

Firmware

Subrata Banik,Vincent Zimmer

Embedded Firmware Solutions Vincent Zimmer, Jiming Sun, Marc Jones, Stefan Reinauer, 2015-02-03 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, 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.

The Firmware Handbook Jack Ganssle, 2004-04-16 The Firmware Handbook provides a comprehensive reference for firmware developers looking to increase their skills and productivity. It addresses each critical step of the development process in detail, including how to optimize hardware design for better firmware. Topics covered include real-time issues, interrupts and ISRs, memory management (including Flash memory), handling both digital and analog peripherals, communications interfacing, math subroutines, error handling, design tools, and troubleshooting and debugging. This book is not for the beginner, but rather is an in-depth, comprehensive one-volume reference that addresses all the major issues in firmware design and development, including the pertinent hardware issues. Included CD-Rom contains all the source code used in the design examples, so engineers can easily use it in their own designs

Beyond BIOS Vincent Zimmer, Michael Rothman, Suresh Marisetty, 2017 This book provides an overview of modern boot firmware, including the Unified Extensible Firmware Interface (UEFI) and its associated EFI Developer Kit II (EDKII) firmware. The authors have each made significant contributions to developments in these areas. The reader will learn to use the latest developments in UEFI on modern hardware, including open source firmware and open hardware designs. The book begins with an exploration of interfaces exposed to higher-level software and operating systems, and commences to the left of the boot timeline, describing the flow of typical systems, beginning with the machine restart event. Software engineers working with UEFI will benefit greatly from this book, while specific sections of the book address topics relevant for a general audience: system architects, pre-operating-system application developers, operating system vendors (loader, kernel), independent hardware vendors (such as for plug-in adapters), and developers of end-user applications. As a secondary audience, project technical leaders or managers may be interested in this book to get a feel for what their engineers are doing. The reader will find: An overview of UEFI and underlying Platform Initialization (PI) specifications How to create UEFI applications and drivers Workflow to design the firmware solution for a modern platform Advanced usages of UEFI firmware for security and manageability

Firmware Development Subrata Banik, Vincent Zimmer, 2022 Build your own system firmware. This book helps you understand system firmware architecture and minimalist design, and provides a specialized knowledge of firmware development. The book includes guidance on understanding the system firmware build procedure, integrating pieces of firmware and allowing configuration, updating system firmware, creating a development infrastructure for allowing multi-party collaboration in firmware development, and gaining advanced system firmware debugging knowledge. After reading the book you will be able to assume better control while developing your own firmware and know how to interact with native hardware while debugging. You will understand key principles for future firmware development using newer technology, and be ready for the introduction of modern safe programming languages for firmware development. Detailed system firmware development case studies using a futuristic approach cover: Future scalable system firmware development models Types of firmware development (system firmware, device firmware, manageability firmware) Tools and their usage while creating system firmware How to build infrastructure for seamless firmware development using a multi-party development model Debugging methodologies used during various phases of firmware product development Setting up key expectations for future firmware, including thinner firmware footprints and faster execution time, easier configuration, and increased transparent security What You Will Learn Understand the system firmware working model of the future Gain knowledge to say goodbye to proprietary firmware for different types of firmware development Know the different types of tools required for creating firmware source code before flashing the final image into the boot device of the embedded system Develop skills to understand the failure in firmware or in the system and prepare the debugging environment to root cause the defects Discern the platform minimal security requirement Optimize the system firmware boot time based on the target hardware requirement Comprehend the product development cycle using open source firmware development.

System Firmware Subrata Banik, Vincent Zimmer, 2022-10-01 Find the right bootloader solution or combination of firmware required to boot a platform considering its security, product features, and optimized boot solutions. This book covers system boot firmware, focusing on real-world firmware migration from closed source to open source adaptation. The book provides an architectural overview of popular boot firmware. This includes both closed sourced and/or open source in nature, such as Unified Extensible Firmware Interface (UEFI), coreboot, and Slim Bootloader and their applicable market segments based on product development and deployment requirements. Traditional system firmware is often complex and closed sourced whereas modern firmware is still a kind of hybrid between closed and open source. But what might a future firmware model look like? The most simplistic boot firmware solution uses open source firmware development. This book helps you decide how to choose the right boot firmware for your products and develop your own boot firmware using open source. Coverage includes: Why open source firmware is used over closed source The pros and cons of closed and open source firmware A hybrid work model: for faster bring-up activity using closed source, binary integrated with open source firmware What You Will Learn Understand the architecture of standard and popular boot firmware Pick the correct bootloader for your required target hardware Design a hybrid workflow model for the latest chipset platform Understand popular payload architectures and offerings for embedded systems Select the right payload for your bootloader solution to boot to the operating system Optimize the system firmware boot time based on your target hardware requirement Know the product development cycle using open source firmware development Who This Book Is For Embedded firmware and software engineers migrating the product development from closed source firmware to open source firmware for product adaptation needs as well as engineers working for open source firmware development. A secondary audience includes engineers working on various bootloaders such as open source firmware, UEFI, and Slim Bootloader development, as well as undergraduate and graduate students working on developing firmware skill sets.

