

Freescale Yocto Project Users Guide Users Guide

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

This book constitutes the refereed proceedings of the 32nd IFIP TC 11 International Conference on ICT Systems Security and Privacy Protection, SEC 2017, held in Rome, Italy, in May 2017. The 38 revised full papers presented were carefully reviewed and selected from 199 submissions. The papers are organized in the following topical sections: network security and cyber attacks; security and privacy in social applications and cyber attacks defense; private queries and aggregations; operating systems and firmware security; user authentication and policies; applied cryptography and voting schemes; software security and privacy; privacy; and digital signature, risk management, and code reuse attacks.

This book is meant to serve as a textbook for beginners in the field of nanoscience and nanotechnology. It can also be used as additional reading in this multifaceted area. It covers the entire spectrum of nanoscience and technology: introduction, terminology, historical perspectives of this domain of science, unique and widely differing properties, advances in the various synthesis, consolidation and characterization techniques, applications of nanoscience and technology and emerging materials and technologies.

This volume offers readers various perspectives and visions for cutting-edge research in ubiquitous healthcare. The topics emphasize large-scale architectures and high performance solutions for smart healthcare, healthcare monitoring using large-scale computing techniques, Internet of Things (IoT) and big data analytics for healthcare, Fog Computing, mobile health, large-scale medical data mining, advanced machine learning methods for mining multidimensional sensor data, smart homes, and resource allocation methods for the BANs. The book contains high quality chapters contributed by leading international researchers working in domains, such as e-Health, pervasive and context-aware computing, cloud, grid, cluster, and big-data computing. We are optimistic that the topics included in this book will provide a multidisciplinary research platform to the researchers, practitioners, and students from biomedical engineering, health informatics, computer science, and computer engineering. Thanks to the decreasing cost of prototyping, it's more feasible for professional makers and

first-time entrepreneurs to launch a hardware startup. But exactly how do you go about it? This book provides the roadmap and best practices you need for turning a product idea into a full-fledged business. Written by three experts from the field, *The Hardware Startup* takes you from idea validation to launch, complete with practical strategies for funding, market research, branding, prototyping, manufacturing, and distribution. Two dozen case studies of real-world startups illustrate possible successes and failures at every stage of the process. Validate your idea by learning the needs of potential users Develop branding, marketing, and sales strategies early on Form relationships with the right investment partners Prototype early and often to ensure you're on the right path Understand processes and pitfalls of manufacturing at scale Jumpstart your business with the help of an accelerator Learn strategies for pricing, marketing, and distribution Be aware of the legal issues your new company may face

Femtocells are low-power wireless access points used in the home and office. They operate in licensed spectrum to connect standard mobile phones (WCDMA, LTE, WiMAX, CDMA and GSM) and other mobile devices to a mobile operator's network via standard broadband internet connections. This technology is of high interest for mobile operators and for millions of users who will benefit from enhanced access to mobile broadband services. Femtocells outlines how wireless access points can be used by mobile operators to provide high-speed wireless access, enhancing coverage and capacity and delivering entirely new services, while maximising the benefits of licensed spectrum. The book examines the market, exploring commercial and technical factors which are critical in the initial deployment and long-term success of femtocells. Business, standards and regulatory aspects are also considered to provide a complete but concise overview. One of the first authoritative texts to concentrate on femtocells

Written by expert authors from industry including leading analysts, femtocell and system vendors Covers both technology and business aspects in detail Provides overview of the relevant standards across WCDMA, LTE, CDMA, WiMAX and GSM air interfaces

Design, build, and justify an optimal Microsoft IoT footprint to meet your project needs. This book describes common Internet of Things components and architecture and then focuses on Microsoft's Azure components relevant in deploying these solutions. Microsoft-specific topics addressed include: deploying edge devices and pushing intelligence to the edge; connecting IoT devices to Azure and landing data there, applying Azure Machine Learning, analytics, and Cognitive Services; roles for Microsoft solution accelerators and managed solutions; and integration of the Azure footprint with legacy infrastructure. The book concludes with a discussion of best practices in defining and developing solutions and creating a plan for success. What You Will Learn

