configuring, building, and installing a target-specific kernel Creating a complete target

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root filesystem Setting
up, manipulating, and
using solid-state storage
devices Installing and
configuring a bootloader
for the target Cross-
compiling a slew of
utilities and packages
Debugging your embedded
system using a plethora of
tools and techniques
Details are provided for
various target
architectures and hardware
configurations, including
a thorough review of
Linux's support for
embedded hardware. All
explanations rely on the
use of open source and

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free software packages. By presenting how to build the operating system components from pristine sources and how to find more documentation or help, this book greatly simplifies the task of keeping complete control over one's embedded operating system, whether it be for technical or sound financial reasons. Author Karim Yaghmour, a well-known designer and speaker who is responsible for the Linux Trace Toolkit, starts by discussing the strengths and weaknesses

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of Linux as an embedded
operating system.

Licensing issues are included, followed by a discussion of the basics of building embedded Linux systems. The configuration, setup, and use of over forty different open source and free software packages commonly used in embedded Linux systems are also covered. uClibc, BusyBox, U-Boot, OpenSSH, tftpd, tftp, strace, and gdb are among the packages discussed.

The open source nature of Linux has always intrigued

embedded engineers, and the latest kernel releases have provided new features enabling more robust functionality for embedded applications. Enhanced real-time performance, easier porting to new architectures, support for microcontrollers and an improved I/O system give embedded engineers even more reasons to love Linux! However, the rapid evolution of the Linux world can result in an eternal search for new information sources that will help embedded programmers to keep up!

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This completely updated second edition of noted author Doug Abbott's respected introduction to embedded Linux brings readers up-to-speed on all the latest developments. This practical, hands-on guide covers the many issues of special concern to Linux users in the embedded space, taking into account their specific needs and constraints. You'll find updated information on:

- The GNU toolchain**
- Configuring and building the kernel**
- BlueCat Linux**
- Debugging on the target**

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• Kernel Modules • Devices
Drivers • Embedded
Networking • Real-time
programming tips and
techniques • The RTAI
environment • And much
more The accompanying CD-
ROM contains all the
source code from the
book's examples, helpful
software and other
resources to help you get
up to speed quickly. This
is still the reference
you'll reach for again and
again! * 100+ pages of new
material adds depth and
breadth to the 2003
embedded bestseller. *
Covers new Linux kernel

2.6 and the recent major
OS release, Fedora. *

Gives the engineer a guide
to working with popular
and cost-efficient open-
source code.

This book covers the basic
concepts and principles of
operating systems, showing
how to apply them to the
design and implementation
of complete operating
systems for embedded and
real-time systems. It
includes all the
foundational and
background information on
ARM architecture, ARM
instructions and
programming, toolchain for

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developing programs,
virtual machines for
software implementation
and testing, program
execution image, function
call conventions, run-time
stack usage and link C
programs with assembly
code. It describes the
design and implementation
of a complete OS for
embedded systems in
incremental steps,
explaining the design
principles and
implementation techniques.
For Symmetric
Multiprocessing (SMP)
embedded systems, the
author examines the ARM

MPcore processors, which include the SCU and GIC for interrupts routing and interprocessor communication and synchronization by Software Generated Interrupts (SGIs). Throughout the book, complete working sample systems demonstrate the design principles and implementation techniques. The content is suitable for advanced-level and graduate students working in software engineering, programming, and systems theory.

Programming Embedded

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Systems
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**Mastering Embedded Linux
Programming**

**Embedded Linux Systems
with the Yocto Project
Real-Time Concepts for
Embedded Systems**

*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*

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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

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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

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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. Today, Linux is included with nearly every embedded platform. Embedded developers can take a more modern route and spend more time tuning Linux and taking advantage of open source code to build more robust, feature-rich applications. While Gene Sally does not neglect porting Linux to new hardware, modern embedded hardware is

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more sophisticated than ever: most systems include the capabilities found on desktop systems. This book is written from the perspective of a user employing technologies and techniques typically reserved for desktop systems. Modern guide for developing embedded Linux systems Shows you how to work with existing Linux embedded system, while still teaching how to port Linux Explains best practices from somebody who has done it before

The Eclipse environment solves the problem of having to maintain your own Integrated Development Environment (IDE), which is time consuming and costly. Embedded tools can also be easily integrated into Eclipse.

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The C/C++CDT is ideal for the embedded community with more than 70% of embedded developers using this language to write embedded code. Eclipse simplifies embedded system development and then eases its integration into larger platforms and frameworks. In this book, Doug Abbott examines Eclipse, an IDE, which can be vital in saving money and time in the design and development of an embedded system. Eclipse was created by IBM in 2001 and then became an open-source project in 2004. Since then it has become the de-facto IDE for embedded developers. Virtually all of the major Linux vendors have adopted this platform, including MontVista, LynuxWorks, and

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*Applications, Third Edition
Embedded Technology*
*Wind River. *Details the Eclipse
Integrated Development*

*Environment (IDE) essential to
streamlining your embedded
development process *Overview
of the latest C/C++ Developer's
Toolkit (CDT) *Includes case
studies of Eclipse use including
Monta Vista, LynuxWorks, and
Wind River*

*Hands-On RTOS with
Microcontrollers*

Beginning NFC

Embedded Firmware Solutions