Quick Boot Pete Dice, 2017-12-04 Intro -- Acknowledgments -- Contents -- Foreword from the First Edition -- Chapter 1: System Firmware's Missing Link -- Chapter 2: Intel Architecture Basics -- Chapter 3: System Firmware Terms and Concepts -- Chapter 4: Silicon-Specific Initialization -- Chapter 5: Industry Standard Initialization -- Chapter 6: System Firmware Debug Techniques -- Chapter 7: Shells and Native Applications -- Chapter 8: Loading an Operating System -- Chapter 9: The Intel® Architecture Boot Flow -- Chapter 10: Bootstrapping Embedded -- Chapter 11: Intel's Fast Boot Technology -- Chapter 12: Collaborative Roles in Quick Boot -- Chapter 13: Legal Decisions -- Appendix A: Generating Serial Presence Detection Data for Down Memory Configurations -- Index.

Hardware/Firmware Interface Design Gary Stringham, 2009-10-31 Why care about hardware/firmware interaction? These interfaces are critical, a solid hardware design married with adaptive firmware can access all the capabilities of an application and overcome limitations caused by poor communication. For the first time, a book has come along that will help hardware engineers and firmware engineers work together to mitigate or eliminate problems that occur when hardware and firmware are not optimally compatible. Solving these issues will save time and money, getting products to market sooner to create more revenue. The principles and best practices presented in this book will prove to be a valuable resource for both hardware and firmware engineers. Topics include

register layout, interrupts, timing and performance, aborts, and errors. Real world cases studies will help to solidify the principles and best practices with an aim towards cleaner designs, shorter schedules, and better implementation! Reduce product development delays with the best practices in this book Concepts apply to ASICs, ASSPs, SoCs, and FPGAs Real-world examples and case studies highlight the good and bad of design processes

Building Secure Firmware Jiewen Yao,Vincent Zimmer,2020-12-14 Use this book to build secure firmware. As operating systems and hypervisors have become successively more hardened, malware has moved further down the stack and into firmware. Firmware represents the boundary between hardware and software, and given its persistence, mutability, and opaqueness to today's antivirus scanning technology, it represents an interesting target for attackers. As platforms are universally network-connected and can contain multiple devices with firmware, and a global supply chain feeds into platform firmware, assurance is critical for consumers, IT enterprises, and governments. This importance is highlighted by emergent requirements such as NIST SP800-193 for firmware resilience and NIST SP800-155 for firmware measurement. This book covers the secure implementation of various aspects of firmware, including standards-based firmware—such as support of the Trusted Computing Group (TCG), Desktop Management Task Force (DMTF), and Unified Extensible Firmware Interface (UEFI) specifications—and also provides code samples and use cases. Beyond the standards, alternate firmware implementations such as ARM Trusted Firmware and other device firmware implementations (such as platform roots of trust), are covered. What You Will learn Get an overview of proactive security development for firmware, including firmware threat modeling Understand the details of architecture, including protection, detection, recovery, integrity measurement, and access control Be familiar with best practices for secure firmware development, including trusted execution environments, cryptography, and language-based defenses Know the techniques used for security validation and maintenance Who This Book Is For Given the complexity of modern platform boot requirements and the threat landscape, this book is relevant for readers spanning from IT decision makers to developers building firmware

Microprogrammed Systems Daniel Mange,1992

Embedded Systems Firmware Demystified Ed Sutter,2002-02-15 * Understand essential hardware details * Walk through an embedded system startup * Build an extensible development platform * Prebuilt GNU X-Tools for 21 platforms Build embedded microprocessor-based systems from the ground up. Develop an integrated und

The Firmware Handbook Jack G. Ganssle,2004 This handbook provides a comprehensive reference for firmware developers looking to increase their skills and productivity. It addresses each critical step of the development process in detail, including how to optimize hardware design for better firmware. Topics covered include real-time issues, interrupts and ISRs, memory management (including Flash memory), handling both digital and analog peripherals, communications interfacing, math subroutines, error handling, design tools, and troubleshooting and debugging. The companion CD-ROM includes all the code used in the design examples and a searchable ebook version of the text. This book is not for the beginner, but rather is an in-depth, comprehensive one-volume reference that addresses all the major issues in firmware design and development, including the pertinent hardware issues. * Included CD-Rom contains all the source code used in the design examples, so engineers can easily use it in their own designs

Reusable Firmware Development Jacob Beningo,2017-12-06 Gain the knowledge and skills necessary to improve your embedded software and benefit from author Jacob Beningo's more than 15 years developing reusable and portable software for resource-constrained microcontroller-based systems. You will explore APIs, HALs, and driver development among other topics to acquire a solid foundation for improving your own software. Reusable Firmware Development: A Practical Approach to APIs, HALs and Drivers not only explains critical concepts, but also provides a plethora of examples, exercises, and case studies on how to use and implement the concepts. What You'll Learn Develop portable firmware using the C programming language Discover APIs and HALs, explore their differences, and see why they are important to developers of resource-constrained software Master microcontroller driver development concepts, strategies, and examples Write drivers that are reusable across multiple MCU families and vendors Improve the way software documented Design APIs and HALs for microcontroller-based systems Who This Book Is For Those with some prior experience with embedded programming.