Design the right IoT architecture to deliver solutions for a variety of project needs Connect IoT devices to Azure for data collection and delivery of services Use Azure Machine Learning and Cognitive Services to deliver intelligence in cloud-based solutions and at the edge Understand the benefits and tradeoffs of Microsoft's solution accelerators and managed solutions Investigate new use cases that are described and apply best practices in deployment strategies Integrate cutting-edge Azure deployments with existing legacy data sources Who This Book Is For Developers and architects new to IoT projects or new to Microsoft Azure IoT components as well as readers interested in best practices used in architecting IoT solutions that utilize the Azure platform

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 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 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 Operating System), but use of 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.

The purpose of the Beer/McMurrey book is to give engineering students and engineers a brief, easy to use guide to the essentials of engineering writing. Appropriate for use as a supplement to an existing course, or as a resource for an introduction to engineering course that includes writing as one of its components, the Beer/McMurrey book will give engineers the basics of writing reports, specifications, using electronic mail and computers without trying to be an exhaustive survey of all kinds of technical writing.

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.

The following list describes what you can get from this book: Information that lets you get set up to develop using the Yocto Project. Information to help developers who are new to the open source environment and to the distributed revision control system Git, which the Yocto Project uses. An understanding of common end-to-end development models and tasks. Information about common development tasks generally used during image development for embedded devices. Information on using the Yocto Project integration of the QuickEMUlator (QEMU), which lets you simulate running on hardware an image you have built using the OpenEmbedded build system. Many references to other sources of related information.

This manual provides information on the BitBake tool. The information attempts to be as independent as possible regarding systems that use BitBake, such as OpenEmbedded and the Yocto Project. In some cases, scenarios or examples within the context of a build system are used in the manual to help with understanding. For these cases, the manual clearly states the context.

Fundamentally, BitBake is a generic task execution engine that allows shell and Python tasks to be run efficiently and in parallel while working within complex inter-task dependency constraints. One of BitBake's main users, OpenEmbedded, takes this core and builds embedded Linux software stacks using a task-oriented approach.

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, 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 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 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 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.

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 `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 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.

This book shows how Industry 4.0 is a strategic approach for integrating advanced control systems with Internet technology enabling communication between people, products and complex systems. It includes processes such as machining features, machining knowledge, execution control, operation planning, machine tool selection and cutting tool. This book focuses on different articles related to advanced technologies, and their integration to foster Industry 4.0, being useful for researchers as well as industrialists to refer and utilize the

information in production control.

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.

How can we build bridges from the digital world of the Internet to the analog world that surrounds us? By bringing accessibility to embedded components such as sensors and microcontrollers, JavaScript and Node.js might shape the world of physical computing as they did for web browsers. This practical guide shows hardware and software engineers, makers, and web developers how to talk in JavaScript with a variety of hardware platforms. Authors Patrick Mulder and Kelsey Breseman also delve into the basics of microcontrollers, single-board computers, and other hardware components. Use JavaScript to program microcontrollers with Arduino and Espruino Prototype IoT devices with the Tessel 2 development platform Learn about electronic input and output components, including sensors Connect microcontrollers to the Internet with the Particle Photon toolchain Run Node.js on single-board computers such as Raspberry Pi and Intel Edison Talk to embedded devices with Node.js libraries such as Johnny-Five, and remotely control the devices with Bluetooth Use MQTT as a message broker to connect devices across networks Explore ways to use robots as building blocks for shared experiences

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.

Learn to work with XRP and build applications on Ripple's blockchain Key Features Learn to use Ripple's decentralized system for transferring digital assets globally A simplified and shortened learning curve to understand the Ripple innovation and Blockchain Takes a hands-on approach to work with XRP – Ripple's native currency Book Description This book starts by giving you an understanding of the basics of blockchain and the Ripple protocol. You will then get some hands-on experience of working with XRP. You will learn how to set up a Ripple wallet and see how seamlessly you can transfer money abroad. You will learn about different types of wallets through which you can store and transact XRP, along with the security precautions you need to take to keep your money safe. Since Ripple is currency agnostic, it can enable the transfer of value in USD, EUR, and any other currency. You can even transfer digital assets using Ripple. You will see how you can pay an international merchant with their own native currency and how Ripple can exchange it on the fly. Once you understand the applications of Ripple, you will learn how to create a conditionally-held escrow using the Ripple API, and how to send and cash checks. Finally, you will also understand the common misconceptions people have about Ripple and discover the potential risks you must consider before making investment decisions. By the end of this book, you will have a solid foundation for working with Ripple's blockchain. Using it, you will be able to solve problems caused by traditional systems in your respective industry. What you will

learn Understand the fundamentals of blockchain and Ripple Learn how to choose a Ripple wallet Set up a Ripple wallet to send and receive XRP Learn how to protect your XRP Understand the applications of Ripple Learn how to work with the Ripple API Learn how to build applications on check and escrow features of Ripple Who this book is for This book is for anyone interested in getting their hands on Ripple technology and learn where it can be used to gain competitive advantages in their respective fields. For most parts of the book, you need not have any pre-requisite knowledge. However, you need to have basic background of JavaScript to write an escrow.

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

Real-world engineering problems are rarely, if ever, neatly divided into mechanical, electrical, chemical, civil, and other categories. Engineers from all disciplines eventually encounter computer and electronic controls and instrumentation, which require at least a basic knowledge of electrical and other engineering specialties, as well as associated economics, and environmental, political, and social issues. Co-authored by Charles Gross—one of the most well-known and respected professors in the field of electric machines and power engineering—and his world-renowned colleague Thad Roppel, *Fundamentals of Electrical Engineering* provides an overview of the profession for engineering professionals and students whose specialization lies in areas other than electrical. For instance, civil engineers must contend with commercial electrical service and lighting design issues. Mechanical engineers have to deal with motors in HVAC applications, and chemical engineers are forced to handle problems involving process control. Simple and easy-to-use, yet more than sufficient in rigor and coverage of fundamental concepts, this resource teaches EE fundamentals but omits the typical analytical methods that hold little relevance for the audience. The authors provide many examples to illustrate concepts, as well as homework problems to help readers understand and apply presented material. In many cases, courses for non-electrical engineers, or non-EEs, have presented watered-down classical EE material, resulting in unpopular courses that students hate and senior faculty members understandingly avoid teaching. To remedy this situation—and create more well-rounded practitioners—the authors focus on the true EE needs of non-EEs, as determined through their own teaching experience, as well as significant input from non-EE faculty. The book provides several important contemporary interdisciplinary examples to support this approach. The result is a full-color modern narrative that bridges the various EE and non-EE curricula and serves as a truly relevant course that students and faculty can both enjoy.

The First Practical, Hands-On Guide to Embedded System Programming for Android Today, embedded systems programming is a more valuable discipline than ever, driven by fast-growing, new fields such as wearable technology and the Internet of Things. In this concise guide, Roger Ye teaches all the skills you'll need to write the efficient embedded code necessary to make tomorrow's Android devices work. The first title in Addison-Wesley's new Android™ Deep Dive series for intermediate and expert Android developers, *Embedded Programming with Android™* draws on Roger Ye's extensive experience with advanced projects in telecommunications and mobile devices. Step by step, he guides you through building a system with all the key components Android hardware developers must deliver to manufacturing. By the time you're done, you'll have the key programming, compiler, and debugging skills you'll need for real-world projects. First, Ye introduces the essentials of bare-metal programming: creating