Embedded Firmware Solutions Jiming Sun,2015 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, 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.

Quick Boot: a Guide for Embedded Firmware Developers Pete Dice,2013-05-21 Quick Boot is for those developers not familiar with Intel(R) Architecture in general who want to develop their own firmware to meet educational or commercial needs. Booting should be easy. While the open source community provides some raw code and materials, this book provides the guidance and explanations on how to create, craft, and hone them into a finished product. The majority of the technical ground in the system firmware space is not taught in college, and is normally learned only through many years of on-the-job experience. The goal is to make it easy for a designer new to Intel architecture to understand and optimize the firmware for their design, and ease the learning curve to develop and debug the code that gets system ready for the operating system.

Principles of Firmware Engineering in Microprogram Control Michael Andrews,1980 Firmware engineering is the practical application of scientific knowledge to the design of computer programs, and the construction and later associated documentation required to develop, operate, and maintain them. This book recognizes the broad implications of firmware engineering which no single text can fully cover. Rather, it is our intent to develop the significant phase of firmware engineering, namely the design and specification of microprogrammable control units. Our hope is to provide the firmware engineer with useful tools.

Microcontrollers. Hardware and firmware for 8-bit and 32-bit devices Franco Zappa,2020-04-01 The book discusses in details the main hardware and firmware fundamentals about micro- controllers. The goal is to present all the concepts necessary to understand and design an embedded system based on microcontrollers. The book discusses on: Binary logic and arithmetic; Embedded-systems basics; Low-end 8-bit microcontrollers by Microchip and STMicroelectronics; On-chip memories, Input/Output ports, peripherals; Assembly instruction sets; EasyPIC evaluation board by MikroElektronika; High-end 32-bit cores by ARM-Cortex; STM32F4 microprocessor by STMicroelectronics; Nucleo board for STM32F4 by STMicroelectronics; Custom developed board. The book is not targeted for just either low-end or high-end microcontrollers. Instead, the book fully describes both, moving from the basics of microcontroller systems, to 8-bit devices and then to the 32-bit ones. In fact, the book targets well-renowned, commercially-available microcontrollers by the microelectronic leaders in the field. As for low-end 8-bit microcontrollers, the book reviews the widely-spread and well-assessed devices by Microchip (the PIC16 family) and by STMicroelectronics (the ST6 family). Instead, as for high-end 32-bit microcontrollers, the book presents the leading-edge M3 and M4 cores by ARM-Cortex and its implementation by STMicroelectronics (the STM32F4 series). The Book is very modular and most Chapters can be used as stand-alone mini text books (e.g., Chapter 3 - "8-bit microcontrollers", Chapter 5 - "ARM-Cortex architectures", Chapter 6 - "STM32 microcontroller"). Moreover, Chapter 4 and Chapter 7 provide a very useful insight to electronic circuits employing microcontrollers and on-board components, by means of the EasyPIC v7 board by Mikroelektronika (for PIC microcontrollers) and Nucleo board by STmicroelectronics (for the STM32 ARM-Cortex M4

microcontrollers).

The Embedded PC's ISA Bus Edward Nisley,1997 -- Explains real-world techniques for using inexpensive PCs as intelligent controllers.-- Features tips and tricks for both hardware and software.-- Author has large readership from seven years as Circuit Cellar INK columnist.

The Firmware Handbook Jack Ganssle,2004

Implementing Configuration Management Fletcher J. Buckley,1996 Explains configuration management, an engineering discipline and process for maintaining the integrity of hardware, software, and firmware products as they evolve through the development and production stages, for implementers in both commercial and government environments. Outlines the four basic tasks: identification, change control, status accounting, and audits.

Digital Systems and Hardware/Firmware Algorithms Milos D. Ercegovac,Tomás Lang,1985-05-14 This modern treatment of digital system specification, analysis, and design covers all topics from gates and flip-flops to complex hardware and system software algorithms. An upper-level undergraduate/graduate text, it uses two complementary approaches--system model and algorithmic model--in dealing with structured analysis and design, and separates specification from implementation to allow for the ready application of concepts to practical system design. Extensive illustrations and 500 exercises.

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