assembly language code that runs directly on hardware. Then, building on this knowledge, he shows how to use C to create hardware interfaces for booting a Linux kernel with the popular U-Boot bootloader. Finally, he walks you through using filesystem images to boot Android and learning to build customized ROMs to support any new Android device. Throughout, Ye provides extensive downloadable code you can run, explore, and adapt. You will Build a complete virtualized environment for embedded development Understand the workflow of a modern embedded systems project Develop assembly programs, create binary images, and load and run them in the Android emulator Learn what it takes to bring up a bootloader and operating system Move from assembler to C, and explore Android's goldfish hardware interfaces Program serial ports, interrupt controllers, real time clocks, and NAND flash controllers Integrate C runtime libraries Support exception handling and timing Use U-Boot to boot the kernel via NOR or NAND flash processes Gain in-depth knowledge for porting U-Boot to new environments Integrate U-Boot and a Linux kernel into an AOSP and CyanogenMod source tree Create your own Android ROM on a virtual Android device An annotated guide to program and develop GNU/Linux Embedded systems quickly About This Book Rapidly design and build powerful prototypes for GNU/Linux Embedded systems Become familiar with the workings of GNU/Linux Embedded systems and how to manage its peripherals Write, monitor, and configure applications quickly and effectively, manage an external micro-controller, and use it as co-processor for real-time tasks Who This Book Is For This book targets Embedded System developers and GNU/Linux programmers who would like to program Embedded Systems and perform Embedded development. The book focuses on quick and efficient prototype building. Some experience with hardware and Embedded Systems is assumed, as is having done some previous work on GNU/Linux systems. Knowledge of scripting on GNU/Linux is expected as well. What You Will Learn Use embedded systems to implement your projects Access and manage peripherals for embedded systems Program embedded systems using languages such as C, Python, Bash, and PHP Use a complete distribution, such as Debian or Ubuntu, or an embedded one, such as OpenWrt or Yocto Harness device driver capabilities to optimize device communications Access data through several kinds of devices such as GPIO's, serial ports, PWM, ADC, Ethernet, WiFi, audio, video, I2C, SPI, One Wire, USB and CAN Practical example usage of several devices such as RFID readers, Smart card readers, barcode readers, z-Wave devices, GSM/GPRS modems Usage of several sensors such as light, pressure, moisture, temperature, infrared, power, motion In Detail Embedded computers have become very complex in the last few years and developers need to easily manage them by focusing on how to solve a problem without wasting time in finding supported peripherals or learning how to manage them. The main challenge with experienced embedded programmers and engineers is really how long it takes to turn an idea into reality, and we show you exactly how to do it. This book shows how to interact with external environments through specific peripherals used in the industry. We will use the latest Linux kernel release 4.4.x and Debian/Ubuntu distributions (with embedded distributions like OpenWrt and Yocto). The book will present popular boards in the industry that are user-friendly to base the rest of the projects on - BeagleBone Black, SAMA5D3 Xplained, Wandboard and system-on-chip manufacturers. Readers will be able to take their first steps in programming the

embedded platforms, using C, Bash, and Python/PHP languages in order to get access to the external peripherals. More about using and programming device driver and accessing the peripherals will be covered to lay a strong foundation. The readers will learn how to read/write data from/to the external environment by using both C programs or a scripting language (Bash/PHP/Python) and how to configure a device driver for a specific hardware. After finishing this book, the readers will be able to gain a good knowledge level and understanding of writing, configuring, and managing drivers, controlling and monitoring applications with the help of efficient/quick programming and will be able to apply these skills into real-world projects. Style and approach This practical tutorial will get you quickly prototyping embedded systems on GNU/Linux. This book uses a variety of hardware to program the peripherals and build simple prototypes.

Over 79 hands-on recipes for professional embedded Linux developers to optimize and boost their Yocto Project know-how

Key Features

- Optimize your Yocto setup to speed up development and debug build issues
- Use what is quickly becoming the standard embedded Linux product builder framework—the Yocto Project Recipe-based implementation of best practices to optimize your Linux system

Book Description

The Yocto Project has become the de facto distribution build framework for reliable and robust embedded systems with a reduced time to market. You'll get started by working on a build system where you set up Yocto, create a build directory, and learn how to debug it. Then, you'll explore everything about the BSP layer, from creating a custom layer to debugging device tree issues. In addition to this, you'll learn how to add a new software layer, packages, data, scripts, and configuration files to your system. You will then cover topics based on application development, such as using the Software Development Kit and how to use the Yocto project in various development environments. Toward the end, you will learn how to debug, trace, and profile a running system. This second edition has been updated to include new content based on the latest Yocto release.

What you will learn

- Optimize your Yocto Project setup to speed up development and debug build issues
- Use Docker containers to build Yocto Project-based systems
- Take advantage of the user-friendly Toaster web interface to the Yocto Project build system
- Build and debug the Linux kernel and its device trees
- Customize your root filesystem with already-supported and new Yocto packages
- Optimize your production systems by reducing the size of both the Linux kernel and root filesystems
- Explore the mechanisms to increase the root filesystem security
- Understand the open source licensing requirements and how to comply with them when cohabiting with proprietary programs
- Create recipes, and build and run applications in C, C++, Python, Node.js, and Java

Who this book is for

If you are an embedded Linux developer with the basic knowledge of Yocto Project, this book is an ideal way to broaden your knowledge with recipes for embedded development.

Embedded Linux Projects Using Yocto Project CookbookPackt Publishing Ltd
Create unique and amazing projects by using the powerful combination of Yocto and Raspberry Pi

About This Book

Set up and configure the Yocto Project

efficiently with Raspberry Pi Deploy multimedia applications from existing Yocto/OE layers An easy-to-follow guide to utilize your custom recipes on your Raspberry Pi Who This Book Is For If you are a student or a developer of embedded software, embedded Linux engineer or embedded systems in competence with Raspberry Pi and want to discover the Yocto Project, then this book is for you. Experience with Yocto is not needed. What You Will Learn Explore the basic concept of Yocto's build system and how it is organized in order to use it efficiently with Raspberry Pi Generate your first image with Yocto for the Raspberry Pi Understand how to customize your Linux kernel within the Yocto Project Customize your image in order to integrate your own applications Write your own recipes for your graphical applications Integrate a custom layer for the Raspberry Pi In Detail The Yocto Project is a Linux Foundation workgroup, which produces tools (SDK) and processes (configuration, compilation, installation) that will enable the creation of Linux distributions for embedded software, independent of the architecture of embedded software (Raspberry Pi, i.MX6, and so on). It is a powerful build system that allows you to master your personal or professional development. This book presents you with the configuration of the Yocto Framework for the Raspberry Pi, allowing you to create amazing and innovative projects using the Yocto/OpenEmbedded ecosystem. It starts with the basic introduction of Yocto's build system, and takes you through the setup and deployment steps for Yocto. It then helps you to develop an understanding of Bitbake (the task scheduler), and learn how to create a basic recipe through a GPIO application example. You can then explore the different types of Yocto recipe elements (LICENSE, FILES, SRC_URI, and so on). Next, you will learn how to customize existing recipes in Yocto/OE layers and add layers to your custom environment (qt5 for example). Style and approach A step by step guide covering the fundamentals to create amazing new projects with Raspberry Pi and Yocto.

This book contains the practical labs corresponding to the "Linux Kernel and Driver Development: Training Handouts" book from Bootlin. Get your hands on an embedded board based on an ARM processor (the Beagle Bone Black board), and apply what you learned: write a Device Tree to declare devices connected to your board, configure pin multiplexing, and implement drivers for I2C and serial devices. You will learn how to manage multiple devices with the same driver, to access and write hardware registers, to allocate memory, to register and manage interrupts, as well as how to debug your code and interpret the kernel error messages. You will also keep an eye on the board and CPU datasheets so that you will always understand the values that you feed to the kernel.

Sensor Technologies: Healthcare, Wellness and Environmental Applications explores the key aspects of sensor technologies, covering wired, wireless, and discrete sensors for the specific application domains of healthcare, wellness and environmental sensing. It discusses the social, regulatory, and design

considerations specific to these domains. The book provides an application-based approach using real-world examples to illustrate the application of sensor technologies in a practical and experiential manner. The book guides the reader from the formulation of the research question, through the design and validation process, to the deployment and management phase of sensor applications. The processes and examples used in the book are primarily based on research carried out by Intel or joint academic research programs. "Sensor Technologies: Healthcare, Wellness and Environmental Applications provides an extensive overview of sensing technologies and their applications in healthcare, wellness, and environmental monitoring. From sensor hardware to system applications and case studies, this book gives readers an in-depth understanding of the technologies and how they can be applied. I would highly recommend it to students or researchers who are interested in wireless sensing technologies and the associated applications." Dr. Benny Lo Lecturer, The Hamlyn Centre, Imperial College of London "This timely addition to the literature on sensors covers the broad complexity of sensing, sensor types, and the vast range of existing and emerging applications in a very clearly written and accessible manner. It is particularly good at capturing the exciting possibilities that will occur as sensor networks merge with cloud-based 'big data' analytics to provide a host of new applications that will impact directly on the individual in ways we cannot fully predict at present. It really brings this home through the use of carefully chosen case studies that bring the overwhelming concept of 'big data' down to the personal level of individual life and health." Dermot Diamond Director, National Centre for Sensor Research, Principal Investigator, CLARITY Centre for Sensor Web Technologies, Dublin City University "Sensor Technologies: Healthcare, Wellness and Environmental Applications takes the reader on an end-to-end journey of sensor technologies, covering the fundamentals from an engineering perspective, introducing how the data gleaned can be both processed and visualized, in addition to offering exemplar case studies in a number of application domains. It is a must-read for those studying any undergraduate course that involves sensor technologies. It also provides a thorough foundation for those involved in the research and development of applied sensor systems. I highly recommend it to any engineer who wishes to broaden their knowledge in this area!" Chris Nugent Professor of Biomedical Engineering, University of Ulster

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.

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

Optimize and boost your Linux-based system with Yocto Project and increase its reliability and robustness efficiently and cost-effectively. About This Book Optimize your Yocto Project tools to develop efficient Linux-based projects Practical approach to learning Linux development using Yocto Project Demonstrates concepts in a practical and easy-to-understand way Who This Book Is For If you are an embedded Linux developer with a basic knowledge of Yocto Project and want to broaden your knowledge with examples of embedded development, then this book is for you. This book is also for professionals who want to find new insights into working methodologies for Linux development. What You Will Learn Understand the basic concepts involved in Poky workflows along with configuring and preparing the Poky build environment. Configure a build server and customize images using Toaster. Generate images and fit packages into created images using BitBake. Support the development process by setting up and using Package feeds. Debug Yocto Project by configuring Poky. Build an image for the BeagleBone Black, RaspberryPi 3, and Wandboard, and boot it from an SD card. In Detail Yocto Project is turning out to be the best integration framework for creating reliable embedded Linux projects. It has the edge over other frameworks because of its features such as less development time and improved reliability and robustness. Embedded Linux Development using Yocto Project starts with an in-depth explanation of all Yocto Project tools, to help you perform different Linux-based tasks. The book then moves on to in-

depth explanations of Poky and BitBake. It also includes some practical use cases for building a Linux subsystem project using Yocto Project tools available for embedded Linux. The book also covers topics such as SDK, recipetool, and others. By the end of the book, you will have learned how to generate and run an image for real hardware boards and will have gained hands-on experience at building efficient Linux systems using Yocto Project. Style and approach A clear, concise, and straightforward book that will enable you to use and implement the latest features of Yocto Project.

If you are an embedded developer learning about embedded Linux with some experience with the Yocto project, this book is the ideal way to become proficient and broaden your knowledge with examples that are immediately applicable to your embedded developments. Experienced embedded Yocto developers will find new insight into working methodologies and ARM specific development competence.

Modern cars are more computerized than ever. Infotainment and navigation systems, Wi-Fi, automatic software updates, and other innovations aim to make driving more convenient. But vehicle technologies haven't kept pace with today's more hostile security environment, leaving millions vulnerable to attack. The Car Hacker's Handbook will give you a deeper understanding of the computer systems and embedded software in modern vehicles. It begins by examining vulnerabilities and providing detailed explanations of communications over the CAN bus and between devices and systems. Then, once you have an understanding of a vehicle's communication network, you'll learn how to intercept data and perform specific hacks to track vehicles, unlock doors, glitch engines, flood communication, and more. With a focus on low-cost, open source hacking tools such as Metasploit, Wireshark, Kayak, can-utils, and ChipWhisperer, The Car Hacker's Handbook will show you how to: –Build an accurate threat model for your vehicle –Reverse engineer the CAN bus to fake engine signals –Exploit vulnerabilities in diagnostic and data-logging systems –Hack the ECU and other firmware and embedded systems –Feed exploits through infotainment and vehicle-to-vehicle communication systems –Override factory settings with performance-tuning techniques –Build physical and virtual test benches to try out exploits safely If you're curious about automotive security and have the urge to hack a two-ton computer, make The Car Hacker's Handbook your first stop. 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, you can make the most of this book to efficiently create custom Linux-based systems.

Optimize and boost your Linux-based system with Yocto Project and increase its reliability and robustness efficiently and cost-effectively. About This Book* Optimize your Yocto Project tools to develop efficient Linux-based projects* Practical approach to learning Linux development using Yocto Project* Demonstrates concepts in a practical and easy-to-understand way Who This Book Is For If you are an embedded Linux developer with a basic knowledge of Yocto Project and want to broaden your knowledge with examples of embedded development, then this book is for you. This book is also for professionals who want to find new insights into working methodologies for Linux development. What You Will Learn* Understand the basic concepts involved in Poky workflows along with configuring and preparing the Poky build environment.* Configure a build server and customize images using Toaster.* Generate images and fit packages into created images using BitBake.* Support the development process by setting up and using Package feeds.* Debug Yocto Project by configuring Poky.* Build an image for the BeagleBone Black, RaspberryPi 3, and Wandboard, and boot it from an SD card. In Detail Yocto Project is turning out to be the best integration framework for creating

reliable embedded Linux projects. It has the edge over other frameworks because of its features such as less development time and improved reliability and robustness. Embedded Linux Development using Yocto Project starts with an in-depth explanation of all Yocto Project tools, to help you perform different Linux-based tasks. The book then moves on to in-depth explanations of Poky and BitBake. It also includes some practical use cases for building a Linux subsystem project using Yocto Project tools available for embedded Linux. The book also covers topics such as SDK, recipetool, and others. By the end of the book, you will have learned how to generate and run an image for real hardware boards and will have gained hands-on experience at building efficient Linux systems using Yocto Project. Style and approach A clear, concise, and straightforward book that will enable you to use and implement the latest features of Yocto Project.

This textbook is designed for the first course in Computer Architecture, usually offered at the junior/senior (3rd, 4th year) level in electrical engineering, computer science or computer engineering departments. This course is required of all electrical engineering and computer science/computer engineering majors specializing in the design of computer systems. This text provides a comprehensive introduction to computer architecture, covering topic from design of simple microprocessors to techniques used in the most advanced supercomputers.

This book is a collection of papers from international experts presented at the International Conference on NextGen Electronic Technologies (ICNETS2). ICNETS2 encompassed six symposia covering all aspects of electronics and communications engineering, including relevant nano/micro materials and devices. Highlighting recent research in intelligent embedded systems, the book is a valuable resource for professionals and students working in the core areas of electronics and their applications, especially in signal processing, embedded systems, and networking. The contents of this volume will be of interest to researchers and professionals alike.

This book offers readers an idea 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 meta-realtime layer and the newly created meta-cgl layer, its purpose, and how it can add value to poky.

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